

SERCOS
I/O Unit
RECO02.2
Configuration

SYSTEM200

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- for describing the hardware functions at the RECO02.2 unit
 - connecting and installing the RECO02.2 unit
 - providing the Specifications of the RECO02.2 unit

Configuration control

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1 Brief Description and Installation of the RECO02.2 Unit

1.1 Brief Description

RECO02.2 is a remote I/O station with a SERCOS interface.

A unit consists of one/several RMB02.2-04 base racks (4 slots), a SERCOS coupler unit RMK02.2-LWL-SER, and up to 15 I/O modules. An expansion to 16 module locations is possible by installing four RMB02.2-04 base racks side by side. Communication between the SERCOS coupler unit and the I/O modules takes place via the bus board in the racks.

The individual SERCOS devices are interconnected via fiber optics cables. A maximum of 254 devices can operate in one ring.

Using the RMB02.2-04 base racks, the SERCOS coupling unit in IP 20 rating and the I/O modules can indirectly be attached to a 35-mm DIN rail.

1.2 Overview

Designation	Type	Explanation	Material no.:
Base rack, 4 slots	RMB02.2-04	accommodates up to 4 modules	278 846
SERCOS coupling unit	RMK02.2-LWL-SER-FW	SERCOS interface	280 946
Input module	RME02.2-16-DC024	2 x 8 inputs, 24 VDC	280 936
Input module	RME02.2-32-DC024	4 x 8 inputs, 24 VDC	280 937
Input module	RME02.2-32-AC115	2 x 8 inputs, 115 VAC	280 938
Output module	RMA02.2-16-DC024-200	2 x 8 outputs, 24 VDC, 2 A	280 930
Output module	RMA02.2-32-DC024-050	4 x 8 outputs, 24 VDC, 500 mA	280 931
Output module	RMA02.2-16-AC230-200	2 x 8 outputs, 230 VAC, 2 A	280 929
Output module	RMA02.2-16-RE230-200	2 x 8 relay outputs, 230 V, 2 A	280 928
Analog module	RMC02.2-2E-1A	Analog module 2 x input, 1 x output	280 945

Figure 1-1: Brief overview - RECO02.2

1.3 Installation Instructions

Installing the racks

The RMB02.2-04 racks are latched onto a TS 35x27x15 DIN rail, and secured with a screw. If necessary, the racks can be mounted directly on the mounting plate in the switchgear cabinet, using the holes provided in the racks (Figure 1-4: RMB02.2-04 rack).

A maximum of four 4 RMB02.2-04 racks can be mounted side by side. Slot addressing requires the DIP switches on the bus boards of the racks to be configured (Figure 1-6: Setting the slot addresses).

Rack arrangement

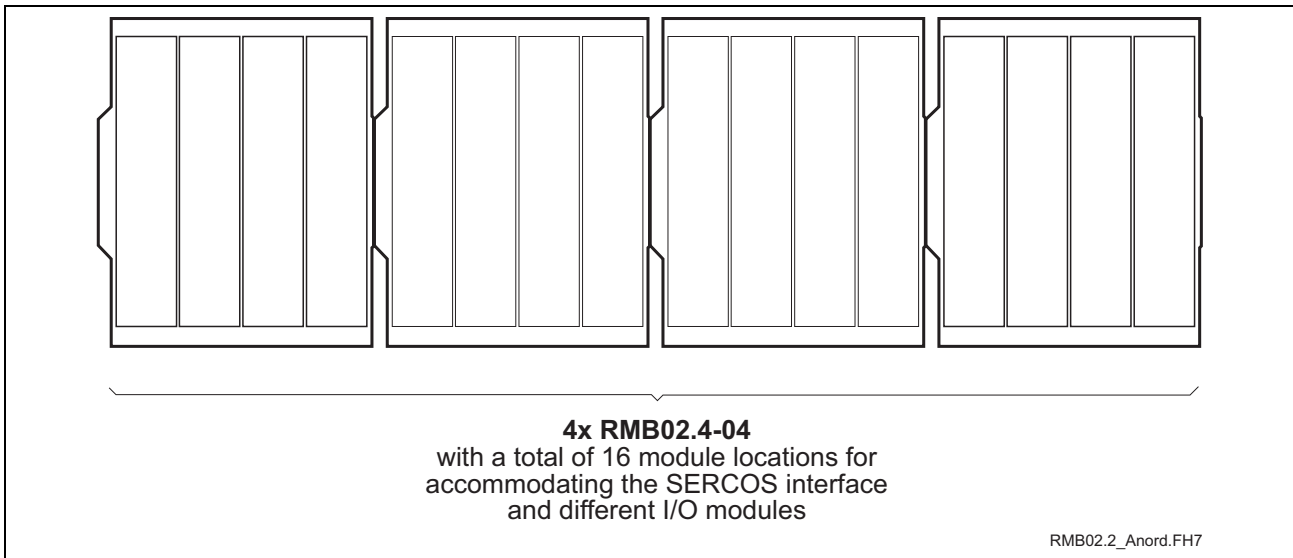


Figure 1-2: RMB02.2-04 maximum configuration

Installing the modules

Beginning with the SERCOS coupling unit and in slot 1 (left-hand side), the modules are plugged into the base rack. Each module is secured with two retaining screws. The I/O modules are installed side by side to the right of the bus coupling unit in the slots 2 through 16. There must be no gaps between the modules.

Caution: Prior to commissioning you must tighten the retaining screws of the base racks and modules. (Figure 1-4: RMB02.2-04 rack)

Never insert or disconnect a connector or module while power is applied to the unit.

1.4 Mounting dimensions of the RECO02.2 Unit

- Installing on DIN rail and fixing
- Mounting dimensions **without** mating connector

