

Industrial Controls

Soft starters and solid-state switching devices SIRIUS 3RW55 soft starter




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.

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


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Description

Target group

The manual is intended for everyone involved in the following tasks:

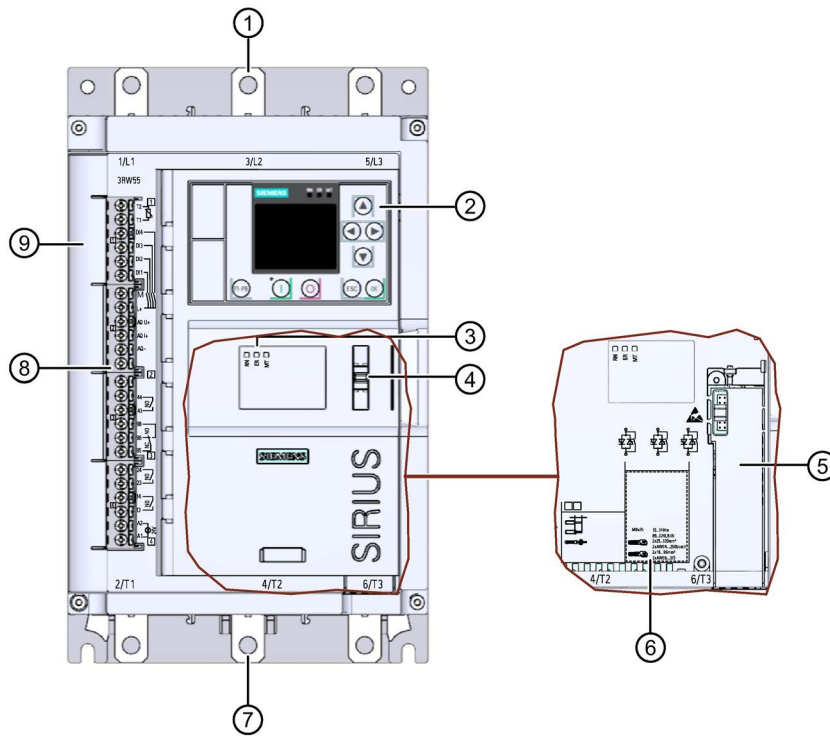
- Planning and configuring systems
- Installation
- Commissioning
- Service and maintenance

Requirements for use of 3RW5 soft starters

Basic knowledge of the following areas:

- General electrical engineering
- Drive technology
- Automation technology
- Handling the automation system and the software used

1.1 Hardware configuration



- ① Main circuit connection (mains supply)
- ② 3RW5 HMI High Feature
- ③ Diagnostics LEDs
- ④ Eye for lead seal
- ⑤ Slot for 3RW5 communication module (accessory)
- ⑥ Connectable conductor cross sections
- ⑦ Main circuit connection (motor)
- ⑧ Control terminals (inputs / outputs)
- ⑨ Control cable duct with cover

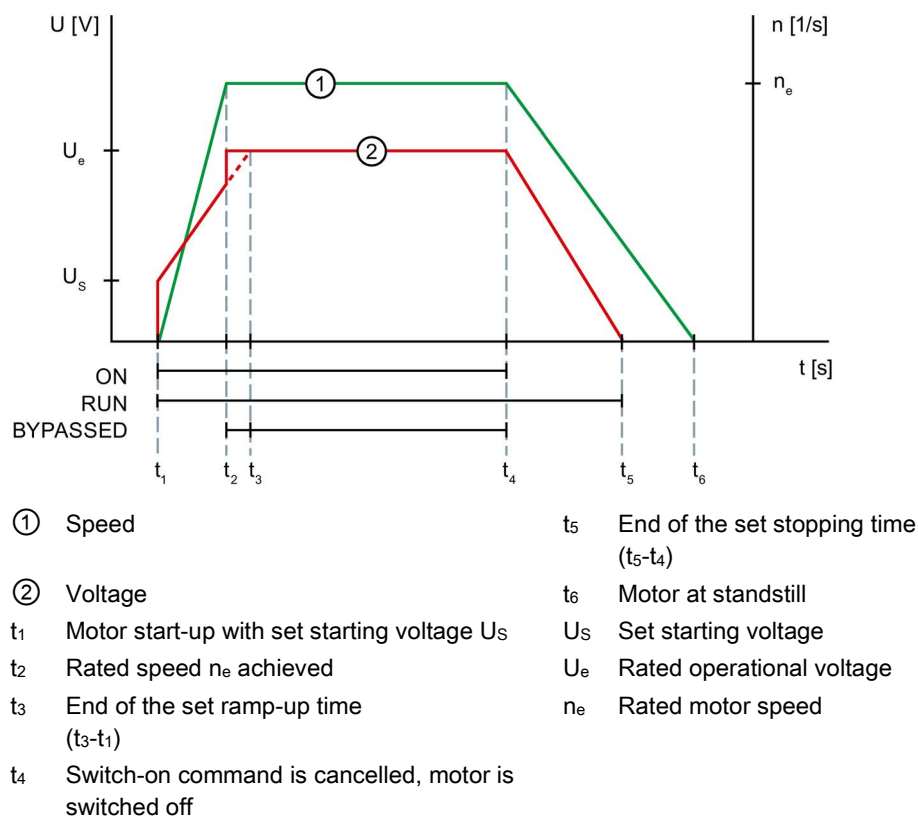
1.2 Operating principle

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

The 3RW5 soft starter starts the motor as soon as the switch-on command is issued (t_1). During the ramp-up time (t_1 to t_3), the current is conducted via power semiconductors which start the motor up smoothly.

The 3RW5 soft starter features internal start-up detection. If it detects that the motor has reached its rated operating speed before the ramp-up time expires, the motor voltage is immediately increased to 100 % of the line voltage (t_2). The internal bypass contacts close and the power semiconductors are bypassed. The soft starter is then in bypass operation.

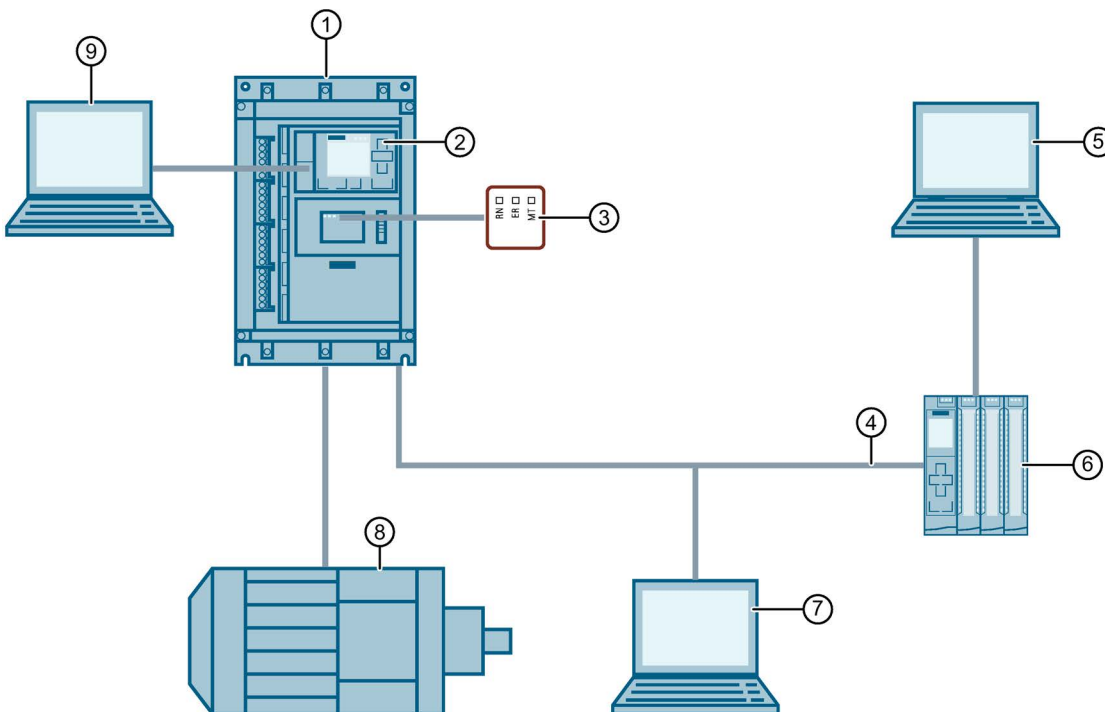
Coast-down to zero speed is activated when the switch-on command is cancelled (t_4) and the motor is shut down. The power semiconductors also ensure that the motor coasts down smoothly to a stop. The power supply to the motor is maintained until the end of the stopping time is reached (t_4 to t_5). It may take longer for the motor to actually coast down to a standstill (t_6).



Functions

- Parameterizable **soft starting** for a smooth drive startup
- Parameterizable **soft stopping** for a smooth drive stop
- Parameterizable **current limiting** for reducing energy costs and avoiding current peaks
- **Integrated motor overload protection** with adjustable trip class (OFF, CLASS 10A, 10E, 20E, 30E)
- Universal **intrinsic device protection** protects the 3RW55 soft starter against overload.
- Extended full motor protection by means of **thermistor motor protection** for connection of a temperature sensor
- **Analog output** for displaying a set measured value using an external display device.
- **Automatic parameterization** simplifies the system commissioning.
- **Current limit monitoring** with 4 separate limit values
- **Monitoring of switching frequency** in order to comply with application-dependent wait / cooling times.
- **Condition Monitoring** for plant monitoring
- Parameterizable **digital inputs and outputs**
- The basic unit can record **trace data** (evaluation via Soft Starter ES)
- Connection to motor in **inline circuit** or **inside-delta circuit**
- The **emergency start function** allows the system to continue being operated in the event of a system fault.
- **Phase asymmetry monitoring** protects the motor from asymmetrical current consumption.
- **Motor heating** for minimizing condensation inside the motor for drives outdoors.
- **Pump cleaning function** for removing blockages and dirt from water pipes, filters, and pump blades.
- **Breakaway pulse** for overcoming high stiction, e.g. in mills.
- **Access protection** by PIN and user accounts
- Micro SD card for **saving data**
- Optional **communication module**
- **Creep speed function** in applications with a low counter-torque, e.g. positioning of machine tools.
- The **application wizard** supports the commissioning of various applications.
- **Parameter set change** for applications with different load conditions
- **Cascade connection** for connecting the output of a 3RW55 to the input of further soft starters.
- **Serial switch-on** can switch on and off as many as 3 different motors one after the other.

1.3 Interaction interfaces



- ① SIRIUS 3RW55 soft starter
- ② 3RW5 HMI High Feature
- ③ LED display on 3RW55 soft starter
- ④ Fieldbus (via optional 3RW5 communication module)
- ⑤ PC or programming device with configuration software of the controller (e.g. STEP 7)
- ⑥ Programmable logic controller (e.g. SIMATIC S7-1500)
- ⑦ PC with SIRIUS Soft Starter ES (TIA Portal) Premium via 3RW5 communication module
- ⑧ Motor
- ⑨ PC with SIRIUS Soft Starter ES (TIA Portal) via local interface at 3RW5 HMI High Feature

	3RW5 HMI High Feature	SIRIUS Soft Starter ES (TIA Portal) ¹⁾	Fieldbus via communication module	3RW55 soft starter
Monitoring	✓	✓	✓ (via user program)	LEDs
Diagnostics	✓	✓	✓	LEDs
Control	✓	✓	✓	Via input IN
Parameter assignment	✓	✓	✓	-

1) Via the local interface on the 3RW5 HMI High Feature or via a suitable 3RW5 communication module

1.4 Operating modes and master control function

The following modes are available (in ascending order of priority):

Mode	Control source	Control of the 3RW5 soft starter	Priority	
Automatic	Fieldbus	PROFINET and PROFIBUS: PLC controlled	Lowest	
		Modbus: Modbus client (e.g. PLC) controlled		
Manual operation bus (depending on the 3RW5 communication module)	-	-	Connection abort	↓
	PC controlled	Fieldbus	SIRIUS Soft Starter ES (TIA Portal) Premium controlled	↓
Manual operation local	-	-	Connection abort (depending on parameter assignment)	
	Input controlled	Digital inputs	Input actions controlled	↓
	3RW5 HMI controlled	3RW5 HMI	3RW5 HMI controlled	↓
	PC controlled	Local interface	SIRIUS Soft Starter ES (TIA Portal) controlled	Highest

If the connection to the control source is aborted, the control priority automatically switches back to the lowest priority of the current mode.

Depending on the parameter assignment, "Input controlled" has the lowest priority in the "Manual operation local" mode in the following cases:

- Input action "Manual operation local" is parameterized and switched on.
- A controlling input action (e.g. "Motor CW") is parameterized, but the input action "Manual operation local" is not parameterized.

Setting the mode

A higher-priority mode can actively take over as master control from a lower-priority mode at any time; the reverse is not possible.

The master control function can only be returned to the mode with the lowest priority. Control sources with higher priority must take the master control function from the mode with the lowest priority.

A mode with lower priority can only take the master control function back while the motor is switched off.

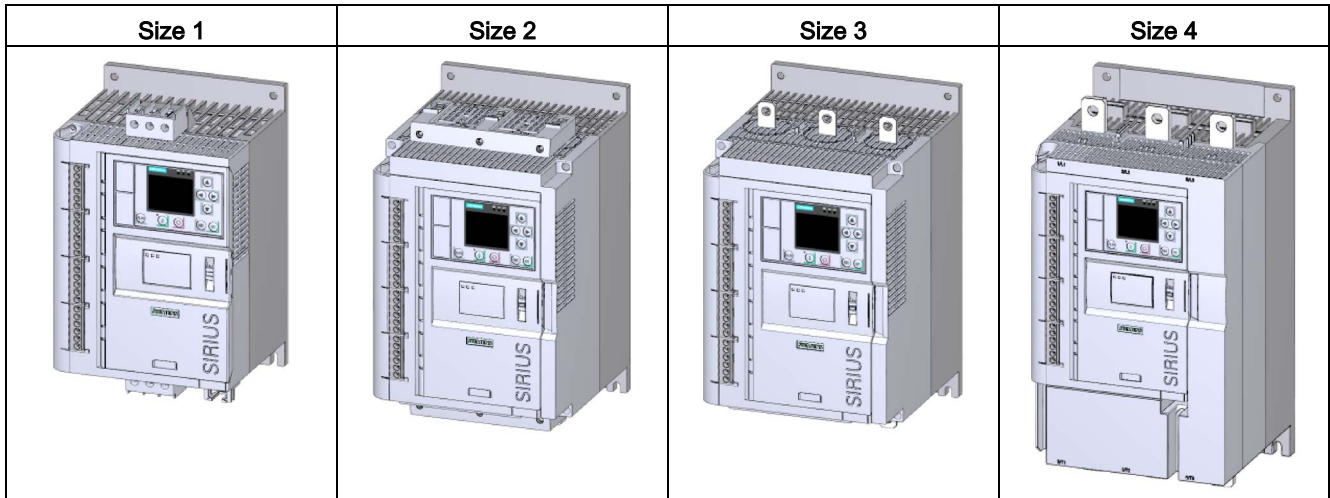
The mode with higher priority takes over or receives the master control function from the current mode in the following ways:

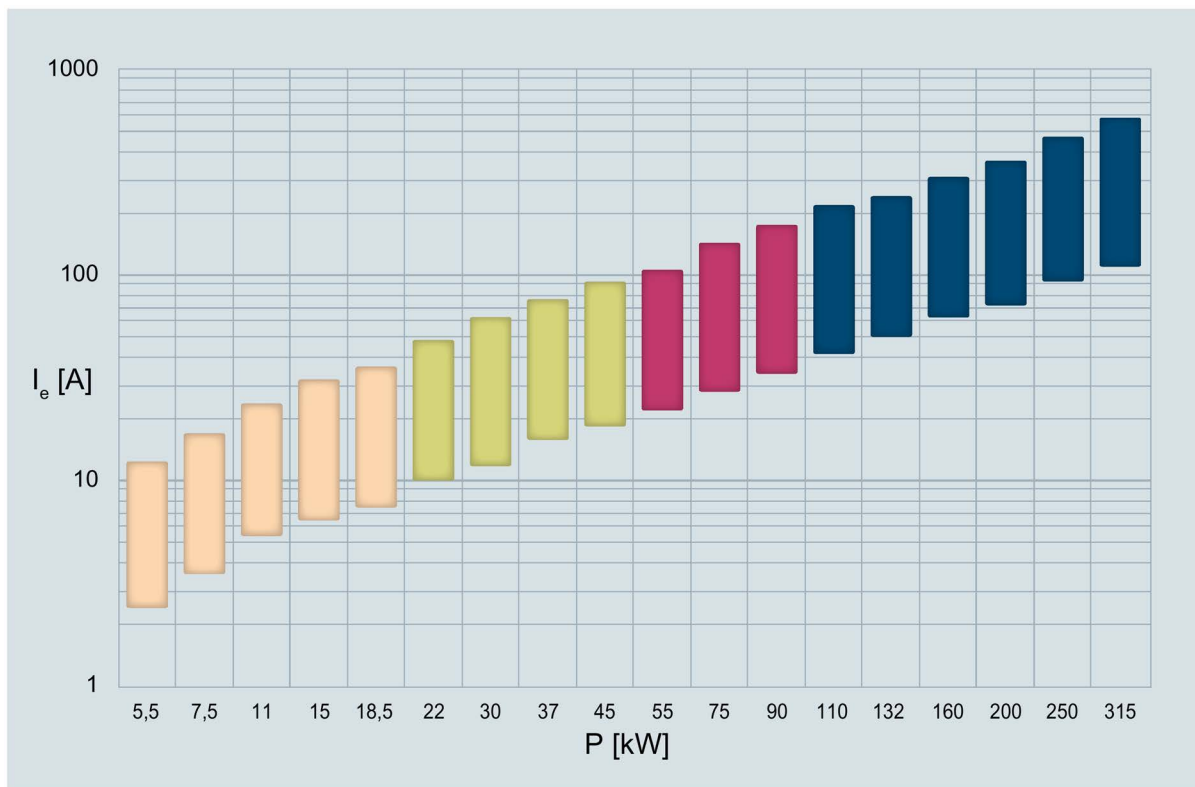
- The mode with higher priority actively takes over the master control function:
 - Digital inputs: By switching on the input action "Manual operation local", if this is parameterized.
 - 3RW5 HMI: With the action "LOCAL / REMOTE"
 - SIRIUS Soft Starter ES (TIA Portal)
- If the input action "Manual operation local" is not parameterized, the digital inputs obtain the master control function from a mode of lower priority in one of the following ways:
 - Via the "Manual operation local - input controlled" bit in the process image output (PIQ) or in the data table "Process image output (PIQ)" (depending on the 3RW5 communication module). You will find more information on the process images and data tables in the manual for the 3RW5 communication module in question.
 - SIRIUS Soft Starter ES (TIA Portal) (depending on the 3RW5 communication module)

The mode with the lowest priority receives or takes over the master control function from the current mode in the following ways:

- The mode with higher priority actively returns the master control function:
 - Digital inputs: By switching off the input action "Manual operation local", if this is parameterized.
 - 3RW5 HMI: With the action "LOCAL / REMOTE"
 - SIRIUS Soft Starter ES (TIA Portal)
- If the input action "Manual operation local" is not parameterized, the mode with the lowest priority can actively obtain the master control function from the digital inputs or on connection abort:
 - Via the "Manual operation local - input controlled" bit in the process image output (PIQ) or in the data table "Process image output (PIQ)" (depending on the 3RW5 communication module). You will find more information on the process images and data tables in the manual for the 3RW5 communication module in question.
 - SIRIUS Soft Starter ES (TIA Portal) (depending on the 3RW5 communication module)

1.5 Device versions





Size 1



Size 2



Size 3



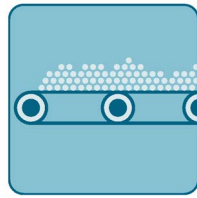
Size 4

I_e Rated operational current

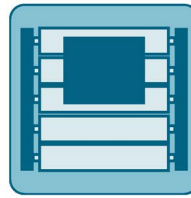
P Rated power

The stated power ratings apply to a rated operational voltage of $U_e = 400$ V in an inline circuit.

1.6 Areas of application / load types



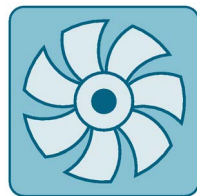
Conveyor belts



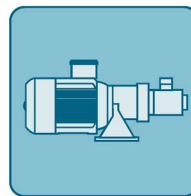
Roller conveyors



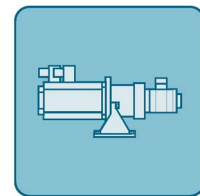
Compressors



Small / large fan



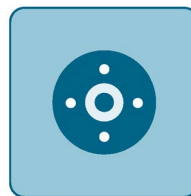
Pumps



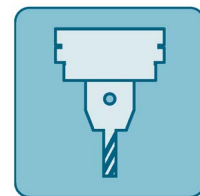
Hydraulic pumps



Agitators



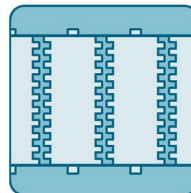
Centrifuges



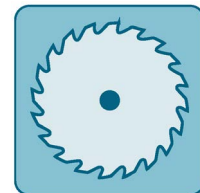
Milling machines



Mills



Crushers



Circular saw / band saw

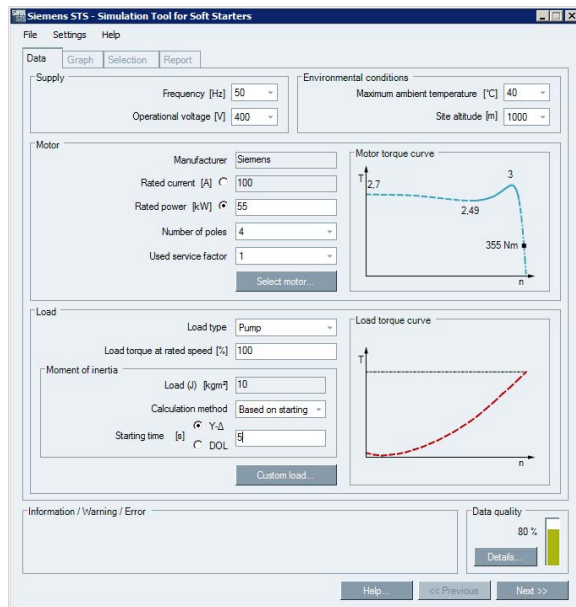
Starting of a motor causes a rapid change in the load current. The resulting torque impulses place severe stresses on the mechanical parts of a machine or plant. Moreover, voltage dips can occur in the power supply system which can have a negative influence on other devices:

- Flicker in lights
- Influence on computer systems
- Contactors and relays dropping out

The 3RW55 soft starter controls the voltage continuously. The torque and the current are thus also increased continuously. The power supply system is safeguarded against peak loads and the drive train is protected against damage:

- Smooth starting / stopping, e.g. for conveyor belts
- No pressure surges, e.g. for pumps
- Increased service life of the pipe system, e.g. for compressors
- Reduced starting current, e.g. for agitators
- Reduced stress on gearbox and V belt, e.g. for saws

1.7 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.

The Simulation Tool for Soft Starters (STS) can be downloaded from the Internet (<https://support.industry.siemens.com/cs/ww/en/view/101494917>).

1.8 Structure of the article number

Digit of the article number	1st-4th	5th	6th	7th	8th	9th	10th	11th	12th
SIRIUS 3RW soft starter	3RW5	5				H	A		
Size and rated operational current I _e of the soft starter				x*	x**				x***
Connection system	<ul style="list-style-type: none"> Applies to sizes 1 / 2 Main circuit: Screw terminals Control circuit: Screw terminals 				1				
	<ul style="list-style-type: none"> Applies to sizes 3 / 4 Main circuit: Bus connection Control circuit: Spring-loaded terminals 				2				
	<ul style="list-style-type: none"> Applies to sizes 1 / 2 Main circuit: Screw terminals Control circuit: Spring-loaded terminals 				3				
	<ul style="list-style-type: none"> Applies to sizes 3 / 4 Main circuit: Bus connection Control circuit: Screw terminals 				6				
	<ul style="list-style-type: none"> Special connection 				8				
Rated control supply voltage U _s					24 V AC / DC		0		
					110 V - 250 V AC		1		
Rated operational voltage U _e							200 - 480 V AC	4	
							200 - 600 V AC	5	
							400 - 690 V AC	6	

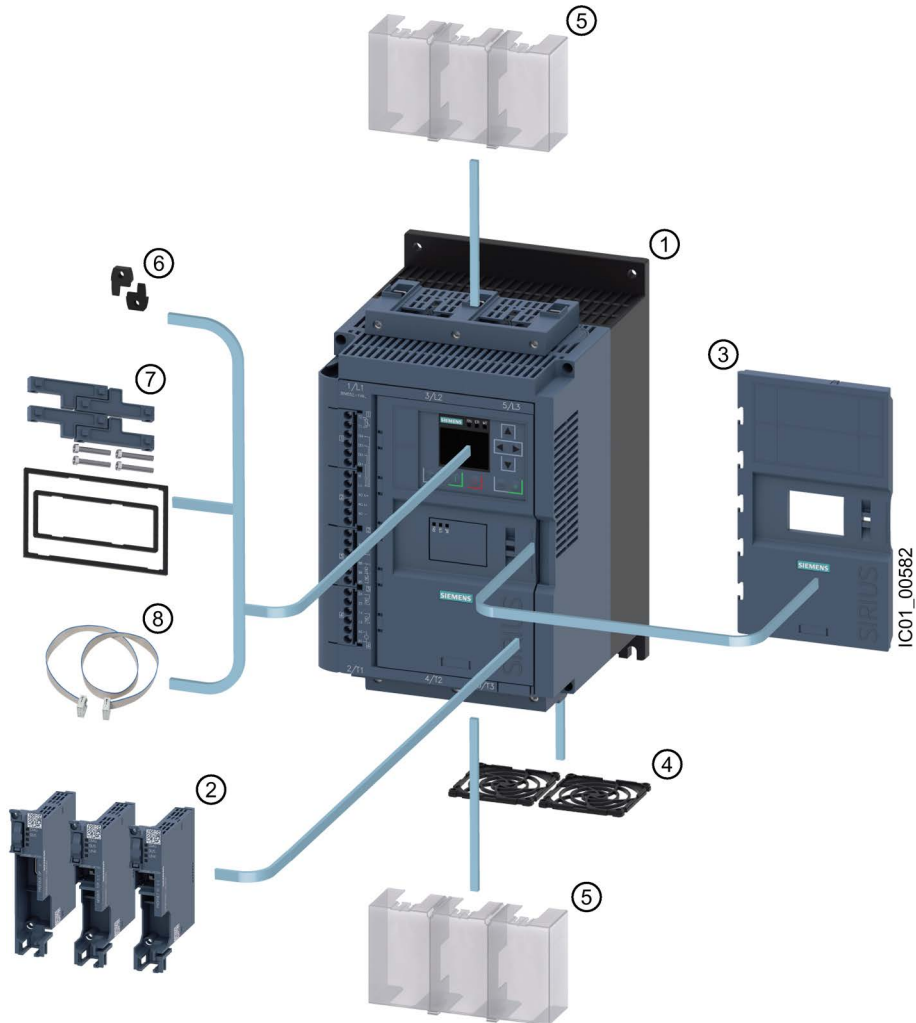
*see table below.

Table 1- 1 Size and rated operational current at $U_e = 400$ V and $T_U = 40^\circ\text{C}$ and in an inline circuit

	Rated operational current I_e of the soft starter	Rated operating power P_e of the soft starter	x^*	x^{**}	x^{***} (Size 2, 690 V only)
Size 1	$I_e = 13$ A	$P_e = 5.5$ kW	1	3	
	$I_e = 18$ A	$P_e = 7.5$ kW	1	4	
	$I_e = 25$ A	$P_e = 11$ kW	1	5	
	$I_e = 32$ A	$P_e = 15$ kW	1	6	
	$I_e = 38$ A	$P_e = 18.5$ kW	1	7	
Size 2	$I_e = 25$ A	$P_e = 11$ kW	2	1	6
	$I_e = 47$ A	$P_e = 22$ kW	2	4	
	$I_e = 63$ A	$P_e = 30$ kW	2	5	
	$I_e = 77$ A	$P_e = 37$ kW	2	6	
	$I_e = 93$ A	$P_e = 45$ kW	2	7	
Size 3	$I_e = 114$ A	$P_e = 55$ kW	3	4	
	$I_e = 143$ A	$P_e = 75$ kW	3	5	
	$I_e = 171$ A	$P_e = 90$ kW	3	6	
Size 4	$I_e = 210$ A	$P_e = 110$ kW	4	3	
	$I_e = 250$ A	$P_e = 132$ kW	4	4	
	$I_e = 315$ A	$P_e = 160$ kW	4	5	
	$I_e = 370$ A	$P_e = 200$ kW	4	6	
	$I_e = 470$ A	$P_e = 250$ kW	4	7	
	$I_e = 570$ A	$P_e = 315$ kW	4	8	

1.9 Accessories

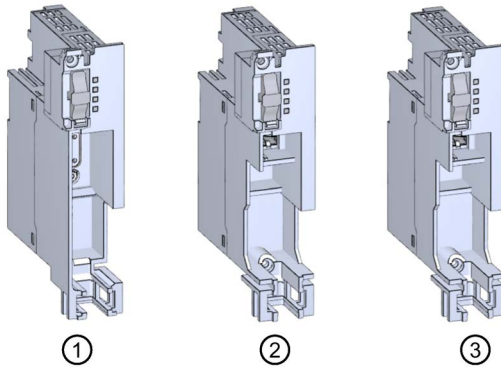
1.9.1 3RW55 soft starter accessories



- ① 3RW55 soft starter
- ② 3RW5 communication modules
 - PROFIBUS (3RW5980-0CP00)
 - PROFINET Standard (3RW5980-0CS00)
 - Modbus TCP (3RW5980-0CT00)
- ③ Hinged cover (3RW5950-0GL20)
- ④ Fan cover:
 - Sizes 1, 2 and 3 (3RW5983-0FC00)
 - Size 4 (3RW5984-0FC00)
- ⑤ Terminal cover, top and bottom:
 - Sizes 2 and 3 (3RW5983-0TC20)
 - Size 4 (3RW5984-0TC20)
- ⑥ Push-in lugs for wall mounting (3ZY1311-0AA00)
- ⑦ IP65 door mounting kit (3RW5980-0HD00)
- ⑧ HMI connecting cable:
 - 0.1 m (3UF7931-0AA00-0)
 - 0.5 m (3UF7932-0BA00-0)
 - 1 m (3UF7937-0BA00-0)
 - 2.5 m (3UF7933-0BA00-0)
 - 5 m (3RW5980-0HC60)

1.9.2 3RW5 communication module

The following 3RW5 communication modules are available for integration of the 3RW55 soft starter in fieldbus systems:



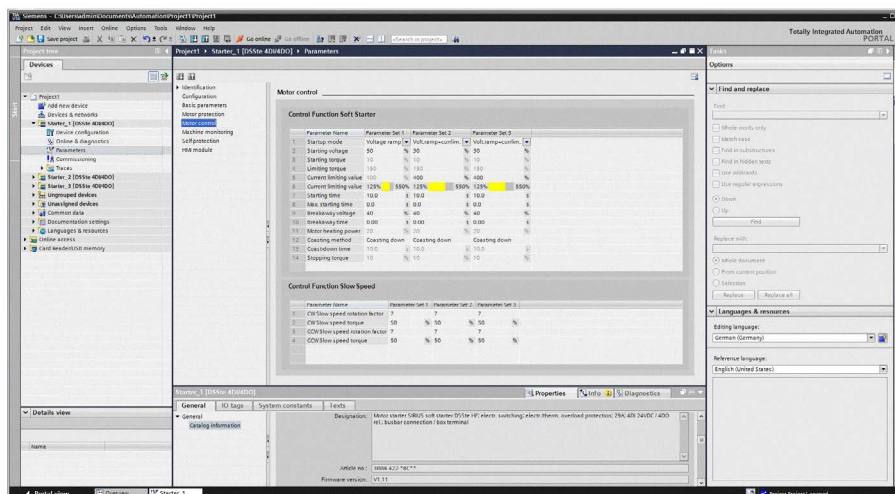
- ① 3RW5 PROFIBUS communication module
- ② 3RW5 PROFINET Standard communication module
- ③ 3RW5 Modbus TCP communication module

Integration into the automation software

The 3RW55 soft starter can be integrated in an automation software, e.g. STEP 7 (TIA Portal) via GSD / GSDML or HSP.

You will find further information on operation of the 3RW5 communication module in the manual for the 3RW5 communication module in question.

1.9.3 SIRIUS Soft Starter ES (TIA Portal)



SIRIUS Soft Starter ES (TIA Portal) is the central software for configuring, commissioning, operation, and diagnostics of 3RW5 soft starters.

You connect your PC / programming device to the soft starter via the local interface on the optional 3RW5 HMI High Feature.

By displaying all operating data, service data and diagnostics data, SIRIUS Soft Starter ES supplies reliable information, helping to avoid faults, or quickly locating and eliminating them if they occur.

With the premium license, soft starters can also be parameterized and diagnosed from a central location via PROFIBUS DP or PROFINET on the optional communication module.

SIRIUS Soft Starter ES (TIA Portal) can be downloaded from the Internet (<https://support.industry.siemens.com/cs/ww/en/ps/24231/dl>).

1.10 Additional documentation

Manuals / online help

At this point, you will find further manuals and online help 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.

- 3RW5 topic page (<https://support.industry.siemens.com/cs/ww/en/view/109747404>)
- Equipment Manual for the 3RW52 soft starter (<https://support.industry.siemens.com/cs/ww/en/view/109753751>)
- Equipment Manual for the 3RW55 soft starter (<https://support.industry.siemens.com/cs/ww/en/view/109753752>)
- Equipment manuals for the 3RW5 soft starter (<https://support.industry.siemens.com/cs/ww/en/ps/16212/man>)
- Equipment Manual for the 3RW5 PROFINET communication module (<https://support.industry.siemens.com/cs/ww/en/view/109753754>)
- Equipment Manual for the 3RW5 PROFIBUS communication module (<https://support.industry.siemens.com/cs/ww/en/view/109753753>)
- Equipment Manual for the 3RW5 Modbus TCP communication module (<https://support.industry.siemens.com/cs/ww/en/view/109753755>)
- Online help for SIRIUS Soft Starter ES (TIA Portal)
- Online help for STEP 7
- The EMC Directive 2014/30/EU in practice (<http://www.siemens.com/emc-guideline>)
- Industrial Control Panels and Electronic Equipment of Industrial Machinery for North America (<http://www.siemens.com/UL508A>)
- Control Panels compliant with IEC Standards and European Directives (<http://www.siemens.com/iec60204>)

Interesting links

- FAQs for soft starters 3RW5
(<https://support.industry.siemens.com/cs/ww/en/ps/16212/faq>)
- Downloads for soft starters 3RW5
(<https://support.industry.siemens.com/cs/ww/en/ps/16212/dl>)
- Manuals in Siemens Industry Online Support
(<https://support.industry.siemens.com/cs/ww/en/ps/man>)
- Product support for STEP 7 (TIA Portal)
(<https://support.industry.siemens.com/cs/ww/en/ps/14672>)
- Further information on PROFINET
(<https://www.siemens.com/global/en/home/products/automation/industrial-communication/profinet.html>)
- SIMATIC Modbus/TCP - The easy way to interface SIMATIC controllers to multi-vendor systems (<http://w3.siemens.com/mcms/human-machine-interface/en/customized-products/customized-software/Pages/default.aspx?tabcardname=simatic%20modbus/tcp>)
- Premium Efficiency - Efficiency class IE3
(<http://w3.siemens.com/mcms/topics/en/application-consulting/ie3ready/Pages/Default.aspx>)

1.11 Siemens Industry Online Support

Information and service

At Siemens Industry Online Support you can obtain up-to-date information from our global support database quickly and simply. To accompany our products and systems, we offer a wealth of information and services that provide support in every phase of the lifecycle of your machine or plant – from planning and implementation and commissioning, right through to maintenance and modernization:

- Product support
- Application examples
- Services
- Forum
- mySupport

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

Product support

Here you will find all the information and comprehensive know-how for your product:

- **FAQs**
Our replies 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

With "mySupport", your personal work area, you get the very best out of your Industry Online Support experience. Everything enables you to find the right information - every time.

