Guide

GROWND FAULT RELAY D64RP410
Single-channel AC and pulsed DC sensitive residual current monitor for AC systems

Powering Business Worldwide

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Contents

1 General instructions

1.1 How to use this manual

⚠ IMPORTANT

This manual is intended for qualified personnel working in electrical engineering and electronics! In addition to this manual, the enclosed "Safety instructions for Bender products"are part of the device documentation.

Read the manual before mounting, connecting, and commissioning the device. Always keep the manual within easy reach for future reference.

1.2 Indication of important instructions and information

⚠ WARNING

Indicates a high risk of danger that will result in death or serious injury if not avoided.

⚠ WARNING

Indicates a medium risk of danger that can lead to death or serious injury, if not avoided.

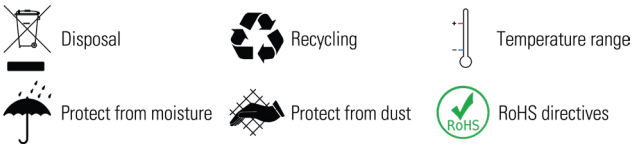
⚠ CAUTION

Indicates a low-level risk that can result in minor or moderate injury or damage to property if not avoided.

⚠ IMPORTANT

Information can help to optimise the use of the product.

1.2.1 Signs and symbols



1.3 Inspection, transport and storage

Check the shipping and device packaging for transport damage and scope of delivery. The following must be observed when storing the devices:

1.4 Warranty and liability

Warranty and liability claims in the event of injury to persons or damage to property are excluded in case of:

- Improper use of the device.
- Incorrect mounting, commissioning, operation and maintenance of the device.
- Failure to observe the instructions in this operating manual regarding transport, commissioning, operation and maintenance of the device.
- Unauthorised changes to the device made by parties other than the manufacturer.
- Non-observance of technical data.
- Repairs carried out incorrectly.
- Use of accessories and spare parts not recommended by EATON.
- Catastrophes caused by external influences and force majeure.
- Mounting and installation with device combinations not recommended by the manufacturer.

This operating manual and the enclosed safety instructions must be observed by all persons working with the device. Furthermore, the rules and regulations that apply to accident prevention at the place of use must be observed.

1.5 Safety

If the device is used outside the Federal Republic of Germany, the applicable local standards and regulations must be complied with. In Europe, the European standard EN 50110 applies.

⚠ WARNING

Risk of electrocution due to electric shock! Touching live parts of the system carries the risk of:

- A fatal electric shock
- Damage to the electrical installation
- Destruction of the device

Before installing the device or working on its connections, make sure that the installation has been de-energised. The rules for working on electrical systems must be observed.

1.6 Intended use

The D64RP410 devices in conjunction with the specified measuring current transformers (CT) are intended for AC and pulsed DC sensitive residual current measurement according to IEC 62020-1.

Its area of application is the monitoring of residual currents IΔ for preventive maintenance in TN, TT and IT systems with IΔ ≤ 50 A rms, where IΔ is intended to be measured within a range off= 42…70 Hz.

The devices are intended for operation in control cabinets or similarly protected environments. For intended operation, observe the specifications in the manual.

Any other use than that described in this manual is regarded as improper.

2 Function

2.1 Device features

- AC and pulsed DC sensitive residual current monitor type A according to DIN EN IEC 62020-1
- r.m.s. value measurement
- Residual operating current: 10 mA…30 A (42…70 Hz)
- Prewarning: 50...100 % of the residual operating current
- Supply voltage DC 24 V or AC/DC 100…240 V

- LED-strip measured value display
- Adjustable response delay
- Alarm relay (designed as changeover contact)
- N/C or N/O operation and fault memory behaviour selectable
- RS-485 with Modbus RTU
- Continuous CT-connection monitoring

2.2 Functional description

Once the supply voltage Us is applied, the start-up delay *t* starts. During this period, exceeding the residual operating current has no influence on the switching state of the alarm relay. The residual current measurement is carried out via an external measuring current transformer. If the measured value exceeds the value of the prewarning and/or the residual operating current, the set response delay ton starts.

After ton has elapsed, the alarm relay switches and the corresponding alarm LED lights up. If the value falls below the release value before ton has elapsed, no alarm is signalled: The LEDs AL1, AL2 do not light and the alarm relay does not switch. The set release time toff starts if the measured

value falls below the release value again after the alarm relay has switched. Once toff has elapsed, the alarm relay switches back to its initial position. When the fault memory is enabled, the alarm relay remains switched until the T/R button is pressed > 1 s and < 3 s.

The T/R button can also be used to test the device, to enable and disable the NFC function, as well as to set the Modbus device address.

2.2.1 Connection monitoring

The connections to the measuring current transformer are continuously monitored. In the event of a fault, the alarm relay switches and the status LED flashes yellow. After the fault has been eliminated, the alarm relay automatically switches back to its initial position and the status LED lights up green. When the fault memory is enabled, the alarm relay only switches back to its initial position when the T/R button is pressed > 1 s and < 3 s. Until then the status LED flashes yellow.

2.2.2 Manual self test

By pressing the T/R button > 3 s and < 6 s, the device simulates a residual current with the value 1.5 x *I*Δn. All LEDs light up and the relay switches. When the fault memory is enabled, the alarm LEDs and the relay remain active until the fault memory is cleared by means of the T/R button.

