

The Earth is waking  
to a new day.  
**Starting with SIRIUS.**



# sirius

# START

**SIEMENS**

*The Earth slowly moves out of the moon's shadow.*



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As the Earth quietly slips past the moon, a new



day is dawning. It's the way you want things



to start. The optimum load feeder is available



in the SIRIUS system for every start, so that



every wish becomes reality. And it will be.

*Spiral galaxies, as here M100 in the Virgo constellation, comprise cooler, older stars at the center, while young hot stars colonize it some considerable distance away*





Our solar system is unique,  
flexible, and stable.

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

*SIRIUS 3RW30: Smoothly start conveyor belts, minimize wear, and extend maintenance intervals*

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

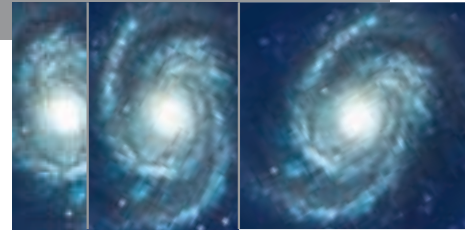
It is quite obvious that people are enthusiastic about the technology of the modular SIRIUS system. However, a glance into a cabinet is also extremely appealing. Outstanding ergonomics, excellent optical design and finish ensure a transparent image – which is reflected in the fact that the SIRIUS series 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 (500 HP/ 600 V) 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.



PRODUCT  
DESIGN AWARD



**When it involves starting:  
the question of the load feeder**

If you think about starting motors, then you quickly get down to the basics about load feeders. Load feeders are a combination of protective element (circuit-breaker, fuse, etc.) and switching element (contactor). Such a combination is used to protect and switch loads. Loads include all types of electrical equipment and devices such as lights, heating systems, motors, etc., which draw current from the line supply. The discussion will now focus on motor starting, and in most cases, it is three-phase motors that are being switched.

*Classic application:  
A load feeder with soft  
starter ensures smooth  
escalator operation.*

**Many possibilities, one objective: the motor runs**

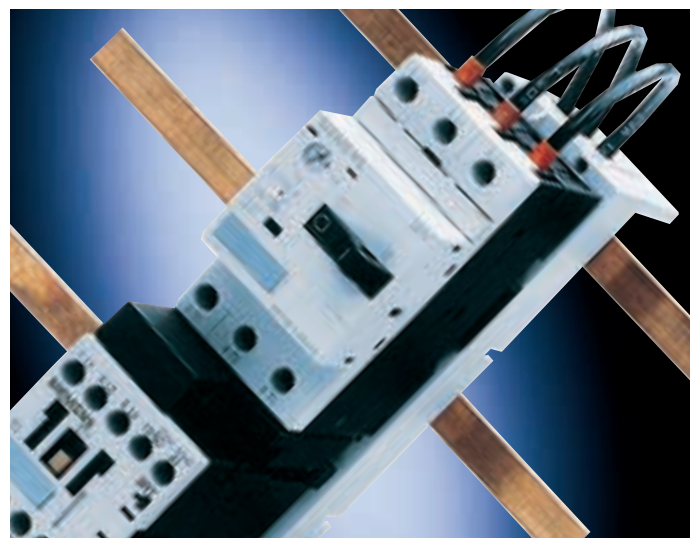
The range of possibilities that are available to start a motor is as numerous as the requirements in the field. For example, certain applications may require a high breakaway torque or smooth, jerk-free starting. However, power supply companies also specify their conditions to companies that operate plants. For instance, as power needs increase, a load cannot be directly connected to the line supply, and the current has to be limited in order to reduce the stress on the public utility.

The SIRIUS system offers the optimum solution for every requirement encountered in practice. All types of starting can be easily and reliably implemented with switching and protective devices, which are harmonized with one another and which are complemented by a full range of accessories.

**A question of philosophy:  
with fuses or without**

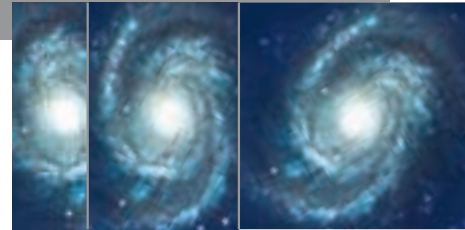
When it comes to load feeders, a fundamental question arises as to whether they should have fuses or no fuses. The SIRIUS system allows fuseless combinations to be configured using circuit-breakers\* and contactors, or with fuses using contactors and overload relays.

*\*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.*

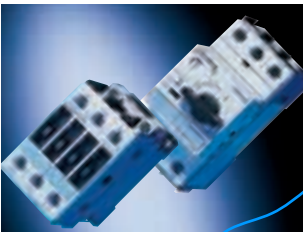




... which proves itself when **starting**




The advantages of the SIRIUS system are quite clear. The wide range of uses for three-phase motors demands flexible ways of starting – adapted to the particular application. The features of the SIRIUS system fulfill these special requirements when starting motors.



*The user has the choice: Load feeders which are wired-up and ready for use, or those which can be assembled.*

*In 1997, the Hale-Bopp comet could be seen with the naked eye when it came quite close to Earth.*





The only question that remains –  
just how to **start** ...



*Operation in practice is the most important issue. SIRIUS starter combinations offer the optimum solution.*

### **Straight to the point: the direct online starter**

A simple starter configuration comprising circuit-breaker and contactor without starting steps or soft starting is the right solution for motors in pump, saw, and similar applications. However, this also applies to large motors; for example, amusement rides and rolling mills can be directly started with SIRIUS. A direct online start is characterized by the high motor starting torque. SIRIUS completely covers the power range from 0.06 to 250 kW at 400 V (1/4 to 500 HP at 600 V).

