

Industrial Controls

Soft starters SIRIUS 3RW30 / 3RW40


Equipment Manual


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Legal information

Warning notice system

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

| |
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|  DANGER |
| indicates that death or severe personal injury will result if proper precautions are not taken. |

| |
|---|
|  WARNING |
| indicates that death or severe personal injury may result if proper precautions are not taken. |

| |
|--|
|  CAUTION |
| indicates that minor personal injury can result if proper precautions are not taken. |

| |
|--|
| NOTICE |
| indicates that property damage can result if proper precautions are not taken. |


If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

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

Proper use of Siemens products

Note the following:

| |
|--|
|  WARNING |
| Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed. |

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1.1 Important notes

Purpose of this manual

This manual contains fundamental information and practical tips for using SIRIUS soft starters. The SIRIUS 3RW30 and 3RW40 soft starters are electronic motor control devices that facilitate optimal starting and stopping three-phase induction motors. The manual describes all of the functions of the SIRIUS 3RW30 and 3RW40 soft starters.

Target group

This manual is intended for any user involved in

- Commissioning
- Servicing and maintenance
- Planning and configuring systems

Basic knowledge required

A general knowledge of the field of electrical engineering is required to understand this manual.

Scope of validity

The manual is valid for the SIRIUS 3RW30 and 3RW40 soft starters. It describes the components that are valid at the time of publication. SIEMENS reserves the right to include a Product Information for each new component, and for each component of a later version.

Standards and approvals

The SIRIUS 3RW30 and 3RW40 soft starters are based on the IEC/EN 60947-4-2 standard.

Disclaimer of liability

It is the responsibility of the manufacturer to ensure that a system or machine is functioning properly as a whole. SIEMENS AG, its regional offices, and associated companies (hereinafter referred to as "SIEMENS") cannot guarantee all the properties of a whole plant system or machine that has not been designed by SIEMENS.

Similarly, SIEMENS can assume no liability for recommendations that appear or are implied in the following description. No new guarantee, warranty, or liability claims beyond the scope of the SIEMENS general terms of supply are to be derived or inferred from the following description.

Orientation aids

The manual contains various features supporting quick access to specific information:

- At the beginning of the manual you will find a table of contents.
- A comprehensive index at the end of the manual allows quick access to information on specific subjects.

Selection data and ordering data

You can find additional information about soft starters on the Internet in the Industry Mall.

Here, you have access to

- Catalogs/brochures (<https://support.industry.siemens.com/cs/ww/en/ps/25247/cat>)
- Online configuration (<http://www.siemens.com/sirius/configurators>)

1.2 Additional documentation

Manuals/operating instructions

At this point, you will find further manuals and operating instructions that may be of interest to you for your automation system. They are available to download from the Internet free of charge. You can create your own individual system documentation in mySupport.

Manuals

- Manual - SIRIUS 3RW44 Soft Starter (<https://support.industry.siemens.com/cs/document/21772518>)
- Manual PROFINET communications module for SIRIUS 3RW44 soft starter (<https://support.industry.siemens.com/cs/document/85225796>)

Operating instructions

- SIRIUS 3RW301/302/303/304 soft starters (<https://support.industry.siemens.com/cs/document/26378636>)
- Semiconductor motor controllers (<https://support.industry.siemens.com/cs/document/9835687>)
- SIRIUS semiconductor motor controllers (<https://support.industry.siemens.com/cs/document/6015580>)
- SIRIUS 3RW405/407 soft starters (<https://support.industry.siemens.com/cs/document/19501475>)
- SIRIUS 3RW40 soft starters - Safety and commissioning instructions for hazardous areas (<https://support.industry.siemens.com/cs/document/22809303>)
- SIRIUS 3RW442/443/444/445/446 soft starters (<https://support.industry.siemens.com/cs/document/21189750>)

Note

The operating instructions are included in the scope of supply.

Interesting links

- FAQs on 3RW soft starters (<https://support.industry.siemens.com/cs/ww/de/ps/16212/faq>)
- Downloads relating to 3RW soft starters (<https://support.industry.siemens.com/cs/ww/de/ps/16212/dl>)
- Manuals in Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/de/ps/man>)
- Product support for STEP 7 (TIA Portal) (<https://support.industry.siemens.com/cs/ww/de/ps/14672>)
- More information on PROFINET (<https://www.siemens.com/global/de/home/produkte/automatisierung/industrielle-kommunikation/profinet.html>)

1.3 Siemens Industry Online Support

Information and service

At Siemens Industry Online Support you can obtain up-to-date information from our global support database:

- Product support
- Application examples
- Forum
- mySupport

Link: Siemens Industry Online Support (<https://support.industry.siemens.com/cs/de/en>)

Product support

You can find information and comprehensive know-how covering all aspects of your product here:

- **FAQs**
Answers to frequently asked questions
- **Manuals/operating instructions**
Read online or download, available as PDF or individually configurable.
- **Certificates**
Clearly sorted according to approving authority, type and country.
- **Characteristics**
For support in planning and configuring your system.
- **Product announcements**
The latest information and news concerning our products.
- **Downloads**
Here you will find updates, service packs, HSPs and much more for your product.
- **Application examples**
Function blocks, background and system descriptions, performance statements, demonstration systems, and application examples, clearly explained and represented.
- **Technical data**
Technical product data for support in planning and implementing your project

Link: Product support (<https://support.industry.siemens.com/cs/ww/en/ps>)

mySupport

The following functions are available in your personal work area "mySupport":

- **Support Request**
Search for request number, product or subject
- **My filters**
With filters, you limit the content of the online support to different focal points.

- **My favorites**
With favorites you bookmark articles and products that you need frequently.
- **My notifications**
Your personal mailbox for exchanging information and managing your contacts. You can compile your own individual newsletter in the "Notifications" section.
- **My products**
With product lists you can virtually map your control cabinet, your system or your entire automation project.
- **My documentation**
Configure your individual documentation from different manuals.
- **CAX data**
Easy access to CAX data, e.g. 3D models, 2D dimension drawings, EPLAN macros, device circuit diagrams
- **My IBase registrations**
Register your Siemens products, systems and software.

1.4 Siemens Industry Online Support app

Siemens Industry Online Support app

The Siemens Industry Online Support app provides you access to all the device-specific information available on the Siemens Industry Online Support portal for a particular article number, such as operating instructions, manuals, data sheets, FAQs etc.

The Siemens Industry Online Support app is available for Android and iOS:



Android



iOS

1.5 Support Request

After you have registered, you can use the Support Request form in the online support to send your question directly to Technical Support:

| | |
|-------------------------|--|
| Support Request: | Internet (https://www.siemens.com/support-request) |
|-------------------------|--|

Safety information

2.1 ESD Guidelines

ESD

All electronic devices are equipped with large-scale integrated ICs or components. Due to their design, these electronic elements are highly sensitive to overvoltage, and thus to any electrostatic discharge.

The acronym ESD has become the established designation for such electrostatic sensitive components/devices. This is also the international abbreviation for such devices.

ESD devices are identified by the following symbol:



NOTICE

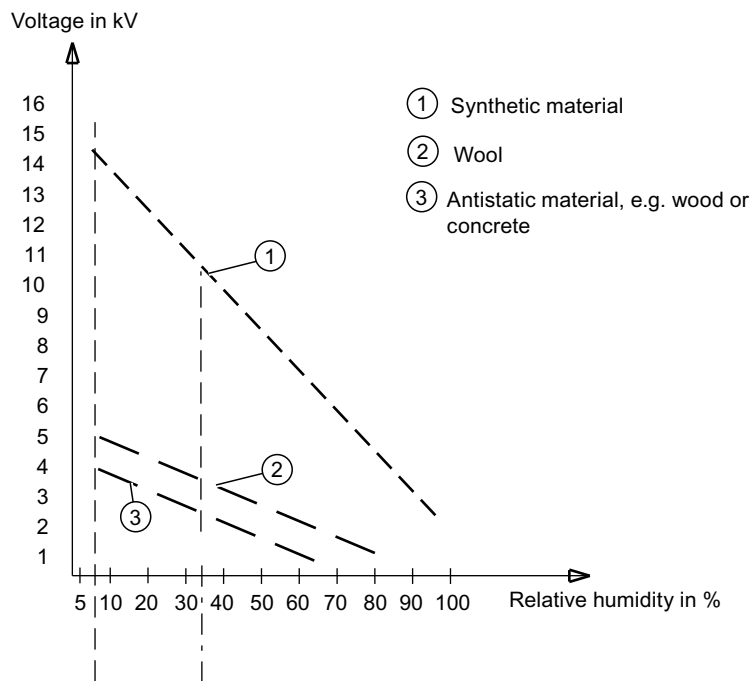
Electrostatic discharge

ESD devices can be destroyed by voltages well below the threshold of human perception. These static voltages develop when you touch a component or electrical connection of a device without having drained the static charges present on your body. The damage caused to a device by overvoltage is usually not immediately evident and is only noticed after an extended period of operation.

Electrostatic charging

Anyone who is not connected to the electrical potential of their surroundings can be electrostatically charged.

The diagram below shows the maximum electrostatic voltage which may build up on a person coming into contact with the materials specified in the diagram. These values correspond to IEC 801-2 specifications.



Basic protective measures against electrostatic discharge

- Make sure the grounding is good:
When handling electrostatic sensitive devices, ensure that your body, the workplace and packaging are grounded. In this way, you can avoid becoming electrostatically charged.
- Avoid direct contact:
As a general rule, only touch electrostatic sensitive devices when this is unavoidable (e.g. during maintenance work). Handle the devices without touching any chip pins or PCB traces. In this way, the discharged energy cannot reach or damage sensitive devices. Discharge your body before taking any necessary measurements on a device. Do so by touching grounded metallic parts. Use only grounded measuring instruments.

2.2 Reactive power compensation

Capacitors for improving the power factor (reactive power compensation)

Capacitors must not be connected to the output terminals of the 3RW30/40 Soft Starter. If there is a connection to the output terminals, the 3RW30/40 Soft Starter will be damaged.

Active filters, e.g. for reactive power compensation, must not be operated parallel to the motor control device.

If capacitors are to be used to correct the power factor (actively or passively), they must be connected on the line side of the device. They must not actively control the power factor during the starting and coasting down phases. If an isolating contactor or main contactor are used together with the electronic 3RW30/40 Soft Starter, the capacitors must be disconnected from the 3RW30/40 Soft Starter when the contactor is open.

2.3 Electromagnetic compatibility (EMC) according to IEC 60947-4-2

This product is designed for Environment A. It may produce radio interference in domestic environments, in which case the user may be required to take adequate mitigation measures.

2.4 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit

<https://www.siemens.com/industrialsecurity>.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under

<https://www.siemens.com/cert>.

2.5 Recycling and disposal

For environmentally-friendly recycling and disposal of your old device, contact a company certified for the disposal of used electrical and electronic equipment, and dispose of the device as specified in the regulations for your particular country.

2.6 Before commencing work: Isolating the equipment from the supply system and ensuring that it cannot be reconnected.

2.6 Before commencing work: Isolating the equipment from the supply system and ensuring that it cannot be reconnected.

DANGER

Hazardous voltage Will cause death or serious injury.

- Disconnect the system and all devices from the power supply before starting work.
- Secure against switching on again.
- Verify that the equipment is not live.
- Ground and short-circuit.
- Erect barriers around or cover adjacent live parts.

DANGER

Hazardous voltage Will cause death or serious injury.

Qualified Personnel.

The equipment / system may only be commissioned and operated by qualified personnel. For the purpose of the safety information in these Operating Instructions, a "qualified person" is someone who is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures.

2.7 Five safety rules for work in or on electrical systems

A set of rules, which are summarized in DIN VDE 0105 as the "five safety rules", are defined for work in or on electrical systems as a preventative measure against electrical accidents:

1. Isolate
2. Secure against switching on again
3. Verify that the equipment is not live
4. Ground and short-circuit
5. Erect barriers around or cover adjacent live parts

These five safety rules must be applied in the above order prior to starting work on an electrical system. After completing the work, proceed in the reverse order.

It is assumed that every electrician is familiar with these rules.

Explanations

1. The isolating distances between live and deenergized parts of the system must vary according to the operating voltage that is applied.
"Isolate" refers to the all-pole disconnection of live parts.
All-pole disconnection can be achieved, e.g. by.:
 - Switching off the miniature circuit breaker
 - Switching off the motor circuit breaker
 - Unscrewing fusible links
 - Removing LV HRC fuses
2. The feeder must be secured against inadvertent restarting to ensure that it remains isolated for the duration of the work. This can be achieved, for instance, by securing the motor and miniature circuit breakers with lockable blocking elements in the disconnected state, either using a lock or by unscrewing the fuses.
3. The deenergized state of the equipment should be verified using suitable test equipment, e.g. a two-pole voltmeter. Single-pole test pins are not suitable for this purpose. The absence of power must be established for all poles, phase to phase, and phase to N/PE.
4. Grounding and short-circuiting are only mandatory if the system has a nominal voltage greater than 1 kV. In this case, the system should always be grounded first and then connected to the live parts to be short-circuited.
5. These parts should be covered, or barriers erected around them, to avoid accidental contact during the work with adjacent parts that are still live.

Product description

3.1 Fields of application

Soft starters are used to start three-phase induction motors with reduced torque and reduced starting current.

SIRIUS soft starter family

The SIEMENS SIRIUS soft starter family comprises three different versions with different functionalities and prices.

3RW30 and 3RW40

Simple or standard applications are covered by the SIRIUS 3RW30 and 3RW40 soft starters and are described in this manual.

3RW44

The SIRIUS 3RW44 soft starter is used if higher functionality is specified, e.g. communication over PROFIBUS or the availability of measuring and monitoring values, as well as for ultra-heavy-duty starting. The SIRIUS 3RW44 soft starter is described in a separate system manual.

Download from 3RW44 manual (<https://support.industry.siemens.com/cs/ww/en/view/21772518>).

3.2 Functional principle of the SIRIUS 3RW30 and 3RW40 soft starters

The SIRIUS 3RW30 and 3RW40 soft starters have two antiparallel thyristors in two out of the three phases. One thyristor for the positive half-wave and one for the negative half-wave is provided in each phase (refer to Fig. "Phase angle control and schematic diagram of a two-phase controlled soft starter with integral bypass contacts"). The current in the third, uncontrolled phase is the sum of the currents in the controlled phases.

The rms value of the motor voltage is increased (from a settable starting voltage) to the rated motor voltage within a definable starting time by means of the phase angle control.

The motor current changes in proportion to the voltage applied to the motor. As a result, the starting current is reduced by the factor of this voltage.

There is a quadratic relationship between the torque and the voltage applied to the motor. As a result, the starting torque is reduced quadratically in relation to this voltage.

Example

SIEMENS 1LG4253AA motor (55 kW)

Rated data at 400 V

| | |
|-----------------------------------|---|
| P_e : | 55 kW |
| I_e : | 100 A |
| $I_{\text{direct starting}}$: | Approx. 700 A |
| M_e : | 355 Nm; e.g.: $M_e = 9.55 \times 55 \text{ kW} \times \frac{1000}{1480 \text{ min}^{-1}}$ |
| n_e : | 1480 rpm |
| $M_{\text{direct starting}}$: | Approx. 700 Nm |
| Set starting voltage: | 50 % ($\frac{1}{2}$ of mains voltage) |
| $\Rightarrow I_{\text{starting}}$ | $\frac{1}{2}$ of direct starting current (approx. 350 A) |
| $\Rightarrow M_{\text{starting}}$ | $\frac{1}{4}$ of direct starting torque (approx. 175 Nm) |

The diagrams below show the starting current and torque characteristics for a three-phase induction motor in combination with a soft starter:

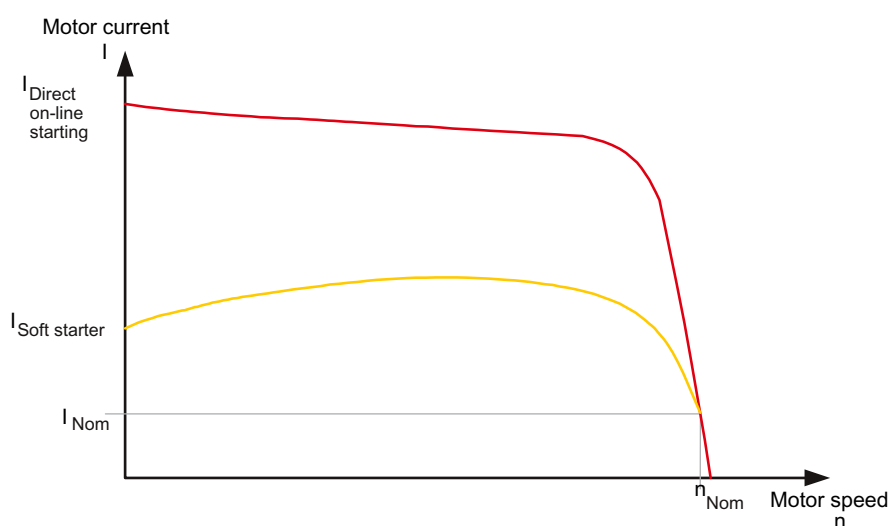


Figure 3-1 Reduced current characteristic of a three-phase induction motor during starting with a SIRIUS 3RW30 or 3RW40 soft starter

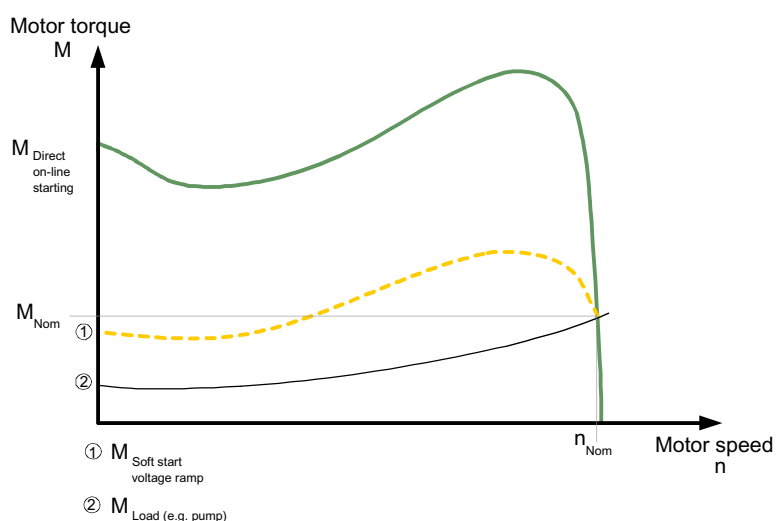


Figure 3-2 Reduced torque characteristic of a three-phase induction motor during starting with a SIRIUS 3RW30 or 3RW40 soft starter

Soft start /soft stop

This means that, since the motor voltage is controlled by the electronic soft starter during the startup process, the consumed starting current and the starting torque generated in the motor are also controlled.

The same principle is applied during the stop process. This ensures that the torque generated in the motor is gradually reduced, so that the application can stop smoothly (the soft stop function is only supported by the 3RW40).

The frequency remains constant during this process and corresponds to the mains frequency, in contrast to frequency controlled starting and stopping of a frequency converter.

Bypass mode

Once the motor has been started up correctly, the thyristors are subject to fully advanced control, meaning that the whole mains voltage is applied to the motor terminals. As the motor voltage does not have to be controlled during operation, the thyristors are bridged by integral bypass contacts that are rated for AC1 current. This minimizes the waste heat generated during uninterrupted duty (which is caused by the thyristor's power loss), and minimizes heating up of the switching device's environment.

The bypass contacts are protected by an integrated, electronic arc quenching system during operation. If they are opened in the event of a fault, e.g. if the control voltage is temporarily interrupted, mechanical vibrations occur, or the coil operating mechanism or the main contact spring has reached the end of its service life and is defective, the equipment is not damaged.

The diagram below shows the method of operation of the SIRIUS 3RW30 and 3RW40 soft starters:

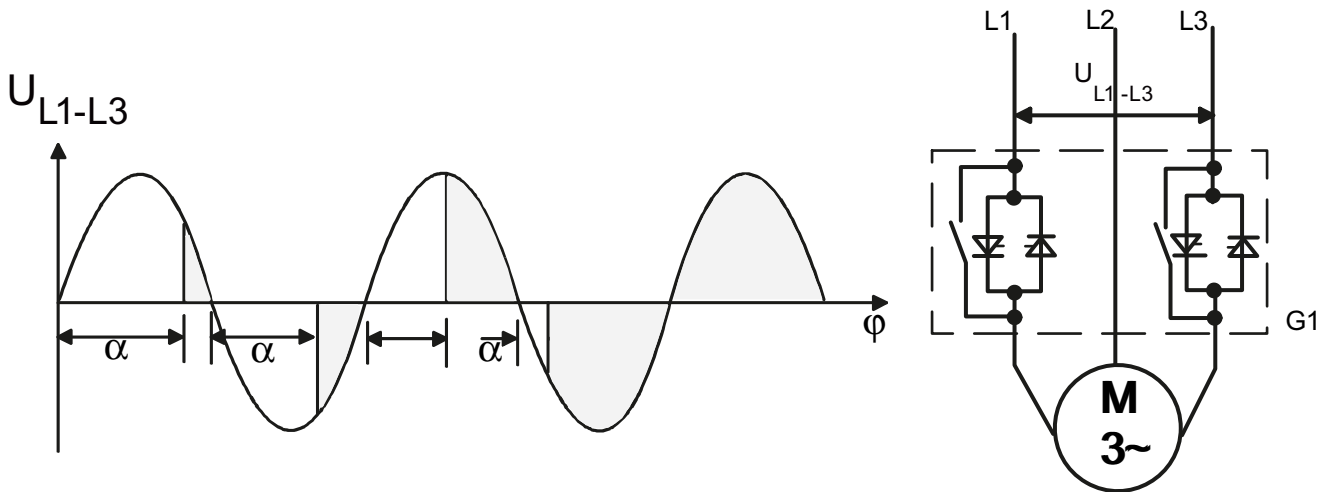


Figure 3-3 Phase angle control and schematic diagram of a two-phase controlled soft starter with integral bypass contacts

3.2.1 Method of operation of a two-phase controlled soft starter

A special method of operation is used for the SIRIUS 3RW30 and 3RW40 two-phase controlled soft starters based on SIEMENS' patented "polarity balancing" control principle.

Two-phase control

The SIRIUS 3RW30 and 3RW40 soft starters are two-phase controlled soft starters, in other words they are designed with two antiparallel thyristors in each of phases L1 and L3. Phase 2 is an uncontrolled phase, which is merely guided through the starter by a copper connection.

In a two-phase controlled soft starter, the current that results from the superimposition of the two controlled phases flows in the uncontrolled phase. The main advantages of two-phase control include the more compact size compared to a three-phase version and the lower hardware costs.

The occurrence of DC components, caused by the phase angle and the overlapping phase currents, is a negative physical effect of two-phase control during the startup process that can mean a louder noise is produced by the motor. The "polarity balancing" control principle was developed and patented by SIEMENS to prevent these DC components during starting.

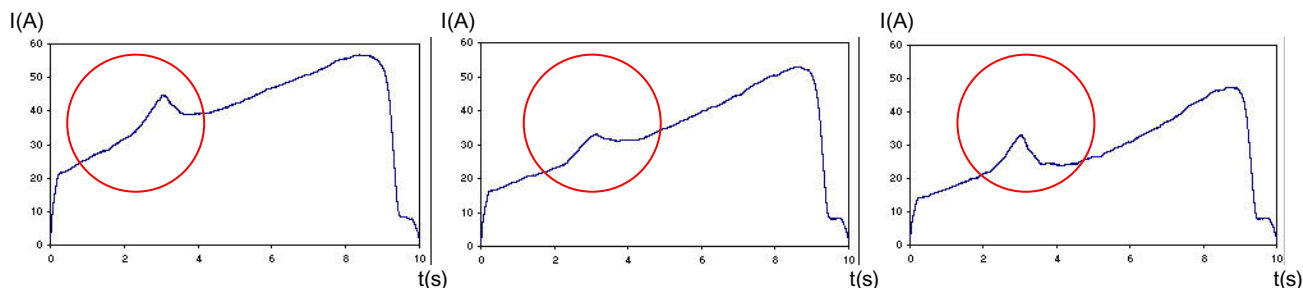


Figure 3-4 Current characteristic and occurrence of DC components in the three phases without "polarity balancing"

Polarity balancing

"Polarity balancing" effectively eliminates these DC components during the ramp-up phase. It allows the motor to be started up with a constant speed, torque, and current rise.

The acoustic quality of the startup process comes very close to that of a three-phase controlled startup. This is made possible by the continuous dynamic alignment and balancing of current half-waves with different polarities during the motor startup.

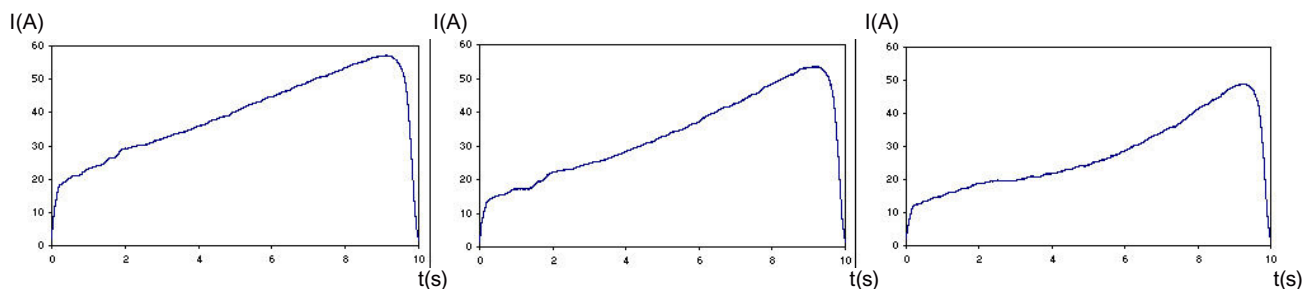


Figure 3-5 Current characteristic in the three phases without DC components thanks to "polarity balancing"

3.2.2 Starting current asymmetry

With two-phase control the starting current is asymmetrical for physical reasons, because the current in the uncontrolled phase is the sum of the currents in the two controlled phases.

This asymmetry can be as much as 30 to 40% during starting (current ratio: maximum deviation from mean value to mean value).

Even though this cannot be influenced, it is not critical in most applications. It could cause an insufficiently rated fuse to trip in the uncontrolled phase, for instance. For recommended fuse ratings, refer to the tables in chapter Technical data (Page 133).

3.2 Functional principle of the SIRIUS 3RW30 and 3RW40 soft starters

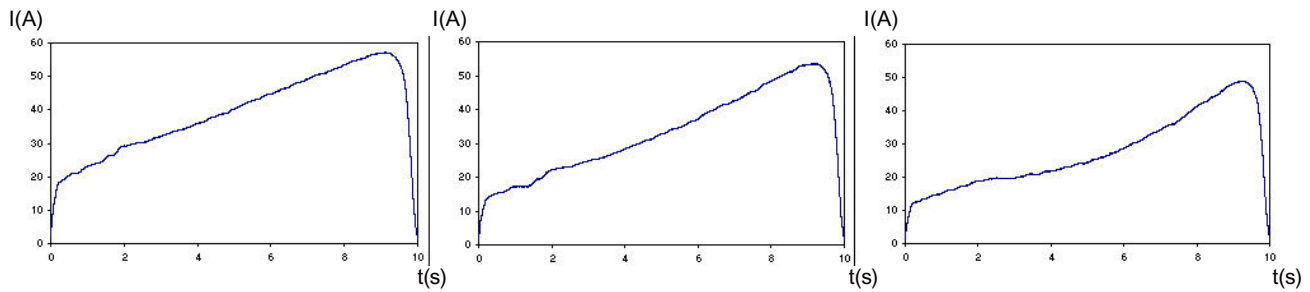


Figure 3-6 Starting current asymmetry

Note

If wye-delta starters are exchanged for soft starters in an existing system, you should check the fuse ratings in the feeder in order to avoid false tripping. This is particularly important in connection with heavy-duty starting or if the fuse that is installed has already been operated close to the thermal tripping limit with the wye-delta assembly.

All elements of the main circuit (such as fuses, motor starter protectors, and switching devices) must be dimensioned for direct starting and according to the on-site short-circuit conditions, and ordered separately.

For recommended fuse and motor starter protector ratings for the feeder with soft starter, refer to chapter Technical data (Page 133).

3.2.3 Applications and use

Applications and selection criteria

The SIRIUS 3RW30 and 3RW40 soft starters represent a good alternative to direct or wye-delta starters.

The most important advantages are:

- Soft start
- Soft stop (3RW40 only)
- Uninterrupted switching without current peaks that place a heavy load on the system
- Simple installation and commissioning
- Compact, space-saving design

Applications

The typical applications include:

- Conveyor belts
- Roller conveyors
- Compressors

- Fans
- Pumps
- Hydraulic pumps
- Agitators
- Circular saws / band saws

Advantages

Conveyor belts and transport systems:

- Smooth starting
- Smooth stopping

Rotary pumps and piston pumps:

- No pressure surges
- Increased service life of the pipe system

Agitators and mixers:

- Reduced starting current

Fans:

- Protection for the gearbox and V belt

3.3 Comparison of device functions

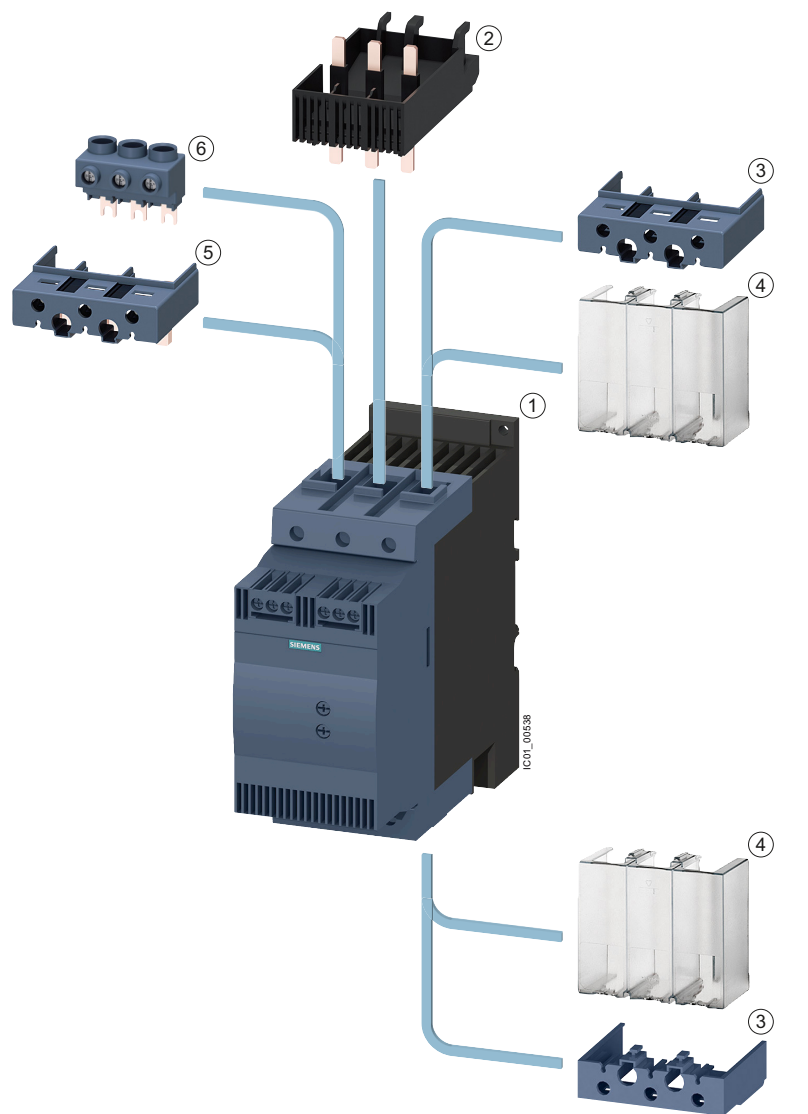


| | | SIRIUS 3RW30 Standard applications | SIRIUS 3RW40 Standard applications | SIRIUS 3RW44 High-Feature applications |
|---|--------|---------------------------------------|---------------------------------------|---|
| Rated current at 40 °C / 50 °C | A | 3...106 / 3 ... 98 | 12.5 ... 432 / 11 ... 385 | 29 ... 1214 / 26 ... 1076 |
| Rated operational voltage | V | 200...480 | 200...600 | 200...690 |
| Motor output at 400 V / 460 V | kW /hp | 1.5 ... 55 / 1.5 ... 75 | 5.5 ... 250 / 7.5 ... 300 | 15 ... 710 / 15 ... 950 |
| •Standard circuit | kW /hp | – | – | 22 ... 1200 / 30 ... 1700 |
| •Inside-delta circuit | | | | |
| Ambient temperature | °C | -25...+60 | -25...+60 | 0 ... + 6 0 |
| Soft starting/stopping | | ✓ ¹⁾ | ✓ | ✓ |
| Voltage ramp | | ✓ | ✓ | ✓ |
| Starting/stopping voltage | % | 40...100 | 40...100 | 20...100 |
| Starting and stopping time | s | 0 ... 2 0 | 0 ... 2 0 | 1 ... 3 6 0 |
| Torque control | | – | – | ✓ |
| Starting/stopping torque | % | – | – | 20...100 |
| Torque limit | % | – | – | 20...200 |
| Ramp time | s | – | – | 1 ... 3 6 0 |
| Integrated bypass contact system | | ✓ | ✓ | ✓ |
| Intrinsic device protection | | – | ✓ | ✓ |
| Motor overload protection | | – | ✓ ⁷⁾ | ✓ |
| Thermistor motor protection | | – | ✓ ²⁾ | ✓ |
| Integrated remote RESET | | – | ✓ ³⁾ | ✓ |
| Adjustable current limiting | | – | ✓ | ✓ |
| Inside-delta circuit | | – | – | ✓ |
| Breakaway pulse | | – | – | ✓ |
| Creep mode in both directions | | – | – | ✓ |
| Pump stop | | – | – | ✓ ⁴⁾ |
| DC braking | | – | – | ✓ ⁴⁾ 5) |
| Combined braking | | – | – | ✓ ⁴⁾ 5) |
| Motor heating | | – | – | ✓ |
| Communication | | – | – | with PROFIBUS DP (option) |
| External display and operating module | | – | – | (Option) |
| Operating measured value display | | – | – | ✓ |
| Error logbook | | – | – | ✓ |
| Event list | | – | – | ✓ |
| Maximum pointer function | | – | – | ✓ |
| Trace function | | – | – | ✓ ⁶⁾ |
| Programmable control inputs and outputs | | – | – | ✓ |
| Number of parameter sets | | 1 | 1 | 3 |
| Parameterization software (SoftStarterES) | | – | – | ✓ |
| Power semiconductors (thyristors) | | 2 controlled phases | 2 controlled phases | 3 controlled phases |
| Screw terminals | | ✓ | ✓ | ✓ |
| Spring-type terminals | | ✓ | ✓ | ✓ |
| UL/CSA | | ✓ | ✓ | ✓ |
| CE symbol | | ✓ | ✓ | ✓ |
| Soft starting under heavy starting conditions | | – | – | ✓ ⁴⁾ |

Configuration support Win-Soft Starter, electronic selection slide, Technical Assistance ++49 9118955900
 ✓ Function available; – Function not available. 3) For 3RW402. to 3RW404.; 5) Not possible in inside-delta circuit.
 1) Only soft starting for 3RW30. optional for 3RW405. and 3RW407. 6) Trace function with SoftStarterES software.
 2) Optional up to size S3 (device variant). 4) If necessary, select over-dimensioned soft starter and motor. 7) According to ATEX

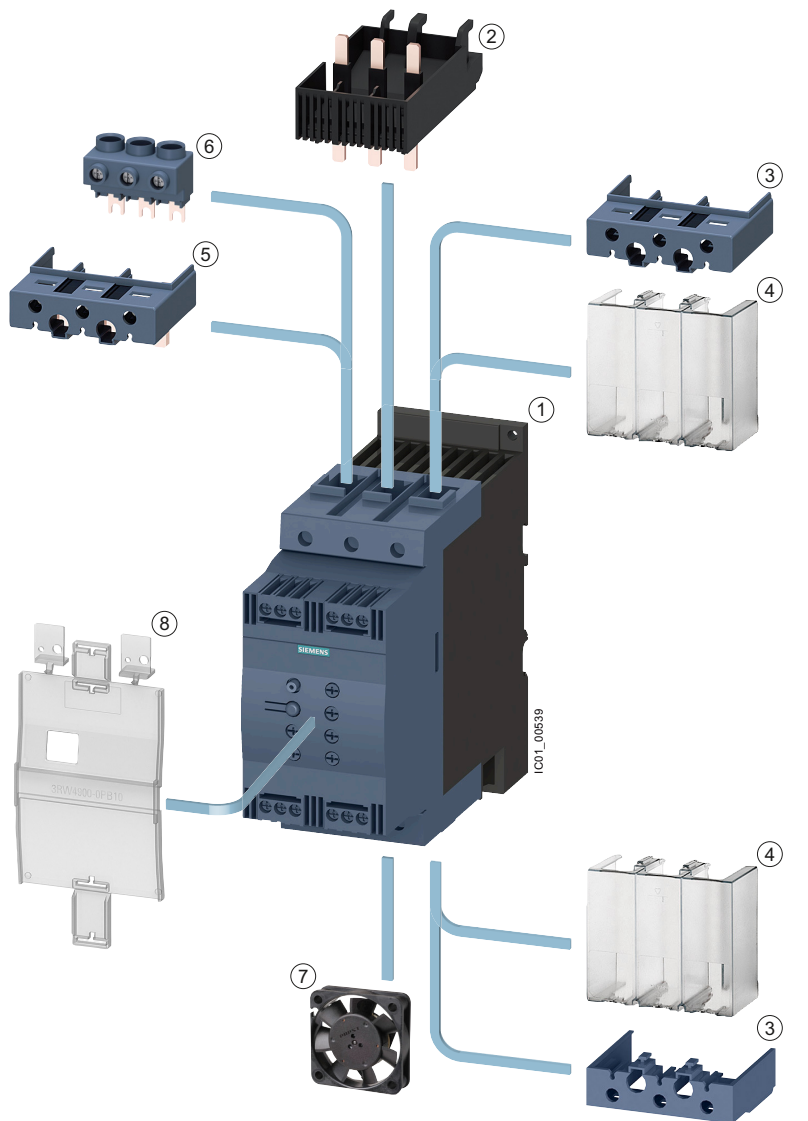
3.4 Accessories

3.4.1 Accessories for 3RW30 soft starters



- ① 3RW30 soft starter
- ② Link module for circuit breaker/motor starter protector
- ③ Terminal cover for box terminals (S2, S3)
- ④ Terminal cover for cable lug connection and busbar connection (S3)
- ⑤ Auxiliary terminal (S3)
- ⑥ Infeed terminal (S00, S0)

3.4.2 Accessories for 3RW40 soft starters



- ① 3RW40 soft starter
- ② Link module for circuit breaker/motor starter protector
- ③ Terminal cover for box terminals (S2, S3)
- ④ Terminal cover for cable lug connection and busbar connection (S3)
- ⑤ Auxiliary terminal (S3)
- ⑥ Infeed terminal (S0)
- ⑦ Fan
- ⑧ Sealable cover

Product combinations

4.1 SIRIUS modular system

Switching, protecting, and starting motors

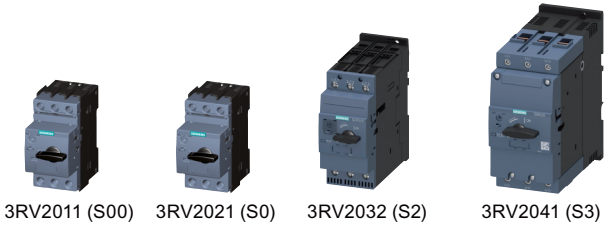
In order to simplify the assembly of load feeders, the SIRIUS modular system offers standard components that are optimally harmonized and are easy to combine. Just 7 sizes cover the entire performance range up to 250 kW / 300 hp. The individual switching devices can be assembled to form complete load feeders, either using link modules or by mounting directly.

For a selection of matching device combinations, e.g. soft starters and motor starter protectors, refer to chapter Technical data (Page 133).

For further information on individual products, refer to System manual (<https://support.industry.siemens.com/cs/ww/en/view/39740306>) "SIRIUS Innovations", Order No. 3ZX1012-ORA01-1AB1.

4.1 SIRIUS modular system

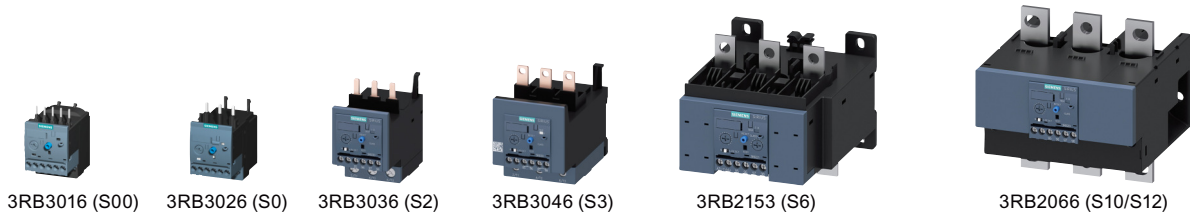
SIRIUS motor starter protectors



SIRIUS contactors



SIRIUS overload relays



SIRIUS soft starters



Figure 4-1 SIRIUS modular system

Functions

5.1 Start modes

You can choose between different startup functions reflecting the wide range of applications and functionality of the SIRIUS 3RW30 and 3RW40 soft starters. The motor start can be optimally adapted to each particular application.

5.1.1 Voltage ramp

The SIRIUS 3RW30 and 3RW40 soft starters achieve soft starting by means of a voltage ramp. The motor terminal voltage is increased from a parameterizable starting voltage up to the mains voltage within a definable ramp-up time.

Starting voltage

The starting voltage determines the starting torque of the motor. A lower starting voltage results in a lower starting torque and a lower starting current. The starting voltage selected must be sufficiently high to ensure that motor starts up smoothly as soon as the start command is received by the soft starter.

Ramp time

The length of the set ramp time determines the time taken to increase the motor voltage from the parameterized starting voltage to the mains voltage. This influences the motor's acceleration torque, which drives the load during the ramp-up process. A longer ramp time results in a lower acceleration torque as the motor is started up. The startup is slower and smoother as a result. The ramp time should be long enough for the motor to reach its nominal speed. If the time selected is too short, in other words if the ramp time ends before the motor has started up successfully, a very high starting current that can even equal the direct starting current at the same speed occurs at this instant.

The SIRIUS 3RW40 soft starter limits the current to the value set with the current limiting potentiometer (refer to chapter Current limiting and ramp-up detection (3RW40 only) (Page 40)). As soon as the current limiting value is also reached, the voltage ramp or the ramp time is interrupted and the motor is started with the current limiting value until it has started up successfully. In this case, the motor ramp-up time may be longer than the maximum parameterizable 20 seconds ramp time (for further information about the maximum ramp-up times and switching frequencies, refer to chapter 3RW40 2. to 7. power electronics (Page 151) ff).

The SIRIUS 3RW40 soft starter has intrinsic device protection, current limiting, and ramp-up detection functions. These functions do not form part of the SIRIUS 3RW30 soft starter.

| |
|--|
| NOTICE |
| Risk of property damage |
| When using the 3RW30: Make sure the selected ramp time is longer than the actual motor ramp-up time. If not, the SIRIUS 3RW30 may be damaged because the internal bypass contacts close when the set ramp time elapses. If the motor has not finished starting up, an AC3 current that could damage the bypass contact system will flow. |
| When using the 3RW40: The 3RW40 has an integrated ramp-up detection function that prevents this operating state from occurring. |

The maximum ramp time for the SIRIUS 3RW30 soft starter is 20 seconds. An appropriately dimensioned SIRIUS 3RW40 or 3RW44 soft starter should be chosen for startup processes with a motor ramp-up time > 20 seconds.

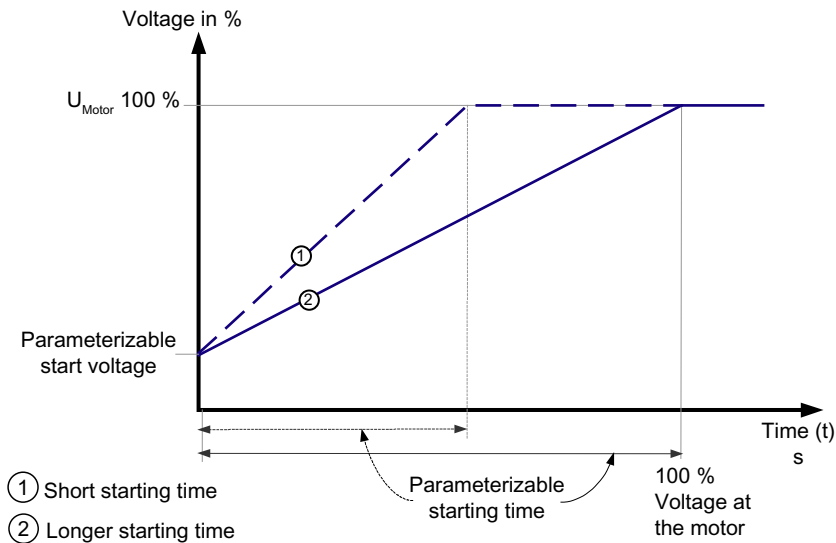


Figure 5-1 Principle of the voltage ramp

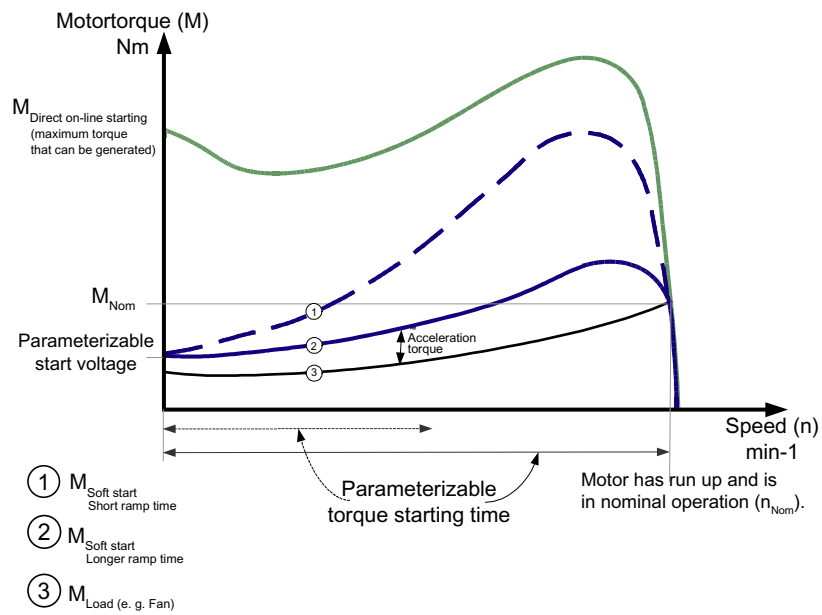


Figure 5-2 Principle of the voltage ramp for the torque characteristic

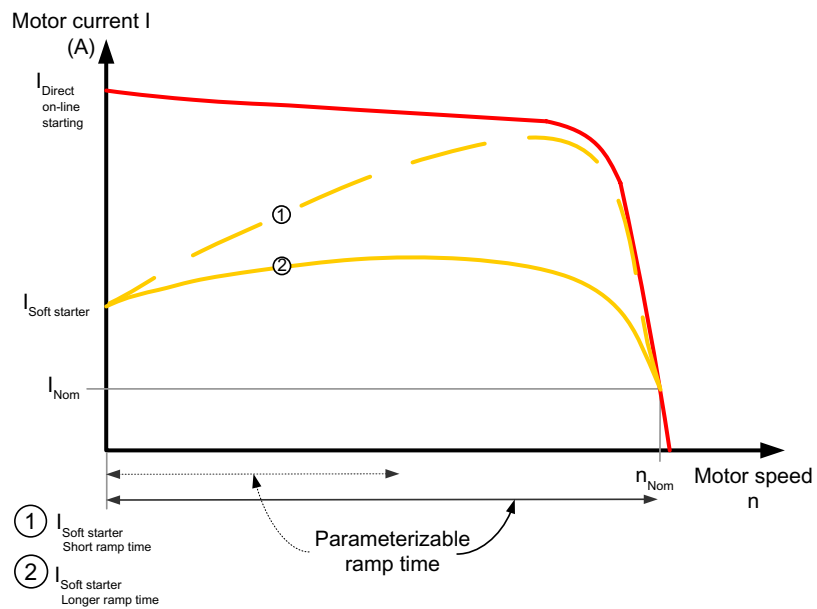


Figure 5-3 Principle of the voltage ramp for the starting current characteristic

Typical applications of the voltage ramp

The voltage ramp principle is valid for all applications, e.g. pumps, compressors, conveyor belts.

5.1.2 Current limiting and ramp-up detection (3RW40 only)

The SIRIUS 3RW40 soft starter measures the phase current (motor current) continuously with the help of integrated current transformers.

