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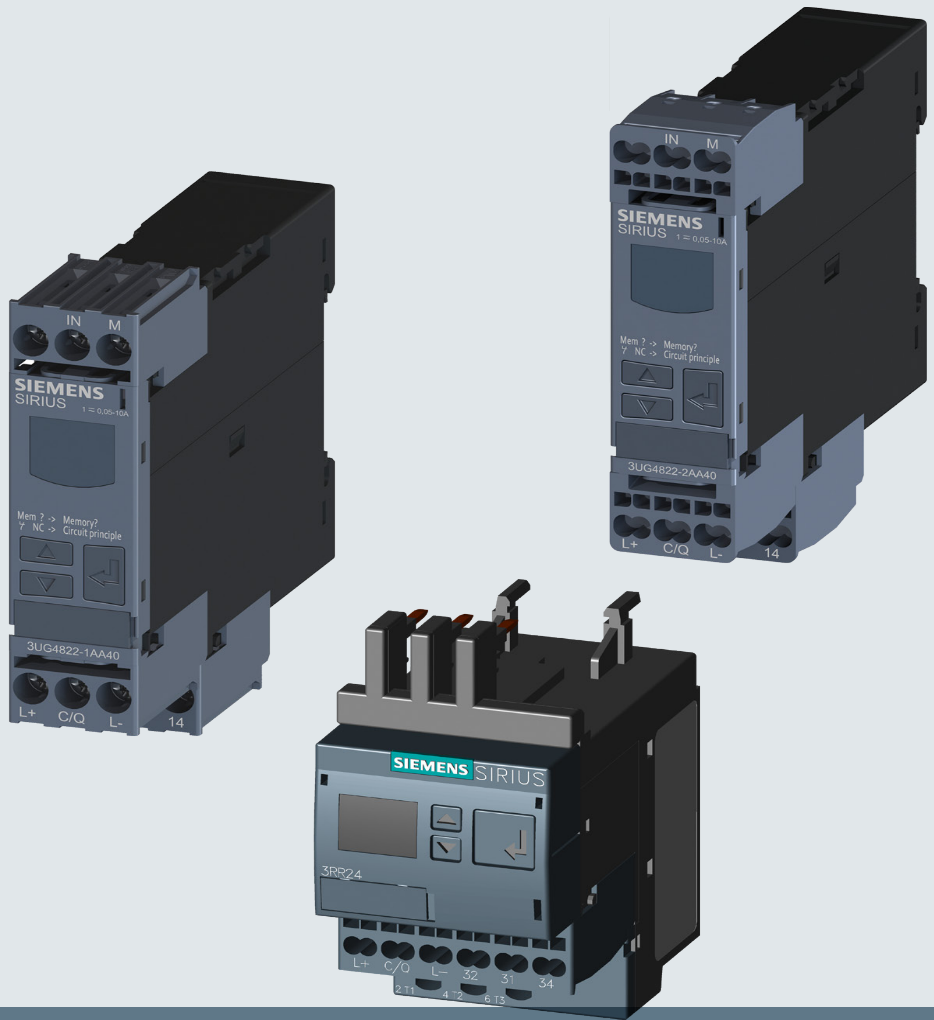

Industrial Controls

Monitoring and Control Devices

3UG48/3RR24 Monitoring Relays for IO-Link

Manual

Edition 09/2014

Answers for industry.

SIEMENS

Industrial Controls

Monitoring and control devices 3UG48/3RR24 monitoring relays for IO-Link

Manual

09/2014

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Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

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

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Industry Sector
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GERMANY

3ZX1012-0UG48-0AC1
℗ 09/2014 Subject to change

Table of contents

Introduction 1

1.1 Purpose of the manual

Purpose of the manual

This manual describes the 3UG48/3RR24 monitoring relays for IO-Link.

The manual provides overview information for integrating the monitoring relays into the system environment, and it describes the hardware and software components of the devices.

The information in this manual enables you to commission the monitoring relays.

Required basic knowledge

To understand these operating instructions you should have a general knowledge of automation engineering and low-voltage switchgear.

Scope of the manual

The manual is valid for these monitoring relays. It contains a description of the devices that is valid at the time of publication.

1.2 Service&Support

Online Support

The Online Support in the Service&Support portal is an extensive information system for all questions relating to Siemens products and solutions. This service enables direct and central access to in-depth information concerning the products, systems and applications for industry and to a large number of programming, configuration and application examples. Its content is available via a mobile app.

The Technical Forum of the Online Support provides the opportunity for users to swap information. Support Request allows contact to be established with Siemens experts in Technical Support.

Siemens Industry Online Support ensures that users in industry are always kept up-to-date with news, software updates and announcements by means of newsletters and Twitter.

Links: Service&Support Portal (http://support.automation.siemens.com), Online Support (http://support.automation.siemens.com/WW/view/en/16605022)

Product Support

Are you looking for product information such as technical data, updates or FAQs? Here, the "Product Support" section of the Service & Support Portal offers an extensive collection of all information about the Siemens Industry Automation and Drive Technologies products and solutions:

- Answers to frequently asked questions (FAQs)
- Updates/upgrades, service packs and support tools for downloading
- Manuals and operating instructions
- Technical data/CAx data
- Approvals and certificates
- Test certificates and characteristic curves

All Product Support information is at your disposal free of charge and around the clock, and you always get the current version.

Link: Product Support (http://support.automation.siemens.com/WW/view/en/4000024)

CAx data

The CAx Download Manager provides you with a simple means of gaining access to up-to-date product data for your CAx or CAe system.

You configure your own download package with just a few clicks. You can choose from the following information for products

- Product images
- 2D dimensional drawings
- 3D models
- Internal circuit diagrams
- EPLAN macro files
- Manuals
- Characteristics
- Operating instructions
- Certificates
- Product master data

Link: CAx Download Manager (http://support.automation.siemens.com/WW/view/en/42455541)

Applications & Tools

Applications & Tools supports you with various tools and examples when it comes to solving your automation tasks. Solutions are presented in interaction with several components in the system, without focusing on individual products.

- Application examples
- Function blocks & tools
- Background and system descriptions
- Performance statements
- Demonstration systems/videos

Link: Applications & Tools (http://support.automation.siemens.com/WW/view/en/20208582)

My Documentation Manager

My Documentation Manager enables you to compile your own documentation from our standard documents (manuals), which are located in the Product Support section. Under mySupport, you have the opportunity to create and manage you own compilations in a structure of their own.

Link:

MyDocumentationManager (http://support.automation.siemens.com/WW/view/en/38715968)

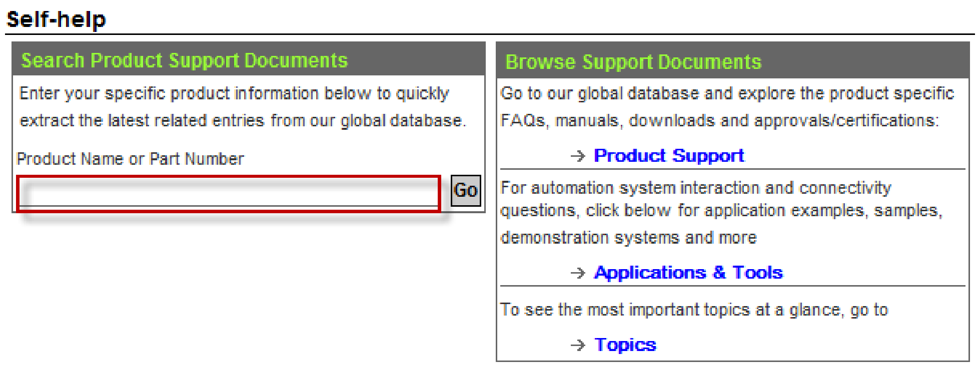
Reference

You can find further information on structure and navigation in Online Support here (http://support.automation.siemens.com/WW/view/en/11774658).

1.3 Product data sheet

You will find the current SIRIUS Innovations product data sheets in the Service&Support Portal (http://support.automation.siemens.com).

Enter the article number of the device in the "Product Name or Part Number" field and confirm your selection by clicking on the "Go" button.



On the "Product Support" page, select the "Technical/CAx data" tab.

Select the "Technical Data" option box and a list of the contents of the product data sheet will appear:

- Technical data
- Approvals/Certificates
- Dimension drawing
- Wiring diagram
- Internal circuit diagram

3RT2015-1AB01 CONTACTOR,AC3:3KW 1NO AC24V 50/60HZ

Product information | Entries | Technical / CAx data | Modification Manual | Successor product

◉ Technical Data ○ CAx data

CONTACTOR, AC-3, 3KW/400V, 1NO, AC 24V, 50/60 HZ, 3-POLE, SZ S00 SCREW TERMINAL

General technical data:		
product brand name		SIRIUS
Size of the contactor		S00
Product extension		
• auxiliary switch		Yes
• function module for communication		No
Protection class IP / on the front		IP20
Protection against electrical shock		finger-safe
Degree of pollution		3
Installation altitude / at a height over sea level / maximum	m	2,000
Ambient temperature		
• during storage	°C	-55…+80
• during operating	°C	-25…+60
Shock resistance		
• at rectangular impulse		
• at AC		6,7g / 5 ms, 4,2g / 10 ms
• at sine pulse		
• at AC		10,5g / 5 ms, 6,6g / 10 ms
Impulse voltage resistance / rated value	kV	6
Insulation voltage / rated value	V	690
Maximum permissible voltage for protective separation / between coil and main contacts / in	V	400

Using the "Create PDF" button on the right-hand side, you have the option of downloading your selection in a PDF file.
All information on the product you have chosen is at your disposal free of charge around the clock and you always get the current version.

Further documentation

To install and connect the monitoring relays, you require the operating instructions of the monitoring relays used.

The Appendix "References (Page 245)" has a list of the operating instructions.

1.4 DataMatrix code

A DataMatrix code is lasered onto all 3UG4/3RR2 monitoring relay devices underneath the label.

The DataMatrix codes are standardized in ISO/IEC 16022. The DataMatrix codes on Siemens devices use ECC200 coding for powerful error correction.

The following device information is encoded in the DataMatrix codes as a bit stream:

- Article number
- Serial number
- If applicable, MAC address

This information is stored in the following format in the DataMatrix code:

1P	Article number	+	S	Location	/	Date	Serial number
Data identifier	User content	Separator	User content	Separator	User content	User content	User content

---

Note

The information content is displayed without spaces.

This machine-readable information simplifies and accelerates handling of the respective devices.
As well as fast access to the serial numbers of the respective devices for unique identification, the DataMatrix codes simplify communication with Siemens Technical Support.

SIEMENS Industry Support App

DataMatrix codes primarily enable extremely fast and convenient access to all device-specific information relating to an article number in the SIEMENS Service&Support Portal, such as operating instructions, manuals, data sheets, FAQs, etc.
We provide the SIEMENS Industry Support app free for this purpose and it can be used on most commercially available smartphones and tablets.
The SIEMENS Industry Support app is available for iOS and Android-based devices and can be accessed via the following links:

Link for Android

Link for iOS

Recycling and disposal

These devices can be recycled thanks to their low pollutant content. For environmentally-friendly recycling and disposal of your electronic waste, please contact a company certified for the disposal of electronic waste.

Up-to-the-minute information

You can obtain further assistance by calling the following numbers:

Technical Assistance:

Telephone: +49 (911) 895-5900 (8 a.m. to 5 p.m. CET)

Fax: +49 (911) 895-5907

or on the Internet at:

E-mail: (mailto:technical-assistance@siemens.com)

Internet: (www.siemens.com/industrial-controls/technical-assistance)

Correction sheet

A correction sheet is included at the end of the manual. Please use it to record your suggestions for improvements, additions and corrections, and return the sheet to us. This will help us to improve the next edition of the manual.

Safety information 2

2.1 Standards

Applicable standards

The monitoring relays comply with the following standards:

Table 2- 1 Standards - monitoring relays

Device standards	• IEC / EN 60947-1 "Low-voltage switchgear and controlgear: General rules" • IEC / EN 60947-4-1 "Contactors and motor-starters: Electromechanical contactors and motor-starters" • IEC / EN 60947-5-1 "Control circuit devices and switching elements: Electromechanical control circuit devices"; VDE 0660 "Low-voltage switchgear" • DIN EN 50042 "Terminal marking" • DIN EN 60044-1 "Instrument transformers - Part 1: Current transformers"
EMC standard1)	• IEC / EN 61000-6-2 "Generic standards - Immunity for industrial environments" • IEC / EN 61000-6-4 "Generic standards - Emission standard for industrial environments"
Resistance to extreme climates	• IEC 60721-3-3 "Classification of environmental conditions" The monitoring relays are climate-proof according to IEC 60721-3.
Touch protection	• IEC / EN 60529 "Degrees of protection provided by enclosures" Monitoring relays are safe to touch in accordance with IEC / EN 60529.

1) This is a device of Class A. When used in domestic areas, the device can cause radio interference. Users may have to take suitable measures.

Reference

SIRIUS components have been approved by a whole range of bodies for various sectors (shipbuilding, etc.). An up-to-date list of approvals appears in Chapter 10 of the Catalog IC 10 - SIRIUS "Industrial Controls" (www.siemens.com/industrial-controls/catalogs), and more information, as well as an option to download certificates, can be obtained on the Internet (www.siemens.com/automation/csi_en).

IO-Link

You can find more information about communication via IO-Link, and about the valid standards for monitoring relays for IO-Link, on the Internet (http://www.io-link.com/en).

2.2 Product-specific safety information

Intended use

> **WARNING**
>
> **Intended use**
>
> **Can Cause Death, Serious Injury, or Property Damage.**
>
> The devices may only be used for the applications described in the catalog and the technical description, and only in conjunction with equipment or components from other manufacturers which have been approved or recommended by Siemens.
>
> This product can function correctly and reliably only if it is transported, stored, assembled, and installed correctly, and operated and maintained as recommended.
>
> Before you run any sample programs or programs that you have written yourself, make sure that running the plant cannot cause injury to anyone else or damage to the machine itself.

Hazardous Voltage

> **WARNING**
>
> **Hazardous Voltage.**
>
> Will cause death or serious injury.
>
> Turn off and lock out all power supplying this device before working on this device.

Radio interference

> **Note**
>
> The devices have been built as Class A devices.
> Use of these devices in domestic areas can result in radio interference!

2.2.1 Current information about operational safety

Important note for maintaining the operational safety of your system

> **WARNING**
>
> **Hazardous Voltage**
>
> **Can Cause Death, Serious Injury, or Property Damage.**
>
> **Please take note of our latest information**
>
> Systems with safety-related characteristics are subject to special operational safety requirements on the part of the operator. The supplier is also obliged to comply with certain actions when monitoring the product. For this reason, we publish a special newsletter containing information on product developments and features that are (or could be) relevant to operation of safety-related systems. You should subscribe to the corresponding newsletter in order to obtain the latest information and to allow you to modify your plant accordingly.
>
> SIEMENS newsletter (www.siemens.com/sirius/newsletter)
>
> Sign up to the following newsletter under "Products & Solutions":
>
> - Control Components and System Engineering News

2.3 Approvals, test certificates, characteristics

Approvals, test certificates, characteristics

You can find an overview of the certifications available for low-voltage controls and distribution products and other technical documentation, updated daily, on the Internet (www.siemens.com/industrial-controls/support).

You will find further information in the Catalog IC 10 - SIRIUS "Industrial Controls," Chapter 10 (www.siemens.com/industrial-controls/catalogs).

3 System overview

3.1 Product description

Product description

The tried and tested SIRIUS monitoring relays for electrical and mechanical quantities enable constant monitoring of all important characteristic quantities that provide information about the reliability performance of the plant. Sudden disturbances and gradual changes, which may reveal a maintenance requirement, for example, are both indicated. Through relay outputs, the monitoring relays enable direct shutdown of the affected sections of the plant as well as alarming (e.g. by switching a warning lamp). To respond flexibly to short-term disturbances such as voltage dips or load variation, the monitoring relays have settable delay times. This avoids unnecessary alarming and shutdowns while enhancing plant availability.

The individual monitoring relays provide the following functions in different combinations:

- Phase sequence
- Phase failure, neutral failure
- Phase asymmetry via current or voltage measurement
- Voltage below and / or above thresholds
- Current below and / or above thresholds
- Power factor below and / or above thresholds
- Monitoring of the active current or apparent current
- Monitoring of fault current
- Speed below and / or above thresholds

The SIRIUS 3UG48/3RR24 monitoring relays for IO-Link offer many other performance features in addition to monitoring functions:

- Measured values (including resolution and unit) to the higher-level control.
  Some device versions allow you to set which value is to be transferred cyclically.
- Transmission of alarm flags to the higher-level control.
- Comprehensive diagnostics capability by querying the precise cause of the error in the diagnostic data record.
- Remote parameterization additionally possible (supplementing local parameterization or instead of local parameterization).
- Fast parameterization of identical devices by duplicating the parameter assignment in the higher-level control.
- Parameter transfer by means of Upload to the higher-level control via- IO-Link call or by parameter server[1)] when using an IO-Link master in
  IO-Link Communication Specification V1.1 or higher).
- Local parameter assignment can be disabled via IO-Link.
- To prevent automatic startup after a power failure and to avoid losing diagnostic data, errors can be configured so that they are saved to non-volatile memory.
- Linking to a higher-level control makes it possible to assign parameters to the monitoring relays via a display unit. The measured values can be displayed directly in a control room or at the machine/control cabinet.

Up until now, using redundant sensors and/or analog signal converters to transfer measured values to a higher-level control incurred significant additional expense and wiring effort. Combining the autonomous monitoring relays with IO-Link communication reduces this wiring outlay and cuts costs.
As the availability of up-to-date measured values means that the higher-level control can take care of the control tasks within the plant, the continued availability of the output relays on the monitoring relays increases the plant's operational reliability (e.g. by shutting down the plant if thresholds that cannot be achieved under normal operating conditions are overshot).

The monitoring relays continue to function autonomously in spite of the IO-Link connection. Parameters can be assigned locally at the device, independently of a higher-level control. As long as the 24 VDC supply voltage is available, the monitoring relays will function if the controller fails or is not yet available. If the 3UG48/3RR24 monitoring relay is used for IO-Link without a connection to a higher-level control, because of the integrated SIO-Mode, the devices feature an additional semiconductor output that switches when settable warning thresholds are exceeded.

[1)] The parameter server provides an assurance of consistent central data management in the event of changes to parameters (made locally or via the control). The "Parameter server" function supports the automatic backup of parameter data (automatic re-assignment of parameter data if a device is replaced).

3.2 Application areas

Application areas

Use of SIRIUS 3UG48/3RR24 monitoring relays for IO-Link is especially recommended for machines and plants in which the devices for providing the current measured values and / or for remote parameterization are to be connected to the automation level easily, rapidly and with no errors.

3.3 Application planning

The following information must be taken into account when planning applications involving the SIRIUS monitoring relays.

Installation altitude

The monitoring relays are approved for installation altitudes up to 2,000 m. The reduced air density at altitudes higher than 2,000 meters affects the electrical characteristics of the monitoring relays. The reduction factors which have to be taken into account when using monitoring relays at altitudes higher than 2,000 m can be obtained on request on the Internet (www.siemens.com/automation/csi_en).

Operating conditions and resistance to extreme climates

The monitoring relays are climate-proof. They are intended for use in enclosed spaces in which no severe operating conditions prevail (e.g. dust, caustic vapors, hazardous gases). Appropriate measures must be taken when installing in areas subject to dust and humidity. Condensation on the devices is not permissible.

Special application environments

The SIRIUS devices have been approved by a whole range of bodies for various sectors (shipbuilding, etc.). An up-to-date list of approvals is provided in Chapter 10 of the Catalog IC 10 - SIRIUS "Industrial Controls." You will find more information and an option to download certificates on the Internet (www.siemens.com/automation/csi_en).

3.4 Connection systems

3.4.1 Screw connection

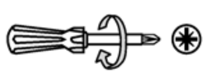
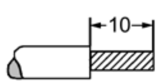
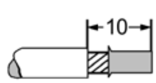
Screw-type connection

Use the following tool to establish the connection: All SIRIUS monitoring relays feature size PZ 2 screws for Pozidriv screwdrivers.

The devices have screw terminals with captive screws and washers. The screw terminals also allow for the connection of 2 conductors with different cross-sections.

Connection cross-sections of the removable terminal blocks with screw-type connections

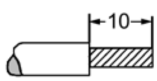
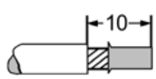
Table 3- 1 Removable terminal block with screw-type connections - monitoring relays

		Removable terminal
Tool		Pozidriv size PZ 2, Ø 5 to 6 mm
Tightening torque		0.8 to 1.2 Nm
Solid and stranded		1 x (0.5 to 4) mm²
		2 x (0.5 to 2.5) mm²
Finely stranded without end sleeve		---
Finely stranded with end sleeve		1 x (0.5 to 2.5) mm²
		2 x (0.5 to 1.5) mm²
AWG		2 x (20 to 14)

Connection cross-sections of the permanently connected terminal blocks with screw-type connections

The following table lists the permissible conductor cross-sections for the main conductor terminals of 3RR24 digitally adjustable current monitoring relays (size S00, S0 and S2) with screw-type connections.

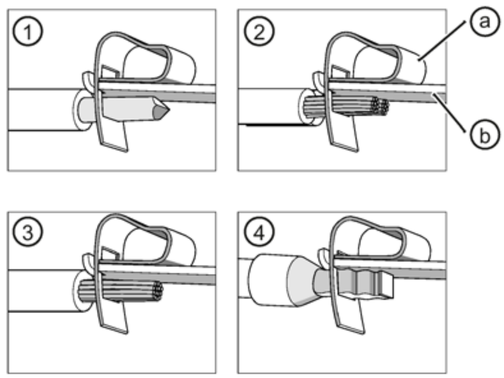
Table 3- 2 Permanently connected terminal block with screw-type connections - Main conductor terminals of the 3RR24 current monitoring relays

		Permanently connected terminal		
		Size S00	**Size S0**	**Size S2**
Tool		Pozidriv size PZ 2, Ø 5 to 6 mm	Pozidriv size PZ 2, Ø 5 to 6 mm	Pozidriv size PZ 2, Ø 5 to 6 mm
Tightening torque		0.8 to 1.2 Nm	2 - 2.5 Nm	3 to 4.5 Nm
Solid		2 x (0.5 to 1.5) mm²	2 x (1 to 2.5) mm²	2 x (1.0 to 35 mm²)
		2 x (0.75 to 2.5) mm²	2 x (2.5 to 10) mm²	1 x (1.0 to 50 mm²)
		max. 2 x (1 ... 4) mm²		
Finely stranded without end sleeve		---	---	---
Finely stranded with end sleeve		2 x (0.5 to 1.5) mm²	2 x (1 to 2.5) mm²	2 x (1.0 to 25 mm²)
		2 x (0.75 to 2.5) mm²	2 x (2.5 to 6) mm²	1 x (1.0 to 35 mm²)
			max. 1 x 10 mm²	
AWG		2 x (20 to 14)	2 x (16 to 12)	2 x (18 to 2)
		1 x 12	2 x (14 to 8)	1 x (18 to 1)

3.4.2 Spring-loaded connection

Spring-loaded connection

All SIRIUS monitoring relays have spring-loaded connections. They make wiring quick and maintenance-free, while also meeting high demands in terms of vibration and shock resistance. If the cross-section of a connectable wire is greater than 6 mm², the forces required for operation of the tension spring are so high that the spring-loaded connection can no longer be used in a problem-free manner. For this reason, size S2 current monitoring relays are only offered with screw-type or spring-loaded terminals in the control circuit. The terminals of the main current paths are always screw-type terminals.



①	Solid
②	Finely stranded
③	Stranded
④	Finely stranded with end sleeve
a	Spring-loaded terminal
b	Busbar

Figure 3-1 Spring-loaded terminal

The conductors can be clamped directly or you can pre-treat them to add a form of splice protection. This could involve attaching end sleeves or pin cable lugs to the ends of the conductors; the tidiest solution is to use conductors whose ends have been sealed by means of ultrasound.

The devices are equipped with a two-wire terminal, i.e. two independent connections for each current path (exception: in the case of 3RR2, terminals of the main current paths have one clamping point). Just one conductor is connected to each clamping point. The spring-loaded terminal presses the conductor against the busbar, which curves around inside the terminal. The high contact pressure per unit area achieved in this way is gas-tight. The spring-loaded terminal presses flat against the conductor, but does not damage it. The spring force of the spring-loaded terminal has been dimensioned such that the clamping force adjusts to the conductor diameter automatically. This ensures that any conductor deformation caused by settling, creepage, or yielding is compensated for. The clamping point cannot become loose of its own accord. This connection is vibration- and shock-proof. Vibrations or shocks will not damage the conductor, nor will they cause contact separation. These terminals are particularly well suited for use with machines and systems which are subject to stresses such as these, e.g. vibrators, rail vehicles, and elevators.

The contact pressure between the conductor and the busbar is set to an optimum level, so this clamp connection is appropriate for high-voltage applications, as well as for transferring voltages and currents in the mV or mA range within instrumentation and electronic components.

A standardized screwdriver (3 mm slot; 3RA2908-1A) is offered in the Catalog IC10 "Industrial Controls" (www.siemens.com/industrial-controls/catalogs) as an actuation tool for opening the spring-loaded terminals.

3.4.3 Making spring-loaded connections (3RR24 IO-Link)

Spring-loaded connection for mountable 3RR24 current monitoring relays

The table below describes the procedure for creating a spring-loaded connection:

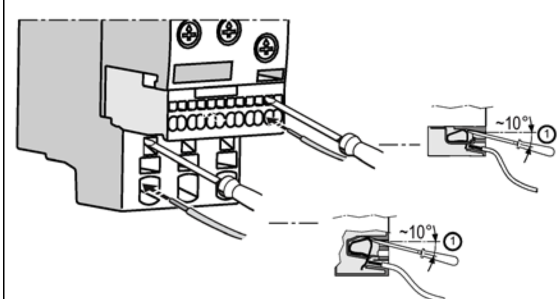
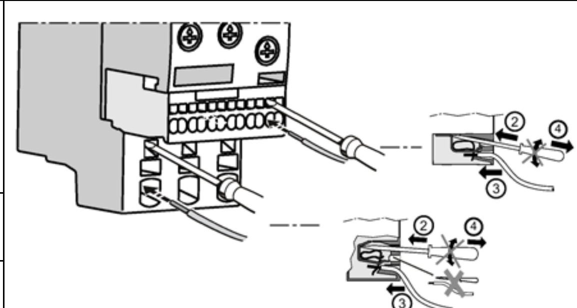
DANGER

Hazardous Voltage.

Will cause death or serious injury.

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

Table 3- 3 Connecting the spring-loaded terminal of the 3RR24 current monitoring relay

Step	Instructions	Figure
1	Insert the screwdriver into the respective operating slot.	
2	Press the screwdriver down, then push it into the operating slot as far as it will go. The screwdriver blade keeps the spring-loaded terminal open automatically.	
3	Insert the conductor into the oval connection slot.	
4	Remove the screwdriver. The terminal closes and the conductor is now securely clamped.	

Note

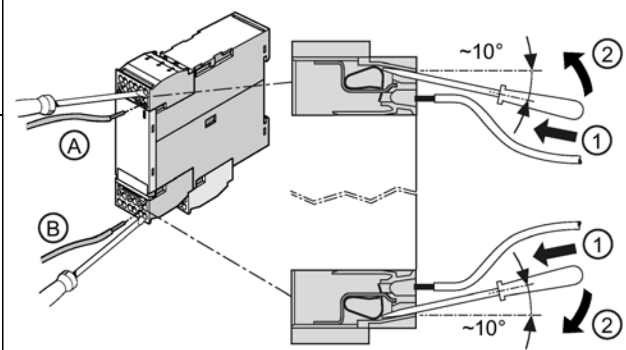
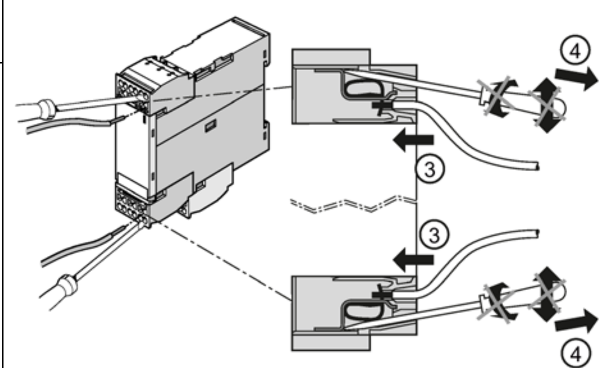
Damage to spring-loaded terminal on the 3RR24 current monitoring relay!

If you insert the screwdriver into the central opening (main circuit S00 and S0 only) on the spring-loaded terminal, this could damage the terminal.

Do not insert the screwdriver into the central opening on the spring-loaded terminal.

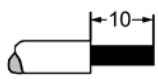
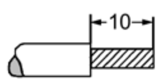
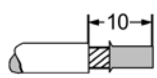
Spring-loaded terminal for 3UG4 monitoring relay

Table 3- 4 Connecting the monitoring relay spring-loaded terminal

Step	Operating instruction	Figure
1	Insert the screwdriver into the topmost (A) or bottommost (B) operating slot on the right-hand side.	
2	Press the screwdriver up (A) or down (B), then push it into the operating slot as far as it will go. The screwdriver blade keeps the spring-loaded terminal open automatically.	
3	Insert the conductor into the oval connection slot.	
4	Remove the screwdriver. The terminal closes and the conductor is now securely clamped.	

Connection cross-sections of the removable terminal blocks with a spring-loaded connection (3RR and 3UG)

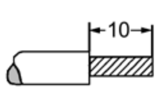
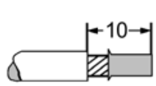
Table 3- 5 Removable terminal block with spring-loaded connections - monitoring relays

		Removable terminal
Tool		Ø 3.0 x 0.5 (3RA2908-1A)
Solid and stranded		2 x (0.25 to 1.5) mm²
Finely stranded without end sleeve		2 x (0.25 to 1.5) mm²
Finely stranded with end sleeve		2 x (0.25 to 1.5) mm²
AWG		2 x (24 to 16)

Connection cross-sections of the permanently connected terminal blocks with a spring-loaded connection

The following table lists the permissible conductor cross-sections for the main conductor terminals of the digitally adjustable 3RR2 current monitoring relays (size S00 and S0) with spring-loaded connection.

Table 3- 6 Permanently connected terminal block with spring-loaded connection - main conductor terminals of 3RR24 current monitoring relays

		Permanently connected terminal	
		Size S00	Size S0
Tool		Ø3.0 x 0.5 (3RA2908-1A)	Ø3.0 x 0.5 (3RA2908-1A)
Solid		1 x (0.5 to 4) mm²	1 x (1 to 10) mm²
Finely stranded with-out end sleeve		1 x (0.5 to 2.5) mm²	1 x (1 to 6) mm²
Finely stranded with end sleeve		1 x (0.5 to 2.5) mm²	1 x (1 to 6) mm²
AWG		1 x (20 to 12)	1 x (18 to 8)

3.4.4 Device replacement by means of removable terminals

DANGER

Hazardous Voltage

Will cause death or serious injury.

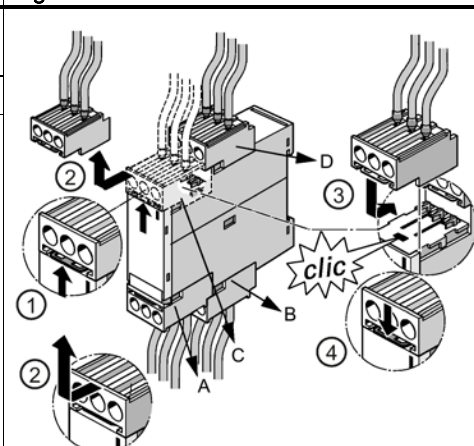
Turn off and lock out power before working on this equipment.

The removable terminals of 3UG4 monitoring relays facilitate device replacement when necessary. The mechanical coding on the terminals prevents mix-ups.

Note

The terminals can only be dismantled in the following order due to their arrangement on the monitoring relay:

1. Lower, front terminal (A)
2. Lower, rear terminal (B)
3. Upper, front terminal (C)
4. Upper, rear terminal (D)

Step	Instructions	Figure
1	Press the interlock in the direction of the removable terminal.	
2	Remove the terminal to the front.	
3 / 4	Attach the new terminal and press the terminal into the device until the interlock audibly engages.	

Note

The procedure is similar on devices with fewer connection terminals.

3.4.5 Connection options for IO-Link

The IO-Link device is connected to the IO-Link master via the removable terminal and supplied with 24 V DC via this connection.

DANGER

Hazardous Voltage

If voltages are too high, the IO-Link device can be damaged and electric shock can result.

Use only power supplies that comply with the requirements of protective extra-low voltage (PELV in accordance with IEC EN 50178).

DANGER

Hazardous Voltage

Will cause death or serious injury.

Turn off and lock out power before working on this equipment.

There are 2 ways of powering the monitoring relays via the control circuit.

Option 1: Connection to IO-Link master

Connect the IO-Link device with the master via the three cables L+, C / Q and L-. The IO-Link device is powered via the 2 cables L+ and L-. The monitoring relay communicates with the master via cable C / Q.

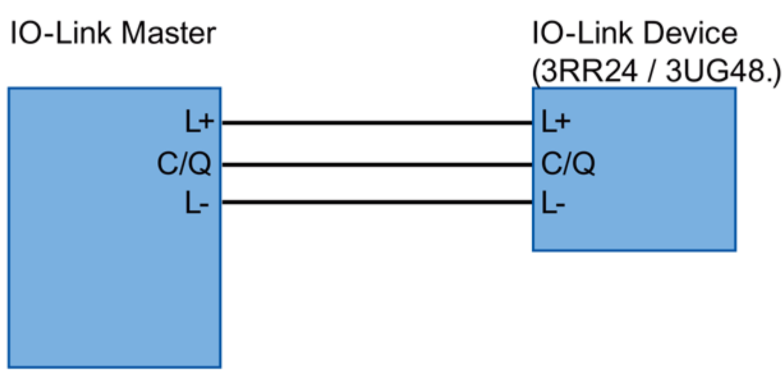


Figure 3-2 Connection to IO-Link master

Option 2: Direct voltage supply with 24 V DC

If no master is available, you can operate the IO-Link device with a 24 V DC voltage source.

For this purpose, connect the IO-Link device with the voltage source via the two cables L+ and L-. Because cable C / Q is not used in this case, communication via IO-Link is not possible.

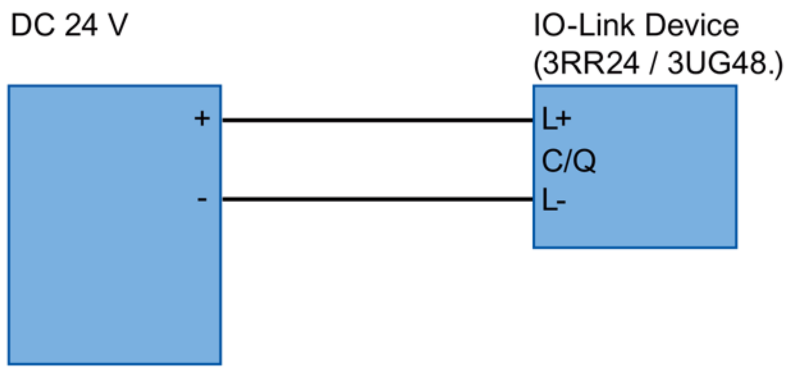


Figure 3-3 Direct voltage supply with 24 V DC

The pin assignments of the available IO-Link devices are described in the relevant product chapters.

3.5 Mounting/removal

3.5.1 Mounting 3RR24 current monitoring relays

Mounting options

3RR24 current monitoring relays are matched electrically and mechanically to the 3RT2 contactors and the 3RF34 solid-state contactors (size S0). This makes direct mounting easy. Alternatively, the devices can also be installed as stand-alone units in the case of separate mounting or simultaneous use of a 3RU2/3RB3 overload relay. The accessories required for separate mounting are described in the Chapter "Terminal support for stand-alone assembly (Page 210)".

Minimum clearance

The following minimum clearances from grounded and live parts must be complied with when installing the 3RR24 monitoring relay:

- At the side: 6 mm
- Forward (on front): 6 mm

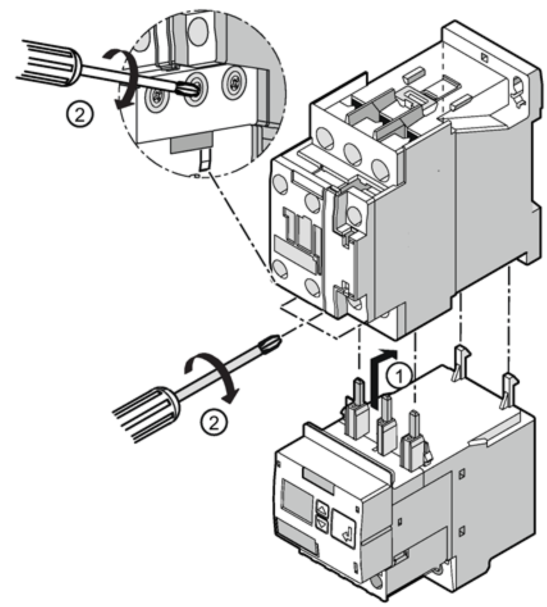
Mounting position

It can be mounted in any position.

Direct mounting on 3RT2 contactor / 3RF34 (size S0) solid-state contactor

The diagram below shows a typical scenario based on mounting the analog setting 3RR24 current monitoring relay, size S0, on the 3RT2 contactor.

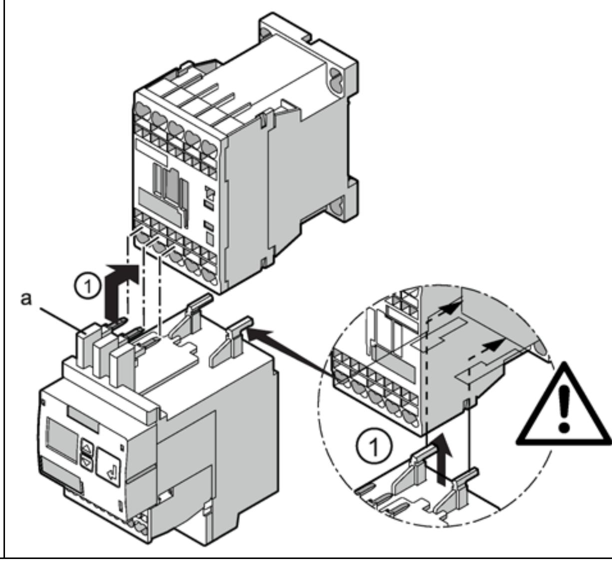
Table 3- 7 Mounting 3RR24 current monitoring relays, screw-type connections (size S0)

Step	Instructions	Figure
1	Push the current monitoring relay into the contactor from below. Attach the two hooks on the current monitoring relay to the two openings on the rear of the contactor. This pushes the main current contacts into the corre- sponding terminals on the contactor.	
2	Tighten the screws on the contactor with a Pozidriv size 2 (S00) or Pozidriv size 3 (S0) screwdriver (tightening torque 0.8 to 1.2 Nm). or a Pozidriv size 2 (S2) screwdriver (3.0 to 4.5 Nm). Check that the cable is firmly clamped.	

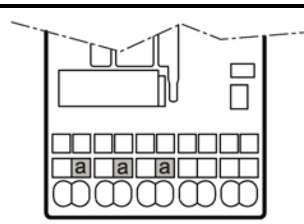
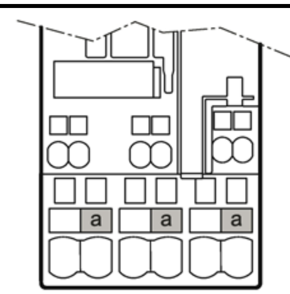
Note

The connection cross-sections of the removable and permanently connected terminal blocks with screw-type connections are described in the Chapter "Screw connection (Page 26)".

Table 3- 8 Mounting 3RR24 current monitoring relays, spring-loaded connection system (size S0)

Step	Instructions	Figure
1	Insert the contacts (a) into the central opening of the spring-loaded terminals on the contactor (see below, a), with the contacts flush to the right. Make sure that the guide tabs (zoom view) are inserted into the designated slots on the contactor. The current monitoring relay will sit correctly flush with the contactor on the left- and right-hand sides.	

The figures below show the openings of the main conductor terminals on the contactor (S00 and S0) into which the contacts on the current monitoring relay have to be inserted.

Main conductor terminal on the contactor (a) (S00):	Main conductor terminal on the contactor (a) (S0):
	

Note

Adapter for direct mounting on 3RF34 solid-state contactor

For direct mounting on a 3RF34 solid-state contactor, an additional 3RF3900-0QA88 adapter is required, which is attached to the solid-state contactor. Information is provided in the "SIRIUS solid state contactors / solid state reversing contactors" (http://support.automation.siemens.com/WW/view/en/44362244) operating instructions.

Disassembly

To disassemble the S00 / S0 assemblies from the DIN rail, press the contactor down and pull it toward you.

Table 3- 9 Disassembling 3RR24 current monitoring relays, screw-type connections (size S0)

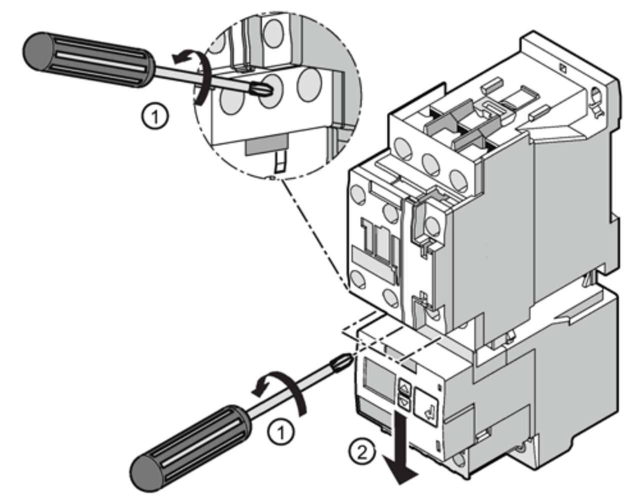
Step	Instructions	Figure
1	Undo the screws on the main conductor terminals.	
2	Pull the current monitoring relay down and away from the contactor.	

Table 3- 10 Disassembling 3RR24 current monitoring relays, spring-loaded connection system (size S00)

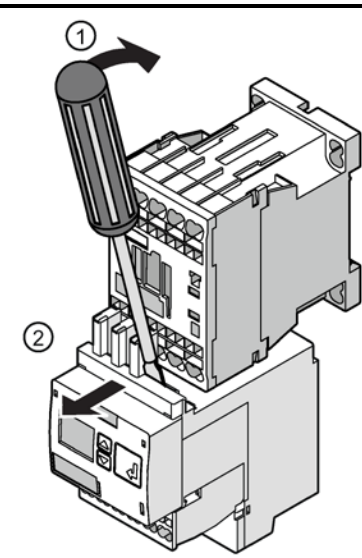
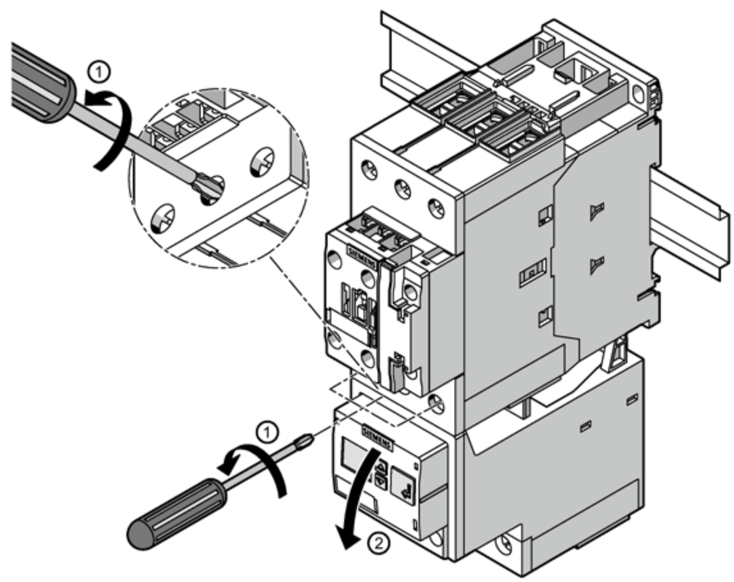
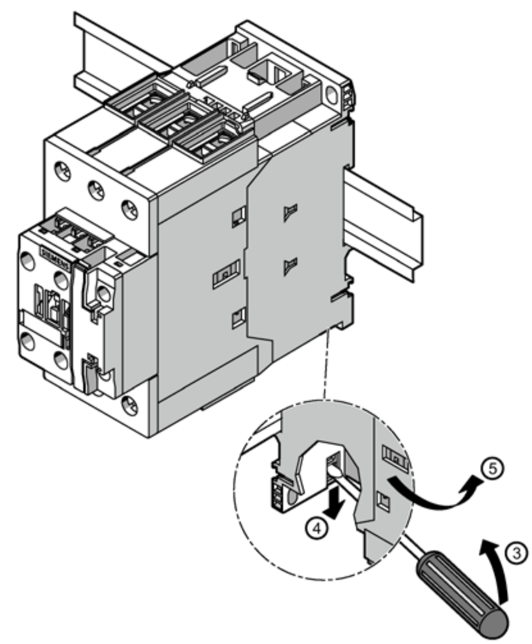
Step	Instructions	Figure
1	Position the screwdriver on the current monitoring relay as shown in the figure. Carefully dislodge the current monitoring relay from the contactor.	
2	Pull the current monitoring relay toward you and away from the contactor.	

Table 3- 11 Disassembling 3RR24 current monitoring relays (size S2)

Step	Instructions	Figure
1	Undo the screws on the main conductor terminals.	
2	Pull the current monitoring relay down and away from the contactor	
3	Push the release slide down with a screwdriver	
4		
5	Swing the contactor upwards to remove it	

Separately mounted

Note

The accessories required for separate mounting are described in the Chapter "Terminal support for stand-alone assembly (Page 210)".

3.5.2 Mounting 3UG4

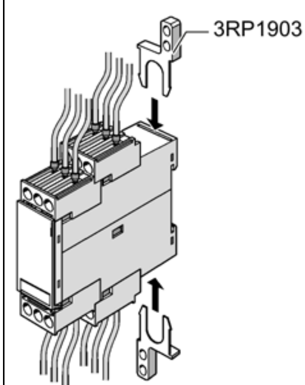
Mounting position

It can be mounted in any position.

Screw mounting

The illustration below shows how to screw-mount the 3UG4 monitoring relay.

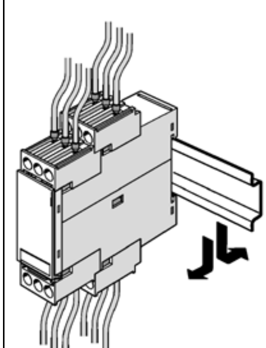
Table 3- 12 Mounting the monitoring relay (screw mounting)

Step	Operating instruction	Image
1	Slide the push-in lugs into the openings on the monitoring relay at the top and bottom, and use the screwdriver to secure the device by screwing suitable screws through the holes in the push-in lugs.	

Standard-rail mounting

The illustration below shows how to mount the 3UG4 monitoring relay onto a standard rail.

Table 3- 13 Mounting the monitoring relay (mounting on and removing from standard rail)

Step	Operating instruction	Image
1	Position the device on the top edge of the mounting rail and press it down until it snaps onto the bottom edge of the rail. To remove the device, press it down, pushing against the mounting springs, and swivel the device to remove it.	

3.6 Overview of the functions

Table 3- 14 Functions of the digitally adjustable 3RR24 current monitoring relays for IO-Link

	Current monitoring relay
	3RR24
Current monitoring	
Monitoring for undercurrent	3p
Monitoring for overcurrent	3p
Range monitoring	3p
Apparent current monitoring	✓
Active current monitoring	✓
Monitoring for phase failure, wire break	3p
Monitoring for phase sequence	✓
Monitoring for current asymmetry	✓
Internal ground-fault detection (fault current monitoring)	✓
Blocking current monitoring	✓
Supply voltage	
External power supply (via the IO-Link master or an external 24 V DC voltage source)	✓
Additional functions	
Runtime meter	✓
Switching cycle counter	✓
Voltage measurement	1p
Cos phi calculation	✓
Runtime meter	✓
Switching cycle counter	✓
Voltage measurement	1p
Cos phi calculation	✓
Apparent power calculation	3p
Active power calculation	3p

✓: Function available

1p: Measuring is single-phase

3p: Monitoring/calculation is 3-phase

Table 3- 15 Functions of the 3UG48 monitoring relays for IO-Link

Function	Monitoring relays						
	3UG48						
	15	16	32	22	25	41	51
Line monitoring and voltage monitoring							
Monitoring for phase sequence	✓	✓	—	—	—	—	—
Monitoring for phase failure	✓	✓	—	—	—	—	—
Monitoring for asymmetry	✓	✓	—	—	—	—	—
Monitoring for undervoltage	3p	3p	1p	—	—	—	—
Monitoring for overvoltage	3p	3p	1p	—	—	—	—
Monitoring for N-conductor failure	—	✓	—	—	—	—	—
Fault current monitoring							
Monitoring for fault current/ground fault	—	—	—	—	✓	—	—
Cos phi monitoring and current monitoring							
Monitoring for undercurrent	—	—	—	1p	—	1p	—
Monitoring for overcurrent	—	—	—	1p	—	1p	—
Active current monitoring	—	—	—	—	—	1p	—
Apparent current monitoring	—	—	—	1p	—	—	—
Monitoring for cos phi	—	—	—	—	—	1p	—
Speed monitoring							
Monitoring for speed overshoot	—	—	—	—	—	—	✓
Monitoring for speed undershoot	—	—	—	—	—	—	✓
Supply voltage							
External power supply (via the IO-Link master or an external 24 V DC voltage source)	✓	✓	✓	✓	✓	✓	✓

✓: Function available

1p: Monitoring is single-phase

3p: Monitoring is 3-phase

— : Function not available

True root mean square measurement (tRMS) / use with frequency converters:

The monitoring relays work with an electronic measuring method which calculates the actual (effective) value of a measured value (tRMS), regardless of whether the measured variable's waveform is purely sinusoidal or distorted.

The measured signal must only meet the following requirements:

- Periodic waveform (sinusoidal) within the specified frequency range
- Continuous zero crossings

As long as the line on the primary or the secondary side in the environment of a frequency converter fulfills these requirements, the monitoring relays can also be operated upstream or downstream of frequency converters. The required line quality can be ensured by using line filters/sine-wave filters where applicable. Of course, the suitability of the relevant monitoring relay for the monitored line frequencies must also be considered.

3.7 Menu-based operation

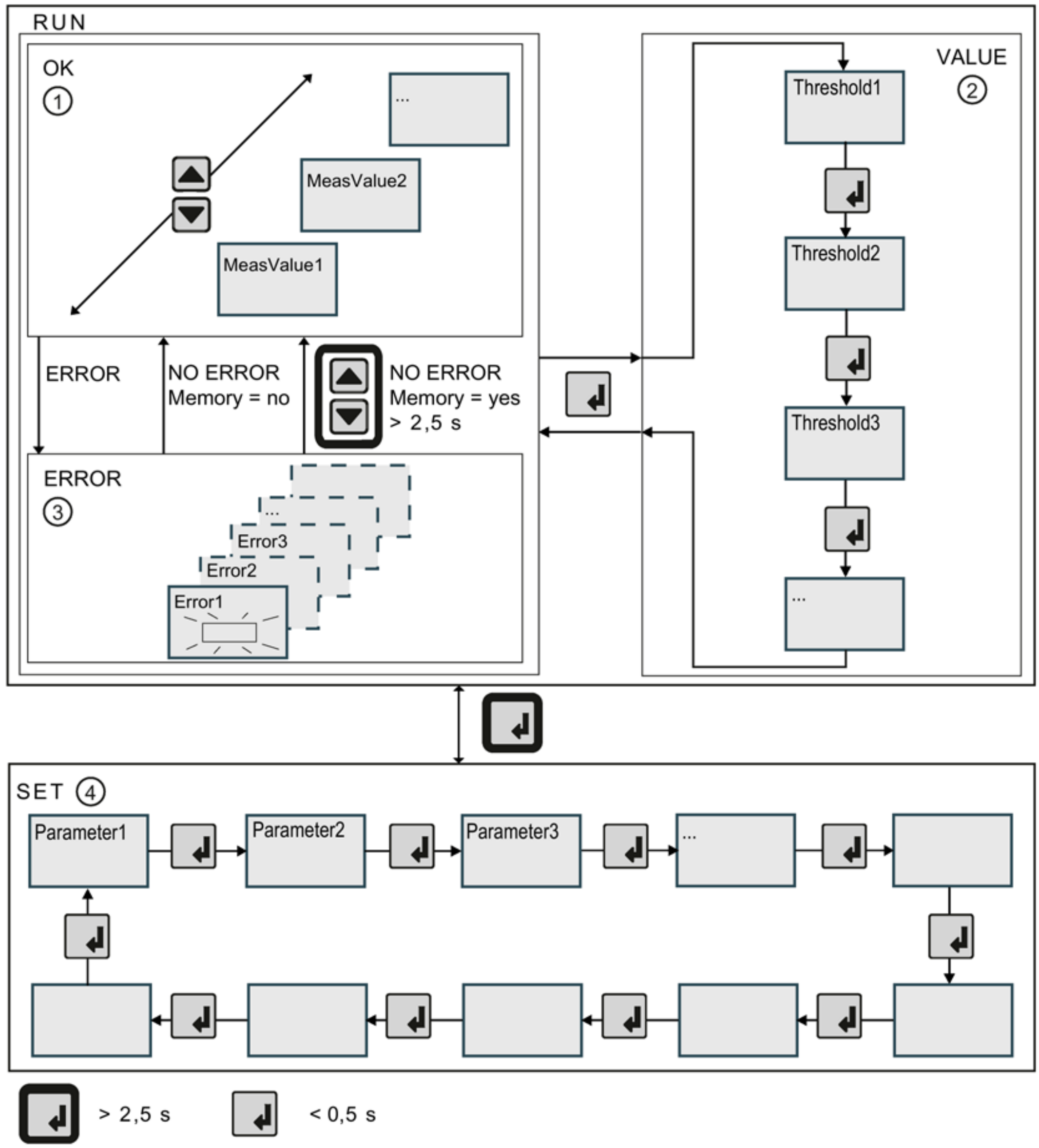
Operator controls

The digitally adjustable monitoring relays have three keys for navigating on the menu levels:

- SET key for navigating to the menu levels and for switching between the menu levels
- 2 arrow keys for setting parameters

Navigation through the menu system of the monitoring relays is explained below in a schematic diagram.
Depending on the device version and as long as no faults have occurred, one or more different measuring values ① can be displayed with the help of the arrow keys. In the event of a fault, the display indicates the type of fault ③ by means of flashing symbols. By repeatedly pressing the SET key briefly, it is possible to set the desired type of monitoring (overshoot, undershoot, or range monitoring) and parameterize the lower and/or upper threshold ② in accordance with the device-specific setting ranges. After pressing the SET key for at least 2.5 s, in a further step, the basic device parameters ④, such as the switching behavior of the output relays, the reset response in the event of a fault, and/or the tripping delay times can be set.

Menu-based operation



①	RUN - OK • Measured value1 / Measured value2 / ...	Status display in the correct range, see below
②	RUN - VALUE	Settings of the monitored thresholds, see below
③	RUN - ERROR	Status display in the event of a fault If a threshold is overshot or undershot, the outputs of the monitoring relays switch over after the set delay time. The display indicates the type of error.
	• Error1 / Error2 / ...	Error detected
④	SET	Settings for basic device parameters, see below

Menu levels "RUN" and "SET"

The RUN menu alternately shows the current measuring value ① and the communication status. You can use the arrow keys to change between the individual measuring values on devices with multiple outputs. In this case, the display changes automatically between the name of the measuring value, the actual measuring value and the communication status. The following symbols indicate the current communication status of the devices:

Table 3- 16 Communication status

Symbol	Meaning
	After switching on, the device is in standard I/O mode (SIO-Mode) until communication has taken place. The IO-Link master can switch the device back to standard I/O mode (SIO-Mode) at any time.
	IO-Link communication is being established.
	The connected IO-Link Master has switched the device to Communication-Mode (IO-Link mode).
	IO-Link communication interrupted The device signals a fault. The monitoring functions of the monitoring relay are still active. The IO-Link Master can switch the device back to Communication-Mode (IO-Link mode) when communication is resumed.

② represents the selected type of monitoring (overshoot, undershoot, or window monitoring). An arrow symbol indicates whether the measuring value is within, above or below the set warning thresholds or thresholds. If a threshold has been parameterized, the symbol is represented by continuous lines. If a warning threshold only has been parameterized, the symbol is represented by broken lines.

Next to this, one or two symbols ③ represent the type (changeover contact) and the switching status of the outputs.

Note

If the IO-Link connection is not used, the monitoring relays work in standard I/O mode (SIO-Mode) and terminal C/Q is used as a semiconductor output.

If a device is in SIO-Mode, the semiconductor output is not shown on the display (③)!

Navigation in the menu

There are basically two ways of navigating on both menu levels:

- Brief pressing the SET key (≤ 0.5 s)

  You can jump from one parameter to the next within one menu level by briefly pressing the SET key . The order is not variable.

Entry	Display at the RUN menu level	Display at the SET menu level
1.	Current measuring value (MeasValue1 / MeasValue2 / ...) or error symbol (Error1 / Error2 / Error3 / ...), switching contact symbols and monitoring methods for diagnostics	Parameter1
2.	Threshold1	Parameter2
3.	Threshold2	Parameter3
4.	Threshold3	...
5.	...	

Note

The setting options a device actually offers depends on the type and can be looked up in the relevant chapters on operation in this manual.

- Pressing and holding the SET key (> 2.5 s)

  By pressing and holding the SET key , the menu changes from RUN to SET and vice versa.

  – RUN → SET

    Menu level change can be started from any display. While the SET key is pressed, appears on the display.

    After a successful change, you always arrive at the first menu item (parameter1) of the "SET" menu level.

    In the event of an error, changing to the "SET" menu level is only possible from "RUN-VALUE" ②. If an error is indicated, the SET key must be pressed first briefly (< 0.5 s).

  – SET → RUN

    You can switch menus from any of the menu commands. While the SET key is pressed, appears on the display.

    After a successful change, you arrive at current measuring value (measuringvalue1) or the current error of the RUN menu level.

Note

Aborting the menu switchover

The switchover process will be interrupted if the SET key is released while or is displayed. The menu will revert to the menu command you were working with when the switch was initiated.

Note

Reset in the event of an error

To reset the device, it is necessary to press both arrow keys simultaneously for more than 2.5 s after removal of the cause of error and with Hand-RESET active. While the keys are pressed, appears on the display.

The possible settings for resetting the devices via the "Reset response" parameter can be found in the "Operation" chapters of the relevant monitoring relays.

Note

A return to showing the actual measured value takes place automatically 30 seconds after the last limit value change.

Note

When you exit the SET menu level, an internal Reset is performed and the ON-delay time or stabilization time will be restarted.

Note

On device variants 3UG4822 / 3UG4825 and 3UG4841, an internal reset is performed when you exit menu level SET, and the startup delay time is restarted.

3RR24 current monitoring relays 4

4.1 Application areas

The 3RR24 current monitoring relays are used, for example, in the following applications:

- Monitoring for current overshoot and current undershoot
- Monitoring for cable breaks
- Monitoring for no-load operation and load shedding (as might be the case, for example, in the event of a torn V belt)
- Underload monitoring in the lower performance range (if a pump was running in no-load operation, for example)
- Monitoring for overload (as might affect pumps with a soiled filter system, for example)
- Monitoring the performance of electrical loads such as heaters
- Monitoring for incorrect phase sequences on mobile equipment such as compressors or cranes
- Monitoring for high-impedance faults to ground (caused by damaged insulation or moisture, for example)
- Energy management
- Condition monitoring

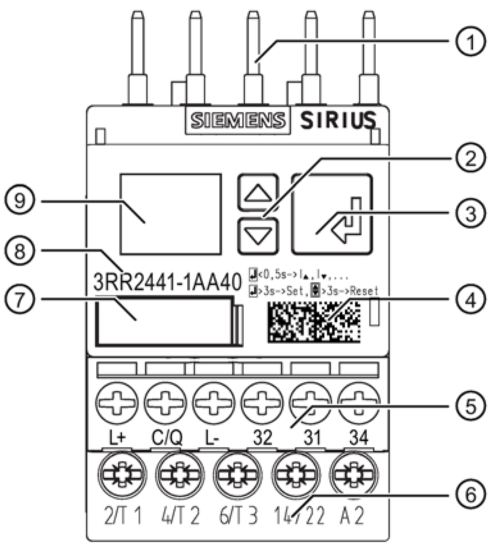
Table 4- 1 Application areas of the 3RR24 current monitoring relays

Function	Application
• Undercurrent • Overcurrent • Apparent current • Active current • Phase failure / wire break • Phase sequence • Internal ground-fault detection (fault current monitoring) • Blocking current • Runtime meter • Switching cycle counter	• Emergency lighting • Heating systems (electroplating plants, plastic injection machines, paintshops) • Lamps (tunnels, OR lighting, traffic lights, signal systems, UV lamps, infrared radiators, laser lamps) • Fan • Pumps • Sawing system • Conveyor belt • Surface grinding machine • Breaking mill • Milling machine • Car wash • Lifting platform • Screw conveyor • Crane • Turning machine • Woodworking • Grain mills • Steel industry

4.2 Operator controls and connection terminals

Front view / terminal labeling

Front view



Description

Position digits	
①	Connection for contactor mounting or for stand-alone assembly
②	Arrow keys for menu navigation
③	SET key for menu navigation
④	Legend for menu-based operation/data matrix code
⑤	Control circuit terminal (removable): The control circuit can be connected using either the screw-type or the spring-loaded connection system.
⑥	Main circuit terminal (permanently connected) : The main circuit can be connected using either the screw-type or the spring-loaded connection system.
⑦	Label
⑧	Device article number
⑨	Display for parameterization, actual-value indication, and diagnostics

Terminal labels	
L+	Supply voltage for IO-Link
C/Q	Communication signal/switching signal
L-	Ground IO-Link
32	Output relay K1 CO contact NC contact, e.g. for alarm threshold
31	Output relay K1 CO contact root, e.g. for alarm threshold
34	Output relay K1 CO contact NO contact, e.g. for alarm threshold
2/T1, 4/T2, 6/T3	Main circuit terminals
14/22	Feed-through contactor auxiliary switch (only for S00 with screw-type connection)
A2	Feed-through contactor coil connection (only for S00 with screw-type connection)

You can find additional information on the connection terminals and the permissible conductor cross-sections in the Chapter "Connection systems (Page 26)".

You can find information on connecting in the Chapter "Internal circuit diagrams (Page 65)".

4.3 Function

Overview

SIRIUS 3RR24 current monitoring relays are suitable for monitoring the current of motors or other loads. They perform three-phase monitoring of the rms value of AC currents for **overshoot** or **undershoot** of set thresholds. The SIRIUS 3RR24 current monitoring relays have a change-over contact and also monitor **phase sequence**, **phase failure**, **ground fault** and **blocking current**. The settings can be made using three buttons and a display direct on the device. The devices can also be parameterized via IO-Link to transfer the measured current values and error messages to a controller. As well as detailed fault diagnostics, the integral runtime meter and switching cycle counter can also be read out and reset via IO-Link.