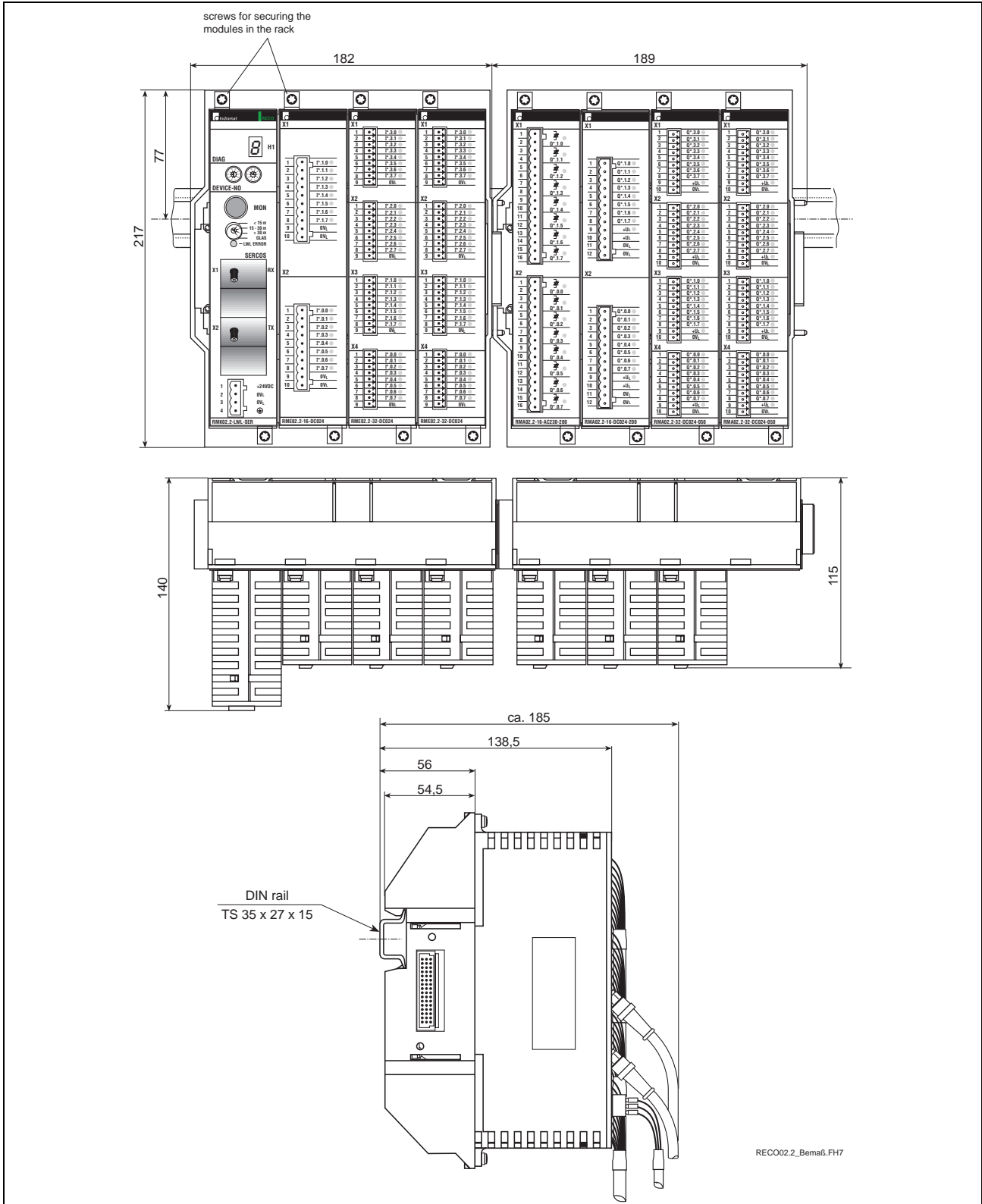


Figure 1-3: Mounting dimensions of the RECO02.2 unit

Mounting dimensions of the RMB02.2-04 rack

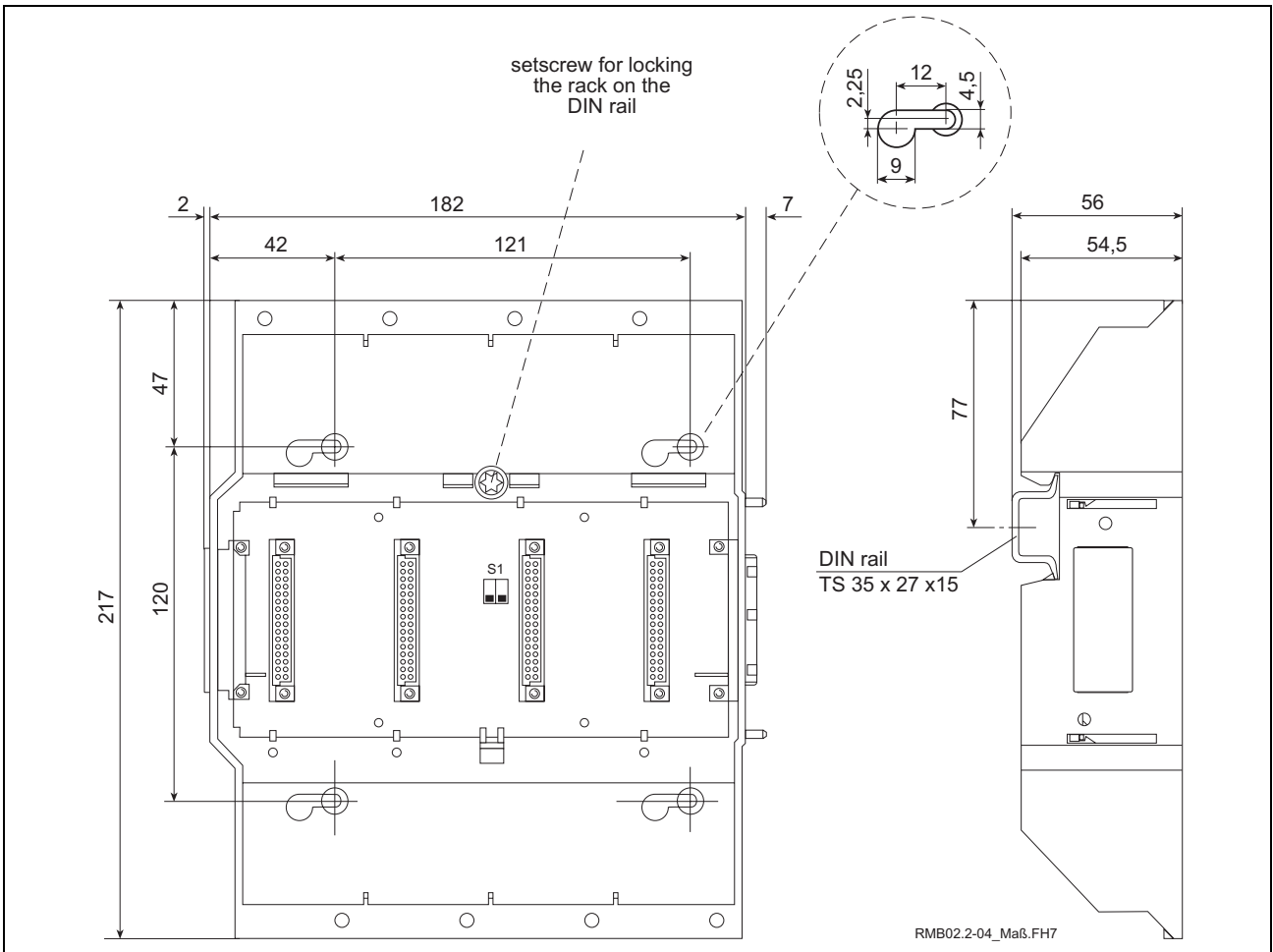


Figure 1-4: RMB02.2-04 rack

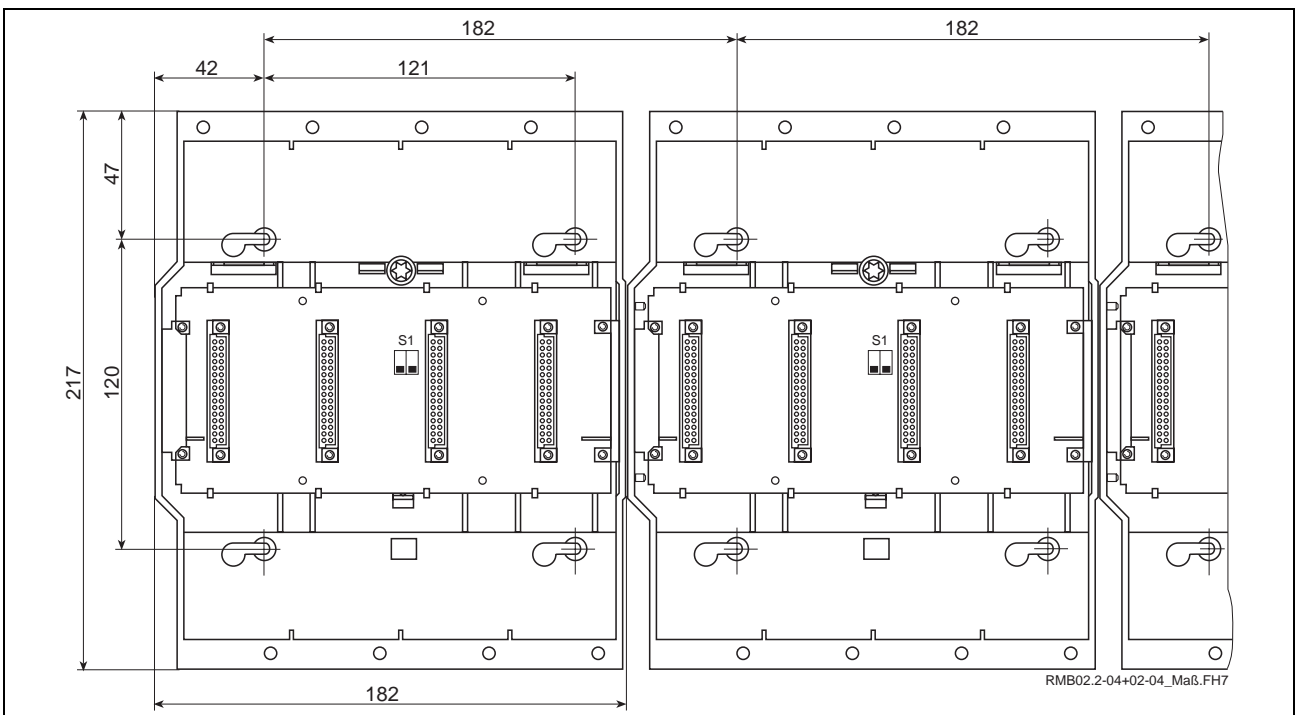


Figure 1-5: Installing several RMB02.2-04 racks side by side

1.5 Slot Addresses of the Individual I/O racks

A DIP switch on the rack's bus board enables the four racks that are possible in a chain to be addressed specifically. Depending on the module type (slot 00-03, see Figure below), this DIP switch must be set accordingly. Each slot may only be selected once.

