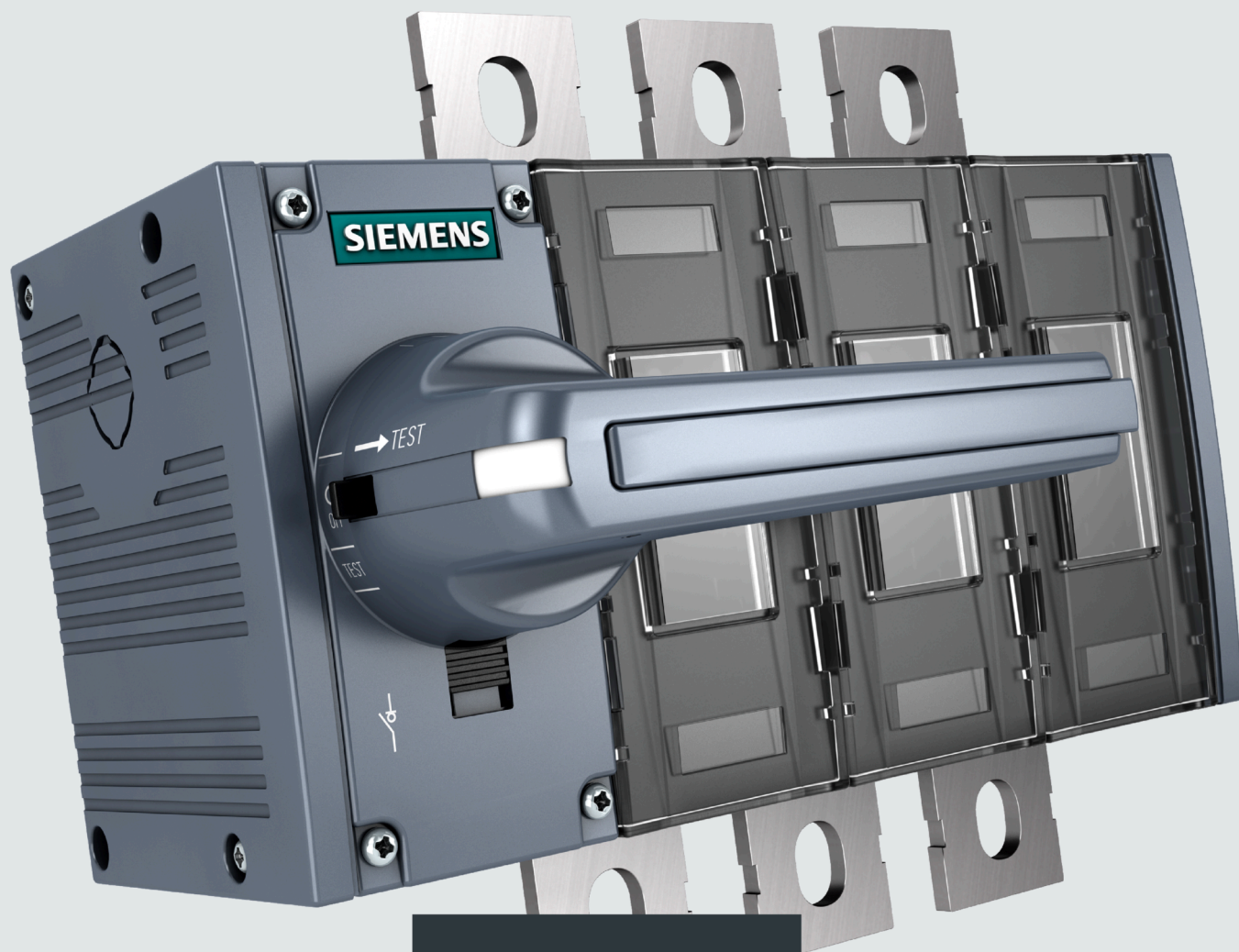


SIEMENS



Manual

SENTRON

Switching Devices

3KD Switch Disconnectors

Edition

12/2019

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SENTRON

Switch disconnectors 3KD Switch-disconnector




Equipment Manual

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Legal information

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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.

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.
NOTICE
indicates that property damage can result if proper precautions are not taken.


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Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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Introduction

Purpose of this manual

This manual describes the basic functions of the "switch disconnecter" range of switching devices.

It contains information about:

- Selection
- Configuring
- Commissioning

Target group











Planners, installation personnel, configuring engineers.
















Required basic knowledge

A general knowledge of low-voltage controls and distribution is required to understand this manual.

Used symbols

The following table explains the meaning of the various symbols used within this document:

Symbol	Meaning	Symbol	Meaning
	Pincer pliers		File
	Allen wrench		Touch handling
	Crosstip screwdriver PZ		Lock
	Hex tip screwdriver		Click to snap
	Burin		Solid conductor

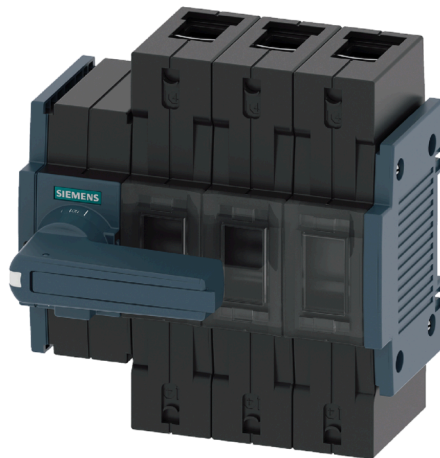
Symbol	Meaning	Symbol	Meaning
	Crosstip screwdriver PH		Stranded conductor
	Slot screwdriver		Fine stranded conductor with end sleeve
	Trash bin		Busbar
	Cut off in the trash bin		Dismantle of busbar
	OK		Dismantle of solid conductor
	Not OK		Dismantle of solid conductor with end sleeve
	Measure		Dismantle of solid conductor with end sleeve without insulating collars
	Handsaw		

General information

2.1 General information

Definitions of switch disconnecter

3KD switch disconnectors are used as main EMERGENCY-STOP or maintenance switches. They ensure activation and deactivation of the specified rated current under load. At the same time they constitute a safety isolation function and isolating distance in all low-voltage circuits.



For standards, directives, certifications and environmental compatibility, please see appendix.

Safety note

DANGER

Hazardous voltage. Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

NOTICE

Qualified personnel.

Installation and maintenance must be carried out by qualified personnel.

Product description

3.1 Function, performance features, application areas

Function

The 3KD switch disconnecter is used to make, carry, and break rated currents up to 2000 A.

Performance features

- 3-pole and 4-pole versions for AC and DC applications
- 6-pole DC switch for high DC voltages
- 5 frame sizes from 16 A to 2000 A
- Modular retrofitting of additional poles (4th contact element, N or N-PE pole)
- Different operating mechanism designs
- Manual operation from the side or front
- Locking function for handle
- Floor mounting or mounting on standard mounting rail

Application areas

The 3KD switch disconnecter is suitable for the following branches of industry:

- Process and basic industries
- Manufacturing industry
- Infrastructure (building installations, supply and disposal)
- Mining
- Machine control

Installation points

3KD series products are primarily used in the following places:

- Distribution boards with standard system dimensions
- Cabinets
- Mounting plates (free assembly)

Product line, product group

4.1 3KD switch disconnecter



Frame size	1	2	3	4	5
Rated current I_n (A)	16...100	80...250	200...500	500...1000	1000...2000
Number of poles					
3	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓
Operating mechanism					
Front operation	✓	✓	✓	✓	✓
Side operation	✓	✓	✓	✓	✓
Type of mounting					
Floor mounting	✓	✓	✓	✓	✓
Mounting on a standard mounting rail	✓	✓	X	X	X
Connections					
Flat terminal	X	✓	✓	✓	✓
Box terminal	✓	✓	X	X	X

4.1.1 Frame sizes

3KD switch disconnectors are available in the following frame sizes:

- Frame size 1: 16 - 32 - 63 - 80 - 100 A
- Frame size 2: 80 - 100 - 125 - 160 - 200 - 250 A
- Frame size 3: 200 - 250 - 315 - 400 - 500 A
- Frame size 4: 500 - 630 - 800 - 1000 A
- Frame size 5: 1000 - 1250 - 1600 - 2000 A

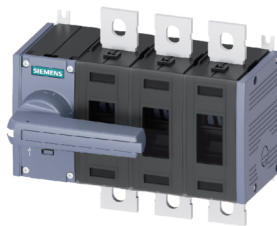
Frame sizes



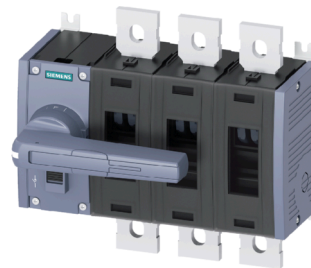
Frame size 1



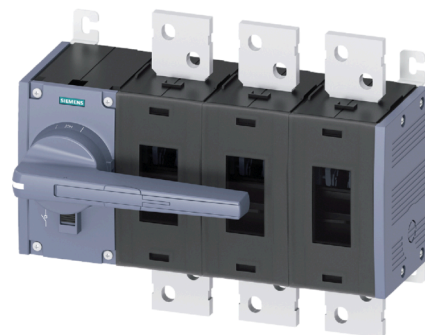
Frame size 2



Frame size 3



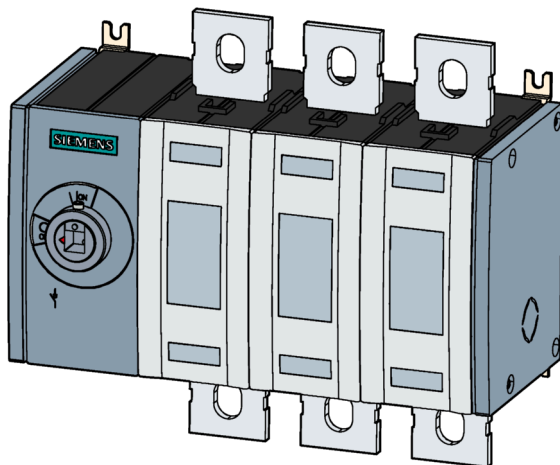
Frame size 4



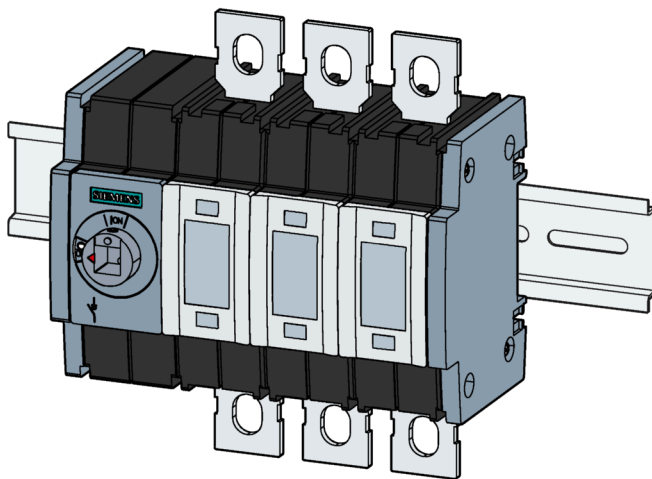
Frame size 5

4.1.2 Type of mounting

Type of mounting	Frame size
Floor mounting	1, 2, 3, 4, 5
Mounting on a standard mounting rail	1, 2



Floor mounting



Mounting on a standard mounting rail

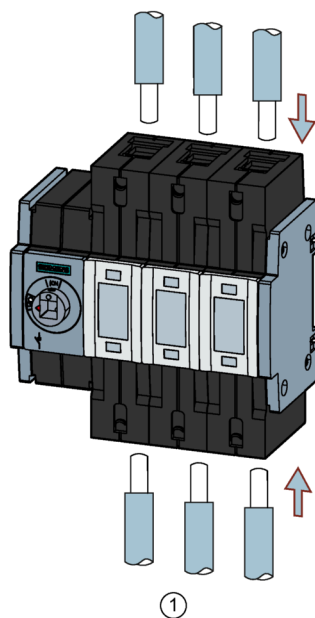
4.1.3 Connection

Connection types

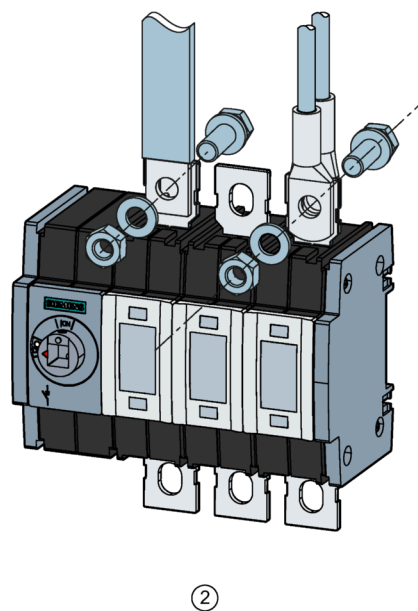
Connections	Frame size
Flat terminal	2, 3, 4, 5
Box terminal	1, 2

Frame size 1 and 2 are available with box terminals for connection of stripped conductors.

Frame size 2, 3, 4 and 5 are available with flat terminals for connection of cable lugs or busbars.



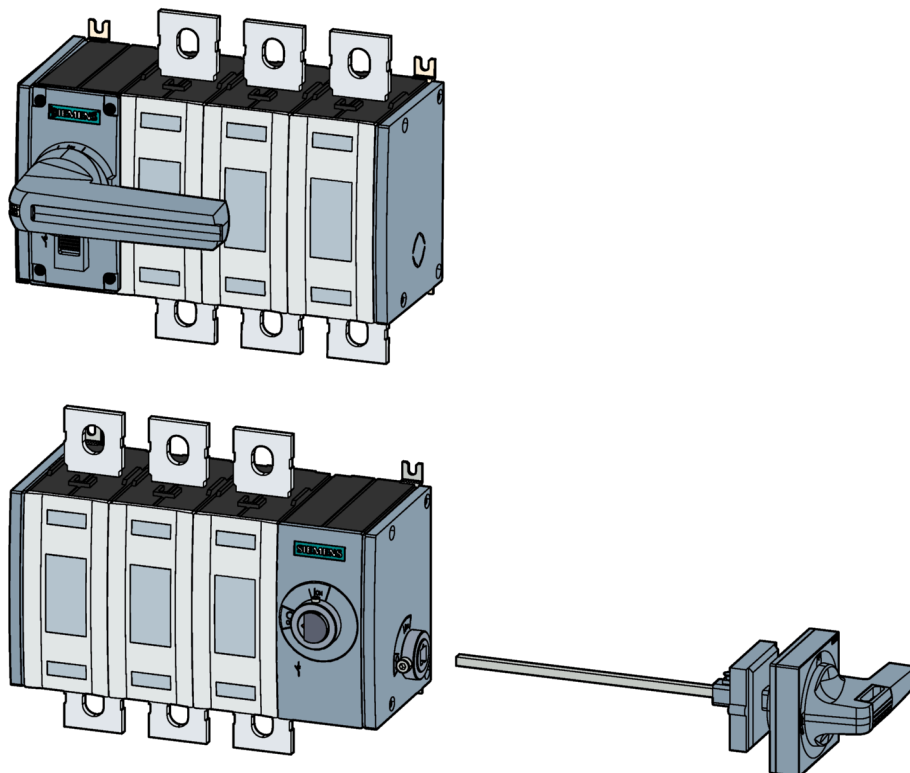
① Box terminal



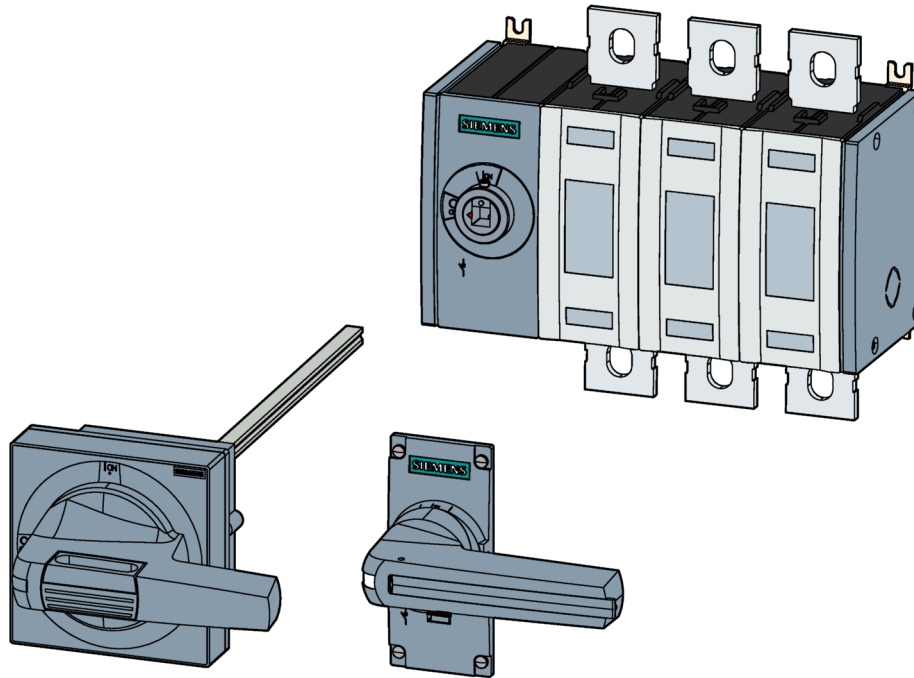
② Flat terminal

4.1.4 Operating mechanism / handle

All frame sizes of 3KD are available for manual operation from the front or side.



3KD with manual operation can be fitted with direct operating mechanisms for operation directly at the switch or with door coupling handles for operation from the outer side of a switchboard.



Note

3KD is available as complete units (including handle) only with direct operating mechanisms from front side in gray color.

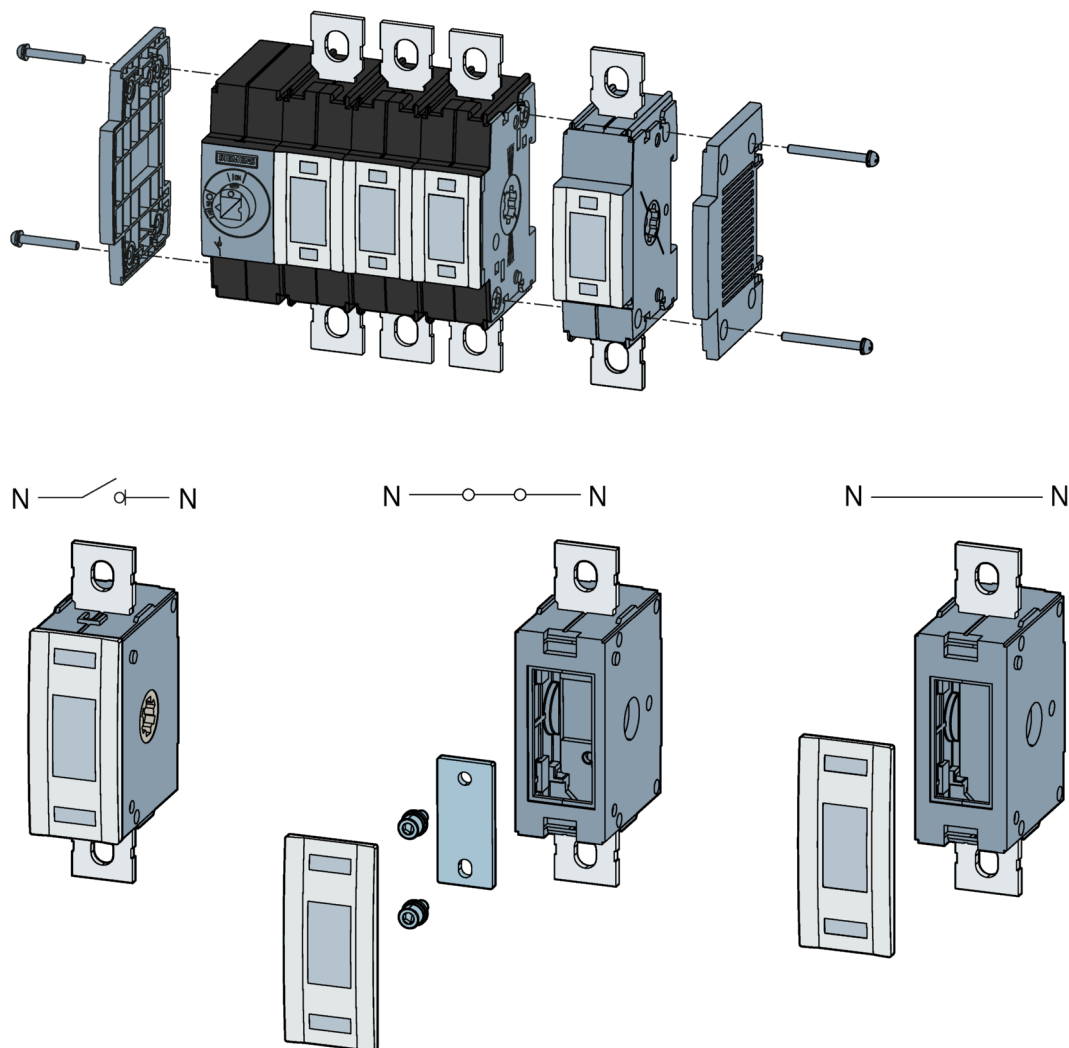
For other combinations (red/yellow handles, door coupling handles or operation from the side) 3KD basic units (w/o handle) and handle has to be ordered separately.

4.2 Accessories

4.2.1 Additional poles

All frame sizes of 3KD can be retrofitted with additional poles, e.g. for N or PE phase.

Available are a switching pole, an N/PE terminal (with fixed jumper) and N terminal (with removable jumper).



4.2.2 Direct operating mechanism

Direct operating mechanisms are used if a 3KD shall be operated directly at the switch. They are available for all frame sizes in the colors gray and red/yellow (for EMERGENCY-STOP applications).

Every standard direct operating mechanisms can be locked with up to 3 padlocks. For frame size 1 and 2 additional flat versions are available which can be locked only with one padlock, but which needs no additional depth when locked.

Versions of direct operating mechanisms - example frame size 2



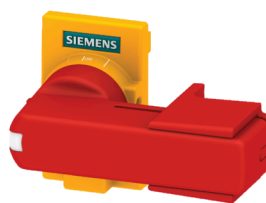
Direct operating mechanism,
standard version, gray



Direct operating mechanism,
standard version, red/yellow



Direct operating mechanism,
flat version, gray



Direct operating mechanism,
flat version, red/yellow



Door-coupling rotary operating mechanism

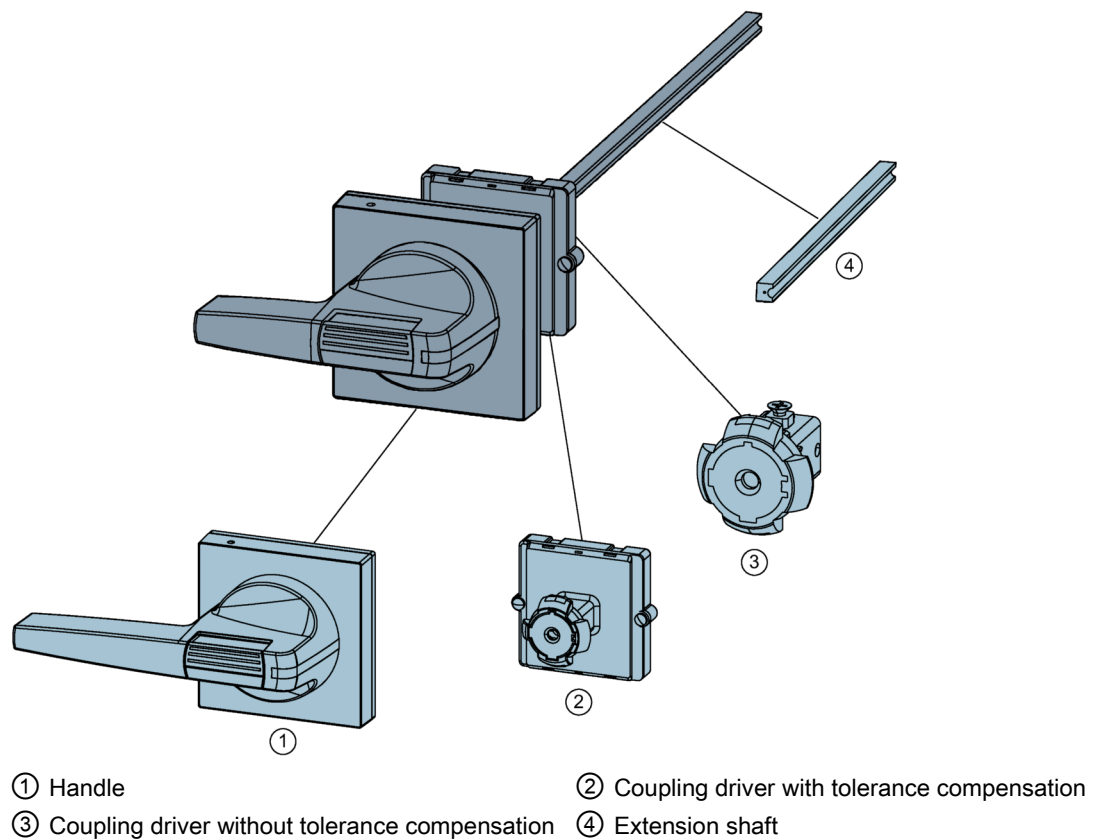
The door-coupling rotary operating mechanism enables operation of the switch disconnectors from the outside of the cabinet door.

8UD1 - modern handle design, new features. The 8UD1 door-coupling rotary operating mechanism allows illumination of the front cover, and supports the test function for auxiliary switches.

The door-coupling rotary operating mechanisms are available as complete units including handle, coupling driver and 300 mm long shaft.

All parts are also available separately.

Exploded view of all components for 8UD1 as below:



4.2.4 Auxiliary switches

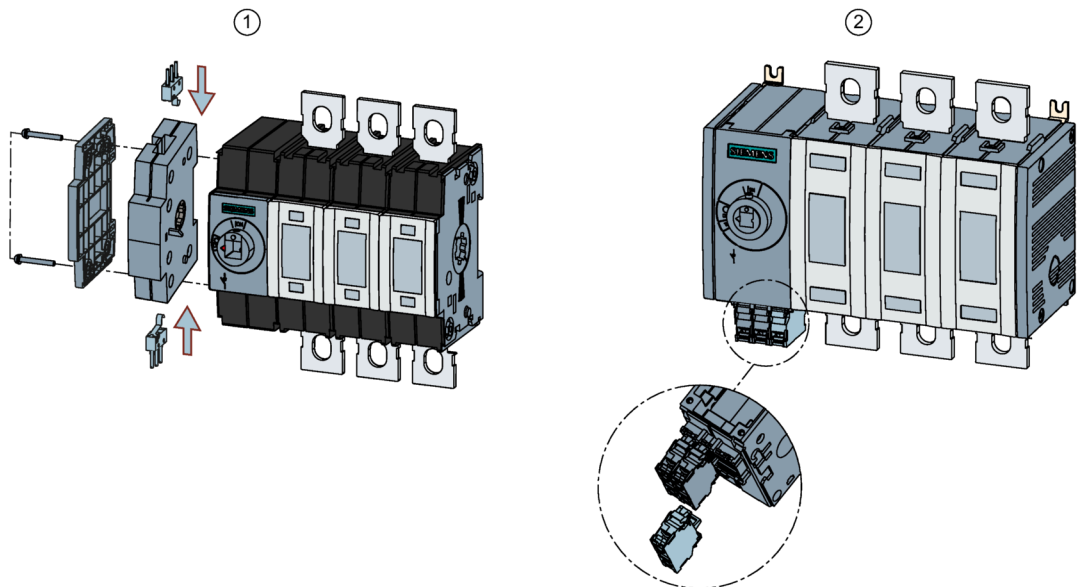
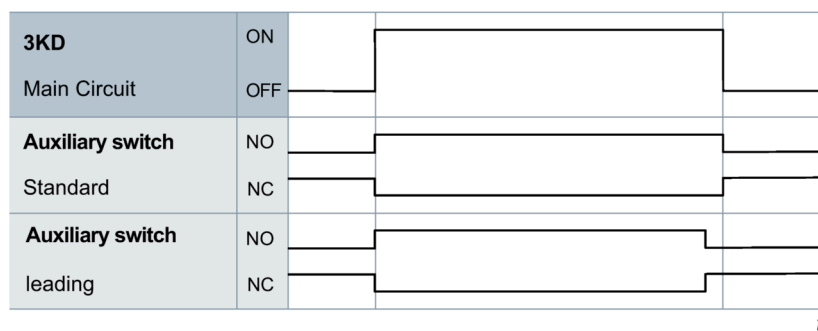
Auxiliary switches are used to signal the switch position ON – OFF of the 3KD. Auxiliary switches can be used with different switching instants (leading / simultaneously).

Simultaneously: Auxiliary switches at the same time as the main contacts of the 3KD.

Leading: When switching the 3KD from ON to OFF position, the auxiliary switches are operated before the main contacts open.

For frame sizes 3, 4 and 5 the auxiliary contacts are snapped directly to the drive unit of the 3KD, for frame size 1 and 2 micro-switches are used which have to be assembled into auxiliary switch modules.

Switching diagram for main contact, simultaneously and leading auxiliary switch as below:

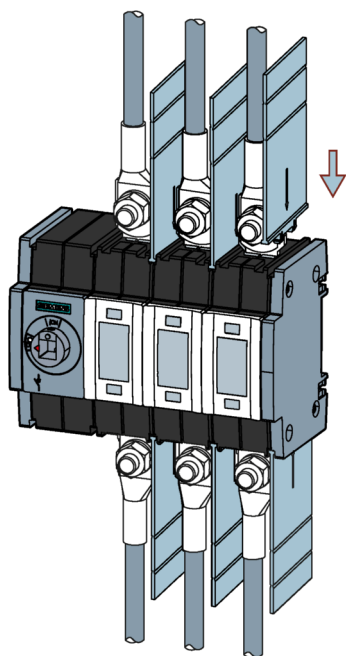


① Auxiliary switch of frame size 1 and 2

② Auxiliary switch of frame size 3, 4 and 5

4.2.5 Phase barriers

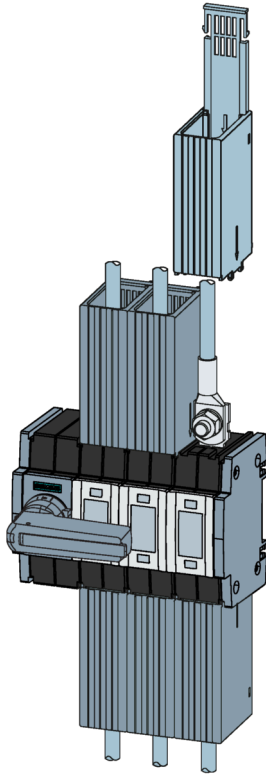
Phase barriers are used between the terminals of 3KD with flat terminals. They increase isolation between the contacts. Phase barriers have to be used under certain circumstances (voltage level, switching category, assembly position of the switch). For details please see chapter Phase barriers (Page 46)



Phase barriers on a 3KD, example frame size 2

4.2.6 Terminal covers

Terminal covers can be used on 3KD with flat terminals to provide touch protection, exception: 2000 A.



Terminal covers on a 3KD, example of frame size 2.

Note

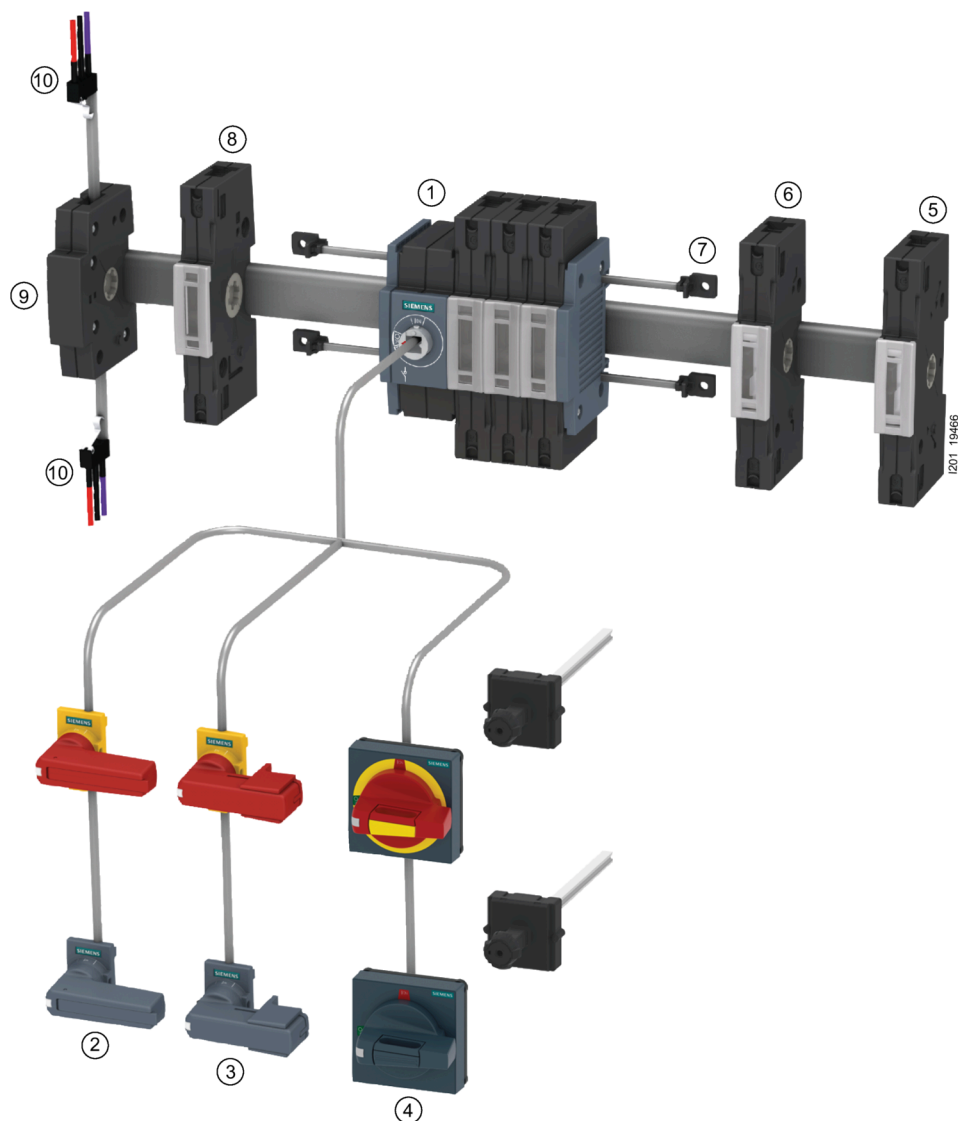
Terminal covers can also be assembled to the drive unit of a 3KD to get a consistent design or to cover the wiring of auxiliary switches.

Note

Terminal covers are not permitted for 2000 A.