Whereas apparent current monitoring is primarily used in the rated torque range or for overload, active current monitoring can be used to observe and evaluate the degree of loading across a motor's entire torque range.

Apparent current monitoring and active current monitoring are described in more detail in the Chapter "Parameters (Page 247)".

Combination with 3RT20 contactors

The 3RR24 current monitoring relays have been matched to the contactors in the 3RT2 series both electrically and mechanically and can be integrated in the feeder by means of direct mounting. This eliminates the need for the main circuit to be wired separately and no additional transformers are required.

Table 4- 2 Combination options with 3RT20 contactors

Current monitoring relay type	Current range	3RT20 1 S00 contactors 3/4/5.5/7.5 kW	3RT20 2 S0 contactors 5.5/7.5/11/15/18.5 kW	3RT20 3 S2 contactors kW 18.5/22/30/37 kW
3RR2441	1.6 to 16 A	✓	(with stand-alone assembly support)	(with stand-alone assembly support)
3RR2442	4.0 to 40 A	(with stand-alone assembly support)	✓	(with stand-alone assembly support)
3RR2443	8.0 to 80 A	(with stand-alone assembly support)	(with stand-alone assembly support)	✓

For a stand-alone assembly or if an overload relay is being used at the same time, terminal supports for stand-alone assembly are available for separate DIN rail mounting. See the Chapter "Terminal support for stand-alone assembly (Page 210)"

The current monitoring relays are available in three sizes (S00, S0 and S2).

Accessories

The accessories have been tailored to the current monitoring relays; they can be mounted easily and without the need for tools. The accessories are described in the Chapter "Accessories (Page 209)".

General functionality

Depending on the set limit values, 3RR24 current monitoring relays monitor 3-phase AC load currents (apparent current I_s or active current I_p) that flow via the device's terminals 1/L1 - 2/T1, 3/L2 - 4/T2 and 5/L3 - 6/T3 for **overshoot** (**I▲**) or **undershoot** (**I▼**) or in **range monitoring** (**I▲** and **I▼**). The true root mean square value (tRMS) of the current is measured.

The devices are supplied via the supply voltage IO-Link (L+) and ground IO-Link (L-) or via an external 24 V DC voltage source.

The devices support further diagnostic options such as **residual current monitoring** and **phase sequence monitoring**, and are also be used to monitor motors even below the rated torque. The integral counters for **runtime** and **switching cycles** support operators in requirement-oriented plant maintenance.

The **runtime meter** gives the time during which there was a measurable current in at least two current paths. The properties of the insulation material of the motor windings, for example, deteriorate during operation due to the thermal load. The operating hours can be used as an indicator for pending maintenance or replacement of machine or plant parts. To reset the **operating hours counter**, the value **0xA1** must be written into data set 2.

The **switching cycle counter** is incremented by one each time a breaking operation is detected (transition from three-phase current flow to no current flow can be measured). The number of switching cycles can be used as an indicator of pending maintenance or replacement of switching elements. Arcs in breaking operations cause high loads and wear. To reset the **switching cycle counter**, the value **0xA0** must be written into data set 2.

The 3RR24 current monitoring relays have a display and are parameterized with three keys. The devices can also be parameterized via IO-Link and transfer the measured current values and error messages to a controller.

You can find the setting ranges and factory settings of the 3RR24 current monitoring relays in the Chapter "Operation (Page 55)".

You will find a description of the individual parameters in the Chapter "Parameters (Page 247)". You can find the full data sets in the Chapter "Process data and data sets (Page 279)".

Monitoring

If the supply voltage is switched on and no load current is flowing, the display indicates "I1" and a symbol for the set current monitoring principle.

ON-delay time

If the load current exceeds the lower measuring range limit (size S00: 1.5 A; S0: 3.8 A; S2: 7.6 A), the set ON-delay time (onDel) begins according to the set current principle (closed-circuit principle NC or open-circuit principle NO). During this time, undershooting or overshooting of the set threshold values will not result in a relay response of the CO contact.

Tripping delay time

The set tripping delay time (I▾Del, I▴Del) starts if the load current flowing under normal operating conditions overshoots or undershoots the corresponding set threshold value. After expiry of this time, the output relay K1 changes the switching state, depending on the set relay switching response. On the display, the currently displayed measuring value and the symbol for undershoot or overshoot flash. An output change-over contact is available as a signaling contact.

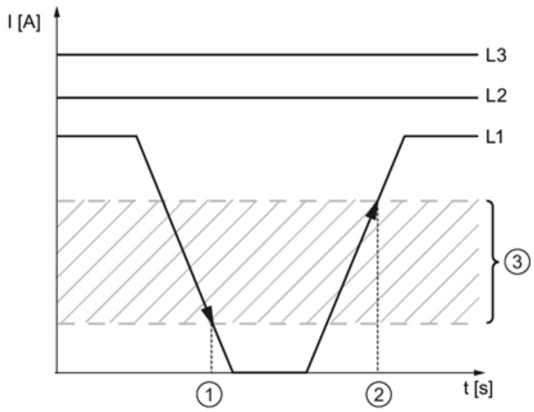
You can find the switching states of the output relay K1 below in the section "Function diagrams" and in the Chapter "Diagnostics (Page 59)".

SIO-Mode

The monitoring relays have a connection C/Q to IO-Link. If the IO-Link connection is not used for communication via IO-Link, the 3RR24 current monitoring relays work in standard I/O mode (SIO-Mode). In this mode, terminal C/Q can be used as a semiconductor output that switches on a violation of the warning threshold for undershoot, overshoot or voltage asymmetry.

- Q off: 24 V DC supply voltage present.
- Q on: The output has a high resistance.

Cable break detected



① Cable break detected

② No cabel break

③ Hysteresis cable break:
- S00: 1.2 A to 1.6 A
- S0: 3.0 A to 4.0 A
- S2: 6.0 A to 8.0 A

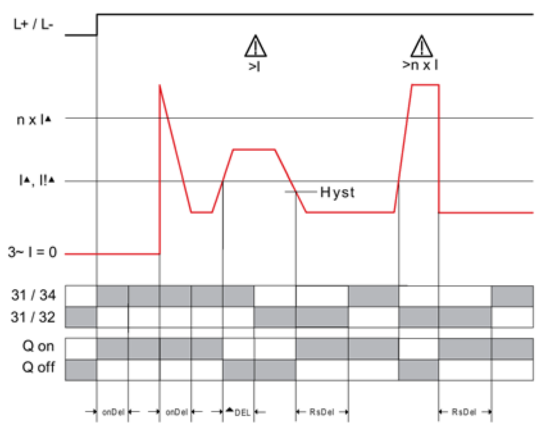
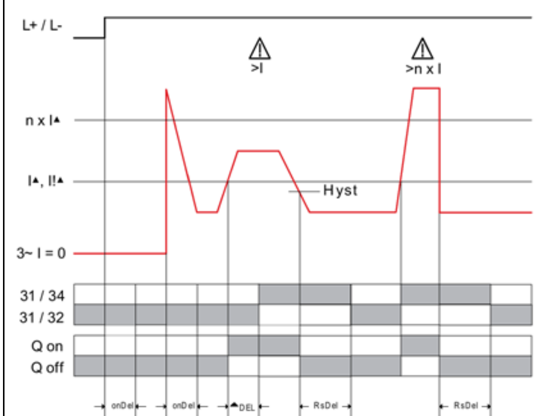
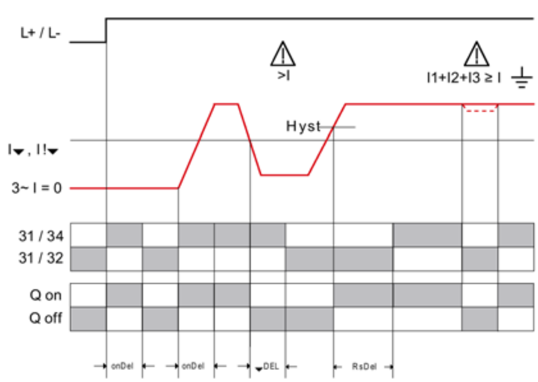
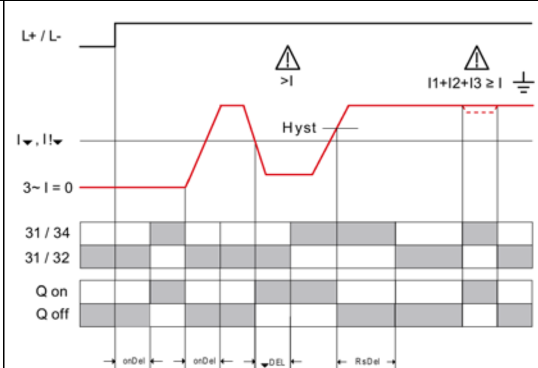
Figure 4-1 Cable break

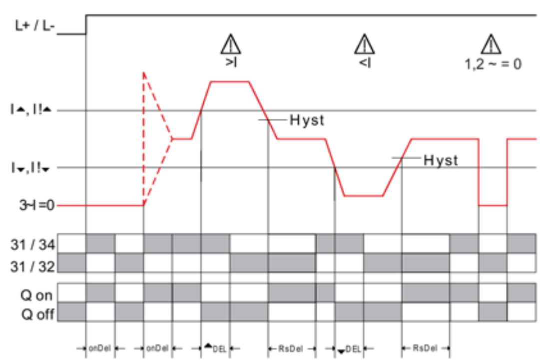
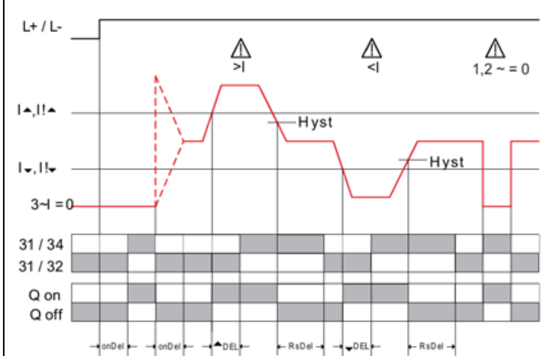
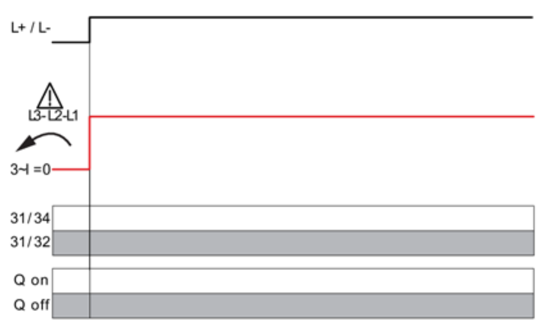
If a cable break is detected in a branch circuit (time ①), all delay times which are running (onDel, RsDel, Del) are aborted and the CO contact changes its switching state immediately (≤ 200 ms). The cable break is reported to the controller via IO-Link.

When a defined current flow returns to all branch circuits (1L/1 - 2/T1, 3/L2 - 4/T2 und 5/L3 - 6/T3) (time ②), the CO contact responds again according to the defined settings.

If manual RESET (Mem = yes) is selected, the tripping state is saved.

Function diagrams

Display	Memory = no Relay switching behavior = NC (closed-circuit principle)	Memory = no Relay switching behavior = NO (open-circuit principle)
I▲ / I!▲ I▼ / I!▼ = Off n x I▲		
I▲ / I!▲ = Off I▼ / I!▼ I >> ⏚ = yes		

<table>
<tr><th>Display</th><th>Memory = no
Relay switching behavior = NC (closed-circuit principle)</th><th>Memory = no
Relay switching behavior = NO (open-circuit principle)</th></tr>
<tr><td>I▲ / I!▲ = Off
I▼ / I!▼</td><td>
</td><td>
</td></tr>
<tr><td> = yes</td><td>
</td><td>
</td></tr>
</table>

4.4 Operation

Parameters

The devices can be parameterized either locally via the display and the three keys, or via IO-Link.
You can find further information on configuring via IO-Link in the Chapter "Configuring the IO-Link (Page 235)".

Parameter information

The table below shows the settable parameter information of the 3RR24 current monitoring relay:

Table 4- 3 Parameter information, 3RR24 current monitoring relays

Menu level/IO-Link	Parameter	Setting range		Increment	Factory setting
		Minimum value	Maximum value		
"RUN" / IO-Link	Threshold for current undershoot(I▼)	1.6 A or OFF[1)] 4 A or OFF[2)] 8 A or OFF[3)]	16 A or OFF[1)] 40 A or OFF[2)] 80 A or OFF[3)]	0.1 A[1)] 0.1 A[2)] 0.2 A[3)]	1.6 A[1)] 4 A[2)] 8 A[3)]
"RUN" / IO-Link	Threshold for current overshoot (I▲)	1.6 A or OFF[1)] 4 A or OFF[2)] 8 A or OFF[3)]	16 A or OFF[1)] 40 A or OFF[2)] 80 A or OFF[3)]	0.1 A[1)] 0.1 A[2)] 0.2 A[3)]	3 A[1)] 8 A[2)] 16 A[3)]
"RUN" / IO-Link	Threshold for current asymmetry (Asy)	5% or OFF	50 %	0,1 %	Disabled (0%)
"RUN" / IO-Link	Warning threshold for current undershoot (I!▼)	1.6 A or OFF[1)] 4 A or OFF[2)] 8 A or OFF[3)]	16 A or OFF[1)] 40 A or OFF[2)] 80 A or OFF[3)]	0.1 A[1)] 0.1 A[2)] 0.2 A[3)]	1.6 A[1)] 4 A[2)] 8 A[3)]
"RUN" / IO-Link	Warning threshold for current overshoot (I!▲)	1.6 A or OFF[1)] 4 A or OFF[2)] 8 A or OFF[3)]	16 A or OFF[1)] 40 A or OFF[2)] 80 A or OFF[3)]	0.1 A[1)] 0.1 A[2)] 0.2 A[3)]	3 A[1)] 8 A[2)] 16 A[3)]
"RUN" / IO-Link	Warning threshold for current asymmetry (Asy!)	5% or OFF	50 %	0,1 %	Disabled (0%)
"SET" / IO-Link	Hysteresis (Hyst)	0.1 A	3.0 A[1)] 8.0 A[2)] 16.0 A[3)]	0.1 A[1)] 0.1 A[2)] 0.2 A[3)]	0.5 A[1)] 0.8 A[2)] 1.6 A[3)]
"SET" / IO-Link	ON-delay time (onDel)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[4)] IO-Link: 0.1 s	Enabled (1 s)
"SET" / IO-Link	Tripping delay time (Del)	0 s	local: 999 s IO-Link: 999,9	local: 0.1 s[4)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Reclosing delay time (RsDel)	0 min.[5)]	300 min.[5)]	local: 0.1 min.[5,6)] IO-Link: 0.1 min.	Disabled (0 min.)[5)]

Menu level/IO-Link	Parameter	Setting range		Increment	Factory setting
		Minimum value	Maximum value		
"SET" / IO-Link	Blocking current monitoring (n x I▲) [7]	no x I▲ or 2 x I▲ IO-Link: Disabled	5 x I▲ IO-Link: 5	1 x I▲	no x I▲ IO-Link: Disabled
"SET" / IO-Link	Residual current monitoring (I >> ⏚)	local: no IO-Link: Disabled	local: yes IO-Link: Enabled	--	Disabled
"SET" / IO-Link	Reset response (Mem)	local: no = Autoreset IO-Link: Automatic	local: yes = Hand-RESET IO-Link: Manual	--	local: no = Autoreset IO-Link: Automatic
"SET" / IO-Link	Phase sequence monitoring ( )	local: no IO-Link: Disabled	local: yes IO-Link: Enabled	--	Disabled
"SET" / IO-Link	Load current monitoring (apparent current I_s/active current I_p)	I_s or I_p		--	I_s
"SET" / IO-Link	Relay switching behavior (closed-circuit principle NC / open-circuit principle NO)	Closed-circuit principle (NC) or Open-circuit principle (NO)		--	Closed-circuit principle (NC)
IO-Link	Group diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Group error diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Local threshold change	Disabled	Enabled	--	Enabled
IO-Link	Local parameter change	Disabled	Enabled	--	Enabled
IO-Link	Local reset	Disabled	Enabled	--	Enabled
IO-Link	Retentive error memory	Disabled	Enabled	--	Disabled
IO-Link	Analog value coding	0 (Disabled)	255	--	20

1) 3RR2441 current monitoring relay

2) 3RR2442 current monitoring relay

3) 3RR2443 current monitoring relay

4) Up to 99.9 s; at values > 99.9 s, the increment is 1 s

5) Only "m" is shown on the display instead of min.

6) Up to 99.9 min; at values > 99.9 min, the increment is 1 min.

7) You can disable or enable blocking current monitoring. To enable it, enter a factor between 2 and 5. It defines when blocking current monitoring trips.

Note

The "current undershoot" or "current overshoot" monitoring mode is defined with the setting OFF for the upper and lower threshold.

Note

Deactivating monitoring

If the upper and lower threshold values are deactivated (OFF), monitoring will cease for:

- Current overshoot
- Current undershoot
- Blocking current

The following parameters continue to be monitored:

- Fault current (if activated)
- Incorrect phase sequence (if activated)
- Phase failure (if activated)
- Current asymmetry (if activated)

The up-to-date measured value is displayed permanently.

The runtime meter and switching cycle counter continue to be updated.

Note

If a time greater than 100.0 s or 100.0 min. is set via- IO-Link, the display shows only the value without the decimal place.

Note

The hysteresis value of the threshold and the warning threshold for current asymmetry is fixed at 40% of the set threshold or warning threshold.

The parameters are described in the Chapter "Parameters (Page 247)".

You will find further information on the parameters of the 3RR24 current monitoring relay for IO-Link that can be set via IO-Link in the Chapter "3RR24 current monitoring relays (Page 282)".

Menu-based operation is described in the Chapter "Menu-based operation (Page 42)".

4.5 Diagnostics

4.5.1 Indications on the display

Display information

The display is divided into three different areas.

① Current measured value or fault symbol
② Type of monitoring
③ Symbol of the change-over contact

Meaning of the information on the display

Note

Displays in the event of an error

The symbols on the display (① and ②) flash to indicate an error.

The following states and errors are shown on the display:

Display areas	Symbol	Meaning
①	Ix <-> ▼▼▼ A	The current is below the current range that can be measured. No threshold set for undershoot.
①	Ix <-> ▲▲▲ A	The current is above the current range that can be measured. No threshold set for overshoot.
①	Asy <-> 5 %	Currently measured current asymmetry value is displayed. • Not flashing: Current asymmetry value in the correct range, or delay time is running. • Flashing: Threshold overshot, delay time expired, relay has switched.
①	Ix <-> 5.0A	Currently measured current is displayed. • Not flashing: Current in the correct range or delay time is running. • Flashing: Threshold overshot or undershot, delay time expired, relay has switched
①	n x I	Flashing: Current is above the set blocking current
①	I>> ⏚	Flashing: Fault current detected
①	L1	Flashing: Cable break/phase failure detected
①	!	Flashing: Incorrect phase sequence detected
①	P.ERR	Invalid parameter
①	ERR	Self-test error/internal error
①		IO-Link communication is being established [1)]
①	OK	Device is in Communication-Mode (IO-Link)
①	ERR	IO-Link communication interrupted
①	SIO	Device is in SIO-Mode
②		Monitoring for current overshoot or current asymmetry overshoot
②		Monitoring of the warning threshold for current overshoot (only visible if the parameter "Threshold for overshoot" is set to OFF.)
②		Monitoring for current undershoot
②		Monitoring of the warning threshold for current undershoot (only visible if the parameter "Threshold for undershoot" is set to OFF.)
②		Range monitoring (monitoring for current overshoot and current undershoot)
②	◄	Current is in correct range.
②	▲	There is a current overshoot or current asymmetry overshoot. • Not flashing: Threshold overshot, tripping delay running • Flashing: Threshold overshot, tripping delay expired, relay has switched
②	▲ ◄	Alternate flashing: The current has risen above the set warning threshold.

Display areas	Symbol	Meaning
②	▼	Current has fallen below threshold. • Not flashing: Threshold undershot, tripping delay running • Flashing: Threshold undershot, tripping delay expired, relay has switched
②	▼ ◄	Alternate flashing: The current has fallen below the set warning threshold.
③	I▼, I!▼ I▲, I!▲	• Not flashing: Relay contact 31/32 open, relay contact 31/34 closed • Flashing: Delay time (ON delay or tripping delay) running • Masked out: Relay contact 31/32 closed, relay contact 31/34 open

1) If this symbol is repeated for an extended period, the connection to the IO-Link master has been interrupted during communication buildup. Perform a restart of the monitoring relay.

Note

The value shown on the display always corresponds to the currently measured value even if the displayed value is flashing because a threshold has been overshot or undershot. The symbol for a threshold overshoot or undershoot indicates the fault causing this if manual RESET (Mem = yes) is set. In this way, the user can check before a Reset whether the cause of error has been remedied and a Reset is likely to result in a successful outcome.

You can find more information on the switching response of the output relay K1 in the Chapter "Function (Page 50)".

4.5.2 Diagnostics via IO-Link

The 3RR24 current monitoring relays with IO-Link connection provide an option for diagnostics via IO-Link.

The manufacturer-specific diagnostics listed in the table are reported via the diagnostics mechanism of IO-Link. The table below provides information on possible causes and remedial measures:

Table 4- 4 Possible causes and remedial measures

Diagnostics and messages	Possible cause	Possible remedial measure
Invalid parameter	The set parameter is invalid.	Specify a parameter in accordance with the parameter table in the Chapter "Operation (Page 55)".
Self-test error/internal error	Fault in internal test.	Return the device to the manufacturer.
Value above (warning) threshold for overshoot	The set current is higher than the set threshold for overshoot.	• Reduce the current. • Set a higher threshold.
Value below (warning) threshold for undershoot	The set current is lower than the set threshold for undershoot.	• Increase the current. • Set a lower threshold.
Value above (warning) threshold for current asymmetry	Different currents at phases L1, L2 and L3.	• Check the currents of the individual phases.
Phase failure L1	Connection to phase L1 interrupted.	Check the electrical connection.
Phase failure L2	Connection to phase L2 interrupted.	Check the electrical connection.
Phase failure L3	Connection to phase L3 interrupted.	Check the electrical connection.
Phase sequence error	Error in phase sequence.	Swap the two phases.
Measured value is outside the range that can be measured	The measured current is above or below the range that can be measured.	• Reduce the current. • Increase the current.
Blocking current n x Imax	The load current has exceeded the set threshold for current overshoot by at least n times in at least one phase within a very short time.	• Eliminate the cause of blocking. • Check the dimensioning of the motor.
Threshold for fault current exceeded	The sum of the individual phase currents should be 0 A without fault currents. This message is triggered from a measured fault current greater than 1.6 A in the case of S00 (4.0 A in the case of S0; 8.0 A in the case of S2).	• Check the terminals for contamination. • Check the insulation of the cable.

The table below indicates how the manufacturer-specific diagnostics are reported:

Table 4- 5 Diagnostics and messages

Diagnostics and messages	IO-Link for event code [1]	PII [2]		Data set 92	Display information
		GE [3]	GW [4]		
Invalid parameter	0x6320	x	—	x	P.ERR
Self-test error/internal error	0x5000	x	—	x	ERR
Threshold for overshoot exceeded	0x8C10	x	—	x	▲
Blocking current n x I▲	0x8C10	x	—	x	n x I
Threshold for undershoot violated	0x8C30	x	—	x	▼
Threshold for fault current exceeded	0x8CB1	x	—	x	I>>
Phase failure L1	0x8CB1	x	—	x	L1
Phase failure L2	0x8CB1	x	—	x	L2
Phase failure L3	0x8CB1	x	—	x	L3
Phase sequence error	0x8CB1	x	—	x	
Measured value is outside the range that can be measured[5]	0x8C20	—	—	—	▲ ▲ ▲A ▼ ▼ ▼A

1) The manufacturer-specific diagnostic events listed in the table are reported to the IO-Link master via the diagnostics mechanism of IO-Link.

2) With the "process image input" (see "3RR24 current monitoring relays (Page 282)"), you can determine via the group error (GE) bit or general warning (GW) bit in the user program whether detailed information on diagnostics or messages is present in diagnostic data set 92. If bit (= 1) is set, you can obtain detailed information on what caused a "group error" or "general warning" by reading data set 92.

3) GE = Group error: You can find detailed information in diagnostics data set 92 (see "3RR24 current monitoring relays (Page 282)").

4) GW = General warning: You can find detailed information in diagnostics data set 92 (see "3RR24 current monitoring relays (Page 282)").

x: Bit set

○: Not relevant

5) 3RR2441 (S00): < 1.6 A or > 16 A; 3RR2443 (S0): < 4.0 A or > 40 A; 3RR2443 (S2): < 8.0 A or > 80 A

4.5.3 Reset

Resetting of the outputs is dependent on the "Reset response" parameter (see the Chapter "Reset response (Page 247)"). On the 3RR24 monitoring relays, the parameter can also be set via IO-Link.

The following settings can be selected:

- Automatic reset (Mem = no)

  The device is reset automatically as soon as a previously occurring error has been dealt with.

- Manual RESET (Mem = yes)

  To reset digitally adjustable devices, you must press both arrow keys simultaneously for more than 2.5 s after the cause of the error has been rectified. If the cause of the error has not been removed, a new error message appears immediately. Alternately, the devices (with deactivated retentive error memory) can be reset by switching the supply voltage on and off.

Note

The outputs can also be reset via the process image of the outputs (PIQ) by setting the "Reset" control command or using the corresponding system command (see the Chapter "3RR24 current monitoring relays (Page 282)").

Note

With the "Local reset" parameter that can be set via the IO-Link, resetting locally on the device can be disabled.

4.6 Circuit diagrams

4.6.1 Internal circuit diagrams

3RR2441/3RR2442/3RR2443 internal circuit diagrams

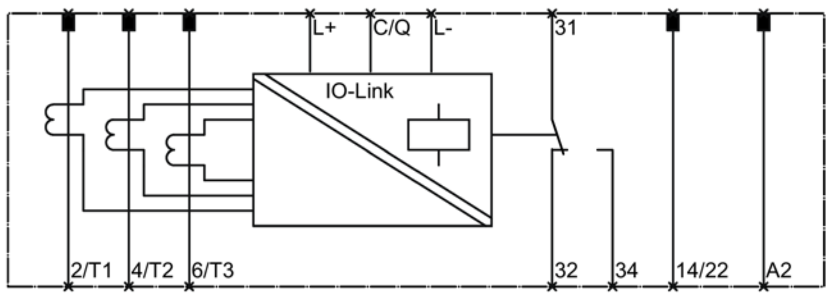


Figure 4-2 3RR2441-1AA40 current monitoring relay for IO-Link, 1 changeover contact, 3-phase

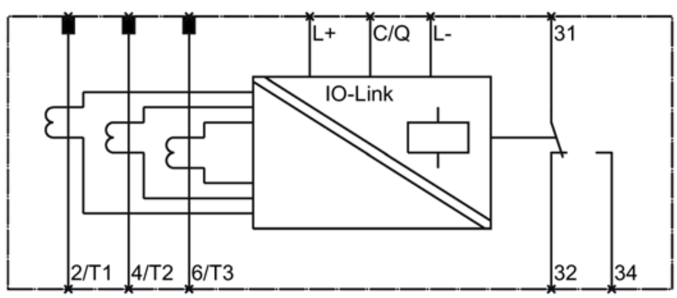


Figure 4-3 3RR2441-2AA40/3RR2442-.AA40 current monitoring relay for IO-Link, 1 changeover contact, 3-phase

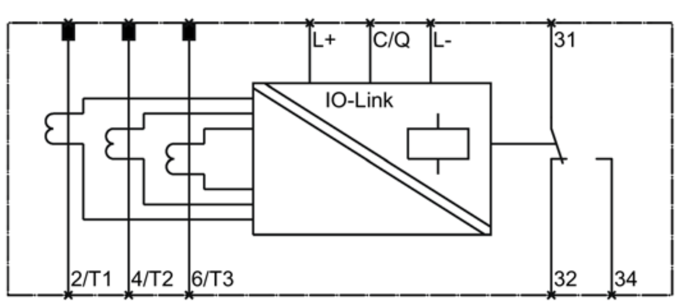


Figure 4-4 3RR2443-.AA40 current monitoring relay for IO-Link, 1 CO contact, 3-phase

4.7 Technical data

General technical specifications

		3RR2441-.....	3RR2442-.....	3RR2443-.....
product brand name		SIRIUS		
Design of the product		multi-phase current monitoring		
Size of the contactor can be combined company-specific		S00	S0	S2
Protection class IP				
• on the front		IP20		
• of the terminal		IP20		IP00
Insulation voltage for over-voltage category III according to IEC 60664 with degree of pollution 2 rated value	V	—		
Installation altitude at a height over sea level maximum	m	2 000		
Ambient temperature				
• during storage	°C	-40 … +80		
• during operating	°C	-25 … +60		
Electromagnetic compatibility		IEC 60947-1 / IEC 61000-6-2 / IEC 61000-6-4		
EMC immunity to interference according to IEC 60947-1		ambience A (industrial sector)		
EMC emitted interference according to IEC 60947-1		ambience A (industrial sector)		
Resistance against shock		15g / 11 ms		
Resistance against vibration		10 ... 55 Hz / 0.35 mm		10 ... 55 Hz / 0,35 mm
Impulse voltage resistance rated value	kV	6		
Operating apparent output rated value	V·A	2.5		
Rating Rated value	W	2.5		

		3RR2441-.....	3RR2442-.....	3RR2443-.....
Reference code				
• according to DIN 40719 extended according to IEC 204-2 according to IEC 750		K		
• according to DIN EN 61346-2		K		
Mechanical operating cycles as operating time typical		10 000 000		
Electrical operating cycles as operating time at AC-15 at 230 V typical		100 000		
Precision of digital display		+/-1 digit		+/-1 Digit
Adjustable response delay time				
• when starting	s	0 … 999.9		
• with lower or upper limit violation	s	0 … 999.9		
Standby time for restart after fault	s	0.2		
Phase number		3		
Number of monitored phases		3		
Product function				
• overcurrent monitoring		Yes		
• undercurrent monitoring		Yes		
• overcurrent and undercurrent monitoring		Yes		
• apparent current monitoring		Yes		
• active current monitoring		Yes		
• undercurrent recognition of 3 phases		Yes		
• phase sequence recognition		Yes		
• can be activated or deactivated phase sequence recognition		Yes		
• self-reset		Yes		
• reset external		Yes		
• manual RESET		Yes		

		3RR2441-.....	3RR2442-.....	3RR2443-.....
Adjustable response current				
• 1	A	1.6 … 16	4 … 40	8 … 80
• 2	A	1.6 … 16	4 … 40	8 … 80
Factor as multiple of the current monitoring upper limit				
• for the adjustable value of a blocking current		2 … 5		
Response value residual current detection at 50/60 Hz typical	A	1.5	4	8
Relative metering precision with regard to measured value	%	5		
Type of current for monitoring		AC		
Measurable current				
• for AC	A	1.6 … 16	4 … 40	8 … 80
Adjustable switching hysteresis for measured current value	A	0.1 … 3	0.1 … 8	0.2 … 16
Relative switching hysteresis for measured current value	%	—		
Response time maximum	s	0.2		
Relative repeat accuracy	%	2		
Temperature drift per °C	%/°C	0.1		
Current-carrying capacity				
• for permanent overcurrent maximum permissible	A	16	40	80
• for overcurrent duration < 1 s maximum permissible	A	320	800	1 600

Communication

		3RR2441-.....	3RR2442-.....
Type of voltage supply via input/ output link master		Yes	
IO-Link transfer rate		COM2 (38,4 kBaud)	
Protocol is supported IO-Link protocol		Yes	
Data volume			
• of the address range of the outputs with cyclical transfer total	byte	2	
• of the address range of the inputs with cyclical transfer total	byte	4	
Point-to-point cycle time between master and IO-Link device minimum	ms	10	

Connections 3RR2241 (size S00)

		3RR2441-1....	3RR2441-2....
Design of the electrical connection			
• for main current circuit		screw-type terminals	spring-loaded terminals
• for auxiliary and control current circuit		screw-type terminals	spring-loaded terminals
Product function			
• removable terminal for main circuit		No	
• removable terminal for auxiliary and control circuit		Yes	
Type of the connectable conductor cross-section			
• for main contacts			
– solid		1x (0.5 ... 4 mm²)	
– stranded		—	
– finely stranded			
– with conductor end processing		1x (0.5 ... 2.5 mm²)	
– without conductor final cutting		—	1x (0.5 ... 2.5 mm²)
• for AWG conductors for main contacts		1x (20 ... 12)	
• for auxiliary contacts			
– solid		1x (0.5 ... 4 mm²), 2x (0.5 ... 2.5 mm²)	
– finely stranded			
– with conductor end processing		2x (0.25 ... 1.5 mm²)	
– without conductor final cutting		—	2x (0.25 ... 1.5 mm²)
• for AWG conductors for auxiliary contacts		2x (24 ... 16)	
Tightening torque			
• with screw-type terminals	N·m	0.8 … 1.2	
Verification of suitability		CE / UL / CSA	

Connections 3RR2242 (size S0)

		3RR2442-1....	3RR2442-2....
Design of the electrical connection			
• for main current circuit		screw-type terminals	spring-loaded terminals
• for auxiliary and control current circuit		screw-type terminals	spring-loaded terminals
Product function			
• removable terminal for main circuit		No	
• removable terminal for auxiliary and control circuit		Yes	
Type of the connectable conductor cross-section			
• for main contacts			
– solid		2x (1 ... 2.5 mm²), 2x (2.5 ... 10 mm²)	
– stranded		—	
– finely stranded			
– with conductor end processing		2x (1 ... 2.5 mm²), 2x (2.5 ... 6 mm²), 1x 10 mm²	
– without conductor final cutting		—	1x (1 ... 6 mm²)
• for AWG conductors for main contacts		2 x (16 ... 14), 2x (14 ... 8)	
• for auxiliary contacts			
– solid		1x (0.5 ... 4 mm²), 2x (0.5 ... 2.5 mm²)	
– finely stranded			
– with conductor end processing		1x (0.5 ... 2.5 mm²), 2x (0.5 ... 1.5 mm²)	
– without conductor final cutting		—	2x (0.25 ... 1.5 mm²)
• for AWG conductors for auxiliary contacts		2x (20 ... 14)	
Tightening torque			
• with screw-type terminals	N·m	0.8 … 1.2	
Verification of suitability		CE / UL / CSA	

3RR2443 terminals (size S2)

	3RR2443-1....	3RR2443-3....
Design of the electrical connection		
• for main current circuit	screw-type terminals	
• for auxiliary and control current circuit	screw-type terminals	spring-loaded terminals
Product function		
• removable terminal for main circuit	No	
• removable terminal for auxiliary and control circuit	Yes	
Type of the connectable conductor cross-section		
• for main contacts		
– solid	2x (1 ... 35 mm²), 1x (1 ... 50 mm²)	
– stranded	2x (1 ... 35 mm²), 1x (1 ... 50 mm²)	
– finely stranded		
– with conductor end processing	2x (1 ... 25 mm²), 1x (1 ... 35 mm²)	
– without conductor final cutting	—	
• for AWG conductors for main contacts	2x (18 ... 2), 1x (18 ... 1)	
• for auxiliary contacts		
– solid	1x (0.5 ... 4 mm²), 2x (0.5 ... 2.5 mm²)	
– finely stranded		
– with conductor end processing	1x (0.5 ... 2.5 mm²), 2x (0.5 ... 1.5 mm²)	2x (0.25 ... 1.5 mm²)
– without conductor final cutting	—	2x (0.25 ... 1.5 mm²)
• for AWG conductors for auxiliary contacts	2x (20 ... 14)	2x (24 ... 16)
Tightening torque		
• with screw-type terminals N·m	0.8 1.2	
Verification of suitability	CE / UL / CSA	

Mounting, fixing, dimensions Frame size: S00,S0

		3RR2441-1....	3RR2442-1....	3RR2441-2....	3RR2442-2....
Mounting position		any			
Mounting type		direct mounting			
Width	mm	45			
Height	mm	79	87	90	109
Depth	mm	80	91	80	92
Distance, to be maintained, to the ranks assembly					
• forwards	mm	0			
• backwards	mm	0			
• upwards	mm	0			
• downwards	mm	0			
• sidewards	mm	0			
Distance, to be maintained, to earthed part					
• forwards	mm	0	6		
• backwards	mm	0			
• upwards	mm	0	6	0	6
• downwards	mm	0	6	0	6
• sidewards	mm	6			
Distance, to be maintained, conductive elements					
• forwards	mm	0	6		
• backwards	mm	0			
• upwards	mm	0	6	0	6
• downwards	mm	0	6	0	6
• sidewards	mm	6			

Frame size: S2

		3RR2443-1....	3RR2443-3....
mounting position		any	
Mounting type		direct mounting	
Width	mm	55	
Height	mm	99	
Depth	mm	112	
Distance, to be maintained, to the ranks assembly			
• forwards	mm	0	
• backwards	mm	0	
• upwards	mm	0	
• downwards	mm	10	
• sidewards	mm	0	
Distance, to be maintained, to earthed part			
• forwards	mm	10	
• backwards	mm	0	
• upwards	mm	10	
• downwards	mm	10	
• sidewards	mm	10	
Distance, to be maintained, conductive elements			
• forwards	mm	10	
• backwards	mm	0	
• upwards	mm	10	
• downwards	mm	10	
• sidewards	mm	10	

Auxiliary circuit

		3RR2441-.....	3RR2442-.....
Design of the contact element of the output relay		closed-circuit current / open-circuit current	
Operating current at 17 V minimum	mA	5	
Number of changeover contacts for auxiliary contacts		1	
Operating current of the auxiliary contacts			
• at AC-15			
– at 24 V	A	3	
– at 230 V	A	3	
– at 400 V	A	—	
• at DC-13 at 24 V	A	1	
• at DC-13 at 125 V	A	0.2	
• at DC-13 at 250 V	A	0.1	

Supply voltage

		3RR2441-.....	3RR2442-.....
Type of supply voltage		DC	
Supply voltage 1 for DC			
• rated value	V	24	
• initial rated value	V	18	
• final rated value	V	30	

3UG4815 / 3UG4816 line monitoring relays 5

5.1 Application areas

Application areas

The various line monitoring relays are used, for example, in the following applications:

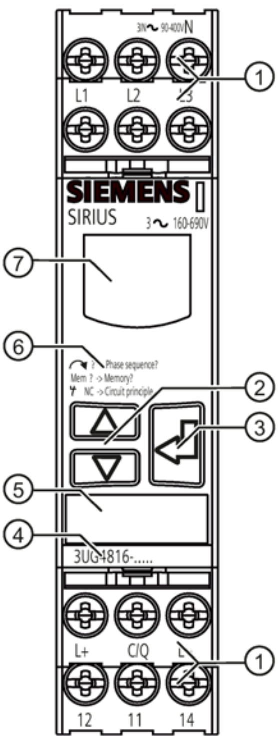
Table 5- 1 Application areas of the line monitoring relays

Function	Application
Phase sequence	• Direction of rotation of the drive • Refrigeration trucks • Refrigerators • Saws • Pumps • Rollers • Transportation of persons (elevators, moving staircases and walk-ways)
Phase failure	• A fuse has tripped • Control supply voltage failure • Cable break • Crane systems • Electrical welding • Emergency generating sets (banks, hospitals, alarm systems, power plants) • Transportation of persons (elevators, moving staircases and walk-ways)
Phase asymmetry	• Motor protection (overheating of the motor due to asymmetric voltage) • Detection of asymmetric systems

Function	Application
Undervoltage	• Increased current on a motor with corresponding overheating • Unintended device reset • Blackout – particularly with battery supply • Fork-lift trucks • Heating systems • Cranes • Elevators • Protection on unstable systems (switchover to emergency current, monitoring of the generator)
Overvoltage	• System protection against destruction caused by supply overvoltages • Energy supply to the line • Lamps (UV lamps, laser lamps, OP lighting, tunnels, traffic lights)

5.2 Operator controls and connection terminals

Front view / terminal labeling

Front view	Description	
	**Position digits**	
	①	Terminal block (removable) Connection is possible using screw-type terminals or spring-loaded terminals.
	②	Arrow keys for menu navigation
	③	SET key for menu navigation
	④	Device article number
	⑤	Label
	⑥	Legend for menu
	⑦	Display for parameterization, actual-value indication, and diagnostics
	Terminal labels	
	L1, L2, L3	Measuring signal (line voltage)
	N	Neutral conductor (only on 3UG4816)
	L+	Supply voltage for IO-Link
	C/Q	Communication signal / switching signal
	L-	Ground IO-Link
	12	Output relay K1 CO contact NC contact
	11	Output relay K1 CO contact root
	14	Output relay K1 CO contact NO contact

You can find additional information on the connection terminals and the permissible conductor cross-sections in the Chapter "Connection systems (Page 26)".

You can find information on connecting in the Chapter "Internal circuit diagrams (Page 91)".

5.3 Functionality

General functionality

The 3UG4815 line monitoring relays monitor a three-phase system for **phase sequence**, **phase failure**, **undervoltage**, **overvoltage**, and **phase asymmetry**.

Note

The 3UG4816 line monitoring relays have the same functions as the 3UG4815 monitoring relays and additionally monitor the **neutral conductor for failure**.

The 3UG4815 / 3UG4816 line monitoring relays have a wide-range input.

The devices are supplied via the supply voltage IO-Link (L+) and ground IO-Link (L-) or via an external 24 V DC voltage source.

The 3UG4815 / 3UG4816 line monitoring relays have an output relay K1.

The 3UG4815 / 3UG4816 line monitoring relays have a display and are parameterized with three keys. The devices can also be parameterized via IO-Link and transfer the measured voltage values and error messages to a controller.

You will find the setting ranges and factory settings of the 3UG4815 / 3UG4816 line monitoring relays in Chapter "Operation (Page 82)."

You can find a description of the individual parameters in the Chapter Parameters (Page 247).

You can find the full data sets in the Chapter "Process data and data sets (Page 279)".

Monitoring

As soon as the supply voltage is applied or the monitoring relay is reset, the set stabilization delay begins (stDel). During this time, undershooting or overshooting of the set threshold values will not cause the CO contact to respond but instead will result in a restart of the stabilization delay.

You can find further information on the stabilization delay in the Chapter "Parameters (Page 247)".

The output relay K1 responds in accordance with the set relay switching response (closed-circuit principle NC or open-circuit principle NO).

If a fault occurs (phase failure, incorrect phase sequence, phase asymmetry, voltage undershoot or voltage overshoot), the output relay K1 switches in accordance with the relay switching response. In the case of voltage undershoot or voltage overshoot, the output relay K1 does not respond until expiry of the set tripping delay time (U▼Del, U▲Del). If the parameterized (warning) threshold for voltage asymmetry is overshot or undershot, the output relay K1 does not respond until the set tripping delay time (AsyDel) has expired. On phase failure, monitoring of the other quantities is deactivated. The measured voltage of all three phases is set to the maximum value (7FFF).

In the case of incorrect direction of rotation, the devices immediately shut down.

Even if monitoring for undervoltage is deactivated (U▾ = OFF) when the voltage falls below a measurement range limit (3UG4815: 160 V and 3UG4816: 90 V), phase failure or neutral failure (on the 3UG4816 only) will be signaled and the output relay K1 will change its switching state.

The display indicates the following voltages in the case of the line monitoring relay:

- 3UG4815: Line-to-line voltage between L1 and L2, L1 and L3, L2 and L3
- 3UG4816: Line-to-neutral voltage between L1 and N, L2 and N, L3 and N

It is possible to switch between the individual voltage values using the arrow keys.

Thanks to a special measuring method, a phase failure is detected with certainty despite wide-range voltage from 160 to 690 V AC and power recovery of up to 80% by the load.

Note

The specified voltages represent the absolute thresholds.

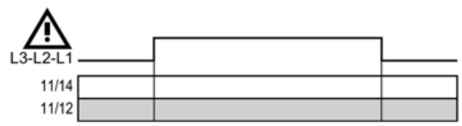
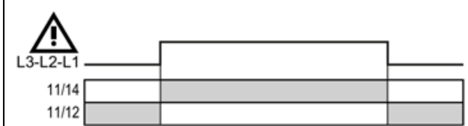
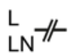
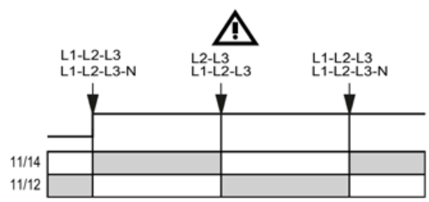
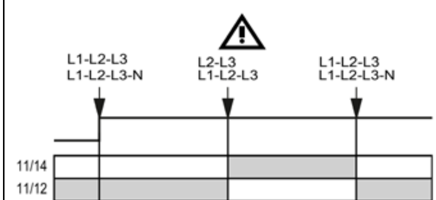
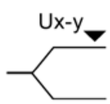
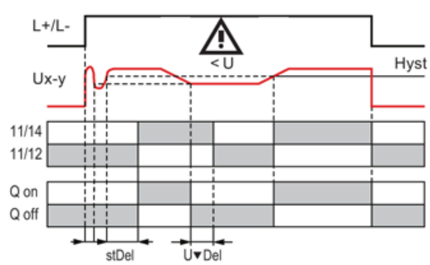
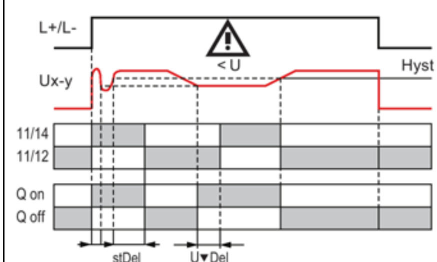
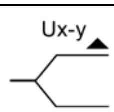
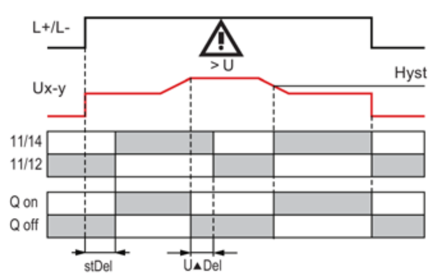
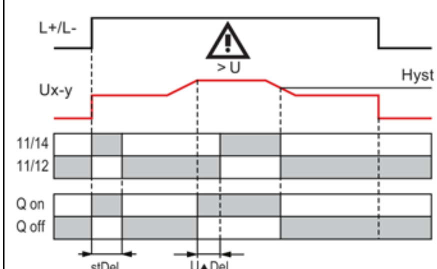
You can find the switching states of the output relay K1 below in the section "Function diagrams" and in the Chapter "Diagnostics (Page 85)".

SIO-Mode

The monitoring relays have a connection C/Q to IO-Link. If the IO-Link connection is not used for communication via IO-Link, the 3UG4815 and 3UG4816 line monitoring relays work in standard I/O mode (SIO-Mode). In this mode, terminal C/Q can be used as a semiconductor output that switches on a violation of the warning threshold for undershoot, overshoot or voltage asymmetry.

- Q off: 24 V DC supply voltage present.
- Q on: The output has a high resistance.

Function diagrams

	Memory = no Relay switching response = NC (closed-circuit principle)	Memory = no Relay switching response = NO (open-circuit principle)
		
		
		
		

5.4 Operation

Parameters

The devices can be parameterized either locally via the display and the three keys, or via IO-Link.
You can find further information on configuring via IO-Link in the Chapter "Configuring the IO-Link (Page 235)".

Parameter information

The table below shows the settable parameter information of the 3UG4815 and 3UG4816 line monitoring relays:

Table 5- 2 Parameter information, 3UG4815 and 3UG4816 line monitoring relays

Menu level / IO-Link	Parameters	Setting range		Increment	Factory setting
		Minimum value	Maximum value		
"RUN" / IO-Link	Threshold for undershoot (U▼)	160 V or OFF[1)] 90 V or OFF[2)]	690 V or OFF[1)] 400 V or OFF[2)]	0.1 V[4)]	375 V[1)] 215 V[2)]
"RUN" / IO-Link	Threshold for overshoot (U▲)	160 V or OFF[1)] 90 V or OFF[2)]	690 V or OFF[1)] 400 V or OFF[2)]	0.1 V[4)]	425 V[1)] 245 V[2)]
"RUN" / IO-Link	Warning threshold for undershoot (U!▼)	160 V or OFF[1)] 90 V or OFF[2)]	690 V or OFF[1)] 400 V or OFF[2)]	0.1 V[4)]	375 V[1)] 215 V[2)]
"RUN" / IO-Link	Warning threshold for overshoot (U!▲)	160 V or OFF[1)] 90 V or OFF[2)]	690 V or OFF[1)] 400 V or OFF[2)]	0.1 V[4)]	425 V[1)] 245 V[2)]
"SET" / IO-Link	Hysteresis (Hyst)	0.1 V or OFF	20.0 V or OFF	0.1 V	5.0 V
"SET" / IO-Link	Stabilization delay (stDel)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[3)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Tripping delay time (U▼Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[3)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Tripping delay time (U▲Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[3)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Reset response (Mem)	local: no = Auto-reset IO-Link: Automatic	local: yes = Hand-RESET IO-Link: Manual	--	local: no = Auto-reset IO-Link: Automatic
"SET" / IO-Link	Phase sequence monitoring ( )	local: no IO-Link: Disabled	local: yes IO-Link: Enabled	--	local: yes IO-Link: Enabled
"SET" / IO-Link	Relay switching response (closed-circuit principle NC / open-circuit principle NO)	Closed-circuit principle (NC) or Open-circuit principle (NO)		--	Closed-circuit principle (NC)
IO-Link	Threshold for voltage asymmetry (Asy)	0.1 %	20 %	0.1 %	5 %
IO-Link	Warning threshold for voltage asymmetry (Asy!)	0.1 %	20 %	0.1 %	5 %
IO-Link	Tripping delay time for asymmetry (AsyDel)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[3)] IO-Link: 0.1 s	Disabled (0 s)
IO-Link	Hysteresis for voltage asymmetry	0.1 %	5 %	0.1 %	2 %

Menu level / IO-Link	Parameters	Setting range		Increment	Factory setting
		Minimum value	Maximum value		
IO-Link	Stabilization delay (at Power ON)	Disabled	Enabled	--	Enabled
IO-Link	Stabilization delay (at manual reset)	Disabled	Enabled	--	Enabled
IO-Link	Group diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Group error diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Local threshold change	Disabled	Enabled	--	Enabled
IO-Link	Local parameter change	Disabled	Enabled	--	Enabled
IO-Link	Local reset	Disabled	Enabled	--	Enabled
IO-Link	Retentive error memory	Disabled	Enabled	--	Disabled
IO-Link	Analog value coding	0 (Disabled)	255	--	48

1) 3UG4815 line monitoring relay (Ux-y)

2) 3UG4816 line monitoring relay (Ux-N)

3) up to 99.9 s; at values > 99.9 s, the increment is 1 s

4) up to 99.9 V; at values > 99.9 V, the increment is 1 V

Note

If a time is set via IO-Link within the value range 100.0 to 999.9 s with one decimal place, the display will show only the value without the decimal place.

The parameters are described in the Chapter "Parameters (Page 247)".

You will find further information on the parameters of the 3UG4815 and 3UG4816 line monitoring relays that can be set via IO-Link in the Chapter "Process data and data sets (Page 279)".

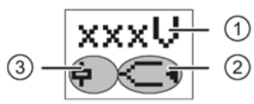
Menu-based operation is described in the Chapter "Menu-based operation (Page 42)".

5.5 Diagnostics

5.5.1 Indication on the display

Display information

The display is basically divided into three different areas.



① Voltage measured value or fault symbol
② Type of monitoring
③ Symbol of the change-over contact

Meaning of the information on the display

Note

Displays in the event of an error

The symbols on the display (① and ②) flash to indicate an error.

The following states and errors are shown on the display:

Display areas	Symbol	Meaning
①	>xyz	Measured value is above the range that can be measured. 3UG4815: xyz = 690 3UG4816: xyz = 400
①	200V <-> U1-2, U2-3, U3-1 (3UG4815) 200V <-> U1-N, U2-N, U3-N (3UG4816)	Currently measured voltage or U1-2, U2-3, U3-1 (3UG4815) / U1-N, U2-N, U3-N (3UG4816) is displayed. • Not flashing: Voltage in the correct range or delay time is running • Flashing: U1-2, U2-3, U3-1 (3UG4815) / U1-N, U2-N, U3-N (3UG4816) overshot or undershot, delay time expired, relay has switched
①	Lx	Flashing: Phase failure detected
①	Asy <-> 5 %	Flashing: Asymmetry has been exceeded
①	!	Flashing: Incorrect phase sequence detected
①	P.ERR	Invalid parameter
①	ERR	Self-test error/internal error
①		IO-Link communication is being established [1]
①	OK	Device is in Communication-Mode (IO-Link)
①	ERR	IO-Link communication interrupted
①	SIO	Device is in SIO-Mode
②		Monitoring for voltage overshoot
②		Monitoring of the warning threshold for voltage overshoot (only visible if the parameter "Threshold for overshoot" is set to OFF.)
②		Monitoring for voltage undershoot

Display areas	Symbol	Meaning
②		Monitoring of the warning threshold for voltage undershoot (only visible if the parameter "Threshold for undershoot" is set to OFF.)
②	◄	Voltage is in correct range.
②	▲	A voltage undershoot has occurred. • Not flashing: Threshold overshot, tripping delay running • Flashing: Threshold overshot, tripping delay expired, relay has switched
②	▲ ◄	Alternate flashing: The voltage has risen above the set warning threshold.
②	▼	A voltage undershoot has occurred. • Not flashing: Threshold undershot, tripping delay running • Flashing: Threshold undershot, tripping delay expired, relay has switched
②	▼ ◄	Alternate flashing: The voltage has fallen below the set warning threshold.
③	U▼, U!▼ U▲, U!▲ Asy, Asy!	• Not flashing: Relay contact 11/12 open, relay contact 11/14 closed • Flashing: Delay time (ON delay or tripping delay) running • Masked out: Relay contact 11/12 closed, relay contact 11/14 open

1) If this symbol is repeated for an extended period, the connection to the IO-Link master has been interrupted during communication buildup. Perform a restart of the monitoring relay.

Note

If the monitoring relays are used downstream of a frequency converter, it is necessary to obtain a waveform without additional zero crossings of the voltage. This can be achieved with the help of a sine-wave filter.

Note

The value shown on the display always corresponds to the currently measured value even if the displayed value is flashing because a threshold has been overshot or undershot. The symbol for a threshold overshoot or undershoot indicates the fault causing this if manual RESET (Mem = yes) is set. In this way, the user can check before a Reset whether the cause of error has been remedied and a Reset is likely to result in a successful outcome.

You can find more information on the switching response of the output relay K1 in the Chapter "Functionality (Page 80)".

5.5.2 Diagnostics via IO-Link

Diagnostics via IO-Link

In the 3UG4815 and 3UG4816 line monitoring relays with IO-Link connection, there is the option for diagnostics via IO-Link.

The manufacturer-specific diagnostics listed in the table are reported via the diagnostics mechanism of IO-Link. The table below provides information on possible causes and remedial measures:

Table 5- 3 Possible causes and remedial measures

Diagnostics and messages	Possible cause	Possible remedial measure
Invalid parameter	The set parameter is invalid.	Specify a parameter in accordance with the parameter table in the Chapter "Operation (Page 82)".
Self-test error/internal error	Fault in internal test.	Return the device to the manufacturer.
Value above (warning) threshold for overshoot	The set voltage is higher than the set threshold for overshoot.	• Reduce the voltage. • Set a higher threshold.
Value below (warning) threshold for undershoot	The set voltage is lower than the set threshold for undershoot.	• Increase the voltage. • Set a lower threshold.
Value above (warning) threshold for voltage asymmetry	Different voltage at phases L1, L2 and L3.	• Check the voltages of the individual phases. • Set a higher threshold.
Phase failure L1	Connection to phase L1 interrupted.	Check the electrical connection.
Phase failure L2	Connection to phase L2 interrupted.	Check the electrical connection.
Phase failure L3	Connection to phase L3 interrupted.	Check the electrical connection.
Phase sequence error	Error in phase sequence.	Swap the two phases.
Phase failure N conductor [1)]	Connection to N conductor interrupted.	Check the electrical connection.
Measured value is outside the range that can be measured	The measured voltage is above or below the range that can be measured.	• Reduce the voltage. • Increase the voltage.

[1)] Only on the 3UG4816 line monitoring relays.

The table below indicates how the manufacturer-specific diagnostics are reported:

Table 5- 4 Diagnostics and messages

Diagnostics and messages	IO-Link event code [1]	PII [2]		Data set 92	Display information	
		GE [3]	GW [4]		3UG4815	3UG4816
Invalid parameter	0x6320	x	—	x	P.ERR	
Self-test error/internal error	0x5000	x	—	x	ERR	
Threshold for overshoot exceeded	0x8C10	x	—	x	▲	
Threshold for undershoot violated	0x8C30	x	—	x	▼	
Threshold for voltage asymmetry exceeded	0x8C10	x	—	x	▲	
Phase failure L1	0x8CB1	x	—	x	Lx	L1
Phase failure L2	0x8CB1	x	—	x	Lx	L2
Phase failure L3	0x8CB1	x	—	x	Lx	L3
Phase sequence error	0x8CB1	x	—	x	↶!	
Phase failure N conductor	0x8CB1	x	—	x	—	N
Measured value is outside the range that can be measured[5]	0x8C20	—	—	—	>xyz	

[1] The manufacturer-specific diagnostic events listed in the table are reported to the IO-Link master via the diagnostics mechanism of IO-Link.

[2] With the "process input image" (see "3UG4815 line monitoring relay (Page 293)" for 3UG4815 and "3UG4816 line monitoring relay (Page 302)" for 3UG4816), you can determine via the group error (GE) bit or general warnings (GW) bit in the user program whether detailed information on diagnostics or messages is present in diagnostics data set 92. If bit (= 1) is set, you can obtain detailed information on what caused a "group error" or "general warning" by reading data set 92.

[3] GE = Group error: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 296)" for 3UG4815 and the Chapter "System commands - data set (index) 2 (Page 305) " for 3UG4816).

[4] GW = General warning: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 296)" for 3UG4815 and the Chapter "System commands - data set (index) 2 (Page 305) " for 3UG4816).

x: Bit set

○: Not relevant

[5] 3UG4815: > 690 V (line-to-line voltage) or 3UG4816: > 400 V (line-to-neutral voltage)

5.5.3 Reset

Reset

Resetting of the outputs is dependent on the "Reset response" parameter (see the Chapter "Reset response (Page 247)"). On the 3UG48 monitoring relays, the parameter can also be set via IO-Link.

The following settings can be selected:

- Automatic reset (Mem = no)

  The device is reset automatically as soon as a previously occurring error has been dealt with.

- Manual RESET (Mem = yes)

  To reset digitally adjustable devices, you must press both arrow keys ▲▼ simultaneously for more than 2.5 s after the cause of the error has been rectified. If the cause of the error has not been removed, a new error message appears immediately. Alternately, the devices (with deactivated retentive error memory) can be reset by switching the supply voltage on and off.

Note

The outputs can also be reset via the process image of the outputs (PIQ) by setting the "Reset" control command or using the corresponding system command (see the Chapter "Process data and data sets (Page 279)").

Note

With the "Local reset" parameter that can be set via the IO-Link, resetting locally on the device can be disabled.

Note

The warning threshold is always reset by autoreset.

5.6 Circuit diagrams

5.6.1 Internal circuit diagrams

Internal circuit diagrams 3UG4815 / 3UG4816

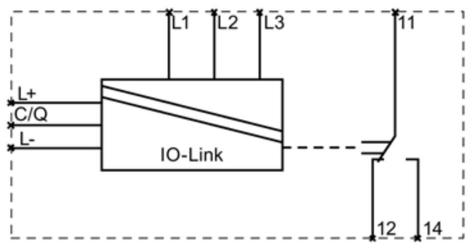


Figure 5-1 3UG4815 line monitoring relay for IO-Link

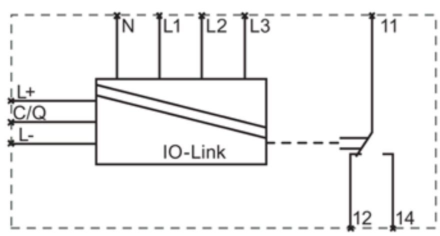


Figure 5-2 3UG4816 line monitoring relay for IO-Link

Note

It is not necessary to fuse the measuring circuit to protect the device. Fusing for line protection depends on the cross-section used.

Note

The 3UG4815 and 3UG4816 line monitoring relays are only suitable for line frequencies of 50 / 60 Hz!