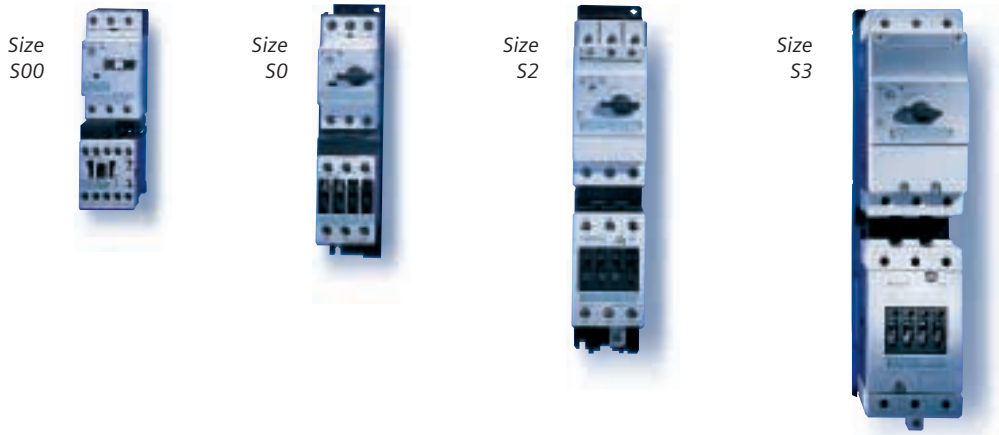
### **Interchanged phases: the reversing starter**

Clockwise or counter-clockwise – our reversing combinations allow a motor to be operated with two directions of rotation. This combination comprises two standard contactors where the phases are interchanged. If you wish to assemble the combination yourself, the contactors can be quickly, simply, and reliably wired-up and mechanically interlocked using the appropriate link and interlocking modules from the modular SIRIUS system. The starting characteristics are the same as those of a direct online starter. In conjunction with the appropriate protective elements, just like the direct online starter, space-saving and compact load feeders can be assembled, both with fuses and without fuses.

### **Two stages - one start: the star-delta starter**

Three standard contactors and a time relay are used for star-delta combinations. The combinations are pre-assembled and tested for both AC and DC operation. The modular SIRIUS system has the matching overload relays and circuit-breakers to optimally protect your motor. These starters are especially suitable for starting fans, pumps, and compressors.





**Direct starting** – using a **reversing starter** or a **star-delta combination?**



The SIRIUS system also offers a wide range of starting possibilities.

From the basic direct online starter, through the star-delta starter, up

to the soft starter, the optimum starter solution is available for every

requirement encountered in the field.

## Some basic information

### What happens when the motor is started directly online?



Direct online starting is the most frequently used motor-starting method and is the most favorably priced. Just as the name suggests, the full line supply voltage is immediately connected to the motor windings. The motor does not immediately start to spin, which means that the stator windings represent a short-circuit which is only limited by the ohmic component of the winding. This is the reason why the current quickly increases to between 6x and 8x the rated current. The current also defines the torque, which in turn means an extremely high break-away torque. This is the reason that this type of starter is especially suitable for applications such as mills and crushers. The direct online starter is also of interest due to its basic design, which has a positive impact on the cost.

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### What distinguishes a reversing starter?

A reversing starter is essentially the same as a direct online starter. Two contactors, which interchange two phases, are used to change over between the two directions of rotation. This results in the clockwise and counter-clockwise directions of rotation. The contactors are generally electrically and mechanically interlocked using a supplementary block, so that a short-circuit cannot occur if this combination is incorrectly controlled. If one contactor is energized, then the other cannot switch.

### How does a star-delta starter function?

A star-delta starter is used for applications where it is important to have a reduced starting torque. This type of starter is configured using a combination of three contactors – the line contactor, the delta and the star contactor, as well as time

relay. In the first stage, the motor windings are switched into a star circuit configuration. The starting current which flows is a factor of 0.33 less than when starting directly online. After a defined changeover time (this lies between one and several seconds), the time relay switches the motor into a delta circuit configuration. This changeover time is selected so that the motor has already reached 90 percent of its rated speed in the star circuit configuration. This type of starting reduces the stress on the motor and reduces the starting current.

### When is a soft starter necessary?

A soft starter is always required if the starting behavior of a three-phase asynchronous motor represents an operational risk. Current spikes caused by direct online or star-delta starting can result in operational disturbances. A soft starter is the solution in such cases.

### What types of load feeders are there?

In addition to mechanically switching the load using contactors, these two components must also be protected against overload and short-circuit. Depending on how the short-circuit protection is implemented, a differentiation is made between fused and fuseless load feeders. For fused load feeders, the fuses provide short-circuit protection for the devices in the feeder and the load. An overload relay is used to provide overload protection. For fuseless load feeders, a 3RV10 circuit-breaker for motor protection is responsible for these two protective functions (overload and short-circuit protection) for the devices in the feeder and the load. In addition to this circuit-breaker, there is also the 3RV13 circuit-breaker for starter protection. This can be used instead of a fuse and only provides short-circuit protection for the devices in the feeder and the load. In this case, an overload relay must be used for overload protection.

