



MANUAL

SENTRON

Protection devices

3VA Molded Case Circuit Breakers with UL and IEC Certification

SIEMENS

SENTRON

Protection devices
3VA molded case circuit breakers
with UL and IEC certification

Equipment Manual

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Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

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Introduction

1.1 About this documentation

3VA molded case circuit breakers with UL 489 certification for the North American market

The 3VA molded case circuit breakers from the portfolio of SENTRON protection, switching, measuring and monitoring devices ensure the reliable protection of people and property as integral components of efficient power distribution systems.

For global applications, a special product portfolio has been developed that has the required approvals according to standards UL 489 as well as IEC 60947. 3VA molded case circuit breakers certified to UL 489 are suitable for the following applications:

- Incoming circuit breakers (feeders) and outgoing circuit breakers (branches) in distribution systems
- Switching and protection devices for motors (motor protection in combination with a contactor and motor protection relay), transformers and capacitors
- Disconnecting means with features for stopping and switching off in an emergency (main disconnecting means and EMERGENCY-OFF switches) in conjunction with lockable rotary operators.

The 3VA molded case circuit breakers certified to UL are available in the following versions:

1. For line protection:
The overload and short-circuit releases are designed for the protection of wiring and non-motor loads.
2. For starter combinations:
These instantaneous trip circuit breakers are used for short-circuit protection as well as for the disconnecter function, which may be required in Combination Motor Controllers consisting of instantaneous trip circuit breaker, overload relay and motor contactor. These instantaneous trip circuit breakers are all equipped with adjustable, instantaneous short-circuit releases.
3. As molded case switches:
These molded case switches can be used as feeder switches, main switches or non-automatic circuit breakers without overload protection. They incorporate an integrated short-circuit self-protection system.

Scope of validity of this document

This manual has been specially compiled for the 3VA molded case circuit breakers certified to UL 489, or 3VA UL for short.

The accessories of the 3VA UL molded case circuit breakers are also described in this manual.

This manual serves as a reference manual for technical information regarding the configuration, commissioning and operation of 3VA UL molded case circuit breakers and corresponding accessories.

This manual does not purport to cover all details or variations in equipment, or to provide for every possible contingency in connection with installation, operation, or maintenance. Should additional information be desired, please refer to the individual product instruction sheets or contact the local Siemens sales office.

The contents of this manual shall not become part of or modify any prior or existing agreement, commitment, or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

1.2 Product-specific information

1.2.1 Target readers

Target readers of this documentation

The information contained in this manual is provided for the benefit of:

- Users
- Cubicle manufacturers
- Switchgear manufacturers
- Maintenance personnel

1.2.2 Technical Support

You can find further support on the Internet at:

TechnicalSupport (<https://www.siemens.com/support-request>)

1.2.3 Reference documents

Further documents

You will find more information in the following documents:

Title	Article number		Link
3VA IEC Molded Case Circuit Breakers Manual	DE	A5E03603177001	3VA molded case circuit breakers documentation (https://support.industry.siemens.com/cs/ww/en/view/90318775)
	EN	A5E03603177010	

Title	Article number		Link
Catalog LV 18 - Air Circuit Breakers and Molded Case Circuit Breakers with UL Certification	DE	E86060-K8280-E347-A8	3VA UL Molded Case Circuit Breakers Catalog (https://support.industry.siemens.com/cs/de/en/view/109761061)
	EN	E86060-K8280-E347-A7-7600	
3VA UL Molded Case Circuit Breakers Operating Instructions			3VA UL Molded Case Circuit Breakers Operating Instructions (https://support.industry.siemens.com/cs/ww/en/ps/man)
3VA Communication System Manual	DE	A5E03603182001	3VA molded case circuit breakers documentation (https://support.industry.siemens.com/cs/ww/en/view/98746267)
	EN	A5E03603182010	
Automatic Transfer Controller ATC5300 - Manual	DE	A5E02469034-01	ATC5300 Automatic Transfer Controller (https://support.industry.siemens.com/cs/ww/en/view/41909986)
	EN	A5E02469035-01	
ATSE - Remote Control Software Manual	DE	A5E02469028-01	ATSE - Remote Control Software Manual (https://support.industry.siemens.com/cs/ww/en/view/41909978)
	EN		
ATSE - Modbus Communication Protocol	DE	A5E02469001-01	ATSE - Modbus Communication Protocol (https://support.industry.siemens.com/cs/ww/en/view/40761679)
	EN		
Grundlagen der Niederspannungsschalttechnik (Fundamentals of Low-Voltage Switchgear and Controlgear), Siemens AG © 2008	—		—
Hartmut Kiank, Wolfgang Fruth: Planungseleitfaden für Energieverteilungsanlagen (Planning Guide for Power Distribution Plants), Publicis Publishing	ISBN: A19100-L531-B115		—
Schalten, Schützen, Verteilen in Niederspannungsnetzen (Switching, Protection and Distribution in Low-Voltage Networks), substantially extended and revised edition 1997	ISBN 3-89578-041-3		—

Description

2.1 Overview - applications and portfolio

This chapter provides an overview of all 3VA molded case circuit breakers with certification according to the North American standard UL 489 (3VA UL) and shows the areas in which the various molded case circuit breakers are used.

The topics discussed in this chapter are listed below:

- Applications and possible uses
- Aspects of the UL market - Low-voltage systems in the USA
- Portfolio
- Possible configurations
- Detailed information about applications and possible uses
- Technical specifications
- Molded case circuit breakers and accessories in the system

2.1.1 Applications and possible uses

The 3VA UL molded case circuit breakers can be used in various areas in infrastructure, industry or residential and commercial buildings where they perform different protection tasks.

Portions of this manual are intended to familiarize customers and users residing outside the North American market, who may build and export panels, with some of the unique aspects of UL Certified applications. This range of applications is very diverse, and they are typically solutions for industry.

Applications in infrastructure and buildings in the North American market are generally directly supported from within the respective regions.

The 3VA UL molded case circuit breakers are used for various functions as shown in the following table:

	3VA5	3VA6
Incoming circuit breakers (feeders) and outgoing circuit breakers (branches) in distribution systems	✓	✓
Switching and protection device for motors, transformers and capacitors	✓	✓
Disconnect unit	✓	✓
Application in DC systems	✓	
High breaking capacity		✓
Data transmission of measured data and status information (communication)		✓

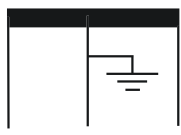
2.1.2 Aspects of the UL market - Low-voltage systems in the USA

This chapter is an excerpt from the UL guidelines. You will find the complete document under <https://xcelerator.siemens.com/global/en/industries/panel-building/north-american-standards.html> (<https://www.siemens.com/global/en/markets/panel-building/north-american-standards.html>).

Low-voltage systems in the USA

The usual line system configurations in the USA are very different from those found in Europe. Unlike in the IEC, there is a corner-grounded delta system in addition to the solidly grounded wye system, which is very similar to the TN-S system. In the USA / UL / NEC, all voltages that occur in the respective line system configuration are always specified (see table below). When devices are selected, very close attention must be paid to which line system configuration is present at the location of use and the line system configuration for which the individual devices are approved.

The main configurations in industry and in non-residential buildings are 3-phase networks with 240 V and 480 V, as well as 3- and 4-conductor systems with 480Y/277 V. In residential buildings and in office spaces of industrial and non-residential buildings, the single-phase system with 120/240 V can also be commonly found.

Industry and commercial		Residential
		
Solidly grounded wye, 3 phase, 4 wire	Corner grounded delta, 3 phase, 3 wire	Single phase, 120 / 240 V Grounded midpoint
Notice: The PE must not carry any current. There is no PEN conductor → N = "Grounded Conductor" (white or gray); for PE and N, separate conductors must be used.		Example: 120 V are used on the wall receptacle and 240 V for household cookers, air-conditioning units and laundry dryers.
600Y / 347 V ¹⁾	600 V	240 V to phase conductor
480Y / 277 V ¹⁾	480 V	120 V to ground
240Y / 131 V ¹⁾	240 V	
208Y / 120 V ¹⁾		

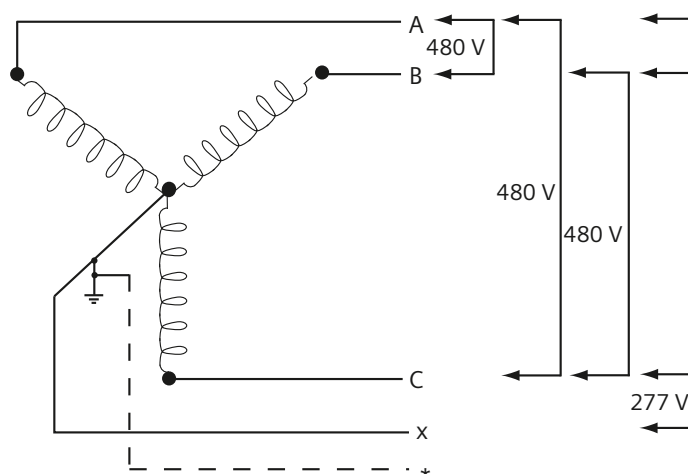
¹⁾ Y describes the "Solidly grounded circuit". The value "Y" indicates the voltage between the phases (e.g. 480 V), and the value behind the slash indicates the voltage between the phase and the grounding or the neutral conductor (e.g. 277 V with 480 V voltage between the phases).

Electric circuits with "straight" and "slash" voltages

In the USA, voltages are considered from the power supply company side or the secondary side of the power supply company transformers. The connection (wye or delta) of the electric circuit and the method of grounding play a major role here.

In electric circuits with a Grounded Wye, the circuit breaker only switches the full voltage between the phases (e.g. 480 V). The phase-to-ground voltage is only 277 V in this case, which explains the "slash" voltage of 480Y/277 V. Industrial Control Panels in which these devices are installed must be marked with the following inscription: "For use on a solidly grounded wye source only" (UL 508A Art. 54.12).

In non-grounded or high-resistance grounded star (wye) or delta circuits, and in corner-grounded delta circuits, only devices (e.g. circuit breakers) that are labeled with a "straight" voltage, such as 240 V, 480 V or 600 V, may be used. These devices must be able to switch the full voltage between the phases and between one phase to ground.



Grounded wye, 480 Y/277 V, 3-phase, 4-wire

Short-circuit strength of the control cabinet main (power) circuit

An industrial control panel must be marked with a short-circuit current rating (SCCR). In IEC terms, this corresponds approximately to the I_{cw} value of the panel. NEC 2017 Article 409 describes the specifications of the short circuit current rating markings on industrial control panels (with reference to UL 508A, SB4). For the short-circuit current rating, not only is the short-circuit breaking capacity (e.g. of the circuit breaker) relevant, but also the short-circuit current rating of each individual device. The SCCR-relevant components in the main circuit include circuit breakers, contactors, overload relays, and solid-state switching devices, as well as terminals, busbars, the line side of control transformers and frequency converters, but not the internal wiring of the control cabinet.

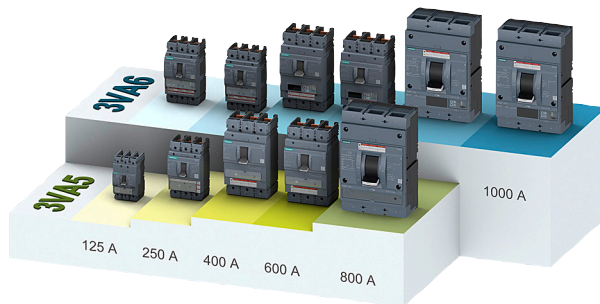
The lowest value applies to the entire control panel. A short-circuit current higher than this must not be available at the input terminals of the control cabinet.

2.1.3 Portfolio

The integrated 3VA UL portfolio consists of two different ranges of molded case circuit breakers in six different rated operational current versions (frame sizes).

Frame sizes

The new 3VA UL molded case circuit breakers set new standards in flexibility and the variety of modular accessories available. Standardized accessories suitable for use with several frame sizes across all ranges of the 3VA UL molded case circuit breaker as well as quick and easy installation help to cut costs and save time.



The new 3VA UL molded case circuit breakers are available in the following ranges:

- 3VA5 with thermal-magnetic trip units
- 3VA6 with electronic trip units

The 3VA5 molded case circuit breakers are available in the following versions:

- 1, 2, 3 and 4-pole versions in the frame size up to 125 A (3VA51)
- 2(3), 3 and 4-pole versions in the frame sizes up to 800 A (3VA52, 53, 54, 55)

The 3VA6 molded case circuit breakers are available in the following versions:

- 3- and 4-pole version

Depending on the range and frame size, the circuit breakers are suitable for rated operational currents ranging from 15 A to 1000 A and rated voltages up to 600 V AC.

3VA5 molded case circuit breakers



The new 3VA5 molded case circuit breakers reliably perform all the tasks required for line protection.

Features

The key features of the 3VA5 range are:

- Compact design
 - Number of poles available (dependent on frame size):
 - 1, 2, 3 and 4-pole versions in the frame size up to 125 A
 - 2(3)-pole¹⁾, 3 and 4-pole versions in the frame sizes 250 A, 400 A, 600 A and 800 A
- ¹⁾ 2-pole molded case circuit breaker in a 3-pole enclosure

- Breaking capacity (dependent on frame size):
 - Depending on the frame size and number of poles, up to 100 kA at 480 V AC and 50 kA at 600 V AC, as well as up to 100 kA at 750 V DC (in some cases 1000 V DC)
- Fixed mounting
- Thermal-magnetic trip units
- AC/DC applications
- Modular and easy-to-fit internal accessories with diverse functions
- Uniform accessories platform across all 3VA UL molded case circuit breakers

Compact dimensions

Due to its small dimensions, the 3VA UL molded case circuit breaker 125 A (3VA51) is ideally suited to the protection of cables and systems wherever space is limited.

In addition, the 3VA51 molded case circuit breaker is suitable for mounting on 35 mm DIN rails.

Thermal-magnetic trip units

The 3VA5 molded case circuit breakers have a thermal-magnetic trip unit with overload and short-circuit protection. This has been developed for implementing economical, cost-efficient installations up to 800 A. It is suitable for use in three-phase networks, AC networks, and 400 Hz applications and with DC currents.

3VA6 molded case circuit breakers



The new 3VA6 molded case circuit breakers reliably perform all the tasks required for line protection.

This range is designed for applications with more exacting requirements:

- Increased breaking capacity
- Compact dimensions
- Integrated metering function
- Connection to a fieldbus communications system

Features

The key features of the 3VA6 range are:

- Compact dimensions
- 3 and 4-pole versions
- Five breaking capacity classes with breaking capacities of
 - 35 kA up to 200 kA (E class) at 480 V AC
 - 18 kA up to 100 kA (E class) at 600 V AC
- Fixed mounting, plug-in technology, withdrawable technology
- Electronic trip units (ETU)

- Retrofittable communication for 5-series and 8-series ETUs
- Depending on the trip unit: Integrated metering function for voltages, currents, powers, etc.
- AC applications
- No derating up to +50 °C
- Modular and easy-to-fit internal accessories with diverse functions
- Uniform accessories platform across all 3VA UL molded case circuit breakers
- Electronic trip units (ETU) with a wide range of different setting values

Compact dimensions with expanded functionality

Besides the expanded functionality, the 3VA6 molded case circuit breaker is also characterized by its compact dimensions for fixed mounting. In addition, plug-in and withdrawable sockets are available for 3VA6 molded case circuit breakers. Fixed-mounted circuit breakers can be retrofitted for these mounting designs with little effort.

Moreover, the different breaking capacity classes available and the many possibilities afforded by the various electronic trip units also provide the flexibility needed for planning.

Electronic trip unit (ETU)

The current sensor of the 3VA6 molded case circuit breaker comprises an iron-cored transformer for the internal power supply and a Rogowski coil for precise sensing and measurement of the current values. Each of these transformers was specifically optimized for its task. Thanks to the high accuracy of current measurement achieved by the Rogowski coil, the 3VA6 molded case circuit breaker is suitable for power and energy measurement. In addition, finer adjustment of ground fault current monitoring is possible.

The electronic trip units (ETUs) provide the following protective functions:

- Overload protection L ("L" = Long-time delay)
Adjustable in steps from 40% to 100% of the rated operational current of the molded case circuit breaker.
- Short-time-delayed short-circuit protection S ("S" = Short-time delay) for time-selective response in case of a short circuit
- Instantaneous short-circuit protection I ("I" = instantaneous):
- Protection of the neutral conductor against overload and short-circuit ("N" = neutral)
- Protection against residual currents to ground ("G" = Ground fault).

Two possibilities are available for protection against residual currents to ground:

- Tripping of the breaker when a ground fault is present and thus disconnection of the system
- Alarm-only indication, via LED, that a ground fault is present. The signal is also available through communication and a digital output, when applied with the appropriate accessories.
The breaker is not tripped here, the system remains connected although the ground fault still exists.

3VA6 molded case circuit breakers with corresponding ETUs are available for both applications.

Energy management and communication

The electronic trip units (ETUs) provide the following energy management and communication functions:

- Metering functions for current, voltage, power and energy consumption
- Transfer of measured values and status information of the circuit breaker
- Remote parameterization of tripping thresholds and miscellaneous parameters
- Flexible use of digital inputs and outputs of the optionally available External Function Box EFB300
- Commissioning/setting the plant topology as well as individual circuit breaker parameters with the SENTRON Powerconfig software package
- Testing and archiving with the TD300, TD400 and TD500 test devices (with SENTRON Powerconfig)
- Condition monitoring (health indicator, remaining life time) makes predictive maintenance possible

100% rated versions of the 3VA UL molded case circuit breaker

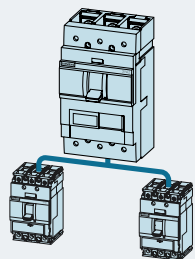
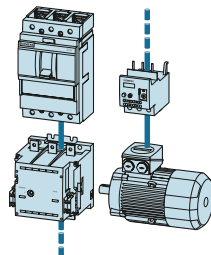
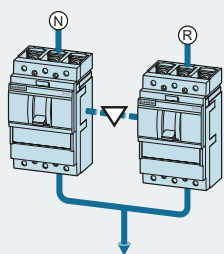
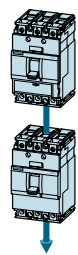
The US National Electrical Code, NEC recognizes two categories of overcurrent protective devices (OCPD) and has different required load calculations for their application. The two categories are standard OCPDs and OCPDs listed for operation at 100% of their rated operational current (commonly referred to as "100 % rated").

For standard OCPDs, the rating selected must be no less than the sum of 100% of the non-continuous loads and 125% of the continuous loads (3 hours or more). For OCPDs listed for operation at 100% of their rating, the calculation for the minimum rating is based on the sum of 100% of the non-continuous loads and 100% of the continuous loads.

For 100% rated circuit breakers, there are additional UL489 requirements for the wire connectors/lugs, conductor sizes and types, and minimum enclosure sizing.

100% rated versions are available for the 3VA6 molded case circuit breaker.

2.1.4 Detailed information about applications and possible uses

Application	3VA5	3VA6	Description
Line protection for AC and DC 	■	■	The trip units for line protection are designed for protection against overload and short-circuit in AC and DC supply systems (DC only with 3VA5 molded case circuit breakers): - of cables and wires - of non-motor loads
Protection for starter combinations (MCP) 	■	■	Starter combinations consist of: molded case circuit breaker + contactor + overload relay. In this case, the molded case circuit breaker provides the short-circuit protection and the disconnecter function. The contactor is responsible for operational switching of the feeder. The overload relay handles overload protection that can be specially matched to the motor. The molded case circuit breaker for the starter combination is therefore equipped with an adjustable and instantaneous short-circuit release.
Transfer switching equipment 	■	■	Transfer switching equipment switches loads on two independent supply networks. Transfer switching equipment is used to ensure a reliable supply after failure of the normal supply network.
Molded case switch 	■	■	These molded case switches can be used as feeder switches, main switches or disconnectors without overload protection. They incorporate an integrated short-circuit self-protection system.

2.1.5 Technical specifications

2.1.5.1 Technical specifications of 3VA51

Type			3VA51			3VA51			3VA51		
											
Number of poles			1-pole			2-pole			3-pole/4-pole		
Frame size		A	125			125			125		
Rated current I _n		A	15 ... 125			15 ... 125			15 ... 125		
Frequency		Hz	0 ... 400			0 ... 400			0 ... 400		
Electrical characteristics according to UL 489											
Rated voltage U _e 50/60 Hz AC		V	347			600 Y/347 and 480			600 Y/347 and 480		
Electrical characteristics according to IEC 60947-2											
Rated voltage U _e 50/60 Hz AC		V	415			415			690		
Rated insulation voltage U _i		V	500			600			800		
Rated impulse withstand voltage U _{imp}		kV	8			8			8		
Breaking capacity (line protection)			S	M	H	S	M	H	S	M	H
UL breaker type			SEAS	MEAS	HEAS	SEAS	MEAS	HEAS	SEAS	MEAS	HEAS
Short-circuit breaking capacity according to UL 489											
AC 50/60 Hz	120 V	kA	65	85	100	--	--	--	--	--	--
	240 V	kA	--	--	--	65	85	150	65	85	150
	277 V	kA	25	35	50	--	--	--	--	--	--
	347 V	kA	14	18	18	--	--	--	--	--	--
	480 Y/277 V	kA	--	--	--	25	35	65	25	35	65
	480 V	kA	--	--	--	25	35	65	25	35	65
	600 Y/347 V	kA	--	--	--	14	18	25	14	18	25
DC ¹⁾	125 V	kA	14	25	30	14	25	30	--	--	--
	250 V	kA	--	--	--	50	85	100	50	85	100
	500 V	kA	--	--	--	--	--	--	50	85	100
	600 V	kA	--	--	--	--	--	--	50	85	100
Short-circuit breaking capacity according to IEC 60947-2											
Rated ultimate short-circuit breaking capacity I _{cu} AC 50/60 Hz ²⁾	240 V	kA	25	36	55	55	85	150	55	85	150
	415 V	kA	5	5	5	36	55	70	36	55	70
	690 V	kA	--	--	--	--	--	--	5	7	10

Description

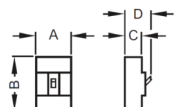
2.1 Overview - applications and portfolio

Type			3VA51			3VA51			3VA51		
Rated service short-circuit breaking capacity I_{cs} AC 50/60 Hz ²⁾	240 V	kA	25	36	55	55	85	150	55	85	150
	415 V	kA	5	5	5	36	55	70	36	55	70
	690 V	kA	--	--	--	--	--	--	5	5	5
DC ¹⁾	125 V	kA	14	25	30	14	25	30	--	--	--
	250 V	kA	--	--	--	50	85	100	50	85	100
	500 V	kA	--	--	--	--	--	--	50	85	100
	600 V	kA	--	--	--	--	--	--	50	85	100

¹⁾ For detailed data on DC breaking capacity, number of switching poles and circuit diagrams, see FAQ (<https://support.industry.siemens.com/cs/ww/en/view/109775443>) or Use of 3VA UL molded case circuit breaker in DC systems (Page 183)

²⁾ I_{cu} = rated ultimate short-circuit breaking capacity, rms value, acc. to IEC 60947-2
 I_{cs} = rated service short-circuit breaking capacity, rms value, acc. to IEC 60947-2

2.1.5.2 Dimensions of 3VA51

Type			3VA51	3VA51	3VA51
					
Number of poles			1-pole	2-pole	3-pole/4-pole
Frame size		A	125	125	125
Rated current I _n		A	15 ... 125	15 ... 125	15 ... 125
Frequency		Hz	0 ... 400	0 ... 400	0 ... 400
Dimensions					
	A	inch	1.0	2.0	3.0 (3P) 4.0 (4P)
		mm	25.4	50.8	76.2 (3P) 101.6 (4P)
	B	inch	5.51	5.51	5.51
		mm	140	140	140
	C	inch	3.01	3.01	3.01
		mm	76.5	76.5	76.5
	D	inch	3.72	3.72	3.72
		mm	94.5	94.5	94.5

2.1.5.3 Application of 3VA51

Type			3VA51		3VA51		3VA51	
								
Number of poles			1-pole		2-pole		3-pole/4-pole	

Type			3VA51	3VA51	3VA51
Frame size		A	125	125	125
Rated current I_n		A	15 ... 125	15 ... 125	15 ... 125
Frequency		Hz	0 ... 400	0 ... 400	0 ... 400
3VA5 molded case circuit breakers for line protection					
<i>Endurance (operating cycles)</i>					
Mechanical (CLOSE-OPEN cycles)			20000	20000	20000
Electrical at U_e 480 V (UL 489)/415 V (IEC 60947)			4000	4000	8000
<i>Trip units</i>					
FTFM	TM210		✓	✓	✓
FTAM	TM230		--	--	✓
ATAM	TM240		--	--	✓
3VA5 motor circuit protectors					
Rated current I_n		A	--	--	15 ... 125
Breaking capacity according to UL 489 without contactor at 480 V ¹⁾		kA	--	--	65
Approval according to IEC 60947-2 Annex O ICB			--	--	✓
<i>Integrated instantaneous short-circuit release for intrinsic device protection</i>					
AM	TM120M		--	--	✓
3VA5 molded case switches					
<i>Electrical characteristics according to UL 489</i>					
Rated uninterrupted current I_n at 40 °C ambient temperature for short-circuit current rating (SCCR) ²⁾	Up to 65 kA at 480 V	A	--	100	100
	Up to 100 kA at 480 V	A	--	--	--
Approval according to IEC 60947-2 Annex L CBI-X			--	✓	✓
<i>Integrated instantaneous short-circuit release for intrinsic device protection</i>					
FM	MCS110		--	✓	✓
Standards and regulations					
Standards and regulations			UL 489, IEC 60947-2	UL 489, IEC 60947-2	UL 489, IEC 60947-2
Direction of power flow and incoming supply			Top and bottom	Top and bottom	Top and bottom
Standard connection technology			No connection technology	No connection technology	No connection technology

¹⁾ Breaking capacities in combination with contactors (SCCR ratings) may differ

Description

2.1 Overview - applications and portfolio

²⁾ Breaking capacity (SCCR rating) is the maximum permissible short-circuit current at the installation location of the MCS in combination with an appropriate overload protection device

2.1.5.4 Technical specifications of 3VA52 / 3VA53 / 3VA54

Type			3VA52			3VA53			3VA54		
											
Number of poles			2-pole in 3-pole, 3-pole/4-pole			2-pole in 3-pole, 3-pole/4-pole			2-pole in 3-pole, 3-pole/4-pole		
Frame size		A	250			400			600		
Rated current I _n		A	40 ... 250			200 ... 400			450, 500, 600		
Frequency		Hz	0 ... 400			0 ... 400			0 ... 400		
Electrical characteristics according to UL 489											
Rated voltage U _e 50/60 Hz AC		V	600			600			600		
Electrical characteristics according to IEC 60947-2											
Rated voltage U _e 50/60 Hz AC		V	690			690			690		
Rated insulation voltage U _i		V	800			800			800		
Rated impulse withstand voltage U _{imp}		kV	8			8			8		
Breaking capacity (line protection)			M	H	C	M	H	C	M	H	C
UL breaker type			MFAS	HFAS	CFAS	MJAS	HJAS	CJAS	MLAS	HLAS	CLAS
Short-circuit breaking capacity according to UL 489											
AC 50/60 Hz	240 V	kA	85	100	200	85	100	200	85	100	200
	480 Y/ 277 V	kA	35	65	100	35	65	100	35	65	100
	480 V	kA	35	65	100	35	65	100	35	65	100
	600 Y/ 347 V	kA	18	25	35	20	25	35	20	25	35
	600 V	kA	18	25	35	20	25	35	20	25	35
DC ¹⁾	250 V	kA	50	85	100	50	85	100	50	85	100
	500 V	kA	50	85	100	50	85	100	50	85	100
	600 V	kA	50	85	100	50	85	100	50	85	100
	750 V	kA	50	85	100	50	85	100	50	85	100
	1000 V	kA	50	85	100	6	6	10	6	6	10
Short-circuit breaking capacity according to IEC 60947-2											

Type			3VA52			3VA53			3VA54		
Rated ultimate short-circuit breaking capacity I_{cu} AC 50/60 Hz ²⁾	240 V	kA	85	100	200	85	100	200	85	100	200
	415 V	kA	55	70	110 (3P) 85 (4P)	55	70	110	55	70	110
	690 V	kA	7	10	10	7	10	10	7	10	10
Rated service short-circuit breaking capacity I_{cs} AC 50/60 Hz ²⁾	240 V	kA	85	100	200	85	100	200	85	100	200
	415 V	kA	55	70	110 (3P) 85 (4P)	55	70	110	55	70	110
	690 V	kA	7	10	10	5	6	6	6	6	6
DC ¹⁾	125 V	kA	--	--	--	8	16	25	8	16	25
	250 V	kA	50	85	100	8	16	25	8	16	25
	500 V	kA	50	85	100	8	16	25	8	16	25
	600 V	kA	50	85	100	8	16	25	8	16	25
	750 V	kA	50	85	100	--	--	--	--	--	--
	1000 V	kA	25	36	50	--	--	--	--	--	--

¹⁾ For detailed data on DC breaking capacity, number of switching poles and circuit diagrams, see FAQ (<https://support.industry.siemens.com/cs/ww/en/view/109775443>) or Use of 3VA UL molded case circuit breaker in DC systems (Page 183)

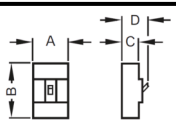
²⁾ I_{cu} = rated ultimate short-circuit breaking capacity, rms value, acc. to IEC 60947-2
 I_{cs} = rated service short-circuit breaking capacity, rms value, acc. to IEC 60947-2

2.1.5.5 Dimensions of 3VA52 / 3VA53 / 3VA54

Type			3VA52	3VA53	3VA54
					
Number of poles			2-pole in 3-pole, 3-pole/4-pole	2-pole in 3-pole, 3-pole/4-pole	2-pole in 3-pole, 3-pole/4-pole
Frame size		A	250	400	600
Rated current I_n		A	40 ... 250	200 ... 400	450, 500, 600
Frequency		Hz	0 ... 400	0 ... 400	0 ... 400
Dimensions					

Description

2.1 Overview - applications and portfolio

Type			3VA52	3VA53	3VA54
	A	inch	4.1 (3P)	5.43 (3P)	5.43 (3P)
			5.5 (4P)	7.24 (4P)	7.24 (4P)
		mm	105 (3P)	138 (3P)	138 (3P)
			139.6 (4P)	184 (4P)	184 (4P)
	B	inch	7.3	9.76	9.76
		mm	185	210	248
	C	inch	3.27	4.33	4.33
		mm	83	110	110
	D	inch	4.21	5.41	5.41
		mm	107	137.5	137.5

2.1.5.6 Application of 3VA52 / 3VA53 / 3VA54

Type			3VA52	3VA53	3VA54
					
Number of poles			2-pole in 3-pole, 3-pole/4-pole	2-pole in 3-pole, 3-pole/4-pole	2-pole in 3-pole, 3-pole/4-pole
Frame size		A	250	400	600
Rated current I_n		A	40 ... 250	200 ... 400	450, 500, 600
Frequency		Hz	0 ... 400	0 ... 400	0 ... 400
3VA5 molded case circuit breakers for line protection					
<i>Endurance (operating cycles)</i>					
Mechanical (CLOSE-OPEN cycles)			20000	20000	20000
Electrical at U_e 480 V (UL 489)/415 V (IEC 60947)			8000	6000	3000
<i>Trip units</i>					
FTFM	TM210		✓	--	--
FTAM	TM230		✓	✓	✓
ATAM	TM240		✓	✓	✓
3VA5 motor circuit protectors					
Rated current I_n		A	150 ... 250	250	400, 500, 600
Breaking capacity according to UL 489 without contactor at 480 V ¹⁾		kA	65/100	65/100	65/100
Approval according to IEC 60947-2 Annex O ICB			✓	✓	✓
<i>Integrated instantaneous short-circuit release for intrinsic device protection</i>					
AM	TM120M		✓	✓	✓
3VA5 molded case switches					

Type			3VA52	3VA53	3VA54
<i>Electrical characteristics according to UL 489</i>					
Rated uninterrupted current I_n at 40 °C ambient temperature for short-circuit current rating (SCCR) ²⁾	Up to 65 kA at 480 V	A	150, 250	400	600
	Up to 100 kA at 480 V	A	100, 150, 250	400	600
Approval according to IEC 60947-2 Annex L CBI-X			✓	✓	✓
<i>Integrated instantaneous short-circuit release for intrinsic device protection</i>					
FM	MCS110		✓	✓	✓
Standards and regulations					
Standards and regulations			UL 489, IEC 60947-2	UL 489, IEC 60947-2	UL 489, IEC 60947-2
Direction of power flow and incoming supply			Top and bottom	Top and bottom	Top and bottom
Standard connection technology			No connection technology	No connection technology	No connection technology

¹⁾ Breaking capacities in combination with contactors (SCCR ratings) may differ

²⁾ Breaking capacity (SCCR rating) is the maximum permissible short-circuit current at the installation location of the MCS in combination with an appropriate overload protection device

2.1.5.7 Technical specifications of 3VA55

Type			3VA55		
					
Number of poles			2-pole in 3-pole, 3-pole/4-pole		
Frame size		A	800		
Rated current I_n		A	600, 700, 800		
Frequency		Hz	0 ... 400		
Electrical characteristics according to UL 489					
Rated voltage U_e 50/60 Hz AC		V	600		
Electrical characteristics according to IEC 60947-2					
Rated voltage U_e 50/60 Hz AC		V	690		
Rated insulation voltage U_i		V	800		
Rated impulse withstand voltage U_{imp}		kV	8		
Breaking capacity (line protection)			M	H	C

Description

2.1 Overview - applications and portfolio

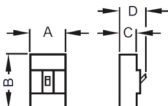
Type			3VA55								
UL breaker type			MMAS	HMAS	CMAS						
Short-circuit breaking capacity according to UL 489											
AC 50/60 Hz	240 V	kA	85	100	200						
	480 Y/ 277 V	kA	35	65	100						
	480 V	kA	35	65	100						
	600 Y/ 347 V	kA	18	25	50						
	600 V	kA	18	25	50						
DC ¹⁾	250 V	kA	50	85	100						
	500 V	kA	50	85	100						
	600 V	kA	50	85	100						
	750 V	kA	50	85	100						
	1000 V	kA	18	25	50						
Short-circuit breaking capacity according to IEC 60947-2											
Rated ultimate short-circuit breaking capacity I_{cu} AC 50/60 Hz ²⁾	240 V	kA	85	100	200						
	415 V	kA	55	70	110						
	690 V	kA	25	35	35						
Rated service short-circuit breaking capacity I_{cs} AC 50/60 Hz ²⁾	240 V	kA	85	100	150						
	415 V	kA	55	70	85						
	690 V	kA	19	19	19						
DC ¹⁾	125 V	kA	50	85	100						
	250 V	kA	50	85	100						
	500 V	kA	50	85	100						
	600 V	kA	50	85	100						
	750 V	kA	50	85	100						
	1000 V	kA	25	35	50						

¹⁾ For detailed data on DC breaking capacity, number of switching poles and circuit diagrams, see FAQ (<https://support.industry.siemens.com/cs/ww/en/view/109775443>) or Use of 3VA UL molded case circuit breaker in DC systems (Page 183)

²⁾ I_{cu} = rated ultimate short-circuit breaking capacity, rms value, acc. to IEC 60947-2
 I_{cs} = rated service short-circuit breaking capacity, rms value, acc. to IEC 60947-2

2.1.5.8 Dimensions of 3VA55

Type			3VA55		
					
Number of poles			2-pole in 3-pole, 3-pole/4-pole		
Frame size		A	800		
Rated current I_n		A	600, 700, 800		

Type			3VA55		
Frequency		Hz	0 ... 400		
Dimensions					
	A	inch	8.27 (3P) 11.02 (4P)		
		mm	201 (3P) 280 (4P)		
	B	inch	12.91		
		mm	328		
	C	inch	4.72		
		mm	120		
	D	inch	6.14		
		mm	156		

2.1.5.9 Application of 3VA55

Type			3VA55		
					
Number of poles			2-pole in 3-pole, 3-pole/4-pole		
Frame size		A	800		
Rated current I_n		A	600, 700, 800		
Frequency		Hz	0 ... 400		
3VA5 molded case circuit breakers for line protection					
<i>Endurance (operating cycles)</i>					
Mechanical (CLOSE-OPEN cycles)			10000		
Electrical at U_e 480 V (UL 489)/415 V (IEC 60947)			4800		
<i>Trip units</i>					
FTFM	TM210		--		
FTAM	TM230		✓		
ATAM	TM240		--		
3VA5 motor circuit protectors					
Rated current I_n		A	600, 800		
Breaking capacity according to UL 489 without contactor at 480 V ¹⁾		kA	65/100		
Approval according to IEC 60947-2 Annex O ICB			✓		
<i>Integrated instantaneous short-circuit release for intrinsic device protection</i>					

Description

2.1 Overview - applications and portfolio

Type			3VA55		
AM	TM120M		✓		
3VA5 molded case switches					
<i>Electrical characteristics according to UL 489</i>					
Rated uninterrupted current I_n at 40 °C ambient temperature for short-circuit current rating (SCCR) ²⁾	Up to 65 kA at 480 V	A	800		
	Up to 100 kA at 480 V	A	800		
Approval according to IEC 60947-2 Annex L CBI-X			✓		
<i>Integrated instantaneous short-circuit release for intrinsic device protection</i>					
FM	MCS110		✓		
Standards and regulations					
Standards and regulations			UL 489, IEC 60947-2		
Direction of power flow and incoming supply			Top and bottom		
Standard connection technology			Nut keeper kit		

¹⁾ Breaking capacities in combination with contactors (SCCR ratings) may differ

²⁾ Breaking capacity (SCCR rating) is the maximum permissible short-circuit current at the installation location of the MCS in combination with an appropriate overload protection device

2.1.5.10 Technical specifications of 3VA61 / 3VA62

Type			3VA61	3VA62
				
Number of poles			3-pole/4-pole	3-pole/4-pole
Frame size		A	150	250
Rated current I_n		A	40 ... 150	100, 250
Frequency		Hz	50 ... 60	50 ... 60
Electrical characteristics according to UL 489				
Rated voltage U_e 50/60 Hz AC		V	600	600
Electrical characteristics according to IEC 60947-2				
Rated voltage U_e 50/60 Hz AC		V	690	690
Rated insulation voltage U_i		V	800	800
Rated impulse withstand voltage U_{imp}		kV	8	8

Type			3VA61					3VA62				
Breaking capacity (line protection)			M	H	C	L	E	M	H	C	L	E
UL breaker type			MDAE	HDAE	CDAE	LDAE	EDAE	MFAE	HFAE	CFAE	LFAE	EF AE
Current limitation according to UL 489			--	--	--	--	✓	--	--	--	--	✓
Short-circuit breaking capacity according to UL 489												
AC 50/60 Hz	240 V	kA	100	100	200	200	--	100	100	200	200	--
	480 V/277 V	kA	35	65	100	150	200	35	65	100	150	200
	480 V	kA	35	65	100	150	200	35	65	100	150	200
	600 V/347 V	kA	18	22	35	50	100	18	22	35	50	100
	600 V	kA	18	22	35	50	100	18	22	35	50	100
Short-circuit breaking capacity according to IEC 60947-2												
Rated ultimate short-circuit breaking capacity I_{cu} AC 50/60 Hz ¹⁾	240 V	kA	85	110	150	200	--	85	110	150	200	--
	415 V	kA	55	85	110	150	150	55	85	110	150	150
	690 V	kA	2.5	2.5	2.5	2.5	3	3	3	3	3	3
Rated service short-circuit breaking capacity I_{cs} AC 50/60 Hz ¹⁾	240 V	kA	85	110	150	200	--	85	110	150	200	--
	415 V	kA	55	85	110	150	150	55	85	110	150	150
	690 V	kA	2.5	2.5	2.5	2.5	3	3	3	3	3	3

¹⁾ I_{cu} = rated ultimate short-circuit breaking capacity, rms value, acc. to IEC 60947-2

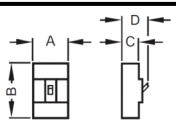
I_{cs} = rated service short-circuit breaking capacity, rms value, acc. to IEC 60947-2

2.1.5.11 Dimensions of 3VA61 / 3VA62

Type			3VA61	3VA62
				
Number of poles			3-pole/4-pole	3-pole/4-pole
Frame size		A	150	250
Rated current I_n		A	40 ... 150	100, 250
Frequency		Hz	50 ... 60	50 ... 60
Dimensions				

Description

2.1 Overview - applications and portfolio

Type			3VA61	3VA62
	A	inch	4.13 (3P) 5.51 (4P)	4.13 (3P) 5.51 (4P)
		mm	105 (3P) 140 (4P)	105 (3P) 140 (4P)
	B	inch	7.8	7.8
		mm	198	198
	C	inch	3.39	3.39
		mm	86	86
	D	inch	4.21	4.21
		mm	107	107

2.1.5.12 Application of 3VA61 / 3VA62

Type			3VA61	3VA62
				
Number of poles			3-pole/4-pole	3-pole/4-pole
Frame size		A	150	250
Rated current I_n		A	40 ... 150	100, 250
Frequency		Hz	50 ... 60	50 ... 60
3VA6 molded case circuit breakers for line protection				
<i>Endurance (operating cycles)</i>				
Mechanical (CLOSE-OPEN cycles)			25000	25000
Electrical at U_e 480 V (UL 489)/415 V (IEC 60947)			14000	9000
<i>Trip units</i>				
LI	ETU320		✓	✓
	ETU820		✓	✓
LIG	ETU330		✓	✓
	ETU830		✓	✓
LSI	ETU350		✓	✓
	ETU550		✓	✓
	ETU850		✓	✓
LSI (G alarm, no integrated G protection)	ETU556		✓	✓
	ETU856		✓	✓
LSIG	ETU560		✓	✓
	ETU860		✓	✓
3VA6 motor circuit protectors				
Rated current I_n		A	25 ... 100	110 ... 200

Type			3VA61	3VA62
Breaking capacity according to UL 489 without contactor at 480 V ¹⁾		kA	100	100
Approval according to IEC 60947-2 Annex O ICB			✓	✓
<i>Integrated instantaneous short-circuit release for intrinsic device protection</i>				
I	ETU310M		✓	✓
Standards and regulations				
Standards and regulations			UL 489, IEC 60947-2	UL 489, IEC 60947-2
Direction of power flow and incoming supply			Top and bottom	Top and bottom
Standard connection technology			No connection technology	No connection technology

¹⁾ Breaking capacities in combination with contactors (SCCR ratings) may differ

2.1.5.13 Technical specifications of 3VA63 / 3VA64

Type			3VA63					3VA64				
												
Number of poles			3-pole/4-pole					3-pole/4-pole				
Frame size		A	400					600				
Rated current I _n		A	250, 400					400, 600				
Frequency		Hz	50 ... 60					50 ... 60				
Electrical characteristics according to UL 489												
Rated voltage U _e 50/60 Hz AC		V	600					600				
Electrical characteristics according to IEC 60947-2												
Rated voltage U _e 50/60 Hz AC		V	690					690				
Rated insulation voltage U _i		V	800					800				
Rated impulse withstand voltage U _{imp}		kV	8					8				
Breaking capacity (line protection)			M	H	C	L	E	M	H	C	L	E
UL breaker type			MJAE	HJAE	CJAE	LJAE	EJAE	MLAE	HLAE	CLAE	LLAE	ELAE
Current limitation according to UL 489			--	--	--	--	✓	--	--	--	--	✓
Short-circuit breaking capacity according to UL 489												

Description

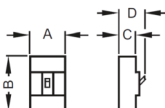
2.1 Overview - applications and portfolio

Type			3VA63					3VA64				
AC 50/60 Hz	240 V	kA	100	100	200	200	--	100	100	200	200	--
	480 Y/ 277 V	kA	35	65	100	150	200	35	65	100	150	200
	480 V	kA	35	65	100	150	200	35	65	100	150	200
	600 Y/ 347 V	kA	18	22	35	50	100	18	22	35	50	100
	600 V	kA	18	22	35	50	100	18	22	35	50	100
Short-circuit breaking capacity according to IEC 60947-2												
Rated ultimate short-circuit breaking capacity I _{cu} AC 50/60 Hz ¹⁾	240 V	kA	85	110	150	200	--	85	110	150	200	--
	415 V	kA	55	85	110	150	150	55	85	110	150	150
	690 V	kA	5	5	5	5	6	6	6	6	6	6
Rated service short-circuit breaking capacity I _{cs} AC 50/60 Hz ¹⁾	240 V	kA	85	110	150	200	--	85	110	150	200	--
	415 V	kA	55	85	110	150	150	55	85	110	150	150
	690 V	kA	5	5	5	5	6	6	6	6	6	6

¹⁾ I_{cu} = rated ultimate short-circuit breaking capacity, rms value, acc. to IEC 60947-2

I_{cs} = rated service short-circuit breaking capacity, rms value, acc. to IEC 60947-2

2.1.5.14 Dimensions of 3VA63 / 3VA64

Type			3VA63	3VA64	
					
Number of poles			3-pole/4-pole	3-pole/4-pole	
Frame size		A	400	600	
Rated current I _n		A	250, 400	400, 600	
Frequency		Hz	50 ... 60	50 ... 60	
Dimensions					
	A	inch	5.43 (3P) 7.24 (4P)	5.43 (3P) 7.24 (4P)	
		mm	138 (3P) 184 (4P)	138 (3P) 184 (4P)	
		B	inch	9.76	9.76
			mm	248	248
	C	inch	4.33	4.33	
		mm	110	110	
	D	inch	5.39	5.39	
		mm	137	137	

2.1.5.15 Application of 3VA63 / 3VA64

Type			3VA63	3VA64
				
Number of poles			3-pole/4-pole	3-pole/4-pole
Frame size		A	400	600
Rated current I_n		A	250, 400	100, 600
Frequency		Hz	50 ... 60	50 ... 60
3VA6 molded case circuit breakers for line protection				
<i>Endurance (operating cycles)</i>				
Mechanical (CLOSE-OPEN cycles)			15000	15000
Electrical at U_e 480 V (UL 489)/415 V (IEC 60947)			6000	4000
<i>Trip units</i>				
LI	ETU320		✓	✓
	ETU820		✓	✓
LIG	ETU330		✓	✓
	ETU830		✓	✓
LSI	ETU350		✓	✓
	ETU550		✓	✓
	ETU850		✓	✓
LSI (G alarm, no integrated G protection)	ETU556		✓	✓
	ETU856		✓	✓
LSIG	ETU560		✓	✓
	ETU860		✓	✓
3VA6 motor circuit protectors				
Rated current I_n		A	200, 250	400, 500
Breaking capacity according to UL 489 without contactor at 480 V ¹⁾		kA	100	100
Approval according to IEC 60947-2 Annex O ICB			✓	✓
<i>Integrated instantaneous short-circuit release for intrinsic device protection</i>				
I	ETU310M		✓	✓
Standards and regulations				
Standards and regulations			UL 489, IEC 60947-2	UL 489, IEC 60947-2
Direction of power flow and incoming supply			Top and bottom	Top and bottom
Standard connection technology			No connection technology	No connection technology

¹⁾ Breaking capacities in combination with contactors (SCCR ratings) may differ

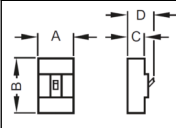
2.1.5.16 Technical specifications of 3VA65 / 3VA66

Type			3VA65			3VA66		
Number of poles			3-pole/4-pole			3-pole/4-pole		
Frame size		A	800			1000		
Rated current I _n		A	600, 800			1000		
Frequency		Hz	50 ... 60			50 ... 60		
Electrical characteristics according to UL 489								
Rated voltage U _e 50/60 Hz AC		V	600			600		
Electrical characteristics according to IEC 60947-2								
Rated voltage U _e 50/60 Hz AC		V	690			690		
Rated insulation voltage U _i		V	800			800		
Rated impulse withstand voltage U _{imp}		kV	8			8		
Breaking capacity (line protection)			M	H	C	M	H	C
UL breaker type			MMAE	HMAE	CMAE	MMNAE	HMNAE	CLMNE
Current limitation according to UL 489			--	--	--	--	--	--
Short-circuit breaking capacity according to UL 489								
AC 50/60 Hz	240 V	kA	100	150	200	100	150	200
	480 Y/ 277 V	kA	35	65	100	35	65	100
	480 V	kA	35	65	100	35	65	100
	600 Y/ 347 V	kA	25	35	50	25	35	50
	600 V	kA	25	35	50	25	35	50
Short-circuit breaking capacity according to IEC 60947-2								
Rated ultimate short-circuit breaking capacity I _{cu} AC 50/60 Hz ¹⁾	240 V	kA	85	110	200	85	110	200
	415 V	kA	55	85	110	55	85	110
	690 V	kA	25	35	35	25	35	35
Rated service short-circuit breaking capacity I _{cs} AC 50/60 Hz ¹⁾	240 V	kA	85	110	150	85	110	150
	415 V	kA	55	85	85	55	85	85
	690 V	kA	19	19	19	19	19	19

¹⁾ I_{cu} = rated ultimate short-circuit breaking capacity, rms value, acc. to IEC 60947-2

I_{cs} = rated service short-circuit breaking capacity, rms value, acc. to IEC 60947-2

2.1.5.17 Dimensions of 3VA65 / 3VA66

Type			3VA65	3VA66
Number of poles			3-pole/4-pole	3-pole/4-pole
Frame size		A	800	1000
Rated current I_n		A	600, 800	1000
Frequency		Hz	50 ... 60	50 ... 60
Dimensions				
	A	inch	8.27 (3P) 11.02 (4P)	8.27 (3P) 11.02 (4P)
		mm	210 (3P) 280 (4P)	210 (3P) 280 (4P)
	B	inch	12.91	12.91
		mm	328	328
	C	inch	4.61	4.61
		mm	117	117
	D	inch	6.14	6.14
		mm	156	156

2.1.5.18 Application of 3VA65 / 3VA66

Type			3VA65	3VA66
Number of poles			3-pole/4-pole	3-pole/4-pole
Frame size		A	800	1000
Rated current I_n		A	600, 800	1000
Frequency		Hz	50 ... 60	50 ... 60
3VA6 molded case circuit breakers for line protection				
<i>Endurance (operating cycles)</i>				
Mechanical (CLOSE-OPEN cycles)			10000	10000
Electrical at U_e 480 V (UL 489)/415 V (IEC 60947)			5100	4900
<i>Trip units</i>				
LI	ETU320		✓	✓
	ETU820		✓	✓
LIG	ETU330		✓	✓
	ETU830		✓	✓
LSI	ETU350		✓	✓
	ETU550		✓	✓
	ETU850		--	--

Description

2.1 Overview - applications and portfolio

Type			3VA65	3VA66
LSI (G alarm, no integrated G protection)	ETU556		✓	✓
	ETU856		✓	✓
LSIG	ETU560		✓	✓
	ETU860		✓	✓
3VA6 motor circuit protectors				
Rated current I_n		A	800	--
Breaking capacity according to UL 489 without contactor at 480 V ¹⁾		kA	100	--
Approval according to IEC 60947-2 Annex O ICB			✓	--
<i>Integrated instantaneous short-circuit release for intrinsic device protection</i>				
I	ETU310M		✓	✓
Standards and regulations				
Standards and regulations			UL 489, IEC 60947-2	UL 489, IEC 60947-2
Direction of power flow and incoming supply			Top and bottom	Top and bottom
Standard connection technology			Nut keeper kit	Nut keeper kit

¹⁾ Breaking capacities in combination with contactors (SCCR ratings) may differ

2.1.6 Molded case circuit breakers and accessories in the system

The new 3VA UL molded case circuit breakers come with a large portfolio of accessory components that – depending on the type of accessory – can be flexibly installed internally or externally regardless of the frame size of circuit breaker.

The table below indicates which accessories are compatible with particular molded case circuit breakers, and which breaker frame sizes are compatible with the same accessory:

Accessories	3VA5					3VA6					
	3VA51 125 A	3VA52 250 A	3VA53 400 A	3VA54 600 A	3VA55 800 A	3VA61 150 A	3VA62 250 A	3VA63 400 A	3VA64 600 A	3VA65 800 A	3VA66 1000 A
Auxiliary switches and signaling switches	✓										
Auxiliary releases	✓										
Connection technology	✓	✓	✓		✓	✓		✓		✓	
Plug-in technology	--	--	--	--	--	✓		✓		--	--
Withdrawable technology	--	--	--	--	--	✓		✓		--	--
Front mounted rotary operator	✓	✓	✓		✓	✓		✓		✓	

2.1 Overview - applications and portfolio

Accessories	3VA5					3VA6					
	3VA51 125 A	3VA52 250 A	3VA53 400 A	3VA54 600 A	3VA55 800 A	3VA61 150 A	3VA62 250 A	3VA63 400 A	3VA64 600 A	3VA65 800 A	3VA66 1000 A
Door mounted rotary operator	✓	✓	✓		✓	✓		✓		✓	
Operator kit with Bowden cable / variable depth flange mounted operator	✓	✓	✓		✓	✓		✓		✓	
MO320 motor operator (mounted on the front)	✓	✓	✓		--	✓		✓		--	--
SEO520 motor operator with stored energy mechanism	--	✓	✓		--	✓		✓		--	--
Locking, blocking and interlocking systems	✓	✓	✓		✓	✓		✓		✓	
Communication link	--	--	--	--	--	✓		✓		✓	
EFB300	--	--	--	--	--			✓			
MMB300	--	--	--	--	--			✓			
Testing and commissioning devices	--	--	--	--	--			✓			
Cover frame	✓	✓	✓		✓	✓		✓		✓	

[illegible]

This chapter provides an overview of the ergonomic design features of the new 3VA UL molded case circuit breakers and explains what makes them so special.

- Optional installation variants
- Color-coded indication of switching position in the withdrawable unit
- Clear status display
- Active illumination
- Ergonomic handle

- Color-coded operator controls
- Broad range of accessories
- Connection options

Integrated system

The 3VA UL molded case circuit breakers set new standards, not only in terms of their technical features and functional scope, but also in terms of their design.

The new 3VA UL range provides an integrated system with regard to operation, functionality and installation. This principle is embodied in the basic units and in all internal and external accessories.

The internal and external accessories of the 3VA UL molded case circuit breakers offer the following benefits:

- Standardized methods of operation
- Standardized scope of functions
- Standardized installation procedures
- The same internal accessories for all circuit breaker frame sizes from 125 A to 1000 A (auxiliary switches, auxiliary releases)

2.2.1 Installation variants for 3VA UL

To ensure full flexibility when planning a system, the molded case circuit breaker range can be extended with additional components in such a way that operability is guaranteed in every situation.

The following components can be installed to suit the installation location:

- Front mounted rotary operator
- Door mounted rotary operator
- Operator kit with Bowden cable (Max-Flex™ operator)
- Variable depth flange mounted operator
- Motor operator

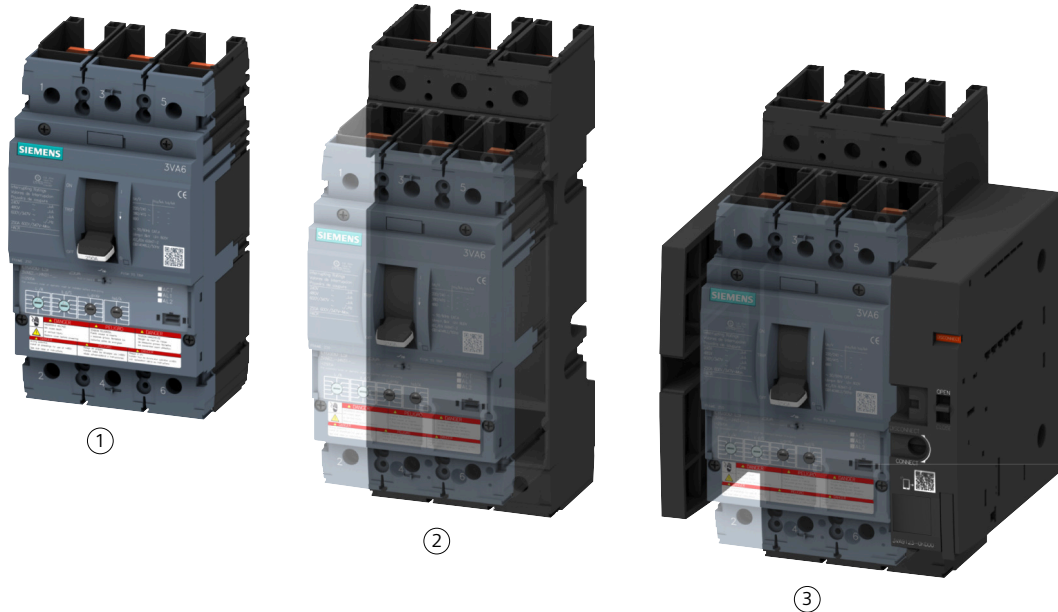
When the 3VA UL molded case circuit breaker is in the OFF position, it ensures that the circuit is reliably disconnected in all current paths. The clearances dimensioned according to UL 489 ensure that, in the event of overvoltages between input and output, isolation is maintained.

The main switch functionality is not diminished by installation of the following accessories:

- Motor operator
- Manual operators
- Plug-in and withdrawable design

Optional installation variants

The 3VA UL molded case circuit breakers are available in the following installation variants:



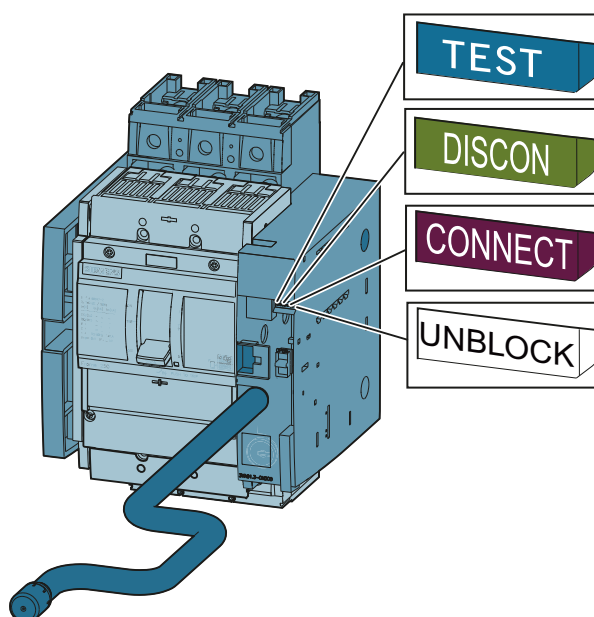
- Fixed-mounted ①
- Plug-in technology up to 600 A ②
- Withdrawable technology up to 600 A ③

Plug-in and withdrawable designs provide the option of quickly replacing the molded case circuit breakers during maintenance and of establishing visible electrical isolation in the main circuit, when the breaker is removed.

The terminals of the circuit breakers and their corresponding plug-in or withdrawable socket are designed the same. This means that all connectors, terminal covers and other connection elements can be mounted on the bases exactly as they would mount on the breakers.

Indication of breaker positions in the withdrawable unit

The picture below illustrates the colors used to indicate the breaker position in the withdrawable unit:



The breaker position is indicated in a window of the withdrawable unit and is clearly color-coded, enabling immediate identification of the current position of the molded case circuit breaker.

The withdrawable unit has three positions:

- **CONNECT:**
The molded case circuit breaker is connected to the main circuit. The auxiliary circuits are also connected.
- **TEST:**
In the TEST position, the main contacts of the molded case circuit breaker are not connected to the main circuit, but the auxiliary components are connected to the control circuit. This allows the functionality of the auxiliary circuit and all of its components (auxiliary switches, auxiliary releases, communication, etc.) to be tested when the main circuit is open.
- **DISCONNECT:**
The molded case circuit breaker is not connected to the main circuit or to the auxiliary circuit. The molded case circuit breaker can be removed.
- **UNBLOCK:**
The molded case circuit breaker is not in any of the positions defined above and can be moved by means of the crank handle.

2.2 Ergonomic design

Motor operator for remote control

3VA UL molded case circuit breakers can also be controlled remotely. Whether the circuit breaker is controlled from "just" the other side of the closed control cabinet door, or the breaker is switched on via a control room, operator panel, etc., is irrelevant.

Motor operators are available as accessories for remote control of the circuit breakers.

2.2.2 Ergonomic design of circuit breakers, handles and operator kit

Ergonomic handle



With its wide surface area, the ergonomic handle is designed to assist manual operation of the circuit breaker. The white strip around the edge of the handle makes it easy to identify in conditions of poor visibility. The additional ampere rating information stamped on the white strip also significantly eases identification of the circuit breaker when it is one of many breakers in a large panel installation.

Clear status display



The possible breaker positions of manual rotary operators are listed below:

- ON - red marking
- TRIP - yellow marking
- OFF - green marking

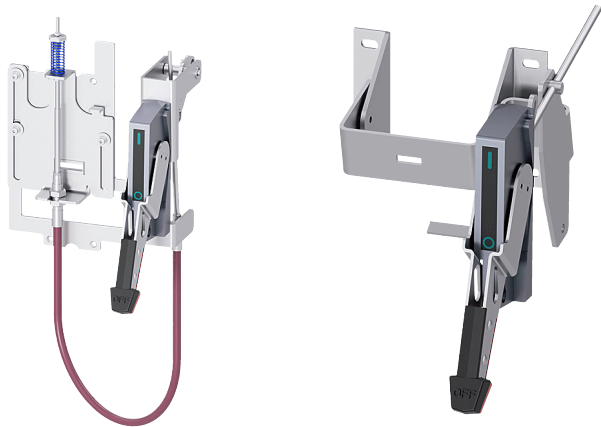
The handle clearly engages in one of these positions depending on the status of the molded case circuit breaker. The breaker positions are color-coded so that you can identify the status of the circuit breaker at a glance.

Active illumination



You can retrofit an active illumination kit to manual rotary operators. The illuminated indicator in the rotary handle signals the relevant breaker position in the colors red, yellow and green. This provides clear visualization of the breaker position on-site in conditions of poor visibility.

Operator kit with Bowden cable (Max-Flex operator) / variable depth flange mounted operator



The operator kit with Bowden cable / variable depth flange mounted operator is a manual handle operating mechanism for operating the breaker from the outside of the control cabinet. The handle is connected to the switching mechanism via a Bowden cable / rigid rod.

Color-coded operator controls

The operator controls on the thermal-magnetic and electronic trip units are color-coded.

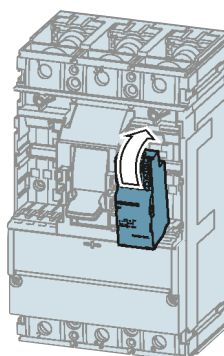


Each colored operator control is assigned to a corresponding protective function, helping you to make the required settings quickly.

Color	Function
 Petrol	Overload protection
 Black	Short-circuit protection, ground-fault protection
 Gray	Neutral conductor protection

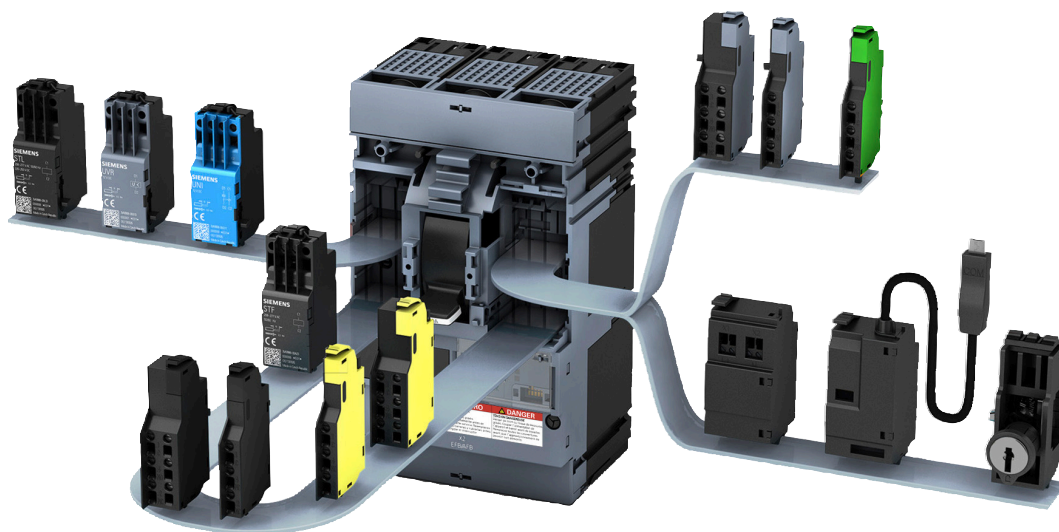
2.2.3 Wide range of accessories

The internal accessories (e.g. alarm and auxiliary switches, auxiliary releases, etc.) all belong to one family and can be installed within the 3VA5 and 3VA6 series regardless of the circuit breaker frame size. Installation is carried out quickly and easily by simply snapping on and screwing the connecting cables. Through color and mechanical coding and corresponding information found inside the lid of the accessories compartment, installation at the right place in the circuit breaker is ensured.



Color coding of accessories

The internal accessories are color coded to clearly indicate their specific function.



A system of color coding has been used to clearly identify the specific functions of individual accessories:

Color	Auxiliary switches and alarm switches	Auxiliary releases
Black	Auxiliary switch AUX	Shunt trip left STL
		Shunt trip flexible STF

2.2 Ergonomic design

Color	Auxiliary switches and alarm switches	Auxiliary releases
Gray	Leading changeover switch LCS	Undervoltage release UVR
Yellow	Trip alarm switch TAS	
Green	Electrical alarm switch EAS	
Blue		Universal release UNI

The cylinder lock and communication accessories shown next to the internal accessories are explained in chapters Locking and interlocking (Page 394) and Communication and system integration (Page 419).

Fast assembly of motor operators

The motor operators have been designed for quick and easy mounting and removal. The internal accessories are therefore easily accessible.



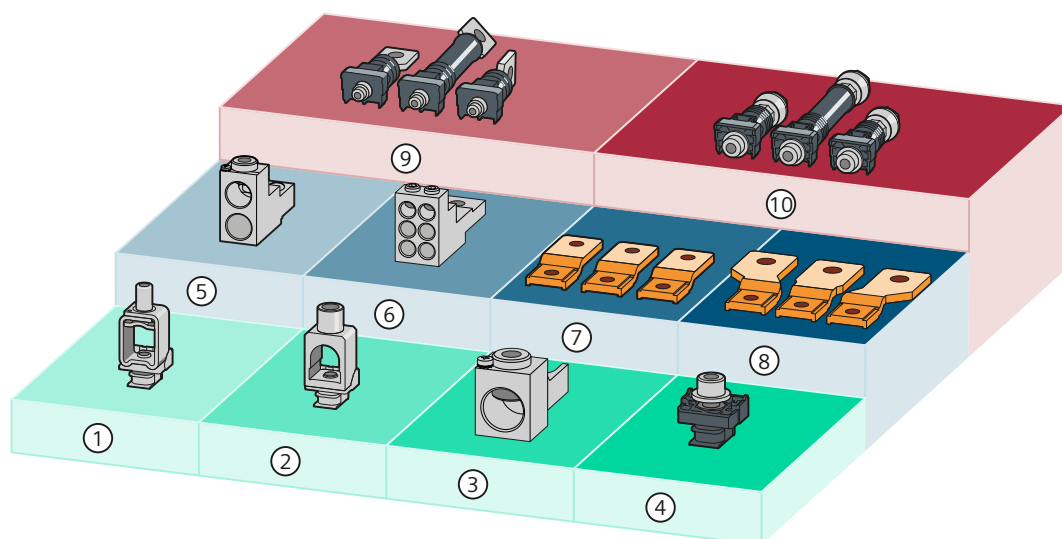
2.2.4 Connection technology

A large selection of terminals and connectors are available for the new range of 3VA UL molded case circuit breakers.

The supported cable cross-sections are based on the frame size of the molded case circuit breaker and the cable terminals used. The terminals are fitted either internally or externally to the molded case circuit breaker.

The connection technology can be easily integrated in the new range of 3VA UL molded case circuit breakers.

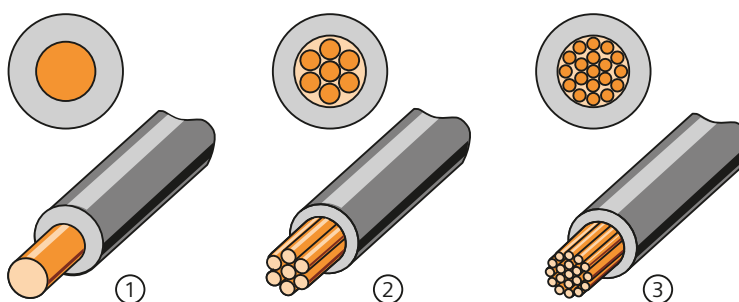
With it you can implement various front and rear main conductor connections for the molded case circuit breakers in all types of installation (fixed-mounted, plug-in and withdrawable).



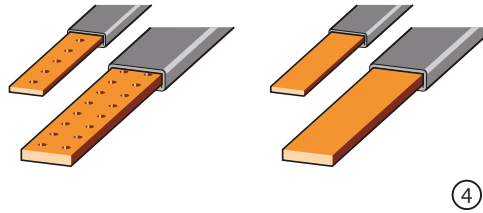
- | | |
|-------------------------------|--|
| ① Box terminal | ⑥ Distribution wire connector for 6 cables |
| ② Wire connector | ⑦ Front bus connectors extended |
| ③ Wire connector, large | ⑧ Front bus connectors broadened ¹⁾ |
| ④ Nut keeper kit | ⑨ Rear connection stud flat |
| ⑤ Wire connector for 2 cables | ⑩ Rear connection stud round |
- ¹⁾ Only available with frame size 400 A and higher

Cables and busbars

The new range of 3VA UL molded case circuit breakers are designed for different cables and busbars:



- Different cable types, e.g.
 - ① Circular conductor - UL cable class Solid
 - ② Stranded - UL cable class B
 - ③ Stranded - UL cable class C



- ④ Rigid busbars
- Different materials
 - Cables/busbars made of copper
 - Cables/busbars made of aluminum

2.3 Technical details

This chapter provides an overview of the technical details of the 3VA UL molded case circuit breakers.

The topics discussed in this chapter are listed below:

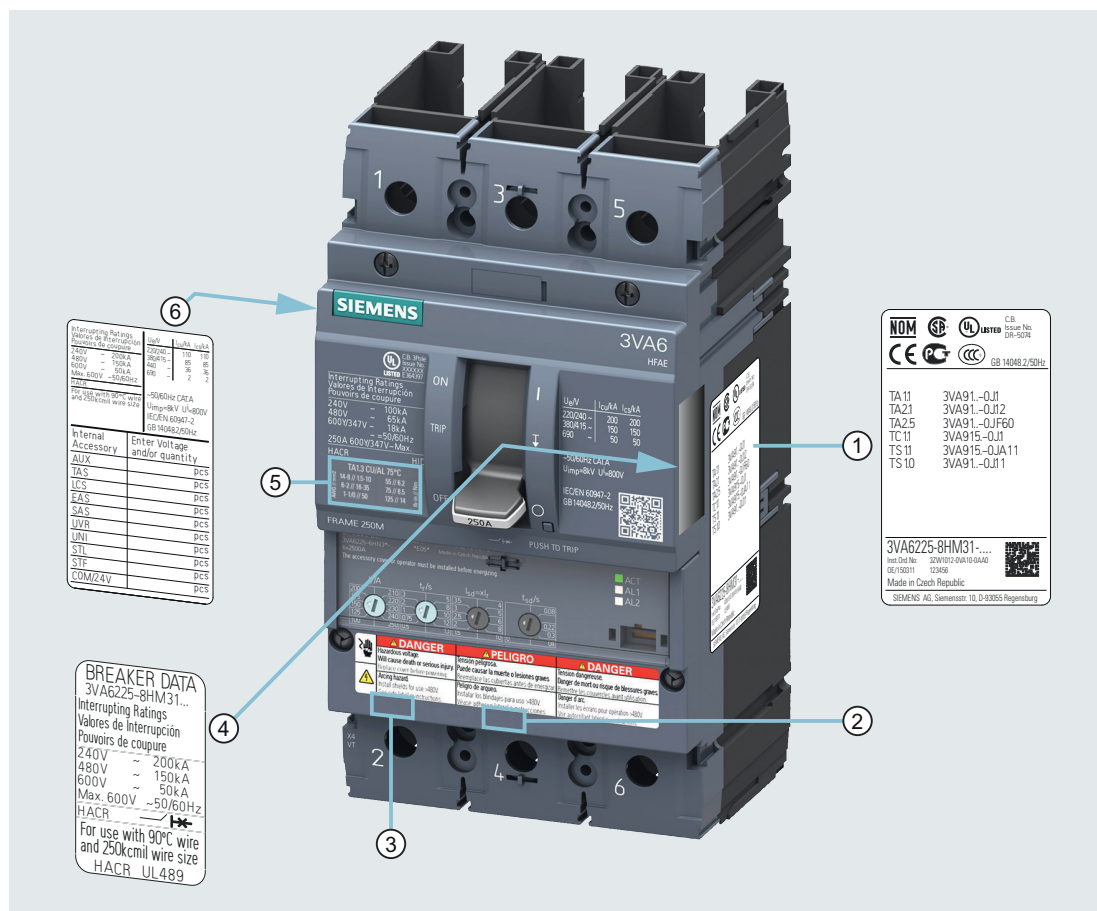
- Circuit breaker identification
- Operation
- Current limitation
- Breaking capacity

2.3.1 Circuit breaker identification

Each 3VA UL molded case circuit breaker can be clearly identified in several ways.

Circuit breaker labeling

Each 3VA UL molded case circuit breaker is labeled with all UL-required information and is thus clearly identifiable:



- ① "Connection information" adhesive label
- ② Connection socket for External Function Box EFB300 and Maintenance Mode Box MMB300 on the ETU
- ③ Connection possibility for an external current transformer (for neutral conductor protection, etc.)
- ④ Adhesive label insert (in accessories compartment)
- ⑤ "Detailed information on installed connection technology" adhesive label
- ⑥ "Internal accessories" adhesive label

Front panel: Labeling

The following information is displayed on the front panel of the circuit breaker:



- | | |
|------------------------------------|--|
| ① Circuit breaker designation | ⑨ Product version |
| ② UL Type Listing | ⑩ Circuit breaker article number (MLFB) |
| ③ CE approval mark | ⑪ Trip unit designation |
| ④ Key electrical data IEC | ⑫ Frame size and breaking capacity class |
| ⑤ Knowledge Manager (see below) | ⑬ Labeling field for installed connection technology |
| ⑥ Ampere rating | ⑭ Key electrical data NEMA |
| ⑦ Date and location of manufacture | ⑮ UL approval mark |
| ⑧ Safety labels | |

Knowledge Manager

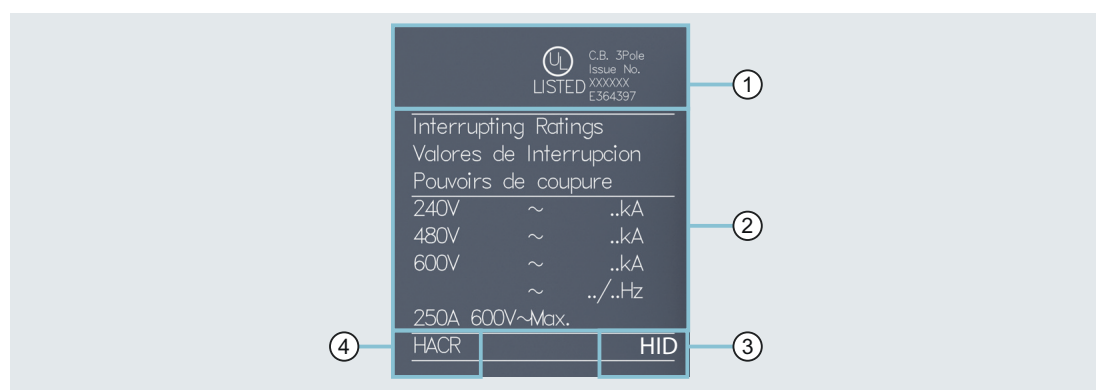
A QR code is attached in a clearly visible location to every 3VA UL molded case circuit breaker. This code can be scanned with a smartphone or a tablet PC. For the full range of QR code functions, use the "Industry Online Support" app supplied free of charge by Siemens.

All relevant product information regarding the molded case circuit breaker (e.g. operating instructions, characteristic curves, FAQ, etc.) can be quickly accessed and viewed in this way.



Key electrical data NEMA

The key electrical data for the UL market on the left side of the molded case circuit breaker (when viewed from above) contains the following information:



- ① cULus and NOM approval marks, if valid for this circuit breaker
- ② NEMA breaking capacity values with various voltages
- ③ HID type information (see below)
- ④ HACR type information (see below)

HID and SWD type information

Circuit breakers marked "SWD" (switching duty) are suitable for use in applications – up to max. 347 V – intended to switch fluorescent lighting loads on a regular basis.

SWD stands for Switching Duty.

Circuit breakers marked "HID" (high-intensity discharge) are suitable for use in applications intended to switch high-intensity discharge lighting loads on a regular basis.

HACR type information

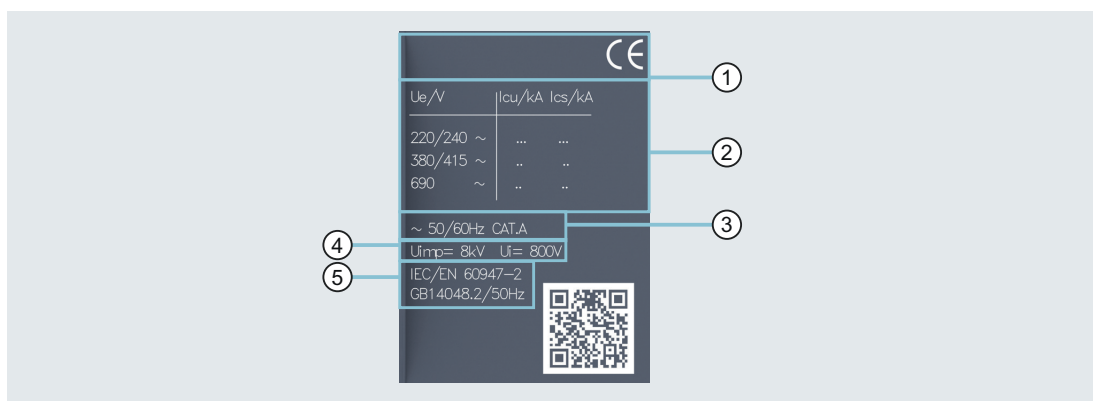
HACR stands for heating, air conditioning and refrigeration. The information on the circuit breaker states that the protection device may be used for overcurrent protection of corresponding systems.

HACR applications are a known example of installations with motor groups. Many modern heating systems operate with fans for exhaust air from combustion systems, exhaust control and ventilation systems for hot air. Air conditioning systems and refrigerators use compressors for coolant and fans for ventilation systems with cold air.

The HACR mark on molded case circuit breakers certified according to UL 489 is actually no longer required. Based on changes in the National Electrical Code® (NEC®) and in UL 489, all UL 489 certified switching devices today are automatically HACR certified and may bear the HACR mark.

Key electrical data IEC

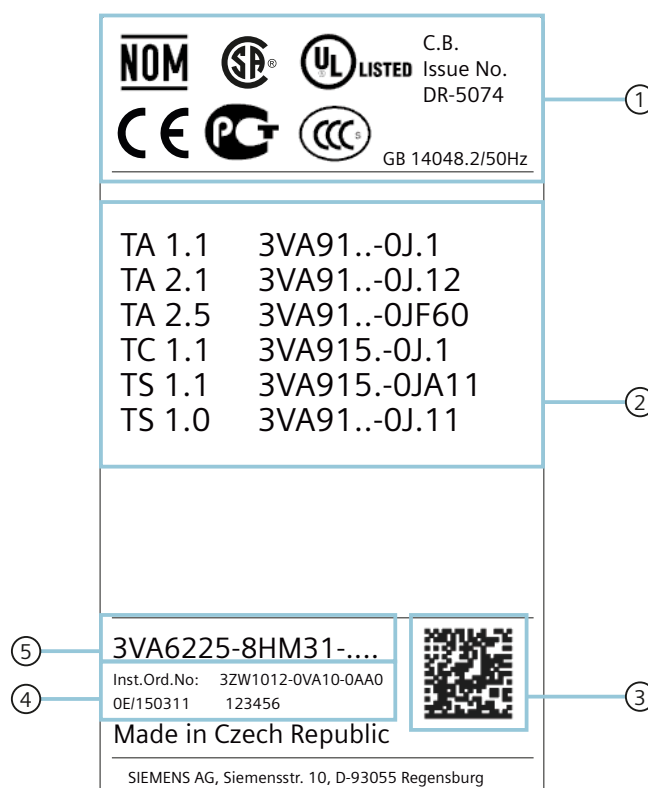
The key electrical data for the IEC market on the right side of the molded case circuit breaker (when viewed from above) contains the following information:



- ① CE, CCC, EAC, etc. approval marks, if valid for this circuit breaker
- ② IEC breaking capacity values at various voltages
- ③ Frequency, utilization category
- ④ Insulation data
- ⑤ Standards data according to IEC and SAC (Standardization Administration of the Peoples Republic of China)

"Connection information" adhesive label

The "Connection information" label is attached on the side and contains the following information:



- ① cULus, NOM, as well as CE, CCC, etc. approval marks, if valid for this circuit breaker
- ② List of allowed connection technology for this circuit breaker (see below)
- ③ 2D matrix code of production
- ④ Article number for operating instructions
- ⑤ Circuit breaker article number

List of allowed connection technology

The table shows the brief terminal designation, on the left, of all terminals and connections that may be installed with this circuit breaker. These terminal designations are unique.

On the right, in the table, are the order numbers for these terminals. The order number is also expressed with dots for wildcards if necessary. This is always the case when several packages are available in which the same terminals are used. The reason for this is that some terminals can be ordered individually or in multiple terminal packages.

2D matrix code of production

This is a production code that contains the article number of the device, production date, production facility and other information in encoded form.

This code can also be scanned with the free "Industry Support" app for smartphone and tablet PC. You then receive the same information as with the QR code on the device front.

Adhesive label insert

In the accessories compartment on the right, you can find two adhesive label inserts for 3VA UL: one for use of the circuit breaker in IEC applications and the other for use of the molded case circuit breaker in UL applications.

When an accessory (e.g. motor operator or manual operator) is mounted on the circuit breaker, this adhesive label can be attached to the accessory.

The adhesive labels are shown in the following example of the 3VA62 molded case circuit breaker. The adhesive labels are slightly different for molded case circuit breakers (MCCB), motor circuit protectors (MCP) and molded case switches (MCS). Ultimately, the following information is always specified:

- Article number MLFB
- Frame size
- Rated currents
- Breaking capacities at listed voltages

BREAKER DATA 3VA6225-8HM31...	
Interrupting Ratings Valores de Interrupción Pouvoirs de coupure	
240V ~	200kA
480V ~	150kA
600V ~	50kA
Max. 600V ~50/60Hz	
HACR	
For use with 90°C wire and 250kcmil wire size	
HACR UL489	

"Detailed information on installed connection technology" adhesive label

This adhesive label accompanies the various terminals. At this time, 3VA UL molded case circuit breakers up to 600 A can only be ordered without preassembled connection technology, i.e. terminals or connecting bars for the incoming and outgoing sides must be ordered separately for each circuit breaker. The adhesive label shown below is enclosed with the terminals in duplicate.

An area is kept free on the left side of the accessory cover for the purpose of attaching the adhesive label. The user thus always has all relevant information on the installed connection technology of the circuit breaker concerned.

The adhesive label contains the following information:

①	②
TA 1.1 CU / AL75°C	
AWG (mm ²)	lb-in (Nm)
14-12 (1.5-2.5)	25 (2.8)
10 (4-6)	35 (4)
8 (10)	55 (6.2)
6-3/0 (16-95)	100 (11)
④	③

- ① Unique brief terminal designation
- ② Permitted cable materials CU/AL with rated temperature
- ③ Tightening torque in pound-inch (lb-in) and newton meter (Nm)
- ④ Permitted cable diameter in AWG/kcmil and mm²

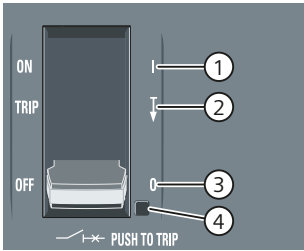
"Internal accessories" adhesive label

You can make a note of the number of installed accessory components on the "Internal accessories" adhesive label. This will enable you to ascertain which accessories are installed without removing the accessory cover and to use the information, for example, to reorder components. In addition, the breaking capacities according to UL 489 and IEC 60947-2 are named here again. This information is identical to the information on the accessory cover.

Interrupting Ratings Valores de Interrupción Pouvoirs de coupure 240V ~200kA 480V ~150kA 600V ~ 50kA MAX. 600V ~50/60Hz HACR For use with 90°C wire and 20k cmil wire size	<table><tr><th>U_e/V</th><th>I_{cu}/kA</th><th>I_{cs}/kA</th></tr><tr><td>220/240 ~</td><td>110</td><td>110</td></tr><tr><td>380/415 ~</td><td>85</td><td>85</td></tr><tr><td>440 ~</td><td>36</td><td>36</td></tr><tr><td>690 ~</td><td>10</td><td>5</td></tr></table> ~50/60Hz CAT.A $U_{imp}=8kV$ $U_i=800V$ IEC/EN 60947-2 GB 14048.2/50Hz	U_e/V	I_{cu}/kA	I_{cs}/kA	220/240 ~	110	110	380/415 ~	85	85	440 ~	36	36	690 ~	10	5
U_e/V	I_{cu}/kA	I_{cs}/kA														
220/240 ~	110	110														
380/415 ~	85	85														
440 ~	36	36														
690 ~	10	5														

Internal Accessory	Enter Voltage and/or quantity
AUX	pcs
TAS	pcs
LCS	pcs
EAS	pcs
UVR	pcs
UNI	pcs
STL	pcs
STF	pcs
COM/24V	pcs

2.3.2 Operation



- ① ON: Main contacts closed
- ② TRIP: Switching position following a trip
- ③ OFF: Main contacts open
- ④ PUSH TO TRIP: A mechanical trip is initiated using the button

The main contacts of the molded case circuit breakers are opened and closed by means of a handle mounted on the front of the unit. All contacts open and close simultaneously on all 3VA UL molded case circuit breakers when one of the following events occurs:

- The handle is moved from OFF to ON.
- The handle is moved from ON to OFF.
- The tripping mechanism is activated by a trip unit.
- The tripping mechanism is activated by auxiliary releases (e.g. shunt trips, trip units).

Reclosing the circuit breaker contacts from the TRIP position

Follow the steps below to reclose the circuit breaker contacts from the TRIP position:

1. Move the handle to the OFF position.
2. Move the handle to the ON position.
→ The breaker contacts are now closed.

Free tripping

All 3VA molded case circuit breakers have a free tripping capability. This function ensures that the breaker cannot be prevented from tripping even if the operator blocks or is held manually in the ON position or if the breaker is about to close.

Follow the steps below to test the free tripping function in order to verify that the breaker's mechanical release system is working correctly:

1. Move the handle to the ON position.
2. Hold the handle in the ON position and press the button marked <PUSH TO TRIP>.
→ The circuit breaker trips and opens the main contacts.
→ The handle moves quickly into the TRIP position as soon as you release it.

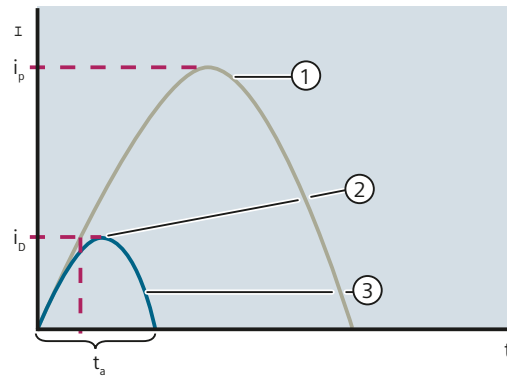
Failure of the molded case circuit breaker to trip indicates that it is defective and must be replaced.

2.3.3 Current limitation

"Current limitation" means that the peak value of the prospective peak short-circuit current i_p is limited to a smaller let-through current i_D .

The compact design of the breakers has been made possible by their excellent current limitation capabilities. In the event of a short circuit, the molded case circuit breaker significantly reduces the magnitude of let-through current, i.e. it reduces the current loading of downstream equipment (lower thermal load, fewer dynamic forces). The level of let-through energy is also reduced to a considerable extent.

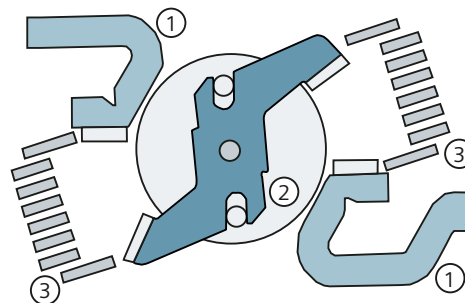
The 3VA UL molded case circuit breakers are designed as current-limiting molded case circuit breakers. The 3VA6 electronic molded case circuit breakers of breaking capacity class E (extremely high breaking capacity) have current-limiting certification according to UL 489.



- ① Unlimited current
- ② Peak value of limited current
- ③ Limited current
- i_D Let-through current
- i_p Unlimited peak short-circuit current
- t_a Break time

Rotary double-contact system

To achieve excellent current limitation, the 3VA UL molded case circuit breakers are equipped with a rotary double-contact system that opens dynamically - on its own - above the specified disengaging currents, on the principle of magnetic repulsion, before the expected peak value of the short-circuit current is reached. These limits have been coordinated and optimized to suit the overall device characteristics. This substantially reduces the thermal and mechanical loading on the molded case circuit breaker and the electrical installation.



- ① Fixed contacts
- ② Rotary contact system
- ③ Arc splitter chute

The switching pole cassettes are optimized for high breaking capacity, and their rotary double-contact system design enables extremely good current limiting thanks to the build-up of peak arc voltage generated at both contacts in the event of a short-circuit. This results in significant limitation of the let-through energy I^2t and the let-through current.

3VA molded case circuit breakers with a rated operational current $I_n > 600$ A are equipped with a single-break contact system in order to optimize the mounting depth.

2.4 Standards and guidelines

This chapter provides you with an overview of the standards and guidelines that are met with the 3VA UL molded case circuit breakers

The topics discussed in this chapter are listed below:

- Compliance with standards
- Electromagnetic compatibility
- Ambient conditions
- Degrees of protection

2.4.1 Compliance with standards and electromagnetic compatibility

The 3VA UL molded case circuit breakers meet the requirements of the following standards:

- UL 489
- UL 1053
- IEC / EN 60947-1
- IEC / EN 60947-2
- IEC / EN 60947-6-1
- CISPR11, Class A and Class B

The 3VA UL molded case circuit breakers are adequately protected against the following factors:

- Electrostatic charge
- Electrostatic discharge
- Electromagnetic waves, e.g. from transmission systems, mobile phones, radio telephone sets, radar systems, frequency converters, etc.
- Overvoltages, e.g. caused by lightning
- Voltage surges

2.4.2 Certificates

Information regarding available certifications such as cULus, CE and marine approvals can be found in our Service and Support Portal on the internet at the following link (<https://support.industry.siemens.com/cs/ww/en/ps/19479/cert>).

In the Entry List you can use the certificate type (general product approval, explosion protection, test certificates, shipbuilding, etc.) as a filter criterion.

2.4.3 Ambient conditions

Degree of pollution

Operation of the 3VA5 and 3VA6 molded case circuit breakers is approved in accordance with IEC / EN 60947-1 and IEC / EN 60664-1 for pollution degree 3.

Ambient temperature

3VA UL molded case circuit breakers may be used at ambient temperatures from -25 °C to +70 °C.

3VA UL thermal-magnetic circuit breakers are calibrated for use at +40 °C.

There may be reductions in the rated operational current depending on ambient conditions, frame size and accessories used (Derating (Page 582)).

Please contact Siemens concerning operating conditions that are outside the values specified in the derating table.

The permissible storage temperature in original Siemens packaging is between -40 °C and +80 °C.

Special climatic requirements

3VA UL molded case circuit breakers can also be used under harsh conditions.

Harsh conditions of storage, transportation and stationary use

The molded case circuit breakers have been tested according to the relevant special test procedures defined in IEC / EN 60947-1, Annex Q for **Class E** applications.

This class covers the areas MC3 + CC2 + SC1:

- Ambient temperature
- Humidity
- Vibration environment
- Shock environment

These ambient conditions can be referred to as "Open deck, damp and cold atmosphere without salt spray" or "Difficult, non-marine conditions".

The following standards-related criteria are complied with:

- IEC / EN 60068-2-2 "Bd" and IEC / EN 60068-2-1 "Ab":
Temperature range: -25 °C ... +70 °C
- IEC / EN 60068-2-30 "Db"
Damp heat up to +55 °C and air humidity up to 95%, without condensation
- IEC / EN 60068-2-6 "Fc"
Vibration test
- IEC / EN 60068-2-27 "Ea"
Shock resistance test

After each test for compliance with standards and at the end of the tests, the usability of the devices is assured by means of the "Verification of operation and performance".

Note

Preventing condensation

Condensation on the 3VA molded case circuit breakers must be prevented by means of suitable measures, e.g. control cabinet heating.

Vibration resistance and shock resistance

3VA UL molded case circuit breakers are insensitive to vibrations and meet the requirements relating to mechanical and electromechanical vibration strength according to IEC / EN 60068 and the specifications of the shipbuilding societies.

The circuit breakers resist impacts of up to 10 g without tripping and are tested to withstand without damage their operating conditions with shock impact according to IEC / EN 60068-2 27 "Ea" with 150 m/s² / 11 ms.

Installation altitudes

When 3VA5 and 3VA6 molded case circuit breakers are used at up to 6562 ft or 2000 m above sea level, the rating data will not change.

An installation altitude above 6562 ft or 2000 m can result in higher temperatures on the switching devices. The lower density of air can significantly reduce heat dissipation, making it necessary to decrease rated voltage, the rated uninterrupted current and the short-circuit values.

Refer to the table below for the calculation factor for determining the key values:

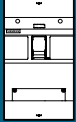
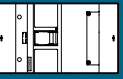
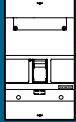
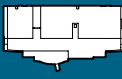
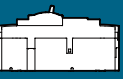
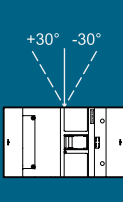
	Height			
	6562 ft 2000 m	9843 ft 3000 m	13123 ft 4000 m	16404 ft 5000 m
Breaking capacity	1.00	0.85	0.75	0.65
Operating voltage U_{max}	1.00	0.86	0.75	0.67
Operational current I_{max}	1.00	0.96	0.93	0.90

2.4.4 Permissible mounting positions and mounting positions with accessories

The tested mounting positions for 3VA UL molded case circuit breakers are illustrated below.

Please adhere to local codes and standards for specific application regulations.

2.4 Standards and guidelines

	Wall mounting				Ceiling mounting suspended from above	Floor mounting supported from below
	vertical upright	horizontal right	horizontal left	vertical inverted ²⁾		
						
						
3VA5 molded case circuit breakers						
3VA51 circuit breaker with DIN rail mounting, including installed, internal accessories ¹⁾	■	■	■	—	—	■
3VA51 circuit breaker with screw connection to mounting plate, including installed, internal accessories	■	■	■	■	■	■
3VA52 circuit breaker including internal accessories	■	■	■	■	■	■
3VA6 molded case circuit breakers						
All circuit breakers with installed internal accessories	■	■	■	■	■	■
3VA5 and 3VA6 molded case circuit breakers with external accessories, 3- and 4-pole circuit breakers						
Connection technology (terminals, covers, etc.)	■	■	■	■	■	■
Interlocking technology	■	■	■	■	■	■
Plug-in technology	■	■	■	—	—	■
Draw-out technology	■	■	■	—	—	■
Motor operator without ¹⁾ /with plug-in or draw-out technology	■/■	■/■	■/■	— / —	■ / —	■/■
Front mounted rotary operator without/with plug-in or draw-out technology	■/■	■/■	■/■	■/ —	■/ —	■/■
Door mounted rotary operator without/with plug-in or draw-out technology	■/■	■/■	■/■	■/ —	■/ —	■/■
Operator kit with Bowden cable (Max-Flex operator)	■	■	■	—	—	■
Operator kit with linkage	■	—	—	—	—	■
3-pole circuit breaker mounted on adapter for 60 mm busbar system	■	—	—	—	—	—

¹⁾ 3VA51: A motor operator cannot be used with DIN-rail mounting

²⁾ Not allowed by NEC

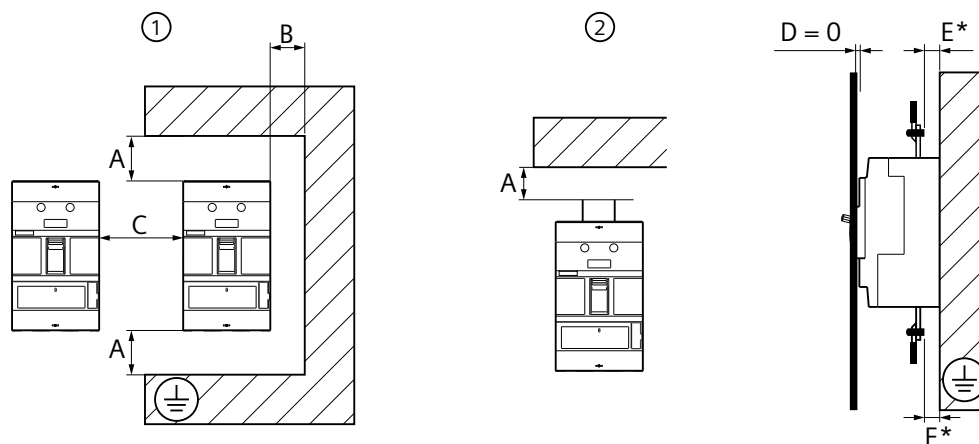
2.4.5 Safety clearances (for IEC applications)

During a short-circuit interruption, high temperatures, ionized gases and high pressures occur in and above the arc chutes of the molded case circuit breaker. For this reason, defined minimum clearances must be adhered to during installation between the molded case circuit breakers and the mounting plates, busbars and other protection systems placed in the immediate vicinity. This safety area was successfully confirmed with the help of tests on test setups according to IEC 60947-2 (perforated grid cage).

Safety clearances are required to:

- allow pressure distribution
- prevent fire or damage caused by any diffused ionized gases
- prevent a flashover to grounded parts
- prevent arcing or short-circuit currents to live sections.

The following safety clearances apply to 3VA molded case circuit breakers with UL and IEC approval:



- ① Molded case circuit breaker without additional insulation measures or with short terminal cover
- ② Molded case circuit breaker with additional insulation measures, phase barrier or long terminal cover
- A Minimum clearance between molded case circuit breaker and conducting paths (uninsulated and grounded metal), see tables below
- B Minimum clearance between molded case circuit breaker and side walls left / right (uninsulated and grounded metal), see tables below
- C Minimum clearance between two horizontally installed molded case circuit breakers, see tables below;
applicable to fixed-mounted and plug-in versions (see chapter Plug-in and draw-out technology (Page 304))
- D Minimum clearance between molded case circuit breaker and control cabinet door
- E Minimum clearance between live parts of connection system and grounded mounting plate
- * For breaker frame sizes 3VA51, 3VA52, 3VA54 and 3VA61, 3VA62, 3VA63 and 3VA64, minimum clearance E is 0.31 in [8 mm].
For breaker frame sizes 3VA55, 3VA65 and 3VA66, minimum clearance E is 0.47 in [12 mm].

2.4 Standards and guidelines

Minimum clearance for 3VA5 molded case circuit breakers:

Rated voltage	Clearances								
	between devices	to grounded plate				to insulating material			
		3VA51 125 A		3VA52 250 A		3VA51 125 A		3VA52 250 A	
	C	A	B	A	B	A	B	A	B
U ≤415 V									
Molded case circuit breakers									
Without additional insulation measures or with short terminal covers	0	35	10	40	5	35	10	30	5
With short phase barriers (1st third) ¹⁾	0	0	10	5	5	0	10	0	5
With long phase barriers ²⁾	0	0	10	0	5	0	10	0	5
With long terminal cover	0	35	10	25	5	35	10	25	5
415 V > U ≤690 V									
Molded case circuit breakers									
Without additional insulation measures or with short terminal covers	0	35	10	50	10	35	10	... ³⁾	... ³⁾
With long phase barriers	0	0	10	0	10	0	10	0	5
With long terminal cover	0	35	10	35	10	35	10	20	5

¹⁾ Can be used for connection technology: box terminal, screw terminal, internal wire connector and rear terminals

²⁾ Can be used for connection technology: wire connector large, bus connectors extended and bus connectors broadened

³⁾ Is not permitted in this voltage range for IEC applications

Rated voltage		Clearances							
	between devices	to grounded plate				to insulating material			
		3VA53 400 A		3VA54 600 A		3VA53 400 A		3VA54 600 A	
	C	A	B	A	B	A	B	A	B
U ≤500 V									
Circuit breakers									
Without additional insulation measures or with short terminal covers	0	50	10	50	20	40	5	40	5
With short phase barriers (1st third) ¹⁾	0	0	10	0	20	0	5	0	5
With long phase barriers ²⁾	0	0	10	0	20	0	5	0	5
With long terminal cover	0	30	10	50	20	25	5	25	5
500 V < U ≤690 V									
Circuit breakers									

Rated voltage		Clearances							
		to grounded plate				to insulating material			
		3VA53 400 A		3VA54 600 A		3VA53 400 A		3VA54 600 A	
	C	A	B	A	B	A	B	A	B
With long phase barriers + insulating plate	0	70	20	70	20	0	5	0	5
With long terminal cover	0	70	20	70	20	20	5	20	5

¹⁾ Can be used for connection technology: box terminal, screw terminal, internal wire connector and rear terminals

²⁾ Can be used for connection technology: wire connector large, bus connectors extended and bus connectors broadened

Rated voltage		Clearances							
		to grounded plate				to insulating material			
		3VA55 800 A				3VA55 800 A			
	C	A	B			A	B		
U ≤ 415 V AC; U ≤ 250 V DC Circuit breakers									
With short terminal cover	0	50	15			50	15		
With phase barriers	0	50	15			50	15		
With long terminal cover	0	50	15			50	15		
415 V < U ≤ 690 V AC; 250 V < U ≤ 1000 V DC Circuit breakers									
With phase barriers	0	75	15			75	15		
With long terminal cover	0	75	15			75	15		

Minimum clearance for 3VA6 molded case circuit breakers:

Rated voltage		Clearances											
		to grounded plate						to insulating material					
		3VA61 3VA62 150 A 250 A		3VA63 250 A		3VA64 400 A 600 A		3VA61 3VA62 150 A 250 A		3VA63 250 A		3VA64 400 A 600 A	
	C	A	B	A	B	A	B	A	B	A	B	A	B
U ≤ 525 V Molded case circuit breakers													
Without additional insulation measures or with short terminal covers	0	40	5	50	10	50	20	30	5	40	5	40	5
With short phase barriers (1st third) ¹⁾	0	0	5	0	10	0	20	0	5	0	5	0	5
With long phase barriers ²⁾	0	0	5	0	10	0	20	0	5	0	5	0	5
With long terminal cover	0	25	5	30	5	30	5	25	5	25	5	25	5

Description

2.4 Standards and guidelines

Rated voltage		Clearances											
		to grounded plate						to insulating material					
		3VA61 3VA62 150 A 250 A	3VA63 250 A	3VA64 400 A 600 A	3VA61 3VA62 150 A 250 A	3VA63 250 A	3VA64 400 A 600 A	3VA61 3VA62 150 A 250 A	3VA63 250 A	3VA64 400 A 600 A	3VA61 3VA62 150 A 250 A	3VA63 250 A	3VA64 400 A 600 A
	C	A	B	A	B	A	B	A	B	A	B	A	B
525 V < U ≤ 690 V Molded case circuit breakers													
Without additional insulation measures or with short terminal covers	Is not permitted in this voltage range for IEC applications												
With long phase barriers + insulating plate	0	0	20	33	20	33	20	0	5	5	10	5	10
With long terminal cover	0	35	10	135	20	135	20	20	5	55	10	55	10

- 1) Can be used for connection technology: box terminal, screw terminal, internal wire connector and rear terminals
2) Can be used for connection technology: wire connector large, bus connectors extended and bus connectors broadened

Rated voltage		Clearances									
		to grounded plate					to insulating material				
		3VA65 3VA66 800 A 1000 A					3VA65 3VA66 800 A 1000 A				
	C	A	B				A	B			
U ≤ 415 V Circuit breakers											
Without additional insulation measures or with short terminal covers	0	50	15				50	15			
With phase barriers	0	50	15				50	15			
With long terminal cover	0	50	15				50	15			
415 V < U ≤ 690 V Circuit breakers											
With phase barriers	0	75	15				75	15			
With long terminal cover	0	75	15				75	15			

Note

In addition to the clearances stated above, any insulation measures that might be required must also be considered, see chapter Insulating equipment (Page 267).

If the molded case circuit breaker is installed in a system whose connection type and operating voltage does not correspond to the specified insulation measures, a type test is required.

It must be ensured that the cable or busbar connection does not reduce the through-air insulation clearance.

Additional insulation measures such as long terminal covers or phase barriers can increase the width or height of the molded case circuit breaker. In this case, the minimum clearances apply from the corresponding sides of the overall molded case circuit breaker/insulation measure combination.

NOTICE

Damage to the molded case circuit breaker and the system

Depending on the application, larger minimum clearances may be necessary.

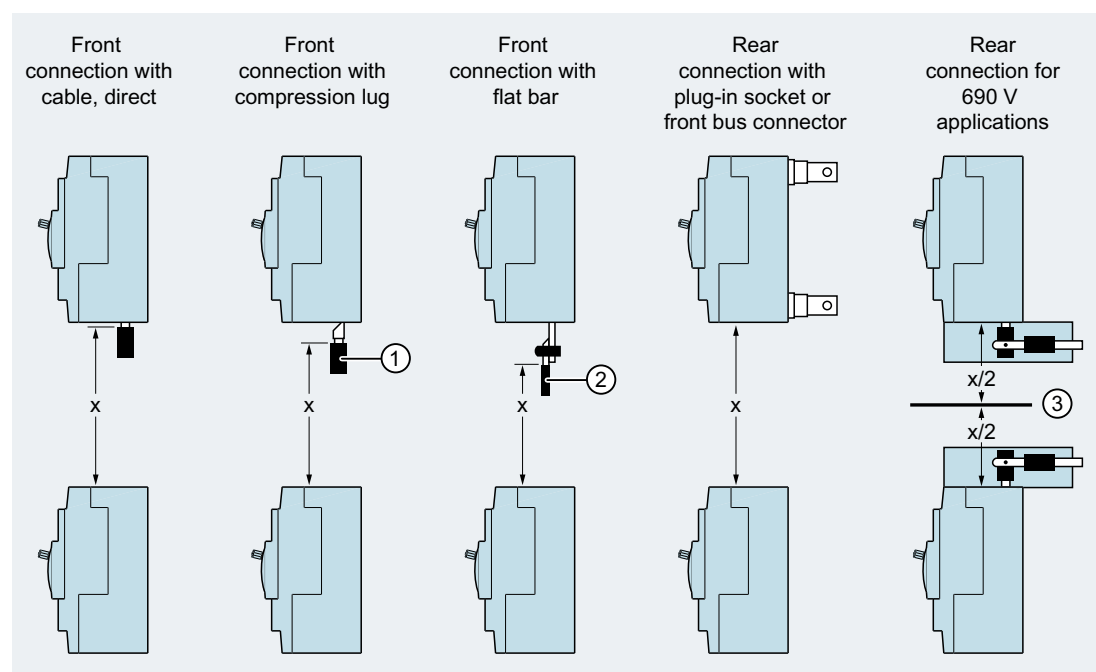
Note the specifications regarding clearances and creepage distances in the applicable overriding IEC 61439 standards "Switchgear and controlgear assemblies" as well as the applicable UL standards and local installation and application codes.

Safety clearances between molded case circuit breakers

Generally, no minimum clearance needs to be observed between the molded case circuit breakers placed side-by-side.

For more details please refer to the relevant operating instructions of the circuit breakers.

The following safety clearances apply to molded case circuit breakers installed directly on top of each other:



x See tables below for minimum clearance

① Insulation of cable

② Insulation of busbar

③ Insulation between the molded case circuit breakers

Minimum clearance for 3VA5 molded case circuit breakers:

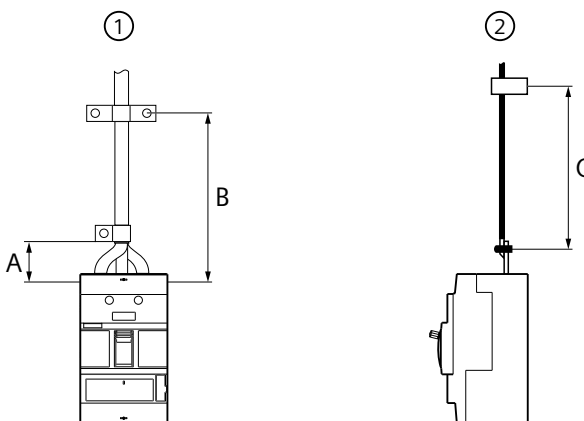
	x; $U \leq 415 \text{ V}$	x; $415 \text{ V} < U \leq 690 \text{ V}$	x; $U \leq 500 \text{ V}$	x; $500 \text{ V} < U \leq 690 \text{ V}$
3VA51 125 A	5.91 inch / 150 mm		--	--
3VA52 250 A	5.91 inch / 150 mm		--	--
3VA53 400 A	--		5.91 inch / 150 mm	7.88 inch / 200 mm
3VA54 600 A	--		5.91 inch / 150 mm	15.75 inch / 400 mm
3VA55 800 A	10 inch / 250 mm		--	--

Minimum clearance for 3VA6 molded case circuit breakers:

	x; $U \leq 500 \text{ V}$	x; $500 \text{ V} < U \leq 690 \text{ V}$
3VA61 / 62 150/250 A	5.91 inch / 150 mm	7.88 inch / 200 mm
3VA63 / 64 400/600 A	5.91 inch / 150 mm	15.75 inch / 400 mm
3VA65 / 66 800/1000 A	10 inch / 250 mm	10 inch / 250 mm

Maximum clearance to first fixing point of cable or busbar

The following figures and tables show the recommended maximum clearance between molded case circuit breakers and the first fixing point of the cable or busbar.



- ① Fixing of cable
- ② Fixing of busbar

Recommended maximum clearance for 3VA5 molded case circuit breakers

Frame size	Conductor cross-section	Maximum clearances to first fixing point (recommended)		
		Cable		Busbar
		A inch mm	B inch mm	C inch mm
3VA51	≤6 AWG ≤16 mm ²	4.72 120	10 250	10 250
	6 AWG <2/0 16 mm ² ≤70 mm ²	6 150	10 250	10 250
3VA52 3VA53 / 54	≤6 AWG ≤16 mm ²	30 kA: 6 150 70 kA / 110 kA: 2 + cable duct 50 + cable duct	10 250	10 250
	6 AWG <2/0 16 mm ² ≤70 mm ²	4 100	10 250	10 250
	2/0 <500 kcmil 70 mm ² ≤240 mm ²	6 150	10 250	10 250
3VA55	4/0 <750 kcmil 120 mm ² ≤300 mm ²	10 250	20 500	10 250

Recommended maximum clearance for 3VA6 molded case circuit breakers:

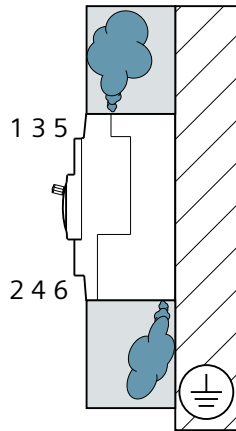
Frame size	Conductor cross-section	Maximum clearances to first fixing point (recommended)		
		Cable		Busbar
		A inch mm	B inch mm	C inch mm
3VA61 / 62 3VA63 / 64	≤6 AWG ≤16 mm ²	30 kA: 6 150 30 kA <: 2 + cable duct 50 + cable duct	10 250	10 250
	6 AWG <2/0 16 mm ² ≤70 mm ²	4 100	10 250	10 250
	2/0 <500 kcmil 70 mm ² ≤240 mm ²	6 150	10 250	10 250
3VA65 / 66	4/0 <750 kcmil 120 mm ² ≤300 mm ²	10 250	20 500	10 250

2.4.6 Breaker venting

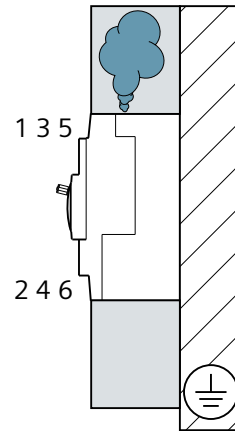
Adequate venting space must be taken into account during planning and installation of the molded case circuit breakers.

In particular, the following must be observed:

- Ventilation openings must be kept free.
- Ionized gases must not be routed in the direction of connecting terminals or non-insulated busbars.
- Venting spaces must not be blocked by busbars installed too close to one another or by other objects.



3VA51 / 52 / 53 / 54
3VA61 / 62 / 63 / 64

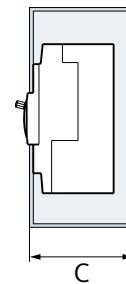
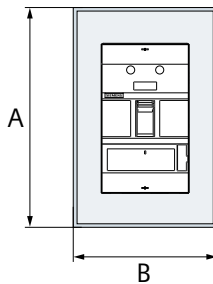


3VA55
3VA65 / 66

2.4.7 Minimum enclosure dimensions

The 3VA UL molded case circuit breakers are tested in appropriate steel enclosures as per UL 489.

The minimum enclosure dimensions are summarized in the following tables by frame size.



- A Minimum enclosure height
B Minimum enclosure width
C Minimum enclosure depth

Minimum enclosure dimensions for 3VA5 molded case circuit breakers:

Frame size	Rated	Breaking capacity	A inch mm	B inch mm	C inch mm
3VA51 125 A	80%	S / M / H	20 508	8.77 233	4.00 102
3VA52 250 A	80%	M / H / C	30.9 785	9.13 232	5.07 129
3VA53 400 A	80%	M / H / C	39.4 1000	14.2 360	14.6 370
3VA54 600 A	80%	M / H / C	39.4 1000	14.2 360	14.6 370
3VA55 800 A	80%	M / H / C	60 1524	22.5 572	10 254

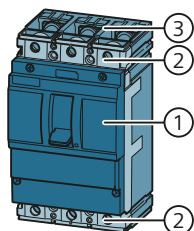
Minimum enclosure dimensions for 3VA6 molded case circuit breakers:

Frame size	Rated	Breaking capacity	A inch mm	B inch mm	C inch mm
3VA61 150 A	80% 100%	M / H / C / L / E	25.2 640	12 305	5.1 ¹⁾ 130 ¹⁾
3VA62 250 A	80% 100%	M / H / C / L / E	25.2 640	12 305	5.1 ¹⁾ 130 ¹⁾
3VA63 250 A	80% 100%	M / H / C / L / E	39.4 1000	14.2 360	14.6 370
3VA63 400 A	80%	M / H / C / L / E	39.4 1000	14.2 360	14.6 370
3VA64 400 A	80% 100%	M / H / C / L / E	39.4 1000	14.2 360	14.6 370
3VA64 600 A	80%	M / H / C / L / E	39.4 1000	14.2 360	14.6 370
3VA65 800 A	80% 100%	M / H / C	60 1524	22.5 572	10 254
3VA66 1000 A	80%	M / H / C	70 1778	22.5 572	15 381

¹⁾ With plug-in socket/withdrawable unit: 7.87 inch / 200 mm

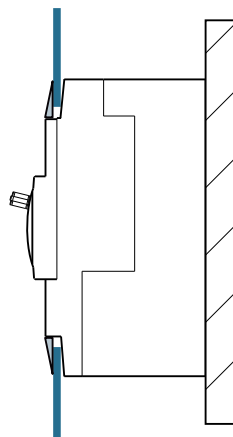
2.4.8 IP degrees of protection

The 3VA UL molded case circuit breakers meet the following IP protection classes as defined by IEC 60529 and IEC 60947-1, Annex C:



	Lid of accessories compartment		Terminal cover	
	Without	With	Without	With
① Front panel without terminal area	--	IP4x		
② Front terminal area			IP2x	IP4x
③ Infeed side / load side			IP3x	IP4x

Degree of protection IP30 is achieved when a 3VA UL molded case circuit breaker is installed in a switchboard with a door cutout including cover frame (see below).



Handle and release are freely accessible, the control cabinet door closes flush with the molded case circuit breaker.

You can achieve a higher degree of protection up to IP65 in combination with the door mounted rotary operator.

The IP protection system according to IEC 60529 is used for devices and enclosures or panels. However, there is not a comparable system for electrical devices themselves in the UL world. According to NEMA 250, there is a "type-rated system" for electrical enclosures and panels. In NFPA79 "Electrical Standard for Industrial Machinery", in which the NEMA 250 ratings for electrical enclosures are provided in detail, requirements for electrical equipment without enclosure can also be found in section 6 "Protection from Electrical Hazards". In essence, it

states that the protection from electric shock is to be tested using a jointed test finger with a diameter of 12.5 mm. The test finger described in detail here corresponds pretty closely to the test finger that must be used according to IEC 60529 for testing the finger safety for IP2x degree of protection, except that the IEC finger must have a diameter of 12.0 mm

Thus, devices that meet IP2x degree of protection generally meet the requirements of the U.S. touch-safe standards.

You can find NEMA protection types of the manual operators in chapter NEMA degree of protection (Page 371).

2.4.9 Environmental protection

The 3VA UL molded case circuit breakers fulfill the requirements of the European RoHS Directive 2015/863/EU (Restriction of the use of certain hazardous substances in electrical and electronic equipment). The development and production processes have been devised to have the lowest possible environmental impact.

2.5 Protection functions

This chapter provides an overview of the protection system of 3VA UL molded case circuit breakers.

The topics discussed in this chapter are listed below:

- Description of functions
- Overload protection (L)
- Short-time delayed short-circuit protection (S)
- Instantaneous short-circuit protection (I)
- Ground-fault protection (G)
- Neutral conductor protection (N)
- ZSI - Zone Selective Interlocking
- Guide to setting the tripping characteristic

2.5.1 Description of functions

The protective function performed by the molded case circuit breaker in the power distribution network is defined by the choice of trip unit. There are two different types of trip unit, i.e. thermal-magnetic (TMTU) and electronic (ETU):

Description

2.5 Protection functions

Protection	Thermal-magnetic TM 2-series		Electronic 3-series ETU	
Trip unit	 Line protection: TM210, TM230 Motor circuit protector: TM120M		 Line protection: ETU320, ETU330, ETU350 Motor circuit protector: ETU310M	
Integrated functions				
Parameterization		Setting and reading the parameters in A		Setting and reading the parameters in A and s
Status display				Display of ETU status via LEDs
Interface				Interface for test devices
Metering function				
Optional expansions				
				External Function Box EFB300 for connection to the ETU
				Maintenance Mode Box MMB300 for connection to the ETU
				Test device TD300 / TD400 / TD500

Protection	Electronic with display 5-series ETU	Electronic with display and metering function 8-series ETU
Trip units	 Line protection: ETU550, ETU556, ETU560	 Line protection: ETU820, ETU830, ETU850, ETU856, ETU860
Integrated functions		

Protection	Electronic with display 5-series ETU		Electronic with display and metering function 8-series ETU	
Parameterization	 - Setting and reading the parameters via display and communication - Fine adjustment of the parameters - Reading the measured values		 - Setting and reading the parameters via display and communication - Fine adjustment of the parameters - Reading the measured values	
Status display		Display of ETU status via LEDs		Display of ETU status via LEDs
Interface		Interface for test devices		Interface for test devices
Metering function			Metering function integrated	
Optional expansions				
		24 V module for continuous power supply (also without primary current through the molded case circuit breaker)		24 V module for continuous power supply (also without primary current through the molded case circuit breaker)
		External Function Box EFB300 for connection to the ETU		External Function Box EFB300 for connection to the ETU
		Maintenance Mode Box MMB300 for connection to the ETU		Maintenance Mode Box MMB300 for connection to the ETU
		COM060 communications module		COM060 communications module
		COM800/COM100 data concentrator Interface to - PROFIBUS - PROFINET - Modbus RTU - Ethernet (Modbus TCP)		COM800/COM100 data concentrator Interface to - PROFIBUS - PROFINET - Modbus RTU - Ethernet (Modbus TCP)
		External display DSP800 for installing in the control cabinet door		External display DSP800 for installing in the control cabinet door
		Test device TD300 / TD400 / TD500		Test device TD300 / TD400 / TD500

2.5.2 Characteristic curves

To design a low-voltage switchboard installation in accordance with the valid rules, the system planner needs to select the protection settings of the molded case circuit breakers.

The settings selected for the trip unit of a molded case circuit breaker depend on the type of equipment to be protected, e.g. switchboard and applications.

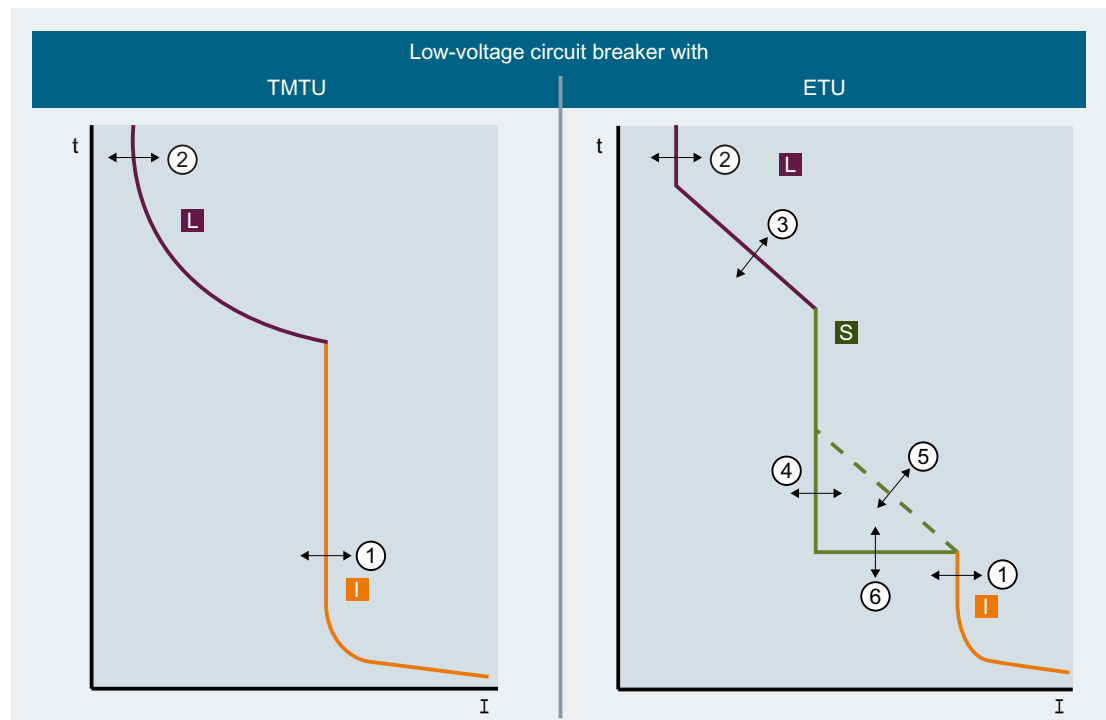
Tripping characteristics are represented graphically. In order to ease the coordination of different protection devices, the current is sometimes specified as a multiple of the current setting value and the time is specified in seconds.

Tripping characteristics for thermal-magnetic trip units

The graph is drawn in the log-log coordinate system.

Tripping characteristics for electronic trip units

The graph is drawn in the log-log coordinate system.



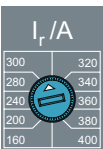
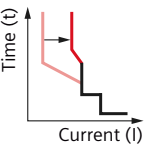
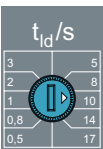
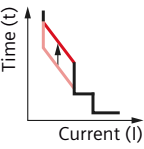
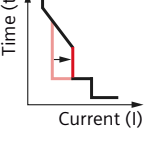
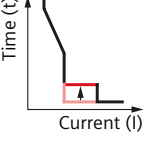
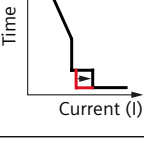
- | | |
|---|--|
| ① Response value of the instantaneous protection | ⑥ Delay of the short-time-delayed protection |
| ② Response value of the long-time delayed protection | L Overload range |
| ③ Delay of the long-time-delayed protection | S Short-time-delayed short-circuit current range |
| ④ Response value of the short-time-delayed protection | I Instantaneous short-circuit current range |
| ⑤ Fixed tripping time or I^2t function of the short-time-delayed protection | |

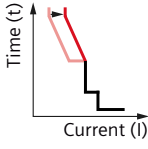
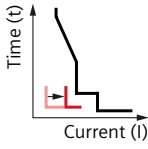
2.5.3 Guide to setting the tripping characteristic

Constraints

The settings selected for the trip unit of a molded case circuit breaker depend on the technical environment (e.g. switchboard and applications) and the type of equipment to be protected. The task of determining the protection settings in accordance with the valid rules is the responsibility of the Engineer of Record.

Basic rules for setting different trip parameters

	Parameter	Knobs	Effect on characteristic curve	Brief description	Reason	Example
L	I_r			Response current of the overload protection: ETU $I_r = 0.4 \dots 1 \times I_n$ TMTU $I_r = 1 \times I_n$ Absolute values in A	Optimization of the overload range by setting to the operational current of the circuit to be protected	Overload range from 300 A
	t_{id}			Delay time (or time-lag class) in the overload range. In this case, the set tripping time relates to reference point of $6 \times I_r$	Better selectivity in the overload range in switchboards with multiple selective tripping levels	The tripping time of $t_{id} = 10$ s applies to $6 \times I_r$, in this case 6×300 A = 1800 A
S	I_{sd}			Response current of the short-time-delayed short-circuit protection	Limiting of the short-circuit range in which the current must be disconnected faster but possibly with a small time delay.	When $I_r = 300$ A and $I_{sd} = 5$: Tripping with 1500 A after delay time t_{sd}
	t_{sd}			Delay time of the short-time-delayed short-circuit protection	Better selectivity in the overload range in switchboards with multiple selective tripping levels	$t_{sd} = 0.15$ s: Tripping after 0.15 s for current values between I_i and I_{sd}
I	I_i			Response current of the instantaneous short-circuit protection	Limiting of the short-circuit range in which the fault current has to be switched off as quickly as possible.	When $I_i = 2000$ A: Instantaneous tripping with currents > 2000 A

	Parameter	Knobs	Effect on characteristic curve	Brief description	Reason	Example
N	I_N			Response current of the neutral conductor protection	Protection of the neutral conductor for overcurrent and short circuit	When $I_N = \text{ON}$, $I_N = 0.5 \times I_r$ and $I_r = 300 \text{ A}$, overload from 150 A in neutral conductor, instantaneous tripping at 2000 A
G	$I_g + t_g$			Response current of the ground-fault protection and delay time until disconnection	Line protection	With ground-fault currents of $I_g = 50 \text{ A}$ or higher: Tripping after time $t_g = 0.1 \text{ s}$

Setting the parameters for 5-series and 8-series ETUs

5-series and 8-series ETU electronic trip units are equipped with an LCD display and operator buttons. These can be used to change the parameters.

The SENTRON Powerconfig software can also be used to input parameter settings. The TD500 test device and the COM800/COM100 data concentrator combined with the COM060 communications module can be used as the software interface.

2.5.4 Overload protection (L)

The ID letter for overload protection is L (stands for "Long-time (protection)").

The trip unit is inverse-time delayed and exhibits the following characteristics depending on the trip unit type:

- Bimetal characteristic with thermal-magnetic trip units
- I^2t characteristic with electronic trip units

I_r refers to the current setting value (and the circuit breaker rated current) and t_{id} to the associated time delay.

The time delay with the device-specific reference point defines the current-dependent curve shape of the setpoint characteristic. With 3VA UL molded case circuit breakers, this reference point of the overcurrent trip is 6 times the current setting value I_r . The following mathematical equation determines the remaining curve of the setpoint characteristic:

$$I^2t = \text{constant}$$

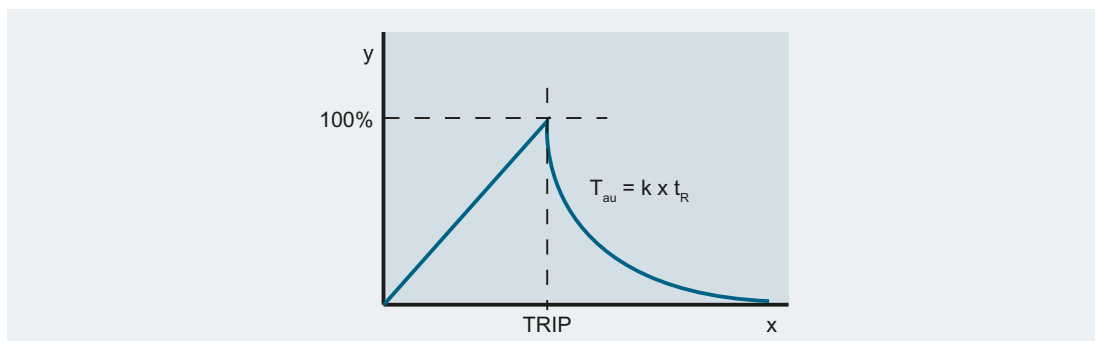
Thermal memory

The electronic trip units have a so-called thermal memory via which temperature rises in the past are taken into account for tripping.

Thermal memory activated (ON)

If the thermal memory is activated, the previous thermal history is taken into account. After tripping, the thermal memories of the phases are set to a value corresponding to 85 % of

the thermal equivalent of the warmest phase. This setting allows reclosure of the contacts of the molded case circuit breaker. This is followed by a cool-down period according to an exponential function with a time constant T_{au} (τ).



2.5.5 Short-time delayed short-circuit protection (S)

The ID letter for the short-time-delayed short-circuit protection is "S" (stands for "Short-time (protection)"). The S function of the trip unit can be used to implement time-selective short-circuit tripping in low-voltage networks in which multiple molded case circuit breakers are installed in series.

The short-time-delayed short-circuit protection refers to the short-circuit protection of phases L1 to L3 (called phases A to C in North America) and the neutral conductor. The protection function responds if the current in at least one phase exceeds the set tripping current I_{sd} for the set delay period t_{sd} .

The S release has a characteristic curve with current-dependent characteristic I^2t , i.e. the delay time is dependent on the energy content of the short-circuit current present. The 5-series and 8-series ETU electronic trip units can be optionally switched over to a current-independent tripping characteristic. In this case, a fixed delay time t_{sd} applies.

2.5.6 Instantaneous short-circuit protection (I)

The ID letter for instantaneous short-circuit protection is "I" (stands for "Instantaneous").

This short-circuit protection function protects phases L1 to L3. The instantaneous short-circuit protection function responds if the instantaneous value equal to the rms of the current in at least one phase exceeds the instantaneous tripping current I_i .

2.5.7 Ground-fault protection

The ID letter for ground-fault protection is "G" (stands for "ground fault").

The G protection detects residual currents between phases and grounded, electrically conductive parts. The ground-fault protection function responds if the ground fault current exceeds the set tripping current I_g for the set delay period t_g .

2.5 Protection functions

Like for the short-time-delayed short-circuit protection, the delay time of the ground-fault protection can be set as either a current-independent or a current-dependent (I^2t) value, dependent on the trip unit options.

Special variants with ground-fault alarm-only are available for the 3VA UL molded case circuit breakers. These are the 3VA6 molded case circuit breakers with ETUs 556 and 856. When a ground-fault current is detected, the breaker does not trip.

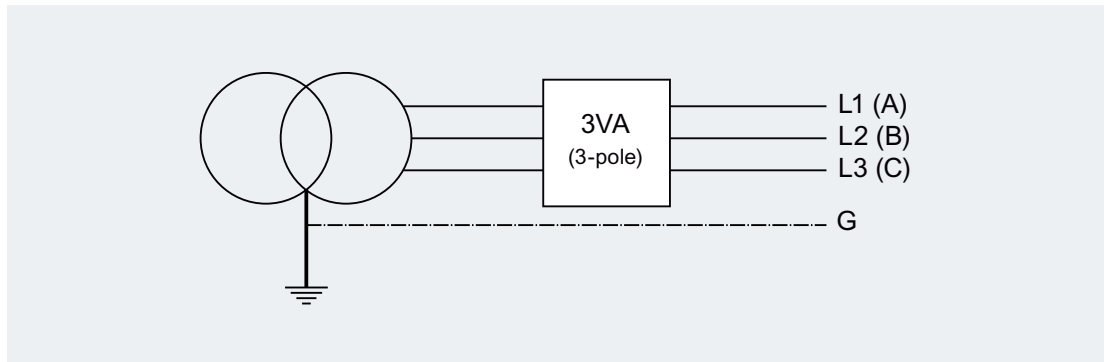
Rather, only an indication is provided via the ETU display and, if desired, via a programmable digital output on the external function box (EFB) and/or through communications. This allows the system to remain in operation.

On 4-pole molded case circuit breakers and 3-pole molded case circuit breakers with external current transformer for the N conductor, the G protection calculates the vector sum of the currents of the three phases and the neutral conductor. The G release trips the molded case circuit breaker, or an alarm is issued via the communications system if the trip unit is alarm-only, if the rms value of this vector sum exceeds the set response value I_g for the set delay time t_g .

2.5.7.1 Measurement method 1: Vectorial summation (residual) current

Ground-fault detection in balanced systems

3-pole molded case circuit breaker in balanced systems:



Trip unit variants:

- 3-series ETUs: ETU330 (LIG)
- 5-series ETUs: ETU556 (LSIG alarm), ETU560 (LSIG)
- 8-series ETUs: ETU830 (LIG), ETU856 (LSIG alarm), ETU860 (LSIG)

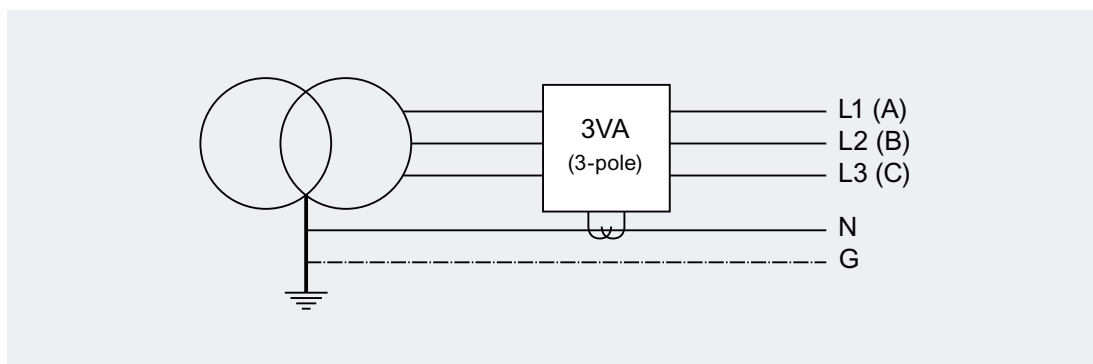
Ground-fault detection in unbalanced systems

The neutral current is measured directly and in the case of 3-pole molded case circuit breakers only for the ground-fault protection, but in the case of 4-pole circuit breakers the neutral conductor current is also evaluated for the neutral conductor protection.

The trip unit calculates the ground-fault current using the three phase currents and the neutral conductor current for the vectorial summation.

For 4-pole molded case circuit breakers, the fourth current transformer is internally installed for the neutral conductor.

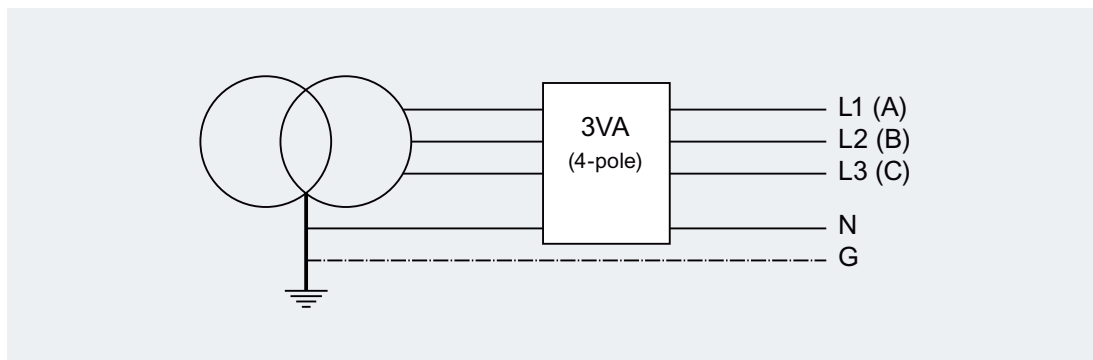
3-pole molded case circuit breaker in unbalanced systems, 3-pole 3VA with external N transformer:



Trip unit variants, 3-pole 3VA6 molded case circuit breaker with external N transformer:

- 5-series ETUs: ETU556 (LSIG alarm), ETU560 (LSIG)
- 8-series ETUs: ETU856 (LSIG alarm), ETU860 (LSIG)

4-pole molded case circuit breaker in unbalanced systems:



Trip unit variants, 4-pole 3VA6 molded case circuit breaker:

- 3-series ETUs: ETU330 (LIG)
- 5-series ETUs: ETU556 (LSIG alarm), ETU560 (LSIG)
- 8-series ETUs: ETU830 (LIG), ETU856 (LSIG alarm), ETU860 (LSIG)

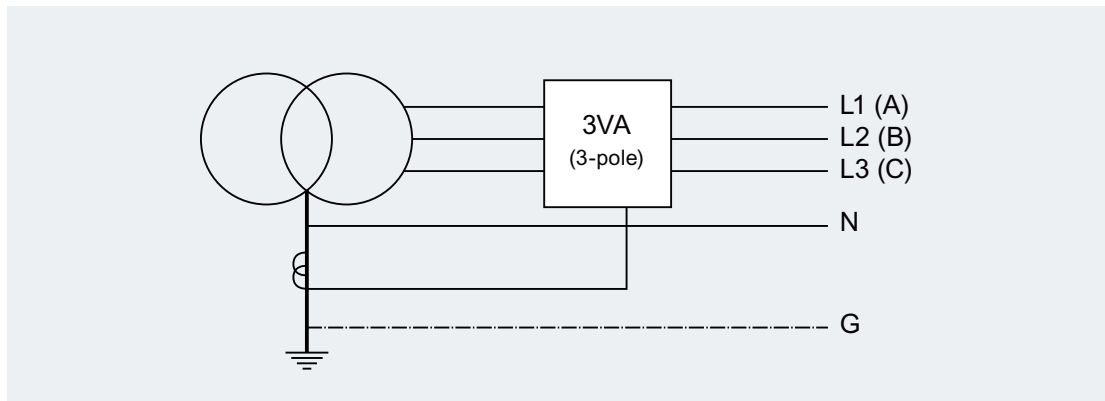
2.5.7.2 Measurement method 2: Direct detection

In this case, an external current transformer is installed directly in the grounded neutral point of the transformer. When the set ground-fault current is reached, a message is directly output (ETU556 and ETU856) or the circuit breaker is tripped (ETU560 and ETU860).

Note

This measuring method must be activated explicitly in the ETU: On the display under menu item "GF M", switch over from "rES" (measurement method 1) to "d Ir" (measurement method 2).

3-pole molded case circuit breaker, external current transformer in the grounded neutral point of the transformer:



Trip unit variants, 3-pole 3VA6 molded case circuit breaker with external N transformer:

- ETUs 5-series: ETU556 (LSIG alarm), ETU560 (LSIG)
- ETUs 8-series: ETU856 (LSIG alarm), ETU860 (LSIG)

2.5.8 Neutral conductor protection (N)

The ID letter for neutral conductor protection is "N".

The neutral conductor protection system protects the neutral conductor against overloads and short circuits.

The setting value of the current is designated with I_N , the associated setting time is identical to t_{ld} .

Note

A neutral conductor with full cross-sectional area (distributed neutral conductor of the same size as the phases) is normally protected by the phase protection system and does not require separate protection.

Neutral conductor protection

Neutral conductor protection must be implemented in accordance with the standards valid in the country of installation. Possible reasons for implementing neutral conductor overload protection are:

- The neutral conductor has a smaller cross-section than the phase conductors.
- Higher harmonic components in the system can be expected.
- A large number of loads, or predominantly single-phase loads, will be connected.
- The neutral conductor will be isolated for functional reasons, e.g. because there are several voltage sources.
- The neutral conductor will be isolated for safety reasons, e.g. because work is in progress on disconnected units

Neutral conductor protection and 3VA6 molded case circuit breakers

The following 3VA6 molded case circuit breakers have neutral conductor protection:

- All 3-pole versions with external current transformer for N conductor (only with 5-series and 8-series ETUs)
- All 4-pole versions

The tripping systems of the 5-series and 8-series ETUs enable an overdimensioned neutral conductor protection. This might be necessary to provide protection against third-order harmonics and multiples thereof.

2.5 Protection functions

3VA	Options	Neutral conductor protection	TMTU	ETU 3-series	ETU 5-series	ETU 8-series
3-pole molded case circuit breaker	3-pole, 3 phases monitored	None	■	■		
3-pole molded case circuit breaker with external transformer for neutral conductor	3-pole, 3 phases monitored	None			■	■
	3-pole, 3 phases monitored + N (20% ^{1) 2)} ... 100% I_n)	Protection for user-defined cross section of neutral conductor			■	■
	3-pole, 3 phases monitored + N (100% ... 160% I_n)	Oversized neutral conductor			■	■
4-pole molded case circuit breaker	4-pole, 3 phases monitored, N = OFF	None		■	■	■
	4-pole, 3 phases monitored + N (50% $\times I_r$)	Protection for half cross section of neutral conductor		■ ₃₎		
	4-pole, 3 phases monitored + N (100% $\times I_r$)	Protection for full cross section of neutral conductor		■		
	4-pole, 3 phases monitored + N (20% ^{1) 2)} ... 100% I_n)	Protection for user-defined cross section of neutral conductor			■	■
	4-pole, 3 phases monitored + N (100% ... 160% I_n)	Oversized neutral conductor			■ ₄₎	■ ₄₎

N Neutral conductor protection

1) With rated current $I_n \leq 40$ A: $I_N = 40\% \dots 100\% I_n$

2) With rated current $I_n \leq 100$ A: $I_N = 20\% \dots 100\% I_n$

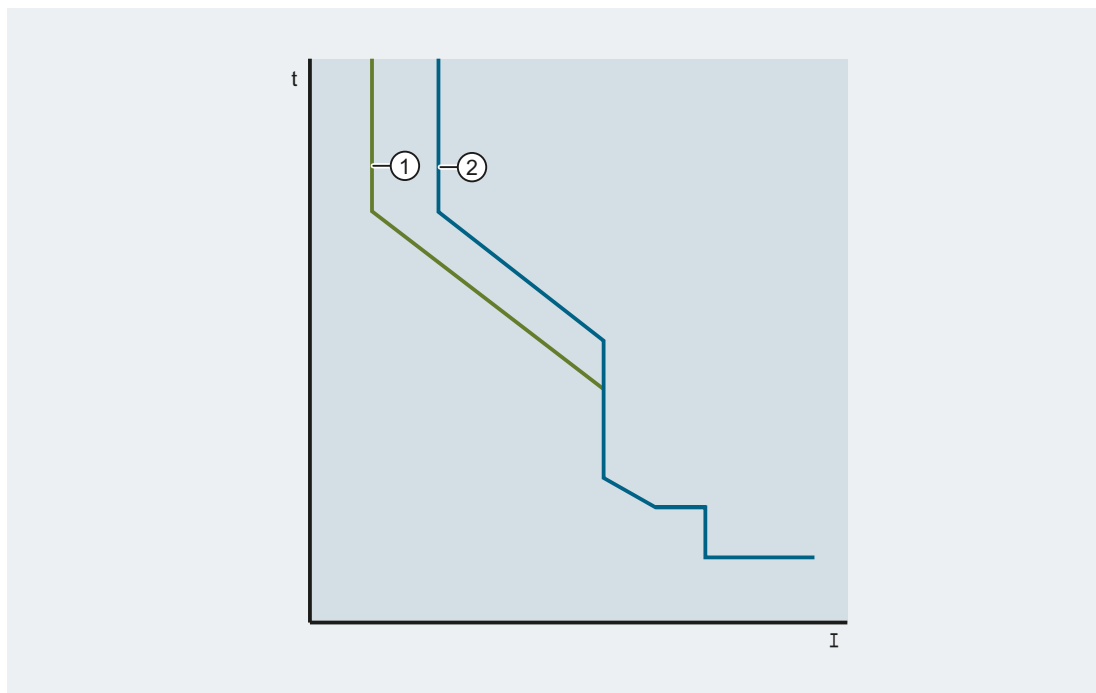
3) Starting from rated current $I_n \geq 100$ A

4) Dependent on circuit breaker frame size and rated current

Parameters of the neutral conductor protection function

- Tripping current I_N :
Adjustable as a proportion of the current setting (I_r) for overload protection
- Tripping delay:
Corresponds to the delay (t_r) for overload protection
- Tripping current of the short-time-delayed short-circuit protection:
Corresponds to the short-time-delayed short-circuit protection (I_{sd})
- Tripping delay:
Corresponds to the delay setting for short-time-delayed short-circuit protection (t_{sd})
- Instantaneous short-circuit protection:
Corresponds to the tripping current (I_l) for instantaneous short-circuit protection

Example of a neutral conductor protection characteristic



- ① Response value of the neutral conductor protection
- ② Response value of the long-time delayed protection

Adjustment of neutral conductor protection settings

The tripping current I_N can be adjusted:

- for 3-series ETU via rotary selector switches
- for 5-series and 8-series ETUs
 - via the buttons on the ETU display
 - via PC with SENTRON Powerconfig

See also

Use of the 3VA UL molded case circuit breakers in line protection (Page 121)

2.5.9 Zone-selective interlocking ZSI

The microprocessor-controlled, zone selective interlocking function has been developed in order to control the total disconnection time in low-voltage networks with multiple molded case circuit breakers connected in series.

2.5 Protection functions

Regardless of the number of series-connected molded case circuit breakers, all short circuits in the network greater than I_{st} but less than I_i will have a delay of no more than 50 ms.

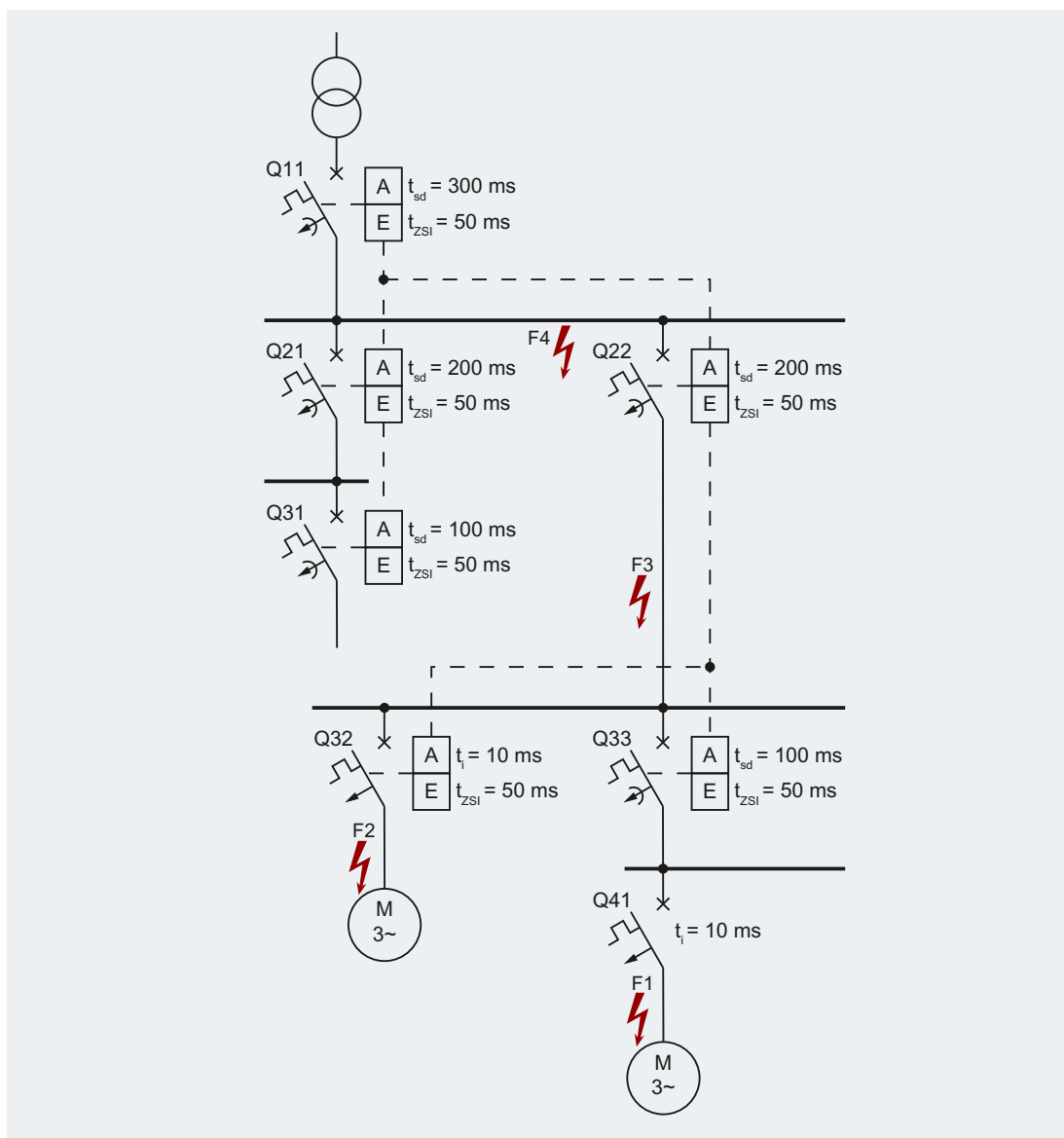
Note

Backward compatibility

The ZSI function of 3VA UL molded case circuit breakers is compatible with the ZSI functions of Siemens 3WL/3WA air circuit breakers.

Operating principle

The diagram below demonstrates the operating principle of zone selective interlocking:



---	Communication cable	t_i	"Virtual" tripping time of short-circuit (I) release
A	Output, transmits the blocking signal	t_{SD}	Delay time setting of S release
E	Input, receives the blocking signal	t_{ZSI}	Delay time of all molded case circuit breakers which detect the short circuit but do not receive a blocking signal when ZSI is activated

The ZSI function acts on the S and G ranges of the tripping characteristic. Currents within the I range (instantaneous short circuit) continue to cause instantaneous tripping.

2.6 Thermal-magnetic trip unit

Fault 1

If the short-circuit current is sufficiently large, the trip units of molded case circuit breakers Q41, Q33, Q22 and Q11 are activated. Since Q41 clears the fault within $t_i = 10$ ms, none of the other molded case circuit breakers trips even though Q41 has no ZSI and cannot therefore transmit a blocking signal to Q33.

Fault 2

If the short-circuit current is sufficiently large, the trip units of molded case circuit breakers Q32, Q22 and Q11 are activated. As a result of the ZSI function, Q32 temporarily blocks Q22 which in turn temporarily blocks Q11. Depending on the magnitude of the short-circuit current, the fault is cleared either within $t_i = 10$ ms or $t_{zsi} = 50$ ms plus the mechanical clearing time.

Fault 3

Q22 signals short-circuit protection to Q11 with the result that only Q22 trips when delay time $t_{zsi} = 50$ ms expires. Without the ZSI function, the fault would not be cleared until $t_{sd} = 200$ ms had expired.

Fault 4

The short circuit is detected only by Q11. Since Q11 does not receive a blocking signal from the downstream molded case circuit breakers, it trips after $t_{zsi} = 50$ ms. Without the ZSI function, Q11 would not trip until $t_{sd} = 300$ ms had expired.

It is especially important to minimize break times when short circuits involving very high short-circuit currents occur.

2.6 Thermal-magnetic trip unit

2.6.1 Thermal-magnetic trip unit (TMTU)

A thermal-magnetic trip unit consists of a thermal trip unit for protecting against overload, and a magnetic trip unit for protecting against short circuits. Both trip units are series-connected. Thermal-magnetic trip units are available with Fixed-Thermal-Fixed-Magnetic (FTFM) or Fixed-Thermal-Adjustable-Magnetic (FTAM) settings.

2.6.2 Application cases and trip unit types

The table below illustrates the applications for which different types of thermal-magnetic trip units can be used:

Protection	TM210 FTFM	TM230 FTAM	TM240 ATAM
Line protection	✓	✓	✓
Version available with			
1-pole breaker	✓		

Protection	TM210 FTFM	TM230 FTAM	TM240 ATAM
2-pole breaker	✓		
2(3)-pole breaker	✓	✓	
3-pole breaker	✓	✓	✓
4-pole breaker		✓	✓
Available protection parameters			
I_r adjustable			✓
I_i adjustable		✓	✓
I_r fixed	✓	✓	
I_i fixed	✓		

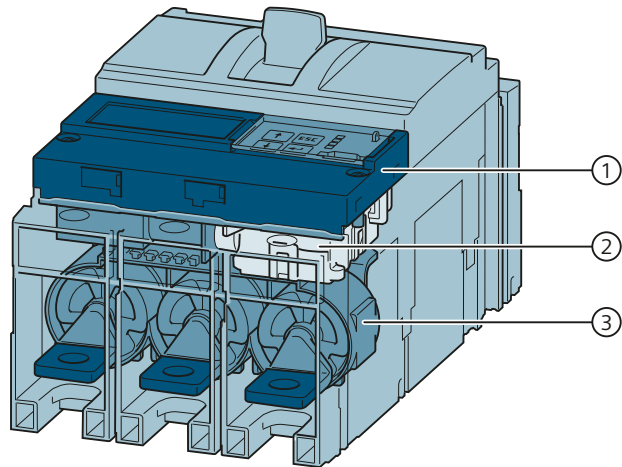
2.7 Electronic trip unit

2.7.1 Electronic trip unit (ETU)

An electronic trip unit is based on the following concepts:

- Complete measurement of the current in the phases L1, L2 and L3, with N and currents to ground optional
- Rogowski coil
 - Very precise measurement of the current
 - Better ground-fault protection because the vectorial summation formation is more exact
- Evaluation of the current measurement values and constant comparison with the tripping limits
- Tripping by means of a tripping solenoid

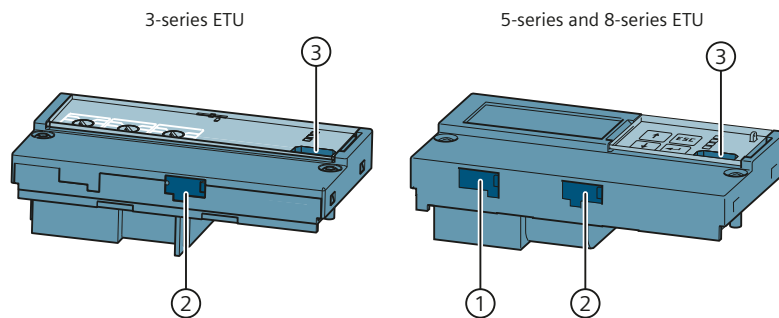
2.7 Electronic trip unit



- ① Electronic trip unit (ETU)
- ② Tripping solenoid
- ③ Current sensor

2.7.2 Connections

The connections on the ETU are illustrated in the diagram below:



- ① Interface for an external current transformer for N conductor
- ② Interface for connection of an External Function Box EFB300 and Maintenance Mode Box MMB300
- ③ Connection for test devices TD300, TD400 and TD500

2.7.3 Arc energy reduction

The U.S. "National Electrical Code (NFPA 70) Section 240.87" requires special protection measures for circuit breakers with an rated uninterrupted current of 1200 A or higher, or an uninterrupted current which can be set in this range.