5.6.2 Typical circuit diagrams

3UG4815

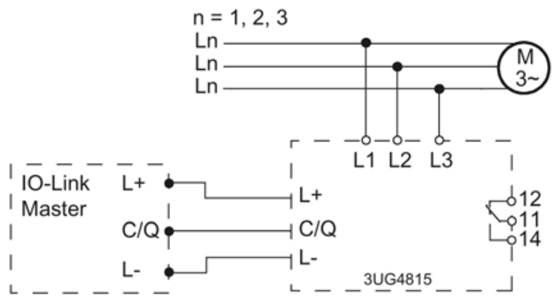


Figure 5-3 3UG4815 line monitoring relay

3UG4816

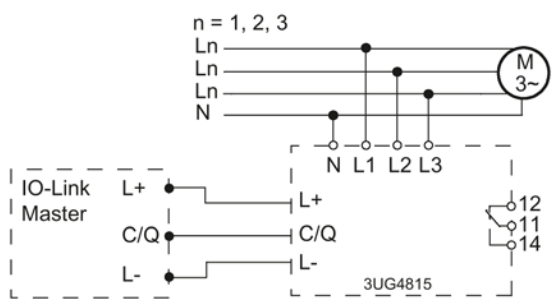


Figure 5-4 3UG4816 line monitoring relay

5.7 Technical data

Measuring circuit

		3UG4815-.....	3UG4816-.....
Type of voltage for monitoring		AC	
Number of poles for main current circuit		3	
Measurable voltage			
• for AC	V	160 … 690	90 … 400
Adjustable voltage range	V	160 … 690	90 … 400
Adjustable response delay time			
• when starting	s	0 … 999.9	
• with lower or upper limit violation	s	0 … 999.9	

General technical details

	3UG4815-.....	3UG4816-.....
Product function	Phase monitoring relay	
Design of the display	LCD	
Type of display LED	No	
Product function		
• undervoltage recognition	Yes	
• overvoltage recognition	Yes	
• phase sequence recognition	Yes	
• phase disturbance recognition	Yes	
• asymmetry recognition	Yes	
• overvoltage recognition of 3 phases	Yes	
• undervoltage recognition of 3 phases	Yes	
• tension window recognition of 3 phases	Yes	
• reset external	Yes	
• self-reset	Yes	
• open-circuit or closed-circuit current principle	Yes	

		3UG4815-.....	3UG4816-.....
Starting time after the control supply voltage has been applied	s	1	
Response time maximum	ms	450	
Relative adjustment accuracy	%	0.2	
Relative metering precision	%	5	
Precision of digital display		+/-1 digit	
Relative repeat accuracy	%	1	
Type of voltage of the controlled supply voltage		DC	
Control supply voltage for DC rated value	V	24	
Operating range factor control supply voltage rated value for DC		1	
Impulse voltage resistance rated value	kV	6	
Recorded real power	W	2	
Protection class IP		IP20	
Electromagnetic compatibility		IEC 60947-1 / IEC 61000-6-2 / IEC 61000-6-4	
Operating current at 17 V minimum	mA	20	
Continuous current of the DIAZED fuse link of the output relay	A	4	
Resistance against vibration according to IEC 60068-2-6		1 … 6 Hz: 15 mm, 6 … 500 Hz: 2g	
Resistance against shock according to IEC 60068-2-27		sinusoidal half-wave 15g / 11 ms	
Current carrying capacity of output relay			
• at AC-15			
– at 250 V at 50/60 Hz	A	3	
– at 400 V at 50/60 Hz	A	3	
• at DC-13			
– at 24 V	A	1	
– at 125 V	A	0.2	
– at 250 V	A	0.1	
Installation altitude at a height over sea level maximum	m	2 000	
Conductor-bound parasitic coupling BURST according to IEC 61000-4-4		2 kV	
Conductor-bound parasitic coupling conductor-earth SURGE according to IEC 61000-4-5		2 kV	
Conductor-bound parasitic coupling conductor-conductor SURGE according to IEC 61000-4-5		1 kV	

		3UG4815-.....	3UG4816-.....
Electrostatic discharge according to IEC 61000-4-2		6 kV contact discharge / 8 kV air discharge	
Field-bound parasitic coupling according to IEC 61000-4-3		10 V/m	
Thermal current of the contact-affected switching element maximum	A	5	
Degree of pollution		2	
Ambient temperature			
• during operating phase	°C	-25 … +60	
• during storage	°C	-40 … +85	
• during transport	°C	-40 … +85	
Galvanic isolation between entrance and outlet		Yes	
Galvanic isolation between the voltage supply and other circuits		Yes	
Mechanical operating cycles as operating time typical		10 000 000	
Electrical operating cycles as operating time at AC-15 at 230 V typical		100 000	
Operating cycles with 3RT2 contactor maximum	1/h	5 000	

Communication

		3UG4815-.....	3UG4816-.....
Type of voltage supply via input/ output link master		Yes	
IO-Link transfer rate		COM2 (38,4 kBaud)	
Protocol will be supported IO-Link protocol		Yes	
Data volume			
• of the address range of the outputs with cyclical transfer total	byte	2	
• of the address range of the inputs with cyclical transfer total	byte	4	
Point-to-point cycle time between master and IO-Link device minimum	ms	10	

Mechanical design

		3UG4815-1....	3UG4816-1....	3UG4815-2....	3UG4816-2....
Width	mm	22.5			
Height	mm	102		103	
Depth	mm	91			
Built in orientation		any			
Distance, to be maintained, to earthed part					
• forwards	mm	0			
• backwards	mm	0			
• sidewards	mm	0			
• upwards	mm	0			
• downwards	mm	0			
Distance, to be maintained, to the ranks assembly					
• forwards	mm	0			
• backwards	mm	0			
• sidewards	mm	0			
• upwards	mm	0			
• downwards	mm	0			
Distance, to be maintained, conductive elements					
• forwards	mm	0			
• backwards	mm	0			
• sidewards	mm	0			
• upwards	mm	0			
• downwards	mm	0			
Type of mounting		snap-on mounting			
Product function removable terminal for auxiliary and control circuit		Yes			
Design of the electrical connection		screw-type terminals		spring-loaded terminals	

		3UG4815-1....	3UG4816-1....	3UG4815-2....	3UG4816-2....
Type of the connectable conductor cross-section					
• solid		1x (0.5 ... 4 mm²), 2x (0.5 ... 2.5 mm²)		2x (0.25 ... 1.5 mm²)	
• finely stranded					
– with wire end processing		1x (0.5 ... 2.5 mm²), 2x (0.5 ... 1.5 mm²)		2 x (0.25 ... 1.5 mm²)	
– without wire end processing		—		2x (0.25 ... 1.5 mm²)	
• for AWG conductors					
– solid		2x (20 ... 14)		2x (24 ... 16)	
– stranded		2x (20 ... 14)		2x (24 ... 16)	
Tightening torque					
• with screw-type terminals	N·m	0.8 … 1.2		— …	
Number of change-over switches delayed switching		1			

3UG4822 current monitoring relays 6

6.1 Application areas

Application areas

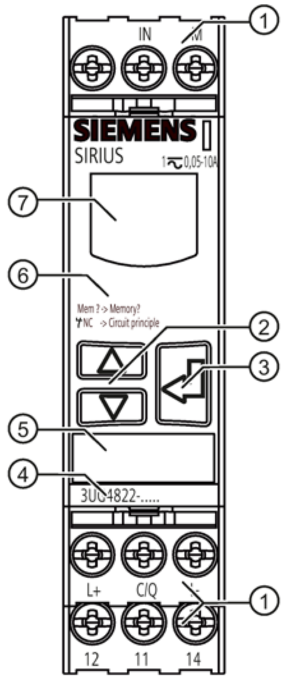
The current monitoring relays are used, for example, in the following applications:

Table 6- 1 Application areas of the current monitoring relays

Function	Application
• Undercurrent monitoring and overcurrent monitoring • Monitoring the functionality of electrical loads • Wire-break monitoring	• Emergency lighting (failure of a lamp → drop in current strength in the system) • Heating systems (electroplating plants, plastic injection machines, paintshops) • Lamps (tunnels, OP lighting, traffic lights, signal systems, UV lamps, infrared radiators, laser lamps)

6.2 Operator controls and connection terminals

Front view / terminal labeling

Front view	Description	
	**Position digits**	
	①	Terminal block (removable): Connection is possible using screw terminals or spring-loaded terminals
	②	Arrow keys for menu navigation
	③	SET key for menu navigation
	④	Device article number
	⑤	Label
	⑥	Legend for menu
	⑦	Display for parameterization, actual-value indication, and diagnostics
	Terminal labels	
	L+	Supply voltage for IO-Link
	C/Q	Communication signal / switching signal
	L-	Ground IO-Link
	M	Measuring signal input -
	IN	Measuring signal input +
	12	Output relay K1 CO contact NC contact
	11	Output relay K1 CO contact root
	14	Output relay K1 CO contact NO contact

You can find additional information on the connection terminals and the permissible conductor cross-sections in the Chapter "Connection systems (Page 26)".

You can find information on connecting in the Chapter "Internal circuit diagrams (Page 115)".

6.3 Functionality

General functionality

Depending on the set threshold, the 3UG4822 current monitoring relays monitor a single-phase AC load current (RMS value) or DC load current flowing over terminals IN and M of the device for **overshoot** (I▲) or **undershoot** (I▼) or in **window monitoring** (I▲ and I▼). The true root mean square value (tRMS) of the current is measured.

The devices are supplied via the supply voltage IO-Link (L+) and ground IO-Link (L-) or via an external 24 V DC voltage source.

The 3UG4822 current monitoring relays have a display and are parameterized with three keys. The devices can also be parameterized via IO-Link and transfer the measured current values and error messages to a controller.

You can find the setting ranges and factory settings of the 3UG4822 current monitoring relays in the Chapter "Operation (Page 106)".

You can find a description of the individual parameters in the Chapter Parameters (Page 247).

You can find the full data sets in the Chapter "Process data and data sets (Page 279)".

Monitoring

If the supply voltage is switched on and no load current is flowing yet, the display will indicate "I▼▼▼" and show a symbol for current overshoot monitoring, current undershoot monitoring, or range monitoring.

ON-delay time

If the load current overshoots the lower measuring range limit 0.05 A, the set ON-delay time begins (onDel). During this time, undershooting or overshooting of the set threshold values will not result in a relay response of the CO contact.

Tripping delay time

The set tripping delay time (I▼Del, I▲Del) starts if the load current flowing under normal operating conditions overshoots or undershoots the corresponding set threshold value. After expiry of this time, the output relay K1 changes the switching state, depending on the set relay switching response. On the display, the currently displayed measuring value and the symbol for undershoot or overshoot flash. An output change-over contact is available as a signaling contact.

Note

For AC currents I > 10 A, commercially available current transformers, e.g. 4NC, can be used as accessories. You will find more information in Catalog LV10 (www.siemens.com/lowvoltage/infomaterial).

Using the "transformer transmission factor" parameter (Scale), the display and transmission of the measured values via IO-Link can reproduce the measured primary current. The maximum primary current that can be measured is 750 A.

Relay switching response

The relay switching response can be defined in order to adapt the current monitoring relay to different external circuit connections and applications.
If the closed-circuit principle (NC) is set, active switching of the relay when no fault is pending also ensures that a power failure is detected as a fault. If the open-circuit principle (NC) is set, active switching of the relay only when a fault occurs means that a power failure is not detected as a fault.

With the setting U_S = on, the relay switches to the correct state when the supply voltage is applied but waits to detect the current flow before actually monitoring. The monitoring relay is thus switched on without generating an error message because, for example. the motor is not yet running and no current is flowing.

With parameterization NC / U_S = on, a motor can also be switched directly by closing the monitoring relay if the output relay K1 switches the contactor coil voltage. However, a defect that prevents current from flowing is not signaled with this setting. This can be suitably handled by setting the relay switching response to NC / I > 50 mA. When the supply voltage is applied, the output relay K1 is switched to the operate condition and the ON-delay time (onDel) is started. If current is not flowing normally after this time has elapsed, the output relay will switch back to the fault condition.

If a motor is not to be started directly using the monitoring relay, but in parallel using a pushbutton, with the monitoring relay ensuring the contactor holding, the switching response can be set accordingly.

With the setting I > 50 mA in conjunction with a set ON-delay time onDel = 0, the output relay K1 will not switch to the correct state until a current is actually measured. In this case, the monitoring relay will hold the contactor until a fault occurs or the current flow is interrupted by a further button or switch. If an ON-delay time is necessary, initial switching of the output relay on application of the supply voltage or on starting the ON-delay time must be suppressed by means of external logic.

Note

The name of the parameter values is based on the assumption that the ON-delay time onDel = 0 is set. The output relay K1 then responds either immediately when the supply voltage U_S is applied or after measurement of a current flow on the set NC or NO working principle.

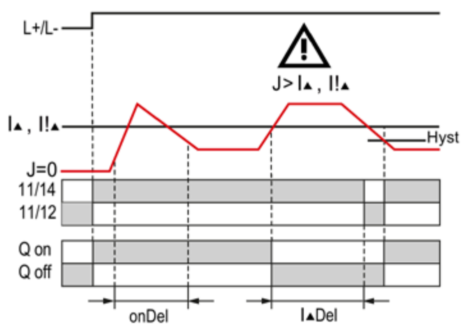
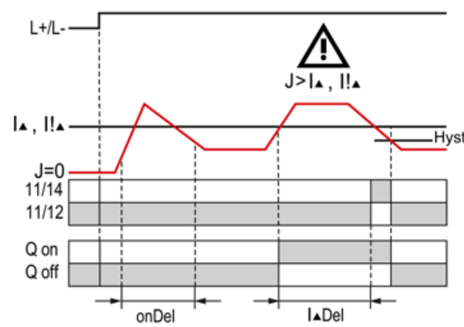
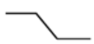
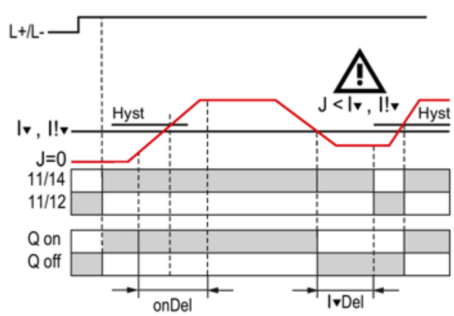
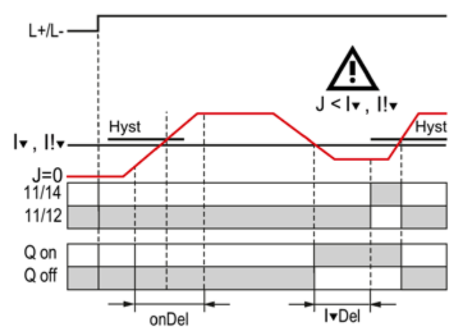
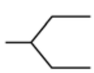
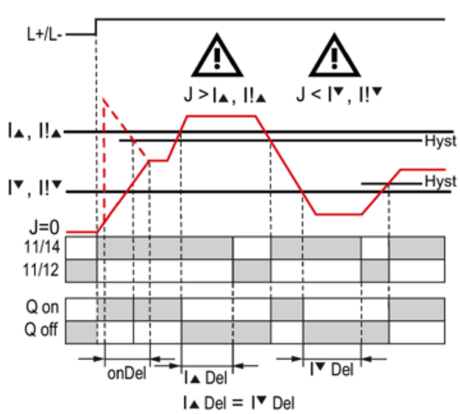
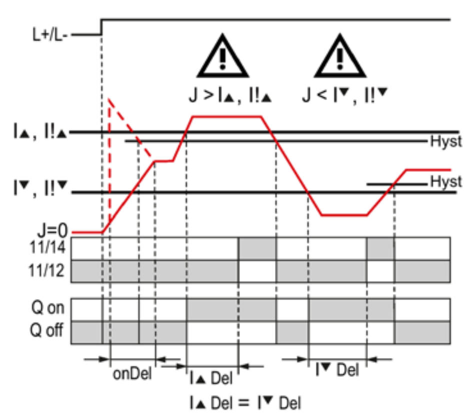
You can find the switching states of the output relay K1 below in the section "Function diagrams" and in the Chapter "Diagnostics (Page 109)".

SIO-Mode

The monitoring relays have a connection C/Q to IO-Link. If the IO-Link connection is not used for communication via IO-Link, the 3UG4822 current monitoring relays work in standard I/O mode (SIO-Mode). In this mode, terminal C/Q can be used as a semiconductor output that switches on a violation of the warning threshold for undershoot or overshoot.

- Q off: 24 V DC supply voltage present.
- Q on: The output has a high resistance.

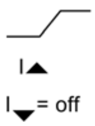
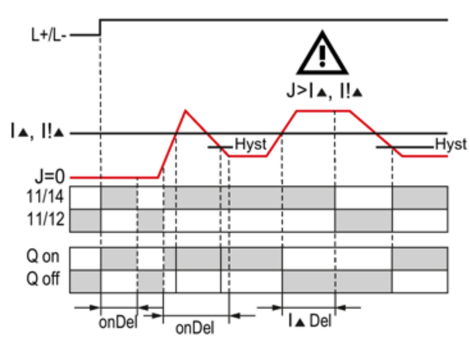
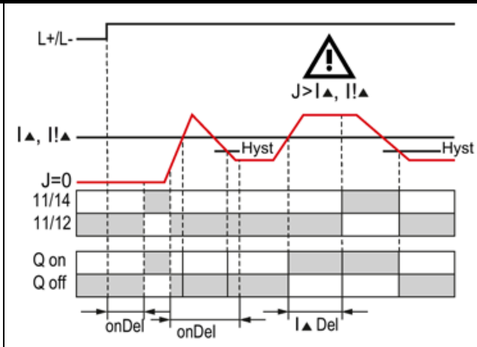
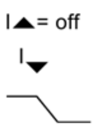
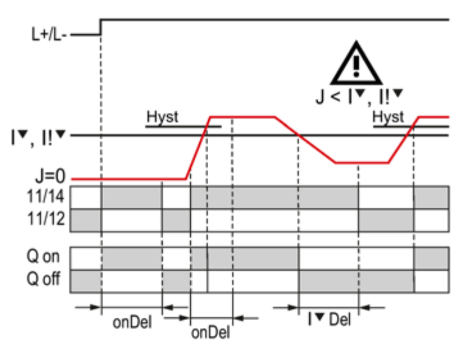
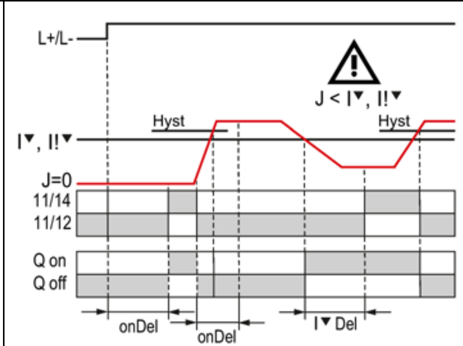
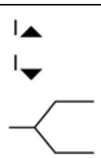
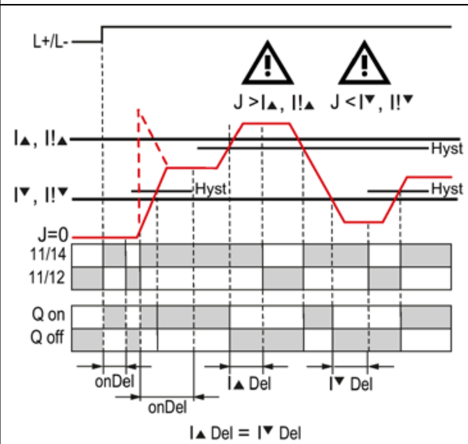
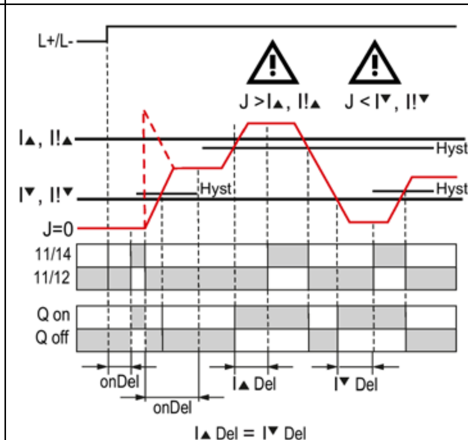
Function diagrams (from application of the supply voltage U_s = on)

<table>
<tr><th></th><th>Memory = no
Relay switching response = NC (closed-circuit principle)
U_s = on</th><th>Memory = no
Relay switching response = NO (open-circuit principle)
U_s = on</th></tr>
<tr><td>
I▲
I▼ = off</td><td>
</td><td>
</td></tr>
<tr><td>I▲ = off
I▼
</td><td>
</td><td>
</td></tr>
<tr><td>I▲
I▼
</td><td>
</td><td>
</td></tr>
</table>

J = Currently measured current value

I = Set threshold value for the current

Function diagrams (on reaching the lower measuring range limit of the measuring current I > 50 mA)

	Memory = no Relay switching response = NC (closed-circuit principle) I > 50 mA	Memory = no Relay switching response = NO (open-circuit principle) I > 50 mA
		
		
		

J = Currently measured current value

I = Set threshold value for the current

6.4 Operation

Parameters

The devices can be parameterized either locally via the display and the three keys, or via IO-Link.
You can find further information on configuring via IO-Link in the Chapter "Configuring the IO-Link (Page 235)".

Parameter information

The table below shows the settable parameter information of the 3UG4822 current monitoring relay:

Table 6- 2 Parameter information, 3UG4822 current monitoring relay

Menu level / IO-Link	Parameters	Setting range		Increment	Factory setting
		Minimum value	**Maximum value**		
"RUN" / IO-Link	Threshold for undershoot (I▾)	0.05 A or OFF	10.0 A or OFF	0.01 A	1.5 A
"RUN" / IO-Link	Threshold for overshoot (I▴)	0.05 A or OFF	10.0 A or OFF	0.01 A	2.5 A
"RUN" / IO-Link	Warning threshold for undershoot (I!▾)	0.05 A or OFF	10.0 A or OFF	0.01 A	1.5 A
"RUN" / IO-Link	Warning threshold for overshoot (I!▴)	0.05 A or OFF	10.0 A or OFF	0.01 A	2.5 A
"SET" / IO-Link	Hysteresis (Hyst)	0.01 A or OFF	5.0 A or OFF	0.01 A	0.5 A
"SET" / IO-Link	ON-delay time (onDel)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[2)] IO-Link: 0.1 s	Disabled (0 s)
IO-Link	ON-delay time (at Power ON)	Disabled	Enabled	--	Enabled
IO-Link	ON-delay time (at manual reset)	Disabled	Enabled	--	Enabled
IO-Link	ON-delay time (at restart)	Disabled	Enabled	--	Disabled
"SET" / IO-Link	Tripping delay time (I▾Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[2)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Tripping delay time (I▴Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[2)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Reset response (Mem)	local: no = Auto-reset IO-Link: Automatic	local: yes = Hand-RESET IO-Link: Manual	--	local: no = Auto-reset IO-Link: Automat-ic

Menu level / IO-Link	Parameters	Setting range		Increment	Factory setting
		Minimum value	Maximum value		
"SET" / IO-Link	Relay switching response (closed-circuit principle NC / open-circuit principle NO)	[00] Closed-circuit principle NC, I > 50 mA [01] Open-circuit principle NO, I > 50 mA [10] Closed-circuit principle NC, U_s = on [11] Open-circuit principle NO, U_s = on		--	[00] Closed-circuit principle NC, I > 50 mA
"SET" / IO-Link	Transformer transmission factor (Scale)	2 or OFF	750[3)]	1[1)]	Disabled (OFF)
IO-Link	Group diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Group error diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Local threshold change	Disabled	Enabled	--	Enabled
IO-Link	Local parameter change	Disabled	Enabled	--	Enabled
IO-Link	Local reset	Disabled	Enabled	--	Enabled
IO-Link	Retentive error memory	Disabled	Enabled	--	Disabled
IO-Link	Analog value coding	0 (Disabled)	255	--	16

1) To 20. For values from 20 to 100, the increment is 5.
For values from 100 to 500, the increment is 10.
For values from 500 to 750, the increment is 50.

2) up to 99.9 s; at values > 99.9 s, the increment is 1 s

3) The maximum value refers to a current transformer with a secondary current of 1 A. The measuring range of the primary current is limited to 750 A.

The following table provides an overview of the settable thresholds for the transformer transmission factor and the resulting thresholds for the primary current.

Primary current (in A)	**Secondary current (in A)**	
	5	1
	Transformer transmission factor (Scale)	
--	OFF	OFF
5	1	5
10	2	10
15	3	15
20	4	20
25	5	25
30	6	30
40	8	40
50	10	50
60	12	60
75	15	75
80	16	80
100	20	100
150	30	150
200	40	200
250	50	250
300	60	300
400	80	400
500	100	500
600	120	600
750	150	750

Note

Setting OFF for the transformer transmission factor defines a current measurement range of 0 to 10 A.

Note

If a time is set via IO-Link within the value range 100.0 to 999.9 s with one decimal place, the display will show only the value without the decimal place.

Note

"Overshoot" monitoring mode is activated when the undershoot threshold is set to OFF.

"Undershoot" monitoring mode is activated when the overshoot threshold is set to OFF.

Note

Deactivating monitoring

If the upper and lower threshold values are deactivated (OFF), monitoring will cease for:

- Current overshoot
- Current undershoot

The up-to-date measured value is displayed permanently.

The parameters are described in the Chapter "Parameters (Page 247)".

You will find further information on those parameters of the 3UG4822 current monitoring relay for IO-Link that can be set via IO-Link in the Chapter "Process data and data sets (Page 279)".

Menu-based operation is described in the Chapter "Menu-based operation (Page 42)".

6.5 Diagnostics

6.5.1 Indication on the display

Display information

The display is divided into three different areas.

① Current measured value or fault symbol
② Type of monitoring
③ Symbol of the change-over contact

Meaning of the information on the display

Note

Displays in the event of an error

The symbols on the display (① and ②) flash to indicate an error.

The following states and errors are shown on the display:

Display areas	Symbol	Meaning
①	I▼▼▼	The current is below the current range that can be measured.
①	I▲▲▲	The current is above the current range that can be measured.
①	5.0A	Currently measured current is displayed. • Not flashing: Current in the correct range or delay time is running • Flashing: Threshold overshot or undershot, delay time expired, relay has switched
①	P.ERR	Invalid parameter
①	ERR	Self-test error/internal error
①		IO-Link communication is being established 1)
①	OK	Device is in Communication-Mode (IO-Link)
①	ERR	IO-Link communication interrupted
①	SIO	Device is in SIO-Mode
②		Monitoring for current overshoot
②		Monitoring of the warning threshold for current overshoot (only visible if the parameter "Threshold for overshoot" is set to OFF.)
②		Monitoring for current undershoot
②		Monitoring of the warning threshold for current undershoot (only visible if the parameter "Threshold for undershoot" is set to OFF.)
②	◄	Current is in correct range.
②	▲	Current has risen above threshold. • Not flashing: Threshold overshot, tripping delay running • Flashing: Threshold overshot, tripping delay expired, relay has switched
②	▲ ◄	Alternate flashing: The current has risen above the set warning threshold.
②	▼	Current has fallen below threshold. • Not flashing: Threshold undershot, tripping delay running • Flashing: Threshold undershot, tripping delay expired, relay has switched
②	▼ ◄	Alternate flashing: The current has fallen below the set warning threshold.
③	I▼, I!▼ I▲, I!▲	• Not flashing: Relay contact 11/12 open, relay contact 11/14 closed • Flashing: Delay time (ON delay or tripping delay) running • Masked out: Relay contact 11/12 closed, relay contact 11/14 open

1) If this symbol is repeated for an extended period, the connection to the IO-Link master has been interrupted during communication buildup. Perform a restart of the monitoring relay.

Note

The value shown on the display always corresponds to the currently measured value even if the displayed value is flashing because a threshold has been overshot or undershot. The symbol for a threshold overshoot or undershoot indicates the fault causing this if manual RESET (Mem = yes) is set. In this way, the user can check before a Reset whether the cause of error has been remedied and a Reset is likely to result in a successful outcome.

You can find more information on the switching response of the output relay K1 in the Chapter "Functionality (Page 101)".

6.5.2 Diagnostics via IO-Link

Diagnostics via IO-Link

The 3UG4822 current monitoring relays with IO-Link connection provide an option for diagnostics via IO-Link.

The manufacturer-specific diagnostics listed in the table are reported via the diagnostics mechanism of IO-Link. The table below provides information on possible causes and remedial measures:

Table 6- 3 Possible causes and remedial measures

Diagnostics and messages	Possible cause	Possible remedial measure
Invalid parameter	The set parameter is invalid.	Specify a parameter in accordance with the parameter table in the Chapter "Operation (Page 106)".
Self-test error/internal error	Fault in internal test.	Return the device to the manufacturer.
Value above (warning) threshold for overshoot	The set current is higher than the set threshold for overshoot.	• Reduce the current. • Set a higher threshold.
Value below (warning) threshold for undershoot	The set current is lower than the set threshold for undershoot.	• Increase the current. • Set a lower threshold.
Measured value is outside the range that can be measured	The measured current is above or below the range that can be measured.	• Reduce the current. • Increase the current.

The table below indicates how the manufacturer-specific diagnostics are reported:

Table 6- 4 Diagnostics and messages

Diagnostics and messages	IO-Link event code [1]	PII [2]		Data set 92	Display information
		GE [3]	GW [4]		
Invalid parameter	0x6320	x	—	x	P.ERR
Self-test error/internal error	0x5000	x	—	x	ERR
Threshold for overshoot exceeded	0x8C10	x	—	x	▲
Threshold for undershoot violated	0x8C30	x	—	x	▼
Measured value is outside the range that can be measured	0x8C20	—	—	—	I▼▼▼ I▲▲▲

[1] The manufacturer-specific diagnostic events listed in the table are reported to the IO-Link master via the diagnostics mechanism of IO-Link.

[2] With the "process input image" (see "3UG4822 current monitoring relays (Page 311)"), you can determine via the group error (GE) bit or general warning (GW) bit in the user program whether detailed information on diagnostics or messages is present in diagnostic data set 92. If bit (= 1) is set, you can obtain detailed information on what caused a "group error" or "general warning" by reading data set 92.

[3] GE = Group error: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 314)").

[4] GW = General warning: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 314)").

x: Bit set

○: Not relevant

6.5.3 Reset

Reset

Resetting of the outputs is dependent on the "Reset response" parameter (see the Chapter "Reset response (Page 247)"). On the 3UG48 monitoring relays, the parameter can also be set via IO-Link.

The following settings can be selected:

- Automatic reset (Mem = no)

  The device is reset automatically as soon as a previously occurring error has been dealt with.

- Manual RESET (Mem = yes)

  To reset digitally adjustable devices, you must press both arrow keys simultaneously for more than 2.5 s after the cause of the error has been rectified. If the cause of the error has not been removed, a new error message appears immediately. Alternately, the devices (with deactivated retentive error memory) can be reset by switching the supply voltage on and off.

Note

The outputs can also be reset via the process image of the outputs (PIQ) by setting the "Reset" control command or using the corresponding system command (see the Chapter "Process data and data sets (Page 279)").

Note

With the "Local reset" parameter that can be set via the IO-Link, resetting locally on the device can be disabled.

Note

The warning threshold is always reset by autoreset.

6.6 Circuit diagrams

6.6.1 Internal circuit diagrams

Internal circuit diagrams 3UG4822

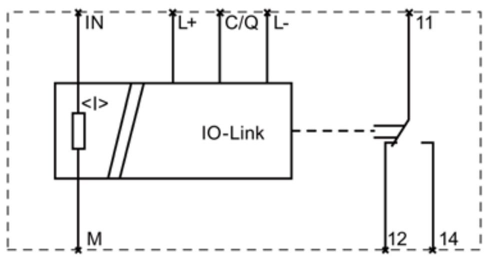


Figure 6-1 3UG4822 current monitoring relay for IO-Link

Note

On the 3UG4822 current monitoring relays for IO-Link, the measuring circuit and the IO-Link circuit are electrically isolated.

6.6.2 Typical circuit diagrams

3UG4822

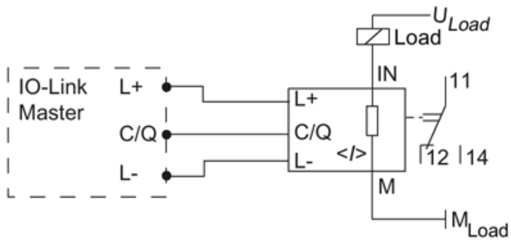


Figure 6-2 3UG4822-.AA40 single-phase operation

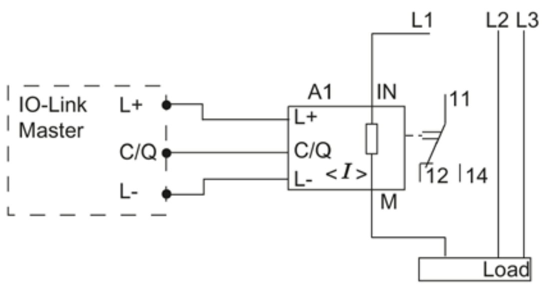


Figure 6-3 3UG4822-.AA40 three-phase operation

6.7 Technical data

Measuring circuit

		3UG4822-.....
Number of poles for main current circuit		1
Type of current for monitoring		AC/DC
Measurable current		
• initial value	A	0.05
• final value	A	10
• for AC	A	0.05 … 750
Measurable line frequency	Hz	500 … 40
Internal resistance of the measuring circuit	Ω	0.005
Adjustable response current		
• 1	A	0.05 … 10
• 2	A	0.05 … 10
Adjustable response delay time		
• when starting	s	0 … 999.9
• with lower or upper limit violation	s	0 … 999.9
Adjustable switching hysteresis for measured current value	mA	5 … 10
Stored energy time at mains power cut minimum	s	—
Operating voltage		
• rated value	V	24

General technical details

		3UG4822-.....
Product function		Current monitoring relay
Design of the display		LCD
Product function		
• overcurrent recognition of 1 phase		Yes
• overcurrent recognition of 3 phases		No
• undercurrent recognition of 1 phase		Yes
• undercurrent recognition of 3 phases		No
• overcurrent recognition DC		Yes
• undercurrent recognition DC		Yes
• current window recognition DC		Yes
• tension window recognition of 1 phase		No
• tension window recognition of 3 phases		No
• reset external		Yes
• self-reset		Yes
• open-circuit or closed-circuit current principle		Yes
Starting time after the control supply voltage has been applied	s	1
Response time maximum	ms	450
Relative metering precision	%	5
Precision of digital display		+/-1 digit
Relative temperature-related measurement deviation	%	5
Relative repeat accuracy	%	1
Type of voltage of supply voltage		DC
Supply voltage 1 for DC rated value	V	24
Supply voltage 1 for DC	V	18 … 30
Impulse voltage resistance rated value	kV	6
Recorded real power	W	2
Protection class IP		IP20
Electromagnetic compatibility		IEC 60947-1 / IEC 61000-6-2 / IEC 61000-6-4
Operating current at 17 V minimum	mA	10
Continuous current of the DIAZED fuse link of the output relay	A	4
Resistance against vibration according to IEC 60068-2-6		1 … 6 Hz: 15 mm, 6 … 500 Hz: 2g
Resistance against shock according to IEC 60068-2-27		sinusoidal half-wave 15g / 11 ms

		3UG4822-.....
Current carrying capacity of output relay		
• at AC-15		
– at 250 V at 50/60 Hz	A	3
– at 400 V at 50/60 Hz	A	3
• at DC-13		
– at 24 V	A	1
– at 125 V	A	0.2
– at 250 V	A	0.1
Current-carrying capacity for permanent overcurrent maximum permissible	A	15
Installation altitude at a height over sea level maximum	m	2 000
Conductor-bound parasitic coupling BURST according to IEC 61000-4-4		2 kV
Conductor-bound parasitic coupling conductor-earth SURGE according to IEC 61000-4-5		2 kV
Conductor-bound parasitic coupling conductor-conductor SURGE according to IEC 61000-4-5		1 kV
Electrostatic discharge according to IEC 61000-4-2		6 kV contact discharge / 8 kV air discharge
Field-bound parasitic coupling according to IEC 61000-4-3		10 V/m
Thermal current of the contact-affected switching element maximum	A	5
Maximum permissible voltage for safe disconnection		
• between control and auxiliary circuit	V	690
• between auxiliary circuit and auxiliary circuit	V	300
Degree of pollution		2
Ambient temperature		
• during operating phase	°C	-25 … +60
• during storage	°C	-40 … +85
• during transport	°C	-40 … +85
Galvanic isolation between entrance and outlet		Yes
Galvanic isolation between the voltage supply and other circuits		Yes
Mechanical operating cycles as operating time typical		10 000 000
Electrical operating cycles as operating time at AC-15 at 230 V typical		100 000
Operating cycles with 3RT2 contactor maximum	1/h	5 000

Communication

		3UG4822-.....
Type of voltage supply via input/ output link master		Yes
IO-Link transfer rate		COM2 (38,4 kBaud)
Protocol will be supported IO-Link protocol		Yes
Data volume		
• of the address range of the outputs with cyclical transfer total	byte	2
• of the address range of the inputs with cyclical transfer total	byte	4
Point-to-point cycle time between master and IO-Link device minimum	ms	10

Mechanical design

		3UG4822-1....	3UG4822-2....
Width	mm	22.5	
Height	mm	92	94
Depth	mm	91	
Built in orientation		any	
Distance, to be maintained, to earthed part			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Distance, to be maintained, to the ranks assembly			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	

		3UG4822-1....	3UG4822-2....
Distance, to be maintained, conductive elements			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Type of mounting		snap-on mounting	
Design of the electrical connection			
• for auxiliary and control current circuit		screw-type terminals	spring-loaded terminals
• for main current circuit		screw-type terminals	spring-loaded terminals
Product function			
• removable terminal for auxiliary and control circuit		Yes	
• removable terminal for main circuit		Yes	
Type of the connectable conductor cross-section			
• solid		1x (0.5 ... 4 mm²), 2x (0.5 ... 2.5 mm²)	2x (0.25 ... 1.5 mm²)
• finely stranded			
– with wire end processing		1x (0.5 ... 2.5 mm²), 2x (0.5 ... 1.5 mm²)	2 x (0.25 ... 1.5 mm²)
– without wire end processing		—	2x (0.25 ... 1.5 mm²)
• for AWG conductors			
– solid		2x (20 ... 14)	2x (24 ... 16)
– stranded		2x (20 ... 14)	2x (24 ... 16)
Tightening torque			
• with screw-type terminals	N·m	0.8 … 1.2	— …
Number of change-over switches delayed switching		1	

3UG4825 residual current monitoring relay with 3UL23 transformer 7

7.1 Application areas

Application areas

Residual current monitoring relays are used in industry to:

- Protect systems from damage caused by fault currents
- Prevent production losses caused by unplanned downtime
- Perform maintenance to meet all demands

3UG4825 residual current monitoring relays are used in conjunction with 3UL23 residual current transformers to monitor systems where environmental conditions increase the chance of higher fault currents. The devices are used for applications including in the following areas:

Table 7- 1 Application areas of 3UG4825 residual current monitoring relays

Cause of fault	Application
• Dust deposits on terminals	• Woodworking, grain mills
• Increased levels of humidity	• Mining, power supply containers
• Capacitive fault currents as "basic fault load"	• For large systems (line length)
• Porous cables and lines	• Motor winding insulation
• Diminishing insulation caused by material wear	• Furnaces

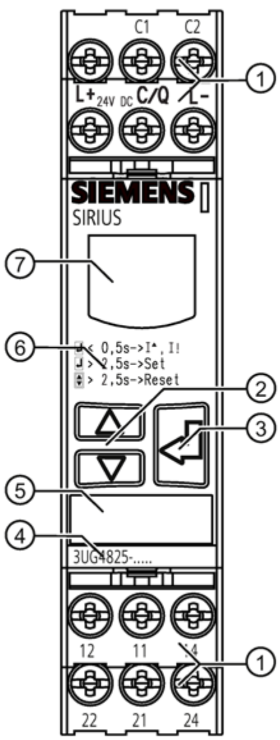
Note

3UG4825 residual current monitoring relays monitor devices and systems for their correct function.

They are **not** suitable for personal protection or protection from fires.

7.2 Operator controls and connection terminals

3UG4825 front view/terminal labeling

Front view	Description	
	**Position digits**	
	①	Terminal block (removable): Connection is possible using screw terminals or spring-loaded terminals.
	②	Arrow keys for menu navigation
	③	SET key for menu navigation
	④	Device article number
	⑤	Label
	⑥	Legend for menu
	⑦	Display for parameterization, actual-value indication, and diagnostics
	Terminal labels	
	L+	Supply voltage for IO-Link
	C/Q	Communication signal/switching signal
	L-	Ground IO-Link
	C1	Connection for 3UL23 residual current transformer
	C2	
	12	Output relay K1 CO contact NC contact (alarm output)
	11	Output relay K1 CO contact root
	14	Output relay K1 CO contact NO contact
	22	Output relay K2 CO contact NC contact (warning output)
	21	Output relay K2 CO contact root
	24	Output relay K2 CO contact NO contact

You can find additional information on the connection terminals and the permissible conductor cross-sections in the Chapter "Connection systems (Page 26)".

You can find information on connecting in the Chapter "Internal circuit diagrams (Page 140)".

7.3 Function

General functionality

The 3UG4825 residual current monitoring devices are supplied via the supply voltage IO-Link (L+) and ground IO-Link (L-) or via an external 24 V DC voltage source.

3UG4825 residual current monitoring relays are equipped with a display and are parameterized with three keys.

You will find the setting ranges and factory settings of the available parameters in Chapter "Operating (Page 133)".

You will find a description of the individual parameters in Chapter "Parameters (Page 247)".

The main conductors and, if present, the neutral conductor to which the load is connected, are routed through the opening of the ring core of a 3UL23 residual current transformer. There is a secondary winding around this ring core to which the 3UG4825 residual current monitoring relay is connected.

In fault-free operation of a system, the sum of inflowing and outflowing currents equals zero. No current is then induced in the secondary winding of the residual current transformer.

When an insulation error occurs, for example, the sum of the inflowing currents is greater than the sum of the outflowing currents.

The residual current induces a secondary current in the secondary winding of the transformer. This current is evaluated in the monitoring relay and used to display the current residual current and to switch the output relays when the set warning threshold or the tripping threshold is overshot.

To ensure a maximum plant availability 3UG4825 residual current monitoring relays focus on the following features:

- **High degree of measuring accuracy**
  3UG4825 residual current monitoring relays in combination with 3UL23 differential current transformers operate with a measuring accuracy of -7.5%/+7.5%. This enables set limit values to be monitored very precisely. False tripping caused by measuring errors is minimized.
- **Adjustable delay times**
  The ON-delay time of 3UG4825 residual current monitoring relays can be configured freely, enabling fading out of fault currents due to high input currents that are measured during motor start-up only. Short-term fault currents or emitted interference can be easily faded out using the adjustable tripping delay time. For more information please see the Chapter "Measuring accuracy".

- **Supply voltage**
  The 3UG4825 residual current monitoring relays are supplied via the supply voltage IO-Link (L+) and ground IO-Link (L-) or via an external 24 V DC voltage source. This not only ensures that devices can be used worldwide, but also that autonomous operation is possible with a communication connection or when the communication fails. The switching response of the relay outputs can be set to open-circuit principle (NO) if you intend to continue plant operation even if the monitoring function fails. This means only actively determined fault currents are reported via the relay outputs.
- **Permanent self-monitoring**
  The permanent self-monitoring feature of 3UG4825 ensures reliable system monitoring. The connected 3UL23 residual current transformer is also permanently monitored for open-circuit or short-circuit. As a result, cyclic manual tests to ensure its function are obsolete. Regardless of this, it is possible at any time to test the output relays for switching capability. Pressing the Set button for longer than 2.5 s will call up parameter assignment mode. This will cause the output relays to switch to the fault state as a safety precaution. Proceed as described above to quit parameter assignment mode. The output relay will once again switch back to its normal operating state.

See also

Parameters (Page 247)

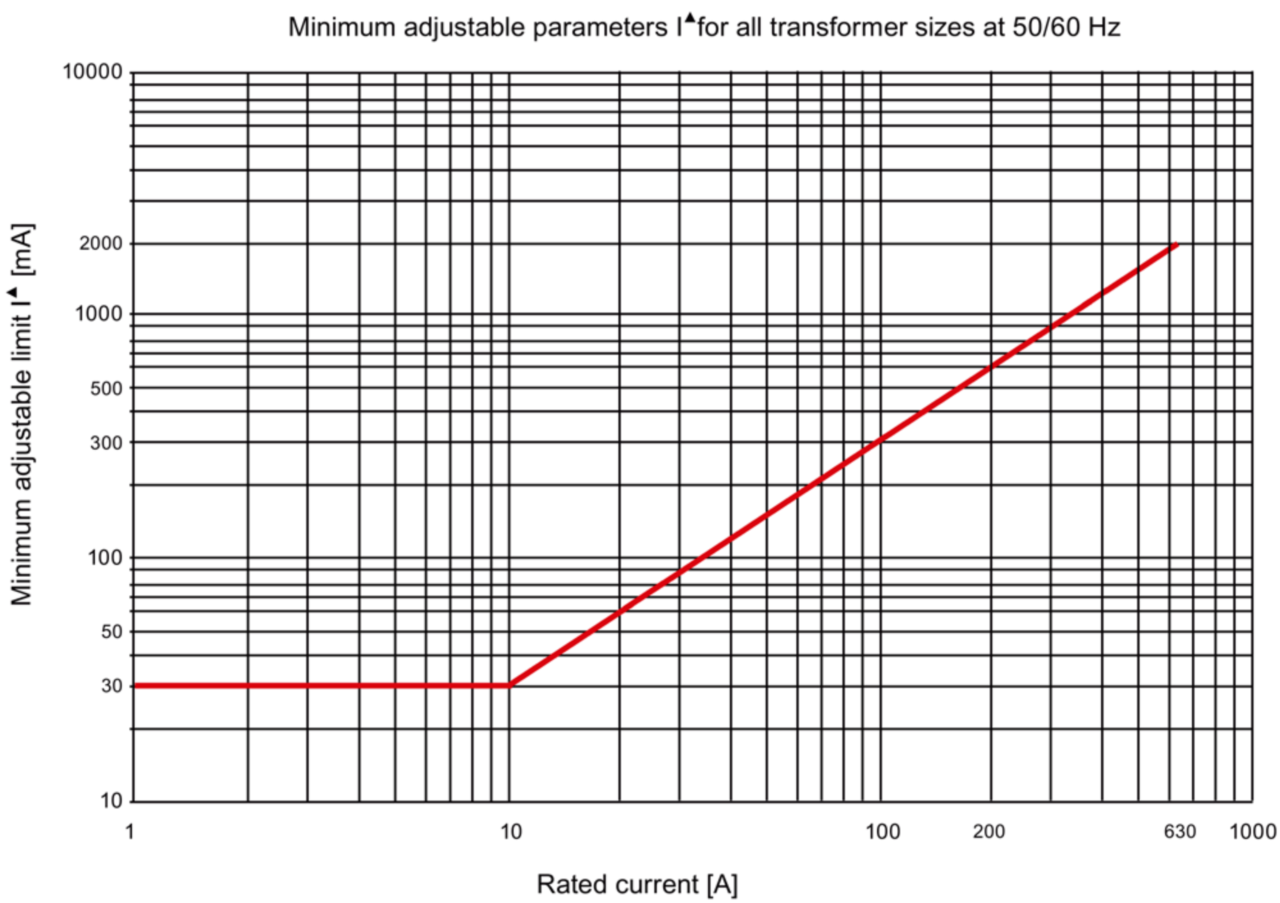
Measuring accuracy

The combination of 3UG4825 residual current monitoring relay and 3UL23 residual current transformer is designed so that a warning or alarm is triggered at the latest upon exceeding the set limit values. To safeguard this function, slightly higher fault currents than those actually measured are displayed and compared with the set limit values.

The measuring accuracy is -7.5 %/+7.5 % of the value displayed. This takes into account the measuring accuracy of monitoring relay and residual current transformer.

Limits of fault current measurement

In the event of increasing primary currents, transformer production tolerances, imbalances in the cable routing and current loads in individual cables increasingly cause what appear to be fault currents that are detected by the evaluation units.
An increased false tripping may occur if excessively low monitoring limit values have been set at high primary currents. Such tolerances also mean that the measuring accuracy no longer corresponds to the range of between -7.5 %/+7.5 %.
To avoid these types of measuring errors and false tripping, we recommend to set the limit values to the minimum values listed in the following graphic, depending on the applicable primary current.



If monitoring is required within limit values that are lower than those recommended, we recommend the use of delay times, particularly if false tripping occurs exclusively during motor start-up.
If delay times do not lead to the desired result, the use of shield sleeves may considerably lower the minimum possible monitoring limit.
For more information see Chapters "Installation specifications (Page 217)" and "Potential for optimization (Page 221)".

The monitored current waveforms also have a strong influence on the measuring accuracy. In the case of loads with generalized phase control, deviations from the measuring accuracy can occur when monitoring for high residual current limits. The cause of this is the extreme difference between the monitored rms values and the peak values of the residual current. The more extreme the generalized phase control, the shorter the time during which current flows, and the lower the resulting rms value. To achieve and monitor a high rms value in such a case, an extremely high peak value of the residual current is necessary. In the case of high currents, current transformers tend towards saturation in which a further increase in current on the primary side does not result in an equivalent increase on the secondary side. In the case of extreme peak values of the residual current, the measuring accuracy suffers as a result of this principle. Due to the great difference between the peak value and the rms value, monitoring for lower limits is useful.

Monitoring

Internal functional tests are performed upon connecting the monitoring relay to the supply voltage. In particular the connection to the 3UL23 residual current transformer is tested. During this time no fault current measurement or monitoring is performed and the display shows ---A instead.
This initial self-test takes approximately 1.6 s. Then a permanent self-test is performed without interrupting the monitoring function.
If the measured fault current exceeds the set warning threshold (I!), the corresponding CO contact 21-22-24 immediately changes the switching state and on the display the arrows highlighting that the threshold was exceeded and that the measured value is within the set limits ( ) flash alternately as an indication.

Note

Currents with line frequencies of between 16 and 400 Hz can be monitored by 3UG4825 residual current monitoring relays in conjunction with 3UL23 residual current transformers!

Startup delay

The set ON-delay time is triggered if the fault current overshoots the lower measuring range limit of 20 mA (onDel). During this time, exceeding the set limit values will not trigger a relay response of the CO contacts.
To start a drive, the output relay switches to the correct state during the ON-delay time (onDel), depending on the selected open-circuit principle or closed-circuit principle, even if the measured value remains above the set value.

Tripping delay

If the measured value exceeds the set threshold (I▲) after expiry of the ON-delay time (onDel), the set tripping delay time (I▲Del) starts and the relay symbol flashes. After expiry of this time, the output relay K1 changes the switching state. Exceeding the set warning threshold will cause output relay K2 to switch immediately without taking into account the tripping delay time. On the display, the actual measured value and the symbol for overshoot flash.

You will find the switching states of the output relays below in section "Function diagrams" and in Chapter "Diagnostics (Page 135)."

SIO-Mode

The monitoring relays have a connection C/Q to IO-Link. If the IO-Link connection is not used for communication via IO-Link, the 3UG4825 current monitoring relays work in standard I/O mode (SIO-Mode). In this mode, terminal C/Q can be used as a semiconductor output that switches on a violation of the warning threshold for undershoot or overshoot.

- Q off: 24 V DC supply voltage present.
- Q on: The output has a high resistance.

Tripping conditions

The combination of 3UG4825 residual current monitoring relay and 3UL23 residual current transformer responds according to the following tripping conditions:

Residual current monitoring relays	Fault current
No tripping	0 to 85 % of the set threshold
Tripping not defined	85 to 100 % of the set threshold
Tripping	>= 100 % of the set threshold

3UL23 residual current transformer

3UL23 residual current transformers can be used in conjunction with 3UG4825 residual current monitoring relays to detect fault currents in machines and systems.

3UL23 residual current transformers are suitable for detecting pure AC fault currents and AC fault currents with a pulsating direct-current component.

These necessary accessories are described in Chapter "3UL23 residual current transformers for 3UG4825 monitoring relays (Page 214)."

Note

Do not ground the neutral conductor downstream of the residual current transformer as otherwise fault current monitoring functions can no longer be ensured.

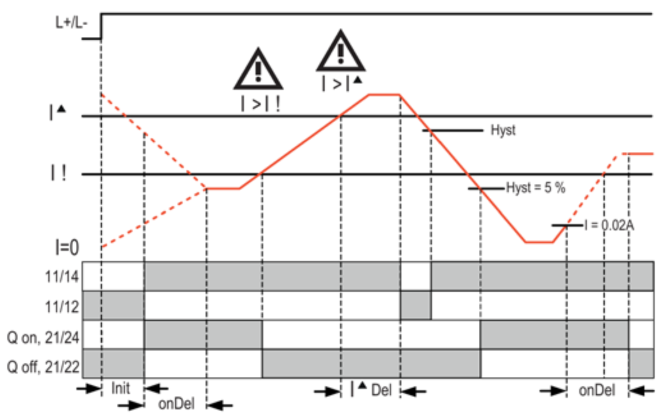
Function diagrams 3UG4825

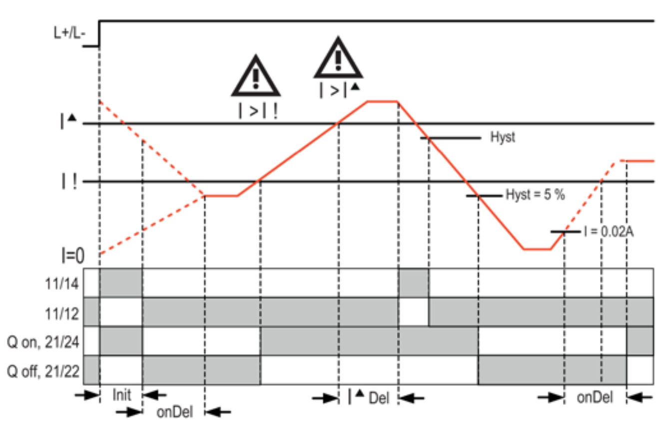
Note

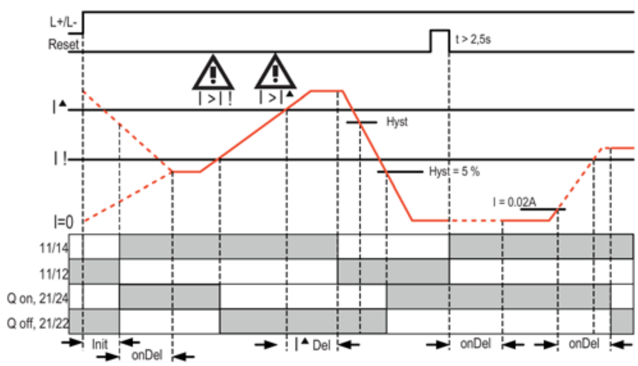
Difference between Hyst and Hysteresis

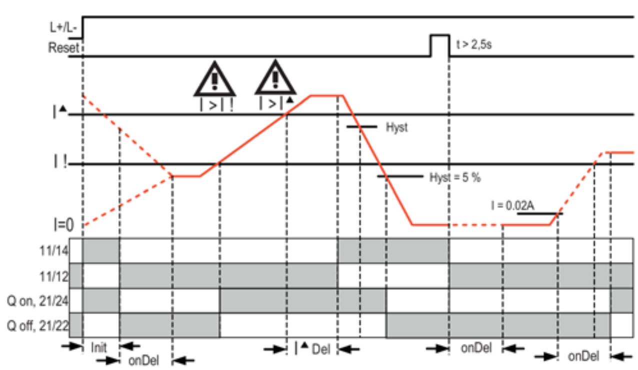
In the following diagrams, the term "Hyst" refers to the "Hysteresis" parameter. The "Hysteresis" parameter refers to the monitored limit values (I▲) and can be set in the SET menu.

However, "Hyst = 5 %" refers to the warning thresholds (I!) and is permanently set to 5 %.

<table>
<tr><th>Display</th><th>Memory = no
Relay switching behavior = NC (closed-circuit principle)</th></tr>
<tr><td>I▲ / I!
Mem = no</td><td>
</td></tr>
</table>

<table>
<tr><th>Display</th><th>Memory = no
Relay switching behavior = NO (open-circuit principle)</th></tr>
<tr><td>I▲ / I!
Mem = no</td><td>
</td></tr>
</table>

Display	Memory = yes Relay switching behavior = NC (closed-circuit principle)
I▲ / I! Mem = yes	

Display	Memory = yes Relay switching behavior = NO (open-circuit principle)
I▲ / I! Mem = yes	

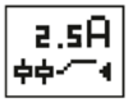
Note

The system is immediately switched off in the event of an open-circuit or short-circuit in the transformer connection cables.

7.4 Operating

Parameters

Parameterization of the devices is possible locally using the display and the three keys.



Parameter information

The table below shows the settable parameter information of the 3UG4825 residual current monitoring relay:

Table 7- 2 Parameter information, 3UG4825 residual current monitoring relays with digital setting

Menu level	Parameters	Setting range		Increment	Factory setting
		Minimum value	Maximum value		
"RUN" / IO-Link	Threshold for overshoot (I▲)	0.03 A	40.0 A	Depending on the value, 0.01 A or 0.1 A	1.0 A
"RUN / IO-Link	Warning threshold for overshoot (I!)	0.03 A or OFF	40.0 A	Depending on the value, 0.01 A or 0.1 A	0.5 A
"SET / IO-Link	Hysteresis (Hyst)	OFF (0 %)	50 %	5 %	5 %
"SET / IO-Link	ON-delay time (onDel)	0.1 s or OFF	999.9 s	0.1 s	OFF
IO-Link	ON-delay time (for Power-On)	Disabled	Released	--	Released
IO-Link	ON-delay time (at manual reset)	Disabled	Released	--	Released
IO-Link	ON-delay time (for Power-On (load))	Disabled	Released	--	Released
"SET / IO-Link	Tripping delay time (I▲Del)	0.1 s or OFF	999.9 s	0.1 s	0.1 s
"SET / IO-Link	Reset response (Mem)	no = Autoreset IO-Link: Automatic	yes = Hand-RESET IO-Link: Manual	--	no = Autoreset IO-Link: Automatic
"SET / IO-Link	Relay switching behavior (closed-circuit principle NC/ open-circuit principle NO)	NC or NO		--	NC

Menu level	Parameters	Setting range		Increment	Factory setting
		Minimum value	Maximum value		
IO-Link	Group diagnostics	Disabled	Released	--	Released
IO-Link	Group error diagnostics	Disabled	Released	--	Released
IO-Link	Local threshold change	Disabled	Released	--	Released
IO-Link	Local parameter change	Disabled	Released	--	Released
IO-Link	Local reset	Disabled	Released	--	Released
IO-Link	Retentive error memory	Disabled	Released	--	Disabled
IO-Link	Analog value coding 1)	0 (Disabled)	255	--	14

1) You can find the analog value codings accepted by the residual current monitoring relay in the chapter "Analog value coding (Page 280)".

Note

Various parameters are deactivated by setting OFF.

The parameters are described in the Chapter "Parameters (Page 247)".

Menu-based operation is described in the Chapter "Menu-based operation (Page 42)".

The 3UL23 residual current transformers used cover the entire fault current range from 0.03 to 40 A in all sizes.

For more information on the technical data of 3UL23 residual current transformers see Chapter "Technical data (Page 143)".

7.5 Diagnostics

7.5.1 Indications on the display

Display information

The display is divided into three different areas.

① Current measured value or fault symbol
② Type of monitoring
③ Symbols of the change-over contacts

Meaning of the information on the display

Note

Indications in the event of a fault

The symbols on the display flash to indicate an error.

The following statuses and faults are indicated on the display as a diagnostics message with flashing symbols:

Display area	Symbol	Meaning
①	5.00A	Displays the measured current
①	PERR	Invalid parameter
①	ERR	Self-test error/internal error
①		IO-Link communication is being established 1)
①	OK	Device is in Communication-Mode(IO-Link)
①	ERR	IO-Link communication interrupted
①	SIO	Device is in SIO-Mode

Display area	Symbol	Meaning
②		Monitoring for current overshoot
②	◄	Current is in correct range
②	▲	A current overshoot has occurred
②		Flashing alternately. The warning threshold has been exceeded
③	I▲	• Not flashing: Relay contact 11/12 open, relay contact 11/14 closed • Flashing: Delay time (ON-delay or tripping delay) running • Masked out: Relay contact 11/12 closed, relay contact 11/14 open
③	I!	• Not flashing: Relay contact 21/22 open, relay contact 21/24 closed • Flashing: Delay time (ON-delay) running • Masked out: Relay contact 21/22 closed, relay contact 21/24 open
①	---A	Self-test active, no measurements
①	I▲▲▲	Measurement range exceeded (> 43 A)
①	0.00A	Fallen below measurement range
①		Wire break
①		Short-circuit

1) If this symbol is repeated for an extended period, the connection to the IO-Link master has been interrupted during communication buildup. Perform a restart of the monitoring relay.

You will find more information about the switching behavior of the output relay in Chapter "Function (Page 125)."

7.5.2 Diagnostics via IO-Link

Diagnostics via IO-Link

The 3UG4825 residual current monitoring relays with IO-Link connection provide an option for diagnostics via IO-Link.

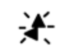
The manufacturer-specific diagnostics listed in the table are reported via the diagnostics mechanism of IO-Link. The table below provides information on possible causes and remedial measures:

Table 7- 3 Possible causes and remedial measures

Diagnostics and messages	Possible cause	Possible remedial measure
Invalid parameter	The set parameter is invalid.	Specify a parameter in accordance with the parameter table in the Chapter "Operating (Page 133)".
Self-test error/internal error	Fault in internal test.	Return the device to the manufacturer.
Value above (warning) threshold for overshoot	The set residual current is higher than the set threshold for overshoot.	• Reduce the residual current. • Set a higher threshold.
Measured value is outside the range that can be measured	The measured residual current value is above the measurable range.	• Reduce the residual current.
Wire break	There is no transformer connected	Connect a transformer (3UL23).
	Connecting cable defective	Check the wiring for damage.
Short-circuit	Transformer connecting cable damaged	Check the wiring for damage.
	Wrong transformer connected	Use only 3UL23 transformer

The table below indicates how the manufacturer-specific diagnostics are reported:

Table 7- 4 Diagnostics and messages

Diagnostics and messages	IO-Link event code 1)	PII 2)		Data set 92	Display information
		GE 3)	GW 4)		
Invalid parameter	0x6320	x	—	x	P.ERR
Self-test error/internal error	0x5000	x	—	x	ERR
Warning threshold for overshoot exceeded	—	—	x	x	
Threshold for overshoot exceeded	0x8C10	x	—	x	
Measured value is outside the range that can be measured	0x8C20	—	—	x	
Wire break	0x8CA6	x	—	x	
Short-circuit	0x8CA1	x	—	x	

1) The manufacturer-specific diagnostic events listed in the table are reported to the IO-Link master via the diagnostics mechanism of IO-Link.

2) With the "process input image" (see "3UG4825 residual current monitoring relay (Page 320)"), you can determine via the group error (GE) bit or general warning (GW) bit in the user program whether detailed information on diagnostics or messages is present in diagnostic data set 92. If bit (= 1) is set, you can obtain detailed information on what caused a "group error" or "general warning" by reading data set 92.

3) GE = Group error: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 323)").

4) GW = General warning: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 323)").

x: Bit set

—: Not relevant

7.5.3 Reset

Reset

Resetting of the outputs is dependent on the "Reset response" parameter (see the Chapter "Reset response (Page 247)"). On the 3UG48 monitoring relays, the parameter can also be set via IO-Link.

The following settings can be selected:

- Automatic reset (Mem = no)

  The device is reset automatically as soon as a previously occurring error has been dealt with.

- Manual RESET (Mem = yes)

  To reset digitally adjustable devices, you must press both arrow keys simultaneously for more than 2.5 s after the cause of the error has been rectified. If the cause of the error has not been removed, a new error message appears immediately. Alternately, the devices (with deactivated retentive error memory) can be reset by switching the supply voltage on and off.

Note

The outputs can also be reset via the process image of the outputs (PIQ) by setting the "Reset" control command or using the corresponding system command (see the Chapter "Process data and data sets (Page 279)").

Note

With the "Local reset" parameter that can be set via the IO-Link, resetting locally on the device can be disabled.

Note

The warning threshold is always reset by autoreset.