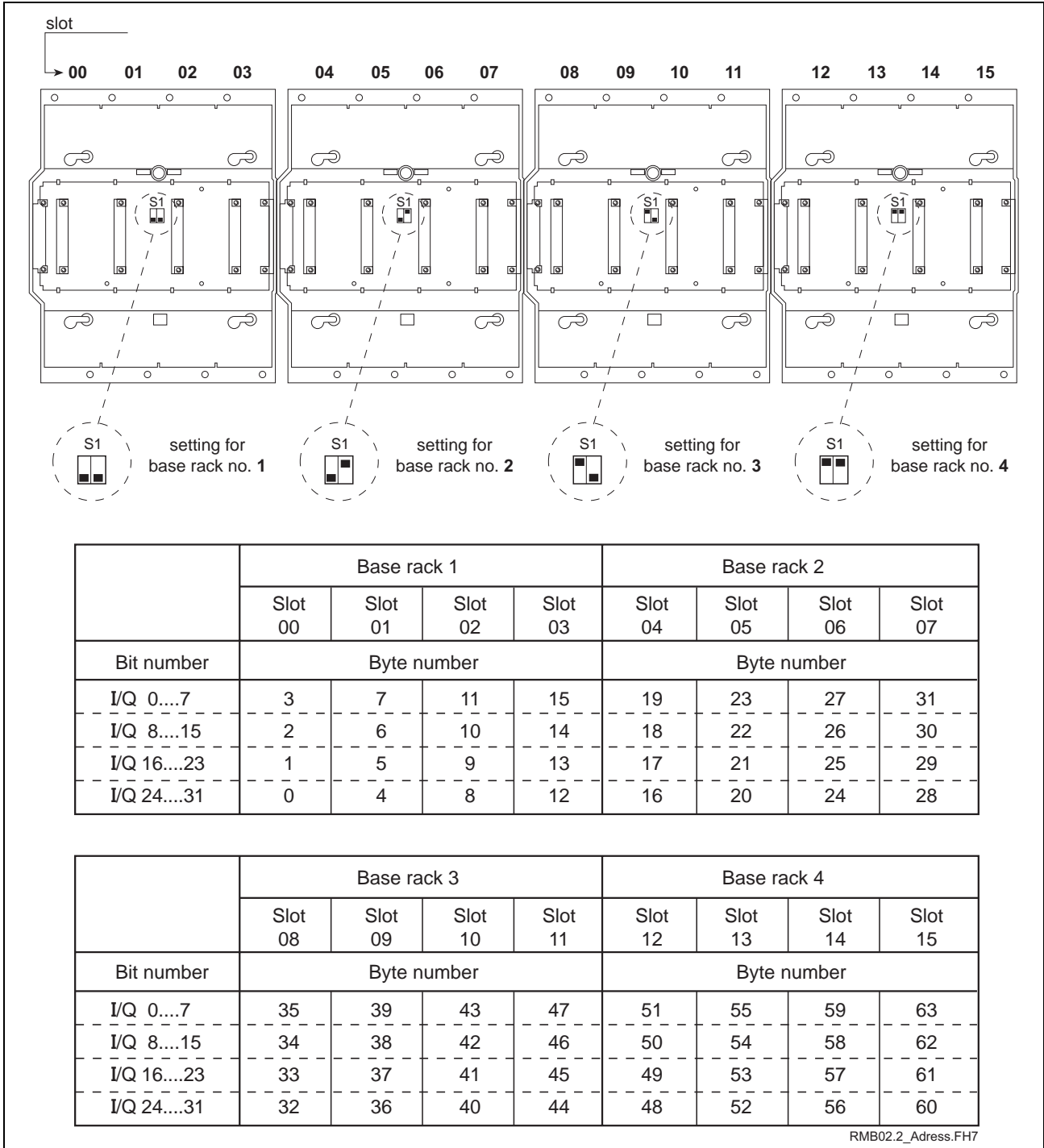


Figure 1-6: Setting the slot addresses

2 Specifications

2.1 General

Permissible cable cross-section for the supply voltage:	up to 2.5 mm ²
Mounting in the switchgear cabinet:	Using RMB02.2 racks on TS 35 x 27 x 15 DIN rail
Protection rating:	IP 20, DIN VDE, EN 60529
Humidity:	75%, no condensation 85%, no condensation (occasional) DIN 40 040 Class F
Atmospheric pressure:	860 ... 1080 hPa, 1500 m (operation) 660 ... 1080 hPa, 3500m (storage)
Operating temperature:	0°C ... 50°C, DIN 40 040 Class KV
Storage temperature:	-30°C ... +85°C

Power supply

Nominal value:	24 VDC
Permissible ripples:	4 Vss within the permissible voltage range
Permissible voltage range:	19.5 ... 31 VDC, including ripples
Current consumption:	max. 0.8 A (depends on installed configuration)
Short-circuit current:	3.0 A (fuse)

EMC

Noise emission to EN 55022:	Class an industry environment)
Noise immunity to IEC 1000-4-2 (ESD):	Judgement criterion B
Noise immunity to IEC 1000-4-4 (Burst):	Judgement criterion B
Noise immunity to IEC 1000-5-5 (Surge):	Judgement criterion B

2.2 Addressing

General information about addressing

The SERCOS-RECO is slot-oriented. This means that each RECO module can be addressed via its slot. Thus, 16 addresses are available in a maximum configuration. Each RECO module has its own module ID that can be read via the SERCOS parameters (see SERCOS-RECO02.2 description of functions).

Each SERCOS-RECO possesses a device address in the SERCOS fiber optics ring. This address can be selected in the range between 1 and 99. The address 0 is not a valid SERCOS device address. A SERCOS-RECO with this address does not participate in the communication with the controller.