The intent of these protective functions is to reduce the let-through energy under fault conditions (e.g. short-circuit) to the smallest possible amount in order to best protect the worker.

One method to satisfy this requirement is to provide energy-reducing maintenance switching with local status indicator.

The Siemens DAS when used with a remote external switch meets this requirement.

3VA6 molded case circuit breakers and Dynamic Arc Sentry

All 3VA6 molded case circuit breakers are equipped with the Dynamic Arc Sentry mode (DAS mode).

When the 3VA6 molded case circuit breakers are in Dynamic Arc Sentry mode, the instantaneous short-circuit current I_i is automatically reduced to the smallest available value (factory setting). Likewise, the ground-fault current I_g is reduced to the smallest available value for the ETU variants with ground-fault protection or ground-fault detection. In this way it is ensured that the molded case circuit breaker disconnects as quickly as possible under fault conditions and enhanced personal protection is achieved.

To facilitate the optimal adaptation of the molded case circuit breaker in DAS mode to local or system-specific circumstances, it is possible to configure the DAS parameter set (I_i and I_g) using the SENTRON Powerconfig parameterization software.

Protection parameters		Normal operating state	Dynamic Arc Sentry mode DAS parameter set	
Parameter	ETU type		Factory setting	Parameter assignment via powerconfig possible
I_i	System protection ETUs (3-series, 5-series and 8-series)	Value can be adjusted or is fixed	$1.5 \times I_n$	■
	ETU310M	Value adjustable	$3.0 \times I_n$	■
I_g	ETU variants with ground-fault protection or ground-fault detection	Value adjustable	$0.2 \times I_n$	■
t_g	ETU variants with ground-fault protection or ground-fault detection	Time adjustable	t_g and curve characteristic not adapted in DAS mode	

All molded case circuit breakers with electronic trip units (3-series, 5-series and 8-series ETUs) receive the signal for switchover of the protection parameters to DAS mode via the Maintenance Mode Box MMB300 applied with the appropriate control scheme. You can find more information about the Maintenance Mode Box MMB300 in chapter MMB300 maintenance mode box (Page 446).

Additionally, it is possible to activate DAS mode for the 5-series and 8-series ETUs directly at the molded case circuit breakers via the keys on the LCD display.

2.7 Electronic trip unit

Indication on LCD display	Meaning
	DAS mode on molded case circuit breaker deactivated (factory setting)
	DAS mode on molded case circuit breaker activated
	Molded case circuit breaker is in DAS mode ¹⁾

¹⁾ For LED displays, see chapter Operator controls (Page 98)

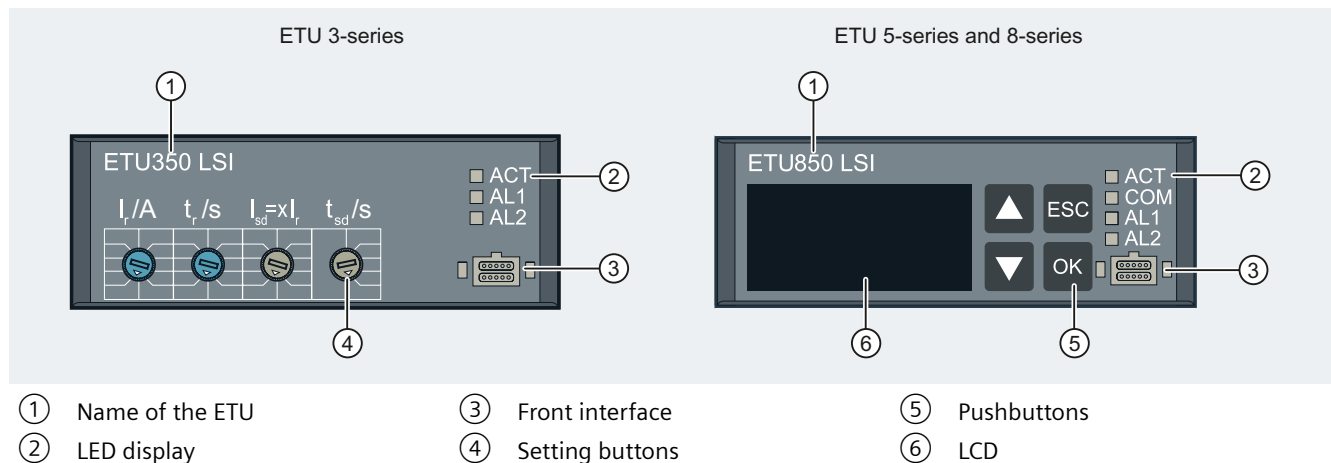
2.7.4 Protection functions

Protection	ETU 320 LI	ETU 330 LIG	ETU 350 LSI	ETU 550 LSI	ETU 556 LSI-G	ETU 560 LSIG	ETU 820 LI	ETU 830 LIG	ETU 850 LSI	ETU 856 LSI-G	ETU 860 LSIG
Line protection	■	■	■	■	■	■	■	■	■	■	■
Generator protection	■	■	■	■	■	■	■	■	■	■	■
Version											
3-pole without external neutral conductor transformer	■	■	■								
3-pole with external neutral conductor transformer				■	■	■			■	■	■
4-pole with protected neutral conductor transformer	■	■	■	■	■	■	■	■	■	■	■
Available protection parameters											
I_r	■	■	■	■	■	■	■	■	■	■	■
t_{id} with $6 \times I_r$	■	■	■	■	■	■	■	■	■	■	■
Characteristic in L range: $I^2 t_{id}$	■	■	■	■	■	■	■	■	■	■	■
Thermal image	■	■	■	■	■	■	■	■	■	■	■
I_{sd}			■	■	■	■			■	■	■
t_{sd} with $8 \times I_r$			■	■	■	■			■	■	■
Characteristic in S range: $I^2 t_{sd}$			■	■	■	■			■	■	■
Characteristic in S range: Selectable $I^2 t_{sd} / t_{sd}$				■	■	■			■	■	■
I_i	■	■	■	■	■	■	■	■	■	■	■
$I_N^{1)}$	■	■	■	■	■	■	■	■	■	■	■
I_g		■			■	■		■		■	■
t_g with $2 \times I_g$		■			■	■		■		■	■
Characteristic in G range: $I^2 t_g$					■	■		■		■	■
Characteristic in G range: selectable $I^2 t_g / t_g$					■	■				■	■
Ground fault alarm-only function					■					■	
Ground fault trip function						■		■			■
ZSI	■	■	■	■	■	■	■	■	■	■	■
Arc fault mitigation mode (DAS)	■	■	■	■	■	■	■	■	■	■	■
Features and options											
Setting with rotary coding switch	■	■	■								
Setting via the operator buttons on the ETU display				■	■	■	■	■	■	■	■
Data shown on ETU display				■	■	■	■	■	■	■	■
Metering function							■	■	■	■	■
Communication option				■	■	■	■	■	■	■	■
Front interface	■	■	■	■	■	■	■	■	■	■	■

¹⁾ Available in a version with external current transformer for N conductor or 4-pole breaker

2.7.5 Operator controls

The following figure shows the available ETU types of the 3VA molded case circuit breakers. You can decide which ETU to select according to the area of application.



LED displays

The following table explains what the LED displays mean:

LED		Meaning	Description
☐	ACT	Off	Current flow in the main conducting path less than 20% I_n
	ACT	Flashing	8-series ETUs: Missing external 24 V DC supply voltage for metering function
	ACT	On	ETU ready for operation, current flow greater than 20% I_n
☐	COM	Off	No communication with a COM100/800 via COM060.
	COM	Flashing	Communication interrupted. The LED flashes if communication has already existed
	COM	On	Active communication to COM100/800 data concentrator
	ACT	On	Current flow between 90% and 105% I_r
	AL1	On	
☐	AL2	Off	
	ACT	On	Current flow greater than 105% I_r
	AL1	On	
	AL2	On	

LED		Meaning	Description
	ACT	On	Overtemperature alarm AL1 and AL2 flashing alternately
	AL1	Flashing	
	AL2	Flashing	
	ACT	Flashing	Fault Internal fault in trip unit All LEDs flash simultaneously with same frequency
	COM	Flashing	
	AL1	Flashing	
	AL2	Flashing	
	ACT	On	ETU is in Dynamic Arc Sentry mode (DAS mode)
	COM	On	
	AL1	Off	
	AL2	Flashing	

Activation limits for ETUs without an external supply

Rated current in [A]	Current in one of the three phases	Current in two of the three phases	Current in all three phases	Significance for ETU
40	0 ... 40% I_n	0 ... 30% I_n	0 ... 20% I_n	The ETU is not active.
	>40% I_n	>30% I_n	>20% I_n	ETU protection is active. Display (ACT LED or display) is active.
60	0 ... 30% I_n	0 ... 20% I_n	0 ... 20% I_n	The ETU is not active.
	>30% I_n	>20% I_n	>20% I_n	ETU protection is active. Display (ACT LED or display) is active.
100	0 ... 20% I_n	0 ... 20% I_n	0 ... 10% I_n	The ETU is not active.
	>20% I_n	>20% I_n	>10% I_n	ETU protection is active. Display (ACT LED or display) is active.
>100	0 ... 20% I_n	0 ... 10% I_n	0 ... 10% I_n	The ETU is not active.
	>20% I_n	>10% I_n	>10% I_n	ETU protection is active. Display (ACT LED or display) is active.

3-series ETU trip units

See also

Guide to setting the tripping characteristic (Page 81)

Displays of the 5-series and 8-series ETU electronic trip units

5-series and 8-series electronic trip units have an LCD display. The displayed values are refreshed once per second.



Note

The backlighting of the LED display is only active with an external voltage supply (e.g. by the COM060 communications module, by the 24 V module or by the EFB300 External Function Box).

The following table explains what the symbols in the display mean:

Symbol	Meaning
	If this symbol is activated, the indicated value is a measured value.
	This symbol is shown when the first alarm threshold for this measured value was exceeded.
	This symbol is shown when the second alarm threshold for this measured value was exceeded.
	Display in parameter edit mode. The value can be changed with the <UP> and <DOWN> arrow keys.
	If TRIP is shown, the display indicates the information from the previous tripping operation.
	Name of the displayed value. Here, current I phase "a" or "I".

The following table explains what functions are performed by the buttons next to the display:

Symbol	Meaning
	Goes back to the previous screen page. Increases a parameter in parameter edit mode.
	Goes to the next screen page. Decreases a parameter in parameter edit mode.
	Goes to parameter edit mode when a parameter is displayed. Confirms a parameter in parameter edit mode.
	Goes to the standard display. Discards a parameter in parameter edit mode.

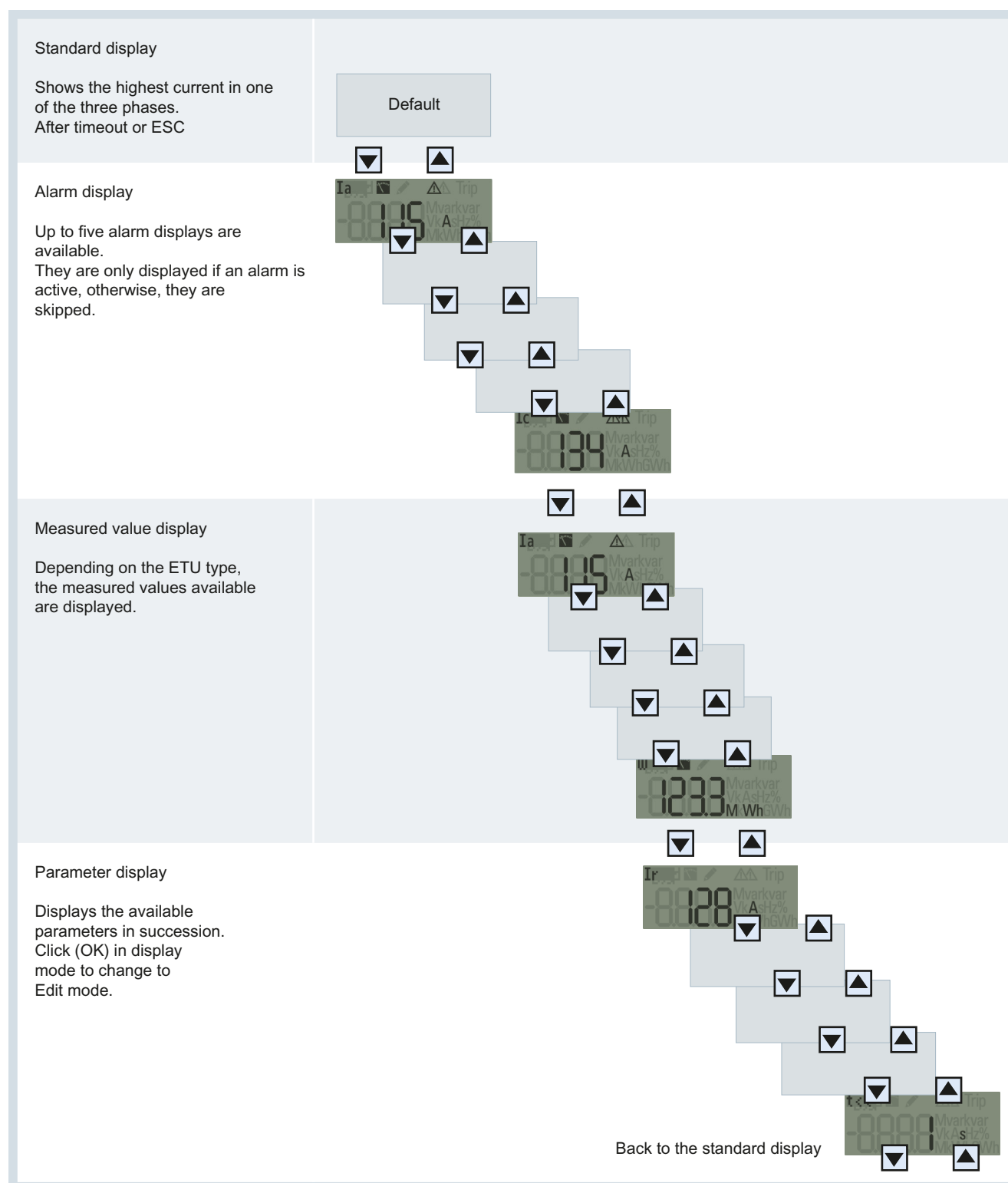
Displays of the 5-series and 8-series ETUs

The basic structure comprises the following displays:

- Standard display
- Alarm display
- Measured value display
- Parameter display

If no selection is made within an adjustable time period, the standard display will appear.

2.7 Electronic trip unit



Standard display



Alarm display

Active alarms are displayed consecutively in screens AV1 ... AV5. If no alarms are active, these screens are concealed.

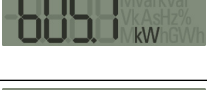
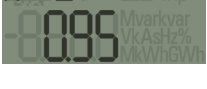
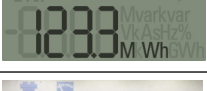
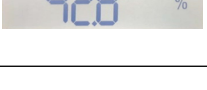


Measured value display

The table below explains the measured value display:

Number	Screen	Measured value	Description	ETU 550	ETU 556	ETU 560	ETU 820	ETU 830	ETU 850	ETU 856	ETU 860
MV 1		I_a	Instantaneous current I_a in phase A	✓	✓	✓	✓	✓	✓	✓	✓
MV 2		I_b	Instantaneous current I_b in phase B	✓	✓	✓	✓	✓	✓	✓	✓
MV 3		I_c	Instantaneous current I_c in phase C	✓	✓	✓	✓	✓	✓	✓	✓
MV 4		I_N	Instantaneous current in the neutral conductor	✓	✓	✓	✓	✓	✓	✓	✓

2.7 Electronic trip unit

Number	Screen	Measured value	Description	ETU 550	ETU 556	ETU 560	ETU 820	ETU 830	ETU 850	ETU 856	ETU 860
MV 5		I_g	Instantaneous residual current to ground		✓	✓				✓	✓
MV 6		U_{ab}	Instantaneous voltage U_a - U_b				✓	✓	✓	✓	✓
MV 7		U_{bc}	Instantaneous voltage U_b - U_c				✓	✓	✓	✓	✓
MV 8		U_{ca}	Instantaneous voltage U_c - U_a				✓	✓	✓	✓	✓
MV 9		f	Instantaneous frequency				✓	✓	✓	✓	✓
MV 10		P	Instantaneous active power (total)				✓	✓	✓	✓	✓
MV 11		Q	Instantaneous reactive power (total)				✓	✓	✓	✓	✓
MV 12		PF	Instantaneous power factor				✓	✓	✓	✓	✓
MV 13		W	Active energy				✓	✓	✓	✓	✓
MV 14		%	Circuit breaker health factor	✓	✓	✓	✓	✓	✓	✓	✓

Parameter display

The table below explains the parameter display:

Number	Screen	Parameter	Description	ETU 550	ETU 556	ETU 560	ETU 820	ETU 830	ETU 850	ETU 856	ETU 860
PV1		I_r	Current overload protection	✓	✓	✓	✓	✓	✓	✓	✓
PV2		t_{id}	Overload protection delay time	✓	✓	✓	✓	✓	✓	✓	✓
PV5		I_{sd}	Short-time-delayed short-circuit current	✓	✓	✓	✓	✓	✓	✓	✓
PV6		t_{sd}	Short-time-delayed short-circuit current delay time	✓	✓	✓	✓	✓	✓	✓	✓
PV7		I^2t_{sd}	Characteristic in S range	✓	✓	✓	✓	✓	✓	✓	✓
PV8a		ZSI S	Zone selective interlocking	✓	✓	✓	✓	✓	✓	✓	✓
PV8b		ZSI G	Zone selective interlocking in the event of a ground fault		✓	✓				✓	✓
PV9		i_i	Instantaneous short-circuit protection current	✓	✓	✓	✓	✓	✓	✓	✓
PV10		I_N	Overload protection in the neutral conductor	✓ ⁽¹⁾	✓ ⁽¹⁾	✓ ⁽¹⁾	✓ ⁽¹⁾	✓ ⁽¹⁾	✓ ⁽¹⁾	✓ ⁽¹⁾	✓ ⁽¹⁾

2.7 Electronic trip unit

Number	Screen	Parameter	Description	ETU 550	ETU 556	ETU 560	ETU 820	ETU 830	ETU 850	ETU 856	ETU 860
PV11		I_g	Ground-fault protection current		✓	✓				✓	✓
PV12		t_g	Ground-fault protection Delay time		✓	✓				✓	✓
PV13		I^2t_g	Ground-fault protection characteristic		✓	✓				✓	✓
PV14		I_{gA}	Ground-fault alarm current		✓	✓				✓	✓

¹⁾ Dependent on the rated current of the molded case circuit breaker and the ETU version

Setting and changing parameters

1. Use the arrow keys to navigate to the correct display.
2. Press the <OK> button.
→ Edit mode is active. Activation is confirmed by display of "pencil" symbol.



3. Use the arrow keys to adjust the parameter setting.
4. Confirm the setting with the <OK> button, or cancel the operation with <ESC>.
→ The setting is accepted with <OK>. The parameter display now appears.

"Tripped" display

After the ETU has initiated a trip, the "Tripped" display automatically appears:



This screen can be identified by the word "Trip" which is displayed in the top, right-hand corner. The displayed current value shows the current at the moment of tripping.

Press <ESC> to exit the display.

The additional information contained in the "Tripped" display is explained in the table below:

Number	Display in the title	Meaning	Unit
TV1	LT	Tripped by long-time (overload) protection	A
TV2	ST	Tripped by short-time delayed short-circuit protection	A
TV3	Inst	Tripped by instantaneous short-circuit protection	A, kA
TV4	N	Tripped by overload in the neutral conductor	A
TV5	GF	Tripped by ground-fault protection	A
TV6	Temp	Tripped by overheating	%

Diagnostics display

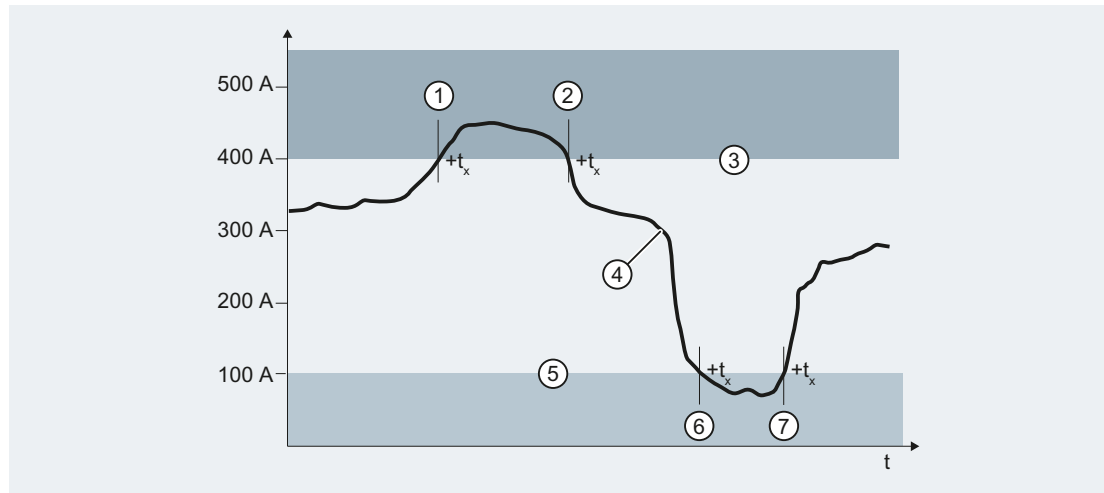
When a TD500 test device is connected, you can use it to initiate a test. The following screen appears when a TD500 is connected. The bar flashes at a frequency of 0.5 Hz.



The bar travels from left to right while testing is in progress. The test ends with a trip.

2.7.6 Load acceptance and load shedding - load management

3VA UL molded case circuit breakers equipped with a 3-series ETU or higher series provide two current thresholds for the purpose of implementing a local load management function. Load shedding is the upper threshold, and load restore the lower threshold.



- | | |
|----------------------------------|---------------------------------|
| ① Incoming alarm "load shedding" | ⑤ Parameter load restore 100 A |
| ② Outgoing alarm "load shedding" | ⑥ Incoming alarm "load restore" |
| ③ Parameter load shedding 400 A | ⑦ Outgoing alarm "load restore" |
| ④ Current in one phase | |

Note

No trip

Tripping is not initiated as a result of the current value crossing the upper or lower thresholds.

If the current in one phase exceeds the parameter setting for "load shedding", an incoming alarm "load shedding" is generated. Only when the current in all three phases drops below this threshold is an outgoing alarm "load shedding" generated.

The incoming and outgoing alarms can be output via the External Function Box EFB300 and transferred via the communication function. Parameterization can also take place via the SENTRON Powerconfig software.

The opposite applies for the load restore threshold. If the current in all three phases drops below the parameter setting, an incoming alarm "load restore" is generated. If only one of the three currents exceeds the parameter setting, an outgoing alarm "load restore" is generated.

To prevent these alarms being generated by brief current peaks and troughs, they can be delayed by the time t_x from 1 s to 15 s.

2.7.7 Measuring with a Rogowski coil

The Rogowski coil is a toroidal coil without a ferromagnetic core. It is used as a component in electronic measuring devices to measure alternating current.

Advantages of the current sensor:

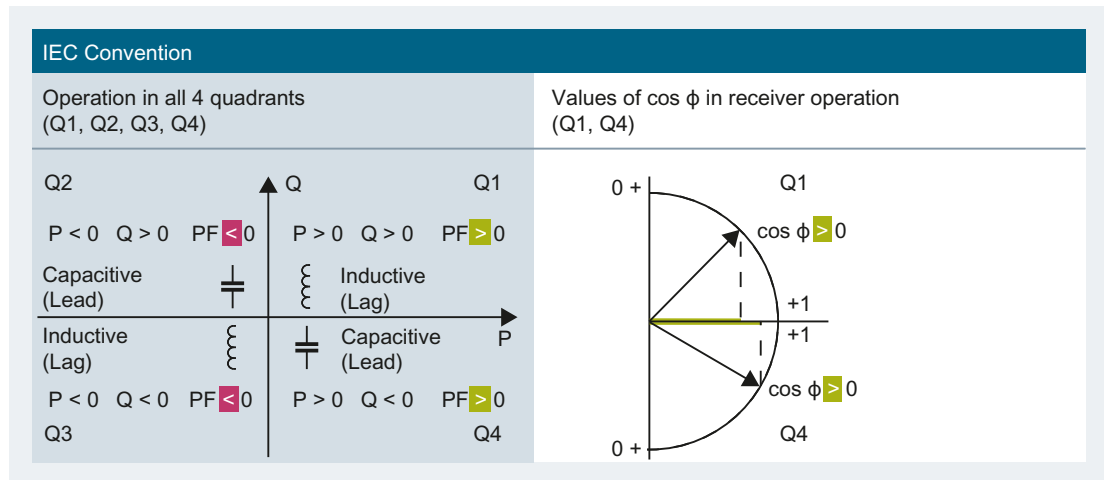
- Each transformer can be optimized for its task and operating points
 - Transformers for power generation
 - Transformers for measurement
- Higher accuracy of current measurement and therefore higher accuracy for ground-fault currents

Energy measurement is made possible by the more exact and more linear measurement of the current together with the integrated voltage tap in the molded case circuit breaker.

Accuracy levels of the specified measured values of the 8-series ETU, including the integrated current sensors

Measured value	Additional condition	Accuracy in % of the read-off measured value
Current	$0.08 I_b \dots 2 I_b$	$\pm 1\%$
Voltage (L - N)	$80 \text{ V} < U < 480 \text{ V}$	$\pm 1\%$
THD current	up to the 19th harmonic $0.08 I_b \dots 2 I_b$	$\pm 5\%$
THD voltage	up to the 19th harmonic $80 \text{ V} < U < 480 \text{ V}$	$\pm 5\%$
Power factor PF	$0.08 I_b \dots 2 I_b$	± 0.05 absolute
Active power	I_b and U_n as described below the table	Class 2 acc. to IEC 61557-12
Active energy	I_b and U_n as described below the table	Class 2 acc. to IEC 61557-12
Reactive power Apparent power	$0.08 I_b \dots 2 I_b$ $\text{PF} \geq 0.6$ inductive $\text{PF} \geq 0.8$ capacitive	$\pm 2\%$
Reactive energy Reactive power	$0.08 I_b \dots 2 I_b$ $\text{PF} \geq 0.6$ inductive $\text{PF} \geq 0.8$ capacitive	$\pm 2\%$
Frequency	$80 \text{ V} < U < 480 \text{ V}$	$\pm 0.1\%$

Interpretation of measured values



PF Power factor

Measured current and voltage values are always positive.

The "normal" direction of energy flow of the 3VA UL molded case circuit breaker is from top (terminals 1, 3, 5) to bottom (terminals 2, 4, 6), which corresponds to operation in quadrants Q1 and Q4. If the molded case circuit breaker is supplied from below (terminals 2, 4, 6), it operates in quadrants Q2 and Q3, and the measurement direction can be adjusted using the SENTRON Powerconfig software.

The following table provides an overview of the setting values:

Setting values ¹⁾				ETUs of the		Display		Communication
				5-series	8-series	Display in ETU	DSP800	COM100/800 via COM060
Overload protection	Current	I_r	A	■	■	 		 
	Delay time	t_{id}	s	■	■	 		 
	Thermal memory	ThM		■	■			
Short-time delayed short-circuit protection	Current	I_{sd}	A	■	■	 		 
	Delay time	t_{sd}	s	■	■	 		 
	Characteristic curve in S range	I^2t_{sd}		■	■	 		 
	Zone selective interlocking	ZSI		■	■	 		 
Instantaneous short-circuit protection	Current	I_i	A	■	■	 		 
Overload protection in the neutral conductor	Current	I_N	A	■	■	 		 
Ground-fault protection	Current	I_g	A	■	■	 		 
	Delay time	t_g	s	■	■	 		 
	Characteristic curve	I^2t_g		■	■	 		 
	Alarm current	I_{gA}	A	■	■	 		 

¹⁾ Dependent on ETU version

 Value can be read

 Value can be edited

2.7 Electronic trip unit

Metering function ¹⁾				ETUs		Display		Communication
				5-series	8-series	Display in ETU	DSP800	COM100/800 via COM60
Current	Phase and neutral conductor currents	I_1, I_2, I_3, I_N	A	■	■	👁	👁	👁
	Residual current to ground	I_g	A	■	■	👁	👁	👁
	Phase with highest load		A	■	■	👁	👁	👁
	Mean value over the three phase currents	$I_{LAVG}(I_1 + I_2 + I_3)/3$	A	■	■		👁	👁
	Asymmetry of the phase currents	I_{nba}	%	■	■		👁	👁
	THD of the 3 phases	$THDI_1, THDI_2, THDI_3$	%		■		👁	👁
Voltage	Phase voltages incl. mean value	U_1, U_2, U_3, U_{phavg}	V		■	👁	👁	👁
	Voltages to N conductor incl. mean value	$U_{1N}, U_{2N}, U_{3N}, U_{Navg}$	V		■		👁	👁
	Asymmetry of the voltages		%		■		👁	👁
	THD phase/phase and phase/N	$THDI_1, THDI_2, THDI_3$	%		■		👁	👁
Power	Active power, total and per phase	P_1, P_2, P_3, P_{tot}	kW		■	👁 (P_{tot})	👁	👁
	Apparent power, total and per phase	S_1, S_2, S_3, S_{tot}	kVA		■		👁	👁
	Reactive power, total and per phase	Q_1, Q_2, Q_3, Q_{tot}	kVAr		■	👁 (Q_{tot})	👁	👁
	Fundamental power factor	$PF_1, PF_2, PF_3, PF_{avg}$			■	👁 (PF_{avg})	👁	👁
Energy	Active energy, infeed and feedback	E_p	kWh		■	👁	👁	👁
	Reactive energy, infeed and feedback	E_q	kVArh		■		👁	👁
	Apparent energy	E_s	kVAh		■		👁	👁
Frequency	Present frequency	f	Hz		■	👁	👁	👁
Maximum pointer function	Min/max current, voltage, power	with time stamp						👁

¹⁾ Dependent on ETU version

👁 Value can be displayed/read

		ETUs of the		Display		Communication
		5-series	8-series	Display in ETU	DSP800	COM100/800 via COM060
Status, diagnostics and maintenance¹⁾						
Breaker status	On, Off, TRIP	■	■		👁	👁
Currently pending alarm messages		■	■	👁	👁	👁
Reason for last trip		■	■	👁	👁	👁
Event Log	of the last 100 events	■	■			👁
	of the last 10 trips	■	■			👁
	of the last 100 switching operations	■	■			👁
Maintenance information	Trip counter after LSIG trips	■	■		👁	👁
	Operating hours counter	■	■		👁	👁
	Switching cycle counter	■	■		👁	👁
Position in the draw-out unit		■	■			👁
Identification						
Identification data of the breaker	Order No.	■	■		👁	👁
	Rated operational current, number of poles, I_{cu}	■	■		👁	👁
HW/FW version		■	■			👁
Power management functions						
Power demand values of the last demand period	Active, reactive and apparent power in fixed block or rolling block 5 to 60 min		■		👁	👁
Energy pulse output	S0 signal at EFB output		■			
Load monitoring	Load shedding/load pick-up, output via EFB	■	■		👁	👁
Threshold value parameters	10 freely adjustable monitoring parameters	■	■		👁	👁

¹⁾ Dependent on ETU version

👁 Value can be displayed/read

2.8 Condition monitoring

Circuit breakers are core components of a power distribution system. They conduct uninterrupted current and can open and close the main contacts as required during operation. They also protect against overload and short circuits. The operating capability of a circuit breaker must be ensured by means of condition monitoring. Up to now, the operating capability of circuit breakers could only be assessed based on the following data:

- Electrical operating cycles
- Mechanical operating cycles
- Tripping operations (the trip counter differentiates between different reasons for tripping)
- Operating hours (measured by the operating hours counter)

In addition to this basic information, the 3VA molded case circuit breaker continuously records the usage behavior of the circuit breaker. It analyzes data and evaluates them using an algorithm so that conclusions about the device condition can be drawn from the results. The patented intelligent algorithm extends condition monitoring in the 3VA molded case circuit breaker to include the health indicator and the remaining life time.

Health indicator

The operating capability of a circuit breaker depends first and foremost on the condition of the main contacts. Switching operations without current, at rated current, and in the event of overload and short-circuit trips cause different degrees of wear on the switching contacts however. For this reason, the health indicator continuously calculates the condition of the contacts based on data acquired directly in the circuit breaker.

Health indicator of the 3VA molded case circuit breaker

The health indicator of the 3VA molded case circuit breaker is calculated based on an analysis of the opening and tripping operations. Every opening or tripping operation of a molded case circuit breaker changes the condition of the main contacts. It can therefore be said that the condition of the main contacts defines the health indicator of the molded case circuit breaker.

Its value in the as-delivered state is 100%. The event-related adaptation of the health indicator is activated upon commissioning. The indicator value decreases during the life time of the circuit breaker relative to the different switching operations that are performed and can fall as far as 0%.

Explanation of indicator values	
100%	The molded case circuit breaker is in the as-delivered state.
100% to 30%	No restriction of the operating capability of the molded case circuit breaker.
30% to 1%	No restriction of the operating capability of the molded case circuit breaker. However, preparations should be made for maintenance or replacement of the device and a suitable replacement device should be supplied. Additional information about the urgency of replacement can be obtained from the display of the remaining life time.
0%	Full operating capability can no longer be guaranteed; the device must be replaced as soon as possible.

Flexible querying of indicator values

The current condition of the health indicator (in %) can be read on the display of the 5-series and 8-series ETU electronic trip unit at any time. Different communication applications also make it possible to query the health indicator. In addition to the SENTRON Powerconfig configuration software, the SENTRON Powerconfig mobile app and the SENTRON Powermanager energy monitoring software, further options include cloud applications like SENTRON Powermind. The data of the molded case circuit breaker can be transferred to cloud applications via the IoT data platform 7KN Powercenter 3000.



Display of the health indicator (in %) on the display of the electronic trip unit (ETU)

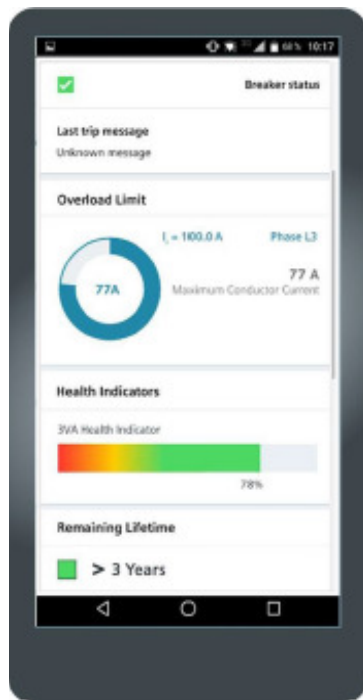
Remaining life time

A patented algorithm is used for calculating the remaining life time. It analyzes the previous usage behavior, projects this into the future and makes a prognosis based on the result. If the usage behavior changes, the remaining life time is adjusted accordingly. This means that unpredictable tripping operations can suddenly reduce the remaining life time quite significantly. They reduce the health indicator, which serves as a starting point for calculating the remaining life time.

The remaining life time is calculated continuously. If the remaining life time is more than three years, the plant operator does not need to take any acute measures (e.g. maintenance or replacement of device). A detailed display is not provided for this reason. The life time in years, months and weeks is only displayed when the remaining life time falls below three years.



This information is available for every device which supports this function via the communications interface of the power interface in the DSP800 display, in the SENTRON Powerconfig commissioning software, including SENTRON Powerconfig mobile and SENTRON Powercenter 3000, as well as in SENTRON Powermanager and SENTRON Powermind. A display is not provided on the device itself.



2.8.1 Predictive maintenance

The health indicator and the remaining life time prognosis of the 3VA molded case circuit breaker make it possible to plan plant maintenance and inspections precisely. Plant operators therefore benefit from more efficient material and personnel deployment. As the life time progresses, the plant behavior and the wear of the molded case circuit breaker can be predicted with greater accuracy. The longer the molded case circuit breaker is used in a system, the more reliable the health indicator and the predicted remaining life time will become.

Limits to calculability

The life time of a circuit breaker depends on a large number of factors. The 3VA molded case circuit breaker currently only takes contact wear into account when calculating the health indicator and the remaining life time. Other factors, such as environmental influences like humidity or salt mist, are not considered. The aging behavior of the molded case circuit breaker varies depending on the application and cannot therefore be represented by the health indicator and the remaining life time prognosis.

The remaining life time prognosis calculates possible future usage based on previous usage. Serious breaker events cannot be predicted however. They are not included in the calculation for this reason and can suddenly reduce a previously adequate remaining life time to zero.

Disclaimer of liability

All conditioning monitoring information (e.g. health indicator and remaining life time) is based on the calculated data and the average basic behavior of the circuit breaker in relation to its usage in the past. Special variations in application or use and special environmental factors mean that deviations between the actual condition of the device and the information provided by condition monitoring are possible. No claims can be asserted in relation to conflicting information.

More importantly, the customer remains responsible for preventing circuit breaker failures due to a lack of regular inspections, due to expiry of the remaining life time or due to other damaging events.

Failure to observe or exceeding the specified values can result in failures and incidents.

Device configuration for predictive maintenance

The use of condition monitoring with 3VA molded case circuit breakers is possible with the following devices and preconditions:

- 3VA2 or 3VA6 molded case circuit breaker with a 5-series or 8-series ETU electronic trip unit
- ETU electronic trip unit with firmware V4.4 or higher
- COM060 communications module with firmware V4.4 or higher
- COM800 or COM100 data concentrators with firmware V4.4 or higher
- The external power supply of the molded case circuit breaker (via COM800 or COM100 data concentrators) must be ensured over the entire operating period of the circuit breaker so that the data for usage behavior can be recorded without any gaps.
- The COM800 or COM100 data concentrators must be commissioned using the SENTRON Powerconfig configuration software or via the TIA Portal. The Totally Integrated Automation Portal (TIA Portal) is an automation engineering platform featuring a wide range of software tools.
- In the event of a voltage dip or voltage interruption of the auxiliary power supply, the time of the COM800 or COM100 data concentrators must subsequently be updated. This can be done using the SENTRON Powerconfig configuration software or automatically by means of the SNTP function.

2.8.2 General overview of the system condition

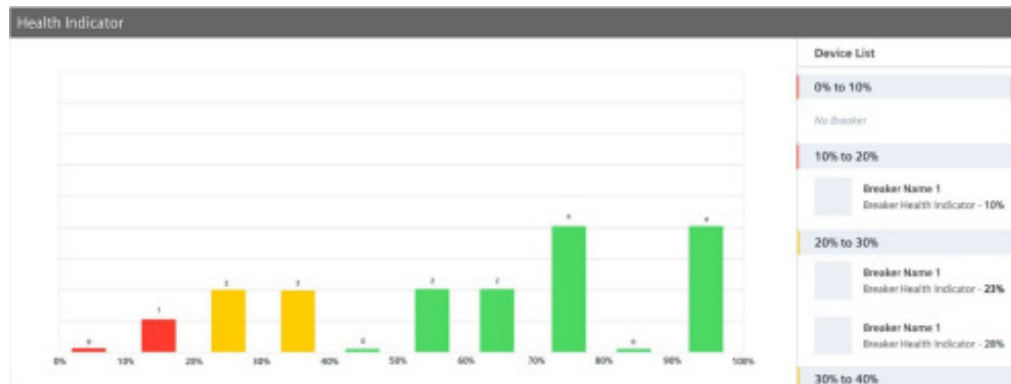
The transfer of maintenance data provides the operator with a holistic picture in which the maintenance condition of the entire power distribution system can be observed and not just of a single component. The combination of health indicators and the remaining life time prognoses of all devices provides the following advantages:

- A quick overview of the maintenance condition of the system is possible, and components in a critical condition can be detected and replaced, thus increasing system availability.
- Maintenance procedures can be scheduled well in advance, and personnel and materials can be deployed at just the right time. This optimizes system availability and reduces costs.
- And finally but also of great importance, transparent maintenance requirements offer operators the certainty that spontaneous failures due to overdue maintenance of components are a thing of the past and will no longer impact upon system availability.

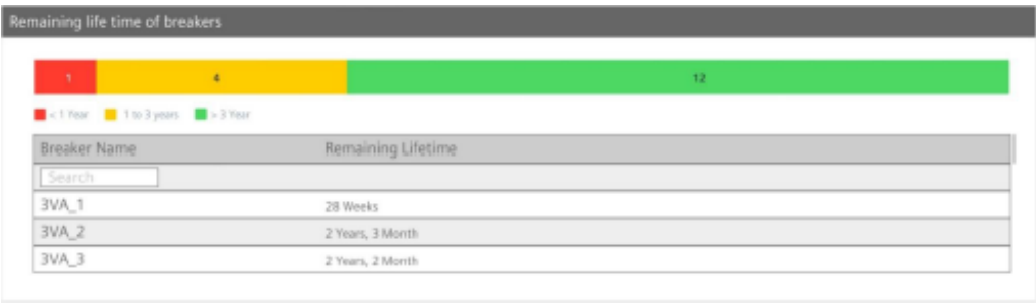
Detecting maintenance requirements at first glance

The figure below shows the user interface of the SENTRON Powermanager energy monitoring software or the SENTRON Powermind app in the MindSphere cloud. This example visualizes an overview of the health indicator values of the molded case circuit breakers in a power distribution system.

At first glance, it is clear that one molded case circuit breaker is in the critical range between 10% and 20%. The health indicator values of two further devices are between 20% and 30%. With reference to the predicted remaining life time, the operator should now consider when it would make sense to replace these three devices.



The second example of a user interface shows devices grouped according to their remaining life time. The time ranges "<1 year", "1 to 3 years" and ">3 years" are shown in both graphical and tabular form, and the circuit breakers and their numbers are also listed.



In addition to these overviews which provide information about the overall condition of the system, further detailed information for diagnostics and statistics can be called up for each individual molded case circuit breaker.

Applications

3.1 Use of the 3VA UL molded case circuit breakers in line protection

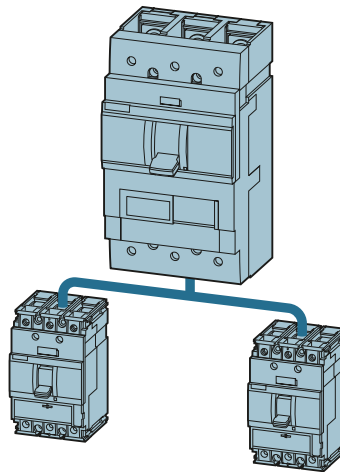
3.1.1 Applications in line protection

The main applications of the circuit breakers as line protection components are:

- Feeder circuit breaker of machines
- Branch circuit breaker for predominantly resistive loads
- Group switch for loads that are jointly protected
- In main switchboards to provide protection for cables to subdistribution boards
- In subdistribution boards to provide protection for cables to small distribution boards
- Protection for mixed load (e.g. machine, lighting system, heating system, etc.)

The trip units for line protection are designed to provide overload and short-circuit protection for:

- Cables
- Conductors
- Non-motor loads



Suitable 3VA UL molded case circuit breakers and trip units

3VA UL molded case circuit breakers equipped with the following trip units are suitable for use in line protection:

- 3VA5 with thermal-magnetic trip units
 - TM 2-series (Page 125)
- 3VA6 with electronic trip units
 - 3-series ETU (Page 129)
 - 5-series ETU (Page 145)
 - 8-series ETU (Page 145)
- Sealable, transparent protective cover of trip units
All trip units for the 3VA UL molded case circuit breakers have a sealable protective cover. Sealing this protective cover is intended to prevent unauthorized changes of the setting values.

Overview of the trip units

3VA5						
Article No. supplement	Trip unit	Line protection	Generator protection	Starter protection	Function	Number of poles
BB	MSC110	--	--	✓	I	3p
ED	TM210	✓	--	--	LI	1p - 4p
EC	TM230	✓	--	--	LI	2p - 4p
EF	TM240	✓	--	--	LI	3p; 4p
GD	TM210	✓	--	--	LIN	4p
GC	TM230	✓	--	--	LIN	4p
GF	TM240	✓	--	--	LIN	4p
MH	TM120M	--	--	✓	I	3p
MU	TM120M	--	--	✓	I	3p

3VA5							
Article No. supplement	Trip unit	Setting options					
		L	S ¹⁾		I ²⁾	G	N ³⁾
		Overload protection	Short-circuit protection (short-time-delayed)		Short-circuit protection (instantaneous)	Ground-fault protection	Neutral conductor protection
		$I_r = x I_n$	$I_{sd} = x I_n$	t_{sd} [s]	$I_i = x I_n$	$I_g = x I_n$	$I_N = x I_n$
BB	MSC110	--	--	--	10	--	--
ED	TM210	1	--	--	10	--	--
EC	TM230	1	--	--	5 ... 10	--	--
EF	TM240	0.8 ... 1	--	--	5 ... 10	--	--
GD	TM210	1	--	--	10	--	1

3.1 Use of the 3VA UL molded case circuit breakers in line protection

3VA5							
Article No. supplement	Trip unit	Setting options					
		L	S ¹⁾		I ²⁾	G	N ³⁾
		Overload protection	Short-circuit protection (short-time-delayed)		Short-circuit protection (instantaneous)	Ground-fault protection	Neutral conductor protection
		$I_r = x I_n$	$I_{sd} = x I_n$	t_{sd} [s]	$I_i = x I_n$	$I_g = x I_n$	$I_N = x I_n$
GC	TM230	1	--	--	5 ... 10	--	1
GF	TM240	0.8 ... 1	--	--	5 ... 10	--	1
MH	TM120M	--	--	--	5 ... 12	--	--
MU	TM120M	--	--	--	3 ... 7	--	--

¹⁾ I_{sd} up to 9 / 10 x I_n , dependent on rated operational current and frame size

²⁾ I_i up to 9 / 10 / 12 x I_n , dependent on rated operational current and frame size

³⁾ I_N up to 1.6 x I_n , dependent on rated operational current and frame size

3VA6								
Article No. supplement	Trip unit	Line protection	Generator protection	Starter protection	Communication capability	Metering function	Function	Number of poles
BB	MCS110	--	--	✓	--	--	I	3p
MS	ETU310M	--	--	✓	--	--	I	3p
HL	ETU320	✓	--	--	--	--	LI	3p
							LIN	4p
HM	ETU330	✓	--	--	--	--	LIG	3p
							LIGN	4p
HN	ETU350	✓	✓	--	--	--	LSI	3p
							LSIN	4p
JP	ETU550	✓	✓	--	✓	--	LSI	3p + N
							LSIN	4p
JT	ETU556	✓	✓	--	✓	--	LSI G (alarm)	3p + N
							LSIN G (alarm)	4p
JQ	ETU560	✓	✓	--	✓	--	LSIG	3p + N
							LSING	4p
KL	ETU820	✓	--	--	✓	✓	LI	3p
							LIN	4p
KM	ETU830	✓	--	--	✓	✓	LIG	3p
							LIGN	4p
KP	ETU850	✓	✓	--	✓	✓	LSI	3p + N
							LSIN	4p

3.1 Use of the 3VA UL molded case circuit breakers in line protection

3VA6								
Article No. supplement	Trip unit	Line protection	Generator protection	Starter protection	Communication capability	Metering function	Function	Number of poles
KT	ETU856	✓	✓	--	✓	✓	LSI G (alarm)	3p + N
							LSIN G (alarm)	4p
KQ	ETU860	✓	✓	--	✓	✓	LSIG	3p + N
							LSING	4p

3VA6							
Article No. supplement	Trip unit	Setting options					
		L	S ¹⁾		I ²⁾	G	N ³⁾
		Overload protection	Short-circuit protection (short-time-delayed)		Short-circuit protection (instantaneous)	Ground-fault protection	Neutral conductor protection
		$I_r = x I_n$	$I_{sd} = x I_n$	t_{sd} [s]	$I_i = x I_n$	$I_g = x I_n$	$I_N = x I_n$
BB	MCS110	--	--	--	15	--	--
MS	ETU310M	--	--	--	3 ... 15	--	--
HL	ETU320	0.4 ... 1	--	--	1.5 ... 12	--	--
		0.4 ... 1	--	--	1.5 ... 12	--	0.5; 1; OFF
HM	ETU330	0.4 ... 1	--	--	1.5 ... 12	0.2 ... 1	-
		0.4 ... 1	--	--	1.5 ... 12	0.2 ... 1	0.5; 1; OFF
HN	ETU350	0.4 ... 1	1.5 ... 10	0 ... 0.4	12	--	--
		0.4 ... 1	1.5 ... 10	0 ... 0.4	12	--	0.5; 1; OFF
JP	ETU550	0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	--	0.2 ... 1.6; OFF
		0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	--	0.2 ... 1.6; OFF
JT	ETU556	0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	0.2 ... 1	0.2 ... 1.6; OFF
		0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	0.2 ... 1	0.2 ... 1.6; OFF
JQ	ETU560	0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	0.2 ... 1	0.2 ... 1.6; OFF
		0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	0.2 ... 1	0.2 ... 1.6; OFF
KL	ETU820	0.4 ... 1	--	--	1.5 ... 12	--	--
		0.4 ... 1	--	--	1.5 ... 12	--	0.2 ... 1.6; OFF
KM	ETU830	0.4 ... 1	--	--	1.5 ... 12	0.2 ... 1	--
		0.4 ... 1	--	--	1.5 ... 12	0.2 ... 1	0.2 ... 1.6; OFF
KP	ETU850	0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	--	0.2 ... 1.6; OFF
		0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	--	0.2 ... 1.6; OFF
KT	ETU856	0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	0.2 ... 1	0.2 ... 1.6; OFF
		0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	0.2 ... 1	0.2 ... 1.6; OFF
KQ	ETU860	0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	0.2 ... 1	0.2 ... 1.6; OFF
		0.4 ... 1	0.6 ... 10	0.05 ... 0.5	1.5 ... 12	0.2 ... 1	0.2 ... 1.6; OFF

- ¹⁾ I_{sd} up to $9 / 10 \times I_n$, dependent on rated operational current and frame size
- ²⁾ I_i up to $9 / 10 / 12 \times I_n$, dependent on rated operational current and frame size
- ³⁾ I_N up to $1.6 \times I_n$, dependent on rated operational current and frame size

Use of the 3VA UL molded case circuit breaker as a molded case switch (MCS) (Page 180)

3.1.2 Versions of the trip units

3.1.2.1 Thermal-magnetic trip units

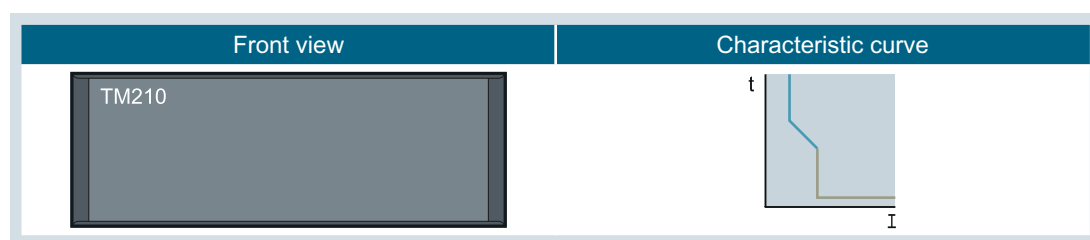
TMTUs for line protection applications

Derating

Thermal-magnetic trip units employ a temperature-dependent bimetal to provide overload protection. The setting values are calibrated at an ambient temperature of +40 °C. Compensation factors must be applied for ambient temperatures greater than +50 °C.

You will find more information and derating factors in chapter Derating (Page 582).

Thermal-magnetic trip unit TM210 LI



Line protection FTFM - function LI

The thermal-magnetic trip unit TM210 has:

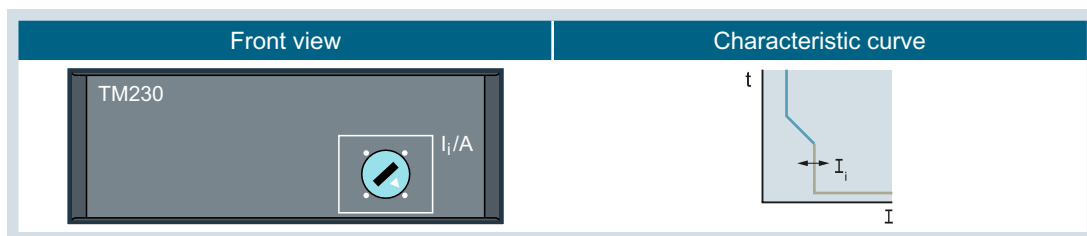
- Fixed parameter setting I_r for overload protection (L)
- Fixed parameter setting I_i for instantaneous short-circuit protection (I)

3.1 Use of the 3VA UL molded case circuit breakers in line protection

TM210 parameters:

Frame size		Rated current I_n	Values I_r	Values I_i
		[A]	[A]	[A]
3VA51	3VA5195	15	15	300
	3VA5120	20	20	300
	3VA5125	25	25	300
	3VA5130	30	30	300
	3VA5135	35	35	350
	3VA5140	40	40	400
	3VA5145	45	45	450
	3VA5150	50	50	500
	3VA5160	60	60	600
	3VA5170	70	70	700
	3VA5180	80	80	800
	3VA5190	90	90	900
	3VA5110	100	100	1000
	3VA5111	110	110	1100
	3VA5112	125	125	1250
3VA52	3VA5295	15	15	350
	3VA5282	20	20	350
	3VA5285	25	25	350
	3VA5230	30	30	350
	3VA5235	35	35	350
	3VA5240	40	40	400
	3VA5245	45	45	450
	3VA5250	50	50	500
	3VA5260	60	60	600
	3VA5270	70	70	700
	3VA5280	80	80	800
	3VA5290	90	90	900
	3VA5210	100	100	1000
	3VA5211	110	110	1100
	3VA5212	125	125	1250
	3VA5215	150	150	1500
	3VA5217	175	175	1750
	3VA5220	200	200	2000
	3VA5222	225	225	2250
	3VA5225	250	250	2500

Thermal-magnetic trip unit TM230 LI



Line protection FTAM - function LI

The thermal-magnetic trip unit TM230 has:

- Fixed parameter setting I_r for overload protection (L)
- Adjustable parameter setting I_i for instantaneous short-circuit protection (I)

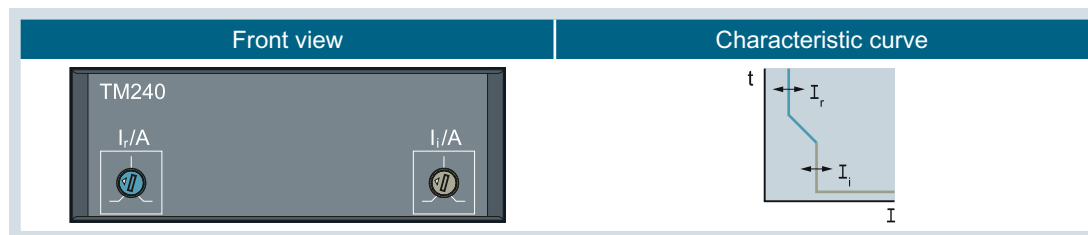
TM230 parameters:

Frame size		Rated current I_n	Values I_r	Setting values for I_i					
		[A]	[A]	[A]					
3VA51	3VA5195	15	15	150	180	210	240	270	300
	3VA5120	20	20	150	180	210	240	270	300
	3VA5125	25	25	150	180	210	240	270	300
	3VA5130	30	30	150	180	210	240	270	300
	3VA5135	35	35	175	210	245	280	315	350
	3VA5140	40	40	200	240	280	320	360	400
	3VA5145	45	45	225	270	315	360	405	450
	3VA5150	50	50	250	300	350	400	450	500
	3VA5160	60	60	300	360	420	480	540	600
	3VA5170	70	70	350	420	490	560	630	700
	3VA5180	80	80	400	480	560	640	720	800
	3VA5190	90	90	450	540	630	720	810	900
	3VA5110	100	100	500	600	700	800	900	1000
	3VA5111	110	110	550	660	770	880	990	1100
	3VA5112	125	125	625	750	875	1000	1125	1250

3.1 Use of the 3VA UL molded case circuit breakers in line protection

Frame size		Rated current I_n	Values I_r	Setting values for I_i					
		[A]	[A]	[A]					
3VA52	3VA5270	70	70	350	420	490	560	630	700
	3VA5280	80	80	400	480	560	640	720	800
	3VA5290	90	90	450	540	630	720	810	900
	3VA5210	100	100	500	600	700	800	900	1000
	3VA5211	110	110	550	660	770	880	990	1100
	3VA5212	125	125	625	750	875	1000	1125	1250
	3VA5215	150	150	750	900	1050	1200	1350	1500
	3VA5217	175	175	875	1050	1225	1400	1575	1750
	3VA5220	200	200	1000	1200	1400	1600	1800	2000
	3VA5222	225	225	1125	1350	1575	1800	2025	2250
	3VA5225	250	250	1250	1500	1750	2000	2250	2500
3VA53	3VA5320	200	200	1000	1200	1400	1600	1800	2000
	3VA5322	225	225	1125	1350	1575	1800	2025	2250
	3VA5325	250	250	1250	1500	1750	2000	2250	2500
	3VA5330	300	300	1500	1800	2100	2400	2700	3000
	3VA5335	350	350	1750	2100	2450	2800	3150	3500
	3VA5340	400	400	2000	2400	2800	3200	3600	4000
3VA54	3VA5445	450	450	2250	2700	3150	3600	4050	4500
	3VA5450	500	500	2500	3000	3500	4000	4500	5000
	3VA5460	600	600	--	2400	3000	3600	4200	4800
3VA55	3VA5560	600	600	3000	3600	4200	4800	5400	6000
	3VA5570	700	700	3500	4200	4900	5600	6300	7000
	3VA5580	800	800	4000	4800	5600	6400	7200	8000

Thermal-magnetic trip unit TM240 LI



Line protection ATAM - function LI

The thermal-magnetic trip unit TM240 has:

- Adjustable parameter setting I_r for overload protection (L)
- Adjustable parameter setting I_i for instantaneous short-circuit protection (I)
- With 4-pole versions only: Neutral conductor (N) protection permanently set to 0%, 50% or 100% I_r depending on version

3.1 Use of the 3VA UL molded case circuit breakers in line protection

Parameter TM240:

Frame size		Rated current I_n	Values I_r			Setting values for I_i					
		[A]	[A]			[A]					
3VA51	3VA5195	15	12	14	15	150	180	210	240	270	300
	3VA5120	20	16	18	20	150	180	210	240	270	300
	3VA5130	30	24	27	30	150	180	210	240	270	300
	3VA5140	40	32	36	40	200	240	280	320	360	400
	3VA5150	50	40	45	50	250	300	350	400	450	500
	3VA5160	60	48	54	60	300	360	420	480	540	600
	3VA5170	70	56	63	70	350	420	490	560	630	700
	3VA5180	80	64	72	80	400	480	560	640	720	800
	3VA5110	100	80	90	100	500	600	700	800	900	1000
3VA52	3VA5270	70	56	63	70	350	420	490	560	630	700
	3VA5280	80	64	72	80	400	480	560	640	720	800
	3VA5210	100	80	90	100	500	600	700	800	900	1000
	3VA5211	110	88	99	110	550	660	770	880	990	1100
	3VA5212	125	100	113	125	625	750	875	1000	1125	1250
	3VA5215	150	120	135	150	750	900	1050	1200	1350	1500
	3VA5217	175	140	158	175	875	1050	1225	1400	1575	1750
	3VA5220	200	160	180	200	1000	1200	1400	1600	1800	2000
	3VA5222	225	180	203	225	1125	1350	1575	1800	2025	2250
3VA53	3VA5225	250	200	225	250	1250	1500	1750	2000	2250	2500
	3VA5320	200	160	180	200	1000	1200	1400	1600	1800	2000
	3VA5322	225	180	200	225	1125	1350	1575	1800	2025	2250
	3VA5325	250	200	225	250	1250	1500	1750	2000	2250	2500
	3VA5330	300	240	270	300	1500	1800	2100	2400	2700	3000
	3VA5335	350	280	315	350	1750	2100	2450	2800	3150	3500
3VA54	3VA5340	400	320	360	400	2000	2400	2800	3200	3600	4000
	3VA5445	450	360	405	450	2250	2700	3150	3600	4050	4500
	3VA5450	500	400	450	500	2500	3000	3500	4000	4500	5000
	3VA5460	600	480	540	600	--	2400	3000	3600	4200	4800

3.1.2.2 Electronic trip units

ETUs for line protection applications

The following electronic trip units are suitable for use in line protection applications:

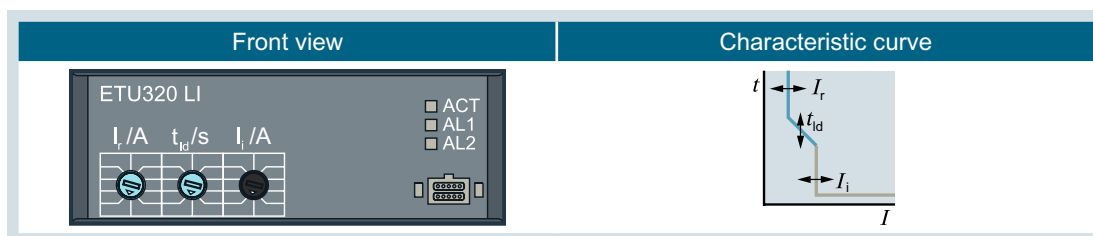
- ETU320 LI
- ETU330 LIG

3.1 Use of the 3VA UL molded case circuit breakers in line protection

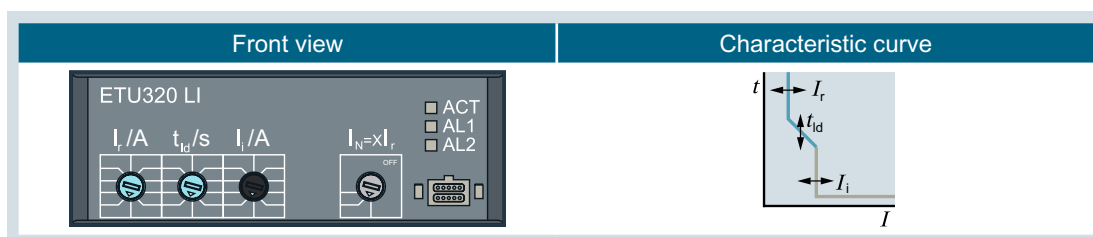
- ETU350 LSI
- ETU550 LSI
- ETU556 LSI-G (alarm-only)
- ETU560 LSI-G
- ETU820 LI
- ETU830 LIG
- ETU850 LSI
- ETU856 LSI-G (alarm-only)
- ETU860 LSI-G

Electronic trip unit ETU320 LI

ETU320 LI 3-pole:



ETU320 LI 4-pole:



Line protection - function LI

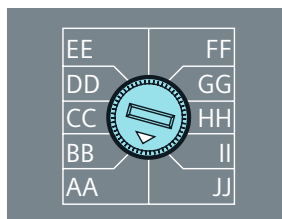
The electronic trip unit ETU320 has:

- Adjustable parameter settings I_r and t_{id} for overload protection (L)
- Adjustable parameter setting I_i for instantaneous short-circuit protection (I)
- With 4-pole versions only: Neutral conductor protection (N) which can be deactivated

ETU320 parameters:

The parameters are selected with the setting knob. The diagram below shows an example of the possible selections with setting knob I_r .

3.1 Use of the 3VA UL molded case circuit breakers in line protection



The values for the respective setting are listed in the following tables.

Setting values for current I_r

	Breaking capacity class	Rated current I_n [A]	Setting values for I_r									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	15	20	25	28	30	32	35	37	39	40
3VA6160	E	60	24	30	37	42	45	48	52	55	58	60
3VA6110	M / H / C / L / E	100	40	50	60	70	75	80	85	90	95	100
3VA6115	M / H / C / L / E	150	60	70	80	90	100	110	125	135	145	150
3VA6210	M / H / C / L / E	100	40	50	60	70	75	80	85	90	95	100
3VA6225	M / H / C / L	250	100	125	150	175	200	210	220	230	240	250
3VA6225	E	250	100	125	150	175	200	210	220	230	240	250
3VA6325	M / H / C / L / E	250	100	125	150	175	200	210	220	230	240	250
3VA6340	M / H / C / L / E	400	150	200	240	280	300	320	340	360	380	400
3VA6440	M / H / C / L / E	400	150	200	240	280	300	320	340	360	380	400
3VA6460	M / H / C / L / E	600	250	300	350	400	450	500	525	550	575	600
3VA6560	M / H / C	600	250	300	350	400	450	500	525	550	575	600
3VA6580	M / H / C	800	315	350	400	450	500	600	650	700	750	800
3VA6610	M / H / C	1000	400	500	600	700	750	800	850	900	950	1000

3.1 Use of the 3VA UL molded case circuit breakers in line protection

Setting values for long-time delay t_{ld}

	Breaking capacity class	Rated current I_n [A]	Setting values for t_{ld}									
			[s]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	0.5	0.75	1	2	3	5	8	10	14	17
3VA6160	E	60	0.5	0.75	1	2	3	5	8	10	14	17
3VA6110	M / H / C / L / E	100	0.5	0.75	1	2	3	5	8	10	14	17
3VA6115	M / H / C / L / E	150	0.5	0.75	1	2	3	5	8	10	14	17
3VA6210	M / H / C / L / E	100	0.5	0.75	1	2	3	5	8	10	14	17
3VA6225	M / H / C / L	250	0.5	0.75	1	2	3	5	8	10	12	13
3VA6225	E	250	0.5	0.75	1	2	3	5	8	10	14	15
3VA6325	M / H / C / L / E	250	0.5	0.75	1	2	3	5	8	10	14	17
3VA6340	M / H / C / L / E	400	0.5	0.75	1	2	3	5	8	10	14	17
3VA6440	M / H / C / L / E	400	0.5	0.75	1	2	3	5	8	10	14	17
3VA6460	M / H / C / L / E	600	0.5	0.75	1	2	3	5	8	10	14	15
3VA6560	M / H / C	600	0.5	0.75	1	2	3	5	8	10	14	17
3VA6580	M / H / C	800	0.5	0.75	1	2	3	5	8	10	14	17
3VA6610	M / H / C	1000	0.5	0.75	1	2	3	5	8	10	14	17

Setting values for instantaneous short-circuit protection I_i

	Breaking capacity class	Rated current I_n [A]	Setting values for I_i									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	60	80	100	120	160	200	240	320	400	480
3VA6160	E	60	90	120	150	180	240	300	360	480	600	720
3VA6110	M / H / C / L / E	100	150	200	250	300	400	500	600	800	1,000	1,200
3VA6115	M / H / C / L	150	225	300	375	450	600	750	900	1,200	1,350	1,500
3VA6210	E	150	225	300	375	450	600	750	900	1,200	1,500	1,800
3VA6225	M / H / C / L / E	100	150	200	250	300	400	500	600	800	1,000	1,200
3VA6225	M / H / C / L	250	375	500	625	750	1,000	1,250	1,500	2,000	2,250	2,500
3VA6325	E	250	375	500	625	750	1,000	1,250	1,500	2,000	2,250	2,500

3.1 Use of the 3VA UL molded case circuit breakers in line protection

	Breaking capacity class	Rated current I_n	Setting values for I_i									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6340	M/H/C/L/E	250	375	500	625	750	1,000	1,250	1,500	2,000	2,500	3,000
3VA6440	M/H/C/L	400	600	800	1,000	1,200	1,600	2,000	2,400	3,200	3,600	4,000
3VA6460	E	400	600	800	1,000	1,200	1,600	2,000	2,400	3,200	4,000	4,800
3VA6560	M/H/C/L/E	400	600	800	1,000	1,200	1,600	2,000	2,400	3,200	4,000	4,800
3VA6580	M/H/C/L/E	600	900	1,200	1,500	1,800	2,400	3,000	3,600	4,800	5,100	5,400
3VA6610	M/H/C	600	900	1,200	1,500	1,800	2,400	3,000	3,600	4,800	6,000	7,200

Setting values for neutral conductor current (4-pole devices) I_N

	Breaking capacity class	Rated current I_n	Setting values for $I_N = x I_r$									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M/H/C/L	40	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6160	E	60	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6110	M/H/C/L/E	100	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6115	M/H/C/L/E	150	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6210	M/H/C/L/E	100	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6225	M/H/C/L	250	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6225	E	250	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6325	M/H/C/L/E	250	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6340	M/H/C/L/E	400	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6440	M/H/C/L/E	400	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6460	M/H/C/L/E	600	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6560	M/H/C	600	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6580	M/H/C	800	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6610	M/H/C	1000	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

3.1 Use of the 3VA UL molded case circuit breakers in line protection

Overload release L:

- I_r Adjustable in 10 steps from 0.4 to $1.0 \times I_n$:
 $0.4 / 0.5 / 0.6 / 0.7 / 0.75 / 0.8 / 0.85 / 0.9 / 0.95 / 1.0$
- t_{id} Adjustable in 10 steps from 0.5 to $12 / 15$ s or 17 s:
 t_{id} is the tripping time with $6 \times I_r$

The ETU320 LI has a permanently active thermal memory.

Instantaneous short-circuit protection I:

- I_i Adjustable in 10 steps from 1.5 to $9 / 10 / 11 / 12 \times I_n$ (dependent on the frame size)

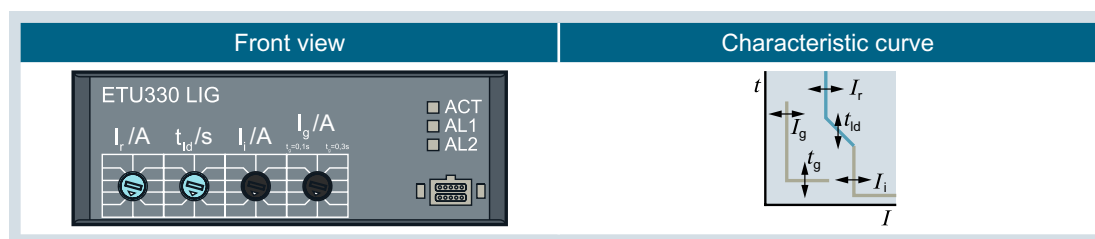
Neutral conductor protection N:

The neutral conductor protection function is available for 4-pole molded case circuit breakers only.

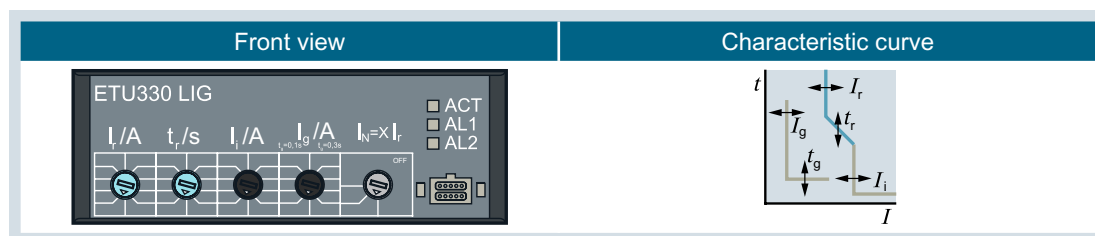
- I_N $I_n < 100$ A: $1.0 \times I_r$ or OFF
 $I_n \geq 100$ A: $0.5 / 1.0 \times I_r$ or OFF

Electronic trip unit ETU330 LIG

ETU330 LIG 3-pole:



ETU330 LIG 4-pole:



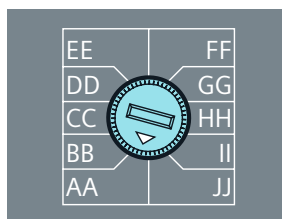
Line protection - function LIG

The electronic trip unit ETU330 has:

- Adjustable parameter settings I_r and t_{id} for overload protection (L)
- Adjustable parameter setting I_i for instantaneous short-circuit protection (I)
- Adjustable parameter settings I_g and t_g for ground-fault protection (G)
- With 4-pole versions only: Neutral conductor protection (N) which can be deactivated

ETU330 parameters:

The parameters are selected with the setting knob. The diagram below shows an example of the possible selections with setting knob I_r .



The values for the respective setting are listed in the following tables.

Setting values for current I_r

	Breaking capacity class	Rated current I_n [A]	Setting values for I_r									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	15	20	25	28	30	32	35	37	39	40
3VA6160	E	60	24	30	37	42	45	48	52	55	58	60
3VA6110	M / H / C / L / E	100	40	50	60	70	75	80	85	90	95	100
3VA6115	M / H / C / L / E	150	60	70	80	90	100	110	125	135	145	150
3VA6210	M / H / C / L / E	100	40	50	60	70	75	80	85	90	95	100
3VA6225	M / H / C / L	250	100	125	150	175	200	210	220	230	240	250
3VA6225	E	250	100	125	150	175	200	210	220	230	240	250
3VA6325	M / H / C / L / E	250	100	125	150	175	200	210	220	230	240	250
3VA6340	M / H / C / L / E	400	150	200	240	280	300	320	340	360	380	400
3VA6440	M / H / C / L / E	400	150	200	240	280	300	320	340	360	380	400

3.1 Use of the 3VA UL molded case circuit breakers in line protection

	Breaking capacity class	Rated current I_n	Setting values for I_r									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6460	M / H / C / L / E	600	250	300	350	400	450	500	525	550	575	600
3VA6560	M / H / C	600	250	300	350	400	450	500	525	550	575	600
3VA6580	M / H / C	800	315	350	400	450	500	600	650	700	750	800
3VA6610	M / H / C	1000	400	500	600	700	750	800	850	900	950	1000

Setting values for long-time delay t_{ld}

	Breaking capacity class	Rated current I_n	Setting values for t_{ld}									
			[s]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	0.5	0.75	1	2	3	5	8	10	14	17
3VA6160	E	60	0.5	0.75	1	2	3	5	8	10	14	17
3VA6110	M / H / C / L / E	100	0.5	0.75	1	2	3	5	8	10	14	17
3VA6115	M / H / C / L / E	150	0.5	0.75	1	2	3	5	8	10	14	17
3VA6210	M / H / C / L / E	100	0.5	0.75	1	2	3	5	8	10	14	17
3VA6225	M / H / C / L	250	0.5	0.75	1	2	3	5	8	10	12	13
3VA6225	E	250	0.5	0.75	1	2	3	5	8	10	14	15
3VA6325	M / H / C / L / E	250	0.5	0.75	1	2	3	5	8	10	14	17
3VA6340	M / H / C / L / E	400	0.5	0.75	1	2	3	5	8	10	14	17
3VA6440	M / H / C / L / E	400	0.5	0.75	1	2	3	5	8	10	14	17
3VA6460	M / H / C / L / E	600	0.5	0.75	1	2	3	5	8	10	14	15
3VA6560	M / H / C	600	0.5	0.75	1	2	3	5	8	10	14	17
3VA6580	M / H / C	800	0.5	0.75	1	2	3	5	8	10	14	17
3VA6610	M / H / C	1000	0.5	0.75	1	2	3	5	8	10	14	17

3.1 Use of the 3VA UL molded case circuit breakers in line protection

Setting values for instantaneous short-circuit protection I_i

	Breaking capacity class	Rated current I_n	Setting values for I_i									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	60	80	100	120	160	200	240	320	400	480
3VA6160	E	60	90	120	150	180	240	300	360	480	600	720
3VA6110	M / H / C / L / E	100	150	200	250	300	400	500	600	800	1,000	1,200
3VA6115	M / H / C / L	150	225	300	375	450	600	750	900	1,200	1,350	1,500
3VA6210	E	150	225	300	375	450	600	750	900	1,200	1,500	1,800
3VA6225	M / H / C / L / E	100	150	200	250	300	400	500	600	800	1,000	1,200
3VA6225	M / H / C / L	250	375	500	625	750	1,000	1,250	1,500	2,000	2,250	2,500
3VA6325	E	250	375	500	625	750	1,000	1,250	1,500	2,000	2,250	2,500
3VA6340	M / H / C / L / E	250	375	500	625	750	1,000	1,250	1,500	2,000	2,500	3,000
3VA6440	M / H / C / L	400	600	800	1,000	1,200	1,600	2,000	2,400	3,200	3,600	4,000
3VA6460	E	400	600	800	1,000	1,200	1,600	2,000	2,400	3,200	4,000	4,800
3VA6560	M / H / C / L / E	400	600	800	1,000	1,200	1,600	2,000	2,400	3,200	4,000	4,800
3VA6580	M / H / C / L / E	600	900	1,200	1,500	1,800	2,400	3,000	3,600	4,800	5,100	5,400
3VA6610	M / H / C	600	900	1,200	1,500	1,800	2,400	3,000	3,600	4,800	6,000	7,200

Setting values for ground-fault pickup I_g

	Breaking capacity class	Rated current I_n	Setting values for I_g									
			[A]									
			$t_g = 0.1 \text{ s}$					$t_g = 0.3 \text{ s}$				
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	15	24	28	32	40	15	24	28	32	40
3VA6160	E	60	15	25	35	50	60	15	25	35	50	60
3VA6110	M / H / C / L / E	100	20	40	60	80	100	20	40	60	80	100
3VA6115	M / H / C / L / E	150	30	60	90	120	150	30	60	90	120	150
3VA6210	M / H / C / L / E	100	20	40	60	80	100	20	40	60	80	100
3VA6225	M / H / C / L	250	50	100	150	200	250	50	100	150	200	250
3VA6225	E	250	50	100	150	200	250	50	100	150	200	250
3VA6325	M / H / C / L / E	250	50	100	150	200	250	50	100	150	200	250

3.1 Use of the 3VA UL molded case circuit breakers in line protection

	Breaking capacity class	Rated current I_n	Setting values for I_g									
			[A]									
			$t_g = 0.1 \text{ s}$					$t_g = 0.3 \text{ s}$				
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6340	M / H / C / L / E	400	80	160	240	320	400	80	160	240	320	400
3VA6440	M / H / C / L / E	400	80	160	240	320	400	80	160	240	320	400
3VA6460	M / H / C / L / E	600	120	240	360	480	600	120	240	360	480	600
3VA6560	M / H / C	600	120	240	360	480	600	120	240	360	480	600
3VA6580	M / H / C	800	160	320	480	640	800	160	320	480	640	800
3VA6610	M / H / C	1000	200	400	600	800	1,000	200	400	600	800	1,000

Setting values for neutral conductor current (4-pole devices) I_N

	Breaking capacity class	Rated current I_n	Setting values for $I_N = x I_r$									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6160	E	60	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6110	M / H / C / L / E	100	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6115	M / H / C / L / E	150	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6210	M / H / C / L / E	100	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6225	M / H / C / L	250	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6225	E	250	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6325	M / H / C / L / E	250	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6340	M / H / C / L / E	400	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6440	M / H / C / L / E	400	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6460	M / H / C / L / E	600	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6560	M / H / C	600	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6580	M / H / C	800	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6610	M / H / C	1000	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Overload release L:

- I_r Adjustable in 10 steps from 0.4 to $1.0 \times I_n$:
0.4 / 0.5 / 0.6 / 0.7 / 0.75 / 0.8 / 0.85 / 0.9 / 0.95 / 1.0
- t_{ld} Adjustable in 10 steps from 0.5 to 12 / 15 s or 17 s:
 t_{ld} is the tripping time with $6 \times I_r$

The ETU330 LIG has a permanently active thermal memory.

Instantaneous short-circuit protection I:

- I_i Adjustable in 10 steps from 1.5 to 9 / 10 / 11 / 12 $\times I_n$ (dependent on the frame size)

Ground-fault protection G:

- I_g Adjustable in 5 steps of 0.2 / 0.25 / 0.4 / 0.6 to $1.0 \times I_n$
(depending on frame size)
- t_g Adjustable to 100 ms or 300 ms, at $2 \times I_g$ in each case

The ground-fault protection cannot be deactivated.

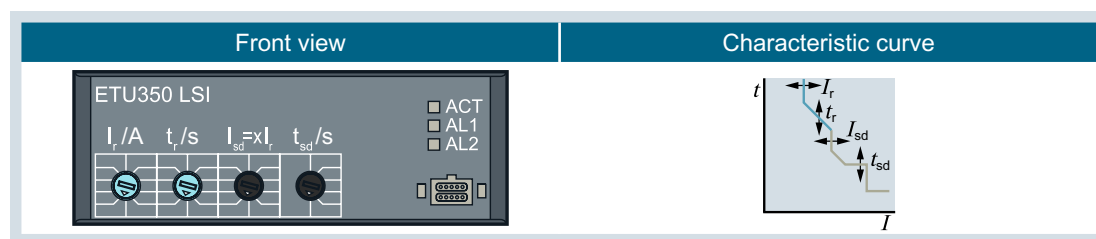
Neutral conductor protection N:

The neutral conductor protection function is available for 4-pole molded case circuit breakers only.

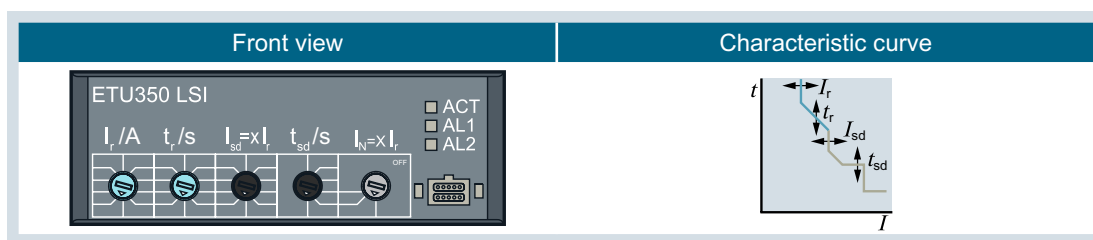
- I_N $I_n < 100$ A: $1.0 \times I_r$ or OFF
 $I_n \geq 100$ A: 0.5 / $1.0 \times I_r$ or OFF

Electronic trip unit ETU350 LSI

ETU350 LSI 3-pole:



ETU350 LSI 4-pole:



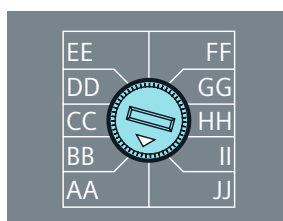
Line protection - function LSI

The electronic trip unit ETU350 has:

- Adjustable parameter settings I_r and t_{id} for overload protection (L)
- Adjustable parameter settings I_{sd} and t_{sd} for short-time-delayed short-circuit protection (S)
- Fixed parameter setting I_i for instantaneous short-circuit protection (I)
- With 4-pole versions only: Neutral conductor protection (N) which can be deactivated

ETU350 parameters:

The parameters are selected with the setting knob. The diagram below shows an example of the possible selections with setting knob I_r .



The values for the respective setting are listed in the following tables.

Setting values for current I_r

	Breaking capacity class	Rated current I_n [A]	Setting values for I_r [A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	15	20	25	28	30	32	35	37	39	40
3VA6160	E	60	24	30	37	42	45	48	52	55	58	60
3VA6110	M / H / C / L / E	100	40	50	60	70	75	80	85	90	95	100
3VA6115	M / H / C / L / E	150	60	70	80	90	100	110	125	135	145	150
3VA6210	M / H / C / L / E	100	40	50	60	70	75	80	85	90	95	100

3.1 Use of the 3VA UL molded case circuit breakers in line protection

	Breaking capacity class	Rated current I_n	Setting values for I_r									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6225	M / H / C / L	250	100	125	150	175	200	210	220	230	240	250
3VA6225	E	250	100	125	150	175	200	210	220	230	240	250
3VA6325	M / H / C / L / E	250	100	125	150	175	200	210	220	230	240	250
3VA6340	M / H / C / L / E	400	150	200	240	280	300	320	340	360	380	400
3VA6440	M / H / C / L / E	400	150	200	240	280	300	320	340	360	380	400
3VA6460	M / H / C / L / E	600	250	300	350	400	450	500	525	550	575	600
3VA6560	M / H / C	600	250	300	350	400	450	500	525	550	575	600
3VA6580	M / H / C	800	315	350	400	450	500	600	650	700	750	800
3VA6610	M / H / C	1000	400	500	600	700	750	800	850	900	950	1000

Setting values for long-time delay t_{ld}

	Breaking capacity class	Rated current I_n	Setting values for t_{ld}									
			[s]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	0.5	0.75	1	2	3	5	8	10	14	17
3VA6160	E	60	0.5	0.75	1	2	3	5	8	10	14	17
3VA6110	M / H / C / L / E	100	0.5	0.75	1	2	3	5	8	10	14	17
3VA6115	M / H / C / L / E	150	0.5	0.75	1	2	3	5	8	10	14	17
3VA6210	M / H / C / L / E	100	0.5	0.75	1	2	3	5	8	10	14	17
3VA6225	M / H / C / L	250	0.5	0.75	1	2	3	5	8	10	12	13
3VA6225	E	250	0.5	0.75	1	2	3	5	8	10	14	15
3VA6325	M / H / C / L / E	250	0.5	0.75	1	2	3	5	8	10	14	17
3VA6340	M / H / C / L / E	400	0.5	0.75	1	2	3	5	8	10	14	17
3VA6440	M / H / C / L / E	400	0.5	0.75	1	2	3	5	8	10	14	17
3VA6460	M / H / C / L / E	600	0.5	0.75	1	2	3	5	8	10	14	15
3VA6560	M / H / C	600	0.5	0.75	1	2	3	5	8	10	14	17
3VA6580	M / H / C	800	0.5	0.75	1	2	3	5	8	10	14	17
3VA6610	M / H / C	1000	0.5	0.75	1	2	3	5	8	10	14	17

3.1 Use of the 3VA UL molded case circuit breakers in line protection

Setting values for instantaneous short-circuit protection I_i

	Breaking capacity class	Rated current I_n	Setting values for I_i
			[A]
			(permanently set)
3VA6140	M / H / C / L	40	480
3VA6160	E	60	720
3VA6110	M / H / C / L / E	100	1200
3VA6115	M / H / C / L	150	1500
3VA6115	E	150	1500
3VA6210	M / H / C / L / E	100	1200
3VA6225	M / H / C / L	250	2500
3VA6225	E	250	2500
3VA6325	M / H / C / L / E	250	3000
3VA6340	M / H / C / L	400	4000
3VA6340	E	400	4800
3VA6440	M / H / C / L / E	400	4800
3VA6460	M / H / C / L / E	600	5400
3VA6560	M / H / C	600	7200
3VA6580	M / H / C	800	8000
3VA6610	M / H / C	1000	10000

Setting values for short-time-delayed short-circuit protection I_{sd}

	Breaking capacity class	Rated current I_n	Setting values for $I_{sd} = x I_r$									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6160	E	60	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6110	M / H / C / L / E	100	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6115	M / H / C / L	150	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6115	E	150	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6210	M / H / C / L / E	100	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6225	M / H / C / L	250	1.5	2	2.5	3	3.5	4	5	6	8	10

3.1 Use of the 3VA UL molded case circuit breakers in line protection

	Breaking capacity class	Rated current I_n	Setting values for $I_{sd} = x I_r$									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6225	E	250	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6325	M/H/C/L/E	250	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6340	M/H/C/L	400	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6340	E	400	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6440	M/H/C/L/E	400	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6460	M/H/C/L/E	600	1.5	2	2.5	3	3.5	4	5	6	8	9
3VA6560	M/H/C	600	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6580	M/H/C	800	1.5	2	2.5	3	3.5	4	5	6	8	10
3VA6610	M/H/C	1000	1.5	2	2.5	3	3.5	4	5	6	8	10

Setting values for short-time delay t_{sd}

	Breaking capacity class	Rated current I_n	Setting values for t_{sd}									
			[s]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M/H/C/L	40	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6160	E	60	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6110	M/H/C/L/E	100	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6115	M/H/C/L	150	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6115	E	150	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6210	M/H/C/L/E	100	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6225	M/H/C/L	250	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6225	E	250	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6325	M/H/C/L/E	250	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6340	M/H/C/L	400	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6340	E	400	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6440	M/H/C/L/E	400	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6460	M/H/C/L/E	600	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6560	M/H/C	600	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6580	M/H/C	800	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4
3VA6610	M/H/C	1000	0	0	0	0	0	0.08	0.15	0.22	0.3	0.4

3.1 Use of the 3VA UL molded case circuit breakers in line protection

Setting values for neutral conductor current (4-pole devices) I_N

	Breaking capacity class	Rated current I_n [A]	Setting values for $I_N = x I_r$									
			[A]									
			AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6140	M / H / C / L	40	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6160	E	60	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6110	M / H / C / L / E	100	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6115	M / H / C / L / E	150	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6210	M / H / C / L / E	100	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6225	M / H / C / L	250	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6225	E	250	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6325	M / H / C / L / E	250	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6340	M / H / C / L / E	400	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6440	M / H / C / L / E	400	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6460	M / H / C / L / E	600	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6560	M / H / C	600	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6580	M / H / C	800	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3VA6610	M / H / C	1000	0.5	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Overload release L:

- I_r Adjustable in 10 steps from 0.4 to $1.0 \times I_n$:
0.4 / 0.5 / 0.6 / 0.7 / 0.75 / 0.8 / 0.85 / 0.9 / 0.95 / 1.0
- t_{ld} Adjustable in 10 steps from 0.5 to 12 / 15 s or 17 s:
 t_{ld} is the tripping time with $6 \times I_r$

The ETU350 LSI has a permanently active thermal memory.

Short-time-delayed short-circuit protection S:

- I_{sd} Adjustable in 10 steps from 1.5 to $9 / 10 \times I_r$
- t_{sd} Adjustable in 6 steps from 0 to 0.4 s
with the reference point at $I_{sd} = 8 \times I_r$

The curve shape is $I^2t = \text{constant}$.

Instantaneous short-circuit protection I:

- I_i Not adjustable: Permanently set to 9 / 10 / 11 / 12 x I_n (depending on rated operational current and frame size)

Neutral conductor protection N:

The neutral conductor protection function is available for 4-pole molded case circuit breakers only.

- I_N $I_n < 100$ A: 1.0 x I_r or OFF
 $I_n \geq 100$ A: 0.5 / 1.0 x I_r or OFF

5-series and 8-series electronic trip units**Parameter input via display unit**

With 5-series and 8-series electronic trip units, it is possible to set more parameters and scale the selection of parameters more finely than for 3-series trip units.

Parameters are set via the display unit and its buttons. This functionality is available, however, only if a separate, dedicated power supply is connected to the molded case circuit breakers.

Potential alternatives for this power supply:

- 24 V supplied externally via:
 - External Function Box EFB300
 - Maintenance Mode Box MMB300
 - temporarily connected TD300 or TD500 test device
 - internal 24 V module
 - internal COM060 communications module
- Current flow > 20% I_n in one of the 3 phases

A description of the parameter display can be found in chapter "Operator controls".

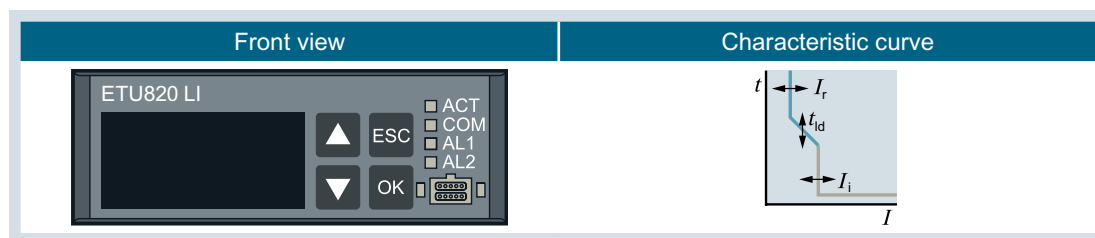
Additional features of 8-series units

In addition to the features shared with 5-series trip units, 8-series units also offer:

- An integrated voltage tap, plus an external voltage tap in the case of 3-pole molded case circuit breakers
- Additional sensing of power measurements (function requires an external 24 V supply)

Electronic trip unit ETU820 LI

ETU820 LI 3-pole and 4-pole:



Line protection - function LI

The electronic trip unit ETU820 has:

- Adjustable parameter settings I_r and t_{id} for overload protection (L)
- Adjustable parameter setting I_i for instantaneous short-circuit protection (I)
- With 4-pole versions only: Adjustable parameter setting I_N for protection of neutral conductor (N)

ETU820 parameters, 3-pole

	Breaking capacity class	Rated current I_n	I_r	t_{id}	I_i
		[A]	[A]	[s]	[A]
3VA6140	M / H / C / L	40	15 ... 40	0.5 ... 25	60 ... 480
3VA6110	M / H / C / L	100	40 ... 100	0.5 ... 25	150 ... 1,200
3VA6115	M / H / C / L	150	60 ... 150	0.5 ... 20	225 ... 1,500
3VA6210	M / H / C / L	100	40 ... 100	0.5 ... 25	150 ... 1,200
3VA6225	M / H / C / L	250	100 ... 250	0.5 ... 13	375 ... 2,500
3VA6325	M / H / C / L	250	100 ... 250	0.5 ... 25	375 ... 3,000
3VA6340	M / H / C / L	400	150 ... 400	0.5 ... 17	600 ... 4,000
3VA6440	M / H / C / L	400	150 ... 400	0.5 ... 25	600 ... 4,800
3VA6460	M / H / C / L	600	250 ... 600	0.5 ... 15	900 ... 5,400
3VA6560	M / H / C	600	250 ... 600	0.5 ... 25	900 ... 7,200
3VA6580	M / H / C	800	315 ... 800	0.5 ... 25	1,200 ... 8,000
3VA6610	M / H / C	1,000	400 ... 1,000	0.5 ... 25	1,500 ... 10,000

3.1 Use of the 3VA UL molded case circuit breakers in line protection

ETU820 parameters, 4-pole

	Breaking capacity class	Rated current I_n	I_r	t_{id}	I_i	I_N
		[A]	[A]	[s]	[A]	[A]
3VA6140	M / H / C / L	40	15 ... 40	0.5 ... 25	60 ... 480	15 ... 64; OFF
3VA6110	M / H / C / L	100	40 ... 100	0.5 ... 25	150 ... 1,200	20 ... 150; OFF
3VA6115	M / H / C / L	150	60 ... 150	0.5 ... 20	225 ... 1,500	30 ... 150; OFF
3VA6210	M / H / C / L	100	40 ... 100	0.5 ... 25	150 ... 1,200	20 ... 160; OFF
3VA6225	M / H / C / L	250	100 ... 250	0.5 ... 13	375 ... 2,500	50 ... 250; OFF
3VA6325	M / H / C / L	250	100 ... 250	0.5 ... 25	375 ... 3,000	50 ... 400; OFF
3VA6340	M / H / C / L	400	150 ... 400	0.5 ... 17	600 ... 4,000	80 ... 400; OFF
3VA6440	M / H / C / L	400	150 ... 400	0.5 ... 25	600 ... 4,800	80 ... 600; OFF
3VA6460	M / H / C / L	600	250 ... 600	0.5 ... 15	900 ... 5,400	120 ... 600; OFF
3VA6560	M / H / C	600	250 ... 600	0.5 ... 25	900 ... 7,200	120 ... 800; OFF
3VA6580	M / H / C	800	315 ... 800	0.5 ... 25	1,200 ... 8,000	160 ... 800; OFF
3VA6610	M / H / C	1,000	400 ... 1,000	0.5 ... 25	1,500 ... 10,000	200 ... 1,000; OFF

Overload release L:

- I_r Adjustable from 0.4 to $1.0 \times I_n$ in absolute current values
 $I_r = 40 \text{ A}$: In steps of 0.5 A
 $I_r \geq 100 \text{ A}$: In steps of 1 A
- t_{id} Adjustable from 0.5 to 13 / 15 / 17 / 20 / 25 s (dependent on rated operational current and frame size)
with a reference point of $6 \times I_r$.
In steps of 0.1 s

The ETU820 LI has a permanently active thermal memory.

Instantaneous short-circuit protection I:

- I_i Adjustable from 1.5 to 9 / 10 / 11 / 12 $\times I_n$ (dependent on the frame size):
In steps of 1 A

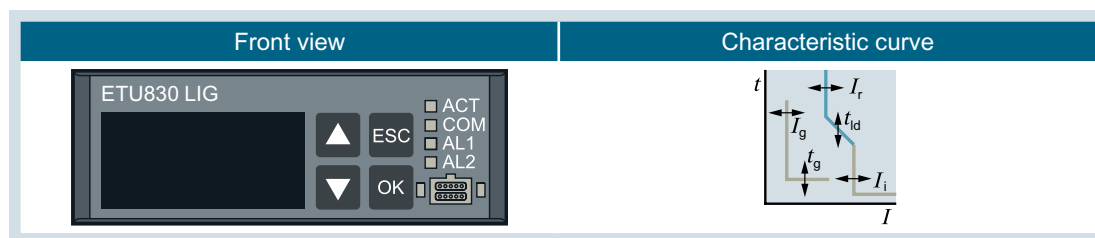
Neutral conductor protection N:

Protection of the neutral conductor is available only for 4-pole molded case circuit breakers.

- I_N $I_n = 40 \text{ A}$: 0.4 to $1.6 \times I_n$
 $I_n \geq 100 \text{ A}$: 0.2 to 1.0 or 1.5 / $1.6 \times I_n$

Electronic trip unit ETU830 LIG

ETU830 LIG 3-pole and 4-pole



Line protection - function LIG

The electronic trip unit ETU830 has:

- Adjustable parameter settings I_r and t_{id} for overload protection (L)
- Adjustable parameter setting I_i for instantaneous short-circuit protection (I)
- Adjustable parameter settings I_g and t_g for ground-fault protection (G)
- With 4-pole versions only: adjustable parameter setting I_N for protection of neutral conductor (N)

ETU830 parameters, 3-pole

	Breaking capacity class	Rated current I_n	I_r	t_{id}	I_i	I_g	t_g
		[A]	[A]	[s]	[A]	[A]	[s]
3VA6140	M / H / C / L	40	15 ... 40	0.5 ... 25	60 ... 480	15 ... 40	0.05 ... 0.8
3VA6110	M / H / C / L	100	40 ... 100	0.5 ... 25	150 ... 1,200	20 ... 100	
3VA6115	M / H / C / L	150	60 ... 150	0.5 ... 20	225 ... 1,500	30 ... 150	
3VA6210	M / H / C / L	100	40 ... 100	0.5 ... 25	150 ... 1,200	20 ... 100	
3VA6225	M / H / C / L	250	100 ... 250	0.5 ... 13	375 ... 2,500	50 ... 250	
3VA6325	M / H / C / L	250	100 ... 250	0.5 ... 25	375 ... 3,000	50 ... 250	
3VA6340	M / H / C / L	400	150 ... 400	0.5 ... 17	600 ... 4,000	80 ... 400	
3VA6440	M / H / C / L	400	150 ... 400	0.5 ... 25	600 ... 4,800	80 ... 400	
3VA6460	M / H / C / L	600	250 ... 600	0.5 ... 15	900 ... 5,400	120 ... 600	

3.1 Use of the 3VA UL molded case circuit breakers in line protection

ETU830 parameters, 4-pole

	Breaking capacity class	Rated current I_n	I_r	t_{id}	I_i	I_g	t_g	I_N
		[A]	[A]	[s]	[A]	[A]	[s]	[A]
3VA6140	M / H / C / L	40	15 ... 40	0.5 ... 25	60 ... 480	15 ... 40	0.05 ... 0.8	15 ... 64; OFF
3VA6110	M / H / C / L	100	40 ... 100	0.5 ... 25	150 ... 1,200	20 ... 100		20 ... 150; OFF
3VA6115	M / H / C / L	150	60 ... 150	0.5 ... 20	225 ... 1,500	30 ... 150		30 ... 150; OFF
3VA6210	M / H / C / L	100	40 ... 100	0.5 ... 25	150 ... 1,200	20 ... 100		20 ... 160; OFF
3VA6225	M / H / C / L	250	100 ... 250	0.5 ... 13	375 ... 2,500	50 ... 250		50 ... 250; OFF
3VA6325	M / H / C / L	250	100 ... 250	0.5 ... 25	375 ... 3,000	50 ... 250		50 ... 400; OFF
3VA6340	M / H / C / L	400	150 ... 400	0.5 ... 17	600 ... 4,000	80 ... 400		80 ... 400; OFF
3VA6440	M / H / C / L	400	150 ... 400	0.5 ... 25	600 ... 4,800	80 ... 400		80 ... 600; OFF
3VA6460	M / H / C / L	600	250 ... 600	0.5 ... 15	900 ... 5,400	120 ... 600		120 ... 600; OFF

Overload release L:

- I_r Adjustable from 0.4 to $1.0 \times I_n$ in absolute current values
 $I_r = 40 \text{ A}$: In steps of 0.5 A
 $I_r \geq 100 \text{ A}$: In steps of 1 A
- t_{id} Adjustable from 0.5 to 13 / 15 / 17 / 20 / 25 s (dependent on rated operational current and frame size)
with a reference point of $6 \times I_r$.
In steps of 0.1 s

The ETU830 LI has a permanently active thermal memory.

Instantaneous short-circuit protection I:

- I_i Adjustable from 1.5 to 9 / 10 / 11 / 12 $\times I_n$ (dependent on the rated operational current and the frame size):
In steps of 1 A

Ground-fault protection G:

- I_g Adjustable from 0.2 / 0.4 to $1.0 \times I_n$ in absolute current values
In steps of 1 A

3.1 Use of the 3VA UL molded case circuit breakers in line protection

- t_g Adjustable from 0.05 to 0.8 s
with a reference point of $2 \times I_g$
In steps of 0.01 s

An alarm threshold I_{gA} of 0.2 / 0.4 to $1 \times I_n$ can also be set. In steps of 1 A

The ground-fault protection can **not** be deactivated.

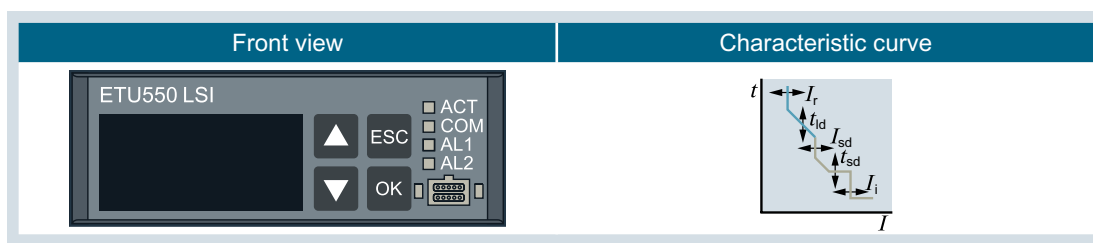
Neutral conductor protection N:

Protection of the neutral conductor is available only for 4-pole molded case circuit breakers.

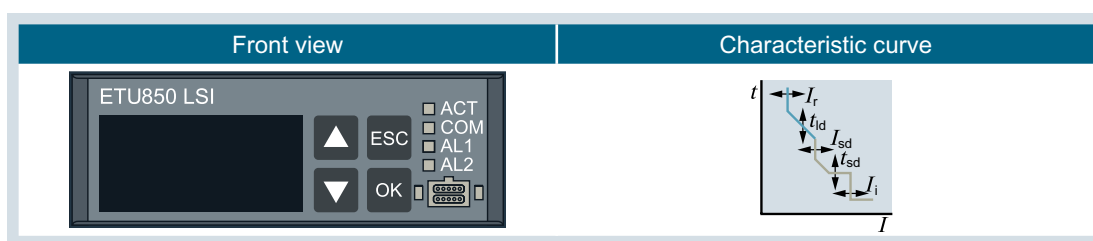
- I_N $I_n = 40$ A: 0.4 to $1.6 \times I_n$
 $I_n \geq 100$ A: 0.2 to 1.0 or $1.6 \times I_n$

Electronic trip units ETU550 LSI and ETU850 LSI

ETU550 LSI 3-pole and 4-pole units:



ETU850 LSI 3-pole and 4-pole units:

**Line protection - function LSI**

The electronic trip units ETU550 and ETU850 have:

- Adjustable parameter settings I_r and t_{id} for overload protection (L)
- Adjustable parameter settings I_{sd} and t_{sd} for short-time-delayed short-circuit protection (S)
- Adjustable parameter setting I_i for instantaneous short-circuit protection (I)
- With 4-pole versions: adjustable parameter setting I_N for neutral conductor protection (N) can be activated optionally for 3-pole versions

3.1 Use of the 3VA UL molded case circuit breakers in line protection

ETU550 / ETU850 parameters (3-pole version):

	Breaking capacity class	Rated current I_n	I_r	t_{ld}	I_{sd}	t_{sd}	I_i	$I_N^{1)}$
		[A]	[A]	[s]	[A]	[s]	[A]	[A]
3VA6140	M / H / C / L	40	15 ... 40	0.5 ... 25	24 ... 400	0.05 ... 0.5	60 ... 480	15 ... 64; OFF
3VA6110	M / H / C / L	100	40 ... 100	0.5 ... 25	60 ... 1,000		150 ... 1,200	20 ... 150; OFF
3VA6115	M / H / C / L	150	60 ... 150	0.5 ... 20	90 ... 1,500		225 ... 1,500	30 ... 240; OFF
3VA6210	M / H / C / L	100	40 ... 100	0.5 ... 25	60 ... 1,000		150 ... 1,200	20 ... 160; OFF
3VA6225	M / H / C / L	250	100 ... 250	0.5 ... 13	150 ... 2,500		375 ... 2,500	50 ... 400; OFF
3VA6325	M / H / C / L	250	100 ... 250	0.5 ... 25	150 ... 2,500		375 ... 3,000	50 ... 400; OFF
3VA6340	M / H / C / L	400	150 ... 400	0.5 ... 17	240 ... 4,000		600 ... 4,000	80 ... 640; OFF
3VA6440	M / H / C / L	400	150 ... 400	0.5 ... 25	240 ... 4,000		600 ... 4,800	80 ... 640; OFF
3VA6460	M / H / C / L	600	250 ... 600	0.5 ... 15	360 ... 5,400		900 ... 5,400	120 ... 960; OFF
3VA6560	M / H / C	600	250 ... 600	0.5 ... 25	360 ... 7,200		900 ... 7,200	120 ... 960; OFF
3VA6580	M / H / C	800	315 ... 800	0.5 ... 25	480 ... 8,000		1,200 ... 8,000	160 ... 1280; OFF
3VA6610	M / H / C	1,000	400 ... 1,000	0.5 ... 25	600 ... 10,000		1,500 ... 10,000	200 ... 1,600; OFF

1) With external current transformer for N conductor

3.1 Use of the 3VA UL molded case circuit breakers in line protection

ETU550 / ETU850 parameters (4-pole version):

	Breaking capacity class	Rated current I_n	I_r	t_{ld}	I_{sd}	t_{sd}	I_i	I_N
		[A]	[A]	[s]	[A]	[s]	[A]	[A]
3VA6140	M / H / C / L	40	15 ... 40	0.5 ... 25	24 ... 400	0.05 ... 0.5	60 ... 480	15 ... 64; OFF
3VA6110	M / H / C / L	100	40 ... 100	0.5 ... 25	60 ... 1,000		150 ... 1,200	20 ... 150; OFF
3VA6115	M / H / C / L	150	60 ... 150	0.5 ... 20	90 ... 1,500		225 ... 1,500	30 ... 150; OFF
3VA6210	M / H / C / L	100	40 ... 100	0.5 ... 25	60 ... 1,000		150 ... 1,200	20 ... 160; OFF
3VA6225	M / H / C / L	250	100 ... 250	0.5 ... 13	150 ... 2,500		375 ... 2,500	50 ... 250; OFF
3VA6325	M / H / C / L	250	100 ... 250	0.5 ... 25	150 ... 2,500		375 ... 3,000	50 ... 400; OFF
3VA6340	M / H / C / L	400	150 ... 400	0.5 ... 17	240 ... 4,000		600 ... 4,000	80 ... 400; OFF
3VA6440	M / H / C / L	400	150 ... 400	0.5 ... 25	240 ... 4,000		600 ... 4,800	80 ... 600; OFF
3VA6460	M / H / C / L	600	250 ... 600	0.5 ... 15	360 ... 5,400		900 ... 5,400	120 ... 600; OFF
3VA6560	M / H / C	600	250 ... 600	0.5 ... 25	360 ... 7,200		900 ... 7,200	120 ... 800; OFF
3VA6580	M / H / C	800	315 ... 800	0.5 ... 25	480 ... 8,000		1,200 ... 8,000	160 ... 800; OFF
3VA6610	M / H / C	1,000	400 ... 1,000	0.5 ... 25	600 ... 10,000		1,500 ... 10,000	200 ... 1,000; OFF

Overload release L:

- I_r Adjustable from 0.4 to $1.0 \times I_n$ in absolute current values
 $I_r < 40$ A: In steps of 0.5 A
 $I_r \geq 100$ A: In steps of 1 A
- t_{ld} Adjustable from 0.5 to 13 / 15 / 17 / 20 / 25 s (dependent on rated operational current and frame size):
in steps of 0.1 s
with a reference point of $6 \times I_r$

The ETU550 LSI and ETU850 LSI have a permanently active thermal memory.

Short-time-delayed short-circuit protection S:

- I_{sd} Adjustable from 0.6 to $9 / 10 \times I_n$
 $I_{sd} < 40$ A: In steps of 0.5 A
 $I_{sd} \geq 100$ A: In steps of 1 A

3.1 Use of the 3VA UL molded case circuit breakers in line protection

- t_{sd} Adjustable from 0.05 to 0.5 s:
in steps of 0.01 s
with a reference point of $I_{sd} = 8 \times I_r$

The curve shape $I^2t = \text{constant}$ can be deactivated.

Instantaneous short-circuit protection I:

- I_i Adjustable from 1.5 to 9 / 10 / 12 $\times I_n$ (dependent on rated operational current and frame size)
In steps of 1 A

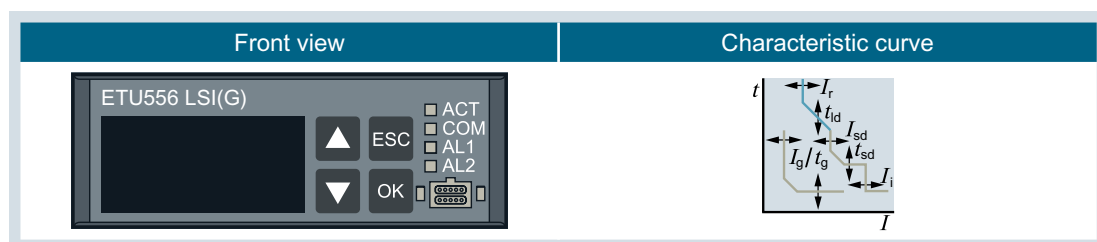
Neutral conductor protection N:

The neutral conductor protection function is available only for 3-pole molded case circuit breakers with external current transformer for N conductor for 4-pole molded case circuit breakers.

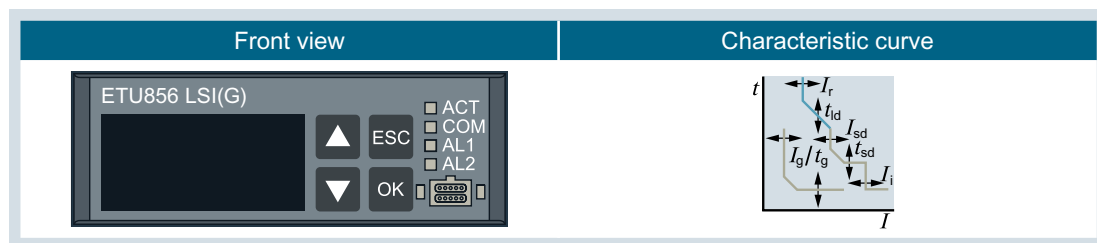
- I_N Adjustable in steps of 1 A
3-pole circuit breakers with external current transformer for N conductor:
 $I_n < 40$ A: 0.4 to 1.6 $\times I_n$
 $I_n \geq 100$ A: 0.2 to 1.6 $\times I_n$
4-pole circuit breakers:
 $I_n < 40$ A: 0.4 to 1.6 $\times I_n$
 $I_n \geq 100$ A: 0.2 to 1.0 or 1.5 / 1.6 $\times I_n$

Electronic trip units ETU556 LSI G (alarm-only) and ETU856 LSI G (alarm-only)

ETU556 LSI(G) 3-pole and 4-pole:



ETU856 LSI(G) 3-pole and 4-pole:



3.1 Use of the 3VA UL molded case circuit breakers in line protection

Line protection - function LSI(G)

The electronic trip units ETU556 and ETU856 have:

- Adjustable parameter settings I_r and t_{ld} for overload protection (L)
- Adjustable parameter settings I_{sd} and t_{sd} for short-time-delayed short-circuit protection (S)
- Adjustable parameter setting I_i for instantaneous short-circuit protection (I)
- Adjustable parameter settings I_g and t_g for ground-fault alarm (G)
- With 4-pole versions: adjustable parameter setting I_N for neutral conductor protection (N) optionally available for 3-pole versions

3.1 Use of the 3VA UL molded case circuit breakers in line protection

ETU556 / ETU856 parameters, 3-pole:

	Breaking capacity class	Rated current I_n	I_r	t_{id}	I_{sd}	t_{sd}	I_g	t_g	I_i	$I_N^{1)}$
		[A]	[A]	[s]	[A]	[s]	[A]	[s]	[A]	[A]
3VA6140	M / H / C / L	40	15 ... 40	0.5 ... 25	24 ... 40 0	0.05 ... 0.5	15 ... 40	0.05 ... 0.8	60 ... 480	15 ... 64; OFF
3VA6160	E ²⁾	60	24 ... 60	0.5 ... 25	36 ... 60 0		15 ... 60		90 ... 750	24 ... 96; OFF
3VA6110	M / H / C / L / E ²⁾	100	40 ... 100	0.5 ... 25	60 ... 1,000		20 ... 10 0		150 ... 1,200	20 ... 150; OFF
3VA6115	M / H / C / L	150	60 ... 150	0.5 ... 20	90 ... 1,500		30 ... 15 0		225 ... 1,500	30 ... 240; OFF
3VA6115	E ²⁾	150	60 ... 150	0.5 ... 25	60 ... 1,000		30 ... 15 0		225 ... 1,800	30 ... 240; OFF
3VA6210	M / H / C / L	100	40 ... 100	0.5 ... 25	60 ... 1,000		20 ... 10 0		150 ... 1,200	20 ... 160; OFF
3VA6225	M / H / C / L	250	100 ... 250	0.5 ... 13	150 ... 2,500		50 ... 250		375 ... 2,500	50 ... 400; OFF
3VA6225	E ²⁾	250	100 ... 250	0.5 ... 15	150 ... 2,500		50 ... 250		375 ... 2,500	50 ... 400; OFF
3VA6325	M / H / C / L / E ²⁾	250	100 ... 250	0.5 ... 25	150 ... 2,500		50 ... 250		375 ... 3,000	50 ... 400; OFF
3VA6340	M / H / C / L	400	150 ... 400	0.5 ... 17	240 ... 4,000		80 ... 400		600 ... 4,000	80 ... 640; OFF
3VA6340	E ²⁾	400	150 ... 400	0.5 ... 25	240 ... 4,000		80 ... 400		600 ... 4,800	80 ... 640; OFF
3VA6440	M / H / C / L	400	150 ... 400	0.5 ... 25	240 ... 4,000		80 ... 400		600 ... 4,800	80 ... 640; OFF
3VA6460	M / H / C / L / E ²⁾	600	250 ... 600	0.5 ... 15	360 ... 5,400		120 ... 600		900 ... 5,400	120 ... 960; OFF
3VA6560	M / H / C	600	250 ... 600	0.5 ... 25	360 ... 7,200		120 ... 600		900 ... 7,200	120 ... 960; OFF
3VA6580	M / H / C	800	315 ... 800	0.5 ... 25	480 ... 8,000		160 ... 800		1,200 ... 8,000	160 ... 1280; OFF
3VA6610	M / H / C	1,000	400 ... 1,000	0.5 ... 25	600 ... 10,000		200 ... 1000		1,500 ... 10,000	200 ... 1,600; OFF

¹⁾ With external current transformer for N conductor²⁾ E class only available for ETU856

3.1 Use of the 3VA UL molded case circuit breakers in line protection

ETU556 / ETU856 parameters, 4-pole:

	Breaking capacity class	Rated current I_n	I_r	t_{ld}	I_{sd}	t_{sd}	I_g	t_g	I_i	I_N
		[A]	[A]	[s]	[A]	[s]	[A]	[s]	[A]	[A]
3VA6140	M / H / C / L	40	15 ... 40	0.5 ... 25	24 ... 40 0	0.05 ... 0.5	15 ... 40	0.05 ... 0.8	60 ... 480	15 ... 64; OFF
3VA6160	E ²⁾	60	24 ... 60	0.5 ... 25	36 ... 60 0		15 ... 60		90 ... 750	24 ... 96; OFF
3VA6110	M / H / C / L / E ²⁾	100	40 ... 100	0.5 ... 25	60 ... 1,000		20 ... 10 0		150 ... 1,200	20 ... 150; OFF
3VA6115	M / H / C / L	150	60 ... 150	0.5 ... 20	90 ... 1,500		30 ... 15 0		225 ... 1,500	30 ... 150; OFF
3VA6115	E ²⁾	150	60 ... 150	0.5 ... 25	60 ... 1,000		30 ... 15 0		225 ... 1,800	30 ... 150; OFF
3VA6210	M / H / C / L	100	40 ... 100	0.5 ... 25	60 ... 1,000		20 ... 10 0		150 ... 1,200	20 ... 160; OFF
3VA6225	M / H / C / L	250	100 ... 250	0.5 ... 13	150 ... 2,500		50 ... 250		375 ... 2,500	50 ... 250; OFF
3VA6225	E ²⁾	250	100 ... 250	0.5 ... 15	150 ... 2,500		50 ... 250		375 ... 2,500	50 ... 250; OFF
3VA6325	M / H / C / L / E ²⁾	250	100 ... 250	0.5 ... 25	150 ... 2,500		50 ... 250		375 ... 3,000	50 ... 400; OFF
3VA6340	M / H / C / L	400	150 ... 400	0.5 ... 17	240 ... 4,000		80 ... 400		600 ... 4,000	80 ... 400; OFF
3VA6340	E ²⁾	400	150 ... 400	0.5 ... 25	240 ... 4,000		80 ... 400		600 ... 4,800	80 ... 400; OFF
3VA6440	M / H / C / L	400	150 ... 400	0.5 ... 25	240 ... 4,000		80 ... 400		600 ... 4,800	80 ... 600; OFF
3VA6460	M / H / C / L / E ²⁾	600	250 ... 600	0.5 ... 15	360 ... 5,400		120 ... 600		900 ... 5,400	120 ... 600; OFF
3VA6560	M / H / C	600	250 ... 600	0.5 ... 25	360 ... 7,200		120 ... 600		900 ... 7,200	120 ... 800; OFF
3VA6580	M / H / C	800	315 ... 800	0.5 ... 25	480 ... 8,000		160 ... 800		1,200 ... 8,000	160 ... 800; OFF
3VA6610	M / H / C	1,000	400 ... 1,000	0.5 ... 25	600 ... 10,000		200 ... 1000		1,500 ... 10,000	200 ... 1,000; OFF

²⁾ E class only available for ETU856**Overload release L:**

- I_r Adjustable from 0.4 to 1.0 x I_n in absolute current values
 $I_r = 40 \text{ A}$: In steps of 0.5 A
 $I_r \geq 100 \text{ A}$: In steps of 1 A

- t_{ld} Adjustable from 0.5 to 13 / 15 / 17 / 20 / 25 s (dependent on rated operational current and frame size)
with a reference point of $6 \times I_r$
In steps of 0.1 s

The ETU556 LSI(G) and ETU856 LSI(G) have a permanently active thermal memory.

Short-time-delayed short-circuit protection S:

- I_{sd} Adjustable from 0.6 to 9 / 10 $\times I_n$
 $I_{sd} = 40 \text{ A}$: In steps of 0.5 A
 $I_{sd} \geq 100 \text{ A}$: In steps of 1 A
- t_{sd} Adjustable from 0.05 to 0.5 s
with a reference point of $I_{sd} = 8 \times I_r$
in steps of 0.01 s

The curve shape $I^2t = \text{constant}$ can be deactivated.

Instantaneous short-circuit protection I:

- I_i Adjustable from 1.5 to 9 / 10 / 12 $\times I_n$ (dependent on rated operational current and frame size)
In steps of 1 A

Ground-fault alarm (G):

The detection of the ground-fault current is based on a vectorial summation of the phase currents and the neutral conductor current for 4-pole or 3-pole circuit breakers with external current transformer for N conductor.

- I_g Adjustable from 0.2 / 0.4 to 1.0 $\times I_n$ in absolute current values
In steps of 1 A
- t_g Adjustable from 0.05 to 0.8 s
with a reference point of $2 \times I_g$
In steps of 0.01 s

An alarm threshold I_{gA} from 0.2 / 0.4 to 1 $\times I_n$ can also be set. In steps of 1 A

The current-dependent curve shape $I^2t = \text{constant}$ can be deactivated.

If a ground fault is detected, the ETU556 or ETU856 only issues an alarm without tripping the circuit breaker. This alarm is displayed directly on the LCD display and/or communicated to higher-level systems via the communication link, the EFB and the Maintenance Mode Box MMB.

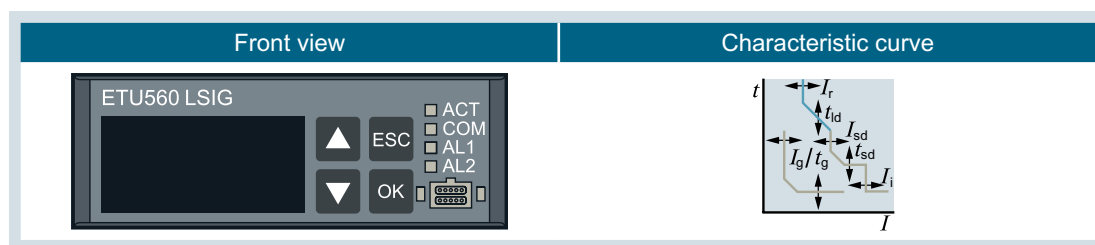
Neutral conductor protection N:

The neutral conductor protection function is available only for 3-pole molded case circuit breakers with external current transformer for N conductor for 4-pole molded case circuit breakers.

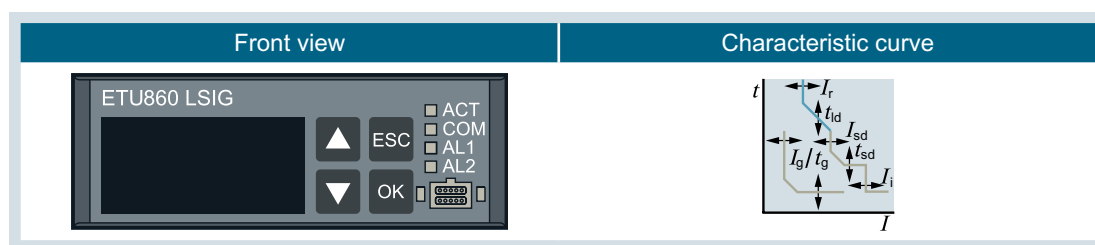
- I_N Adjustable in steps of 1 A
3-pole circuit breakers with external current transformer for N conductor:
 $I_n = 40 \text{ A}$: 0.4 to $1.6 \times I_n$
 $I_n \geq 100 \text{ A}$: 0.2 to $1.6 I_n$
4-pole circuit breakers:
 $I_n = 40 \text{ A}$: 0.4 to $1.6 \times I_n$
 $I_n \geq 100 \text{ A}$: 0.2 to 1.0 or $1.5 / 1.6 \times I_n$

Electronic trip units ETU560 LSIG and ETU860 LSIG

ETU560 LSIG 3-pole and 4-pole units:



ETU860 LSIG 3-pole and 4-pole units:

**Line protection - function LSIG**

The electronic trip units ETU560 and ETU860 have:

- Adjustable parameter settings I_r and t_{id} for overload protection (L)
- Adjustable parameter settings I_{sd} and t_{sd} for short-time-delayed short-circuit protection (S)
- Adjustable parameter setting I_i for instantaneous short-circuit protection (I)
- Adjustable parameter settings I_g and t_g for ground-fault protection (G)
- With 4-pole versions: adjustable parameter setting I_N for neutral conductor protection (N) optionally available for 3-pole versions

3.1 Use of the 3VA UL molded case circuit breakers in line protection

ETU560 / ETU860 parameters (3-pole version):

	Breaking capacity class	Rated current I_n	I_r	t_{id}	I_{sd}	t_{sd}	I_g	t_g	I_i	$I_N^{1)}$
		[A]	[A]	[s]	[A]	[s]	[A]	[s]	[A]	[A]
3VA6140	M / H / C / L	40	15 ... 40	0.5 ... 25	24 ... 40 0	0.05 ... 0.5	15 ... 40	0.05 ... 0.8	60 ... 480	15 ... 64; OFF
3VA6160	E ²⁾	60	24 ... 60	0.5 ... 25	36 ... 60 0		15 ... 60		90 ... 750	24 ... 96; OFF
3VA6110	M / H / C / L / E ²⁾	100	40 ... 100	0.5 ... 25	60 ... 1,000		20 ... 10 0		150 ... 1,200	20 ... 150; OFF
3VA6115	M / H / C / L	150	60 ... 150	0.5 ... 20	90 ... 1,500		30 ... 15 0		225 ... 1,500	30 ... 240; OFF
3VA6115	E ²⁾	150	60 ... 150	0.5 ... 25	60 ... 1,000		30 ... 15 0		225 ... 1,800	30 ... 240; OFF
3VA6210	M / H / C / L	100	40 ... 100	0.5 ... 25	60 ... 1,000		20 ... 10 0		150 ... 1,200	20 ... 160; OFF
3VA6225	M / H / C / L	250	100 ... 250	0.5 ... 13	150 ... 2,500		50 ... 250		375 ... 2,500	50 ... 400; OFF
3VA6225	E ²⁾	250	100 ... 250	0.5 ... 15	150 ... 2,500		50 ... 250		375 ... 2,500	50 ... 400; OFF
3VA6325	M / H / C / L / E ²⁾	250	100 ... 250	0.5 ... 25	150 ... 2,500		50 ... 250		375 ... 3,000	50 ... 400; OFF
3VA6340	M / H / C / L	400	150 ... 400	0.5 ... 17	240 ... 4,000		80 ... 400		600 ... 4,000	80 ... 640; OFF
3VA6340	E ²⁾	400	150 ... 400	0.5 ... 25	240 ... 4,000		80 ... 400		600 ... 4,800	80 ... 640; OFF
3VA6440	M / H / C / L	400	150 ... 400	0.5 ... 25	240 ... 4,000		80 ... 400		600 ... 4,800	80 ... 640; OFF
3VA6460	M / H / C / L / E ²⁾	600	250 ... 600	0.5 ... 15	360 ... 5,400		120 ... 600		900 ... 5,400	120 ... 960; OFF
3VA6560	M / H / C	600	250 ... 600	0.5 ... 25	360 ... 7,200		120 ... 600		900 ... 7,200	120 ... 960; OFF
3VA6580	M / H / C	800	315 ... 800	0.5 ... 25	480 ... 8,000		160 ... 800		1,200 ... 8,000	160 ... 1280; OFF
3VA6610	M / H / C	1,000	400 ... 1,000	0.5 ... 25	600 ... 10,000		200 ... 1000		1,500 ... 10,000	200 ... 1,600; OFF

¹⁾ With external current transformer for N conductor²⁾ E class only available for ETU860

3.1 Use of the 3VA UL molded case circuit breakers in line protection

ETU560 / ETU860 parameters (4-pole version):

	Breaking capacity class	Rated current I_n	I_r	t_{ld}	I_{sd}	t_{sd}	I_g	t_g	I_i	I_N
		[A]	[A]	[s]	[A]	[s]	[A]	[s]	[A]	[A]
3VA6140	M / H / C / L	40	15 ... 40	0.5 ... 25	24 ... 40 0	0.05 ... 0.5	15 ... 40	0.05 ... 0.8	60 ... 480	15 ... 64; OFF
3VA6160	E ²⁾	60	24 ... 60	0.5 ... 25	36 ... 60 0		15 ... 60		90 ... 750	24 ... 96; OFF
3VA6110	M / H / C / L / E ²⁾	100	40 ... 100	0.5 ... 25	60 ... 1,000		20 ... 10 0		150 ... 1,200	20 ... 150; OFF
3VA6115	M / H / C / L	150	60 ... 150	0.5 ... 20	90 ... 1,500		30 ... 15 0		225 ... 1,500	30 ... 150; OFF
3VA6115	E ²⁾	150	60 ... 150	0.5 ... 25	60 ... 1,000		30 ... 15 0		225 ... 1,800	30 ... 150; OFF
3VA6210	M / H / C / L	100	40 ... 100	0.5 ... 25	60 ... 1,000		20 ... 10 0		150 ... 1,200	20 ... 160; OFF
3VA6225	M / H / C / L	250	100 ... 250	0.5 ... 13	150 ... 2,500		50 ... 250		375 ... 2,500	50 ... 250; OFF
3VA6225	E ²⁾	250	100 ... 250	0.5 ... 15	150 ... 2,500		50 ... 250		375 ... 2,500	50 ... 250; OFF
3VA6325	M / H / C / L / E ²⁾	250	100 ... 250	0.5 ... 25	150 ... 2,500		50 ... 250		375 ... 3,000	50 ... 400; OFF
3VA6340	M / H / C / L	400	150 ... 400	0.5 ... 17	240 ... 4,000		80 ... 400		600 ... 4,000	80 ... 400; OFF
3VA6340	E ²⁾	400	150 ... 400	0.5 ... 25	240 ... 4,000		80 ... 400		600 ... 4,800	80 ... 400; OFF
3VA6440	M / H / C / L	400	150 ... 400	0.5 ... 25	240 ... 4,000		80 ... 400		600 ... 4,800	80 ... 600; OFF
3VA6460	M / H / C / L / E ²⁾	600	250 ... 600	0.5 ... 15	360 ... 5,400		120 ... 600		900 ... 5,400	120 ... 600; OFF
3VA6560	M / H / C	600	250 ... 600	0.5 ... 25	360 ... 7,200		120 ... 600		900 ... 7,200	120 ... 800; OFF
3VA6580	M / H / C	800	315 ... 800	0.5 ... 25	480 ... 8,000		160 ... 800		1,200 ... 8,000	160 ... 800; OFF
3VA6610	M / H / C	1,000	400 ... 1,000	0.5 ... 25	600 ... 10,000		200 ... 1000		1,500 ... 10,000	200 ... 1,000; OFF

²⁾ E class only available for ETU860**Overload release L:**

- I_r Adjustable from 0.4 to 1.0 x I_n in absolute current values
 $I_r = 40 \text{ A}$: In steps of 0.5 A
 $I_r \geq 100 \text{ A}$: In steps of 1 A

- t_{ld} Adjustable from 0.5 to 13 / 15 / 17 / 20 / 25 s (dependent on rated operational current and frame size)
with a reference point of $6 \times I_r$.
In steps of 0.1 s

The ETU560 LSIG and ETU860 LSIG have a permanently active thermal memory.

Short-time-delayed short-circuit protection S:

- I_{sd} Adjustable from 0.6 to 9 / 10 $\times I_n$
 $I_{sd} = 40 \text{ A}$: In steps of 0.5 A
 $I_{sd} \geq 100 \text{ A}$: In steps of 1 A
- t_{sd} Adjustable from 0.05 to 0.5 s
with a reference point of $I_{sd} = 8 \times I_r$
in steps of 0.01 s

The curve shape $I^2t = \text{constant}$ can be deactivated.

Instantaneous short-circuit protection I:

- I_i Adjustable from 1.5 to 9 / 10 / 12 $\times I_n$ (dependent on rated operational current and frame size)
In steps of 1 A

Ground-fault protection G:

The detection of the ground-fault current is based on a vectorial summation of the phase currents and the neutral conductor current for 4-pole or 3-pole circuit breakers with external current transformer for N conductor.

- I_g Adjustable from 0.2 / 0.4 to 1.0 $\times I_n$
In steps of 1 A
- t_g Adjustable from 0.05 to 0.8 s
with a reference point of $2 \times I_g$
In steps of 0.01 s
- Changeover of measurement method from "rES" (measurement method 1) to "d Ir" (measurement method 2), for details see chapter Ground-fault protection (Page 83)

An alarm threshold I_{gA} between 0.2 to 1 $\times I_n$ can also be set. In steps of 1 A

The current-dependent curve shape $I^2t = \text{constant}$ can be deactivated.

Ground-fault protection G can **not** be deactivated.

3.1 Use of the 3VA UL molded case circuit breakers in line protection

Neutral conductor protection N:

The neutral conductor protection function is available only for 3-pole molded case circuit breakers with external current transformer for N conductor for 4-pole molded case circuit breakers.

- I_N Adjustable in steps of 1 A
3-pole circuit breakers with external current transformer for N conductor:
 $I_n = 40 \text{ A}$: 0.4 to $1.6 \times I_n$
 $I_n \geq 100 \text{ A}$: 0.2 to $1.6 I_n$
4-pole circuit breakers:
 $I_n = 40 \text{ A}$: 0.4 to $1.6 \times I_n$
 $I_n \geq 100 \text{ A}$: 0.2 to 1.0 or $1.5 / 1.6 \times I_n$

3.1.3 Overview of 3VA UL molded case circuit breakers in line protection

3.1.3.1 3VA5 molded case circuit breakers

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers	
		3VA51 125 A	3VA51 125 A
Number of poles		1	3
Rated operational current I_n	A	15 ... 125	15 ... 125
Frequency	Hz	0 ... 400	0 ... 400
Electrical characteristics according to UL 489			
Rated voltage U_e 50/60 Hz AC	V	347	600
Rated voltage U_e DC	V	125	500
Electrical characteristics according to IEC 60947-2			
Rated voltage U_e	V	415	690
Rated insulation voltage U_i	V	500	800
Rated impulse withstand voltage U_{imp}	kV	8	8
Use in IT systems		✓	✓
Endurance (operating cycles)			
Mechanical		15000	15000
Electrical with U_e UL 489 480 V / IEC 60947 415 V		8000	8000
Switching frequency	Operating cycles/hour	120	120

3.1 Use of the 3VA UL molded case circuit breakers in line protection

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers					
		3VA51 125 A			3VA51 125 A		
		Short-circuit breaking capacity according to UL 489					
		S	M	H	S	M	H
Rated ultimate short-circuit breaking capacity							
120 V AC	kA	65	85	100			
240 V AC	kA				65	85	100
227 V AC	kA	25	35	50			
347 V AC	kA	14	14	14			
480Y/277 V AC	kA				25	35	65
480 V AC	kA				25	35	65
600Y/347 V AC	kA				14	18	25
600 V AC	kA						
125 V DC	kA	14	25	30			
250 V DC	kA				50	85	100
500 V DC	kA				50	85	100
600 V DC (3-pole only)	kA						
Short-circuit breaking capacity according to IEC 60947-2							
		S	M	H	S	M	H
Rated ultimate short-circuit breaking capacity I_{cu}/I_{cs}							
240 V AC	kA	25/25	36/36	55/55	55/55	85/85	150/150
415 V AC	kA	5/5	5/5	5/5	36/36	55/55	70/70
690 V AC	kA				5/5	7/5	10/5
125 V DC	kA	14	25	30			
250 V DC	kA				50	85	100
500 V DC	kA				50	85	100
750 V DC (3-pole only)	kA						

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers	
		3VA51 125 A	3VA51 125 A
Trip units			
Trip units			
FTFM	TM210	✓	✓
FTAM	TM230		✓
LI	ETU320		
LIG	ETU330		
LSI	ETU350		
LSI	ETU550/ETU850		
LSI (G)	ETU556/ETU856		
LSIG	ETU560/ETU860		

3.1 Use of the 3VA UL molded case circuit breakers in line protection

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers	
		3VA52 250 A	3VA53 400 A
Number of poles		2-pole in 3-pole, 3	2-pole in 3-pole, 3-pole/4-pole
Rated operational current I_n	A	100 ... 250	200 ... 400
Frequency	Hz	0 ... 400	0 ... 400
Electrical characteristics according to UL 489			
Rated voltage U_e 50/60 Hz AC	V	600	600
Rated voltage U_e DC	V	600	
Electrical characteristics according to IEC 60947-2			
Rated voltage U_e	V	690	690
Rated insulation voltage U_i	V	800	800
Rated impulse withstand voltage U_{imp}	kV	8	8
Use in IT systems		✓	
Endurance (operating cycles)			
Mechanical		15000	20000
Electrical with U_e UL 489 480 V / IEC 60947 415 V		8000	6000
Switching frequency	Operating cycles/hour	120	

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers					
		3VA52 250 A			3VA53 400 A		
Short-circuit breaking capacity according to UL 489							
		M	H	C	M	H	C
Rated ultimate short-circuit breaking capacity							
120 V AC	kA						
240 V AC	kA	85	100	200	85	100	200
227 V AC	kA						
347 V AC	kA						
480Y/277 V AC	kA	35	65	100	35	65	100
480 V AC	kA	35	65	100	35	65	100
600Y/347 V AC	kA	18	25	35	20	25	35
600 V AC	kA	18	25	35	20	25	35
125 V DC	kA						
250 V DC	kA	50	85	100	50	85	100
500 V DC	kA	50	85	100	50	85	100

3.1 Use of the 3VA UL molded case circuit breakers in line protection

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers					
		3VA52 250 A			3VA53 400 A		
600 V DC (3-pole only)	kA	50	85	100	50	85	100
Short-circuit breaking capacity according to IEC 60947-2							
		M	H	C	M	H	C
Rated ultimate short-circuit breaking capacity I_{cu}/I_{cs}							
240 V AC	kA	85/85	100/100	200/200	85	100	200
415 V AC	kA	55/55	70/70	110/110	55	70	110
690 V AC	kA	7/7	10/10	10/10	7	10	10
125 V DC	kA				8	16	25
250 V DC	kA	50	85	100	8	16	25
500 V DC	kA	50	85	100	8	16	25
750 V DC (3-pole only)	kA	50	85	100			

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers	
		3VA52 250 A	3VA53 400 A
Trip units			
Trip units			
FTFM	TM210	✓	
FTAM	TM230	✓	✓
LI	ETU320		
LIG	ETU330		
LSI	ETU350		
LSI	ETU550/ETU850		
LSI (G)	ETU556/ETU856		
LSIG	ETU560/ETU860		

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers	
		3VA54 400 A	3VA55 800 A
Number of poles		2-pole in 3-pole, 3-pole/4-pole	2-pole in 3-pole, 3-pole/4-pole
Rated operational current I_n	A	450, 500, 600	600, 700, 800
Frequency	Hz	0 ... 400	0 ... 400
Electrical characteristics according to UL 489			
Rated voltage U_e 50/60 Hz AC	V	600	600
Rated voltage U_e DC	V		
Electrical characteristics according to IEC 60947-2			
Rated voltage U_e	V	690	690
Rated insulation voltage U_i	V	800	800
Rated impulse withstand voltage U_{imp}	kV	8	8

3.1 Use of the 3VA UL molded case circuit breakers in line protection

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers	
		3VA54 400 A	3VA55 800 A
Use in IT systems			
Endurance (operating cycles)			
Mechanical		20000	10000
Electrical with U _e UL 489 480 V / IEC 60947 415 V		3000	4800
Switching frequency	Operating cycles/hour		

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers					
		3VA54 400 A			3VA55 800 A		
Short-circuit breaking capacity according to UL 489							
		M	H	C	M	H	C
Rated ultimate short-circuit breaking capacity							
120 V AC	kA						
240 V AC	kA	85	100	200	85	100	200
227 V AC	kA						
347 V AC	kA						
480Y/277 V AC	kA	35	65	100	35	65	100
480 V AC	kA	35	65	100	35	65	100
600Y/347 V AC	kA	20	25	35	18	25	50
600 V AC	kA	20	25	35	18	25	50
125 V DC	kA						
250 V DC	kA	50	85	100	50	85	100
500 V DC	kA	50	85	100	50	85	100
600 V DC (3-pole only)	kA						
Short-circuit breaking capacity according to IEC 60947-2							
		M	H	C	M	H	C
Rated ultimate short-circuit breaking capacity I _{cu} /I _{cs}							
240 V AC	kA	85	100	200	85	100	200
415 V AC	kA	55	70	110	55	70	110
690 V AC	kA	7	10	10	25	35	35
125 V DC	kA	8	16	25	50	85	100
250 V DC	kA	8	16	25	50	85	100
500 V DC	kA				50	85	100
750 V DC (3-pole only)	kA						

3.1 Use of the 3VA UL molded case circuit breakers in line protection

3VA UL molded case circuit breakers for line protection		3VA5 molded case circuit breakers	
		3VA54 400 A	3VA55 800 A
Trip units			
Trip units			
FTFM	TM210		
FTAM	TM230	✓	✓
LI	ETU320		
LIG	ETU330		
LSI	ETU350		
LSI	ETU550/ETU850		
LSI (G)	ETU556/ETU856		
LSIG	ETU560/ETU860		

For the rated ultimate short-circuit breaking capacity and rated service short-circuit breaking capacity with direct current, see chapter Use of 3VA UL molded case circuit breaker in DC systems (Page 183) .

3.1.3.2 3VA6 molded case circuit breakers

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers	
		3VA61 150 A	3VA62 250 A
Number of poles		3, 4	3, 4
Rated operational current I_n	A	40 ... 150	100, 250
Frequency	Hz	50 ... 60	50 ... 60
Electrical characteristics according to UL 489			
Rated voltage U_e 50/60 Hz AC	V	600	600
Electrical characteristics according to IEC 60947-2			
Rated voltage U_e	V	690	690
Rated insulation voltage U_i	V	800	800
Rated impulse withstand voltage U_{imp}	kV	8	8
Use in IT systems		✓	✓
Endurance (operating cycles)			
Mechanical		20000	20000
Electrical with U_e UL 489 480 V / IEC 60947 415 V		9000	6000
Switching frequency	Operating cycles/hour	120	120

3.1 Use of the 3VA UL molded case circuit breakers in line protection

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers							
		3VA61 150 A				3VA62 250 A			
Short-circuit breaking capacity according to UL 489									
		M	H	C	L	M	H	C	L
Rated ultimate short-circuit breaking capacity									
240 V AC	kA	100	100	200	200	100	100	200	200
480Y/277 V AC	kA	35	65	100	150	35	65	100	150
480 V AC	kA	35	65	100	150	35	65	100	150
600Y/347 V AC	kA	18	22	35	50	18	22	35	50
600 V AC	kA	18	22	35	50				
Short-circuit breaking capacity according to IEC 60947-2									
		M	H	C	L	M	H	C	L
Rated ultimate short-circuit breaking capacity I_{cu}/I_{cs}									
240 V AC	kA	85/85	110/110	150/150	200/200	85/85	110/110	150/150	200/200
415 V AC	kA	55/55	85/85	110/110	150/150	55/55	85/85	110/110	150/150
690 V AC	kA	2.5/2.5	2.5/2.5	2.5/2.5	2.5/2.5	3/3	3/3	3/3	3/3

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers	
		3VA61 150 A	3VA62 250 A
Trip units			
Trip units			
FTFM	TM210		
FTAM	TM230		
LI	ETU320	✓	✓
LIG	ETU330	✓	✓
LSI	ETU350	✓	✓
LSI	ETU550/ETU850	✓	✓
LSI (G) ⁴⁾	ETU556/ETU856	✓	✓
LSIG	ETU560/ETU860	✓	✓

⁴⁾ G alarm, no G protection

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers	
		3VA63 400 A	3VA64 600 A
Number of poles		3, 4	3, 4
Rated operational current I_n	A	250, 400	400, 600
Frequency	Hz	50 ... 60	50 ... 60
Electrical characteristics according to UL 489			
Rated voltage U_e 50/60 Hz AC	V	600	600
Electrical characteristics according to IEC 60947-2			

3.1 Use of the 3VA UL molded case circuit breakers in line protection

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers	
		3VA63 400 A	3VA64 600 A
Rated voltage U_e	V	690	690
Rated insulation voltage U_i	V	800	800
Rated impulse withstand voltage U_{imp}	kV	8	8
Use in IT systems		✓	✓
Endurance (operating cycles)			
Mechanical		15000	15000
Electrical with U_e UL 489 480 V / IEC 60947 415 V		6000	4000
Switching frequency	Operating cycles/hour	120	120

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers							
		3VA63 400 A				3VA64 600 A			
Short-circuit breaking capacity according to UL 489									
		M	H	C	L	M	H	C	L
Rated ultimate short-circuit breaking capacity									
240 V AC	kA	100	100	200	200	100	100	200	200
480Y/277 V AC	kA	35	65	100	150	35	65	100	150
480 V AC	kA	35	65	100	150	35	65	100	150
600Y/347 V AC	kA	18	22	35	50	18	22	35	50
600 V AC	kA	18	22	35	50	18	22	35	50
Short-circuit breaking capacity according to IEC 60947-2									
		M	H	C	L	M	H	C	L
Rated ultimate short-circuit breaking capacity I_{cu}/I_{cs}									
240 V AC	kA	85/85	110/110	150/150	200/200	85/85	110/110	150/150	200/200
415 V AC	kA	55/55	85/85	110/110	150/150	55/55	85/85	110/110	150/150
690 V AC	kA	5/5	5/5	5/5	5/5	6/6	6/6	6/6	6/6

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers	
		3VA63 400 A	3VA64 600 A
Trip units			
Trip units			
FTFM	TM210		
FTAM	TM230		
LI	ETU320	✓	✓
LIG	ETU330	✓	✓
LSI	ETU350	✓	✓

3.1 Use of the 3VA UL molded case circuit breakers in line protection

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers	
		3VA63 400 A	3VA64 600 A
LSI	ETU550/ETU850	✓	✓
LSI (G) ⁴⁾	ETU556/ETU856	✓	✓
LSIG	ETU560/ETU860	✓	✓

⁴⁾ G alarm, no G protection

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers	
		3VA65 800 A	3VA66 1000 A
Number of poles		3-pole/4-pole	3-pole/4-pole
Rated operational current I_n	A	600, 800	1000
Frequency	Hz	50 ... 60	50 ... 60
Electrical characteristics according to UL 489			
Rated voltage U_e 50/60 Hz AC	V	600	600
Electrical characteristics according to IEC 60947-2			
Rated voltage U_e	V	690	690
Rated insulation voltage U_i	V	800	800
Rated impulse withstand voltage U_{imp}	kV	8	8
Use in IT systems			
Endurance (operating cycles)			
Mechanical		10000	10000
Electrical with U_e UL 489 480 V / IEC 60947 415 V		5100	4900
Switching frequency	Operating cycles/hour		

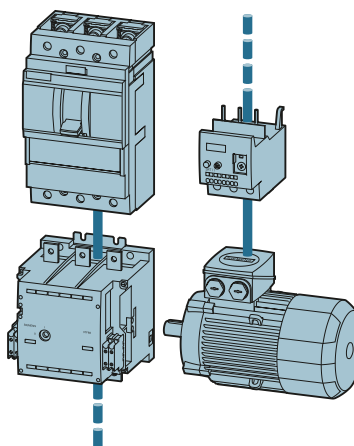
3VA UL molded case circuit breakers for line protection	3VA6 molded case circuit breakers						
	3VA65 800 A			3VA66 1000 A			
Short-circuit breaking capacity according to UL 489							
	M	H	C	M	H	C	
Rated ultimate short-circuit breaking capacity							
240 V AC	kA	100	150	200	100	150	200
480Y/277 V AC	kA	35	65	100	35	65	100
480 V AC	kA	35	65	100	35	65	100
600Y/347 V AC	kA	25	35	50	25	35	50
600 V AC	kA	25	35	50	25	35	50
Short-circuit breaking capacity according to IEC 60947-2							

3.2 Use as Motor Circuit Protector (MCP) for starter combinations

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers					
		3VA65 800 A			3VA66 1000 A		
		M	H	C	M	H	C
Rated ultimate short-circuit breaking capacity I_{cu}/I_{cs}							
240 V AC	kA	85/85	110/110	200/150	85/85	110/110	200/150
415 V AC	kA	55/55	85/85	110/85	55/55	85/85	110/85
690 V AC	kA	25/19	35/19	35/19	25/19	35/19	35/19

3VA UL molded case circuit breakers for line protection		3VA6 molded case circuit breakers	
		3VA65 800 A	3VA66 1000 A
Trip units			
Trip units			
FTFM	TM210		
FTAM	TM230		
LI	ETU320	✓	✓
LIG	ETU330	✓	✓
LSI	ETU350	✓	✓
LSI	ETU550/ETU850		
LSI (G)	ETU556/ETU856	✓	✓
LSIG	ETU560/ETU860	✓	✓

3.2 Use as Motor Circuit Protector (MCP) for starter combinations



Motor circuit protectors for starter protection are used to protect three-phase asynchronous motors.

3.2 Use as Motor Circuit Protector (MCP) for starter combinations

Starter combinations consist of:

- Motor circuit protectors (MCP) for starter protection
- Contactor
- Overload relay

In this case, the motor circuit protector provides the short-circuit protection and the disconnecter function. It is therefore equipped with an adjustable and instantaneous short-circuit release. The contactor is responsible for operational switching of the feeder. The overload relay provides the overload protection. These can be specially matched to the motor.

Siemens offers two versions of the 3VA UL motor circuit protectors:

- Magnetic trip units from the 3VA5 series in frame sizes 125 A and 250 A with a magnetic setting range from 3 to $12 \times I_n$
- Electronic trip units with instantaneous short-circuit protection in frame sizes 150 A, 250 A, 400 A and 600 A with a setting range from 3 to $15 \times I_n$

See also

<https://support.industry.siemens.com/cs/ww/en/view/29755649> (<https://support.industry.siemens.com/cs/ww/en/view/29755649>)

3.2.1 3VA UL motor circuit protectors

3VA UL motor circuit protectors for starter combinations

3VA UL motor circuit protectors (MCP)			3VA5 motor circuit protectors				
			3VA51 125 A	3VA52 250 A		3VA53 400 A	
Number of poles			3	3		3	
Rated operational current	I_n	[A]	15 ... 125	150 ... 200		250	
Breaking capacity according to UL 489 without contactors			H	H	C	H	C
240 V AC		[kA]	100	100	200	100	200
480 V AC		[kA]	65 ¹⁾	65	100	65	100
600/347 V AC		[kA]	25 ²⁾	25	35	25	35
600 V AC		[kA]		25	35	25	35
Breaking capacity according to IEC 60947			H	H	C	H	C
240 V AC	I_{cu}/I_{CS}	[kA]	150/150	100/100	200/200	100/100	200/200
415 V AC	I_{cu}/I_{CS}	[kA]	70/70	70/70	110/110	70/70	110/110
690 V AC	I_{cu}/I_{CS}	[kA]	5/5	10/5	10/5	10/5	10/5
Trip unit							
Magnetic adjustable	TM120M		✓	✓	✓	✓	✓

3.2 Use as Motor Circuit Protector (MCP) for starter combinations

3VA UL motor circuit protectors (MCP)			3VA5 motor circuit protectors			
			3VA54 600 A		3VA55 800 A	
Number of poles			3		3	
Rated operational current	I_n	[A]	400 ... 600		600, 800	
Breaking capacity according to UL 489 without contactors			H	C	H	C
240 V AC		[kA]	100	200	100	200
480 V AC		[kA]	65	100	65	100
600/347 V AC		[kA]	25	35	25	35
600 V AC		[kA]	25	35	25	35
Breaking capacity according to IEC 60947			H	C	H	C
240 V AC	I_{cu}/I_{CS}	[kA]	100/100	200/200	100/100	200/200
415 V AC	I_{cu}/I_{CS}	[kA]	70/70	110/110	70/70	110/110
690 V AC	I_{cu}/I_{CS}	[kA]	10/5	10/5	10/5	10/5
Trip unit						
Magnetic adjustable	TM120M		✓	✓	✓	✓

3VA UL motor circuit protectors (MCP)			3VA6 motor circuit protectors		
			3VA61 150 A	3VA62 250 A	3VA63 400 A
Number of poles			3	3	3
Rated operational current	I_n	[A]	25 ... 100	110 ... 200	200 ... 250
Breaking capacity according to UL 489 without contactors			C	C	C
240 V AC		[kA]	200	200	200
480 V AC		[kA]	100	100	100
600/347 V AC		[kA]	35	35	35
600 V AC		[kA]	35		35
Breaking capacity according to IEC 60947			C	C	C
240 V AC	I_{cu}/I_{CS}	[kA]	200/200	200/200	200/200
415 V AC	I_{cu}/I_{CS}	[kA]	110/110	110/110	110/110
690 V AC	I_{cu}/I_{CS}	[kA]	2.5/2.5	3/3	5/5
Trip unit					
Electronic	ETU310M		✓	✓	✓

3.2 Use as Motor Circuit Protector (MCP) for starter combinations

3VA UL motor circuit protectors (MCP)			3VA6 motor circuit protectors	
			3VA64 600 A	3VA65 800 A
Number of poles			3	3
Rated operational current	I_n	[A]	400 ... 500	800
Breaking capacity according to UL 489 without contactors			C	C
240 V AC		[kA]	200	200
480 V AC		[kA]	100	100
600/347 V AC		[kA]	35	35
600 V AC		[kA]	35	35
Breaking capacity according to IEC 60947			C	C
240 V AC		I_{cu}/I_{CS} [kA]	200/200	200/200
415 V AC		I_{cu}/I_{CS} [kA]	110/110	110/110
690 V AC		I_{cu}/I_{CS} [kA]	6/6	6/6
Trip unit				
Electronic	ETU310M		✓	✓

3.2.2 Trip units for starter combinations

Frame size		3VA51 125 A	3VA52 250 A	3VA53 250 A	3VA54 600 A	3VA55 800 A
Rated operational current I _n	Trip unit					
[x I _n]	TM120M, magnetic adjustable					
1 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
2 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
3 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
5 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
7 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
10 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
15 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
25 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				

3.2 Use as Motor Circuit Protector (MCP) for starter combinations

Rated operational current I_n	Frame size	3VA51 125 A	3VA52 250 A	3VA53 250 A	3VA54 600 A	3VA55 800 A
	Trip unit					
[x I_n]	TM120M, magnetic adjustable					
30 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
40 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
50 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
70 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
80 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
90 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
100 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
110 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
125 A	MU ¹⁾	3 ... 7				
	MH ¹⁾	5 ... 12				
150 A	MU ¹⁾		3 ... 6			
	MH ¹⁾		6 ... 12			
200 A	MU ¹⁾		3 ... 6			
	MH ¹⁾		6 ... 12			
250 A	MU ¹⁾		3 ... 6	3 ... 6		
	MH ¹⁾		6 ... 10	6 ... 12		
400 A	MU ¹⁾				3 ... 6	
	MH ¹⁾				6 ... 12	
500 A	MU ¹⁾				3 ... 6	
	MH ¹⁾				8 ... 12	
600 A	MU ¹⁾				3 ... 6	--
	MH ¹⁾				7 ... 10	8 ... 16
800 A	MU ¹⁾					--
	MH ¹⁾					6 ... 12

¹⁾ 9th and 10th digit of article number, e.g. 3VA5215-5MH31-0AA0

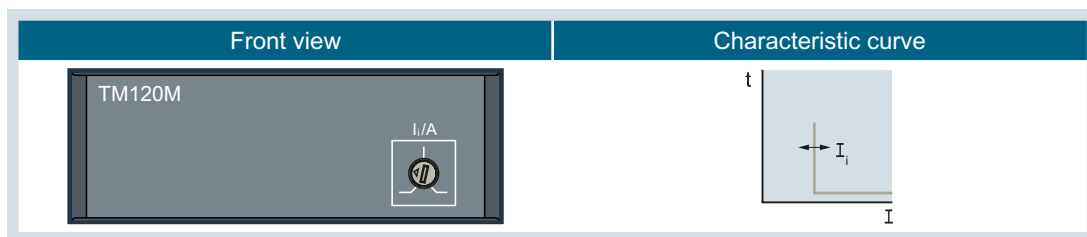
3.2 Use as Motor Circuit Protector (MCP) for starter combinations

Frame size		3VA61 150 A	3VA62 250 A	3VA63 400 A	3VA64 600 A	3VA65 800 A
Rated operational current I _n	Trip unit					
[x I _n]	ETU310M, electronically adjustable					
1 A						
2 A						
3 A						
5 A						
7 A						
10 A						
15 A						
25 A		3 ... 15				
30 A		3 ... 15				
40 A		3 ... 15				
50 A		3 ... 15				
70 A		3 ... 15				
80 A		3 ... 15				
90 A		3 ... 15				
100 A		3 ... 15				
110 A			3 ... 15			
125 A			3 ... 15			
150 A			3 ... 15			
200 A			3 ... 12	3 ... 15		
250 A				3 ... 15		
400 A					3 ... 13	
500 A					3 ... 12	
600 A						--
800 A						3 ... 15

Note

For the relevant short-circuit current ratings (SCCR ratings) of the combination of contactor and overload relay, please refer to the corresponding UL certificates for contactor and overload relay. These can be found in Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/view/29755649>).