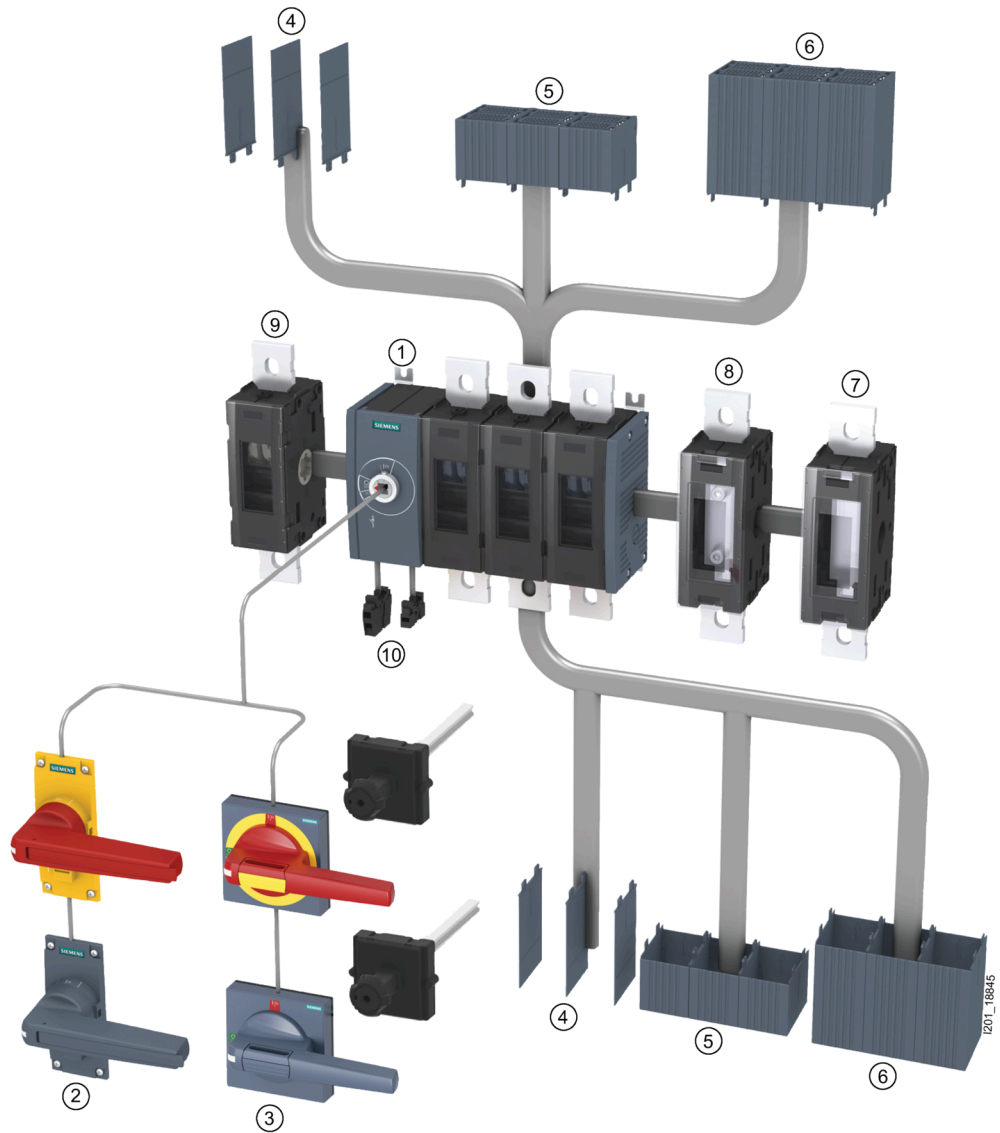
4.3 Exploded views

4.3.1 Exploded views for frame size 1 and 2



- | | |
|---|--|
| ① 3KD switch disconnector | ⑥ Neutral conductor terminal (with removable jumper) |
| ② Direct operating mechanism (standard version) | ⑦ Mounting bracket (spare part) |
| ③ Direct operating mechanism (suitable for distribution boards) | ⑧ 4th contact element |
| ④ 8UD1 door-coupling rotary operating mechanism | ⑨ Auxiliary switch module |
| ⑤ N/PE terminal (with permanent jumper) | ⑩ Auxiliary switch |

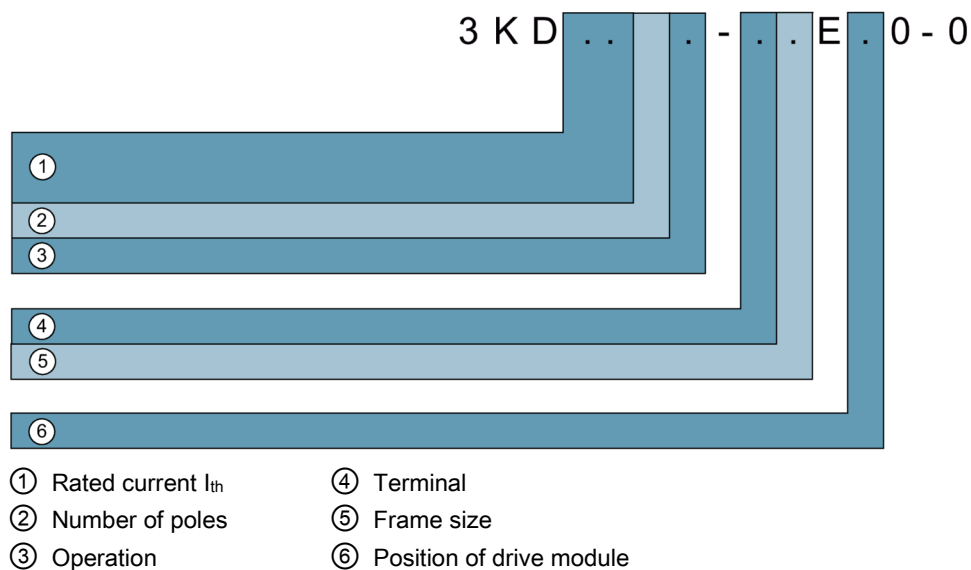
4.3.2 Exploded views for frame size 3, 4 and 5



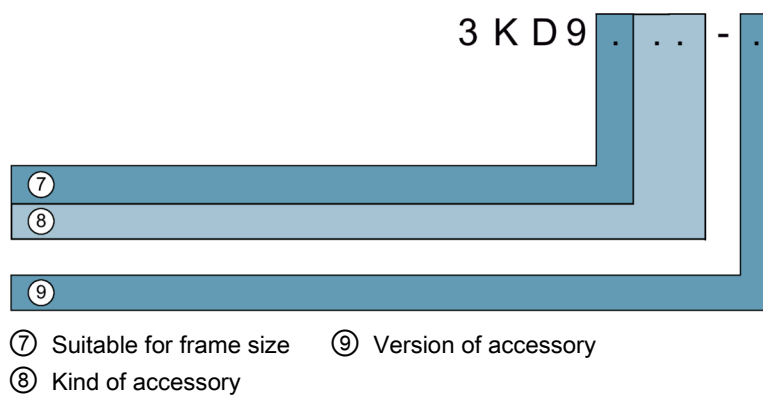
- | | |
|---|---|
| ① 3KD switch disconnectors | ⑥ Terminal covers |
| ② Direct operating mechanism | ⑦ N/PE terminal (with permanent jumper) |
| ③ 8UD1 door-coupling rotary operating mechanism | ⑧ Neutral conductor (with removable jumper) |
| ④ Phase barriers | ⑨ 4th contact element |
| ⑤ Terminal covers, short | ⑩ Auxiliary switch |

4.4 Article number structure

Article numbers for switches

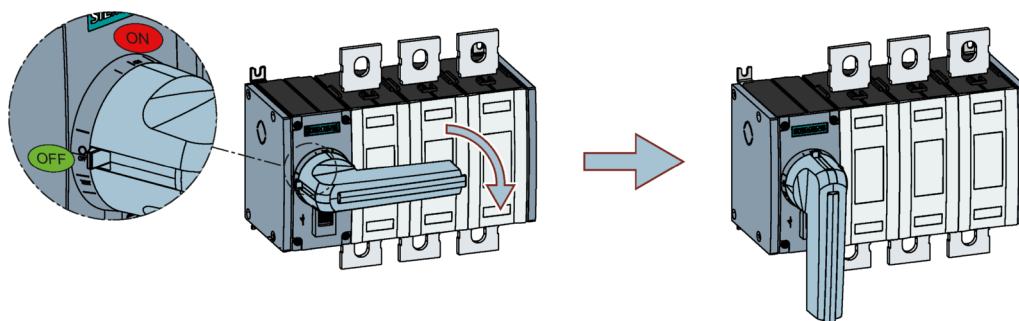


Article numbers for accessory



Function and operation

5.1 Manual operation



Note

The manually operated 3KD can be operated with the direct operating mechanism for operation directly at the switch or with the door-coupling rotary operating mechanism for operation from outside of the cabinet.

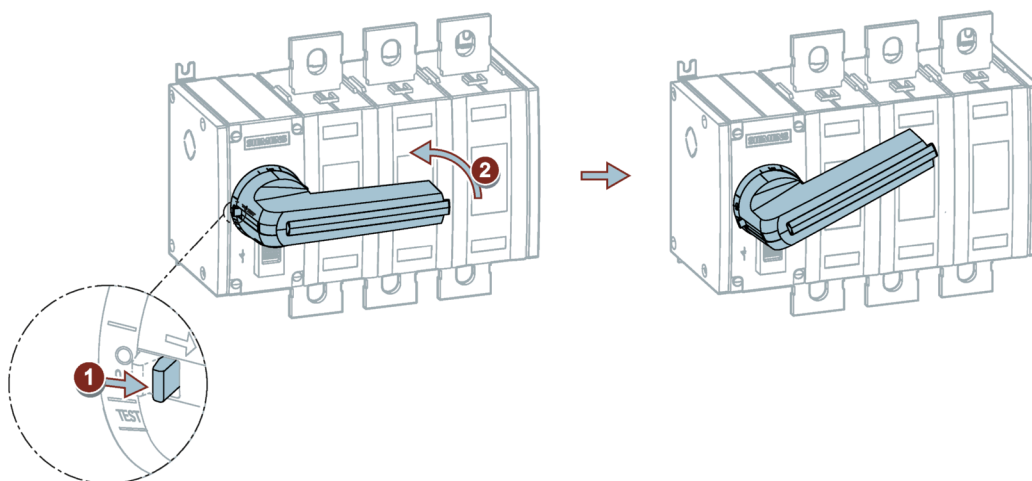
Details please see chapter Accessories (Page 19).

Test position

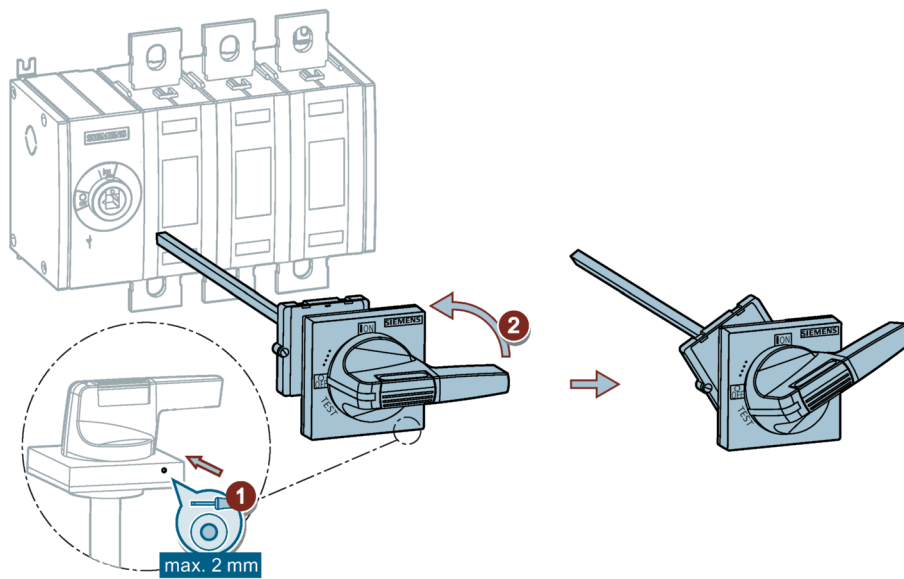
In test position only the auxiliary contacts are operated, main contacts stay open.

To switch to test position, pull the lever and turn the handle counterclockwise.

Operation of "test lever" and switching to test as below:



3KD with direct operating mechanism



3KD with door-coupling rotary operating mechanism (8UD1 series)

Note

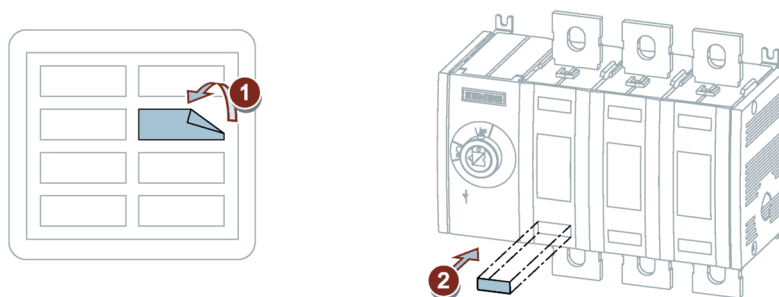
Function "test position" is only possible if the 3KD switch is equipped with a direct operating mechanism or a door coupling handle of 8UD1 series.

Assembly and mounting

6.1 Assembly of parts in scope of delivery

Labels

The labels in the scope of delivery of every 3KD switch disconnecter are intended to identify the phases which are connected to the switching poles on the 3KD switch disconnectors.



Note

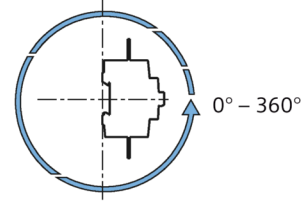
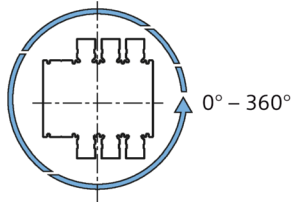
As an alternative to the supplied labels, also every other kind of label with the correct size can be used.

Sizes:

Frame size	Max. label size [mm x mm]
1, 2	6.8 x 4.3
3, 4, 5	20 x 7.2

6.2 Mounting position

Valid for all frame sizes.



WARNING

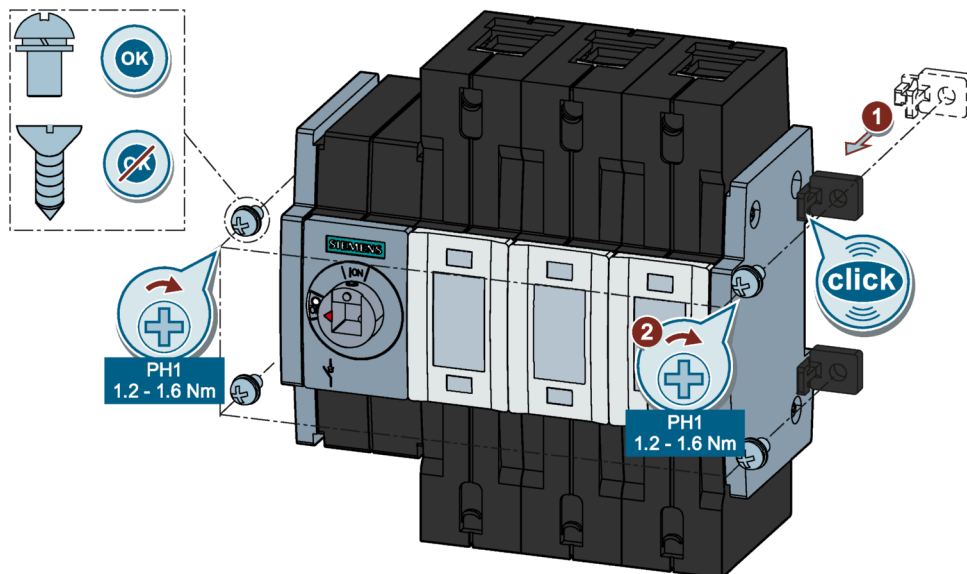
Fire hazard.

Some combinations of mounting position and load may cause flashovers between the terminals if no phase barriers or terminal covers are used.

Use phase barriers or terminal covers if applicable according to chapter Phase barriers (Page 46).

6.3 Floor mounting

6.3.1 Frame size 1 and 2

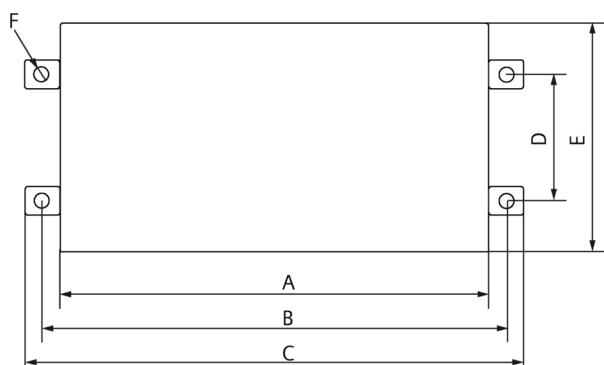


Mounting bracket are in the scope of delivery of the switch and have to be snapped into the rear side of the switch.

Note

If the 3KD is assembled on a DIN rail, the mounting bracket do not have to be assembled.

Drilling template frame size 1 and 2



Frame size	Poles	Terminal	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
1	3	Box terminal	94	109	119.6	46.5	119	M4
	4		112	127	137.6	46.6	119	M4
	6		148	163	173.6	46.5	119	M4
2	3	Box terminal	121	136	146.6	46.5	126	M4
		Flat terminal	121	136	146.6	46.5	130 ¹⁾	M4
	4	Box terminal	148	163	173.6	46.5	126	M4
		Flat terminal	148	163	173.6	46.5	130 ¹⁾	M4
	6	Box terminal	202	217	227.6	46.5	126	M4
		Flat terminal	202	217	227.6	46.5	130 ¹⁾	M4

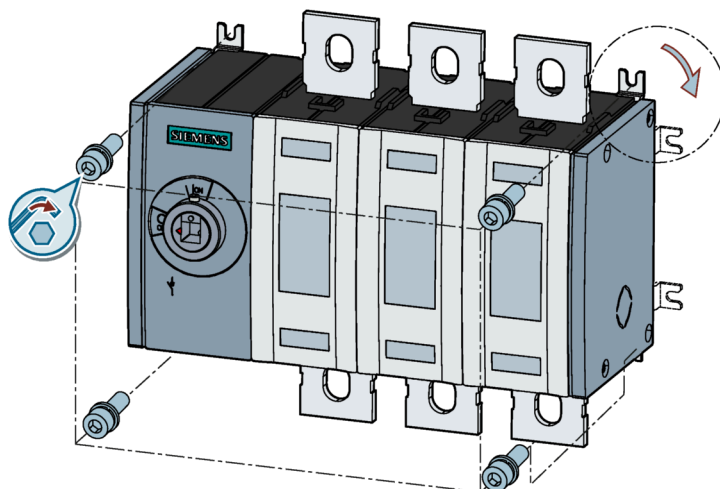
1) Without phase barriers




Note

Scale

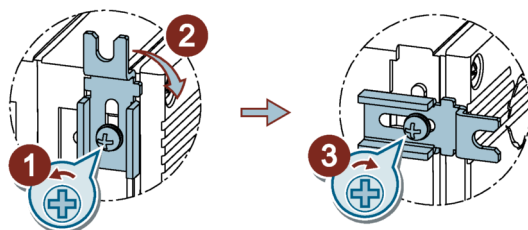
The drilling template is not in scale 1:1.



6.3.2 Frame size 3 and 4



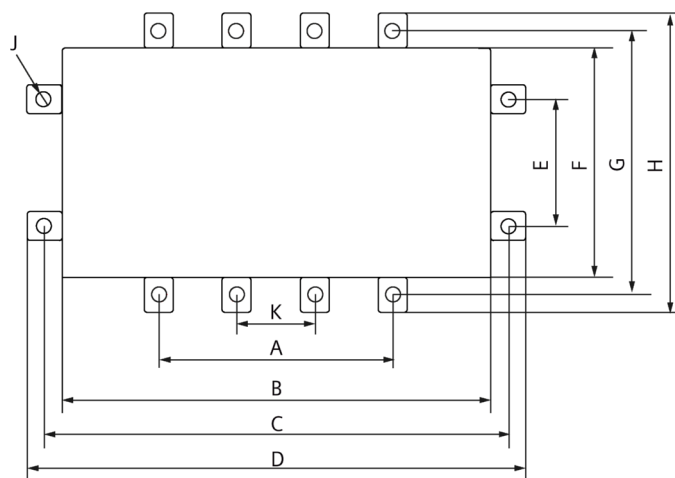
Frame size			
3	M4	2.0 ... 2.5 Nm	3.0 mm
4	M6	5.0 ... 6.0 Nm	5.0 mm

The mounting bracket can be used in horizontal or vertical alignment to adjust them to the dimension of the mounting location.



Frame size		
3	PH1	0.9 ... 1.1 Nm
4	PH2	2.7 ... 3.3 Nm

Drilling template frame size 3 and 4



Frame size	Poles	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F ¹⁾ [mm]	G [mm]	H [mm]	J [mm]	K ²⁾ [mm]
3	3	167	190	200	208	65	100	110	118	M4	-
	4	211	234	244	252	65	100	110	118	M4	-
	6	299	323	332	340	65	100	110	118	M4	35
4	3	228	260	279	291	93	145	161	173	M6	-
	4	288	320	339	351	93	145	161	173	M6	-
	6	408	440	459	471	93	145	161	173	M6	48

¹⁾ Dimension of the body of the switch (without phase barriers and terminal bars)

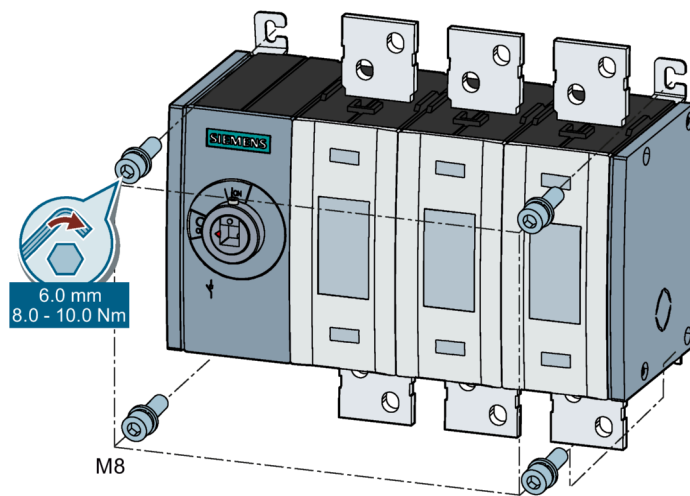
²⁾ Only for 6-pole versions

Note

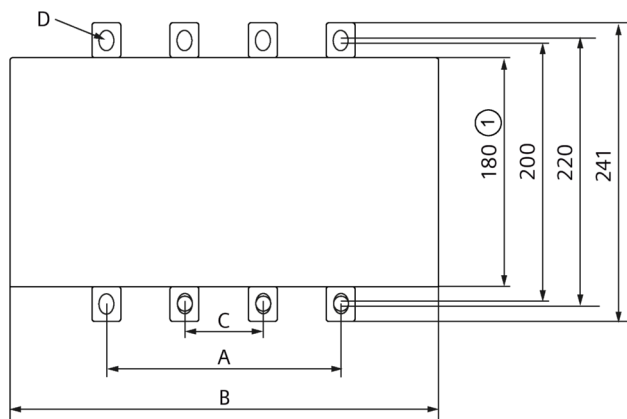
Scale

The drilling template is not in scale 1:1.

6.3.3 Frame size 5



Drilling template for frame size 5



① Dimension of the body of the switch (without phase barriers and terminal bars)

C is the distance of the inner mounting bracket

Poles	A [mm]	B [mm]	C ²⁾ [mm]
3	340	382	-
4	430	472	-
6	610	652	70

²⁾ Only for 6-pole versions

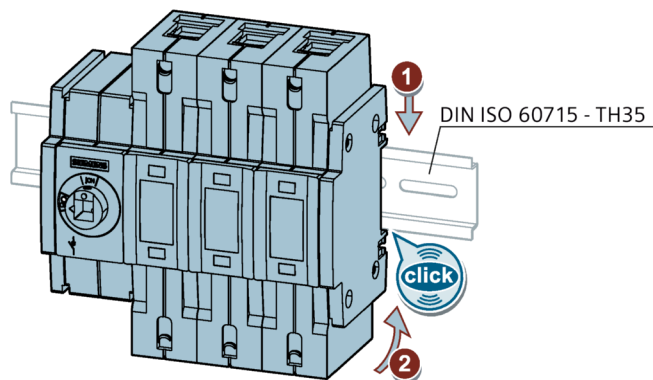
Note

Scale

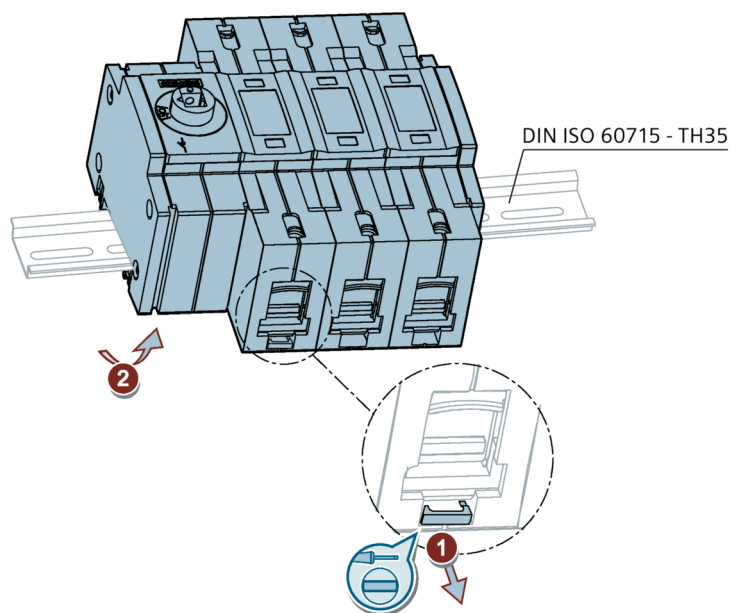
The drilling template is not in scale 1:1.

6.4 Mounting on DIN rails

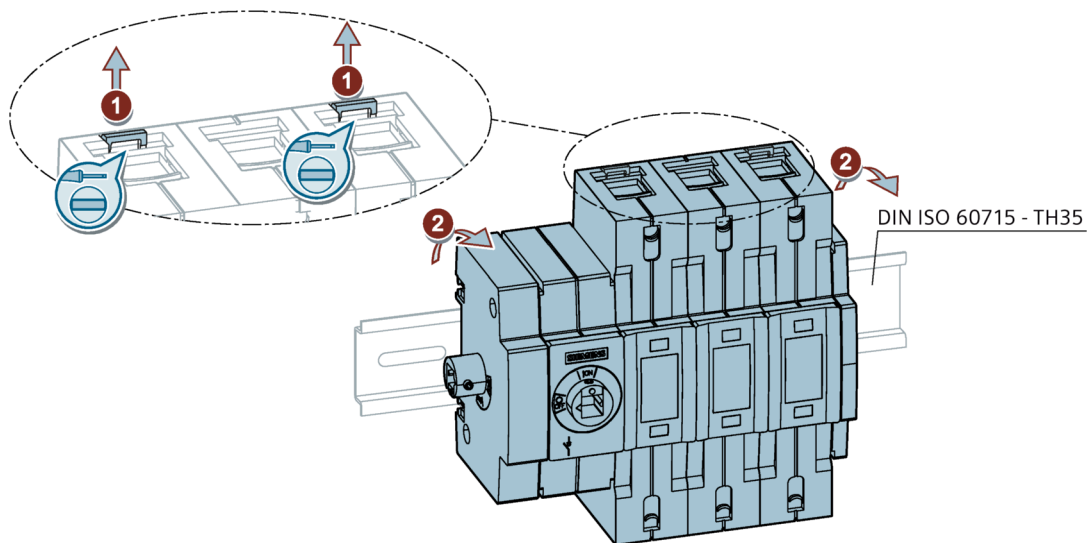
Mounting on DIN rail— Frame sizes 1 and 2



Dismounting from DIN rail— Frame sizes 1 and 2 with front operation



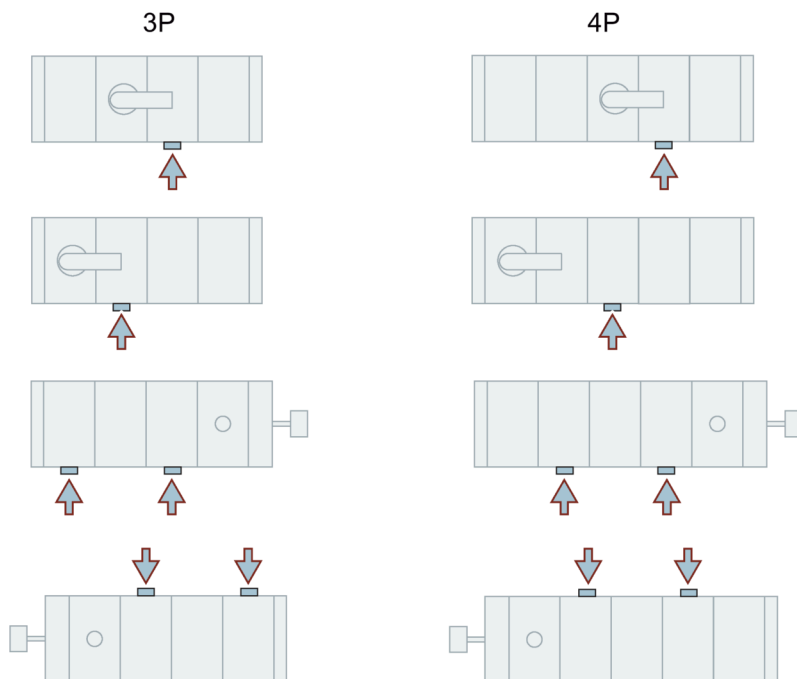
Disassembly from DIN rail - Frame sizes 1 and 2 with side operation from left side



Note

The mounting bracket which are in the scope of delivery of the switch are not necessary for mounting on DIN rails.

Position of release hooks



Connection and wiring

7.1 Main circuit connection

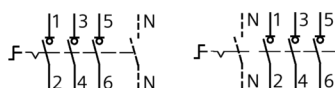
The connections of the main conductors for the various frame sizes are described below:

- Tools to be used
- Tightening torque range
- Permissible conductor cross-sections

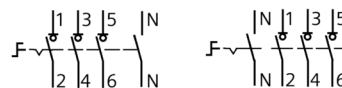
7.1.1 Approved circuit diagrams

The following circuits are approved

AC applications



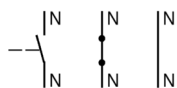
AC applications, 3 pole



AC applications, 4 pole

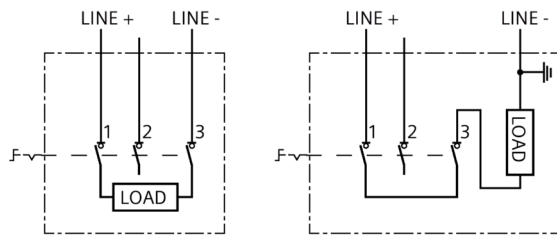
Note

4th pole is optional accessory.

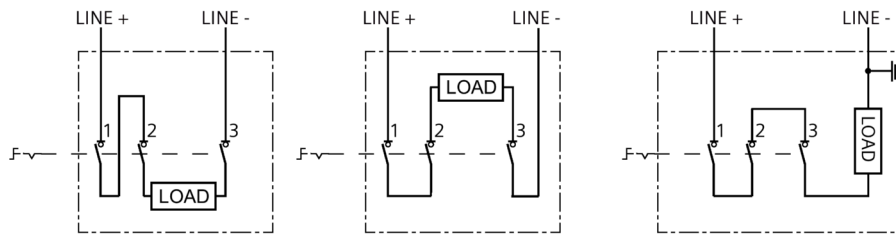


Options for additional poles

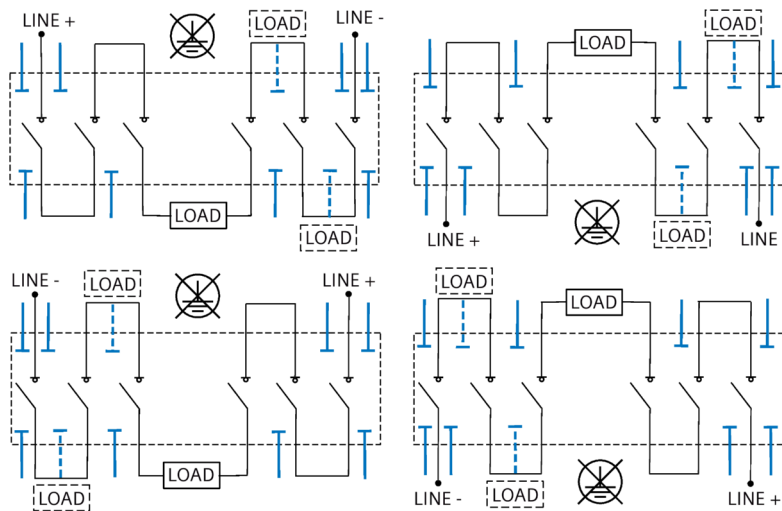
DC applications



DC applications, 2 series-connected switching poles - max. 220 V DC

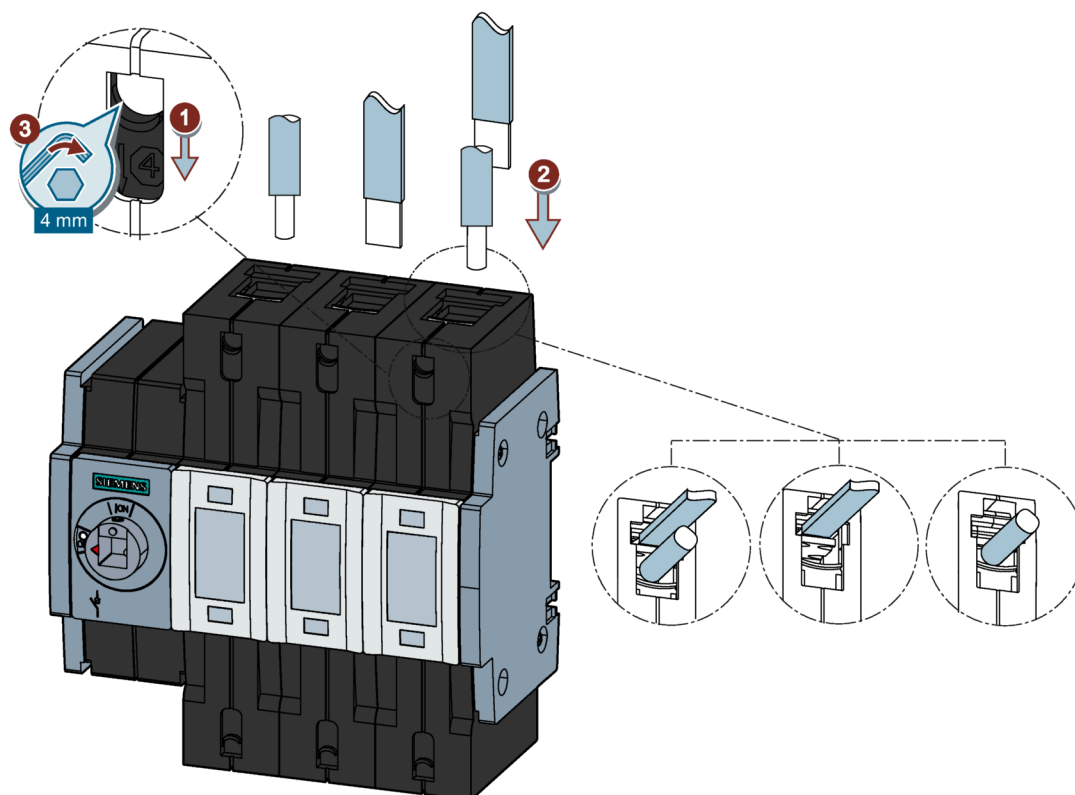


DC applications, 3 series-connected switching poles - max. 440 V DC



Typical circuit diagrams for 3KD 6-pole for DC applications up to 1200 V, all sizes in which 3 of the 6 poles in each case are to be connected in series using the connecting bridges.

7.1.2 Box terminal



Frame size	
1	5.0 ... 6.5 Nm
2	6.5 ... 8.0 Nm

To get access to the screw of the terminal, the integrated cover has to be slid by the tip of the tool (show as step 1).









Box terminals of 3KD are designed to connect one round cable and one bar (massive copper or flexibar) at the same time.