The following functions are now available:

- **Personal Messages**

Your personal mailbox for exchanging information and managing your contacts

- **Requests**

Use our online form for specific solution suggestions, or send your technical inquiry directly to a specialist in Technical Support

- **Notifications**

Make sure you always have the latest information - individually tailored to your needs

- **Filter**

Simple management and re-use of your filter settings from Product Support and the Technical Forum

- **Favorites / Tagging**

Create your own knowledge database by assigning "Favorites" and "Tags" to documents – simply and efficiently

- **Entries last viewed**

Clear presentation of your last viewed entries

- **Documentation**

Configure your individual documentation from different manuals – quickly and without complications

- **Personal data**

Change personal data and contact information here

- **CAX data**

Simple access to thousands of items of CAX data such as 3D models, 2D dimension drawings, EPLAN macros, and much more

1.12 Technical Assistance

Using the support request form in Online Support you can send your query directly to our Technical Assistance. After describing your query in a few guided steps, you will immediately be provided with possible suggestions for solving the problem.

Technical Assistance:	Telephone: +49 (0) 911-895-5900 (8:00 a.m. - 5:00 p.m. CET) Fax: +49 (0) 911-895-5907 E-mail (mailto:technical-assistance@siemens.com) Internet (http://www.siemens.com/sirius/technical-assistance)
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1.13 Siemens Industry Online Support app

Siemens Industry Online Support app

You can use the Siemens Industry Online Support app to access all the device-specific information available on the Siemens Industry Online Support portal for a particular article number, including operating instructions, manuals, datasheets, FAQs etc.

The Siemens Industry Online Support app is available for iOS, Android or Windows Phone devices. You can download the app from the following links:



Link for Android



Link for iOS



Link for Windows Phone

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:

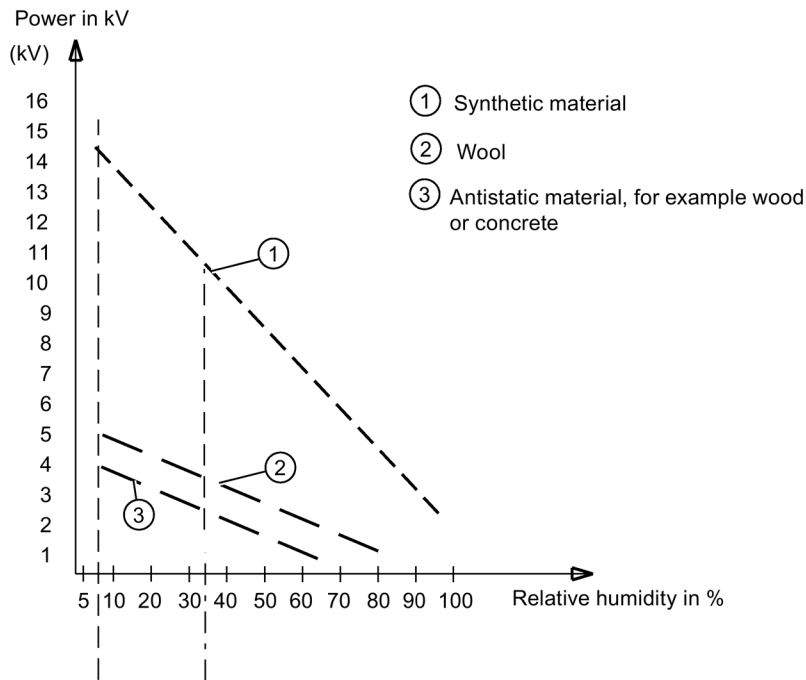


NOTICE
Electrostatic discharge
ESD devices can be destroyed by voltages well below the threshold of human perception. These static voltages develop when you touch a component or electrical connection of a device without having drained the static charges present on your body. The damage caused to a device 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 Five safety rules for working in or on electrical systems

A set of rules, which are summarized in DIN VDE 0105 as the "five safety rules", are defined for working 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 de-energized 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 locked against inadvertent reconnection to ensure that it remains isolated for the duration of the work. This can be achieved, for instance, by locking the motor and system circuit breakers in the OFF position or by unscrewing the fuses and using lockable elements to prevent them from being reinserted.
3. The de-energized 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.

2.3 Reactive power compensation

Capacitors for improving the power factor (reactive power compensation)

Capacitors must not be connected to the output terminals of the 3RW55 soft starter. If capacitors are connected to the output terminals, the 3RW55 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 a contactor disconnect or main contactor are used together with the electronic 3RW55 soft starter, the capacitors must be disconnected from the 3RW55 soft starter when the contactor is open.

2.4 Electromagnetic compatibility (EMC) according to IEC 60947-4-1

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.

2.5 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/industrialsecurity>.

2.6 Recycling and disposal

For environmentally friendly recycling and disposal of your old device, please contact a company certified for the disposal of old electrical and electronic devices and dispose of the device in accordance with the regulations in your country.

Mounting and dismantling

3.1 Mounting the 3RW55 soft starter

Procedure

1. Mount the 3RW55 soft starter on a level surface. (Page 39)
2. Ensure that the permissible temperature range and the necessary clearances are complied with.

Technical data in Siemens Industry Online Support (Page 187)

3. Optionally mount the fan cover. (Page 38)
4. Optionally install the communication module.

You will find further information in the manual for the 3RW5 communication module in question.

Result

The 3RW55 soft starter is now mounted and ready for connection.

The 3RW5 HMI High Feature can be removed and installed in a control cabinet door, for example.

Removing the 3RW5 HMI High Feature (Page 41)

Installing the 3RW5 HMI High Feature in the control cabinet door (Page 44)

Installing the High Feature 3RW5 HMI on a flat surface (Page 43)

3.2 Mounting the fan cover

Requirements

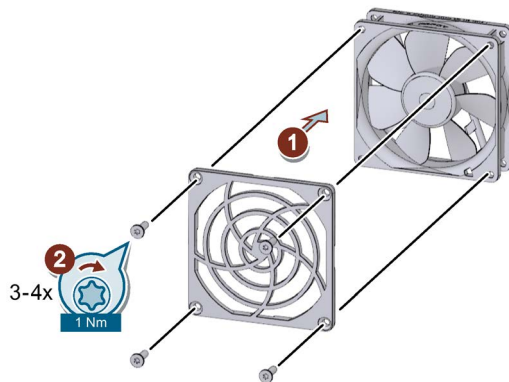
- Screwdriver T20
- Fan cover that matches the size

Size	Article number of the soft starter	Article number of the fan cover	Number of required fan covers
Size 1	3RW551.-.....	3RW5983-0FC00	1
Size 2	3RW552.-.....		2
Size 3	3RW553.-.....		2
Size 4	3RW554.-.....	3RW5984-0FC00	1

Procedure

NOTICE

Material damage due to mechanical load.
 Avoid a mechanical load on the fan hub when mounting the fan cover.



- Place the fan cover on the fan ① and fasten the fan cover ②.
 - Size 1: You require 1 fan cover and 4 screws.
 - Sizes 2 and 3: You require 2 fan covers. Due to the design, 3 screws are sufficient in each case.
 - Size 4: You require 1 fan cover and 4 screws.

Result

The fan cover provides enhanced touch protection and prevents the fan from being blocked by foreign objects.

3.3 Mounting the 3RW55 soft starter on a level surface

Requirements

- Note the mounting positions, minimum clearances and ambient conditions stated on the data sheet.
- Level surface, e.g. sufficiently strong mounting plate
- 4 correctly implemented bore holes
- 4 screws of suitable size and with regular thread for insertion into the selected mounting plate or wall
- Screwdriver (depending on the drive of the screws)

Note

If necessary, use shims and snap rings.

Size	Article number	Screws	Tightening torque
Size 1	3RW551.-.....	M6	5 Nm
Size 2	3RW552.-.....		
Size 3	3RW553.-.....		
Size 4	3RW554.-.....	M8	8 Nm

Procedure

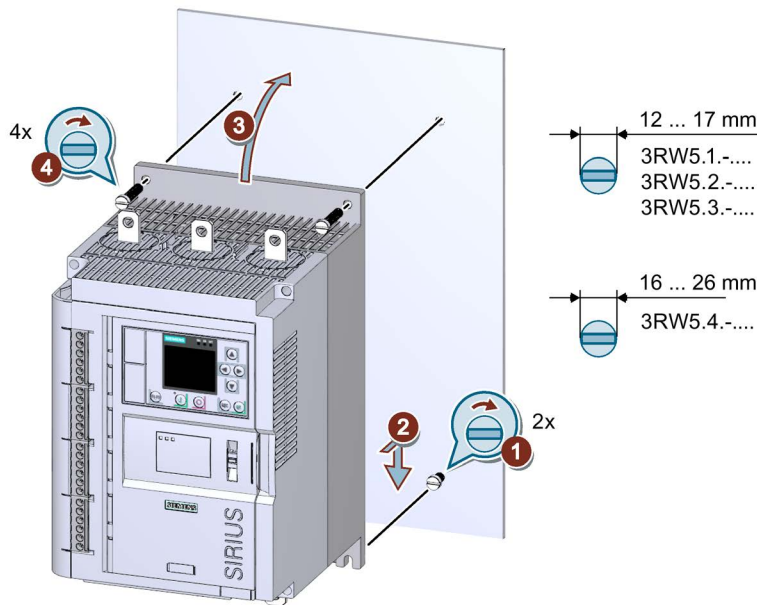
! CAUTION

Heavy device.

Device can cause injury if it falls.

Always ask a second person to help you transport, install and dismantle a heavy device.

Use suitable lifting equipment and wear personnel protective equipment.



- Screw the lower 2 screws into the mounting plate ①. Ensure that both screws protrude a minimum of 1.5 cm (min. 2 cm for size 4) and then place the 3RW55 soft starter onto the 2 lowermost screws ② from above.
- Tilt the 3RW55 soft starter up so that it is resting level against the mounting plate ③ and tighten all 4 screws ④.

3.4 Installing / mounting / removing 3RW5 HMI High Feature

3.4.1 Removing the 3RW5 HMI High Feature

Requirements

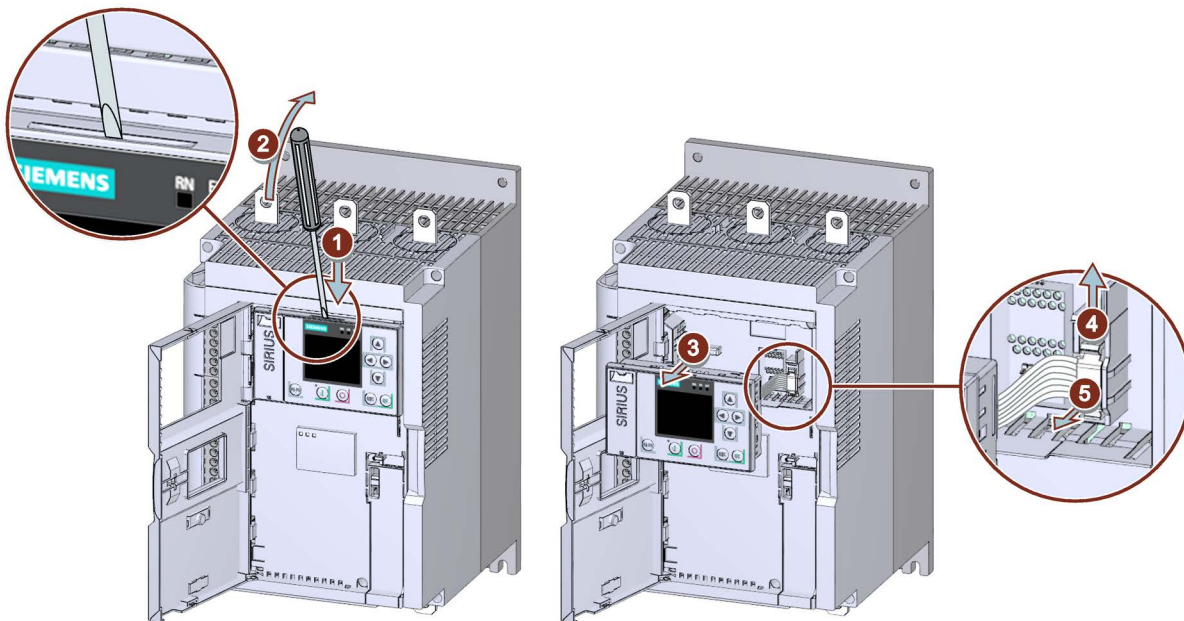
- Flat-bladed screwdriver

Procedure

NOTICE

Damage to sealing surfaces.

Make sure that the sealing surfaces are not damaged by the screwdriver.



- Release the 3RW5 HMI High Feature using a flat-bladed screwdriver in the groove provided ① + ②.
- Pull the 3RW5 HMI High Feature far enough out of the 3RW55 soft starter ③ to gain access to the HMI connecting cable.
- Unfasten the retaining elements of the HMI connecting cable ④ and pull the HMI connecting cable out of the 3RW55 soft starter ⑤.

3.4.2 Installing the 3RW5 HMI High Feature in the 3RW55 soft starter

Requirements

- 3RW5 HMI High Feature
- HMI connecting cable, 0.1 m (accessories)

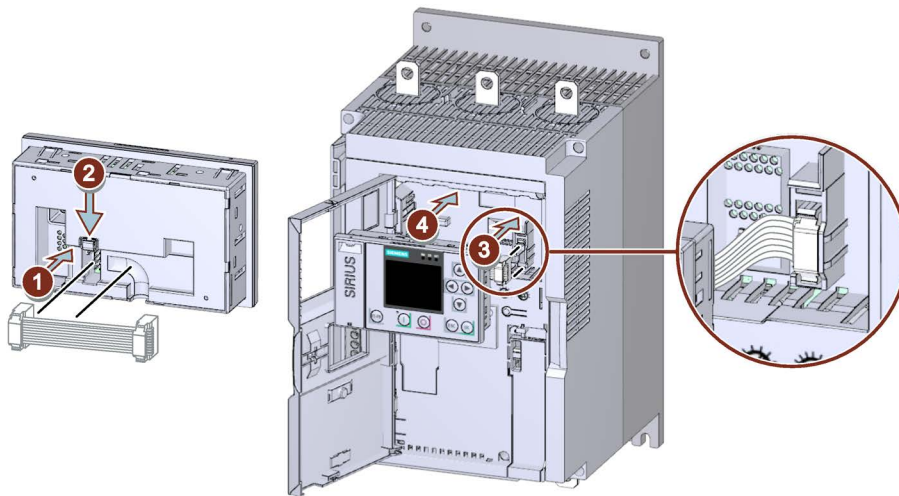
Procedure



NOTICE

Material damage caused by electrostatic charge.

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 discharged your own body. The electrostatic discharge current may result in latent failure of a module, that is, this damage may not be apparent immediately, but may cause malfunction after a lengthy period of operation.



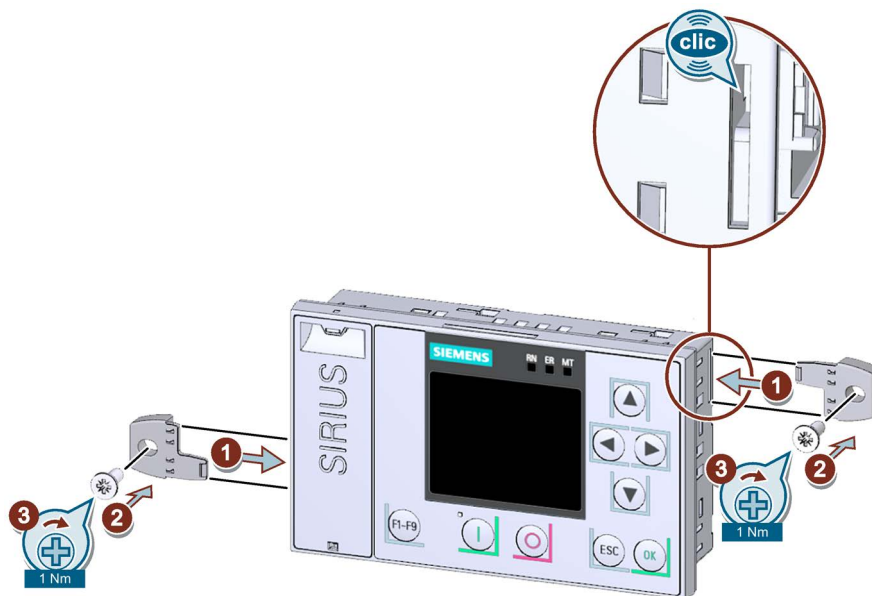
- Observe the coding of the plug and socket ① + ③.
- Observe the cable routing:
 - ① Cable routing to the right
 - ③ Cable routing to the left

3.4.3 Installing the High Feature 3RW5 HMI on a flat surface

Requirements

- Note the mounting positions, minimum clearances and ambient conditions stated on the data sheet.
- Disassembled 3RW5 HMI High Feature
- Level surface, e.g. sufficiently strong mounting plate
- 2 correctly implemented bore holes
- 2 cap screws M4 x 12 DIN ISO 7045 to fit the bore holes
- Screwdriver (depending on the drive of the screws)
- Push-in lugs for wall mounting (accessories)
- Connected HMI connecting cable of suitable length (accessories)

Procedure



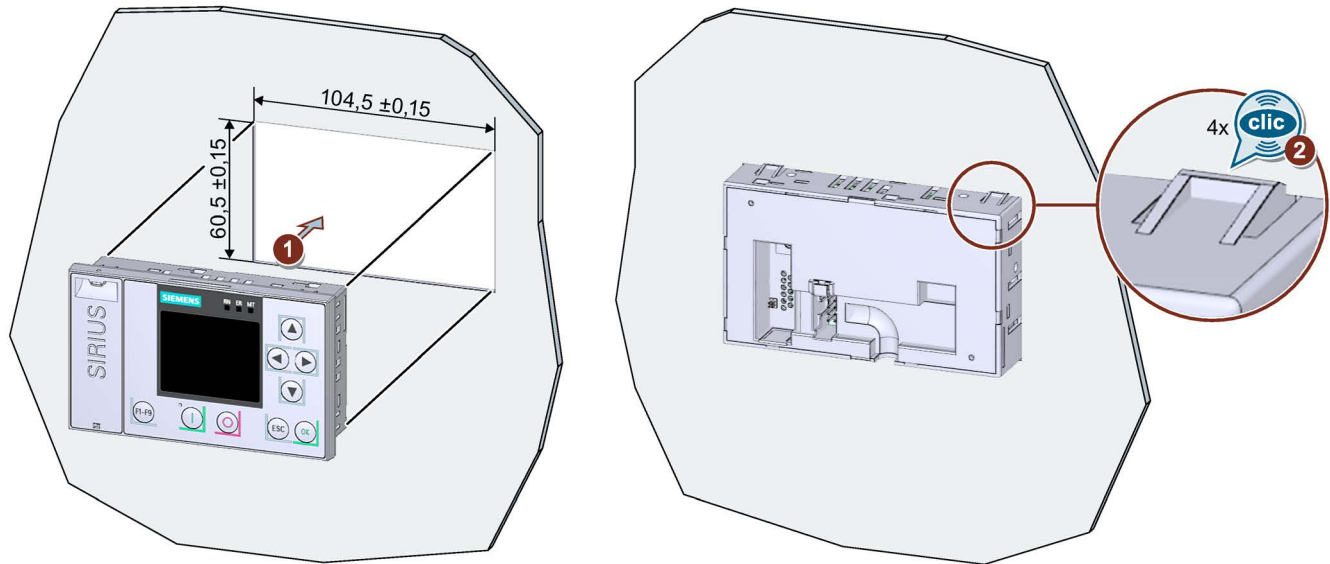
- Connect the connecting cable of the 3RW5 HMI High Feature to the 3RW55 soft starter. Pay attention to the coding of the plug and socket.
- Insert the push-in lugs into each side of the enclosure until you hear them engage ① and fix the 3RW5 HMI High Feature on the wall ② + ③.

3.4.4 Installing the 3RW5 HMI High Feature in the control cabinet door

Requirements

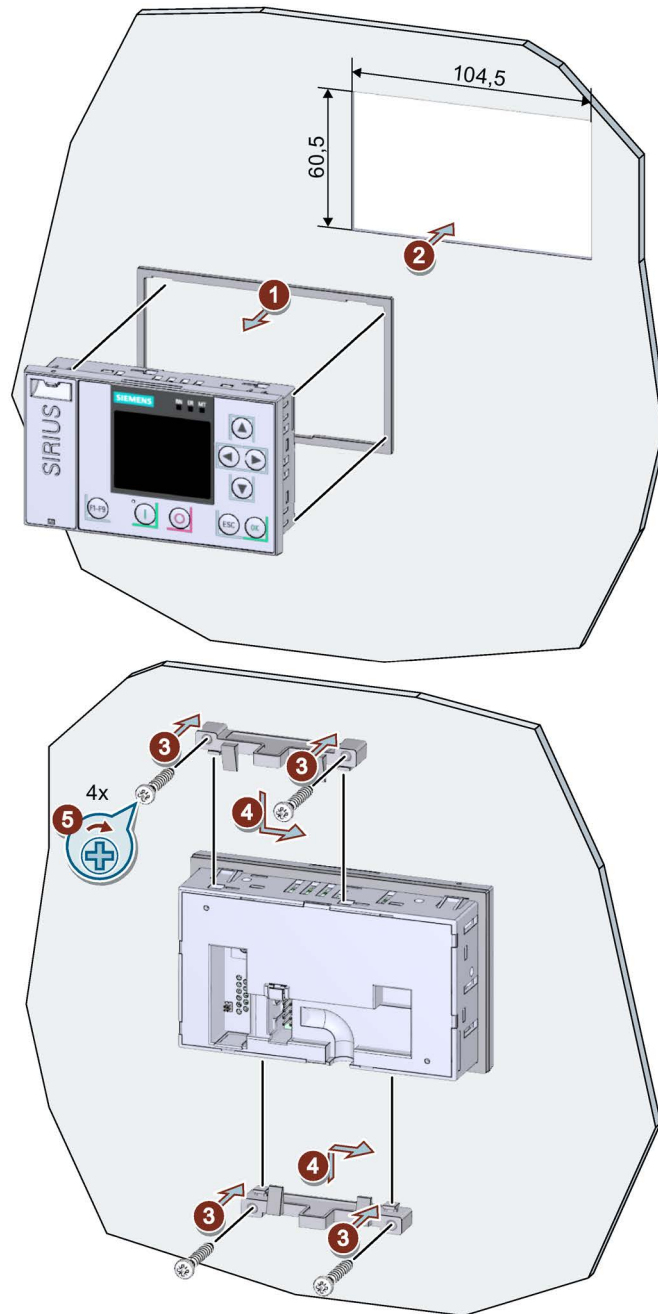
- Note the mounting positions, minimum clearances and ambient conditions stated on the data sheet.
- Disassembled 3RW5 HMI High Feature
- An HMI connecting cable (accessory) of suitable length
- Cutout of suitable size in the control cabinet door
- PZ2 screwdriver in installation with IP65 door mounting kit
- Depth of the 3RW5 HMI High Feature:
 - Total depth: 32 mm
 - Recessed depth: 26 mm
- Permissible wall thickness of the control cabinet door:
 - Without IP65 door mounting kit: 1.5 to 3.0 mm
 - With IP65 door mounting kit: 1.0 to 7.0 mm
- Optional accessories:
 - IP65 door mounting kit

Procedure without IP65 door mounting kit



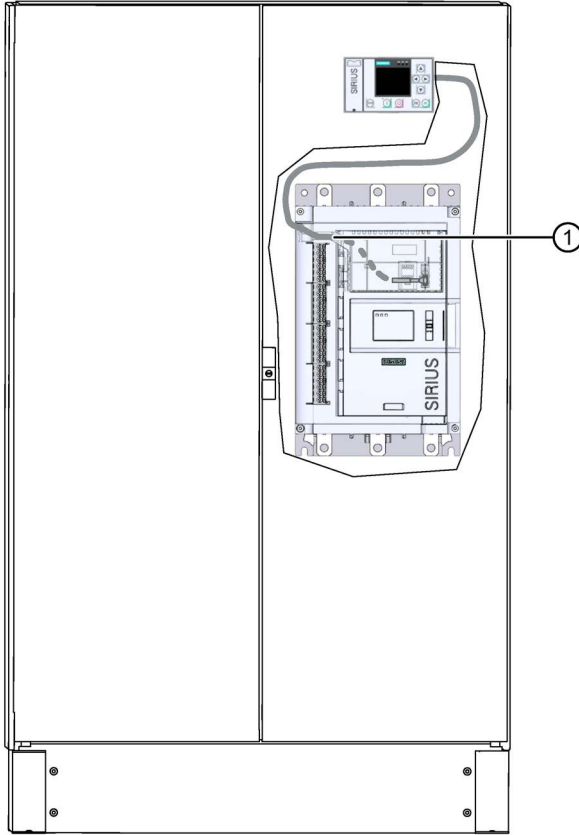
Place the 3RW5 HMI High Feature in the cutout of the control cabinet door ①. Ensure that the 3RW5 HMI High Feature engages audibly in the 4 fixtures ②.

Procedure with IP65 door mounting kit



- Insert the seal of the door mounting kit onto the 3RW5 HMI High Feature ① and place the 3RW5 HMI High Feature into the cutout of the cabinet door ②.
- Continue to screw the screws into the fixing brackets ③ until they protrude approx. 8 mm at the front. Fasten the fixing brackets onto the 3RW5 HMI High Feature ④.
- Tighten the 3RW5 HMI High Feature with a tightening torque of 0.3 ... 0.35 Nm ⑤.
Ensure that the fixing brackets with marking "002" are used.

Procedure for installing the cable



- Connect the connecting cable of the 3RW5 HMI High Feature to the 3RW55 soft starter. Pay attention to the coding of the plug and socket.
- Use the opening to the cable duct ① to install the cable in the 3RW55 soft starter.
- It is possible to route the cable up or down in the cable duct.

Make sure that you install the cable in accordance with EMC requirements. For example, route data cables separately from the motor cable. Connect both sides of shielded cables over a large surface area.

3.4.5 Replacing the hinged cover of the 3RW55 soft starter

Requirements

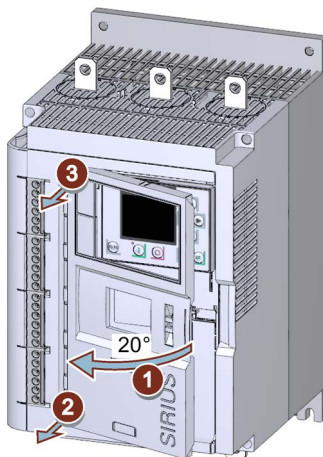
- Optional accessories:
 - Hinged cover without cutout

Procedure

NOTICE

Damage to the HMI display.

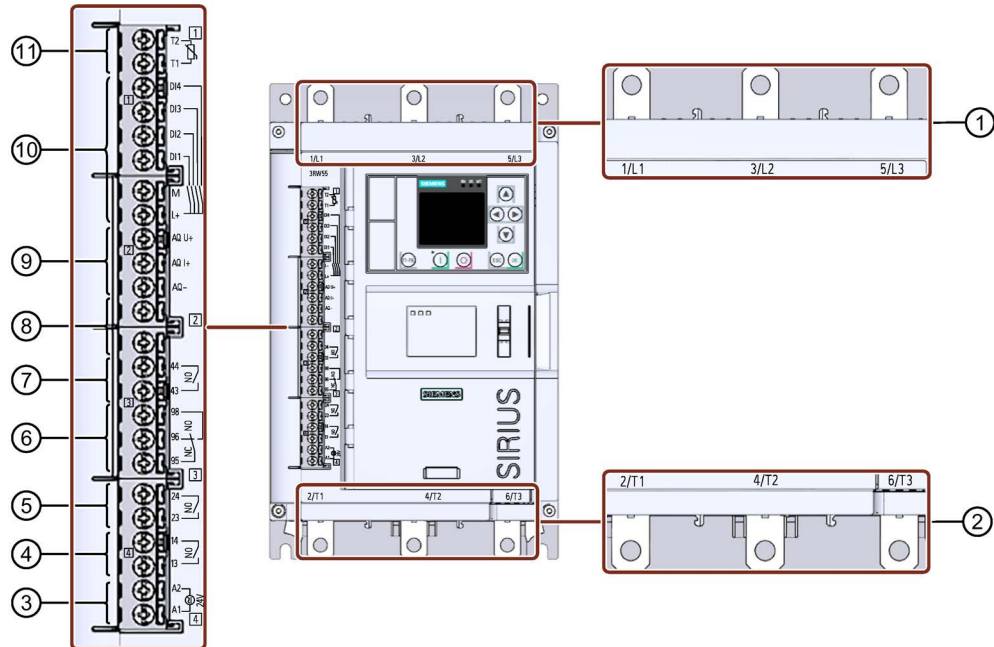
Ensure that the display of the HMI does not sustain damage when replacing the hinged cover.



- Open the hinged cover ① at an angle of approx. 20°.
- Loosen the hinges vertical to the soft starter surface ② + ③ starting from the bottom.
- Take the cover off the 3RW55 soft starter.
- Follow the steps in reverse order to install the replacement hinged cover.

Connecting

4.1 Overview of all connections



- ① Main circuit connection network 1 / L1, 3 / L2, 5 / L3
- ② Main circuit connection load (motor) 2 / T1, 4 / T2, 6 / T3
- ③ A1 / A2: Supply voltage for control terminals
- ④ Output 13, 14 (output 1): For signaling operating states and faults (parameterizable)
- ⑤ Output 23, 24 (output 2): For signaling operating states and faults (parameterizable)
- ⑥ Output 95, 96 and 98 (output 3): For signaling warnings and faults
- ⑦ Output 43, 44 (output 4): For signaling operating states and faults (parameterizable)
- ⑧ Not assigned
- ⑨ Analog output AQ-, AQ I+ and AQ U+: Connection of a measuring device to display the motor current (optional)
 - AQ- / AQ U+: For measuring devices with output signal type Voltage, signal range 0 ... 10 V
 - AQ- / AQ I+: For measuring devices with output signal type Current, signal range 4 ... 20 mA
- ⑩ Control inputs DI1, DI2, DI3, DI4, L+ and M
- ⑪ Thermistor motor protection T1 and T2: Connection of a temperature sensor (optional)

Note

Parameterizing the analog output

You can parameterize the output of the analog output with the 3RW5 HMI High Feature.
(Page 133)

4.2 Connecting the 3RW55 soft starter

Requirements

- Observe the conductor cross-sections and tightening torques in the data sheet or on the front beneath the hinged cover.
- Pay attention to the required tools indicated on the front beneath the hinged cover.
- Optional accessories:
 - Terminal cover for soft starter with sizes 2, 3, and 4

Procedure



<p>! DANGER</p> <p>Hazardous voltage.</p> <p>Will cause death or serious injury.</p> <p>Turn off and lock out all power supplying this device before working on this device.</p>

1. Connect the main circuit connections (line side / motor side) of the 3RW55 soft starter. (Page 51)
2. Optionally mount the terminal covers for sizes 2 / 3 / 4. (Page 53)
3. Connect the control terminals of the 3RW55 soft starter.
 - Connecting the control terminals (screw terminals) (Page 56)
 - Connecting the control terminals (spring-type terminals) (Page 58)
4. Mount the supplied cover for the control cable duct. (Page 62)

Result

The 3RW55 soft starter is connected and ready to operate.

4.3 Connect the 3RW55 soft starter to the main circuit connection (line side / motor side)

Requirements

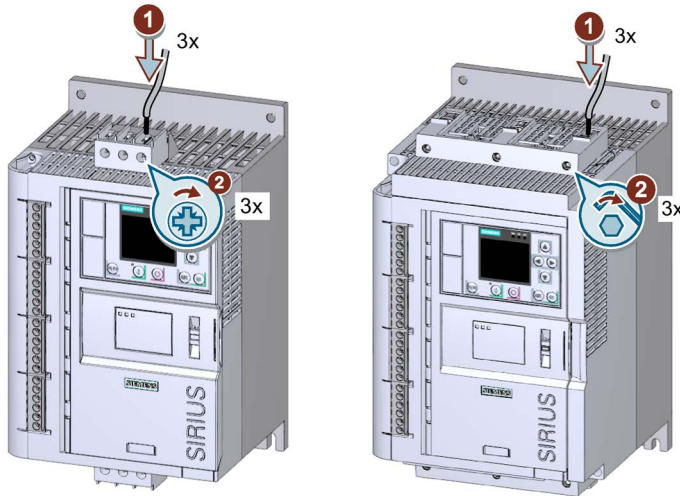
- Observe the conductor cross-sections and tightening torques in the data sheet or on the front beneath the hinged cover.
- Pay attention to the required tools indicated on the front beneath the hinged cover.
- If you use a bar connection, you require wrenches of width A/F 13 and 17.

Size	Article number	Tightening torque
Size 1	3RW5.1.-....	2 ... 2.5 Nm
Size 2	3RW5.2.-....	4.5 ... 6 Nm
Size 3	3RW5.3.-....	10 ... 14 Nm
Size 4	3RW5.4.-....	14 ... 24 Nm



! DANGER
<p>Hazardous voltage.</p> <p>Will cause death or serious injury.</p> <p>Turn off and lock out all power supplying this device before working on this device.</p>

Procedure for screw connection - sizes 1 and 2



- Connect connection 1 / L1, 3 / L2, 5 / L3 to the supply system ① and tighten the screws ②.
- Repeat steps ① + ② for connection 2 / T1, 4 / T2, 6 / T3 with the motor.

Procedure for bar connection - sizes 2, 3, and 4

Pay attention to the diagram on the packaging of the connection set.

- Connect connection 1 / L1, 3 / L2, 5 / L3 to the supply network.
- Connect connection 2 / T1, 4 / T2, 6 / T3 to the motor.

Example circuits

- Feeder assembly, type of coordination 1 fuseless (Page 193)
- Feeder assembly, type of coordination 1 with fuses (Page 194)
- Feeder assembly, type of coordination 2 (Page 195)
- Inside-delta circuit (Page 196)

4.4 Mounting terminal covers on main circuit connections

Requirements

- Optional terminal cover for 3RW55

Note

Touch protection by terminal cover

Touch protection according to EN 50274 finger-safe only for vertical contact from the front.

Procedure

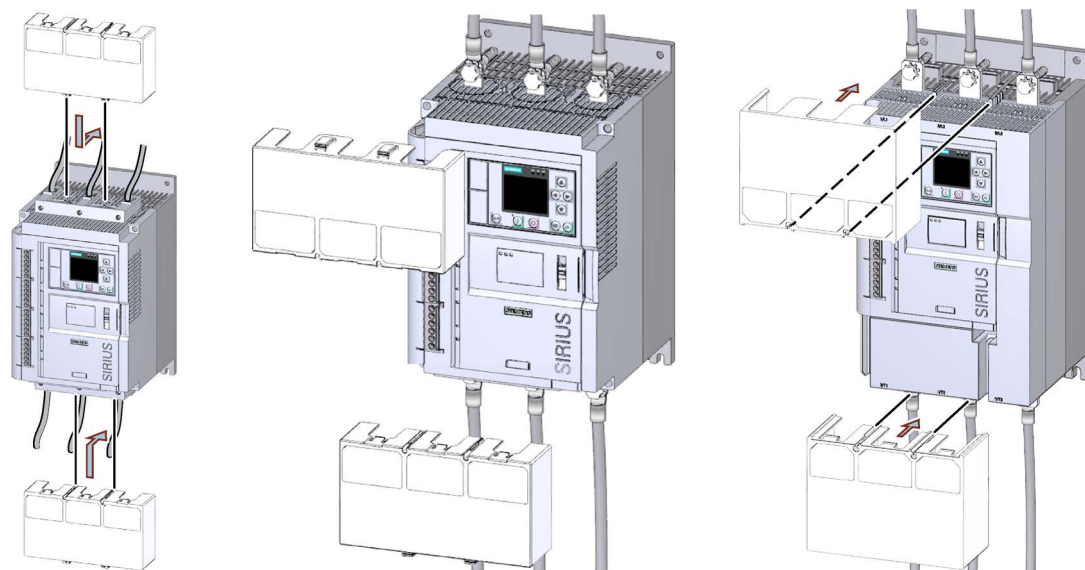


! DANGER

Hazardous voltage.

Will cause death or serious injury.

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



- Make sure that you mount the terminal cover the right way round on the connecting terminal, as shown in the diagram.