2.2.3 Malfunction

If an internal malfunction occurs, the status LED lights up RED. The error code can be queried via the device interfaces.

2.2.4 Alarm assignments to the alarm relay

The messages "Device error", "Residual operating current *I*Δn", "Prewarning", "CT connection fault" and/or "Test" can be assigned to the alarm relay via the device interface.

2.2.5 Delay times *t*b, *t*, *t*on, and *t*off

The times tb, t, ton and toff described below delay the output of alarms via LEDs, relay and Modbus RTU.

2.2.5.1 Recovery time tb

The recovery time is the time the device needs to be ready for measurement after the supply voltage *Us* has been connected.

2.2.5.2 Start-up delay t

After the supply voltage US has been connected, the measuring function is delayed by the set time t (0…999 s) plus the recovery time tb.

2.2.5.3 Response delay ton

If a residual operating current is exceeded, the residual current monitor requires the response time tan to output the alarm. A set response delay ton (0…10 s) is added to the device-specific operating time tae and delays signalling:

Response time tan = tae + ton

If the fault does not persist during the response delay, the alarm is not signalled.

2.2.5.4 Delay on release toff

If the alarm no longer exists and the fault memory has been disabled, the alarm LEDs go out and the alarm relays switch back to their initial status. By means of the delay on release (0…999 s), the alarm state is maintained for the selected period.

2.2.6 Factory settings FAC

There are two ways to carry out a reset:

2.2.6.1 Factory settings without interface

After the factory settings have been restored, all previously changed settings are reset to the state upon delivery. The settings for the Modbus interface are not reset.

2.2.6.2 Factory settings with interface

After the factory settings have been restored, all previously changed settings including the settings

for the Modbus interface and the device address are reset to the state upon delivery.

2.2.7 Combined function button (T/R button)

Reset = pressing the T/R button > 1s < 3s

Test = pressing the T/R button > 3s < 6s

Addr. = pressing the T/R button > 10s < 15s

2.2.8 Fault memory

The fault memory can be enabled or disabled. Stored alarms are reset by pressing the T/R button > 1s and < 3s when the fault memory is enabled. The fault memory is factory-set to enabled.

3 Mounting and connection

⚠ IMPORTANT

Only qualified personnel are permitted to carry out the work necessary to install, commission and run a device or system.

⚠ WARNING

Risk of electrocution due to electric shock! Touching live parts of the system carries the risk of:

- **A fatal electric shock**
- **Damage to the electrical installation**
- **Destruction of the device.**

Before installing the device or working on its connections, make sure that the installation has been de-energised. The rules for working on electrical systems must be observed.