The motor current that flows during the startup process can be actively limited by means of the soft starter. The current limiting function takes priority over the voltage ramp function. As soon as a parameterizable current limit is reached, in other words, the voltage ramp is interrupted and the motor is started with the current limiting value until it has started up successfully. The current limiting function is always active with SIRIUS 3RW40 soft starters. If the current limiting potentiometer is set to clockwise stop, the starting current is limited to the maximum possible current (refer to chapter Setting the current limiting value (Page 121)).

Current limiting value

The current limiting value is set to the current required during starting as a factor of the rated motor current (refer to chapter Setting the current limiting value (Page 121)). Since the starting current is asymmetrical, the set current corresponds to the arithmetic mean value for the three phases.

Example

If the current limiting value is set to 100 A, the currents might be approx. 80 A in L1, 120 A in L2, and 100 A in L3 (refer to chapter Starting current asymmetry (Page 29)).

As soon as the selected current limiting value is reached, the motor voltage is reduced or controlled by the soft starter to prevent the current from exceeding the limit. The set current limiting value must be high enough to ensure that the torque generated in the motor is sufficient to accelerate the motor to nominal speed. Three to four times the value of the motor's rated operational current (I_e) can be assumed as typical here.

The current limiting function is always active because it is required by the intrinsic device protection. If the current limiting potentiometer is set to clockwise stop, the starting current is limited to the maximum possible current (refer to chapter Setting the current limiting value (Page 121)).

Ramp-up detection (3RW40 only)

The SIRIUS 3RW40 soft starter is equipped with an integrated ramp-up detection function. If it detects a motor startup, the motor voltage is immediately increased to 100% of the mains voltage. The internal bypass contacts close and the thyristors are bridged.

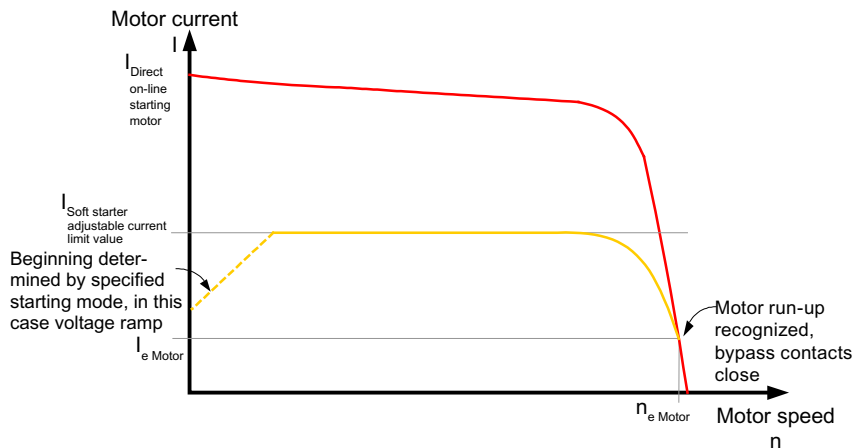


Figure 5-4 Current limiting with soft starter

Typical applications for current limiting

Current limiting is used for applications with large centrifugal masses (mass inertias) and therefore longer starting times, e.g. fans, circular saws etc.

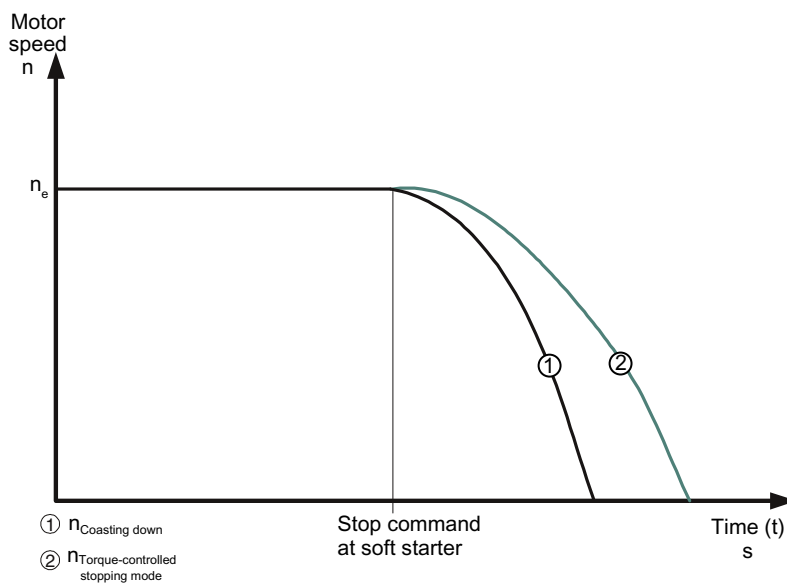
5.2 Stop modes

You can choose between different stop modes reflecting the wide range of applications for SIRIUS soft starters. The motor stop can be optimally adapted to each particular application.

If a start command is issued during the stop process, the process is interrupted and the motor is started again with the set start mode.

Note

If you select "soft stop" (3RW40 only) as the stop mode, the feeder (soft starter, cables, feeder protective devices, and motor) may need to be dimensioned for higher values because the current exceeds the rated motor current during the stop process.



5.2.1 Stop without load (3RW30 and 3RW40)

"Stop without load" means the power supplied to the motor via the soft starter is interrupted when the ON command is removed from the starter. The motor coasts to a standstill, driven only by the mass inertia (centrifugal mass) of the rotor and load. This is also referred to as a natural stop. A large centrifugal mass means a longer stop time without load.

Typical applications for stop without load

Stop without load is used for loads that place no special demands on the startup characteristic, e.g. fans.

5.2.2 Soft stop (3RW40 only)

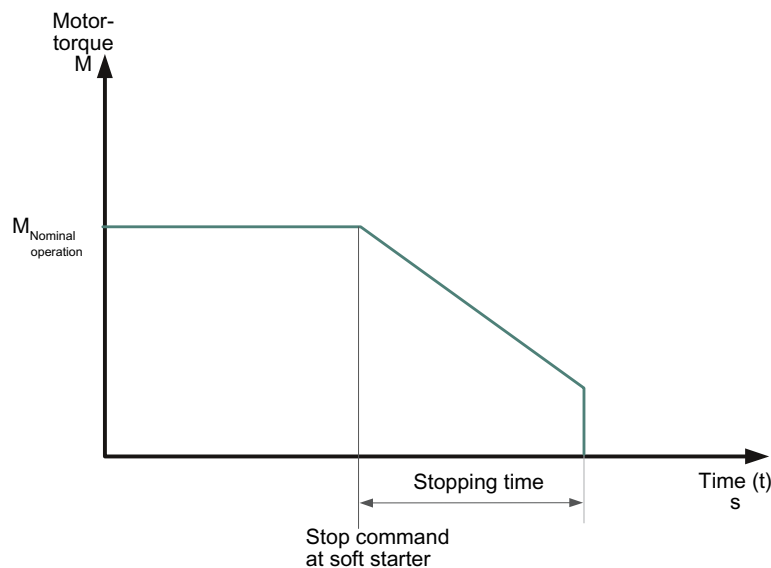
In "soft stop" mode, the natural stop process of the load is decelerated. The function is used when the load must be prevented from stopping abruptly. This is typically the case in applications with a low mass inertia or a high counter-torque.

Ramp-down time

The "Ramp-down time" potentiometer on the soft starter allows you to specify how long power should still be supplied to the motor after the ON command is removed. The torque generated in the motor is reduced by means of a voltage ramp function within this ramp-down time and the application stops smoothly.

If the motor is stopped abruptly in pump applications, as is normal with wye-delta or direct starting, for instance, water hammer can occur. Water hammer is caused by the sudden flow separation, leading to pressure fluctuations on the pump. It has the effect of producing noise and mechanical impacts on the pipelines as well as on any flaps and valves installed there.

Water hammer can be reduced compared to direct or wye-delta starting by using the SIRIUS 3RW40 soft starter. An optimum pump stop is achieved using a SIRIUS 3RW44 soft starter with an integrated pump stop function (refer to chapter Comparison of device functions (Page 32)).



Typical applications for soft stop

Use soft stop for

- Pumps to reduce water hammer.
- Conveyor belts to prevent the conveyed product from tilting.

5.3 Motor protection / intrinsic device protection (3RW40 only)

Note

If the soft starter is disconnected because the motor overload protection or the intrinsic device protection trips, you must wait a defined cooling time (recovery time) prior to acknowledging the fault or starting the motor again. (Motor overload tripping time: 5 minutes, temperature sensor: after cooling,
intrinsic device protection tripping time:
- 30 seconds upon overload of the thyristors,
- 60 seconds upon overload of the bypasses)

5.3.1 Motor protection function

The motor overload protection function is implemented on the basis of the winding temperature. This indicates whether the motor is overloaded or functioning in the normal operating range.

The winding temperature can either be calculated with the help of the integrated, electronic motor overload function or measured with a connected motor thermistor.

The two types of protection must be combined to achieve full motor protection. This combination is recommended to protect the motor optimally.

Note

Thermistor motor protection evaluation

The thermistor motor protection evaluation function is optionally available for the SIRIUS 3RW402 to 3RW404 soft starters in the 24 V AC/DC control voltage version.

Motor overload protection

The current flow during motor operation is measured by measuring the current with transformers integrated in the soft starter. The temperature rise in the winding is calculated based on the rated operational current set for the motor.

A trip is generated by the soft starter when the characteristic is reached, depending on the trip class (CLASS setting).

Trip class (electronic overload protection)

The trip class (CLASS) specifies the maximum time within which a protective device must trip from a cold state at $7.2 \times$ the rated operational current (motor protection to IEC 60947). The tripping characteristics represent this time as a function of the tripping current (refer to chapter Motor protection tripping characteristics for 3RW40 (with symmetry) (Page 163)). You can set different CLASS characteristics according to the startup class.

Note

The rating data of the soft starters refers to normal starting (CLASS 10). The starters may need to be calculated with a size allowance for heavy-duty starting ($>$ CLASS 10). You can only set a rated motor current that is lower than the soft starter rated current (for the permissible settings, refer to chapter Technical data (Page 133)).

Recovery time (motor overload protection)

A recovery time of 5 minutes, during which the motor cools down and cannot be restarted, starts if the thermal motor model is tripped.

Protection against voltage failure in the event of a fault

If the control supply voltage fails during a trip, the current tripping state of the thermal motor model and the current recovery time are stored in the soft starter. When the control supply voltage is restored, the current tripping state of the thermal motor model and the intrinsic device protection prior to the power failure are likewise automatically restored. If the control voltage is disconnected during operation (without a preceding fault trip), the starter is not protected against voltage failure.

Temperature sensor

Note

Temperature sensor

The temperature sensor evaluation function is optionally available for the SIRIUS 3RW4024 to 3RW4047 soft starters in the 24 V AC/DC control voltage version.

This motor protection function measures the motor's stator winding temperature directly with the help of a sensor installed in the motor, in other words the motor must have a sensor wound into the stator winding.

You can choose between two different sensor types for the evaluation.

1. Type A PTC thermistors ("type A sensors") for connection to terminals T11/21 and T12
2. Thermoclick sensors for connection to terminals T11/21 and T22

The wiring and sensors are monitored for wire breakage and short-circuits.

Recovery time (thermistor motor protection)

If the thermistor motor protection is tripped, the soft starter cannot be restarted until the sensor installed in the motor has cooled down. The recovery time varies according to the temperature state of the sensor.

5.3.2 ATEX / UKEX for sizes S0 ... S3

Safety instructions

 **WARNING**

Danger of death or serious injury.

The 3RW40 is not suitable for installation in hazardous areas. The device may only be used in a control cabinet with degree of protection IP4x. Appropriate measures (e.g. encapsulation) must be taken if it is to be installed in hazardous areas.

Note

Devices with ATEX and UKEX approval must only be repaired at the manufacturer's plant.

Have repairs of ATEX/UKEX devices carried out at the manufacturer's plant only. A repair that is not performed at the manufacturer's plant will result in loss of the ATEX/UKEX approval.

Parameterizing the motor protection functions (RESET setting)

Note that the "Auto RESET" setting is not permissible when operating motors in hazardous areas.

Explosion protection according to ATEX Directive 2014/34/EU and UKEx

SIRIUS 3RW40 Soft Starters sizes S0 to S3 are to be installed outside the hazardous area and are suitable for starting explosion protected motors with type of protection "increased safety" Ex eb, "flameproof enclosure" Ex db, "protection by enclosure" tb and "pressurized enclosure" pxb.

They also comply with "Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016 (S.I.2016 No.1107)" and all associated amendments.

II (2)G [EX eb Gb] [EX db Gb] [EX pxb Gb]¹⁾

II (2)D [EX tb Db] [EX pxb Db]

¹⁾ For pxb applications, pressure and flow rate monitoring are additionally required for pressurized enclosure systems.

Wiring the fault output 95 96

Wire the fault output (95 96) to an upstream switching device in such a way that if a fault occurs, this device disconnects the feeder (refer to Fig. "3RW40 wiring fault with 3RV").

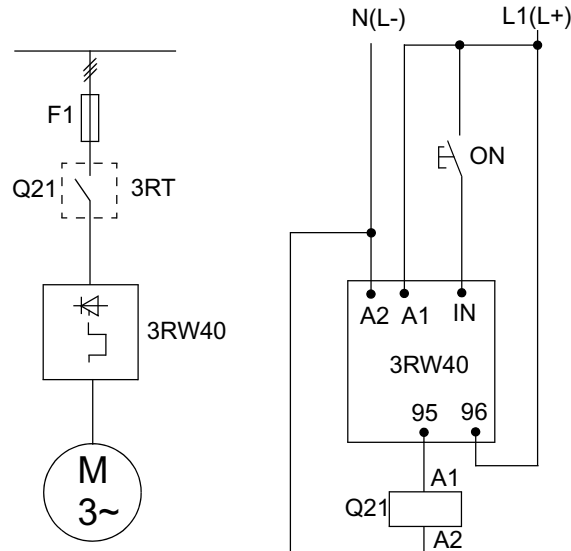


Figure 5-5 3RW40 wiring fault

For more information, refer to the Operating Instructions 3ZX1012-0RW40-1CA1 (<http://support.automation.siemens.com/WW/view/de/22809303>).

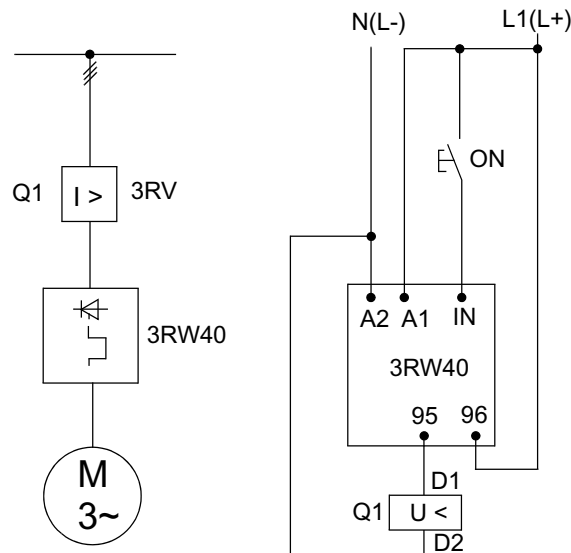



Figure 5-6 3RW40 wiring fault with 3RV

5.3.3 ATEX for sizes S6 and S12

Safety instructions

| |
|--|
|  WARNING |
| <p>Danger of death or serious injury.</p> <p>The 3RW40 is not suitable for installation in hazardous areas. The device may only be used in a control cabinet with degree of protection IP4x. Appropriate measures (e.g. encapsulation) must be taken if it is to be installed in hazardous areas.</p> |

Note

Devices with ATEX approval must only be repaired at the manufacturer's plant.

Have repairs of ATEX devices carried out at the manufacturer's plant only. A repair that is not performed at the manufacturer's plant will result in loss of the ATEX approval.

"Increased safety" type of protection EEx e according to ATEX

The SIRIUS 3RW40 soft starter sizes S6 and S12 are suitable for starting explosion-protected motors with the "increased safety" type of protection EEx e (type of protection/markings: Ex II (2) GD).

Wiring the fault output 95 96

Wire the fault output (95 96) to an upstream switching device in such a way that if a fault occurs, this device disconnects the feeder (refer to Fig. "3RW40 wiring fault with 3RV").

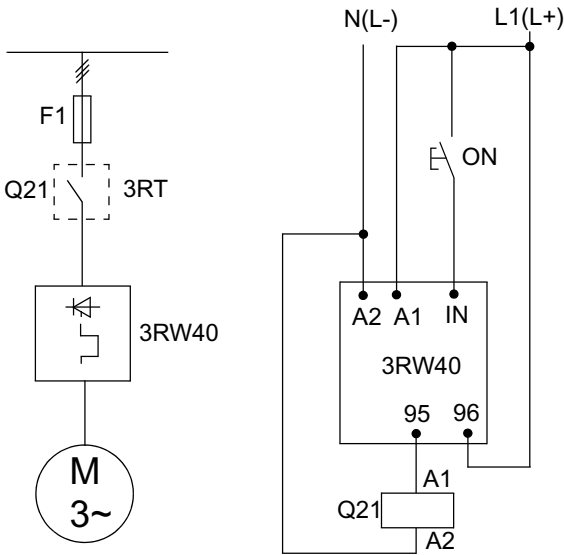


Figure 5-7 3RW40 wiring fault

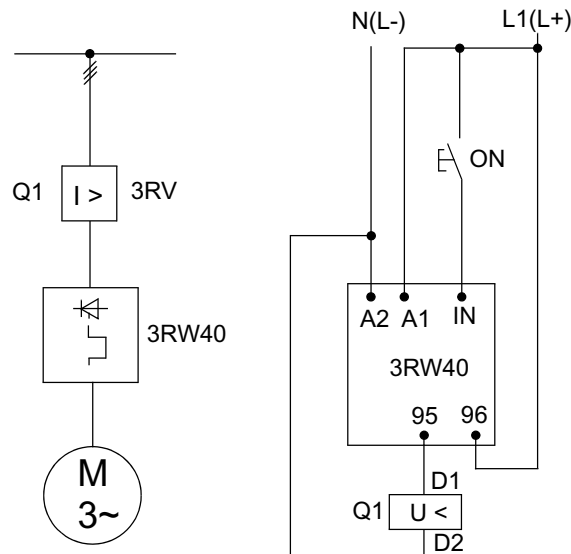


Figure 5-8 3RW40 wiring fault with 3RV

For more information, refer to the Operating Instructions 3ZX1012-0RW40-1CA1 (<https://support.industry.siemens.com/cs/ww/de/view/22809303>).

5.3.4 Intrinsic device protection (3RW40 only)

Thyristor protection (thermal)

SIRIUS 3RW40 soft starters are equipped with integrated intrinsic device protection to prevent thermal overloading of the thyristors.

This is achieved on the one hand by means of current measuring transformers in the three phases and on the other, by measuring the temperature with temperature sensors on the thyristor's heat sink.

If the fixed, internally set trip value is exceeded, the soft starter is automatically disconnected.

Recovery time (intrinsic device protection)

If the intrinsic device protection is tripped, the soft starter cannot be restarted until a recovery time of at least 30 seconds has elapsed upon overload of the thyristors and at least 60 seconds upon overload of the bypasses.

Thyristor protection (short-circuit)

SITOR semiconductor fuses must be connected upstream to protect the thyristors against short-circuits (e.g. in case of cable damage or an interturn fault in the motor; refer to chapter Soft starter assembly with type of coordination 2 (Page 78)). For the fuse selection tables, refer to chapter Technical data (Page 133).

Protection against voltage failure (in the event of a fault)

If the control supply voltage fails during a trip, the current tripping state of the thermal intrinsic device protection model and the current recovery time are stored in the soft starter. When the control supply voltage is restored, the current tripping state of the thermal intrinsic device protection prior to the power failure are likewise automatically restored.

Note

If the control voltage is disconnected during operation (e.g. in "automatic mode"), the starter is not protected against voltage failure. You must wait five minutes between two starts to ensure that the motor protection and the intrinsic device protection are working correctly.

5.4 Functions of the RESET buttons

5.4.1 SIRIUS 3RW402, 3RW403 and 3RW404 soft starters

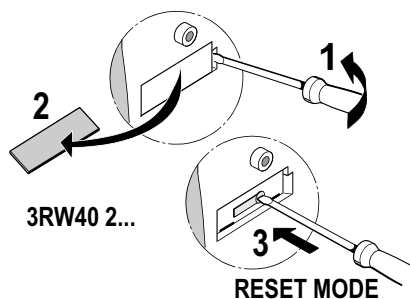
5.4.1.1 Setting the RESET MODE

RESET MODE button

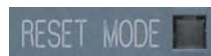
By pressing the RESET MODE button, you define the reset procedure in case of a fault. This is indicated by the RESET MODE LED.

Note

On the SIRIUS 3RW402. soft starter, the RESET MODE button is located underneath the label (refer to chapter Operator controls, displays, and connections on the 3RW40 (Page 88)).



Auto RESET
Manual RESET
Remote RESET



Yellow
Off (factory setting)
Green

5.4.1.2 Manual RESET

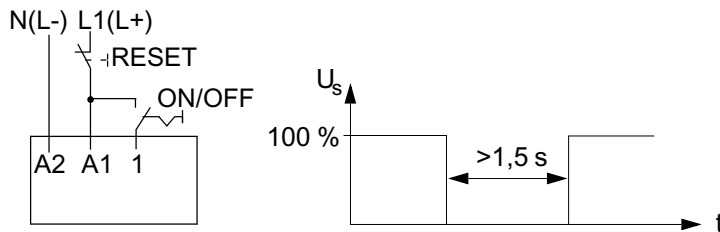
Manual RESET via RESET/TEST button (LED RESET MODE off)

You can reset a fault by pressing the RESET/TEST button.



5.4.1.3 Remote RESET

Remote RESET (LED RESET MODE green)




You can reset a pending error message by removing the control feed voltage for more than 1.5 s.

5.4.1.4 Auto RESET

Auto RESET (LED RESET MODE yellow)

If you set the RESET mode to AUTO, a fault is automatically reset.

- If the motor overload protection function trips: after 5 minutes
- On tripping the intrinsic device protection:
 - after 30 seconds upon overload of the thyristors,
 - after 60 seconds upon overload of the bypasses
- If the thermistor evaluation function trips: after the temperature sensor in the motor has cooled down

| |
|---|
|  WARNING |
| <p>Automatic restart Danger of death, serious injury, or property damage.</p> <p>The automatic reset mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.</p> |

5.4.1.5 Acknowledging faults

For information on whether faults can be acknowledged, and on the corresponding LED and output contact states, refer to chapter Messages and diagnosis (Page 61).

5.4.2 SIRIUS 3RW405 and 3RW407 soft starters

5.4.2.1 Setting the RESET MODE



Auto RESET

Yellow

Manual RESET / (remote RESET)

Off (factory setting)

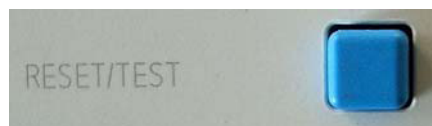
RESET MODE button

By pressing the RESET MODE button, you define the reset procedure in case of a fault. This is indicated by the AUTO LED.

5.4.2.2 Manual RESET

Manual RESET with the RESET/TEST button (LED AUTO is off)

You can reset a fault by pressing the RESET/TEST button.



5.4.2.3 Auto RESET

Auto RESET (AUTO LED is yellow)

If you set the RESET mode to AUTO, the fault is automatically reset.

- If the motor overload protection function trips: after 5 minutes
- On tripping the intrinsic device protection:
 - after 30 seconds upon overload of the thyristors,
 - after 60 seconds upon overload of the bypasses

WARNING

Automatic restart

Can result in death, serious injury, or property damage.

The automatic reset mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

5.4 Functions of the RESET buttons

5.4.2.4 Acknowledging faults

For information on whether faults can be acknowledged, and on the corresponding LED and output contact states, refer to chapter Messages and diagnosis (Page 61).

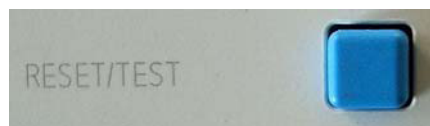
5.4.3 Other functions of the RESET button

5.4.3.1 Motor protection trip test

You initiate a motor overload trip by pressing the RESET / TEST button for longer than five seconds. The SIRIUS 3RW40 soft starter is tripped by the fault signal at the OVERLOAD LED, the FAILURE / OVERLOAD contact 95-98 closes, and the motor that is connected and running is switched off.



RESET/TEST button of 3RW402, 3RW403 and 3RW404



RESET/TEST button of 3RW405 and 3RW407

5.4.3.2 Reparameterizing the ON / RUN output contact

For information about reparameterizing the output with the RESET / TEST button, refer to chapter Parameterizing the 3RW40 outputs (Page 130) .

5.4.4 Reset options for fault acknowledgement

| Fault | RESET MODE | | |
|--|--------------|------------|--------------|
| | Manual RESET | Auto RESET | Remote RESET |
| Line fault (missing line voltage, phase failure, missing load) | + | — | + |
| I _e /CLASS setting not permissible | + | — | + |
| Asymmetry | + | — | + |
| Self-protection thyristor | + | + | + |
| Self-protection bypass | + | + | + |
| Motor protection | + | + | + |
| Thermistor motor protection | + | + | + |
| Supply voltage not permissible | Automatic | Automatic | Automatic |

5.5 Functions of the inputs

5.5.1 Start input (terminal 1) on 3RW30 and 3RW402 to 3RW404

Rated control voltage is present at terminal A1 / A2: The startup process of the soft starter begins when a signal is present at terminal 1 (IN). The starter operates until the signal is removed again.

If a ramp-down time is parameterized (3RW40 only), a soft stop starts as soon as the signal is removed.

The potential of the signal at terminal 1 must correspond to the potential of the rated control voltage at terminal A1 / A2.



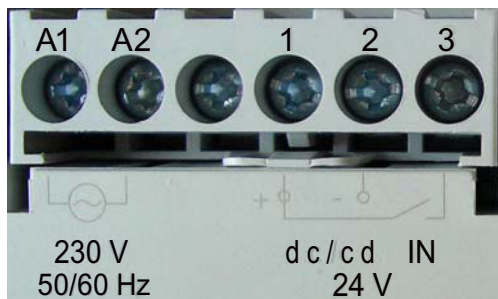
For recommended circuits, e.g. control by means of pushbuttons, contactor contacts, or a PLC, refer to chapter Typical circuit diagrams (Page 167).

5.5.2 Start input (terminal 3) on 3RW405 and 3RW407

Rated control voltage is present at terminal A1 / A2: The startup process of the soft starter begins when a signal is present at terminal 3 (IN). The starter operates until the signal is removed again. If a ramp-down time is parameterized, a soft stop starts as soon as the signal is removed.

The 24 V DC control voltage supplied by the soft starter must be taken from terminal 1 (+) as voltage for the signal at terminal 3.

If you select direct control by a PLC, the "M" of the PLC's reference potential must be connected to terminal 2 (-).

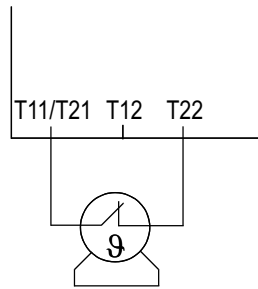
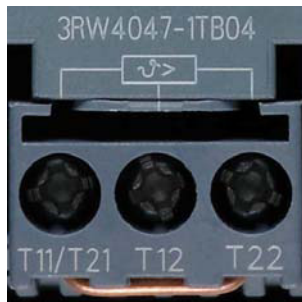


For recommended circuits, e.g. control by means of pushbuttons, contactor contacts, or a PLC, refer to chapter Typical circuit diagrams (Page 167).

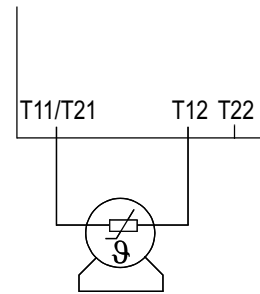
5.5.3 Thermistor input / connection on 3RW402 to 3RW404

24 V AC/DC rated control voltage

After removing the copper jumper between T11/T21 and T22, you can connect and evaluate either a Klaxon thermistor integrated in the motor winding (at terminal T11/T21-T22) or a type A PTC (at terminal T11/T21-T12).



Klaxon



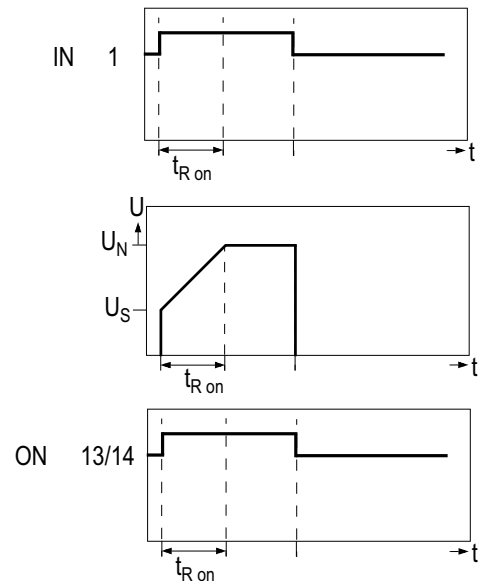
Type A PTC

5.6 Functions of the outputs

5.6.1 3RW30: Output terminal 13 / 14 ON

The potential-free output contact at terminal 13/14 (ON) closes if a signal is present at terminal 1 (IN); it remains closed until the start command is removed.

The output can be used, for instance, to control a line contactor connected upstream or to implement latching if you selected pushbutton control. For recommended circuits, refer to chapter Typical circuit diagrams (Page 167).



For a state diagram of the contact in the various operating states, refer to chapter Messages and diagnosis (Page 61).

5.6.2 3RW40: Output terminals 13 / 14 ON / RUN and 23 / 24 BYPASSED

ON

The potential-free output contact at terminal 13/14 (ON) closes if a signal is present at terminal 1 (IN); it remains closed until the start command is removed (factory default). The ON function can be used, for instance, as a latching contact if you selected pushbutton control.

Reparameterizing from ON to RUN

You can reparameterize the function of the ON output on the 3RW40 to RUN by simultaneously pressing the RESET TEST and RESET MODE buttons (refer to chapter Commissioning the 3RW40 (Page 116)).

RUN

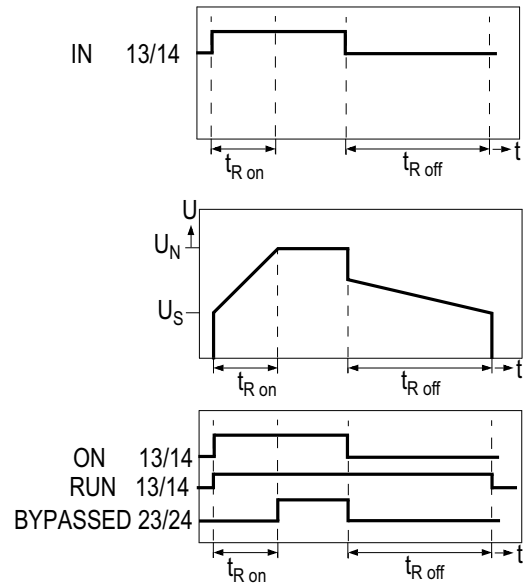
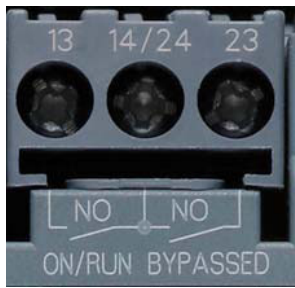
The RUN output remains closed as long as the motor is controlled by the soft starter, in other words during the startup phase, in bypass mode, and during the soft stop (if set). This output function can be used, for instance, if a line contactor connected upstream must be controlled by the soft starter, especially if the soft stop function is set.

BYPASSED

The BYPASSED function can be used, for instance, to indicate that the motor has started up successfully.

The BYPASSED output at terminal 23 / 24 closes as soon as the SIRIUS 3RW40 soft starter detects that the motor has started up (refer to chapter Ramp-up detection (Page 123)).

The integral bypass contacts simultaneously close and the thyristors are bridged. The integral bypass contacts and output 23 / 24 open again as soon as the start input IN is removed.



For a state diagram of the contacts and the LEDs in the various operating and fault states, refer to chapter Messages and diagnosis (Page 61).

For recommended circuits, refer to chapter Typical circuit diagrams (Page 167).

5.6.3 3RW40: Group fault output at terminal 95 / 96 / 98 OVERLOAD / FAILURE

If there is no rated control voltage or if a failure occurs, the potential-free FAILURE / OVERLOAD output is switched.



For recommended circuits, refer to chapter Typical circuit diagrams (Page 167).

For a state diagram of the contacts in the various fault and operating states, refer to chapter Messages and diagnosis (Page 61).

Messages and diagnosis

6.1 3RW30: LEDs

| 3RW30 | | 3RW30 LED indicators | | Aux. contact |
|--|----|----------------------|--------------------------------|--------------|
| | | DEVICE (RD/GN/YE) | STATE/BYPASSED/FAILURE (GN/RD) | |
| | | Soft starter | | |
| $U_s = 0$ | | ● | ● | — / — |
| Operating state | IN | | | |
| Off | 0 | ☀ GN | ● | — / — |
| Startup | 1 | ☀ GN | ◐ GN | — / — |
| Bypassed | 1 | ☀ GN | ☀ GN | — / — |
| Fault | | | | |
| Impermissible electronics supply voltage ¹⁾ | | ● | ☀ RD | — / — |
| Bypass overload ²⁾ | | ☀ YE | ☀ RD | — / — |
| - missing load voltage ¹⁾ - phase failure / missing load ¹⁾ | | ☀ GN | ☀ RD | — / — |
| Device error ³⁾ | | ☀ RD | ☀ RD | — / — |

| LED indications | | | GN | RD | YE |
|-----------------|----|----------|-------|-----|--------|
| ● | ☀ | ◐ | = | = | = |
| Off | On | Flashing | Green | Red | Yellow |

1) The fault is automatically reset by an outgoing event. An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

⚠ WARNING

Automatic restart
Danger of death, serious injury, or property damage.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

2) The fault can be acknowledged by removing the start command at the start input.

3) Switch off the control voltage, then switch it on again. If the fault is still present, contact your SIEMENS partner or Support Request (Page 15).

6.2 3RW30: Troubleshooting

| Fault | Cause | Remedy |
|--|--|---|
| Impermissible electronics supply voltage | The control supply voltage does not correspond to the soft starter's rated voltage. | Check the control supply voltage; an incorrect control supply voltage could be caused by a power failure or a voltage dip. |
| Bypass overload | A current $> 3.5 \times I_e$ of the soft starter occurs for > 60 ms in bypass mode (e.g. because the motor is blocked). | Check the motor and load, and check the soft starter's dimensions. |
| Missing load voltage, phase failure / missing load | <p>Cause 1: Phase L1 / L2 / L3 is missing at the start of soft starting or fails / collapses when the motor is operating.</p> <p>A trip occurs if a phase failure is detected by the 3RW30 at the start of soft starting:</p> <ul style="list-style-type: none"> at the beginning of starting: tripping time $t > 0.5$ s in run-up or in bypass mode: phase failure not detected | <p>Connect L1 / L2 / L3 or correct the voltage dip.</p> <p>Note:</p> <p>As soon as the motor is in run-up or bypass mode, these faults are no longer detected. The soft starter does not go to a fault state in these cases, and contact 13-14 remains closed.</p> <p>If the phase failure occurs in the uncontrolled phase, the response varies depending on whether the control voltage has a reference or connection to the AC network, or whether it is isolated:</p> <ul style="list-style-type: none"> If the control voltage is isolated, the phase failure of the uncontrolled phase will also be detected when the motor is switched off. With an On command, the 3RW30 goes immediately to a fault state, and contact 13 / 14 does not close. If the control voltage has a reference to the AC network, the phase failure of the uncontrolled phase is not detected, and with an On command, the soft starter attempts to start the motor. This can cause the motor to hum. |
| | <p>Cause 2: a motor that is not powerful enough is connected.</p> <p>A trip occurs if the current flowing through the 3RW30 soft starter at the start of soft starting is less than 10% of the rated operational current of the 3RW30, or less than 1 A.</p> | <p>Connect a motor with a higher rated operational current, or select a different soft starter.</p> <p>Note:</p> <p>As soon as the motor is in run-up or bypass mode, these faults are no longer detected. The soft starter does not go to a fault state in these cases, and contact 13-14 remains closed.</p> |
| | <p>Cause 3: Motor phase T1 / T2 / T3 is not connected.</p> | <p>Connect the motor properly (e.g. jumpers in the motor terminal box, repair switch closed etc.)</p> |
| Device error | Soft starter defective. | Contact your SIEMENS partner or Support Request (Page 15). |

6.3 3RW402 / 3RW403 / 3RW404: LEDs

| | | LED statuses 3RW40 | | | | Auxiliary contacts | | | |
|---|----|--------------------|------------------------------------|------------------|--|---|---|------------------|-----------------------------|
| | | Soft starter | | Motor protection | | 13 14 (ON) | | 24 23 (BYPASSED) | |
| 3RW402 / 3RW403 / 3RW404 | | DEVICE (RD/GN/YE) | STATE / BYPASSED / FAILURE (GN/RD) | OVERLOAD (RD) | RESET MODE (YE/GN) | 13 14 (ON) | 13 14 (RUN) | 24 23 (BYPASSED) | 96 95 98 FAILURE / OVERLOAD |
| U _s = 0 | | ● | ● | ● | ● | | | | |
| Operating state | IN | | | | | | | | |
| Off | 0 | GN | ● | ● | ● | | | | |
| Start | 1 | GN | GN | ● | ● | | | | |
| Bypassed | 1 | GN | GN | ● | ● | | | | |
| Stop | 0 | GN | GN | ● | ● | | | | |
| Warning | | | | | | | | | |
| I _e /class-setting impermissible ²⁾ | | GN | GN GN | | ● | | | | |
| Start inhibited, device too warm (cooling time may vary accord. to thyristor temperature) ³⁾ | | YE | ● | ● | ● | | | | |
| Fault | | | | | | | | | |
| Impermissible electronics supply voltage ²⁾ | | ● | RD | ● | ● | | | | |
| Impermissible I _e / class setting and IN (0 -> 1) ²⁾ | | GN | RD | | ● | | | | |
| Motor protection tripping Overload relay cooling time 5 min / Thermistor cooling time may vary according to motor temperature ¹⁾ | | GN | ● | | ● | | | | |
| Thermistor motor protection Wire break / short-circuit ^{1) 3)} | | GN | ● | | ● | | | | |
| Thermal overload on device ³⁾ (cooling time > 30 s) | | YE | RD | ● | ● | | | | |
| - No load voltage - Phase failure, missing load ⁶⁾ | | GN | RD | ● | ● | | | | |
| Device fault (cannot be acknowledged, device defective) ⁵⁾ | | RD | RD | ● | ● | | | | |
| Test function | | | | | | | | | |
| Press TEST t>5s ⁴⁾ | | GN | ● | RD | ● | | | | |
| RESET MODE (press to change) | | | | | | | | | |
| Manual reset | | GN | ● | ● | ● | | | | |
| Auto reset | | GN | ● | ● | YE | | | | |
| Remote Reset | | GN | ● | ● | GN | | | | |
| Display of the LEDs | | | | | 1) Optional, only 3RW402. to 3RW404. with 24 V AC/DC | | | | |
| | | | | GN = green | YE = yellow | RD = red | 2) Is reset automatically with the right setting or by an outgoing event. | | |
| | | | | | | 3) Must be acknowledged according to set reset mode | | | |
| | | | | | | 4) Motor protection trip test | | | |
| | | | | | | 5) Device faults cannot be acknowledged. Please contact your Siemens partner or Technical Assistance. | | | |
| | | | | | | 6) Can only be reset by manual or remote reset. | | | |



WARNING

Automatic restart

Can result in death, serious injury, or property damage.

The automatic reset mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output on the 3RW40 (terminals 95 and 96), or the signaling contact of the motor or miniature circuit breaker on all devices, in the controller.

6.4 3RW405 / 3RW407: LEDs

| | | LED displays on 3RW40 | | | | | Auxiliary contacts | | | |
|---|------|-----------------------|--------------------------------|------------------|---------------|-----------|---|--|-------------|---------------------------|
| | | Soft starter | | Motor protection | | | 13 14 (ON) | | 13 14 (RUN) | 24 23 (BYPASSED / RUN UP) |
| 3RW405 / 3RW407 | | DEVICE (RD/GN/YE) | STATE / BYPASSED / RUN UP (GN) | FAILURE (RD) | OVERLOAD (RD) | AUTO (GN) | | | | |
| $U_S = 0$ | | ● | ● | ● | ● | ● | | | | |
| Operating state | IN_1 | | | | | | | | | |
| OFF | 0 | GN | ● | ● | ● | ● | | | | |
| Start-up | 1 | GN | | ● | ● | ● | | | | |
| Bypassed / RUN UP | 1 | GN | | ● | ● | ● | | | | |
| Run-out | 0 | GN | | ● | ● | ● | | | | |
| Warning | | | | | | | | | | |
| I_e / class setting invalid | | GN | ● | ● | | ● | | | | |
| Start-up locked, thyristors too warm | | YE | ● | ● | ● | ● | | | | |
| Error | | | | | | | | | | |
| Supply voltage electronics invalid ($U < 0.75 \times U_S$) or ($U > 1.15 \times U_S$) | | ● | ● | | ● | ● | | | | |
| Invalid I_e / class setting and IN (0 -> 1) | | GN | ● | | | ● | | | | |
| Motor protection switch-off | | GN | ● | ● | | ● | | | | |
| Thermal overload thyristors | | YE | ● | | ● | ● | | | | |
| - Missing load voltage - Phase failure, no load | | GN | ● | | ● | ● | | | | |
| Device fault | | | | | | | | | | |
| Device fault | | RD | ● | | ● | ● | | | | |
| Test function | | | | | | | | | | |
| 1) Press TEST for $t < 2$ s | | GN | | | | ● | | | | |
| 2) Press TEST for $2 \text{ s} < t < 5 \text{ s}$; $I_e > 0$ | | RD | | ● | ● | ● | | | | |
| 2) Press TEST for $2 \text{ s} < t < 5 \text{ s}$; $I_e = 0$ | | RD | ● | ● | ● | ● | | | | |
| 3) Press TEST for $t > 5$ s | | GN | ● | ● | | ● | | | | |
| RESET MODE (press to change) | | | | | | | | | | |
| Manual Reset | | GN | ● | ● | ● | ● | | | | |
| Auto Reset | | GN | ● | ● | ● | YE | | | | |
| LED display | | | | | | | 1) LED test 2) Current measuring test 3) Motor protection shutdown test | | | |
| | | | | GN | YE | RD | | | | |
| | | | | = | = | = | | | | |
| OFF | ON | flashing | flickering | green | yellow | red | | | | |



WARNING

Automatic restart

Can result in death, serious injury, or property damage.

The automatic reset mode (AUTO RESET) must not be used in applications where there is a risk of serious injury to persons or substantial damage to property if the motor starts up again unexpectedly. The start command (e.g. issued by a contact or the PLC) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output on the 3RW40 (terminals 95 and 96), or the signaling contact of the motor or miniature circuit breaker on all devices, in the controller.

6.5 3RW40: Troubleshooting

| Warning | Cause | Remedy |
|--|--|--|
| Impermissible I_e /CLASS setting (control voltage present, no start command) | The rated operational current I_e set for the motor (control voltage present, no start command) exceeds the associated, maximum permissible setting current referred to the selected CLASS setting (chapter Motor current settings (Page 126)). | Check the rated operational current set for the motor, select a lower CLASS setting, or calculate the soft starter with a size allowance. As long as the 3RW40 is not controlled IN (0->1), this is only a status signal. However, it becomes a fault signal if the start command is applied. |
| Start inhibited, device too hot | The acknowledgment and the motor start are inhibited for a defined time by the inherent device protection following an overload trip, to allow the 3RW40 to cool down. Possible causes <ul style="list-style-type: none"> • Too many starts, • Motor starting time too long, • Ambient temperature in switching device's environment too high, • Minimum installation clearances not complied with. | The device cannot be started until the temperature of the thyristor or the heat sink has cooled down enough to guarantee sufficient reserve for a successful startup. The time until restarting is allowed can vary but is a minimum of 30 s. Rectify the causes and, if necessary, retrofit the optional fan (for 3RW402. to 3RW404.). |

| Fault | Cause | Remedy |
|--|---|--|
| Impermissible electronics supply voltage: | The control supply voltage does not correspond to the soft starter's rated voltage. | Check the control supply voltage; could be caused by a power failure, voltage dip, or incorrect control supply voltage. Use a stabilized power supply unit if due to mains fluctuations. |
| Impermissible I_e /CLASS setting and IN (0->1) (control voltage present, IN start command changes from 0 to 1) | The rated operational current I_e set for the motor (control voltage present, start command present) exceeds the associated, maximum permissible setting current referred to the selected CLASS setting (chapter Motor current settings (Page 126)). For the maximum permissible settings, refer to chapter Technical data (Page 133). | Check the rated operational current set for the motor, select a lower CLASS setting, or calculate the soft starter with a size allowance. |
| Motor protection tripping Overload relay / thermistor: | The thermal motor model has tripped. After an overload trip, restarting is inhibited until the recovery time has elapsed. <ul style="list-style-type: none"> - Overload relay tripping time: 60 s - Thermistor tripping time: When the temperature sensor (thermistor) in the motor has cooled down. | <ul style="list-style-type: none"> - Check whether the motor's rated operational current I_e is set correctly, or - Change the CLASS setting, or - Possibly reduce the switching frequency, or - Deactivate the motor protection (CLASS OFF), or - Check the motor and the application |
| Thermistor protection: wire breakage / short-circuit (optional for devices 3RW402. to 3RW404.): | Temperature sensor at terminals T11/T12/T22 is short-circuited or defective, a cable is not connected, or no sensor is connected. | Check the temperature sensor and the wiring |

6.5 3RW40: Troubleshooting

| Fault | Cause | Remedy |
|---|--|---|
| Thermal overload on the device: | Overload trip of the thermal model for the power unit of the 3RW40 Possible causes <ul style="list-style-type: none"> • Too many starts, • Motor starting time too long, • Ambient temperature in switching device's environment too high, • Minimum installation clearances not complied with. | Wait until the device has cooled down again, possibly increase the current limiting value set for starting, or reduce the switching frequency (too many consecutive starts). If necessary, retrofit the optional fan (for 3RW402. to 3RW404.) Check the load and the motor, check whether the ambient temperature in the soft starter's environment is too high (de-rating above 40 °C, refer to chapter Technical data (Page 133)), comply with the minimum clearances. |
| Missing load voltage, phase failure / missing load: | Cause 1: Phase L1 / L2 / L3 is missing or fails / collapses when the motor is operating. A trip occurs if the current measured by the current transformers of the 3RW40 is less than 20% of the minimum rated motor current that can be set on the 3RW40 potentiometer: <ul style="list-style-type: none"> • At starting/coasting down: tripping time $t > 1$ s • In bypass mode: tripping time $t > 5$ s | Connect L1 / L2 / L3 or correct the voltage dip. |
| | Cause 2: a motor that is not powerful enough is connected. A trip occurs if the current measured by the current transformers of the 3RW40 is less than 20% of the minimum rated motor current that can be set on the 3RW40 potentiometer, or less than 2 A. | Set the rated operational current for the connected motor correctly on the 3RW40 potentiometer, or set it to the minimum. |
| | Cause 3: Motor phase T1 / T2 / T3 is not connected. | Connect the motor properly (e.g. jumpers in the motor terminal box, repair switch closed etc.) |
| Device error | Soft starter defective. | Contact your SIEMENS partner or Support Request (Page 15). |

Application planning

7.1 Application examples

7.1.1 Roller conveyor application

Using the 3RW30 with roller conveyors

Roller conveyors are employed, for example, in parcel distribution systems for transporting parcels to and from individual workstations. For this purpose, the direction of rotation of the 11 kW / 15 hp motor that is used has to be adjustable in order for the conveyor to work in both directions.

The following requirements must be met by the roller conveyor:

- The roller conveyor has to start smoothly, to prevent damage to the transported goods due to slipping or tilting.
- The machine's wear and maintenance intervals should be minimized, which is why slippage of the belt drive during startup must be prevented.
- The high current load upon motor startup must be reduced by means of a voltage ramp.
- The feeder assembly should be as small as possible so as not to exceed the control cabinet's space capacity.

The SIRIUS 3RW30 soft starter offers the following advantages:

- The roller conveyor is rapidly accelerated to the nominal speed without torque surges thanks to the optimum setting of the voltage ramp during startup.
- The motor's starting current is reduced.
- Reversing operation of the conveyor belt is realized through contactor interconnection with SIRIUS 3RA13 reversing contactor combinations.
- The feeder and the motor protection are implemented with SIRIUS 3RV motor starter protectors.
- The use of SIRIUS system components guarantees maximum wiring reductions and space savings.

7.1.2 Hydraulic pump application

Using the 3RW40 with hydraulic pumps

The SIRIUS 3RW40 is optimally suited for soft starting and stopping of hydraulic pumps. With a rating of 200 kW / 250 hp, this soft starter is used, for example, in the production of sheet parts to drive the presses.

The drives for hydraulic pumps must meet the following requirements:

- The motor's starting current has to be reduced to minimize the load on the higher-level mains transformer during startup.
- Integrated motor protection is called for to reduce wiring expenditure and space requirements in the control box.
- The hydraulic pump must be started and stopped in a soft manner to minimize the mechanical load on the drive and the pump caused by torque surges during starting and stopping.