3.2.3 TM120M magnetic trip unit



Starter protection (motor circuit protector) AM - function I

The TM120M magnetic trip unit has an adjustable short-circuit release I_i .

TM120M parameters:

Frame size		Rated current I_n	Values I_r	Setting values for I_i [A]				
		[A]	[A]	TM120M MU				
3VA51	3VA5181	1	1	3	4	5	6	7
	3VA5102	2	2	6	8	10	12	14
	3VA5103	3	3	9	12	15	18	21
	3VA5105	5	5	15	20	25	30	35
	3VA5107	7	7	21	28	35	42	49
	3VA5191	10	10	30	40	50	60	70
	3VA5195	15	15	45	60	75	90	105
	3VA5125	25	25	75	100	125	150	175
	3VA5130	30	30	90	120	150	180	210
	3VA5140	40	40	120	160	200	240	280
	3VA5150	50	50	150	200	250	300	350
	3VA5170	70	70	210	280	350	420	490
	3VA5180	80	80	240	320	400	480	560
	3VA5190	90	90	270	360	450	540	630
	3VA5110	100	100	300	400	500	600	700
	3VA5111	110	110	330	440	550	660	770
	3VA5112	125	125	375	500	625	750	875
3VA52	3VA5215	150	150	--	450	600	750	900
	3VA5220	200	200	--	600	800	1,000	1,200
	3VA5225	250	250	--	750	1,000	1,250	1,500
3VA53	3VA5325	250	250	--	750	1,000	1,250	1,500
3VA54	3VA5440	400	400	--	1,200	1,600	2,000	2,400
	3VA5450	500	500	--	1,500	2,000	2,500	3,000
	3VA5460	600	600	--	1,800	2,400	3,000	3,600

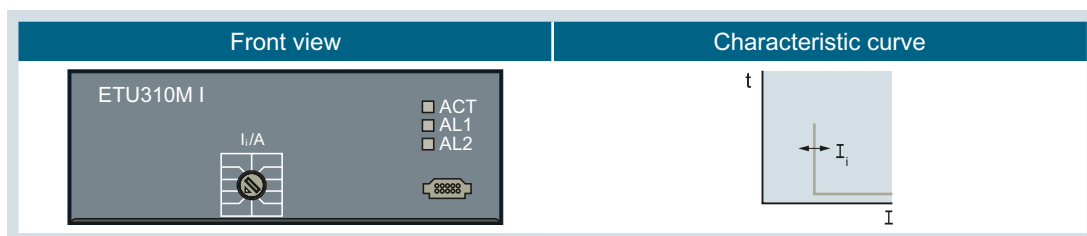
3.2 Use as Motor Circuit Protector (MCP) for starter combinations

Frame size		Rated current I_n	Values I_r	Setting values for I_i [A]				
		[A]	[A]	TM120M MU				
3VA55	3VA5560	600	600	--	--	--	--	--
	3VA5580	800	800	--	--	--	--	--

Frame size		Rated current I_n	Values I_r	Setting values for I_i [A]							
		[A]	[A]	TM120M MH							
3VA51	3VA5181	1	1	5	6	7	8	9	10	11	12
	3VA5102	2	2	10	12	14	16	18	20	22	24
	3VA5103	3	3	15	18	21	24	27	30	33	36
	3VA5105	5	5	25	30	35	40	45	50	55	60
	3VA5107	7	7	35	42	49	56	63	70	77	84
	3VA5191	10	10	50	60	70	80	90	100	110	120
	3VA5195	15	15	75	90	105	120	135	150	165	180
	3VA5125	25	25	125	150	175	200	225	250	275	300
	3VA5130	30	30	150	180	210	240	270	300	330	360
	3VA5140	40	40	200	240	280	320	360	400	440	480
	3VA5150	50	50	250	300	350	400	450	500	550	600
	3VA5170	70	70	350	420	490	560	630	700	770	840
	3VA5180	80	80	400	480	560	640	720	800	880	960
	3VA5190	90	90	450	540	630	720	810	900	990	1,080
	3VA5110	100	100	500	600	700	800	900	1,000	1,100	1,200
	3VA5111	110	110	550	660	770	880	990	1,100	1,210	1,320
	3VA5112	125	125	625	750	875	1,000	1,125	1,250	1,375	1,500
3VA52	3VA5215	150	150	--	900	1,050	1,200	1,350	1,500	1,650	1,800
	3VA5220	200	200	--	1,200	1,400	1,600	1,800	2,000	2,200	2,400
	3VA5225	250	250	--	--	1,250	1,500	1,750	2,000	2,250	2,500
3VA53	3VA5325	250	250	--	1,500	1,750	2,000	2,250	2,500	2,750	3,000
3VA54	3VA5440	400	400	--	2,400	2,800	3,200	3,600	4,000	4,400	4,800
	3VA5450	500	500	--	--	--	4,000	4,500	5,000	5,500	6,000
	3VA5460	600	600	--	--	--	--	4,200	4,800	5,400	6,000
3VA55	3VA5560	600	600	4,800	5,760	6,720	7,680	8,640	9,600	--	--
	3VA5580	800	800	4,800	5,760	6,720	7,680	8,640	9,600	--	--

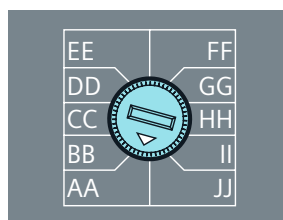
3.2.4 ETU310M electronic trip unit

ETU310M 3-pole



ETU310M parameters:

The parameters are selected with the setting knob. The diagram below shows the possible selections.



The values for the respective setting are listed in the following table.

	Rated current I_n [A]	Setting values for I_i [A]									
		AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6125	25	75	100	125	150	200	250	300	325	350	375
3VA6130	30	90	120	150	180	240	300	360	390	420	450
3VA6140	40	120	160	200	240	320	400	480	520	560	600
3VA6150	50	150	200	250	300	400	500	600	650	700	750
3VA6170	70	210	280	350	420	560	700	840	910	980	1,050
3VA6180	80	240	320	400	480	640	800	960	1,040	1,120	1,200
3VA6190	90	270	360	450	540	720	900	1,080	1,170	1,260	1,350
3VA6110	100	300	400	500	600	800	1,000	1,200	1,300	1,400	1,500
3VA6211	110	330	440	550	660	880	1,100	1,320	1,430	1,540	1,650
3VA6212	125	375	500	625	750	1,000	1,250	1,500	1,625	1,750	1,875
3VA6215	150	450	600	750	1,000	1,200	1,400	1,600	1,800	2,000	2,250
3VA6220	200	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400
3VA6320	200	600	800	1,000	1,200	1,600	2,000	2,400	2,600	2,800	3,000
3VA6325	250	750	1,000	1,250	1,500	2,000	2,500	3,000	3,250	3,500	3,750
3VA6440	400	1,200	1,700	2,100	2,600	3,100	3,600	4,000	4,400	4,800	5,200

3.3 Use of the 3VA UL molded case circuit breaker as a molded case switch (MCS)

	Rated current I_n	Setting values for I_i									
		[A]									
		AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
3VA6450	500	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000
3VA6580	800	2,400	3,200	4,000	4,800	6,400	8,000	9,600	10,400	11,200	12,000

Instantaneous short-circuit protection I:

- I_i adjustable in 10 steps from 3 to 12 / 13 / 15 x I_n (dependent on the frame size)

3.3 Use of the 3VA UL molded case circuit breaker as a molded case switch (MCS)

Molded case switches are used as:

- Disconnectors in subdistribution and final distribution boards
- Bus couplers
- Disconnectors for machine groups, e.g. as maintenance and repair breakers
- Operator control and disconnector element for cables, busbars and device groups
- Application as disconnector unit
- Application as main switches
- Isolation of small distribution systems in industrial/commercial buildings
- Disconnection of loads

Molded case switches can be used to switch equipment and parts of electrical installations up to their rated current and rated voltage.

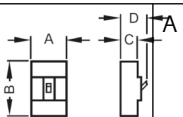
In contrast to the switch disconnector according to IEC 60947-3, the molded case switch has a short-circuit release for intrinsic device protection up to a specified maximum short-circuit current and is certified to UL 489. The special advantage of the molded case switch is that the type of protective device in the upstream panelboard up to the specified short-circuit current of the molded case switch is insignificant.

So that the molded case switches of the 3VA UL series can also be used globally in IEC applications, they are also approved as CBI-X according to IEC 60947-2 Annex L.

Depending on the requirement, the range of 3VA UL molded case switches includes devices for a short-circuit current of 65 kA as well as 100 kA at 480 V according to UL 489.

3.3 Use of the 3VA UL molded case circuit breaker as a molded case switch (MCS)

Technical specifications of molded case switch

3VA UL molded case switch (MCS)		3VA51 125 A	3VA52 250 A	3VA53 400 A	3VA54 600 A	3VA55 800 A	3VA63 400 A	3VA64 600 A	
Number of poles		3	2(3)-pole ¹⁾ / 3	2(3)-pole / 3			3	3	
Electrical characteristics according to UL 489									
Breaking capacity (short-circuit current rating, SCCR) up to 65 kA at 480 V ²⁾									
Rated uninterrupted current I _n at 40 °C ambient temperature	[A]	100	150, 250	400	600	800	--	--	
Breaking capacity (short-circuit current rating, SCCR) up to 100 kA at 480 V ²⁾									
Rated uninterrupted current I _n at 40 °C ambient temperature	[A]	--	100, 150, 250	400	600	800	400	600	
Approval according to IEC 60947-2 Annex L BI-X		✓	✓	✓	✓	✓	✓	✓	
Overcurrent release ³⁾	FM MCS100	✓	✓	✓	✓	✓	✓	✓	
Dimensions									
	A	inch	3	4.13	5.43 (2P) 7.24 (3P)	5.43 (2P) 7.24 (3P)	8.27	7.24	7.24
		mm	76.2	105	138 (2P) 184 (3P)	138 (2P) 184 (3P)	201	184	184
	B	inch	551	7.28	9.76	9.76	12.91	9.76	9.76
		mm	140	185	248	248	328	248	248
	C	inch	3	3.27	4.33	4.33	4.72	4.33	4.33
		mm	76.5	83	110	110	120	110	110
	D	inch	3.67	4.21	5.39	5.39	6.14	5.39	5.39
		mm	93.4	107	137	137	156	137	137
General information									
Direction of power flow and incoming supply		Top and bottom	Top and bottom	Top and bottom	Top and bottom	Top and bottom	Top and bottom	Top and bottom	
Standard connection technology		No connection technology	No connection technology	No connection technology	No connection technology	Nut keeper kit	No connection technology	No connection technology	

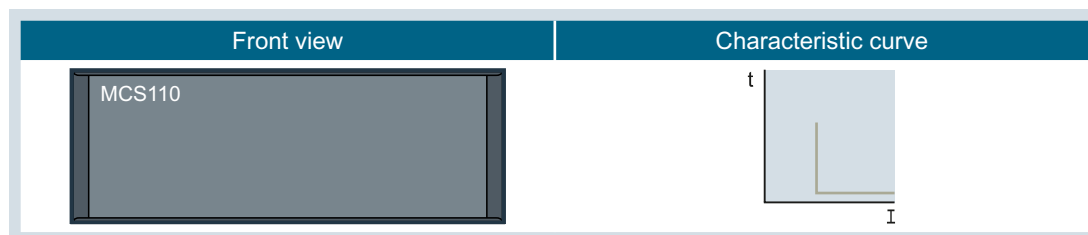
¹⁾ 2-pole circuit breaker in 3-pole enclosure (frame)

²⁾ The breaking capacity (short-circuit current rating, SCCR) is the maximum permissible short-circuit current at the installation location of the molded case switch when an appropriate overload protection device is used

3.3 Use of the 3VA UL molded case circuit breaker as a molded case switch (MCS)

- 3) Integrated instantaneous short-circuit release for intrinsic device protection

MCS110 magnetic trip unit



Molded case switch FM - function I for intrinsic device protection

The MCS110 magnetic trip unit has a fixed short-circuit release I_i .

MCS110 parameters:

Frame size		Rated current I_n	Setting values for I_i
		[A]	[A]
3VA51	3VA5110	100	1,600
3VA52	3VA5210	100	2,500
	3VA5215	150	2,400
	3VA5225	250	2,500
3VA53	3VA5340	400	6,000
3VA54	3VA5460	600	6,000
3VA55	3VA5580	800	9,600
3VA63	3VA6340	400	5,600
3VA64	3VA6460	600	5,400

3.3.1 Compatibility of 3VA UL molded case switch and accessories

The 3VA UL molded case switches are derived from the molded case circuit breakers and share the following:

- Sizes
- Dimensions
- Mounting options
- Procedure for installing accessories

This means that, for example, a shunt trip can trip the molded case switches via remote control or the molded case switch can be opened or closed with a door mounted rotary operator.

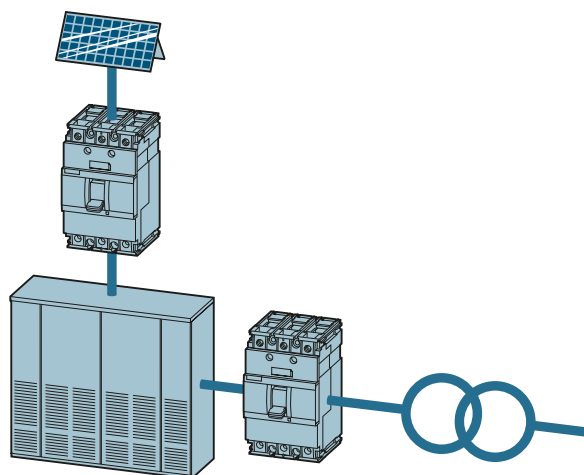
3.4 Use of 3VA UL molded case circuit breaker in DC systems

3.4.1 Introduction

The main applications for 3VA circuit breakers in DC installations or systems are:

- Public transport systems, e.g. electric cars, underground rail networks and streetcars
- UPS systems
- Photovoltaic systems
- Wind power systems

The 3VA5 molded case circuit breakers for line protection with thermal overload and magnetic short-circuit releases are suitable for use in DC systems.



Features specific to direct current

Short-circuits are interrupted in DC networks by a method similar to the one applied to high alternating currents, i.e. by current limiting. A high arc voltage builds up in molded case circuit breakers, which forces the current to zero when the source voltage (supply system voltage) is exceeded.

Overloads are interrupted by a completely different principle to the method applied in AC networks. With direct currents, there is no periodic zero crossing and thus also no period of time without magnetic energy in the circuit during which the conditions for extinguishing the arc are favorable. The arc is not extinguished until the arc voltage exceeds the line voltage and the current reduces to zero. In other words, a high arc voltage must be developed in order to interrupt the direct current.

The rated operational current values are generally the same for DC and AC applications.

With DC applications, the breaking capacity depends only on:

- The arc extinction method used
- The line voltage

3.4.2 Variants

The same thermal-magnetic trip units used as line protection devices in AC installations are also available for protecting DC installations.

However, a correction factor must be applied to the magnetic trip unit, relative to the actual current rating.

Correction factor for the magnetic trip unit for DC systems		
Frame size	Rated current	Correction factor
3VA51	125 A	0.70
3VA52	250 A	0.85
3VA53	400 A	0.80
3VA54	600 A	0.80
3VA55	800 A	0.90

Example:

3VA51 100 A, TM230 FTAM:

If the switching device is to trip instantaneously on an overcurrent of 1000 A, the parameter I_i for instantaneous short-circuit current protection (I) is set to:

$$I_i = 1000 \text{ A} \times 0.7 = 700 \text{ A.}$$

You can find more information on trip units and details about the setting parameters in chapter Applications in line protection (Page 121).

It is not possible to use electronic trip units for this application.

3.4.3 Breaking capacity with direct current

DC breaking capacity and DC circuit diagrams for 3VA5 molded-case circuit breakers

3VA molded case circuit breakers with approval according to UL 489 and IEC 60947-2 (3VA UL/IEC)

DC breaking capacity according to UL 489 in kA

In a non-grounded system, all poles must always be disconnected.

The grounded pole must always be assigned to the individual conducting path so that, in the event of a ground fault, at least ...

- 2 conducting paths in series with a 3-pole breaker or
- 3 conducting paths in series with a 4-pole molded case circuit breaker can take over the disconnection.

Further circuits are available on request.

3.4 Use of 3VA UL molded case circuit breaker in DC systems

3VA51		3VA52		3VA53		3VA54		3VA55		3VA57		3VA58		3VA59		DC single-pole disconnection		DC all-pole disconnection			
125 A (15 – 125 A)		250 A (40 – 250 A)		400 A (200 – 400 A)		600 A (450 – 600 A)		800 A (600 – 800 A)		1,200 A (800 – 1,200 A)		1,600 A (1,200 – 1,600 A)		2,000 A (1,600 – 2,000 A)		grounded ^{*)}		center grounded		isolated	
DC breaking capacity acc. UL 489 in kA																					
S	M	H	M	H	C	M	H	C	M	H	C	M	H	C	M	H	C				
125 V		250 V		250 V		250 V		250 V		250 V		250 V		250 V		250 V					

During operation and in the event of a fault, voltages > 262 V DC per pole path must not occur at any time (including any voltage ripple that may occur).

*) Positive pole grounded

3.4 Use of 3VA UL molded case circuit breaker in DC systems

**) Also covers 1-pole breakers in 2-pole frame

***) Terminal cover 3VA9471-0WF.0 / 3VA9671-0WF.0 must be used as an insulation measure. The cabling in the control cabinet must be protected against ground faults and short circuits.

****) Only 3-pole molded case circuit breakers are available

Ground-fault monitoring GF

See DC double ground fault (Page 190)

Note

Breaker suitable for pollution degree 3, over 800 V pollution degree 2.

4-pole breakers must have either no protection or 100% protection in the N pole. This applies to MCCBs in line protection and MCS, provided these are protected by a suitable overcurrent protection device.

DC breaking capacity according to UL 489 supplement SC

This applies to molded case circuit breakers in line protection and molded case switches, provided these are protected by a suitable overcurrent protection device.

The grounded pole must always be assigned to the individual conducting path so that, in the event of a ground fault, at least ...

- 2 conducting paths in series with a 3-pole breaker or
- 3 conducting paths in series with a 4-pole molded case circuit breaker can take over the disconnection.

3.4 Use of 3VA UL molded case circuit breaker in DC systems

3VA51	3VA52	3VA53	3VA54	3VA55	3VA57	3VA58	3VA59		
125 A (15 – 125 A)	250 A (40 – 250 A)	400 A (200 – 400 A)	600 A (450 – 600 A)	800 A (600 – 800 A)	1.200 A (800 – 1.200 A)	1.600 A (1.200 – 1.600 A)	2.000 A (1.600 – 2.000 A)		
DC breaking capacity acc. UL 489 Suppl. SC in kA									
Level 2 500 V nominal 600 V maximum		Level 2 500 V nominal 600 V maximum			Level 3 600 V nominal 750 V maximum				
S	M	H	C	M	H	C	M	H	C
50	85	100	100	50	85	100	50	85	100

3.4 Use of 3VA UL molded case circuit breaker in DC systems

Note

This applies to MCCBs in **line protection** and molded case switches (MCS), provided these are protected by a suitable overcurrent protection device.

DC breaking capacity according to IEC 60947

In a non-grounded system, all poles must always be disconnected.

The grounded pole must always be assigned to the individual conducting path so that, in the event of a ground fault, at least ...

- 2 conducting paths in series with a 3-pole breaker or
- 3 conducting paths in series with a 4-pole molded case circuit breaker can take over the disconnection.

Further circuits are available on request.

3.4 Use of 3VA UL molded case circuit breaker in DC systems

3VA51		3VA52		3VA53		3VA54		3VA55		3VA57		3VA58		DC single-pole disconnection		DC all-pole disconnection	
125 A (15 – 125 A)		250 A (40 – 250 A)		400 A (200 – 400 A)		600 A (450 – 600 A)		800 A (600 – 800 A)		1,200 A (800 – 1,200 A)		1,600 A (1,200 – 1,600 A)		grounded *)		center grounded	
S M H		M H C		M H C		M H C		M H C		M H C		M H C		grounded *)		center grounded	
125 V		250 V		125 V		125 V		250 V		250 V		250 V		250 V		250 V	
14	25	30	50	85	100	8	16	25	8	16	25	8	16	25	8	16	25
250 V		500 V		250 V		250 V		500 V		500 V		500 V		500 V		500 V	
50	85	100	50	85	100	8	16	25	8	16	25	8	16	25	8	16	25
500 V		750 V		500 V		500 V		750 V		750 V		750 V		750 V		750 V	
50	85	100	50	85	100	8	16	25	8	16	25	8	16	25	8	16	25
600 V		1,000 V		600 V		600 V		1,000 V		1,000 V		1,000 V		1,000 V		1,000 V	
50	85	100	50	85	100	8	16	25	8	16	25	8	16	25	8	16	25

Ground-fault monitoring GF

*) Negative pole grounded

**) Also covers 1-pole breaker in 2-pole frame

***) Terminal cover 3VA9471-0WF.0 / 3VA9671-0WF.0 must be used as an insulation

3.4 Use of 3VA UL molded case circuit breaker in DC systems

measure. The cabling in the control cabinet must be protected against ground faults and short circuits.

****) Only 3-pole molded case circuit breakers are available

Ground-fault monitoring GF

During operation and in the event of a fault, voltages > 262 V DC per pole path must not occur at any time (including any voltage ripple that may occur).

See DC double ground fault (Page 190)

Note

Breaker suitable for pollution degree 3, over 800 V pollution degree 2.

4-pole breakers should have either no protection or 100% protection in the N pole.

This applies to MCCBs in line protection and MCS, provided these are protected by a suitable overcurrent protection device.

DC breaking capacity and DC circuit diagrams for 3VA5 molded-case circuit breakers, see FAQ (<https://support.industry.siemens.com/cs/ww/en/view/109775443>)

3.4.4 DC double ground fault



In an isolated DC system (IT system), a ground fault can only be detected if a separate monitoring device is installed.

In the event of a **double ground fault** on the infeed side and the load side, it may even be possible that only one switching path of the circuit breaker has to take over disconnection of the entire voltage of 750 V / 1000 V DC depending on the constellation.

It is not capable of doing this!

This connection version is only possible and permitted

if the first ground fault is already detected by a ground-fault detection system and the IT system is disconnected

and

if the simultaneous occurrence of a spontaneous double ground fault is technically impossible.

Parallel outgoing feeders must also be taken into account. This restricts the increased availability of isolated DC systems, which is often the driving intention.

The first detected ground fault must result in disconnection of the IT system, as the circuit breaker would no longer be able to handle a second fault at a critical point.

3.5 Use of 3VA UL molded case circuit breakers in IT systems according to IEC 60947-2

3.5.1 Introduction

The main advantage of IT systems is that they safeguard continuity of service by electrical installations and are therefore deployed predominantly in consumer installations where availability of electrical power is a priority. As a general rule, circuits are interrupted only if two insulation faults occur simultaneously.

Preferred applications for IT systems are therefore:

- In buildings with rooms used for medical purposes
- For operation of mobile generators
- In certain industries, e.g.:
 - in the chemical industry
 - in the oil industry
 - in the steel industry
 - in mining

The IT system is a low-voltage power supply network with increased failure-safety in the event of ground faults. In an IT system, live phases are not connected to ground. A ground fault does not cause system shutdown. DIN EN 60204-1 (VE 0113) therefore stipulates that an insulation monitoring device must be installed in order to indicate ground faults. In the unusual event that a fault on the load side coincides with a second fault on the line side, the full phase-to-phase voltage is connected across one contact of the breaker. The Siemens 3VA UL molded case circuit breakers for line protection, with thermal-magnetic and electronic trip units, are suitable for use in IT systems.

Accordingly, the molded case circuit breakers meet the requirements of standard IEC / DIN EN 60947-2 Annex H up to a maximum voltage ($U_{e, max.}$) of 690 V AC.

3.5.2 Selection criteria for 3VA UL molded case circuit breakers

The circuit breakers are always dimensioned and selected irrespective of the system type in which they will be deployed.

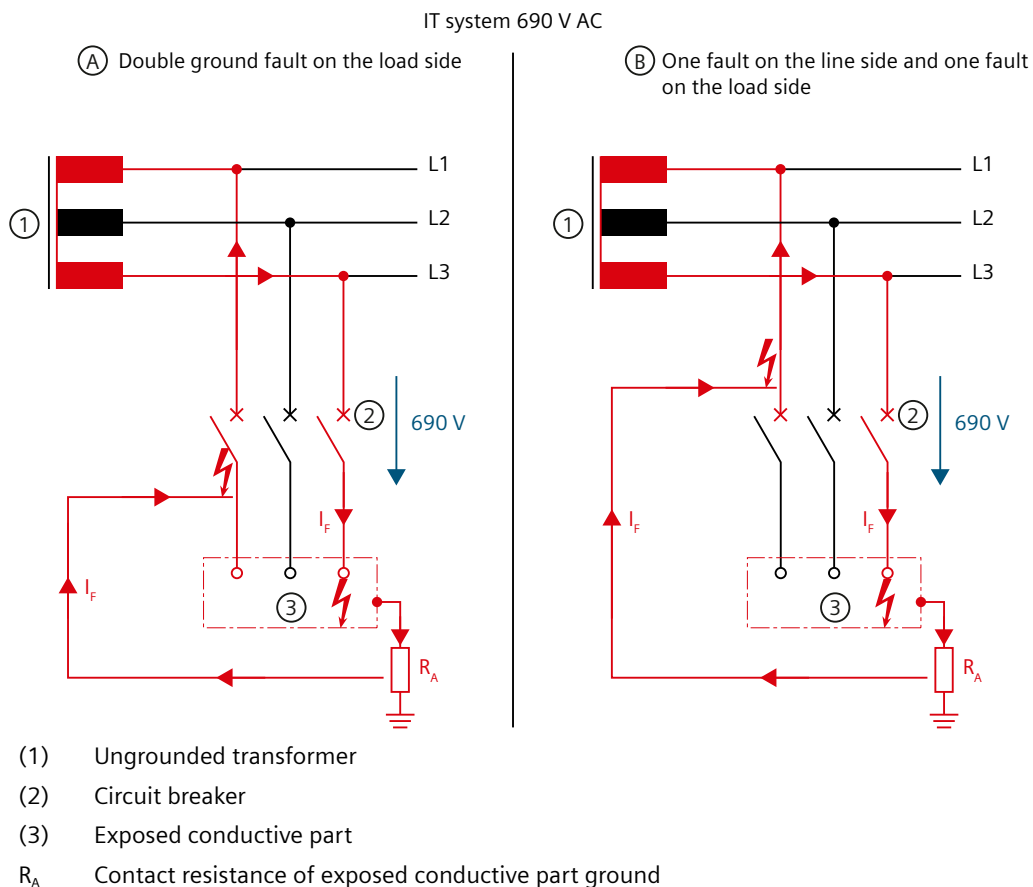
The circuit breaker is always selected according to the maximum potential short-circuit current in the IT system. The device is selected in accordance with the relevant I_{cu} values of the 3VA UL molded case circuit breaker.

If the system operator takes measures to ensure that a double-phase-to-ground fault cannot develop on the line side or load side of the circuit breaker, the breaking capacity I_{cu}/I_{cs} remains unchanged in IT systems. If this cannot be ensured, the values in accordance with the standard IEC 60947-2 Annex H apply for single-pole short circuits.

3.5.3 Fault situation

Simultaneous ground faults on the infeed and load sides of the circuit breaker is the most critical scenario for a circuit breaker in an IT system. If this fault occurs, the full line-to-line voltage is applied to one breaking pole of the circuit breaker.

The graphic below shows an example of simultaneous ground faults in an IT system with an operational voltage of 690 V AC.



Fault scenario A: Double ground fault on the load side

- On two line conductors, a fault occurs to an exposed conductive part or to ground. The fault pattern corresponds to a 2-pole short circuit.
- A voltage of 690 V is applied at the main contacts. This voltage is disconnected by two breaker poles.
- The circuit breaker is rated for short-circuit breaking capacity I_{cu} and I_{cs} at 690 V AC.

Fault scenario B: One fault on the infeed side and one fault on the load side

- The fault pattern corresponds to a 1-pole short circuit.
- The full line-to-line voltage of 690 V AC is applied to main contact L3. This full line-to-line voltage must be disconnected by a breaking pole.
- The circuit breaker is selected based on suitability for an IT system according to IEC 60947-2, Annex H.

Accessories

4.1 Overview - Accessories for 3VA UL molded case circuit breakers

You can adapt the 3VA UL molded case circuit breakers to their respective tasks with a comprehensive range of accessories.

The table below indicates which accessories are compatible with particular 3VA UL molded case circuit breakers, and which breaker frame sizes are compatible with the same accessory:

Chapter	Accessories	3VA5				
		3VA51 125 A	3VA52 250 A	3VA53 400 A	3VA54 600 A	3VA55 800 A
4.2	Internal accessories (Page 196)					
	Auxiliary switches and alarm switches	✓				
	Auxiliary releases	✓				
4.3	Connection system (Page 214)	✓	✓	✓		✓
4.4	Plug-in and draw-out technology (Page 304)					
	Plug-in technology	--	--	--		--
	Withdrawable technology	--	--	--		--
4.5	Manual operators (Page 339)					
	Front mounted rotary operator	✓	✓	✓		✓
	Door mounted rotary operators	✓	✓	✓		✓
	Auxiliary switch module for door mounted rotary operators	✓	✓	✓		--
	Side wall mounted operator	✓	✓	--		--
	Auxiliary switch module for side wall mounted operator	✓	✓	--		--
	Operator kit with Bowden cable (Max-Flex operator)	✓	✓	✓		✓
	Variable depth flange mounted operator	✓	✓	✓		--
4.6	Motor operator (Page 375)					
	MO320 motor operator	✓	✓	✓		--
	SEO520 stored energy mechanism	--	✓	✓		--
4.7	Locking and interlocking (Page 394)	✓	✓	✓		✓
4.8	Communication and system integration (Page 419)	✓	✓	✓		✓
4.9	EFB300 external function box (Page 429)	✓				
4.10	MMB300 maintenance mode box (Page 446)	✓				
4.11	Test devices (Page 455)	✓				
	TD300, TD400 and TD500					
4.12	Cover frame (Page 484)	✓	✓	✓		✓

4.2 Internal accessories

Chapter	Accessories	3VA6					
		3VA61 150 A	3VA62 250 A	3VA63 400 A	3VA64 600 A	3VA65 800 A	3VA66 1000 A
4.2	Internal accessories (Page 196)						
	Auxiliary switches and alarm switches			✓			
	Auxiliary releases			✓			
4.3	Connection system (Page 214)	✓		✓		✓	
4.4	Plug-in and draw-out technology (Page 304)						
	Plug-in technology	✓		✓		--	--
	Withdrawable technology	✓		✓		--	--
4.5	Manual operators (Page 339)						
	Front mounted rotary operator	✓		✓		✓	✓
	Door mounted rotary operators	✓		✓		✓	✓
	Auxiliary switch module for door mounted rotary operators	✓		✓		--	--
	Side wall mounted operator	✓		--		--	--
	Auxiliary switch module for side wall mounted operator	✓					--
	Operator kit with Bowden cable (Max-Flex operator)	✓		✓		✓	✓
	Variable depth flange mounted operator	✓		✓		--	--
4.6	Motor operator (Page 375)						
	MO320 motor operator	✓		✓		--	--
	SEO520 stored energy mechanism	✓		✓		--	--
4.7	Locking and interlocking (Page 394)	✓		✓		✓	✓
4.8	Communication and system integration (Page 419)	✓		✓		✓	✓
4.9	EFB300 external function box (Page 429)	✓		✓		✓	✓
4.10	MMB300 maintenance mode box (Page 446)	✓		✓		✓	✓
4.11	Test devices (Page 455) TD300, TD400 and TD500	✓		✓		✓	✓
4.12	Cover frame (Page 484)	✓		✓		✓	✓

4.2 Internal accessories

4.2.1 Mounting locations of 3VA UL molded case circuit breakers

The portfolio of internal accessories includes:

- Auxiliary switches
- Alarm switches
- Auxiliary releases
- COM060 communications module

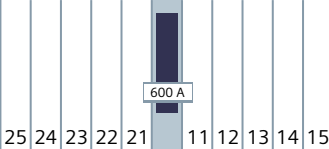
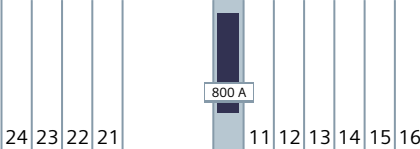
- 24 V module
- Cylinder lock (type Ronis)

The following tables show the alternative mounting locations for internal accessories, which depend on the frame size and number of poles of the circuit breaker.

3VA5 molded case circuit breakers:

Internal accessories Optional equipment		3VA51 125 A 1(2)-pole /2-pole	3VA51 125 A 3- and 4-pole	3VA52 250 A 3- and 4-pole
Slot No.:		23 22 21	23 22 21 11 12 13	24 23 22 21 11 12 13 14
Auxiliary switch	Type			
Auxiliary switch	AUX_HQ	x x x	x x x x x x	x x x x x x
	AUX_HQ_el	x x x	x x x x x x	x x x x x x
	AUX_HP	x	x	x x x
Leading changeover switch	LCS_HQ			
	LCS_HQ_el			
	LCS_HP			
Alarm switch	Type			
Trip alarm switch	TAS_HQ	x x	x x x x	x x x x
	TAS_HQ_el	x x	x x x x	x x x x
	TAS_HP	x	x x	x x
Auxiliary release	Type			
Shunt trip flexible	STF	x	x	x
Shunt trip left	STL	x	x	x
Undervoltage release	UVR	x	x	x
Universal release	UNI	x	x	x
Other				
Cylinder lock (type Ronis)			x	x

4.2 Internal accessories

Internal accessories Optional equipment		3VA53/3VA54 400/600 A 3- und 4-pole															3VA55 800 A 3- und 4-pole													
Slot No.:																														
Auxiliary switch	Type																													
Auxiliary switch	AUX_HQ																													
	AUX_HQ_el																													
	AUX_HP																													
Leading changeover switch	LCS_HQ																													
	LCS_HQ_el																													
	LCS_HP																													
Alarm switch	Type																													
Trip alarm switch	TAS_HQ																													
	TAS_HQ_el																													
	TAS_HP																													
Auxiliary release	Type																													
Shunt trip flexible	STF																													
Shunt trip left	STL																													
Undervoltage release	UVR																													
Universal release	UNI																													
Other																														
Cylinder lock (type Ronis)																														

3VA6 molded case circuit breakers:

Internal accessories		3VA61/3VA62 150/250 A 3-pole														3VA61/3VA62 150/250 A 4-pole													
Optional equipment		3-pole														4-pole													
		250 A														250 A													
		24	23	22	21	11	12	13	14	34	33	32	31	24	23	22	21	11	12	13	14	34	33	32	31	24	23	22	21
Auxiliary switch	Type	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	AUX_HQ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	AUX_HQ_el	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	AUX_HP	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Leading changeover switch	LCS_HQ																												
	LCS_HQ_el																												
	LCS_HP																												
Alarm switch		Type														Type													
Trip alarm switch	TAS_HQ																												
	TAS_HQ_el																												
	TAS_HP																												
Electrical alarm switch	EAS_HQ																												
	EAS_HQ_el																												
Auxiliary release		Type														Type													
Shunt trip flexible	STF																												
Shunt trip left	STL																												
Undervoltage release	UVR																												
Universal release	UNI																												
ETU/communication		Type														Type													
Communication module	COM060																												
24 V module																													
Other																													
Cylinder lock (type Ronis)																													

4.2 Internal accessories

Internal accessories Optional equipment		3VA63/3VA64 400/600 A 3-pole															3VA63/3VA64 400/600 A 4-pole														
Slot No.:		25	24	23	22	21	11	12	13	14	15	35	34	33	32	31	25	24	23	22	21	11	12	13	14	15					
Auxiliary switch	Type																														
	AUX_HQ	x	x	x	x	x		x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x			
	AUX_HQ_el	x	x	x	x	x		x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x			
Auxiliary switch	AUX_HP			x		x			x		x			x		x			x		x			x		x					
		x		x				x		x			x					x		x			x		x						
Leading changeover switch	LCS_HQ							x															x								
	LCS_HQ_el							x														x									
	LCS_HP							x														x									
Alarm switch	Type																														
Trip alarm switch	TAS_HQ				x	x		x	x											x	x		x	x							
	TAS_HQ_el				x	x		x	x											x	x		x	x							
	TAS_HP				x			x												x			x								
Electrical alarm switch	EAS_HQ											x															x				
	EAS_HQ_el											x															x				
Auxiliary release	Type																														
Shunt trip flexible	STF				x				x										x				x								
Shunt trip left	STL				x														x												
Undervoltage release	UVR				x														x												
Universal release	UNI				x														x												
ETU/communication	Type																														
Communication module	COM060								x																	x					
Breaker data server																															
24 V module									x																	x					
Other																															
Cylinder lock (type Ronis)									x																	x					

Internal accessories Optional equipment		3VA65/3VA66 800/1000 A 3-pole												3VA65/3VA66 800/1000 A 4-pole											
Slot No.:		24	23	22	21		11	12	13	14	15	16		24	23	22	21		11	12	13	14	15	16	
Auxiliary switch	Type																								
Auxiliary switch	AUX_HQ	x	x	x	x				x	x	x	x			x	x	x	x			x	x	x	x	
	AUX_HQ_el	x	x	x	x				x	x	x	x			x	x	x	x			x	x	x	x	
	AUX_HP	x		x					x		x				x		x				x		x		
Leading changeover switch	LCS_HQ						x												x						
	LCS_HQ_el						x											x							
	LCS_HP						x											x							
Alarm switch	Type																								
Trip alarm switch	TAS_HQ						x	x											x	x					
	TAS_HQ_el						x	x										x	x						
	TAS_HP						x											x							
Electrical alarm switch	EAS_HQ											x											x		
	EAS_HQ_el											x											x		
Auxiliary release	Type																								
Shunt trip flexible	STF		x						x						x										
Shunt trip left	STL		x																						
Undervoltage release	UVR		x												x										
Universal release	UNI		x												x										
ETU/communication	Type																								
Communication module	COM060								x												x				
Breaker data server																									
24 V module									x																
Other																									
Cylinder lock (type Ronis)									x																

4.2.2 Auxiliary and alarm switches

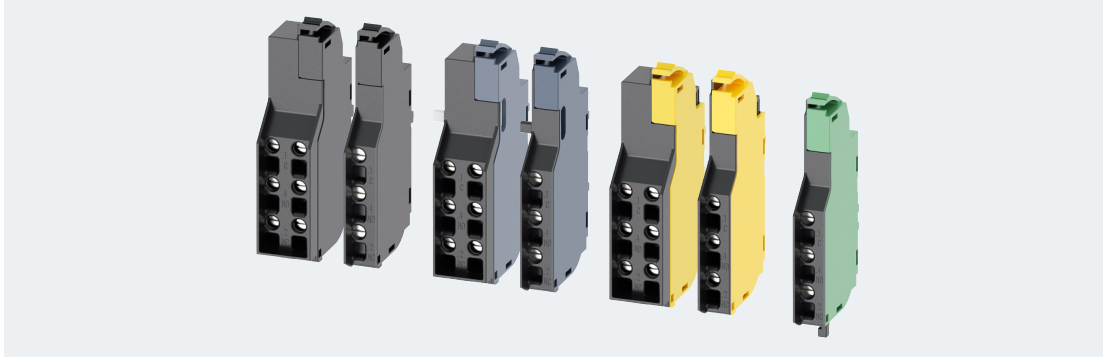
The auxiliary and alarm switches for the 3VA UL molded case circuit breaker form a single family. They can be installed in all frame sizes of all circuit breakers up to 600 A.

The auxiliary and alarm switches can be very simply snapped into place and connected up in accessories compartments provided on the front panel of the unit to the left and right of the handle.

All auxiliary and alarm switches are designed as changeover contacts and therefore provide a high degree of flexibility for planning and installation purposes.

HQ and HP switches

The switches are available in two versions: High Quantity (HQ) and High Power (HP). HQ switches are 7 mm wide, and HP switches 14 mm wide.



Both switch versions can be combined extremely flexibly in a molded case circuit breaker. This level of compatibility means that two HQ switches can be optionally installed in place of one HP switch.

HQ and HP switches have the same functionality, but differ in terms of the following features:

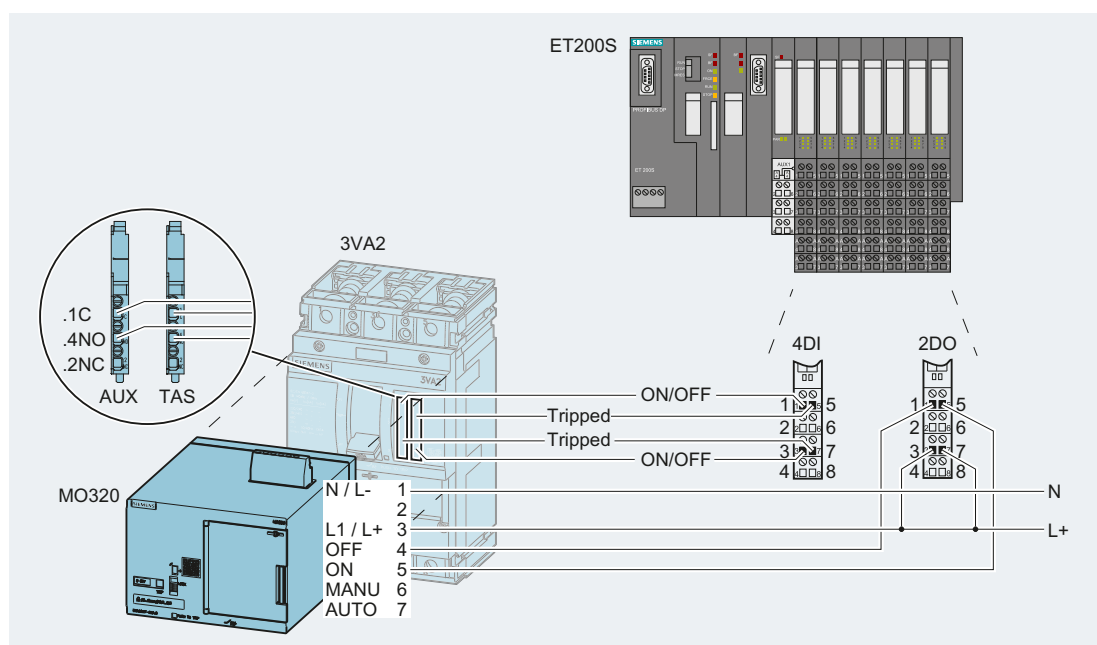
- Connection technology
 - HQ: One conductor per contact point
 - HP: Two conductors per contact point possible (two screw terminals support one internal contact point)
- Key electrical data
 - HQ: max. 300 V AC, max. 6 A
 - HP: max. 600 V; max. 10 A

Individual key electrical data can be found at the end of this chapter.

All HQ switches are also available in a version suitable for lower-level electronic signals (HP_el).

The auxiliary switches suitable for electronics (HQ_el) are specially optimized for switching small voltages and currents. They are thus especially well suited to digital inputs and outputs in the environment of PLC controllers.

The diagram below uses the example of an ET200S to illustrate the conventional method of connecting the electronics-compatible auxiliary switch AUX, the trip alarm switch TAS and the motor operator MO320 to a distributed I/O device.



You can find more information about contact reliability can be found at the end of this chapter.

Auxiliary switches AUX



The purpose of auxiliary switches is to signal the position of the main contacts of the molded case circuit breaker. The contacts of the auxiliary switch open and close simultaneously with the main contacts of the molded case circuit breaker.

Leading changeover switches LCS



Leading changeover switches signal the opening of the main contacts with a lead time of 20 ms in advance of circuit breaker trips and can be used for load shedding, for example.

Trip alarm switches TAS



Trip alarm switches signal every circuit breaker trip, regardless of the cause of the trip. The trip alarm switches are operated whenever the molded case circuit breaker switches to the TRIP position.

Electrical alarm switches EAS



Electrical alarm switches are operated as soon as the main contacts of the molded case circuit breaker open in the event that the breaker is tripped by the ETU. They indicate the following conditions:

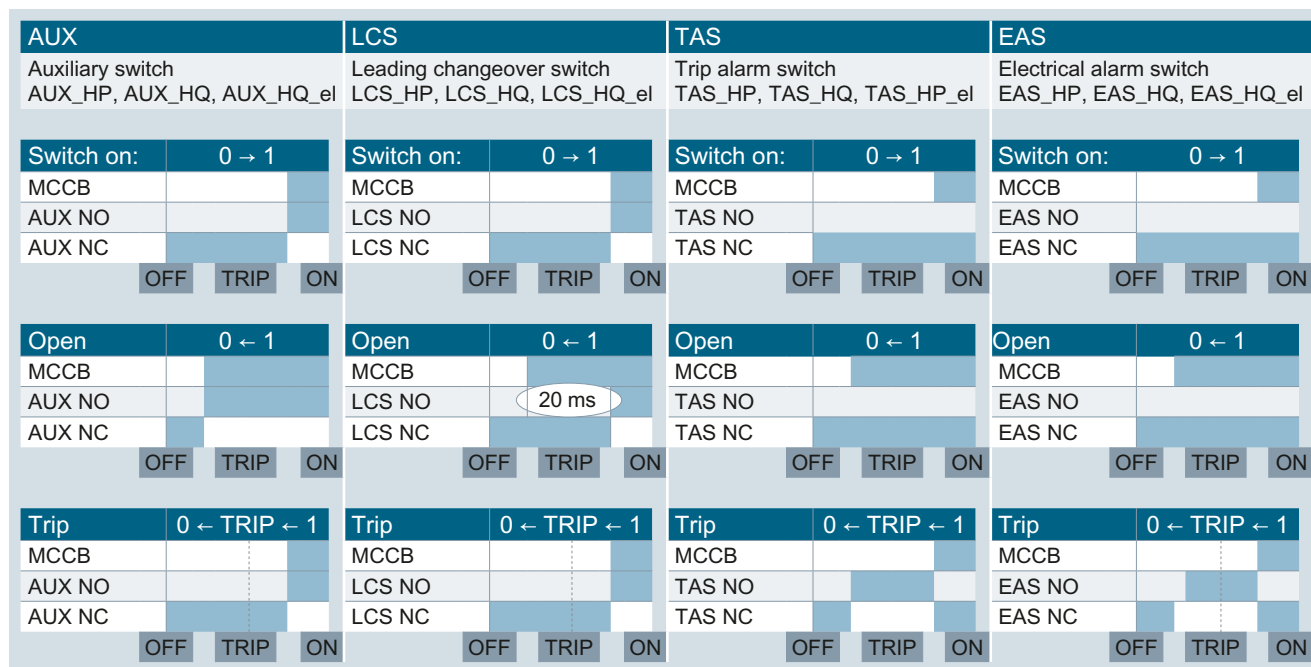
- Overload L and neutral conductor overload
- Short-circuit S, I
- Ground-fault tripping G

The electrical alarm switch is not operated:

- When the breaker is tripped manually
 - PUSH TO TRIP
 - When the breaker is withdrawn from the plug-in/withdrawable socket when the main contacts are closed
- When activated via an auxiliary release
 - Shunt trip STL, STF
 - Undervoltage release UVR
 - Universal release UNI

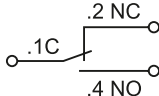
You can use electrical alarm switches only with the 3VA6 molded case circuit breakers with electronic trip units (ETU).

4.2.3 Contact sequence diagrams



-  Main contacts open
-  Auxiliary contacts open
-  Contacts closed

4.2.4 Technical specifications of auxiliary and alarm switches

Technical specifications Auxiliary and alarm switches			HQ				HQ_el				HP		
			AUX	LCS	TAS	EAS	AUX	LCS	TAS	EAS	AUX	LCS	TAS
													
Width			mm			7				14			
Graphic symbol													
Wire range	 Solid/stranded/finely stranded with ferrule	Screw connection (per contact)	1 x (0.5 mm ² - 1.5 mm ²)							2 x (0.75 mm ² - 2.5 mm ²)			
		Screw connection (per contact)	1 x (AWG20 - AWG16)							2 x (AWG18 - AWG14)			
	 Flexible with insulated ferrule	Screw connection (per contact)	1 x (0.5 mm ² - 1.0 mm ²)							2 x (0.75 mm ² - 1.0 mm ²)			
		Screw connection (per contact)	1 x (AWG20 - AWG16)							2 x (AWG18 - AWG16)			
	Tightening torque (connecting cables)	lb-in Nm	3.54 ^{+0.88} 0.4 ^{+0.1}										
	Stripped length 	inch mm	0.59 15										
Rated insulation voltage		I _i	V AC	690 Overvoltage category III Pollution degree 3									
Rated impulse withstand voltage		U _{imp}	kV	4							6		
Rated operational voltage			IEC 60947										
			U _e	V	240			24			600		
				AC 50 Hz									
			U _e	V	250			24			250		
				DC									
			UL / CSA										
Safety separation IEC 60947-1			U _e	V	300			24			600		
				AC 60 Hz									
			U _e	V	250			24			250		
				DC									
			Safety separation of auxiliary circuits is provided up to 500 V ^{1) 2)}										

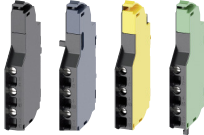
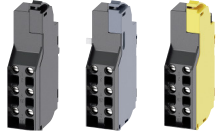
¹⁾ Safe separation in the case of side-by-side construction of auxiliary switches and auxiliary releases only up to 440 V and in systems up to a rated impulse voltage of 4 kV

²⁾ HP switches without adjacent switches; not in mounting locations 11 and 21 up to 690 V

Technical specifications Auxiliary and alarm switches			HQ				HQ_el				HP			
			AUX	LCS	TAS	EAS	AUX	LCS	TAS	EAS	AUX	LCS	TAS	
														
Conventional free-air thermal current		$I_{th} = I_e$	A	6				0.3				10		
Rated making capacity			A	6				0.3				10		
Rated operational current	AC-12	12 V	A	6				0.3				10		
		24 V	A	6				0.3				10		
		48 V	A	6								10		
		125 V	A	6								10		
		220/240 V	A	6								10		
		280/440 V	A									6		
		600 V	A									2		
	AC-15	12 V	A	3				0.3				6		
		24 V	A	3				0.3				6		
		48 V	A	3								6		
		125 V	A	3								6		
		220/240 V	A	3								6		
		280/440 V	A									2		
		600 V	A									0.6		
	DC-12	12 V	A	6				0.1				6		
		24 V	A	4				0.1				6		
		48 V	A	2								2		
		110 V	A	0.5								0.6		
		250 V	A	0.25								0.3		
	DC-13	12 V	A	1				0.07				3		
		24 V	A	0.8				0.07				3		
		48 V	A	0.4								0.8		
		110 V	A	0.2								0.2		
		250 V	A	0.1								0.1		
Short-circuit protection	Fuses	Type gG/gL	Corresponding to the specifications under rated operational current											
	Miniature circuit breakers	Characteristic type B	Corresponding to the specifications under rated operational current											
Lead time compared with main contacts ¹⁾	LCS		ms	> 20										
Switching frequency	Switching operations per hour			240										
Degree of protection	Lid of accessories compartment closed			IP40										
	Lid of accessories compartment open			IP20										
Minimum load	with 24 V DC		mA	70				0.5				70		
	with 5 V DC		mA					1						

¹⁾ In combination with manual switching operations, but not when motor operators are used

4.2 Internal accessories

Maximum rated current UL/CSA			HQ				HQ_el				HP		
			AUX	LCS	TAS	EAS	AUX	LCS	TAS	EAS	AUX	LCS	TAS
													
Inductive load (0.75 – 0.8 AC)	24 V	A	3				0.3				6		
	300 V	A	3								6		
	600 V	A									6		
Maximum rated current (AC)	24 V	A	3								6		
	127 V	A	3								6		
	240 V	A	3								3		
	480 V	A									1.5		
	600 V	A									1.2		
Resistive load (DC)	24 V	A	0.25				0.1				0.3		
	250 V	A	0.25								0.3		
Resistive load	125 V	A	0.6								0.9		
Maximum rated current (DC)	250 V	A	0.3								0.55		

4.2.5 Auxiliary release

Auxiliary releases allow remote electrical tripping of the circuit breaker. They can be used to monitor control or main circuits in order to implement a protective system against accidental restart following a power failure, for example.

Auxiliary releases therefore perform a main circuit monitoring function in addition to the main circuit monitoring performed by the trip unit.

Auxiliary releases are extremely easy to install. No tools are required because these 21 mm wide components are simply snapped into place in the accessories compartments to the left and right of the handle. The accessories are connected by screw terminals for auxiliary conductors with a cross-section of up to 1.5 mm². The terminals are mounted on the front of the unit for easy access.

The shunt trips are suitable for use in electrical interlocks. An attempt to switch on a circuit breaker while the interlock voltage is applied to the shunt trip leads to a so-called "no-load switching operation", i.e. the basic breaker always returns to the TRIP position and the main contacts never close.

Note

All auxiliary releases are reverse-polarity-protected.

4.2.5.1 Shunt Trip Left (STL)



Shunt trips of type STL can be fitted in the left-hand accessories compartment as an alternative to an undervoltage release. The units are available with six rated voltages in the following range:

- 24 to 600 V AC 50/60 Hz
- 12 to 250 V DC

They have a maximum power consumption of 58 VA which is significantly lower than the power consumption of the flexible shunt trip versions.

Switches (permanent signal) or momentary push-buttons (minimum signal duration 40 ms) may be used to control shunt trips.

4.2.5.2 Shunt Trip Flexible (STF)



Shunt trips of type STF can be installed in the left and right (3VA6 only) accessories compartment. They are therefore suitable for combining different auxiliary releases in one switch.

The following rated voltage is available:

- 24 to 600 V AC 50/60 Hz

Due to their design, their power consumption ranges up to maximum 750 VA and is therefore higher than the power consumption of STL versions.

4.2.5.3 Undervoltage Release (UVR)



Undervoltage releases trip the molded case circuit breaker in the event that the rated voltage fails or drops to between 70% and 35% of its normal value (in compliance with the relevant standard).

The main contacts of the breaker cannot be closed until the voltage applied to the UVR reaches 85% of its rated value.

The units are available with rated voltages in the following range:

- 24 to 480 V AC 50/60 Hz
- 12 to 250 V DC

4.2.5.4 Universal Release (UNI)



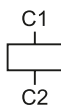
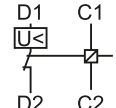
A universal release is a single, 21 mm wide component in which a shunt trip and an undervoltage release are combined. These are subject to the same tripping conditions as the individual devices. A single component with minimal footprint can therefore perform both functions.

4.2 Internal accessories

The three available rated voltages are identical in each case for both the shunt trip and the undervoltage release. These rated voltages are:

- 12 V DC
- 24 V DC
- 48 V DC

4.2.5.5 Technical specifications of auxiliary releases

Technical specifications Auxiliary releases				STL	STF	UVR	UNI	
Width				mm				
Graphic symbol				21				
								
Wire range		Screw connection (per contact)	Number x mm²	1 x (0.5 mm² - 1.5 mm²)				
		Screw connection (per contact)	Number x AWG	1 x (AWG20 - AWG16)				
		Screw connection (per contact)	Number x mm²	1 x (0.5 mm² - 1.0 mm²)				
		Screw connection (per contact)	Number x AWG	1 x (AWG20 - AWG16)				
	Tightening torque (connecting cables)		lb-in Nm	3.54 ^{+0.88} 0.4 ^{+0.1}				
	Stripped length		inch mm	0.39 10				
Rated insulation voltage		I _i	V AC	690 Overvoltage category III Pollution degree 3				
Power consumption U _e	12 - 30	V DC	W	7.0 - 50	—		< 2.5	
	48 - 60	V DC	W	20.0 - 30	—		< 2.5	
	110 - 127	V DC	W	30.0 - 40	—		< 2.5	
	220 - 250	V DC	W	28.0 - 35.0	—		< 2.5	
	24	V AC 50/60 Hz	VA	20	—		< 2.0	
	48 - 60	V AC 50/60 Hz	VA	20.0 - 30	—		< 2.0	
	110 - 127	V AC 50/60 Hz	VA	30.0 - 40	—		< 2.0	
	208 - 277	V AC 50/60 Hz	VA	16.0 - 35	—		See table below	
	380 - 600	V AC 50/60 Hz	VA	10.0 - 30	—		See table below	
	24	V AC 50/60 Hz	VA	—	300			
	48 - 60	V AC 50/60 Hz	VA	—	340 - 600			
	110 - 127	V AC 50/60 Hz	VA	—	500 - 650			
	208 - 277	V AC 50/60 Hz	VA	—	360 - 650			
	380 - 500	V AC 50/60 Hz	VA	—	330 - 600			
	600	V AC 50/60 Hz	VA	—	300			

Technical specifications of auxiliary releases				STL	STF	UVR	UNI
							
Power consumption U _e	12	V DC	W			<2.5	
	24	V DC	W			<2.5	
	48	V DC	W			<2.5	
	60	V DC	W			<2.5	
	125 - 127	V DC	W			<2.5	
	220 - 230	V DC	W			<2.5	
	250	V DC	W			<2.5	
	24	V AC 50/60 Hz	VA			<2.0	
	48	V AC 50/60 Hz	VA			<2.0	
	60	V AC 50/60 Hz	VA			<2.0	
	110	V AC 50/60 Hz	VA			<2.0	
	120 - 127	V AC 50/60 Hz	VA			<2.0	
	208 - 230	V AC 50/60 Hz	VA			<2.0	
	380 - 400	V AC 50/60 Hz	VA			<2.5	
	440 - 480	V AC 50/60 Hz	VA			<2.5	
	12	V DC (Cat II; PELV/SELV)	W				UVR: <2.5 SHT: 20
	24	V DC (Cat II; PELV/SELV)	W				UVR: <2.5 SHT: 20
	48	V DC (Cat II; PELV/SELV)	W				UVR: <2.5 SHT: 20
Back-up fuse	DIAZED fuse link 500 V for cable and line protection gG, size DII, E27		A			10 A (greater than or equal to 230 V)	
Rated impulse withstand voltage		U _{imp}	kV	6		4	0.5
Making current		I max	with V	1.5 A / 24 V AC	18 A / 24 V AC	5 mA / 480 V	1.5 A / 24 V AC
Maximum tripping time			ms	<10		DC: <10 AC: <25	<10
Endurance		Electronic tripping operations	8500				
		Mechanical switching cycles of the circuit breaker	25000				
Takes precedence over other control signals				Yes			

4.2 Internal accessories

Technical specifications of auxiliary releases				STL	STF	UVR	UNI
Degree of protection		Lid of accessories compartment closed		IP40			
		Lid of accessories compartment open		IP20			
Minimum signal duration			ms	40	40		40
Response voltage of shunt trip: Pickup (circuit breaker is tripped)		Us/V	%	70 ... 110			70 ... 110
Response voltage Undervoltage release:	Pickup (circuit breaker can be closed)	Us/V	%			85 ... 110	
	Release (circuit breaker is tripped)	Us/V	%			35 ... 70	
Tripping frequency		Trips per hour		Unlimited	120	Unlimited	
Can be used for electrical interlocking of MCCBs				No	No	Yes	

4.2.6 Time-delay devices for undervoltage releases

Undervoltage releases can also be equipped with external, electronic time-delay devices which prevent unintentional tripping in response to brief voltage dips during periods of disrupted operation.

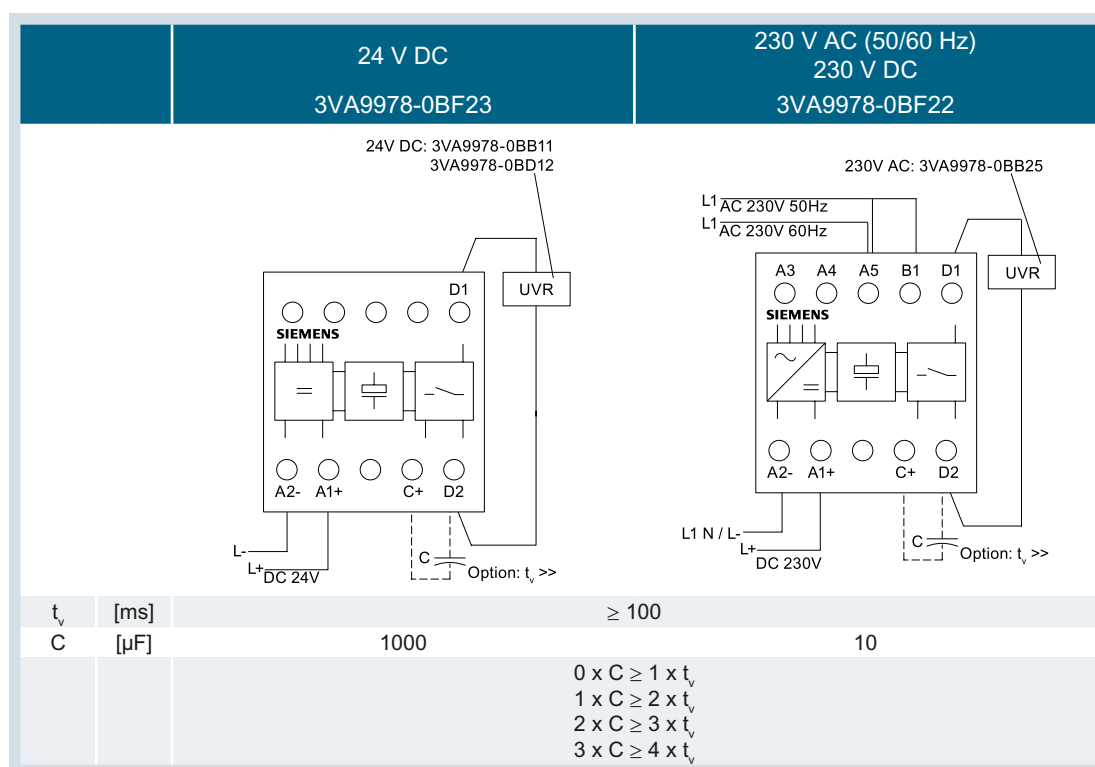
Time-delay device for UVR with fixed delay setting



The simple time-delay device with fixed delay setting is available for the following voltages:

- 230 V AC and 230 V DC
- 24 V DC

The default delay time is >100 ms, as supplied, but can be extended by the customer with the addition of customer-supplied supplementary capacitors:



As an alternative to screw fixing, the device can also be mounted on a 35 mm DIN rail.

You can find a circuit diagram for the time-delay device in chapter Circuit diagrams (Page 493) or in the operating instructions.

4.2.7 COM060 communication module

You can find information about the COM060 communication module in chapter Communication and system integration (Page 419).

4.2.8 24 V module



With the aid of the 24 volt module, the ETU electronic trip unit of the 3VA6 molded case circuit breakers can be permanently activated.

The module is installed in the right-hand accessory compartment and has 4 slots.

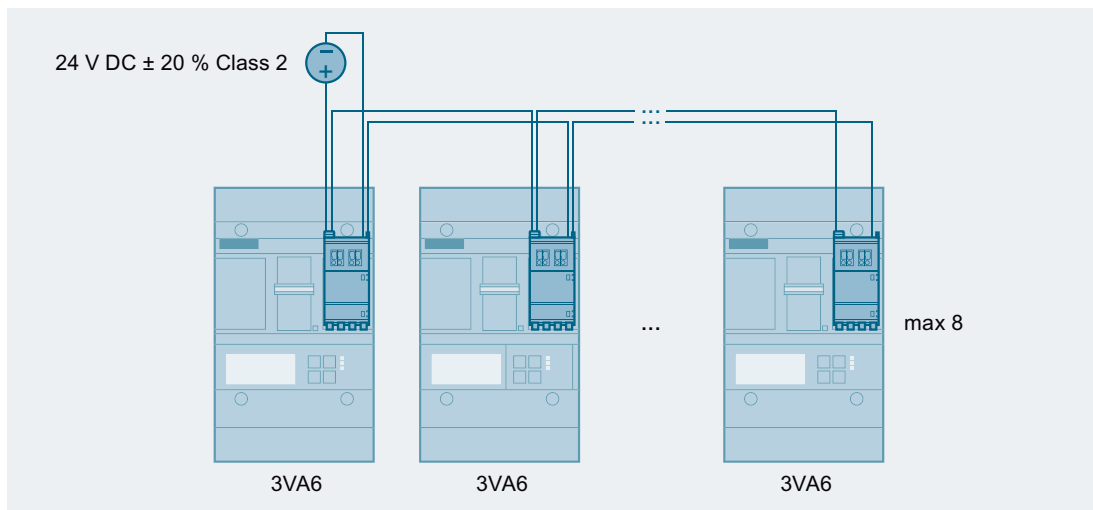
The following advantages arise from the use of the 24 V module:

- Activated display even when the circuit breaker is switched off or no current is flowing through the main circuit.
- Backlighting permanently activated

4.3 Connection system

- Through activation of the ETUs, it is possible to test and change setting parameters (ETUs 5-series and 8-series)
- Faster tripping of the 3VA6 molded case circuit breaker on connecting to a short-circuit by an already active ETU.

There are two connection points available for ground and 24 V DC so that looping through of the voltage can be done very easily.



Mechanical design		
Width	inch	1.13
	mm	28.8
Height	inch	2.53
	mm	64.1
Depth	inch	1.32
	mm	33.5
Number of slots		4
Net weight	g	80
General technical specifications		
Pollution degree		3
Overvoltage category		1

4.3 Connection system

4.3.1 Introduction

The chapter "Connection technology" contains useful information and provides an overview of the 3VA UL connection technology. It provides a helpful guide to connecting cables or busbars to a molded case circuit breaker and so helps to ensure the safety of personnel and material assets. Mistakes which affect the operational safety of electrical installations can be avoided.

Contents

The chapter discusses the following topics:

- General information about cables and busbars
- 3VA UL molded case circuit breakers with
 - Front cable connection
 - Front busbar connector / compression lug connection
 - Rear busbar connector / compression lug connection
- Further connection accessories

Note

UL connectors

3VA UL connectors are not UL Listed for use with fine-stranded or sector-shaped conductors.

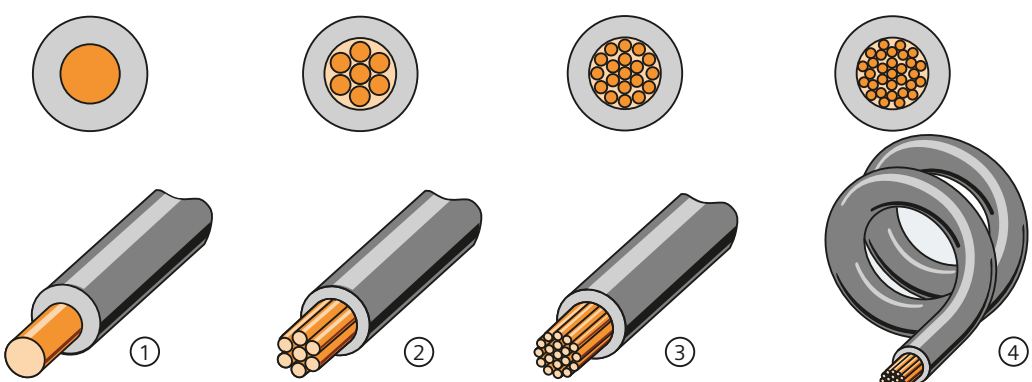
4.3.2 General information about cables and busbars

Cables and busbars: Cables

Cable designation and cable classes

A key design feature of a cable is its flexibility. This is primarily determined by the number of cores inside the cable.

Cable classes according to UL 486 and IEC 60228:



① Cable with solid wire in core

② Cable with stranded wires in core

③ Cable with stranded wires in core

④ Cable with a large number of extra finely stranded conductors

UL 486	IEC 60228
Solid	Class 1
Class B / C	Class 2
	Class 5
Class K	Class 6

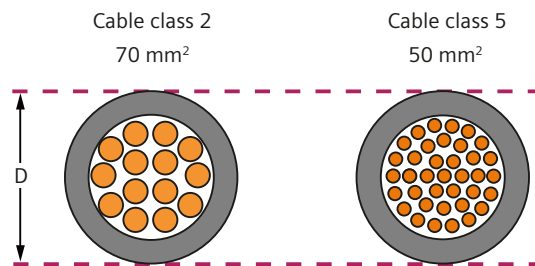
4.3 Connection system

The conductors of class 1 / solid and class 2 / B refer to rigid conductors, solid and stranded. These are used predominantly in applications with low-curvature cable bending radii and in fixed or inflexible installations.

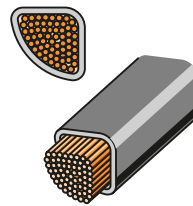
Flexible conductors of class 5 / C and class 6 permit higher-curvature cable bending radii.

Solid cables of class 1 / solid are normally used only up to a cross-section of 16 mm² (IEC) / AWG 10 (UL).

Please note: Solid-conductor cables in classes 1 / solid and 2 / B are smaller in diameter than cables in classes 5 / C and 6 even when their cross-sectional area is the same. As a result, cables with the same diameter from different classes may have different conductor cross-sections.



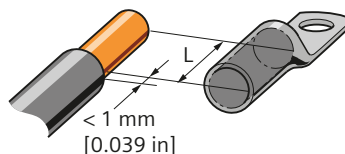
Solid and stranded sector-shaped conductors are also used. Round crimping of sector-shaped conductors is required.



Cable lugs

For stable and reliable connecting of cables to molded case circuit breakers, cable lugs are also used. These elements help to make solid connections at the breaker.

Insulation is first stripped from the end of the cable (by amount of length L) before the cable lug is attached to the cable.



The cable must be stripped carefully to ensure that the correct amount of insulating material is removed. In this way, a reliable connection of the cable to the cable lug is ensured. A total of 1 mm more insulation can be stripped than is specified by length L.

Cable lugs compliant with DIN 46235 have ideal heat transfer characteristics for connecting busbar connectors. By contrast, "Tubular lugs with narrow palm for switching devices" (designation "SG" for example) must be used to make direct cable connections in the termination area of the molded case circuit breaker. These cable lugs vary in design depending on make. All cable lugs of this kind with the dimensions stipulated in standard IEC 609437-1, Annex P are generally suitable.

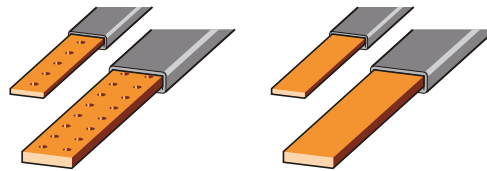
Cables and busbars: Busbars

In addition to cables, the busbar is also widely used in electrical connections, especially in control cabinets.

Some of the reasons for using busbars include:

- High-curvature bending radii which are unsuitable for cables of large cross-section
- Lack of space
- Heat dissipation, air circulation
- ...

Rigid busbars are used in the examples of applications listed above.



Rigid busbars are made of copper or aluminum. Pre-punched aluminum busbars, some of which are threaded, are often used.

Cables and busbars: Aluminum conductor

Please note the following if aluminum conductors are used:

An oxide layer with a high contact resistance is formed on the surface of aluminum within a short time. If an aluminum cable of this type is connected, the clamping point often heats up to an impermissibly high level. Depending on the magnitudes of the current and voltage conducted across the clamping point, this may result in a fire. For this reason, the oxide layer on the cable must be removed prior to connection and any renewed oxidation prevented by greasing the cable with technical Vaseline. According to the electrochemical series of metals, aluminum is a relatively non-precious metal and requires that no tool residues remain on the cable following removal of the oxide layer which could in turn increase the contact resistances as the result of electrochemical corrosion. In practice, the oxide layer is therefore scraped off using a commercially available electric knife. Unlike copper, aluminum also tends to flow much more readily in the clamped state. This can cause the clamping point to loosen, thereby increasing the contact resistances. For this reason, the clamping point must be retightened before commissioning the system and again after 100 to 200 operating hours.

4.3 Connection system

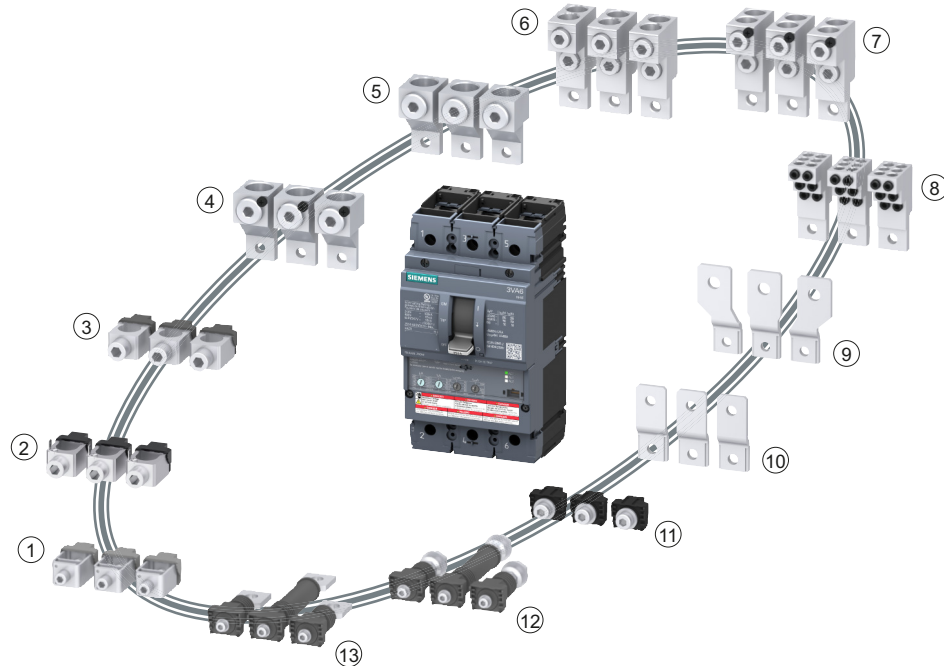
Finally, it should be mentioned that the clamp used must be approved by the manufacturer for aluminum conductors.

4.3.3 Connection portfolio for 3VA UL molded case circuit breakers

4.3.3.1 General overview

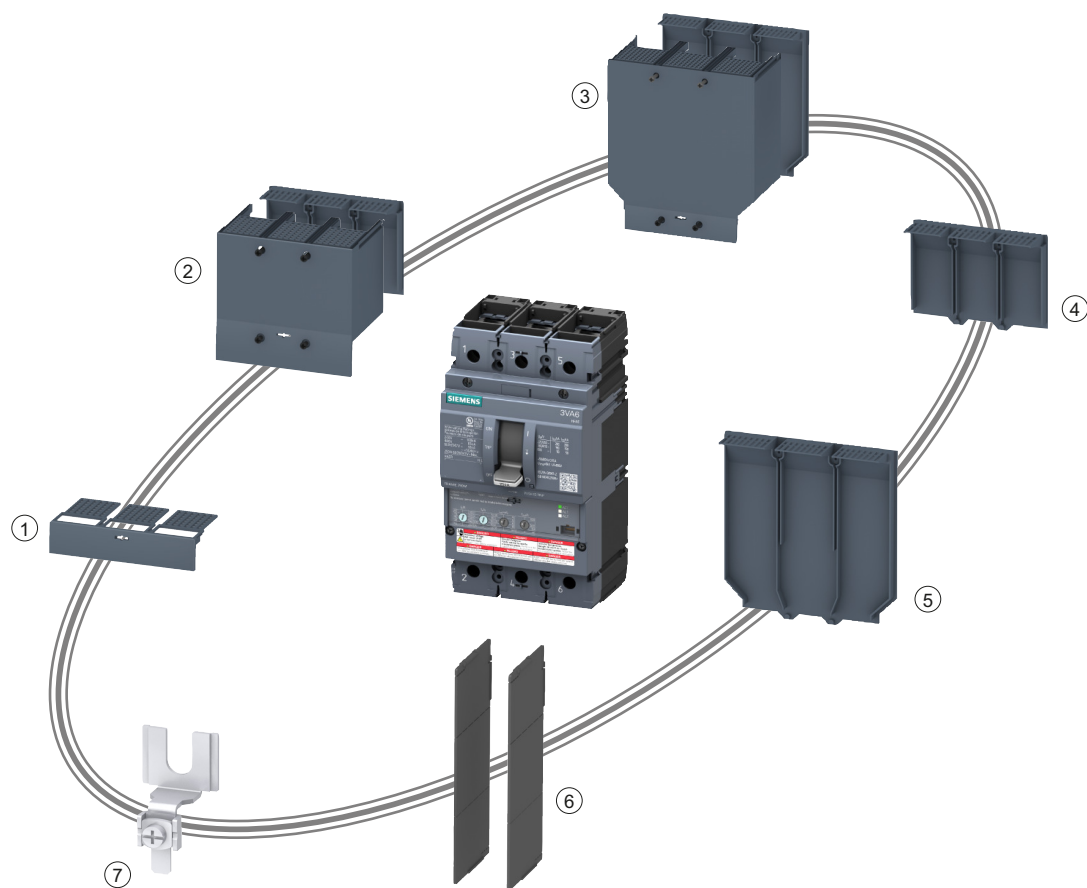
The connection technology of the 3VA UL molded case circuit breakers provides a straightforward and convenient way to commission the molded case circuit breakers in compliance with all installation requirements.

To meet this objective, an extensive portfolio of connection components is available.



- ① Box terminal
 - ② Internal wire connector with auxiliary conductor connection
 - ③ Internal wire connector
 - ④ External wire connector, large, with auxiliary conductor connection
 - ⑤ External wire connector, large
 - ⑥ External wire connector with 2 to 4 cables
 - ⑦ External wire connector with 2 to 4 cables, with control wire tap
 - ⑧ External distribution wire connector with 6 cables
 - ⑨ Front bus connectors broadened ¹⁾
 - ⑩ Front bus connectors extended
 - ⑪ Nut keeper kit
 - ⑫ Rear connection stud round
 - ⑬ Rear connection stud flat
- ¹⁾ Only available for 3VA63 and 3VA64

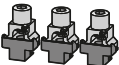
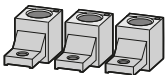
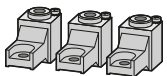
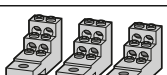
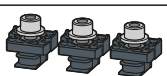
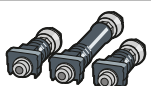
The connection technology accessories (see chapter Further connection accessories (Page 267)) also provide the option of insulating the termination area of the 3VA UL molded case circuit breaker and protecting it from accidental contact. An auxiliary conductor connection can be implemented quickly using accessory components which are available separately.



- ① Terminal cover
 - ② Terminal cover extended
 - ③ Terminal cover offset ¹⁾
 - ④ Insulating plate
 - ⑤ Rear insulating plate offset ¹⁾
 - ⑥ Phase barriers
 - ⑦ Control wire tap for busbars
- ¹⁾ Only available for 3VA63 and 3VA64

The table below lists all the main conductor connection systems available for 3VA UL molded case circuit breakers and also indicates which type of cables or busbars are compatible with each connection system. A basic distinction is made between front and rear connections. The illustration in the table shows the 3-piece pack for the 3-pole molded case circuit breaker. All connection systems are also available in 4-piece packs for 4-pole molded case circuit breakers.

Connection technology		Cables and busbars		
Front terminals	Illustration			
Box terminal for copper cable		✓		
Wire connector ¹⁾		✓		

Connection technology		Cables and busbars		
Wire connector with auxiliary conductor connection ¹⁾		✓		
Wire connector, large		✓		
Wire connector, large, with auxiliary conductor connection		✓		
Wire connector for 2/3/4 cables ¹⁾		✓		
Wire connector for 2/3/4 cables, with auxiliary conductor connection ¹⁾		✓		
Wire connector, large, for 6 cables		✓		
Nut keeper kit			✓	✓
Front bus connectors extended			✓	✓
Front bus connectors broadened ²⁾			✓	✓
Rear connections				
Rear connection stud flat			✓	✓
Rear connection stud round			✓	✓

¹⁾ Copper terminal available

²⁾ Only available for 3VA63 and 3VA64

Note

Wire connectors are generally made of aluminum. For special wire connectors, there are copper versions.

Exact cross-section and torque information for these can be found in chapter Front cable connection (Page 223).

For designs and applications for 100% rated line protection, copper wire connectors without auxiliary conductor connection must be used.

4.3 Connection system

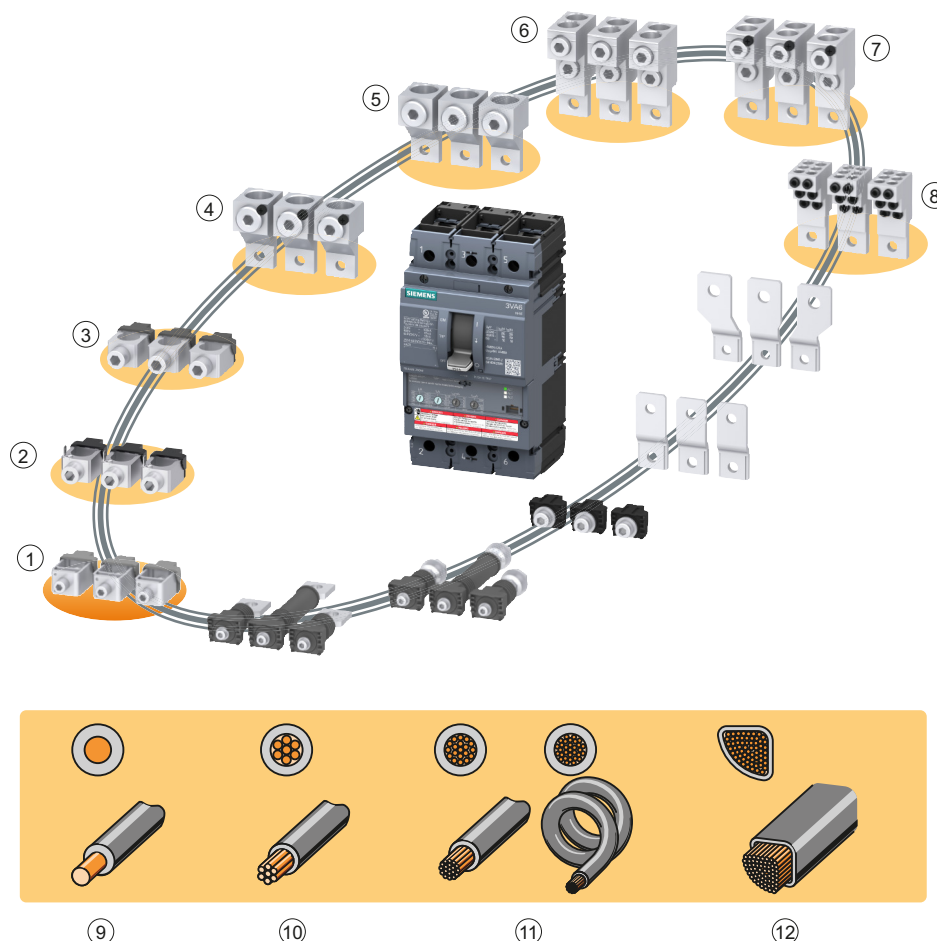
The entire portfolio of connection technology for the 3VA UL molded case circuit breakers can be used without modifications in the following applications:

- On all fixed-mounted versions of molded case circuit breaker
- On all molded case circuit breakers equipped with plug-in technology
- On all molded case circuit breakers equipped with withdrawable technology

The connection components described above are identical for fixed-mounted breakers, for plug-in and for withdrawable versions.

4.3.3.2 Front cable connection

The diagram below illustrates all the components available for implementing a direct cable connection at the molded case circuit breaker. The only exception is the box terminal as this can be used to connect busbars as well as cables.



Connection technology

- ① Box terminal
- ② Wire connector with auxiliary conductor connection
- ③ Wire connector
- ④ Wire connector, large, with auxiliary conductor connection
- ⑤ Wire connector, large
- ⑥ Wire connector, 2 cables
- ⑦ Wire connector, 2 cables, with control wire tap
- ⑧ Distribution wire connector, 6 cables

Cables and busbars

- ⑨ Solid conductor, class 1
- ⑩ Stranded conductor, class 2
- ⑪ Flexible conductors, classes 5 and 6
- ⑫ Sector-shaped conductor

4.3 Connection system

See also

Insulating equipment (Page 267)

Box terminal

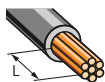


The tables below show all the types and sizes of cable and flexible busbar that can be connected to a box terminal.

3VA5/6 molded case circuit breakers:

Connection options for cable connection with cross-section specifications in AWG

Box terminal		TS1.1	TS1.2	TS1.4	TS1.5 ¹⁾
Article number	Without auxiliary conductor connection	3VA913.-0JA11	3VA923.-0JA11	3VA923.-0JA12	3VA947.-0JA13
	With auxiliary conductor connection	--	3VA923.-0JH11	3VA923.-0JH12	3VA947.-0JH13
Can be installed in		3VA51	3VA52	3VA52	3VA53 3VA54 (400A)
Article number	Without auxiliary conductor connection	--	3VA914.-0JA12	3VA924.-0JA12	3VA947.-0JA13
	With auxiliary conductor connection	--	3VA914.-0JH12	3VA924.-0JH12	3VA947.-0JH13
Can be installed in		--	3VA61 3VA62	3VA61 3VA62	3VA63 3VA64
Copper cable	Stranded (Class C)	1 x 14 AWG ... 3/0 AWG	1 x 10 AWG ... 3/0 AWG	1 x 4 AWG ... 350 kcmil	1 x 1/0 AWG ... 500 kcmil
	Stranded (Class B)	1 x 14 AWG ... 3/0 AWG	1 x 10 AWG ... 3/0 AWG	1 x 4 AWG ... 350 kcmil	1 x 1/0 AWG ... 500 kcmil
	Solid (Class A)	1 x 14 AWG ... 10 AWG	1 x 10 AWG	--	--
Aluminum cable		--	--	--	--
Stripped length of cable L		0.50 in	0.75 in	0.75 in	1.05 in



Box terminal		TS1.1	TS1.2	TS1.4	TS1.5 ¹⁾
Article number	Without auxiliary conductor connection	3VA913.-0JA11	3VA923.-0JA11	3VA923.-0JA12	3VA947.-0JA13
	With auxiliary conductor connection	--	3VA923.-0JH11	3VA923.-0JH12	3VA947.-0JH13
Can be installed in		3VA51	3VA52	3VA52	3VA53 3VA54 (400A)
Article number	Without auxiliary conductor connection	--	3VA914.-0JA12	3VA924.-0JA12	3VA947.-0JA13
	With auxiliary conductor connection	--	3VA914.-0JH12	3VA924.-0JH12	3VA947.-0JH13
Can be installed in		--	3VA61 3VA62	3VA61 3VA62	3VA63 3VA64
Tightening torque	Stranded (Class C)	≤ 6 AWG: 45 lb-in ≥ 4 AWG: 70 lb-in	≤ 4 AWG: 105 lb-in ≥ 3 AWG: 140 lb-in	≤ 1 AWG: 70 lb-in ≥ 1/0: 140 lb-in	≤ 4/0 AWG: 140 lb-in ≥ 250 kcmil: 248 lb-in
	Stranded (Class B)				
	Solid (Class A)				

¹⁾ Maximum current-carrying capacity 380 A

4.3 Connection system

Connection options for cable connection with cross-section specifications in mm²

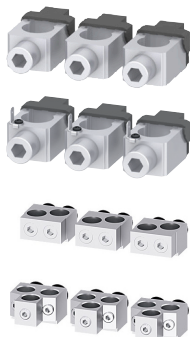
Box terminal		TS1.1	TS1.2	TS1.4	TS1.5 ¹⁾
Article number	Without auxiliary conductor connection	3VA913.-0JA11	3VA923.-0JA11	3VA923.-0JA12	3VA947.-0JA13
	With auxiliary conductor connection	--	3VA923.-0JH11	3VA923.-0JH12	3VA947.-0JH13
Can be installed in		3VA51	3VA52	3VA52	3VA53 3VA54 (400A)
Article number	Without auxiliary conductor connection	--	3VA914.-0JA12	3VA924.-0JA12	3VA947.-0JA13
	With auxiliary conductor connection	--	3VA914.-0JH12	3VA924.-0JH12	3VA947.-0JH13
Can be installed in		--	3VA61 3VA62	3VA61 3VA62	3VA63 3VA64
Copper cable	Finely stranded (Class 5/6)	1 x 1.5 ... 50 mm ²	1 x 10 ... 95 mm ²	1 x 35 ... 150 mm ²	1 x 35 ... 240 mm ²
	Finely stranded (Class 5/6) with end sleeve	1 x 1.5 ... 50 mm ²	1 x 6 ... 95 mm ²	1 x 25 ... 150 mm ²	1 x 35 ... 240 mm ²
	Stranded (Class 2)	1 x 1.5 ... 70 mm ²	1 x 6 ... 120 mm ²	1 x 25 ... 185 mm ²	1 x 35 ... 300 mm ²
	Solid (Class 1)	1 x 1.5 ... 16 mm ²	1 x 6 ... 16 mm ²	--	--
Aluminum cable		--	--	--	--
Stripped length of cable L		12 mm	19 mm	19 mm	26.5 mm
					
Tightening torque	Finely stranded (Class 5/6)	≤ 16 mm ² : 5 Nm ≥ 25 mm ² : 8 Nm	≤ 25 mm ² : 6 Nm ≥ 35 mm ² : 10 Nm	≤ 35 mm ² : 6 Nm ≥ 50 mm ² : 12 Nm	≤ 95 mm ² : 16 Nm ≥ 120 mm ² : 28 Nm
	Stranded (Class 2)				
	Solid (Class 1)				

¹⁾ Maximum current-carrying capacity 380 A

Box terminals can be ordered

- as a pack of 3
- as a pack of 4

Wire connector with and without auxiliary conductor connection



The wire connector is available under separate article numbers depending on whether it is ordered with or without an auxiliary conductor connection. With the exception of the hole for the auxiliary conductor connection, both wire connectors are technically identical, i.e. the same cable cross-sections can be connected to both variants. Both variants are available in aluminum and copper versions.

Note

A maximum current limit of 15 A applies to all auxiliary conductor connections for 3VA UL molded case circuit breakers. Auxiliary conductor overcurrent protection must be applied separately.

Suitable cable cross-sections: Cables up to a maximum AWG 14 / 2.5 mm² can be connected.

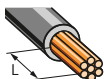
The wire connector is an internal component, i.e. it is contained within the external contour of the molded case circuit breaker. As a result, the size of cable cross-section which can be connected is limited by the geometry of the breaker's termination area.

The tables below show all the types and sizes of cable which can be connected to a wire connector.

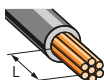
4.3 Connection system

3VA5/6 molded case circuit breakers:

Internal connection options for cable connection with cross-section specifications in AWG

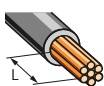
Internal aluminum wire connector, for 1 cable		TA1.0	TA1.1	TA1.3	TA1.4
Article number	Without auxiliary conductor connection	3VA913.-0JB10	3VA913.-0JB11	3VA923.-0JB11	3VA923.-0JB12
	With auxiliary conductor connection	3VA913.-0JG10	3VA913.-0JG11	3VA923.-0JG11	3VA923.-0JG12
Can be installed in		3VA51	3VA51	3VA52	3VA52
Article number	Without auxiliary conductor connection			3VA914.-0JB11	3VA924.-0JB12
	With auxiliary conductor connection			3VA914.-0JG11	3VA924.-0JG12
Can be installed in				3VA61 3VA62	3VA61 3VA62
Copper cable	Stranded (Class C)	1 x 14 AWG ... 8 AWG	1 x 8 AWG ... 3/0 AWG	1 x 14 AWG ... 1/0 AWG	1 x 6 AWG ... 350 kcmil
	Stranded (Class B)	1 x 14 AWG ... 8 AWG	1 x 8 AWG ... 3/0 AWG	1 x 14 AWG ... 1/0 AWG	1 x 6 AWG ... 350 kcmil
	Solid (Class A)	1 x 14 AWG ... 10 AWG	--	1 x 14 AWG ... 10 AWG	--
Aluminum cable	Stranded (Class B)	1 x 8 AWG	1 x 8 AWG ... 3/0 AWG	1 x 8 AWG ... 1/0 AWG	1 x 6 AWG ... 350 kcmil
	Solid (Class A)	--	--	--	--
Stripped length of cable L 		0.48 in	0.48 in	0.8 in	0.80 in
Tightening torque	Stranded (Class C)	14 AWG: 20 lb-in 12 - 10 AWG: 35 lb-in	8 AWG: 55 lb-in >8 AWG: 100 lb-in	≤8 AWG: 55 lb-in 6 AWG ... 2 AWG: 75 lb-in	≤2 AWG: 140 lb-in >2 AWG: 275 lb-in
	Stranded (Class B)	8 AWG: 55 lb-in		≥1 AWG: 120 lb-in	
	Solid (Class A)				

Internal connection options for cable connection with cross-section specifications in mm²

Internal aluminum wire connector, for 1 cable		TA1.0	TA1.1	TA1.3	TA1.4
Article number	Without auxiliary conductor connection	3VA913.-0JB10	3VA913.-0JB11	3VA923.-0JB11	3VA923.-0JB12
	With auxiliary conductor connection	3VA913.-0JG10	3VA913.-0JG11	3VA923.-0JG11	3VA923.-0JG12
Can be installed in		3VA51	3VA51	3VA52	3VA52
Article number	Without auxiliary conductor connection			3VA914.-0JB11	3VA924.-0JB12
	With auxiliary conductor connection			3VA914.-0JG11	3VA924.-0JG12
Can be installed in				3VA61 3VA62	3VA61 3VA62
Copper cable	Finely stranded (Class 5/6)	1 x 1.5 ... 10 mm ²	1 x 10 ... 35 mm ²	1 x 1.5 ... 35 mm ²	1 x 25 ... 150 mm ²
	Finely stranded (Class 5/6) with end sleeve	1 x 1.5 ... 10 mm ²	1 x 10 ... 35 mm ²	1 x 1.5 ... 35 mm ²	1 x 16 ... 120 mm ²
	Stranded (Class 2)	1 x 1.5 ... 10 mm ²	1 x 10 ... 95 mm ²	1 x 1.5 ... 50 mm ²	1 x 16 ... 185 mm ²
	Solid (Class 1)	1 x 1.5 ... 10 mm ²	1 x 10 ... 16 mm ²	1 x 1.5 ... 16 mm ²	1 x 16 mm ²
Aluminum cable	Stranded (Class 2)	--	1 x 10 ... 95 mm ²	--	1 x 16 ... 185 mm ²
	Solid (Class 1)	--	--	--	--
Stripped length of cable L 		12.2 mm	12.2 mm	18 mm	20 mm
Tightening torque	Finely stranded (Class 5/6)	1.5 ... 2.5 mm ² : 2.3 Nm 4 - 6 mm ² : 4 Nm 10 mm ² : 6.2 Nm	10 mm ² : 6.2 Nm >10 mm ² : 11.3 Nm	≤10 mm ² : 6.2 Nm 16 - 35 mm ² : 8.5 Nm 50 mm ² : 13.6 Nm	≤35 mm ² : 15.8 Nm ≥50 mm ² : 31.1 Nm
	Stranded (Class 2)				
	Solid (Class 1)				

4.3 Connection system

Internal connection options for cable connection with cross-section specifications in AWG

Internal aluminum wire connector, for 1/2/3 cables		TA1.5 ¹⁾	TA3.1	TA3.2	
Article number	Without auxiliary conductor connection	3VA937.-0JB13	3VA957.-0JB23	3VA967.-0JB32	
	With auxiliary conductor connection	3VA937.-0JG13	3VA957.-0JG23	3VA967.-0JG32	
Can be installed in		3VA53 3VA54	3VA55	3VA55	
Article number	Without auxiliary conductor connection	3VA937.-0JB13	3VA957.-0JB23	3VA967.-0JB32	
	With auxiliary conductor connection	3VA937.-0JG13	3VA957.-0JG23	3VA967.-0JG32	
Can be installed in		3VA63 3VA64	3VA65	3VA65 3VA66	
Copper cable	Stranded (Class C)	1 x 1 AWG ... 600 kcmil	2 x 4/0 AWG ... 600 kcmil	3 x 4/0 AWG ... 400 kcmil	
	Stranded (Class B)	1 x 1 AWG ... 600 kcmil	2 x 4/0 AWG ... 600 kcmil	3 x 4/0 AWG ... 400 kcmil	
	Solid (Class A)	--	--	--	
Aluminum cable	Stranded (Class B)	1 x 1 AWG ... 600 kcmil	2 x 4/0 AWG ... 600 kcmil	3 x 4/0 AWG ... 400 kcmil	
	Solid (Class A)	--	--	--	
Stripped length of cable L 		1.10 in	1.02 in	1.02 in	
Tightening torque	Stranded (Class C)	375 lb-in	375 lb-in	225 lb-in	
	Stranded (Class B)				
	Solid (Class A)				

¹⁾ Maximum current-carrying capacity with copper cable 380 A; with aluminum cable 310 A.

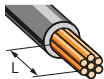
Internal connection options for cable connection with cross-section specifications in mm²

Internal aluminum wire connector, for 1/2/3 cables		TA1.5 ¹⁾	TA3.1	TA3.2	
Article number	Without auxiliary conductor connection	3VA937.-0JB13	3VA957.-0JB23	3VA967.-0JB32	
	With auxiliary conductor connection	3VA938.-0JG13	3VA957.-0JG23	3VA967.-0JG32	
Can be installed in		3VA53 3VA54	3VA55	3VA55	
Article number	Without auxiliary conductor connection	3VA937.-0JB13	3VA957.-0JB23	3VA967.-0JB32	
	With auxiliary conductor connection	3VA937.-0JG13	3VA957.-0JG23	3VA967.-0JG32	
Can be installed in		3VA63 3VA64	3VA65 3VA66	3VA65 3VA66	
Copper cable	Finely stranded (Class 5/6)	1 x 50 ... 240 mm ²	2 x 185 mm ²	--	
	Finely stranded (Class 5/6) with end sleeve	1 x 50 ... 185 mm ²	2 x 120 ... 185 mm ²	3 x 120 mm ²	
	Stranded (Class 2)	1 x 50 ... 300 mm ²	2 x 120 ... 300 mm ²	3 x 120 ... 185 mm ²	
	Solid (Class 1)	--	--	--	
Aluminum cable	Stranded (Class 2)	1 x 50 ... 300 mm ²	2 x 120 ... 300 mm ²	3 x 120 ... 185 mm ²	
	Solid (Class 1)	--	--	--	
Stripped length of cable L		28 mm	26 mm	26 mm	
Tightening torque	Finely stranded (Class 5/6)	42.4 Nm	42.4 Nm	25.4 Nm	
	Solid (Class 1)				

¹⁾ Maximum current-carrying capacity with copper cable 380 A; with aluminum cable 310 A.

4.3 Connection system

Internal connection options for cable connection with cross-section specifications in AWG

Internal copper wire connector, for 1 cable		TC1.0	TC1.1	TC1.3	TC1.4
Article number	Without auxiliary conductor connection	3VA913.-0JD10	3VA913.-0JD11	3VA923.-0JD11	3VA923.-0JD12
	With auxiliary conductor connection	3VA913.-0JK10	3VA913.-0JK11	3VA923.-0JK11	3VA923.-0JK12
Can be installed in		3VA51	3VA51	3VA52	3VA52
Article number	Without auxiliary conductor connection			3VA914.-0JD11	3VA924.-0JD12
	With auxiliary conductor connection			3VA914.-0JK11	3VA924.-0JK12
Can be installed in				3VA61 3VA62	3VA61 3VA62
Copper cable	Stranded (Class C)	1 x 14 AWG ... 8 AWG	1 x 14 AWG ... 2/0 AWG	1 x 14 AWG ... 1/0 AWG	1 x 6 AWG ... 350 kcmil
	Stranded (Class B)	1 x 14 AWG ... 8 AWG	1 x 14 AWG ... 2/0 AWG	1 x 14 AWG ... 1/0 AWG	1 x 6 AWG ... 350 kcmil
	Solid (Class A)	1 x 14 AWG ... 10 AWG	1 x 14 AWG ... 10 AWG	1 x 14 AWG ... 10 AWG	--
Stripped length of cable L 		0.48 in	0.48 in	0.70 in	0.80 in
Tightening torque	Stranded (Class C)	14 AWG: 20 lb-in 12 - 10 AWG: 35 lb-in 8 AWG: 55 lb-in	14 AWG: 25 lb-in 12 AWG: 35 lb-in ≥10 AWG: 55 lb-in	≤8 AWG: 55 lb-in 6 - 2 AWG: 75 lb-in >2 AWG: 120 lb-in	≤2 AWG: 140 lb-in >2 AWG: 275 lb-in
	Stranded (Class B)				
	Solid (Class A)				

Internal connection options for cable connection with cross-section specifications in AWG

Internal copper wire connector, for 1 cable		TC1.5	TC3.2		
Article number	Without auxiliary conductor connection	3VA937.-0JD13	--		
	With auxiliary conductor con- nection	3VA937.-0JK13	3VA967.-0JK32		
Can be installed in		3VA53 3VA54	3VA55		
Article number	Without auxili- ary conductor connection	3VA937.-0JD13	--		
	With auxiliary conductor con- nection	3VA937.-0JK13	3VA967.-0JK32		
Can be installed in		3VA63 3VA64	3VA65 3VA66		
Copper cable	Stranded (Class C)	1 x 1 AWG ... 600 kcmil	3 x 250 AWG ... 400 kcmil		
	Stranded (Class B)	1 x 1 AWG ... 600 kcmil	3 x 250 AWG ... 400 kcmil		
	Solid (Class A)	--	--		
Stripped length of cable L 		1.10 in	1.02 in		
Tightening tor- que	Stranded (Class C)	500 lb-in	225 lb-in		
	Stranded (Class B)				
	Solid (Class A)				

Wire connector with and without auxiliary conductor connection can be ordered:

- as a pack of 3
- as a pack of 4

External wire connector for 1 cable, with and without auxiliary conductor connection

The wire connector, large, is available under separate article numbers depending on whether it is ordered with or without an auxiliary conductor connection. With the exception of the hole for the auxiliary conductor connection, both wire connectors are technically identical, i.e. the same cable cross-sections can be connected to both variants.



Note

A maximum current limit of 15 A applies to all auxiliary conductor connections for 3VA UL molded case circuit breakers. Auxiliary conductor overcurrent protection must be applied separately.

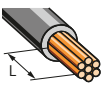
Suitable cable cross-sections: Cables up to a maximum of AWG 14 / 2.5 mm² can be connected.

The wire connector, large is an external terminal, i.e. it projects beyond the external contour of the breaker's termination area. This means that cables with a larger cross-section can be connected.

The extended terminal cover plus the required assembly materials are supplied as standard with all wire connectors, large. This is used for insulation and provides degree of protection IP4x at the front of the molded case circuit breaker and degree of protection IP2x at the infeed side and load side (see chapter Insulating equipment (Page 267)).

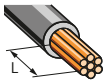
The table below shows all the types and sizes of cable which can be connected to a wire connector, large.

External connection options for cable connection with cross-section specifications in AWG

External aluminum wire connector, for 1 cable		TA2.1	TA2.2	
Article number	Without auxiliary conductor connection	3VA913.-0JJ12	3VA923.-0JJ13	
	With auxiliary conductor connection	3VA913.-0JC12	3VA923.-0JC13	
Can be installed in		3VA51	3VA52	
Article number	Without auxiliary conductor connection		3VA924.-0JJ13	
	With auxiliary conductor connection		3VA924.-0JC13	
Can be installed in		--	3VA61 3VA62	
Copper cable	Stranded (Class C)	1 x 4 AWG ... 300 kcmil	1 x 2 AWG ... 350 kcmil	
	Stranded (Class B)	1 x 4 AWG ... 300 kcmil	1 x 2 AWG ... 350 kcmil	
	Solid (Class A)	--	--	
Aluminum cable	Stranded (Class B)	1 x 4 AWG ... 300 kcmil	1 x 2 AWG ... 350 kcmil	
	Solid (Class A)	--	--	
Stripped length of cable L 		1.20 in	1.20 in	
Tightening torque		252 lb-in	275 lb-in	

4.3 Connection system

External connection options for cable connection with cross-section specifications in mm²

External aluminum wire connector, for 1 cable		TA2.1	TA2.2	
Article number	Without auxiliary conductor connection	3VA913.-0JJ12	3VA923.-0JJ13	
	With auxiliary conductor connection	3VA913.-0JC12	3VA923.-0JC13	
Can be installed in		3VA51	3VA52	
Article number	Without auxiliary conductor connection		3VA924.-0JJ13	
	With auxiliary conductor connection		3VA924.-0JC13	
Can be installed in		--	3VA61 3VA62	
Copper cable	Finely stranded (Class 5/6)	1 x 25 ... 120 mm ²	1 x 50 ... 185 mm ²	
	Finely stranded (Class 5/6) with end sleeve	1 x 25 ... 95 mm ²	1 x 50 ... 185 mm ²	
	Stranded (Class 2)	1 x 25 ... 150 mm ²	1 x 50 ... 240 mm ²	
	Solid (Class 1)	--	--	
Aluminum cable	Stranded (Class 2)	1 x 25 ... 150 mm ²	1 x 50 ... 240 mm ²	
	Solid (Class 1)	--	--	
Stripped length of cable L 		30.5 mm	30.5 mm	
Tightening torque		28.5 Nm	31.1 Nm	

Wire connector, large with or without auxiliary conductor connection can be ordered:

- as a pack of 3
- as a pack of 4

External wire connector for 2 cables, with and without auxiliary conductor connection



The wire connector, 2 cables, is available under separate article numbers depending on whether it is ordered with or without an auxiliary conductor connection. With the exception of the hole for the auxiliary conductor connection, both wire connectors are technically identical, i.e. the same cable cross-sections can be connected to both variants. Both variants are available in aluminum and copper versions.

Note

A maximum current limit of 15 A applies to all auxiliary conductor connections for 3VA UL molded case circuit breakers. Auxiliary conductor overcurrent protection must be applied separately.

Suitable cable cross-sections: Cables up to a maximum of AWG 14 / 2.5 mm² can be connected.

The wire connector, 2 cables is an external terminal, i.e. it projects beyond the external contour of the breaker's termination area. The 2-cable capacity of the terminal allows cables with large cross sectional area to be connected.

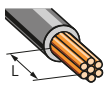
The extended terminal cover plus the required assembly materials are supplied as standard with all wire connectors, 2 cables. This is used for insulation and provides degree of protection IP4x at the front of the molded case circuit breaker and degree of protection IP2x at the infeed side and load side (see chapter Insulating equipment (Page 267)).

The following tables show all the possible cable connections of the wire connector, 2 cables.

External connection options for cable connection with cross-section specifications in AWG

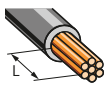
External aluminum wire connector, for 2 cables		TA2.3	TA2.3	TA2.4
Article number	Without auxiliary conductor connection	3VA923.-0JJ22	3VA924.-0JJ22	3VA947.-0JJ23
	With auxiliary conductor connection	3VA923.-0JC22	3VA924.-0JC22	3VA947.-0JC23
Can be installed in		3VA52	--	3VA53 3VA54
		--	3VA61 3VA62	3VA63 3VA64
Copper cable	Stranded (Class C)	2 x 4 AWG ... 300 kcmil	2 x 4 AWG ... 300 kcmil	2 x 2/0 AWG ... 600 kcmil
	Stranded (Class B)	2 x 4 AWG ... 300 kcmil	2 x 4 AWG ... 300 kcmil	2 x 2/0 AWG ... 600 kcmil
	Solid (Class A)	--	--	--

4.3 Connection system

External aluminum wire connector, for 2 cables		TA2.3	TA2.3	TA2.4
Article number	Without auxiliary conductor connection	3VA923.-0JJ22	3VA924.-0JJ22	3VA947.-0JJ23
	With auxiliary conductor connection	3VA923.-0JC22	3VA924.-0JC22	3VA947.-0JC23
Can be installed in		3VA52	--	3VA53 3VA54
		--	3VA61 3VA62	3VA63 3VA64
Aluminum cable	Stranded (Class B)	2 x 4 AWG ... 300 kcmil	2 x 4 AWG ... 300 kcmil	2 x 2/0 AWG ... 600 kcmil
	Solid (Class A)	--	--	--
Stripped length of cable L 		1.00 in / 2.00 in	1.00 in / 2.00 in	1.20 in / 2.30 in
Tightening torque		275 lb-in	275 lb-in	450 lb-in

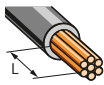
External connection options for cable connection with cross-section specifications in mm²

External aluminum wire connector, for 2 cables		TA2.3	TA2.3	TA2.4
Article number	Without auxiliary conductor connection	3VA923.-0JJ22	3VA924.-0JJ22	3VA947.-0JJ23
	With auxiliary conductor connection	3VA923.-0JC22	3VA924.-0JC22	3VA947.-0JC23
Can be installed in		3VA52	--	3VA53 3VA54
		--	3VA61 3VA62	3VA63 3VA64
Copper cable	Finely stranded (Class 5/6)	2 x 25 ... 150 mm ²	2 x 25 ... 150 mm ²	2 x 70 ... 240 mm ²
	Finely stranded (Class 5/6) with end sleeve	2 x 25 ... 70 mm ²	2 x 25 ... 70 mm ²	2 x 70 ... 185 mm ²
	Stranded (Class 2)	2 x 25 ... 150 mm ²	2 x 25 ... 150 mm ²	2 x 70 ... 300 mm ²
	Solid (Class 1)	--	--	--

External aluminum wire connector, for 2 cables		TA2.3	TA2.3	TA2.4
Article number	Without auxiliary conductor connection	3VA923.-0JJ22	3VA924.-0JJ22	3VA947.-0JJ23
	With auxiliary conductor connection	3VA923.-0JC22	3VA924.-0JC22	3VA947.-0JC23
Can be installed in		3VA52	--	3VA53 3VA54
		--	3VA61 3VA62	3VA63 3VA64
Aluminum cable	Stranded (Class 2)	2 x 25 ... 150 mm ²	2 x 25 ... 150 mm ²	2 x 70 ... 300 mm ²
	Solid (Class 1)	--	--	--
Stripped length of cable L		26 mm / 51 mm	26 mm / 51 mm	31 mm / 58.5 mm
				
Tightening torque		31.1 Nm	31.1 Nm	50.8 Nm

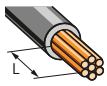
4.3 Connection system

External connection options for cable connection with cross-section specifications in AWG

External aluminum wire connector, for 2 cables		TA2.8	TA4.1	
Article number	Without auxiliary conductor connection	3VA937.-0JJ24	3VA967.-0JJ24	
	With auxiliary conductor connection	3VA937.-0JC24	3VA967.-0JC24	
Can be installed in		3VA53 3VA54 ¹⁾	3VA55	
		3VA63 3VA64 ¹⁾	3VA65 3VA66	
Copper cable	Stranded (Class C)	1 x 250 kcmil ... 750 kcmil 2 x 250 kcmil	2 x 400 kcmil ... 750 kcmil	
	Stranded (Class B)	1 x 250 kcmil ... 750 kcmil 2 x 250 kcmil	2 x 400 kcmil ... 750 kcmil	
	Solid (Class A)	--	--	
	Extra finely stranded (Class K)	--	2 x 500 kcmil	
Aluminum cable	Stranded (Class B)	1 x 250 kcmil ... 750 kcmil 2 x 250 kcmil	2 x 400 kcmil ... 750 kcmil	
	Solid (Class A)	--	--	
Stripped length of cable L 		1.50 in	1.12 in	
Tightening torque		410 lb-in Al (Class B): 375 lb-in	375 lb-in	

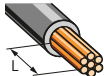
1) Limited to 400 A

External connection options for cable connection with cross-section specifications in mm²

External aluminum wire connector, for 2 cables		TA2.8	TA4.1	
Article number	Without auxiliary conductor connection	3VA937.-0JJ24	3VA967.-0JJ24	
	With auxiliary conductor connection	3VA937.-0JC24	3VA967.-0JC24	
Can be installed in		3VA53 3VA54	3VA55	
		3VA63 3VA64	3VA65 3VA66	
Copper cable	Finely stranded (Class 5/6)	--	--	
	Finely stranded (Class 5/6) with end sleeve	--	2 x 240 mm ²	
	Stranded (Class 2)	--	2 x 240 ... 300 mm ²	
	Solid (Class 1)	--	--	
Aluminum cable	Stranded (Class 2)	--	--	
	Solid (Class 1)	--	--	
Stripped length of cable L		38.1 mm	28.5 mm	
				
Tightening torque		--	42.2 Nm	

4.3 Connection system

External connection options for cable connection with cross-section specifications in AWG

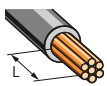
External copper wire connector, for 2/4 cables		TC2.4	TC4.3	TC6.2
Article number	Without auxiliary conductor connection	3VA947.-0JE23	--	3VA9773-0JE43
	With auxiliary conductor connection	3VA947.-0JL23	3VA967.-0JL43	--
Can be installed in		3VA53 3VA54	3VA55	3VA57
		3VA63 3VA64	3VA65 3VA66	3VA67
Copper cable	Stranded (Class C)	2 x 2/0 AWG ... 600 kcmil	4 x 4/0 AWG ... 500 kcmil	4x 1/0 AWG ... 500 kcmil
	Stranded (Class B)	2 x 2/0 AWG ... 600 kcmil	4 x 4/0 AWG ... 500 kcmil	4x 4x1/0 AWG ... 500 kcmil
	Solid (Class A)	--	--	--
Stripped length of cable L 		1.20 in / 2.30 in	0.91 in / 1.75 in	L1 1.0 in L2 1.0 in L3 2.0 in L4 2.0 in
Tightening torque		375 lb-in	325 lb-in	375 lb-in

Wire connector, 2 cables with or without auxiliary conductor connection can be ordered

- as a pack of 3
- as a pack of 4

Wire connector for 3/4 cables, with and without auxiliary conductor connection

Connection options for cable connection with cross-section specifications in AWG

Aluminum wire connector, 3 or 4 cables		TA4.2	TA4.3	TA4.4
Article number	Without auxiliary conductor connection	3VA967.-0JJ34	3VA967.-0JJ43	3VA967.-0JJ44
	With auxiliary conductor connection	3VA967.-0JC34	3VA967.-0JC43	3VA967.-0JC44
Can be installed in		3VA55	3VA55	3VA55
		3VA65	3VA65	3VA65
		3VA66	3VA66	3VA66
Copper cable	Stranded (Class C)	3 x 500 kcmil ... 750 kcmil	4 x AWG 4/0 ... 500kcmil	4 x AWG 4/0 ... 600kcmil
	Stranded (Class B)	3 x 500 kcmil ... 750 kcmil	4 x AWG 4/0 ... 500kcmil	4 x AWG 4/0 ... 600kcmil
	Solid (Class A)	--	--	--
	Extra finely stranded (Class K)	3 x 500 kcmil	--	--
Aluminum cable	Stranded (Class B)	3 x 500 kcmil ... 750 kcmil	4 x AWG 4/0 ... 500kcmil	4 x AWG 4/0 ... 600kcmil
	Solid (Class A)	--	--	--
Stripped length of cable L		1.13 in / 1.69 in / 2.30 in	0.91 in / 1.75 in	1.13 in / 2.21 in
				
Tightening torque		375 lb-in	325 lb-in	375 lb-in

4.3 Connection system

Connection options for cable connection with cross-section specifications in mm²

Aluminum wire connector, 3 or 4 cables		TA4.2	TA4.3	TA4.4
Article number	Without auxiliary conductor connection	3VA967.-0JJ34	3VA967.-0JJ43	3VA967.-0JJ44
	With auxiliary conductor connection	3VA967.-0JC34	3VA967.-0JC43	3VA967.-0JC44
Can be installed in		3VA55	3VA55	3VA55
		3VA65	3VA65	3VA65
		3VA66	3VA66	3VA66
Copper cable	Finely stranded (Class 5/6)	3 x 240 mm ²	4 x 185 mm ²	4 x 150 ... 185 mm ²
	Finely stranded (Class 5/6) with end sleeve	3 x 240 mm ²	4 x 120 ... 150 mm ²	4 x 150 ... 185 mm ²
	Stranded (Class 2)	3 x 240 ... 300 mm ²	4 x 120 ... 240 mm ²	4 x 120 ... 300 mm ²
	Solid (Class 1)	--	--	--
Aluminum cable	Stranded (Class 2)	3 x 240 ... 300 mm ²	--	4 x 120 ... 300 mm ²
	Solid (Class 1)	--	--	--
Stripped length of cable L 		28.7 mm / 42.9 mm / 58.4 mm	23.1 mm / 44.5 mm	28.7 mm / 56.1 mm
Tightening torque		42.4 Nm	36.76 Nm	42.4 Nm

Distribution wire connector, 6 cables



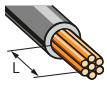
The distribution wire connector, 6 cables, is an external terminal that projects beyond the molded case circuit breaker contour of the termination area. It can hold up to 6 cables. One of the six holes in the terminal can be used to implement an auxiliary conductor connection.

For all distribution wire connectors, 6 cables, the extended terminal cover and the required installation materials are included in the scope of supply. This is used for insulation and provides degree of protection IP4x at the front of the molded case circuit breaker and degree of protection IP2x at the infeed side and load side (see chapter Insulating equipment (Page 267)).

The following table shows all the possible cable connections of the distribution wire connector, 6 cables.

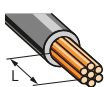
3VA5/6 molded case circuit breakers:

External connection options for cable connection with cross-section specifications in AWG

External aluminum distribution wire connector, for 6 cables		TA2.5	TA2.6	TA2.7
Article number	Without auxiliary conductor connection	3VA913.-0JF60	3VA923.-0JF60	3VA937.-0JF60
Can be installed in		3VA51	3VA52	3VA53 3VA54
Article number	Without auxiliary conductor connection		3VA924.-0JF60	3VA937.-0JF60
Can be installed in		--	3VA61 3VA62	3VA63 3VA64
Copper cable	Stranded (Class C)	6 x 14 AWG ... 2 AWG	6 x 14 AWG ... 2 AWG	6 x 14 AWG ... 2 AWG
	Stranded (Class B)	6 x 14 AWG ... 2 AWG	6 x 14 AWG ... 2 AWG	6 x 14 AWG ... 2 AWG
	Solid (Class A)	6 x 14 AWG ... 10 AWG	6 x 14 AWG ... 10 AWG	6 x 14 AWG ... 10 AWG
Aluminum cable	Stranded (Class B)	6 x 8 AWG ... 2 AWG	6 x 8 AWG ... 2 AWG	6 x 8 AWG ... 2 AWG
	Solid (Class A)	--	--	--
Stripped length of cable L 		0.47 in / 0.90 in / 1.55 in	0.53 in / 1.00 in / 1.50 in	0.7 in / 1.35 in
Tightening torque		≤8 AWG: 55 lb-in >8 AWG: 62 lb-in	≤8 AWG: 55 lb-in >8 AWG: 62 lb-in	≤8 AWG: 55 lb-in >8 AWG: 62 lb-in

4.3 Connection system

External connection options for cable connection with cross-section specifications in mm²

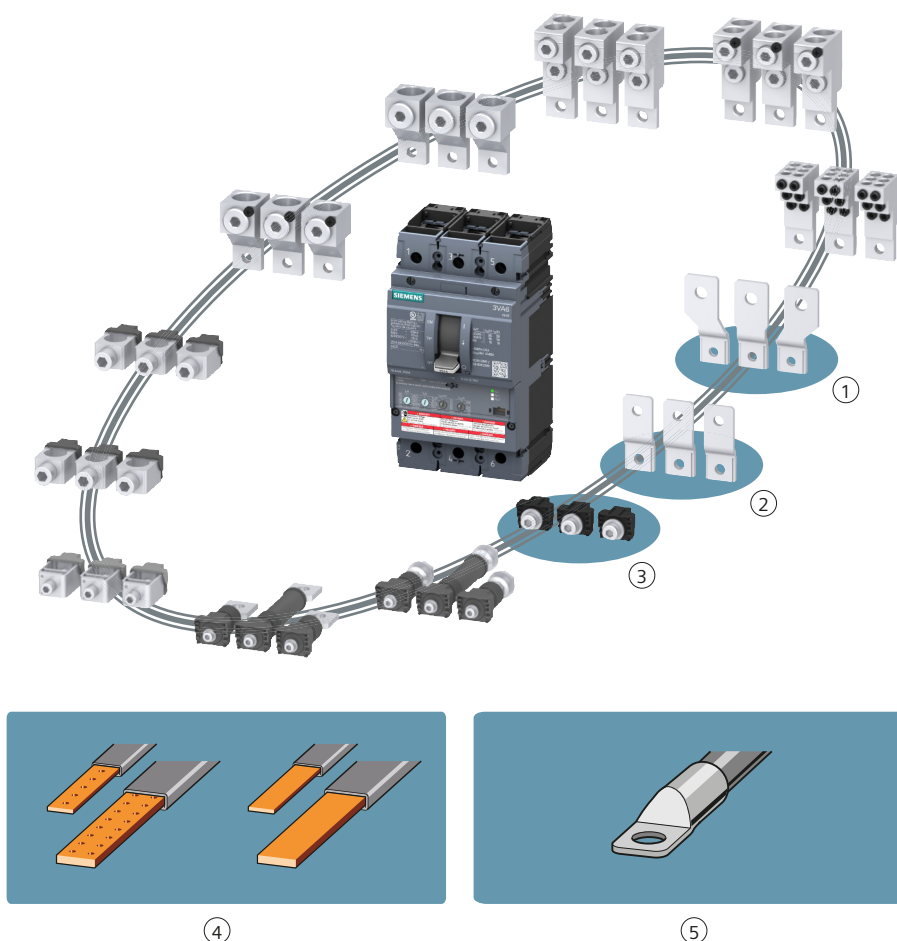
External aluminum distribution wire connector, for 6 cables		TA2.5	TA2.6	TA2.7
Article number	Without auxiliary conductor connection	3VA913.-0JF60	3VA923.-0JF60	3VA937.-0JF60
Can be installed in		3VA51	3VA52	3VA53 3VA54
Article number	Without auxiliary conductor connection		3VA924.-0JF60	3VA937.-0JF60
Can be installed in		--	3VA61 3VA62	3VA63 3VA64
Copper cable	Finely stranded (Class 5/6)	6 x 1.5 ... 25 mm ²	6 x 1.5 ... 25 mm ²	6 x 1.5 ... 25 mm ²
	Finely stranded (Class 5/6) with end sleeve	6 x 1.5 ... 25 mm ²	6 x 1.5 ... 25 mm ²	6 x 1.5 ... 25 mm ²
	Stranded (Class 2)	6 x 1.5 ... 35 mm ²	6 x 1.5 ... 35 mm ²	6 x 1.5 ... 35 mm ²
	Solid (Class 1)	6 x 1.5 ... 16 mm ²	6 x 1.5 ... 16 mm ²	6 x 1.5 ... 16 mm ²
Aluminum cable	Stranded (Class 2)	--	--	--
	Solid (Class 1)	--	--	--
Stripped length of cable L 		12 mm / 24 mm / 39.5 mm	13.5 mm / 26 mm / 38.5 mm	18 mm / 34.5 mm
Tightening torque		1.5 mm ² : 2.8 Nm 2.5 - 10 mm ² : 6.2 Nm >10 mm ² : 7 Nm	1.5 mm ² : 2.8 Nm 2.5 - 10 mm ² : 6.2 Nm >10 mm ² : 7 Nm	1.5 mm ² : 2.8 Nm 2.5 - 10 mm ² : 6.2 Nm >10 mm ² : 7 Nm

The distribution wire connector, 6 cables, can be ordered:

- as a pack of 3
- as a pack of 4

4.3.3.3 Front busbar and cable lug connections

The diagram below illustrates all the components available for implementing a busbar or cable lug connection on the front panel of the 3VA UL molded case circuit breaker.



Connection technology

- ① Front bus connectors broadened ¹⁾
 - ② Front bus connectors extended
 - ③ Nut keeper kit
- ¹⁾ Only available for 3VA63 and 3VA64

Cables and busbars

- ④ Busbars
- ⑤ Cable lugs

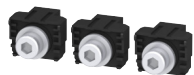
See also

Insulating equipment (Page 267)

Control wire tap (Page 301)

4.3 Connection system

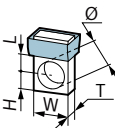
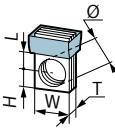
Nut keeper kit

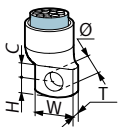
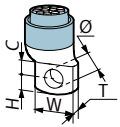


With the nut keeper kit, it is possible to connect busbars and cable lugs directly to the terminal of the 3VA UL molded case circuit breaker.

An auxiliary conductor connection can be implemented using a special control wire tap. You can find more detailed information about this in chapter Control wire tap (Page 301).

The table below provides an overview of the minimum and maximum sizes of cables and busbars which can be connected by a nut keeper kit.

Nut keeper kit			
Article number	3VA913.-0QA00	3VA923.-0QA00	3VA924.-0QA00
Can be installed in	3VA51	3VA52	--
	--	--	3VA61 3VA62
Busbar connection (rigid & flexible):  Insulated busbar  Insulated flexible busbar			
Maximum width W_{max}	0.66 in 17 mm	0.98 in 25 mm	0.98 in 25 mm
Thickness T	<0.25 in ≤6.5 mm	<0.31 in ≤8 mm	<0.31 in ≤8 mm
Length L	0.32 ... 0.39 in 8 ... 10 mm	0.40 ... 0.47 in 10 ... 12 mm	0.40 ... 0.47 in 10 ... 12 mm
Length H	0.31 in 8 mm	0.39 in 10 mm	0.39 in 10 mm
Hole diameter $\varnothing$	1/4 in 6.5 mm	5/16 in 8.5 mm	5/16 in 8.5 mm
Tightening torque	70 lb-in 8 Nm	177 lb-in 20 Nm	177 lb-in 20 Nm
Tool: Allen key	5/32 in	1/4 in	1/4 in

Nut keeper kit			
Article number	3VA913.-0QA00	3VA923.-0QA00	3VA924.-0QA00
Can be installed in	3VA51	3VA52	--
	--	--	3VA61 3VA62
Cable connection with cable lug:			
			
Non-insulated cable lug			
			
Insulated cable lug			
Maximum width $W_{\max}$	0.66 in 17 mm	0.98 in 25 mm	0.98 in 25 mm
Thickness T	<0.25 in ≤6.5 mm	<0.31 in ≤8 mm	<0.31 in ≤8 mm
Length $C_{\min}$	0.32 in 8 mm	0.40 in 10 mm	0.40 in 10 mm
Length H	0.31 8 mm	0.39 in 10 mm	0.39 in 10 mm
Hole diameter Ø	1/4 in 6.5 mm	5/16 in 8.5 mm	5/16 in 8.5 mm
Tightening torque	70 lb-in 8 Nm	177 lb-in 20 Nm	177 lb-in 20 Nm
Tool: Allen key	5/32 in	1/4 in	1/4 in

4.3 Connection system

Nut keeper kit			
Article number	3VA947.-0QA00	3VA967.-0QA00	
Can be installed in	3VA53 3VA54	3VA55	
		600 A	700/800/1000 A
	3VA63 3VA64	3VA65	
		600 A	800/1000 A

Busbar connection (rigid & flexible):

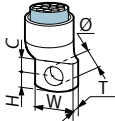
Insulated busbar

Insulated flexible busbar

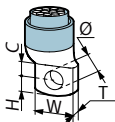
Maximum width $W_{\max}$	1.37 in 35 mm	2 in 50 mm	
Thickness T	0.04 ... 0.39 in 1 ... 10 mm	0.16 ... 1.14 in 4 ... 29 mm	
Length L	0.67 ... 0.78 in 17 ... 20 mm	0.63 ... 0.82 in 16 ... 21 mm	0.51 ... 0.71 in 13 ... 18 mm
Length H	0.57 in 14.5 mm	0.57 in 14.5 mm	0.7 in 18 mm
Hole diameter Ø	3/8 in 11 mm	0.41 in 10.5 mm	
Tightening torque	354 lb-in 40 Nm	274.4 lb-in 31 Nm	
Tool: Allen key	5/16 in	5/16 in	

Nut keeper kit				
Article number	3VA947.-0QA00	3VA967.-0QA00		
Can be installed in	3VA53	3VA55		
	3VA54	600 A	700/800/1000 A	
	3VA63	3VA65		
	3VA64	600 A	800/1000 A	

Cable connection with cable lug:



Non-insulated cable lug



Insulated cable lug

Maximum width $W_{\max}$	1.37 in 35 mm	2 in 50 mm	
Thickness T	0.04 ... 0.39 in 1 ... 10 mm	0.16 ... 1.14 in 4 ... 25 mm	
Length $C_{\min}$	0.59 in 15 mm	0.5 in 12.7 mm	
Length H	0.57 in 14.5 mm	0.57 in 14 mm	0.7 in 18 mm
Hole diameter Ø	3/8 in 11 mm	0.41 in 10.5 mm	
Tightening torque	354 lb-in 40 Nm	274.4 lb-in 31 Nm	
Tool: Allen key	5/16 in	5/16 in	

Nut keeper kits can be ordered:

- as a pack of 3
- as a pack of 4

4.3 Connection system

Front bus connectors extended

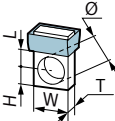
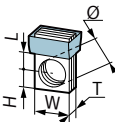


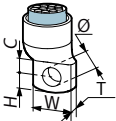
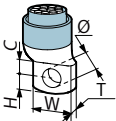
The front bus connectors extended enable larger busbars and cable lugs to be connected outside the termination area of a 3VA UL molded case circuit breaker. The front bus connectors therefore extend the terminal of the breaker.

You can find information on the required insulation measures in chapter Insulating equipment (Page 267).

An auxiliary conductor connection can be implemented using a special control wire tap. You can find more detailed information about this in chapter Control wire tap (Page 301).

The table below provides an overview of the minimum and maximum sizes of cables and busbars which can be connected by front bus connectors extended.

Front bus connectors extended				
Article number	3VA913.-0QB00	3VA927.-0QB00	3VA947.-0QB00	3VA967.-0QB00
Can be installed in	3VA51	3VA52	3VA53 3VA54	3VA55
	--	3VA61 3VA62	3VA63 3VA64	3VA65 3VA66
Busbar connection (rigid & flexible):  Insulated busbar  Insulated flexible busbar				
Maximum width W_{max}	0.86 in 22 mm	1.25 in 32 mm	1.57 in 40 mm	2.00 in 50.8 mm
Thickness T	≤0.31 in ≤8 mm	≤0.39 in ≤10 mm	≤0.49 in ≤12.5 mm	≤1.18 in ≤30 mm
Length L	0.39 in 10 mm	0.49 in 12.5 mm	0.59 in 15 mm	0.67 in 17 mm
Length H	0.47 in 12 mm	0.78 in 20 mm	0.78 in 20 mm	0.51 in 13 mm
Hole diameter Ø	1/4 in 6.5 mm	3/8 in 11 mm	3/8 in 11 mm	3/8 in 11 mm
Tightening torque	70 lb-in 8 Nm	132.8 lb-in 15 Nm	177 lb-in 20 Nm	275 lb-in 31 Nm
Tool: Allen key	3/16 in	5/16 in	5/16 in	5/16 in

Front bus connectors extended				
Article number	3VA913.-0QB00	3VA927.-0QB00	3VA947.-0QB00	3VA967.-0QB00
Can be installed in	3VA51	3VA52	3VA53 3VA54	3VA55
	--	3VA61 3VA62	3VA63 3VA64	3VA65 3VA66
Cable connection with cable lug:				
 Non-insulated cable lug  Insulated cable lug				
Maximum width W_{max}	0.86 in 22 mm	1.25 in 32 mm	1.57 in 40 mm	2.00 in 50.8 mm
Thickness T	≤0.31 in ≤8 mm	≤0.39 in ≤10 mm	≤0.49 in ≤12.5 mm	≤1.18 in ≤30 mm
Length C_{min}	0.39 in 10 mm	0.49 in 12.5 mm	0.59 in 15 mm	0.67 in 17 mm
Length H	0.47 in 12 mm	0.78 in 20 mm	0.78 in 20 mm	0.51 in 13 mm
Hole diameter Ø	1/4 in 6.5 mm	3/8 in 11 mm	3/8 in 11 mm	3/8 in 11 mm
Tightening torque	70 lb-in 8 Nm	132.8 lb-in 15 Nm	177 lb-in 20 Nm	275 lb-in 31 Nm
Tool: Allen key	3/16 in	5/16 in	5/16 in	5/16 in

The front bus connectors extended can be ordered:

- as a pack of 3
- as a pack of 4

Front bus connectors broadened



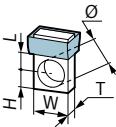
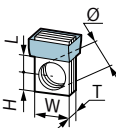
The front bus connectors broadened enable very large busbars and cable lugs to be connected outside the termination area of a 3VA UL molded case circuit breaker. Front bus connectors broadened increase the distance between pole centers.

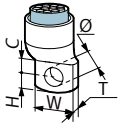
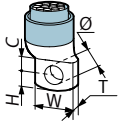
4.3 Connection system

You can find information on the required insulation measures in chapter Insulating equipment (Page 267).

An auxiliary conductor connection can be implemented using a special control wire tap. You can find more detailed information about this in chapter Control wire tap (Page 301).

The table below provides an overview of the minimum and maximum sizes of cables and busbars which can be connected by front bus connectors broadened.

Front bus connectors broadened				
Article number	3VA947.-0QC00	3VA967.-0QC00		
Can be installed in	3VA53 3VA54	3VA55		
	3VA63 3VA64	3VA65 3VA66		
Busbar connection (rigid & flexible):  Insulated busbar  Insulated flexible busbar				
Maximum width W_{max}	2.40 in 60 mm	3.15 in 80 mm		
Thickness T	<0.49 in <12.5 mm	≤1.18 in ≤30 mm		
Length L	0.79 in 20 mm	0.67 in 17 mm		
Length H	0.78 in 20 mm	0.51 in 13 mm		
Hole diameter Ø	1/2 in 14 mm	3/8 in 11 mm		
Tightening torque	265 lb-in 30 Nm	275 lb-in 31 Nm		
Tool: Allen key	3/8 in	5/16 in		

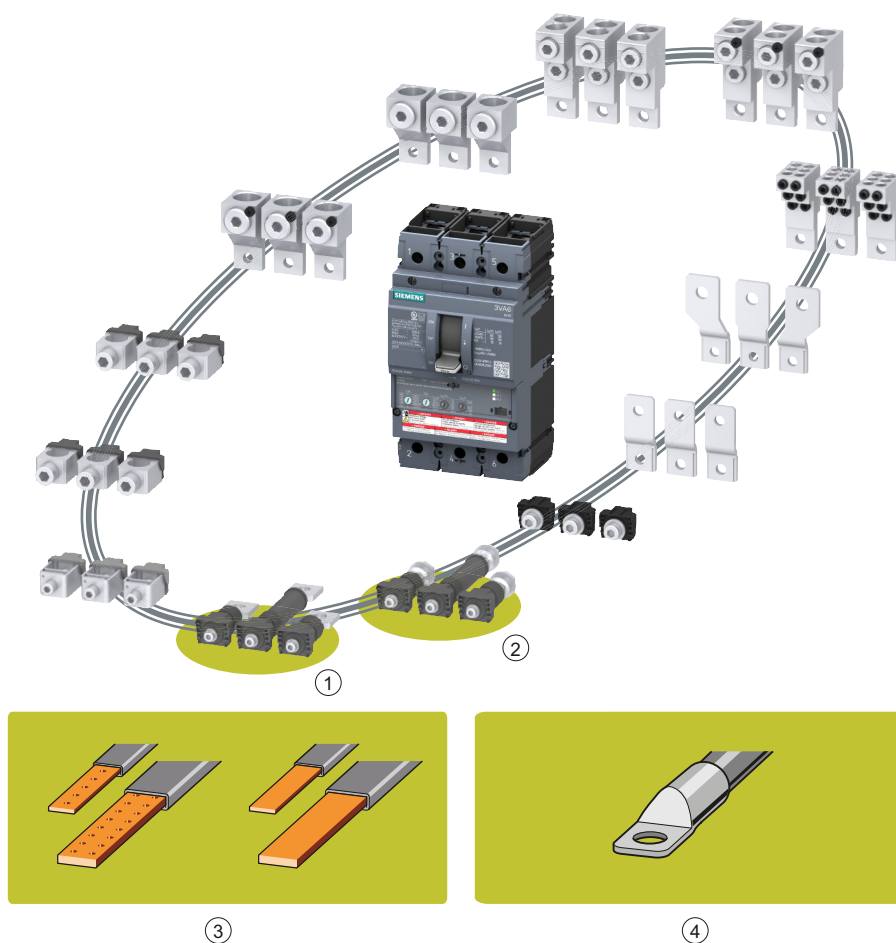
Front bus connectors broadened				
Article number	3VA947.-0QC00	3VA967.-0QC00		
Can be installed in	3VA53	3VA55		
	3VA54			
	3VA63	3VA65		
	3VA64	3VA66		
Cable connection with cable lug:				
 Non-insulated cable lug				
 Insulated cable lug				
Maximum width W_{max}	2.40 in 60 mm	3.15 in 80 mm		
Thickness T	<0.49 in <12.5 mm	≤1.18 in ≤30 mm		
Length C_{min}	0.79 in 20 mm	0.67 in 17 mm		
Length H	0.78 in 20 mm	0.51 in 13 mm		
Hole diameter Ø	1/2 in 14 mm	3/8 in 11 mm		
Tightening torque	265 lb-in 30 Nm	275 lb-in 31 Nm		
Tool: Allen key	3/8 in	5/16 in		

Front bus connectors broadened can be ordered:

- as a pack of 3
- as a pack of 4

4.3.3.4 Rear busbar and cable lug connections

The diagram below illustrates all the components available for implementing a busbar or cable lug connection on the rear panel of the 3VA UL molded case circuit breaker.



Connection technology

- ① Rear connection stud flat
- ② Rear connection stud round

Cables and busbars

- ③ Busbars
- ④ Cable lugs

Rear connection stud flat

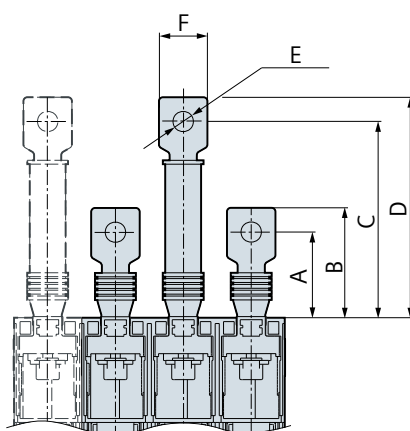


The rear connection stud flat enables busbars and cable lugs to be connected to the rear of the 3VA UL molded case circuit breaker.

The rear connection stud flat can be rotated in steps of 45°, i.e. it can be installed at an angle of 0°, 45° or 90°:



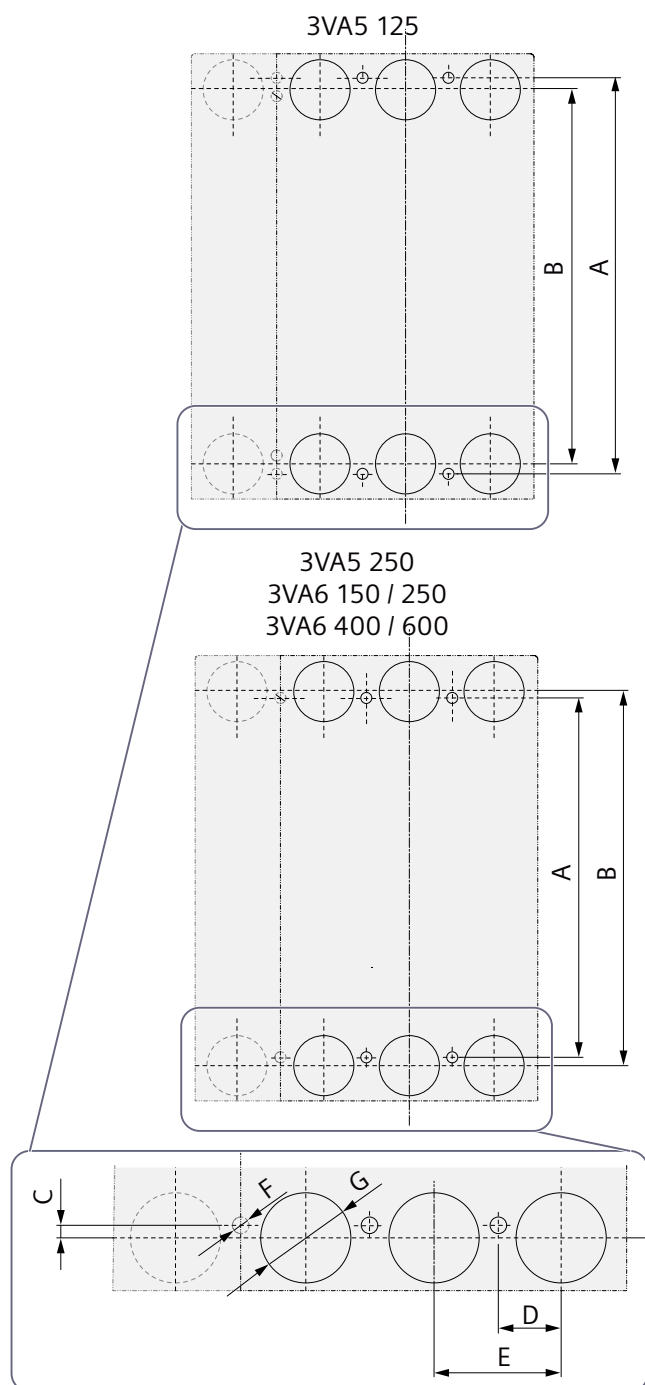
The dimensions of rear connection studs flat are stated in the table below:



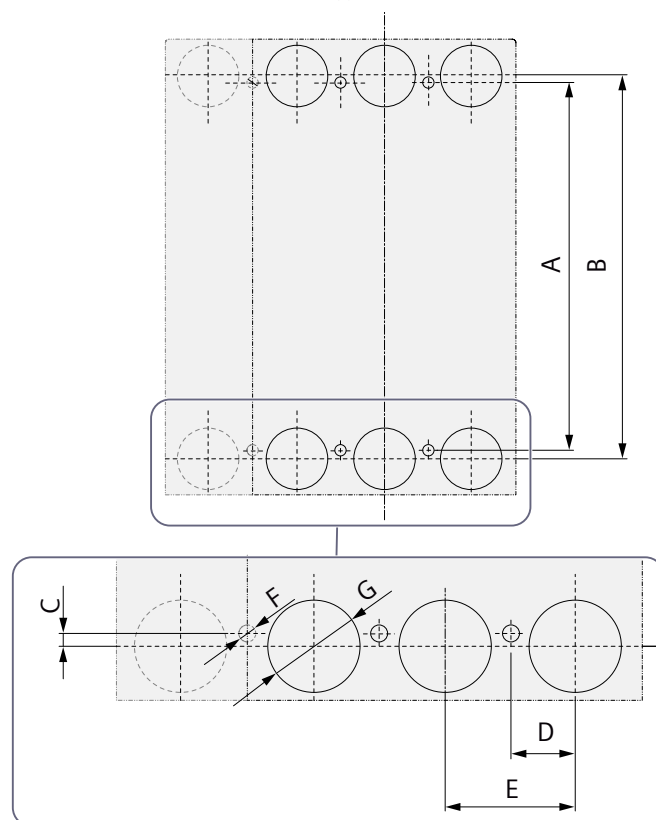
Rear connection stud flat				
Article number	3VA913.-0QE.0	3VA923.-0QE.0	3VA924.-0QE.0	3VA947.-0QE.0
Can be installed in	3VA51	3VA52	--	3VA53 3VA54
	--	--	3VA61 3VA62	3VA63 3VA64
A	1.75 in [44.5 mm]	1.69 in [43 mm]	1.69 in [43 mm]	2.00 in [50 mm]
B	2.22 in [56.5 mm]	2.19 in [55.5 mm]	2.19 in [55.5 mm]	2.60 in [65 mm]
C	4.00 in [101.5 mm]	3.94 in [100 mm]	3.94 in [100 mm]	4.50 in [115 mm]
D	4.49 in [114 mm]	4.43 in [112.5 mm]	4.43 in [112.5 mm]	5.20 in [130 mm]
E	5/16 in [8.4 mm]	3/8 in [10.05 mm]	3/8 in [10.05 mm]	1/2 in [13.2 mm]
F	0.60 in [16 mm]	0.87 in [22 mm]	0.87 in [22 mm]	1.20 in [29.4 mm]

4.3 Connection system

Drilling pattern for fixed-mounted circuit breaker



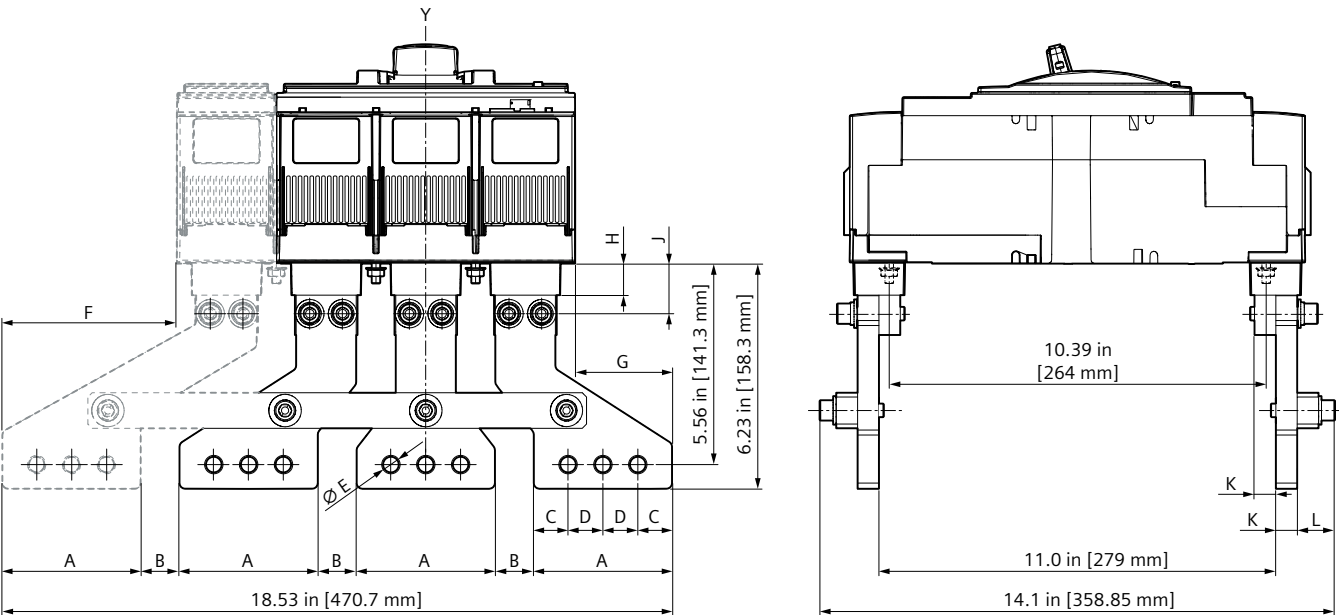
Drilling pattern for socket, plug-in/withdrawable technology



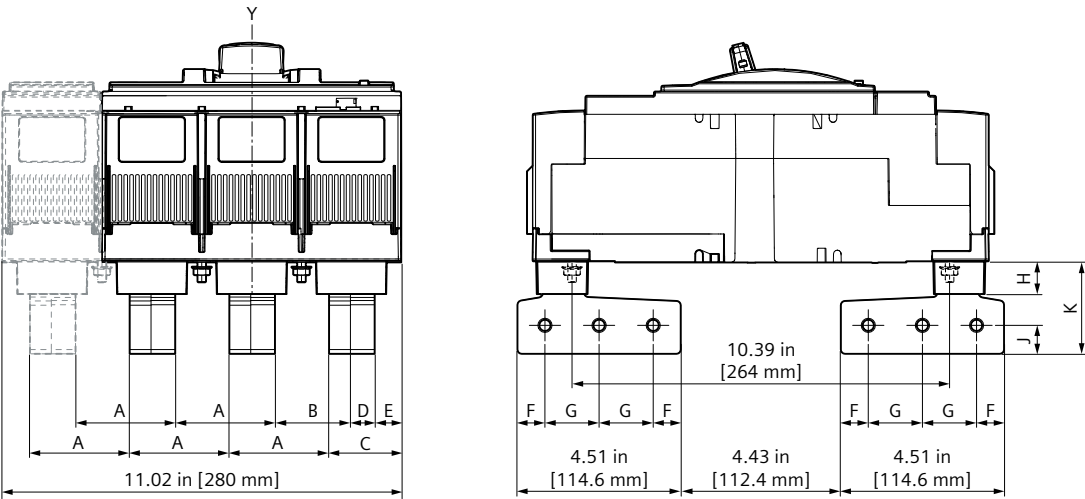
Rear connection stud flat				
Article number	3VA913.-0QE.0	3VA923.-0QE.0	3VA924.-0QE.0	3VA947.-0QE.0
Can be installed in	3VA51	3VA52	--	3VA53 3VA54
	--	--	3VA61 3VA62	3VA63 3VA64
Drilling pattern for fixed-mounted circuit breaker				
A - Fixing screws	4.51 in [114.5 mm]	5.24 in [133 mm]	5.24 in [133 mm]	7.09 in [180 mm]
B - Hole for rear connections	4.24 in [107.8 mm]	5.67 in [144 mm]	5.67 in [144 mm]	7.87 in [200 mm]
C	0.14 in [3.5 mm]	0.22 in [5.5 mm]	0.22 in [5.5 mm]	0.39 in [10 mm]
D	0.50 in [12.7 mm]	0.69 in [17.5 mm]	0.69 in [17.5 mm]	0.91 in [23 mm]
E	1 in [25.4 mm]	1.38 in [35 mm]	1.38 in [35 mm]	1.81 in [46 mm]
F	0.16 in [4 mm]	0.18 in [4.5 mm]	0.18 in [4.5 mm]	0.22 in [5.5 mm]
G	0.67 in [17 mm]	0.96 in [24.5 mm]	0.96 in [24.5 mm]	1.34 in [34 mm]
Drilling pattern for socket, plug-in/withdrawable technology				
A	--	--	8.23 in [209 mm]	.. ¹⁾
B	--	--	8.66 in [220 mm]	.. ¹⁾
C	--	--	0.22 in [5.5 mm]	.. ¹⁾
D	--	--	0.69 in [17.5 mm]	.. ¹⁾
E	--	--	1.38 in [35 mm]	.. ¹⁾
F	--	--	0.18 in [4.5 mm]	.. ¹⁾
G	--	--	0.96 in [24.5 mm]	.. ¹⁾

¹⁾ Plug-in and withdrawable designs only possible in combination with bus connectors broadened and associated terminal cover

3VA967.-0QE60

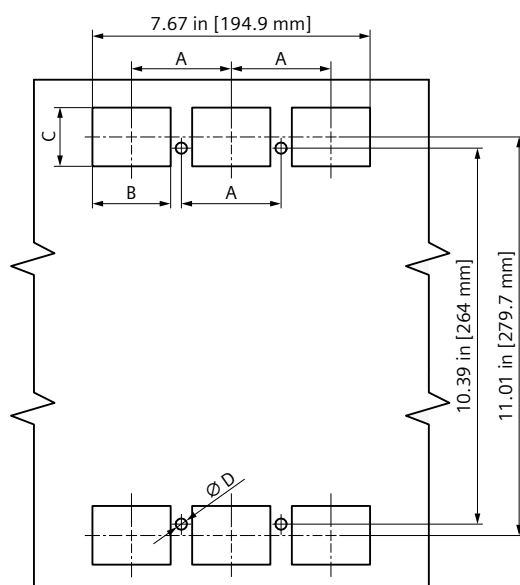


3VA967.-0QE00

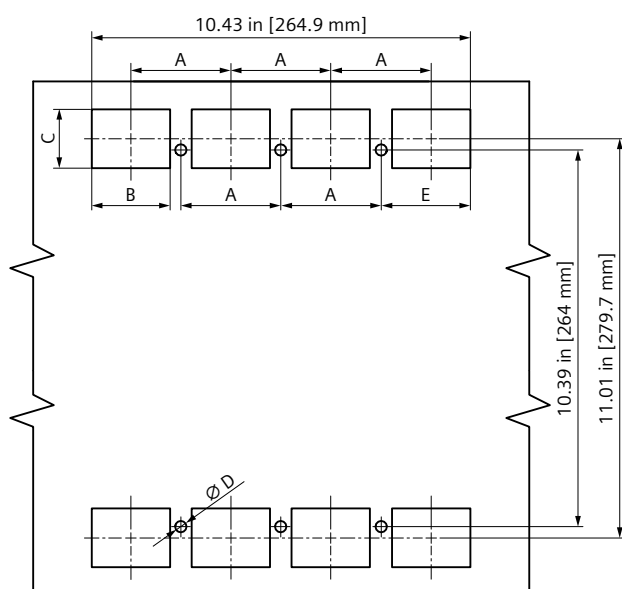


Rear connection stud flat		
Article number	3VA967.-0QE60	3VA967.-0QE00
Can be installed in	--	--
	3VA65	3VA65
	3VA66	3VA66
A	3.83 in [97.2 mm]	2.76 in [70 mm]
B	1.07 in [27.3 mm]	2.09 in [53 mm]
C	0.95 in [24.1 mm]	2.01 in [51 mm]
D	0.96 in [24.5 mm]	0.67 in [17 mm]
E	0.43 in [11 mm]	0.75 in [19 mm]

Rear connection stud flat		
Article number	3VA967.-0QE60	3VA967.-0QE00
Can be installed in	--	--
	3VA65 3VA66	3VA65 3VA66
F	4.83 in [122.6 mm]	0.76 in [19.3 mm]
G	2.68 in [86.1 mm]	1.50 in [38.1 mm]
H	0.87 in [22.2 mm]	0.87 in [22.2 mm]
J	1.39 in [35.2 mm]	0.79 in [20.1 mm]
K	0.59 in [15 mm]	2.53 in [64.2 mm]
L	0.98 in [24.9 mm]	



4.3 Connection system



Rear connection stud flat		
Article number	3VA967.-0QE60	3VA967.-0QE00
Can be installed in	--	--
	3VA65 3VA66	3VA65 3VA66
A	2.76 in [70 mm]	
B	2.16 in [54.9 mm]	
C	1.62 in [41.2 mm]	
D	0.31 in [8 mm]	
E	2.46 in [62.5 mm]	

Rear connection studs flat can be ordered:

- as a pack of 3 (2 short flat connectors and 1 long flat connector)
- as a pack of 4 (2 short flat connectors and 2 long flat connectors)
- as a pack of 1 (1 short flat connector)
- as a pack of 1 (1 long flat connector)

Note

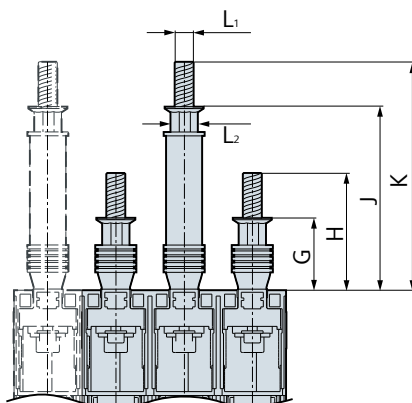
In order to achieve degree of protection IP40, terminal covers (short version) must also be attached when a rear connection stud flat is installed.