3.1 Mounting

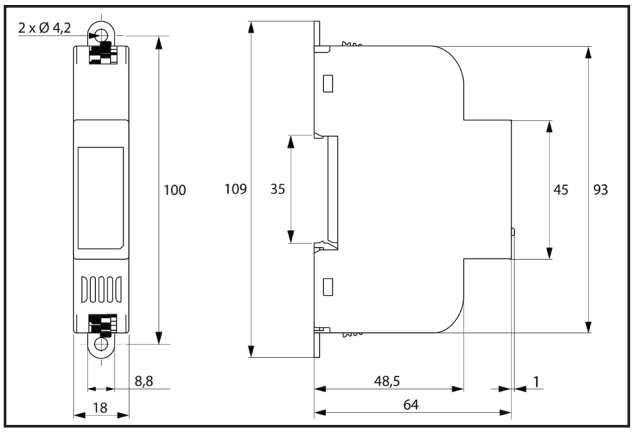


Figure 1. Dimensions in mm

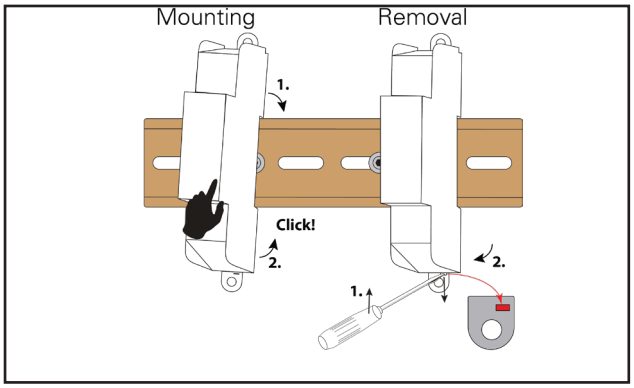


Figure 2. DIN rail mounting

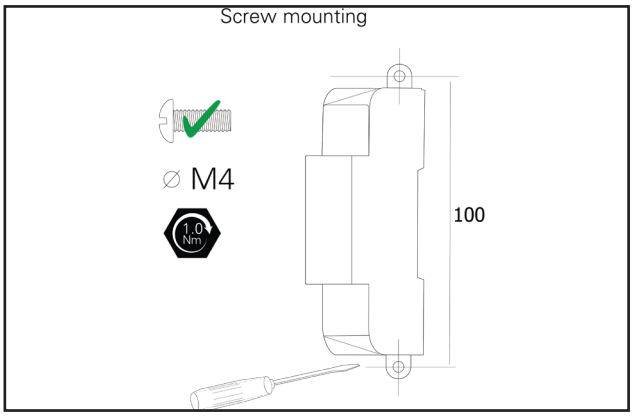


Figure 3. Screw mounting

3.2 Connection of D64RP410

3.2.1 Connections

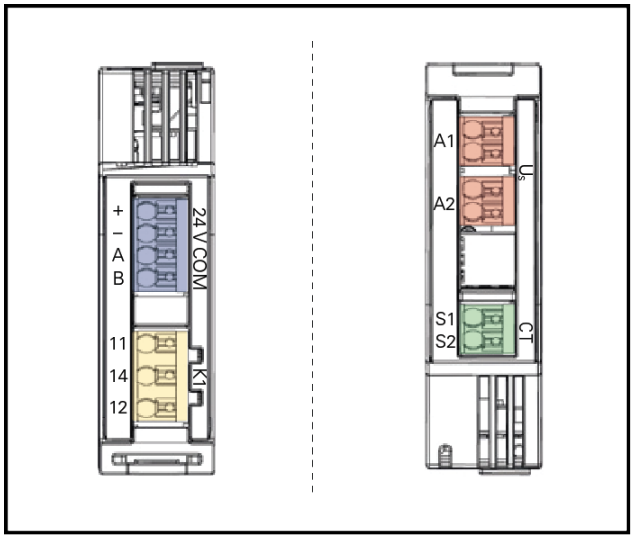


Figure 4. Connections

Table 1. Connection

Terminal	Connection
A1, A2	Supply voltage Us
S1, S2	Current transformer
11, 14, 12	Alarm relay K1
+	+24 V
-	Ground
A	RS-485 A
B	RS-485 B

The cables are connected to the device via push-in terminals. The maximum permissible conductor cross section is 1.5 mm².

⚠ CAUTION

Short circuit. When finely stranded cables are inserted directly into the push-in terminals, spliced wires can cause a short circuit. Use ferrules.

The terminals only allow the use of ferrules from 0.25 mm² to 1.5 mm². The maximum cross section of 1.5 mm² should under no circumstances be exceeded!

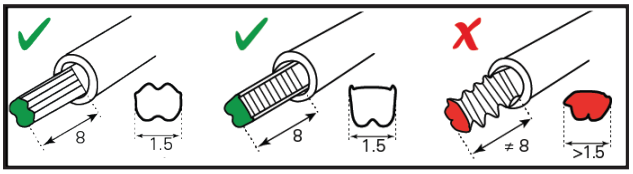


Figure 5. Anschluss / Connection

Use crimping pliers which

1. do not exceed the permitted crimp width of the ferrule and
2. do not leave strong crimp impressions on the ferrule.

⚠ IMPORTANT

For a cross section of 0.75 mm² or more, use suitable crimping pliers similar to the models "CRIMPFOX 6", "Weidmüller PZ6" or "Weidmüller PZ6/5".

For UL applications: Use 60 °C/75 °C copper lines only!

3.2.2 Wiring diagrams

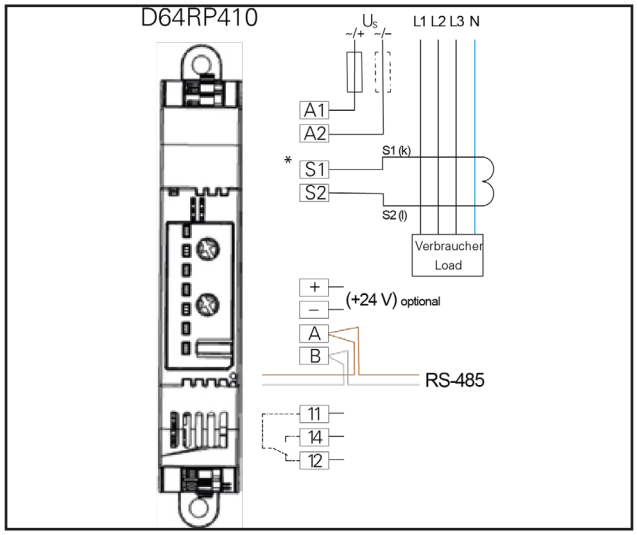
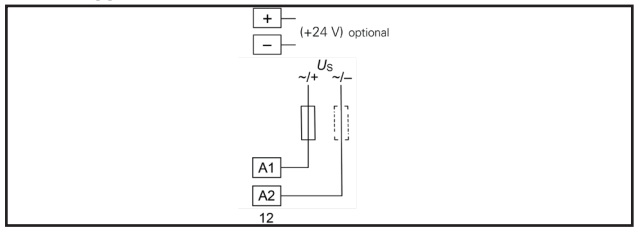


Figure 6. Wiring diagrams D64RP410

⚠ IMPORTANT

For UL applications: The measuring current transformers must be connected before operation is started.

3.2.2.1 Supply voltage Us



D64RP410 can be operated with a voltage of DC +24 V. The connection is made at the bottom side of the device.

Can be alternatively operated via terminals A1 and A2 with a voltage of AC/DC 100…240 V. In this case, the device must be provided with a back-up fuse. The connection is made at the top side of the device.

If the device is supplied by an unearthed system, two back-up fuses are required.

