

The system is starting to pick up speed.
Switching with SIRIUS.

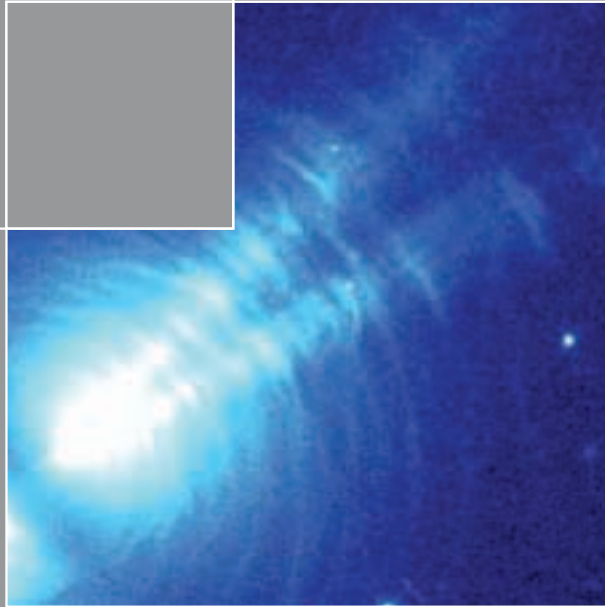


sirius

SWITCH

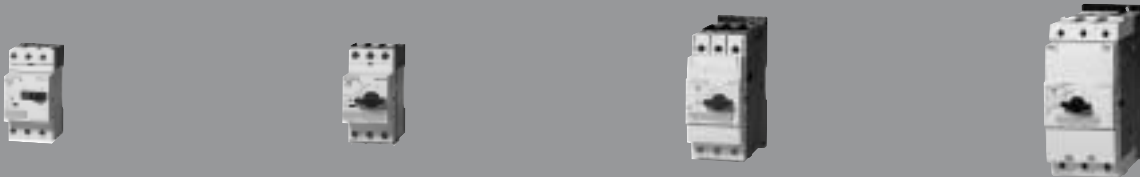
SIEMENS

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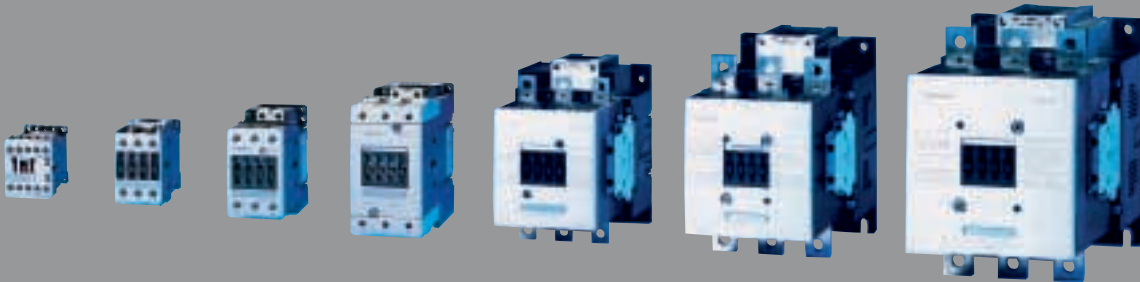


*The life cycle of a star has 12 stages.
Here is star CRL2688 presently in a
transition phase from red giant through
supernova to pulsar.*

Inconceivable eternity and extreme conditions are common



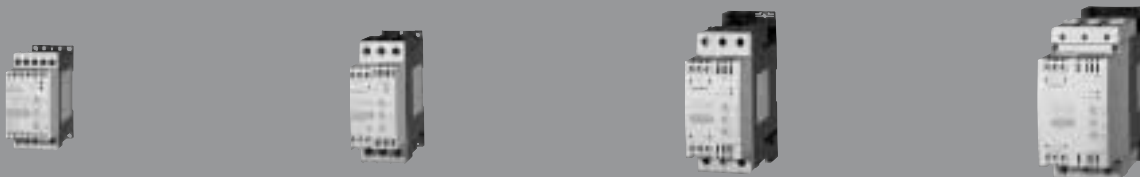
in space – and down here on Earth people expect similar



things from us on a daily basis. The contactors of the SIRIUS



system have been further developed in order to always fulfill



requirements such as these.

Spiral galaxies, like the M100 shown here in the stellar constellation Virgo, comprise cooler, older stars at the center, while young, hot stars colonize it a considerable distance away.





Our solar system is unique,
flexible and stable.

Before we continue on the subject of switching with SIRIUS, we should first get to know the SIRIUS system. Siemens, with SIRIUS, has created a modular system for protecting, switching and starting. It comprises modular standard components which are optimally harmonized with one another and which can be combined as required.

With the modular SIRIUS system, it is extremely easy to configure load feeders from modular standard components.



The advantages of the SIRIUS system at a glance:	
Load feeders	Up to 250 kW/400 V (500 Hp/600 V) can be simply realized using standard devices
Modular design	Everything fits together and can be combined as required
Versions and sizes	Cost-effective and flexible using seven compact sizes
Assembly	Fast commissioning, short setup times, simple wiring
Communications	Open for SIRIUS NET; can be connected to AS-Interface and PROFIBUS-DP
Service	Extremely long service life, reliability and low maintenance
Design	Space-saving as a result of the low device width and side-by-side mounting up to 60°C
Approvals	Approved and certified world-wide with UL, CSA, marine and more
Optical design	Simple and ergonomic, it has received several awards
Mounting	Screwed or snapped on for reliable mounting over its service life
Service	Fast delivery of components and spare parts through a global logistics network
Environmental issues	Environmentally-compatible production and materials; can be recycled; low power loss
Accessories	Optimal variance with standard accessories
Cage Clamp	Fast, reliable connections, vibration-proof and maintenance-free

Just like the **SIRIUS** system ...

Get to know the SIRIUS system

The modular SIRIUS system is being continuously expanded and offers everything that is required to switch, protect and start motors and other loads. Modular, standard components, which fit together and can be easily combined, make working with SIRIUS so easy. Using SIRIUS, all of the requirements from the field can be individually fulfilled cost-effectively. The individual components distinguish themselves as a result of their space-saving design and high degree of flexibility. Engineering, installation and mounting, wiring, and service are extremely simple – saving a lot of valuable time. From the technical perspective, the SIRIUS system fulfills the highest standards and offers some unique highlights, for example, vacuum contactors and the remaining life-time signal for contactors. It doesn't make any difference whether a load feeder uses a circuit-breaker or overload relay, contactor or soft starter – SIRIUS always provides the optimum solution for every application.

Technical perfection: the SIRIUS design

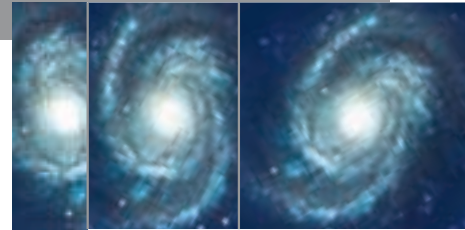
It is quite obvious that people are enthusiastic about the technology of the modular SIRIUS system. However, a glance into a cabinet is also extremely appealing. Outstanding ergonomics, excellent optical design and finish ensure a transparent image – which is reflected in the fact that the SIRIUS series was awarded the iF Product Design Award.

Convincing flexibility: the combination possibilities

With SIRIUS, circuit-breakers, contactors, soft starters, and overload relays can be simply combined. The complete power range up to 250 kW/400 V(500HP/ 600V) is covered by just six widths and seven sizes. Plug components together, tighten the screws, and the load feeder is ready. The ability to snap assemblies on to mounting rails also saves a lot of time.