The SIRIUS 3RW40 soft starter offers the following advantages:

- The settable current limiting of the SIRIUS 3RW40 limits the load on the mains transformer during the motor startup.
- Motor protection is ensured by the motor overload relay with settable tripping times integrated in the soft starter.
- The adjustable voltage ramp ensures that the hydraulic pump is started and stopped without torque surges.

Installation

8.1 Installing the soft starter

8.1.1 Unpacking

NOTICE

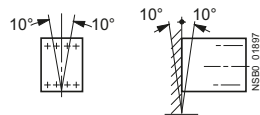
Do not lift the device by the cover

Do not lift the device by the cover when removing it from the packaging, especially in the case of sizes 3RW4055 to 3RW4076, because this could lead to damage.

8.1.2 Permissible mounting position

3RW30

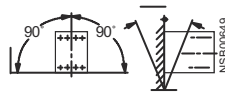
3RW40



Vertical mounting

3RW402 ... 3RW404 (with optional auxiliary fan)

3RW405 ... 3RW407



Horizontal mounting

Note

The permissible switching frequency values can vary according to the selected mounting position. For information about factors and how to determine the new switching frequency, refer to chapter Configuration (Page 91).

Note

For devices 3RW4024 to 3RW4047 an optional fan can be ordered, and from 3RW4055 to 3RW4076 the fan is integrated in the device. The 3RW30 cannot be equipped with a fan.

8.1.3 Mounting dimensions, clearances, and assembly type

The minimum clearances from other devices must be complied with to ensure unobstructed cooling as well as the free supply and discharge of air to and from the heat sink.

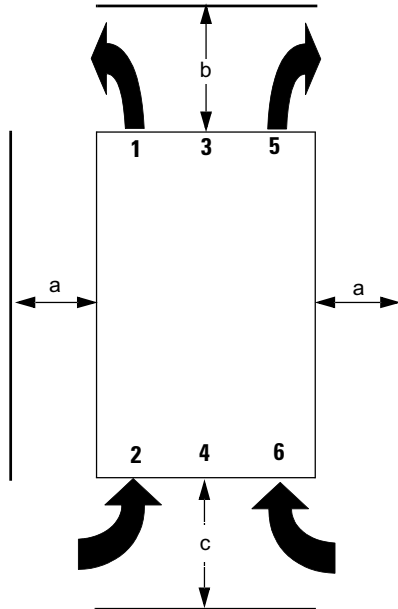


Figure 8-1 Clearances from other devices

| Article No. | a (mm) | a (in) | b (mm) | b (in) | c (mm) | c (in) |
|-----------------|--------|--------|--------|--------|--------|--------|
| 3RW301./3RW302. | 15 | 0.59 | 60 | 2.36 | 40 | 1.56 |
| 3RW303./3RW304 | 30 | 1.18 | 60 | 2.36 | 40 | 1.56 |
| 3RW402. | 15 | 0.59 | 60 | 2.36 | 40 | 1.56 |
| 3RW403./3RW404. | 30 | 1.18 | 60 | 2.36 | 40 | 1.56 |
| 3RW405./3RW407. | 5 | 0.2 | 100 | 4 | 75 | 3 |

Note

Allow sufficient clearances for the cooling air to circulate freely. The device is ventilated from bottom to top.

8.1.4 Assembly type: Standalone assembly, side-by-side assembly, direct mounting

Standalone assembly



The term "standalone assembly" is used if the clearances a / b / c described in chapter Mounting dimensions, clearances, and assembly type (Page 72) are complied with.

Side-by-side assembly



The term "side-by-side assembly" is used if the lateral clearance a described in chapter Mounting dimensions, clearances, and assembly type (Page 72) are not complied with, e.g. if several switching devices are assembled side by side.

Direct mounting



The term "direct mounting" is used if the top clearance b described in chapter Mounting dimensions, clearances, and assembly type (Page 72) is not complied with, e.g. if the soft starter is mounted directly on a motor starter protector (e.g. 3RV2) using a link module (e.g. 3RV29).

Note

The permissible switching frequency values can vary according to the selected assembly type. For information about factors and how to determine the new switching frequency, refer to chapter Configuration (Page 91).

8.1.5 Installation requirements

Degree of protection IP00

The SIRIUS 3RW30 / 3RW40 soft starters conform to the IP00 degree of protection.

The devices must be installed in control cabinets with IP4x degree of protection (pollution degree 2), taking account of the ambient conditions.

Make sure no liquids, dust, or conductive objects can get inside the soft starter. The soft starter produces waste heat (heat dissipation) while it is operating (refer to chapter Technical data (Page 133)).

NOTICE

Risk of material damage

Provide adequate cooling at the place of installation to prevent the switching device from overheating.

Installation / mounting

9.1 General information

General information

A motor feeder comprises a **disconnecter**, a **contact**, and a **motor** as a minimum.

Line protection against short-circuits must be implemented, together with overload protection for the line and motor.

Disconnecter

The isolating function with line protection against overload and short-circuits can be achieved with a motor starter protector or a fuse disconnecter, for instance. The motor overload protection function is integrated in the SIRIUS 3RW40 soft starter. The motor overload protection for the SIRIUS 3RW30 soft starter can be implemented with a motor circuit breaker, for instance, or using a motor overload relay in conjunction with a contactor (for the fuse and motor starter protector assignment, refer to Technical data (Page 133)).

Contact

The contact function is taken care of by the SIRIUS 3RW30 or 3RW40 soft starter.

DANGER

Hazardous voltage
Danger of death or serious injury.

If mains voltage is present at the input terminals of the soft starter, hazardous voltage may still be present at the soft starter output even if a start command has not been issued. This voltage must be isolated by means of a disconnecter (open isolating distance, e.g. with an open switch disconnecter) whenever work is carried out on the feeder (refer to chapter Five safety rules for work in or on electrical systems (Page 24)).

Note

All elements of the main circuit (such as fuses, motor starter protectors, and switching devices) must be dimensioned for direct starting and according to the on-site short-circuit conditions, and ordered separately.

For recommended fuse and motor starter protector ratings for the feeder with soft starter, refer to chapter Technical data (Page 133).

9.2 General feeder assembly (type of coordination 1)

The SIRIUS 3RW30 or 3RW40 soft starter is connected into the motor feeder between the motor starter protector and the motor.

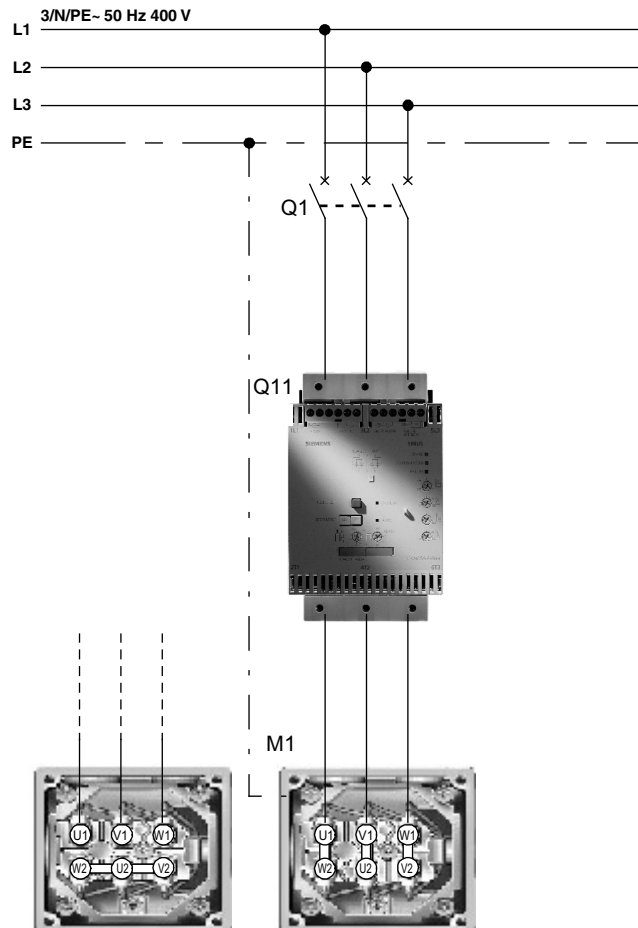


Figure 9-1 Block diagram of the SIRIUS 3RW40 soft starter

Note

For the component design, refer to chapter Technical data (Page 133).

9.3 Soft starter with line contactor (type of coordination 1)

If electrical isolation is specified, you can install a motor contactor between the soft starter and the motor starter protector.

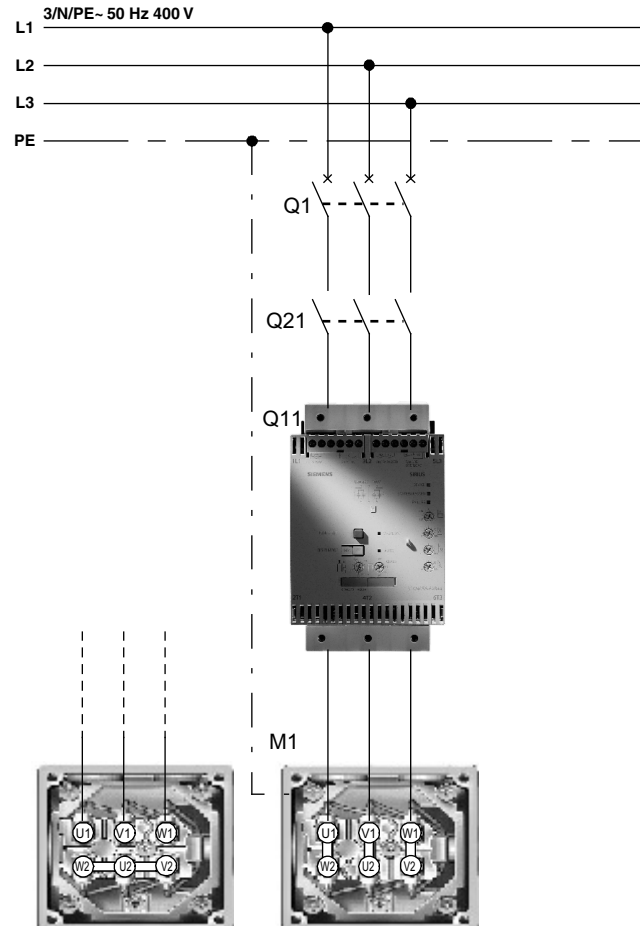


Figure 9-2 Block diagram of a feeder with an optional main / line contactor

Note

For the component design, refer to chapter Technical data (Page 133).

Note

If a main or line contactor is used, it should not be connected between the soft starter and the motor. The soft starter could otherwise indicate a "Missing load voltage" fault in case of a start command and delayed connection of the contactor.

9.4 Soft starter assembly with type of coordination 2

The SIRIUS 3RW40 soft starter has internal protection to prevent overloading of the thyristors. The SIRIUS 3RW30 soft starter has no internal protection to prevent overloading of the thyristors. The soft starter must always be dimensioned according to the duration of the startup process and the desired starting frequency. If the feeder of the SIRIUS 3RW30 or 3RW40 soft starter is assembled accordingly with the feeder components recommended in chapter Technical data (Page 133) (e.g. motor starter protector or LV HRC fuse), type of coordination 1 is achieved. In order to achieve type of coordination 2, all thyristors must be additionally protected against short-circuits by means of special semiconductor fuses (e.g. SIEMENS SITOR). A short-circuit can occur, for instance, as a result of a defect in the motor windings or in the motor's power supply cable.

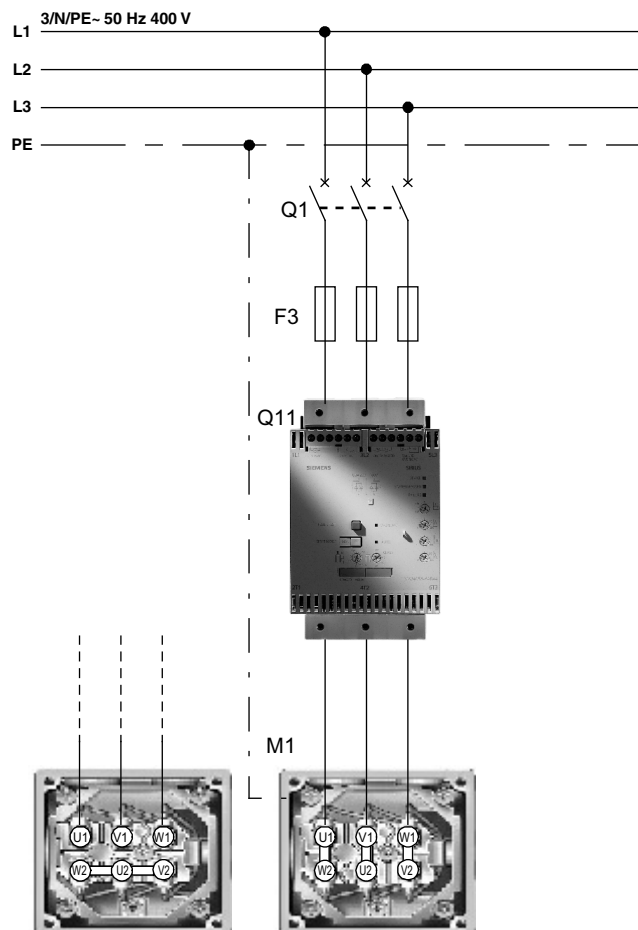


Figure 9-3 Block diagram of a feeder with semiconductor fuses

Note

For the component design, refer to chapter Technical data (Page 133).

Note**Minimum and maximum configuration of the semiconductor fuses**

The fuses for the minimum and maximum configuration are specified in chapter Technical data (Page 133).

Minimum configuration: The fuse is optimized for the thyristor's I^2t value.

If the thyristor is cold (ambient temperature) and the startup process lasts a maximum of 20 s at 3.5 times the rated current of the device, the fuse does not trip.

Maximum configuration: The maximum current permitted for the thyristor can flow without the fuse tripping.

The maximum configuration is recommended for heavy-duty starting.

NOTICE**Risk of property damage**

Type of coordination 1 in accordance with IEC 60947-4-1:

The device is defective following a short-circuit failure and therefore unsuitable for further use (personnel and equipment must not be put at risk).

Type of coordination 2 in accordance with IEC 60947-4-1:

The device is suitable for further use following a short-circuit failure (personnel and equipment must not be put at risk).

The type of coordination only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.

9.5 Capacitors to improve the power factor

 **CAUTION**

Risk of property damage

No capacitors must be connected to the output terminals of the soft starter. If so, the soft starter will be damaged.

Active filters, e.g. for power factor correction, must not be operated parallel to the motor control device.

If capacitors are to be used to correct the power factor, they must be connected on the device's line side. If an isolating or main contactor is used together with the electronic soft starter, the capacitors must be disconnected from the soft starter when the contactor is open.

9.6 Maximum cable length

The cable between the soft starter and the motor must not be more than 300 m long (3RW30 and 3RW40).

The voltage drop due to the length of the cable to the motor may need to be considered when dimensioning the cable.

Cable lengths up to 500 m are permitted for SIRIUS 3RW44 soft starters (refer to the 3RW44 System Manual (<https://support.industry.siemens.com/cs/ww/en/view/21772518>)).

9.6 Maximum cable length

Connecting

10.1 Electrical connection

10.1.1 Control and auxiliary terminals

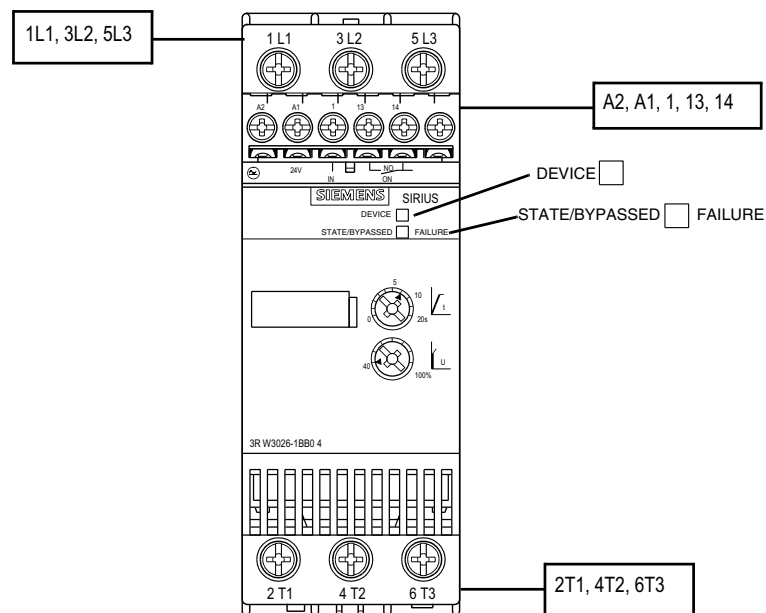
The SIRIUS 3RW30 and 3RW40 soft starters can be supplied with two different connection technologies:

- Screw-type technology
- Spring-loaded technology

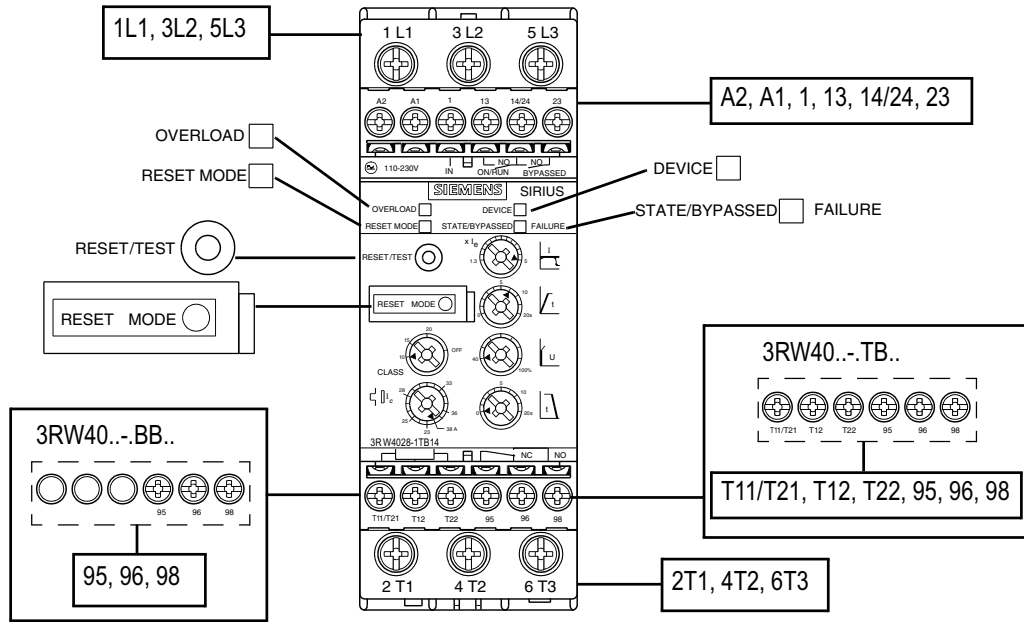
10.1.2 Main circuit connection

SIRIUS 3RW30 and 3RW40 soft starters up to the 55 kW / 75 hp size at 400 V / 480 V are designed with removable terminals at the main circuit connections.

Size 3RW301. to 3RW304.



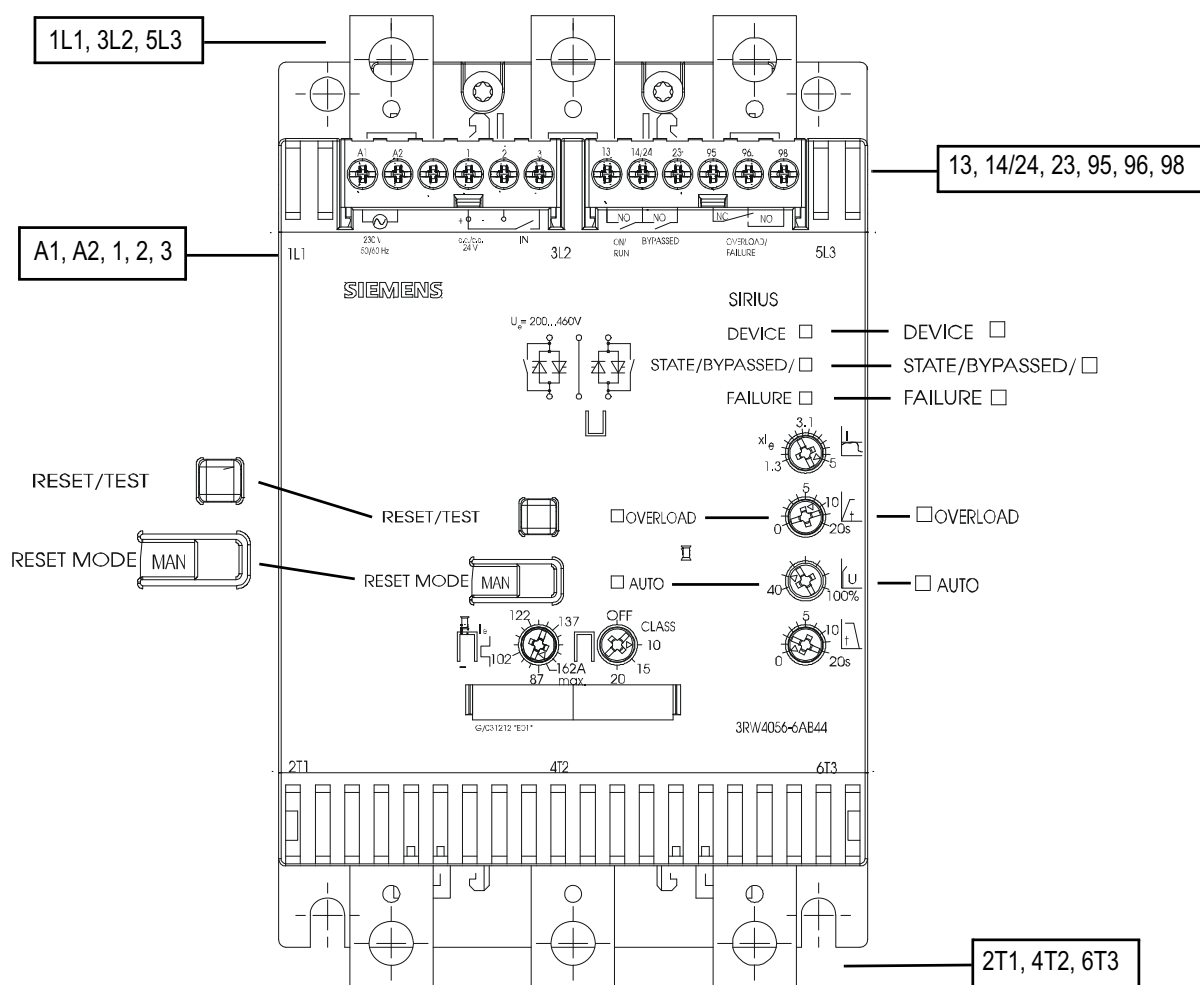
Size 3RW402. to 3RW404.



Size 3RW405 . and 3RW407.

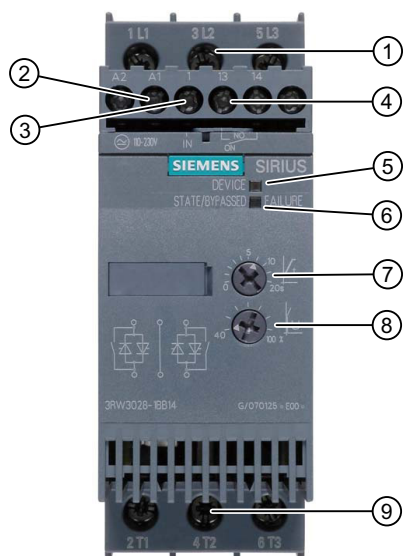
Sizes 3RW405 . and 3RW407. have busbar connections for the main circuit connection.

Box terminals can be retrofitted on these devices as optional accessories (refer to chapter Accessories (Page 33)).



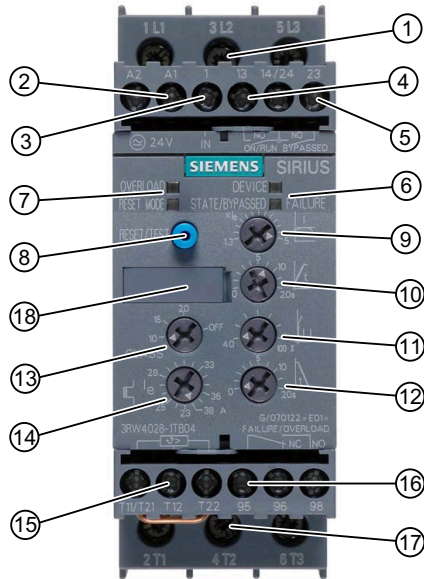
Operation

11.1 Operator controls, displays, and connections on the 3RW30



- 1 Operating voltage (three-phase mains voltage)
- 2 Control supply voltage
- 3 IN start input
- 4 ON output
- 5 DEVICE status LED
- 6 STATE / BYPASSED / FAILURE status LED
- 7 Ramp-up time
- 8 Starting voltage
- 9 Motor terminals

11.2 Operator controls, displays, and connections on the 3RW40



- 1 Operating voltage (three-phase mains voltage)
- 2 Control supply voltage
- 3 IN start input
- 4 ON / RUN output
- 5 BYPASSED output
- 6 DEVICE / STATE / BYPASSED / FAILURE status LEDs
- 7 OVERLOAD, RESET MODE status LEDs
- 8 TEST / RESET button
- 9 Current limiting
- 10 Ramp-up time
- 11 Starting voltage
- 12 Ramp-down time
- 13 Trip class
- 14 Motor current
- 15 Thermistor input (can be optionally ordered with 24 V AC/DC control voltage for 3RW402. to 3RW404. devices)
- 16 Fault output
- 17 Motor terminals
- 18 RESET MODE button (behind the label on the 3RW402., refer to the diagram below)

11.2 Operator controls, displays, and connections on the 3RW40

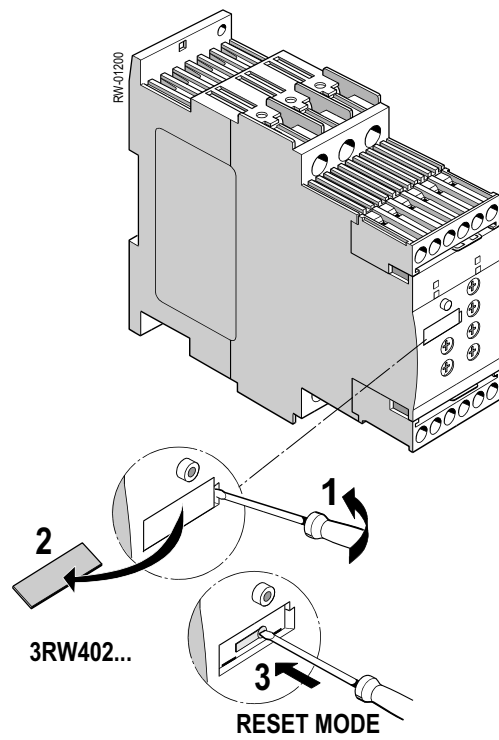


Figure 11-1 Button for setting RESET MODE behind the label

11.3 Effects on changing the potentiometer settings

| Potentiometer | Change | Reaction / behavior Startup | Reaction / behavior Bypass operation | Reaction / behavior Run-down |
|-----------------------|----------------------------|------------------------------|--------------------------------------|---|
| Starting voltage | Increase voltage | Effective at next start | Effective at next start | Effective at next start |
| Ramp-up time | Extend time | Change effective immediately | Effective at next start | Change effective immediately |
| Current limiting | In case of limiting factor | Change effective immediately | Effective at next start | Change effective immediately |
| Ramp-down time | Extend time | Effective at next start | Effective at next shut-down | Change effective immediately in down ramp |
| CLASS setting | Change from 10 to 20 | Change effective immediately | Change effective immediately | Change effective immediately |
| Motor current setting | Change | Change effective immediately | Change effective immediately | Change effective immediately |

Configuration

12.1 Configuration in general

The SIRIUS 3RW30 and 3RW40 electronic soft starters are designed for normal starting. A larger size may need to be selected for longer ramp-up times or a higher starting frequency.

An appropriately dimensioned SIRIUS 3RW40 or 3RW44 soft starter should be chosen for startup processes with motor ramp-up times > 20 s.

The motor feeder between the soft starter and motor must not contain any capacitive elements (such as compensation systems). Active filters must not be operated in combination with soft starters.

All elements of the main circuit (such as fuses and switching devices) must be dimensioned for direct starting and according to the on-site short-circuit conditions, and ordered separately.

The harmonic component load of the starting current must be taken into consideration when selecting motor starter protectors (trip selection).

Note

Voltage dips generally occur in all start modes (direct starting, wye-delta starting, soft starting) when a three-phase motor is switched on. The infeed transformer must always be dimensioned so that the voltage dip at the motor startup remains within the permissible tolerance. If the infeed transformer is insufficiently dimensioned, the control voltage should be supplied from a separate circuit (independently of the main voltage) in order to prevent the voltage dip from disconnecting the 3RW.

Note

All elements of the main circuit (such as fuses, motor starter protectors, and switching devices) must be dimensioned for direct starting and according to the on-site short-circuit conditions, and ordered separately.

If wye-delta starters are exchanged for soft starters in an existing system, you should check the fuse ratings in the feeder in order to avoid false tripping. This is particularly important in connection with heavy-duty starting or if the fuse that is installed has already been operated close to the thermal tripping limit with the wye-delta assembly.

For recommended fuse and motor starter protector ratings for the feeder with soft starter, refer to chapter Technical data (Page 133).

12.1.1 Configuration procedure

1. Select the correct starter

What application must be started and what functionality must be provided by the soft starter?

12.1 Configuration in general

Chapter Selecting the optimum soft starter (Page 92)

2. Take account of the startup class and the switching frequency

Chapters Startup class (Page 94) and Calculating the permissible switching frequency (Page 102)

3. Take account of a possible reduction in the soft starter's rated data due to the ambient conditions and the type of assembly.

Chapter Reducing the rated data (Page 98)

12.1.2 Selecting the optimum soft starter

Selection aid

You can choose the optimum starter from the soft starter types available based on the intended application or the required functionality.

| Normal starting (CLASS 10) applications | 3RW30 | 3RW40 | 3RW44 |
|---|-------|-------|-------|
| Pump | + | + | + |
| Pump with special stop (against water hammer) | - | - | + |
| Heat pump | + | + | + |
| Hydraulic pump | x | + | + |
| Press | x | + | + |
| Conveyor belt | x | + | + |
| Roller conveyor | x | + | + |
| Conveyor worm | x | + | + |
| Escalator | - | + | + |
| Piston compressor | - | + | + |
| Screw compressor | - | + | + |
| Small fan ¹⁾ | - | + | + |
| Centrifugal blower | - | + | + |
| Bow thruster | - | + | + |

+ Recommended soft starter

x Possible soft starter

1) Small fan: Mass inertia (centrifugal mass) of fan < 10 x mass inertia of motor

| Heavy-duty starting (CLASS 20) applications | 3RW30 | 3RW40 | 3RW44 |
|---|-------|-------|-------|
| Agitator | - | x | + |
| Extruder | - | x | + |

| Heavy-duty starting (CLASS 20) applications | 3RW30 | 3RW40 | 3RW44 |
|---|-------|-------|-------|
| Turning machine | - | x | + |
| Milling machine | - | x | + |

+ Recommended soft starter

x Possible soft starter

| Ultra-heavy-duty starting (CLASS 30) applications | 3RW30 | 3RW40 | 3RW44 |
|---|-------|-------|-------|
| Large fan ²⁾ | - | - | + |
| Circular saw / band saw | - | - | + |
| Centrifuge | - | - | + |
| Mill | - | - | + |
| Crusher | - | - | + |

+ Recommended soft starter

2) Large fan: Mass inertia (centrifugal mass) of fan $\geq 10 \times$ mass inertia of motor

| Soft starter functions | 3RW30 | 3RW40 | 3RW44 |
|---|-------|-------|-------|
| Soft start function | + | + | + |
| Soft stop function | - | + | + |
| Integrated intrinsic device protection | - | + | + |
| Integrated electronic motor overload protection | - | + | + |
| Settable current limiting | - | + | + |
| Special pump stop function | - | - | + |
| Braking when coasting down | - | - | + |
| Settable breakaway torque | - | - | + |
| Communication via PROFIBUS (optional) | - | - | + |
| External operation and indication display (optional) | - | - | + |
| Soft Starter ES parameterization software | - | - | + |
| Special functions, e.g. measured values, display languages etc. | - | - | + |
| Motor overload protection acc. to ATEX | - | + | - |

+ Recommended soft starter

Note

SIRIUS 3RW44 soft starter

For more information about the SIRIUS soft starter, refer to the 3RW44 System Manual. You can download (<https://support.industry.siemens.com/cs/ww/en/view/21772518>) the manual free of charge.

12.2 Startup class

To achieve the optimum soft starter design, it is important to know and take into account the starting time (startup class) of the application. Long starting times mean a higher thermal load on the thyristors of the soft starter. An appropriately dimensioned SIRIUS 3RW40 or 3RW44 soft starter should be chosen for startup processes with a motor ramp-up time > 20 s. The maximum permissible starting time for SIRIUS 3RW30 soft starters is 20 seconds. SIRIUS soft starters are designed for continuous operation with normal starting (CLASS 10), an ambient temperature of 40 °C, and a defined switching frequency (refer to chapter Technical data (Page 133)). If other data applies, the starters may need to be calculated with a size allowance.

NOTICE

Risk of property damage

When using the 3RW30: Make sure the selected ramp time is longer than the actual motor run-up time. If not, the SIRIUS 3RW30 may be damaged because the internal bypass contacts close when the set ramp time elapses. If the motor has not finished starting up, an AC3 current that could damage the bypass contact system will flow.

When using the 3RW40: The 3RW40 has an integrated ramp-up detection function that prevents this operating state from occurring.

Selection criteria

Note

You must select the size of your SIRIUS soft starters according to the rated motor current (rated current_{soft starter} ≥ rated motor current).

12.2.1 Application examples for normal starting (CLASS 10) with 3RW30 and 3RW40

Recommended basic parameter settings

Assuming the conditions and constraints indicated below apply, the size of the soft starters can be equivalent to the motor rating for a normal starting characteristic (CLASS 10).

You can find a suitable soft starter for the required motor rating based on the required startup class in chapter Technical data (Page 133).

For typical applications where normal starting applies as well as recommended parameter settings for the soft starter, refer to the table below.

Normal starting (CLASS 10)

The soft starter rating can be equivalent to the motor rating.

| Application | Conveyor belt | Roller conveyor | Compressor | Small fan ¹⁾ | Pump | Heat / hydraulic pump |
|-------------------------------------|---------------------------------|---------------------------------|--------------------|-------------------------|------------------------|-----------------------|
| Start parameters | | | | | | |
| • Voltage ramp and current limiting | | | | | | |
| - Starting voltage | % 70 | 60 | 50 | 40 | 40 | 40 |
| - Ramp-up time | s 10 | 10 | 10 | 10 | 10 | 10 |
| - Current limiting value (3RW40) | off (max / 5 x I _M) | off (max / 5 x I _M) | 4 x I _M | 4 x I _M | 4 x I _M | 4 x I _M |
| Stop mode | Soft stop (3RW40 only) | Soft stop (3RW40 only) | Stop without load | Stop without load | Soft stop (3RW40 only) | Stop without load |

1) Small fan: Mass inertia (centrifugal mass) of fan < 10 x mass inertia of motor

| General conditions and constraints | |
|--|-----------------------|
| CLASS 10 (normal starting) | |
| 3RW30: Maximum starting time 3 s, 300 % starting current, 20 starts / hour | |
| 3RW40: Maximum starting time 10 s, 300% current limiting, 5 starts / hour | |
| ON time | 30% |
| Standalone assembly | |
| Installation altitude | Max. 1000 m / 3280 ft |
| Ambient temperature kW | 40 °C / 104 °F |

12.2.2 Application examples for heavy-duty starting (CLASS 20): 3RW40 only

Recommended basic parameter settings

Assuming the conditions and constraints indicated below apply, the soft starter size must be at least one power class higher than the motor rating for heavy-duty starting (CLASS 20).

You can find a suitable soft starter for the required motor rating based on the required startup class in chapter Technical data (Page 133).

For typical applications where heavy-duty starting can apply as well as recommended parameter settings for the soft starter, refer to the table below.

Heavy-duty starting (CLASS 20)

The soft starter must be at least one power class larger than the motor rating.

| Application | Agitator | Extruder | Milling machine |
|-------------------------------------|--------------------|---------------------------------|--------------------|
| Start parameters | | | |
| • Voltage ramp and current limiting | | | |
| - Starting voltage | % 40 | 70 | 40 |
| - Ramp-up time | s 20 | 10 | 20 |
| - Current limiting value (3RW40) | 4 x I _M | off (max / 5 x I _M) | 4 x I _M |
| Stop mode | Stop without load | Stop without load | Stop without load |

| General conditions and constraints | |
|------------------------------------|---|
| CLASS 20 (heavy-duty starting) | |
| 3RW402. / 3RW403. / 3RW404. | Maximum starting time 20 s, 300% current limiting, max. 5 starts / hour |
| 3RW405. / 3RW407. | Maximum starting time 40 s, 350% current limiting, max. 1 start / hour |
| ON time | 30% |
| Standalone assembly | |
| Installation altitude | Max. 1000 m / 3280 ft |
| Ambient temperature kW | 40 °C / 104 °F |

Note

The settings and device dimensions indicated in these tables are examples only; they are merely provided for information purposes and are not binding. The actual settings depend on the application and must be optimized when the equipment is commissioned.

If other conditions and constraints apply, either refer to the chapter Technical data (Page 133) or check your requirements and selection with Support Request (Page 15).

12.3 ON time and switching frequency

Based on the rated motor current and the startup class, the SIRIUS 3RW30 and 3RW40 soft starters are dimensioned for a maximum permissible switching frequency in combination with a relative ON time (refer to chapter Technical data (Page 133)). If these values are exceeded, a larger soft starter may have to be selected.

ON time

The relative ON time in % is the ratio between the load duration and the cycle duration for loads that are frequently switched on and off.

The ON time (OT) can be calculated using the following formula:

$$OT = \frac{t_s + t_b}{t_s + t_b + t_p}$$

where:

OT = ON time [%]

t_s = ramp-up time [s]

t_b = operating time [s]

t_p = idle time [s]

The following diagram illustrates this process.

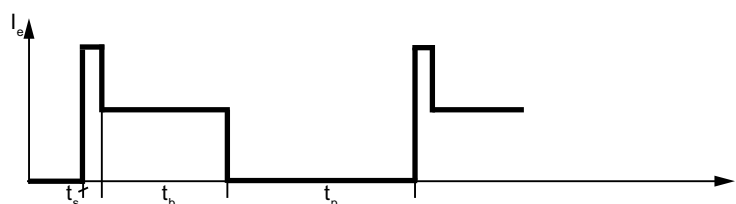


Figure 12-1 ON time

Switching frequency

The maximum permissible switching frequency must not be exceeded because the devices could be damaged due to thermal overloading.

Optional additional fan

The switching frequency of the 3RW402. to 3RW404. soft starters can be increased by installing an optional additional fan. For information about factors and how to determine the maximum switching frequency if an additional fan is installed, refer to chapter Calculating the permissible switching frequency (Page 102).

12.4 Reducing the rated data

You can reduce the rated data of the SIRIUS 3RW30 and 3RW40 soft starters if

- The installation altitude is higher than 1000 m.
- The ambient temperature in the switching device's environment exceeds 40 °C.
- The lateral clearances described earlier are not complied with, e.g. side-by-side assembly or direct mounting of other switching devices (assembly type).
- The vertical mounting position is not complied with.

12.5 Dimensioning of soft starters for motors with high starting current conditions

When using motors with high starting current conditions (typically $I/I_e \geq 8$), overdimensioning of the 3RW40 soft starter can be necessary. For this application case, we recommend 3RW40 soft starters with product version E07 or higher (for 3RW40 sizes S0, S2, S3) or with product version E11 or higher (for 3RW40 sizes S6 and S12). These 3RW40 devices make it possible to select the set value for current limiting sufficiently high for a successful motor start (refer to chapter Setting the current limiting value (Page 121)).

For dimensioning soft starters for motors with high starting current conditions (typically $I/I_e > 8$), refer to Siemens Support Request (Page 15).

12.6 Installation altitude and ambient temperature

Installation altitude

The permissible installation altitude must not be higher than 5000 m above sea level (higher than 5000 m on request).

If the installation altitude exceeds 1000 m, the rated operational current must be reduced for thermal reasons.

If the installation altitude exceeds 2000 m, the rated voltage must also be reduced owing to the restricted dielectric strength. A maximum permissible rated voltage of 460 V applies at installation altitudes between 2000 m and 5000 m above sea level.

The following diagram shows the reduction in the rated device current as a function of the installation altitude:

The rated operational current I_e must be reduced at altitudes higher than 1000 m above sea level.

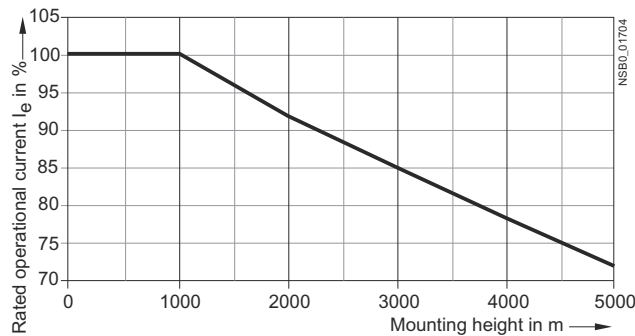


Figure 12-2 Reduction as a function of the installation altitude

Ambient temperature

The maximum permissible ambient temperature of the soft starter must not exceed 60 °C.

SIRIUS 3RW30 and 3RW40 soft starters are designed for operation with nominal current at an ambient temperature of 40 °C. If this temperature is exceeded, e.g. owing to an impermissible temperature rise in the control cabinet, other loads, or a general increase in the ambient temperature, the resulting deterioration in the soft starter's performance must be taken into account when the device is dimensioned (refer to chapter Technical data (Page 133)).

NOTICE

Risk of material damage

The soft starter may be damaged if the maximum installation altitude (5000 m above sea level) or an ambient temperature of 60 °C is ignored.

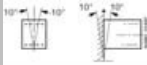
Mounting position, assembly type


The mounting position and assembly type (refer to chapter Installing the soft starter (Page 71)) can influence the soft starter's permissible switching frequency. Refer to chapter Calculating the permissible switching frequency (Page 102) for the permissible mounting and assembly combinations as well as the resulting factors for the soft starter switching frequencies.

12.7 Calculating the permissible switching frequency

12.7.1 Table of permissible assembly combinations with switching frequency factors

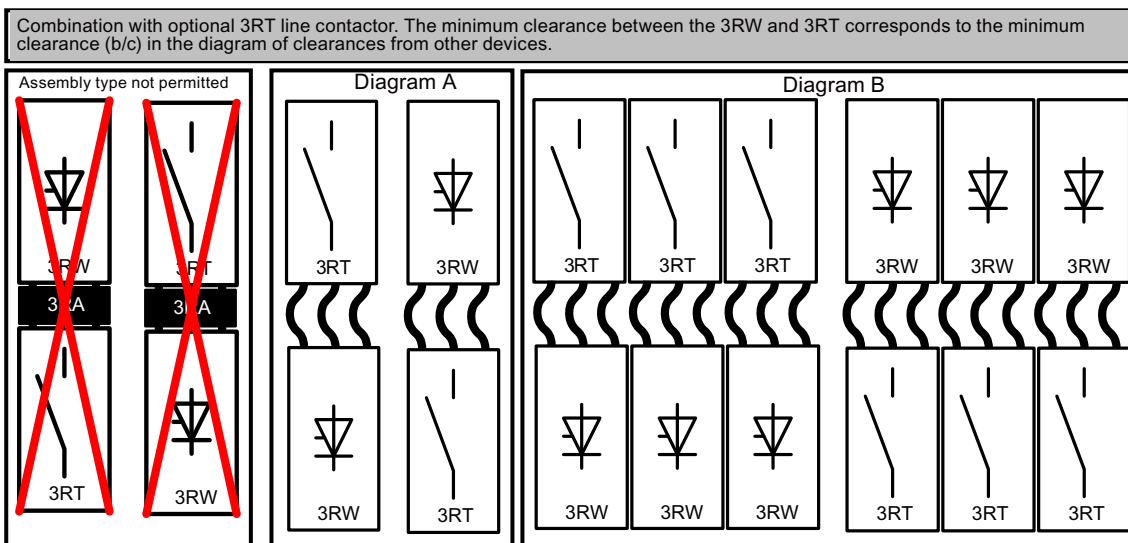
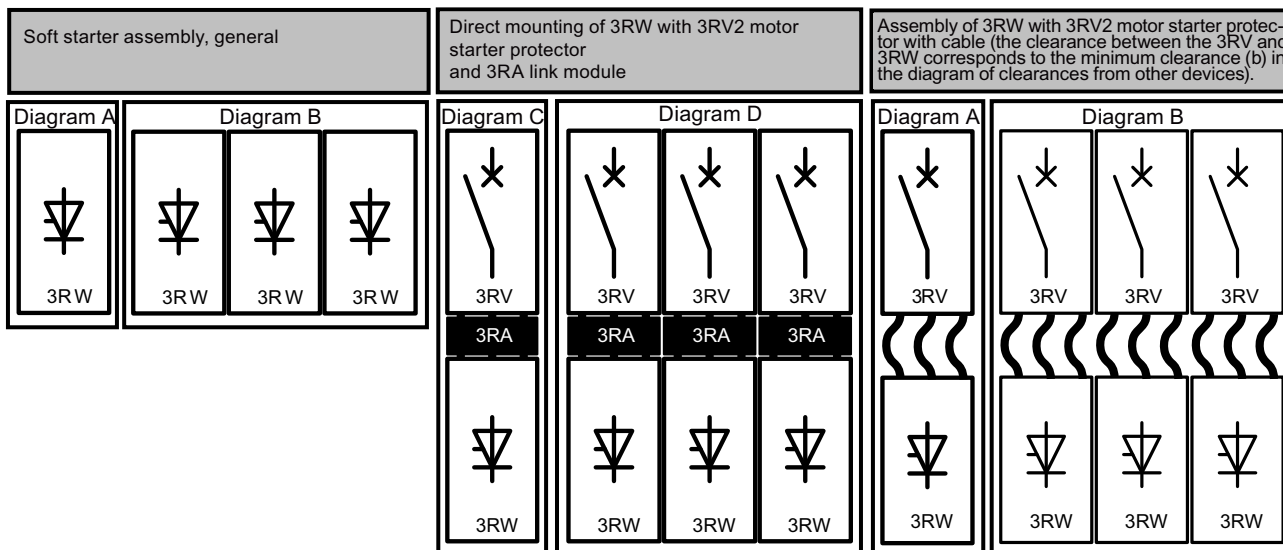
The factors indicated in the table refer to the switching frequency (starts / hour) as specified in chapter Technical data (Page 133).

| | |  Vertical mounting | | | | | | | | | |
|-------|-----------------------|---|---------|---------|---------|---------|---------|---------|----------------------|---------|---------|
| Graph | Assembly type | 3RW30 | | | | 3RW40 | | | 3RW40 + optional fan | | |
| | | 3RW301* | 3RW302* | 3RW303* | 3RW304* | 3RW402* | 3RW403* | 3RW404* | 3RW402* | 3RW403* | 3RW404* |
| A | Standalone assembly | 1.0 | | | | 1.0 | | | 1.6 | 2.0 | 2.8 |
| B | Side-by-side assembly | 0.7 | 0.1 | 0.3 | | 0.1 | 0.3 | | 1.6 | 2.0 | 2.8 |
| C | Standalone assembly | 0.5 | | 0.8 | | 0.5 | 0.8 | | 1.6 | 2.0 | |
| D | Side-by-side assembly | 0.3 | - | - | | - | | | 1.6 | 1.8 | |

| | |  Horizontal mounting | | | |
|-------|-----------------------|--|----------------------|---------|---------|
| Graph | Assembly type | 3RW30/40 | 3RW40 + optional fan | | |
| | | | 3RW402* | 3RW403* | 3RW404* |
| A | Standalone assembly | - | 1.6 | 2.0 | 2.8 |
| B | Side-by-side assembly | - | 1.6 | 2.0 | 2.8 |
| C | Standalone assembly | - | 1.6 | 2.0 | |
| D | Side-by-side assembly | - | 1.4 | 1.8 | |

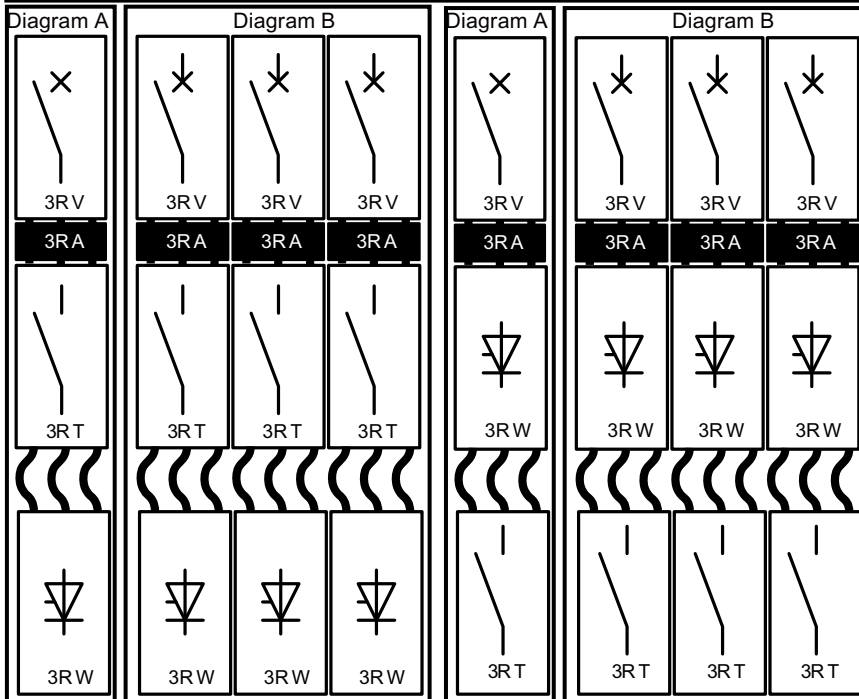
| |
|---|
| Standard switching frequency |
| High switching frequency (fan required) |
| Reduced switching frequency |
| Assembly type not permitted |
| Assembly type not tested |

12.7 Calculating the permissible switching frequency

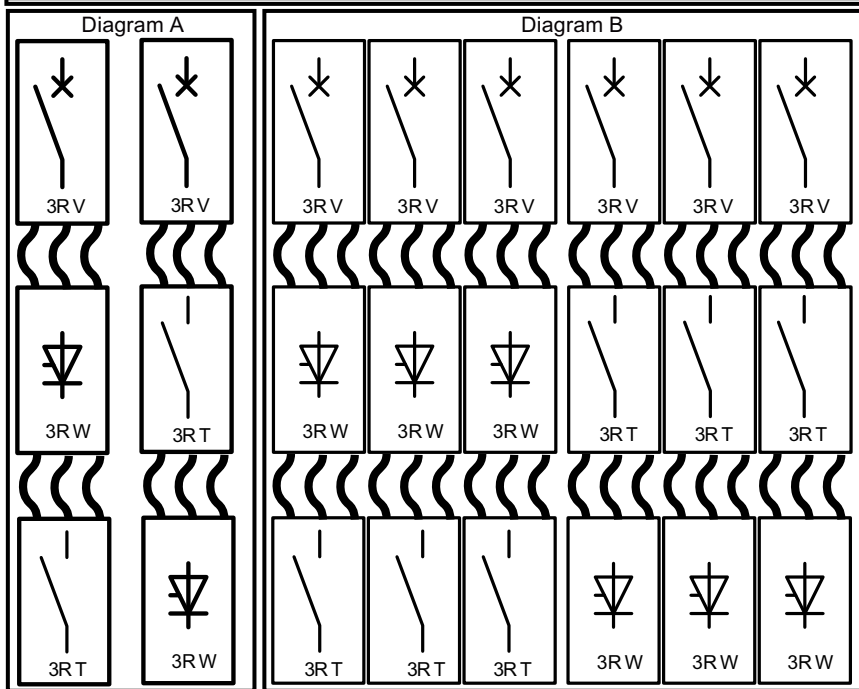


12.7 Calculating the permissible switching frequency

Assembly of 3RW with 3RV2 motor starter protector, 3RA link module, cable, and 3RT line contactor. The minimum clearance between the 3RW, 3RV, and 3RT corresponds to the minimum clearance (b/c) in the diagram of clearances from other devices.