3.2.2.2 Measuring current transformer connection

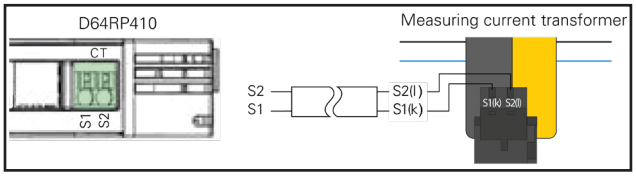


Figure 7. Measuring current

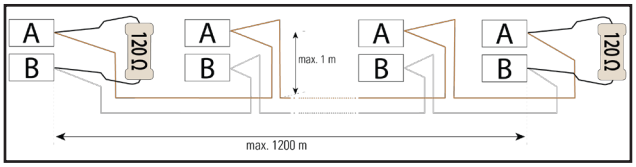
⚠ IMPORTANT

Ensure that the measuring current transformers are connected correctly. Terminal S1must be connected to terminal "S1" (k) of the measuring current transformer. Terminal S2 must be connected to terminal "S2" (l) of the measuring current transformer.

3.2.2.3 RS-485 interface

Specification

The RS-485 specification restricts the cable length to 1200 m and requires a daisy chain connection.



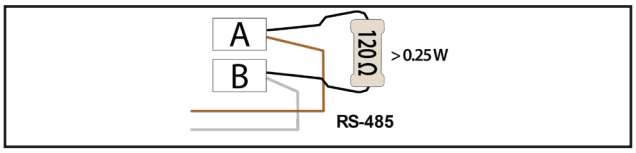
A twisted-pair, shielded cable must be used as bus cable. For example, cable type J-Y(St)Y n x 2 x 0.8 mm² is suitable. The shield must be connected to PE at one end.

⚠ IMPORTANT

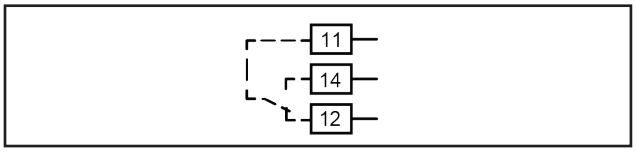
If there are more than 16 bus devices, the interface must be designed to be shockproof, because the maximum permissible total leakage current of 0.5 mA is exceeded.

Termination

The bus cable must be terminated at both ends with resistors (120 Ω, > 0.25 W). The terminating resistors are connected in parallel to the terminals A and B.



3.2.2.4 Relay



⚠ IMPORTANT

Attention! High contact currents damage the hard gold plating of the relay contacts. Damaged contacts prevent the relay from switching correctly at low contact currents.

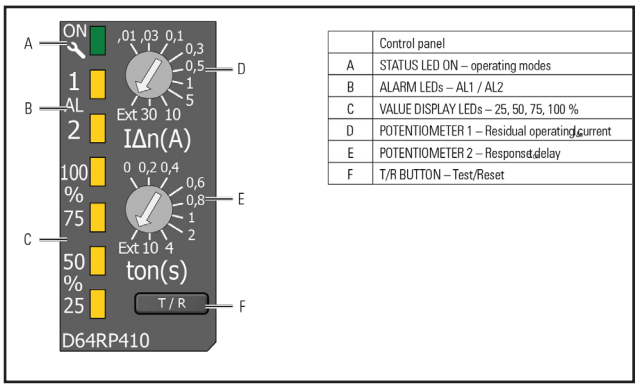
The terminals 11, 14, 12 are relay outputs of the measuring sensor. The following settings can be made via the interface:

Table 2. Anschluss / Connection

Function	State	Description
Test	on | off	This parameter determines whether the relay is actuated during a test
Operating mode	N/O principle | N/C principle	This parameter determines the operating mode of the relay. N/O principle = coil is energised during alarm state N/C principle = coil is energised during normal operation
Main alarm	on | off	The relay switches if the residual operating current has been exceeded
Prewarning	on | off	The relay switches if the prewarning threshold has been exceeded
Device error	on | off	The relay switches if a device error exists
CT connection fault	on | off	The relay switches if a measuring current transformer connection fault exists

4 Operation and settings on the device

4.1 Control panel D64RP410



	Control panel
A	STATUS LED ON – operating modes
B	ALARM LEDs – AL1 / AL2
C	VALUE DISPLAY LEDs – 25, 50, 75, 100 %
D	POTENTIOMETER 1 – Residual operating current
E	POTENTIOMETER 2 – Response delay
F	T/R BUTTON – Test/Reset

Figure 8. Control panel

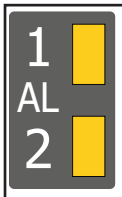
4.1.1 STATUS LED

Multicoloured display of various operating mode

LED	Operating mode
GREEN	START PHASE Device booting after start NORMAL OPERATION Device in fault-free state
YEL-LOW flashing	CT FAULT CT connection fault
RED	DEVICE ERROR Restart or replacement of the device required.
BLUE flashing	NFC ACTIVE

4.1.2 ALARM LEDs

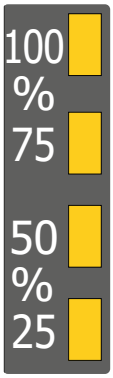
Display of prewarning AL1 and main alarm AL2.



LED	Operating state
AL1	PREWARNING Lights permanently when the prewarning threshold (% value of $I_{\Delta n}$) has been exceeded.
AL2	MAIN ALARM Lights permanently when the residual operating current threshold $I_{\Delta n}$ has been exceeded.