Module addressing of the INDRAMAT SPS

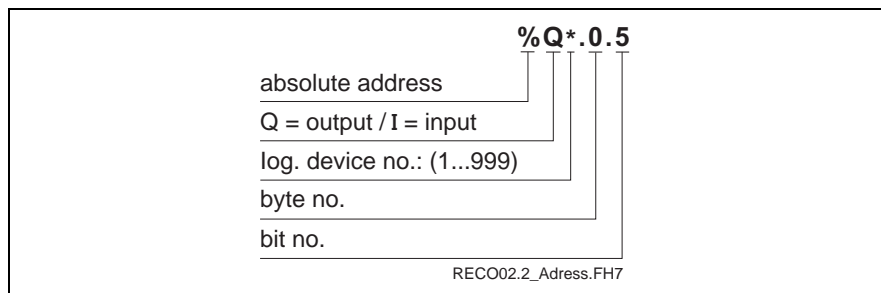


Figure 2-7: Typical address selection for an output module

Address selection for input modules

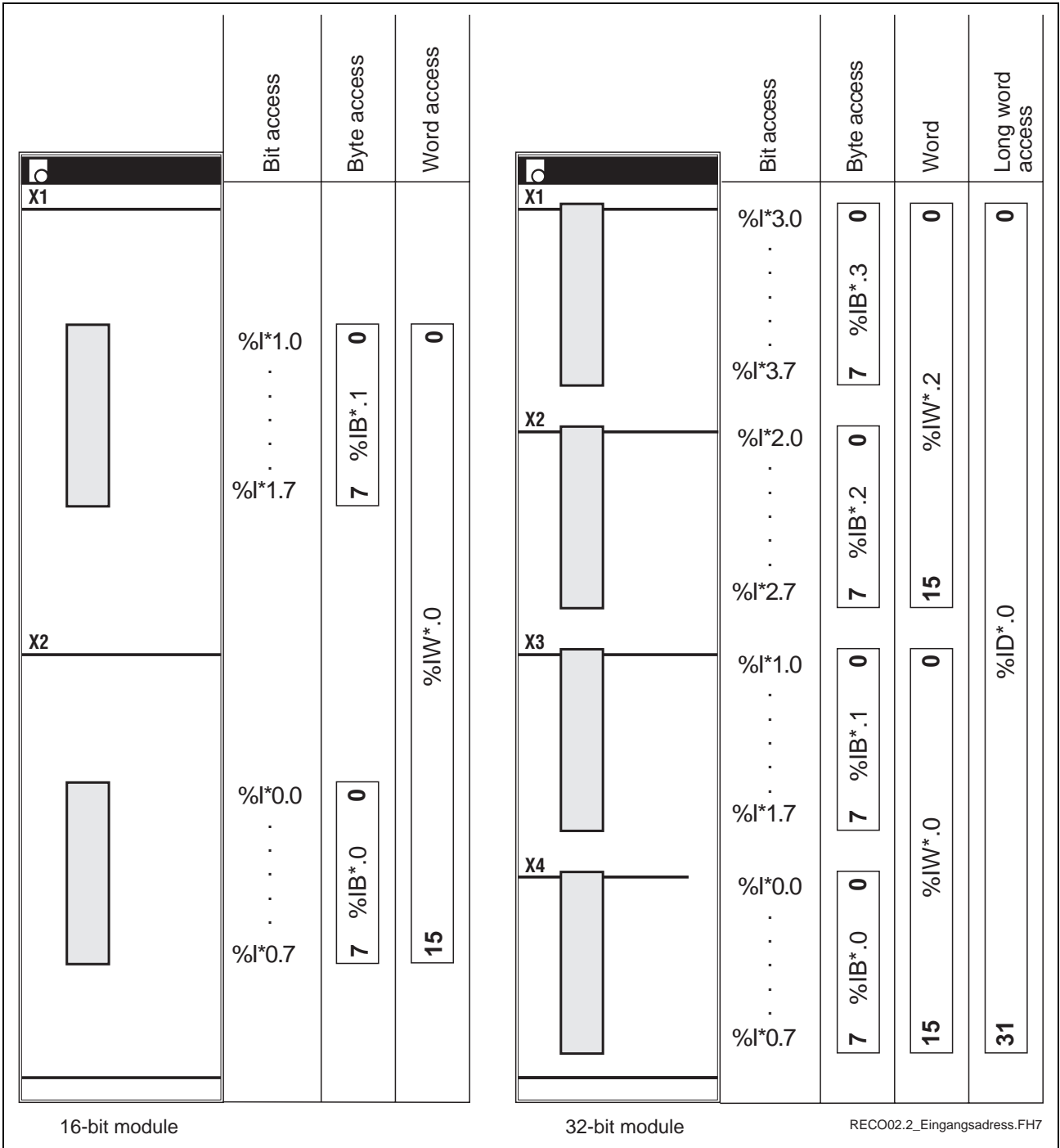


Figure 2-8: Bit, byte, word, and long word addresses for input modules

Address selection for output modules

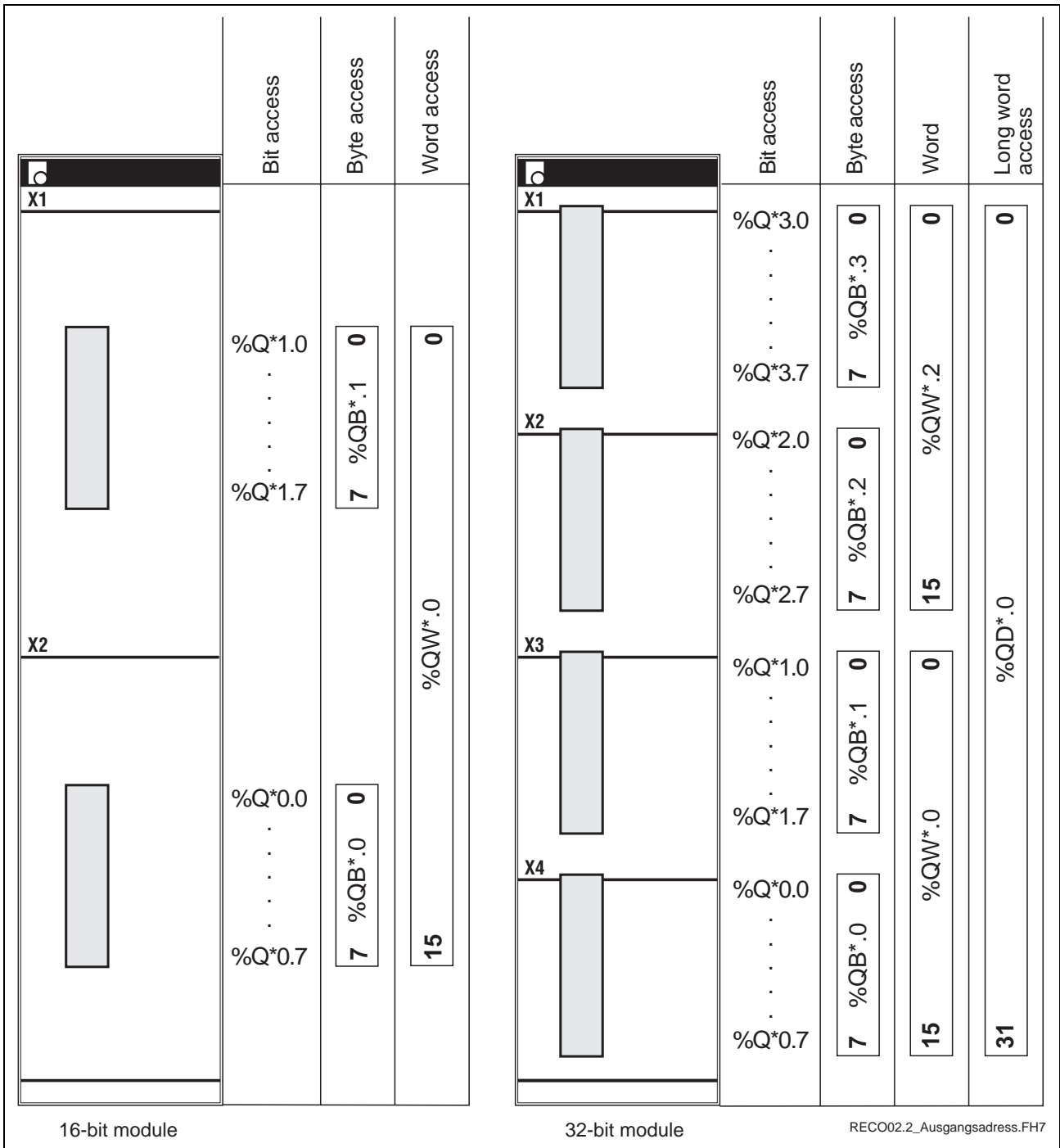


Figure 2-9: Bit, byte, word, and long word addresses for output modules

3 SERCOS Coupling Unit RMK02.2-LWL-SER

3.1 Brief Description

The SERCOS coupling unit RMK02.2-LWL-SER is an I/O device in the SERCOS drive ring. The communication between controller and drive is the same as the communication between controller and Sercos I/O device. The difference is merely in the data contents. This means that there is now input and output information in the data blocks, instead of the command and actual values. The transfer of the data, the required data, and the diagnosis information is carried out according to the SERCOS specification and/or the SERCOS I/O specification.

3.2 Dimensions

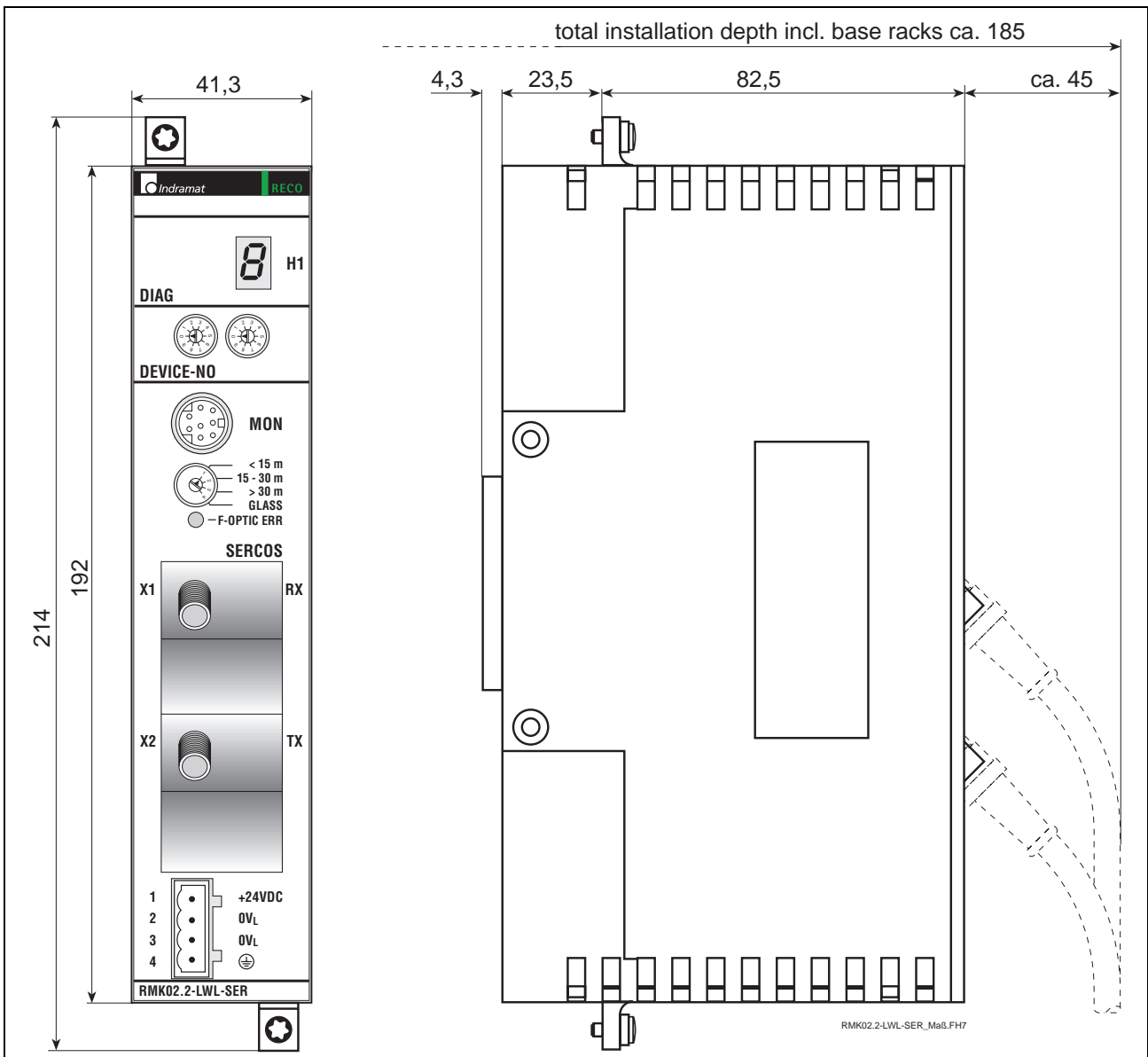


Figure 3-10: Mounting dimensions of RMK02.2-LWL-SER

3.3 SERCOS Interface

Setting the device address

Two 9-step rotary switches on the front panel of the RMF02.2-LWL-SER unit permit a device address between 1 and 99 to be selected. This enables each SERCOS device in the SERCOS ring to be addressed unambiguously (Figure 3-11: Setting the device no. and the light intensity).

