SIEMENS

Industrial controls

Soft starters and semiconductor
switching devices
SIRIUS 3RW50 soft starter

Equipment Manual

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

> ⚠ **WARNING**
>
> indicates that death or severe personal injury **may** result if proper precautions are not taken.

> ⚠ **CAUTION**
>
> indicates that minor personal injury can result if proper precautions are not taken.

> **NOTICE**
>
> indicates that property damage can result if proper precautions are not taken.

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

Qualified Personnel

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

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Note the following:

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

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

Table of contents

Table of contents

Description

1

1.1 Target group

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

1.2   Device design
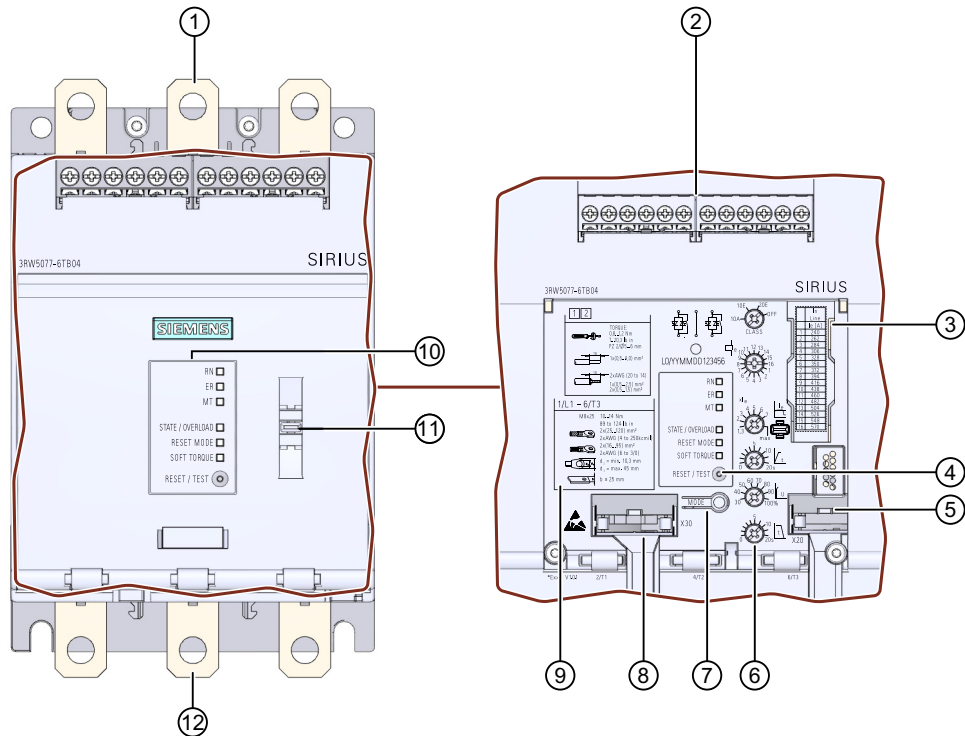
①	Main circuit connection (mains supply)
②	Control terminals (inputs / outputs)
③	Scale of the setting element I_e
④	RESET / TEST key
⑤	Interface for 3RW5 HMI Standard (accessories) or 3RW5 HMI High Feature (accessories)
⑥	Setting elements for parameter assignment
⑦	MODE key
⑧	Interface for 3RW5 communication module (accessory)
⑨	Connectable conductor cross sections
⑩	Diagnostics LEDs and RESET key
⑪	Eye for lead seal
⑫	Main circuit connection (motor)

1.3   Operating principle

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

The 3RW50 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 (switching elements) which start the motor up smoothly.

The 3RW50 soft starter features internal run-up recognition. If a successful motor run-up is detected before the ramp up time elapses, 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 3RW50 soft starter is 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. As long as the stopping time is active (t_4 to t_5), energy is still supplied to the motor. It may take longer for the motor to actually coast down to a standstill (t_6).

①	Speed	t_5	End of the set stopping time (t_5-t_4)
②	Voltage	t_6	Motor at standstill
t_1	Motor start-up with set starting voltage U_s	U_s	Set starting voltage
t_2	Rated operating speed n_e reached	U_e	Rated operational voltage
t_3	End of the set ramp up time (t_3-t_1)	n_e	Rated operating speed of the motor
t_4	Switch-on command is cancelled, motor is switched off		
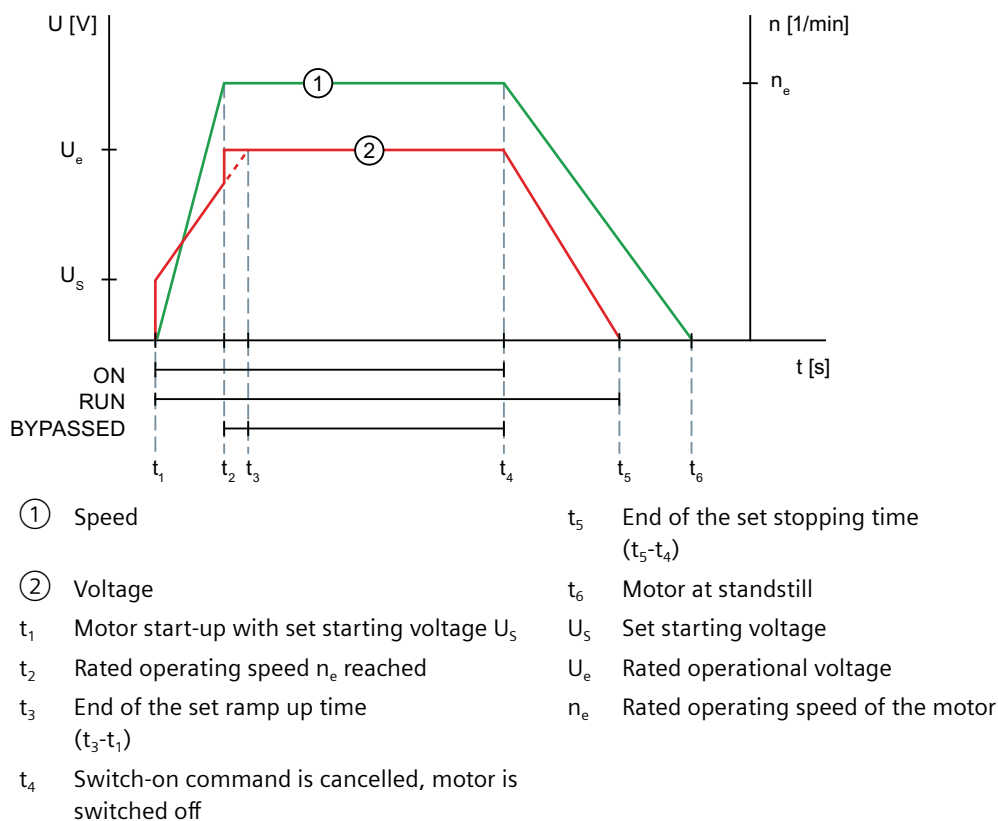
Functions

- **Soft starting** with parameterizable starting voltage and ramp up time for a smooth starting of the drive

- **Soft stopping** with parameterizable stopping time for a smooth run-down of the drive

- Parameterizable **current limit** for avoiding current peaks

- **Soft torque** for smooth ramp up and ramp-down (avoiding torque peaks by means of torque limitation)

- **Integrated electronic motor overload protection** with adjustable tripping class (Off, CLASS 10A, 10E, 20E)

- **Intrinsic device protection** protects the 3RW50 soft starter against overload

- **Ramp-up detection**

- Extended operating and diagnostic functions provided by the optional **3RW5 HMI Standard** or **3RW5 HMI High Feature**

- Connection to motor in **standard circuit**

- Adjustable **RESET MODE** (Manual RESET, Remote RESET, Auto RESET) for the functions of motor protection

- Extended full motor protection via optional **thermistor motor protection** for connection of a temperature switch (e.g. Thermoclick) or a thermistor (e.g. PTC type A) (alternative to analog output)

- Optional **analog output** for displaying a measured value with the aid of an external display device (alternative to the thermistor motor protection)

- Optional **3RW5 communication module** for integration into bus systems

- **Firmware updates** upgrade the firmware of the respective device

- ATEX / IECEx certification

Further information

You can find an overview of all of the functions of the 3RW5 soft starter in the Catalog IC 10 (https://support.industry.siemens.com/cs/ww/en/view/109747945).

Further details of the functions can be found in Chapter Functions (Page 103).

1.4 Access options for the 3RW50 soft starter
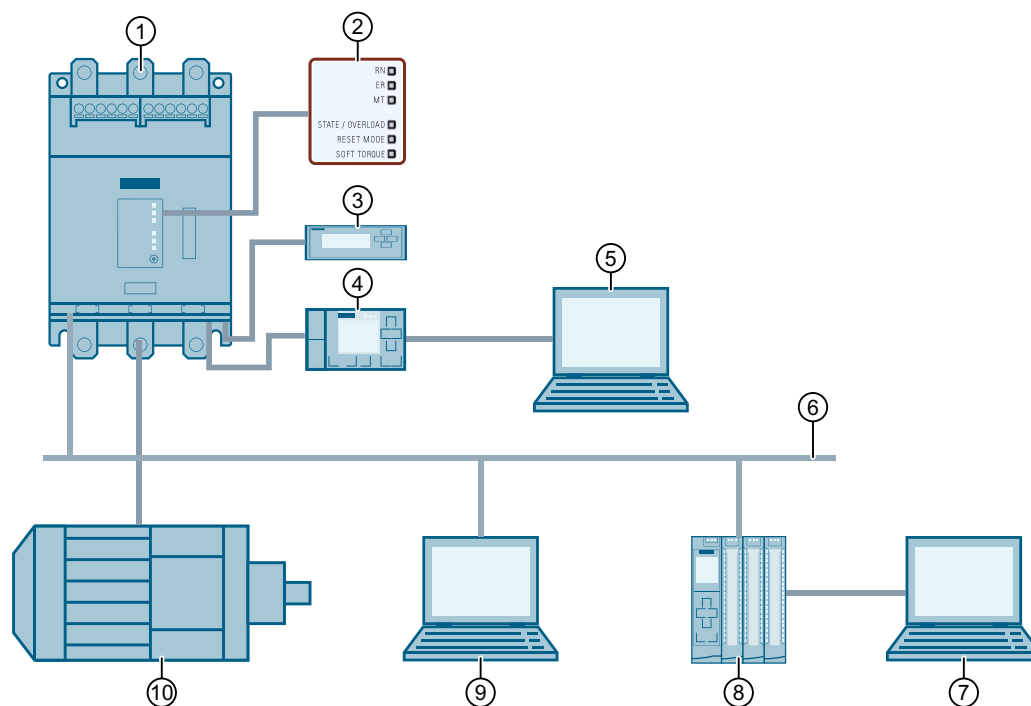
① SIRIUS 3RW50 Soft Starter
② LED display on 3RW50 soft starter
③ 3RW5 HMI Standard (accessories)
④ 3RW5 HMI High Feature (accessory) (firmware version V3.0 or higher)
⑤ PC with SIRIUS Soft Starter ES (TIA Portal) via local interface on 3RW5 HMI High Feature
⑥ Fieldbus (via optional communication module)
⑦ PC or programming device with configuration software of the controller (e.g. STEP 7)
⑧ Programmable logic controller (e.g. SIMATIC S7-1500)
⑨ PC with SIRIUS Soft Starter ES (TIA Portal) Premium via 3RW5 communication module
⑩ Motor

Options for data transfer

	Monitoring	Diagnostics	Control	Parameter assignment
3RW5 HMI High Feature	✓	✓	✓	[2), 3)]
3RW5 HMI Standard	✓	✓	✓	[4)]
SIRIUS Soft Starter ES (TIA Portal)[1)]	✓	✓	✓	-

	Monitoring	Diagnostics	Control	Parameter assign-ment
Fieldbus via 3RW5 communication module	✓ (via user program)	✓	✓	-
3RW50 soft starter	LEDs	LEDs	Via input IN	Setting elements

[1] Via the local interface on the 3RW5 HMI High Feature or via a 3RW5 communication module PROFINET or PROFIBUS.

[2] Analog output (for device version with analog output only) and ON / RUN relay output can be set.

[3] Communication parameters of all compatible communication modules can be set.

[4] Station address can be set for a 3RW5 PROFIBUS and Modbus RTU communication module.

1.5 Operating modes and master control function

1.5.1 Operating modes

Control source and master control function

The operating modes assign access rights to the various control sources (access sources). The control source that possesses the rights for controlling and writing access has master control function. As only one control source can ever possess the master control function at one time, different priorities are assigned to the modes. Read access is also possible without master control function.
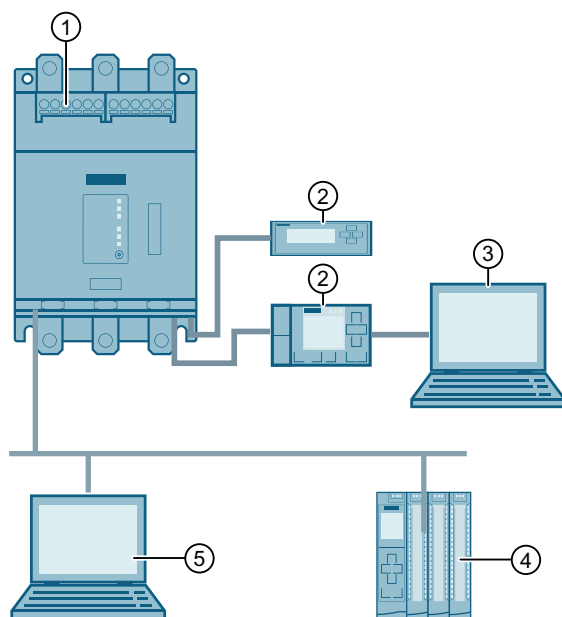
① Control source: Input IN, operating mode: Manual operation local - input controlled

② Control source: 3RW5 HMI, operating mode: Manual operation local - HMI controlled

③ Control source: SIRIUS Soft Starter ES (TIA Portal), operating mode: Manual operation local - PC controlled

④ Control source: PLC, operating mode: Automatic

⑤ • Control source: SIRIUS Soft Starter ES (TIA Portal) Premium, operating mode: Manual - bus

   • Control source: Modbus client or Modbus master, operating mode: Automatic

"Automatic" mode

For the "Automatic" mode you require a 3RW5 communication module and a higher-level control (e.g. PLC). The control source is connected to the 3RW50 soft starter via the 3RW5 communication module.

In the "Automatic" mode the master control function rests with a higher-level control:

- PROFINET, PROFIBUS, EtherNet/IP: Programmable logic controller (PLC)

- Modbus TCP: Modbus Client (e.g. PLC)

- Modbus RTU: Modbus Master (e.g. PLC)

Operating mode "manual - bus"

For the "Manual-bus" mode you require a 3RW5 PROFINET or PROFIBUS communication module and a PC with SIRIUS Soft Starter ES (TIA Portal) Premium. The control source is connected to the 3RW50 soft starter via the 3RW5 communication module.

In the operating mode "manual - bus" the master control function rests with the SIRIUS Soft Starter ES (TIA Portal) Premium software.

Operating mode "manual - local"

In the operating mode "manual - local" the master control function rests with a control source directly on the 3RW50 soft starter:

- Input IN

- 3RW5 HMI (accessories)

- SIRIUS Soft Starter ES (TIA Portal) via local interface on the 3RW5 HMI High Feature (accessory)

Priorities of the operating modes

Mode		Control source	Priority
Automatic		Higher-level control (e.g. PLC)	Lowest
Manual - bus (depending on the 3RW5 communication module)	-	Connection abort[1]	↓
	PC controlled	SIRIUS Soft Starter ES (TIA Portal) Premium	↓
Manual - local	Input controlled	Input IN	↓ [2]
	3RW5 HMI controls	3RW5 HMI	↓
	PC controlled	SIRIUS Soft Starter ES (TIA Portal)	Highest

[1]   Explanation in text below

[2]   Lowest priority without 3RW5 communication module

Connection abort

On failure of the bus connection or a CPU stop, the 3RW50 soft starter behaves independently of the mode in accordance with the parameter "Control via digital input" (Page 118).

If other connections between the control source and 3RW50 soft starter are aborted, the master control function automatically switches back to the lowest priority of the current mode.

- "Automatic" mode: The 3RW50 soft starter behaves in accordance with the parameter "Control via digital input" (Page 118).

- Operating mode "manual - bus": The master control function switches to "Manual - bus - Connection abort".

- Operating mode "manual - local": The master control function switches to "Manual - local - Input controlled".

Further information

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

1.5.2 Sets the operating mode

Fundamental response when changing the mode

A higher-priority mode can 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.

Requirements

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

- For the "Automatic" mode and "Manual - bus" mode you require a 3RW5 communication module.

"Automatic" mode

Receive master control function

The "Automatic" mode receives the master control function from the "Manual - bus" or "Manual - local" mode as follows:

- Command in SIRIUS Soft Starter ES (TIA Portal) Premium (fieldbus)

- Action "LOCAL / REMOTE" on the 3RW5 HMI

- Command in SIRIUS Soft Starter ES (TIA Portal) (local interface on the 3RW5 HMI High Feature)

Assume master control

By disabling 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), the "Automatic" mode receives the master control function from the Input IN.

Relinquish master control

By enabling 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) the "Automatic" mode gives up the master control function to the Input IN.

Revocation of the master control by other control sources

In the "Automatic" mode, the master control function can be withdrawn from any control source.

Operating mode "manual - bus"

Assume master control

SIRIUS Soft Starter ES (TIA Portal) Premium actively assumes the master control function from the "Automatic" mode in the event of a corresponding command.

Relinquish master control

SIRIUS Soft Starter ES (TIA Portal) Premium actively passes on the master control function to the "Automatic" mode in the event of a corresponding command.

Revocation of the master control by other control sources

The master control function is withdrawn from the operating mode "manual - bus" by the operating mode "manual - local" as follows:

- Activation of 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)

- Action "LOCAL / REMOTE" on the 3RW5 HMI

- Command in SIRIUS Soft Starter ES (TIA Portal) (local interface on the 3RW5 HMI High Feature)

"Manual operation local - input controlled" mode

Assume master control

By enabling 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), the Input IN receives the master control function from the "Automatic" mode or operating mode "manual - bus".

If the master control function is on the 3RW5 HMI or, in the case of the local interface, on the 3RW5 HMI High Feature (higher priority), you must actively give up the master control function beforehand. Subsequently the Input IN can assume the master control function.

Relinquish master control

By disabling 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), the "Automatic" mode receives the master control function.

Revocation of the master control by other control sources

The master control function is withdrawn from the Input IN as follows:

- Action "LOCAL / REMOTE" on the 3RW5 HMI

- Command in SIRIUS Soft Starter ES (TIA Portal) (local interface on the 3RW5 HMI High Feature)

"Manual operation local - HMI controlled" mode

Assume master control

The 3RW5 HMI actively assumes the master control function via the action "LOCAL / REMOTE" from the lower priority control source.

If the master control function at the local interface on the 3RW5 HMI High Feature (higher priority), you must actively give up the master control function beforehand in SIRIUS Soft Starter ES (TIA Portal). You can then assume the master control function by means of the action "LOCAL / REMOTE".

Relinquish master control

The 3RW5 HMI actively gives up the master control function via the action "LOCAL / REMOTE" to the "Automatic" mode or alternatively to the Input IN. In the following cases the master control function is given up to the Input IN.

- No 3RW5 communication module is connected to the 3RW50 soft starter.

- The parameter "Control via digital input" (Page 118) is set to "Permanent activation".

Revocation of the master control by other control sources

In the event of a corresponding command in SIRIUS Soft Starter ES (TIA Portal) at the local interface on the 3RW5 HMI High Feature, the master control function is taken from the 3RW5 HMI.

"Manual operation local - PC controlled" mode

Assume master control

If there is a corresponding command, SIRIUS Soft Starter ES (TIA Portal) actively assumes the master control function from every control source.

Relinquish master control

If there is a corresponding command, SIRIUS Soft Starter ES (TIA Portal) actively gives up the master control function to the "Automatic" mode or alternatively to the Input IN. In the following cases the master control function is given up to the Input IN:

• No 3RW5 communication module is connected to the 3RW50 soft starter.

• The parameter "Control via digital input" (Page 118) is set to "Permanent activation".

Revocation of the master control by other control sources

The master control function cannot be withdrawn from SIRIUS Soft Starter ES (TIA Portal) by any control source.

Further information

You will find more information on the process images and data tables in the manual for the 3RW5 communication module in question.

1.6 Device versions
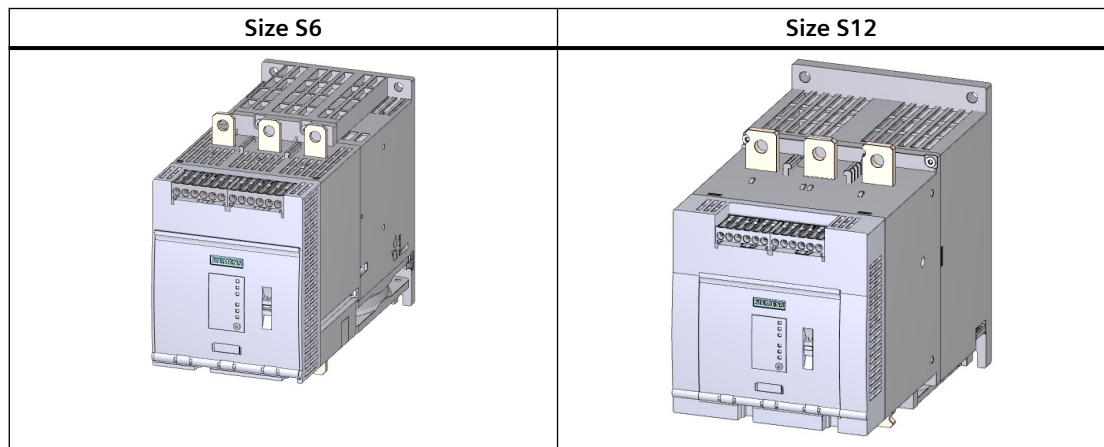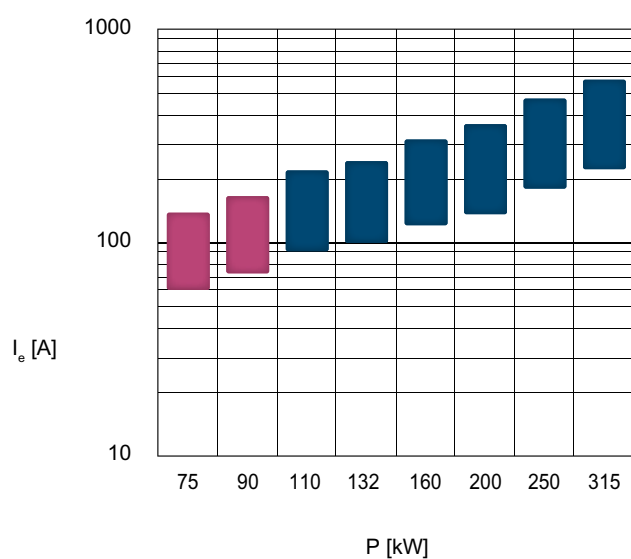
Size S6	Size S12
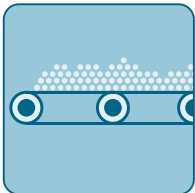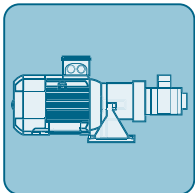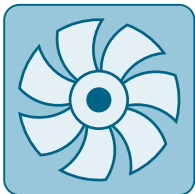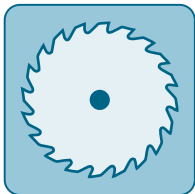
Size S6

Size S12

I_e Rated operational current

P   Rated power

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

1.7   Areas of application / load types

Conveyor belts	Pumps	Compressors
Agitator	Fans	Saws

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 3RW50 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

1.8 Selection of the soft starter using the Simulation Tool for Soft Starters
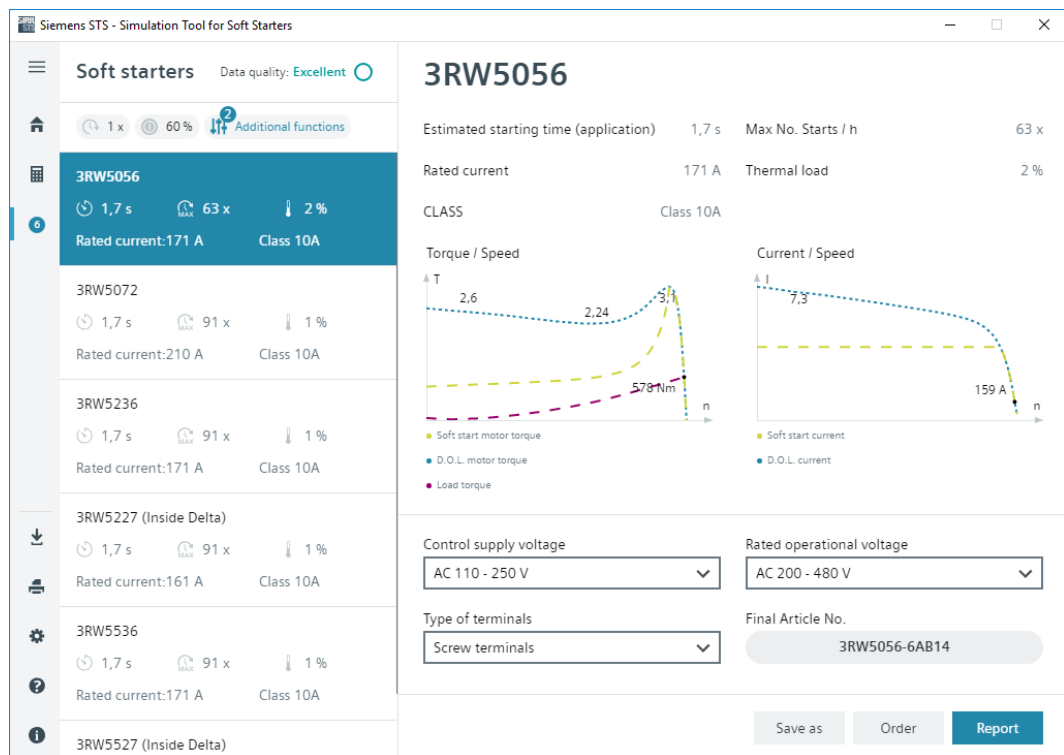
The soft starter can be configured with the STS (Simulation Tool for Soft Starters) software. The STS suggests suitable soft starters for the respective application based on the entered motor and

load data and application requirements, as well as providing information on the parameterization.

You can download the Simulation Tool for Soft Starters (STS) for free on the 3RW5 topic page (https://support.industry.siemens.com/cs/ww/en/view/109747404).

1.9 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	0					B		
Frame size (FS) and rated operational current I_e of the soft starter				x*[1]	x**[1]					
Connection system	Control circuit: Spring-type terminals					2				
	Control circuit: Screw terminals					6				
Control terminals with	Analog output						A			
	Thermistor motor protection						T			
Rated control supply voltage U_s[2]						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

[1] Explanation in the following table.

[2] When rating the control supply voltage, pay attention to the maximum starting current when closing the bypass contacts; details can be found in the technical data.

The following table shows the size and rated operational current for Ue = 400 V and TU = 40 °C and in a standard circuit:

	Rated operational current I_e of the soft starter	Rated operational power P_e of the soft starter	x*	x**
S6	I_e = 143 A	P_e = 75 kW	5	5
	I_e = 171 A	P_e = 90 kW	5	6
S12	I_e = 210 A	P_e = 110 kW	7	2
	I_e = 250 A	P_e = 132 kW	7	3
	I_e = 315 A	P_e = 160 kW	7	4
	I_e = 370 A	P_e = 200 kW	7	5
	I_e = 470 A	P_e = 250 kW	7	6
	I_e = 570 A	P_e = 315 kW	7	7

Ambient temperature during operation

Note that the 3RW50 soft starters are approved for operation in a temperature range of -25 °C to +60 °C.

Consider the derating of the rated operational current at ambient temperatures higher than 40 °C. You can find further information on derating in the Technical specifications (Page 171) in the section "Power electronics" or in the Catalog IC 10 (https://support.industry.siemens.com/cs/ww/en/view/109747945).

1.10 Accessories

1.10.1 Accessories for 3RW50 soft starters
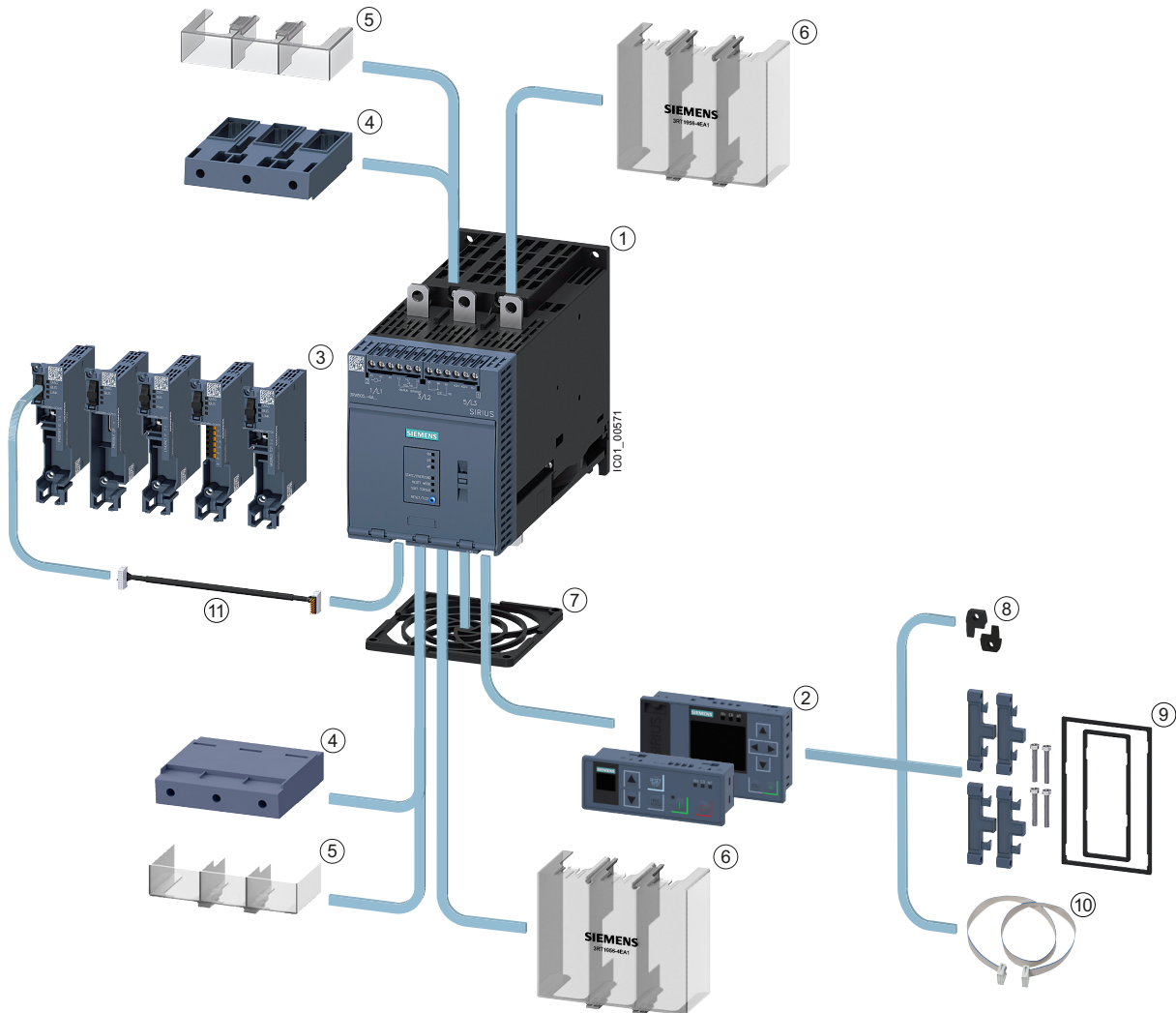
① 3RW50 soft starter

② 3RW5 HMI modules:
   - 3RW5 HMI Standard (3RW5980-0HS00)
   - 3RW5 HMI High Feature (3RW5980-0HF00) (firmware version V3.0 or higher)

③ 3RW5 communication modules:
   - PROFINET standard (3RW5980-0CS00) (firmware version V1.0.1 or higher)
   - PROFIBUS (3RW5980-0CP00) (firmware version V1.0.1 or higher)
   - EtherNet/IP (3RW5980-0CE00)
   - Modbus RTU (3RW5980-0CR00)
   - Modbus TCP (3RW5980-0CT00) (firmware version V1.1 or higher)

④   Box terminal blocks:

  • Size S6 (3RT1956-4G)

  • Size S12 (3RT1966-4G)

⑤   Terminal covers for box terminals:

  • Size S6 (3RT1956-4EA2)

  • Size S12 (3RT1966-4EA2)

⑥   Terminal covers for cable lug connection and bar connection:

  • Size S6 (3RT1956-4EA1)

  • Size S12 (3RT1966-4EA1)

⑦   Fan cover:

  • Size S6 and S12 (3RW5985-0FC00)

⑧   Push-in lugs for wall mounting (3ZY1311-0AA00)

⑨   IP65 door mounting kit (3RW5980-0HD00)

⑩   HMI connecting cable:

  • 0.5 m (3UF7932-0BA00-0)

  • 1 m (3UF7937-0BA00-0)

  • 2.5 m (3UF7933-0BA00-0)

  • 5 m (3RW5980-0HC60)

⑪   COM connecting cable (3RW5900-0CC00)

1.10.2   3RW5 communication module

The following 3RW5 communication modules are available for integration of the 3RW50 soft starter in fieldbus systems:
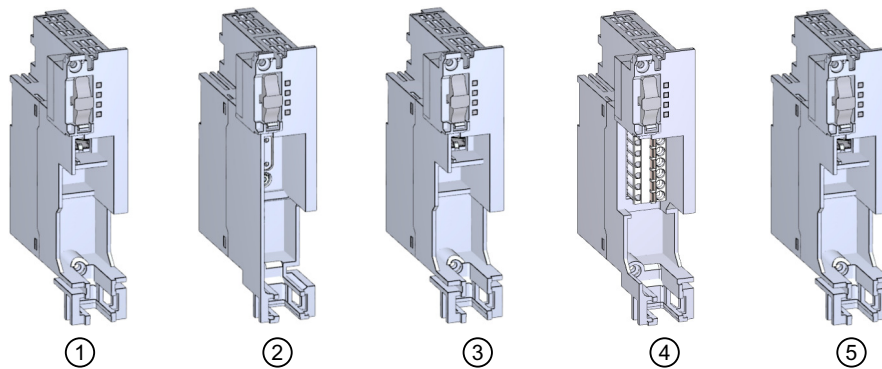
①   3RW5 PROFINET Standard communication module (firmware version V1.0.1 or higher)

②   3RW5 PROFIBUS communication module (firmware version V1.0.1 or higher)

③   3RW5 EtherNet/IP communication module

④   3RW5 Modbus RTU communication module

⑤   3RW5 communication module Modbus TCP (firmware version V1.1)

The following accessories are available for using the 3RW5 communication modules on the 3RW50 soft starter:

- Push-in lugs for wall mounting (3ZY1311-0AA00)

- COM connecting cable (3RW5900-0CC00)

Integration into the automation software

The 3RW50 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 (Page 30) for the 3RW5 communication module in question.

1.10.3 SIRIUS Soft Starter ES (TIA Portal)

SIRIUS Soft Starter ES (TIA Portal) as of V15 Update 2 is the central software for configuring, commissioning, operation, and diagnostics of 3RW5 soft starters. 3RW50 soft starters are supported depending on the firmware as of V15.1 Update 2.

You connect your PC or your programming device to the 3RW50 soft starter via the local interface on the 3RW5 HMI High Feature (accessory). With the Premium license, you can also connect your PC or your programming device from a central point to the 3RW50 soft starter via a 3RW5 PROFINET or PROFIBUS communications module (accessory).