Stripping insulation



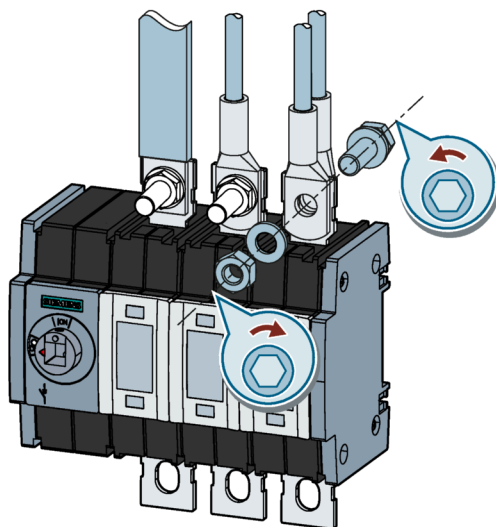
Frame size	A [mm]
1	15
2	18

Technical data - box terminal

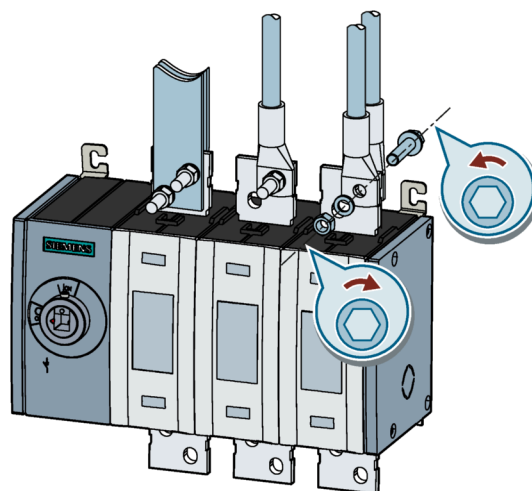
Frame size		1		2	
Cable type	Cable material	Tool 	Conductor cross-section [mm / mm²]	Tool 	Conductor cross-section [mm / mm²]
	CU	4 mm, 5.0 ... 6.5 Nm	1 x 1...16	4 mm, 6.5 ... 8.0 Nm	1 x 2.5...16
	CU		1 x 6...35		1 x 10...70
	CU		1 x 1...35		1 x 2.5...70
	CU		2 x 9 ¹⁾		3 x 14 ¹⁾
 +	CU		1 x 1...16 + 2 x 9		1 x 2.5 ... 16 + 3 x 14
 +	CU		1 x 6...35 + 2 x 9		1 x 10 ... 70 + 3 x 14

- ¹⁾ Attention: When the number of layers multiplied with thickness of layer of flexible copper bars are exactly the allowed maximum thickness of the terminal it could be the case that it does not fit to the terminal because in practice the flexibar is a little bit thicker – e.g. a flexibar with 4 layers of 0.5 could be thicker than 2 mm.

7.1.3 Flat terminal



Frame sizes 2, 3 and 4



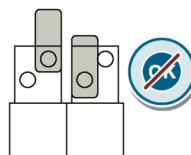
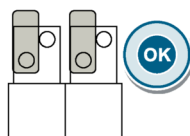
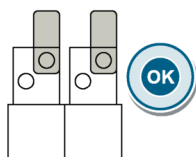
Frame size 5

! WARNING

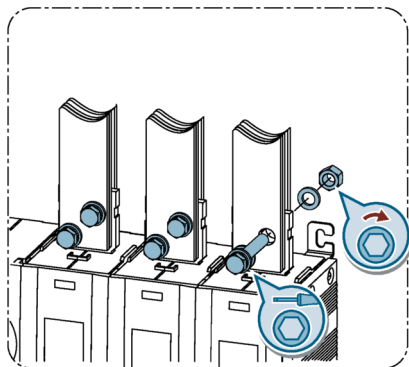
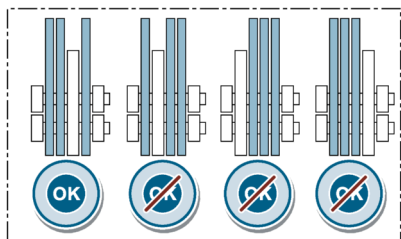
Fire hazard.

Incorrect connection of cables may cause the risk of flashovers between the terminals.

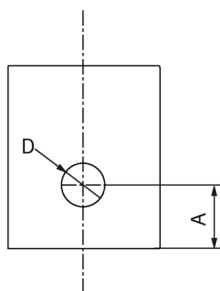
- Terminal screw has to have the correct alignment – nuts on top.
- Frame size 5: If only one of the two holes in the connecting lug is used - always the same side has to be used (holes on the left or right side).



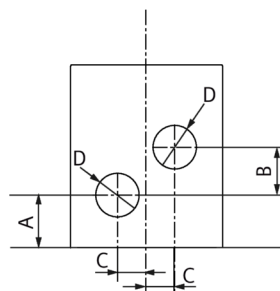
When using 3 busbars for size 5



Dimensions for drilling of busbars








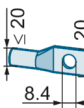

Frame sizes 2, 3 and 4










Frame size 5

Frame size	A [mm]	B [mm]	C [mm]	D [mm]
2	< 10	-	-	9
3	< 15.5	-	-	11
4	< 21	-	-	14
5	< 19	23 ... 29	13	14

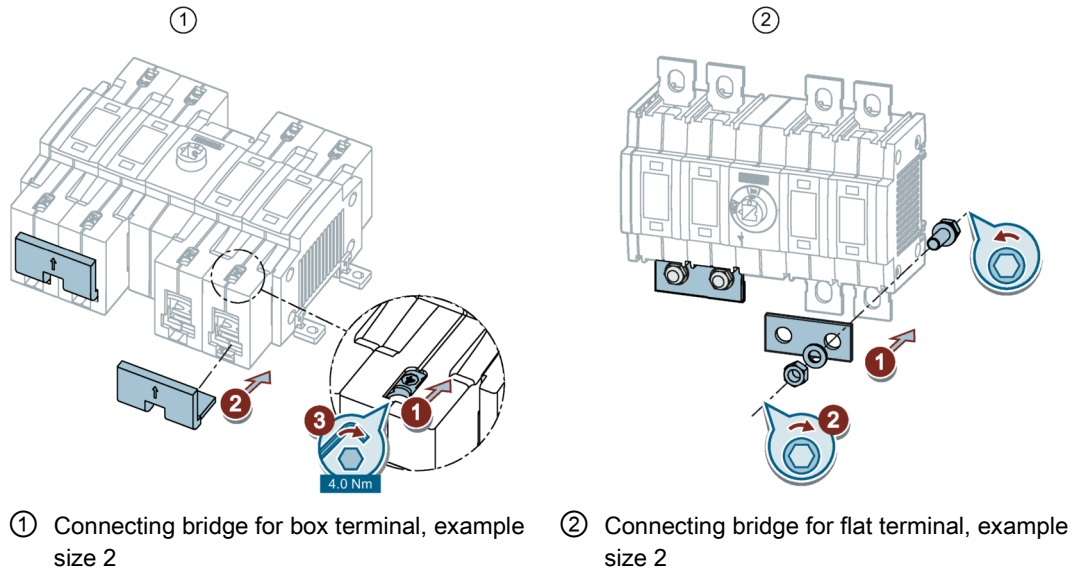
Technical data – flat terminal

Frame size		2 Up to 160 A		2 200 A		2 250 A	
Cable type	Cable material	Tool 	Conductor cross-section [mm / mm²]	Tool 	Conductor cross-section [mm / mm²]	Tool 	Conductor cross-section [mm / mm²]
DIN ISO 46234 	CU	13 mm, 15 ... 22 Nm	1 x 2.5 ... 95 2 x 2.5 ... 50	13 mm, 15 ... 22 Nm	1 x 2.5 ... 95	13 mm, 15 ... 22 Nm	-
DIN ISO 46235 	CU		1 x 25 ... 70 2 x 25 ... 50		-		-
	CU		-		-		1 x 120
	CU		1 x 15 x 3 1 x 20 x 3		1 x 20 x 3		1 x 20 x 4

Frame size		3		4		5	
Cable type	Cable material	Tool 	Conductor cross-section [mm / mm²]	Tool 	Conductor cross-section [mm / mm²]	Tool 	Conductor cross-section [mm / mm²]
DIN ISO 46234 	CU	16 mm, 30 ... 44 Nm	1 x 6 ... 240 2 x 6 ... 150	18 mm, 50 ... 75 Nm	1 x 25 ... 240 2 x 25 ... 240	18 mm, 50...75 Nm	1 x 120 ... 240 2 x 95 ... 240
DIN ISO 46235 	CU		1 x 16 ... 185 2 x 16 ... 150		1 x 25 ... 240 2 x 25 ... 240		1 x 120 ... 185 2 x 95 ... 185
	CU		1 x 20 x 3 1 x 25 x 3 1 x 30 x 4 1 x 30 x 10		1 x 30 x 10 1 x 40 x 10 2 x 40 x 5 2 x 50 x 6		-
	CU		-		-		2 x 50 x 6 2 x 40 x 10 2 x 60 x 10 3 x 60 x 10

7.1.4 Connecting bridges

For DC switches connecting bridges are available which connect two terminals.



For tool size and torque, please see charts in chapters of Box terminal (Page 41) and Flat terminal (Page 43)

7.1.5 Wiring accessories

7.1.5.1 Phase barriers

Phase barriers are used at 3KD with flat terminals for additional isolation between the terminals. They prevent interphase arcing during switching.

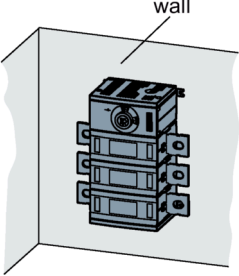
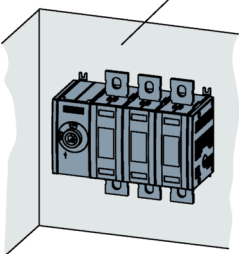
Background:

During switching of the 3KD, it has to extinguish the electric arc in the contact modules. The arc produces conductive gases, which are blown out of the contact modules. If there are too many of these conductive gases a short circuit between the terminals can occur.

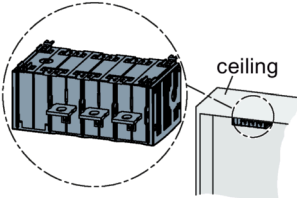
The following table shows under which circumstances an isolation between the terminals is necessary to prevent short circuits between the terminals. This isolation can be implemented by using phase barriers.

Note

3KD size 2 has phase barriers in scope of delivery.

Mounting position	Connection with	Categories	Size 2	Size 3	Size 4	Size 5
Horizontal wall 	Busbar	AC-23 A	✓	✓	☑ 415 V, 630 A or 690 V	□
		AC-22 A	✓	☑ max. 415 V, 400 A	□	□
		AC-21 A	✓	□	□	□
		DC-23 A	✓	□	□	□
		DC-22 A	✓	□	□	□
		DC-21 A	✓	□	□	□
	Cable lug	AC-23 A	✓	✓	✓	□
		AC-22 A	✓	✓	✓	□
		AC-21 A	✓	✓	✓	□
		DC-23 A	✓	✓	✓	□
		DC-22 A	✓	✓	✓	□
		DC-21 A	✓	✓	✓	□
Vertical wall (standard) 	Busbar	AC-23 A	✓	✓	☑ 415 V, 630 A or 690 V	□
		AC-22 A	✓	☑ max. 415 V, 400 A	□	□
		AC-21 A	✓	□	□	□
		DC-23 A	✓	□	□	□
		DC-22 A	✓	□	□	□
		DC-21 A	✓	□	□	□
	Cable lug	AC-23 A	✓	✓	✓	□
		AC-22 A	✓	✓	✓	□
		AC-21 A	✓	✓	✓	□
		DC-23 A	✓	✓	✓	□
		DC-22 A	✓	✓	✓	□
		DC-21 A	✓	✓	✓	□

7.1 Main circuit connection

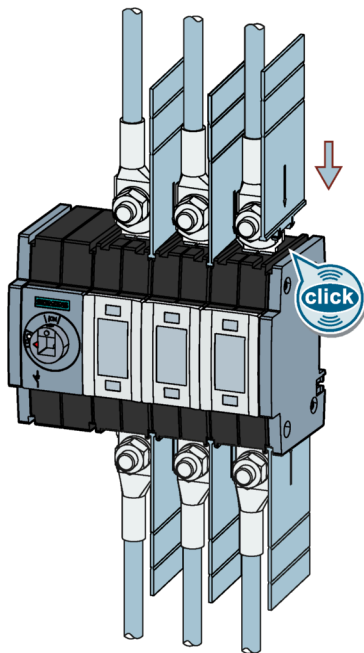
Mounting position	Connection with	Categories	Size 2	Size 3	Size 4	Size 5
	Busbar	AC-23 A	✓	✓	✓	□
		AC-22 A	✓	✓	✓	□
		AC-21 A	✓	✓	✓	□
		DC-23 A	✓	✓	✓	□
		DC-22 A	✓	✓	✓	□
		DC-21 A	✓	✓	✓	□
	Cable lug	AC-23 A	✓	✓	✓	□
		AC-22 A	✓	✓	✓	□
		AC-21 A	✓	✓	✓	□
		DC-23 A	✓	✓	✓	□
		DC-22 A	✓	✓	✓	□
		DC-21 A	✓	✓	✓	□

✓ It is mandatory to use phase barriers.

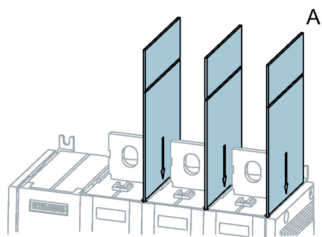
☑ These phase barriers have to be used if the limit is exceeded.

□ The 3KD disconnecter can be used without phase barriers.

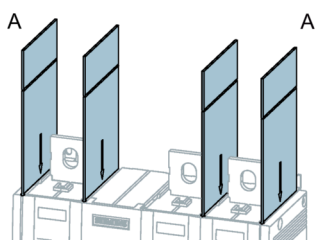
Assembly of phase barriers



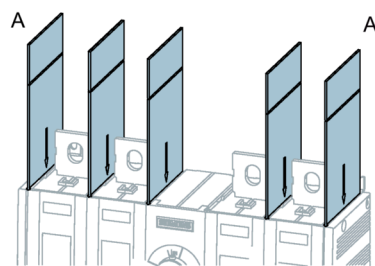
Assembly positions of phase barriers



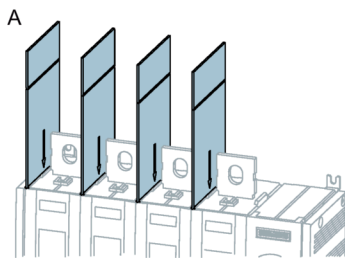
3KD, front operation, 3-pole, drive module on left side



3KD, front operation, 3-pole, drive module in center position



3KD, front operation, 4-pole, drive module in center position



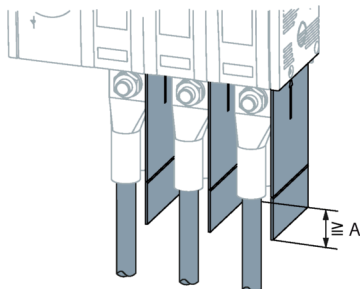
3KD, side operation

Note

On position "A" assembly of a phase barrier is only necessary if another device with non-isolated contacts or a grounded metal part is located directly next to the 3KD, e.g. another switch with non-isolated terminals or a cabinet side wall.

Minimum distance to end of non-isolated part of cable lug

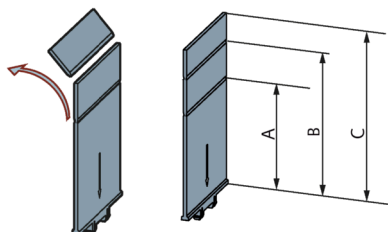
Phase barriers need a minimum distance from the end of the phase barrier to the end of the non-isolated part of the installed cable lugs.



Frame size	A [mm]
2	≥ 4
3, 4, 5	≥ 7

Shortening of phase barriers

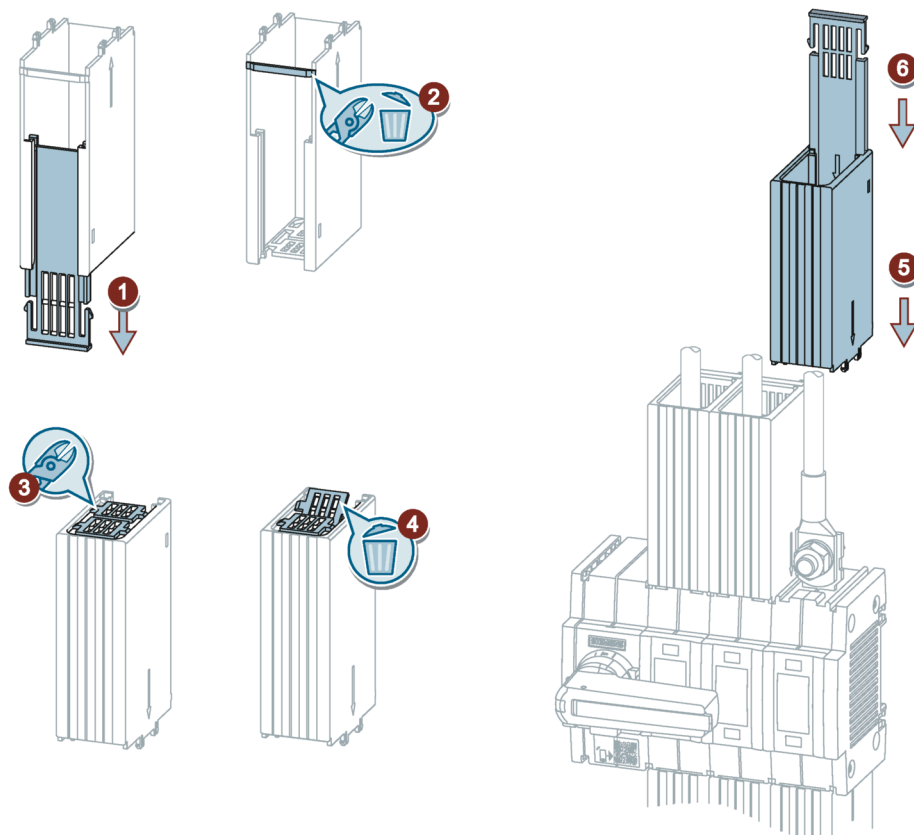
The phase barriers can be shortened according to the available space in the application.



Frame size	A [mm]	B [mm]	C [mm]
2	44	60	73
3	-	76.5	106.5
4	-	86	122
5	-	-	135

7.1.5.2 Terminal covers

Terminal covers are used on 3KD with flat terminals if touch protection is required, exception: 2000 A.



Note

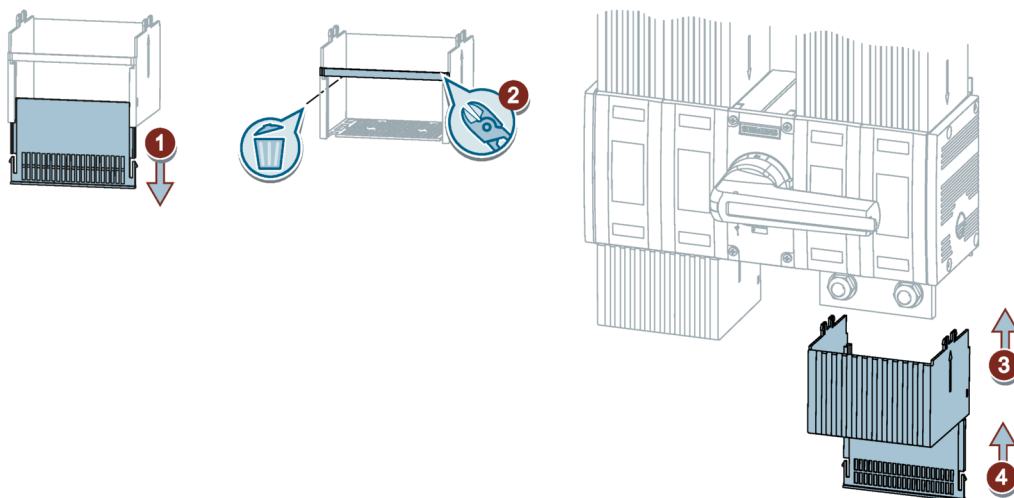
Terminal covers fulfill the same functionality as phase barriers. If additional touch protection of the terminals is necessary, terminal covers can be used instead of phase barriers. It is not possible to use phase barriers and terminal covers at the same time.

Note

Terminal covers are not permitted for 2000 A.

Terminal covers for connecting bridges

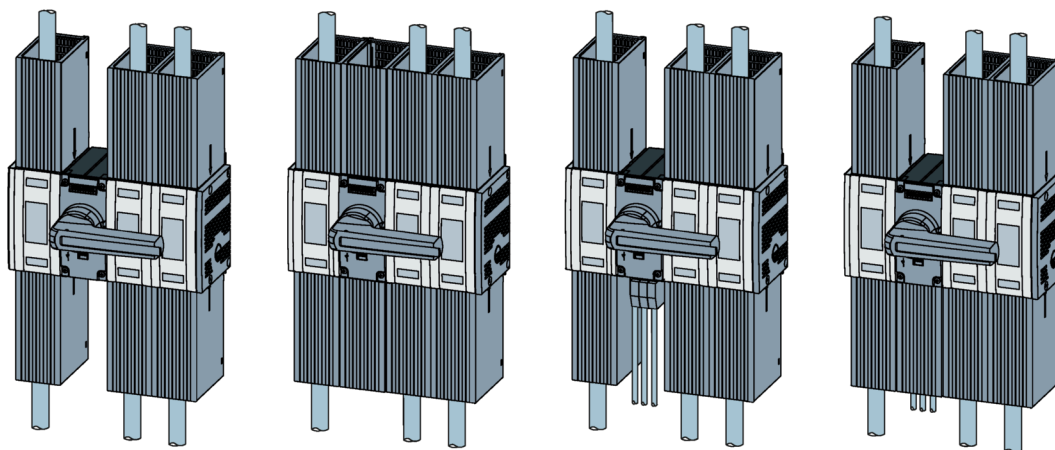
For DC switches which are using connecting bridges, versions of terminal covers which cover two terminals including the bridging bar are available.



Note

Terminal covers can also be assembled on the drive module of the 3KD switch.

The following images show the additional functionality of terminal covers. For example, they can be used if an integrated design is desired, or if assembled auxiliary switches (frame sizes 3, 4 and 5) should be covered.



7.2 Auxiliary circuit connection

7.2.1 Auxiliary switches

For more information about assembling the auxiliary switches, please see chapter of Auxiliary switches (Page 59).

7.2.1.1 Auxiliary switches of frame size 1 and 2

Auxiliary switches for frame size 1 and 2 are available in two different versions:

With cable

These are delivered with soldered 50 cm long cables. If longer wiring is necessary, terminal blocks have to be used.

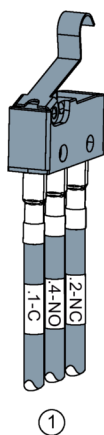
Conductor cross-section of the soldered cables is AWG18 / 0.82 mm².

Without cable

These are delivered with 3 pcs of blade terminals and 3 pcs of identification tubes.

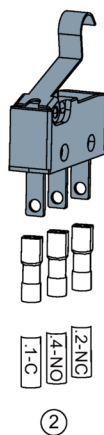
The blade terminals can be used with conductor cross-section from 0.5 - 1.5 mm² (22-16AWG) mm².

The identification tubes can be placed on the cables for easy identification of the auxiliary switch pins. They can be fixed with a hot-air gun (heat shrink tube).



①

① Version with cable

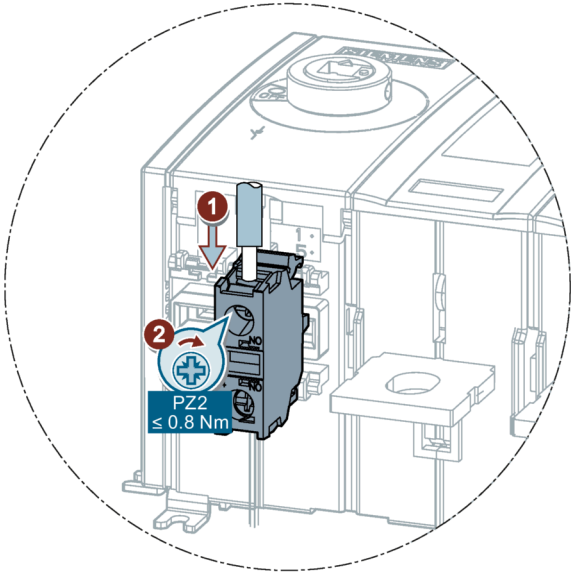






②

② Version without cable

7.2.1.2 Auxiliary switches for frame size 3, 4 and 5

3KD frame size 3, 4 and 5 uses contact elements from the 3SU1 pushbutton range as auxiliary switches.



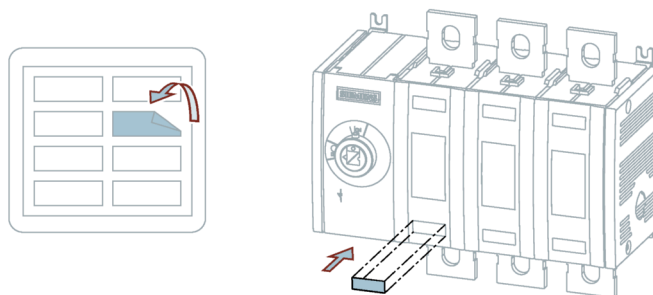
	3SU14
	 0.8 Nm
	2 X (1.0 ... 1.5) mm ²
	(0.5 ... 0.75) mm ²
	2 X (0.5 ... 1.5) mm ²
AWG	18 ... 14

7.3 Contact numbers

This chapter describes contact numbers for wiring plans.

7.3.1 Main circuit

For identification of the main terminals in wiring plans, every 3KD switch and also additional poles have corresponding labels in the scope of delivery.



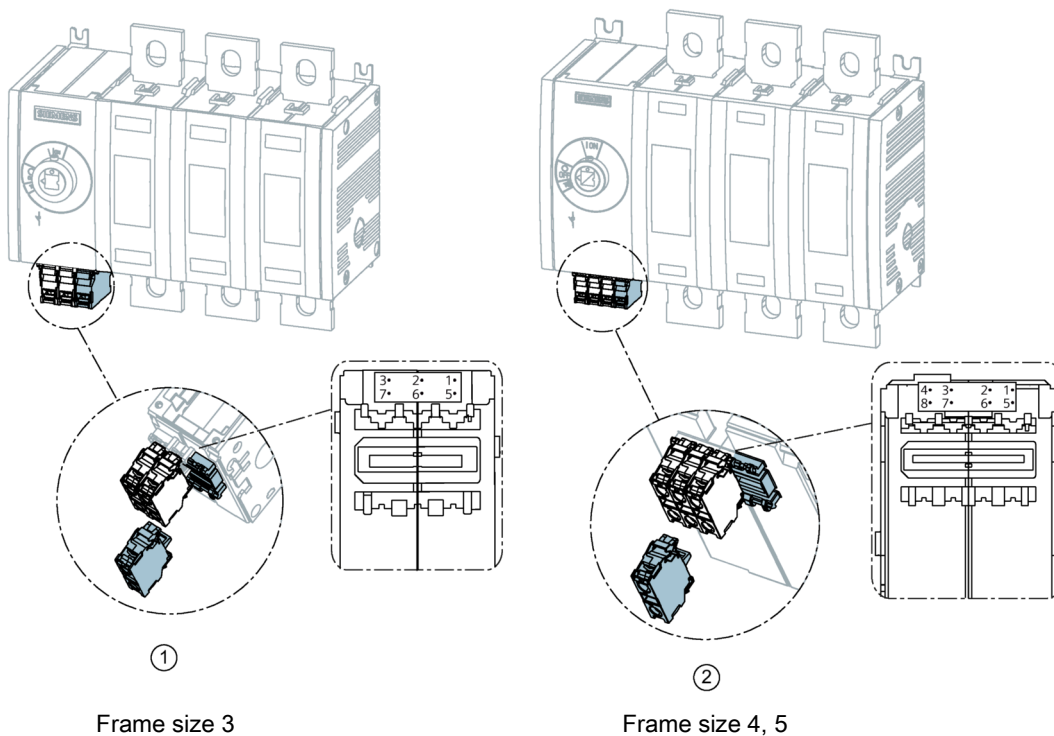
As an alternative to the supplied labels it is possible to use labels that are suitable for use in an industrial environment (e.g. heat resistance). For further information see chapter Assembly of parts in scope of delivery (Page 31)

7.3.2 Auxiliary switches

Every contact number consists of two digits, the first digit is printed on the drive module of the 3KD switch (frame size 3, 4 and 5) or the auxiliary switch module (frame size 1, 2).

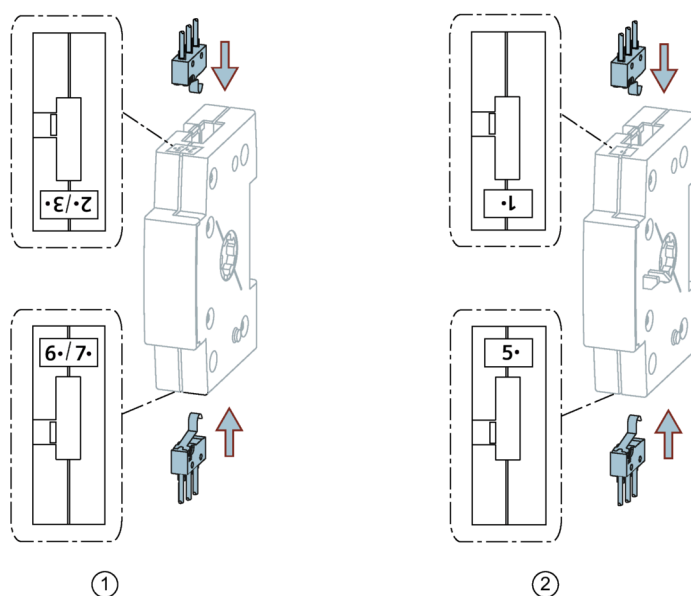
The second digit is printed on the auxiliary switch.

The first digit of auxiliary switch contact number:



Note

If a single-pole auxiliary switch is assembled, only the numbers in the first line are used. If a double-pole auxiliary switch is assembled the upper line of numbers on the drive module is used for the upper contact in the auxiliary switch, the lower line for the lower contact of auxiliary switch module.

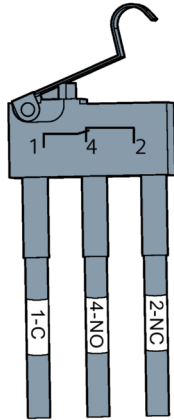


- ① Frame size 1, 2, Auxiliary switch module, standard version
- ② Frame size 1, 2, Auxiliary switch module, versions with test function or leading switching instant

Note

The auxiliary switch module standard version is printed with two sets of numbers for the first digit because it is possible to use two of these modules on one 3KD switch. The left number shall be used if only one of the modules is used, the right number if a second module is installed.

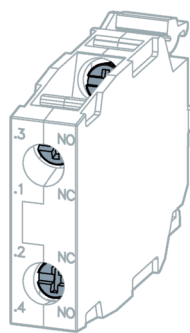
Second digit of auxiliary switch contact number:



Frame size 1, 2



①



②

- ① Frame size 3, 4, 5, Single-pole auxiliary switch (3SU1400-1AA10-1BA0)
- ② Frame size 3, 4, 5, Double-pole auxiliary switch (3SU1400-1AA10-1FA0)

Further accessories

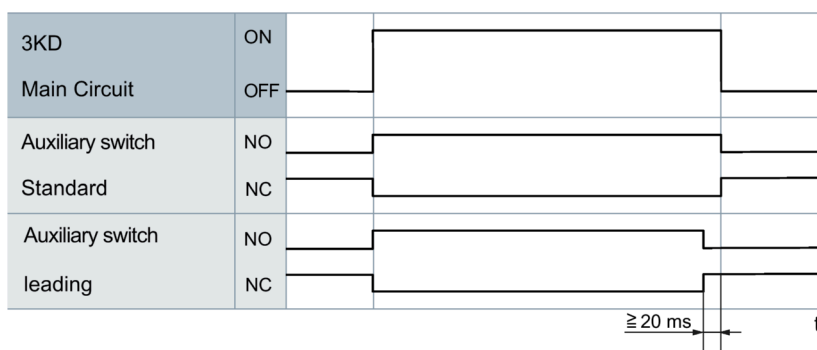
8.1 Auxiliary switches

Purpose of the auxiliary switches

Auxiliary switches are used to signal the switch position of the main contacts of the 3KD. They can be retrofitted if required.

Switching instant of the auxiliary switches

You can set different switching instant (leading / simultaneously) for the auxiliary switches, please refer to the chapter Installation of auxiliary switches (Page 62)



Note

Simultaneous switching means that the main contacts of the 3KD and auxiliary switch contacts are switching in a tolerance of < 5 ms.

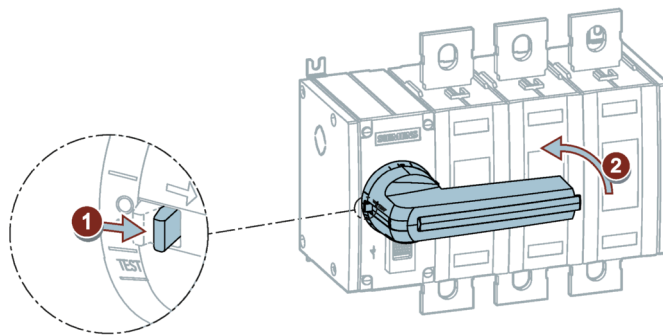
Test function

3KD supports a test function for auxiliary switches. The test function is allowed to operate the auxiliary switches in the OFF position of the 3KD switch without the need for closing of the main contacts.

The test function can be used to check the correct wiring of auxiliary contacts during placing a machine into operation.

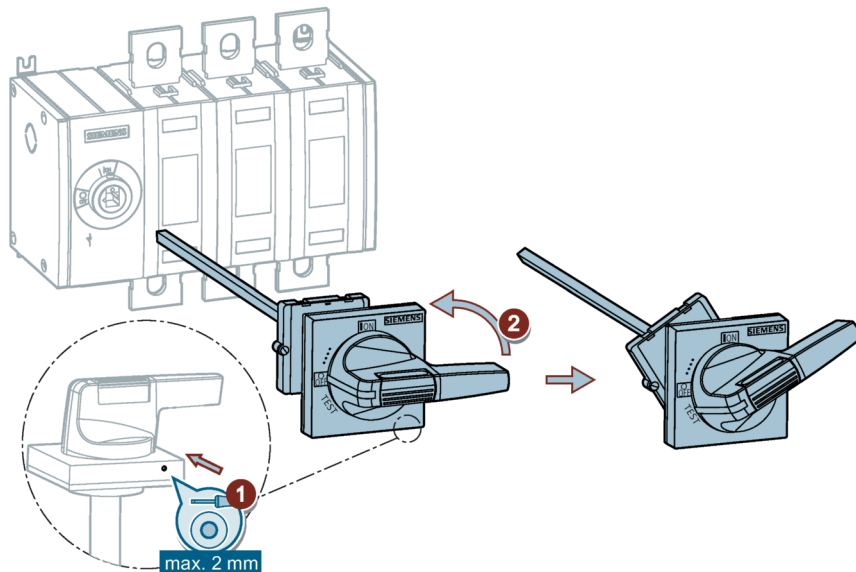
To prevent accidental switching to the test position when switching from ON to OFF during operation, switching to the test position is blocked on the handle. To be able to switch to the test position, a conscious action must be performed.

To be able to switch to the test position on the 3KD with direct operating mechanism, a lever on the handle must be operated.



3KD with direct operating mechanism

To be able to switch to the test position on the 3KD with 8UD1 door-coupling rotary operating mechanism, the interlocking on the handle must be manually deactivated using a pointed object, as shown in the figure below.



3KD with door-coupling rotary operating mechanism, 8UD1 series

Note

The test function is only possible on 3KD with operation from the front. With frame sizes 1 and 2, test function is only possible for switch versions where the drive module is not in the center position. 3KD with side wall operation does not support the test function for auxiliary switches. On this device a door-coupling rotary operating mechanism without the inscription "Test" has to be used.

Overview - availability of test function and switching times for auxiliary switches

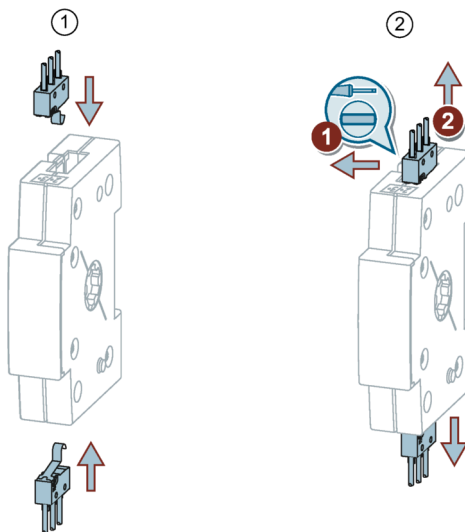
Frame size	Operation	Kind of handle	Test function	Switching time	
				Simultaneously	Leading
1, 2	Front, drive module on left side	Direct	Yes	Yes	Yes
		8UD1	Yes	Yes	Yes
	Front, drive module in center position	Direct	No	Yes	No
		8UD1	No	Yes	No
	Side operated versions	8UD1	No	Yes	Yes
3, 4, 5	Front, drive module on left side	Direct	Yes	Yes	Yes
		8UD1	Yes	Yes	Yes
	Front, drive module in center position	Direct	Yes	Yes	Yes
		8UD1	Yes	Yes	Yes
	Side operated versions	8UD1	No	Yes	Yes

8.1.1 Installation of auxiliary switches

8.1.1.1 Frame sizes 1 and 2

Frame sizes 1 and 2 use micro-switches as auxiliary switches with a changeover contact, (NO/NC) which are snapped into an auxiliary switch module.