With SIRIUS, you are never left alone: the global service network

It does not matter whether you are in Oslo, London or Capetown, world-wide, you can utilize the benefits of the unique modular SIRIUS system. SIRIUS has all of the relevant global approvals and is available everywhere. Siemens is at your service in 190 countries.





Complete load feeders can be easily and simply assembled – this is important for larger and smaller plants alike.

High-performance devices with a small footprint: the narrow concept

Put briefly, the narrow concept achieves one thing: compact electrical cabinets with a high device density. The complete power range up to 250 kW/400 V (500 HP/600 V) is covered by only seven sizes; auxiliary contact blocks and coil surge suppressors are within the envelope dimensions of the contactors. This makes it easier to expand the system and naturally saves a lot of space in the electrical cabinet. Furthermore, the contactors are designed for side-by-side mounting without derating – and that for ambient temperatures up to 60 °C. This is made possible by using low-loss operating systems, where the power loss in the cabinet is significantly lower.

Safety: always top priority

The operating reliability of SIRIUS contactors is especially high. They have an extremely long service life, require little service, and are rugged. They also fulfill all of the relevant domestic and international regulations and can be used world-wide. It goes without saying that the 3RT contactors and 3RH contactor relays fulfill the requirements for "safe separation" in accordance with IEC 61 140 and the conditions for positive control according to IEC, ZH1 and SUVA. Shock hazard protection for parts under voltage is provided for all versions. This feature is either integrated or can be retrofitted as an accessory. This clearly reflects the fact that for SIRIUS, the issue of safety is always taken seriously.

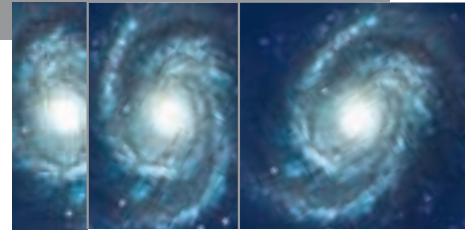
Complete and flexible: contactors with auxiliary contacts

When required, SIRIUS contactors can also be supplied with mounted auxiliary contacts. This means that the contactors are ready to handle interlocking functions. However, the 3RT and 3RH contactors can be retrofitted with auxiliary contacts. This is where the invaluable advantages of the SIRIUS modular system come into play. Standard accessories range from the auxiliary contact block to the surge suppressor and mechanical interlocks. A comprehensive range of accessories is available for all sizes. The standard range of auxiliary contacts for contactors, sizes S0 to S12, is also a decisive advantage when it comes to handling and storage costs.

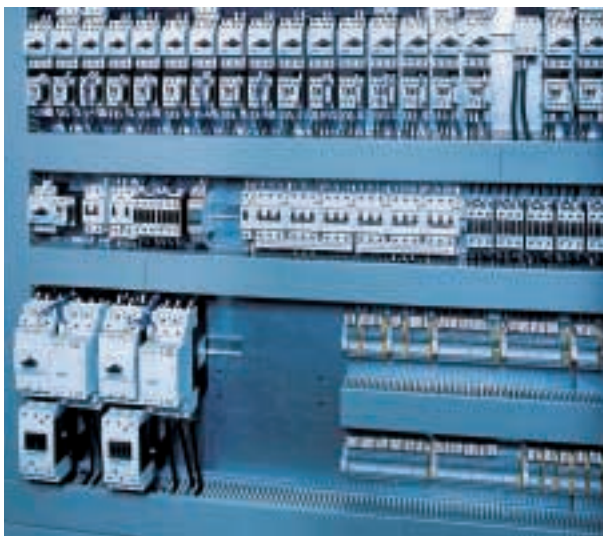
Fast and safe: mounting and assembling load feeders

Contactors up to 45 kW (100 HP) are all mounted in standard ways. They can either be snapped onto 35 mm mounting rails without having to use a tool, or they can be screwed into place. Above 45 kW, the devices are always mounted using screws. In order to safely and reliably assemble load feeders, the position of the connections, connection cross-sections, and basic dimensions of all of the SIRIUS devices are harmonized with one another. This simplifies the engineering as well as mounting and installation of load feeders.

... which proves itself when **switching**

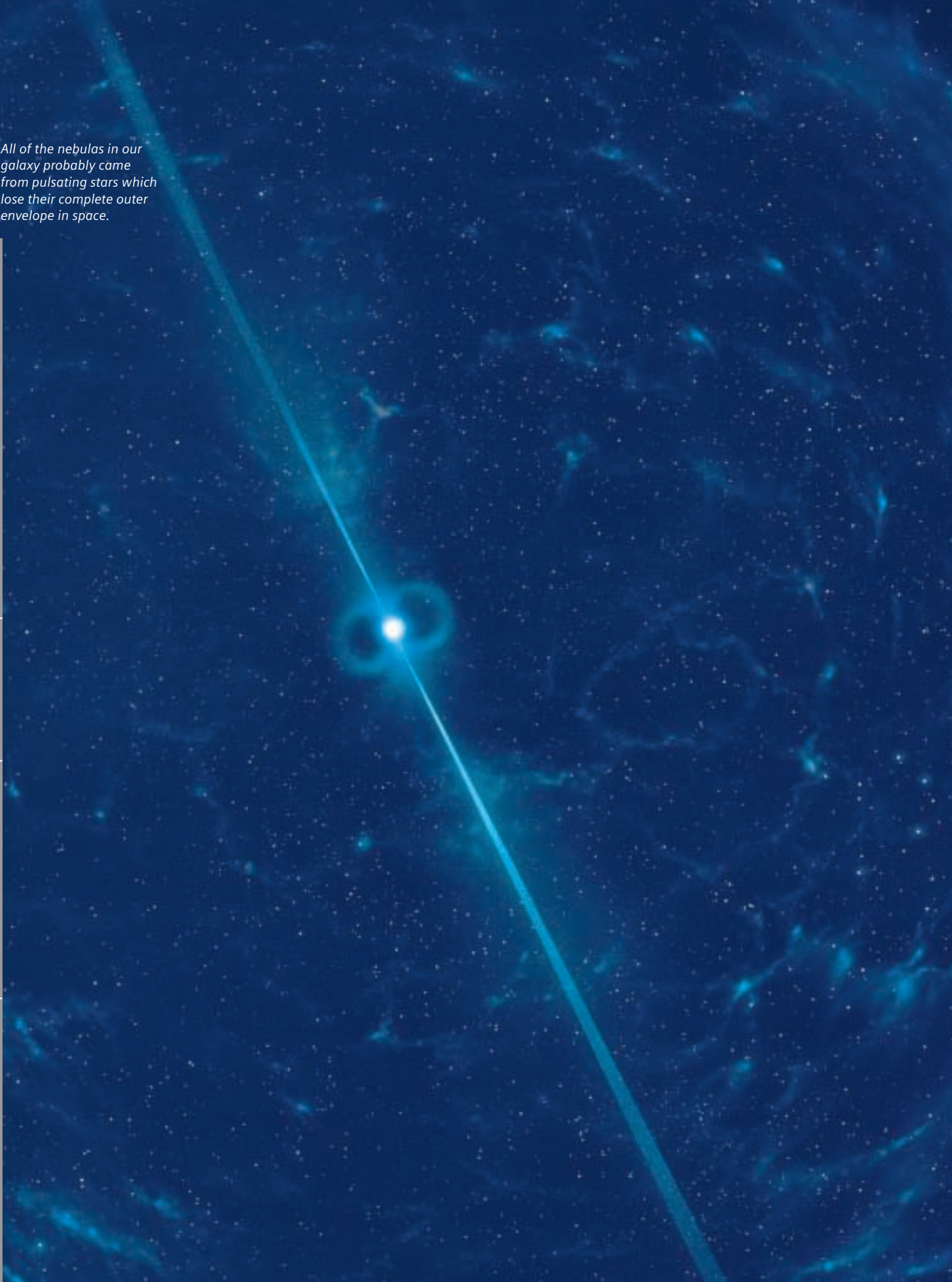



The many advantages of the SIRIUS system are clearly reflected in practice. The narrow design, the available range of contactors, and the modularity ensure that SIRIUS can handle any requirement.