4.1.3 VALUE DISPLAY LEDs

Display of the measured value as a percentage of the residual operating current IΔn (incl. relative uncertainty)



LED	Operating state
25	Lights permanently when the present measured value is above 25 % of $I_{\Delta n}$.
50	Lights permanently when the present measured value is above 50 % of $I_{\Delta n}$.
75	Lights permanently when the present measured value is above 75 % of $I_{\Delta n}$.
100	Lights permanently when the present measured value is above 100 % of $I_{\Delta n}$.

4.1.4 Potentiometer residual operating current IΔn

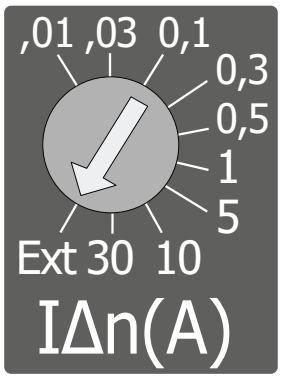


Figure 9. Setting of the residual operating current IΔn.

In switch position "Ext", the values can be changed via the Modbus RTU interface.

If a fixed value is set at the potentiometer, this value is always valid. In this case, no other residual operating current can be set via Modbus RTU.

If IΔn is exceeded, the main alarm AL2 is triggered.

The prewarning is a percentage value of IΔn . The value can only be set via the Modbus RTU interface.

4.1.5 Potentiometer response delay t_{on}

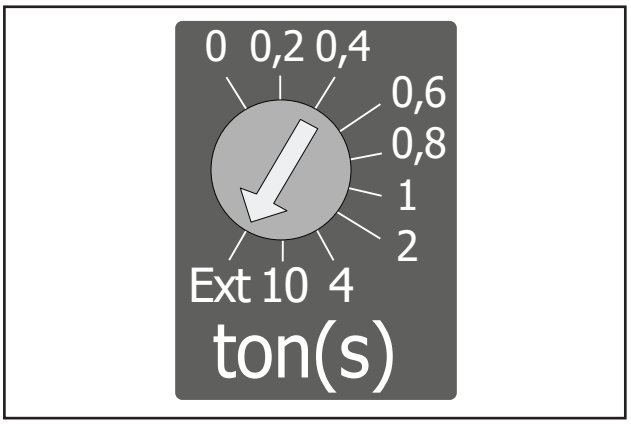


Figure 10. Setting of the delay time t_{on}.

The residual operating current and the prewarning must be exceeded at least for the duration of the set response delay ton to trigger the respective alarm. The amount by which the response value is exceeded is not relevant.

Only with the switch in position "Ext" can the parameter be changed via the interface. The set response delay ton is added to the operating time t_{ae}.

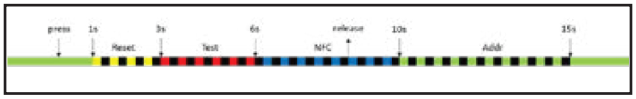
4.1.6 T/R BUTTON

The T/R button activates different operating modes depending on how long it is pressed.

Table 3. BUTTON mode

Mode	Period	STATUS LED
Reset	1 s to 3 s	flashes yellow
Test	3 s to 6 s	flashes red
NFC	6 s to 10 s	flashes blue
Addr.	10 s to 15 s	flashes green

Overview



4.1.6.1 "Reset" function

The "Reset" function resets stored alarm states.

4.1.6.2 "Test" function

The "Test" function simulates a residual current of 1.5 x $I_{\Delta n}$ for a period of 5 seconds. During this period, the device has the following states:

- Display of the alarm value via the LEDs and the interface.
- The relays switches if the alarm assignment "Test" has been activated.
- The test status can be read out via the interface:
  - 0 = no test
  - 1 = internal test
  - 2 = external test (interface)
- t_{on} and t_{off} are set to 0 s for the duration of the test

4.1.6.3 "Addr." function

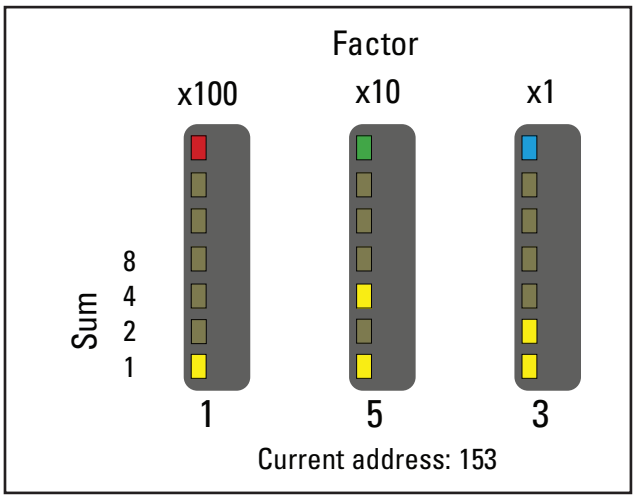
The "Addr." function puts the device into the address setting mode for the RS-485 interface. The LED measured value display and the status LED indicate the devices address.

How to enter an address:

1. Press T/R button until the status LED flashes green.
   - After the T/R button is released, the status LED lights RED.
2. Set HUNDREDS DIGIT. Press T/R button briefly until the desired value appears. Press and hold T/R button once (> 2 s) to confirm.
   - After the T/R button is released, the status LED lights GREEN.
3. Set TENS DIGIT. Press T/R button briefly until the desired value appears. Press and hold T/R button once (> 2 s) to confirm.
   - After the T/R button is released, the status LED lights BLUE.
4. Set UNITS DIGIT. Press T/R button briefly until the desired value appears. Press and hold T/R button once (> 2 s) to confirm.
5. To exit the address setting mode, press and hold T/R button once (2 s).
   - After the T/R button is released, the status LED lights GREEN.