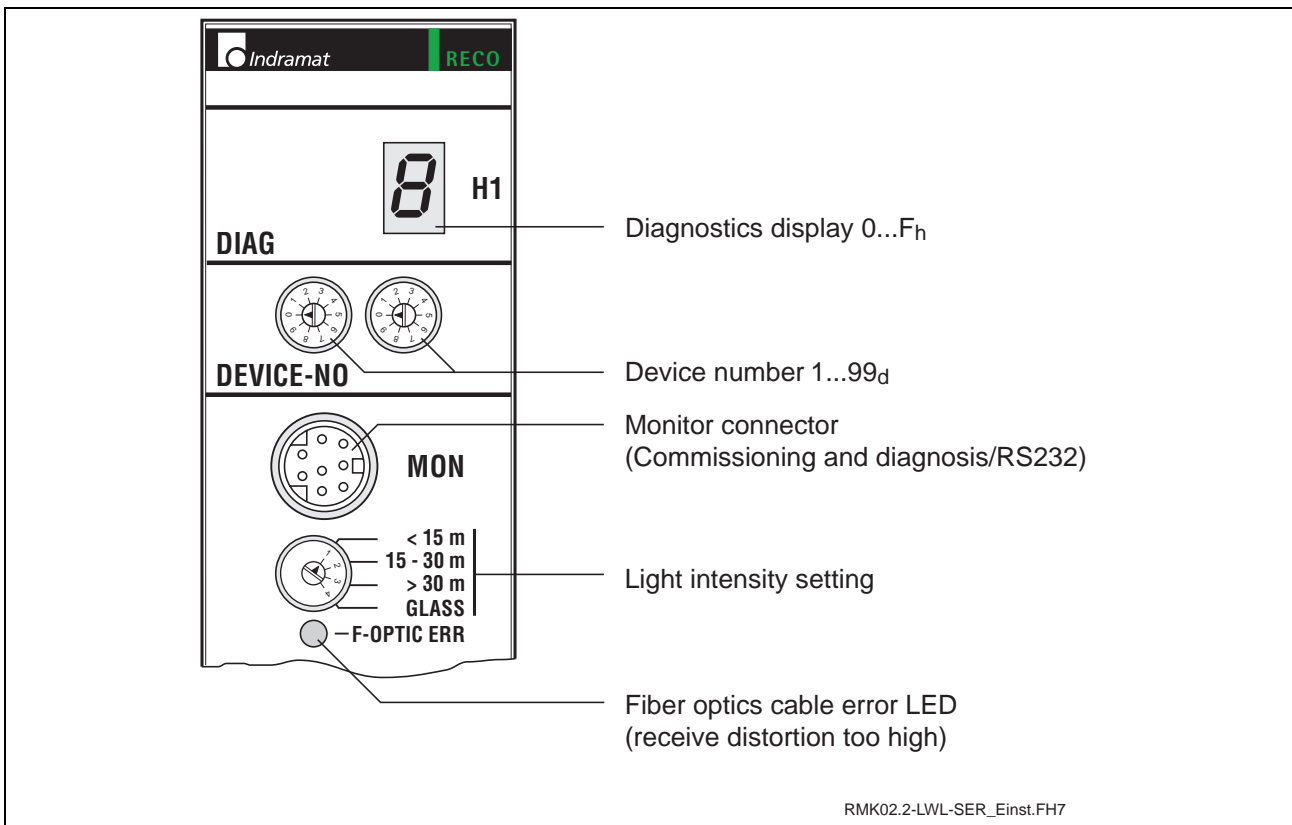


Figure 3-11: Setting the device no. and the light intensity

Communication

Communication with other SERCOS devices is performed via the SERCOS interface.

The major features of the SERCOS interface are:

- Cyclic data exchange of input and output data.
- Overall synchronization of all connected SERCOS devices with the controller.
- Cycle times between 0.5 and 65 ms.
- Selectable baud rate of 2 or 4 Mbits/s.
- Service channel for parameter value assignment and diagnosis
- Data transfer via fiber optics ring
- Configurability of the message frames

Here, the functionality of the interface will only be discussed briefly. Please refer to the SERCOS interface specification and the SERCOS interface I/O functions for more detailed information.

Cyclic data transfer via SERCOS

To synchronize the SERCOS device on the ring, the master synchronization frame (MST) is transmitted at the beginning of each SERCOS cycle. The sole information content of this frame is the communication phase that is specified by the master.

Once per SERCOS cycle time, a master data frame (MDT) is transmitted from the controller to each SERCOS device. It contains the master control word, segments of the service channel, and a configurable data block. The data block usually contains the output information the controller wants to send to the SERCOS device for controlling the respective mode. The contents of this data block can be configured through the message frame selection.

The master data message frame is received by all SERCOS devices in the ring at the same time.

Likewise, once per SERCOS cycle time, a drive message frame (AT) is transmitted from each SERCOS device to the controller. It contains the drive status word, segments of the service channel, and a configurable data block. The data block usually contains the input information the controller requires for controlling the respective mode of the SERCOS device.

3.4 Power Supply

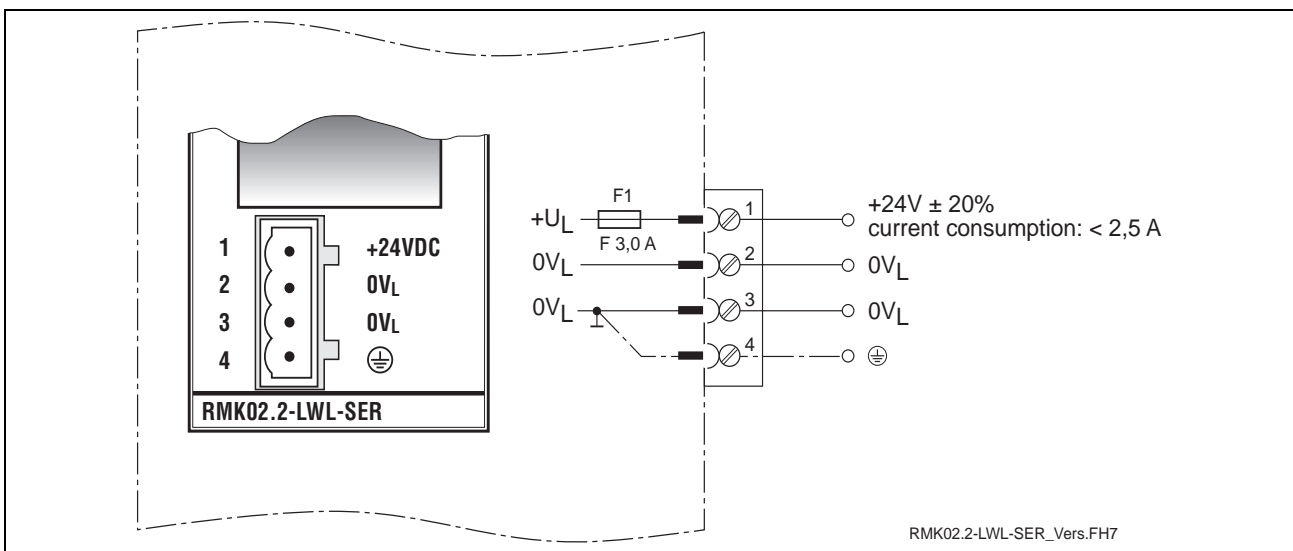


Figure 3-12: Connector pin assignments of the power supply

3.5 Status Display and Fault Diagnosis

Operating state display

The 7-segment display H1 permits a diagnosis of the SERCOS-RECO unit to be made. The display element employs the following one-digit error codes (see Figure 3-13: Operating states of RMK02.2-LWL-SER)

Code	Meaning
<i>b</i>	Operational (SPS is running)
<i>0.</i>	Power-on state (reset test)
<i>F.</i>	Firmware in Flash EPROM invalid

Figure 3-13: Operating states of RMK02.2-LWL-SER

Note: Please notify Service **immediately** if any other 1-digit code with a period is displayed.

Error display

A 7-segment display that flashes in succession is used for displaying **4-digit** error states.

Code	Meaning
<i>F401</i>	Shutdown, double MST failure
<i>F402</i>	Shutdown, double MDT failure
<i>F403</i>	Shutdown, illegal communication phase
<i>F404</i>	Error in incrementing the phase
<i>F405</i>	Error in decrementing the phase
<i>F406</i>	Phase changeover without ready message

Figure 3-14: Error codes of RMK02.2-LWL-SER

Please refer to the SERCOS-RECO description of functions for further error codes.

4 RME02.2-16-DC024 Input Module

4.1 Brief Description

The digital 24 VDC input modules are designed for connecting digital control signals that are produced by pushbuttons, limit switches or electronic proximity switches. The 16 inputs are arranged in 2 isolated potential groups.