A classic application for SIRIUS contactors: Switching three-phase motors (top), can be mounted in a user-friendly fashion in the electrical cabinet – thanks to the standard widths of the load feeder elements (left).

All of the nebulas in our galaxy probably came from pulsating stars which lose their complete outer envelope in space.





Once a pulsar has started to move, it reaches a staggering **180,000 RPM** – and it continues for over **30 million years** without any interruption.

There is no application which is too unique to prevent it from being perfectly handled by the SIRIUS device family. Standard components and contactors that can be combined with one another for special applications solve every problem.



Switching motors: air and vacuum contactors

The three-pole 3RT10 contactors are admirably suited for one of the most generally encountered applications – switching three-phase motors. The complete power range from 3 to 250 kW/400 V (3 to 500 HP/ 600 V), for AC or DC control, is covered by just seven sizes. For applications where an extremely high electrical service life is important, for heavy-duty starting, or for applications with 1000 V, the 3RT12 vacuum contactors are the right choice. But more about these later.

System-compliant partnership: coupling relays

The SIRIUS coupling relays to switch motors and auxiliary and control circuits have been specially designed to operate with electronic control systems. The contactors distinguish themselves as a result of their low power drain and the wide operating range of the coils. The high contact reliability of the auxiliary contacts guarantees that there are no fault signals, even at low level switching.

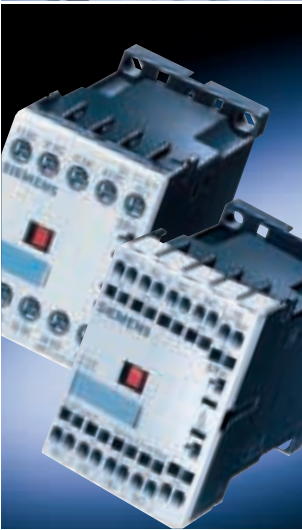
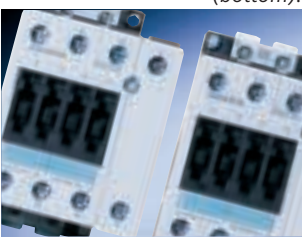
Four-pole contactors are used to switch motors and ohmic loads (top).

The SIRIUS coupling relays allow for smooth operation with electronic controls (bottom).

Sensitive output stages are protected against switching overvoltages of the coil by use of an integrated surge suppressor.

Four main contacts: 4 NO or 2 NO + 2 NC: the 4-pole contactors

In addition to the 3RT13 4-pole contactors with 4 NO contacts to switch ohmic loads, there are also the 3RT15 SIRIUS contactors with 2 NO + 2 NC contacts. These are used, for example, to change over the poles of crane motors, as brake contactors, or to switch two loads separately from one another.



Size S00



Size S0



Size S2

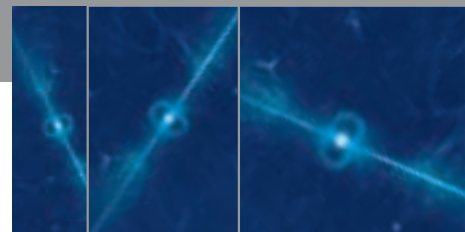


Size S3



When endurance and extreme load capability are the name of the game, we assume that SIRIUS contactors are part of the team. This is because the range of SIRIUS contactors has the optimum type for every requirement. High contact reliability, long life cycle, and the ability to operate under extreme conditions (up to 60°C when mounted side-by-side in the cabinet) distinguish the SIRIUS switching devices.

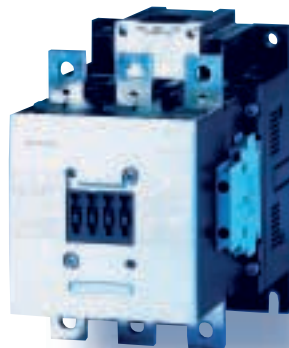
Back down on Earth, **long-life SIRIUS contactors** cause the system to pick up speed.



Size
S6



Size
S10



Size
S12

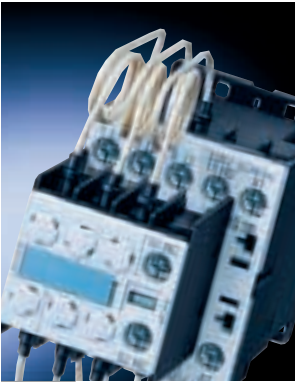




Ohmic loads and then: AC-1 contactors

There are two ways of switching ohmic (resistive) loads in accordance with utilization category AC-1.

On one hand, there are the 3RT10 motor contactors, which can be used to switch inductive loads, e.g. according to utilization categories AC-2/AC-3 and AC-4, and to switch ohmic loads according AC-1. On the other hand, there are the special 3RT14 AC-1 contactors with 3 NO main contacts. These are cost-effective alternatives for rated operating currents greater than 100 A to 690 A. These AC-1 contactors are especially optimized to switch loads according to utilization category AC-1. These high-performing AC-1 contactors are used anywhere only the rated current has to be switched and conducted. These include applications such as switching heating circuits, or operating as a bypass contactor.



Controlling: contactor relays

Contactor relays are switching devices for control and auxiliary circuits and are used to control, provide signals, and interlock switching devices in control panels. It goes without saying that the 3RH1 SIRIUS contactor relays have connection designations in compliance with the standards and use a connection system which is both time- and cost-saving – fulfilling the requirements from the field. The 3RH1 contactor relays and the size S00 motor contactors are the same size and have the same optical design – this represents a significant advantage, especially when it comes to accessories. They are designed for AC or DC control circuits and are available with screw or Cage Clamp connection systems. The basic version of the contactor relays has four poles, but this can be extended up to eight poles using auxiliary contact blocks which can be snapped on.

3RT14 AC-1 contactors look the same outside – what's inside is what makes the difference (top)
3RT16 capacitor contactors (bottom)

Compensating reactive currents: capacitor contactors

3RT16 capacitor contactors are used to switch power capacitors which are used for reactive current compensation. Special series resistors and auxiliary contacts, integrated in the capacitor contactor, reduce the high inrush current of the capacitor which would otherwise flow. This reduced inrush current guarantees longer contactor and capacitor life. These contactors are available in sizes S00, S0, and S3, and can generally be equipped with the standard accessories of the basic devices.

For extreme conditions and hot environments the modular SIRIUS system has the right solution.



The SIRIUS family of devices includes, in addition to contactors to switch motors, a series of high performance switching devices with a long life cycle for special applications.

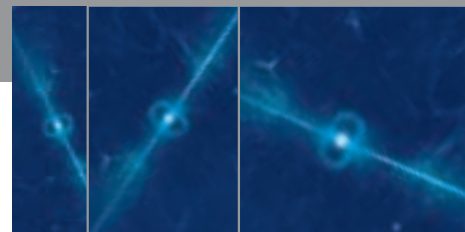


Contactor relay,
45 wide



Latching contactor relay,
90 wide

If pulsars perpetually rotate, then our **SIRIUS contactors** could be involved...