By displaying all operating data, service data and diagnostics data, SIRIUS Soft Starter ES (TIA Portal) supplies reliable information, helping to avoid faults, or to quickly locate and eliminate them if they occur.
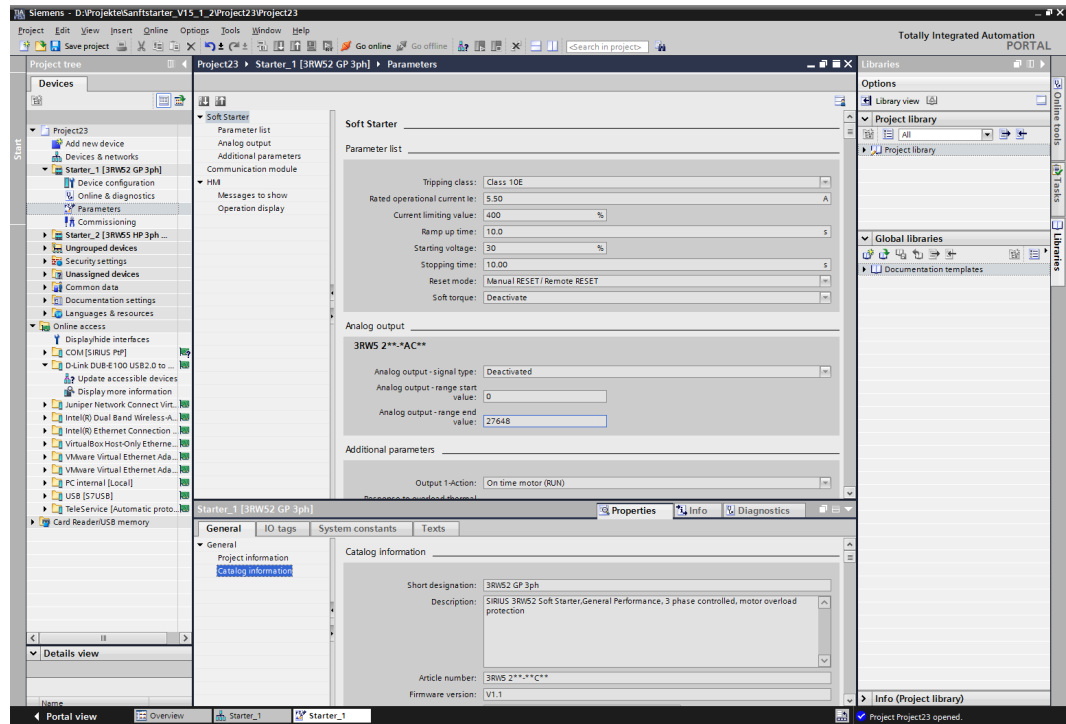
Illustration similar

Download

SIRIUS Soft Starter ES (TIA Portal) can be downloaded on the 3RW5 topic page (https://support.industry.siemens.com/cs/ww/en/view/109747404) or via the following link (https://support.industry.siemens.com/cs/ww/en/ps/24231/dl).

You will find more information on the SIRIUS Soft Starter ES (TIA Portal) software program and necessary versions and updates in Catalog IC 10 (https://support.industry.siemens.com/cs/ww/en/view/109747945) and on the 3RW5 topic page.

Available variants

Supported functions	SIRIUS Soft Starter ES (TIA Portal)		
	Basic	**Standard**	**Premium**
Access via local interface on the 3RW5 HMI High Feature	x	x	x
Parameter assignment	x	x	x
Operator control	x	x	x
Diagnostics	x	x	x
Creation of typicals	-	x[1]	x
Parameter export	-	x	x
Comparison functions	-	x	x
Service data (min/max pointer, statistic data)	-	x	x
Access via PROFIBUS or PROFINET	-	-	x

Supported functions	SIRIUS Soft Starter ES (TIA Portal)		
	Basic	Standard	Premium
Parameter comparison	-	-	x
Teleservice via MPI	-	-	x
Routing	-	-	x

[1]   Typicals with Service Pack 1 and higher

1.10.4   3RW5 HMI

3RW5 HMI Standard

The 3RW50 soft starter can be monitored and controlled using the 3RW5 HMI Standard (Motor ON/OFF). The 3RW5 HMI Standard can be installed in the control cabinet door or mounted on a wall using accessories. The 3RW5 HMI Standard has an LCD with red display illumination, LEDs for status display, and function and control keys.

Functions

- Any changes of setting elements will be indicated immediately in the display.

- Error diagnostics are output as error numbers (Faults and remedial actions of the 3RW50 soft starter (Page 143)).

- Acknowledgment of faults and execution of user tests via the RESET / TEST key

- Starting and stopping the motor via control keys

- Switching modes via the LOCAL / REMOTE key.

- Setting the PROFIBUS station address.

- Display of the device LEDs of the 3RW5 HMI Standard shows the messages of the following devices:

  – 3RW50 soft starter

  – 3RW5 HMI Standard

  – Communication module (if there is one)

3RW5 HMI High Feature (HF)

> **Note**
>
> **3RW5 HMI High Feature**
>
> The 3RW50 soft starter is supported by the 3RW5 HMI High Feature as of firmware version V3.0.

The 3RW5 HMI High Feature can be used to parameterize, monitor and control (motor ON / OFF) the 3RW50 soft starter. The 3RW5 HMI High Feature can be installed in the control cabinet door or mounted on a wall using accessories. It can be connected to the SIRIUS Soft Starter ES software (TIA Portal) via the local interface. The 3RW5 HMI High Feature has a TFT color display, LEDs for the status display, and function and control keys.
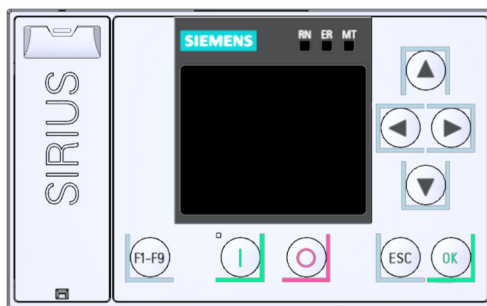
Functions

- Language selection

- Starting and stopping the motor via control keys

- Local interface

- Display of error diagnoses as plain-text messages

- Display of up to 5 measured values at the same time

- Analog output and ON / RUN relay output can be parameterized with the 3RW5 HMI High Feature.

- Setting communication parameters of 3RW5 communication modules:

  – PROFINET (device name and IP parameters)

  – PROFIBUS (station address)

  – EtherNet/IP (IP parameters)

  – Modbus RTU (station address)

  – Modbus TCP (IP parameters)

- Backup of parameterization data on a micro SD card

- The display of the device LEDs of the 3RW5 HMI High Feature shows the messages of the following devices:
    - 3RW50 soft starter
    - 3RW5 HMI High Feature
    - Communication module (if there is one)
- Firmware updates can be performed using the 3RW5 HMI High Feature and a micro SD card for the following devices (Performing firmware update with micro SD card (3RW5 HMI High Feature) (Page 165)):
    - 3RW50 soft starter
    - 3RW5 HMI High Feature
    - Communication module (if there is one)

1.11 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 3RW50 soft starter (https://support.industry.siemens.com/cs/ww/en/view/109753750)
- Equipment Manual for the 3RW52 soft starter (https://support.industry.siemens.com/cs/ww/en/view/109753751)
- Equipment Manual for the 3RW55 and 3RW55 Failsafe Soft Starters (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 modules (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 communication modules (https://support.industry.siemens.com/cs/ww/en/view/109753755)
- Equipment Manual for the 3RW5 EtherNet/IP communication module (https://support.industry.siemens.com/cs/ww/en/view/109758201)
- 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

- Manuals in Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/man)

- 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)

- Catalog IC 10 (https://support.industry.siemens.com/cs/ww/en/view/109747945)

- Product support for STEP 7 (TIA Portal) (https://support.industry.siemens.com/cs/ww/en/ps/14672)

- Premium Efficiency - Efficiency class IE3 (http://w3.siemens.com/mcms/topics/en/application-consulting/ie3ready/Pages/Default.aspx)

1.12 Siemens Industry Online Support

Information and service

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

- Product support

- Application examples

- Forum

- mySupport

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

Product support

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

- **FAQs**
  Answers to frequently asked questions

- **Manuals/operating instructions**
  Read online or download, available as PDF or individually configurable.

- **Certificates**
  Clearly sorted according to approving authority, type and country.

- **Characteristics**
  For support in planning and configuring your system.

- **Product announcements**
  The latest information and news concerning our products.

- **Downloads**
  Here you will find updates, service packs, HSPs and much more for your product.

- **Application examples**
  Function blocks, background and system descriptions, performance statements, demonstration systems, and application examples, clearly explained and represented.

- **Technical data**
  Technical product data for support in planning and implementing your project

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

mySupport

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

- **Support Request**
  Search for request number, product or subject

- **My filters**
  With filters, you limit the content of the online support to different focal points.

- **My favorites**
  With favorites you bookmark articles and products that you need frequently.

- **My notifications**
  Your personal mailbox for exchanging information and managing your contacts. You can compile your own individual newsletter in the "Notifications" section.

- **My products**
  With product lists you can virtually map your control cabinet, your system or your entire automation project.

- **My documentation**
  Configure your individual documentation from different manuals.

- **CAx data**
  Easy access to CAx data, e.g. 3D models, 2D dimension drawings, EPLAN macros, device circuit diagrams

- **My IBase registrations**
  Register your Siemens products, systems and software.

Siemens Industry Online Support app

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

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

Android   iOS

1.13   Support Request

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

Support Request:	Internet (https://support.industry.siemens.com/My/ww/en/requests)

Safety information

2

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 re-connection

3. Verify absence of operating voltage

4. Ground and short-circuit

5. Provide protection against 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 electrically skilled person 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)

Do not connect any capacitors to the output terminals of the 3RW5 soft starter. If capacitors are connected to the output terminals, the 3RW5 soft starter will be damaged.

Do not operate active filters, e.g. for reactive power compensation, parallel to the 3RW5 soft starter.

If you use capacitors to correct the power factor (actively or passively), you must connect them on the line side of the 3RW5 soft starter. Make sure that the capacitors do not actively control the power factor during the starting and coasting down phases. If you use a contactor disconnector or main contactor together with the 3RW5 soft starter, the capacitors must be disconnected from the 3RW5 soft starter when the contactor is open.

You will find further information in the Internet (https://support.industry.siemens.com/cs/ww/en/view/67131557).

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 ATEX / IECEx

2.6.1 Use in hazardous areas

The components of the 3RW50 soft starters are not suitable for installation in hazardous areas. Use the device only in a control cabinet with at least degree of protection IP 4x.

If you have any questions, ask your ATEX / IECEx expert.

2.6.2 ATEX / IECEx-certified motor overload protection

Environmental conditions

Comply with the ambient conditions for which the 3RW50 soft starter is approved.

Note

Ambient temperature during operation.

Note that the 3RW50 soft starters are approved for operation in a temperature range of -25 °C to +60 °C.

In ambient temperatures higher than 40 °C, take the derating of the rated operational current into consideration.
You can find further information on derating in the Technical specifications (Page 171) in the section "Power electronics" or in Catalog IC 10 (https://support.industry.siemens.com/cs/ww/en/view/109747945).

Note

Temperature sensor

For ATEX / IECEx-certified motor protection, use of the PTC type A sensor only is approved.

Note

Simulation Tool for Soft Starters

Note that the Simulation Tool for Soft Starters (Page 22) already takes into account the derating for certain ambient temperatures when selecting a suitable 3RW5 soft starter.

Parameterizing the soft starter

The parameters for ATEX / IECEx applications are to be set using the setting elements of the 3RW50 soft starter.

Setting the rated motor operational current

Set the 3RW50 soft starter to the rated operational current of the motor as stated on the type plate or design test certificate of the motor.

Tripping class (electronic overload protection)

Make sure that the motor and the cables are dimensioned for the selected tripping class.

Note that the trip class "CLASS OFF" when operating motors in hazardous areas is only permissible if a "PTC thermistor type A" temperature sensor is used.

The rated data of the 3RW5 soft starter relates to normal starting (CLASS 10E). For heavy starting (> CLASS 10E), you may have to overdimension the 3RW5 soft starter.

Parameterizing the motor protection functions (RESET setting)

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

Short-circuit protection

The 3RW50 soft starter does not have short-circuit protection. Make sure that short-circuit protection is provided.

Line protection

Avoid impermissibly high cable surface temperatures by correctly dimensioning the cross-sections. Select a sufficiently large conductor cross-section.

Cyclic test of the motor protection functions

Only perform the Self-test (user-test) (Page 154) locally by means of the RESET / TEST key or the 3RW5 HMI High Feature to ensure that the correct 3RW50 soft starter is tested. Only in this way can the certified motor overload protection according to ATEX / IECEx be guaranteed.

On soft starters in ATEX / IECEx applications, perform the Self-test (user-test) (Page 154) during commissioning and periodically at intervals of no more than 36 months.

Certification of the 3RW50 soft starters

The motor overload protection of the 3RW50 soft starters is ATEX / IECEx-certified to SIL 1.

The 3RW50 soft starters are approved under Equipment Groups I and II, Category (2) or (M2) in zones "G" and "D". Zones "G" and "D" are areas in which explosive gas, vapor, mist or air mixtures and combustible dust are present:

IECEx BVS 19.0053 X [Ex]

BVS 19 ATEX F001 X

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

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

I (M2) [EX db Mb]

[1] For the px applications, pressure and flow rate monitoring are additionally required for the pressurized enclosure systems.

Certified motor overload protection according to ATEX / IECEx

> ⚠ **DANGER**
>
> **Loss of the certified motor overload protection according to ATEX/IECEx.**
> **Will cause death or serious injury.**
>
> Note that operation in the standard type of motor connection without implementing one of the two following remedial measures results in loss of certified motor overload protection according to ATEX / IECEx.
>
> Depending on the structure of the circuit, choose one of the following possibilities for ensuring certified motor overload protection according to ATEX / IECEx:
>
> * Use an additional line contactor in the main circuit.
>   Connect the line contactor at outputs 95, 96 and 98 (output 3).
> * For a motor feeder configuration with a circuit breaker, use an additional undervoltage trip unit.
>   Connect the undervoltage trip unit at outputs 95, 96 and 98 (output 3).
>   You will find more information in chapter Connections (Page 59).

Observing standards

Increased danger in hazardous areas means it is necessary to carefully observe the following standards:

* **IEC / EN 60079-14** / **VDE 0165-1**: For electrical apparatus for hazardous areas.
* **IEC / EN 60079-17**: Inspection and maintenance of electrical installations in explosive atmosphere.
* **EN 50495**: Safety devices required for the safe functioning of equipment with respect to explosion risks.

ATEX / IECEx-specific safety data

The motor protection function according to ATEX / IECEx for 3RW50 soft starters has the following safety data:

* Safety Integrity Level (SILCL): 1
* Hardware Fault Tolerance (HFT): 0
* Interval for testing the protective functions: 3 years
* Probability of failure on demand (PFD): 8×10^{-3}
* Probability of a dangerous failure per hour (PFH): 5×10^{-7} 1/h

Maintenance and repair

The 3RW50 soft starters are maintenance-free. The repair of soft starters with approval according to IEC 61508 / EN 13849 is only permissible in the manufacturer's plant.

A repair on 3RW50 soft starters that is not performed in the manufacturer's plant results in loss of ATEX / IECEx approval.

2.7 Protection against unauthorized actuation

Protect freely accessible operator controls on your machine / system against unauthorized actuation if this could result in a risk or danger. Take suitable action in this regard, for example, a lockable key-operated switch.

2.8 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/or electronic devices and dispose of the device in accordance with the regulations in your country.

Mounting and dismantling

<div style="text-align: right; font-size: large;">3</div>

3.1 Installing 3RW50 soft starters

Procedure

1. Mount the 3RW50 soft starter on a level surface. (Page 44)

2. Ensure that the permissible temperature range and the necessary distances are complied with.
   Technical data in Siemens Industry Online Support (Page 171)

3. Optionally mount the fan cover. (Page 43)

4. Connect the HMI connecting cable to the 3RW50 soft starter and optionally secure the 3RW5 HMI Standard or High Feature in the cabinet door or on a level surface.

   – Connect the HMI connecting cable to the 3RW50 soft starter (Page 46).

   – Installing the Standard 3RW5 HMI into the control cabinet door (Page 47).

   – Installing the High Feature 3RW5 HMI in the control cabinet door (Page 49).

   – Installing the Standard 3RW5 HMI on a flat surface (Page 51).

   – Installing the High Feature 3RW5 HMI on a flat surface (Page 53).

5. Optionally attach the 3RW5 communication module to a level surface.
   You will find more details in the equipment manual for the 3RW5 communication module in question.

Result

The 3RW50 soft starter is now mounted and ready for connection.

3.2 Mounting the fan cover

Requirements

- Screwdriver T20
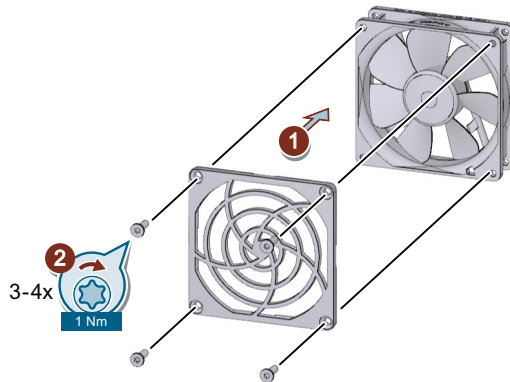
- Fan cover (accessory) suitable for the frame size

Size	Article number of the soft starter	Article number of the fan cover
S6	3RW505.-.....	3RW5985-0FC00
S12	3RW507.-.....	

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 using the 4 screws supplied.

Result

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

3.3 Mount the 3RW50 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 properly executed drill holes with thread or plug on the level surface.
- 4 screws of suitable size and with regular thread for insertion into the selected mounting plate or wall.
  Use an additional four washers if the head of the screw is smaller than the specified diameter.
- Screwdriver (depending on the drive of the screws)
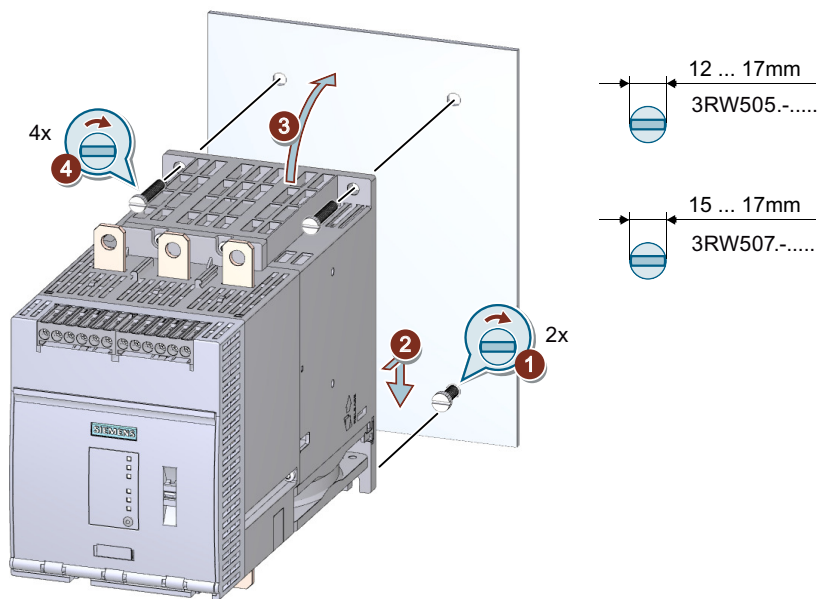- If necessary, use shims and snap rings.

Size	Article number	Screws	Tightening torque
Size S6	3RW505.-.....	M6	5 Nm
Size S12	3RW507.-.....	M8	8 Nm

Procedure

> ⚠ **CAUTION**
>
> **Heavy device.**
>
> Device can cause injury if it is dropped.
>
> 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 3RW50 soft starter onto the 2 lowermost screws ② from above.

- Tilt the 3RW50 soft starter up so that it is resting level against the mounting plate ③ and tighten all 4 screws with the specified torque setting ④.
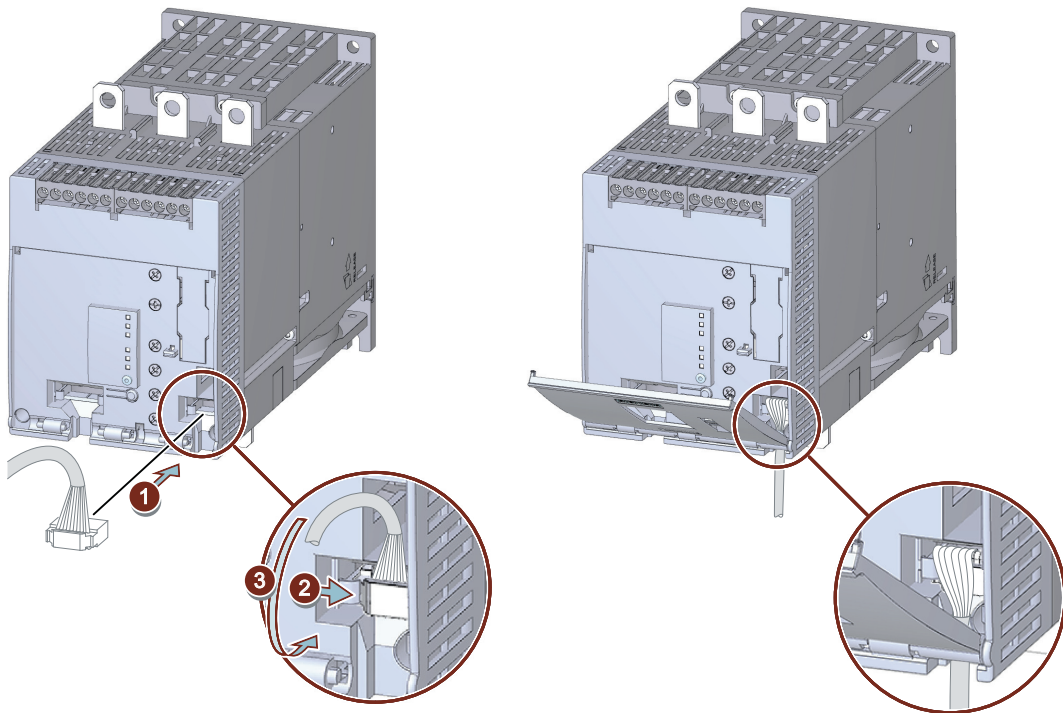
3.4 Connecting the 3RW5 HMI

3.4.1 Connect the HMI connecting cable to the 3RW50 soft starter

Requirements

- Note the mounting positions, minimum clearances and ambient conditions stated on the data sheet.
- HMI connecting cable (accessory) of suitable length
- Removed hinged cover (Page 54)

Procedure

- Connect the HMI connecting cable to the 3RW50 soft starter. Observe the coding of the plug and socket ①.
- Lock the connector in the socket ②.
- Route the HMI connecting cable downward out of the HMI cable duct ③.
  Then fit the hinged cover. (Page 54)
  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.

## 3.4.2 Installing the Standard 3RW5 HMI into the control cabinet door

Requirements

- Note the mounting positions, minimum clearances and ambient conditions stated on the data sheet.
- 3RW5 HMI Standard (accessories)
- HMI connecting cable (accessory) of suitable length connected to the soft starter (Page 46)
- Cutout of suitable size in the control cabinet door
- Device depth of the 3RW5 HMI Standard:
  - Total depth: 32 mm
  - Embedded depth: 29 mm
- Permissible wall thickness of the cabinet door:
  - Without IP65 door mounting kit: 1.5 to 3.0 mm
  - With IP65 door mounting kit: 1.0 to 7.0 mm

For using door mounting kit IP65:

- IP65 door mounting kit (accessory)
  The fixing brackets with marking "001" are intended for a 3RW5 HMI Standard.
- Screwdriver PZ2

Procedure without door mounting kit IP65
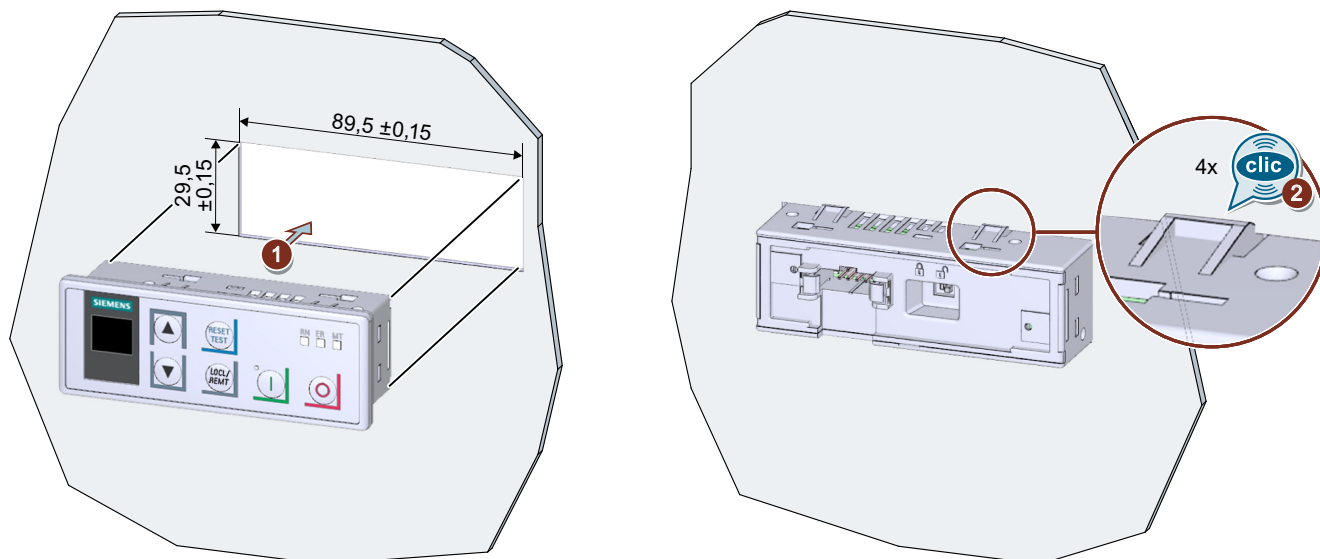
Place the 3RW5 HMI Standard in the cutout of the control cabinet door ①. Ensure that the 3RW5 HMI Standard engages audibly in the 4 fixtures ②.

Procedure with IP65 door mounting kit
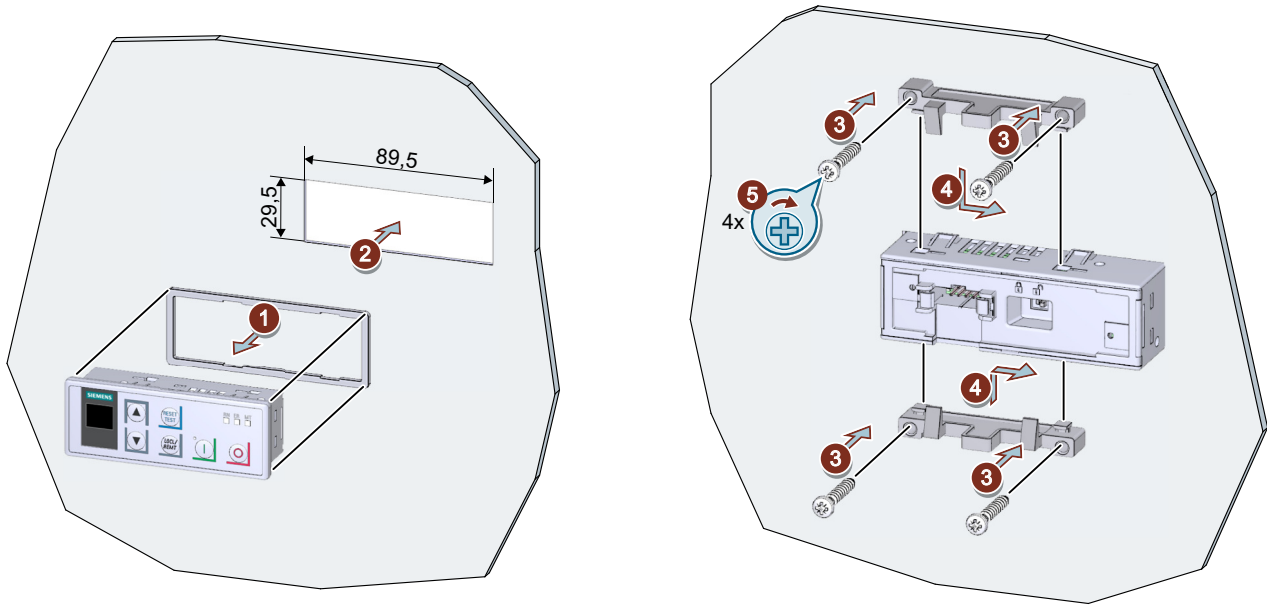
- Remove the protective film from the adhesive tape on the seal and secure the seal on the rear side of the 3RW5 HMI Standard ①.
  Ensure that the seal does not overlap.

- Place the 3RW5 HMI Standard in the cutout of the control cabinet door ②.

- Continue to screw the screws into the fixing brackets ③ until they protrude approx. 10 mm at the front. Fasten the fixing brackets onto the 3RW5 HMI Standard ④.

- Tighten the 3RW5 HMI Standard with a tightening torque of 0.3 ... 0.35 Nm ⑤.
  Ensure that all of the screw heads are in contact with the fixing bracket.

Procedure for connecting with the HMI connecting cable
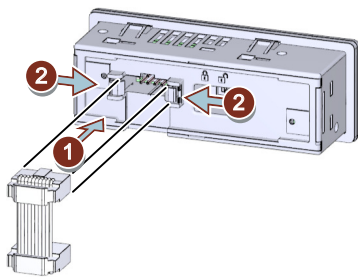
- Observe the coding of the plug and socket ①.

- Lock the connector in the socket ②.

- The HMI connecting cable in the cable duct of the 3RW5 HMI Standard may only be routed downward.
  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.

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

Requirements

- Note the mounting positions, minimum clearances and ambient conditions stated on the data sheet.
- 3RW5 HMI High Feature (accessories)
- HMI connecting cable (accessory) of suitable length connected to the soft starter (Page 46)
- Cutout of suitable size in the control cabinet door
- Device depth of the High Feature 3RW5 HMI:
  - Total depth: 32 mm
  - Embedded depth: 26 mm
- Permissible wall thickness of the cabinet door:
  - Without IP65 door mounting kit: 1.5 to 3.0 mm
  - With IP65 door mounting kit: 1.0 to 7.0 mm

For using door mounting kit IP65:

- IP65 door mounting kit (accessory)
  The fixing brackets with marking "002" are intended for a 3RW5 HMI High Feature.
- Screwdriver PZ2

Procedure without door mounting kit IP65
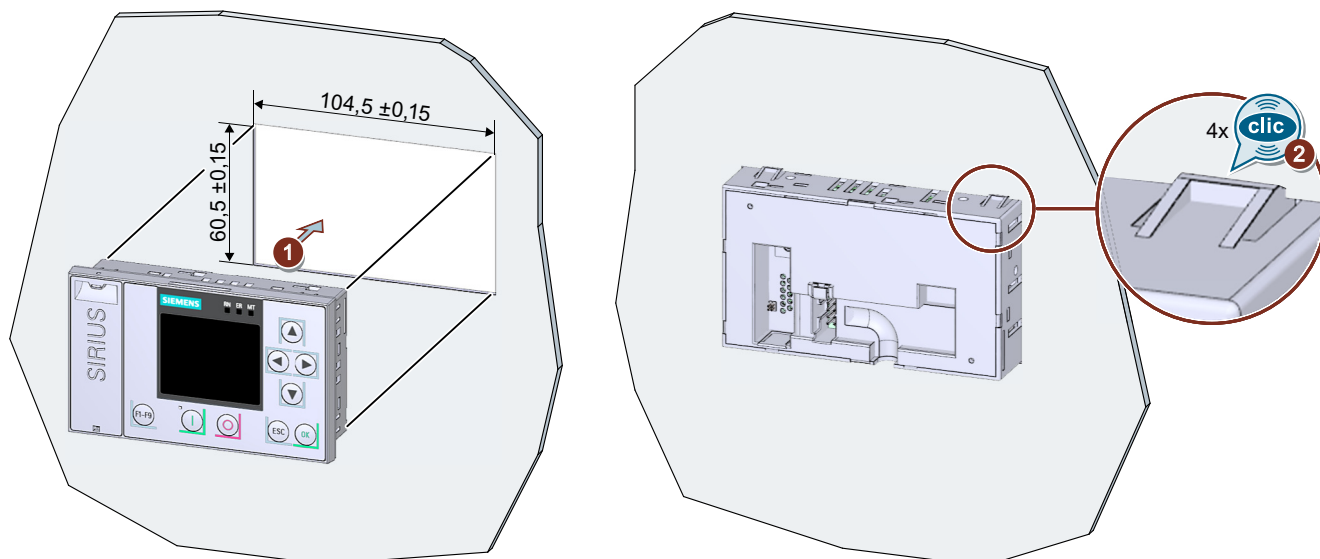
Place the 3RW5 HMI High Feature in the cutout of the control cabinet door ①. Ensure that the 3RW5 HMI High Feature engages audibly in the 4 fixtures ②.

Procedure with door mounting kit IP65
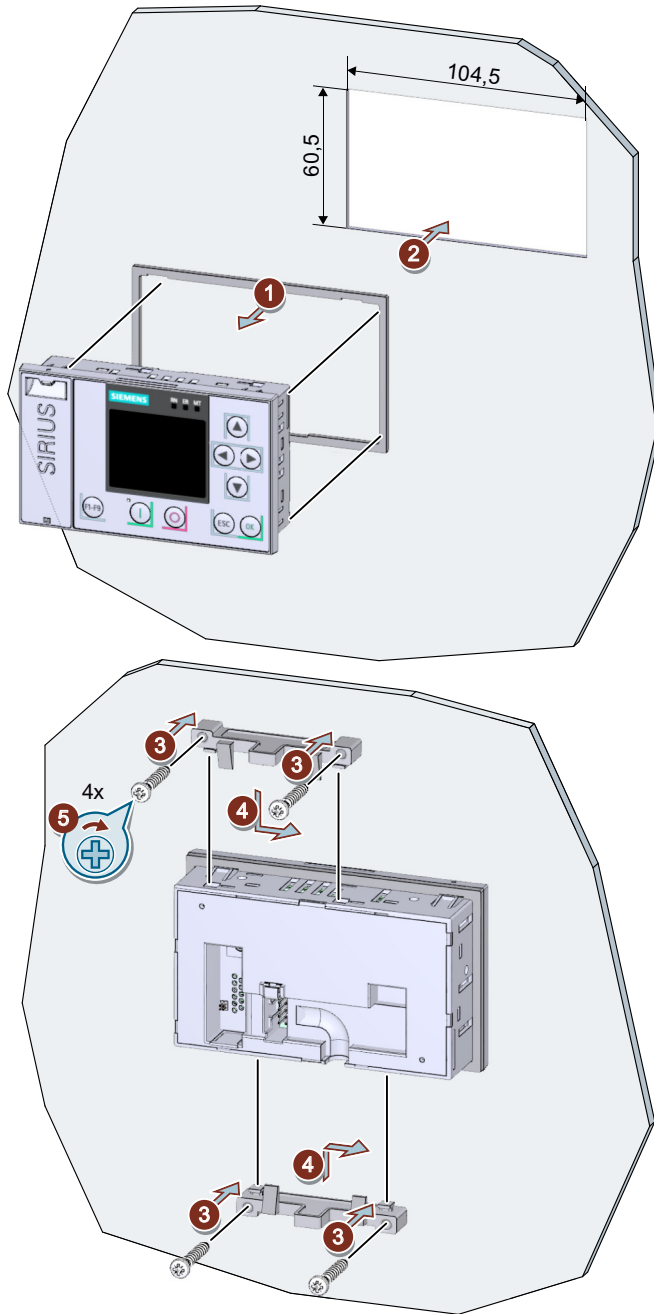
- Remove the protective film from the adhesive tape on the seal and secure the seal on the rear side of the 3RW5 HMI High Feature ①.
  Ensure that the seal does not overlap.

- Place the 3RW5 HMI High Feature in the cutout of the control 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 all of the screw heads are in contact with the fixing bracket.

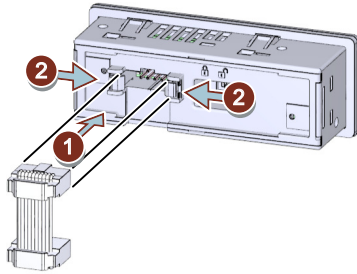**Procedure for connecting with the HMI connecting cable**
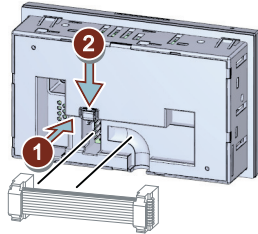
- Observe the coding of the plug and socket ①.

- Lock the connector in the socket ②.

- The HMI connecting cable in the cable duct of the 3RW5 HMI High Feature may only be routed downward.
  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.

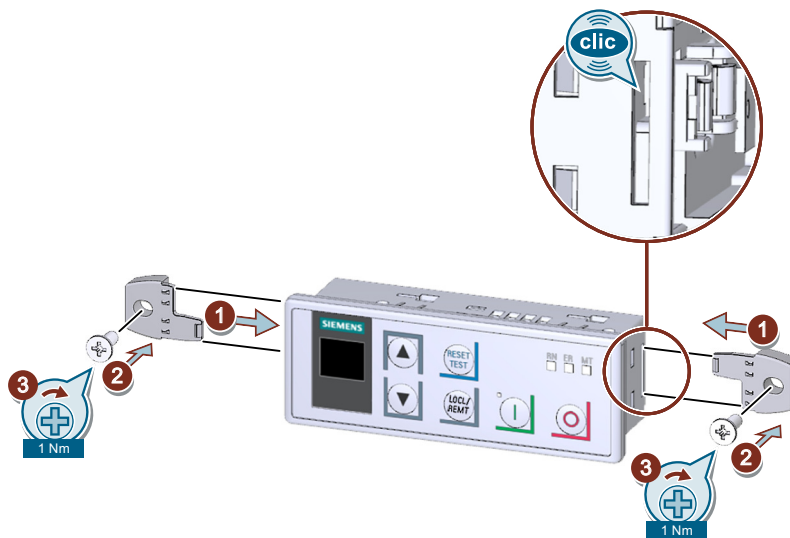### 3.4.4 Installing the Standard 3RW5 HMI on a flat surface

Requirements

- Note the mounting positions, minimum clearances and ambient conditions stated on the data sheet.

- 3RW5 HMI Standard (accessories)

- Level surface, e.g. sufficiently strong mounting plate

- 2 properly executed drill holes with thread or plugs on the level surface. Refer to the drilling pattern (Page 173).