### The classic approach: with fuses

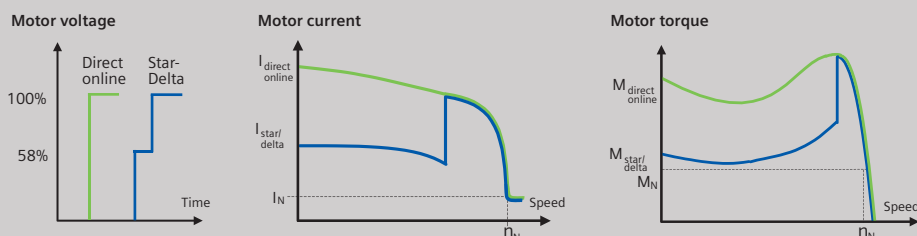
The classic configuration of the fused load feeder still dominates in some regions of the world (e.g. NAFTA, Latin America and Southeast Asia) and also in some industry sectors (e.g. the chemical industry). This is especially true where motors have long starting times, high line supply voltages are involved, or a cost-effective solution is required. Motors driving heavy loads (e.g. large fans and mixers) sometimes require longer than 20 seconds to reach their rated speed. These long starting times are only possible when using a special overload relay (e.g. our 3RB1 solid-state overload relay), which has an appropriately high tripping class (e.g. class 30). On the other hand, tripping class 10 can be covered by standard circuit-breakers for motor protection, and therefore is a fuseless design. Fused load feeders still offer numerous advantages at high line supply voltages (e.g. 690 V) when compared to fuseless load feeders. In this case, the fused load feeder provides optimum protection against overload conditions and short-circuits.

Fused load feeders can also be interesting from an economic perspective. Frequently, the price of a fused load feeder is lower. Our solid-state overload relays also offer cost-saving potential: with a power loss of 0.05 Watt they enormously reduce the energy consumption and in so doing reduce the temperature rise in the cabinet; the number of versions is minimized as a result of the wide setting range of 1:4 – which has an extremely positive impact when it comes to engineering and stock inventory.

### Solution for the future: fuseless

Contrary to the classic design with fuses, for most applications with standard starting conditions, the fuseless load feeder is the leading-edge alternative. This is becoming more common, especially in Europe. This is due to its compact design. Using the appropriate connection blocks, mounting rails and busbar adapters, complete feeders to switch and protect your loads can be simply implemented from standard components – 3RV10 circuit-breakers for motor protection, which provide the short-circuit and overload protection, and 3RT1 contactors to switch loads. These load feeders can also be supplied as complete units - 3RA11 for direct online starters and 3RA12 for reversing starters.

## A comparison of starting methods



# Technology in detail: SIRIUS load feeders.

## Load feeder versions



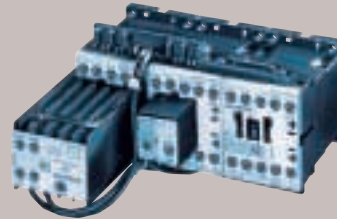
### Direct online starter

*The optimum starter combination for all motors, example, Size S0*



### Reversing starter

*The right combination for reversing duty*



### Star-delta combination

*The solution for staged motor run-up*

## Fuseless heavy-duty starting

If, on the other hand, you are looking for a fuseless solution for heavy-duty starting conditions (e.g. with tripping class 30), then the right choice is a 3RV13 circuit-breaker for starter protection and the 3RB1 solid-state overload relay. With this configuration, you can also enjoy the other advantages of solid-state overload relays.

## The SIRIUS system

As these few examples show, we can offer you almost unlimited possibilities to configure load feeders using standard devices: Direct online starter, reversing starter, and star-delta starter – both fused and fuseless. We will present another interesting alternative from Page 20: Soft starting - a real highlight. The "Protect" brochure provides you with detailed information about the many ways of protecting your loads. The "Switch" brochure gives you a detailed overview on this subject.

## Some detailed information

### What does coordination type mean?

The load feeders are classified in two coordination types in compliance with DIN VDE 0660 Part 102/IEC 947-4-1.

### Coordination type 1

In this case, fuseless load feeders must be able to interrupt a short-circuit without representing a hazard to personnel and the plant. It is possible that the load feeder does not function after such a short-circuit has been interrupted. It is

also acceptable that the contactor or overload release is damaged.

### Coordination type 2

For co-ordination type 2, the short-circuit must be interrupted without representing a hazard to personnel and the plant. The load feeders must still continue to function. However, it is permissible that the contactor contacts weld, as long as they can be easily separated again without resulting in mechanical deformation.

### What is the short-circuit breaking capacity of SIRIUS components?

The SIRIUS combinations have an excellent short-circuit breaking capacity and that over the complete power range up to 45 kW. A short-circuit breaking capacity of 100 kA is achieved - and in the lower power range up to 5.5 kW, even 130 kA.