In every auxiliary switch module up to two auxiliary switches can be assembled. The auxiliary switch modules are assembled to the sides of the 3KD switch in the same way as an additional pole – for assembling the auxiliary switch modules refer to chapter of Assembly of additional poles (Page 73).



① Assembling of auxiliary switch

② Disassembling of auxiliary switch

Test function, switching instant setting

With frame sizes 1 and 2, the functionality of the auxiliary switches is adjusted by using the corresponding version of auxiliary switch module:

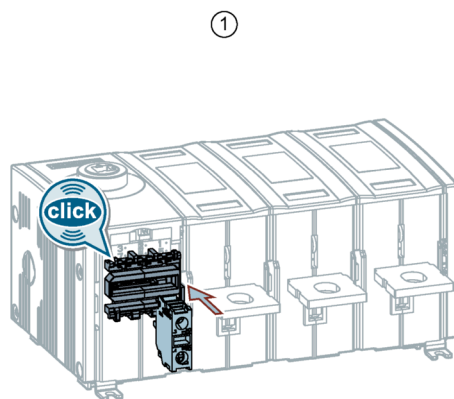
Version	Article number	Switching instant		Test function
		Simultaneously	Leading	
Standard	3KD9103-5	Yes	No	No
With test function	3KD9103-6	Yes	No	Yes
Leading and test function	3KD9103-7	No	Yes	Yes

Note

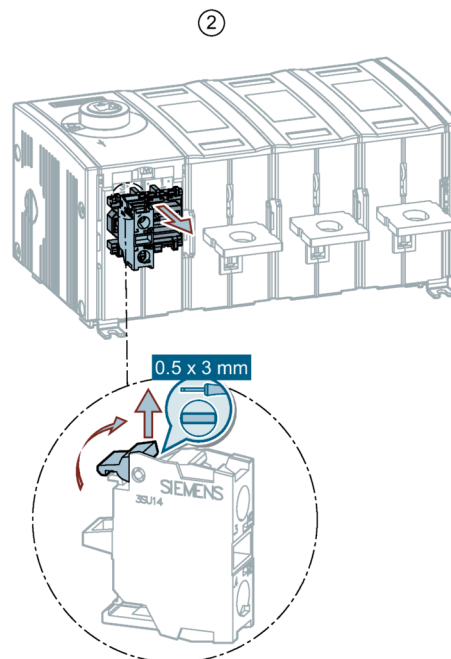
Auxiliary switch modules 3KD9103-6 and 3KD9103-7 can only be assembled directly next to the drive module of the 3KD switch. Please also refer to chapter of Assembly of additional poles (Page 73).

8.1.1.2 Frame sizes 3, 4 and 5

Frame sizes 3, 4 and 5 uses contact elements of series 3SU1 as auxiliary switches, which are snapped onto the drive module of the 3KD switch.



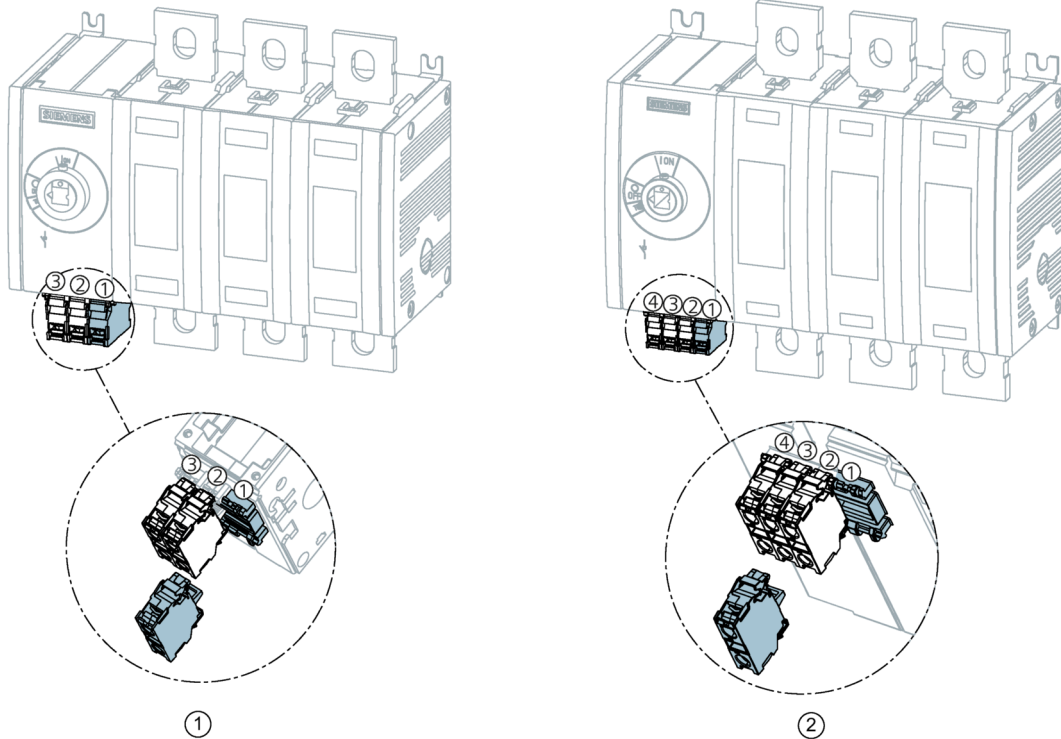
① Assembling of auxiliary switch



② Disassembling of auxiliary switch

Assembly positions

3KD frame size 3 is allowed to assemble up to three auxiliary switches, frame sizes 4 and 5 up to four auxiliary switches.



① Assembling positions for frame size 3

② Assembling positions for frame size 4 and 5

Test function

When the 3KD is switched to test position, the auxiliary switches at all possible assembly positions are actuated – ①, ②, ③ and ④ (④ only at frame size 4 and 5).

Note

Test function is not supported by all versions of 3KD. Details please see chapter Auxiliary switches (Page 59).

Switching instant setting

Auxiliary switches which are assembled to position ① have leading switching instant.

Auxiliary switches which are assembled to position ②, ③ or ④ (④ only with frame size 4 and 5) have simultaneously switching instant.

8.1.2 Disabling of test function

Test function is possible on certain combinations of 3KD switch and handle:

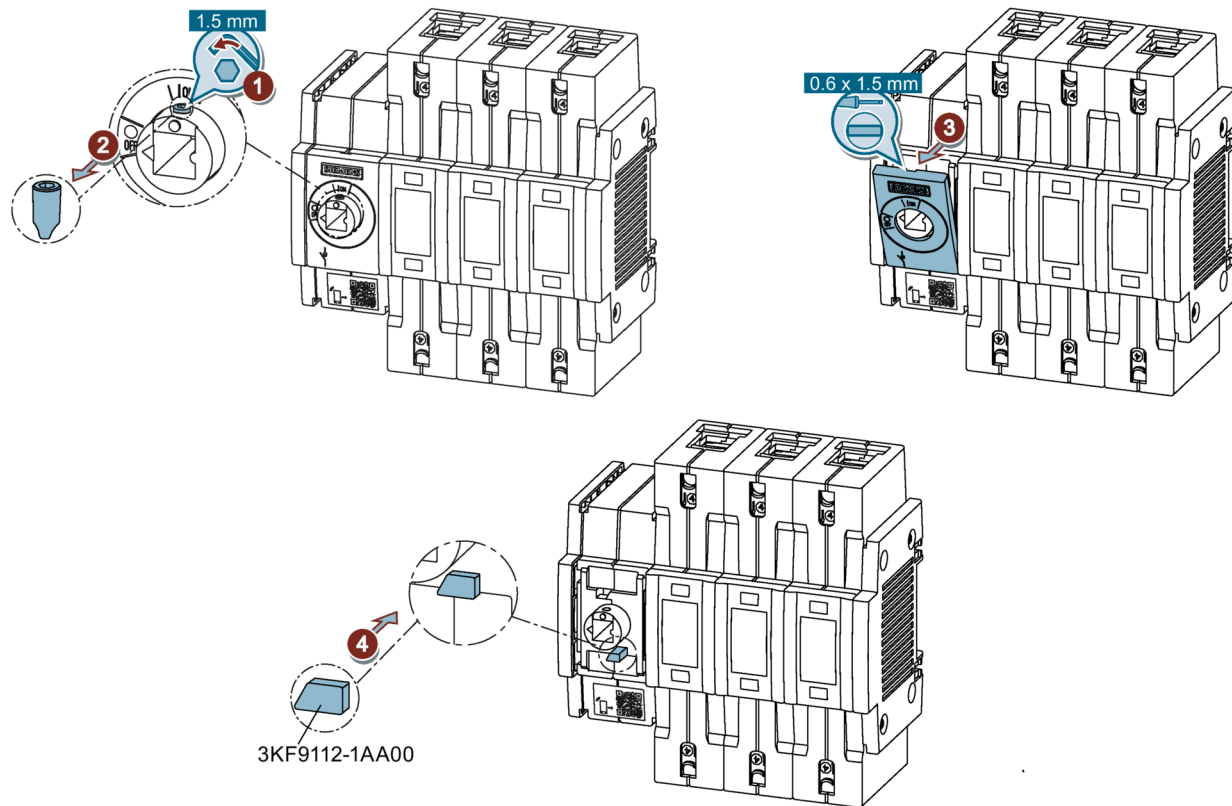
3KD version	Assembled handle	Test function
Operated from front	Direct operating mechanism	Yes
	8UD1 door-coupling rotary operating mechanism	Yes
Operated from the side	8UD1 door-coupling rotary operating mechanism	No

Note

- 3KD with operation from the side does not support the test function in general, disabling of the test function is not necessary.
- 3KD with operation from the side, the correct version of the door-coupling rotary operating mechanism has to be used (with inscription O-I, without inscription "Test").

If the test function is not required, it is also possible to disable it when an 8UD1 door-coupling rotary operating mechanism is used on a 3KD with operation from the front. Make sure to use the correct version of the 8UD1 in this case (without inscription "Test").

8.1.2.1 Frame sizes 1 and 2

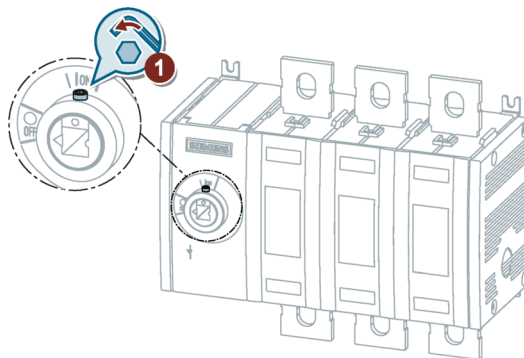



1. Loosen the screw which is used to fix the shaft of the door-coupling rotary operating mechanism.
2. Remove the screw.
3. Remove the cover on the drive module.
4. Insert the test function blocking pin to deactivate the test function.

Reassemble the cover and screw if a door-coupling rotary operating mechanism is used or assemble the direct operating mechanism (cover and screw are not necessary).

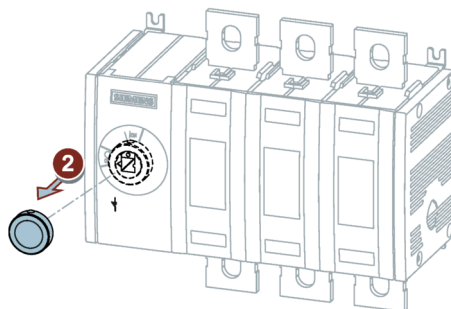
Frame size	Order number for blocking pin
1, 2	3KF9112-1AA00

8.1.2.2 Frame sizes 3, 4 and 5



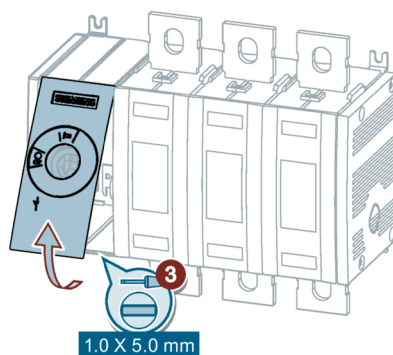
Frame size	
3	2.0 mm
4	2.5 mm
5	3.0 mm

Remove the screw which is used to fix the shaft of a door-coupling rotary operating mechanism

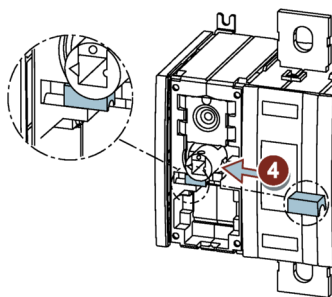


Remove the shaft fixing ring

8.1 Auxiliary switches



Remove the cover on the drive module.



Insert the test function blocking pin to deactivate the test function.

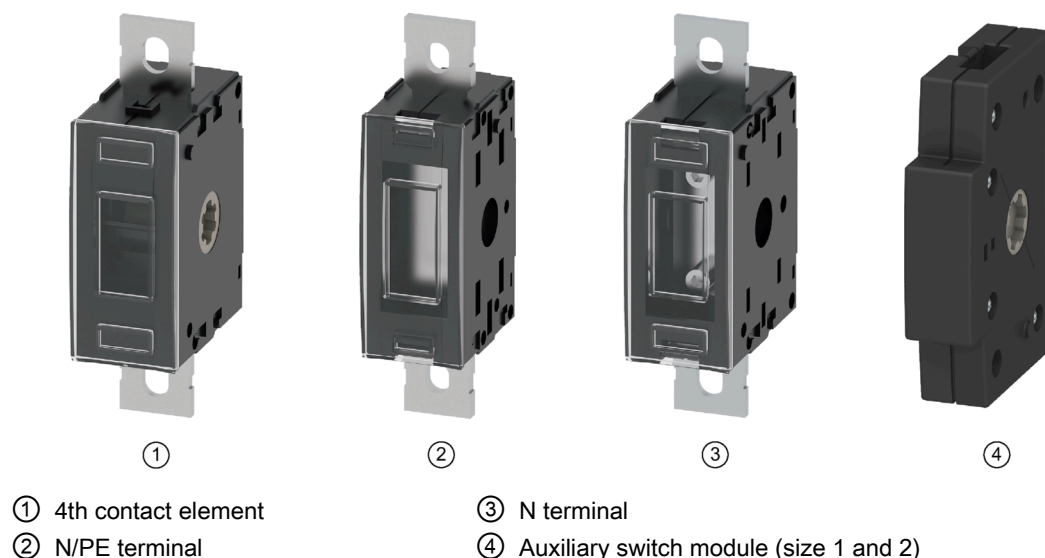
Reassemble the cover, ring and screw if a door-coupling rotary operating mechanism is used or assemble the direct operating mechanism (cover and screw are not necessary).

Frame size	Order numbers for blocking pin
3, 4	3KF9412-1AA00
5	3KF9512-1AA00

8.2 Additional poles

8.2.1 Versions of available poles

Example: frame size 3 with flat terminal.



4th contact element

Additional pole with contact element inside – it has the same functionality like the contact poles which are assembled to a 3KD switch. The 4th pole is intended to expand a 3-pole 3KD to a 4-pole version if the N phase shall be switched.

N/PE terminal

Additional pole without switching functionality, with fixed connection between the upper and lower terminal of the pole. The N/PE terminal is intended to expand a 3KD switch with a connection possibility for Neutral or Protective Earth phase.

N terminal

Additional pole without switching functionality, with connection between the upper and lower terminal of the pole. The connection between the terminals can be opened by unscrewing the jumper. The N terminal is intended to expand a 3KD switch with a connection possibility for Neutral phase if it is wished to have the possibility to unconnect N (e.g. for maintenance), but not wished to switch N.

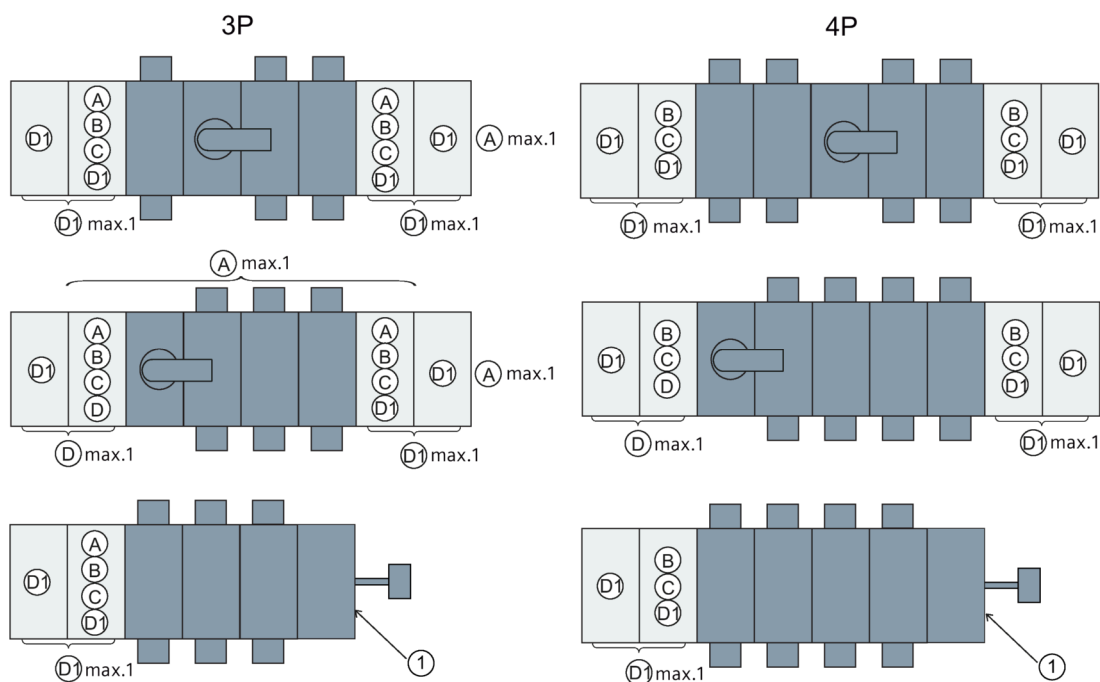
Auxiliary switch module (for size 1 and 2)

They are used for frame sizes 1 and 2 to assemble auxiliary switches to the 3KD.

8.2.2 Possible assembly positions for additional poles and auxiliary switch modules

8.2.2.1 Frame sizes 1 and 2

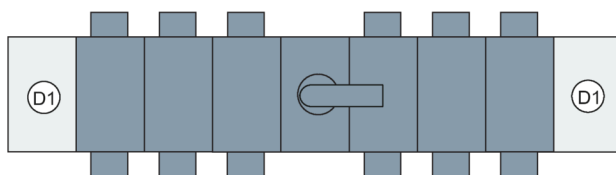
(A)	4th pole	
(B)	Neutral terminal	
(C)	N/PE terminal	
(D1)	Auxiliary switch module Standard	
(D2)	Auxiliary switch module with test function	
(D3)	Auxiliary switch module with leading NO contact and test function	



Note

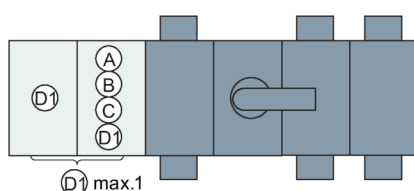
① The side operated 3KD frame size 1 and 2 have a wider side cover next to the drive module, with an integrated assembly place for one auxiliary switch. This auxiliary switch supports early break switching time.

6-pole 3KD for DC applications:

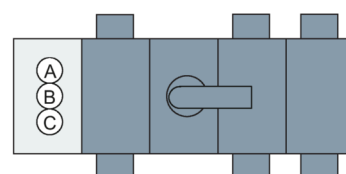


Note

- A 3KD switch for AC applications can have a maximum of 4 switched contact elements, a 4th pole can only be used on a 3-pole 3KD.
- It is possible to use one additional pole or auxiliary switch module on each side of a front operated 3KD.
- It is possible to use one additional pole or auxiliary switch module on the side opposite of the drive module of a side operated module.
- Auxiliary switch modules have two sets of screws in the scope of delivery. The self-tapping screws are used if the module is assembled to a 3KF switch disconnecter with fuses, for 3KD the screws with thread have to be used.
- Auxiliary switch modules with test function or with leading NO and test function can only be used directly next to the drive module of the 3KD.
- Additional poles have two sets of screws in the scope of delivery. The shorter screws are used if only the additional pole shall be assembled, and the longer screws have to be used if an additional pole and an auxiliary switch module are assembled.

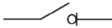




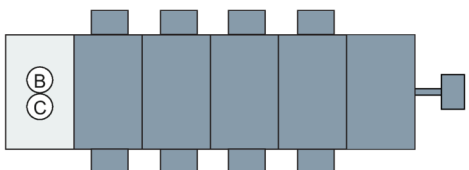
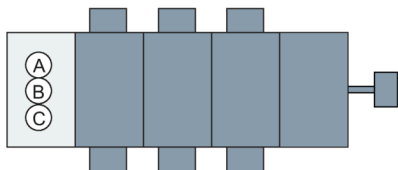
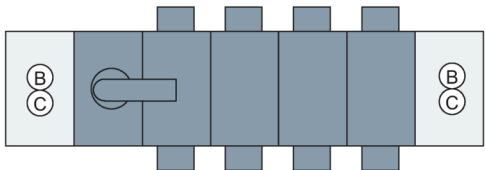
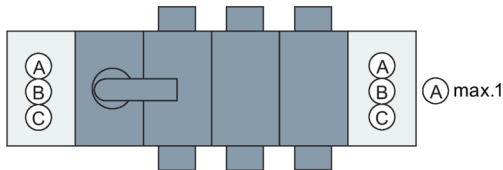
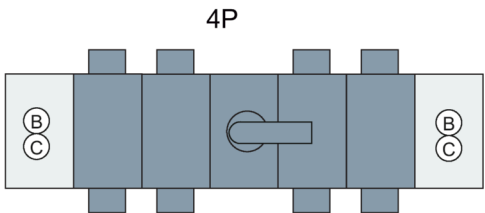
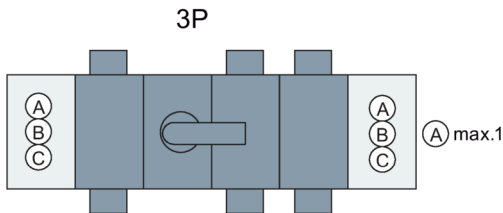
Long screw



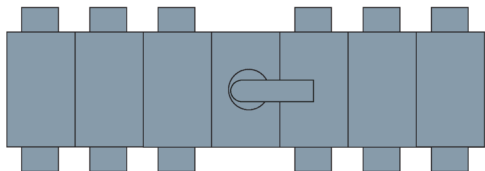
Short screw

8.2.2.2 Frame sizes 3, 4 and 5

(A)	4th pole	
(B)	Neutral terminal	
(C)	N/PE terminal	



6-pole 3KD for DC applications:



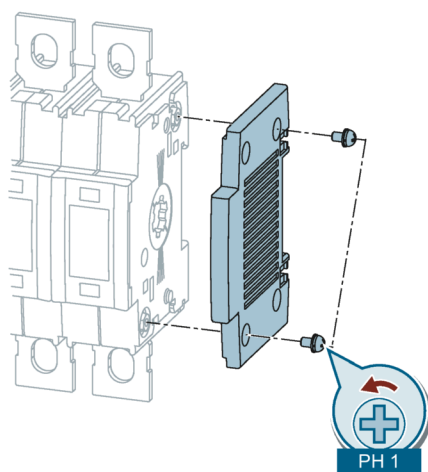
NOTICE
Damage to property. Risk of malfunction or damaging the device. A 3KD switch for AC applications can have a maximum of 4 switched contact elements, a 4th pole can only be used on a 3-pole 3KD.

Note

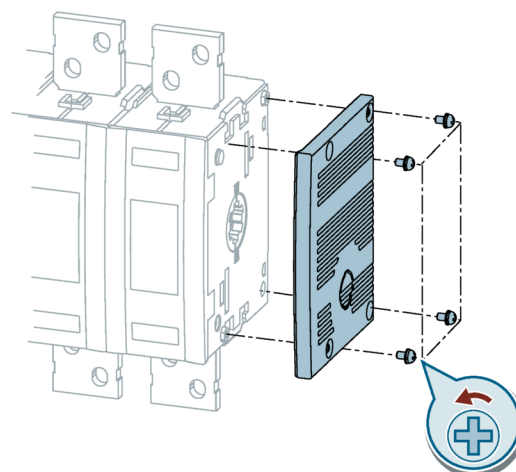
- It is possible to use one additional pole on each side of a front operated 3KD.
- It is possible to use one additional pole on the side opposite of the drive module of a side operated 3KD.

8.2.3**Assembly of additional poles**


Remove the side cover from 3KD on the side of the switch on which the additional pole shall be assembled.



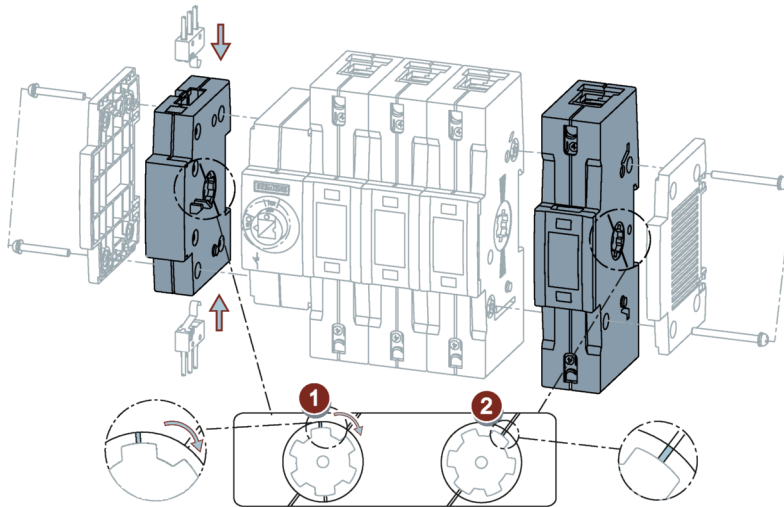
Frame size 1, 2, 3



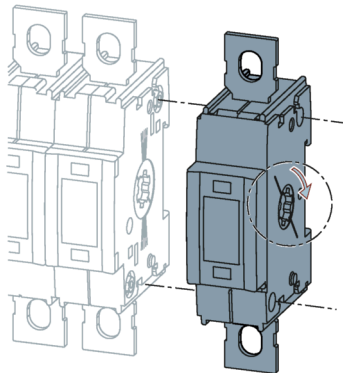
Frame size 4, 5

Frame size	
4	PH2
5	PH3

Turn the shaft of the additional pole to the right position for the assembly to the 3KD.



N and N/PE terminal, auxiliary switch (frame sizes 1 and 2)



4th pole

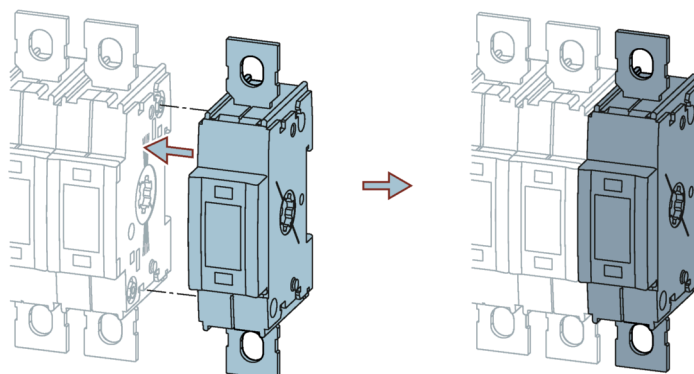
Frame size 1 and 2:

For auxiliary switch modules and N and N/PE poles of frame size 1 and 2, two lines on the housing and shaft have to be aligned. The 4th pole has to be turned clockwise until no further turning is possible.

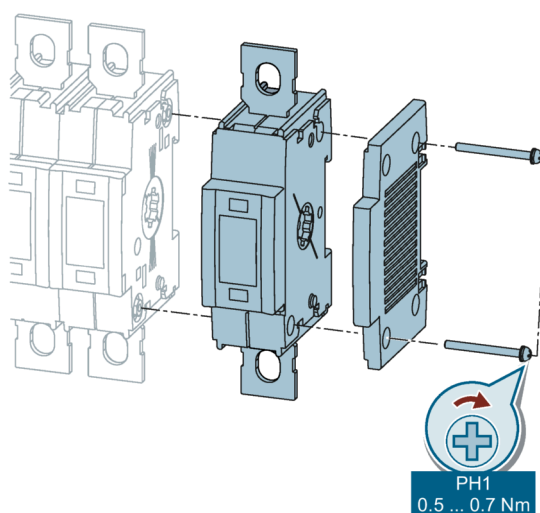
Frame size 3, 4 and 5:

4th pole has to be turned clockwise until no further turning is possible. N and N/PE poles need no alignment.

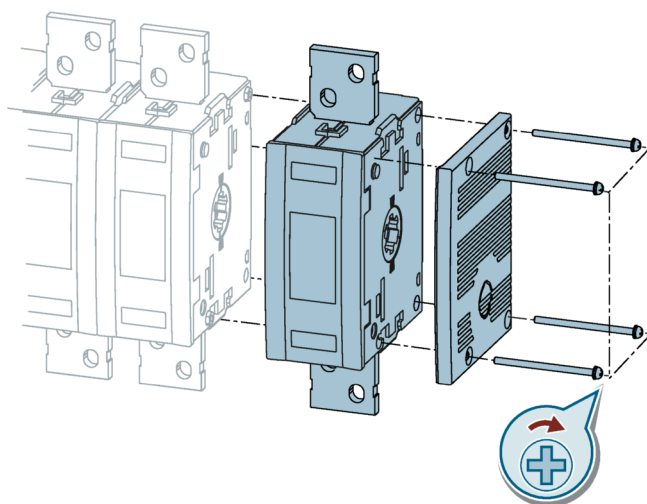
Place the additional pole on the 3KD switch. The additional pole has to be fitted directly to the 3KD (without a gap between switch and additional pole).





Reassemble the side cover with the longer screws which are in the scope of delivery of the additional pole.



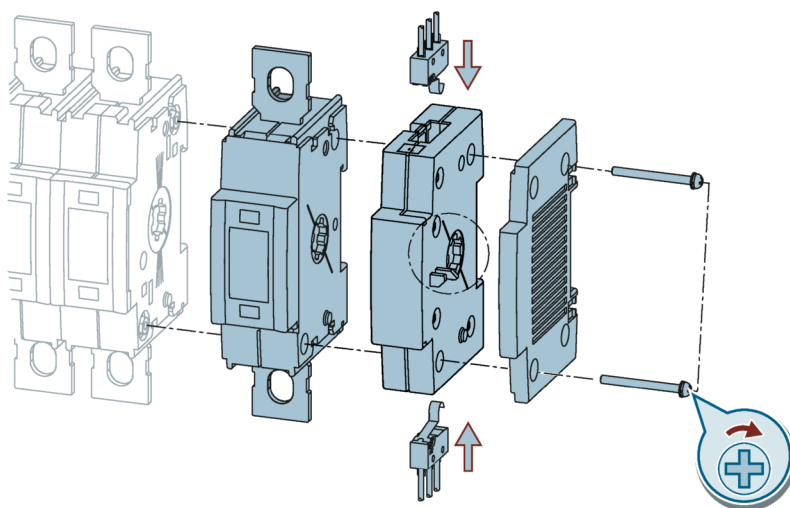
Frame sizes 1, 2, 3



Frame sizes 4, 5

Frame size		
4	PH2	0.5 ... 0.7 Nm
5	PH3	0.7 ... 0.9 Nm

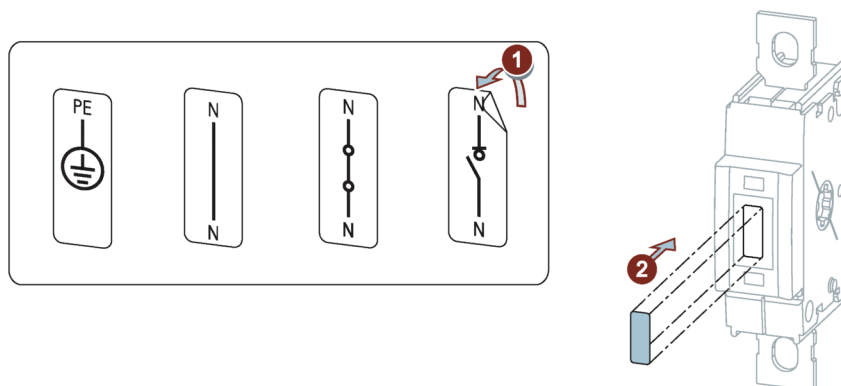
Assembly of two modules on one side of the switch



3KD frame sizes 1 and 2 allow the usage of two modules on one side of the switch (see chapter Frame sizes 1 and 2 (Page 70)). For this kind of assembly the additional poles have two sets of screws with different lengths in the scope of delivery.

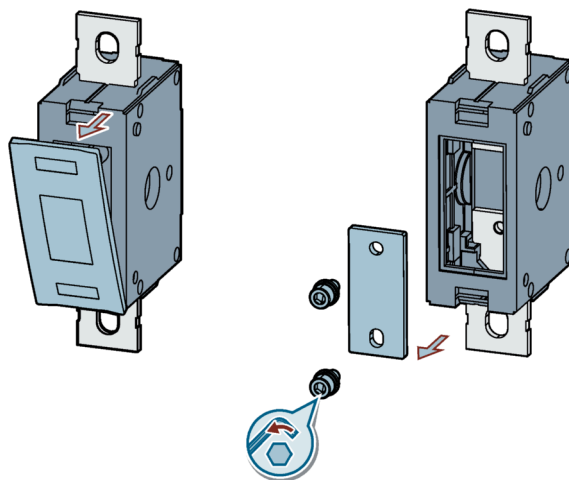
The short version of screw is used if the additional pole is used, the longer version is used if an additional pole is used in combination with an auxiliary switch module.


The scope of delivery of the additional poles includes labels which can be used to identify the phase type (N, PE).



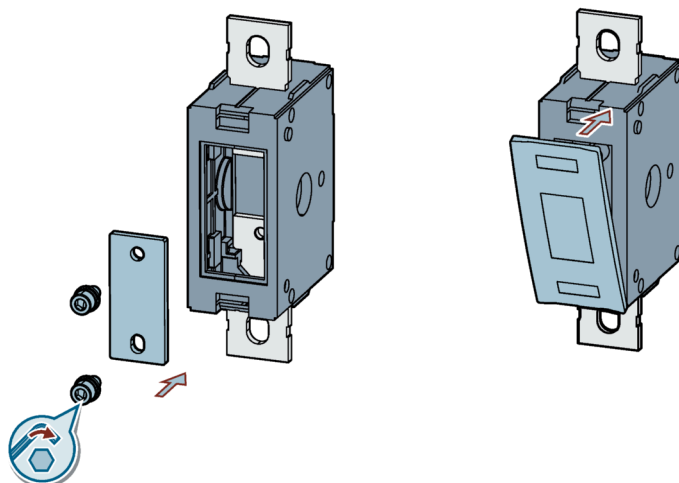
8.2.4 Removing the jumper at N terminal

Removing the jumper



3KD frame size		
1	With box terminal	3 mm
2	With flat terminal	3 mm
	With box terminal	4 mm
3	With flat terminal	5 mm
4, 5	With flat terminal	6 mm

Reassembling the jumper



3KD frame size			
1	With box terminal	3 mm	1.3 ... 1.7 Nm
2	With flat terminal	3 mm	1.3 ... 1.7 Nm
	With box terminal	4 mm	1.9 ... 2.5 Nm
3	With flat terminal	5 mm	3.0 ... 5.0 Nm
4	With flat terminal	6 mm	5.0 ... 7.0 Nm
5	With flat terminal	6 mm	7.0 ... 9.0 Nm

8.3 Direct operating mechanism

8.3.1 Versions



Direct operating mechanism,
standard version, gray



Direct operating mechanism,
standard version, red/yellow



Direct operating mechanism,
flat version, gray



Direct operating mechanism,
flat version, red/yellow

DANGER

Hazardous voltage. Will cause death or serious injury.