Assembly of 3RW with 3RV2 motor starter protector and 3RT line contactor with cable. The minimum clearance between the 3RV and 3RT corresponds to the minimum clearance (b/c) in the diagram of clearances from other devices.



12.7 Calculating the permissible switching frequency

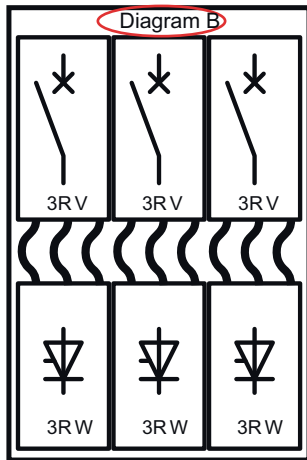
| | Article No. | a (mm) | a (in) | b (mm) | b (in) | c (mm) | c (in) |
|--------------------------------------|-----------------|--------|--------|--------|--------|--------|--------|
| <p>Clearances from other devices</p> | 3RW301./3RW302. | 15 | 0.59 | 60 | 2.36 | 40 | 1.56 |
| | 3RW303./3RW304 | 30 | 1.18 | 60 | 2.36 | 40 | 1.56 |
| | 3RW402. | 15 | 0.59 | 60 | 2.36 | 40 | 1.56 |
| | 3RW403./3RW404. | 30 | 1.18 | 60 | 2.36 | 40 | 1.56 |
| | 3RW405./3RW407. | 5 | 0.2 | 100 | 4 | 75 | 3 |

12.7.2 Calculating the switching frequency (example)

Problem

The maximum permissible switching frequency of a 5.5 kW (12.5 A) 3RW4024 soft starter must be determined. The requirements are side-by-side assembly and vertical mounting. A run-up time of approx. 3 s at an ambient temperature of 40 °C is specified as a supplementary condition (e.g. a pump motor with CLASS 10 starting). The soft starter must be connected to a 3RV2021 motor starter protector by means of cables. (Clearance between 3RV and 3RW ≥ 40 mm)

Calculating the number of starts / hour of a 3RW40 for side-by-side assembly and vertical mounting



| Graph | Assembly type | 3RW30 | | | 3RW40 | | | 3RW40 + optional fan | | |
|-------|-----------------------|---------|---------|---------|---------|---------|---------|----------------------|---------|---------|
| | | 3RW301* | 3RW302* | 3RW303* | 3RW304* | 3RW402* | 3RW403* | 3RW404* | 3RW402* | 3RW403* |
| A | Standalone assembly | 1.0 | | | 1.0 | | | 1.6 | 2.0 | 2.8 |
| B | Side-by-side assembly | 0.7 | 0.1 | 0.3 | 0.1 | 0.3 | 1.6 | 2.0 | 2.8 | |
| C | Standalone assembly | 0.5 | | | 0.5 | | | 1.6 | | |
| D | Side-by-side assembly | 0.3 | - | | - | | | 1.6 | | |

| Type | 3RW4024 |
|---|----------|
| Power electronics | |
| Load rating with rated operational current I_e | |
| • According to IEC and UL/CSA ¹⁾ , for standalone assembly, AC-53a | |
| - At 40°C | A 12.5 |
| - At 50°C | A 11 |
| - At 60°C | A 10 |
| Minimum settable rated motor current I_M for the motor overload protection | A 5 |
| Power loss | |
| • During operation after successful startup with uninterrupted rated operational current (40°C) approx. | W 2 |
| • During starting with current limit set to 300% I_M (40°C) | W 68 |
| Permissible rated motor current and starts per hour | |
| • For normal starting (CLASS 10) | |
| - Rated motor current $I_M^{(2)}$, ramp-up time 3 s | A 12.5 |
| - Starts per hour ³⁾ | 1 / h 50 |

Assembly of a 3RV2021 motor starter protector and connection of a 3RW4024 soft starter with cables and vertical mounting for CLASS 10 starting:

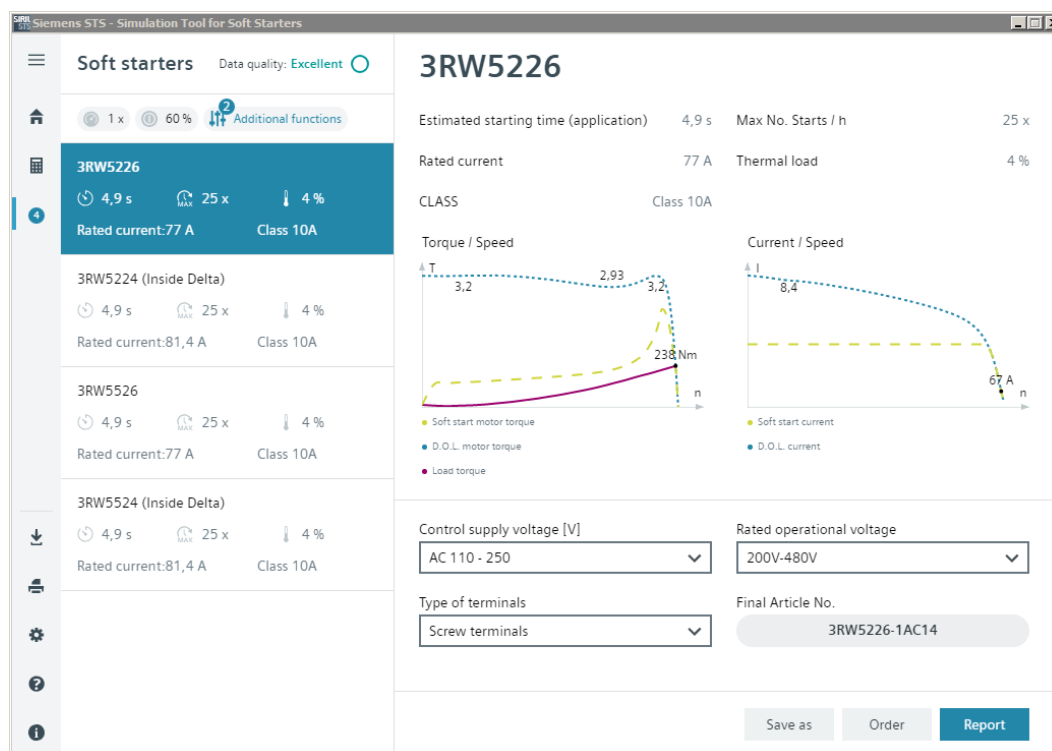
- Switching frequency of 3RW40 with standalone assembly: 50 1/h
- Switching frequency factor for diagram B without a fan: 0.1
- Switching frequency factor for diagram B with a fan ¹⁾: 1.6
- Maximum permissible switching frequency:
- Without fan 50 1/h x 0.1 = 5 1/h
- With fan ¹⁾: 50 1/h x 1.6 = 80 1/h
- 1) Optional fan: 3RW4928-8VB00

Result

The pump could be started five times an hour providing the above assembly conditions are complied with (side-by-side assembly, vertical mounting). A switching frequency of up to 80 starts per hour can be achieved by equipping the 3RW4026 with the optional 3RW4928-8VB00 fan.

12.8 Configuration aids

12.8.1 Selection of the soft starter using the Simulation Tool for Soft Starters



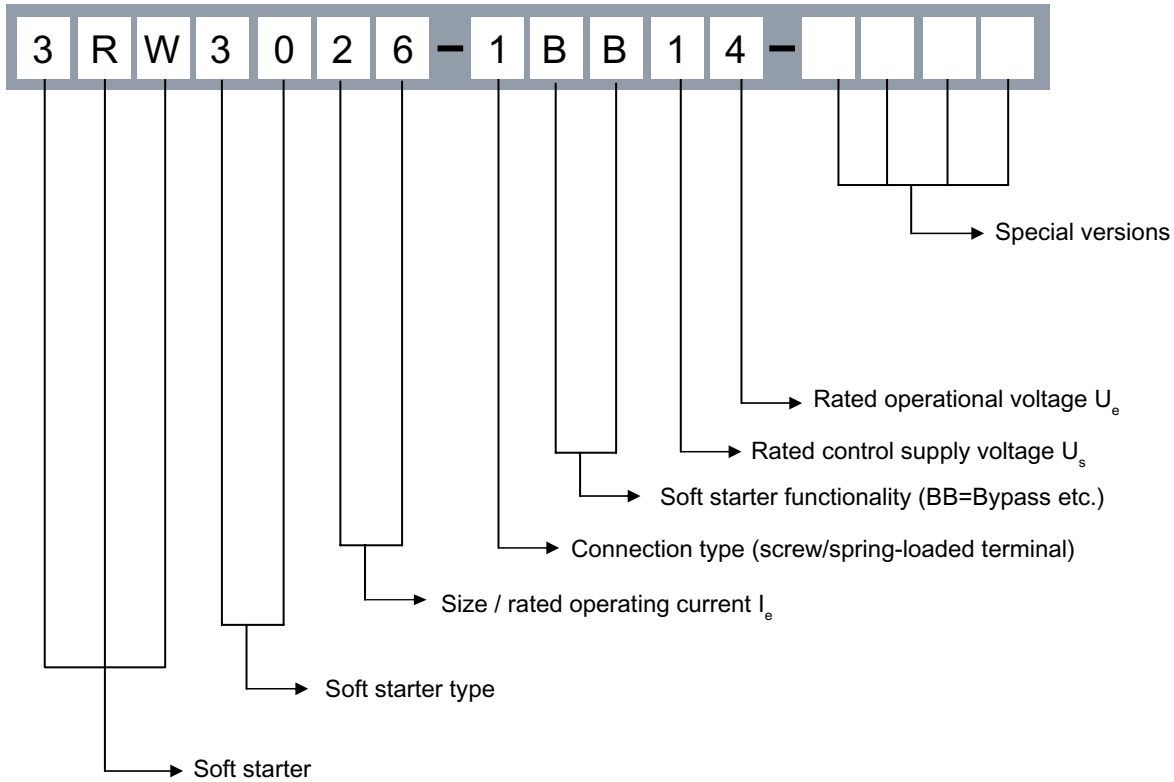
The soft starter can be configured with the STS (Simulation Tool for Soft Starters) software. The STS suggests suitable soft starters for the respective application based on the entered motor and load data and application requirements, as well as providing information on the parameterization.

You can download the Simulation Tool for Soft Starters (STS) for free on the 3RW5 topic page.

See also

Link for STS (<https://support.industry.siemens.com/cs/ww/en/view/101494917>)

12.9 Article number system for the 3RW30

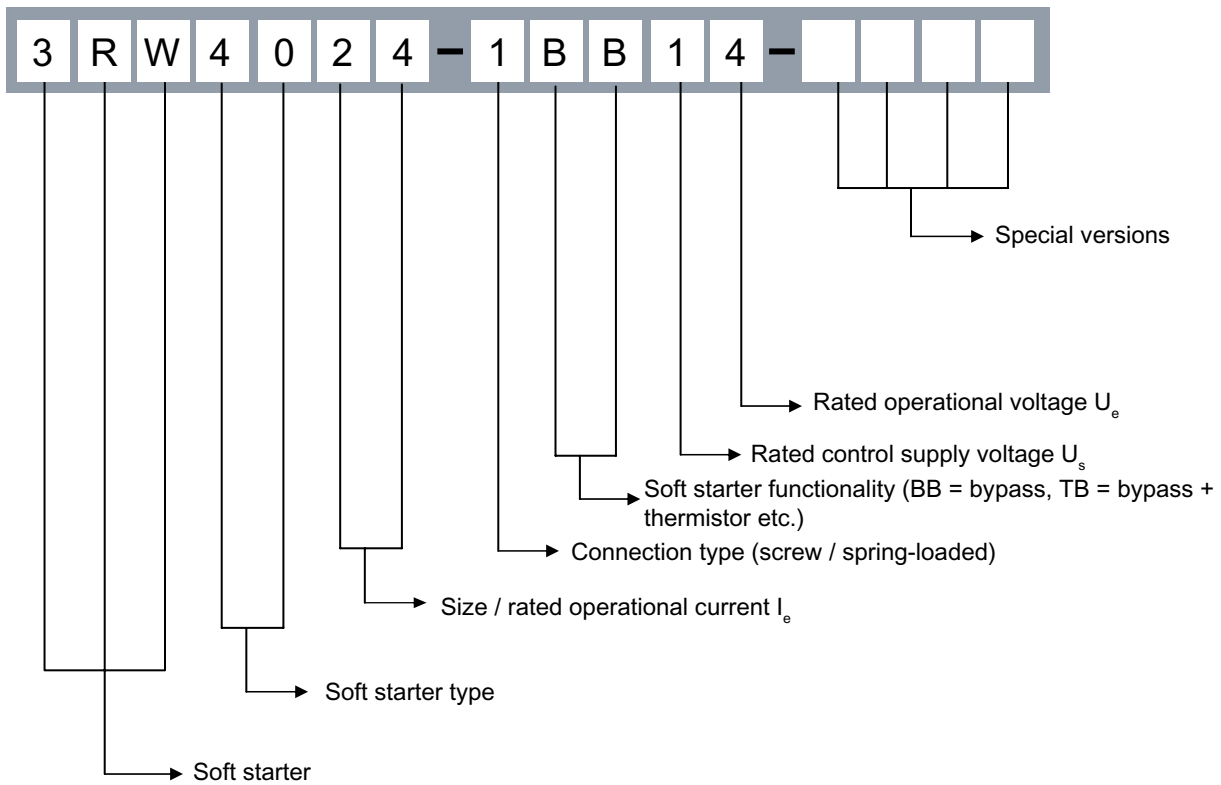


Rated current and rated power at $U_e = 400\text{ V} / 460\text{ V}$ and $T_{amb} = 40\text{ °C} / 50\text{ °C}$

| | | | |
|----|-------------------------------------|---------------------------------------|----------|
| 13 | $I_e = 3.6\text{ A} / 3\text{ A}$ | $P_e = 1.5\text{ kW} / 1.5\text{ hp}$ | Size S00 |
| 14 | $I_e = 6.5\text{ A} / 4.8\text{ A}$ | $P_e = 3\text{ kW} / 3\text{ hp}$ | |
| 16 | $I_e = 9.0\text{ A} / 7.8\text{ A}$ | $P_e = 4\text{ kW} / 5\text{ hp}$ | |
| 17 | $I_e = 12.5\text{ A} / 11\text{ A}$ | $P_e = 5.5\text{ kW} / 7.5\text{ hp}$ | |
| 18 | $I_e = 17.6\text{ A} / 17\text{ A}$ | $P_e = 7.5\text{ kW} / 10\text{ hp}$ | |
| 26 | $I_e = 25\text{ A} / 23\text{ A}$ | $P_e = 11\text{ kW} / 15\text{ hp}$ | Size S0 |
| 27 | $I_e = 32\text{ A} / 29\text{ A}$ | $P_e = 15\text{ kW} / 20\text{ hp}$ | |
| 28 | $I_e = 38\text{ A} / 34\text{ A}$ | $P_e = 18.5\text{ kW} / 25\text{ hp}$ | |
| 36 | $I_e = 45\text{ A} / 42\text{ A}$ | $P_e = 22\text{ kW} / 30\text{ hp}$ | Size S2 |
| 37 | $I_e = 63\text{ A} / 58\text{ A}$ | $P_e = 30\text{ kW} / 40\text{ hp}$ | |
| 38 | $I_e = 72\text{ A} / 62\text{ A}$ | $P_e = 37\text{ kW} / 40\text{ hp}$ | |
| 46 | $I_e = 80\text{ A} / 73\text{ A}$ | $P_e = 45\text{ kW} / 50\text{ hp}$ | Size S3 |
| 47 | $I_e = 106\text{ A} / 398\text{ A}$ | $P_e = 55\text{ kW} / 75\text{ hp}$ | |

For more information, refer to chapter Technical data (Page 133).

12.10 Article number system for the 3RW40



Rated current and rated power at $U_e = 400\text{ V} / 460\text{ V}$ and $T_{amb} = 40\text{ °C} / 50\text{ °C}$

| | | | |
|----|-------------------------------------|---------------------------------------|----------|
| 24 | $I_e = 12.5\text{ A} / 11\text{ A}$ | $P_e = 5.5\text{ kW} / 7.5\text{ hp}$ | Size S0 |
| 26 | $I_e = 25\text{ A} / 23\text{ A}$ | $P_e = 11\text{ kW} / 15\text{ hp}$ | |
| 27 | $I_e = 32\text{ A} / 29\text{ A}$ | $P_e = 15\text{ kW} / 20\text{ hp}$ | |
| 28 | $I_e = 38\text{ A} / 34\text{ A}$ | $P_e = 18.5\text{ kW} / 25\text{ hp}$ | |
| 36 | $I_e = 45\text{ A} / 42\text{ A}$ | $P_e = 22\text{ kW} / 30\text{ hp}$ | Size S2 |
| 37 | $I_e = 63\text{ A} / 58\text{ A}$ | $P_e = 30\text{ kW} / 40\text{ hp}$ | |
| 38 | $I_e = 72\text{ A} / 62\text{ A}$ | $P_e = 37\text{ kW} / 40\text{ hp}$ | |
| 46 | $I_e = 80\text{ A} / 73\text{ A}$ | $P_e = 45\text{ kW} / 50\text{ hp}$ | Size S3 |
| 47 | $I_e = 106\text{ A} / 98\text{ A}$ | $P_e = 55\text{ kW} / 75\text{ hp}$ | |
| 55 | $I_e = 132\text{ A} / 117\text{ A}$ | $P_e = 75\text{ kW} / 75\text{ hp}$ | Size S6 |
| 56 | $I_e = 160\text{ A} / 145\text{ A}$ | $P_e = 90\text{ kW} / 100\text{ hp}$ | |
| 73 | $I_e = 230\text{ A} / 205\text{ A}$ | $P_e = 132\text{ kW} / 150\text{ hp}$ | Size S12 |
| 74 | $I_e = 280\text{ A} / 248\text{ A}$ | $P_e = 160\text{ kW} / 200\text{ hp}$ | |
| 75 | $I_e = 350\text{ A} / 315\text{ A}$ | $P_e = 200\text{ kW} / 250\text{ hp}$ | |
| 76 | $I_e = 432\text{ A} / 385\text{ A}$ | $P_e = 250\text{ kW} / 300\text{ hp}$ | |

For more information, refer to chapter Technical data (Page 133).

Commissioning

13.1 Commissioning the 3RW30

Commissioning, description of the start and output parameters



13.1.1 Commissioning procedure

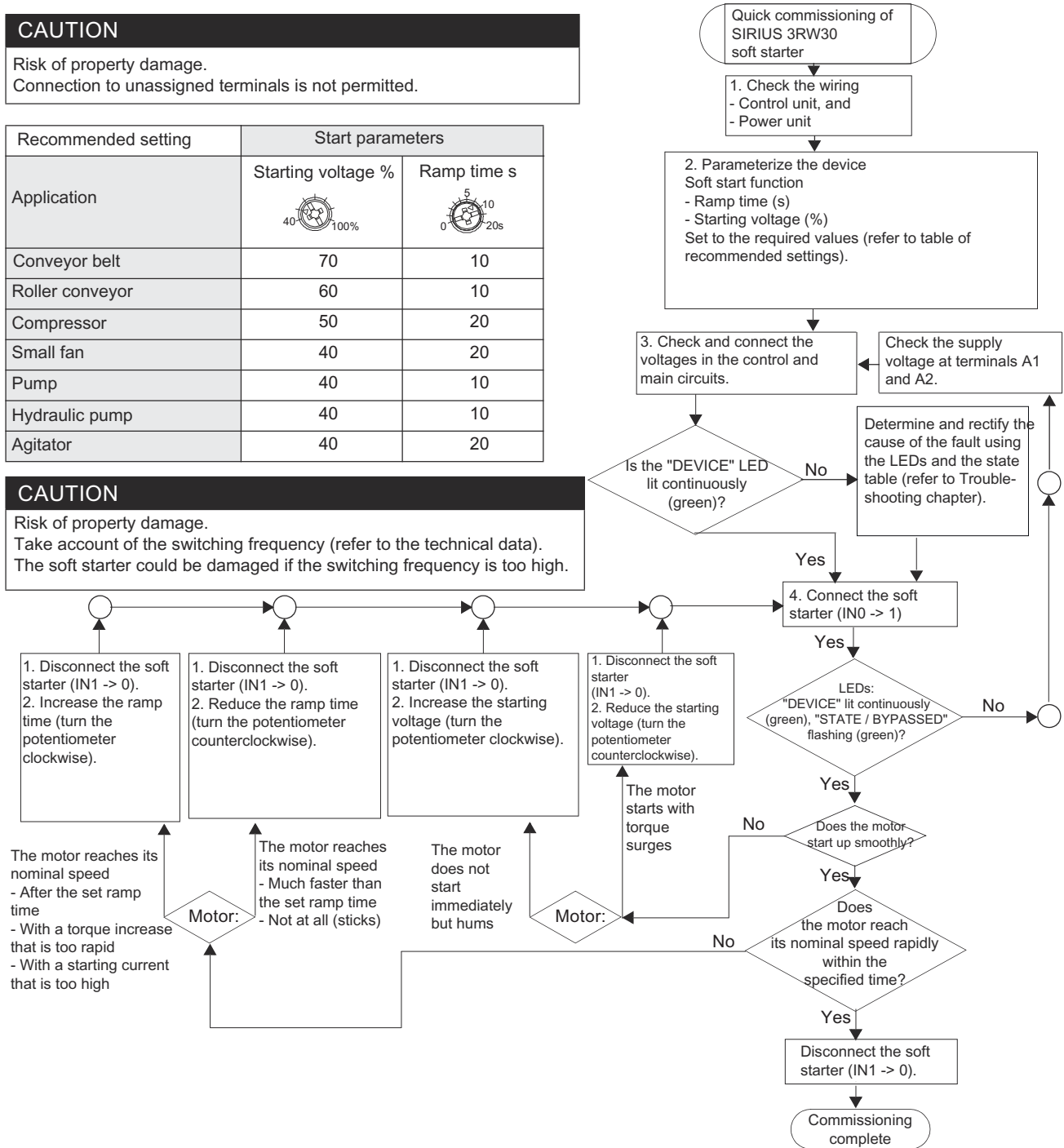
1. Check the voltages and wiring.
2. Set the start parameters (for recommended parameters, refer to the quick commissioning table).
3. Start up the motor and if necessary optimize the parameters (refer to the quick commissioning table).
4. Document the parameter settings if required (refer to chapter Table of parameters used (Page 205)).

13.1.2 Quick commissioning of the 3RW30 and optimization of the parameters

CAUTION
 Risk of property damage.
 Connection to unassigned terminals is not permitted.

| Recommended setting | Start parameters | |
|---------------------|--------------------|-------------|
| | Starting voltage % | Ramp time s |
| Application | | |
| Conveyor belt | 70 | 10 |
| Roller conveyor | 60 | 10 |
| Compressor | 50 | 20 |
| Small fan | 40 | 20 |
| Pump | 40 | 10 |
| Hydraulic pump | 40 | 10 |
| Agitator | 40 | 20 |

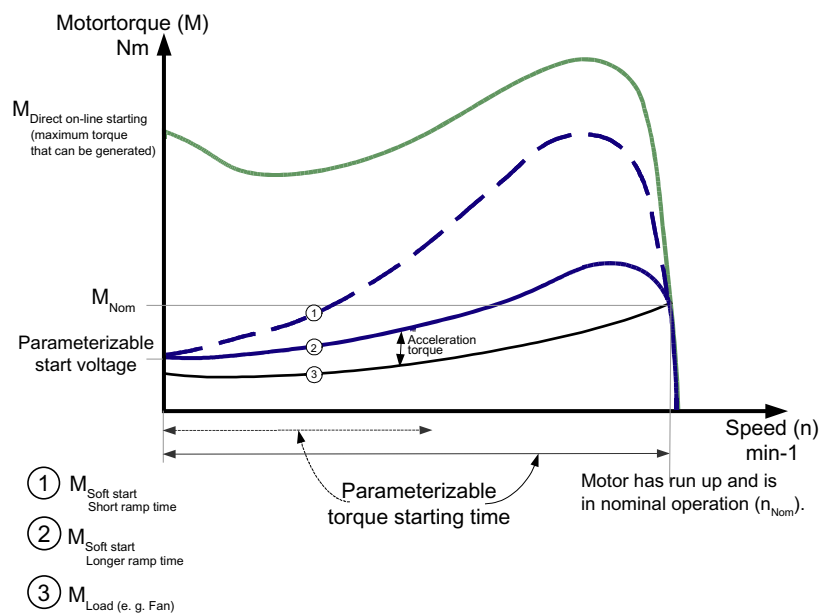
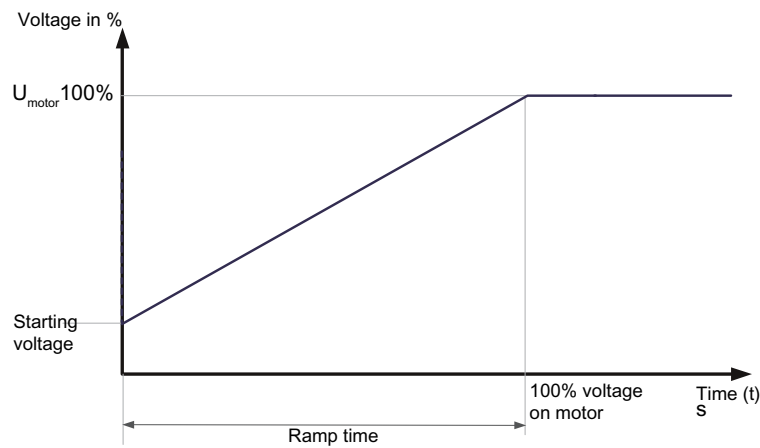
CAUTION
 Risk of property damage.
 Take account of the switching frequency (refer to the technical data).
 The soft starter could be damaged if the switching frequency is too high.



13.1.3 Setting the soft start function

Voltage ramp

The SIRIUS 3RW30 achieves soft starting by means of a voltage ramp. The motor terminal voltage is increased from a parameterizable starting voltage to the mains voltage within a definable ramp time.



13.1.4 Setting the starting voltage

U potentiometer



The starting voltage value is set with the U potentiometer. This value determines the starting torque of the motor. A lower starting voltage results in a lower starting torque (softer start) and a lower starting current.

The starting voltage selected must be sufficiently high to ensure that motor starts up smoothly as soon as the start command is received by the soft starter.

13.1.5 Setting the ramp time

t potentiometer



You define the length of the required ramp time with the t potentiometer. The ramp time determines the time taken to increase the motor voltage from the parameterized starting voltage to the mains voltage. This time merely influences the motor's acceleration torque, which drives the load during the ramp-up process. The actual motor starting times are load-dependent and can differ from the 3RW soft starter settings.

A longer ramp time results in a lower starting current and a reduced acceleration torque as the motor starts up. The startup is slower and smoother as a result. The ramp time must be long enough for the motor to reach its nominal speed. If the time selected is too short, in other words if the ramp time ends before the motor has started up successfully, a very high starting current that can even equal the direct starting current at the same speed occurs at this instant.

The SIRIUS 3RW30 soft starter can be damaged in this application (set ramp time shorter than the actual motor ramp-up time). A maximum ramp-up time of 20 s is possible for the

3RW30. An appropriately dimensioned SIRIUS 3RW40 or 3RW44 soft starter should be chosen for startup processes with a motor ramp-up time > 20 s.

NOTICE

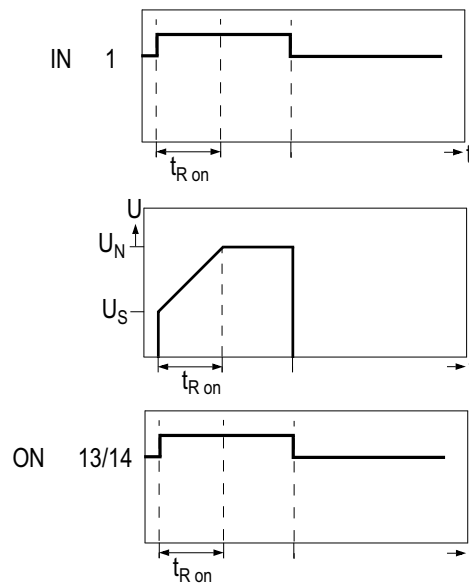
Risk of property damage

Make sure the selected ramp time is longer than the actual motor ramp-up time. If not, the SIRIUS 3RW30 may be damaged because the internal bypass contacts close when the set ramp time elapses. If the motor has not finished starting up, an AC3 current that could damage the bypass contact system will flow.

When using the 3RW40: The 3RW40 has an integrated ramp-up detection function that prevents this operating state from occurring.

13.1.6 ON output

ON output contact



State diagram of the ON output contact

The output contact at terminal 13/14 (ON) closes if a signal is present at terminal 1 (IN); it remains closed until the start command is removed.

The output can be used, for instance, to control a line contactor connected upstream or to implement latching if you selected pushbutton control. For recommended circuits, refer to chapter Typical circuit diagrams (Page 167).

For the state diagram of the contacts in the various operating states, refer to chapter 3RW30: LEDs (Page 61).

13.2 Commissioning the 3RW40

Commissioning, description of the start, stop, motor protection, and output parameters



13.2.1 Commissioning procedure

1. Check the voltages and wiring.
2. Set the start and stop parameters (for recommended parameters, refer to the quick commissioning table).
3. Set the motor overload function (if required)
4. Define the RESET mode if a failure occurs.
5. Start up the motor and if necessary optimize the parameters (refer to the quick commissioning table).
6. Document the parameter settings if required.

13.2.2 Quick commissioning of the 3RW40 and optimization of the parameters

CAUTION
 Risk of property damage.
 Connection to unassigned terminals is not permitted.

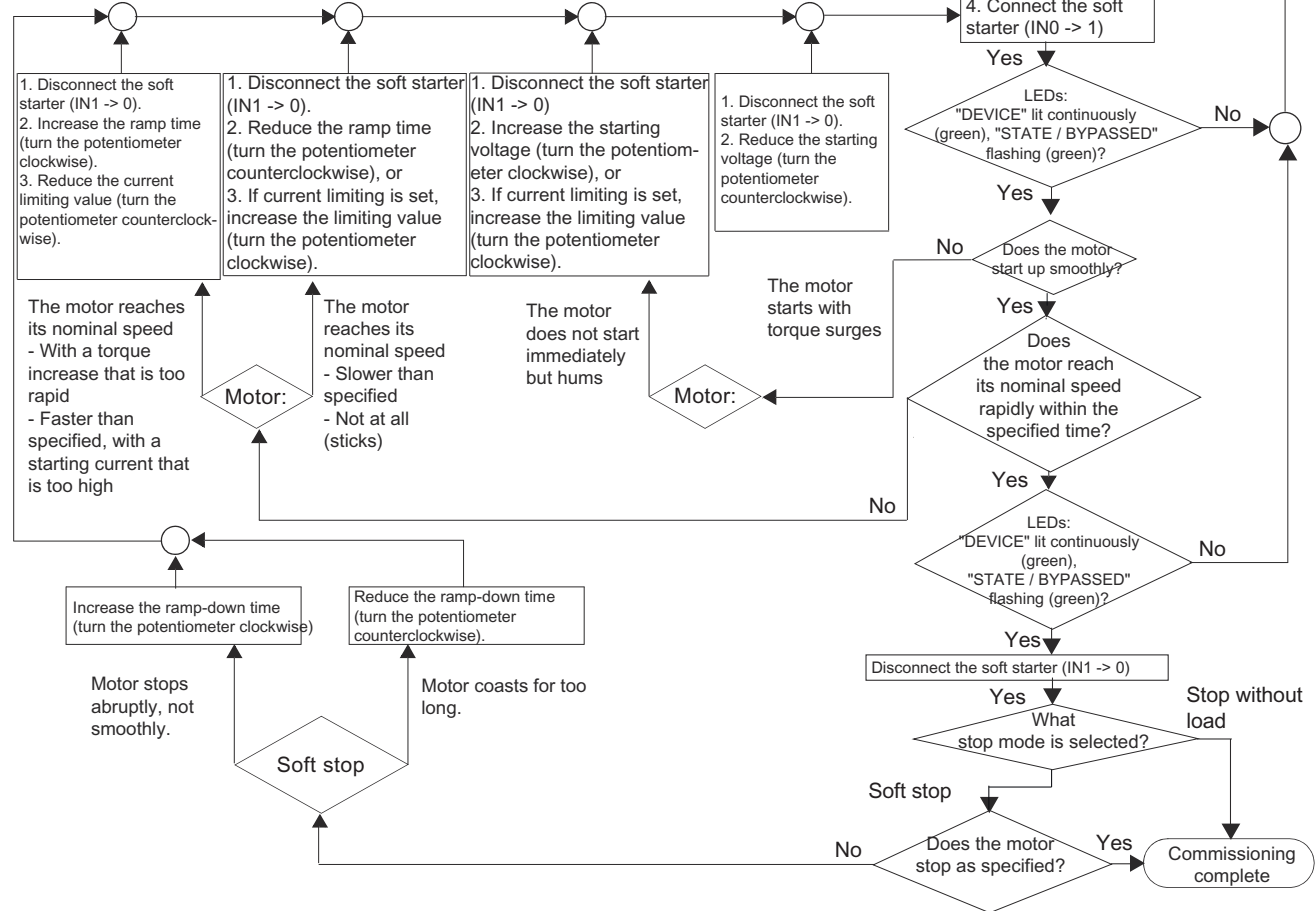
Quick commissioning of SIRIUS 3RW40 soft starter

1. Check the wiring
 - Control unit, and
 - Power unit

| Application | Start parameters | | | Stop parameter |
|-----------------|--------------------|-------------|------------------------|------------------|
| | Starting voltage % | Ramp time s | Current limiting value | Ramp-down time s |
| Conveyor belt | 70 | 10 | 5 x I _e | 5 |
| Roller conveyor | 60 | 10 | 5 x I _e | 5 |
| Compressor | 50 | 10 | 4 x I _e | 0 |
| Small fan | 40 | 10 | 4 x I _e | 0 |
| Pump | 40 | 10 | 4 x I _e | 10 |
| Hydraulic pump | 40 | 10 | 4 x I _e | 0 |
| Agitator | 40 | 20 | 4 x I _e | 0 |
| Milling machine | 40 | 20 | 4 x I _e | 0 |

2. Parameterize the device
 Motor protection
 - Set the rated motor current of the operating mechanism with the I_e adjuster
 - Set the required trip class with the CLASS switch
 Soft start function
 - Current limiting value (x I_e)
 - Ramp time (s)
 - Ramp-down time (s)
 Set to the required values (refer to table of recommended settings).

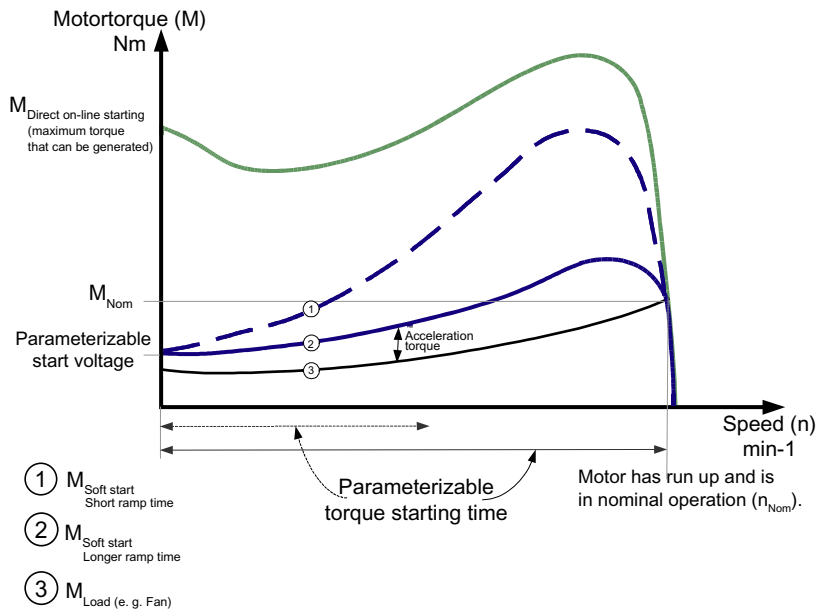
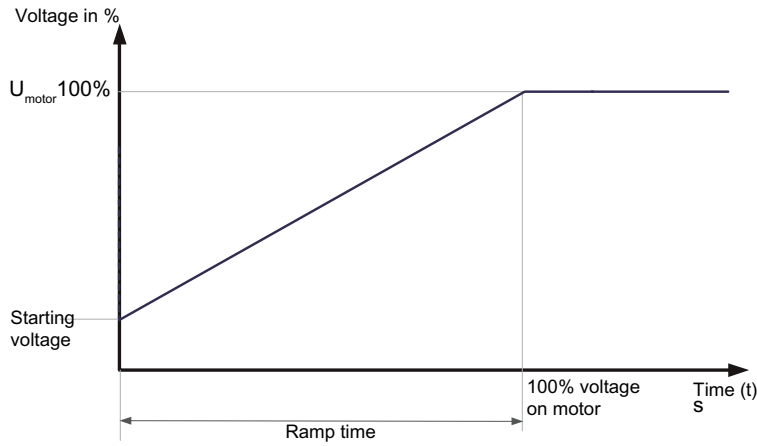
3. Check and connect the voltages in the control and main circuits.
 Determine and rectify the cause of the fault using the LEDs and the state table. (refer to Troubleshooting chapter)



13.2.3 Setting the soft start function

Voltage ramp

The SIRIUS 3RW40 achieves soft starting by means of a voltage ramp. The motor terminal voltage is increased from a parameterizable starting voltage to the mains voltage within a definable ramp time.



13.2.4 Setting the starting voltage

U potentiometer



The starting voltage value is set with the U potentiometer. This value determines the starting torque of the motor. A lower starting voltage results in a lower starting torque (softer start) and a lower starting current.

The starting voltage selected must be sufficiently high to ensure that motor starts up smoothly as soon as the start command is received by the soft starter.

13.2.5 Setting the ramp time

t potentiometer



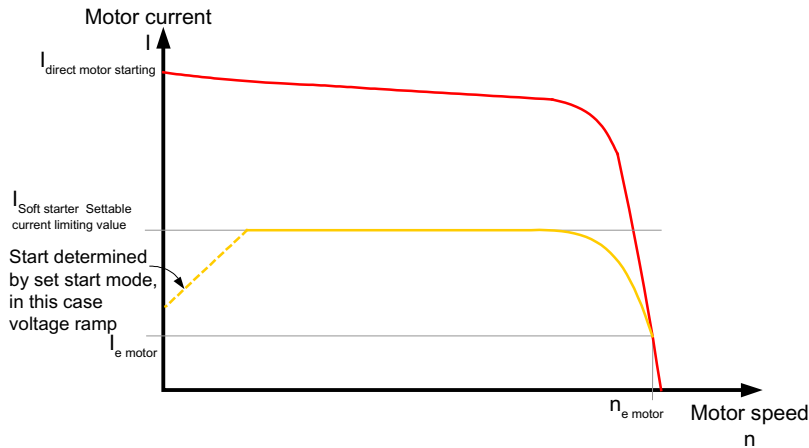
You define the length of the required ramp time with the t potentiometer. The ramp time determines the time taken to increase the motor voltage from the parameterized starting voltage to the mains voltage. This time merely influences the motor's acceleration torque, which drives the load during the ramp-up process. The actual motor starting times are load-dependent and can differ from the 3RW soft starter settings.

A longer ramp time results in a lower starting current and a reduced acceleration torque as the motor starts up. The startup is slower and smoother as a result. The ramp time must be long enough for the motor to reach its nominal speed. If the time selected is too short, in other words if the ramp time ends before the motor has started up successfully, a very high starting current that can even equal the direct starting current at the same speed occurs at this instant.

The SIRIUS 3RW40 soft starter additionally limits the current to the value set with the current limiting potentiometer. As soon as the current limiting value is reached, the voltage ramp or the ramp time is interrupted and the motor is started with the current limiting value until it has started up successfully. In this case, the motor ramp-up times may be longer than the maximum parameterizable 20 seconds ramp time or the ramp time that is actually set on the soft starter (for further information about the maximum ramp-up times and switching frequencies, refer to the Technical data chapter > 3RW30 13, 14, 16, 17, 18-BB.. power electronics (Page 136)) ff. and 3RW40 24, 26, 27, 28 power electronics (Page 152) ff.).

13.2.6 Current limiting in conjunction with a starting voltage ramp and ramp-up detection

Current limiting



The SIRIUS 3RW40 soft starter measures the phase current (motor current) continuously with the help of integrated current transformers.

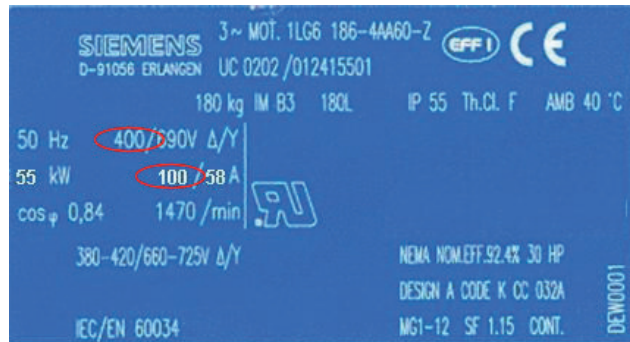
The motor current that flows during the startup process can be actively limited by means of the soft starter. The current limiting function takes priority over the voltage ramp function.

As soon as a parameterizable current limit is reached, in other words, the voltage ramp is interrupted and the motor is started with the current limiting value until it has started up successfully. The current limiting function is always active with SIRIUS 3RW40 soft starters.

If the current limiting potentiometer is set to clockwise stop, the starting current is limited to the maximum possible current (refer to chapter Setting the current limiting value (Page 121)).

13.2.7 Setting the motor current

I_e potentiometer



The rated operational current of the motor must be set with the I_e potentiometer according to the mains voltage and the motor connection (wye-delta). The electronic motor overload protection also refers to this set value if it is active. For the permissible settings referred to the required motor overload trip class, refer to chapter Motor current settings (Page 126).

13.2.8 Setting the current limiting value

xI_e potentiometer



Representation valid for 3RW40 S0, S2, S3 up to product version E06, and 3RW40 S6 and S12 up to product version E10.



Representation valid for 3RW40 S0, S2, S3 for product version E07 and higher, and 3RW40 S6 and S12 for product version E11 and higher.

The current limiting value is set with the xI_e potentiometer to the maximum required starting current as a factor of the set rated motor current (I_e).

Example

- I_e potentiometer set to 100 A
- xI_e potentiometer set to 5 \Rightarrow current limiting 500 A.

As soon as the selected current limiting value is reached, the motor voltage is reduced or controlled by the soft starter to prevent the current from exceeding the limit. Since the starting current is asymmetrical, the set current corresponds to the arithmetic mean value for the three phases.

If the current limiting value is set to the equivalent of 100 A, the starting currents might be approx. 80 A in L1, 120 A in L2, and 100 A in L3 (refer to chapter Starting current asymmetry (Page 29)).

The set current limiting value must be high enough to ensure that the torque generated in the motor is sufficient to accelerate the motor to nominal speed. Three to four times the value of the motor's rated operational current (I_e) can be assumed as typical here.

The current limiting function is always active because it is required by the intrinsic device protection. If the current limiting potentiometer is set to clockwise stop, the starting current is limited to the maximum possible current. We must differentiate between two cases here:

Scenario A:

3RW40 devices up to product version E06 (for 3RW40 size S0, S2, S3) or up to product version E10 (for 3RW40 size S6 and S12)

\Rightarrow The maximum possible limiting current is 5 times the value of the rated motor current set on the 3RW40 soft starter (refer to chapter Setting the motor current (Page 120)).

Scenario B:

3RW40 devices from product version E07 (for 3RW40 size S0, S2, S3) or from product version E11 (for 3RW40 size S6 and S12)
 ⇒ On these 3RW40 devices, the maximum possible limiting current ("max" setting) is 5 times the value of the maximum rated operational current set on the soft starter (see the rating plate of the soft starter). This value depends on the rated motor current actually set on the 3RW40 soft starter (potentiometer I_e). This value is identical with 5 times the maximum value that can be set on the potentiometer I_e .

Overdimensioning, due to motors with high starting current conditions, for example

For dimensioning soft starters for motors with high starting current conditions (typically $I/I_e \geq 8$) observe the configuring information in the chapter Dimensioning of soft starters for motors with high starting current conditions (Page 99).