The address values are displayed via BCD code.

Addresses can only be entered within the valid address range. The valid address range is protected on the software side by an input mask.



5 Modbus settings

5.1 Overview

Description of the Modbus registers for D64RP410 devices. The following Modbus function codes are supported:

- Holding register for reading out values
  (Read Holding Register; function code 0x03)
- Register for device programming
  (Write Multiple Registers; function code 0x10)

For a complete Modbus protocol specification, visit http://www.modbus.org.

5.1.1 Read and write accesses

Table 4. Accesses

RO	READ ONLY (read access only)
RW	READ/WRITE (read and write access)
WO	WRITE ONLY (write access only)

5.1.2 Data types

Table 5. Data Types

Float	IEEE754 32-bit (single precision floating point number)
Int16	Signed 16-bit integer
Int32	Signed 32-bit integer
Uint16	Unsigned 16-bit integer
Uint32	Unsigned 32-bit integer
String UTF8	ASCII character string

5.1.3 Register areas

Table 6. Data Types

Area	Start address	End address
Info	0	999
Measured values	1000	1999
Alarm status	2000	2999
Addr.	3000	3999
Test status	4000	4999
CT status	5000	5999
Modbus RTU parameters	32000	32099
Parameters	32100	32199
Device error codes	58000	58999
Control commands	60000	60099

5.2 Register table

Address (dec)	Register name	Data type	Bytes	Mode	Value/Unit/ Comment	Factory setting
Device information (0-3999)						
0	Device name	String UTF8	32	RO		N/A
16	Article number	String UTF8	32	RO	e.g.: B74602000 B74603000	N/A
32	Serial number	String UTF8	32	RO	10 digits e.g.: 2002123456	N/A
48	Manufacturer	String UTF8	96	RO		N/A
100	Application D number	Uint16	2	RO	642 = D642	N/A
101	Application version number	Uint16	2	RO	xxx = Vx.xx	N/A
102	Application build number	Uint16	2	RO		N/A
103	Boot loader D number	Uint16	2	RO	641 = D641	N/A
104	Bootloader version number	Uint16	2	RO	xxx = Vx.xx	N/A
105	Boot loader build number	Uint16	2	RO		N/A
106	Device status	Uint32	4	RO	Bit 0 (LSB): NFC- 0=disabled, 1= enabled Bit 1: Potentiometer $I_{\Delta n}$-0!=ext, 1= ext Bit 2: Potentiometer t_{on}-0!= ext, 1= ext Bit 3-31: 0 (reserved)	N/A
Measured values (1000...1999)						
1000	Residual current measured value	Float	4	RO	0...50 [A]	N/A
Alarm status (2000...2999)						
2000	Alarm status	Uint16	2	RO	0= no alarm 1= prewarning 2= main alarm	N/A
Range (3000...3999)						
3000	Measuring range status	Uint16	2	RO	0 : " " → within measuring range 1 : "<" → below measuring range (not used) 2: ">" → measuring range exceeded	N/A
Test status (4000...4999)						
4000	Test status	Uint16	2	RO	0= no active test 1= test active via T/R button, 2= test active via interface	N/A
CT status (5000...5999)						
5000	CT status	Uint16	2	RO	0 = OK 1 = short circuit 2 = interruption	N/A
Modbus RTU parameters (32000...32099)						
32000	Device address	Uint16	2	RW	1…247	Last 2 digits of the serial number +100

32001	Baud rate	Uint32	4	RW	9600, 19200, 38400, 57600, 115200	19200
32003	Parity	Uint16	2	RW	1 = even 2 = odd 3 = none	1
32004	Stop bits	Uint16	2	RW	1 = 1 2 = 2 3 = automatic	3
Parameters (32100...32199)						
32100	Alarm assignment test	Uint16	2	RW	1 = enabled 2 = disabled	1
32101	Operating mode	Uint16	2	RW	1 = N/O principle 2 = N/C principle	2
32102	Alarm assignment prewarning	Uint16	2	RW	1 = enabled 2 = disabled	2
32103	Alarm assignment main alarm	Uint16	2	RW	1 = enabled 2 = disabled	1
32104	Alarm assignment CT connection fault	Uint16	2	RW	1 = enabled 2 = disabled	1
32105	Alarm assignment device error	Uint16	2	RW	1 = enabled 2 = disabled	1
32106	Fault memory	Uint16	2	RW	1 = enabled 2 = disabled	1
32107	Residual operating current	Uint32	4	RW	10…30000 [mA], step size 1 mA	10 mA
32109	Prewarning threshold	Uint16	2	RW	50…100 [%], step size 1 %	50%
32110	Hysteresis	Uint16	2	RW	10…25 [%], step size 1 %	15%
32111	CT connection monitoring	Uint16	2	RW	1 = enabled 2 = disabled	1
32112	Response delay	Uint32	4	RW	0…10000 [ms], step size 1 ms	0
32114	Delay on release	Uint32	4	RW	0…999000 [ms], step size 1 ms	0
32116	Start-up delay	Uint32	4	RW	0…999000 [ms], step size 1 ms	0
Device error codes(58000...58999)						
58000	Number of device errors	Uint16	2	RO	Number of active device errors	N/A
58001	Internal device error	Uint16	2	RO	0 = no device error > 0 = internal device error	N/A
58002		Uint16	2	RO		N/A
58003		Uint16	2	RO		N/A
58004		Uint16	2	RO		N/A
58005		Uint16	2	RO		N/A
58006		Uint16	2	RO		N/A
58007		Uint16	2	RO		N/A