7.6 Circuit diagrams

7.6.1 Internal circuit diagrams

Internal circuit diagrams 3UG4825

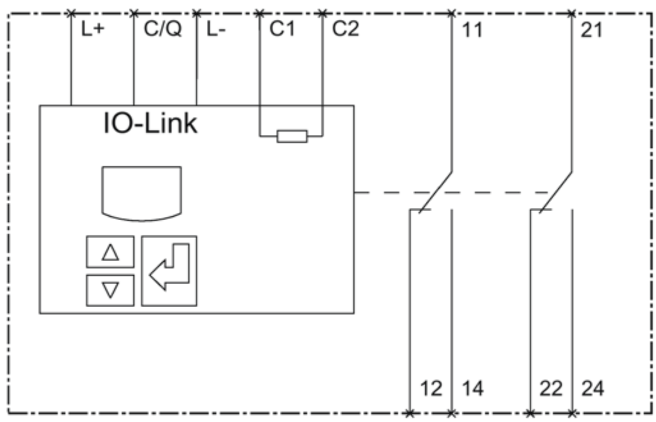
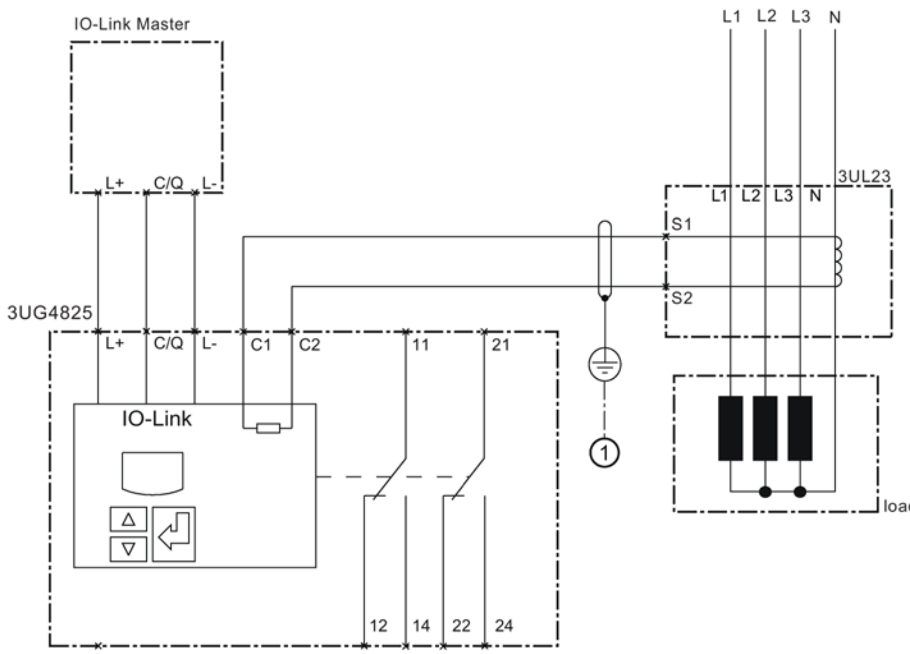


Figure 7-1 3UG4825-.CA40 residual current monitoring relay

Note

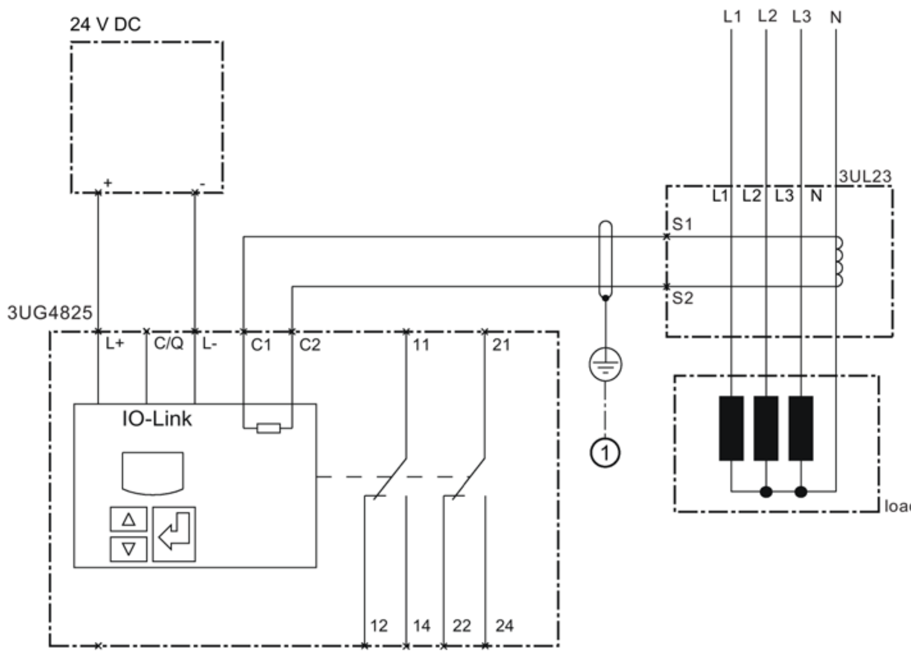
The 3UG4825 residual current monitoring relay for IO-Link is suitable for operation with 3UL23 residual current transformers for external ground-fault monitoring. The output signal of the 3UL23 residual current transformer is connected to terminals C1 and C2 of the monitoring relay. To avoid interference injection, which could result in incorrect measurements, these connecting lines must be routed as parallel as possible and twisted, or shielded cables must be used.

7.6.2 Wiring examples



① Cable shielding recommended

Figure 7-2 Wiring example 3UG4825 with 3UL23 (connection to IO-Link master)



① Cable shielding recommended

Figure 7-3 Wiring example 3UG4825 with 3UL23 (direct power supply with 24 V DC)

7.7 Technical data

Measuring circuit

		3UG4825-.....
Type of current for monitoring		AC
Measurable line frequency	Hz	16 400
Adjustable response current		
• 1	A	0.03 … 40
• 2	A	0.03 … 40
Adjustable response delay time when starting	s	0 … 999.9
Adjustable response delay time	s	0 … 999.9
Switching hysteresis	%	0 … 50
Stored energy time at mains power cut minimum	ms	10
Operating voltage		
• rated value	V	24

General technical details

		3UG4825-.....
Product function		for three-phase supplies
Design of the display		LCD
Product function		
• difference current indication		Yes
• defect storage		Yes
• overcurrent recognition of 1 phase		Yes
• undercurrent recognition of 1 phase		No
• reset external		Yes
• open-circuit or closed-circuit current principle		Yes
Starting time after the control supply voltage has been applied	ms	1 600
Response time maximum	ms	150
Relative metering precision	%	5
Precision of digital display		+/-1 digit
Temperature drift per °C	%/°C	0.1
Relative repeat accuracy	%	1
Type of voltage of the controlled supply voltage		DC

		3UG4825-.....
Control supply voltage at 50 Hz at AC rated value	V	— —
Control supply voltage at 60 Hz at AC rated value	V	— —
Control supply voltage for DC • rated value	V	24
Operating range factor control supply voltage rated value • at 50 Hz – for AC • at 60 Hz – for AC • for DC		— — — — 0.85 … 1.1
Impulse voltage resistance rated value	kV	4
Recorded real power	W	2
Protection class IP		IP20
Electromagnetic compatibility		IEC 60947-1 / IEC 61000-6-2 / IEC 61000-6-4
Operating current at 17 V minimum	mA	5
Continuous current of the DIAZED fuse link of the output relay	A	4
Resistance against vibration according to IEC 60068-2-6		1 ... 6 Hz: 15 mm, 6 ... 500 Hz: 2g
Resistance against shock according to IEC 60068-2-27		sinusoidal half-wave 15g / 11 ms
Installation altitude at a height over sea level maximum	m	2 000
Current carrying capacity of output relay at AC-15 • at 250 V at 50/60 Hz • at 400 V at 50/60 Hz	 A A	 3 3
Current carrying capacity of output relay at DC-13 • at 24 V • at 125 V • at 250 V	 A A A	 1 0.2 0.1
Conductor-bound parasitic coupling BURST according to IEC 61000-4-4		2 kV
Conductor-bound parasitic coupling conductor-earth SURGE according to IEC 61000-4-5		2 kV
Conductor-bound parasitic coupling conductor-conductor SURGE according to IEC 61000-4-5		1 kV
Electrostatic discharge according to IEC 61000-4-2		4 kV contact discharge / 8 kV air discharge

		3UG4825-.....
Field-bound parasitic coupling according to IEC 61000-4-3		10 V/m
Thermal current of the contact-affected switching element maximum	A	5
Insulation voltage for overvoltage category III according to IEC 60664 with degree of pollution 3 rated value	V	300
Degree of pollution		3
Ambient temperature		
• during operating	°C	-25 … +60
• during storage	°C	-40 … +85
• during transport	°C	-40 … +85
Design of the electrical isolation		galvanic
Galvanic isolation		
• between entrance and outlet		Yes
• between the outputs		Yes
• between the voltage supply and other circuits		No
Mechanical operating cycles as operating time typical		10 000 000
Electrical operating cycles as operating time at AC-15 at 230 V typical		100 000
Operating cycles with 3RT2 contactor maximum	1/h	5 000

Mechanical design

		3UG4825-1....	3UG4825-2....
Width	mm	22.5	
Height	mm	102	103
Depth	mm	91	
mounting position		any	
Distance, to be maintained, to earthed part			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Distance, to be maintained, to the ranks assembly			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Distance, to be maintained, conductive elements			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Type of mounting		screw and snap-on mounting onto 35 mm standard mounting rail	
Product function removable terminal for auxiliary and control circuit		Yes	
Design of the electrical connection		screw-type terminals	spring-loaded terminals

		3UG4825-1....	3UG4825-2....
Type of the connectable conductor cross-section			
• solid		1x (0.5 ... 4 mm²), 2x (0.5 ... 2.5 mm²)	2x (0.25 ... 1.5 mm²)
• finely stranded			
– with wire end processing		1x (0.5 ... 2.5 mm²), 2x (0.5 ... 1.5 mm²)	2 x (0.25 ... 1.5 mm²)
– without wire end processing		—	2x (0.25 ... 1.5 mm²)
• for AWG conductors			
– solid		2x (20 ... 14)	2x (24 ... 16)
– stranded		2x (20 ... 14)	2x (24 ... 16)
Tightening torque			
• with screw-type terminals	N·m	0.8 … 1.2	—
Number of change-over switches delayed switching		2	

Communication

		3UG4825-.....
Type of voltage supply via input/ output link master		Yes
IO-Link transfer rate		COM2 (38,4 kBaud)
Protocol will be supported IO-Link protocol		Yes
Data volume		
• of the address range of the outputs with cyclical transfer total	byte	2
• of the address range of the inputs with cyclical transfer total	byte	4
Point-to-point cycle time between master and IO-Link device minimum	ms	10

3UG4832 voltage monitoring relay 8

8.1 Application areas

Application areas

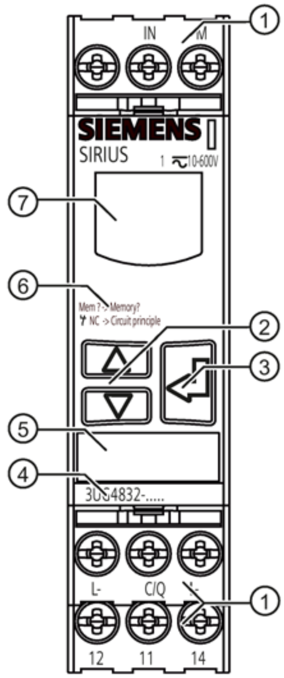
The voltage monitoring relays are used, for example, in the following applications:

Table 8- 1 Application areas of the voltage monitoring relays

Function	Application
• Undervoltage • Overvoltage	• Motor current increased due to undervoltage resulting in overheating • Unintended device reset • Mains failure – particularly with battery supply • Heating systems • Cranes • Elevators • Protection against undervoltage on overloaded supply voltages (pre-dominantly with battery supply) • System protection against destruction caused by supply overvoltages • Energy supply to the line • Machine switch-on when a defined voltage is reached • Lamps (UV lamps, laser lamps, OP lighting, tunnels, traffic lights)

8.2 Operator controls and connection terminals

Front view / terminal labeling

Front view	Description	
	**Position digits**	
	①	Terminal block (removable): Connection is possible using screw terminals or spring-loaded terminals.
	②	Arrow keys for menu navigation
	③	SET key for menu navigation
	④	Device article number
	⑤	Label
	⑥	Legend for menu
	⑦	Display for parameterization, actual-value indication, and diagnostics
	Terminal labels	
	L+	Supply voltage for IO-Link
	C/Q	Communication signal / switching signal
	L-	Ground IO-Link
	M	Measuring signal input -
	IN	Measuring signal input +
	12	Output relay K1 CO contact NC contact
	11	Output relay K1 CO contact root
	14	Output relay K1 CO contact NO contact

You can find additional information on the connection terminals and the permissible conductor cross-sections in the Chapter "Connection systems (Page 26)".

You can find information on connecting in the Chapter "Internal circuit diagrams (Page 160)".

8.3 Functionality

General functionality

Depending on the setting, the 3UG4832 voltage monitoring relays monitor an AC voltage or DC voltage at terminals IN and M of the device for **overshoot** (U▲) or **undershoot** (U▼) or in **window monitoring** (U▲ and U▼).

The devices are supplied via the supply voltage IO-Link (L+) and ground IO-Link (L-) or via an external 24 V DC voltage source.

The 3UG4832 voltage monitoring relays have a display and are parameterized with three keys. The devices can also be parameterized via IO-Link and transfer the measured voltage values and error messages to a controller.

You will find the setting ranges and factory settings of the 3UG4832 voltage monitoring relays in Chapter "Operation (Page 153)."

You can find a description of the individual parameters in the Chapter Parameters (Page 247).

You can find the full data sets in the Chapter "Process data and data sets (Page 279)".

Monitoring

The output relay K1 responds in accordance with the set relay switching response (closed-circuit principle NC or open-circuit principle NO). The set tripping delay time starts if the monitored voltage overshoots or undershoots the corresponding set threshold value. After expiry of the tripping delay time, the output relay K1 changes the switching state. On the display, the currently displayed measuring value and the symbol for undershoot or overshoot flash.

An output change-over contact is available as a signaling contact.

If the supply voltage is switched on and no monitoring voltage is present yet, the display will indicate U▼▼▼ and show a symbol for voltage overshoot monitoring, voltage undershoot monitoring, or range monitoring.

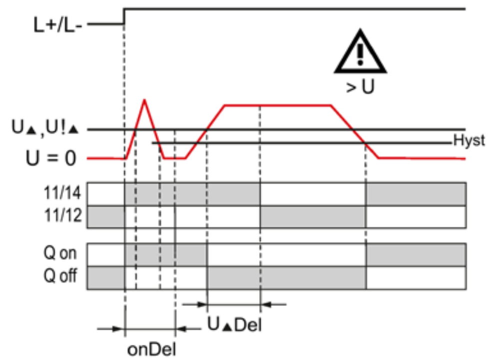
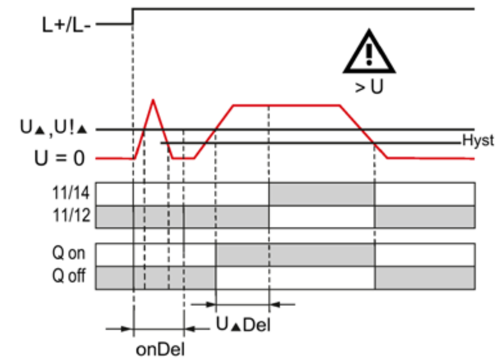
You can find the switching states of the output relay K1 below in the section "Function diagrams" and in the Chapter "Diagnostics (Page 155)".

SIO-Mode

The monitoring relays have a connection C/Q to IO-Link. If the IO-Link connection is not used for communication via IO-Link, the 3UG4832 voltage monitoring relays work in standard I/O mode (SIO-Mode). In this mode, terminal C/Q can be used as a semiconductor output that switches on a violation of the warning threshold for undershoot or overshoot.

- Q off: 24 V DC supply voltage present.
- Q on: The output has a high resistance.

Function diagrams 3UG4832

<table>
<tr><th></th><th>Memory = no
Relay switching response = NC
(closed-circuit principle)</th><th>Memory = no
Relay switching response = NO
(open-circuit principle)</th></tr>
<tr><td>
U▲
U▼ = off</td><td>
</td><td>
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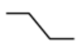
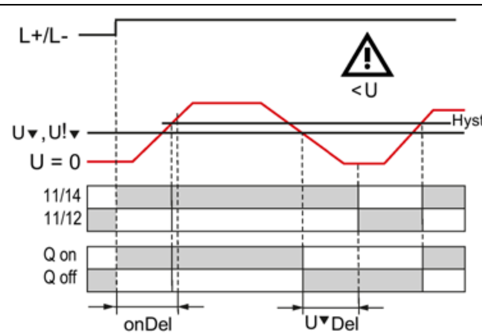
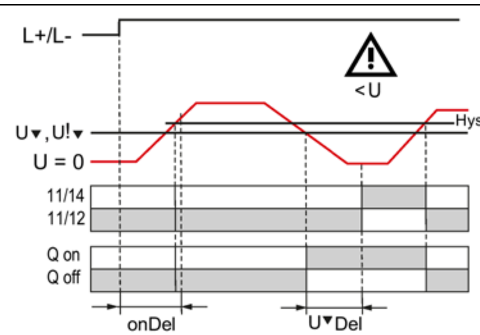
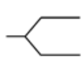
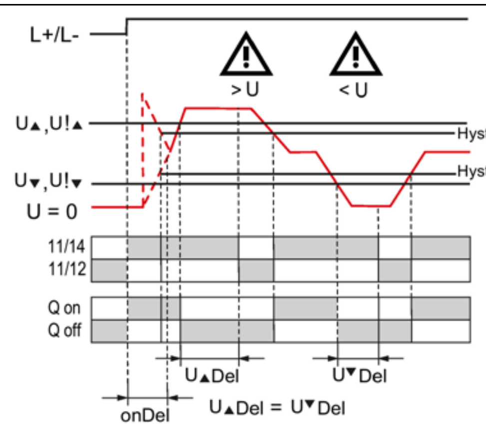
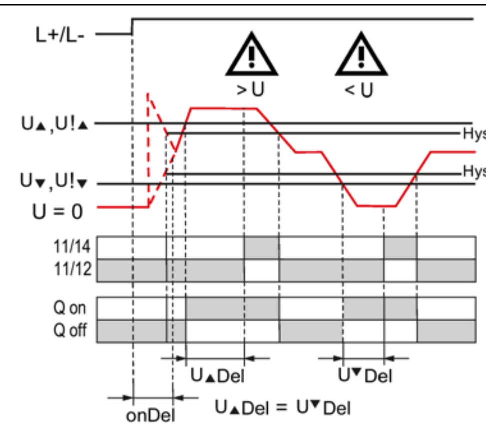
<tr><td>
U▲ = off
U▼</td><td>
</td><td>
</td></tr>
<tr><td>U▲
U▼
</td><td>
</td><td>
</td></tr>
</table>

8.4 Operation

Parameters

The devices can be parameterized either locally via the display and the three keys, or via IO-Link.
You can find further information on configuring via IO-Link in the Chapter "Configuring the IO-Link (Page 235)".

Parameter information

The table below shows the settable parameter information of the 3UG4832 voltage monitoring relays:

Table 8- 2 Parameter information, 3UG4832 voltage monitoring relay

Menu level / IO-Link	Parameters	Setting range		Incre-ment	Factory setting
		Minimum value	Maximum value		
"RUN" / IO-Link	Threshold for undershoot (U▼)	10 V or OFF	600 V or OFF	0.1 V[2]	200 V
"RUN" / IO-Link	Threshold for overshoot (U▲)	10 V or OFF	600 V or OFF	0.1 V[2]	300 V
"RUN" / IO-Link	Warning threshold for under-shoot (U!▼)	10 V or OFF	600 V or OFF	0.1 V[2]	200 V
"RUN" / IO-Link	Warning threshold for over-shoot (U!▲)	10 V or OFF	600 V or OFF	0.1 V[2]	300 V
"SET" / IO-Link	Hysteresis (Hyst)	0.1 V or OFF	300 V or OFF	0.1 V[2]	5 V
"SET" / IO-Link	ON-delay time (onDel)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1] IO-Link: 0.1 s	Disabled (0 s)
IO-Link	ON-delay time (at Power ON)	Disabled	Enabled	--	Enabled
IO-Link	ON-delay time (at manual reset)	Disabled	Enabled	--	Enabled
"SET" / IO-Link	Tripping delay time (U▼Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Tripping delay time (U▲Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1] IO-Link: 0.1 s	Disabled (0 s)

Menu level / IO-Link	Parameters	Setting range		Incre-ment	Factory setting
		Minimum value	Maximum value		
"SET" / IO-Link	Reset response (Mem)	local: no = Auto-reset IO-Link: Automatic	local: yes = Hand-RESET IO-Link: Manual	--	local: no = Auto-reset IO-Link: Automat-ic
"SET" / IO-Link	Relay switching response (closed-circuit principle NC / open-circuit principle NO)	Closed-circuit principle (NC) or Open-circuit principle (NO)		--	Closed-circuit principle (NC)
IO-Link	Group diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Group error diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Local threshold change	Disabled	Enabled	--	Enabled
IO-Link	Local parameter change	Disabled	Enabled	--	Enabled
IO-Link	Local reset	Disabled	Enabled	--	Enabled
IO-Link	Retentive error memory	Disabled	Enabled	--	Disabled
IO-Link	Index for analog value stamp-ing	0 (Disabled)	255	--	44

1) up to 99.9 s; at values > 99.9 s, the increment is 1 s

2) up to 99.9 V; at values > 99.9 V, the increment is 1 V

Note

If a time is set via IO-Link within the value range 100.0 to 999.9 s with one decimal place, the display will show only the value without the decimal place.

Note

The monitoring mode "Overshoot" or "Undershoot" is defined with the setting OFF at the threshold for undershoot or overshoot.

The parameters are described in the Chapter "Parameters (Page 247)".

You will find further information on those parameters of the 3UG4832 voltage monitoring relays for IO-Link that can be set via IO-Link in the Chapter "Process data and data sets (Page 279)."

Menu-based operation is described in the Chapter "Menu-based operation (Page 42)".

8.5 Diagnostics

8.5.1 Indication on the display

Display information

The display is divided into three different areas.

① Voltage measured value or fault symbol
② Type of monitoring
③ Symbol of the change-over contact

Meaning of the information on the display

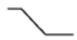
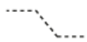
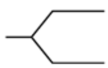
Note

Displays in the event of an error

The symbols on the display (① and ②) flash to indicate an error.

The following states and errors are shown on the display:

Display area	Symbol	Meaning
①	U▼▼▼	The voltage is below the voltage range that can be measured.
①	U▲▲▲	The voltage is above the voltage range that can be measured.
①	20.0V	Currently measured voltage is displayed. • Not flashing: Voltage in the correct range or delay time is running • Flashing: Threshold overshot or undershot, delay time expired, relay has switched
①	P.ERR	Invalid parameter
①	ERR	Self-test error/internal error
①		IO-Link communication is being established [1)]
①	OK	Device is in Communication-Mode (IO-Link)
①	ERR	IO-Link communication interrupted
①	SIO	Device is in SIO-Mode

Display area	Symbol		Meaning
②			Monitoring for voltage overshoot
②			Monitoring of the warning threshold for voltage overshoot (only visible if the parameter "Threshold for overshoot" is set to OFF.)
②			Monitoring for voltage undershoot
②			Monitoring of the warning threshold for voltage undershoot (only visible if the parameter "Threshold for undershoot" is set to OFF.)
②			Window monitoring (monitoring for voltage overshoot and undershoot)
②	◄		Voltage is in correct range.
②	▲		A voltage undershoot has occurred. • Not flashing: Threshold overshot, tripping delay running • Flashing: Threshold overshot, tripping delay expired, relay has switched
②	▲ ◄		Alternate flashing: The voltage has risen above the set warning threshold.
②	▼		A voltage undershoot has occurred. • Not flashing: Threshold undershot, tripping delay running • Flashing: Threshold undershot, tripping delay expired, relay has switched
②	▼ ◄		Alternate flashing: The voltage has fallen below the set warning threshold.
③		U▼, U!▼ U▲, U!▲	• Not flashing: Relay contact 11/12 open, relay contact 11/14 closed • Flashing: Delay time (ON delay or tripping delay) running • Masked out: Relay contact 11/12 closed, relay contact 11/14 open

1) If this symbol is repeated for an extended period, the connection to the IO-Link master has been interrupted during communication buildup. Perform a restart of the monitoring relay.

Note

The value shown on the display always corresponds to the currently measured value even if the displayed value is flashing because a threshold has been overshot or undershot. The symbol for a threshold overshoot or undershoot indicates the fault causing this if manual RESET (Mem = yes) is set. In this way, the user can check before a Reset whether the cause of error has been remedied and a Reset is likely to result in a successful outcome.

You can find more information on the switching response of the output relay K1 in the Chapter "Functionality (Page 151)".

8.5.2 Diagnostics via IO-Link

Diagnostics via IO-Link

The 3UG4832 voltage monitoring relays with IO-Link connection provide an option for diagnostics via IO-Link.

The manufacturer-specific diagnostics listed in the table are reported via the diagnostics mechanism of IO-Link. The table below provides information on possible causes and remedial measures:

Table 8- 3 Possible causes and remedial measures

Diagnostics and messages	Possible cause	Possible remedial measure
Invalid parameter	The set parameter is invalid.	Specify a parameter in accordance with the parameter table in the Chapter "Operation (Page 153)".
Self-test error/internal error	Fault in internal test.	Return the device to the manufacturer.
Value above (warning) threshold for overshoot	The set voltage is higher than the set threshold for overshoot.	• Reduce the voltage. • Set a higher threshold.
Value below (warning) threshold for undershoot	The set voltage is lower than the set threshold for undershoot.	• Increase the voltage. • Set a lower threshold.
Measured value is outside the range that can be measured	The measured voltage is above or below the range that can be measured.	• Reduce the voltage. • Increase the voltage.

The table below indicates how the manufacturer-specific diagnostics are reported:

Table 8- 4 Diagnostics and messages

Diagnostics and messages	IO-Link event code [1]	PII [2]		Data set 92	Display information
		GE [3]	GW [4]		
Invalid parameter	0x6320	x	—	x	P.ERR
Self-test error/internal error	0x5000	x	—	x	ERR
Threshold for overshoot exceeded	0x8C10	x	—	x	▲
Threshold for undershoot violated	0x8C30	x	—	x	▼
Measured value is outside the range that can be measured	0x8C20	—	—	—	U▼▼▼ or U▲▲▲

1) The manufacturer-specific diagnostic events listed in the table are reported to the IO-Link master via the diagnostics mechanism of IO-Link.

2) With the "process input image" (see "3UG4832 voltage monitoring relay (Page 328)"), you can determine via the group error (GE) bit or general warning (GW) bit in the user program whether detailed information on diagnostics or messages is present in diagnostic data set 92. If bit (= 1) is set, you can obtain detailed information on what caused a "group error" or "general warning" by reading data set 92.

3) GE = Group error: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 331)").

4) GW = General warning: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 331)").

x: Bit set

○: Not relevant

8.5.3 Reset

Reset

Resetting of the outputs is dependent on the "Reset response" parameter (see the Chapter "Reset response (Page 247)"). On the 3UG48 monitoring relays, the parameter can also be set via IO-Link.

The following settings can be selected:

- Automatic reset (Mem = no)

  The device is reset automatically as soon as a previously occurring error has been dealt with.

- Manual RESET (Mem = yes)

  To reset digitally adjustable devices, you must press both arrow keys simultaneously for more than 2.5 s after the cause of the error has been rectified. If the cause of the error has not been removed, a new error message appears immediately. Alternately, the devices (with deactivated retentive error memory) can be reset by switching the supply voltage on and off.

Note

The outputs can also be reset via the process image of the outputs (PIQ) by setting the "Reset" control command or using the corresponding system command (see the Chapter "Process data and data sets (Page 279)").

Note

With the "Local reset" parameter that can be set via the IO-Link, resetting locally on the device can be disabled.

Note

The warning threshold is always reset by autoreset.

8.6 Circuit diagrams

8.6.1 Internal circuit diagrams

Internal circuit diagrams 3UG4832

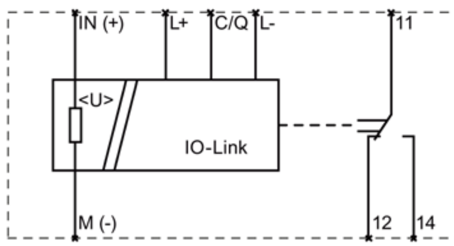


Figure 8-1 3UG4832 voltage monitoring relay for IO-Link

8.6.2 Typical circuit diagrams

3UG4832

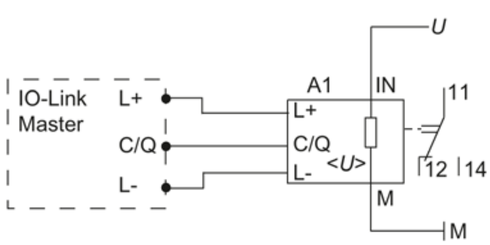


Figure 8-2 3UG4832-.AA40 single-phase operation

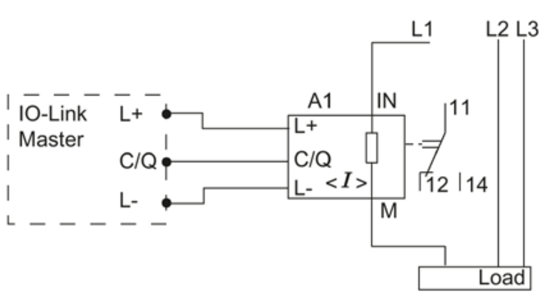


Figure 8-3 3UG4832-.AA40 three-phase operation

8.7 Technical data

General technical details

		3UG4832-2AA40	3UG4832-1AA40
Product function		Voltage monitoring relay	
Design of the display		LCD	
Product function			
• tension window recognition of 1 phase		Yes	
• tension window recognition of 3 phases		No	
• tension window recognition DC		Yes	
• overvoltage recognition of 1 phase		Yes	
• overvoltage recognition of 3 phases		No	
• overvoltage recognition DC		Yes	
• undervoltage recognition of 1 phase		Yes	
• undervoltage recognition of 3 phases		No	
• undervoltage recognition DC		Yes	
• reset external		Yes	
• self-reset		Yes	
• open-circuit or closed-circuit current principle		Yes	
Starting time after the control supply voltage has been applied	s	1	
Response time maximum	ms	450	
Relative metering precision	%	5	
Precision of digital display		+/-1 digit	
Relative temperature-related measurement deviation	%	0.1	
Relative repeat accuracy	%	1	
Type of voltage of the controlled supply voltage		DC	
Control supply voltage for DC rated value	V	18 … 30	
Operating range factor control supply voltage rated value for DC		0.75 … 1.25	
Impulse voltage resistance rated value	kV	6	
Recorded real power	W	2	
Protection class IP		IP20	
Degree of pollution		2	

		3UG4832-2AA40	3UG4832-1AA40
Electromagnetic compatibility		IEC 60947-1 / IEC 61000-6-2 / IEC 61000-6-4	
Operating current at 17 V minimum	mA	10	
Continuous current of the DIAZED fuse link of the output relay	A	4	
Resistance against vibration according to IEC 60068-2-6		1 … 6 Hz: 15 mm, 6 … 500 Hz: 2g	
Resistance against shock according to IEC 60068-2-27		sinusoidal half-wave 15g / 11 ms	
Installation altitude at a height over sea level maximum	m	2 000	
Maximum permissible voltage for safe disconnection			
• between control and auxiliary circuit	V	690	
• between auxiliary circuit and auxiliary circuit	V	300	
Conductor-bound parasitic coupling BURST according to IEC 61000-4-4		2 kV	
Conductor-bound parasitic coupling conductor-earth SURGE according to IEC 61000-4-5		2 kV	
Conductor-bound parasitic coupling conductor-conductor SURGE according to IEC 61000-4-5		1 kV	
Electrostatic discharge according to IEC 61000-4-2		6 kV contact discharge / 8 kV air discharge	
Field-bound parasitic coupling according to IEC 61000-4-3		10 V/m	
Ambient temperature			
• during operating phase	°C	-25 … +60	
• during storage	°C	85 … -40	
• during transport	°C	85 … -40	
Design of the electrical isolation		Safe isolation	
Galvanic isolation between entrance and outlet		Yes	
Galvanic isolation between the voltage supply and other circuits		Yes	
Mechanical operating cycles as operating time typical		10 000 000	
Electrical operating cycles as operating time at AC-15 at 230 V typical		100 000	
Operating cycles with 3RT2 contactor maximum	1/h	5 000	

Mechanical design

		3UG4832-1AA40	3UG4832-2AA40
Width	mm	22.5	
Height	mm	92	94
Depth	mm	91	
Built in orientation		any	
Distance, to be maintained, to earthed part			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Distance, to be maintained, to the ranks assembly			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Distance, to be maintained, conductive elements			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	

		3UG4832-1AA40	3UG4832-2AA40
Type of mounting		snap-on mounting	
Product function removable terminal for auxiliary and control circuit		Yes	
Design of the electrical connection		screw-type terminals	spring-loaded terminals
Type of the connectable conductor cross-section			
• solid		1x (0.5 ... 4 mm²), 2x (0.5 ... 2.5 mm²)	2x (0.25 ... 1.5 mm²)
• finely stranded			
– with wire end processing		1x (0.5 ... 2.5 mm²), 2x (0.5 ... 1.5 mm²)	2 x (0.25 ... 1.5 mm²)
– without wire end processing		—	2x (0.25 ... 1.5 mm²)
• for AWG conductors			
– solid		2x (20 ... 14)	2x (24 ... 16)
– stranded		2x (20 ... 14)	2x (24 ... 16)
Tightening torque			
• with screw-type terminals	N·m	1.2 … 0.8	— …
Number of change-over switches delayed switching		1	

Measuring circuit

		3UG4832-.....
Type of voltage for monitoring		AC/DC
Number of poles for main current circuit		1
Measurable line frequency	Hz	40 … 500
Measurable voltage		
• for AC	V	10 … 600
• for DC	V	10 … 600
Adjustable voltage range	V	10 … 600
Adjustable response delay time		
• when starting	s	0 … 999.9
• with lower or upper limit violation	s	0 … 999.9

Communication

		3UG4832-1AA40	3UG4832-2AA40
Type of voltage supply via input/ output link master		Yes	
IO-Link transfer rate		COM2 (38,4 kBaud)	
Protocol will be supported IO-Link protocol		Yes	
Data volume			
• of the address range of the outputs with cyclical transfer total	byte	2	
• of the address range of the inputs with cyclical transfer total	byte	4	
Point-to-point cycle time between master and IO-Link device minimum	ms	10	

3UG4841 cos phi and active current monitoring relay 9

9.1 Application areas

Application areas

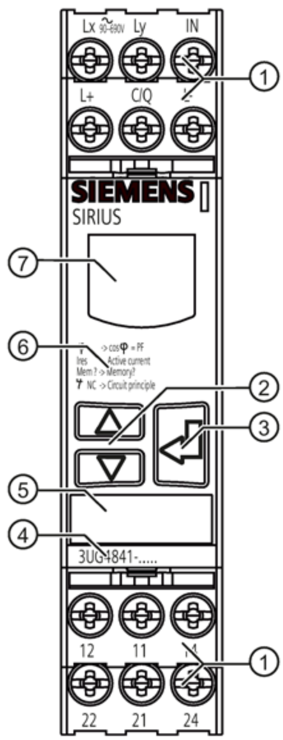
The cos phi and active current monitoring relays are used, for example, in the following application areas:

Table 9- 1 Application areas of the cos phi and active current monitoring relays

Function	Application
• No-load monitoring and load shedding • Underload monitoring in the low-end performance range • Monitoring for overload • Simple cos phi monitoring in power systems for controlling compensation systems • Cable break between the control cabinet and the motor	• Fans (in the case of a broken fan belt, for example) • Pumps (in the case of an idling pump, for example) • Filter system (a contaminated filter system, for example) • Reactive power compensation • Sawing system • Conveyor belt • Surface grinding machine • Breaking mill • Milling machine • Car wash • Lifting platform • Screw conveyor • Crane • Turning machine • Infrared heating system

9.2 Operator controls and connection terminals

Front view / terminal labeling

Front view	Description	
	**Position digits**	
	①	Terminal block (removable): Connection is possible using screw terminals or spring-loaded terminals.
	②	Arrow keys for menu navigation
	③	SET key for menu navigation
	④	Device article number
	⑤	Label
	⑥	Legend for menu
	⑦	Display for parameterization, actual-value indication, and diagnostics
	Terminal labels	
	Lx	Measuring signal (voltage) ~ / +
	Ly	Measuring signal (voltage) ~ / -
	L+	Supply voltage for IO-Link
	C/Q	Communication signal / switching signal
	L-	Ground IO-Link
	IN	Measuring signal (current)
	12	Output relay K1 CO contact NC contact
	11	Output relay K1 CO contact root
	14	Output relay K1 CO contact NO contact
	22	Output relay K2 CO contact NC contact
	21	Output relay K2 CO contact root
	24	Output relay K2 CO contact NO contact

You can find additional information on the connection terminals and the permissible conductor cross-sections in the Chapter "Connection systems (Page 26)".

You can find information on connecting in the Chapter "Internal circuit diagrams (Page 182)".

9.3 Functionality

General functionality

Depending on their parameterization, the 3UG4841 cos phi and active current monitoring relays monitor the single-phase power factor (PF: Power Factor) and the resulting active current I_{res} (I resistive), for **overshoot**(φ▲ / I_{res}▲), **undershoot** (φ▼ / I_{res}▼) or **window monitoring** (φ▲ and φ▼ / I_{res}▲ and I_{res}▼). The load to be monitored is connected upstream of the terminal IN. The load current flows over the terminals IN and Ly / N.

The devices are supplied via the supply voltage IO-Link (L+) and ground IO-Link (L-) or via an external 24 V DC voltage source.

The 3UG4841 cos phi and active current monitoring relays have a display and are parameterized with three keys. The devices can also be parameterized via IO-Link, and transfer the measured values and error messages to a controller.

You will find the setting ranges and factory settings of the 3UG4841 cos phi and active current monitoring relays in Chapter "Operation (Page 174)."

You can find a description of the individual parameters in the Chapter Parameters (Page 247).

You can find the full data sets in the Chapter "Process data and data sets (Page 279)".

Monitoring

If the motor is switched on and the current value overshoots the measuring range limit 0.2 A, the set ON-delay time begins (onDel). During this time, undershooting or overshooting of the set threshold values will not result in a relay response of the CO contact.

If a threshold is reached, the relevant output relay responds after expiry of the tripping delay time (Del) depending on the set relay switching response (open-circuit principle NO or closed-circuit principle NC).

Note

In the case of active currents I_{res} > 10 A, commercially available current transformers, e.g. 4NC, can be used as accessories. You will find more information in Catalog LV10 (www.siemens.com/lowvoltage/infomaterial).

The set tripping delay time (Del) starts if the active current flowing under normal operating conditions and/or the cos phi value overshoots or undershoots the corresponding set threshold value. After expiry of this time, the relevant output relay changes the switching state. On the display, the affected measuring variable and the symbol for undershoot or overshoot flash. If monitoring for active current undershoot is switched off (I_{res}▼ = off), and if the load current undershoots the lower measuring range threshold (0.2 A), the change-over contacts remain unchanged. The display indicates I < 0.2 A and the message "Measured value is outside the measuring range" is transmitted via IO-Link. If a threshold is set for monitoring for active current undershoot, undershoot of the measuring range threshold (0.2 A) will result in a relay response of the change-over contacts.

Note

If the apparent current (I_s) flowing under normal operating conditions moves outside the measuring range, the message "Measured value is outside the measuring range" is transmitted via IO-Link and both changeover contacts change their switching state.

This can also occur if the set thresholds for power factor and active current have not yet been exceeded.

(Context: $I_{res} = I_s$ x cos phi)

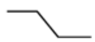
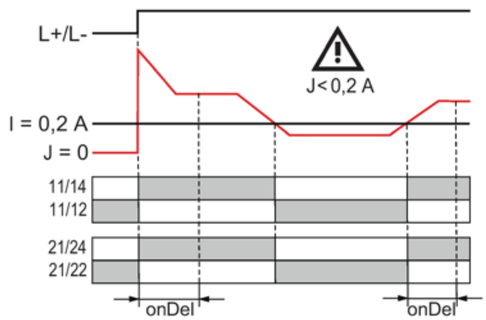
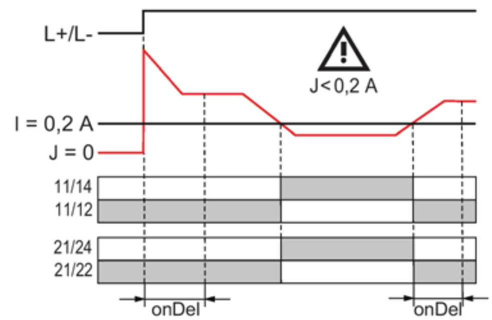
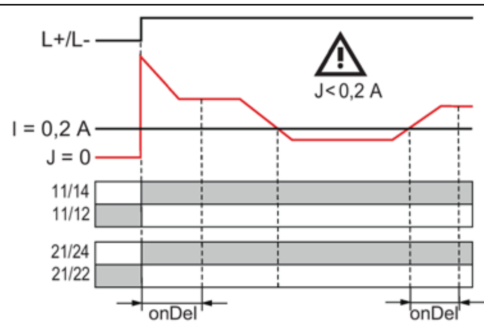
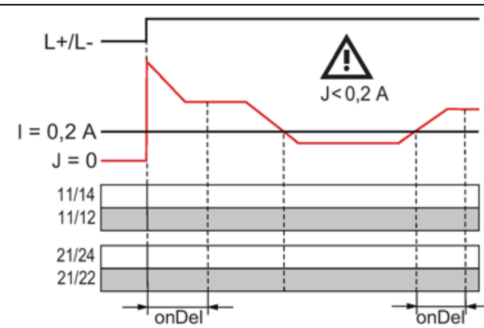
You can find the switching states of output relays K1 and K2 below in the section "Function diagrams" and in the Chapter "Diagnostics (Page 176)".

SIO-Mode

The monitoring relays have a connection C/Q to IO-Link. If the IO-Link connection is not used for communication via IO-Link, the 3UG4841 power factor and active current monitoring relays work in standard I/O mode (SIO-Mode). In this mode, terminal C/Q can be used as a semiconductor output and is switched on violation of the warning threshold for undershoot or overshoot of the power factor and on violation of the warning threshold for undershoot or overshoot of the active current.

- Q off: 24 V DC supply voltage present.
- Q on: The output has a high resistance.

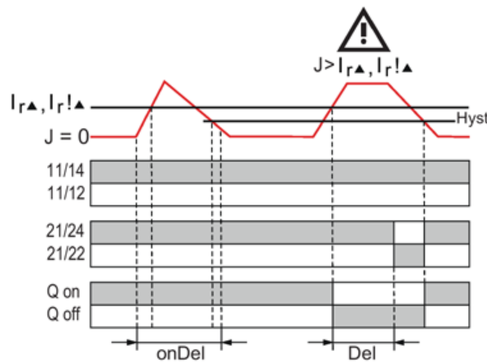
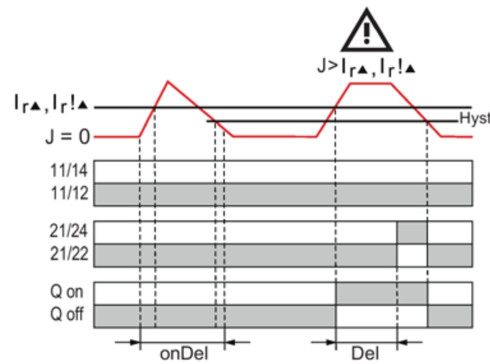
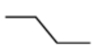
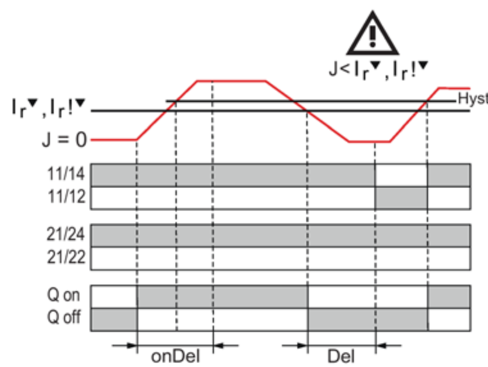
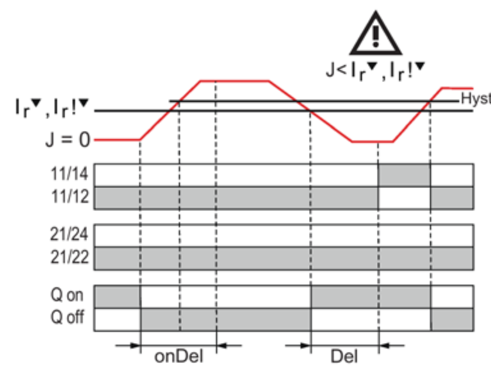
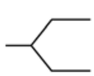
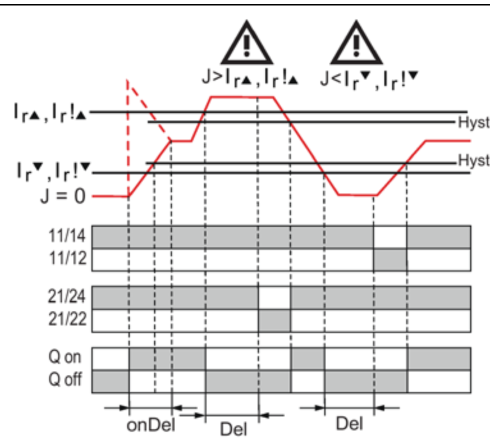
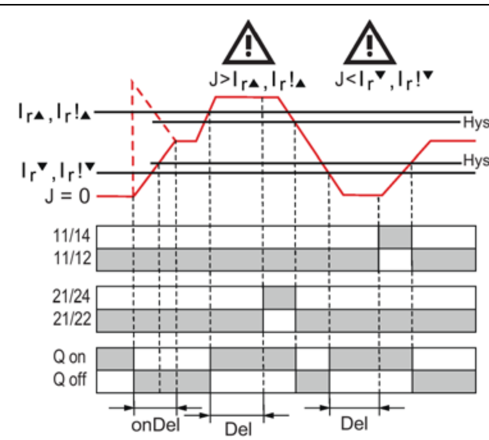
Function diagrams (lower current measuring threshold 0.2 A)

<table>
<tr><th></th><th>Memory = no
Relay switching response = NC (closed-circuit principle)</th><th>Memory = no
Relay switching response = NO (open-circuit principle)</th></tr>
<tr><td>I_r ▼
</td><td></td><td></td></tr>
<tr><td>I_r ▼ = off</td><td></td><td></td></tr>
</table>

J = Currently measured current value

I = Set threshold value for the current

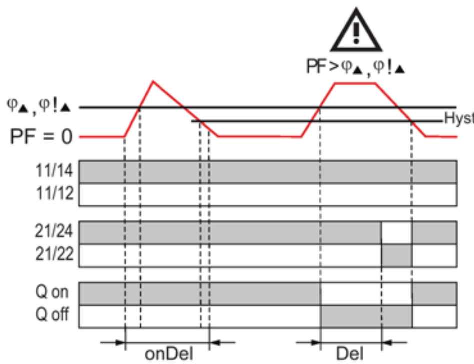
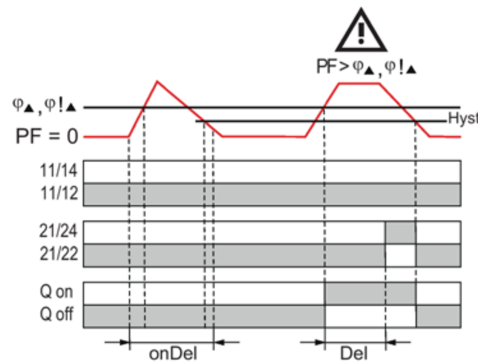
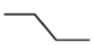
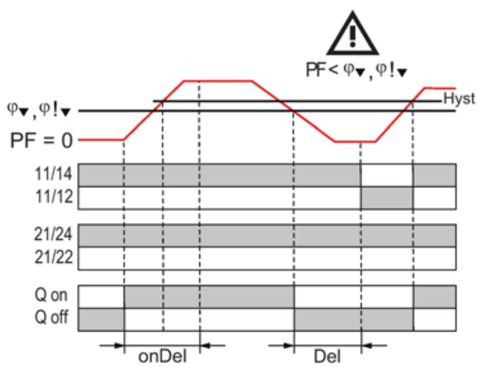
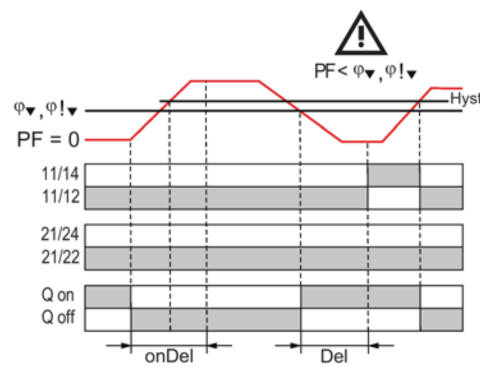
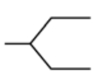
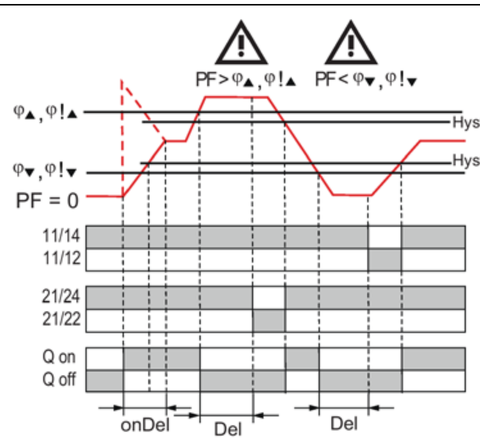
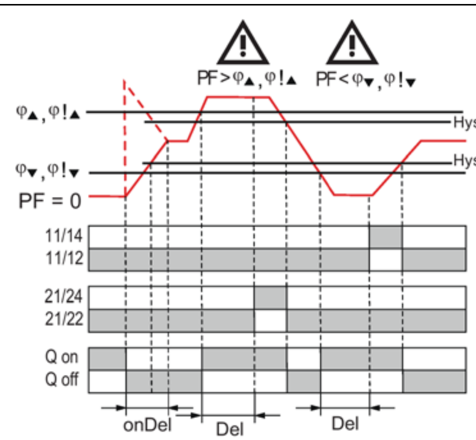
Function diagrams (active current monitoring I_{res})

<table>
<tr><td></td><td>Memory = no
Relay switching response = NC (closed-circuit principle)</td><td>Memory = no
Relay switching response = NO (open-circuit principle)</td></tr>
<tr><td>
I_r▲
I_r▼ = off</td><td>
</td><td>
</td></tr>
<tr><td>I_r▲ = off
I_r▼
</td><td>
</td><td>
</td></tr>
<tr><td>I_r▲
I_r▼
</td><td>
</td><td>
</td></tr>
</table>

J = Currently measured current value

I = Set threshold value for the current

Function diagrams (cos phi monitoring)

	Memory = no Relay switching response = NC (closed-circuit principle)	Memory = no Relay switching response = NO (open-circuit principle)
 φ▲ φ▼ = off	 	
φ▲ = off φ▼ 	 	
φ▲ φ▼ 	 	

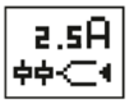
φ = currently set value for cos φ

PF = power factor = set threshold for cos φ

9.4 Operation

Parameters

The devices can be parameterized either locally via the display and the three keys, or via IO-Link.
You can find further information on configuring via IO-Link in the Chapter "Configuring the IO-Link (Page 235)".



Parameter information

The table below shows the settable parameter information of the 3UG4841 cos phi and active current monitoring relays:

Table 9- 2 Parameter information, 3UG4841 cos phi and active current monitoring relay

Menu level / IO-Link	Parameters	Setting range		Increment	Factory setting
		Minimum value	Maximum value		
"RUN" / IO-Link	Threshold for undershoot (I_{res}▼)	0.2 A or OFF	10.0 A or OFF	0.1 A	1 A
"RUN" / IO-Link	Threshold for overshoot (I_{res}▲)	0.2 A or OFF	10.0 A or OFF	0.1 A	3 A
"RUN" / IO-Link	Warning threshold for under-shoot (I_{res}!▼)	0.2 A or OFF	10.0 A or OFF	0.1 A	1 A
"RUN" / IO-Link	Warning threshold for overshoot (I_{res}!▲)	0.2 A or OFF	10.0 A or OFF	0.1 A	3 A
"RUN" / IO-Link	Threshold for undershoot (φ▼)	0.01 or OFF	0.99 or OFF	0.01	0.2
"RUN" / IO-Link	Threshold for overshoot (φ▲)	0.01 or OFF	0.99 or OFF	0.01	0.5
"RUN" / IO-Link	Warning threshold for under-shoot (φ!▼)	0.01 or OFF	0.99 or OFF	0.01	0.2
"RUN" / IO-Link	Warning threshold for overshoot (φ!▲)	0.01 or OFF	0.99 or OFF	0.01	0.5
"SET" / IO-Link	Hysteresis (Hyst)	0.1 A or OFF	3.0 A or OFF	0.01 A	0.5 A
IO-Link	Hysteresis (cosφ)	0.1 or OFF	0.2 or OFF	0.01	0.1
"SET" / IO-Link	ON-delay time (onDel)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1)] IO-Link: 0.1 s	Disabled (0 s)
IO-Link	ON-delay time (at Power ON)	Disabled	Enabled	--	Enabled
IO-Link	ON-delay time (at manual reset)	Disabled	Enabled	--	Enabled
IO-Link	ON-delay time (at restart)	Disabled	Enabled	--	Disabled
"SET" / IO-Link	Tripping delay time (φ▼Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Tripping delay time (φ▲Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1)] IO-Link: 0.1 s	Disabled (0 s)

Menu level / IO-Link	Parameters	Setting range		Increment	Factory setting
		Minimum value	Maximum value		
"SET" / IO-Link	Tripping delay time (I▼Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Tripping delay time (I▲Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Reset response (Mem)	local: no = Autoreset IO-Link: Auto-matic	local: yes = Hand-RES ET IO-Link: Manual	--	local: no = Autoreset IO-Link: Auto-matic
"SET" / IO-Link	Relay switching response (closed-circuit principle NC / open-circuit principle NO)	Closed-circuit principle (NC) or Open-circuit principle (NO)		--	Closed-circuit principle (NC)
IO-Link	Group diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Group error diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Local threshold change	Disabled	Enabled	--	Enabled
IO-Link	Local parameter change	Disabled	Enabled	--	Enabled
IO-Link	Local reset	Disabled	Enabled	--	Enabled
IO-Link	Retentive error memory	Disabled	Enabled	--	Disabled
IO-Link	Analog value coding	0 (Disabled)	255	--	43

1) up to 99.9 s; at values > 99.9 s, the increment is 1 s

Note

If a time is set via IO-Link within the value range 100.0 to 999.9 s with one decimal place, the display will show only the value without the decimal place.

Note

The monitoring mode "Overshoot" or "Undershoot" is defined with the setting OFF at the threshold for undershoot or overshoot.

The parameters are described in the Chapter "Parameters (Page 247)".

You will find further information on those parameters of the 3UG4841 cos phi and active current monitoring relays that can be set via IO-Link in Chapter "3UG4841 cos phi and active current monitoring relay (Page 336)".

Menu-based operation is described in the Chapter "Menu-based operation (Page 42)".

9.5 Diagnostics

9.5.1 Indication on the display

Display information

The display is divided into three different areas.

① Current measuring value / cos phi measuring value or error symbol
② Type of monitoring
③ Symbols of the change-over contacts

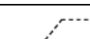
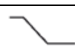
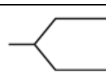
Meaning of the information on the display

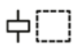
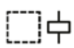
Note

Displays in the event of an error

The symbols on the display (① and ②) flash to indicate an error.

The following states and errors are shown on the display:

Display area	Symbol	Meaning
①	U<30	Measured value is below the range that can be measured.
①	U▲▲▲	Measured value is above the range that can be measured.
①	I<0,2	Measured value is below the range that can be measured.
①	I▲▲▲	Measured value is above the range that can be measured.
①	cosφ <-> ▲▲▲	When the maximum measurable power factor is exceeded.
①	I <-> 5.0A cosφ <-> 0.83	I and the currently measured active current value or cos-phi value are displayed alternately. • Not flashing: Measured value in the correct range or delay time is running • Flashing: Threshold overshot or undershot, delay time expired, relay has switched
①	PERR	Invalid parameter
①	ERR	Self-test error/internal error
①		IO-Link communication is being established 1)
①	 OK	Device is in Communication-Mode (IO-Link)
①	ERR	IO-Link communication interrupted
①	SIO	Device is in SIO-Mode
②		Monitoring for overshoot (φ▲ / I_{res}▲)
②		Monitoring of the warning threshold for overshoot (φ!▲ / I_{res}!▲) (only visible if the parameter "Threshold for overshoot" is set to OFF.)
②		Monitoring for undershoot (φ▼ / I_{res}▼)
②		Monitoring of the warning threshold for undershoot (φ!▼ / I_{res}!▼) (only visible if the parameter "Threshold for undershoot" is set to OFF.)
②		Window monitoring (φ▲ and φ▼ / I_{res}▲ and I_{res}▼)

Display area	Symbol		Meaning
②	◄		Measured values are in the correct range.
②	▲		A measured value overshoot has occurred. • Not flashing: Threshold overshot, tripping delay running • Flashing: Threshold overshot, tripping delay expired, relay has switched
②	▲ ◄		Alternate flashing: The measured value has risen above the set warning threshold.
②	▼		A measured value undershoot has occurred • Not flashing: Threshold undershot, tripping delay running • Flashing: Threshold undershot, tripping delay expired, relay has switched
②	▼ ◄		Alternate flashing: A measured value has fallen below the set warning threshold.
③		φ▼ / I_{res}▼, φ!▼ / I_{res}!▼ φ▲ / I_{res}▲, φ!▲ / I_{res}!▲	• Not flashing: Relay contact 11/12 open, relay contact 11/14 closed • Flashing: Delay time (ON delay or tripping delay) running • Masked out: Relay contact 11/12 closed, relay contact 11/14 open
③		φ▼ / I_{res}▼, φ!▼ / I_{res}!▼ φ▲ / I_{res}▲, φ!▲ / I_{res}!▲	• Not flashing: Relay contact 21/22 open, relay contact 21/24 closed • Flashing: Delay time (ON delay or tripping delay) running • Masked out: Relay contact 21/22 closed, relay contact 21/24 open

1) If this symbol is repeated for an extended period, the connection to the IO-Link master has been interrupted during communication buildup. Perform a restart of the monitoring relay.

Note

The value shown on the display always corresponds to the currently measured value even if the displayed value is flashing because a threshold has been overshot or undershot. The symbol for a threshold overshoot or undershoot indicates the fault causing this if manual RESET (Mem = yes) is set. In this way, the user can check before a Reset whether the cause of error has been remedied and a Reset is likely to result in a successful outcome.

You can find more information on the switching response of output relays K1 and K2 in the Chapter "Functionality (Page 169)".

9.5.2 Diagnostics via IO-Link

Diagnostics via IO-Link

The 3UG4841 cos phi and active current monitoring relays with IO-Link connection provide a facility for diagnostics via IO-Link.

The manufacturer-specific diagnostics listed in the table are reported via the diagnostics mechanism of IO-Link. The table below provides information on possible causes and remedial measures:

Table 9- 3 Possible causes and remedial measures

Diagnostics and messages	Possible cause	Possible remedial measure
Invalid parameter	The set parameter is invalid.	Specify a parameter in accordance with the parameter table in the Chapter "Operation (Page 174)".
Self-test error/internal error	Fault in internal test.	Return the device to the manufacturer.
Value above (warning) threshold value for overshoot (power factor)	The set cos phi value is higher than the set threshold for overshoot.	• Reduce the cos phi value. • Set a higher threshold.
Value below (warning) threshold for undershoot (power factor)	The set cos phi value is lower than the set threshold for undershoot.	• Increase the cos phi value. • Set a lower threshold.
Value above (warning) threshold for overshoot (active current)	The set active current value is higher than the set threshold for overshoot.	• Reduce the active current. • Set a higher threshold.
Value below (warning) threshold for undershoot (active current)	The set active current value is lower than the set threshold for undershoot.	• Increase the active current. • Set a lower threshold.
Measured value is outside the range that can be measured	• The measured voltage is above or below the measurable range. • The measured apparent current is above or below the measurable range. • The calculated power factor is 1 (pure non-inductive load).	• Reduce the current. • Increase the current. • Reduce the voltage. • Increase the voltage. • Connect a load with an inductive or capacitive component.

The table below indicates how the manufacturer-specific diagnostics are reported:

Table 9- 4 Diagnostics and messages

Diagnostics and messages	IO-Link event code 1)	PII 2)		Data set 92	Display information
		GE 3)	GW 4)		
Invalid parameter	0x6320	x	—	x	P.ERR
Self-test error/internal error	0x5000	x	—	x	ERR
Threshold value for overshoot exceeded (cos phi value)	0x8C10	x	—	x	▲
Threshold value for undershoot violated (cos phi value)	0x8C30	x	—	x	▼
Threshold for overshoot exceeded (active current value)	0x8C10	x	—	x	▲
Threshold for undershoot violated (active current value)	0x8C30	x	—	x	▼
Measured value is outside the range that can be measured	0x8C20	—	—	—	• U<30 or U▲▲▲ • I<0,2 or I▲▲▲ • cosφ <-> ▲▲▲

1) The manufacturer-specific diagnostic events listed in the table are reported to the IO-Link master via the diagnostics mechanism of IO-Link.

2) With the "process input image" (see "3UG4841 cos phi and active current monitoring relay (Page 336)"), you can determine via the group error (GE) bit or general warning (GW) bit in the user program whether detailed information on diagnostics or messages is present in diagnostic data set 92. If bit (= 1) is set, you can obtain detailed information on what caused a "group error" or "general warning" by reading data set 92.

3) GE = Group error: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 339)").

4) GW = General warning: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 339)").

x: Bit set

○: Not relevant

9.5.3 Reset

Reset

Resetting of the outputs is dependent on the "Reset response" parameter (see the Chapter "Reset response (Page 247)"). On the 3UG48 monitoring relays, the parameter can also be set via IO-Link.

The following settings can be selected:

- Automatic reset (Mem = no)

  The device is reset automatically as soon as a previously occurring error has been dealt with.

- Manual RESET (Mem = yes)

  To reset digitally adjustable devices, you must press both arrow keys simultaneously for more than 2.5 s after the cause of the error has been rectified. If the cause of the error has not been removed, a new error message appears immediately. Alternately, the devices (with deactivated retentive error memory) can be reset by switching the supply voltage on and off.

Note

The outputs can also be reset via the process image of the outputs (PIQ) by setting the "Reset" control command or using the corresponding system command (see the Chapter "Process data and data sets (Page 279)").

Note

With the "Local reset" parameter that can be set via the IO-Link, resetting locally on the device can be disabled.

Note

The warning threshold is always reset by autoreset.