4.5 Replacing the terminals on size 2 devices

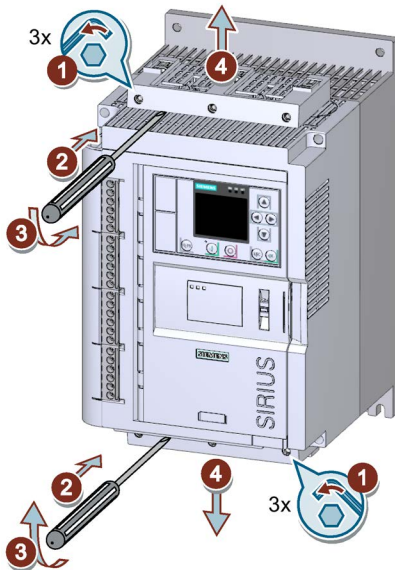
Requirements

- Pay attention to the required tools indicated on the front beneath the hinged cover.

Dismantling procedure

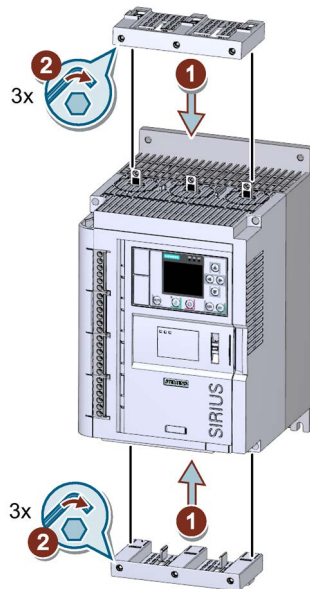


! DANGER
Hazardous voltage.
Will cause death or serious injury.
Turn off and lock out all power supplying this device before working on this device.



- Unscrew the 3 screws on the two connecting terminals ① and lever the terminal off the main circuit connections ② + ③.
- Remove the connecting terminal from the main circuit connection ④.

Assembly procedure



- Plug the new terminal into the main circuit connections ① and tighten the screws with a tightening torque of 4.5 ... 6 Nm ②.

4.6 Connecting the control terminals (screw terminals)

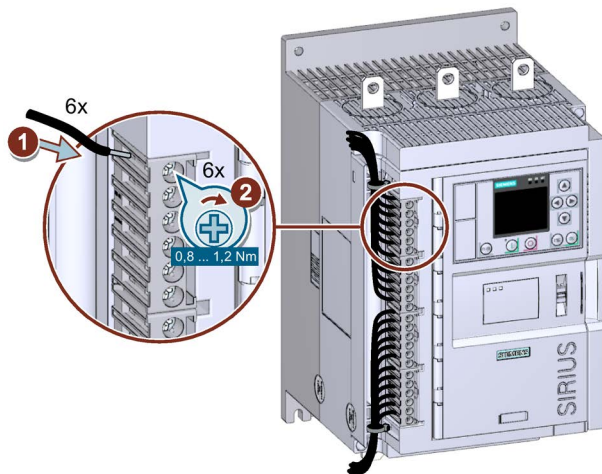
Requirements

- Observe the conductor cross-sections and tightening torques in the data sheet or on the front beneath the hinged cover.
- Pay attention to the required tools indicated on the front beneath the hinged cover.

Procedure



! DANGER
Hazardous voltage.
Will cause death or serious injury.
Turn off and lock out all power supplying this device before working on this device.



Example circuits

You will find additional information on connecting the control terminals in Chapters Control circuit connection (Page 199) and Special applications (Page 204).

4.7 Disconnecting the control current from the screw-type terminals

Requirements

- Pay attention to the required tools indicated on the front beneath the hinged cover.

Procedure

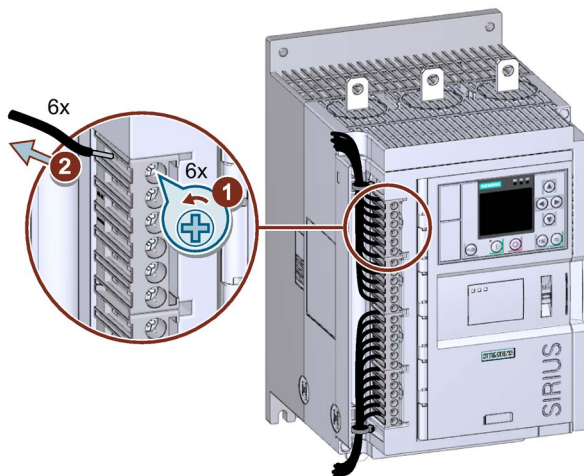


! DANGER

Hazardous voltage.

Will cause death or serious injury.

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



4.8 Connecting the control terminals (spring-type terminals)

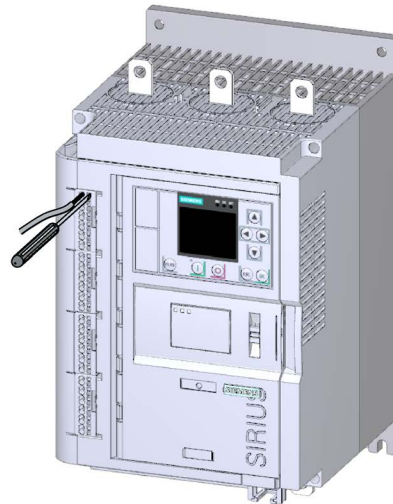
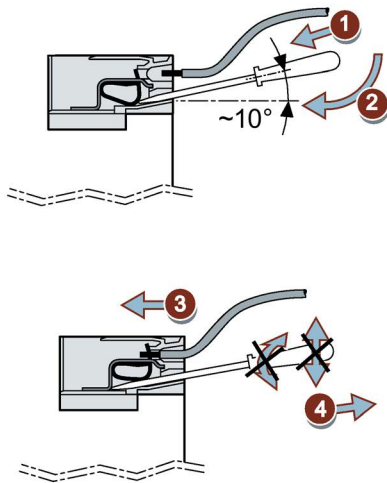
Requirements

- Observe the conductor cross-sections and tightening torques in the data sheet or on the front beneath the hinged cover.
- Pay attention to the required tools indicated on the front beneath the hinged cover.

Procedure



! DANGER
Hazardous voltage.
Will cause death or serious injury.
Turn off and lock out all power supplying this device before working on this device.



Example circuits

You will find additional information on connecting the control terminals in Chapters Control circuit connection (Page 199) and Special applications (Page 204).

4.9 Disconnecting the control current from the spring-loaded terminals

Requirements

- Pay attention to the required tools indicated on the front beneath the hinged cover.

Procedure

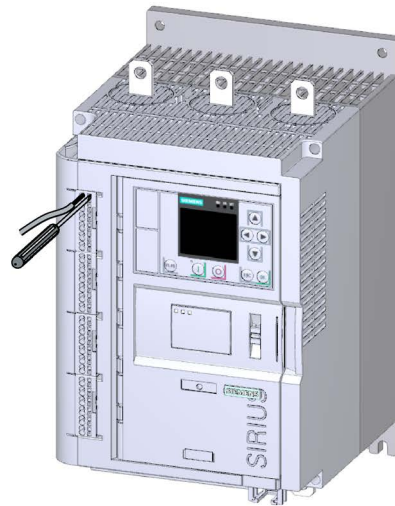
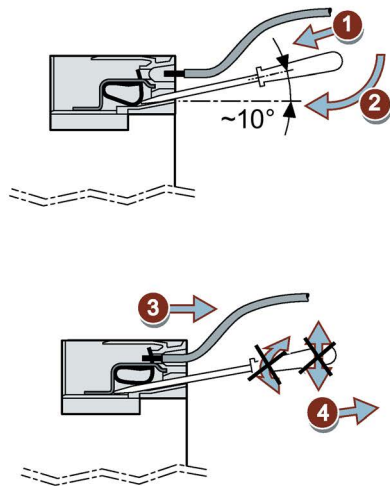


! DANGER

Hazardous voltage.

Will cause death or serious injury.

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



4.10 Replacing the control terminals

Requirements

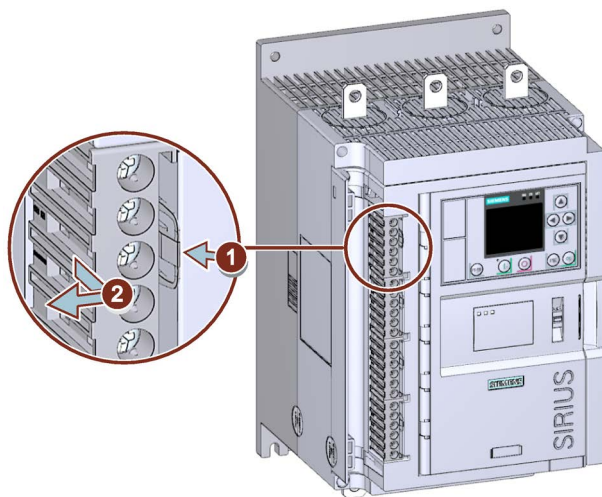
- Remove the cover over the control cable duct.
- Control terminal as spare part

Type of connection	Article number
Screw terminal	3RW5980-1TR00
Spring-loaded connection	3RW5980-2TR00

Dismantling procedure

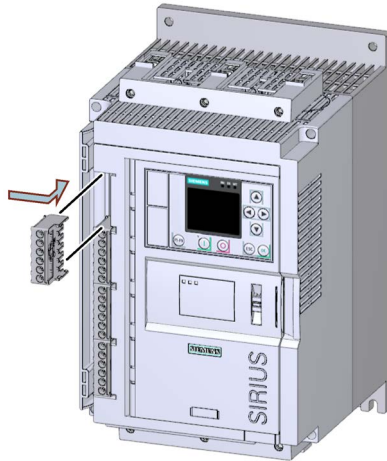


! DANGER
Hazardous voltage.
Will cause death or serious injury.
Turn off and lock out all power supplying this device before working on this device.



- Press against the lock ① and pull the control terminal out ②.

Assembly procedure



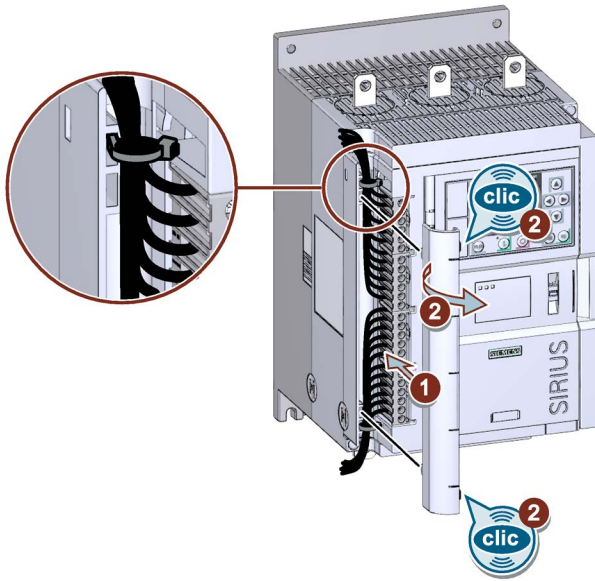
- Place the control terminal onto the intended connection until the terminal engages.

4.11 Installing the cover for the control cable duct

Requirements

- 1-2 cable ties
- Cover for control cable duct (spare part: 3RW5950-0GD20)

Procedure



NOTICE

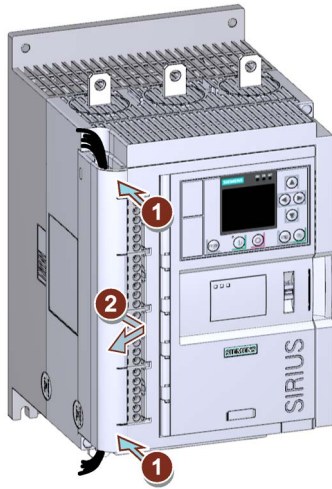
Damage to the cables

Make sure that the cables are not trapped prior to locking.

- Lay the control cables in the control cable ducts and fix the control cables in place with cable ties.
- Press the cover for the control cable duct into the openings ① provided until it audibly engages ②.

4.12 Removing the cover of the control cable duct

Procedure



- Press the cover of the control cable duct at top and bottom ① from the front and remove the cover for the control cable duct of the 3RW55 soft starter ②.

Parameter assignment

5.1 Parameterizing the 3RW55 soft starter

Operating principle

You can parameterize the 3RW55 soft starter in the following ways:

- 3RW5 HMI High Feature
- SIRIUS Soft Starter ES (TIA Portal) via the local interface on the 3RW5 HMI High Feature
- SIRIUS Soft Starter ES (TIA Portal) Premium via fieldbus (3RW5 communication module required)
- Configuration software of the controller on PC / PG

In the following example procedure the 3RW55 soft starter is parameterized with a 3RW5 HMI High-Feature in parameter set 1.

To use additional parameter sets, e.g. in order to start applications with different load conditions (e.g. conveyor belt full and conveyor belt empty), you can define the parameter sets 2 and 3 in the menu "Number of parameter sets (Page 125)".

As soon as more than one parameter set is activated, the relevant parameter sets appear in the menu of the 3RW5 HMI High-Feature. To set the parameter sets 2 and 3, proceed as described below. In the factory setting, parameter set 1 is active.

Application wizard

To enable simple commissioning the 3RW5 HMI High Feature supports various applications with an application wizard. In the menu, navigate to "Parameters > Soft Starter > Application wizard". For more information, see Chapter Application wizard (Page 72).

Requirements

- The 3RW55 soft starter is mounted and connected.
- Rated control voltage and rated operational voltage have been applied.
- 3RW5 HMI High Feature is connected and ready for operation.

Note

Tips for parameterizing the 3RW55 soft starter.

Entering the motor and load data in the STS software (Page 19) will simulate the application and a suitable soft starter will be suggested. In addition, information regarding parameterization is also provided.

Procedure

Set the desired parameters depending on the selected application:

1. Set the motor parameters. (Page 68)
Menu: "Parameters > Soft Starter > Motor parameters"
2. Set the start parameters. (Page 76)
Menu: "Parameters > Soft Starter > Start settings"
Alternatively, use the automatic parameterization. (Page 77)
Menu: "Parameters > Soft Starter > Automatic parameterization"
3. Set the stopping mode parameters. (Page 92)
Menu: "Parameters > Soft Starter > Settings stopping mode"
4. Set the motor protection. (Page 104)
Menu: "Parameters > Soft Starter > Motor protection"
5. Set the creep speed function. (Page 109)
Menu: "Parameters > Soft Starter > Creep speed"
6. Set the Condition Monitoring parameters. (Page 110)
Menu: "Parameters > Soft Starter > Condition Monitoring"
7. Set the asymmetry monitoring parameters. (Page 122)
Menu: "Parameters > Soft Starter > Asymmetry"
8. Set the ground fault monitoring parameters. (Page 123)
Menu: "Parameters > Soft Starter > Ground fault"
9. Set the emergency start. (Page 124)
Menu: "Parameters > Soft Starter > Emergency start"
10. Set the number of parameter sets. (Page 125)
Menu: "Parameters > Soft Starter > Number of parameter sets"
11. Set the inputs. (Page 126)
Menu: "Parameters > Soft Starter > Inputs"
12. Set the outputs. (Page 131)
Menu: "Parameters > Soft Starter > Outputs"
13. Set the additional parameters. (Page 135)
Menu: "Parameters > Soft Starter > Additional parameters"
14. Set the date and time (Page 138).
Menu: "Parameters > Soft Starter > Date and time"
15. Define the characteristics to be monitored.
Monitoring the measured values of the 3RW55 soft starter with the 3RW5 HMI High Feature (Page 152)
Menu: "Monitoring > Measured values"
Monitoring the process image of the 3RW55 soft starter with the 3RW5 HMI High Feature (Page 153)
Menu: "Monitoring > Process image"

Result

The 3RW55 soft starter has been parameterized and is ready for operation. You can now parameterize the 3RW5 HMI High Feature. (Page 155)

If you are using a 3RW5 communication module, set its parameters. You will find further information on operation of the communication module in the manual of the relevant 3RW5 communication module.

5.2 Motor parameters

Setting of the rated operational current I_e is the minimum requirement for operation. The motor parameters are located on the rating plate of the three-phase induction motor being used. You will find a description of all other parameters in Chapter Functions (Page 75).

You can also specify additional parameters under the following menu:
"Parameters > Soft Starter > Motor parameters"

Rated operational current I_e

The rated operational current I_e is the current that can be continuously conducted by the feeder (switchgear and motor). Normally this is the rated current I_e of the motor. The setting range depends on the rating class of the soft starter.

Note

Motor overload protection

If motor overload protection is to be ensured by the soft starter, you must set the rated operational current I_e .

The motor overload protection can be switched off. In this case, motor overload protection must be ensured by means of a temperature sensor in the motor (thermistor motor protection with temperature sensor).

Service factor

The service factor determines the maximum permissible overload factor of the motor in the ramped-up status. At values above 1.05 the motor overload protection trips later.

If a service factor is specified by the manufacturer, select this service factor.

If no service factor is specified, select the service factor 1.0.

Setting range	Factory setting	Increment
1.0 ... 1.15	1.0	0.01

Rated torque

If the motor's rated torque is not indicated on the rating plate, you can calculate it using the following formula:

$$\text{Rated torque (Nm)} = \text{Power (kW)} \times (9\,550 / \text{rated operating speed (rpm)})$$

Setting range	Factory setting	Increment
0 ... 10 000 Nm	0 Nm	1 Nm

Rated operating speed

The rated operating speed is required for calculating the current rated torque.

Setting range	Factory setting	Increment
500 ... 3 600 rpm	1 500 rpm	1 rpm

Type of connection

Type of connection	Description
Automatic detection	The soft starter detects the type of connection (inline circuit or inside-delta circuit) automatically if the load voltage is applied and the motor is connected to the device. Thus no parameterization of the type of connection is necessary.
Inline	The connections of the soft starter are wired into the motor feeder between the motor starter protector and the motor.
Inside-delta	The inside-delta circuit makes it possible to increase the operable motor power of the individual devices by a factor of root 3. Operation in the inside-delta circuit is not possible for 690 V.

Commissioning

6.1 Commissioning the 3RW55 soft starter

Procedure

1. Install the soft starter. (Page 37)
2. Connect up the soft starter. (Page 50)
3. Set the required language, the current date and time and the rated operational current.
Design and operator controls of the High Feature 3RW5 HMI (Page 143)
4. Parameterize the soft starter according to your application. (Page 65)
For support, use the application wizards and the automatic parameterization.
Application wizard (Page 72)
Automatic parameterization (Page 77)
5. Conduct a test run in order to test the application. (Page 154)
6. Optionally, you can conduct a diagnosis including self-test in order to test the correct function of the devices. (Page 175)
7. Set the access protection (optional).
Defining the local access protection (PIN) (Page 159)
User login and logout (Page 161)
Sealing the soft starter (optional) (Page 73)

Result

The 3RW55 soft starter is ready for operation and protected against third-party access. Alternatively commissioning can be performed via an optional communication module and fieldbus system.

You will find additional information on operating modes and the respective control priority in Chapter Operating modes and master control function (Page 14).

6.2 Application wizard

Operating principle

The application wizard enables easy commissioning by suggesting a suitable selection of parameters for specific applications. The application wizard can be used for any set of parameters.

Requirements

- Access protection to the 3RW5 HMI High Feature is not active or has been reset.
- You are in menu "Parameters > Soft Starter > Application wizard"

Procedure

1. You receive a list that is reduced to the relevant parameters.
All parameters that are not displayed remain unchanged.
2. Select the parameters that you would like to adapt.

Alternatively, activate the "Start automatic parameterization" function. In this case, the recommended parameters of the selected application are automatically accepted as the start value for the automatic parameterization: For the PRESET starting time the ramp-up time is adopted as the start value and, for the current limiting, the preset value of the application. Then adjust the rated operational current I_e of the motor connected to the soft starter.

Result

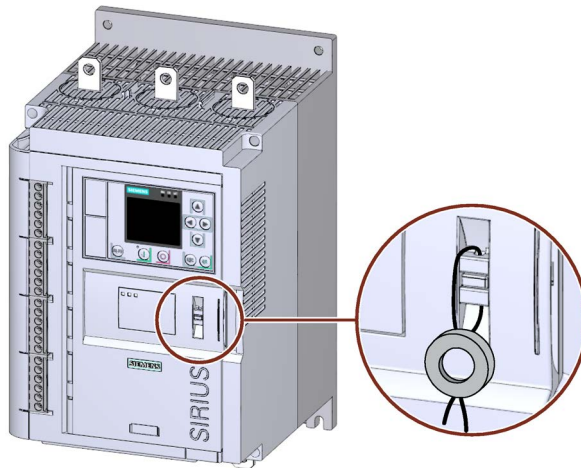
The parameterization has been performed for the selected application. You can make changes to parameters at any time in the "Parameters" menu.

6.3 Sealing the soft starter (optional)

Requirements

- Seal, sealing wire and a suitable sealing tool

Procedure



1. Push the wire through the openings provided.
2. Seal the wire to secure the hinged cover against unauthorized opening.

Result

By sealing the hinged cover, the interface cover of the 3RW5 HMI High Feature is protected against unauthorized access. In addition, the 3RW5 HMI High Feature and the communication module (where present) are protected against unauthorized removal. It is still possible to operate the 3RW5 HMI High Feature.

Tip

If you install the 3RW5 HMI High Feature outside of the soft starter, use an anti-tamper seal on the interface cover to protect the local interface and the slot of the micro SD card from unauthorized access. Proceed in the same sequence as for sealing the spring flap.

For more information, see Chapter Design and operator controls of the High Feature 3RW5 HMI (Page 143).

Functions

7.1 Last changed parameters

Operating principle

For each parameter set, you can view and directly modify the last 10 changed parameters.

7.2 Start-up

7.2.1 Starting modes

Starting modes of the soft starter

The starting mode of the soft starter determines how the motor is ramped up after the start command. You can set various starting modes:

- Soft starting with voltage ramp (Page 79)
- Soft starting with torque control (Page 82)
- Soft starting with voltage ramp and current limiting (Page 85)
- Soft starting with torque control and current limiting (Page 87)
- Direct-on-line starting (Page 88)
- Motor heating (Page 89)

Breakaway pulse

In connection with the four soft starting modes, you can set an advance breakaway pulse. (Page 90)

Tip

The Automatic parameterization (Page 77) supports you during commissioning and optimizes the starting parameters of the soft starter at each motor start.

7.2.2 Automatic parameterization

Operating principle

When automatic parameterization is activated, the soft starter optimizes the starting parameters each time the motor is started. The parameters are selected in such a way that the motor starts immediately with minimum current and does not falter during run-up. Automatic parameterization can be set for each of the parameter sets.

Once the parameters have been stored, you can view the automatically determined values in the parameter settings of the respective parameter set. If you deactivate automatic parameterization, the stored values are no longer modified. The parameters learned in the device are only overwritten if the device is parameterized again.

Note

Prevent overwriting of the starting parameters with the parameter disable

If you insert a 3RW5 communication module (PROFIBUS or PROFINET) and activate a parameter disable, you prevent the learned parameters from being overwritten by the starting parameters during a system restart.

Note

Rated operational current I_e of the motor

Set the rated operational current I_e of the motor before activating the automatic parameterization.

If a rated operational current I_e of the motor has not been set, an input prompt pops up after the automatic parameterization has been activated.

Note

Starting mode of the automatic parameterization

As long as the "automatic parameterization" function is active, the 3RW55 soft starter monitors and analyzes the starting times and the starting currents at every start up.

The 3RW55 soft starter always sets the selected starting mode to "Soft starting with voltage ramp and current limiting (Page 85)".

If another starting mode is required, deactivate the automatic parameterization and modify the corresponding parameters.

Parameters

Parameters	Description
Rated operational current I_e	Depending on the rated operational current I_e of the motor connected to the soft starter.
Application	<p>Selection of all supported applications.</p> <p>When selecting the application, the recommended start values for the parameters "Preset starting time" and "Current limiting value - maximum" are used, depending on the application. You can find these values in the "Extended parameters" menu. Change these values as required.</p> <p>The recommended application parameters for the first start of the automatic parameterization are rough guide values. Change these values as required.</p>
Extended parameters	
Mode	Select the mode depending on the selected application, depending on whether current limiting is recommended or not. You can change the mode manually at any time.
	Off (factory setting) The function is deactivated.
	On - with preset starting time The motor should have reached the rated operating speed after a specified starting time.
	On - with preset starting time and current limiting The motor should reach the rated operating speed after a specified starting time if the current value is limited.
Preset starting time	<p>The time after which the motor should have reached its rated operating speed.</p> <p>If the parameter has the value "0", there is no automatic parameterization. (Identical with the parameter of the Starting time monitoring (Page 118))</p> <p>Depending on the selected application, the corresponding preset values are used for this parameter. Change the preset values as required.</p> <ul style="list-style-type: none"> • Factory setting: 4 s • Setting range: 0 ... 360 s • Increment: 0.1 s
Current limiting value - maximum	<p>This parameter only takes effect in connection with the parameter "Mode" (On - with preset starting time and current limiting).</p> <p>Depending on the selected application, the corresponding preset values are used for this parameter. Change the preset values as required.</p> <ul style="list-style-type: none"> • Factory setting: 400 % • Setting range: 125 ... 800 % • Increment: 1%

7.2.3 Soft starting with voltage ramp

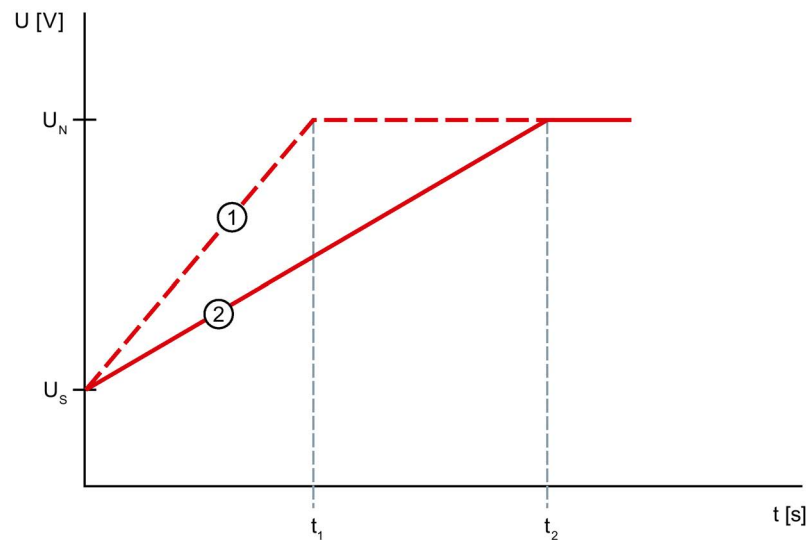
Operating principle

A voltage ramp is used to implement soft starting. The 3RW55 soft starter increases the motor voltage from a parameterizable starting voltage to the line voltage within a definable ramp-up time.

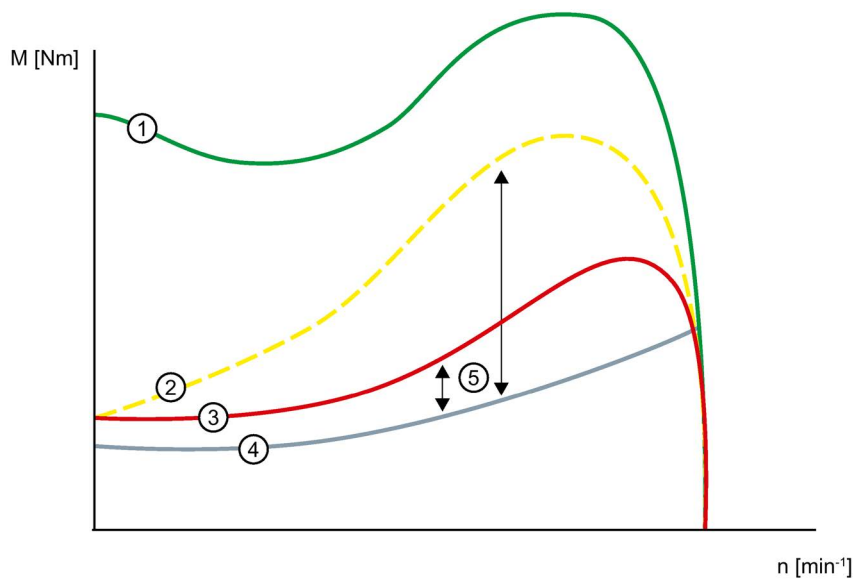
Application

- Conveyor belts
- Systems in which a startup of the drive without interfering jerky movements is required.

Diagrams



- ① Voltage ramp with short ramp-up time t_1
- ② Voltage ramp with long ramp-up time t_2
- U_{rated} Line voltage
- U_s Parameterizable starting voltage
- t_1 Short ramp-up time
- t_2 Long ramp-up time



- ① Torque with direct-on-line starting without the 3RW55 soft starter
- ② Torque with short ramp-up time
- ③ Torque with long ramp-up time
- ④ Torque of the load
- ⑤ Acceleration torque = Difference between activation torque and torque of load

Parameters

Parameters	Description
Starting voltage	<p>The starting voltage determines the starting torque of the motor. A lower starting voltage results in a lower switch-on torque and a lower starting current. Set the starting voltage to a value that ensures that the motor starts up immediately and smoothly once the start command reaches the 3RW55 soft starter.</p> <ul style="list-style-type: none"> • Factory setting: 30% • Setting range: 20 ... 100% • Increment: 5%
Ramp-up time	<p>The ramp-up time determines the time taken to increase the motor voltage from the parameterized starting voltage to the line voltage. This has an influence on the motor's acceleration torque which drives the load during the ramp-up operation. A longer ramp-up time results in a shorter acceleration torque across the motor ramp-up time. The motor therefore runs up more slowly and smoothly.</p> <p>Set the length of the ramp-up time so that the motor can reach its rated speed by the time the end of the ramp is reached. The actual motor starting time is load-dependent and can differ from the parameterized ramp-up time. If you choose a time that is too short, the ramp-up time ends before the motor has accelerated to speed. If the time selected is too short, a very high starting current that equals the direct starting current at the same speed will occur. In this case, the 3RW55 soft starter can switch itself off via the internal overload protection function and go into fault mode.</p> <p>If parameter value "0" is set, the motor is switched on with a ramp-up time of approx. 100 ms.</p> <ul style="list-style-type: none"> • Factory setting: 10 s • Setting range: 0 ... 360 s • Increment: 0.1 s
Maximum starting time	<p>This time determines the period after which the drive must have completed its run-up. If the drive is not operating under rated service conditions after the specified interval has expired, the current limiting is interrupted and the motor is switched to 100%.</p> <p>Maximum starting time \geq ramp-up time.</p> <ul style="list-style-type: none"> • Factory setting: 0 s • Setting range: 0 ... 1 000 s • Increment: 0.1 s
Breakaway time	See Breakaway pulse for startup functions (Page 90)
Breakaway voltage	

7.2.4 Soft starting with torque control

Operating principle

Torque control means that the torque generated in the motor is linearly increased from a parameterizable starting torque up to a parameterizable end torque within an adjustable starting time.

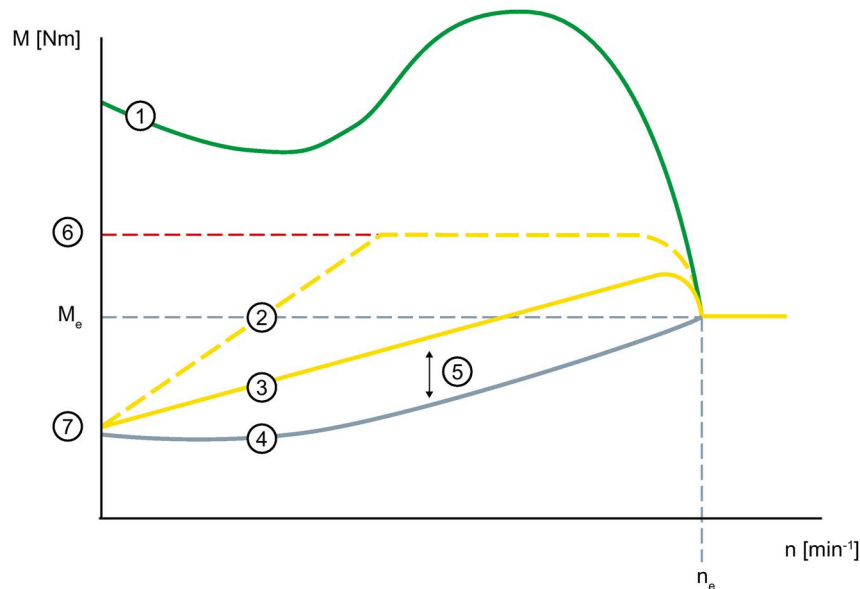
The advantage over a voltage ramp is the improved mechanical run-up behavior of the machine. The soft starter controls the torque generated on the motor continuously and linearly according to the set parameters until the motor has completed its run-up.

For optimum torque control during the starting procedure, enter the motor data of the motor connected to the soft starter in the selected parameter set.

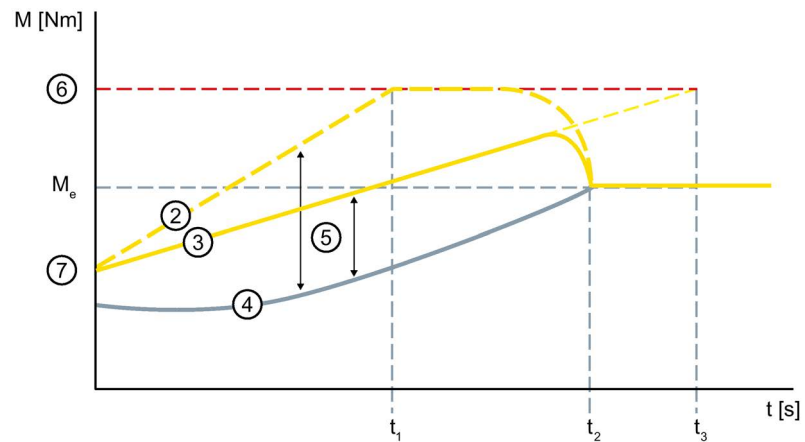
Application

- Uniform, load-mitigating ramp-up
- Machines that require a breakaway pulse, e.g. mills, crushers and drives with journal bearings.