Rear connection stud round



The rear connection stud round enables busbars and cable lugs to be connected to the rear of the 3VA UL molded case circuit breaker.

The dimensions of rear connecting studs are given in the table below:

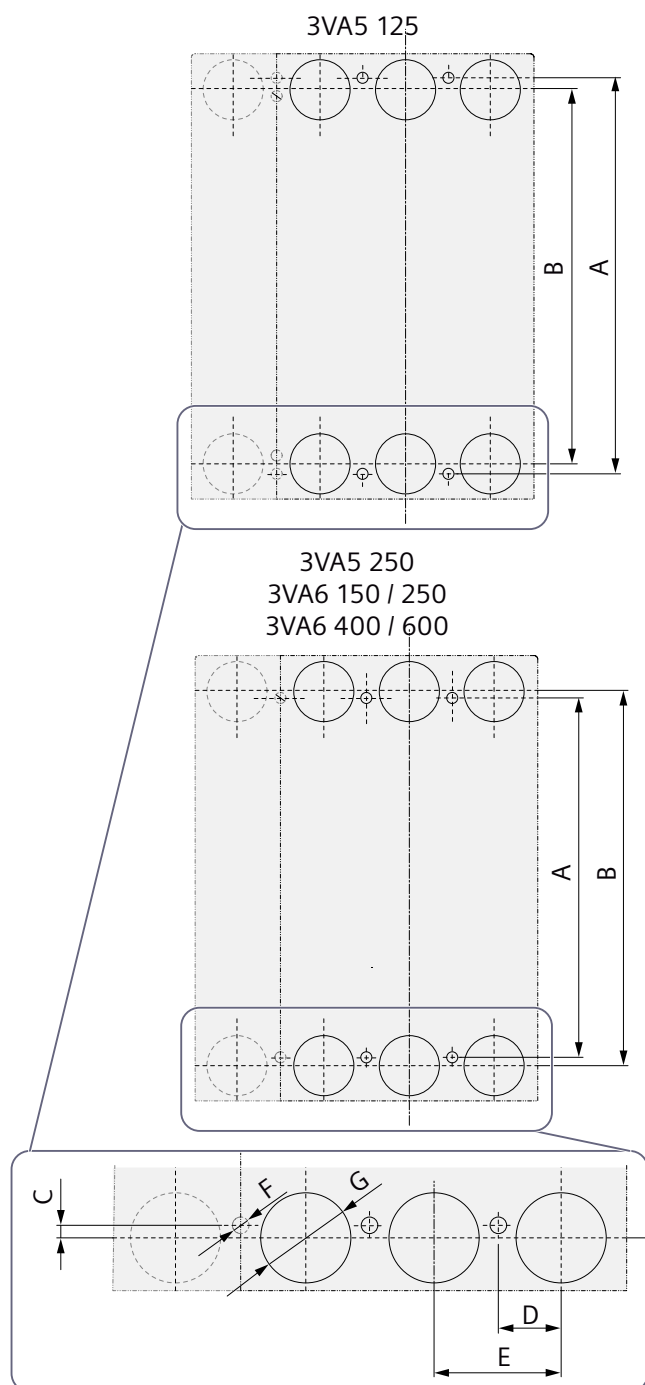


Rear connection stud round					
Article number		3VA913.-0QF.0	3VA923.-0QF.0	3VA924.-0QF.0	3VA947.-0QF.0
Can be installed in		3VA51	3VA52	--	3VA53 3VA54
		--	--	3VA61 3VA62	3VA63 3VA64
G		0.85 in [21.5 mm]	1.42 in [36 mm]	1.42 in [36 mm]	1.77 in [45 mm]
H		2.34 in [59.5 mm]	2.32 in [59 mm]	2.32 in [59 mm]	3.29 in 83.5 mm
J		3.09 in [78.5 mm]	3.66 in [93 mm]	3.66 in [93 mm]	4.13 in [105 mm]
K		4.59 in [116.5 mm]	4.57 in [116 mm]	4.57 in [116 mm]	5.56 in [143.5 mm]
L ₁	Hexagon nut	M8	3/8"	3/8"	1/2"
	Hexagon nut width across flats	11/16	9/16	9/16	3/4
	Hexagon nut tightening torque	105	88	88	177
L ₂	Connection stud round width across flats	11/16 ¹⁾	9/16	9/16	11/16

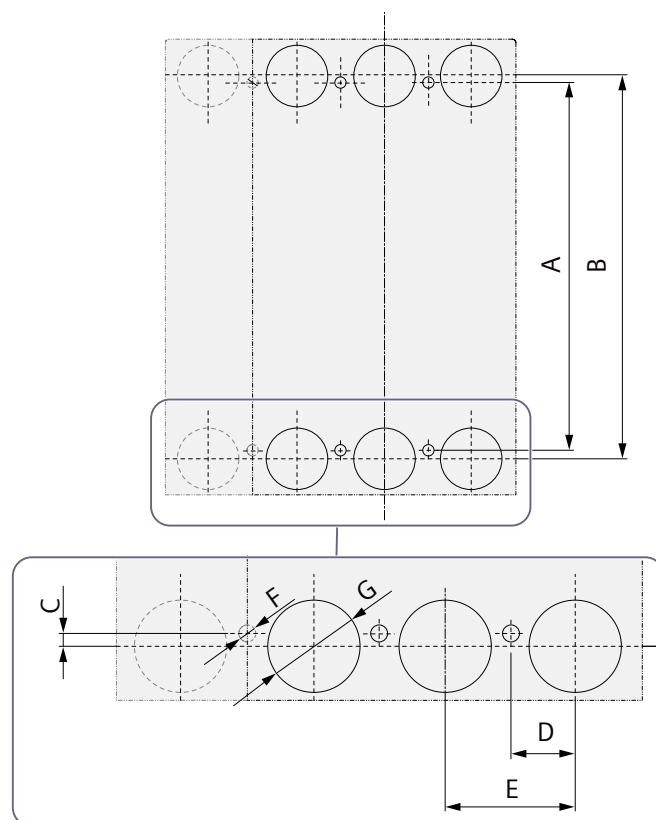
¹⁾ Width across flats of the supplied lock nut

4.3 Connection system

Drilling pattern for fixed-mounted circuit breaker



Drilling pattern for socket, plug-in/withdrawable technology



Rear connection stud round				
Article number	3VA913.-0QF.0	3VA923.-0QF.0	3VA924.-0QF.0	3VA947.-0QF.0
Can be installed in	3VA51	3VA52	--	3VA53 3VA54
	--	--	3VA61 3VA62	3VA63 3VA64
Drilling pattern for fixed-mounted circuit breaker				
A	4.51 in [114.5 mm]	5.24 in [133 mm]	5.24 in [133 mm]	7.09 in [180 mm]
B	4.24 in [107.8 mm]	5.67 in [144 mm]	5.67 in [144 mm]	7.87 in [200 mm]
C	0.14 in [3.5 mm]	0.22 in [5.5 mm]	0.22 in [5.5 mm]	0.39 in [10 mm]
D	0.50 in [12.7 mm]	0.69 in [17.5 mm]	0.69 in [17.5 mm]	0.91 in [23 mm]
E	1 in [25.4 mm]	1.38 in [35 mm]	1.38 in [35 mm]	1.81 in [46 mm]
F	0.16 in [4 mm]	0.18 in [4.5 mm]	0.18 in [4.5 mm]	0.22 in [5.5 mm]
G	0.67 in [17 mm]	0.96 in [24.5 mm]	0.96 in [24.5 mm]	1.34 in [34 mm]
Drilling pattern for socket, plug-in/withdrawable technology				
A	--	--	8.23 in [209 mm]	.. ²⁾
B	--	--	8.66 in [220 mm]	.. ²⁾
C	--	--	0.22 in [5.5 mm]	.. ²⁾
D	--	--	0.69 in [17.5 mm]	.. ²⁾
E	--	--	1.38 in [35 mm]	.. ²⁾
F	--	--	0.18 in [4.5 mm]	.. ²⁾
G	--	--	0.96 in [24.5 mm]	.. ²⁾

¹⁾ Width across flats of the supplied lock nut

²⁾ Plug-in and withdrawable designs only possible in combination with bus connectors broadened and associated terminal cover

Rear connection studs round can be ordered

- as a pack of 3 (2 short studs and 1 long stud)
- as a pack of 4 (2 short studs and 2 long studs)

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- as a pack of 1 (1 short stud)
- as a pack of 1 (1 long stud)

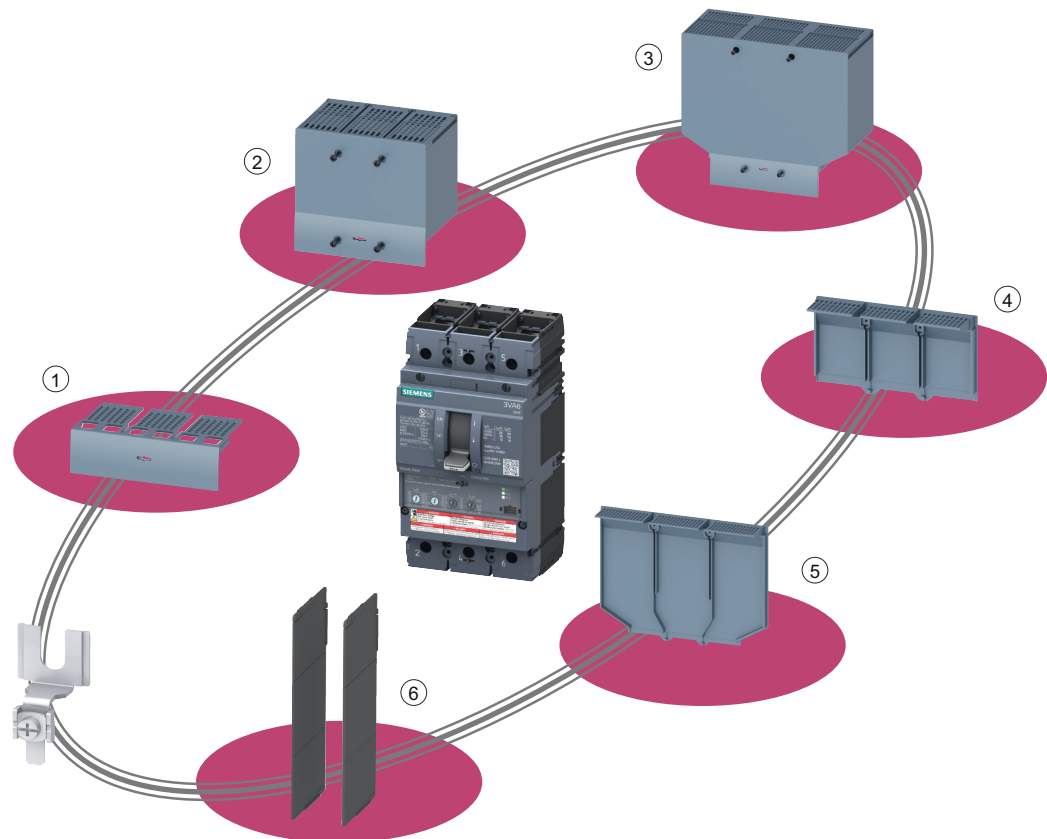
Note

In order to achieve degree of protection IP40, terminal covers (short version) must also be attached when a rear connection stud is installed.

4.3.4 Further connection accessories

4.3.4.1 Insulating equipment

The connection technology accessories provide a comprehensive range of insulation measures. The following overview shows the insulation accessories available for the 3VA UL molded case circuit breakers.

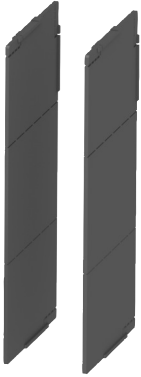


- ① Terminal cover
- ② Terminal cover extended
- ③ Terminal cover offset ¹⁾
- ④ Insulating plate
- ⑤ Insulating plate, offset ¹⁾
- ⑥ Phase barriers

¹⁾ Only available for frame sizes 400/600 A

4.3 Connection system

4.3.4.2 Phase barriers



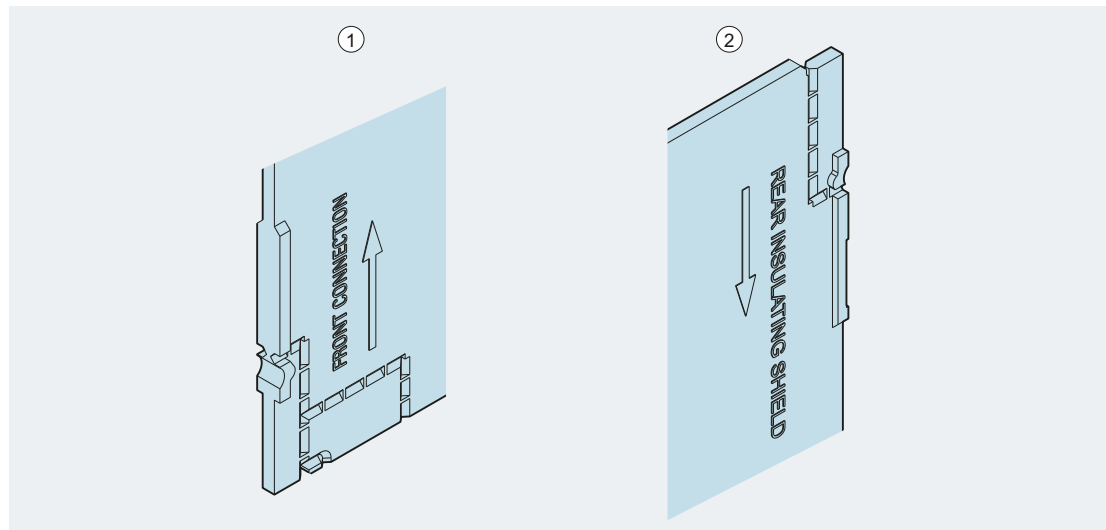
Phase barriers provide insulation between the individual phases of the molded case circuit breaker. They are simply snapped into place on the 3VA UL molded case circuit breaker.

Phase barriers can be used in combination with the insulating plate and the insulating plate offset, in order to provide additional insulation from the mounting plate.

Phase barriers are compatible with:

- Box terminal
- Wire connector
- Front bus connectors extended (included in scope of supply)
- Front bus connectors broadened (included in scope of supply)
- Other insulation accessories: Insulating plate or insulating plate, offset

Depending on the intended purpose of the phase barriers, they must be snapped into position in the direction indicated by the arrows below:



- ① Front connection
② In combination with insulating plate

4.3.4.3 Terminal cover, extended terminal cover, and offset terminal cover

Note

The broadened terminal cover is only available for the 3VA53/54 and 3VA63/64 molded case circuit breakers.

All terminal covers provide degree of protection IP40 at the front of the breaker and degree of protection IP20 at the infeed and load side provided that they are correctly installed (cutting of grille structure). The requirements of NFPA 79 "Protection against electric shock" for UL applications are met with degree of protection IP20.

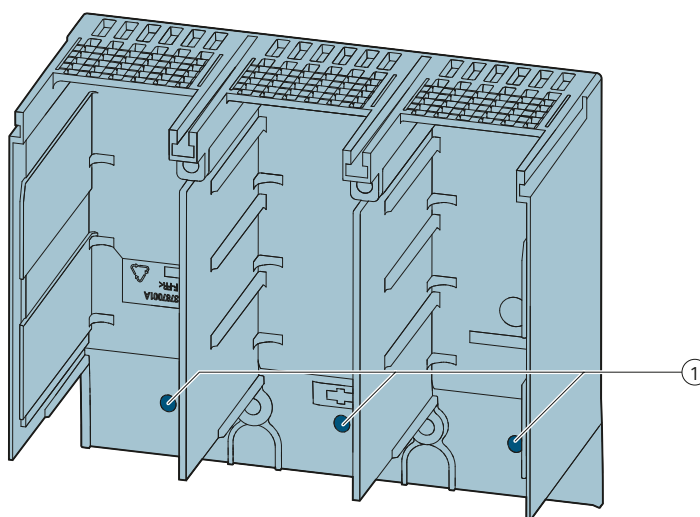
All terminal covers have a marking on the inside face which can be drilled through before the cover is installed. A suitable voltage detector can be inserted through this hole to test for safe isolation.

⚠ WARNING

Reduced degree of barrier protection

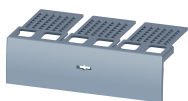
Degree of protection IP40 is not maintained at the front of the breaker if a hole is drilled through the terminal cover.

Suitable precautions must be taken to safeguard against any hazards posed by this loss of protection.



① Marking for holes

Phase barriers can also be installed on all terminal covers to increase clearances and creepage distances which might be impacted by ionized gas following a short circuit.

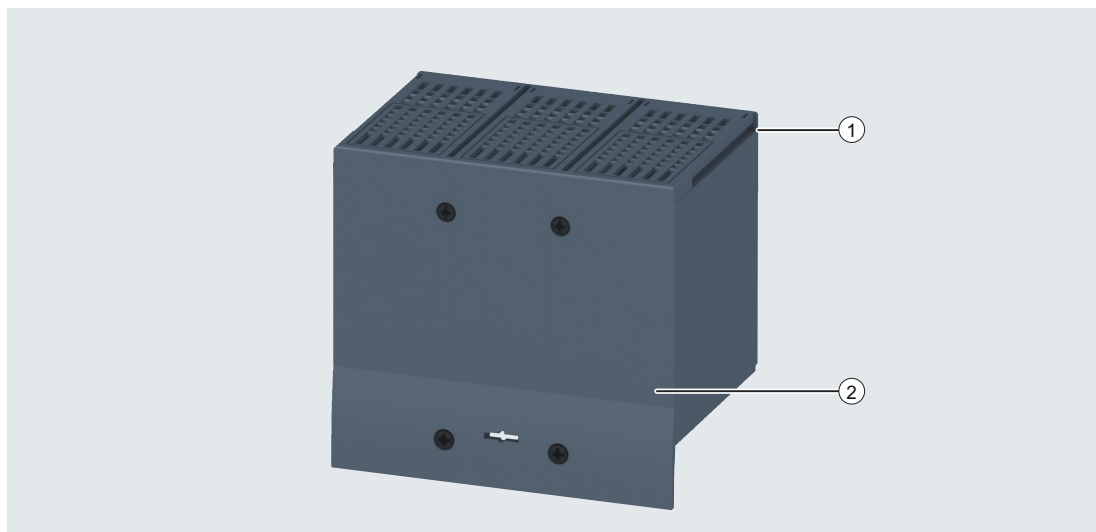


Terminal cover

The terminal cover is compatible with:

- Box terminals
- Wire connectors
- Nut keeper kits

The terminal cover is simply snapped onto the 3VA UL molded case circuit breaker (3VA5 125 A) or snapped into place and secured with 2 screws (other frame sizes).

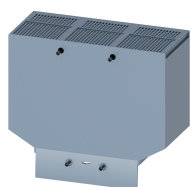
**Terminal cover extended**

- ① Rear insulating plate, provides insulation from the mounting plate of the control cabinet
- ② Front half, pushed over the molded case circuit breaker from the front

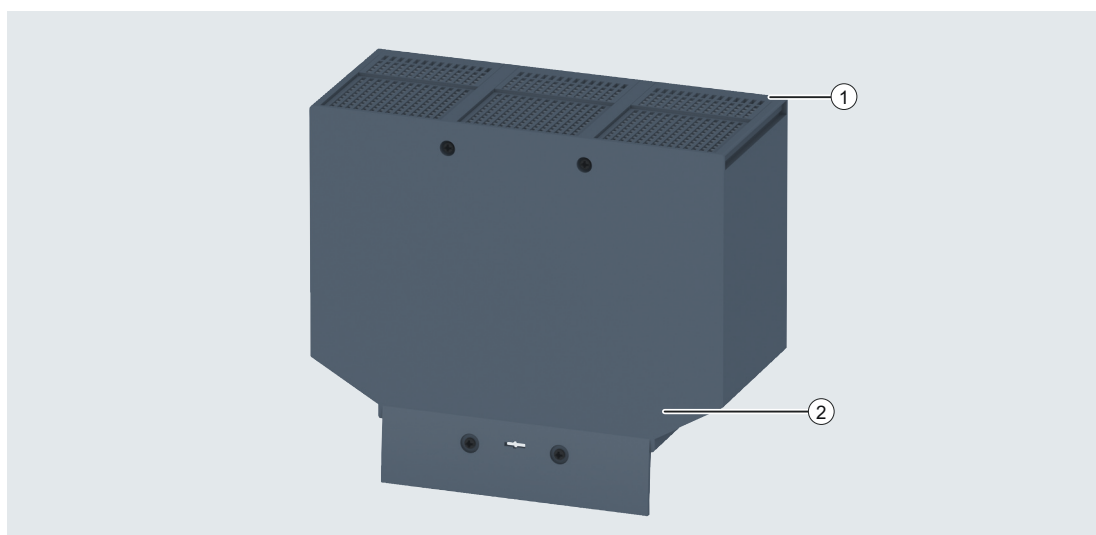
The insulating plate is fitted to the rear panel of the molded case circuit breaker and then secured by 2 screws to the front half of the terminal cover. The terminal cover extended is also secured by 2 additional screws to the molded case circuit breaker itself.

The terminal cover extended is compatible with:

- Wire connectors, large (terminal cover extended included in scope of supply)
- Wire connectors, 2 cables (terminal cover extended included in scope of supply)
- Distribution wire connectors, 6 cables (terminal cover extended included in scope of supply)
- Front bus connectors extended

**Terminal cover offset**

The terminal cover offset always consists of two parts:



- ① Rear insulating plate, provides insulation from the mounting plate of the control cabinet
- ② Front half, pushed over the molded case circuit breaker from the front

The insulating plate is fitted to the rear panel of the molded case circuit breaker and then secured by 2 screws to the front half of the terminal cover. The terminal cover offset is also secured by 2 additional screws to the molded case circuit breaker itself.

The terminal cover offset is compatible with:

- Front bus connectors broadened

4.3.4.4 Insulating plate and insulating plate offset



If insulation for the mounting plate is needed, this can be ensured by an insulating plate.

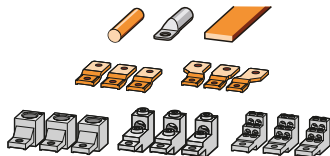
The insulating plate is fitted to the rear panel of the molded case circuit breaker and can be installed in combination with phase barriers.

Potential applications:

- Insulating plate:
 - Bus connectors extended
 - Non-insulated, straight conductors / terminals
- Insulating plate, offset:
 - Bus connectors broadened

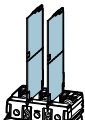
4.3 Connection system

4.3.4.5 General insulation measures

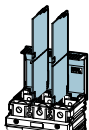
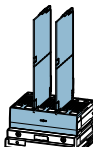
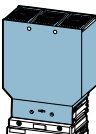
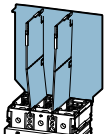
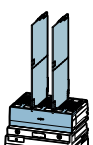
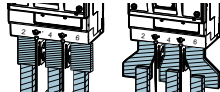
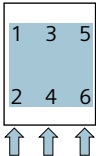
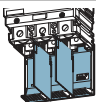
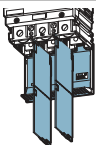
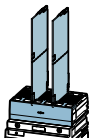
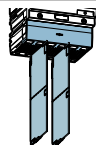
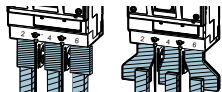
Voltage level [V AC]		Insulated cables and busbars e.g. insulated cable, insulated cable lug, insulated busbar, rear round connection stud, rear flat connection stud	Non-insulated cables and busbars e.g. bare cable, bare cable lug, bare busbar, bus connector extended, external wire connector	
				
3VA5	3VA51 ≤ 480	No additional insulating measures are required.	If the insulation extends inside the termination area, no additional insulating measures are required.	Additional insulating measures are always required: 1. Phase to phase: Phase barriers or terminal cover extended 2. Phase to mounting plate: Insulating plates or terminal cover extended
	≥ 480			
	3VA52 ≤ 480	Only the short terminal cover is required as an additional insulating measure.	If the insulation extends inside the termination area, no additional insulating measures are required.	Additional insulating measures are always required, e.g. phase barriers, insulating panel, terminal cover extended
	≥ 480	In addition to the short terminal cover, phase barriers are also required.	Additional insulating measures are always required: 1. Phase to phase: Phase barriers or terminal cover extended 2. Phase to mounting plate: Insulating plates or terminal cover extended with infeed from below (terminals 2/4/6)	
3VA6	3VA61/62 ≤ 480	Only the short terminal cover is required as an additional insulating measure.	If the insulation extends inside the termination area, no additional insulating measures are required.	Additional insulating measures are always required, e.g. phase barriers, insulating panel, terminal cover extended
	≥ 480	In addition to the short terminal cover, phase barriers are also required.	Additional insulating measures are always required: Phase to phase: Phase barriers or terminal cover extended	
	3VA63/64 ≤ 480	Only the short terminal cover is required as an additional insulating measure.	If the insulation extends inside the termination area, no additional insulating measures are required.	Additional insulating measures are always required, e.g. phase barriers, insulating panel, terminal cover extended
	≥ 480	In addition to the short terminal cover, phase barriers are also required.	Additional insulating measures are always required: Phase to phase: Phase barriers or terminal cover extended	

4.3.4.6 Insulation measures - UL

The insulation accessories for UL applications are presented by identification letters in the following tables.

Insulation requirements for all terminals				
	A	B	C	D
				
	3VA9272-OWA00 3VA9472-OWA00	3VA9272-OWA00 3VA9472-OWA00	3VA9271-OWD.0 3VA9471-OWD.0	3VA9131-OWF20 3VA9271-OWD.0 3VA9471-OWF.0

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E	F	G	H	K
				
3VA9272-0WA00 3VA9271-0WJ.0	3VA9132-0WA00 3VA9131-0WJ20 3VA9272-0WA00 3VA9271-0WJ.0 3VA9472-0WA00 3VA9471-0WJ.0	3VA9272-0WA00 3VA9271-0WD.0 3VA9472-0WA00 3VA9471-0WD.0	3VA9272-0WA00 3VA9271-0WD.0 3VA9472-0WA00 3VA9471-0WD.0	3VA9471-0WG.0
L	Q	R	S	U
				
3VA9472-0WA00 3VA9471-0WK.0	3VA9671-0WD30 3VA9671-0WD40	3VA9671-0WE30 3VA9671-0WE40	3VA967.-0QA00 3VA967.-0WA00	
				--
				No insulation requirements
Insulation requirements only for terminals 2 / 4 / 6				
				
	3VA9272-0WA00 3VA9271-0WJ.0	3VA9272-0WA00 3VA9271-0WJ.0	3VA967.-0QA00 3VA967.-0WA00	3VA967.-0QA00 3VA967.-0WA00
				--
				No insulation requirements

4.3 Connection system

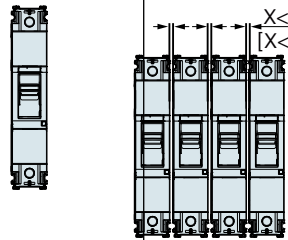
Note

All the presented insulation measures represent minimum requirements.

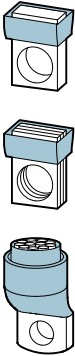
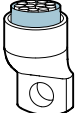
Covers can be replaced with more substantial covers:

- Insulation measure A can be replaced with D and E
- Insulation measure B can be replaced with D and F
- Insulation measure E can be replaced with D
- Insulation measure L can be replaced with K

4.3.4.7 Insulation measures for 3VA51 molded case circuit breakers for UL use

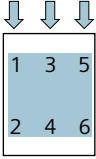
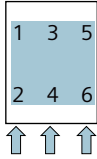
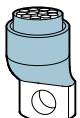
			3VA51...	3VA51...-ED1.	
			≤600 V AC ≤500 V DC		
	 TA1.0 TC1.0	3VA913.-OJB10 3VA913.-OJG10 3VA913.-OJD10 3VA913.-OJK10	--		
	 TA1.1 TC1.1	3VA913.-OJB11 3VA913.-OJG11 3VA913.-OJD11 3VA913.-OJK11	--		
	 TS1.1	3VA913.-OJA11	--		
	 TA2.1  TA2.5	3VA913.-OJJ12 3VA913.-OJC12 3VA913.-OJF60	D		

4.3 Connection system

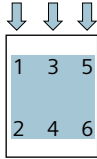
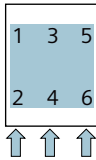
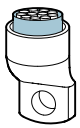
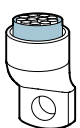
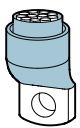
		3VA913.-0QA00	--		
		3VA913.-0QB00	D/F		
		3VA913.-0QE00	--		
		3VA913.-0QA00	D/F		
		3VA913.-0QB00	D/F		
		3VA913.-0QE00	--		

4.3 Connection system

4.3.4.8 Insulation measures for 3VA52 molded case circuit breakers for UL use

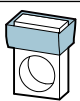
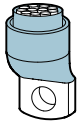
			$\leq 480 \text{ V AC}$ $\leq 500 \text{ V DC}$	 $< 600 \text{ V AC}$ $< 600 \text{ V DC}$	 $< 600 \text{ V AC}$ $< 600 \text{ V DC}$
		3VA923.-0JB12 3VA923.-0JG12 3VA923.-0JD12 3VA923.-0JK12	--	A/B/D	D/I/J
		3VA923.-0JA1.	--	A/B/D	D/I/J
	 TA2.2	3VA923.-0JJ13 3VA923.-0JC13 3VA923.-0JJ22 3VA923.-0JC22 3VA923.-0JF60	D	D	D
	 TA2.3				
	 TA2.6				
  		3VA923.-0QA00	--	A/B/D	D/I/J
		3VA927.-0QB00	D/F	D	D

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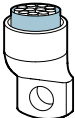
			$\leq 480 \text{ V AC}$ $\leq 500 \text{ V DC}$	 $< 600 \text{ V AC}$ $< 600 \text{ V DC}$	 $< 600 \text{ V AC}$ $< 600 \text{ V DC}$
		3VA923.-0QA00	D/F	D	D
		3VA927.-0QB00	D/F	D	D
		3VA923.-0QA00	A/B/D	D/E/F	D/E/F
		3VA927.-0QB00	D/F	D	D
    		3VA923.-0QE.0	C/G/H	G/H	G/H
		3VA923.-0QF.0	C/G/H	G/H	G/H

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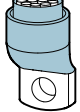
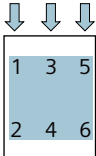
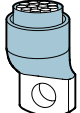
4.3.4.9 Insulation measures for 3VA53/54 molded case circuit breakers for UL use

			Position	480 V AC 500 V AC	600 V AC 600 V DC
      	 TA1.5 TC1.5	3VA937.-0JB13 3VA937.-0JG13 3VA937.-0JD13 3VA937.-0JK13		--	A/B/D
	 TS1.5	3VA947.-0JA13		--	A/B/D
	 TA2.4 TC2.4  TA2.6	3VA947.-0JJ23 3VA947.-0JC23 3VA947.-0JE23 3VA947.-0JL23 3VA937.-0JF60		D	D
	 TA2.8	3VA937.-0JJ24 3VA937.-0JC24		D	D
   	 3VA947.-0QA00			--	A/B/D
	 3VA947.-0QB00			D/F	D
	 3VA947.-0QC00			K/L	K
	 3VA947.-0QE.0			C	G/H
	 3VA947.-0QF.0			C	G/H

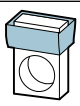
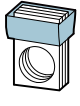
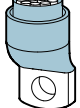
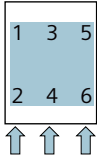
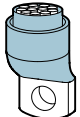
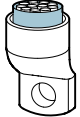
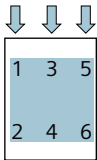
4.3 Connection system

			Position	480 V AC 500 V AC	600 V AC 600 V DC
		3VA947.-0QA00		D/F	D
		3VA947.-0QB00		D/F	D
		3VA947.-0QC00		K/L	K
		3VA947.-0QE.0		C	G/H
		3VA947.-0QF.0		C	G/H
		3VA947.-0QA00		E/F	D/E/F
		3VA947.-0QB00		D/F	D
		3VA947.-0QC00		K/L	K
		3VA947.-0QE.0		C	G/H
		3VA947.-0QF.0		C	G/H

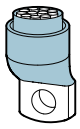
4.3.4.10 Insulation measures for 3VA55 molded case circuit breakers for UL use

			Position	≤480 V AC ≤250 V DC	≤600 V AC	≤1000 V DC
	 TA3.1	3VA957.-0JB23 3VA957.-0JG23		Q	G	
	 TA3.2	3VA967.-0JB32 3VA967.-0JG32 3VA967.-0JD32 3VA967.-0JK32		Q	G	
	 TA4.1	3VA967.-JJ24 3VA967.-JC24		R	R	R
	 TA4.3	3VA967.-0JJ43 3VA967.-0JC43 3VA967.-0JE43 3VA967.-0JL43		R	R	R
  		3VA967.-0QA00		S	S	R
		3VA967.-0QB00		S+U	R	R

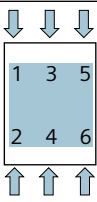
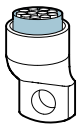
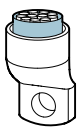
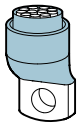
4.3 Connection system

			Position	≤480 V AC ≤250 V DC	≤600 V AC	≤1000 V DC
  		3VA967.-0QA00		T	T	T
		3VA967.-0QA00		T+U	T+U	T+U
  		3VA967.-0QC00		S+U	S+U	
		3VA967.-0QC00		T+U	T+U	

4.3.4.11 Insulation measures for 3VA61/62/63/64 molded case circuit breakers for UL use

			Position	≤240 V AC ≤480 V AC	≤600 V AC
	 TA1.5	3VA9...-0JB1. 3VA9...-0JG1. 3VA9...-0JD1. 3VA9...-0JK1.		--	A/B/D
		3VA9...-0JA12		--	A/B/D
	 TA2.2	3VA9...-0JJ.3 3VA9...-0JC.3 3VA9...-0JJ2. 3VA9...-0JC2. 3VA9...-0JF60		D	D
	 TA2.3  TA2.6				
  		3VA9...-0QA00		--	A/B/D
		3VA9...-0QB00		D/F	D
		3VA947...-0QC00 ¹⁾		K/L	K

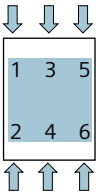
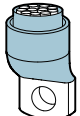
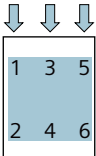
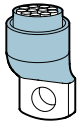
¹⁾ For 3VA63/64 only

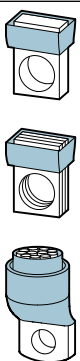
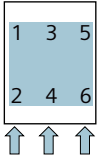
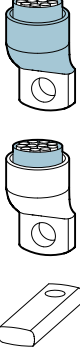
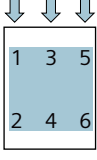
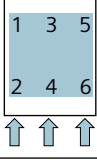
			Position	≤240 V AC ≤480 V AC	≤600 V AC
		3VA9...-0QA00		D/F	D
		3VA9...-0QB00		D/F	D
		3VA947...-0QC00 ¹⁾		K/L	K
		3VA9...-0QA00		E/F	D/E/F
		3VA9...-0QB00		D/F	D
		3VA947...-0QC00 ¹⁾		K/L	K
    		3VA9...-0QE.0		C	G/H
		3VA9...-0QF.0		C	G/H

¹⁾ For 3VA63/64 only

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4.3.4.12 Insulation measures for 3VA65/66 molded case circuit breakers for UL use

			Position	≤480 V AC	≤600 V AC
	 TA3.1	3VA957.-0JB23 3VA957.-0JG23		Q	G
	 TA3.2	3VA967.-0JB32 3VA967.-0JG32 3VA967.-0JD32 3VA967.-0JK32		Q	G
	 TA4.1	3VA967.-JJ24 3VA967.-JC24		R	R
	 TA4.3	3VA967.-0JJ43 3VA967.-0JC43 3VA967.-0JE43 3VA967.-0JL43		R	R
  		3VA967.-0QA00		S	S
		3VA967.-0QB00		S+U	S+U

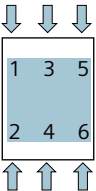
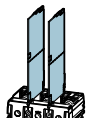
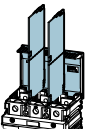
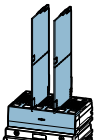
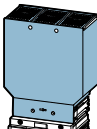
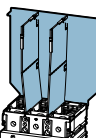
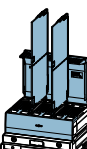
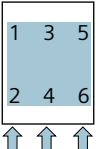
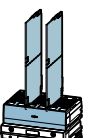
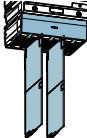
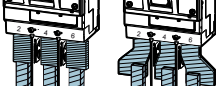
			Position	≤480 V AC	≤600 V AC
		3VA967.-0QA00		T	T
		3VA967.-0QA00		T+U	T+U
		3VA967.-0QC00		S+U	S+U
		3VA967.-0QC00		T+U	T+U

4.3.4.13 Insulation measures - IEC

The insulation measures for IEC applications are presented in the following. The insulation measures are identified with letters in the tables. These letters stand for the following insulation accessories:

Insulation requirements for all terminals				
	A	B	C	D

4.3 Connection system

				
	3VA9272-0WA00 3VA9472-0WA00	3VA9272-0WA00 3VA9472-0WA00	3VA9271-0WD.0 3VA9471-0WD.0	3VA9271-0WD.0
E	F	G	H	K
				
3VA9272-0WA00 3VA9271-0WJ.0 3VA9472-0WA00 3VA9471-0WJ.0	3VA9272-0WA00 3VA9271-0WJ.0 3VA9472-0WA00 3VA9471-0WJ.0	3VA9272-0WA00 3VA9271-0WD.0 3VA9472-0WA00 3VA9471-0WD.0	3VA9272-0WA00 3VA9271-0WD.0 3VA9472-0WA00 3VA9471-0WD.0	3VA9471-0WG.0
L	M	N	Q	R
				
3VA9472-0WA00 3VA9471-0WK.0	3VA9472-0WA00 3VA9471-WJ.0 3VA9471-0WD.0	3VA9472-0WA00 3VA9471-WJ.0 3VA9471-0WD.0	3VA9671-0WD30 3VA9671-0WD40	3VA9671-0WE30 3VA9671-0WE40
				--
				No insulation requirements
Insulation requirements only for terminals 2 / 4 / 6				
	S	T	U	--
				No insulation requirements
	3VA967.-0QA00 3VA967.-0WA00	3VA967.-0QA00 3VA967.-0WA00		

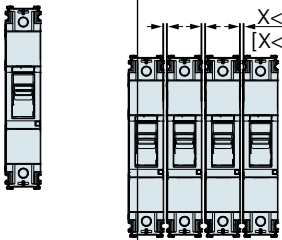
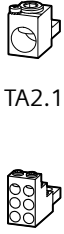
Note

All the presented insulation measures represent minimum requirements.

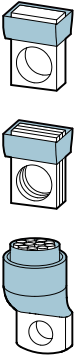
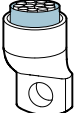
Covers can be replaced with higher-quality covers:

- Insulation measure A can be replaced with D and E
- Insulation measure B can be replaced with D and F
- Insulation measure E can be replaced with D
- Insulation measure L can be replaced with K

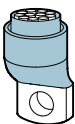
4.3.4.14 Insulation measures for 3VA51 molded case circuit breakers for IEC use

			3VA51...	3VA51...-ED1.	
			≤600 V AC ≤500 V DC		
	 TA1.0 TC1.0	3VA913.-0JB10 3VA913.-0JG10 3VA913.-0JD10 3VA913.-0JK10	--		
	 TA1.1 TC1.1	3VA913.-0JB11 3VA913.-0JG11 3VA913.-0JD11 3VA913.-0JK11	--		
	 TS1.1	3VA913.-0JA11	--		
	 TA2.1 TA2.5	3VA913.-0JJ12 3VA913.-0JC12 3VA913.-0JF60	D		

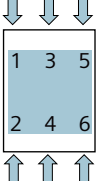
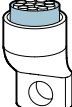
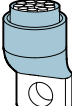
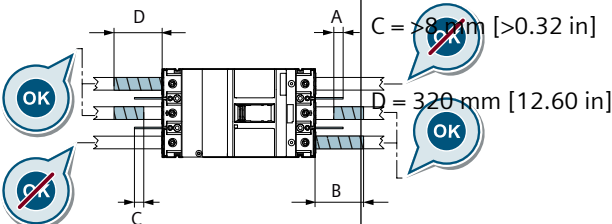
4.3 Connection system

		3VA913.-0QA00	--		
		3VA913.-0QB00	D/F		
		3VA913.-0QE00	--		
		3VA913.-0QA00	D/F		
		3VA913.-0QB00	D/F		
		3VA913.-0QE00	--		

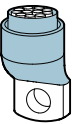
4.3.4.15 Insulation measures for 3VA52 molded case circuit breakers for IEC use

IEC			Position	≤415 V AC ≤415 V DC	≤690 V AC ≤750 V DC
		3VA923.-0JB12 3VA923.-0JG12 3VA923.-0JD12 3VA923.-0JK12		--	D/E/F
		3VA923.-0JA1.		--	D/E/F
	 TA2.2  TA2.3  TA2.6	3VA923.-0JJ13 3VA923.-0JC13 3VA923.-0JJ22 3VA923.-0JC22 3VA923.-0JF60		D	D
		3VA923.-0QA00		--	D/E/F
 		3VA927.-0QB00		A/B	D/E/F

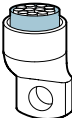
4.3 Connection system

IEC			Position	≤415 V AC ≤415 V DC	≤690 V AC ≤750 V DC
1) 		3VA923.-0QA00		D/F	
		3VA927.-0QB00		D/F	
		3VA923.-0QA00		A/B/D	D/E/F
		3VA927.-0QB00		D/F	D
    		3VA923.-0QE.0		C/G/H	G/H
		3VA923.-0QF.0		C/G/H	G/H
1) 	 A = >8 mm [>0.32 in] B = 320 mm [12.60 in] C = >8 mm [>0.32 in] D = 320 mm [12.60 in]				

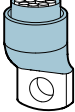
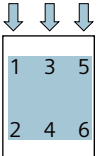
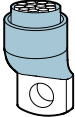
4.3.4.16 Insulation measures for 3VA53/54 molded case circuit breakers for IEC use

IEC			Position	480 V AC 500 V AC	600 V AC 600 V DC
	 TA1.5 TC1.5	3VA937.-0JB13 3VA937.-0JG13 3VA937.-0JD13 3VA937.-0JK13		--	A/B/D
	 TS1.5	3VA947.-0JA13		--	A/B/D
	 TA2.4 TC2.4	3VA947.-0JJ23 3VA947.-0JC23 3VA947.-0JE23 3VA947.-0JL23 3VA937.-0JF60		D	D
	 TA2.6				
	 TA2.8	3VA937.-0JJ24 3VA937.-0JC24		D	D
  	 3VA947.-0QA00			--	A/B/D
	 3VA947.-0QB00			D/F	D
	 3VA947.-0QC00			K/L	K
	 3VA947.-0QE.0			C	G/H
	 3VA947.-0QF.0			C	G/H

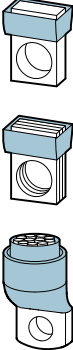
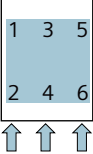
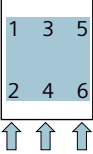
4.3 Connection system

			Position	480 V AC 500 V AC	600 V AC 600 V DC
		3VA947.-0QA00		D/F	D
		3VA947.-0QB00		D/F	D
		3VA947.-0QC00		K/L	K
		3VA947.-0QE.0		C	G/H
		3VA947.-0QF.0		C	G/H
		3VA947.-0QA00		E/F	D/E/F
		3VA947.-0QB00		D/F	D
		3VA947.-0QC00		K/L	K
		3VA947.-0QE.0		C	G/H
		3VA947.-0QF.0		C	G/H

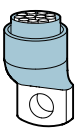
4.3.4.17 Insulation measures for 3VA55 molded case circuit breakers for IEC use

IEC			Position	≤480 V AC ≤250 V DC	≤600 V AC	≤1000 V DC
	 TA3.1	3VA957.-0JB23 3VA957.-0JG23		Q	G	
	 TA3.2	3VA967.-0JB32 3VA967.-0JG32 3VA967.-0JD32 3VA967.-0JK32		Q	G	
	 TA4.1	3VA967.-JJ24 3VA967.-JC24		R	R	R
	 TA4.3	3VA967.-0JJ43 3VA967.-0JC43 3VA967.-0JE43 3VA967.-0JL43		R	R	R
  		3VA967.-0QA00		S	S	R
				S+U	R	R
		3VA967.-0QB00				

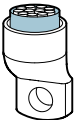
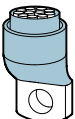
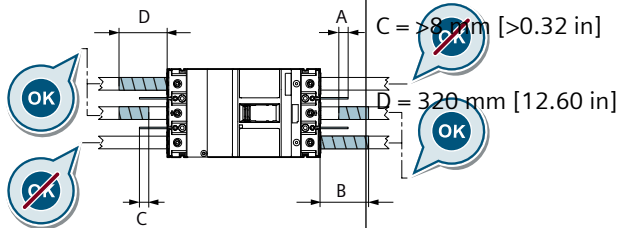
4.3 Connection system

			Position	≤480 V AC ≤250 V DC	≤600 V AC	≤1000 V DC
		3VA967.-0QA00		T	T	T
		3VA967.-0QA00		T+U	T+U	T+U
		3VA967.-0QC00		S+U	S+U	
		3VA967.-0QC00		T+U	T+U	

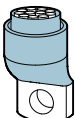
4.3.4.18 Insulation measures for 3VA61/62 molded case circuit breakers for IEC use

IEC			Position	≤500 V AC	≤690 V AC
	 TA1.1	3VA9.4.-0JB1. 3VA9.4.-0JG1. 3VA9.4.-0JD1. 3VA9.4.-0JK1.		--	D/E/F
		3VA9.4.-0JA12		--	D/E/F
	 TA2.2	3VA924.-0JJ13 3VA924.-0JC13 3VA924.-0JJ22 3VA924.-0JC22 3VA924.-0JF60		D	D
	 TA2.3				
	 TA2.6				
  		3VA924.-0QA00		--	D/E/F
		3VA927.-0QB00		A/B	D/E/F

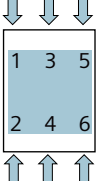
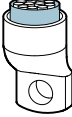
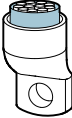
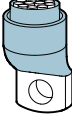
4.3 Connection system

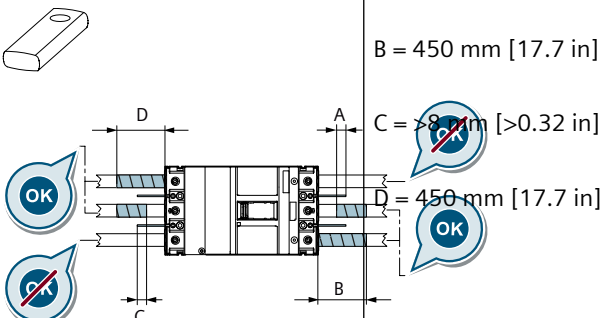
IEC			Position	≤500 V AC	≤690 V AC
1) 		3VA924.-0QA00		A/B	
		3VA927.-0QB00		A/B	
		3VA924.-0QA00		A/B	D/E/F
		3VA927.-0QB00		A/B	D/F
    		3VA924.-0QE.0		C	M/N
		3VA924.-0QF.0		C	M/N
1)  					

4.3.4.19 Insulation measures for 3VA63/64 molded case circuit breakers for IEC use

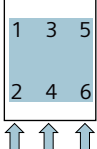
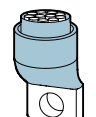
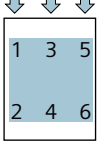
IEC			Position	≤500 V AC	≤690 V AC
	 TA1.5	3VA937.-0JB13 3VA937.-0JG13 3VA937.0JD13 3VA937.0JK13		--	D/E/F
	 3VA9.47-0JA13			--	D/E/F
	 TA2.2	3VA947.-0JJ23 3VA947.-0JC23 3VA947.-0JE23 3VA947.-0JL23 3VA937.-0JF60		D	D
	 TA2.3				
	 TA2.6				
  	 3VA924.-0QA00			--	D/E/F
	 3VA927.-0QB00			A/B	D/E/F
	 3VA947.-0QF.0			A/B	K/L

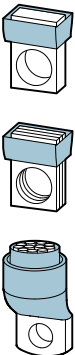
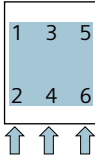
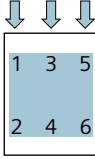
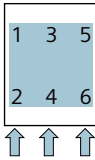
4.3 Connection system

IEC			Position	≤500 V AC	≤690 V AC
1) 		3VA924.-0QA00		A/B	
		3VA947.-0QB00		A/B	
		3VA947.-0QF.0		B/K/L	
		3VA947.-0QA00		A/B	D/E/F
		3VA947.-0QB00		K/L	D/F
		3VA947.-0QF.0		K/L	K/L
    		3VA947.-0QE.0		C	M/N
		3VA947.-0QF.0		C	M/N

1) 	A = >8 mm [>0.32 in] B = 450 mm [17.7 in] C = >8 mm [>0.32 in] D = 450 mm [17.7 in]			
---	---	--	--	--

4.3.4.20 Insulation measures for 3VA65/66 molded case circuit breakers for IEC use

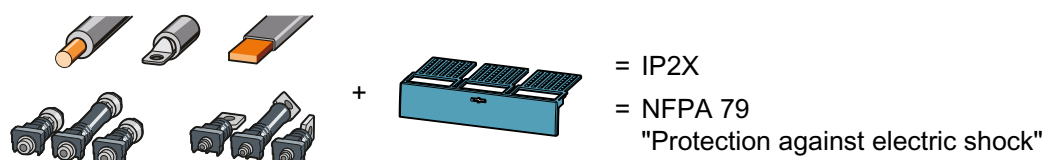
			Position	≤480 V AC	≤600 V AC
	 TA3.1	3VA957.-0JB23 3VA957.-0JG23		Q	G
	 TA3.2	3VA967.-0JB32 3VA967.-0JG32 3VA967.-0JD32 3VA967.-0JK32		Q	G
	 TA4.1	3VA967.-JJ24 3VA967.-JC24		R	R
	 TA4.3	3VA967.-0JJ43 3VA967.-0JC43 3VA967.-0JE43 3VA967.-0JL43		R	R
  		3VA967.-0QA00		S	S
		3VA967.-0QB00		S+U	S+U

IEC			Position	≤480 V AC	≤600 V AC
		3VA967.-0QA00		T	T
		3VA967.-0QA00		T+U	T+U
		3VA967.-0QC00		S+U	S+U
		3VA967.-0QC00		T+U	T+U

4.3.4.21 Touch protection

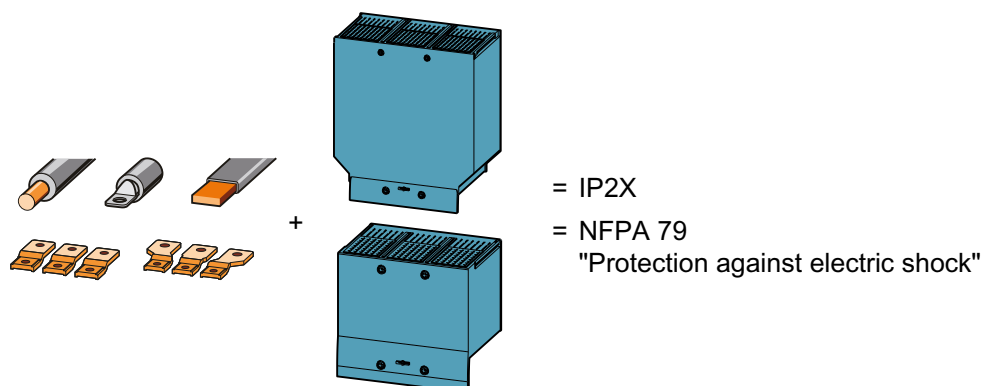
Insulated cables and busbars

With insulated cables and busbars whose insulation extends inside the termination area of the 3VA molded case circuit breaker, finger safety according to IP2X degree of protection is achieved in IEC applications with the terminal cover. The requirements of NFPA 79 "Protection against electric shock" for UL applications are met with degree of protection IP20. A basic precondition for this is proper installation.



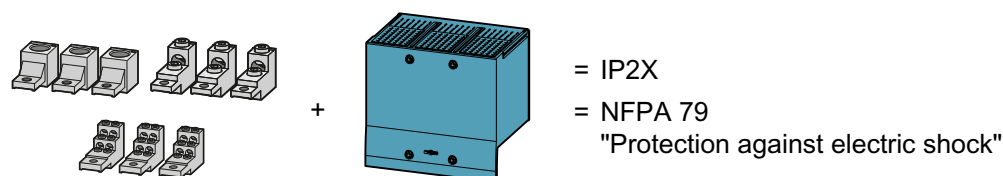
Non-insulated cables and busbars

With non-insulated cables and busbars and bus connectors extended or bus connectors broadened, finger safety according to IP2X degree of protection is achieved in IEC applications with terminal covers extended or broadened. The requirements of NFPA 79 "Protection against electric shock" for UL applications are met with degree of protection IP20. A basic precondition for this is proper installation.



External wire connectors

External wire connectors are supplied as standard with a terminal cover extended. When a terminal cover extended is used and properly installed, the external wire connectors achieve finger safety according to IP2X degree of protection in IEC applications. The requirements of NFPA 79 "Protection against electric shock" for UL applications are met with degree of protection IP20.



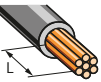
4.3.4.22 Control wire tap



The portfolio of the 3VA UL molded case circuit breaker enables easy implementation of an auxiliary conductor connection.

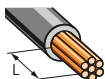
4.3 Connection system

Internal connection options for cable connection with cross-section specifications in AWG

Auxiliary conductor connection			
Use		Auxiliary conductor connection at wire connectors	Auxiliary conductor connection for busbar connection
Suitable cables and busbars		Ring cable lug plug-in connection	Ring cable lug plug-in connection, bare conductor
Copper cable	Stranded (Class C)	2 x 18 AWG ... 14 AWG	2 x 18 AWG ... 14 AWG
	Stranded (Class B)	2 x 18 AWG ... 14 AWG	2 x 18 AWG ... 14 AWG
	Solid (Class A)	2 x 18 AWG ... 14 AWG	2 x 18 AWG ... 14 AWG
Stripped length of cable L 		0.2 ... 0.3 in	0.2 ... 0.3 in
Tightening torque	Stranded (Class C)	TA1.x/TC1.x: 4.4 lb-in TA2.x/TC2.x: 4.4 lb-in TA3.x/TC3.x: 17.7 lb-in TA4.x/TC4.x: 17.7 lb-in TA6.x/TC6.x: 10 lb-in	17.7 lb-in
	Stranded (Class B)		
	Solid (Class A)		

Internal connection options for cable connection with cross-section specifications in mm²

Auxiliary conductor connection			
Use		Auxiliary conductor connection at wire connectors	Auxiliary conductor connection for busbar connection
Suitable cables and busbars		Ring cable lug plug-in connection	Ring cable lug plug-in connection, bare conductor

Copper cable	Finely stranded (Class 5/6)	2 x 0.75 ... 2.5 mm ²	2 x 0.75 ... 2.5 mm ²
	Finely stranded (Class 5/6) with end sleeve	2 x 0.75 ... 2.5 mm ²	2 x 0.75 ... 2.5 mm ²
	Stranded (Class 2)	--	--
	Solid (Class 1)	2 x 0.75 ... 2.5 mm ²	2 x 0.75 ... 2.5 mm ²
Stripped length of cable L 		5 ... 8 mm	5 ... 8 mm
Tightening torque	Finely stranded (Class 5/6)	TA1.x/TC1.x: 0.5 Nm TA2.x/TC2.x: 0.5 Nm TA3.x/TC3.x: 2.0 Nm TA4.x/TC4.x: 2.0 Nm TA6.x/TC6.x: 1.1 Nm	2 Nm
	Stranded (Class 2)		
	Solid (Class 1)		

Note

A maximum current limit of 15 A applies to all auxiliary conductor connections for 3VA UL molded case circuit breakers. Auxiliary conductor overcurrent protection must be applied separately.

The tapping of the auxiliary conductor connection must be taken into account when configuring the molded case circuit breaker. Suitable cable cross-sections: Cables up to a maximum of AWG 14 / 2.5 mm² can be connected. If 2 cables are connected, these must have the same cross-section and the same connection type.

All wire connectors can be ordered with auxiliary conductor connection under a separate article number. The wire connector is then supplied with a hole for the auxiliary conductor connection. A ring cable lug can be applied using this hole and, in some cases, a spade plug-in connector. The required screw is supplied.

Auxiliary conductor connection for busbar connection

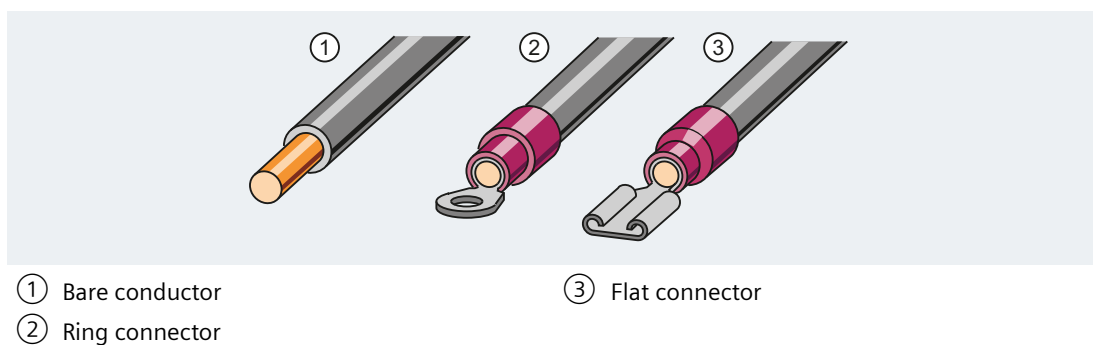
This auxiliary conductor connection is installed on the 3VA UL molded case circuit breaker with the busbar to be installed.

It can also be installed using:

- Front bus connectors extended
- Front bus connectors broadened

The following connections can be selected for the control wire tap:

4.4 Plug-in and draw-out technology



4.4 Plug-in and draw-out technology

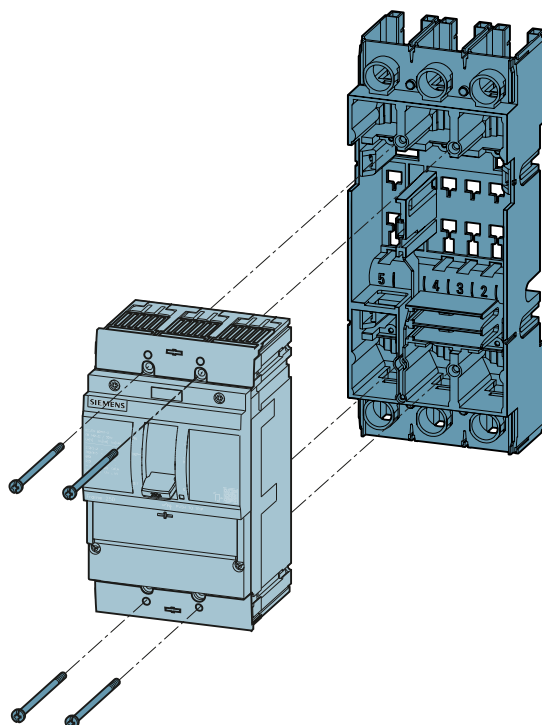
4.4.1 Introduction

In most applications, 3VA UL molded case circuit breakers are fixed-mounted in switchboards or distribution boards. The breaker is normally secured by fixing screws directly to the mounting plate or other suitable supports inside the control cabinet. The cables or busbars of the main circuits are connected directly to the 3VA UL molded case circuit breaker with various terminals or connectors. The molded case circuit breaker thus has a fixed and rigid connection to the control cabinet.

For certain applications, such as for cyclic inspections or service, it must be possible to replace the 3VA UL molded case circuit breakers quickly. To meet this requirement, the molded case circuit breakers can be retrofitted for plug-in and withdrawable technology.

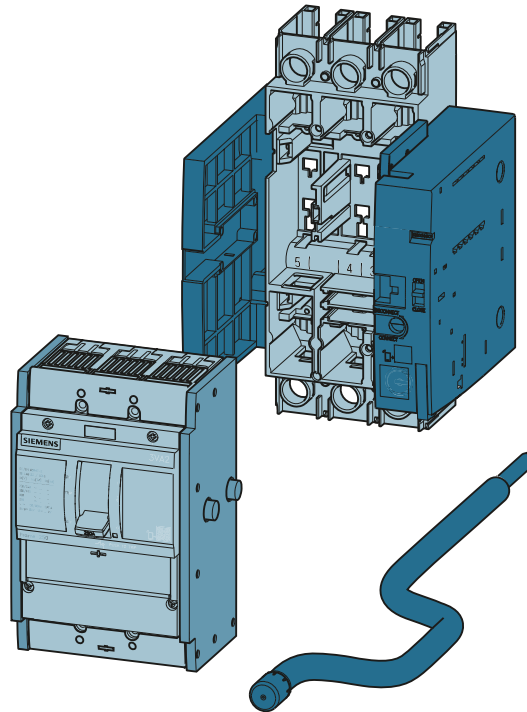
The main differences between plug-in units and withdrawable units are convenience of operation and the potential for functional expansion.

Plug-in technology



Plug-in technology is the less expensive and more space-saving of the two solutions. Here, the molded case circuit breaker is inserted into the corresponding socket and equipped with plug-in contacts that establish a force- and form-fitted connection with the mating contacts in the plug-in socket – the tulip contacts. In this case, the device is plugged in and withdrawn manually.

Withdrawable technology



With withdrawable technology, the 3VA UL molded case circuit breaker is equipped with plug-in contacts for the main conducting paths, as with plug-in technology. In addition, side walls including guide and retaining studs are screwed onto the side of the molded case circuit breakers.

In this case, the mating contacts are in the withdrawable socket. This is also equipped with a guide mechanism via which the molded case circuit breaker is moved into the withdrawable socket by means of a crank handle in order to connect the breaker to the main circuits. The operator can clearly read from a position indicator whether the breaker is properly connected to the main circuits or is 100% safely isolated from them (so that it can be withdrawn).

Cable connection

With plug-in and withdrawable circuit breakers, the cables or busbars are connected to the plug-in socket or the withdrawable socket. Here, the termination areas are implemented in the same way as for the molded case circuit breaker. That is, all the connection technology available for the 3VA UL molded case circuit breaker is also available in a similar way for the plug-in and withdrawable sockets.

Plug-in and withdrawable designs for 3VA UL

The following describes the interplay of plug-in and withdrawable technology and 3VA UL molded case circuit breakers. However, the 3VA UL molded case switch (MCS) and

motor circuit protector (MCP) types can also be implemented with plug-in or withdrawable technology. The information given below also applies analogously to these device types.

 **WARNING**

Arcing hazard

Insertion and withdrawal of the 3VA UL molded case circuit breaker in switched-on state (circuit breaker position ON) leads to formation of arcs between contacts and can result in irreparable damage to the molded case circuit breaker and electrical installation as well as bodily injuries.

Install an autotrip plunger in all 3VA UL molded case circuit breakers before inserting into a plug-in or withdrawable socket. Always turn the circuit breaker OFF before removing from a plug-in or withdrawable socket.

Note the color coding and labels for the autotrip plunger:

- Plug-in technology: Black, labeled "Plug-in"
- Withdrawable design: Grey, labeled "Withdrawable"

The autotrip plunger cannot be removed from the circuit breaker after installation.

Before inserting or withdrawing the molded case circuit breaker into or from the socket, use the handle to switch it to the OFF position. In order to prevent operating errors, 3VA UL molded case circuit breakers are equipped with an autotrip plunger when they are converted to plug-in or withdrawable designs. This plunger immediately trips the molded case circuit breaker (circuit breaker position TRIP) and thus opens the switching contacts whenever an attempt is made to withdraw a closed molded case circuit breaker (circuit breaker position ON) or close a breaker which is not properly engaged with a base.

4.4.2 Overview of variants / products

Installation overview

The table below lists the 3VA UL molded case circuit breakers that are available in 3-pole and 4-pole versions for fixed mounting, plug-in and withdrawable technology:

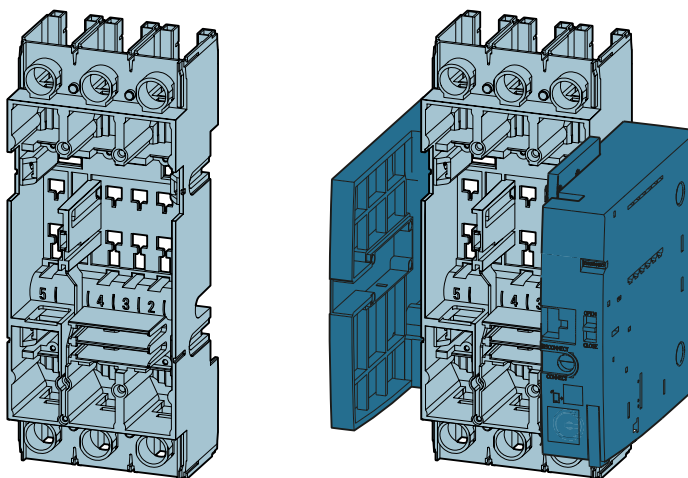
4.4 Plug-in and draw-out technology

Frame size		Fixed mounting	Plug-in technology	Withdrawable technology
3VA5	(Applies to all frame sizes)	✓	--	--
3VA6	3VA61 150 A, 3-pole	✓	✓	✓
	3VA61 150 A, 4-pole	✓	✓	✓
	3VA62 250 A, 3-pole	✓	✓	✓
	3VA62 250 A, 4-pole	✓	✓	✓
	3VA63 400 A, 3-pole	✓	✓	✓
	3VA63 400 A, 4-pole	✓	✓	✓
	3VA64 600 A, 3-pole	✓	✓	✓
	3VA64 600 A, 4-pole	✓	✓	✓

Besides the complete kit for plug-in or withdrawable technology, a "conversion kit" for the 3VA UL molded case circuit breaker alone can be ordered. These conversion kits are used to prepare 3VA UL molded case circuit breakers so that completely assembled molded case circuit breakers are available at short notice if a replacement is required. They include all components that are installed on the molded case circuit breakers.

4.4.3 General information

With plug-in and draw-out circuit breakers, the cables or busbars are connected to the plug-in socket or the draw-out socket. The same socket unit is used for the same sizes of both variants.



The termination area of the incoming and outgoing side of the socket unit is implemented the same as the associated 3VA UL molded case circuit breakers. The major benefit of this is that all terminal and connection variants including terminal covers of the 3VA UL molded case circuit breaker can be used with the corresponding plug-in or draw-out unit without limitation.

Which connection technology is available for a 3VA UL size and which cable or busbar cross-sections can be used here is described in detail in chapter Connection system (Page 214).

4.4.4 Information about installation, built-on and built-in components

Securing plug-in and draw-out units to the mounting plate

Bolts supplied with complete kit

Supplied with each complete kit for plug-in or draw-out technology:

- 4 fastening bolts, metric thread, Phillips pan head

The fastening bolts are used to attach the relevant socket unit to a mounting plate or supports. Fastening bolts with an inch thread are also available.

Mounting positions

The permissible mounting positions are described in Chapter Permissible mounting positions and mounting positions with accessories (Page 65).

See also

Connection system (Page 214)

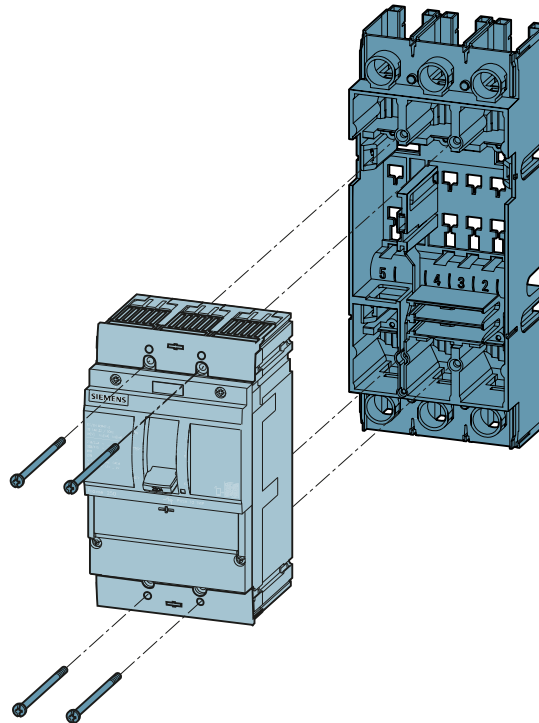
4.4.5 Plug-in technology

4.4.5.1 Product description

Applications

The plug-in units for the 3VA UL molded case circuit breakers are designed for complex applications in which fast replacement of the molded case circuit breaker is needed. Plug-in technology can be used, for example, when clear visual evidence of safe electrical isolation of circuits is essential, e.g. when inspection work is in progress.

Description



With a plug-in system, the molded case circuit breaker is moved into and out of the plug-in socket manually.



WARNING

Projectile hazard.

The molded case circuit breaker can be ejected from its socket by the resulting magnetic forces of a short-circuit event if not properly secured to its base.

Screw the 3VA UL molded case circuit breakers to the plug-in socket in inserted state. The complete kit for plug-in technology contains assembly screws for this purpose.

A complete kit for plug-in technology contains all the components for conversion of a fixed-mounted molded case circuit breaker type to a plug-in technology type.

A complete kit for plug-in technology contains:

- Plug-in socket
- 4 fixing screws for installing the socket in the control cabinet

- Fixing screws for securing the molded case circuit breaker in the plug-in socket:
 - 3-pole version:
2 fixing screws from the scope of supply of the plug-in unit and
2 fixing screws from the scope of supply of the molded case circuit breaker
 - 4-pole version:
No additional fixing screws in the scope of supply of the plug-in unit
4 fixing screws from the scope of supply of the molded case circuit breaker
- Plug-in contacts for attachment to the main connections of the molded case circuit breaker
 - 3-pole: 6 plug-in contacts
 - 4-pole: 8 plug-in contacts
- Autotrip plunger, labeled with "Plug-in"
- 2 screw-mounted terminal covers for the molded case circuit breaker
- Cable cages (see chapter Cable cage (Page 337))
- Frame size 3VA6 600 (3VA944.-0KP00) only: Broadened bus connectors extended and corresponding terminal covers

Note

The complete plug-in technology kits for circuit breaker frame sizes 3VA6 600 (3VA944.-0KP00) additionally come with broadened bus connectors extended and corresponding terminal covers. For temperature reasons, molded case circuit breakers of frame size 3VA6 600 are installed and operated only with plug-in sockets with broadened bus connectors extended.

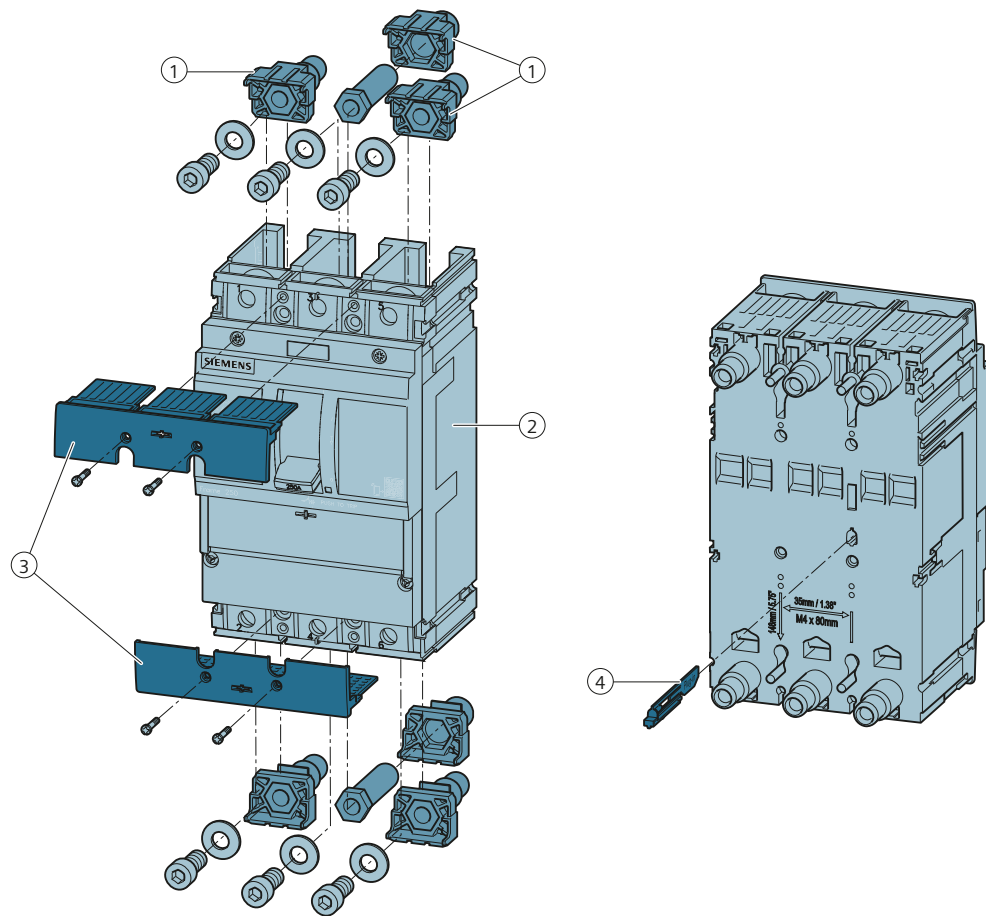
A conversion kit for plug-in technology contains:

- Plug-in contacts for attachment to the main connections of the molded case circuit breaker
 - 3-pole: 6 plug-in contacts
 - 4-pole: 8 plug-in contacts
- Autotrip plunger, labeled with "Plug-in"
- 2 screw-mounted terminal covers for the molded case circuit breaker
- Cable cages (see chapter Cable cage (Page 337))

Scope of supply of the 3VA UL molded case circuit breaker, 3VA UL molded case switch (MCS) and motor circuit protector (MCP):

- | | |
|-----------------------------------|------------------|
| • For 3-pole version up to 250 A: | 2 assembly bolts |
| • For 4-pole version | 4 assembly bolts |

4.4 Plug-in and draw-out technology



- ① Plug-in contacts for attachment to the main connections of the 3VA UL molded case circuit breaker
- ② 3VA UL molded case circuit breaker
- ③ Screw-mounted terminal covers for the molded case circuit breaker
- ④ Autotrip plunger

Terminal covers

As described above, two screw-mounted terminal covers are included in the plug-in socket complete kit and the plug-in socket conversion kit. These feature molded grips to ease withdrawal of the molded case circuit breaker from its socket. Since more force is needed to remove a molded case circuit breaker from its socket, the plug-in technology terminal covers are screwed to the molded case circuit breaker.

If the terminal area of the plug-in socket needs to be protected by terminal covers, a variety of terminal covers are available to order as options for this purpose. The circuit breaker terminal covers and insulation materials can be used because direct mounting on the plug-in socket is also possible.

Autotrip plunger

An autotrip plunger comes with every plug-in technology complete kit and every plug-in technology conversion kit for the 3VA UL molded case circuit breaker. The plunger performs safety functions in operation.

When a molded case circuit breaker is converted to a molded case circuit breaker for plug-in technology, this plunger is installed from the rear of the device and latched. The plunger performs safety functions in operation. It prevents the molded case circuit breaker from being switched to the ON position if the breaker is not correctly bolted to the plug-in socket. For further information, see also section "Signal 'Plug-in unit - MCCB correctly bolted to plug-in socket'" in chapter Position signaling switches (Page 326).

! WARNING

Arcing hazard

Insertion and withdrawal of the 3VA UL molded case circuit breaker in switched-on state (circuit breaker position ON) leads to formation of arcs between contacts and can result in irreparable damage to the molded case circuit breaker and electrical installation as well as bodily injuries.

Install an autotrip plunger in all 3VA UL molded case circuit breakers before inserting into a plug-in or withdrawable socket. Always turn the circuit breaker OFF before removing from a plug-in or withdrawable socket.

Note the color coding and labels for the autotrip plunger:

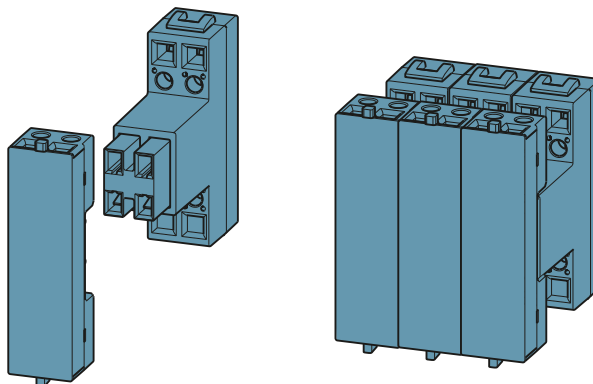
- Plug-in technology: Black, labeled "Plug-in"
- Withdrawable design: Grey, labeled "Withdrawable"

The autotrip plunger cannot be removed from the circuit breaker after installation.

Auxiliary circuit connectors

Molded case circuit breakers are frequently equipped with internal accessories, e.g. auxiliary switches, auxiliary releases, etc. A broad range of components is also available for the 3VA UL molded case circuit breaker. You can find more information on this in chapter Internal accessories (Page 196).

To ensure that the electrical connections required by plug-in units can be quickly and safely disconnected, auxiliary circuit connectors can be installed.



The part of the auxiliary circuit connectors on the circuit breaker side is mounted on the underside of the molded case circuit breaker using the cable cage and is electrically connected to the internal accessories. Appropriate openings and cable ducts are provided in the molded case circuit breaker for routing stranded wires. The plug-in socket half of

4.4 Plug-in and draw-out technology

the auxiliary circuit connector is inserted in the socket and electrically connected to the customer's installation.

When the molded case circuit breaker is inserted into the plug-in socket, the internal accessories in the breaker are quickly connected to the customer's installation without the use of tools.

Note

Plug-in and withdrawable units use different versions of the auxiliary circuit connector. The withdrawable version has a longer, movable telescopic rail because the distance to be bridged in the withdrawable socket is longer.

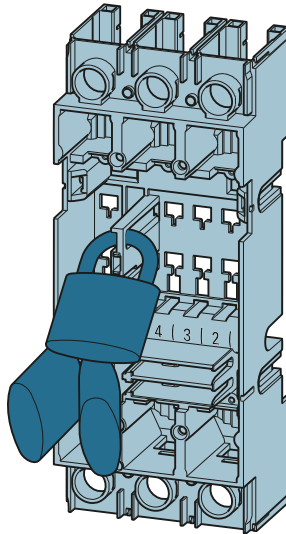
Further details about auxiliary circuit connectors can be found in chapter Auxiliary circuit connector (Page 332).

Position signaling in the plug-in socket

Several position signaling switches (number depends on socket size) can be fitted in the plug-in socket. Auxiliary switches are capable of signaling "Plug-in unit - MCCB correctly bolted to plug-in socket" via electrical connections.

You can find more information on this in chapter Position signaling switches (Page 326).

Padlocks for preventing insertion of a molded case circuit breaker



The socket unit can be locked with padlocks to prevent unauthorized insertion of a molded case circuit breaker during service calls and inspections. Using these locks to prevent insertion and operation of a molded case circuit breaker helps to protect personnel and the installation itself. The socket unit of the plug-in socket is equipped with three openings for padlocks.

Openings for padlocks:

- Up to 3 padlocks
- Shackle diameter 1/4" to 5/16" / 6 mm to 8 mm

Benefits of plug-in technology

- Defective molded case circuit breakers can be replaced quickly and easily
- Clear visual evidence of safe electrical isolation of main circuits with removal of the circuit breaker
- Remote signaling of molded case circuit breaker positions:
 - "INSERTED": The 3VA UL molded case circuit breaker is properly inserted and screwed into place
 - "WITHDRAWN": Screws have been removed, the 3VA UL molded case circuit breaker has been removed
- Plug-in socket can be locked by padlocks to prevent insertion of a molded case circuit breaker
- Degree of protection IP20 / this meets NFPA 79 "Protection against electric shock" requirements
- No grounding required

See also

Locking and interlocking (Page 394)

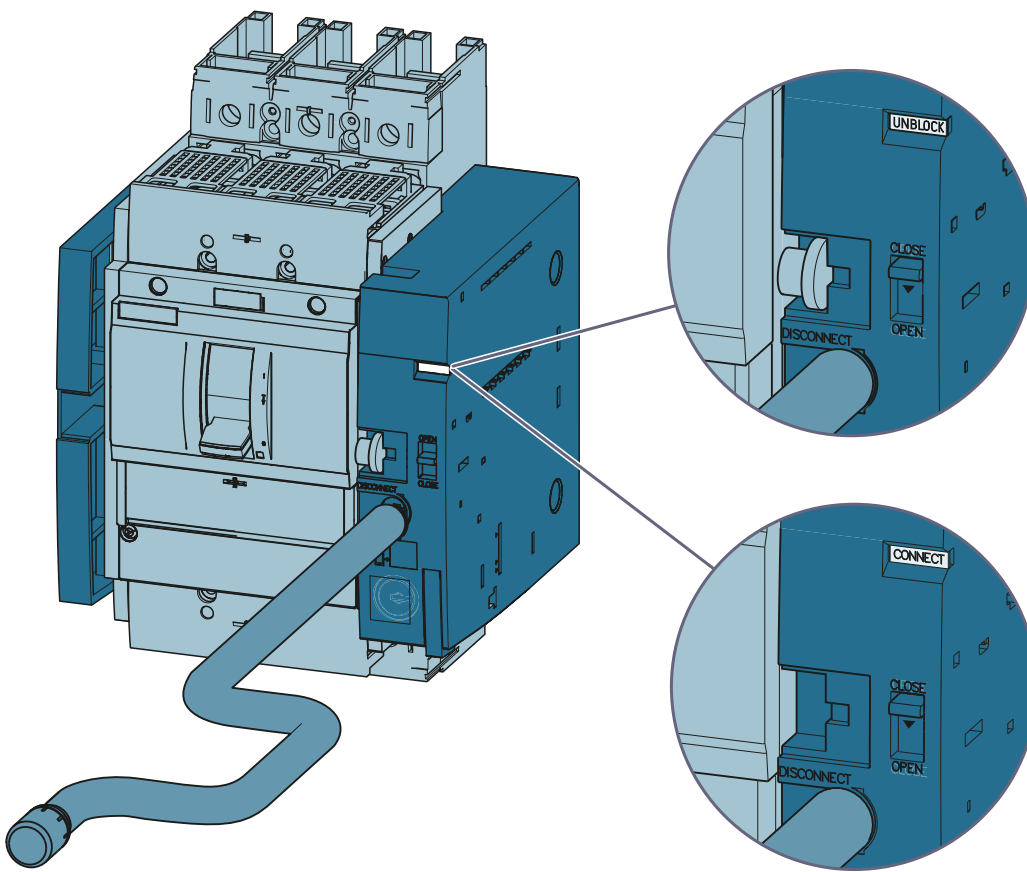
4.4.5.2 Combination with other accessories

Accessory group	Component
Manual operators	Front mounted rotary operator
	Door mounted rotary operator
Remote control mechanisms	MO320 motor operator
	SEO520 stored energy mechanism
Interlocks	Rear interlocking module
	Bowden cable interlocking for handle
Handle locking device	

4.4.6 Draw-out technology

4.4.6.1 Product description

Typical applications for withdrawable units for the 3VA UL molded case circuit breaker range are installations in which inspections need to be carried out at regular intervals and a visible electrical isolation is required by removal of the circuit breaker, which must be implemented quickly. In addition, withdrawable units for the 3VA UL molded case circuit breaker range are used when a very fast replacement of molded case circuit breakers or molded case switches is required.



In the case of withdrawable technology, the 3VA UL molded case circuit breaker is mounted on the side walls and can be moved into three defined positions by turning the crank handle. The current breaker position is indicated by the breaker status indicator.

Defined positions

- **CONNECT position:** The molded case circuit breaker is connected to the main circuits. The auxiliary circuits are also electrically connected to the installation via the auxiliary circuit connectors.
This is the normal operating position of the molded case circuit breaker.
- **TEST position:** The main circuits are not connected to the installation. The auxiliary circuits are connected to the installation via auxiliary circuit connectors.
The auxiliary circuits can be function-tested with the breaker in the TEST position even when the installation itself is not live.
- **DISCON position:** Neither the main circuits nor the auxiliary circuits are connected to the installation.
The molded case circuit breaker is electrically isolated.

If the molded case circuit breaker is not in any of these defined positions, the breaker status indicator displays the word UNBLOCK on a white background. When the breaker is in this position, its main contacts cannot be closed if the autotrip plunger is correctly installed (see below).

Move the molded case circuit breaker into a defined position**NOTICE****Irreparable damage to the racking mechanism when rotated in wrong direction**

The following operations will lead to irreparable damage of the withdrawable socket gear:

- Molded case circuit breaker is in DISCONNECT position:
Insertion of the crank handle (position indicator changes to UNBLOCK) and counterclockwise turning of the crank handle toward DISCONNECT.
- Molded case circuit breaker is in CONNECT position:
Insertion of the crank handle (position indicator changes to UNBLOCK) and clockwise turning of the crank handle toward CONNECT.

In the situations described above, pay attention **not** to turn the crank handle in the indicated direction.

Note

Once the circuit breaker has been moved into the position CONNECT, TEST or DISCON, the sliding clutch of the crank gear is disengaged and additional rotation of the crank handle has no effect.

By removing and reinserting the crank handle, it is possible to reengage the gear. The breaker status indicator will then show UNBLOCK. The molded case circuit breaker can now be moved to a new position.

1. If the crank handle is inserted in the crankcase, pull it out.
2. Insert the crank handle into the crankcase again.
By removing and reinserting the crank handle, it is possible to reengage the gear.
3. Turn the crank handle until the breaker status indication shows the required position.

Remove the molded case circuit breaker**NOTICE****Irreparable damage to the racking mechanism when rotated in wrong direction**

The following operations will lead to irreparable damage of the withdrawable socket gear:

- Molded case circuit breaker is in DISCONNECT position:
Insertion of the crank handle (position indicator changes to UNBLOCK) and counterclockwise turning of the crank handle toward DISCONNECT.
- Molded case circuit breaker is in CONNECT position:
Insertion of the crank handle (position indicator changes to UNBLOCK) and clockwise turning of the crank handle toward CONNECT.

In the situations described above, pay attention **not** to turn the crank handle in the indicated direction.

1. Move the molded case circuit breaker into the DISCON position.
The molded case circuit breaker is electrically isolated.
2. To disengage the lock, press the safety lock slide underneath the breaker status indication downwards as indicated by the arrow.
3. Remove the molded case circuit breaker.

Components of a complete kit for withdrawable technology

A complete kit for withdrawable technology contains all the components for conversion of a fixed-mounted molded case circuit breaker type to a withdrawable technology type.

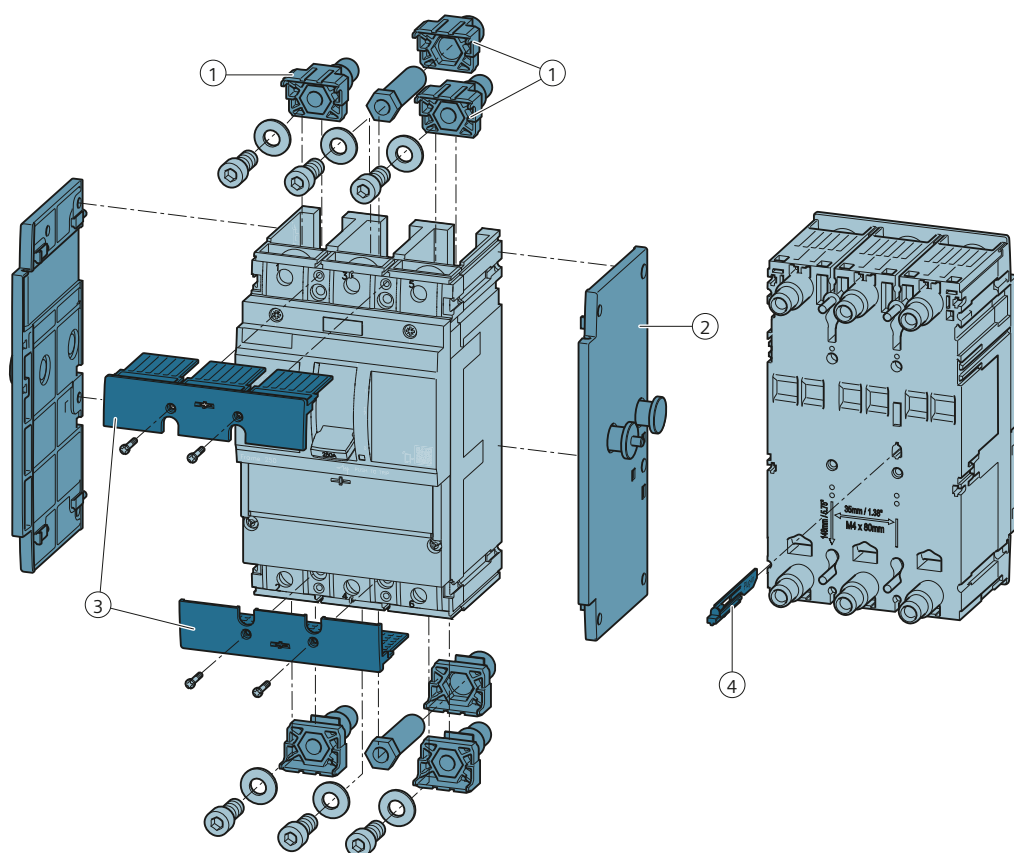
- Withdrawable socket including side walls with the mechanical components required to guide the molded case circuit breaker into and out of the socket under the control of a crank handle
- 4 fixing screws for installing the socket in the control cabinet
- Plug-in contacts for attachment to the main connections of the molded case circuit breaker
 - 3-pole: 6 plug-in contacts
 - 4-pole: 8 plug-in contacts
- Side walls with guide bolts for mounting on the molded case circuit breaker
- Autotrip plunger, labeled with "Withdrawable"
- 2 screw-mounted terminal covers for the molded case circuit breaker
- Cable cage (see chapter Cable cage (Page 337))
- Only frame size 3VA64 (3VA944.-0KP00): Broadened bus connectors extended and corresponding terminal covers

Note**Information about the crank handle**

The crank handle is not supplied as part of the complete kit and must be ordered separately.

Components of a conversion kit for withdrawable technology

- Plug-in contacts for attachment to the main connections of the molded case circuit breaker
 - 3-pole: 6 plug-in contacts
 - 4-pole: 8 plug-in contacts
- Side walls with guide bolts for mounting on the molded case circuit breaker
- Autotrip plunger, labeled with "Withdrawable"
- 2 screw-mounted terminal covers for the molded case circuit breaker



- ① Plug-in contacts for attachment to the main connections of the molded case circuit breaker
- ② Side walls with guide bolts for mounting on the molded case circuit breaker
- ③ Screw-mounted terminal covers for the molded case circuit breaker
- ④ Autotrip plunger

Installation instructions

The withdrawable socket is permanently mounted in the control cabinet by means of the fixing screws included in the complete kit for withdrawable technology.

4.4 Plug-in and draw-out technology

The molded case circuit breaker / molded case switch comes with two assembly screws (3-pole version) or four assembly screws (4-pole version). These screws are not required if the device is to be converted to a withdrawable unit.

Note

The complete kits for withdrawable technology for circuit breaker frame sizes 3VA64 (3VA944.-OKD00) additionally come with broadened bus connectors extended and corresponding terminal covers. For temperature reasons, molded case circuit breakers of frame size 3VA6 600 are installed and operated only with withdrawable sockets with broadened bus connectors extended.

Terminal cover

Two terminal covers are included in the scope of supply of the complete kit for withdrawable technology and the conversion kit for withdrawable technology for the molded case circuit breaker. These two terminal covers are intended for the molded case circuit breaker. If terminal covers are to be attached to the busbars of the withdrawable socket, they must be ordered separately, see chapter Insulating equipment (Page 267).

Autotrip plunger

An autotrip plunger is supplied as standard with every complete kit and every conversion kit for converting a molded case circuit breaker to withdrawable technology.



WARNING

Arcing hazard

Insertion and withdrawal of the 3VA UL molded case circuit breaker in switched-on state (circuit breaker position ON) leads to formation of arcs between contacts and can result in irreparable damage to the molded case circuit breaker and electrical installation as well as bodily injuries.

Install an autotrip plunger in all 3VA UL molded case circuit breakers before inserting into a plug-in or withdrawable socket. Always turn the circuit breaker OFF before removing from a plug-in or withdrawable socket.

Note the color coding and labels for the autotrip plunger:

- Plug-in technology: Black, labeled "Plug-in"
- Withdrawable design: Grey, labeled "Withdrawable"

The autotrip plunger cannot be removed from the circuit breaker after installation.

When a molded case circuit breaker is converted to a molded case circuit breaker for withdrawable technology, the autotrip plunger is installed from the rear of the device and latched.

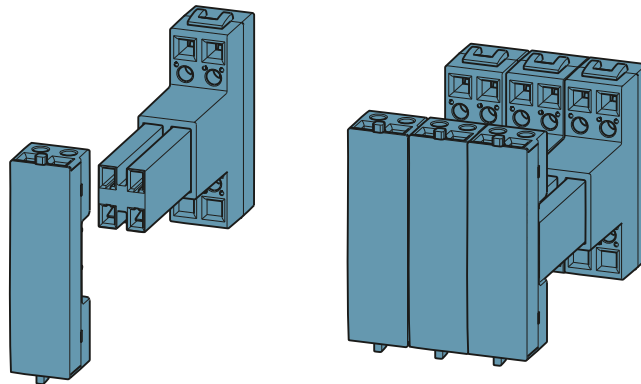
The autotrip plunger performs various safety functions in operation:

- It prevents closure of the main contacts of the molded case circuit breaker when the breaker is inserted in the withdrawable socket and in an undefined position (breaker status indication is UNBLOCK).
- It allows the breaker to be closed in the defined positions TEST and CONNECT.
- It trips the molded case circuit breaker (TRIP) when the breaker's main contacts are closed (switching position ON) and an attempt is made to move the breaker out of one of the three defined positions CONNECT, TEST or DISCON using the crank handle.

Auxiliary circuit connectors

Molded case circuit breakers are frequently equipped with internal accessories, e.g. auxiliary switches, auxiliary releases, etc. A broad range of components is also available for the 3VA UL molded case circuit breaker. You can find more information on this in chapter Internal accessories (Page 196).

To ensure that the electrical connections required by withdrawable units can be quickly and safely disconnected, auxiliary circuit connectors can be installed.



The part of the auxiliary circuit connectors on the circuit breaker side is mounted on the underside of the molded case circuit breaker using the cable cage and is electrically connected to the internal accessories. Appropriate openings and cable ducts are provided in the 3VA UL molded case circuit breaker for routing stranded wires. The socket-end half of the auxiliary circuit connector with the movable telescopic rail is inserted in the socket and electrically connected to the customer's installation.

When the molded case circuit breaker is inserted into the withdrawable unit, an electrical connection between the internal accessories in the breaker and the customer's installation is quickly established.

Note

Plug-in and withdrawable units use different versions of the auxiliary circuit connector.

The withdrawable version has a longer, movable telescopic rail because the distance to be bridged in the withdrawable socket is longer.

4.4 Plug-in and draw-out technology

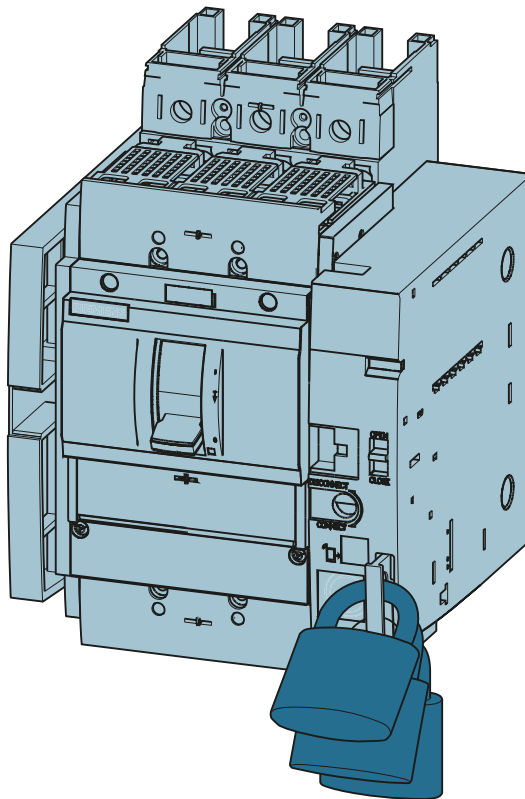
Further details about auxiliary circuit connectors can be found in chapter Auxiliary circuit connector (Page 332).

Position signaling in the withdrawable socket

Several position signaling switches can be inserted in the right side wall of the withdrawable socket. These auxiliary switches are capable of signaling breaker positions DISCON, TEST and CONNECT. The auxiliary switches also output a position indication signal if the molded case circuit breaker in the withdrawable socket is not in one of the positions specified above. For information, please refer to chapter Position signaling switches (Page 326).

Protection against unauthorized operation of molded case circuit breaker

Padlocks for protection against unauthorized operation



To provide protection against unauthorized operation of the molded case circuit breaker, padlocks can be inserted through the plastic frame opening of the padlock locking unit on the right side wall of the withdrawable socket. The plastic frame is simple to pull out. The crank handle opening is mechanically sealed when the plastic frame is in the OUT position.

Openings for padlocks:

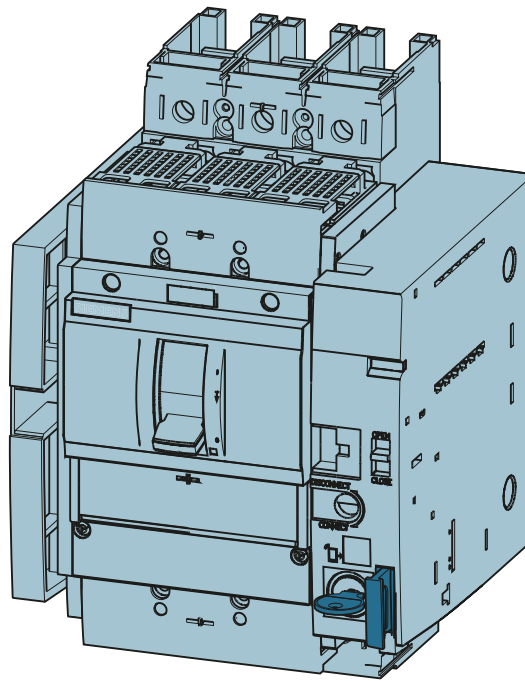
- Up to 3 padlocks
- Shackle diameter 1/4" to 5/16" / 6 mm to 8 mm

Attaching padlocks

1. Move the molded case circuit breaker into the CONNECT, TEST or DISCON position.
The breaker must be in one of these positions before the plastic frame can be pulled out.
2. Pull out the plastic frame.
The crank handle opening is sealed off.
3. Insert padlock shackles through the plastic frame and lock padlocks as illustrated above.

Cylinder lock for protection against unauthorized operation

A cylinder lock can be retrofitted in the right-hand side wall of the withdrawable socket. Like with the padlocks, it can be used to lock a molded case circuit breaker in the CONNECT, TEST and DISCON positions. The cylinder lock utilizes the locking mechanism of the plastic frame. This is evident from the way the plastic frame moves into or out of the socket as the cylinder lock is turned.

**Signaling of locked/unlocked status**

The locked or unlocked status of a withdrawable unit can be signaled electrically. An additional position signaling switch (3VA9977-0KB00) is inserted in the right side wall of the withdrawable socket for this. This switch signals whether the plastic frame described above is in the "IN" or "OUT" position. For further details, refer to chapter Position signaling switches (Page 326).

4.4 Plug-in and draw-out technology

Integration of molded case circuit breaker position signal into a communication network

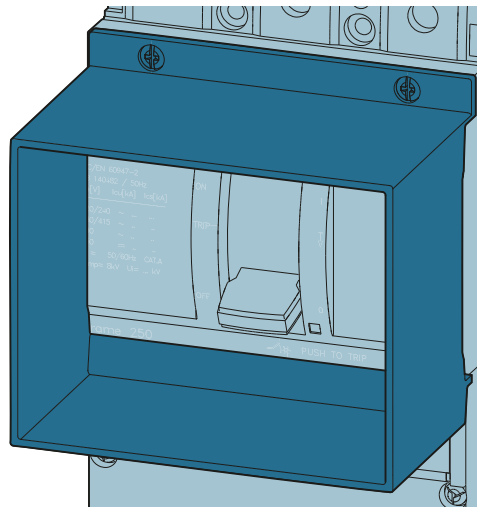
By means of the COM100 and COM800 data concentrators, various statuses of multiple molded case circuit breakers can be queried and passed on by bus systems. This includes messages such as "Breaker tripped", "Breaker on", "Breaker off", reason for tripping, etc. Depending on the version of the 3VA UL molded case circuit breaker, actual current and voltage measurements can also be passed on. To provide this communications capability, the molded case circuit breaker itself is equipped with a COM060 communications module which functions as the breaker's actual communications interface.

In addition to the status information listed above, the position of the molded case circuit breaker in the withdrawable unit can also be transferred. For this purpose, the molded case circuit breaker and guide frame must be equipped with the "Communication link for withdrawable unit" (3VA9977-0KC00). This assembly kit allows the position of the molded case circuit breaker in the withdrawable unit to be picked up and transferred to the COM060 communications module and from there to the higher-level communication network. You can find more information about the communication kit for withdrawable units in chapter Communications interface for draw-out unit (Page 331).

Operation through the cabinet door

The molded case circuit breaker can be optionally installed in the control cabinet in such a way that the breaker can be operated even when the cabinet door is closed. Withdrawable versions of molded case circuit breakers can then be switched on or off when the cabinet door is not open. This is made possible by a cutout in the cabinet door which allows access to the main operator controls, i.e. the handle and the <PUSH TO TRIP> button of the molded case circuit breaker, but prohibits access to other live components inside the control cabinet. This solution is referred to as a "door feedthrough".

Door feedthroughs are mounted on the front of the molded case circuit breaker and securely attached to the breaker by means of two bolts and a latch.



The cabinet door cutout must be positioned such that it is flush with the door feedthrough. It must also be positioned in such a way as to minimize the size of the gap between

the feedthrough walls and the cutout. Optimum results are achieved here by additionally attaching a cover frame (Page 484).

An opening in the panel through which the crank handle can be inserted must be provided in addition to the cutout for the door feedthrough.

With its straight sides, the door feedthrough is designed to allow the molded case circuit breaker to be moved through positions DISCON, TEST and CONNECT, while at the same time providing a permanently tight seal around the feedthrough area (degree of protection IP30) and preventing access to live components inside the panel.

Markings are visible on the door feedthrough to help the user identify the current position of the molded case circuit breaker as it is moved into or out of the panel. Since mounting dimensions may vary slightly, however, these markings should be regarded as a rough guide only. The crank handle mechanism provides the user with feedback information about the molded case circuit breaker position, e.g. whether it has been correctly inserted.

Benefits of withdrawable technology

- Defective molded case circuit breakers can be replaced quickly and easily
- Clear visual evidence of safe electrical isolation of main circuits with the circuit breaker removed
- Molded case circuit breaker and accessories can be function-tested in the TEST position
- Remote signaling of molded case circuit breaker positions CONNECT, TEST and DISCON
- Padlocks and / or cylinder locks can be used to lock withdrawable unit so that the molded case circuit breaker cannot be inserted or removed by unauthorized persons
- Molded case circuit breaker can be operated through the cabinet door
- Degree of protection IP20 / this meets NFPA 79 "Protection against electric shock" requirements
- No grounding required

See also

Locking and interlocking (Page 394)

4.4.6.2 Combination with other accessories

Accessory group	Component
Manual operators	Front mounted rotary operator
	Door mounted rotary operator
Remote control mechanisms	MO320 motor operator
	SEO520 stored energy mechanism
Interlocks	Rear interlocking module
	Bowden cable interlocking for handle
Handle locking device	

4.4.7 Accessories for plug-in and draw-out units

4.4.7.1 Description of individual product variants

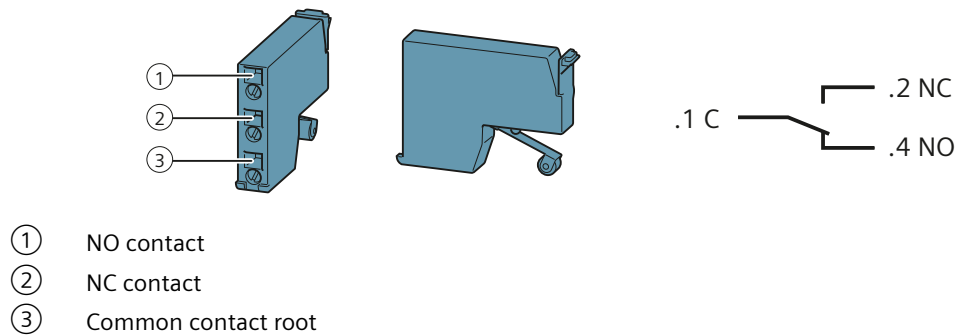
Position signaling switches

These auxiliary switches are capable of signaling a variety of states via electrical connections. The position signaling switch is available in only one version.

Applications:

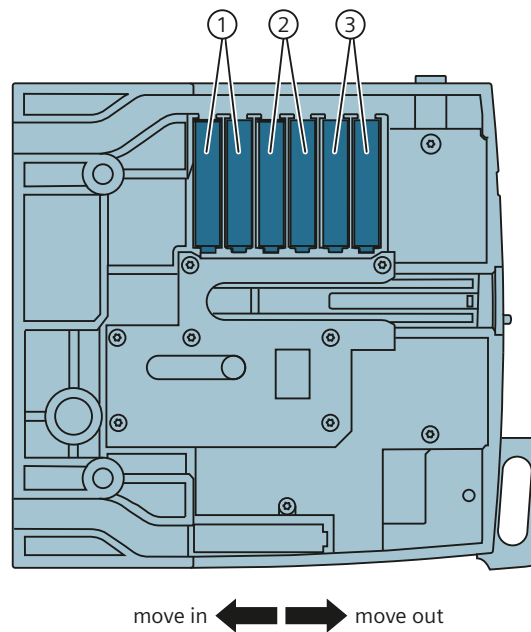
- Signal "Position of breaker in the withdrawable unit"
- Signal "Withdrawable unit locked / open"
- Signal "Plug-in unit - MCCB correctly bolted to plug-in socket"

The position signaling switches are changeover switches, i.e. they have three connections:



Signal "Position of molded case circuit breaker in the withdrawable unit"

So that the position of the molded case circuit breaker within the withdrawable socket can be passed on electrically to the monitoring and control systems, up to six position signaling switches can be inserted in the right side wall of the withdrawable unit at the following positions:



- ① Slot No. 41a or 41b: Detects position CONNECT
- ② Slot No. 42a or 42b: Detects position TEST
- ③ Slot No. 43a or 43b: Detects position DISCON

Signal "Position of molded case circuit breaker in the withdrawable unit"

It is irrelevant whether the position signaling switch is inserted in slot a or b. Only one position signaling switch per position is usually installed. The remaining free slots can be used for the signaling switches of the communication link kit. Alternatively, another position signaling switch can also be inserted, however.

If the molded case circuit breaker in the withdrawable unit is moved into a defined position with the crank handle, the corresponding position signaling switch outputs a signal that can be further used electrically, such as for visual or acoustic alarm indications.

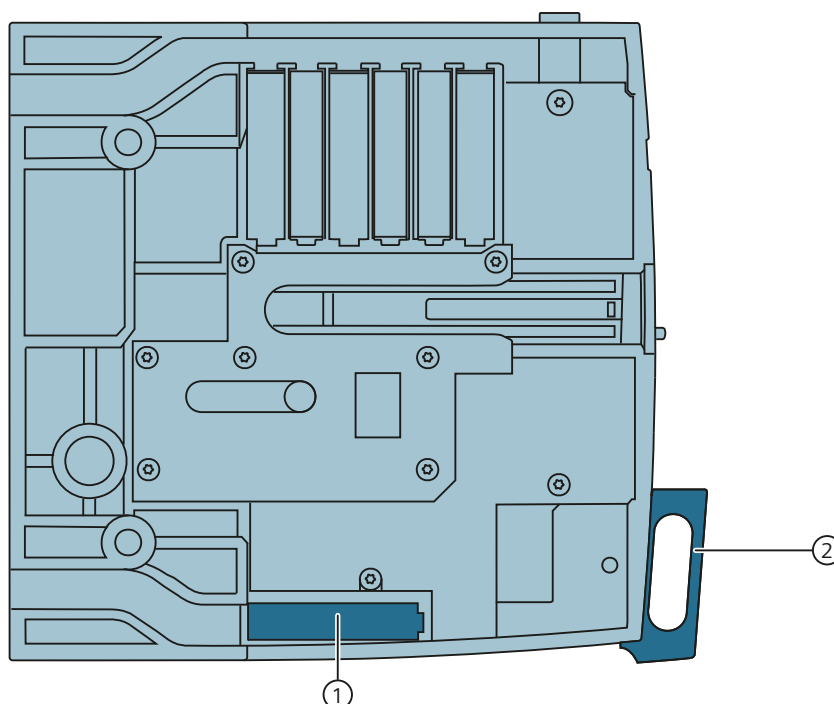
If the molded case circuit breaker is not in any of the defined positions, the breaker status indicator displays the word UNBLOCK on a white background. In this position, the molded case circuit breaker is either off (position OFF, contacts open) or tripped (position TRIP, contacts open). The breaker main contacts cannot be closed with the breaker in the UNBLOCK state.

4.4 Plug-in and draw-out technology

Depending on the position of the molded case circuit breaker in the withdrawable unit, the outputs of the position signaling switches assume one of the following states:

Position signaling switch		Position in frame			
		DISCON	TEST	CONNECT	UNBLOCK
DISCON	NC	Open	Closed	Closed	Closed
	NO	Closed	Open	Open	Open
TEST	NC	Closed	Open	Closed	Closed
	NO	Open	Closed	Open	Open
CONNECT	NC	Closed	Closed	Open	Closed
	NO	Open	Open	Closed	Open

Signal "Withdrawable unit locked / open"



- ① Slot for position signaling switch for signal "Withdrawable unit locked / open"
- ② Plastic frame for padlock locking unit

Signal "Withdrawable unit locked / open"

A position signaling switch to transmit this signal is installed in position 44 of the right-hand side wall of the withdrawable unit.

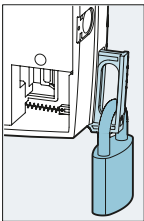
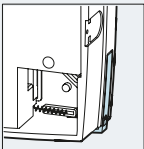
A position signaling switch in position 44 outputs a signal which indicates whether the padlock locking unit is in the OUT position, thereby locking the withdrawable unit.

The withdrawable unit can be locked in the defined breaker positions CONNECT, TEST and DISCON by padlocks or a cylinder lock (available as retrofit component). The position of the molded case circuit breaker cannot be changed when the withdrawable is locked. In the

4.4 Plug-in and draw-out technology

locked state, the opening for the crank handle is mechanically sealed and the handle cannot be inserted.

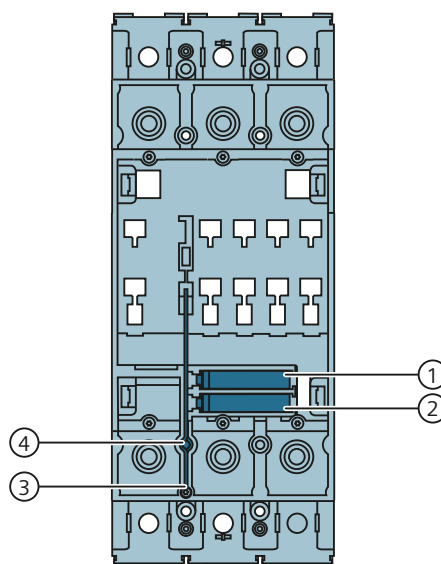
To lock the unit using padlocks, the padlock locking unit on the withdrawable unit must be pulled out manually so that the shackles of the padlocks can be inserted through the opening. When the withdrawable unit is locked by the cylinder lock, the padlock locking unit moves out automatically as the cylinder lock is turned because it is mechanically coupled with the cylinder lock in the withdrawable unit. The position of the padlock locking unit ultimately determines the position of the contacts of the position signaling switch.

	NO	NC
	Closed	Open
	Open	Closed

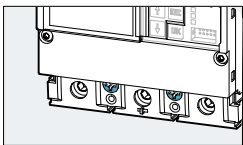
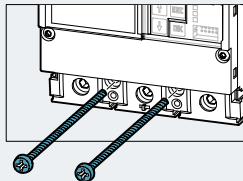
Signal "Plug-in unit - MCCB correctly bolted to plug-in socket"

This option is provided for plug-in units only. Depending on the plug-in socket size, up to two position signaling switches can be installed in slot No. 46.

4.4 Plug-in and draw-out technology



- ① Slot 46 for position signaling switch of the plug-in socket
- ② Slot 46 for position signaling switch of the plug-in socket
- ③ Mechanical system for actuation of position signaling switches when the bolt is tightened
- ④ Bolt hole which determines the signal output by the position signaling switches

	NO	NC
	Closed	Open
	Open	Closed

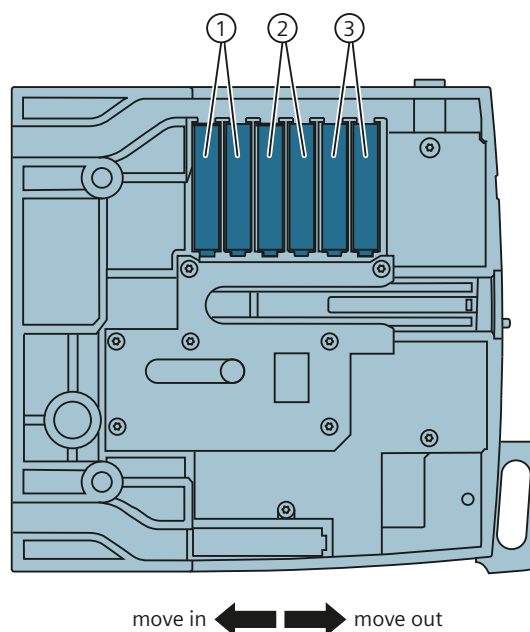
With this application, the position signaling switches indicate whether the molded case circuit breaker is inserted in the plug-in socket and secured by at least one screw. The reason for this application is that the molded case circuit breaker needs to be secured in position by fixing screws in the plug-in socket. All four fixing screws of the complete kit for withdrawable technology must be used for this purpose.

Communications interface for draw-out unit

The cable set for the communication link for the withdrawable unit consists of a preassembled cable with a mini USB port at one end and three special position signaling switches at the other. It is also supplied with another cable with mini USB plug and flat connector.

Attaching the cable set

1. Insert the 3 position signaling switches of the cable set in the right-hand side wall according to the color coding of the cables, see diagram below.
It is irrelevant whether the switches are inserted in slots a or b.



- ① CONNECT: Position signaling switch with green cables
- ② TEST: Position signaling switch with blue cables
- ③ DISCON: Position signaling switch with red cables

The remaining slots are normally used to install standard position signaling switches.

2. Remove the seal over the opening for the micro USB port on the right-hand side wall.
3. Insert the micro USB plug attached to the cable set into the micro USB port in the right-hand side wall.
4. Store the cable in the space available behind the side wall.
5. Connect the position signaling switches and the COM060 communications module to the USB plug and flat connector of the second cable.

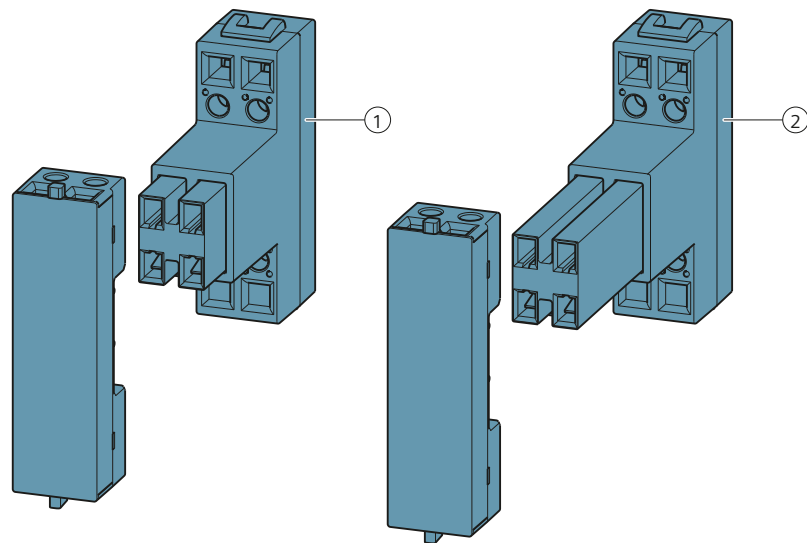
4.4 Plug-in and draw-out technology

The cable with pre-assembled USB plug and flat connector can also be ordered as an individual item for installation on molded case circuit breakers prepared for use as withdrawable devices.

For detailed instructions on how to install the communication link for the withdrawable unit, please refer to the relevant operating instructions (<https://support.industry.siemens.com/cs/ww/en/view/109741015>).

For instructions on how to read out data via remote data transfer, refer to the operating instructions for the COM100/COM800 data concentrator.

Auxiliary circuit connector

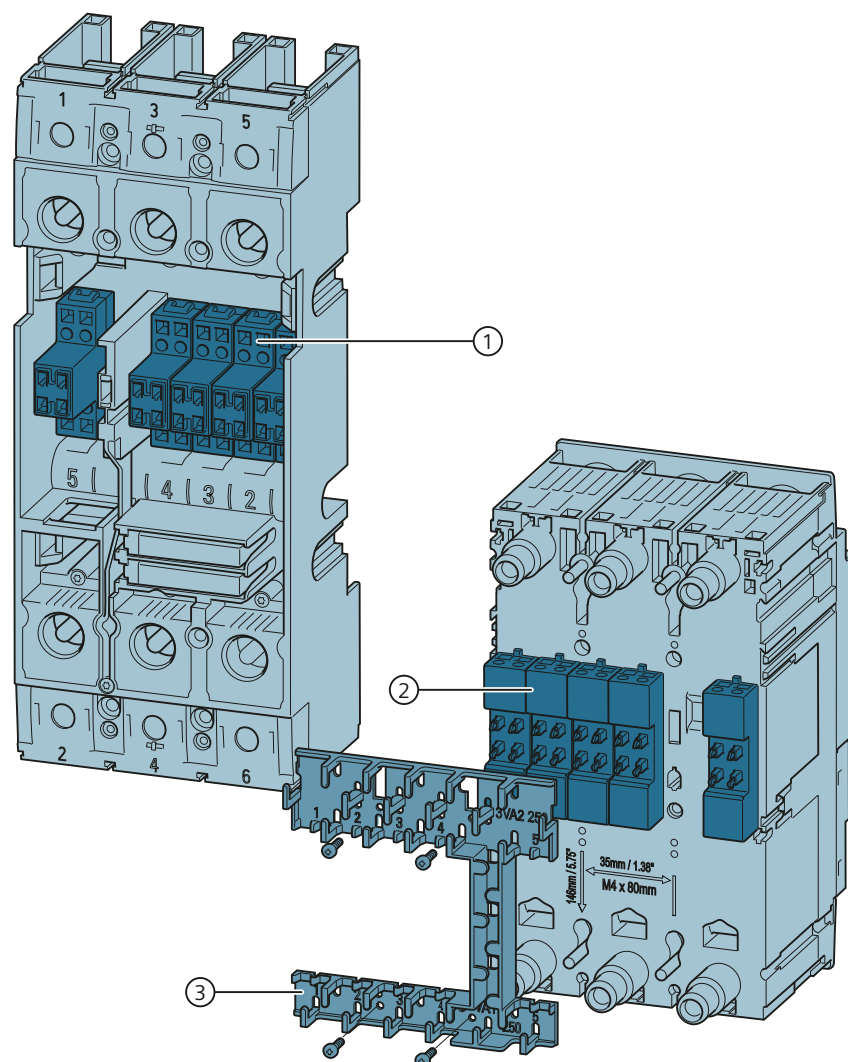


- ① Plug-in technology
- ② Withdrawable technology

Auxiliary circuit connectors are required only if the molded case circuit breaker to be converted to plug-in or withdrawable technology is equipped with internal accessories. Plug-in units use a different design of auxiliary circuit connector than withdrawable units.

The number of auxiliary circuit connectors required depends on the accessories to be installed in the molded case circuit breaker and ultimately on the number of electrical connections which need to be brought out of the molded case circuit breaker. Each auxiliary circuit connector can be used to connect up to four cables. Accordingly, the breaker-end and socket-end halves of the auxiliary circuit connectors have four screw-type terminals which are labeled ".1" to ".4".

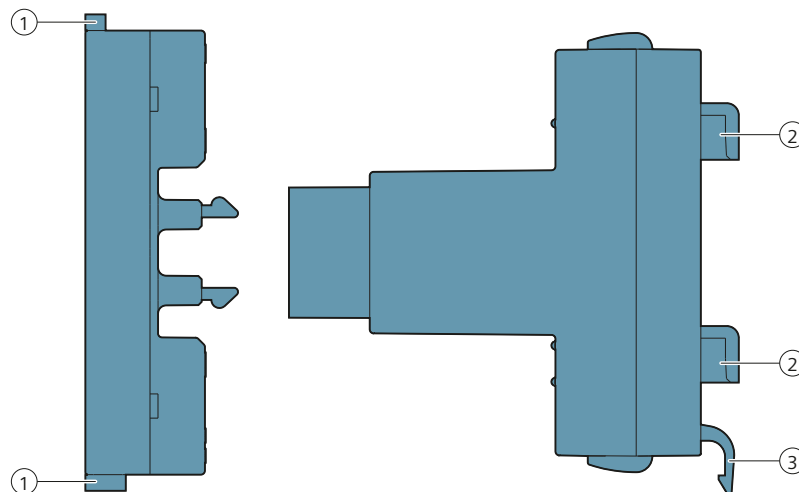
A total of nine auxiliary circuit connectors can be installed depending on the frame size of the molded case circuit breaker and the size of the plug-in or withdrawable socket. The slots for auxiliary circuit connectors are labeled from right to left in the socket, starting at 1.



- ① Socket-end auxiliary circuit connector
- ② Breaker-end auxiliary circuit connector
- ③ Cable cage

Cable cages are used to attach the breaker-end half of the auxiliary circuit connector to the underside of the molded case circuit breaker. Slot numbers are also printed on the cable cages. The design of the cable cages for the top and bottom halves of the molded case circuit breaker is different so that the cages cannot be mixed up or installed in the wrong position. The positioning tongues of the breaker-end half of the auxiliary circuit connectors latch into small recesses in the cable cages which are screw-mounted to the rear panel of the molded case circuit breaker. The auxiliary circuit connectors are securely fixed once the cable cages have been installed.

4.4 Plug-in and draw-out technology



- ① Positioning tongue (breaker end)
- ② Positioning hook (socket end)
- ③ Latching element (socket end)

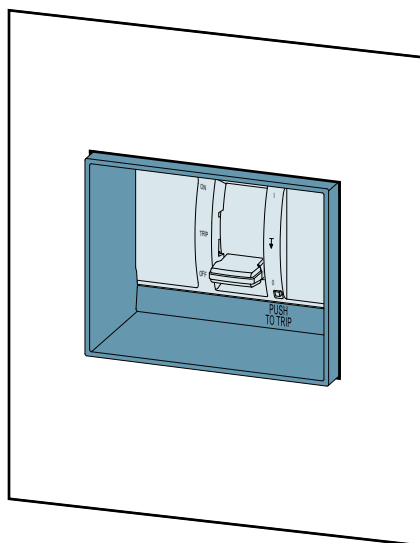
The socket-end half of the auxiliary circuit connectors is simply snapped into the socket.

Various cable routing openings and ducts are provided in the socket and the molded case circuit breaker. For further details, please refer to the operating instructions for the complete kits for plug-in or withdrawable technology.

See also

Cable cage (Page 337)

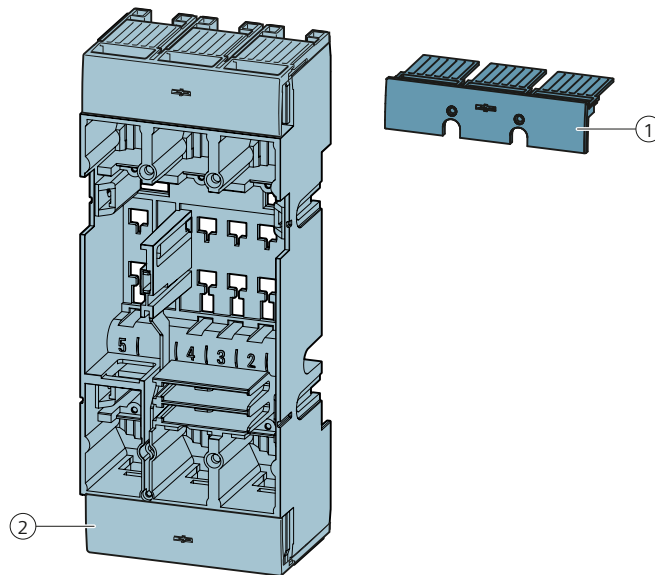
Door feedthrough



Door feedthroughs must be installed for applications which require

- direct operation of a molded case circuit breaker even when the cabinet door is closed,
- the withdrawable version of a molded case circuit breaker to be electrically isolated from or connected to the installation while the cabinet door is closed,
- prevention of access to live components inside the control cabinet.

Door feedthroughs are mounted over the front of the molded case circuit breaker and securely attached to the breaker by means of two bolts and a latch.

Terminal cover for a molded case circuit breaker converted to plug-in or draw-out technology

- ① Terminal cover with molded grips, can be screwed to contact unit
- ② Terminal cover for covering the terminal area

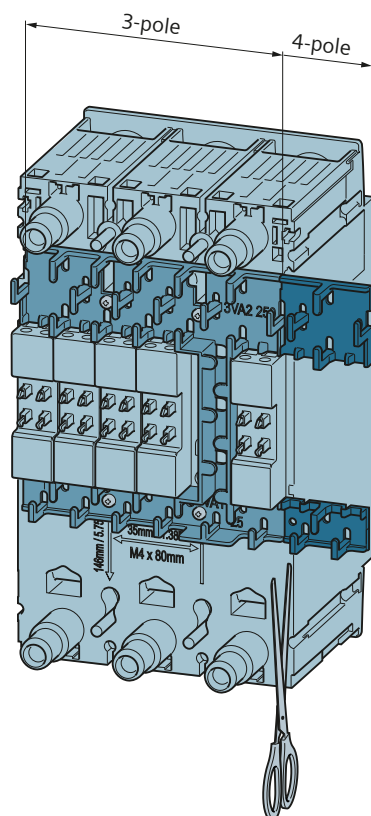
Two screw-mounted terminal covers ① are included in the scope of supply of the complete kits and the conversion kits for plug-in and withdrawable designs. These feature molded grips to ease withdrawal of the molded case circuit breaker from its socket. Since it requires significant force to remove a molded case circuit breaker from its socket, the plug-in terminal covers are bolted to the contact unit.

These terminal covers can be ordered separately as a spare part.

The additionally available terminal covers ② are used for the plug-in technology as well as the withdrawable technology for covering the terminal area.

Cable cage

Cable cages are used to attach the breaker-end half of auxiliary circuit connectors to the molded case circuit breaker. They are also designed to act as cable ducts for installing wires from internal accessories to the auxiliary circuit connector. For further information about cable cages, please refer to chapter Auxiliary circuit connector (Page 332).



Cable cages consist of a top half and a bottom half. These parts are designed such that they cannot be mounted in the wrong position at the rear of the molded case circuit breaker.

Cable cages are included in the scope of supply of the conversion kits and complete kits for converting molded case circuit breakers to plug-in or draw-out units and are therefore also supplied with complete kits. They are available as standard only in the offset version for 4-pole units. For use on 3-pole units, part of the cable cage need only be cut away (at the required breaking point).

4.4 Plug-in and draw-out technology

4.4.7.2 Overview of technical specifications

Technical specifications of the accessories for internal components of molded case circuit breakers in plug-in and withdrawable technology:

Position signaling switch				
Article No.			3VA9977-0KB00	
Rated operating voltage U _e			V	AC 250
			V	AC 250
Rated insulation voltage U _i			V	AC 250
Rated frequency f _n			Hz	50 / 60
Rated operating current I _e / U _e	AC-13	12 V	A	6
		24 V	A	6
		48 V	A	6
		110 V	A	6
		230 V	A	6
	DC-15	12 V	A	6
		24 V	A	3
		48 V	A	1
		110 V	A	0.5
		230 V	A	0.25
Thermal current I _{th}			A	6
Contact switching			001	
Conductor cross section S			mm²	0.5 ... 1.5
Degree of protection of terminals (when breaker is connected)			IP20 ¹⁾	

¹⁾ This meets NFPA 79 "Protection against electric shock" requirements

Auxiliary circuit connector				
Article No.				3VA9977-0KP80
				3VA9977-0KD80
Rated operating voltage U_e		V		AC 250
		V		DC 250
Rated insulation voltage U_i		V		AC 500
Rated frequency f_n		Hz		50 / 60
Rated operating current I_e / U_e	AC-13			3 A / 400 V
	DC-15			0.15 A / 250 V; 3 A / 125 V
Thermal current I_{th}		A		10
Conductor cross section S		mm ²		0.5 ... 1.5
Degree of protection of terminals (when breaker is connected)				IP20 ¹⁾

¹⁾ This meets NFPA 79 "Protection against electric shock" requirements

4.4.7.3 Combination with other accessories

- The communication link for the draw-out unit and the switches for signaling the position of the molded case circuit breaker in the draw-out unit are mutually compatible. For further information, please refer to the following chapters:
Position signaling switches (Page 326)
Communications interface for draw-out unit (Page 331)
- The switches for signaling whether or not the molded case circuit breaker is locked have no influence on other accessories described in chapter Position signaling switches (Page 326)

Note**No transfer of "locked / not locked" signals**

The information "locked / not locked" cannot be transferred via the COM060 communication module.

- A molded case circuit breaker which requires a communication link to transfer signals must be equipped with a COM060 communication module.
- When internal accessories are integrated in a molded case circuit breaker, auxiliary circuit connectors and cable cages for plug-in and draw-out technology must also be installed.
- Door feedthroughs are required only if the molded case circuit breaker needs to be operated when the panel door is closed. The door feedthrough is compatible with position signaling switches, communication link and auxiliary circuit connectors with cable cages.
- The terminal cover for plug-in technology can be installed in combination with any other internal accessories. It does not have any effect on other accessories.
- A variable depth adapter (see section Door mounted rotary operator (Page 351)) can be used in conjunction with the door mounted rotary operator in order to compensate the racking distance and so allow the molded case circuit breaker to be moved out when the panel door is closed.

4.5 Manual operators

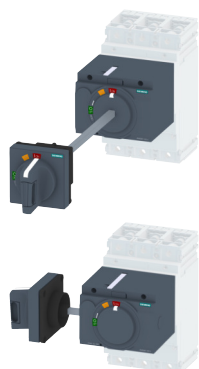
4.5.1 Introduction

The manual operators for the 3VA UL molded case circuit breaker are described in this chapter.

Overview of manual operators



4.5 Manual operators



The following manual operators are available for the 3VA UL molded case circuit breaker:

- Front mounted rotary operator (optionally with door interlock and door open function)
 - Illumination kit
- Door mounted rotary operator
 - Fixing bracket for long shafts
 - Variable depth adapter for withdrawable units
 - Supplementary handle for door mounted rotary operator
 - Illumination kit
 - Auxiliary switch module for rotary operators
- Side wall mounted rotary operator
 - Illumination kit
 - Auxiliary switch module for rotary operators
- Operator kit with Bowden cable (Max-Flex operator)
 - Auxiliary switches
 - Bowden cables
- Variable depth flange mounted operator (VDFMO)

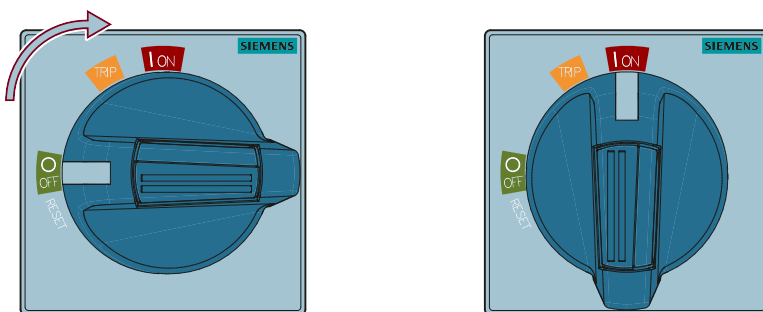
All manual operators are designed for 3-pole and 4-pole circuit breakers.

Locking provisions are available for all manual operators.

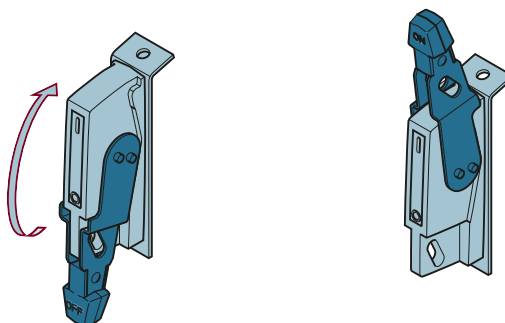
4.5.2 Operator control of the 3VA UL molded case circuit breakers with manual operators

Opening and closing

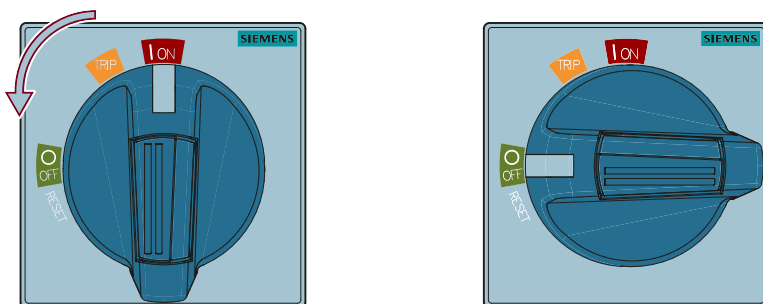
- To close the 3VA UL molded case circuit breaker:
Turn the manual operator to the ON (I) position.
Front mounted rotary operator, door mounted rotary operator, side wall mounted rotary operator:



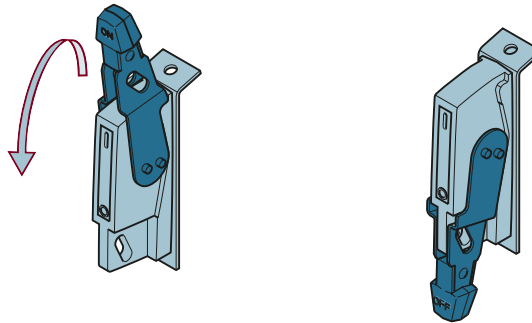
Handle of operator kit with Bowden cable/variable depth flange mounted operator:



- To open the 3VA UL molded case circuit breaker:
Turn the manual operator to the OFF (O) position.
Front mounted rotary operator, door mounted rotary operator, side wall mounted rotary operator:



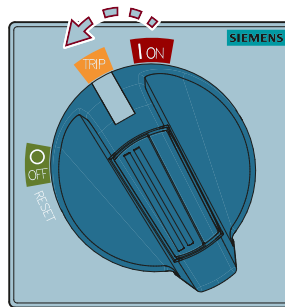
Handle of operator kit with Bowden cable/variable depth flange mounted operator:



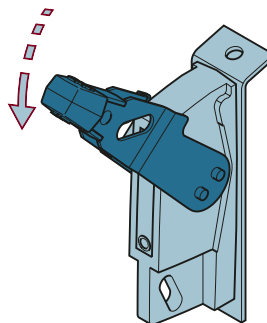
Resetting the manual operator after the molded case circuit breaker has tripped

When the molded case circuit breaker trips, the manual operator moves automatically from the ON (I) to the TRIP position.

Front mounted rotary operator, door mounted rotary operator, side wall mounted rotary operator:

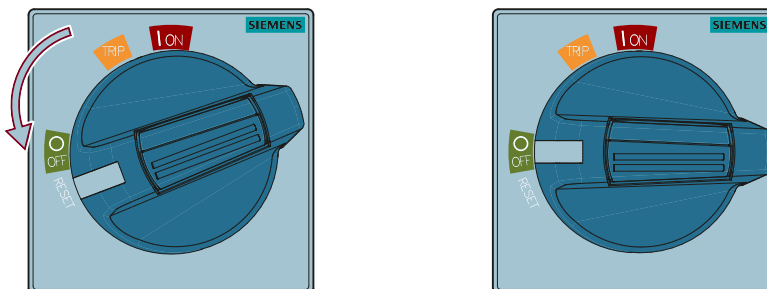


Handle of operator kit with Bowden cable/variable depth flange mounted operator:

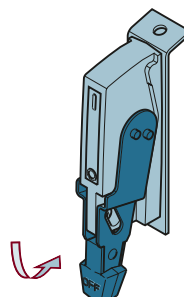


The molded case circuit breaker remains in the tripped state until the manual operator is reset:

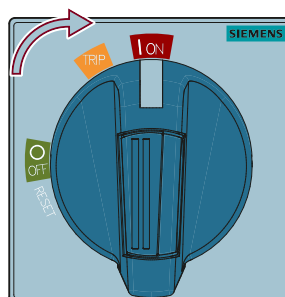
1. Clear the fault which has caused the molded case circuit breaker to trip.
2. Turn the manual operator counter-clockwise to the RESET position (just beyond OFF (O)). Pull the Max-Flex operator downwards as far as it will go. The manual operator remains in the OFF (O) position. Front mounted rotary operator, door mounted rotary operator, side wall mounted rotary operator:



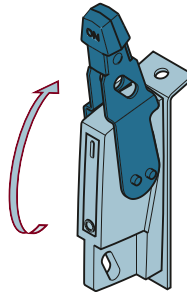
Handle of operator kit with Bowden cable/variable depth flange mounted operator:



3. Turn the manual operator to the ON (I) position. Front mounted rotary operator, door mounted rotary operator, side wall mounted rotary operator:



Handle of operator kit with Bowden cable/variable depth flange mounted operator:



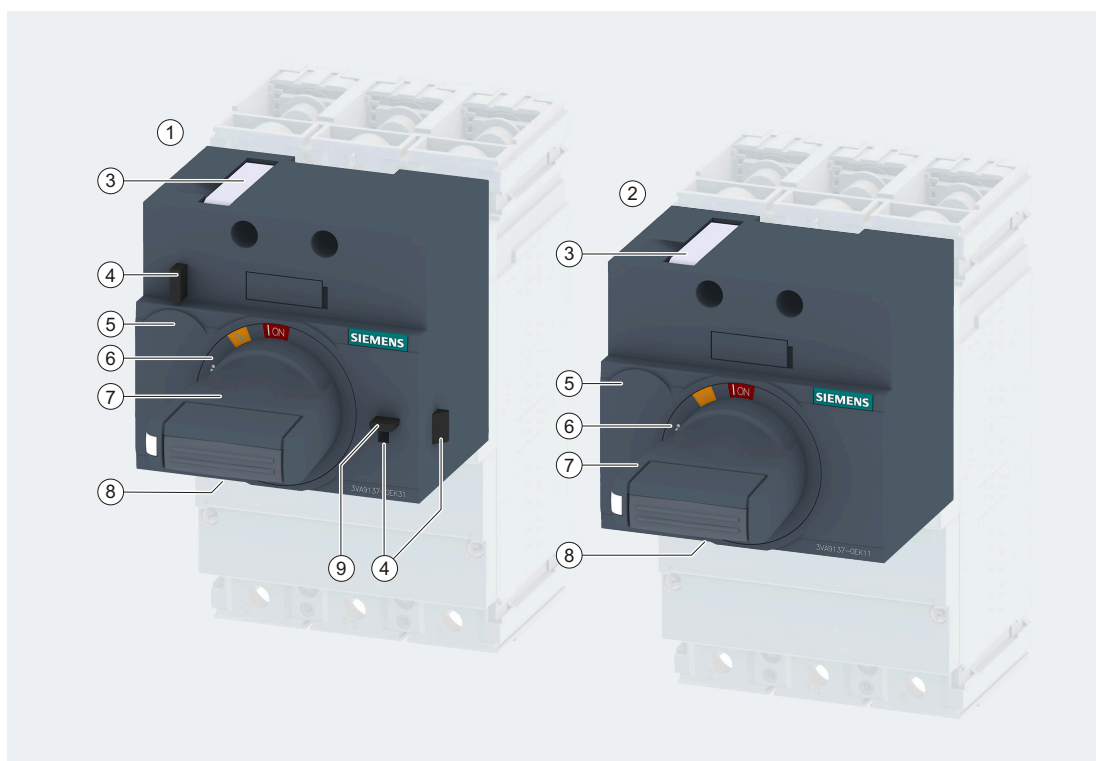
The molded case circuit breaker is closed again.

4.5.3 Front mounted rotary operator

4.5.3.1 Elements of the front mounted rotary operator

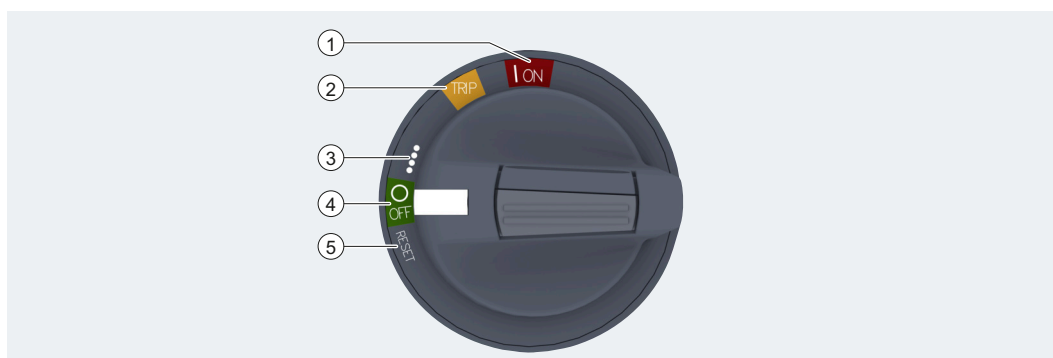
The front mounted rotary operator is available in two versions:

- With door interlock
- Without door interlock



- | | |
|---|--|
| ① Front mounted rotary operator with door interlock | ⑥ Indication of the breaker status (on, off, trip) (see below) |
| ② Front mounted rotary operator without door interlock | ⑦ Handle with mechanism for up to 3 padlocks |
| ③ Locking bracket for up to 3 padlocks | ⑧ Manual trip button <PUSH TO TRIP> |
| ④ Door interlocking elements (door position switch, defeat function, interlock) | ⑨ Door open function (optional) |
| ⑤ Position for a cylinder lock (optional) | |

Indication of the breaker status on front mounted rotary operator



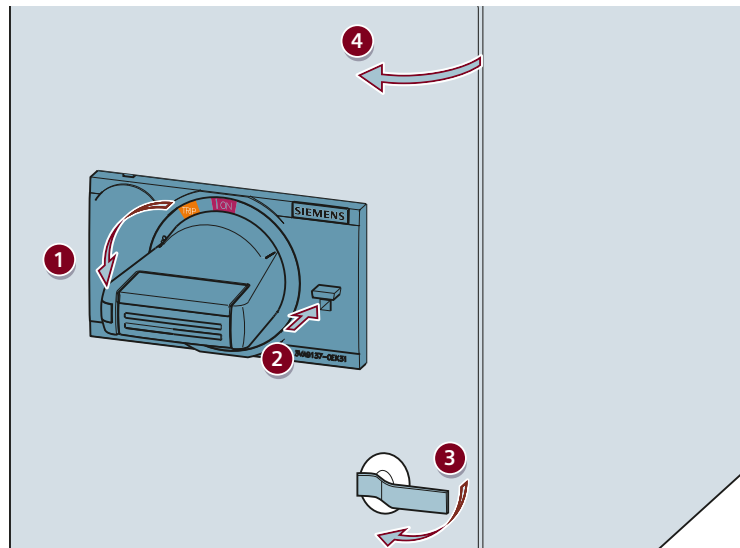
- | | |
|-------------------------|---------------------------------|
| ① ON: Breaker closed | ④ OFF: Breaker open |
| ② TRIP: Breaker tripped | ⑤ RESET: Reset following a trip |
| ③ Mounting position | |

4.5.3.2 Front mounted rotary operator with door interlock

The front mounted rotary operator with door interlock projects through the panel door. This arrangement ensures that the molded case circuit breaker can be switched on only when the panel door is closed. The door is locked automatically when the front mounted rotary operator is turned to position ON (I).

For front mounted rotary operators with door open function, this function must be additionally operated in order to open the door in position OFF (0).

Opening panel door with door open function.

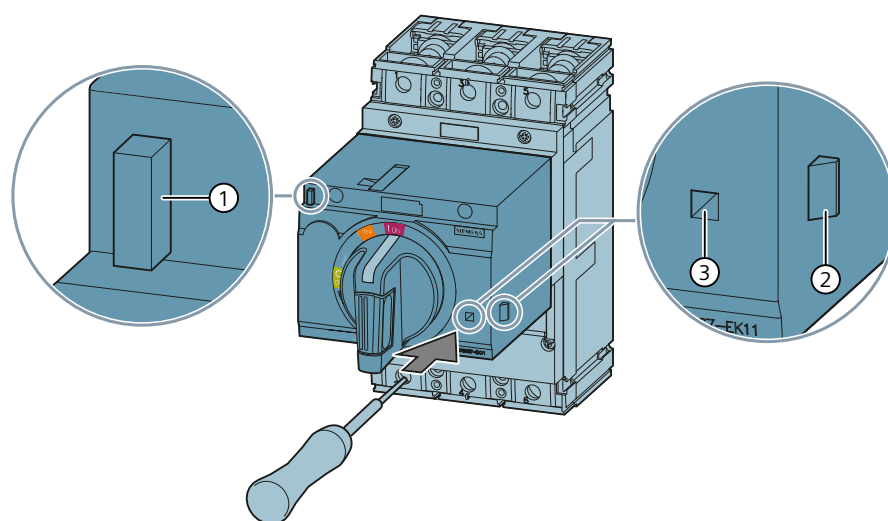


Procedure

1. Turn the front mounted rotary operator to position OFF (0) in order to open the molded case circuit breaker.
2. Press the button of the door open function
3. Actuate the NC contact of the panel door and open the panel door.

Overriding the door interlock

The door interlock can be overridden by a deliberate action. This means that the door can be opened with the operator in position ON (I) so that maintenance can be carried out, for example.



- 1) Door position switch
- 2) Door interlock
- 3) Defeat function

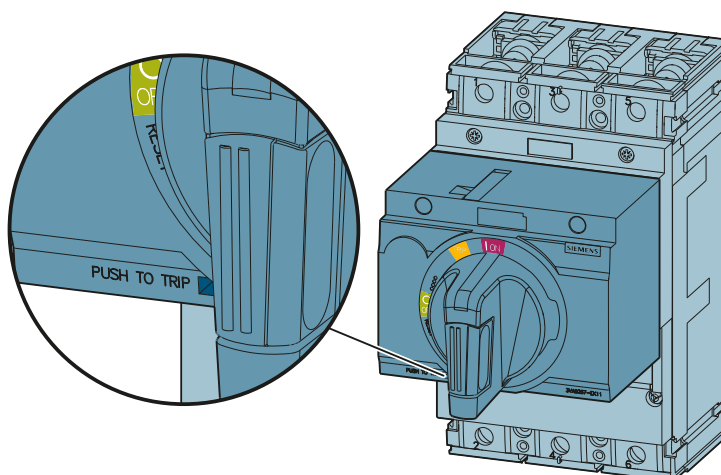
Procedure (overriding the door interlock)

- Use a slotted screwdriver 0.3 x 2.0 mm to press into the opening for the defeat function of the door interlock and simultaneously open the door.

4.5.3.3 Testing the tripping mechanism

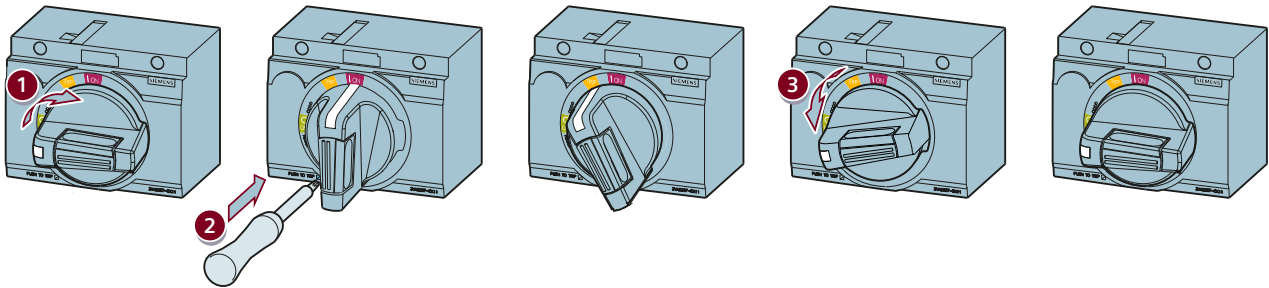
Testing the tripping mechanism

The button <PUSH TO TRIP> can be pressed to perform a function test on the tripping mechanism.



4.5 Manual operators

Procedure



1. Turn the front mounted rotary operator to position ON (I) in order to close the molded case circuit breaker.
2. Press the button <PUSH TO TRIP> with a tool such as a screwdriver.
The front mounted rotary operator moves from position ON (I) to position TRIP. The molded case circuit breaker is now in the tripped state.
3. Turn the front mounted rotary operator counter-clockwise to the RESET position (just beyond OFF (O)).
The front mounted rotary operator remains in the OFF (O) position, the molded case circuit breaker can now be closed again.

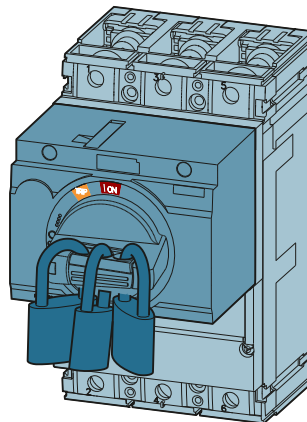
4.5.3.4 Locking, blocking and interlocking

The following locking, blocking and interlocking systems are used:

- Locking at the handle
- Locking, blocking and interlocking at the rotary operator

Locking at the handle

The rotary operator can be locked at the handle with up to three padlocks with a diameter of 3/16" to 3/8" / 5 mm to 9.5 mm. Padlocks are not included in the scope of supply.



Lockable positions:

- Position OFF (O)
- Position ON (I)
Possible only if the front mounted rotary operator has been modified according to the operating instructions.

Note**No impairment of protective function**

Locking the rotary operators in the ON (I) position does not impair the protective function of the molded case circuit breakers. In the event of a fault, the molded case circuit breaker trips in the normal way.

When the rotary operator is unlocked, the position changes to TRIP.

Locking, blocking and interlocking at the rotary operator

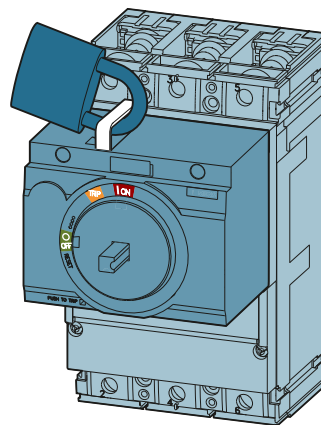
Locking at the rotary operator is possible with up to three padlocks with a diameter of 1/4" to 3/8" / 6.35 mm to 9.5 mm and with a cylinder lock (type Ronis). Interlocking is only possible with a cylinder lock (type Ronis).

Padlocks and cylinder locks are not included in the scope of supply of manual rotary operators.

Locking with padlocks

All rotary operators have a mechanism for padlocks. This can be pulled out from the rotary operator.