Overview of SIRIUS motor contactors									
Size	S00		S0		S2		S3		
									
Contactor	type	3RT10 15/16/17		3RT10 23/24/25/26		3RT10 34/35/36		3RT10 44/45/46	
Vacuum contactor	type								
AC-3									
I_e /AC-3/400 V	A	7/9/12		9/12/17/25		32/40/50		65/80/95	
400 V	kW	3/4/5.5		4/5.5/7.5/11		15/18.5/22		30/37/45	
230 V	kW	2.2/3/3		3/3/4/5.5		7.5/11/15		18.5/22/22	
500 V	kW	3.5/4.5/5.5		4.5/7.5/10/11		18.5/22/30		37/45/55	
690 V	3RT10, 12 kW	4/5.5/5.5		5.5/7.5/11/11		18.5/22/22		45/55/55	
1000 V	3RT10, 12 kW	–		–		–		30/37/37	
460 V	HP	3/5/7.5		5/7.5/10/15		25/30/40		50/60/75	
AC-4 (for $I_a = 6 \times I_e$)									
400 V	kW	3/4/4		4/5.5/7.5/7.5		15/18.5/22		30/37/45	
400 V	3RT10, 12 kW	1.15/2/2		2/2.6/3.5/4.4		8.2/9.5/12.6		15.1/17.9/22	
(200,000 operating cycles)									
AC-1 (40 °C, ≤ 690 V)									
I_e	3RT10, 12 A	18/22/22		40/40/40/40		50/60/55		100/120/120	
Accessories									
Auxiliary contact blocks at the front laterally		3RH19 11		3RH19 21					
		–		3RH19 21					
Terminal covers		–		–		3RT19 36-4EA2		3RT19 46-4EA 1/2	
Box terminal blocks		–		–		–		–	
Surge suppressors		3RT19 16		3RT19 26		3RT19 26/36			

Some basic information

What does the narrow concept mean?

With only seven sizes and six narrow widths, the clearly structured range covers the complete power range up to 250 kW/400 V (500 HP/600 V) and has proven itself to be cost-effective and versatile. Auxiliary contacts can be mounted on the front on all sizes. On size S6 onwards, snap-on side-mount auxiliary contacts and coil surge suppression are included within the contours of the contactor. This makes it far easier to expand or modify existing plants and systems. Old contactors can be easily replaced.

3RT contactors are designed for use in ambient temperatures of up to 60 °C; even when mounted side-by-side they do not have to be de-rated.

The amount of heat generated in the electrical cabinet is significantly lower as a result of the low-loss operating systems. The narrow-profile 3RT contactors are therefore ideally suited for state-of-the-art plant concepts: compact electrical cabinets with a high packing density.

What are the advantages of the standard, unified accessories?

Whether auxiliary contact blocks, surge suppressors, electronically delayed auxiliary contact blocks, time relays which can be directly mounted on the contactors, or mechanical interlocks: a comprehensive range of standard accessories is available for all sizes. This is where the modular SIRIUS system comes through with flying colors down to the smallest detail.

The standard range of accessories is a decisive advantage when it comes to handling and stock inventory costs. For instance, for the air contactors, the laterally-mounted and front-mounted auxiliary contacts can be used from size S0 to S12. For size S00, the accessories for contactors to switch motors and for contactor relays are identical. Auxiliary contact blocks, surge suppressors, and time delay blocks can be plugged in at the front. Mechanical interlocking to configure reversing combinations does not increase the contactor contours, and customers can easily install them. With only one mechanical interlock for sizes S6 to S12, reversing combinations or combinations of different sizes can be simply created, e.g. for system transfers.

Technology in detail: SIRIUS motor contactors.

S6	S10	S12
		
3RT10 54/55/56	3RT10 64/65/66	3RT10 75/76
	3RT12 64/65/66	3RT12 75/76
115/150/185	225/265/300	400/500
55/75/90	110/132/160	200/250
37/45/55	55/75/90	132/160
75/90/110	160/160/200	250/355
110/132/160	200/250/250	400/400,500
75/90/90	90,315/132,355/132,400	250,560/250,710
100/125/150	150/200/250	300/400
55/75/90	110/132/160	200/250
29/38/45	54,78/66,93/71,112	84,140/98,161
160/185/215	275,330/330/330	430,610/610
3RT19 56-4EA1/2/3	3RT19 66-4EA1/2/3	
3RT19 55/56-4G	3RT19 66-4G	
3RT19 56-1C		

Some detailed information

How are the contactors mounted?

Standard mounting methods are used for sizes S00 to S3. The contactors can be snapped onto a mounting rail without having to use any tools, or they can be retained using screws. When snapped onto mounting rails, up to size S0, contactors can be removed without tools. For larger contactors, the snap-retaining mechanism can be released using a screwdriver. They can be simply and reliably mounted, and the mounting time is reduced to a minimum. Above 45 kW (sizes S6 to S12), the contactors are designed for screw mounting.




What has to be observed when connecting?



The connecting system has been well-proven in the field. All of the devices have captive screws, and all of the terminals are open when the contactor is supplied. Screwdriver guides enable the use of automatic screwdrivers. Surge suppressors and electronic time delays which can be connected at the front (for sizes S00 to S3) are simply plugged on, which simultaneously establishes the electrical connections.

DETAIL

Overview of SIRIUS AC-1 contactors

Size	S3	S6	S10	S12
				
Type	3RT14 46	3RT14 56	3RT14 66	3RT14 76
I_e /AC-1/40 °C/≤ 690 V	A 140	275	400	690

Overview of SIRIUS contactor relays

Size	S00	S00	S00	S00, latching
				
Type	3RH11 40	3RH11 31	3RH11 22	3RH14
Width in mm	45	45	45	90
Contacts	4 NO (40 E)	3 NO + 1 NC (31 E)	2 NO + 2 NC (22 E)	4 NO; 3 NO + 1 NC; 2 NO + 2 NC
Screw and snap-mounting on 35 mm mounting rails, AC and DC operation				
Contact reliability at 17 V, 1 mA according to DIN 19 240	Contact fault frequency < 10 ⁻⁸ , this means < 1 fault for every 100 million operating cycles			
Rated data:				
Operational voltage U_e V	230	400	500	690
Operational current I_e /AC-15 A	6	3	2	1
I_e /AC-12 A	10	10	10	10
Endurance, mechanical	30 million operating cycles			5 mill. operating cycles
Power consumption, coil	Closing			Closed
(AC) VA	27			4.6
(DC) W	3.2			3.2

Some basic information

What can SIRIUS offer to switch ohmic loads?

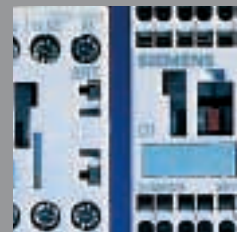
SIRIUS offers two ways of switching ohmic (resistive) loads. On one hand the 3RT10 motor contactors, which can switch inductive loads, e.g. according to utilization categories AC-2/AC-3 and AC-4, and can also switch ohmic loads according to AC-1. Furthermore, SIRIUS has special 3RT14 AC-1 contactors with 3 NO main contacts. These contactors are optimized for switching loads in accordance with utilization category AC-1 and provide a cost-effective alternative for rated operating currents up to 690 A.

Where are the special AC-1 contactors to be used

AC-1 contactors are used wherever only the rated current has to be switched and carried. Typical applications include, switching heating circuits, for use as generator or bypass contactors, or as input and output contactors in drive converter circuits. The AC-1 contactors distinguish themselves as a result of their high performance and at the same time low overall dimensions.