## Some special information

### Are the load feeders available with communications technology?

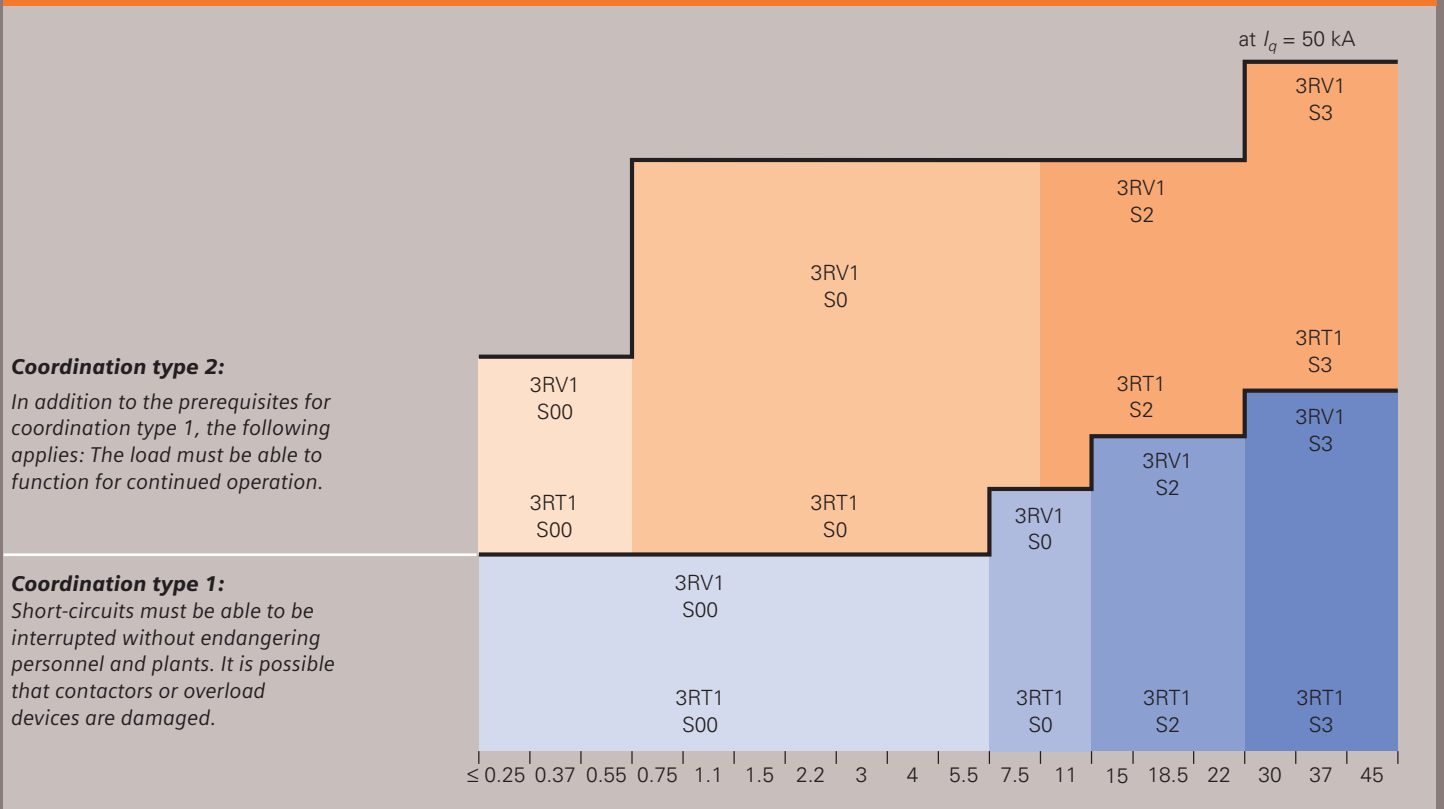
The subject of communications for switchgear and switching devices is becoming increasingly important. This is reflected in the fact that load feeders are available with a communications interface. The pre-wired 3RA5 load feeder is such a communications-capable starter solution. The load feeder is equipped with an AS-Interface connection, which means that it can be easily linked to higher-level automation systems. The 3RA5 AS-Interface load feeders are pre-assembled up to 7.5 kW (15 HP).

DETAIL

This table provides information about the power ranges of the load feeders and which co-ordination types are available.

**Fuseless load feeders up to 100 A with coordination types**

Type	3RA11	3RA11	3RA11	3RA11
				
<b>Size</b>	<b>S00</b>	<b>S0</b>	<b>S2</b>	<b>S3</b>
<b>Coordination type 1</b>	0.06 kW–5.5 kW	0.06 kW–11 kW	11 kW–22 kW	22 kW–45 kW
<b>Coordination type 2</b>	0.06 kW–0.75 kW	0.06 kW–7.5 kW	11 kW–22 kW	30 kW–45 kW





# Technology in detail: SIRIUS load feeders.



## What are the many advantages of 3RA7 load feeders with integrated safety technology?

The advantages of the modular SIRIUS system are ideally teamed-up with electronic safety technology. A complete, pre-assembled and wired, certified load feeder with integrated safety technology, coordination type 2 is obtained using a circuit-breaker and two contactors connected in series. Depending on the type of safety electronics, these load feeders achieve Category 3 or 4 according to EN 954-1.



Load feeders, Category 3, represent a simple, favorably-priced solution. They distinguish themselves as a result of the high switching capacity of the contactors, which, in addition to the AC-3 switching capacity of 25 A, can also switch DC-1 current up to 35 A. This means that motors and larger valves can be switched at a favorable cost. Extended functions, such as operational switching, the ability to be expanded, and cascading are covered by load feeders, Category 4, in accordance with EN-954-1.

## Applications

For small processing and finishing machines with only one motor, for example a milling machine, the safe load feeder combines the functions of a motor starter with that of an EMERGENCY OFF circuit. The circuit-breaker

protects the motor against overload and short-circuits, and the operating personnel are protected as a result of the EMERGENCY OFF functionality. If several motors are being used, e.g. for panel saws, then several safe load feeders can be used in a **group**. These are then actuated from one EMERGENCY OFF switch in a group circuit. The safe signal is transferred from the first safe load feeder to the next. Safety logic functions can be quickly and simply configured by cascading and expanding. The flexibility at the machine is increased. The wiring costs are reduced to a minimum as a result of the "single conductor connection." The result – significantly less time and lower costs. This load feeder has integrated operational switching functionality in order to permit optimum protection as well as optimum switching.

## How can motors be simply switched locally?



The 3RE encapsulated motor starters from the SIRIUS range offer user-friendly ways of locally switching and protecting motors. A contactor and a thermal or solid-state overload relay are accommodated in an enclosure with ON and OFF buttons. Simple machines, such as drills, construction, and sewing machines, and pumps, are switched using such a combination. The starter is protected against dust and splashing water (degree of protection IP65).