13.2.9 Optimized setting ranges for current limiting

Example of optimized current limiting setting ranges for the 3RW40 soft starters

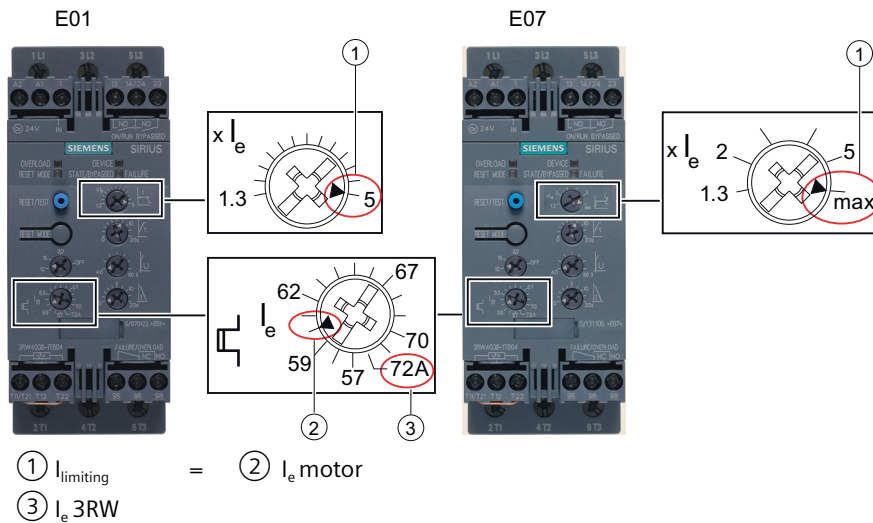
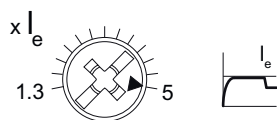


Figure 13-1 Optimized current limiting setting ranges

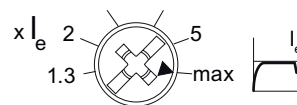
Example of calculating the current limiting

Up to product version E06 (for 3RW40 size S0, S2, S3) or up to product version E10 (for 3RW40 size S6 and S12)



$$\begin{aligned}
 I_{e \text{ motor}} &= 60 \text{ A} \\
 I_{e \text{ 3RW}} &= 72 \text{ A} \\
 I_{\text{limiting}} &= 1 \dots 5 \times I_{e \text{ motor}} \\
 I_{\text{max}} &= 5 \times I_{e \text{ motor}} = 300 \text{ A}
 \end{aligned}$$

Product version E07 and higher (for 3RW40 size S0, S2, S3) or product version E11 and higher (for 3RW40 size S6 and S12)



$$\begin{aligned}
 I_{e \text{ motor}} &= 60 \text{ A} \\
 I_{e \text{ 3RW}} &= 72 \text{ A} \\
 I_{\text{limiting}} &= 1 \dots 5 \times I_{e \text{ motor}} \\
 I_{\text{max}} &= 5 \times I_{e \text{ 3RW}} = \mathbf{360 \text{ A}}
 \end{aligned}$$

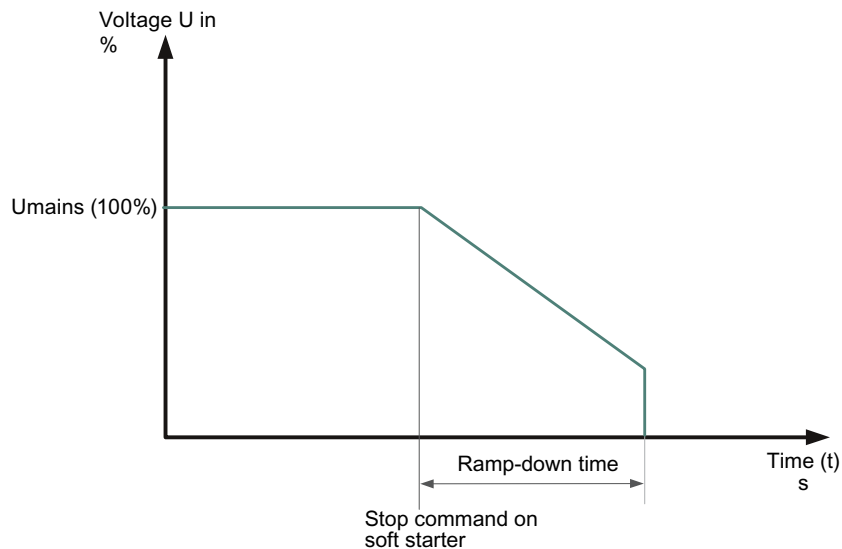
For setting values, see Optimized setting ranges for current limiting (Page 122).

13.2.10 Ramp-up detection

The SIRIUS soft starter has a motor ramp-up detection function that is always active regardless of the start mode. If it detects a motor startup, the motor voltage is immediately increased to 100 % of the mains voltage. The thyristors of the soft starter are bridged by the bypass contacts integrated in the device and the successful startup is indicated by means of the BYPASS output and the STATE / BYPASSED LED.

13.3 Setting the soft stop function

In "soft stop" mode, the natural stop process of the load is decelerated. The function is used when the load must be prevented from stopping abruptly. This is typically the case in applications with a low mass inertia or a high counter-torque.



13.3.1 Setting the ramp-down time

t potentiometer



You can set a ramp-down time with the t potentiometer. This determines how long power should still be supplied to the motor after the ON command is removed. The torque generated in the motor is reduced by means of a voltage ramp function within this ramp-down time and the application stops smoothly.

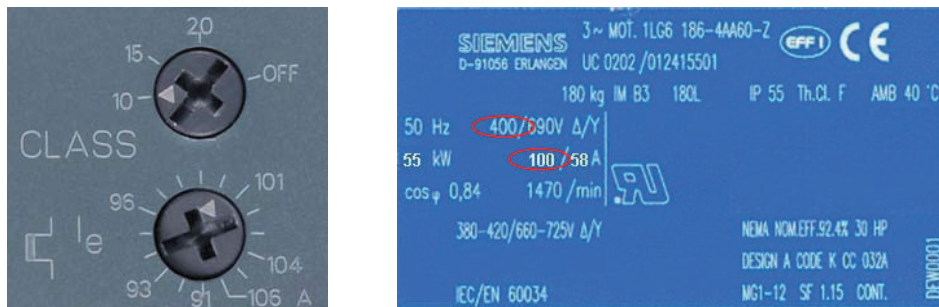
If the potentiometer is set to 0, there is no voltage ramp during stopping (stop without load).

13.4 Setting the motor protection function

The motor overload protection function is implemented on the basis of the winding temperature. This indicates whether the motor is overloaded or functioning in the normal operating range.

The winding temperature can either be calculated with the help of the integrated, electronic motor overload function or measured with a connected motor thermistor.

13.4.1 Setting the electronic motor overload protection



I_e potentiometer

The rated operational current of the motor must be set with the I_e potentiometer according to the mains voltage and the motor connection (wye-delta).

The current flow during motor operation is measured by measuring the current with transformers integrated in the soft starter. This value is also used for the current limiting function. The temperature rise in the winding is calculated based on the rated operational current set for the motor.

CLASS potentiometer

You can set the required trip class (10, 15, or 20) with the CLASS potentiometer. A trip is generated by the soft starter when the standardized characteristic is reached, depending on the trip class (CLASS setting).

The trip class specifies the maximum time within which a protective device must trip from a cold state at $7.2 \times$ the rated operational current (motor protection to IEC 60947). The tripping characteristics represent this time as a function of the tripping current (refer to chapter Motor protection tripping characteristics for 3RW40 (with symmetry) (Page 163)).

13.4 Setting the motor protection function

You can set different CLASS characteristics according to the startup class. If the potentiometer is set to OFF, the "electronic motor overload protection" function is deactivated.

Note

The rated data of the soft starters refers to normal starting (CLASS 10). The starters may need to be calculated with a size allowance for heavy-duty starting (> CLASS 10). You can only set a rated motor current that is lower than the soft starter rated current (refer to chapter Motor current settings (Page 126)); if not, a fault will be indicated by the OVERLOAD LED (red flashing) and it will not be possible to start the SIRIUS 3RW soft starter.

13.4.2 Motor current settings

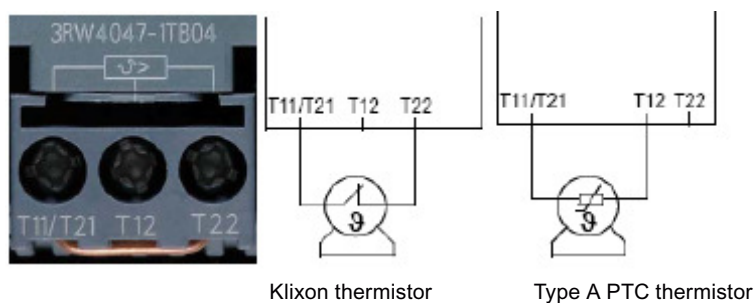
| | I_e [A] | I_{min} [A] | I_{max} [A] CLASS 10 | I_{max} [A] CLASS 15 | I_{max} [A] CLASS 20 |
|-------------|-----------|---------------|------------------------|------------------------|------------------------|
| 3RW4024-... | 12.5 | 5 | 12.5 | 11 | 10 |
| 3RW4026-... | 25.3 | 10.3 | 25.3 | 23 | 21 |
| 3RW4027-... | 32.2 | 17.2 | 32.2 | 30 | 27 |
| 3RW4028-... | 38 | 23 | 38 | 34 | 31 |
| 3RW4036-... | 45 | 22.5 | 45 | 42 | 38 |
| 3RW4037-... | 63 | 25.5 | 63 | 50 | 46 |
| 3RW4038-... | 72 | 34.5 | 72 | 56 | 50 |
| 3RW4046-... | 80 | 42.5 | 80 | 70 | 64 |
| 3RW4047-... | 106 | 46 | 106 | 84 | 77 |
| 3RW4055-... | 134 | 59 | 134 | 134 | 124 |
| 3RW4056-... | 162 | 87 | 162 | 152 | 142 |
| 3RW4073-... | 230 | 80 | 230 | 210 | 200 |
| 3RW4074-... | 280 | 130 | 280 | 250 | 230 |
| 3RW4075-... | 356 | 131 | 356 | 341 | 311 |
| 3RW4076-... | 432 | 207 | 432 | 402 | 372 |

13.4.3 Motor protection acc. to ATEX

Refer to the information in chapter Motor protection / intrinsic device protection (3RW40 only) (Page 44).

13.5 Thermistor motor protection

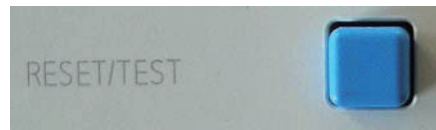
(Optional for 3RW402. to 3RW404. with 24 V AC/DC rated control voltage)



Thermistor motor protection

After removing the copper jumper between T11/T21 and T22, you can connect and evaluate either a Klaxon thermistor integrated in the motor winding (at terminal T11/T21-T22) or a type A PTC (at terminal T11/T21-T12).

13.6 Motor protection trip test

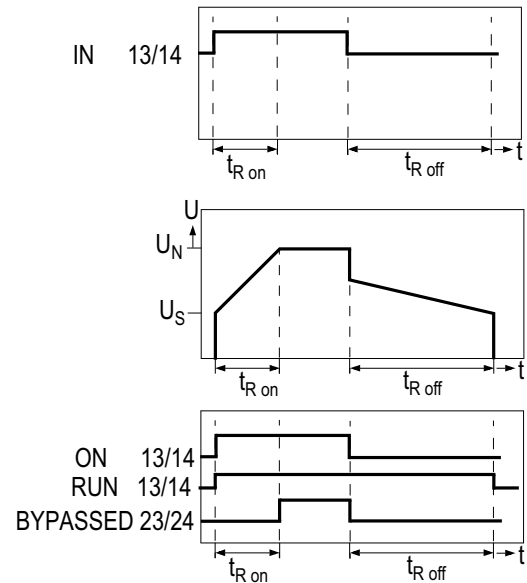


TEST / RESET button

You initiate a motor overload trip by pressing the RESET / TEST button for longer than five seconds. The SIRIUS 3RW40 soft starter is tripped by the fault signal at the OVERLOAD LED, the FAILURE / OVERLOAD contact 95-98 closes, and the motor that is connected and running is switched off.

13.7 Functions of the outputs

13.7.1 Functions of the BYPASSED and ON / RUN outputs



BYPASSED output contact

The BYPASSED output at terminal 23 / 24 closes as soon as the SIRIUS 3RW40 soft starter detects that the motor has started up (refer to chapter Ramp-up detection (Page 123)). The integral bypass contacts simultaneously close and the thyristors are bridged. The integral bypass contacts and output 23 / 24 open again as soon as the start input IN is removed.

ON / RUN output contact

ON function set: The potential-free output contact at terminal 13/14 (ON) closes if a signal is present at terminal 1 (IN); it remains closed until the start command is removed (factory default). The ON function can be used, for instance, as a latching contact if you selected pushbutton control (refer to chapter Control by pushbutton (Page 168)).

Reparameterizing the output of the ON function (factory default) to RUN

You can reparameterize the output function from ON to RUN by simultaneously pressing two buttons (refer to chapter Parameterizing the 3RW40 outputs (Page 130)).

RUN function set: The potential-free output contact at terminal 13/14 closes if a signal is present at terminal 1 (IN); it remains closed until the start command is removed and after that until the set ramp-down time has elapsed.

13.7 Functions of the outputs

If the RUN function is set, you can control a line contactor during the startup process, operation, or the set soft stop (refer to chapter Control with an optional main / line contactor (Page 180))

For recommended circuits, refer to chapter Typical circuit diagrams (Page 167).

13.7.2 Parameterizing the 3RW40 outputs

Programming the ON / RUN output 13/14 on the SIRIUS 3RW40 soft starter

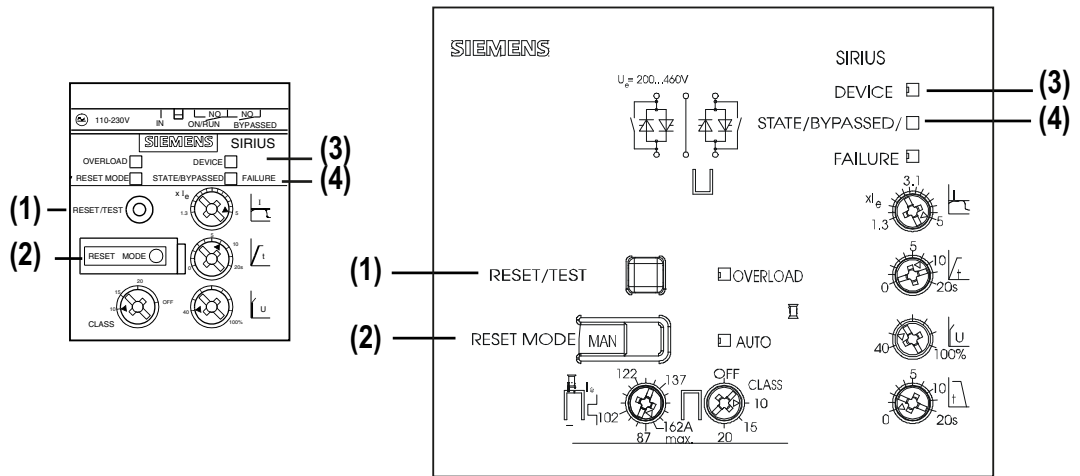
















Figure 13-2 Overview of buttons/LEDs for 3RW40 2 - 3RW404 and 3RW405 - 3RW407

| | A | B | C | D | E |
|--------------------|---|--|--|--|--|
| RESET / TEST (1) | | |  >1 s | |  >1 s |
| RESET MODE (2) | |  > 2 s |  > 1 s |  > 1 s | |
| | | = | = | = | = |
| DEVICE (3) | GN  | GN  | RD  | RD  | GN  |
| STATE BYPASSED (4) | ● OFF | ● OFF | ◐ ON/ ◑ RUN | ◑ RUN/ ◐ ON | ● OFF |
| FAILURE | ● OFF | ● OFF | ● OFF | ● OFF | ● OFF |
| AUTO | ● /  |  / ● | | | ● /  |

| | | | |
|-----------|---|----------|------------|
| ● |  | ◐ | ◑ |
| OFF / off | ON / on | Flashing | Flickering |

Reparameterizing the ON / RUN output

A: Control voltage is present and the soft starter is in the normal, fault-free position:
The DEVICE LED is continuously lit (green) while the STATE / BYPASSED and FAILURE LEDs are off.
The AUTO LED indicates the color of the set RESET mode.

B: Start programming:
(On the 3RW402 device, remove the RESET MODE cover as shown in chapter Setting the RESET MODE (Page 51).) Press the RESET MODE button (2) for longer than 2 s until the DEVICE LED (3) flickers (green). Hold the RESET MODE button (2) pressed down.

C: Simultaneously press the RESET/TEST button (1) for longer than 1 s until the DEVICE LED (3) lights up (red). The active mode set at the ON / RUN output is indicated by the STATE / BYPASSED / FAILURE LED (4):
STATE / BYPASSED / FAILURE LED (4) flashes (green): ON mode (factory setting).
STATE / BYPASSED / FAILURE LED (4) flickers (green): RUN mode.

D: Change the mode:
Press the RESET MODE button (2) briefly. By pressing this button, you change the mode at the output, and the new mode is indicated by the STATE / BYPASSED / FAILURE LED (4):
STATE / BYPASSED / FAILURE LED (4) flickers (green): RUN mode is set.
STATE / BYPASSED / FAILURE LED (4) flashes (green): ON mode is set.

E: Exit programming and save the settings:
Press the RESET / TEST MODE button (1) for longer than 1 s until the DEVICE LED (3) lights up (green).
The LEDs indicate the following states again if the output was successfully parameterized:

13.7 Functions of the outputs

DEVICE LED: Continuously lit (green).
STATE / BYPASSED and FAILURE LEDs: Off.
The AUTO LED indicates the color of the set RESET mode.

13.7.3 Function of the FAILURE / OVERLOAD output



FAILURE / OVERLOAD output contact

If there is no rated control voltage or if a failure occurs, the potential-free FAILURE / OVERLOAD output is switched.

Note

For information about whether or not faults can be acknowledged, as well as the recovery time and the corresponding LED and output contact states, refer to chapter Messages and diagnosis (Page 61).

Technical data

14.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/ps/25247/td>).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.

The screenshot shows the Siemens Industry Online Support search interface. At the top, there is a search bar with the text "Enter keyword..." and a search icon. Below the search bar, there are three tabs: "Product", "Entry type", and "Date". The "Product" tab is active, and the search results are displayed below it. The search results show the product number "3RV2031-4BA10" in a red box, followed by a search icon and a close icon. Below the product number, there is a description: "CIRCUIT BREAKER, SCREW TYPE, 20 A, CIRCUIT BREAKER SIZE S2, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 14... 20A, N-RELEASE 20DA, SCREW TERMINAL, STANDARD BREAKING CAPACITY". At the bottom of the search results, there are three links: "> Product details", "> Technical data" (highlighted in a red box), and "> CAx data".

14.2 3RW30

14.2.1 Overview

SIRIUS 3RW30 soft starters reduce the motor voltage through variable phase angle control and increase it from a selectable starting voltage up to the mains voltage within the ramp time. They limit the starting current and torque, so that the shocks that occur during direct starts or wye-delta starting are avoided. Mechanical loads and mains voltage dips can be effectively prevented in this way.

Soft starting reduces the stress on the connected equipment, resulting in lower wear and therefore longer periods of trouble-free production. The selectable starting voltage means the soft starters can be individually adjusted to the requirements of the application in question and – unlike wye-delta starters – are not restricted to two-stage starting with fixed voltage ratios.

SIRIUS 3RW30 soft starters are characterized above all by their small space requirements. Integral bypass contacts mean that no power loss has to be taken into account at the power semiconductors (thyristors) after the motor has started up. This cuts down on heat losses, enabling a more compact design and making external bypass circuits superfluous.

Soft starters rated up to 55 kW (at 400 V) can be supplied for standard applications in three-phase systems. Extremely small sizes, low power losses and simple startup are just three of the many advantages of this soft starter.

Note

The rated motor current is extremely important when selecting a soft starter.

Refer to the information about selecting soft starters in chapter Configuration (Page 91).

Conditions for normal starting:

Max. ramp time 3 s, starting current 300%, 20 starts/hour, ON time 30%, standalone assembly, max. installation altitude 1000 m / 3280 ft, ambient temperature kW 40 °C / 104 °F. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. For information about the rated currents for ambient temperatures above 40 °C, refer to chapter 3RW30...BB.. power electronics (Page 136).

14.2.2 3RW30...BB.. control electronics

| Type | 3RW301., 3RW302. | | 3RW303., 3RW304. | |
|--|------------------|-------|---|----------------------------|
| Control electronics | | | | |
| Rated values | Terminal | | | |
| Rated control supply voltage | A1 / A2 | V | 24 | 110...230 |
| • Tolerance | | % | ±20 | -15/+10 |
| Rated control supply current | | | | |
| • STANDBY | | mA | <50 | 6 |
| • During pickup | | mA | <100 | 15 |
| • ON | | mA | <100 | 15 |
| Rated frequency | | Hz | 50/60 | |
| • Tolerance | | % | ±10 | |
| Control input | | | ON / OFF | |
| IN | | | | |
| Power consumption with version | | | approx. 12 | |
| • 24 V DC | | mA | AC: 3/6; DC: 1.5/3 | |
| • 110/230 V AC | | mA | | |
| Relay outputs | | | | |
| Output 1 | ON | 13/14 | Operating indication (NO) | |
| Rated operational current | | A | 3AC-15/AC-14 at 230 V, | |
| | | A | 1DC-13 at 24 V | |
| Protection against overvoltages | | | Protection by means of varistor through contact | |
| Short-circuit protection | | | 4 A gL/gG operational class; | |
| | | | 6 A quick (fuse is not included in scope of supply) | |
| Operating indications | | LED | DEVICE | STATE/BYPASSED/ FAILURE |
| Off | | | Green | Green |
| Start | | | Green | Green flashing |
| Bypass | | | Green | Green |
| Fault signals | | | | |
| • 24 V DC: $U < 0.75 \times U_s$ or $U > 1.25 \times U_s$ | | | Off | Red |
| • AC 110...230 V: $U < 0.75 \times U_s$ or $U > 1.15 \times U_s$ | | | Off | Red |
| Electrical overloading of bypass (reset by removing IN command) | | | Yellow | Red |
| Missing mains voltage, phase failure / missing load | | | Green | Red |
| Device fault | | | Red | Red |

14.2.3 3RW30...BB.. control times and parameters

| Type | 3RW301....3RW304. | | Factory default |
|---|-------------------|----------|-----------------|
| Control times and parameters | | | |
| Control times | | | |
| Closing delay (with connected control voltage) | ms | <50 | |
| Closing delay (automatic / line contactor mode) | ms | <300 | |
| Mains failure bridging time | | | |
| Control supply voltage | ms | 50 | |
| Mains failure response time ¹⁾ | | | |
| Load current circuit | ms | 500 | |
| Start parameters | | | |
| • Ramp-up time | s | 0...20 | 7.5 |
| • Starting voltage | % | 40...100 | 40 |
| Ramp-up detection | | No | |
| Operating mode output 13/14 | | | |
| Rising edge at | Start command | ON | |
| Falling edge at | Off command | | |

1) Mains failure detection only in standby state, not during operation.

14.2.4 3RW30...BB.. power electronics

| | | |
|--|---|--|
| Type | 3RW301...BB.4...3RW304...BB.4 | |
| Power electronics | | |
| Rated operational voltage | V AC | 200...480 |
| Tolerance | % | -15/+10 |
| Rated frequency | Hz | 50/60 |
| Tolerance | % | ±10 |
| Continuous duty at 40°C (% of I _e) | % | 115 |
| Minimum load (% of I _e) | % | 10 (at least 2 A) |
| Maximum cable length between soft starter and motor | m | 300 |
| Permissible installation altitude | m | 5000 (Derating from 1000, see characteristic curves); higher on request |
| Permissible mounting position (auxiliary fan not available) | | |
| Permissible ambient temperature | °C | -25...+60; (derating from +40) |
| Operation | °C | -40...+80 |
| Storage | °C | -40...+80 |
| Degree of protection | IP20 for 3RW301. and 3RW302.; IP00 for 3RW303. and 3RW304. | |

14.2.5 3RW30 13, 14, 16, 17, 18-BB.. power electronics

| | | | | | | |
|---|-----|-----------|-----------|---------|-------------|-------------|
| Type | | 3RW3013 | 3RW3014 | 3RW3016 | 3RW3017 | 3RW3018 |
| Power electronics | | | | | | |
| Current carrying capacity rated operating current I _e | | | | | | |
| • Acc. to IEC and UL/CSA ¹⁾ , for standalone assembly, AC-53a | | | | | | |
| - At 40 °C | A | 3.6 | 6.5 | 9 | 12.5 | 17.6 |
| - At 50 °C | A | 3.3 | 6 | 8 | 12 | 17 |
| - At 60 °C | A | 3 | 5.5 | 7 | 11 | 14 |
| Power loss | | | | | | |
| • During operation after startup of the motor at uninterrupted rated operat. curr. (40°C) approx. | W | 0,25 | 0,5 | 1 | 2 | 4 |
| • During starting at 300 % I _M (40 °C) | W | 24 | 52 | 80 | 80 | 116 |
| Permissible rated motor current and starts per hour for normal starting (class 10): | | | | | | |
| - Rated motor curr. I _M ²⁾ , ramp-up time 3s | A | 3.6 / 3.3 | 6,5 / 6,0 | 9 / 8 | 12.5 / 12.0 | 17.6 / 17.0 |
| - Starts per hour ³⁾ | 1/h | 200 / 150 | 87 / 60 | 50 / 50 | 85 / 70 | 62 / 46 |
| - Rated motor curr. I _M ²⁾ , ramp-up time 4s | A | 3.6 / 3.3 | 6,5 / 6,0 | 9 / 8 | 12.5 / 12.0 | 17.6 / 17.0 |
| - Starts per hour ³⁾ | 1/h | 150 / 100 | 64 / 46 | 35 / 35 | 62 / 47 | 45 / 32 |

1) Measurement at 60 °C in accordance with UL/CSA not required.

2) At 300 % I_M. Tamb = 40 °C / 50 °C

3) For intermittent duty S4 with ON time 30 %, T_{amb} = 40 °C / 50 °C, vertical standalone assembly. The specified switching frequencies do not apply to automatic mode.

14.2.6 3RW30 26, 27, 28-.BB.. power electronics

| Type | | 3RW3026 | 3RW3027 | 3RW3028 |
|---|-----|---------|---------|---------|
| Power electronics | | | | |
| Current carrying capacity rated operating current I_e | | | | |
| • Acc. to IEC and UL/CSA ¹⁾ , for standalone assembly, AC-53a | | | | |
| - At 40 °C | A | 25.3 | 32.2 | 38 |
| - At 50 °C | A | 23 | 29 | 34 |
| - At 60 °C | A | 21 | 26 | 31 |
| Power loss | | | | |
| • During operation after startup of the motor at uninterrupted rated operat. curr.(40 °C) approx. | W | 8 | 13 | 19 |
| • During starting at 300 % $I_M(40 °C)$ | W | 188 | 220 | 256 |
| Permissible rated motor current and starts per hour at normal starting (class 10) | | | | |
| - Rated motor curr. $I_M^{(2)}$, ramp-up time 3s | A | 25 / 23 | 32 / 29 | 38 / 34 |
| - Starts per hour ³⁾ | 1/h | 23 / 23 | 23 / 23 | 19 / 19 |
| - Rated motor curr. $I_M^{(2)}$, ramp-up time 4s | A | 25 / 23 | 32 / 29 | 38 / 34 |
| - Starts per hour ³⁾ | 1/h | 15 / 15 | 16 / 16 | 12 / 12 |

1) Measurement at 60 °C in accordance with UL/CSA not required.

2) At 300 % I_M . $T_{amb} = 40 °C / 50 °C$

3) For intermittent duty S4 with ON time 30 %, $T_{amb} = 40 °C / 50 °C$, vertical standalone assembly. The specified switching frequencies do not apply to automatic mode. Factors for permissible switching frequency with different mounting position, direct assembly, side-by-side assembly, see Configuration chapter.

14.2.7 3RW30 36, 37, 38, 46, 47-.BB.. power electronics




| Type | | 3RW3036 | 3RW3037 | 3RW3038 | 3RW3046 | 3RW3047 |
|---|-----|---------|---------|---------|---------|-----------|
| Power electronics | | | | | | |
| Current carrying capacity rated operating current I_e | | | | | | |
| • Acc. to IEC and UL/CSA ¹⁾ , for standalone assembly, AC-53a | | | | | | |
| - At 40 °C | A | 45 | 65 | 72 | 80 | 106 |
| - At 50 °C | A | 42 | 58 | 62.1 | 73 | 98 |
| - At 60 °C | A | 39 | 53 | 60 | 66 | 90 |
| Power loss | | | | | | |
| • During operation after startup of the motor at uninterrupted rated operat. curr.(40 °C) approx. | W | 6 | 12 | 15 | 12 | 21 |
| • During starting at 300 % $I_M(40 °C)$ | W | 316 | 444 | 500 | 576 | 768 |
| Permissible rated motor current and starts per hour at normal starting (class 10) | | | | | | |
| - Rated motor curr. $I_M^{(2)}$, ramp-up time 3s | A | 45 / 42 | 63 / 58 | 72 / 62 | 80 / 73 | 106 / 108 |
| - Starts per hour ³⁾ | 1/h | 38 / 38 | 23 / 23 | 22 / 22 | 22 / 22 | 15 / 15 |
| - Rated motor curr. $I_M^{(2)}$, ramp-up time 4s | A | 45 / 42 | 63 / 58 | 72 / 62 | 80 / 73 | 106 / 98 |
| - Starts per hour ³⁾ | 1/h | 26 / 26 | 15 / 15 | 15 / 15 | 15 / 15 | 10 / 10 |

1) Measurement at 60 °C in accordance with UL/CSA not required.

2) At 300 % I_M . $T_{amb} = 40 °C / 50 °C$

3) For intermittent duty S4 with ON time 70 %, $T_{amb} = 40 °C / 50 °C$, vertical standalone assembly. The specified switching frequencies do not apply to automatic mode.

14.2.8 3RW30 main conductor cross-sections

| Soft starter | Type | | 3RW301. | 3RW302. | 3RW303. | 3RW304. | |
|--|---|--|--|--|--|--|----------------|
| Conductor cross-sections | | | | | | | |
| Screw terminals Front clamping point connected  | Main conductors | | | | | | |
| | <ul style="list-style-type: none"> • Solid • Finely stranded with end sleeve | mm ² | 2 x (1...2.5); 2 x (2.5...6) acc. to IEC 60947 | 2 x (1...2.5); 2 x (2.5...6) acc. to IEC 60947; max. 1 x 10 | 2 x (1.5...16) | 2 x (2.5...16) | |
| | | mm ² | 2 x (1.5...2.5); 2 x (2.5...6) | 2 x (1...2.5); 2 x (2.5...6) | 1 x (0.75...25) | 1 x (2.5...35) | |
| | | mm ² | – | – | 1 x (0.75...35) | 1 x (4...70) | |
| | <ul style="list-style-type: none"> • AWG cables - Solid - Solid or stranded - Stranded | AWG | 2 x (16 ... 12) | 2 x (16 ... 12) | 1 x (18...2) | 1 x (10...2/0) | |
| | | AWG | 2 x (14...10) | 2 x (14...10) | – | – | |
| | | AWG | 1 x 8 | 1 x 8 | – | – | |
| | Rear clamping point connected  | Main conductors | | | | | |
| | | <ul style="list-style-type: none"> • Solid • Finely stranded with end sleeve • Stranded | mm ² | – | – | 2 x (1.5...16) | 2 x (2.5...16) |
| | | | mm ² | – | – | 1 x (1.5...25) | 1 x (2.5...50) |
| mm ² | | | – | – | 1 x (1.5...35) | 1 x (10...70) | |
| <ul style="list-style-type: none"> • AWG cables - Solid or stranded | | AWG | – | – | 1 x (16...2) | 1 x (10...2/0) | |
| | AWG | – | – | – | – | | |
| Both clamping points connected  | Main conductors | | | | | | |
| | <ul style="list-style-type: none"> • Solid • Stranded • Finely stranded with end sleeve | mm ² | – | – | 2 x (1.5...16) | 2 x (2.5...16) | |
| | | mm ² | – | – | 2 x (1.5...25) | 2 x (10...50) | |
| | | mm ² | – | – | 2 x (1.5...16) | 2 x (2.5...35) | |
| | <ul style="list-style-type: none"> • AWG cables - Solid or stranded | AWG | – | – | 2 x (16...2) | 2 x (10...1/0) | |
| AWG | | – | – | – | – | | |
| <ul style="list-style-type: none"> • Tightening torque | Nm | 2...2.5 | 2...2.5 | 4.5 | 6.5 | | |
| | lb.in | 18...22 | 18...22 | 40 | 58 | | |
| Tools | | | PZ2 | PZ2 | PZ2 | Allen screw 4 mm | |
| Degree of protection | | | IP20 | IP20 | IP20 (terminal compartment IP00) | IP20 (terminal compartment IP00) | |
| Spring-loaded terminals | Main conductors | | | | | | |
| | <ul style="list-style-type: none"> • Solid • Finely stranded with end sleeve | mm ² | 1...4 | 1...10 | – | – | |
| | | mm ² | 1...2.5 | 1...2.5 | 1...6; end sleeves, without plastic collar | – | – |
| | <ul style="list-style-type: none"> • AWG cables - Solid or stranded (finely stranded) - Stranded | AWG | 16...14 | 16...10 | – | – | |
| | | AWG | 16...12 | 1 x 8 | – | – | |
| Tools | | | DIN ISO 2380- 1A0; 5 x 3 | DIN ISO 2380- 1A0; 5 x 3 | – | – | |
| Degree of protection | | | IP20 | IP20 | – | – | |
| Busbar connections | Main conductors | | | | | | |
| | <ul style="list-style-type: none"> • With cable lug according to DIN 46234 or max. 20 mm wide - Stranded - Finely-stranded | mm ² | – | – | – | 2 x (10...70) | |
| | | mm ² | – | – | – | 2 x (10...50) | |
| | <ul style="list-style-type: none"> • AWG cables, solid or stranded | AWG | – | – | – | 2 x (7...1/0) | |
| AWG | | – | – | – | – | | |

14.2.9 3RW30 auxiliary conductor cross-sections

| Soft starters | Type | 3RW301....3RW304. | |
|--|-----------------|-----------------------|--|
| Conductor cross-sections | | | |
| Auxiliary conductors (1 or 2 conductors can be connected): | | | |
| Screw terminals | | | |
| • Solid | mm ² | 2 x (0.5...2.5) | |
| • Finely stranded with end sleeve | mm ² | 2 x (0.5...1.5) | |
| • AWG cables | | | |
| - Solid or stranded | AWG | 2 x (20...14) | |
| - Finely stranded with end sleeve | AWG | 2 x (20...16) | |
| • Terminal screws | | | |
| - Tightening torque | Nm lb.in | 0.8...1.2 7...10.3 | |
| Spring-loaded terminals | | | |
| • Solid | mm ² | 2 x (0.25...2.5) | |
| • Finely stranded with end sleeve | mm ² | 2 x (0.25...1.25) | |
| • AWG cables, solid or stranded | AWG | 2 x (24...14) | |

14.2.10 Electromagnetic compatibility according to EN 60947-4-2

| | Standard | Parameters |
|---|--|--|
| Electromagnetic compatibility according to EN 60947-4-2 | | |
| <i>EMC interference immunity</i> | | |
| Electrostatic discharge (ESD) | EN 61000-4-2 | ±4 kV contact discharge, ±8 kV air discharge |
| Electromagnetic RF fields | EN 61000-4-3 | Frequency range: 80 ... 2000 MHz with 80 % at 1 kHz Degree of severity 3: 10 V/m |
| Conducted RF interference | EN 61000-4-6 | Frequency range: 150 kHz ... 80 MHz with 80 % at 1 kHz Interference 10 V |
| RF voltages and RF currents on cables | | |
| • Burst | EN 61000-4-4 | ±2 kV / 5 kHz |
| • Surge | EN 61000-4-5 | ±1 kV line to line ±2 kV line to ground |
| <i>EMC interference emission</i> | | |
| EMC interference field strength | EN 55011 | Limit value of Class A at 30 ... 1000 MHz, Limit value of Class B for 3RW302.; 24 V AC/DC |
| Radio interference voltage | EN 55011 | Limit value of Class A at 0.15 ... 30 MHz, Limit value of Class B for 3RW302.; 24 V AC/DC |
| <i>Radio interference suppression filters</i> | | |
| Degree of noise suppression A (industrial applications) | Not required | |
| Degree of noise suppression B (applications for residential areas) | | |
| Control voltage | | |
| • 230 V AC/DC | Not available ¹⁾ | |
| • 24 V AC/DC | Not required for 3RW301. and 3RW302; Required for 3RW303. and 3RW304. (see table) | |

1) Degree of noise suppression B cannot be obtained through the use of filters as the strength of the electromagnetic field is not attenuated by the filter.

14.2.11 Recommended filters

| Soft starter types | Nominal current Soft starter A | Recommended filters ¹⁾ | | |
|--------------------|--------------------------------------|-----------------------------------|------------------------------|------------------------------|
| | | Filter types | Nominal current filters A | Terminals mm ² |
| 3RW3036 | 45 | 4EF1512-1AA10 | 50 | 16 |
| 3RW3037 | 63 | 4EF1512-2AA10 | 66 | 25 |
| 3RW3038 | 72 | 4EF1512-3AA10 | 90 | 25 |
| 3RW3046 | 80 | 4EF1512-3AA10 | 90 | 25 |
| 3RW3047 | 106 | 4EF1512-4AA10 | 120 | 50 |

1) The radio interference suppression filter is used to remove the conducted interference from the main circuit. The field-related emissions comply with degree of noise suppression B. The filter should be selected under standard conditions: 10 starts per hour, ramp-up time 4 s at 300 % I_e

14.2.12 Types of coordination

The type of coordination according to which the motor feeder with soft starter is mounted depends on the application-specific requirements. Normally, fuseless mounting (combination of motor starter protector and soft starter) is sufficient.

If type of coordination 2 needs to be fulfilled, semiconductor fuses must be fitted in the motor feeder.

ToC 1

Type of coordination 1 in accordance with IEC 60947-4-1:

The device is defective following a short-circuit failure and therefore unsuitable for further use. (Personnel and equipment must not be put at risk).

ToC 2

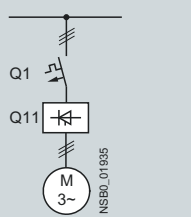
Type of coordination 2 in accordance with IEC 60947-4-1:

The device is suitable for further use following a short-circuit failure. (Personnel and equipment must not be put at risk).

The type of coordination only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.

14.2.13 Fuseless version

Fuseless version

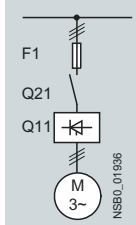


| Soft starter | Rated current | Circuit breaker ¹⁾ | | Rated current |
|------------------------------------|---------------|-------------------------------|-----------------------|---------------|
| T_{9C} 1 | | 400 V + 10 % | | |
| Q11 | | Q1 | $I_{q \max}$ | Rated current |
| Type | A | Type | kA | A |
| Type of coordination ²⁾ | | | | |
| 3RW3003 | 3 | 3RV1011-1EA10 | 3RV2011-1EA (prelim.) | 4 |
| 3RW3013 | 3.6 | 3RV1021-1FA10 | 3RV2011-1FA | 5 |
| 3RW3014 | 6.5 | 3RV1021-1HA10 | 3RV2011-1HA | 8 |
| 3RW3016 | 9 | 3RV1021-1JA10 | 3RV2011-1JA | 10 |
| 3RW3017 | 12.5 | 3RV1021-1KA10 | 3RV2011-1KA | 12.5 |
| 3RW3018 | 17.6 | 3RV1021-4BA10 | 3RV2021-4BA | 20 |
| 3RW3026 | 25 | 3RV1021-4DA10 | 3RV2021-4DA | 25 |
| 3RW3027 | 32 | 3RV1031-4EA10 | 3RV2021-4EA | 32 |
| 3RW3028 | 38 | 3RV1031-4FA10 | 3RV2021-4FA | 40 |
| 3RW3036 | 45 | 3RV1031-4GA10 | | 45 |
| 3RW3037 | 63 | 3RV1041-4JA10 | | 63 |
| 3RW3038 | 72 | 3RV1041-4KA10 | | 75 |
| 3RW3046 | 80 | 3RV1041-4LA10 | | 90 |
| 3RW3047 | 106 | 3RV1041-4MA10 | | 100 |

¹⁾ The rated motor current must be considered when selecting the devices. ²⁾ The types of coordination are described in chapter Types of coordination (Page 140).

14.2.14 Fused version (line protection only)

Fused version (line protection only)



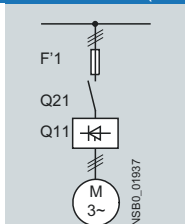
| Soft starters Q11 Type | Nominal current A | Line protection, maximum ⁴⁾ F1 Type | Rated current A | Size | Line contactors (optional) Q21 |
|--|----------------------|--|--------------------|------|--------------------------------------|
| Type of coordination 1 ¹⁾ : I _q = 65 kA at 480 V + 10% | | | | | |
| 3RW3003 ²⁾ | 3 | 3NA3805 ³⁾ | 20 | 000 | 3RT1015 3RT2015 |
| 3RW3013 | 3.6 | 3NA3803-6 | 10 | 000 | 3RT1015 3RT2015 |
| 3RW3014 | 6.5 | 3NA3805-6 | 16 | 000 | 3RT1015 3RT2015 |
| 3RW3016 | 9 | 3NA3807-6 | 20 | 000 | 3RT1016 3RT2016 |
| 3RW3017 | 12.5 | 3NA3810-6 | 25 | 000 | 3RT1024 3RT2018 |
| 3RW3018 | 17.6 | 3NA3814-6 | 35 | 000 | 3RT1026 3RT2026 |
| 3RW3026 | 25 | 3NA3822-6 | 63 | 00 | 3RT1026 3RT2026 |
| 3RW3027 | 32 | 3NA3824-6 | 80 | 00 | 3RT1034 3RT2027 |
| 3RW3028 | 38 | 3NA3824-6 | 80 | 00 | 3RT1035 3RT2028 |
| 3RW3036 | 45 | 3NA3130-6 | 100 | 1 | 3RT1036 |
| 3RW3037 | 63 | 3NA3132-6 | 125 | 1 | 3RT1044 |
| 3RW3038 | 72 | 3NA3132-6 | 125 | 1 | 3RT1045 |
| 3RW3046 | 80 | 3NA3136-6 | 160 | 1 | 3RT1045 |
| 3RW3047 | 106 | 3NA3136-6 | 160 | 1 | 3RT1046 |

1) The types of coordination are described in chapter Types of coordination (Page 140).
 2) I_q = 50 kA at 400 V.
 3) 3NA3 805-1 (NH00), 5SB2 61 (DIAZED), 5SE2 201-6 (NEOZED).
 4) Note: The soft starter protection function of the installed fuse is only guaranteed if the rated current of the fuse is not less than "minimum" and not greater than "maximum".

14.2.15 Fused version with SITOR 3NE1 fuses

Assembly as for type of coordination 2, with SITOR all-range fuses (F'1) for combined thyristor and line protection.

Fused version with SITOR 3NE1 fuses (semiconductor and line protection)



For suitable fuse bases, refer to "SENTRON switching and protecting devices for power distribution" —> "Switch disconnectors" in the LV1 Catalog and to "BETA protecting" —> "SITOR semiconductor fuses" the ET B1 Catalog or consult www.siemens.de/sitor

| Soft starters ToC 2 Q11 Type | Nominal current A | All-range fuses F'1 Type | Rated current A | Size | Line contactors (optional) Q21 |
|---|----------------------|--------------------------------|--------------------|------|--------------------------------------|
| Type of coordination 2 ¹⁾ : I _q = 65 kA at 480 V + 10 % | | | | | |
| 3RW3003 ²⁾ | 3 | 3NE1813-0 ³⁾ | 16 | 000 | 3RT1015 3RT2015 |
| 3RW3013 | 3.6 | 3NE1813-0 | 16 | 000 | 3RT1015 3RT2015 |
| 3RW3014 | 6.5 | 3NE1813-0 | 16 | 000 | 3RT1015 3RT2015 |
| 3RW3016 | 9 | 3NE1813-0 | 16 | 000 | 3RT1016 3RT2016 |
| 3RW3017 | 12.5 | 3NE1813-0 | 16 | 000 | 3RT1024 3RT2018 |
| 3RW3018 | 17.6 | 3NE1814-0 | 20 | 000 | 3RT1026 3RT2026 |
| 3RW3026 | 25 | 3NE1803-0 | 35 | 000 | 3RT1026 3RT2026 |
| 3RW3027 | 32 | 3NE1020-2 | 80 | 00 | 3RT1034 3RT2027 |
| 3RW3028 | 38 | 3NE1020-2 | 80 | 00 | 3RT1035 3RT2028 |
| 3RW3036 | 45 | 3NE1020-2 | 80 | 00 | 3RT1036 |
| 3RW3037 | 63 | 3NE1820-0 | 80 | 000 | 3RT1044 |
| 3RW3038 | 72 | 3NE1820-0 | 80 | 000 | 3RT1045 |
| 3RW3046 | 80 | 3NE1021-0 | 100 | 00 | 3RT1045 |
| 3RW3047 | 106 | 3NE1022-0 | 125 | 00 | 3RT1046 |

¹⁾ The types of coordination are described in chapter Types of coordination (Page 140).
Type of coordination 2 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.

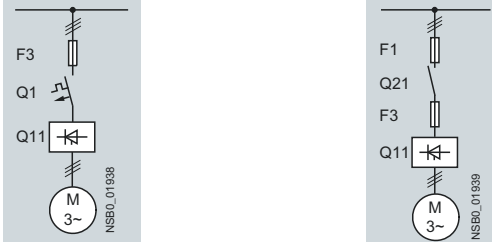
²⁾ I_q = 50 kA at 400 V.

³⁾ No SITOR fuse required!
Alternatively: 3NA3 803 (NH00), 5SB2 21 (DI-AZED), 5SE2 206 (NEOZED)

14.2.16 Fused version with SITOR 3NE3/4/8 fuses

Assembly as for type of coordination 2, with additional SITOR fuses (F3) for thyristor protection only.