Diagrams



- ① Torque with direct-on-line starting without the 3RW55 soft starter
- ② Torque with short ramp-up time
- ③ Torque with long ramp-up time
- ④ Torque of the load
- ⑤ Acceleration torque = Difference between activation torque and torque of load
- ⑥ Parameterizable limiting torque
- ⑦ Parameterizable starting torque
- M_e Rated torque
- n_e Rated motor speed



- ② Torque with short ramp-up time
- ③ Torque with long ramp-up time
- ④ Torque of the load
- ⑤ Acceleration torque = Difference between activation torque and torque of load
- ⑥ Parameterizable limiting torque
- ⑦ Parameterizable starting torque
- t_1 Parameterizable ramp-up time
- t_2 Motor has started up and is in rated operation. The run-up is detected and the bypass contacts close
- t_3 Parameterizable ramp-up time
- M_e Rated torque

Parameters

Parameters	Description
Starting torque	<p>The starting torque determines the switch-on torque of the motor. A lower starting torque results in a lower switch-on torque and a lower starting current. Select a sufficiently high starting torque to ensure that the motor starts immediately and smoothly when the start command is issued to the soft starter.</p> <ul style="list-style-type: none"> • Factory setting: 10 % • Setting range: 10 ... 100 % • Increment: 5%
Limiting torque	<p>The limiting torque value specifies the maximum torque to be generated in the motor during run-up. This value also functions as an adjustable torque limit. The parameter value should be set to approx. 150% to start the motor. It should be high enough to ensure that the motor does not falter during run-up. This ensures that enough acceleration torque is generated throughout the motor run-up phase. The rated torque of the motor serves as the reference value.</p> <p>Limiting torque > Starting torque</p> <ul style="list-style-type: none"> • Factory setting: 150 % • Setting range: 20 ... 200 % • Increment: 5%
Ramp-up time	<p>The length of the ramp-up time determines the time in which the starting torque is increased to the limiting torque. This has an influence on the motor's acceleration torque which drives the load during the ramp-up operation. A longer ramp-up time results in a shorter acceleration torque across the motor ramp-up time. The motor therefore runs up more slowly and smoothly.</p> <p>The actual motor starting time is load-dependent and can differ from the parameterized ramp-up time. If the starting time ends before the motor has completely run up, the torque is limited to the set limiting torque until the soft starter recognizes the run-up process and closes the internal bypass contacts. If parameter value "0" is set, the motor is switched on with a ramp-up time of approx. 100 ms.</p> <ul style="list-style-type: none"> • Factory setting: 10 s • Setting range: 0 ... 360 s • Increment: 0.1 s
Maximum starting time	<p>This time determines the period after which the drive must have completed its run-up. If the drive is not operating under rated service conditions after the specified interval has expired, the current limiting is interrupted and the motor is switched to 100%.</p> <p>Maximum starting time ≥ ramp-up time.</p> <ul style="list-style-type: none"> • Factory setting: 0 s • Setting range: 0 ... 1 000 s • Increment: 0.1 s
Breakaway time	See Breakaway pulse for startup functions (Page 90)
Breakaway voltage	

7.2.5 Soft starting with voltage ramp and current limiting

Operating principle

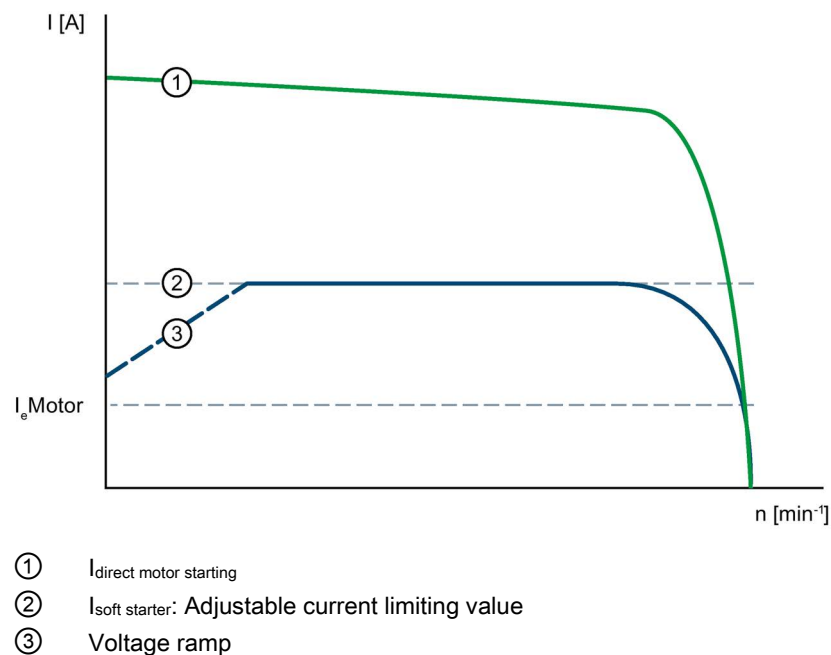
Select the startup function voltage ramp + current limiting if, at the same time as protecting the system during startup, you want to ensure that a specific current value is not exceeded during motor starting.

The motor is always started up with the voltage ramp. If the current exceeds the parameterized current limit, the voltage ramp function is aborted and the current limiting function starts. If the motor current drops below the limit value again, depending on the advanced stage of run-up, then the voltage ramp function takes over control again until the motor has finished running up.

Application

- Avoiding current surges
- Reducing energy costs

Diagram



Parameters

Parameters	Description
Current limiting value	<p>Set the current limiting value, as a factor of the rated motor current, to the maximum current required during startup. Once the set current limiting value has been reached, the motor voltage is reduced or controlled by the soft starter to prevent the current from exceeding the set current limiting value.</p> <p>Select a minimum current limiting value that is 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.</p> <p>(Identical with the parameter of the Automatic parameterization (Page 77) / Soft starting with torque control and current limiting (Page 87))</p> <ul style="list-style-type: none"> • Factory setting: 400 % • Setting range: 125 ... 800 % • Increment: 1%

In addition, the parameters of the voltage ramp startup function apply.

7.2.6 Soft starting with torque control and current limiting

Operating principle

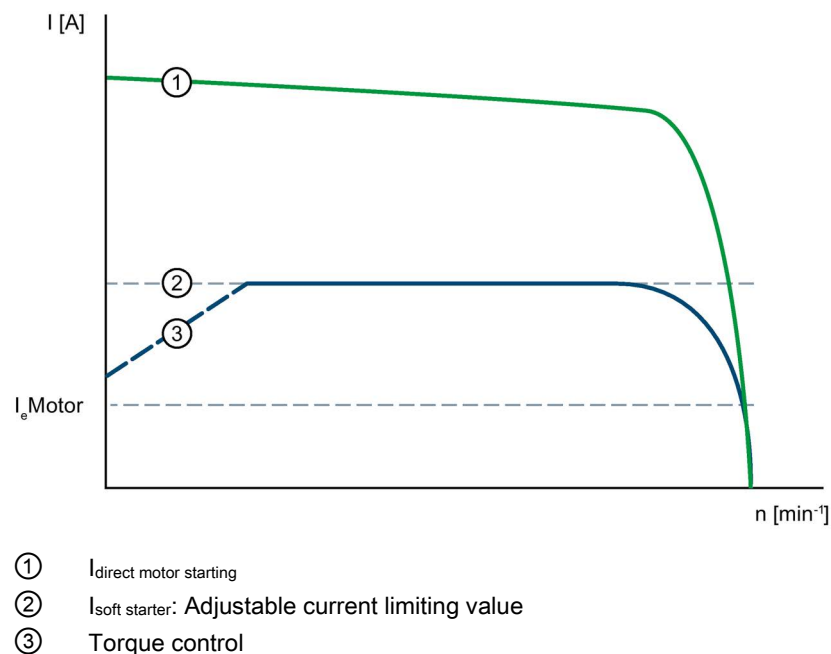
Select the startup function torque control + current limiting if, at the same time as protecting the system during startup of the motor or the connected load, you want to ensure that a specific current value is not exceeded.

The motor is always started up with the torque control. If the current exceeds the parameterized current limit, the torque ramp is aborted and the current limiting function starts. If the motor current drops below the limit value again, depending on the advanced stage of run-up, then the torque ramp function takes over control again until the motor has finished running up.

Application

- Avoiding current surges
- Reducing energy costs
- During heavy starting

Diagram



Parameters

Parameters	Description
Current limiting value	<p>Set the current limiting value, as a factor of the rated motor current, to the maximum current required during startup. Once the set current limiting value has been reached, the motor voltage is reduced or controlled by the soft starter to prevent the current from exceeding the set current limiting value.</p> <p>Select a minimum current limiting value that is 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.</p> <p>(Identical with the parameter of the Soft starting with voltage ramp and current limiting (Page 85) / Automatic parameterization (Page 77))</p> <ul style="list-style-type: none"> • Factory setting: 400 % • Setting range: 125 ... 800 % • Increment: 1%

In addition, the parameters of the torque control startup function apply.

7.2.7 Direct-on-line starting

Operating principle

The motor is switched on immediately without closed-loop control in the direction of rotation (right/CW = line phase direction). This takes place without being influenced by current limiting by the soft starter, for example.

If the "direct" starting mode is set, the motor voltage is increased immediately to the level of the supply voltage once the start command has been issued. This is equivalent to the start behavior with a contactor, i.e. no limitation of the starting current and the starting torque.

7.2.8 Motor heating

Operating principle

The "motor heating" starting mode heats up the motor. No startup takes place. The motor heating remains switched on for as long as the control command "Motor CW" or "Motor CCW" is present.

Assign your own set of parameters for the motor heating to enable you to switch quickly and easily between the motor heating and the actual startup.

Application

- Used for drives outdoors to minimize condensation inside the motor.

Parameters

NOTICE
Damage to property through motor heating in continuous operation
The "motor heating" starting mode is not a continuous operating mode. The motor must be equipped with a temperature sensor to ensure motor protection. The motor model with integrated electronic motor overload protection is not suitable for this kind of operation.

Parameters	Description
Motor heating power	Set the parameter so that the motor is not damaged. 100 % motor heating corresponds to a comparable motor current of about 30 % of the rated motor current. <ul style="list-style-type: none">• Factory setting: 20%• Setting range: 1 ... 100 %• Increment: 1%

7.2.9 Breakaway pulse for startup functions

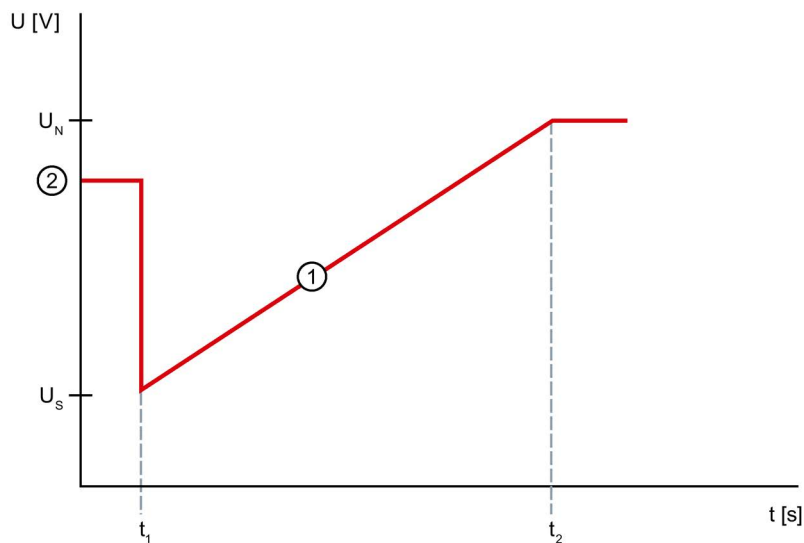
Operating principle

It may be necessary to create a breakaway pulse at the beginning of the machine's starting process. Using the breakaway pulse, the high limiting friction of the load can be overcome and the machine can be set into motion. The breakaway pulse is used in conjunction with the start type of the voltage ramp, the torque control, or the current limiting and overlays this during the set breakaway time.

Application

- Mills
- Crushers
- Drives with journal bearings

Diagram



- ① Voltage ramp
- ② Parameterizable breakaway voltage
- t_1 Breakaway time
- $t_1 \dots t_2$ Ramp-up time
- U_{rated} Line voltage
- U_s Parameterizable starting voltage

Parameters

Parameters	Description
Breakaway time	<p>The breakaway time determines the period during which the breakaway voltage is to be present. Once the breakaway time has expired, the soft starter begins its run-up procedure with the selected type of start, e.g. the voltage ramp or torque control.</p> <p>Select a breakaway time that is at least long enough to ensure that, after the set time has elapsed, the motor does not stop again but continues to accelerate in the selected start type immediately.</p> <p>The parameter value "0" deactivates the breakaway pulse function.</p> <ul style="list-style-type: none"> • Factory setting: 0 s • Setting range: 0 ... 2 s • Increment: 0.01 s
Breakaway voltage	<p>The breakaway voltage is used to set the breakaway torque to be generated. The breakaway torque can be up to 100% of the switch-on torque generated during direct-on-line starting.</p> <p>Select a breakaway voltage that is high enough to ensure that the motor starts rotating as soon as the start command is issued to the soft starter.</p> <ul style="list-style-type: none"> • Factory setting: 40 % • Setting range: 40 ... 100 % • Increment: 5%

7.3 Run-down

7.3.1 Types of soft stop

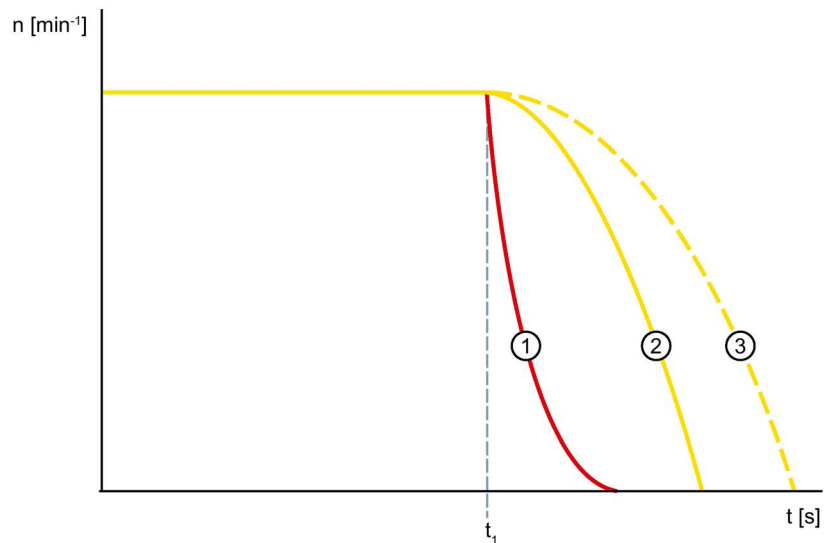
Stopping function of the soft starter

Just like starting, stopping can also be adapted to the application:

You can set various types of stopping:

- Coasting down (Page 93)
- Torque control (Page 94)
- Pump stop (Page 96)
- DC braking with external braking contactor (Page 98)
- Dynamic DC braking without contactor (Page 100)
- Voltage ramp (Page 102)
- Alternative stopping (Page 103)

Diagram



- ① n_{DC} braking
- ② n_{free} ramp-down
- ③ n_{torque} controlled ramp-down
- t_1 Stop command on soft starter

7.3.2 Coasting down

Operating principle

Coasting down means the power supplied to the motor via the soft starter is interrupted when the ON command is removed from the soft starter. The motor will coast down freely without closed-loop control, driven only by the mass inertia (centrifugal mass) of the rotor and load. This is also referred to as natural stopping. A larger centrifugal mass means a longer stop time without load.

Coasting down is used for loads that make no special demand on the startup characteristic.

Application

- Fans

7.3.3 Torque control

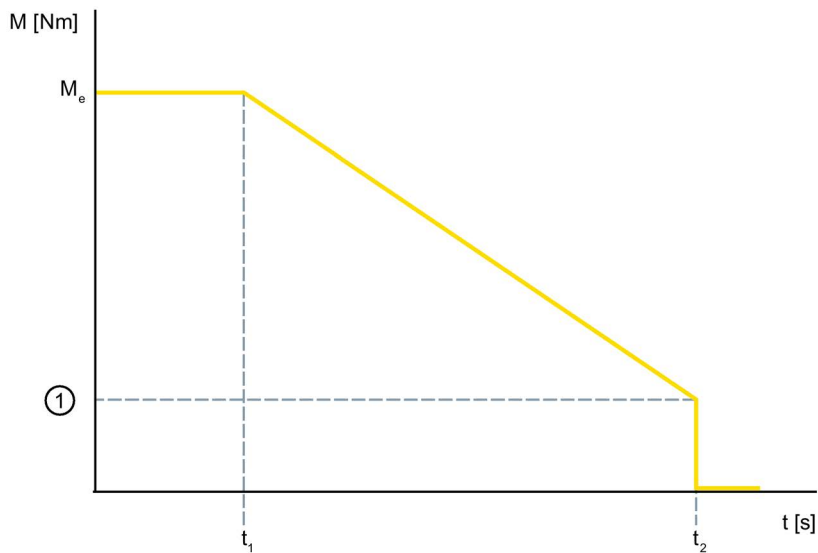
Operating principle

Torque-controlled stopping extends the stopping of the load. The motor is powered down on a linear, negative torque ramp. This function is activated if there is a need to prevent the load from being stopped abruptly.

Application

- For conveyor belts, to prevent the conveyed materials from toppling.
- Applications with a low mass inertia or a high counter-torque.

Diagram



- ① Stopping torque
- $t_1 \dots t_2$ Stopping time
- M_e Rated torque

Parameters

Note

Motor data

For optimum torque control during the stopping procedure, enter the motor data of the motor connected to the soft starter in the selected parameter set using the "Motor parameters" menu item. The "Motor parameters" menu item can be found at the following path: "Parameters > Soft Starter > Motor parameters".

Parameters	Description
Stopping time	<p>The length of the stopping time defines the time within which the motor voltage is reduced from line voltage to 0 V.</p> <p>It may take longer for the motor to actually coast down to a standstill.</p> <p>The parameter value "0" causes the motor to be shut down immediately without a down ramp.</p> <ul style="list-style-type: none">• Factory setting: 10 s• Setting range: 0 ... 360 s• Increment: 0.1 s
Stopping torque	<p>The motor torque is "controlled" until the stopping torque is reached and then switched off.</p> <ul style="list-style-type: none">• Factory setting: 10 %• Setting range: 10 ... 100 %• Increment: 5%

7.3.4 Pump stop

Operating principle

In the case of a torque-controlled pump stop, the stopping of the load is extended. This function is set if there is a need to prevent the load from being stopped abruptly. This is typical in applications with a low mass inertia or a high counter-torque. In order to use the "alternative stopping" function, activate the "alternative stopping mode" control function via one of the following control sources:

- Input action
- 3RW5 communication module (PIQ)
- 3RW5 HMI High Feature

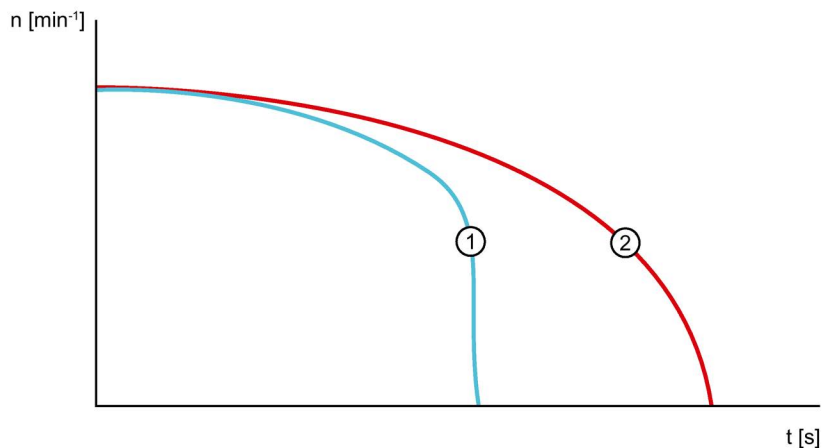
You will find additional information on input actions in Chapter Control (Page 154).

Due to the very low moment of inertia in pumps, the pump operating mechanism (motor) can come to a standstill suddenly when shutting down, due to the counter-pressure of fluid in the piping system. This can result in pressure fluctuations in the pipe system which in turn cause loud noises (water hammer) and mechanical problems, e.g. to return valves. For this reason, the flow rate of the pump is reduced gradually during pump stop. In the case of smaller pumps this effect can often be ignored.

Application

- Drives for which the abrupt stopping of the load is to be prevented.
- Applications with a low mass inertia or a high counter-torque.

Diagram



- ① Voltage ramp stopping mode
- ② Pump stop stopping mode

Parameters

Note

Motor data

For optimum torque control during the stopping procedure, enter the motor data of the motor connected to the soft starter in the selected parameter set using the "Motor parameters" menu item. The "Motor parameters" menu item can be found at the following path: "Parameters > Soft Starter > Motor parameters".

Parameters	Description
Stopping time	<p>The length of the stopping time defines the time within which the motor voltage is reduced from line voltage to 0 V.</p> <p>It may take longer for the motor to actually coast down to a standstill.</p> <p>The parameter value "0" causes the motor to be shut down immediately without a down ramp.</p> <ul style="list-style-type: none">• Factory setting: 10 s• Setting range: 0 ... 360 s• Increment: 0.1 s
Stopping torque	<p>The motor torque is "controlled" until the stopping torque is reached and then switched off.</p> <ul style="list-style-type: none">• Factory setting: 10 %• Setting range: 10 ... 100 %• Increment: 5%

7.3.5 DC braking with external braking contactor

Operating principle

In the case of DC braking, the coasting down or the natural stopping of the load is shortened by electrical braking using a braking contactor. The soft starter imposes a (pulsating) direct current in phases L1 and L2 on the motor stator. This current generates a permanent magnetic field in the stator. Since the rotor is still rotating due to its mass inertia, currents are induced in the short-circuited rotor winding that generate a DC braking torque. If the braking process is not completed on expiry of the stopping time, the motor coasts down.

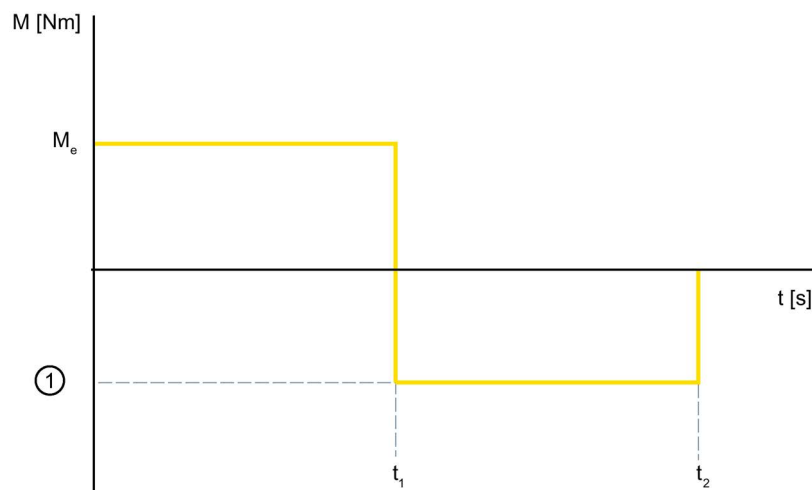
In order to guarantee a secure premature cancelation of the braking process, an external motor standstill detection can be used to detect the motor standstill before the stopping time has elapsed. To do this, activate the input action "Motor standstill" or the associated bit in the process image output "Motor standstill".

For more information about the operating principle, see Chapters 3RW55 soft starters in inline circuit and stopping function, DC braking with a braking contactor (Page 204) and 3RW55 soft starters in inline circuit and stopping function, DC braking with 2 braking contactors (Page 206).

Application

- Use the "DC braking" function if applications with small mass inertias (centrifugal masses) are to be stopped ($J_{load} \leq 5 \times J_{motor}$).
- Lathes (e.g. when replacing tools)
- Circular saws
- Punches
- Conveyor belts

Diagram



- ① DC braking torque
- t_1 Stop command on soft starter
- $t_1 \dots t_2$ Stopping time
- M_e Rated torque

Requirements

In this braking variant, one output of the soft starter must be changed over to "DC braking", through which an external braking contactor is controlled.

Parameters

Note

Type of connection

The "DC braking" stopping function is not possible in inside-delta circuits.

Parameters	Description
Stopping time	On expiry of the stopping time, the DC braking is automatically terminated. The parameter value "0" causes the motor to be switched off immediately without DC braking.
DC braking torque	The motor's braking force can be set with the amount of the DC braking torque. <ul style="list-style-type: none"> • Factory setting: 50% • Setting range: 20 ... 100% • Increment: 5%

7.3.6 Dynamic DC braking without contactor

Operating principle

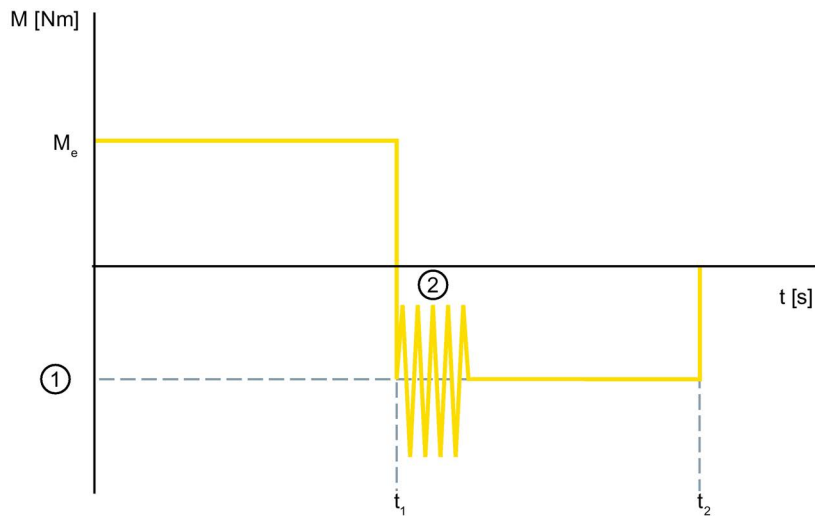
The braking process takes place in two phases. In the first phase, the motor is braked by controlled DC braking pulses. In the second phase, the motor is brought to a standstill with a constant DC braking. Use the DC braking function to achieve a uniformly long braking time.

In order to guarantee a secure premature cancelation of the braking process, an external motor standstill detection can be used to detect the motor standstill before the stopping time has elapsed. To do this, activate the input action "Motor standstill" or the associated bit in the process image output "Motor standstill".

Application

- If applications with small mass inertias (centrifugal masses) are to be stopped ($J_{load} \leq J_{motor}$).
- If an electrical braking process without braking contactor is required.

Diagram



- ① DC braking torque
- ② Dynamic braking torque
- t_1 Stop command on soft starter
- $t_1 \dots t_2$ Stopping time
- M_e Rated torque

Parameters

NOTICE
<p>Property damage due to DC braking pulses</p> <p>DC braking pulses cause a higher current load and motor-specific noises and vibrations.</p> <p>This can lead to premature failure of motor bearings. It may be necessary to overdimension the soft starter.</p>

Parameters	Description
Stopping time	<p>The stopping time specifies the period during which the DC braking torque is to be generated on the motor. The chosen braking time should be long enough to bring the load to a standstill. To achieve an adequate braking effect down to standstill, the centrifugal mass (J) of the load should not exceed that of the motor. The length of the stopping time should be chosen such that the motor comes to a standstill. Standstill detection does not take place in the soft starter and, if required, must be realized by means of external measures.</p> <p>The actual stopping time may vary with this braking process.</p>
DC braking torque	<p>The motor's braking force can be set with the amount of the DC braking torque. The dynamic braking torque must be increased if the motor is to accelerate again during DC braking.</p> <ul style="list-style-type: none"> • Factory setting: 50% • Setting range: 20 ... 100% • Increment: 5%
Dynamic braking torque	<p>The dynamic braking torque determines the braking effect at the start of the braking process to reduce the speed of the motor. Following this, the braking operation is continued automatically with the "DC braking" function.</p> <ul style="list-style-type: none"> • Factory setting: 50% • Setting range: 20 ... 100% • Increment: 5%

7.3.7 Voltage ramp

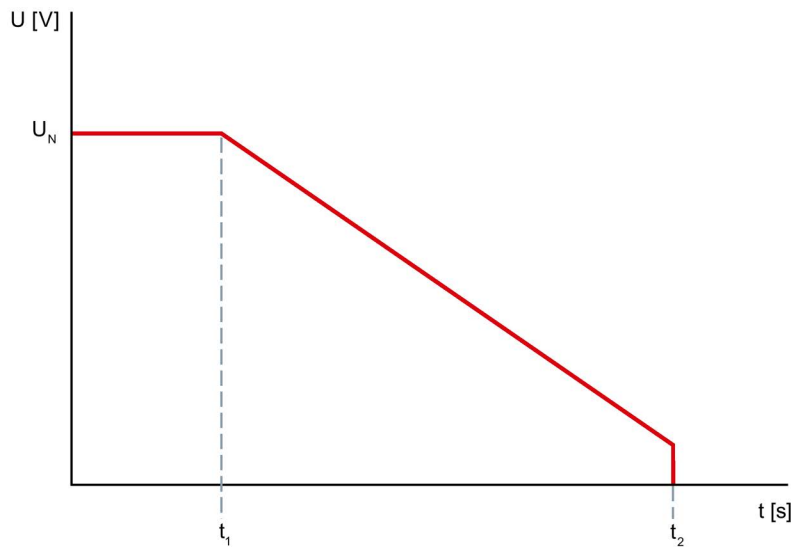
Operating principle

With the "voltage ramp" stopping function, the motor voltage is decreased along a linear, negative voltage ramp until the motor stops.

Application

- Drives that stop abruptly when switched off, causing the transported goods to be damaged, such as bottling plants.

Diagram



$t_1 \dots t_2$ Stopping time

U_N

U_{rated} Line voltage

Parameters

Parameters	Description
Stopping time	<p>The length of the stopping time defines the time within which the motor voltage is reduced from line voltage to 0 V.</p> <p>It may take longer for the motor to actually coast down to a standstill.</p> <p>The parameter value "0" causes the motor to be shut down immediately without a down ramp.</p> <ul style="list-style-type: none"> • Factory setting: 10 s • Setting range: 0 ... 360 s • Increment: 0.1 s

7.3.8 Alternative stopping

Operating principle

With the aid of a control command, you can switch from the parameterized stopping mode to a parameterizable alternative stopping mode. Every stopping mode can be combined with every alternative stopping mode. The switchover to alternative stopping must take place before the start of the planned stopping. You cannot switch to alternative stopping while stopping. In order to use the "alternative stopping" function, activate the control function via one of the following control sources:

- Input actions ("Use alternative stopping mode")
- 3RW5 communication module (PIQ: Use alternative stopping mode)
- 3RW5 HMI High Feature ("Parameters > Soft Starter > Settings stopping mode > Alternative stopping")

You will find additional information on input actions in Chapter Control (Page 154).

Requirements

- Access protection to the 3RW5 HMI High Feature is not active or has been reset.
- You are in the "Control" menu.

Parameters

Parameters	Description
Stopping mode	<ul style="list-style-type: none"> • Coasting down (factory setting). • Torque control • Pump stop • DC braking • Dynamic DC braking • Voltage ramp
Stopping time	<ul style="list-style-type: none"> • 10 s (factory setting)
Stopping torque	<ul style="list-style-type: none"> • 50% (factory setting)
Dynamic braking torque	<ul style="list-style-type: none"> • 50% (factory setting)
DC braking torque	The motor's braking force can be set with the amount of the alternative DC braking torque. The alternative DC braking torque must be increased if the motor is to accelerate again during DC braking.

7.4 Motor protection

The 3RW55 soft starter has 2 functions for protecting the motor:

- Motor overload protection
- Thermistor motor protection with temperature sensor

Use a combination of both of these functions to implement full motor protection.

NOTICE
Deactivated motor protection can cause material damage.
If the motor is not monitored by a temperature sensor and if the trip class is set to "CLASS OFF", there will be no motor protection.

Note

Reset after cooling time.

If the 3RW55 soft starter is switched off via a motor protection or intrinsic device protection tripping operation, the action cannot be acknowledged using the "Reset" function until the displayed cooling time has expired.

7.4.1 Motor overload protection

Operating principle


The approximate temperature of the motor is calculated using the measured motor currents and the device parameters "Rated operational current" and "Tripping class". This indicates whether the motor is overloaded or is functioning in the normal operating range.

Note

Take note of the motor parameters.

Take note of the set Motor parameters (Page 68) before activating the motor load protection.

Parameters

 WARNING
<p>Automatic restart following fault acknowledgement/restart.</p> <p>Will cause death or serious injury.</p> <p>The 3RW55 soft starter immediately continues to operate with the values specified by the control following fault acknowledgement/restart. Outputs are activated when the ON condition is met.</p> <p>Take appropriate measures (e.g. start key with monitored start) to prevent unintentional restarting and to ensure a defined start of the system.</p>

Parameters	Description
Response to overload thermal motor model	<p>Use this device parameter to specify how the 3RW55 soft starter is to behave in the event of motor overload:</p> <ul style="list-style-type: none"> • Trip without restart (factory setting) <p>On the occurrence of the motor overload, an error message is generated and the motor is tripped. When the parameterized recovery time (cooling time) has elapsed, the fault message and the trip can be acknowledged with the "Reset" function.</p> <ul style="list-style-type: none"> • Trip with restart <p>On the occurrence of the motor overload, an error message is generated and the motor is tripped. When the parameterized recovery time (cooling time) has elapsed, the fault message and the motor trip are automatically canceled.</p>
Tripping class	<p>Deactivates motor overload protection. You can find additional information below the table.</p> <ul style="list-style-type: none"> • CLASS OFF <p>The tripping times correspond to the trip class. You can find additional information below the table.</p> <ul style="list-style-type: none"> • CLASS 10A • CLASS 10E (factory setting) • CLASS 20E • CLASS 30E
Recovery time	<p>Minimum cooling down time for the motor after an overload trip. Reset signals present during the recovery time have no effect.</p> <ul style="list-style-type: none"> • Factory setting: 300 s • Setting range: 60 ... 1 800 s • Increment: 30 s

Parameters	Description
Remaining time for tripping warning limit	<p>The 3RW55 soft starter warns about imminent motor overload tripping within the set time if the present operating conditions are retained. The parameter value "0" deactivates the function.</p> <ul style="list-style-type: none"> • Factory setting: 0 s • Setting range: 0 ... 500 s • Increment: 1 s
Motor heating warning limit	<p>You use this parameter to preset a motor heating value in percent as a warning limit. The parameter value "0" deactivates the function.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 0 ... 99% • Increment: 1%
Non-volatile tripping status	<p>If the non-volatile tripping status is activated, and the control supply voltage fails during a trip, the current tripping state of the motor overload protection and the current recovery time are stored in the soft starter.</p> <ul style="list-style-type: none"> • Yes (factory setting) • No
Rated operational current I_e	<p>The rated operational current I_e is the current that can be continuously conducted by the feeder (switchgear and motor). This is normally the rated operational current I_e of the motor and depends on whether the motor is connected in an inline or an inside-delta circuit.</p>

Tripping class

The tripping class (CLASS) specifies the maximum time within which a protective device must trip from a cold state at 7.2 x the rated operational current (motor protection to IEC 60947). The tripping class defines the starting time at a particular current before the trip occurs.

You can set different tripping characteristics according to the startup class. The higher the class, the longer the permitted starting time.

You can find the graphic for the respective tripping characteristic under this link (<https://support.industry.siemens.com/cs/ww/en/ps/25100/char>).

7.4.2 Thermistor motor protection with temperature sensor

Operating principle


The temperature sensor of a motor can be connected to the soft starter and evaluated. If a specific motor-dependent temperature is exceeded, the soft starter recognizes this and reacts accordingly. You can set the reaction. The sensor cables can be monitored for open-circuit and short-circuit.

Two different types of measuring sensor can be connected to the soft starter:

- PTC thermistors type A
- Thermoclick

You will find more information on the connection of the temperature sensor in Chapter Connecting the temperature sensor (Page 202).

Parameters

 **WARNING**

**Automatic restart following fault acknowledgement/restart.
Will cause death or serious injury.**

The 3RW55 soft starter immediately continues to operate with the values specified by the control following fault acknowledgement/restart. Outputs are activated when the ON condition is met.

Take appropriate measures (e.g. start key with monitored start) to prevent unintentional restarting and to ensure a defined start of the system.

Parameters	Description
Temperature sensor	<ul style="list-style-type: none"> • Deactivated (factory setting) The motor protection function is deactivated. • Thermoclick This type of sensor describes a temperature-dependent switch. • PTC - Type A This type of sensor describes a temperature-dependent resistor.
Response to overload temperature sensor	<p>If the temperature sensor detects an overload on the motor, this is signaled to the soft starter. You can set the response to this:</p> <ul style="list-style-type: none"> • Trip without restart (factory setting) If the temperature is exceeded, an error message is generated and the motor is tripped. After the motor has cooled down, the error message and the trip can be acknowledged with the "Reset" function. • Trip with restart If the temperature is exceeded, an error message is generated and the motor is tripped. After the motor has cooled down, the error message and the motor trip are automatically canceled. • Warn If a specific limit value is exceeded, only a warning message is issued. If the value falls below this limit again, the warning message is automatically retracted.

7.5 Intrinsic device protection

Operating principle

The soft starter has integrated intrinsic device protection (power semiconductors and bypasses) that prevents inadmissible thermal overloading of the switching elements.

In order to protect the bypasses and power semiconductors, the startup and maximum operational currents of the motor are limited and the temperature monitored if current measurement is available. In addition, the internal bypass is protected against an overload or irreparable damage due to unintended opening of the bypass contacts.

The intrinsic device protection does not protect from short-circuit stress.

Note

Acknowledgment after cooling time has elapsed.

If the soft starter is switched off via a motor protection or intrinsic device protection tripping operation, the action cannot be acknowledged using the "Reset" function until the displayed cooling time has expired.

7.6 Creep speed

Operating principle

The creep speed function enables the motor to be controlled at low speed in both directions during operation. The result of this function, however, is that only a reduced torque can be generated in the motor. Due to possible heat rise of the motor, this function is not suitable for continuous operation and the use of a measuring sensor (thermoclick or PTC thermistors type A) is advisable. Furthermore, the creep speed causes mechanical vibrations, which can reduce the lifetime of the bearings. The creep speed function is active for as long as the "Creep speed" control command is set.

Application

- In applications with a low counter-torque, e.g. positioning of machine tools.