Example of rotary operator with shaft stub:

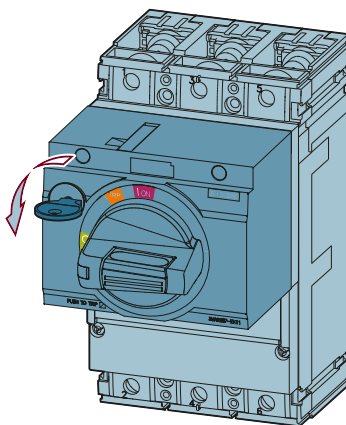


Lockable positions:

- Position OFF (O)

Locking, blocking or interlocking with cylinder lock (type Ronis)

The cylinder lock (type Ronis) is used, depending on the installation of the cylinder lock holder, for locking, blocking and interlocking the rotary operators.

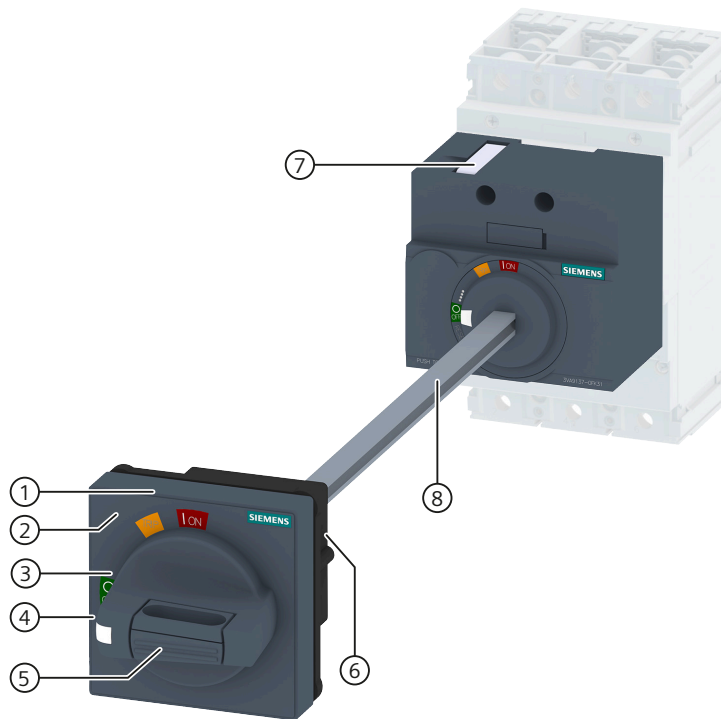


- **Locking with cylinder lock (type Ronis):**
The cylinder lock (type Ronis) locks the rotary operators in the OFF (O) position.
- **Mutual interlocking with cylinder lock (type Ronis):**
Through use of the cylinder lock insert for interlocking, any number of rotary operators can be mutually interlocked.
This requires that the keys of all opened and locked molded case circuit breakers be removed and securely stored. Only the key of the rotary operator which is in the ON (I) position is left in the cylinder lock. This key cannot be removed in the ON (I) position. This key can only be removed if the rotary operator has been turned to the OFF (O) position, the cylinder lock has been locked and the molded case circuit breaker has thus been interlocked. See also chapter Cylinder locks for interlocking multiple 3VA UL molded case circuit breakers (Page 403).

4.5.4 Door mounted rotary operator

4.5.4.1 Elements of the door mounted rotary operator

With the door mounted rotary operator installed, it is possible to operate the molded case circuit breaker through the panel door without opening the door.



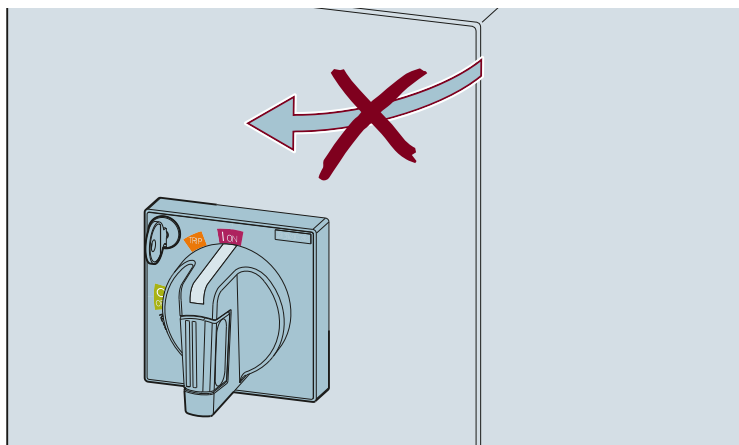
- ① Door mounted rotary operator
- ② Position for a cylinder lock
- ③ Indication of the breaker status ON, TRIP, mounting position, OFF, RESET
For mounting position, see chapter Front mounted rotary operator (Page 344)
- ④ Door open function (Door-Open) (optional)
- ⑤ Handle with mechanism for up to 3 padlocks
- ⑥ Tolerance compensator
- ⑦ Interlock mechanism for up to 3 padlocks
- ⑧ Shaft

4.5.4.2 Door interlock with door mounted rotary operator

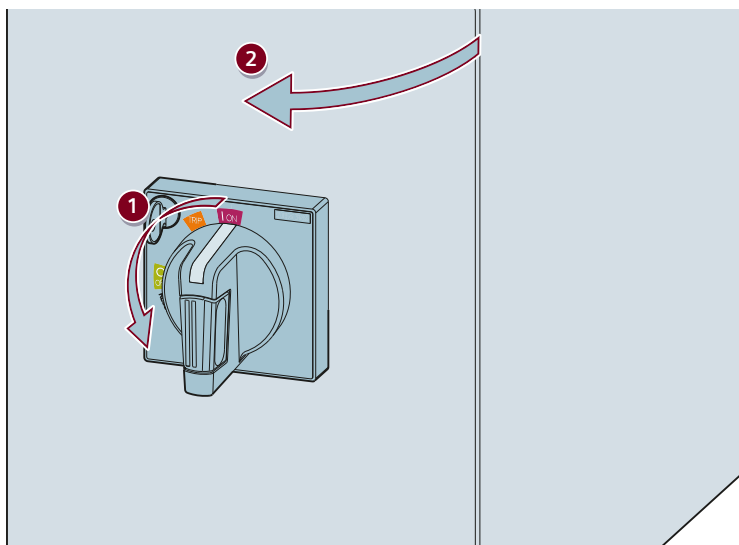
Door interlock with door mounted rotary operator

In the case of door mounted rotary operators with door interlock, the door is interlocked as soon as the switch is in ON (I) position.

In the case of door mounted rotary operators with door open function, the door is interlocked starting from the closing of the door (OFF (0)).



Opening control cabinet door with door open function.

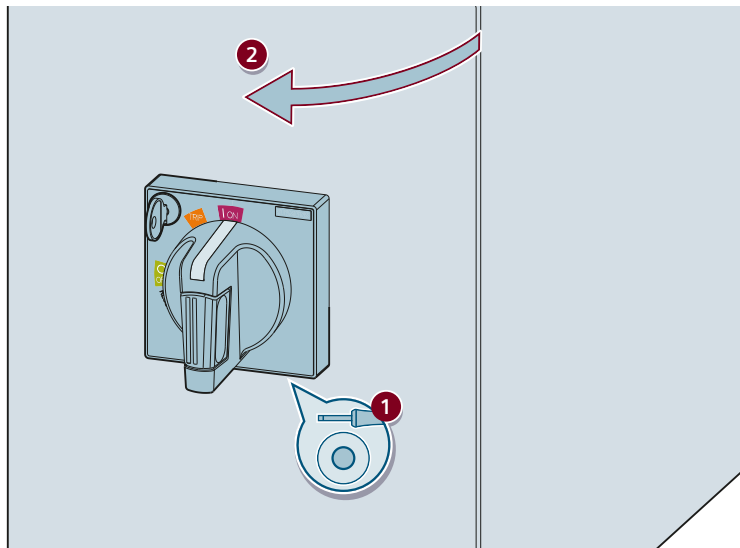


Procedure

1. Turn the door mounted rotary operator the RESET / DOOR-OPEN position in order to activate the door open function.
2. Hold the handle in RESET / DOOR-OPEN position while the door is opened.

Overriding the door interlock

The door interlock can be overridden by a deliberate action. This means that the door can be opened with the operator in position ON (I) so that maintenance can be carried out, for example.

**Procedure (overriding the door interlock)**

- Use a slotted screwdriver 0.3 x 2.0 mm to press into the opening for the defeat function of the door interlock and simultaneously open the door.

Deactivation of the door interlock function

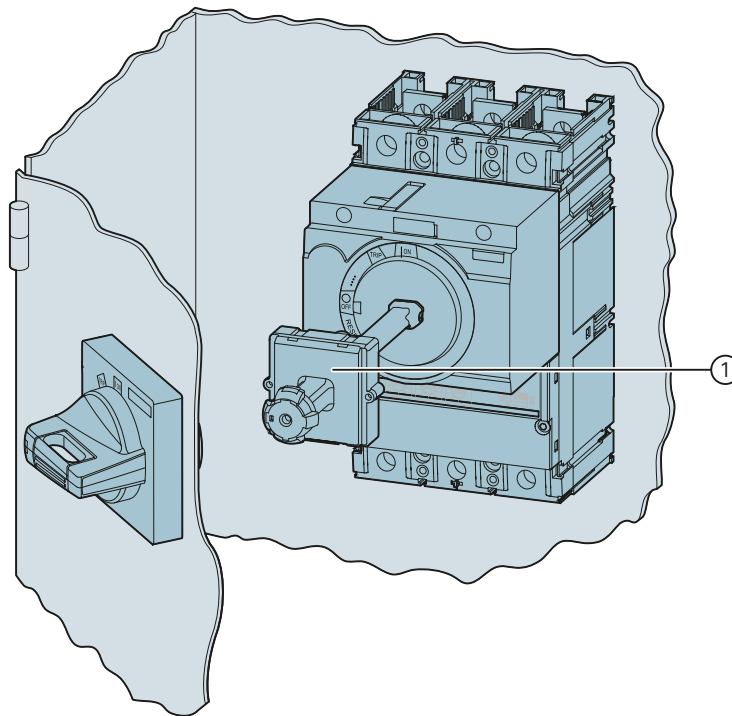
The door interlock can be completely deactivated by a small modification on the inside of the handle. The cabinet door can then also be opened at any time without additional measures if the circuit breaker is switched on (position ON). This applies to all door mounted rotary operators with article numbers 3VA9...-0FK2...

For details, see operating instructions (<https://support.industry.siemens.com/cs/ww/en/view/109741016>).

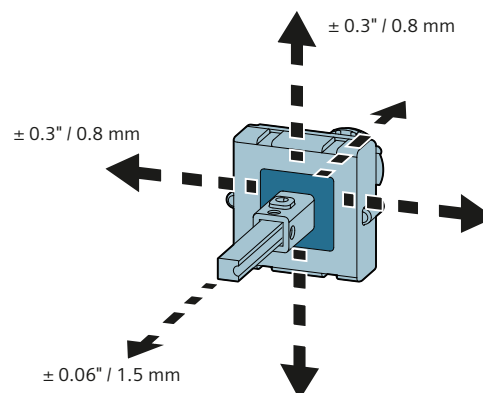
4.5.4.3 Tolerance compensator

Tolerance compensator

Door mounted rotary operators are supplied as standard with a tolerance compensator. This tolerance compensation compensates for a possible small misalignment between the handle in the control cabinet door and the shaft of the door mounted rotary operator.



① Tolerance compensator

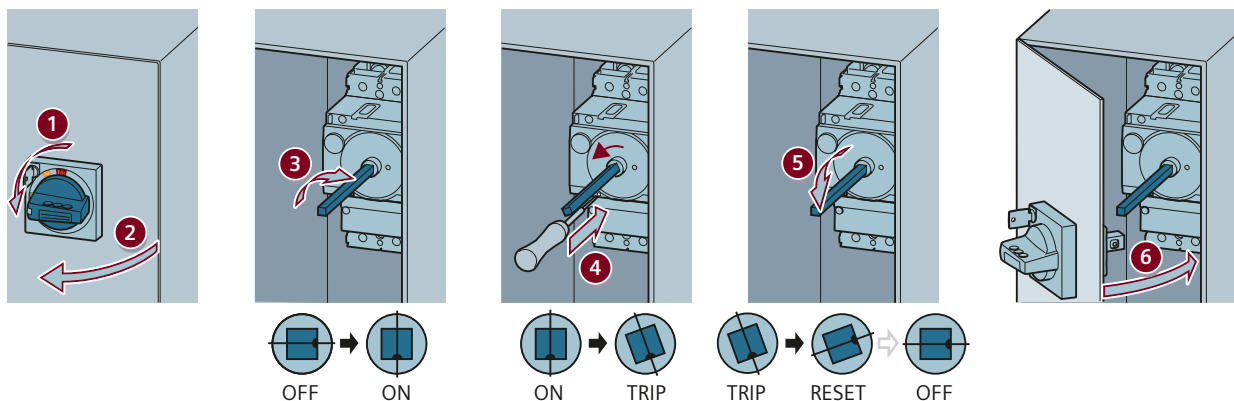


4.5.4.4 Testing the tripping mechanism

Testing the tripping mechanism

The <PUSH TO TRIP> button can be used to check whether the tripping mechanism is working properly.

Procedure



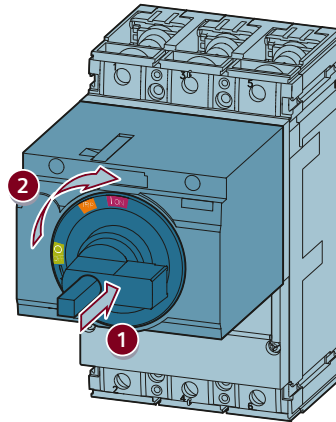
1. Turn the door mounted rotary operator to the OFF (O) position.
2. Open the panel door.
3. Use a tool to turn the shaft to the ON (I) position in order to close the molded case circuit breaker.
Alternatively, you can use the supplementary handle for the door mounted rotary operator to close the molded case circuit breaker, see Supplementary handle for door mounted rotary operator (Page 356).
4. Press the button <PUSH TO TRIP> with a tool such as a screwdriver.
The door mounted rotary operator moves from position ON (I) to position TRIP. The molded case circuit breaker is now in the tripped state.
5. Turn the door mounted rotary operator counter-clockwise to the limit stop (RESET position, just beyond OFF (O)).
The manual operator remains in the OFF (O) position.
6. Close the panel door.
The molded case circuit breaker can now be closed again.

4.5.4.5 Supplementary handle for door mounted rotary operator

Supplementary handle for door mounted rotary operator

The supplementary handle can be used to operate the molded case circuit breaker when the cabinet door is open. The supplementary handle is mandatory for applications requiring NFPA 79-compliant door mounted rotary operators.

The supplementary handle is not included in the scope of supply of the door mounted rotary operator and must be ordered separately.



Use the supplementary handle to close the molded case circuit breaker:

In accordance with NFPA 79, a deliberate action is required to reach the ON (I) position:

1. Push in the supplementary handle.
2. Turn the supplementary handle to the ON (I) position in order to close the molded case circuit breaker.

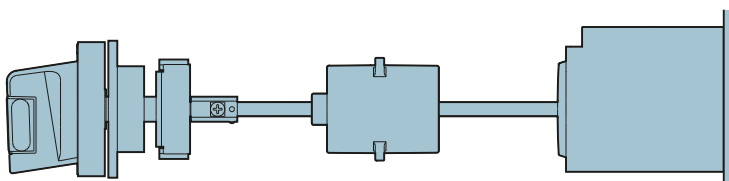
Note

The supplementary handle is mandatory for applications requiring NFPA 79-compliant door mounted rotary operators.

4.5.4.6 Variable depth adapter

Variable depth adapter

The variable depth adapter enables adjustment of the travel distance CONNECT, TEST and DISCONNECT when using withdrawable technology. As a result, the control cabinet door does not have to be opened to move the switch to the CONNECT, TEST and DISCONNECT positions. See also chapter Draw-out technology (Page 316).



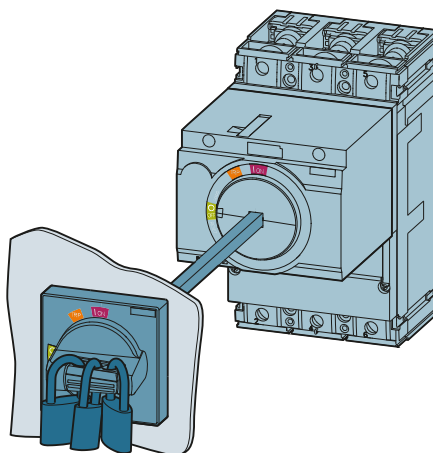
4.5.4.7 Locking, blocking and interlocking

The following locking, blocking and interlocking systems are used:

- Locking at the handle
- Locking at the masking plate of the control cabinet door
- Locking, blocking and interlocking at the rotary operator

Locking at the handle

The rotary operator can be locked at the handle with up to three padlocks with a diameter of 3/16" to 3/8" / 5 mm to 9.5 mm. Padlocks are not included in the scope of supply.



4.5 Manual operators

Lockable positions:

- Position OFF (O)
Locking the door mounted rotary operator in OFF (O) position prevents the molded case circuit breaker from being switched on and the control cabinet door from being opened. The door interlock cannot be overridden.
- Position ON (I)
Possible only if the door mounted rotary operator has been modified according to the operating instructions.

Note

No impairment of protective function

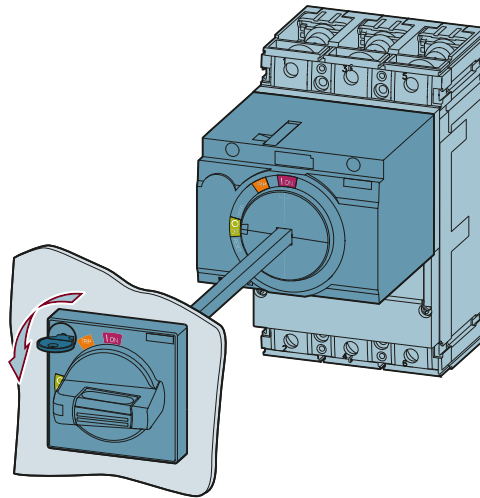
Locking the rotary operators in the ON (I) position does not impair the protective function of the molded case circuit breakers. In the event of a fault, the molded case circuit breaker trips in the normal way.

When the rotary operator is unlocked, the position changes to TRIP.

Locking at the masking plate of the control cabinet door with cylinder lock (Kaba)

The door mounted rotary operator can be locked at the control cabinet door with a cylinder lock (type Kaba).

The cylinder lock can **not** be used for locking in the ON (I) position.



Note

The cylinder lock (type Kaba) for the masking plate must be ordered separately.

Locking, blocking and interlocking at the rotary operator

Locking at the rotary operator is possible with up to three padlocks with a diameter of 1/4" to 3/8" / 6.35 mm to 9.5 mm and with cylinder locks (type Ronis). Interlocking is only possible with cylinder locks (type Ronis).

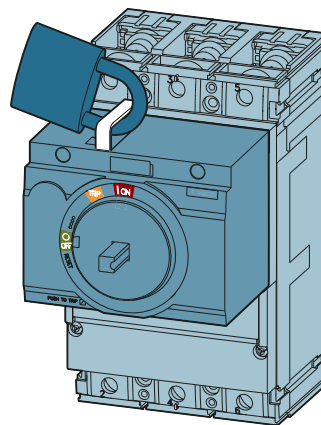
In addition, the door mounted rotary operator can also be locked with cylinder locks (type Kaba) at the masking plate in the control cabinet door.

Padlocks and cylinder locks are not included in the scope of supply of manual rotary operators.

Locking with padlocks

All rotary operators have a mechanism for padlocks. This can be pulled out from the rotary operator.

Example of rotary operator with shaft stub:

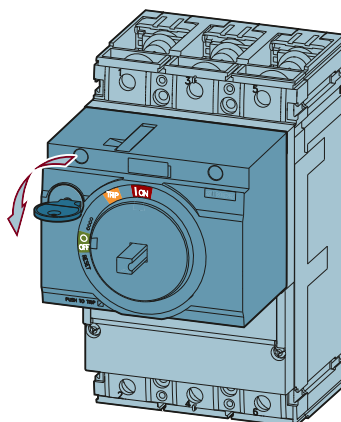


Lockable positions:

- Position OFF (O)

Locking, blocking or interlocking with cylinder lock (type Ronis)

The cylinder lock (type Ronis) is used, depending on the installation of the cylinder lock holder, for locking, blocking and interlocking the rotary operators.

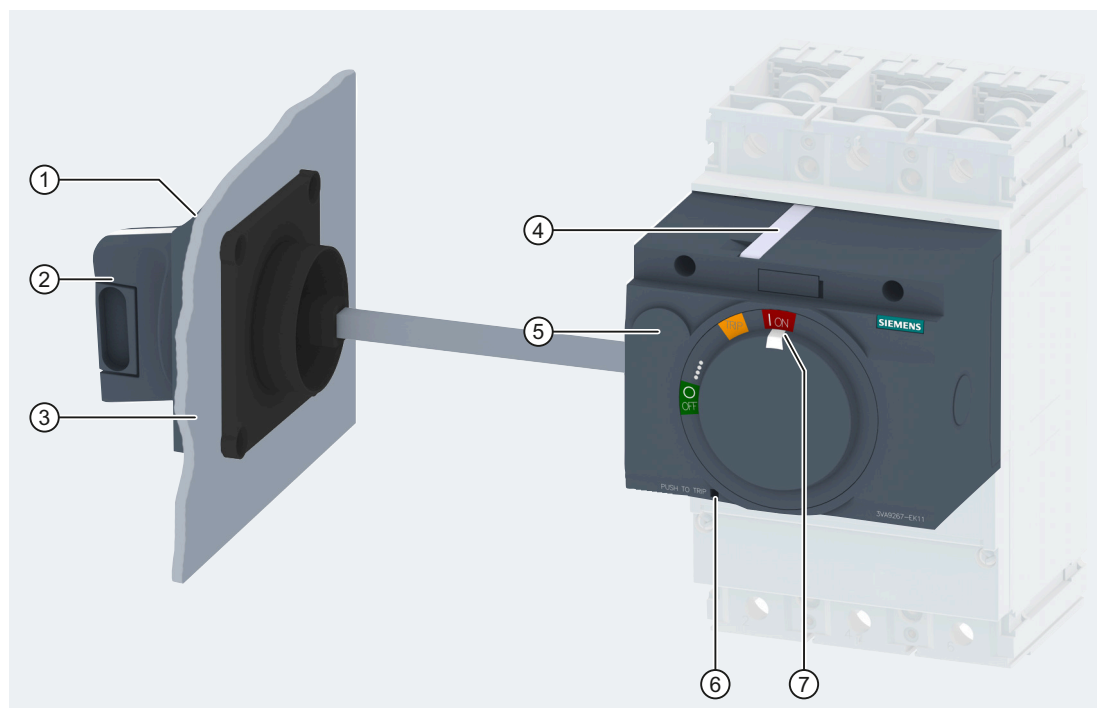


- Locking with cylinder lock (type Ronis):
The cylinder lock (type Ronis) locks the rotary operators in the OFF (O) position.
- Mutual interlocking with cylinder lock (type Ronis):
Through use of the cylinder lock insert for interlocking, any number of rotary operators can be mutually interlocked.
This requires that the keys of all opened and locked molded case circuit breakers be removed and securely stored. Only the key of the rotary operator which is in the ON (I) position is left in the cylinder lock. This key cannot be removed in the ON (I) position. This key can only be removed if the rotary operator has been turned to the OFF (O) position, the cylinder lock has been locked and the molded case circuit breaker has thus been interlocked. See also chapter Cylinder locks for interlocking multiple 3VA UL molded case circuit breakers (Page 403).

4.5.5 Side wall mounted rotary operator

4.5.5.1 Elements of the side wall mounted rotary operator

The side wall mounted rotary operator allows the molded case circuit breaker to be operated through the right-hand or left-hand side wall of the panel.

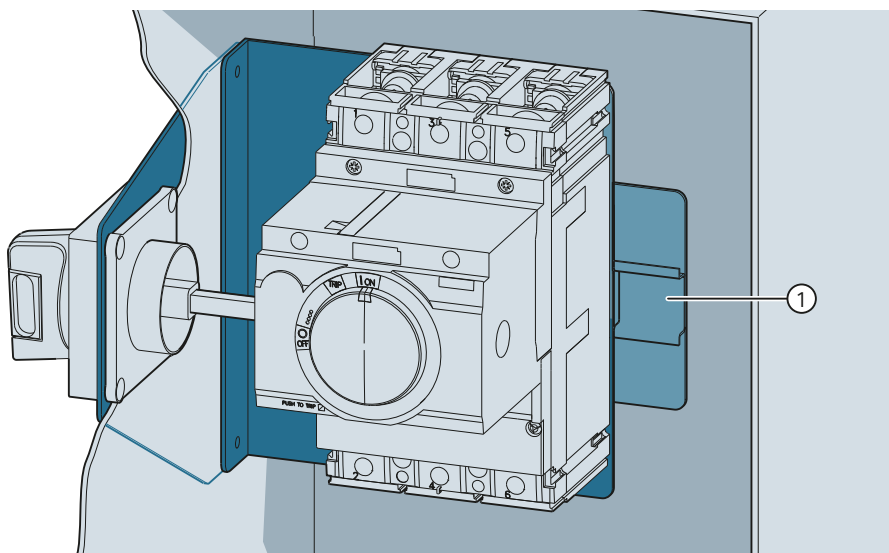


- ① Side wall mounted rotary operator
- ② Handle with mechanism for up to 3 padlocks
- ③ Side wall of panel
- ④ Device for up to 3 padlocks
- ⑤ Device for cylinder lock
- ⑥ Trip unit button <PUSH TO TRIP>
- ⑦ Indication of the breaker status ON, TRIP, mounting position, OFF, RESET
For mounting position, see chapter Front mounted rotary operator (Page 344)

4.5.5.2 Side wall mounted rotary operator with mounting plate

Side wall mounted rotary operator with mounting plate

The side wall mounted rotary operator is available in a version with mounting plate for molded case circuit breakers up to 250 A. The mounting plate can be installed on the right-hand or left-hand side panel. The space on the mounting plate can be used to install other components.



If there is insufficient space available on the mounting plate to install terminals, a terminal plate ① can be bolted to the cubicle.

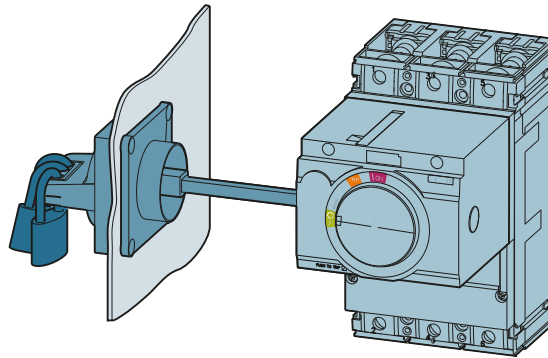
4.5.5.3 Locking, blocking and interlocking

The following locking, blocking and interlocking systems are used:

- Locking at the handle
- Locking at the masking plate of the side wall
- Locking, blocking and interlocking at the rotary operator

Locking at the handle

The rotary operator can be locked at the handle with up to three padlocks with a diameter of 3/16" to 3/8" / 4.5 mm to 9.5 mm. Padlocks are not included in the scope of supply.



Lockable positions:

- Position OFF (O)
Locking the side wall mounted rotary operator in the OFF (O) position prevents the molded case circuit breaker from being closed.
- Position ON (I)
Possible only if the side wall mounted rotary operator has been modified according to the operating instructions.

Note

No impairment of protective function

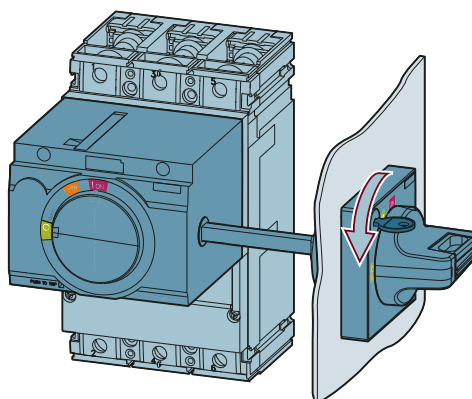
Locking the rotary operators in the ON (I) position does not impair the protective function of the molded case circuit breakers. In the event of a fault, the molded case circuit breaker trips in the normal way.

When the rotary operator is unlocked, the position changes to TRIP.

Locking at the masking plate of the side wall with cylinder lock (Kaba)

The side wall mounted rotary operator can be locked at the side wall with a cylinder lock (type Kaba).

The cylinder lock can **not** be used for locking in the ON (I) position.



Note

The cylinder lock (type Kaba) for the masking plate must be ordered separately.

Locking, blocking and interlocking at the rotary operator

Locking at the rotary operator is possible with up to three padlocks with a diameter of 1/4" to 3/8" / 6.35 mm to 9.5 mm and with cylinder locks (type Ronis). Interlocking is only possible with cylinder locks (type Ronis).

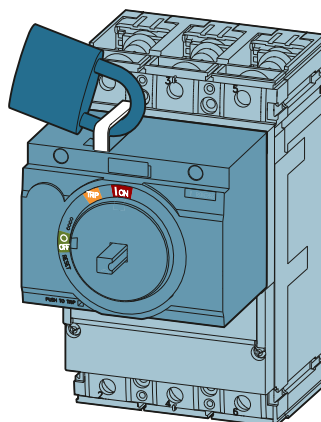
In addition, the side wall mounted rotary operator can also be locked at the masking plate of the side wall with cylinder locks (type Kaba).

Padlocks and cylinder locks are not included in the scope of supply of manual rotary operators.

Locking with padlocks

All rotary operators have a mechanism for padlocks. This can be pulled out from the rotary operator.

Example of rotary operator with shaft stub:

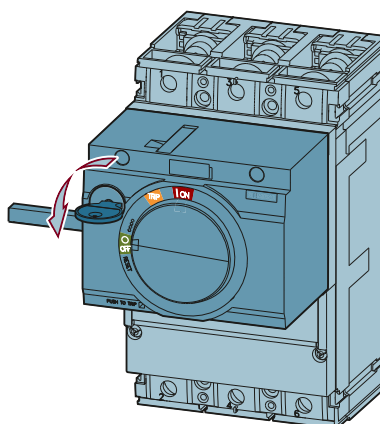


Lockable positions:

- Position OFF (O)

Locking, blocking or interlocking with cylinder lock (type Ronis)

The cylinder lock (type Ronis) is used, depending on the installation of the cylinder lock holder, for locking, blocking and interlocking the rotary operators.

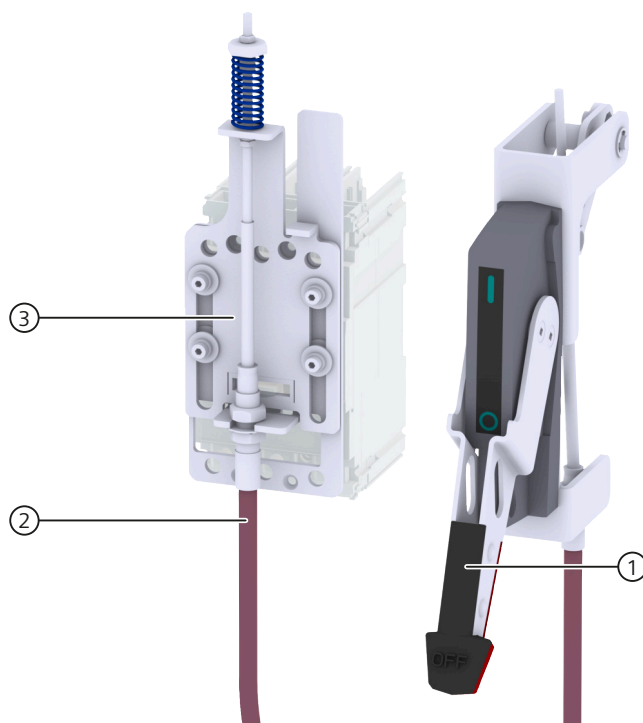


- Locking with cylinder lock (type Ronis):
The cylinder lock (type Ronis) locks the rotary operators in the OFF (O) position.
- Mutual interlocking with cylinder lock (type Ronis):
Through use of the cylinder lock insert for interlocking, any number of rotary operators can be mutually interlocked.
This requires that the keys of all opened and locked molded case circuit breakers be removed and securely stored. Only the key of the rotary operator which is in the ON (I) position is left in the cylinder lock. This key cannot be removed in the ON (I) position. This key can only be removed if the rotary operator has been turned to the OFF (O) position, the cylinder lock has been locked and the molded case circuit breaker has thus been interlocked. See also chapter Front interlocking (Page 402).

4.5.6 Operating unit with Bowden cable (Max-Flex operator)

4.5.6.1 Elements of the operating unit with Bowden cable

The Max-Flex operator is installed for switching a 3VA UL molded case circuit breaker using a handle and Bowden cable through the control cabinet door. The switching mechanism and handle are connected to one another with a flexible Bowden cable.



- ① Handle
- ② Bowden cable
- ③ Switching mechanism

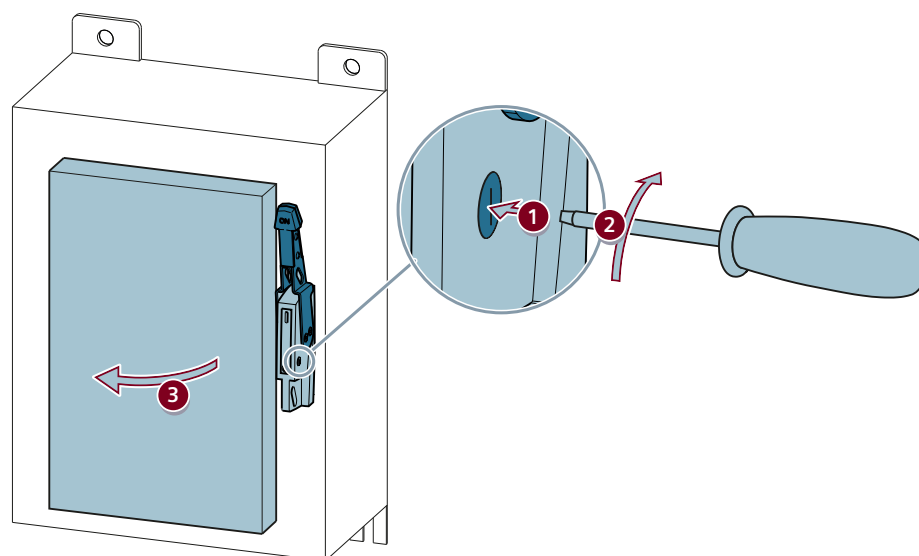
A variety of Bowden cable lengths are available.

4.5.6.2 Door interlocking with the operating unit with Bowden cable

The handle of the operating mechanism with Bowden cable interlocks the control cabinet door as soon as the handle is in position ON (I).

Defeat function of the door interlock

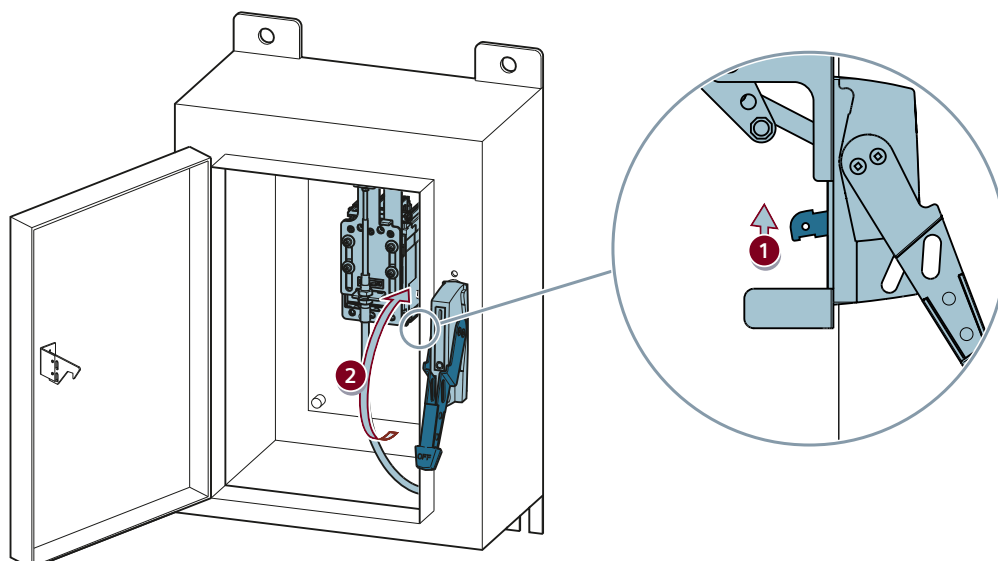
In order to open the control cabinet door even when the molded case circuit breaker is closed, the door interlocking can be defeated. This is done using the screw on the side of the handle.

**Procedure**

1. Use a screwdriver to turn the screw clockwise by 90°.
2. Keep the screw turned while the door is opened.

Switching on the molded case circuit breaker when control cabinet door is open

When the control cabinet door is open, the 3VA UL molded case circuit breaker can be switched using the Max-Flex operator with a deliberate action only.

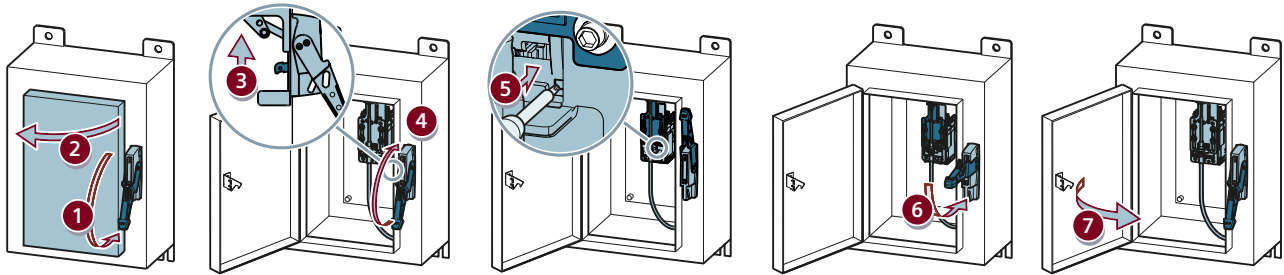
**Procedure**

1. Press locking pin upward.
2. Keep locking pin pressed while the molded case circuit breaker is closed.

4.5.6.3 Testing the tripping mechanism

The <PUSH TO TRIP> button can be used to check whether the tripping mechanism is working properly.

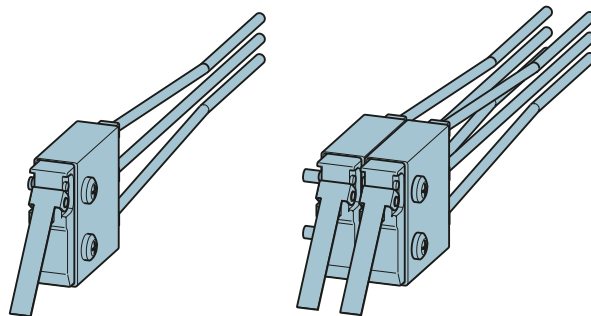
Procedure



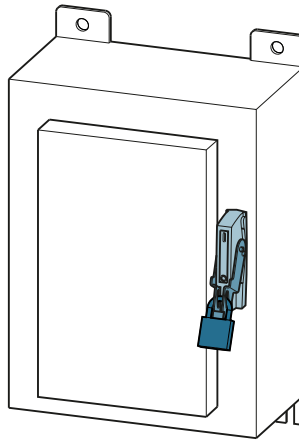
1. Turn the Max-Flex handle to the OFF (O) position.
2. Open the panel door.
3. Keep the interlock pin pressed as described above.
4. Bring the molded case circuit breaker to the ON (I) position using the handle.
5. Press the <PUSH TO TRIP> button with a tool such as a screwdriver.
The Max-Flex operator moves from the ON (I) position to the TRIP position. The molded case circuit breaker is now in the tripped state.
6. Move the handle for resetting the molded case circuit breaker to the OFF (O) position.
7. Close the panel door.
The molded case circuit breaker can now be closed again.

4.5.6.4 Auxiliary switches for the operating unit with Bowden cable

For the operator kit with Bowden cable, auxiliary switches are available with one or two changeover contacts. These are screwed to the switching mechanism and signal the switching state.



4.5.6.5 Locking, blocking and interlocking



Lockable positions:

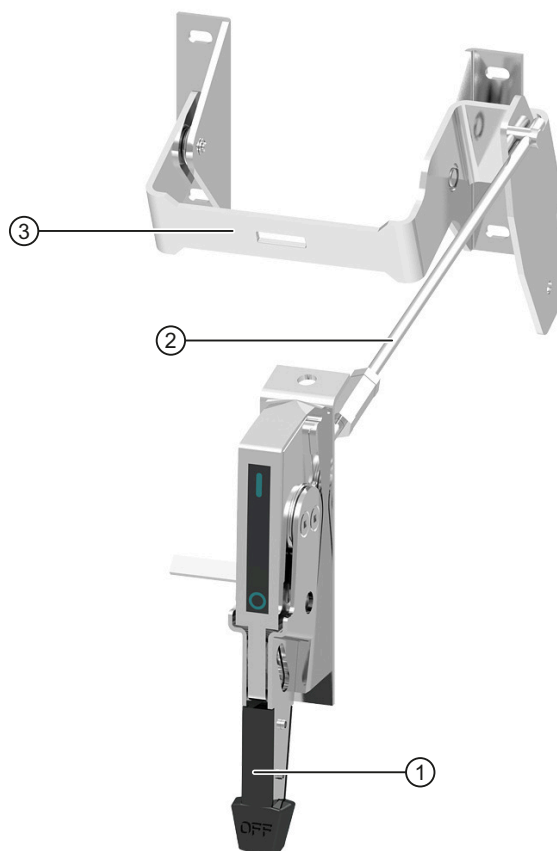
- Position OFF (O)
Locking the handle of the operator kit with Bowden cable in the OFF (O) position prevents the molded case circuit breaker from being closed.
- Position ON (I)
The handle of the operator kit with Bowden cable can **not** be locked in the ON position.

4.5.7 Variable depth flange mounted operator (VDFMO)

4.5.7.1 Variable depth flange mounted operator

The variable depth flange mounted operator is very similar to the operator with Bowden cable, the difference being that the handle and the operating mechanism are connected by means of a rigid rod.

Elements of the variable depth flange mounted operator:



- ① Handle
- ② Fixed connecting rod
- ③ Switching mechanism

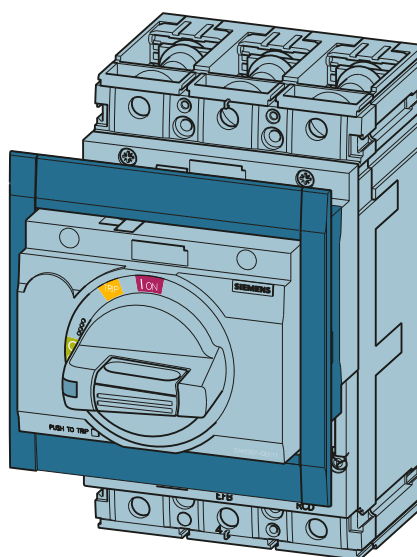
Testing, operation, locking and defeat function of the door interlocking are performed for the variable depth flange mounted operator as well as for the Operating unit with Bowden cable (Max-Flex operator) (Page 366)

4.5.8 Degree of protection

4.5.8.1 IP degree of protection

Operator	IP degree of protection
Front mounted rotary operator	IP30
Front mounted rotary operator with cover frame	IP30
Door mounted rotary operator	IP65
Side wall mounted rotary operator	IP65
Operating unit with Bowden cable	IP65

When fitted with a cover frame (see illustration below), a front mounted rotary operator installed in the panel door has degree of protection IP30.



Note

To ensure that the panel door can still be opened, the front mounted rotary operator must not project over the cover frame by more than 5 mm when the door is closed.

4.5.8.2 NEMA degree of protection

All 3VA UL rotary operators are designed in such a way that the NEMA degrees of protection 1, 12, 3R and 4 or 4X for enclosures can be met.

The handle of the operator kit with Bowden cable is also available in variants with NEMA degrees of protection 1, 12 and 3R or NEMA degrees of protection 4/4X.

4.5.9 Accessories

4.5.9.1 Illumination kit

Illumination kit



The illumination kit illuminates the indication of the breaker status of the front mounted rotary operator or the door mounted rotary operator or the masking plate of the door mounted or side wall mounted rotary operator. The illumination kit can be ordered with the operator as a pre-assembled accessory, or individually as a retrofit component.

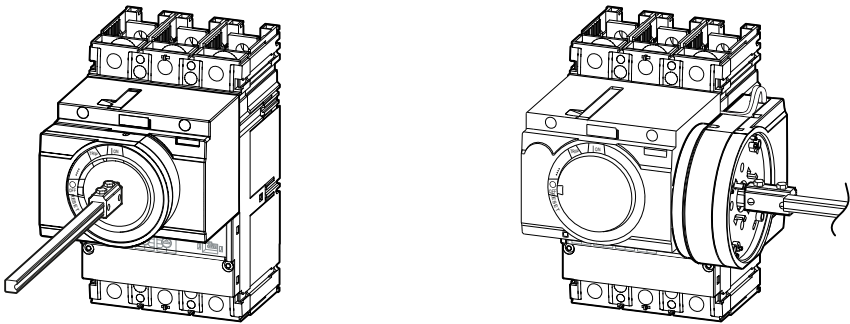
The illumination kit operates on a 24 V DC supply.

Its power consumption is 0.16 W.

4.5.9.2 Auxiliary switch module for rotary operators



The auxiliary switch module for rotary operators can be used with door mounted rotary operators and side wall mounted rotary operators for circuit breakers up to frame size 600 A. It contains auxiliary switches which signal the opening/closing of the main contacts early (leading) in order to operate an undervoltage release for example.

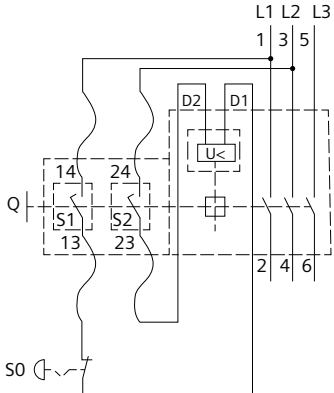
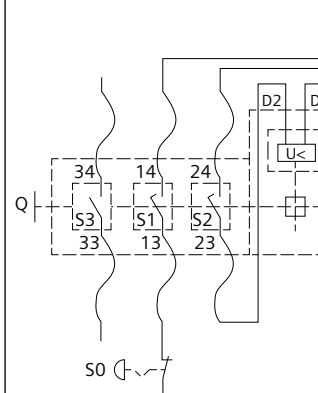


The auxiliary switch module with door mounted rotary operator (on the left) and side wall mounted rotary operator (on the right).

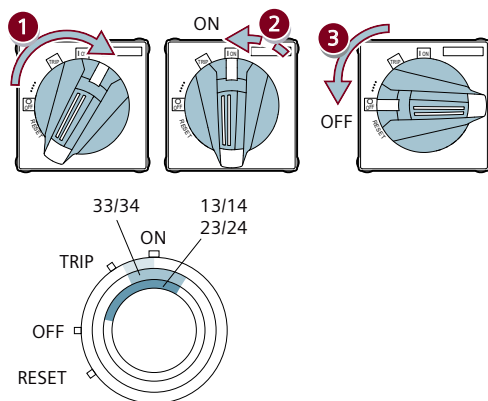
The auxiliary switch module is available in different versions:

With door mounted rotary operator		
For 3VA51	All other frame sizes	
2 leading contacts in the ON direction	2 leading contacts in the ON direction	2 leading contacts in the ON direction, 1 leading contact in the OFF direction

4.5 Manual operators

With side wall mounted rotary operator (adapter required)		
For 3VA51	All other frame sizes	
2 leading contacts in the ON direction	2 leading contacts in the ON direction	2 leading contacts in the ON direction, 1 leading contact in the OFF direction
		

In order to implement the leading function, the handle is turned past the normal ON position when switching on, as shown in the diagram.



Applications:

The leading auxiliary switches in the ON direction are used, for example, with undervoltage releases in order to signal closing of the MCCB early (leading), thus ensuring that the MCCB can be closed.

The leading auxiliary switches in the OFF direction are primarily used where there is no space for internal LCS (leading changeover switch) accessories because a COM060 communications module is installed.

4.6 Motor operator

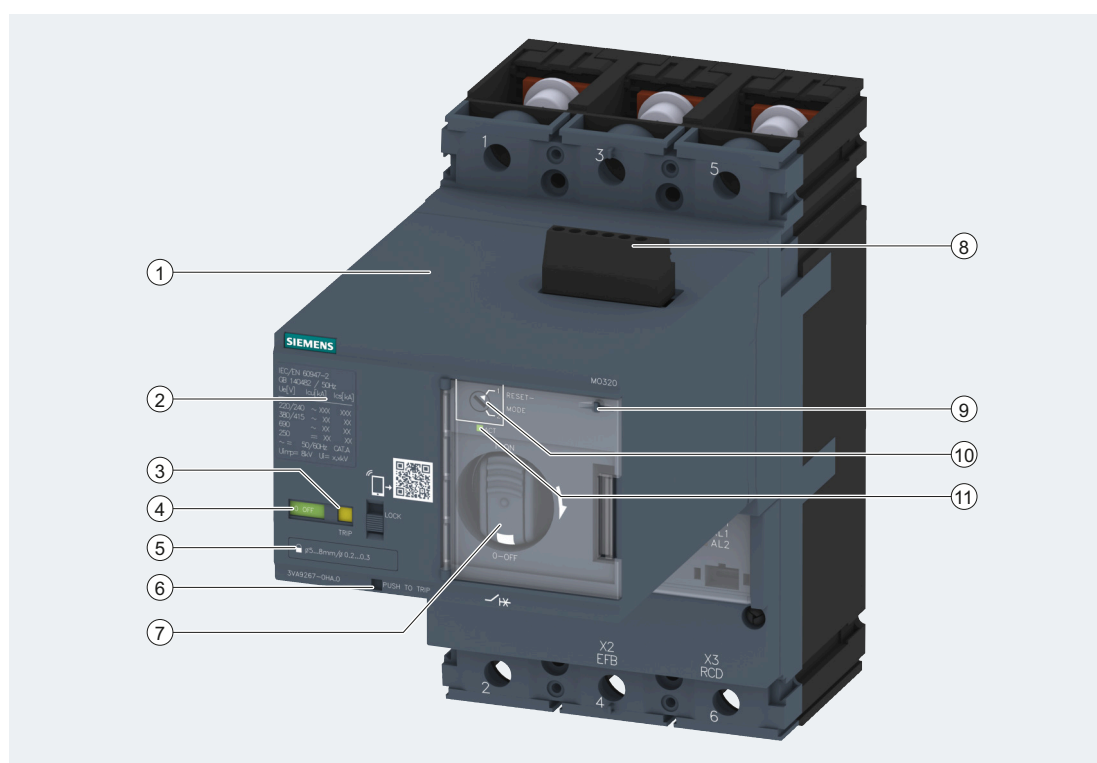
4.6.1 MO320 motor operator

4.6.1.1 Elements of the motor operator MO320



The motor operator MO320 transmits commands via electrical control cables to open and close the molded case circuit breaker. The source of commands transmitted via electrical control cables can be a pushbutton or a PLC, for example.

Motor operators must also be used in conjunction with automatic transfer controllers.

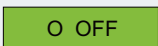


- | | |
|--|--|
| ① MO320 motor operator | ⑦ Handle for manual operation |
| ② Characteristic data of the molded case circuit breaker | ⑧ Connecting terminals for power supply (AC/DC depending on version) |
| ③ "TRIP" LED | ⑨ Seal |
| ④ Indication of the breaker status ON/OFF | ⑩ Reset mode setting |
| ⑤ Mechanism for padlocks | ⑪ "Active" LED |
| ⑥ Button for trip unit <PUSH TO TRIP> | |

4.6.1.2 Description of front panel

The front panel of the motor operator MO320 features an indication of the breaker status and a "TRIP" LED. The indication directly reflects the status of the switch shaft. With its clear breaker status indication, the motor operator MO320 meets the requirements pertaining to isolating features stipulated by IEC / EN 60947-1.

Indication of the breaker status on the front panel

	ON	The main contacts of the molded case circuit breaker are closed.
	OFF	The main contacts of the molded case circuit breaker are open.
 	Off and LED TRIP lit	The molded case circuit breaker is in TRIP position.

LED status displays

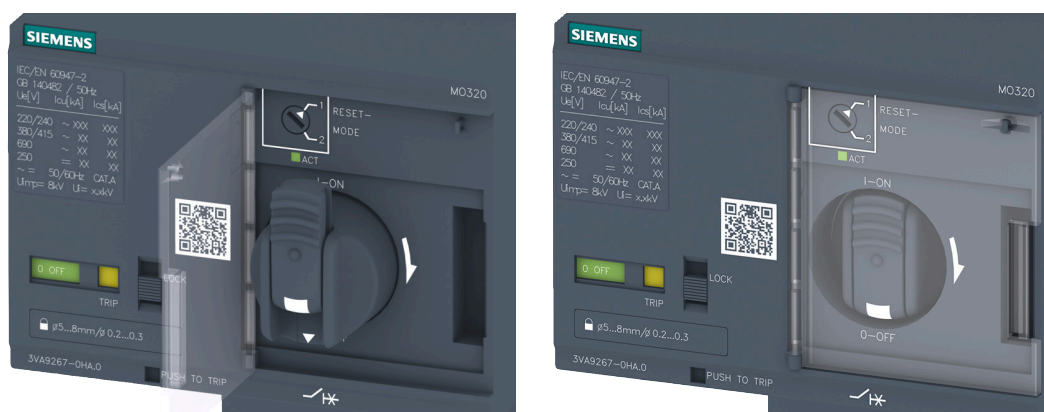


ACT	TRIP	Status
		No power supply
		Internal error
		Normal operating status
		Tripped if TRIP LED is illuminated
		Device defective

See also chapter Faults, causes of faults and rectification of faults (Page 382).

4.6.1.3 MANUAL, AUTO and LOCK modes

The motor operator MO320 is switched to MANUAL or AUTO mode when the plastic window is opened (MANUAL) or closed (AUTO).



MANUAL:

When the plastic window is open, the motor operator MO320 is in MANUAL mode. The motor operator is moved to position ON (I) or OFF (O) by manual operation of the handle.

AUTO:

When the plastic window is closed, the motor operator MO320 is in AUTO mode. The motor operator can be operated via control cables, e.g. in response to signals issued by a pushbutton or by control commands output by a PLC.

LOCK:

The motor operator can be locked in the OFF (O) position to prevent reclosing of the breaker. The padlock device snaps out if the slide above it is moved to the "LOCK" position.

The padlock device can be locked with up to three padlocks with a diameter of 3/16" - 5/16" / 5 - 8 mm. Padlocks are not included in the scope of supply.

4.6 Motor operator



4.6.1.4 Operating the molded case circuit breaker with motor operator

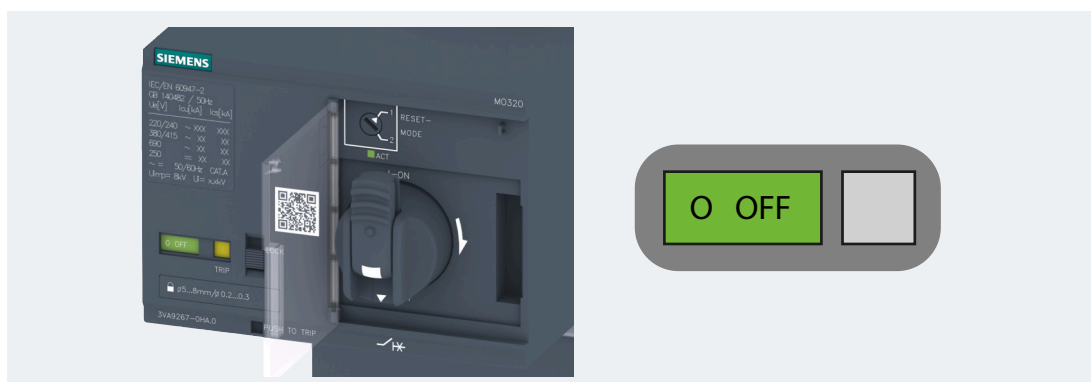
Opening and closing in **MANUAL** mode

The plastic window is open, the motor operator is in MANUAL mode. The supply to the LEDs is also disconnected, but the motor operator remains fully operational.

- Closing the 3VA UL molded case circuit breaker:
Turn the handle clockwise until the breaker status indication indicates ON (I).
The molded case circuit breaker is now closed ON (I). The main contacts are closed.



- Opening the 3VA UL molded case circuit breaker:
Turn the handle clockwise until the breaker status indication indicates OFF (O).
The molded case circuit breaker is now OFF (O). The main contacts are open.



Opening and closing in AUTO mode

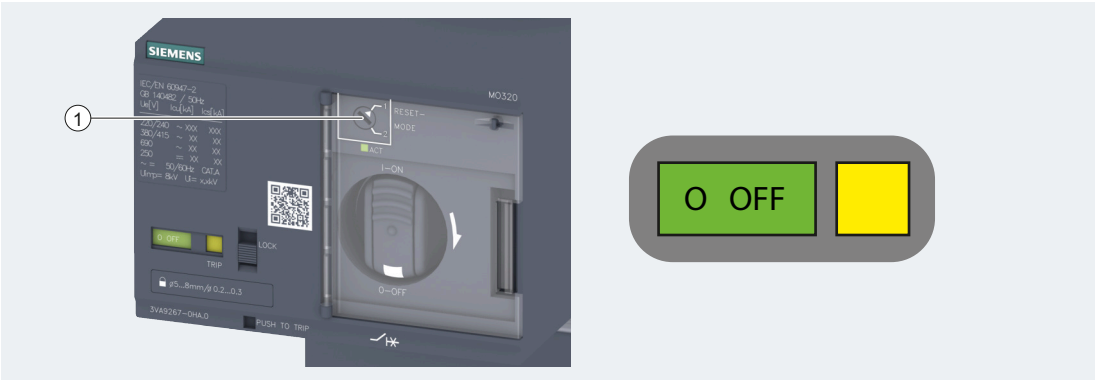
The plastic window is closed, the motor operator is in AUTO mode. The 3VA UL molded case circuit breaker can be closed or opened with electrical signals.



- Close the 3VA UL molded case circuit breaker with an electrical ON signal at the terminal block:
The molded case circuit breaker is closed - ON (I). The main contacts are closed. The indicator on the front panel of the motor operator indicates ON (I).
- Open the 3VA UL molded case circuit breaker with an electrical OFF signal at the terminal block:
The molded case circuit breaker is opened - OFF (O). The main contacts are separated. The indicator on the front panel of the motor operator indicates OFF (O).

Resetting the molded case circuit breaker

If the 3VA UL molded case circuit breaker is tripped, the "TRIP" LED lights up



① Reset mode setting

The resetting of the 3VA UL molded case circuit breaker by the motor operator depends on the selected reset mode.

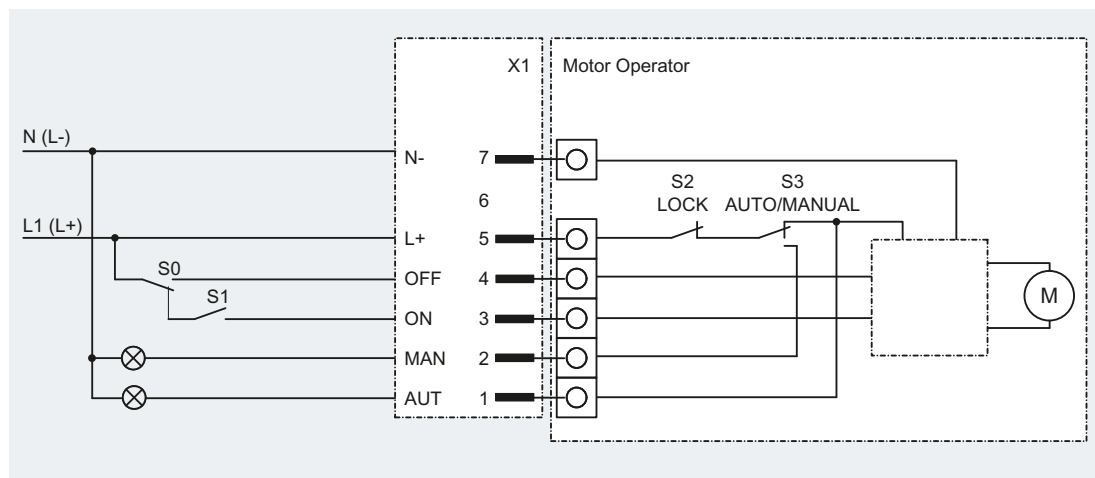
Reset modes

The reset mode can be set. After the molded case circuit breaker has tripped, the selected reset mode determines the response of the motor operator in the TRIP position.

Response of the motor operator to tripping of the 3VA UL molded case circuit breaker, depending on the reset mode:

Reset mode	Requirements	Operating mode	Setting Rotary button	Description
Operating mode 1: Automatic reset	Plastic window closed, motor operator is in AUTO position.	AUTO		If the molded case circuit breaker has tripped, the motor operator moves it automatically from position TRIP to position OFF.
Operating mode 2: Manual reset or reset by remote control	Plastic window open or closed, motor operator is in the MANUAL or AUTO position.	MANUAL / AUTO		MANUAL operating mode: The motor operator must be reset locally by means of the handle (switching position OFF (O)). AUTO operating mode: The motor operator must be reset with an OFF signal transferred via control cables (e.g. pushbutton, PLC).

Connection diagram for control of the motor operator MO320



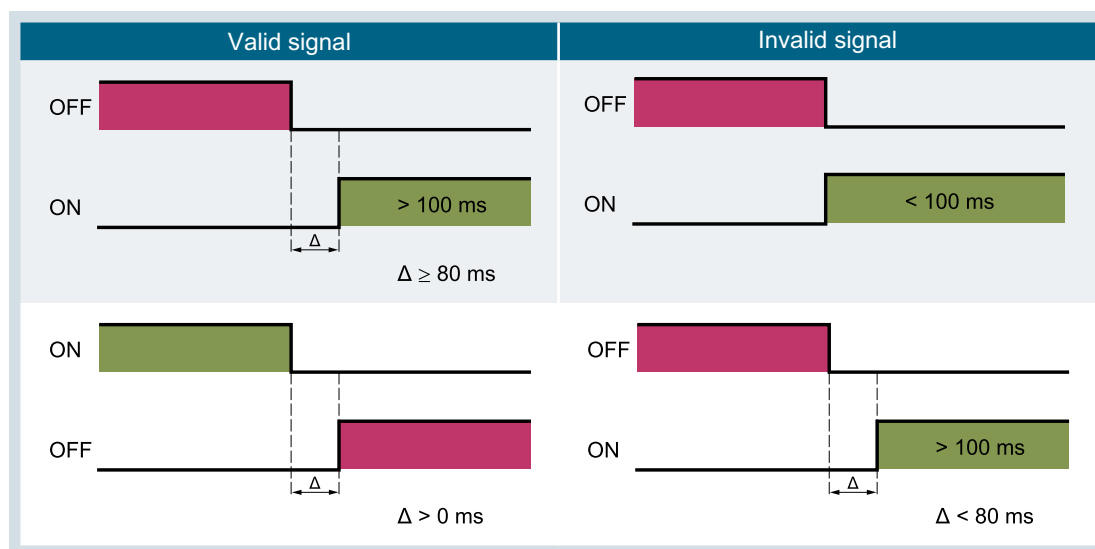
Note

An EMERGENCY-OFF circuit may be implemented by means of a shunt trip or undervoltage release (Page 208).

For further circuit diagrams, see chapter "Circuit diagrams" (Page 493).

The motor operator MO320 is edge-controlled, i.e. it reacts only to the positive edge of an ON or OFF command at the relevant terminals 3 and 4. In this case, the OFF signal is dominant, i.e. the motor operator will be switched off in response to an OFF edge even if an ON signal is applied.

The MO320 requires a pause period of 80 ms between the end of an OFF signal and the edge of an ON signal. Since the OFF signal is dominant, it does not require a pause period.



4.6 Motor operator

4.6.1.5 Faults, causes of faults and rectification of faults

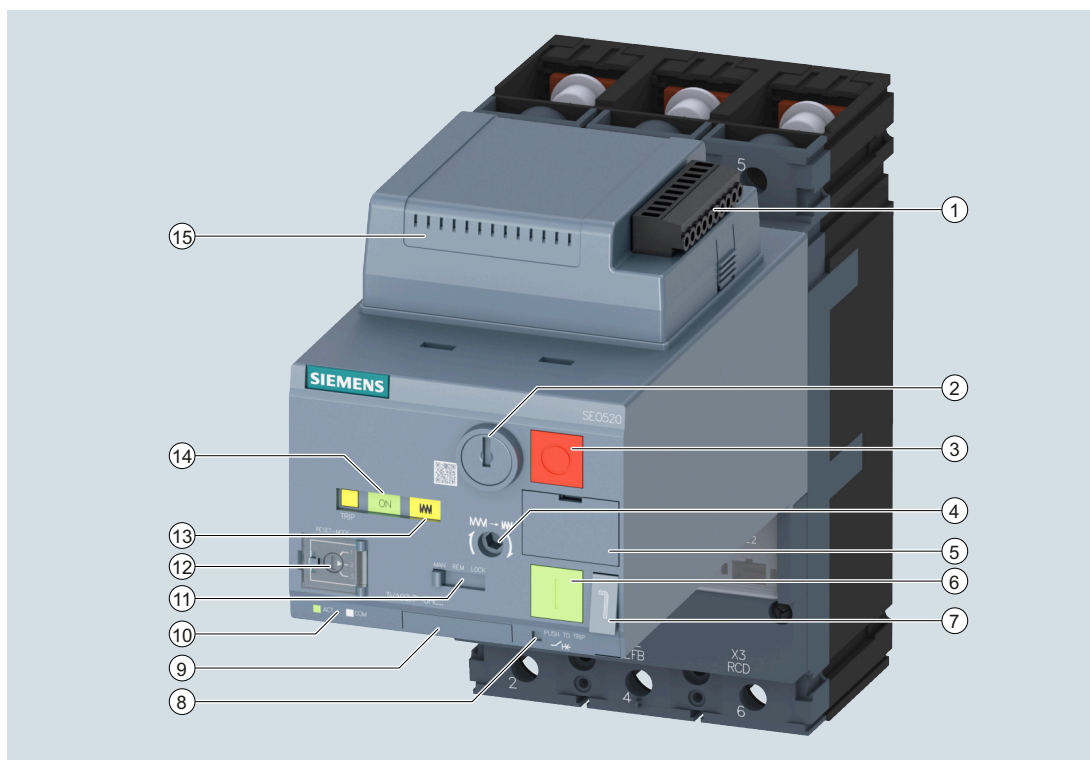
Causes of faults	LED display		Elimination
	ACT	TRIP	
Defects			
Device defective (e.g. defective microswitch)			Cannot be eliminated, replace device
Fault			
Switching time too long (e.g. blocked motor)		☐	If the motor operator fault condition cannot be rectified by switching it ON/OFF again, the switch position must be corrected manually. Before doing this, also ensure that the rotary switch for RESET mode is in a defined state.
Incorrect switch position following command (e.g. OFF position following ON signal)		☐	
Undefined switch position		☐	
Undefined switch position		☐	
Reset mode undefined (e.g. rotary switch not in position 1 or 2)		☐	

4.6.2 SEO520 motor operator with stored energy mechanism



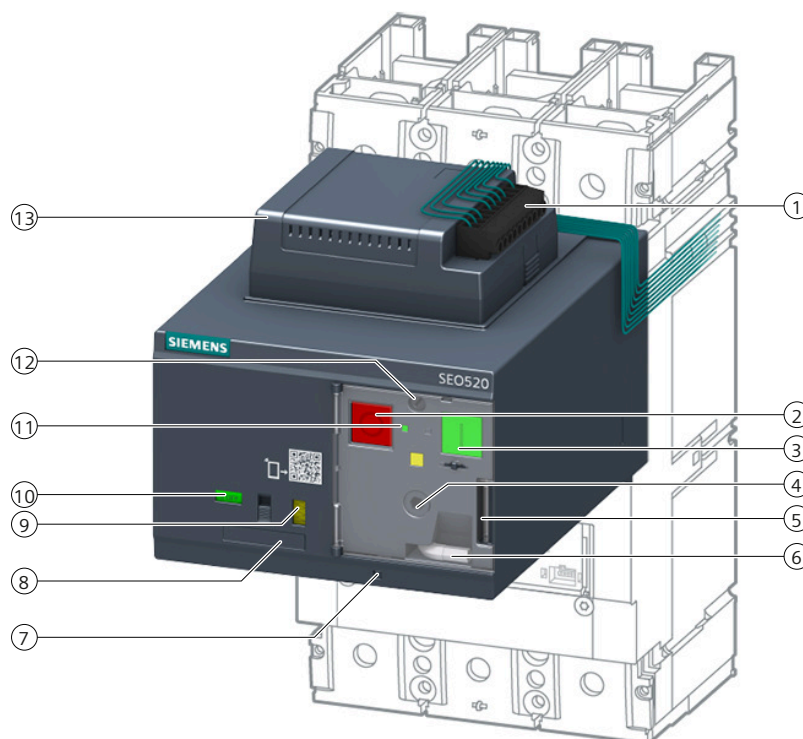
The front motor operator with SEO520 stored energy mechanism is primarily designed for network synchronization applications on account of its fast switching times. It also offers the option of a communication link which allows the 3VA molded case circuit breaker to be remotely controlled in fieldbus systems associated with the 3VA range.

For frame size 250 A



- ① Connecting terminals
- ② Cylinder lock installation option (type Ronis) for mode interlocking
- ③ OFF button
- ④ Tool insertion slot for manually winding up the stored energy mechanism
- ⑤ Installation option for mechanical operating cycles counter
- ⑥ ON button
- ⑦ Slot for storing tool for manual wind-up
- ⑧ <PUSH TO TRIP> test button
- ⑨ Locking provision for padlocks
- ⑩ Active and Communication LEDs
- ⑪ Mode slide switch
- ⑫ Reset mode selector switch
- ⑬ Indication of status of stored energy mechanism
- ⑭ Indication of the breaker status (ON/OFF)
- ⑮ Power supply top unit (24 V DC, 42 - 60 V AC/DC, 110 - 230 V AC/DC)

For frame sizes 400/600 A



- ① Connecting terminals
- ② OFF button
- ③ ON button
- ④ Tool insertion slot for manually winding up the stored energy mechanism
- ⑤ AUTO/MANUAL mode by opening/closing the cover, as with MO320
- ⑥ Slot for storing tool for manual wind-up
- ⑦ <PUSH TO TRIP> test button
- ⑧ Locking provision for padlocks
- ⑨ Indication of status of stored energy mechanism
- ⑩ Indication of the breaker status (ON/OFF)
- ⑪ Active and Communication LEDs
- ⑫ Reset mode selector switch
- ⑬ Power supply top unit (24 V DC, 42 - 60 V AC/DC, 110 - 230 V AC/DC)

Description of front panel

The front panel of the motor operator with SEO520 stored energy mechanism features an indication of the breaker status and a "TRIP" LED. The clear breaker status indication allows the SEO520 motor operator to meet the requirement pertaining to isolating features stipulated by IEC / EN 60947-1.

Indication of the breaker status on the front panel

	ON	The main contacts of the molded case circuit breaker are closed.
	OFF	The main contacts of the molded case circuit breaker are open.
	Off and LED TRIP light up	The molded case circuit breaker is in TRIP position. It is not absolutely certain that all main contacts are open.

LED status displays

ACT	TRIP	Status
		No power supply
		Internal error
		Normal operating state
		Tripped if TRIP LED is active
		Device defective

Stored energy mechanism status display

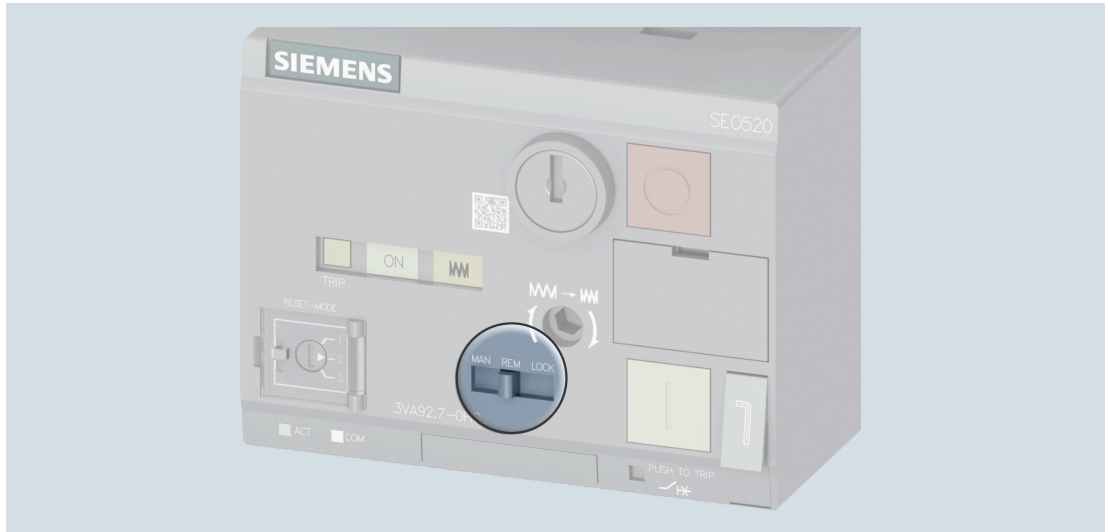
	Frame size	
	250 A	400/600 A
Spring status	Meaning	
	Installation position (OFF spring discharged, ON spring charged)	--
	Both springs charged – SEO520 motor operator ready	Spring charged, SEO520 motor operator ready; installation position
	SEO520 motor operator at ON, ON spring discharged, OFF spring still charged	SEO520 motor operator at ON, ON spring discharged
	SEO520 motor operator at OFF, both springs discharged – charging is automatic (4 - 5 s, with supply voltage) or manual (without supply voltage)	SEO520 motor operator at OFF, spring discharged – charging is automatic (8 s, with supply voltage) or manual (without supply voltage)

4.6.2.1 MANUAL, AUTO and LOCK modes

The SEO520 motor operator with stored energy mechanism features the operating modes

- MANUAL (manual mode)
- AUTO (remote control mode)
- LOCK (locked)

These are selected using a slide switch on the front of the SEO (250 A devices) or by means of the plastic cover (400/600 A devices).



MANUAL

In MANUAL mode (slide switch on the left or plastic cover open), the SEO520 motor operator can only be operated using the buttons on the front panel of the SEO520 motor operator.

AUTO

In AUTO mode (slide switch in the middle or plastic cover closed), the SEO520 motor operator is operated via control cables, e.g. via pushbuttons or a PLC, or via the optional communication function.

LOCK

In LOCK mode (slide switch on the right or on top, only possible in the OFF (O) position), the SEO520 motor operator can be interlocked to prevent reclosing. The locking device can be locked with up to three padlocks (shackle diameter 5.0 mm to 8.0 mm).

Padlocks are not included in the scope of supply.



4.6.2.2 Closing, opening and resetting the 3VA molded case circuit breaker

Closing and opening

In MANUAL mode

In MANUAL mode, the molded case circuit breaker is operated using the buttons on the front panel of the SEO520 motor operator. Remote control is not possible.

Operating the ON (I) button causes the contacts of the molded case circuit breaker to close. Operating the OFF (O) button causes the contacts to open. This is not performed by means of a TRIP. It is an actual opening process.

In AUTO mode

In AUTO mode, the molded case circuit breaker can be closed and opened by means of electrical signals at the terminal block.

Versions with the communications module can be closed and opened via the connection to the COM060 communications module in the molded case circuit breaker. This takes place via the communication environment selected for the 3VA2 molded case circuit breaker, e.g. PROFIBUS, PROFINET, Ethernet (Modbus TCP). Closing and opening commands can also be issued via the SENTRON Powerconfig commissioning and parameterization software. Here too, an actual switch-off operation is performed and not a TRIP.

In AUTO mode, the OFF (O) button on the SEO520 operator can be used. The ON (I) button cannot be operated.

Resetting the molded case circuit breaker

The method by which the molded case circuit breaker is reset by the SEO520 motor operator depends on the selected reset mode.

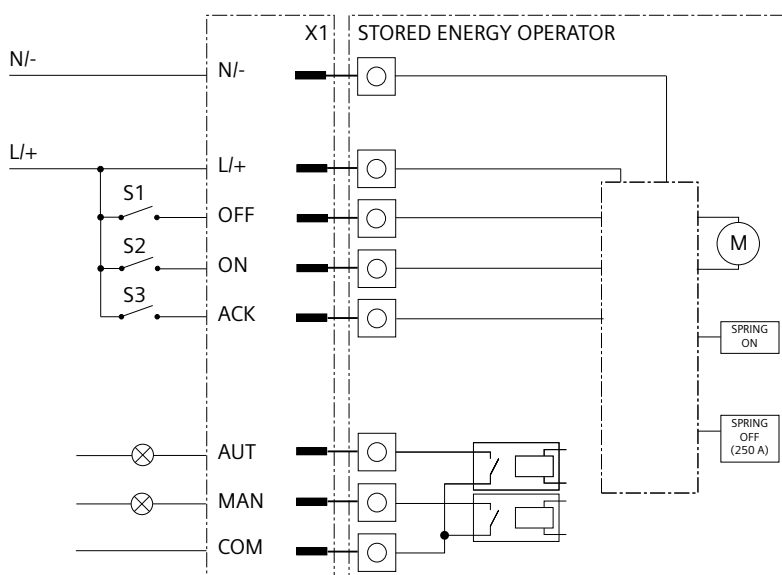
4.6 Motor operator

Selectable reset mode

The reset mode can be set. After the molded case circuit breaker has tripped, the selected reset mode determines the response of the motor operator in the TRIP position.

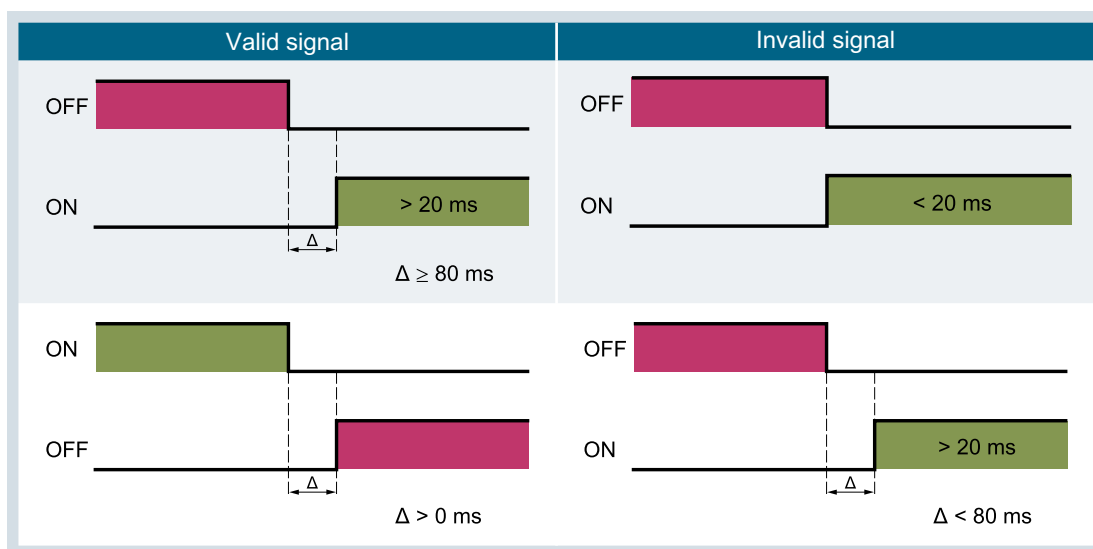
Response of SEO520 motor operator to tripping of the molded case circuit breaker, depending on the selected reset mode:

Reset mode	Requirement	Operating mode	Position of rotary knob	Description
Mode 1: Automatic reset	Slide switch at AUTO, the SEO520 motor operator is in the AUTO position	AUTO		If the molded case circuit breaker trips, the SEO520 motor operator automatically moves it from the TRIP position to the OFF position.
Mode 2: Reset via manual operation or remote control	Slide switch at AUTO or MANU, the SEO520 motor operator is in the MANUAL or AUTO position	MANUAL / AUTO		MANUAL mode: The motor operator must be reset locally using the pushbuttons (OFF (O)). It may be necessary to charge the spring assembly manually beforehand. AUTO mode: The motor operator must be reset via control cables (e.g. pushbutton, PLC) or communication with an OFF signal.
Mode 3: Reset after additional acknowledgement	Slide switch at AUTO, the SEO520 motor operator is in the AUTO position	AUTO		If the molded case circuit breakers trips, the SEO520 motor operator requires an acknowledgement (via electrical signal at terminal block (ACK) or via communication) before it can be reset by an OFF signal.

Connection diagram for control of the SEO520 motor operator

The SEO520 motor operator is edge-controlled, i.e. it reacts only to the positive edge of an ON or OFF command at the relevant terminals 3 and 4. In this case, the OFF signal is dominant, i.e. the motor operator will be switched off in response to an OFF edge even if an ON signal is applied.

The SEO520 requires a pause period of 80 ms between the end of an OFF signal and the edge of an ON signal. Since the OFF signal is dominant, it does not require a pause period.



4.6.2.3

Faults, causes of faults and rectification of faults

"Device defective" refers to a fault or defect in the motor operator which cannot be rectified. The device must be replaced. This can be caused by a defective microswitch, for example.

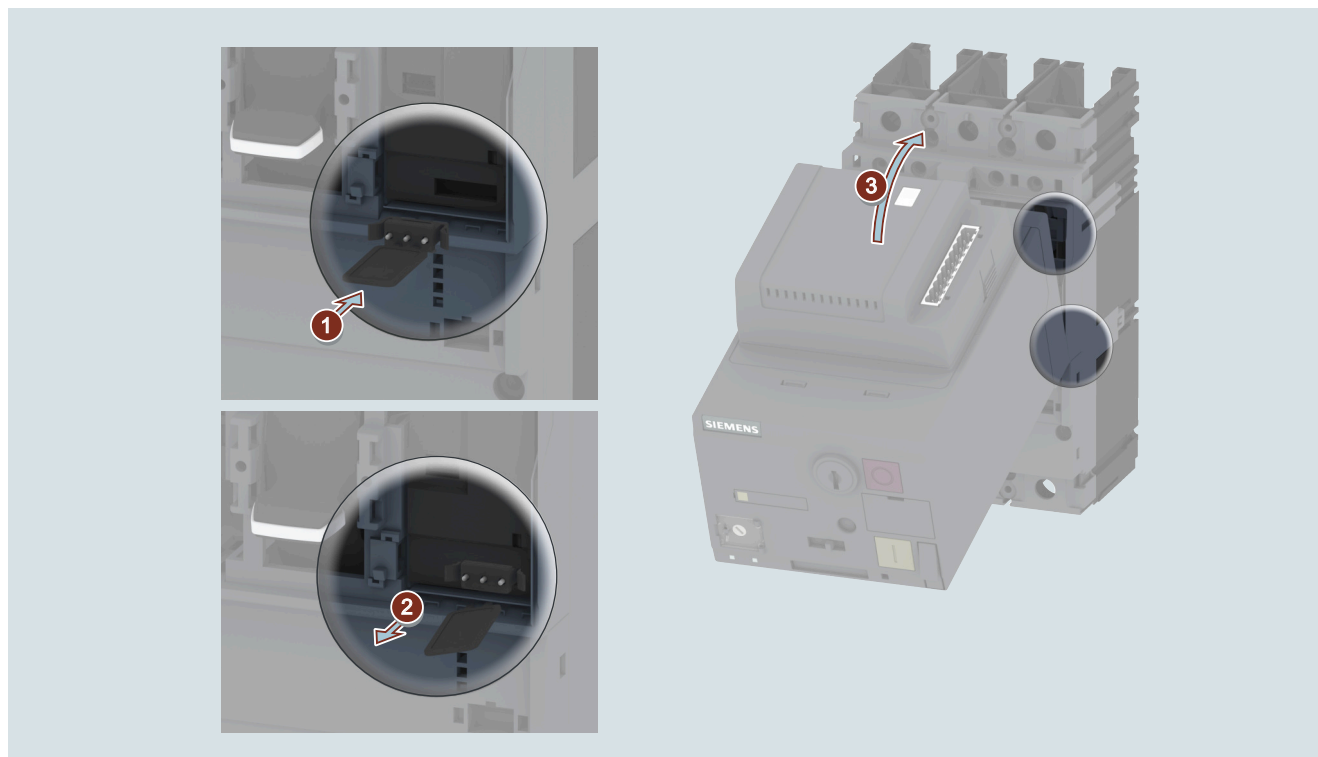
"Internal error" refers to faults which can be rectified (e.g. an undefined switching position, fault on automatic RESET, excessively long switching times). If the motor operator fault condition cannot be rectified by (remotely) switching it ON/OFF again, the following actions are necessary:

- Ensure that the rotary switch for RESET mode is in a defined state (1, 2 or 3)
- Correct the switching position manually (manually charge the stored energy and operate the ON/OFF button).

ACT	TRIP	Status
☐	☐	No power supply
	☐	Internal error
	☐	Normal operating state
		Tripped if TRIP LED is active
		Device defective

4.6.2.4 Communication

A communication-capable version of the SEO520 motor operator can be ordered as an option. This integrates it in the 3VA communication environment and makes it possible to remotely control the molded case circuit breaker. The signal transmission takes place via an SEO-COM adapter to the COM060 communication module in the right-hand accessory compartment of the molded case circuit breaker.



1. Insert the COM060 communication module and the SEO-COM adapter in the molded case circuit breaker.
2. Break off the assembly support of the SEO-COM adapter.
3. Fit the SEO520 in the mounting position.
The communication connection is established automatically when the COM060 is connected to COM800/100, thereby contacting the 24 V DC.

4.6.2.5 Accessories

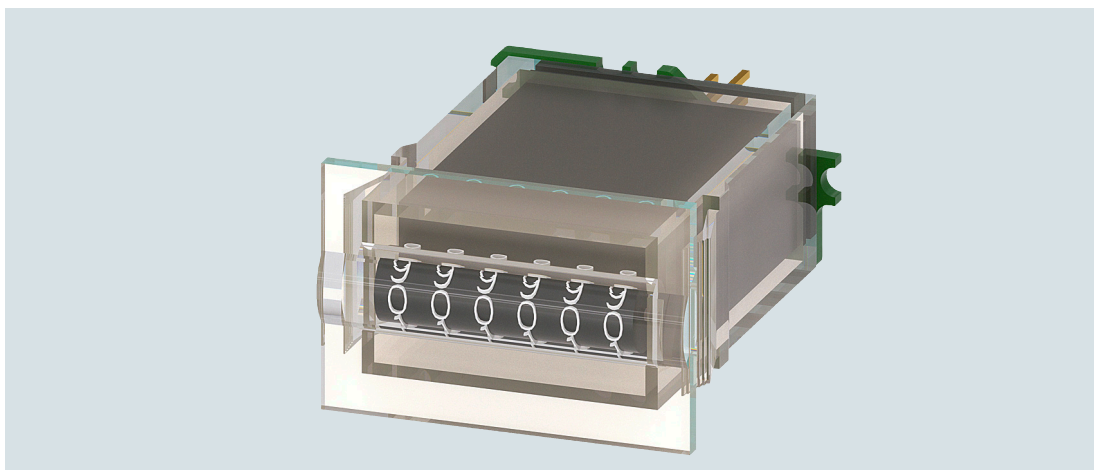
Cylinder lock (type Ronis)

The SEO520 motor operator can be fitted with a cylinder lock (type Ronis) at the front. The lock kit comprises a cylinder lock with four possible key versions and the SEO-specific lock insert. The cylinder lock interlocks the selected operating mode (MANUAL, AUTO, LOCK) to prevent any unauthorized change of operating mode.



Operating cycles counter

The mechanical operating cycle counter can be installed at the front. It counts the number of ON/OFF cycles from the time it is installed.



Compatibility with other accessories**CAUTION****Irreparable damage to the molded case circuit breaker**

If the SEO520 motor operator is equipped with a communication option, the use of auxiliary (AUX) switches is **not** permitted in the HP version (3VA9988-0AA11) due to requirements pertaining to air and creepage distances in the right-hand accessory compartment of the molded case circuit breaker.

This warning notice is relevant for cases where an SEO520 motor operator with a communication option is used in an application without communication. If the SEO520 motor operator is connected to a communication system, the COM060 communication module occupies the mounting location of the auxiliary (AUX) switch in the HP version in the right-hand accessory compartment.

4.6.3 Technical specifications

MO320 motor operator

			MO320 motor operator			
			125 A	3VA5 250 A	250 A	3VA6 400 A / 600 A
Ambient temperature (operation)		°C	-25 ... +70			
Ambient temperature (storage)		°C	-40 ... +80			
Rated control supply voltage (control supply voltage range)			24 ... 60 V DC (0.85 ... 1.26) 110 ... 240 V AC / 110 ... 250 V DC (0.85 ... 1.1)			
Rating		W/VA	250, max. 500 (60 ms)			
Breaking capacity (outputs)	24 ... 60 V DC	A	0.5			
	110 ... 230 V AC	A	1			
	110 ... 250 V DC	A	0.04			
Input impedance	24 ... 60 V DC	kΩ	10 ... 25			
	110 ... 230 V AC	kΩ	100 ... 140			
	110 ... 250 V DC	kΩ	100 ... 160			
Make time, typical		ms	< 800	< 1000		< 1700
Break time, typical		ms	< 800	< 1000		< 1400
Pulse duration, minimum		ms	100			
Maximum switching frequency		1/h	120			
Degree of protection			IP20, with escutcheon IP30			
Connectable conductor cross sections	mm ²		1.5 ... 2.5			
	AWG		16 ... 14			
Tightening torque	Nm		0.4 ±0,04			
	lb-in		3.5 ±0,4			
Stripped length	mm		7			
	in		0.28			
DIAZED fuse	A		4			
			Operational class gG Characteristic: slow			
Miniature circuit breakers			C characteristic to DIN VDE 0641			

SEO520 motor operator with stored energy mechanism

			SEO520 motor operator with stored energy mechanism	
			3VA62 250 A	3VA53 / 54 3VA63 / 64 600 A
Ambient temperature (operation)	°C		-25 ... +70	
Ambient temperature (storage)	°C		-40 ... +80	
Rated control supply voltage (operating range of control supply voltage)			24 V DC (0.85 ... 1.26)	
			42 ... 60 V DC / 42 ... 60 V AC (0.85 ... 1.26)	
			110 ... 230 V AC / 110 ... 250 V DC (0.85 ... 1.1)	
Rated operational power	W/VA		300, max. 500 (60 ms)	
Outputs			2 x relay outputs (250 V rated voltage), see below for details	

4.7 Locking and interlocking

SEO520 motor operator with stored energy mechanism			
		3VA62 250 A	3VA53 / 54 3VA63 / 64 600 A
Make time, typically	ms	<80	
Break time, typically	ms	<80	5000
Pulse duration, minimum	ms	20	
Spring charging time	s	3.5 ... 4.5	<8
Maximum switching frequency	1/h	120	
Degree of protection		IP20, with cover frame IP30	
Connectable conductor cross-sections	mm ²	1.5 ... 2.5	
Tightening torque	Nm	0.4	
Stripped length	mm	7	
DIAZED fuse	A	4	
		Operational class gG Characteristic: slow-response	
Miniature circuit breaker		On request	

Control voltage	AC-15	AC-12	DC-13	DC-12
24 V	3 A	6 A	0.8 A	4 A
42 V			0.4 A	2 A
60 V			0.25 A	0.8 A
110 V			0.2 A	0.5 A
230 V			0.1 A	0.25 A
250 V				

4.7 Locking and interlocking

4.7.1 General information

4.7.1.1 General information

For all 3VA UL molded case circuit breakers, a basic distinction is made between:

- Locking of molded case circuit breakers
- Interlocking of molded case circuit breakers

4.7.1.2 Locking

The locking provisions can be used to lock the 3VA UL molded case circuit breaker in the OFF (O) position or ON (I) position. A molded case circuit breaker cannot be operated when it is locked.

Locking a molded case circuit breaker in the OFF (O) position



In order to prevent the 3VA UL molded case circuit breaker from being closed, the position OFF (O) can be secured with a locking provision. As a result of this locking, the 3VA UL molded case circuit breaker is in the secure OFF (O) position. It can be unlocked again only by an authorized person.

The locking provisions of the 3VA UL molded case circuit breaker in the OFF (O) position ensure safe separation of the main contacts as defined by IEC 60947-2.

Locking a molded case circuit breaker in the ON (I) position



Like the OFF (O) position, the ON (I) positions can also be secured with a locking provision in order to secure the 3VA UL molded case circuit breaker against being opened. Only an authorized person can remove the locking of the 3VA UL molded case circuit breaker in the ON position again.

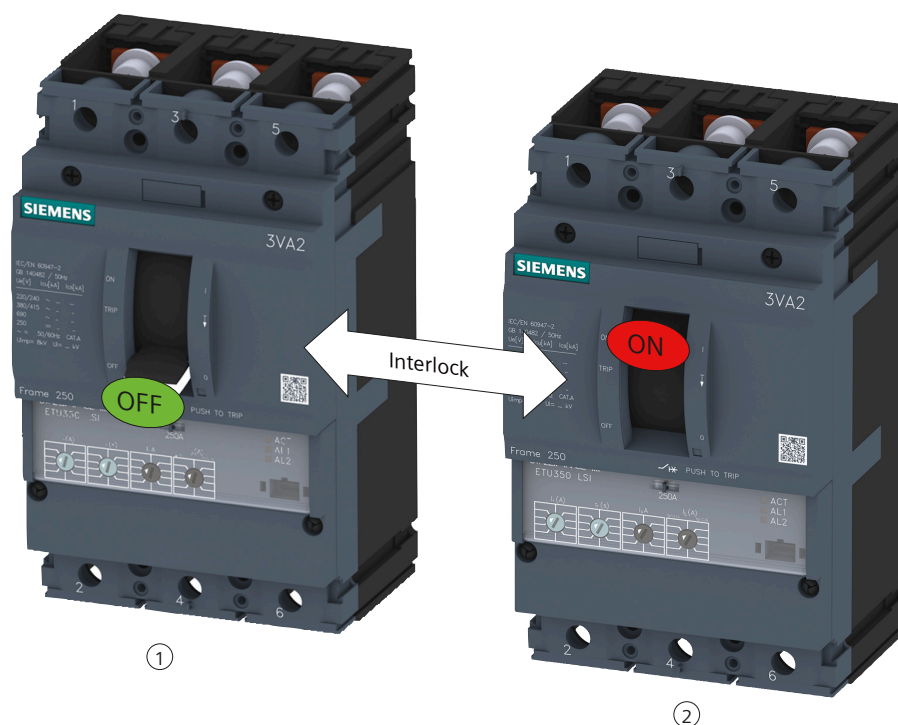
The TRIP function and thus the protective function of the 3VA UL molded case circuit breaker is not impaired by locking in the ON (I) position. In the event of a fault, the 3VA UL molded case circuit breaker trips in the normal way.

4.7.1.3 Interlocking

Two or more 3VA UL molded case circuit breakers can be mutually interlocked with the interlocking devices.

The interlocking device releases only one 3VA UL molded case circuit breaker at a time, thereby ensuring that only the released circuit breaker can be actuated. All other 3VA UL molded case circuit breakers are in the safe OFF (O) position and are blocked by the interlocking system.

Principle of two interlocked 3VA UL molded case circuit breakers:



- ① Molded case circuit breaker blocked/locked in the safe switching state OFF (O)
- ② Molded case circuit breaker released for operation

The 3VA UL molded case circuit breakers provide the following interlocking options:

- Front interlock
- Rear interlock

Front interlock

All front interlocks are installed on the front panel of the 3VA UL molded case circuit breaker. Front interlocks make it impossible to install some other external accessories such as motor operator, rotary operators, etc. They also partially restrict access to internal accessories compartments.

Rear interlock

The rear interlock does not affect the front panel of the 3VA UL molded case circuit breaker. All components of the interlocking system are concealed behind the molded case circuit breaker or the mounting plate.

4.7.2 Blocking and locking

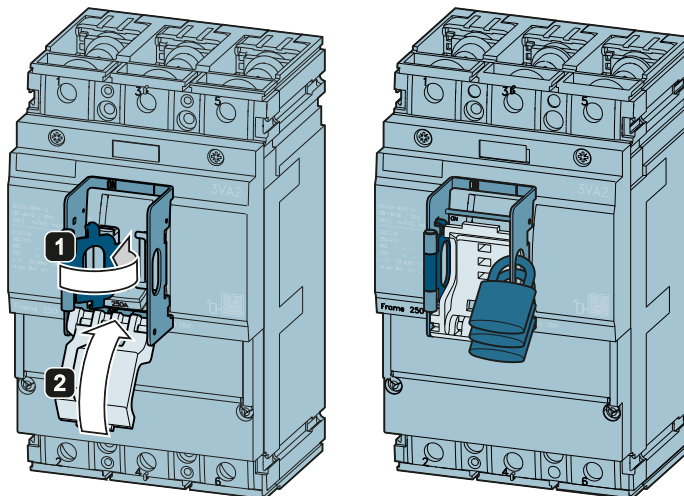
The following locking methods are available for the 3VA UL molded case circuit breaker:

- Handle blocking device including padlocks
- Cylinder locks for locking the 3VA UL molded case circuit breaker

4.7 Locking and interlocking

4.7.2.1 Handle blocking device

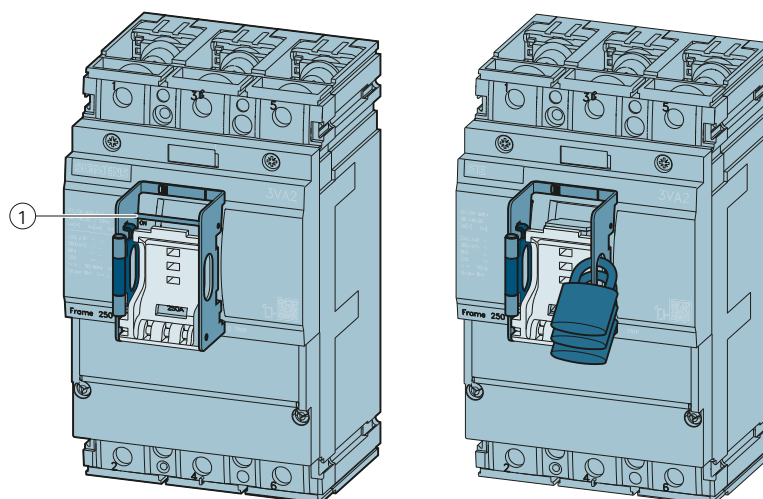
The handle locking device is attached directly to the handle of the 3VA UL molded case circuit breaker to be locked and latched in place.

**Note**

You can find information on installation in the operating instructions "Handle locking device" (<https://support.industry.siemens.com/cs/ww/en/view/109775675>).

With the help of the handle locking device, the 3VA UL molded case circuit breaker can be locked in the OFF (O) position with up to three padlocks (shackle diameter 3/16" - 5/16" / 4.5 - 8.5 mm).

If the 3VA UL molded case circuit breaker also needs to be lockable in the ON (I) position, the metal pin ① on the handle locking device must be removed with pliers, see diagram below. This deliberate action is a safety precaution and prevents accidental locking of the breaker in the ON position.



① Metal pin

Installation of other accessories

The installed handle locking device partly excludes the installation of other accessory components, e.g. front mounted accessories such as manual and motor operators as well as front interlocks. In addition, the handle locking device must be removed to gain access to the accessory compartment for the internal accessories.

Note

The handle locking device must be removed from the circuit breaker to change the state of the breaker from OFF to ON or from ON to OFF.

4.7.2.2 Cylinder locks for locking the 3VA molded case circuit breaker

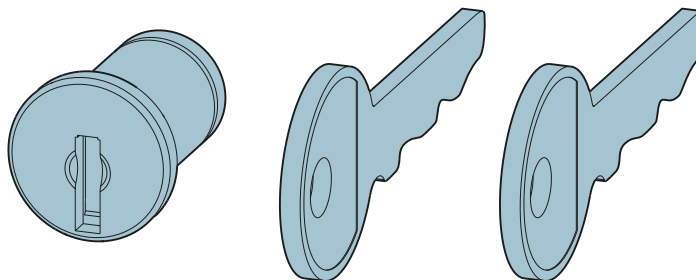
The OFF (O) or ON (I) position of the 3VA UL molded case circuit breaker can also be locked with a cylinder lock (type Ronis). After the locking, the 3VA UL molded case circuit breaker is protected from further actuation.

Locking with cylinder locks (type Ronis) is possible on all 3VA UL molded case circuit breakers. The cylinder lock is installed in an accessories compartment of the 3VA UL molded case circuit breaker.

4.7 Locking and interlocking

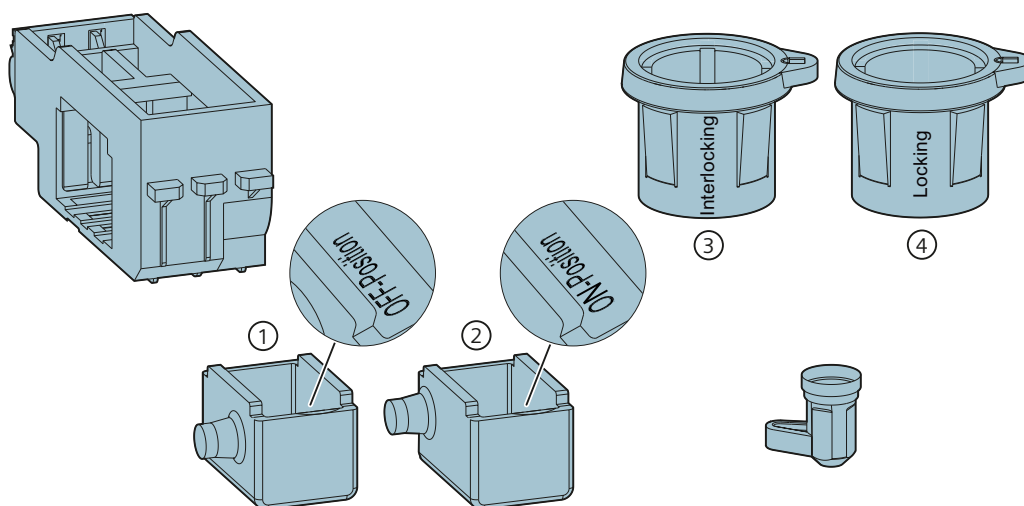
To provide a cylinder lock, the following 2 components need to be ordered:

- One cylinder lock (type Ronis)
1 lock and 2 keys are always included in the order.



Selection of the lock number is highly flexible, i.e. it can be selected from a choice of three different lock numbers. If different cylinder lock numbers are required for multiple locks, they can be selected from the predefined article numbers stated in the catalog.

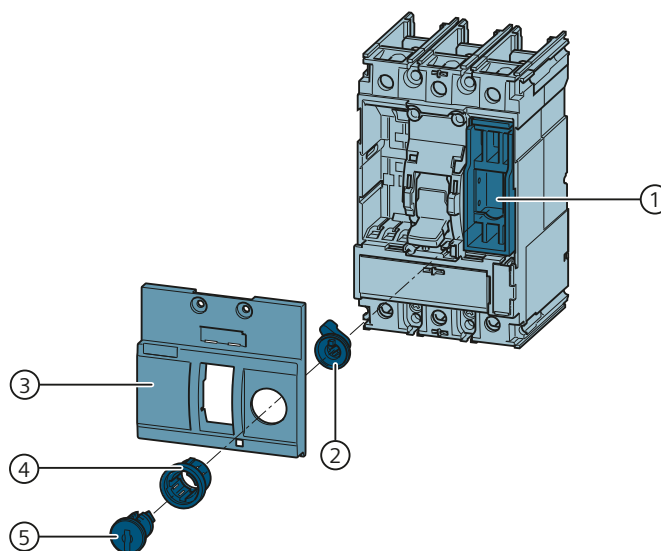
- One adapter kit
The adapter kit transfers the motion of the lock to the switching mechanism.
The article number includes the adapter kit and two cylinder lock housings. One cylinder lock housing (locking) is used for locking systems and the other housing (interlocking) for interlocking systems.



- ① Slide for locking in the OFF position
- ② Slide for locking in the ON position
- ③ Cylinder lock housing for locking
- ④ Cylinder lock housing for interlocking

Locking in the OFF (O) position

In order to lock the 3VA UL molded case circuit breaker in the OFF (O) position, the cylinder lock (type Ronis) is installed with the adapter kit and the cylinder lock housing for locking in the right-hand accessory compartment of the molded case circuit breaker. The slide for locking in the OFF position is fitted for this purpose.



- | | |
|---------------------------------------|-------------------------------------|
| ① Adapter kit with OFF position slide | ④ Cylinder lock housing for locking |
| ② Actuating lever | ⑤ Cylinder lock (type Ronis) |
| ③ Accessory cover | |

1. Remove the accessory cover ③ from the 3VA UL molded case circuit breaker.
2. From the rear of the lid of the accessory cover, drill a hole through the lid at the position designated for the cylinder lock housing and remove burrs with a file.
In addition, introduce as precise a gap as possible for anti-rotation protection of the cylinder lock housing.
3. Insert a cylinder lock (type Ronis) ⑤ and the locking version of the cylinder lock housing ④ in the drilled hole and connect it securely to the accessory cover ② via the actuating lever.
4. Install the adapter kit ① in the right-hand accessories compartment of the 3VA UL molded case circuit breaker.
5. Reattach the accessory cover to the 3VA UL molded case circuit breaker.

To lock the 3VA UL molded case circuit breaker in the OFF (O) position, the key must be turned to the vertical "locked" position.



Locking in the ON (I) position

For safety reasons, a deliberate action is required to lock the breaker in the ON (I) position. The slide for locking in the ON position must be used for this purpose. Further information can be found in the relevant operating instructions.

Use of cylinder locks (type Ronis) for other applications

Cylinder locks (type Ronis) can also be used in the following applications:

- For locking the travel of withdrawable technology, see chapter Draw-out technology (Page 316)
- For locking in the manual operators of the 3VA UL molded case circuit breaker, see chapter Manual operators (Page 339)

Installation of other accessories

The installation of the cylinder lock in the accessory compartment of the molded case circuit breaker partly excludes the installation of other accessory components, e.g. front mounted accessories such as manual and motor operators as well as front interlocks. Likewise the cylinder lock blocks slots for internal accessories, for overview see chapter Mounting locations of 3VA UL molded case circuit breakers (Page 196).

4.7.3 Front interlocking

Front interlocks are installed on the front panel of the 3VA UL molded case circuit breaker.

The following interlocking systems are available for the 3VA UL molded case circuit breaker:

- Cylinder locks for implementing interlocks between an unlimited number of molded case circuit breakers
- Cable interlock module using a Bowden cable
- Handle interlocking module

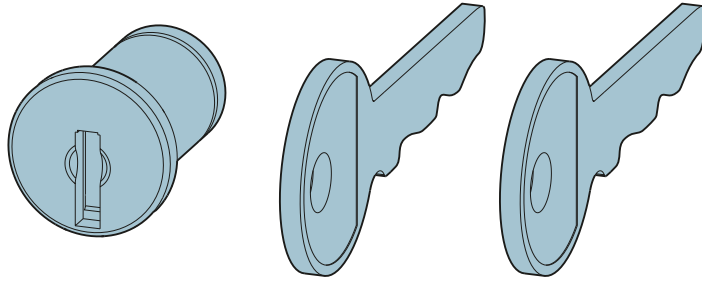
4.7.3.1 Cylinder locks for interlocking multiple 3VA UL molded case circuit breakers

With cylinder locks (type Ronis) in the accessory compartments, molded case circuit breakers cannot only be locked (see chapter Cylinder locks for locking the 3VA molded case circuit breaker (Page 399)), but it is also possible to mutually interlock any number of 3VA UL molded case circuit breakers. This ensures that only one 3VA UL molded case circuit breaker at a time in the interlock application can be in position ON (I).

4.7 Locking and interlocking

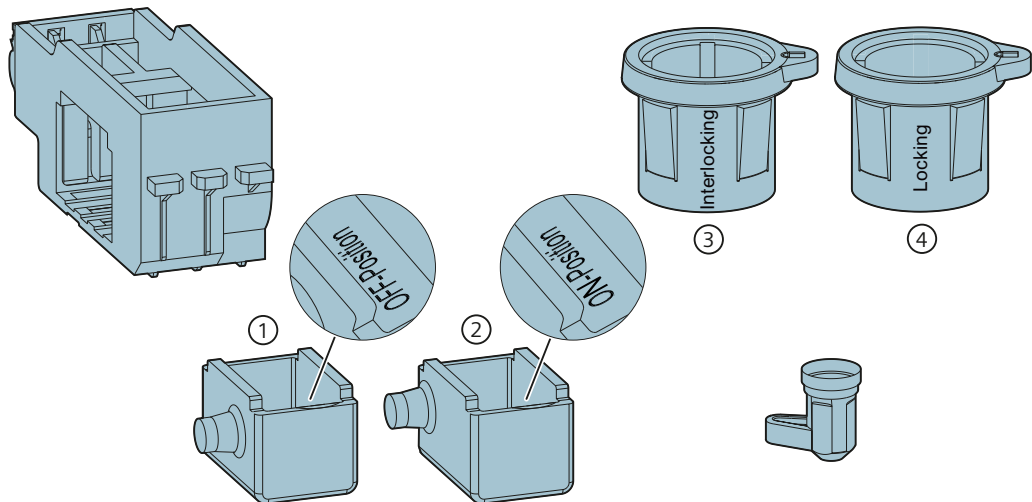
In order to implement an interlock application on multiple 3VA UL molded case circuit breakers, the following two components must be ordered for each 3VA UL molded case circuit breaker to be interlocked:

- One cylinder lock (type Ronis)
1 lock and 2 keys are always included in the order

**Note**

It is important to order the same lock number for all circuit breakers to be included in the interlock arrangement.

- One adapter kit
The adapter kit transfers the motion of the lock to the switching mechanism.
The article number includes the adapter kit and two cylinder lock housings.

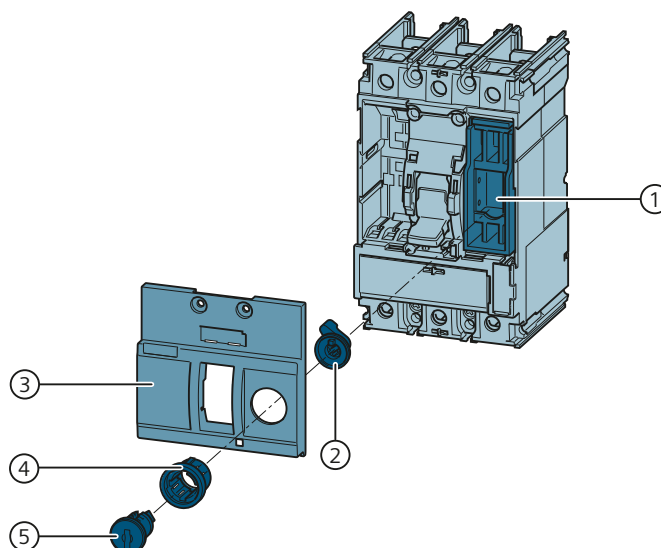


- ① Slide for locking in the OFF position
- ② Slide for locking in the ON position
- ③ Cylinder lock housing for locking system
- ④ Cylinder lock housing for interlocking system

If, for example, three 3VA UL molded case circuit breakers are to be interlocked, three cylinder locks (type Ronis) with the same lock number and 3 adapter kits suitable for the respective 3VA UL molded case circuit breaker must be ordered.

Installing the cylinder lock in the accessory compartment

The cylinder lock (type Ronis) is installed with the adapter kit and the "Interlocking" cylinder lock housing in the right-hand accessory compartment of the molded case circuit breaker.



- | | | | |
|---|-----------------|---|--|
| ① | Adapter kit | ④ | Cylinder lock housing for interlocking |
| ② | Actuating lever | ⑤ | Cylinder lock (type Ronis) |
| ③ | Accessory cover | | |

1. Remove the accessory cover ③ from the 3VA UL molded case circuit breaker.
2. From the rear of the lid of the accessory cover, drill a hole through the lid at the position designated for the cylinder lock housing and remove burrs with a file.
In addition, introduce as precise a gap as possible for anti-rotation protection of the cylinder lock housing.
3. Insert a cylinder lock (type Ronis) ⑤ and the locking version of the cylinder lock housing ④ in the drilled hole and connect it securely to the accessory cover ② via the actuating lever.
4. Install the adapter kit ① in the right-hand accessories compartment of the 3VA UL molded case circuit breaker.
5. Reattach the accessory cover to the 3VA UL molded case circuit breaker.

A cylinder lock (type Ronis) is installed at each 3VA UL molded case circuit breaker to be interlocked.

Interlocking of molded case circuit breakers

⚠ WARNING

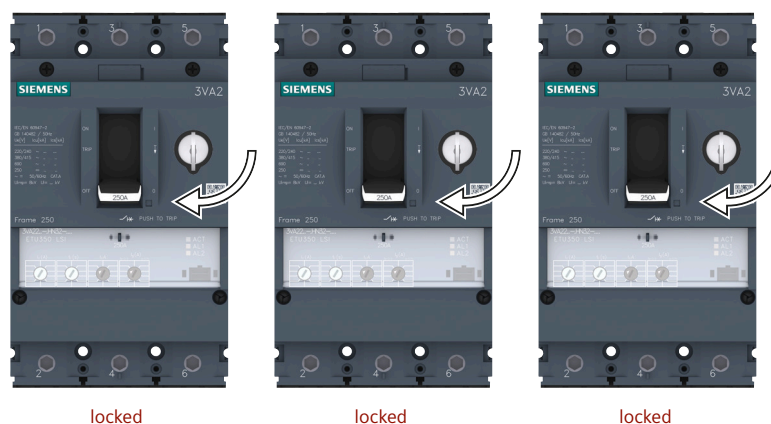
Risk of interlock defeat. Use of more than one key poses safety hazard.

Leave a key inserted in only one of the circuit breakers in the interlock arrangement.

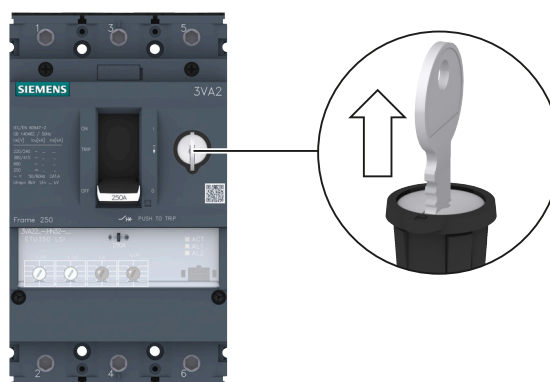
Store all other keys in a safe place or lock them away.

In order to ensure reliable functioning of the interlock, only 1 key is left in one circuit breaker included in the interlock arrangement. This one key serves as the release instrument for only one molded case circuit breaker at a time.

1. Bring all 3VA UL molded case circuit breakers of the interlock arrangement to the OFF position and lock them (cylinder lock in vertical "locked" position).



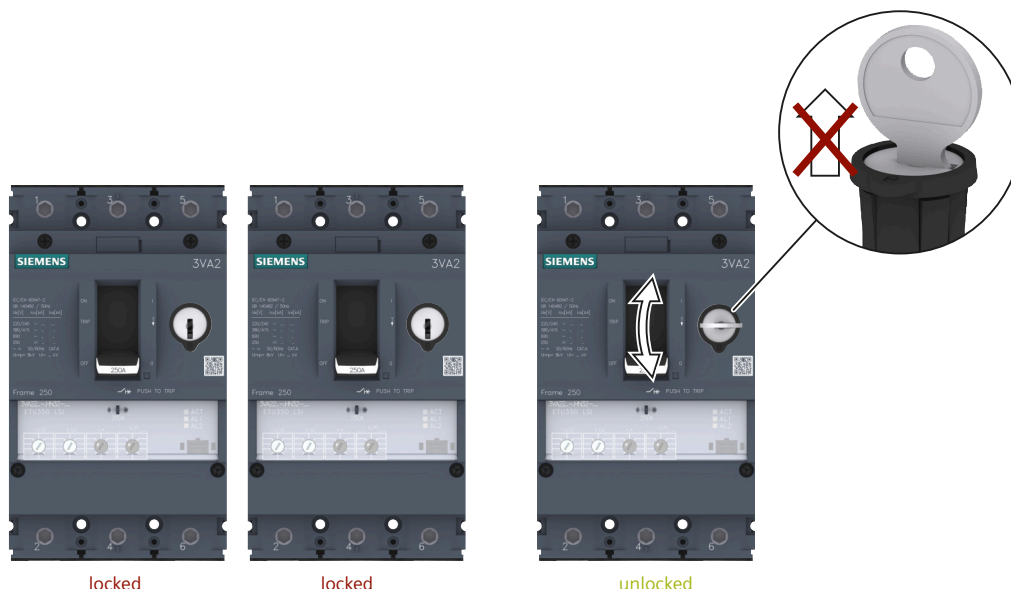
2. Remove all keys.



All 3VA UL molded case circuit breakers of the interlock arrangement are now securely locked in the OFF (O) position and cannot be actuated.

3. Insert **one single** key in one circuit breaker included in the interlock; store or lock away **all other** keys.

- Use the single key to turn the cylinder lock of the 3VA UL molded case circuit breaker to be released to the "unlocked" position.
In "unlocked" position, the key can no longer be removed and must remain in the cylinder lock.



- Move the handle of the released 3VA UL molded case circuit breaker to the ON (I) position.

Releasing a different molded case circuit breaker

- Move the handle of the currently released molded case circuit breaker to the OFF (O) position.
- Turn the cylinder lock to the vertical "locked" position and remove the key.
The 3VA UL molded case circuit breaker released up to then is now securely locked in the OFF (O) position and cannot be actuated.
- Use the removed key to turn the cylinder lock of the 3VA UL molded case circuit breaker to be newly released to the horizontal "unlocked" position.
- Move the handle of the released 3VA UL molded case circuit breaker to the ON (I) position.

Interlock combinations

The following interlock combinations can be implemented with cylinder locks:

- All 3VA5 and 3VA6 molded case circuit breakers can be interlocked.
- Interlocks can be implemented between all breaker frame sizes.
- Mutual interlocks can be implemented between all 2-pole, 3-pole and 4-pole molded case circuit breakers.

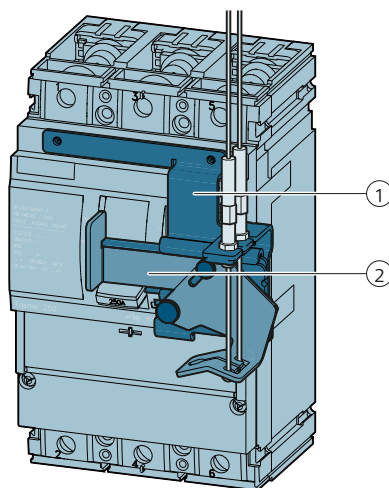
Installation of other accessories

The installation of the cylinder lock in the accessory compartment of the molded case circuit breaker partly excludes the installation of other accessory components, e.g. front mounted accessories such as manual and motor operators as well as front interlocks. Likewise the cylinder lock blocks slots for internal accessories (for overview see chapter Mounting locations of 3VA UL molded case circuit breakers (Page 196)).

4.7.3.2 Cable interlock module using a Bowden cable

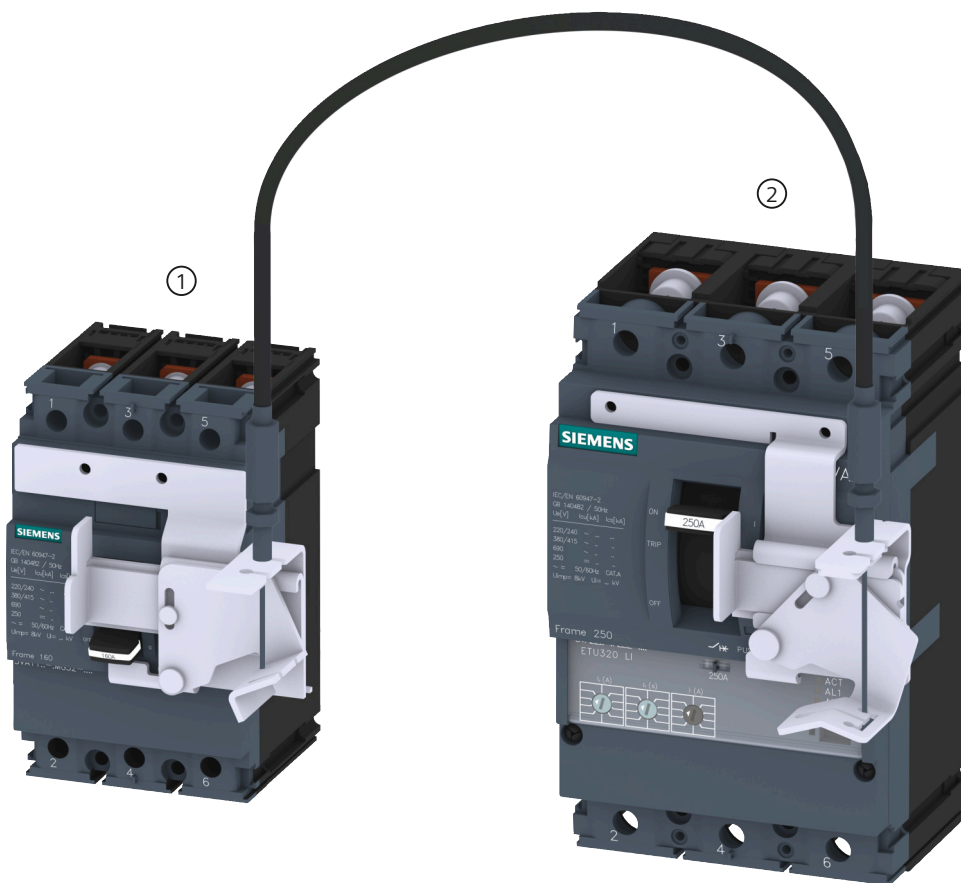
A mutual interlock between up to three molded case circuit breakers can be implemented by means of the front Bowden cable interlocking system. This interlock functions according to the blocking principle: If one of the circuit breakers included in the interlock is unlocked, the Bowden cables move in such a way as to ensure that the other molded case circuit breakers are locked in the OFF (O) position.

In order to implement Bowden cable interlocking at the front, handle interlocking modules must be mounted on the 3VA molded case circuit breakers to be included in the interlock arrangement. Each of these modules is equipped with a slide which blocks or releases operation of the handle.



- ① Handle interlocking module
- ② Slide

A Bowden cable must be installed in addition to the handle interlocking modules. This cable prevents the slides from releasing more than one molded case circuit breaker at any one time. As a result, only one 3VA molded case circuit breaker at a time can be operated and only **one** molded case circuit breaker can be in the ON (I) position.



- ① 3VA5 125 molded case circuit breaker, blocked by slide
- ② 3VA6 250 molded case circuit breaker, released by slide

Bowden cable lengths

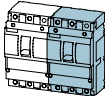
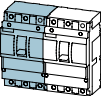
The following lengths of Bowden cable can be ordered:

- 23.62" / 0.6 m
- 39.37" / 1.0 m
- 59.05" / 1.5 m

4.7 Locking and interlocking

Interlock combinations

The following 3VA UL molded case circuit breakers can be interlocked:

										
			3VA5				3VA6			
			3VA51 125 A 3-pole and 4- pole	3VA52 250 A 3-pole and 4- pole	3VA53 / 54 400/600 A 3-pole and 4- pole	3VA55	3VA61 / 62 150/250 A 3-pole and 4- pole	3VA63 / 64 400/600 A 3-pole and 4- pole	3VA65	3VA66
	3VA5	3VA51 125 A 3-pole and 4- pole	✓	✓	✓	--	✓	✓	--	--
		3VA52 250 A 3-pole and 4- pole	✓	✓	✓	--	✓	✓	--	--
		3VA53 / 54 400/600 A 3-pole and 4- pole	✓	✓	✓	--	✓	✓	--	--
		3VA55	--	--	--	✓	--	--	✓	✓
	3VA6	3VA61 / 62 150/250 A 3-pole and 4- pole	✓	✓	✓	--	✓	✓	--	--
		3VA64 / 64 400/600 A 3-pole and 4- pole	✓	✓	✓	--	✓	✓	--	--
		3VA65	--	--	--	✓	--	--	✓	✓
		3VA66	--	--	--	✓	--	--	✓	✓

Possible combinations of handle positions

When a handle interlocking module with Bowden cable is installed to interlock **two** 3VA molded case circuit breakers, the following combinations of handle position are possible:

Molded case circuit breaker 1	Molded case circuit breaker 2
ON / TRIP	OFF
OFF	ON / TRIP
OFF	OFF

When a handle interlocking module with Bowden cable is installed to interlock **three** 3VA molded case circuit breakers, the following combinations of handle position are possible:

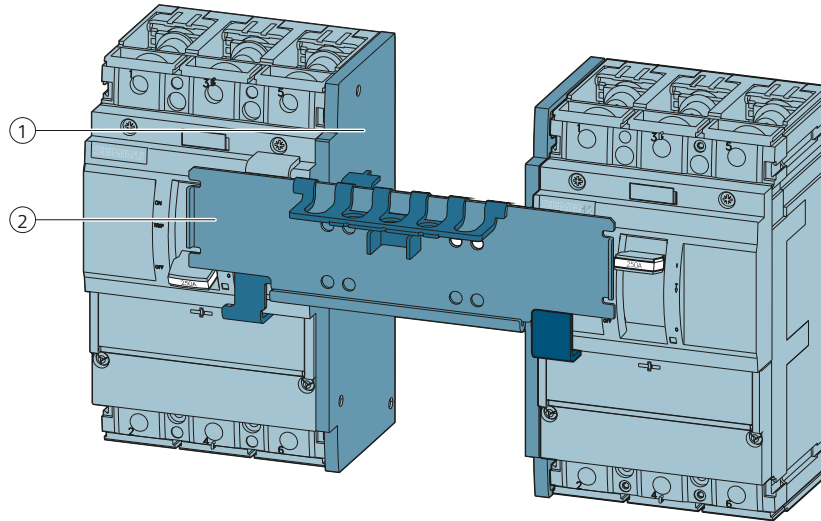
Molded case circuit breaker 1	Molded case circuit breaker 2	Molded case circuit breaker 3
ON / TRIP	OFF	OFF
OFF	ON / TRIP	OFF
OFF	OFF	ON / TRIP
OFF	OFF	OFF

Installation of other accessories

The installation of the front Bowden cable interlocking system partly excludes the installation of other accessory components, e.g. front mounted accessories such as manual and motor operators as well as cylinder locks. In addition, the front interlock must be removed to gain access to the accessory compartment for the internal accessories.

4.7.3.3 Sliding bar

With the front handle interlocking module, up to three 3VA UL molded case circuit breakers of the same frame size can be mutually interlocked with a bar device. The handle interlocking module can be locked with up to three padlocks (shackle diameter 1/4" to 5/16" / 6 mm to 8 mm).

Installing the handle interlocking module

- ① Side plate
- ② Locking slide

1. Attach two side plates ① to the side of the 3VA UL molded case circuit breaker.
2. Attach the locking slide ② securely to the two side plates.

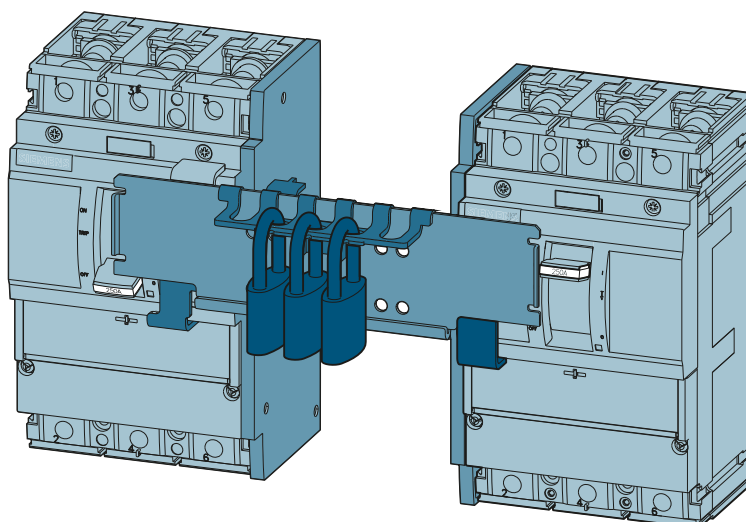
Locking the handle

The handle of the 3VA UL molded case circuit breaker to be interlocked is blocked by sliding the locking slide.

Up to three commercially available padlocks (shackle diameter 1/4" to 5/16" / 6 mm to 8 mm) can be fitted to lock the slide in position and prevent operation of the blocked handle. The blocked 3VA UL molded case circuit breaker is thus always locked in the safe and locked OFF (O) position, while the released 3VA UL molded case circuit breaker can be actuated.

If the locking slide is in the midway position and locked there with padlocks, two or all three of the molded case circuit breakers can also be blocked or secured in the OFF (O) position.

Example of an interlock based on two 3VA UL molded case circuit breakers:



Scope of supply

The order number includes the following items:

- 2 side plates
- 1 locking slide

Interlock combinations

The following interlock combinations can be implemented with the handle interlocking module:

- Molded case circuit breakers of the same frame size up to 600 A can be interlocked:
 - 3VA51 125 A with 3VA51 125 A
 - 3VA52 250 A with 3VA52 250 A and 3VA61 / 62 150/250 A
 - 3VA61 / 62 150/250 A with 3VA52 250 A and 3VA61 / 62 150/250 A
 - 3VA53 / 54 / 63 / 64 400/600 A with 3VA53 / 54 / 63 / 64 400/600 A
- All 3-pole and 4-pole molded case circuit breakers of the same frame size can be interlocked.

Possible combinations of handle positions

In the case of a handle interlocking module for **two** 3VA UL molded case circuit breakers locked with padlocks, the following handle positions are possible:

Molded case circuit breaker 1	Molded case circuit breaker 2
ON / TRIP	OFF
OFF	ON / TRIP
OFF	OFF

In the case of a handle interlocking module for **three** 3VA UL molded case circuit breakers locked with padlocks, the following handle positions are possible:

4.7 Locking and interlocking

Molded case circuit breaker 1	Molded case circuit breaker 2	Molded case circuit breaker 3
ON / TRIP	OFF	OFF
OFF	ON / TRIP	OFF
OFF	OFF	ON / TRIP
OFF	OFF	OFF

Installation of other accessories

The installation of the front handle interlocking module partly excludes the installation of other accessory components, e.g. front mounted accessories such as manual and motor operators as well as cylinder locks. In addition, the front interlock must be removed to gain access to the accessory compartment for the internal accessories.

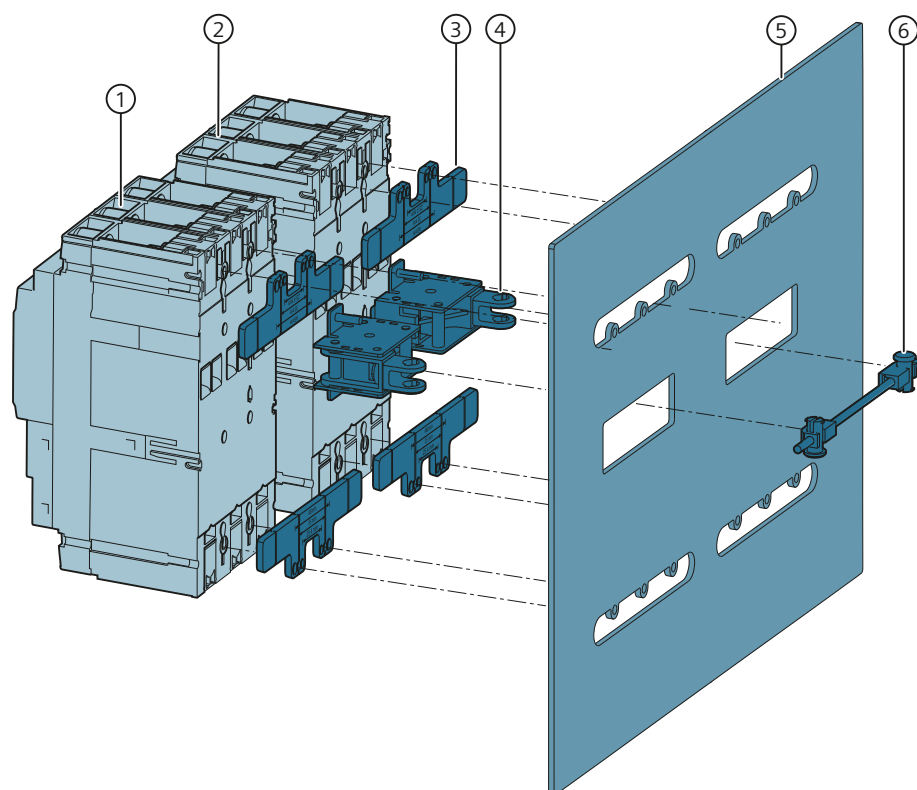
4.7.4 Rear interlock**Rear interlock**

The rear interlock system is capable of creating an interlock between two 3VA UL molded case circuit breakers and does not restrict the number of accessories which can be assembled on the front panel of the molded case circuit breaker.

The rear interlock operates according to the following principle: When one molded case circuit breaker is closed, the other circuit breaker is prevented from closing by a tappet which engages in the breaker mechanism directly from the rear panel of the molded case circuit breaker.

The rear interlock is provided by two interlocking modules which are attached at the rear of the molded case circuit breakers and behind the mounting plate. The two interlocking modules are interconnected by means of the interlocking rod.

Modification of the panel mounting plate may be required.



- | | | | |
|---|-------------------------------|---|------------------------------------|
| ① | Molded case circuit breaker 1 | ④ | Interlocking modules |
| ② | Molded case circuit breaker 2 | ⑤ | Mounting plate for control cabinet |
| ③ | Mounting accessories | ⑥ | Interlocking rod |

Note

You can find installation information in the operating instructions of the rear interlock (<https://support.industry.siemens.com/cs/ww/en/view/109742930>).

Scope of supply

The order number includes the following items:

- Two interlocking modules
- Mounting accessories
- Interlocking rod

Interlock combinations

The following interlock combinations are possible:

- All 3VA5 and 3VA6 molded case circuit breakers can be interlocked.
- All frame sizes up to 600 A can be interlocked.
- All 3-pole and 4-pole molded case circuit breakers can be interlocked.

4.7 Locking and interlocking

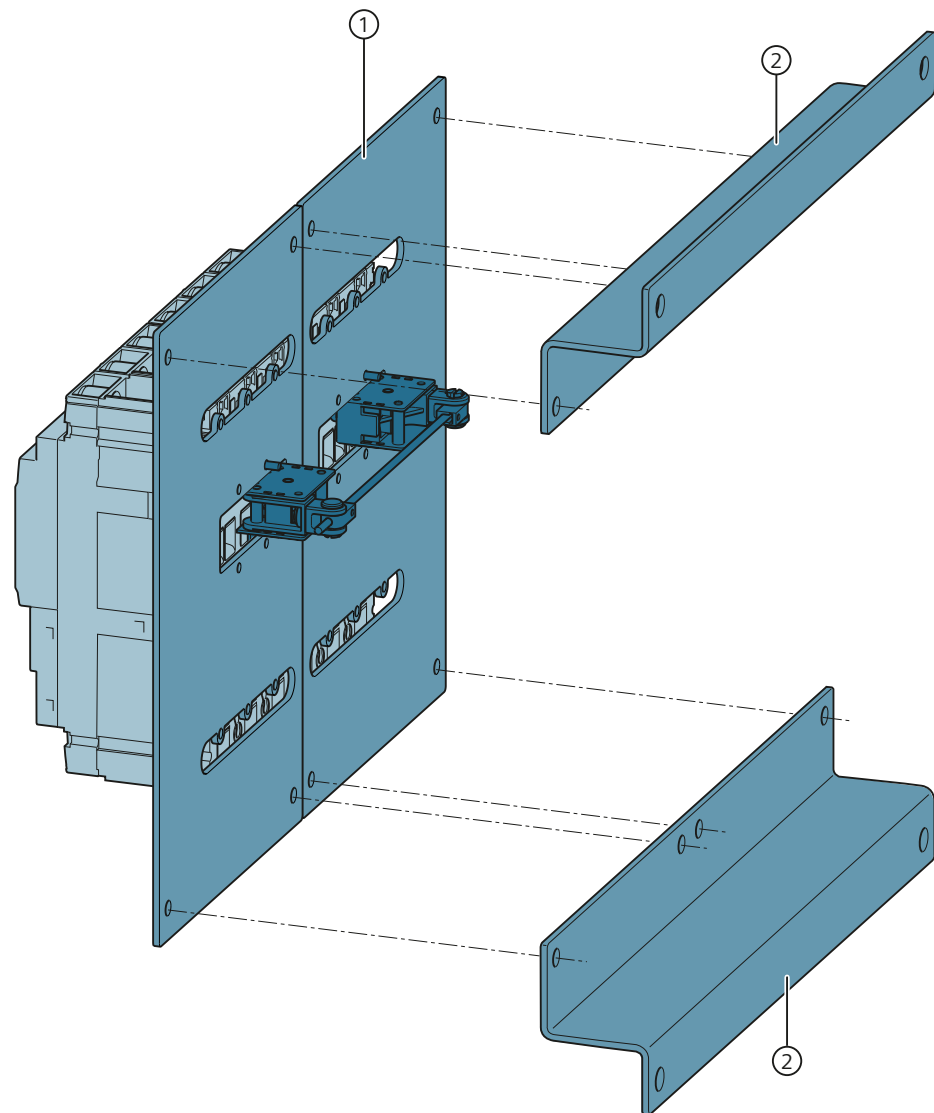
Handle positions

When a rear interlock is installed for two 3VA UL molded case circuit breakers, the following handle positions are possible:

Molded case circuit breaker 1	Molded case circuit breaker 2
ON / TRIP	OFF
OFF	ON / TRIP
OFF	OFF

Assembling aid to facilitate installation of rear interlock

An assembling aid is available for all 3VA UL molded case circuit breakers. It facilitates installation of the rear interlock and reduces the amount of work required to the mounting plate of the cabinet.



- ① Mounting plates (specific to molded case circuit breaker)
- ② Mounting rail

1. Assemble installation frame:

- Place mounting plates ① on the molded case circuit breaker.
- Bolt the mounting rails ② to the adapter plates.
- Install rear interlock.

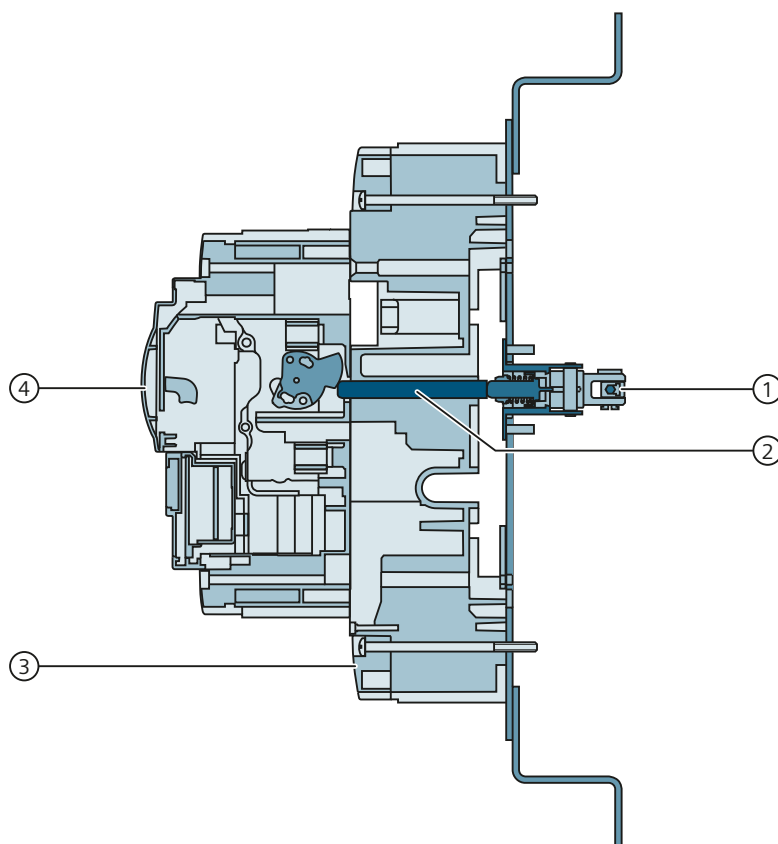
2. Bolt the assembled installation frame to the mounting plate of the control cabinet.

No further work to the mounting plate of the control cabinet is required.

The same rear interlock combinations can be implemented regardless of whether or not the assembling aid is used.

Rear interlock for plug-in and withdrawable units

In order to use a rear interlock for plug-in or withdrawable versions of the molded case circuit breakers, the tappet needs to be lengthened. The tappet extension transfers the interlocking motion of the modules through the plug-in socket or the withdrawable socket.



- | | |
|-----------------------|----------------------------------|
| ① Interlocking module | ③ Plug-in or withdrawable socket |
| ② Tappet extension | ④ Molded case circuit breaker |

The rear interlock for plug-in or withdrawable units is available as a complete kit containing all the required components:

- Two interlocking modules
- Mounting accessories
- Interlocking rod
- All the required tappet extensions

Interlock combinations

The same rear interlock combinations can be implemented for plug-in and withdrawable versions as for fixed-mounted versions.

Note

The withdrawable technology cannot be installed together with the mounting plates and the mounting rails.

4.8 Communication and system integration

4.8.1 System description

Communication-capable 3VA UL molded case circuit breakers are presented in this chapter. You will learn which components the 3VA UL molded case circuit breakers need for communication, how these components are assembled and what properties they have.

Optimum integration of the 3VA UL molded case circuit breakers in a software and communication system yields the following advantages:

- Acquisition of breaker status
- Remote parameterization
- Monitoring of capacity utilization
- Acquisition of consumption and performance data
- Local signaling via the EFB300 external function box
- Local visualization of the 3VA UL molded case circuit breakers

To make use of all these functions, a COM060 communication module must be installed in the respective 3VA UL molded case circuit breaker and connected to a COM800 breaker data server for up to eight 3VA UL molded case circuit breakers or a COM100 breaker data server for a single 3VA UL molded case circuit breaker.

You can find detailed information on the communication module and breaker data server and the communication link of the molded case circuit breaker in the 3VA Communication System Manual (<https://support.industry.siemens.com/cs/ww/en/view/98746267>).

4.8.2 Communication system of the 3VA UL molded case circuit breaker

The following components combine with the 3VA UL molded case circuit breaker to form the communications system:

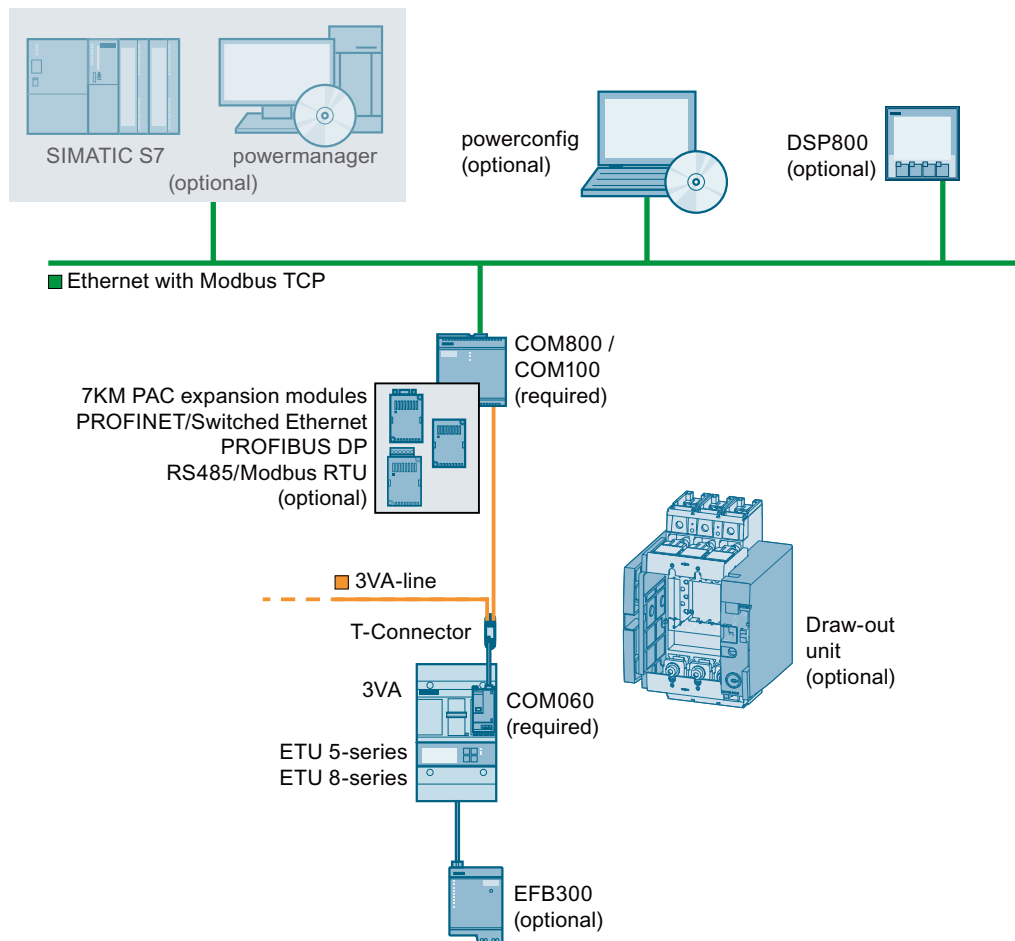
- Electronic trip unit (ETU)
- COM800/COM100 data concentrator
- Optional expansion modules for three other communication networks

4.8 Communication and system integration

- COM060 communications module
- Withdrawable unit with communication link
- External Function Box EFB300 (EFB)
- DSP800 display
- Commissioning and service software: SENTRON Powerconfig

The diagram below presents the components which render a 3VA UL molded case circuit breaker capable of communication.

System architecture of 3VA UL communication



The central components of communication-capable 3VA UL molded case circuit breakers are the 5-series and 8-series ETUs.

You can find more information in the 3VA Communication System Manual (Page 12). There the components are regarded only as suppliers of information or receivers of commands. Typical communication partners are:

- SIMATIC S7
- SENTRON Powermanager

These are named multiple times but are not an integral part of the 3VA UL communications system.

4.8.3 COM800 / COM100 breaker data server

The COM800/COM100 data concentrators can be used to integrate communication-capable 3VA UL molded case circuit breakers with 5-series and 8-series electronic trip units into various communication networks.

- The COM800 data concentrator supports a maximum of eight 3VA UL molded case circuit breakers
- The COM100 data concentrator supports one 3VA UL molded case circuit breaker

3VA molded case circuit breakers can be connected to higher-level communication networks by the following methods:

- Direct Ethernet connection to Modbus TCP
- 7KM PAC PROFIBUS DP expansion module to PROFIBUS DPV1 / V2
- 7KM PAC Switched Ethernet PROFINET expansion module to PROFINET IO and PROFINergy, as well as Modbus TCP
- 7KM PAC RS 485 expansion module for Modbus RTU

The 3VA UL molded case circuit breakers are typically integrated in the SENTRON Powermanager energy monitoring software or the TIA (Totally Integrated Automation) automation concept via a communication network.

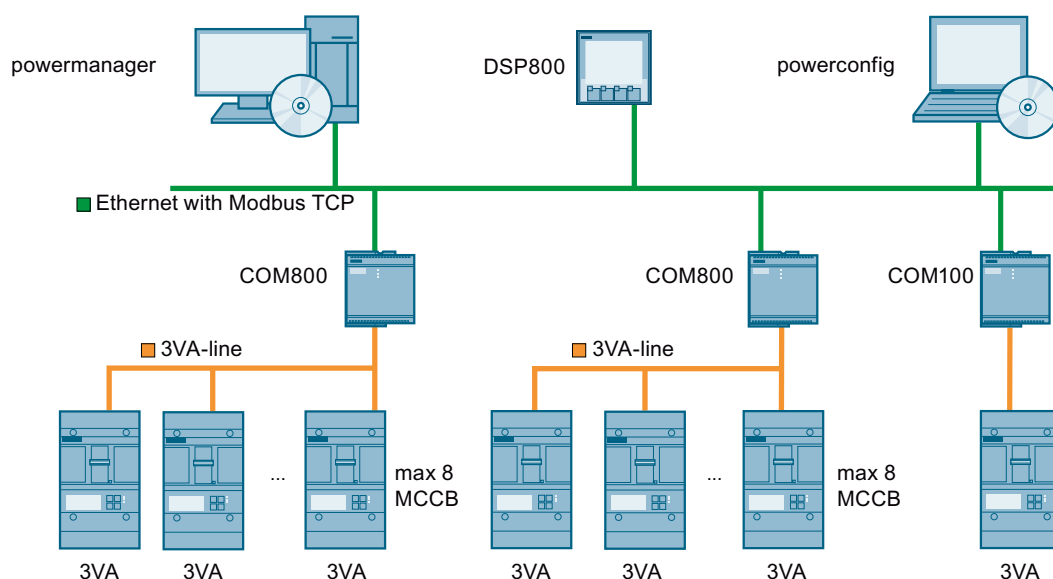
The 3VA UL molded case circuit breakers can also be connected to the SENTRON Powerconfig commissioning and service software.

The 3VA UL molded case circuit breakers can also be connected to many non-Siemens systems via these communication networks.

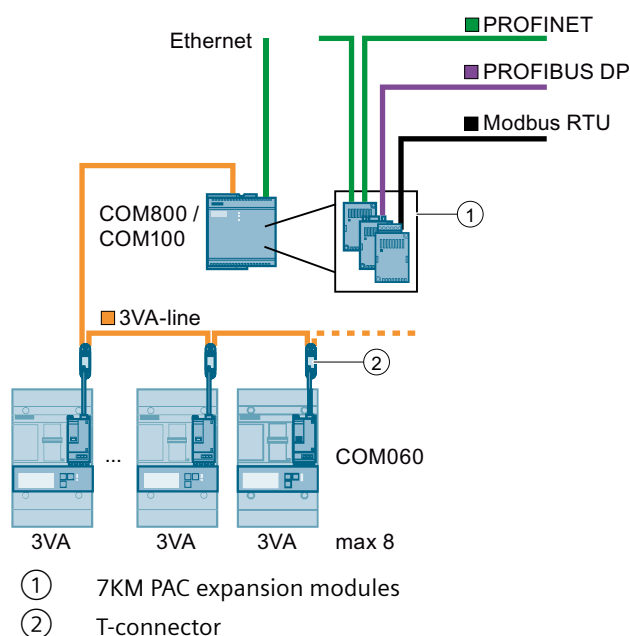
Furthermore, local visualization on the DSP800 display can be implemented with the COM800/COM100 data concentrator.

Example: Configuration of the COM800/COM100 data concentrator with a 3VA-line of three 3VA UL molded case circuit breakers and with connection to the SENTRON Powermanager energy monitoring software (on the left), to the DSP800 (center) and to the SENTRON Powerconfig commissioning and service software (on the right).

4.8 Communication and system integration



To establish a communication link, the COM800 or COM100 data concentrator is connected via the 3VA-line to the COM060 communications module of the relevant circuit breaker.



From a UL Class 2, 24 V DC power supply, the COM800/COM100 data concentrator supplies power to all the 3VA UL molded case circuit breakers involved and the following components:

- COM060 communications module
- 5-series and 8-series ETUs
- Position signaling switch for guide frame
- 7KM PAC PROFIBUS DP expansion module
- 7KM PAC Switched Ethernet PROFINET expansion module

- 7KM PAC RS 485 expansion module
- Direct Ethernet connection to Modbus TCP

4.8.3.1 Area of application

The COM800/COM100 data concentrator enables the integration of the 3VA UL molded case circuit breakers in:

- SENTRON Powermanager energy monitoring software
- Industrial automation systems
- Building automation systems
- Parameterization and breaker condition evaluation via communication link
- Maintenance systems

4.8.3.2 Features

The COM800/COM100 breaker data server together with the connected 3VA UL molded case circuit breakers with the ETUs 5-series and 8-series provides the following information about the power distribution system:

- Condition of the 3VA UL molded case circuit breaker
- Tripping history with time stamp, cause of trip and number of trip events for breakers with ETUs 5-series and 8-series
- Minimum and maximum values of measured variables
- Limit-value monitoring for measured variables in the 3VA UL molded case circuit breakers
- Load curves with power demands, e.g. 15-minute demands
- Energy values such as active energy (kWh) and reactive energy (kvarh)
- Power supply to connected 3VA UL molded case circuit breakers
- Three simultaneous communication connections via the integrated Ethernet interface

4.8.4 Communication with ETUs

Electronic trip units allow detailed setting of protection parameters from a central location. They record measured variables and maintenance information in order to support energy monitoring and system monitoring.

The electronic trip units (ETUs) provide the following protective functions:

- Overload protection L ("L" = Long time)
- Short-time-delayed short-circuit release S ("S" = Short time) for time-selective response in case of a short-circuit
- Instantaneous short-circuit release I ("I" = Instantaneous)

4.8 Communication and system integration

- Protection of the neutral conductor against overload and short-circuit ("N" = neutral)
- Protection from fault currents to ground ("G" = Ground fault).

4.8.4.1 Area of application

Communication-capable ETUs are deployed for any application which requires the following functions:

- Diverse protective functions
- Fine adjustment of protective functions
- Metering functions
- For 50 Hz and 60 Hz systems (45 ... 65 Hz)
- Communication of the actual condition and history of the molded case circuit breaker

4.8.5 DSP800 display

The DSP800 display is designed for mounting in the control cabinet door and can be optionally connected to the Ethernet (Modbus TCP) interface integrated in the COM800 / COM100 data concentrator. The DSP800 display shows the data of the data concentrator and thus the data of up to eight connected 3VA6 molded case circuit breakers.

The start page of the DSP800 displays the status and maximum current of all the 3VA6 molded case circuit breakers. All the detailed information about individual molded case circuit breakers can be selected via the efficiently structured menu. This includes

- Measured values of 5-series and 8-series ETUs
- ETU setting parameters
- Status
- Diagnostics

With firmware 2.07 and higher, the display options have been expanded to include data from up to three 3WL10 / 3VA27 circuit breakers. Note however that data from a maximum of eight circuit breakers can be displayed. Templates for the display of one, two, four or eight circuit breakers have also been introduced. These are placed automatically but can also be assigned manually. This can be done using SENTRON Powerconfig or on the display itself.

With firmware version 3.0 and higher, data from 7KN PAC3200T and 3WL circuit breakers (with COM35) can also be displayed. A total of eight IP addresses are now available for configuring the source data. This makes it possible to display eight 3WLs, eight PAC3200Ts, or a mixture of different devices, for example. The restriction to a maximum of eight end devices still applies however.

Additional languages were integrated in firmware 3.1. As well as German and English, the languages Spanish, Portuguese, Polish, Russian, Turkish, Italian, French and Chinese are now available.