9.6 Circuit diagrams

9.6.1 Internal circuit diagrams

Internal circuit diagrams 3UG4841

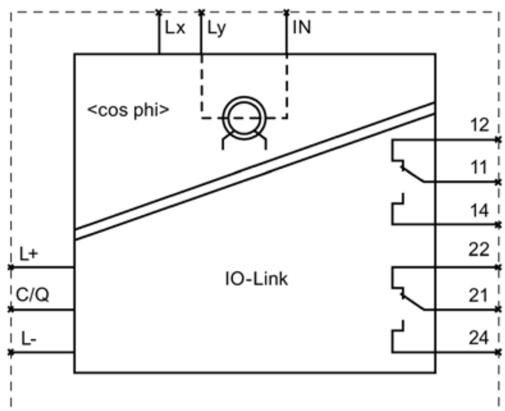


Figure 9-1 3UG4841 cos phi and active current monitoring relay for IO-Link

9.6.2 Typical circuit diagrams

3UG4841

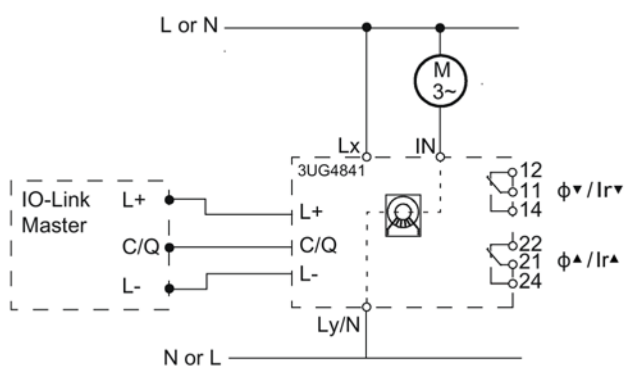


Figure 9-2 Cos phi and active current monitoring for single-phase motors

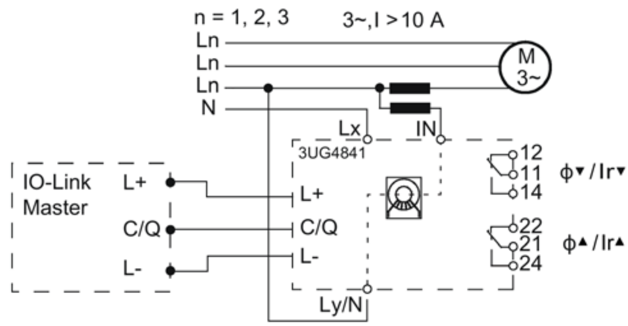


Figure 9-3 Cos phi and active current monitoring for three-phase motors with transformer for currents (with neutral conductor)

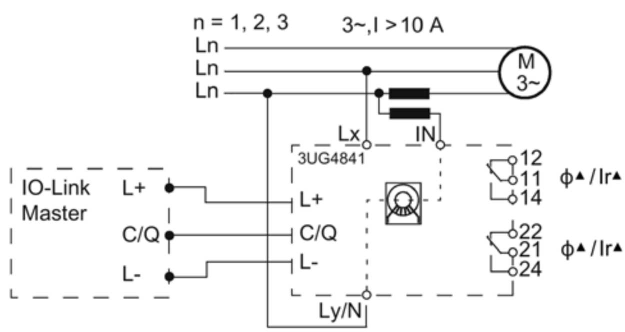


Figure 9-4 Cos phi and active current monitoring for three-phase motors with transformers for currents

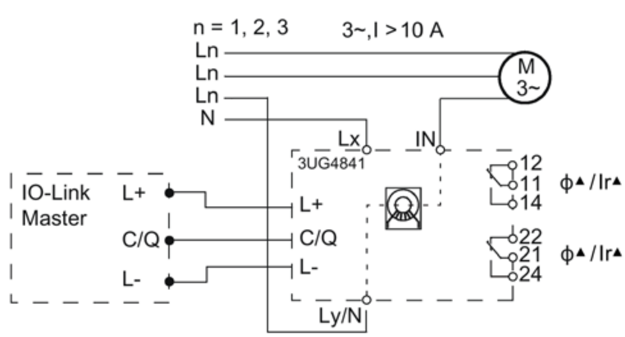


Figure 9-5 Cos phi and active current monitoring for three-phase motors (with neutral conductor)

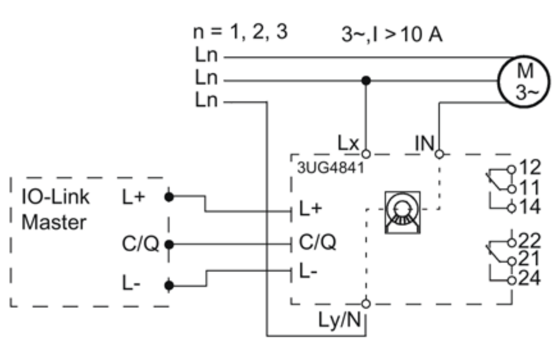


Figure 9-6 Cos phi and active current monitoring for three-phase motors

9.7 Technical data

Measuring circuit

		3UG4841-.....
Number of poles for main current circuit		1
Phase number		1
Adaptable response value phase angle	°	0.1 … 0.99
Type of current for monitoring		AC
Measurable current	A	0.2 … 10
Adjustable response current		
• 1	A	0.2 … 10
• 2	A	0.2 … 10
Adjustable response delay time		
• when starting	s	0 … 999.9
• with lower or upper limit violation	s	0 … 999.9
Adjustable switching hysteresis for measured current value	A	0 … 3
Stored energy time at mains power cut minimum	ms	—
Operating voltage		
• rated value	V	90 … 690

General technical details

		3UG4841-.....
Product function		Active power monitoring relay
Design of the display		LCD
Product function		
• overcurrent recognition of 1 phase		Yes
• undercurrent recognition of 1 phase		Yes
• reset external		Yes
• open-circuit or closed-circuit current principle		Yes
Starting time after the control supply voltage has been applied	s	1
Relative metering precision	%	10
Precision of digital display		+/-1 digit
Relative repeat accuracy	%	1
Type of voltage of the controlled supply voltage		DC
Control supply voltage for DC rated value	V	24
Operating range factor control supply voltage rated value for DC		0.75 … 1.25

		3UG4841-.....
Impulse voltage resistance rated value	kV	6
Recorded real power	W	2
Protection class IP		IP20
Electromagnetic compatibility		IEC 60947-1 / IEC 61000-6-2 / IEC 61000-6-4
Operating current at 17 V minimum	mA	10
Continuous current of the DIAZED fuse link of the output relay	A	4
Resistance against vibration according to IEC 60068-2-6		1 … 6 Hz: 15 mm, 6 … 500 Hz: 2g
Resistance against shock according to IEC 60068-2-27		sinusoidal half-wave 15g / 11 ms
Installation altitude at a height over sea level maximum	m	2 000
Current carrying capacity of output relay		
• at AC-15		
– at 250 V at 50/60 Hz	A	3
– at 400 V at 50/60 Hz	A	3
• at DC-13		
– at 24 V	A	1
– at 125 V	A	0.2
– at 250 V	A	0.1
Conductor-bound parasitic coupling BURST according to IEC 61000-4-4		2 kV
Conductor-bound parasitic coupling conductor-earth SURGE according to IEC 61000-4-5		2 kV
Conductor-bound parasitic coupling conductor-conductor SURGE according to IEC 61000-4-5		1 kV
Electrostatic discharge according to IEC 61000-4-2		6 kV contact discharge / 8 kV air discharge
Field-bound parasitic coupling according to IEC 61000-4-3		10 V/m
Thermal current of the contact-affected switching element maximum	A	5
Degree of pollution		2

		3UG4841-.....
Ambient temperature		
• during operating phase	°C	-25 … +60
• during storage	°C	-40 … +85
• during transport	°C	-40 … +85
Galvanic isolation		
• between entrance and outlet		Yes
• between the outputs		Yes
• between the voltage supply and other circuits		Yes
Mechanical operating cycles as operating time typical		10 000 000
Electrical operating cycles as operating time at AC-15 at 230 V typical		100 000
Operating cycles with 3RT2 contactor maximum	1/h	5 000

Communication

		3UG4841-.....
Type of voltage supply via input/ output link master		Yes
IO-Link transfer rate		COM2 (38,4 kBaud)
Protocol will be supported IO-Link protocol		Yes
Data volume		
• of the address range of the outputs with cyclical transfer total	byte	2
• of the address range of the inputs with cyclical transfer total	byte	4
Point-to-point cycle time between master and IO-Link device minimum	ms	10

Mechanical design

		3UG4841-1....	3UG4841-2....
Width	mm	22.5	
Height	mm	102	103
Depth	mm	91	
Built in orientation		any	
Distance, to be maintained, to earthed part			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Distance, to be maintained, to the ranks assembly			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Distance, to be maintained, conductive elements			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	

		3UG4841-1....	3UG4841-2....
Type of mounting		snap-on mounting	
Product function removable terminal for auxiliary and control circuit		Yes	
Design of the electrical connection		screw-type terminals	spring-loaded terminals
Type of the connectable conductor cross-section			
• solid		1x (0.5 ... 4 mm^2), 2x (0.5 ... 2.5 mm^2)	2x (0.25 ... 1.5 mm^2)
• finely stranded			
– with wire end processing		1x (0.5 ... 2.5 mm^2), 2x (0.5 ... 1.5 mm^2)	2 x (0.25 ... 1.5 mm^2)
– without wire end processing		—	2x (0.25 ... 1.5 mm^2)
• for AWG conductors			
– solid		2x (20 ... 14)	2x (24 ... 16)
– stranded		2x (20 ... 14)	2x (24 ... 16)
Tightening torque			
• with screw-type terminals	N·m	1.2 … 0.8	— …
Number of change-over switches delayed switching		2	

3UG4851 speed monitoring relays

10

10.1 Application areas

Application areas

The speed monitoring relays are used, for example, in the following applications:

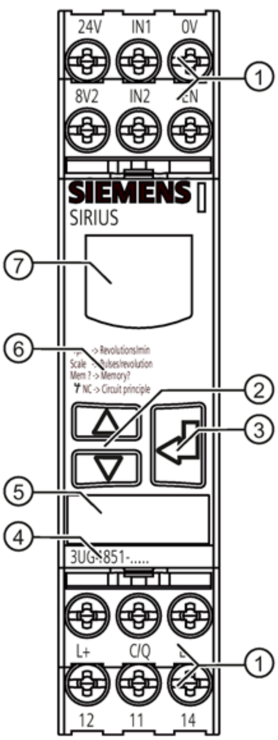
Table 10- 1 Application areas of the speed monitoring relays

Function	Application
• Monitoring for overload/underload	• Conveyor belt (monitoring transported goods for completeness, for example) • Milling machine • Turning machine • Slippage or tear of a drive belt

The monitoring relays can also be used for all functions where a continuous pulse signal is to be monitored (e.g. belt travel monitoring, completeness checking, pass monitoring, or cycle time monitoring).

10.2 Operator controls and connection terminals

Front view / terminal labeling

Front view	Description	
	**Position digits**	
	①	Terminal block (removable): Connection is possible using screw terminals or spring-loaded terminals.
	②	Arrow keys for menu navigation
	③	SET key for menu navigation
	④	Device article number
	⑤	Label
	⑥	Legend for menu
	⑦	Display for parameterization, actual-value indication, and diagnostics
	Terminal labels	
	L+	Supply voltage for IO-Link
	C/Q	Communication signal / switching signal
	L-	Ground IO-Link
	24V	Supply voltage for pulse input IN1 (24 V / max. 50 mA)
	IN1	Pulse input for pnp-switching three-wire sensor (for pulses 0 V DC/ +24 V)
	0V	Supply voltage for pulse input IN1 (0 V / max. 50 mA)
	EN	Enable
	IN2	Pulse input for two-wire NAMUR sensor or mechanical contact
	8V2	Supply voltage for pulse input IN2
	12	Output relay K1 CO contact NC contact
	11	Output relay K1 CO contact root
	14	Output relay K1 CO contact NO contact

You can find additional information on the connection terminals and the permissible conductor cross-sections in the Chapter "Connection systems (Page 26)".

You can find information on connecting in the Chapter "Internal circuit diagrams (Page 201)".

10.3 Functionality

General functionality

Depending on the setting, the 3UG4851 speed monitoring relays monitor a speed in revolutions per minute (rpm = revolutions per minute) for overshoot (rpm▲), undershoot (rpm▼) or in window monitoring (rpm▲ and rpm▼).

The devices are supplied via the supply voltage IO-Link (L+) and ground IO-Link (L-) or via an external 24 V DC voltage source.

The 3UG4851 speed monitoring relays have a display and are parameterized with three keys. The devices can also be parameterized via IO-Link and transfer the measured speed values and error messages to a controller.

You will find the setting ranges and factory settings of the 3UG4851 speed monitoring relays in Chapter "Operation (Page 194)."

You can find a description of the individual parameters in the Chapter "Parameters (Page 247)"

You can find the full data sets in the Chapter "Process data and data sets (Page 279)".

Monitoring according to the principle of period duration measurement

Speed monitoring functions according to the principle of period duration measurement.

In the speed monitoring relay, the time interval between two consecutive rising edges of the pulse encoder is measured and compared with the minimum and/or maximum permissible period duration calculated from the set threshold values for the speed. Period duration measurement already detects a speed deviation after two pulses.

By using up to ten pulse encoders distributed simultaneously across the range, the period duration, and thus the response time, can be reduced. By taking account of the number of sensors in the speed monitoring relay, the speed continues to be displayed in revolutions per minute.

The number of pulses supplied by the pulse encoder can be defined with the help of entering a scaling value (Scale). This allows the revolutions per minute to be read direct on the display.

The speed monitoring relay has two different pulse inputs. Only one of these may be used! At the terminal IN1, a pnp-switching three-wire sensor for 0 V / +24 V DC pulses can be connected. This is supplied from the monitoring relay via terminals 0V and 24V / with up to 50 mA. Use of a mechanical pulse contact with an external DC supply of 4.5 to 30 V is also permissible at terminal IN1.

Note

To detect the edges reliably, the pulses and pauses between pulses of the pulse encoders used must be applied for at least 5 ms. A pause is detected when the voltage level < 1 V. A pulse requires a minimum value of 4.5 V.

Alternatively, a two-wire NAMUR sensor supplied from terminal 8V2, or a mechanical contact, can be connected at terminal IN2.

Startup delay

To be able to start a drive, the output relay K1 switches to the correct state during the ON-delay time depending on the selected open-circuit principle or closed-circuit principle, even if the speed is still under the set value.

The ON-delay time is started either by switching on the supply voltage or, if the supply voltage is present, by actuating the relevant NC contact (e.g. auxiliary contact of a contactor).

Tripping delay

The set tripping delay time (Del) begins, and the symbol of the output relay K1 flashes if the measured speed overshoots or undershoots the corresponding set threshold after the ON-delay time (onDel) has stopped. After expiry of this time, the output relay K1 changes the switching state. On the display, the current measuring value and the symbol for undershoot or overshoot flash.

Operating mode with/without enable contact

In the operating mode without enable contact (terminal EN = Enable not connected), the output relay K1 responds when the supply voltage is switched in accordance with the set closed-circuit principle NC or open-circuit principle NO (relay control is inverted to the closed-circuit principle NC), and the ON-delay time (onDel) is started, provided the lower threshold is not at OFF. If the speed reaches the lower threshold value plus the set hysteresis during this time, the ON-delay time is stopped and normal monitoring begins. If this value has not yet been reached after expiry of the ON-delay time, the output relay K1 switches to the fault state depending on the selected relay switching response.

For the functioning of the operating mode with enable contact (terminal EN = Enable is connected with an isolated NC contact with terminal 24V), a supply voltage must be present at the monitoring relay. Only when this NC contact is actuated will the ON-delay time (onDel) and the drive (with a second contact, for example) be started.

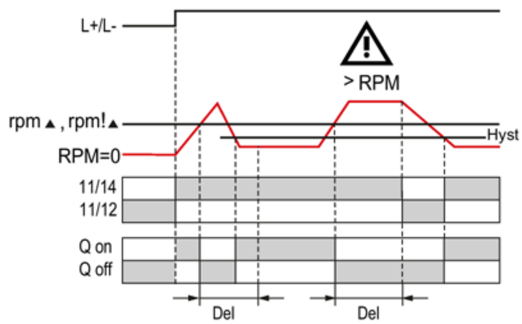
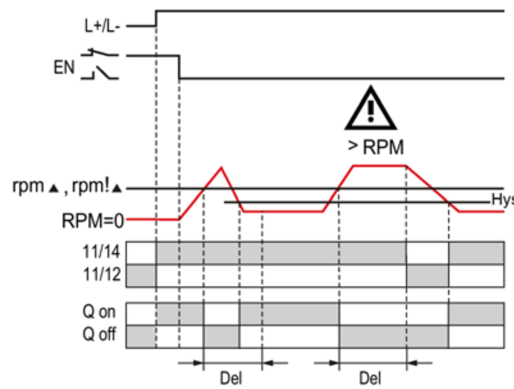
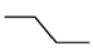
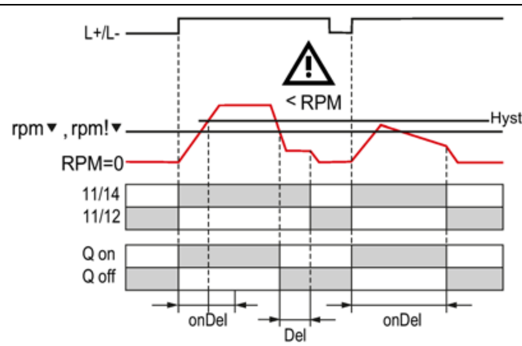
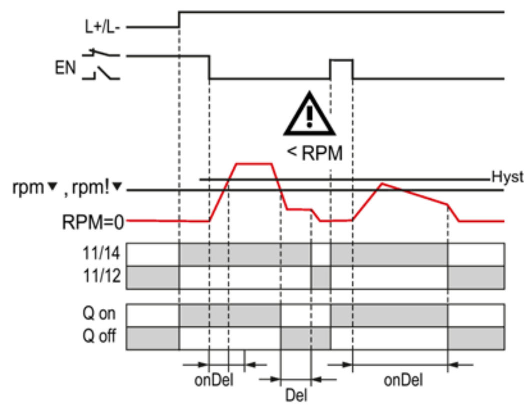
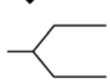
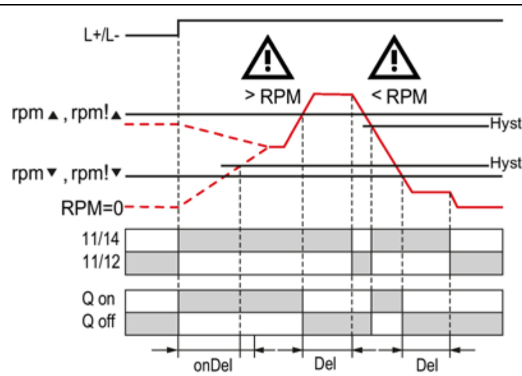
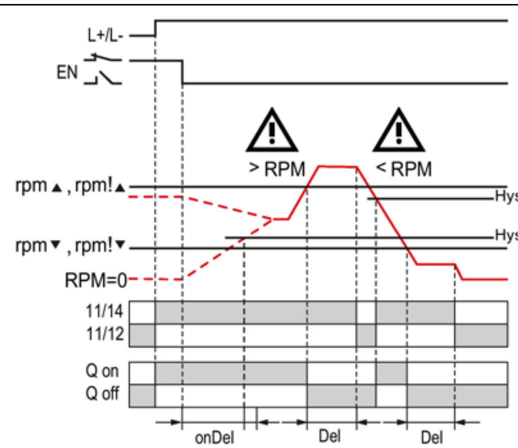
You can find the switching states of the output relay K1 below in the section "Function diagrams" and in the Chapter "Diagnostics (Page 196)".

SIO-Mode

The monitoring relays have a connection C/Q to IO-Link. If the IO-Link connection is not used for communication via IO-Link, the 3UG4851 speed monitoring relays work in standard I/O mode (SIO-Mode). In this mode, terminal C/Q can be used as a semiconductor output that switches on a violation of the warning threshold for undershoot or overshoot.

- Q off: 24 V DC supply voltage present.
- Q on: The output has a high resistance.

Function diagrams

<table>
<tr><th rowspan="2"></th><th colspan="2">Memory = no
Relay switching response = NC (closed-circuit principle)</th></tr>
<tr><th>Without Enable input</th><th>With Enable input</th></tr>
<tr><td>rpm▲
rpm▼ = off
</td><td>
</td><td>
</td></tr>
<tr><td>rpm▲ = off
rpm▼
</td><td>
</td><td>
</td></tr>
<tr><td>rpm▲
rpm▼
</td><td>
</td><td>
</td></tr>
</table>

RPM = currently measured speed

rpm = set limit for the speed

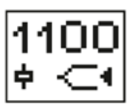
Note

The relay control for the open-circuit principle NO is inverted to the represented function diagrams in the closed-circuit principle NC after application of the supply voltage U_S.

10.4 Operation

Parameters

The devices can be parameterized either locally via the display and the three keys, or via IO-Link.
You can find further information on configuring via IO-Link in the Chapter "Configuring the IO-Link (Page 235)".



Parameter information

The table below shows the settable parameter information of the 3UG4851 speed monitoring relays:

Table 10- 2 Parameter information, 3UG4851 speed monitoring relays

Menu level / IO-Link	Parameters	Setting range		Incre-ment	Factory setting
		Minimum value	Maximum value		
"RUN" / IO-Link	Threshold for undershoot (rpm▼)	0.1 or OFF	2200 or OFF	0.1[2)]	800
"RUN" / IO-Link	Threshold for overshoot (rpm▲)	0.1 or OFF	2200 or OFF	0.1[2)]	1400
"RUN" / IO-Link	Warning threshold for undershoot (rpm!▼)	0.1 or OFF	2200 or OFF	0.1[2)]	800
"RUN" / IO-Link	Warning threshold for overshoot (rpm!▲)	0.1 or OFF	2200 or OFF	0.1[2)]	1400
"SET" / IO-Link	Scaling factor (Scale)	1	10	1	1
"SET" / IO-Link	Hysteresis (Hyst)	0.1 or OFF	99.9 or OFF	0.1	50
"SET" / IO-Link	ON-delay time (onDel)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1)] IO-Link: 0.1 s	Disabled (0 s)
IO-Link	ON-delay time (at Power ON)	Disabled	Enabled	--	Enabled

Menu level / IO-Link	Parameters	Setting range		Incre-ment	Factory setting
		Minimum value	Maximum value		
IO-Link	ON-delay time (at manual reset)	Disabled	Enabled	--	Enabled
"SET" / IO-Link	Tripping delay time (▼Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Tripping delay time (▲Del)	0 s	local: 999 s IO-Link: 999.9 s	local: 0.1 s[1)] IO-Link: 0.1 s	Disabled (0 s)
"SET" / IO-Link	Reset response (Mem)	local: no = Auto-reset IO-Link: Auto	local: yes = Hand-RESET IO-Link: Manual	--	local: no = Auto-reset IO-Link: 1
"SET" / IO-Link	Relay switching response (closed-circuit principle NC / open-circuit principle NO)	Closed-circuit principle (NC) or Open-circuit principle (NO)		--	Closed-circuit principle (NC)
IO-Link	Group diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Group error diagnostics	Disabled	Enabled	--	Enabled
IO-Link	Local threshold change	Disabled	Enabled	--	Enabled
IO-Link	Local parameter change	Disabled	Enabled	--	Enabled
IO-Link	Local reset	Disabled	Enabled	--	Enabled
IO-Link	Retentive error memory	Disabled	Enabled	--	Disabled
IO-Link	Analog value coding	0 (Disabled)	255	--	13

1) up to 99.9 s; at values > 99.9 s, the increment is 1 s

2) up to 99.9 V; at values > 99.9 V, the increment is 1 V

Note

If a time is set via IO-Link within the value range 100.0 to 999.9 s with one decimal place, the display will show only the value without the decimal place.

Note

The monitoring mode "Overshoot" or "Undershoot" is defined with the setting OFF at the threshold for undershoot or overshoot.

The parameters are described in the Chapter "Parameters (Page 247)".

You will find further information on the parameters of the 3UG4851 speed monitoring relays that can be set via IO-Link in the Chapter "Process data and data sets (Page 279)".

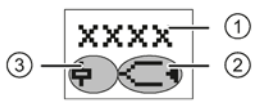
Menu-based operation is described in the Chapter "Menu-based operation (Page 42)".

10.5 Diagnostics

10.5.1 Indication on the display

Display information

The display is divided into three different areas.



① Speed measured value or fault symbol
② Type of monitoring
③ Symbol of the change-over contact

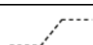
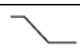
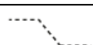
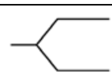
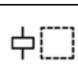
Meaning of the information on the display

Note

Displays in the event of an error

The symbols on the display (① and ②) flash to indicate an error.

The following states and errors are shown on the display:

Display area	Symbol	Meaning
①	- - - -	Measured value is outside the range that can be measured.
①	1100	Currently measured speed is displayed. • Not flashing: Speed in the correct range or delay time is running • Flashing: Threshold overshot or undershot, delay time expired, relay has switched
①	P.ERR	Invalid parameter
①	ERR	Self-test error/internal error
①		IO-Link communication is being established [1]
①	 OK	Device is in Communication-Mode (IO-Link)
①	ERR	IO-Link communication interrupted
①	SIO	Device is in SIO-Mode
②		Monitoring for speed overshoot
②		Monitoring of the warning threshold for speed overshoot (only visible if the parameter "Threshold for overshoot" is set to OFF.)
②		Monitoring for speed undershoot
②		Monitoring of the warning threshold for speed undershoot (only visible if the parameter "Threshold for undershoot" is set to OFF.)
②		Window monitoring (monitoring for speed overshoot and undershoot)
②	◄	Speed is in the correct range.
②	▲	A speed overshoot has occurred. • Not flashing: Threshold overshot, tripping delay running • Flashing: Threshold overshot, tripping delay expired, relay has switched
②	▲ ◄	Alternate flashing: The speed has risen above the set warning threshold.
②	▼	A speed undershoot has occurred. • Not flashing: Threshold undershot, tripping delay running • Flashing: Threshold undershot, tripping delay expired, relay has switched
②	▼ ◄	Alternate flashing: The speed has fallen below the set warning threshold.
③	 rpm▲, rpm!▲ rpm▼, rpm!▼	• Not flashing: Relay contact 11/12 open, relay contact 11/14 closed • Flashing: Delay time (ON delay or tripping delay) running • Masked out: Relay contact 11/12 closed, relay contact 11/14 open

[1] If this symbol is repeated for an extended period, the connection to the IO-Link master has been interrupted during communication buildup. Perform a restart of the monitoring relay.

Note

The value shown on the display always corresponds to the currently measured value even if the displayed value is flashing because a threshold has been overshot or undershot. The symbol for a threshold overshoot or undershoot indicates the fault causing this if manual RESET (Mem = yes) is set. In this way, the user can check before a Reset whether the cause of error has been remedied and a Reset is likely to result in a successful outcome.

You can find more information on the switching response of the output relay K1 in the Chapter "Functionality (Page 191)".

10.5.2 Diagnostics via IO-Link

Diagnostics via IO-Link

The 3UG4851 speed monitoring relays with IO-Link connection provide an option for diagnostics via IO-Link.

The manufacturer-specific diagnostics listed in the table are reported via the diagnostics mechanism of IO-Link. The table below provides information on possible causes and remedial measures:

Table 10- 3 Possible causes and remedial measures

Diagnostics and messages	Possible cause	Possible remedial measure
Invalid parameter	The set parameter is invalid.	Specify a parameter in accordance with the parameter table in the Chapter "Operation (Page 194)".
Self-test error/internal error	Fault in internal test.	Return the device to the manufacturer.
Value above (warning) threshold for overshoot	The set speed is higher than the set threshold for overshoot.	• Reduce the speed. • Set a higher threshold.
Value below (warning) threshold for undershoot	The set speed is lower than the set threshold for undershoot.	• Increase the speed. • Set a lower threshold.
Measured value is outside the range that can be measured	The measured speed is above or below the measurable range.	• Reduce the speed. • Increase the speed

The table below indicates how the manufacturer-specific diagnostics are reported:

Table 10- 4 Diagnostics and messages

Diagnostics and messages	IO-Link event code 1)	PII 2)		Data set 92	Display information
		GE 3)	GW 4)		
Invalid parameter	0x6320	x	—	x	P.ERR
Self-test error/internal error	0x5000	x	—	x	ERR
Threshold for overshoot exceeded	0x8C10	x	—	x	▲
Threshold for undershoot violated	0x8C30	x	—	x	▼
Measured value is outside the range that can be measured	0x8C20	—	—	x	- - - -

1) The manufacturer-specific diagnostic events listed in the table are reported to the IO-Link master via the diagnostics mechanism of IO-Link.

2) With the "process input image" (see "3UG4851 speed monitoring relays (Page 346)"), you can determine via the group error (GE) bit or general warning (GW) bit in the user program whether detailed information on diagnostics or messages is present in diagnostic data set 92. If bit (= 1) is set, you can obtain detailed information on what caused a "group error" or "general warning" by reading data set 92.

3) GE = Group error: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 349)").

4) GW = General warning: You can find detailed information in diagnostics data set 92 (see the Chapter "System commands - data set (index) 2 (Page 349)").

x: Bit set

○: Not relevant

10.5.3 Reset

Reset

Resetting of the outputs is dependent on the "Reset response" parameter (see the Chapter "Reset response (Page 247)"). On the 3UG48 monitoring relays, the parameter can also be set via IO-Link.

The following settings can be selected:

- Automatic reset (Mem = no)

  The device is reset automatically as soon as a previously occurring error has been dealt with.

- Manual RESET (Mem = yes)

  To reset digitally adjustable devices, you must press both arrow keys simultaneously for more than 2.5 s after the cause of the error has been rectified. If the cause of the error has not been removed, a new error message appears immediately. Alternately, the devices (with deactivated retentive error memory) can be reset by switching the supply voltage on and off.

Note

The outputs can also be reset via the process image of the outputs (PIQ) by setting the "Reset" control command or using the corresponding system command (see the Chapter "Process data and data sets (Page 279)").

Note

With the "Local reset" parameter that can be set via the IO-Link, resetting locally on the device can be disabled.

Note

The warning threshold is always reset by autoreset.

10.6 Circuit diagrams

10.6.1 Internal circuit diagrams

Internal circuit diagrams 3UG4851

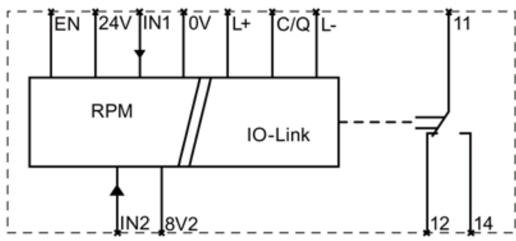


Figure 10-1 3UG4851 speed monitoring relay for IO-Link

10.6.2 Typical circuit diagrams

3UG4851

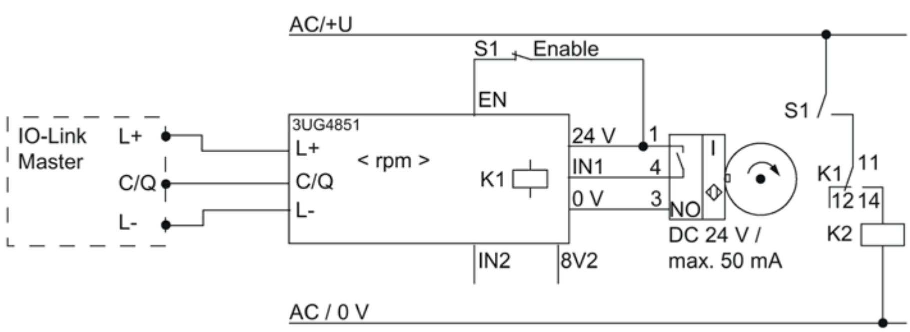


Figure 10-2 Speed monitoring with Enable input

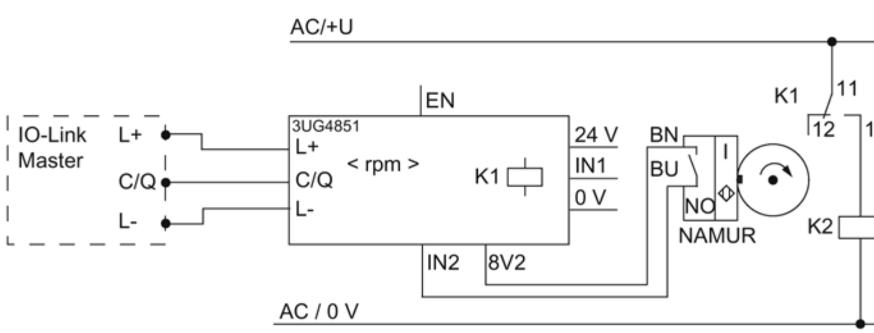


Figure 10-3 Speed monitoring without Enable input

10.7 Technical data

Measuring circuit

		3UG4851-.....
Adjustable response delay time		
• when starting	s	0 … 999.9
• with lower or upper limit violation	s	0 … 999.9
Adjustable response value revolution	1/s	0 … 36.667
Input voltage at the digital input 1		
• initial value for signal<0>-recognition	V	0
• final value for signal<0>-recognition	V	1
• initial value for signal<1>-recognition	V	4.5
• final value for signal<1>-recognition	V	30
Input current at the digital input 2		
• initial value for signal<0>-recognition	mA	0
• final value for signal<0>-recognition	mA	1.2
• initial value for signal<1>-recognition	mA	2.1
• final value for signal<1>-recognition	mA	8.2
Design of the input reducing-entrance		No
Design of the sensor		
• at the digital input 1 connectable		PNP switching three-wire sensor or mechanical impulse contact with external DC supply (4.5 V … 30 V)
• at the digital input 2 connectable		2-conductor Namur sensor or mechanical impulse contact
Input current at the digital input 1 maximum	mA	50
Pulse duration minimum	ms	5
Pulse interval minimum	ms	5
Number of sensor signals per revolution		1 … 10
Switching hysteresis for rotational speed	1/h	0 … 5 994

General technical details

		3UG4851-.....
Product function		RPM monitoring relay
Design of the display		LCD
Product function		
• rotation speed monitoring		Yes
• standstill monitoring		No
• defect storage		Yes
• reset external		Yes
• self-reset		Yes
• manual RESET		Yes
• open-circuit or closed-circuit current principle		Yes
Starting time after the control supply voltage has been applied	ms	500
Number of outputs		
• as contact-affected switching element		
– safety-related		
– delayed switching		0
– non-delayed		0
– for reporting function		
– delayed switching		1
– non-delayed		0
• as contact-less semiconductor switching element		
– safety-related		
– delayed switching		0
– non-delayed		0
– for reporting function		
– delayed switching		0
– non-delayed		0
Response time maximum	ms	100
Stored energy time at mains power cut minimum	ms	—
Relative metering precision	%	10
Precision of digital display		+/- 1 Digit
Relative repeat accuracy	%	1
Type of voltage of the controlled supply voltage		DC
Control supply voltage for DC rated value	V	24
Operating range factor control supply voltage rated value for DC		0.75 … 1.25
Impulse voltage resistance rated value	kV	4

		3UG4851-.....
Recorded real power	W	2
Protection class IP		IP20
Electromagnetic compatibility		IEC 60947-1 / IEC 61000-6-2 / IEC 61000-6-4
Operating current at 17 V minimum	mA	5
Continuous current of the DIAZED fuse link of the output relay	A	4
Resistance against vibration according to IEC 60068-2-6		1 … 6 Hz: 15 mm, 6 … 500 Hz: 2g
Current carrying capacity of output relay		
• at AC-15		
– at 230 V at 50/60 Hz	A	3
– at 250 V at 50/60 Hz	A	3
– at 400 V at 50/60 Hz	A	—
• at DC-13		
– at 24 V	A	1
– at 110 V	A	0.2
– at 125 V	A	0.2
– at 230 V	A	0.1
– at 250 V	A	0.1
Resistance against shock according to IEC 60068-2-27		sinusoidal half-wave 15g / 11 ms
Installation altitude at a height over sea level maximum	m	2 000
Conductor-bound parasitic coupling BURST according to IEC 61000-4-4		2 kV
Conductor-bound parasitic coupling conductor-earth SURGE according to IEC 61000-4-5		2 kV
Conductor-bound parasitic coupling conductor-conductor SURGE according to IEC 61000-4-5		1 kV
Electrostatic discharge according to IEC 61000-4-2		6 kV contact discharge / 8 kV air discharge
Field-bound parasitic coupling according to IEC 61000-4-3		10 V/m
Thermal current of the contact-affected switching element maximum	A	5
Degree of pollution		2
Apparent power consumed at 24 V for DC maximum	V·A	4

		3UG4851-.....
Ambient temperature		
• during operating phase	°C	-25 … +60
• during storage	°C	-40 … +80
• during transport	°C	-40 … +80
Galvanic isolation		
• between entrance and outlet		Yes
• between the outputs		No
• between the voltage supply and other circuits		Yes
Mechanical operating cycles as operating time typical		10 000 000
Electrical operating cycles as operating time at AC-15 at 230 V typical		100 000
Operating cycles with 3RT2 contactor maximum	1/h	5 000
Acceptability for application safety-related circuits		No
Category according to EN 954-1		none
safety Integrated Level according to IEC 61508		none

Communication

		3UG4851-.....
Type of voltage supply via input/ output link master		Yes
IO-Link transfer rate		COM2 (38,4 kBaud)
Protocol will be supported IO-Link protocol		Yes
Data volume		
• of the address range of the outputs with cyclical transfer total	byte	2
• of the address range of the inputs with cyclical transfer total	byte	4
Point-to-point cycle time between master and IO-Link device minimum	ms	10

Mechanical design

		3UG4851-1....	3UG4851-2....
Width	mm	22.5	
Height	mm	91	
Depth	mm	102	103
Built in orientation		any	
Distance, to be maintained, to earthed part			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Distance, to be maintained, to the ranks assembly			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Distance, to be maintained, conductive elements			
• forwards	mm	0	
• backwards	mm	0	
• sidewards	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Type of mounting		screw and snap-on mounting	
Product function removable terminal for auxiliary and control circuit		Yes	

		3UG4851-1....	3UG4851-2....
Design of the electrical connection		screw-type terminals	spring-loaded terminals
Type of the connectable conductor cross-section			
• solid		1x (0.5 ... 4 mm²), 2x (0.5 ... 2.5 mm²)	2x (0.25 ... 1.5 mm²)
• finely stranded			
– with wire end processing		1x (0.5 ... 2.5 mm²), 2x (0.5 ... 1.5 mm²)	2 x (0.25 ... 1.5 mm²)
– without wire end processing		—	2x (0.25 ... 1.5 mm²)
• for AWG conductors			
– solid		2x (20 ... 14)	2x (24 ... 16)
– stranded		2x (20 ... 14)	2x (24 ... 16)
Tightening torque			
• with screw-type terminals	N·m	0.8 … 1.2	— …
Number of change-over switches delayed switching		1	

11 Accessories

11.1 Accessories for 3RR24 current monitoring relays

11.1.1 Sealable cover

Description

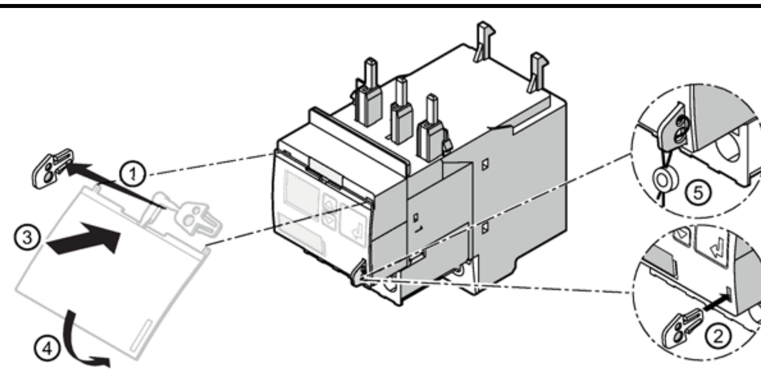
A sealable cover for use with all sizes (3RR2940) is available for the digitally adjustable 3RR24 current monitoring relays.

The sealable cover is used to protect the keys of the digitally adjustable current monitoring relays against unauthorized or unintentional manipulation.

Mounting

The diagram below shows an example mounting scenario based on mounting the sealable cover on the 3RR21 current monitoring relay with analog setting, size S0. The mounting sequence for the sealable cover for size S00 is exactly the same as that for size S0.

Table 11- 1 Mounting the sealable cover on the 3RR2 current monitoring relay

Step	Operating instruction	Figure
1	Remove the key from the cover.	
2	Insert the key into the designated opening.	
3	Attach the hooks on the cover to the openings on the current monitoring relay.	
4	Tilt the cover down.	
5	Lock the cover with the key connector to secure it against unauthorized removal.	

11.1.2 Terminal support for stand-alone assembly

Description

For a stand-alone assembly or if an overload relay is being used at the same time, adapters for stand-alone installation are available for separate DIN rail mounting or screw mounting.

The accessories are exactly the same as the accessories for the 3RU21 thermal overload relay and the 3RB3 solid-state overload relay.

Table 11- 2 Stand-alone assembly of the 3RR2 current monitoring relay

Size	Connection system	Terminal support for stand-alone assembly
S00	Screw-type	3RU2916-3AA01
	Spring-loaded	3RU2916-3AC01
S0	Screw-type	3RU2926-3AA01
	Spring-loaded	3RU2926-3AC01
S2	Screw-type	3RU2936-3AA01

Mounting

The terminal supports can be snapped onto 35 mm DIN rails according to DIN EN 50022. They can also be screw-mounted.

The figure below shows how the terminal support for stand-alone assembly is mounted and disassembled, based on the example of an analog setting current monitoring relay.

Table 11- 3 Mounting the terminal support (screw connection in the main circuit)

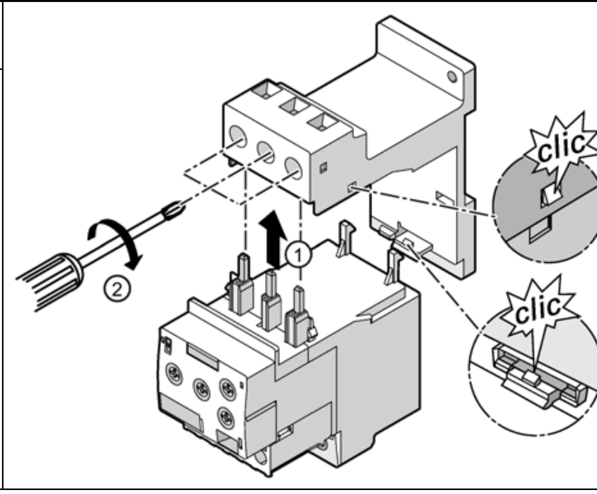
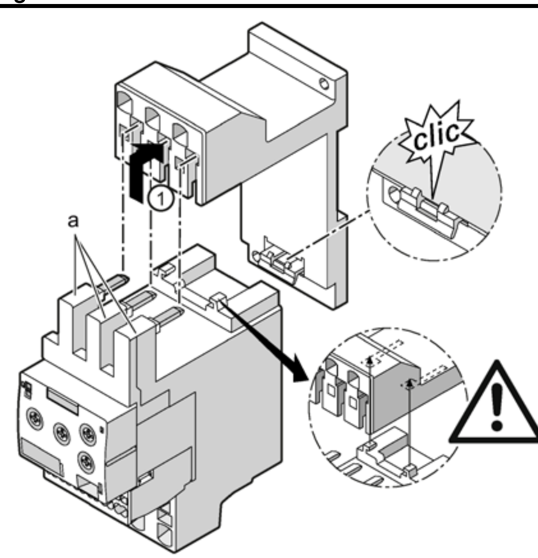
Step	Instructions	Figure
1	Guide the current monitoring relay into the terminal support from below.	
2	Tighten the screws on the terminal support with a Pozidriv size 2 (S00) or Pozidriv size 3 (S0) screw-driver (tightening torque 0.8 to 1.2 Nm). Check that the cable is clamped tight.	

Table 11- 4 Mounting the terminal support (spring-loaded connection in the main circuit)

Step	Instructions	Figure
1	Insert the contacts (a) into the central opening of the main terminals on the terminal support, with the con-tacts flush to the right. Make sure that the guide tabs are inserted into the designated slots on the terminal support.	

Disassembly

Table 11- 5 Removing the terminal support (screw connection in the main circuit)

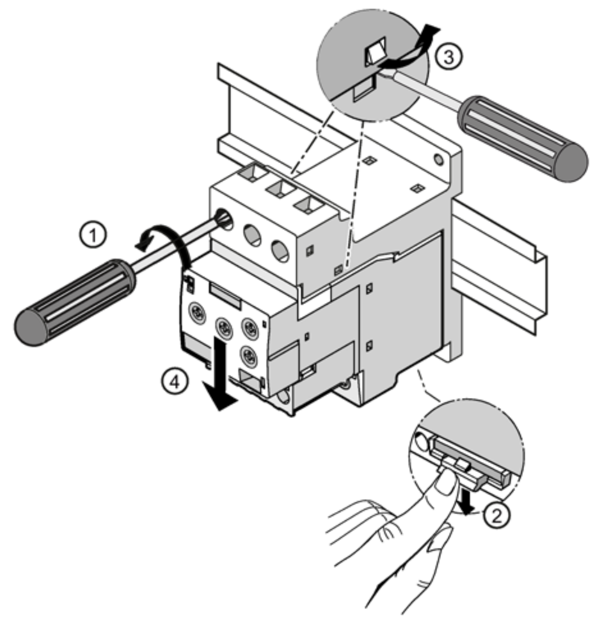
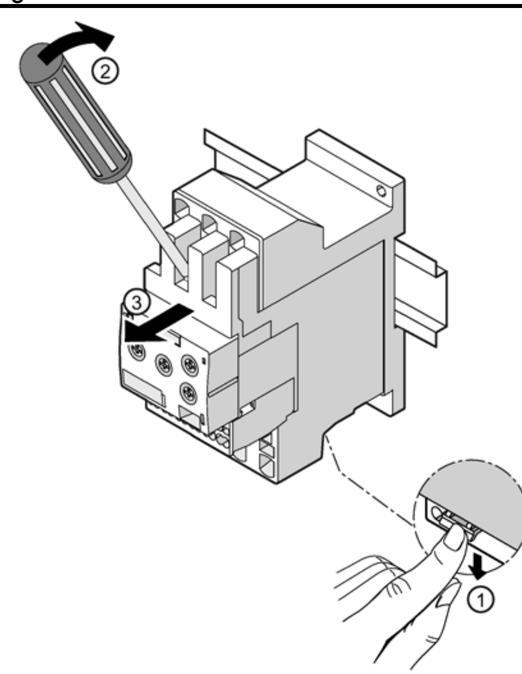
Step	Instructions	Figure
1	Undo the screws on the main conductor terminals.	
2	Release the current monitoring relay by pushing down the clip on the underside of the terminal support.	
3	Use a screwdriver to dislodge the terminal support from the current monitoring relay.	
4	Pull the current monitoring relay down and away from the contactor.	

Table 11- 6 Removing the terminal support (spring-loaded connection in the main circuit)

Step	Instructions	Figure
1	Release the current monitoring relay by pushing down the clip on the underside of the terminal support.	
2	Position the screwdriver on the terminal support as shown in the figure. Carefully dislodge the current monitoring relay from the contactor.	
3	Pull the current monitoring relay toward you and away from the terminal support.	

11.2 Accessories for 3UG48 monitoring relays

11.2.1 Sealable cover

Description

There is a uniform sealable cover for the monitoring relays with an overall width of 22.5 mm.

The sealable cover can be used to secure the actuators (rotary buttons, sliding switches, and keys) of the monitoring relays against unauthorized or unintentional manipulation.

Siemens also offers a sealable membrane (3TK2820-0AA00) for securing the monitoring relays with analog setting. The sealable membrane is affixed to the front of the device and secures rotary buttons and sliding switches against unintentional manipulation.

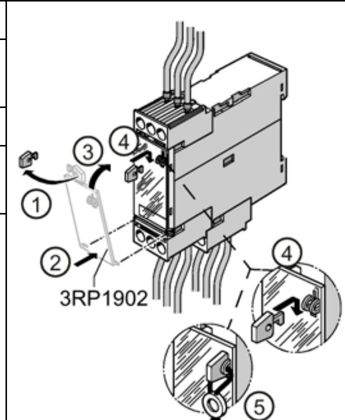
Note

The sealable membrane does not protect keys against unauthorized or unintentional manipulation.

Mounting

The figure below shows how to mount the sealable cover 3RP1902 on the monitoring relay.

Table 11- 7 Mounting the sealable cover on the monitoring relay

Step	Operating instruction	Image
1	Break off the clip on the sealable cover.	
2	Insert the sealable cover into the openings on the monitoring relay.	
3	Swing the sealable cover up.	
4	Insert the clip into the opening until it engages.	
5	Seal the clip to secure it against unauthorized removal.	

11.2.2 Push-in lugs

Description

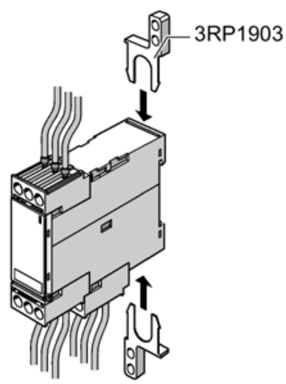
The 3RP1903 push-in lugs are available for the monitoring relays.

With the help of the push-in lugs, the monitoring relays can be secured with screws on a level surface (e.g. a wall). Two push-in lugs are required per device.

Mounting

The figure below shows how to attach the 3RP1903 push-in lugs to the monitoring relay.

Table 11- 8 Attaching the push-in lugs on the monitoring relay

Step	Operating instruction	Image
1	Insert the push-in lugs at the top and bottom on the monitoring relay and tighten the push-in lugs with a screwdriver.	

11.2.3 3UL23 residual current transformers for 3UG4825 monitoring relays

Description

3UL23 residual current transformers detect fault currents in machines and systems. Together with the residual current monitoring relay or the 3UF7510 SIMOCODE motor management and control device ground-fault module, residual current monitoring and ground-fault monitoring are possible. The 3UL23 residual current transformer is available in six sizes with bushing opening diameters of ∅ 35 mm, ∅ 55 mm, ∅ 80 mm, ∅ 110 mm, ∅ 140 mm, and ∅ 210 mm.

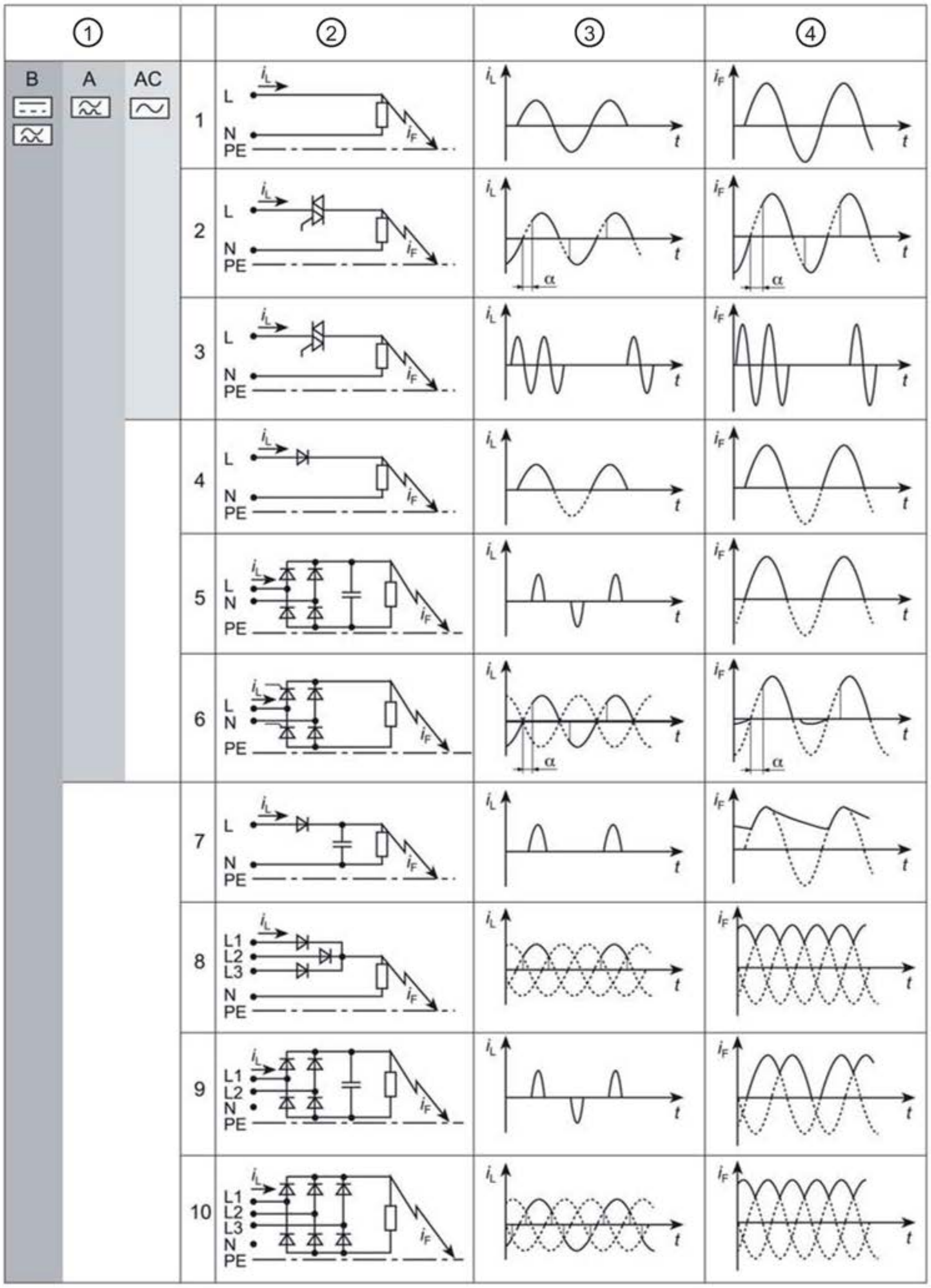
11.2.3.1 General information

Various circuit types with resulting fault currents

The following table shows various circuit types and the resulting fault currents in the event of a ground fault. Circuits 1 to 6 create pure AC fault currents or AC fault currents with a pulsating direct fault current component. This type of fault current can be detected by type A transformers in accordance with DIN VDE 0100-530, such as 3UL23 residual current transformers.

Note

3UG4.25 residual current monitoring relays are only suitable for use with 3UL23 residual current transformers.



① Suitable FI type
② Circuit
③ Load current
④ Fault current

Figure 11-1 Possible fault current forms and suitable residual current devices

More information is available on the Internet (www.siemens.com/industrial-controls/support).

11.2.3.2 Installation specifications

Note

Please ensure strict adherence to the installation specifications for live cables.

WARNING

Open-circuit voltage may result in death, serious injury or material damage

The current transformer output is a constant current power supply. In accordance with U = R * I, the output voltage increases with an increasing resistance. If the connecting terminals of the current transformer are open, the output voltage may become high enough for you to put your life at risk or permanently damage the current transformer.

Avoid operating the unit when open. Operating a network for monitoring safely and without faults requires that the monitoring relay and the 3UL23 residual current transformer have been installed completely. It is absolutely necessary to short-circuit previously installed 3UL23 residual current transformers when the units are not connected to a monitoring relay.

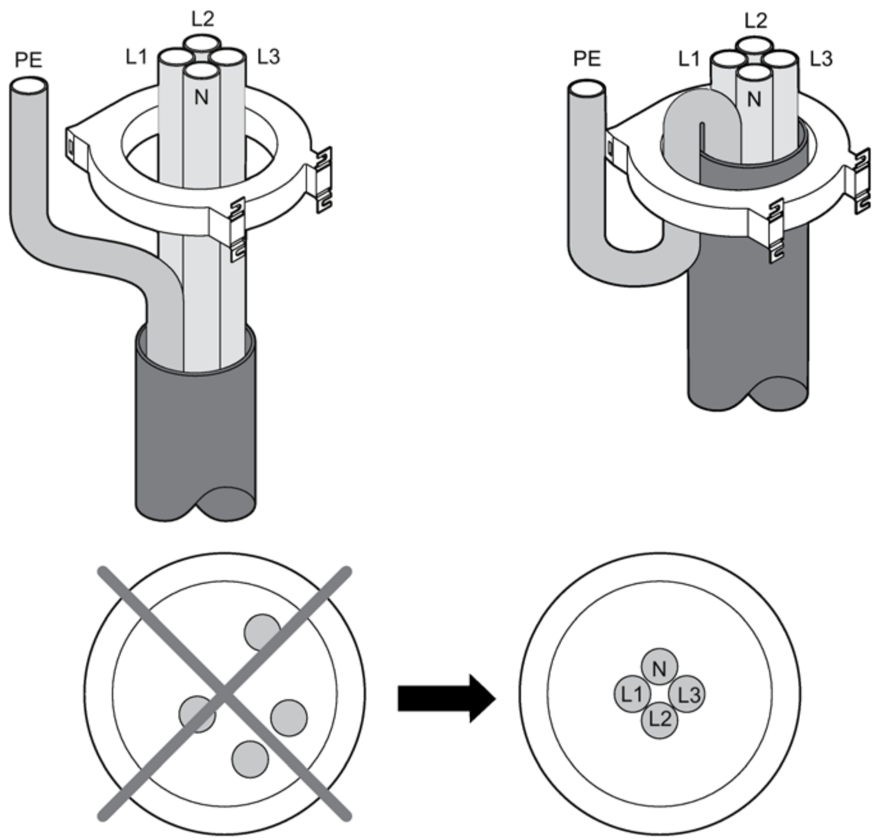
3UL23 residual current transformer conductor cross-sections

In accordance with DIN EN 60204-1 "Safety of machinery", the current carrying capacity of conductors is limited depending on their cross-section. This results in the ideally suitable residual current transformer to be used as per the following table. Please observe potentially deviating, local installation specifications.

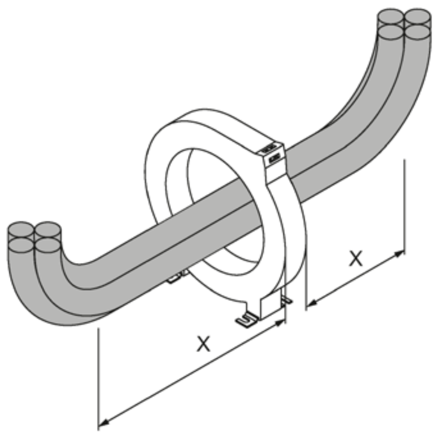
Order number	Bushing opening Diameter [mm]	Max. conductor cross-section 3P copper cable + N [mm²]	AWG [kcmil]	Rated current per phase [A]
3UL2302-1A	35	25	4	85
3UL2303-1A	55	50	1 / 0	150
3UL2304-1A	80	150	300	225
3UL2305-1A	110	240	500	400
3UL2306-1A	140	2 x 185	2 x 350/400	500
3UL2307-1A	210	2 x 240	2 x 500	630

3UL23 residual current transformers for external fault current monitoring

All live cables must be routed as close to the center of the transformer as possible.
Any neutral conductor must be routed through the transformer. Grounded protective conductors must not be routed through the transformer or need to be routed through the transformer in both directions.

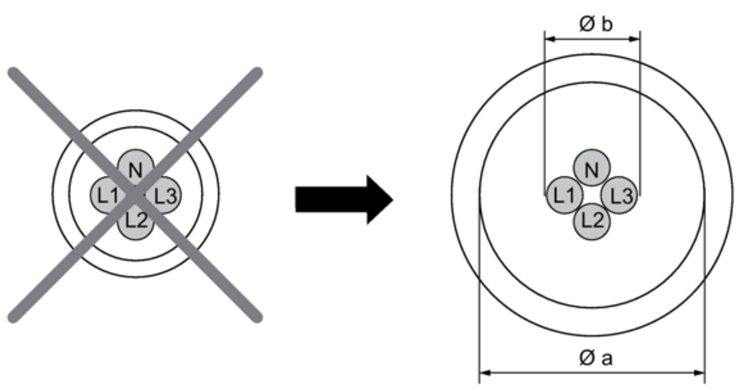


Route power cables around the residual current transformer in a straight line and ensure the area corresponds at minimum to the internal transformer diameter.



X > ∅ residual current transformer

The internal transformer diameter must be at minimum twice the size of the power cable bundle diameter.



∅ a ≥ 2 x ∅ b

Transformer connection

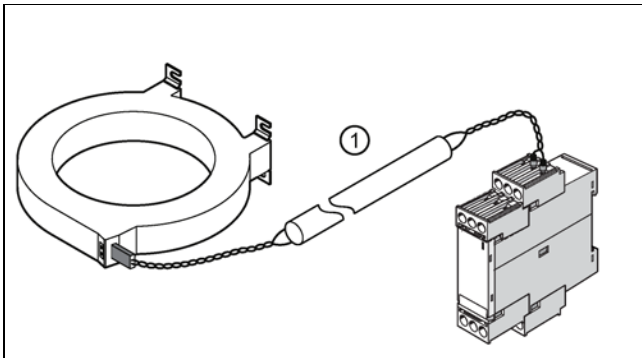
Transformer connecting cables must be twisted and not routed in parallel to live cables to protect from emitted interference. Keep the length of the connecting cables to a minimum. The resistance at the transformer connecting cable must not exceed 5 Ω to ensure correct fault current monitoring. This is ensured by the following limits given here as examples.

Conductor cross-section [mm²]	AWG/[kcmil]	Max. cable length [m]
0.5	20	70
1.0	18	140
1.5	16	210
2.5	14 / 12	300
4.0[1)]	10	550

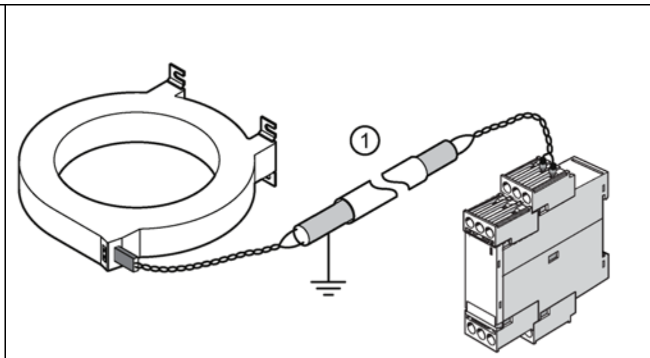
1) only possible in the case of transformers with a 210 mm diameter

Note

We recommend using twisted cables.



① Maximum cable lengths (see table above)



① Length ≥ 10 m (shielded, twisted, grounded cables)

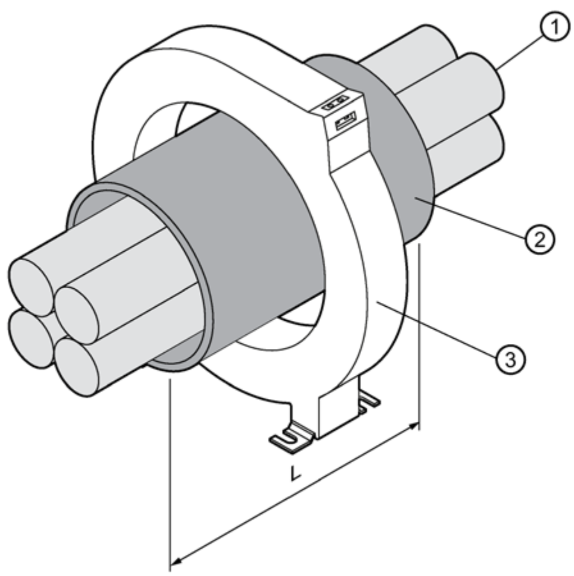
Note

Use shielded, twisted, and grounded cables for transformer connecting cables with a length of more than 10 m.

11.2.3.3 Potential for optimization

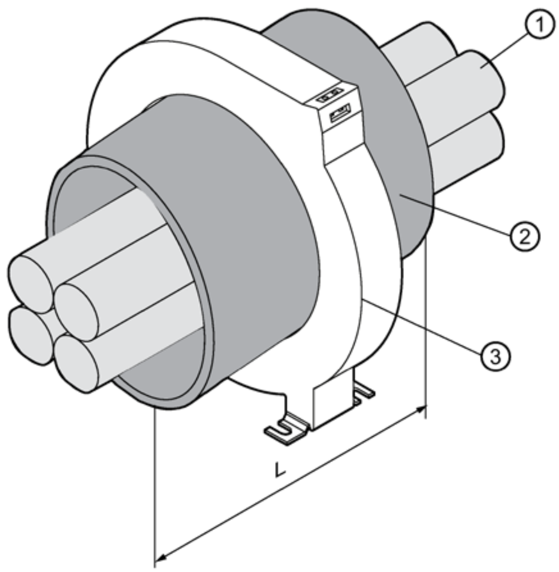
Potential for optimization in the event of extremely high currents, false tripping due to high starting currents or in environments with high EMC interference

1. Extend the ON-delay time to fade out fault currents measured during motor startup.
2. Extend the tripping delay time to prevent false tripping due to EMC interference.
3. Select a residual current transformer with a larger internal diameter. The reduced magnetic field strength that passes through the transformer due to the extended distance between power cables and transformer reduces the measuring accuracy but also the susceptibility to interference.
4. Route the transformer connecting cables at a greater distance to live cables
5. a) Using solid shield sleeves or wound shield sleeves made of soft iron sheet metal may be advisable to be able to monitor for small fault currents at extremely high rated currents.
   We recommend using a soft iron sheet metal shield with a thickness of 0.1 mm at minimum and fold it around the cable bundle several times so that the overall shield is 1 mm at minimum. The shielding sleeve length (L) must correspond to the internal diameter of the transformer used.