- 2 head screws M4 x 12 DIN ISO 7045 to fit the drill-holes

- Screwdriver (depending on the drive of the screws)

- 2 push-in lugs (accessories) for wall mounting

- HMI connecting cable (accessory) of suitable length connected to the soft starter (Page 46)

Procedure

- Observe the coding of the plug and socket ①.

- Lock the connector in the socket ②.

- The HMI connecting cable in the cable duct of the 3RW5 HMI Standard may only be routed downward.
  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.

- Make sure that the locking switch on the rear of the 3RW5 HMI Standard is in the required position.
  For more information, see Chapter 3RW5 HMI Standard (Page 120).

- Insert the push-in lugs into each side of the enclosure until you hear them engage ① and fix the 3RW5 HMI Standard on the wall ② / ③.

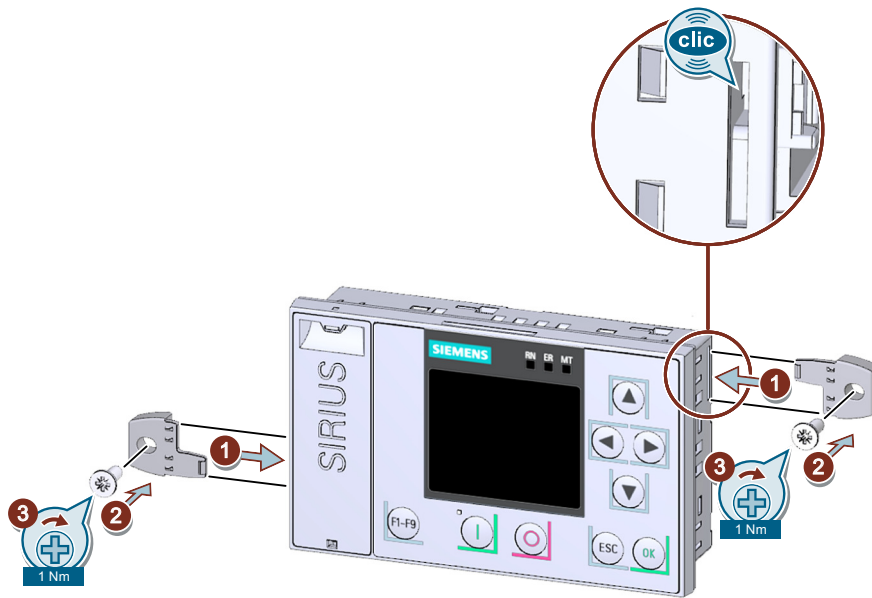## 3.4.5 Installing the High Feature 3RW5 HMI on a flat surface

Requirements

- Note the mounting positions, minimum clearances and ambient conditions stated on the data sheet.

- 3RW5 HMI High Feature (accessories)

- Level surface, e.g. sufficiently strong mounting plate

- 2 properly executed drill holes with thread or plugs on the level surface. Refer to the drilling pattern (Page 174).

- 2 head screws M4 x 12 DIN ISO 7045 to fit the drill-holes

- Screwdriver (depending on the drive of the screws)

- 2 push-in lugs (accessories) for wall mounting

- HMI connecting cable (accessory) of suitable length connected to the soft starter (Page 46)

Procedure
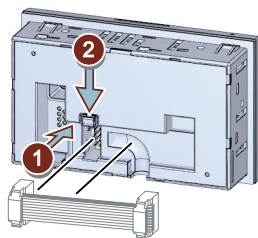
- Observe the coding of the plug and socket ①.

- Lock the connector in the socket ②.

- The HMI connecting cable in the cable duct of the 3RW5 HMI High Feature may only be routed downward.
  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.
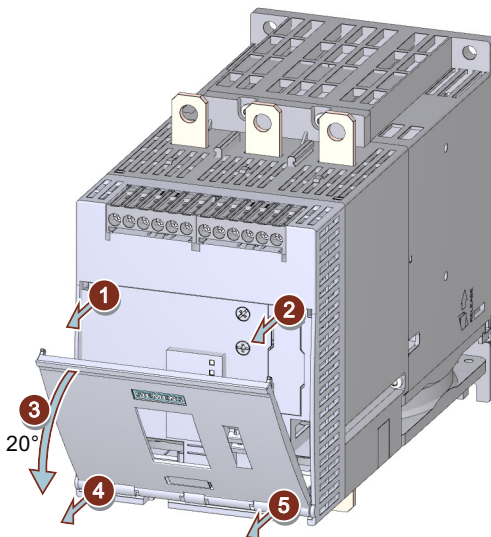
- Insert the push-in lugs into each side of the enclosure until you hear them engage ① and fix the 3RW5 HMI High Feature on the wall ② / ③.

3.4.6 Removing and installing the hinged cover of the 3RW50 soft starter

Requirements

- Hinged cover

Procedure

- Unlock the hinged cover on both sides ① / ②.

- Open the hinged cover ③ at an angle of approx. 20°.

- Loosen the hinges horizontally to the soft starter surface ④ / ⑤ starting from the left.

- Take the cover off the 3RW50 soft starter.

- Follow the steps in reverse order to install the replacement hinged cover.

3.5   3RW5 communication module

3.5.1   Installing the 3RW5 communication module on a level surface

Requirements

- 3RW5 communication module (accessory)

- Level surface, e.g. sufficiently strong mounting plate

- Observe the mounting positions, minimum clearances and ambient conditions stated on the data sheet.

- 2 properly executed drill holes with thread or plugs on the level surface.
  The 3RW5 communication module must be mounted to the left of the 3RW50 soft starter.
  Observe the position of the 3RW5 communication module in the drilling pattern (Page 175).
  The COM connecting cable has a limited length.

- 2 head screws M4 x 12 DIN ISO 7045 to fit the drill-holes

- Screwdriver (depending on the drive of the screws)
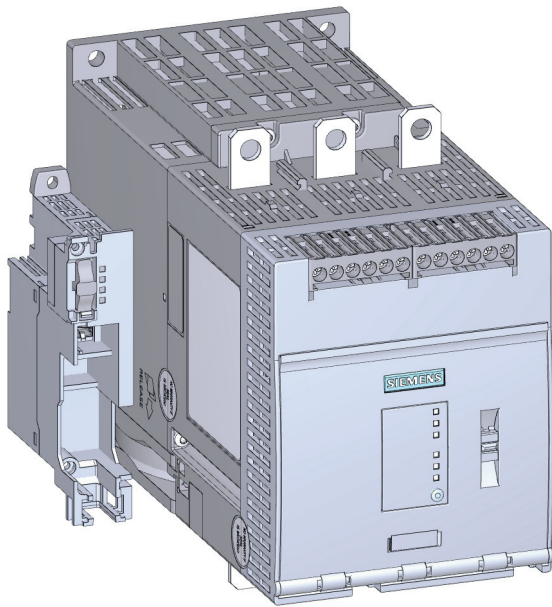
- 2 push-in lugs (accessories) for wall mounting

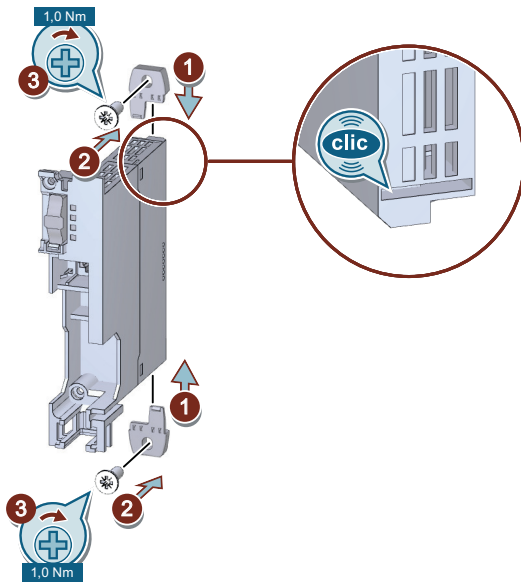Illustration similar

Procedure

Illustration similar

1. Insert the push-in lugs into each side of the enclosure until you hear them engage.

2. Position the 3RW5 communication module on the level surface over the drill-holes and insert the head screws.

3. Attach the 3RW5 communication module on the bottom and top side of the level surface using the head screws.

Result

You have mounted the 3RW5 communication module on a level surface. You can connect the COM connecting cable to the 3RW50 soft starter (Page 72) and on the 3RW5 communication module (Page 73) and connect the 3RW50 soft starter to the fieldbus via the 3RW5 communication module.

You can find further information on connecting to the fieldbus in the Equipment Manual for the respective 3RW5 communication module.

3.5.2 Removing the 3RW5 communication module on a level surface

Requirements

- 3RW5 communication module (accessory)
- Removed bus connector (fieldbus)
  You can find further information on connecting to the fieldbus in the Equipment Manual for the respective 3RW5 communication module.
- Removed COM connecting cable (Page 74)
- Screwdriver (depending on the drive of the screws)
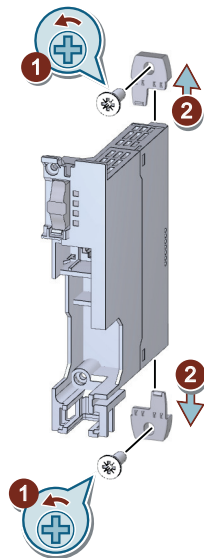
Procedure

Illustration similar

1. Loosen the head screws on the 3RW5 communication module.

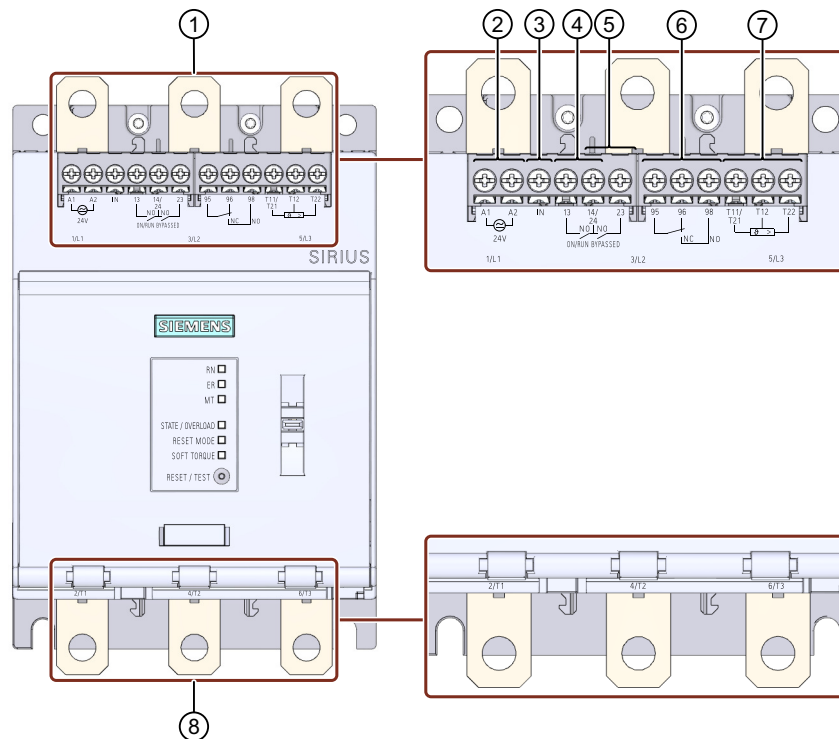2. Pull out the push-in lugs from the 3RW5 communication module.

Result

You have removed the 3RW5 communication module and can now mount another 3RW5 communication module.

Connecting

4

4.1 Connections

4.1.1 Overview of all connections

①   Main circuit connection network 1 / L1, 3 / L2, 5 / L3
②   A1 / A2: Supply voltage for control terminals
③   Input IN to switch the motor on and off
④   Output 13, 14: For signaling the operating state ON or RUN (parameterizable (Page 84))
⑤   Output 23, 24: To signal operating state BYPASSED
⑥   Output 95, 96, and 98 to signal warnings and faults

⑦   Dependent on the variant of the 3RW50 soft starter:

- Thermistor motor protection T11 / 21, T12, and T22: Connection of a temperature sensor (optional)
  T11 / T21 - T22: Connection for Thermoclick
  T11 / T21 - T12: Connection for PTC Type A

- Analog output AQ-, AQ I+ and AQ U+: Connection of an evaluation unit to display the motor current (optional, average phase current in %)
  AQ- / AQ U+: For evaluation units with output signal type **Voltage**:
  Signal range 0 - 10 V
  AQ- / AQ I+: For evaluation units with output signal type **Current**:
  Signal range 4 - 20 mA (factory setting)

⑧   Main circuit connection load (motor) 2 / T1, 4 / T2, 6 / T3

Note

Parameterizing output 13 / 14

You will find more information on parameterization in Chapter Parameterizing output 13 / 14 (output signal ON or RUN) (Page 84).
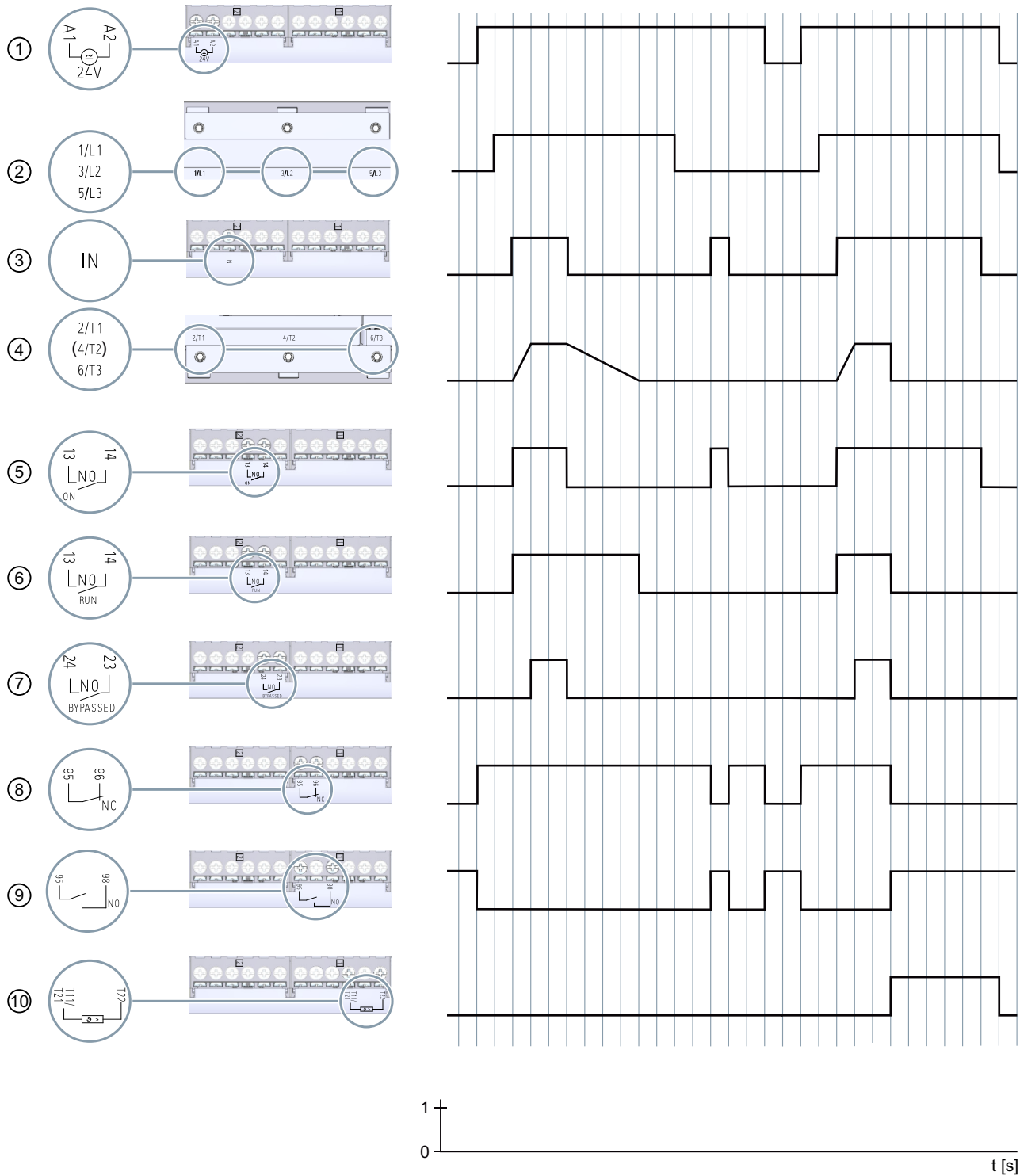

Note

Parameterizing the analog output

You can parameterize the output of the analog output with the 3RW5 HMI High Feature (Page 95).

4.1.2 State diagrams of the inputs and outputs

① Supply voltage for control terminals A1 and A2 (example model: 24 V)

② Main circuit connection network 1 / L1, 3 / L2, 5 / L3

③ Input IN to switch the motor on and off

④   Main circuit connection load (motor) 2 / T1, 4 / T2, 6 / T3

⑤   Output 13, 14: Parameterized to signal operating state ON

⑥   Output 13, 14: Parameterized to signal operating state RUN

⑦   Output 23, 24: To signal operating state BYPASSED

⑧   Output 95, 96 (NC) to signal warnings and faults

⑨   Output 95, 98 (NO) to signal warnings and faults

⑩   Temperature sensor (Thermoclick)

4.2   Connecting the 3RW50 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 3RW50 soft starter in sizes S6 and S12

  – Box terminal block for 3RW50 soft starter in sizes S6 and S12

  – Terminal cover for box terminal in sizes S6 and S12

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.

1. Connect the main circuit connections (line side / motor side) of the 3RW50 soft starter. (Page 63)

2. Optionally install the box terminal blocks for sizes S6 and S12. (Page 64)

3. Optionally install the terminal covers for sizes S6 and S12. (Page 65)

4. Connect the control terminals of the 3RW50 soft starter.
Connecting the control terminals (screw terminals) (Page 66)
Connecting the control terminals (spring-type terminals) (Page 68)

Result

The 3RW50 soft starter is connected and ready to operate.

4.3 Connecting the 3RW50 soft starter to the main circuit connection (mains / motor)

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.

Size	Article number	Tightening torque
S6	3RW505.-.....	10 ... 14 Nm
S12	3RW507.-.....	14 ... 24 Nm

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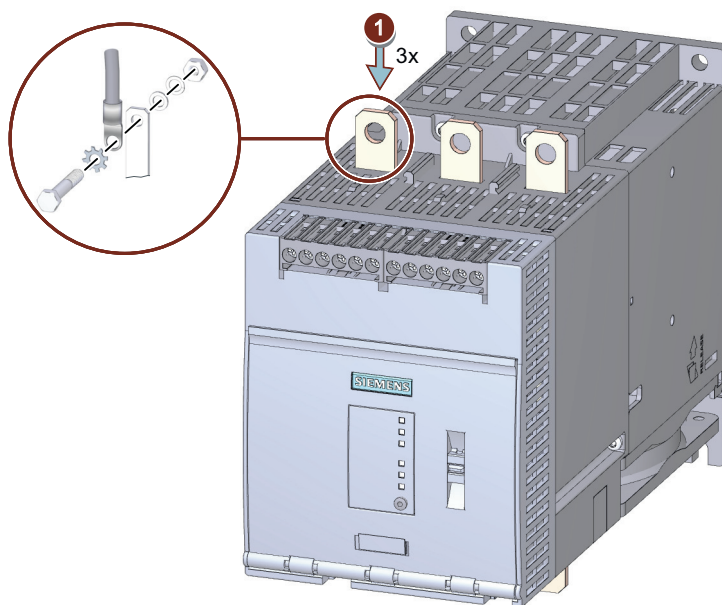
Pay attention to the diagram on the packaging of the enclosed connection set.

- Connect terminal 1 / L1, 3 / L2, 5 / L3 to the supply network ①.

- Repeat step ① for connection 2 / T1, 4 / T2, 6 / T3 with the motor.

Example circuits

- Feeder assembly, type of coordination 1 fuseless (Page 179)
- Feeder assembly, type of coordination 1 with fuses (Page 180)
- Feeder assembly, type of coordination 2 (Page 181)

4.4 Mounting and dismantling box terminal blocks

Requirements

- Box terminal blocks (accessories) for 3RW50 soft starters
- Pay attention to the required tools indicated on the front beneath the hinged cover.
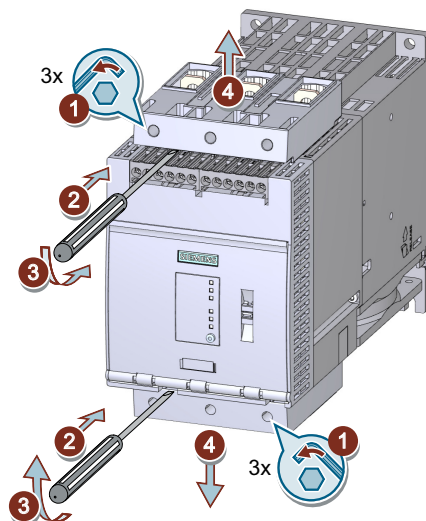
Assembly procedure
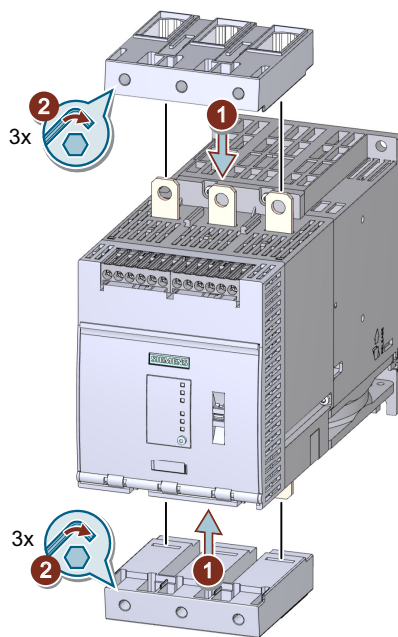
- Plug the new box terminal blocks into the main circuit connections ① and tighten the screws with a torque of 4.5 ... 6 Nm ②.
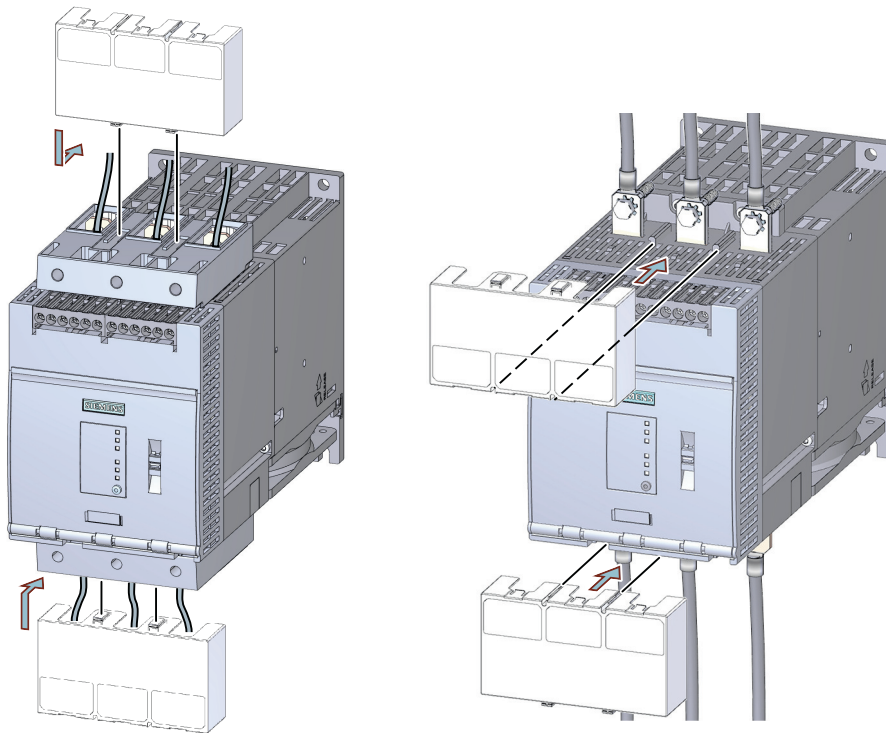
Dismantling procedure

> ⚡ **⚠ 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 each of the box terminal blocks ① and lever the box terminal blocks off the main circuit connections ② / ③.
- Pull the box terminal blocks off the main circuit connections ④.

4.5 Mounting terminal covers on main circuit connections

Requirements

- Terminal cover (accessory) for 3RW50 soft starter

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.

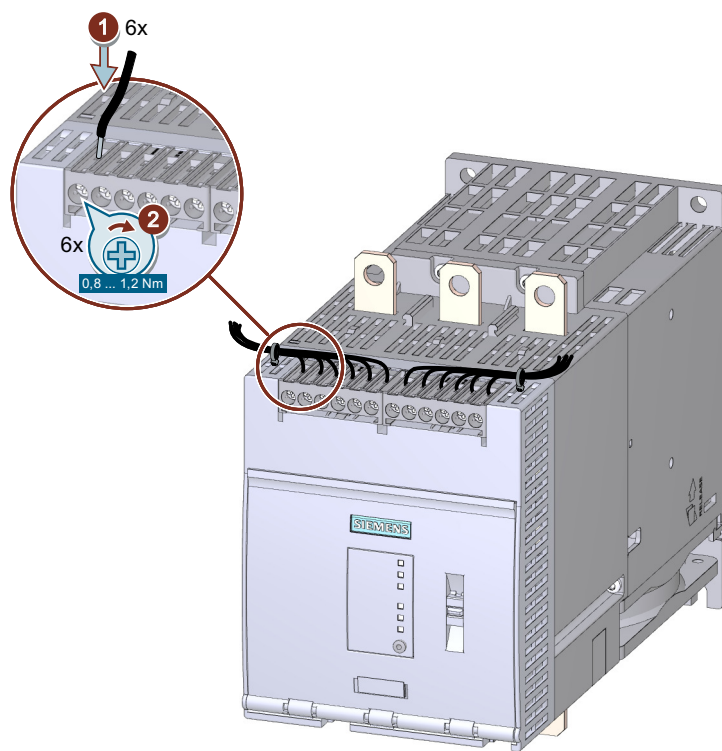## 4.6 Connecting the control terminals (screw terminals)

Requirements

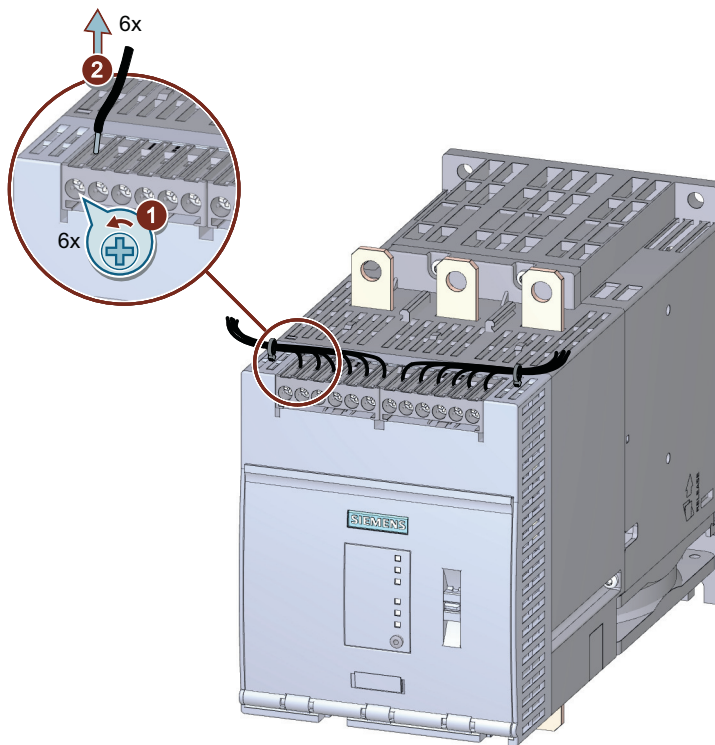- Observe the conductor cross-sections and tightening torques in the data sheet or on the front beneath the hinged cover.

- 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

- Control by pushbutton (Page 182)
- Control by switch (Page 183)
- Switching with the control supply voltage (Page 184)
- Control by PLC (Page 186)
- Actuation of a line contactor (Page 187)
- Wiring for remote RESET (Page 189)
- Connecting the temperature sensor (Page 189)
- Connecting the evaluation unit to the analog output (Page 190)

4.7 Disconnecting the control current form 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.
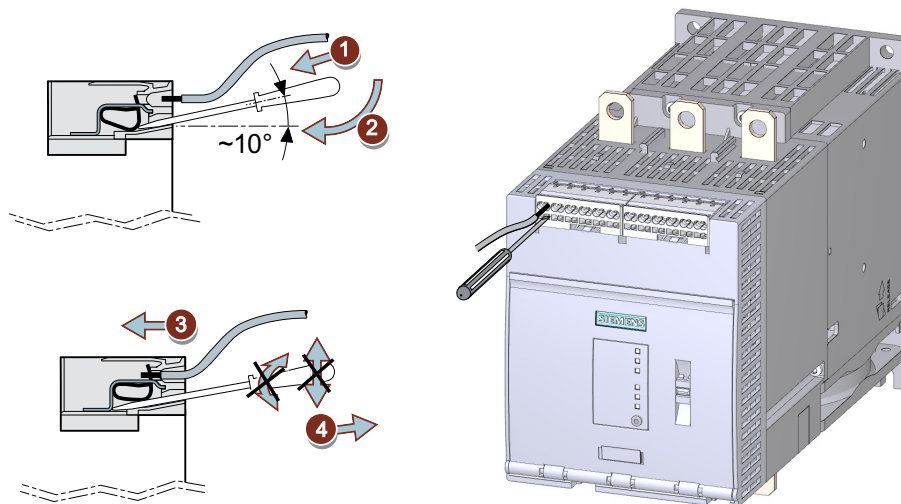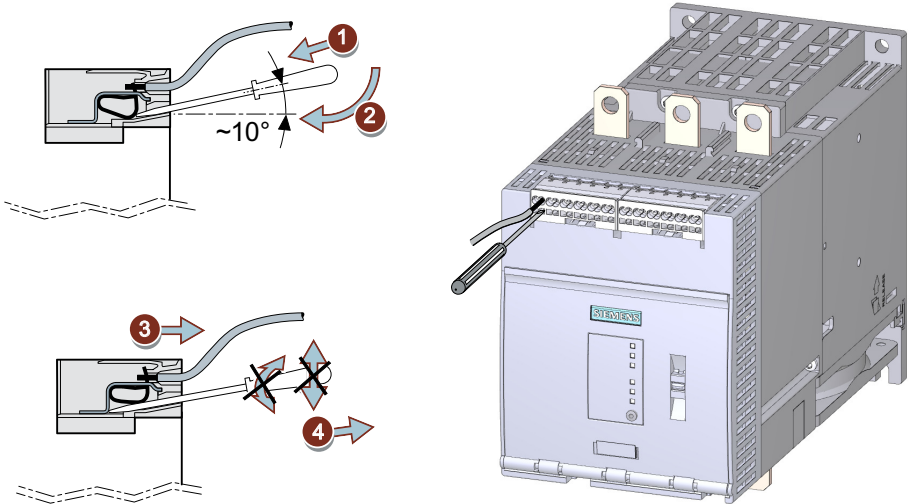
Procedure

> ⚡ **! 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

- Control by pushbutton (Page 182)
- Control by switch (Page 183)
- Switching with the control supply voltage (Page 184)
- Control by PLC (Page 186)
- Actuation of a line contactor (Page 187)
- Wiring for remote RESET (Page 189)
- Connecting the temperature sensor (Page 189)
- Connecting the evaluation unit to the analog output (Page 190)

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.
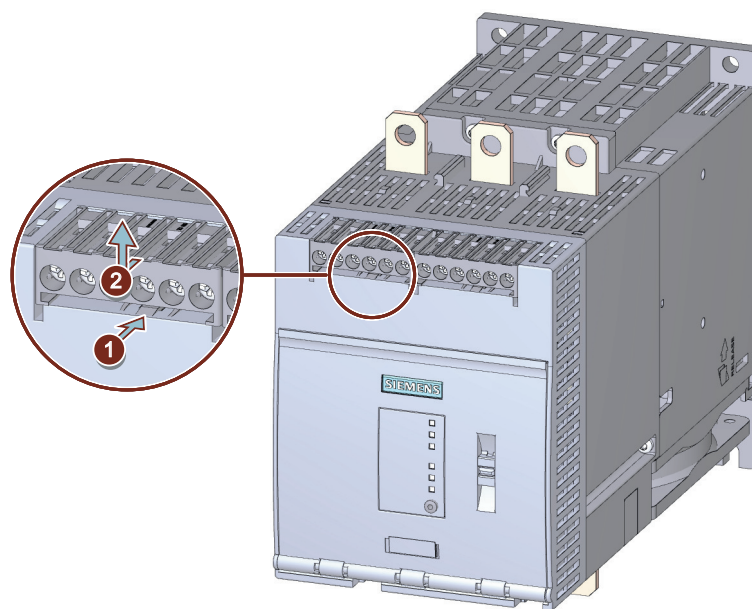

4.10   Replacing the control terminals

Requirements

- Control terminal as spare part (screw terminal: 3RW5980-1TR00, spring-type: 3RW5980-2TR00)
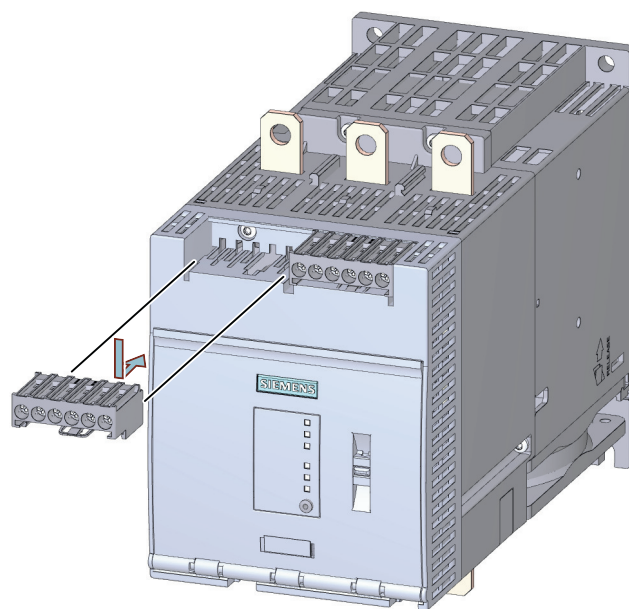
Dismantling procedure

> ⚠ **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 COM connection cable

4.11.1 Connecting the COM connecting cable to the 3RW50 soft starter

Requirements

- 3RW5 communication module (accessory)
- Removed hinged cover (Page 54)
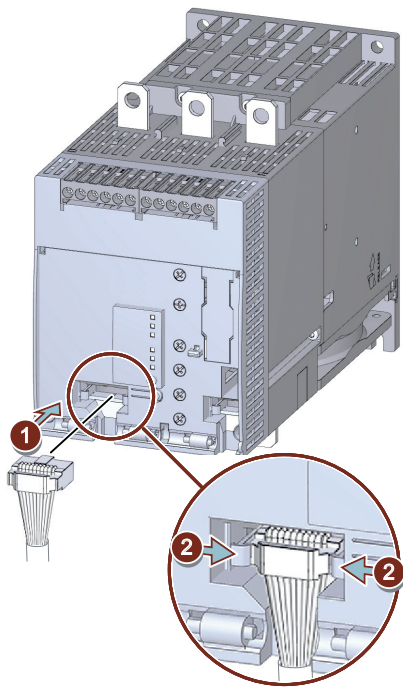- COM connecting cable (accessory)

Procedure

Illustration similar

1. Plug the bus connector of the COM connecting cable (without pin connectors) into the corresponding socket on the 3RW50 soft starter. Observe the coding of the bus connector and of the socket.
2. Lock the bus connector in the socket.
3. Install the hinged cover (Page 54).

Result

You have connected the COM connecting cable to the 3RW50 soft starter. You can connect the other side of the COM connecting cable to the 3RW5 communication module (Page 73).

4.11.2   Connecting the COM connecting cable to the 3RW5 communication module

Requirements

- A 3RW5 communication module mounted on a level surface (accessory) (Page 55)

- Removed cover cap
  Loosen and remove the securing mechanism of the cover cap and keep the cover cap in a safe place.

- 3RW50 soft starter with connected COM connecting cable (accessory) (Page 72)

NOTICE
Damage to property due to electrical voltage
Switch off the power to the 3RW5 soft starter before starting work (main and control supply voltage).

Procedure

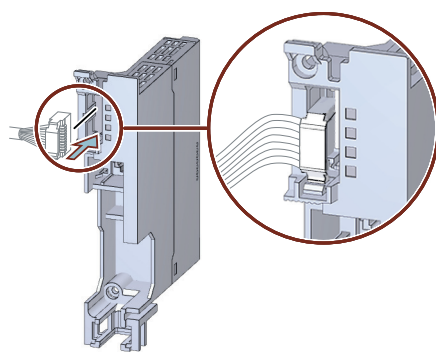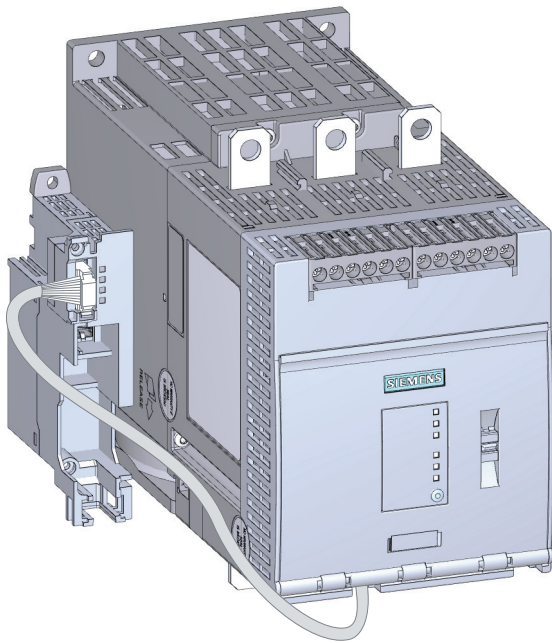| NOTICE |
| --- |
| **Material damage due to incorrect plug-in connection** |
| Use the front plug-in connection of the 3RW5 communication module for the 3RW5 soft starter. The rear plug-in connection is not suitable for connecting to the COM connecting cable. |

Illustration similar

Illustration similar

Plug the bus connector of the COM connecting cable with the pin connectors into the front plug-in connection of the 3RW5 communication module for the 3RW5 soft starter until the securing mechanism on the bus connector of the COM connecting cable latches into place.