4.8.6 Commissioning and testing electronic trip units using SENTRON Powerconfig

SENTRON Powerconfig

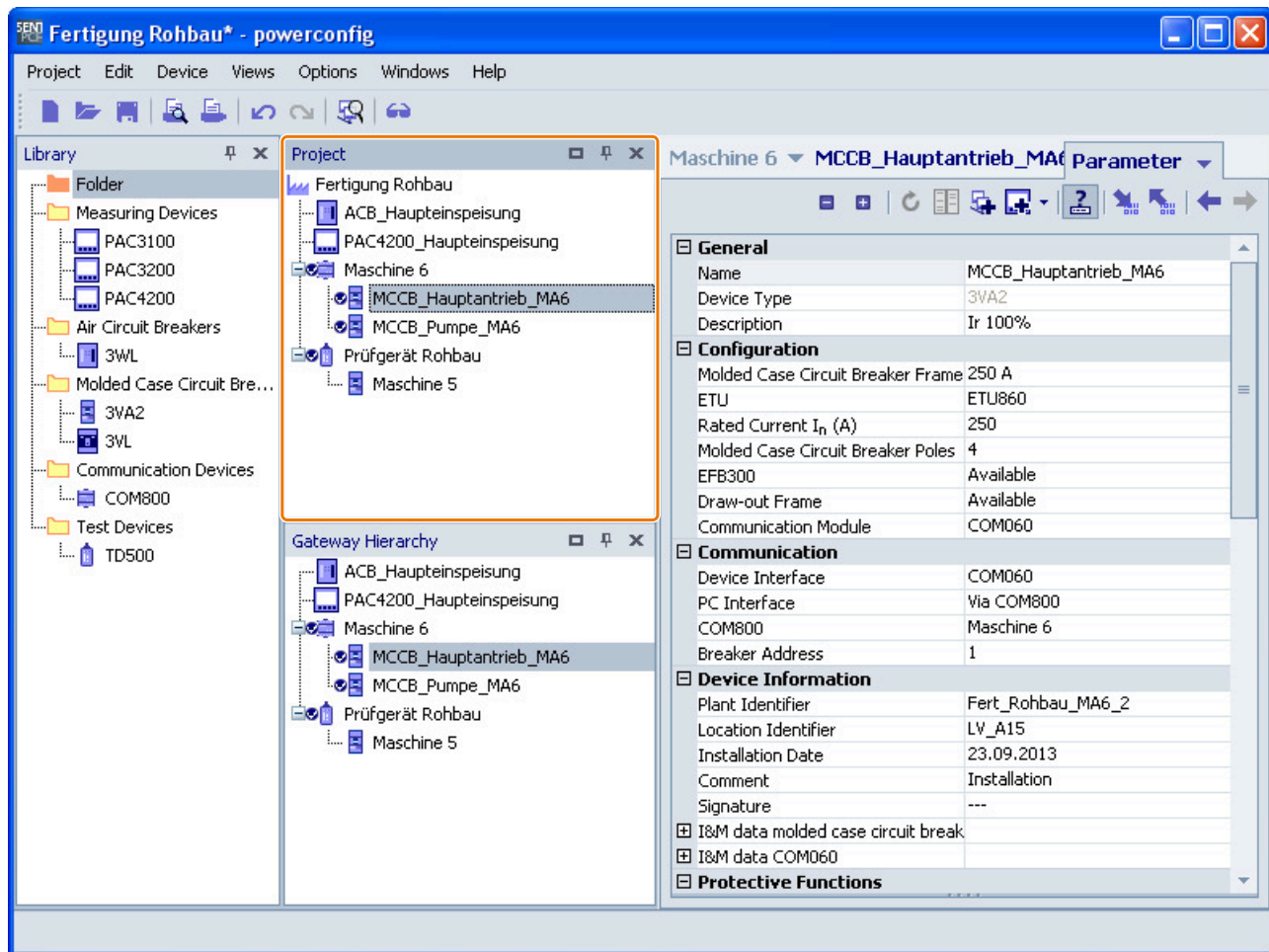
SENTRON Powerconfig offers the following functions for 3VA UL molded case circuit breakers:

- Parameterization of 3VA UL ETUs and other 3VA UL components
- Testing of 3VA UL
- Commissioning of 3VA UL
- Statistical analysis of 3VA UL
- Readout of measured variables such as energy, current, voltage and power from the 3VA UL molded case circuit breakers
- Readout of minimum and maximum values from 3VA UL molded case circuit breakers
- Diagnostics of 3VA UL

The PC on which SENTRON Powerconfig is installed is connected to the 3VA UL molded case circuit breaker by means of the COM800 / COM100 data concentrator (optionally with modules) or the TD500 test device.

The TD500 test device is required in order to perform function tests. You can find information on the TD500 test device in chapter The TD500 test device (Page 471).

3VA UL molded case circuit breakers and, in some cases, other devices supported by SENTRON Powerconfig are combined in SENTRON Powerconfig to form a project if they are related from a technical, organizational or other perspective.

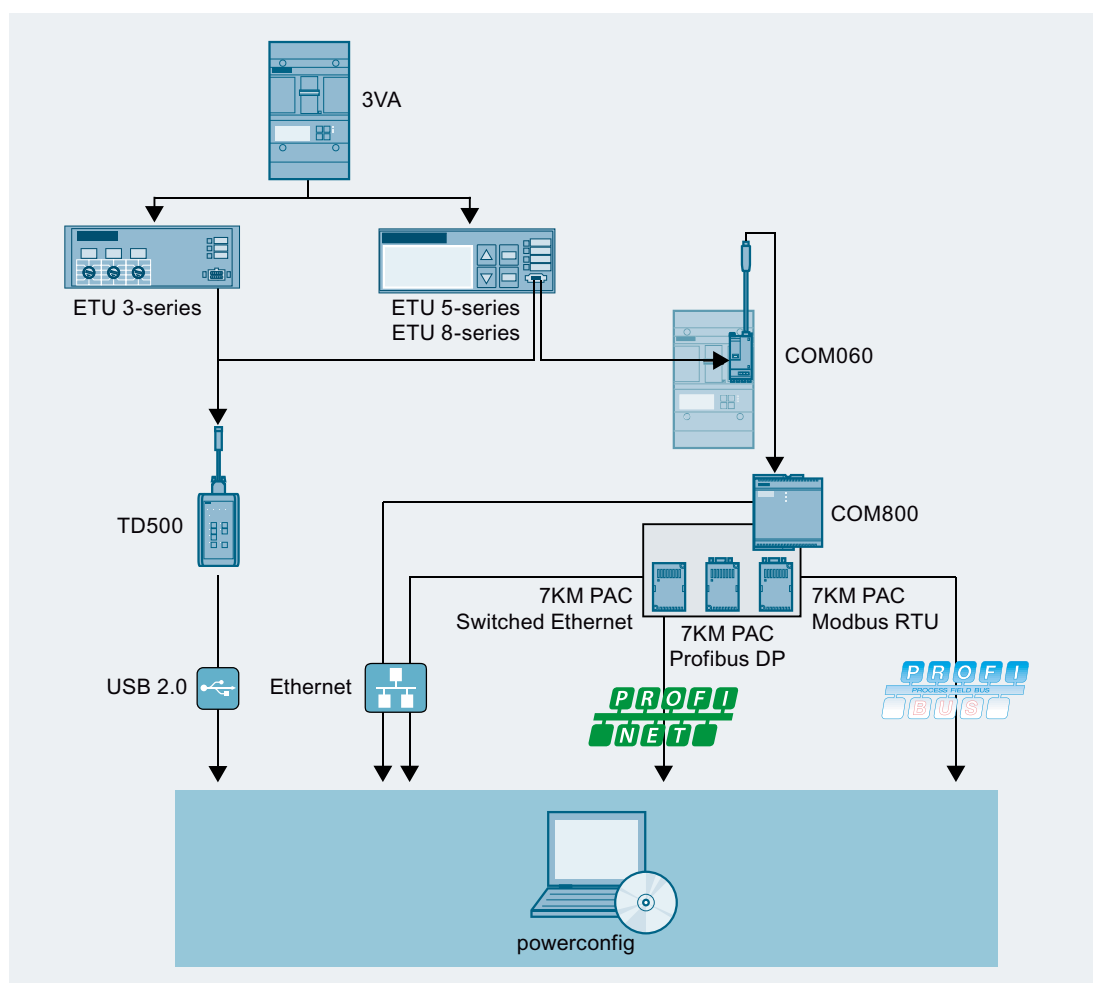


The SENTRON Powerconfig software is a convenient tool for configuring the electronic trip units (ETU), the External Function Box EFB300 and the communication infrastructure. On completion of the commissioning process, the ETU settings can be stored as a project on the PC and printed out.

SENTRON Powerconfig can also be used to perform ETU trip tests. A test report is generated automatically and stored in the project every time a test is carried out.

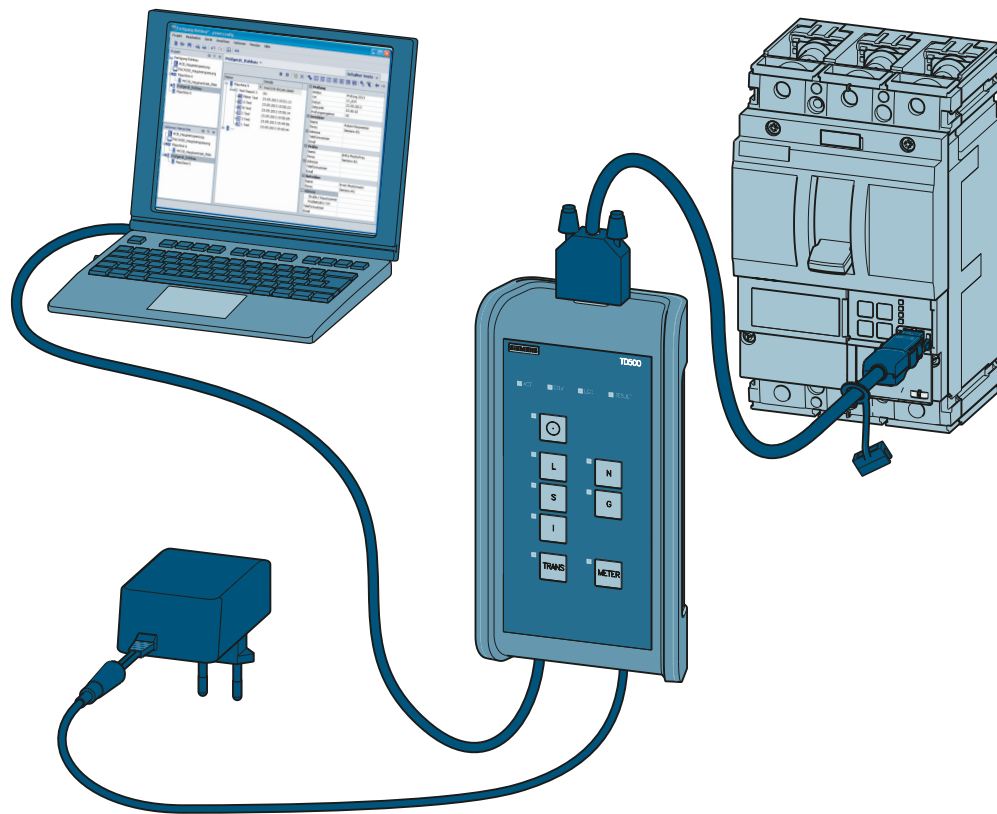
SENTRON Powerconfig supports a variety of different device communications interfaces depending on the SENTRON device used:

- USB
- Ethernet (Modbus TCP)
- PROFINET
- PROFIBUS
- MODBUS RTU



The possible means of connection of the COM800 / COM100 data concentrator are described in detail in the 3VA Communication System Manual (see Reference documents (Page 12)).

With 3VA6 molded case circuit breakers and 3-series ETUs, SENTRON Powerconfig is linked to the ETU interface via the USB interface of the PC and the interface of the TD500 test device.



4.8.7 Energy management with SENTRON Powermanager

Siemens has developed the SENTRON Powermanager software for energy monitoring and system monitoring. When used in conjunction with SENTRON protection devices such as 3VA, 3WL, 3VL and PAC as well as equipment supplied by third parties, SENTRON Powermanager provides an energy monitoring system that reduces energy costs and increases the availability of electrical systems.

SENTRON Powermanager acquires the measured variables that are necessary in order to optimize energy consumption and reduce costs. These variables not only include energy and power values, but also electrical parameters such as current, voltage, or power factor. Not only is this system able to display values, but also to monitor and archive them for later analysis. In addition, the load monitoring function is capable of monitoring a specified setpoint and making recommendations as to which loads should be connected and disconnected.

Identifying savings potential

The energy monitoring software has been tested by TÜV Rheinland for its suitability to support an energy management system in accordance with ISO 50001.

Functionality and user-friendliness

The salient features and functions of the energy monitoring software are as follows:

- Good scalability
- Enhanced report templates
- Response plans
- Mass parameterization
- Virtual measuring points for computing customer-specific parameters
- Load monitoring function for monitoring specified power limits for freely definable time periods
- Switching recommendations in the event of limit violations
- Remote control of circuit breakers

4.9 EFB300 external function box

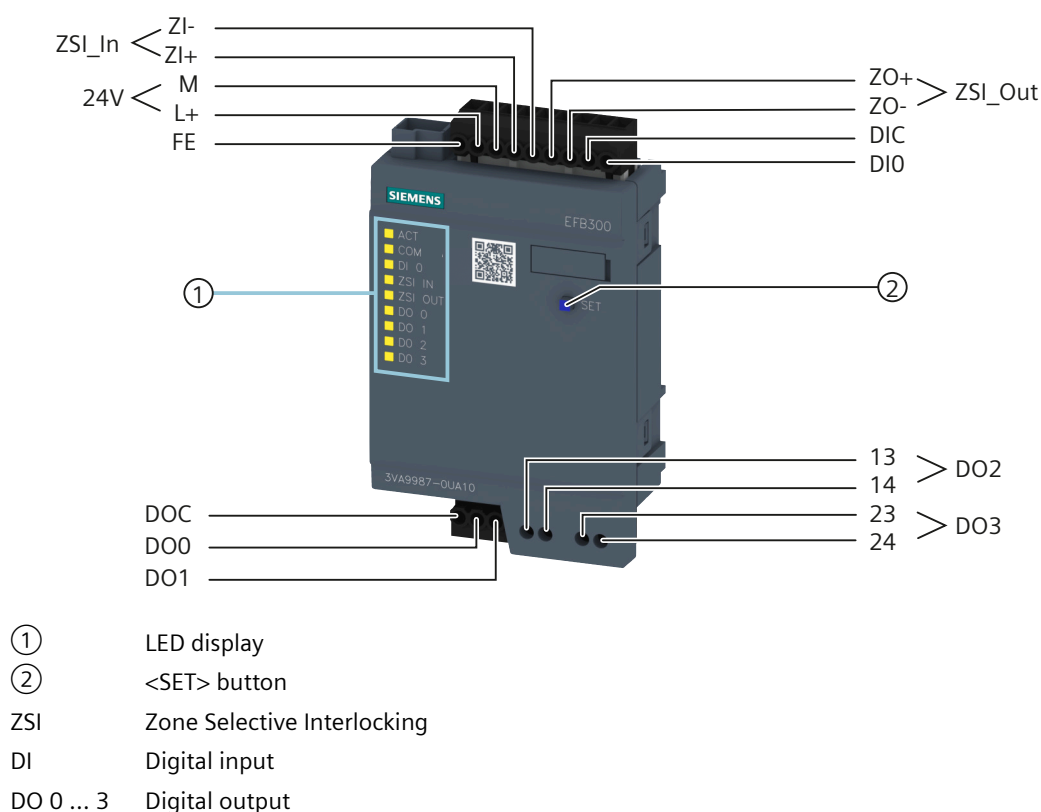
4.9.1 General information

The 3VA UL molded case circuit breakers with the 3-series, 5-series and 8-series ETU electronic trip units can be functionally expanded with the External Function Box EFB300.

The External Function Box EFB300 receives information from the ETU via a cable connection. This information (warnings, reason for last trip, energy counter) can be output via the four digital outputs.

Zone selective interlocking functionality (ZSI, see chapter Zone Selective Interlocking (Page 89)) can also be implemented via the EFB300. The EFB300 also supplies the ETU with power which means that the ETU can be parameterized via the display even when a 3VA UL molded case circuit breaker is in the de-energized state.

4.9 EFB300 external function box



4.9.2 Power supply

The EFB300 external function box requires a UL Class 2, 24 V DC power supply and acts as a power supply for the connected ETU. This allows the ETU to remain operational even after a 3VA UL molded case circuit breaker has tripped.

4.9.3 Functions of the digital input and digital outputs

Functions of the digital input

Active alarms transmitted by the ETU can be acknowledged via the digital input.

Functions of the digital outputs

The SENTRON Powerconfig software makes it possible to selectively assign signals transmitted by the connected ETU to the four digital outputs of the EFB300. SENTRON Powerconfig can be accessed via the TD500 test device or by means of the COM800 or COM100 data concentrator through the link to the communications system.

The following signals (dependent on the ETU) can be assigned:

- **All reasons for ETU tripping** (L, S, I, N and G)
- **Overload alarms AL 1 and AL 2**
- **Pre-trip alarm for overload protection**
An alarm is output in advance of a trip event, allowing time for a load to be disconnected before the main voltage ceases as a result of the trip.
- **Load shedding/load restore**
By means of the load shedding and load restore signals, a load can be disconnected or connected automatically depending on the capacity utilization of the 3VA UL molded case circuit breaker.
- **Energy pulse** (8-series ETUs only)
An energy pulse (S0 signal pulse) contains information that a certain amount of energy has flowed through the molded case circuit breaker. The data are transmitted by weighted pulses, i.e. a specific number of pulses are transferred to represent one kWh unit. Settings for the energy pulse, see table on next page.

Example of energy pulse:

Energy counter source:	Active energy kWh
Pulses per unit:	10
Unit:	1 kWh
Pulse length:	100 ms
For a flow of 50 kWh:	500 pulses with a length of 100 ms each

4.9 EFB300 external function box

Overview of functions available with External Function Box EFB300

Version available with	ETU320 LI	ETU330 LIG	ETU350 LSI	ETU550 LSI	ETU560 LSI G-ALARM	ETU560 LSIG	ETU820 LI	ETU830 LIG	ETU850 LSI	ETU860 LSI G-ALARM	ETU860 LSIG
3-pole breaker without external neutral conductor transformer	■	■	■				■	■			
3-pole breaker with external neutral conductor transformer				■	■	■			■	■	■
4-pole breaker with protected neutral conductor transformer	■	■	■	■	■	■	■	■	■	■	■
Configurable trip alarms and output signals											
Trip reason overload	■	■	■	■	■	■	■	■	■	■	■
Trip reason short-time delayed short-circuit			■	■	■	■			■	■	■
Trip reason instantaneous short circuit	■	■	■	■	■	■	■	■	■	■	■
Trip reason overload at neutral conductor		■	■	■	■	■			■	■	■
Trip reason ground fault protection		■	■		■	■		■		■	■
Trip reason overtemperature	■	■	■	■	■	■	■	■	■	■	■
Alarm level 1 for overload	■	■	■	■	■	■	■	■	■	■	■
Alarm level 2 for overload	■	■	■	■	■	■	■	■	■	■	■
Pre-trip alarm for overload	■	■	■	■	■	■	■	■	■	■	■
Temperature alarm	■	■	■	■	■	■	■	■	■	■	■
Alarm ground-fault protection		■	■		■	■	■	■		■	■
Alarm to indicate internal ETU fault	■	■	■	■	■	■	■	■	■	■	■
Undershooting of threshold for load reconnection	■	■	■	■	■	■	■	■	■	■	■
Overshooting of threshold for load shedding	■	■	■	■	■	■	■	■	■	■	■
Energy pulse							■	■	■	■	■
Energy source	Apparent energy (kVAh)						■	■	■	■	■
	Active energy (kWh) import						■	■	■	■	■
	Active energy (kWh) export						■	■	■	■	■
	Reactive energy (kvarh) inductive						■	■	■	■	■
	Reactive energy (kvarh) capacitive						■	■	■	■	■
Weighted pulse	1 ... 1000 (in steps of 1 in kWh or kVAh)						■	■	■	■	■
Pulse width	30 ... 500 ms (in steps of 10 ms)						■	■	■	■	■
Time-delayed Zone Selective Interlocking ZSI	■	■	■	■	■	■	■	■	■	■	■
Load monitoring	■	■	■	■	■	■	■	■	■	■	■

4.9.4 Zone-selective interlocking ZSI

Description

The microprocessor-controlled, zone selective interlocking function ZSI has been developed in order to control the total disconnection time in low-voltage networks with multiple molded case circuit breakers connected in series.

Advantage of ZSI:

Regardless of the number of series-connected molded case circuit breakers, all short circuits in the network greater than I_{st} but less than I_l will have a delay of no more than 50 ms.

Short-circuit clearance times should be minimized, particularly in the case of system short circuits of very large magnitude.

Note

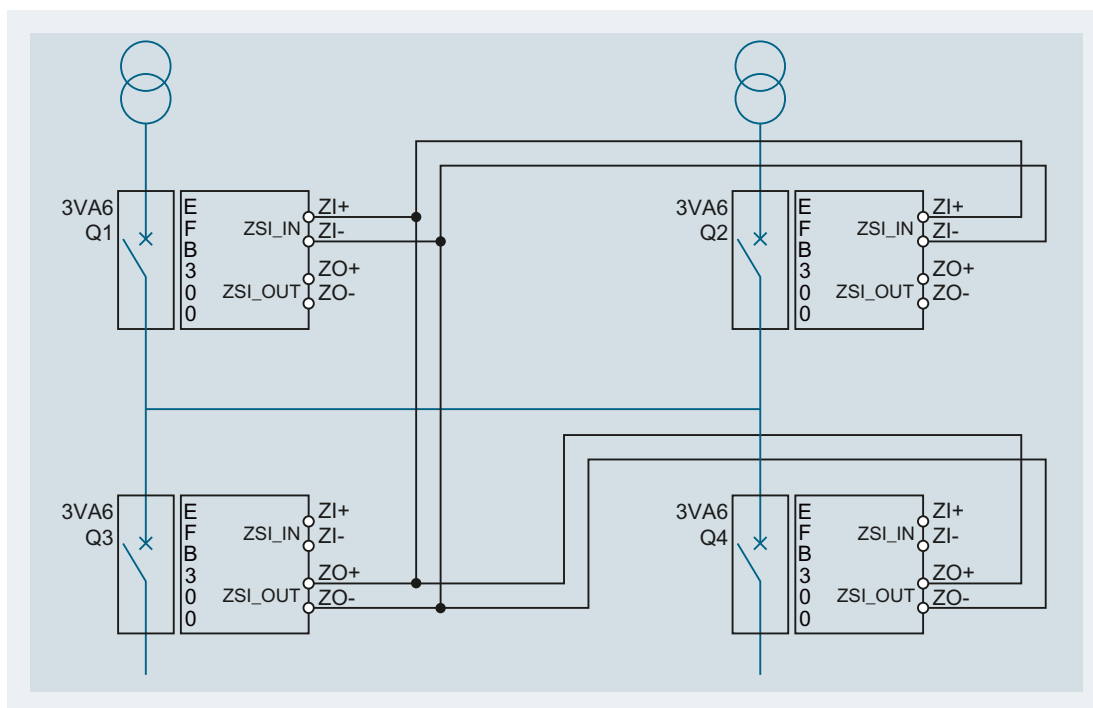
Backward compatibility

The ZSI function is compatible with the ZSI function of the 3VL and 3WL/3WA molded case circuit breakers.

Connection

Use of the ZSI function is conditional upon the connection of a dedicated External Function Box EFB300 to each 3VA6 molded case circuit breaker. The EFB300 allows molded case circuit breakers to communicate with one another, a capability which is a basic requirement for the ZSI function.

To permit utilization of the ZSI function, the EFB300 must be interconnected as illustrated below:



4.9.5 <SET> button

The <SET> button performs the following functions depending on mode:

- Operating mode: Acknowledgment of signals
- Test mode: Execution of a test function

Operating mode

The External Function Box EFB300 is in operating mode during operation. Operation of the EFB300 is indicated by steady illumination of the "ACT" LED.

If a tripped signal is present at an output (output is activated), the user can acknowledge the signal or reset the output. This can be done by various methods:

- By application of a signal to the digital input of the EFB300
- By brief actuation of the <SET> button on the EFB300
- By actuation of the <ESC> button on the ETU

LED states in operating mode

LED		Meaning	Description
	ACT	Off	EFB300 not active
	ACT	On	EFB300 ready for use
	COM	Off	No communication with ETU
	COM	Flashing (2 Hz)	Establishing communication with ETU
	COM	On	Communication connection with ETU established
	DI 0	Off	Input not activated
	DI 0	On	Input activated
	ZSI IN	Off	ZSI function not activated
	ZSI IN	On	ZSI function activated
	ZSI OUT	Off	No ZSI OUT signal transmitted
	ZSI OUT	On	ZSI OUT signal transmitted
	DO 0	Off	No reason for signaling present
	DO 0	On	Signal present
	DO 1	Off	No reason for signaling present
	DO 1	On	Signal present
	DO 2	Off	No reason for signaling present
	DO 2	On	Signal present

LED		Meaning	Description
	DO 3	Off	No reason for signaling present
	DO 3	On	Signal present

 Steady illumination

 Flashing

 Off

Simultaneous flashing of all LEDs indicates that the EFB300 is defective.

ACT	COM	DI 0	ZSI IN	ZSI OUT	DO 0	DO 1	DO 02	DO 3	
									EFB300 defective

 Flashing

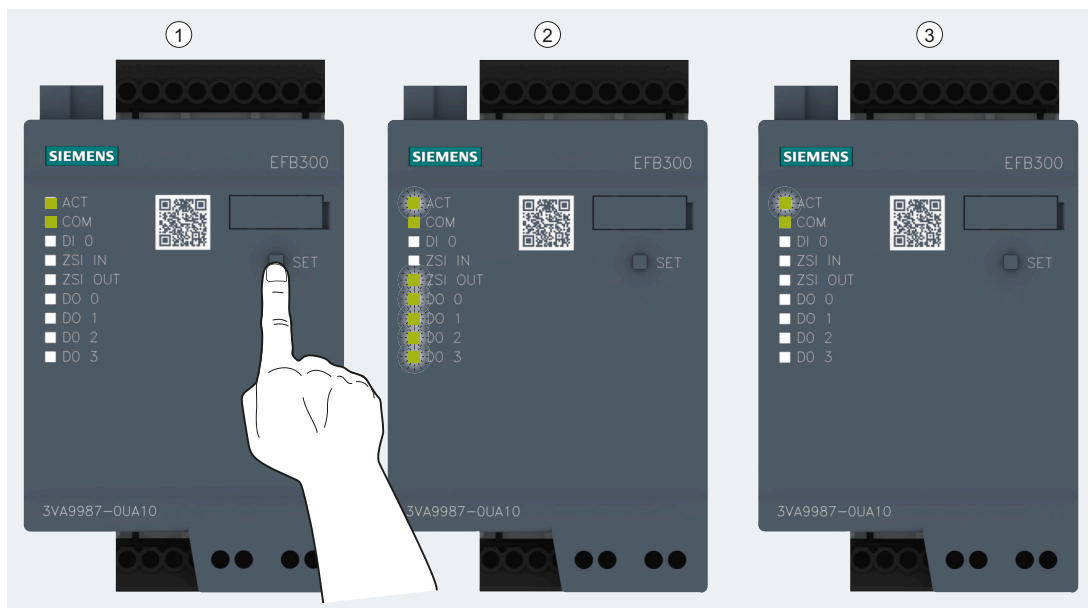
Test mode

All inputs and outputs can be activated or deactivated manually in test mode. This can be done to determine whether the digital outputs and the ZSI bus are functioning properly and wired correctly.

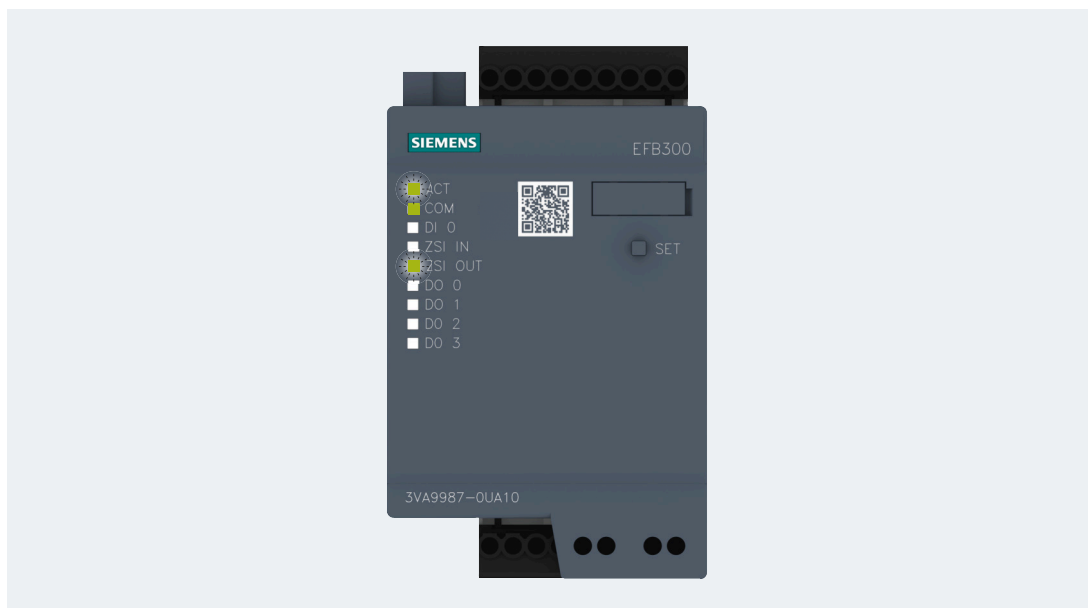
The "ACT" LED flashes to indicate that test mode is active. The SENTRON Powerconfig software can also be used to test outputs.

Activating test mode and performing tests

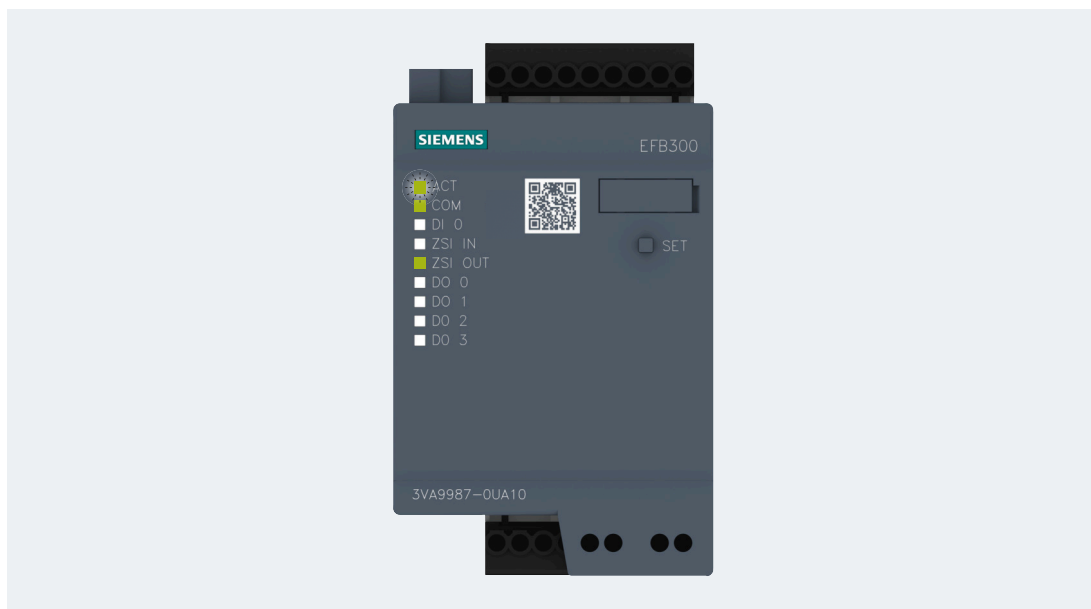
1. In order to activate test mode, press the <SET> button for at least 2 seconds ① until all the LEDs for the outputs light up briefly ②. Test mode is activated when the "ACT" LED starts to flash ③.



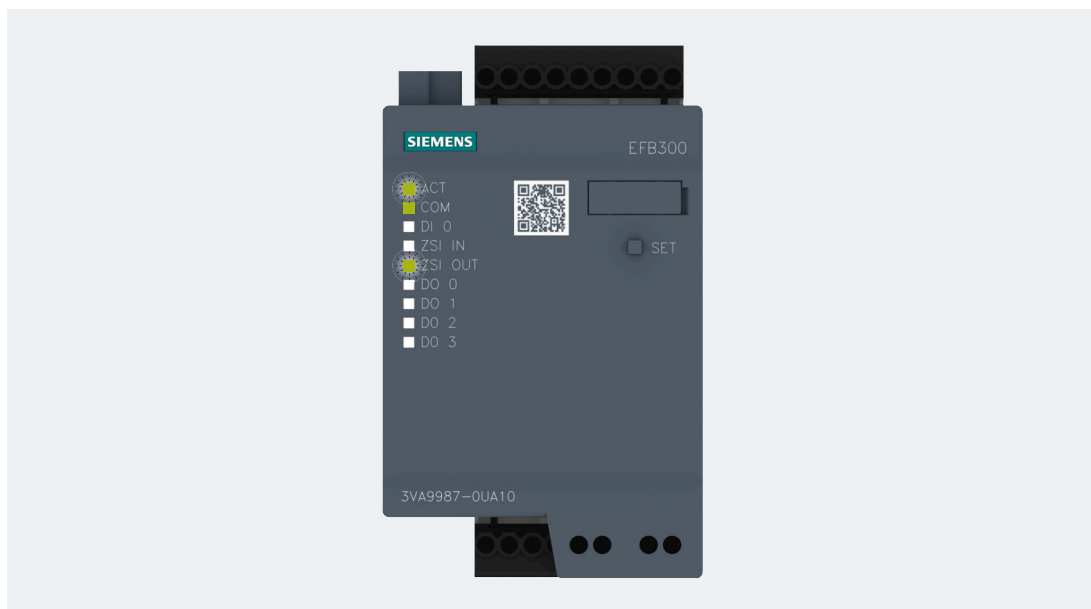
2. Press the <SET> button briefly.
The "ZSI_OUT" LED flashes, the ZSI output is selected.



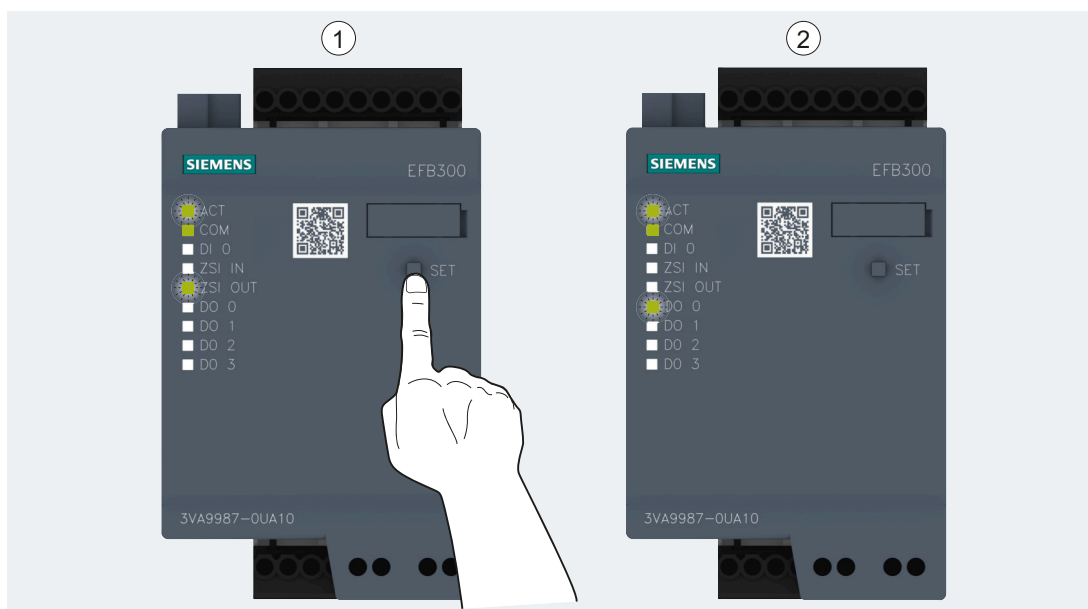
3. In order to activate the selected output, press the <SET> button for longer than 2 seconds. The LED of the selected output changes from flashing to steady illumination to indicate activation of the selected output.



4. In order to deactivate the output again, press the <SET> button again for longer than 2 seconds. The LED of the activated output will change from steady illumination to flashing. The output is deactivated, but still selected.



5. In order to select the next output, press the <SET> button briefly ①.
The LED of the next output starts to flash ②, the output is selected.



6. Repeat steps 3 to 5 in order to check the wiring of all digital outputs in succession.

Terminating test mode

If the <SET> button is not pressed for a period of three minutes after selection of an output, test mode is terminated automatically and the EFB300 reverts to operating mode.

Alternative method:

After working through the entire menu structure (only the "ACT" LED flashes), press the <SET> button for longer than 2 seconds.

LED states in test mode

LED		Meaning	Description
☐	ACT	Off	EFB300 not active
	ACT	Flashing (2 Hz)	Test mode active
☐	COM	Off	No communication with ETU
	COM	Flashing (2 Hz)	Establishing communication with ETU
	COM	On	Communication connection with ETU established
☐	DI 0	Off	Input not activated
	DI 0	On	Input activated
☐	ZSI IN	Off	ZSI function not activated

4.9 EFB300 external function box

LED		Meaning	Description
	ZSI IN	On	ZSI function activated
	ZSI OUT	Off	No ZSI OUT signal transmitted
	ZSI OUT	On	ZSI OUT signal transmitted
	DO 0	Off	Output not selected
	DO 0	Flashing (2 Hz)	Output selected
	DO 0	On	Output selected and activated
	DO 1	Off	Output not selected
	DO 1	Flashing (2 Hz)	Output selected
	DO 1	On	Output selected and activated
	DO 2	Off	Output not selected
	DO 2	Flashing (2 Hz)	Output selected
	DO 2	On	Output selected and activated
	DO 3	Off	Output not selected
	DO 3	Flashing (2 Hz)	Output selected
	DO 3	On	Output selected and activated



Steady illumination



Flashing



Off

4.9.6 Operating 3VA6 by means of communication with the MO320 motor operator via EFB300

Objective:

As well as being able to open and close 3VA2 very quickly due to its two spring assemblies (i.e. synchronizable), SEO520 can also be operated very easily and without the need for further modules via the 3VA2 communication function.

If the "normal" MO320 motor operator is to be operated via communication instead of the SEO520, this can either be achieved using standard output modules of the bus system (e.g. ET200S) or the External Function Box EFB300 which is connected directly to the ETU.

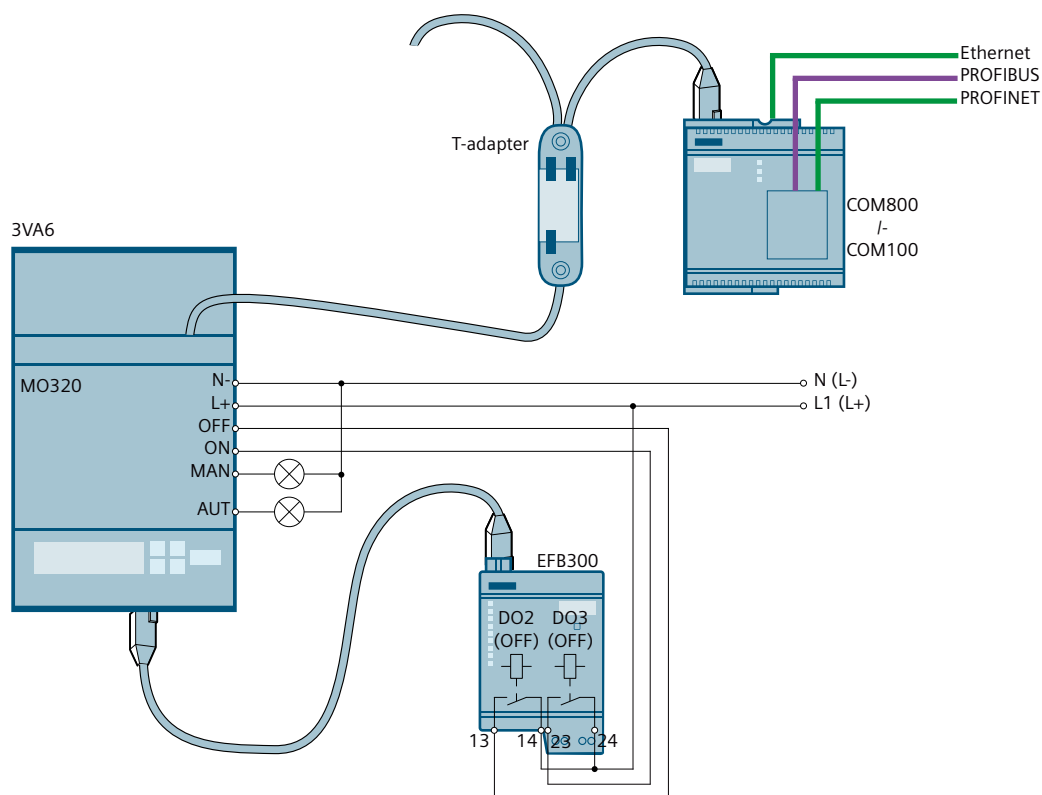
Precondition:

- 3VA6 with 5-series or 8-series ETUs with firmware 4.2 or higher (minimum product version can be obtained from the table depending on I_n and ETU)

	I_n			
	Up to 250 A	400 - 500 A	630 A	1000 A
ETU550	E07	E04	E03	E04
ETU560	E07	E04	E03	E04
ETU550M	E03	E03	E03	E03
ETU850	E07	E04	E03	E04
ETU860	E07	E04	E03	E04
ETU860M	E03	E03	E03	E03

- COM060 with firmware 4.2 or higher (firmware update can be downloaded from SIOS)
- COM800/100 with firmware 4.2 or higher (firmware update can be downloaded from SIOS)
- EFB300
- MO320 (24 ... 60 V DC, 110 ... 230 V AC or 110 ... 250 V DC)

Drawing:



Description:

Outputs DO2 and DO3 of the EFB300 can be used for controlling the MO320 inputs; only these relay outputs can be used. The MAN and AUT indications in the drawing are optional.

The outputs of the EFB300 must be controlled as follows in order to make it possible to control the circuit breaker via the MO320.

DO2	DO3	Action
0	0	None
0	1	Activates
1	0	Deactivates
1	1	n.d.

Before the outputs of the EFB300 can be controlled, they must be configured as shown below for digital output 2 and digital output 3 using SENTRON Powerconfig software version 3.10 or higher (can be downloaded from SIOS).

EFB/MMB functions	
Digital input	Not used
Digital output 0	Alarm level 1 for overload
Digital output 1	Alarm level 2 for overload
Digital output 2	Remote control

4.9 EFB300 external function box

EFB/MMB functions	
Digital output 3	Remote control
⇒ Zone Selective Interlocking (ZSI)	
⇒ EFB/MMB limit 0	
⇒ EFB/MMB limit 1	
⇒ EFB/MMB limit 2	
⇒ EFB/MMB limit 3	

Controlling the outputs via Modbus TCP (Ethernet)

The outputs can be activated and deactivated using control command 0x06 in Modbus register EFB_MMB_OUT_REMOTE (0x9CCB) and must be masked in binary:

Bit 00: Set DO0 (0x01)

Bit 01: Reset DO0 (0x02)

Bit 02: Set DO1 (0x04)

Bit 03: Reset DO1 (0x08)

Bit 04: Set DO2 (0x10) ⇒ Deactivates

Bit 05: Reset DO2 (0x20) ⇒ Reset opening command

Bit 06: Set DO3 (0x40) ⇒ Activates

Bit 07: Reset DO3 (0x80) ⇒ Reset closing command

Bit 08 – 15 reserved

Note**With Modbus**

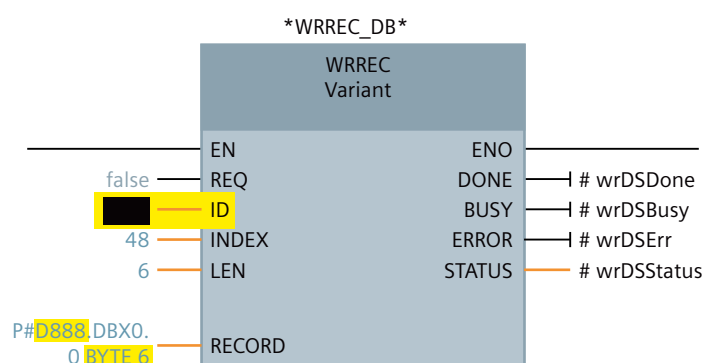
please note that 1 must always be subtracted from the address. In the case of EFB_MMB_OUT_REMOTE, for example, the write address would be 0x9CCA.

Controlling the outputs via PROFIBUS or PROFINET

The bits in the cyclic channel only control the communication-capable SEO520.

An acyclic service is required to control the outputs of the EFB300.

For this purpose, the contents of a data block must be written using data record DS48. S7 uses the following call to do this:



This call uses data record DS48 to write the contents of **DB88** with a length of 6 bytes to the PROFIBUS/PROFINET module of the COM800/100 with the **ID** (identification number of the hardware component, see HWConfig).

The structure of the DS88 data record (88 is just an example number here) is as follows:

DB88		
	Name	Datentyp
1	Static	
2	REG_ADDR	Word
3	BREAKER_ADDR	Byte
4	REG_CNT	Byte
5	CONTROL_VALUE	Word

This means:

REG_ADDR must be filled with 0x9CCA (Modbus register).

BREAKER_ADDR is the address of the circuit breaker on the 3VA-Line. Only addresses in the range 1 to 8 are permitted.

REG_CNT must be filled with 0x01.

CONTROL_VALUE must now contain the contents that are to be sent to Modbus register EFB_MMB_OUT_REMOTE.

Multiple circuit breakers can also be opened or closed simultaneously (with an acyclic frame). To do this, DB88 must be extended by exactly the same structure for each circuit breaker and the length must be adapted in WRREC.

FAQ Operating 3VA2 molded case circuit breakers by means of communication with the MO320 motor operator via EFB300 (<https://support.industry.siemens.com/cs/ww/en/view/109760536>)

4.9.7 Technical specifications

Dimensions and weights		
Suitability for application		Installation in fixed switchboard inside enclosed rooms
Type of mounting		
DIN rail (35 mm)		Yes
Flat mounting		Yes
Mounting position		Vertical
Width	inch mm	2,75 70
Height	inch mm	4,52 115
Depth	inch mm	1,33 34
Weight (net)	g	145
Functions		
ETU power supply		Yes
Data exchange with ETU		Yes
Digital input and output module		Yes
Supply		
Rated power dissipation P_v	VA	4
Rated control supply voltage U_c	V DC	24
Operating range	x U_c	$\pm 20 \%$
Power consumption	A	≤ 0.16
Communication with molded case circuit breakers		
Number of 3VA-line interfaces		1
Length of cable	inch m	59,05 1,5
ZSI		
Number of breakers which can be connected to ZSI IN		≤ 20
Number of breakers which can be connected to ZSI OUT		≤ 8
Cable for ZSI		Flexible, shielded (min. 85 % coverage), twisted cable, max. capacitance: 200 nF/km (cable/shield), 160 nF/km (cable/cable), inductance 0.65 H/km, total cable resistance: max. 28 ohms
Cable length for ZSI		< 600 m / 0.75 mm ² (AWG 18) < 1200 m / 1.5 mm ² (AWG 16) < 2000 m / 2.5 mm ² (AWG 14)

Digital input			
Number of digital inputs			1
Rated operational voltage	V DC		24
Operating range			+ 20 % IEC: SELV/PELV
Voltage value for reliable detection of a "1" signal	V		15
Voltage value for reliable detection of a "0" signal	V		≤ 5
Digital outputs			
Number of relays			2
Voltage			IEC: ≤ 250 V AC/DC UL: LVLE
Rated uninterrupted current			6 A
Rated breaking capacity	AC-12 / 250 V	A	6
	AC-15 / 250 V	A	3
	DC-12 / 250 V	A	0.2
	DC-13 / 250 V	A	0.1
Output current for signal <1>	mA		10 ... 27
Output current for signal <0>	mA		≤ 0.2
Design of fuse link for short-circuit protection of auxiliary contacts of output relay	A		6
Specified fuse for auxiliary contact elements			Fuse links operating class gL/gG 6A
Overvoltage category			III (relays) I (all others)
Number of static semiconductor outputs			2
Rated voltage			24 V DC ± 20 % IEC: SELV/PELV UL: LVLE
Rated operational current	mA		100
Connection elements and terminals			
Design of electrical connection			
- Inputs for supply voltage			Removable / plug-in
- At the inputs for supply voltage			Screw-type terminals
Type of connectable conductor cross sections			
- Solid	mm ²		0.5 ... 2.5
- Finely stranded / with end sleeve	mm ²		0.5 ... 2.5
- With AWG cables / solid			1 x 21 ... 14; 2 x 21 ... 16
Tightening torque	Nm		0.4 ... 0.5
Electromagnetic compatibility			
Conducted or radiated emissions			EN 61000-6-3 / FCC Class A and marine application requirements
Immunity in industrial environments			EN 61000-6-2 and marine application requirements
Ambient conditions			
Ambient temperature			
- during operation	°C		-25 ... +60
- during operation with derating of rated operational current of digital outputs to 80 mA	°C		-25 ... +70
- during storage and transportation	°C		-25 ... +70
Pollution degree			3
Degree of protection and safety class			
Degree of protection (acc. to IEC 60529)			IP20

4.10 MMB300 maintenance mode box

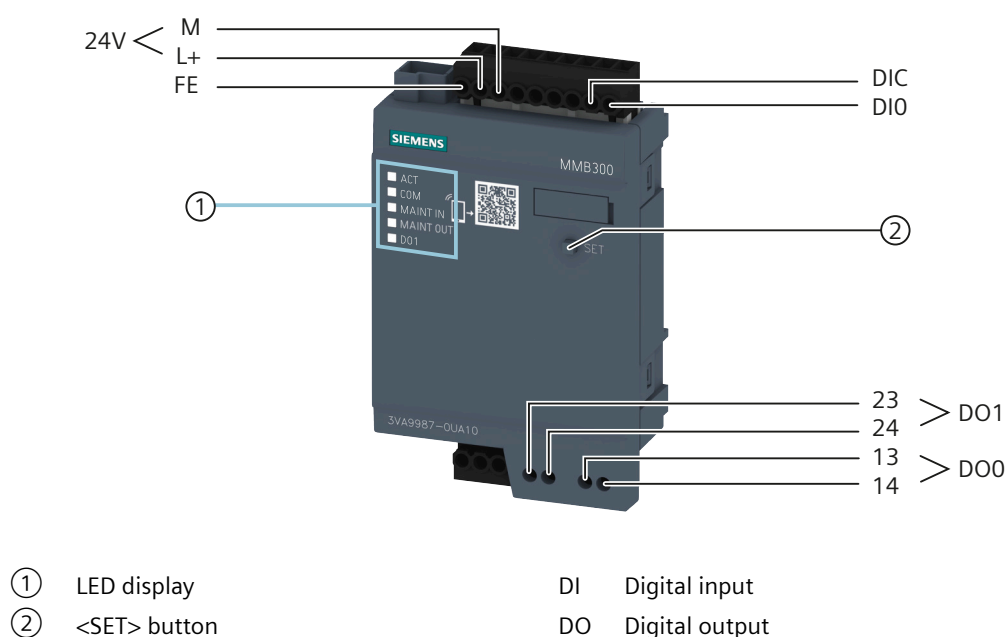
4.10.1 Operating principle of the MMB300 maintenance mode box

The 3VA6 molded case circuit breakers with the 3-series, 5-series and 8-series ETU electronic trip units can be functionally expanded with a **Maintenance Mode Box** MMB300.

With the Maintenance Mode Box MMB300, the Dynamic Arc Sentry mode (DAS mode, chapter Arc energy reduction (Page 94)) of the molded case circuit breaker is activated and the setting parameters for the instantaneous short-circuit current I_i and the ground-fault current I_g are set to the lowest setting values of the circuit breaker. This reduces the let-through energy of the molded case circuit breaker under fault conditions. This results in improved protection when personnel is in the vicinity of the installation and the installation is in maintenance mode.

This parameter changeover can occur, for example, through a door contact at the switchboard or an externally actuated switch. In addition, a signal lamp or horn, for example, signals when the circuit breaker is in maintenance mode.

A series connection of up to eight 3VA6 molded case circuit breakers with the associated Maintenance Mode Box MMB300 is possible.



LED states of the Maintenance Mode Box MMB300

LED	Meaning	Description
 ACT	Off	MMB300 not active
 ACT	On	MMB300 ready for use
 COM	Off	No communication with ETU
 COM	Flashing (2 Hz)	Establishing communication with ETU
 COM	On	Communication connection with ETU established
 MAINT IN	Off	No input signal
 MAINT IN	On	Input signal active
 MAINT OUT	Off	No output signal
 MAINT OUT	On	Output signal active
 DO 1	Off	No output signal
 DO 1	On	Output signal active

 Steady illumination

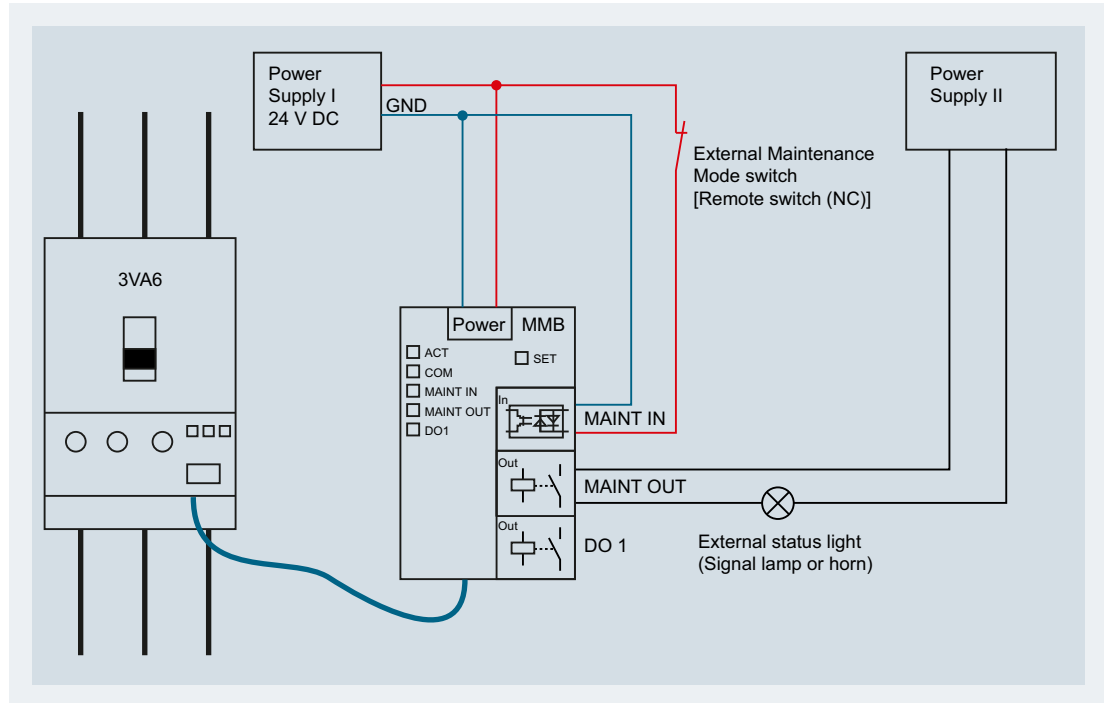
 Flashing

 Off

Simultaneous flashing of all LEDs indicates that the MMB300 is defective.

4.10.2 Configuration of MMB300 with a 3VA6 molded case circuit breaker

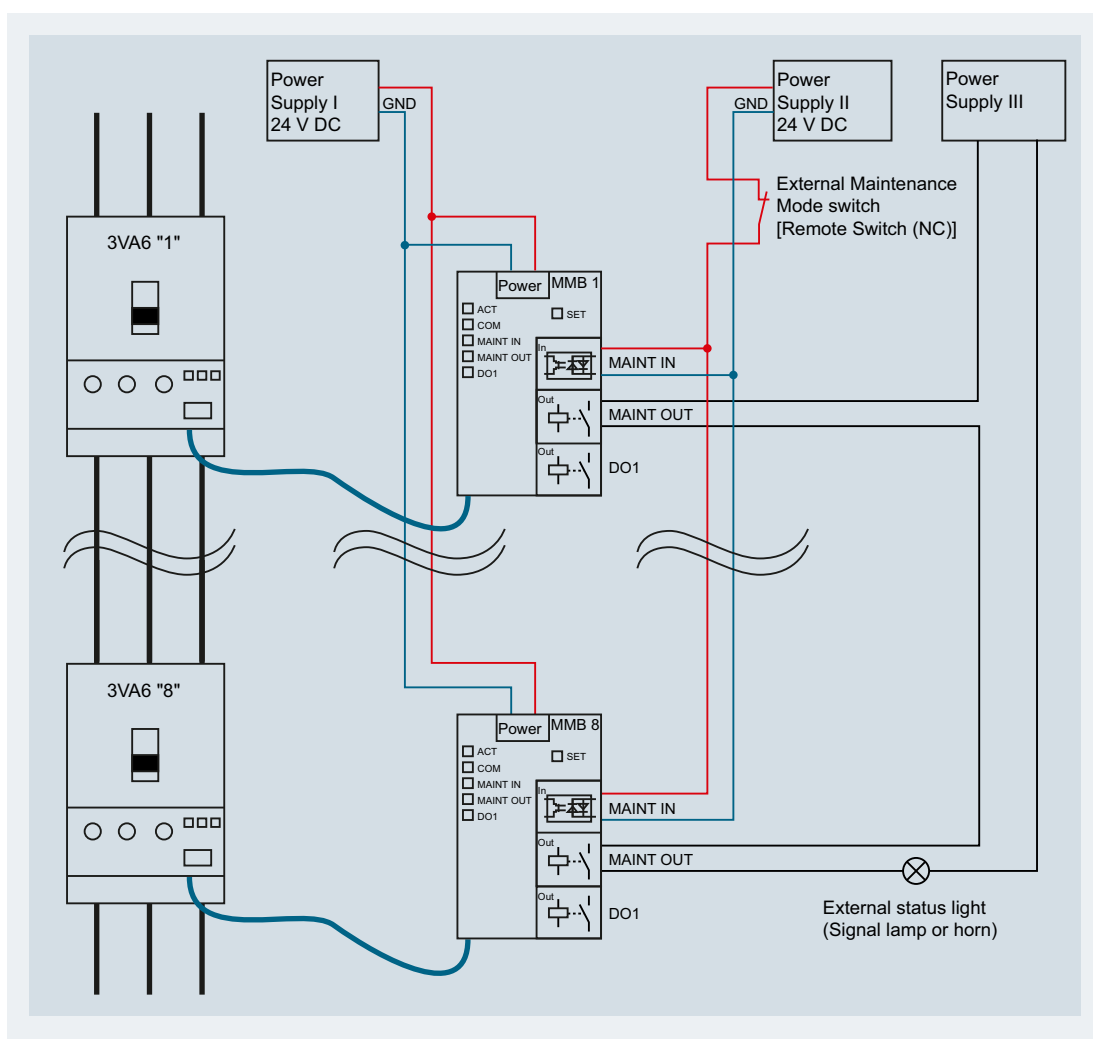
The possible configuration of the Maintenance Mode Box MMB300 with the associated molded case circuit breaker is shown in the following.



Alternatively, up to eight 3VA6 molded case circuit breakers can be connected in series with a Maintenance Mode Box MMB300.

This ensures that the external status display only signals that maintenance mode is activated when all series-connected molded case circuit breakers are in DAS mode.

4.10 MMB300 maintenance mode box



It is also possible to combine the power supplies.

LED states for the 3VA6 molded case circuit breaker and Maintenance Mode Box MMB300 in different applications

The LED states shown in the following tables relate to the circuit diagram of the multiple series-connected 3VA6 molded case circuit breakers (see above).

4.10 MMB300 maintenance mode box

Application	Description	Status LEDs	
		3VA6	MMB300
1	1. All power supplies "On" 2. Maintenance mode box closed - 3VA6 "1" to 3VA6 "8" → normal operation - External status display → Off	 ACT (all)  AL 2 (all)	 ACT  COM  MAINT IN  MAINT OUT
2	1. All power supplies "On" 2. Maintenance mode box open - 3VA6 "1" to 3VA6 "8" → maintenance mode - External status display → On	 ACT (all)  AL 2 (all)	 ACT  COM  MAINT IN  MAINT OUT
3	1. Power supply I is "Off" (before ETU is activated) 2. Maintenance mode box open 3. 3VA6 circuit breakers are switched on → ETUs are active - 3VA6 circuit breakers do not detect the MMBs - 3VA6 "1" to 3VA6 "8" → normal operation - External status display → Off	 ACT (all)  AL 2 (all)	 ACT  COM  MAINT IN  MAINT OUT
4	1. Power supply II is "Off" 2. Maintenance mode box closed - 3VA6 "1" to 3VA6 "8" → maintenance mode - External status display → On	 ACT (all)  AL 2 (all)	 ACT  COM  MAINT IN  MAINT OUT

 Steady illumination

 Flashing

 Off

Application	Description	Status LEDs	
		3VA6	MMB300
5	1. Power supply III is "Off" 2. Maintenance mode box closed - 3VA6 "1" to 3VA6 "8" → normal operation - External status display → Off	 ACT (all)	 ACT
		☐ AL 2 (all)	 COM  MAINT IN ☐ MAINT OUT
6	1. Power supply III is "Off" 2. Maintenance mode box open - 3VA6 "1" to 3VA6 "8" → maintenance mode - External status display → Off (no power supply III)	 ACT (all)	 ACT
		 AL 2 (all)	 COM ☐ MAINT IN  MAINT OUT
7	1. All power supplies "On" 2. The connection between 3VA6 "1" and MMB I is faulty (before ETU is activated) 3. Maintenance mode box open - 3VA6 "1" → normal operation (MMB not detected) - 3VA6 "8" → maintenance mode - External status display → Off	 ACT (3VA6 "1")	 ACT
		☐ AL 2 (3VA6 "1")	 COM (MMB 1)
		 ACT (3VA6 "8")	 COM (MMB 8)
		 AL 2 (3VA6 "8")	☐ MAINT IN ☐ MAINT OUT "1"  MAINT OUT "8"

 Steady illumination

 Flashing

☐ Off

If the external status display is "On", this guarantees that all 3VA6 molded case circuit breakers are in maintenance mode.

4.10.3 <SET> button

The SET button on the Maintenance Mode Box MMB300 functions exactly like on the External Function Box EFB300.

The SET button can be used to activate test mode of the Maintenance Mode Box MMB300. This means that the "MAINT Out" and "DO1" outputs can be manually activated or

4.10 MMB300 maintenance mode box

deactivated. This allows you to check whether the outputs are functioning correctly and the wiring is correct.

LED		Meaning	Description
	ACT	Off	MMB300 not active
	ACT	On	MMB300 ready for use
	ACT	Flashing (2 Hz)	MMB300 in test mode
	COM	Off	No communication with ETU
	COM	Flashing (2 Hz)	Establishing communication with ETU
	COM	On	Communication connection with ETU established
	MAINT IN	Off	No input signal
	MAINT IN	On	Input signal active
	MAINT OUT	Off	No output signal
	MAINT OUT	Flashing (2 Hz)	Output selected
	MAINT OUT	On	Output signal active
	DO 1	Off	No output signal
	DO 1	Flashing (2 Hz)	Output selected
	DO 1	On	Output signal active



Steady illumination



Flashing



Off

4.10.4 Power supply

The MMB300 maintenance mode box requires a UL Class 2, 24 V DC power supply and also serves as the power supply for the connected ETUs. This allows the ETU to remain operational even after the 3VA6 molded case circuit breaker has tripped or is in the Off position.

4.10.5 Technical specifications

Dimensions and weights		
Suitability for use		Installation in stationary switchboards within closed rooms
Type of mounting		
DIN rail (35 mm)		Yes
Flat mounting		Yes
Mounting position		Vertical
Width	inch	2.75
	mm	70
Height	inch	4.52
	mm	115
Depth	inch	1.33
	mm	34
Weight (net)	g	145
Functions		
Power supply ETU		Yes
Data exchange with ETU		Yes
Digital input and output module		Yes
Supply		
Rated power loss P_v	VA	4
Rated control supply voltage U_c	V DC	24
Operating range	x U_c	$\pm 20\%$
Current consumption	A	≤ 0.16
Communication with the molded case circuit breakers		
Number of interfaces 3VA-line		1
Length of cable	inch	59.05
	m	1.5

4.10 MMB300 maintenance mode box

Digital input MAINT IN		
Number of digital inputs		1
Rated operational voltage	V DC	24
Operating range		+ 20% IEC: SELV/PELV
Voltage value for reliable detection of a "1" signal	V	15
Voltage value for reliable detection of a "0" signal	V	≤ 5
Digital outputs MAINT OUT and D		
Number of relays		2
Voltage		IEC/UL: ≤ 250 V AC/DC
Rated uninterrupted current		6 A
Rated breaking capacity	UL 250 Vac	A 6
	UL 30 Vdc	A 5
	AC-12 / 250 V	A 6
	AC-15 / 250 V	A 3
	DC-12 / 250 V	A 0.2
	DC-13 / 250 V	A 0.1
Design of fuse link for short-circuit protection of auxiliary contacts of the output relay	A	6
Specified fuse for auxiliary contacts		Fuse links, operating class gL/gG 6A
Overvoltage category		III (relay) I (all others)
Number of static semiconductor outputs		2
Rated voltage		24 V DC ± 20% IEC: SELV/PELV UL: LVLE
Rated operational current	mA	100

Connection elements and terminals		
Design of electrical connection		
- Inputs for supply voltage		removable / plug-in
- at inputs for supply voltage		Screw connection
Type of connectable wire ranges		
- Solid	mm ²	0.5 ... 2.5
- Finely stranded / with ferrule	mm ²	0.5 ... 2.5
- AWG cables / solid		1 x 21 ... 14; 2 x 21 ... 16
Tightening torque	Nm	0.4 ... 0.5
Electromagnetic compatibility		
Conducted or radiated emissions		EN 61000-6-3 / FCC Class A and marine engineering requirements
Immunity in industrial environment		EN 61000-6-2 and marine engineering requirements
Ambient conditions		
Ambient temperature		
- During operation	°C	-25 ... +70
- During storage and transport	°C	-25 ... +70
Pollution degree		3
Degree of protection and protection class		
Degree of protection (according to IEC 60529)		IP20
NEMA protection class		1

4.11 Test devices

4.11.1 Introduction

Test devices are required in order to perform local tests of the 3VA6 molded case circuit breakers with electronic trip units (ETUs).

Two versions of the test devices are available:

- TD300 activation and trip box
- TD400 test device
- TD500 test device

Functional scope of test devices

	TD300 activation and trip box			TD400 test device			TD500 test device		
ETU	3-series	5-series	8-series	3-series	5-series	8-series	3-series	5-series	8-series
Activation of ETU	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mechanical trip tests	✓	✓	✓				✓	✓	✓
Testing of tripping function							✓	✓	✓
Testing of current measurement							✓	✓	✓
Testing of transformers ¹⁾							✓	✓	✓
Connection to a PC with SENTRON Powerconfig				✓	✓	✓	✓	✓	✓
Parameterization of ETU					✓ ²⁾	✓ ²⁾		✓ ²⁾	✓ ²⁾
Saving of test results							✓	✓	✓

¹⁾ One energy transformer, one Rogowski coil

²⁾ Via SENTRON Powerconfig

4.11.2 The TD300 activation and trip box

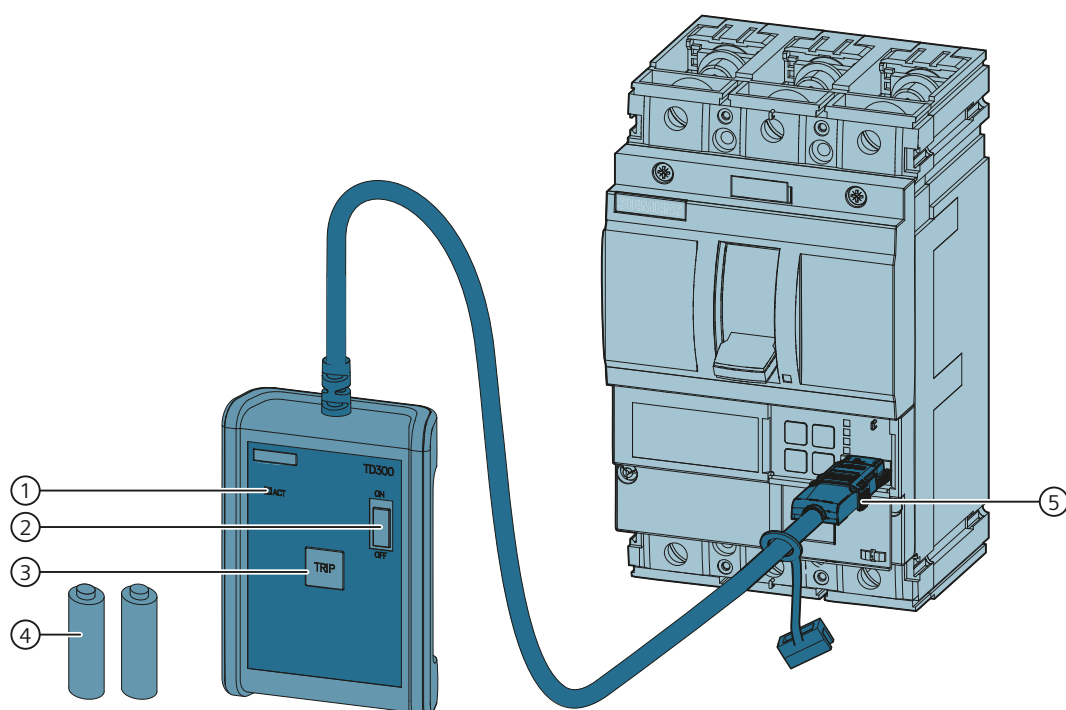
The TD300 activation and trip box is a mobile, battery-operated local test device. Its purpose is:

- To supply the ETU with power so that the ETU can be parameterized when the molded case circuit breaker is switched off and de-energized.
- To test and service the electronic trip unit (ETU).

The power supply is provided by two AA batteries included in the scope of supply.

The TD300 activation and trip box has a compact size of 3 x 4.21 x 1" / 76 x 107 x 25 mm (W x H x D).

Description of the TD300 activation and trip box



- ① "ACT" LED for indicating the battery status
- ② Slide switch ON/OFF
- ③ <TRIP> pushbutton for testing the molded case circuit breaker
- ④ 2 1.5 V AA batteries
- ⑤ Plug-in connector for insertion in the test socket on the ETU

4.11.2.1 Operation and execution of the tripping function

⚠ CAUTION

Personal injury, unintentional tripping and irreparable damage to the TD300

Use of the TD300 when the molded case circuit breaker is not de-energized can result in personal injury, unintentional tripping of the circuit breaker and irreparable damage to the TD300.

Disconnect the molded case circuit breaker from the power supply before using the TD300 activation and trip box.

Connecting, switching on/off and disconnecting the TD300

Connecting the TD300 to the 3VA molded case circuit breaker

1. Disconnect the molded case circuit breaker from the power supply.
2. Insert the connecting cable in the test socket of the ETU.

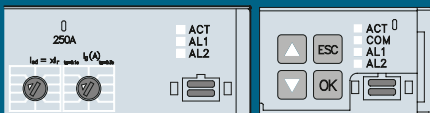
Switch the TD300 on and off

1. Check whether the molded case circuit breaker is disconnected from the power supply. If it is not, disconnect it.
2. Push the slide switch to ON.
The "ACT" LED on the TD300 lights up and the ETU display is activated. The TD300 is ready.
If the "ACT" LED does not light up:
 - Push the slide switch to OFF.
 - Detach the connecting cable from the molded case circuit breaker.
 - Replace the batteries.
 - Follow the correct sequence of steps to connect the unit to the molded case circuit breaker again.
 - Push the slide switch to ON.
3. Push the slide switch to OFF.
The "ACT" LED on the TD300 goes out to indicate that the unit is switched off.

Disconnecting the TD300 from the 3VA molded case circuit breaker

1. Switch off the molded case circuit breaker (OFF position).
2. Detach the connecting cable from the molded case circuit breaker.

LED states when the TD300 and the molded case circuit breaker are switched on

TD300	ETU					Description
						
ACT	ACT	COM	AL1	AL2		
		 ☐	☐	☐	TD300 and ETU are ready	
☐	  ☐	☐	☐	☐	The batteries on the TD300 need to be replaced	
		 ☐	 ☐	 ☐	TD300 is ready ETU is not ready	

Test the molded case circuit breaker (mechanical trip test)

1. Connect the TD300 to the molded case circuit breaker in the correct sequence and switch on.
2. Switch on the molded case circuit breaker (ON position).
3. Press the <TRIP> pushbutton on the TD300.

The molded case circuit breaker trips:

The molded case circuit breaker is functioning correctly.

The molded case circuit breaker does not trip:

- Switch off the TD300.
- Switch off the molded case circuit breaker (OFF position).
- Detach the connecting cable from the molded case circuit breaker.
- Connect the TD300 correctly to the molded case circuit breaker again and switch on.
- Repeat the trip test (by pressing the <TRIP> pushbutton on the TD300).
- If the molded case circuit breaker fails to trip again, contact Technical Support.

4.11.2.2 Technical specifications of TD300

Mechanical properties			
Height		inch	4,21
		mm	107
Width		inch	3
		mm	76
Depth		inch	1
		mm	25
Degree of protection			IP30
Ambient temperature			
	• During operation	°C	-10 ... +40
	• During storage	°C	-40 ... +50
	• With battery installed – During storage	°C	0 ... +25
Mounting position			Any
Interface to circuit breaker			
Number of circuit breakers that can be connected directly			1
Length of connecting cable		m	1
Power supply			
Type of battery			AA, alkaline, 1.5 V
Approvals / certificates:			

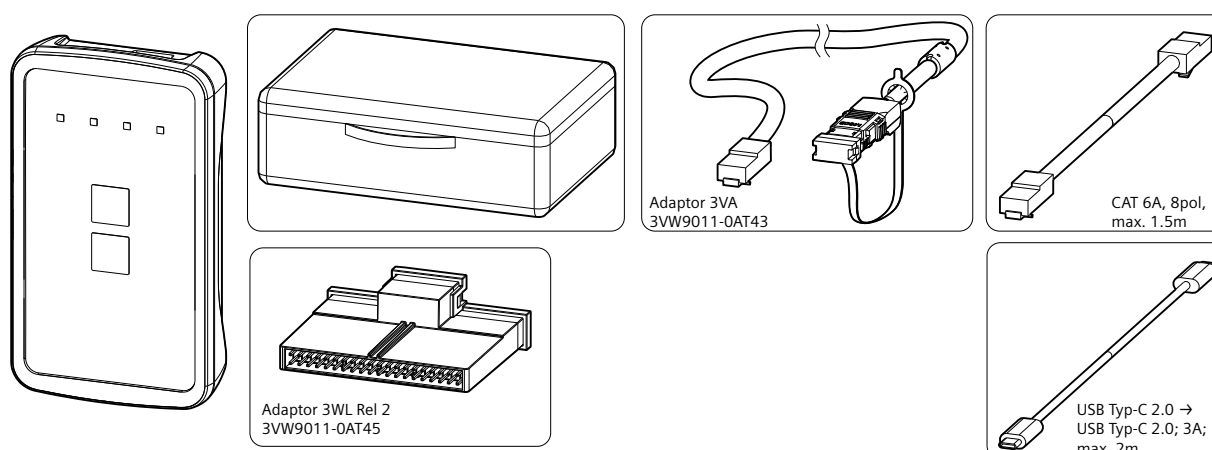
Mechanical properties			
Declaration of Conformity			
			

4.11.3 The TD400 test device

4.11.3.1 Scope of supply

The scope of supply of the TD400 test device comprises

- The actual test device
- The connecting cable to the 3VA trip unit
- The connecting cable to the 3WL (ETU Release 2)
- A 2 m long USB cable for connecting a computer with a USB port to the TD400
- A customized case that holds the scope of supply described above



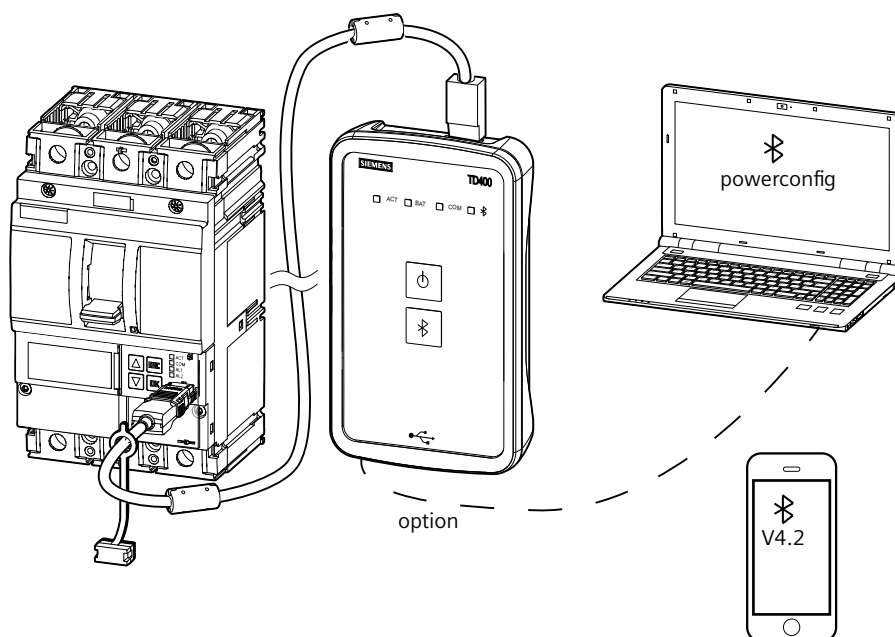
4.11.3.2 Operating principle

The TD400 is connected to the front interface of the 3VA trip unit by means of the connecting cable supplied with the device. If the electronic trip unit is not yet connected to the power supply (primary current, COM060 or EFB300), it can be supplied with power via the TD400.

The TD400 makes all the data of the 3VA trip unit available in one of two ways, either via USB cable to a PC on which SENTRON Powerconfig is installed.

Or via a Bluetooth® interface to a mobile end device, e.g. a cell phone. This device requires the SENTRON Powerconfig app in order to interpret the circuit breaker data.

4.11 Test devices



4.11.3.3 Operator controls / interfaces



- 1 Interfaces to the circuit breaker
- 2 LEDs for displaying TD400 states
- 3 ON/OFF button
- 4 Bluetooth® button

- 5 USB
- 6 Magnetic rear
- 7 Internal batteries

LED displays

Status LED	Function	 LED ON	 LED OFF	 LED flashes 2 Hz	 LED flashes 4 Hz
ACT	Operating mode			Not ready	
BAT	Battery state		Battery empty or TD400 is USB powered	Battery low but charge level is sufficient to continue activating the ETU	Battery nearly empty, too low to activate an ETU
COM	Communication with ETU			Establishing a connection	
	Bluetooth® status	Connected	Bluetooth® off	Connectable	

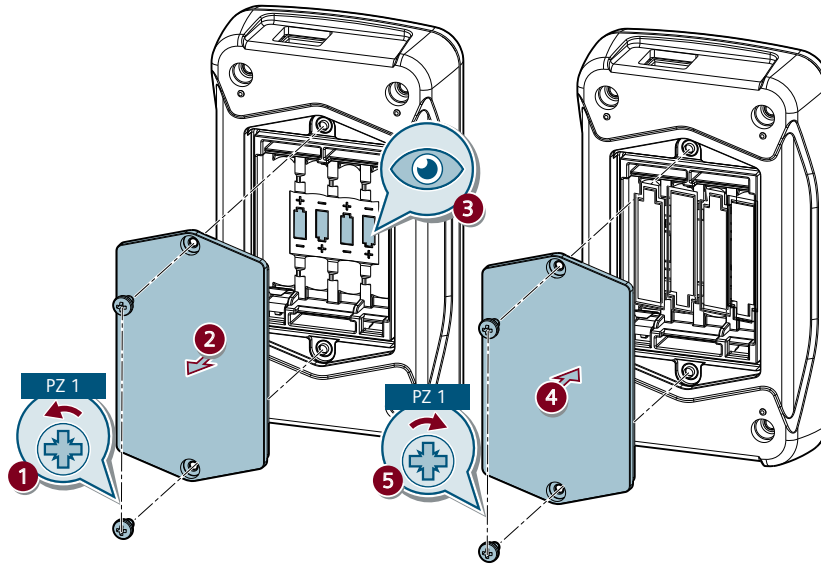
Operator controls:

- ON/OFF button: Press for >0.5 s Switch TD400 on or off
- Press for <0.5 s Activate/deactivate connected ETU
- Bluetooth® button: Press for <0.5 s Switch Bluetooth® on or off
- Press for >10 s Reset Bluetooth® connection and PIN

The TD400 has magnets at the rear for affixing it to the control cabinet door or to metal surfaces.

4.11.3.4 Power supply

The power supply of the TD400 and the connected ETU, if this is not already supplied with primary current or external energy (COM060, 24 V module, EFB300), is provided by four batteries of the type AAA or rechargeable batteries of the type AAA HR03 NiMH ≤ 800 mAh. If rechargeable batteries are used, these are not charged via the USB interface.



To prolong battery life, connecting one of the following to the USB port in addition is recommended:

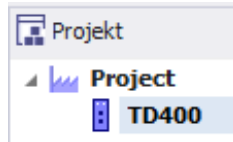
- USB-C power bank: QC 3.0; 5 V; 3 A; ≥ 10000 mAh.
Suitable USB chargers or power banks are usually marked "Quick Charge 3.0".
- USB-C power supply unit: QC 3.0; 5 V; 3 A; 15 W

4.11.3.5 Connection via USB

Procedure for establishing a connection via USB

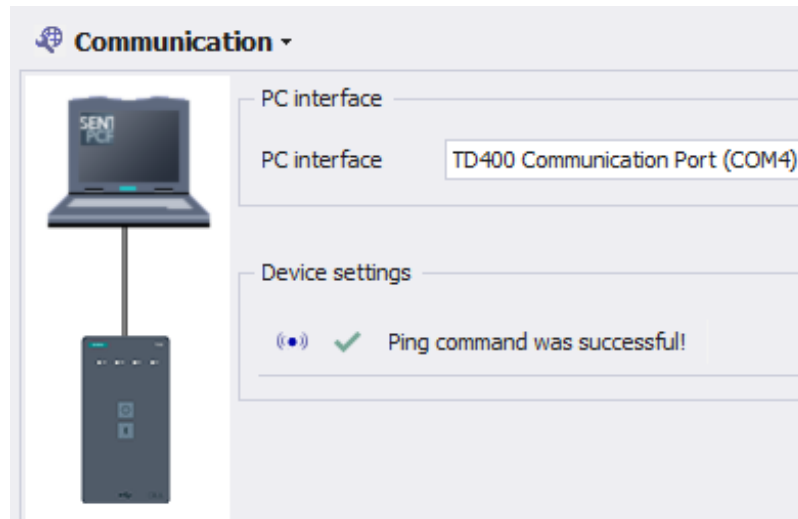
1. Connect the TD400 to the 3VA trip unit
2. Connect the TD400 to a PC via a USB cable
3. Ensure that SENTRON Powerconfig V3.14 (<https://support.industry.siemens.com/cs/ww/en/view/63452759>) or higher is installed
4. Ensure that fully functional batteries or charged rechargeable batteries have been inserted in the TD400
5. Switch on the TD400 by a long press of
6. Wake up the ETU by a short press of

7. Copy the TD400 from the library into the project using drag & drop

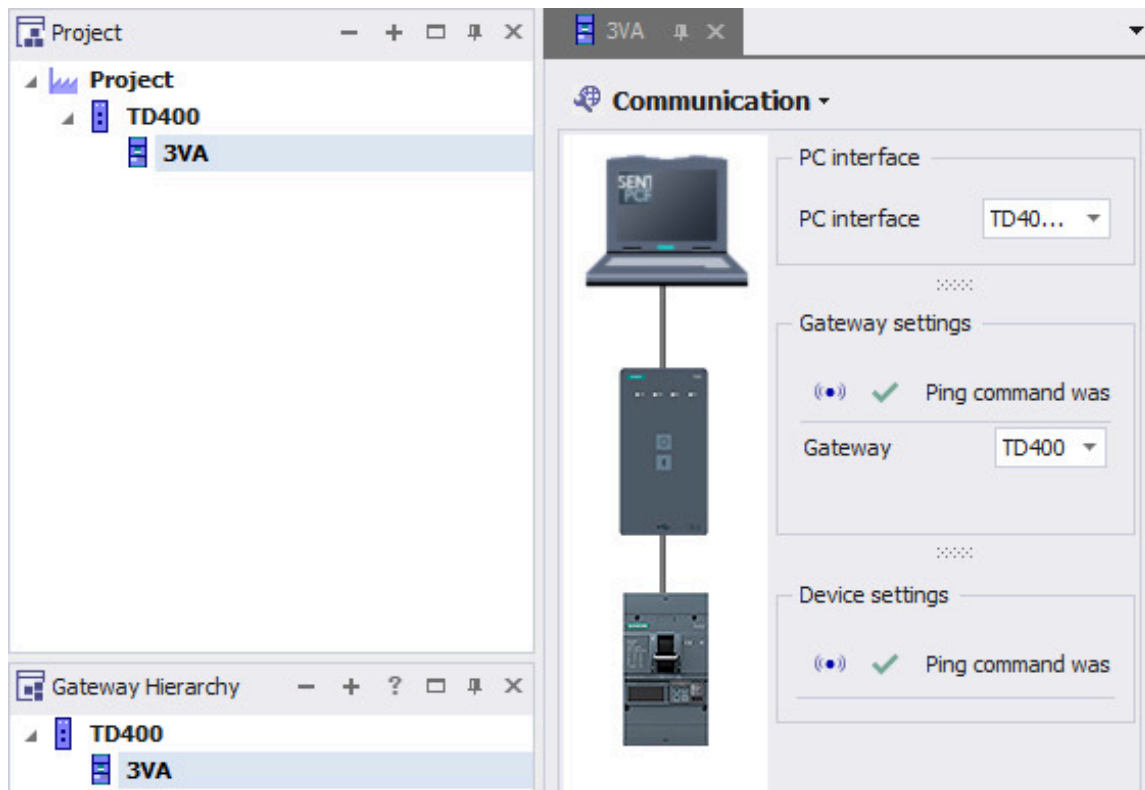


4.11 Test devices

8. Under "Communication", select the TD400 Communication Port
Clicking the  symbol should result in a successful ping



9. Then create a 3VA below the TD400, also in the device hierarchy (see below).

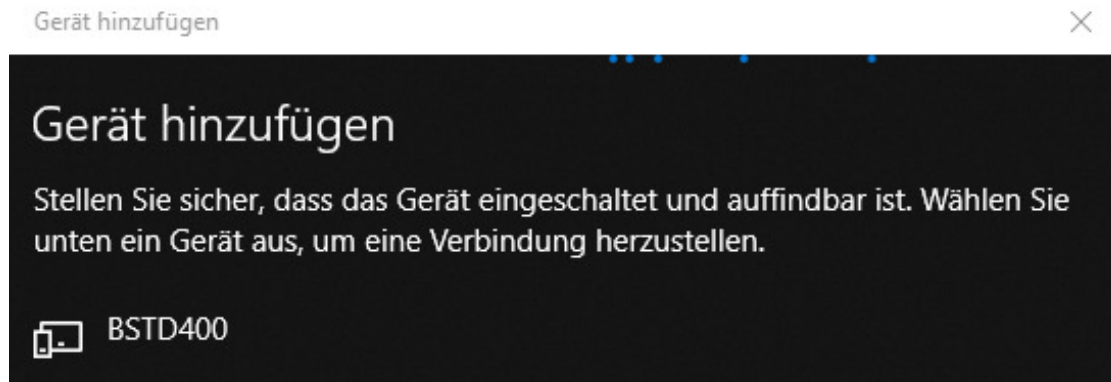


A ping should also be issued here in order to verify communication.
Communication with upload and download from SENTRON Powerconfig and 3VA should now be possible.

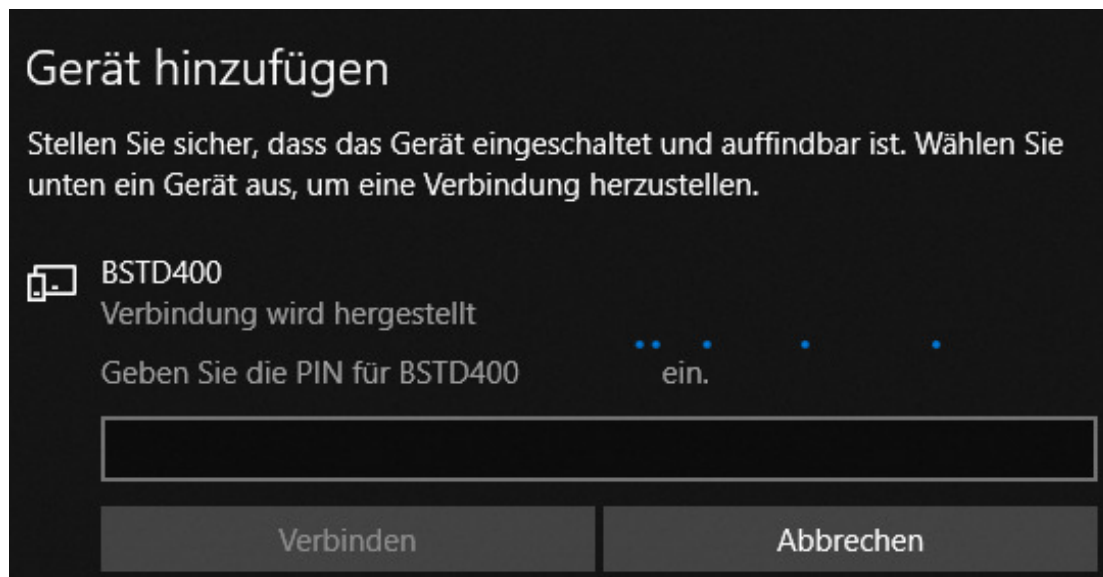
4.11.3.6 Connection via Bluetooth®

With SENTRON Powerconfig to Windows

1. Switch on the TD400 by a long press of 
2. Activate the ETU by a short press of 
3. Scan for new Bluetooth® devices (Control Panel)



4. Enter the passkey



5. Switch Bluetooth® on again on the TD400 by pressing the symbol button
6. The Bluetooth® LED flashes

7. Create the TD400 in SENTRON Powerconfig and select "Bluetooth® Device (RFCOMM Protocol TDI)" in the communication properties on the PC interface. Then issue a ping. The Bluetooth® LED should now emit a steady light

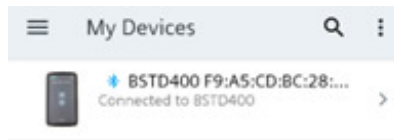


8. Communication is now ready

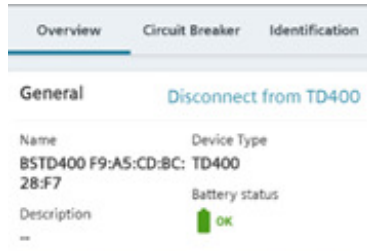
With SENTRON Powerconfig for mobile device (smart device)

1. Switch on the TD400 by a long press of
2. Activate the ETU by a short press of
3. Switch on Bluetooth® on the TD400 by a short tap of the button, the associated LED flashes
4. Activate Bluetooth® on the mobile device and search for TD400
5. Enter the PIN and pair the devices, the LED on the TD400 continues flashing
6. Start the SENTRON Powerconfig app

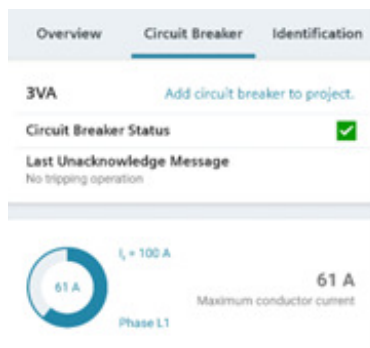
7. Manually add a TD400 and confirm this with a check mark



8. Enter a new password, pairing completed
9. Click TD400 (Bluetooth® LED on the TD400 changes to a steady light)



Then change to the "Circuit Breaker" tab and press "Add circuit breaker to project"



10. The connection cell phone – TD400 – 3VA connection is now complete

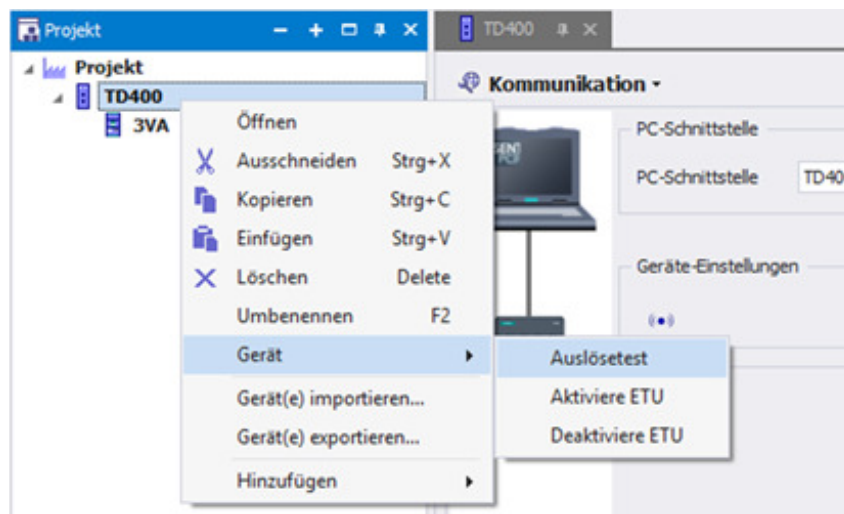
Principle of operation: For all of the parameter values marked in red, the value on the display (cell phone) differs from the current value in the device (RED). It is now possible to import the values from the 3VA or to load the values from the cell phone into the 3VA.

Overview	Parameters	Messages	Identification
Protective functions [*] ^			
Parameter Set A/Overload Protection			
Overload release I_r		40	100
Parameter Set A/Overload Protection			
Overload release tripping time t_r (s)		0.5	5
Parameter Set A/Overload Protection			
Thermal memory ThM		On	
Parameter Set A/Short-Time Delay Short-Circuit Protection			
Short time pick-up current I_{sd} (A)		60	500
Parameter Set A/Short-Time Delay Short-Circuit Protection			
Short time pick-up current tripping time t_{sd} (s)		0.05	
Overwrite Project Values		Overwrite Device Parameter	

4.11.3.7 Test trip of a circuit breaker

In order to perform and document the test trip of a 3VA molded case circuit breaker, the TD400 and SENTRON Powerconfig can be used to generate a trip.

For this purpose, a connection must be established as described above. Right-click the TD400 to open the context-sensitive menu and select "Trip test" under "Device".



The circuit breaker then trips and the following message appears.



An entry is made in the trip archive which can also be read out via the TD400.

4.11 Test devices

Auslösearchiv	
Typ	Meldung
Warnung	Der 3VA hat wegen einer Testauslösung durch das TD400 ausgelöst.
Details	
Name	Wert
Kategorie: Allgemein	
Leistungsschaltertemperatur (°C)	34
TD400 Testauslösung	Ja
Kategorie: Strom	
Strom L1 (A)	0
Strom L2 (A)	0
Strom L3 (A)	0
Strom N (A)	0
Erdschlussstrom (A)	0
Warnung	Der 3VA hat wegen einer unverzögerten Kurzschlussauslösung an Phase L1 ausgelöst.
Details	
Name	Wert
Kategorie: Allgemein	
Leistungsschaltertemperatur (°C)	34
TD400 Testauslösung	Nein
Kategorie: Parameter	
Bemessungsauslösestrom der unverzögerten Auslösung I _n (A)	1000
Kategorie: Strom	
Strom L1 (A)	1740
Strom L2 (A)	955
Strom L3 (A)	912
Strom N (A)	0
Erdschlussstrom (A)	160
Warnung	Der 3VA hat wegen einer kurzzeitverzögerten Kurzschlussauslösung an Phase L2 ausgelöst.
Warnung	Der 3VA hat wegen einer unverzögerten Kurzschlussauslösung an Phase L1 ausgelöst.

The data in the trip archive can also be exported to a CSV file.

4.11.3.8 Technical specifications

Property	Value
Designation	TD400
Article designation	3VW9011-0AT40 IEC Kit 3VA9011-0AT41 UL Kit
TD400 IEC Kit - contents	TD400, case, USB cable, RJ45 cable, 3VA adapter cable, 3WL/3WT adapter for ETU Release 2
TD400 UL Kit - contents	TD400, case, USB cable, RJ45 cable, 3VA adapter cable, 3WL adapter for ETU Release 1
Wireless protocol	Bluetooth® LE version 4.2 or higher
USB protocol	USB 2.0
Connection technology	USB-C
Adapter as spare part	3WL with ETU Release 1 (3VW9011-0AT44) 3WL/3WT with Release 2 (3VW9011-0AT45) 3VA2 / 3VA6 (3VW9011-0AT43)
Power supply	4 x AAA battery HR03
IP	IP40
Operating temperature range	-25 °C to +50 °C (temperatures below 0 °C can reduce the battery life)

Property	Value
Storage temperature range	-40 °C to +70 °C (without battery)
Standards	EN 62368-1 (Communication technology - Part 1: Safety requirements) EN 61000 (Electromagnetic compatibility (EMC)) EN 55014 (Electromagnetic compatibility)

4.11.4 The TD500 test device

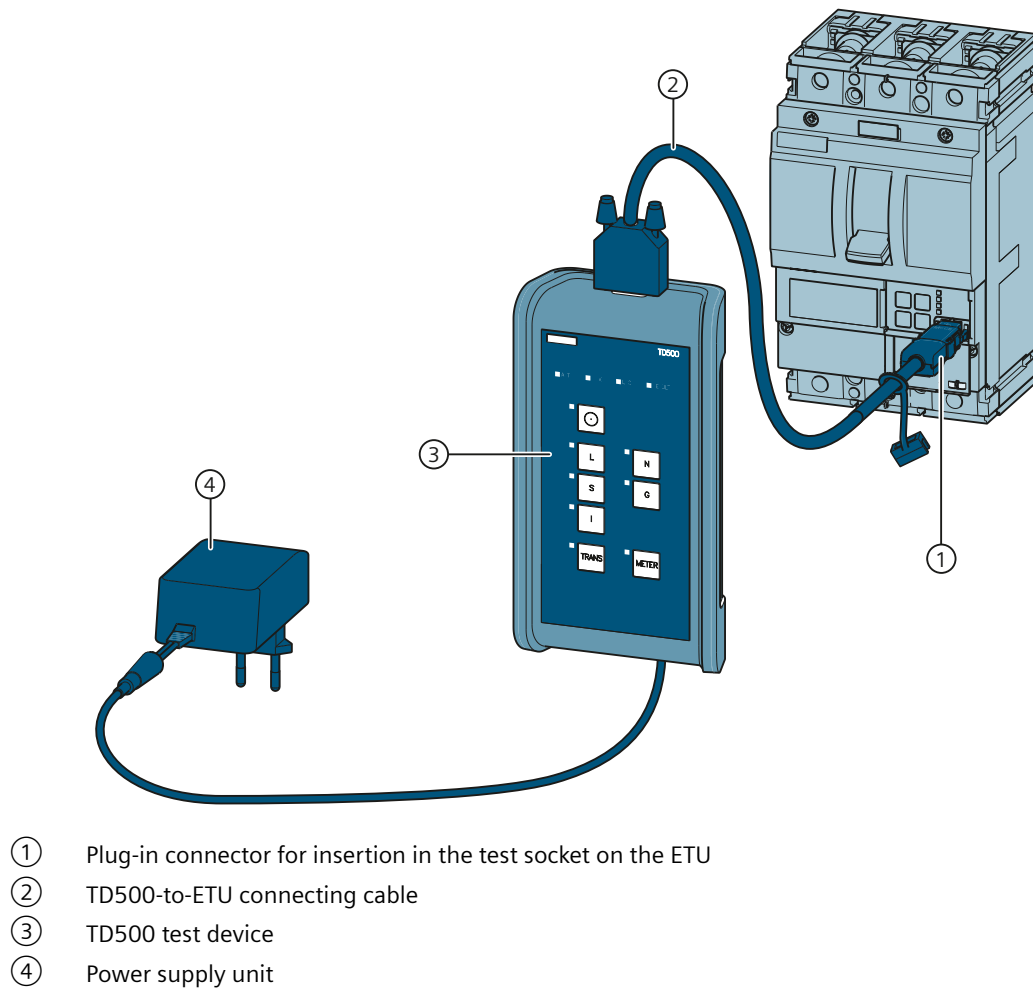
4.11.4.1 General information, preparations

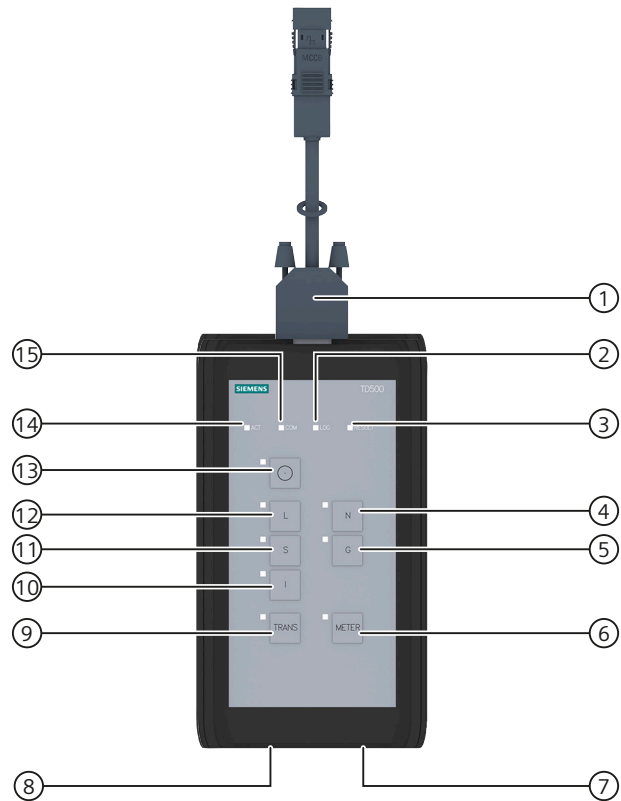
The TD500 mobile test device can be used to test the different causes of ETU trips. This enables testing of the functioning and wiring of all connected system components before the 3VA molded case circuit breaker is commissioned. The system behaves as it would in the case of a real trip event. The molded case circuit breaker trips when the set delay times expire and signals all alarms and tripped signals from connected components.

Benefits of the TD500 test device

- A TD500 test device can be used to successively parameterize all 3VA molded case circuit breakers directly in situ via SENTRON Powerconfig.
- The device can store up to 100 test results.
- The TD500 test device and the SENTRON Powerconfig software can be used to archive all the diagnostic data of the 3VA molded case circuit breaker either in digital form or as a hardcopy.
- Test functions can also be performed directly on the PC using the SENTRON Powerconfig software.

Description of the TD500





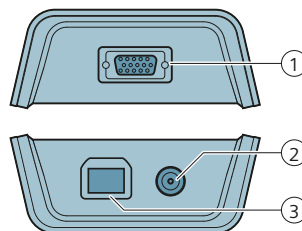
- | | |
|---|--|
| ① Connecting cable for ETU | ⑨ Pushbutton for transformer test |
| ② "LOG" LED (available memory status) | ⑩ Pushbutton for instantaneous short-circuit trip test I |
| ③ "RESULT" LED | ⑪ Pushbutton for short-time-delayed short-circuit test S |
| ④ Pushbutton for neutral trip test N | ⑫ Pushbutton for overload trip test L |
| ⑤ Pushbutton for ground fault trip test G | ⑬ Pushbutton for ETU Power ON/OFF |
| ⑥ Pushbutton for meter test (current measurement display) | ⑭ "ACT" LED (status) |
| ⑦ PC connection | ⑮ "COM" LED (communication status) |
| ⑧ Mains cable connection | |

LED display

LED	Meaning	Description
☐ ACT	Off	TD500 switched off
 ACT	On	TD500 ready
☐ COM	Off	No communication link with ETU
 COM	Flashing (2 Hz)	- Establishing communication link with ETU - Communications error - TD500 not ready
 COM	On	Communication link established with ETU
☐ LOG	Off	No free memory space The TD500 device can continue to be used, but the results of the trip tests will no longer be stored on the TD500. The device is still capable of executing all test functions.
 LOG	Flashing (2 Hz)	Available memory space < 25 % The TD500 device can continue to be used without restriction, but there is only enough memory space available to store a few test results. In order to ensure safe storage of test results, save the existing results to a PC and delete the contents of the TD500 memory using powerconfig.
 LOG	On	Free memory space ≥ 25 % The TD500 device can continue to be used without restriction.
☐ RESULT	Off	No test has been carried out and no test result has been recorded.
 RESULT	Flashing red (2 Hz)	It has not been possible to establish whether or not the molded case circuit breaker is functioning correctly.
 RESULT	On	No faults have been detected.

Interfaces of the TD500 test device

The diagram below shows the physical interfaces of the TD500 test device.



- ① Top of unit: Connection to 3VA molded case circuit breaker
- ② Bottom of unit on right: 24 V DC supply
- ③ Bottom of unit on left: Connection to PC

Compatibility with molded case circuit breakers

The TD500 test device can be connected to all 3VA molded case circuit breakers equipped with 3-series, 5-series and 8-series ETU electronic trip units. The connecting cable from the test device is inserted in the test socket of the ETU.

Data stored in the TD500

The following data are stored in the TD500:

- Article number
- ETU parameter settings
- Causes of ETU trips

Note

Readout of data and clearing of the internal memory of the TD500

Using a PC and the SENTRON Powerconfig software, you can read these data out of the TD500 and clear its internal memory.

Test functions of the TD500

The relevant pushbutton must be pressed in order to start a specific test. The molded case circuit breaker is tripped electronically when the pushbutton is actuated. This is essential to allow effectual testing of the electronic and mechanical control elements of the circuit breaker.

Test	Description
L test	Overload function test The circuit breaker trips when the time setting t_l elapses
S test	Function test on the short-time delayed short-circuit protection system The circuit breaker trips when the time t_{sd} set on the ETU elapses
I test	Function test on the instantaneous short-circuit protection system The circuit breaker trips instantaneously
N test	Function test on neutral conductor protection system The circuit breaker trips when the time t_l set on the ETU elapses
G test	Function test on ground fault protection system The circuit breaker trips when the time t_g set on the ETU elapses
TRANS test	Function test on transformers (energy and Rogowski transformers) One energy transformer and one Rogowski transformer is tested The circuit breaker trips after a delay of several seconds
METER test	Function test on the measured value display In order to test the displayed current measurement The circuit breaker does not trip during this test

4.11.4.2 Operation and execution of test functions

Connecting and disconnecting the TD500

**CAUTION****Personal injury, malfunctions and false test results**

Failure to connect the TD500 test device to the molded case circuit breaker according to the sequence of steps specified below can result in personal injury, malfunctions and false test results.

Disconnect the molded case circuit breaker from the power supply before connecting the TD500 test device.

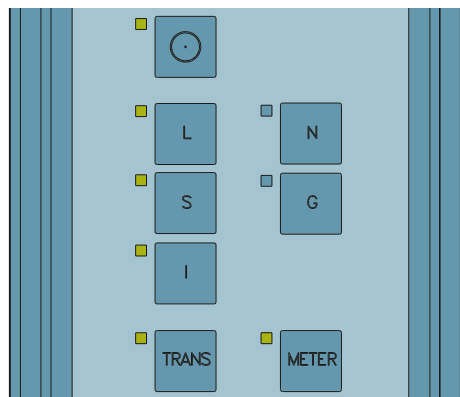
Strictly adhere to the sequence of steps described below for connecting the two devices.

Connecting the TD500 to the 3VA molded case circuit breaker

1. Disconnect the molded case circuit breaker from the power supply.
2. Insert the connecting cable in the socket on top of the TD500 test device.
3. Insert the connecting cable in the test socket of the ETU.
4. Insert the cable of the power supply unit in the socket on the bottom of the TD500 test device.
5. Connect the power supply unit to a socket.
The TD500 test device is now switched on and ready.
6. Press the <ETU Power ON/OFF>  pushbutton on the TD500 test device.
The ETU is now powered via the TD500 and activated. Successful communication between the TD500 and ETU is indicated by illumination of the "COM" LED on the TD500.

All test functions available for the connected ETU are indicated by illumination of the corresponding LEDs.

Example: In this example, the L (overload), S (short-time-delayed short-circuit) and I (short-circuit) releases, the transformers (TRANS) and the current meter (METER) can be tested on the connected ETU:

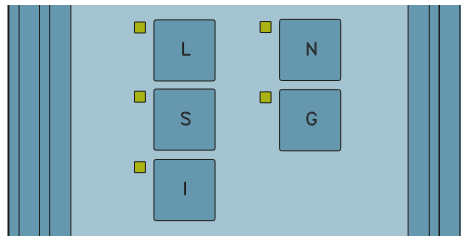


Disconnecting the TD500 from the 3VA molded case circuit breaker

1. Open the 3VA molded case circuit breaker.
2. Press the <ETU Power ON/OFF>  pushbutton on the TD500 test device.
The "COM" LED on the TD500 goes out. The ETU is now no longer powered via the TD500 and is deactivated.
3. Disconnect the power supply unit from the socket.
4. Detach the power supply unit cable from the TD500.
5. Detach the connecting cable between the TD500 and the ETU.

Test tripping functions L, S, I, N and G

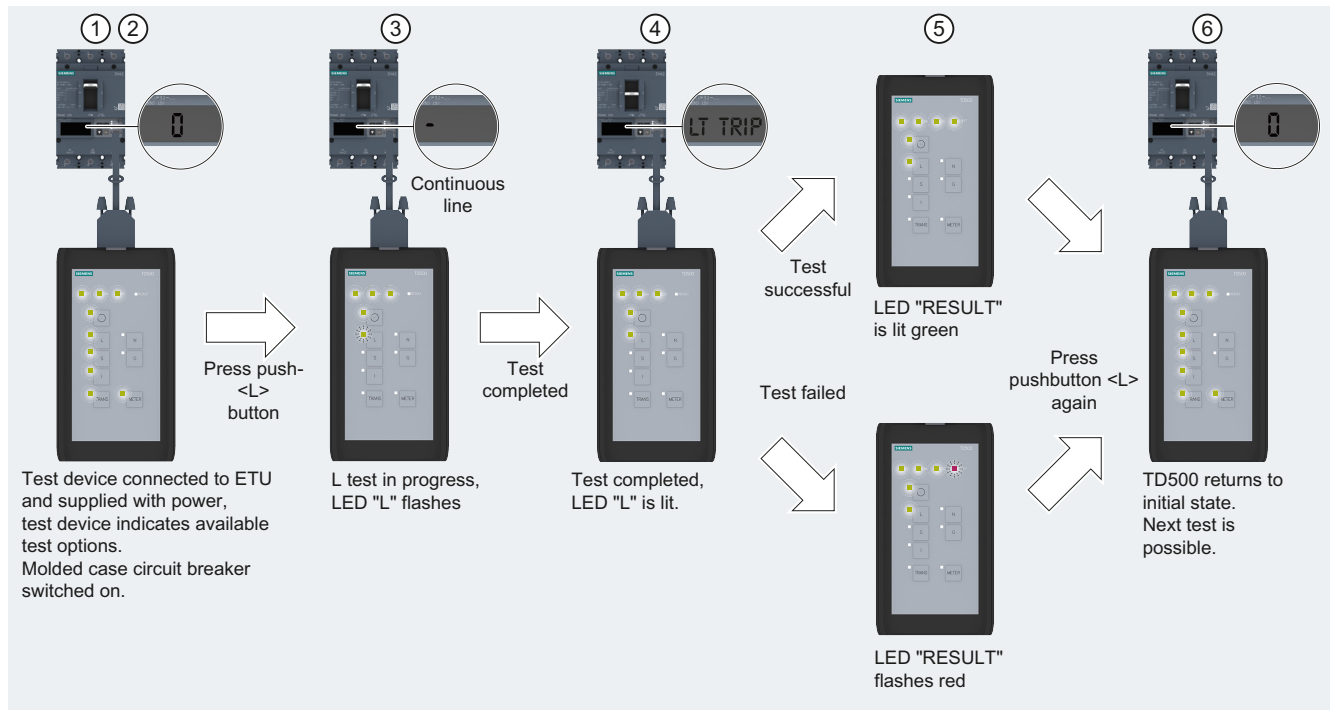
1. Connect the TD500 test device to the 3VA molded case circuit breaker, see above.
2. Close the 3VA molded case circuit breaker.
3. To test the tripping function, press one of the pushbuttons <L>, <S>, <I>, <N> or <G> on the TD500 test device.



- When a pushbutton is pressed, its LED flashes while the test is in progress.
 - The ETU trips when the set trip times expire and the molded case circuit breaker switches from "ON" to "TRIP".
 - On completion of the test, the LED of the selected pushbutton changes from flashing to a steady light.
4. Wait for the test to end and evaluate the test result by the status of the "RESULT" LED:
Test was successful:
 The "RESULT" LED lights up green.

Test was unsuccessful:
 The "RESULT" LED flashes red.
 Repeat the test. If the test fails again, contact TechnicalSupport (<https://www.siemens.com/support-request>) .
 5. Press the pushbutton for the same tripping function again in order to confirm the test result and restore the TD500 to its initial state.
 6. Switch on the molded case circuit breaker again (ON position) in order to carry out further tripping function tests.

Example: Testing the tripping function L on an ETU550 LSI



1. Connect the TD500 test device to the 3VA molded case circuit breaker.
2. Close the 3VA molded case circuit breaker.
3. Press pushbutton <L> on the TD500 test device.
The LED in the pushbutton <L> starts to flash.
4. Wait until the LED in the pushbutton <L> changes from flashing to a steady light.
The test is completed.
5. Evaluate the test result by the status of the "RESULT" LED:
The "RESULT" LED emits a **steady green light: The test was successful.**
The "RESULT" LED flashes **red: The test was unsuccessful** and must be repeated. If the test fails again, contact TechnicalSupport (<https://www.siemens.com/support-request>) .
6. Press the pushbutton <L> again in order to confirm the test result and restore the TD500 to its initial state.

Carry out a meter test

The purpose of the meter test is to determine whether the ETU is measuring and displaying current correctly. A test current of $0.4 \times I_{rated}$ is fed into the ETU. The current value measured by the ETU is then checked to confirm that it matches the test current.

Note

The molded case circuit breaker does **not** need to be switched to position "ON" for this test.

Performing the test

1. Connect the TD500 test device to the 3VA molded case circuit breaker.
2. Press the <METER> ① pushbutton.



The LED in the <METER> pushbutton begins to flash. The test takes approximately 30 seconds.

3. Wait until the LED in the pushbutton <METER> changes from flashing to a steady light. The test is completed.
4. Evaluate the test result by the status of the "RESULT" LED:
The "RESULT" LED emits a **steady green light: The test was successful.**
The "RESULT" LED flashes **red: The test was unsuccessful** and must be repeated. If the test fails again, contact TechnicalSupport (<https://www.siemens.com/support-request>) .
5. Press the pushbutton <METER> again in order to confirm the test result and restore the TD500 to its initial state.

Test transformers

This procedure tests the transformers (energy transformer or Rogowski coil) to determine the following:

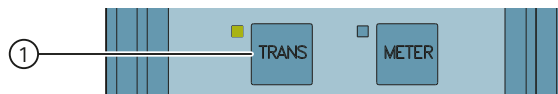
- Are transformers installed in the ETU?
- Are transformers correctly installed in the ETU?
- Are the installed transformers functioning correctly?

Note

In order to carry out this test, it is absolutely essential to disconnect all external power supplies (e.g. EFB300, COM800, COM100, 24 V module) to the electronics.

Performing the test

1. Disconnect all external power supplies to the electronics.
2. Connect the TD500 test device to the 3VA molded case circuit breaker.
3. Switch on the 3VA6 molded case circuit breaker.
4. Press the <TRANS> ① pushbutton.



The LED in the <TRANS> pushbutton begins to flash. The test takes several seconds.

4.11 Test devices

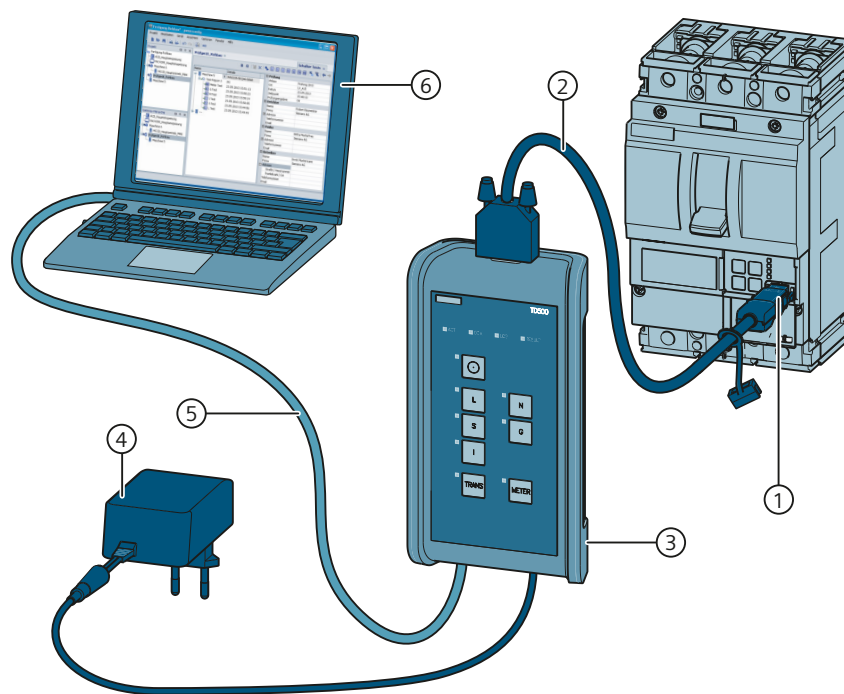
5. Wait until the LED in the pushbutton <TRANS> changes from flashing to a steady light. The test is completed.
6. Evaluate the test result by the status of the "RESULT" LED:
The "RESULT" LED emits a **steady green light: The test was successful.**
The "RESULT" LED flashes **red: The test was unsuccessful** and must be repeated. If the test fails again, contact TechnicalSupport (<https://www.siemens.com/support-request>) .
7. Press the pushbutton <TRANS> again in order to confirm the test result and restore the TD500 to its initial state.

4.11.4.3 Executing the test functions using a PC and SENTRON Powerconfig

In addition to its capabilities as a stand-alone test device, the TD500 can also act as a PC interface to the ETU.

If the TD500 test device is connected both to the ETU and a PC, the protective functions can be executed by means of a mouse click using the SENTRON Powerconfig software. A test log for the molded case circuit breaker is generated and stored in the SENTRON Powerconfig project. The test log can be printed out.

Connections between ETU - TD500 - PC



- | | |
|---|-------------------------------|
| ① Plug-in connector for insertion in the test socket on the ETU | ④ Power supply unit |
| ② TD500-to-ETU connecting cable | ⑤ USB connecting cable |
| ③ TD500 test device | ⑥ PC with SENTRON Powerconfig |

4.11.4.4 Parameterization using the SENTRON Powerconfig software

In addition to test functions, the SENTRON Powerconfig software package also provides tools for setting the parameters of 5-series and 8-series ETUs.

These tools allow you to:

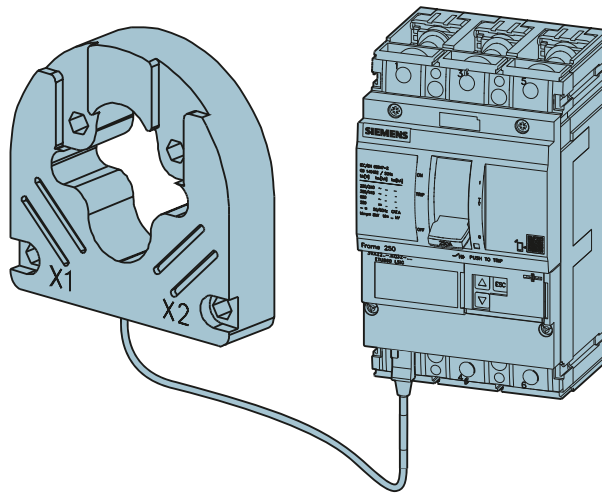
- Set parameters for 5-series and 8-series ETUs
- Store parameter settings for 5-series and 8-series ETUs in the SENTRON Powerconfig project and print them out

4.11.4.5 Technical specifications

Mechanical characteristics		
Dimensions		
Length	inch	7.5
	mm	190
Width	inch	4.13
	mm	105
Depth	inch	4.65
	mm	42
Degree of protection		IP30
Ambient conditions		
Ambient operating temperature	°C	-10 ... +40
Storage temperature	°C	-40 ... +80
Normal position of use		Any
Interface to molded case circuit breakers		
Number of directly connectable molded case circuit breakers		1
Length of cable	inch	59.05
	m	1.5
Power supply		
Number of electrical connections / for external network		1
External power supply unit		
Input voltage	V AC	100 ... 240
Output voltage	V DC	12
Interface to PC		
Number of interfaces / acc. to USB		1
Approvals / certificates		
Declaration of conformity		
 EG-Konf.		

4.12 External current transformer for N conductor

The external current transformer for N conductor is a current transformer for 3-pole 3VA6 molded case circuit breakers with 5-series and 8-series ETUs. It is used when 3-pole circuit breakers are to be used in 4-wire systems but monitoring of the N conductor is still desired. The N conductor is thereby protected against short-circuit and overload.



Available external current transformers for N conductor

3VA	Options	Neutral conductor protection	TMTU	ETU		
				3-series	5-series	8-series
Molded case circuit breaker 3-pole	3 phases monitored	None	■	■		
Molded case circuit breaker 3-pole with external neutral conductor transformer	3 phases monitored	None			■	■
	3 phases monitored + N (20% ¹⁾²⁾ ... 100%)	Neutral conductor, user-defined cross-section protected			■	■
	3 phases monitored + N (100% ... 160%)	Neutral conductor oversized			■	■
Molded case circuit breaker 4-pole	3 phases monitored	None	■	■	■	■
	3 phases monitored + N (50% x I _n)	Neutral conductor, half cross-section protected		■ ³⁾		
	3 phases monitored + N (100% x I _n)	Neutral conductor, full cross-section protected	■	■		
	3 phases monitored + N (20% ¹⁾²⁾ ... 100%)	Neutral conductor, user-defined cross-section protected			■	■
	3 phases monitored + N (100% ... 160%)	Neutral conductor oversized			■ ⁴⁾	■ ⁴⁾

N Neutral conductor protection

1) With rated operational current I_n = 40 A: I_N = 40% ... 100% I_n

2) With rated operational current I_n ≥ 100 A: I_N = 20% ... 100% I_n

3) Starting from rated operational current I_n ≥ 100 A

4) Dependent on circuit breaker frame size and rated operational current

Rated current I _n of circuit breaker 3VA6	Order number of external current transformer	Rated current I _n of external current transformer	Measuring range	For cable cross-sections	For busbar cross-sections
40 / 60 / 100 / 150 A	3VA9077-0NA10	25 ... 150 A	0.05 ... 15 x I _n	2 x 600 kcmil	0.5 x 3 in
250 A	3VA9177-0NA10	160 ... 350 A		2 x 300 mm ²	1 x 50 x 10 mm
400 / 600 A	3VA9377-0NA10	400 ... 600 A			2 x 40 x 10 mm
600 / 800 / 1000 / 1200 A	3VA9677-0NA10	600 ... 1200 A		--	1.25 x 4 in 2 x 100 x 10 mm

Technical specifications

	Rated current I _n			
	25 ... 150 A	200 ... 250 A	400 ... 600 A	600 ... 1000 A
Rated frequency	50/60 Hz			
Rated voltage U _e	Max. 690 V			
Rated impulse withstand voltage U _{imp}	8 kV			
Rated insulation voltage U _i	0.8 kV			

4.13 Cover frame

	Rated current I _n			
	25 ... 150 A	200 ... 250 A	400 ... 600 A	600 ... 1000 A
IP degree of protection	IP00			
Ambient temperature	-25 °C ... +50 °C			
>50 °C: Derating	7.5% / 10 K			
Max. busbar temperature	115 °C at 50 °C ambient temperature			
Approvals / certificates				
	 EU conf.			

4.13 Cover frame

Molded case circuit breakers or supplementary motor operators or front mounted rotary operators for molded case circuit breakers are often installed in panels or distribution boards in such a way that only the operating device is directly accessible. Busbars, cables and the termination area of the molded case circuit breaker are covered by metal or plastic plates in order to prevent direct contact with live components. The cabinet door itself is often designed as a protective cover.

Cutouts must be made in these covers

- in order to allow access to operator controls,
- which are designed to prevent direct contact with cables, and
- which are large enough in size that the cover can be closed easily.

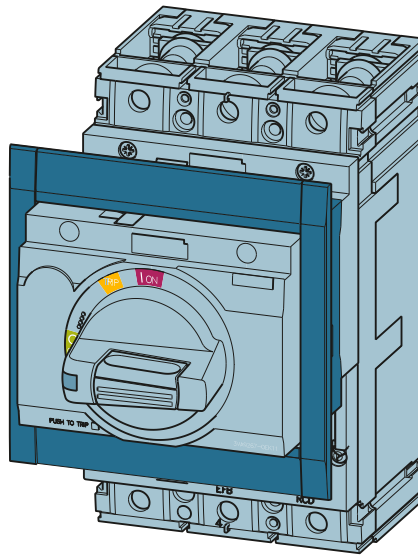
All these requirements necessitate gap dimensions of a few millimeters between the cutout and the unit.

Door cover frames are used when the gap is to be covered and as small as possible. With door cover frames you achieve a clean, attractive panel appearance in the front view as well as a higher degree of protection of IP30 in IEC applications.

4.13.1 Product description

Cover frames are generally available for the following devices of the 3VA UL product range:

- 3VA5 / 3VA6 molded case circuit breakers, 3- or 4-pole: Handle area only
- 3VA5 / 3VA6 molded case circuit breakers, 3- or 4-pole: Area around handle and trip unit
- Front mounted rotary operator
- Motor operators
- Door feedthroughs



Installation

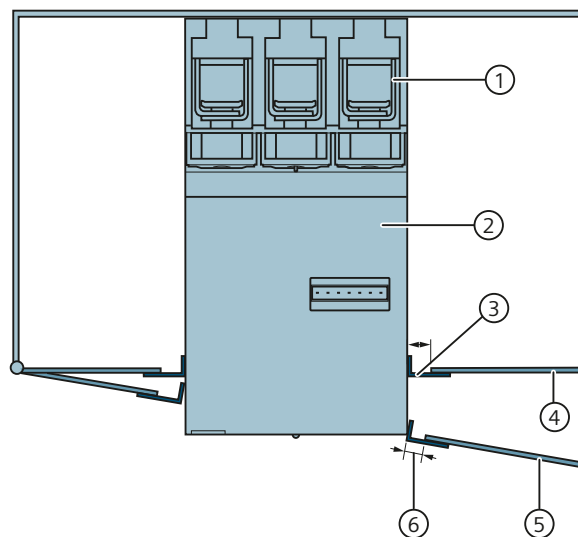
1. Cut out an opening in the cover plate.
Refer to the operating instructions for the correct cutout dimensions.
2. Insert the cover frame into the cutout from the front and fasten by means of small spring steel sheets at the rear of the cover plate.

The fastening system is designed such that the cover frame can move in the cutout. In other words, the cover frame is "float-mounted". Tolerance compensation in the range $\pm 0.12"$ / ± 3 mm is thus possible in the horizontal direction and in the range $\pm 0.24"$ / ± 6 mm in the vertical direction. On the one hand, this tolerance compensation is required to achieve the small gap dimension of max. $\pm 0.19"$ / ± 0.5 mm between the cover frame and device. On the other hand, it is needed to compensate for tolerances, for example, in the control cabinet, which are always present due to the construction.

Typical tolerance compensation examples are:

- Tolerance compensation of the door angle with right-hinged or left-hinged doors
- Tilting of devices under their own weight when they are fastened to thin mounting plates

4.13 Cover frame



- ① Molded case circuit breaker
- ② Motor operator
- ③ Cover frame
- ④ Cabinet door (closed)
- ⑤ Cabinet door (open)
- ⑥ Tolerance compensator

Note

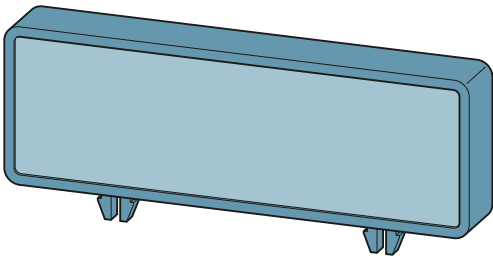
To ensure that the control cabinet door can still be opened, a mounted accessory component must not project beyond the cover frame by more than 5 mm (0.19") when the door is closed.

4.13.2 Labeling plate

A supplementary labeling plate (3VA9087-0SX10) is available for the cover frame.

It can be latched in position in the center of any of the four sides of the cover frame. Paper or plastic labels displaying plant-specific information are attached by adhesive to the labeling plate.

The scope of supply includes 10 labeling plates and 10 aluminum-colored labels.



4.14 3VA with 8US adapter

4.14.1 Overview



8US			
		3-pole	4-pole
3VA5	3VA51 (90 mm)	8US1211-4SS00 8US1215-4SS00	--
	3VA52 (105 mm)	8US1213-4AP03	8US1313-4AH03
	3VA53 (140 mm)	8US1213-4AH04	8US1313-4AM04
	3VA54 (140 mm)	8US1213-4AH04	8US1313-4AM04
3VA6	3VA61/62 (105 mm)	8US1213-4AP03	8US1313-4AH03
	3VA63 (140 mm)	8US1213-4AH04	8US1313-4AM04
	3VA64 (140 mm)	8US1213-4AH04	8US1313-4AM04

Note

More information

on the 8US busbar adapters can be found in the 8US operating instructions (<https://support.industry.siemens.com/cs/de/de/ps/19720/man>) and the Manual for 8US busbar systems (<https://support.industry.siemens.com/cs/de/en/view/109769746>)

Service and maintenance

5.1 Notes

Qualified personnel

It is essential to refer to this documentation when setting up and operating the relevant equipment / system. The equipment / system may only be serviced and maintained by qualified personnel. For the purpose of the safety information in these operating instructions, a "qualified person" is someone who is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures.

Maintenance category

Maintenance category	Maintenance interval
Inspection	Annually
Maintenance	As required; 10 years after delivery at the latest
Corrective maintenance	As required; 20 years after delivery or after 1000 switching cycles at the latest

5.2 Regular maintenance

Recommended maintenance/inspection intervals

Following initial commissioning, the equipment/system must be inspected at least once per year.

In addition, an inspection should be carried out after 1000 operating cycles at rated operational current.

If the molded case circuit breaker or molded case switch (MCS) is operated in a dusty environment or an environment with corrosive vapors, gases or salt spray, it is recommended that the inspection intervals be adjusted, e.g. to twice per year.

Recommended inspection of the 3VA UL molded case circuit breaker / molded case switch (MCS)

Test item	Test procedure
3VA molded case circuit breaker / molded case switch (MCS)	
Check that connections are tight	- Check the tightening torque of the terminal screws (80% of the tightening torque is recommended) - Visually inspect the incoming and outgoing cables - Visually inspect the connection accessories - Replace any damaged connection accessories after cleaning the termination area
Inspect the exterior surfaces of the molded case circuit breaker / molded case switch	- Examine all visible surfaces for oxidation, residues or other adverse effects - Remove any residues with a clean and dry lint-free cloth. Never use chemical cleaning agents or water!
Check the protection parameters	Check that the trip unit is correctly set for the prevailing conditions in the installation and adjust the settings if necessary
Test the electrical and mechanical functions of the molded case circuit breaker / molded case switch (MCS)	Move the handle from OFF to ON, and from ON to OFF, in order to check the mechanical function of the molded case circuit breaker contacts
Test the tripping function with the <PUSH TO TRIP> button	Press the <PUSH TO TRIP> button. The molded case circuit breaker / molded case switch (MCS) must trip and move to the "TRIP" position.
Undervoltage release (UVR, UNI)	
Test the tripping function	- Open the molded case circuit breaker. - Set the operating voltage (terminals D1 and D2) to 0 V. - Close the molded case circuit breaker (move handle to ON). The molded case circuit breaker must trip and move to the "TRIP" position.

Optional inspection possibilities for the ETU of the 3VA6 molded case circuit breaker**What needs to be tested/inspected? What is the correct test/inspection procedure?**

The various protective trip functions of the ETU need to be tested

Test the individual protective functions LSING in the ETU using the TD500 test device.

The circuit breaker must trip at the end of each test.

The current transformer and the metering function can also be tested for proper functioning.

Refer to section "Test devices".

5.3 Maintenance following tripping of a molded case circuit breaker

If a 3VA UL molded case circuit breaker trips because of an overcurrent (overload, short circuit) or fault current (ground fault), the cause of the trip must be identified and eliminated before the molded case circuit breaker may be switched on again.

In the case of 3VA6 molded case circuit breakers, the cause of the trip can be output via the External Function Box EFB300. With 5-series and 8-series ETU electronic trip units, the cause of tripping can be indicated on the LCD display and optionally transferred via communications modules.

An inspection as described in chapter Regular maintenance (Page 489) should be carried out after each trip by the trip unit. In addition, any black residue on the molded case circuit breaker must be removed as it may contain conductive particles. The molded case circuit breaker should then be switched on and off without load at least five times.

It is also necessary to inspect and clean any attached or installed circuit breaker accessories.

5.4 Fault diagnostics

Problem description	Possible cause of the fault	Corrective measures
Recurrent tripping	Protection settings of the trip unit are not correct	Check whether the current setting of the overload release matches the rated line current.
	Fluctuations in the voltage of the undervoltage release (UVR, UNI)	Check the voltage on the undervoltage release. Connecting other loads with high power requirements (e.g. motor operators) to the same source can sometimes cause a temporary voltage dip.
	The ambient temperature is too high	The protection settings are specified for a reference point. If the ambient temperature is higher than this or if other ambient conditions have not been sufficiently taken into account (e.g. derating with withdrawable units, mounting location over 2000 m), tripping operations can occur. Take ambient conditions and applicable derating into account.
	Shunt trip is activated	Tripping is initiated by shunt trip STL, STF or UNI. Check for unintended activation.
	Tripping due to ground fault	Check the insulation in the low-voltage network and on the loads
Molded case circuit breaker cannot be closed using the handle or manual operators	No voltage is present at undervoltage release UVR or UNI	Check the supply voltage of undervoltage release UVR, UNI
	No voltage is present at shunt trip STL, STF or UNI	Check the voltage
	The molded case circuit breaker is locked, e.g. using handle locking device, cylinder locks in manual operators	Remove the lock
	Molded case circuit breaker is interlocked, e.g. with a front interlock	Remove the interlock

Problem description	Possible cause of the fault	Corrective measures
Molded case circuit breaker cannot be closed using the motor operator	No voltage is present at the undervoltage release (UVR, UNI)	Check the supply voltage of undervoltage release UVR, UNI
	No voltage is present at shunt trip STL, STF or UNI	Check the voltage
	Molded case circuit breaker is locked, e.g. with a cylinder lock in the motor operator	Remove the lock
	Molded case circuit breaker cannot be opened and closed via communication when the write protect slide switch on the COM800 is engaged	Check the position of the write protect slide switch on the COM800

5.5 Condition monitoring

You can find all the relevant information on this in chapter Condition monitoring (Page 113)

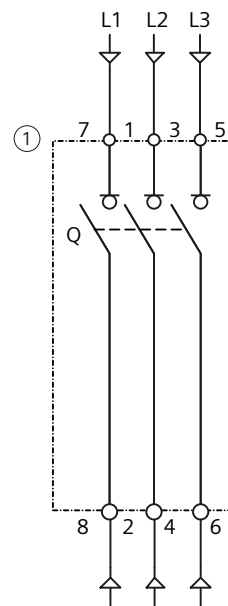
Technical specifications

6.1 Circuit diagrams

6.1.1 3VA5 molded case circuit breakers

6.1.1.1 Basic units

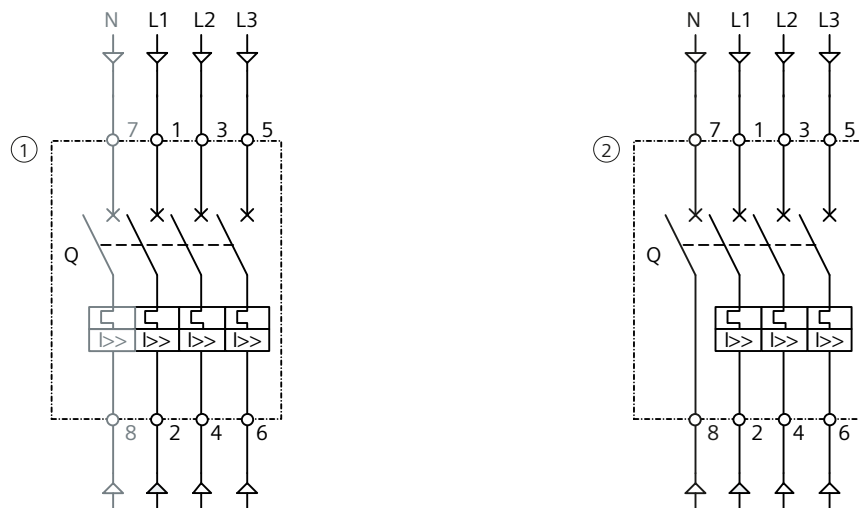
Molded case switch / motor circuit protector



① Fixed mounting

3VA5 molded case circuit breakers with thermal-magnetic trip unit

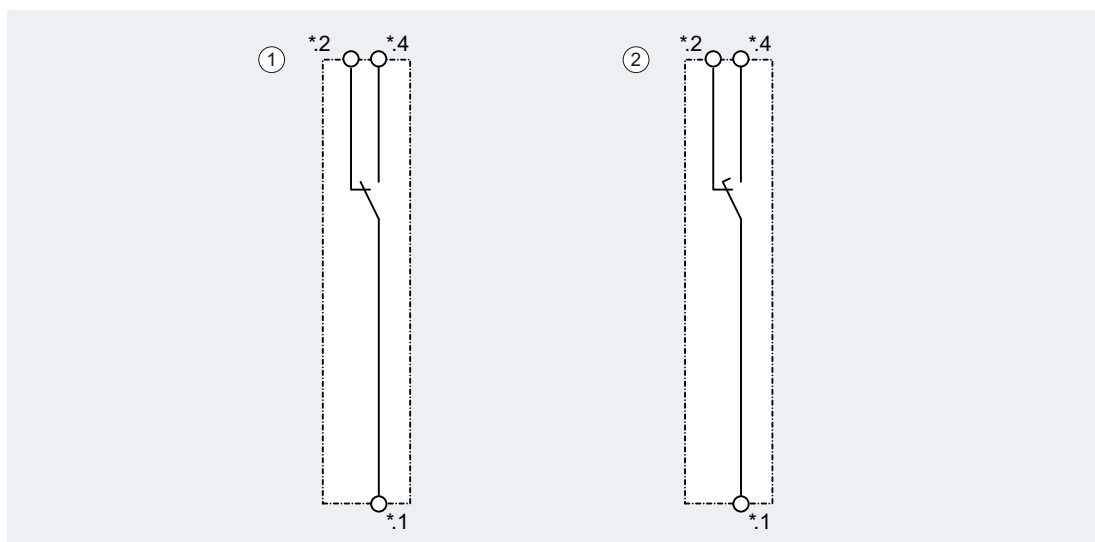
Fixed mounting



- ① Fixed mounting, 3-pole and 4-pole
- ② Fixed mounting, 4-pole, unprotected N conductor

6.1.1.2 Accessories

Auxiliary switches, alarm switches and position signaling contacts



- ① Changeover contacts for auxiliary switches AUX, trip alarm switches TAS and electrical alarm switches EAS, position signaling switches for plug-in and withdrawable units
- ② Leading changeover contacts for leading changeover switch LCS

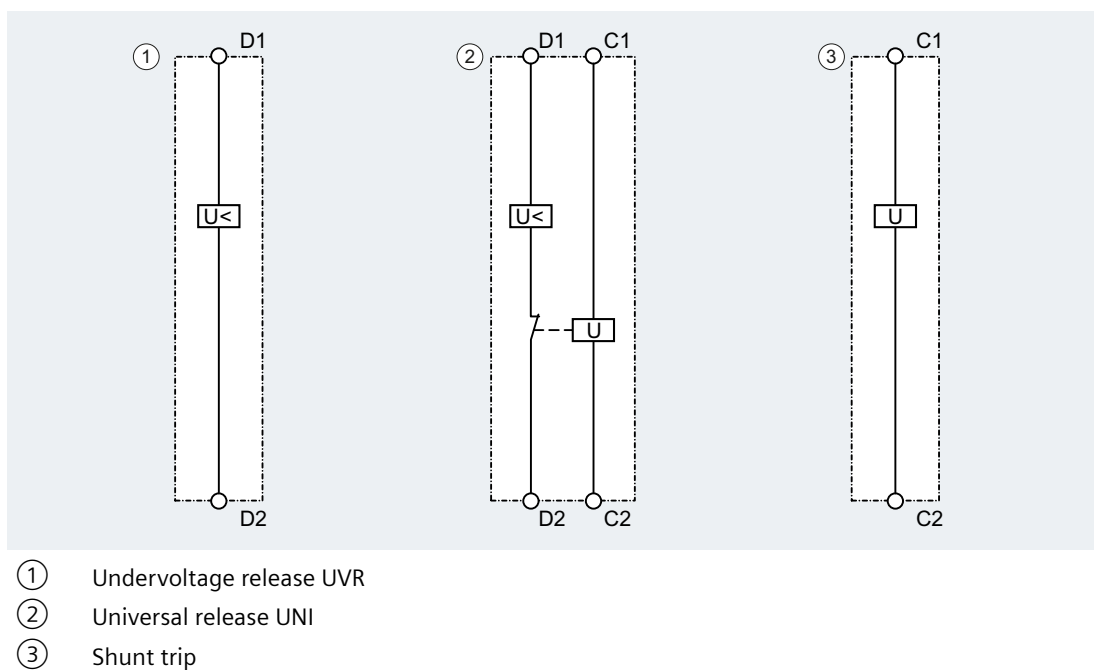
Auxiliary releases

Note

Back-up fuse

Back-up fuses must be used for device versions with voltages greater than or equal to 230 V.

6.1 Circuit diagrams

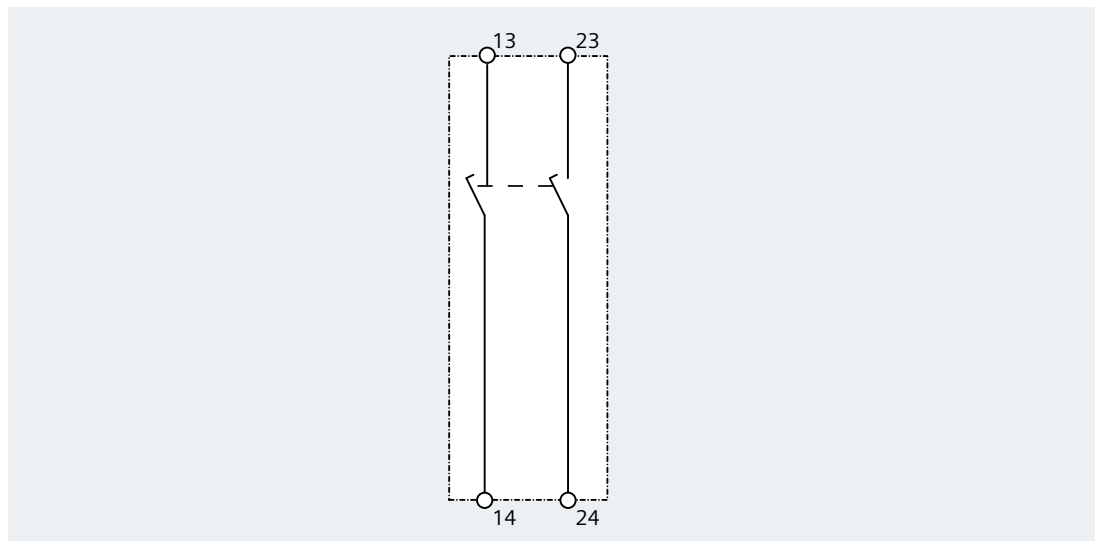


Auxiliary switch module for rotary operators (VHS module)

With 2 normally open (NO) contacts – leading from OFF to ON

Accessories for: 3VA5 125 A
3VA9137-0GX10

Accessories for: 3VA5 250/400/600 A
3VA9477-0GX10

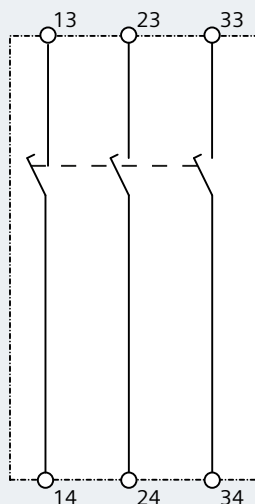


With 2 normally open (NO) contacts – leading from OFF to ON

With 1 normally open (NO) contact – leading from ON to OFF

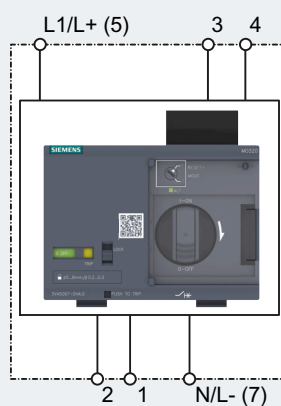
Accessories for: 3VA5 250/400/600 A

3VA9477-0GX20



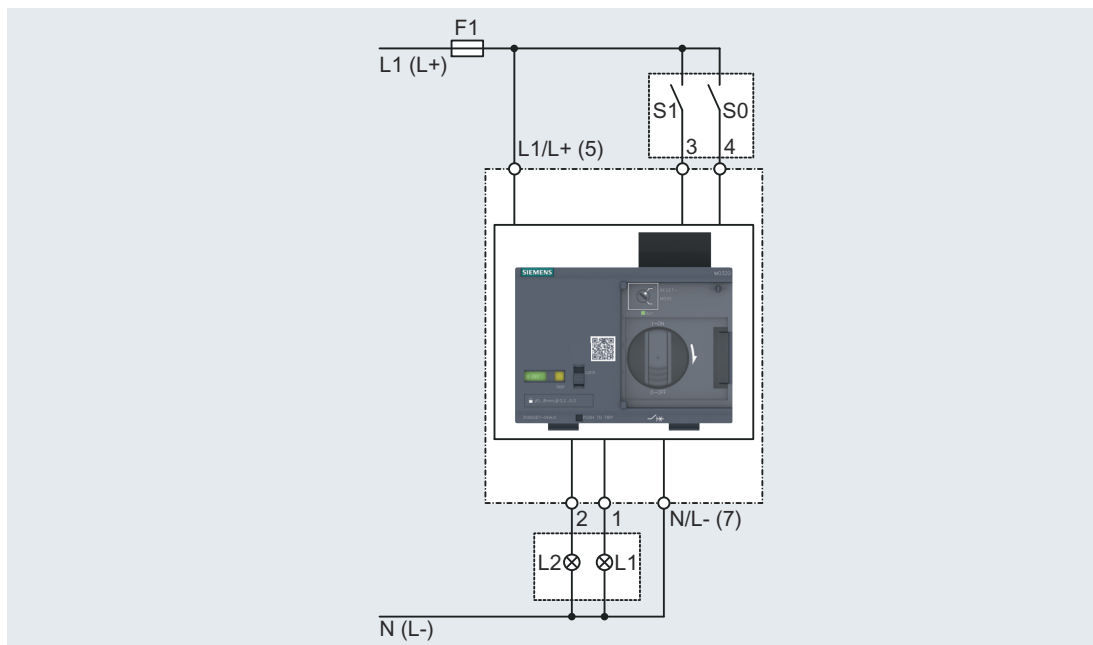
Motor operators

Front mounted motor operator



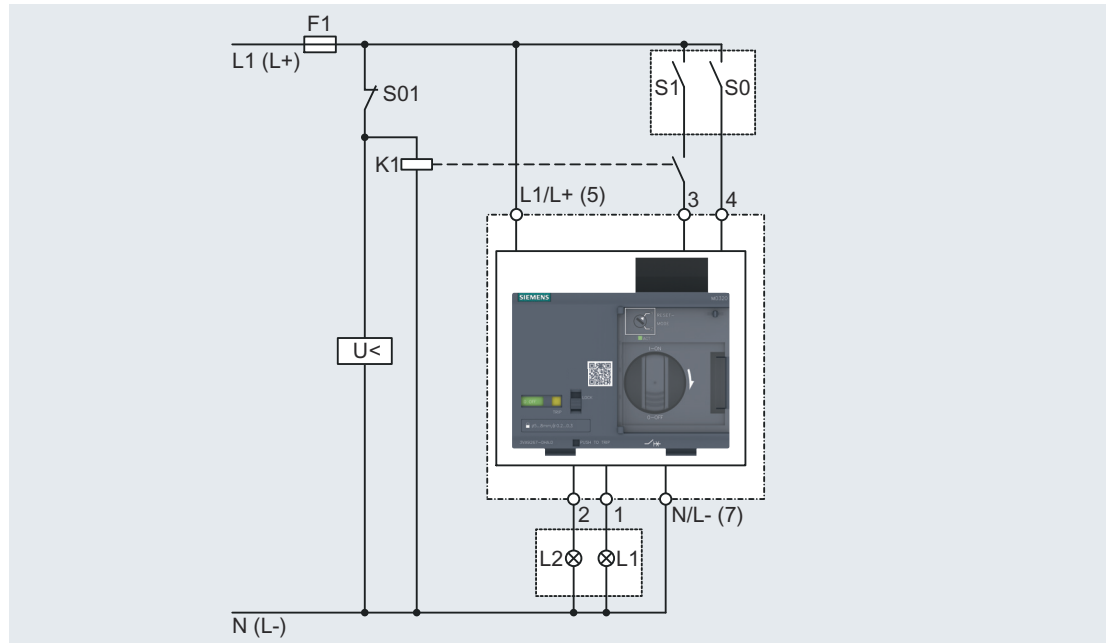
6.1 Circuit diagrams

Motor operator actuation controlled via control cable



- S0 OFF (to be provided by customer)
- S1 ON (to be provided by customer)
- F1 Fuse in the control circuit (to be provided by customer)
- L1 Indicator light AUTO mode (to be provided by customer)
- L2 Indicator light MAN mode (to be provided by customer)

Motor operator actuation controlled via control cable and undervoltage release



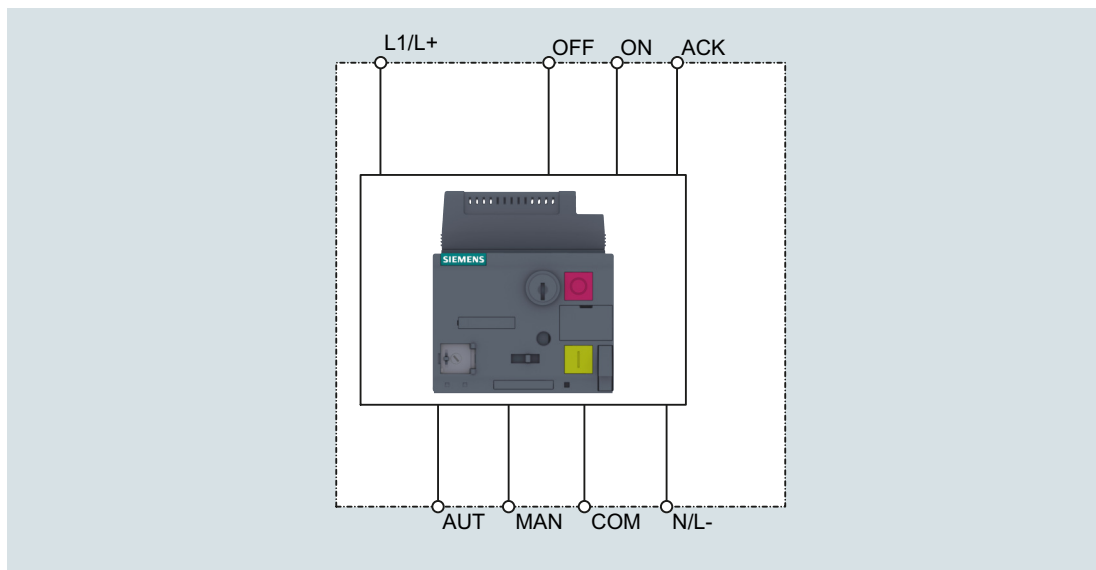
- S0 OFF (to be provided by customer)
- S1 ON (to be provided by customer)
- S01 Remote command (to be provided by customer)
- K1 Auxiliary contactor (to be provided by customer)
- U< Undervoltage release (to be provided by customer)
- F1 Fuse in the control circuit (to be provided by customer)
- L1 Indicator light AUTO mode (to be provided by customer)
- L2 Indicator light MAN mode (to be provided by customer)

This circuit is deployed in order to prevent no-load operation of the molded case circuit breaker. The contact of auxiliary contactor K1 prevents no-load operation when the undervoltage release "U<" is de-energized.