The starters are supplied from the factory with a completely connected contactor. Customers can then simply mount the matching SIRIUS overload relay. The variance can be significantly reduced as the overload relay can be separately mounted; and, because the range up to 22 kW (50 HP) can be covered by eight basic versions, stock inventory costs can also be reduced. In addition to its high level of cost-effectiveness, the 3RE starter has large metric cable glands, it is extremely easy to mount, and it complies with all of the relevant requirements as a result of its ergonomic and natural design.

DETAIL



*Nebulas, as shown here in the reflection nebula NGC 1973/75-76 in the Orion constellation, can in some cases be spotted with the naked eye, and in other cases, with binoculars.*



**100 million** years will pass by  
before this nebula becomes a star.



*The narrow SIRIUS soft starter:  
it works with solid-state overload  
relays and circuit-breakers.*

Size  
S00



Size  
S0



Size  
S2



Size  
S3



Even though you don't want to give your motor five billion years to start, in many cases, direct online starting is not the best solution.

Flexibility and adaptability to local conditions provide the decisive advantage. A soft start can be realized using the 3RW 30/31 SIRIUS soft starters, sizes S00 to S3.

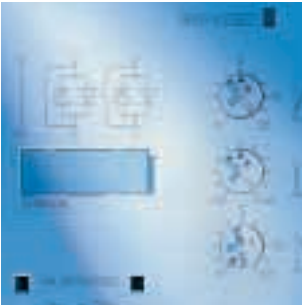
### Easy does it: soft starters

Using the SIRIUS 3RW30/31 soft starters, motor starting and stopping times can be set. Stress on the electric motors is reduced as a result of the soft starting. Starting torque is reduced and the power supply is protected against dangerous current spikes as a lower current is drawn when starting. Soft stopping avoids line supply interruptions when the motor regenerates into the line supply.

The soft starter from the modular SIRIUS system distinguishes itself as a result of its narrow design and the fact that it can be combined with circuit-breakers and solid-state overload relays. The starters, which can be accurately set using a potentiometer, are available in sizes S00 to S3. A special version for pole-changing motors is available in size S0. Just like all SIRIUS devices, the 3RW30/31 soft starter is suitable for side-by-side mounting up to 60°C. Furthermore, circuits can be easily engineered and the devices quickly mounted. A wide range of accessories is also available.

The advantages of SIRIUS soft starters can be put to full use in any area where a star-delta starter was previously used: for example, conveyor belts, compressors, grinding machines, saws, textile machines, mixers, and many more.

Motors with a rated current up to 3 A can be controlled using a special version that is just 22.5 mm wide.



Our **soft starters** don't give motors that much starting time.



Overview of the sizes				
Type	3RW301	3RW302	3RW303	3RW304
				
Size	S00	S0	S2	S3
<b>Control electronics</b>				
Rated control supply voltage V	UC 110–230 or UC 24	UC 110–230 or UC 24	UC 110–230 or UC 24	UC 110–230 or UC 24
Rated frequency Hz	50/60	50/60	50/60	50/60
<b>Power electronics</b>				
Rated operational voltage V	AC 200–460 or 460–575	AC 200–460 or 460–575	AC 200–460 or 460–575	AC 200–460 or 460–575
Rated frequency Hz	50/60	50/60	50/60	50/60
Rated operational current I <sub>e</sub> (AC 53b acc. to IEC)				
at 40° C A	6/9	12,5/16/25	32/38/45	63/75/100
at 50° C A	5/8	11/14/21	27/32/38	54/64/85
at 60° C A	4/7	9/12/18	23/27/32	46/54/72
Permissible ambient temperature °C	–25...+60	–25...+60	–25...+60	–25...+60

## Some basic information

### What is the basic principle of a soft starter?

Mechanical stress as well as line supply voltage dips are avoided by limiting the starting current and starting torque. The motor voltage is reduced and the starting voltage is increased up to the line supply voltage within a selectable starting time using phase control. Soft starting and stopping guarantee minimum stressing on the plant and smooth production operations.

### Are there any other ways of softly starting a motor?

A motor can also be softly started using an AC converter. However, an AC converter is only practical if the motor speed is to be varied after starting.

## Some detailed information

### How are the parameters set at the soft starter?

The starting time, starting voltage and stopping time are selected using three potentiometers. The ramp time can be especially finely adjusted over the usual setting range.

## Some special information

### Can a soft starter be mounted in any position?

By simply snapping a fan into the soft starter enclosure, the starter can be mounted in almost any position.

### Is an external bypass contactor required?



Integrated bypass contacts mean that an external bypass contactor is no longer required. This effectively minimizes the power semiconductor losses.

# Technology in detail: **soft starting** with SIRIUS.

## The soft starter



### Status LEDs

Two LEDs provide information about the actual operating condition.

### Potentiometer 1 from 0-20 seconds

This potentiometer sets the starting ramp time. The time can be precisely set between 0 and 20 seconds over the wide progressive setting range.

### Potentiometer 2 min-max

The starting voltage is pre-selected in a range between 40 and 100 percent  $V_N$ . Even direct online starting is possible.