Route the COM connecting cable in front under the 3RW50 soft starter and then on the side next to the 3RW50 soft starter. Maintain sufficient distance from the main power connections and ensure that your routing is EMC-compliant.

Result

The 3RW5 communication module is now properly mounted and connected to the 3RW50 soft starter. You can connect the 3RW50 soft starter via the 3RW5 communication module on the fieldbus.

You can find further information on connecting to the fieldbus in the Equipment Manual for the respective 3RW5 communication module.

4.11.3   Removing the COM connecting cable on the 3RW5 communication module

Requirements

- 3RW5 communication module (accessory)

- Removed bus connector (fieldbus)
  You can find further information on connecting to the fieldbus in the Equipment Manual for the respective 3RW5 communication module.

- Cover cap

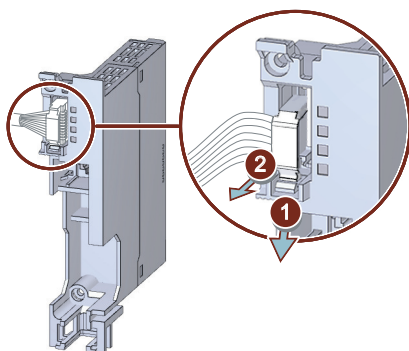| NOTICE |
| --- |
| **Damage to property due to electrical voltage** |
| Switch off the power to the 3RW5 soft starter before starting work (main and control supply voltage). |

Procedure

Illustration similar

1. Loosen die securing mechanism on the bus connector of the COM connecting cable.

2. Pull the bus connector of the COM connecting cable out of the plug-in connection of the 3RW5 communication module for the 3RW5 soft starter.

Result

You have disconnected the 3RW5 communication module from the 3RW50 soft starter. Place the cover cap onto the front plug-in connection of the 3RW5 communication module for the 3RW5 soft starter.

4.11.4 Remove the COM connecting cable on the 3RW50 soft starter

Requirements

- 3RW5 communication module (accessory)

- Removed hinged cover (Page 54)

- COM connecting cable (accessory) on the 3RW5 communication module removed (Page 74)

Procedure
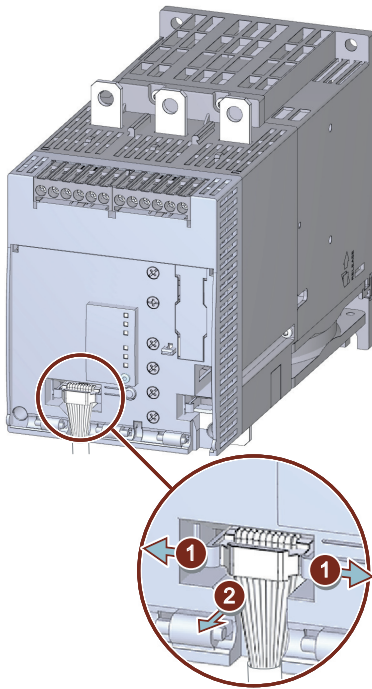
Illustration similar

1. Loosen die securing mechanism on the bus connector of the COM connecting cable.

2. Pull the bus connector of the COM connecting cable out of the socket on the 3RW50 soft starter.

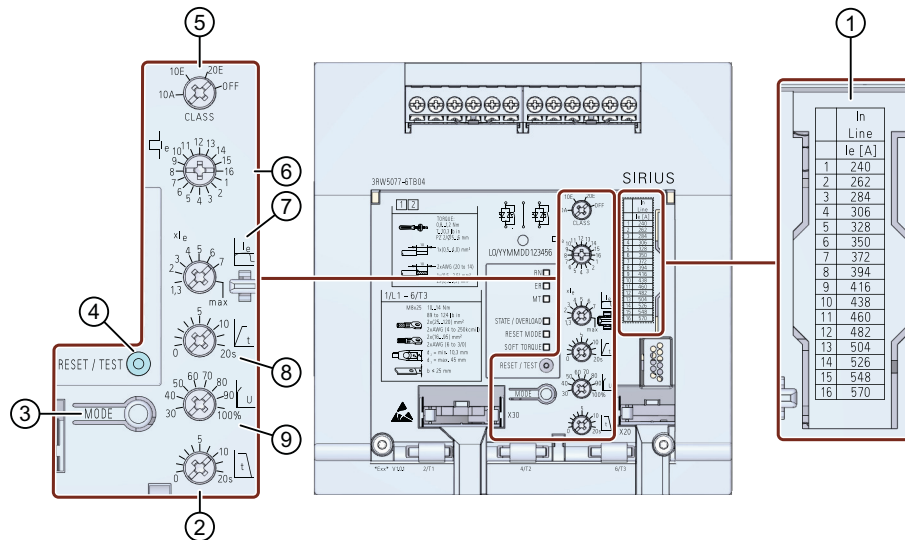3. Install the hinged cover (Page 54).

Result

You have disconnected the COM connecting cable from the 3RW50 soft starter.

Parameter assignment

<div style="text-align: right; font-size: 3em;">5</div>

5.1 Setting elements on 3RW50 soft starter

①   Scale of rated operational current I_e of the motor
②   Stopping time
③   MODE key
  - Parameterization of RESET MODE
  - Deactivation / activation of Soft Torque
  - Parameterization of ON / RUN relay output
  - Parameterizing mode
  - Restoring factory setting
④   RESET / TEST key
  - Acknowledges faults
  - Performing the self-test (user test)
  - Parameterization of ON / RUN relay output
  - Parameterizing mode
  - Restoring factory setting
⑤   CLASS setting for the motor overload protection
⑥   Rated operational current I_e of the motor
⑦   Current limiting factor as a multiple of the set rated operational current I_e of the motor
⑧   Ramp up time
⑨   Starting voltage

Requirements

- Slotted screwdriver or cross-tip screwdriver PZ1

Procedure
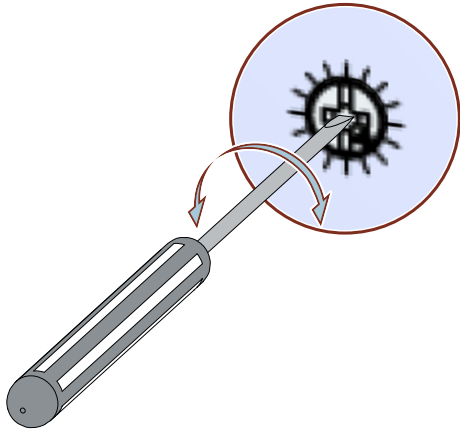
- Insert the slotted screwdriver in the opening of the setting element.
- Turn the slotted screwdriver until the arrow of the setting element points to the required parameter setting.
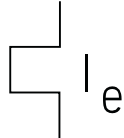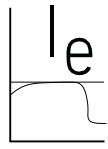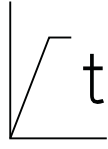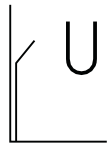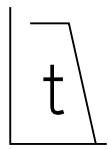
Tip

Please note that the displays on the setting elements are approximate values which are subject to production engineering tolerances. To perform a detailed setting, a 3RW5 HMI should be used.

Display of the parameter value in the 3RW5 HMI (accessories)

- 3RW5 HMI Standard
  During the setting of parameters at the setting elements, the current value is indicated on the display of the 3RW5 HMI Standard and undergoes cyclic updating.

- 3RW5 HMI High Feature
  During the setting of parameters at the setting elements, the current value is indicated in the "Parameters > Parameter list" menu on the display of the 3RW5 HMI High Feature and undergoes cyclic updating.

5.2 Overview of parameters

Parameter	Symbol	Setting range	Factory setting
Tripping class for motor overload protection	CLASS	10A, 10E, 20E, OFF	10E
Rated operational current I_e of the motor[1]	I_e	1 ... 16[2]	1
Current limiting value as a multiple of the set rated operational current I_e of the motor	I_e	• 1.3 ... 7 x I_e • max The "max" setting corresponds to 7 times the maximum rated operating current I_e of the 3RW50 soft starter.	4 x I_e
Ramp up time	t	• 0 ... 20 s • If parameter value "0" is set, the motor is switched on with a ramp up time of approx. 100 ms.	10 s
Starting voltage	U	30 ... 100 %	30 %
Stopping time	t	0 ... 20 s	0 s
Soft torque	SOFT TORQUE ☐ MODE	• Off (LED off) • On (LED on)	Off
RESET MODE	RESET MODE ☐ MODE	• Manual RESET (LED off) • Remote RESET (LED flashes green) • Auto RESET (LED lit green)	Manual RESET

[1] The rated operational current I_e of the motor may, according to the standard, deviate by 20% from the rating plate specification of the manufacturer.

[2] For meaning of scale, refer to laser-cut table on front panel of device.

5.3 Suggested settings

Application	Starting voltage [%]	Ramp up time [s]	Current limitation	Stopping time [s]
Conveyor belt (full)	70	5	$7 \times I_e$	10
Roller conveyor (full)	60	5	$7 \times I_e$	10
Compressor (without pressure)	50	4	$4 \times I_e$	Not relevant
Small fan	40	2	$4 \times I_e$	Not relevant
Pump[1]	40	3	$4 \times I_e$	10
Hydraulic pump	40	2	$4 \times I_e$	Not relevant
Agitator	40	2	$4 \times I_e$	Not relevant
Milling machine	40	4	$4 \times I_e$	Not relevant

[1] It is recommended that the Soft Torque function is activated.

5.4 Parameterizing the 3RW50 soft starter

Requirements

- The 3RW50 soft starter is mounted and connected.
- Rated control voltage and rated operational voltage have been applied.
- Suggested settings (Page 80)

Note

Tips for parameterizing the 3RW50 soft starter.

Entering the motor and load data in the STS software (Page 22) will simulate the application and a suitable 3RW5 soft starter will be suggested. In addition, information regarding parameterization is also provided.

Procedure

1. You set the parameters on the setting elements of the 3RW50 soft starter (Page 77).

2. Set the motor overload protection on the setting elements "CLASS" and "I_e" (Page 109). The scale for rated operational current I_e is listed for each type of connection in the table on the front of the 3RW50 soft starter.
Make sure that the arrow of the "CLASS" setting element points to the required setting.

3. Set the soft starting on the setting elements "t" and "U" (Page 103).

4. Set the current limit at the setting element "Current limiting value x I_e" (Page 105).

5. Set the soft stopping on the setting element "t" (Page 107).

6. Activate the Soft Torque function, if required.
Note the information in chapters Setting RESET MODE and Soft Torque (Page 81) and Soft torque (Page 111).

7. Set the required RESET MODE (Page 81).

8. Set the signal of your choice at the ON / RUN relay output (Page 84).

9. Set the parameters in Chapter Additional parameters (Page 116) if desired.

Result

The 3RW50 soft starter has been parameterized and is ready for operation. You can parameterize the signal of the analog output via an optional 3RW5 HMI High Feature (Page 95).

5.5 Setting RESET MODE and Soft Torque

RESET MODE and Soft Torque

With the MODE key you set the functions RESET MODE and Soft Torque at the same time.

Procedure

⚠ 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.
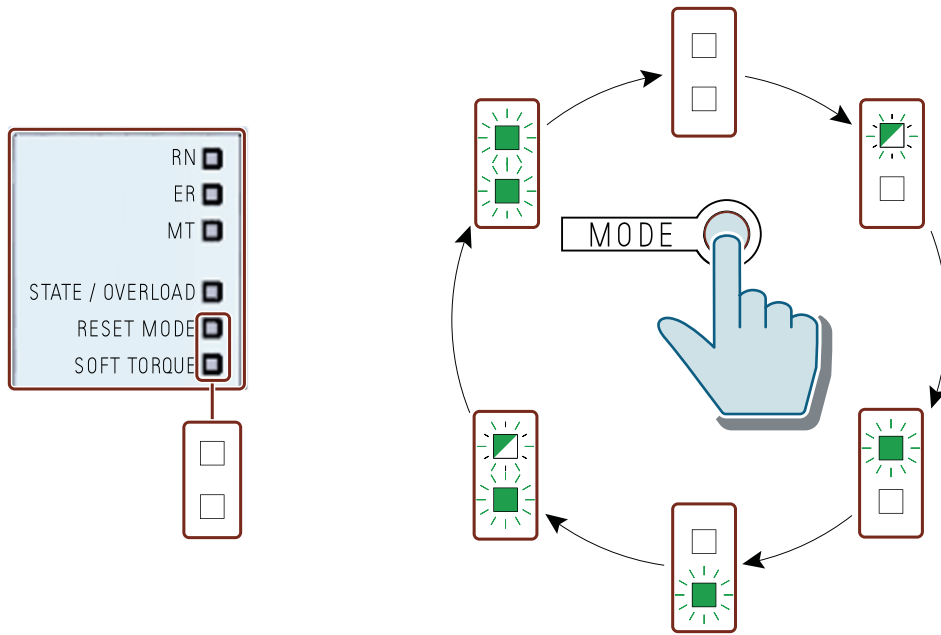
RESET MODE

Note that the setting of the RESET MODE (Page 83) only has an effect on the acknowledgment response of the motor overload protection.

You will find more information in Chapter Faults and remedial actions of the 3RW50 soft starter (Page 143) with the comment "Depends on parameter RESET MODE".

Note

ATEX / IECEx applications

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

RESET MODE LED	Set RESET MODE
☐ Off	Manual RESET
▣ Flashes green	Remote RESET
■ Lights up green	Auto RESET

Soft torque

For more information, see Chapter Soft torque (Page 111).

SOFT TORQUE LED	Set soft torque
□ Off	Off
🟩 Lights up green	On

5.6 RESET MODE

Effects of RESET MODE

Note that the setting of the RESET MODE only has an effect on the acknowledgment response of the motor overload protection.

You will find more information in Chapter Faults and remedial actions of the 3RW50 soft starter (Page 143) with the comment "Depends on parameter RESET MODE".

ATEX / IECEx applications

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

Manual RESET

"Manual RESET" means that the following options are available for acknowledging faults:

- RESET / TEST key on the 3RW50 soft starter
- RESET / TEST key on the 3RW5 HMI Standard
- Reset via bus interface
- Reset via F key on 3RW5 HMI High Feature
- Reset via 3RW5 HMI High Feature (diagnosis state)

Remote RESET

"Remote RESET" means that faults are acknowledged by switching the control supply voltage off and on again. The control supply voltage on the 3RW50 soft starter must be switched off for at least 4 s.

Auto RESET

"Auto RESET" means that faults are automatically reset as soon as the cause is eliminated.

5.7 Parameterizing output 13 / 14 (output signal ON or RUN)

Application

One of these two states is output at output 13 / 14:

- ON

- RUN

You will find additional information in Chapters Operating principle (Page 10) and State diagrams of the inputs and outputs (Page 61).

Use the **output function ON**, for instance, to implement latching if you selected pushbutton control.

Use the **Output function RUN** in order, for instance, to control a line contactor connected upstream.

Requirements

- Control supply voltage is connected.

- The 3RW50 soft starter does not signal any errors, the STATE / OVERLOAD LED is extinguished.

Procedure

1. Start programming by pressing the MODE key longer than 2 seconds until the STATE / OVERLOAD LED flickers green.
   Press and hold the MODE key.

2. Also press the RESET / TEST key longer than 2 seconds until the LED STATE / OVERLOAD illuminates red.
   The set state of ON / RUN relay output is displayed on the SOFT TORQUE LED:

LED Soft Torque	Signal set on output 13 / 14
Flashes green	ON (factory setting)
Flickers green	RUN

3. Release the MODE and RESET / TEST keys.

4. Switch the mode by pressing the MODE key briefly. The SOFT TORQUE LED switches between flickering green and flashing green.
You can switch between the modes at the output as often as you want.

   Note

   If you do not press a key in the programming mode for longer than 10 s, the 3RW50 soft starter automatically terminates the programming mode.

5. Terminate programming mode by pressing the RESET / TEST key for longer than 1 s until the STATE / OVERLOAD LED no longer shines red.

Tip

Alternatively, output 13 / 14 may also be set in the "Parameters > Soft Starter > ON / RUN relay output" menu of the 3RW5 HMI High Feature (accessories).

5.8 Setting parameterizing mode via key combination on the 3RW50 soft starter

5.8.1 Activate parameterizing mode

Adjustable parameters in parameterizing mode

- Control via digital input (Page 118)
- Output 13 / 14 (ON / RUN) (Page 84)

Requirements

During the activation you must be able to switch off the supply voltage.

Procedure

1. Press the MODE key during operation longer than 2 seconds until the STATE / OVERLOAD LED flickers green and press and hold the MODE key.

2. Switch off the supply voltage of the 3RW50 soft starter for at least 5 s. After the 5 s elapse, you can release the MODE key.

3. Press and hold the MODE and TEST / RESET keys.

4. Switch the supply voltage of the 3RW50 soft starter on again.
When the SOFT TORQUE and RESET MODE LEDs flicker green, the parameterization mode is active. You can release the MODE and TEST / RESET keys.

Result

You have activated the parameterizing mode and can now set the parameters (Page 86).

Further parameterization options

- 3RW5 HMI High Feature
  Menu: "Parameters > Soft Starter > Additional parameters > Control via digital input"
  Menu: "Parameters > Soft Starter > ON / RUN relay output"

- Parameterizing output 13 / 14 (output signal ON or RUN) (Page 84)

5.8.2 Setting parameters in the parameterizing mode

Requirements

- Activated parameterizing mode (Page 85)

Procedure

1. Select the desired parameter using the MODE key.
   You can recognize your selection by the color of the STATE / OVERLOAD LED.

LED STATE / OVERLOAD	Set parameter
☐ Off	No selection
🟩 Lights up green	Control via digital input
🟥 Lights up red	Output ON / RUN

2. Change the setting of the selected parameter using the RESET / TEST key.
   You can recognize your selection by the color combination of the three LEDs RN, ER and MT.
   Setting the parameter "Control via digital input" (selection in Step 1):

Control via digital input			
"RN" LED	**"ER" LED**	**"MT" LED**	**Set parameter value**
☐ Off	☐ Off	☐ Off	**Manual activation**
☐ Off	☐ Off	🟨 Lights up yellow	**Permanent activation**
☐ Off	🟥 Lights up red	🟨 Lights up yellow	**Activate on bus error** (factory setting)
🟩 Lights up green	🟥 Lights up red	🟨 Lights up yellow	**No change on bus error**

Setting of the parameter "Output ON / RUN" (selection in Step 1):

Output ON / RUN			
"RN" LED	**"ER" LED**	**"MT" LED**	**Set parameter value**
☐ Off	☐ Off	☐ Off	Output function ON
☐ Off	☐ Off	🟨 Lights up yellow	Output function RUN

3. Switch off the supply voltage of the 3RW50 soft starter for at least 5 s.
The set parameters and parameter values are stored.

4. Switch the supply voltage of the 3RW50 soft starter on again.
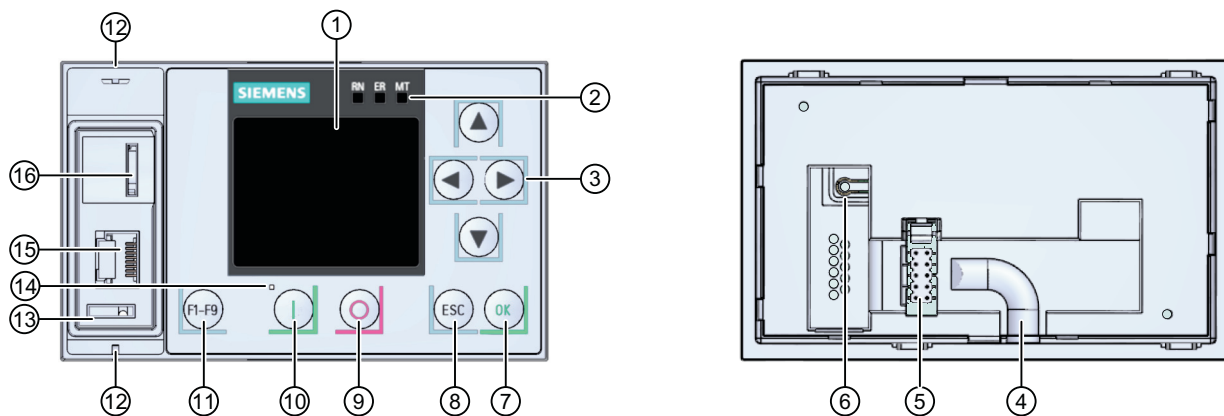The set parameters and parameter values are now active.

Result

You have set the parameters in the parameterizing mode.

Further information

For more information about the parameters, see Chapters Parameterizing output 13 / 14 (output signal ON or RUN) (Page 84) and Control via digital input (Page 118).

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

①	Display
②	Device LEDs (Page 139)
③	Navigation keys
④	Cable duct
⑤	Plug-in connection for HMI connecting cable
⑥	Master RESET key
⑦	OK key
⑧	ESC key
⑨	Motor stop key
⑩	Motor start key
⑪	Favorites key
⑫	Eyes for lead seals
⑬	Hole for mounting the interface cover
⑭	Status LED (Page 141)
⑮	Local interface (point-to-point connection between PC and 3RW5 HMI High Feature)
⑯	Slot for micro SD card (Page 133)

Navigating and setting

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

Please note that parameters which are set manually using the 6 setting elements cannot be parameterized via the 3RW5 HMI High Feature.

Key	Actions
▶	• Move one position to the right in the input field
	• Display of the line chart in the operation display. Further information can be found in Chapter Graphic display of measured values on the 3RW5 HMI High Feature (Page 125).
◀	• Move one position to the left in the input field
	• Switch between the measured values "phase currents (%)" and "phase currents (eff)". For more information, see Chapter Graphic display of measured values on the 3RW5 HMI High Feature (Page 125).
▼	• Jump to next menu item
	• Set number or letter
▲	• Jump to previous menu item
	• Set number or letter
OK	• To confirm
	• To open the menu
	• Jump to selected menu item
ESC	• To exit the menu
◯	• Motor stops as parameterized if the 3RW5 HMI High Feature is the master control
I	• Motor starts as parameterized if the 3RW5 HMI High Feature is the master control After an error has been acknowledged when using the 3RW5 HMI High Feature, you must repeat the ON command by pressing the "Motor Start" key.
F1-F9	• F1: LOCAL / REMOTE: Changes master control
	• F2: Reset
	• F3-F9 (not available for 3RW50 soft starter)
▣	Master RESET key for restoring the factory setting (Page 168).

[1] All parameters that have not been set by means of the setting elements are reset.

5.10   Menu of the 3RW5 HMI High Feature

Overview of the main menu options on the 3RW5 HMI High Feature

Monitoring	Diagnostics	Parameter

Overview	Security	Micro SD card
⌈i⌋	⌈⚷⌋	⌈▮⌋

Menu of the 3RW5 HMI High Feature

Monitoring [1/1]	Diagnostics [1/1]

Measured values

- Phase currents (%)
∟ I L1
∟ I L2
∟ I L3
∟ I L1-3
∟ Show bar chart
- Phase currents (rms)
∟ I L1
∟ I L2
∟ I L3
∟ I L1-3
∟ Show bar chart
- Motor temperature rise (%)
- Remaining motor cooling time (s)
- Remaining switching element cooling time (s)
- Switching element heating (%)

Process image

- Process image
∟ Process image input (PII)
∟ Process image output (PIQ)

Further information

Soft starter

- Diagnosis state
∟ Errors
∟ Warnings
- Device state
∟ Type of connection
∟ Rotation direction
∟ ...
- Statistic data
∟ Operating hours - motor
∟ Number of motor overload trips
∟ Number of starts motor CW
∟ 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
- Maximum pointer
∟ Phase currents (%)
∟ Phase currents (rms)
∟ Maximum trigger current (%)
∟ Maximum trigger current (rms)
∟ Number of motor overload trips
∟ Maximum switching element heating (%)
- Self-test
- Logbooks
∟ Application
∟ Device
∟ **Delete**
... ∟ Application

Communication module

- Diagnosis state
∟ Errors
∟ Prewarnings

HMI

- Diagnosis state
∟ Errors
∟ Warnings
∟ Device status
- Self-test
∟ Test LEDs
∟ Test buttons
∟ Test display

Further information

Parameter [1/2]		

↓

Soft starter	Setting Factory	Setting Customer
- Parameter list		
∟ Tripping class	CLASS 10E	
∟ Rated operational current I_e	1	
∟ Current limiting value	400 %	
∟ Ramp up time	10 s	
∟ Starting voltage	30 %	
∟ Stopping time	0 s	
∟ **Reset mode**		
... ∟ Manual RESET	x	
... ∟ Auto RESET		
... ∟ Remote RESET		
∟ **Soft torque**		
... ∟ Deactivate	x	
... ∟ Activate		
- Analog output		
∟ **Output signal type**		
... ∟ Deactivated		
... ∟ 4 ... 20 mA	x	
... ∟ 0 ... 10 V		
∟ Range start value	0	
∟ Range end value	96	
- ON / RUN relay output		
- Additional parameters		
∟ Typical ambient temperature	60 °C	
∟ Test with small load		
∟ **Control via digital input**		
... ∟ Manual activation		
... ∟ Permanent activation		
... ∟ Activate on bus error	x	
... ∟ No change on bus error		
- Spare part Article No.		

Communication module		
- PROFINET		
∟ MAC address		
∟ Device name		
∟ IP address		
∟ Subnet mask		
∟ Router address		
- EtherNet/IP		
∟ MAC address		
∟ IP address setting		
∟ IP address		
∟ Subnet mask		
∟ Router address		
- Modbus TCP		
∟ MAC address		
∟ IP address		
∟ Subnet mask		
∟ Router address		
∟ Access monitoring time		

⚙ Parameter [2/2]		

↓

Communication module	Setting Factory	Setting Customer
- Modbus RTU		
└ Station address		
└ Baud rate		
└ Port configuration		
└ Access monitoring time		
└ Silent interval time		
- Detected baud rate		
- Detected port configuration		
- PROFIBUS DP		
└ Station address		
└ Baud rate		
- Group diagnostics		
└ Group error		
└ Group warning		

HMI		
- Local interface		
- Timer lighting dark	5 min	
- Do control after log off		
└ Continue with motor control		
└ Stop motor and give back control	x	
- Message display		
└ **Errors**		
... └ Enable	x	
... └ Disable		
└ **Warnings**		
... └ Enable	x	
... └ Disable		
- Operation display		
└ **Measured value 1**		
... └ Phase current average (%)	x	
└ **Measured value 2**		
... └ Phase current average (rms)	x	
└ **Measured value 3**		
... └ Phase current I L1 (rms)	x	
└ **Measured value 4**		
... └ Phase current I L2 (rms)	x	
└ **Measured value 5**		
... └ Phase current I L3 (rms)	x	
- Language	English	

Factory settings		
- Soft starter		
- Communication module		
- HMI		
- All devices		

Further information		

```
┌─────────────────────────────────────┐   ┌─────────────────────────────────────┐
│ (i)           Overview [1/1]         │   │ (key)          Security [1/1]        │
└─────────────────────────────────────┘   └─────────────────────────────────────┘
                    ↓                                         ↓
┌─────────────────────────────────────┐   ┌─────────────────────────────────────┐
│             Soft starter             │   │ - Local access protection           │
│                                      │   │ └ Define PIN                         │
│ - Module                             │   │ └ Change PIN                         │
│ └ Article number                     │   │ └ Delete PIN                         │
│ └ Hardware                           │   │ └ Auto log off time                  │
│ └ Firmware                           │   │ └ Log on                             │
│ - Module information                 │   │ └ Log off                            │
│ └ Tag function                       │   │                                      │
│ └ Tag location                       │   ├─────────────────────────────────────┤
│ └ Installation date                  │   │         Further information          │
│ └ Additional information             │   └─────────────────────────────────────┘
│ - Manufacturer information           │
│ └ Manufacturer                       │
│ └ Serial number                      │
├─────────────────────────────────────┤   ┌─────────────────────────────────────┐
│         Communication module         │   │          Micro SD card [1/1]         │
│                                      │   └─────────────────────────────────────┘
│ - Module                             │                      ↓
│ └ Article number                     │   ┌─────────────────────────────────────┐
│ └ Hardware                           │   │ - Load communication and HMI parameters to soft starter │
│ └ Firmware                           │   │ - Load communication and HMI parameters to micro SD card │
│ - Manufacturer information           │   │ - Device change                      │
│ └ Manufacturer                       │   │ - Save logbooks to micro SD card     │
│ └ Serial number                      │   │ - Save service data to micro SD card │
├─────────────────────────────────────┤   │ - FW update                          │
│                 HMI                  │   │ └ Soft Starter                       │
│                                      │   │ └ HMI                                │
│ - Module                             │   │ └ Communication module               │
│ └ Article number                     │   │ - Download language                  │
│ └ Hardware                           │   │ - Memory space                       │
│ └ Firmware                           │   │ └ Complete memory                    │
│ - Manufacturer information           │   │ └ Free memory                        │
│ └ Manufacturer                       │   │ └ Used memory                        │
│ └ Serial number                      │   │                                      │
├─────────────────────────────────────┤   ├─────────────────────────────────────┤
│         Further information          │   │         Further information          │
└─────────────────────────────────────┘   └─────────────────────────────────────┘
```

5.11 Parameterizing analog output AQ via the High Feature 3RW5 HMI

Operating principle

You can re-parameterize the output of the analog output with the 3RW5 HMI High Feature.

The actual average phase current L1 - L3 of the motor is displayed in % at the evaluation unit via the analog output. Depending on the respective connecting terminal being used, the signal can be displayed either as current or voltage.

- Terminals: AQ- / AQ I+
  Measuring range of current output: 4 - 20 mA

- Terminals: AQ- / AQ U+
  Measuring range of voltage output: 0 - 10 V

Requirements

- 3RW5 HMI High Feature
  Menu: "Parameters > Soft Starter > Analog output"

- Access protection to the 3RW5 HMI High Feature is not active or has been reset.

- Device version with analog output

- Evaluation unit is connected properly (Page 190).

Parameter

Parameter	Description
Output signal type	Via the "Output signal type" parameter you can define with what type of signal the analog value will be output. • Deactivated • 4 - 20 mA (factory setting) • 0 ... 10 mA

Range start value
 	
 Range end value
	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 respective value depends on the coding of the measured value.
	Factory setting:
	• Range start value: 0
	  Setting of the analog range, e.g. 4 mA = 0
	• Range end value: 96
	  Setting of the analog range, e.g. 20 mA = 96, corresponds to 300 % of the average phase current (%).

Factor for calculating the output measured value

Measured value	Factor	Unit	Range of values	Coding
Phase current average (%)	3.125	%	0 ... 796.9 %	0 ... 255

Example for calculating the parameters for the range start value and range end value

In this example, a pointer instrument indicates the measured value "Phase current average (%)" at the left stop with 50 % (start value) and the right stop with 200 % (end value). You can divide the scale of the pointer instrument between the left stop and the right stop, depending on the desired resolution.

The following parameters are given as examples at this point:

- Output signal type: 4 ... 20 mA

- Range start value = desired start value (%) / factor of the measured value

- Range end value = desired end value (%) / factor of the measured value

Procedure

1. Parameterize the output signal type, e.g. 4 ... 20 mA.

2. Parameterize the range start value and the range end value taking the following factor into account:

   – Range start value (50 % / 3.125 %) → 16

   – Range end value (e.g. 200 % / 3.125 %) → 64

Result

You have adjusted the output signal of the analog output.

5.12 Parameterizing the High Feature 3RW5 HMI

Requirements

- 3RW5 HMI High Feature

Setting options

- 3RW5 HMI High Feature
  Menu: "Parameters > HMI"
  Access protection to the 3RW5 HMI High Feature is not active or has been reset.

- With SIRIUS Soft Starter ES (TIA Portal) via the local interface on the 3RW5 HMI High Feature

- With a fieldbus via a 3RW5 communication module:

  – With SIRIUS Soft Starter ES (TIA Portal) Premium (only via a 3RW5 PROFINET or PROFIBUS communication module)

  – Configuration software of the control system (e.g. STEP 7 with corresponding HSP)

  – User program

  You can find further information on the parameters that can be set via the fieldbus in the Equipment Manual of the respective 3RW5 communication module.

Parameter

Parameter	Description
Local interface activated (via 3RW5 HMI High Feature only)	The parameter is only visible if the local interface is enabled (factory setting). Disables the local interface of the 3RW5 HMI High Feature. Before you can connect a PC with SIRIUS Soft Starter ES (TIA Portal) to the 3RW50 soft starter via the local interface, the local interface must be enabled. You can prevent unauthorized access via SIRIUS Soft Starter ES (TIA Portal) by disabling the local interface.
Local interface deactivated (via 3RW5 HMI High Feature only)	The parameter is only visible if the local interface is disabled. Enables the local interface of the 3RW5 HMI High Feature.

Parameter	Description
Timer lighting dark	If no keys on the 3RW5 HMI High Feature are pressed, the display will shut down after a specified time period has elapsed. The parameter value "0" deactivates the shutdown of the display. • 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 The master control is retained by the 3RW5 HMI High Feature.
	Stop motor and give back control (factory setting) The motor stops and the master control is no longer with the 3RW5 HMI High Feature. Refer to Chapter Operating modes and master control function (Page 15).
Message display	If errors and/or warnings are enabled, they will appear as pop-up windows in the display of the 3RW5 HMI High Feature as soon as they occur.
	Error • Enable (factory setting) • Disable
	Warnings • Enable (factory setting) • Disable
Operation display	Up to 5 different measured values can be selected from a list of measured values. These measured values are then shown in the status display. You can find more information on input actions in Chapter Monitoring the measured values of the 3RW50 soft starter with the 3RW5 HMI High Feature (Page 124). • Phase current average (%) (factory setting) • Phase current average (rms) (factory setting) • Phase current I L1 (rms) (factory setting) • Phase current I L2 (rms) (factory setting) • Phase current I L3 (rms) (factory setting)
Languages	The required language is set in the "Languages" menu. • English (factory setting) • German • French • Spanish • Italian • Portuguese • Chinese • Additional language[1] (Page 135)

[1] Only visible if an additional language has been added.

Commissioning 6

6.1 Commissioning the 3RW50 soft starter

Procedure

1. Install the 3RW50 soft starter (Page 43).

2. Connect the 3RW50 soft starter (Page 62).

3. Parameterize the 3RW50 soft starter according to the application with the setting suggestions (Page 80).
   If necessary, optimize the setting suggestions step by step (Page 80).
   For example, you can continually adjust the current limiting factor while the motor is starting up.

4. Perform the self-test (user test) (Page 154).

5. Optionally seal the 3RW50 soft starter with a lead seal (Page 99).

Result

The 3RW50 soft starter is now ready for operation.

6.2 Sealing the 3RW50 soft starter

Requirements

- Seal, sealing wire and a suitable sealing tool

Procedure
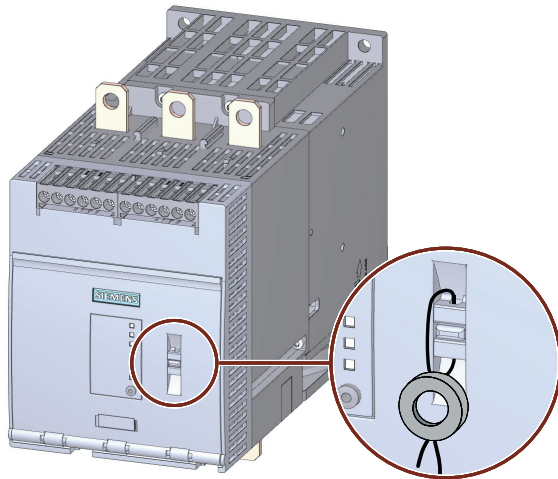
Push the wire through the openings provided and seal the ends.

Result

By sealing the hinged cover, you protect the operator controls of the 3RW50 soft starter from unauthorized access. It is nevertheless still possible to operate a 3RW5 HMI and acknowledge messages.

Tip

The local interface and the memory module interface of the 3RW5 HMI High Feature can be protected from unauthorized access by sealing the interface cover. Proceed in the same sequence as for sealing the hinged cover.

For more information, see Chapter Design and operator controls of the High Feature 3RW5 HMI (Page 89).

6.3 First commissioning of the High Feature 3RW5 HMI

Requirements

Control supply voltage is connected for the first time or the factory settings have been restored on the 3RW5 HMI High Feature.

Procedure

Set the desired language.

Result

The 3RW5 HMI High Feature is ready to use. It is now possible to modify the parameters of the 3RW5 HMI High Feature, the 3RW50 soft starter, and any connected 3RW5 communication module.