Control commands (60000)						
60000	Function selection	Uint16	2	WO	Function selection register to control the function of the following registers. Only specified values are permitted. 1 = Set Modbus address 2 = Find device 4 = Reset to factory settings /Reset parameters 6 = Test 7 = Reset	N/A
Function 1: Set Modbus address						
60000	Function selection	Uint16	2	WO	1 → Selection of "Set Modbus address" function	N/A
60001	Serial number	Uint32	2	WO	Serial number of the device to which the new Modbus address is assigned. The new Modbus address is assigned only to the device with the corresponding serial number.	N/A
60003	Modbus address	Uint16	2	WO	0…247 → New Modbus address	N/A
Function 2: Find device						
60000	Function selection	Uint16	2	WO	2 → Selection of the "Find device" function	N/A
60001	Pattern value part 1	Uint16	2	WO	61918 → Security pattern must be written for the function to be executed	N/A
60002	Pattern value part 2	Uint16	2	WO	0 → Security pattern must be written for the function to be executed.	N/A
60003	Period	Uint16	2	WO	0…300 → Period in seconds during which the device lights up. If the device receives the value "0", the function is stopped.	N/A

Function 4: Reset to factory settings/Reset parameters						
60000	Function selection	Uint16	2	WO	4 → Selection of "Reset to factory settings/Reset parameters" function	N/A
60001	Pattern value part 1	Uint16	2	WO	62663 → Security pattern must be written for the function to be executed	N/A
60002	Pattern value part 2	Uint16	2	WO	1304 → Security pattern must be written for the function to be executed	N/A
60003	Type of reset	Uint16	2	WO	1 → Reset to factory settings excluding interface parameters 2 → Reset to factory settings including interface parameters	N/A
Function 6: Test						
60000	Function selection	Uint16	2	WO	6 → Selection of the "Test" function	N/A
60001	Pattern value part 1	Uint16	2	WO	32343 → Security pattern must be written for the function to be executed	N/A
60002	Pattern value part 2	Uint16	2	WO	0 → Security pattern must be written for the function to be executed	N/A
60003	Type of test	Uint16	2	WO	3 → Start RCM test	N/A
Function 7: Reset						
60000	Function selection	Uint16	2	WO	7 → Selection of "Reset" function	N/A
60001	Pattern value part 1	Uint16	2	WO	13623 → Safety pattern must be written for the function to be executed	N/A
60002	Pattern value part 2	Uint16	2	WO	0 → Security pattern must be written for the function to be executed	N/A
60003	Type of reset	Uint16	2	WO	1 → Reset of the alarm message when fault memory is enabled	N/A

6 Error – Cause – Error correction

Error pattern	Cause	Correction	Source
RS-485			
Unstable system	Missing termination due to incorrect commissioning or defective component. No device is terminated.	Configure the terminating resistor, determine the terminating resistor value and replace it if necessary.	
	Faulty termination due to incorrect configuration or defective component. Only one or more than two devices are terminated.	Configure the terminating resistor, check quality of the bus signal.	
No communication	Incorrect configuration: different baud rates between bus devices.	Calibrate baud rates between all bus devices.	
	Incorrect connection: terminals A and B are mixed up.	Establish correct bus wiring.	
Alarm relays			
Relays do not energise	No alarm message due to defective component or defective controlling devices. No alarm source has been assigned.	Check relay for proper function, replace device if necessary. Assign alarm sources.	
Relays do not de-energise	No alarm reset due to sticking or defective relay. Switching current > 5 A.	Replace device, if necessary. Observe technical data of the switching output.	
	No switching of the relay due to excessive preloads on contacts.	Observe technical data of the switching output.	
Enclosure			
Broken screw-mounting brackets	Device becomes detached due to broken mounting brackets.	Preventive measure: Use correct screw type and observe max. tightening torque. If the screw-mounting brackets are defective: mount on DIN rail or replace device.	
Non-compliance with the insulation guideline	Insufficient insulation due to insufficient distance between mounting screws and connecting wires.	Use screws with plastic cover or mount on DIN rail.	
Terminals			
Wires detach from the terminal	Due to splicing of wire ends, it is not possible to insert them into the terminal or hold them firmly in the terminal.	Use ferrules for mounting and connection to flexible cables.	
Wires cannot be removed from terminal	Ferrules with strong crimp impressions get stuck in the terminal	Use correct crimping pliers for mounting and connection with flexible cables.	