① Phase (and neutral conductor)
② Shield sleeve
③ Residual current transformer

b) A solid shield sleeve, e.g. turned from a normal, low-carbon tool steel must be precisely in contact with the internal ring of the residual current transformer. The wall thickness of the sleeve must be 1 mm at minimum, the length of the sleeve (L) must correspond to the internal diameter of the transformer used.



① Phase (and neutral conductor)
② Shield sleeve
③ Residual current transformer

11.2.3.4 Installation faults

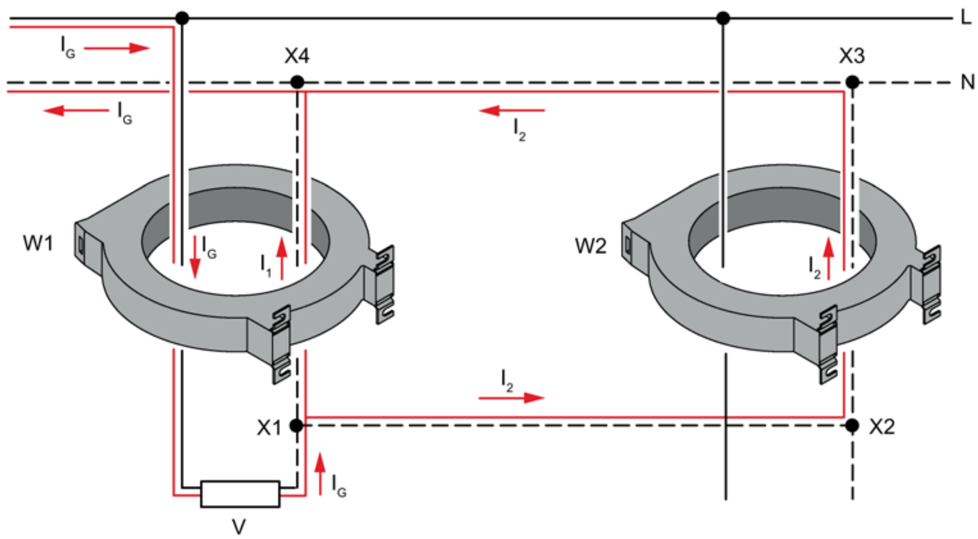
For reasons of clarity, the representations show only the residual current transformer with the currents passing through it rather than the complete residual current monitoring unit and residual current transformer. If the vectorial sum of the currents passing through the residual current transformer does not equal zero, part of the current is bypassing the transformer to ground and the residual current monitoring relay triggers a warning or an alarm if the current is correspondingly high.

In some instances, false alarms may occur for no apparent reason. However, these represent installation faults.

The following examples demonstrate the most common installation faults.

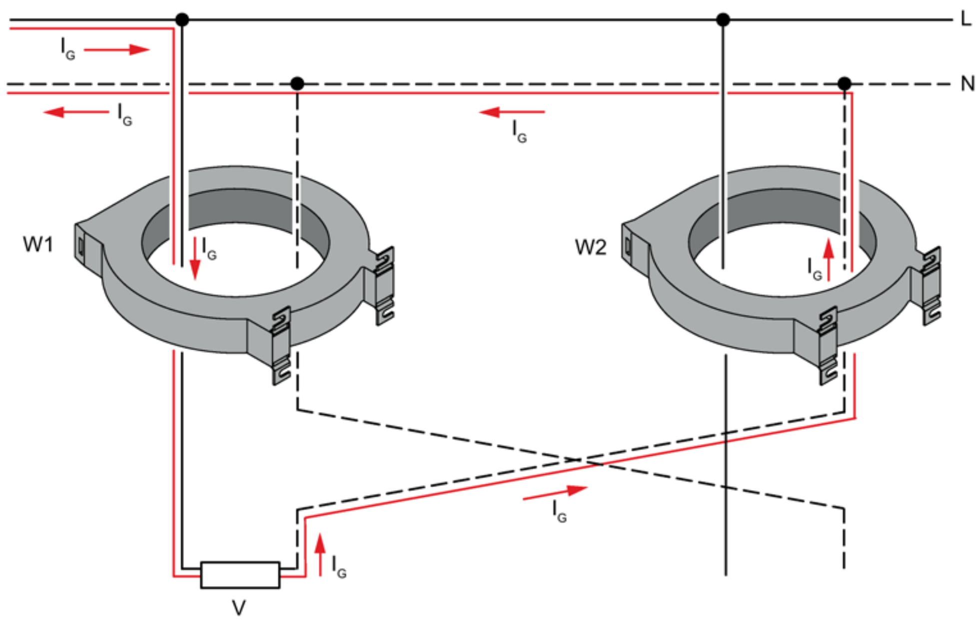
Parallel connections of conductors

If several residual current monitoring relays are installed in one network, a conductor routed through several residual current transformers must not be connected to itself downstream of the transformer, as this would effectively represent a parallel connection of the conductor. This fault occurs particularly often with neutral conductors. This fault causes the currents to be distributed across the conductor. This means that the current flowing through the load to be monitored is no longer 100 % of the total current and all integrated monitoring relays measure fault currents.



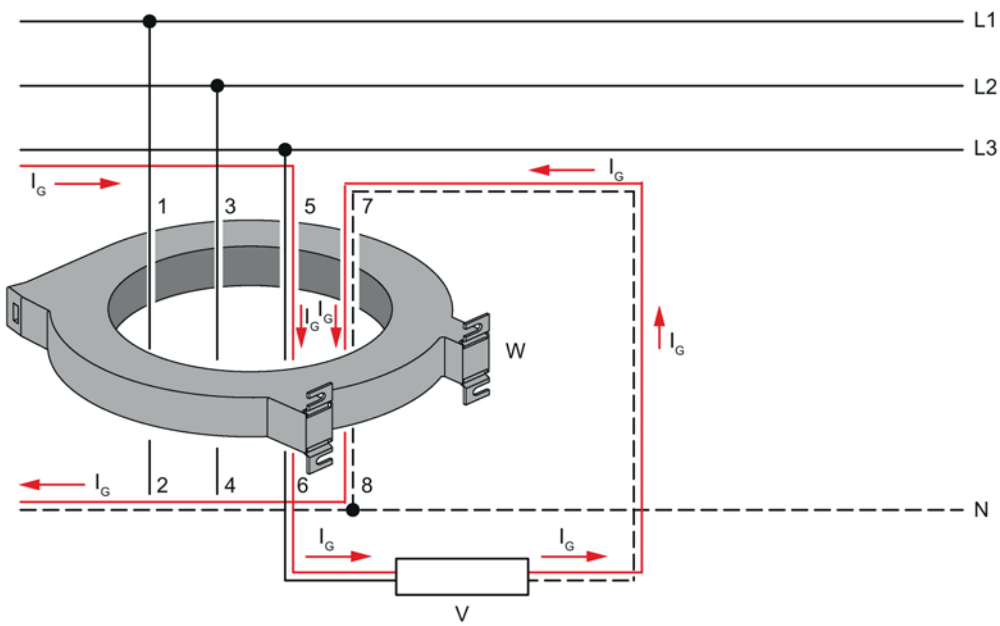
Mixing up conductors

In a network with several loads there is the risk that active conductors of loads that are to be separately monitored for fault currents can get mixed up. This fault leads to false tripping as the inflowing and outflowing currents are not always exactly the same strength, even if the loads are identical.



Routing contrary to the current flow

To be able to form the vectorial sum of currents to and from a load correctly, all active conductors must be routed through the residual current transformer from the same direction. Due to the restricted space in a control cabinet it may be easier to route the neutral conductor through the transformer in the opposite direction to the phase conductor. This means the vectorial sum of currents does not equal zero, even without a ground fault, and the residual current monitoring relay trips.



11.2.3.5 Internal circuit diagram

3UL23 internal circuit diagram

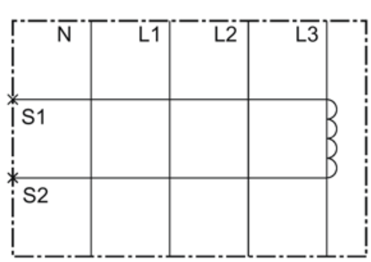
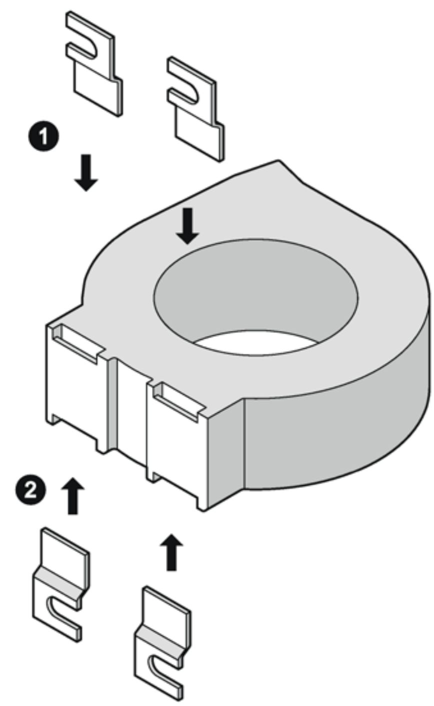


Figure 11-2 3UL23 residual current transformer

11.2.3.6 Installing

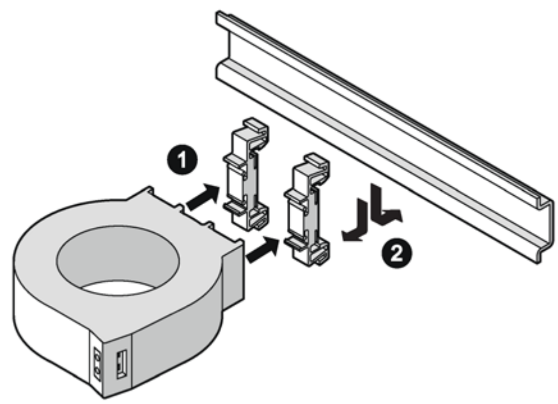
Wall mounting procedure

Step	Instructions	Figure
1 / 2	Insert the fixing lugs into the designated openings in the unit until they reach the stop.	
3	Place the device against the wall surface prepared for establishing a screw connection.	
4	Insert the head screws through the corresponding elongated holes in the fixing lugs.	
5	Screw the device onto the level surface so that it is secure.	

Rail mounting

Requirement: At the installation location, a horizontal 35-mm wide mounting rail in accordance with DIN EN 60715 has been properly secured.

Rail mounting is possible with residual current transformers with bushing opening diameters of up to ∅ 55 mm only (3UL2302-1A, 3UL2303-1A).

Step	Instructions	Figure
1	Mount the holder (3UL2900) to the device.	
2	Mount the device to the rail.	

11.2.3.7 Technical data

3UL2302 / 3UL2303 / 3UL2304 residual current transformers for fault current monitoring

		3UL2302-1A	3UL2303-1A	3UL2304-1A
Product equipment touch-protection		Yes		
Height	mm	64		
Width	mm	70	92	124.5
Depth	mm	75.5	98	130
Ambient temperature				
• during operating	°C	-25 … +60		
Type of mounting		screw fixing		
Diameter of the feed-through	mm	35	55	80
Conductor cross section that can be connected of the terminal	mm²	2.5		
Item designation				
• according to DIN 40719 extendable after IEC 204-2 according to IEC 750		T		
• according to DIN EN 61346-2		B		
Design of the electrical connection secondary side		screw-type terminals		
Residual current at the input rated value	A	40		

3UL2305 / 3UL2306 / 3UL2307 residual current transformers for fault current monitoring

		3UL2305-1A	3UL2306-1A	3UL2307-1A
Product equipment touch-protection		Yes		
Height	mm	64		62
Width	mm	163	201	300
Depth	mm	169	207.5	286
Ambient temperature • during operating	°C	-25 … +60		
Type of mounting		screw fixing		
Diameter of the feed-through	mm	110	140	210
Conductor cross section that can be connected of the terminal	mm²	2.5		4
Item designation • according to DIN 40719 extendable after IEC 204-2 according to IEC 750 • according to DIN EN 61346-2		T B		
Design of the electrical connection secondary side		screw-type terminals		
Residual current at the input rated value	A	40		

11.2.3.8 Dimension drawings

3UL23 residual current transformer

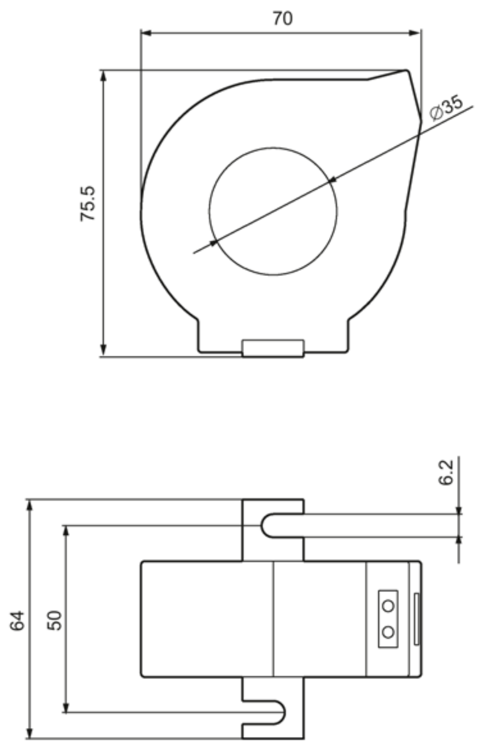


Figure 11-3 3UL2302-1A

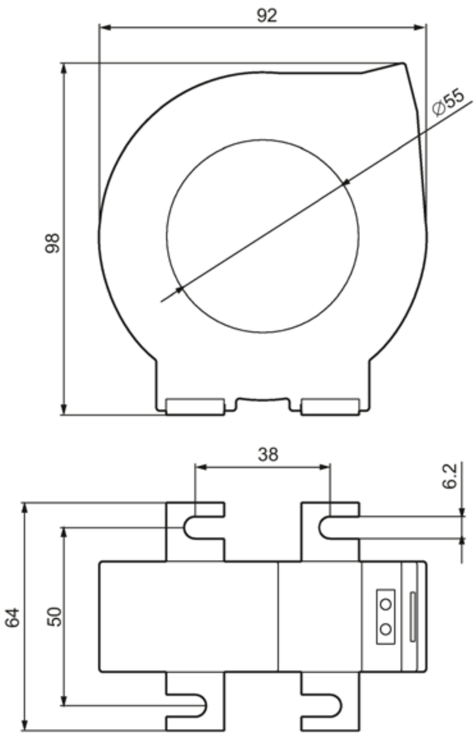


Figure 11-4 3UL2303-1A

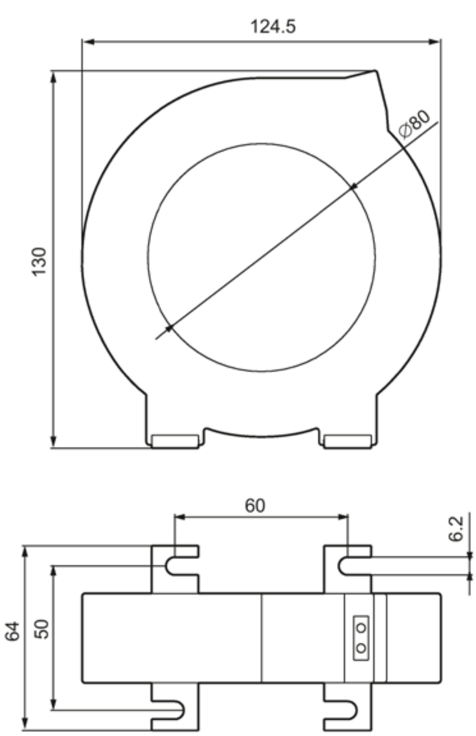


Figure 11-5 3UL2304-1A

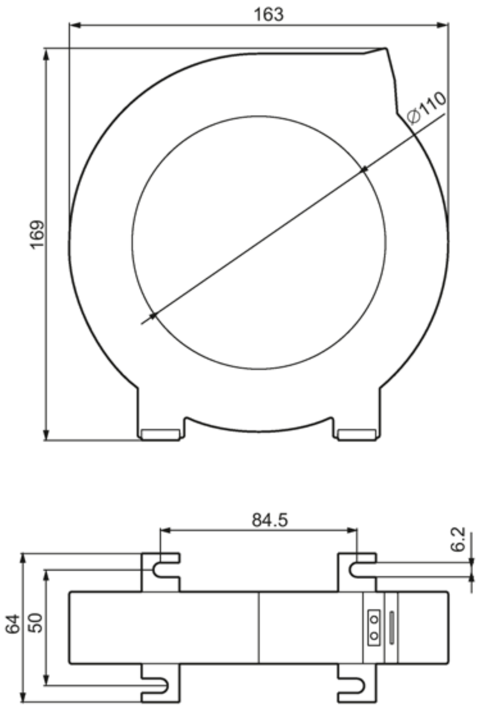


Figure 11-6 3UL2305-1A

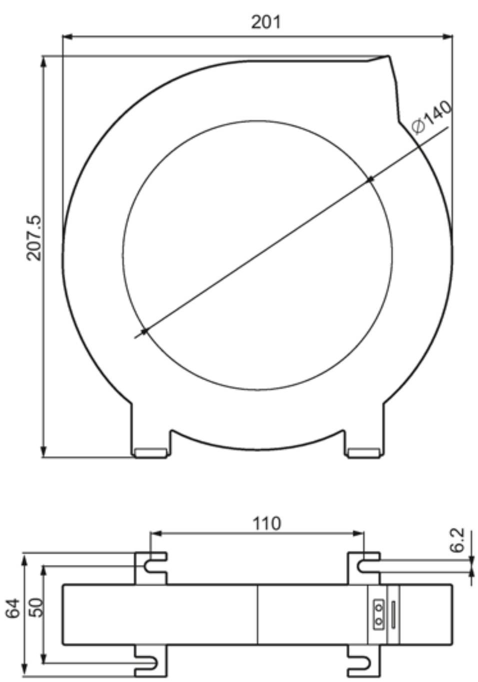


Figure 11-7 3UL2306-1A

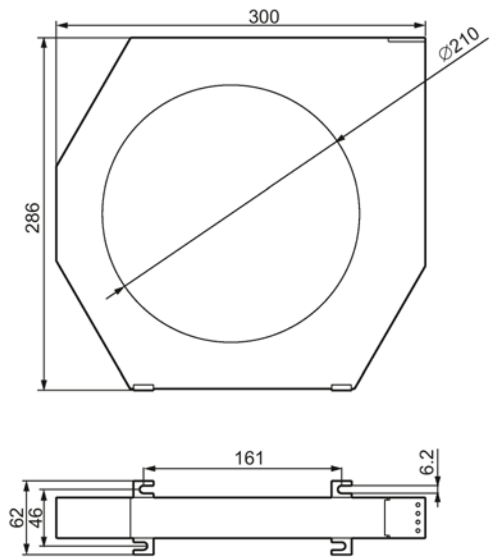


Figure 11-8 3UL2307-1A

Configuring the IO-Link 12

12.1 Combinations

IO-Link master and IO-Link device combinations are shown in the following table.

IO-Link master...	IO-Link device...	
	... according to IO-Link communication specification V1.0	... according to IO-Link communication specification V1.1
...according to IO-Link communication specification V1.0	Operation according to specification V1.0	Operation according to specification V1.0
...according to IO-Link communication specification V1.1	Operation according to specification V1.0	**Operation according to specification V1.1** [1)]

1) By selection of IODD V1.0.1, the device can be operated according to IO-Link communication specification V1.0.

Differences between IO-Link communication specifications V1.0 and V1.1

- Usable IO-Link telegram length (not relevant)
- Application-specific name: V1.0: 64 bytes max./V1.1: 32 bytes max.
- IO-Link device LED: V1.0: green/V1.1: Green blinking
- Device ID: V1.0: 0x00/V1.1: 0x01
- Parameter server functionality: V1.0: not available/V1.1: available

12.2 Configuring with STEP7 and the S7-PCT port configuration tool

12.2.1 Basic procedure and prerequisites

Procedure when configuring IO-Link master and IO-Link devices

Configuration takes place in two steps with STEP 7, V5.4 SP5 or STEP 7 TIA Portal, V12.0 or higher:

1. Configuring the IO-Link master in *HW Config*. You will find IO-Link master on the Internet (http://www.siemens.com/industrymall) under "Automation" > "Industrial communication" > "IO-Link" > "Master".
2. With the Port Configuraton Tool *S7-PCT* , you configure the connected IO-Link-Devices.

Note

You will find an application example of how to read and write process data and parameterization data of IO-Link masters and IO-Link devices on the Internet (http://support.automation.siemens.com/WW/view/en/38006560).

Requirements

- STEP 7 V5.4 SP5 or higher (you can download Service Pack 5 from the Internet (http://support.automation.siemens.com/WW/view/en/36184684)) or STEP 7 TIA Portal V12.0 or higher.
- The Port Configuration Tool *S7-PCT* is installed on the PG/PC.
  You can either install *S7-PCT* together with or STEP 7 or you can download it from the Internet (http://support.automation.siemens.com/WW/view/en/37936752).
- IO-Link IODD files (IO Device Description) are installed in the *S7-PCT hardware catalog*.
  You can download all current IODD files for the SIRIUS Geräte from the Internet (http://support.automation.siemens.com/WW/view/de/29801139/133100).
  IODD files for V1.0 and V1.1 are available for the combination of an IO-Link master and an IO-Link device according to the IO-Link communication specification V1.1. You may need IODD files according to the IO-Link communication specification V1.0 when replacing devices in existing installations.
- The GSD files of the IO-Link masters are already installed in *STEP 7 HW Config*. You can download all current GSD files for the Siemens IO-Link masters from the Internet (http://www.siemens.com/comdec).
- Optional: Install the IOL_Call function block for backing up/restoring IO-Link master parameters, IO-Link device parameters, parameterizing IO-Link devices during operation and reading out IO-Link port functions.
  The IOL_Call function block is available on the Internet (http://support.automation.siemens.com/WW/view/en/38487085).
  You will find further information on the IOL_Call function block in Section "Acyclic data exchange with the IOL_CALL function block (Page 240)".

12.2.2 Configuration

Configuring the IO-Link master in *HW Config*

1. Start the SIMATIC Manager (*STEP 7*) or the TIA Portal and configure the project as described in the *STEP 7* online help.
2. Select the IO-Link master in the hardware catalog of *HW Config*.
3. Drag and drop the IO-Link master from the hardware catalog to the configuration table.
4. Select the IO-Link master in the configuration table (*STEP 7*)/ device view (TIA Portal).
5. Press the right mouse button and select "**Object Properties**" from the shortcut menu.
   Result: The "**Properties**" window of the IO-Link master opens.
6. Check the settings of the addresses.
   Every IO-Link master port needs a corresponding overall address range depending on the IO-Link device used.

Configuring the IO-Link device with the S7-PCT port configuration tool

1. Select the configured IO-Link master.
2. Press the right mouse button and select "**Start device tool**" (*STEP 7* or TIA Portal)/"**Configure IO-Link**" (*STEP 7* or TIA Portal) from the shortcut menu depending on the configuration tool used.
3. Select the IO-Link device in the component catalog of the S7-PCT port configuration tool.
4. Drag the IO-Link device out of the component catalog to the required port of the IO-Link master.
5. Start by parameterizing the IO-Link device.
   Additional information is available in the *S7-PCT* online help.

12.3 Configuring with the S7-PCT port configuration tool (stand-alone)

12.3.1 Application

Configuration is always done with the S7-PCT port configuration tool whenever no SIMATIC CPU is available.

12.3.2 Basic procedure and prerequisites

Basic procedure when configuring IO-Link master and IO-Link devices with the S7-PCT port configuration tool (stand-alone)

1. You configure the connected IO-Link devices with the *S7-PCT V2.0* port configuration tool.

Requirements

- The *S7-PCT* port configuration tool is installed on the PG/PC.

  You can either install *S7-PCT* together with STEP 7 V5.4 SP5 or higher or STEP 7 TIA Portal V12.0 or higher, or you can download it from the Internet (http://support.automation.siemens.com/WW/view/en/37936752).
- IO-Link IODD files (IO Device Description) are installed in the *S7-PCT* hardware catalog. All current IODD files of the SIRIUS devices are available on the Internet (http://support.automation.siemens.com/WW/view/de/29801139/133100).
  IODD files for V1.0 and V1.1 are available for the combination of an IO-Link master and an IO-Link device according to the IO-Link communication specification V1.1. You may need IODD files according to the communication specification V1.0 when replacing devices in existing installations.

Note

Configuring with S7-PCT stand-alone is not possible for the CPU versions of the ET 200.

12.3.3 Configuration

Configuring the IO-Link device with the S7-PCT port configuration tool

1. Start the *S7-PCT* port configuration tool.
2. Create a new project or open an existing project as described in the online help.
3. Select a bus category (PROFIBUS DP/PROFINET IO).
4. Select an IO-Link master.
5. Select the IO-Link device in the component catalog of the *S7-PCT* port configuration tool.
6. Drag the IO-Link device out of the component catalog to the required port of the IO-Link master.
7. Load the configuration into the IO-Link master before parameterizing the IO-Link device.
8. Start by parameterizing the IO-Link device.
   Additional information is available in the *S7-PCT* online help.

Note

To be able to access the IO-Link master or an IO-Link device online, communication between the ET 200 and the higher-level controller must be active (BF LED on ET 200 interface module is off).

12.4 Acyclic data exchange with the IOL_CALL function block

For acyclic data exchange, the "IOL_Call" function block is available as a download for controllers of the S7 families.

The block supports you in the following tasks:

- Parameterization of an IO-Link device during operation
- Executing IO-Link port functions
- Backing up/restoring IO-Link device parameters
- Backing up/restoring IO-Link master parameters

Requirements

- Install the "IOL_Call" function block.
  You can download the IOL_Call function block and the description from the Internet (http://support.automation.siemens.com/WW/view/en/38487085).

Procedure when using the IOL_Call function block

1. Copy the IOL_Call function block (including data block DB10) to a *STEP 7* project.
2. Use the IOL_Call function block as described in the documentation.
3. You will find an application example of how to use the IO-Link devices with the IOL_Call function block on the Internet (http://support.automation.siemens.com/WW/view/en/38006560).

12.5 Replacing an IO-Link device

To replace 3RA27 modules, the devices must be isolated from communication and disconnected from the power supply. The complete group of load feeders becomes inactive. After removal of the connections between the load feeders, the applicable module can then be replaced. After the connections have been restored and communication has been resumed, the parameterization can be restored according to the respective IO-Link communication specification:

- IO-Link communication specification V1.0: via the IOL_Call function block
- IO-Link communication specification V1.1: via automatic parameterization under the ET 200SP

12.5.1 Replacing an IO-Link device according to the IO-Link communication specification V1.0)

12.5.1.1 Procedure

Parameter data and configuration data specially optimized by the user for a specific application are stored in an IO-Link-Device. This data deviates in many cases from the default values stored in the IO-Link-Device.

In the event of replacement of an IO-Link-Device (referred to below as a "module"), the optimized data must be transferred to the new module because the parameters are stored only in the IO-Link device itself.

Data can be transferred via two channels:

- Module replacement with PG/PC
- Module replacement without PG/PC

12.5.1.2 Procedure with PG/PC

In the event of a replacement, a PG/PC is available with the SIMATIC project of the plant.

With the data stored in the SIMATIC project, and the *S7-PCT* port configuration tool, you transfer the parameters belonging to the replaced IO-Link-Device to the new IO-Link-Device.

12.5.1.3 Procedure without PG/PC

Requirements

- Install the "IOL_Call" function block.
  You can download the IOL_Call function block and the description from the Internet (http://support.automation.siemens.com/WW/view/en/33102519/133100).

On completion of commissioning, a PG/PC with the project is no longer available. For backing up and restoring the parameter data and configuration data from or to a module, the IOL_Call" function block is available for the SIMATIC controllers belonging to the S7 family.

With this function block, you back up all relevant data records of a module after commissioning, in a data block (DB), for example. In the event of a replacement, you write the relevant data from the data block to the replaced module with the IOL_Call function block.

Refer to the Appendix "Process data and data sets (Page 279)" for data records to be backed up in the case of a module.

Procedure

1. Copy the IOL_Call function block (including data block DB10) to a STEP 7 project.
2. Use the IOL_Call function block as described in the documentation.
3. You will find an application example of how to use the IO-Link devices with the IOL_Call function block on the Internet (http://support.automation.siemens.com/WW/view/en/38006560).

Note

An IO-Link-Device is a module that communicates with the IO-Link master via its communication connection. With the special cases "SIRIUS 3RA64/65 compact starter " and "SIRIUS 3RA2711 function modules", where group formations of up to four starters are possible, the above information refers to the replacement of the first load feeder. Replacement of load feeders 2 to 4 of a group of four does not require any supplementary measures.

12.5.2 Replacing an IO-Link device according to the IO-Link communication specification V1.1)

Automatic saving of parameter data

If IO-Link masters and IO-Link devices according to the IO-Link Kommunikations-Spezifikation V1.1 are available, the "parameter server" function can be used to automatically back up parameter data.
When devices are replaced, this parameter data is written back to the new IO-Link device automatically on system startup.

WARNING
Risk of uncontrolled motor start-up **can cause death, serious injury, or property damage.** The preset configuration of a starter group is saved by the starter connected to the IO-Link master via the removable terminal. Make sure that the correct preset configuration is electronically stored in the new starter after the starters have been replaced.

12.6 Integration into the SIMATIC environment

Integration into the SIMATIC environment

Faceplates embedded in application examples are offered for downloading for human machine interfacing and diagnostics for Siemens IO-Link-Devices in conjunction with a SIMATIC and WinCC.

The faceplates can be transferred from the application examples to your own WinCC project.

Faceplates are available for the process data and the diagnostics data.

You can download application examples from the Internet (http://support.automation.siemens.com/WW/view/en/38006560) free of charge.

References

A

Further references

You will find more information about the 3UG48/3RR24 monitoring relays for IO-Link on the Internet (http://support.automation.siemens.com/WW/view/en/20356134/133300).

In addition to this manual, please refer to the operating instructions and manuals for any accessories. You can download the relevant documentation from the Internet (http://www.siemens.com/sirius/manuals). Simply enter the article number of the relevant item into the search field.

Operating instructions

Title	Article number
SIRIUS monitoring relays for 3-phase current monitoring for IO-Link for mounting on contactors S00/S0 (3RR24)	3ZX1012-0RR24-0AA0
SIRIUS monitoring relays for 3-phase current monitoring for IO-Link for mounting on S2 contactors (3RR2443)	3ZX1012-0RR24-3AA1
SIRIUS monitoring relays for three-phase voltage monitoring for IO-Link (3UG4815 and 3UG4816)	3ZX1012-0UG48-1AA1
SIRIUS monitoring relays for single-phase current monitoring for IO-Link (3UG4822)	3ZX1012-0UG48-2AA1
SIRIUS monitoring relays for residual current monitoring for IO-Link (3UG4825)	3ZX1012-0UG48-0AA0
SIRIUS monitoring relays for single-phase voltage monitoring for IO-Link (3UG4832)	3ZX1012-0UG48-3AA1
SIRIUS monitoring relays for power factor cos phi and active power monitoring for IO-Link (3UG4841)	3ZX1012-0UG48-4AA1
SIRIUS monitoring relays for speed monitoring for IO-Link (3UG4851)	3ZX1012-0UG48-5AA1

Parameters B

(Warning) threshold for voltage asymmetry

Voltage asymmetry is the difference between the highest and the lowest phase voltage in relation to the highest phase voltage (Ux-y max - Ux-y min) / Ux-y max.

Note

Deviation from the definition according to IEC/NEMA

The definition given above for voltage asymmetry deviates from the definition according to IEC/NEMA. It usually results in a greater value for voltage asymmetry than that arrived at from the definition according to IEC/NEMA, so that a higher level of measuring accuracy is achieved.

Voltage asymmetry can be parameterized as "Threshold for voltage asymmetry" or as "Warning threshold for voltage asymmetry" (only on devices for IO-Link).

If the warning threshold is reached on device variants for IO-Link, this is transmitted cyclicly via IO-Link and the relevant bits are set in the diagnostics data set or the semiconductor output (terminal C/Q) is switched in SIO mode.

If the threshold has been reached, the output relays are switched accordingly and an IO-Link message may be sent.

Possible indications on the display: Asy (threshold), possibly Asy! (warning threshold)

(Warning) threshold for current asymmetry

Current asymmetry is the difference between the highest and lowest phase current in relation to the highest phase current ($I_{x-y\ max}$ - $I_{x-y\ min}$) / $I_{x-y\ max}$.

Note

Deviation from the definition according to IEC/NEMA

The definition of current asymmetry given above deviates from the definition according to IEC/NEMA. It usually results in a greater value for current asymmetry than that arrived at from the definition according to IEC/NEMA, so that a higher level of measuring accuracy is achieved.

Current asymmetry can be parameterized as "Threshold for current asymmetry" or as "Warning threshold for current asymmetry" (only on devices for IO-Link).

If the warning threshold is reached on device variants for IO-Link, this is transmitted cyclically via IO-Link and the relevant bits are set in the diagnostics data set, or the semiconductor output (terminal C/Q) is switched in SIO mode.

If the threshold has been reached, the output relays are switched accordingly and an IO-Link message may be sent.

Possible indications on the display: Asy (threshold), possibly Asy! (warning threshold)

Tripping delay time

If the measured value overshoots or undershoots the set limit value, the delay time that can be set using the "Tripping delay time" parameter starts. On expiry of this time, the switching contact changes state and a message may be sent via IO-Link.

Possible indications on the display:

- Tripping delay time in the case of voltage undershoot: U▼Del
- Tripping delay time in the case of voltage overshoot: U▲Del
- Tripping delay time in the case of (active) current undershoot: I▼Del
- Tripping delay time in the case of (active) current overshoot: I▲Del
- Tripping delay time in the case of speed undershoot: ▼Del
- Tripping delay time in the case of speed overshoot: ▲Del
- Tripping delay time for asymmetry: AsyDel
- Tripping delay time in the case of undershoot of the cos phi value: φ▼Del
- Tripping delay time in the case of overshoot of the cos phi value: φ▲Del

ON-delay time

The setting of the "ON-delay time" parameter prevents limit violations such as undershoots (typical of inductive loads) while the system engages from generating a switching response.

The ON-delay time starts in the following cases, depending on the parameter settings:

- **At restart**

  If a measurable signal is again detected after the lower measuring range limit has been undershot.

- **At Power-ON**

  Re-connection of the supply voltage (Power-ON) of the device after switching off the current flow (zero current).

- **At manual reset**

  A fault is acknowledged by a manual reset. Following this, the device behaves in the same way as when the supply voltage is switched on again.

Starting the ON-delay time via IO-Link

The ON-delay time can also be started through the process image of the outputs (PIQ) by setting the control command "Start ON delay time." This is a simple method of permitting brief load steps during operation if these are predictable.

The ON-delay time can be set either locally via the three keys on the device, or via IO-Link. The requirements governing the starting of the ON-delay time (Power-ON, manual reset and/or restart) can only be modified via IO-Link.

Note

After exiting the menu level SET, the ON-delay time starts again.

Start of the ON-delay

The following table shows the behavior of the ON-delay (onDel) with the 3UG48/3RR24 monitoring relays for IO-Link.

Device variants	Start of the ON-delay possible for:			
	"Power-ON" (de-vice)	Automatic reset	Manual reset	"Power-ON" (load)
3UG4822	Yes	No	Yes	Yes
3UG4825	Yes	No	Yes	Yes
3UG4832	Yes	No	Yes	No
3UG4841	Yes	No	Yes	Yes
3UG4851	Yes	No	Yes	No
3RR24	Yes	No	Yes	Yes

You will find further information on the ON-delay time in the "Functionality" chapter for each monitoring relay.

Possible indications on the display:onDel

(Warning) threshold for undershoot

The device monitors a measured value for undershoot.

The measured value can be parameterized as "Threshold for undershoot" or as "Warning threshold for undershoot" (only on devices for IO-Link).

The setting for the "Warning threshold for undershoot" parameter defines the switching threshold of the relevant output relay prior to tripping due to a measured value undershoot.

If the set "Threshold for undershoot" parameter is undershot, the output relay will change its switching state after expiry of the set delay time and an IO-Link message may be sent. If the measured value has reached the relevant set hysteresis value, the output relay ("Reset response" parameter set to Autoreset) will immediately revert to its original state and a new IO-Link message may be sent.

Further response depends on the set reset response (see "Reset response" parameter).

You can find information on the switching response of the output relays in the "Functionality" chapters of the relevant monitoring relays.

Possible indications on the display:

- Current undershoot: I▾ (threshold),I!▾(warning threshold)
- Voltage undershoot: U▾ (threshold),U!▾ (warning threshold)
- Speed undershoot: rpm▾ (threshold),rpm!▾ (warning threshold)
- Cos phi undershoot: φ▾ (threshold),φ!▾ (warning threshold)
- Active current undershoot: I_r▾ (threshold),I_r!▾(warning threshold)

(Warning) threshold for overshoot

The device monitors a measured value for overshoot.

The measured value can be parameterized as "Threshold for overshoot" or as "Warning threshold for overshoot" (only on devices for IO-Link).

The setting for the "Warning threshold for overshoot" parameter defines the switching threshold of the relevant output relay prior to tripping due to a measured value overshoot.

If the set "Threshold for overshoot" parameter is overshot, the output relay will change its switching state after expiry of the set delay time and an IO-Link message may be sent. If the measured value has reached the relevant set hysteresis value, the output relay ("Reset response" parameter set to autoreset) will immediately revert to its original state and a new IO-Link message may be sent.

Further response depends on the set reset response (see "Reset response" parameter).

You can find information on the switching behavior of the output relays in the "Functionality" chapters of the relevant monitoring relays.

Possible indications on the display:

- Current overshoot: I▲ (threshold),I!▲ (warning threshold)
- Voltage overshoot: U▲ (threshold),U!▲ (warning threshold)
- Speed overshoot: rpm▲ (threshold),rpm!▲ (warning threshold)
- Cos phi overshoot: φ▲ (threshold),φ!▲ (warning threshold)
- Active current overshoot: I_r▲ (threshold),I_r!▲ (warning threshold)

Reset response

The setting of the "Reset response" parameter controls how the device behaves after tripping in the event of an error, and the subsequent reversion of the measured values to the normal range once the cause of the error has been dealt with.

The outputs are reset dependent on the setting of the "Reset response" parameter.
The following settings can be selected:

- Automatic reset

  If the device is set to automatic reset, the switching contact will respond once the normal range plus the hysteresis threshold have been reached. The device is reset automatically as soon as a previously occurring error has been dealt with. The overshoot or undershoot which triggered the response is not saved.

- Manual RESET

  If manual RESET is selected, the switching contact remains in the current switching state even if the measured value returns to a permissible value.

Possible indications on the display: Mem

Hysteresis

Hysteresis is the continuation of an effect within the hysteresis range after its cause has been removed; its purpose is to prevent repeated response in the threshold value range.

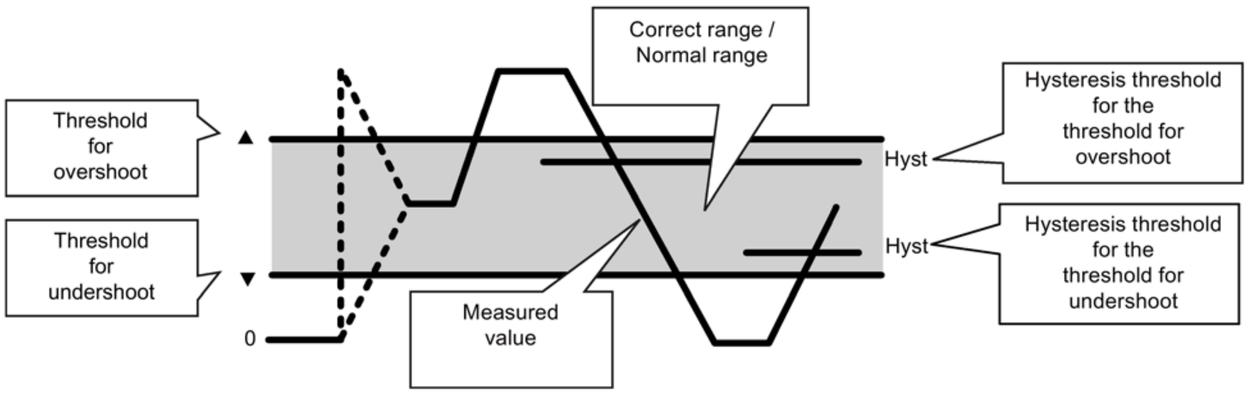


Figure B-1 Explanation of hysteresis

If, after the upper threshold value has been overshot to such an extent that switching was necessary, the measured value returns to the normal range, and switching over to the correct range will not take place until a measured value which undershoots the hysteresis threshold has been reached. The same applies if the lower threshold value is undershot.

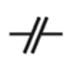
The hysteresis is only active if the "Reset response" parameter is set to autoreset.

Possible indications on the display: Hyst

Phase failure monitoring

If the "phase failure monitoring" parameter is activated, an immediate shutdown is carried out in the event of a failure of one of the phases (or of the N conductor) to protect the application from follow-on damage.
Set delay times have no effect on phase failure monitoring.

The "phase failure monitoring" parameter on the 3UG48/3RR24 monitoring relays is set either locally via the three keys on the device, or via IO-Link.

Possible indications on the display: 

Phase sequence monitoring

If the "Phase sequence monitoring" parameter has been activated and the load currents exhibit the wrong phase sequence, the changeover contact will change its switching status immediately (≤ 200 ms).

Possible indications on the display: 

Relay switching response

The "Relay switching response" parameter allows the user to adjust the switching response of an output relay. Several variations can be distinguished here:

- Closed-circuit principle (NC)

  With the closed-circuit principle, the output relay picks up when the voltage is applied (normally-open contact (NO) closed). The output relay drops out in the event of an error (normally-closed contact (NC) closed). If the supply voltage fails, the output relay also returns to this position so that a supply voltage failure is detected and reported.

  The semiconductor output responds as an NC contact, in other words, if a fault is detected, the output Q has a high resistance.

- Open-circuit principle (NO)

  With the open-circuit principle, the output relay only picks up in the event of an error (normally-open contact (NO) closed). Interruptions to the supply voltage are not displayed.

  The semiconductor output responds as an NO contact, in other words, if a fault is detected, the supply voltage is present at output Q.

Possible indications on the display:

- Closed-circuit principle: NC
- Open-circuit principle: NO

Blocking current monitoring

If the load current overshoots the value of the set threshold for overshoot (I▲) by a multiple of n during operation, a blocking current error has occurred. The tripping delay time that is running due to the current threshold overshoot is stopped and the outputs are switched.

Indication on the display: n x I▲

Scaling factor

The "scaling factor" parameter allows the user to set the number of pulses per revolution provided by the pulse encoder. This allows the revolutions per minute to be read direct on the display.

Possible indications on the display: Scale

Reclosing delay time

If autoreset is activated on the monitoring relay, the reclosing delay time will start as soon as the measured value to be monitored returns to the correct range after an overshoot or undershoot. The associated hysteresis threshold is taken into consideration here. At the end of this time the contacts switch back to normal operation.

The reclosing delay time permits motor cooling if the device has tripped due to a temperature rise.

Possible indications on the display: RsDel

Stabilization delay

An output is only switched to the "correct position" after switching on the supply voltage if all monitored measured values are stable for the duration of the stabilization delay. The monitoring functions are active within the stabilization delay. A threshold overshoot or undershoot in this time does not result in a fault, but instead in restarting of the stabilization delay.

The stabilization delay starts in the following cases:

- **At Power-ON**

  Reapplication of the supply voltage (Power-ON) of the device after

  disconnection of the current flow (zero current).

- **At manual reset**

  A fault is acknowledged by a manual reset. After this, the device responds in the same way as

  when the supply voltage is connected.

Starting the stabilization delay via IO-Link

The stabilization time can also be started through the process image of the outputs (PIQ) by setting the control command "Start stabilization time."

The "Stabilization time" parameter is set either locally using the three keys on the device, or via IO-Link. The requirements governing the starting of the stabilization delay (Power-ON and/or manual reset) can only be modified via IO-Link.

The stabilization of line voltage is useful, for example, in the case of generator operation.

Note

Whenever the menu level is exited SET, the stabilization time starts again.

Start of the stabilization time

The following table shows the behavior of the stabilization time (stDel) with the 3UG48/3RR24 monitoring relays for IO-Link.

Device variants	Start of the stabilization time possible for:			
	"Power-ON"	Automatic reset	Manual reset	Restart
3UG4815	Yes	No	Yes	No
3UG4816	Yes	No	Yes	No

You will find further information on the ON-delay time in the "Functionality" chapter for each monitoring relay.

Indication on the display: stDel

Transformer transmission factor

The "Transformer transmission factor" parameter allows the user to determine the transformation ratio of the current transformer used.

To measure higher AC currents than those immediately possible with the relevant current monitoring relay, current transformers/instrument transformers can be connected. The conversion factor of the transformer used can be set for correct display of the current values.

The "Transformer transmission factor" parameter is set either locally using the three keys on the device, or via IO-Link.

Indication on the display: Scale

Group diagnostics

The "Group diagnostics" parameter enables the user to enable or completely disable "Automatic signaling" via the fieldbus. The message bits "Group error" and "General warning" in the process image are not affected by this.

The possible settings for this parameter are listed in the chapter titled "Process data and data sets (Page 279)". Changes to this parameter can only be made via IO-Link.

Group error diagnostics

The "Group error diagnostics" parameter enables the user to suppress "Automatic signaling" of all error messages via the fieldbus.

The possible settings for this parameter are listed in the chapter titled "Process data and data sets (Page 279)". Changes to this parameter can only be made via IO-Link.

Local threshold change

The "Local threshold change" parameter enables the user to set product-specific limit values and warning thresholds for undershoot and overshoot locally on the monitoring relay. If the parameter is disabled, local setting on the device is prevented.

The possible settings for this parameter are listed in the chapter titled "Process data and data sets (Page 279)". Changes to this parameter can only be made via IO-Link.

Local parameter change

The "Local parameter change" parameter enables the user to set product-specific parameters (e.g. delay times, hysteresis, or the relay switching response) locally on the monitoring relay. If the parameter is disabled, local setting on the device is prevented.

The possible settings for this parameter are listed in the chapter titled "Process data and data sets (Page 279)". Changes to this parameter can only be made via IO-Link.

Local reset

The "Local reset" parameter enables the user to acknowledge the error message pending once an error has been detected directly on the monitoring device so that the normal monitoring function can be resumed. This requires the monitoring relay to be set to manual reset. If the parameter is disabled, fault acknowledgment on the device is prevented.

The possible settings for this parameter are listed in the chapter titled "Process data and data sets (Page 279)". Changes to this parameter can only be made via IO-Link.

Retentive error memory

The "Retentive error memory" parameter enables the user to save all error messages in the device in the event of a power failure. The monitoring device is not reset in the event of power failure. If the parameter is enabled, automatic restart of the system is prevented if power is restored while a fault is active. This increases plant safety.

If the parameter is disabled, fault messages are discarded on power recovery.

The possible settings for this parameter are listed in the chapter titled "Process data and data sets (Page 279)". Changes to this parameter can only be made via IO-Link.

Analog value coding

The "Analog value coding" parameter enables the user to transfer not just the measured value but also the unit and resolution of the analog measured value via the process image. This parameter can be used for device-specific setting of the value to be sent cyclically.

The Chapter "Analog value coding (Page 280)" contains a table listing the units and resolutions of the analog measured values to be transferred, as well as the assignment to the relevant monitoring relays.

The possible settings for this parameter are listed in the chapter titled "Process data and data sets (Page 279)". Changes to this parameter can only be made via IO-Link.

Switching cycle counter

The switching cycle counter is incremented by one each time a breaking operation is detected (transition from three-phase current flow to no current flow can be measured). The number of switching cycles can be used as an indicator of pending maintenance or replacement of switching elements. Arcs in breaking operations cause high loads and wear.

Runtime meter

The runtime meter gives the time during which there was a measurable current in at least two current paths.

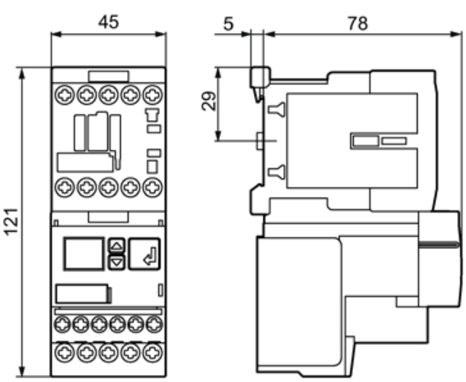
The properties of the insulation material of the motor windings, for example, deteriorate during operation due to the thermal load. The runtime can be used as an indicator of pending maintenance or replacement of machine parts and system components.

Dimension drawings

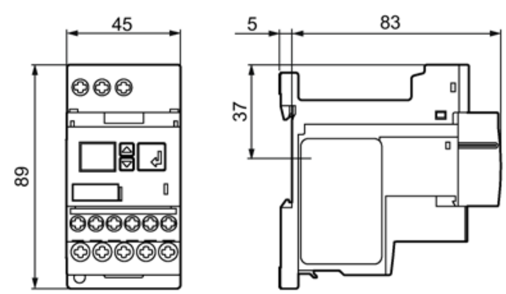
C

C.1 Dimension drawings 3RR24 current monitoring relays

3RR2441-1AA40 (screw connection, S00)

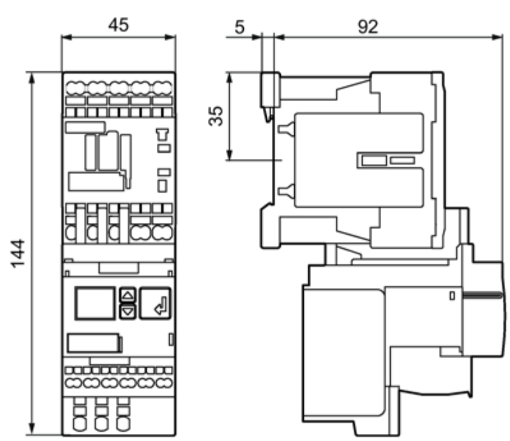


3RR2441-1AA40 with contactor

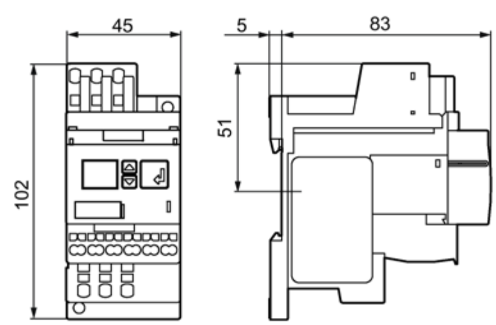


3RR2441-1AA40 with terminal support for stand-alone assembly

3RR2441-2AA40 (spring-loaded connection, S00)

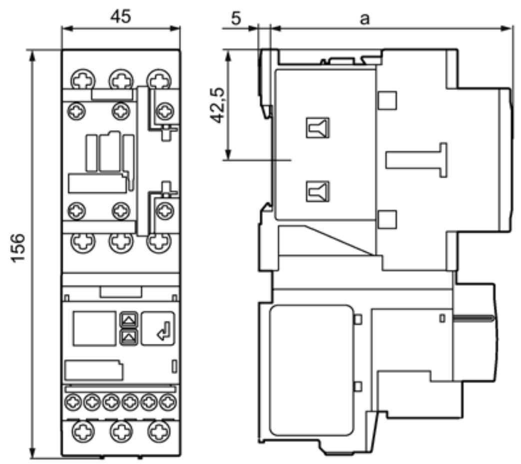


3RR2441-2AA40 with contactor

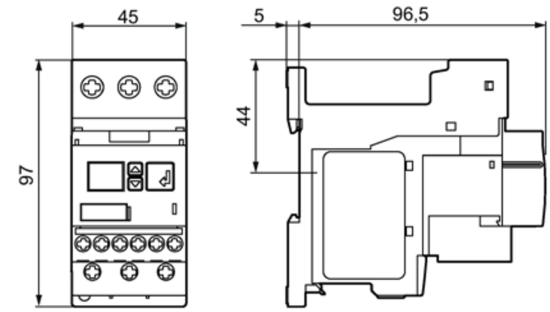


3RR2441-2AA40 with terminal support for stand-alone assembly

3RR2442-1AA40 (screw connection, S0)

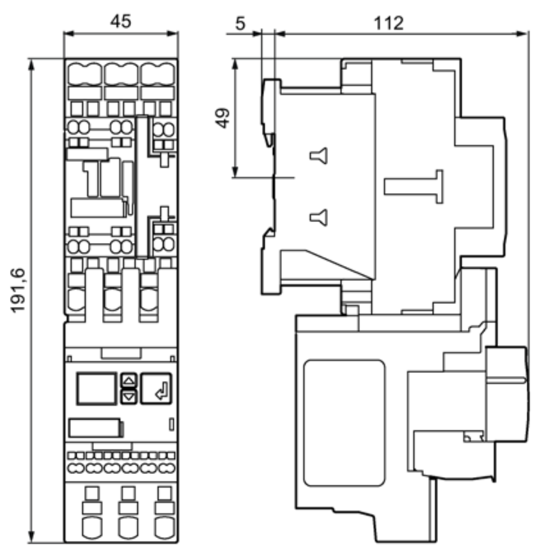


3RR2442-1AA40 with contactor

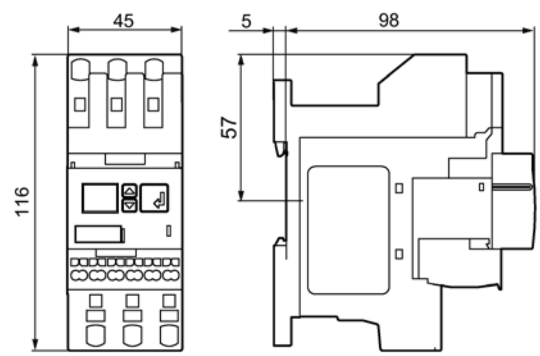


3RR2442-1AA40 with terminal support for stand-alone assembly

3RR2442-2AA40 (spring-loaded connection, S0)

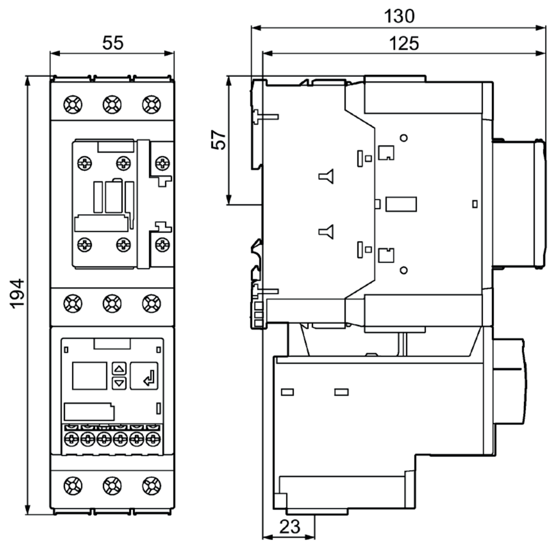


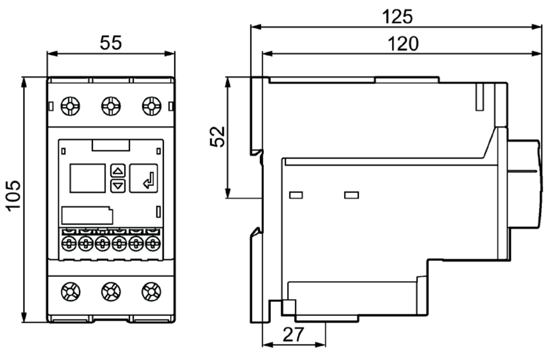
3RR2442-2AA40 with contactor



3RR2442-2AA40 with terminal support for stand-alone assembly

3RR2443-1AA40 (S2)

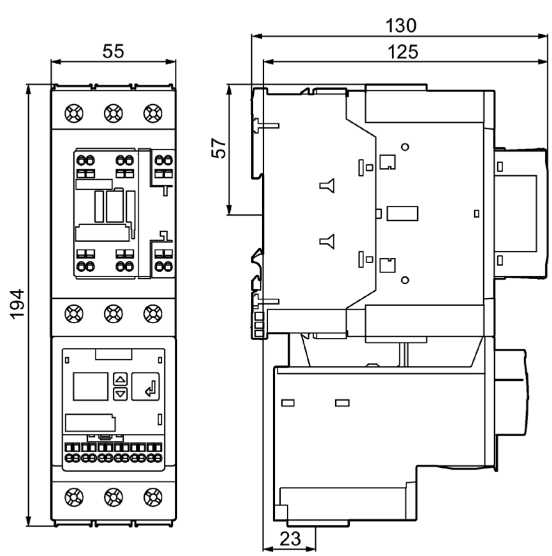


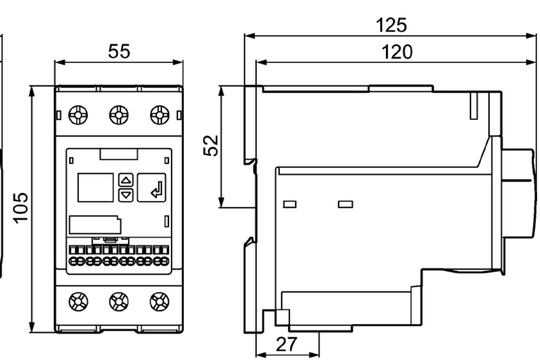


3RR2443-1AA40 with terminal support for stand-alone assembly

3RR2443-1AA40 with contactor

3RR2443-3AA40 (S2)





3RR2443-3AA40 with terminal support for stand-alone assembly

3RR2443-3AA40 with contactor

C.2 Dimension drawings 3UG4 monitoring relays. (3 connecting terminals)

3UG4. monitoring relays with 3 connecting terminals (screw-type connection)

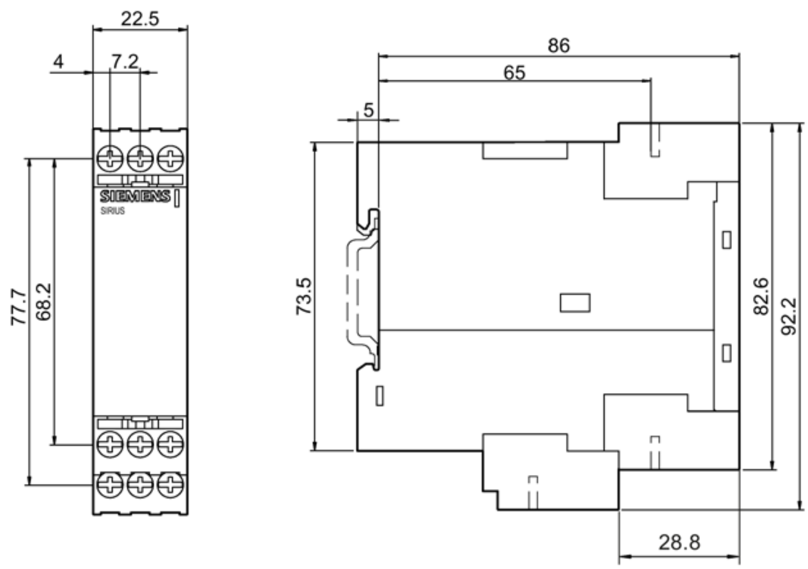


Figure C-1 3UG4. monitoring relays with 3 connecting terminals with screw-type connections

3UG4. monitoring relays with 3 connecting terminals (spring-loaded connections)

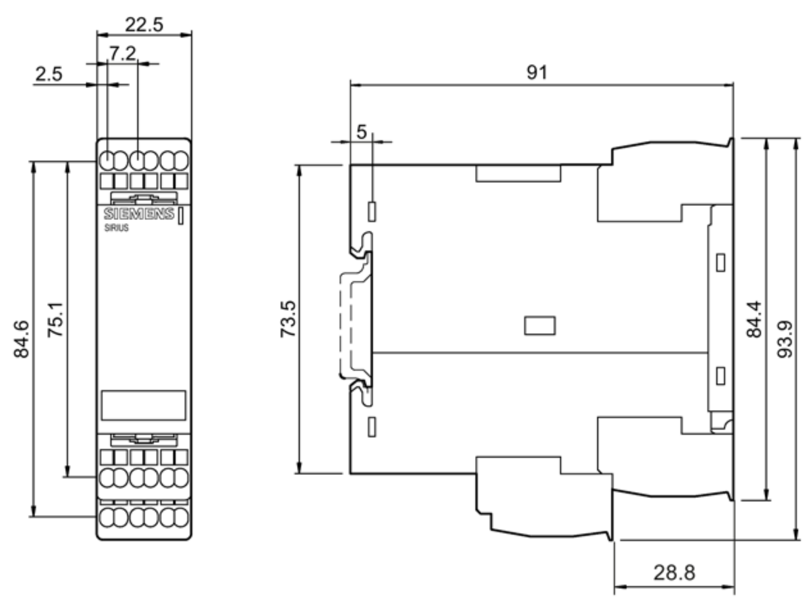


Figure C-2 3UG4. monitoring relays with 3 connecting terminals with spring-loaded connections

C.3 Dimension drawings 3UG4 monitoring relays. (4 connecting terminals)

3UG4. monitoring relays with 4 connecting terminals (screw-type connection)

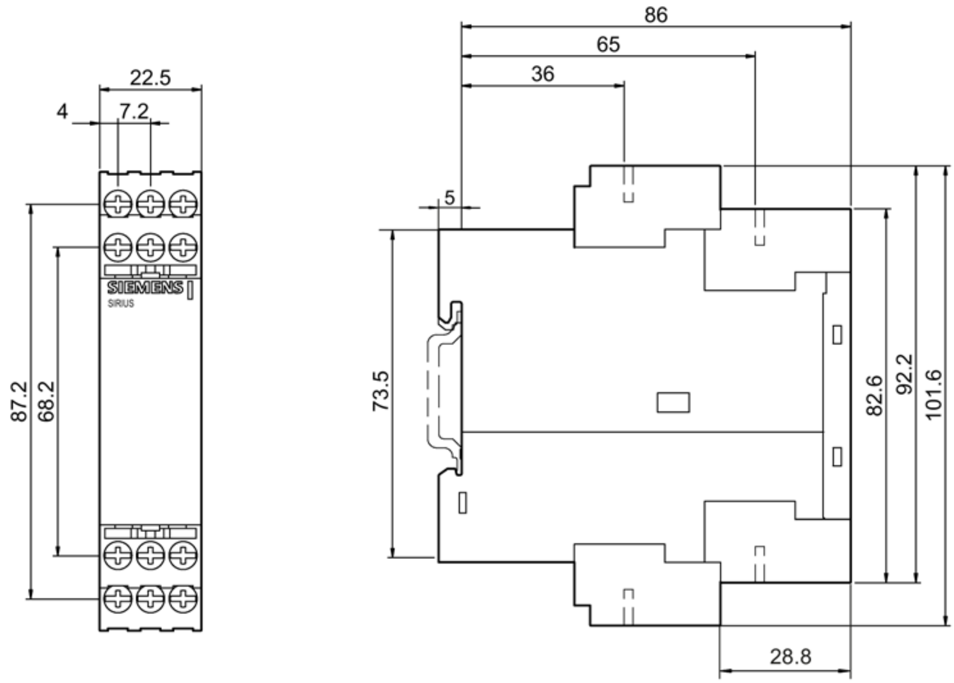


Figure C-3 3UG4. monitoring relays with 4 connecting terminals with screw-type connections