If a direct operating mechanism is used, it is mandatory to fit terminal covers or a protection plate.

Note

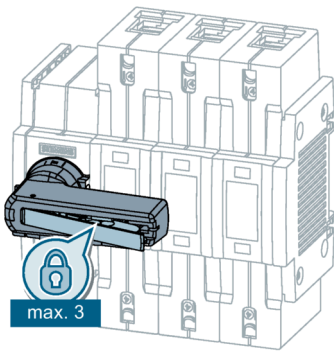
Handles in red/yellow color are used for EMERGENCY-STOP applications, and gray handles for all other applications.


- The standard version of direct operating mechanism can be padlocked with up to 3 padlocks, but needs additional depth when padlocked.
- The flat version of direct operating mechanism can be padlocked with one padlock, but needs no additional depth when padlocked.
- The flat versions of direct operating mechanism are available for frame sizes 1 and 2.

8.3.2 Padlocking

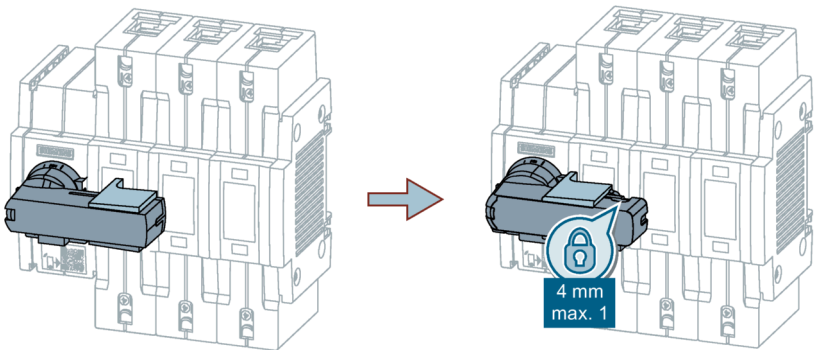
3KD switches can be padlocked in OFF position.

Standard version of the direct operating mechanism



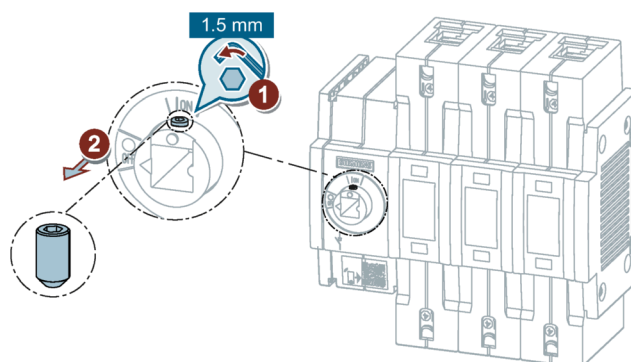
Frame size	 Ø [mm]
1, 2, 3	4 ... 6
4, 5	4 ... 8

Flat version of the direct operating mechanism

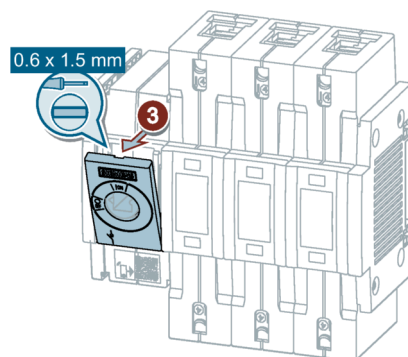


8.3.3 Assembling

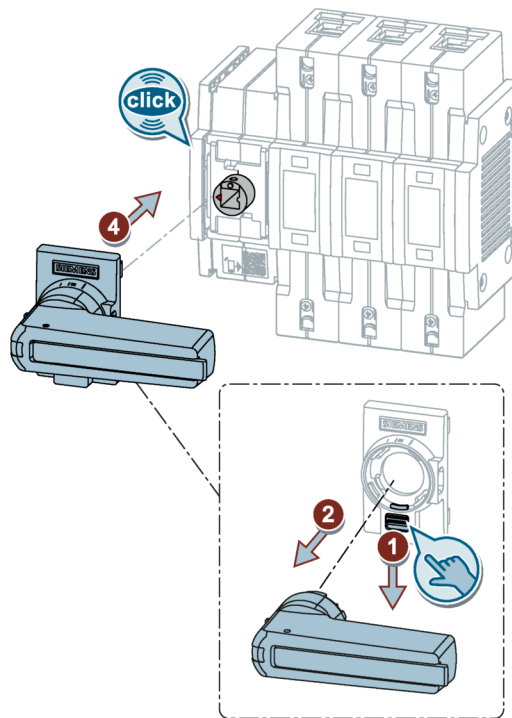
8.3.3.1 Frame sizes 1 and 2



Remove the screw which is intended to tighten the shaft of a door-coupling rotary operating mechanism.



Remove the front cover from the drive module.



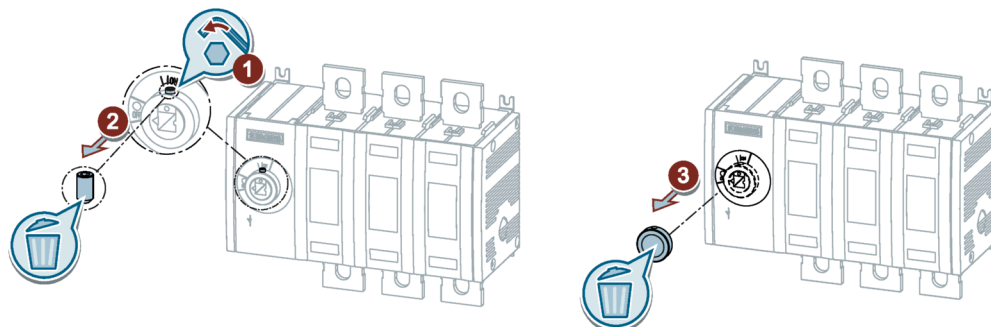
Snap the direct operating mechanism onto the 3KD


Note

- The snapping mechanism of the direct operating mechanism's cover fits strongly inside the drive module to prevent accidental loosening of the handle during operational switching of the 3KD. It is not possible to disassemble the cover, so please make sure to assemble the desired version of the direct operating mechanism.
- The handle can be released from the 3KD.

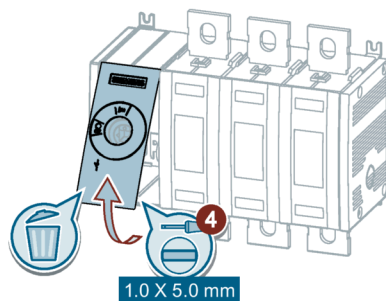
8.3.3.2 Frame sizes 3, 4 and 5

Remove the screw and the metal ring which are intended to tighten the shaft of a door-coupling rotary operating mechanism.

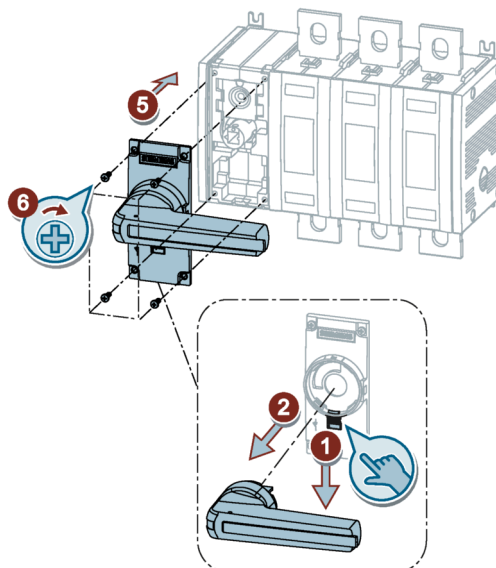




Frame size	
3	2.0 mm
4	2.5 mm
5	3.0 mm

Remove the front cover from the drive module.



Screw the handle to the 3KD



Frame size		
3	PH1	0.25 ... 0.35 Nm
4	PH2	0.7 ... 0.9 Nm
5	PH3	0.9 ... 1.1 Nm

Note

The handle can also be released from the 3KD.

8.4 8UD1 door-coupling rotary operating mechanism

The door-coupling rotary operating mechanism enables operation of the switch disconnecter from the outside of the cabinet door.

Note

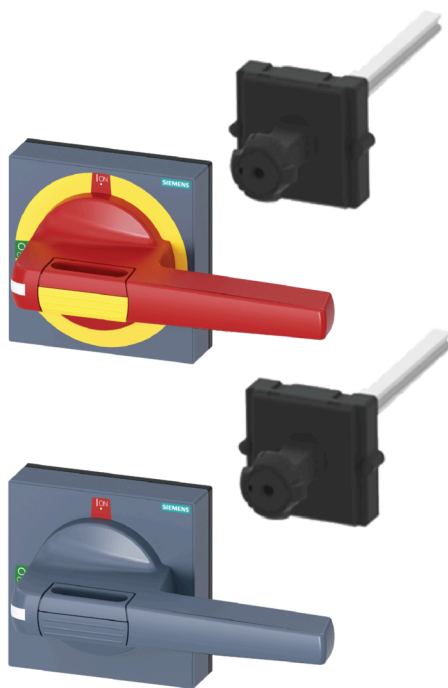
Door-coupling rotary operating mechanism can only be retrofitted to 3KD without factory assembled direct operating mechanism.

Retrofitting to 3KD with factory assembled direct operating mechanism is not possible.

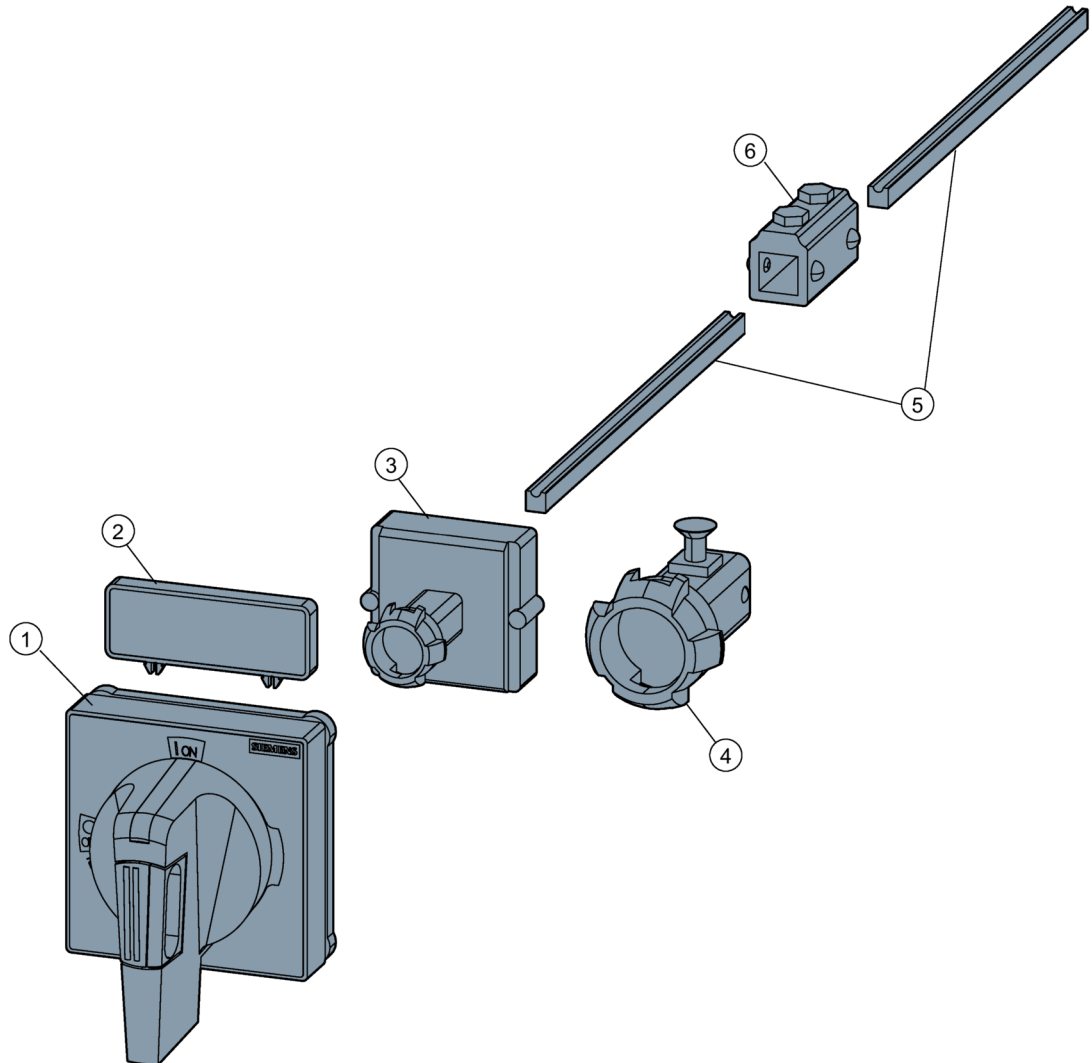
8UD1 Series

Modern design of the handles identical with the handles which are used on the new range of 3VA MCCBs.

- Locking function at the handle with padlocks.
- Switching symbols in the handle can be illuminated.
- Test function of auxiliary switches is supported.



8.4.1 Component overview



- ① Handle (including front cover, gasket and screws for fixing in front door)
- ② Labeling plate
- ③ Coupling driver with tolerance compensation
- ④ Coupling driver without tolerance compensation
- ⑤ Extension shaft
- ⑥ Shaft coupling

8.4.2 Delivery forms and versions

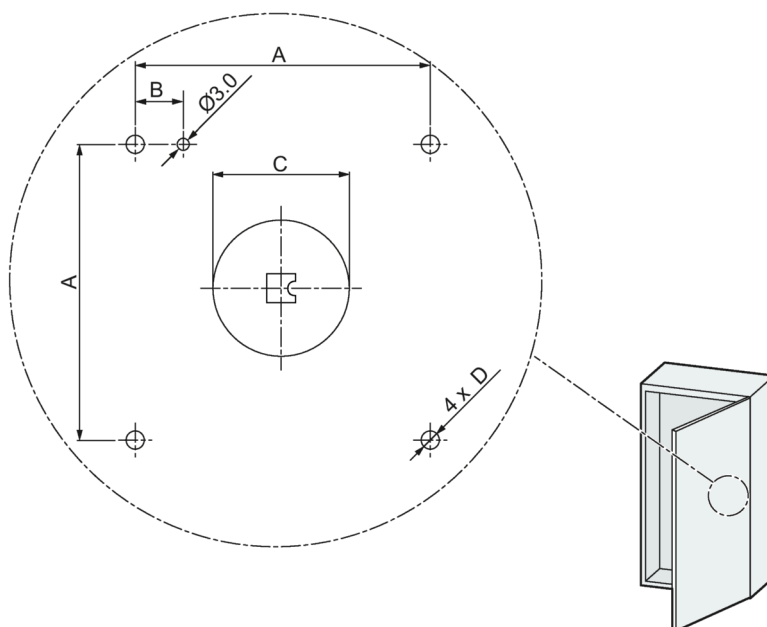
8UD1 is available as a ready-to-assemble complete unit.

This includes a handle without illumination, coupling driver with tolerance compensation and 300 mm long extension shaft.

All components are also available separately, shafts are available in 300 mm and 600 mm length, handles are available in illuminated and non-illuminated versions.

8.4.3 Assembly

Drilling template for cabinet door



Frame size	A [mm]	B [mm]	C [mm]	D [mm]
1, 2	65	10.5	Ø 30	Ø 4.5
3, 4, 5	88	13.5	Ø 65	Ø 5.5

Note

Scale

The drilling template is not in scale 1:1.

Note

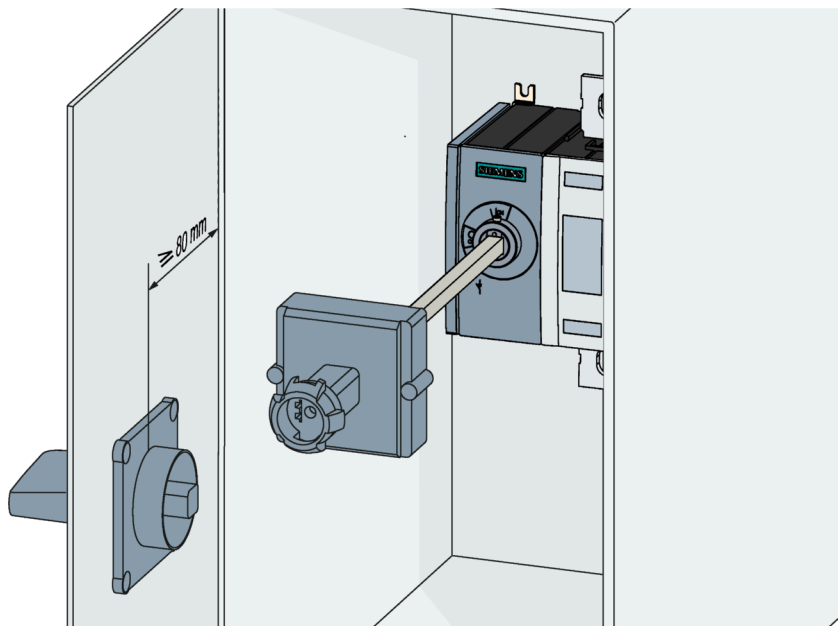
Illuminated 8UD1

The hole diameter of 3 mm is only necessary if an illuminated version of 8UD1 is used.

Note

Placement of the shaft

Alignment of center hole and the cabinet door (shaft), to the position of the 3KD switch disconnector inside the cabinet can be found in the 3KD dimension drawings. Please see chapter Drilling templates (Page 127).



The distance from the center hole in the cabinet door to the hinge of the cabinet door has to be 80 mm or more.

Note

Hinge clearance

The smaller the hinge clearance compared with the total width of the cabinet door, the smaller the force required to prevent unintended opening of the cabinet door while the switch disconnector is in the closed state.

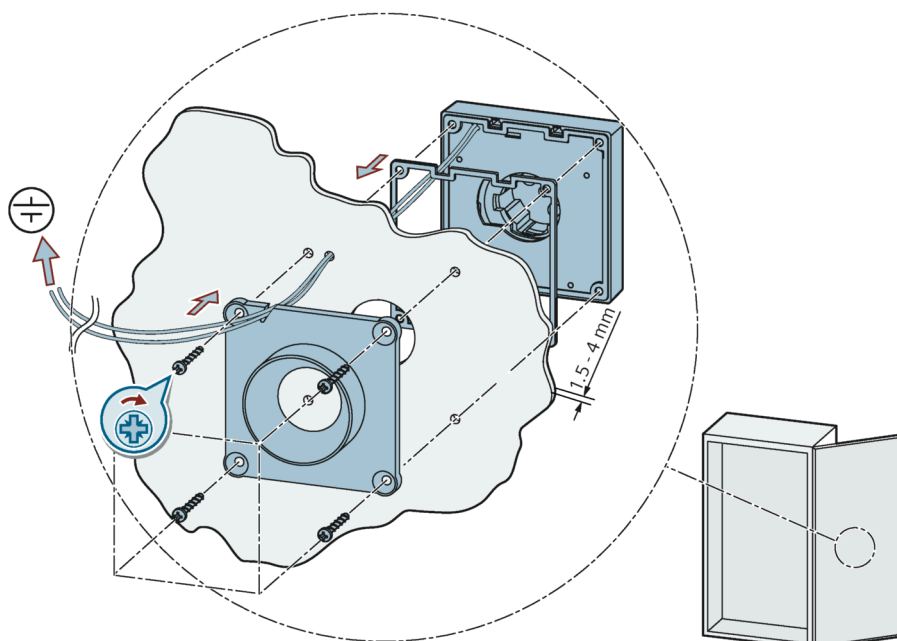
We therefore recommend increasing the hinge clearance to at least 1/3 of the total width of the cabinet door.



Assembling the handle to the door

The following modification of the handle can only be performed, as long as the handle is not assembled to the cabinet door:

- Disabling of door interlock.
- Enabling of padlocking in ON position.
- Assembly of labelling plate.

If you want to use these functions / accessories, you should do the necessary steps before continue with assembling of the handle to the door. For details about above features / accessories see chapter Functions and operation (Page 96), and Accessories for 8UD1 (Page 106).



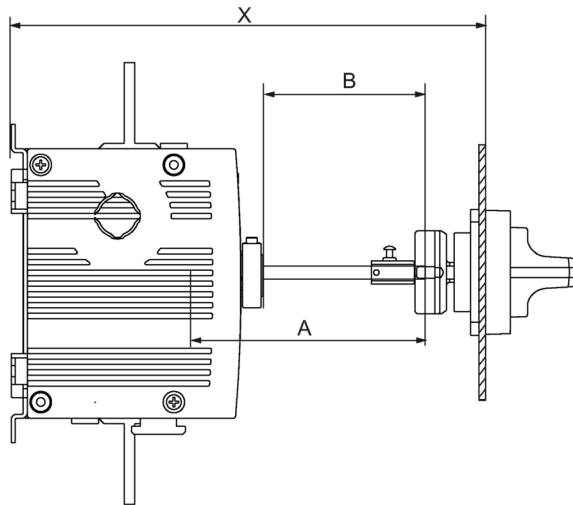
Frame size		
1, 2	PZ2	1.1 ... 1.3 Nm
3, 4, 5		2.1 ... 2.4 Nm

Note

8UD1 handles can be used in doors with a thickness between 2.0 and 5.5 mm. The 24 V DC power supply cable is only relevant if an illuminated version of the 8UD1 handle is used.

Calculating the length of the shaft/cutting the shaft

Front operated 3KD



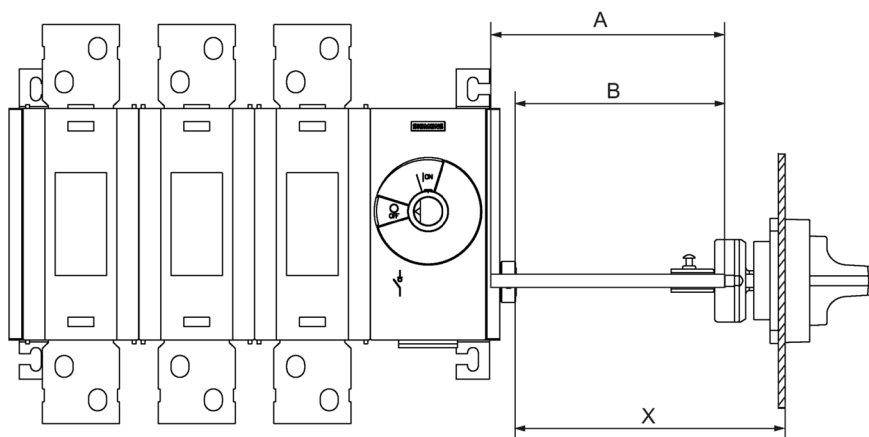
X = Distance from outside of the cabinet door to mounting plate for the 3KD switch
(according to the dimension of the used cabinet)

Length of the shaft

Frame size of 3KD	Coupling driver					
	With tolerance compensation			Without tolerance compensation		
	A [mm]	Tolerance	B [mm]	A [mm]	Tolerance	B [mm]
1, 2	X - 96	+ 5	X - 111	X - 54	+ 5	X - 69
3	X - 99.5	+10	X - 136.5	X - 57.5	+10	X - 94.5
4	X - 103	+10	X - 153	X - 61	+10	X - 111
5	X - 117.5	+10	X - 195.5	X - 75.5	+10	X - 153.5

Min. distance from mounting plate to front of door X

Frame size of 3KD	Min. distance X [mm]
1, 2	138.5
3	169
4	185.5
5	228

Side operated 3KD

X = Distance from inside of the cabinet side wall to outer side of the 3KD switch (according to the location of the 3KD inside of the cabinet)

Length of the shaft

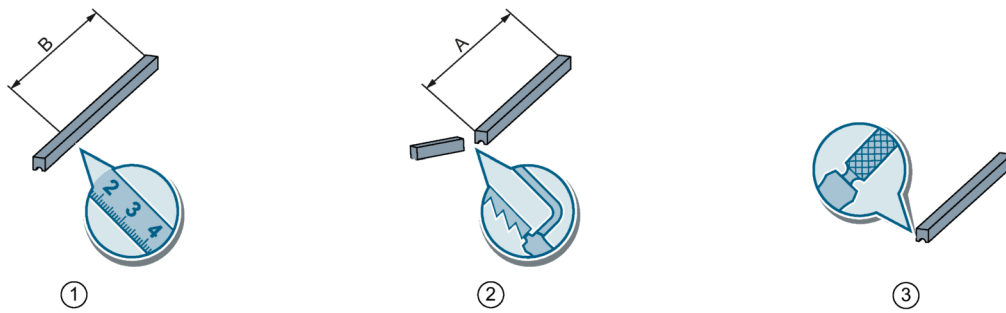
Frame size of 3KD	A [mm]	Tolerance	B [mm]
1, 2	$X + 14$	+ 5	$X - 1$
3	$X + 20$	+10	$X - 1$
4	$X + 34$	+10	$X - 1$
5	$X + 53$	+10	$X - 1$

Min. distance X from switch to outside of side wall:

Frame size of 3KD	Min. distance X [mm]
1, 2	28.5
3, 4, 5	33.5

Note

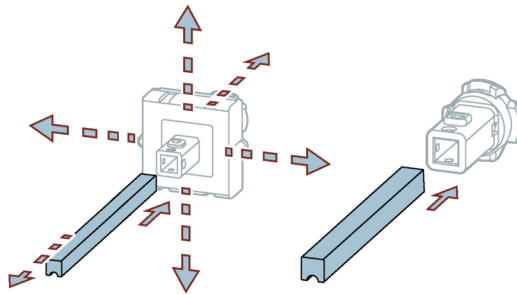
On 3KD with side operation only coupling drivers without tolerance compensation can be used.



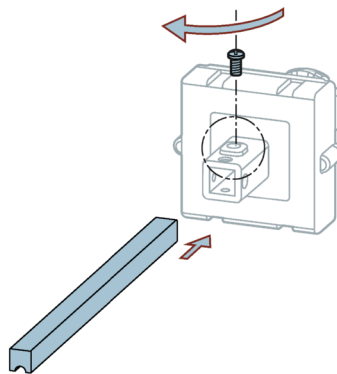
- ① Mark dimension B at the shaft
- ② Cut the shaft to length A
- ③ Deburr the cut edges of the shaft to ensure proper assembly

As for the letter A and B, please see the content of "cutting the shaft" in this chapter.

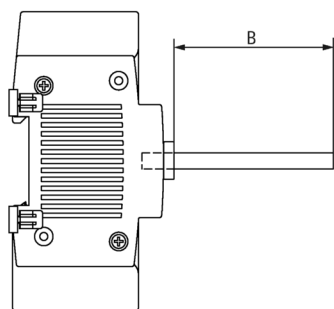
Fix the coupling driver to the shaft.



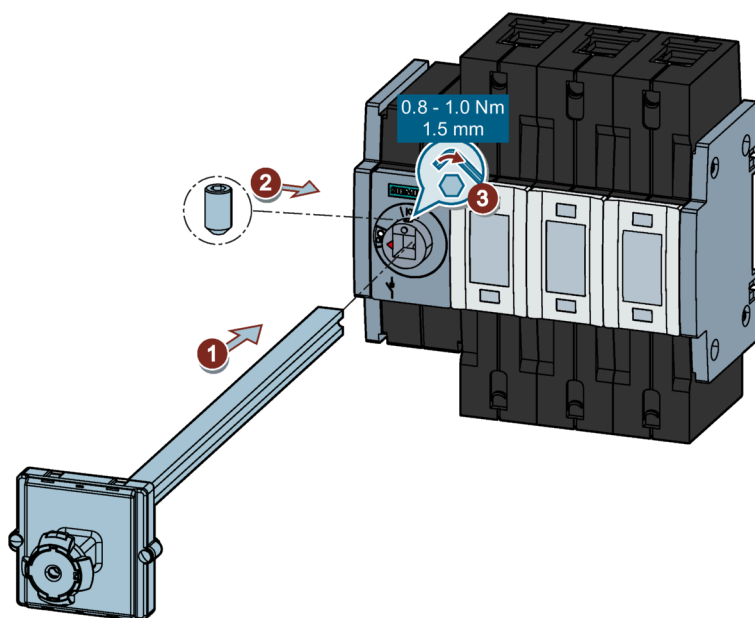
Move the shaft into the coupling driver as far as it will go.



Fix the shaft to the 3KD.

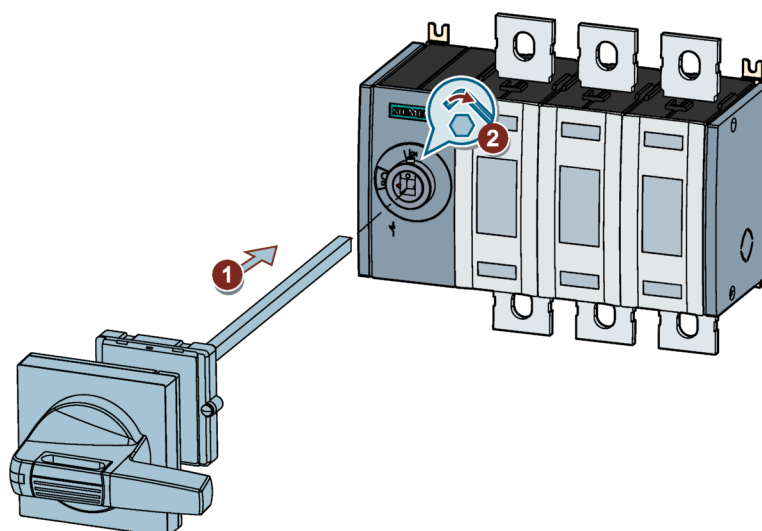


Move the shaft into the 3KD up to marking B.







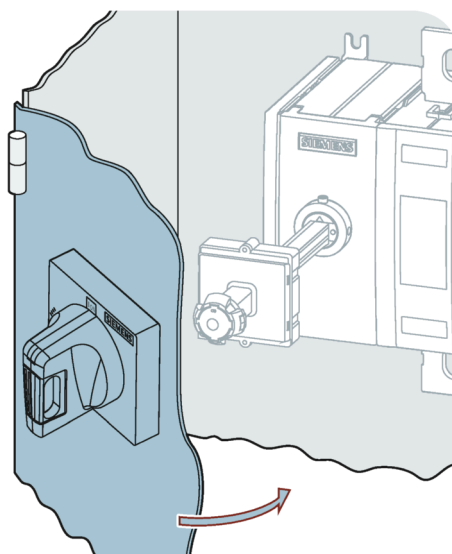
Frame size 1 and 2

8.4 8UD1 door-coupling rotary operating mechanism



Frame size 3, 4 and 5

Frame size	Front operation		Side operation	
				
3	2.0 mm	1.5 ... 2.0 Nm	3.0 mm	2.0 ... 2.5 Nm
4	2.5 mm	4.0 ... 4.5 Nm	4.0 mm	6.0 ... 6.5 Nm
5	3.0 mm	7.0 ... 7.5 Nm	5.0 mm	8.5 ... 9.0 Nm



Close the cabinet door carefully the first time to check correct alignment between 8UD1 handle and 3KD switch.

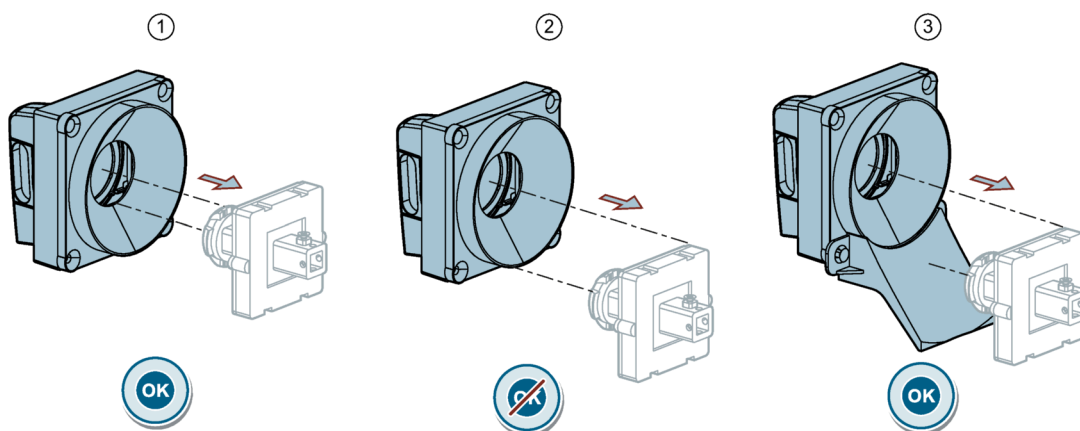
NOTICE**Damage to property.**

Risk of damaging the device.

When the cabinet door is opened, the 8UD1 coupling head is deflected downwards a little bit. This deflection is caused by tolerances between the 8UD1 shaft and the fixing point at 3KD and by tolerances where the 3KD is assembled inside the cabinet.

In typical applications the cone on the backplate of the handle ensures that the coupling head hooks into the handle mechanism, even when deflected.

If 3KD is assembled onto DIN rails and shafts longer than 300 mm are used, it may be the case that the deflection of the coupling head is too wide and the cabinet cannot be closed or the 8UD1 mechanism can be damaged. In this case the 8UD1 shaft can be supported by an internal structure of the cabinet (to eliminate deflection) or the accessory "shaft jack" for 8UD1 can be used. Please see chapter Accessories for 8UD1 (Page 106).

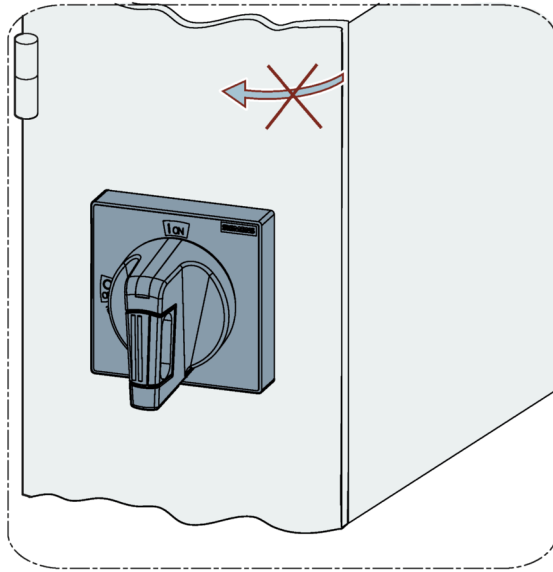
Closing the cabinet door

- ① Coupling head slightly deflected downwards - cabinet door can be closed
- ② Coupling head widely deflected downwards - cabinet door cannot be closed
- ③ Coupling head widely deflected downwards, 8UD1 handle with shaft jack - cabinet door can be closed

8.4.4 Functions and operation

Door interlock

The door interlock of the door-coupling rotary operating mechanism locks the door as soon as the door-coupling rotary operating mechanism is turned to position ON (I).



NOTICE

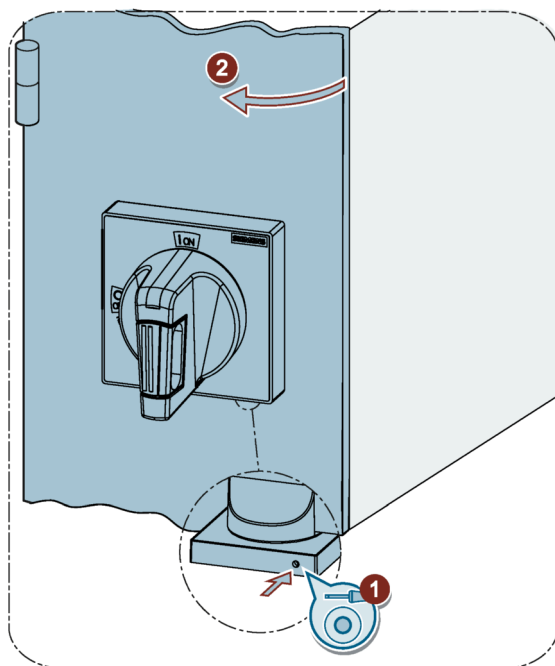
Damage to property.