4.2 Dimensions

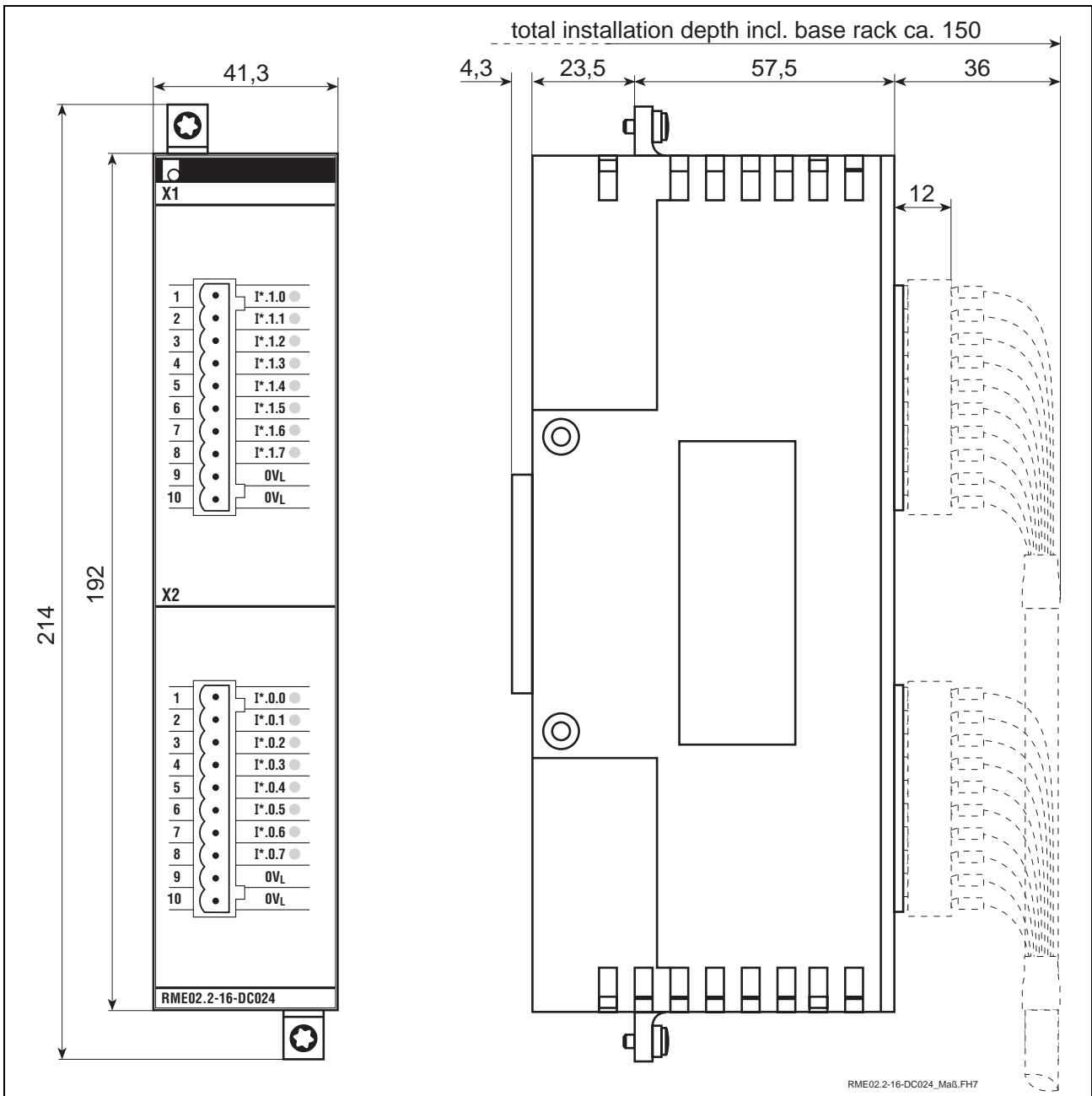


Figure 4-15: Mounting dimensions of RME02.2-16-DC024

4.3 Pin Assignments

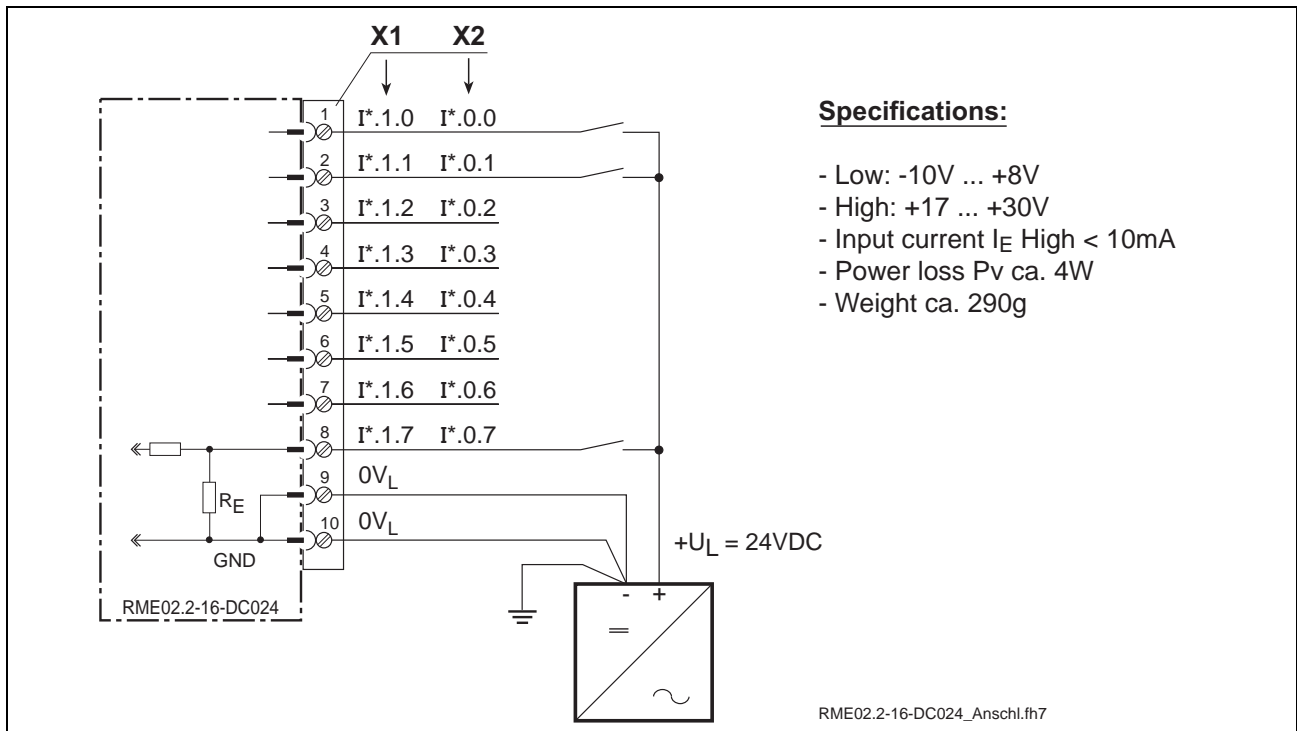


Figure 4-16: Wiring diagram of RME02.2-16-DC024

5 RME02.2-32-DC024 Input Module

5.1 Brief Description

The digital 24 VDC input modules are designed for connecting digital control signals that are produced by pushbuttons, limit switches or electronic proximity switches. The 32 inputs are arranged in 4 isolated potential groups.