Parameters

Parameters	Description
Creep speed factor	<p>Counter-clockwise rotation / Clockwise rotation</p> <p>The speed is reduced by the creep speed factor, in other words the rotational speed in creep mode is the quotient derived from rated speed and creep speed factor.</p> <p>The creep speed function operates ideally at a creep speed factor of 7 ... 9.</p> <ul style="list-style-type: none"> • Factory setting: 7 • Setting range: 3 ... 21 • Increment: 1
Creep speed torque	<p>Counter-clockwise rotation / Clockwise rotation</p> <p>The torque generated in the motor is influenced with the creep speed torque. The maximum torque that can be generated depends on the selected creep speed. 100 % creep speed torque corresponds to approximately 30 % of the rated motor torque.</p> <ul style="list-style-type: none"> • Factory setting: 50% • Setting range: 20 ... 100% • Increment: 5%

Notes

Note

In addition to the set parameters, motor-specific characteristics and the connected load influence the speed resulting from the creep speed function and the creep speed torque generated in the motor.

Note

If you are controlling the 3RW55 soft starter via digital inputs, you will need an additional input for the creep speed function, parameterized to the "Creep speed" function.

For more information, see Chapter 3RW55 soft starter in inline circuit with soft starting and stopping and additional creep speed function (Page 209).

7.7 Condition Monitoring

7.7.1 Condition Monitoring for plant monitoring

Operating principle

Condition Monitoring monitors your plant and is able to detect imminent wear at an early stage. This enables you to avoid unplanned plant downtimes and loss of production. To do this, you can specify the response to limit violations of the following functions:

- Current monitoring
- Active power monitoring
- Switching frequency monitoring
- Starting time monitoring
- Pump cleaning function

7.7.2 Current monitoring

Operating principle

The current flow is influenced by the loading status of the motor.

- If the motor current is increased, this indicates bearing damage, for example.
- If a very low motor current is flowing, this can indicate a broken conveyor belt or a motor in no-load operation.
- If a very high motor current is flowing, this can indicate a blocked system and an overloaded motor.

The current monitoring is deactivated automatically during starting and stopping. The rated operational current I_e acts as a reference value for the current limit monitoring function.

Parameters

Here you specify the parameters as a percentage of the rated operational current I_e

Parameters	Description
Upper limit	
Upper limit - error	<p>If the current exceeds this value, an error is generated and, depending on the parameter, an internal trip command may or may not be generated. The parameter value "0" deactivates the monitoring of the limit value.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 50 ... 400 % • Increment: 1%
Upper limit - maintenance demanded	<p>If the current exceeds this value, a warning is generated. The parameter value "0" deactivates the monitoring of the limit value.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 50 ... 400 % • Increment: 1%
Response to error	<p>Do not turn off (factory setting) On exceeding the "upper limit - error" the motor is not turned off.</p>
	<p>Turn off On exceeding the "upper limit - error" the motor is turned off.</p>
Lower limit	
Lower limit - error	<p>The currently measured current value is checked against this limit value. If the value falls below this limit, an error is generated and, depending on the parameter, an internal trip command may or may not be generated. The parameter value "0" deactivates the monitoring of the limit value.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 19 ... 100% • Increment: 1%
Lower limit - maintenance demanded	<p>The currently measured current value is checked against this limit value. If the speed falls below this threshold, a warning is generated. The parameter value "0" deactivates the monitoring of the limit value.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 19 ... 100% • Increment: 1%
Response to error	<p>Do not turn off (factory setting) If the "lower limit - error" is undershot, the motor is not turned off.</p>
	<p>Turn off If the "lower limit - error" is undershot, the motor is turned off.</p>

7.7.3 Active power monitoring

Operating principle

The active power P is influenced by the loading status of the motor. Depending on the limit that is exceeded, a warning or an error is signaled.

- Load monitoring for over-dimensioned motors
- If pumps are running in no-load operation, the pump wheels can be damaged.
- To avoid load peaks
- To derive production quality data from energy data

The active power monitoring is deactivated during starting and stopping.

Parameters

Parameters	Description
Reference value	<p>The reference value (rated motor power) is compared with the amount of active power actually available. The rated motor power can be obtained from the motor data. The parameter value "0" deactivates the active power monitoring.</p> <ul style="list-style-type: none"> • Factory setting: 0 W • Setting range: 0 W ... 2 000 kW • Increment: 1 W
Upper limit	
Upper limit - error	<p>If the active power exceeds this value, an error is generated. If the parameter value is "0", the limit as a percentage of the reference value is not monitored.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 0 ... 400 % • Increment: 1%
Upper limit - maintenance demanded	<p>If the active power exceeds this value, a warning is generated. If the parameter value is "0", the limit as a percentage of the reference value is not monitored.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 0 ... 400 % • Increment: 1%
Response to error	<p>Do not turn off (factory setting) On exceeding the "upper limit - error" the motor is not turned off.</p>
	<p>Turn off On exceeding the "upper limit - error" the motor is turned off.</p>
Lower limit	
Lower limit - error	<p>If the active power undershoots this value, an error is generated. If the parameter value is "0", the limit as a percentage of the reference value is not monitored.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 0 ... 100% • Increment: 1%
Lower limit - maintenance demanded	<p>If the active power falls below this value, a warning is generated. If the parameter value is "0", the limit as a percentage of the reference value is not monitored.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 0 ... 100% • Increment: 1%
Response to error	<p>Do not turn off (factory setting) If the "lower limit - error" is undershot, the motor is not turned off.</p>
	<p>Turn off If the "lower limit - error" is undershot, the motor is turned off.</p>

7.7.4 Switching frequency monitoring

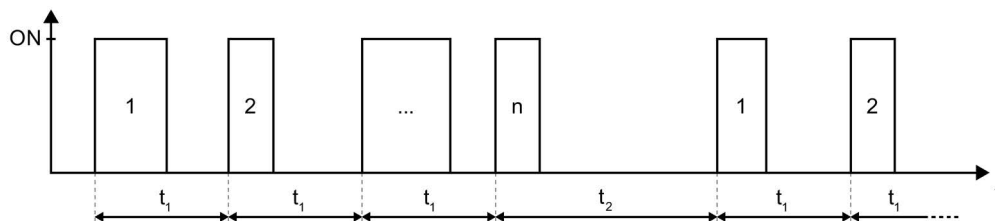
Operating principle

If motors are started frequently, this can cause the motor to overheat. The soft starter monitors the switching frequency in order to adhere to the wait and cooling down times.

Application

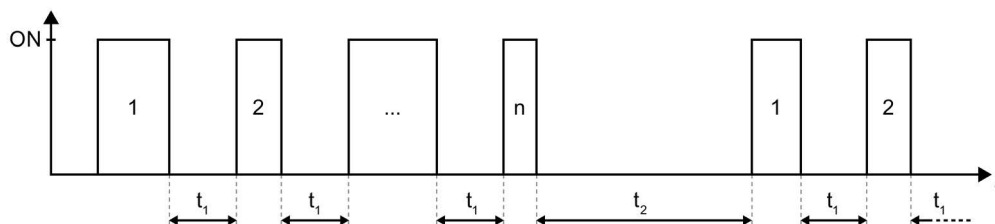
- Prevention of a critical motor temperature rise due to too frequent starting in conjunction with too short a cooling time of the motor (Mode 1).
- Prevention of a critical application temperature rise, if cooling times between 2 operating phases have not been adhered to (Mode 2).

Switching frequency monitoring - Mode 1



- n Maximum number of starts
- t₁ Switching frequency monitoring time t₁
- t₂ Switching frequency monitoring time t₂

Switching frequency monitoring - Mode 2



- n Maximum number of starts
- t₁ Switching frequency monitoring time t₁
- t₂ Switching frequency monitoring time t₂

Parameters

Parameters	Description
Switching frequency monitoring	<p>Deactivated (factory setting) The switching frequency monitoring is deactivated.</p>
	<p>Mode 1 (ON-ON) The switching frequency monitoring always relates to the start time of the preceding Motor ON command and the start time of the new Motor ON command. The switching frequency monitoring time t_1 or t_2 starts as soon as an effective switch-on command is present.</p>
	<p>Mode 2 (OFF-ON) The switching frequency monitoring always relates to the end time of the preceding Motor ON command (Motor OFF) and the starting time of the new Motor ON command. The switching frequency monitoring time t_1 or t_2 starts as soon as no effective switch-on command is present.</p>
Maximum number of starts	<p>This parameter is only relevant in combination with the switching frequency monitoring time t_2. If the parameter for the switching frequency monitoring time t_2 has the value "0" (= deactivated), then this parameter is irrelevant and its value has no meaning.</p> <p>If the parameter for the switching frequency monitoring time t_2 has a value not equal to "0" (= activated), then this parameter defines the maximum number of starts, until which the switching frequency monitoring time t_2 does not have to be observed. At the latest upon reaching the maximum number of starts, the switching frequency monitoring time t_2 must be observed once. If the switching frequency monitoring time t_2 is observed before reaching the maximum number of starts, then the counter for the number of starts begins again at "1".</p> <ul style="list-style-type: none"> • Factory setting: 2 • Setting range: 2 ... 255 • Increment: 1
Switching frequency monitoring time t_1	<p>The time t_1 must be shorter than the time t_2. The parameter value "0" deactivates the switching frequency monitoring time t_1.</p> <ul style="list-style-type: none"> • Factory setting: 0 s • Setting range: 0 ... 65 535 s • Increment: 1 s
Switching frequency monitoring time t_2	<p>The time t_2 must be longer than the time t_1. The parameter value "0" deactivates the switching frequency monitoring time t_2.</p> <ul style="list-style-type: none"> • Factory setting: 0 s • Setting range: 0 ... 65 535 s • Increment: 1 s

Parameters	Description
Response to ON-command during active monit. time	<p>Trip with restart The trip is automatically acknowledged if no monitoring time is still active. If an ON command is still pending, the motor is switched on.</p>
	<p>Trip without restart The trip must be acknowledged with the "Reset" function.</p>
	<p>Warning without lock-out If an ON command for the motor is issued during the switching frequency monitoring time t_1 or t_2, the motor is switched on quite normally without a lock-out.</p>
	<p>Warning with lock-out (factory setting) If an ON command for the motor is issued during the switching frequency monitoring time t_1 or t_2, the motor is not switched on (locked-out). After expiry of t_1 or t_2, the motor is switched on if an ON command is still pending. The trip can be bypassed using the "emergency start". If the emergency start function is activated in advance, the motor is switched on despite the error message.</p>

7.7.5 Starting time monitoring

Operating principle

An over/undershoot of the preset starting time can indicate an overload or underload of the system.

Parameters

Parameters	Description
Preset starting time	<p>The preset starting time (identical with the parameter of the Automatic parameterization (Page 77)) is compared with the value of the present actual starting time.</p> <p>If the parameter has the value "0", there is no limit monitoring.</p> <ul style="list-style-type: none"> • Factory setting: 10 s • Setting range: 0 ... 360 s • Increment: 0.1 s
Upper limit - warning	<p>During the startup phase of the motor, the present actual starting time is checked against this limit. If it is exceeded, a warning is generated and the motor is not switched off.</p> <p>If this limit has not been reached or exceeded at the latest at the end of the motor starting phase, then any pending warning is reset. If the parameter has the value "0", there is no limit monitoring.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 0 ... 400 % • Increment: 1%
Lower limit - warning	<p>During the starting phase of the motor, the current actual starting time is checked against this limit and, if it is exceeded, any pending warning is reset.</p> <p>If this limit has not been exceeded at the latest by the end of the motor starting phase, then a warning is generated and the motor is not switched off. If the parameter has the value "0", there is no limit monitoring.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Setting range: 0 ... 100% • Increment: 1%

7.7.6 Pump cleaning function

Operating principle

The 3RW55 soft starter supports a pump cleaning function that can prevent an imminent blockage or, within certain limits, can also clear an existing blockage. Pump cleaning is only possible if the motor or pump is switched on, i.e. if one or both control commands Motor CW or Motor CCW is present and there is no internal trip command (e.g. disconnection due to motor overload trip).

In order to use the pump cleaning function, activate the control function via one of the following control sources:

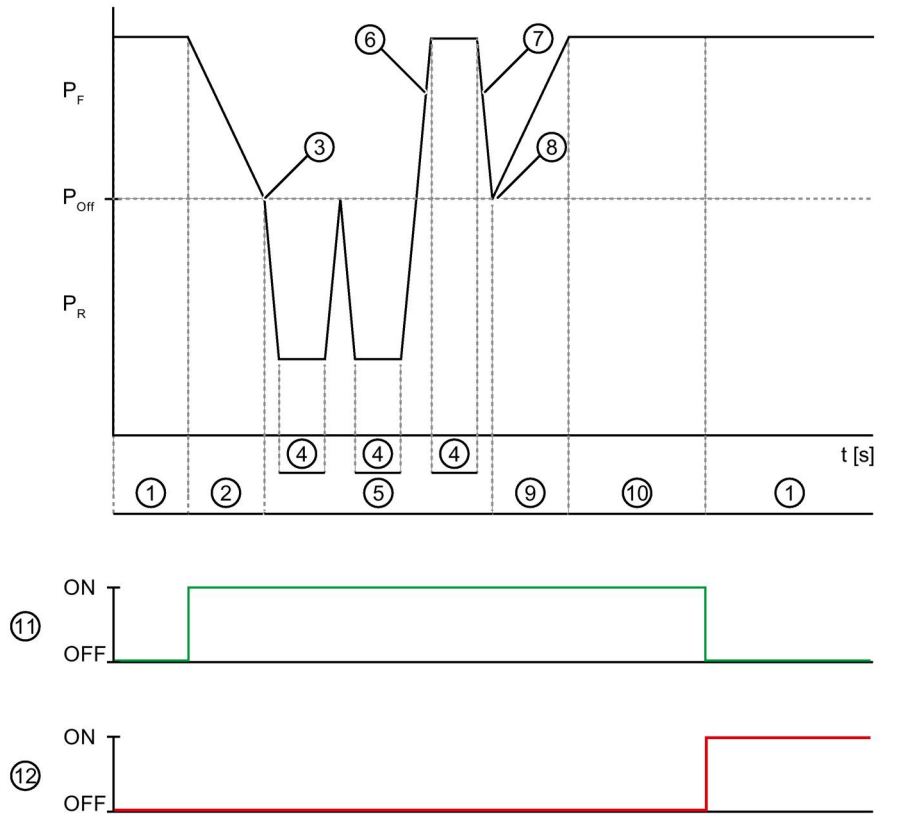
- Input action ("Pump cleaning mode")
- 3RW5 communication module (PIQ: Pump cleaning)
- 3RW5 HMI High Feature (Parameters > Soft Starter > Condition Monitoring > Pump cleaning)

The cancelation of the control command or the occurrence of an internal trip command results in the pump cleaning process being aborted.

Application

- To remove blockages and dirt from water pipes, filters and pump blades.

Diagram



- ① Operation
- ② Operation / stopping
- ③ Start of the cleaning process with the set pump cleaning start/stop parameters
- ④ Pump cleaning - time
- ⑤ Pump cleaning - cycles
- ⑥ Pump cleaning start
- ⑦ Pump cleaning stop
- ⑧ End of cleaning process
- ⑨ Operation starting
- ⑩ Monitoring time (3 x pump cleaning - time)
- ⑪ Pump cleaning active
- ⑫ Pump cleaning failed
- P_F Pump running forward
- P_{Off} Pump is off
- P_R Pump running in reverse

Parameters

Parameters	Description
Pump cleaning - mode	Deactivated (factory setting) The pump cleaning function is deactivated.
	Manual The pump cleaning function is started with the aid of a control command by means of an input action at the digital input or in the process image outputs.
Pump cleaning - time	During the cleaning time, the pump runs at reduced speed and the maximum possible torque. <ul style="list-style-type: none"> • Factory setting: 20 s • Setting range: 1 ... 30 s • Increment: 1 s
Pump cleaning - cycles	During a cycle, the pump rotation changes direction several times. <ul style="list-style-type: none"> • Factory setting: 3 • Setting range: 1 ... 10 • Increment: 1
Pump cleaning - start/stop parameters	You can select the parameters for starting and stopping the pump for different cleaning processes here. For example, you can make different settings for starting and stopping in parameter set 2 than for the normal starting and stopping procedure.
	Parameter set 1 The pump cleaning function is carried out with the starting and ramp-down parameters of parameter set 1.
	Parameter set 2 The pump cleaning function is carried out with the starting and ramp-down parameters of parameter set 2.
	Parameter set 3 The pump cleaning function is carried out with the starting and ramp-down parameters of parameter set 3.
	Operating parameters (factory setting) The pump cleaning function is carried out with the starting and ramp-down parameters of the currently selected parameter set.

7.8 Asymmetry

Operating principle

In certain phases of the motor, an asymmetrical current consumption can cause a reduction in power or damage to the motor. Possible causes for this are a different line or phase voltage or an already damaged motor winding. The asymmetry monitoring monitors the 3 phase currents and issues a warning or switches the motor off at parameterizable limits.

Parameters

Parameters	Description
Asymmetry limit warning	<p>If the asymmetry exceeds this limit, a warning is generated and the motor is not switched off. The parameter value "0" (factory setting) deactivates the limit.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Limit: 10 ... 60% • Increment: 5%
Asymmetry limit error	<p>If the asymmetry exceeds this limit, a fault is generated and the motor is switched off. The parameter value "0" deactivates the limit.</p> <ul style="list-style-type: none"> • Factory setting: 30% • Limit: 10 ... 60% • Increment: 5%

7.9 Ground fault

Operating principle

The "ground fault" function of the 3RW55 soft starter records and monitors all three phase currents. By evaluating the summation current of the three current values, the motor feeder can be monitored for a possible residual current or ground fault.

Parameters

Parameters	Description
Ground fault limit warning	<p>If the ground fault current exceeds this limit, a warning is generated and the motor is not switched off. The parameter value "0" deactivates the monitoring of the limit value.</p> <ul style="list-style-type: none"> • Factory setting: 0% • Limit: 10 ... 95% • Increment: 5%
Ground fault limit error	<p>If the ground fault current exceeds this limit, a fault is generated and the motor is switched off. The parameter value "0" deactivates the monitoring of the limit value.</p> <ul style="list-style-type: none"> • Factory setting: 20% • Limit: 10 ... 95% • Increment: 5%

7.10 Emergency start

Operating principle

With the emergency start function the system can continue to be operated in the case of system faults. This is necessary for systems in which the product becomes unusable without continued operation, e.g. glue and paint production. In crusher plants, in which a disconnection makes any further startup impossible in certain situations, continued operation is also necessary.

The emergency start is activated only if it has been enabled and a trip command exists due to a system fault. The motor is switched on by means of a normal control command.

NOTICE

Damage to the system

If the emergency start function is activated, both system defects and system protection messages are ignored. This can cause further damage in the system.

In the case of some faults, the motor can be started via the emergency start function despite a pending group error:

- Phase asymmetry limit exceeded
- Motor overload protection
- Temperature sensor wire break
- Temperature sensor short-circuit
- Temperature sensor overload
- Maximum starting time exceeded
- I_e upper/lower limit value violation
- Ground fault detected
- Impermissible I_e Class setting

Parameters

Note

If the control source is "Digital input", only a normally open contact may be connected to this input. A normally closed contact would result in activation of the emergency start in the event of a wire break.

Parameters	Description
Emergency start	Disable The emergency start is disabled and cannot be enabled.
	Manual disable / enable (factory setting) The emergency start can be disabled or enabled by means of command, PIQ bit or input action. In the event of device faults, intrinsic device protective shutdown, process mapping errors or stall protection, no emergency start is possible, even if it has been enabled.

7.11 Number of parameter sets

Operating principle

The soft starter provides three individually adjustable parameter sets, of which only one parameter set is active at a time. Different parameters can be set for each parameter set. The switchover between the individual parameter sets is performed by means of an input action or with a 3RW5 HMI High-Feature or using a control command in the process image outputs.

The switchover from one parameter set to another is only possible when the motor is switched off. As soon as additional parameter sets are used, the relevant parameter sets appear in the menu of the 3RW5 HMI High-Feature. In the factory setting, parameter set 1 is active.

Application

- Starting Dahlander motors (variable-speed drive).
- Starting an application with different load conditions (e.g. empty or full conveyor belt).
- Separate starting of up to three drives with different run-up behavior (e.g. compressor and pump).

7.12 Inputs

7.12.1 Overview of the input functions

Operating principle

The soft starter has 4 digital inputs DI1 - DI4, to which you can assign one input function each.

Parameters

You can only modify an input action if the relevant input is not active.

Note

If the same action is assigned to two different inputs, both of the inputs must also be controlled to carry out the selected function. For example, to obtain logical "AND" linking for a start command, assign the "Motor CW with PS1" function to both input 1 and input 2. A start command is accepted only if both inputs are active.

Input action	Description	Factory setting			
		DI1	DI2	DI3	DI4
No action	Input has no function.		x	x	
Manual operation local	You can only control the soft starter locally via the local interface, the 3RW5 HMI High Feature or via the digital inputs.				
Emergency start	In the case of some faults, the motor can be started via the emergency start function despite a pending group fault. An emergency start action is assigned to one input, and, for example, "Motor CW > Parameter set 1" to another. The emergency start is active as long as the input is activated. It can also be activated during operation. For more information, see Chapter Emergency start (Page 124).				
Creep speed	The motor starts with the values set in the "Creep speed parameters" menu item when the "Creep speed" input and the "Motor CW/CCW parameter set 1/2/3" input are activated at the same time.				
Quick-stop	If the input is activated, normal tripping with the currently set stopping function is executed. No group error appears and the quick stop is executed independently of the control priority.				
Reset	You can acknowledge the fault after it has been remedied. The "Reset" input is edge-controlled. The level change from 0 to 24 V DC is evaluated at the input. All other input functions are evaluated at the already pending 24 V DC level.				x

Input action		Description	Factory setting			
			DI1	DI2	DI3	DI4
Motor CW	with parameter set 1	The motor starts with rotation in line phase direction and stops with the values stored in the respective parameter set.	x			
	with parameter set 2					
	with parameter set 3					
Motor CCW	with parameter set 1	This function is active only when the "Creep speed" parameter or reversing mode with external reversing contactors is active at the same time. The motor starts with the values stored in the "Creep speed parameters" menu item (with rotation opposite to the line phase direction).				
	with parameter set 2					
	with parameter set 3					
Motor standstill		The 3RW55 soft starter evaluates the signal from an external motor standstill detection at the input.				
Use alternative stopping mode		For more information, see Chapter Alternative stopping (Page 103).				
Pump cleaning		For more information, see Chapter Pump cleaning function (Page 119).				

7.12.2 Process data and process images

The basic functions of the 3RW5 soft starter are controlled and monitored in the process data in the process images.

The process images can be transferred as follows:

- Cyclically in the fieldbus protocol
- Acyclically using data sets

Process image input (PII) and process image output (PIQ)

The following process images are transferred:

- Process image input with 16 bytes
- Process image output with 4 bytes

Note

The tables for the process images describe only the supported process data. Inputs and outputs that are not listed are not assigned.

Process image input (PII)

Process data	Process image	
DI 0.0	Ready (automatic)	
DI 0.1	Motor On	
DI 0.2	Group error	
DI 0.3	Group warning	
DI 0.4	Input 1	
DI 0.5	Input 2	
DI 0.6	Input 3	
DI 0.7	Input 4	
DI 1.0	Motor current lact-bit0	
DI 1.1	Motor current lact-bit1	
DI 1.2	Motor current lact-bit2	
DI 1.3	Motor current lact-bit3	
DI 1.4	Motor current lact-bit4	
DI 1.5	Motor current lact-bit5	
DI 1.6	Manual operation local	
DI 1.7	Ramp operation	
DI 2.0	Motor CW	
DI 2.1	Motor CCW	
DI 2.4	Start mode active	
DI 2.5	Operation / bypass active	
DI 2.6	Stop mode active	
DI 2.7	Test operation active	
DI 3.0	Thermal motor model overload	
DI 3.1	Temperature sensor overload	
DI 3.2	Switching element overload	
DI 3.3	Cooling time active	
DI 3.4	Device error	
DI 3.5	Automatic parameterization active	
AI 4 (Float32)	Measured value 1	You can find more information on the settable measured values in Chapter Cyclic send data (Page 134).
AI 8 (Float32)	Measured value 2	
AI 12 (Float32)	Measured value 3	

Process image output (PIQ)

Process data	Process image
DQ 0.0	Motor CW
DQ 0.1	Motor CCW
DQ 0.3	Reset
DQ 0.4	Emergency start
DQ 0.5	Self-test (user-test)
DQ 0.6	Creep speed
DQ 1.0	Output 1, 2 or 3 (depending on parameter)
DQ 1.1	Output 1, 2 or 3 (depending on parameter)
DQ 1.2	Parameter set bit 0*
DQ 1.3	Parameter set bit 1*
DQ 1.7	Disable Quick-stop
DQ 2.0	Output 1, 2 or 3 (depending on parameter)
DQ 2.3	Pump cleaning
DQ 3.0	Manual operation local - input controlled
DQ 3.1	Use alternative stopping mode
DQ 3.2	Motor standstill

More information

The following table describes the assignment of the process images "Parameter set bit 0" and "Parameter set bit 1":

Assignment of the PIQ bits	Parameter set bit 0	Parameter set bit 1
Process image error	1	1
Parameter set 1 (PS1)	0	0
Parameter set 2 (PS2)	1	0
Parameter set 3 (PS3)	0	1

7.13 Outputs

7.13.1 Digital outputs

Operating principle

The soft starter has four digital outputs with which external actuators, such as a braking contactor or a signal lamp are controlled.

Using the output actions, you can assign an output action to each digital output. Output 3 is permanently assigned to the output action "Group error". Each output can be independently assigned an output action.

Parameters

Parameters	Description
ON delay time	The switching of the output is delayed by this time. <ul style="list-style-type: none">• Factory setting: 0 s• Setting range: 0 ... 6 500 s• Increment: 0.1 s
OFF delay time	

Digital output actions

Action	Description
No action	-
Activation by means of external control sources	
Control source PIQ-DQ 1.0 output 1	Output is activated by control command "Output 1".
Control source PIQ-DQ 1.1 output 2	Output is activated by control command "Output 2".
Control source PIQ-DQ 2.0 output 3	Output is activated by control command "Output 3".
Control source input 1	Output is activated by "Digital input 1".
Control source input 2	Output is activated by "Digital input 2".
Control source input 3	Output is activated by "Digital input 3".
Control source input 4	Output is activated by "Digital input 4".
Activation by means of soft starter	
Start-up	For further information, refer to the diagram in Chapter Operating principle (Page 11).
Operation / bypass	
Run-down	
On time motor (RUN)	
Operation / run-down	
Control command MOTOR ON (ON)	The output is activated for as long as the control command "Motor CW" or "Motor CCW" is present.
DC braking contactor	The output action controls a DC braking contactor via this output. For more information, see Chapter DC braking with external braking contactor (Page 98).
Device ON	The output is active for as long as the electronic supply is present at the 3RW55 soft starter.
Activation by signals from the soft starter	
Group warning	Group signals
Group error	
Bus error	
Device error	
Reversing switching element - right	The internal control signal for the reversing function is switched to the corresponding digital output of the starter.
Reversing switching element - left	
Generator operation	Status messages
Ready for motor ON	
Pump cleaning active	
Alternative stopping mode active	
CM - maintenance demanded	
CM - error	

7.13.2 Analog output

Operating principle

The set measured value is displayed via the analog output using an external display device.

Parameters

Parameters	Description
Output signal type	<p>Via the "Output signal type" parameter you can define with what type of signal the analog value will be output.</p> <ul style="list-style-type: none"> • Deactivated (factory setting) • 4 ... 20 mA • 0 ... 10 V
Measured value	<p>Via the "Measured value" parameter, select the measured value to be transferred from the analog output.</p> <ul style="list-style-type: none"> • Phase current I L1 (%) • Phase current I L2 (%) • Phase current I L3 (%) • Phase current average (%) • Phase current I L1 (rms) • Phase current I L2 (rms) • Phase current I L3 (rms) • Phase current average (rms) • Line-to-line voltage U L1-L2 • Line-to-line voltage U L2-L3 • Line-to-line voltage U L3-L1 • Active power PL1 ... 3 • Power factor L1..3 • Active energy import (total) • Motor temperature rise • Switching element heating <p>You will find additional information in Chapter "Monitoring the measured values of the 3RW55 soft starter with the 3RW5 HMI High Feature (Page 152)".</p>
Range start value	<p>With parameters "Range start value" and "Range end value" you can define which value of the analog value to be output corresponds to the lower output signal value and which to the upper output signal value. The corresponding value depends on the coding of the measured value to be transferred (Unsigned 32).</p> <ul style="list-style-type: none"> • Setting of the analog range, e.g. 4 mA = 100 • Setting of the analog range, e.g. 20 mA = 400
Range end value	

7.13.3 Cyclic send data

Operating principle

For "measured value 1", "measured value 2" and "measured value 3" specify one measured value from the following list in each case:

- Phase current I L1 (rms) (factory setting measured value 1)
- Phase current I L2 (rms) (factory setting measured value 2)
- Phase current I L3 (rms) (factory setting measured value 3)
- Power factor L1..3
- Phase current average (rms)
- Active energy import (total)
- Active power PL1..3

7.14 Additional parameters

Operating principle

The soft starter has additional parameters.

Requirements

- Access protection to HMI module High Feature is not active or has been reset.
- You are in menu "Parameters > Soft Starter > Additional parameters".

Parameters

Parameters	Description
Operation with CPU / Master	
Response to CPU / Master Stop	The 3RW55 soft starter sets the control commands internally in the process image output according to the user-parameterized setting.
	Last value The soft starter does not modify the process image output. The current control commands are retained.
	Substitute value (factory setting) The process image output is automatically changed by the the soft starter to the values specified in the following "substitute value" parameter.
Substitute value*	<p>This parameter is only visible if the "substitute value" is selected in the parameter "Response to CPU / Master Stop".</p> <p>In the event of a bus failure, the 3RW55 soft starter can be controlled by a corresponding substitute process image output (depending on the 3RW55 soft starter).</p> <ul style="list-style-type: none"> • Motor CW • Motor CCW • Reset • Emergency start • Creep speed • Output 1 • Output 2 • Parameter set bit 0 • Parameter set bit 1 • Disable Quick-stop • Output 3 • Pump cleaning • Manual operation local - input controlled • Use alternative stopping mode • Motor standstill

7.14 Additional parameters

Parameters	Description
Parameters of CPU/master disabled (depending on the 3RW5 communication module)	<p>Activated</p> <p>If a parameter disable is activated, all parameter values received for control via cyclic and acyclic communication channels are positively acknowledged and rejected by the soft starter. This prevents the parameters stored in the soft starter from being overwritten.</p>
	<p>Deactivated (factory setting)</p> <p>The parameter disable is deactivated.</p>
	<p>Activate for startup parameters only</p> <p>The parameter disable affects all startup parameters that come from a higher-level controller.</p>

Parameters	Description
Response to overload switching element	<p>Trip without restart (factory setting)</p> <p>If an upper fault limit is violated, an error message and an internal trip command are generated. If a lower fault limit is violated, the error message and the internal trip command can be acknowledged with the "Reset" function after a cooling time of 60 seconds.</p>
	<p>Trip with restart</p> <p>If an upper fault limit is violated, an error message and an internal trip command are generated. If a lower fault limit is violated, the error message and internal trip command are automatically acknowledged or canceled after a cooling time of 60 seconds.</p>
Response to preset unequal actual configuration for the following devices: <ul style="list-style-type: none"> • Soft starter • 3RW5 HMI High Feature • Communication module (if there is one) 	<p>A preset unequal actual configuration is present if there is a faulty configuration or if there are differences between the real and configured slots of the module. The parameter has no effect if a higher-level controller transfers a parameter assignment.</p>
	<p>Ignore (factory setting)</p> <p>In the case of a preset unequal actual configuration the device continues to operate (if necessary) with a restricted function. If necessary, the technology function operates with substitute values to be determined on a product-specific basis.</p>
	<p>Warn</p> <p>In the case of a preset unequal actual configuration, no internal trip command is generated. The warning "preset unequal actual configuration" appears.</p>
	<p>Trip</p> <p>In the case of a preset unequal actual configuration, an internal trip command is generated. This internal trip command must be acknowledged with the "Reset" function. If a system interface is available, then when a module is withdrawn or inserted a corresponding withdrawal / insertion alarm is sent to the higher-level controller.</p>
Permissible main power rotation	<p>Any (factory setting)</p> <p>The main power rotation may be "clockwise" or "counter-clockwise".</p>
	<p>CW</p> <p>The main power rotation must be "CW".</p>
	<p>CCW</p> <p>The main power rotation must be "CCW".</p>

Parameters	Description
Response to faulty main power	<p>In certain applications, operation of the motor is permitted only in a specified, preset direction of rotation, to avoid damage. The 3RW55 soft starter detects the main power rotation via the measurement process. The correspondingly required main power rotation is determined during first commissioning of the application. Via the "Response to faulty main power" parameter, you can determine the response of the 3RW55 soft starter to main power rotation deviations.</p>
	<p>Group error only at ON command (factory setting) If the 3RW55 soft starter detects a wrong main power rotation, a fault is generated.</p>
	<p>Warn If the 3RW55 soft starter detects a wrong main power direction, a warning is generated.</p>
Typical ambient temperature	<p>The 3RW55 soft starter is set to the predominant, typical ambient temperature actually present in the system. Specific to functions, this parameter is processed further by the individual device functions that are based on this parameter value.</p>
	<ul style="list-style-type: none"> • 40°C • 50°C • 60°C (factory setting)

7.15 Setting the date and time

Requirements

- Access protection to the 3RW5 HMI High Feature is not active or has been reset.
- You are in menu "Parameters > Soft Starter > Date and time".

Procedure

1. Select the menu item "Edit time".
2. Set the current time.
3. Select the menu item "Edit date".
4. Set the current date.

Parameters

Parameters	Description
Edit time	Sets the current time
Time format	<ul style="list-style-type: none"> • 12 h • 24 h (factory setting)
Time offset	UTC +/- 12 h (in steps of at least 30 min.)
Display time	<p>The time is shown in the display.</p> <ul style="list-style-type: none"> • Yes (factory setting) • No
Edit date	Sets the current date
Date format	<ul style="list-style-type: none"> • Day.Month.Year • Day/Month/Year (factory setting) • Year-Month-Day

Result

Date and time are stored in the soft starter. When replacing the 3RW5 HMI High Feature, the date and time are retained in the soft starter.

7.16 User account administration

Operating principle

In combination with the SIRIUS Soft Starter ES software (TIA Portal), the 3RW55 soft starter supports the function of user account administration.

Before a user is able to log in to the 3RW5 HMI High-Feature, the user administrator must first set up a user account with HMI User PIN using the SIRIUS Soft Starter ES software (TIA Portal). The user account is transferred to the 3RW55 soft starter using the local interface, 3RW5 communication module or a Micro SD Card.

Using their HMI User PIN, the user logs in via the "User login" on the 3RW5 HMI High-Feature. The user account administration performs a comparison between the user account data stored in the device and the HMI User PIN entered by the user. If the data matches, the user is granted access with the access rights that are stored in the user account data until the user monitoring time has elapsed and the user logs out, or the user logs out by means of the "User logout" function. The access rights are not contained directly in the user account data, but indirectly as user roles.

More information about setting up a user account can be found in the online help for SIRIUS Soft Starter ES (TIA Portal).

You can find further information on logging in and out using the HMI User PIN in Chapter User login and logout (Page 161).

Requirements

- User account has been set up in SIRIUS Soft Starter ES (TIA Portal).
- User account has been transferred with SIRIUS Soft Starter ES (TIA Portal) via one of the following paths to the 3RW55 soft starter:
 - Local interface
 - Fieldbus via suitable 3RW5 communication module
 - Micro SD card

User roles and user rights

- **User administrator:** Creating, editing or deleting all user accounts.
- **Diagnostics personnel:** Access rights in order to display diagnostic data (without login).
- **Operating personnel:** Operation of the soft starter under normal operating conditions.
- **Maintenance personnel:** Maintenance access (control, parameterize, test) to the device.

	Diagnostics	Control	Parameter assignment	FW update	Administration of user accounts
User administrator					x
Diagnostics personnel	X				
Operating personnel	X	X			
Maintenance personnel	X	X	X	X	

User account

It is possible to log in to the soft starter with the username and the four-digit HMI User PIN.