Risk of damaging the device.

If a force of at least 800 N pulls at the 8UD1 along the shaft when door interlocking is activated, the operating mechanism can be irreparably damaged.

Overriding the door interlock

The door interlock can be overridden by a deliberate action. This means that the door can be opened with the operating mechanism in position ON (I) so that maintenance can be carried out, for example.



Procedure

1. Press the door interlocking pin with a sharp object.
2. Hold the pin down while the door is opened.

NOTICE

Damage to property.

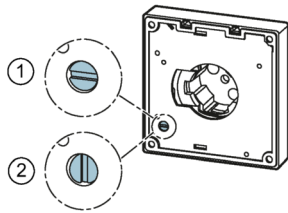
Risk of damaging the device.

If door interlock is overridden, take care that the 8UD1 handle and the 3KD switch are in the same position (both ON or both OFF) before closing the cabinet door to prevent damage to the mechanism.

Disabling door interlock

Door interlock can also be deactivated permanently.

To deactivate the door interlock, a lever on the back of the 8UD1 front cover has to be turned to vertical position (with slotted screwdriver 2.5 mm)



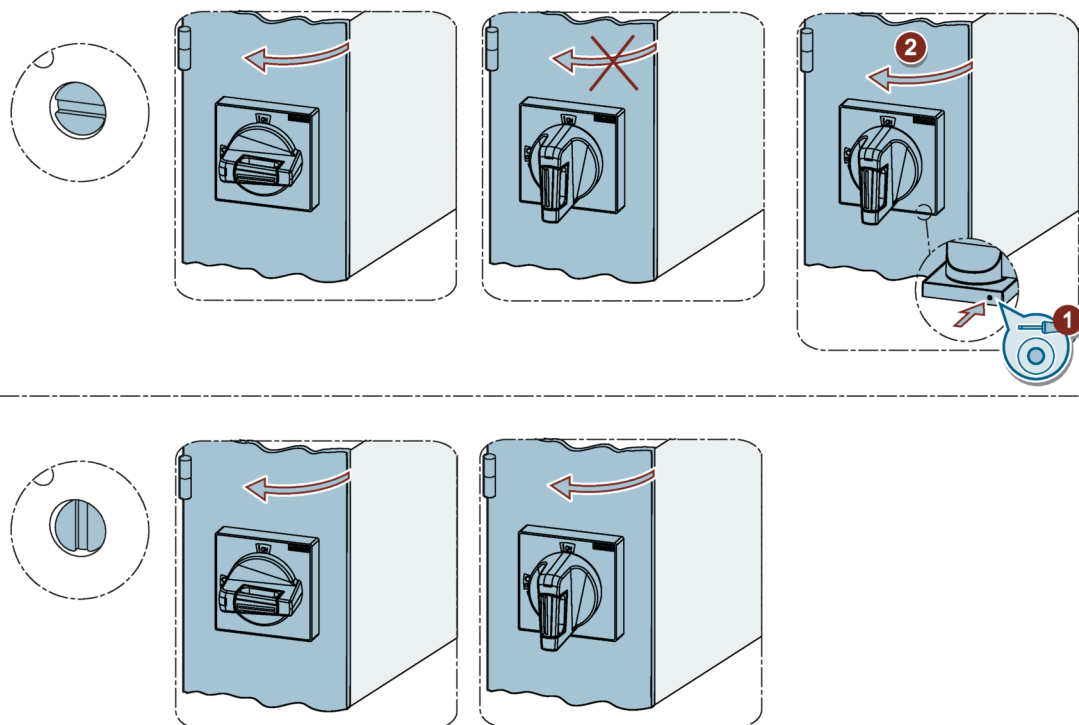
① Door interlock activated

② Door interlock deactivated

Note

The lever for deactivation of the door interlock is only accessible when the handle is not assembled to the cabinet door. If you want to deactivate door interlocking, take care to rotate the lever before installation of the handle.

Overview door interlock



NOTICE

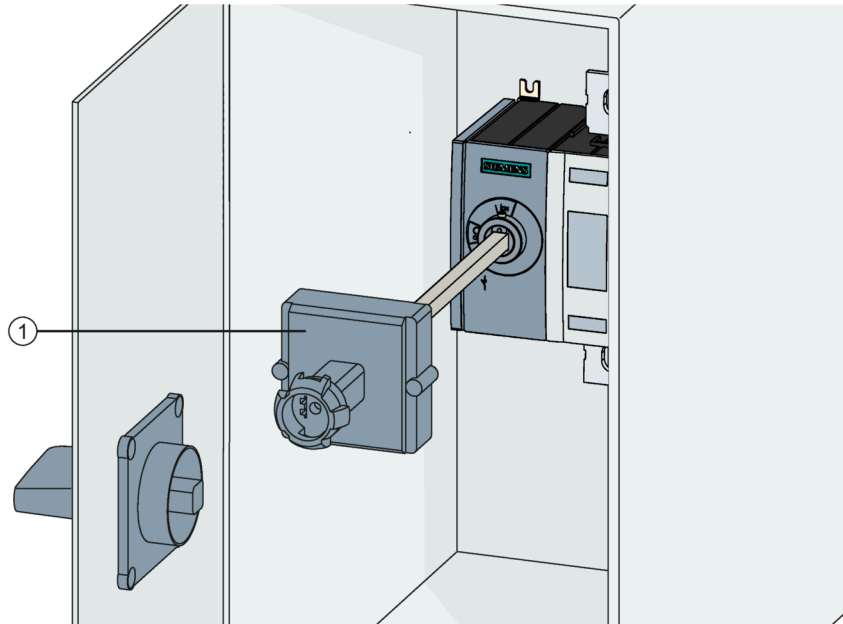
Damage to property.

Risk of damaging the device.

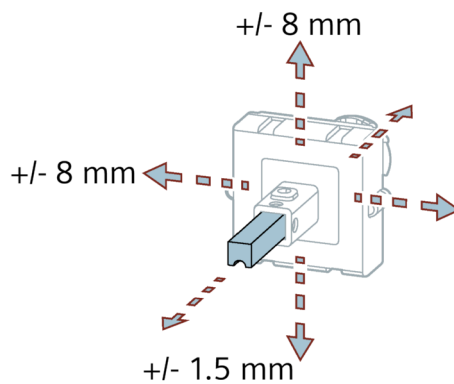
If the door interlock is deactivated, take care that the 8UD1 handle and the 3KD switch are in the same position (both ON or both OFF) before closing the cabinet door to prevent damage to the mechanism.

Tolerance compensation

Door-coupling rotary operating mechanisms are supplied as standard with a tolerance compensator. This device compensates any potential minor offset between the rotary switch of the cabinet doors and the shaft of the door-coupling rotary operating mechanism.



① Tolerance compensator



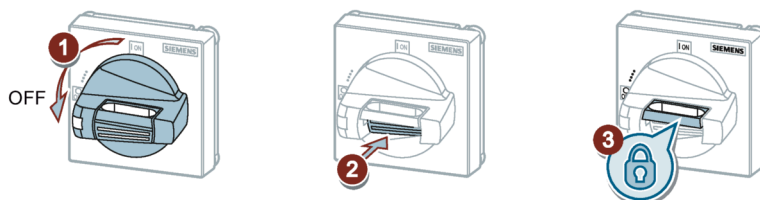
Note

The coupling drivers are also available without tolerance compensation (accessory). These are used for 3KD with side operation.

Padlocking

8UD1 handles in as-delivered condition can be locked with padlocks in OFF position. When the handle is locked in OFF position, the 3KD switch disconnecter cannot be closed, nor can the cabinet door be opened. The door interlock cannot be overridden.

Up to three padlocks with a shackle diameter of between 4.5 and 9.5 mm can be used to lock the rotary operating mechanisms. Padlocks are not included in scope of supply.

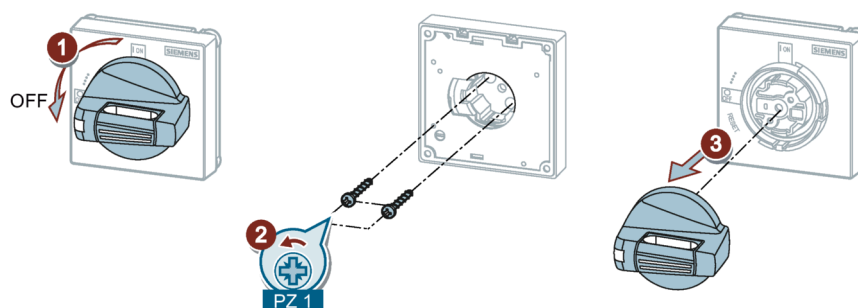


Enabling padlocking in ON position

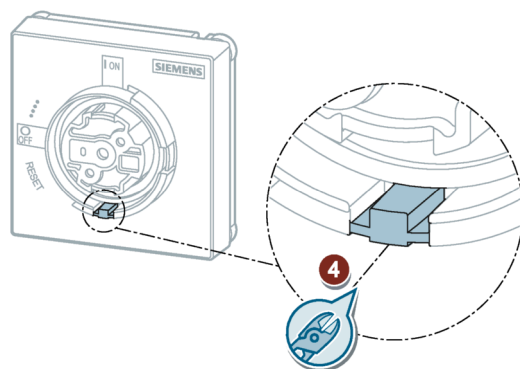
8UD1 handles can be modified in a way to allow padlocking in OFF and ON position.

Note

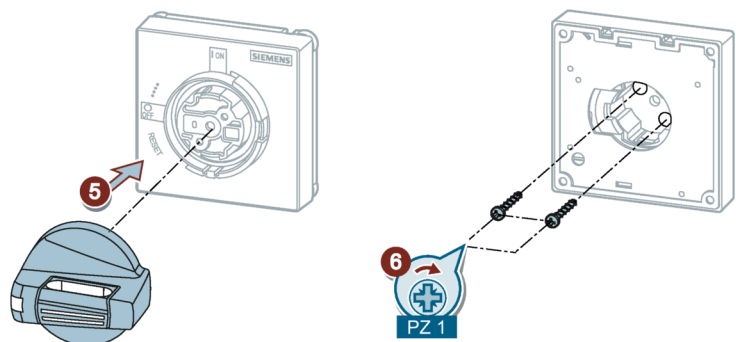
- This modification is not reversible.
- Enabling of padlocking in ON position is only possible as long the handle is not assembled to the cabinet door. If you want to enable padlocking in the ON position, please take care to do it before installation of the handle.




Disassemble the operator from the front cover.

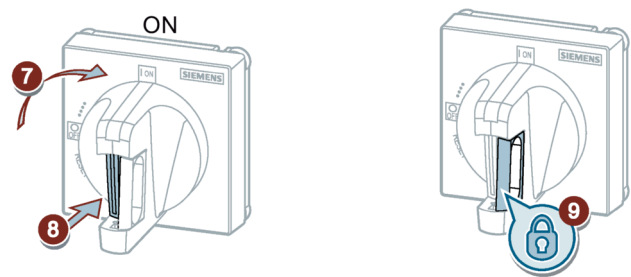


Remove the knockout contour



Frame size	
1, 2	1.0 ... 1.2 Nm
3, 4, 5	2.0 ... 2.5 Nm

Re-assemble the operator to the front cover.



Test padlocking in ON position before installation to the cabinet door.

Up to three padlocks with a shackle diameter of between 4.5 and 9.5 mm can be used to lock the rotary operating mechanisms.

Note

3KD can also be used as an EMERGENCY-STOP switch (with red / yellow handle) – if 3KD is used as an EMERGENCY-STOP switch, padlocking in the ON position is not allowed.

Test function for auxiliary switches

3KD offers a test function for assembled auxiliary switches which is supported by the 8UD1 door-coupling rotary operating mechanism.

Note

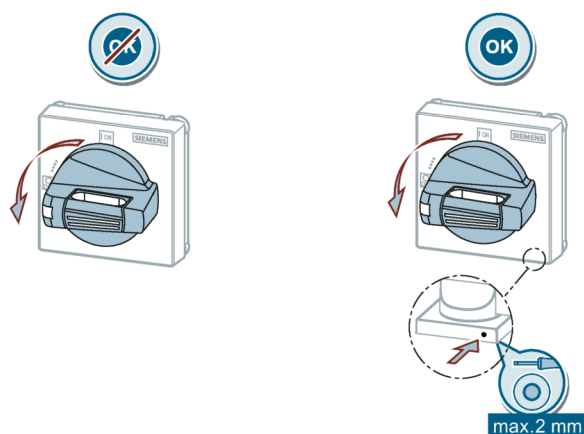
For details about test function please see chapter Auxiliary switches (Page 59).

Switching to test position

Test position is located 20° counterclockwise from the OFF position and is mechanically blocked to prevent accidental switching to test during normal switching from ON to OFF.

Procedure:

1. Press the Test position – Pin with a sharp object (up to 2 mm diameter).
2. Hold the Pin down while the handle is turned to test position.

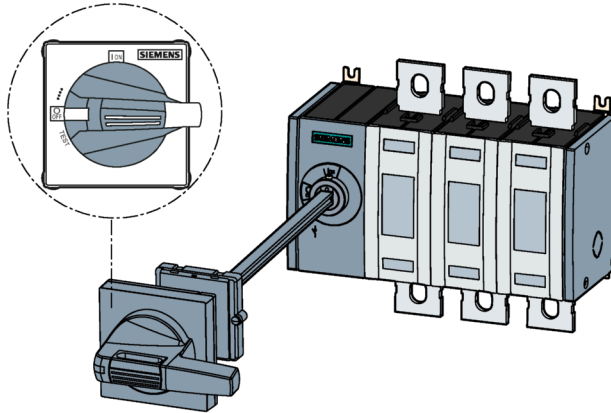


Note

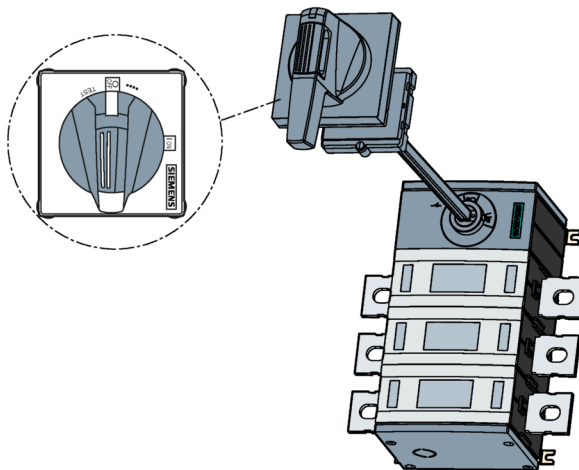
The pin can also be used for overriding door locking in the ON position of the handle.

Assignment of switching position between 8UD1 handle and 3KD

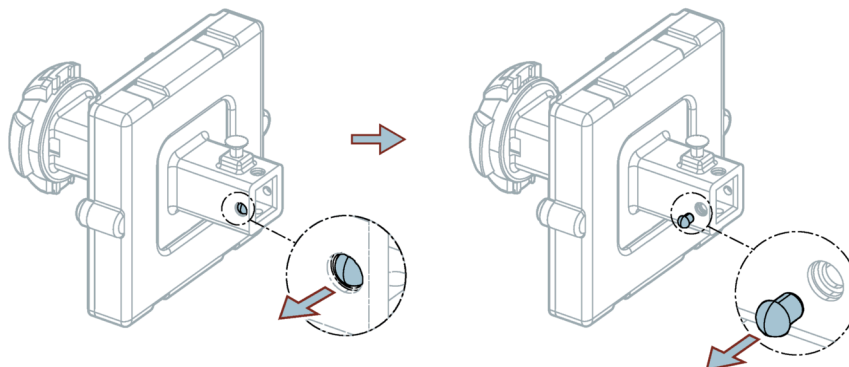
To ensure the usual position of the 8UD1 handle ("OFF" on left, "ON" on top) the coupling drivers, shafts and the drive module of 3KD are equipped with a tongue-and-groove joint.



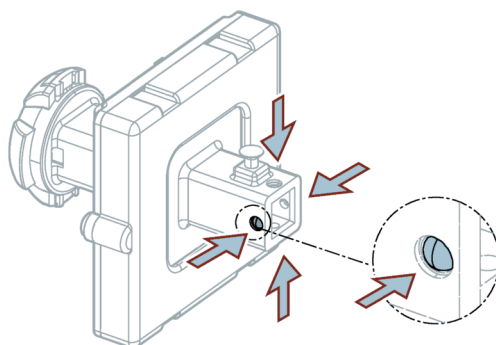
If the 3KD is assembled, e.g. turned by 90°, the location of OFF of the 8UD1 handle would be in top position – to move it to the left position, the tongue-and-groove joint can be modified at the coupling drivers and the shaft coupling in steps of 90°.



Modification of tongue-and-groove joint at coupling driver



Remove with tool such as screwdriver (push from inside)

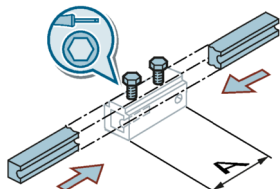


Reinsert from outside at any position desired



8.4.5 Accessories for 8UD1

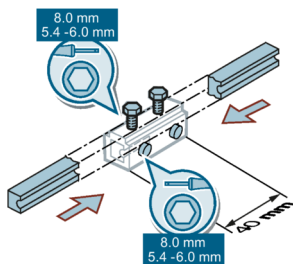
Shaft coupling

The shaft coupling is used when the length of the shafts of 300 / 600 mm is not long enough and has to be extended.



For 3KD sizes 1 to 4

Frame size			A [mm]
1, 2, 3	8 mm	2.6 ... 3.0 Nm	28
4, 5	8 mm	5.4 ... 6.0 Nm	40

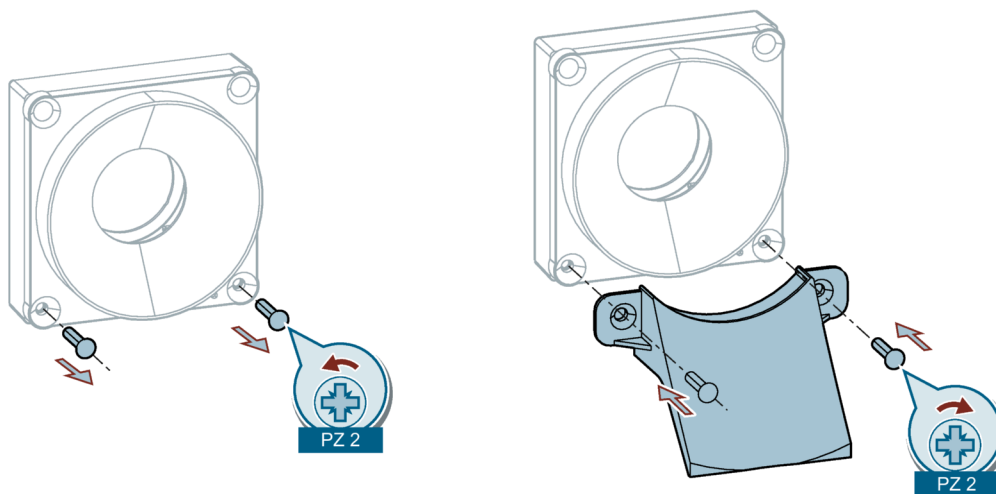




For 3KD size 5

Shaft jack for 3KD size 1 and 2

The shaft jack can be used if the coupling head is too widely deflected and the cabinet door cannot be closed due to a mechanical collision between the coupling head and the 8UD1 handle.

This accessory part is necessary if a 3KD is assembled onto a DIN rail and shafts longer than 300 mm are used.



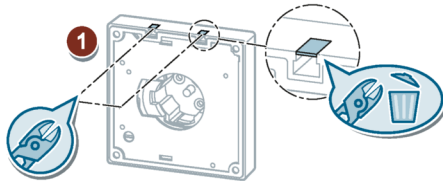
Frame size		
1, 2	PZ2	1.0 Nm

Labeling plate

The labeling plate with the order number 3VA9087-0SX10 can be used for inscription directly on the front cover of the 8UD1 handle. Size of the inscription area is 44.5 x 14.5 mm.

Assembly

Remove the knockout contours on the back of the 8UD1 front cover.



Snap the labeling plate onto the 8UD1 front cover.



Maintenance

9.1 Maintenance

No maintenance procedures are necessary.

Technical data

10.1 3-pole and 4-pole versions of 3KD switch disconnectors

Standards		IEC 60947-1, IEC 60947-3											
Type		3KD 16	3KD 22	3KD 26	3KD 28-.M	3KD 30-.M	3KD 28-.N	3KD 30-.N	3KD 32	3KD 34	3KD 36-.N	3KD 38-.N	
Frame size		1						2					
General technical details													
Rated uninterrupted current I _u	A	16	32	63	80	100	80	100	125	160	200	250	
Continous free-air thermal current I _{th} ¹⁾	A												
Rated operational voltage U _e													
At AC 50/60 Hz (tolerance up to +10% permissible)	V	1000											
At DC - 2 conducting path series-connected	V	220											
At DC - 3 conducting path series-connected	V	440											
Rated insulation voltage U _i	V	1000											
Rated impulse withstand voltage U _{imp}	kV	8											
Overvoltage category		III											
Degree of protection													
With masking plate or terminal cover		IP20											
Without masking plate or terminal cover		IP20				IP00 ²⁾ / IP20						IP00	
Ambient conditions													
Ambient temperature													
During operation	°C	-25 ... +70 (no derating of I _{th} at -5 ... +55 °C)											
During storage	°C	-50 ... +80											
Mounting position		Any ³⁾											
Pollution degree		3											
Durability													
Mechanical durability, operating cycles		15000											
Electrical durability, operating cycles													
At AC-23A, 690 V / 50 ... 60 Hz		6000					1500						
At DC-23A, 220 / 440 V		1500					1500		1000				

10.1 3-pole and 4-pole versions of 3KD switch disconnectors

Standards			IEC 60947-1, IEC 60947-3										
Type			3KD 16	3KD 22	3KD 26	3KD 28-.M	3KD 30-.M	3KD 28-.N	3KD 30-.N	3KD 32	3KD 34	3KD 36-.N	3KD 38-.N
Frame size			1					2					
Main conductor connections ⁴⁾													
Condcutor cross-section, max.		mm ²	35					70 (95) ⁵⁾				95	
Busbar system, max. dimensions (number x width x thickness)													
	Flat terminal	mm	-					1 x 20 x 3 ⁶⁾					
	Box terminal	mm	1 x 9 x 2					1 x 14 x 3				-	
Tightening torque													
	Flat terminal	Nm	-					15 ... 22					
	Box terminal	Nm	5 ... 6.5					6.5 ... 8				-	

1) Configuring note: Max. permissible operating temperature at connections 125 °C

2) Relevant only for devices with flat terminals

3) Under certain circumstances usage of phase barriers is mandatory - please see chapter Phase barriers

4) For more detailed information please see chapter Main circuit connection

5) 95 mm² valid for variants with flat terminals

6) When using busbars that are 20 mm wide, these must be insulated

Standards			IEC 60947-1, IEC 60947-3										
Type			3KD 16	3KD 22	3KD 26	3KD 28-.M	3KD 30-.M	3KD 28-.N	3KD 30-.N	3KD 32	3KD 34	3KD 36-.N	3KD 38-.N
Frame size			1					2					
Operating and short-circuit behaviour ¹⁾													
Rated operational current I _e													
At AC-20A													
	At 1000 V	A	16	32	63	80	100	80	100	125	160	200	250
At AC-21A													
	At 400 V	A	16	32	63	80	100	80	100	125	160	200	250
	At 500 V	A											200
	At 690 V	A											
	At 1000 V	A											
At AC-22 A													
	At 400 V	A	16	32	63	80	100	80	100	125	160	200	250
	At 500 V	A					200						
	At 690 V	A											
	At 1000 V	A											80
At AC-23 A													
	At 400 V	A	16	32	63	80	80	80	100	125	160	160	160
	At 500 V	A											
	At 690 V	A											

10.1 3-pole and 4-pole versions of 3KD switch disconnectors

Standards			IEC 60947-1, IEC 60947-3										
Type			3KD 16	3KD 22	3KD 26	3KD 28-.M	3KD 30-.M	3KD 28-.N	3KD 30-.N	3KD 32	3KD 34	3KD 36-.N	3KD 38-.N
Frame size			1					2					
At DC-20 A													
	At 1000 V	A	16	32	63	80	100	80	100	125	160	200	250
At DC-21 A													
	At 220 V	A	16	32	63	80	100	80	100	125	160	160	160
	At 440 V	A											
At DC-22 A													
	At 220 V	A	16	32	63	80	100	80	100	125	160	160	160
	At 440 V	A											
At DC-23 A													
	At 220 V	A	16	32	63	80	100	80	100	125	160	160	160
	At 440 V	A											
Continous current													
	Rated value	A	16	32	63	80	100	80	100	125	160	200	250
	At 40 °C	A											
	At 45 °C	A											
	At 50 °C	A											
	At 55 °C	A											
	At 60 °C	A											238
	At 65 °C	A											225
	At 70 °C	A											213

1) Under certain circumstances usage of phase barriers is mandatory - please see chapter Phase barriers

10.1 3-pole and 4-pole versions of 3KD switch disconnectors

Standards		IEC 60947-1, IEC 60947-3											
Type		3KD 16	3KD 22	3KD 26	3KD 28-M	3KD 30-M	3KD 28-N	3KD 30-N	3KD 32	3KD 34	3KD 36-N	3KD 38-N	
Frame size		1						2					
Operating and short-circuit behaviour ¹⁾													
Motor switching capacity AC-23 A ²⁾													
At 400 V	kW	7.5	15	30	45	45	45	55	55	90	90	90	
At 500 V	kW	7.5	18.5	37	55	55	55	55	75	110	110	110	
At 690 V	kW	11	30	55	75	75	75	90	110	110	110	110	
Rated short-time withstand current I _{cw} with t = 1 s. rms value 1000 V AC / 440 V DC	kA	3						4					
Rated short-circuit making capacity I _{cm}													
At 1000 V AC	kA	7						12					
At 440 V DC	kA	7						12					
Rated current of upstream fuse ³⁾		100						250					
At 400 / 500 V AC	A	100						250					
At 690 V AC	A												
At 1000 V AC	A												
Rated conditional short-circuit current with upstream fuse ³⁾													
At 400 / 500 V AC	kA	100						100					
At 690 V AC	kA							80					
At 1000 V AC	kA							100					
Let-through current combined with up-stream fuse ³⁾													
At 400 / 500 V AC	kA	13.1						27.7					
At 690 V AC	kA	11.5						23.7					
At 1000 V AC	kA	5.06						10.79					
Let-through I ² t combined with upstream fuse ³⁾													
At 400 / 500 V AC	kA ² s	34.1						548					
At 690 V AC	kA ² s	45.71						596.5					
At 1000 V AC	kA ² s	2.33						19.82					
Power loss per pole with thermal current I _{th}	W	0.1	0.4	1	2.1	2.5	1.1	1.7	3.2	4.6	6.4	8.2	

¹⁾ Under certain circumstances usage of phase barriers is mandatory - please see chapter Phase barriers

²⁾ The values are provided as a guide only and may vary depending on the make of motor

³⁾ Valid for the combination of 3KD and fuse type 3NA..., characteristic gG, for voltages up to 690 V

10.1 3-pole and 4-pole versions of 3KD switch disconnectors

Standards		IEC 60947-1, IEC 60947-3												
Type		3KD 36.-P	3KD 38.-P	3KD 40	3KD 42	3KD 44.-P	3KD 44.-Q	3KD 46	3KD 48	3KD 50.-Q	3KD 50.-R	3KD 52	3KD 54	3KD 56
Frame size		3					4				5			
General technical details														
Rated uninterrupted current I _u	A	200	250	315	400	500	500	630	800	1000	1000	1250	1600	2000
Continous free-air thermal current I _{th} ¹⁾	A													
Rated operational voltage U _e														
At AC 50/60 Hz (tolerance up to +10% permissible)	V	1000												
At DC - 2 conducting path series-connected	V	220												
At DC - 3 conducting path series-connected	V	440												
Rated insulation voltage U _i	V	1000												
Rated impulse withstand voltage U _{imp}	kV	12												
Overvoltage category		IV												
Degree of protection														
With masking plate or terminal cover		IP20												
Without masking plate or terminal cover		IP00												
Ambient conditions														
Ambient temperature														
During operation	°C	-25 ... +70 (no derating of I _{th} at -5 ... +55 °C)												
During storage	°C	-50 ... +80												
Mounting position		Any ²⁾												
Pollution degree		3												
Durability														
Mechanical durability, operating cycles		15000					8000							
Electrical durability, operating cycles														
At AC-23A, 690 V / 50 ... 60 Hz		1000					1000		500		500			
At DC-23A, 220 / 440 V		1000					1000		500		500			

10.1 3-pole and 4-pole versions of 3KD switch disconnectors

Standards		IEC 60947-1, IEC 60947-3													
Type		3KD 36.-P	3KD 38.-P	3KD 40	3KD 42	3KD 44.-P	3KD 44.-Q	3KD 46	3KD 48	3KD 50.-Q	3KD 50.-R	3KD 52	3KD 54	3KD 56	
Frame size		3					4				5				
Main conductor connections ³⁾															
Condcutor cross-section, max.	mm ²	240					2 x 240				2 x 240				
Busbar system, max. dimensions (number x width x thickness)															
	Flat terminal	mm	1 x 30 x 10				2 x 40 x 5				2 x 60 x 10				
	Box terminal	mm	-												
Tightening torque															
	Flat terminal	Nm	30 ... 44				50 ... 75				50 ... 75				
	Box terminal	Nm	-												

1) Configuring note: Max. permissible operating temperature at connections 125 °C

2) Under certain circumstances usage of phase barriers is mandatory - please see chapter Phase barriers

3) For more detailed information see chapter Main circuit connection

Standards			IEC 60947-1, IEC 60947-3												
Type			3KD 36.-P	3KD 38.-P	3KD 40	3KD 42	3KD 44.-P	3KD 44.-Q	3KD 46	3KD 48	3KD 50.-Q	3KD 50.-R	3KD 52	3KD 54	3KD 56
Frame size			3					4				5			
Operating and short-circuit behaviour ¹⁾															
Rated operational current I _e															
At AC-20A															
	At 1000 V	A	200	250	315	400	500	500	630	800	1000	1000	1250	1600	2000
At AC-21A															
	At 400 V	A	200	250	315	400	500	500	630	800	1000	1000	1250	1600	2000
	At 500 V	A					400								
	At 690 V	A													
	At 1000 V	A									800				1600
At AC-22 A															
	At 400 V	A	200	250	315	400	500	500	630	800	1000	1000	1250	1600	2000
	At 500 V	A					400								
	At 690 V	A													
	At 1000 V	A									800				1600
At AC-23 A															
	At 400 V	A	200	250	315	400	400	500	630	800	1000	1000	1250	1600	2000
	At 500 V	A													
	At 690 V	A													

10.1 3-pole and 4-pole versions of 3KD switch disconnectors

Standards			IEC 60947-1, IEC 60947-3												
Type			3KD 36.-P	3KD 38.-P	3KD 40	3KD 42	3KD 44.-P	3KD 44.-Q	3KD 46	3KD 48	3KD 50.-Q	3KD 50.-R	3KD 52	3KD 54	3KD 56
Frame size			3					4				5			
At DC-20 A															
	At 1000 V	A	200	250	315	400	500	500	630	800	1000	1000	1250	1600	2000
At DC-21 A															
	At 220 V	A	200	250	315	400	400	500	630	800	800	1000	1250	1600	1600
	At 440 V	A													
At DC-22 A															
	At 220 V	A	200	250	315	400	400	500	630	800	800	-			
	At 440 V	A													
At DC-23 A															
	At 220 V	A	200	250	315	400	400	500	630	800	800	-			
	At 440 V	A													
Continous current															
	Rated value	A	200	250	315	400	500	500	630	800	1000	1000	1250	1600	2000
	At 40 °C	A													
	At 45 °C	A													
	At 50 °C	A													
	At 55 °C	A					475	500	630	630	950	1250	1600		
	At 60 °C	A													
	At 65 °C	A								1500					
	At 70 °C	A									1400				

1) Under certain circumstances usage of phase barriers is mandatory - please see chapter Phase barriers

Standards		IEC 60947-1, IEC 60947-3														
Type		3KD 36.-P	3KD 38.-P	3KD 40	3KD 42	3KD 44.-P	3KD 44.-Q	3KD 46	3KD 48	3KD 50.-Q	3KD 50.-R	3KD 52	3KD 54	3KD 56		
Frame size		3					4				5					
Operating and short-circuit behaviour ¹⁾																
Motor switching capacity AC-23 A ²⁾																
	At 400 V	kW	110	132	160	200	200	250	355	400	560	560	710	900	1000	
	At 500 V	kW	132	160	200	250	250	355	400	560	710	710	900	1000	1000	
	At 690 V	kW	185	250	315	315	315	500	630	800	1000	1000	1000	1000	1000	
Rated short-time withstand current I _{cw} with t = 1 s, rms value 1000 V AC / 440 V DC		kA	13					30				55				

10.1 3-pole and 4-pole versions of 3KD switch disconnectors

Standards			IEC 60947-1, IEC 60947-3												
Type			3KD 36.-P	3KD 38.-P	3KD 40	3KD 42	3KD 44.-P	3KD 44.-Q	3KD 46	3KD 48	3KD 50.-Q	3KD 50.-R	3KD 52	3KD 54	3KD 56
Frame size			3					4				5			
Rated short-circuit making capacity I _{cm}															
	At 1000 V AC	kA	36					80				121			
	At 440 V DC	kA	36					42.6				80			
Rated current of upstream fuse ³⁾															
	At 400 / 500 V AC	A	500					1000				2 x 1000			
	At 690 V AC	A						2 x 500				2 x 800		2 x 1000	
	At 1000 V AC	A										3 x 630			
Rated conditional short-circuit current with upstream fuse ³⁾															
	At 400 / 500 V AC	kA	100					100				100	80		
	At 690 V AC	kA	80					80				80		65	
	At 1000 V AC	kA	100					100				100			
Let-through current combined with upstream fuse ³⁾															
	At 400 / 500 V AC	kA	49					92.8				122			
	At 690 V AC	kA	42.3					67.95				112		101.45	
	At 1000 V AC	kA	20.22					31.21				52.08			
Let-through I ² t combined with upstream fuse ³⁾															
	At 400 / 500 V AC	kA²s	3580					15125				49550			
	At 690 V AC	kA²s	2010					7810				31200		32170	
	At 1000 V AC	kA²s	239.65					647.25				3492			
Power loss per pole with thermal current I _{th}		W	3.4	5.9	9.5	13.2	17.2	11.6	16.9	24.8	35	19.5	31.9	56.8	80

¹⁾ Under certain circumstances usage of phase barriers is mandatory - please see chapter Phase barriers

²⁾ The values are provided as a guide only and may vary depending on the make of motor

³⁾ Valid for the combination of 3KD and fuse type 3NA..., characteristic gG, for voltages up to 690 V

See also

Phase barriers (Page 23)

Main circuit connection (Page 39)

10.2 6 pole versions of 3KD switch disconnectors for DC 1200 V

Standards		IEC 60947-1, IEC 60947-3							
Type		3KD 16	3KD 22	3KD 26	3KD 28	3KD 30	3KD 32	3KD 34	
Frame size		1			2				
General technical details									
Rated uninterrupted current I _u		A	16	32	63	80	100	125	160
Continuous free-air thermal current I _{th} ¹⁾		A							
Rated operational voltage U _e									
	At DC - with pollution degree 2	V	1200						
	At DC - with pollution degree 3	V	1000		1000 ²⁾				
Rated insulation voltage U _i		V	1000						
	At DC - with pollution degree 2	V	1250						
	At DC - with pollution degree 3	V	1000		1000 ³⁾				
Rated impulse withstand voltage U _{imp}		kV	8						
Overvoltage category		III							
Degree of protection									
	With masking plate or terminal cover	IP20							
	Without masking plate or terminal cover	IP20		IP00 ⁴⁾ / IP20					
Ambient conditions									
Ambient temperature									
	During operation	°C	-25 ... +70 (no derating of I _{th} at -5 ... +55 °C)						
	During storage	°C	-50 ... +80						
Mounting position		Any							
Durability									
Mechanical durability, operating cycles		15000							
Electrical durability, operating cycles at DC-21A, 1200 V		15000							
Main conductor connections ⁵⁾									
Condcutor cross-section, max.		mm ²	35		70				
Busbar system, max. dimensions (number x width x thickness)									
	Flat terminal	mm	-		1 x 20 x 3 ⁶⁾				
	Box terminal	mm	1 x 9 x 2		1 x 14 x 3				
Tightening torque									
	Flat terminal	Nm	-		15 ... 22				
	Box terminal	Nm	5 ... 6.5		6.5 ... 8				

1) Configuring note: Max. permissible operating temperature at connections 110 °C

2) Valid for versions with box terminals, versions with flat terminals max. 1200 V

3) Valid for versions with box terminals, versions with flat terminals max. 1250 V

4) Relevant only for devices with flat terminals

5) For more detailed information see chapter Main circuit connection

6) When using busbars that are 20 mm wide, these must be insulated

Standards			IEC 60947-1, IEC 60947-3						
Type			3KD 16	3KD 22	3KD 26	3KD 28-N	3KD 30-N	3KD 32	3KD 34
Frame size			1			2			
Operating and short-circuit behaviour ¹⁾									
Rated operational current I _e									
	At DC-21A, 1200 V	A	16	32	63	80	100	125	160
	At DC-21B, 1200 V	A							
Continous current									
	Rated value	A	16	32	63	80	100	125	160
	At 40 °C	A							
	At 45 °C	A							
	At 50 °C	A							
	At 55 °C	A							
	At 60 °C	A							
	At 65 °C	A							
	At 70 °C	A							
Rated short-time withstand current I _{cw} With t = 1 s, rms value, 1200 V DC		kA	3			4			
Rated short-circuit making capacity I _{cm} At 1200 V DC		kA	4.3			5.7			
Power loss per pole with thermal current I _{th}		W	0.1	0.4	1	1.1	1.8	3.2	4.6

10.2 6 pole versions of 3KD switch disconnectors for DC 1200 V

Standards		IEC 60947-1, IEC 60947-3										
Type		3KD 36	3KD 38	3KD 40	3KD 42	3KD 44	3KD 46	3KD 48	3KD 50	3KD 52	3KD 54	
Frame size		3				4			5			
General technical details												
Rated uninterrupted current I _u		A	200	250	315	400	500	630	800	1000	1250	1600
Continous free-air thermal current I _{th} ¹⁾		A										
Rated operational voltage U _e												
At DC - with pollution degree 2		V	1200									
At DC - with pollution degree 3		V	1200			1000			1200			
Rated insulation voltage U _i												
At DC - with pollution degree 2		V	1250									
At DC - with pollution degree 3		V	1250			1000			1250			
Rated impulse withstand voltage U _{imp}		kV	12									
Overvoltage category		IV										
Degree of protection												
With masking plate or terminal cover		IP20										
Without masking plate or terminal cover		IP00										
Ambient conditions												
Ambient temperature												
During operation		°C	-25 ... +70 (no derating of I _{th} at -5 ... +40 °C)									
During storage		°C	-50 ... +80									
Mounting position		Any										
Durability												
Mechanical durability, operating cycles		10000				8000			6000			
Electrical durability, operating cycles at DC-21A, 1200 V		200				100						
Main conductor connections ²⁾												
Condcutor cross-section, max.		mm ²	240				2 x 240					
Busbar system, max. dimensions (number x width x thickness)												
Flat terminal		mm	1 x 30 x 10				2 x 40 x 5			2 x 60 x 10		
Box terminal		mm	-									
Tightening torque												
Flat terminal		Nm	30 ... 44				50 ... 75					
Box terminal		Nm	-									

1) Configuring note: Max. permissible operating temperature at connections 110 °C

2) For more detailed information see chapter Main circuit connection

Standards			IEC 60947-1, IEC 60947-3									
Type			3KD 36.-P	3KD 38.-P	3KD 40	3KD 42	3KD 44	3KD 46	3KD 48	3KD 50	3KD 52	3KD 54
Frame size			3				4			5		
Operating and short-circuit behaviour												
Rated operational current I _e ¹⁾												
	At DC-21A, 1200 V	A	-									
	At DC-21B, 1200 V	A	200	250	315	400	500	630	800	1000	1250	1600
Continous current												
	Rated value	A	200	250	315	400	500	630	800	1000	1250	1600
	At 40 °C	A										
	At 45 °C	A										
	At 50 °C	A										
	At 55 °C	A										
	At 60 °C	A							670			1250
	At 65 °C	A										
	At 70 °C	A										
Rated short-time withstand current I _{cw} With t = 1 s, rms value, 1200 V DC		kA	10				20					
Rated short-circuit making capacity I _{cm} At 1200 V DC		kA	14.2				28.4					
Power loss per pole with thermal current I _{th}		W	4	6	10	14	12	17	25	20	32	57

¹⁾ For switch disconnectors size 3 and 4, phase barriers or terminal covers (accessories) are required when connecting cable lugs

10.3 Technical data of accessories for 3KD

10.3.1 Additional poles

Additional poles - 4th contact element, neutral terminal and N/PE terminal, have the same technical data as the corresponding main switch 3KD, please see chapter Technical data of 3-pole and 4-pole versions of 3KD switch disconnectors (Page 111).