Functions

7

7.1 Soft starting

Operating principle

A voltage ramp is used to implement soft starting. The 3RW50 soft starter increases the motor voltage from a parameterizable starting voltage to the line voltage within a definable ramp up time.

Application

- Systems in which a startup of the drive without interfering jerky movements is required.
- E.g. pumps or small fans

Voltage characteristic
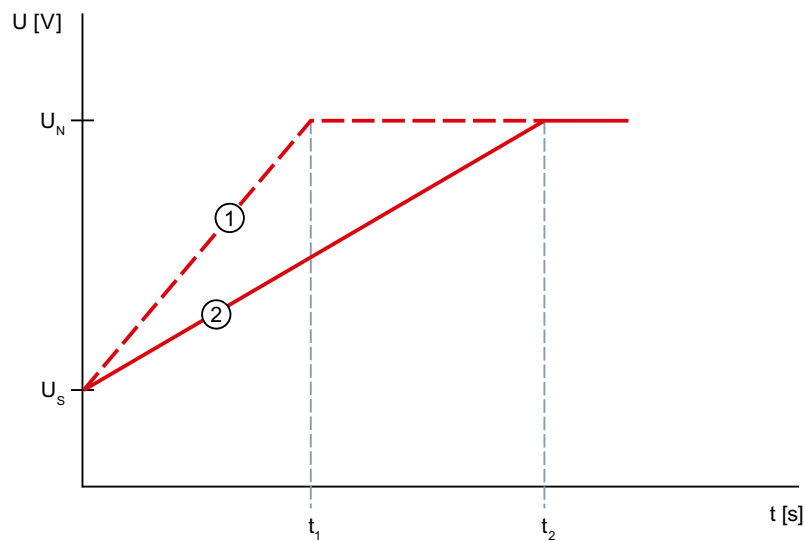
①	Voltage ramp with short ramp up time t_1
②	Voltage ramp with long ramp up time t_2
U_N	Line voltage
U_S	Parameterizable starting voltage
t_1	Short ramp up time
t_2	Long ramp up time

Torque curve

M [Nm]
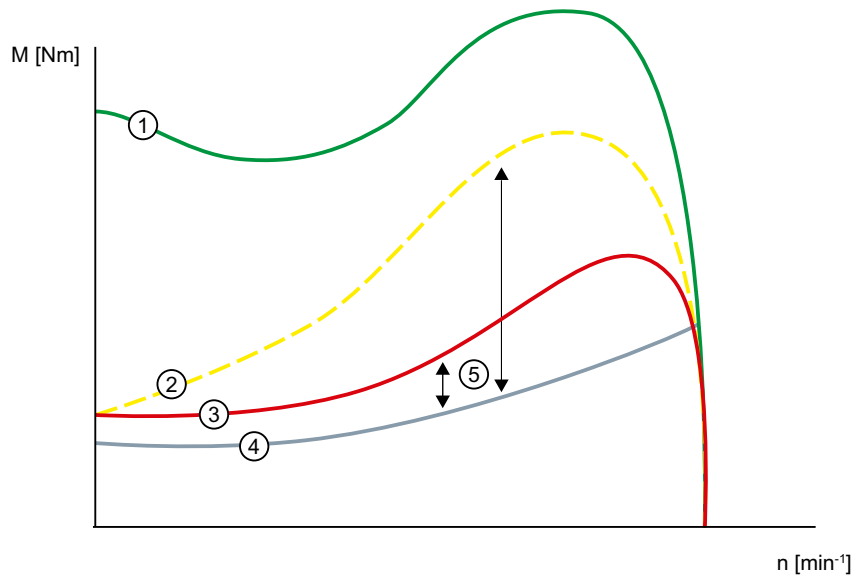
① Torque with direct-on-line starting without 3RW50 soft starter
② Torque with short ramp up time
③ Torque with long ramp up time
④ Torque of the load
⑤ Acceleration torque = Difference of activation torque and torque of load

Current path

I [A]
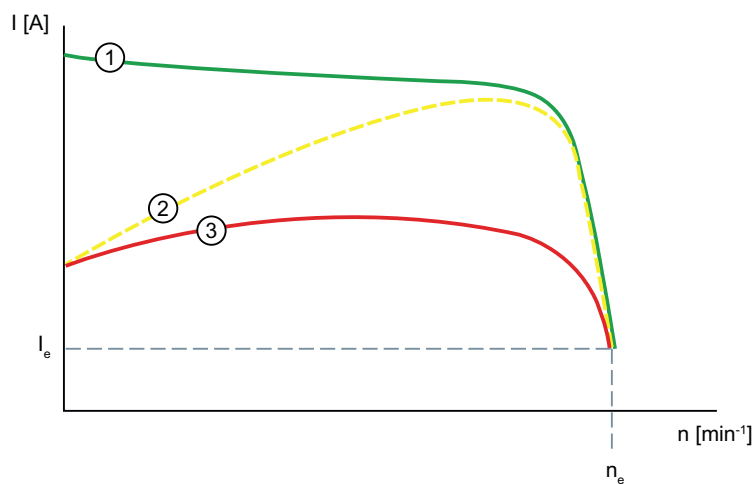
① Current characteristic with direct-on-line starting without 3RW50 soft starter
② Current characteristic with short ramp up time
③ Current characteristic with long ramp up time
I_e Rated operational current during rated operation
n_e Rated operating speed of the motor

Parameter

Parameter	Description
Starting voltage	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 3RW50 soft starter. • Factory setting: 30% • Setting range: 30 ... 100 %
Ramp up time	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. 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 up 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. A very high starting current that can reach the value of the direct starting current at this speed then occurs. In this case, the 3RW50 soft starter can switch itself off via the internal overload protection function and signal a fault. If parameter value "0" is set, the motor is switched on with a ramp up time of approx. 100 ms. • Factory setting: 10 s • Setting range: 0 ... 20 s

7.2 Current limiting function

Operating principle

Activate the current limiting function if 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 x I_e, the voltage ramp function is aborted and the current limitation function starts. The current limitation function remains active until the 3RW50 soft starter has detected the motor ramp up and the motor is in a normal operating state.

Application

• Avoiding current surges

• Reducing energy costs

Current path
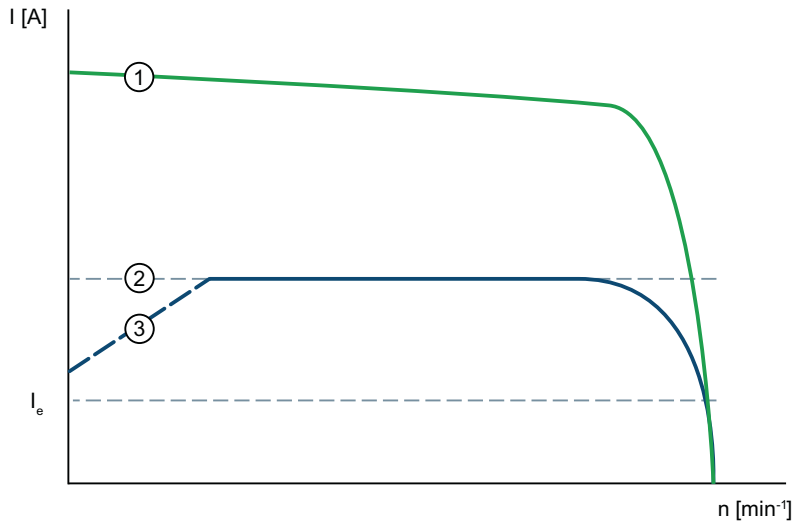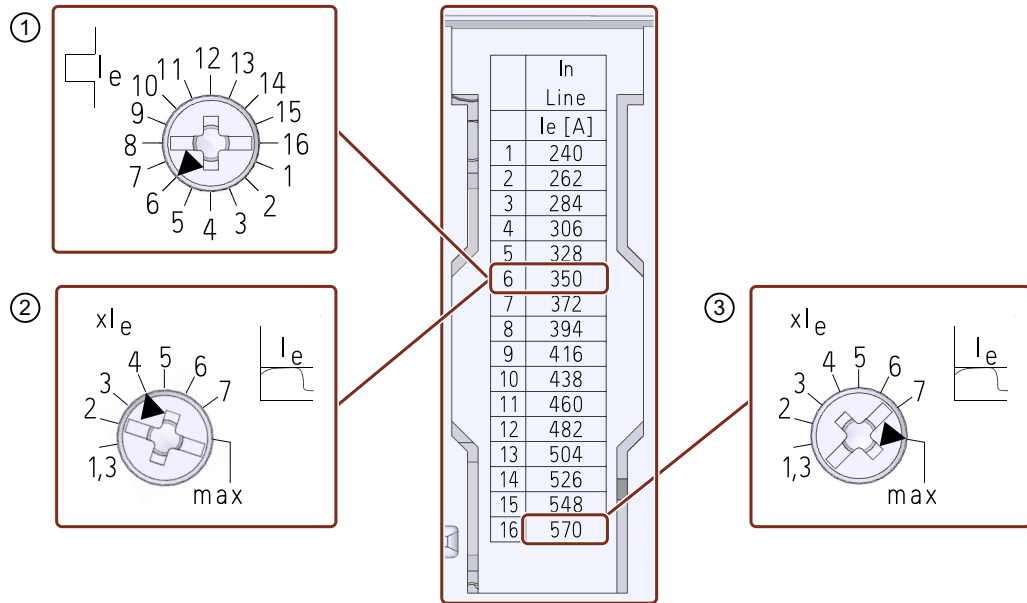

①   Current characteristic with direct-on-line starting without 3RW50 soft starter
②   Adjustable current limiting value
③   Voltage ramp
I_e Rated operational current during rated operation

Parameter

Parameter	Description
Current limiting value	In order to ensure that the drive can reach its rated speed, the minimum current limiting value that you select must be high enough to generate sufficient torque in the motor.
	A typical value is 3 to 4 times the rated operational current (I_e).
	As soon as the current limiting value is reached, the motor is started with this value until it has reached its rated operating speed. In this case, the motor starting times may be longer than the maximum parameterizable ramp up time.
	The maximum possible current limiting value for the 3RW50 soft starter ("max." position) is 7x the value of the maximum rated operational current for the 3RW50 soft starter, where this value is identical to 7x the value of the maximum rated operational current I_e which can be set.
	This value is independent of the actual rated operational current I_e of the motor set at the 3RW50 soft starter.
	• Factory setting: 4 x I_e
	• Setting range: 1.3 ... 7 x I_e The setting "max" corresponds to the 7-fold value of the maximum rated operational current I_e of the 3RW50 soft starter.

Example

	In Line Ie [A]
1	240
2	262
3	284
4	306
5	328
6	350
7	372
8	394
9	416
10	438
11	460
12	482
13	504
14	526
15	548
16	570

①   Rated operational current I_e of the motor: $I_{e\,motor}$ = 350 A

②   Current limitation of the 3RW50 soft starter: 4 x I_{eMotor} = 4 x 350 A = 1 400 A

③   Maximum current limitation that can be set on this 3RW50 soft starter: I_{max} = 7 x 570 A = 3 990 A

7.3 Soft stopping

Operating principle

A voltage ramp is used to implement a smooth ramp-down. With the "voltage ramp" stopping function, the motor voltage is decreased along a linear, negative voltage ramp until the motor stops.

Application

- Drives that abruptly come to a stop when switched off, thereby damaging the transported goods.

- E.g. bottle filling plants

Voltage characteristic
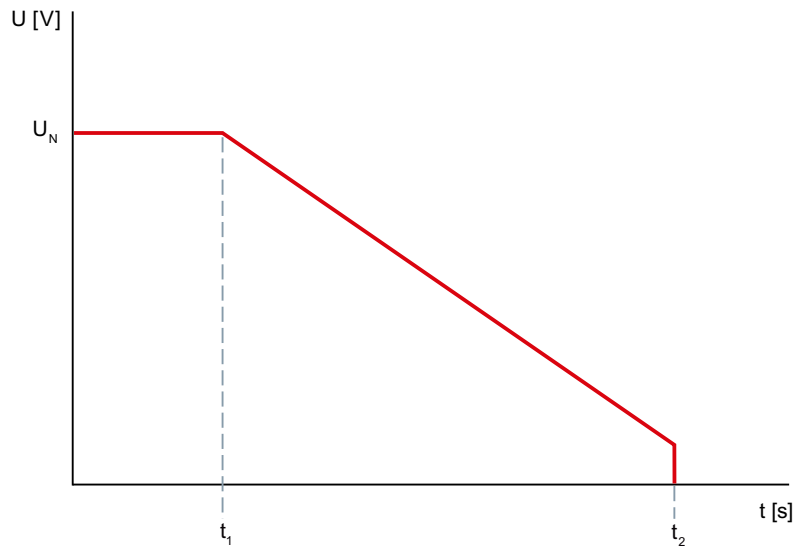
t₁ ... t₂   Stopping time
Uₙ   Line voltage

Parameter

Parameter	Description
Stopping time	The length of the stopping time defines the time within which the motor voltage is reduced from line voltage to 0 V. It may take longer for the motor to actually coast down to a standstill.
	The parameter value "0" causes the motor to be shut down immediately without a down ramp.
	• Factory setting: 0 s
	• Setting range: 0 ... 20 s

7.4   Motor protection

The 3RW50 soft starter has two functions for protecting the motor:

• Electronic motor overload protection

• Thermistor motor protection with temperature sensor (optional)

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

7.4.1   Electronic motor overload protection

Operating principle

The approximate temperature of the motor is calculated using the measured motor currents and the parameter settings "Rated operational current I_e" and "tripping class". This indicates whether the motor is overloaded or is functioning in the normal operating range. When overload is detected, the 3RW50 soft starter shuts the motor down. The setting for RESET MODE determines how the motor is restarted.

Parameter

> ⚠ **WARNING**
>
> **Automatic restart following fault acknowledgement/restart.**
> **Can cause death or serious injury.**
>
> The 3RW50 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.

> **NOTICE**
>
> **Damage to property possible due to deactivated motor protection.**
>
> If the motor is not monitored by a temperature sensor and the tripping class is set to "CLASS OFF", no motor protection is provided.

Parameter	Description
Tripping class	The tripping class specifies the maximum time within which a protective device must trip from a cold state at 7.2 x the rated operational current I_e (motor protection to IEC 60947). • CLASS OFF: Deactivates the electronic motor overload protection • CLASS 10A / 10E / 20E: Tripping times according to the tripping class
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 operational current I_e of the motor.

Recovery time following motor overload protection tripping

The recovery time after the electronic overload protection is tripped is 5 minutes. With Auto RESET set, the error is automatically reset after the recovery time has elapsed. With Manual RESET or Remote RESET set, a RESET is only possible once the recovery time has elapsed.

You will find further information on resetting the faults in Chapter RESET MODE (Page 83).

7.4.2 Thermistor motor protection with temperature sensor (optional)

Operating principle

> ⚠️ **WARNING**
>
> **Automatic restart following fault acknowledgement/restart.**
> **Can cause death or serious injury.**
>
> The 3RW50 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.

You can connect the temperature sensor of the motor to the 3RW50 soft starter and evaluate it. If a specific motor-dependent temperature is exceeded, the 3RW50 soft starter recognizes this and reacts accordingly.

Two different types of measuring sensor can be connected to the 3RW50 soft starter:

- PTC thermistors type A

- This sensor type is a temperature-dependent resistor.
  Thermoclick
  This sensor type is a temperature-dependent switch.

Note

ATEX / IECEx-certified motor overload protection

Note that the sensor type "Thermoclick" is not permissible when operating motors in hazardous areas.

If the thermistor motor protection is tripped, the 3RW50 soft starter cannot be restarted until the sensor installed in the motor has cooled down. The recovery time varies according to the temperature state of the sensor.

The sensor cables of PTC thermistors type A can be monitored for wire break and short-circuit.

Further information

You will find further information on resetting the faults in Chapter RESET MODE (Page 83).

You will find more information on the connection of the temperature sensor in Chapter Connecting the temperature sensor (Page 189).

7.5 Intrinsic device protection

Operating principle

The integrated intrinsic device protection protects the power semiconductors as well as the bypass contacts against impermissible overload. If the internal warning limit is exceeded, a message is output on the 3RW50 soft starter. If the internal fault threshold is exceeded, the 3RW50 soft starter will switch off automatically.

NOTICE
Property damage due to short circuits.
The intrinsic device protection system does not protect against irreparable equipment damage caused by short circuits.
Connect semiconductor fuses upstream in order to protect the power semiconductors against irreparable damage by short circuits (e.g. in case of cable damage or an interturn fault in the motor).

Recovery time after device protection is triggered

If the 3RW50 soft starter shuts down because the motor overload protection or the intrinsic device protection trips, you must wait a defined cooling time (recovery time) prior to acknowledging the fault or restarting the motor.

- In the event of power semiconductor overload: 30 s
- In the case of bypass overload: 60 s

7.6 Soft torque

Principle of operation of soft torque during starting

The Soft Torque function reduces the drive acceleration rate shortly before the motor reaches its rated operating speed. This produces an almost linear speed curve. This helps to ensure smooth movement of a conveyor belt, for example, and so prevent fragile goods on the belt from tipping over.

Torque curve

M [Nm]

n [min^{-1}]
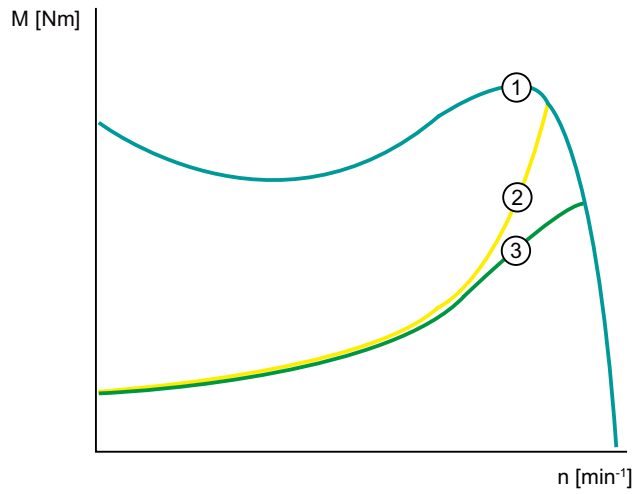
①   Torque with direct start
②   Torque without Soft Torque
③   Torque with Soft Torque

Speed curve

n [min^{-1}]

n$_e$

t [s]
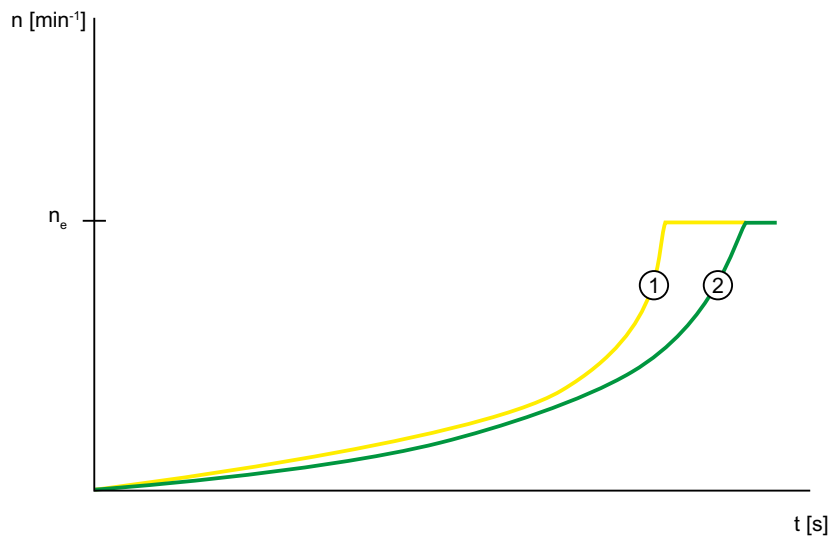
n$_e$ Rated operating speed of the motor
①   Motor speed without Soft Torque
②   Motor speed with Soft Torque

Principle of operation of Soft Torque during stopping

The Soft Torque function enables the motor to coast down smoothly at an almost constant rate of deceleration. Ensuring that the motor coasts down smoothly is particularly useful for stopping pumps in order to prevent water hammers in the connected piping. The Soft Torque function for stopping can only be activated when a stopping time of more than 3 s is set.

Speed curve
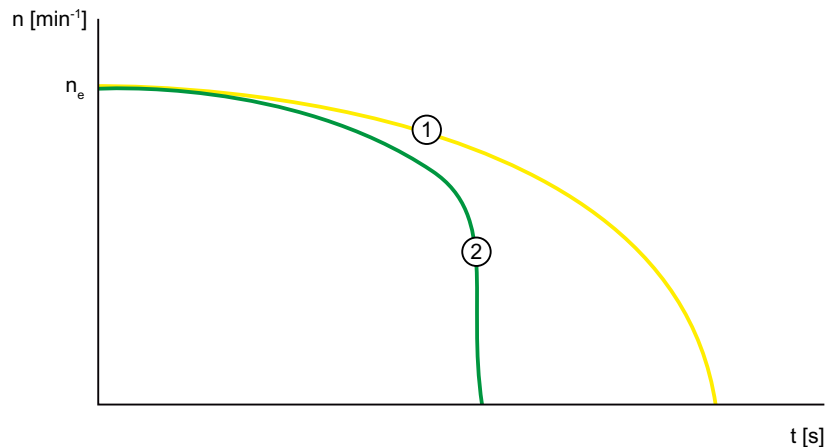
n_e	Rated operating speed of the motor
①	Motor speed with Soft Torque
②	Motor speed without Soft Torque

7.7 ATEX / IECEx-certified motor overload protection

Environmental conditions

Comply with the ambient conditions for which the 3RW50 soft starter is approved.

Note

Ambient temperature during operation.

Note that the 3RW50 soft starters are approved for operation in a temperature range of -25 °C to +60 °C.

In ambient temperatures higher than 40 °C, take the derating of the rated operational current into consideration.
You can find further information on derating in the Technical specifications (Page 171) in the section "Power electronics" or in Catalog IC 10 (https://support.industry.siemens.com/cs/ww/en/view/109747945).

> **Note**
>
> **Temperature sensor**
>
> For ATEX / IECEx-certified motor protection, use of the PTC type A sensor only is approved.

> **Note**
>
> **Simulation Tool for Soft Starters**
>
> Note that the Simulation Tool for Soft Starters (Page 22) already takes into account the derating for certain ambient temperatures when selecting a suitable 3RW5 soft starter.

Parameterizing the soft starter

The parameters for ATEX / IECEx applications are to be set using the setting elements of the 3RW50 soft starter.

Setting the rated motor operational current

Set the 3RW50 soft starter to the rated operational current of the motor as stated on the type plate or design test certificate of the motor.

Tripping class (electronic overload protection)

Make sure that the motor and the cables are dimensioned for the selected tripping class.

Note that the trip class "CLASS OFF" when operating motors in hazardous areas is only permissible if a "PTC thermistor type A" temperature sensor is used.

The rated data of the 3RW5 soft starter relates to normal starting (CLASS 10E). For heavy starting (> CLASS 10E), you may have to overdimension the 3RW5 soft starter.

Parameterizing the motor protection functions (RESET setting)

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

Short-circuit protection

The 3RW50 soft starter does not have short-circuit protection. Make sure that short-circuit protection is provided.

Line protection

Avoid impermissibly high cable surface temperatures by correctly dimensioning the cross-sections. Select a sufficiently large conductor cross-section.

Cyclic test of the motor protection functions

Only perform the Self-test (user-test) (Page 154) locally by means of the RESET / TEST key or the 3RW5 HMI High Feature to ensure that the correct 3RW50 soft starter is tested. Only in this way can the certified motor overload protection according to ATEX / IECEx be guaranteed.

On soft starters in ATEX / IECEx applications, perform the Self-test (user-test) (Page 154) during commissioning and periodically at intervals of no more than 36 months.

Certification of the 3RW50 soft starters

The motor overload protection of the 3RW50 soft starters is ATEX / IECEx-certified to SIL 1.

The 3RW50 soft starters are approved under Equipment Groups I and II, Category (2) or (M2) in zones "G" and "D". Zones "G" and "D" are areas in which explosive gas, vapor, mist or air mixtures and combustible dust are present:

IECEx BVS 19.0053 X [Ex]

BVS 19 ATEX F001 X

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

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

I (M2) [EX db Mb]

[1] For the px applications, pressure and flow rate monitoring are additionally required for the pressurized enclosure systems.

Certified motor overload protection according to ATEX / IECEx

> ⚠ **DANGER**
>
> **Loss of the certified motor overload protection according to ATEX/IECEx.**
> **Will cause death or serious injury.**
>
> Note that operation in the standard type of motor connection without implementing one of the two following remedial measures results in loss of certified motor overload protection according to ATEX / IECEx.
>
> Depending on the structure of the circuit, choose one of the following possibilities for ensuring certified motor overload protection according to ATEX / IECEx:
>
> * Use an additional line contactor in the main circuit.
>   Connect the line contactor at outputs 95, 96 and 98 (output 3).
> * For a motor feeder configuration with a circuit breaker, use an additional undervoltage trip unit.
>   Connect the undervoltage trip unit at outputs 95, 96 and 98 (output 3).
>   You will find more information in chapter Connections (Page 59).

Observing standards

Increased danger in hazardous areas means it is necessary to carefully observe the following standards:

- **IEC / EN 60079-14** / **VDE 0165-1**: For electrical apparatus for hazardous areas.

- **IEC / EN 60079-17**: Inspection and maintenance of electrical installations in explosive atmosphere.

- **EN 50495**: Safety devices required for the safe functioning of equipment with respect to explosion risks.

ATEX / IECEx-specific safety data

The motor protection function according to ATEX / IECEx for 3RW50 soft starters has the following safety data:

- Safety Integrity Level (SILCL): 1

- Hardware Fault Tolerance (HFT): 0

- Interval for testing the protective functions: 3 years

- Probability of failure on demand (PFD): 8x10-3

- Probability of a dangerous failure per hour (PFH): 5x10-7 1/h

Maintenance and repair

The 3RW50 soft starters are maintenance-free. The repair of soft starters with approval according to IEC 61508 / EN 13849 is only permissible in the manufacturer's plant.

A repair on 3RW50 soft starters that is not performed in the manufacturer's plant results in loss of ATEX / IECEx approval.

7.8 Additional parameters

Operating principle

The soft starter has additional parameters.

Setting options

The parameterization is possible by the following methods:

- 3RW5 HMI High Feature
  Access protection to 3RW5 HMI High Feature is not active or has been reset.
  Menu: "Parameters > Soft Starter > Additional parameters"

- You can find additional setting options, if they exist, in the associated chapter of the respective parameter.

Parameter

Parameter	Description
Typical ambient temperature (by means of 3RW5 HMI High Feature only)	The 3RW50 soft starter is set to the typical ambient temperature actually prevailing in the plant. Ensure that the set typical ambient temperature is not exceeded. • 40 °C • 50 °C • 60 °C (factory setting)
Test with small load	The control and main circuit wiring is tested on a small load using a test motor. A direction of rotation test can be performed by monitoring the motor shaft or the load connected to it. • Activate • Deactivate For more setting options and further information, see Chapter Test with small load (Page 117).
Control via digital input	The parameter defines how the master control behaves on failure of the bus connection or a CPU stop. For more setting options and further information, see Chapter Control via digital input (Page 118).

7.9 Test with small load

Requirements

- The 3RW50 soft starter is connected to the main circuit.
- The test motor is connected to the 3RW50 soft starter.
- Permissible power range of the test motor:
  - < 10% of the rated power of the motor provided for the application
  - ≥ 1 kW
- The test motor is switched off prior to the activation of the test mode function "Test with small load".

Operating principle

The test mode function "Test with small load" is helpful during commissioning and when troubleshooting, as the correct function of the application can be tested before installation in a control cabinet or before the use of a motor provided for the application. The "Test with small load" enables the wiring of the control and main circuit to be checked with the aid of a small motor (test motor).

In the test mode function "Test with small load", the motor operating states and all functions and messages can be executed and displayed by the 3RW50 soft starter as in normal operation.

If, during an active "Test with small load", the 3RW50 soft starter detects a lack of main current, a fault is generated with a shutdown command and the message text "Line voltage for test required". After connecting the 3RW50 soft starter to the main supply this error message can be acknowledged with RESET.

The error monitoring functions that are to be attributed to a missing or inadequate main supply are not active. The test mode function "Test with small load" remains active until the test mode function is deactivated.

The motor and intrinsic device protection functions of the 3RW50 soft starter remain active according to their parameterization and are not influenced by the test mode function "Test with small load".

Setting options

The execution of the test mode function "Test with small load" is possible as follows:

- 3RW5 HMI High Feature
  Access protection to 3RW5 HMI High Feature is not active or has been reset.
  Menu: "Parameters > Soft Starter > Additional parameters"

- With SIRIUS Soft Starter ES (TIA Portal) via the local interface on the 3RW5 HMI High Feature

- With a fieldbus via a 3RW5 communication module (only via a 3RW5 PROFINET or PROFIBUS communication module):

  – With SIRIUS Soft Starter ES (TIA Portal) Premium

  – Configuration software of the control system (e.g. STEP 7 with corresponding HSP)

  – User program

Parameter

Parameter	Description
Activate test with small load	The 3RW50 soft starter switches to the test mode function "Test with small load".
Deactivate test with small load	The test mode function "Test with small load" is terminated. The 3RW50 soft starter exits the test mode and switches back to the parametrized operating mode.

7.10 Control via digital input

Operating principle

The parameter "Control via digital input" is only relevant when using a 3RW5 communication module. The parameter is helpful, for example, for applications in which the bus connection serves mainly for observation and monitoring purposes.

The parameter defines how the master control function behaves on failure of the bus connection or a CPU stop. A failure of the bus connection or a CPU stop can also occur in the operating mode "manual - local", for example when observing or monitoring via the bus connection. You can use the parameter to disable a switchover to the "Automatic" mode and operating mode "manual - bus".

Setting options

Parameterization of the control via digital input is possible by the following methods:

- Setting parameterizing mode via key combination on the 3RW50 soft starter (Page 85)

- 3RW5 HMI High Feature
  Access protection to 3RW5 HMI High Feature is not active or has been reset.
  Menu: "Parameters > Soft Starter > Additional parameters > Control via digital input"

Parameter

Parameter	Description
Control via digital input	**Manual activation**
	On failure of the bus connection or a CPU stop the 3RW50 soft starter remains in the "Automatic" mode or the 3RW50 soft starter switches to the "Automatic" mode.
	Permanent activation
	A switch to the "Automatic" mode and operating mode "manual - bus" is not possible. If the 3RW50 soft starter is in the "Automatic" or "manual - bus" mode, the 3RW50 soft starter switches to the "Manual operation local - input controlled" mode. Control by means of a higher-level control (e.g. PLC) is not possible.
	Activate on bus error (factory setting)
	On failure of the bus connection or a CPU stop, the 3RW50 soft starter switches from the "Automatic" mode to the "Manual operation local - input controlled" mode or the 3RW50 soft starter remains in the operating mode "manual - local" mode.
	No change on bus error
	On failure of the bus connection or a CPU stop the master control function does not switch, but the 3RW50 soft starter remains in the current mode.

Note that for the settings "Manual activation" and "No change on bus error", the 3RW50 soft starter switches to the "Automatic" mode after connection of the 3RW5 communication module to the 3RW50 soft starter.

If, on failure of the bus connection or CPU stop, the 3RW50 soft starter remains in the "Automatic" mode or switches to the "Automatic" mode, you can switch to the operating mode "manual - local" by means of the following procedures:

- Via a 3RW5 HMI or SIRIUS Soft Starter ES (TIA Portal) over the local interface on the 3RW5 HMI High Feature (Page 17).

- Change the setting of the parameter "Control via digital input" in the parameterizing mode by means of a key combination on the 3RW50 soft starter (Page 85).

- Remove the COM connecting cable from the 3RW5 communication module (Page 74). Then restore the 3RW50 soft starter on the device to the factory setting, in order to (Page 169) switch to the "Manual operation local - Input controlled" mode.

Further information

For more information, see Chapter Operating modes and master control function (Page 15).

You will find further information about operation on failure of the bus connection to the control in the manual for the 3RW5 communication module in question.

7.11 3RW5 HMI Standard

7.11.1 Design of the Standard 3RW5 HMI
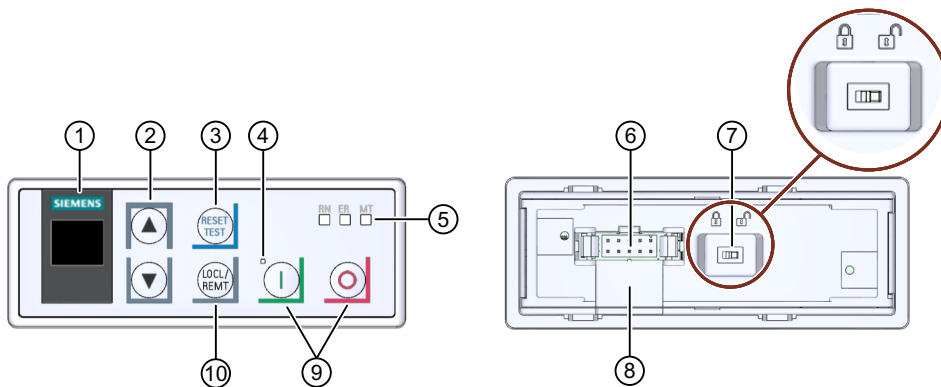
① Display
② Navigation keys
③ RESET / TEST
④ Status LED (Page 140)
⑤ Device LEDs (Page 140)
⑥ Plug-in connection for HMI connecting cable
⑦ Locking switch
⑧ Cable duct
⑨ Start key
    Stop key
⑩ LOCL / REMT

Navigating and setting

Key	Actions
▼	• Jump to next menu item • Set digit
▲	• Jump to previous menu item • Set digit

Key	Actions
RESET TEST	• Identical to RESET key on 3RW50 soft starter
⬭ (O)	• Motor stops as parameterized if the 3RW5 HMI Standard is the master control.
(I)	• Motor starts as parameterized if the 3RW5 HMI Standard is the master control.
LOCL/ REMT	• Changes master control **LOCL** means that the 3RW5 HMI Standard is the master control. **REMT** means that the 3RW5 HMI Standard is not the master control.
Locking switch	• Locking switch Locked / Unlocked: To be able to operate the 3RW50 soft starter with the Standard 3RW5 HMI, the locking switch on the rear of the Standard 3RW5 HMI must be unlocked. If the locking switch on the rear of the 3RW5 HMI Standard is in the "Locked" switch position, the "RESET / TEST", "LOCL / REMT" and "Start" and "Stop" keys are disabled. Navigation through the menu using the navigation keys, however, is still possible.

7.11.2 Standard 3RW5 HMI menu

The following information is shown on the display of the 3RW5 HMI Standard:

• Operating state

• Measured values

• Parameter
While you are setting the parameters, the actual value is shown in the display.

• Diagnostics

Operating state

Display	Explanation
STATE	
ON STATE	The ramp up time comes to an end and the motor is running.
RAMP STATE	The ramp up time or the stopping time is active.
OFF STATE	The motor is switched off.
ER O STATE	The motor is not ready to start because there is a fault. Additional information is provided by the diagnostics display.
OVLD (OVERLOAD)	
WN I OVLD	The motor is switched on. A motor overload protection warning is pending.
WN O OVLD	The motor is switched off. A motor overload protection warning is pending.
ER O OVLD	The motor is switched off. There is a fault at the motor overload protection.

Display	Explanation	
---- OVLD	No motor overload exists.	
OVLD% (OVERLOAD in percent)		
...% OVLD%	Status of the electronic motor overload protection as a percentage.	
SCR % (silicon-controlled rectifier, power semiconductor temperature rise)		
...% SCR %	Status of the intrinsic device protection as a percentage. This measured value reflects the temperature rise of the power semiconductor. It comprises the measurement of the heat sink temperature and the calculated temperature rise of the junction (thermal model of the semiconductor).	
S-TRQ (Soft Torque)		
ON S-TRQ	The Soft Torque function is activated.	
OFF S-TRQ	The Soft Torque function is deactivated.	
CNTRL (CONTROL)		
LOCL CNTRL	Manual mode	The master control function is with the 3RW5 HMI Standard ("Manual operation local - HMI controlled" mode).
REMT CNTRL	Automatic	Master control function is not with the 3RW5 HMI Standard. To make the unit the master control, press the LOCAL / REMOTE key. Refer to Chapter Operating modes and master control function (Page 15).

Measured values

Display	Explanation
...A I AVG	The average of the 3 phase currents is displayed in amps.
...A I L1	Current measured value phase L1 is displayed in amps.
...A I L2	Current measured value phase L2 is displayed in amps.
...A I L3	Current measured value phase L3 is displayed in amps.

Parameter list

Display	Explanation
.. xIe	Current limiting value as a multiple of the set rated operational current I_e of the motor.
...% U ON	Starting voltage
...s t ON	Ramp up time
...s t OFF	Stopping time

Display	Explanation	
... CLASS	Tripping class for motor overload protection	
...A Ie	Rated operational current I_e of the motor	
.... RMode	AUTO	Auto RESET
	MAN	Manual RESET
	REMT	Remote RESET
... PBADR	Station address for PROFIBUS (only displayed if a "PROFIBUS" communication module is being used)	
... MODBS	Station address for Modbus (only displayed if a "Modbus RTU" communication module is being used)	

Diagnostics display

Display	Explanation
.... ERROR	Display of the error number with 3RW5 HMI Standard (Page 123) Faults and remedial actions of the 3RW50 soft starter (Page 143)
NO COMM	No connection between the 3RW50 soft starter and the 3RW5 HMI Standard.