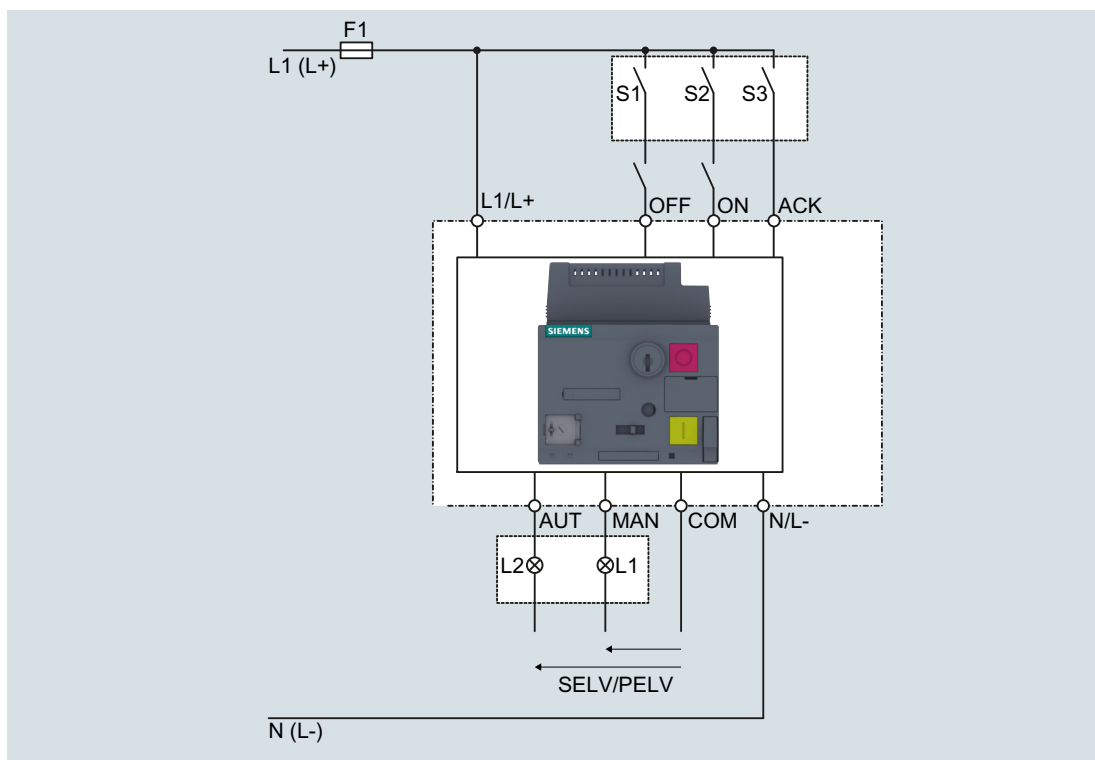
No-load operations subject the molded case circuit breaker to high stresses. If the undervoltage release is de-energized, auxiliary contactor K1 has not picked up. The contact in the ON circuit (control circuit) of the motor operator is thus not closed, that is, the molded case circuit breaker cannot be switched.

This auxiliary contactor is not necessary when the undervoltage release is supplied uninterrupted (e.g. pushbutton S01) from the same source as the motor operator itself (e.g. contact 3).

SEO520 motor operator with stored energy mechanism



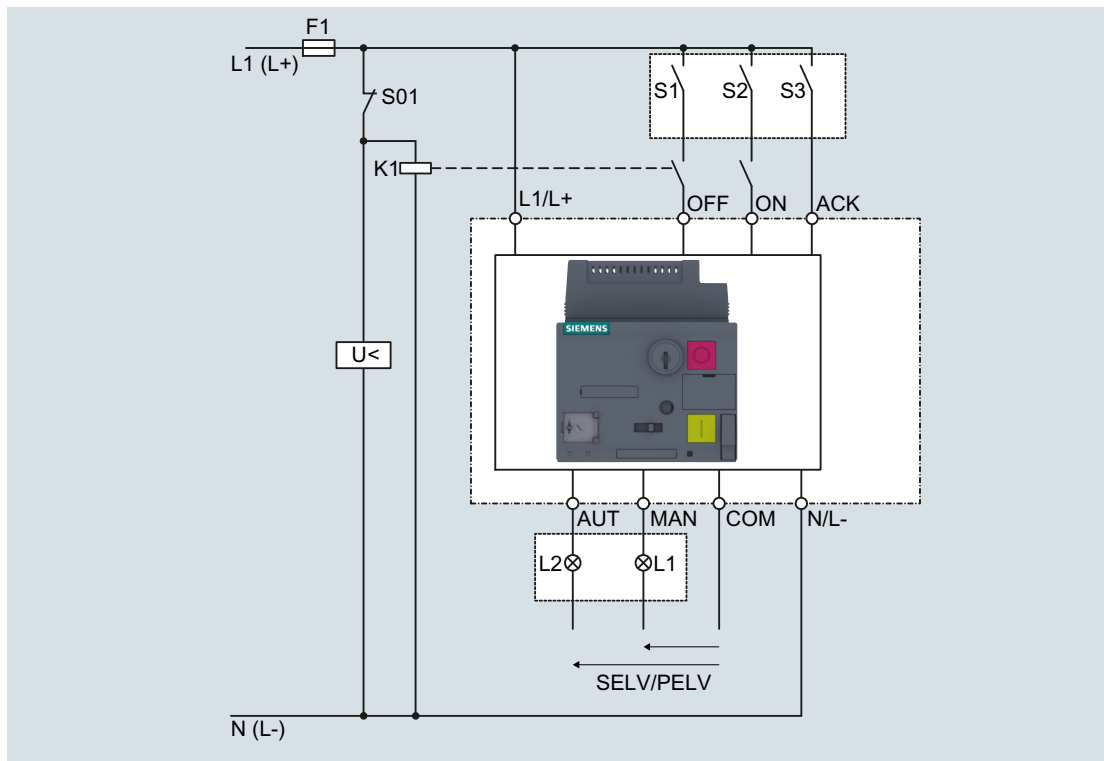
Actuation of SEO520 motor operator with stored energy mechanism via control cable



- S1 OFF (to be provided by customer)
- S2 ON (to be provided by customer)
- S3 Reset signal for operating mode 3 (to be provided by customer)
- F1 Fuse in the control circuit (to be provided by customer)
- L1 Indicator light AUTO mode (to be provided by customer)
- L2 Indicator light MAN mode (to be provided by customer)

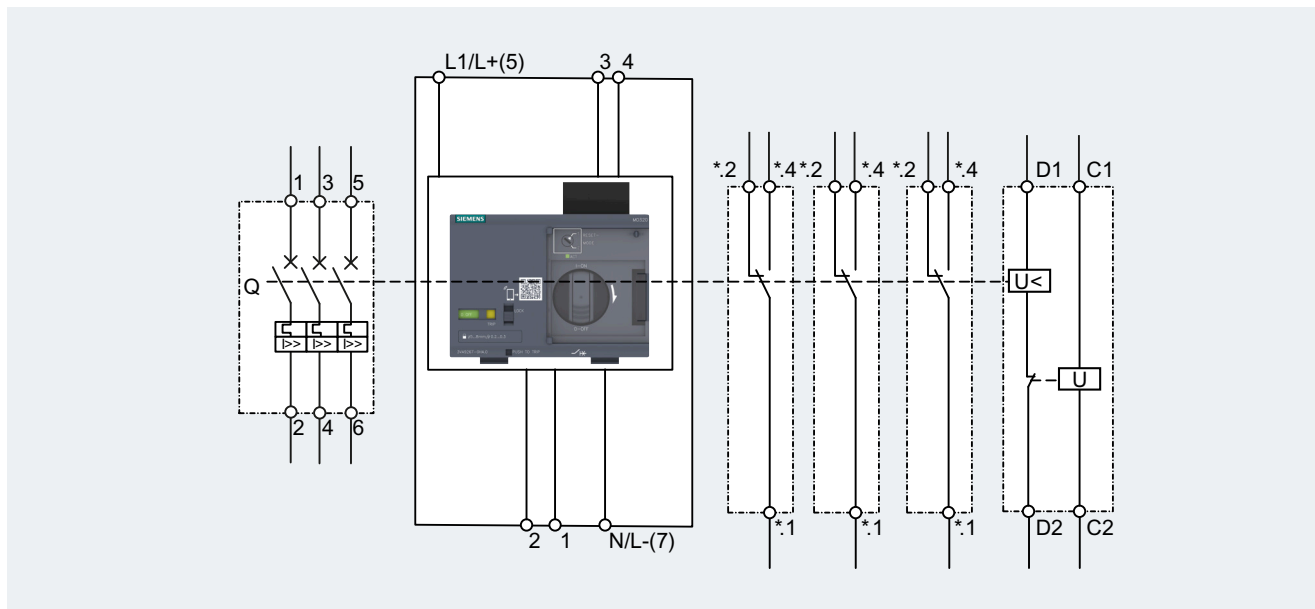
6.1 Circuit diagrams

Actuation of SE0520 motor operator with stored energy mechanism via control cable and undervoltage release



- S1 OFF (to be provided by customer)
- S2 ON (to be provided by customer)
- S3 Reset signal for operating mode 3 (to be provided by customer)
- S01 Remote command (to be provided by customer)
- K1 Auxiliary contactor (to be provided by customer)
- U< Undervoltage release (to be provided by customer)
- F1 Fuse in the control circuit (to be provided by customer)
- L1 Indicator light AUTO mode (to be provided by customer)
- L2 Indicator light MAN mode (to be provided by customer)

6.1.1.3 Example: 3VA5 molded case circuit breakers with accessories (external/internal)

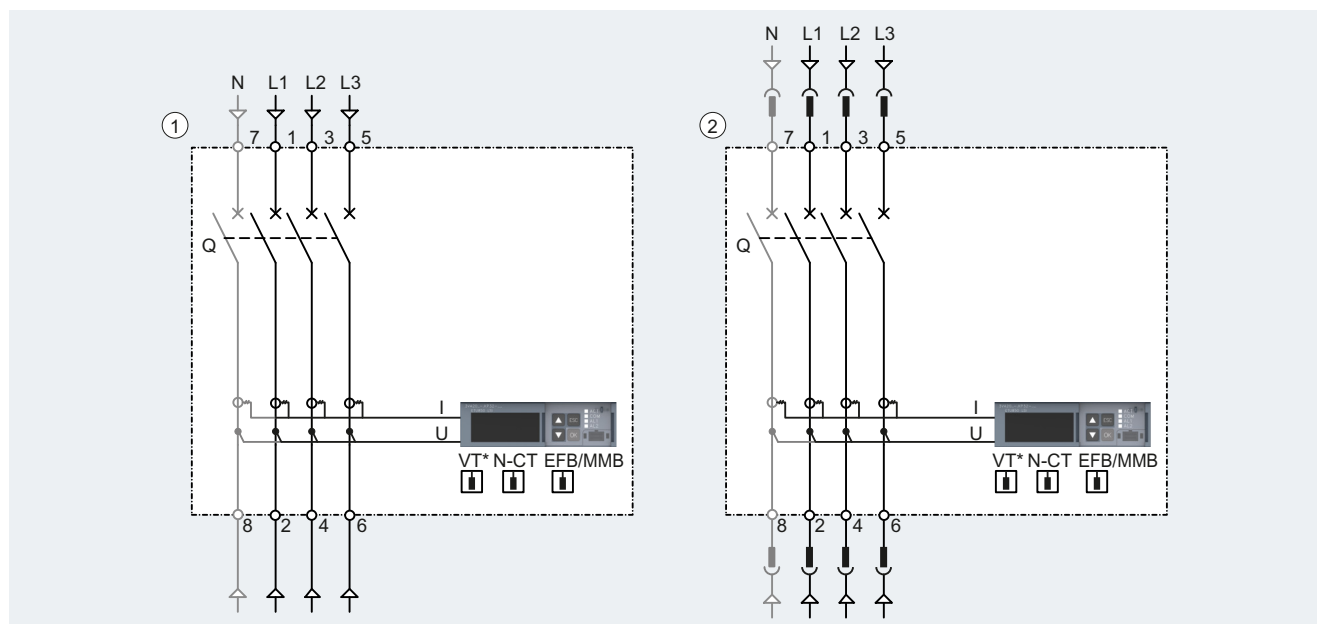


6.1 Circuit diagrams

6.1.2 3VA6 molded case circuit breakers

6.1.2.1 Basic units

Fixed-mounted and plug-in/draw-out units, 3-pole and 4-pole

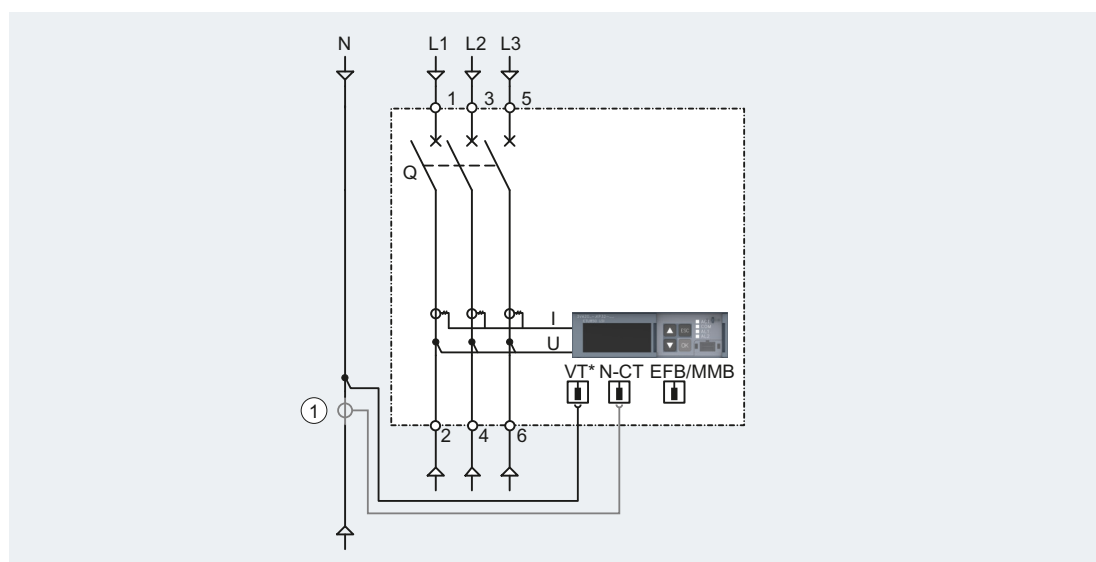


① Fixed-mounted, 3-pole and 4-pole

② Plug-in/draw-out units, 3-pole and 4-pole

* Voltage tap

Fixed-mounted, 3-pole 3VA6 molded case circuit breaker in 5-wire system

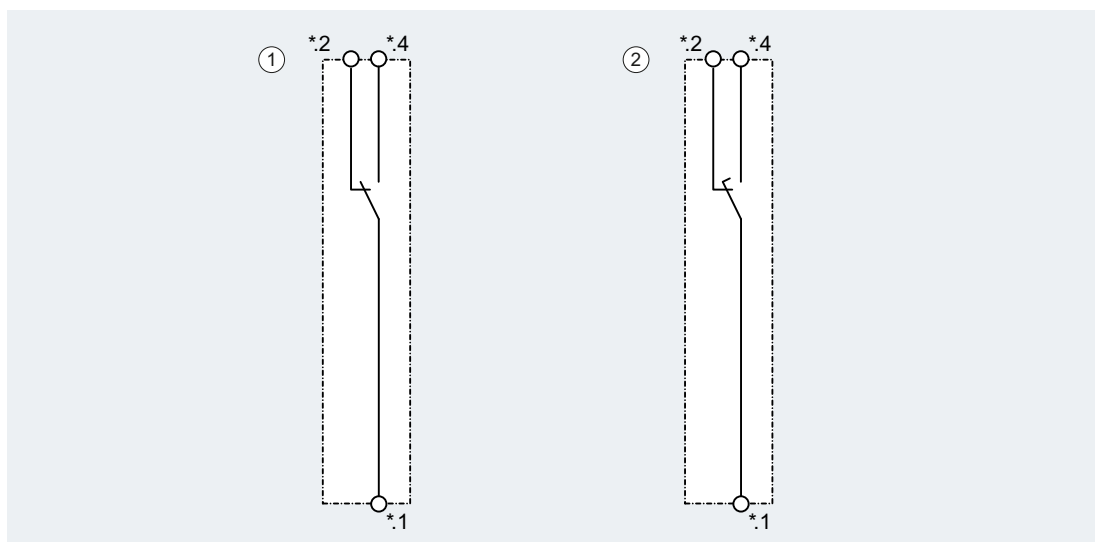


① Optional external current transformer for N conductor (gray line)

* Voltage tap

6.1.2.2 Accessories

Auxiliary switches, alarm switches and position signaling contacts



- ① Changeover contacts for auxiliary switches AUX, trip alarm switches TAS and electrical alarm switches EAS, position signaling switches for plug-in and withdrawable units
- ② Leading changeover contacts for leading changeover switch LCS

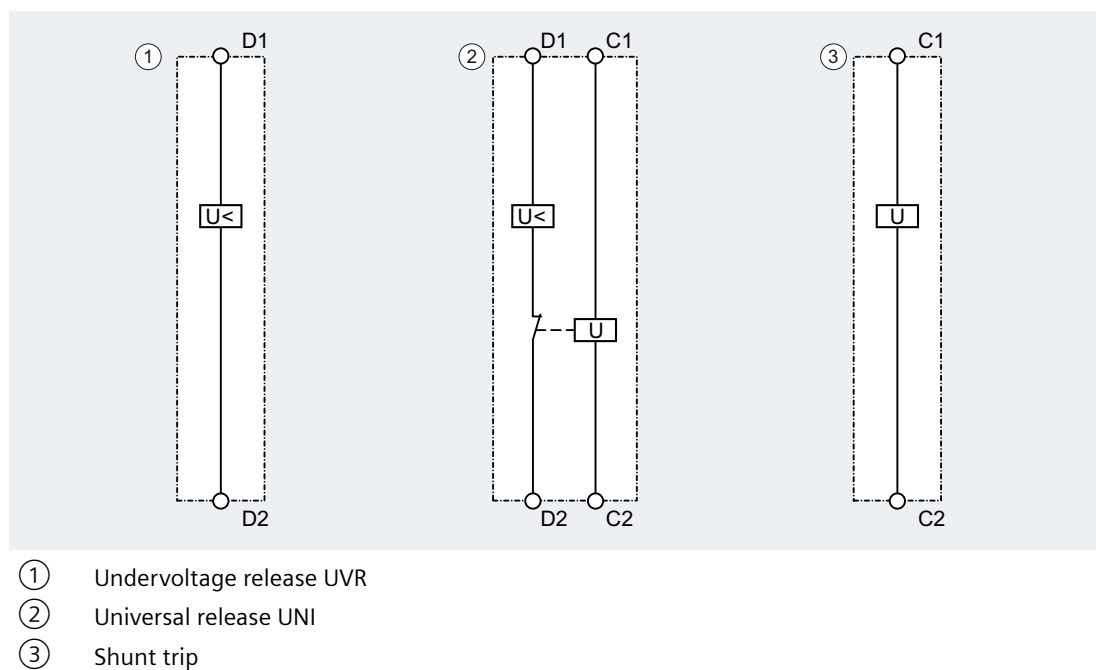
Auxiliary releases

Note

Back-up fuse

Back-up fuses must be used for device versions with voltages greater than or equal to 230 V.

6.1 Circuit diagrams

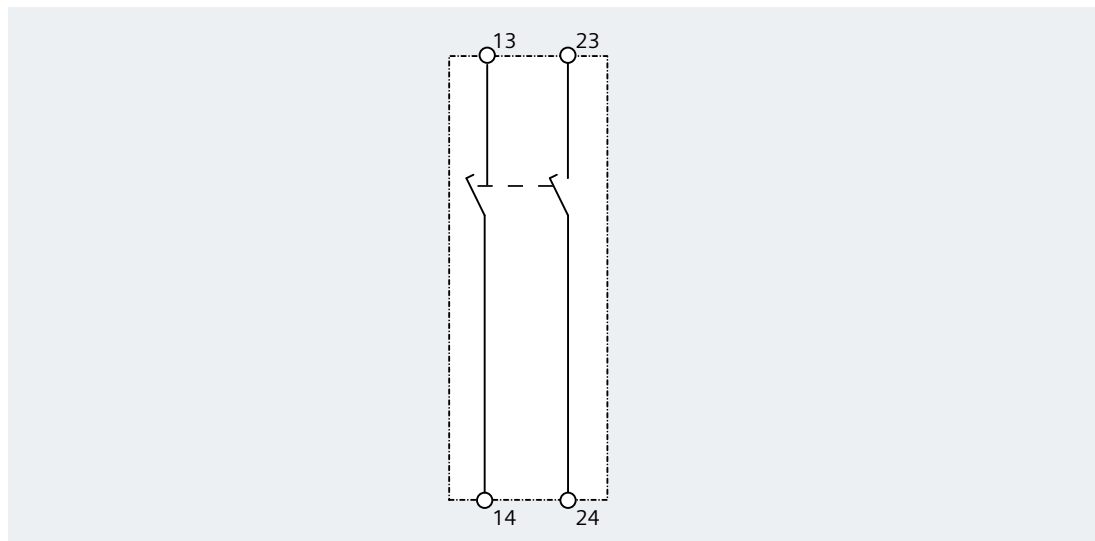


Auxiliary switch module for rotary operators (VHS module)

With 2 normally open (NO) contacts – leading from OFF to ON

Accessories for: 3VA6 150/250/400/600 A

3VA9477-0GX10

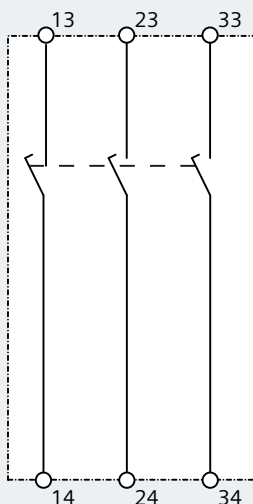


With 2 normally open (NO) contacts – leading from OFF to ON

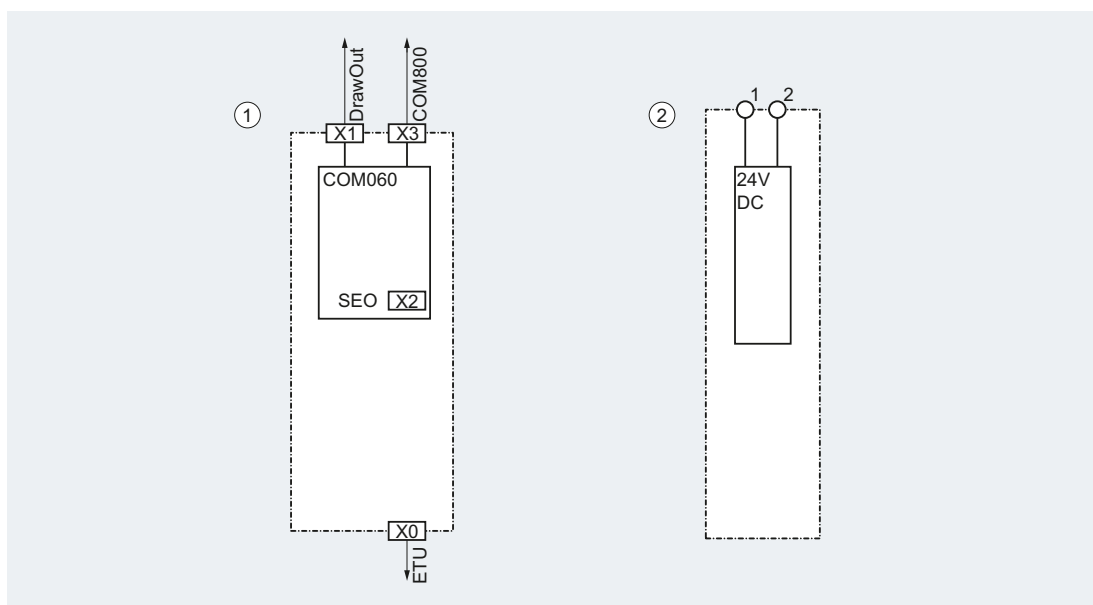
With 1 normally open (NO) contact – leading from ON to OFF

Accessories for: 3VA6 150/250/400/600 A

3VA9477-0GX20



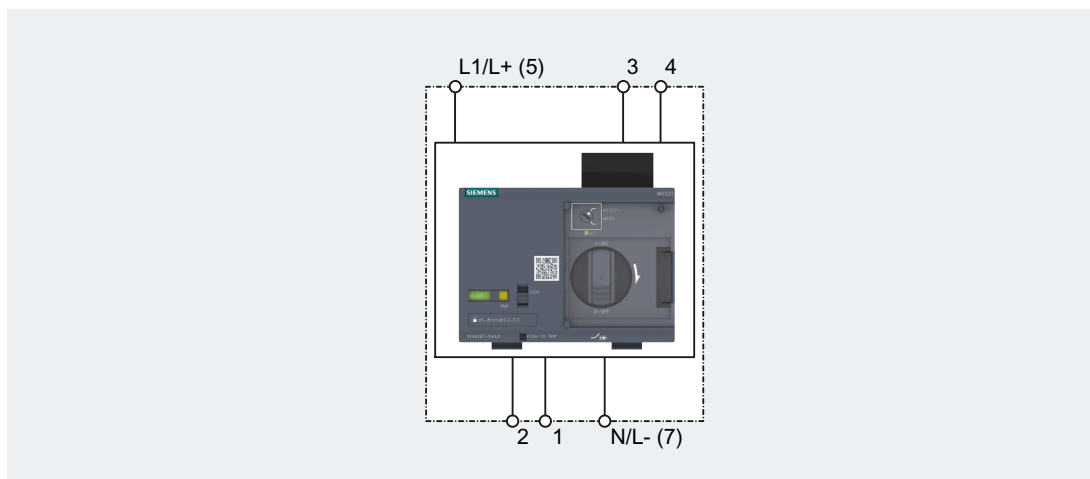
Other internal accessories



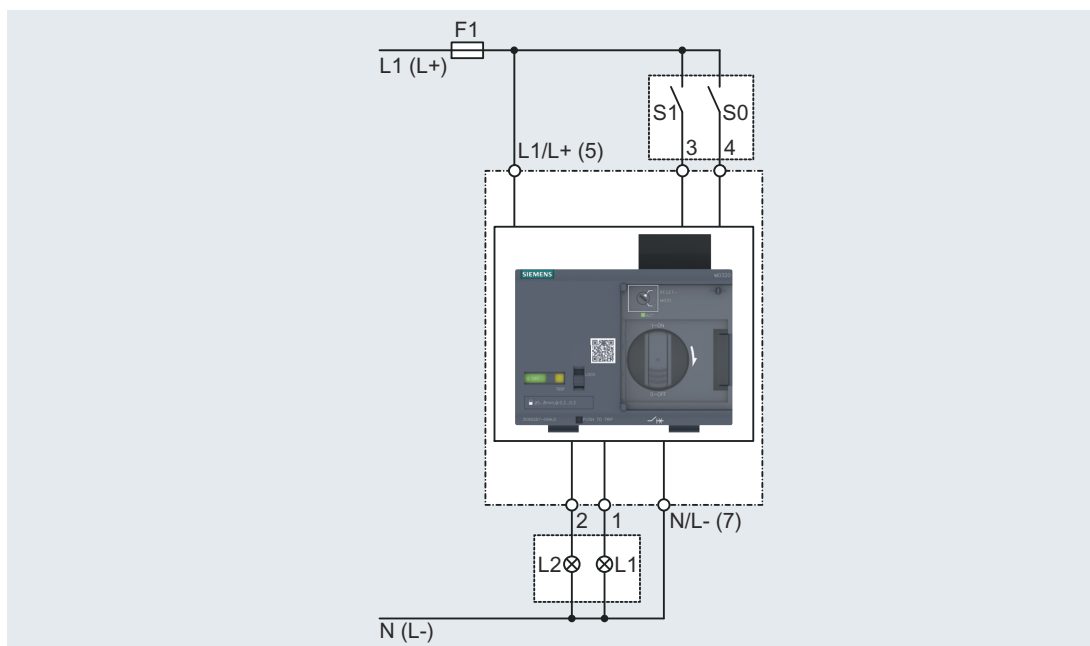
- ① COM060 communications module
- ② 24 V module

Motor operators

Front mounted motor operator

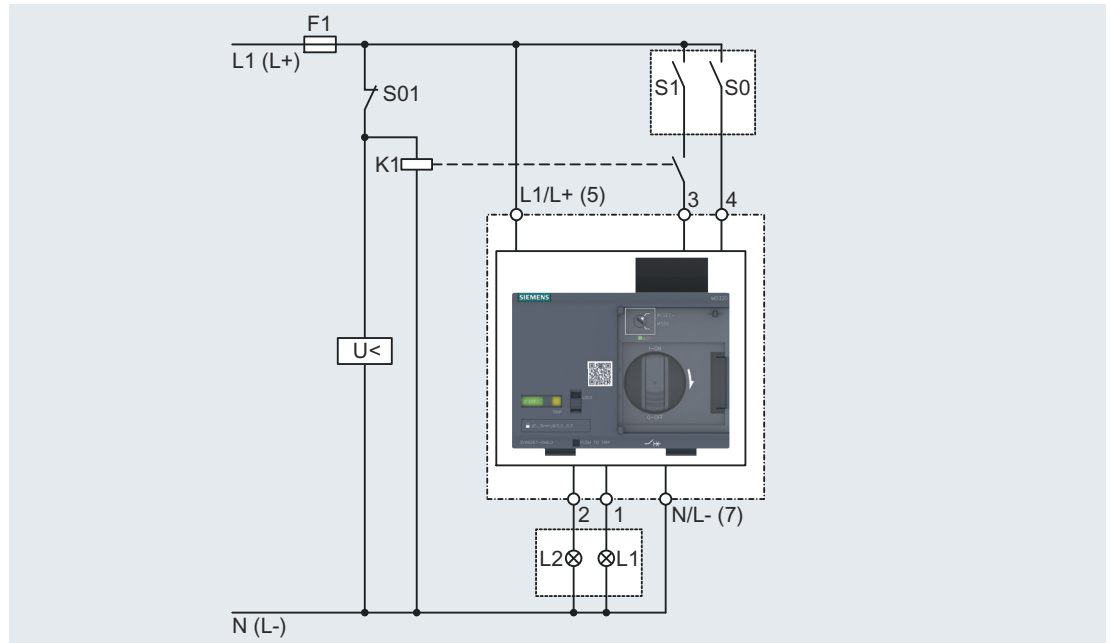


Motor operator actuation controlled via control cable



- S0 OFF (to be provided by customer)
- S1 ON (to be provided by customer)
- F1 Fuse in the control circuit (to be provided by customer)
- L1 Indicator light AUTO mode (to be provided by customer)
- L2 Indicator light MAN mode (to be provided by customer)

Motor operator actuation controlled via control cable and undervoltage release



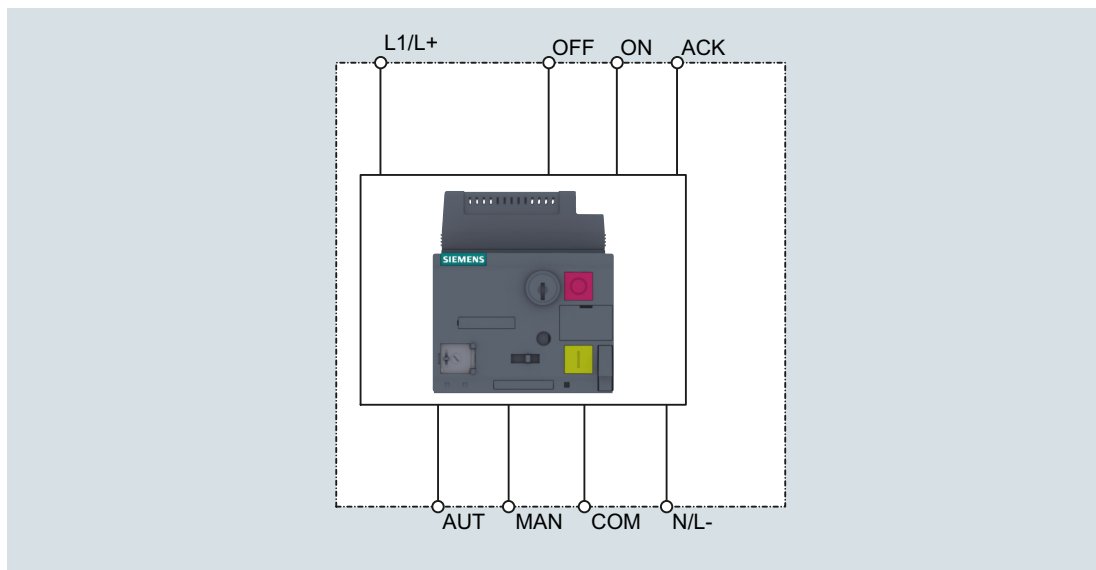
- S0 OFF (to be provided by customer)
- S1 ON (to be provided by customer)
- S01 Remote command (to be provided by customer)
- K1 Auxiliary contactor (to be provided by customer)
- U< Undervoltage release (to be provided by customer)
- F1 Fuse in the control circuit (to be provided by customer)
- L1 Indicator light AUTO mode (to be provided by customer)
- L2 Indicator light MAN mode (to be provided by customer)

This circuit is deployed in order to prevent no-load operation of the molded case circuit breaker. The contact of auxiliary contactor K1 prevents no-load operation when the undervoltage release "U<" is de-energized.

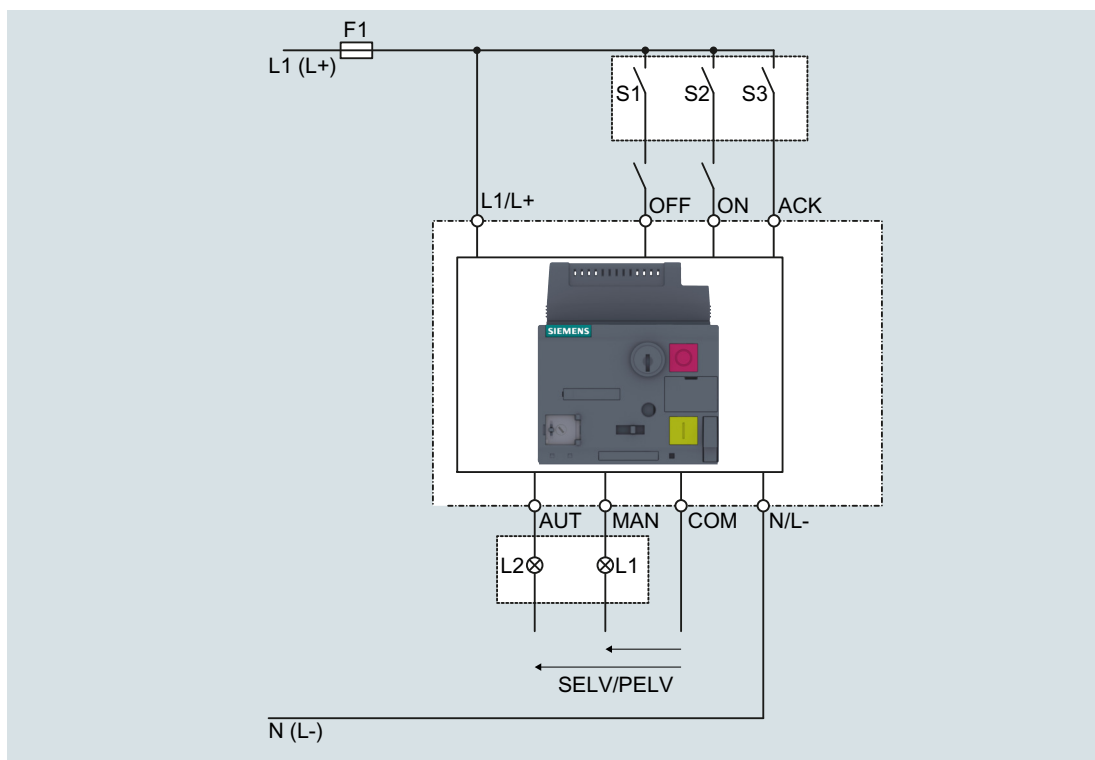
No-load operations subject the molded case circuit breaker to high stresses. If the undervoltage release is de-energized, auxiliary contactor K1 has not picked up. The contact in the ON circuit (control circuit) of the motor operator is thus not closed, that is, the molded case circuit breaker cannot be switched.

This auxiliary contactor is not necessary when the undervoltage release is supplied uninterrupted (e.g. pushbutton S01) from the same source as the motor operator itself (e.g. contact 3).

SEO520 motor operator with stored energy mechanism



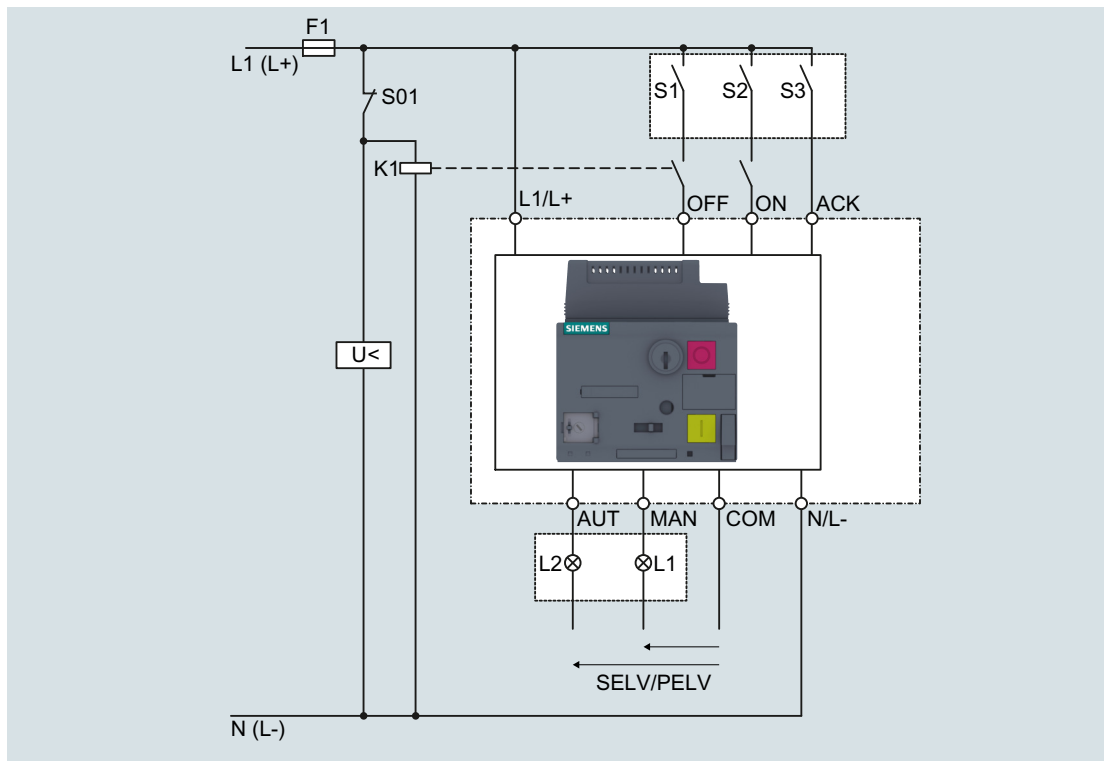
Actuation of SEO520 motor operator with stored energy mechanism via control cable



- S1 OFF (to be provided by customer)
- S2 ON (to be provided by customer)
- S3 Reset signal for operating mode 3 (to be provided by customer)
- F1 Fuse in the control circuit (to be provided by customer)
- L1 Indicator light AUTO mode (to be provided by customer)
- L2 Indicator light MAN mode (to be provided by customer)

6.1 Circuit diagrams

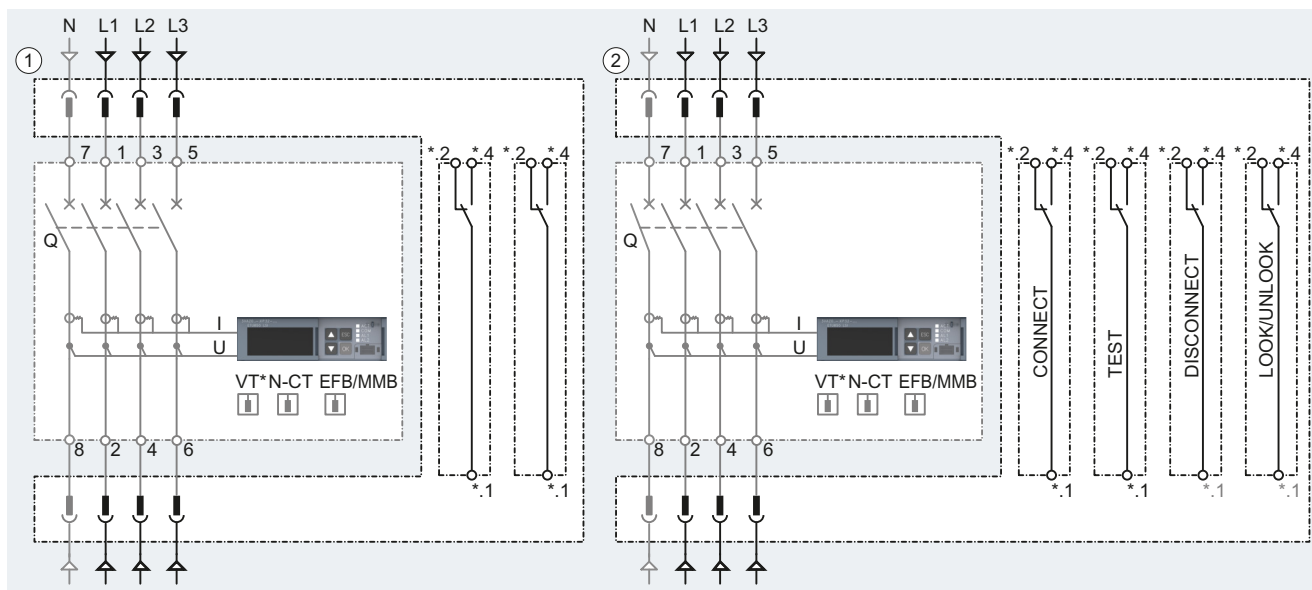
Actuation of SE0520 motor operator with stored energy mechanism via control cable and undervoltage release



- S1 OFF (to be provided by customer)
- S2 ON (to be provided by customer)
- S3 Reset signal for operating mode 3 (to be provided by customer)
- S01 Remote command (to be provided by customer)
- K1 Auxiliary contactor (to be provided by customer)
- U< Undervoltage release (to be provided by customer)
- F1 Fuse in the control circuit (to be provided by customer)
- L1 Indicator light AUTO mode (to be provided by customer)
- L2 Indicator light MAN mode (to be provided by customer)

Plug-in and withdrawable design

Plug-in and withdrawable design



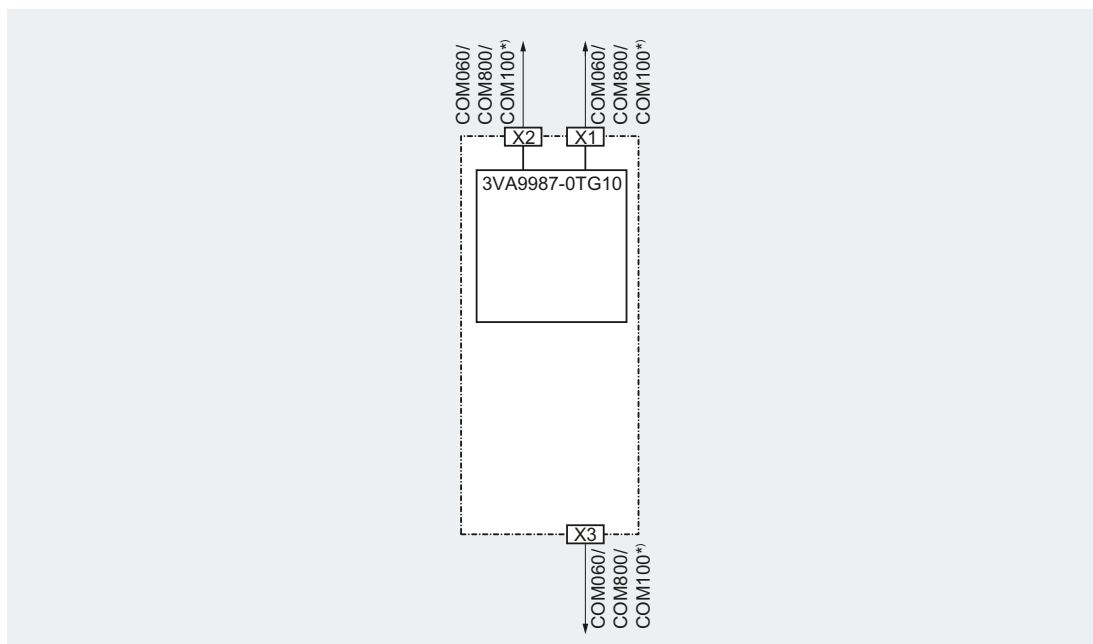
- ① Plug-in units, 3-pole and 4-pole, with two optionally integrated position signaling switches for signaling "Plug-in unit - MCCB correctly bolted to plug-in socket".
- ② Withdrawable units, 3-pole and 4-pole, with an optional switch for signaling the condition "Withdrawable unit locked / open" and six optionally integrated position signaling switches for signaling "Position of breaker in the withdrawable unit".

* Voltage tap

Withdrawable units, 3-pole and 4-pole, with an optional switch for signaling the condition "Withdrawable unit locked / open" and three optionally integrated position signaling switches for signaling "Position of breaker in the withdrawable unit".

Other external accessories

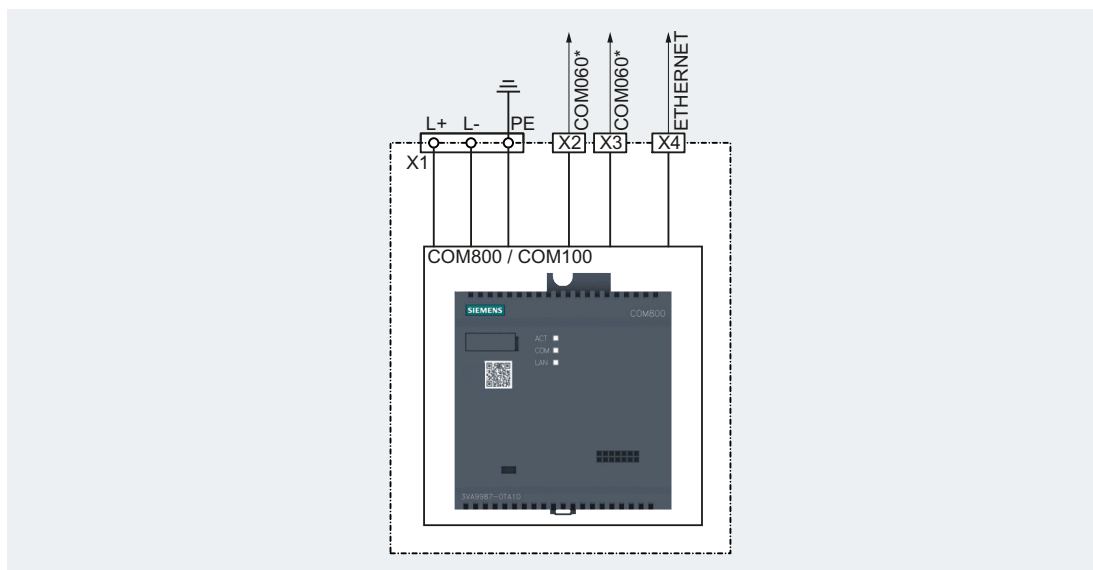
T-connector



* A connection can also be optionally equipped with a bus terminating resistor.

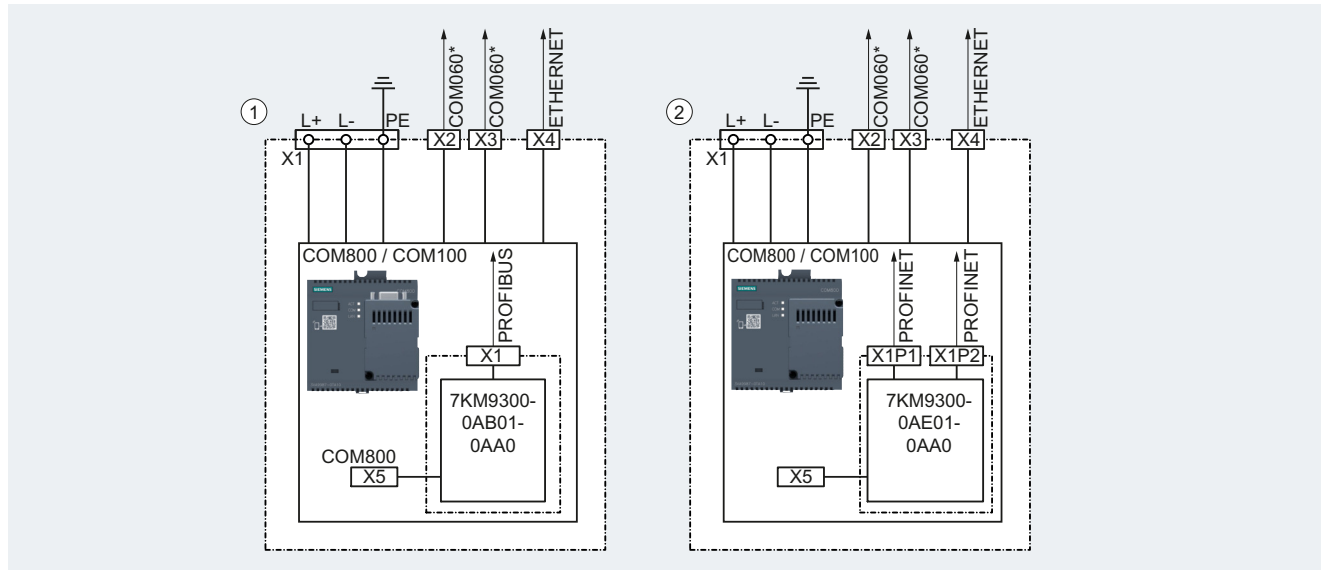
The T-connector is included in the scope of supply of the COM060 communications module.

COM800 / COM100 data concentrator



* A connection can also be optionally equipped with a bus terminating resistor.

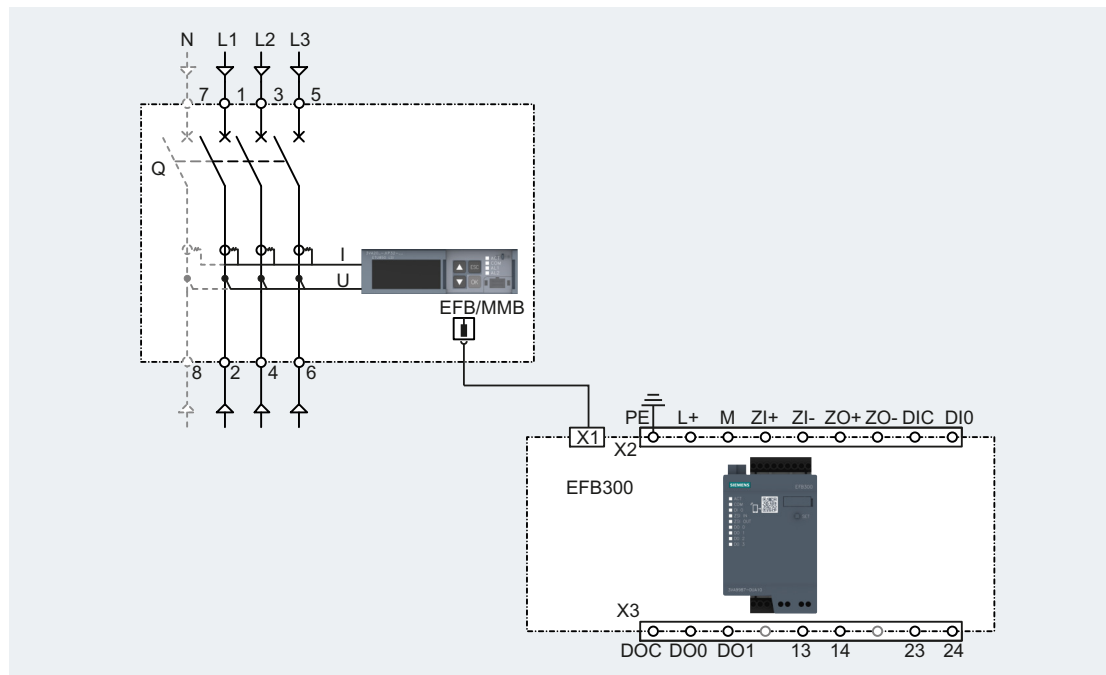
COM800 / COM100 data concentrator with expansion modules



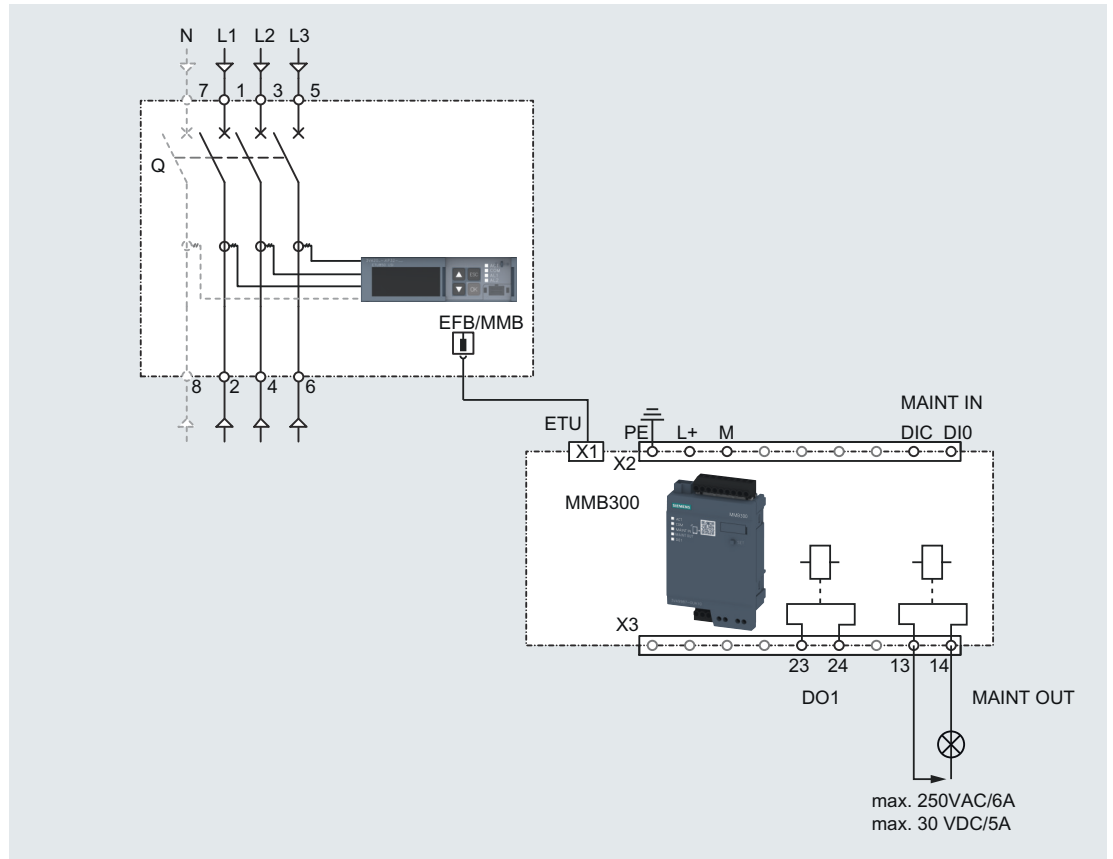
- ① COM800 / COM100 data concentrator with 7KM PAC PROFIBUS DP expansion module
- ② COM800 / COM100 data concentrator with 7KM PAC Switched Ethernet PROFINET expansion module

* A connection can also be optionally equipped with a bus terminating resistor.

External Function Box EFB300

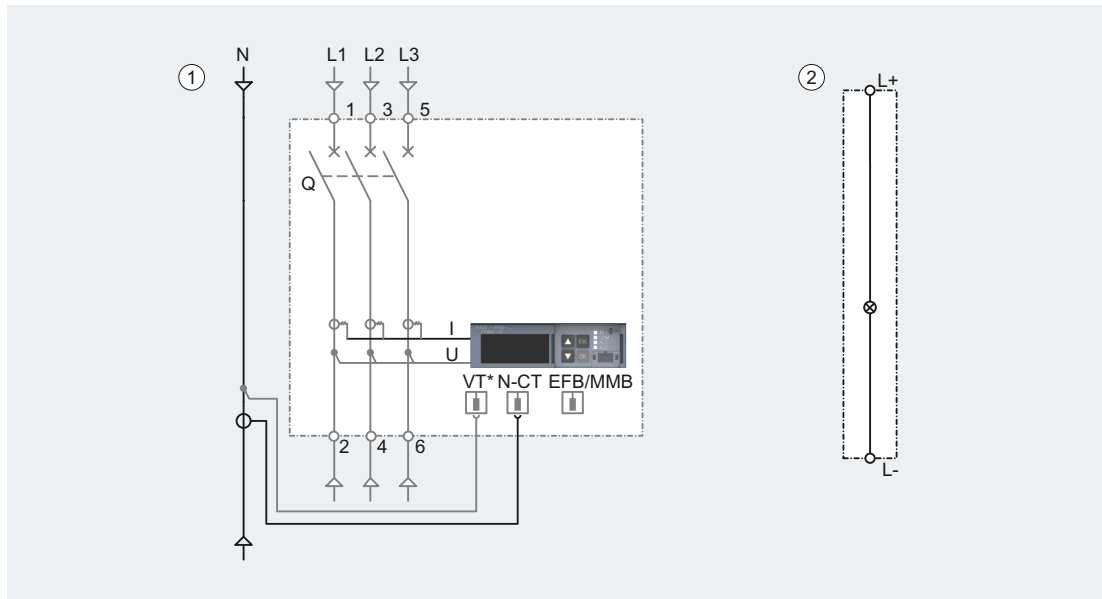


Maintenance Mode Box MMB300



6.1 Circuit diagrams

External current transformer for N conductor and illumination kit (24 V DC) for manual handle

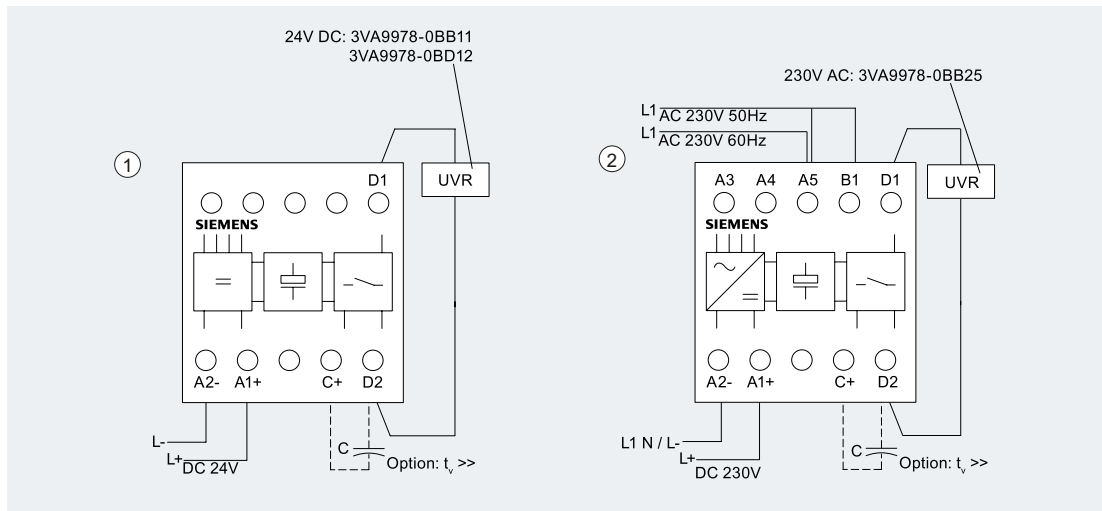


① Connection for external current transformer for N conductor

② Illumination kit (24 V DC) for manual handle

* Voltage tap

Time-delay device for undervoltage releases

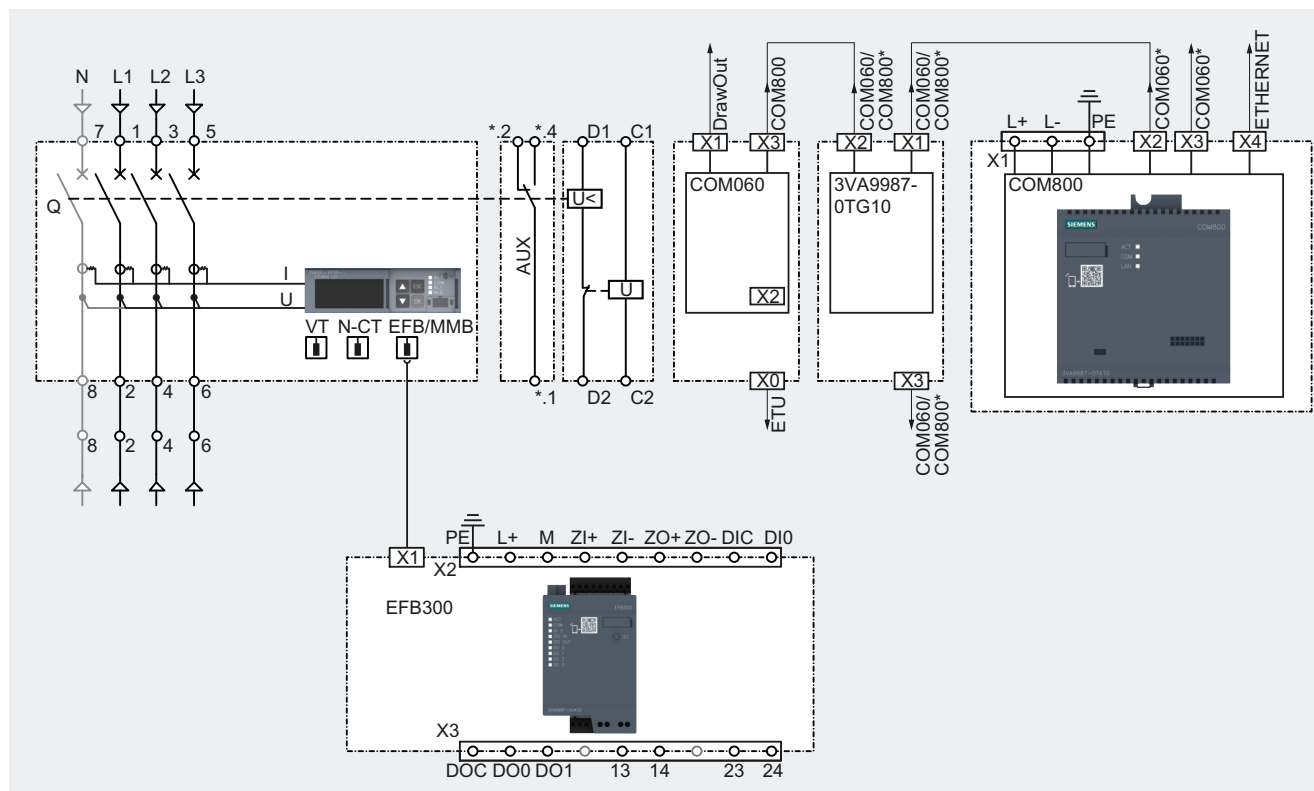


① 24 V DC

② 230 V AC (50/60 Hz), 230 V DC

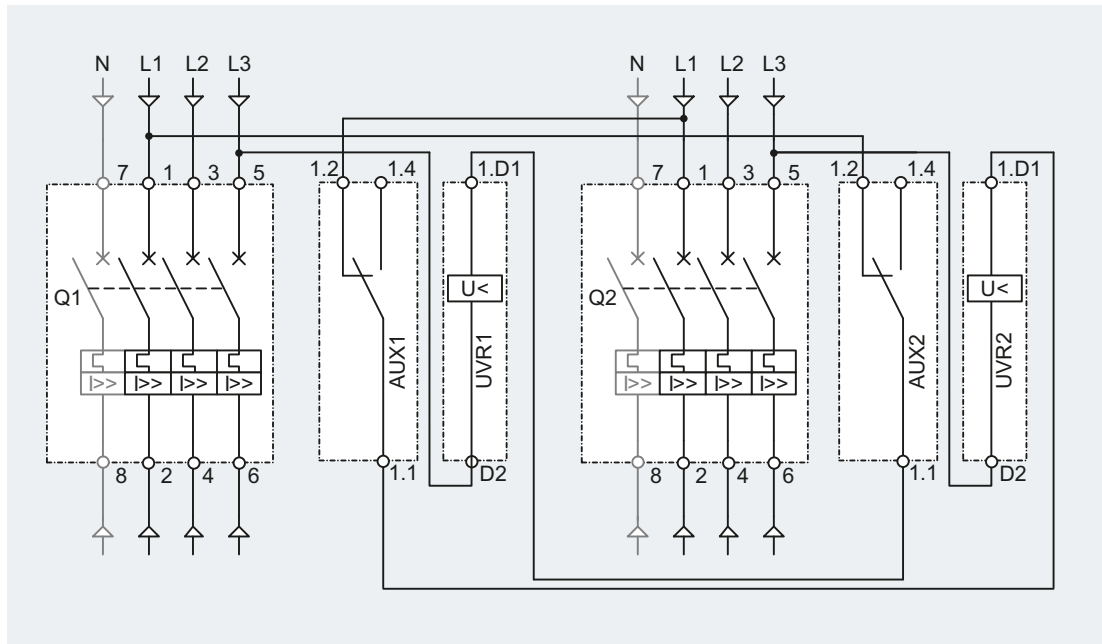
Dashed lines represent optional connections. For the detailed wiring, refer to the operating instructions.

6.1.2.3 Example: 3VA6 molded case circuit breakers with accessories (external/internal)



* A connection can also be optionally equipped with a bus terminating resistor.

6.1.3 Application example: Electrical interlocking of two 3VA UL molded case circuit breakers with undervoltage releases



- Q 1 Molded case circuit breaker 1
- UVR 1 Undervoltage release in molded case circuit breaker 1
- AUX 1 Auxiliary switch in molded case circuit breaker 1
- Q 2 Molded case circuit breaker 2
- UVR 2 Undervoltage release in molded case circuit breaker 2
- AUX 2 Auxiliary switch in molded case circuit breaker 2

Note

In the case of supply voltage > 480 V AC, the undervoltage release UVR must not be connected to phases L1 and L3. In this case, it is connected to phase L1 and the N conductor or to a control voltage supply up to maximum 480 V AC.

Note

If undervoltage release UVR is operated with a voltage greater than or equal to 230 V, a back-up fuse (operational class gG, max. 10 A) must be used. (See 3VA5 auxiliary releases (Page 495) and 3VA6 auxiliary releases (Page 505)).

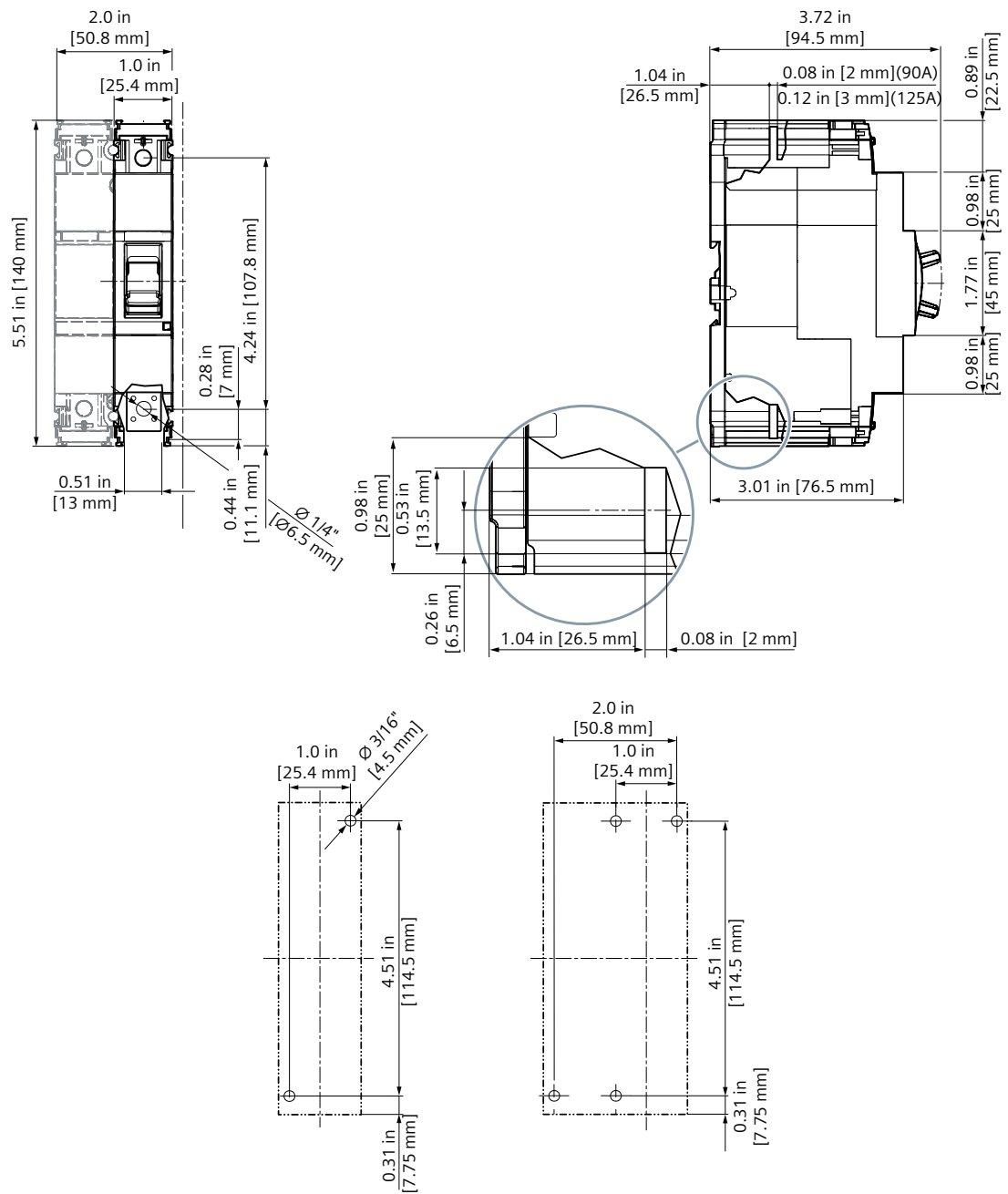
6.2 Dimensional drawings

6.2.1 Dimensions of basic units

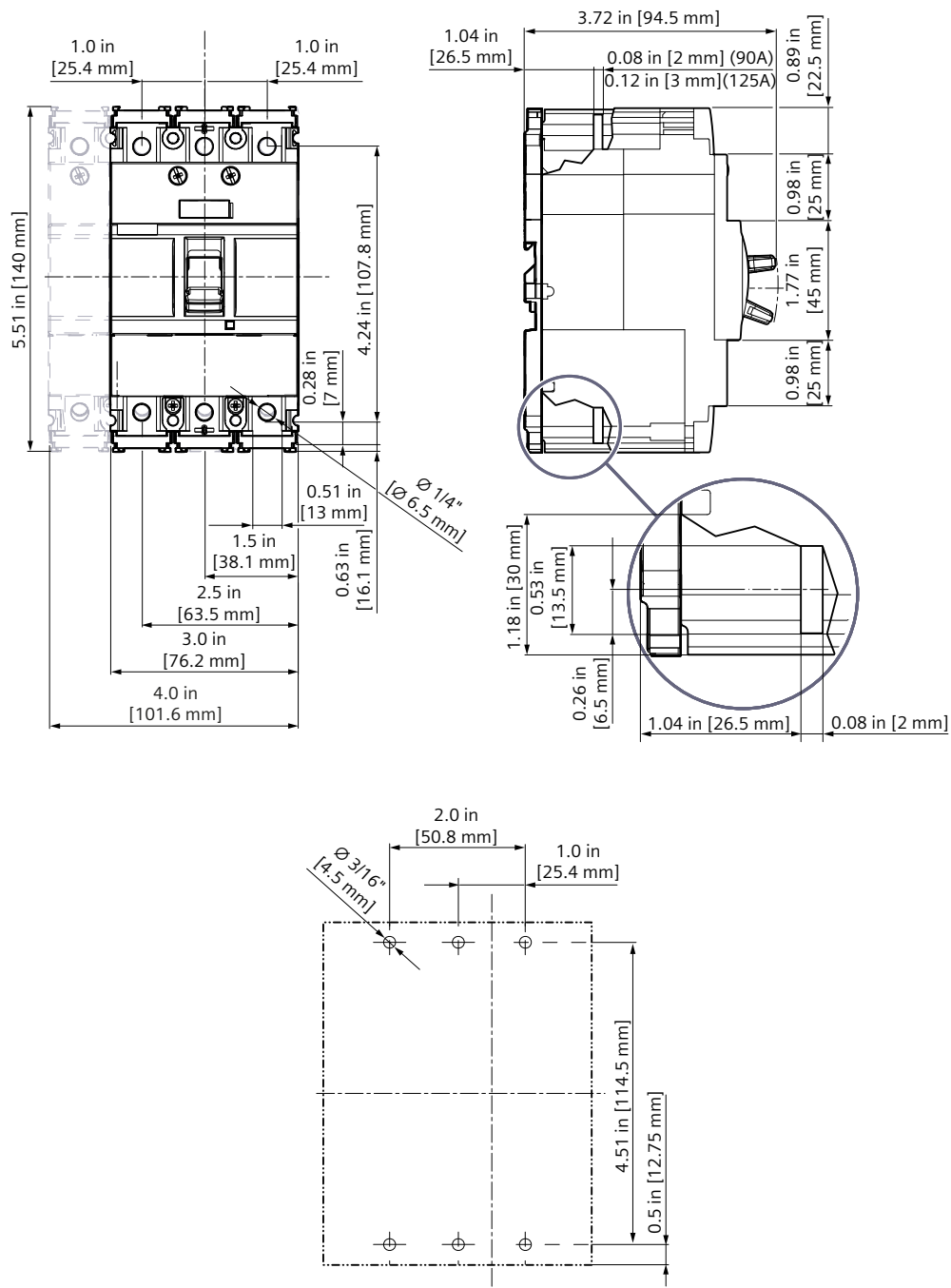
6.2.1.1 3VA51

3VA51 125 A 1-pole and 2-pole

6.2 Dimensional drawings

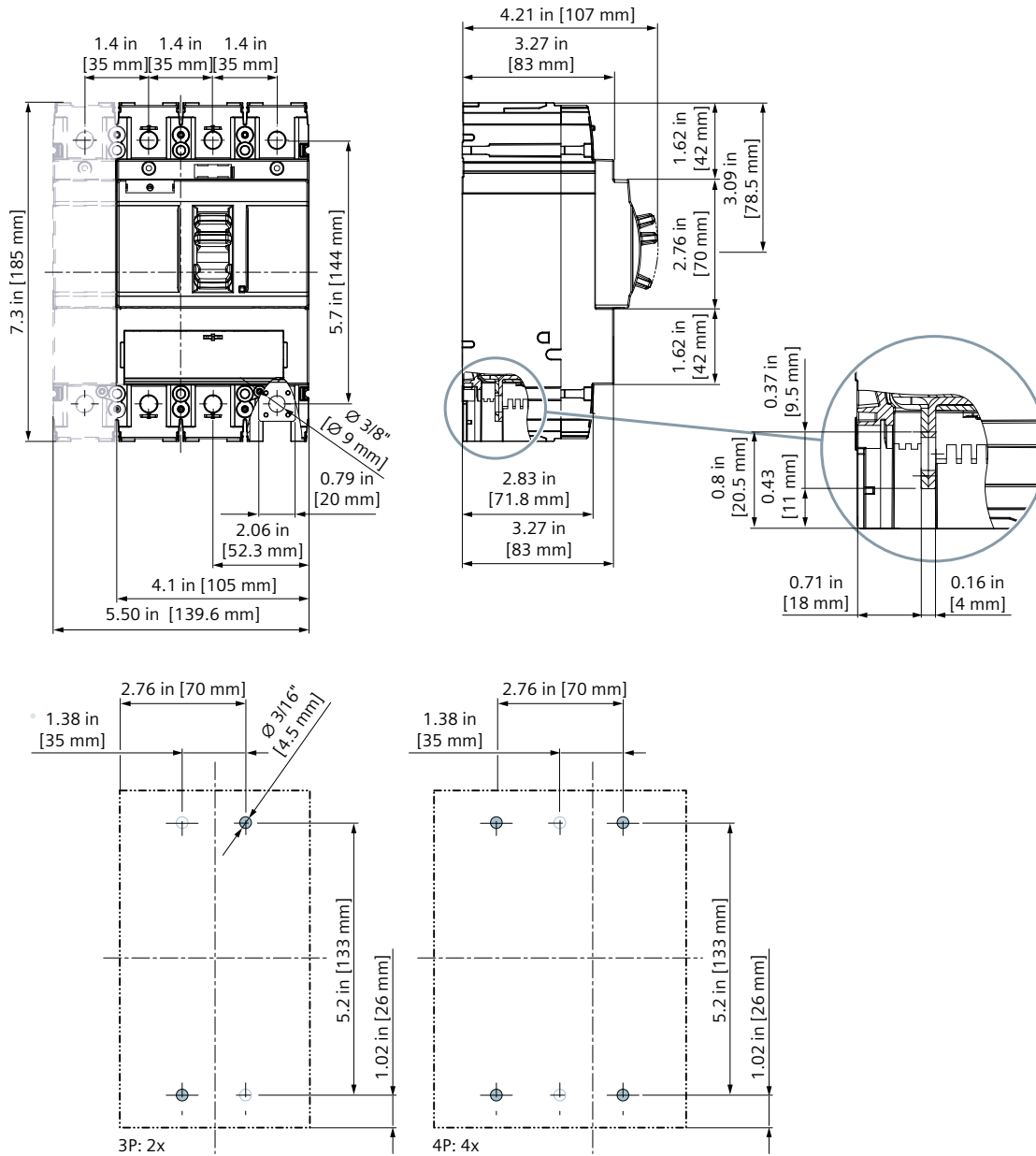


3VA51 125 A 3-pole and 4-pole



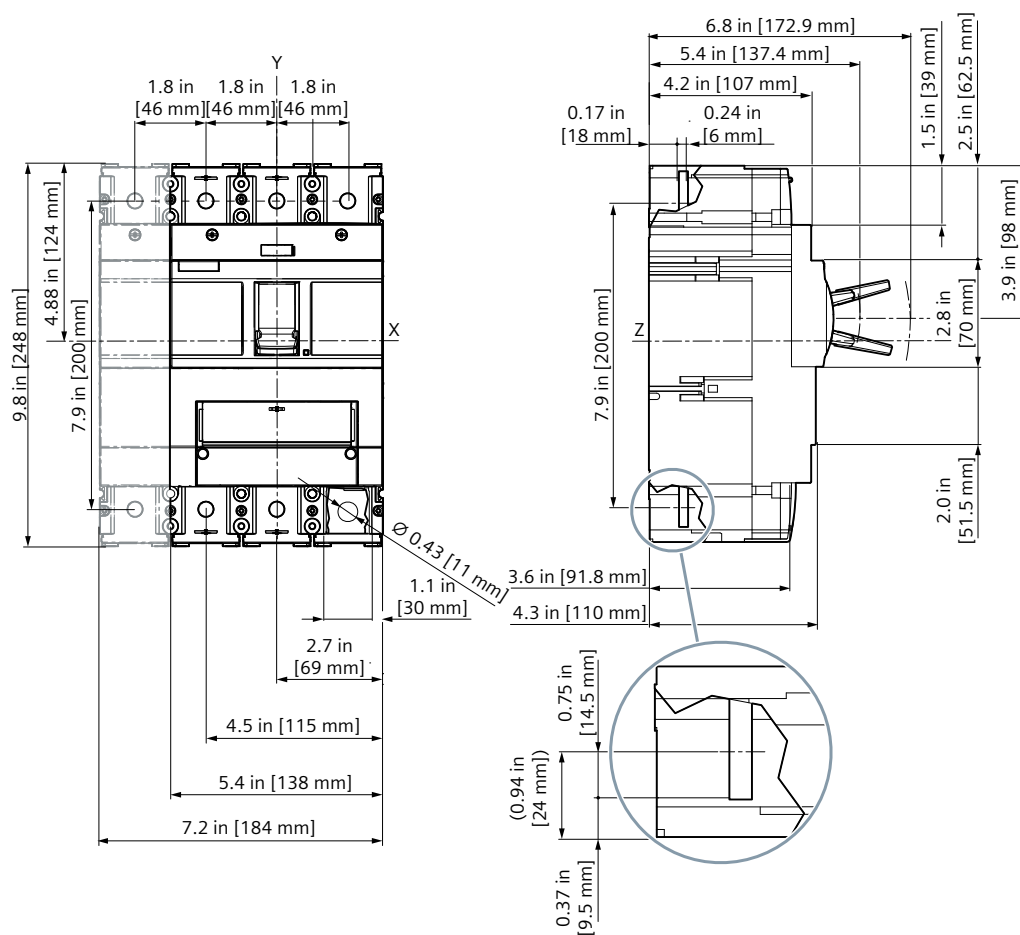
6.2.1.2 3VA52

3VA52 250 A 3-pole and 4-pole



6.2.1.3 3VA53 / 3VA54

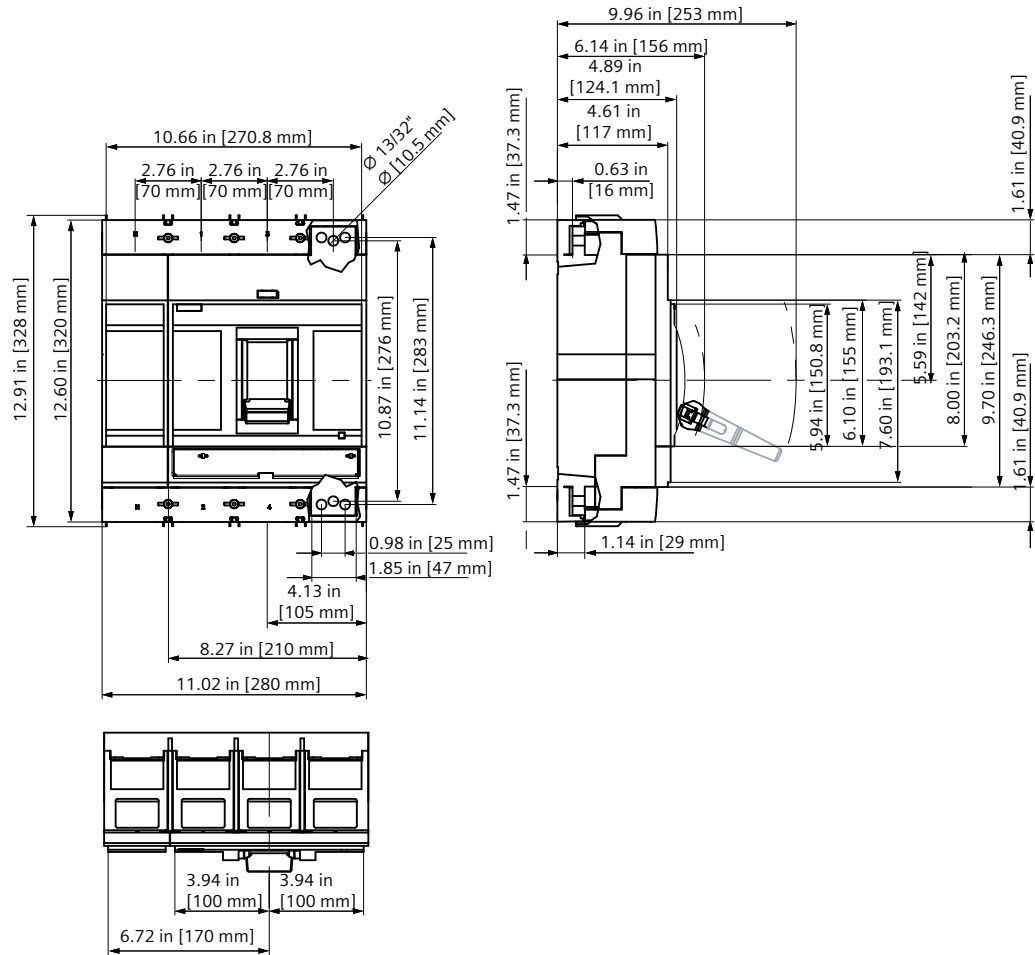
3VA53 400 A / 3VA54 600 A, 3-pole and 4-pole



6.2 Dimensional drawings

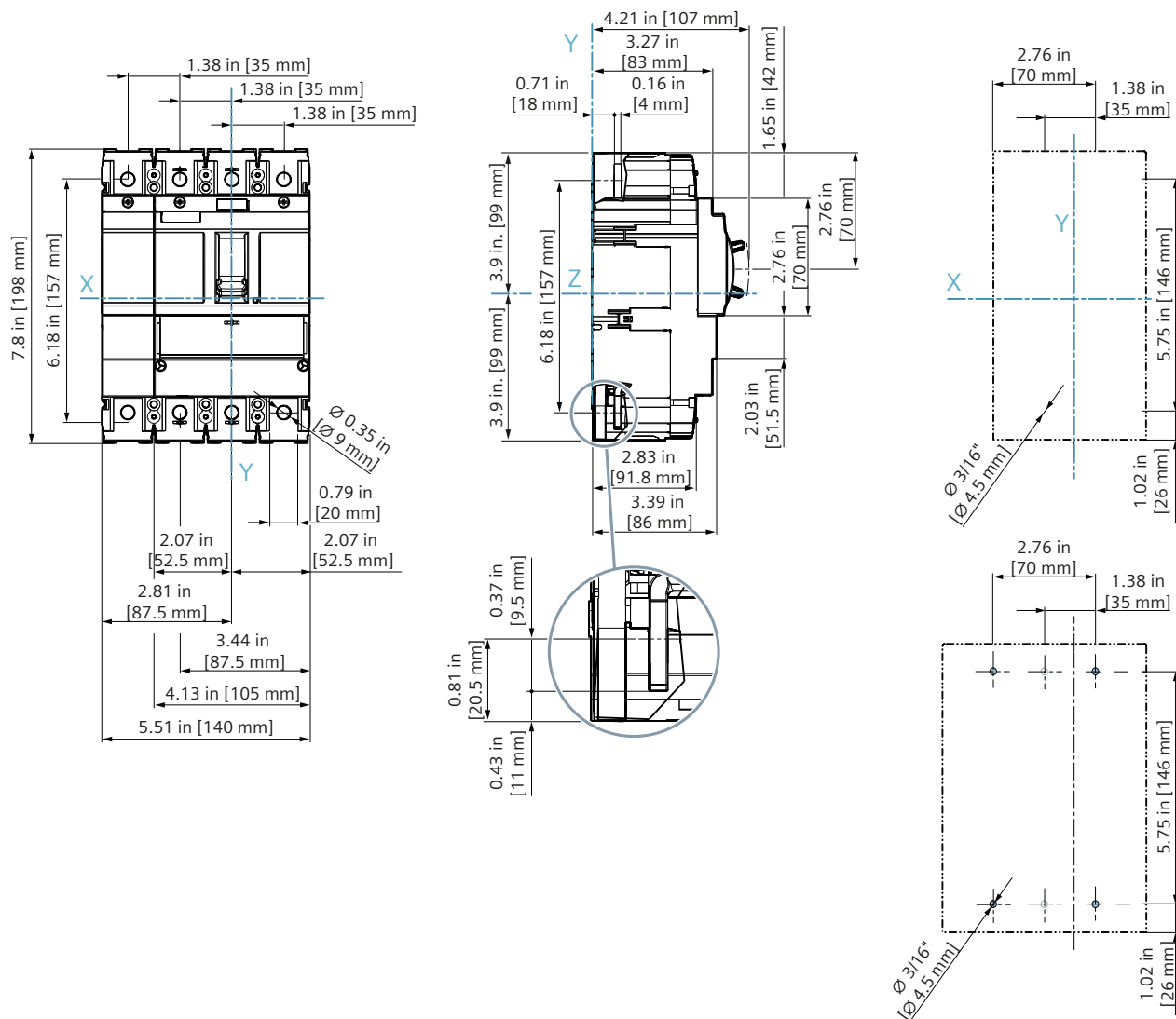
6.2.1.4 3VA55

3VA55 800 A



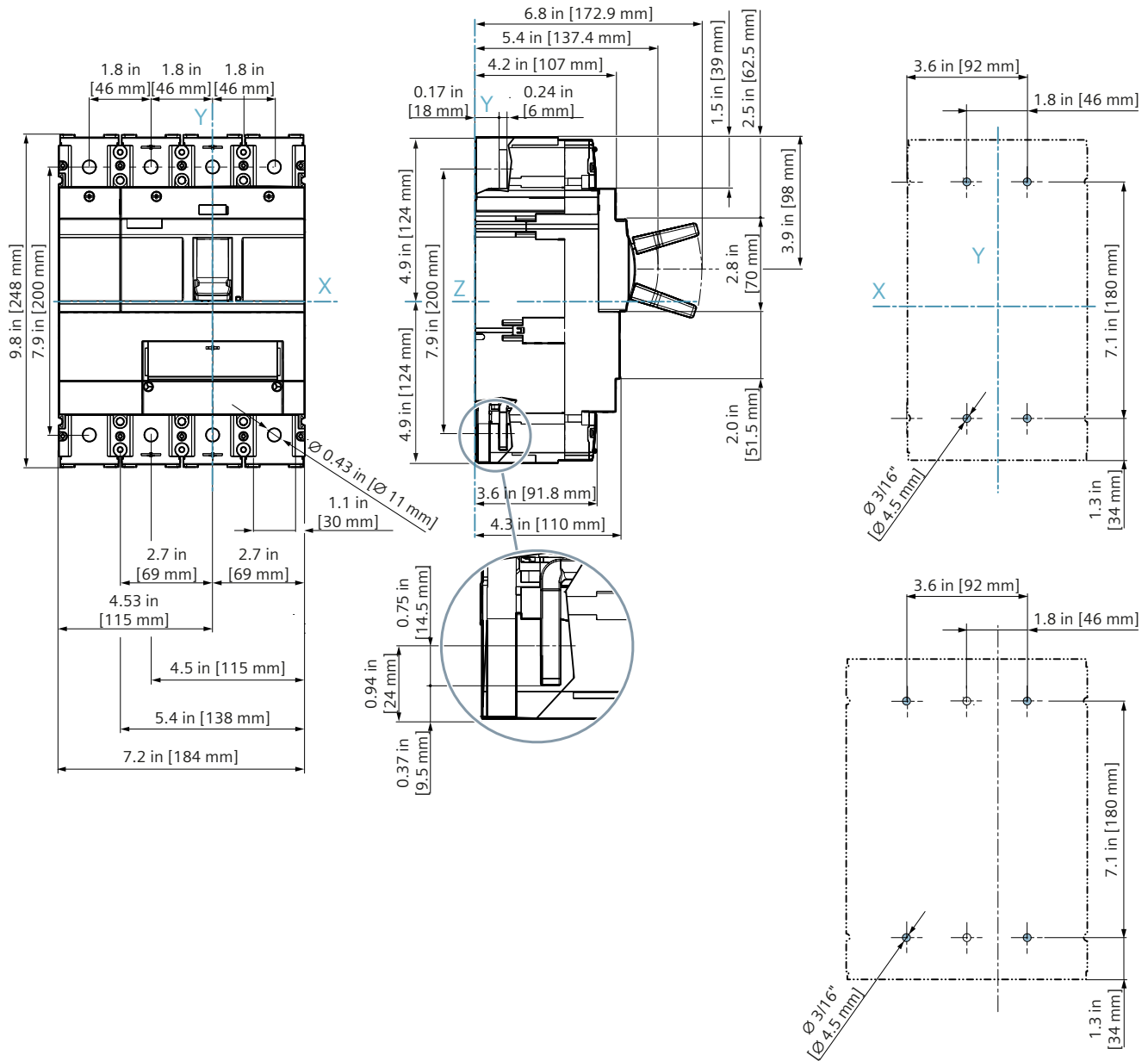
6.2.1.5 3VA61 / 3VA62

3VA61 150 A / 3VA62 250 A, 3- and 4-pole



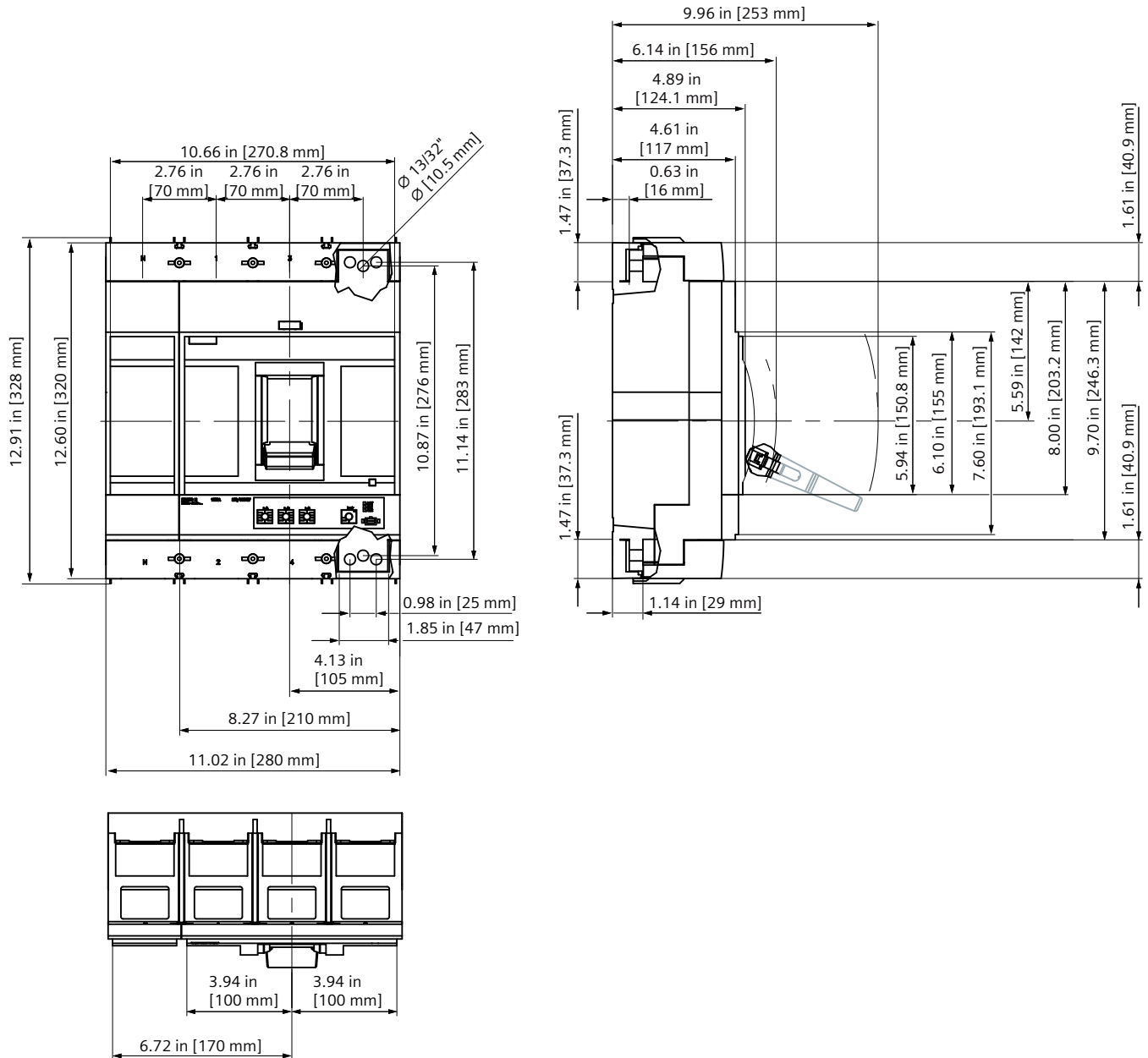
6.2.1.6 3VA63 / 3VA64

3VA63 400 A / 3VA64 600 A, 3- and 4-pole



6.2.1.7 3VA65 / 66

3VA65 800 A / 3VA66 1000 A, 3-pole and 4-pole

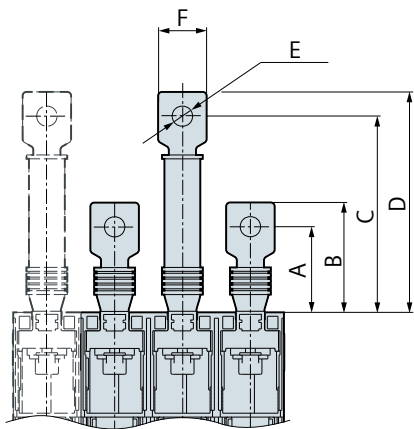


6.2.2 Dimensions of accessories

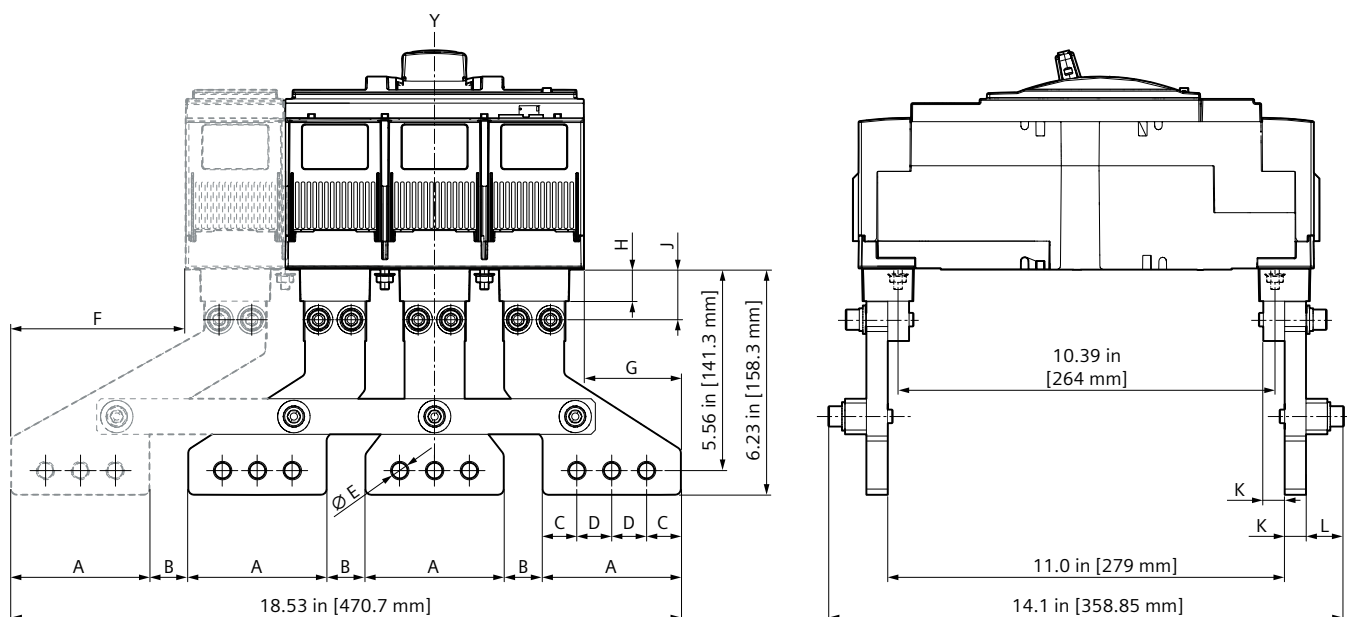
6.2.2.1 Connection technology

Rear busbar and cable lug connections for plug-in and withdrawable molded case circuit breakers

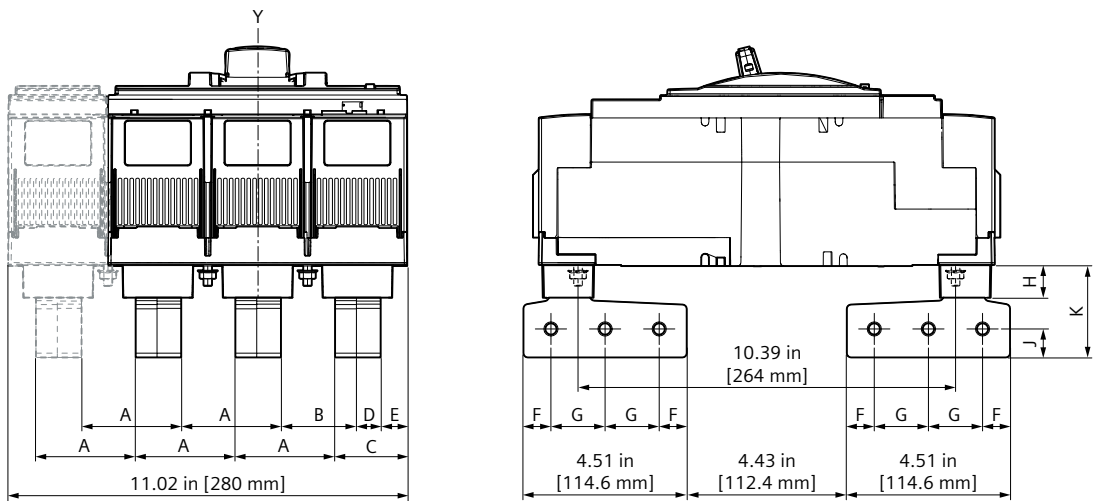
Rear connection stud flat



	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
A	1.75 in [44.5 mm]	1.69 in [43 mm]	2.00 in [50 mm]	1.69 in [43 mm]	2.00 in [50 mm]
B	2.22 in [56.5 mm]	2.19 in [55.5 mm]	2.60 in [65 mm]	2.19 in [55.5 mm]	2.60 in [65 mm]
C	4.00 in [101.5 mm]	3.94 in [100 mm]	4.50 in [115 mm]	3.94 in [100 mm]	4.50 in [115 mm]
D	4.49 in [114 mm]	4.43 in [112.5 mm]	5.20 in [130 mm]	4.43 in [112.5 mm]	5.20 in [130 mm]
E	5/16 in [8.4 mm]	3/8 in [10.05 mm]	1/2 in [13.2 mm]	3/8 in [10.05 mm]	1/2 in [13.2 mm]
F	0.60 in [16 mm]	0.87 in [22 mm]	1.20 in [29.4 mm]	0.87 in [22 mm]	1.20 in [29.4 mm]

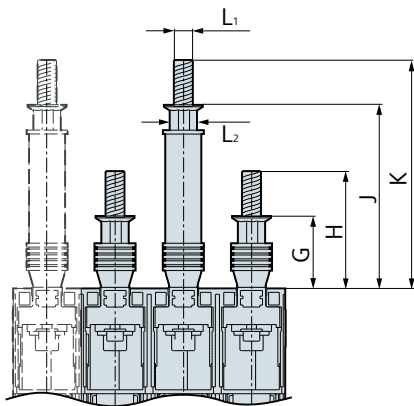


	3VA6
	3VA65 / 66
A	3.83 in [97.2 mm]
B	1.07 in [27.3 mm]
C	0.95 in [24.1 mm]
D	0.96 in [24.5 mm]
E	0.43 in [11 mm]
F	4.83 in [122.6 mm]
G	2.68 in [86.1 mm]
H	0.87 in [22.2 mm]
J	1.39 in [35.2 mm]
K	0.59 in [15 mm]
L	0.98 in [24.9 mm]



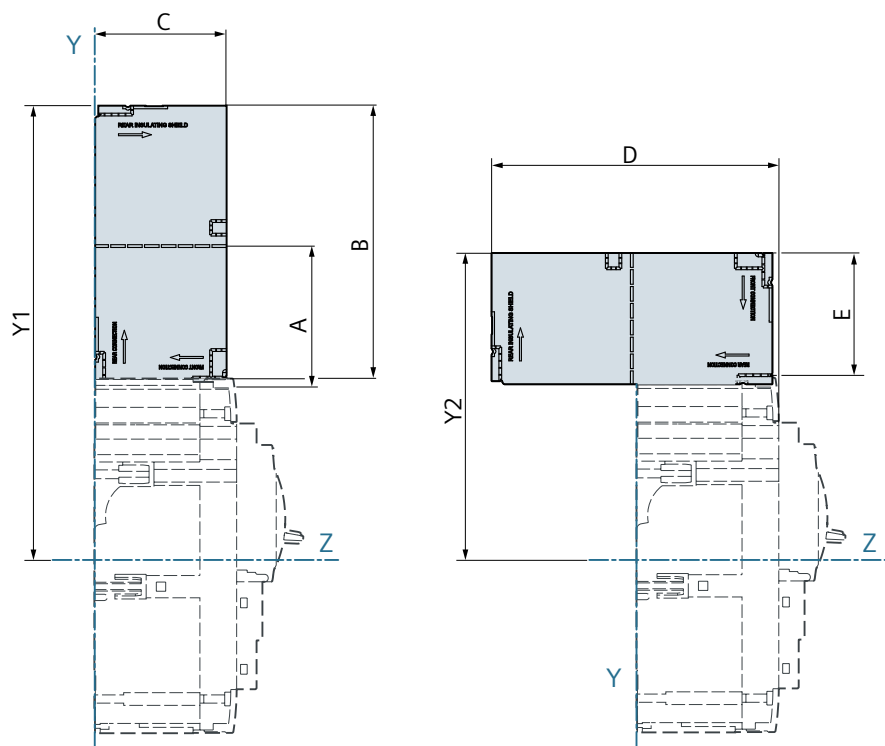
	3VA6
	3VA65 / 66
A	2.76 in [70 mm]
B	2.09 in [53 mm]
C	2.01 in [51 mm]
D	0.67 in [17 mm]
E	0.75 in [19 mm]
F	0.76 in [19.3 mm]
G	1.50 in [38.1 mm]
H	0.87 in [22.2 mm]
J	0.79 in [20.1 mm]
K	2.53 in [64.2 mm]

Rear connection stud round



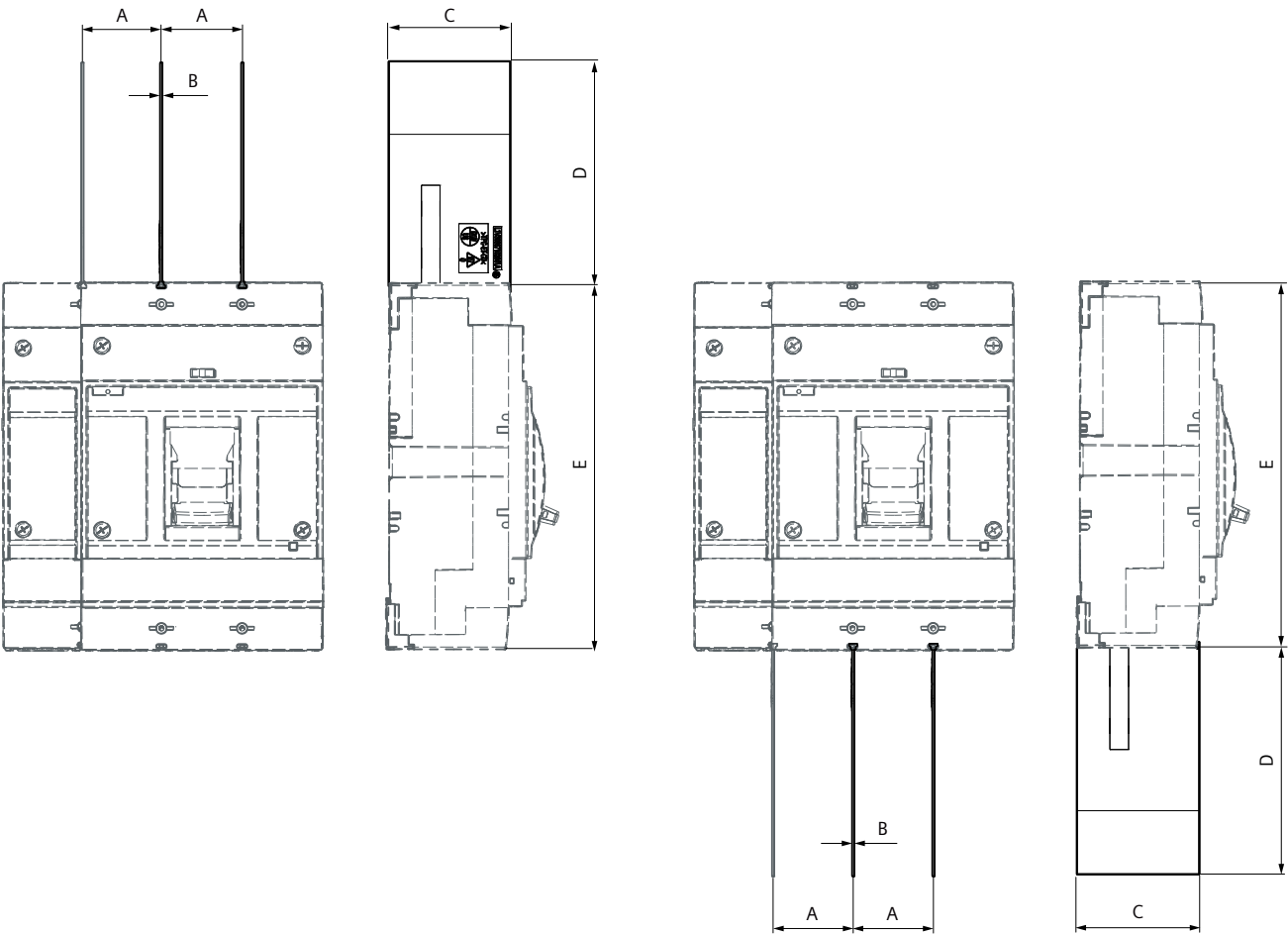
	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
G	0.85 in [21.5 mm]	1.42 in [36 mm]	1.77 in [45 mm]	1.42 in [36 mm]	1.77 in [45 mm]
H	2.34 in [59.5 mm]	2.32 in [59 mm]	3.29 in [83.5 mm]	2.32 in [59 mm]	3.29 in [83.5 mm]
J	3.09 in [78.5 mm]	3.66 in [93 mm]	4.13 in [105 mm]	3.66 in [93 mm]	4.13 in [105 mm]
K	4.59 in [116.5 mm]	4.57 in [116 mm]	5.56 in [143.5 mm]	4.57 in [116 mm]	5.56 in [143.5 mm]
L	M8	3/8"	1/2"	3/8"	1/2"

Phase barrier



	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
A	1.5 / 2.7 in [38.5 / 68.5 mm]	3.15 in [79.9 mm]	3.4 in [87.2 mm]	3.15 in [79.9 mm]	3.4 in [87.2 mm]
B	3.8 in [96.6 mm]	5.8 in [148.1 mm]	6.6 in [166.5 mm]	5.8 in [148.1 mm]	6.6 in [166.5 mm]
C	2.4 in [61.2 mm]	2.7 in [68.4 mm]	3.4 in [87.2 mm]	2.7 in [68.4 mm]	3.4 in [87.2 mm]
D	3.9 in [100.2 mm]	6.5 in [164.1 mm]	6.9 in [174.4 mm]	6.5 in [164.1 mm]	6.9 in [174.4 mm]
E	2.3 in [57.8 mm]	2.3 in [57 mm]	3.1 in [79.3 mm]	2.3 in [57 mm]	3.1 in [79.3 mm]
Y1	6.6 in [166.6 mm]	9.5 in [240.6 mm]	11.4 in [290.5 mm]	9.7 in [247.1 mm]	11.4 in [290.5 mm]
Y2	5.0 in [127.8 mm]	5.9 in [149.5 mm]	8.0 in [203.3 mm]	6.1 in [156.0 mm]	8.0 in [203.3 mm]

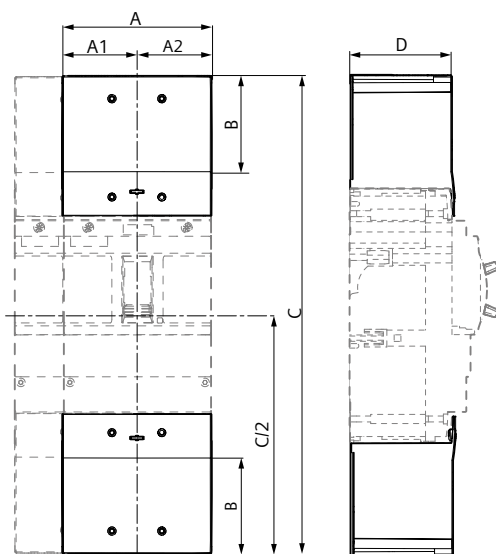
Phase barriers for circuit breakers greater than 600 A



	3VA5	3VA6
	3VA55	3VA65 / 66
A	2.8 in [70 mm]	2.8 in [70 mm]
B	0.1 in [2.5 mm]	0.1 in [2.5 mm]
C	4.1 in [104 mm]	4.1 in [104 mm]
D	6.82 in [173.1 mm]	6.82 in [173.1 mm]
E	12.6 in [320 mm]	12.6 in [320 mm]

Terminal cover

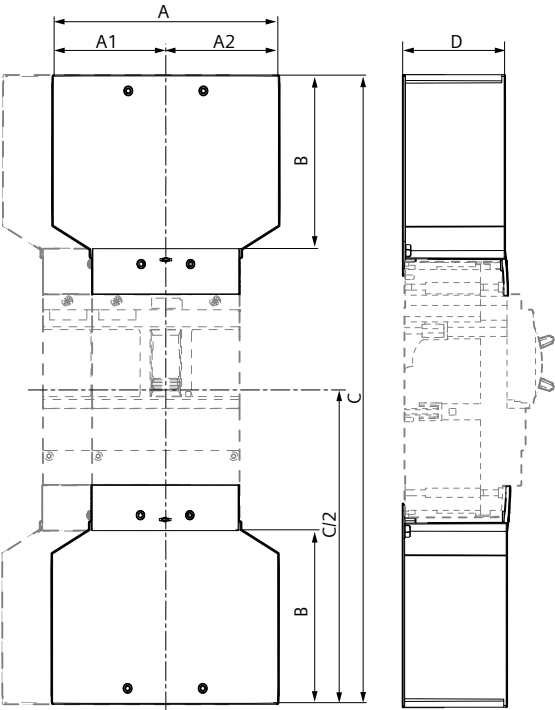
Terminal cover extended



	3VA5						
	3VA51			3VA52		3VA53 / 54	
	2P	3P	4P	3P	4P	3P	4P
A	2.0 in [50.8 mm]	3.0 in [76.2 mm]	4.0 in [101.6 mm]	4.1 in [105 mm]	5.5 in [140 mm]	5.4 in [138 mm]	7.2 in [184 mm]
A1	1.5 in [38.1 mm]	1.5 in [38.1 mm]	2.5 in [63.5 mm]	2.07 in [52.5 mm]	3.44 in [87.5 mm]	2.7 in [69 mm]	4.53 in [115 mm]
A2	0.5 in [12.7 mm]	1.5 in [38.1 mm]	1.5 in [38.1 mm]	2.07 in [52.5 mm]	2.07 in [52.5 mm]	2.7 in [69 mm]	2.7 in [69 mm]
B	1.97 in [50 mm]			2.65 in [67.4 mm]		2.6 in [64.9 mm]	
C	9.45 in [240 mm]			12.59 in [319.8 mm]		14.9 in [377.8 mm]	
D	2.64 in [67 mm]			2.8 in [71 mm]		3.6 in [91.5 mm]	

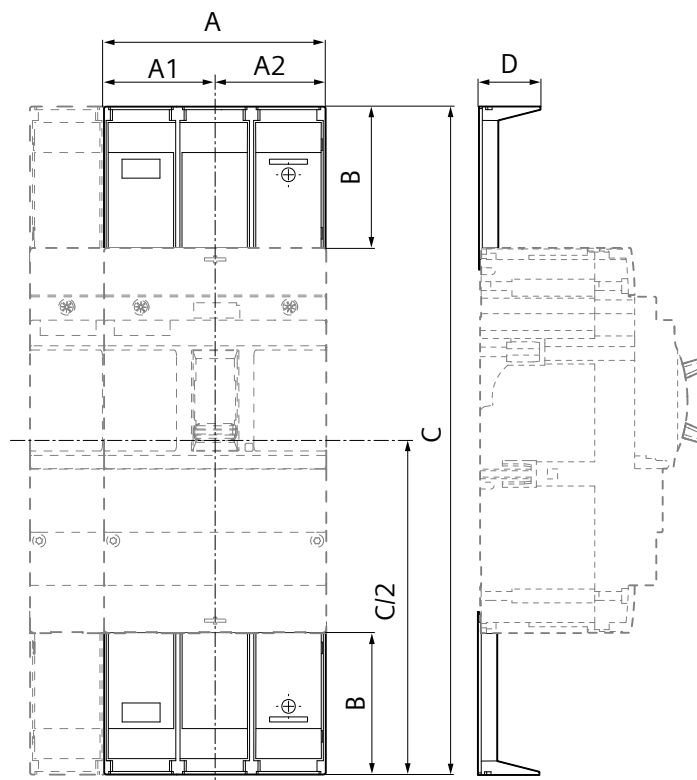
	3VA6			
	3VA61 / 62		3VA63 / 64	
	3P	4P	3P	4P
A	4.1 in [105 mm]	5.5 in [140 mm]	5.4 in [138 mm]	7.2 in [184 mm]
A1	2.07 in [52.5 mm]	3.44 in [87.5 mm]	2.7 in [69 mm]	4.53 in [115 mm]
A2	2.07 in [52.5 mm]	2.07 in [52.5 mm]	2.7 in [69 mm]	2.7 in [69 mm]
B	2.65 in [67.4 mm]		2.6 in [64.9 mm]	
C	13.11 in [333 mm]		14.9 in [377.8 mm]	
D	2.8 in [71 mm]		3.6 in [91.5 mm]	

Terminal cover offset



	3VA5		3VA6	
	3VA53 / 54		3VA63 / 64	
	3P	4P	3P	4P
A	8.3 in [212 mm]	11.1 in [282 mm]	8.3 in [212 mm]	11.1 in [282 mm]
A1	4.17 in [106 mm]	6.94 in [176 mm]	4.17 in [106 mm]	6.94 in [176 mm]
A2	4.17 in [106 mm]	4.17 in [106 mm]	4.17 in [106 mm]	4.17 in [106 mm]
B	5.8 in [147.5 mm]		5.8 in [147.5 mm]	
C	21.4 in [543 mm]		21.4 in [543 mm]	
D	3.6 in [91.5 mm]		3.6 in [91.5 mm]	

Insulating plate

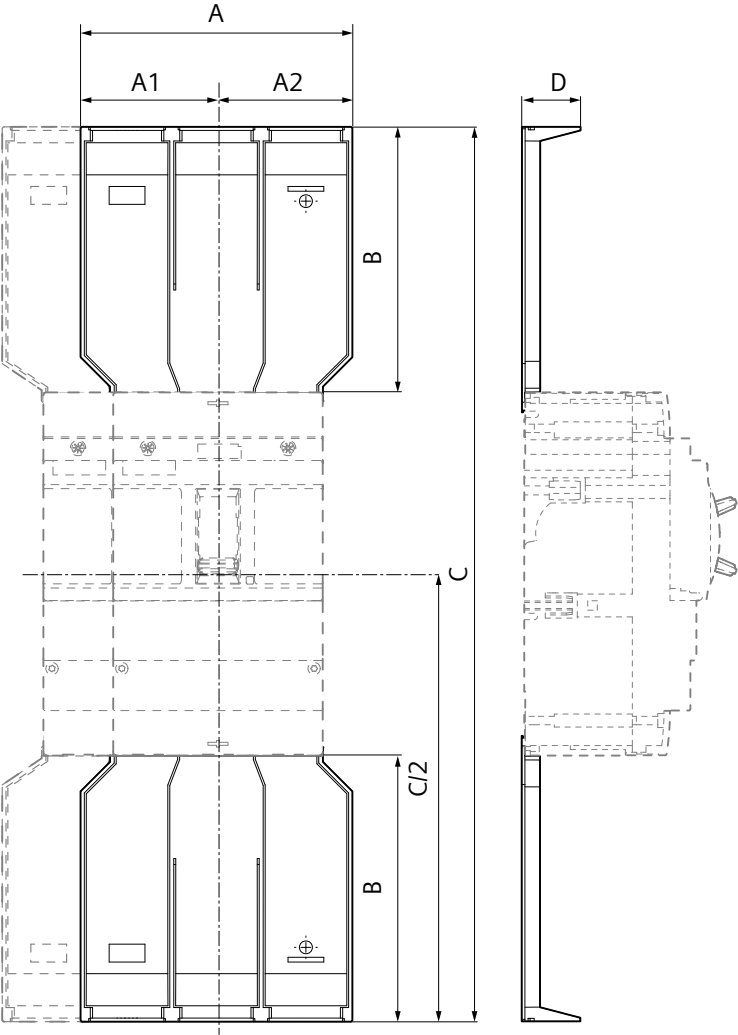


	3VA5						
	3VA51			3VA52		3VA53 / 54	
	2P	3P	4P	3P	4P	3P	4P
A	2.0 in [50.8 mm]	3.0 in [76.2 mm]	4.0 in [101.6 mm]	4.1 in [105 mm]	5.5 in [140 mm]	5.4 in [138 mm]	7.2 in [184 mm]
A1	1.5 in [38.1 mm]	1.5 in [38.1 mm]	2.5 in [63.5 mm]	2.07 in [52.5 mm]	3.44 in [87.5 mm]	2.7 in [69 mm]	4.53 in [115 mm]
A2	0.5 in [12.7 mm]	1.5 in [38.1 mm]	1.5 in [38.1 mm]	2.07 in [52.5 mm]	2.07 in [52.5 mm]	2.7 in [69 mm]	2.7 in [69 mm]
B	1.97 in [50 mm]			2.65 in [67.4 mm]		2.6 in [64.9 mm]	
C	9.45 in [240 mm]			12.59 in [319.8 mm]		14.9 in [377.8 mm]	
D	0.52 in [13.2 mm]			1.15 in [29.2 mm]		1.3 in [33.2 mm]	

	3VA6			
	3VA61 / 62		3VA63 / 64	
	3P	4P	3P	4P
A	4.1 in [105 mm]	5.5 in [140 mm]	5.4 in [138 mm]	7.2 in [184 mm]
A1	2.07 in [52.5 mm]	3.44 in [87.5 mm]	2.7 in [69 mm]	4.53 in [115 mm]
A2	2.07 in [52.5 mm]	2.07 in [52.5 mm]	2.7 in [69 mm]	2.7 in [69 mm]
B	2.65 in [67.4 mm]		2.6 in [64.9 mm]	

	3VA6			
	3VA61 / 62		3VA63 / 64	
	3P	4P	3P	4P
C	13.11 in [333 mm]		14.9 in [377.8 mm]	
D	1.15 in [29.2 mm]		1.3 in [33.2 mm]	

Broadened insulating plate



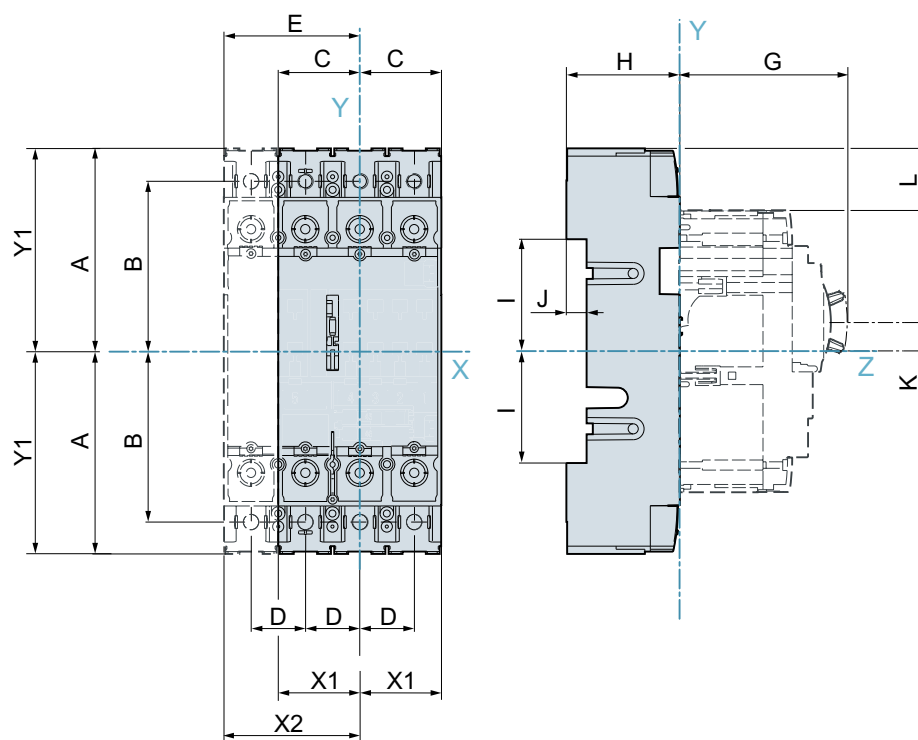
	3VA5		3VA6	
	3VA53 / 54		3VA63 / 64	
	3P	4P	3P	4P
A	8.3 in [212 mm]	11.1 in [282 mm]	8.3 in [212 mm]	11.1 in [282 mm]
A1	4.17 in [106 mm]	6.94 in [176 mm]	4.17 in [106 mm]	6.94 in [176 mm]
A2	4.17 in [106 mm]	4.17 in [106 mm]	4.17 in [106 mm]	4.17 in [106 mm]
B	5.8 in [147.5 mm]		5.8 in [147.5 mm]	

	3VA5		3VA6	
	3VA53 / 54		3VA63 / 64	
	3P	4P	3P	4P
C	21.4 in [543 mm]		21.4 in [543 mm]	
D	1.5 in [37.3 mm]		1.5 in [37.3 mm]	

6.2.2.2 Plug-in and draw-out units

Plug-in socket

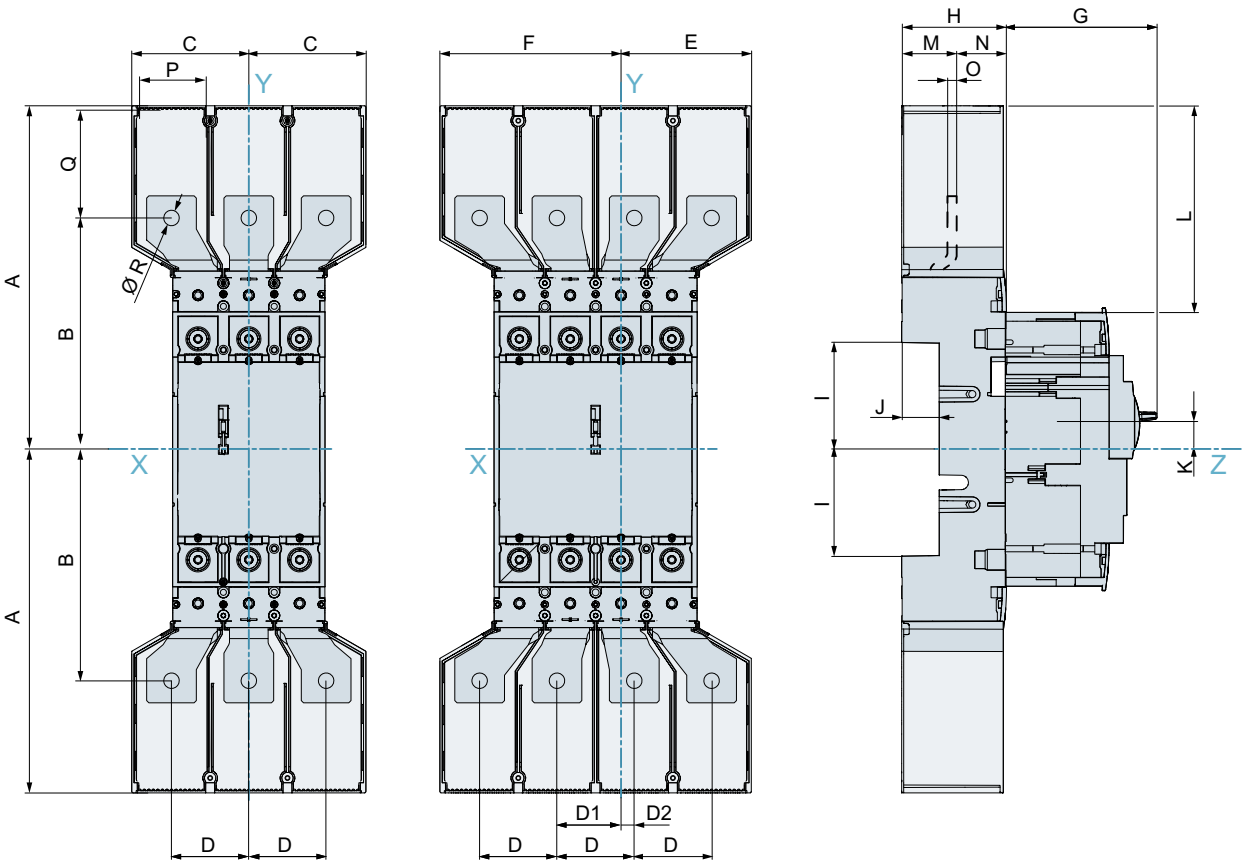
3VA61/62 150 / 250 A and 3VA63 400 A



	3VA6	
	3VA61/62 150 / 250 A	3VA63 400 A
A	5.14 in [130.5 mm]	6.44 in [163.5 mm]
B	4.33 in [110 mm]	5.49 in [139.5 mm]
C	2.06 in [52.2 mm]	2.72 in [69 mm]
D	1.38 in [35 mm]	1.81 in [46 mm]
E	3.44 in [87.5 mm]	4.53 in [115 mm]
F	4.21 in [107 mm]	5.41 in [137.5 mm]
G	2.87 in [73 mm]	3.70 in [94 mm]
H	2.83 in [72 mm]	3.78 in [96.1 mm]

	3VA6	
	3VA61/62 150 / 250 A	3VA63 400 A
I	0.51 in [13 mm]	1.34 in [34 mm]
J	0.81 in [20.5 mm]	1.02 in [26 mm]
K	1.57 in [40 mm]	1.56 in [39.5 mm]
X1	2.06 in [52.2 mm]	2.72 in [69 mm]
X2	3.44 in [87.5 mm]	4.53 in [115 mm]
Y1	5.14 in [130.5 mm]	6.44 in [163.5 mm]

3VA64 600 A

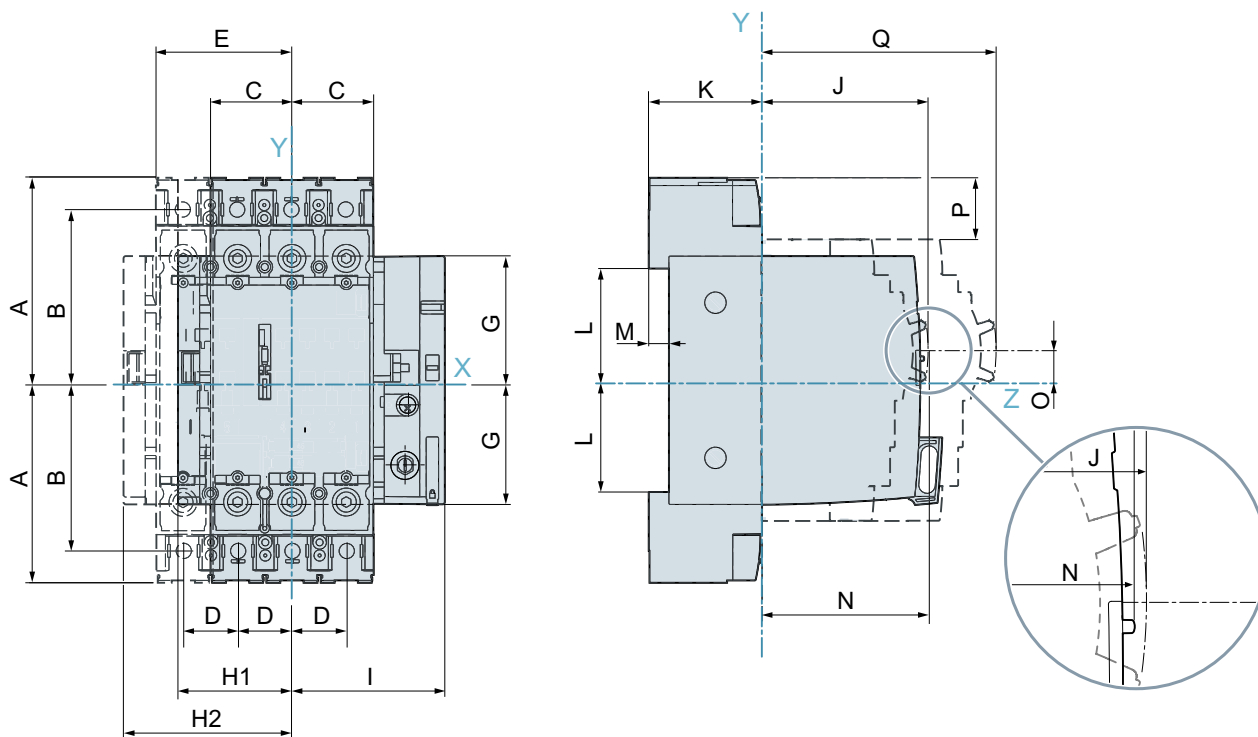


	3VA6
	3VA64 600 A
A	12.25 in [311.1 mm]
B	11.44 in [290.5 mm]
C	4.17 in [106 mm]
D	2.76 in [70 mm]
D1	2.26 in [58 mm]
D2	0.47 in [12 mm]

	3VA6
	3VA64
	600 A
E	4.65 in [118 mm]
F	6.46 in [164 mm]
G	5.41 in [137.5 mm]
H	3.70 in [94 mm]
I	3.78 in [96.1 mm]
J	1.34 in [34 mm]
K	1.02 in [26 mm]
L	7.37 in [187.1 mm]
M	1.93 in [49 mm]
N	1.77 in [45 mm]
O	0.31 in [8 mm]
P	2.48 in [63 mm]
Q	3.91 in [99.4 mm]
R	0.55 in [14 mm]

Withdrawable unit

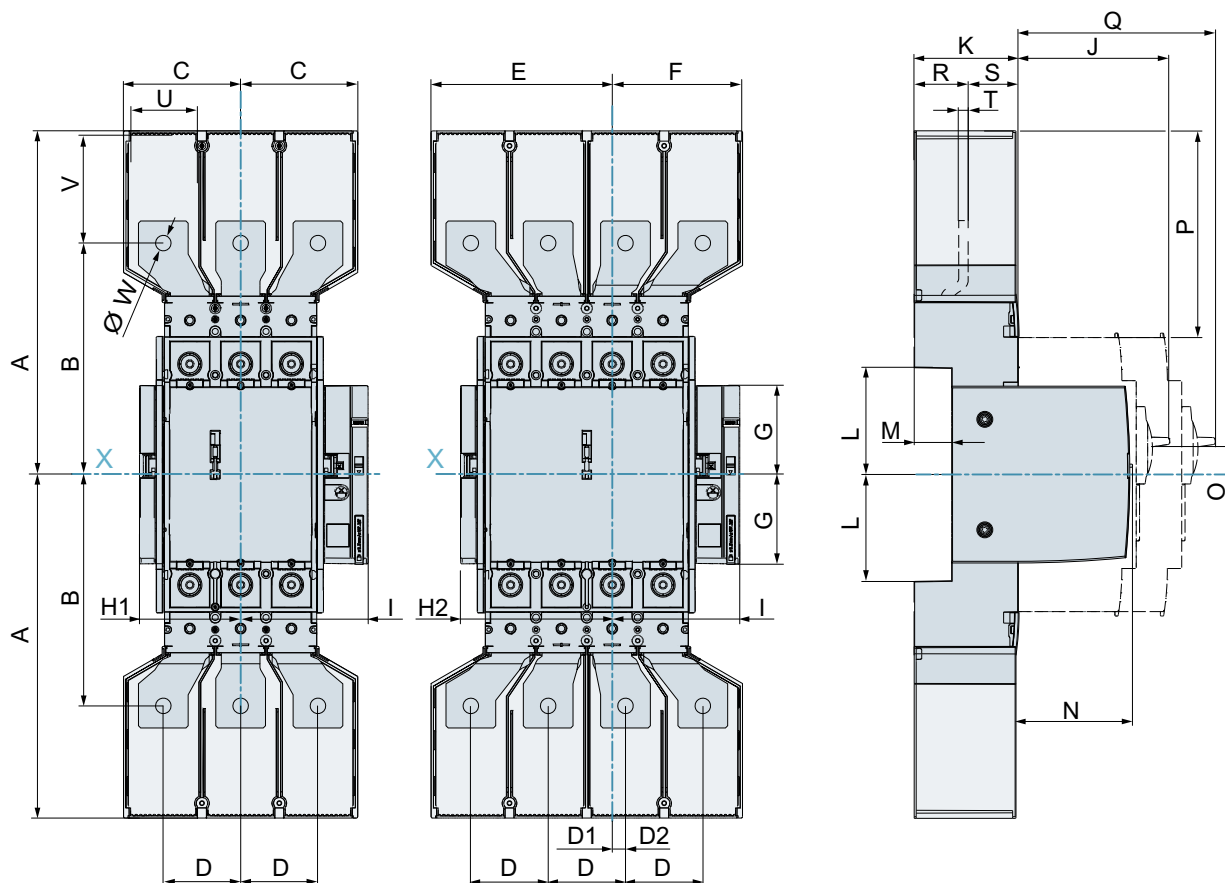
3VA61/62 150 / 250 A and 3VA63 400 A



6.2 Dimensional drawings

	3VA6	
	3VA61/62 150 / 250 A	3VA63 400 A
A	5.14 in [130.5 mm]	6.44 in [163.5 mm]
B	4.33 in [110 mm]	5.49 in [139.5 mm]
C	2.06 in [52.2 mm]	2.72 in [69 mm]
D	1.38 in [35 mm]	1.81 in [46 mm]
E	3.44 in [87.5 mm]	4.53 in [115 mm]
G	3.15 in [80 mm]	3.15 in [80 mm]
H1	2.91 in [73.9 mm]	3.54 in [90 mm]
H2	4.27 in [108.5 mm]	5.35 in [136 mm]
I	3.88 in [98.5 mm]	4.53 in [115 mm]
J	4.21 in [107 mm]	5.41 in [137.5 mm]
K	2.87 in [73 mm]	3.70 in [94 mm]
L	2.83 in [72 mm]	3.78 in [96.1 mm]
M	0.51 in [13 mm]	1.34 in [34 mm]
N	4.11 in [104.5 mm]	4.11 in [104.5 mm]
O	0.81 in [20.5 mm]	1.02 in [26 mm]
P	1.24 in [31.5 mm]	1.56 in [39.5 mm]
Q	5.87 in [149 mm]	7.07 in [179.5 mm]

3VA64 600 A

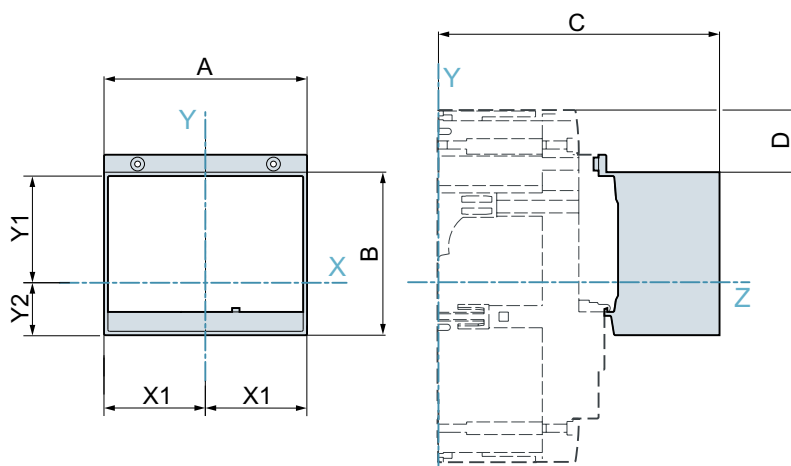


	3VA6 3VA64 600 A
A	12.25 in [311.1 mm]
B	8.25 in [209.5 mm]
C	4.17 in [106 mm]
D	2.76 in [70 mm]
D1	2.26 in [58 mm]
D2	0.47 in [12 mm]
E	6.46 in [164 mm]
F	4.65 in [118 mm]
G	3.15 in [80 mm]
H1	5.35 in [136 mm]
H2	7.17 in [182 mm]
I	4.53 in [115 mm]
J	5.41 in [137.5 mm]
K	3.70 in [94 mm]
L	3.78 in [96.1 mm]

6.2 Dimensional drawings

	3VA6
	3VA64 600 A
M	1.34 in [34 mm]
N	4.11 in [104.5 mm]
O	1.02 in [26 mm]
P	7.37 in [187.1 mm]
Q	7.07 in [179.5 mm]
R	1.93 in [49 mm]
S	1.77 in [45 mm]
T	0.31 in [8 mm]
U	2.48 in [63 mm]
V	3.91 in [99.4 mm]
W	0.55 in [14 mm]

Door feedthrough

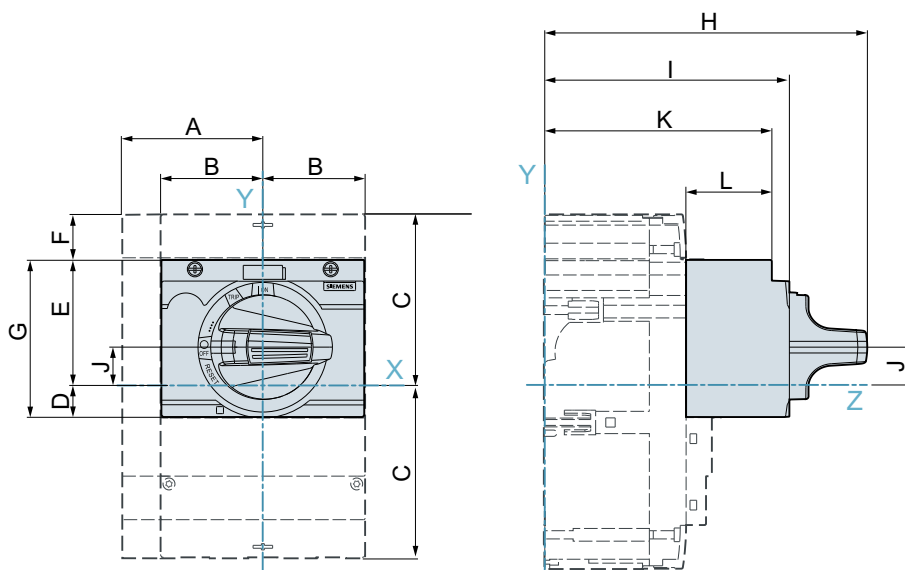


	3VA6	
	3VA61/62 150 / 250 A	3VA63/64 400 / 600 A
A	4.12 in [104.6 mm]	5.42 in [137.6 mm]
B	3.31 in [84 mm]	4.27 in [108.5 mm]
C	5.72 in [145.3 mm]	6.77 in [172 mm]
D	1.24 in [31.5 mm]	2.01 in [51 mm]
X1	2.06 in [52.3 mm]	2.71 in [68.8 mm]
Y1	2.66 in [67.5 mm]	2.87 in [73 mm]
Y2	0.65 in [16.5 mm]	0.87 in [22 mm]

6.2.2.3 Manual operators

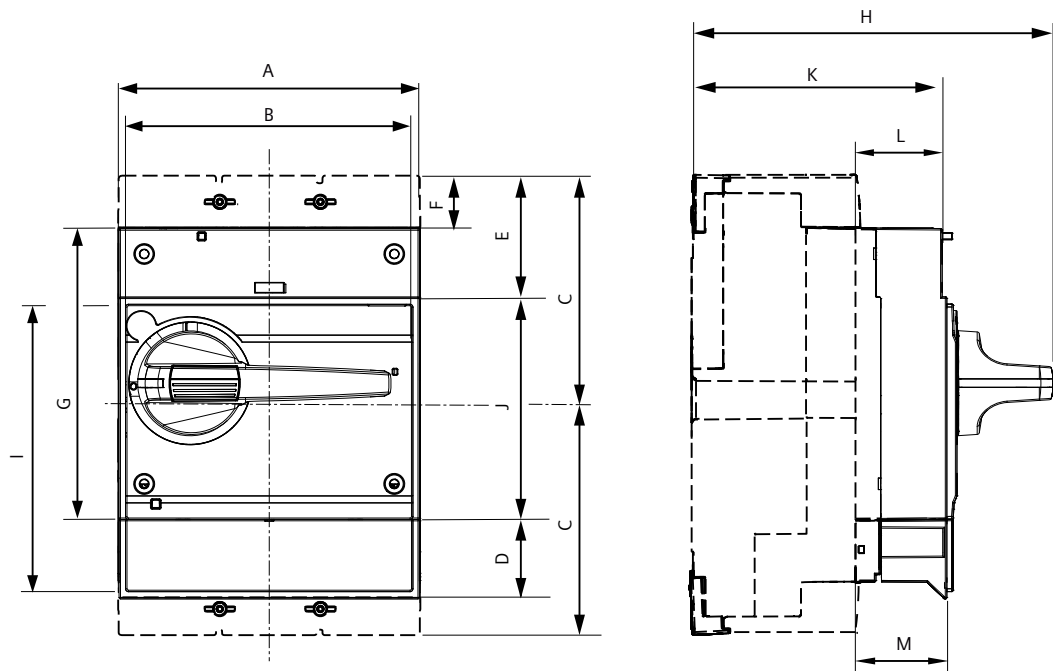
Front mounted rotary operator

3VA51-3VA54 / 3VA61-3VA64



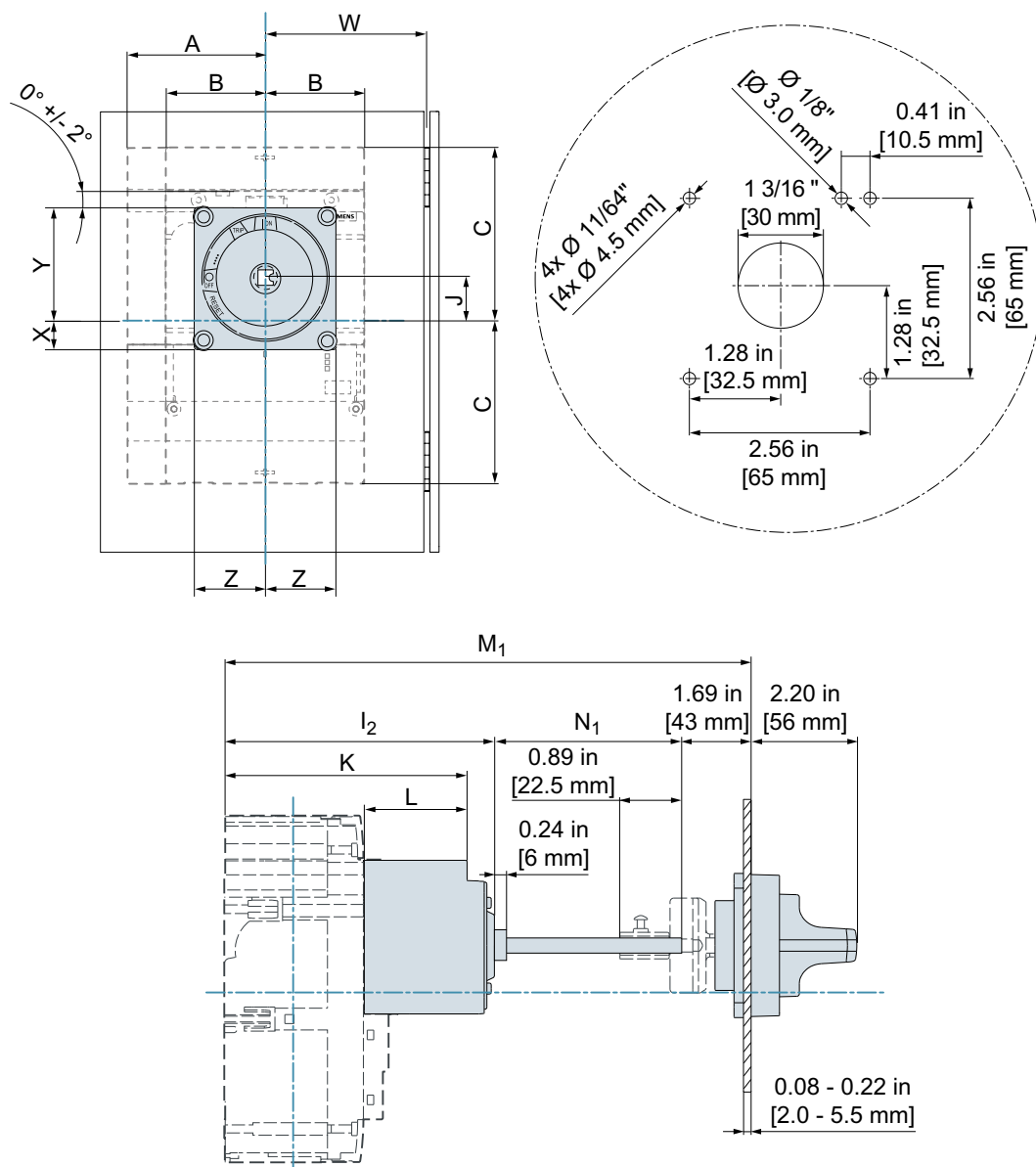
	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
A	2.50 in [63.5 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]
B	1.50 in [38.1 mm]	2.07 in [52.5 mm]	2.72 in [69 mm]	2.07 in [52.5 mm]	2.72 in [69 mm]
C	2.76 in [70 mm]	3.64 in [92.5 mm]	4.88 in [124 mm]	3.90 in [99 mm]	4.88 in [124 mm]
D	0.89 in [22.6 mm]	0.77 in [19.6 mm]	0.33 in [8.5 mm]	0.52 in [13.1 mm]	0.33 in [8.5 mm]
E	1.87 in [47.4 mm]	2.42 in [61.4 mm]	3.34 in [84.9 mm]	2.67 in [67.9 mm]	3.34 in [84.9 mm]
F	0.89 in [22.6 mm]	1.22 in [31.1 mm]	1.54 in [39 mm]	1.22 in [31.1 mm]	1.54 in [39 mm]
G	1.77 in [45 mm]	2.76 in [70 mm]	2.76 in [70 mm]	2.76 in [70 mm]	2.76 in [70 mm]
H	6.52 in [165.5 mm]	7.13 in [181 mm]	7.87 in [200 mm]	7.13 in [181 mm]	7.87 in [200 mm]
I	4.85 in [123.1 mm]	5.36 in [136.1 mm]	6.30 in [160 mm]	5.36 in [136.1 mm]	6.30 in [160 mm]
J	0.00 in [0 mm]	0.65 in [16.4 mm]	1.08 in [27.5 mm]	0.90 in [22.9 mm]	1.08 in [27.5 mm]
K	4.63 in [117.5 mm]	5.00 in [127 mm]	5.94 in [151 mm]	5.00 in [127 mm]	5.94 in [151 mm]
L	1.81 in [46 mm]	2.13 in [54 mm]	2.24 in [57 mm]	2.13 in [54 mm]	2.24 in [57 mm]

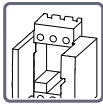
3VA55 / 3VA65-3VA66



	3VA5	3VA6
	3VA55	3VA65 / 66
A	8.3 in [210 mm]	
B	7.9 in [200 mm]	
C	6.3 in [160 mm]	
D	2.2 in [56 mm]	
E	3.3 in [85 mm]	
F	1.5 in [37 mm]	
G	8 in [203 mm]	
H	9.1 in [230 mm]	
I	7.9 in [200 mm]	
J	6.1 in [155.2 mm]	
K	6.3 in [159 mm]	
L	2.2 in [55 mm]	
M	2.3 in [58 mm]	

Door mounted rotary operator

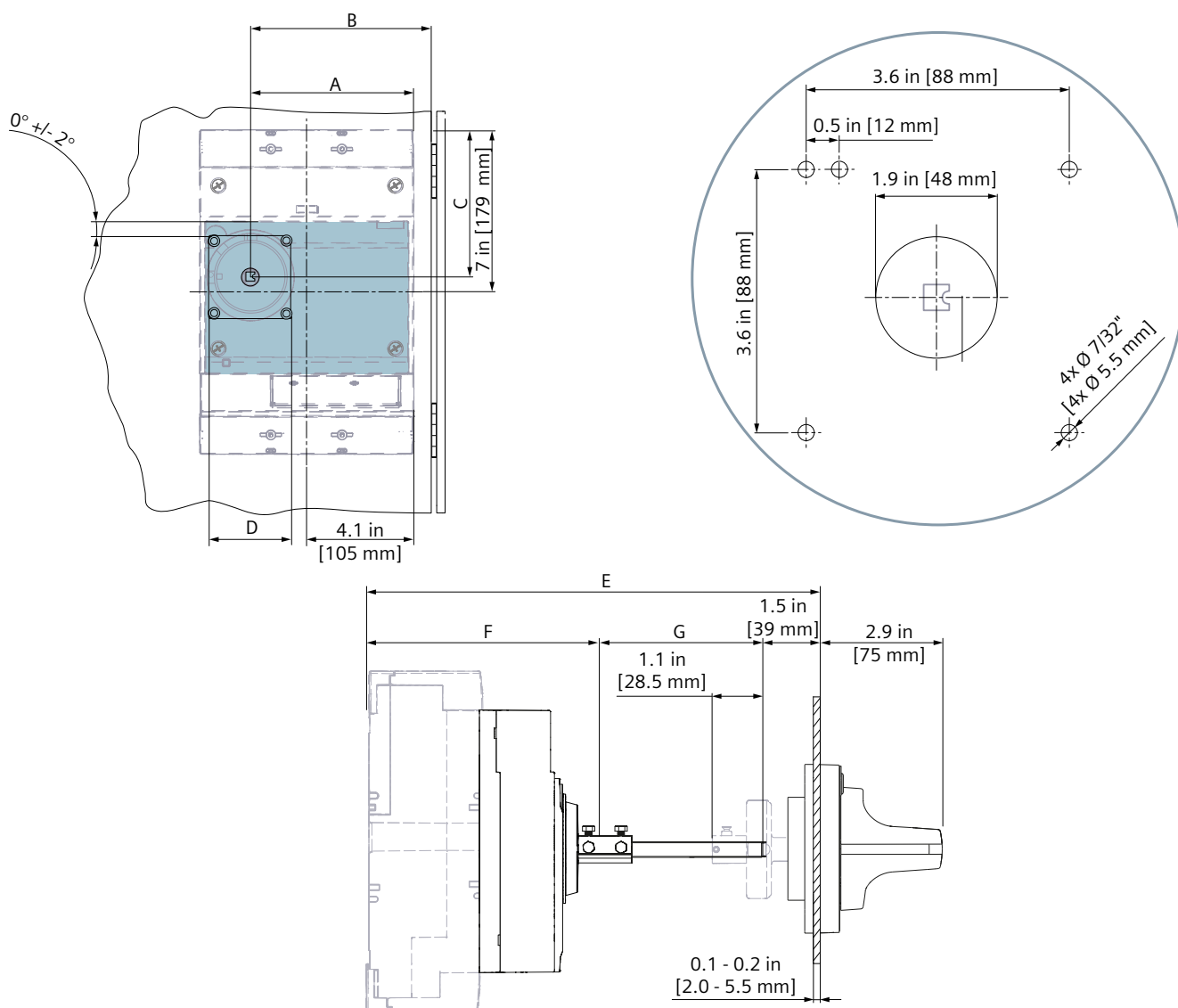


	3VA5			3VA6		 3VA5 / 3VA6 + 3VA9487-0GB10 1)
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64	
A	2.50 in [63.5 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]	