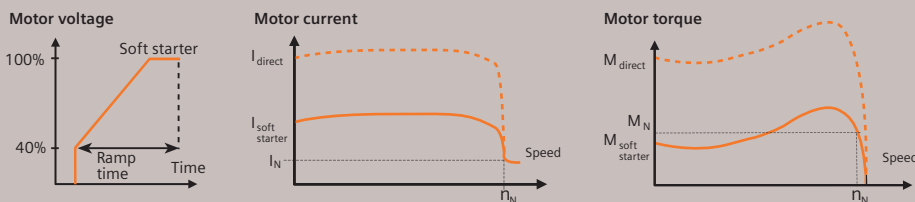
### Potentiometer 3 from 0-20 seconds

The stopping time is set here; for 3RW31 devices, the second starting ramp time is set here.

### Contacts

The operating states "Self-latching" and "End of starting" can be signaled using two auxiliary contacts.

## Voltage, current and torque



### What are the other special features of the 3RW3 soft starter?

Sizes S0 to S3 are equipped with integrated auxiliary contacts for "Self-latching" and "End of starting" for simple and user-friendly control.

DETAIL

*The Swift-Tuttle comet can almost be considered modest with its orbiting time of 130 years. Hyakutake requires 14,000 years for one orbit – and theoretically there could be comets out there that take one million years to orbit the sun.*







High **velocities**,  
brilliant **acceleration levels**,  
and meteoric **orbits** –  
these are abundant in space.

<b>Device type</b>	SIRIUS 3RW30/31	3RA5 SIRIUS AS-i module load feeders	3RA11/3RA12 load feeders	3RA13 reversing starter	3RA14 star-delta starter
Main Order No.	3RW30/31	3RA5	3RA1	3RA13	3RA14
Width (mm)	45/55/70	45	45/55/70	90–320	135–550
Sizes	S00–S3	S00–S0	S00–S3	S00–S3	S00–S3
AC	yes	yes	yes	yes	yes
DC	yes	yes	yes	yes	yes
Power range	3-55 kW (3-100 HP)	0.06-7.5 kW (1/4-10 HP)	0.06-45 kW (1/4-75 HP)	3-45 kW (3-75 HP)	5-75 kW (5-125 HP)
Cage Clamp	no	yes	partially	yes	yes
AS-i, PLC	optional	yes	optional	optional	optional
Application examples	Mixers, escalators, transport systems, fans, reciprocating pumps, centrifugal pumps	Drives for metal and woodworking machines; machine tools; packaging machines; machines for the food and beverage industry; conveyor systems and cranes; air systems, pumps; compressors; rubber and plastic machines			Pumps, fans, compressors
Examples of requirement profiles	Soft starting and soft stopping for three-phase asynchronous motors with approx. outputs at 400 V: Up to 55 kW, also controlling Dahlander motors	Powering three-phase motors up and down with a high number of operating cycles.			Staged acceleration of three-phase asynchronous motors with an approx. output at 400 V: Up to 758 kW, 800 kW, with fuses
Advantages and special features	Continuous, jerk-free soft starting and stopping using only one device with the smallest dimensions; limiting the starting currents and the motor starting torque, no speed steps, no transient current spikes; also Dahlander versions; starter combinations can be quickly assembled (SIRIUS 3R), maintenance-free	Simple starter assembly; electrical isolation; insensitive to EMC; based on conventional technology, established world-wide; lower service/maintenance costs as a result of the high mechanical and electrical endurance  3RA5 up to 7.5 kW (10 HP) pre-assembled	3RA11 up to 22 kW (40 HP); 3RA12 up to 11 kW (15 HP) pre-assembled	3RA13 up to 45 kW (75 HP) pre-assembled	Reduced starting torque and starting current, can be realized at an especially favorable price, cost-saving assembly with SIRIUS 3R standard components and their accessories.

# Only Siemens has the right starter: you have the choice.

MICROMASTER	Masterdrives	ECOFAST	SIRIUS NET
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Heating ventilation and cooling systems	Machines for man-made fibers, foils, glass fiber, glass and cable production, paper machines, cranes, elevators for personnel, injection moulding machines, packaging machines, rubber kneaders, mixers, industrial ovens, rolling mills, marine drives, etc.	Distributed conveyor-related systems for the automobile industry, logistics, food and beverage industry, linking conveyor systems for production machines	Drives in conveyor-related systems for the automobile industry, logistics, food and beverage industry, as well as in production and machine tools. And wherever the highest level of availability is decisive.
Variable speed in the output range 0.12 kW to 250 kW for fans, pumps; high control accuracy; energy-saving operation; low-noise operation	Variable speed for standard, trans-standard and servomotors for drive outputs between 0.55 kW and 6000 kW, highest control precision and dynamic response, speed stability under changing load conditions, highest positioning accuracy, single and multi-motor drives, energy feedback. Compensates brief line supply failures and low harmonics operation using Active Front End	Powering-up and down, reversing operation, soft starting and stopping, several velocities, e.g. rapid traverse-crawl, any speed, switching, controlling and protecting three-phase/g geared motors up to approx. 5.5 kW, data acquisition using sensor systems and controlling actuators	Powering-up and down, reversing operation, direct starting, ramp functions, protecting and switching three-phase motors up to 7.5 kW, data acquisition using sensor systems and controlling actuators. Safe motor shutdown. Fast communications at all levels.
	MASTERDRIVES drives are simply integrated into the Siemens automation environment. Simple coupling via PROFIBUS. Fast commissioning and diagnostics	System-based solution for cabinetless distributed architecture for completely equipping machines and plants with automation and drive components, directly mounted in the machine as a result of rugged devices with degree of protection IP65, unified standardized plug-in connection system for communications and energy, switching devices for PROFIBUS-DP and AS-interface with integrated switching and protective functions, comprehensive diagnostic functions as well as integrated digital inputs	Finely modular design allows pre-commissioning, pre-wired complete devices using SIRIUS standard components reduce the amount of cabling, can be easily replaced even under voltage, increased availability as a result of previously unknown level of diagnostic functions, can be remotely parameterized, current limit evaluation, differentiation between short-circuit and overload, integrated safety technology up to Category 4 (EN 954-1), self-configuring energy bus, IP20 for the cabinet up to IP65 for direct mounting on the machine
			*Different device blocks on request