7.11.3   Display of the error number with 3RW5 HMI Standard

Display of the error number with 3RW5 HMI Standard

The 3RW5 HMI Standard can display up to 10 active errors (ER 0 ... 9) in the menu item "ERROR".

Procedure

1. Select the menu item "ERROR".

2. Press and hold a navigation key until the entry "ER 0" appears on the display.

3. Select the desired entry (ER 0 ... 9) using the navigation key.
   If an entry contains an active error, the associated error number (Page 143) will appear above it.
   If an entry contains no errors, the error number "0000" will appear.

4. To exit the menu, press and hold a navigation key until the entry "ERROR" appears on the display.
   Alternatively, the 3RW5 HMI Standard automatically exits the menu after 5 seconds of inactivity.

7.12 3RW5 HMI High Feature

Observe the hardware configuration in Chapter Design and operator controls of the High Feature 3RW5 HMI (Page 89).

7.12.1 Monitoring

7.12.1.1 Monitoring the measured values of the 3RW50 soft starter with the 3RW5 HMI High Feature

Requirements

- 3RW5 HMI High Feature
  Menu: "Monitoring > Measured values"

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 shown on the operation display (Page 97).

Measured values

Measured value		Description
Phase currents (%)	• IL1 • IL2 • IL3 • Average • Show bar chart	The phase currents are displayed as a percentage. You can monitor each phase (L1/L2/L3) individually, or the average of all 3 phases. These measured values can be presented graphically as bar or line graph on the display of the 3RW5 HMI High Feature. For more information, see Chapter Graphic display of measured values on the 3RW5 HMI High Feature (Page 125).
Phase currents (rms)		The phase currents are displayed in amperes. You can monitor each phase (L1/L2/L3) individually, or the average of all 3 phases. These measured values can be presented graphically as bar or line graph on the display of the 3RW5 HMI High Feature. For more information, see Chapter Graphic display of measured values on the 3RW5 HMI High Feature (Page 125).
Motor temperature rise [%]		The measured value shows the relative temperature rise of the motor.
Remaining motor cooling time [s]		The remaining recovery time is the minimum cooling time of the motor that must elapse following activation of motor overload protection before the 3RW50 soft starter is once again ready for operation.

Measured value	Description
Remaining switching element cooling time [s]	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.). The remaining cooling time of the switching element is the time that must elapse following activation of the intrinsic device protection before the 3RW50 soft starter is once again ready for operation.
Switching element heating [%]	The currently calculated switching element heating is displayed as a percent value of the previously saved switching element heating.

Further display options of the measured values

- With SIRIUS Soft Starter ES (TIA Portal) via the local interface on the 3RW5 HMI High Feature
- With a fieldbus via a 3RW5 communication module:
  - With SIRIUS Soft Starter ES (TIA Portal) Premium (only via a 3RW5 PROFINET or PROFIBUS communication module)
  - Configuration software of the control system (e.g. STEP 7 with corresponding HSP)
  - User program

7.12.1.2 Graphic display of measured values on the 3RW5 HMI High Feature

Requirements

- 3RW5 HMI High Feature

Operating principle

The 3RW50 soft starter supports the graphic display of the measured values "Phase currents (%)" and "Phase currents (rms)". These measured values can be presented as bar or line charts on the display of the 3RW5 HMI High Feature.

The following measured values can be displayed in the charts:

- Phase current IL1 (%) and (rms)
- Phase current IL2 (%) and (rms)
- Phase current IL3 (%) and (rms)
- Phase current average (%) and (rms)

Procedure for displaying bar charts

1. Select the menu item "Monitoring > Measured values > Phase currents (%) / Phase currents (rms) > Show bar chart".
   Depending on the menu item selected, the current values of the 3 phase currents (%) or phase currents (rms) and the average value are displayed graphically in a bar chart.

2. Use the left and right navigations keys of the 3RW5 HMI High Feature to switch the view between Phase currents (%) and Phase currents (rms).

3. Press the "ESC" key to exit the bar chart view.

The example chart shows the current 3 phase currents (L1/L2/L3) and the associated average value as a percentage.

L1	137.50
L2	50.50
L3	102.88
LØ	96.96
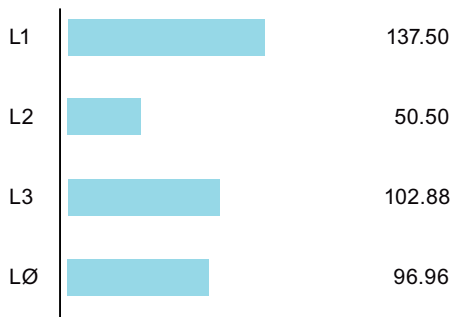
Procedure for displaying line charts

Operation display

1. Select the measured value to be displayed in the operating display and press the right navigation key of the 3RW5 HMI High Feature.
   The selected measured value is shown graphically in a line chart.

2. Use the left and right navigations keys of the 3RW5 HMI High Feature to switch the view between Phase currents (%) and Phase currents (rms).

3. Press the "ESC" key to exit the line chart view.

"Monitoring" menu

1. Select the menu item "Monitoring > Measured values > Phase currents (%) / Phase currents (rms)".

2. Select the phase current to be displayed and press the right navigation key of the 3RW5 HMI High Feature.
   The selected phase current is shown graphically in a line chart.

3. Use the left and right navigations keys of the 3RW5 HMI High Feature to switch the view between Phase currents (%) and Phase currents (rms).

4. Press the "ESC" key to exit the line chart view.

The sample chart shows the current phase current I IL1 as a percentage.

I L1 [%]
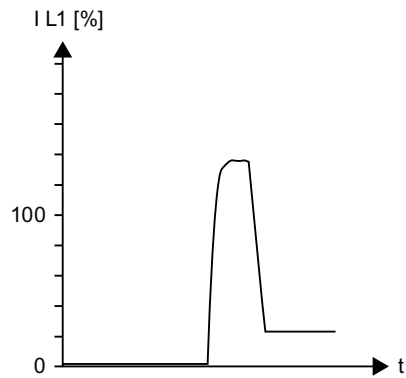
7.12.1.3 Monitoring the process image of the 3RW50 soft starter with the 3RW5 HMI High Feature

Operating principle

The process image input (PII) contains current information about the soft starter and process state. The process image output (PIQ) contains current control commands to the 3RW5 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 output.

Requirements

- 3RW5 HMI High Feature
  Menu: "Monitoring > Process image"

Display of the process images

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

Checkbox	Status	Bit
☐	inactive	0
◼	active	1

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 1.0	Motor current Iact-bit0

Process data	Process image
DI 1.1	Motor current Iact-bit1
DI 1.2	Motor current Iact-bit2
DI 1.3	Motor current Iact-bit3
DI 1.4	Motor current Iact-bit4
DI 1.5	Motor current Iact-bit5
DI 1.6	Manual operation local
DI 1.7	Ramp operation
DI 2.0	Motor CW
DI 2.4	Starting 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
AI 4 (Float32)	Measured value 1 (factory setting: Phase current I L1 (rms))
AI 8 (Float32)	Measured value 2 (factory setting: Phase current I L2 (rms))
AI 12 (Float32)	Measured value 3 (factory setting: Phase current I L3 (rms))

Process image output (PIQ)

Process data	Process image
DQ 0.0	Motor CW
DQ 0.3	Reset
DQ 0.5	Self-test (user-test)
DQ 3.0	Manual operation local - input controlled

Further information

You will find further information on transferring the process images via a fieldbus in the device manual for the respective 3RW5 communication module.

7.12.2 Overview

Requirements

- 3RW5 HMI High Feature (accessory)
  Menu: "Overview"

Operating principle

The "Overview" menu displays the connected components and their device-related information (I&M data).

Note

Device-related information

Note that, with the 3RW5 HMI High Feature, it is only possible to edit the displayed device name of the 3RW5 soft starter.

Additional display options of the device-related information (I&M data)

- With SIRIUS Soft Starter ES (TIA Portal) via the local interface on the 3RW5 HMI High Feature
  Brief overview: Window "Project Navigation" with current project under created Soft Starter > "Online & Diagnostics" > Window "Work area" > "Soft Starter / 3RW5 communication module used / HMI > Diagnosis > General"

- With a fieldbus via a 3RW5 communication module:

  - With SIRIUS Soft Starter ES (TIA Portal) Premium / Professional (only via a 3RW5 PROFINET or PROFIBUS communication module)
    Brief overview: See SIRIUS Soft Starter ES (TIA Portal) via the local interface on the 3RW5 HMI High Feature

  - Configuration software of the control system (e.g. STEP 7 with corresponding HSP)

  - User program

Note

I&M data

I&M0 data is assigned for all of the devices (3RW5 soft starter, 3RW5 HMI High Feature, and 3RW5 communication module) and can be read out. Only the proxy for the "Station" (slot 0) has adjustable and readable I&M1, I&M2 and I&M3 data. The "Station" comprises the following devices:

- 3RW5 communication module (slot 1)
- 3RW5 soft starter (slot 2)
- 3RW5 HMI High Feature (slot 3)

Parameters

Parameter		Description
Soft starter	Module	• Article number[1]
		• Hardware[1]
		• Firmware[1]
	Module information	• Tag function[2]
		• Tag location[2]
		• Installation date[3]
		• Additional information[4] Assign a device name to the 3RW5 soft starter via SIRIUS Soft Starter ES (TIA Portal) or with the 3RW5 HMI High Feature. The device name appears in the top line of the display of the 3RW5 HMI High Feature. If you do not assign any name to the 3RW5 soft starter, the 3RW5 soft starter retains its short code. If the set device name is too long, only the first part of the device name is displayed.
	Manufacturer information	• Manufacturer[1]
		• Serial number[1]
HMI	Module	• Article number[1]
		• Hardware[1]
		• Firmware[1]
	Manufacturer information	• Manufacturer[1]
		• Serial number[1]
Communication module (if existing)	Module	• Article number[1]
		• Hardware[1]
		• Firmware[1]
	Manufacturer information	• Manufacturer[1]
		• Serial number[1]

[1] Part of the I&M0 data

[2] Part of the I&M1 data

[3] Part of the I&M2 data

[4] Part of the I&M3 data

7.12.3 Local access protection (PIN)

Requirements

• 3RW5 HMI High Feature (accessory)
Menu: "Security > Local access protection"

Operating principle

With the PIN, you can protect the 3RW5 HMI High Feature from unauthorized access. The menus of the 3RW5 HMI High Feature can still be viewed with local access protection activated. It is not possible to issue a control command or to set a parameter. If you issue a control command or change a parameter when local access protection is enabled, you will automatically receive an entry prompt for the current PIN beforehand.

The PIN remains even after the power supply has been interrupted. You can reset the local access protection to the factory setting with the master RESET key on the rear of the 3RW5 HMI High Feature (Page 168). Protect the master RESET key from unauthorized access.

Parameters

Parameter		Description
Local access protection	Define PIN[1]	PIN is set up and active (Page 131). In the factory setting, no PIN is set up and the local access protection is not active.
	Change PIN[2]	Existing PIN is changed (Page 132).
	Delete PIN[2]	PIN is deactivated and deleted (Page 133).
	Auto log off time[2]	If you do not regularly press a key on the 3RW5 HMI High Feature, the current session will be terminated after the auto logoff time has elapsed. • Factory setting: 0 min = deactivated • Setting range: 0 ... 60 min
	Log on[3]	Remove the local access protection by logging on with your 4-digit PIN.
	Log off[4]	Log out of your current session. The local access protection is activated again. Alternatively, the session will be terminated after the auto logoff time.

[1] Menu entry is displayed if no PIN has been defined.
[2] Menu entry is displayed if a PIN has been defined.
[3] Menu entry is displayed after logging off with an active PIN.
[4] Menu entry is displayed after logging on with an active PIN.

7.12.3.1 Define PIN

Requirements

• 3RW5 HMI High Feature (accessory)
  Menu: "Security > Local access protection"

• No PIN is defined (factory setting).

Procedure

1. Select the menu item **"**Define PIN".

2. Using the navigation keys, set a 4-digit PIN and confirm your entry with the OK key.

3. The user information "HMI PIN defined" appears on the display of the 3RW5 HMI High Feature. Confirm by pressing the OK key.
The 3RW5 HMI High Feature then returns to the "Local access protection" menu.

Result

You have defined the PIN and the set PIN is active.

7.12.3.2   Change PIN

Requirements

- 3RW5 HMI High Feature (accessory)
Menu: "Security > Local access protection"

- A PIN is defined.

Procedure

1. Select the menu item **"**Change PIN".

2. Log on using the current 4-digit PIN and confirm your entry with the OK key.
If the entry is correct, the user information "Log on was successful" appears on the display of the 3RW5 HMI High Feature. Confirm by pressing the OK key.

3. Using the navigation keys, set a 4-digit PIN and confirm your entry with the OK key.
The user information "HMI PIN changed" appears on the display of the 3RW5 HMI High Feature. Confirm by pressing the OK key. The 3RW5 HMI High Feature then returns to the "Local access protection" menu.

4. Select the menu item "Log on".

5. Log on using the current 4-digit PIN and confirm your entry with the OK key.
If the entry is correct, the user information "Log on was successful" appears on the display of the 3RW5 HMI High Feature. Confirm by pressing the OK key.

Result

You have changed the PIN and the changed PIN is active.

7.12.3.3 Delete PIN

Requirements

- 3RW5 HMI High Feature (accessory)
  Menu: "Security > Local access protection"

- A PIN is defined.

Procedure

1. Select the menu item **"**Delete PIN".

2. Log on using the current 4-digit PIN and confirm your entry with the OK key.
   If the entry is correct, the user information "HMI PIN deleted" appears on the display of the 3RW5 HMI High Feature. Confirm by pressing the OK key. The 3RW5 HMI High Feature then returns to the "Local access protection" menu.

Resetting the PIN via the factory setting

You can reset the local access protection to the factory setting with the master RESET key on the rear of the 3RW5 HMI High Feature (Page 168).

Result

You have deactivated and deleted the current PIN.

7.12.4 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 service data, and store logbooks.

The replacing of configuration files allows serial parameter assignment (3RW5 HMI High Feature and 3RW5 communication module) and supports the device replacement. Observe the respective transferred parameters and data in this regard.

Requirements

- Inserted micro SD card, e.g. micro SDHC Class 10

  – File format: FAT32

  – Capacity: max. 32 GB

- 3RW5 HMI High Feature
  Menu: "Micro SD card"
  The "Micro SD card" menu is only visible after you have inserted a micro SD card into the 3RW5 HMI High Feature.

- Access protection to the 3RW5 HMI High Feature is not active or has been reset.
- Load data onto the 3RW50 soft starter ("Load communication and HMI parameters to soft starter" or "Device change"):
  - Make sure that there is only 1 folder with configuration data on the micro SD card.
  - Rename the folder as follows: "1P3RW5 xxx-xxx" (specify the article number of the 3RW50 soft starter instead of the placeholders "x".)
    Example: When you use a soft starter of size S6 with article number "3RW5055-2AB04", name the folder as follows: "1P3RW5 055-2AB".

Parameter

Parameter	Description
Load communication and HMI parameters to soft starter	The parameters of the communication and the 3RW5 HMI High Feature are transferred from the micro SD card to the 3RW50 soft starter. The following data is transferred: • Device parameters of the 3RW5 HMI High Feature • Communication parameters
Load communication and HMI parameters to micro SD card	The parameters of the communication and the 3RW5 HMI High Feature are transferred from the 3RW50 soft starter to the micro SD card. The data is saved in an automatically generated folder. The following data is transferred: • Device parameters of the 3RW5 HMI High Feature • Communication parameters

Device change	When a device is replaced, the configuration data and communication parameters can be transferred to the new device.
	The following data is transferred:
	• Device-related information (Page 128) for the 3RW50 soft starter:
	  – Tag function
	  – Tag location
	  – Additional information
	• Device parameters of the 3RW5 HMI High Feature
	• Communication parameters

Save logbooks to micro SD card	The logbooks are backed up on the micro SD card. For more information, see Chapter Logbooks (Page 158).
Save service data to micro SD card	The 3RW50 soft starter records service data during starting and stopping. If problems occur in the system in conjunction with the 3RW50 soft starter, you can save the service data on the micro SD card and have them evaluated by the service personnel. This action is only possible when the motor is switched off.
FW update • Soft starter • Communication module • HMI	The firmware update is carried out 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 The firmware update is documented in the device logbook (Page 158). You can find more information on the firmware update in Chapter Performing firmware update with micro SD card (3RW5 HMI High Feature) (Page 165).

Parameter		Description
Download language		An additional language is loaded onto the 3RW5 HMI High Feature. For more information, see Chapter Reloading a language for the High Feature 3RW5 HMI (Page 135).
Memory space	• Complete memory • Free memory • Used memory	The memory capacity is displayed.

7.12.5 Reloading a language for the High Feature 3RW5 HMI

Requirements

- Micro SD card (Page 133) with valid language file
  The first two digits of the version of the language file must match the first two digits of the firmware version (Vx.y) of the 3RW5 HMI High Feature.
  You will find the current language files on the 3RW5 topic page (https://support.industry.siemens.com/cs/ww/en/view/109747404).

- The valid language file is located in the root directory (topmost level).

- 3RW5 HMI High Feature
  Menu: "Micro SD card"

- Access protection to 3RW5 HMI High Feature is not active or has been reset.

Operating principle

The 3RW5 HMI High Feature supports the subsequent loading of an additional language. The additional language is transferred from the micro SD card to the 3RW5 HMI High Feature and can then be selected. Loading an additional language overwrites or deletes an already loaded additional language. If the additional language is active when the language update is performed, it will be retained until another language is selected. It is only possible to return to this additional language if this language is updated. The following languages contained in the factory setting of the 3RW5 HMI High Feature are not provided for downloading and are always part of the firmware update for the 3RW5 HMI High Feature:

- English (factory setting)

- German

- French

- Spanish

- Italian

- Portuguese

- Chinese

Procedure

1. Choose the menu item "Download language" and confirm with OK.

2. Select the required language file on the micro SD card and confirm with OK.

Result

You have loaded an additional language onto the 3RW5 HMI High Feature and can set it with the selection "Additional language" (Page 97).

Messages and diagnosis

8

8.1   Diagnostics options

The 3RW50 soft starter offers the following diagnostics options:

- LEDs on the 3RW50 soft starter
- 3RW5 HMI Standard (accessories)
- 3RW5 HMI High Feature (accessories)
- SIRIUS Soft Starter ES (TIA Portal) (accessories) via local interface on the 3RW5 HMI High Feature

Further diagnostics options

Further diagnostics options via the fieldbus can be found in the Equipment Manual for the respective 3RW5 communication module.

8.2 LED display

8.2.1 Overview of the device LEDs of the 3RW50 soft starter
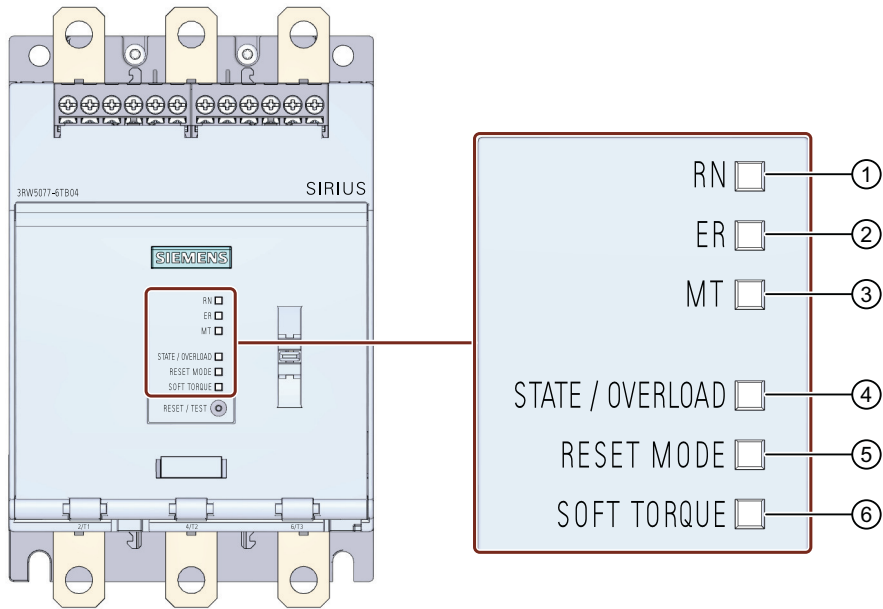
①	RUN (green)	Indicates whether the 3RW50 soft starter is ready for operation.
②	ERROR (red)	Indicates whether there is an error.
③	MAINTAINANCE (amber)	Indicates whether a message is present.
④	STATE / OVERLOAD with LED (green / yellow-orange / red)	Indicates the motor operating state.
⑤	RESET MODE with LED (green)	Indicates the selected RESET MODE (Page 81).
⑥	SOFT TORQUE with LED (green)	Indicates whether Soft Torque (Page 81) is activated or deactivated.

8.2.2   Status and error displays

LED "RN" - RUN

State	Meaning
Lights up green	The 3RW50 soft starter is now ready for operation.
Flashes green	The 3RW50 soft starter is not ready, e.g. due to: • System startup • Device factory settings are being restored. • Self-test active • Firmware update

LED "ER" - ERROR

State	Meaning
☐ Off	No errors are present.
Flashes red	There is at least one error.

LED "MT" - MAINTENANCE / WARNING

State	Meaning
☐ Off	No alarm is active.
Lights up yellow	At least one warning exists. The cause has not been eliminated.

LED combinations

State			Meaning
RN	ER	MT	
Flashes green	Flashes red	Flashes yellow	• The 3RW50 soft starter is not ready. • Device error detected

8.2.3   STATE / OVERLOAD LED

ST/OL LED	Status of the 3RW50 soft starter	Motor operating state
Lights up green	Operation	The ramp-up time comes to an end and the motor is running.
Flashes green	Ramp-up or ramp-down time active	Motor is ramping up or ramping down.
Off	Stop	• Motor is switched off but might still be rotating. • Motor is ready to start.
Flashes yel-low-orange	Stop - not ready to start	• Motor is switched off but might still be rotating. • Motor is not ready to start. An ON command will cause an error while at least one of the starting conditions is not fulfilled, e.g.: – Supply voltage of motor missing.
Flashes alter-nately green / yel-low-orange	Operation with motor overload warning	Motor has started up and is running. A motor overload warning exists, e.g.: • Motor is too hot
Lights up yel-low-orange	Stop with motor over-load warning	Motor has decelerated to zero speed and shut down. A motor overload warning exists, e.g.: • Motor is too hot
Flashes red	Stop with motor over-load error	Motor has decelerated to zero speed and shut down due to an overload error. A motor overload error exists, e.g.: • Motor is too hot • Temperature sensor wire break • Temperature sensor short circuit

8.2.4   Overview of LEDs on Standard 3RW5 HMI

Device LEDs (RN, ER, MT)

The display of the device LEDs of the 3RW5 HMI Standard (Page 120) shows the status summary for the following devices:

• 3RW50 soft starter

• 3RW5 communication module (if there is one)

Please note that the display of the device LEDs of the 3RW5 HMI Standard does not have to correlate with the display of the device LEDs of the 3RW50 soft starter.

Status LED

The display on the status LEDs of the 3RW5 HMI Standard (Page 120) indicates the state of the 3RW50 soft starter and the operating state of the motor.

Status LED	Status of the soft starter	Motor operating state
Lights up green	Operation	The ramp up time comes to an end and the motor is running.
Flashes green	Starting or stopping time active	Motor is ramping up or ramping down.

Further information

You will find more information on the messages of the 3RW50 soft starter in the Chapter Status and error displays (Page 139).

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

8.2.5 Overview of LEDs on High Feature 3RW5 HMI

Device LEDs (RN, ER, MT)

The display of the device LEDs of the 3RW5 HMI High Feature (Page 89) shows the status summary for the following devices:

- 3RW50 soft starter
- 3RW5 communication module (if there is one)
- 3RW5 HMI High Feature

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 3RW50 soft starter.

Status LED

The display on the status LEDs of the 3RW5 HMI High Feature (Page 89) indicates the state of the 3RW50 soft starter and the operating state of the motor.

Status LED	Status of the 3RW50 soft starter	Motor operating state
Lights up green	Operation	The ramp up time comes to an end and the motor is running.
Flashes green	Starting or stopping time active	Motor is ramping up or ramping down.

Further information

You will find more information on the messages of the 3RW50 soft starter in the Chapter Status and error displays (Page 139).

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 actions of the 3RW50 soft starter

Display of the warnings

The 3RW50 soft starter signals warnings by means of the following displays:

- LED "MT" (yellow)
- 3RW5 HMI High Feature (accessories)

Display of the warnings on the 3RW5 HMI High Feature

Detailed information about warnings and remedial actions appears in plain text on the display of the 3RW5 HMI High Feature.

Warnings and remedial measures

Warning	Cause	Remedy
Connection abort in manual mode	Connection to a local control station (e.g. device HMI) has been interrupted.	• Check the connection between the HMI and the device. • Check the connection between the PC and the local device interface.
Switching element overload	Switching element (switch contact, power semiconductors) too hot.	• Check the ambient conditions associated with cooling. You may want to consider lowering the operating characteristics. • Check the number of switching operations.
Therm. motor model overload	• The motor feeder is overloaded. • The motor temperature has exceeded a limit.	• 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.
Internal fan fault	• Internal fan is dirty (not rotating freely). • Connecting cable has fallen off or is defective. • Internal fan faulty	• Check the function of the fan. • Clean the fan. • Check the wiring. • Replace the fan.

8.4 Faults and remedial actions of the 3RW50 soft starter

Display of the faults

The 3RW50 soft starter signals faults by means of the following displays:

- LED "ER" (red)
- 3RW5 HMI Standard (accessories)
- 3RW5 HMI High Feature (accessories)

Display of the faults on the 3RW5 HMI

- 3RW5 HMI Standard: The display shows fault numbers that you can assign to the respective fault on the basis of the following table.
- 3RW5 HMI High Feature: Detailed information about faults and remedial actions appears in plain text on the display.

Faults and remedial actions

Error No.[1]	Error	Cause	Remedy	RESET MODE		
				Manual[2]	Remote[3]	Auto[4]
303	Bus error	-	• Acknowledgment via Auto RESET	-	-	x
308	Switching element defective	-	• Check switching elements L1, L2, and L3. • Replace the defective devices.	-	-	-
309	Switching element overload	Contact block (switching contact, power semiconductor) too hot	• 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	x	x	-
317	Electronics supply voltage too low	The supply voltage is below the permitted value.	• Check the power supply (load dimensioning, voltage range).	-	-	x
319	Supply voltage missing	• The line side switch or the power supply is not plugged in correctly. • No current	• Check the cables and the cable connections and replace any defective components.	x	x	-
324	Temperature sensor overload	The temperature of the motor is too high.	• 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.	x[5]	x[5]	x[5]
325	Temperature sensor wire break	A wire has broken in the sensor cable of the temperature sensor.	• Check the sensor cable and the temperature sensor.	x[5]	x[5]	x[5]
326	Temperature sensor short-circuit	A short-circuit has occurred in the sensor line of the temperature sensor.	• Check the sensor cable and the temperature sensor.	x[5]	x[5]	x[5]

Error No.[1]	Error	Cause	Remedy	RESET MODE		
				Manual[2]	Remote[3]	Auto[4]
327	Therm. motor model overload	• The motor feeder is overloaded. • The motor temperature has exceeded a limit.	• 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.	x[5]	x[5]	x[5]
328	Motor overload tripping	• The motor feeder has been overloaded • The temperature rise of the motor has exceeded a limit value	• 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.	x[5]	x[5]	x[5]
378	Invalid / inconsistent firmware present	The firmware is incomplete and / or the firmware expansions are incomplete or incompatible.	• Execute a complete firmware update. • Check any occurring error messages. • Check to see whether the firmware update has been interrupted.	-	-	x
381	Device error	Unrecoverable error detected after internal diagnostics (self-test, contactor contacts, switching element, etc.).	• Replace the device. • Please contact Technical Support (Support Request (Page 33)).	-	-	-
1408	Zero current after ON command	No current flow is detected after the motor feeder is switched on. Possible causes: • Main circuit interrupted (fuse, circuit breaker) • Motor contactor or contactor control is defective • No load	• Acknowledgment once the cause has been rectified.	x	x	-
1409	Loss of phase L1	The main power monitoring detects a phase failure.	• Acknowledgment once the cause has been rectified.	x	x	-
1410	Loss of phase L2					
1411	Phase failure L3					

Error No.[1]	Error	Cause	Remedy	RESET MODE		
				Man- ual[2]	Re- mote[3]	Auto[4]
1417	Bypass defective	• Bypass defective • The error can also be generated by successive, brief interruptions of the control supply voltage.	• Check the bypasses for L1, L2 and L3 and replace any that are defective. • Please contact Technical Support (Support Request (Page 33)).	-	-	-
1418	Bypass protective shut-off	An excessively high current has occurred in bypass mode.	• Check the motor. • Check the dimensioning of the soft starter. • Acknowledgment after cooling down	x	x	-
1454	Module slot wrong or configuration faulty	There is a difference between a real slot and a slot configured in the SIRIUS Soft Starter ES (TIA Portal).	• Ensure consistency between plugged and configured module. Possibly the referenced module has a wiring error. • After the cause is eliminated, the error self-acknowledges.	-	-	-
1466	Contact 1 failed	Switching element defective	• Check the contact blocks for L1, L2, and L3 and replace any that are defective. • Please contact Technical Support (Support Request (Page 33)).	-	-	-
1468	Contact 3 failed					

1479	Phase control failure	• Error appears without motor start:
		  – Motor incorrectly connected
		  – Inside-delta circuit wrongly configured
		  – Ground fault
		• Error appears while motor is starting:
		  – Starting voltage too high
			• Check and correct the wiring.
			• Adapt parameters.
				x	x	-

1482	Current measuring range exceeded	• With sensors: The measured value exceeds the measuring range • With actuators: The output value exceeds a high limit value	• Check the interaction between the module and the sensor or actuator.	x	x	-

Error No.[1]	Error	Cause	Remedy	RESET MODE		
				Man-ual[2]	Re-mote[3]	Auto[4]
1523	Device error	Unrecoverable error detected after internal diagnostics (self-test, contactor contacts, switching element, etc.).	• Replace the device. • Please contact Technical Support (Support Request (Page 33)).	-	-	-
1605	Supply voltage missing	• The line side switch or the power supply is not plugged in correctly. • No current	• Check the cables and the cable connections and replace any defective components.	x	x	-
1755	Overtemperature of electronic components	The temperature in the components has exceeded the maximum limit.	Check the ambient temperature or the control cabinet ventilation.	-	-	x

[1] Visible on the display of the 3RW5 HMI Standard.

[2] Acknowledgment via Manual RESET.

[3] Acknowledgment via Remote RESET.

[4] Acknowledgment via Auto RESET.

[5] Acknowledgment depends on parameter RESET MODE.

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

Display of the faults on the 3RW5 HMI High Feature

Detailed information about faults and remedial actions appears in plain text on the display.

Faults and remedial actions

Error	Cause	Remedy
Error HMI	Unrecoverable error detected after internal diagnostics (self-test, etc.).	Replace the device.
FW update not successful	The firmware is incomplete and/or the firmware expansions are incomplete or incompatible.	• Run a complete firmware update. • Check any error messages that occur. • Check to see whether or not the firmware update was aborted.
Error during self-test	Unrecoverable error detected after internal diagnostics (self-test, etc.).	Replace the device.
Write Error	File cannot be written to the micro SD card.	• Check whether the micro SD card is inserted. • Check whether the micro SD card is write-protected.

Error	Cause	Remedy
FWUpdateInvalidSignature	The firmware is incomplete and/or the firmware expansions are incomplete or incompatible.	• Run a complete firmware update. • Check any error messages that occur. • Check to see whether or not the firmware update was aborted.
No device answer	The connection to the connected soft starter has been interrupted.	Check the connection between the HMI and the device.
Loading language unsuccessful[1] Invalid signature 'Load additional language'[1]	Subsequently loading the language is incomplete and/or the loaded language is incomplete or incompatible.	• Ensure the languages are loaded completely. • Check any error messages that occur. • Check to see whether or not loading the language has been interrupted.

[1]   3RW5 HMI High Feature firmware version V3.0 or higher

8.6   RESET MODE

Effects of RESET MODE

Note that the setting of the RESET MODE only has an effect on the acknowledgment response of the motor overload protection.

You will find more information in Chapter Faults and remedial actions of the 3RW50 soft starter (Page 143) with the comment "Depends on parameter RESET MODE".

ATEX / IECEx applications

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

Manual RESET

"Manual RESET" means that the following options are available for acknowledging faults:

- RESET / TEST key on the 3RW50 soft starter
- RESET / TEST key on the 3RW5 HMI Standard
- Reset via bus interface
- Reset via F key on 3RW5 HMI High Feature
- Reset via 3RW5 HMI High Feature (diagnosis state)

Remote RESET

"Remote RESET" means that faults are acknowledged by switching the control supply voltage off and on again. The control supply voltage on the 3RW50 soft starter must be switched off for at least 4 s.

Auto RESET

"Auto RESET" means that faults are automatically reset as soon as the cause is eliminated.

8.7 Performing diagnostics of the 3RW50 soft starter with the 3RW5 HMI High Feature

Requirements

- 3RW5 HMI High Feature
  Menu: "Diagnosis > Soft Starter"

Parameter

Diagnostic value	Comment
Diagnosis state	Shows all active warnings and faults.
	You can acknowledge errors here (manual RESET).

Diagnostic value		Comment
Device state	Type of connection	If the 3RW50 soft starter is supplied with main voltage and a motor is connected, the type of connection is automatically detected. • Type of motor connection unknown • Type of motor connection inline
	Rotation direction	• Unknown main power direction (direction of phase rotation of the power system at terminals L1/L2/L3 not detected) • Clockwise • Counter-clockw.
	Ready (automatic)	
	Motor CW	
	Starting mode active	
	Stopping mode active	
	Cooling time active	
	Current limiting active	
	Input control	
	Input 1	
	Maximum pointer reset	
	CPU/Master STOP	
	Automatic mode	
	Operating mode manual - bus	
	Operating mode manual - local	
	Main power rotation right	
	Main power rotation left	
	Output 1 active	
	Output 2 active	
	Output 3 active	
	Ready to start for motor ON	
	Thermal motor model deactivated	
	Switching element cooling time active	
	Manual operation bus - PC controlled	
	Manual operation local - input controlled	
	Manual operation local - HMI controlled	
	Manual operation local - PC controlled	
	FW update rejected	
	FW update active	
	FW update successful	
	Operation / bypass active	
	Normal operation active	
	Test mode active	
	Missing initialization after maintenance	
	Test with small load active	
	Logbook application - errors deleted	

Diagnostic value	Comment	
Statistic data[1]	Operating hours - motor	
	Number of motor overload trips	
	Number of starts motor CW	
	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	
Maximum pointer[2]	Phase currents (%)	Phase current I L1 min (%)
		Phase current I L2 min (%)
		Phase current I L3 min (%)
		Phase current I L1 max (%)
		Phase current I L2 max (%)
		Phase current I L3 max (%)
	Phase currents (rms)	Phase current I L1 min (rms)
		Phase current I L2 min (rms)
		Phase current I L3 min (rms)
		Phase current I L1 max (rms)
		Phase current I L2 max (rms)
		Phase current I L3 max (rms)
	Maximum trigger current	
	Maximum trigger current	
	Number of motor overload trips	
	Maximum switching element heating	
Self-test (user-test)	Initiate the self-test functions of the 3RW50 soft starter here.	
	For more information, see Chapter Self-test (user-test) (Page 154).	
Logbooks	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 logbook can be stored on a micro SD card (Page 133).	
	For more information, see Chapter Logbooks (Page 158).	

[1] The statistic data is based primarily on operating states relating to operating hours and operating frequency of the 3RW50 soft starter in the past.

[2] Maximum pointers are based on measured values and represent the highest or smallest measured value that occurred in the past.

8.8 Performing diagnostics of the 3RW5 communication module with the 3RW5 HMI High Feature

With the diagnosis, you can display the diagnosis state of the 3RW5 communication module.

Requirements

- 3RW5 HMI High Feature (accessory)
  Menu: "Diagnosis > Communication module"

- 3RW5 communication module (accessory)

Parameter

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

Additional information

You will find further information on the diagnostics of the 3RW5 communication module in the Equipment Manual for the respective 3RW5 communication module.

8.9 Execute HMI diagnostics with the 3RW5 HMI High Feature

With the diagnosis, you can display the diagnosis state of the 3RW5 HMI High Feature and check correct functioning of the 3RW5 HMI High Feature with various tests.

Requirements

- 3RW5 HMI High Feature (accessory)
  Menu: "Diagnosis > HMI"

Note

Self-tests

To be able to start the self-tests with a 3RW5 HMI High Feature with firmware version V3.1, the motor connected to the 3RW5 soft starter must be switched off.

3RW5 HMI High Feature with firmware version V3.1 or earlier: During the self-test, you cannot switch off the motor on the 3RW5 HMI High Feature. If you are controlling the motor via the 3RW5 HMI High Feature, switch off the motor before a self-test.