10.3.2 Auxiliary switches

Frame size 1 and 2

Type		Auxiliary switch 1 CO	
Version		Standard	Solid state compatible
Operating current			
At AC-12 / AC230 V	A	5	-
At AC-13 / AC230 V	A	-	0.1
At AC-15 / AC230 V	A	2	-
At AC-13 / AC230 V		0.2	-
Electrical connection		With soldered-on cable (finely stranded) 0.75 mm ² (18 AWG), 50 cm long or with blade terminals for conductor cross-section 0.5 - 1.5 mm ² (22 - 16 AWG).	

Frame size 3, 4 and 5

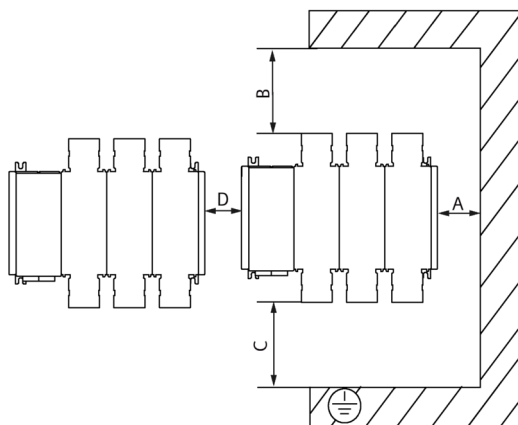
Standards		IEC 60947-5-1, IEC 60947-5-5	
General technical details			
Continuous free-air thermal current I _{th}	A	10	
Rated insulation voltage U _i	V	500	
At degree of pollution acc. to IEC 60947-1		Class 3	
Rated impulse withstand voltage U _i	kV	6	
Switching frequency	1/h	3600	
Contact reliability		1 maloperation per 10 million	
Test voltage	V	5	
Test current	mA	1	
Degree of protection acc. to IEC 60529			
Terminals		IP20	
Contact room		IP40	
Ambient conditions			
Ambient temperature			
During operation	°C	-25 ... + 70	

10.3 Technical data of accessories for 3KD

Standards		IEC 60947-5-1, IEC 60947-5-5
During storage	°C	-25 ... + 80
Degree of pollution		3
Durability		
Mechanical		10 million
Electrical		10 million
Conductor connections		
Finely stranded, with end sleeves acc. to DIN 46228	mm ²	2 x (0.5 ... 1.5)
Finely stranded, without end sleeves	mm ²	2 x (1.0 ... 1.5)
Solid	mm ²	2 x (1 ... 1.5)
Solid, with end sleeves acc. to DIN 46228	mm ²	2 x (0.5 ... 0.75)
AWG cables		2 x AWG 18 ... 14
Tightening torque	Nm	0.8 ... 0.9
Operating behavior		
Rated operational current I _e		
At AC-12		
Up to 110 V	A	10
At 230 V, 400 V	A	8
At AC-15		
Up to 230 V	A	6
At 400 V	A	3
At 500 V	A	1.4
At DC-12		
At 24 V	A	10
At 48 V	A	5
At 110 V	A	2.5
At 230 V	A	1
At 400 V, 500 V	A	0.3
At DC-13		
At 24 V	A	3
At 48 V	A	1.5
At 110 V	A	0.7
At 230 V	A	0.3
At 400 V, 500 V	A	0.1

Dimension drawings and hole drilling templates

11.1 Distance to grounded parts and between two 3KD



Frame size	Terminal	A [mm]	B [mm]	C [mm]	D [mm]
1	Box terminal	0	10	10	0
2	Box terminal	0	10	10	0
	Flat terminal	0	30	30	0
3	Flat terminal	20	40	40	20
4	Flat terminal	30	50	50	30
5	Flat terminal	30	50	50	30

! WARNING

Fire hazard.

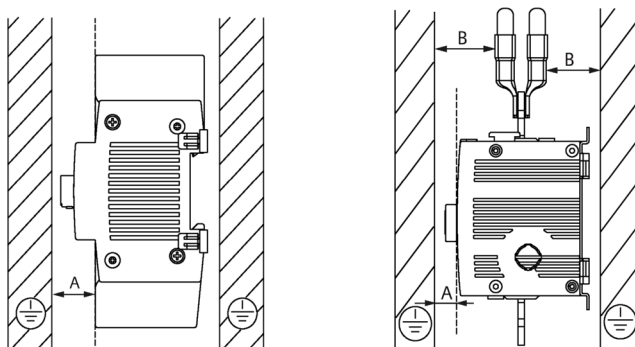
Some combinations of mounting position and load may cause flashovers between the terminals if no phase barriers or terminal covers are used.

Use phase barriers or terminal covers if applicable according to chapter Phase barriers (Page 46).

Note

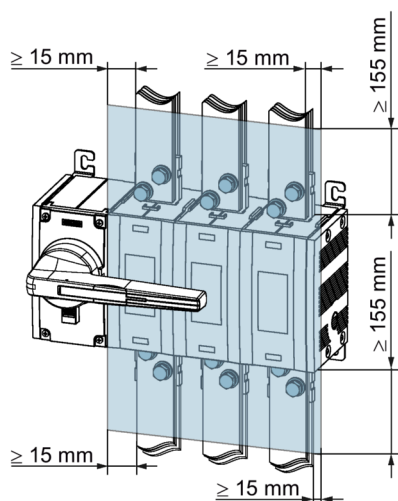
Dimensions A and D can be reduced to 0 mm if phase barriers or terminal covers are assembled to the 3KD.

11.1 Distance to grounded parts and between two 3KD



Frame size	Terminal	A [mm]	B [mm]
1	Box terminal	0	-
2	Box terminal	0	-
	Flat terminal	0	8
3, 4, 5	Flat terminal	0	14

Cover plate for 3KD 2000 A



11.2 Drilling templates

This chapter describes the drilling templates for floor mounting and door-coupling rotary operating mechanisms.

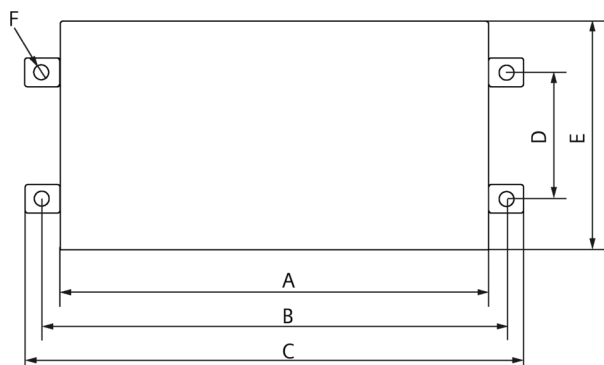
Note

Scale

The drilling templates in this chapter are not in scale 1:1.

Drilling template for 3KD floor mounting

Frame sizes 1 and 2

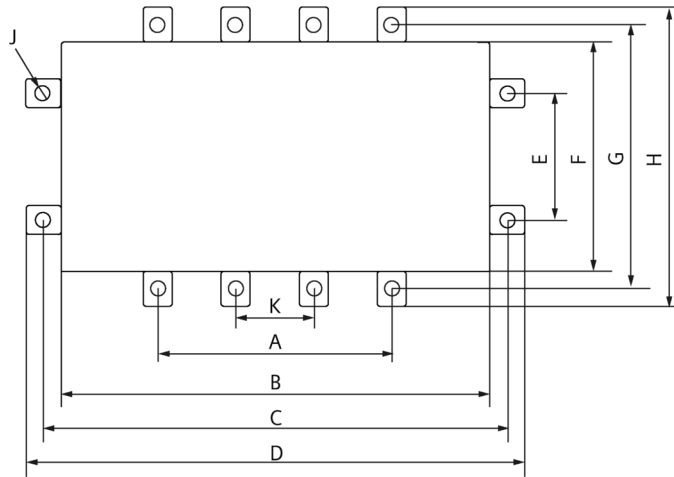


Frame size	Poles	Terminal	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
1	3	Box terminal	94	109	119.6	46.5	119	M4
	4	Box terminal	112	127	137.6	46.5	119	M4
	6	Box terminal	148	163	173.6	46.5	119	M4
2	3	Box terminal	121	136	146.6	46.5	126	M4
		Flat terminal	121	136	146.6	46.5	130 ¹⁾	M4
	4	Box terminal	148	163	173.6	46.5	126	M4
		Flat terminal	148	163	173.6	46.5	130 ¹⁾	M4
	6	Box terminal	202	217	227.6	46.5	126	M4
		Flat terminal	202	217	227.6	46.5	130	M4

¹⁾ Without phase barriers

11.2 Drilling templates

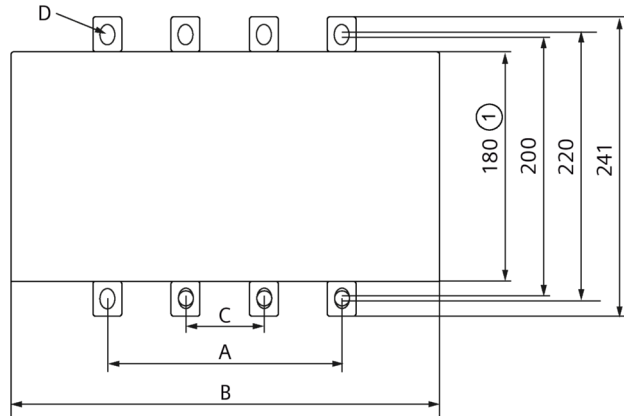
Frame sizes 3 and 4



Frame size	Poles	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F ¹⁾ [mm]	G [mm]	H [mm]	J [mm]	K [mm]
3	3	167	190	200	208	65	100	110	118	M4	-
	4	211	234	244	252	65	100	110	118	M4	-
	6	299	323	332	340	65	100	110	118	M4	35
4	3	228	260	279	291	93	145	161	173	M6	-
	4	288	320	339	351	93	145	161	173	M6	-
	6	408	440	459	471	93	145	161	173	M6	48

¹⁾ Dimension of the body of the switch (without phase barriers and terminal bars)

Frame sizes 5

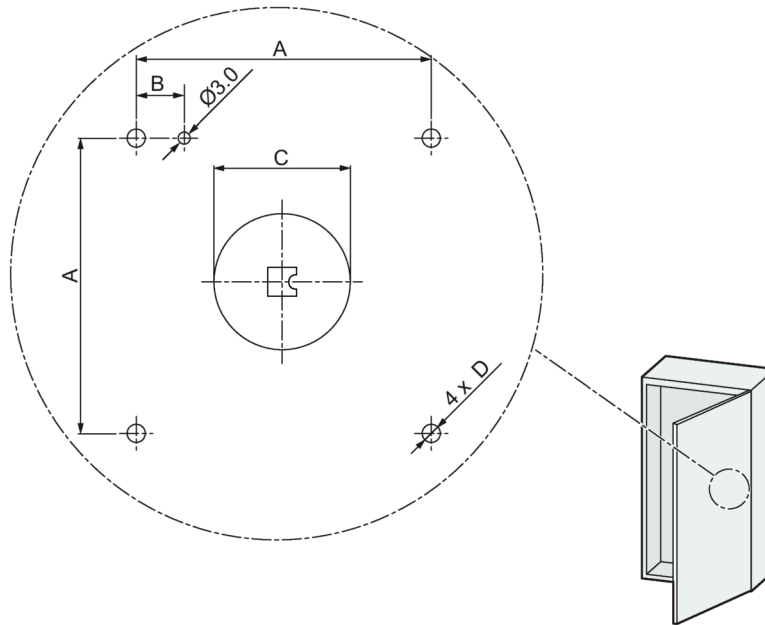


Frame size	Poles	A [mm]	B [mm]	C [mm]	D [mm]
5	3	340	382	-	M8
	4	430	472	-	M8
	6	610	652	70	M8

① Dimension of the body of the switch (without phase barriers and terminal bars)

Drilling templates for 8UD1 door-coupling rotary operating mechanisms

(For assembly of the handle in the cabinet door or side wall)



Frame size	A [mm]	B [mm]	C [mm]	D [mm]
1, 2	65	10.5	Ø 30	Ø 4.5
3, 4, 5	88	13.5	Ø 65	Ø 5.5

Note

Illuminated 8UD1

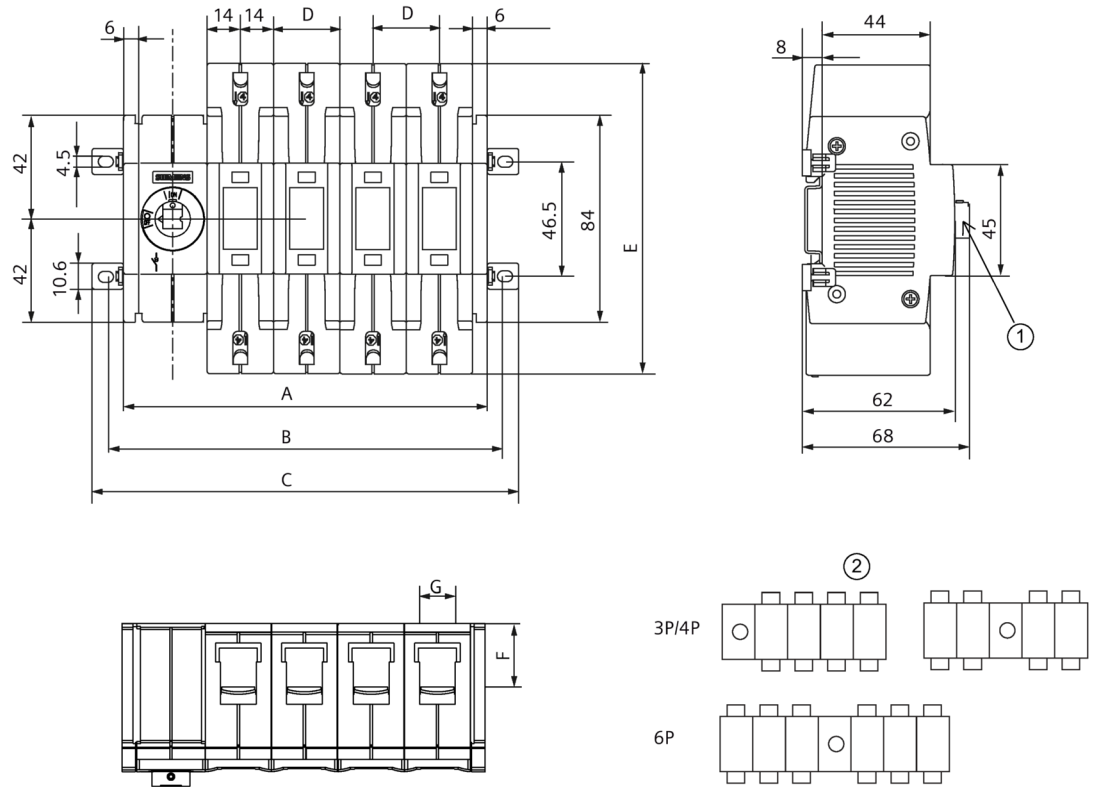
The hole diameter of 3 mm is only necessary if an illuminated version of 8UD1 is used.

11.3 Dimensional drawings

Basic units

The following dimensions are measured in units of mm.

3KD, frame size 1 and 2, front operation with box terminal



- ① Mounting depth of shaft of door-coupling rotary operating mechanism is: Min.15, Max. 20
- ② Possible configuration

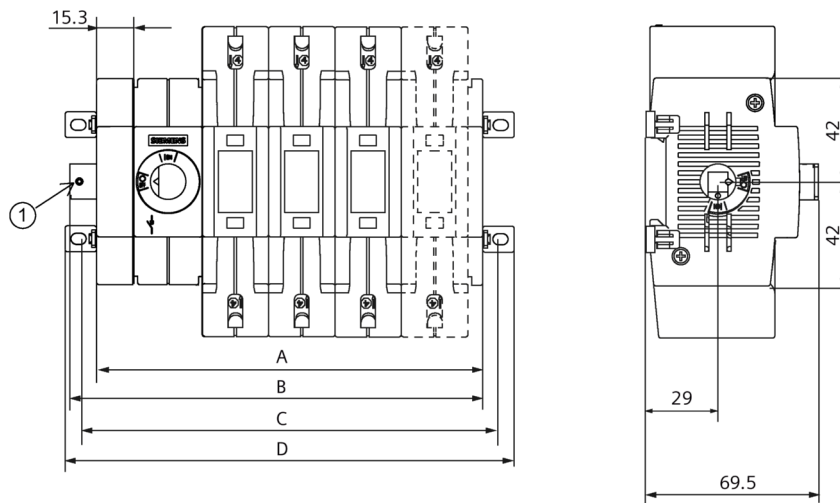
Version	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
Frame size 1, 3-pole	94	109	119.6	18	119	18.4	9.6
Frame size 1, 4-pole	112	127	137.6	18	119	18.4	9.6
Frame size 1, 6-pole DC	148	163	173.6	18	119	18.4	9.6
Frame size 2, 3-pole	121	136	146.6	27	126	15.8	13.4
Frame size 2, 4-pole	148	163	173.6	27	126	15.8	13.4
Frame size 2, 6-pole DC	202	217	227.6	27	126	15.8	13.4

Note

Additional dimensions for complete units with direct operating mechanismect handle, please see accessories of direct operating mechanism.

11.3 Dimensional drawings

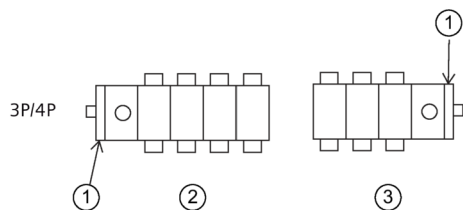
3KD, Frame size 1 and 2, side operation with box terminal



- ① Mounting depth of shaft of door-coupling rotary operating mechanism: Min. 15, Max. 20

Version	A [mm]	B [mm]	C [mm]	D [mm]
Frame size 1, 3-pole	103.3	114.3	118.3	128.9
Frame size 1, 4-pole	121.3	132.3	136.3	146.9
Frame size 2, 3-pole	130.3	141.3	145.3	155.9
Frame size 2, 4-pole	157.3	168.3	172.3	182.9

Possible configurations

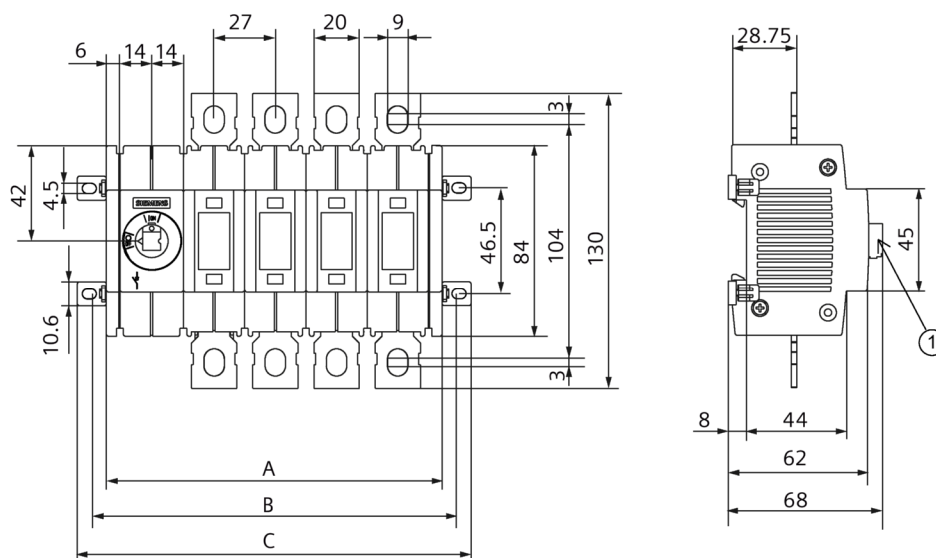


- ① Assembly position of auxiliary switch
 ② Operation from left side
 ③ Operation from right side

Note

- For additional dimensions see drawing for front operated version.
- The axis of rotation on the front side is only for indication of switch position – an 8UD1 handle can only be assembled at the side.

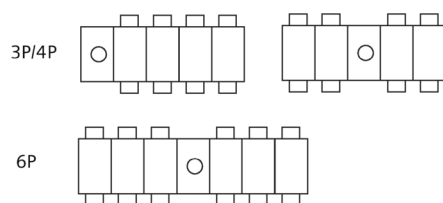
3KD, Frame size 2, with flat terminal



① Mounting depth of shaft of door-coupling rotary operating mechanism is: Min.15, Max. 20

Version	A [mm]	B [mm]	C [mm]	X [mm]
3-pole	121	136	146.6	2.5
4-pole	148	163	173.6	2.5
6-pole DC	202	217	227.6	2.5

Possible configurations

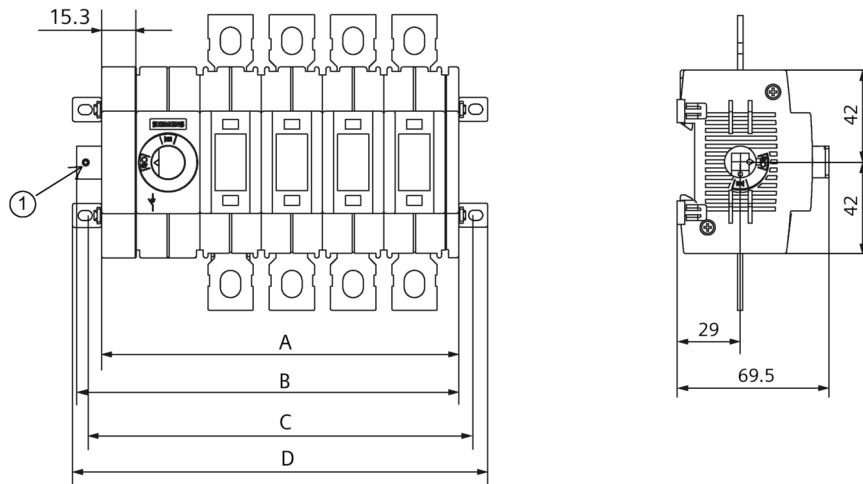


Note

Additional dimensions for complete units with direct operating mechanism, please see accessories of direct operating mechanism.

11.3 Dimensional drawings

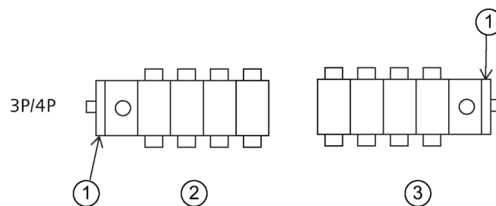
3KD, frame size 2, side operation with flat terminal



- ① Mounting depth of shaft of door-coupling rotary operating mechanism: Min.15, Max. 20

Version	A [mm]	B [mm]	C [mm]	D [mm]
3-pole	130.3	141.3	145.3	155.9
4-pole	157.3	168.3	172.3	182.9

Possible configurations

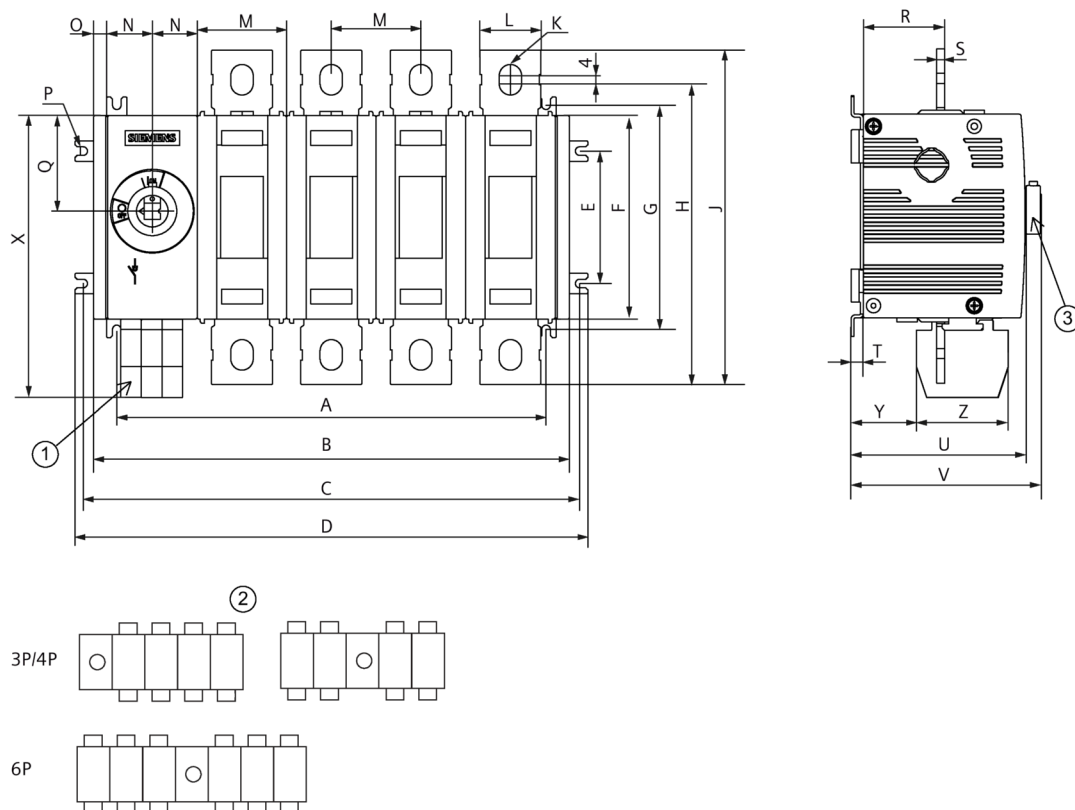


- ① Assembly position of auxiliary switch
 ② Operation from left side
 ③ Operation from right side

Note

- Additional dimensions see drawing for front operated version.
- The axis of rotation on the front side is only for indication of switch position – an 8UD1 handle can only be assembled at the side.

3KD, frame size 3 and 4, with flat terminal



Aux switch type	3KD frame size	X [mm]	Y [mm]	Z [mm]
3SU1400-1AA10-1BA0	3	128	38.2	33.2
	4	173	51.3	33.2
3SU1400-1AA10-1DA0	3	150	37.7	34.1
	4	196	50.8	34.1
3SU1400-1AA10-1CA0	3	128	38.2	33.2
	4	173	51.3	33.2
3SU1400-1AA10-1EA0	3	150	37.7	34.1
	4	196	50.8	34.1
3SU1400-1AA10-1FA0	3	150	37.7	34.1
	4	196	50.8	34.1

11.3 Dimensional drawings

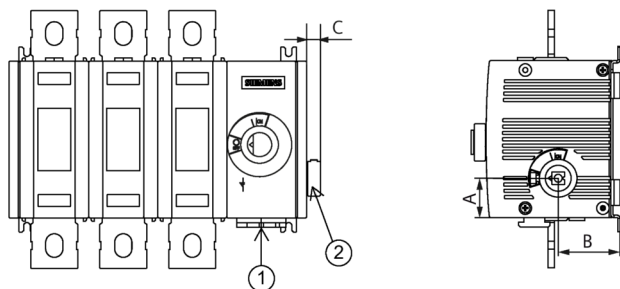
Version	Frame size 3, 3-pole	Frame size 3, 4-pole	Frame size 3, 6-pole DC	Frame size 4, 3-pole	Frame size 4, 4-pole	Frame size 4, 6-pole DC
A [mm]	167	211	299	228	288	408
B [mm]	190	234	323	260	320	440
C [mm]	200	244	332	279	339	459
D [mm]	208	252	340	291	351	467
E [mm]	65	65	65	93	93	93
F [mm]	100	100	100	145	145	145
G [mm]	110	110	110	161	161	161
H [mm]	131	131	131	187	187	187
J [mm]	164	164	164	235	235	235
K [mm]	Ø11	Ø11	Ø11	Ø14	Ø14	Ø14
L [mm]	30	30	30	40	40	40
M [mm]	44	44	44	60	60	60
N [mm]	22	22	22	30	30	30
O [mm]	7	7	7	10	10	10
P [mm]	M4	M4	M4	M6	M6	M6
Q [mm]	47	47	47	67.5	67.5	67.5
R [mm]	40	40	40	46.5	46.5	46.5
S [mm]	4	4	4	8	8	8
T [mm]	6	6	6	8	8	8
U [mm]	85.5	85.5	85.5	101.5	101.5	101.5
V [mm]	93.5	93.5	93.5	110	110	110

Note

For additional dimensions for complete units with direct operating mechanism, please see accessories of direct operating mechanism.

For additional dimensions for 3KD with side operation (position of shaft), please see accessories of door-coupling rotary operating mechanisms.

3KD, frame size 3 and 4, side operation from right side



- ① Assembly place for auxiliary switches
 ② Mounting depth of shaft of door-coupling rotary operating mechanism for size 3 is: Min. 21, Max. 31; for size 4 is: Min. 35, Max. 45

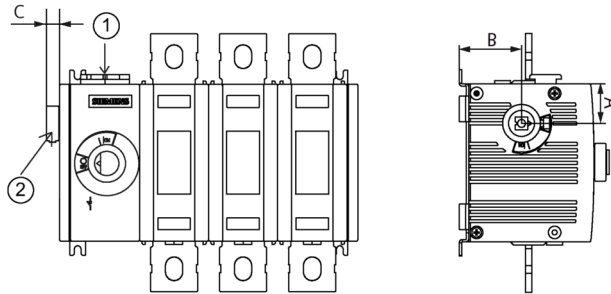
Version	A [mm]	B [mm]	C [mm]
Frame size 3	25	39.5	8.5
Frame size 4	38.5	43	11

Note

- For additional dimensions please see drawing for front operated version.
- The axis of rotation on the front side (dimensions E and F) is only for indication of switch position – an 8UD1 handle can only be assembled at the side.

11.3 Dimensional drawings

3KD, frame size 3 and 4, side operation from left side



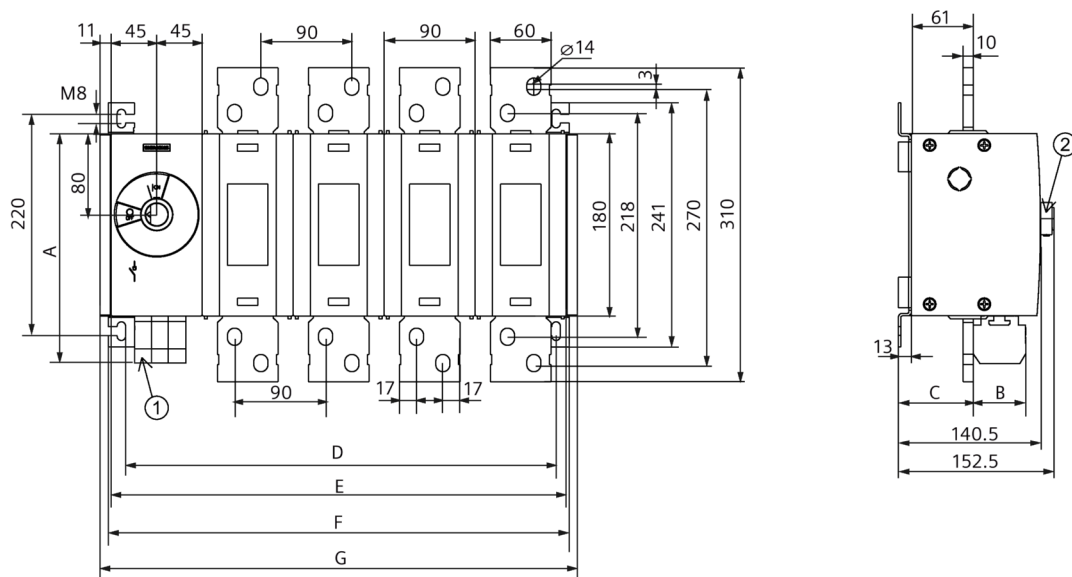
- ① Assembly place for auxiliary switches
- ② Mounting depth of shaft of door-coupling rotary operating mechanism for size 3 is: Min. 21, Max. 31; for size 4 is: Min. 35, Max. 45

Version	A [mm]	B [mm]	C [mm]
Frame size 3	25	39.5	8.5
Frame size 4	38.5	43	11

Note

- For additional dimensions see drawing for front operated version.
- The axis of rotation on the front side (dimensions E and F) is only for indication of switch position – an 8UD1 handle can only be assembled at the side.