3UG4. monitoring relays with 4 connecting terminals (spring-loaded connections)

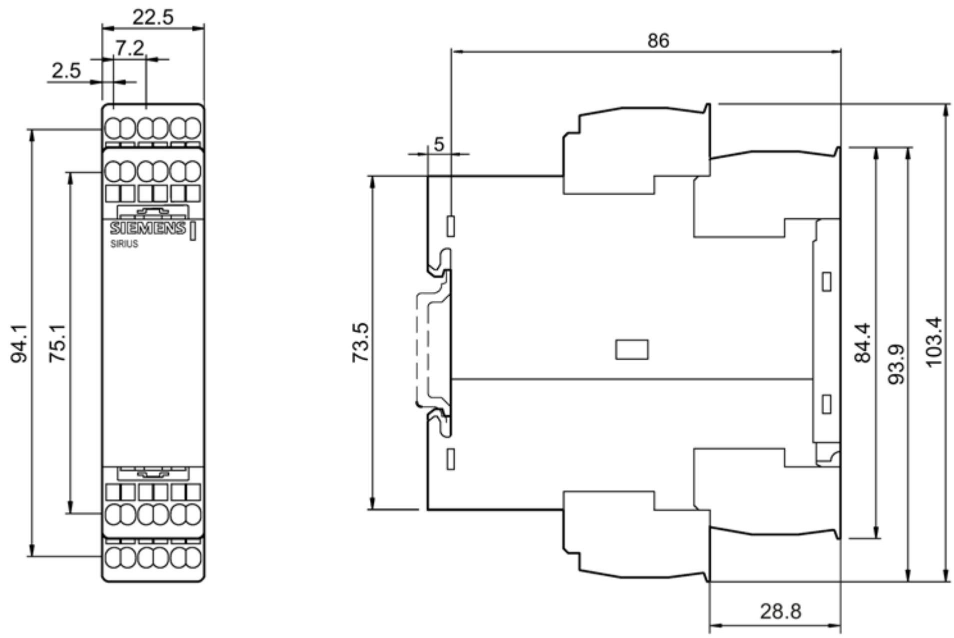
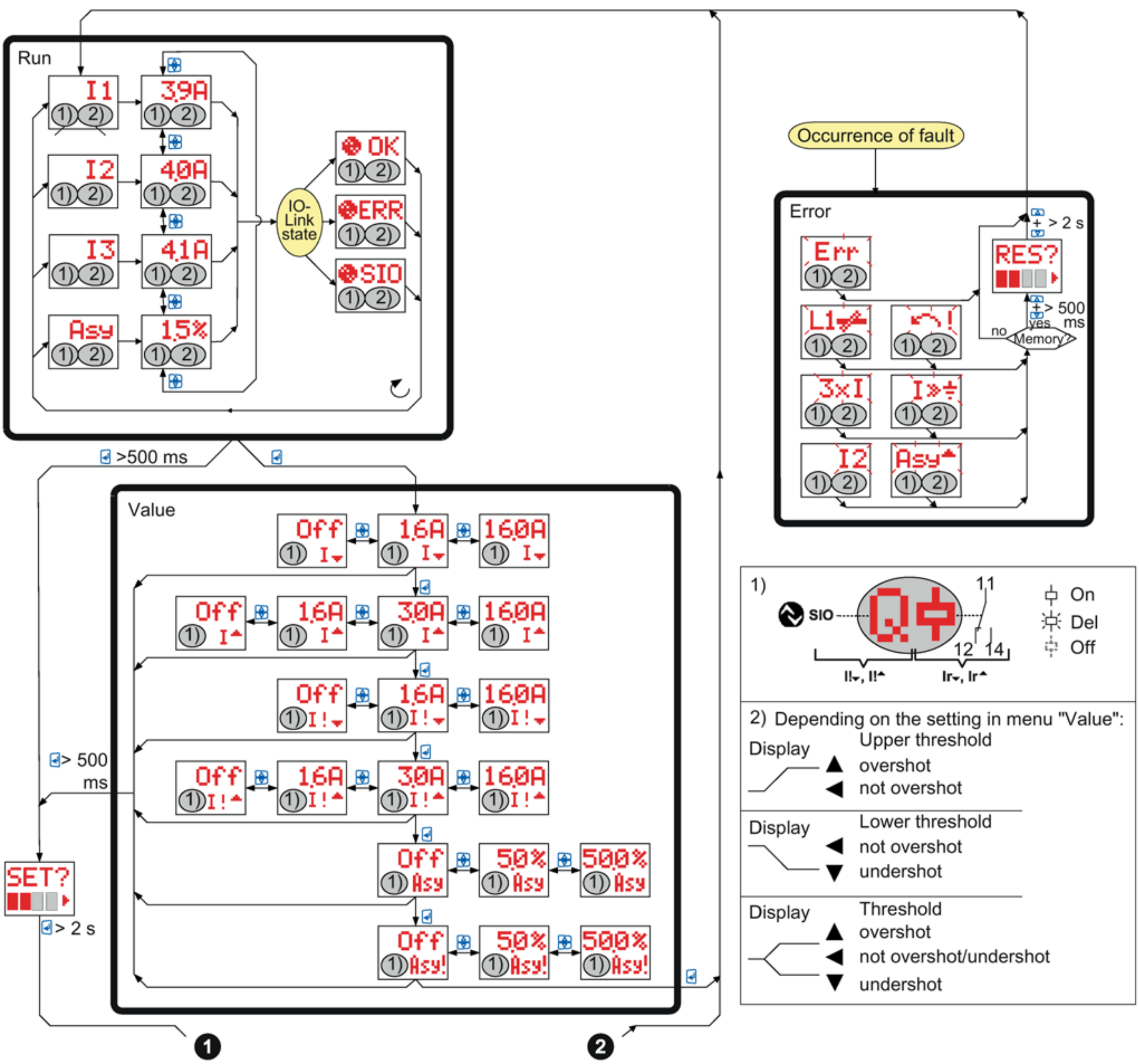


Figure C-4 3UG4. monitoring relays with 4 connecting terminals with spring-loaded connections

Menu-based operation

D

3RR2441



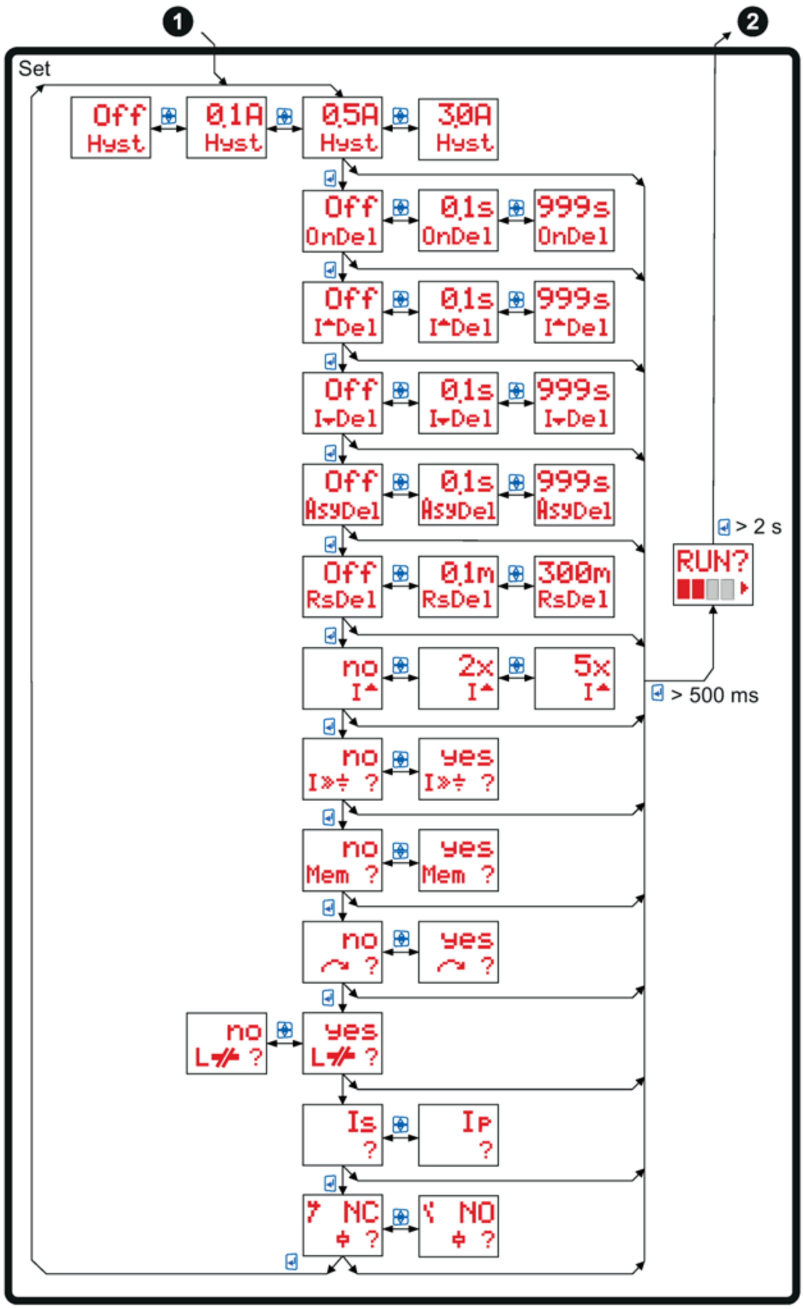
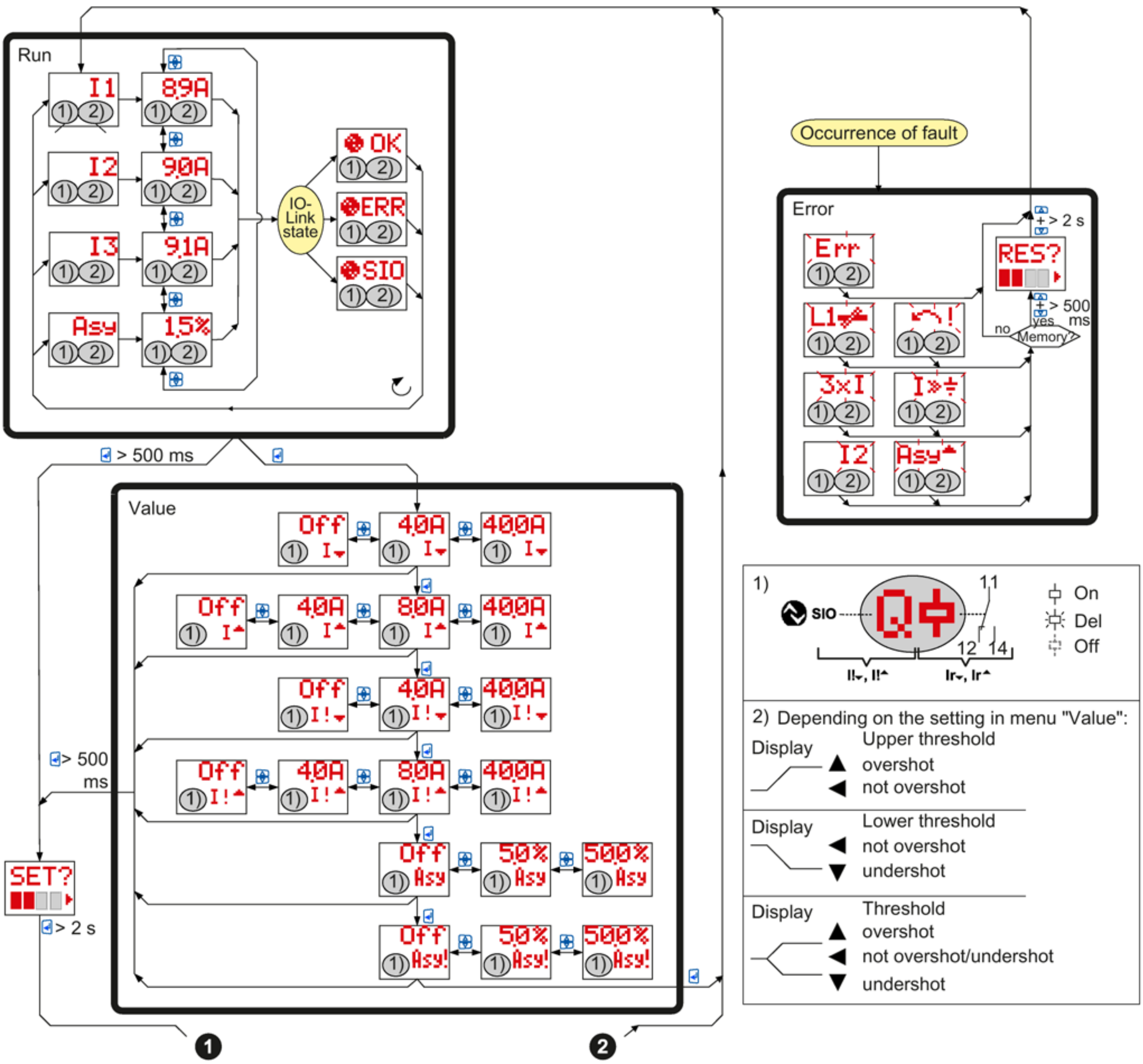


Figure D-1 Menu-based operation 3RR2441

3RR2442


Run
I1
89A
I2
90A
I3
91A
Asy
15%
IO-Link state
OK
ERR
SIO
> 500 ms
Value
Off
40A
400A
80A
50%
500%
> 500 ms
SET?
> 2 s
Occurrence of fault
Error
Err
RES?
> 2 s
> 500 ms
yes
no
Memory?
3xI
I2
Asy
1) SIO
11
12
14
On
Del
Off
2) Depending on the setting in menu "Value":
Display
Upper threshold
overshot
not overshot
Display
Lower threshold
not overshot
undershot
Display
Threshold
overshot
not overshot/undershot
undershot
1
2

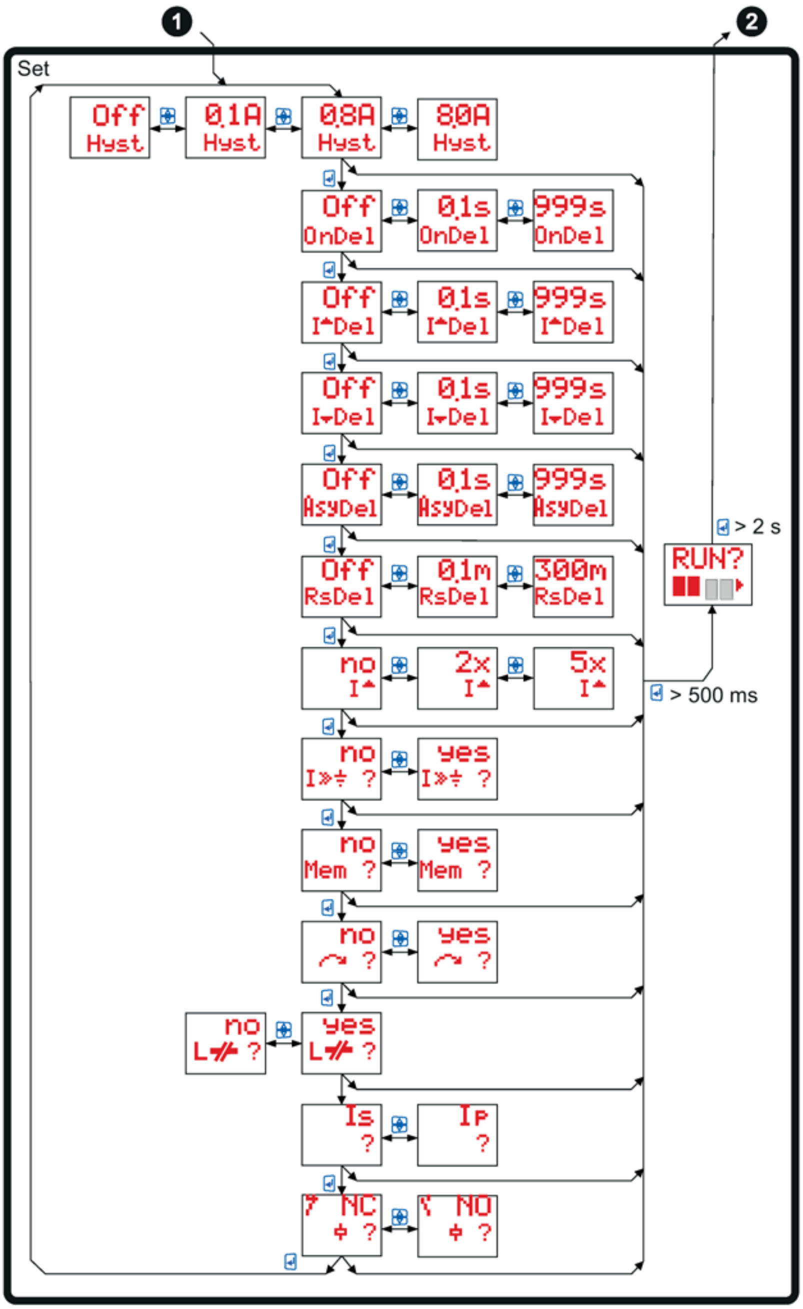
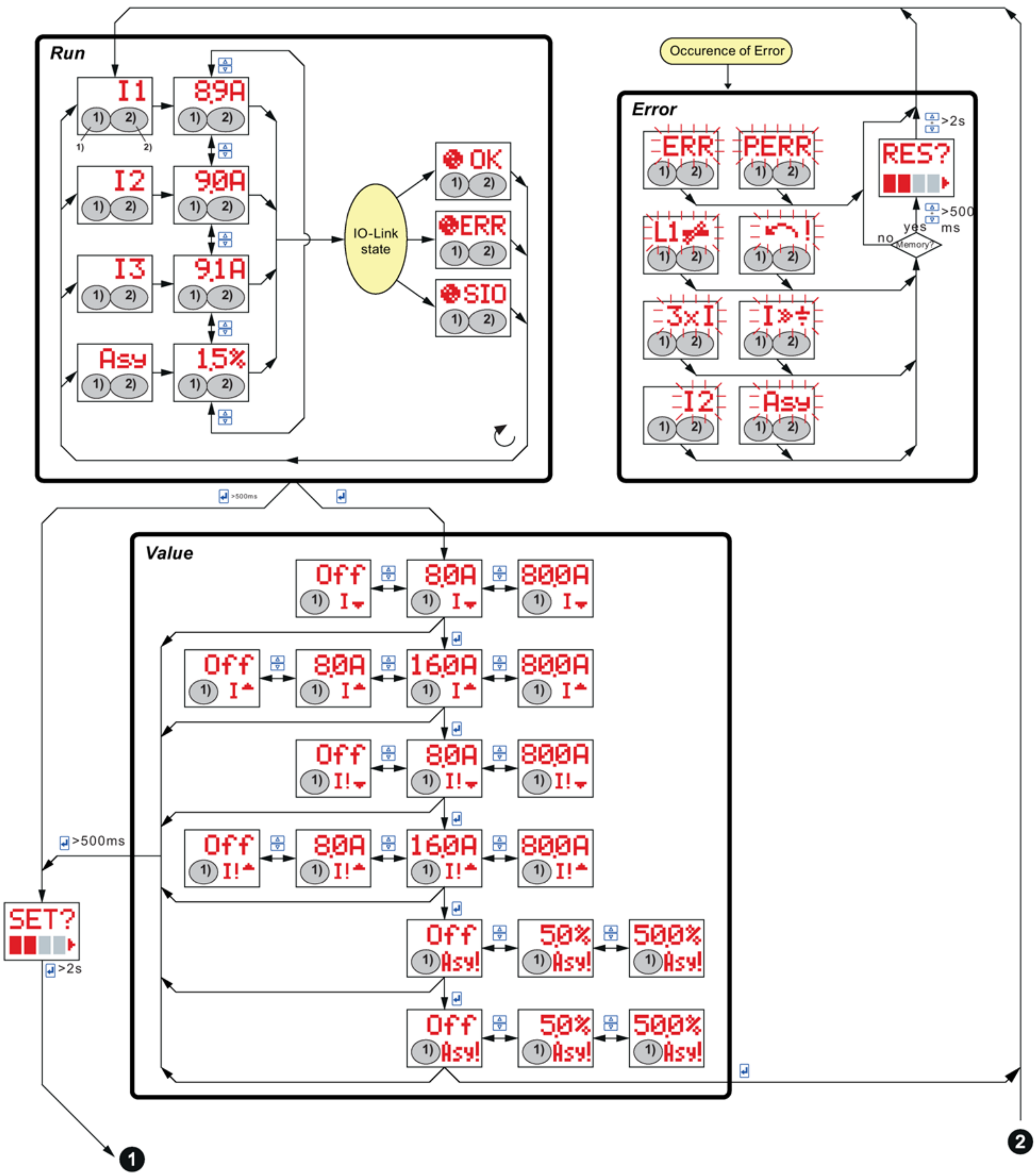


Figure D-2 Menu-based operation 3RR2442

3RR2443


Run
I1
89A
I2
90A
I3
91A
Asy
15%
IO-Link state
OK
ERR
SIO
Occurence of Error
Error
ERR
PERR
RES?
>2s
>500 ms
yes
no
Memory?
3xI
I2
Asy
>500ms
Value
Off
80A
800A
160A
50%
500%
SET?
>500ms
>2s
1
2

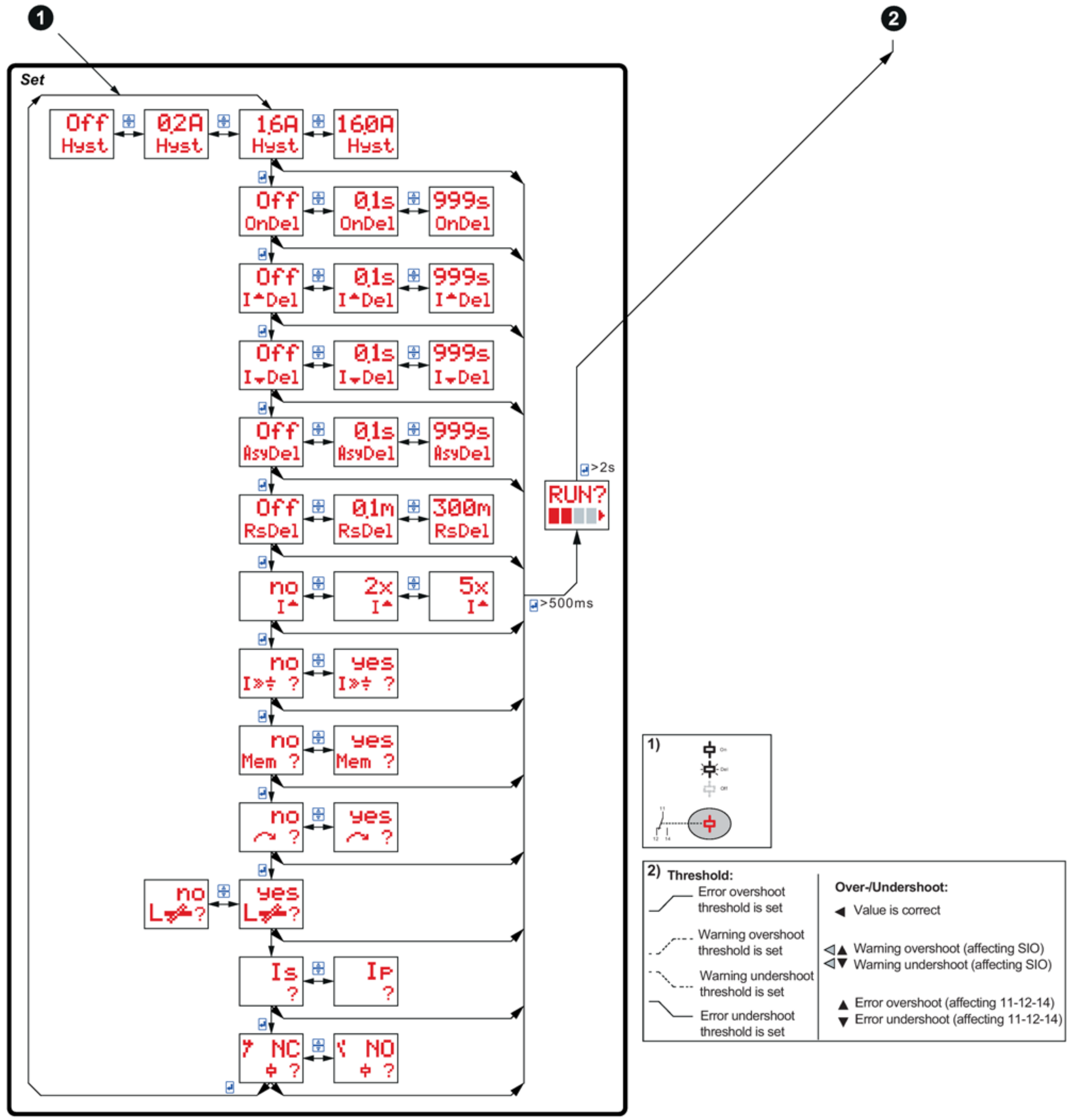


Figure D-3 Menu-based operation 3RR2443

3UG4815

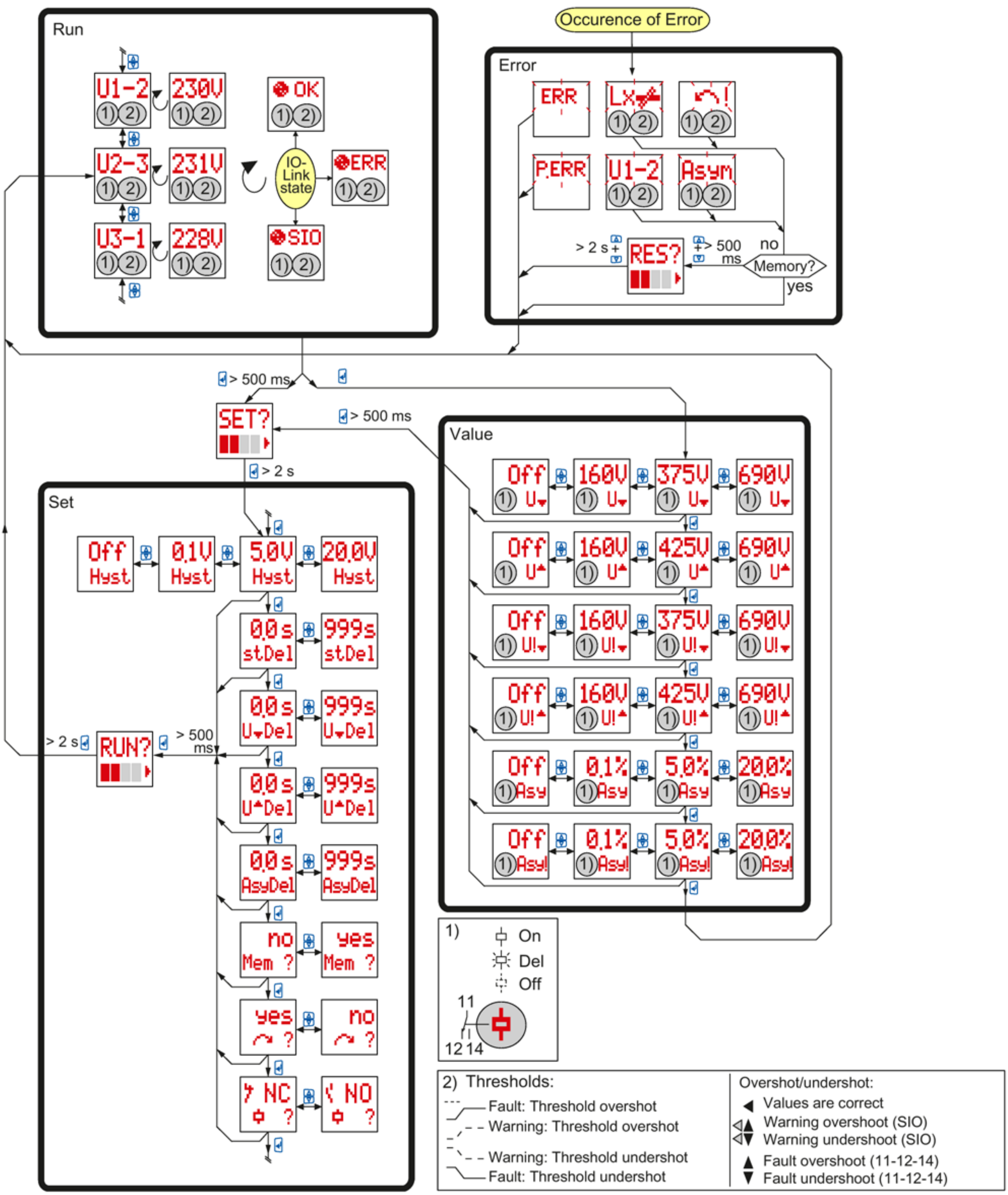


Figure D-4 Menu-based operation 3UG4815

3UG4816

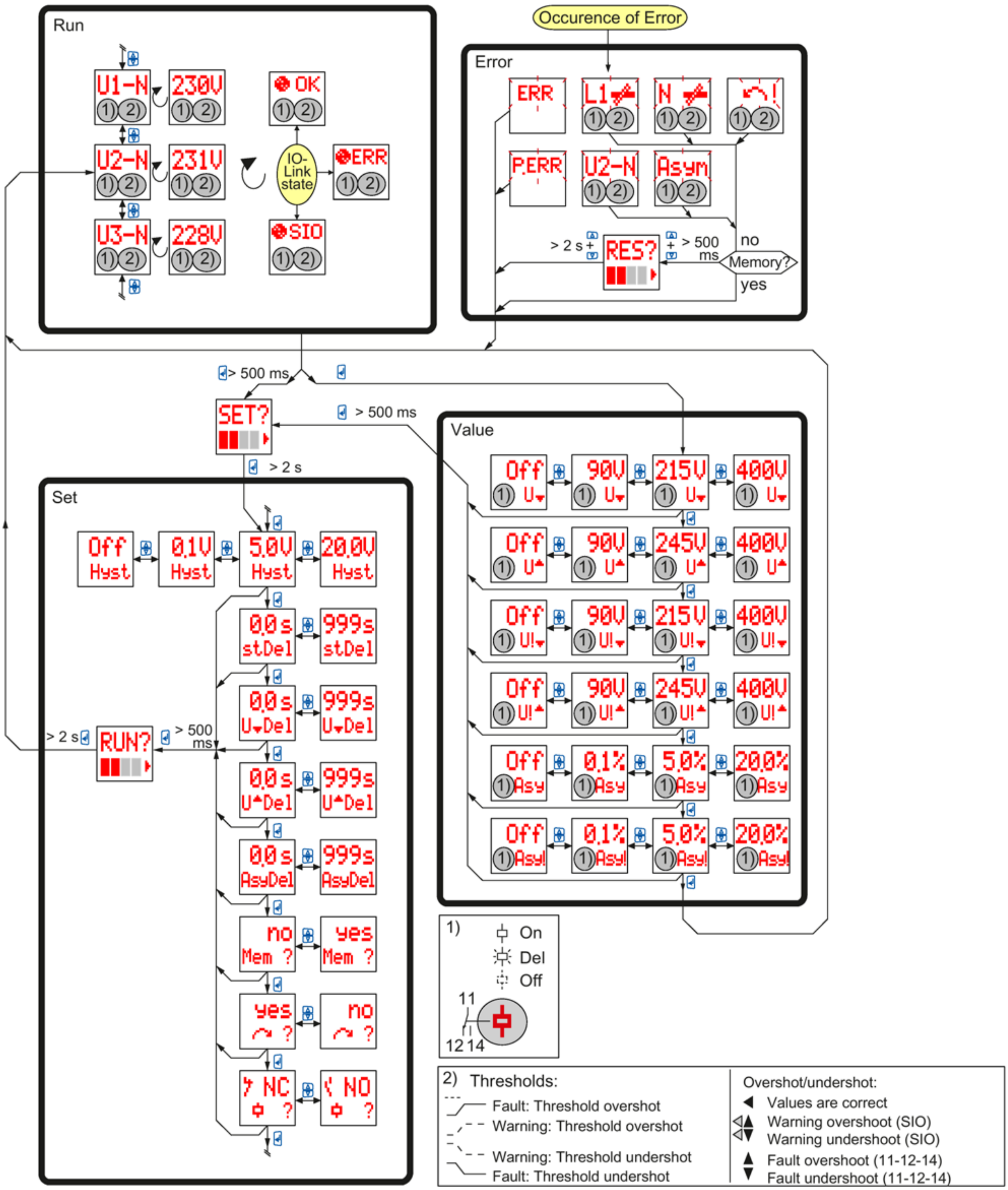


Figure D-5 Menu-based operation 3UG4816

3UG4822

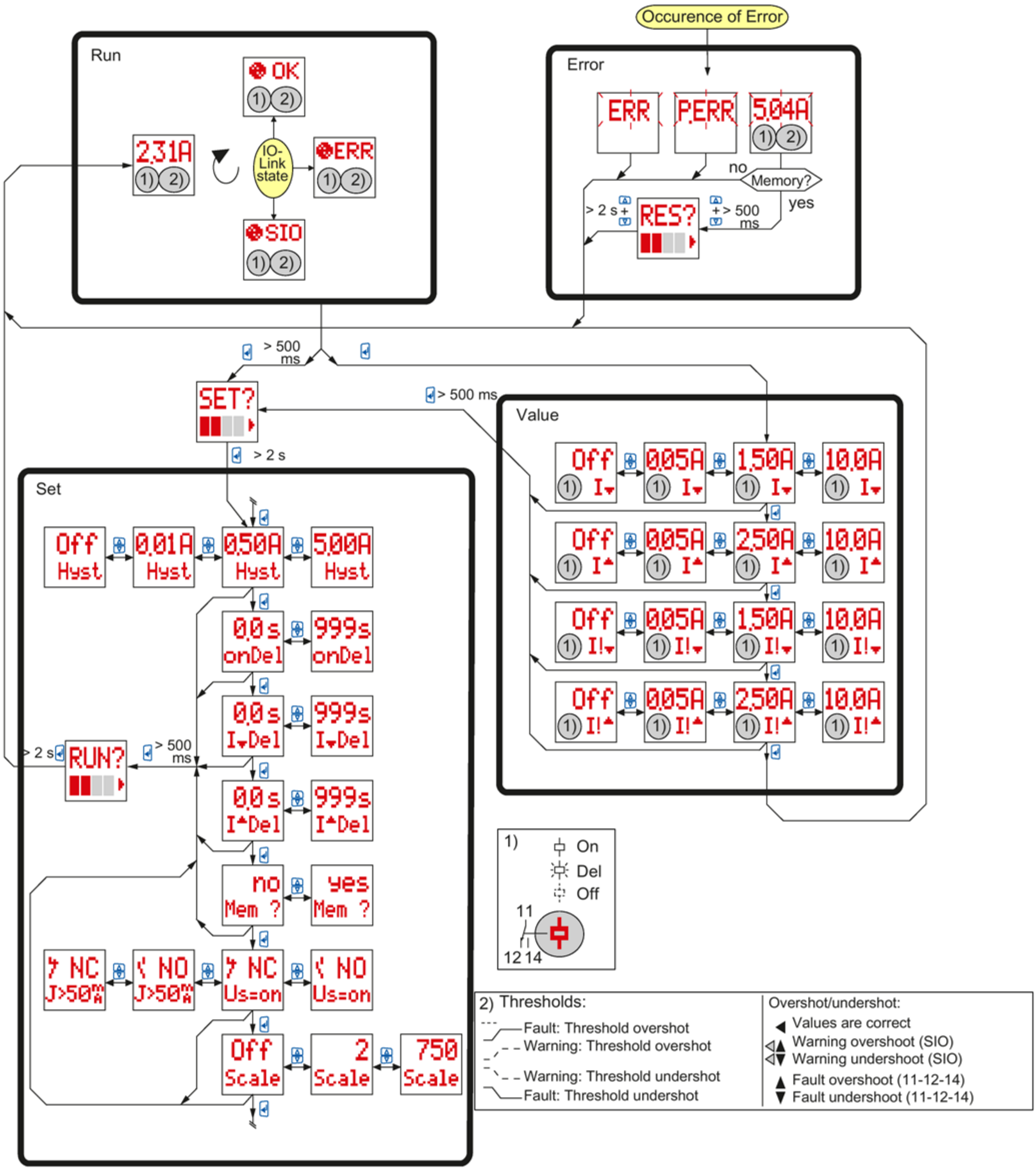


Figure D-6 Menu-based operation 3UG4822

3UG4825

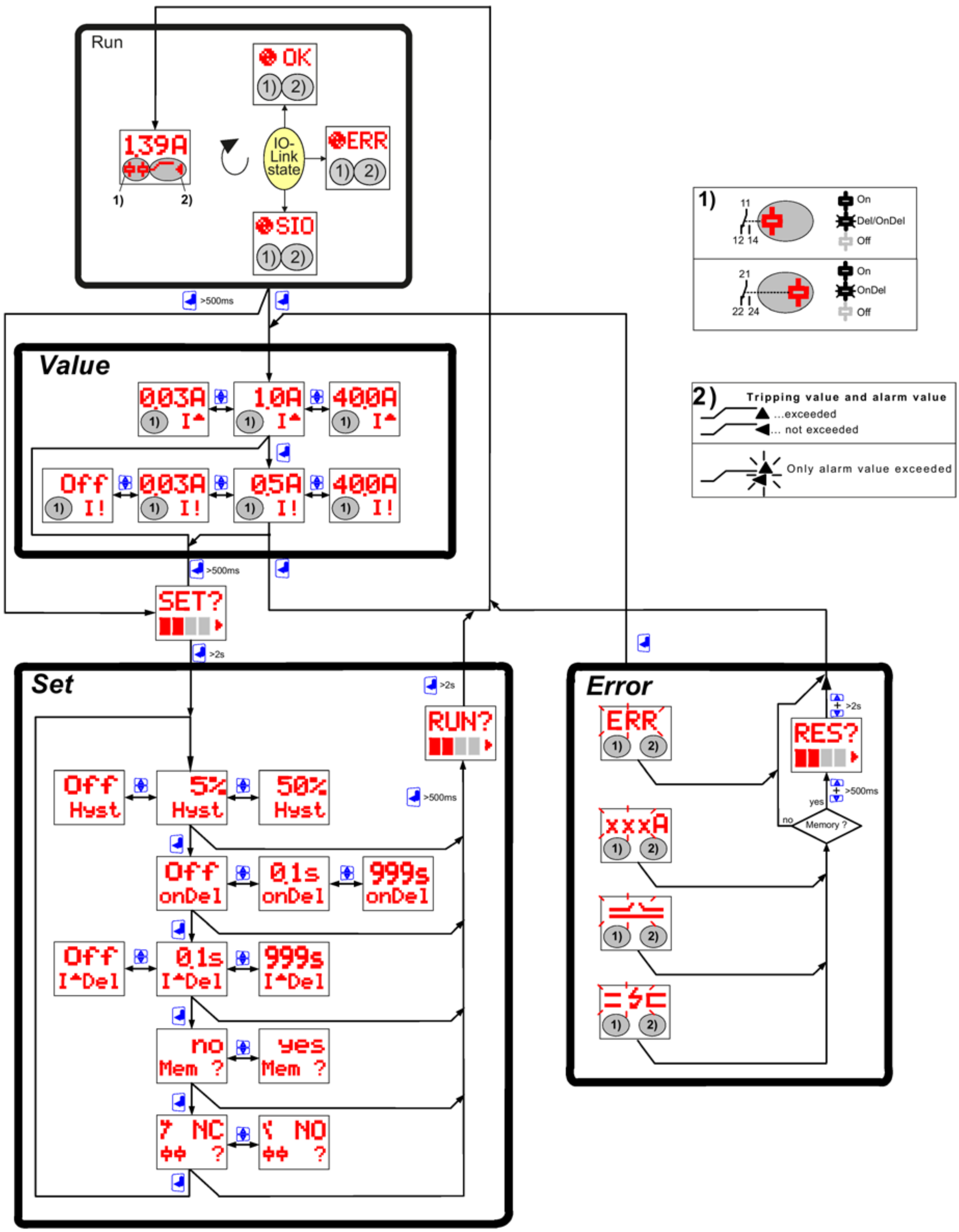


Figure D-7 Menu-based operation 3UG4825

3UG4832

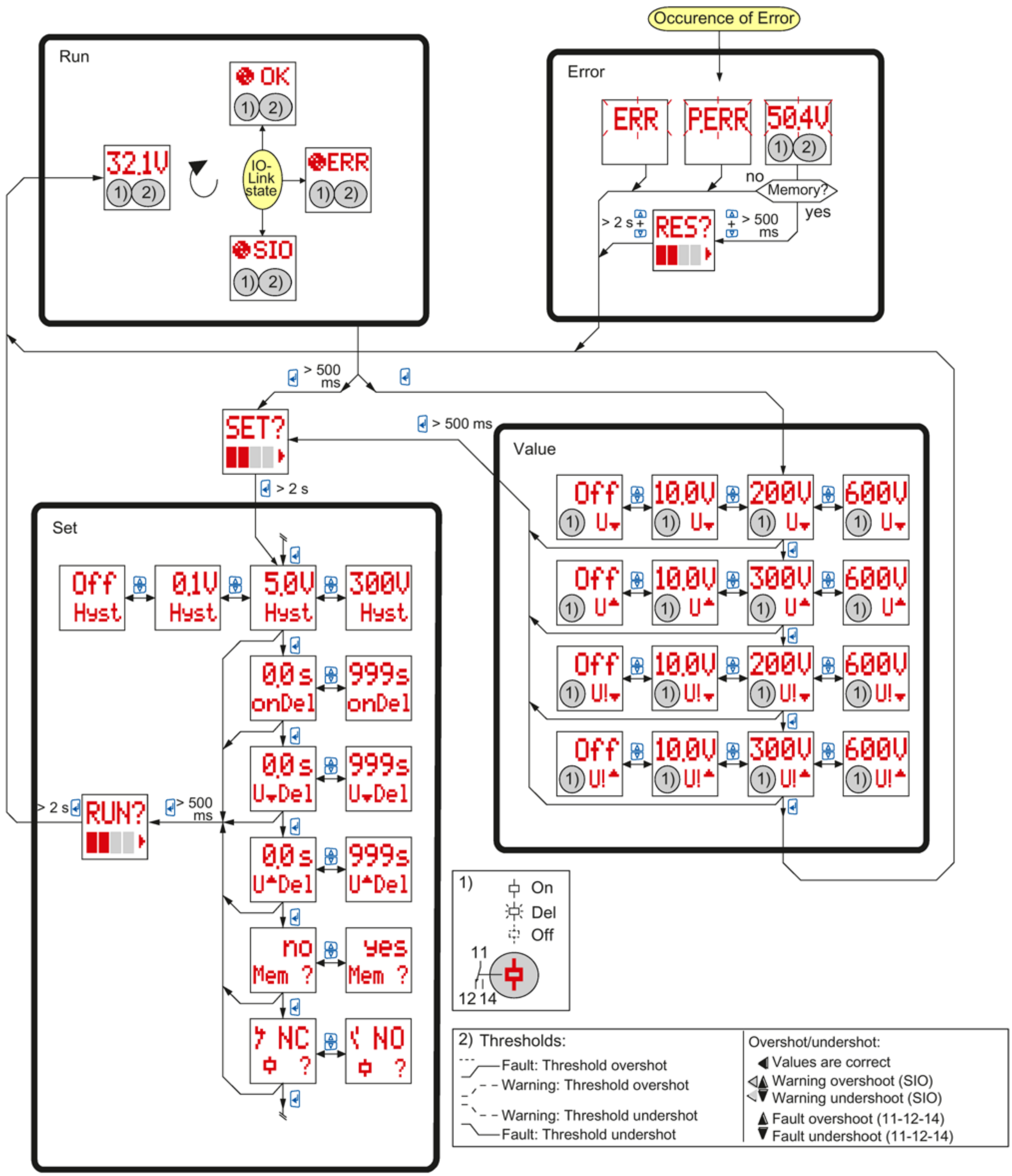


Figure D-8 Menu-based operation 3UG4832

3UG4841

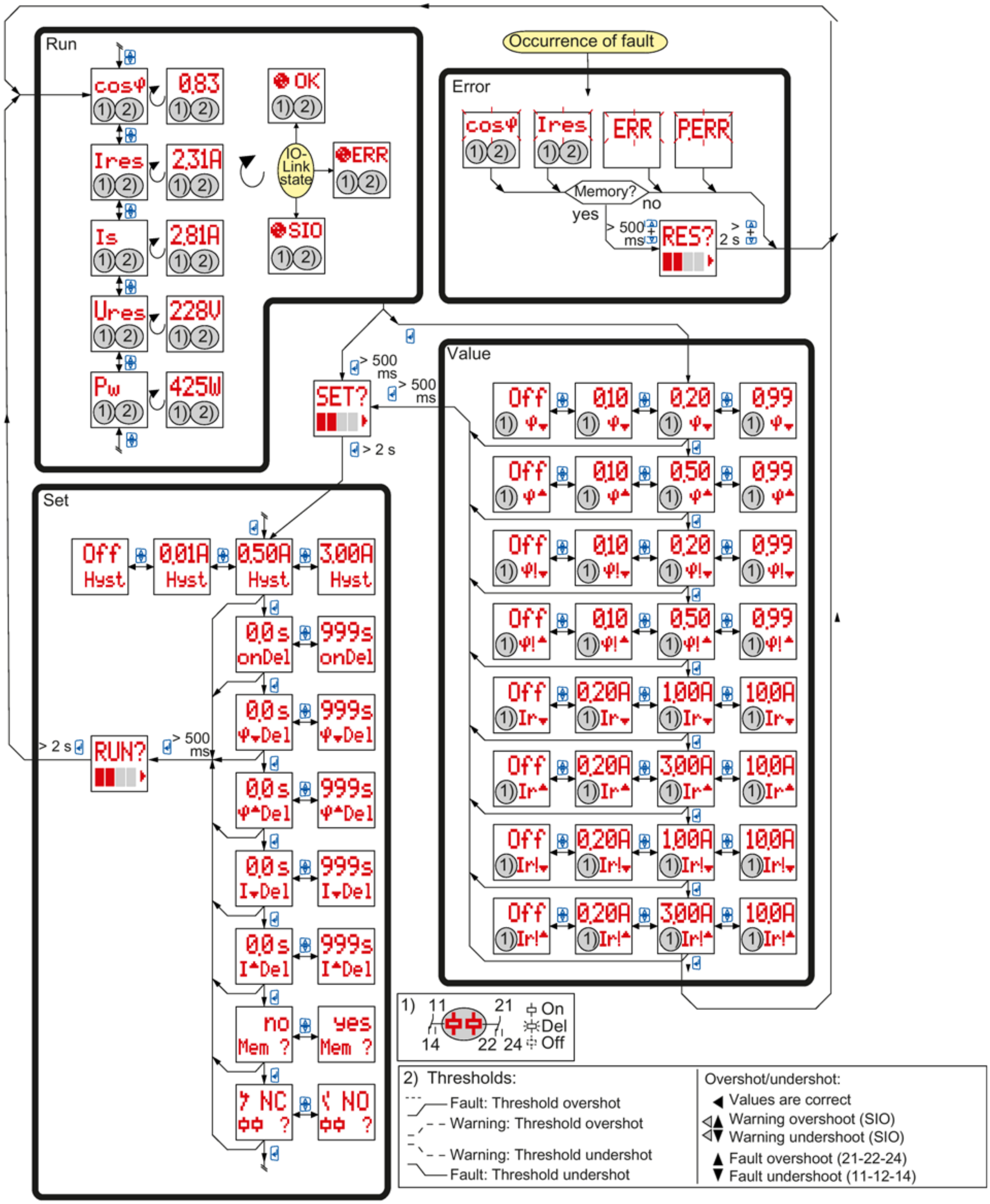


Figure D-9 Menu-based operation 3UG4841

3UG4851

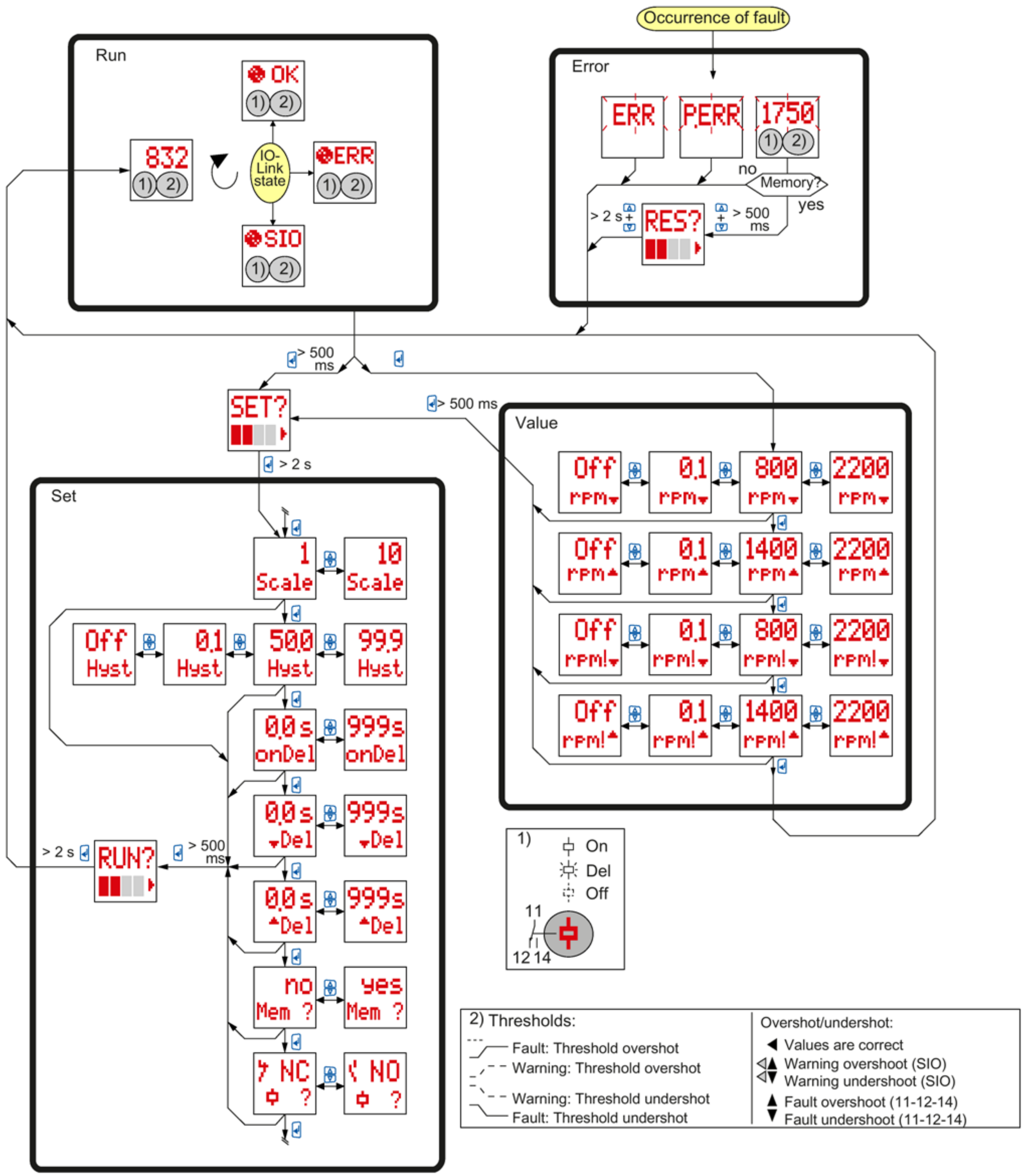


Figure D-10 Menu-based operation 3UG4851

Process data and data sets

E

E.1 Structure of the data sets

Table E- 1 Device-independent data sets

Data set		Name	Access	Value	Length (bytes)
Address (dec)	**Subindex supported**				
0x00 (0)	Yes	**Parameter Page 0**	r	—	16
0x10 (16)	No	Vendor Name	r	Siemens AG	11
0x11 (17)	No	Vendor Text	r	Internet (http://support.automation.siemens.com/WW/view/en/37432258/133200)	64 max.
0x12 (18)	No	Product Name	r	*Device name*[1)](e.g. SIRIUS Line Monitoring Relay for IO-Link)	64 max.
0x13 (19)	No	Product ID	r	*Article number*[1)] (e.g. 3UG4815-1AA40)	14
0x15 (21)	No	Serial Number	r	Place/Date Serial Number	16
0x16 (22)	No	Hardware Revision	r	*Hardware version* [1)]	7
0x17 (23)	No	Firmware Revision	r	*Firmware version* [1)]	7
0x18 (24)	No	Application Specific Name	r/w	—	64 max.

[1)] Value varies for each monitoring relay.

r: readable

w: writeable

E.2 IO-Link communication parameters

Table E- 2 Parameter Page 0 - IO-Link communication parameters

Address	Name	Access	Description
0x00	Master Command	r / w	—
0x01	Master Cycle Time	r / w	—
0x02	Min. Cycle Time	r	0x49
0x03	M-Sequence Capability	r	0x11
0x04	IO-Link Revision ID	r	0x11
0x05	Process data IN	r	0xC3
0x06	Process data OUT	r	0x10
0x07	Vendor ID 1	r	0x00
0x08	Vendor ID 2	r	0x2A
0x09	Device ID 1	r	Device-specific
0x0A	Device ID 2	r	Device-specific
0x0B	Device ID 3	r	Device-specific
0x0C	Function ID 1	r	0x00
0x0D	Function ID 2	—	0x00
0x0E	Reserved	—	—
0x0F	Reserved	—	—

E.3 Analog value coding

Analog value coding

The table below shows the coding for the value as unit and resolution of the analog measured values to be transferred, as well as the assignment to the relevant monitoring relays.

Table E- 3 Analog value coding

Cod-ing	Meaning	Unit	Reso-lution	3RR24	3UG48						
					15	16	22	25	32	41	51
13	Revolutions per minute RPM	1 / min	1								✓
14	Residual current Ir	A	0.1					✓			
15	Residual current Ir	mA	0.1					✓			
16	Apparent current I / I1	A	0.01	✓			✓			✓	
17	Apparent current I2	A	0.01	✓							
18	Apparent current I3	A	0.01	✓							
19	Apparent current I1-I2-I3 min	A	0.01	✓							

Cod-ing	Meaning	Unit	Reso-lution	3RR24	3UG48						
					15	16	22	25	32	41	51
20	Apparent current I1-I2-I3 max	A	0.01	✓							
21	Apparent current I1-I2-I3 avg.	A	0.01	✓							
28	Active currentIres / I1	A	0.01	✓						✓	
29	Active current I2	A	0.01	✓							
30	Active current I3	A	0.01	✓							
31	Active current I1-I2-I3 min	A	0.01	✓							
32	Active current I1-I2-I3 max	A	0.01	✓							
33	Active current I1-I2-I3 avg.	A	0.01	✓							
40	Active power	W	0.1							✓	
43	Power factor / Cos phi		0.01	✓						✓	
44	VoltageU	V	0.1	✓					✓	✓	
45	VoltageL1-L2 / L1-N	V	0.1		✓	✓					
46	VoltageL2-L3 / L2-N	V	0.1		✓	✓					
47	VoltageL3-L1 / L3-N	V	0.1		✓	✓					
48	VoltageLx-Ly max / Lx-N max	V	0.1		✓	✓					
49	VoltageLx-Ly min / Lx-N min	V	0.1		✓	✓					
51	Current asymmetry (according to IEC/NEMA definition)	%	0.1	✓							
52	Current asymmetry (as defined by Siemens)	%	0.1	✓							
54	Voltage asymmetry (as defined by Siemens)	%	0.1		✓	✓					

Note

Entering the relevant value in the "Analog value coding" parameter defines which measured value will be cyclicly transmitted via IO-Link in the process input image (PII). Because this change is also possible during operation, the valid coding for analog value is also transmitted.

E.4 3RR24 current monitoring relays

Process image of the outputs (PIQ)

The process output image contains the control commands for the 3RR24 current monitoring relays.

Table E- 4 PIQ - control commands

DO (2 bytes)	PIQ
DO0.0	1: Start ON-delay time
DO0.1	---
DO0.2	---
DO0.3	1: Reset
DO0.4	---
DO0.5	---
DO0.6	---
DO0.7	---
DO1.0 - DO1.7	---

Process image of the inputs (PII)

The process input image contains the most important status information of the 3RR24 current monitoring relays.

Table E- 5 PII - status information

DI (4 bytes)	PII
DI0.0	Ready
DI0.1	---
DI0.2	1: Group error
DI0.3	1: General warning
DI0.4	Status output relay K1[1)]
DI0.5	---
DI0.6	---
DI0.7	---
DI1.0	Analog value coding bit 0
DI1.1	Analog value coding bit 1
DI1.2	Analog value coding bit 2
DI1.3	Analog value coding bit 3
DI1.4	Analog value coding bit 4

DI (4 bytes)	PII
DI1.5	Analog value coding bit 5
DI1.6	---
DI1.7	---
DI2.0 - DI3.7	Analog value[2)]

[1)] 0: Contact .1 / .2 closed 1: Contact .1 / .4 closed

[2)] The analog value is a 16-bit integer value. Together with the analog value coding (DI1.0 - DI1.5), which defines the unit and resolution of the analog value, this results in the complete measured value. You can find the analog value codings accepted by the monitoring relay in the chapter "Analog value coding (Page 280)".

Identification data

Identification data refers to data stored in a module that supports users in the following areas:

- When checking the system configuration
- When locating modified system hardware
- When troubleshooting a system.

Modules can be uniquely identified using the identification data.

Table E- 6 Identification data of the 3RR24 current monitoring relays

DPP [1] **Index (dec)**	**Data set** **Index (dec)**	**Access**	**Parameter**	**Length (bytes)**	**Default setting**
0x07 (7)	—	r	Vendor ID	2	0x00
0x08 (8)	—	r			0x2A
0x09 (9)	—	r	Device ID	3	0x09
0x0A (10)	—	r			0x08
0x0B (11)	—	r			0x71 (for S00) 0x81 (for S0) 0x91 (for S2)
—	0x10 (16)	r	Vendor Name	11	SIEMENS AG
—	0x11 (17)	r	Vendor Text	64 max.	Internet (http://support.automation.siemens.com/WW/view/en/37432258/133200)
—	0x12 (18)	r	Product Name	64 max.	S00: SIRIUS 3RR2441 3ph Current Monitoring Relay for IO-Link S0: SIRIUS 3RR2442 3ph Current Monitoring Relay for IO-Link S2: SIRIUS 3RR2443 3ph Current Monitoring Relay for IO-Link
—	0x13 (19)	r	Product ID	14	3RR2441-1AA40 3RR2441-2AA40 3RR2442-1AA40 3RR2442-2AA40 3RR2443-1AA40 3RR2443-3AA40
—	0x15 (21)	r	Serial Number	16	Place/Date Serial Number [2]
—	0x16 (22)	r	Hardware Revision	7	*Hardware version* [2]
—	0x17 (23)	r	Firmware Revision	7	*Firmware version* [2]
—	0x18 (24)	r / w	Application Specific Name	32 max.	—

1) Direct Parameter Page

2) Value varies for each monitoring relay.

Data set (index) 2 - system commands

Table E- 7 Data set (index) 2 - system commands

Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x02 (2)	w	System Command[1]	1	—

[1] Permissible manufacturer-specific system commands:
0x80 for device reset
0x82 for factory reset
0xA0 for switching cycle counter reset
0xA1 for runtime meter reset

Data set (index) 92 - diagnostics

Note

Bits that are not described in the tables below are reserved and should be ignored.

Table E- 8 Data set (index) 92 - diagnostics

Byte.Bit	Subindex	Description
Operating system functions 3RR24		
0.0 ... 15.7	1 ... 3	*Reserved*
16.0	4	Ready
16.1	5	Group error
16.2	6	Group warning
16.3	7	*Reserved*
16.4	8	*Reserved*
16.5	9	Parameter assignment active
16.6	10	Invalid parameter
16.7	11	Self-test error/internal error
18.0 ... 19.7	12	Parameter error number
20.0 ... 25.7	13	*Reserved*
Current monitoring		
26.0	14	ON-delay time running
26.1	15	Tripping delay time running (threshold for overshoot)
26.2	16	Tripping delay time running (threshold for undershoot)
26.3	17	Tripping delay time running (threshold for current asymmetry)
26.4	18	Reclosing delay time is running
27.0	19	Threshold for overshoot exceeded
27.1	20	Threshold for undershoot violated
27.2	21	Threshold for current asymmetry exceeded

Byte.Bit	Subindex	Description
27.3	22	Warning threshold for overshoot exceeded
27.4	23	Warning threshold for undershoot violated
27.5	24	Warning threshold for current asymmetry exceeded
27.6	25	*Reserved*
27.7	26	*Reserved*
28.0	27	*Reserved*
28.1	28	Phase failure L1
28.2	29	Phase failure L2
28.3	30	Phase failure L3
28.4	31	Overcurrent n x I_{max} L1
28.5	32	Overcurrent n x I_{max} L2
28.6	33	Overcurrent n x I_{max} L3
29.0	34	Threshold for fault current exceeded
29.1	35	Phase sequence L1-L2-L3
29.2	36	Phase sequence L3-L2-L1
29.3	38	Phase sequence error

Data set (index) 94 (measured values)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Table E- 9 Data set (index) 94 (measured values)

Byte.Bit	Subindex	Description
Current monitoring		
0.0 … 15.7	1 ... 3	*Reserved*
16.0 … 17.7	4	Active current L1
18.0 … 19.7	5	Active current L2
20.0 … 21.7	6	Active current L3
22.0 … 23.7	7	Active current min.
24.0 … 25.7	8	Active current max.
26.0 … 27.7	9	Active current avg.
28.0 … 29.7	10	Apparent current L1
30.0 … 31.7	11	Apparent current L2
32.0 … 33.7	12	Apparent current L3
34.0 … 35.7	13	Apparent current min.
36.0 … 37.7	14	Apparent current max.
38.0 … 39.7	15	Apparent current avg.
40.0 … 41.7	16	Active voltage
42.0 … 43.7	17	cos phi value
44.0 … 45.7	18	Asymmetry Siemens
46.0 … 47.7	19	Asymmetry IEC/NEMA
48.0 … 51.7	20	Switching cycle counter
52.0 … 55.7	21	Runtime meter

Note

Switching cycle counter and runtime meter

The two counter values are available only in data set 94 and cannot be transmitted cyclically in the process image.

Note

If a measured value is outside the measuring range, all measured values dependent on it will be set to 7FFF (invalid value).