Parameters

Diagnostic value		Comment
Diagnosis state		Shows all active diagnostic messages (faults, warnings, device state).
Self-test	Test LEDs	The device LEDs of the 3RW5 HMI High Feature are tested one after the other. The display shows which device LED is currently being controlled. Navigate through the test operation with the OK key.
	Test buttons	The 3RW5 HMI High Feature keys are tested one after the other. The display shows which keys must be actuated in sequence in order to perform the test.
	Test display	The 3RW5 HMI High Feature runs a color program on the display. Navigate through the test operation with the OK key.

8.10 Self-test (user-test)

With the Self-test (user-test), you can test correct functioning of the 3RW52 soft starter (LEDs, current measurement, electronic motor overload protection).

Requirements

- The 3RW52 soft starter is in a fault-free condition.

- Perform the test with the motor switched off.

Activation options

- Using the RESET / TEST key on the 3RW52 soft starter

- 3RW5 HMI High Feature (accessory)
  Menu: "Diagnosis > Soft Starter > Self-test"
  The 3RW5 HMI High Feature (LOCAL) has master control. Access protection to 3RW5 HMI High Feature is not active or has been reset.
  Here the self-test (user-test) is run through completely.

Procedure - Activation with the RESET / TEST key

Depending on how long the RESET / TEST keys are held pressed, the following tests are performed in the specified sequence. Thus, if the key is held pressed for longer than 8 seconds, all 4 tests are performed. If you press and hold the key for only 3 seconds, for example, the first 2 tests are conducted.

Operating time	Explanation
0.15 ... 2 s	**LED test**
	All LEDs are controlled.
2 ... 5 s	**Visual display of the position of the rotary coding switch**
	16 different positions are available for the rotary coding switch for setting the rated operational current I_e of the motor.
	The table "Visual display of the position of the rotary coding switch" displays the exact position of the rotary coding switch based on a combination of 5 LEDs.
	You will find more information in chapter Setting elements on 3RW50 soft starter (Page 77).
5 ... 8 s	**Current detection test**
	The current detection is tested in all 3 phases.
	In the case of 3RW52 soft starters with thermistor motor protection, the thermistor evaluation unit is also tested.
> 8 s	**Motor overload protection test**
	The entire control circuit is tested, including the contact blocks and the error signaling output.
	If the 3RW52 soft starter responds correctly, no overload trip occurs. This can be reset immediately without a cooling-down period by pressing the TEST / RESET key again.

Test result

The test results are provided in the following tables. If the 3RW52 soft starter does not respond as shown in the tables below during the function test, check the external connections, their function, and the wiring. If the error persists even though the connections are correct, the 3RW52 soft starter must be replaced.

If a 3RW5 HMI is connected to the 3RW52 soft starter, the 3RW5 HMI indicates "Motor overload protection - shutoff" when it passes the function test. If the 3RW5 soft starter does not pass the function test, the 3RW5 HMI indicates a device error.

LED test

LED	Display of test result	
	pass	**fail**
"RN"	🟩 Lights up green	☐ Off
"ER"	🟥 Lights up red	☐ Off

LED	Display of test result	
	pass	**fail**
"MT"	Lights up yellow	Off
"STATE / OVERLOAD"	Lights up yellow-orange	Off
"RESET MODE"	Lights up green	Off
"SOFT TORQUE"	Lights up green	Off

Visual display of the position of the rotary coding switch

Position of the rotary coding switch "Rated operational current I_e of the motor"	LED					
	"RN"	**"ER"**	**"MT"**	**"STATE / OVERLOAD"**	**"RESET MODE"**	**"SOFT TOR-QUE"**
1	Flickers green	Off	Off	Off	Off	Lights up green
2	Flickers green	Off	Off	Off	Lights up green	Off
3	Flickers green	Off	Off	Off	Lights up green	Lights up green
4	Flickers green	Off	Off	Lights up green	Off	Off
5	Flickers green	Off	Off	Lights up green	Off	Lights up green
6	Flickers green	Off	Off	Lights up green	Lights up green	Off
7	Flickers green	Off	Off	Lights up green	Lights up green	Lights up green

Position of the rotary coding switch "Rated operational current I_e of the motor"	LED					
	"RN"	"ER"	"MT"	"STATE / OVERLOAD"	"RESET MODE"	"SOFT TORQUE"
8	Flickers green	Off	Lights up yellow	Off	Off	Off
9	Flickers green	Off	Lights up yellow	Off	Off	Lights up green
10	Flickers green	Off	Lights up yellow	Off	Lights up green	Off
11	Flickers green	Off	Lights up yellow	Off	Lights up green	Lights up green
12	Flickers green	Off	Lights up yellow	Lights up green	Off	Off
13	Flickers green	Off	Lights up yellow	Lights up green	Off	Lights up green
14	Flickers green	Off	Lights up yellow	Lights up green	Lights up green	Off
15	Flickers green	Off	Lights up yellow	Lights up green	Lights up green	Lights up green
16	Flickers green	Lights up red	Off	Off	Off	Off

Current detection test

LED	Display of test result	
	pass	fail
"STATE / OVERLOAD"	Flickers red	Off In case of error: System LEDs (RN, ER, MT) flashing. Device error, replace device.

Motor overload protection test

	Display of test result	
	pass	fail
"STATE / OVERLOAD" LED	▨ Flashes red	☐ Off In case of error: System LEDs (RN, ER, MT) flashing. Device error, replace device.
"ER" LED	▨ Flashes red	In case of error: System LEDs (RN, ER, MT) flashing. Device error, replace device.
Error signaling output	Active	Not active
Contact blocks / motor	Deactivated	Unchanged

Self-test of the 3RW5 HMI High Feature

You will find more information on the self-test of the 3RW5 HMI High Feature in Chapter Execute HMI diagnostics with the 3RW5 HMI High Feature (Page 153).

8.11 Logbooks

Operating principle

The logbook lists events, warnings, and faults in chronological order. Each entry is stamped with the real time. For the 3RW50 soft starter there are the following logbooks:

- Logbook application
- Logbook device

The logbook is designed as a circular buffer.

Display and editing options

- 3RW5 HMI High Feature
  Menu: "Diagnosis > Soft Starter > Logbook"
- With SIRIUS Soft Starter ES (TIA Portal) via the local interface on the 3RW5 HMI High Feature
- With a fieldbus via a 3RW5 communication module (only via a 3RW5 PROFINET or PROFIBUS communication module):
  - With SIRIUS Soft Starter ES (TIA Portal) Premium
  - Configuration software of the control system (e.g. STEP 7 with corresponding HSP)

Logbook application

> The logbook application contains all messages relating to functions and parameters. This logbook is only available in the 3RW50 soft starter. The logbook application can be deleted with the command "Delete logbook application – xy".

Logbook device

> The following messages are recorded in the device logbook:
>
> • Error
>
> • Warnings
>
> • Event
>
> The device logbook is available in every module (3RW50 soft starter, 3RW5 HMI High Feature, 3RW5 communication module) and cannot be deleted.

Saving logbooks

> 1. You can save the logbooks on a micro SD card (Page 133) if a micro SD card is inserted in the HMI HF:
>
>   – Menu: "Micro SD card > Save logbooks to micro SD card"
>
>   – Click "OK". A *.csv file is stored on the micro SD card, which you can read out with Microsoft Excel, for example.

8.12 Save service data to micro SD card

Requirements

> • 3RW50 soft starter as of firmware version V1.0.1
>
> • 3RW5 HMI High Feature firmware from version V2.0
>   Menu: "Micro SD card"
>   The "micro SD Card" menu appears after you have inserted a micro SD card into the 3RW5 HMI High Feature.
>
> • Inserted micro SD card (Page 133)
>
> • Access protection to the 3RW5 HMI High Feature is not active or has been reset.
>
> • Motor switched off

Operating principle

The 3RW50 soft starter records service data during starting and stopping. If problems occur in the system in conjunction with the 3RW50 soft starter, you can save the service data on the micro SD card. The service data can help Technical Support to handle the case in the event of a Support Request (Page 33). The service data contain the following data, for example:

- Parameters

- Logbooks

- Statistic data

- Maximum pointer

- I&M data

Procedure

Save the service data on the 3RW5 HMI High Feature onto the micro SD card.

Menu: "Micro SD card > Save service data to micro SD card"

Saving the service data can take a little time (> 1 minute). At the top level of the micro SD card, a folder is created with the serial number of the 3RW50 soft starter in which the service data are stored. Example of a created folder name: "1P3RW5 xxx-xxxxx+SLO..."

Note

Save service data to micro SD card

While the service data are being saved to the micro SD card, the color of the micro SD card icon changes from blue to red on the display 3RW5 HMI High Feature. If the service data have been saved completely, the color of the icon changes back to blue.

Icon of the micro SD card on the display of the 3RW5 HMI High Feature:

Result

You have stored the service data on the micro SD card.

These service data can help Technical Support to handle the case in the event of a Support Request (Page 33). If necessary, read the micro SD card in at a PC and send the folder of service data as a ZIP file.

Maintenance and service

9

9.1 Maintenance and repairs

⚠ WARNING
Hazardous voltage. **Will cause death or serious injury.** The present device / part conducts hazardous voltages. Touching live components will result in death or severe injury. Installation, commissioning, and maintenance only by qualified specialist personnel.

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

If the 3RW5 soft starter detects a replacement part, the menu item "Parameters > Soft Starter > Spare part Article No." appears in the 3RW5 HMI High Feature.

Note

Loss of ATEX / IECEx approval

The repair of devices with approval according to IEC 61508 / EN 13849 is only permissible in the manufacturer's plant.

A repair to the 3RW50 soft starters that is not performed in the manufacturer's plant results in loss of ATEX / IECEx approval.

9.2 Replacing the fan

Requirements

- Replacement fan
- Optional: The fan cover is disassembled.

Procedure

> ⚠ **DANGER**
>
> **Hazardous voltage.**
> **Will cause death or serious injury.**
>
> Disconnect the system and the device from the power supply before starting work.
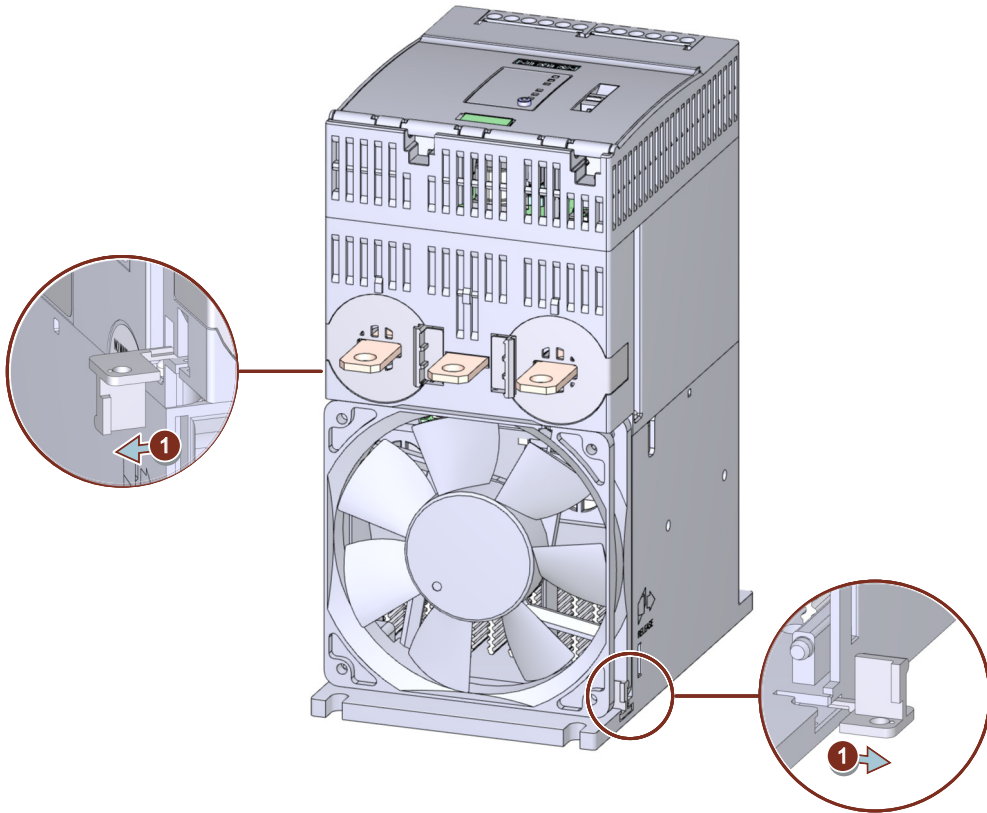
On the underside of the soft starter, pull the lugs on the left and right out of the latch guide ①. The lugs remain in the enclosure.
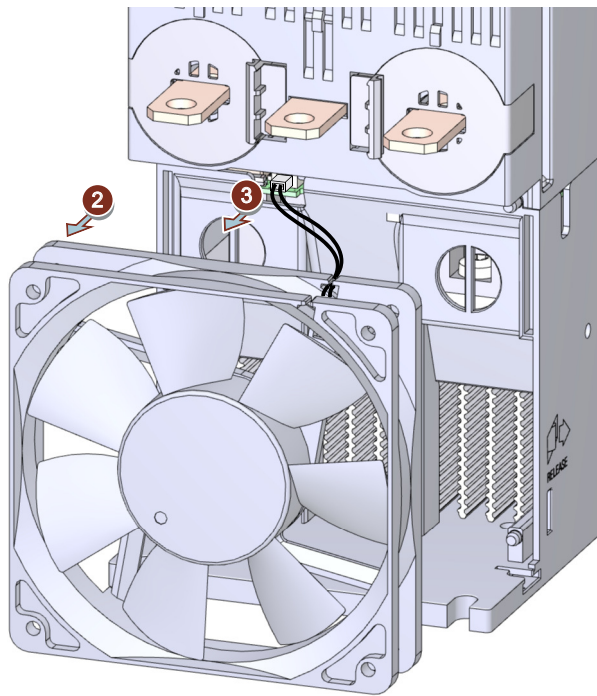
Remove the defective fan ② and disconnect the plug with the cable ③.
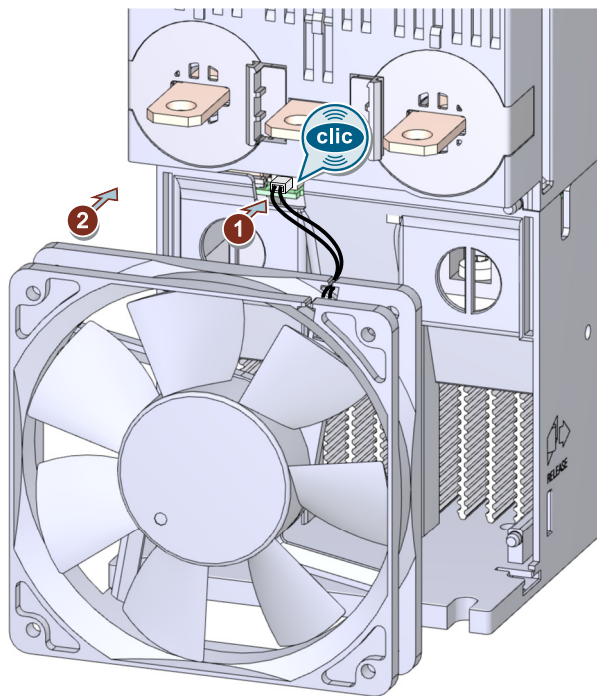
Insert the plug of the cable of the replacement part ① and fit the replacement fan ②.
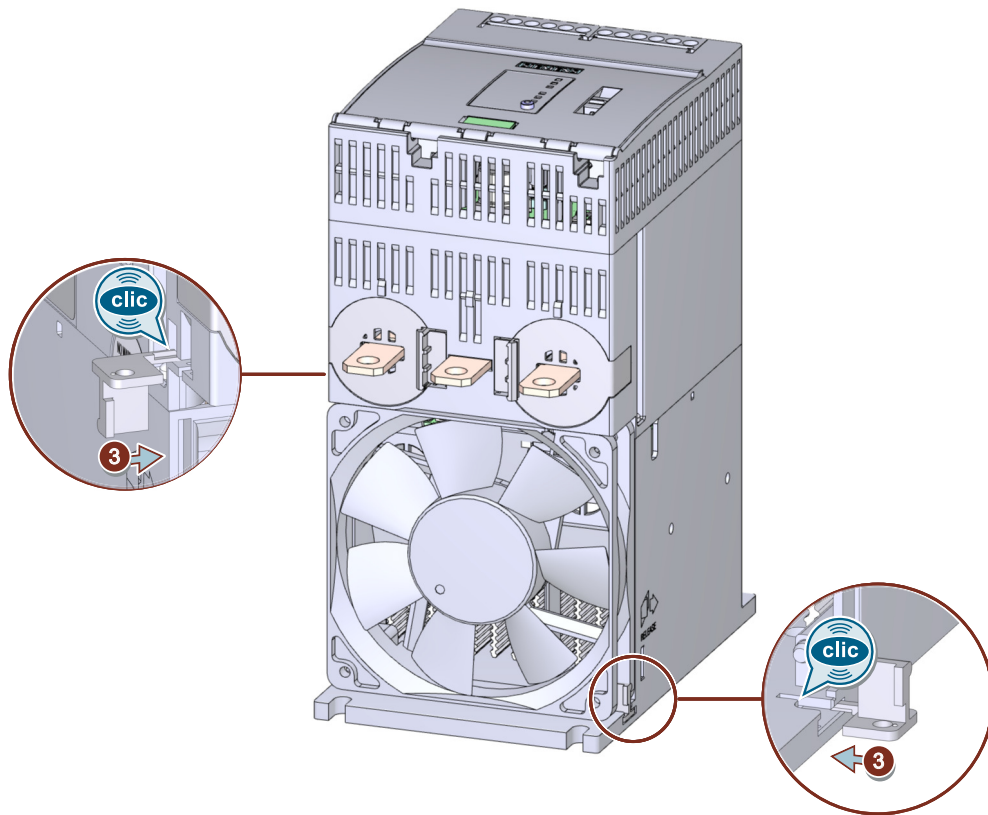
Press the two lugs back into the housing until they audibly engage ③.

9.3 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 respective device with the help of device-specific firmware files. The retentive data is retained after the firmware has been updated.

Firmware updates and a history of the versions with the innovations 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:

• 3RW50 soft starter

• 3RW5 HMI High Feature (not possible via fieldbus)

• 3RW5 communication modules

Requirements

• Valid firmware update
You will find the latest firmware files on the 3RW5 topic page (https:// support.industry.siemens.com/cs/ww/en/view/109747404).

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.
   To ensure the quickest and most fault-free firmware update, it is recommended that you disconnect the main voltage of the 3RW50 soft starter and set the CPU / PLC to STOP state.

2. Perform the update of the device firmware.
   The following procedures are possible:

   – With a micro SD card via the 3RW5 HMI High Feature (Page 165)

   – 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) (via a 3RW5 PROFINET or PROFIBUS communication module only).

Result

You have performed a firmware update for the selected device. The selected device automatically restarts.

Note

Firmware update of the 3RW5 HMI High Feature

Please note that the display switches off for about 30 seconds when the firmware is activated.

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

Requirements

- Micro SD card with valid firmware file (*.upd)

- The valid firmware file is located in the root directory (topmost level)

- 3RW5 HMI High Feature
  Menu: "Micro SD card > FW update"

- Access protection to 3RW5 HMI High Feature is not active or has been reset.

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.

---

1. Select the folder of the respective device.

2. Select the firmware file of the device and confirm with the OK key.
   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.

Note

Firmware update of the 3RW5 HMI High Feature:

Please note that the display switches off for about 30 seconds when the firmware is activated.

---

3. 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.

9.5 Restoring factory setting

9.5.1 Effects of the factory setting

Effects of the factory setting

The following devices can be reset to the factory setting:

- 3RW50 soft starter

  – The parameters of the 3RW50 soft starter that were not set via the setting elements are reset.

- 3RW5 communication module

  – The parameters of the 3RW5 communication module are reset.

Maintenance and service

9.5 Restoring factory setting

- 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 3RW50 soft starter, the 3RW5 communication module, and the 3RW5 HMI High Feature are reset to the factory settings, as described above.

Possible factory settings

The following procedures are possible:

- With the MODE and RESET / TEST (Page 169) keys.
- Via the 3RW5 HMI High Feature:
  - Restoring the factory settings via High Feature 3RW5 HMI (Page 167)
  - Restoring the factory settings with the Master RESET button via 3RW5 HMI High Feature (Page 168)
- 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:
  - With SIRIUS Soft Starter ES (TIA Portal) Premium (only via a 3RW5 PROFINET or PROFIBUS communication module).
  - "Factory settings" command in data record 93 (only via a 3RW5 PROFINET or PROFIBUS communication module).
  - With the configuration software of the control (only via a 3RW5 PROFINET or EtherNet/IP communication module). Only the communication parameters are reset here.

Result

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

9.5.2 Restoring the factory settings via High Feature 3RW5 HMI

Requirements

- Make sure that the motor is switched off and you do not start the motor while restoring the factory settings.
  To ensure the quickest and most fault-free restoration of the factory setting, it is recommended that you disconnect the main voltage at the 3RW5 soft starter.
- 3RW5 HMI High Feature
  Menu: "Parameters > Factory settings"
- Access protection to 3RW5 HMI High Feature is not active or has been removed.
- The 3RW5 HMI High-Feature (LOCAL) has master control.

SIRIUS 3RW50 soft starter
Equipment Manual, 11/2021, A5E35628455002A/RS-AB/002
167

Procedure

1. Select the desired menu item.

   – Soft starter

   – Communication module

   – HMI High Feature

   – All devices

2. Confirm the menu item by pressing the OK key.

Result

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

Note the effects of the factory settings described in Chapter Effects of the factory setting (Page 166).

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

Requirements

- Make sure that the motor is switched off and you do not start the motor while restoring the factory settings.
  To ensure the quickest and most fault-free restoration of the factory setting, it is recommended that you disconnect the main voltage at the 3RW5 soft starter.

- Free access to the Master RESET key of the 3RW5 HMI High Feature.

- 3RW5 HMI High Feature is connected to the 3RW5 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.

   – Soft starter

   – Communication module

   – HMI High Feature

   – All devices

3. Confirm the menu item by pressing the OK key.

Result

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

Note the effects of the factory settings described in Chapter Effects of the factory setting (Page 166).

9.5.4 Restoring the factory settings with the MODE and RESET / TEST keys

Requirements

- Make sure that the motor is switched off and you do not start the motor while restoring the factory settings.
  To ensure the quickest and most fault-free restoration of the factory setting, it is recommended that you disconnect the main voltage at the 3RW50 soft starter.

- The 3RW5 communication module must be isolated from the 3RW50 soft starter.

Procedure

1. Start the restoration of the factory settings by pressing the MODE key longer than 2 s until the STATE / OVERLOAD LED flickers green.
   Press and hold the MODE key.

2. Simultaneously press the RESET / TEST key down for at least 10 s.
   After 2 s, the STATE / OVERLOAD LED begins to illuminate red.
   After 10 s the STATE / OVERLOAD LED goes out and switches back to displaying the motor operating state (e.g. flashing yellow-orange if there is no supply voltage).

3. Release the MODE and RESET / TEST keys.

Result

The factory setting of the 3RW50 soft starter has been restored.

Note the effects of the factory settings described in Chapter Effects of the factory setting (Page 166).

Technical specifications

10

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.

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/10024029?tree=CatalogTree).

Dimension drawings

<div style="text-align: right; font-size: xxx-large;">11</div>

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.

11.2 Drilling pattern for 3RW5 HMI Standard

The drilling pattern below supports you when installing a 3RW5 HMI Standard with push-in lugs on a level surface.

11.3 Drilling pattern for 3RW5 HMI High Feature

The drilling pattern below supports you when installing a 3RW5 HMI High Feature with push-in lugs on a level surface.
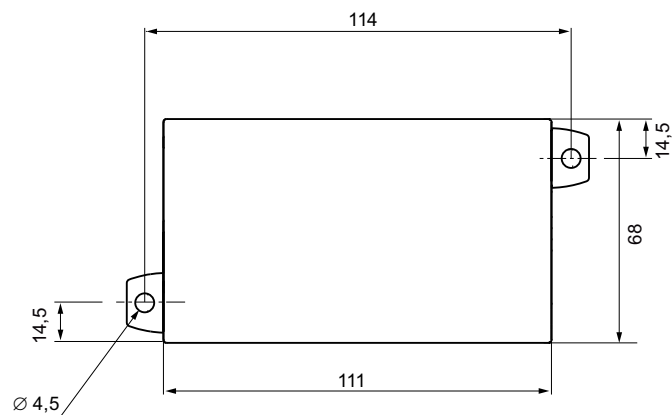
11.4 Drilling patterns for 3RW5 communication module on the 3RW50 soft starter

3RW5 communication module on the 3RW50 soft starter size S6
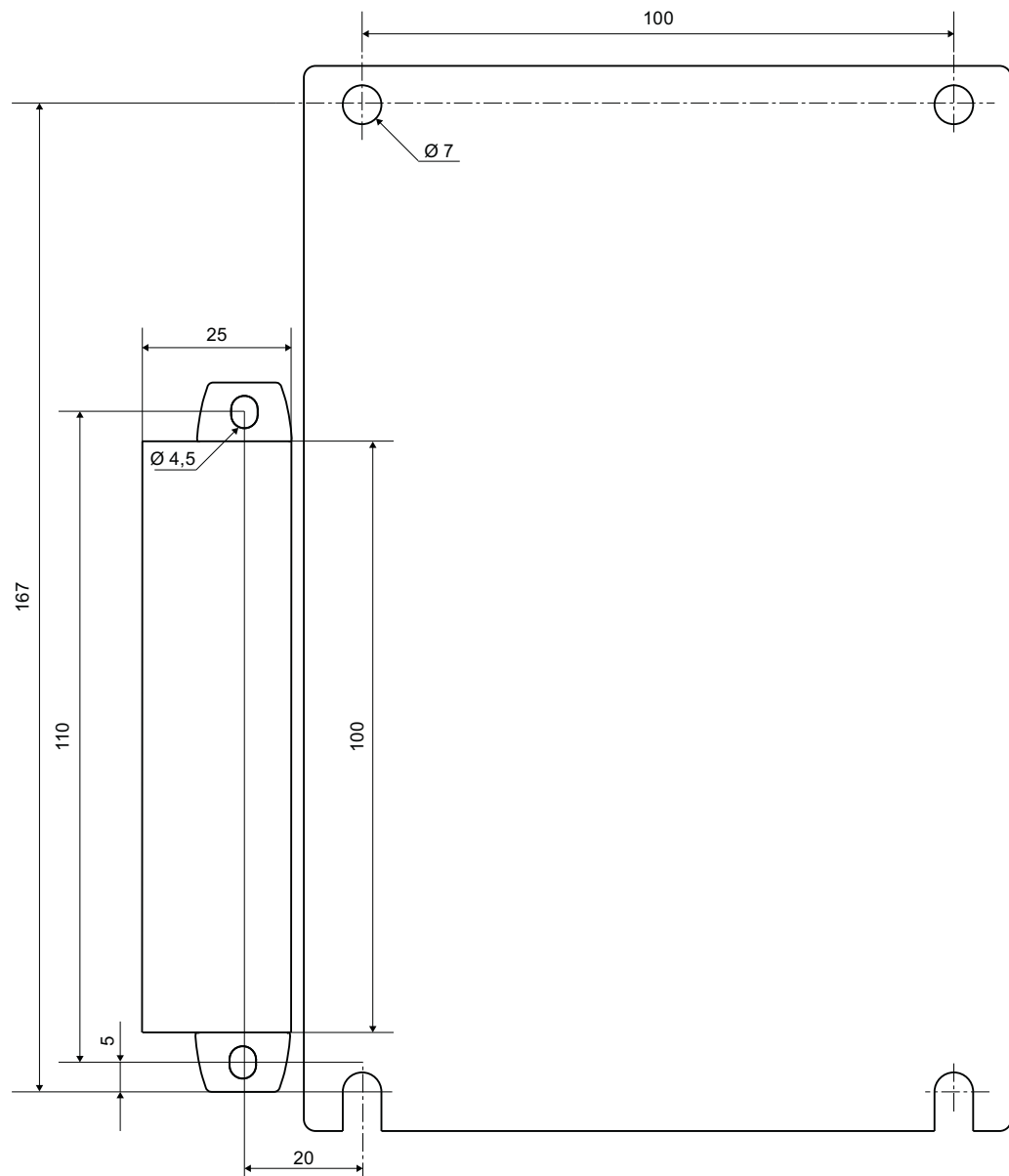
3RW5 communication module on the 3RW50 soft starter size S12

Circuit diagrams

12

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.

SIRIUS 3RW50 soft starter
Equipment Manual, 11/2021, A5E35628455002A/RS-AB/002

Example circuits

A

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 3RW50 soft starter are wired into the motor feeder between the motor starter protector and the motor. This achieves type of coordination 1.
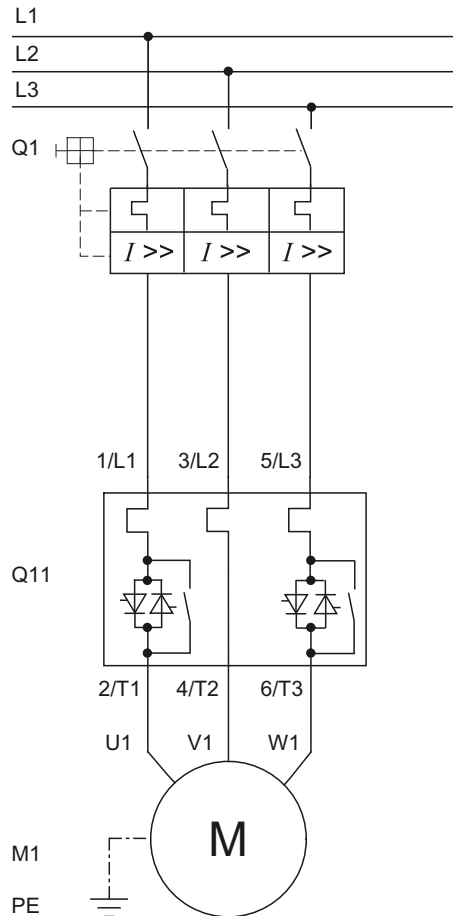
Q1   Motor starter protector (e.g. 3RV2 or 3VA)
Q11   3RW50 soft starter

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 3RW50 soft starter and the motor. The 3RW50 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 3RW50 soft starter and the fuses.
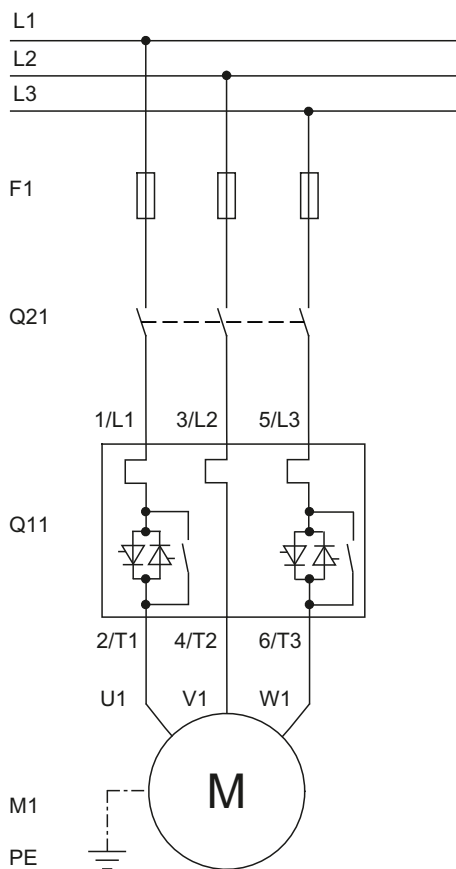
F1   gG full-range fuse for cable and line protection (e.g. 3NA3)

Q21   Main or line contactor for galvanic isolation

Q11   3RW50 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.
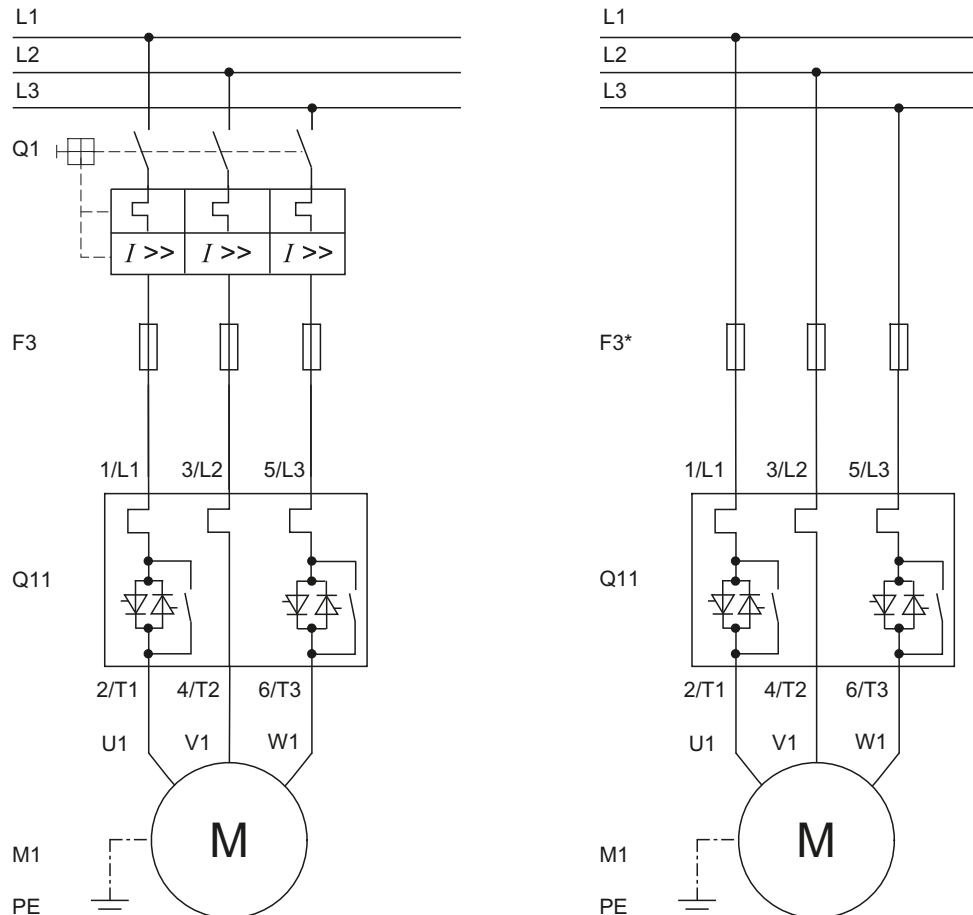
Q1	Motor starter protector
F3	aR partial-range fuse for protection of semiconductors (e.g. SITOR 3NE3/4 or 3NC3)
F3*	gR full-range fuse for protection of semiconductors (e.g. SITOR 3NE1)
Q11	3RW50 soft starter
M1	Motor
PE	Protective conductor

A.2 Control current connection

A.2.1 Control by pushbutton

Requirements

ON / RUN relay output was parameterized to ON.

Wiring of control circuit for control by pushbutton
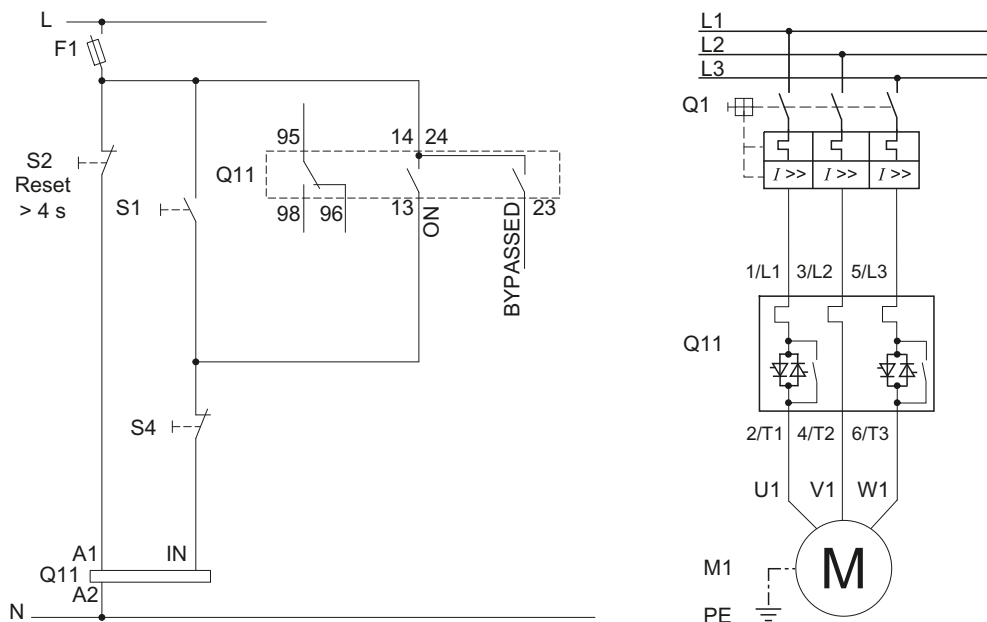
F1   Fuse
S1   Pushbutton: Start motor
S2   Pushbutton: Reset > 4 s
S4   Pushbutton: Stop motor
Q1   Motor starter protector
Q11   3RW50 soft starter
M1   Motor
PE   Protective conductor

Alternatively, the motor feeder can be assembled as a fuseless or fused version with type of coordination 1 or 2.