Which SIRIUS contactors can be used to switch auxiliary circuits?

The SIRIUS range of switching devices has a complete 3RH series of contactor relays, size S00 for controlling, signalling and interlocking.



All of the accessories for size S00, can be used for both contactor relays 3RH and motor contactors 3RT1. Contactor relays are available both for AC and DC operation. In addition to the screw connection system, they are also available with Cage Clamp connections. The basic version can be expanded from four to eight poles using the auxiliary contact blocks which can be snapped on. Furthermore, eight-pole complete devices are available in compliance with SUVA specifications.

Technology in detail: SIRIUS **AC-1** contactors and SIRIUS **contactor relays**.

Some detailed information

How do latching contactors function?

Using an integrated latching mechanism for the 3RH14 contactor relays, the contacts remain closed even if the control voltage at the contactor coil is lost. The contactor can always be released and therefore opened by connecting a voltage to the latching mechanism. In addition, a latching module is available for contactors, size S0, which also functions the same as described above.

How are load feeders engineered?

Load feeders can be simply engineered as a result of the terminals and connection cross-sections that have been harmonized with one another. The thermal overload relays can be easily mounted to the lower contactor terminals without any intermediate space. This means that both devices have a continuous unbroken front profile.

Fuseless motor feeders can be configured without any additional wiring: a connecting module creates the mechanical and electrical connections between the circuit-breaker* and the contactor.

The four coil connections for contactors sizes S0 to S3 also make it far easier to connect load feeders, and very flexibly: top, bottom or – as was usual up until now, diagonally. This provides an optimum solution for fuseless designs with a circuit-breaker connected at the top, or when using fuses, with an overload relay mounted directly below.

When does a 4-pole contactor have to be used?

Four-pole contactors are required in various industrial and commercial sectors as well as in building installation. In many instances, regional requirements and regulations or standards apply, which make it necessary to use 4-pole contactors. The 3RT13 contactors are admirably suited for switching three phases and a neutral conductor. The compact contactors with 2 NO + 2 NC contacts as main switching elements are suitable for reversing circuits.

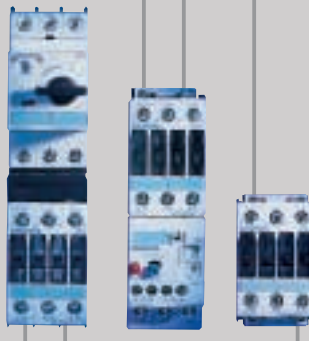
3RT15 contactors are used for phase reversal. Four-pole contactors are available in sizes S00 to S3 for rated currents $I_e/AC-1$ up to 140 A. They utilize the same range of accessories as the 3-pole contactors. This simplifies stock inventory, allows flexible planning, and makes handling a routine issue.

4-pole contactors



Compact and versatile:
the 4-pole SIRIUS contactors with
4 NO or 2 NO + 2 NC.



4-connection coil



Especially flexible:
the 3- and 4-pole
SIRIUS contactors allow
the coil to be
connected from the
bottom, from the top,
or diagonally.

*The 3RV devices are referred to as circuit breakers in this document. However, for UL and CSA applications the 3RV is considered a Motor Starter Protector.

Overview of SIRIUS coupling relays

Size	S00			S0			S00		
									
Type	3RT101			3RT102			3RH11		
Width in mm	45			45			45		
Screw and snap mounting onto 35 mm mounting rails, DC operation									
24 V DC rated control supply voltage									
AC-2-/AC-3 operation at 400 V	kW						$I_e/AC-15$ at 230 V:		
	3	4	5.5	5.5	7.5	11	6 A		
Power consumption of the coil at 24 V	W						$I_e/AC-12$:		
Operating range 0.7 to 1.25 x U_s	2.3	2.3	2.3	4.2	4.2	4.2	10 A		
Operating range 0.85 to 1.85 x U_s	1.4	1.4	1.4	–	–	–	2.3		
Auxiliary contacts (max.)	1 NO or 1 NC (integrated)			Two 1-pole auxiliary contact blocks can be mounted (2 NO, 1 NO + 1 NC, 2 NC)			1.4		
							4 NO 3 NO + 1 NC 2 NO + 2 NC		
Endurance, mechanical	30 million operating cycles			10 million operating cycles			30 mill. operating cycles		

Some basic information

When are coupling relays used and why?

Coupling relays are always used when electronic control systems are to be operated together with electro-mechanical signal transmitters and receivers in a harmonized fashion. When compared to use in conventional control systems, these switching devices must fulfill the following additional requirements:

- The signal receiver must be operated with a DC voltage in compliance with the system.
- The rated voltage and operating range of the signal transmitter/receiver must be adapted to the system data.
- The signal transmitters (e.g. auxiliary contacts) must have high contact reliability at low voltages and currents, but still maintain the full switching capacity at high voltages.
- Damaging surges, which are either generated within or outside the system, must be limited.

The 3RT and 3RH SIRIUS interfaces have been designed so that all of these requirements are completely fulfilled.

How is the signal receiver operated in a system-compliant fashion?

The input and output modules of electronic control systems are available with either a 24 V DC or 110/230 V AC control voltage. However, as shown in practice, the 24 V DC version is frequently preferred in peripheral circuits, due to cost, among other reasons. This is why the signal receivers (coupling relays 3RT and 3RH) are equipped with a DC solenoid system – and in conjunction with a special coil, they offer many advantages. These include an extremely long mechanical endurance, extremely low power consumption when closing and when closed, as well as no hum and low leakage fields.

What is meant by adapting the rated voltage and the operating range of the signal receiver?

For electronic controls with a 24 V DC-rated voltage V_s , the supply voltage range is from 24.4 to 28.8 V. This is in compliance with DIN 19240. If an additional voltage drop of up to 3 V within the output stages is taken into account, then the contactor operating system must operate perfectly at voltages between 17.4 V and 28.8 V. The coupling relays can be used over an operating range of 17 and 30 V (0.7-1.25 x V_s). This represents a significant increase when compared to the operating range of 0.85-1.1 x V_s for contactors, according to IEC 60 947.



Technology in detail: with SIRIUS **coupling relays**.

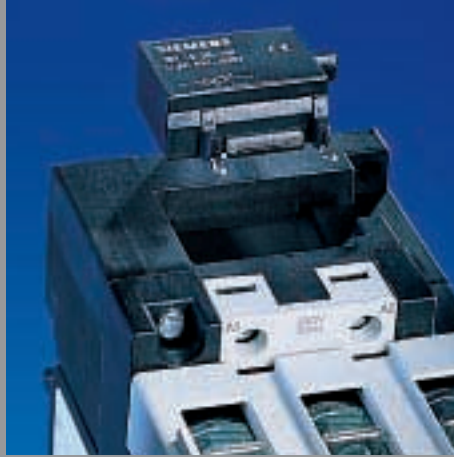
Some special information

How is high contact reliability achieved?

A special contact design for the 3RH coupling relays and the auxiliary contacts of the 3RT in the form of corrugation has proved itself to be an enormously effective measure to increase contact reliability. Tests, where the conditions for the signal transmitter of electronic controls were used as basis (17 V DC, 5 mA), indicated that less than one contact fault occurred for every 100 million operating cycles. This corresponds to a fault frequency of $H_F \leq 10^{-8}$. And, even with the new design, the maximum switching capacity at high-rated voltages was not diminished.

What is meant by "limiting the switch-off overvoltage?"