5.2 Dimensions

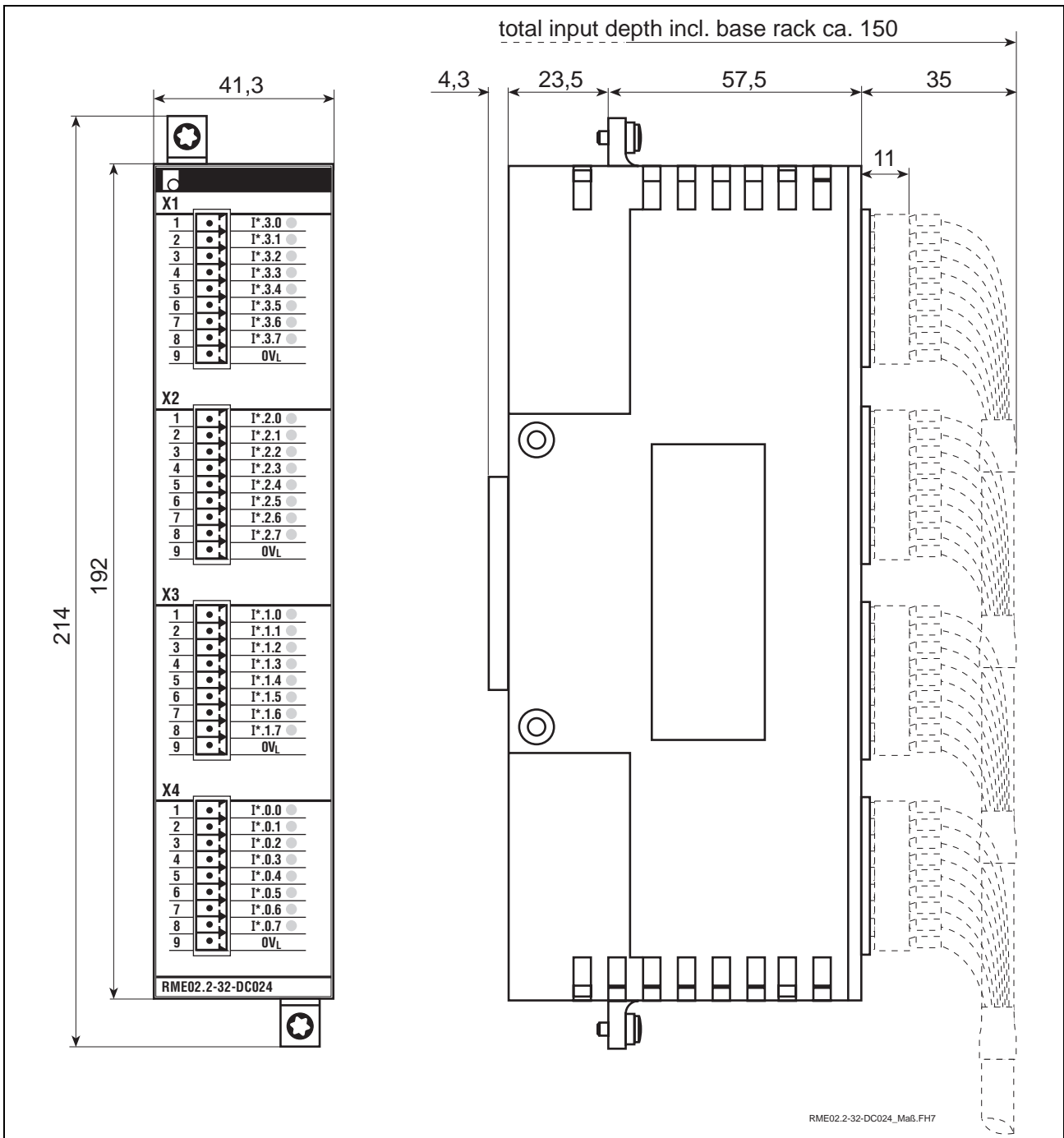


Figure 5-17: Mounting dimensions of RME02.2-32-DC024

5.3 Pin Assignments

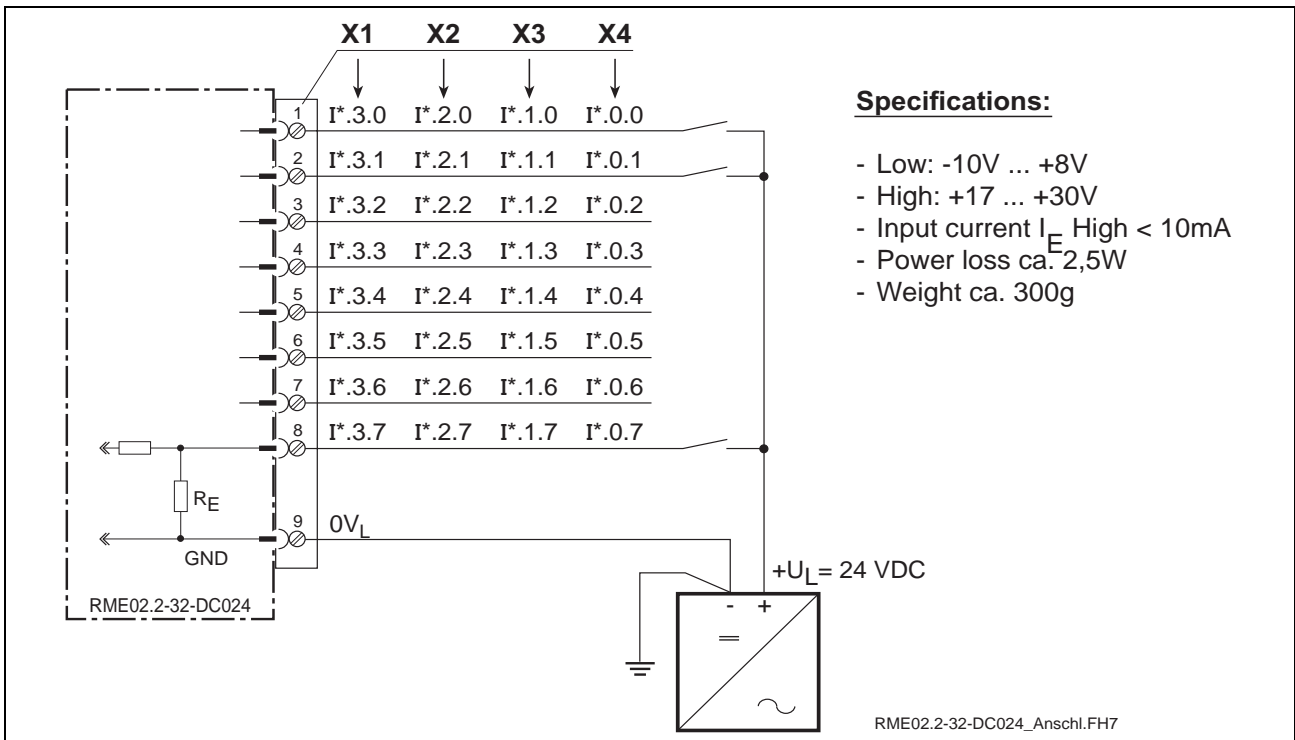


Figure 5-18: Wiring diagram of RME02.2-32-DC024

6 RME02.2-16-AC115 Input Module

6.1 Brief Description

AC sources of a maximum rating of 120VAC / 60Hz can directly be connected to the digital 115VAC input modules. The 16 AC inputs are arranged in 2 isolated potential groups.