Fused version with 3NE3 SITOR fuses (semiconductor protection by fuse, line, and overload protection by motor starter protector; alternatively, installation with contactor and overload relay possible)



For suitable fuse bases, refer to "SENTRON switching and protecting devices for power distribution" -> "Switch disconnectors" the LV1 Catalog and to "BETA protecting" -> "SITOR semiconductor fuses" in the ET B1 Catalog or consult www.siemens.de/sitor

| Soft starters Q11 Type | Nominal current A | Semiconductor fuses, minimum | | | Semiconductor fuses, maximum | | | Semiconductor fuses, minimum | | |
|---|----------------------|------------------------------|--------------------|------|------------------------------|--------------------|------|------------------------------|--------------------|------|
| | | F3 Type | Rated current A | Size | F3 Type | Rated current A | Size | F3 Type | Rated current A | Size |
| Type of coordination 2 ¹⁾ : I _q = 65 kA at 480 V + 10 % | | | | | | | | | | |
| 3RW3003 ²⁾ | 3 | - | - | - | - | - | - | - | - | - |
| 3RW3013 | 3.6 | - | - | - | - | - | - | 3NE4101 | 32 | 0 |
| 3RW3014 | 6.5 | - | - | - | - | - | - | 3NE4101 | 32 | 0 |
| 3RW3016 | 9 | - | - | - | - | - | - | 3NE4101 | 32 | 0 |
| 3RW3017 | 12.5 | - | - | - | - | - | - | 3NE4101 | 32 | 0 |
| 3RW3018 | 17.6 | - | - | - | 3NE3221 | 100 | 1 | 3NE4101 | 32 | 0 |
| 3RW3026 | 25 | - | - | - | 3NE3221 | 100 | 1 | 3NE4102 | 40 | 0 |
| 3RW3027 | 32 | - | - | - | 3NE3222 | 125 | 1 | 3NE4118 | 63 | 0 |
| 3RW3028 | 38 | - | - | - | 3NE3222 | 125 | 1 | 3NE4118 | 63 | 0 |
| 3RW3036 | 45 | - | - | - | 3NE3224 | 160 | 1 | 3NE4120 | 80 | 0 |
| 3RW3037 | 63 | - | - | - | 3NE3225 | 200 | 1 | 3NE4121 | 100 | 0 |
| 3RW3038 | 72 | 3NE3221 | 100 | 1 | 3NE3227 | 250 | 1 | - | - | - |
| 3RW3046 | 80 | 3NE3222 | 125 | 1 | 3NE3225 | 200 | 1 | - | - | - |
| 3RW3047 | 106 | 3NE3224 | 160 | 1 | 3NE3231 | 350 | 1 | - | - | - |

| Soft starters Q11 Type | Nominal current A | Semiconductor fuses, max. | | | Semiconductor fuses, min. | | | Semiconductor fuses, max. | | | Cylindrical fuses | |
|---|----------------------|---------------------------|--------------------|------|---------------------------|--------------------|------|---------------------------|--------------------|------|-------------------|--------------------|
| | | F3 Type | Rated current A | Size | F3 Type | Rated current A | Size | F3 Type | Rated current A | Size | F3 Type | Rated current A |
| Type of coordination 2 ¹⁾ : I _q = 65 kA at 480 V + 10 % | | | | | | | | | | | | |
| 3RW3003 ²⁾ | 3 | - | - | - | 3NE8015-1 | 25 | 00 | 3NE8015-1 | 25 | 00 | 3NC1010 | 10 |
| 3RW3013 | 3.6 | - | - | - | 3NE8015-1 | 25 | 00 | 3NE8015-1 | 25 | 00 | 3NC2220 | 20 |
| 3RW3014 | 6.5 | - | - | - | 3NE8015-1 | 25 | 00 | 3NE8015-1 | 25 | 00 | 3NC2220 | 20 |
| 3RW3016 | 9 | - | - | - | 3NE8015-1 | 25 | 00 | 3NE8015-1 | 25 | 00 | 3NC2220 | 20 |
| 3RW3017 | 12.5 | - | - | - | 3NE8015-1 | 25 | 00 | 3NE8018-1 | 63 | 00 | 3NC2250 | 50 |
| 3RW3018 | 17.6 | - | - | - | 3NE8003-1 | 35 | 00 | 3NE8021-1 | 100 | 00 | 3NC2263 | 63 |
| 3RW3026 | 25 | 3NE4117 | 50 | 0 | 3NE8017-1 | 50 | 00 | 3NE8021-1 | 100 | 00 | 3NC2263 | 63 |
| 3RW3027 | 32 | 3NE4118 | 63 | 0 | 3NE8018-1 | 63 | 00 | 3NE8022-1 | 125 | 00 | 3NC2280 | 80 |
| 3RW3028 | 38 | 3NE4118 | 63 | 0 | 3NE8020-1 | 80 | 00 | 3NE8022-1 | 125 | 00 | 3NC2280 | 80 |
| 3RW3036 | 45 | 3NE4120 | 80 | 0 | 3NE8020-1 | 80 | 00 | 3NE8024-1 | 160 | 00 | 3NC2280 | 80 |
| 3RW3037 | 63 | 3NE4121 | 100 | 0 | 3NE8021-1 | 100 | 00 | 3NE8024-1 | 160 | 00 | - | - |
| 3RW3038 | 72 | - | - | - | 3NE8022-1 | 125 | 00 | 3NE8024-1 | 160 | 00 | - | - |
| 3RW3046 | 80 | - | - | - | 3NE8022-1 | 125 | 00 | 3NE8024-1 | 160 | 00 | - | - |
| 3RW3047 | 106 | - | - | - | 3NE8024-1 | 160 | 00 | 3NE8024-1 | 160 | 00 | - | - |

| Soft starters Q11 Type | Nominal current A | Line contactors (optional) Q21 | | Motor starter protectors 400 V +10 % Q1 Type | | | Line protection, maximum Rated current A Size | | |
|---|-------------------------|--------------------------------------|----------|---|------------------------|------|--|-----|-----|
| | | | | | | | F1 Type | | |
| Type of coordination 2 ¹⁾ : I _q = 65 kA at 480 V + 10 % | | | | | | | | | |
| 3RW3003 ²⁾ | 3 | 3RT10 15 | 3RT20 15 | 3RV1011-1EA10 | 3RV20 11-1EA (provis.) | 4 | 3NA3805 ³⁾ | 20 | 000 |
| 3RW3013 | 3.6 | 3RT10 15 | 3RT20 15 | 3RV1021-1FA10 | 3RV20 11-1FA | 5 | 3NA3803-6 | 10 | 000 |
| 3RW3014 | 6.5 | 3RT10 15 | 3RT20 15 | 3RV1021-1HA10 | 3RV20 11-1HA | 8 | 3NA3805-6 | 16 | 000 |
| 3RW3016 | 9 | 3RT10 16 | 3RT20 16 | 3RV1021-1JA10 | 3RV20 11-1JA | 10 | 3NA3807-6 | 20 | 000 |
| 3RW3017 | 12.5 | 3RT10 24 | 3RT20 18 | 3RV1021-1KA10 | 3RV20 11-1KA | 12.5 | 3NA3810-6 | 25 | 000 |
| 3RW3018 | 17.6 | 3RT10 26 | 3RT20 26 | 3RV1021-4BA10 | 3RV20 21-4BA | 20 | 3NA3814-6 | 35 | 000 |
| 3RW3026 | 25 | 3RT10 26 | 3RT10 26 | 3RV1031-4DA10 | 3RV20 21-4DA | 25 | 3NA3822-6 | 63 | 00 |
| 3RW3027 | 32 | 3RT10 34 | 3RT20 27 | 3RV1031-4EA10 | 3RV20 21-4EA | 32 | 3NA3824-6 | 80 | 00 |
| 3RW3028 | 38 | 3RT10 35 | 3RT20 28 | 3RV1031-4EA10 | 3RV20 21-4FA | 40 | 3NA3824-6 | 80 | 00 |
| 3RW3036 | 45 | 3RT10 36 | | 3RV1031-4GA10 | | 45 | 3NA3130-6 | 100 | 1 |
| 3RW3037 | 63 | 3RT10 44 | | 3RV1041-4JA10 | | 63 | 3NA3132-6 | 125 | 1 |
| 3RW3038 | 72 | 3RT10 45 | | 3RV1041-4KA10 | | 75 | 3NA3132-6 | 125 | 1 |
| 3RW3046 | 80 | 3RT10 45 | | 3RV1041-4LA10 | | 90 | 3NA3136-6 | 160 | 1 |
| 3RW3047 | 106 | 3RT10 46 | | 3RV1041-4MA10 | | 100 | 3NA3136-6 | 160 | 1 |

¹⁾ The types of coordination are described in chapter Types of coordination (Page 140). Type of coordination 2 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.

²⁾ I_q = 50 kA at 400 V.

14.3 3RW40

14.3.1 Overview

SIRIUS 3RW40 soft starters have all the same advantages as the 3RW30 soft starters.

SIRIUS 3RW40 soft starters are characterized above all by their small space requirements. Integral bypass contacts mean that no power loss has to be taken into account at the power semiconductors (thyristors) after the motor has started up. This cuts down on heat losses, enabling a more compact design and making external bypass circuits superfluous.

At the same time, this soft starter comes with additional integrated functions such as settable current limiting, motor overload and intrinsic device protection, and optional thermistor motor protection. The higher the motor rating, the more important these functions become because they make it unnecessary to purchase and install protection equipment (such as overload relays).

Internal intrinsic device protection prevents thermal overloading of the thyristors and the power unit defects this can cause. As an option, the thyristors can also be protected against short-circuiting with semiconductor fuses.

Thanks to integrated status and fault monitoring, this compact soft starter offers many different diagnostics options. Up to four LEDs and relay outputs permit differentiated monitoring and diagnostics of the operating mechanism by indicating the operating state as well as for example mains or phase failure, missing load, non-permissible tripping time/CLASS setting, thermal overloading or device faults.

Soft starters rated up to 250 kW (at 400 V) can be supplied for standard applications in three-phase systems. Extremely small sizes, low power losses, and simple commissioning are just three of the many advantages of the SIRIUS 3RW40 soft starters.

"Increased safety" type of protection EEx e according to ATEX Directive 94/9/EC

The SIRIUS 3RW40 soft starter sizes S0 to S12 are suitable for starting explosion-proof motors with the "increased safety" type of protection EEx e.

Note

The rated motor current is extremely important when selecting a soft starter.

Refer to the information about selecting soft starters in chapter Configuration (Page 91).

Conditions for normal starting (CLASS 10):

Max. starting time 10 s, current limitation 300%, 5 starts/hour, ON time 30%, standalone assembly, max. installation altitude 1000 m / 3280 ft, ambient temperature kW 40 °C / 104 °F. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. For information about the rated currents for ambient temperatures above 40 °C, refer to chapter 3RW40 2. to 7. power electronics (Page 151).

14.3.2 3RW40 2., 3., 4. control electronics

| Type | 3RW402. | | 3RW403., 3RW404. | |
|--|-----------------------------|--------------|--|-------------|
| Control electronics | | | | |
| Rated values | Terminal | | | |
| Rated control supply voltage | A1 / A2 | V | 24 | 110 ... 230 |
| • Tolerance | | % | ±20 | -15 / +10 |
| Rated control supply current | | | | 24 |
| • STANDBY | | mA | < 150 | < 200 |
| • During pickup | | mA | < 200 | < 5000 |
| • ON without fan | | mA | < 250 | < 200 |
| • ON with fan | | mA | < 300 | < 250 |
| Rated frequency | | Hz | 50 / 60 | |
| • Tolerance | | % | ±20 | |
| Control inputs | | | ON / OFF | |
| IN | | | | |
| Rated operational current | | | | |
| • A C | | mA | approx. 12 | 3 / 6 |
| • D C | | mA | approx. 12 | 1,5 / 3 |
| Relay outputs | | | | |
| Output 1 | ON / RUN mode ¹⁾ | 13 / 14 | Operating indication (NO) | |
| Output 2 | BYPASSED | 23 / 24 | Bypass indication (NO) | |
| Output 3 | OVERLOAD / FAILURE | 95 / 96 / 98 | Overload / fault indication (NC/NO) | |
| Thermistor motor protection (PTC binary) | | | | |
| Total cold resistance | | kOhm | ≤ 1,5 | |
| Response value | | kOhm | 3,4 ... 3,8 | |
| Return value | | kOhm | 1,5 ... 1,65 | |
| Cable lengths, cable cross sections | | | 2 x 250 m: 2.5 mm ² | |
| | | | 2 x 150 m: 1.5 mm ² | |
| | | | 2 x 50 m: 0.5 mm ² | |
| Rated operational current | | A | 3 AC-15 / AC-14 at 230 V, | |
| | | A | 1 DC-13 at 24 V | |
| Protection against overvoltages | | | Protection by means of varistor through contact | |
| Short-circuit protection | | | 4 A operational class gL / gG; | |
| | | | 6 A quick (fuse not included in scope of supply) | |

1) Factory setting: ON Mode.

14.3 3RW40

14.3.3 3RW40 5., 7. control electronics

| Type | 3RW405. | | 3RW407. | |
|--|-----------------------------|--------------|---|-----------|
| Control electronics | | | | |
| Rated values | Terminal | | | |
| Rated control supply voltage | A1 / A2 | V AC | 115 | 230 |
| • Tolerance | | % | -15 / +10 | -15 / +10 |
| Rated control supply current | | mA | 15 | 15 |
| • STANDBY | | mA | < 1700 | < 4000 |
| • During pickup | | mA | 440 | 660 |
| • ON ¹⁾ | | mA | 200 | 360 |
| Rated frequency | | Hz | 50 / 60 | 50 / 60 |
| • Tolerance | | % | ±10 | ±10 |
| Control inputs | | | | |
| IN | | | ON / OFF | |
| Rated operational current | | mA | Approx. 10 in accordance with DIN19240 | |
| Rated operational voltage | | V DC | 24 from internal supply dc+ or external DC voltage (in accordance with DIN19240) via terminals - and IN | |
| Relay outputs | | | | |
| Output 1 | ON / RUN mode ²⁾ | 13 / 14 | Operating indication (NO) | |
| Output 2 | BYPASSED | 23 / 24 | Bypass indication (NO) | |
| Output 3 | OVERLOAD / FAILURE | 95 / 96 / 98 | | |
| Thermistor motor protection (PTC binary) | | | | |
| Total cold resistance | | kOhm | ≤ 1,5 | |
| Response value | | kOhm | 3,4 ... 3,8 | |
| Return value | | kOhm | 1,5 ... 1,65 | |
| Cable lengths, cable cross sections | | | 2 x 250 m: 2.5 mm ² | |
| | | | 2 x 150 m: 1.5 mm ² | |
| | | | 2 x 50 m: 0.5 mm ² | |
| Rated operational current | | A | 3 AC-15 / AC-14 at 230 V, | |
| Protection against overvoltages | | A | 1 DC-13 at 24 V | |
| Short-circuit protection | | | Protection by means of varistor through contact | |
| | | | 4 A operational class gL / gG; | |
| | | | 6 A quick (fuse not included in scope of supply) | |

1) Values for the coil current consumption at + 10 % U_n, 50 Hz.

2) Factory setting: ON Mode.

14.3.4 3RW40 2., 3., 4. control electronics

| Type | 3RW402., 3RW403., 3RW404. | | | |
|---|---------------------------|-----------------|------------------------|----------------|
| Control electronics | | | | |
| Operating indications | LED | DEVICE | STATE/BYPASSED/FAILURE | OVERLOAD |
| Off | | Green | Off | Off |
| Start | | Green | Green flashing | Off |
| Bypass | | Green | Green | Off |
| Stop | | Green | Green flashing | Off |
| Alarm signals | | | | |
| Impermissible I _e / CLASS setting | | Green | Not relevant | Red flashing |
| Start inhibited / thyristors too hot | | Yellow flashing | Not relevant | Off |
| Fault signals | | | | |
| • 24 V: U < 0.75 x U _s or U > 1.25 x U _s | | Off | Red | Off |
| • 110 ... 230 V: U < 0.75 x U _s or U > 1.15 x U _s | | Off | Red | Off |
| Impermissible I _e / CLASS setting for edge 0→1 on input IN | | Green | Red | Red flashing |
| Motor protection tripping (overload thermistor) | | Green | Off | Red |
| Thermistor defective (wire breakage, short-circuit) | | Green | Off | Red flickering |
| Thermal overload of the thyristors | | Yellow | Red | Off |
| Missing mains voltage, phase failure / missing load | | Green | Red | Off |
| Device fault | | Red | Red | Off |

14.3.5 3RW40 5., 7. control electronics

| Type | 3RW405. and 3RW407. | | | | |
|--|---------------------|-----------------|----------------|--------------|--------------|
| Control electronics | | | | | |
| Operating indications | LEDs | DEVICE | STATE/BYPASSED | FAILURE | OVERLOAD |
| Off | | Green | Off | Off | Off |
| Start | | Green | Green flashing | Off | Off |
| Bypass | | Green | Green | Off | Off |
| Stop | | Green | Green flashing | Off | Off |
| Alarm signals | | | | | |
| Impermissible I_g / CLASS setting | | Green | Not relevant | Not relevant | Red flashing |
| Start inhibited / thyristors too hot | | Yellow flashing | Not relevant | Not relevant | Off |
| Fault signals | | | | | |
| $U < 0.75 \times U_s$ or $U > 1.15 \times U_s$ | | Off | Off | Red | Off |
| Impermissible I_g / CLASS setting for edge 0→1 on input IN | | Green | Off | Red | Red flashing |
| Motor protection tripping | | Green | Off | Off | Red |
| Thermal overload of the thyristors | | Yellow | Off | Red | Off |
| Missing mains voltage, phase failure / missing load | | Green | Off | Red | Off |
| Device fault | | Red | Off | Red | Off |

14.3.6 3RW40 protection functions

| Type | 3RW40.. | | | Factory default |
|--|---------|---|--|-----------------|
| Protection functions | | | | |
| Motor protection functions | | | | |
| Trips in the event of | | | | |
| Trip class to IEC 60947-4-1 | Class | Thermal overloading of the motor | | 10 |
| Phase failure sensitivity | % | > 40 | | |
| Overload warning | | | | |
| Thermistor protection according to IEC 60947-8, type A / IEC 60947-5-1 | | No | | |
| Reset option after tripping | | Yes ¹⁾ | | |
| | | Manual / automatic / remote reset ²⁾ | | |
| | | (MAN / AUTO / REMOTE ²⁾) | | |
| Recovery time | min | 5 | | |
| Device protection functions | | | | |
| Trips in the event of | | | | |
| Reset option after tripping | | | | |
| | | Thermal overloading of the thyristors or bypass ³⁾ | | |
| | | Manual / automatic / remote reset ²⁾ | | |
| | | (MAN / AUTO / REMOTE ²⁾) | | |
| Recovery time | | | | |
| • During overloading of the thyristors | s | 30 | | |
| • During overloading of the bypass | s | 60 | | |

1) Optional up to size S3 (device version).

2) Integrated remote reset (REMOTE) available only for 3RW402. to 3RW404.; remote reset with accessory module 3RU19 available for 3RW405. and 3RW407.

3) Bypass protection up to size S3.

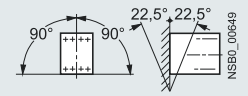
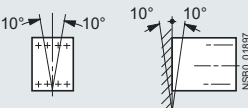
14.3.7 3RW40 control times and parameters

| Type | 3RW40.. | | Factory default |
|---|--------------------------------|---|--------------------|
| Control times and parameters | | | |
| Control times | | | |
| Closing delay (with connected control voltage) | ms | < 50 | |
| Closing delay (automatic / line contactor mode) | ms | < 300 | |
| Recovery time (closing command during active stop) | ms | 100 | |
| Mains failure bridging time | | | |
| Control supply voltage | ms | 50 | |
| Mains / phase failure response time | | | |
| Load circuit | | | |
| • During starting and stopping | s | 1 | |
| • During bypass | s | 5 | |
| Reclosing lockout after overload trip | | | |
| Motor protection trip | min | 5 | |
| Device protection trip | | | |
| • During overloading of the thyristors | s | 30 | |
| • During overloading of the bypass | s | 60 | |
| Start parameters | | | |
| Starting time | s | 0 ... 20 | 7,5 |
| Start voltage | % | 40 ... 100 | 40 |
| Starting current limiting | | 1.3 ... 5 x I _e /max ¹⁾ | 5 x I _e |
| Stop parameters | | | |
| Stopping time | s | 0 ... 20 | 0 |
| Reset mode parameters (for motor / device protection trip) | | | |
| Manual reset | LED | Off | Off |
| Automatic reset | LED | Yellow | |
| Remote reset (REMOTE) ²⁾ | LED | Green | |
| Ramp-up detection | | | |
| Operating mode output 13 / 14 | | | |
| Rising edge at | Start command | ON | |
| Falling edge at | Off command End of stopping | RUN | ON |

1) Product version E07 and higher (for 3RW40 size S0 to S3) or product version E11 and higher (for 3RW40 S6 to S12)

2) Integrated remote reset (REMOTE) available only for 3RW402. to 3RW404.; available for 3RW405. and 3RW407. Remote reset with accessory module 3RU19.

14.3.8 3RW40 2. to 7. power electronics

| Type | | 3RW402.-.B.4, 3RW403.-.B.4, 3RW404.-.B.4 | 3RW402.-.B.5, 3RW403.-.B.5, 3RW404.-.B.5 | 3RW405.-.BB.4, 3RW407.-.BB.4 | 3RW405.-.BB.5, 3RW407.-.BB.5 |
|--|------|--|--|---------------------------------|---------------------------------|
| Power electronics | | | | | |
| Rated operational voltage | V AC | 200 ... 480 | 400 ... 600 | 200 ... 460 | 400 ... 600 |
| Tolerance | % | -15 / +10 | -15 / +10 | -15 / +10 | -15 / +10 |
| Maximum thyristor blocking voltage | V AC | 1600 | | 1400 | 1800 |
| Rated frequency | Hz | 50/60 | | | |
| Tolerance | % | ±10 | | | |
| Continuous duty at 40 °C (% of I _e) | | 115 | | | |
| Minimum load (% of minimum selectable rated motor current I _M) | % | 20 (at least 2 A) | | | |
| Maximum cable length between soft starter and motor | m | 300 | | | |
| Permissible installation altitude | m | 5000 (Derating from 1000, see characteristic curves); higher on request | | | |
| Permissible mounting position | | <p>• With auxiliary fan (for 3RW402. ... 3RW404.)</p>  <p>• Without auxiliary fan (for 3RW402. ... 3RW404.)</p>  <p>– (fan integrated in the soft starter)</p> | | | |
| Permissible ambient temperature | | | | | |
| Operation | °C | -25 ... +60; (derating from +40) | | | |
| Storage | °C | -40 ... +80 | | | |
| Degree of protection | | IP20 for 3RW402.; IP00 for 3RW403. and 3RW404. | | IP00 | |

14.3.9 3RW40 24, 26, 27, 28 power electronics

| Type | | 3RW4024 | 3RW4026 | 3RW4027 | 3RW4028 |
|--|-----|-----------|---------|---------|---------|
| Power electronics | | | | | |
| Current carrying capacity rated operational current I_e | | | | | |
| • According to IEC and UL / CSA ¹⁾ , for single assembly, AC-53a | | | | | |
| - at 40 °C | A | 12.5 | 25.3 | 32.2 | 38 |
| - at 50 °C | A | 11 | 23 | 29 | 34 |
| - at 60 °C | A | 10 | 21 | 26 | 31 |
| Minimum settable rated motor current I_M for motor overload protection | | | | | |
| | A | 5 | 10 | 17 | 23 |
| Power loss | | | | | |
| • During operation after run-up at uninterrupted rated operational current (40 °C) approx. | | | | | |
| | W | 2 | 8 | 13 | 19 |
| • During start-up with set current limitation to 300 % I_M (40 °C) | | | | | |
| | W | 68 | 188 | 220 | 256 |
| Permissible rated motor current and starts per hour | | | | | |
| • For normal starting (class 10) | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 3 s | A | 12.5 / 11 | 25 / 23 | 32 / 29 | 38 / 34 |
| - Starts per hour ³⁾ | 1/h | 50 / 50 | 23 / 23 | 23 / 23 | 19 / 19 |
| - Rated motor current $I_M^{(2)}$, run-up time 4 s | A | 12.5 / 11 | 25 / 23 | 32 / 29 | 38 / 34 |
| - Starts per hour ³⁾ | 1/h | 36 / 36 | 15 / 15 | 16 / 16 | 12 / 12 |
| • For heavy-duty starting (class 15) | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 4.5 s | A | 11 / 10 | 23 / 21 | 30 / 27 | 34 / 31 |
| - Starts per hour ³⁾ | 1/h | 49 / 49 | 21 / 21 | 18 / 18 | 18 / 18 |
| - Rated motor current $I_M^{(2)}$, run-up time 6 s | A | 11 / 10 | 23 / 21 | 30 / 27 | 34 / 31 |
| - Starts per hour ³⁾ | 1/h | 36 / 36 | 14 / 14 | 13 / 13 | 13 / 13 |
| • For heavy-duty starting (class 20) | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 6 s | A | 10 / 9 | 21 / 19 | 27 / 24 | 31 / 28 |
| - Starts per hour ³⁾ | 1/h | 47 / 47 | 21 / 21 | 20 / 20 | 18 / 18 |
| - Rated motor current $I_M^{(2)}$, run-up time 8 s | A | 10 / 9 | 21 / 19 | 27 / 24 | 31 / 28 |
| - Starts per hour ³⁾ | 1/h | 34 / 34 | 15 / 15 | 14 / 14 | 13 / 13 |

- 1) Measurement at 60 °C acc. to UL / CSA not required.
- 2) Current limitation on soft starter set to 300 % I_M . $T_a = 40 °C / 50 °C$. Maximum settable rated motor current I_M , depending on the CLASS setting.
- 3) For intermittent duty S4 with ON time $OT = 30 %$, $T_a = 40 °C / 50 °C$, stand-alone assembly vertical. The specified switching frequencies do not apply to automatic mode. Factors for permissible switching frequency for different mounting position, direct, side-by-side mounting, and use of an optional additional fan, see chapter Configuration.

14.3.10 3RW40 36, 37, 38, 46, 47 power electronics

| Type | 3RW4036 | 3RW4037 | 3RW4038 | 3RW4046 | 3RW4047 | |
|--|---------|---------|---------|---------|---------|----------|
| Power electronics | | | | | | |
| Current carrying capacity rated operational current I_g | | | | | | |
| • According to IEC and UL/CSA ¹⁾ , for single assembly, AC-53a | | | | | | |
| - at 40 °C | A | 45 | 63 | 72 | 80 | 106 |
| - at 50 °C | A | 42 | 58 | 62,1 | 73 | 98 |
| - at 60 °C | A | 39 | 53 | 60 | 66 | 90 |
| Minimum settable rated motor current I_M for motor overload protection | | | | | | |
| | A | 23 | 26 | 35 | 43 | 46 |
| Power loss | | | | | | |
| • During operation after run-up at uninterrupted rated operational current (40 °C) approx. | | | | | | |
| | W | 6 | 12 | 15 | 12 | 21 |
| • During start-up with set current limitation to 300 % I_M (40 °C) | | | | | | |
| | W | 316 | 444 | 500 | 576 | 768 |
| Permissible rated motor current and starts per hour | | | | | | |
| • For normal starting (class 10) | | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 3 s | A | 45 / 42 | 63 / 58 | 72 / 62 | 80 / 73 | 106 / 98 |
| - Starts per hour ³⁾ | 1/h | 38 / 38 | 23 / 23 | 22 / 22 | 22 / 22 | 15 / 15 |
| • For heavy-duty starting (class 15) | | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 4 s | A | 45 / 42 | 63 / 58 | 72 / 62 | 80 / 73 | 106 / 98 |
| - Starts per hour ³⁾ | 1/h | 26 / 26 | 15 / 15 | 15 / 15 | 15 / 15 | 10 / 10 |
| • For heavy-duty starting (class 15) | | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 4.5 s | A | 42 / 38 | 50 / 46 | 56 / 52 | 70 / 64 | 84 / 77 |
| - Starts per hour ³⁾ | 1/h | 30 / 30 | 34 / 34 | 34 / 34 | 24 / 24 | 23 / 23 |
| • For heavy-duty starting (class 20) | | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 6 s | A | 42 / 38 | 50 / 46 | 56 / 52 | 70 / 64 | 84 / 77 |
| - Starts per hour ³⁾ | 1/h | 21 / 21 | 24 / 24 | 24 / 24 | 16 / 16 | 17 / 17 |
| • For heavy-duty starting (class 20) | | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 6 s | A | 38 / 34 | 46 / 42 | 50 / 46 | 64 / 58 | 77 / 70 |
| - Starts per hour ³⁾ | 1/h | 30 / 30 | 31 / 31 | 34 / 34 | 23 / 23 | 23 / 23 |
| • For heavy-duty starting (class 20) | | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 8 s | A | 38 / 34 | 46 / 42 | 50 / 46 | 64 / 58 | 77 / 70 |
| - Starts per hour ³⁾ | 1/h | 21 / 21 | 22 / 22 | 24 / 24 | 16 / 16 | 16 / 16 |

1) Measurement at 60 °C acc. to UL / CSA not required.

2) Current limitation on soft starter set to 300 % I_M . $T_a = 40\text{ °C} / 50\text{ °C}$
Maximum settable rated motor current I_M , depending on the CLASS-setting.




3) For intermittent duty S4 with ON time $OT = 30\%$, $T_a = 40\text{ °C} / 50\text{ °C}$, stand-alone assembly vertical. The specified switching frequencies do not apply to automatic mode. Factors for permissible switching frequency for different mounting position, direct, side-by-side mounting, and use of an optional additional fan, see chapter Configuration.

14.3.11 3RW40 55, 56, 73, 74, 75, 76 power electronics







| Type | | 3RW4055 | 3RW4056 | 3RW4073 | 3RW4074 | 3RW4075 | 3RW4076 |
|--|-----|-----------|-----------|-----------|-----------|-----------|-----------|
| Power electronics | | | | | | | |
| Current carrying capacity rated operational current I_e | | | | | | | |
| • According to IEC and UL/CSA ¹⁾ , for single assembly, AC-53a | | | | | | | |
| - at 40 °C | A | 134 | 162 | 230 | 280 | 356 | 432 |
| - at 50 °C | A | 117 | 145 | 205 | 248 | 315 | 385 |
| - at 60 °C | A | 100 | 125 | 180 | 215 | 280 | 335 |
| Minimum settable rated motor current I_M for motor overload protection | | | | | | | |
| | A | 59 | 87 | 80 | 130 | 131 | 207 |
| Power loss | | | | | | | |
| • During operation after run-up at uninterrupted rated operational current (40 °C) approx. | | | | | | | |
| | W | 60 | 75 | 75 | 90 | 125 | 165 |
| • During start-up with set current limitation to 350 % ²⁾ I_M (40 °C) | | | | | | | |
| | W | 1043 | 1355 | 2448 | 3257 | 3277 | 3600 |
| Permissible rated motor current and starts per hour | | | | | | | |
| • For normal starting (class 10) | | | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 10 s | A | 134 / 117 | 162 / 145 | 230 / 205 | 280 / 248 | 356 / 315 | 432 / 385 |
| - Starts per hour ³⁾ | 1/h | 20 / 20 | 8 / 8 | 14 / 14 | 20 / 20 | 16 / 16 | 17 / 17 |
| - Rated motor current $I_M^{(2)}$, run-up time 20 s | A | 134 / 117 | 162 / 145 | 230 / 205 | 280 / 248 | 356 / 315 | 432 / 385 |
| - Starts per hour ³⁾ | 1/h | 7 / 7 | 1,4 / 1,4 | 3 / 3 | 8 / 8 | 5 / 5 | 5 / 5 |
| • For heavy-duty starting (class 15) | | | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 15 s | A | 134 / 117 | 152 / 140 | 210 / 200 | 250 / 220 | 341 / 315 | 402 / 385 |
| - Starts per hour ³⁾ | 1/h | 11 / 11 | 8 / 8 | 11 / 11 | 13 / 13 | 11 / 11 | 12 / 12 |
| - Rated motor current $I_M^{(2)}$, run-up time 30 s | A | 134 / 117 | 152 / 140 | 210 / 200 | 250 / 220 | 341 / 315 | 402 / 385 |
| - Starts per hour ³⁾ | 1/h | 1,2 / 1,2 | 1,7 / 1,7 | 1 / 1 | 6 / 6 | 2 / 2 | 2 / 2 |
| • For heavy-duty starting (class 20) | | | | | | | |
| - Rated motor current $I_M^{(2)}$, run-up time 20 s | A | 124 / 112 | 142 / 132 | 200 / 185 | 230 / 205 | 311 / 280 | 372 / 340 |
| - Starts per hour ³⁾ | 1/h | 12 / 12 | 9 / 9 | 10 / 10 | 10 / 10 | 10 / 10 | 10 / 10 |
| - Rated motor current $I_M^{(2)}$, run-up time 40 s | A | 124 / 112 | 142 / 132 | 200 / 185 | 230 / 205 | 311 / 280 | 372 / 340 |
| - Starts per hour ³⁾ | 1/h | 2 / 2 | 2 / 2 | 1 / 1 | 5 / 5 | 1 / 1 | 1 / 1 |

- 1) Measurement at 60 °C acc. to UL/CSA not required.
- 2) Current limitation on soft starter set to 350 % I_M . $T_a = 40 °C / 50 °C$
Maximum settable rated motor current I_M , depending on the CLASS-setting.
- 3) For intermittent duty S4 with ON time $OT = 70\%$, $T_a = 40 °C / 50 °C$, stand-alone assembly vertical. The specified switching frequencies do not apply to automatic mode.

14.3.12 3RW40 2., 3., 4. main conductor cross-sections

| Soft starters | Type | | 3RW402. | 3RW403. | 3RW404. | |
|---|---|-------------------------|---|---|-------------------------------------|-------------------------------------|
| Conductor cross-sections | | | | | | |
| Screw terminals Front clamping point connected  NSB00479 | Main conductors | | | | | |
| | • Solid | mm ² | 2 x (1.5 ... 2.5); 2 x (2.5 ... 6) according to IEC 60947; max. 1 x 10 | 2 x (1.5 ... 16) | 2 x (2.5 ... 16) | |
| | • With end sleeve | mm ² | 2 x (1.5 ... 2.5); 2 x (2.5 ... 6) | 1 x (0.75 ... 25) | 1 x (2.5 ... 35) | |
| | • Stranded | mm ² | – | 1 x (0.75 ... 35) | 1 x (4 ... 70) | |
| | • AWG cables | | | | | |
| | - Solid | AWG | 2 x (16 ... 12) | | | |
| | - Solid or stranded | AWG | 2 x (14 ... 10) | 1 x (18 ... 2) | 2 x (10 ... 1/0) | |
| | - Stranded | AWG | 1 x 8 | – | – | |
| | • Solid | mm ² | – | 2 x (1.5 ... 16) | 2 x (2.5 ... 16) | |
| | • With end sleeve | mm ² | – | 1 x (1.5 ... 25) | 1 x (2.5 ... 50) | |
| | • Stranded | mm ² | – | 1 x (1.5 ... 35) | 1 x (10 ... 70) | |
| | • AWG cables | | | | | |
| | - Solid or stranded | AWG | – | 1 x (16 ... 2) | 2 x (10 ... 1/0) | |
| | Rear clamping point connected  NSB00480 | • Solid | mm ² | – | 2 x (1.5 ... 16) | 2 x (2.5 ... 16) |
| • With end sleeve | | mm ² | – | 1 x (1.5 ... 25) | 1 x (2.5 ... 50) | |
| • Stranded | | mm ² | – | 1 x (1.5 ... 35) | 1 x (10 ... 70) | |
| • AWG cables | | | | | | |
| - Solid or stranded | | AWG | – | 1 x (16 ... 2) | 2 x (10 ... 1/0) | |
| Both clamping points connected  NSB00481 | | • Solid | mm ² | – | 2 x (1.5 ... 16) | 2 x (2.5 ... 16) |
| | | • With end sleeve | mm ² | – | 2 x (1.5 ... 16) | 2 x (2.5 ... 35) |
| | | • Stranded | mm ² | – | 2 x (1.5 ... 25) | 2 x (10 ... 50) |
| | | • AWG cables | | | | |
| | | - Solid or stranded | AWG | – | 2 x (16 ... 2) | 1 x (10 ... 2/0) |
| | | • Tightening torque | Nm lb.in | 2 ... 2.5 18 ... 22 | 4.5 40 | 6.5 58 |
| | | Tools | | PZ2 | PZ2 | Allen screw 4 mm |
| | | Degree of protection | | IP20 | IP20 (terminal compartment IP00) | IP20 (terminal compartment IP00) |
| | | Spring-loaded terminals | Main conductors | | | |
| | • Solid | | mm ² | 1 ... 10 | – | |
| | • Finely stranded with end sleeve | | mm ² | 1 ... 6 end sleeves without plastic collar | – | |
| | • AWG cables | | | | | |
| | - Solid or stranded (finely stranded) | | AWG | 16 ... 10 | – | |
| | - Stranded | | AWG | 1 x 8 | – | |
| Tools | | | DIN ISO 2380-1A0; 5 x 3 | – | | |
| Degree of protection | | | IP20 | – | | |
| Busbar connections | Main conductors | | | | | |
| | • With cable lug according to DIN 46234 or 20 mm wide | | | | | |
| | - Stranded | mm ² | – | | 2 x (10 ... 70) | |
| | - Finely-stranded | mm ² | – | | 2 x (10 ... 50) | |
| • AWG cables, solid or stranded | AWG | – | | 2 x (7 ... 1/0) | | |

14.3.13 3RW40 5., 7. main conductor cross-sections

| Soft starters | Type | | 3RW405. | 3RW407. |
|---|---|-----------------|--|--|
| Conductor cross-sections | | | | |
| Screw terminals With box terminal Front clamping point connected | Main conductors: | | 3RT19 55-4G (55 kW) | 3RT19 66-4G |
|  | • Finely stranded with end sleeve | mm ² | 16...70 | 70...240 |
| | • Stranded | mm ² | 16...70 | 95...300 |
| | • Ribbon cable conductors (number x width x thickness) | mm | Min. 3 x 9 x 0.8, Max. 6 x 15.5 x 0.8 | Min. 6 x 9 x 0.8 Max. 20 x 24 x 0.5 |
| | • AWG cables, solid or stranded | AWG | 6...2/0 | 3/0...600 kcmil |
| Rear clamping point connected | • Finely stranded with end sleeve | mm ² | 16...70 | 120...185 |
|  | • Stranded | mm ² | 16...70 | 120...240 |
| | • Ribbon cable conductors (number x width x thickness) | mm | Min. 3 x 9 x 0.8, Max. 6 x 15.5 x 0.8 | Min. 6 x 9 x 0.8 Max. 20 x 24 x 0.5 |
| | • AWG cables, solid or stranded | AWG | 6...2/0 | 250...500 kcmil |
| Both clamping points connected | • Finely stranded with end sleeve | mm ² | Max. 1 x 50, 1 x 70 | Min. 2 x 50; max. 2 x 185 |
|  | • Stranded | mm ² | Max. 2 x 70 | Max. 2 x 70; max. 2 x 240 |
| | • Ribbon cable conductors (number x width x thickness) | mm | Max. 2 x (6 x 15.5 x 0.8) | Max. 2 x (20 x 24 x 0.5) |
| | • AWG cables, solid or stranded | AWG | Max. 2 x 1/0 | Min. 2 x 2/0; max. 2 x 500 kcmil |
| | • Terminal screws | | M10 (hexagon socket, A/F4) | M12 (hexagon socket, A/F5) |
| | - Tightening torque | Nm lb.in | 10...12 90...110 | 20...22 180...195 |
| Screw terminals With box terminal Front or rear clamping point connected | Main conductors: | | 3RT19 56-4G | |
|  | • Finely stranded with end sleeve | mm ² | 16...120 | |
|  | • Stranded | mm ² | 16...120 | |
| | • Ribbon cable conductors (number x width x thickness) | mm | Min. 3 x 9 x 0.8 Max. 6 x 15.5 x 0.8 | |
| | • AWG cables, solid or stranded | AWG | 6...250 kcmil | |
| Both clamping points connected | • Finely stranded with end sleeve | mm ² | Max. 1 x 95, 1 x 120 | |
|  | • Stranded | mm ² | Max. 2 x 120 | |
| | • Ribbon cable conductors (number x width x thickness) | mm | Max. 2 x (10 x 15.5 x 0.8) | |
| | • AWG cables, solid or stranded | AWG | Max. 2 x 3/0 | |
| Screw terminals | Main conductors: <u>Without box terminal / busbar connection</u> | | | |
| | • Finely stranded with cable lug | mm ² | 16...95 ¹⁾ | 50...240 ²⁾ |
| | • Stranded with cable lug | mm ² | 25...120 ¹⁾ | 70...240 ²⁾ |
| | • AWG cables, solid or stranded | AWG | 4...250 kcmil | 2/0...500 kcmil |
| | • Connecting bar (max. width) | mm | 17 | 25 |
| | • Terminal screws | | M8x25 (A/F13) | M10x30 (A/F17) |
| | - Tightening torque | Nm lb.in | 10...14 89...124 | 14...24 124...210 |

1) When connecting cable lugs to DIN 46235, use 3RT1956-4EA1 terminal cover for conductor cross-sections from 95 mm² to ensure the required clearance between phases.

2) When connecting cable lugs to DIN 46234 or DIN 46235, use 3RT1966-4EA1 terminal cover for conductor cross-sections from 240 mm² or 185 mm² respectively to ensure the required clearance between phases.

14.3.14 3RW40 .. auxiliary conductor cross-sections

| Soft starters | Type | 3RW40.. | |
|---|------------------------|---|--|
| Conductor cross-sections | | | |
| Auxiliary conductors (1 or 2 conductors can be connected) | | | |
| Screw terminals | | | |
| • Solid | mm ² | 2 x (0.5 ... 2.5) | |
| • Finely stranded with end sleeve | mm ² | 2 x (0.5 ... 1.5) | |
| • AWG cables | | | |
| - Solid or stranded | AWG | 2 x (20 ... 14) | |
| - Finely stranded with end sleeve | AWG | 2 x (20 ... 16) | |
| • Terminal screws | | | |
| - Tightening torque | Nm lb.in | 0.8 ... 1.2 7 ... 10.3 | |
| Spring-loaded terminals | | | |
| • Solid | | | |
| - 3RW402. to 3RW404. | mm ² | 2 x (0.25 ... 2.5) | |
| - 3RW405., 3RW407. | mm ² | 2 x (0.25 ... 1.5) | |
| • Finely stranded with end sleeve | | | |
| • AWG cables, solid or stranded | mm ² AWG | 2 x (0.25 ... 1.5) 2 x (24 ... 14) for 3RW402. ... 3RW404.; 2 x (24 ... 16) for 3RW405. and 3RW407. | |

14.3.15 Electromagnetic compatibility according to EN 60947-4-2

| | Standard | Parameters |
|--|---|--|
| Electromagnetic compatibility according to EN 60947-4-2 | | |
| EMC interference immunity | | |
| Electrostatic discharge (ESD) | EN 61000-4-2 | ± 4 kV contact discharge, ± 8 kV air discharge |
| Electromagnetic RF fields | EN 61000-4-3 | Frequency range: 80 to 1000 MHz with 80% at 1 kHz Degree of severity 3: 10 V/m |
| Conducted RF interference | EN 61000-4-6 | Frequency range: 150 kHz...80 MHz with 80% at 1 kHz Interference 10 V |
| RF voltages and RF currents on cables | | |
| • Burst | EN 61000-4-4 | ± 2 kV / 5 kHz |
| • Surge | EN 61000-4-5 | ±1 kV line to line ±2 kV line to ground |
| EMC interference emission | | |
| EMC interference field strength | EN 55011 | Limit value of Class A at 30...1000 MHz, Limit value of Class B for 3RW402.; 24 V AC/DC |
| Radio interference voltage | EN 55011 | Limit value of Class A at 0.15...30 MHz, Limit value of Class B for 3RW402.; 24 V AC/DC |
| Radio interference suppression filters | | |
| Degree of noise suppression A (industrial applications) | Not required | |
| Degree of noise suppression B (applications for residential areas) | | |
| Control voltage | | |
| • 110...230 V AC/DC | Not available ¹⁾ | |
| • 115/230 V AC | Not available ¹⁾ | |
| • 24 V AC/DC | Not required for 3RW402.; Required for 3RW403. and 3RW404. | |

1) Degree of noise suppression B cannot be obtained through the use of filters as the strength of the electromagnetic field is not attenuated by the filter.

14.3.16 Recommended filters

| Soft starter type | Rated current of soft starter | Recommended filter ¹⁾ | | |
|-------------------|-------------------------------|--|-------------------------|----------------------|
| | | Voltage range 200 ... 480 V | | |
| | | Filter type | Rated current of filter | Connecting terminals |
| A | A | mm ² | | |
| 3RW4036 | 45 | 4EF1512-1AA10 ⇒ B84143B0050R110 (https://www.epcos.com) | 50 | 16 |
| 3RW4037 | 63 | 4EF1512-2AA10 ⇒ B84143B0066R110 (https://www.epcos.com) | 66 | 25 |
| 3RW4038 | 72 | 4EF1512-3AA10 ⇒ B84143B0090R110 (https://www.epcos.com) | 90 | 25 |
| 3RW4046 | 80 | 4EF1512-3AA10 ⇒ B84143B0090R110 (https://www.epcos.com) | 90 | 25 |
| 3RW4047 | 106 | 4EF1512-4AA10 ⇒ B84143B0120R110 (https://www.epcos.com) | 120 | 50 |

1) The interference suppression filter is used to remove conducted interference in the main circuit. The field-conducted emissions meet radio suppression level B. The filter selection applies under standard conditions: 10 starts per hour, start time 4 s at 300% I_e.

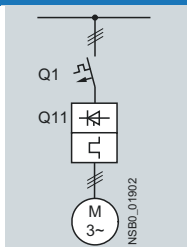
14.3.17 Types of coordination

The type of coordination according to which the motor feeder with soft starter is mounted depends on the application-specific requirements. Normally, fuseless mounting (combination of motor starter protector and soft starter) is sufficient. If type of coordination 2 needs to be fulfilled, semiconductor fuses must be fitted in the motor feeder.

- ToC
1
 Type of coordination 1 in accordance with IEC 60947-4-1:
 The device is defective following a short-circuit failure and therefore unsuitable for further use (personnel and equipment must not be put at risk).
- ToC
2
 Type of coordination 2 in accordance with IEC 60947-4-1:
 The device is suitable for further use following a short-circuit failure (personnel and equipment must not be put at risk).
 The type of coordination only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.

14.3.18 Fuseless version

Fuseless version



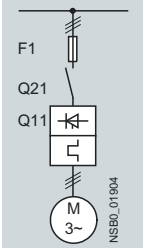
| Soft starters Q11 Type | Nominal current A | Motor starter protectors ¹⁾ 400 V + 10 % | | | | $I_{q \max}$ kA | Rated current A | 575 V + 10 % | | $I_{q \max}$ kA | Rated current A |
|--------------------------------------|----------------------|--|--|---------------|--|--------------------|--------------------|---------------|------------|--------------------|--------------------|
| | | Q1 Type | Q1 Type | Q1 Type | Q1 Type | | | Q1 Type | Q1 Type | | |
| Type of coordination ¹⁾²⁾ | | | | | | | | | | | |
| 3RW4024 | 12.5 | 3RV1021-1KA10 | 3RV2021-4AA/ 3RV2011-4AA (in size S00) | 3RV1321-1KC10 | 3RV2321-4AC/ 3RV2311-4AC (in size S00) | 55 | 16 | – | – | – | – |
| 3RW4026 | 25 | 3RV1021-4DA10 | 3RV2021-4DA | 3RV1321-4DC10 | 3RV2321-4DC | 55 | 25 | – | – | – | – |
| 3RW4027 | 32 | 3RV1031-4EA10 | 3RV2021-4EA | 3RV1331-4EC10 | 3RV2321-4EC | 55 | 32 | – | – | – | – |
| 3RW4028 | 38 | 3RV1031-4FA10 | 3RV2021-4FA | 3RV1331-4FC10 | 3RV2321-4FC | 55 | 40 | – | – | – | – |
| 3RW4036 | 45 | 3RV1031-4GA10 | | 3RV1331-4GC10 | | 20 | 45 | – | – | – | – |
| 3RW4037 | 63 | 3RV1041-4JA10 | | 3RV1341-4JC10 | | 20 | 63 | – | – | – | – |
| 3RW4038 | 72 | 3RV1041-4KA10 | | 3RV1341-4KC10 | | 20 | 75 | – | – | – | – |
| 3RW4046 | 80 | 3RV1041-4LA10 | | 3RV1341-4LC10 | | 11 | 90 | – | – | – | – |
| 3RW4047 | 106 | 3RV1041-4MA10 | | 3RV1341-4MC10 | | 11 | 100 | – | – | – | – |
| 3RW4055 | 134 | 3VL3720-2DC36 | | | | 35 | 200 | 3VL3720-1DC36 | 12 | 200 | |
| 3RW4056 | 162 | 3VL3720-2DC36 | | | | 35 | 200 | 3VL3720-1DC36 | 12 | 200 | |
| 3RW4073 | 230 | 3VL4731-2DC36 | | | | 65 | 315 | 3VL5731-3DC36 | 35 | 315 | |
| 3RW4074 | 280 | 3VL4731-2DC36 | | | | 65 | 315 | 3VL5731-3DC36 | 35 | 315 | |
| 3RW4075 | 356 | 3VL4740-2DC36 | | | | 65 | 400 | 3VL5740-3DC36 | 35 | 400 | |
| 3RW4076 | 432 | 3VL5750-2DC36 | | | | 65 | 500 | 3VL5750-3DC36 | 35 | 500 | |

¹⁾ The rated motor current must be considered when selecting the devices. The 3RV13 and 3RV23 motor starter protectors are used for starter combinations (without motor protection). In this case, motor protection is provided by the 3RW40 soft starter.

²⁾ The types of coordination are described in chapter Types of coordination (Page 158).

14.3.19 Fused version (line protection only)

Fused version (line protection only)



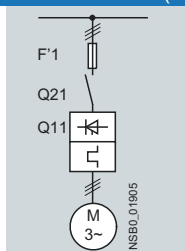
| Soft starters | Nominal current | Line protection, maximum | | Size | Line contactors (optional) | |
|--|-----------------|--------------------------|-----------------|------|----------------------------|---------------------------------|
| Q11 Type | A | F1 Type | Rated current A | | Q21 | |
| Type of coordination 1 ¹⁾ : I _g = 65 kA at 600 V + 5 % | | | | | | |
| 3RW4024 | 12.5 | 3NA3820-6 | 50 | 00 | 3RT1024 | 3RT2025 / 3RT2018 (in size S00) |
| 3RW4026 | 25 | 3NA3822-6 | 63 | 00 | 3RT1026 | 3RT2026 |
| 3RW4027 | 32 | 3NA3824-6 | 80 | 00 | 3RT1034 | 3RT2027 |
| 3RW4028 | 38 | 3NA3824-6 | 80 | 00 | 3RT1035 | 3RT2028 |
| 3RW4036 | 45 | 3NA3130-6 | 100 | 1 | 3RT1036 | |
| 3RW4037 | 63 | 3NA3132-6 | 125 | 1 | 3RT1044 | |
| 3RW4038 | 72 | 3NA3132-6 | 125 | 1 | 3RT1045 | |
| 3RW4046 | 80 | 3NA3136-6 | 160 | 1 | 3RT1045 | |
| 3RW4047 | 106 | 3NA3136-6 | 160 | 1 | 3RT1046 | |
| 3RW4055 | 134 | 3NA3244-6 | 250 | 2 | 3RT1055-6A.36 | |
| 3RW4056 | 162 | 3NA3244-6 | 250 | 2 | 3RT1056-6A.36 | |
| 3RW4073 | 230 | 2 x 3NA3354-6 | 2 x 355 | 3 | 3RT1065-6A.36 | |
| 3RW4074 | 280 | 2 x 3NA3354-6 | 2 x 355 | 3 | 3RT1066-6A.36 | |
| 3RW4075 | 356 | 2 x 3NA3365-6 | 2 x 500 | 3 | 3RT1075-6A.36 | |
| 3RW4076 | 432 | 2 x 3NA3365-6 | 2 x 500 | 3 | 3RT1076-6A.36 | |

¹⁾ The types of coordination are described in chapter Types of coordination (Page 158). Type of coordination 1 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.

14.3.20 Fused version with SITOR 3NE1 fuses

Assembly as for type of coordination 2, with SITOR all-range fuses (F'1) for combined thyristor and line protection.