User name

- 1 ... 32 characters
- Numerals, uppercase and lowercase letters, and all special characters are possible

User password

- 4 ... 32 characters
- Numerals, uppercase and lowercase letters, and special characters ?!+%\$

Note

A secure password can only be used for a single application, is more than 8 characters long, and contains uppercase and lowercase, special characters and numerals. It should not contain any common numeric sequences from the computer keyboard or words from the dictionary. Change your password at regular intervals.

HMI User PIN

- 4-digit HMI User PIN
- Digits 0 ... 9
- A login with PIN is only possible via the 3RW5 HMI High Feature

User monitoring time

On expiry of the programmable user monitoring time, the user will be logged out automatically.

7.16.1 General advice on using PINs

The 3RW55 soft starter has 2 functions with a PIN each for protecting against unauthorized access:

- Local access protection
- User account administration (user login and logout)

You have the option of combining both versions.

Note

Use of PINs

Note that each function uses a separate PIN:

- **HMI PIN** for local access protection
- **HMI User PIN** for user accounts

Note

Combination of both versions

When using local access protection and user account administration, note the sequence of PIN entry on the 3RW5 HMI High-Feature. Enter the HMI PIN first and then the HMI User PIN in order to unlock locked menus.

If the HMI PIN and the HMI User PIN are identical, there is no need to enter the HMI User PIN on the 3RW5 HMI High-Feature.

7.17 Trace function

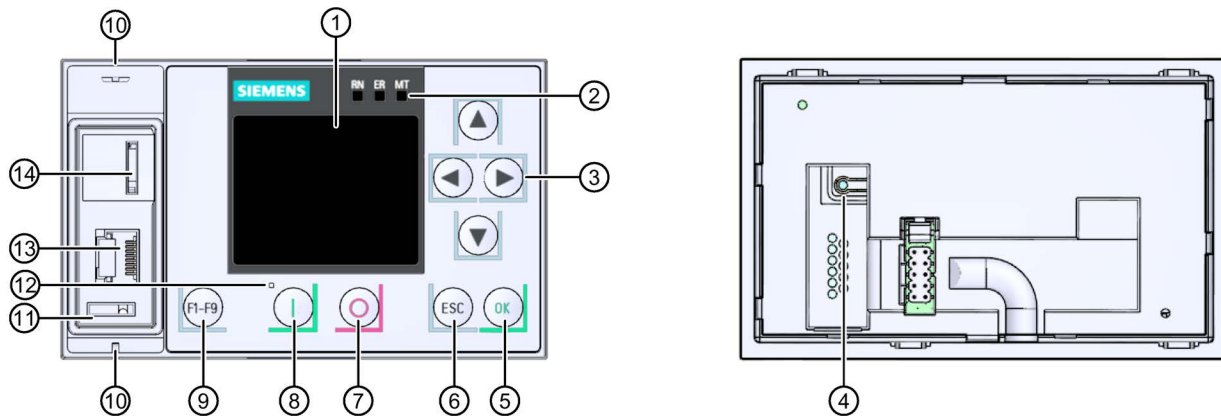
Operating principle

With the trace function, the 3RW55 soft starter can be used as a kind of multichannel digital oscilloscope. The trace function (= oscilloscope function) enables you to record data, events, measured values, etc. in any operating mode of the motor. The trace data must be read out with the aid of the SIRIUS Soft Starter ES software (TIA Portal) from the 3RW55 soft starter and visualized in the form of an oscillogram.

Further information on the trace function can be found in the online help for the SIRIUS Soft Starter ES (TIA Portal).

7.18 3RW5 HMI High Feature











7.18.1 Design and operator controls of the High Feature 3RW5 HMI










- ① Display
- ② Device LEDs (Page 166)
- ③ Navigation keys
- ④ Master RESET key
- ⑤ OK key
- ⑥ ESC key
- ⑦ Motor stop key
- ⑧ Motor start key
- ⑨ Favorites key
- ⑩ Eyes for lead seals
- ⑪ Hole for mounting the interface cover
- ⑫ Status LED (Page 168)
- ⑬ Local interface (point-to-point connection between PC and 3RW5 HMI High Feature)
- ⑭ Slot for micro SD card

Navigating and setting

The keys are used for navigation, for selecting and setting menu items and for executing predefined actions.

Key	Actions
	<ul style="list-style-type: none"> • Move one position to the right in the input field
	<ul style="list-style-type: none"> • Move one position to the left in the input field
	<ul style="list-style-type: none"> • Jump to next menu item • Set number or letter
	<ul style="list-style-type: none"> • Jump to previous menu item • Set number or letter
	<ul style="list-style-type: none"> • To confirm • To open the menu • Jump to selected menu item
	<ul style="list-style-type: none"> • To exit the menu
	<ul style="list-style-type: none"> • Motor stops as parameterized if the 3RW5 HMI High Feature is the master control
	<ul style="list-style-type: none"> • Motor starts as parameterized if the 3RW5 HMI High Feature is the master control
	<ul style="list-style-type: none"> • F1: Local / Remote: Changes master control • F2: Reset • F3-F9: Freely parameterizable
	<p>Master RESET key for restoring the factory settings:</p> <ul style="list-style-type: none"> • Soft starter • Communication • 3RW5 HMI High Feature • All

Menus

Symbol	Menu
	Monitoring
	Diagnostics
	Control
	Parameters
	Overview
	Security
	Micro SD card (only visible if a micro SD card is inserted.)

7.18.2 Configuring favorites keys F1 - F9

Operating principle

Actuation of the favorites keys F1 - F9 causes the functions stored there to be executed. The favorites F1 and F2 are permanently assigned to the functions "Local / Remote" and "Reset". Additional functions can be parameterized for the favorites keys F3 - F9.

Procedure

1. Press the favorites keys F1 - F9 on the 3RW5 HMI High-Feature.
2. Choose menu item "Edit function favorites" and confirm with "OK".
The Favorites menu appears on the display.
3. Select the desired function and confirm with "OK".

Parameters

Parameters		Description
F1 - Local / Remote		Changes master control
F2 - Reset		Acknowledges faults
Fx -...		Favorites menu
Edit function favorites	Add	Adds a favorite
	Delete	Deletes a favorite

Result

The favorites F3 - F9 have been reassigned. Alternatively, you can parameterize the favorites keys F1 - F9 by means of the SIRIUS Soft Starter ES (TIA Portal).

7.18.3 Configure start key

Operating principle

As many as 4 different start functions can be assigned to the start key. In the factory setting, the start function "Motor CW" is assigned to the start key. If the start key is configured and then actuated, this opens the parameterized start functions that can be selected by means of the navigation keys and activated with the "OK" button. In the "Configure start key" menu you can parameterize the functions of the start key.

Requirements

- Access protection to the 3RW5 HMI High Feature is not active or has been reset.
- You are in the menu "Parameters > HMI > Configure start key".

Procedure

1. In the "Configure start key" menu, select the required start function and confirm with the "OK" button.

You can assign as many as 4 start functions to the start key.

2. Press the "Start" key.

You receive a list of all the assigned start functions.

3. Select the required start function and confirm with the "OK" button.

The selected start function is executed.

Parameters

Parameters	Description
Motor CW (factory setting)	Motor turns clockwise with the current parameter set
Motor CW - creep speed	Motor turns clockwise with active creep speed
Motor CCW ¹⁾	Motor turns counter-clockwise
Motor CCW - creep speed	Motor turns counter-clockwise with active creep speed

1) only visible if reversing starter is activated.

Result

As many as 4 start functions have been assigned to the Start button. These functions can be selected and executed after actuating the Start button.

7.18.4 Main menu

Monitoring



Menu	Content
Measured values	<ul style="list-style-type: none"> • Phase currents [%] • Phase currents (rms) • Asymmetry • Line-to-line voltages [V] • Power • Torque • Line frequency • Output frequency • Motor temperature rise • Remaining time for motor overload protection • Remaining motor cooling time • Remaining switching element cooling time • Switching element heating • Remaining switching frequency monitoring time
Process image	<ul style="list-style-type: none"> • Process image input (PII) • Process image output (PIQ)

For more information, see Chapter:

- Monitoring (Page 152)

Diagnostics



Menu	Content
Soft starter	<ul style="list-style-type: none"> • Diagnosis state • Device state • Statistics data • Maximum pointer • Self-test • Logbooks
Communication	<p>This menu item is visible only if a 3RW5 communication module is used.</p> <ul style="list-style-type: none"> • Diagnosis state
HMI	<ul style="list-style-type: none"> • Diagnosis state • Self-test

You can find additional information in Chapters:

- Performing 3RW55 soft starter diagnostics with the 3RW5 HMI High Feature (Page 175)
- Diagnostics of communication with the High Feature 3RW5 HMI (Page 177)
- Execute HMI diagnostics with the 3RW5 HMI High Feature (Page 178)

Control



Menu	Content
Select parameter set	<ul style="list-style-type: none"> • Parameter set 1 • Parameter set 2 • Parameter set 3
Local/Remote	-
Control motor	<ul style="list-style-type: none"> • Motor CW • Motor CCW • Stop motor • Creep speed • Alternative stopping mode • Pump cleaning start
Reset	-
Disable Quick-stop	-
Emergency start	-
Output 1	-
Output 2	-
Output 3	-
Test mode	<ul style="list-style-type: none"> • Test with small load

For more information, see Chapter:

- Control (Page 154)

Parameters



Menu	Content
Soft starter	<ul style="list-style-type: none"> • Parameter set 1 ... 3 <ul style="list-style-type: none"> – Last changed parameters – Automatic parameterization – Application wizards – Motor parameters – Start settings – Stop settings – Motor protection – Creep speed – Condition Monitoring • Asymmetry • Ground fault • Emergency mode • Number of parameter sets • Inputs • Outputs • Additional parameters • Date and time
Communication	<p>This menu item is visible only if a 3RW5 communication module is used.</p> <ul style="list-style-type: none"> • PROFINET • Modbus TCP • PROFIBUS DP
HMI	<ul style="list-style-type: none"> • Local interface • Timer Lighting Dark • Do Control After Logoff • Message display • Operation display • Edit function favorites • Configure start key • Language
Factory settings	<ul style="list-style-type: none"> • Soft starter • Communication • HMI • All devices

You can find additional information in Chapters:

- Functions (Page 75)
- Parameterizing the 3RW5 HMI High Feature (Page 155)
- Restoring factory setting (Page 184)

Overview



Menu	Content
Soft starter	<ul style="list-style-type: none"> • I&M 0 data • I&M 1 data • I&M 2 data • I&M 3 data
Communication	<ul style="list-style-type: none"> • I&M 0 data
HMI	<ul style="list-style-type: none"> • I&M 0 data

For more information, see Chapter:

- Overview (Page 157)

Security



Menu	Content
Local access protection	<ul style="list-style-type: none"> • Define PIN • Change PIN • Delete PIN • Auto Log Off time • Log in • Log out
User login	These menu items are visible only if a user account administration has been set up via SIRIUS Soft Starter ES (TIA Portal).
User logout	

For more information, see Chapter:

- Security (Page 158)

Micro SD card



This menu is only visible if a micro SD card is inserted.

Menu	Content
Load parameter settings to soft starter	This menu item appears only if a valid parameterization file is stored on the micro SD card.
Load parameterization onto micro SD card	-
Device change	<ul style="list-style-type: none"> • Back up the configuration data on the micro SD card • Transfer configuration data to soft starter
Back up the logbooks on the micro SD card	-
Delete micro SD card	-
FW update	This menu item appears only if a valid FW file is stored on the micro SD card.
Memory space	<ul style="list-style-type: none"> • Complete memory • Free memory • Used memory

For more information, see Chapter:

- Micro SD card (Page 162)

7.18.5 Monitoring

7.18.5.1 Monitoring the measured values of the 3RW55 soft starter with the 3RW5 HMI High Feature

Operating principle

The measured values are provided by the respective device functions. All measured values are stored in the measured value memory which is not secure against voltage failure. These values can be read out and evaluated by the 3RW5 HMI High Feature. You can specify up to 5 measured values, which are then shown on the status display.

Requirements

- You are in menu "Monitoring > Measured values".

Procedure

The "Phase currents (%)", "Phase currents (rms)", "Line-to-line voltages [V]" and "Power" menus contain items which you can access by pressing "OK".

Measured value	Display	Description
Phase currents [%]	<ul style="list-style-type: none"> I L1 I L2 I L3 Average 	The phase currents are displayed as a percentage. You can monitor each phase (L1/L2/L3) individually, or the average of all 3 phases.
Phase currents (rms)	<ul style="list-style-type: none"> I L1 I L2 I L3 Average I L1...I L3 max. 	The phase currents are displayed in amperes. You can monitor each phase (L1/L2/L3) individually, the average of all 3 phases, or the maximum value of each phase.
Asymmetry		The maximum deviation of one phase current relative to the average value of all 3 phase currents.
Line-to-line voltages [V]	<ul style="list-style-type: none"> U L1-L2 U L2-L3 U L3-L1 Average 	The motor voltage is shown in Volts. You can monitor the respective motor voltage of each phase as well as the average of the motor voltage.
Power	Active power PL1..3	Indicates the current active power.
	Power factor L1..3	Indicates the current power factor.
Torque		-
Line frequency		-
Output frequency		This value is displayed only if the starting and stopping output frequencies differ from the line frequency.

Measured value	Display	Description
Motor temperature rise		Current value of motor temperature rise in %. This value is recorded by means of sensors and shows the relative temperature rise of the motor.
Remaining time for motor overload protection		The remaining time for tripping the motor overload protection provides a dynamic prediction of the time remaining until the tripping of the motor overload protection, depending on the momentary motor current.
Remaining motor cooling time		The remaining recovery time after protective tripping of the motor until the soft starter is ready to operate again.
Remaining switching element cooling time		The remaining cooling time of the switching element is dependent on the thermal capacity of the power unit and the ambient conditions (temperature, air circulation, installation location etc.)
Switching element heating		The currently calculated switching element heating is continuously compared with the previously saved switching element heating.
Remaining switching frequency monitoring time		For more information, see Chapter Switching frequency monitoring (Page 115).

7.18.5.2 Monitoring the process image of the 3RW55 soft starter with the 3RW5 HMI High Feature

Operating principle

The process image inputs (PII) contains current information about the soft starter and processing state. The process image outputs (PIQ) contains the current control commands to the soft starter. The control command states of the control source, which has control priority according to the operating mode controller, are entered in the data memory of the process image outputs.

Requirements

- You are in menu "Monitoring > Process image".

Procedure

In the process image input (PII) and output (PIQ), you can see which bits of the process image are active or inactive.

Checkbox	Status	Bit
<input type="checkbox"/>	inactive	0
<input checked="" type="checkbox"/>	active	1

7.18.6 Control

Operating principle

Different control commands can be assigned to the Start button and the favorites keys F1 - F9.

Requirements

- Access protection to the 3RW5 HMI High Feature is not active or has been reset.
- You are in the "Control" menu.

Control commands

Depending on the application and parameterization, the following control commands can be issued via the 3RW5 HMI High Feature:

Control command		Description
Select parameter set	Parameter set 1 (factory setting)	Select one of the three parameter sets. One parameter set is deactivated when another is activated. One parameter set must be active at all times.
	Parameter set 2	
	Parameter set 3	
Local/Remote		Changes master control
Control motor	Motor CW	Motor rotates clockwise
	Motor CCW	Motor rotates counter-clockwise When creep speed is activated, the control command appears automatically under the start key. The control command can also be executed in reversing mode (with ext. contactor).
	Stop motor	The activation command to the motor is canceled
	Creep speed	<ul style="list-style-type: none"> • Activated • Deactivated (factory setting)
	Alternative stopping mode	Activate alternative stopping in order to set up an additional stop in parameter set 1. For more information, see Chapter Alternative stopping (Page 103).
	Pump cleaning start	This parameter is only visible if the pump cleaning function has been parameterized. For more information, see Chapter Pump cleaning function (Page 119).
Reset		Execute a RESET.
Disable Quick-stop		Motor does not stop despite pending ON command from Quick-stop.
Emergency start		With the emergency start function the system can continue to be operated in the case of system faults. For more information, see Chapter Emergency start (Page 124).

Control command		Description
Output 1		Requirement: The output n is parameterized on control source "PIQ-DQ x.y Output n". For more information, see Chapter Digital outputs (Page 131).
Output 2		
Output 3		
Test mode	Test with small load	The auxiliary and main circuit wiring is tested using a small load. A direction of rotation test can be performed by visually monitoring the motor shaft or the load connected to it. <ul style="list-style-type: none"> • Activate • Deactivate

7.18.7 Parameterizing the 3RW5 HMI High Feature

Requirements

- Access protection to the 3RW5 HMI High Feature is not active or has been reset.
- You are in the "Parameters > HMI" menu.

Procedure

The following parameters refer to the 3RW5 HMI High Feature.

The "Do Control After Logoff", "Messages to show" and "Operation display" menus contain further items which you can switch to with "OK".

Parameters	Description
Activate local interface	Activates the local interface of the 3RW5 HMI High Feature. This parameter is only visible if the local interface has previously been deactivated. Before you can connect a PC with SIRIUS Soft Starter ES (TIA Portal) to the soft starter via the local interface, the local interface must be activated.
Deactivate local interface	Deactivates the local interface of the 3RW5 HMI High Feature. This parameter is only visible if the local interface has previously been activated (factory setting).
Timer Lighting Dark	The display switches off after the specified time has elapsed. The parameter value "0" deactivates the shutdown of the display. <ul style="list-style-type: none"> • Factory setting: 5 min • Setting range: 0 ... 60 min • Increment: 1 min
Do Control After Logoff	This parameter describes the response after logging off while the motor is running.
	Continue with motor control (factory setting) 3RW5 HMI High Feature is still the master control.
	Stop motor and give back control The motor stops and the 3RW5 HMI High Feature is no longer the master control.

Parameters	Description
Message display	The settings of the messages to show define which messages are displayed as a pop-up window on the display of the 3RW5 HMI High Feature.
	Error <ul style="list-style-type: none"> • Do not display • Display (factory setting)
	Warnings <ul style="list-style-type: none"> • Do not display • Display (factory setting)
Operation display	Up to 5 different measured values can be selected from a list of measured values. You will find additional information on measured values in Chapter Monitoring the measured values of the 3RW55 soft starter with the 3RW5 HMI High Feature (Page 152). <ul style="list-style-type: none"> • Phase current average (%) (factory setting) • Phase current average (rms) (factory setting) • Line-to-line voltage U L1-L2 (factory setting) • Active power PL1..3 (factory setting) • Power factor L1..3 (factory setting)
Edit function favorites	Setting the favorites menu. <ul style="list-style-type: none"> • Add • Delete
Configure start key	Setting the start key <ul style="list-style-type: none"> • Motor CW (factory setting) • Motor CW with creep speed • Motor CCW • Motor CCW with creep speed
Language	The required language is set in the "Language" menu. <ul style="list-style-type: none"> • English (factory setting) • German • French • Spanish • Italian • Portuguese • Chinese • Additional language 1

7.18.8 Overview

Operating principle

The "Overview" function displays the connected components and their device-related information.

Requirements

- You are in the "Overview" menu.

Content of the I&M data

I&M 0 data Device identification	I&M 1 data Equipment identifier	I&M 2 data Installation	I&M 3 data Description
<ul style="list-style-type: none"> MANUFACTURER_ID ORDER_ID SERIAL_NUMBER HARDWARE_REVISION SOFTWARE_REVISION REV_COUNTER PROFILE_ID PROFILE_SPECIFIC_TYPE IM_VERSION IM_SUPPORTED 	<ul style="list-style-type: none"> TAG_FUNCTION TAG_LOCATION 	<ul style="list-style-type: none"> INSTALLATION_DATE 	<ul style="list-style-type: none"> DESCRIPTOR

Procedure

Select one of the following menus and click "OK" to confirm:

- Soft starter
- Communication
- HMI

Depending on the selected menu item, the following device-related information is available to the respective components:

Overview	I&M 0 data Device identification	I&M 1 data Equipment identifier	I&M 2 data Installation	I&M 3 data Description
Soft starter	x	x	x	x
Communication	x	-	-	-
HMI	x	-	-	-

7.18.9 Security

7.18.9.1 General advice on using PINs

The 3RW55 soft starter has 2 functions with a PIN each for protecting against unauthorized access:

- Local access protection
- User account administration (user login and logout)

You have the option of combining both versions.

Note

Use of PINs

Note that each function uses a separate PIN:

- **HMI PIN** for local access protection
- **HMI User PIN** for user accounts

Note

Combination of both versions

When using local access protection and user account administration, note the sequence of PIN entry on the 3RW5 HMI High-Feature. Enter the HMI PIN first and then the HMI User PIN in order to unlock locked menus.

If the HMI PIN and the HMI User PIN are identical, there is no need to enter the HMI User PIN on the 3RW5 HMI High-Feature.

7.18.9.2 Defining the local access protection (PIN)

Operating principle

You can protect the 3RW5 HMI High Feature against unauthorized access by issuing a 4-digit HMI PIN.

Requirements

- Access protection to the 3RW5 HMI High Feature is not active or has been reset.
- You are in the "Security > Local Access Protection" menu.

Procedure

Define PIN

1. Select the "Define PIN" menu.
In the factory setting, no HMI PIN is active.
2. Define a 4-digit HMI PIN and confirm with "OK".
A pop-up window opens in which you can verify the HMI PIN.
3. Enter the HMI PIN again to confirm it and then click on "OK".
The HMI PIN has been defined and is active.

Change PIN

1. Select the "Change PIN" menu.
2. Enter the current HMI PIN in the pop-up window and confirm with "OK".
The correct entry of the HMI PIN is checked.
3. Specify a new 4-digit HMI PIN and confirm with "OK".
The HMI PIN has been changed.

Delete PIN

1. Select the "Delete PIN" menu.
2. Enter the current HMI PIN in the pop-up window and confirm with "OK".
The correct entry of the HMI PIN is checked.
The HMI PIN has been deleted. You can now set a new HMI PIN.

Parameter		Description
Local access protection	Define PIN	This parameter is only visible if no HMI PIN has previously been set. <ul style="list-style-type: none"> • Empty (factory setting) • 4-digit HMI PIN
	Change PIN	This parameter is only visible if an HMI PIN has previously been set. The current HMI PIN is changed.
	Delete PIN	This parameter is only visible if an HMI PIN has previously been set. The current HMI PIN is deleted.
	Auto Log Off time	On expiry of the automatic logoff time, the set HMI PIN is reactivated. <ul style="list-style-type: none"> • 1 ... 300 s
	Log in	Remove the local access protection by logging on with your 4-digit HMI PIN. If you issue a control command while access protection is active or would like to change a parameter, a pop-up window appears prompting you to enter the HMI PIN.
	Log out	Log out of your current session. Access protection is activated again.

Result

With the HMI PIN you can protect the 3RW5 HMI High Feature from unauthorized access. The "Monitor", "Diagnostics", "Overview", and "Security" menus can still be viewed.

The HMI PIN is retained even after the power supply has been interrupted.

Note

HMI PIN reset

You can reset the access protection to the factory setting with the master RESET key on the rear of the 3RW5 HMI High Feature.

Protect the master RESET key from unauthorized access.

7.18.9.3 User login and logout

Operating principle

You can protect the 3RW55 soft starter against unauthorized access by issuing PIN-protected user accounts.

For more information, see Chapter User account administration (Page 139).

Requirements

- User account has been set up in SIRIUS Soft Starter ES (TIA Portal).
- User account has been transferred with SIRIUS Soft Starter ES (TIA Portal) via one of the following paths to the 3RW55 soft starter:
 - Local interface
 - Fieldbus via suitable 3RW5 communication module
 - Micro SD card
- You are in menu "Security > User login"

Procedure for User login

1. Select the "User login" menu in order to log in with your user account.
2. Enter the 4-digit HMI User PIN.

After correctly entering the HMI User PIN you are logged in with your user account.

Procedure for User logout

1. Select the "User logout" menu in order to log out with your user account.
Access protection is activated again.

Result

With the HMI User PIN you can protect the 3RW55 soft starter from unauthorized access. The "Monitoring", "Diagnosis", and "Overview" menus can still be viewed.

The HMI User PIN is retained even after the power supply has been interrupted.

7.18.10 Micro SD card

Operating principle

In combination with a micro SD card, the 3RW5 HMI High Feature can perform firmware updates, exchange configuration files, and store logbooks.

Requirements

- Access protection to the 3RW5 HMI High Feature is not active or has been reset.
- Inserted micro SD card
- You are in the "Micro SD Card" menu.

Parameters

The "Micro SD Card" menu appears after you have inserted a micro SD card into the 3RW5 HMI High Feature.

Action		Description
Load parameter settings to soft starter		<p>This menu item appears if a valid parameterization file is stored on the micro SD card. The parameterization file is transferred from the micro SD card to the soft starter. The following data is transferred:</p> <ul style="list-style-type: none"> • Device parameters of the 3RW5 HMI High Feature • Device parameters of the 3RW55 soft starter • User management / passwords
Load parameterization onto micro SD card		<p>The parameterization file is transferred from the soft starter to the micro SD card. The following data is transferred:</p> <ul style="list-style-type: none"> • Device parameters of the 3RW5 HMI High Feature • Device parameters of the 3RW55 soft starter • User management / passwords
Device change	<ul style="list-style-type: none"> • Back up the configuration data on the micro SD card • Transfer configuration data to soft starter 	<p>When a device is replaced, the configuration can be transferred to the new device. The following data is transferred:</p> <ul style="list-style-type: none"> • I&M 1 data • I&M 3 data • Device parameters of the 3RW5 HMI High Feature • Device parameters of the 3RW55 soft starter • Communication parameters • User management / passwords
Back up the logbooks on the micro SD card		The logbooks are backed up on the micro SD card. For more information, see Chapter Logbooks (Page 179).
Delete micro SD card		The contents of the micro SD card are deleted.
FW update	<ul style="list-style-type: none"> • Soft starter • Communication • HMI • All devices 	<p>This menu item appears if a valid firmware file is stored on the micro SD card. The 3RW5 HMI High Feature automatically detects which firmware file the micro SD card contains:</p> <p>The firmware update is documented in the device logbook.</p>
Memory space	<ul style="list-style-type: none"> • Complete memory • Free memory • Used memory 	The memory capacity is displayed.

Messages and diagnostics

8.1 Diagnostics options

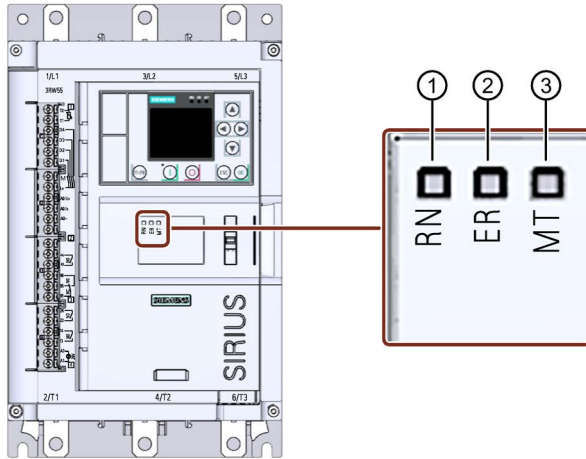
The 3RW55 soft starter offers the following diagnostics options:

- LEDs on the 3RW55 soft starter
- 3RW5 HMI High Feature
- SIRIUS Soft Starter ES (TIA Portal) (accessories) via 3RW5 communication module or 3RW5 HMI High Feature (local interface).

You will find more details in the manual for the 3RW5 communication module in question.

8.2 LED display



8.2.1 Overview of the device LEDs of the 3RW55 soft starter




- ① RUN (green) Indicates whether the 3RW55 soft starter is ready for operation.
- ② ERROR (red) Indicates whether there is an error.
- ③ MAINTAINANCE (yellow) Indicates whether a message is present.

8.2.2 Status and error displays


LED "RN" - RUN

Status	Meaning
 Lights up green	The 3RW55 soft starter is ready for operation.
 Flashes green	The 3RW55 soft starter is not ready for operation, e.g. due to: <ul style="list-style-type: none"> • System startup • Device factory settings are being restored. • Self-test active • Firmware update






LED "ER" - ERROR

Status	Meaning
<input type="checkbox"/> Off	No errors are present.
 Flashes red	There is at least one error.

LED "MT" - MAINTENANCE / WARNING

Status	Meaning
<input type="checkbox"/> Off	No alarm is active.
 Lights up yellow	At least one warning exists. The cause has not been eliminated.

LED combinations

Status			Meaning
RN (RUN)	ER (ERROR)	MT (MAINT)	
 Flashes green	<input type="checkbox"/> Off	 Flashes yellow	<ul style="list-style-type: none"> • The soft starter waits for confirmation via the OK key.
 Flashes green	 Flashes red	 Flashes yellow	<ul style="list-style-type: none"> • The soft starter is not ready for operation. • Device error detected.

8.2.3 Overview of LEDs on High Feature 3RW5 HMI

The display of the device LEDs of the 3RW5 HMI High Feature shows the messages of the following devices:



- 3RW5 soft starter
- 3RW5 communication module (if there is one)
- 3RW5 HMI High Feature

Note

Display of device LEDs.

Please note that the display of the device LEDs of the 3RW5 HMI High Feature does not have to correlate with the display of the device LEDs of the 3RW5 soft starter.

Status LED

Status LED	Status of the soft starter	Motor operating state
 Lights up green	Operation	The ramp-up time is over, the motor is running, and the soft starter is in bypass mode.
 Flashes green	Ramp-up or ramp-down time active	Motor is ramping up or ramping down.

Reference

You will find more information on soft starter messages in the Chapter "Status and error displays (Page 167)".

You will find more information on the messages of the 3RW5 communication module in the manual for the 3RW5 communication module in question.

8.3 Warnings and remedial measures of the 3RW55 soft starter

Warning	Cause	Remedy
Generator operation	The motor is in ramp-down mode. The motor connection cables may be energized.	Parameterize the ramp-down mode to minimize or avoid the generator operation.
Connection break in manual mode	Connection to operator device (e.g. 3RW5 HMI) is interrupted.	<ul style="list-style-type: none"> • Check the communication between the 3RW5 HMI and the device. • Check the connection between PC and the local device interface.
Temperature sensor overload	The temperature of the motor is too high.	<ul style="list-style-type: none"> • Check the motor and the application that is driven by the motor. • After triggering, the motor can only be switched on again if the temperature has reached the release position of the temperature sensor.
Temperature sensor wire break	A wire break has occurred in the sensor line of the temperature sensor.	Check the sensor line and the temperature sensor.
Temperature sensor short-circuit	A short-circuit has occurred in the sensor line of the temperature sensor.	
Module slot wrong or configuration faulty	Real and configured slot of module is different.	Ensure consistency between plugged and configured module position or possibly the referenced module has a wiring fault.
Switching element overload	Switching element (switch contact, power semiconductors) too hot.	<ul style="list-style-type: none"> • Check the ambient conditions associated with cooling. You may want to consider lowering the operating characteristics. • Check the number of switching operations.
Time reserve before tripping underrun	The time to overload trip of the thermal motor model is shorter than the configured time for the tripping reserve.	<ul style="list-style-type: none"> • Let the motor cool down. • For heavy starting and settings for tripping CLASS 20, deactivate this monitoring.
Therm. motor model overload	<ul style="list-style-type: none"> • The motor feeder is overloaded. • The motor temperature has exceeded a limit. 	<ul style="list-style-type: none"> • Check the motor and the applications driven by the motor. • You can switch on the motor again after the cooling-off period has expired or after deleting the thermal motor model.
Above threshold I	The current has exceeded a limit.	Check the application driven by the motor.
Below threshold I	The current has undershot a limit.	

8.3 Warnings and remedial measures of the 3RW55 soft starter

Warning	Cause	Remedy
Asymmetry	A limit for asymmetry has been exceeded. Asymmetry can cause an overload. Possible causes: <ul style="list-style-type: none"> • Phase failure • Fault in the motor windings 	Check the motor feeder and the motor.
Ground fault	The ground-fault monitoring has responded. An impermissibly high residual current is flowing.	Check the connecting cable of the motor for damage.
Number of starting operations exceeded	The maximum number of starting operations in the monitoring period has been exceeded.	The next starting operation should take place only after the interlock time has expired.
Error rotating field	The direction of rotation field is not correct.	-
Internal fan error	<ul style="list-style-type: none"> • Fan is dirty (not rotating freely) • Fan defective 	Check the function of the fan: <ul style="list-style-type: none"> • Clean the fan • Check the wiring • Replace the fan
Overvoltage	The supply voltage is above the tolerance limit.	Change the power supply.
Above threshold P	The active power of the motor has exceeded a limit.	Check the application driven by the motor.
Below threshold P	The active power of the motor has fallen below a limit.	
Ramp up time exceeded	The configured maximum starting time is shorter than the required motor starting time.	Prolong the "max. starting time" parameter, increase the current limiting value or check the load coupled with the motor for a mechanical defect.
Ramp up time underrun	The configured minimum starting time is longer than the required motor starting time.	Shorten the "min. starting time" parameter, lower the current limiting value or check the load coupled with the motor for a mechanical defect.

8.4 Faults and remedial actions of the 3RW55 soft starter

Faults	Cause	Remedy
Switching element overload	Switching element (switch contact, power semiconductors) too hot.	<ul style="list-style-type: none"> Check the ambient conditions associated with cooling. You may want to consider lowering the operating characteristics. Check the number of switching operations. Acknowledgment after cooling down
Power semiconductor defective	-	Check the power semiconductors L1, L2 and L3 and replace any that are defective.
Supply voltage missing	<ul style="list-style-type: none"> The mains switch or the power supply is not plugged in correctly. There is no power. 	Check the cables and the cable connections and replace defective components, if necessary.
Temperature sensor overload	The temperature of the motor is too high.	<ul style="list-style-type: none"> Check the motor and the application that is driven by the motor. After triggering, the motor can only be switched on again if the temperature has reached the release position of the temperature sensor.
Temperature sensor wire break	A wire has broken in the sensor cable of the temperature sensor.	Check the sensor line and the temperature sensor.
Temperature sensor short-circuit	A short-circuit has occurred in the sensor line of the temperature sensor.	
Therm. motor model overload	<ul style="list-style-type: none"> The motor feeder is overloaded. The motor temperature has exceeded a limit. 	<ul style="list-style-type: none"> Check the motor and the applications driven by the motor. You can switch on the motor again after the cooling-off period has expired or after deleting the thermal motor model.
Motor overload tripping	<ul style="list-style-type: none"> The motor feeder has been overloaded The temperature rise of the motor has exceeded a limit value. 	<ul style="list-style-type: none"> Check the motor and the applications driven by the motor. You can switch on the motor again after the cooling-off period has expired or after deleting the thermal motor model.
Asymmetry	<p>A limit for asymmetry has been exceeded. Asymmetry can cause an overload. Possible causes:</p> <ul style="list-style-type: none"> Phase failure Fault in the motor windings 	Check the motor feeder and the motor.
Asymmetry tripping	Additional tripping in the case of asymmetry	-
Above threshold I	The current has exceeded a limit.	Check the application driven by the motor.
Below threshold I	The current has undershot a limit.	
Current fault limit disconnection	Additional tripping in the event of a current fault limit overshoot or undershoot.	-

8.4 Faults and remedial actions of the 3RW55 soft starter

Faults	Cause	Remedy
Ground fault	The ground-fault monitoring has responded. An impermissibly high residual current is flowing.	Check the connecting cable of the motor for damage.
Electronics supply voltage too low	The supply voltage is below the permitted value.	Check the power supply (load rating, voltage range).
Bus error	Fault in the fieldbus communication. You will find further information in the manual for the 3RW5 communication module in question.	-
Process image error	The process image output (PIQ) contains invalid control bit combinations (e.g. control bits for clockwise and counter-clockwise rotation are set at the same time).	Check and correct the process image output (PIQ).
Parameter fault	The module is not or is incorrectly parameterized or parameterization changes are denied in current operating mode.	<ul style="list-style-type: none"> • Correct and execute parameterization. • Switch the operating mode and repeat parameterization.
Missing startup parameters	Necessary startup data for the device are missing.	Check parameterization or startup data records.
Device error	Unrecoverable error detected after internal diagnostics (self-test, contactor contacts, switching element, etc.).	Replace the device.
Module slot wrong or configuration faulty	Real and configured slot of module is different.	Ensure consistency between plugged and configured module.
Motor connection variant unknown or incorrect	The motor connection variant was not recognized or is different from configuration.	Ensure correct connection.
Zero current after ON command	No current flow is detected after the motor feeder is switched on. Possible causes: <ul style="list-style-type: none"> • Main circuit interrupted (fuse, circuit breaker) • Motor contactor or contactor control is defective • The parameter execution time is too short • No load 	-
Phase failure <ul style="list-style-type: none"> • L1 • L2 • L3 	The main power monitoring detects a phase failure.	-
Overvoltage	The supply voltage is above the tolerance limit.	Change the power supply.
Bypass defective	-	Check bypasses for L1, L2 and L3 and replace defective bypasses.
Bypass overload	In bypass operation the current was too high. Fault resetting is only possible after cooling down.	<ul style="list-style-type: none"> • Check motor. • Check dimensioning of the soft starter. • Acknowledgment after cooling down

Faults	Cause	Remedy
Phase control failure	<ol style="list-style-type: none"> Error appears without motor start: <ul style="list-style-type: none"> Motor incorrectly connected Inside-delta circuit incorrectly realized Ground fault Error appears while motor is starting: <ul style="list-style-type: none"> Kick start voltage too high Breakaway pulse incorrectly set 	<ol style="list-style-type: none"> Check and correct the wiring. Adjust parameters or extend pause time.
Current measuring range exceeded	<ul style="list-style-type: none"> For sensors: The measured value exceeds the measuring range. For actuators: The output value exceeds a high limit value. 	<ul style="list-style-type: none"> Check the interaction between the module and the sensor or actuator.
Invalid / inconsistent firmware present	The firmware is incomplete and / or the firmware expansions are incomplete or incompatible.	<ul style="list-style-type: none"> Run a complete firmware update. Check any occurring error messages. Check to see whether or not the firmware update was aborted.
Number of starting operations exceeded	The maximum number of starting operations in the monitoring period has been exceeded.	The next starting operation should take place only after the interlock time has expired.
Error rotating field	The direction of rotation field is not correct.	-
Above threshold P	The active power of the motor has exceeded a limit.	Check the application driven by the motor.
Below threshold P	The active power of the motor has fallen below a limit.	
Active power error limit shutoff	Additional tripping in the event of an active power fault limit overshoot or undershoot.	-
Test mode current flow	Current is flowing in the motor feeder even though it is in test mode or in the test position. Possible causes: <ul style="list-style-type: none"> The main circuit is not interrupted in test mode. 	-
Overtemperature of electronic components	The temperature in the components has exceeded the maximum limit.	Check the ambient temperature or the control cabinet cooling.
Actuator disconnection	The module has disconnected the actuator. An additional diagnostic message will be displayed to provide you with more detailed information about the cause.	