Electronic control systems only operate disturbance-free if there is adequate "electromagnetic compatibility" between the plant components. While conventional control systems have relatively low demands, it is different for electronic control systems where special protective measures are necessary to protect against disturbing or destructive influences as a result of the low signal level. Switching operations in inductive circuits are one of the main causes of overvoltages, e.g. when a contactor or contactor relay solenoid coil is switched off. Coupling relays for use in or with electronic control systems are available either with or without integrated surge suppression. This means that the user can select, from a wide variety of surge suppressors, that version which best corresponds to the requirements of the particular plant or system.



Surge suppressors are simply plugged on and simultaneously connected

DETAIL

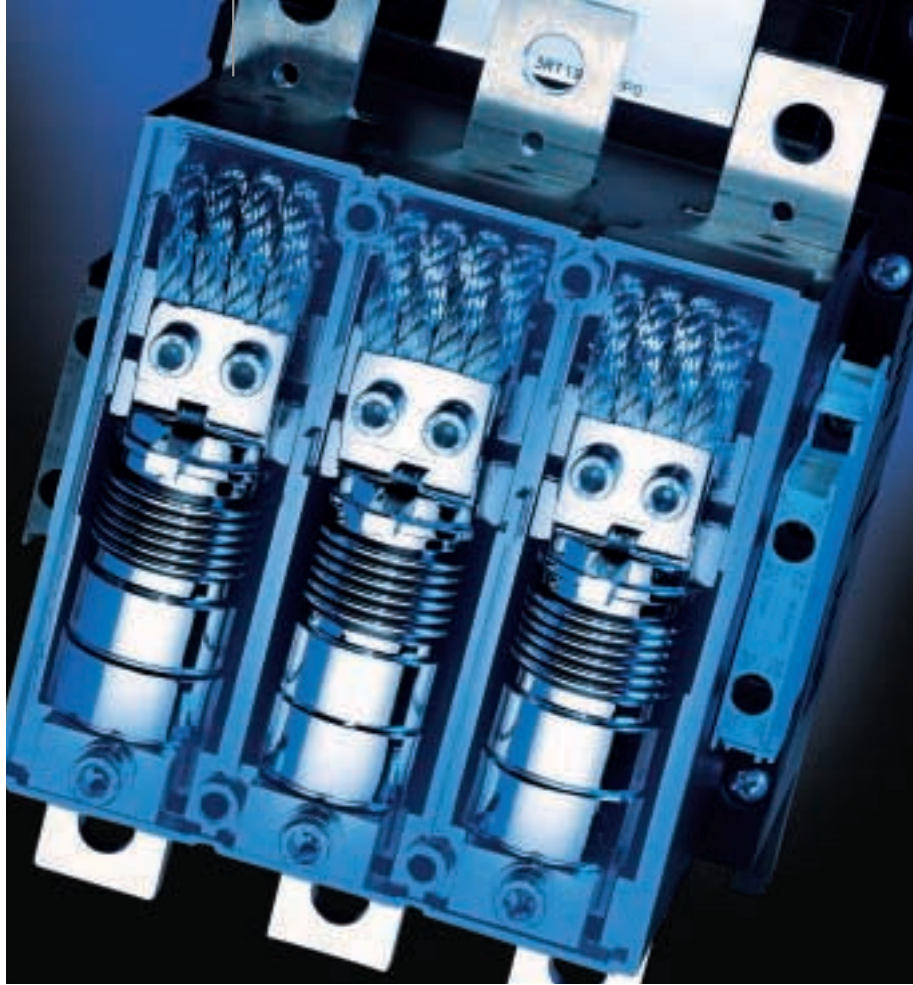


With a velocity of between 40,000 and 110,000 km/h, meteors like the Leonid Meteor here, enter the Earth's atmosphere and vaporize in a burst of intense light and heat.



Meteors orbit in space
**with almost no loss due
to friction.**

The main contacts of vacuum contactors switch with extremely low wear. No arcing, no switching gases, low wear – resulting in high performance, long life, and a high degree of environmental friendliness.



Size
S10



Size
S12



And vacuum really is better than the Earth's atmosphere for switching operations. Vacuum technology transforms "standard" SIRIUS contactors into extremely high-performance switching devices with an extremely long life.

3RT12 vacuum contactors are the right choice if you place significant value on extremely high performance and availability and increased personnel and plant safety. When compared to conventional air contactors, they offer significantly higher electrical performance. There are no arcs and no switching gases. This means that main contact wear and erosion are negligible.

Vacuum contactors are available in sizes S10 and S12 over all power classes from 110 to 250 kW/400 V (200 to 500 HP/600 V). The technical and economic benefits of vacuum contactors are especially important in applications with a high switching frequency, for heavy-duty starting, and for applications up to 1000 V.



This tiny element makes it possible: the vacuum contact tubes.

Reason enough to bring **vacuum** down to Earth for switching.



**Remaining life time (RLT) for contactors S6 through S12:
the service for plant operating companies!**

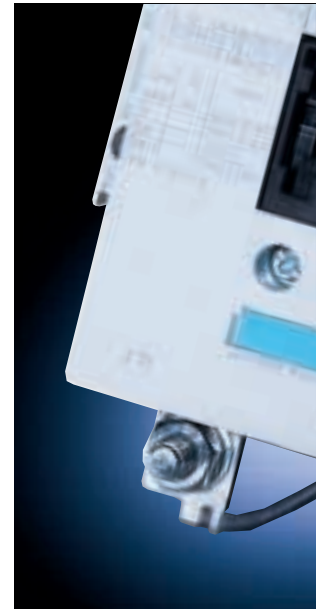
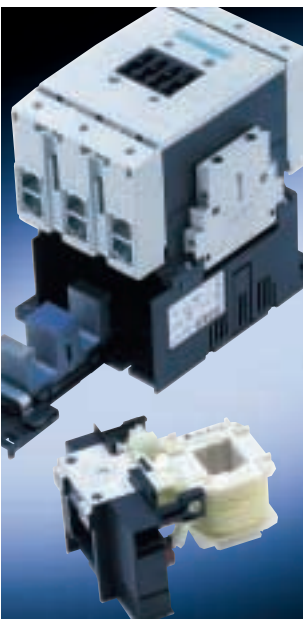
The main contacts of contactors are high-wear parts. They should be changed when they reach the end of their service life time, or better still, before they reach it. Contact wear and erosion depends on factors such as load, utilization category, and duty type. This means that the electrical endurance (number of operating cycles) is generally high. When making routine inspections (visual checks), information must be obtained about the condition of the main contacts. The "Remaining life time" (RLT) function does precisely this. In this case, the operating cycles are not counted – this number does not provide any information about the contact wear. In fact, the actual wear and erosion of each of the three main contacts is electronically sensed, evaluated, stored, and signaled when a defined limit is reached. In this case, it is easy to output a signal through a relay contact or AS-Interface when a remaining life time of 20 percent is reached, i.e. the contacts have worn by up to 80 percent and must therefore be replaced soon. An LED display on the contactor itself provides information about the degree of wear. The stages – 60 percent, 40 percent and 20 percent - can be read from this LED display.

**Leading edge technology and its benefits:
the unique benefits of RLT**

With information at your fingertips about the impending need to change the contacts and associated optimal utilization of the contact material, it is no longer necessary to visually check the condition of the switching elements. This reduces operating costs. Service and maintenance work can be reliably and precisely planned, thus reducing unpredictable plant downtimes.

Flexible and fast: plug-in coils

The solenoid coil can be simply withdrawn from the top and replaced, e.g. if the application has changed or for service and maintenance work. This design consideration is especially convenient for electrical distributors because of the cost-effectiveness. The contactors can be initially supplied without coil, and, depending on the customer's need, the correct coil with the required operating system and operating voltage can be added locally or on-site.