3KD, frame size 5, with flat terminal



- ① Auxiliary switch
 ② Mounting depth of shaft of door-coupling rotary operating mechanism is: Min. 78, Max. 88

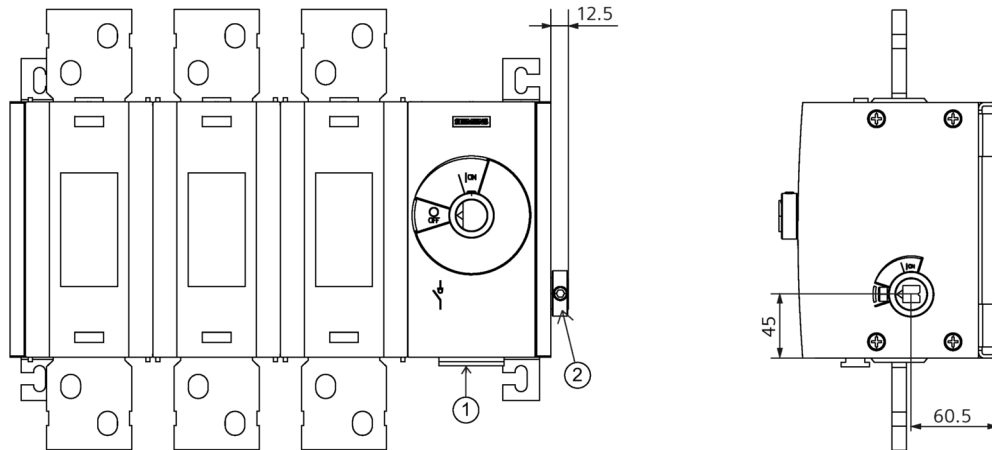
Version	D [mm]	E [mm]	F [mm]	G [mm]
3-pole	340	360	366	382
4-pole	430	450	456	472
6-pole DC	610	-	-	652

Aux switch type	A [mm]	B [mm]	C [mm]
3SU1400-1AA10-1BA0	208	33.2	83.4
3SU1400-1AA10-1DA0	230	34.1	82.9
3SU1400-1AA10-1CA0	208	33.2	83.4
3SU1400-1AA10-1EA0	230	33.2	83.4
3SU1400-1AA10-1FA0	230	33.2	83.4

Note

- For additional dimensions for complete units with direct operating mechanism, please see accessory of direct operating mechanism
- For additional dimensions for 3KD with side operation (position of shaft), please see accessories of door-coupling rotary operating mechanisms.

3KD, frame size 5, side operation from right side

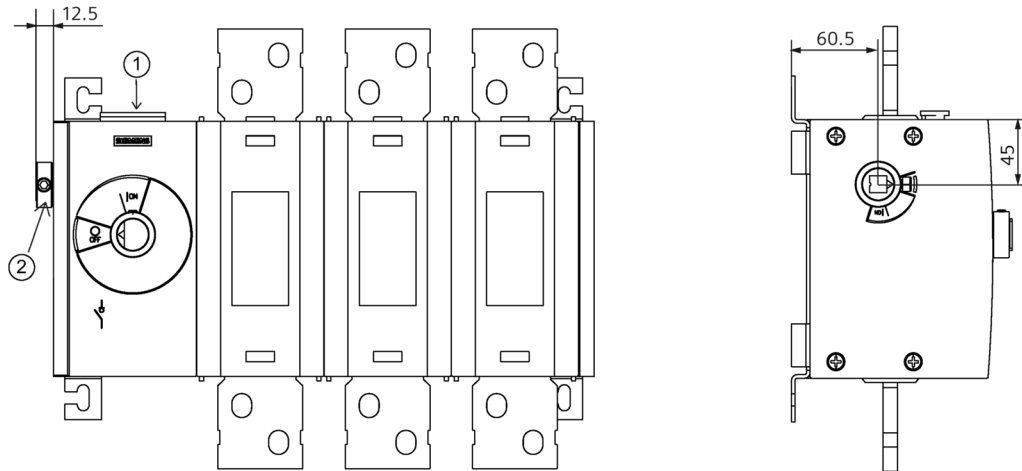


- ① Assembly place for auxiliary switches
- ② Mounting depth of shaft of door-coupling rotary operating mechanism is: Min. 54, Max. 64

Note

- Additional dimensions see drawing for front operated version.
- The axis of rotation on the front side (dimensions E and F) is only for indication of switch position – an 8UD1 handle can only be assembled at the side.

3KD, frame size 5, side operation from left side



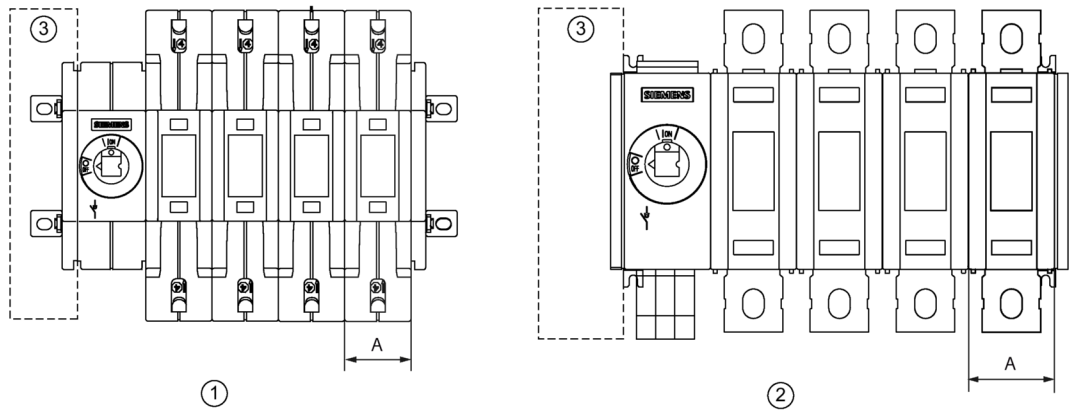
- ① Assembly place for auxiliary switches
- ② Mounting depth of shaft of door-coupling rotary operating mechanism is: Min. 54, Max. 64

Note

- For additional dimensions see drawing for front operated version.
- The axis of rotation on the front side (dimensions E and F) is only for indication of switch position – an 8UD1 handle can only be assembled at the side.

11.3 Dimensional drawings

Accessory: 4th pole, N terminal, N/PE terminal



- ① 3KD, frame size 1 and 2, with box terminal
- ② 3KD, frame size 1 and 2, with flat terminal
- ③ Optional assembly position

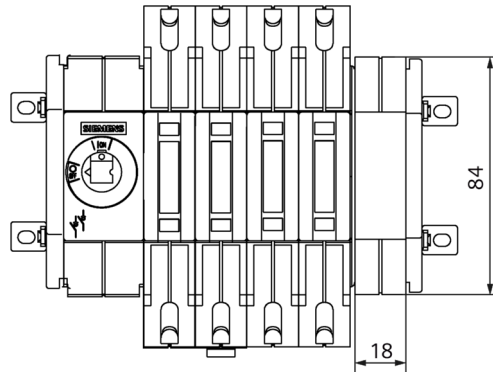
	Frame size	A [mm]
Box terminal	1	18
	2	27
Flat terminal	2	27
	3	44
	4	60
	5	90

Note

Assembly of 4th pole is only possible on 3-pole 3KD, for additional dimensions (side view and terminal) - please see basic units.

Accessory: auxiliary switch module

Auxiliary switch module for frame size 1 and 2



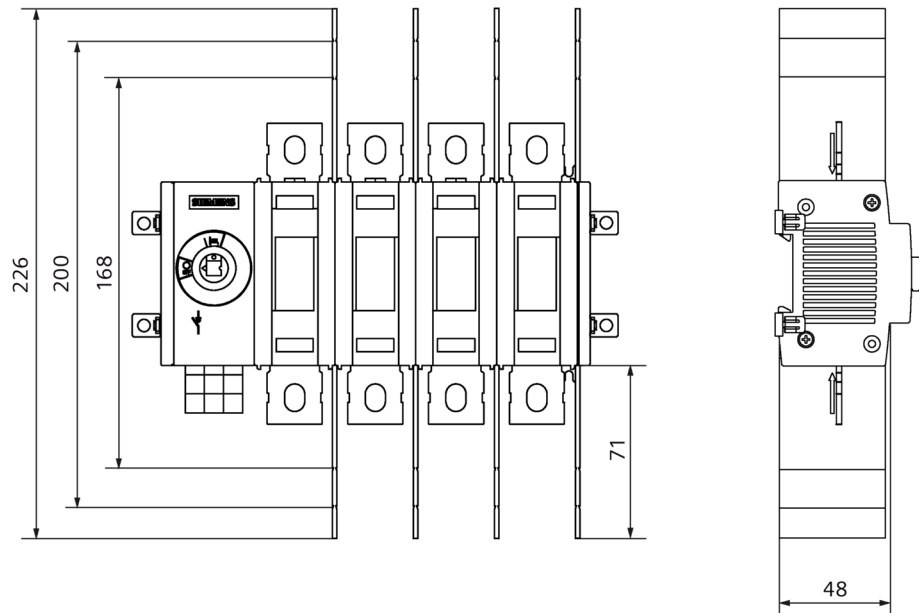
Note

Auxiliary switch modules with test functionality can only be assembled directly next to the drive module of the 3KD.

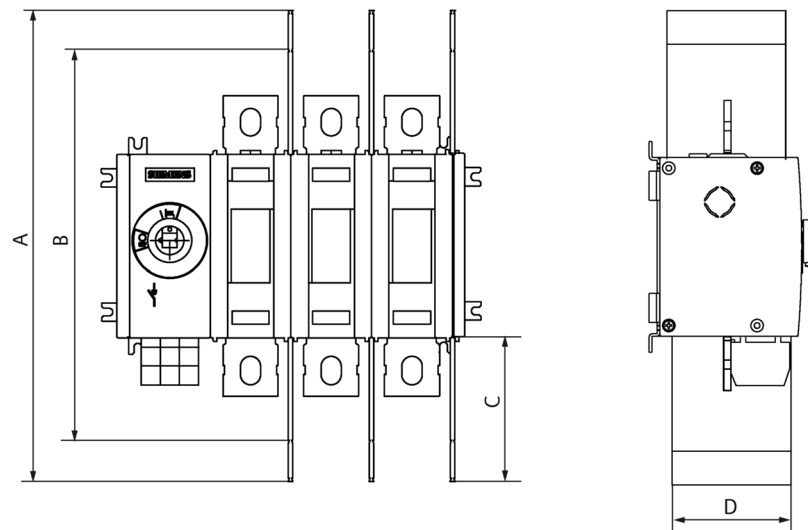
11.3 Dimensional drawings

Accessory: Phase barriers

Phase barriers for frame size 2

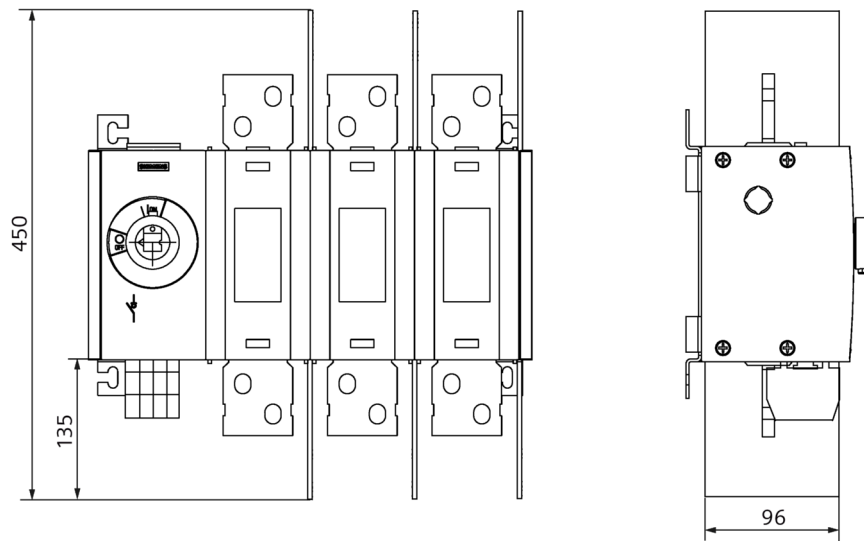


Phase barriers for frame size 3 and 4



Frame size	A [mm]	B [mm]	C [mm]	D [mm]
3	313	253	106.5	68
4	389	317	122	75

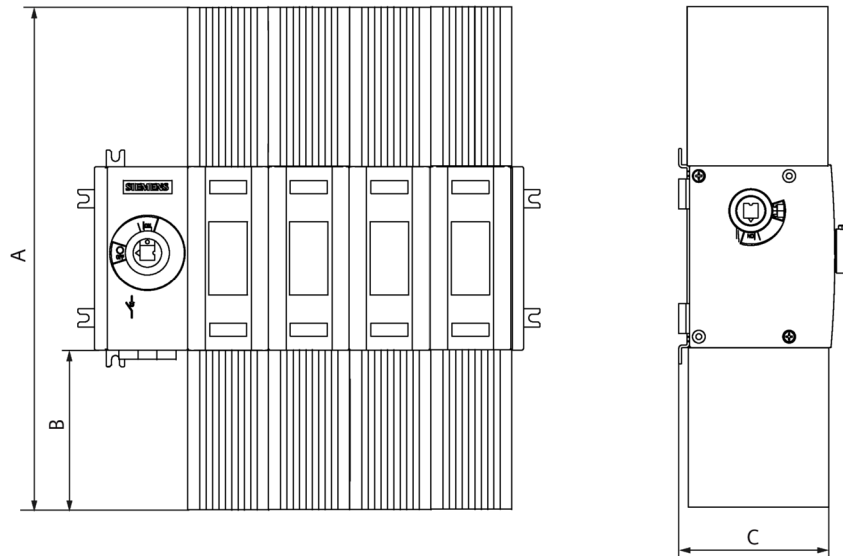
Phase barriers for frame size 5



11.3 Dimensional drawings

Accessory: terminal cover

Terminal covers for frame sizes 2 to 5



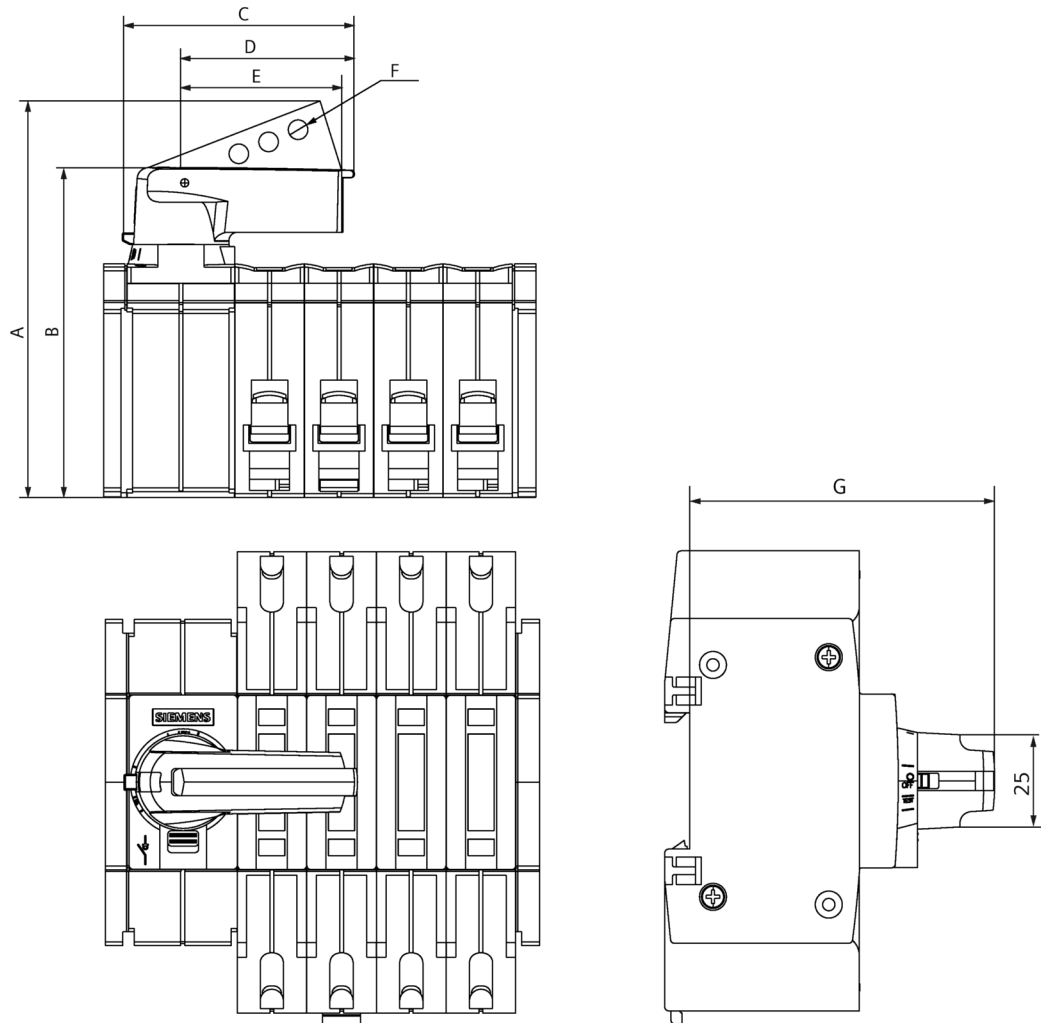
Frame size	Version	A [mm]	B [mm]	C [mm]
2	Standard	240	78	52
	Short	194	55	52
3	Standard	317	108.5	81
	Short	218	59	81
4	Standard	401	128	93.5
	Short	280	67.5	93.5
5	Standard	450	135	117.5

Note

The terminal covers can also be assembled to the drive module of the 3KD (to cover assembled auxiliary switches).

Accessory: direct operating mechanism

Direct operating mechanism for frame size 1 and 2, standard version



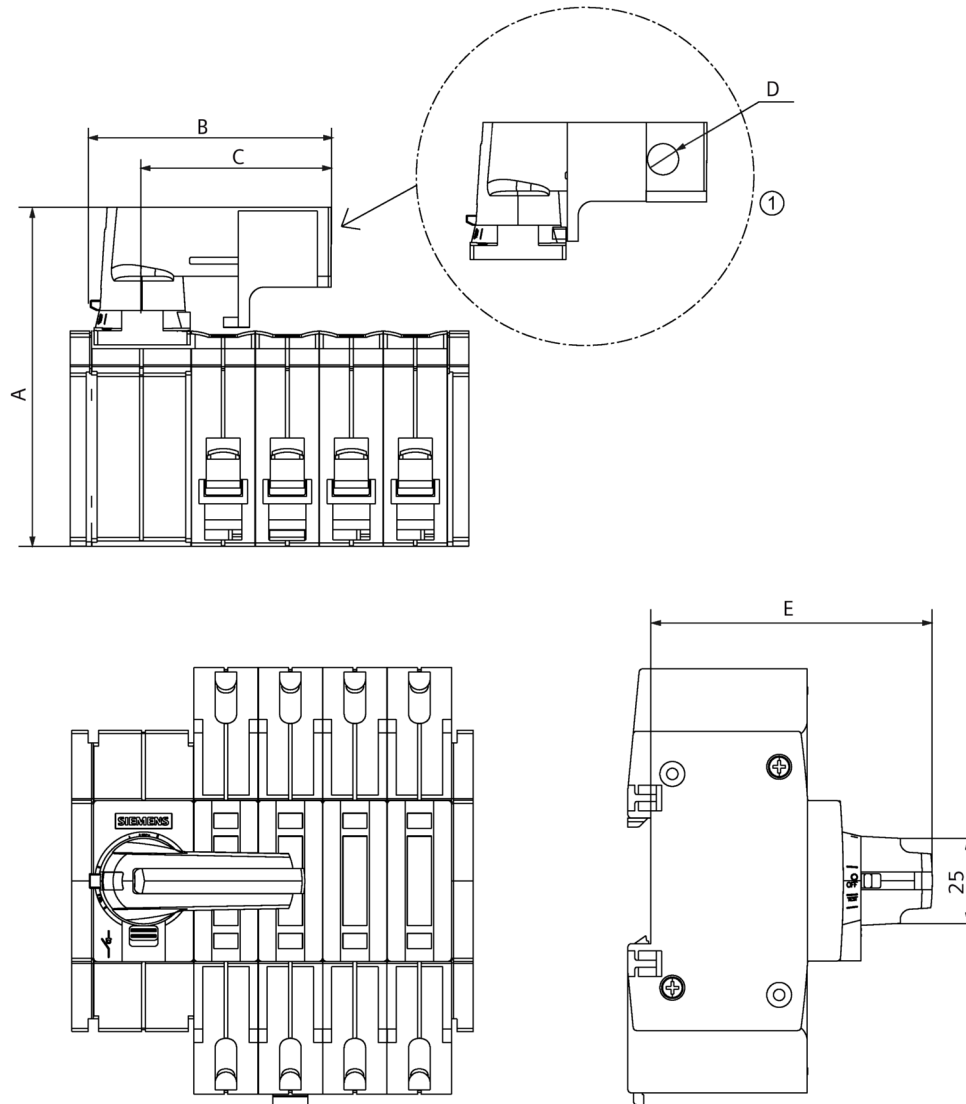
Frame size	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
1	104	87	60	45	42	Ø 6.2	79
2	118	97	73	58	55	Ø 6.2	89

Note

Can be locked with up to 3 padlocks, needs additional depth in locked position, for dimension for axis of rotation - please see basic unit.

11.3 Dimensional drawings

Direct operating mechanism for frame size 1 and 2, flat version



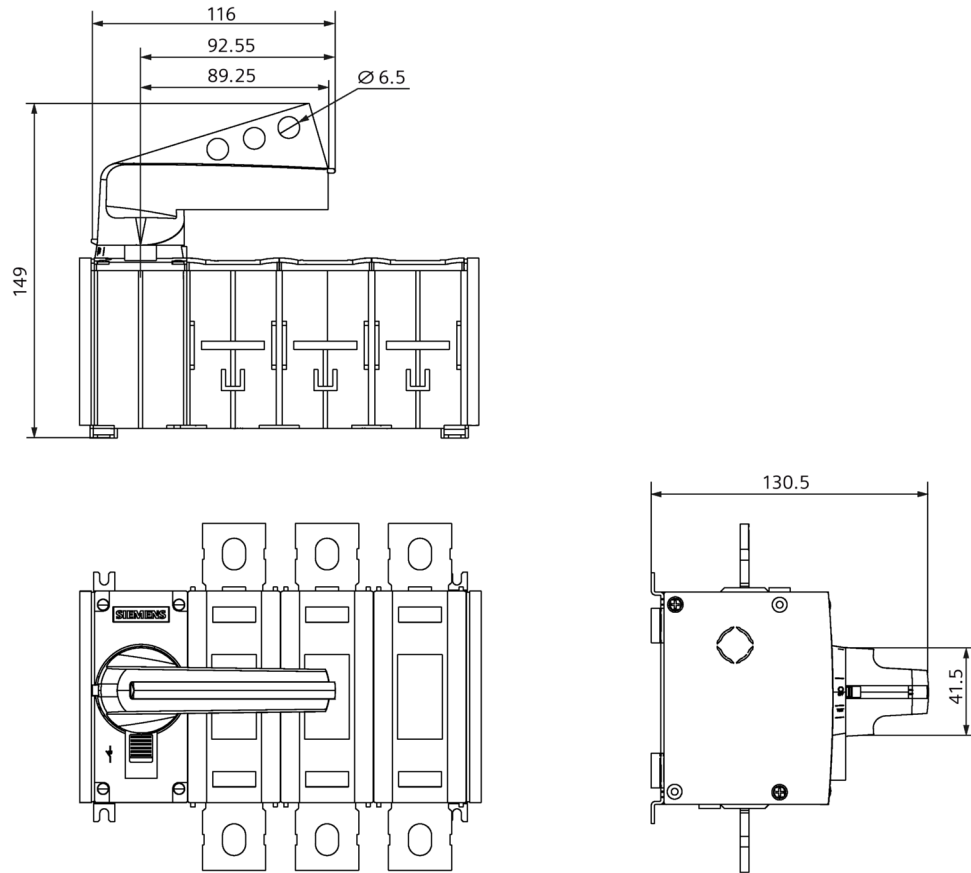
① Padlocked position

Frame size	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
1	78	57	42	Ø 6.2	70
2	97	73	55	Ø 6.2	89

Note

Can be locked with one padlock, needs no additional depth in locked position, for dimension for axis of rotation - please see basic unit.

Direct operating mechanism for frame size 3

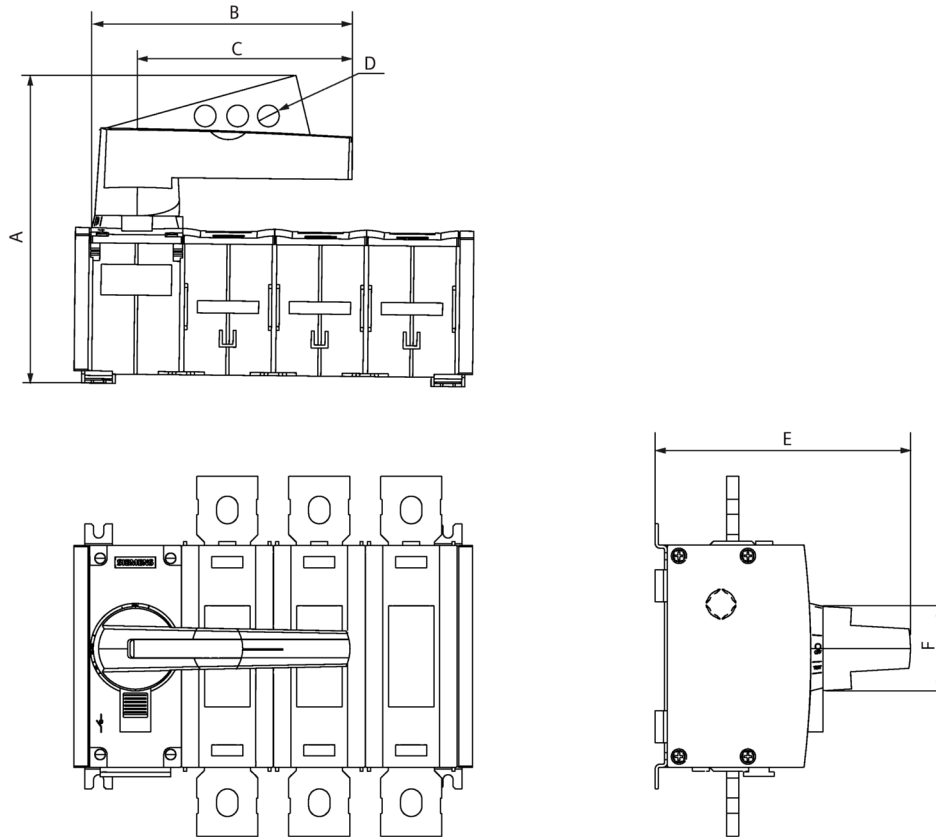


Note

Can be locked with up to 3 padlocks, needs additional depth in locked position, for dimension for axis of rotation - please see basic unit.

11.3 Dimensional drawings

Direct operating mechanism for frame size 4 and 5

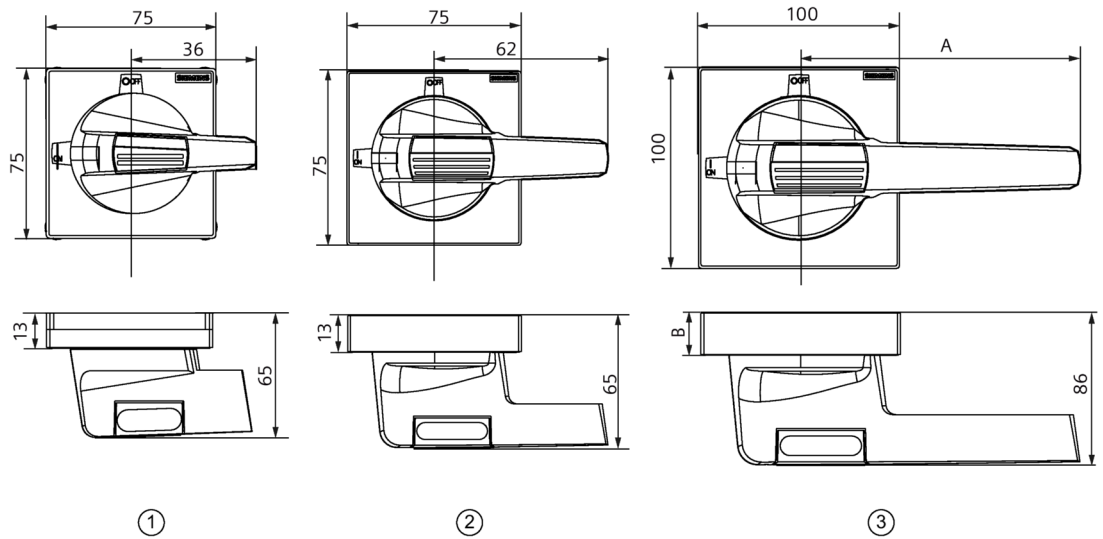


Frame size	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
4	185	171.5	140	Ø 8.2	166.5	55
5	231	247	200	Ø 8.5	212.5	84

Note

Can be locked with up to 3 padlocks, needs additional depth in locked position, for dimension for axis of rotation - please see basic unit.

Accessory: 8UD1 door-coupling rotary operating mechanism



- ① Handle of 8UD1 door-coupling rotary operating mechanism for frame size 1
- ② Handle of 8UD1 door-coupling rotary operating mechanism for frame size 2
- ③ Handle of 8UD1 door-coupling rotary operating mechanism for frame size 3 to 5

Frame size	A [mm]	B [mm]
3	106	13
4	140	13
5	200	15

Appendix

A.1 Standards and approvals

Standards

Series 3KD switch disconnectors confirm to the following international standards.

IEC 60947-3 DIN EN 60947-3	Switches, disconnectors, switch-disconnectors and fuse-combination units
IEC 60947-1 DIN EN 60947-1	Low-voltage switchgear and controlgear – Part 1: General rules
GB14048.3 (CCC)	Switches, Load breakers, disconnectors
IEC 60947-1 Annex Q	Special tests - Damp heat, salt mist, vibration and shock category=E
IEC 60947-5-1 GB14048.5 DIN EN 60947-5	Auxiliary contacts
DIN 43880	Built in equipment for electrical installations
DIN EN 60715	Dimensions of low-voltage switchgear and controlgear Standardized mounting on rails for mechanical support of electrical devices in switchgear and controlgear installations
DIN 46234	Terminal ends for solderless connections, ring type, without insulating sleeve, for copper conductors
DIN 46235	Press-sockets for solderless connections for copper conductors
DIN 46206-2	Supply-terminals for electrical equipment 40 A; connections with rectangular cross-section, basic dimensions and coordination

Directives

EC directives:

- Low-voltage directive
- EMC directive
- Machinery directive

Certifications



Environmental compatibility

All materials used are environmentally compatible, taking account of "Hazardous substances, list of prohibited substances, list of substances to be avoided" (SN 36350).

Please go to following link for further technical support
(<https://support.industry.siemens.com/cs/ww/en/ps/19666>).

List of abbreviations

B.1 Table of abbreviations

Summary

Table B- 1 Meaning of abbreviations used in this document

Abbreviation	Meaning
AC	AC voltage
ATSE	Automatic Transfer Switching Equipment
AUX	Auxiliary switch
C	Common
DC	Direct voltage
DIN	Deutsches Institut für Normierung e. V. (German Institute for Standardization)
ESD	Electrostatic sensitive devices
EMC	Electromagnetic compatibility
EN	European Standard
IEC	International Electrotechnical Commission
IP	International Protection
LBS	Load Break Switch (switch disconnecter)
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
R	RESET
RMS	Root Mean Square
T	Test
UL	Underwriters Laboratories Inc.
VDE	Verein Deutscher Ingenieure (Association of German Electrical Engineers)
VDI	Verein Deutscher Ingenieure (Association of German Engineers)

Table B- 2 Meaning of symbols and abbreviations

Symbol / Abbreviation	Meaning
I^2t	Let-through energy
I_{cm}	Making capacity; rated short-circuit making capacity
I_{cn}	Rated breaking capacity; rated short-circuit breaking capacity
I_{cs}	Maximum short-circuit breaking capacity (partial selectivity); rated service short-circuit breaking capacity
I_{cu}	Maximum short-circuit breaking capacity (full selectivity); rated ultimate short-circuit breaking capacity
I_{cw}	Rated short-time withstand current; rated short-time current
I_c	Let-through current
I_k	Short-circuit current
I_{KD}	Uninterrupted short-circuit current
$I_{K\ MAX}$	Maximum short-circuit current
I_e	Rated operational current
I_P	Rated peak withstand current, impulse short-circuit current
I_{sc}	Prospective current
I_{th}	Conventional free-air thermal current
I_U	Rated uninterrupted current
U	Voltage across main contacts
U_e	Maximum voltage; rated operating voltage

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) Diameter 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	mm²
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 UL 83

Other conversions

Conversion factors for units of length

Length	Conversion factor
1 inch (")	25.4 millimeters (mm)
1 centimeter	0.3937 inch (")

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 factors 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
- 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 lb <i>F</i> in, 8.85 lb-in (inch-pound)
1.36 Newton meter (Nm)	1 lb <i>F</i> ft, 1 lb-ft (inch-pound)
0.113 Newton meter (Nm)	1 lb <i>F</i> in, 1 lb-in (inch-pound)

Glossary

Breaking capacity

The breaking capacity is the rms value of the current at a specific $\cos \phi$ (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 which represents the minimum or maximum values of I^2t in relation to breaking 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 a limited short-circuit current (let-through current).

Let-through current

The let-through current I_D is the maximum instantaneous current value during the breaking 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 limiting).

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 load break switches, the making capacity is expressed as the maximum possible instantaneous value of the potential prospective current at the input terminals for the specified voltage.

Rated breaking capacity

The rated breaking capacity is the maximum current that can be interrupted by a switching device under certain conditions.

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 operational 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 voltage

The rated operational 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 operational voltage must never be higher than the rated insulation voltage. With multi-phase circuits, the specified voltage is generally the phase-to-phase voltage.

Rated peak withstand current, impulse short-circuit current

Maximum rated operational voltage must never be higher than the rated insulation voltage. The current path under the highest load. It characterizes the dynamic short-circuit strength of a switching device.

Rated service short-circuit breaking capacity

The rated service short-circuit breaking capacity I_{cs} is the short-circuit current determined by the operational voltage that a load break switch is capable of interrupting repeatedly (test sequence O - CO - CO, formerly P - 2). After a load break switch has interrupted a short circuit, it can continue to carry the rated operational current despite increased self-heating.

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 operational 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 operational 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 operational 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 operational 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 operational 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 load break switch is capable of interrupting (test sequence O - CO, formerly P - 1). Limit value of rated ultimate short-circuit breaking capacity I_{cu} . The rated ultimate short-circuit breaking capacity I_{cu} is the maximum value of the short-circuit current which the protective device is capable of disconnecting in accordance with regulations. Up to this value, the protective device is also allowed to be used in a network.

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.

Rating

The rating is the power that a switching device is capable of switching at the associated rated operational voltage in accordance with the utilization category, e.g. power contactor utilization category AC-3:37 kW at 400 V.

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.

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Further Information

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