6.2 Dimensional drawings

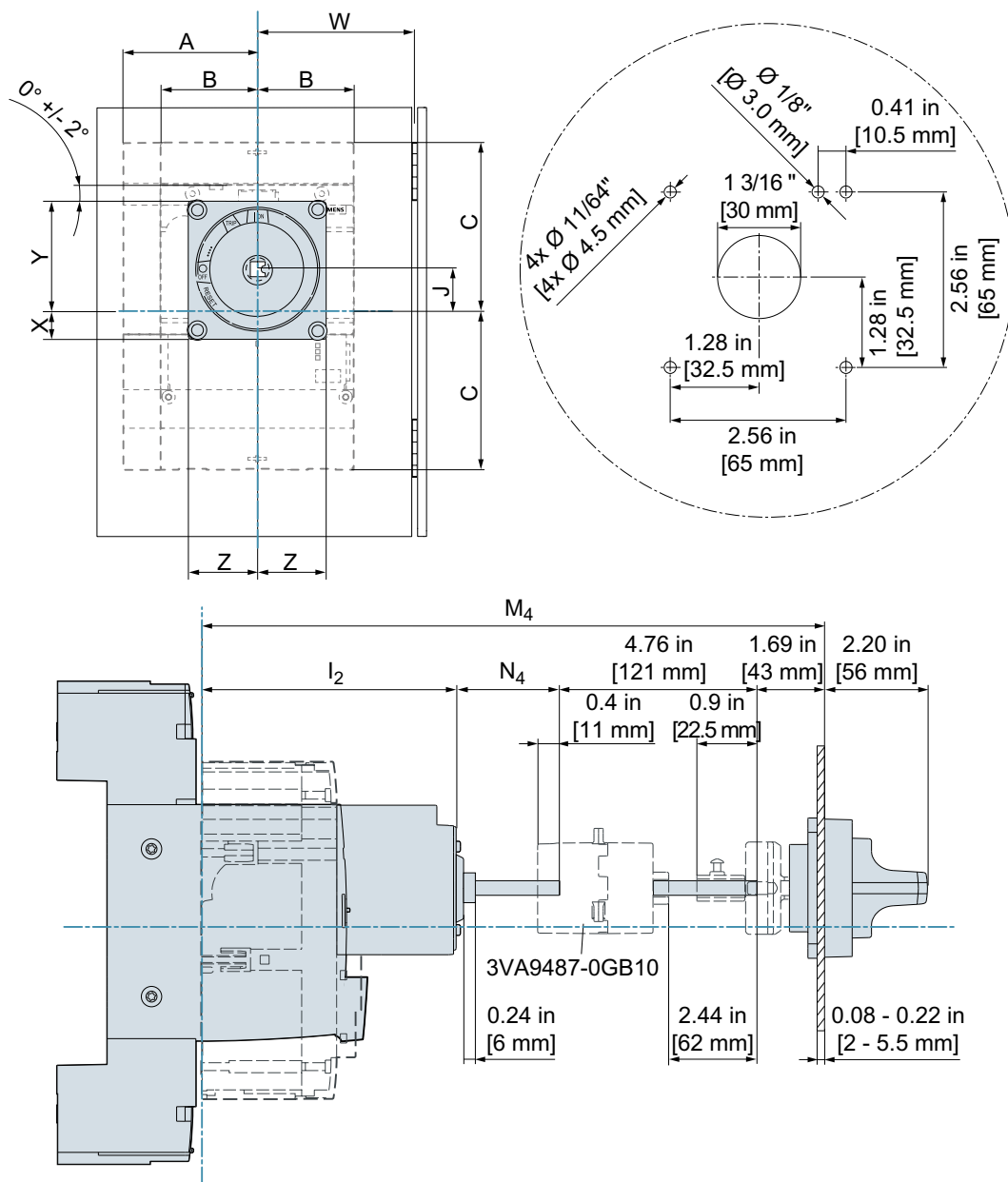
B	1.50 in [38.1 mm]	2.07 in [52.5 mm]	2.72 in [69 mm]	2.07 in [52.5 mm]	2.72 in [69 mm]	
C	2.76 in [70 mm]	2.64 in [92.5 mm]	4.88 in [124 mm]	3.90 in [99 mm]	4.88 in [124 mm]	
I₂	4.94 in [125.6 mm]	5.56 in [141.1 mm]	6.50 in [165 mm]	5.56 in [141.1 mm]	6.50 in [165 mm]	
J	0.00 in [0 mm]	0.65 in [16.40 mm]	1.08 in [27.5 mm]	0.90 in [22.9 mm]	1.08 in [27.5 mm]	
K	4.63 in [117.5 mm]	5.0 in [127 mm]	5.94 in [151 mm]	5.0 in [127 mm]	5.94 in [151 mm]	
L	1.81 in [46 mm]	2.13 in [54 mm]	2.24 in [57 mm]	2.13 in [54 mm]	2.24 in [57 mm]	
M_{1min}	7.78 in [197.6 mm]	8.39 in [213.1 mm]	9.33 in [237 mm]	8.39 in [213.1 mm]	9.33 in [237 mm]	
M_{1max}	17.58 in [446.5 mm]	18.11 in [460 mm]	19.02 in [483 mm]	18.11 in [460 mm]	19.02 in [483 mm]	
N₁	M ₁ - I ₂ - 1.69 in [43 mm]			M ₁ - I ₂ - 1.69 in [43 mm]		
W	≥3.15 in [≥80 mm]			≥3.15 in [≥80 mm]		≥ 9.84 in [≥250 mm]
X	1.50 in [38 mm]	0.85 in [21.6 mm]	0.41 in [10.5 mm]	0.59 in [15.1 mm]	0.41 in [10.5 mm]	
Y	1.50 in [38 mm]	2.14 in [54.4 mm]	2.58 in [65.5 mm]	2.40 in [60.9 mm]	2.58 in [65.5 mm]	
Z	1.50 in [38 mm]			1.50 in [38 mm]		

¹⁾ Variable depth adapter



3VA55 / 65 / 66	
A	6.3 in [160 mm]
B	≥ 7.9 in [200.7 mm]
C	5.7 in [145 mm]
D	3.9 in [100 mm]
E _{min}	11.4 in [290 mm]
E _{max}	21.9 in [555 mm]
F	7.8 in [198 mm]
G	E - 9.3 in [237 mm]

Door mounted rotary operator with variable depth adapter (3VA9487-0GB10)



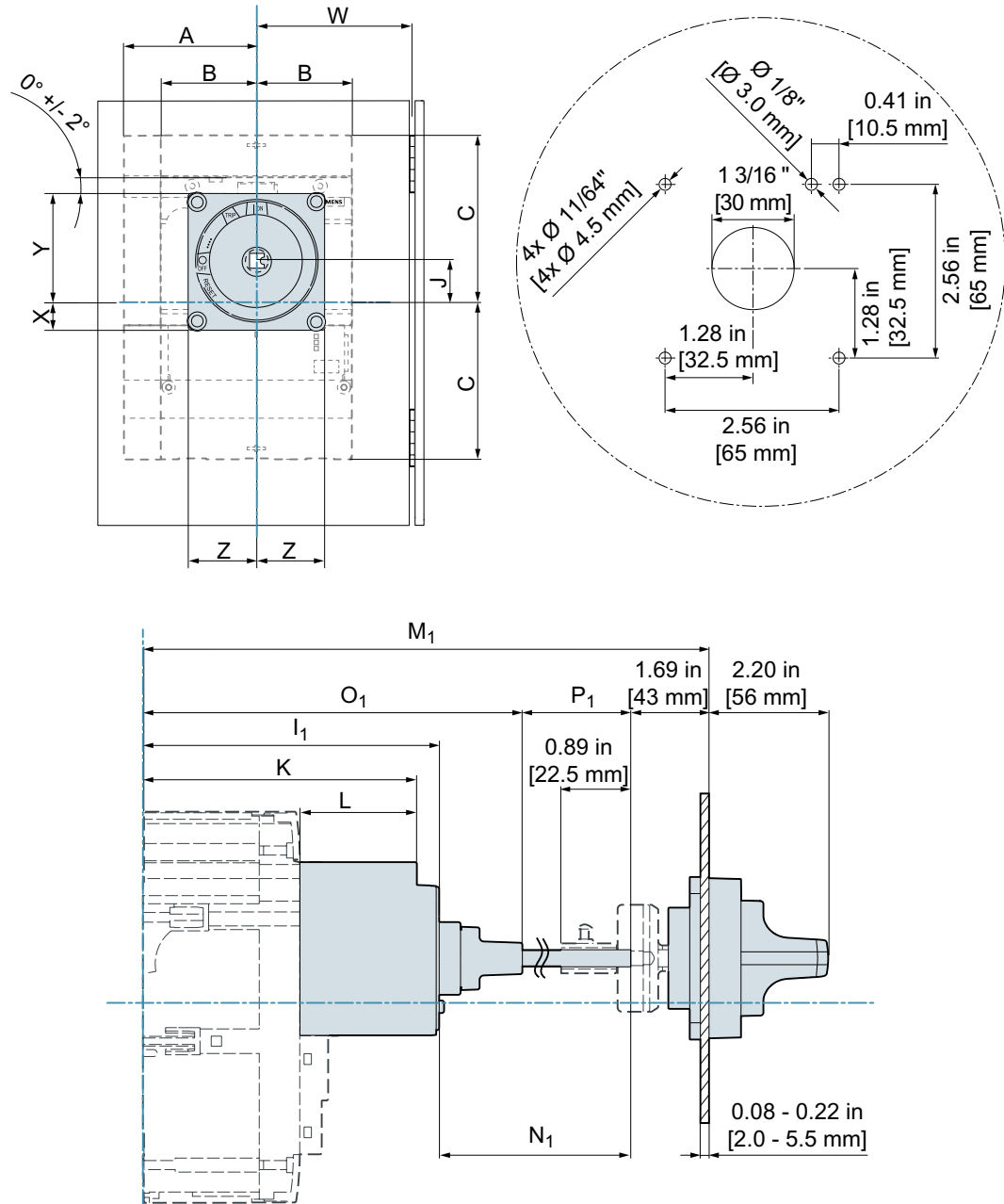
	3VA6	
	3VA61/62 150 / 250 A	3VA63/64 400 / 600 A
A	3.44 in [87.5 mm]	4.53 in [115 mm]
B	2.07 in [52.5 mm]	2.72 in [69 mm]
C	3.90 in [99 mm]	4.88 in [124 mm]
I ₂	5.56 in [141.1 mm]	6.50 in [165 mm]
J	0.90 in [22.9 mm]	1.08 in [27.5 mm]
M _{4min}	13.35 in [334.1 mm]	14.09 in [358 mm]

	3VA6	
	3VA61/62 150 / 250 A	3VA63/64 400 / 600 A
M_{4max}	22.95 in [583 mm]	23.82 in [605 mm]
N₄	M ₄ - l ₂ - 6.46 in [146 mm]	
W	≥9.84 in [≥250 mm]	
X	0.59 in [15.1 mm]	0.41 in [10.5 mm]
Y	2.40 in [60.9 mm]	2.58 in [65.5 mm]
Z	1.50 in [38 mm]	

Door mounted rotary operator with supplementary handle

Supplementary handle for door mounted rotary operator

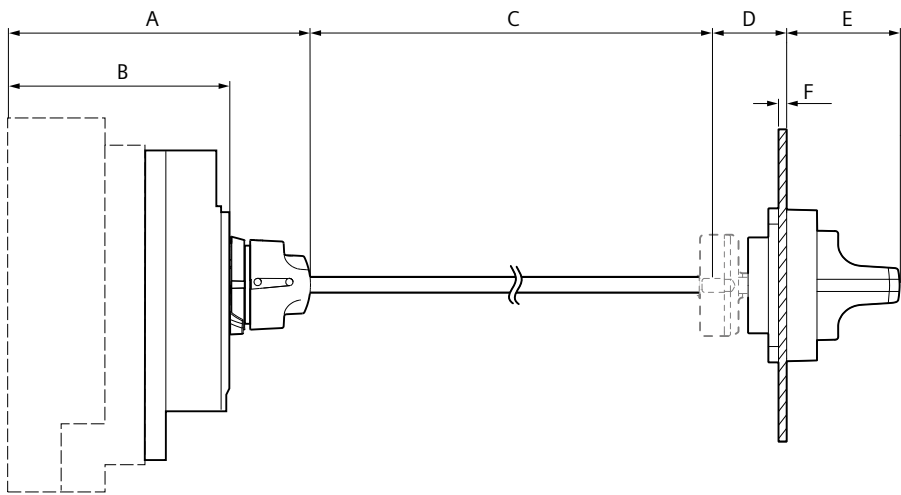
Up to 3VA5 / 3VA6 up to 600 A



	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
A	2.50 in [63.5 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]
B	1.50 in 38.1 mm	2.07 in [52.5 mm]	2.72 in [69 mm]	2.07 in [52.5 mm]	2.72 in [69 mm]
C	2.76 in [70 mm]	2.64 in [92.5 mm]	4.88 in [124 mm]	3.90 in [99 mm]	4.88 in [124 mm]
I₁	4.9 in [123.1 mm]	5.36 in [136.1 mm]	6.30 in [160 mm]	5.36 in [136.1 mm]	6.30 in [160 mm]
J	0.00 in [0 mm]	0.65 in [16.40 mm]	1.08 in [27.5 mm]	0.90 in [22.9 mm]	1.08 in [27.5 mm]
K	4.63 in [117.5 mm]	5.0 in [127 mm]	5.94 in [151 mm]	5.0 in [127 mm]	5.94 in [151 mm]
L	1.81 in [46 mm]	2.13 in [54 mm]	2.24 in [57 mm]	2.13 in [54 mm]	2.24 in [57 mm]
M_{1min}	7.78 in [197.6 mm]	8.39 in [213.1 mm]	9.33 in [237 mm]	8.39 in [213.1 mm]	9.33 in [237 mm]
M_{1max}	17.58 in [446.5 mm]	18.11 in [460 mm]	19.02 in [483 mm]	18.11 in [460 mm]	19.02 in [483 mm]
O₁	6.48 in [164.5 mm]	6.97 in [177 mm]	7.91 in [201 mm]	6.97 in [177 mm]	7.91 in [201 mm]
P_{1min}	0.91 in [23 mm]				
P_{1max}	9.33 in [237 mm]	9.37 in [238 mm]			
W	≥3.15 in [≥80 mm]			≥3.15 in [≥80 mm]	
X	1.50 in [38 mm]	0.85 in [21.6 mm]	0.41 in [10.5 mm]	0.59 in [15.1 mm]	0.41 in [10.5 mm]
Y	1.50 in [38 mm]	2.14 in [54.4 mm]	2.58 in [65.5 mm]	2.40 in [60.9 mm]	2.58 in [65.5 mm]
Z	1.50 in [38 mm]			1.50 in [38 mm]	

3VA55 and 3VA65 / 66

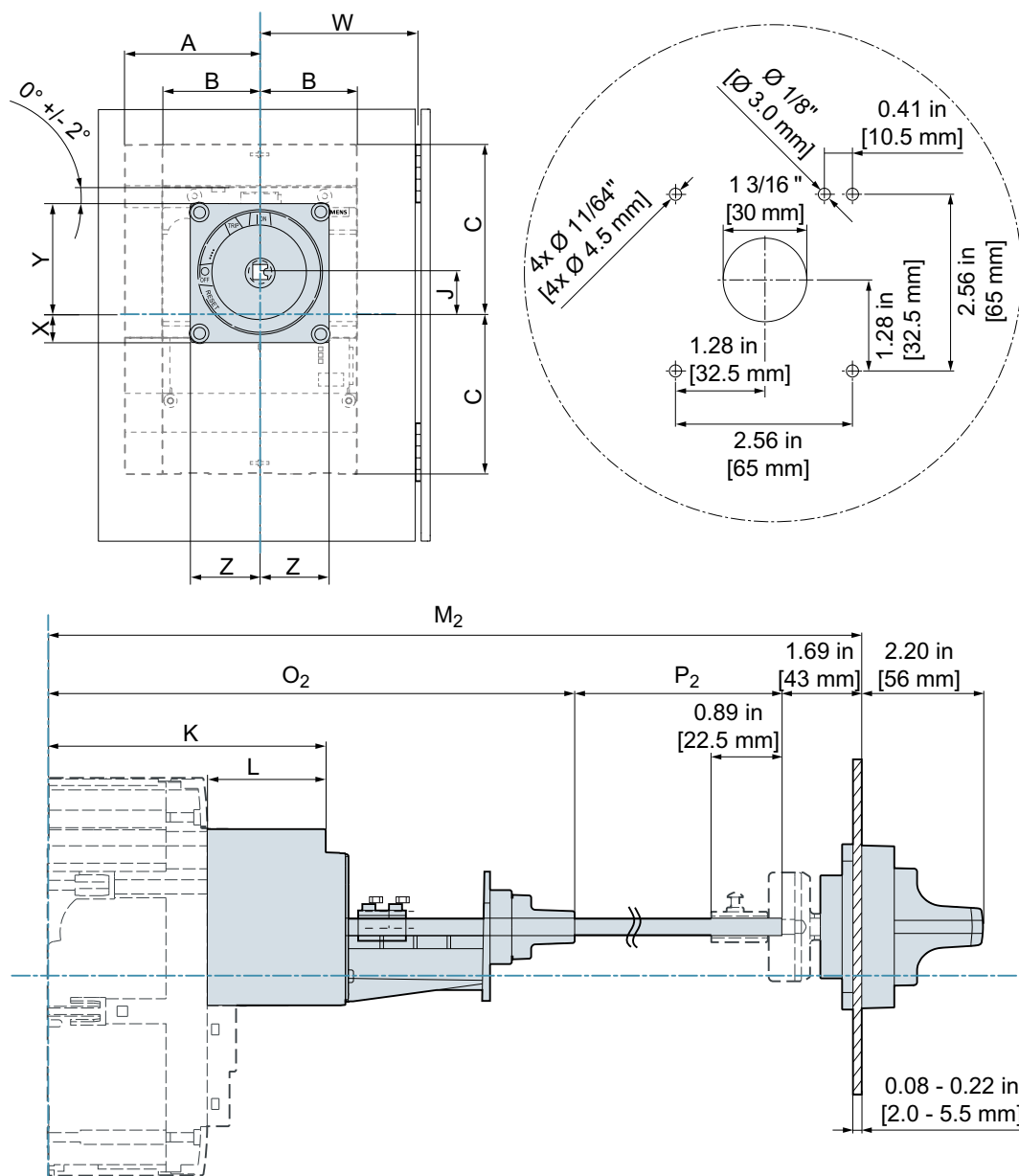
6.2 Dimensional drawings



	3VA9677-0GC01 3VA9677-0GC05
A	9.06 in [230 mm]
B	6.63 in [168.5 mm]
C	1.18 - 10.31 in [30 - 262 mm]
D	1.69 in [43 mm]
E	2.20 in [56 mm]
F	0.08 - 0.22 in [2 - 5.5 mm]

Door mounted rotary operator with supplementary handle and shaft support

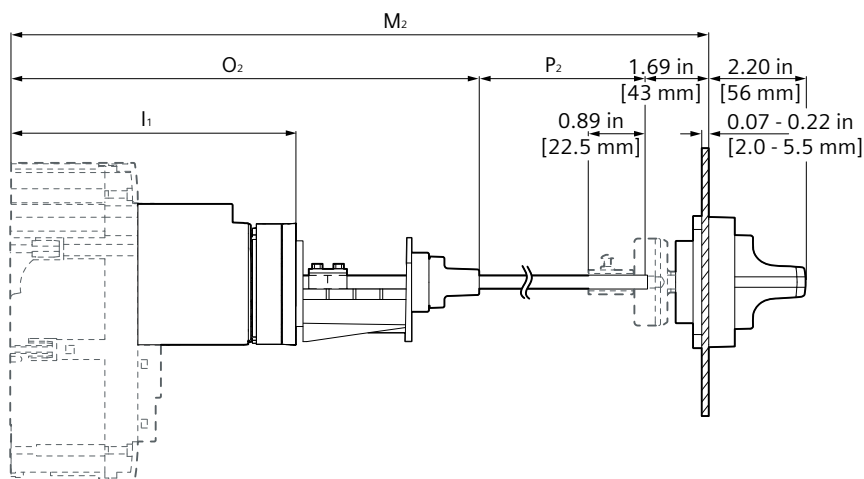
Up to 3VA5 / 3VA6 up to 600 A



	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
A	2.50 in [63.5 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]
B	1.50 in [38.1 mm]	2.07 in [52.5 mm]	2.72 in [69 mm]	2.07 in [52.5 mm]	2.72 in [69 mm]
C	2.76 in [70 mm]	2.64 in [92.5 mm]	4.88 in [124 mm]	3.90 in [99 mm]	4.88 in [124 mm]
I ₁	4.9 in [123.1 mm]	5.36 in [136.1 mm]	6.30 in [160 mm]	5.36 in [136.1 mm]	6.30 in [160 mm]
J	0.00 in [0 mm]	0.65 in [16.40 mm]	1.08 in [27.5 mm]	0.90 in [22.9 mm]	1.08 in [27.5 mm]
K	4.63 in [117.5 mm]	5.0 in [127 mm]	5.94 in [151 mm]	5.0 in [127 mm]	5.94 in [151 mm]

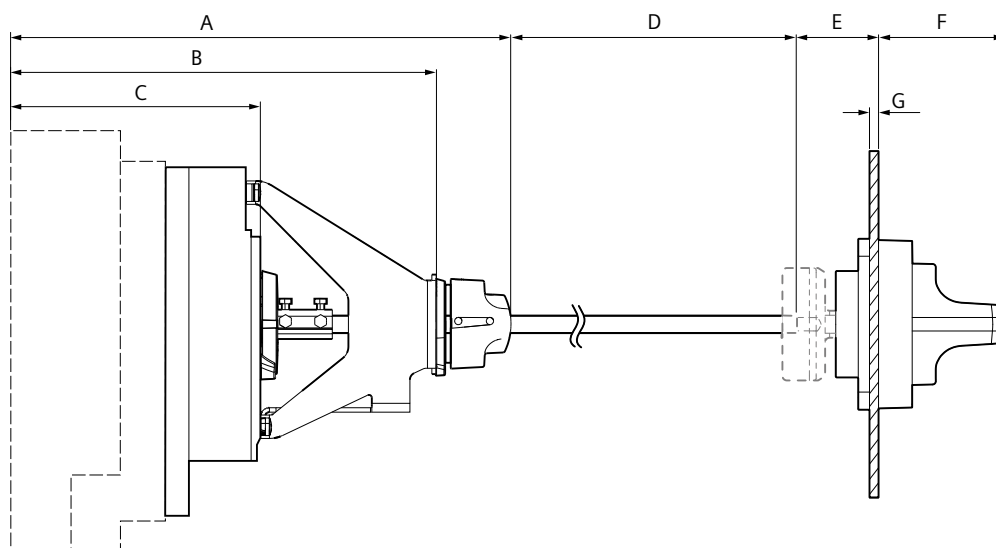
6.2 Dimensional drawings

	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
L	1.81 in [46 mm]	2.13 in [54 mm]	2.24 in [57 mm]	2.13 in [54 mm]	2.24 in [57 mm]
M_{2min}	11.83 in [300.5 mm]	12.32 in [313 mm]	13.27 in [337 mm]	12.32 in [313 mm]	13.27 in [337 mm]
M_{2max}	31.12 in [790.5 mm]	31.61 in [803 mm]	32.60 in [828 mm]	31.61 in [803 mm]	32.60 in [828 mm]
O₂	9.11 in [231.5 mm]	9.61 in [244 mm]	10.55 in [268 mm]	9.61 in [244 mm]	10.55 in [268 mm]
P_{2min}	0.91 in [23 mm]				
P_{2max}	20.31 in [516.00 mm]				
W	≥3.15 in [≥80 mm]			≥3.15 in [≥80 mm]	
X	1.50 in [38 mm]	0.85 in [21.6 mm]	0.41 in [10.5 mm]	0.59 in [15.1 mm]	0.41 in [10.5 mm]
Y	1.50 in [38 mm]	2.14 in [54.4 mm]	2.58 in [65.5 mm]	2.40 in [60.9 mm]	2.58 in [65.5 mm]
Z	1.50 in [38 mm]			1.50 in [38 mm]	



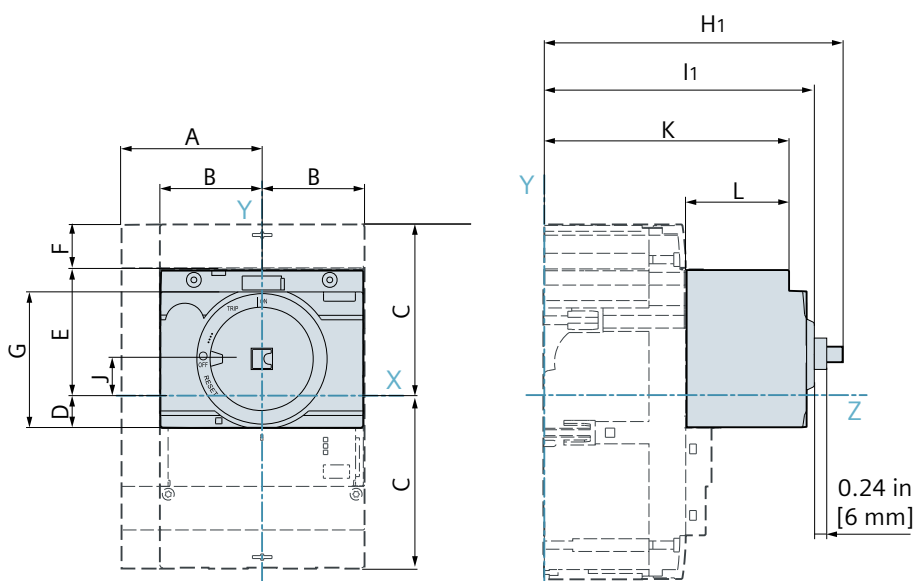
	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
I₁	5.63 in [142.9 mm]	6.61 in [168.1 mm]	7.43 in [188.8 mm]	6.61 in [168.1 mm]	7.55 in [192.0 mm]
M_{2min}	12.39 in [314.8 mm]	13.14 in [333.8 mm]	14.08 in [357.8 mm]	13.14 in [333.8 mm]	14.08 in [357.8 mm]
M_{2max}	31.80 in [807.8 mm]	32.55 in [826.8 mm]	33.49 in [850.8 mm]	32.55 in [826.8 mm]	33.49 in [850.8 mm]
O₂	9.79 in [248.8 mm]	10.54 in [267.8 mm]	11.48 in [291.8 mm]	10.54 in [267.8 mm]	11.48 in [291.8 mm]
P_{2min}	0.91 in [23 mm]				
P_{2max}	20.31 in [516 mm]				

3VA55 and 3VA65 / 66



	3VA9677-0GA80 3VA9677-0GC01 3VA9677-0GC05	3VA9877-0GA80 3VA9877-0GC01 3VA9877-0GC05
A	13.62 in [346 mm]	16.38 in [416 mm]
B	11.36 in [288.5 mm]	14.17 in [360 mm]
C	6.63 in [168.5 mm]	9.29 in [236 mm]
D	1.18 - 17.56 in [30 - 446 mm]	1.18 - 17.56 in [30 - 446 mm]
E	1.69 in [43 mm]	1.69 in [43 mm]
F	2.2 in [56 mm]	2.2 in [56 mm]
G	0.08 in [0.22 mm]	0.08 in [0.22 mm]

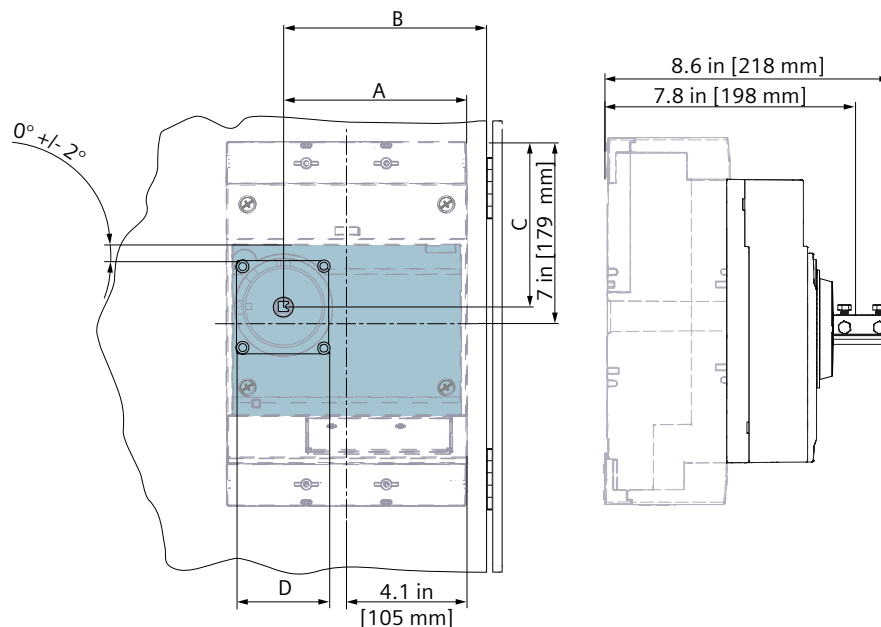
Rotary operator with shaft stub



6.2 Dimensional drawings

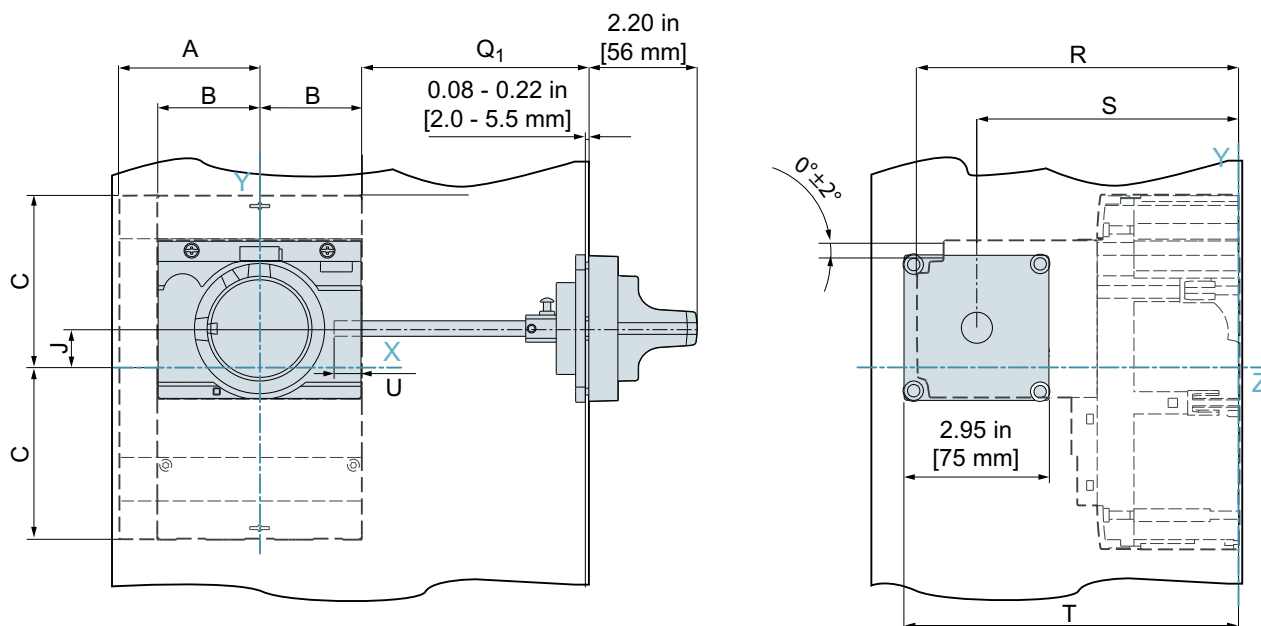
	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
A	2.50 in [63.5 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]
B	1.5 in [38.1 mm]	2.07 in [52.5 mm]	2.72 in [69 mm]	2.07 in [52.5 mm]	2.72 in [69 mm]
C	2.76 in [70 mm]	3.64 in [92.5 mm]	4.88 in [124 mm]	3.90 in [90 mm]	4.88 in [124 mm]
D	0.89 in [22.6 mm]	0.77 in [19.6 mm]	0.33 in [8.5 mm]	0.52 in [13.1 mm]	0.33 in [8.5 mm]
E	1.87 in [47.4 mm]	2.42 in [61.4 mm]	3.34 in [84.9 mm]	2.67 in [67.9 mm]	3.34 in [84.9 mm]
F	0.9 in [23 mm]	1.2 in [31 mm]	1.5 in [39 mm]	1.2 in [31 mm]	1.5 in [39 mm]
G	1.8 in [45 mm]	2.8 in [70 mm]			
H ₁	5.6 in [141 mm]	6.3 in [160 mm]	7.3 in [185 mm]	6.3 in [160 mm]	7.3 in [185 mm]
I ₁	4.65 in [118 mm]	5.4 in [137 mm]	6.3 in [161 mm]	5.4 in [137 mm]	6.3 in [161 mm]
J	0.00 in [0 mm]	0.65 in [16.4 mm]	1.08 in [27.5 mm]	0.90 in [22.9 mm]	1.08 in [27.5 mm]
K	4.63 in [117.5 mm]	5.00 in [127 mm]	5.94 in [151 mm]	5.00 in [127 mm]	5.94 in [151 mm]
L	1.81 in [46 mm]	2.13 in [54 mm]	2.24 in [57 mm]	2.13 in [54 mm]	2.24 in [57 mm]

3VA55 / 65 / 66



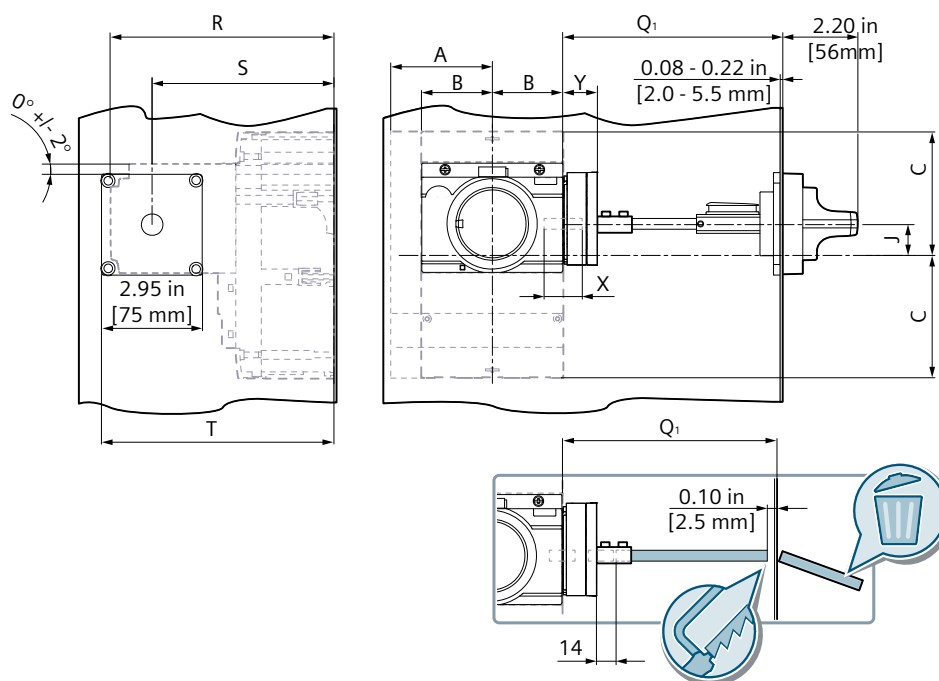
	3VA5	3VA6
	3VA55	3VA65 / 66
A	6.3 in [160 mm]	
B	≥7.9 in [200.7 mm]	
C	5.7 in [145 mm]	
D	3.9 in [100 mm]	

Side wall mounted rotary operator



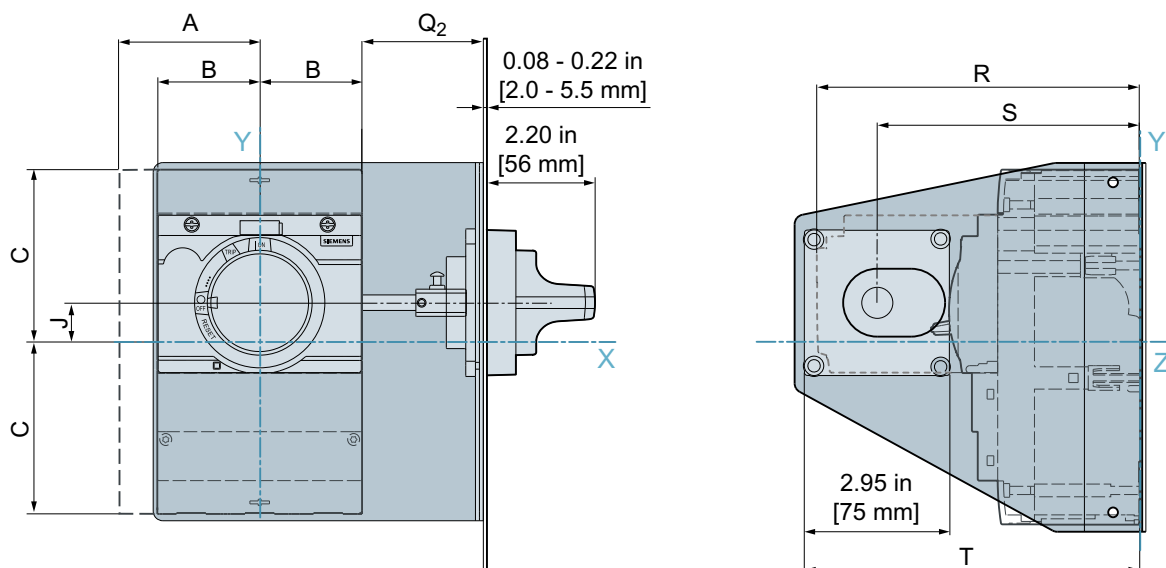
	3VA5		3VA6
	3VA51	3VA52	3VA61 / 62
A	2.50 in [63.5 mm]	3.44 in [87.5 mm]	3.44 in [87.5 mm]
B	1.50 in [38.1 mm]	2.07 in [52.5 mm]	2.07 in [52.5 mm]
C	2.76 in [70 mm]	3.64 in [92.5 mm]	3.90 in [99 mm]
J	0 in [0 mm]	0.65 in [16.4 mm]	0.90 in [22.9 mm]
Q _{1min}	1.10 in [28 mm]	1.10 in [28 mm]	1.10 in [28 mm]
Q _{1max}	11.26 in [286 mm]	10.75 in [273 mm]	10.75 in [273 mm]
R	6.04 in [153.5 mm]	6.57 in [167 mm]	6.57 in [167 mm]
S	4.94 in [125.5 mm]	5.31 in [135 mm]	5.31 in [135 mm]
T	6.44 in [163.5 mm]	6.81 in [173 mm]	6.81 in [173 mm]
U	0.59 in [15 mm]	1.16 in [29.5 mm]	1.16 in [29.5 mm]

6.2 Dimensional drawings



	3VA5		3VA6
	3VA51	3VA52	3VA61 / 62
A	2.50 in [63.5 mm]	3.44 in [87.5 mm]	3.44 in [87.5 mm]
B	1.50 in [38.1 mm]	2.07 in [52.5 mm]	2.07 in [52.5 mm]
C	2.56 in [65 mm]	3.56 in [90.5 mm]	3.56 in [90.5 mm]
J	0 in [0 mm]	0.90 in [22.9 mm]	0.90 in [22.9 mm]
Q _{1min}	3.54 in [90 mm]		
Q _{1max}	11.26 in [286 mm]	10.75 in [273 mm]	10.75 in [273 mm]
R	5.79 in [147 mm]	6.57 in [167 mm]	6.57 in [167 mm]
S	4.69 in [119 mm]	5.31 in [135 mm]	5.31 in [135 mm]
T	6.18 in [157 mm]	6.81 in [173 mm]	6.81 in [173 mm]
U	0.59 in [15 mm]	1.16 in [29.5 mm]	1.16 in [29.5 mm]
X	1.18±0.04 in [30±1 mm]	1.85±0.04 in [47±1 mm]	1.85±0.04 in [47±1 mm]
Y	1.18 in [30 mm]	1.26 in [32 mm]	1.26 in [32 mm]

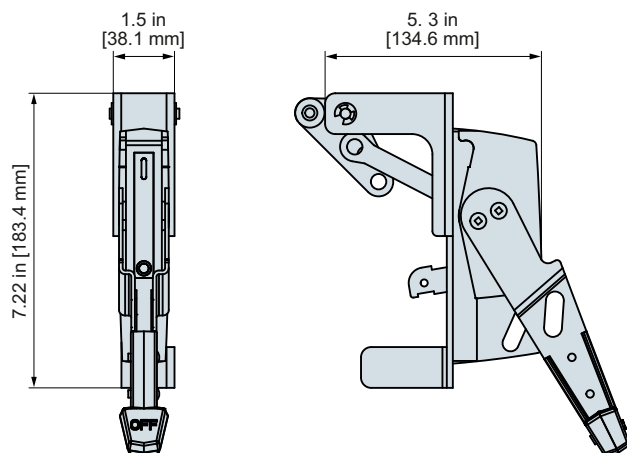
Side wall mounted rotary operator with mounting plate



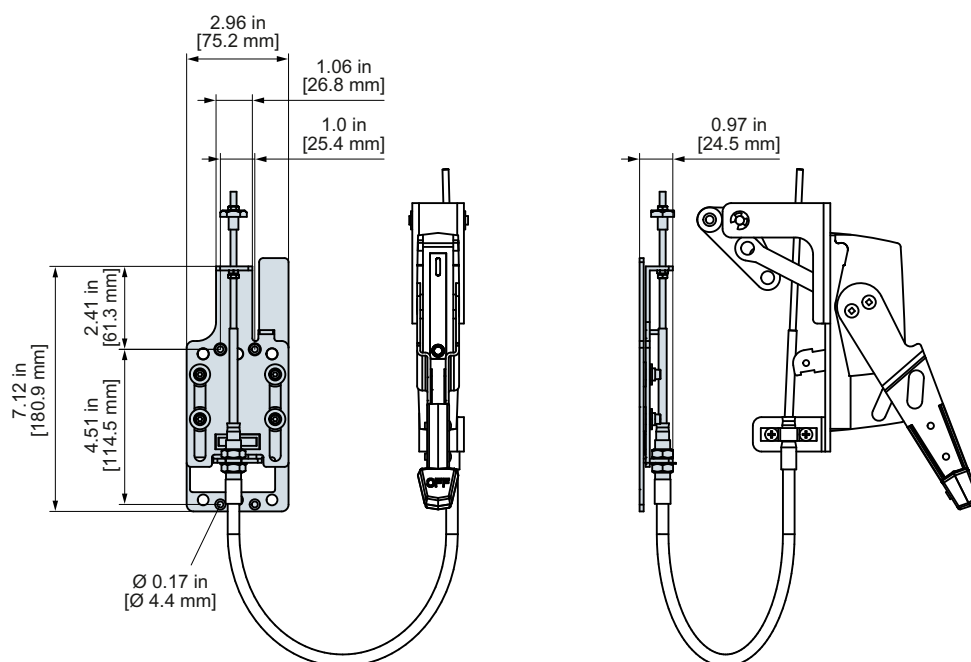
	3VA5		3VA6
	3VA51	3VA52	3VA61 / 62
A	2.50 in [63.5 mm]	3.44 in [87.5 mm]	3.44 in [87.5 mm]
B	1.50 in [38.1 mm]	2.07 in [52.5 mm]	2.07 in [52.5 mm]
C	2.76 in [70 mm]	3.64 in [92.5 mm]	3.90 in [99 mm]
J	0 in [0 mm]	0.65 in [16.4 mm]	0.90 in [22.9 mm]
Q ₂	1.65 in [42 mm]	1.77 in [45 mm]	1.77 in [45 mm]
R	6.04 in [153.5 mm]	6.57 in [167 mm]	6.57 in [167 mm]
S	4.94 in [125.5 mm]	5.31 in [135 mm]	5.31 in [135 mm]
T	6.44 in [163.5 mm]	6.81 in [173 mm]	6.81 in [173 mm]

Operator kit with Bowden cable (Max-Flex operator)

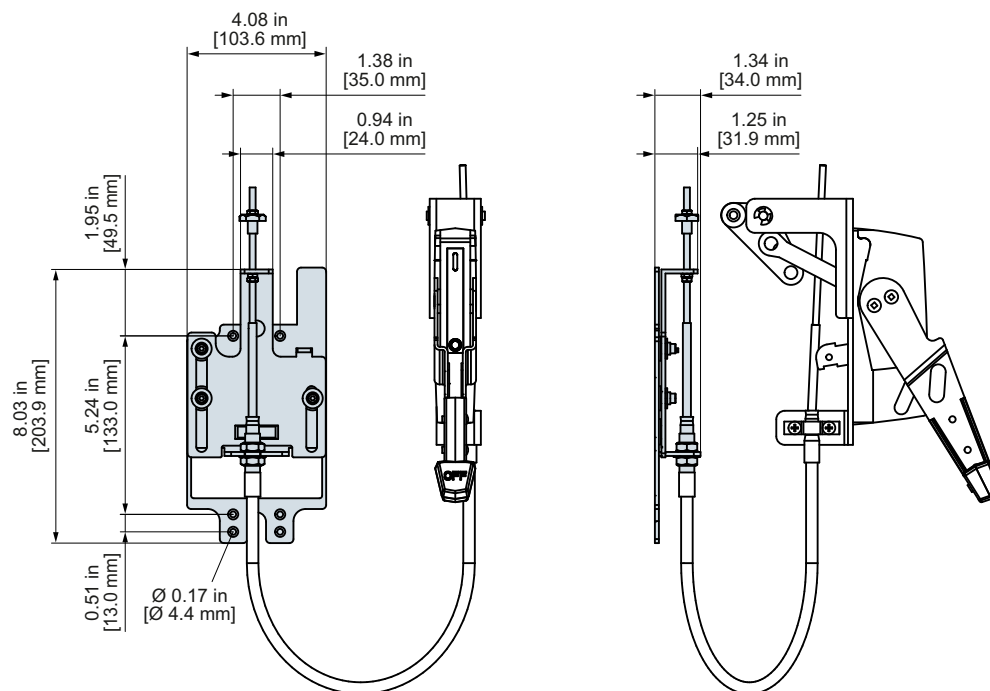
Handle



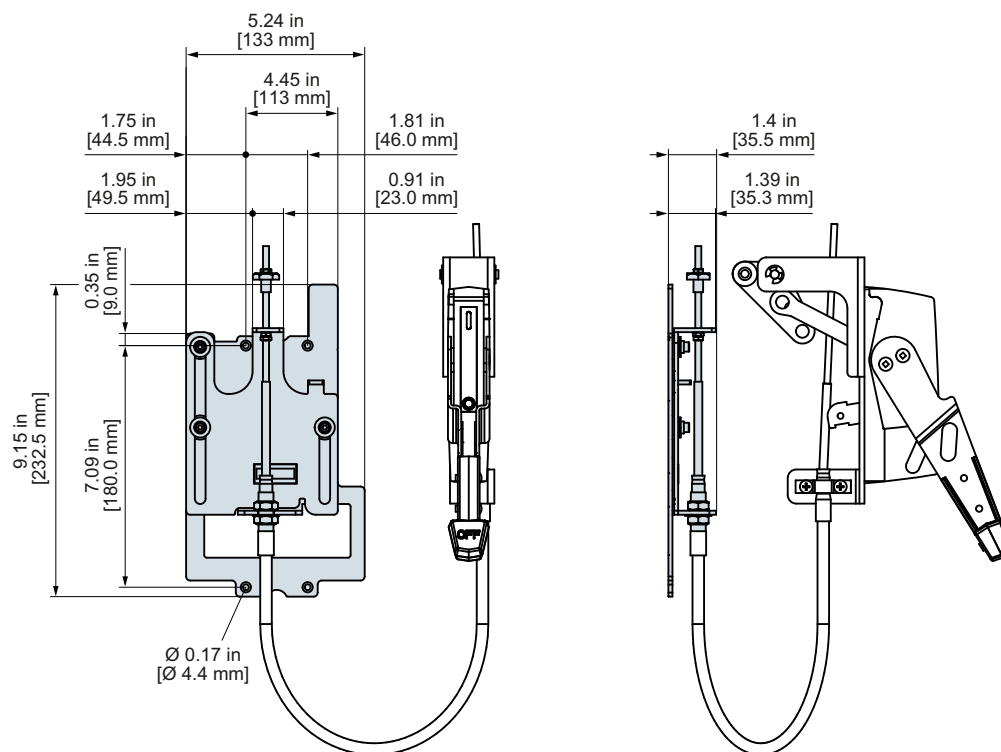
Switching mechanism for 3VA51 125 A



Switching mechanism for 3VA52 250 A and 3VA61/62 150 / 250 A

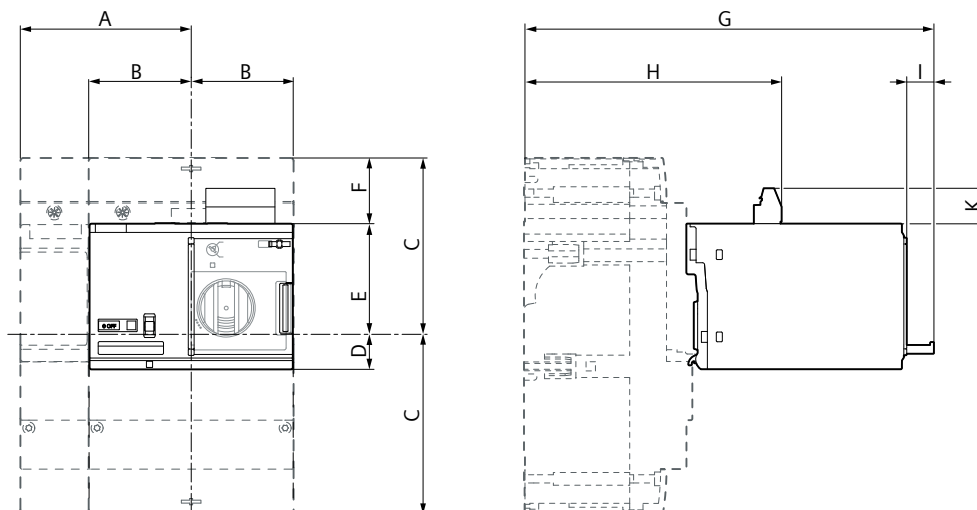


Switching mechanism for 3VA53/54 and 3VA63/64 400 / 600 A



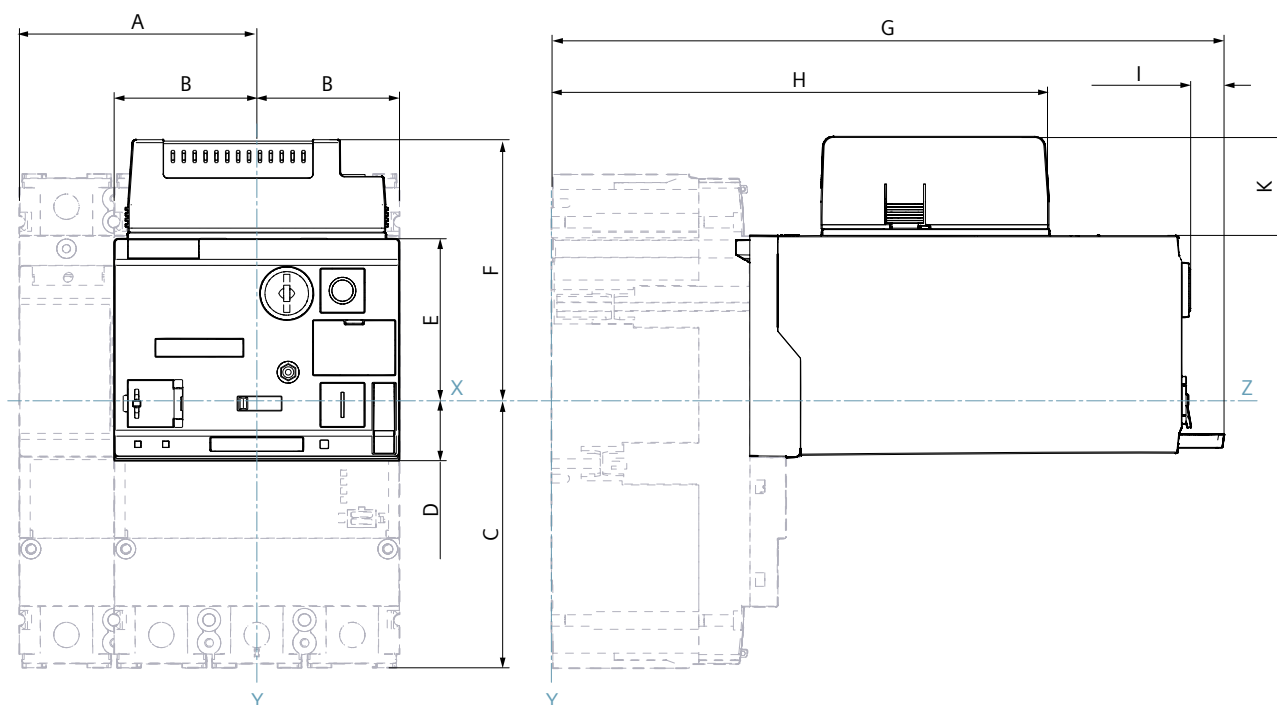
6.2.2.4 Motor operators

MO320 motor operator



	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
A	2.50 in [63.5 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]	3.44 in [87.5 mm]	4.53 in [115 mm]
B	1.50 in 38.1 mm	2.07 in [52.5 mm]	2.72 in [69 mm]	2.07 in [52.5 mm]	2.72 in [69 mm]
C	2.76 in [70 mm]	3.64 in [92.5 mm]	4.88 in [124 mm]	3.90 in [99 mm]	4.88 in [124 mm]
D	0.89 in [22.6 mm]	0.53 in [13.5 mm]	0.28 in [7.0 mm]	0.28 in [7.0 mm]	0.28 in [7.0 mm]
E	1.87 in [47.4 mm]	2.42 in [61.4 mm]	3.5 in [85 mm]	2.67 in [67.9 mm]	3.5 in [85 mm]
F	0.89 in [22.6 mm]	1.22 in [31.1 mm]	1.54 in [39 mm]	1.22 in [31.1 mm]	1.54 in [39 mm]
G	7.38 in [187.5 mm]	8.58 in [217.9 mm]	10.08 in [256.0 mm]	8.58 in [217.9 mm]	10.08 in [256.0 mm]
H	5.02 in [127.60 mm]	5.63 in [143.1 mm]	6.70 in [170.2 mm]	5.63 in [143.1 mm]	6.70 in [170.2 mm]
I	0.59 in [15.0 mm]			0.59 in [15.0 mm]	
K	0.68 in [17.2 mm]			0.68 in [17.2 mm]	

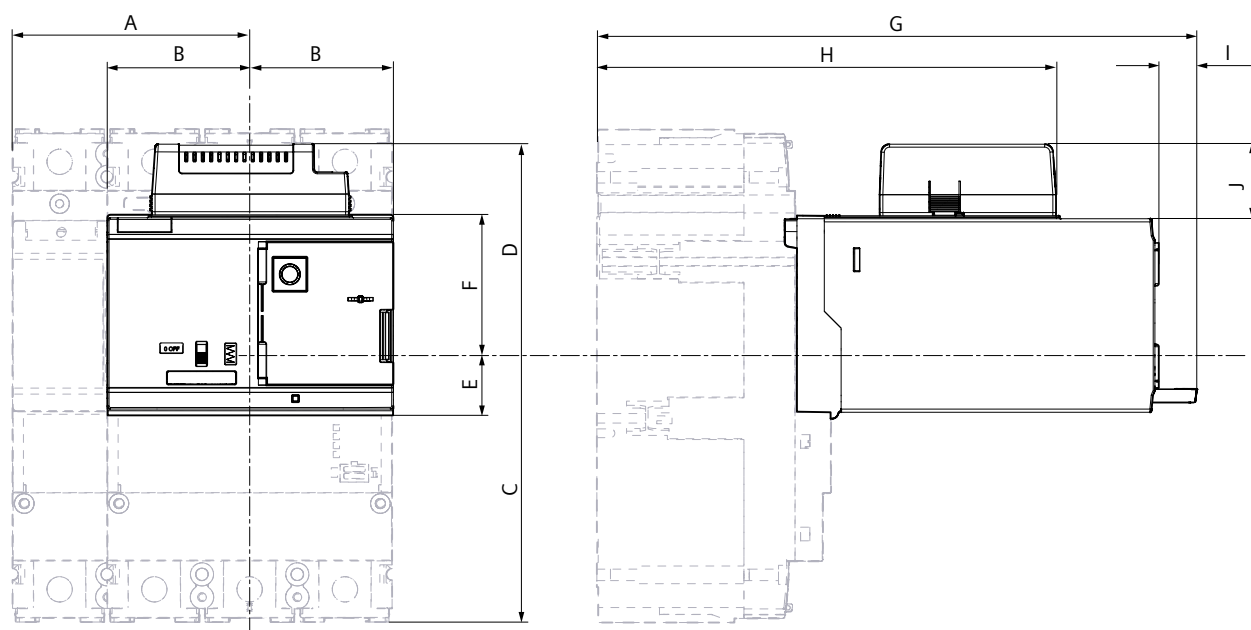
SEO520 motor operator
for 3VA52, 3VA61 and 3VA62



	3VA5	3VA6
	3VA52	3VA61 / 62
A	3.4 in [87.3 mm]	3.4 in [87.3 mm]
B	2.1 in [52.3 mm]	2.1 in [52.3 mm]
C	3.6 in [90.5 mm]	3.6 in [90.5 mm]
D	0.5 in [12.1 mm]	0.5 in [12.1 mm]
E	2.7 in [67.9 mm]	2.7 in [67.9 mm]
F	4.1 in [104.4 mm]	4.1 in [104.4 mm]
G	9.9 in [251.2 mm]	9.9 in [251.2 mm]
H	7.2 in [183.1 mm]	7.2 in [183.1 mm]
I	0.8 in [19.5 mm]	0.8 in [19.5 mm]
K	1.4 in [36.5 mm]	1.4 in [36.5 mm]

for 3VA53 / 54, 3VA63 and 3VA64

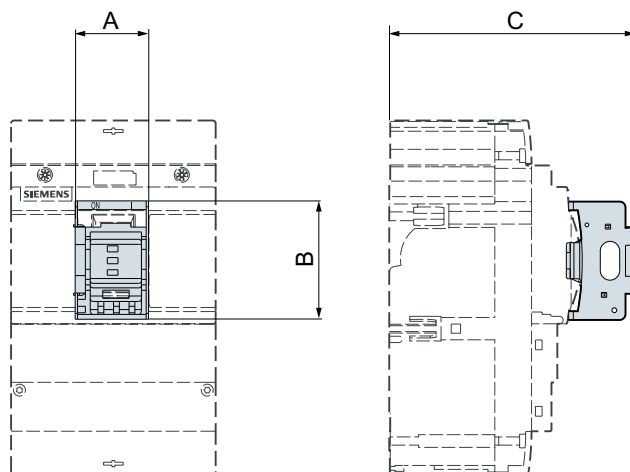
6.2 Dimensional drawings



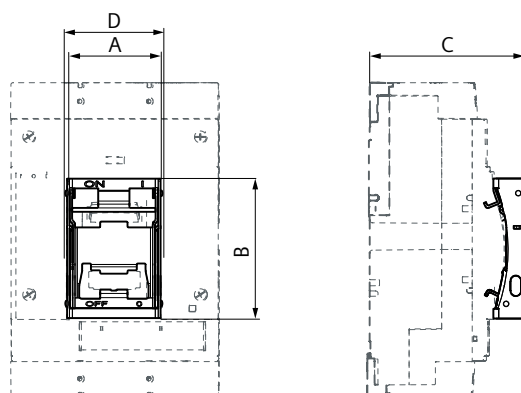
	3VA5	3VA6
	3VA53 / 54	3VA63 / 64
A	4.52 in [114.8 mm]	4.52 in [114.8 mm]
B	2.71 in [68.8 mm]	2.71 in [68.8 mm]
C	4.88 in [124 mm]	4.88 in [124 mm]
D	4.68 in [118.9 mm]	4.68 in [118.9 mm]
E	0.33 in [8.5 mm]	0.33 in [8.5 mm]
F	3.29 in [83.5 mm]	3.29 in [83.5 mm]
G	11.02 in [279.9 mm]	11.02 in [279.9 mm]
H	8.55 in [217.2 mm]	8.55 in [217.2 mm]
I	0.55 in [13.9 mm]	0.55 in [13.9 mm]
J	1.39 in [35.4 mm]	1.39 in [35.4 mm]

6.2.2.5 Locking and interlocking

Handle locking device

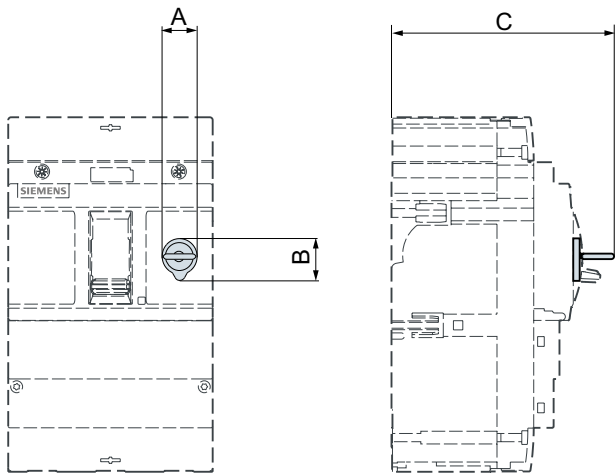


	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
A	1.1 in [29 mm]	1.5 in [39 mm]		1.5 in [39 mm]	
B	1.8 in [45 mm]	2.4 in [61 mm]		2.4 in [61 mm]	
C	4.5 in [114.5 mm]	5.0 in [127 mm]	5.9 in [151 mm]	5.0 in [127 mm]	5.9 in [151 mm]



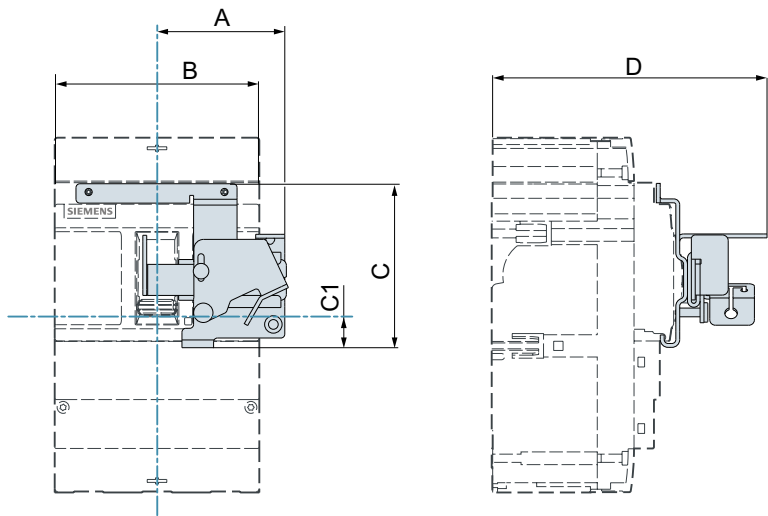
	3VA5	3VA6
	3VA55	3VA65 / 66
A	3.78 in [96 mm]	3.78 in [96 mm]
B	0.55 in [14 mm]	0.55 in [14 mm]
C	6.14 in [156 mm]	6.14 in [156 mm]
D	4.09 in [104 mm]	4.09 in [104 mm]

Locking, blocking or interlocking with cylinder lock



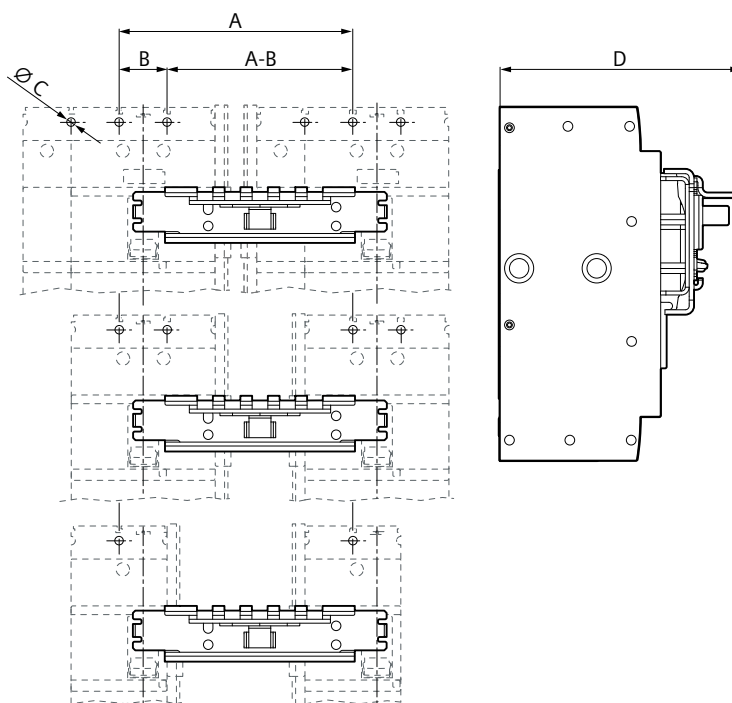
	3VA5				3VA6		
	3VA51	3VA52	3VA53 / 54	3VA55	3VA61 / 62	3VA63 / 64	3VA65 / 66
A	0.8 in [20 mm]						
B	0.9 in [23 mm]						
C	4.4 in [105 mm]	4.8 in [122 mm]	5.8 in [146 mm]	6.06 in [154 mm]	4.8 in [122 mm]	5.8 in [146 mm]	6.06 in [154 mm]

Handle interlocking module with Bowden cable



	3VA5				3VA6		
	3VA51	3VA52	3VA53 / 54	3VA55	3VA61 / 62	3VA63 / 64	3VA65 / 66
A	3.9 in [98 mm]	4.7 in [119 mm]	5.5 in [138.5 mm]	10.7 in [273 mm]	4.7 in [119 mm]	5.5 in [138.5 mm]	10.7 in [273 mm]
B	3.0 in [76.5 mm]	4.1 in [104.6 mm]	5.4 in [137.6 mm]	8.2 in [209 mm]	4.1 in [104.6 mm]	5.4 in [137.6 mm]	8.2 in [209 mm]
C1	2.9 in [73.5 mm]	3.3 in [85 mm]	3.8 in 97.5 mm	--	3.3 in [85 mm]	3.8 in 97.5 mm	--
C	1.0 in [26 mm]	0.8 in [21 mm]	0.5 in [13 mm]	9.2 in [234 mm]	0.7 in [17 mm]	0.5 in [13 mm]	9.2 in [234 mm]
D	4.7 in [120.5 mm]	5.5 in [140.5 mm]	6.5 in [164.5 mm]	7.3 in [185 mm]	5.5 in [140.5 mm]	6.5 in [164.5 mm]	7.3 in [185 mm]

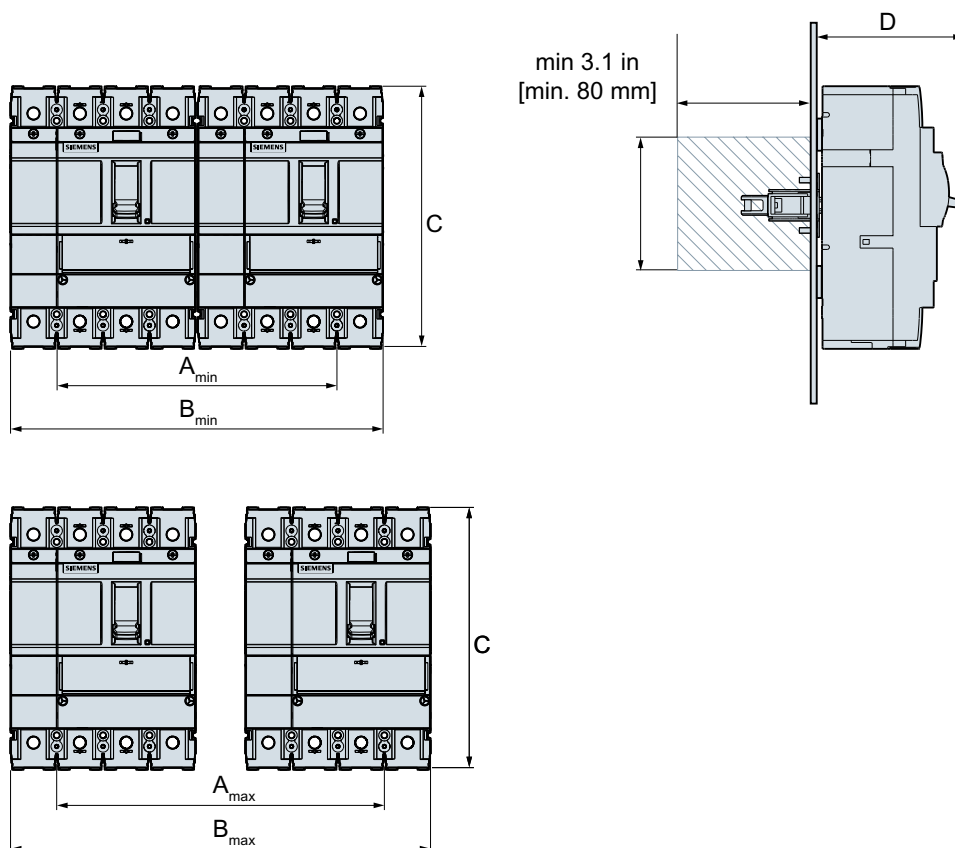
Handle interlocking module



	3VA5			3VA6	
	3VA51	3VA52	3VA53 / 54	3VA61 / 62	3VA63 / 64
A	6.3 in [162 mm]	7.8 in [198.5 mm]			
B	1.0 in [25.4 mm]	1.4 in [35 mm]	1.8 in [46 mm]	1.4 in [35 mm]	1.8 in [46 mm]
C	3/16" [4.5 mm]		1/4" [6 mm]	3/16" [4.5 mm]	1/4" [6 mm]
D	4.1 in [105 mm]	4.9 in [125 mm]	5.9 in [150 mm]	4.9 in [125 mm]	5.9 in [150 mm]

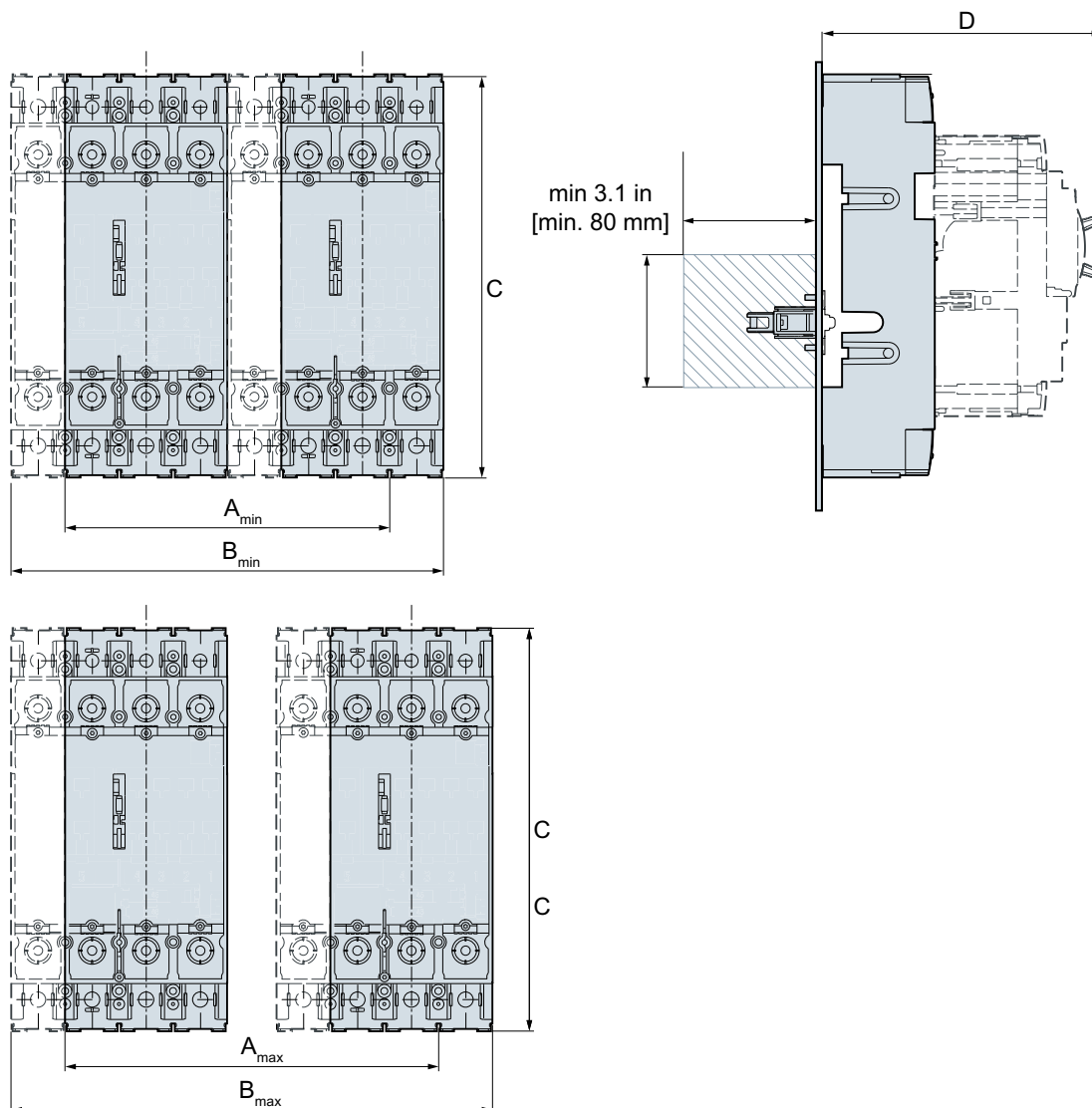
Rear interlock

Mounting on rear wall of control cabinet, fixed-mounted



		3VA5				3VA6		
		3VA51	3VA52	3VA53 / 54	3VA55	3VA61 / 62	3VA63/64	3VA65 / 66
A_{min}	3-pole	6 in [152.4 mm]	8.27 in [210 mm]	10.87 in [276 mm]	19.29 in [490 mm]	8.27 in [210 mm]	10.87 in [276 mm]	19.29 in [490 mm]
A_{max}	3-pole	11.72 in [297.6 mm]	13.21 in [335.6 mm]	14.94 in [379.6 mm]	--	13.21 in [335.6 mm]	14.94 in [379.6 mm]	--
B_{min}	4-pole	8 in [203 mm]	11.02 in [280 mm]	14.49 in [368 mm]	22.04 in [560 mm]	11.02 in [280 mm]	14.49 in [368 mm]	22.04 in [560 mm]
B_{max}	4-pole	13.72 in [348 mm]	15.97 in [405.6 mm]	18.57 in [471.6 mm]	--	15.97 in [405.6 mm]	18.57 in [471.6 mm]	--
C		4.24 in [107.8 mm]	7.3 in [185 mm]	9.8 in [248 mm]	12.91 in [328 mm]	7.8 in [198 mm]	9.8 in [248 mm]	12.91 in [328 mm]
D		3.72 in [94.5 mm]	4.21 in [107 mm]	6.8 in [172.9 mm]	9.96 in [253 mm]	4.21 in [107 mm]	6.8 in [172.9 mm]	9.96 in [253 mm]

Mounting on rear wall of control cabinet, plug-in technology

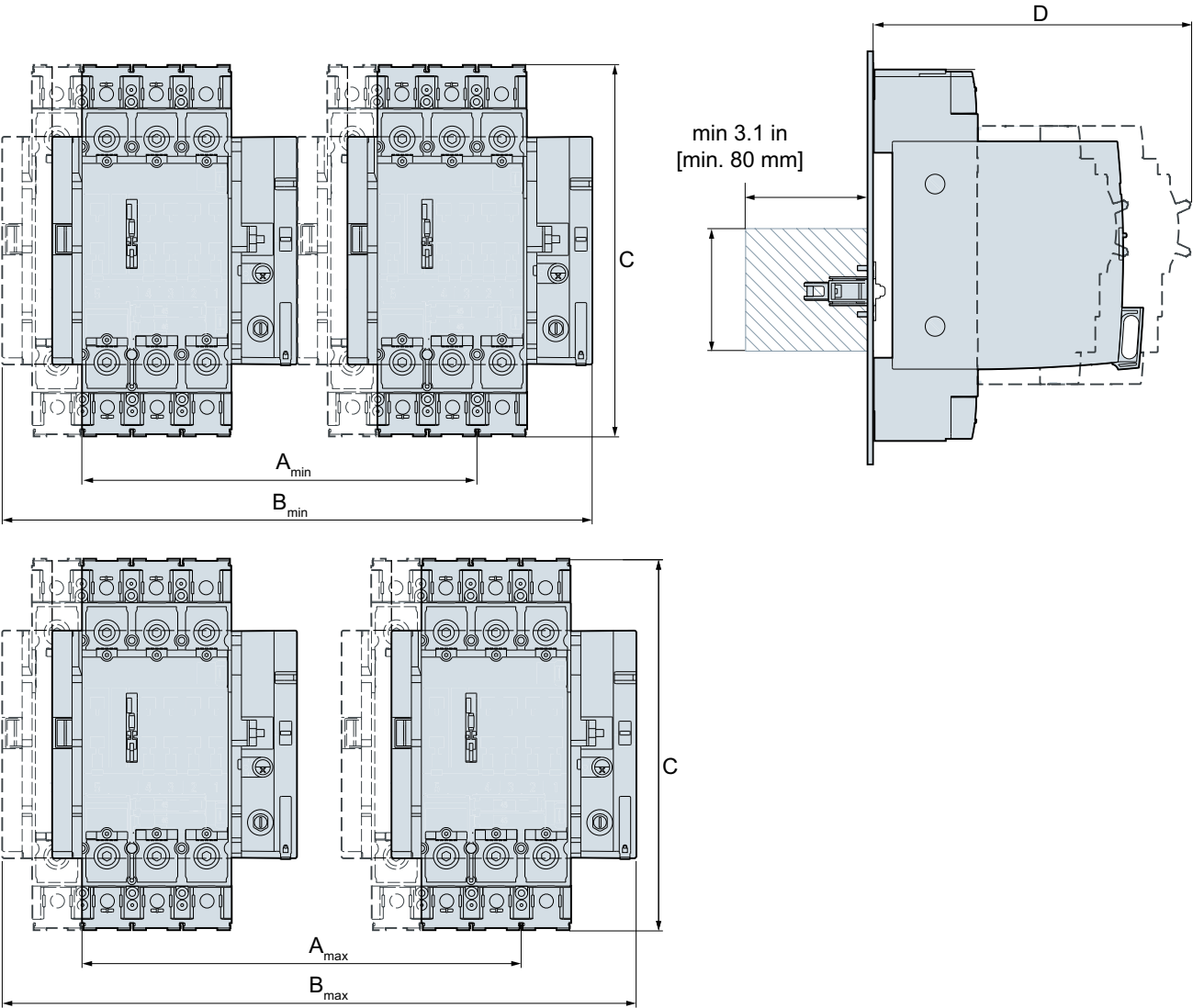


		3VA6	
		3VA61 / 62 150/250 A	3VA63 / 64 400/600 A
A_{min}	3-pole	9.63 in [244.6 mm]	12.55 in [321.6 mm]
A_{max}	3-pole	14.59 in [370.6 mm]	16.76 in [425.6 mm]
B_{min}	4-pole	12.39 in [314.6 mm]	16.28 in [413.6 mm]
B_{max}	4-pole	17.35 in [440.6 mm]	20.38 in [517.6 mm]

6.2 Dimensional drawings

		3VA6	
		3VA61 / 62 150/250 A	3VA63 / 64 400/600 A
C		10.3 in [261 mm]	12.87 in [327 mm]
D		7.1 in [180 mm]	9.11 in [231.5 mm]

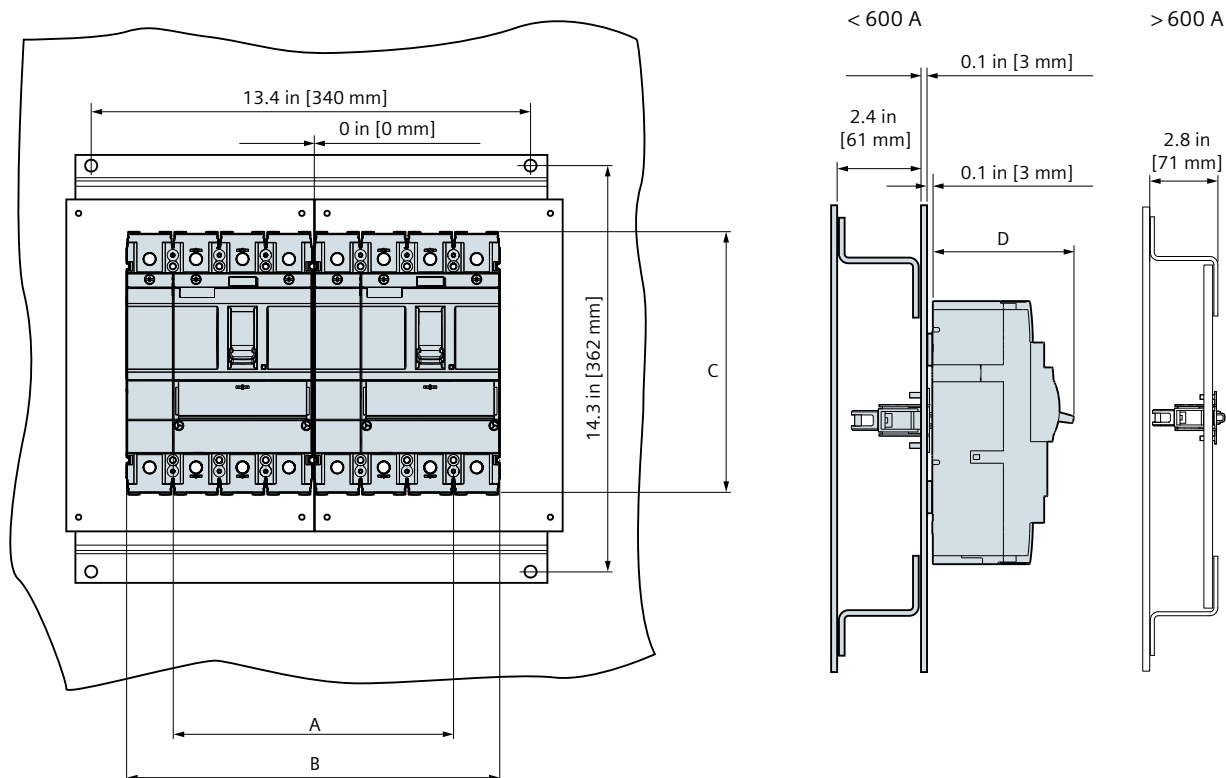
Mounting on rear wall of control cabinet, withdrawable technology



		3VA6	
		3VA61 / 62 150/250 A	3VA63 / 64 400/600 A
A _{min}	3-pole	27.08 in [687.8 mm]	32.25 in [819.2 mm]
A _{max}	3-pole	26.45 in [671.8 mm]	29.89 in [759.2 mm]

		3VA6	
		3VA61 / 62 150/250 A	3VA63 / 64 400/600 A
B _{min}	4-pole	31.78 in [807.2 mm]	39.5 in [1003.2 mm]
B _{max}	4-pole	31.75 in [791.2 mm]	37.13 in [943.2 mm]
C		10.3 in [261 mm]	12.87 in [327 mm]
D		8.74 in [222 mm]	10.77 in [273.5 mm]

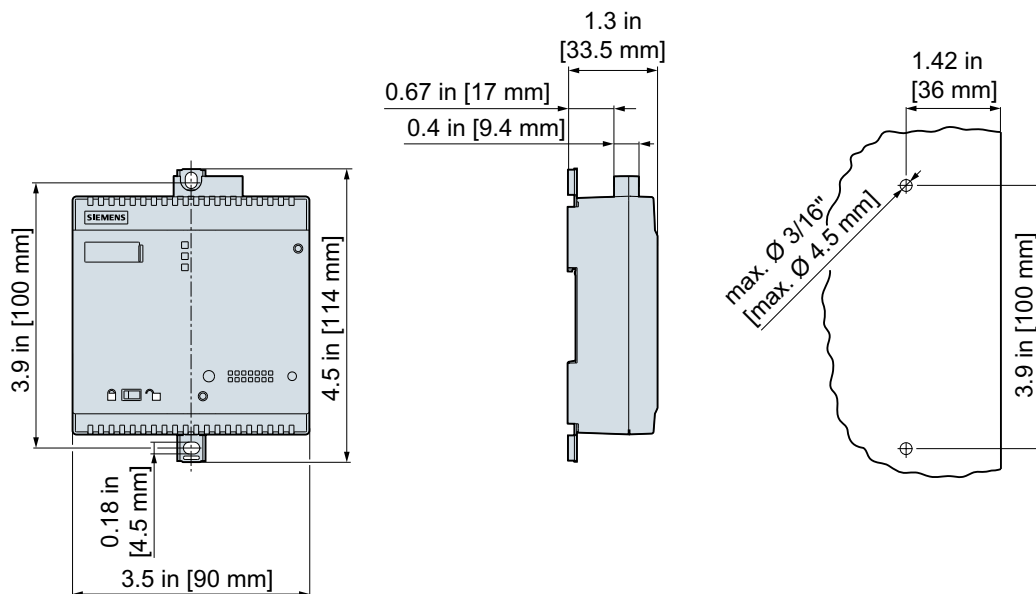
Mounting with mounting plate and mounting rail



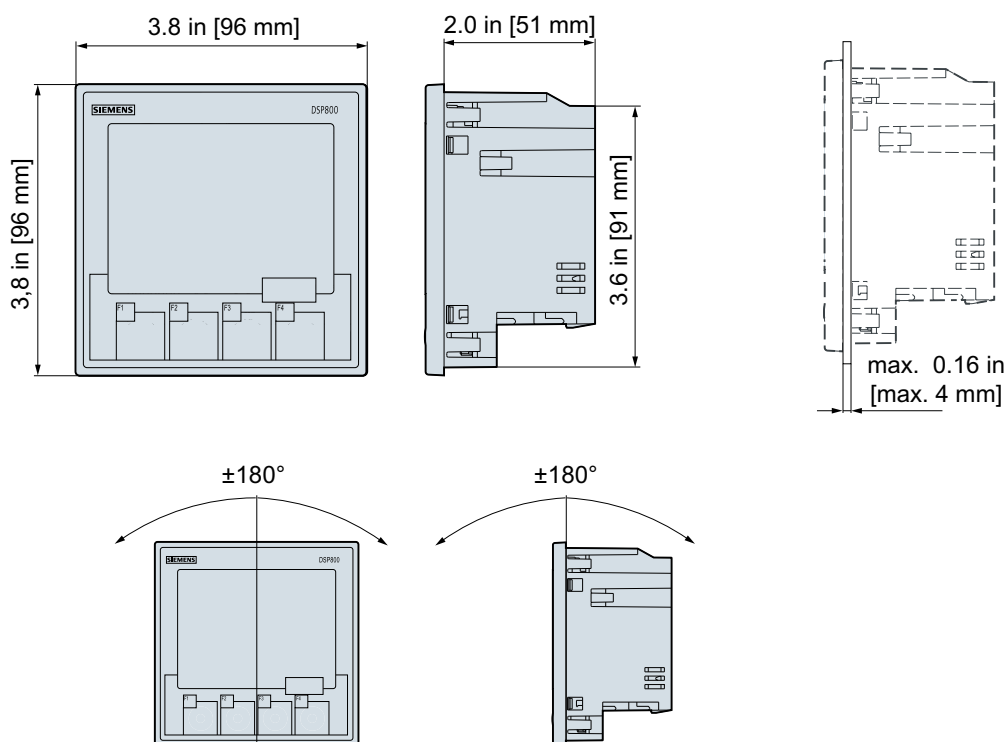
		3VA5				3VA6		
		3VA51	3VA52	3VA53 / 54	3VA55	3VA61 / 62	3VA63 / 64	3VA65 / 66
A	3-pole	6 in [152.4 mm]	8.27 in [210 mm]	10.87 in [276 mm]	19.29 in [490 mm]	8.27 in [210 mm]	10.87 in [276 mm]	19.29 in [490 mm]
B	4-pole	8 in [203 mm]	11.02 in [280 mm]	14.49 in [368 mm]	22.04 in [560 mm]	11.02 in [280 mm]	14.49 in [368 mm]	22.04 in [560 mm]
C		4.24 in [107.8 mm]	7.3 in [185 mm]	9.8 in [248 mm]	12.91 in [328 mm]	7.8 in [198 mm]	9.8 in [248 mm]	12.91 in [328 mm]
D		3.72 in [94.5 mm]	4.21 in [107 mm]	6.8 in [172.9 mm]	9.96 in [253 mm]	4.21 in [107 mm]	6.8 in [172.9 mm]	9.96 in [253 mm]

6.2.2.6 Communication and system integration

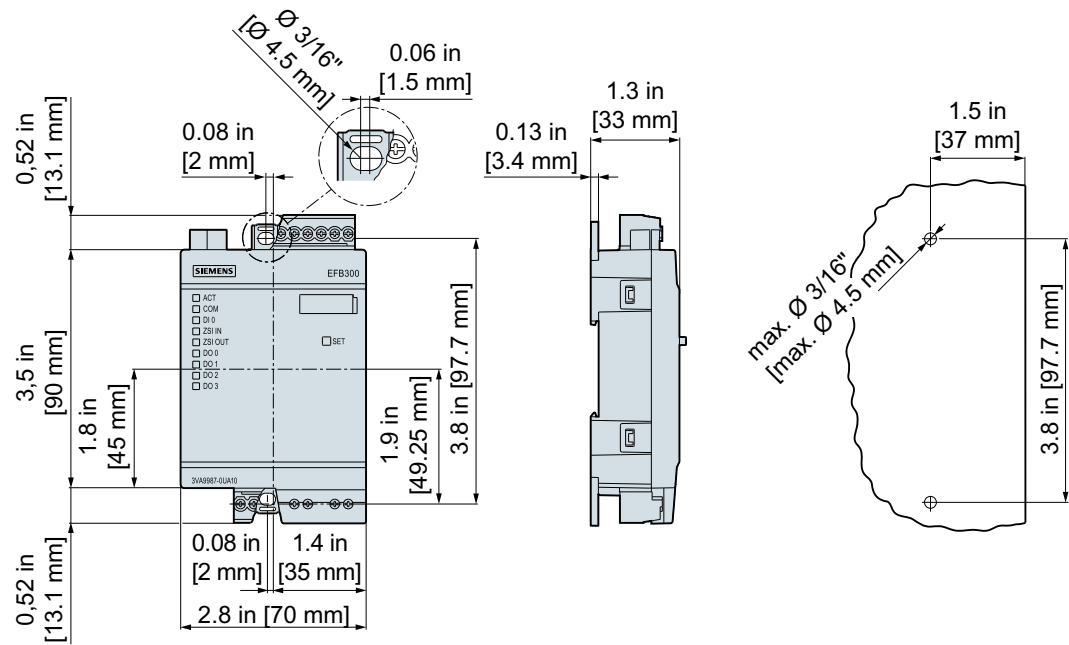
COM800 and COM100 data concentrator



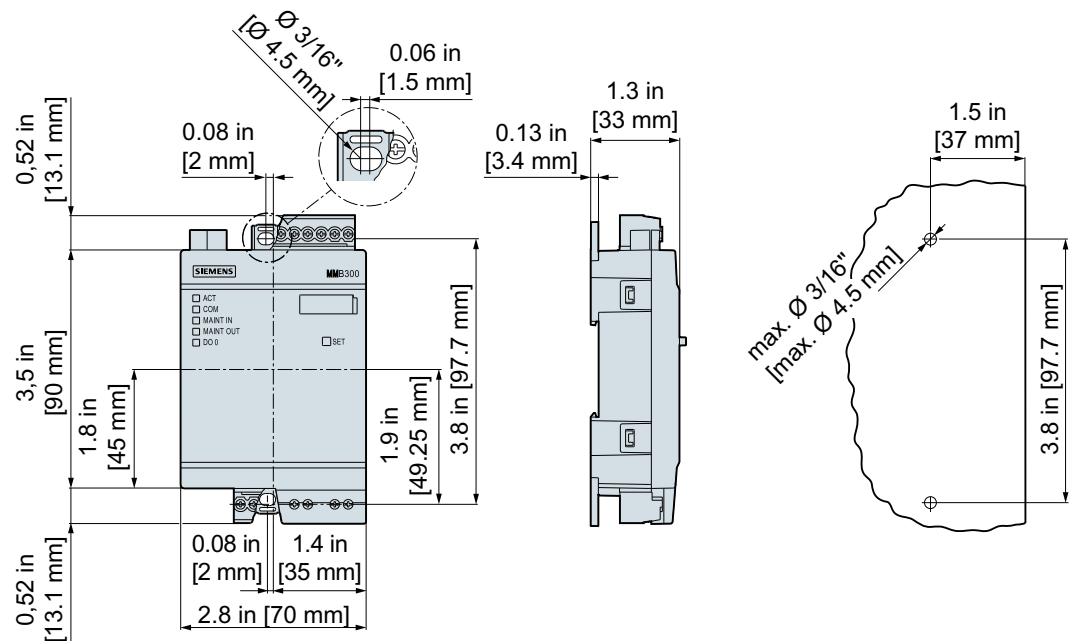
DSP800 display



6.2.2.7 EFB300 external function box



6.2.2.8 MMB300 maintenance mode box



6.2.2.9 Test devices

TD300 activation and trip box

Refer to chapter Technical specifications of TD300 (Page 458).

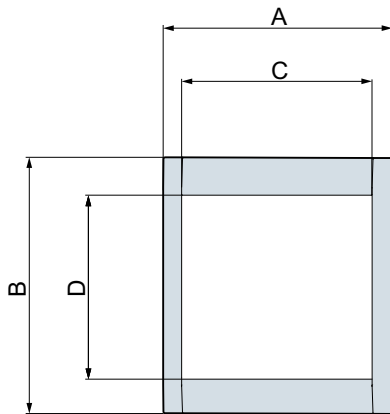
TD400 test device

Refer to chapter Technical specifications (Page 470).

TD500 test device

Refer to chapter Technical specifications (Page 481).

6.2.2.10 Door cover frame



	A in [mm]	B in [mm]	C in [mm]	D in [mm]
3VA9033-OSB10	3.9 [98.2]	3.4 [85.65]	3 [76.2]	1.8 [45.65]
3VA9033-OSB20	3.9 [98.2]	4.4 [111.8]	3 [76.2]	2.8 [70.7]
3VA9034-OSB10	4.9 [123.6]	3.4 [85.65]	4 [101.6]	1.8 [45.65]
3VA9034-OSB20	4.9 [123.6]	4.4 [111.8]	4 [101.6]	2.8 [70.7]
3VA9143-OSB10	5 [126.6]	4.4 [111.8]	4.1 [104.6]	2.8 [70.7]
3VA9143-OSB20	5 [126.6]	5.5 [139.7]	4.1 [104.6]	4 [100.8]
3VA9144-OSB10	6.4 [161.6]	4.4 [111.8]	5.5 [139.7]	2.8 [70.7]
3VA9144-OSB20	6.4 [161.6]	5.5 [139.7]	5.5 [139.7]	4 [100.8]
3VA9147-OSB30	5 [127]	4.8 [120.8]	4.1 [104.6]	3.2 [80.8]
3VA9233-OSB20	5 [127]	6 [152.8]	4.1 [104.6]	4.4 [111.8]
3VA9233-OSB30	5 [127]	4.9 [124.7]	4.1 [104.6]	3.3 [84.7]
3VA9234-OSB20	5 [127]	6.0 [152.8]	5.5 [139.7]	4.4 [111.8]
3VA9237-OSB30	5 [127]	4.6 [115.8]	4.1 [104.6]	3 [75.8]
3VA9333-OSB20	6.3 [159.6]	5.9 [149.3]	5.4 [137.6]	4.3 [109.3]

	A in [mm]	B in [mm]	C in [mm]	D in [mm]
3VA9334-0SB20	8.1 [205.6]	5.9 [149.3]	7.2 [183.6]	4.3 [109.3]
3VA9343-0SB20	6.3 [159.6]	6.4 [162.3]	5.4 [137.6]	4.8 [122.3]
3VA9344-0SB20	8.1 [205.6]	6.4 [162.3]	7.2 [183.6]	4.8 [122.3]
3VA9373-0SB10	6.3 [159.6]	4.4 [111.8]	5.4 [137.6]	2.8 [70.7]
3VA9374-0SB10	8.1 [205.6]	4.4 [111.8]	7.2 [183.6]	2.8 [70.7]
3VA9377-0SB30	6.3 [159.6]	5.2 [132.8]	5.4 [137.6]	3.65 [92.8]
3VA9583-0SB10	8.8 [222.3]	7.5 [190.8]	7.9 [200.7]	5.9 [150.8]
3VA9583-0SB20	8.8 [222.3]	9.2 [233.8]	7.9 [200.7]	7.6 [193.8]
3VA9583-0SB50	8.8 [222.3]	9.5 [240.8]	7.9 [200.7]	7.9 [200.7]
3VA9584-0SB10	11.5 [292.3]	7.5 [190.8]	10.6 [270.3]	5.9 [150.8]
3VA9584-0SB20	11.5 [292.3]	9.2 [233.8]	10.6 [270.3]	7.6 [193.8]
3VA9877-0SB20	9.51 [241.6]	9.28 [235.8]	8.7 [221.1]	7.73 [196.4]
3VA9877-0SB60	9.51 [241.6]	11.54 [293]	8.7 [221.1]	9.98 [253.6]

6.3 Power losses

6.3.1 Power losses of 3VA5 molded case circuit breakers

Note

For 3-pole devices, the specified power loss applies in the case of 3-phase symmetrical loading.

6.3 Power losses

3VA5 molded case circuit breakers for line protection

		3VA5 circuit breakers			3VA5 circuit breakers with UVR		3VA5 circuit breakers with external accessories	
		Power loss P_v			Power loss P_v		Additional power loss P_v	
							Rear connections	
							Power loss P_v	
	I_n [A]	1-pole [W]	2-pole [W]	3-pole [W]	2-pole [W]	3-pole [W]	2-pole [W]	3-pole [W]
3VA51	15	3.2	6.5	9.7	9.0	12.2	0.1	0.1
	20	4.0	8.0	12.0	10.5	14.5	0.1	0.1
	25	2.8	5.6	8.4	8.1	10.9	0.1	0.2
	30	3.1	6.2	9.3	8.7	11.8	0.1	0.2
	35	3.7	7.4	11.0	9.9	13.5	0.2	0.3
	40	3.4	6.8	10.1	9.3	12.6	0.3	0.4
	45	3.4	6.8	10.2	9.3	12.7	0.3	0.5
	50	3.7	7.4	11.1	9.9	13.6	0.4	0.6
	60	4.5	9.1	13.6	11.6	16.1	0.6	0.9
	70	5.3	16.5	16.0	19.0	18.5	0.8	1.2
	80	5.5	11.0	17.7	13.5	20.2	1.1	1.6
	90	5.9	11.8	17.7	14.3	20.2	1.3	2.0
	100	7.6	15.2	22.8	17.7	25.3	1.7	2.5
	110	8.5	16.9	25.4	19.4	27.9	2.0	3.0
	125	9.7	19.4	29.1	21.9	31.6	2.5	3.8
3VA52	40	6.8	13.6	20.4	16.1	22.9	--	--
	45	7.4	14.8	22.2	17.3	24.7	--	--
	50	5.8	11.6	17.4	14.1	19.9	--	--
	60	7.3	14.6	21.9	17.1	24.4	--	--
	70	5.7	11.4	17.1	13.9	19.6	--	--
	80	6.8	13.6	20.4	16.1	22.9	--	--
	90	8.2	16.4	24.6	18.9	27.1	--	--
	100	10.5	21.1	31.6	23.6	34.1	1.1	1.7
3VA53	200	12.5	25.1	37.6	27.6	40.1	--	--
	225	15.8	31.7	47.5	34.2	50.0	--	--
	250	19.6	39.1	58.7	41.6	61.2	--	--
	300	23.4	46.8	70.2	49.3	72.7	--	--
	350	23.5	47.1	70.6	49.6	73.1	--	--
	400	30.7	61.5	92.2	64.0	94.7	--	--
3VA54	450	33.0	66.0	99.0	68.5	101.5	--	--
	500	40.8	81.5	122.3	84.0	124.8	--	--
	600	58.4	116.7	175.0	119.2	177.5	--	--
3VA55	600	54.0	108.0	162.0	110.5	164.5	--	--
	700	70.0	140.0	210.0	142.5	212.5	--	--
	800	61.0	122.0	183.0	124.5	185.5	--	--

3VA5 motor circuit protectors

		3VA5 circuit breakers		3VA5 circuit breakers with UVR		3VA5 circuit breakers with external accessories	
		Power loss P_v		Power loss P_v		Additional power loss P_v	
						Rear connections	
						Power loss P_v	
	I_n [A]	"MU"	"MH"	"MU"	"MH"	"MU"	"MH"
		3-pole [W]	3-pole [W]	3-pole [W]	3-pole [W]	3-pole [W]	3-pole [W]
3VA51	1	3.0	3.0	5.5	5.5	--	--
	2	4.3	4.3	6.8	6.8	--	--
	3	2.9	2.9	5.4	5.4	--	--
	5	8.1	8.1	10.6	10.6	--	--
	7	3.0	3.0	5.5	5.5	--	--
	10	6.2	6.2	8.7	8.7	--	--
	15	2.2	2.2	4.7	4.7	0.1	0.1
	25	2.9	2.9	5.4	5.4	0.2	0.2
	30	4.2	4.2	6.7	6.7	0.2	0.2
	40	3.7	3.7	6.2	6.2	0.4	0.4
	50	5.7	5.7	8.2	8.2	0.6	0.6
3VA52	150	19.6	19.6	22.1	22.1	3.8	3.8
	200	34.8	34.8	37.3	37.3	6.8	6.8
	250	58.0	58.0	60.5	60.5	--	--
3VA53	250	120.0	120.0	122.5	122.5	--	--
3VA54	400	120.0	120.0	122.5	122.5	--	--
	500	120.0	120.0	122.5	122.5	--	--
	600	175.0	175.0	177.5	177.5	--	--
3VA55	600	120.0	120.0	122.5	122.5	--	--
	800	210.0	210.0	212.5	212.5	--	--

6.3.2 Power losses of 3VA6 molded case circuit breakers

Note

The specified power loss applies to 3-pole and 4-pole devices in the case of 3-phase, symmetrical loading.

If the 4th pole is not de-energized (e.g. DC applications; unbalanced loading, many 1-pole loads), the 4th pole has one-third the power loss of the 3-pole power loss.

6.3 Power losses

3VA6 molded case circuit breakers for line protection

		3VA6 circuit breakers		3VA6 circuit breakers with UVR		3VA6 circuit breakers with external accessories	
		Power loss P_v		Power loss P_v		Additional power loss P_v	
		"M", "H", "C", "L"	"E"	"M", "H", "C", "L"	"E"	Rear connections	Plug-in / with-drawable technology
	I_n [A]	3-pole/4-pole [W]	3-pole/4-pole [W]	3-pole/4-pole [W]	3-pole/4-pole [W]	3-pole/4-pole [W]	3-pole/4-pole [W]
3VA61	40	2.4	--	4.9	--	0.3	0.4
	60	--	2.4	--	4.9	0.3	0.4
	100	13.0	6.7	15.5	9.2	1.0	2.0
	150	29.0	15.1	31.5	17.6	3.0	5.0
3VA62	100	6.7	--	9.2	--	1.8	2.4
	250	42.0	42.0	44.5	44.5	11.0	15.0
3VA63	250	27.3	27.3	29.8	29.8	11.0	15.0
	400	70.0	70.0	72.5	72.5	26.0	38.0
3VA64	400	70.0	--	72.5	--	26.0	38.0
	600	151.0	151.0	153.5	153.5	59.0	64.0
3VA65	600	129.0	--	131.5	--	--	--
	800	231.0	--	233.5	--	--	--
3VA66	1000	330.0	--	332.5	--	--	--

3VA6 motor circuit protectors

		3VA6 MCP	3VA6 MCP with UVR	3VA6 MCP with external accessories	
		Power loss P_v	Power loss P_v	Additional power loss P_v	
				Rear connections	Plug-in / with-drawable technology
	I_n [A]	3-pole [W]	3-pole [W]	3-pole [W]	3-pole [W]
3VA61	25	0.9	3.4	--	0.3
	30	1.4	3.9	--	0.4
	40	2.4	4.9	--	0.4
	50	3.8	6.3	--	--
	70	7.4	9.9	--	--
	80	9.6	12.1	--	--
	90	12.2	14.7	--	--
	100	13	15.5	--	2

		3VA6 MCP	3VA6 MCP with UVR	3VA6 MCP with external accessories	
		Power loss P_v	Power loss P_v	Additional power loss P_v	
				Rear connections	Plug-in / withdrawable technology
	I_n [A]	3-pole [W]	3-pole [W]	3-pole [W]	3-pole [W]
3VA62	110	8.1	10.6	--	2
	125	10.5	13	--	--
	150	15	17.5	--	--
	200	26.9	29.4	--	15
3VA63	200	17.9	20.4	--	15
	250	27.3	29.8	--	15
3VA64	400	70	72.5	--	38
	500	105	107.5	--	64
3VA65	800	210	212.5	--	--

6.3.3 Power losses of 3VA UL molded case switches

Note

For 3-pole devices, the specified power loss applies in the case of 3-phase symmetrical loading.

		3VA MCS		3VA MCS with UVR		3VA MCS with external accessories		
		Power loss P_v		Power loss P_v		Additional power loss P_v		
						Rear connections		Plug-in / withdrawable technology
	I_n [A]	2-pole [W]	3-pole [W]	2-pole [W]	3-pole [W]	2-pole [W]	3-pole [W]	3-pole [W]
3VA51	100	12.8	19.2	15.3	21.7	1.67	2.5	--
3VA52	100	5.8	8.7	8.3	11.2	1.13	1.7	--
	150	13.07	19.6	15.57	22.1	2.53	3.8	--
	250	36.26	54.4	38.76	56.9	7.13	10.7	--
3VA53	400	80	120	82.5	122.5	17.33	26	--
3VA54	600	80	120	82.5	122.5	39.33	59	--
3VA55	800	140	210	142.5	212.5	--	--	--
3VA63	400	--	70	--	72.5	17.33	26	38.0
3VA64	600	--	151	--	153.5	39.33	59	64.0

6.4 Derating

6.4.1 Derating of 3VA5 molded case circuit breakers

The temperature inside the molded case circuit breaker is influenced by the ambient temperature and the current-dependent power loss generated inside the unit. To prevent overloading of 3VA5 molded case circuit breakers under difficult thermal conditions, the maximum rated uninterrupted operational current must be limited as a function of the ambient temperature.

Note

The values do not apply to all installation situations of the molded case circuit breaker and may deviate depending upon factors such as cables and busbars, packing density, ventilation, etc.

The extensive range of accessories of the 3VA5 molded case circuit breaker has no effect on the thermal response thresholds of the switching devices.

3VA5 molded case circuit breakers for line protection Fixed mounting

3VA51

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
15	14 2.5	--	--	--	--		14	14	14	14	14
20	12 2.5	--	--	--	--		19	19	19	18	18
25	10 4	--	--	--	--	24	24	23	23	23	22
30	10 6	--	--	--	--	29	29	28	28	28	27
35	8 10	--	--	--	--	34	34	33	33	32	32
40	8 10	--	--	--	--	39	39	38	37	37	36
45	8 10	--	--	--	--	44	44	43	42	42	41
50	8 10	--	--	--	--	49	48	47	46	45	44

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
60	6 16	--	--	--	--	59	58	57	56	55	54
70	4 25	--	--	--	--	69	68	67	66	65	64
80	4 25	--	--	--	--	78	77	76	74	73	72
90	3 35	--	--	--	--	88	86	84	82	80	79
100	3 35	--	--	--	--	98	95	93	91	89	87
110	2 35	--	--	--	--	107	105	103	100	98	96
125	1 50	--	--	--	--	122	119	117	114	112	109

-- No derating up to the rated operational current I_n of the molded case circuit breaker

¹⁾ Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

²⁾ Test cross-sections according to IEC EN 60947-1, Table 11

3VA52

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
40	8 10	--	--	--	--	39.1	38.3	37.4	36.5	35.7	34.8
45	8 10	--	--	--	--	44	43	42.1	41.1	40.1	39.1
50	8 10	--	--	--	--	48.7	47.3	46	44.7	43.3	42
60	6 16	--	--	--	--	58.6	57.2	55.7	54.3	52.9	51.5

6.4 Derating

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
70	4 25	--	--	--	--	--	--	68	66.5	64	61.6
80	4 25	--	--	--	--	--	--	78	76	74	70.4
90	3 35	--	--	--	--	--	--	87	85.5	83	79.2
100	3 35	--	--	--	--	97	95	92	89	87	84
110	2 35	--	--	--	--	107	104	100	97	94	91
125	1 50	--	--	--	--	121	116	112	108	103	99
150	0 50	--	--	--	--	146	141	137	132	128	123
175	00 70	--	--	--	--	171	166	162	158	153	149
200	000 95	--	--	--	--	194	189	183	178	172	167
225	0000 95	--	--	--	--	220	216	211	206	201	197
250	250 kcmil 120	--	--	--	--	244	239	233	227	222	216

3VA53

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
200	000 95	--	--	--	--	196	192	188	184	180	176
225	0000 95	--	--	--	--	221	217	214	210	206	202

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
250	250 kcmil 120	--	--	--	--	245	239	234	228	223	218
300	350 kcmil 185	--	--	--	--	294	288	282	276	270	264
350	400 kcmil 185	--	--	--	--	342	334	327	319	311	303
400	500 kcmil 240	2x 1x0.25 2x 30x5	--	--	--	392	384	375	367	359	351

3VA54

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
450	2x 250 kcmil 2x 150	2x 1x0.25 2x 30x5	--	--	--	440	429	419	409	398	388
500	2x 250 kcmil 2x 150	2x 1x0.25 2x 30x5	--	--	--	488	476	464	451	439	427
600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	--	--	--	587	574	560	547	534	521

6.4 Derating

3VA55

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	--	--	--	583	566	549	532	515	497
700	3x 300 kcmil 2x 240	2x 1.5x0.25 2x 50x5	--	--	--	680	659	639	619	599	578
800	3x 300 kcmil 2x 240	2x 1.5x0.25 2x 50x5	--	--	--	783	766	750	733	715	699

3VA5 MCP motor circuit protectors Fixed mounting

3VA51

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 40 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
1	24 0.2	--	--	--	--	--	--	--	--	--	--
2	22 0.34	--	--	--	--	--	--	--	--	--	--
3	20 0.5	--	--	--	--	--	--	--	--	--	--
5	18 0.75	--	--	--	--	--	--	--	--	--	--
7	16 1	--	--	--	--	--	--	--	--	--	--

Rated operational current I_n	Copper conductor cross-section ¹⁾ [mm ²]	Copper busbar cross-section ²⁾ [mm ²]	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 40 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
10	16 1.5	--	--	--	--	--	--	--	--	--	--
15	14 2.5	--	--	--	--	--	--	--	--	--	--
25	10 4	--	--	--	--	--	--	--	--	--	--
30	10 6	--	--	--	--	--	--	--	--	--	--
40	8 10	--	--	--	--	--	--	--	--	--	--
50	8 10	--	--	--	--	--	--	--	--	--	--
70	4 25	--	--	--	--	--	--	--	--	--	--
80	4 25	--	--	--	--	--	--	--	--	--	--
90	3 35	--	--	--	--	88	86	84	82	80	79
100	3 35	--	--	--	--	98	95	93	91	89	87
110	2 35	--	--	--	--	107	105	103	100	98	96
125	1 50	--	--	--	--	122	119	117	114	112	109

-- No derating up to the rated operational current I_n of the molded case circuit breaker

¹⁾ Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

²⁾ Test cross-sections according to IEC EN 60947-1, Table 11

6.4 Derating

3VA52

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 40 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
150	0 50	--	--	--	--	--	--	--	--	--	--
200	000 95	--	--	--	--	--	--	--	--	--	--
250	250 kcmil 120	--	On request								

3VA53

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 40 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
250	250 kcmil 120	--	--	--	--	--	--	--	--	--	--

3VA54

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 40 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
400	500 kcmil 240	2x 1x0.25 2x 30x5	--	--	--	--	--	--	--	--	--
500	2x 250 kcmil 2x 150	2x 1x0.25 2x 30x5	--	--	--	488	476	464	451	439	427
600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	--	--	--	587	574	560	547	534	521

3VA55

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 40 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	On request								
800	3x 300 kcmil 2x 240	2x 1.5x0.25 2x 50x5	On request								

6.4 Derating

3VA UL MCS molded case switches Fixed mounting

	Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper conductor cross-section ²⁾	Maximum rated uninterrupted operational current								
				86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 40 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
	[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
3VA51	100	3 35	--	--	--	--	--	--	--	--	97	94
3VA52	100	3 35	--	--	--	--	--	--	--	--	--	--
	150	0 50	--	--	--	--	--	--	--	--	--	--
	250	250 120	--	--	--	--	244	239	233	227	222	216
3VA53	400			--	--	--	--	--	--	--	--	--
3VA54	600			--	--	--	587	574	560	547	534	521
3VA55	800			On request								
3VA63	400			--	--	--	--	--	375	350	325	300
3VA64	600			--	--	--	--	593	540	510	480	450

-- No derating up to the rated operational current I_n of the molded case circuit breaker

¹⁾ Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

²⁾ Test cross-sections according to IEC EN 60947-1, Table 11

6.4.2 Use of terminals with control wire tap

When connecting terminals with control wire tap are used, the total current from the main circuit and control wire must not exceed the maximum rated operational current of the molded case circuit breaker.

6.4.3 Additional correction factors with frequencies other than 50/60 Hz for 3VA5 molded case circuit breakers

The temperature rise in the bimetal is greater at frequencies above 50/60 Hz. This is due to eddy-current losses and the reduction in the available conductor cross-section as a result of the skin effect.

The rated operational current must therefore be reduced from the value used in 50/60 Hz applications.

3VA51 Frequency	Correction factor for the thermal trip unit
<150 Hz	1.00
150 Hz ... 400 Hz	0.90

3VA52 Frequency	Correction factor for the thermal trip unit
<100 Hz	1.00
100 Hz ... 250 Hz	0.95
250 Hz ... 400 Hz	0.90

3VA53/54 Frequency	Correction factor for the thermal trip unit
<100 Hz	1.00
100 Hz ... 150 Hz	0.95
200 Hz	0.90
300 Hz ... 400 Hz	0.85

3VA55; I_n = 600 A Frequency	Correction factor for the thermal trip unit
<100 Hz	1.00
100 Hz ... 150 Hz	0.95
150 Hz ... 250 Hz	0.91
250 Hz ... 350 Hz	0.86
350 Hz ... 400 Hz	0.83

3VA55; I_n = 800 A Frequency	Correction factor for the thermal trip unit
<100 Hz	1.00
100 Hz ... 150 Hz	0.93
150 Hz ... 250 Hz	0.88
250 Hz ... 350 Hz	0.82
350 Hz ... 400 Hz	0.78

In an application with 400 Hz, this means the following for the example from chapter Derating of 3VA5 molded case circuit breakers (Page 582) with a 3VA5 molded case circuit breaker and a desired current $I_r = 90$ A:

- Setting value $I_{r(400\text{ Hz})} = 90\text{ A} \cdot 0.9 = 86\text{ A}$

6.4 Derating

Where ambient temperatures differ from the calibration temperature, temperature compensation as described in chapter Derating of 3VA5 molded case circuit breakers (Page 582) must be performed.

In addition, a correction factor for setting the magnetic trip unit as a function of frequency must be applied.

Frame size	Rated current	DC	Correction factor for the magnetic trip unit at frequency f [Hz]									
			20	50	60	100	150	200	250	300	350	400
3VA51	125 A	0.70	1.05	1.00	1.00	1.00	0.95	0.90	0.85	0.80	0.75	0.70
3VA52	250 A	0.85	1.00	1.00	1.00	1.00	0.90	0.80	0.75	0.70	0.65	0.60
3VA53	400 A	0.80	1.00	1.00	0.95	0.91	0.83	0.80	0.75	0.70	0.65	0.60
3VA54	600 A	0.80	1.00	1.00	0.95	0.91	0.83	0.80	0.75	0.70	0.65	0.60
3VA55	800 A	0.90	1.10	1.00	0.95	0.75	0.73	0.70	0.68	0.65	0.63	0.60

Example

Starting point:

A 3VA5 200 A molded case circuit breaker with a TM230 trip unit is used in a 400 Hz application. The molded case circuit breaker is to trip instantaneously at an overcurrent of 2000 A.

The maximum permissible rated uninterrupted operational current is calculated first:

$$200 \text{ A} \cdot 0.9 = 180 \text{ A}$$

The setting value for instantaneous short-circuit protection (I_i) is then determined on the basis of the correction factor from the table above:

$$I_i = 2000 \text{ A} \cdot 0.6 = 1200 \text{ A}$$

6.4.4 Derating for the electronic trip units of 3VA6 molded case circuit breakers

The ambient temperature has no effect on the current measurement of the electronic trip units of 3VA6 molded case circuit breakers. The Rogowski coils integrated in the trip unit measure the current and compare it to the set tripping threshold. Higher or lower ambient temperatures do not influence the tripping threshold, which means that it is not necessary to apply correction factors.

Limitation of the rated operational current

The temperature inside the molded case circuit breaker is nonetheless influenced by the ambient temperature and the current-dependent power loss generated inside the unit. To prevent overloading of molded case circuit breakers under difficult thermal conditions, the maximum rated uninterrupted operational current must therefore be limited as a function of the ambient temperature in some cases:

The tables below contain the maximum rated uninterrupted operational current as a function of the accessories to be taken into account and the ambient temperature. The operational

current must never exceed the maximum rated operational current of the molded case circuit breaker.

Note

The values do not apply to all installation situations of the molded case circuit breaker and may deviate depending upon factors such as cables and busbars, packing density, ventilation, etc.

Please observe the applicable overriding guidelines (e.g. IEC 61439).

When connecting terminals with auxiliary conductor connection are used, the total current from the main conducting path and auxiliary conductor must not exceed the maximum rated operational current of the molded case circuit breaker.

3VA6 molded case circuit breakers for line protection

Fixed-mounted:

Basic circuit breaker³⁾ with electronic trip unit (3-series ETU)

Frame size	Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
				86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
	[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
3VA61	40	8 10	--	--	--	--	--	--	--	--	--	--
	60	6 16	--	--	--	--	--	--	--	--	--	--
	100	3 35	--	--	--	--	--	--	--	--	--	--
	150	0 50	--	--	--	--	--	--	145	139	133	128
3VA62	100	3 35	--	--	--	--	--	--	--	--	--	--
	250	250 kcmil 120	--	--	--	--	--	--	241	232	222	213
3VA63	250	250 kcmil 120	--	--	--	--	--	--	--	--	--	--
	400	500 kcmil 240	2x 1x0.25	--	--	--	--	--	385	370	355	340

6.4 Derating

Frame size	Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
				86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
				[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
3VA64	400	500 kcmil 240	2x 1x0.25	--	--	--	--	--	--	--	--	--
	600	2x 350 kcmil 2x 185	2x 1.25x0.25	--	--	--	--	593	575	557	538	520
3VA65	600	2x 350 kcmil 2x 185	2x 1.25x0.25	--	--	--	--	--	--	--	510	510
	800	3x 300 kcmil 2x 240	2x 1.5x0.25	--	--	--	--	--	752	752	644	644
3VA66	1000	--	2x 2x0.25 2x 60x5	--	--	--	880	880	800	800	700	700

-- No derating up to the rated operational current I_n of the molded case circuit breaker

¹⁾ Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

²⁾ Test cross-sections according to IEC EN 60947-1, Table 11

³⁾ Only the COM060 communications module has an effect on derating. Other internal accessories can be used without restriction.

Basic circuit breaker³⁾ with electronic trip unit (5-series and 8-series ETU)

Frame size	Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
				86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
	[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
3VA61	40	8 10	--	--	--	--	--	--	--	--	--	--
	60	6 16	--	--	--	--	--	--	--	--	--	--
	100	3 35	--	--	--	--	--	--	--	--	--	--
	150	0 50	--	--	--	--	--	--	143	135	128	120
3VA62	100	3 35	--	--	--	--	--	--	--	--	--	--
	250	250 120	--	--	--	--	--	--	238	225	213	200
3VA63	250	250 120	--	--	--	--	--	--	--	--	--	--
	400	500 240	2x 1x0.25 2x 30x5	--	--	--	--	--	375	360	325	300
3VA64	400	500 240	2x 1x0.25 2x 30x5	--	--	--	--	--	--	--	--	--
	600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	--	--	--	--	570	540	510	480	450

6.4 Derating

Frame size	Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
				86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
				[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
3VA65	600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	--	--	--	--	--	--	--	510	510
	800	3x 300 kcmil 2x 240	2x 1.5x0.25 2x 50x5	--	--	--	--	--	752	752	644	644
3VA66	1000	--	2x 2x0.25 2x 60x5	--	--	--	880	880	800	800	700	700

-- No derating up to the rated operational current I_n of the molded case circuit breaker

¹⁾ Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

²⁾ Test cross-sections according to IEC EN 60947-1, Table 11

³⁾ Only the COM060 communications module has an effect on derating. Other internal accessories can be used without restriction.

COM060³⁾ with electronic trip unit (5-series and 8-series ETU)

Frame size	Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
				86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
	[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
3VA61	40	8 10	--	--	--	--	--	--	--	--	--	--
	60	6 16	--	--	--	--	--	--	--	--	--	--
	100	3 35	--	--	--	--	--	--	--	--	--	--
	150	0 50	--	--	--	--	--	--	139	129	119	108
3VA62	100	3 35	--	--	--	--	--	--	--	--	--	--
	250	250 kcmil 120	--	--	--	--	--	--	232	215	198	180
3VA63	250	250 120	--	--	--	--	--	--	--	--	--	--
	400	500 240	2x 1x0.25 2x 30x5	--	--	--	--	--	368	335	303	270
3VA64	400	500 240	2x 1x0.25 2x 30x5	--	--	--	--	--	--	--	--	--
	600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	--	--	--	588	548	507	467	426	385

6.4 Derating

Frame size	Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
				86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
				[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
3VA65	600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	--	--	--	--	--	--	--	510	510
	800	3x 300 kcmil 2x 240	2x 1.5x0.25 2x 50x5	--	--	--	--	--	744	744	640	640
3VA66	1000	--	2x 2x0.25 2x 60x5	--	930	930	850	850	750	750	500	500

-- No derating up to the rated operational current I_n of the molded case circuit breaker

¹⁾ Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

²⁾ Test cross-sections according to IEC EN 60947-1, Table 11

³⁾ Only the COM060 communications module has an effect on derating. Other internal accessories can be used without restriction.

Plug-in and withdrawable design:

Basic circuit breaker³⁾ with electronic trip unit (3-series ETU)

Frame size	Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
				86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
	[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
3VA61	40	8 10	--	--	--	--	--	--	--	--	--	--
	60	6 16	--	--	--	--	--	--	--	--	--	--
	100	3 35	--	--	--	--	--	--	--	--	--	--
	150	0 50	--	--	--	147	142	138	132	126	122	117
3VA62	100	3 35	--	--	--	--	--	--	--	--	--	--
	250	250 kcmil 120	--	--	--	245	238	230	220	210	203	195
3VA63	250	250 kcmil 120	--	--	--	--	--	--	--	--	--	--
	400	500 kcmil 240	2x 1x0.25 2x 30x5	--	--	--	--	390	375	360	345	330
3VA64	400	500 kcmil 240	2x 1x0.25 2x 30x5	--	--	--	--	--	--	--	--	--
	600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	585	562	540	525	510	495	480	465	450

-- No derating up to the rated operational current I_n of the molded case circuit breaker

¹⁾ Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

²⁾ Test cross-sections according to IEC EN 60947-1, Table 11

³⁾ Only the COM060 communications module has an effect on derating. Other internal accessories can be used without restriction.

6.4 Derating

Basic circuit breaker³⁾ with electronic trip unit (5-series and 8-series ETU)

Frame size	Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
				86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
				[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
3VA61	40	8 10	--	--	--	--	--	--	--	--	--	--
	60	6 16	--	--	--	--	--	--	--	--	--	--
	100	3 35	--	--	--	--	--	--	--	--	--	--
	150	0 50	--	--	--	143	136	129	122	116	109	102
3VA62	100	3 35	--	--	--	--	--	--	--	--	--	--
	250	250 kcmil 120	--	--	--	238	227	215	204	193	181	170
3VA63	250	250 kcmil 150	--	--	--	--	--	--	--	--	--	--
	400	500 kcmil 240	2x 1x0.25 2x 30x5	--	--	--	--	380	360	340	320	300
3VA64	400	500 kcmil 240	2x 1x0.25 2x 30x5	--	--	--	--	--	--	--	--	--
	600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	585	562	540	517	493	470	447	423	400

-- No derating up to the rated operational current I_n of the molded case circuit breaker

¹⁾ Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

²⁾ Test cross-sections according to IEC EN 60947-1, Table 11

³⁾ Only the COM060 communications module has an effect on derating. Other internal accessories can be used without restriction.

COM060³⁾ with electronic trip unit (5-series and 8-series ETU)

Frame size	Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
				86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
	[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
3VA61	40	8 10	--	--	--	--	--	--	--	--	--	--
	60	6 16	--	--	--	--	--	--	--	--	--	--
	100	3 35	--	--	--	--	--	--	--	--	--	99
	150	0 50	--	--	--	143	136	128	121	113	106	99
3VA62	100	3 35	--	--	--	--	--	--	--	--	--	--
	250	250 kcmil 120	--	--	--	238	226	214	201	189	177	165
3VA63	250	250 kcmil 150	--	--	--	--	--	--	--	--	--	--
	400	500 kcmil 240	2x 1x0.25 2x 30x5	--	--	--	--	--	355	320	285	250
3VA64	400	500 kcmil 240	2x 1x0.25 2x 30x5	--	--	--	--	--	--	--	--	--
	600	2x 350 kcmil 2x 185	2x 1.25x0.25 2x 40x5	585	562	540	514	487	460	464	407	380

-- No derating up to the rated operational current I_n of the molded case circuit breaker

1) Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

2) Test cross-sections according to IEC EN 60947-1, Table 11

3) Only the COM060 communications module has an effect on derating. Other internal accessories can be used without restriction.

6.4 Derating

3VA6 motor circuit protectors

Fixed-mounted:

3VA61

Rated operational current I_n	Copper conductor cross-section ¹⁾ [mm ²]	Copper busbar cross-section ²⁾ [mm]	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
25	10 4	--	--	--	--	--	--	--	--	--	--
30	10 6	--	--	--	--	--	--	--	--	--	--
40	8 10	--	--	--	--	--	--	--	--	--	--
50	8 10	--	--	--	--	--	--	--	--	--	--
70	4 25	--	--	--	--	--	--	--	--	--	--
80	4 25	--	--	--	--	--	--	--	--	--	--
90	3 35	--	--	--	--	--	--	--	--	--	--
100	3 35	--	--	--	--	--	--	--	--	--	--

-- No derating up to the rated operational current I_n of the molded case circuit breaker

¹⁾ Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

²⁾ Test cross-sections according to IEC EN 60947-1, Table 11

3VA62

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
110	2 35	--	--	--	--	--	--	--	--	--	--
125	1 50	--	--	--	--	--	--	--	--	--	--
150	0 50	--	--	--	--	--	--	--	--	--	--
200	000 95	--	--	--	--	--	--	--	--	--	--

3VA63

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
200	000 95	--	--	--	--	--	--	--	--	--	--
250	250 120	--	--	--	--	--	--	--	--	--	--

6.4 Derating

3VA64

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
400	500 240	2x 1x0.25 2x 30x5	--	--	--	--	--	--	--	--	--
500	2x 250 1x 150	2x 1x0.25 2x 30x5	--	--	--	--	--	495	490	485	480

3VA65

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
800	3x 300 1x 2400	2x 1.5x0.25 2x 50x5	On request								

Plug-in and withdrawable design:

3VA61

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
25	10 4	--	--	--	--	--	--	--	--	--	--
30	10 6	--	--	--	--	--	--	--	--	--	--

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
40	8 10	--	--	--	--	--	--	--	--	--	--
50	8 10	--	--	--	--	--	--	--	--	--	--
70	4 25	--	--	--	--	--	--	--	--	--	--
80	4 25	--	--	--	--	--	--	--	--	--	--
90	3 35	--	--	--	--	--	--	--	--	--	--
100	3 35	--	--	--	--	--	--	--	--	--	--

-- No derating up to the rated operational current I_n of the molded case circuit breaker

¹⁾ Test cross-sections according to IEC EN 60947-1, Tables 9 and 10

²⁾ Test cross-sections according to IEC EN 60947-1, Table 11

3VA62

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm ²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
110	2 35	--	--	--	--	--	--	--	--	--	--
125	1 50	--	--	--	--	--	--	--	--	--	--
150	0 50	--	--	--	--	--	--	--	--	--	--
200	000 95	--	--	--	--	--	--	--	--	--	195

6.4 Derating

3VA63

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
200	000 95	--	--	--	--	--	--	--	--	--	--
250	250 120	--	--	--	--	--	--	--	--	--	--

3VA64

Rated operational current I_n	Copper conductor cross-section ¹⁾	Copper busbar cross-section ²⁾	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
[A]	[AWG/ kcmil] [mm²]	[Inch] [mm]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
400	500 240	2x 1x0.25 2x 30x5	--	--	--	--	--	--	--	--	--
500	2x 250 1x 150	2x 1x0.25 2x 30x5	--	481	466	444	425	412	400	388	375

3VA6 MCS molded case switches

Trip unit	Frame size	Rated operational current I_n	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
			[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
Fixed mounting											
MCS110	3VA64	400	--	--	--	--	--	--	--	--	--
		600	--	--	--	--	593	575	557	538	520
Plug-in and withdrawable design											

Trip unit	Frame size	Rated operational current I_n	Maximum rated uninterrupted operational current								
			86 °F 30 °C	95 °F 35 °C	104 °F 40 °C	113 °F 45 °C	122 °F 50 °C	131 °F 55 °C	140 °F 60 °C	149 °F 65 °C	158 °F 70 °C
			[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
MCS110	3VA64	400	--	--	--	--	390	375	360	345	330
		600	585	562	540	525	510	495	460	465	450

-- No derating up to the rated operational current I_n of the molded case circuit breaker

- 1) Test cross-sections according to IEC EN 60947-1, Tables 9 and 10
- 2) Test cross-sections according to IEC EN 60947-1, Table 11

Example 1

Starting point:

A 3VA61 100 A molded case circuit breaker with an ETU350 LSI trip unit is to be operated at 70 °C with plug-in technology:

$$I_{r(\max 70^\circ \text{C})} = \mathbf{100 \text{ A}}$$

No derating is required.

Example 2

Starting point:

A 3VA62 250 A molded case circuit breaker with an ETU850 LSI trip unit is to be operated at 60 °C with plug-in technology and the COM060 communications module:

$$I_{r(\max 60^\circ \text{C})} = \mathbf{189 \text{ A}}$$

6.4 Derating

Appendix

A.1 Standards and approvals

Description

Table A-1 International standards that the molded case circuit breakers of the 3VA5 and 3VA6 ranges meet

Standard		Title
CISPR11	Class A	Limits and methods of measurement of radio interference suppression of equipment in industrial environments.
	Class B	Limits and methods of measurement of radio interference suppression of equipment in domestic environments.
IEC 60664-1		Insulation coordination for equipment within low-voltage systems.
IEC 60068-2-1 "Ab"		Environmental testing - Part 2-1: Tests - Test A: Cold
IEC 60068-2-2 "Bd"		Environmental testing - Part 2-2: Tests - Test B: Dry heat
IEC 60068-2-27 "Ea"		Environmental testing - Part 2-27: Tests - Test Ea and guidance Shock
IEC 60068-2-30 "Db"		Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 + 12 hours)
IEC 60068-2-52		Environmental testing - Part 2: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)
IEC 60068-2-6 "Fc"		Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)
IEC 60228 Class 1		Solid conductors
IEC 60228 Class 2		Stranded conductors
IEC 60228 Class 5		Flexible conductors
IEC 60228 Class 6		Very flexible conductors (more flexibility than Class 5)
IEC 60364-4-41		Electrical installations of buildings - Part 4-41: Protection for safety - Protection against electric shock
VDE 0100-410		
IEC 60529		Degrees of protection provided by enclosures (IP code)
IEC 60947-1 / DIN EN 60947-1 (VDE 0600-100)		Low-voltage switchgear and controlgear – General rules
IEC / EN 60947-1		Low-voltage switchgear and controlgear – General rules
IEC / EN 60947-1, Annex S		Digital inputs and/or digital outputs contained in switchgear and controlgear
IEC / EN 60947-2 Edition 4.1, 05.2009		Low-voltage switchgear and controlgear - Part 2: Circuit-Breakers
IEC / EN 60947-2 A1		
IEC / EN 60947-2, Annex B		Circuit-breakers incorporating residual current protection
IEC / EN 60947-2, Annex H		"Test sequence for circuit-breakers for IT systems" "Circuit-breakers for IT systems"

Standard	Title
IEC / EN 60947-3 / DIN EN 60947-3 (VDE 0660-107)	Low-voltage switchgear and controlgear – Switches, disconnectors, switch-disconnectors and fuse-combination units
IEC 60947-4-1 / DIN EN 60947-4-1 (VDE 0660-102)	Low-voltage switchgear and controlgear: Contactors and motor-starters
IEC / EN 61000-4-2	Electrostatic discharge immunity test
IEC / EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test
IEC / EN 61000-4-4	Electrical fast transient/burst immunity test
IEC / EN 61000-4-5	Surge immunity test
IEC / EN 61000-4-6	Immunity to conducted disturbances, induced by radio-frequency fields
IEC 61557-12	Electrical safety in low voltage distribution systems up to 1000 V AC and 1500 V DC - Equipment for testing, measuring or monitoring of protective measures - Part 12: Power metering and monitoring devices (PMD)
UL 489	UL Standard for Safety for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 1053	Standard For Safety For Ground-Fault Sensing and Relaying Equipment
	RoHS Directive 2002/95/EC (Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment).

National standards that the 3VA UL molded case circuit breakers meet

You will find the national standards that the 3VA UL molded case circuit breakers meet at (<https://support.industry.siemens.com/cs/ww/en/ps/19492/cert?ct=439>)

Certification by marine classification societies

You will find the marine approvals that the 3VA UL molded case circuit breakers meet at (<https://support.industry.siemens.com/cs/ww/en/ps/19492/cert?ct=446>)

Disposal of waste electronic equipment



Waste electronic equipment must not be disposed of as unsorted municipal waste, e.g. household waste. When disposing of waste electronic equipment, the current local national/ international regulations must be observed.

ESD guidelines

B

B.1 Electrostatic sensitive devices (ESD)

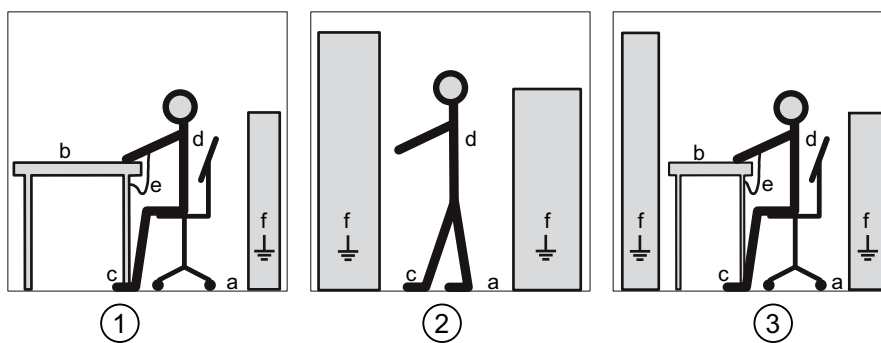
ESD components are destroyed by voltage and energy far below the limits of human perception. Voltages of this kind occur as soon as a device or an assembly is touched by a person who is not electrostatically discharged. ESD components which have been subject to such voltage are usually not recognized immediately as being defective, because the malfunction does not occur until after a longer period of operation.

ESD Guidelines

NOTICE
Electrostatic sensitive devices Electronic modules contain components that can be damaged by electrostatic discharge as a result of improper handling. • You must discharge your body electrostatically immediately before touching an electronic module. To do this, touch a conductive, grounded object, e.g., a bare metal part of a switch cabinet or the water pipe. • Always hold the component by the plastic enclosure. • Electronic modules should not be brought into contact with electrically insulating materials such as plastic film, plastic parts, insulating table supports or clothing made of synthetic fibers. • Always place electrostatic sensitive devices on conductive bases. • Always store and transport electronic modules or components in ESD-safe conductive packaging, e.g. metalized plastic or metal containers. Leave the component in its packaging until installation.

NOTICE
Storage and transport If you have to store or transport the component in non-conductive packaging, you must first pack the component in ESD-safe, conductive material, e.g., conductive foam rubber, ESD bag.

The diagrams below illustrate the required ESD protective measures for electrostatic sensitive devices.



- (1) ESD seat
- (2) ESD standing position
- (3) ESD seat and ESD standing position

Protective measures

- a Conductive floor
- b ESD table
- c ESD footwear
- d ESD smock
- e ESD bracelet
- f Cubicle ground connection

List of abbreviations

C.1 Table of abbreviations

Overview

Table C-1 Meaning of abbreviations used in this document

Abbreviation	Meaning
AC	AC voltage
ACT	ACTIVE (ready signal)
AL	ALARM (pre-alarm)
ASCII [Modbus interface]	American Standard Code for Information Interchange
ATAM	Adjustable Thermal Adjustable Magnetic Trip Unit (adjustable thermal overload release, adjustable magnetic trip unit with short-circuit release)
ATFM	Adjustable Thermal Fixed Magnetic Trip Unit (adjustable thermal overload release, permanently set magnetic trip unit with short-circuit release)
ATSE	Automatic Transfer Switching Equipment
AUX	Auxiliary switch
C	Common
CB-S	Circuit Breaker Switch (standard auxiliary switch (NO contact))
CD	Compact Disk
COM-DO kit	COM draw-out (withdrawable) kit
DAS	Dynamic Arc Sentry
DC	Direct voltage
DIN	Deutsches Institut für Normierung e. V. (German Institute for Standardization)
DISCON	DISCONNECT
DO	Draw-out (withdrawable) design
EFB	External function box
ESD	Electrostatic sensitive devices
EMC	Electromagnetic compatibility
EN	European Standard
ETU	Electronic trip unit
FTAM	Fixed thermal adjustable magnetic trip unit (permanently set thermal overload release, adjustable magnetic trip unit with short-circuit release)
FTFM	Fixed thermal fixed magnetic trip unit (permanently set thermal overload release, permanently set magnetic trip unit with short-circuit release)
G	Ground fault (ground-fault protection)
GF [tripping characteristic]	Ground fault
HH-fuse	High-voltage fuses

C.1 Table of abbreviations

Abbreviation	Meaning
HID	High-intensity discharge
I	Instantaneous (short-circuit protection)
I	Isolated
I- / O-	Input / Output
IEC	International Electrotechnical Commission
INST [tripping characteristic]	INST [tripping characteristic]
INSTA	Final distribution area
IP	International Protection
IT	Injection Tester
IT	Isolated ground, French: "Isolé Terre"
L	Long-time delay (overload protection)
L	Overload release
LBS	Load Break Switch (switch disconnecter)
LCS	Leading changeover switch
LI	Overload protection (L) and instantaneous short-circuit protection (I)
LIG	Overload protection (L), instantaneous short-circuit protection (I) and ground-fault protection (G)
LIN	Overload protection (L), instantaneous short-circuit protection (I) and neutral conductor protection (N)
LSI	Overload protection (L), short-time-delayed short-circuit protection (S) and instantaneous short-circuit protection (I)
LSIN	Overload protection (L), short-time-delayed short-circuit protection (S), instantaneous short-circuit protection (I) and neutral conductor protection (N)
LSING	Overload protection (L), short-time-delayed short-circuit protection (S), instantaneous short-circuit protection (I) and ground-fault protection (G)
LT [tripping characteristic]	Partial overload range of the characteristic curve of a switching device
MCCB	Molded case circuit breaker
MCP	Motor circuit protector
MCS	Molded case switch
MMB	Maintenance mode box
MO	Motor operator
N	Neutral conductor
NC	Normally closed contact
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association.
NO	Normally open contact
LV	Low voltage
LV fuse	Low-voltage fuse
PAC	Power Analysis & Control
PI	Plug-in (unit)
R	RESET
RCR	Residual Current Release

Abbreviation	Meaning
REC	Reclose (automatic reset)
RJ [connector]	Registered Jack
RMS	Root Mean Square
RS [interface]	Formerly: Radio Selector; now usually: Recommended Standard
RTU [Modbus interface]	Remote Terminal Unit
SAS	Short circuit alarm switch
PLC	Programmable logic controller
ST	Shunt trip
STF	Shunt trip flexible
STL	Shunt trip left
SWD	Switching duty
T	Test
T [IT systems]	French: Terre (ground)
TC	Test device for molded case circuit breaker or MRCD, suitable for phase/grounded systems
TCP	Transmission Control Protocol
TD	Test Device
TM	Thermal Magnetic
TMTU	Thermal-Magnetic Trip Unit
TRIP-IND	TRIP INDICATOR (trip alarm switch)
TRUE RMS	TRUE root-mean-square
TU	Trip Unit
UAR	Universal release
UL	Underwriters Laboratories Inc.
UNI	Universal release
UR	Undervoltage release
USB	Universal Serial Bus
UPS	Uninterruptible power supply
UVR	Undervoltage release
VDE	Verein Deutscher Ingenieure (Association of German Electrical Engineers)
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
ZSI	Zone Selective Interlocking
ZSS	Zone Selective Interlocking

Table C-2 Meaning of symbols and abbreviations

Symbol/abbreviation	Meaning
Δt	Delay time
$I_{\Delta n}$	Residual current; rated residual current; response current
I_1	Inrush current
I''_{KG}	Initial balanced short-circuit current

C.1 Table of abbreviations

Symbol/abbreviation	Meaning
I^2t	Let-through energy
I_B	Take-over current
I_b	Pickup value blocking protection
I_{cm}	Making capacity; rated short-circuit making capacity
I_{cn}	Rated short-circuit breaking capacity
I_{cs}	Maximum rated service short-circuit breaking capacity
I_{cu}	Maximum rated ultimate short-circuit breaking capacity
I_{cw}	Rated short-time withstand current; rated short-time current
I_d	Prospective current; residual current; response residual current
I_D	Let-through current
I_g	Ground-fault protection; ground-fault release; ground-fault current setting value
I_i	Instantaneous tripping current; instantaneous short-circuit protection; instantaneous magnetic protection; rated instantaneous short-circuit current setting
I_k	Short-circuit current
I_{KD}	Uninterrupted short-circuit current
$I_{K\ MAX}$	Maximum short-circuit current
$I_{Kmaxline}$	Uninterrupted short-circuit current of system
I_n	Rated operational current
I_{nG}	Rated operational current (generator)
I_p	Rated peak withstand current, peak short-circuit current
I_r	Thermal protection; setting current; response value; current setting value of adjustable overload release (pickup value overload protection)
I_s	Limit current with selectivity; maximum short-circuit current for selectivity limit
I_{sc}	Prospective current
I_{sd}	Short-time-delayed tripping current; response current of S protection; short-time-delayed short-circuit release; short-time-delayed short-circuit protection; delay time of S protection
I_{th}	Conventional free-air thermal current
I_U	Rated uninterrupted current
R_A	Contact resistance of exposed conductive part ground
t_1	Time of inrush current
t_2	Ramp up time
t_A	Safety clearance
t_b	Delay time (delay of blocking time)
t_d	Response time
t_g	Delay time associated with the adjustable response current; trip time associated with ground-fault current setting value
t_i	"Virtual" tripping time of short-circuit (I) release; highest tripping time associated with rated instantaneous short-circuit current setting
t_{ld}	Trip time associated with current setting value of adjustable overload release
T_p	Trip time; delay time; time-lag class
t_{sd}	Trip time associated with short-time-delayed tripping current; delay time of S protection

Symbol/abbreviation	Meaning
t_s	Fuse melting time
t_{ZSI}	Delay time of all molded case circuit breakers which detect the short circuit but do not receive a blocking signal when ZSI is activated.
U	Voltage across main contacts of the molded case circuit breaker
U_e	Maximum voltage; rated voltage
U_{Nn}	System rated voltage

Conversion tables

D.1 Conversion tables

The U.S. units can be converted to the corresponding European/metric units using the conversion tables listed.

Note

No liability assumed for completeness or accuracy

No liability can be assumed for the completeness or accuracy of the values listed in this section of the manual.

Conversion of North American cross-section dimensions into metric cross-section dimensions

Metric cross-sections in accordance with VDE (Verband Deutscher Elektroingenieure (Association of German Electrical Engineers)) (mm²) ↔ conductor cross-sections in accordance with AWG (American Wire Gauge) or kcmil (Thousand Circular Mils)

AWG ↔ mm² conversion table

	AWG / kcmil	Diameter d/mm	mm ²	Metric equivalent [mm ²]
AWG	20	0.81 ¹⁾	0.52	0.75
	18	1.02 ¹⁾	0.82	1
	16	1.29 ¹⁾	1.3	1.5
	14	1.63 ¹⁾	2.08	2.5
	12	2.05 ¹⁾	3.31	4
	10	2.59 ¹⁾	5.26	6
	8	3.26 ¹⁾	8.4	10
	6	4.12 ¹⁾	13.3	16
	4	5.19 ¹⁾	21.2	25
	2	6.54 ¹⁾	33.6	35
	1	7.34 ¹⁾	42.4	50
	1 / 0	8.25 ¹⁾	53.5	—
	2 / 0	9.27 ¹⁾	67.4	70
	3 / 0	10.4 ¹⁾	85.0	95
	4 / 0	11.68 ¹⁾	107	120

1) Diameters over Solid Conductors and Cross-Sectional Area for All Solid and Stranded Conductors
Source: Standard UL 83

kcmil ↔ mm₂ conversion table

	AWG / kcmil	Diameter d/mm	mm ²
kcmil	250	14.6 ¹⁾	126
	300	16 ¹⁾	152
	350	17.3 ¹⁾	177
	400	18.49 ¹⁾	203
	500	20.65 ¹⁾	253
	600	22.68 ¹⁾	304
	800	26.16 ¹⁾	405
	1000	29.26 ¹⁾	507
	1500	35.86 ¹⁾	760
	2000	41.45 ¹⁾	1010

1) Diameter over Round Concentric-Lay-Stranded Conductors for Classes B, C and D
Source: Standard UL83

Other conversions

Conversion factors for units of length

Length	Conversion factor
1 inch (")	25.4 millimeters (mm)
1 centimeter	0.3937 inches (")

Conversion factors for units of weight

Weight	Conversion factor
1 ounce (Oz.)	28.35 grams (g)
1 pound (lb.)	0.454 kilograms (kg)
1 kilogram (kg)	2.205 pounds (lb.)

Pound (lb.)

Conversion for units of temperature

Temperature	
100 degrees Centigrade (°C)	212 degrees Fahrenheit (°F)
80 °C	176 °F
60 °C	140 °F
40 °C	104 °F
20 °C	68 °F
0 °C	32 °F
- 5 °C	23 °F

Temperature	
- 10 °C	14 °F
- 15 °C	5 °F
- 20 °C	- 4 °F
- 25 °C	- 13 °F
- 30 °C	- 22 °F

Conversion factors for tightening torques

Tightening torque	Conversion factor
1 Newton meter (Nm)	8.85 lbF in, 8.85 lb-in (inch-pound)
1.36 Newton meter (Nm)	1 lbF ft, 1 lb-ft (foot-pound)
0.113 Newton meter (Nm)	1 lbF in, 1 lb-in (inch-pound); 1 / 12 lb-ft

Glossary

AUTO

Method of remote operation of the motor operators via control cables, e.g. PLC.

Breaking capacity

The breaking capacity is the rms value of the current at a specific $\cos \varphi$ (power factor) and a specific voltage which can be safely interrupted by a switching device or fuse under prescribed conditions. The rms value of the symmetrical component applies in the case of alternating current.

I^2t characteristic

The I^2t characteristic is a curve that represents the minimum or maximum values of I^2t in relation to break times as a function of the prospective current under defined operating conditions.

I^2t value

The I^2t value is the thermal value of a prospective or limited short-circuit current (let-through current).

Let-through current

The let-through current I_D is the maximum instantaneous current value during the break time of a switching device or fuse. Limited short-circuit currents occur if the switching device reduces the amplitude of the short-circuit current due to, for example, resistance, switching delay and peak arc voltage. The let-through current of a device such as a current-limiting fuse or a current-limiting molded case circuit breaker determines the thermal load (I^2t value) imposed on equipment connected downstream of the device (current limitation).

LOCK

Operating mode of motor operators; the operator is locked and cannot be operated.

Making capacity

The making capacity is the value of the prospective making current which the switching device can safely conduct at the instant of closing under prescribed conditions for a specific circuit.

For molded case circuit breakers, the making capacity is expressed as the maximum possible instantaneous value of the potential prospective current at the input terminals for the specified voltage.

MANUAL

Local, manual operating mode of motor operators.

Protective characteristic

The protective characteristic is determined by the rated operational current and the settings and response values of the circuit breaker.

Rated breaking capacity

The circuit breaker must disconnect this current **three times** without damage. This is followed by a verification of operation and performance, i.e. the circuit breaker must **subsequently** be able to conduct the **operational current** and must still be capable of performing at least one circuit breaking operation.

Rated frequency

Design frequency for a switching device and reference value for other characteristics of the device.

Rated making capacity

The rated making capacity is the maximum current that a switching device can conduct at the instant of closing in accordance with the utilization category at the relevant rated voltage.

Rated operational current

The rated operational current I_n for molded case circuit breakers is equivalent to the rated uninterrupted current I_U and to the conventional free-air thermal current I_{th} .

Rated operational power

The rated operational power is the power that a switching device is capable of switching at the associated rated voltage in accordance with the utilization category, e.g. power contactor utilization category AC-3:37 kW at 400 V.

Rated peak withstand current, peak short-circuit current

Maximum permissible instantaneous (peak) value of the prospective short-circuit current in the conducting path under the highest load. It characterizes the dynamic short-circuit strength of a switching device.

Rated residual current

The rated residual current $I_{\Delta n}$ is the fault (residual) current for which residual current-operated circuit breakers are designed. The residual current rating is declared on the rating plate of the device.

Rated service short-circuit breaking capacity

The rated service short-circuit breaking capacity I_{cs} is the short-circuit current determined by the operating voltage that a molded case circuit breaker is capable of interrupting repeatedly (test O - CO - CO, formerly test sequence P II). After a molded case circuit breaker has interrupted a short circuit, it can continue to carry the rated operational current despite increased self-heating and will trip again in the event of a short circuit.

Rated short-circuit breaking capacity

The rated short-circuit breaking capacity I_{cn} of a molded case circuit breaker is the maximum current that the circuit breaker can safely interrupt at a specific rated voltage and rated frequency. It is specified as an rms value.

With AC molded case circuit breakers, the rated short-circuit breaking capacity must be independent of the magnitude of the DC component. The rated short-circuit breaking capacity also ensures that the molded case circuit breaker can interrupt every current up to the rated short-circuit breaking capacity in the event of a line-frequency recovery voltage with 110% of the rated voltage.

This applies:

- To alternating current at every value of the power factor, but not lower than the value defined in the relevant test specification.
- To direct current (unless otherwise specified by the manufacturer) with every time constant, but not greater than the value defined in the relevant test specification.

The short-circuit breaking capacity does not apply in the event of a recovery voltage at line frequency above 110% of the rated voltage.

Rated short-circuit making capacity

The rated short-circuit making capacity I_{cm} of a molded case circuit breaker is the maximum current that the circuit breaker can safely interrupt at a specific rated voltage and rated frequency. Unlike other characteristic data, this is specified as a peak value.

With AC molded case circuit breakers, the rated short-circuit making capacity must be at least equal to the rated short-circuit breaking capacity multiplied by a factor n .

The rated short-circuit making capacity is calculated to allow the molded case circuit breaker to conduct the current during closing at a voltage of up to 110% inclusive of the rated voltage.

Rated short-time current

Permissible rms value of the AC component of the prospective short-circuit current which the switching device is capable of conducting for a specific time period, e.g. from 0.05 s to 1 s (thermal short-circuit strength).

Rated short-time withstand current

The rated short-time withstand current I_{cw} is specified as an rms value of the short-circuit current and characterizes the thermal strength of a circuit of a switchgear assembly under

brief load conditions. The rated short-time withstand current calculation normally refers to a period of 1 s. The reference time must be specified if it deviates from the above. The rated short-time withstand current is specified for the distribution and/or main busbars of a switchgear assembly.

Rated ultimate short-circuit breaking capacity

The rated ultimate short-circuit breaking capacity I_{cu} is the maximum short-circuit current that a molded case circuit breaker is capable of interrupting (test O - CO, formerly test sequence P III). After the molded case circuit breaker has cleared the short circuit, it is capable of tripping with increased tolerances under overload conditions.

Limit value of rated ultimate short-circuit breaking capacity I_{cu} .

Rated uninterrupted current

The rated uninterrupted current I_U of a switching device, e.g. a molded case circuit breaker, is a current that the device can conduct in uninterrupted operation (for weeks, months or years). This current is specified by the manufacturer.

Rated voltage

The rated voltage U_e of a switching device, e.g. a molded case circuit breaker, is the voltage which serves as a reference to state other characteristics of the device. The maximum rated voltage must never be higher than the rated insulation voltage.

With multi-phase circuits, the specified voltage is generally the phase-to-phase voltage.

Remote control

Or AUTO; method of remote operation of the motor operators via control cables, e.g. PLC.

Response current, ground fault

When the ground fault current reaches or exceeds this limit value, the ground-fault protection, for example, of a molded case circuit breaker, is tripped.

Response current, instantaneous

When this current limit is exceeded, the circuit breaker trips instantaneously.

Response current, overload

When this uninterrupted current limit is exceeded within a predefined time period, the circuit breaker trips (inverse-time delayed tripping).

Response current, short-time delayed

When this current limit is exceeded, the circuit breaker trips after a predefined delay time.

Short circuit

Connection with a negligibly low impedance between two points of different potential in an electric circuit. The short-circuit current is a multiple of the rated operating current. Short circuits can cause thermal or mechanical damage to switching devices and other parts of an electrical installation.

Short-circuit strength

This is the resistivity of a switching device in the closed state, along with its components (e.g. trip units), or a complete switchboard to the electrodynamic and thermal stresses which arise in the event of a short circuit.

The characteristic for the dynamic stress is the rated peak withstand current, which is the maximum instantaneous value of the short-circuit current.

The characteristic for the thermal stress of the short-circuit current is the root-mean-square value of the short-circuit current throughout its duration.

Tripping current of overload release

The current value at which a trip unit trips within a specified time.

Tripping time

Period of time from the instant of commencement of trip command output to the moment at which the command becomes irrevocable (timing concept for the tripping of circuit breakers).

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