8.5 Faults and remedial actions on the 3RW5 HMI High Feature

Faults	Cause	Remedy
HMIFault	Unrecoverable error detected after internal diagnostics (self-test, contactor contacts, switching element, etc.).	Replace the device.
FWUpdateUnsuccessful	The firmware is incomplete and/or the firmware expansions are incomplete or incompatible.	<ul style="list-style-type: none"> • Run a complete firmware update. • Check any occurring error messages. • Check to see whether or not the firmware update was aborted.
FWUpdateInvalidSignature		
Error during self-test	Unrecoverable error detected after internal diagnostics (self-test, contactor contacts, switching element, etc.).	Replace the device.
LIDefective		
Local interface disabled due to flooding	Too many requests to the local device interface	The interface remains disabled until it is no longer flooded with requests.
Write Error	File cannot be written to the micro SD card.	<ul style="list-style-type: none"> • Check whether the micro SD card is inserted. • Check whether the micro SD card is write-protected.
ReadError	File cannot be read from the micro SD card.	<ul style="list-style-type: none"> • Check whether the micro SD card is inserted. • Create and copy a new file onto the micro SD card.
File system error	Micro SD card cannot be read.	Format the micro SD card using FAT32 file format.
No device answer	The connection to the connected basic unit has been interrupted.	Check the connection between the HMI and the device.

8.6 Performing 3RW55 soft starter diagnostics with the 3RW5 HMI High Feature

Requirements

- You are in the "Diagnostics > Soft Starter" menu.

Parameters

Diagnostic value		Description
Diagnosis state		Display of all active diagnostic messages. You can find additional information on diagnostic messages in Chapters Warnings and remedial measures of the 3RW55 soft starter (Page 169) and Faults and remedial actions of the 3RW55 soft starter (Page 171).
Device state	Active parameter set	Display of active parameter set
	Type of connection	If the 3RW55 soft starter is supplied with main voltage and a motor is connected, the type of connection is automatically detected. <ul style="list-style-type: none"> Type of motor connection unknown Type of motor connection inline Type of motor connection inside-delta
	Rotation direction	<ul style="list-style-type: none"> Unknown (line phase direction of the main voltage at terminals L1 / L2 / L3 not detected) CW CCW
	Device I/Os	Display of active inputs and outputs
Statistics data	Active energy import (total)	The statistics data is based primarily on operating states relating to operating hours and operating frequency of the 3RW55 soft starter in the past.
	Operating hours - motor	
	Reset operating hours motor	
	Number of motor overload trips	
	Number of starts motor CW	
	Number of starts motor CCW	
	Number of starts output 1	
	Number of starts output 2	
	Number of starts output 3	
	Number of starts output 4	
	Number of electrical braking stops	
	Phase current max (%)	
	Phase current max (rms)	
	Last tripping current I _A (%)	
	Last tripping current I _A (rms)	
	Number of switching element overload trips	
	Number of bypass overload trips	
Operating hours – device		
Last real starting time		

Diagnostic value		Description
Maximum pointer	Phase currents [%]	<ul style="list-style-type: none"> • I L1 min • I L2 min • I L3 min • I L1 max • I L2 max • I L3 max
	Phase currents (rms)	
	Line-to-line voltages (rms)	
	Maximum tripping current I _A (%)	-
	Maximum tripping current I _A (rms)	-
	Number of motor overload trips	-
	Minimum line frequency	-
	Maximum line frequency	-
	Maximum switching element heating	-
Reset maximum pointer	After maintenance of the device, reset the maximum pointer.	
Self-test (user-test)		<p>Electronic motor overload protection function testing.</p> <p>The entire control circuit is tested, including the switching elements and the error signaling output.</p> <p>If the device responds as intended, tripping on overload occurs. This can immediately be reset by the "Reset" function without a cooling time.</p>
Logbooks		<p>The logbook is a history memory in which events, warnings and faults are shown with a real-time stamp and stored in a list. The communication and HMI device logbook are also displayed here.</p> <p>The logbook can be stored on a micro SD card.</p> <ul style="list-style-type: none"> • All • Application • Device • Service • Delete <ul style="list-style-type: none"> - Application - All (the logbook application is deleted)

8.7 Diagnostics of communication with the High Feature 3RW5 HMI

Requirements

- You are in the "Diagnosis > Communication" menu.

Parameters

Diagnostic value	Comment
Diagnosis state	Shows all active warnings and faults. You can acknowledge faults here.

8.8 Execute HMI diagnostics with the 3RW5 HMI High Feature

Requirements

- You are in the "Diagnosis > HMI" menu.

Parameters

Diagnostic value		Comment
Diagnosis state		Shows all active diagnostic messages.
Self-test	Test LEDs	The device LEDs of the 3RW5 HMI High Feature are tested one after the other. The display of the 3RW5 HMI High Feature shows which device LED is currently being controlled. You can navigate through the test operation with the "OK" key.
	Test buttons	The 3RW5 HMI High Feature keys/buttons are tested one after the other. The display of the 3RW5 HMI High Feature indicates what key has to be pressed.
	Test display	The 3RW5 HMI High Feature runs a color program on the display. Navigate through the test operation with the "OK" key.

8.9 Logbooks

Operating principle

The logbook lists events, warnings, and faults in chronological order. Each of these events is given a real-time stamp. The following logbooks are used for the 3RW55 soft starter:

- Application logbook
- Device logbook
- Service logbook

The logbook is designed as a circular buffer.

Application logbook

The application logbook contains all messages relating to functions and parameters. This logbook is only present in the basic unit. The application logbook can be deleted with the command "Delete application logbook – xy".

Device logbook

The following messages are recorded in the device logbook:

- Device fault
- Device operating error
- Device prewarning
- Device warnings
- Device events

The device logbook is available in every module and cannot be deleted.

Service logbook

Messages about detailed device errors, deactivation of protective functions, etc., are recorded in the service logbook. The service logbook is available in every module and can only be deleted by service personnel.


More information

You can find additional information on the contents and read-out of the logbooks in the "Diagnosis > Soft starter > Logbooks" menu.

You can find additional information on saving the logbooks to a micro SD card in the "Micro SD card > Save logbooks to micro SD card" menu.

Maintenance and service

Maintenance and repairs

 WARNING
Danger to life when live parts are touched The present device / part conducts hazardous voltages. Touching live components can result in death or severe injury. Installation, commissioning, and maintenance only by qualified specialist personnel. Observe the notes included in the operating instructions and manuals of the soft starter in question.

Note

Repair of the devices is only permissible by qualified personnel. Please contact the authorized Siemens service partner for this.

9.1 Firmware update

During operation, it may be necessary to update the firmware (e.g. to extend the available functions). You update the firmware of the device with the help of firmware files. The retentive data is retained after the firmware has been updated.

Firmware updates are provided to you on the Internet. Depending on what firmware updates are available, you can update the devices individually or together.

You can perform a firmware update for the following devices:

- 3RW5 soft starter
- 3RW5 HMI High Feature (not possible via fieldbus)
- 3RW5 communication modules

Requirements

- Valid firmware update

Link (<https://support.industry.siemens.com/cs/ww/en/ps/16212/dl>)

Procedure

1. Make sure that the motor is switched off and you do not start the motor during the firmware update.

A control command for starting the motor is not supported during the firmware update. Make sure that the main voltage is only applied to the 3RW5 soft starter when it is necessary.

In order to avoid possible errors during the firmware update, set the CPU / PLC to STOP.

2. Perform the update of the device firmware.

The following procedures are possible:

- Via the local interface of the 3RW5 HMI High Feature with SIRIUS Soft Starter ES (TIA Portal)
- With a fieldbus via a 3RW5 communication module with SIRIUS Soft Starter ES (TIA Portal) Premium or the configuration software of the controller (e.g. STEP 7 with corresponding HSP) (depending on the 3RW5 communication module)
- With a micro SD card via the 3RW5 HMI High Feature (Page 183)

Result

You have performed a firmware update for the selected device. The firmware update is documented in the device logbook.

9.2 Performing firmware update with micro SD card (3RW5 HMI High Feature)

Requirements

- Micro SD card with valid firmware file (*.udp)
- You are in the "Micro SD card > FW Update" menu.

Procedure

Note**Access to micro SD card.**

Please note that the micro SD card is inserted in the 3RW5 HMI High Feature during updating of the firmware.

Premature removal of the micro SD card from the 3RW5 HMI High Feature is not permissible and will terminate updating of the firmware. Data could also be lost.

- Select the folder of the respective device.
- Select the firmware file of the device and confirm with "OK".

You can see the firmware update is being performed from the progress bar on the display.

Following successful updating of the firmware, the respective device then restarts automatically.

- Check the new firmware version in the "Overview" menu.

Result

You have performed a firmware update for the selected device using the micro SD card. The firmware update is documented in the device logbook.

9.3 Restoring factory setting

Effects of the factory setting

The following devices can be reset to the factory setting:

- 3RW5 soft starter
 - The parameters of the 3RW5 soft starter are reset to the factory setting (depending on the 3RW5 soft starter).
 - User accounts are deleted (depending on the 3RW5 soft starter).
 - An automatic restart of the 3RW5 soft starter is performed.
- 3RW5 communication module
 - The parameters of the 3RW5 communication module are reset.
- 3RW5 HMI High Feature
 - The parameters of the 3RW5 HMI High Feature and the PIN for access protection are reset to the factory setting.
- All devices
 - The 3RW5 soft starter, the 3RW5 communication module, and the 3RW5 HMI High Feature are reset to the factory settings, as described above.

Procedure

1. Make sure that the motor is switched off and you do not start the motor while restoring the factory settings.

Make sure that the main voltage is only applied to the 3RW5 soft starter when it is necessary.

2. Restore the factory settings.

The following procedures are possible:

- Via the local interface on the 3RW5 HMI High Feature with SIRIUS Soft Starter ES (TIA Portal)
- With a fieldbus via a 3RW5 communication module (depending on the respective 3RW5 communication module) with SIRIUS Soft Starter ES (TIA Portal) Premium
- With a fieldbus via a 3RW5 communication module (depending on the respective 3RW5 communication module) with the configuration software of the controller (e.g. STEP 7). Only the communication parameters are reset here.
- Via the 3RW5 HMI High Feature

Restoring the factory settings via High Feature 3RW5 HMI (Page 185)

Restoring the factory settings with the Master RESET button via 3RW5 HMI High Feature (Page 186)

Result

The factory setting of the selected device or all devices is restored.

9.3.1 Restoring the factory settings via High Feature 3RW5 HMI

Requirements

- Access protection to 3RW5 HMI High Feature is not active or has been removed.
- You are in menu "Parameters > Factory Settings"

Procedure

1. Select the desired menu item.
 - 3RW5 soft starter
 - Communication
 - 3RW5 HMI High Feature
 - All
2. Confirm the menu item.

Result

The factory setting of the selected device or all devices is restored.

Note the effects of the factory settings described in Chapter Restoring factory setting (Page 184).

9.3.2 Restoring the factory settings with the Master RESET button via 3RW5 HMI High Feature

Requirements

- Free access to the Master RESET key of the 3RW5 HMI High Feature
Removing the 3RW5 HMI High Feature (Page 41)
- 3RW5 HMI High Feature is connected to the soft starter via the HMI connecting cable.

Procedure

1. Press the Master RESET key on the rear of the 3RW5 HMI High Feature.
The menu for restoring the factory setting appears on the display.
2. Select the desired menu item.
 - 3RW5 soft starter
 - Communication
 - 3RW5 HMI High Feature
 - All
3. Confirm the menu item with "OK".

Result

The factory setting of the selected device or all devices is restored.

Note the effects of the factory settings described in Chapter Restoring factory setting (Page 184).

Technical specifications

10.1 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/16212/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...". Below it, the search results are displayed. The "Product" field contains the article number "3RV2031-4BA10". The "Entry type" is set to "Technical data (1)". The "Date" field is empty. The search results show a product description for "3RV2031-4BA10" and a navigation path: "> Product details > Technical data > CAx data".

Overview tables technical data

You will find overview tables with technical data in the "Product information" tab in our online ordering system ([https://mall.industry.siemens.com/mall/en/WW/Catalog/Products/10143170?tree=CatalogTree#Technische Daten](https://mall.industry.siemens.com/mall/en/WW/Catalog/Products/10143170?tree=CatalogTree#Technische%20Daten)).

Dimension drawings

11.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/ps/16212/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..." and a magnifying glass icon. Below the search bar, there are three filters: "Product" with the value "3RW2031-4DA10", "Entry type" with the value "Technical data (1)", and "Date" with "From" and "To" fields. Below the filters, there is a search button labeled "> Search product". The search results are displayed in a list. The first result is for the product "3RW2031-4DA10" and is highlighted. The product description is: "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". 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.

Circuit diagrams

12.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/ps/16212/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..." and a magnifying glass icon. Below the search bar, there are three filters: "Product" with the value "3RV2021-4BA10", "Entry type" with the value "Technical data (1)", and "Date" with "From" and "To" fields. Below the filters, there is a search button labeled "> Search product". The search results are displayed in a list. The first result is for the product "3RV2021-4BA10", which is a "CIRCUIT BREAKER, SCREW TYPE, 20 A". The description of the product is "CIRCUIT BREAKER SIZE S2, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 14... 20A, N-RELEASE 20DA, SCREW TERMINAL, STANDARD BREAKING CAPACITY". Below the product description, there are three links: "> Product details", "> Technical data", and "> CAx data". The "CAx data" link is highlighted with a red box.

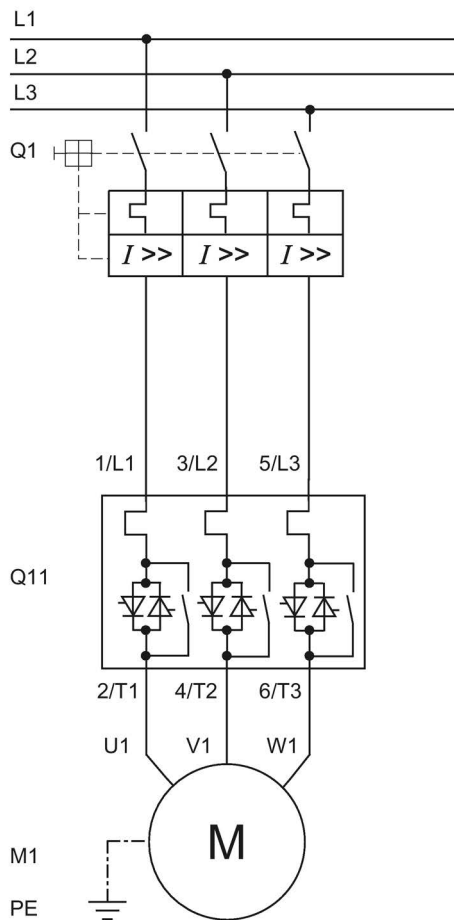
Example circuits

A.1 Main circuit connection

A.1.1 Feeder assembly, type of coordination 1 fuseless

Feeder assembly, type of coordination 1 fuseless

The connections of the SIRIUS soft starter are wired into the motor feeder between the motor starter protector and the motor. This achieves type of coordination 1.



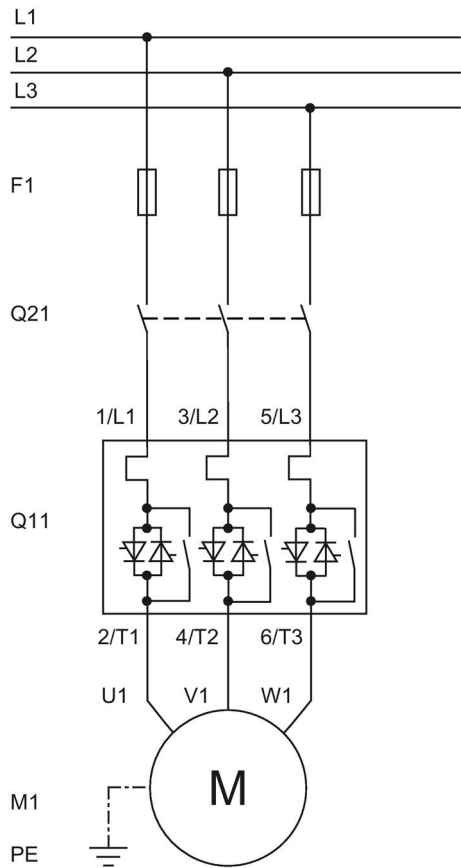
- Q1 Motor starter protector (e.g. 3RV2 or 3VA)
- Q11 Soft starter
- M1 Motor
- PE Protective conductor

A.1.2 Feeder assembly, type of coordination 1 with fuses

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.

Feeder assembly, type of coordination 1 with fuses

If galvanic isolation is required, install a main or line contactor between the soft starter and the fuses.

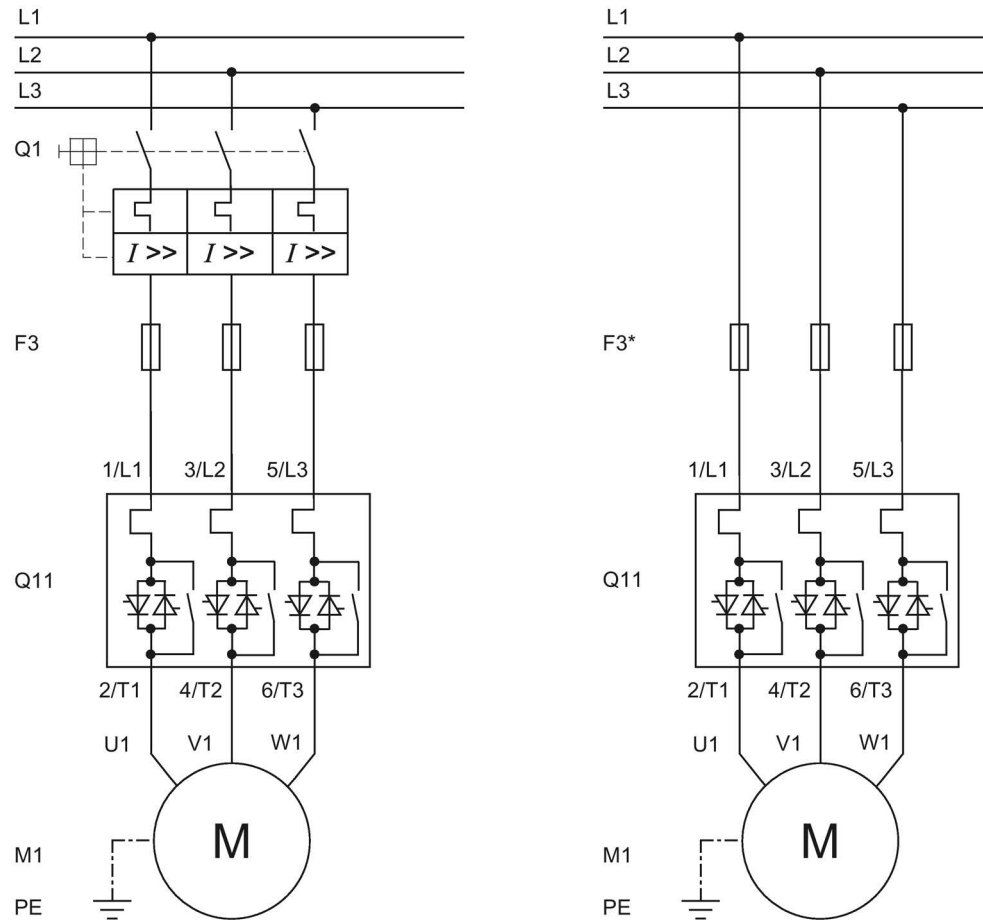


- F1 gG full-range fuse for cable and line protection (e.g. 3NA3)
- Q21 Main or line contactor for galvanic isolation
- Q11 Soft starter
- M1 Motor
- PE Protective conductor

A.1.3 Feeder assembly, type of coordination 2

Feeder assembly, type of coordination 2

In order to achieve type of coordination 2, you must provide protection for all thyristors against short circuits by means of special semiconductor fuses (e.g. SITOR fuses from Siemens). 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.



- Q1 Motor starter protector
- F3 aR partial-range fuse for protection of semiconductors (e.g. SITOR 3NE3/4 or 3NC3)
- F3* gR full-range fuse for protection of semiconductors (e.g. SITOR 3NE1)
- Q11 Soft starter
- M1 Motor
- PE Protective conductor

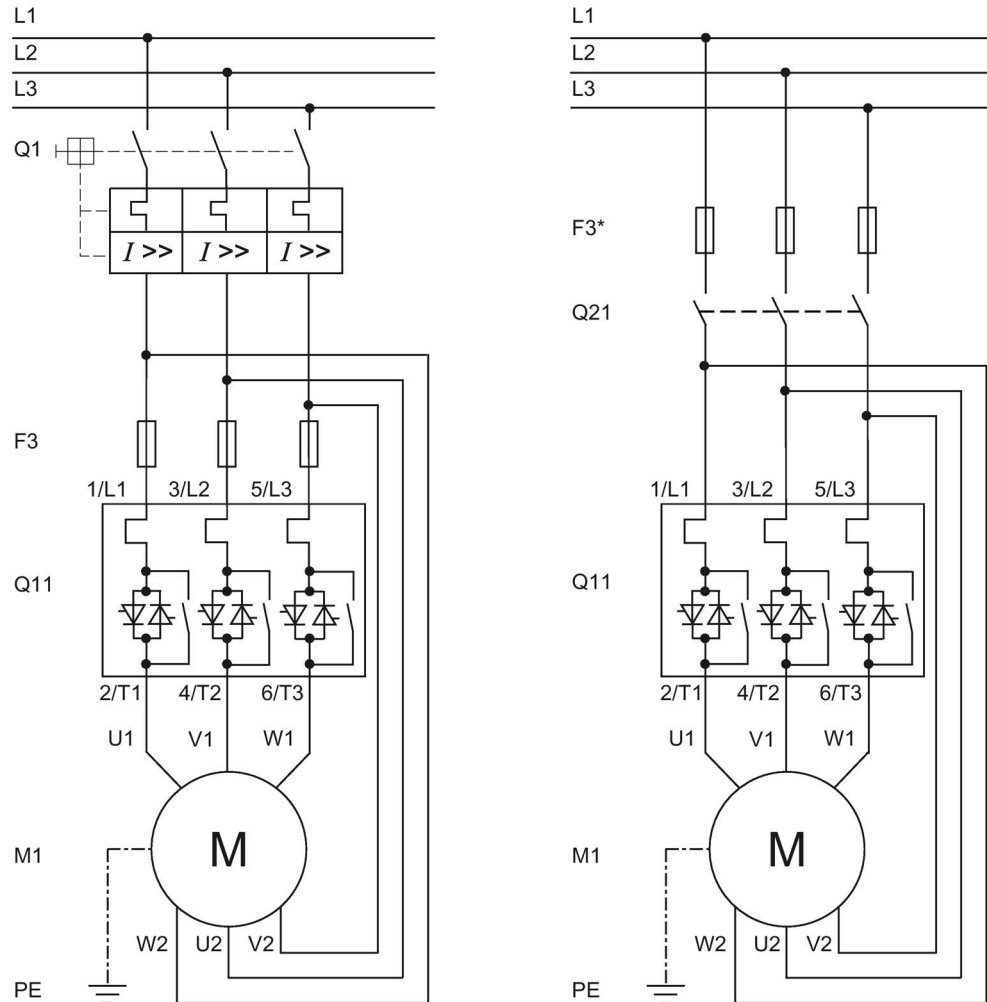
A.1.4 Inside-delta circuit

The inside-delta circuit requires a motor with windings that can be connected in a delta circuit where a line voltage prevails.

If the soft starter is operated in an inside-delta circuit, the motor power output of the individual devices is increased by a factor of root 3. On the front of the device behind the hinged cover, you will find a value table with increased current values for an inside-delta circuit.

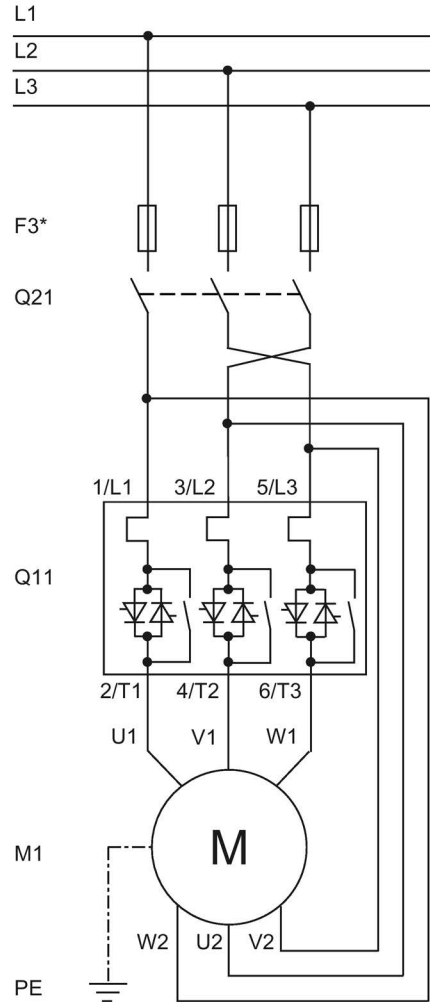
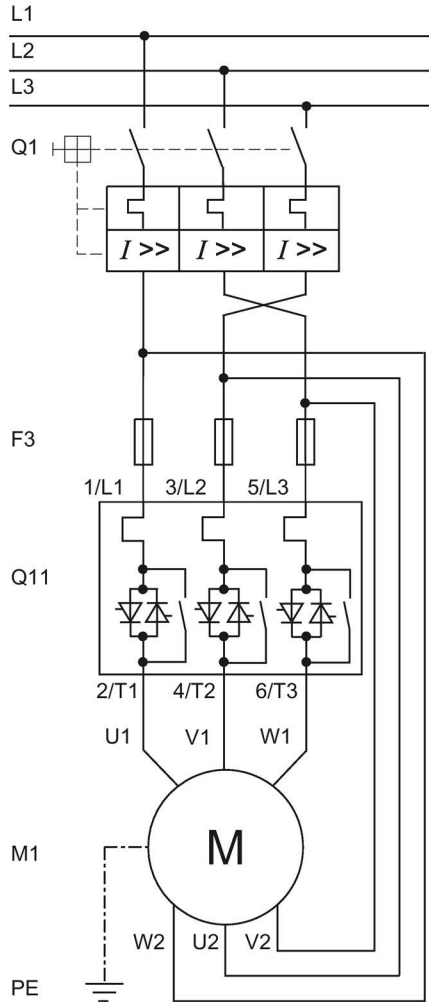
If the load voltage is present and the motor is connected to the device, the soft starter automatically detects the type of connection.

Motor rotation in line phase direction



- Q1 Motor starter protector
- F3 aR partial-range fuse for protection of semiconductors (e.g. SITOR 3NE3/4 or 3NC)
- F3* gR full-range fuse for protection of semiconductors (e.g. SITOR 3NE1)
- Q11 Soft starter
- Q21 Main or line contactor for galvanic isolation
- M1 Motor
- PE Protective conductor

Motor rotation contrary to the line phase direction



- Q1 Motor starter protector
- F3 aR partial-range fuse for protection of semiconductors (e.g. SITOR 3NE3/4 or 3NC)
- F3* gR full-range fuse for protection of semiconductors (e.g. SITOR 3NE1)
- Q11 Soft starter
- Q21 Main or line contactor for galvanic isolation
- M1 Motor
- PE Protective conductor

A.2 Control circuit connection

A.2.1 Control by PLC

⚠ WARNING

**Automatic restart.
Can cause death or serious injury.**

If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.

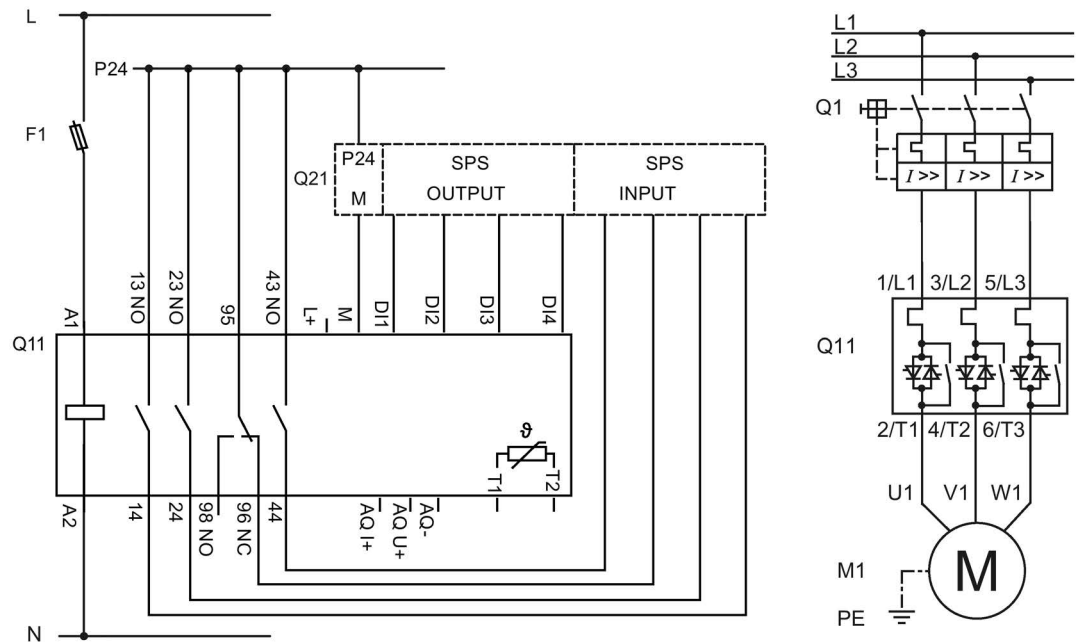
Reset the start command (e.g. via the PLC or switch) before performing a reset.

To do this, for example, link the group error output (terminals 95 and 96) into the control.

Requirements

- Parameterization required

Wiring of control circuit for control by PLC



- F1 Fuse
- Q1 Motor starter protector
- Q11 3RW55 soft starter
- Q21 PLC
- M1 Motor
- PE Protective conductor

A.2.2 Control by means of switch with optional pump cleaning function

⚠ WARNING

**Automatic restart.
Can cause death or serious injury.**

If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.

Reset the start command (e.g. via the PLC or switch) before performing a reset.

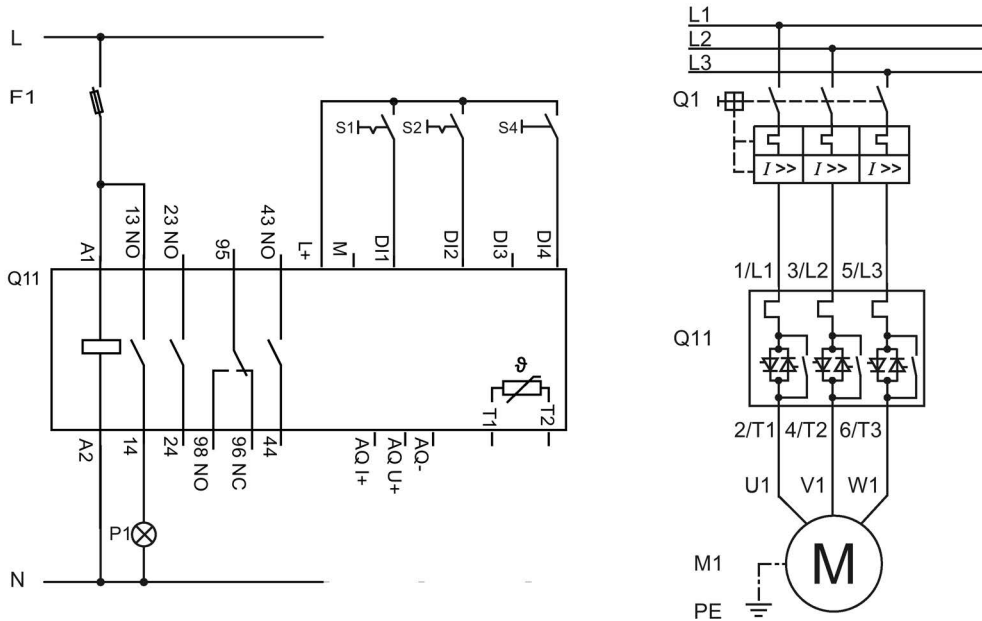
To do this, for example, link the group error output (terminals 95 and 96) into the control.

Requirements

- Parameterization required

For more information, see Chapter Pump cleaning function (Page 119).

Wiring of control circuit for control by means of switch with optional pump cleaning function



- F1 Fuse
- S1 Switch: Motor On / Off
- S2 Activate pump cleaning (optional)
- S4 Pushbutton: Reset
- Q1 Motor starter protector
- Q11 3RW55 soft starter
- P1 Indicator light
- M1 Motor
- PE Protective conductor

A.2.3 Actuation of a line contactor

⚠ WARNING

**Automatic restart.
Can cause death or serious injury.**

If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.

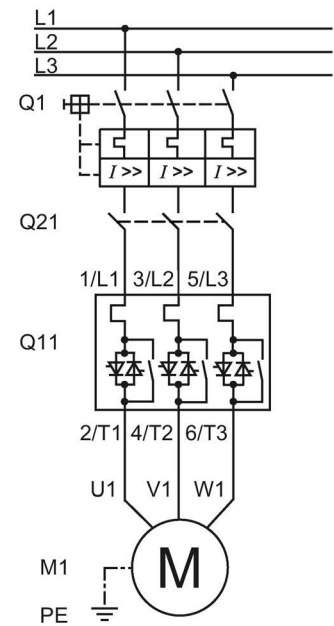
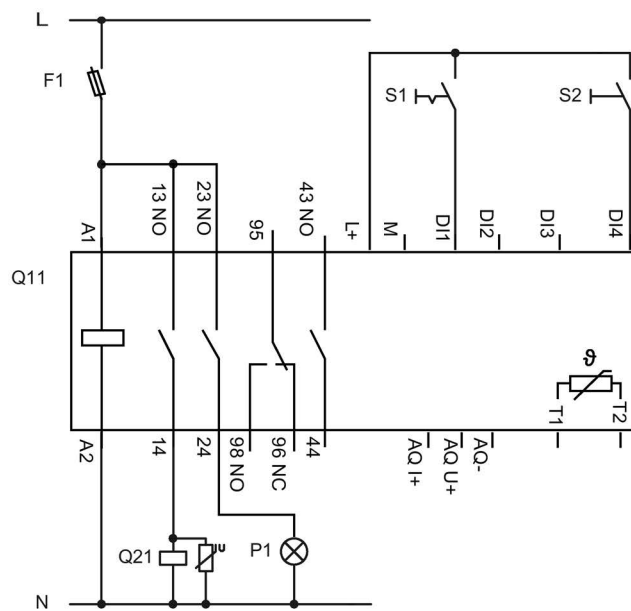
Reset the start command (e.g. via the PLC or switch) before performing a reset.