Fused version with SITOR 3NE1 fuses (semiconductor and line protection)



For suitable fuse bases, refer to "SENTRON switching and protecting devices for power distribution" → "Switch disconnectors" the LV1 Catalog and to "BETA protecting" → "SITOR semiconductor fuses" in the ET B1 Catalog or consult www.siemens.de/sitor

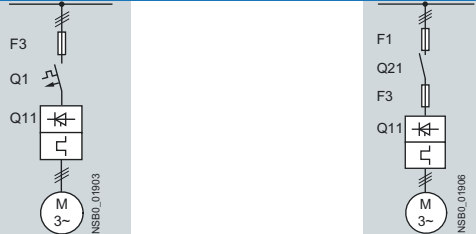
| Soft starters Q11 Type | Nominal current A | All-range fuses F'1 Type | Rated current A | Size | Line contactors (optional) Q21 |
|---|----------------------|--------------------------------|--------------------|------|--------------------------------------|
| Type of coordination 2 ¹⁾ : $I_q = 65 \text{ kA at } 600 \text{ V} + 5 \%$ | | | | | |
| 3RW4024 | 12.5 | 3NE1814-0 | 20 | 000 | 3RT1024 3RT2025 |
| 3RW4026 | 25 | 3NE1803-0 | 35 | 000 | 3RT1026 3RT2026 |
| 3RW4027 | 32 | 3NE1020-2 | 80 | 00 | 3RT1034 3RT2027 |
| 3RW4028 | 38 | 3NE1020-2 | 80 | 00 | 3RT1035 3RT2028 |
| 3RW4036 | 45 | 3NE1020-2 | 80 | 00 | 3RT1036 |
| 3RW4037 | 63 | 3NE1820-0 | 80 | 000 | 3RT1044 |
| 3RW4038 | 72 | 3NE1820-0 | 80 | 000 | 3RT1045 |
| 3RW4046 | 80 | 3NE1021-0 | 100 | 00 | 3RT1045 |
| 3RW4047 | 106 | 3NE1022-0 | 125 | 00 | 3RT1046 |
| 3RW4055 | 134 | 3NE1227-2 | 250 | 1 | 3RT1055-6A.36 |
| 3RW4056 | 162 | 3NE1227-2 | 250 | 1 | 3RT1056-6A.36 |
| 3RW4073 | 230 | 3NE1331-2 | 350 | 2 | 3RT1065-6A.36 |
| 3RW4074 | 280 | 3NE1333-2 | 450 | 2 | 3RT1066-6A.36 |
| 3RW4075 | 356 | 3NE1334-2 | 500 | 2 | 3RT1075-6A.36 |
| 3RW4076 | 432 | 3NE1435-2 | 560 | 3 | 3RT1076-6A.36 |

¹⁾ The types of coordination are described in chapter Types of coordination (Page 158). Type of coordination 2 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.

14.3.21 Fused version with SITOR 3NE3/4/8 fuses

Assembly as for type of coordination 2, with additional SITOR fuses (F3) for thyristor protection only.

Fused version with 3NE3 SITOR fuses (semiconductor protection by fuse, line, and overload protection by motor starter protector; alternatively, installation with contactor and overload relay possible)



For suitable fuse bases, refer to under "SENTRON switching and protecting devices for power distribution" —> "Switch disconnectors" in the LV1 Catalog and to "BETA protecting" —> "SITOR semiconductor fuses" in the ET B1 Catalog or consult www.siemens.de/sitor

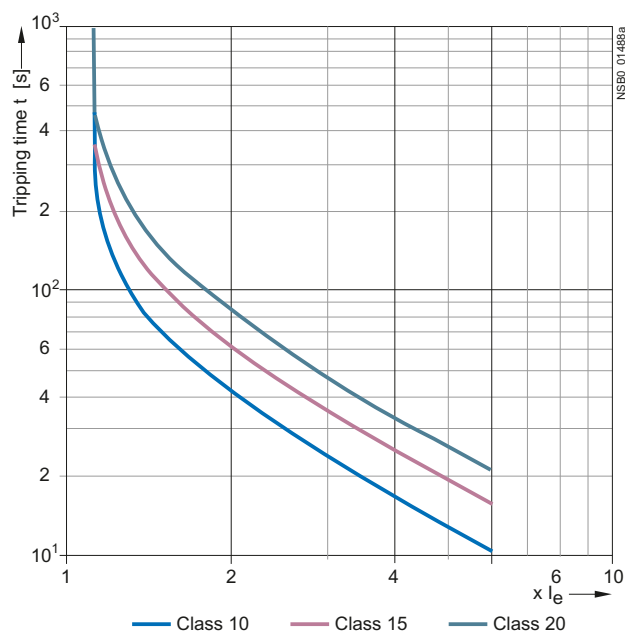
| Soft starters T _{OC} 2 Q11 Type | Nominal current A | Semiconductor fuses, minimum | | | Semiconductor fuses, maximum | | | Semiconductor fuses, minimum | | |
|--|----------------------|------------------------------|--------------------|------|------------------------------|--------------------|------|------------------------------|--------------------|------|
| | | F3 Type | Rated current A | Size | F3 Type | Rated current A | Size | F3 Type | Rated current A | Size |
| Type of coordination 2 ¹⁾ : I _q = 65 kA at 600 V + 5 % | | | | | | | | | | |
| 3RW4024 | 12.5 | — | — | — | — | — | — | 3NE4101 | 32 | 0 |
| 3RW4026 | 25 | — | — | — | 3NE3221 | 100 | 1 | 3NE4102 | 40 | 0 |
| 3RW4027 | 32 | — | — | — | 3NE3224 | 160 | 1 | 3NE4118 | 63 | 0 |
| 3RW4028 | 38 | — | — | — | 3NE3224 | 160 | 1 | 3NE4118 | 63 | 0 |
| 3RW4036 | 45 | — | — | — | 3NE3224 | 160 | 1 | 3NE4120 | 80 | 0 |
| 3RW4037 | 63 | — | — | — | 3NE3225 | 200 | 1 | 3NE4121 | 100 | 0 |
| 3RW4038 | 72 | 3NE3221 | 100 | 1 | 3NE3227 | 250 | 1 | — | — | — |
| 3RW4046 | 80 | 3NE3222 | 125 | 1 | 3NE3225 | 200 | 1 | — | — | — |
| 3RW4047 | 106 | 3NE3224 | 160 | 1 | 3NE3231 | 350 | 1 | — | — | — |
| 3RW4055 | 134 | 3NE3227 | 250 | 1 | 3NE3335 | 560 | 2 | — | — | — |
| 3RW4056 | 162 | 3NE3227 | 250 | 1 | 3NE3335 | 560 | 2 | — | — | — |
| 3RW4073 | 230 | 3NE3232-0B | 400 | 1 | 3NE3333 | 450 | 2 | — | — | — |
| 3RW4074 | 280 | 3NE3233 | 450 | 1 | 3NE3336 | 630 | 2 | — | — | — |
| 3RW4075 | 356 | 3NE3335 | 560 | 2 | 3NE3336 | 630 | 2 | — | — | — |
| 3RW4076 | 432 | 3NE3337-8 | 710 | 2 | 3NE3340-8 | 900 | 2 | — | — | — |

| Soft starters T _{OC} 2 Q11 Type | Nominal current A | Semiconductor fuses, max. | | | Semiconductor fuses, min. | | | Semiconductor fuses, max. | | | Cylindrical fuses | |
|--|----------------------|---------------------------|--------------------|------|---------------------------|--------------------|------|---------------------------|--------------------|------|-------------------|--------------------|
| | | F3 Type | Rated current A | Size | F3 Type | Rated current A | Size | F3 Type | Rated current A | Size | F3 Type | Rated current A |
| Type of coordination 2 ¹⁾ : I _q = 65 kA at 600 V + 5 % | | | | | | | | | | | | |
| 3RW4024 | 12.5 | 3NE4117 | 50 | 0 | 3NE8015-1 | 25 | 00 | 3NE8017-1 | 50 | 00 | 3NC2240 | 40 |
| 3RW4026 | 25 | 3NE4117 | 50 | 0 | 3NE8017-1 | 50 | 00 | 3NE8021-1 | 100 | 00 | 3NC2263 | 63 |
| 3RW4027 | 32 | 3NE4118 | 63 | 0 | 3NE8018-1 | 63 | 00 | 3NE8022-1 | 125 | 00 | 3NC2280 | 80 |
| 3RW4028 | 38 | 3NE4118 | 63 | 0 | 3NE8020-1 | 80 | 00 | 3NE8024-1 | 160 | 00 | 3NC2280 | 80 |
| 3RW4036 | 45 | 3NE4120 | 80 | 0 | 3NE8020-1 | 80 | 00 | 3NE8024-1 | 160 | 00 | 3NC2280 | 80 |
| 3RW4037 | 63 | 3NE4121 | 100 | 0 | 3NE8021-1 | 100 | 00 | 3NE8024-1 | 160 | 00 | — | — |
| 3RW4038 | 72 | — | — | — | 3NE8022-1 | 125 | 00 | 3NE8024-1 | 160 | 00 | — | — |
| 3RW4046 | 80 | — | — | — | 3NE8 022-1 | 125 | 00 | 3NE8024-1 | 160 | 00 | — | — |
| 3RW4047 | 106 | — | — | — | 3NE8 024-1 | 160 | 00 | 3NE8024-1 | 160 | 00 | — | — |
| 3RW4055 | 134 | — | — | — | — | — | — | — | — | — | — | — |
| 3RW4056 | 162 | — | — | — | — | — | — | — | — | — | — | — |
| 3RW4073 | 230 | — | — | — | — | — | — | — | — | — | — | — |
| 3RW4074 | 280 | — | — | — | — | — | — | — | — | — | — | — |
| 3RW4075 | 356 | — | — | — | — | — | — | — | — | — | — | — |
| 3RW4076 | 432 | — | — | — | — | — | — | — | — | — | — | — |

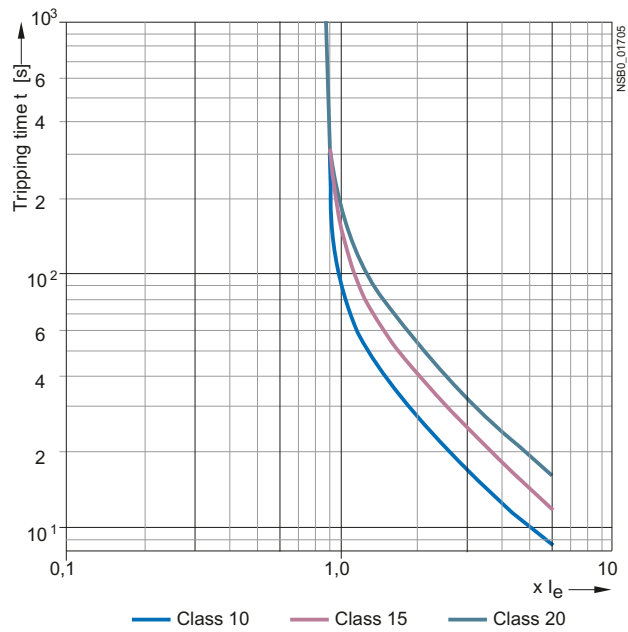
| Soft starters Q11 Type | Nominal current A | Line contactors (optional) Q21 | | Motor starter protectors 400 V + 10 % | | | Line protection, maximum | | | | |
|---|----------------------|--------------------------------------|--------------------------------------|--|--|--------------------|--------------------------|-----|---------------|---------|----|
| | | Rated current A | 575 V + 10 % Q1 Type | Rated current A | F1 Type | Rated current A | Size | | | | |
| Type of coordination 2 ¹⁾ : $I_q = 65 \text{ kA at } 600 \text{ V} + 5 \%$ | | | | | | | | | | | |
| 3RW4024 | 12.5 | 3RT1024 | 3RT2025/ 3RT2018 (in size S00) | 3RV1021-4KA10 | 3RV2021-4AA/ 3RV2011-4AA (in size S00) | 16 | – | – | 3NA3820-6 | 50 | 00 |
| 3RW4026 | 25 | 3RT1026 | 3RT2026 | 3RV1021-4DA10 | 3RV2021-4DA | 25 | – | – | 3NA3822-6 | 63 | 00 |
| 3RW4027 | 32 | 3RT1034 | 3RT2027 | 3RV1031-4EA10 | 3RV2021-4EA | 32 | – | – | 3NA3824-6 | 80 | 00 |
| 3RW4028 | 38 | 3RT1035 | 3RT2028 | 3RV1031-4FA10 | 3RV2021-4FA | 40 | – | – | 3NA3824-6 | 80 | 00 |
| 3RW4036 | 45 | 3RT1036 | | 3RV1031-4GA10 | | 45 | – | – | 3NA3130-6 | 100 | 1 |
| 3RW4037 | 63 | 3RT1044 | | 3RV1041-4JA10 | | 63 | – | – | 3NA3132-6 | 125 | 1 |
| 3RW4038 | 72 | 3RT1045 | | 3RV1041-4KA10 | | 75 | – | – | 3NA3132-6 | 125 | 1 |
| 3RW4046 | 80 | 3RT1045 | | 3RV1041-4LA10 | | 90 | – | – | 3NA3136-6 | 160 | 1 |
| 3RW4047 | 106 | 3RT1046 | | 3RV1041-4MA10 | | 100 | – | – | 3NA3136-6 | 160 | 1 |
| 3RW4055 | 134 | 3RT1055-6A.36 | | 3VL3720 | | 200 | 3VL3720 | 200 | 3NA3244-6 | 250 | 2 |
| 3RW4056 | 162 | 3RT1056-6A.36 | | 3VL3720 | | 200 | 3VL3720 | 200 | 3NA3244-6 | 250 | 2 |
| 3RW4073 | 230 | 3RT1065-6A.36 | | 3VL4731 | | 315 | 3VL5731 | 315 | 2 x 3NA3354-6 | 2 x 355 | 3 |
| 3RW4074 | 280 | 3RT1066-6A.36 | | 3VL4731 | | 315 | 3VL5731 | 315 | 2 x 3NA3354-6 | 2 x 355 | 3 |
| 3RW4075 | 356 | 3RT1075-6A.36 | | 3VL4740 | | 400 | 3VL5740 | 400 | 2 x 3NA3365-6 | 2 x 500 | 3 |
| 3RW4076 | 432 | 3RT1076-6A.36 | | 3VL5750 | | 500 | 3VL5750 | 500 | 2 x 3NA3365-6 | 2 x 500 | 3 |

¹⁾ The types of coordination are described in chapter Types of coordination (Page 158). Type of coordination 2 only refers to soft starters in conjunction with the stipulated protective device (motor starter protector / fuse), not to additional components in the feeder.

14.3.22 Motor protection tripping characteristics for 3RW40 (with symmetry)



14.3.23 Motor protection tripping characteristics for 3RW40 (with asymmetry)



Dimension drawings

15.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/ps/25247/td>).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.

The screenshot shows the Siemens Industry Online Support search interface. At the top, there is a search bar with the text "Enter keyword...". Below the search bar, there are three main sections: "Product", "Entry type", and "Date". The "Product" field contains the article number "3RV2031-4BA10" and is highlighted with a red box. The "Entry type" dropdown menu is set to "Technical data (1)" and is also highlighted with a red box. The "Date" field has "From" and "To" input boxes. Below the search bar, there is a "Search product" button. The search results are displayed in a table with a single entry for the product "3RV2031-4BA10". The product description is "CIRCUIT BREAKER, SCREW TYPE, 20 A, CIRCUIT BREAKER SIZE S2, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 14...30A, N-RELEASE 20DA, SCREW TERMINAL, STANDARD BREAKING CAPACITY". Below the product description, there are navigation links: "> Product details", "> Technical data", and "> CAx data". The "CAx data" link is highlighted with a red box.

Typical circuit diagrams

16.1 Typical circuit for the optional thermistor motor protection evaluation

A thermistor motor protection evaluation function is optionally available for the 24 V AC/DC control voltage version of the 3RW40 2 to 3RW40 4.

Note

If a thermistor is connected (PTC type A or Klixon), you must remove the copper jumper between terminals T11/T21 and T22.

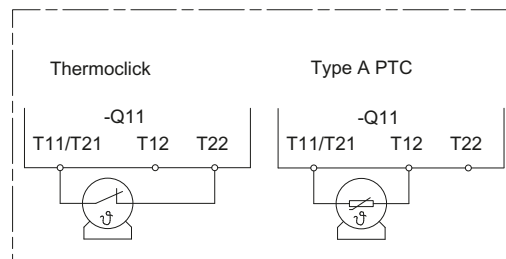


Figure 16-1 Optional thermistor motor protection evaluation

16.2 Control by pushbutton

16.2.1 Control of the 3RW30 by pushbutton

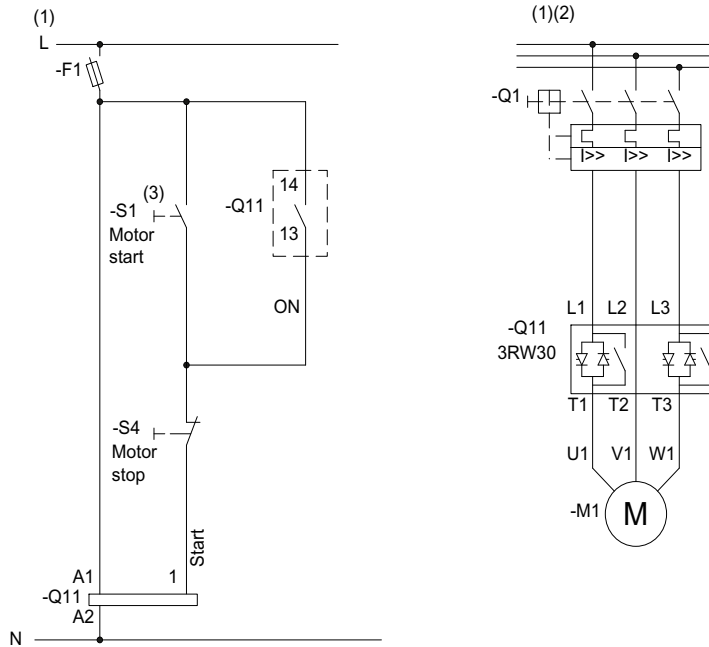


Figure 16-2 Wiring of the 3RW30 control and main circuits

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

(2) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133)

⚠ WARNING

(3) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 61)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input. If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

16.2.2 Control of the 3RW40 by pushbutton

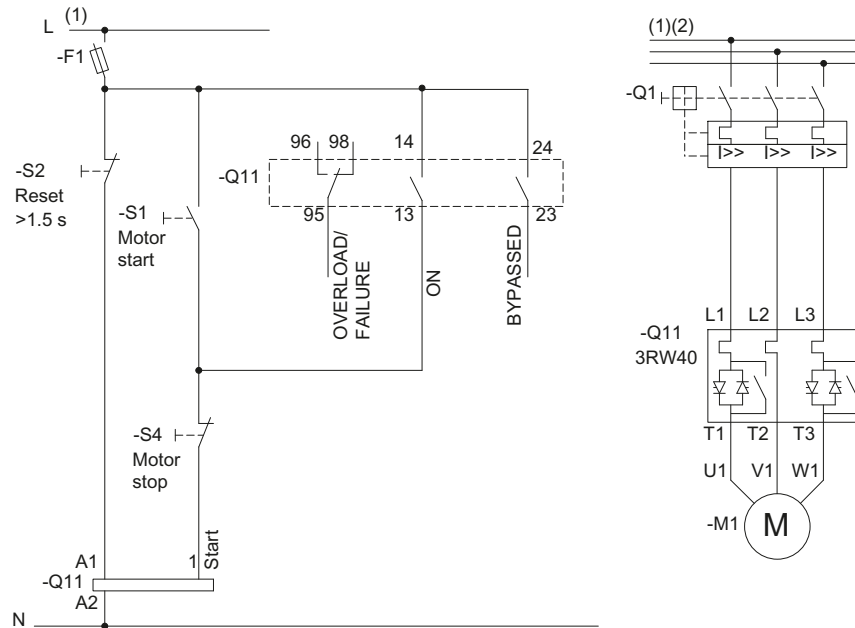


Figure 16-3 Wiring of the 3RW402 - 3RW404 control circuit and 3RW402 - 3RW407 main circuit

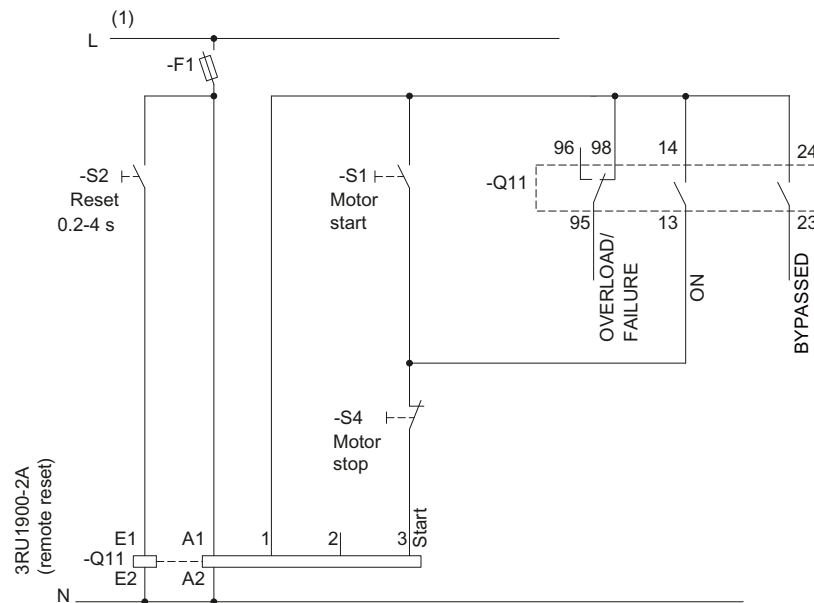


Figure 16-4 Wiring of the control circuit 3RW405 - 3RW407

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

(2) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133)

16.2 Control by pushbutton

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167)

16.3 Control by switch

16.3.1 Control of the 3RW30 by switch

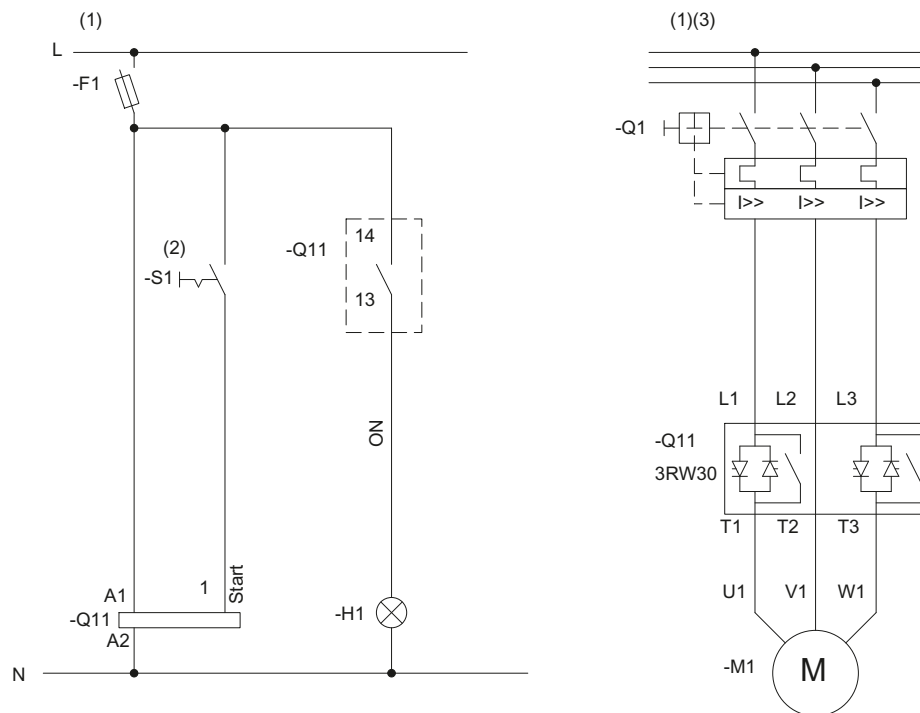


Figure 16-5 Wiring of the control and main circuits

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

⚠ WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 61)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input. If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

16.3.2 Control of the 3RW40 by switch

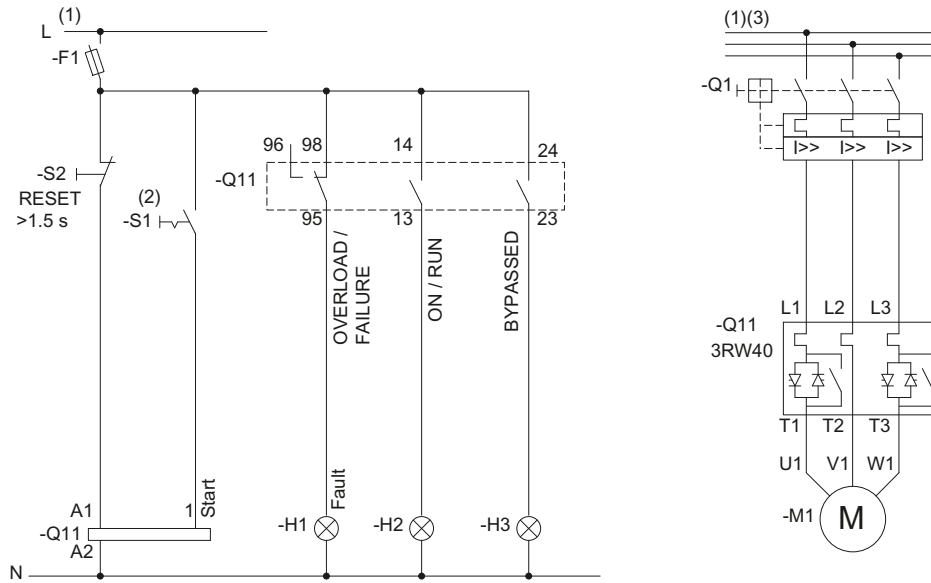


Figure 16-6 Wiring of the 3RW402 - 3RW404 control circuit and 3RW402 - 3RW407 main circuit

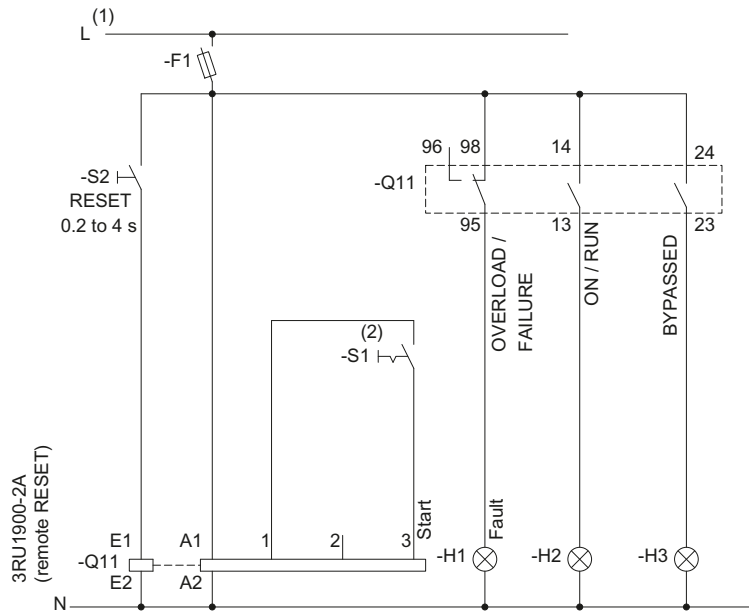


Figure 16-7 Wiring of the control circuit 3RW405 - 3RW407

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

 **WARNING**

(2) Automatic restart. Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167).

16.4 Control in automatic mode

16.4.1 Control of the 3RW30 in automatic mode

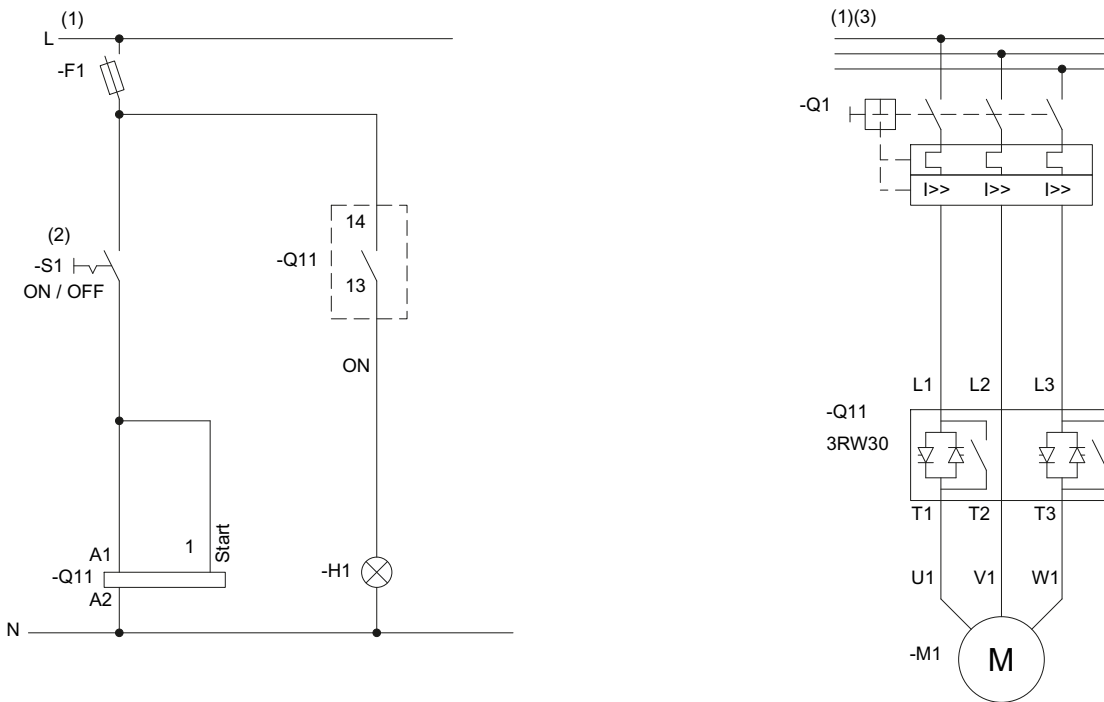


Figure 16-8 Wiring of the 3RW30 control and main circuits

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

! WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 61)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input. If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

16.4.2 Control of the 3RW40 in automatic mode

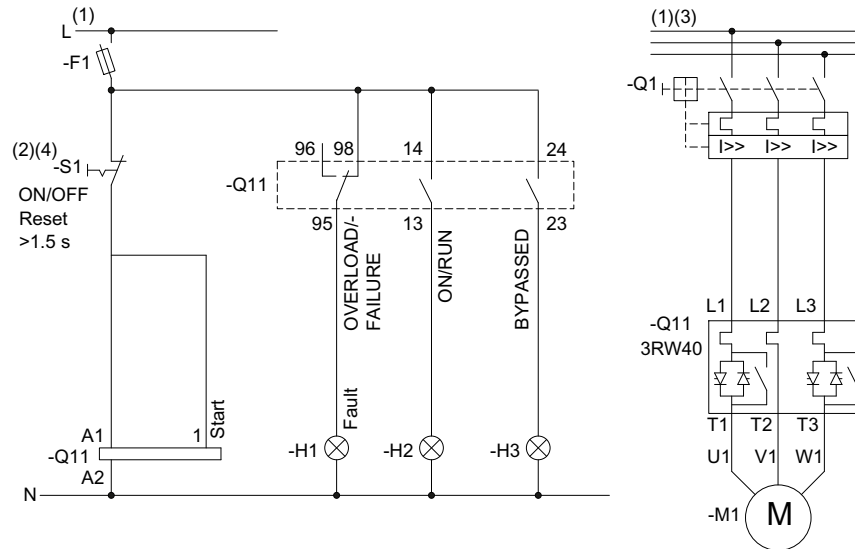


Figure 16-9 Wiring of the 3RW402 - 3RW404 control circuit and 3RW402 - 3RW407 main circuit

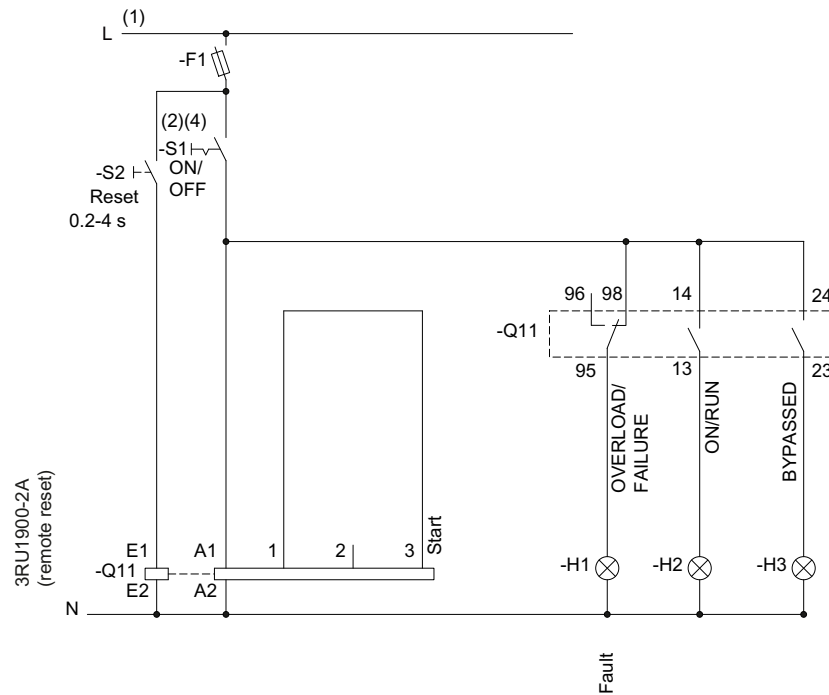


Figure 16-10 Wiring of the control circuit 3RW405 - 3RW407

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

⚠ WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

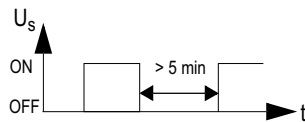
The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

Note

(4) Idle time until restart.

Owing to the intrinsic protection (3RW), an idle time of at least five minutes must be allowed prior to restarting if the device is switched on and off by means of the control voltage under field conditions.



For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167)

16.5 Control by PLC

16.5.1 Control of the 3RW30 with 24 V DC by PLC

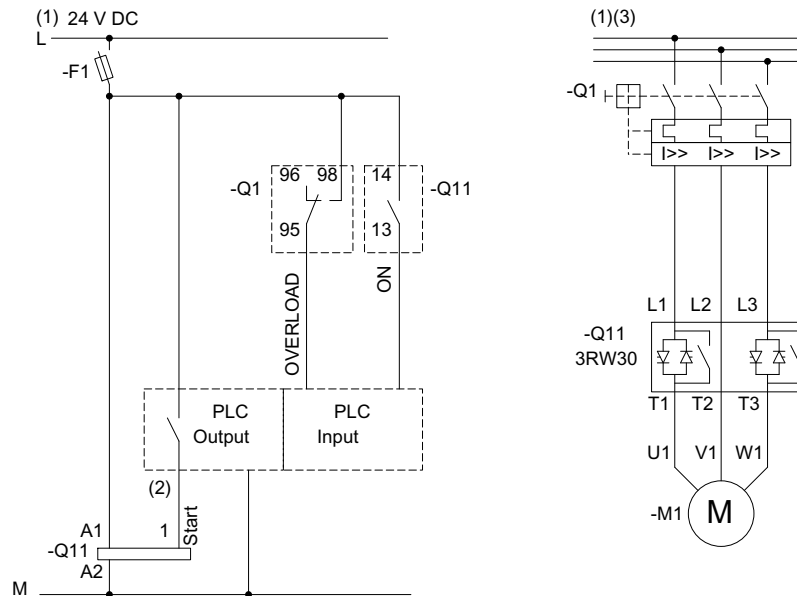


Figure 16-11 Wiring of the 3RW30 control and main circuits

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

⚠ WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 61)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input. If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

16.5.2 Control of the 3RW40 by PLC

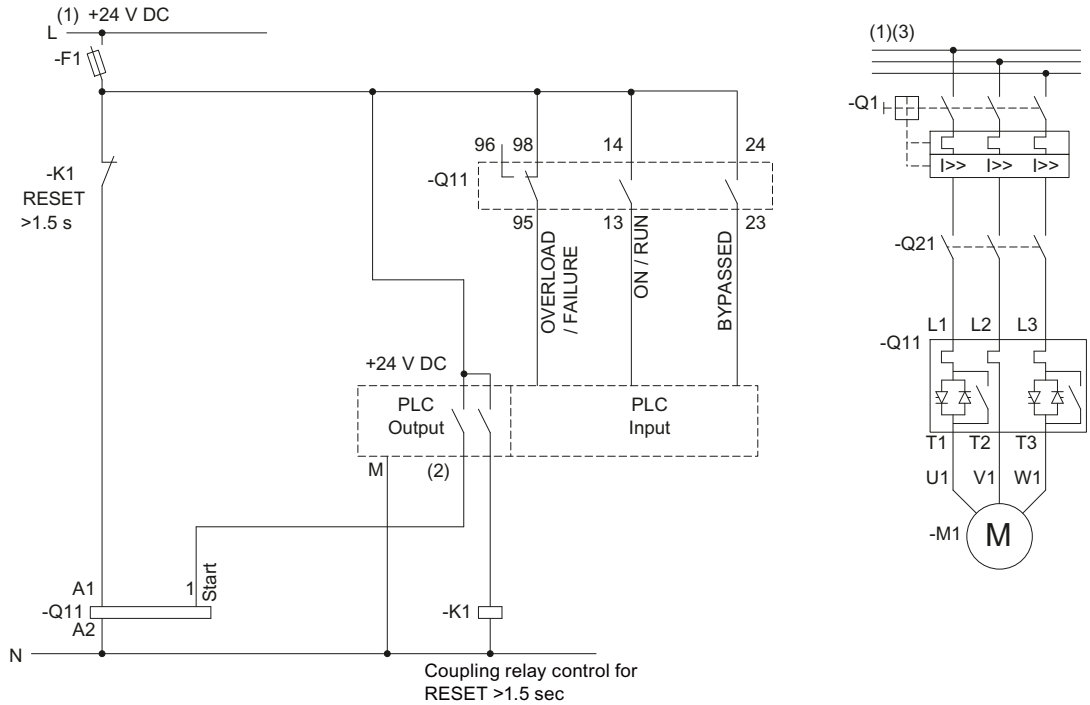


Figure 16-12 Emergency stop wiring of the 3RW402 - 3RW404 control circuit (with 24 V control voltage) and 3RW402 - 3RW407 main circuit

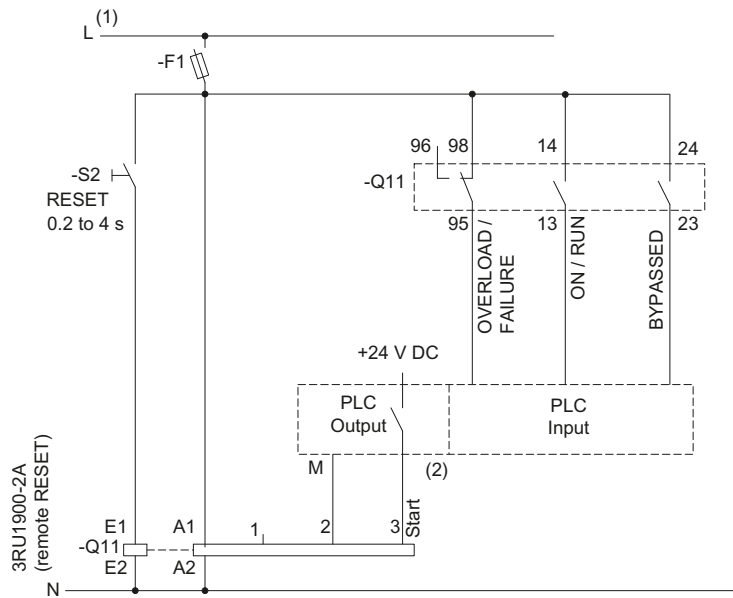


Figure 16-13 Wiring of the control circuit 3RW405 - 3RW407

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

 **WARNING**

(2) Automatic restart. Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167).

16.6 Control with an optional main / line contactor

16.6.1 Control of the 3RW30 with a main contactor

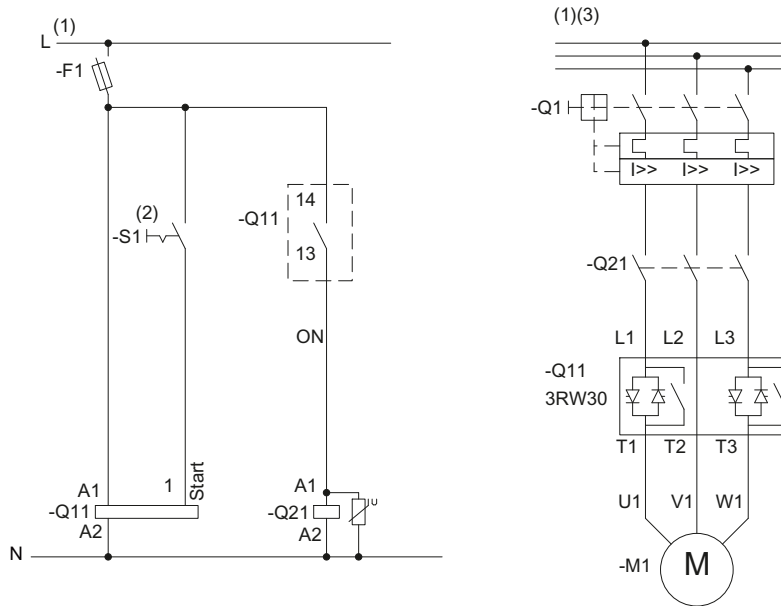


Figure 16-14 Wiring of the 3RW30 control and main circuits

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

⚠ WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 61)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input. If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

16.6.2 Control of the 3RW40 with a main contactor

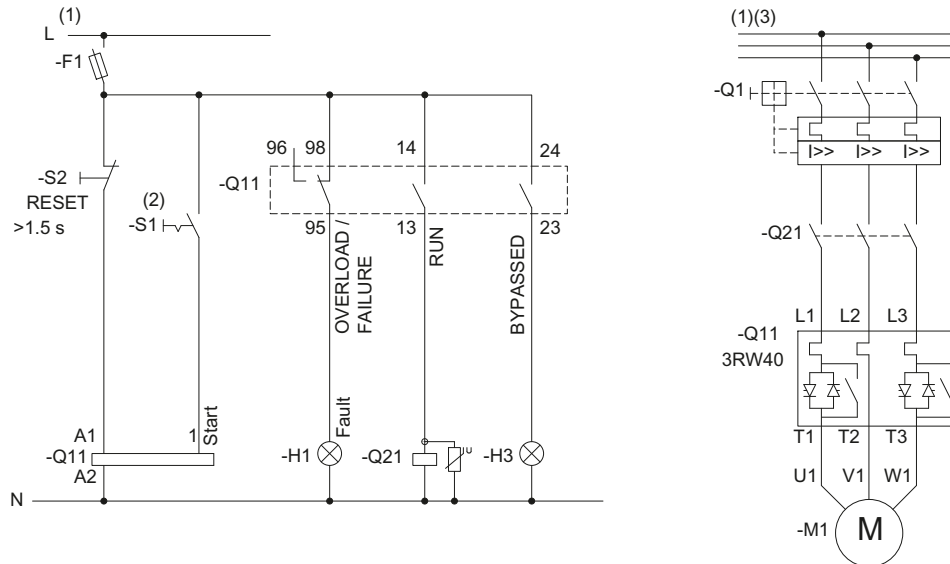


Figure 16-15 Wiring of the 3RW402 - 3RW404 control circuit and 3RW402 - 3RW407 main circuit

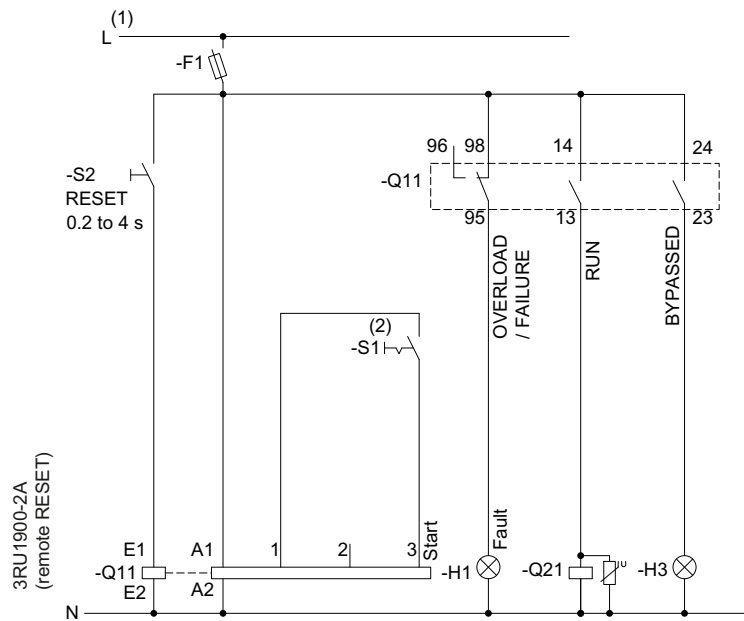


Figure 16-16 Wiring of the control circuit 3RW405 - 3RW407

Note

If a soft stop is required, the function of output 13/14 must be reparameterized to "RUN" (refer to Commissioning the 3RW40 (Page 116)).

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).



WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167).