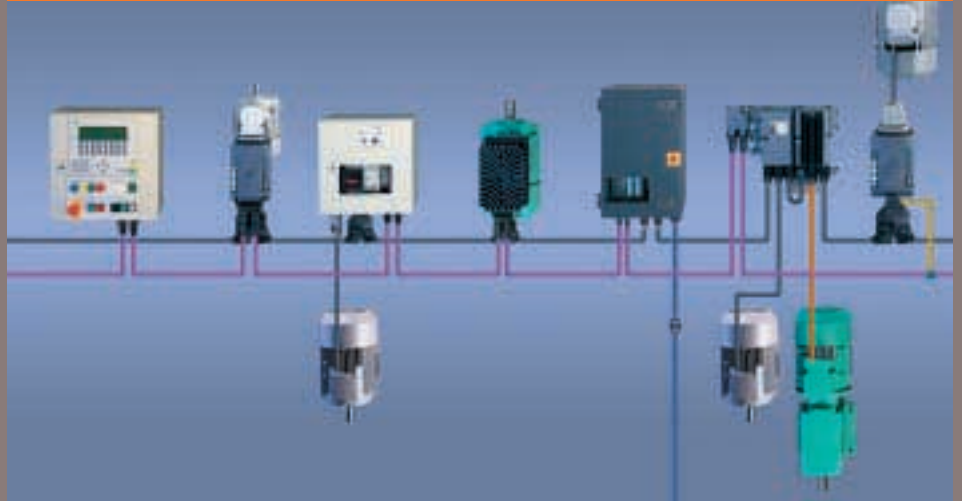
OVERVIEW



## Additional soft starters to complement the SIRIUS system

In addition to the SIRIUS soft starters, Siemens also offers a series of other soft starters which can be easily combined with the SIRIUS components. Every application area can be covered using the SIKOSTART 3RW34, SIKOSTART 3RW22, SIMATIC ET 200S, the above-mentioned SIMOSTART MV soft starters, and ECOFAST. You can obtain an overview of the wide range of soft starter solutions in our brochure, "Naturally-soft starting, soft starter."

## ECOFAST - everything in one system



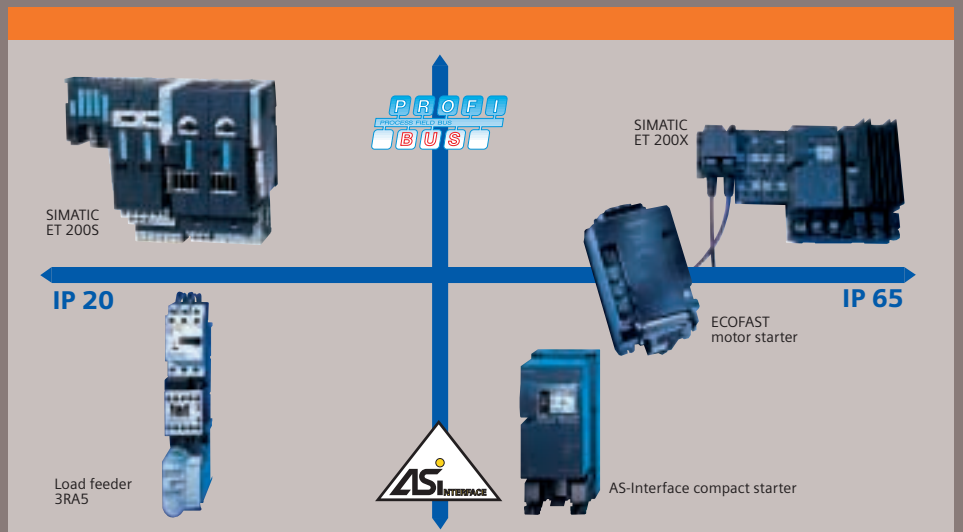
## ECOFAST

ECOFAST (Energy and Communication Field Installation System) is an open system solution in the innovative area of cabinetless distributed architecture – a complete solution with a standardized connection system for data and energy. This is installed directly at the machine and reduces engineering times, cabling costs installation, and commissioning times – thereby ensuring a higher plant availability as a result of shorter service times.

In addition to communications via PROFIBUS DP and AS-Interface, with the ECOFAST system, the energy for the loads is also fed through an energy bus in a line-type topology.

## SIRIUS NET motor starter for AS-Interface and PROFIBUS

Today, mechatronics is more than just a buzzword, as distributed plant structures have, in the meantime, firmly established themselves. The ability to directly integrate



## SIRIUS and then: **Leading-edge add-ons.**

the switching devices, and not just having distributed I/O, is of considerable interest. This calls for new innovative concepts – such as the communication-capable SIRIUS NET motor starter. This makes it easy for you to permanently reduce your planning and production times. Being able to pre-commission modular units in the factory gives you that undeniable competitive edge: not a problem when SIRIUS NET motor starters are used – and communication-capable motor starters reduce the wiring costs by up to 80 percent! They are ideal for small, flexible electrical enclosures mounted directly on or in the machine – or cabinetless concepts, completely pre-assembled. Furthermore, they offer a host of diagnostic functions, which enhance the availability and ensure simple service and maintenance. A wide range of communication-capable motor starters fulfills all of the requirements from the field: AS-Interface for the actuator-sensor level, PROFIBUS for the field level, degree of protection IP20 for the distributed electrical cabinet, up to IP65 for direct mounting on the machine, contactor with electrical isolation, and soft starters for sophisticated actuators.