Even if the contactors have been made to last for almost an eternity, they do have a limited life time. A special display – the remaining life time – provides precise information about the condition of the main contacts of the contactors 3RT10 and 3RT14, and in a user-friendly fashion.



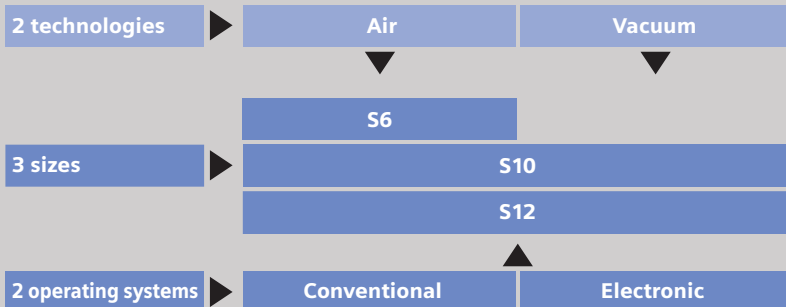
The remaining life time RLT: LEDs indicate it directly at the contactor, and it is also output as a signal.

Even though the **life time** is extremely long – it is still good to know when the time has come: **RLT**.



The family of SIRIUS contactors >45 up to 250 kW (>75 up to 500 HP)

3RT SIRIUS contactors, sizes S6, S10, S12



Some basic information

What are the SIRIUS system versions?

- 3RT10 contactors to switch motors
- 3RT12 vacuum contactors to switch motors
- 3RT14 contactors for AC-1 applications

Some detailed information

What does the standard range of accessories look like?

Side- and front-mounted auxiliary contacts can be used as standard for all sizes from S0 (4 kW) to S12 (250 kW).

Whether for reversing combinations, star-delta combinations, or contactor combinations for system transfer, everything can be quickly and simply configured. Contactors, sizes S6 to S12, can be interlocked as required using just one interlocking element.

How do contactors with electronic operating systems function?

For conventional operating systems, the control voltage is directly connected to the solenoid coil. On the other hand, the electronic operating system supplies the solenoid coil with precisely the necessary power through an electronic control. Many control voltages can be covered using just one coil version thanks to the electronic operating system. Furthermore, the wide operating range makes switching especially reliable.

The danger due to overvoltage or undervoltage conditions is significantly lowered. Furthermore, increased wear of the main contacts and thermal overload of the coil are avoided using defined switch-in and switch-out thresholds. This is especially advantageous for weak and unstable line supplies. Other features of this operating system include low power consumption when closing and when closed and the fact that brief voltage dips can be tolerated. The electronic operating system is available in three user-friendly stages:

- For PLC outputs, 24 V DC
- For PLC outputs, 24 V DC/PLC relay outputs, with remaining life time RLT
- With AS-Interface and remaining life time RLT

How can the contactors be controlled?

In almost any way because the optimum type is available for every requirement. The contactors can be generally controlled with DC and AC voltages. The control voltage is connected to A1 and A2 as usual. Furthermore, the contactors can be directly controlled from the PLC without having to use an additional coupling relay, either via the PLC with a 24 V DC semiconductor output and 30 mA load capacity, or via the PLC with relay output. It is also important to note that air contactors 3RT10 and 3RT14 can be controlled via the AS-Interface or PROFIBUS-DP using SIMOCODE-DP.

Just how does the remaining life time function for air contactors?

The main contacts of contactors are high-wear parts, which means that it is necessary to replace them in plenty of time before they reach the end of their life time. The wear and therefore the electrical endurance (operating cycles) depends on various parameters: load, utilization category, duty type, etc. The condition of the main contacts can be evaluated using routine inspections/visual inspections. The remaining life time RLT takes over this important task. In this case, the operating cycles operations are not counted. Instead, the actual wear and erosion of each of the three main contacts is electronically sensed, evaluated, and saved. When the defined limits are reached, a signal is output. Only this technique provides real definitive information about the state of the contacts.

How are the coils replaced?

The solenoid coil can be easily withdrawn from the top and replaced if this becomes necessary for service or if the application changes. The plug-in coil system offers advantages, both technical and economic. For example, electrical distributors can equip the contactors, which can be initially supplied without coils, when they are sold.

Technology in detail: SIRIUS contactors > 45 up to 250 kW.

The 2 versions with remaining life time signal RLT

Controlled
via
PLC



Terminals A1/A2 for
the supply voltage

LED status displays

- Contactor closed
- AS Interface
- Automatic/local control
- RLT remaining life time

Reset button for RLT

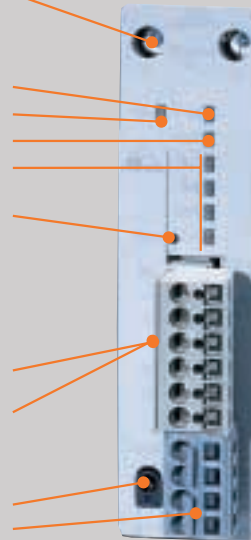
Input/output connector

- Control via PLC 24 V DC
or PLC relay output
- RLT relay output
- Automatic/local control
- Freely available input
(e.g. overload relay tripped)

AS Interface

- Addressing socket
- AS-i cable connector

Controlled
via
AS-Interface



Which signals are possible at the contactor using the AS-Interface?

The version with integrated AS-Interface allows the contactors 3RT10 and 3RT14 to be directly controlled via the bus and the following signals transferred:

- Contactor CLOSED/OPEN
- Overload relay tripped
- Remaining life time signal when reaching the limit value of 20 percent
- Automatic/local control

Additional control with PROFIBUS-DP is possible using SIMOCODE-DP.

Some special information

Why is vacuum switching innovative?

For conventional contactors, the main contactors switch under atmospheric conditions. Vacuum contactors switch in hermetically-sealed, vacuum contact tubes. No open arcing occurs, and therefore no gases are generated. This type of contactor can be recommended when loads have to be frequently switched as a result of extremely high electrical endurance. This is what makes vacuum contactors so well-suited for switching in the jog and mixed mode, e.g. for a crane control. The short-time load capacity for heavy-duty starting is especially high (CLASS 20/30). Finally, using a vacuum contactor, rated currents up to 1000 V can be fully utilized without de-rating. The special technical and economic benefits of the 3RT12 vacuum contactors also apply for the following applications

- Frequent switching
- Heavy-duty starting
- 1000 V

DETAIL



Only undefinable nebulas can be seen long before a star is born – this nebula requires an external influence in order to collapse and become a star.



Inconceivable **eternity**, extreme **conditions**, and unbelievable **forces** – these are abundant in space.

You have the application – we have the SIRIUS contactor		3 pole				
		3RT10 motor contactors	3RT10 coupling relays	3RT12 vacuum contactors	3RT14 AC-1 contactors	3RT16 capacitor contactors
Switching AC current AC						
Three-phase motors	– starting AC-2/3	++	++	++		–
	– jogging AC-4	++	++	+++		–
	– heavy-duty starting	+		+++		–
	– 1000 V	+		+++		–
Ohmic loads	AC-1	+	+	+	+++	–
Gas discharge/incandescent lamps	AC-5a/b	+	+			–
Three-phase transformers	AC-6a	+	+	+		–
Three-phase capacitors	AC-6b	+	+	+		+++
Auxiliary/control circuits	AC-12/14/15	–	–	–	–	–
Switching DC current DC						
Ohmic loads	DC-1	+	+	–	+	–
Shunt-wound/series-wound motors	DC-3/5	+	+	–	+	–
Auxiliary/control circuits	DC-12/13	–	–	–	–	–

You have the application – we have the SIRIUS contactor		4 pole		4/8 pole	1 pole
		3RT13 4 NO	3RT15 2 NO + 2 NC	3RH11/12/14 contactor relays	3RF2 semiconductor contactors / relays
Switching AC current AC					
Three-phase motors	– starting AC-2/3		++	–	*
	– jogging AC-4			–	*
	– heavy-duty starting	–	–	–	–
	– 1000 V	–	–	–	–
Ohmic loads	AC-1	++	+	–	++
Gas discharge/incandescent lamps	AC-5a/b	+	+	–	+
Three-phase transformers	AC-6a	–	–	–	–
Three-phase capacitors	AC-6b	–	–	–	–
Auxiliary/control circuits	AC-12/14/15	–	–	++	+
Switching DC current DC					
Ohmic loads	DC-1	+	+	–	–
Shunt-wound/series-wound motors	DC-3/5	+	+	–	–
Auxiliary/control circuits	DC-12/13	–	–	+	–

* on request

We have the right contactors:
you have a choice.