To do this, for example, link the group error output (terminals 95 and 96) into the control.

Requirements

- Parameterization required

Wiring of control circuit for controlling a line contactor



- | | |
|-----|-------------------------|
| F1 | Fuse |
| S1 | Switch: Motor On / Off |
| S2 | Pushbutton: Reset |
| Q1 | Motor starter protector |
| Q11 | 3RW55 soft starter |
| Q21 | Line contactor |
| P1 | Indicator light |
| M1 | Motor |
| PE | Protective conductor |

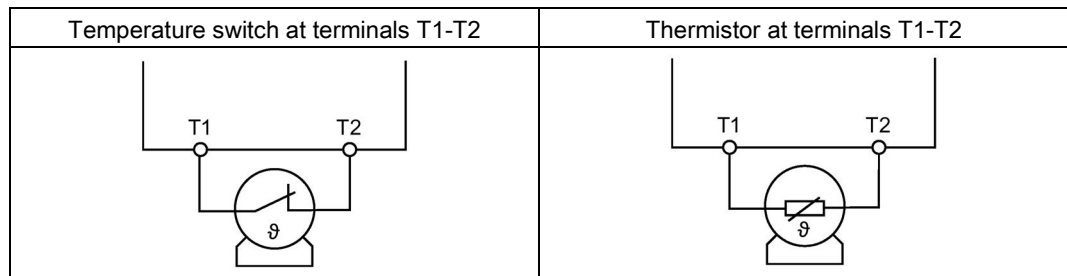
A.2.4 Connecting the temperature sensor

Requirements

- Motor with temperature switch (e.g. Thermoclick) or thermistor (e.g. PTC type A)
- Parameterization required

Procedure

1. Connect the temperature sensor:



2. Parameterize the temperature sensor.

You will find more information on parameterizing the temperature sensor in Chapter Thermistor motor protection with temperature sensor (Page 107).

Result

The 3RW55 soft starter monitors the motor for excessive temperature. If the temperature is exceeded, a warning is generated or the motor is switched off depending upon the parameterization. Restarting takes place after a reset.

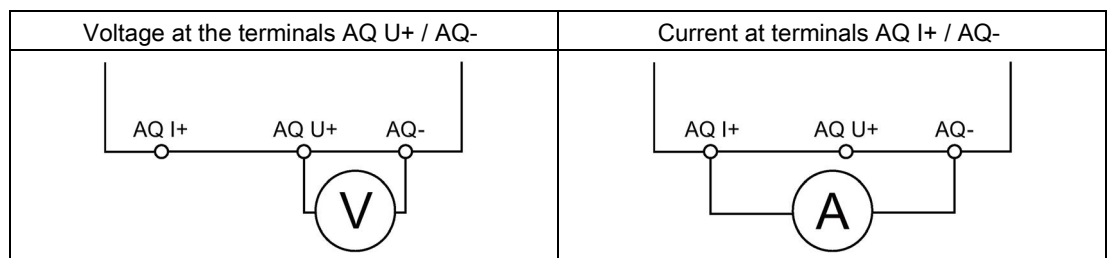
A.2.5 Connecting the evaluation unit to the analog output

Requirements

- Evaluation unit for displaying the analog output signal
- Parameterized analog output
Analog output (Page 133)

Procedure

Connect the evaluation unit:



Result

The specified measured value is shown on the evaluation unit via the analog output.

A.3 Special applications

A.3.1 3RW55 soft starters in inline circuit and stopping function, DC braking with a braking contactor

 **WARNING**

**Automatic restart.
Can cause death or serious injury.**

If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.

Reset the start command (e.g. via the PLC or switch) before performing a reset.

To do this, for example, link the group error output (terminals 95 and 96) into the control.

Use the "DC braking with external braking contactor" function if applications with small mass inertias (centrifugal masses) are to be stopped ($J_{load} \leq 5 \times J_{motor}$).

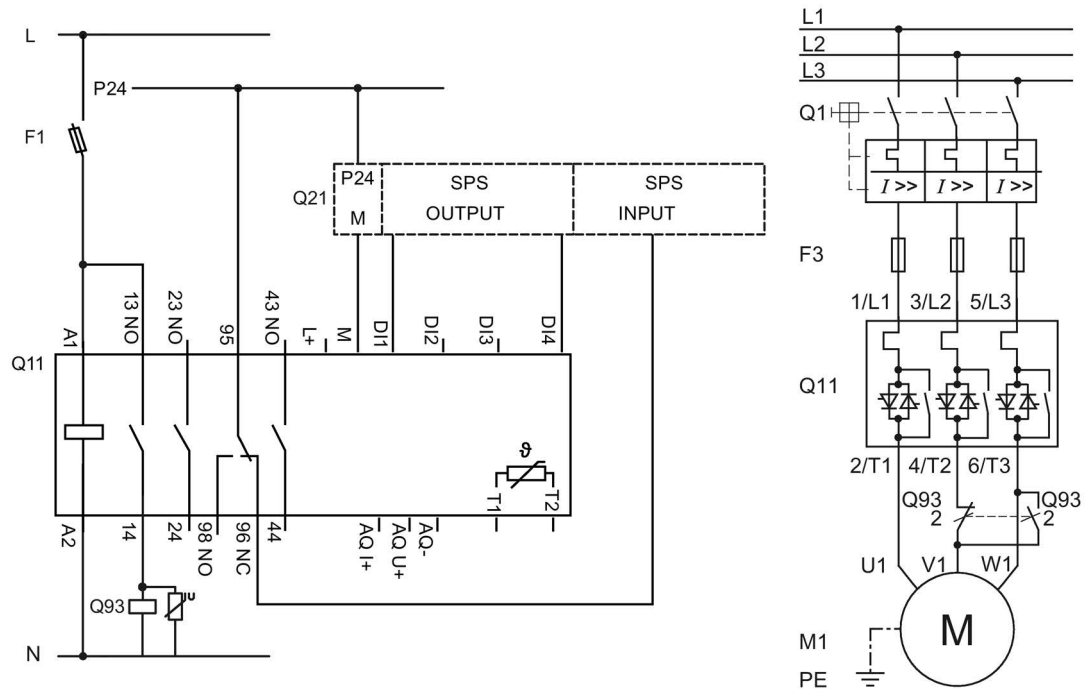
If you select the stopping function "DC braking with external braking contactor", you additionally require a braking contactor. Set the output 1 to "DC braking contactor". If you select the stopping function "Dynamic DC braking without contactor", you do not require a braking contactor.

For more information, see Chapter DC braking with external braking contactor (Page 98).

Requirements


- Parameterization required

Wiring for 3RW55 soft starters in inline circuit and stopping function, with DC braking with a braking contactor



- F1 Fuse
- F3 Fuse
- Q1 Motor starter protector
- Q11 3RW55 soft starter
- Q21 PLC
- Q93 Braking contactor
- M1 Motor
- PE Protective conductor

A.3.2 3RW55 soft starters in inline circuit and stopping function, DC braking with 2 braking contactors

 WARNING
Automatic restart. Can cause death or serious injury.
If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.
Reset the start command (e.g. via the PLC or switch) before performing a reset.
To do this, for example, link the group error output (terminals 95 and 96) into the control.

Use the "DC braking with external braking contactor" function if applications with small mass inertias (centrifugal masses) are to be stopped ($J_{load} \leq 5 \times J_{motor}$).

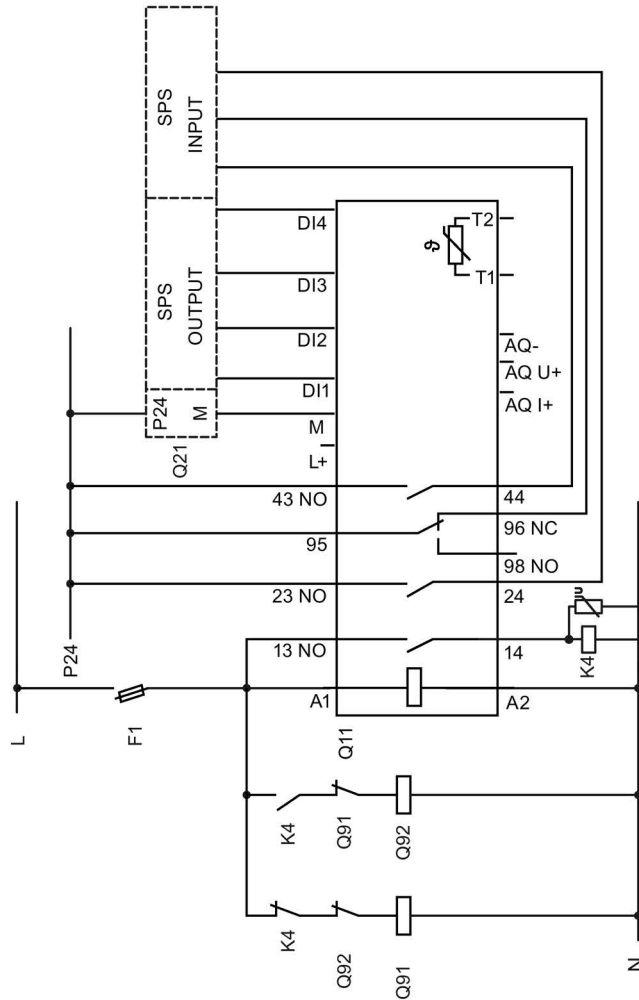
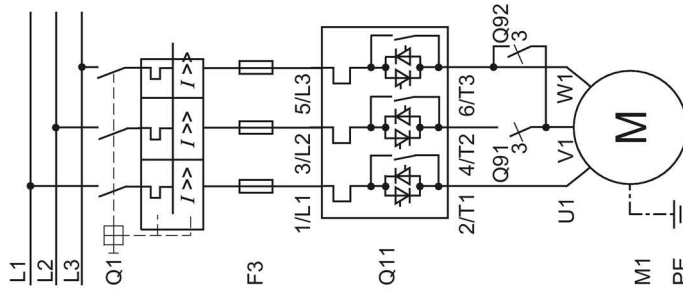
If you select the stopping function "DC braking with external braking contactor", you additionally require 2 braking contactors. Set the output 1 to "DC braking contactor". If you select the stopping function "Dynamic DC braking without contactor", you do not require a braking contactor.

For more information, see Chapter DC braking with external braking contactor (Page 98)

Requirements

- Parameterization required

Wiring for 3RW55 soft starters in inline circuit and stopping function, with DC braking with 2 braking contactors



F1	Fuse
F3	Fuse
K4	Auxiliary relay K4, e.g.: LZS: RT4A4T30 (AC 230 V rated control supply voltage), LZS: RT4A4S15 (AC 115 V rated control supply voltage)
Q1	Motor starter protector
Q11	3RW55 soft starter
Q21	PLC
Q91	Braking contactor
Q92	Braking contactor
M1	Motor
PE	Protective conductor

A.3.3 3RW55 soft starter in inline circuit with soft starting and stopping and additional creep speed function

Note

Do not use the creep speed function in continuous operation. The motor can heat up to an inadmissible extent during continuous operation at creep speed.

Requirements

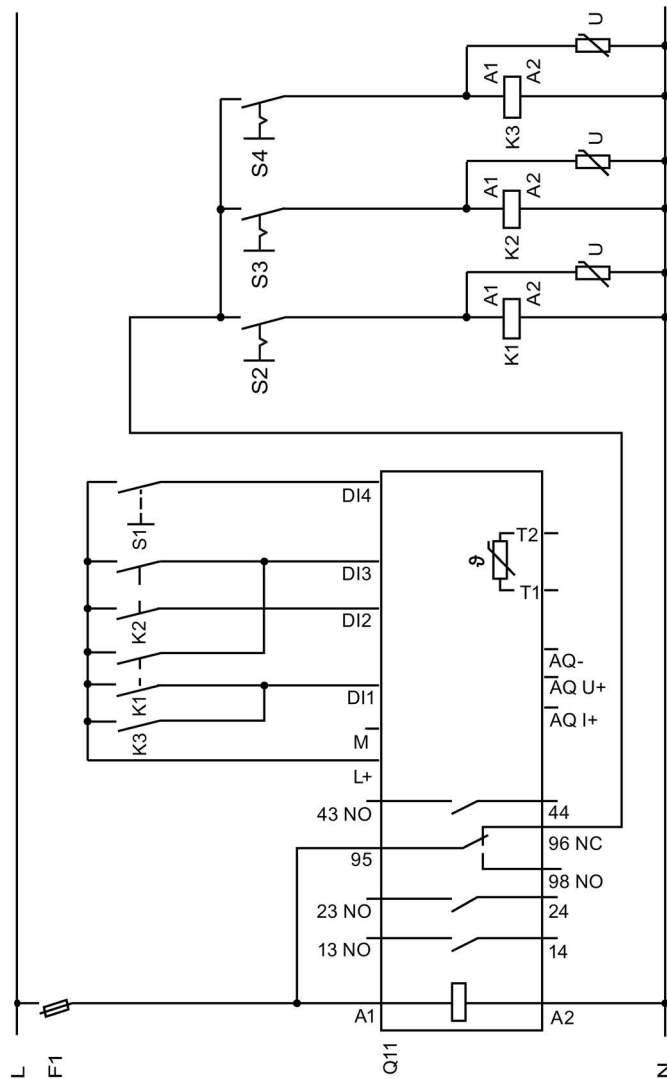
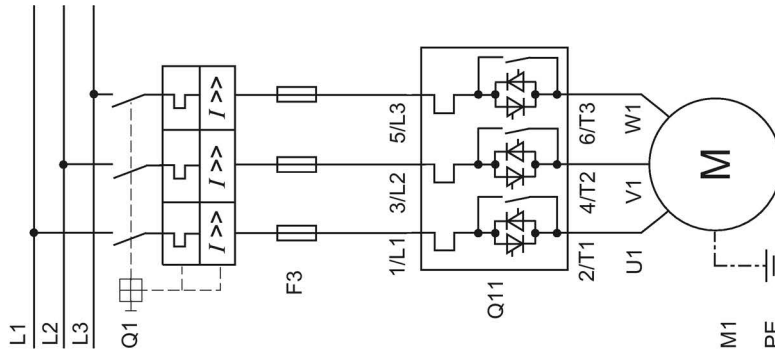
- Parameterization required

For more information, see Chapter Creep speed (Page 109).

Procedure

1. Set the function of the digital inputs:
 - DI1 Motor CW PS1
 - DI2: Motor CCW PS1
 - DI3: Creep speed
 - DI4: Reset (factory setting)
2. Set the creep speed parameters in parameter set 1.

Wiring for 3RW55 soft starter in inline circuit with soft starting and stopping and additional creep speed function in both directions with one parameter set



F1	Fuse
F3	Fuse
K1	Contactor relay
K2	Contactor relay
K3	Contactor relay
S1	Pushbutton: Reset
S2	Switch: Start slowly CW
S3	Switch: Start slowly CCW
S4	Switch: Start CW soft start
Q1	Motor starter protector
Q11	3RW55 soft starter
M1	Motor
PE	Protective conductor

A.3.4 Control via fieldbus with switchover to manual local operation



WARNING

**Automatic restart.
Can cause death or serious injury.**

If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.

Reset the start command (e.g. via the PLC or switch) before performing a reset.

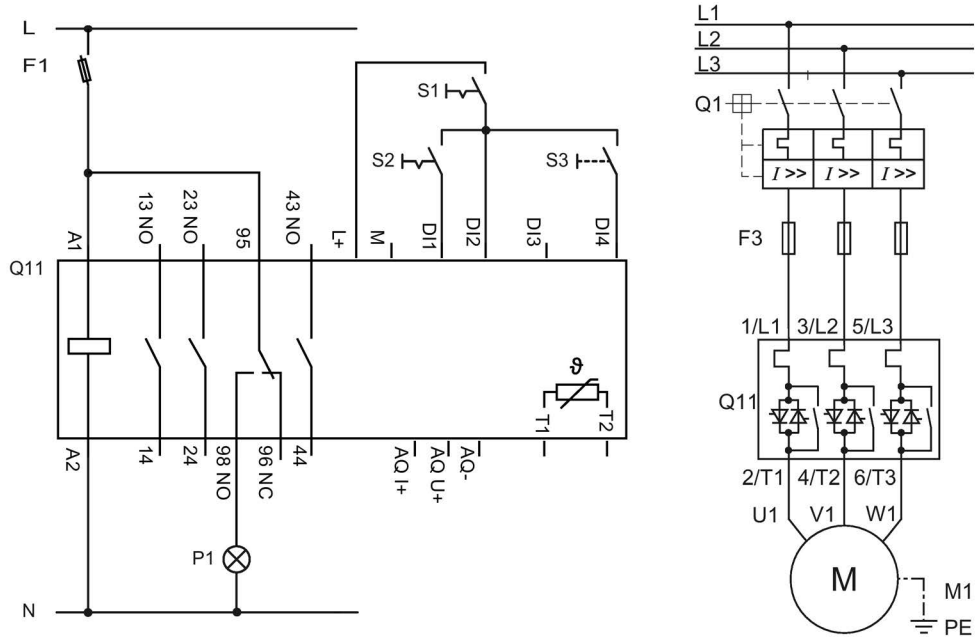
To do this, for example, link the group error output (terminals 95 and 96) into the control.

Requirements

- Parameterization required
- 3RW55 soft starter with additional 3RW5 communication module connected via fieldbus

You will find further information in the manual for the 3RW5 communication module in question.

Wiring for control via fieldbus with switchover to manual local operation



- F1 Fuse
- F3 Fuse
- S1 Switch: Manual mode local
- S2 Switch: Start / stop (manual mode local)
- S3 Switch: Reset (manual mode local)
- P1 Indicator light
- Q1 Motor starter protector
- Q11 3RW55 soft starter via fieldbus (e.g. PROFINET)
- M1 Motor
- PE Protective conductor

A.3.5 Reversing duty



WARNING

**Automatic restart.
Can cause death or serious injury.**

If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.

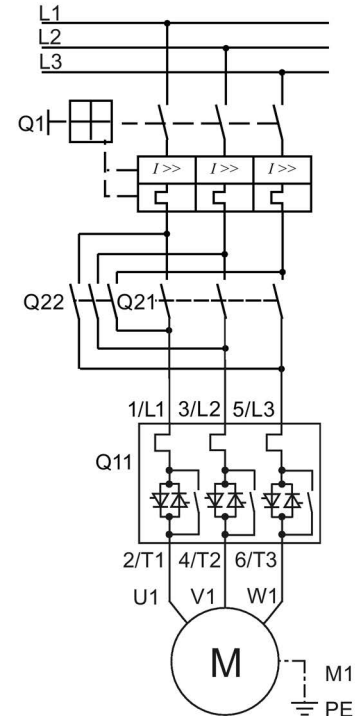
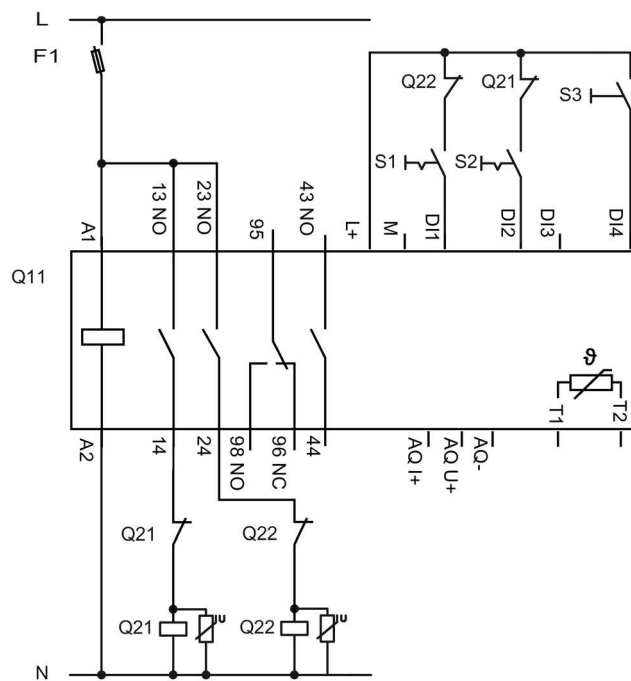
Reset the start command (e.g. via the PLC or switch) before performing a reset.

To do this, for example, link the group error output (terminals 95 and 96) into the control.

Requirements

- Parameterization required

Wiring for reversing duty:



- S1 Switch: Motor On / Off CW
- S2 Switch: Motor On / Off CCW
- S3 Pushbutton: Reset
- Q1 Motor starter protector
- Q11 3RW55 soft starter
- Q21 Line contactor CW
- Q22 Line contactor CCW
- M1 Motor
- PE Protective conductor

A.3.6 3RW55 soft starter for serial starting with 3 parameter sets

 **WARNING**

**Automatic restart.
Can cause death or serious injury.**

If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.

Reset the start command (e.g. via the PLC or switch) before performing a reset.

To do this, for example, link the group error output (terminals 95 and 96) into the control.

Note

Set the "Coasting down" coasting method on the 3RW55.

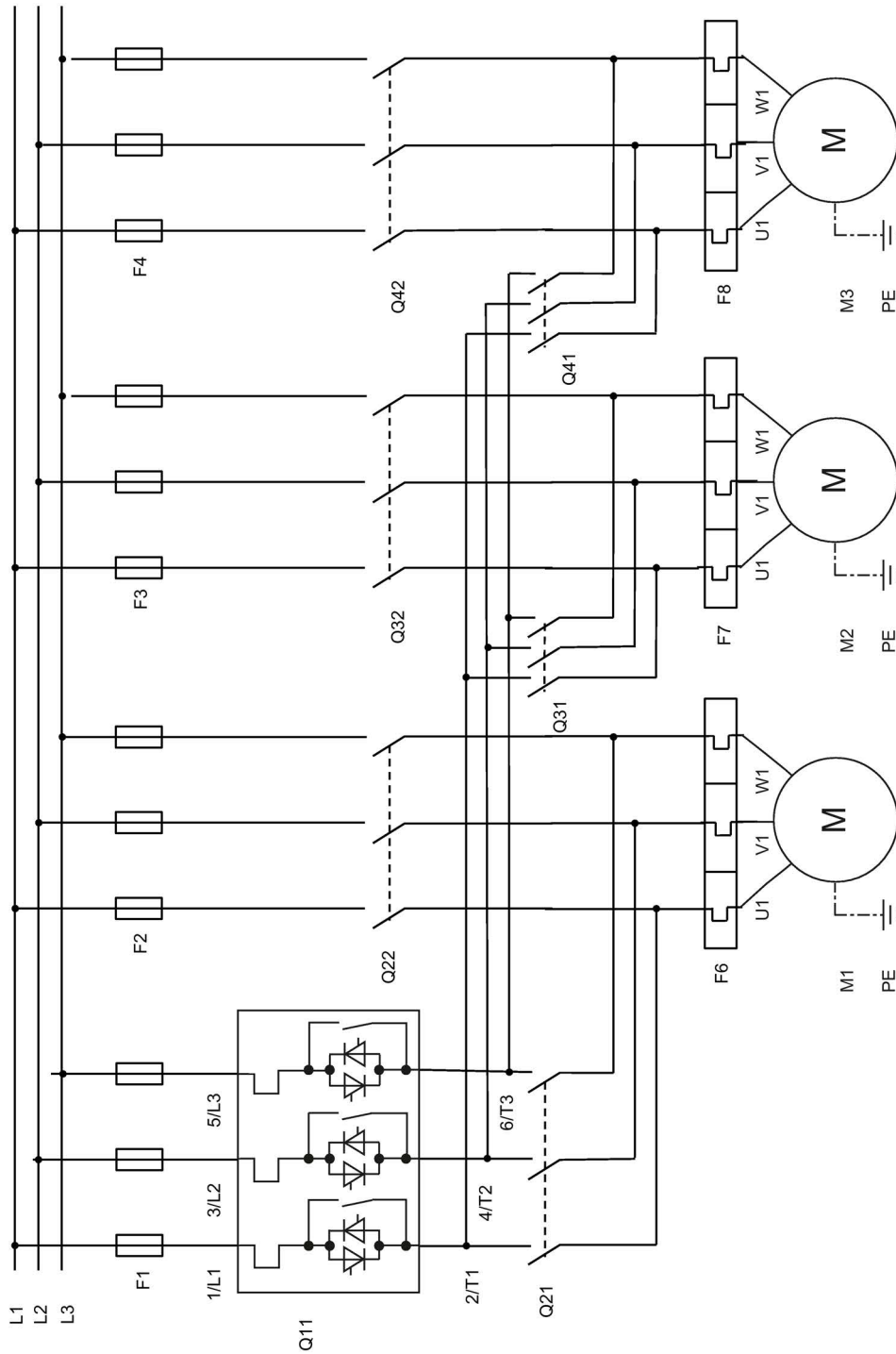
Note

In the case of increased operating sequences, set the dimensions for the 3RW55 soft starters to at least one capacity level higher than the highest connected motor output.

Requirements

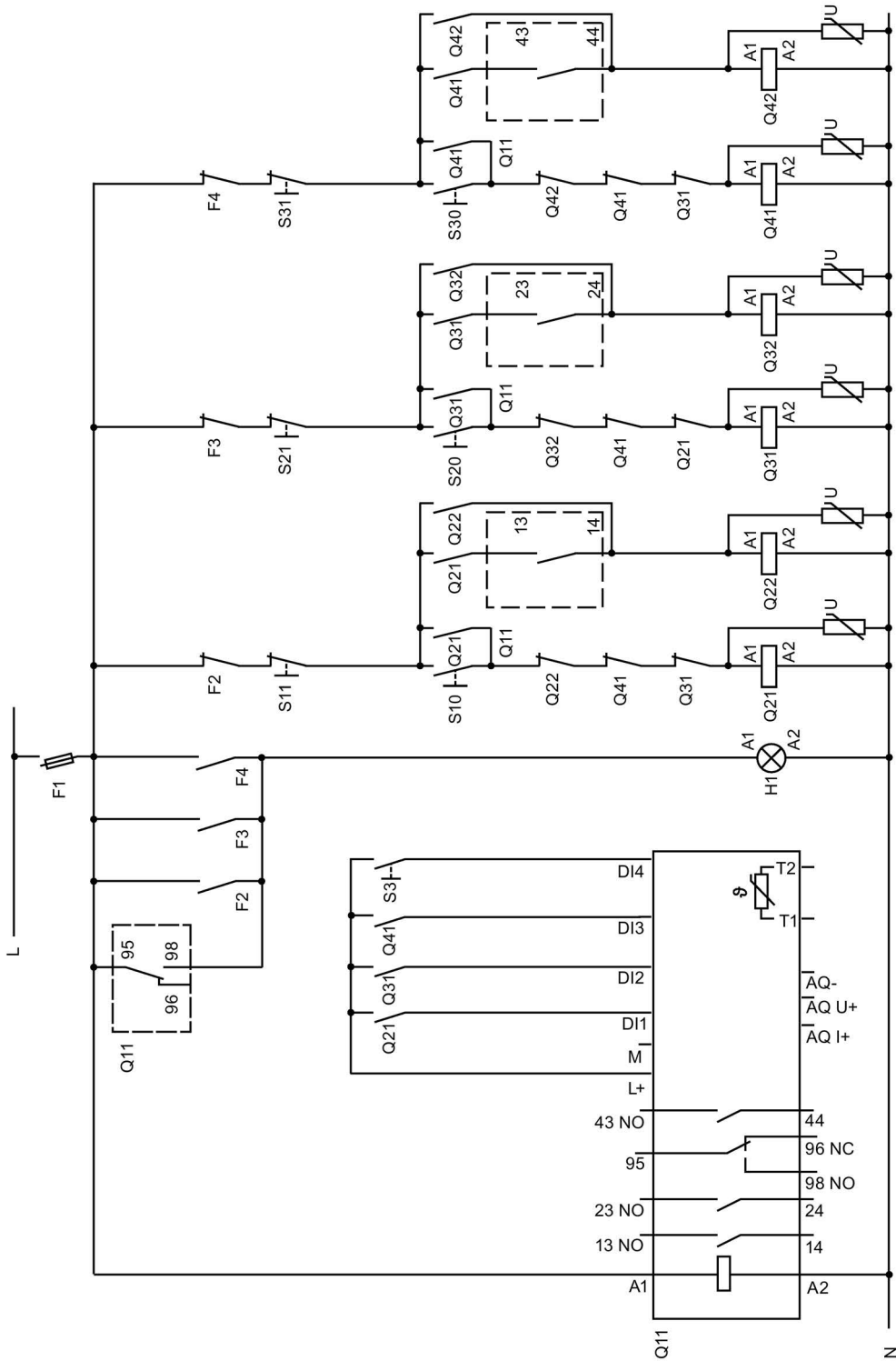
- Parameterization required

Wiring for 3RW55 soft starter for serial starting with 3 parameter sets - main circuit



F1	Fuse
F2	Fuse, motor 1
F3	Fuse, motor 2
F4	Fuse, motor 3
F6	Overload relay, motor 1
F7	Overload relay, motor 2
F8	Overload relay, motor 3
Q11	3RW55 soft starter
Q21	Starting contactor, motor 1
Q22	Line contactor, motor 1
Q31	Starting contactor, motor 2
Q32	Line contactor, motor 2
Q41	Starting contactor, motor 3
Q42	Line contactor, motor 3
M1	Motor 1
M2	Motor 2
M3	Motor 3
PE	Protective conductor


Wiring for 3RW55 soft starter for serial starting with 3 parameter sets - control circuit



A.3 Special applications

F2	Fuse
F3	Fuse
F4	Fuse
S3	Pushbutton: Reset
S10	Pushbutton: Motor 1 Start
S11	Pushbutton: Motor 1 Stop
S20	Pushbutton: Motor 2 Start
S21	Pushbutton: Motor 2 Stop
S30	Pushbutton: Motor 3 Start
S31	Pushbutton: Motor 3 Stop
Q11	3RW55 soft starter
Q21	Starting contactor, motor 1
Q22	Line contactor, motor 1
Q31	Starting contactor, motor 2
Q32	Line contactor, motor 2
Q41	Starting contactor, motor 3
Q42	Line contactor, motor 3
H1	Indicator light

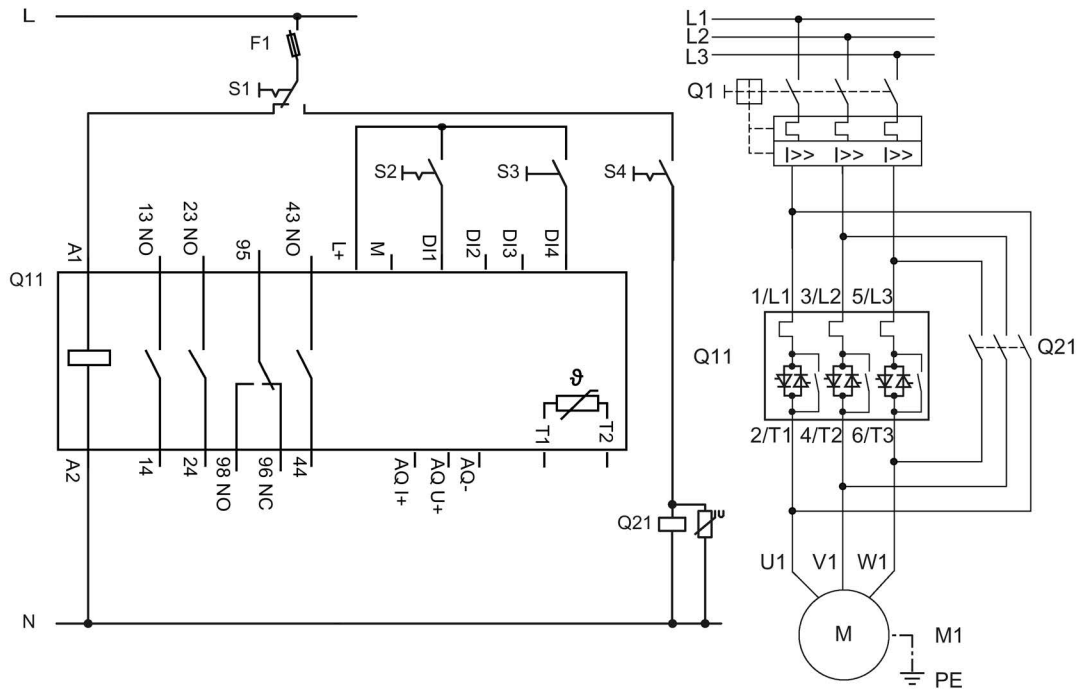
A.3.7 3RW55 soft starter with direct-on-line starting (DOL) as emergency start

 WARNING
<p>Automatic restart. Can cause death or serious injury.</p> <p>If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.</p> <p>Reset the start command (e.g. via the PLC or switch) before performing a reset.</p> <p>To do this, for example, link the group error output (terminals 95 and 96) into the control.</p>

Requirements

- Parameterization required

Wiring for 3RW55 soft starter with direct-on-line starting (DOL) as emergency start



- F1 Fuse
- S1 Selector switch Soft starting / direct-on-line starting
- S2 Switch: Start / stop (3RW55 soft starter)
- S3 Pushbutton: Reset
- S4 Switch: Direct on-line starting (DOL)
- Q11 3RW55 soft starter
- Q21 Line contactor
- M1 Motor
- PE Protective conductor

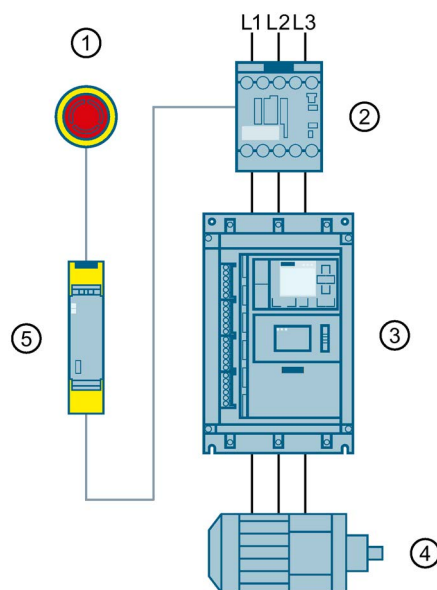
A.3.8 EMERGENCY STOP shutdown to SIL 1 or PL c with a 3SK1 safety relay

<p>⚠ WARNING</p> <p>Automatic restart. Can cause death or serious injury.</p> <p>If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.</p> <p>Reset the start command (e.g. via the PLC or switch) before performing a reset.</p> <p>To do this, for example, link the group error output (terminals 95 and 96) into the control.</p>
--

The 3RW55 soft starter has no effect or influence on the safety function of the application. For this reason, it is neither positively nor negatively considered in the safety application, and also does not have to be included in the calculation for proof according to the standards.

If achievement of SILCL 1 according to IEC 62061:2005 / PL c according to EN ISO 13849-1:2015 is required, the series connection of an additional contactor with the 3RW55 soft starter, in conjunction with a suitable safety relay (e.g.: 3SK1111), is required, as well as monitoring of the contactor's auxiliary contacts.

Basic configuration



- ① EMERGENCY STOP
- ② 3RT20 contactor
- ③ 3RW55 soft starter
- ④ Motor
- ⑤ 3SK1 safety relay

Glossary

Ground fault

Fault whereby an external conductor comes into contact with ground or the grounded neutral point.

GSD

Device master file

This file is required to be able to configure a device as a DP standard slave in the HW Config of a Siemens or external system.

GSDML

Device master file

This file is required to be able to configure a device as a DN device in the HW Config of a Siemens or external system.

HSP

Hardware support package

The hardware support packages allow you to configure modules that are not listed in the hardware catalog of your TIA Portal installation.

PII/PIQ

Process image input/process image output

Process image

Image of the signal states of the digital inputs and outputs in the memory of a controller.

The process images can be transferred as follows:

- Cyclically in the fieldbus protocol
- Acyclically using data sets

STS

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 application based on the motor and load data and application requirements that you enter.

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