### **MICROMASTER**

**Strong communication skills with many benefits: the standard MICROMASTER family of drive converters.**

MICROMASTER AC drive converters are the product of an innovative and modular design. From the very beginning, they distinguish themselves thanks to their easy handling and their simple mounting and installation.

They cover the power range between 0.12 kW and 250 kW and have a high degree of availability and safety. In addition to being easy to operate, this family of AC drive converters is also simple to engineer, and it has many integrated safety functions.

MICROMASTER is in compliance with international standards (CE, UL, cUL, c-tick) and also fulfills product testing procedures (ISO 9001, EFQM Business Excellence). For the MICROMASTER AC drive converters, we can offer you short delivery times and excellent communication capability (PROFIBUS DP Interface and Engineering Software). Furthermore, they are fully compatible with "Totally Integrated Automation" and offer pulse encoder evaluation for high precision velocity control. The advantages speak for themselves.



# PROSPECTS

## SIMOVERT MASTERDRIVES AC drive converters

The MASTERDRIVES series of AC drive converters is designed for continuous processes and cyclic machines with a high dynamic performance. These AC drive converters distinguish themselves thanks to straightforward engineering, high system reliability, and excellent functionality and modularity.

### The drive solution for sophisticated continuous processes

With the unique and integrated MASTERDRIVES Vector Control (VC), Siemens has an AC drive converter with an output range from 0.55 kW to 6,000 kW. It utilizes one control principle, one parameter and operator control concept. One engineering tool (Drive ES) is sufficient for the process control level through the automation level down to the drive. The perfect modular system allows it be universally used for all voltages up to 690 V, which makes it second to none when it comes to control precision, reliability, and compactness with Vector Control Compact Plus.



Simple handling and transparent menu-prompting are the standard just the same as its communication capability, which allows it to be embedded in any automation solution. MASTERDRIVES Vector Control includes special functions. These include integrated intelligence, which ensures optimum machine concepts and high productivity, and Active Front End (AFE) to prevent harmonics being fed back into the line supply.

### Drive solutions for cyclic high-dynamic performance machines

Using Drive ES, MASTERDRIVES Motion Control (MC) AC drive converters can be just as simply integrated into the automation environment as MASTERDRIVES VC. It has a unified design from 0.55 kW to 250 kW and guarantees that series of drives can be optimally commissioned by using script files. Furthermore, it offers positioning, synchronous gearbox operation, and cam disk functionality in one drive unit. Positioning is already included in the standard version. Highest dynamic response and accuracy, with torque rise times down to 0.4 ms and an overload factor of 300 percent for 250 ms in the lower output range, are only some of the outstanding characteristics of MASTERDRIVES MC. With modular, plug-in option cards for encoder evaluation and the ability to simply connect pulse encoders, encoders, resolvers, and absolute value encoders, MASTERDRIVES is optimally equipped for easy use in the field. These AC drive converters have a smart servo drive, thanks to integrated intelligence and a clock-cycle synchronous PROFIBUS for axis synchronization. In fact, using SIMOLINK, up to 200 axes can be synchronized.

# SIRIUS and open questions: definitions and explanations.

## **Bypass contacts:**

For the 3RW30 soft starter, after the motor has run-up, the thyristor is internally bypassed. This therefore eliminates the thyristor power losses which normally occur. This means that the power loss of a 3RW30/31 soft starter is only a few watts higher than a comparably-sized contactor.

## **Coordination type:**

This describes the state of a switchgear combination (motor starter) during and after the test with the conditional-rated short-circuit current.

## **Coordination type "1":**

May not represent a hazard to persons and plants, does not have to be immediately re-usable after the short-circuit, and it is possible that the starter is damaged.

## **Coordination type "2":**

May not represent a hazard to persons and plants, the switchgear combination can be still used, and the starter is not damaged, with the exception of welding of the contacts, if these can be easily separated without causing significant deformation.

## **Phase control:**

This is the principle of operation of a soft starter. During motor starting and stopping the line supply voltage is reduced using phase angle control. This in turn reduces the motor current and torque.

## **Ramp time:**

With the 3RW30/31 soft starter, the motor terminal voltage is increased from the selectable starting voltage up to the line supply voltage within the ramp time. For the 3RW30/31, this time is set between 0 and 20 seconds using a potentiometer located on the upper side of the housing.

## **Soft starter:**

For a soft starter, e.g. the 3RW30/31, the motor terminal voltage is reduced during starting and stopping using phase control. Thyristors are used to control the voltage phase. This voltage change reduces the motor starting current and motor torque. Current and torque peaks no longer occur. Soft starters can be used wherever direct starters or star-delta starters are used.

## **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.

## **Starting voltage:**

For the 3RW30/31 soft starter, the motor terminal voltage is increased from the starting voltage to the line supply voltage within the selectable ramp time. For the 3RW30/31, this time is set between 40 percent and 100 percent of the line supply voltage using a potentiometer located on the upper side of the housing.

## **Stopping time:**

For 3RW30/31 soft starters, motor terminal voltage is reduced from the line supply voltage to the selected starting voltage within the stopping time. For the 3RW30/31, this time is set between 0 and 20 seconds using a potentiometer located on the upper side of the housing.

GLOSSARY

## **Siemens AG**

Automation and Drives

Low Voltage Controls and Distribution

P.O. Box 32 40, D-91050 Erlangen

[www.siemens.com/sirius](http://www.siemens.com/sirius)

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