Data set (index) 131 (parameters)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Table E- 10 Data set (index) 131 (parameters)

Byte.Bit	Subindex	Description
Operating system functions		
0.0 ... 15.7	1 ... 3	*Reserved*
16.0	4	Group diagnostics Default: [1] [0] disabled [1] enabled
16.1	5	Group error diagnostics Default: [1] [0] disabled [1] enabled
16.2	6	*Reserved*
16.3	7	*Reserved*
16.4	8	Local threshold change Default: [1] [0] disabled [1] enabled
16.5	9	Local parameter change Default: [1] [0] disabled [1] enabled
16.6	10	Local reset Default: [1] [0] disabled [1] enabled
16.7	11	Retentive error memory Default: [0] [0] disabled [1] enabled
17.0 ... 17.7	12	Analog value coding Type: BYTE Default: 20 Min: 0 (disabled) Max: 255
18.0 ... 23.7	13	*Reserved*

Byte.Bit	Subindex	Description
Current monitoring		
24.0 ... 24.1	14	Reset response Default: [1] [0] manual [1] automatic
24.2 ... 24.4	15	*Reserved*
25.0 ... 25.1	16	ON-delay time (at Power ON) Default: [1] [0] disabled [1] enabled
25.2 ... 25.3	17	ON-delay time (at manual reset) Default: [1] [0] disabled [1] enabled
25.4 ... 25.5	18	ON-delay time (at restart) Default: [1] [0] disabled [1] enabled
26.0 ... 26.1	19	Phase failure monitoring Default: [1] [0] disabled [1] enabled
26.2 ... 26.3	20	Phase sequence monitoring Default: [0] [0] disabled [1] enabled
26.4 ... 26.5	21	Load current monitoring (apparent current I_S/active current I_P) Default: [0] [0] I_S - apparent current [1] I_p - active current
26.6 ... 26.7	22	Fault current monitoring Default: [0] [0] disabled [1] enabled
27.0 ... 27.1	23	Asymmetry algorithm Default: [0] [0] Siemens [1] IEC/NEMA
28.0 ... 29.7	24	ON-delay time Type: INT16 Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
30.0 ... 31.7	25	Tripping delay time (in the case of current overshoot) Type: INT16 Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s

<table>
<tr><th>Byte.Bit</th><th>Subindex</th><th colspan="3">Description</th></tr>
<tr><td>32.0 ...
33.7</td><td>26</td><td colspan="3">Tripping delay time (in the case of current undershoot)
Type: INT16
Resolution: 0.1 s = 1
Default: 0
Min: 1 or 0 (disabled)
Max: 9999 * 0.1 s = 999.9 s</td></tr>
<tr><td>34.0 ...
35.7</td><td>27</td><td colspan="3">Tripping delay time (in the case of current asymmetry)
Type: INT16
Resolution: 0.1 s = 1
Default: 0
Min: 1 or 0 (disabled)
Max: 9999 * 0.1 s = 999.9 s</td></tr>
<tr><td>36.0 ...
37.7</td><td>28</td><td colspan="3">Reclosing delay time
Type: INT16
Resolution: 0.1 min = 1
Default: 0
Min: 1 or 0 (disabled)
Max: 3000 * 0.1 min = 300 min.</td></tr>
<tr><td></td><td></td><td>3RR2441 (S00)</td><td>3RR2442 (S0)</td><td>3RR2443 (S2)</td></tr>
<tr><td>38.0 ...
39.7</td><td>29</td><td>Threshold for overshoot
Type: INT16
Resolution: 0.1 A = 1
Default: 3
Min: 1.6 or 0 (disabled)
Max: 160 * 0.1 A = 16 A</td><td>Threshold for overshoot
Type: INT16
Resolution: 0.1 A = 1
Default: 8
Min: 4.0 or 0 (disabled)
Max: 400 * 0.1 A = 40 A</td><td>Threshold for overshoot
Type: INT16
Resolution: 0.1 A = 1
Default: 16
Min: 8.0 or 0 (disabled)
Max: 800 * 0.1 A = 80 A</td></tr>
<tr><td></td><td></td><td>3RR2441 (S00)</td><td>3RR2442 (S0)</td><td>3RR2443 (S2)</td></tr>
<tr><td>40.0 ...
41.7</td><td>30</td><td>Threshold for undershoot
Type: INT16
Resolution: 0.1 A = 1
Default: 1,6
Min: 1.6 or 0 (disabled)
160 * 0.1 A = 16 A</td><td>Threshold for undershoot
Type: INT16
Resolution: 0.1 A = 1
Default: 4,0
Min: 4.0 or 0 (disabled)
400 * 0.1 A = 40 A</td><td>Threshold for undershoot
Type: INT16
Resolution: 0.1 A = 1
Default: 8
Min: 8.0 or 0 (disabled)
Max: 800 * 0.1 A = 80 A</td></tr>
</table>

Byte.Bit	Subindex	Description		
42.0 ... 43.7	31	Threshold for current asymmetry Type: INT16 Resolution: 0,1 % = 1 Default: 0 Min: 50 Max: 500		
		3RR2441 (S00)	**3RR2442 (S0)**	**3RR2443 (S2)**
44.0 ... 45.7	32	Warning threshold for over-shoot Type: INT16 Resolution: 0.1 A = 1 Default: 3 Min: 1.6 or 0 (disabled) Max: 160 * 0.1 A = 16 A	Warning threshold for over-shoot Type: INT16 Resolution: 0.1 A = 1 Default: 8 Min: 4.0 or 0 (disabled) Max: 400 * 0.1 A = 40 A	Warning threshold for over-shoot Type: INT16 Resolution: 0.1 A = 1 Default: 16 Min: 8.0 or 0 (disabled) Max: 800 * 0.1 A = 80 A
		3RR2441 (S00)	**3RR2442 (S0)**	**3RR2443 (S2)**
46.0 ... 47.7	33	Warning threshold for under-shoot Type: INT16 Resolution: 0.1 A = 1 Default: 1,6 Min: 1.6 or 0 (disabled) 160 * 0.1 A = 16 A	Warning threshold for under-shoot Type: INT16 Resolution: 0.1 A = 1 Default: 4,0 Min: 4.0 or 0 (disabled) 400 * 0.1 A = 40 A	Warning threshold for under-shoot Type: INT16 Resolution: 0.1 A = 1 Default: 8 Min: 8.0 or 0 (disabled) Max: 800 * 0.1 A = 80 A
48.0 ... 49.7	34	Warning threshold for current asymmetry Type: INT16 Resolution: 0,1 % = 1 Default: 0 Min: 50 Max: 500		
50.0 ... 51.7	35	*Reserved*		
52.0 ... 53.7	36	*Reserved*		
54.0 ... 55.7	37	*Reserved*		
		3RR2441 (S00)	**3RR2442 (S0)**	**3RR2443 (S2)**
56.0 ... 57.7	38	Hysteresis (current) Type: INT16 Resolution: 0.1 A = 1 Default: 0,5 Min: 0.1 or 0 (disabled) Max: 30 * 0.1 A = 3 A	Hysteresis (current) Type: INT16 Resolution: 0.1 A = 1 Default: 0,8 Min: 0.1 or 0 (disabled) Max: 80 * 0.1 A = 8 A	Hysteresis (current) Type: INT16 Resolution: 0.1 A Default: 1,6 Min: 0.1 or 0 (disabled) Max: 160 * 0.1 A = 16 A
58.0 ... 59.7	39	Blocking current monitoring [1)] Type: INT16 Default: [0] Min: 2 or 0 (disabled) Max: 5		

Byte.Bit	Subindex	Description
60.0 ... 60.7	40	*Reserved*
61.0 ... 61.1	41	Relay switching response Default: [0] [0] Closed-circuit principle NC [1] Open-circuit principle NO
61.2 ... 61.3	42	*Reserved*
61.4 ... 61.5	43	*Reserved*

1) You can disable or enable blocking current monitoring. After enabling it, enter a factor between 2 and 5. It defines when blocking current monitoring trips.

Note

The hysteresis value of the threshold and the warning threshold for current asymmetry is fixed at 40% of the set threshold or warning threshold.

E.5 3UG4815 line monitoring relay

Process image of the outputs (PIQ)

The process output image contains the control commands for the 3UG4815 line monitoring relays.

Table E- 11 PIQ - control commands

DO (2 bytes)	PIQ
DO0.0	1: Start stabilization delay
DO0.1	---
DO0.2	---
DO0.3	1: Reset
DO0.4	---
DO0.5	---
DO0.6	---
DO0.7	---
DO1.0 - DO1.7	---

Process image of the inputs (PII)

The process input image contains the most important status information of the 3UG4815 line monitoring relays.

Table E- 12 PII - status information

DI (4 bytes)	PII
DI0.0	Ready
DI0.1	---
DI0.2	1: Group error
DI0.3	1: General warning
DI0.4	Status output relay K1[1)]
DI0.5	---
DI0.6	---
DI0.7	---
DI1.0 - DI1.5	Analog value coding bits 0 to 5
DI1.6	---
DI1.7	---
DI2.0 - DI3.7	Analog value[2)]

[1)] 0: Contact .1 / .2 closed 1: Contact .1 / .4 closed

[2)] The analog value is a 16-bit integer value. Together with the analog value coding (DI1.0 - DI1.5), which defines the unit and resolution of the analog value, this results in the complete measured value. You can find the analog value codings accepted by the monitoring relay in the chapter "Analog value coding (Page 280)".

Identification data

Identification data refers to data stored in a module that supports users in the following areas:

- When checking the system configuration
- When locating modified system hardware
- When troubleshooting a system.

Modules can be uniquely identified using the identification data.

Identification data

DPP [1)] Index (dec)	Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x07 (7)	—	r	Vendor ID	2	0x00
0x08 (8)	—	r			0x2A
0x09 (9)	—	r	Device ID	3	0x09
0x0A (10)	—	r			0x08
0x0B (11)	—	r			0x01
—	0x10 (16)	r	Vendor Name	11	SIEMENS AG
—	0x11 (17)	r	Vendor Text	64 max.	Internet (http://support.automation.siemens.com/WW/view/en/37432258/133200)
—	0x12 (18)	r	Product Name	64 max.	SIRIUS Line Monitoring Relay for IO-Link
—	0x13 (19)	r	Product ID	14	3UG4815-1AA40 3UG4815-2AA40
—	0x16 (22)	r	Hardware Revision	7	*Hardware version* [2)]
—	0x17 (23)	r	Firmware Revision	7	*Firmware version* [2)]
—	0x18 (24)	r / w	Application Specific Name	32 max.	—

1) Direct Parameter Page

2) Value varies for each monitoring relay.

E.5.1 System commands - data set (index) 2

Data set (index) 2 - system commands

Table E- 13 Data set (index) 2 - system commands

Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x02 (2)	w	System Command[1]	1	—

[1] Permissible vendor-specific system commands:
0x80 for Device Reset
0x82 for Factory Reset

Data set (index) 92 - diagnostics

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 14 Data set (index) 92 - diagnostics

Byte.Bit	Description
Operating system functions 3UG4	
0.0 ... 15.7	*Reserved*
16.0	Ready
16.1	Group error
16.2	Group warning
16.3	*Reserved*
16.4	*Reserved*
16.5	Parameter assignment active
16.6	Invalid parameter
16.7	Self-test error/internal error
18.0 ... 19.7	Parameter error number

Byte.Bit	Description
Line monitoring	
26.0	Stabilization delay running
26.1	Tripping delay time running (threshold for overshoot)
26.2	Tripping delay time running (threshold for undershoot)
26.3	Tripping delay time running (threshold for voltage asymmetry)
27.0	Threshold for overshoot exceeded
27.1	Threshold for undershoot violated
27.2	Threshold for voltage asymmetry exceeded
27.3	Warning threshold for overshoot exceeded
27.4	Warning threshold for undershoot violated
27.5	Warning threshold for voltage asymmetry exceeded
27.6	*Reserved*
27.7	*Reserved*
28.0	*Reserved*
28.1	Phase failure L1
28.2	Phase failure L2
28.3	Phase failure L3
28.4	*Reserved*
28.5	Phase sequence L1-L2-L3
28.6	Phase sequence L3-L2-L1
28.7	Phase sequence error

Note

On phase failure, no further device-specific diagnostics are reported. The bits in diagnostic data set 92 (except for phase failure) are set to 0.
The measured values in data set 94 are set to 7FFF (invalid value).

Data set (index) 94 (measured values)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 15 Data set (index) 94 (measured values)

Byte.Bit	Description
Line monitoring	
0.0 ... 15.7	*Reserved*
16.0 … 17.7	Voltage U L1-L2 Min: 160 V Max: 690 V
18.0 … 19.7	Voltage U L2-L3 Min: 160 V Max: 690 V
20.0 ... 21.7	Voltage U L3-L1 Min: 160 V Max: 690 V
22.0 ... 23.7	Voltage U Lx-Ly min Min: 160 V Max: 690 V
24.0 ... 25.7	Voltage U Lx-Ly max Min: 160 V Max: 690 V
26.0 … 27.7	*Reserved*
28.0 … 29.7	*Reserved*
30.0 … 31.7	*Reserved*
32.0 … 33.7	*Reserved*
34.0 … 35.7	*Reserved*
36.0 … 37.7	Asymmetry Min: 0 % Max: 20 %

Note

If a measured value is outside the measuring range or a phase failure is detected, all measured values will be set to 7FFF (invalid value).

Data set (index) 131 (parameters)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 16 Data set (index) 131 (parameters)

Byte.Bit	Description
Operating system functions	
0.0 ... 15.7	*Reserved*
16.0	Group diagnostics Default: [1] [0] disabled [1] enabled
16.1	Group error diagnostics Default: [1] [0] disabled [1] enabled
16.2	*Reserved*
16.3	*Reserved*
16.4	Local threshold change Default: [1] [0] disabled [1] enabled
16.5	Local parameter change Default: [1] [0] disabled [1] enabled
16.6	Local reset Default: [1] [0] disabled [1] enabled
16.7	Retentive error memory Default: [0] [0] disabled [1] enabled
17.0 ... 17.7	Analog value coding Type: BYTE Default: 48 Min: 0 (disabled) Max: 255

Byte.Bit	Description
Line monitoring	
24.0 ... 24.1	Reset response Default: [1] [0] manual [1] automatic
24.2 ... 24.4	*Reserved*
25.0 ... 25.1	Stabilization delay (at Power ON) Default: [1] [0] disabled [1] enabled
25.2 ... 25.3	Stabilization delay (at manual reset) Default: [1] [0] disabled [1] enabled
25.4 ... 25.5	*Reserved*
26.0 ... 26.1	*Reserved*
26.2 ... 26.3	Phase sequence monitoring Default: [1] [0] disabled [1] enabled
28.0 ... 29.7	Stabilization delay Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
30.0 ... 31.7	Tripping delay time (in the case of voltage overshoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
32.0 ... 33.7	Tripping delay time (in the case of voltage undershoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
34.0 ... 35.7	Tripping delay time (in the case of asymmetry) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
36.0 ... 37.7	Threshold for overshoot Type: INT Resolution: 0.1 V = 1 Default: 4250 Min: 1600 or 0 (disabled) Max: 6900 * 0.1 V = 690 V

Byte.Bit	Description
38.0 … 39.7	Threshold for undershoot Type: INT Resolution: 0.1 V = 1 Default: 3750 Min: 1600 or 0 (disabled) Max: 6900 * 0.1 V = 690 V
40.0 … 41.7	Threshold for voltage asymmetry Type: INT Resolution: 0,1 % = 1 Default: 50 Min: 1 or 0 (disabled) Max: 200 * 0,1 % = 20 %
42.0 … 43.7	Warning threshold for overshoot Type: INT Resolution: 0.1 V = 1 Default: 4250 Min: 1600 or 0 (disabled) Max: 6900 * 0.1 V = 690 V
44.0 … 45.7	Warning threshold for undershoot Type: INT Resolution: 0.1 V = 1 Default: 3750 Min: 1600 or 0 (disabled) Max: 6900 * 0.1 V = 690 V
46.0 … 47.7	Warning threshold for voltage asymmetry Type: INT Resolution: 0,1 % = 1 Default: 50 Min: 1 or 0 (disabled) Max: 200 * 0,1 % = 20 %
48.0 … 49.7	*Reserved*
50.0 … 51.7	*Reserved*
52.0 … 53.7	*Reserved*
54.0 … 55.7	Hysteresis Type: INT Resolution: 0.1 V = 1 Default: 50 Min: 1 or 0 (disabled) Max: 200 * 0.1 V = 20 V
56.0 … 57.7	Hysteresis (asymmetry) Type: INT Resolution: 0,1 % = 1 Default: 20 Min: 1 or 0 (disabled) Max: 50 * 0,1 % = 5 %

Byte.Bit	Description
58.0 … 58.1	Relay switching response Default: [0] [0] Closed-circuit principle (NC) [1] Open-circuit principle (NO)
58.2 … 58.3	*Reserved*
58.4 … 58.5	*Reserved*

E.6 3UG4816 line monitoring relay

Process image of the outputs (PIQ)

The process output image contains the control commands for the 3UG4816 line monitoring relays.

Table E- 17 PIQ - control commands

DO (2 bytes)	PIQ
DO0.0	1: Start stabilization delay
DO0.1	---
DO0.2	---
DO0.3	1: Reset
DO0.4	---
DO0.5	---
DO0.6	---
DO0.7	---
DO1.0 - DO1.7	---

Process image of the inputs (PII)

The process input image contains the most important status information of the 3UG4816 line monitoring relays.

Table E- 18 PII - status information

DI (4 bytes)	PII
DI0.0	Ready
DI0.1	---
DI0.2	1: Group error
DI0.3	1: General warning
DI0.4	Status output relay K1[1)]
DI0.5	---
DI0.6	---
DI0.7	---
DI1.0 - DI1.5	Analog value coding bits 0 to 5
DI1.6	---
DI1.7	---
DI2.0 - DI3.7	Analog value[2)]

[1)] 0: Contact .1 / .2 closed 1: Contact .1 / .4 closed

[2)] The analog value is a 16-bit integer value. Together with the analog value coding (DI1.0 - DI1.5), which defines the unit and resolution of the analog value, this results in the complete measured value. You can find the analog value codings accepted by the monitoring relay in the chapter "Analog value coding (Page 280)".

Identification data

Identification data refers to data stored in a module that supports users in the following areas:

- When checking the system configuration
- When locating modified system hardware
- When troubleshooting a system.

Modules can be uniquely identified using the identification data.

Identification data

DPP [1] Index (dec)	Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x07 (7)	—	r	Vendor ID	2	0x00
0x08 (8)	—	r			0x2A
0x09 (9)	—	r	Device ID	3	0x09
0x0A (10)	—	r			0x08
0x0B (11)	—	r			0x11
—	0x10 (16)	r	Vendor Name	11	SIEMENS AG
—	0x11 (17)	r	Vendor Text	64 max.	Internet (http://support.automation.siemens.com/WW/view/en/37432258/133200)
—	0x12 (18)	r	Product Name	64 max.	SIRIUS Line Monitoring Relay for IO-Link
—	0x13 (19)	r	Product ID	14	3UG4816-1AA40 3UG4816-2AA40
—	0x16 (22)	r	Hardware Revision	7	*Hardware version* [2]
—	0x17 (23)	r	Firmware Revision	7	*Firmware version* [2]
—	0x18 (24)	r / w	Application Specific Name	32 max.	—

[1] Direct Parameter Page

[2] Value varies for each monitoring relay.

E.6.1 System commands - data set (index) 2

Data set (index) 2 - system commands

Table E- 19 Data set (index) 2 - system commands

Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x02 (2)	w	System Command[1)]	1	—

[1)] Permissible vendor-specific system commands:
0x80 for Device Reset
0x82 for Factory Reset

Data set (index) 92 - diagnostics

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 20 Data set (index) 92 - diagnostics

Byte.Bit	Description
Operating system functions 3UG4	
0.0 ... 15.7	*Reserved*
16.0	Ready
16.1	Group error
16.2	Group warning
16.3	*Reserved*
16.4	*Reserved*
16.5	Parameter assignment active
16.6	Invalid parameter
16.7	Self-test error/internal error
18.0 ... 19.7	Parameter error number

Byte.Bit	Description
Line monitoring	
26.0	Stabilization delay running
26.1	Tripping delay time running (threshold for overshoot)
26.2	Tripping delay time running (threshold for undershoot)
26.3	Tripping delay time running (threshold for voltage asymmetry)
27.0	Threshold for overshoot exceeded
27.1	Threshold for undershoot violated
27.2	Threshold for voltage asymmetry exceeded
27.3	Warning threshold for overshoot exceeded
27.4	Warning threshold for undershoot violated
27.5	Warning threshold for voltage asymmetry exceeded
27.6	*Reserved*
27.7	*Reserved*
28.0	*Reserved*
28.1	Phase failure L1
28.2	Phase failure L2
28.3	Phase failure L3
28.4	Phase failure N conductor
28.5	Phase sequence L1-L2-L3
28.6	Phase sequence L3-L2-L1
28.7	Phase sequence error
29.0 ... 29.7	Reserved

Data set (index) 94 (measured values)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 21 Data set (index) 94 (measured values)

Byte.Bit	Description
Line monitoring	
0.0 ... 15.7	*Reserved*
16.0 … 17.7	*Reserved*
18.0 … 19.7	*Reserved*
20.0 ... 21.7	*Reserved*
22.0 ... 23.7	*Reserved*
24.0 ... 25.7	*Reserved*
26.0 … 27.7	Voltage U L1-N Min: 90 V Max: 400 V
28.0 … 29.7	Voltage U L2-N Min: 90 V Max: 400 V
30.0 … 31.7	Voltage U L3-N Min: 90 V Max: 400 V
32.0 … 33.7	Voltage U Lx-N min Min: 90 V Max: 400 V
34.0 … 35.7	Voltage U Lx-N max Min: 90 V Max: 400 V
36.0 … 37.7	Asymmetry Min: 0 % Max: 20 %

Note

If a measured value is outside the measuring range or a phase failure or neutral failure is detected, all measured values will be set to 7FFF (invalid value).

Data set (index) 131 (parameters)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 22 Data set (index) 131 (parameters)

Byte.Bit	Designation
Operating system functions	
0.0 ... 15.7	*Reserved*
16.0	Group diagnostics Default: [1] [0] disabled [1] enabled
16.1	Group error diagnostics Default: [1] [0] disabled [1] enabled
16.2	*Reserved*
16.3	*Reserved*
16.4	Local threshold change Default: [1] [0] disabled [1] enabled
16.5	Local parameter change Default: [1] [0] disabled [1] enabled
16.6	Local reset Default: [1] [0] disabled [1] enabled
16.7	Retentive error memory Default: [0] [0] disabled [1] enabled
17.0 ... 17.7	Analog value coding Type: BYTE Default: 48 Min: 0 (disabled) Max: 255

Byte.Bit	Designation
Line monitoring	
24.0 ... 24.1	Reset response Default: [1] [0] manual [1] automatic
24.2 ... 24.4	*Reserved*
25.0 ... 25.1	Stabilization delay (at Power ON) Default: [1] [0] disabled [1] enabled
25.2 ... 25.3	Stabilization delay (at manual reset) Default: [1] [0] disabled [1] enabled
25.4 ... 25.5	*Reserved*
26.0 ... 26.1	*Reserved*
26.2 ... 26.3	Phase sequence monitoring Default: [1] [0] disabled [1] enabled
28.0 ... 29.7	Stabilization delay Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
30.0 ... 31.7	Tripping delay time (in the case of voltage overshoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
32.0 ... 33.7	Tripping delay time (in the case of voltage undershoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
34.0 ... 35.7	Tripping delay time (in the case of asymmetry) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
36.0 ... 37.7	Threshold for overshoot Type: INT Resolution: 0.1 V = 1 Default: 2450 Min: 900 or 0 (disabled) Max: 4000 * 0.1 V = 400 V

Byte.Bit	Designation
38.0 … 39.7	Threshold for undershoot Type: INT Resolution: 0.1 V = 1 Default: 2150 Min: 900 or 0 (disabled) Max: 4000 * 0.1 V = 400 V
40.0 … 41.7	Threshold for voltage asymmetry Type: INT Resolution: 0,1 % = 1 Default: 50 Min: 1 or 0 (disabled) Max: 200 * 0,1 % = 20 %
42.0 … 43.7	Warning threshold for overshoot Type: INT Resolution: 0.1 V = 1 Default: 2450 Min: 900 or 0 (disabled) Max: 4000 * 0.1 V = 400 V
44.0 … 45.7	Warning threshold for undershoot Type: INT Resolution: 0.1 V = 1 Default: 2150 Min: 900 or 0 (disabled) Max: 4000* 0.1 V = 400 V
46.0 … 47.7	Warning threshold for voltage asymmetry Type: INT Resolution: 0,1 % = 1 Default: 50 Min: 1 or 0 (disabled) Max: 200 * 0,1 % = 20 %
48.0 … 49.7	*Reserved*
50.0 … 51.7	*Reserved*
52.0 … 53.7	*Reserved*
54.0 … 55.7	Hysteresis Type: INT Resolution: 0.1 V = 1 Default: 50 Min: 1 or 0 (disabled) Max: 200 * 0.1 V = 20 V
56.0 … 57.7	Hysteresis (asymmetry) Type: INT Resolution: 0,1 % = 1 Default: 20 Min: 1 or 0 (disabled) Max: 50 * 0,1 % = 5 %

Byte.Bit	Designation
58.0 … 58.1	Relay switching response Default: [0] [0] Closed-circuit principle (NC) [1] Open-circuit principle (NO)
58.2 … 58.7	*Reserved*
59.0 ... 59.7	Reserved

E.7 3UG4822 current monitoring relays

Process image of the outputs (PIQ)

The process output image contains the control commands for the 3UG4822 current monitoring relays.

Table E- 23 PIQ - control commands

DO (2 bytes)	PIQ
DO0.0	1: Start ON-delay time
DO0.1	---
DO0.2	---
DO0.3	1: Reset
DO0.4	---
DO0.5	---
DO0.6	---
DO0.7	---
DO1.0 - DO1.7	---

Process image of the inputs (PII)

The process input image contains the most important status information of the 3UG4822 current monitoring relays.

Table E- 24 PII - status information

DI (4 bytes)	PII
DI0.0	Ready
DI0.1	---
DI0.2	1: Group error
DI0.3	1: General warning
DI0.4	Status output relay K1[1)]
DI0.5	---
DI0.6	---
DI0.7	---
DI1.0 - DI1.5	Analog value coding bits 0 to 5
DI1.6	---
DI1.7	---
DI2.0 - DI3.7	Analog value[2)]

[1)] 0: Contact .1 / .2 closed 1: Contact .1 / .4 closed

[2)] The analog value is a 16-bit integer value. Together with the analog value coding (DI1.0 - DI1.5), which defines the unit and resolution of the analog value, this results in the complete measured value. You can find the analog value codings accepted by the monitoring relay in the chapter "Analog value coding (Page 280)".

Identification data

Identification data refers to data stored in a module that supports users in the following areas:

- When checking the system configuration
- When locating modified system hardware
- When troubleshooting a system.

Modules can be uniquely identified using the identification data.

Identification data

DPP [1] Index (dec)	Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x07 (7)	—	r	Vendor ID	2	0x00
0x08 (8)	—	r			0x2A
0x09 (9)	—	r	Device ID	3	0x09
0x0A (10)	—	r			0x08
0x0B (11)	—	r			0x31
—	0x10 (16)	r	Vendor Name	11	SIEMENS AG
—	0x11 (17)	r	Vendor Text	64 max.	Internet (http://support.automation.siemens.com/WW/view/en/37432258/133200)
—	0x12 (18)	r	Product Name	64 max.	SIRIUS Current Monitoring Relay for IO-Link
—	0x13 (19)	r	Product ID	14	3UG4822-1AA40 3UG4822-2AA40
—	0x16 (22)	r	Hardware Revision	7	*Hardware version* [2]
—	0x17 (23)	r	Firmware Revision	7	*Firmware version* [2]
—	0x18 (24)	r / w	Application Specific Name	32 max.	—

[1] Direct Parameter Page

[2] Value varies for each monitoring relay.

E.7.1 System commands - data set (index) 2

Data set (index) 2 - system commands

Table E- 25 Data set (index) 2 - system commands

Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x02 (2)	w	System Command[1)]	1	—

[1)] Permissible vendor-specific system commands:
0x80 for Device Reset
0x82 for Factory Reset

Data set (index) 92 - diagnostics

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 26 Data set (index) 92 - diagnostics

Byte.Bit	Description
Operating system functions 3UG4	
0.0 ... 15.7	*Reserved*
16.0	Ready
16.1	Group error
16.2	Group warning
16.3	*Reserved*
16.4	*Reserved*
16.5	Parameter assignment active
16.6	Invalid parameter
16.7	Self-test error/internal error
18.0 ... 19.7	Parameter error number

Byte.Bit	Description
Current monitoring	
26.0	ON-delay time running
26.1	Tripping delay time running (threshold for overshoot)
26.2	Tripping delay time running (threshold for undershoot)
26.3	*Reserved*
27.0	Threshold for overshoot exceeded
27.1	Threshold for undershoot violated
27.2	Warning threshold for overshoot exceeded
27.3	Warning threshold for undershoot violated
27.4	*Reserved*

Data set (index) 94 (measured values)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 27 Data set (index) 94 (measured values)

Byte.Bit	Description
Current monitoring	
0.0 ... 15.7	*Reserved*
16.0 … 17.7	Current I1 (PA)[1), 2)] Min: 0.05 A Max: 10 A (when the transformer transmission factor is deactivated)
18.0 … 19.7	*Reserved*
20.0 ... 21.7	*Reserved*
22.0 ... 23.7	*Reserved*
24.0 ... 25.7	*Reserved*
26.0 ... 27.7	*Reserved*
28.0 ... 31.7	Current I1[1)] Min: 0.05 A Max: 10 A (when the transformer transmission factor is deactivated)
32.0 ... 35.7	*Reserved*
36.0 … 39.7	*Reserved*
40.0 … 43.7	*Reserved*
44.0 … 47.7	*Reserved*
48.0 … 51.7	*Reserved*

1) An overshoot of the measurement range is signaled when the maximum permissible continuous thermal current (I = 15 A) is exceeded.

2) The maximum primary current when a current transformer is used is 750 A.

Note

If a measured value is outside the measurable range, all measured values will be set to 7FFF (invalid value).

Data set (index) 131 (parameters)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 28 Data set (index) 131 (parameters)

Byte.Bit	Designation
Operating system functions	
0.0 ... 15.7	*Reserved*
16.0	Group diagnostics Default: [1] [0] disabled [1] enabled
16.1	Group error diagnostics Default: [1] [0] disabled [1] enabled
16.2	*Reserved*
16.3	*Reserved*
16.4	Local threshold change Default: [1] [0] disabled [1] enabled
16.5	Local parameter change Default: [1] [0] disabled [1] enabled
16.6	Local reset Default: [1] [0] disabled [1] enabled
16.7	Retentive error memory Default: [0] [0] disabled [1] enabled
17.0 ... 17.7	Analog value coding Type: BYTE Default: 16 Min: 0 (disabled) Max: 255

Byte.Bit	Designation
Current monitoring	
24.0 ... 24.1	Reset response Default: [1] [0] manual [1] automatic
24.2 ... 24.4	*Reserved*
25.0 ... 25.1	ON-delay time (at Power ON) Default: [1] [0] disabled [1] enabled
25.2 ... 25.3	ON-delay time (at manual reset) Default: [1] [0] disabled [1] enabled
25.4 ... 25.5	ON-delay time (at restart) Default: [0] [0] disabled [1] enabled
26.0 ... 27.7	ON-delay time Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
28.0 ... 29.7	Tripping delay time (in the case of current overshoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
30.0 ... 31.7	Tripping delay time (in the case of current undershoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
32.0 ... 35.7	Threshold for overshoot[1)] Type: INT Resolution: 0.01 A = 1 Default: 250 Min: 5 or 0 (disabled) Max: 1000 * 0.01 A = 10 A
36.0 ... 39.7	Threshold for undershoot[1)] Type: INT Resolution: 0.01 A = 1 Default: 150 Min: 5 or 0 (disabled) Max: 1000 * 0.01 A = 10 A

Byte.Bit	Designation
40.0 ... 43.7	Warning threshold for overshoot[1)] Type: INT Resolution: 0.01 A = 1 Default: 250 Min: 5 or 0 (disabled) Max: 1000 * 0.01 A = 10 A
44.0 ... 47.7	Warning threshold for undershoot[1)] Type: INT Resolution: 0.01 A = 1 Default: 150 Min: 5 or 0 (disabled) Max: 1000 * 0.01 A = 10 A
48.0 ... 51.7	*Reserved*
52.0 ... 55.7	*Reserved*
56.0 ... 59.7	Hysteresis Type: INT Resolution: 0.01 A = 1 Default: 50 Min: 1 or 0 (disabled) Max: 500 * 0.01 A = 5 A
60.0 ... 61.7	Transformer transmission factor Type: INT Default: [OFF] Min: OFF or 2 Max: 750[2)]
62.0 ... 62.1	Relay switching response Default: [00] [00] Closed-circuit principle NC, I > 50 mA [01] Open-circuit principle NO, I > 50 mA [10] Closed-circuit principle NC, U_s = on [11] Open-circuit principle NO, U_s = on
62.2 ... 62.7	*Reserved*

1) Setting OFF for the transformer transmission factor defines a measurement range of 0.05 A to 10 A.

2) The maximum value refers to a current transformer with a secondary current of 1 A. The measuring range of the primary current is limited to 750 A.

E.8 3UG4825 residual current monitoring relay

Process image of the outputs (PIQ)

The process output image contains the control commands for the 3UG4825 current monitoring relays.

Table E- 29 PIQ - control commands

DO (2 bytes)	PIQ
DO0.0	1: Start ON-delay time
DO0.1	---
DO0.2	---
DO0.3	1: Reset
DO0.4	---
DO0.5	---
DO0.6	---
DO0.7	---
DO1.0 - DO1.7	---

Process image of the inputs (PII)

The process input image contains the most important status information of the 3UG4825 residual current monitoring relays.

Table E- 30 PII - status information

DI (4 bytes)	PII
DI0.0	1: Ready
DI0.1	---
DI0.2	1: Group error
DI0.3	1: General warning
DI0.4	Status output relay K1[1)]
DI0.5	Status output relay K2[1)]
DI0.6	---
DI0.7	---
DI1.0 - DI1.5	Analog value coding bits 0 to 5
DI1.6	---
DI1.7	---
DI2.0 - DI3.7	Analog value[2)]

[1)] 0: Contact .1 / .2 closed 1: Contact .1 / .4 closed

[2)] The analog value is a 16-bit integer value. Together with the analog value coding (DI1.0 - DI1.5), which defines the unit and resolution of the analog value, this results in the complete measured value. You can find the analog value codings accepted by the monitoring relay in the chapter "Analog value coding (Page 280)".

Identification data

Identification data refers to data stored in a module that supports users in the following areas:

- When checking the system configuration
- When locating modified system hardware
- When troubleshooting a system.

Modules can be uniquely identified using the identification data.

Identification data

DPP [1] Index (dec)	Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x07 (7)	—	r	Vendor ID	2	0x00
0x08 (8)	—	r			0x2A
0x09 (9)	—	r	Device ID	3	0x09
0x0A (10)	—	r			0x08
0x0B (11)	—	r			0x41
—	0x10 (16)	r	Vendor Name	11	SIEMENS AG
—	0x11 (17)	r	Vendor Text	64 max.	Internet (http://support.automation.siemens.com/WW/view/en/37432258/133200)
—	0x12 (18)	r	Product Name	64 max.	SIRIUS Residual Current Monitoring Relay 3 UG4825 for IO-Link
—	0x13 (19)	r	Product ID	14	3UG4825-*CA40
—	0x15 (21)	r	Serial Number	16	Place/Date Number
—	0x16 (22)	r	Hardware Revision	7	*Hardware version* [2]
—	0x17 (23)	r	Firmware Revision	7	*Firmware version* [2]
—	0x18 (24)	r / w	Application Specific Name	32 max.	—

[1] Direct Parameter Page

[2] Value varies for each monitoring relay.

E.8.1 System commands - data set (index) 2

Data set (index) 2 - system commands

Table E- 31 Data set (index) 2 - system commands

Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x02 (2)	w	System Command[1)]	1	—

1) Permissible vendor-specific system commands:
0x80 for Device Reset
0x82 for Factory Reset

Data set (index) 92 - diagnostics

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 32 Data set (index) 92 - diagnostics

Byte.Bit	Description
Operating system functions 3UG4	
0.0 ... 15.7	*Reserved*
16.0	Ready
16.1	Group error
16.2	General warning
16.3	*Reserved*
16.4	*Reserved*
16.5	Parameter assignment active
16.6	Invalid parameter
16.7	Self-test error/internal error
17.0 … 17.7	*Reserved*
18.0 … 19.7	Parameter error number

Byte.Bit	Description
Fault current monitoring	
26.0	ON-delay time running
26.1	Tripping delay time running (threshold for overshoot)
26.2	*Reserved*
26.3	Initialization time running after applying the control supply voltage
27.0	Threshold for overshoot exceeded
27.1	*Reserved*
27.2	Warning threshold for overshoot exceeded
27.3	*Reserved*
27.4	*Reserved*
27.5	*Reserved*
28.0	Wire break
28.1	Short-circuit
28.2	Measuring range overshoot
29.0 … 29.7	*Reserved*

Data set (index) 94 (measured values)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 33 Data set (index) 94 (measured values)

Byte.Bit	Description
Fault current monitoring	
0.0 ... 15.7	*Reserved*
16.0 … 17.7	Residual current Ir (PA) Min: 0.0 A Max: 43.0 A
18.0 ... 21.7	Residual current Ir Min: 0.0 A Max: 43.0 A

Note

If a measured value is outside the measurable range, all measured values will be set to 7FFF (invalid value).

Data set (index) 131 (parameters)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 34 Data set (index) 131 (parameters)

Byte.Bit	Description
Operating system functions	
0.0 ... 15.7	*Reserved*
16.0	Group diagnostics Default: [1] [0] disabled [1] enabled
16.1	Group error diagnostics Default: [1] [0] disabled [1] enabled
16.2	*Reserved*
16.3	*Reserved*
16.4	Local threshold change Default: [1] [0] disabled [1] enabled
16.5	Local parameter change Default: [1] [0] disabled [1] enabled
16.6	Local reset Default: [1] [0] disabled [1] enabled
16.7	Retentive error memory Default: [0] [0] disabled [1] enabled
17.0 ... 17.7	Analog value coding Type: BYTE Default: 14 Min: 0 (disabled) Max: 255

Byte.Bit	Description
Fault current monitoring	
24.0 ... 24.1	Reset response Default: [1] [0] manual [1] automatic
24.2 ... 24.4	*Reserved*
25.0 ... 25.1	ON-delay time (at Power ON) Default: [1] [0] disabled [1] enabled
25.2 ... 25.3	ON-delay time (at manual reset) Default: [1] [0] disabled [1] enabled
25.4 ... 25.5	ON-delay time (at restart) Default: [0] [0] disabled [1] enabled
26.0 ... 27.7	ON-delay time Type: INT Resolution: 0.1 s = 1 Default: 0 (disabled) Max: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
28.0 ... 29.7	Tripping delay time (in the case of current overshoot) Type: INT Resolution: 0.1 s = 1 Default: 1 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
30.0 ... 31.7	*Reserved*
32.0 ... 33.7	Threshold for overshoot Type: INT Resolution: 0.01 A = 1 Default: 100 Min: 3 Max: 4000 * 0.01 A = 40 A
34.0 ... 35.7	*Reserved*
36.0 ... 37.7	Warning threshold for overshoot Type: INT Resolution: 0.01 A = 1 Default: 50 Min: 3 or 0 (disabled) Max: 4000 * 0.01 A = 40 A
38.0 ... 39.7	*Reserved*

Byte.Bit	Description
40.0 ... 41.7	*Reserved*
42.0 ... 43.7	*Reserved*
44.0 ... 45.7	Hysteresis (current) Type: INT Resolution: 1 % = 1 Default: 5 Min: 5 or 0 (disabled) Max: 50 *1 % = 50 %
46.0 ... 46.7	*Reserved*
47.0 ... 47.1	Relay switching response Default: 0 [0] Closed-circuit principle NC [1] Open-circuit principle NO Min: 0 Max: 1
47.2 ... 47.3	*Reserved*
47.4 ... 47.5	*Reserved*

E.9 3UG4832 voltage monitoring relay

Process image of the outputs (PIQ)

The process image of the outputs contains the control commands for the 3UG4832 voltage monitoring relays.

Table E- 35 PIQ - control commands

DO (2 bytes)	PIQ
DO0.0	1: Start ON-delay time
DO0.1	---
DO0.2	---
DO0.3	1: Reset
DO0.4	---
DO0.5	---
DO0.6	---
DO0.7	---
DO1.0 - DO1.7	---

Process image of the inputs (PII)

The process image of the inputs contains the most important status information of the 3UG4832 voltage monitoring relays.

Table E- 36 PII - status information

DI (4 bytes)	PII
DI0.0	Ready
DI0.1	---
DI0.2	1: Group error
DI0.3	1: General warning
DI0.4	Status output relay K1[1)]
DI0.5	---
DI0.6	---
DI0.7	---
DI1.0 - DI1.5	Analog value coding bits 0 to 5
DI1.6	---
DI1.7	---
DI2.0 - DI3.7	Analog value[2)]

[1)] 0: Contact .1 / .2 closed 1: Contact .1 / .4 closed

[2)] The analog value is a 16-bit integer value. Together with the analog value coding (DI1.0 - DI1.5), which defines the unit and resolution of the analog value, this results in the complete measured value. You can find the analog value codings accepted by the monitoring relay in the chapter "Analog value coding (Page 280)".

Identification data

Identification data refers to data stored in a module that supports users in the following areas:

- When checking the system configuration
- When locating modified system hardware
- When troubleshooting a system.

Modules can be uniquely identified using the identification data.

Identification data

DPP [1)] Index (dec)	Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x07 (7)	—	r	Vendor ID	2	0x00
0x08 (8)	—	r			0x2A
0x09 (9)	—	r	Device ID	3	0x09
0x0A (10)	—	r			0x08
0x0B (11)	—	r			0x21
—	0x10 (16)	r	Vendor Name	11	SIEMENS AG
—	0x11 (17)	r	Vendor Text	64 max.	Internet (http://support.automation.siemens.com/WW/view/en/37432258/133200)
—	0x12 (18)	r	Product Name	64 max.	SIRIUS Voltage Monitoring Relay for IO-Link
—	0x13 (19)	r	Product ID	14	3UG4832-1AA40 3UG4832-2AA40
—	0x16 (22)	r	Hardware Revision	7	*Hardware version* [2)]
—	0x17 (23)	r	Firmware Revision	7	*Firmware version* [2)]
—	0x18 (24)	r / w	Application Specific Name	32 max.	—

1) Direct Parameter Page

2) Value varies for each monitoring relay.

E.9.1 System commands - data set (index) 2

Data set (index) 2 - system commands

Table E- 37 Data set (index) 2 - system commands

Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x02 (2)	w	System Command[1)]	1	—

1) Permissible vendor-specific system commands:
0x80 for Device Reset
0x82 for Factory Reset

Data set (index) 92 - diagnostics

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 38 Data set (index) 92 - diagnostics

Byte.Bit	Description
Operating system functions 3UG4	
0.0 ... 15.7	*Reserved*
16.0	Ready
16.1	Group error
16.2	Group warning
16.3	*Reserved*
16.4	*Reserved*
16.5	Parameter assignment active
16.6	Invalid parameter
16.7	Self-test error/internal error
18.0 ... 19.7	Parameter error number
Voltage monitor	
26.0	ON-delay time running
26.1	Tripping delay time running (threshold for overshoot)
26.2	Tripping delay time running (threshold for undershoot)
27.0	Threshold for overshoot exceeded
27.1	Threshold for undershoot violated
27.2	Warning threshold for overshoot exceeded
27.3	Warning threshold for undershoot violated
27.4	*Reserved*
27.5	*Reserved*

Data set (index) 94 (measured values)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 39 Data set (index) 94 (measured values)

Byte.Bit	Description
Voltage monitor	
0.0 ... 15.7	*Reserved*
16.0 … 17.7	Voltage U1[1)] Min: 10 V Max: 600 V
18.0 … 19.7	*Reserved*
20.0 ... 21.7	*Reserved*
22.0 ... 23.7	*Reserved*
24.0 ... 25.7	*Reserved*
26.0 ... 27.7	*Reserved*

1) A measuring range overshoot is signaled when a voltage of 690 V is exceeded.

Note

If a measured value is outside the measurable range, all measured values will be set to 7FFF (invalid value).

Data set (index) 131 (parameters)

> **Note**
>
> Bits that are not described in the tables below are reserved and should be ignored.

> **Note**
>
> Sub-indices are not supported.

Table E- 40 Data set (index) 131 (parameters)

Byte.Bit	Designation
Operating system functions	
0.0 ... 15.7	*Reserved*
16.0	Group diagnostics Default: [1] [0] disabled [1] enabled
16.1	Group error diagnostics Default: [1] [0] disabled [1] enabled
16.2	*Reserved*
16.3	*Reserved*
16.4	Local threshold change Default: [1] [0] disabled [1] enabled
16.5	Local parameter change Default: [1] [0] disabled [1] enabled
16.6	Local reset Default: [1] [0] disabled [1] enabled
16.7	Retentive error memory Default: [0] [0] disabled [1] enabled
17.0 ... 17.7	Analog value coding Type: BYTE Default: 44 Min: 0 (disabled) Max: 255

Byte.Bit	Designation
Voltage monitor	
24.0 ... 24.1	Reset response Default: [1] [0] manual [1] automatic
24.2 ... 24.4	Reserved
25.0 ... 25.1	ON-delay time (at Power ON) Default: [1] [0] disabled [1] enabled
25.2 ... 25.3	ON-delay time (at manual reset) Default: [1] [0] disabled [1] enabled
25.4 ... 25.5	*Reserved*
26.0 ... 27.7	ON-delay time Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
28.0 ... 29.7	Tripping delay time (in the case of voltage overshoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
30.0 ... 31.7	Tripping delay time (in the case of voltage undershoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
32.0 ... 33.7	Threshold for overshoot Type: INT Resolution: 0.1 V = 1 Default: 3000 Min: 100 or 0 (disabled) Max: 6000 * 0.1 V = 600 V
34.0 ... 35.7	Threshold for undershoot Type: INT Resolution: 0.1 V = 1 Default: 2000 Min: 100 or 0 (disabled) Max: 6000 * 0.1 V = 600 V
36.0 ... 37.7	Warning threshold for overshoot Type: INT Resolution: 0.1 V = 1 Default: 3000 Min: 100 or 0 (disabled) Max: 6000 * 0.1 V = 600 V

Byte.Bit	Designation
38.0 ... 39.7	Warning threshold for undershoot Type: INT Resolution: 0.1 V = 1 Default: 2000 Min: 100 or 0 (disabled) Max: 6000 * 0.1 V = 600 V
40.0 ... 41.7	*Reserved*
42.0 ... 43.7	*Reserved*
44.0 ... 45.7	Hysteresis Type: INT Resolution: 0.1 V = 1 Default: 50 Min: 1 or 0 (disabled) Max: 3000 * 0.1 V = 300 V
46.0 ... 46.1	Relay switching response Default: [0] [0] Closed-circuit principle (NC) [1] Open-circuit principle (NO)
46.2 ... 46.7	*Reserved*
47.0 ... 47.7	*Reserved*

E.10 3UG4841 cos phi and active current monitoring relay

Process image of the outputs (PIQ)

The process image of the outputs contains the control commands for the 3UG4841 cos phi and active current monitoring relays.

Table E- 41 PIQ - control commands

DO (2 bytes)	PIQ
DO0.0	1: Start ON-delay time
DO0.1	---
DO0.2	---
DO0.3	1: Reset
DO0.4	---
DO0.5	---
DO0.6	---
DO0.7	---
DO1.0 - DO1.7	---

Process image of the inputs (PII)

The process image of the inputs contains the most important status information of the 3UG4841 cos phi and active current monitoring relays.

Table E- 42 PII - status information

DI (4 bytes)	PII
DI0.0	Ready
DI0.1	---
DI0.2	1: Group error
DI0.3	1: General warning
DI0.4	Status output relay K1[1)]
DI0.5	Status output relay K2[1)]
DI0.6	---
DI0.7	---
DI1.0 - DI1.5	Analog value coding bits 0 to 5
DI1.6	---
DI1.7	---
DI2.0 - DI3.7	Analog value[2)]

[1)] 0: Contact .1 / .2 closed 1: Contact .1 / .4 closed

[2)] The analog value is a 16-bit integer value. Together with the analog value coding (DI1.0 - DI1.5), which defines the unit and resolution of the analog value, this results in the complete measured value. You can find the analog value codings accepted by the monitoring relay in the chapter "Analog value coding (Page 280)".

Identification data

Identification data refers to data stored in a module that supports users in the following areas:

- When checking the system configuration
- When locating modified system hardware
- When troubleshooting a system.

Modules can be uniquely identified using the identification data.

Identification data

DPP 1) Index (dec)	Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x07 (7)	—	r	Vendor ID	2	0x00
0x08 (8)	—	r			0x2A
0x09 (9)	—	r	Device ID	3	0x09
0x0A (10)	—	r			0x08
0x0B (11)	—	r			0x51
—	0x10 (16)	r	Vendor Name	11	SIEMENS AG
—	0x11 (17)	r	Vendor Text	64 max.	Internet (http://support.automation.siemens.com/WW/view/en/37432258/133200)
—	0x12 (18)	r	Product Name	64 max.	SIRIUS Power Factor / Active Current Monitoring Relay for IO-Link
—	0x13 (19)	r	Product ID	14	3UG4841-1CA40 3UG4841-2CA40
—	0x16 (22)	r	Hardware Revision	7	*Hardware version* 2)
—	0x17 (23)	r	Firmware Revision	7	*Firmware version* 2)
—	0x18 (24)	r / w	Application Specific Name	32 max.	—

1) Direct Parameter Page

2) Value varies for each monitoring relay.

E.10.1 System commands - data set (index) 2

Data set (index) 2 - system commands

Table E- 43 Data set (index) 2 - system commands

Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x02 (2)	w	System Command[1)]	1	—

1) Permissible vendor-specific system commands:
0x80 for Device Reset
0x82 for Factory Reset

Data set (index) 92 - diagnostics

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 44 Data set (index) 92 - diagnostics

Byte.Bit	Description
Operating system functions 3UG4	
0.0 ... 15.7	*Reserved*
16.0	Ready
16.1	Group error
16.2	Group warning
16.3	*Reserved*
16.4	*Reserved*
16.5	Parameter assignment active
16.6	Invalid parameter
16.7	Self-test error/internal error
18.0 ... 19.7	Parameter error number
Cos phi and active current monitoring	
26.0	ON-delay time running
26.1	Tripping delay time running (threshold for overshoot: cos phi value)
26.2	Tripping delay time running (threshold for undershoot: cos phi value)
26.3	Tripping delay time running (threshold for overshoot: active current value)
26.4	Tripping delay time running (threshold for undershoot: active current value)
27.0	Threshold value for overshoot exceeded (cos phi value)
27.1	Threshold value for undershoot violated (cos phi value)
27.2	Threshold for overshoot exceeded (active current value)
27.3	Threshold for undershoot violated (active current value)
27.4	Warning threshold for overshoot exceeded (cos phi value)
27.5	Warning threshold for undershoot violated (cos phi value)
27.6	Warning threshold for overshoot exceeded (active current value)
27.7	Warning threshold for undershoot violated (active current value)
28.0 ... 28.7	*Reserved*
29.0 ... 29.7	*Reserved*

Data set (index) 94 (measured values)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 45 Data set (index) 94 (measured values)

Byte.Bit	Description
Cos phi and active current monitoring	
0.0 ... 15.7	*Reserved*
16.0 … 17.7	cos phi value (PA) Min: 0 Max: 0.99
18.0 … 19.7	Active current I_R / I_{RES} (PA) Min: 0,2 A Max: 10 A
20.0 ... 21.7	Apparent current I_S (PA) Min: 0,2 A Max: 10 A
22.0 ... 23.7	Active voltage U (PA) Min: 30 V Max: 690 V
24.0 ... 25.7	Active power P_W (PA) Min: 6 W Max: 6900 W
26.0 ... 27.7	*Reserved*
28.0 … 29.7	*Reserved*
30.0 … 33.7	Active current I_R / I_{RES} (PA) Min: 0,2 A Max: 10 A
34.0 ... 37.7	Apparent current I_S Min: 0,2 A Max: 10 A
38.0 ... 41.7	Active power P_W Min: 6 W Max: 6900 W
42.0 ... 45.7	*Reserved*
46.0 ... 49.7	*Reserved*

Note

If a measured value is outside the measurable range, all measured values will be set to 7FFF (invalid value).

Data set (index) 131 (parameters)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 46 Data set (index) 131 (parameters)

Byte.Bit	Description
Operating system functions	
0.0 ... 15.7	*Reserved*
16.0	Group diagnostics Default: [1] [0] disabled [1] enabled
16.1	Group error diagnostics Default: [1] [0] disabled [1] enabled
16.2	*Reserved*
16.3	*Reserved*
16.4	Local threshold change Default: [1] [0] disabled [1] enabled
16.5	Local parameter change Default: [1] [0] disabled [1] enabled
16.6	Local reset Default: [1] [0] disabled [1] enabled

Byte.Bit	Description
16.7	Retentive error memory Default: [0] [0] disabled [1] enabled
17.0 ... 17.7	Analog value coding Type: BYTE Default: 43 Min: 0 (disabled) Max: 255
Cos phi and active current monitoring	
24.0 ... 24.1	Reset response Default: [1] [0] manual [1] automatic
24.2 ... 24.4	*Reserved*
25.0 ... 25.1	ON-delay time (at Power ON) Default: [1] [0] disabled [1] enabled
25.2 ... 25.3	ON-delay time (at manual reset) Default: [1] [0] disabled [1] enabled
25.4 ... 25.5	ON-delay time (at restart) Default: [0] [0] disabled [1] enabled
26.0 ... 27.7	ON-delay time Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
28.0 ... 29.7	Tripping delay time (in the case of overshoot of the cos phi value) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
30.0 ... 31.7	Tripping delay time (in the case of undershoot of the cos phi value) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
32.0 ... 33.7	Tripping delay time (in the case of active current overshoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s

Byte.Bit	Description
34.0 ... 35.7	Tripping delay time (in the case of active current undershoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
36.0 ... 36.7	Threshold for overshoot of the cos phi value Type: INT Resolution: 0,01 = 1 Default: 50 Min: 1 or 0 (disabled) Max: 99 * 0,01 = 0,99
37.0 ... 37.7	Threshold for undershoot of the cos phi value Type: INT Resolution: 0,01 = 1 Default: 20 Min: 1 or 0 (disabled) Max: 99 * 0,01 = 0,99
38.0 ... 41.7	Threshold for overshoot of the active current value Type: INT Resolution: 0.1 A = 1 Default: 30 Min: 2 or 0 (disabled) Max: 100 * 0.1 A = 10 A
42.0 ... 45.7	Threshold for undershoot of the active current value Type: INT Resolution: 0.1 A = 1 Default: 10 Min: 2 or 0 (disabled) Max: 10.0 * 0.1 A = 10 A
46.0 ... 46.7	Warning threshold for overshoot of the cos phi value Type: INT Resolution: 0,01 = 1 Default: 50 Min: 1 or 0 (disabled) Max: 99 * 0,01 = 0,99
47.0 ... 47.7	Warning threshold for undershoot of the cos phi value Type: INT Resolution: 0,01 = 1 Default: 20 Min: 1 or 0 (disabled) Max: 99 * 0,01 = 0,99
48.0 ... 51.7	Warning threshold for overshoot of the active current value Type: INT Resolution: 0.1 A = 1 Default: 30 Min: 2 or 0 (disabled) Max: 100 * 0.1 A = 10 A

Byte.Bit	Description
52.0 ... 55.7	Warning threshold for undershoot of the active current value Type: INT Resolution: 0.1 A = 1 Default: 10 Min: 2 or 0 (disabled) Max: 100 * 0.1 A = 10 A
56.0 ... 56.7	*Reserved*
57.0 ... 57.7	*Reserved*
58.0 ... 61.7	*Reserved*
62.0 ... 65.7	*Reserved*
66.0 ... 66.7	Hysteresis (cos phi) Type: INT Resolution: 0,01 = 1 Default: 10 Min: 10 or 0 (disabled) Max: 20 * 0,01 = 0,2
67.0 ... 67.7	*Reserved*
68.0 ... 71.7	Hysteresis (active current) Type: INT Resolution: 0.1 A = 1 Default: 5 Min: 1 or 0 (disabled) Max: 30 * 0.1 A = 3.0 A
72.0 ... 72.1	Relay switching response Default: [0] [0] Closed-circuit principle (NC) [1] Open-circuit principle (NO)
72.2 ... 72.7	*Reserved*
73.0 ... 73.7	*Reserved*

E.11 3UG4851 speed monitoring relays

Process image of the outputs (PIQ)

The process image of the outputs contains the control commands for the 3UG4851 speed monitoring relays.

Table E- 47 PIQ - control commands

DO (2 bytes)	PIQ
DO0.0	1: Start ON-delay time
DO0.1	---
DO0.2	---
DO0.3	1: Reset
DO0.4	---
DO0.5	---
DO0.6	---
DO0.7	---
DO1.0 - DO1.7	---

Process image of the inputs (PII)

The process image of the inputs contains the most important status information of the 3UG4851 speed monitoring relays.

Table E- 48 PII - status information

DI (4 bytes)	PII
DI0.0	Ready
DI0.1	---
DI0.2	1: Group error
DI0.3	1: General warning
DI0.4	Status output relay K1[1)]
DI0.5	---
DI0.6	---
DI0.7	---
DI1.0 - DI1.5	Analog value coding bits 0 to 5
DI1.6	---
DI1.7	---
DI2.0 - DI3.7	Analog value[2)]

[1)] 0: Contact .1 / .2 closed 1: Contact .1 / .4 closed

[2)] The analog value is a 16-bit integer value. Together with the analog value coding (DI1.0 - DI1.5), which defines the unit and resolution of the analog value, this results in the complete measured value. You can find the analog value codings accepted by the monitoring relay in the chapter "Analog value coding (Page 280)".

Identification data

Identification data refers to data stored in a module that supports users in the following areas:

- When checking the system configuration
- When locating modified system hardware
- When troubleshooting a system.

Modules can be uniquely identified using the identification data.

Identification data

DPP [1] Index (dec)	Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x07 (7)	—	r	Vendor ID	2	0x00
0x08 (8)	—	r			0x2A
0x09 (9)	—	r	Device ID	3	0x09
0x0A (10)	—	r			0x08
0x0B (11)	—	r			0x61
—	0x10 (16)	r	Vendor Name	11	SIEMENS AG
—	0x11 (17)	r	Vendor Text	64 max.	Internet (http://support.automation.siemens.com/WW/view/en/37432258/133200)
—	0x12 (18)	r	Product Name	64 max.	SIRIUS RPM Monitoring Relay for IO-Link
—	0x13 (19)	r	Product ID	14	3UG4851-1AA40 3UG4851-2AA40
—	0x16 (22)	r	Hardware Revision	7	*Hardware version* [2]
—	0x17 (23)	r	Firmware Revision	7	*Firmware version* [2]
—	0x18 (24)	r / w	Application Specific Name	32 max.	—

[1] Direct Parameter Page

[2] Value varies for each monitoring relay.

E.11.1 System commands - data set (index) 2

Data set (index) 2 - system commands

Table E- 49 Data set (index) 2 - system commands

Data set Index (dec)	Access	Parameter	Length (bytes)	Default setting
0x02 (2)	w	System Command[1)]	1	—

1) Permissible vendor-specific system commands:
0x80 for Device Reset
0x82 for Factory Reset

Data set (index) 92 - diagnostics

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 50 Data set (index) 92 - diagnostics

Byte.Bit	Description
Operating system functions 3UG4	
0.0 ... 15.7	*Reserved*
16.0	Ready
16.1	Group error
16.2	Group warning
16.3	*Reserved*
16.4	*Reserved*
16.5	Parameter assignment active
16.6	Invalid parameter
16.7	Self-test error/internal error
18.0 ... 19.7	Parameter error number
Speed monitoring	
26.0	ON-delay time running
26.1	Tripping delay time running (threshold for overshoot)
26.2	Tripping delay time running (threshold for undershoot)
27.0	Threshold for overshoot exceeded
27.1	Threshold for undershoot violated
27.2	Warning threshold for overshoot exceeded
27.3	Warning threshold for undershoot violated
27.4	*Reserved*
27.5	*Reserved*
28.0	Sensor - Measuring range overshoot
28.1 ... 28.7	*Reserved*
29.0 ... 29.7	*Reserved*

Data set (index) 94 (measured values)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 51 Data set (index) 94 (measured values)

Byte.Bit	Description
Speed monitoring	
0.0 ... 15.7	*Reserved*
16.0 … 17.7	Speed Min: 0 Max: 2200

Note

If a measured value is outside the measurable range, all measured values will be set to 7FFF (invalid value).

Note

The speed cannot be lower than 0 rpm.
Undershoot of the measurement range is signaled when 10 min / scaling factor have elapsed without a measurement pulse (e.g. 1 min for a scaling factor of 10).

Data set (index) 131 (parameters)

Note

Bits that are not described in the tables below are reserved and should be ignored.

Note

Sub-indices are not supported.

Table E- 52 Data set (index) 131 (parameters)

Byte.Bit	Description
Operating system functions	
0.0 ... 15.7	*Reserved*
16.0	Group diagnostics Default: [1] [0] disabled [1] enabled
16.1	Group error diagnostics Default: [1] [0] disabled [1] enabled
16.2	*Reserved*
16.3	*Reserved*
16.4	Local threshold change Default: [1] [0] disabled [1] enabled
16.5	Local parameter change Default: [1] [0] disabled [1] enabled
16.6	Local reset Default: [1] [0] disabled [1] enabled
16.7	Retentive error memory Default: [0] [0] disabled [1] enabled
17.0 ... 17.7	Analog value coding Type: BYTE Default: 13 Min: 0 (disabled) Max: 255

Byte.Bit	Description
Speed monitoring	
24.0 ... 24.1	Reset response Default: [1] [0] manual [1] automatic
24.2 ... 24.2	*Reserved*
25.0 ... 25.1	ON-delay time (at Power ON) Default: [1] [0] disabled [1] enabled
25.2 ... 25.3	ON-delay time (at manual reset) Default: [1] [0] disabled [1] enabled
25.3 ... 25.4	*Reserved*
26.0 ... 27.7	ON-delay time Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
28.0 ... 29.7	Tripping delay time (in the case of speed overshoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
30.0 ... 31.7	Tripping delay time (in the case of speed undershoot) Type: INT Resolution: 0.1 s = 1 Default: 0 Min: 1 or 0 (disabled) Max: 9999 * 0.1 s = 999.9 s
32.0 ... 33.7	Threshold for speed overshoot Type: INT Default: 1400 rpm Min: 0.1 rpm or 0 (disabled) Max: 2200 rpm
34.0 ... 35.7	Threshold for speed undershoot Type: INT Default: 800 rpm Min: 0.1 rpm or 0 (disabled) Max: 2200 rpm
36.0 ... 37.7	Warning threshold for speed overshoot Type: INT Default: 1400 rpm Min: 0.1 rpm or 0 (disabled) Max: 2200 rpm

Byte.Bit	Description
38.0 ... 39.7	Warning threshold for speed undershoot Type: INT Default: 800 rpm Min: 0.1 rpm or 0 (disabled) Max: 2200 rpm
40.0 ... 41.7	*Reserved*
42.0 ... 43.7	*Reserved*
44.0 ... 45.7	Hysteresis Type: INT Resolution: 0,1 Default: 50 Min: 1 or 0 (disabled) Max: 999 * 0,1 = 99.9
46.0 ... 46.1	Relay switching response Default: [0] [0] Closed-circuit principle (NC) [1] Open-circuit principle (NO)
46.2 ... 46.3	*Reserved*
46.4 ... 46.5	*Reserved*
47.0 ... 47.7	Scaling factor Default: 1 Min: 1 Max: 10

Correction sheet

F

Correction sheet

Have you noticed any errors while reading this manual? If so, please use this form to tell us about them. We welcome comments and suggestions for improvement.

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Table F- 1 Errors, comments, and suggestions for improvements

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