16.7 Reversing circuit

16.7.1 3RW30 reversing circuit

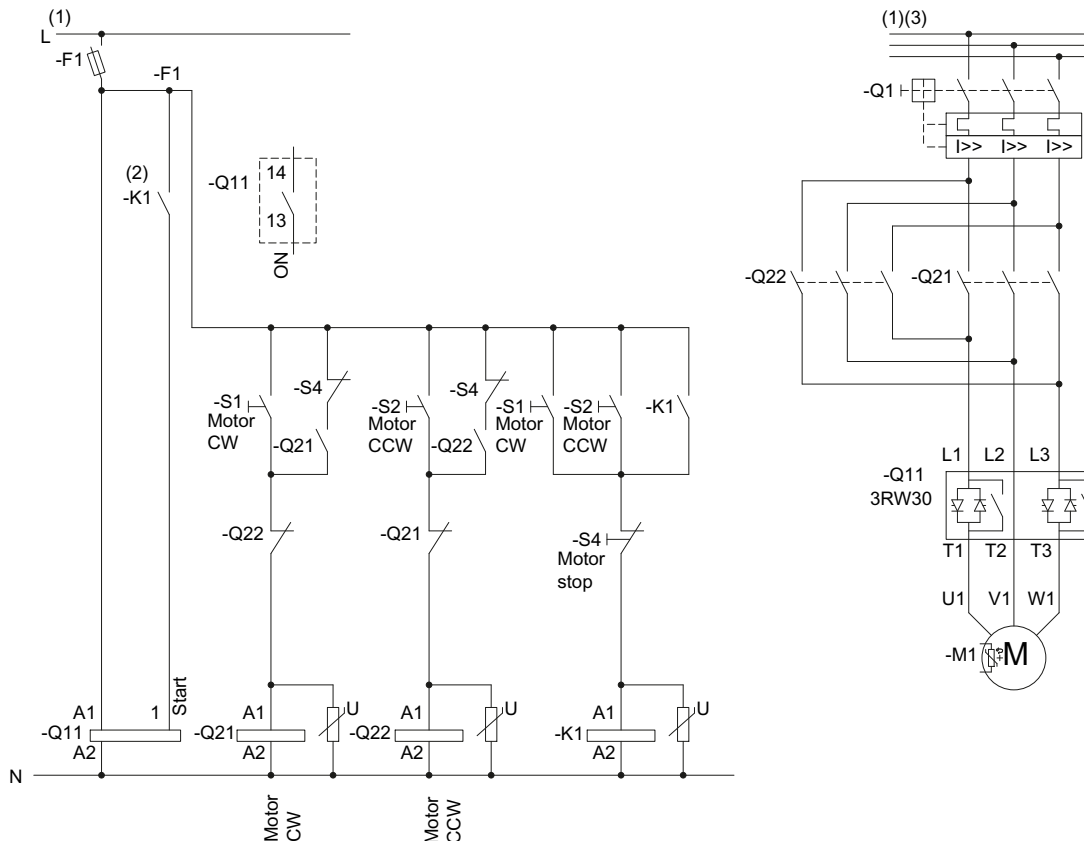


Figure 16-17 Wiring of the 3RW30 control and main circuits

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 61)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input. If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

16.7.2 3RW40 reversing circuit

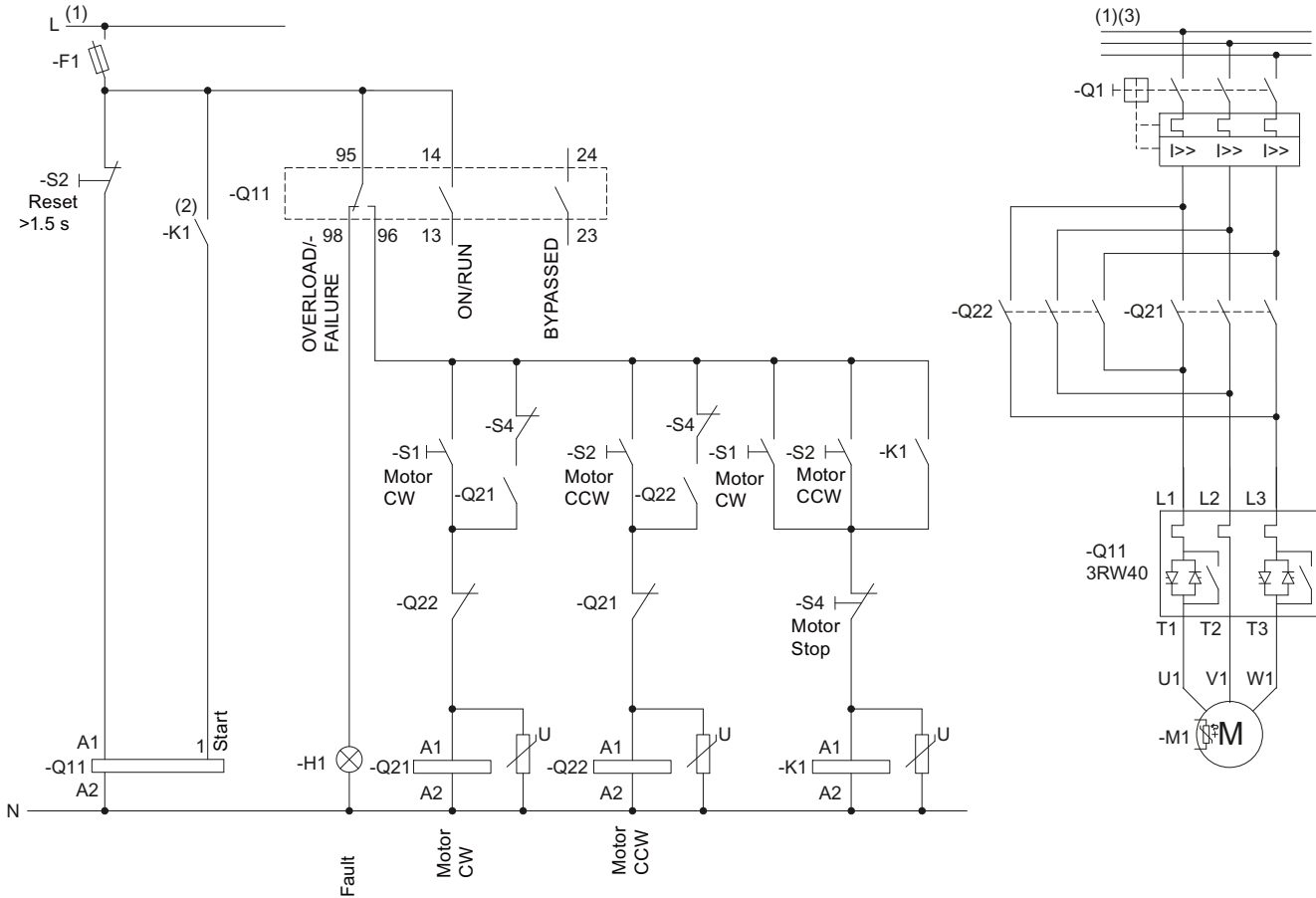


Figure 16-18 Wiring of the 3RW402 - 3RW404 control circuit and 3RW402 - 3RW407 main circuit

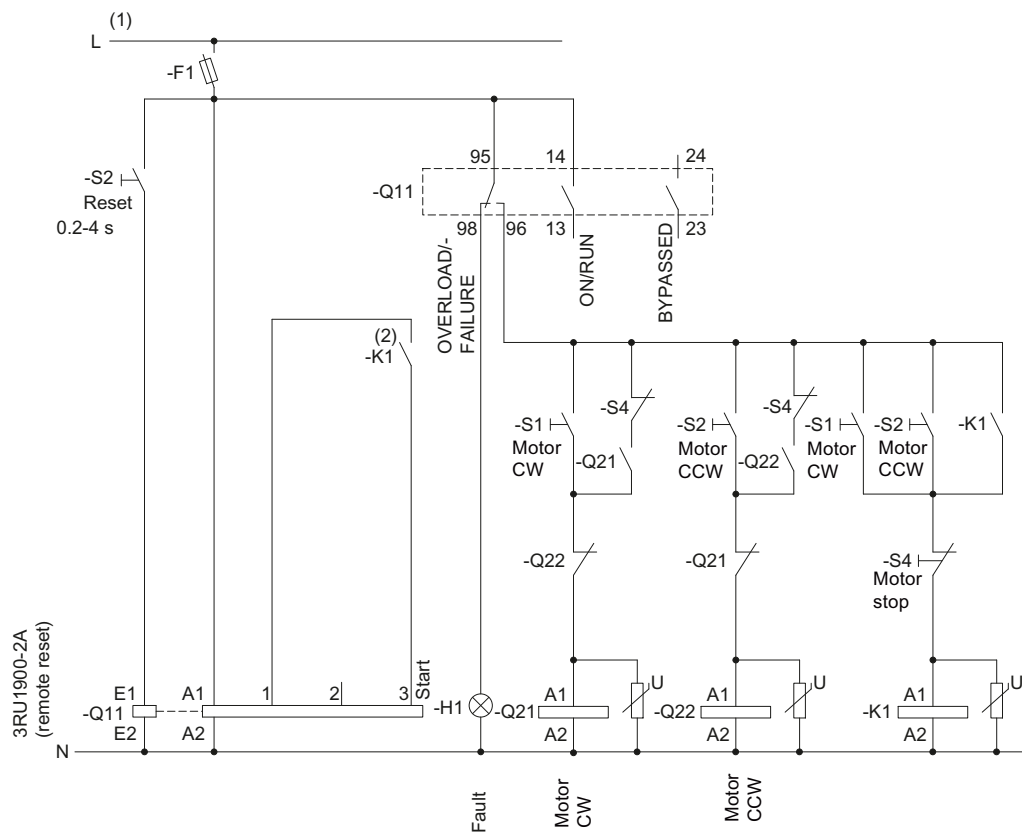



Figure 16-19 Wiring of the control circuit 3RW405 - 3RW407

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

| |
|--|
|  WARNING |
| <p>(2) Automatic restart can result in death, serious injury, or property damage.</p> <p>The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.</p> |

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167).

Note

No soft stop possible. Set the stopping time to 0 s with the potentiometer.

16.8 Control of a magnetic parking brake

16.8.1 3RW30 motor with magnetic parking brake

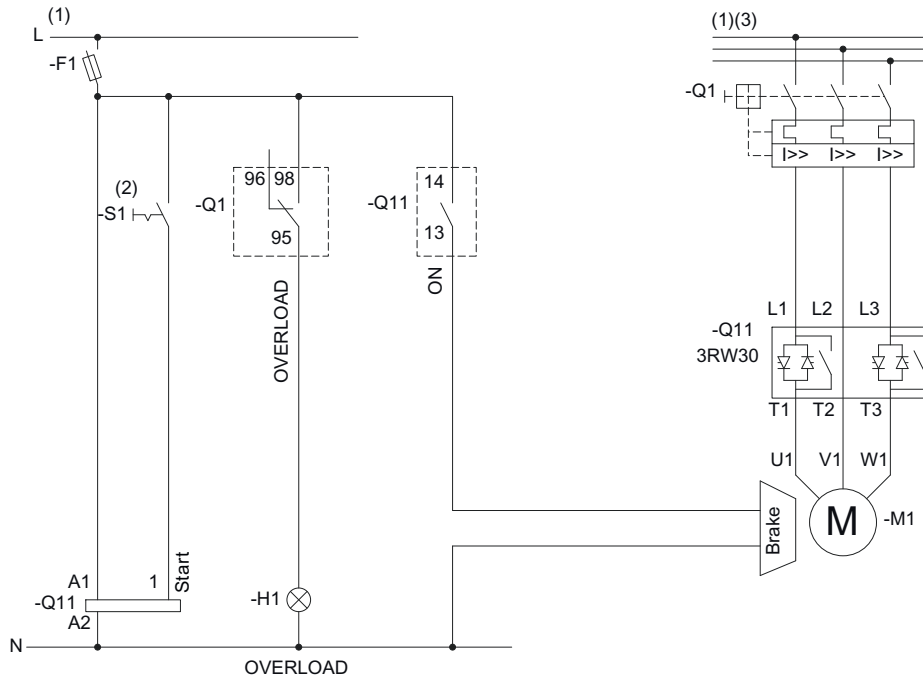


Figure 16-20 Wiring of the 3RW30 control and main circuits

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

⚠ WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 61)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input. If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

16.8.2 3RW402 - 3RW404, control of a motor with a magnetic parking brake

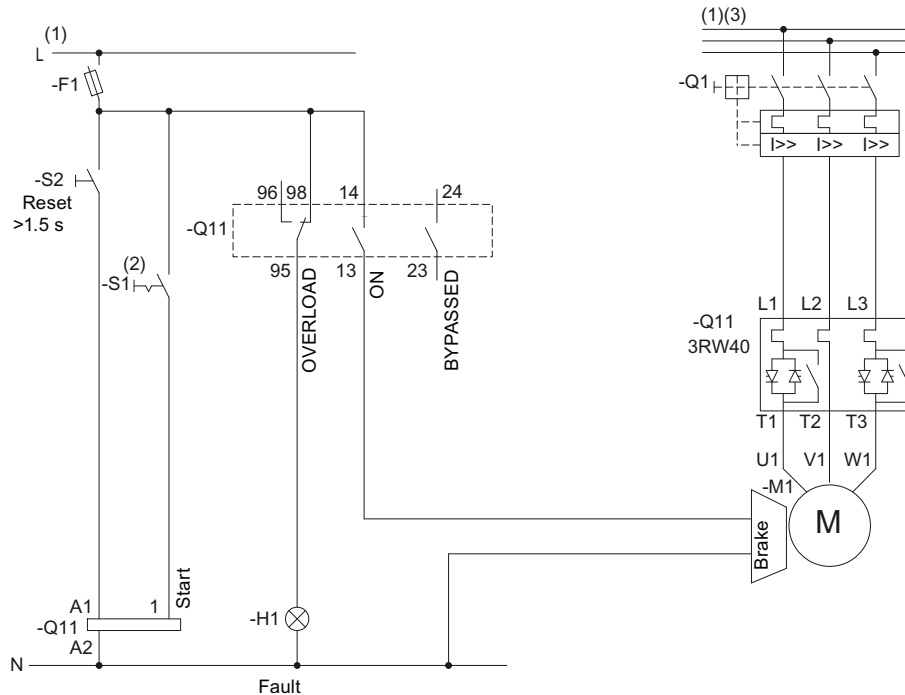


Figure 16-21 Emergency stop wiring of the 3RW402 - 3RW404 control circuit / main circuit

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

⚠ WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167).

Note

No soft stop possible. Set the stopping time to 0 s with the potentiometer.

16.8.3 3RW405 - 3RW407, control of a motor with a magnetic parking brake

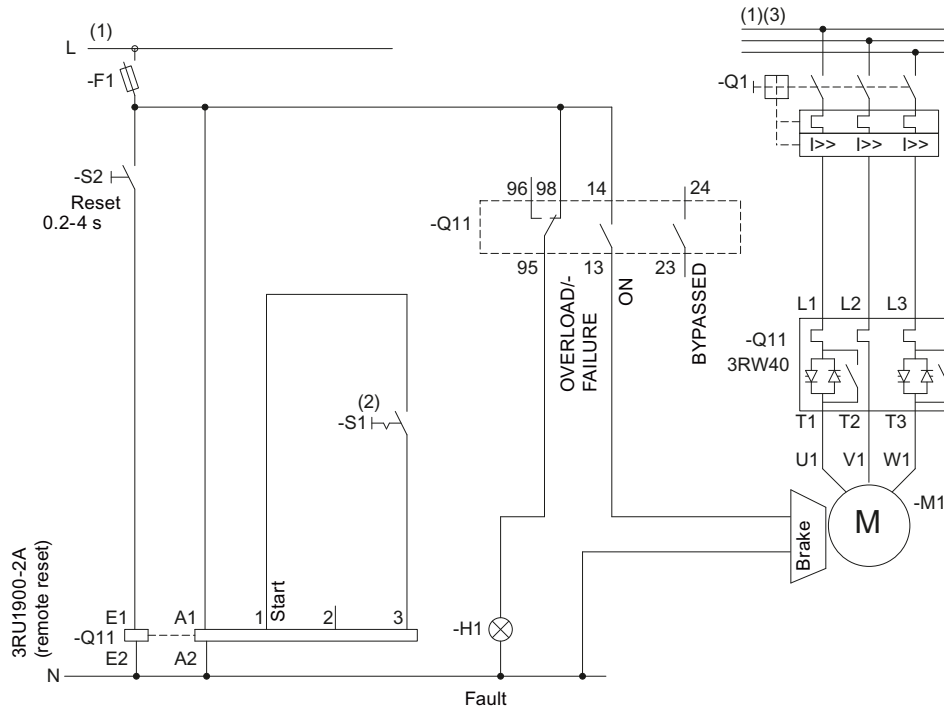


Figure 16-22 Wiring of the control circuit, main circuit 3RW405 - 3RW407

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

! WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167).

Note

No soft stop possible. Set the stopping time to 0 s with the potentiometer.

16.9 EMERGENCY STOP

16.9.1 3RW30 EMERGENCY STOP and 3TK2823 safety relay

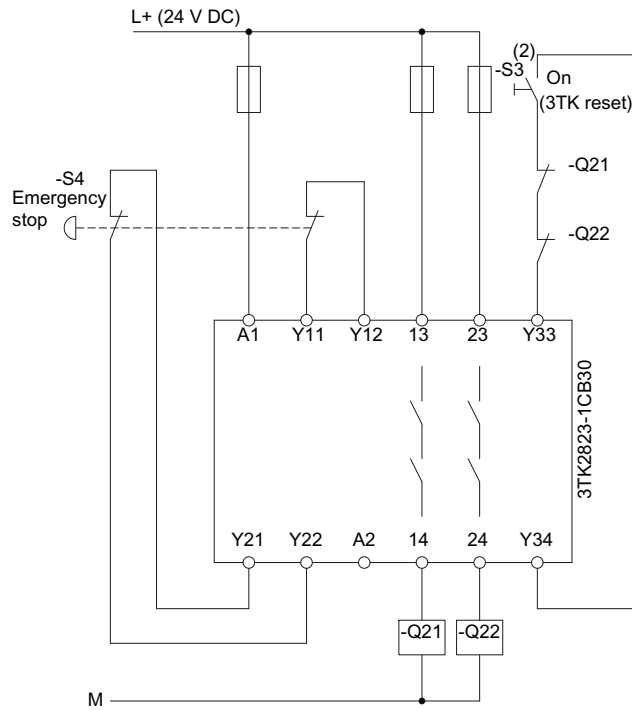


Figure 16-23 Wiring of the EMERGENCY STOP control circuit and the 3TK28 safety relay

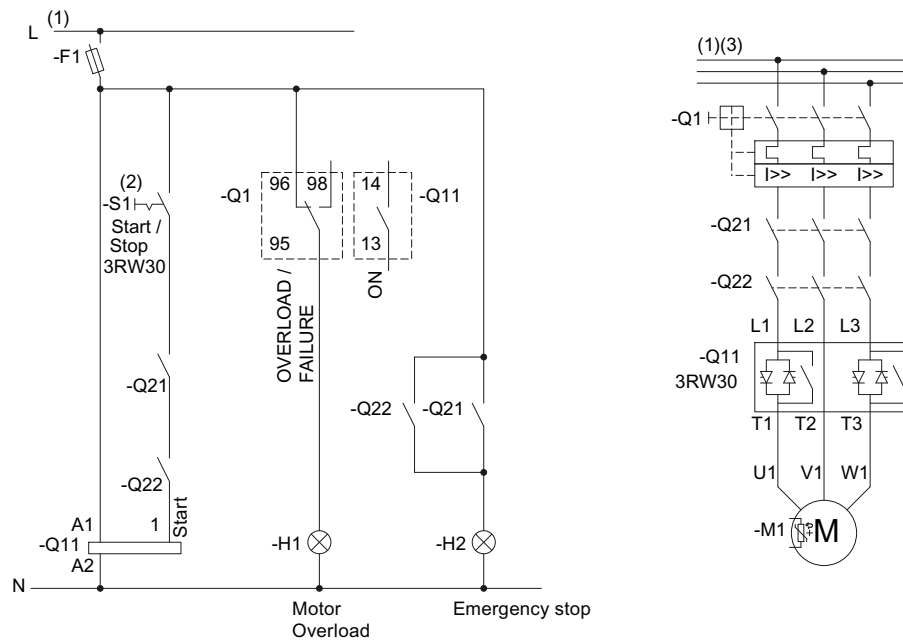


Figure 16-24 Wiring of the 3RW30 control and main circuits

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

⚠ WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

- If the 3TK28 is reset
- Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 61)) are automatically reset when the system returns to normal.

An automatic restart is initiated and the 3RW restarted if a start command is present at the input.

If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

16.9.2 3RW402 - 3RW404 EMERGENCY STOP and 3TK2823 safety relay

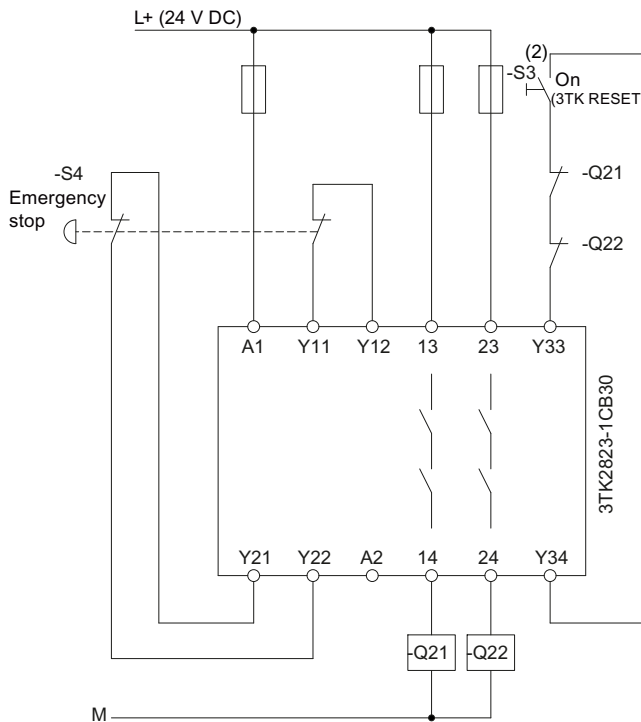


Figure 16-25 Wiring of the EMERGENCY STOP control circuit and the 3TK28 safety relay

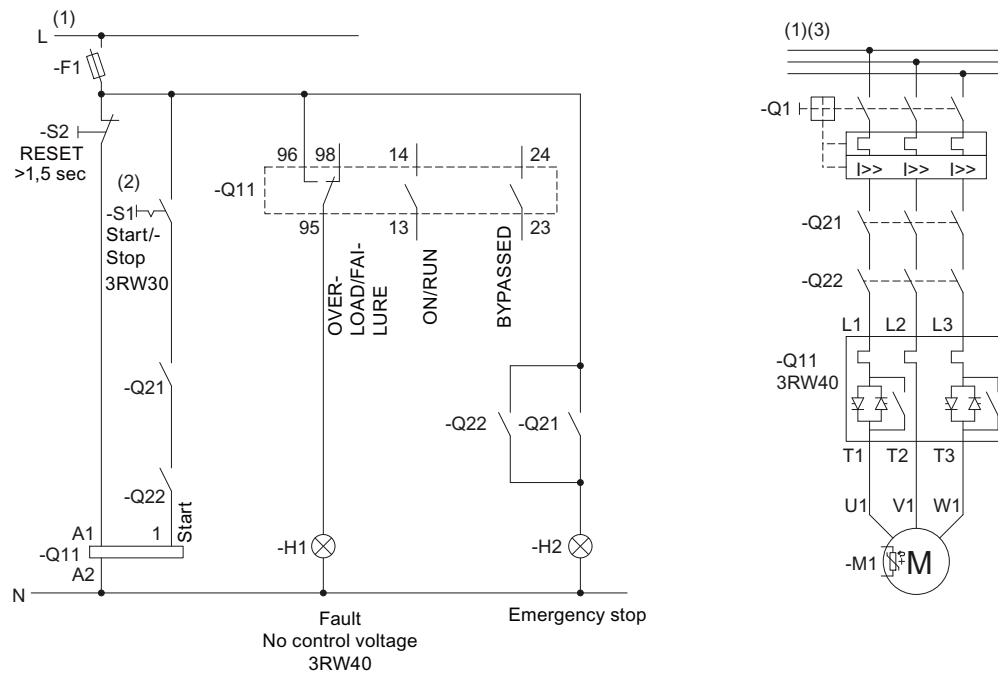


Figure 16-26 Wiring of the 3RW402 - 3RW404 control circuit and 3RW402 - 3RW407 main circuit

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

WARNING

(2) Automatic restart can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command (3TK or 3RW) if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167).

Note

If the soft stop function is set (potentiometer stopping time set to >0 s) and the emergency stop circuit is tripped, a "Missing load voltage, phase failure / missing load" fault may be indicated on the soft starter. In this case, the soft starter must be reset according to the selected RESET MODE.

16.9.3 3RW405 - 3RW407 EMERGENCY STOP and 3TK2823 safety relay

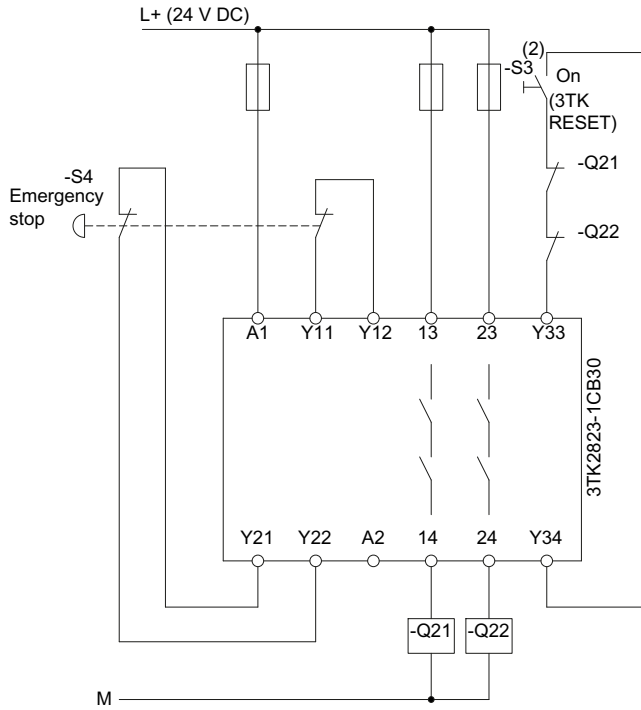


Figure 16-27 Wiring of the EMERGENCY STOP control circuit and the 3TK28 safety relay

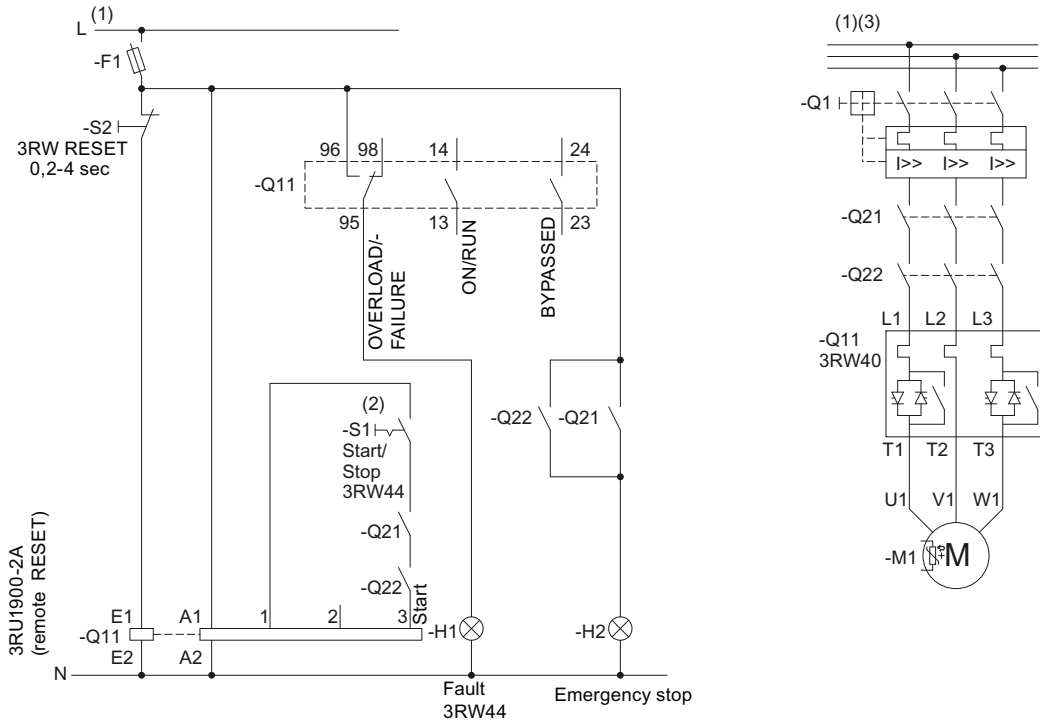


Figure 16-28 Wiring of the 3RW405 - 3RW407 control circuit and 3RW402 - 3RW407 main circuit

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

 **WARNING**

(2) Automatic restart. Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command (3TK or 3RW) if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167).

Note

If the soft stop function is set (potentiometer stopping time set to >0 s) and the emergency stop circuit is tripped, a "Missing load voltage, phase failure / missing load" fault may be indicated on the soft starter. In this case, the soft starter must be reset according to the selected RESET MODE.

16.10 3RW and contactor for emergency starting

16.10.1 3RW30 and contactor for emergency starting

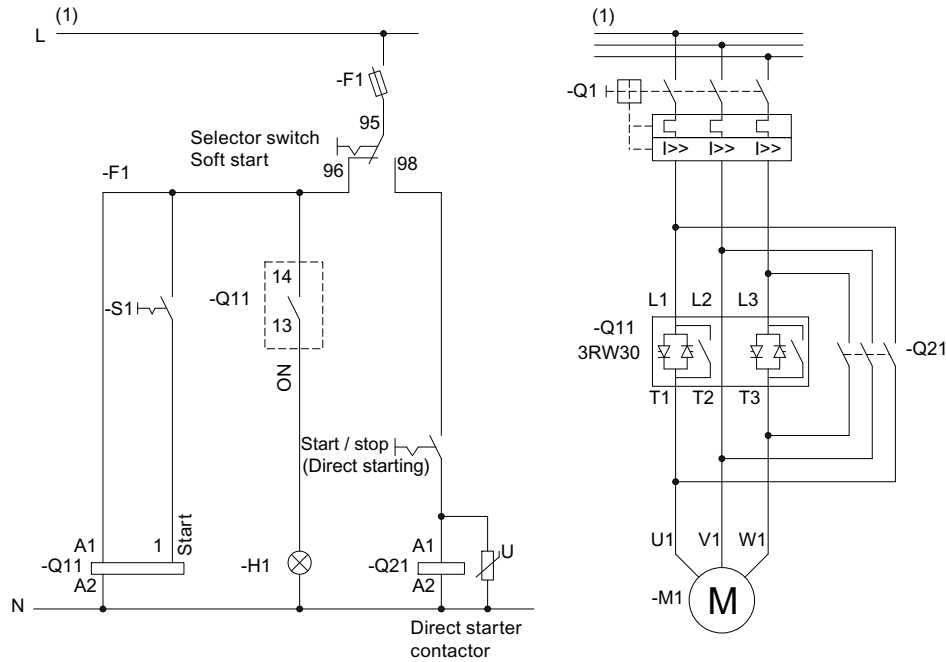


Figure 16-29 Wiring of the 3RW30 control and main circuits

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to Troubleshooting chapter) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input. If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

16.10.2 3RW40 and contactor for emergency starting

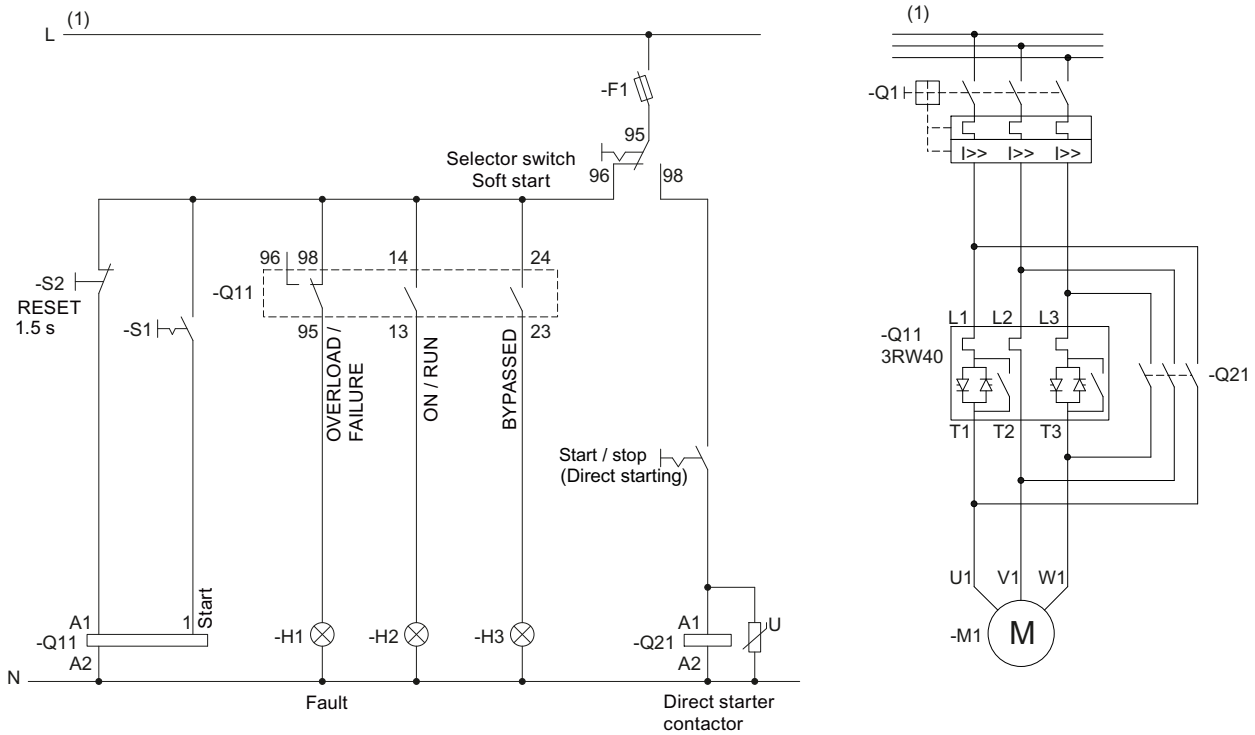


Figure 16-30 Wiring of the 3RW402 - 3RW404 control circuit and 3RW402 - 3RW407 main circuit

16.10 3RW and contactor for emergency starting

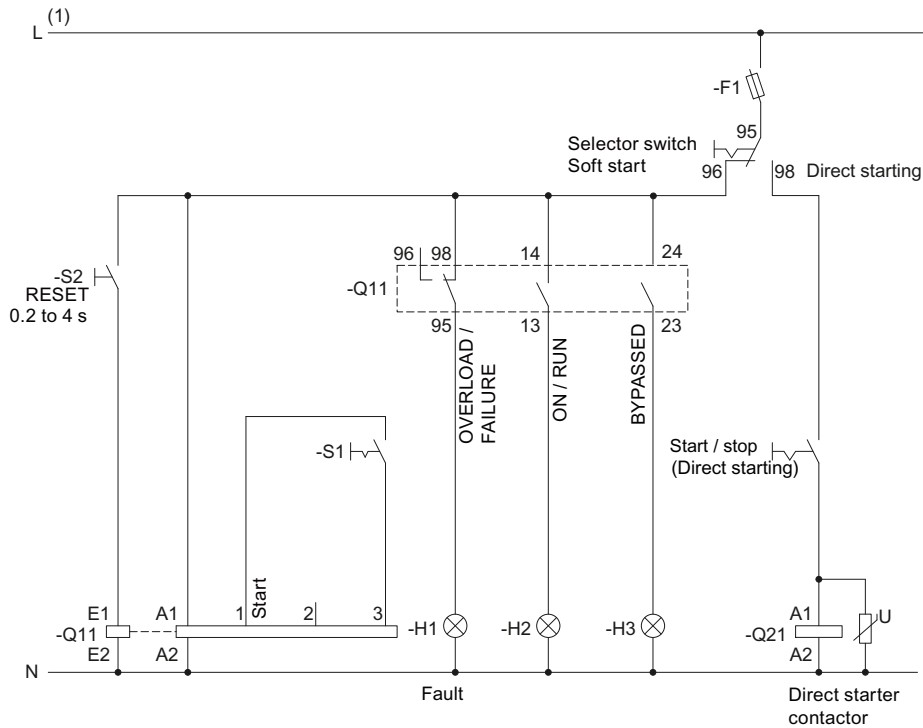


Figure 16-31 Wiring of the control circuit 3RW405 - 3RW407

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

! WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167).

16.11 Dahlander / multispeed motor

16.11.1 3RW30 and Dahlander motor starting

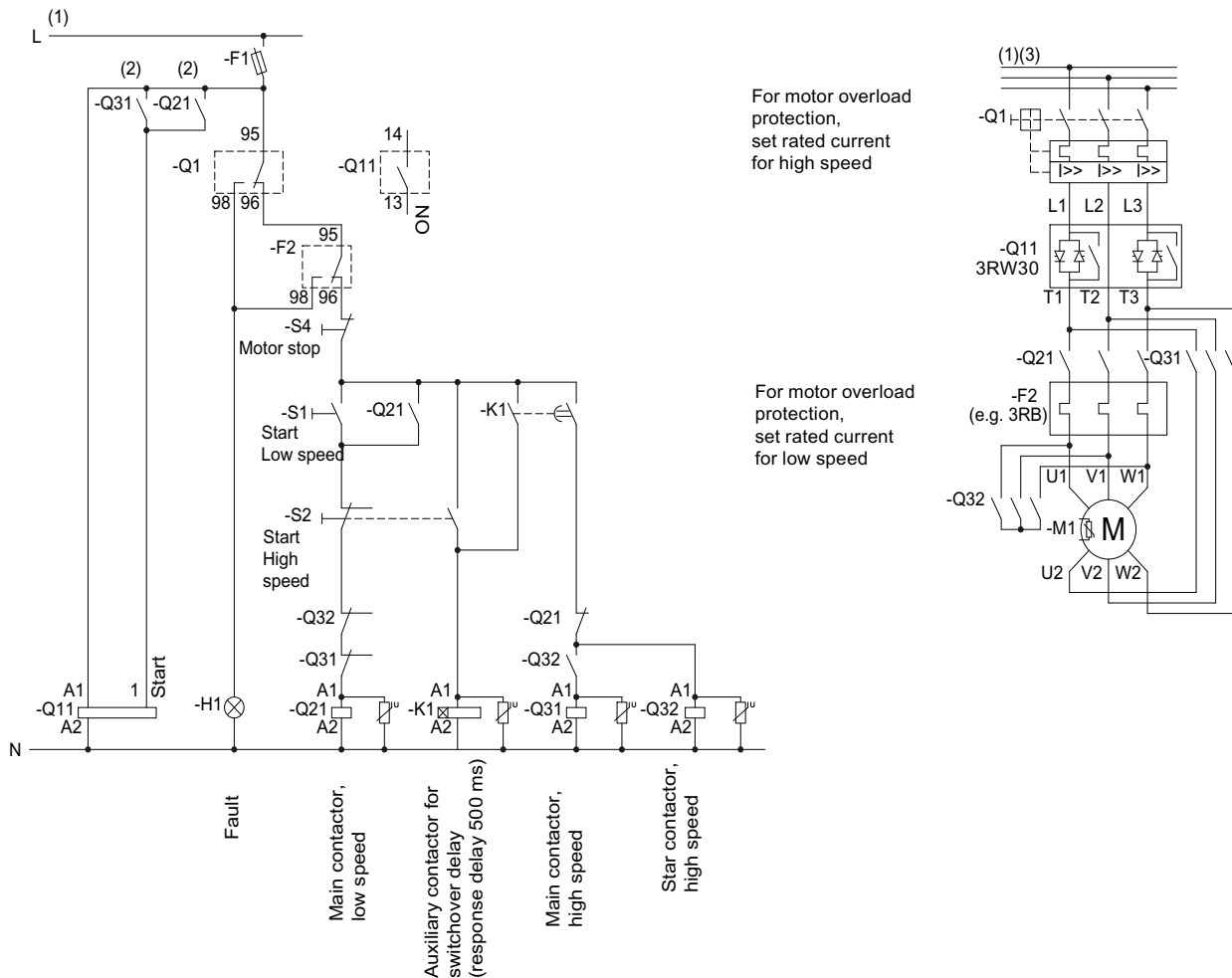


Figure 16-32 Wiring of the 3RW30 control and main circuits

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

⚠ WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

Faults caused by incorrect control voltage, a missing load, or a phase failure (refer to chapter 3RW30: LEDs (Page 61)) are automatically reset when the system returns to normal. An automatic restart is initiated and the 3RW restarted if a start command is present at the input. If you do not want the motor to start automatically, you must integrate suitable additional components, e.g. phase failure or load monitoring devices, into the control and main circuits.

16.11 Dahlander / multispeed motor

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

16.11.2 3RW402 - 3RW404 and Dahlander motor starting

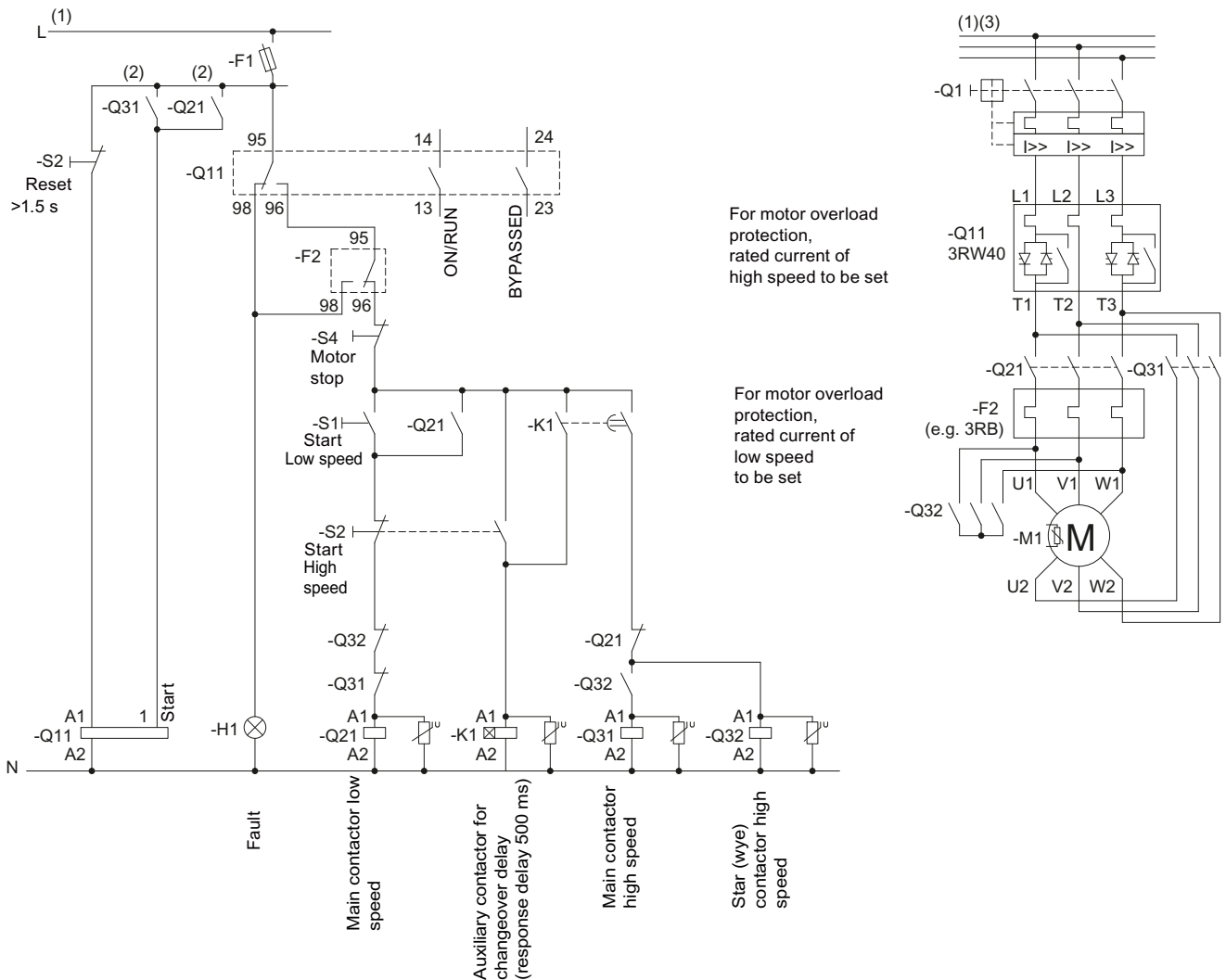


Figure 16-33 Wiring of the 3RW402 - 3RW404 control circuit and 3RW402 - 3RW407 main circuit

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

 **WARNING**

(2) Automatic restart. Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

For the optional thermistor motor protection evaluation, refer to Typical circuit for the optional thermistor motor protection evaluation (Page 167).

Note

No soft stop possible. Set the stopping time to 0 s with the potentiometer.

16.11.3 3RW405 - 3RW407 and Dahlander motor starting

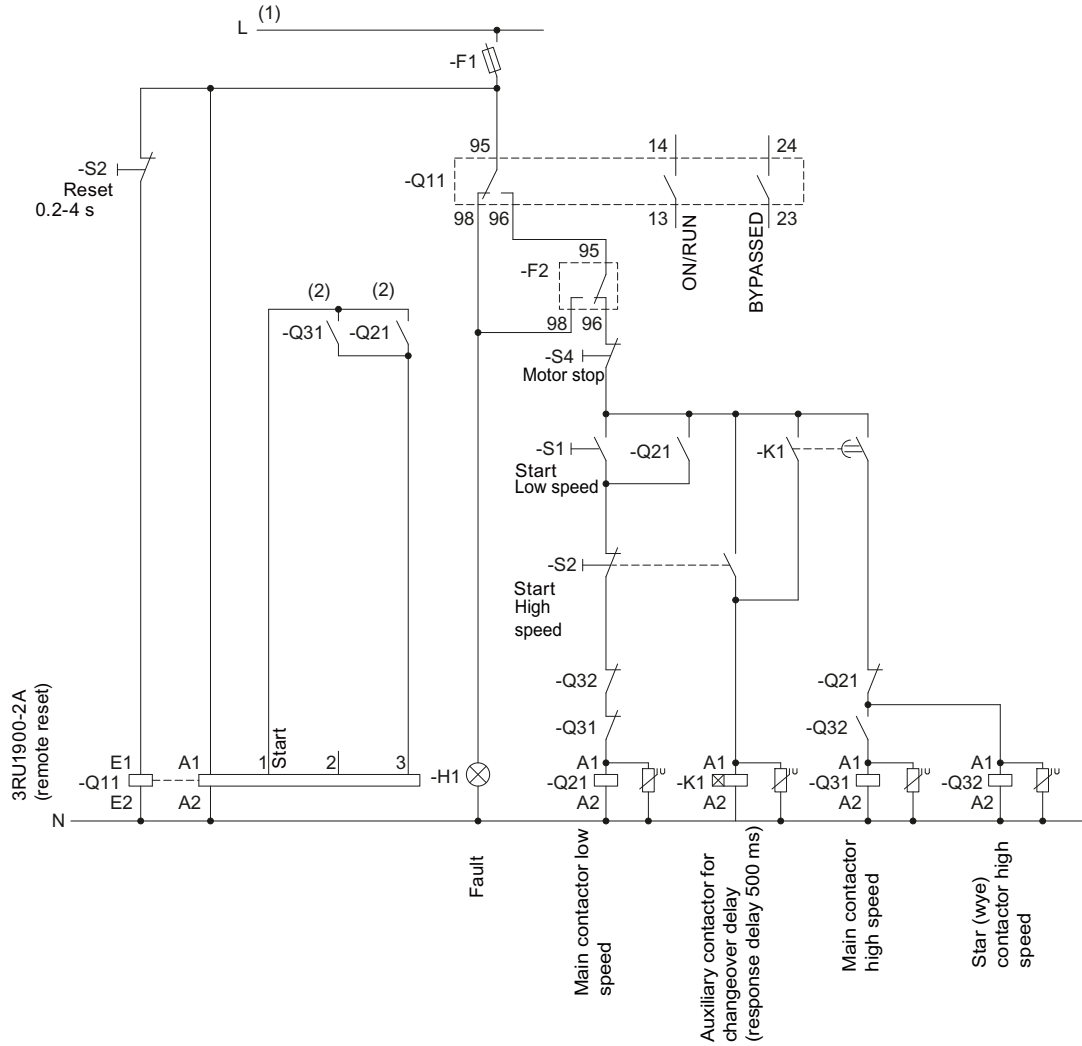


Figure 16-34 Wiring of the control circuit 3RW405 - 3RW407

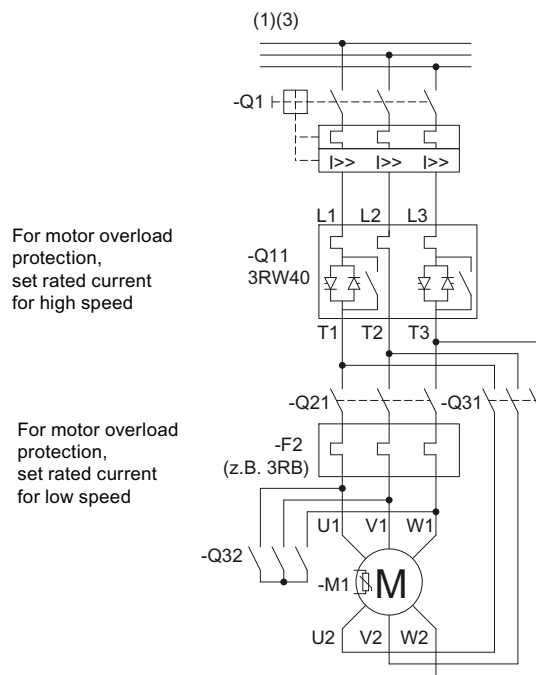


Figure 16-35 Wiring of the main circuit 3RW405 - 3RW407

(1) For permissible main and control voltage values (dependent on article number), refer to chapter Technical data (Page 133).

! WARNING

(2) Automatic restart. Can result in death, serious injury, or property damage.

The start command (e.g. issued by the PLC or switch S1) must be reset prior to issuing a RESET command because the motor attempts to restart again automatically following this RESET command if a start command is still present. This particularly applies if the motor protection has tripped. For safety reasons, you are advised to integrate the group fault output (terminals 95 and 96) in the controller.

(3) Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2. For the assignment of fuses and switching devices, refer to chapter Technical data (Page 133).

Note

No soft stop possible. Set the stopping time to 0 s with the potentiometer.

Appendix

A.1 Configuration data

Motor data

Siemens motor?

Rated power: kW

Rated voltage: V

Mains frequency: Hz

Rated current: A

Starting current: A

Rated speed: rpm

Rated torque: Nm

Breakdown torque: Nm

Mass moment of inertia: kg*m²

Speed / torque characteristic curve

(The speed increments of the value pairs do not have to be equal)

| | | | | | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|
| n_M 1/m | | | | | | | | | | | | | "n _{syn} " |
| M_M / M_B | | | | | | | | | | | | | |

Speed / current characteristic curve

(The speed increments of the value pairs do not have to be equal)

| | | | | | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|
| n_M 1/m | | | | | | | | | | | | | "n _{syn} " |
| I_M / I_B | | | | | | | | | | | | | |

Load data

Load type (e.g. pump, mill etc.):

Rated speed: rpm

Rated torque or rated power Nm or kW

Mass moment of inertia (load-specific) kg*m²

Mass moment of inertia (motor-specific) kg*m²

Speed / torque characteristic curve

A.1 Configuration data

(The speed increments of the value pairs do not have to be equal)

| | | | | | | | | | | | | |
|---------------------------------|--|--|--|--|--|--|--|--|--|--|--|---------------------|
| n _L 1/m | | | | | | | | | | | | "n _{syn} " |
| M _L / M _B | | | | | | | | | | | | |

Start conditions

Starting frequency Starts
 Switching cycles: Run-up time
 Operating time
 Idle time
 Stopping time
 Ambient temperature °C

| | Yes | Value |
|---------------------------------|--------------------------|-------|
| Starting current limitation? | <input type="checkbox"/> | |
| Acceleration torque limitation? | <input type="checkbox"/> | |
| Maximum starting time? | <input type="checkbox"/> | |

Personal details

Last name, first name:
 Company:
 Department:
 Street:
 Zip code, town/city:
 Country:
 Phone:
 Fax:
 Email:

A.2 Table of parameters used

You can document your parameter settings in the table below.

| | | 3RW40 parameters | | | | | | | Output ON / RUN | | Thermistor | | | |
|------------------|--------------------|---------------------------|-------------|---------------|------------|-----------------------|-------------|--------------------------|-------------------------------------|--------------------------|--------------------------|-------------------------------------|--------------------------|--------------------------|
| Plant identifier | Installed 3RW type | Parameters 3RW30 or 3RW40 | | t ramp-down s | le motor A | Factor le limit value | CLASS value | Manual (off) | AUTO (yellow) | Remote (green) | ON | P TC | Klixon | |
| | | U starting % | t ramp-up s | | | | | | | | | | | |
| Pump XYZ | 3RW4038-1TB04 | | | | | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 3RW___-B__ | | | | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 3RW___-B__ | | | | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 3RW___-B__ | | | | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 3RW___-B__ | | | | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 3RW___-B__ | | | | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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