A.2.2 Control by switch
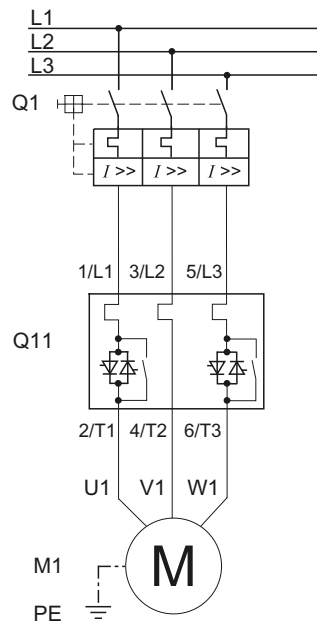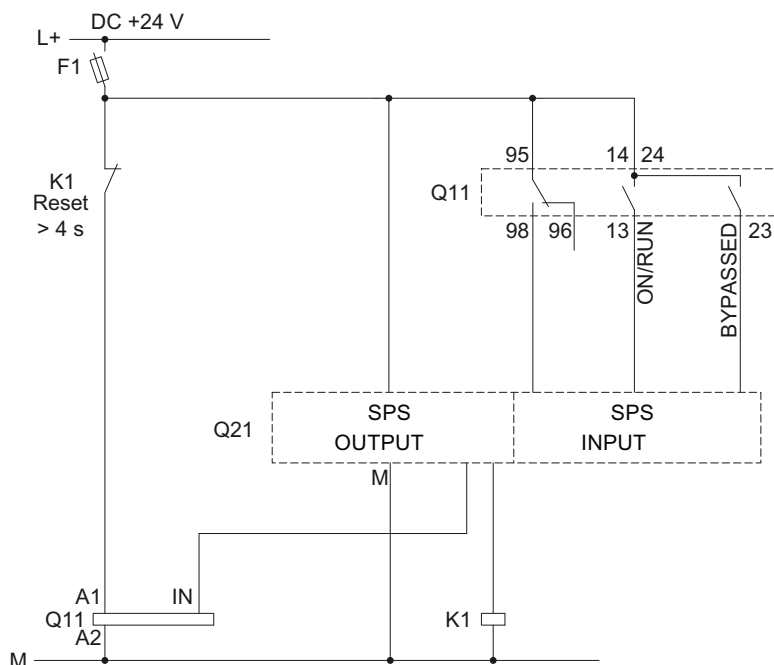
Requirements

> ⚠️ **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.

Wiring of control circuit for control by switch
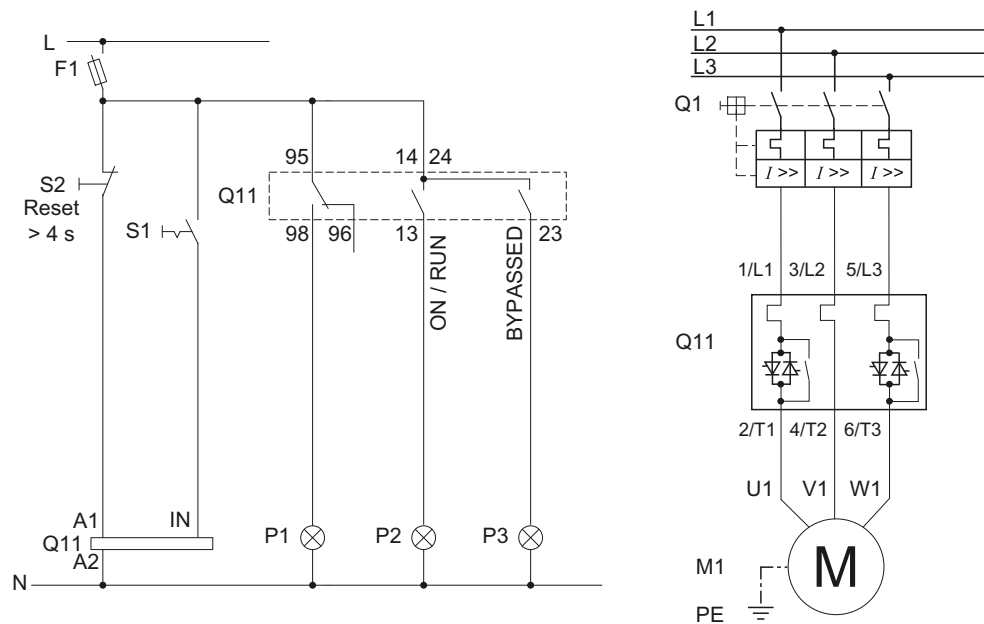
F1	Fuse
S1	Switch
S2	Pushbutton: Reset > 4 s
Q1	Motor starter protector
Q11	3RW50 soft starter
M1	Motor
P1	Indicator light
P2	Indicator light
P3	Indicator light

A.2.3 Switching with the control supply voltage

Requirements

Owing to the intrinsic protection, an interval of at least 5 minutes must be allowed to elapse before the device is restarted if the device is switched on and off in normal operation by means of the control supply voltage.
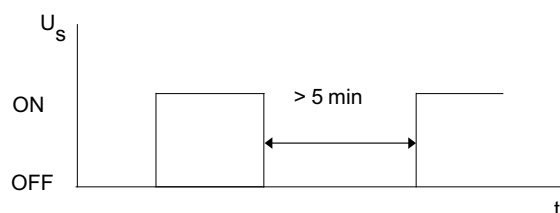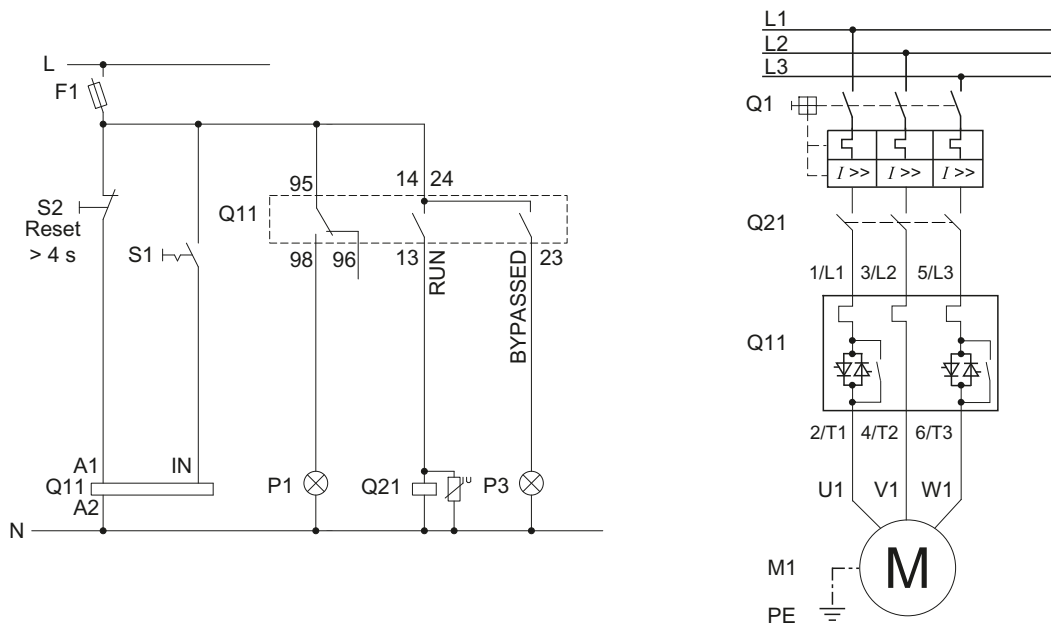

| ⚠ **WARNING** |
|---|
| **Automatic restart.** |
| **Can cause death or serious injury.** |
| If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result. |
| Reset 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. |

Wiring control circuit on switching with the control supply voltage
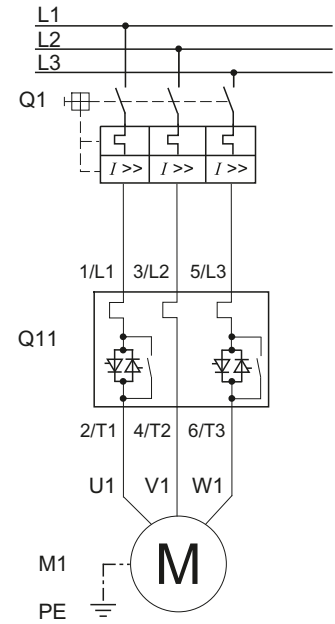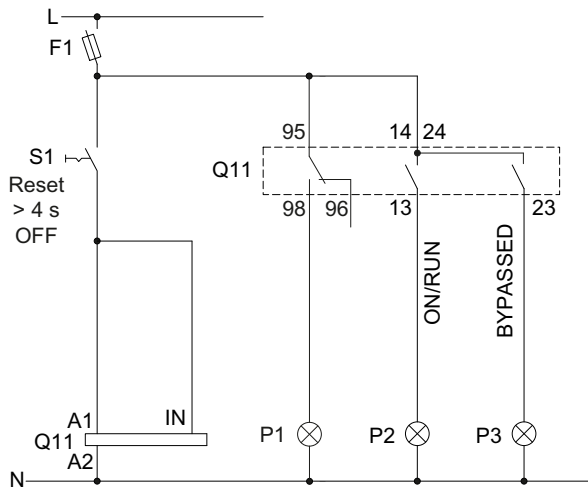
F1   Fuse
S1   Switch: Reset > 4 s OFF
Q1   Motor starter protector
Q11 3RW50 soft starter
M1   Motor
P1   Indicator light
P2   Indicator light
P3   Indicator light
PE   Protective conductor

A.2.4 Control by PLC

Requirements

Utilization of a 3RW50..-....4 (24 V) soft starter and power supply with DC voltage.

⚠ 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.

Wiring of control circuit for control by PLC

F1	Fuse
K1	Coupling relay control for reset > 4 s
Q1	Motor starter protector
Q11	3RW50 soft starter
Q21	PLC
M1	Motor
PE	Protective conductor

A.2.5 Actuation of a line contactor

Requirements

ON / RUN relay output was parameterized to RUN.

⚠ 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.

Wiring of control circuit for controlling a line contactor

F1	Fuse
S1	Switch
S2	Pushbutton: Reset > 4 s
Q1	Motor starter protector
Q11	3RW50 soft starter
Q21	Line contactor
M1	Motor
P1	Indicator light
P3	Indicator light
PE	Protective conductor

A.2.6   Wiring for remote RESET

Procedure
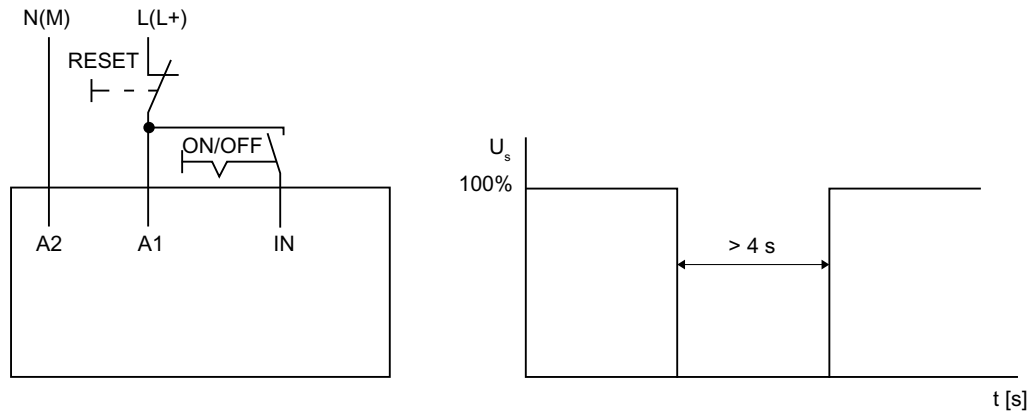
Result

You can reset a pending error message by operating the reset button for > 4 s.

A.2.7   Connecting the temperature sensor

Requirements

- 3RW50 soft starter with thermistor motor protection
- Motor with temperature switch (e.g. Thermoclick) or thermistor (e.g. PTC type A)

Procedure

1. Remove the copper link between terminals and T11 / T21 and T22.

2. Connect the temperature sensor:

Temperature switch at terminals T21-T22	Thermistor at terminals T11-T12
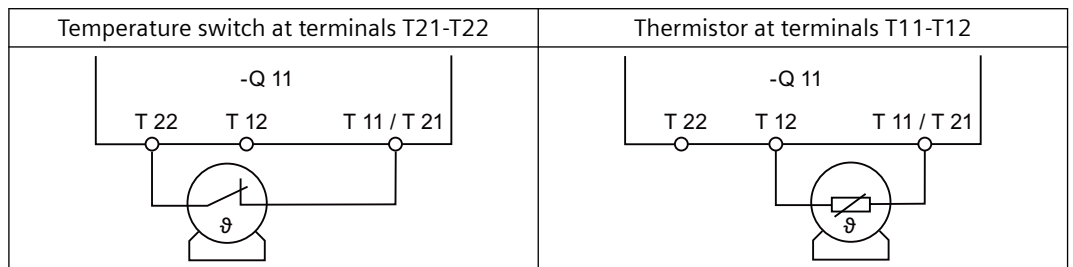
Note

3RW50 soft starter with thermistor motor protection in hazardous areas

Note that the operation of a 3RW50 soft starter with thermistor motor protection in hazardous areas is only possible with a thermistor (e.g. PTC Type A).

You will find additional information on the operation of motors in hazardous areas in Chapters ATEX / IECEx-certified motor overload protection (Page 113) and Thermistor motor protection with temperature sensor (optional) (Page 110).

Result

The 3RW50 soft starter monitors the motor for excessive temperature. The motor is shut down if the maximum temperature limit is exceeded. The setting for RESET MODE determines how the motor is restarted.

A.2.8 Connecting the evaluation unit to the analog output

Requirements

- 3RW50 soft starter with analog output

- Evaluation unit for displaying the analog output signal

- Parameterized analog output
  Parameterizing analog output AQ via the High Feature 3RW5 HMI (Page 95)

Procedure

Connect the evaluation unit:

Voltage at the terminals AQ U+ / AQ-	Current at terminals AQ I+ / AQ-
AQ I+ AQ U+ AQ- (V)	AQ I+ AQ U+ AQ- (A)
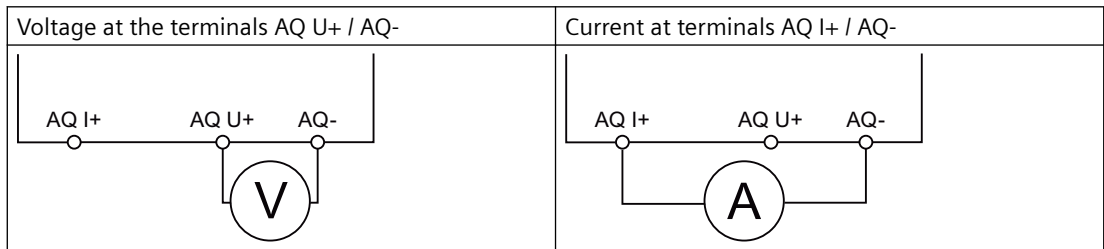
Result

The actual average phase current of the motor is displayed in % at the evaluation unit via the analog output.

A.3 Special applications

A.3.1 Wiring for ATEX / IECEx applications with additional line contactor

Requirements

> ⚠ **DANGER**
>
> **Loss of the certified motor overload protection according to ATEX / IECEx.**
> **Risk of death or serious injury.**
>
> Note that operation in the standard type of motor connection without implementing one of the two following remedial measures results in loss of certified motor overload protection according to ATEX / IECEx.
>
> Depending on the structure of the circuit, choose one of the following possibilities for ensuring certified motor overload protection according to ATEX / IECEx:
>
> • Use an additional line contactor in the main circuit.
>   Connect the line contactor at outputs 95, 96 and 98 (output 3).
>
> • For a motor feeder configuration with a circuit breaker, use an additional undervoltage trip unit.
>   Connect the undervoltage trip unit at outputs 95, 96 and 98 (output 3).
>   For more information, see Chapter Connections (Page 59).
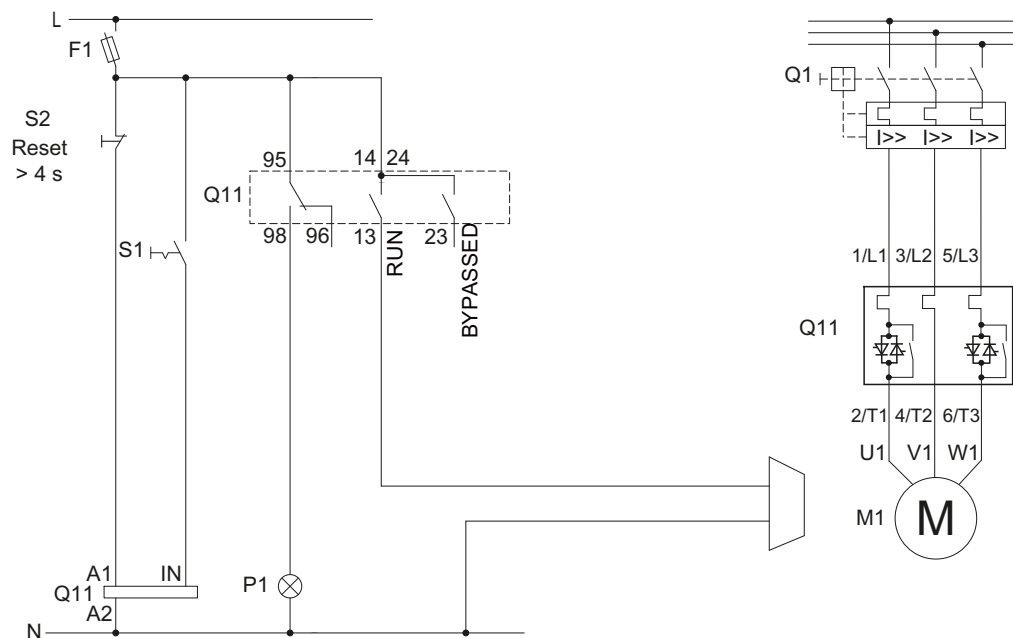
> ⚠ **WARNING**
>
> **Automatic restart.**
> **Can cause death or serious injury.**
>
> If a starting command is pending, a restart will be triggered automatically after the reset. This particularly applies if the motor protection has tripped. Dangerous states of the system can result.
>
> Reset the 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.

Wiring of control circuit for controlling a line contactor

F1	Fuse
S1	Switch
S2	Pushbutton: Reset > 4 s
Q1	Motor starter protector
Q11	3RW50 soft starter
Q21	Line contactor
M1	Motor
P1	Indicator light
P3	Indicator light
PE	Protective conductor

A.3.2 Controlling a motor with a magnetic parking brake

Requirements

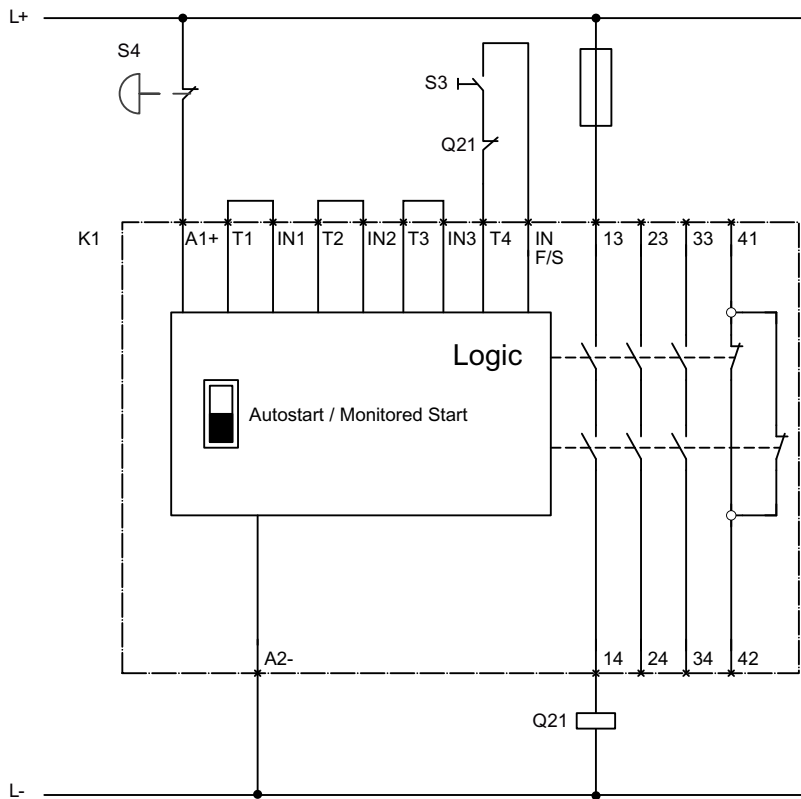ON / RUN relay output was parameterized to RUN.

> **⚠ 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.

Wiring

F1   Fuse

S1   Switch

S2   Pushbutton: Reset > 4 s

Q1   Motor starter protector

Q11   3RW50 soft starter

P1   Indicator light, fault

M1   Motor

A.3.3 EMERGENCY STOP shutdown to SIL 1 or PL c with a 3SK1 safety relay

The 3RW50 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 or PL c according to EN ISO 13849-1:2015 is required, the series connection of an additional contactor with the 3RW50 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
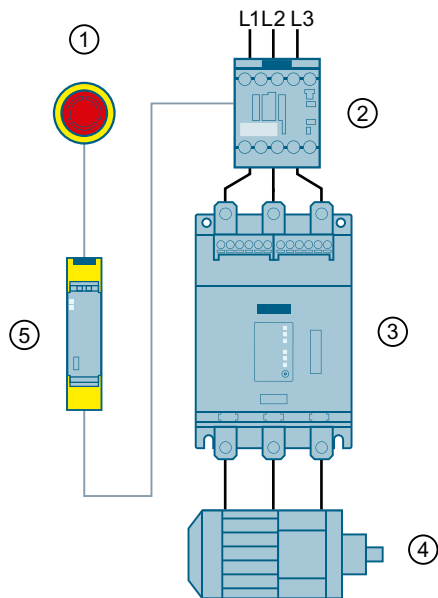
① Emergency stop
② 3RT20 contactor
③ 3RW50 soft starter
④ Motor
⑤ 3SK1 safety relay

Requirements

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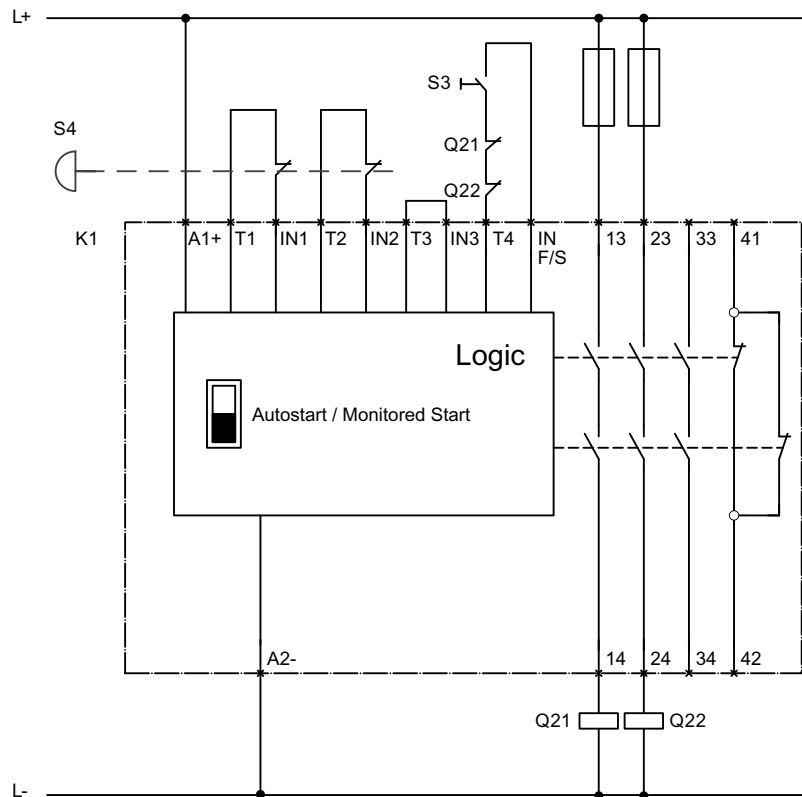>
> To do this, for example, link the group error output (terminals 95 and 96) into the control.

Tripping of the EMERGENCY STOP circuit

If the soft stop function is set (stopping time setting element set to > 0 s) and the emergency stop circuit is tripped, a "Missing load voltage, phase failure / missing load" fault may be indicated on the 3RW50 soft starter. In this case, the 3RW50 soft starter must be reset according to the selected RESET MODE.

Wiring

Wiring of the 3SK1 safety relay

Q21   Contactor

S3   Start button

S4   Emergency stop

K1   3SK1111 safety relay

Wiring of the 3RW50 soft starter
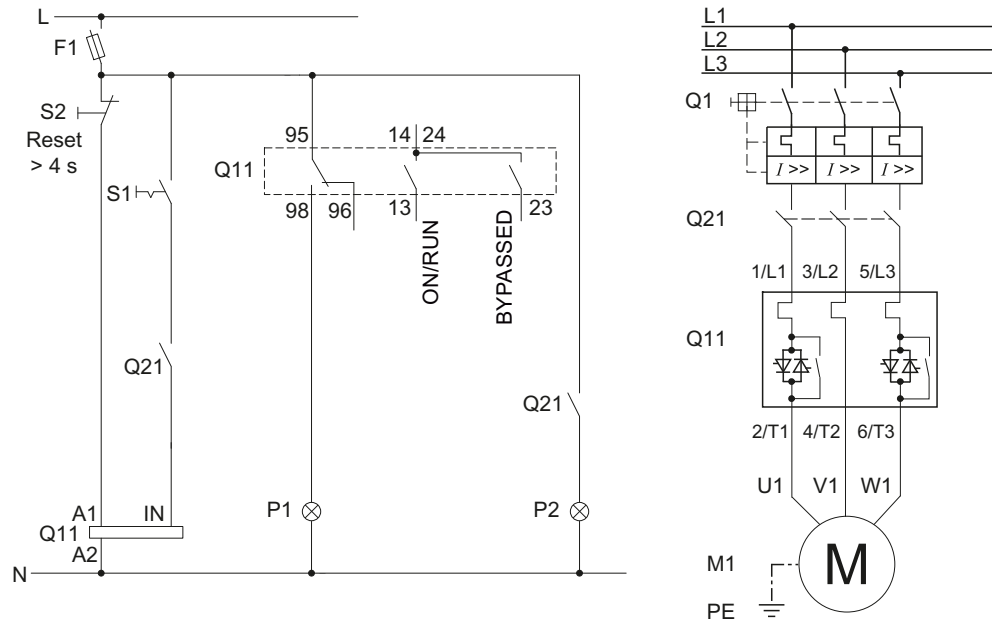
F1	Fuse
S1	Switch: Start / stop
S2	Pushbutton: Reset > 4 s
Q1	Motor starter protector
Q11	3RW50 soft starter
Q21	Contactor
P1	Indicator light
P2	Indicator light
M1	Motor

A.3.4 EMERGENCY STOP shutdown to SIL 3 or PL e with a 3SK1 safety relay

The 3RW50 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.

Safe shutdown up to SILCL 3 according to IEC 62061:2005 and PL e according to EN ISO 13849-1:2015 requires the use of 2 redundant contactors and monitoring of the auxiliary contacts of both contactors. Two-channel monitoring of the EMERGENCY STOP is also required here.

Basic configuration
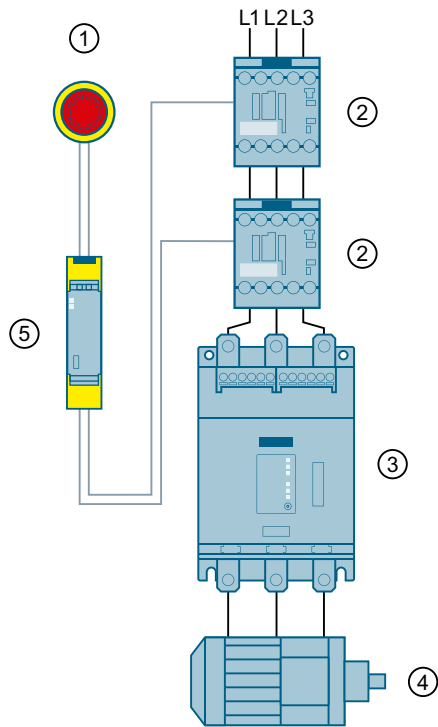
①   Emergency stop
②   3RT20 contactors
③   3RW50 soft starter
④   Motor
⑤   3SK1 safety relay

Requirements

| ⚠ 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. |

Tripping of the EMERGENCY STOP circuit

If the soft stop function is set (stopping time setting element set to > 0 s) and the emergency stop circuit is tripped, a "Missing load voltage, phase failure / missing load" fault may be indicated on the 3RW50 soft starter. In this case, the 3RW50 soft starter must be reset according to the selected RESET MODE.

Wiring

Wiring of the 3SK1 safety relay

Q21	Contactor
Q22	Contactor
S3	Start button
S4	Emergency stop
K1	3SK1111 safety relay

Wiring of the 3RW50 soft starter
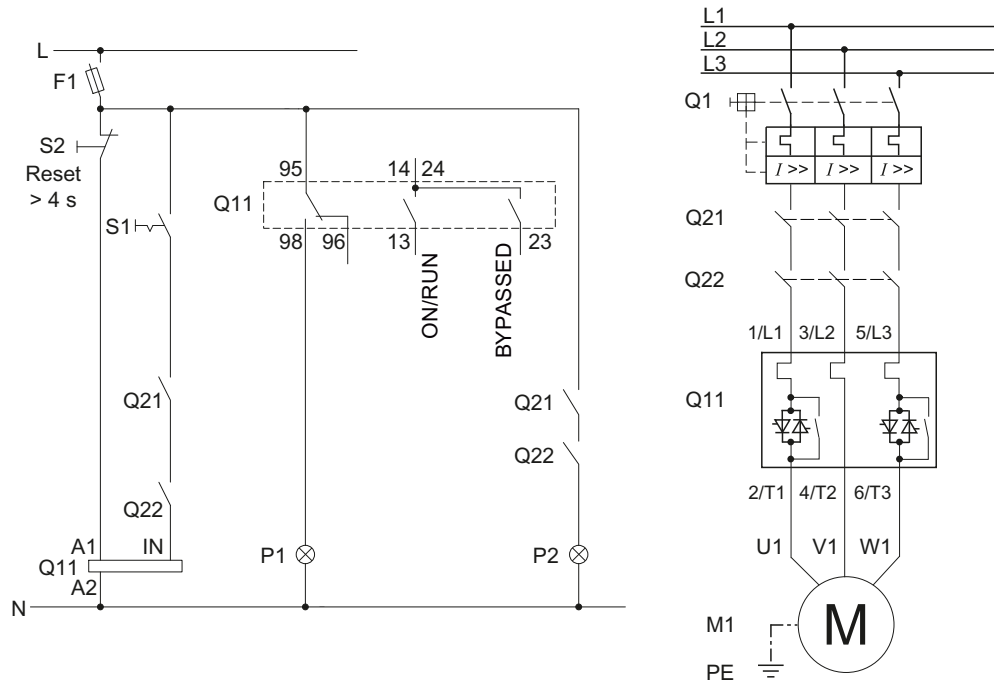
F1	Fuse
S1	Switch: Start / stop
S2	Pushbutton: Reset > 4 s
Q1	Motor starter protector
Q11	3RW50 soft starter
Q21	Contactor
Q22	Contactor
P1	Indicator light
P2	Indicator light
M1	Motor

A.3.5 Contactor for emergency start

Requirements

> ⚠ **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

Loss of the certified motor overload protection according to ATEX / IECEx.

Note that this wiring is not permissible when operating motors in hazardous areas.

Wiring
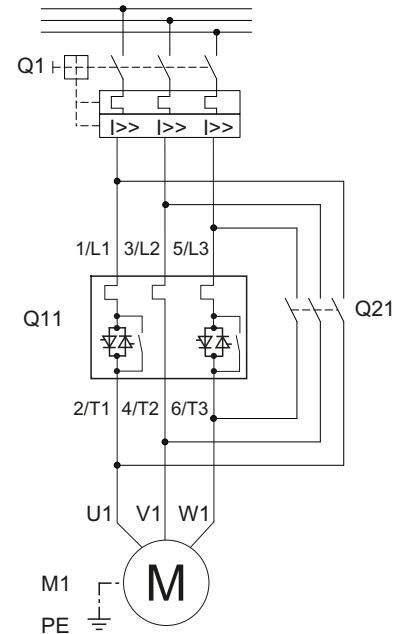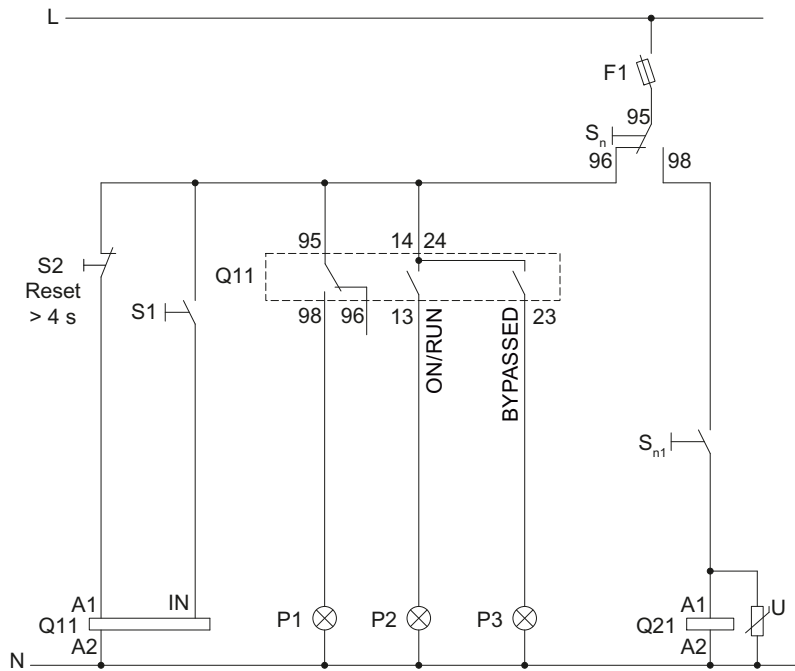
F1   Fuse

S1   Switch

S2   Pushbutton: Reset > 4 s

S$_n$ Soft start selector button

S$_{n1}$ Start / stop (direct-on-line starting)

Q1   Motor starter protector

Q11   3RW50 soft starter

Q21   Direct-on-line starting contactor

P1   Indicator light, fault

P2   Indicator light

P3   Indicator light

M1   Motor

Third-party software B

B.1 Information about third-party software

Note to resellers: Please pass on this document to your customers to avoid license infringements.

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SIRIUS 3RW50 soft starter
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Glossary

Auto RESET

"Auto RESET" means that faults are automatically reset as soon as the cause is eliminated.

Ground fault

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

GSD

Generic station description 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

Generic station description file

This file is required in order to configure a device as a PN 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.

Manual RESET

"Manual RESET" means that the following options are available for acknowledging faults:

- RESET / TEST key on the 3RW50 soft starter
- RESET / TEST key on the 3RW5 HMI Standard
- Reset via bus interface
- Reset via F key on 3RW5 HMI High Feature
- Reset via 3RW5 HMI High Feature

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

Remote RESET

"Remote RESET" means that faults are acknowledged by switching the control supply voltage off and on again. The control supply voltage on the 3RW50 soft starter must be switched off for at least 4 s.

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.

Index

D

Data transfer, 13
Device versions, 20
Device-related information, 128
Diagnostics options, 137
Drilling pattern, 175

E

Electronic motor overload protection, 109
EMERGENCY STOP shutdown to SIL 1 or PL c with a 3SK1 safety relay, 194
EMERGENCY STOP shutdown to SIL 3 or PL e with a 3SK1 safety relay, 197

F

Factory setting, 166
   3RW5 HMI High Feature, 167
   Master RESET key, 168
   MODE and RESET / TEST keys, 169
   Options, 167
   Restore, 169
Fan cover
   Mounting, 43
FAQs, 31
Faults and remedial actions, 143
   3RW5 HMI High Feature, 147
Feeder assembly, type of coordination 1 fuseless, 179
Feeder assembly, type of coordination 1 with fuses, 180
Feeder assembly, type of coordination 2, 181
Firmware update, 164
Function test, 154
Functions, 11
   Additional parameters, 116
   Control via digital input, 118
   Current limiting function, 105
   Soft starting, 103, 107
   Thermistor motor protection with temperature sensor, 110

G

Graphic display of measured values
   Bar chart, 125
   Line chart, 125

H

Hinged cover
   Replacing, 54

I

I&M data, 128
Interaction interfaces, 13
Intrinsic device protection, 111

K

Knowledge, 9

L

LED test, 154
LEDs
   Status and error displays, 139
LICENSE CONDITIONS AND COPYRIGHT NOTICES, 204
Local access protection (PIN), 130
   Change, 132
   Defining, 131
   Delete, 133
Logbooks, 158

M

Main circuit connection (mains supply / motor)
   Connecting, 63
Main circuit connections
   Mounting, 65
Main menu
   Micro SD card, 133
   Monitoring, 127
Maintenance, 161
Manual RESET, 83, 148
Manuals, 30
Master RESET key
   Factory setting, 168
Measured values
   Monitoring, 124
Messages and diagnosis
   Communication diagnostics, 153
   Diagnostics on the 3RW5 HMI High Feature, 153
   Faults and remedial actions of the 3RW5 HMI High Feature, 147

SIRIUS 3RW50 soft starter
Equipment Manual, 11/2021, A5E35628455002A/RS-AB/002