7 Technical data

IEC 60664-1/IEC 60664-3

Definitions:

- Supply circuit (IC1) A1, A2
- Output circuit (IC2) 11, 14, 12
- Measuring & control circuit (IC3) .....S1, S2, +, –, A, B

Rated voltage.....250 V

Overvoltage category..... III

Operating altitude..... ≤ 2000 m AMSL

Rated impulse voltage:

- IC1/(IC2-3).....4 kV
- IC2/IC3.....4 kV

Rated insulation voltage:

- IC1/(IC2-3).....250 V
- IC2/IC3.....250 V

Pollution degree.....2

Protective separation (reinforced insulation) between:

- IC1/(IC2-3) ..... Overvoltage category III, 300 V
- IC2/IC3 ..... Overvoltage category III, 300 V

Voltage test (routine test) acc. to IEC 61010-1:

- IC1/(IC2-3).....AC 2.2 kV
- IC2/IC3.....AC 2.2 kV

Supply voltage

Supply voltage U_S.....AC/DC 100…240 V (47…63 Hz)

Tolerance of U_S.....±15 %

Power consumption..... ≤ 2 W / ≤ 3.5 VA

Inrush current (< 2 ms).....< 1.8 A

Measuring circuit

External measuring current transformer (type A)..... ..... CTAC…, W…, WF…6), WR…, WS… series

Measuring current transformer monitoring1)..... on*/off

Load.....33 Ω

Rated voltage U_n..... ..... see datasheet of measuring current transformer

Operating characteristics.....type A

Frequency range .....42…70 Hz

Measuring range (peak) ..... 2 mA…70 A

Measuring range (RMS) ..... 2 mA…50 A

Rated residual operating current .....30 A

Residual operating current $I_{\Delta n}$ (AL2)..... .....10 mA…30 A (10 mA)*

Prewarning (AL1)[1)].....50…100 % x $I_{\Delta n}$ (50 %)*

Operating uncertainty ..... ±10 % (at 0.5…5 x $I_{\Delta n}$)

Relative uncertainty ..... 0…-20 %

Hysteresis[1)].....10…25 % (15 %)*

Time response

Start-up delay t [1)].....0…999 s (0 s)*

Response delay t_{on}.....0…10 s (0 s)*

Delay on release t_{off} [1)].....0…999 s (0 s)*

Operating time

- t_{ae} at $I_{\Delta n}$ = 1 x $I_{\Delta n}$ ..... ≤ 250 ms
- t_{ae} at $I_{\Delta n}$ = 5 x $I_{\Delta n}$ ..... ≤ 100 ms

Recovery time t_b [5)].....≤ 3 s

Response time for CT monitoring .....≤ 10 s

Displays, memory

Display .....status LED incl. LED bar graph

Display range, measured value ..... 0…100 %

Fault memory alarm messages ..... on/off (on)*

Cable lengths for measuring CTs

Single wire ≥ 0.75 mm².....0…1 m

Single wire, twisted ≥ 0.75 mm².....0…10 m

Shielded cable ≥ 0.75 mm².....0…40 m

RS-485 interface

Protocol.....Modbus RTU

Baud rate ..... max 115.2 kbits/s (19.2 kbits/s)*

Parity ..... even, no, odd (even)*

Stop bits..... 1/2/auto (auto)*

Cable length (at 9.6 kbits/s).....≤ 1200 m

Cable: twisted pair ..... min. J-Y(St)Y 2 x 0.6 mm²

Required terminating resistor .....120 Ω (>0.25 W)

Device address [4)]..... 1…247 (100+last 2 digits of SN)*

Switching elements

Switching elements .....1 changeover contact

Operating principle..... .....N/C or N/O operation (N/C operation)*

Electrical endurance, number of cycles 10000

Connection

Connection type: .....Push-In

Connection properties

rigid.....0.2…1.5 mm² (AWG 24…16)

flexible .....0.2…1.5 mm² (AWG 24…16)

with ferrule with plastic sleeve ..... 0.25…0.75 mm²

with ferrule without plastic sleeve .....0.75…1.5 mm² [3)]

Contact data acc. to IEC 60947-5-1:

Utilisation category.....AC 13 / AC 14 / DC-12 / DC-12 / DC-12

Rated operational voltage.....230 V / 230 V / 24 V / 110 V / 220 V

Rated operational current..... 5 A / 3 A / 1 A / 0.2 A / 0.1 A

Minimum contact rating [2].....1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC..... DIN EN IEC 62020-1

Ambient temperatures

Operation .....-25…+55 °C

Transport .....-40…+85 °C

Storage.....-40…+70 °C

Classification of climatic conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3).....3K22

Transport (IEC 60721-3-2).....2K11

Long-term storage (IEC 60721-3-1) 1K22

Classification of mechanical conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3) 3M11

Transport (IEC 60721-3-2)..... 2M4

Long-term storage (IEC 60721-3-1).....1M12

Other

Operating mode ..... continuous operation

Mounting ..... vertical

Degree of protection, internal components (DIN EN 60529) IP30

Degree of protection, terminals (DIN EN 60529).....IP20

Enclosure material..... polycarbonate

DIN rail mounting acc. to..... IEC 60715

Flammability class..... UL94 V-0

Documentation number.....D00403

Weight..... ≤ 100 g

* Factory setting

1. Can only be configured via RS-485
2. Refers to relays that have not been operated with high contact currents
3. Use crimping pliers similar to CRIMPFOX 6 / Weidmüller PZ6/PZ6/5 only
4. Factory setting: 100 + last two digits of serial number
5. See chapter 2.2.5.1
6. See chapter 3.2.2.2

7.1 Standards & certifications

Devices of the D64RP410 series have been developed according to the following standards:

- DIN EN IEC 62020-1

7.2 Ordering information

Supply voltage US		Type
AC/DC	DC	
100…240 V	24 V	D64RP410

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