*3RF2 semiconductor contactors –
switching in noise-sensitive
environments*

Contactless switching: the semiconductor contactor

The SIRIUS range of contactors is sensibly complemented by the SIRIUS 3RF2 semiconductor contactors. SIRIUS SC is admirably suited for noise-sensitive environments such as hospitals and hotels, as well as industrial applications that require fast and frequent switching. These devices are especially compact; have integrated heat-sinks, require no maintenance, and have an almost unlimited service life.

OVERVIEW

Coordination type:

This describes the state of a switchgear combination (motor starter) during and after the test with the conditional-rated short-circuit current. For both coordination types, neither personnel nor plant parts and components are endangered.

Coordination type "1":

- After the short-circuit condition, the equipment does not have to be suitable for further service, and
- It is possible that the starter is damaged.

Coordination type "2":

- The starter can still be used, and
- It is not possible that the starter is damaged with the exception of slight welding of the contacts, if these can be easily separated without causing any significant deformation.

Contact erosion:

This is the loss of contact material caused by arcing when electrical current is switched. The thickness of the contact material is reduced through evaporation and splashing of the material. Important factors which influence contact erosion are the type and nature of the contact material, the current density, the phase angle of the current during contact separation, the velocity with which the contacts move apart, as well as the heat dissipation and the thermal capacity of the contact elements.

Endurance:

The duration for which a switching device operates reliably under normal, specified, operating conditions: The service life is generally expressed as the number of operating cycles. A distinction is made between mechanical endurance and electrical endurance (contact life). The end of the electrical endurance is reached when the contact material of the contacts (contact tips) is used up to such an extent that reliable making and breaking operation is no longer guaranteed. The mechanical endurance of a switching device is specified by the manufacturer as the number of operating cycles the switching device can be expected to carry out, without load, without parts having to be repaired or replaced. The mechanical endurance can be negatively influenced, for example, by harsh environments (e.g. abrasive dust), incorrect maintenance procedures, incorrect control supply voltages, or impermissible mounting positions.

Here are the essential utilization categories for contactors:

Utilization category for AC voltages, contactors					
AC	Typical application	Switching capacity making I/I_e breaking I/I_e		Endurance, electrical making I/I_e breaking I/I_e	
AC-1	Non-inductive or weakly inductive loads, resistance ovens	1.5	1.5	1	1
AC-2	Slipring rotor motors: Starting, stopping	4	4	2.5	2.5
AC-3	Squirrel-cage induction motors: Starting, powering-down while running	10	8	6	1
AC-4	Squirrel-cage induction motors: Starting, plug braking or reversing, jogging	12	10	6	6
Utilization categories, test conditions for AC voltages					
Utilization category for AC voltage contactor relays and auxiliary contacts					
AC	Typical application	Switching capacity making I/I_e		Switching capacity breaking I/I_e	
AC-12	Controlling ohmic and semiconductor loads in the input circuits of optocouplers	1		1	
AC-14	Controlling small electro-magnetic loads (max. 72 VA)	6		1	
AC-15	Controlling electro-magnetic loads (greater than 72 VA)	10		1	
Utilization categories, test conditions for AC voltage					
Utilization category for DC voltages, contactors					
DC	Typical application	Switching capacity making / breaking I/I_e		L/R (ms)	
DC-1	Non-inductive or weakly inductive load, resistance ovens	1.5		1	
DC-3	Shunt-wound motors: Starting, plug braking, reversing, jogging	4		2.5	
DC-5	Series-wound motors: Starting, plug braking, reversing, jogging	4		15	
Utilization categories, test conditions for DC voltages					
Utilization category for DC voltage, contactor relays and auxiliary contact elements					
DC	Typical application	Switching capacity making / breaking I/I_e		L/R (ms)	
DC-12	Controlling ohmic loads and semiconductor loads in the input circuits of optocouplers	1		1	
DC-13	Controlling solenoids	1		300	
Utilization categories, test conditions for DC voltage					

SIRIUS and open questions: definitions and explanations.

Heavy-duty starting:

If a motor requires more than approximately 10 to 15 seconds to reach its rated speed due to the load characteristics, then this represents heavy-duty starting. With heavy-duty starting, the opposing load torque is greater during starting than in rated operation. It takes a considerable time to reach the rated speed, as high moments of inertia have to be accelerated, e.g. for rolling mills and centrifuges. Special overload relays or thermistor motor protection devices are required to protect motors that are used to accelerate high inertia loads.

Operating voltage tolerance:

The range within which the operating voltage may deviate from the rated control supply voltage without influencing the operational reliability of the switching device (for example, a contactor).

Positively driven contacts:

Positively driven contacts are such that normally open (NO) and normally closed (NC) contacts can never be closed at the same time. If an NO contact which is welded does not return to its initial state, then it is not permissible that the NC contact closes. This means that incorrect behavior can be detected.

Rated control supply voltage V_s :

This is the voltage at the control circuit input connections of a switching device. It may differ from the rated control supply voltage, owing to the presence of transformers or resistors in the control circuit.

Safe separation:

Safe separation designates a special mechanical design measure, for example, reinforced or double insulation which safely and reliably prevents voltage transfer from one circuit at a hazardous voltage to another, e.g. a circuit with a safe extra-low voltage. Safe separation is specifically used between all of the main and auxiliary circuits of switching devices.

Starting:

Rotating movement from standstill up to the rated speed. A pre-condition for successful motor starting is that the torque of the drive motor is higher than the load torque of the driven machine at all speeds.

Switching contact endurance:

This is the number of operating cycles that a set of contacts can achieve under specified electrical and/or mechanical load conditions. The switching contact endurance is reached, for example, if the volume or the thickness of the switching contact material at the contact tips is reduced as a result of contact erosion, so that the material on which the contacts are mounted is exposed, and the risk of contact welding is extremely high. Switching contacts are also subject to mechanical wear, so that the switching contact endurance is itself limited if the switching contact erosion is extremely low due to electric load. If, for example, the contactor load is known, it is possible to predict the expected switching contact endurance from diagrams. Of course, the validity of predictions such as these depends very heavily on whether short-circuits or unexpected overcurrents occur.

Utilization category:

The utilisation category defines the intended application and the stressing of the switching device. It involves the combination of requirements defined in the equipment regulations and Standards (e.g. JEC 60 947, DIN EN 60 947, VDE 0660) which essentially correspond to a group of practical applications. The utilization category is characterized by:

- Values of making and breaking currents expressed as multiples of the rated operational current,
- Values of the voltage expressed as multiples of the rated operational voltage (rated voltage),
- Values of the power factor $\cos \varphi$ or time constant.

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