6.2 Dimensions

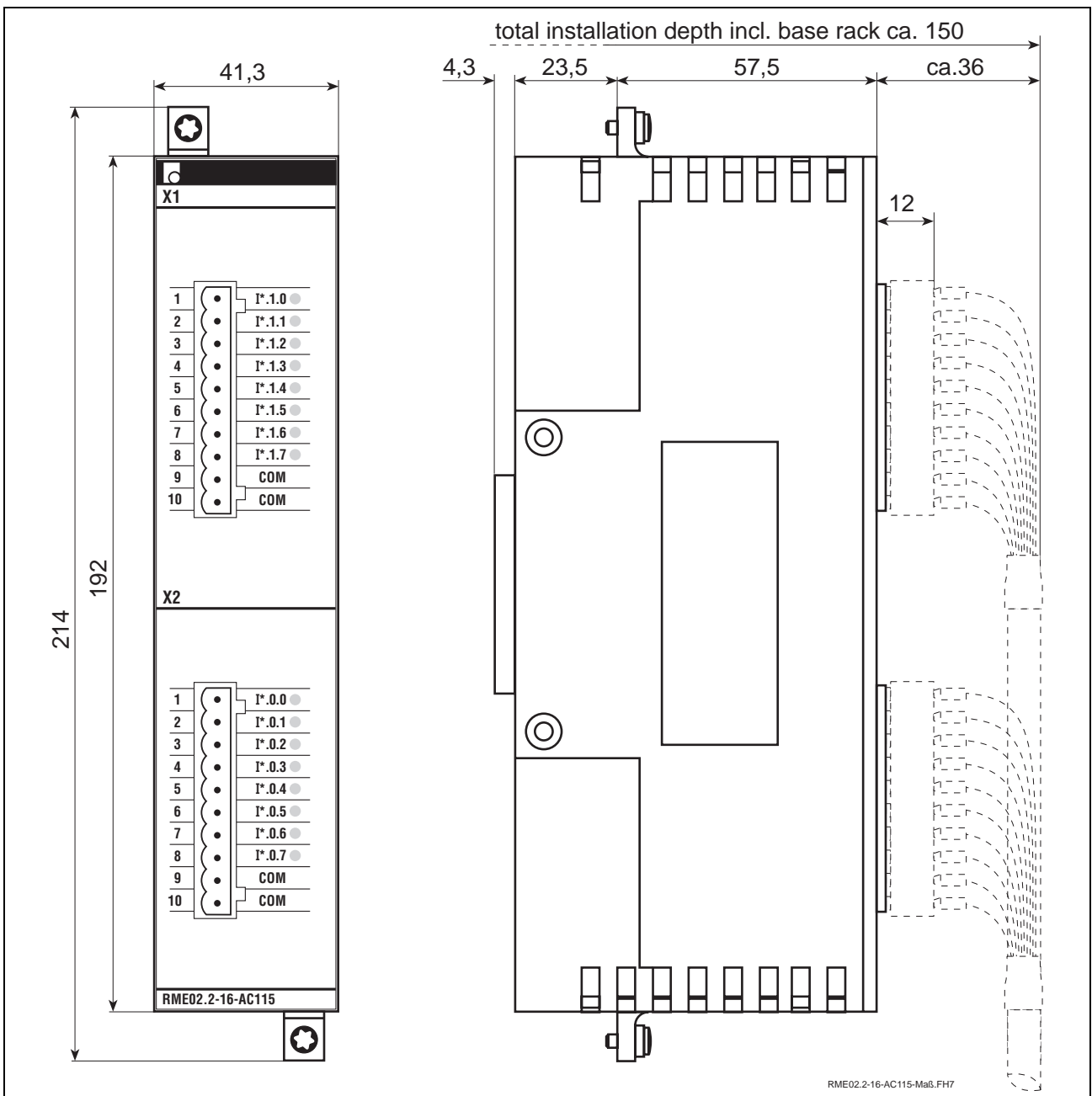


Figure 6-19: Mounting dimensions of RME02.2-16-AC115

6.3 Pin Assignments

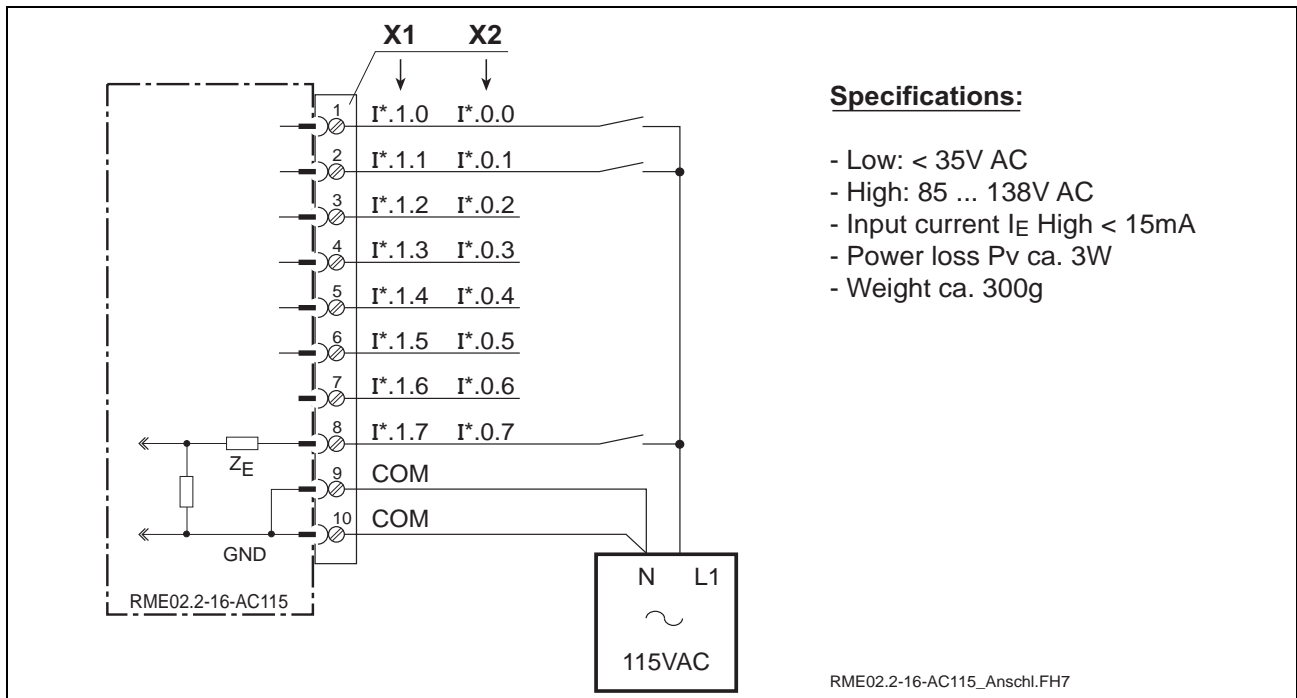


Figure 6-20: Wiring diagram of RME02.2-16-AC115

7 RMA02.2-16-DC024-200 output module

7.1 Brief Description

The digital 24VDC output modules are designed for the connection of digital actuators, such as solenoid valves, contactors, or indicator lights. The 16 outputs are FET transistor switches (active 1 switching) that are arranged in 2 isolated groups of 8 outputs each. Each 24V output can source loads up to 2 A.

7.2 Dimensions

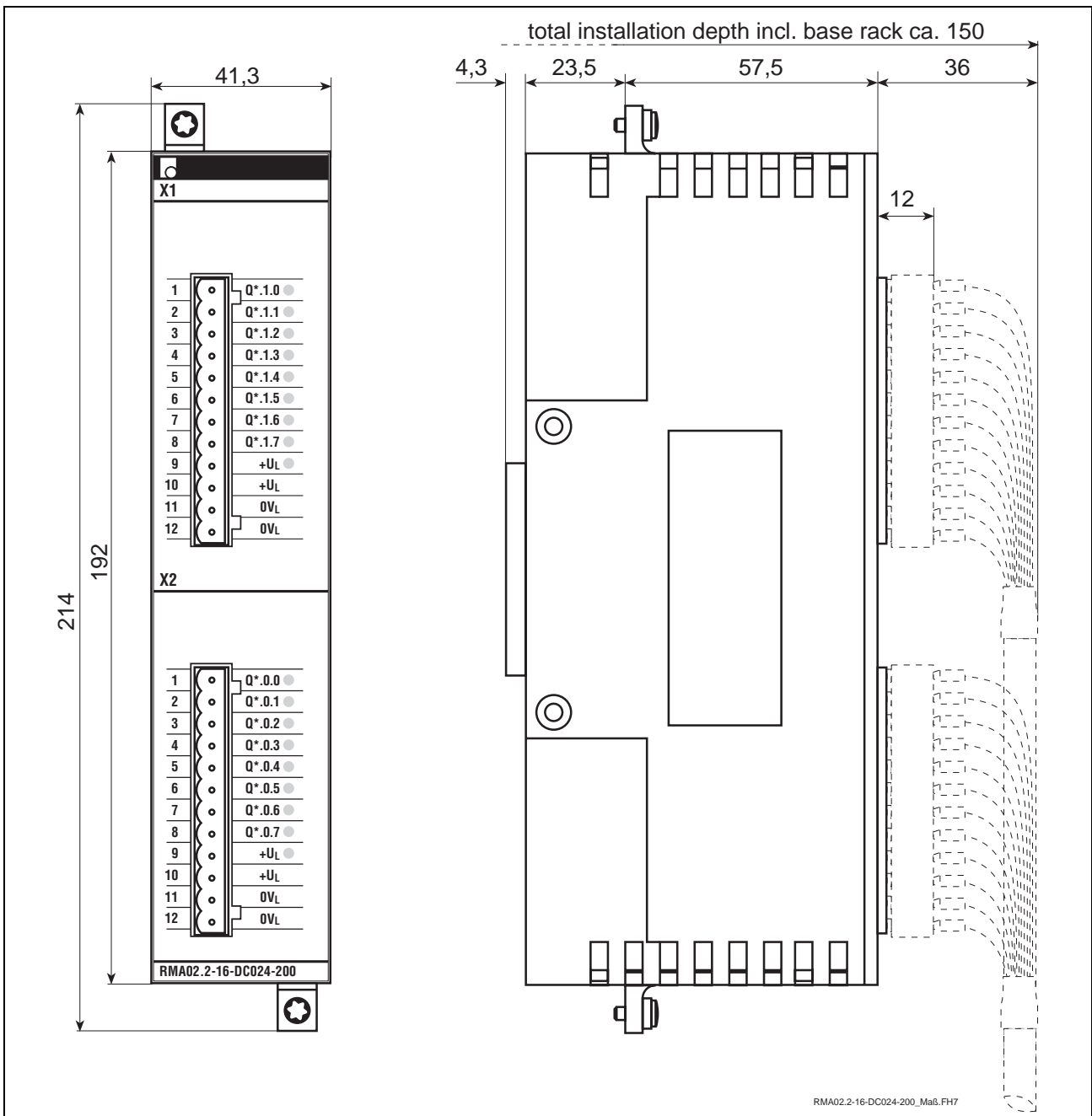


Figure 7-21: Mounting dimensions of RMA02.2-16-DC024-200

7.3 Pin Assignments

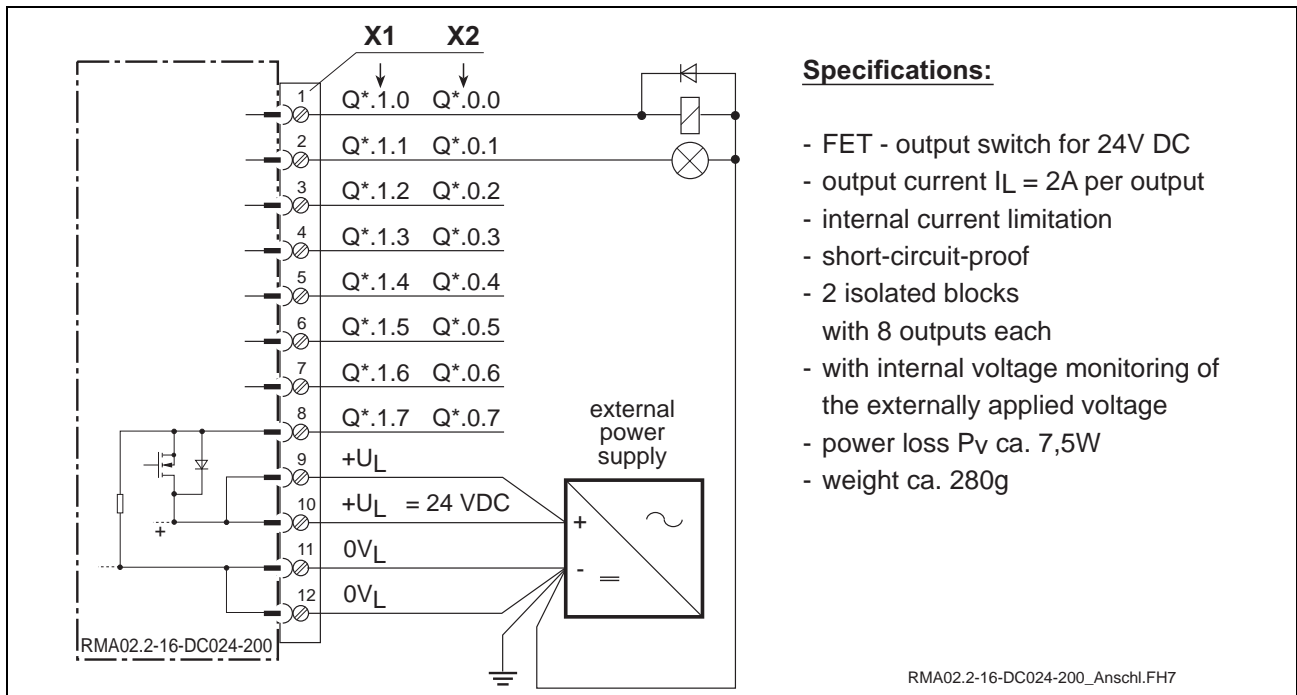


Figure 7-22: Wiring diagram of RMA02.2-16-DC024-200

8 RMA02.2-32-DC024-050 Output Module

8.1 Brief Description

The digital 24VDC output modules are designed for the connection of digital actuators, such as solenoid valves, contactors, or indicator lights. The 32 outputs are FET transistor switches (active 1 switching) that are arranged in 4 isolated groups of 8 outputs each. Each 24V output can source loads up to 500 mA.

8.2 Dimensions

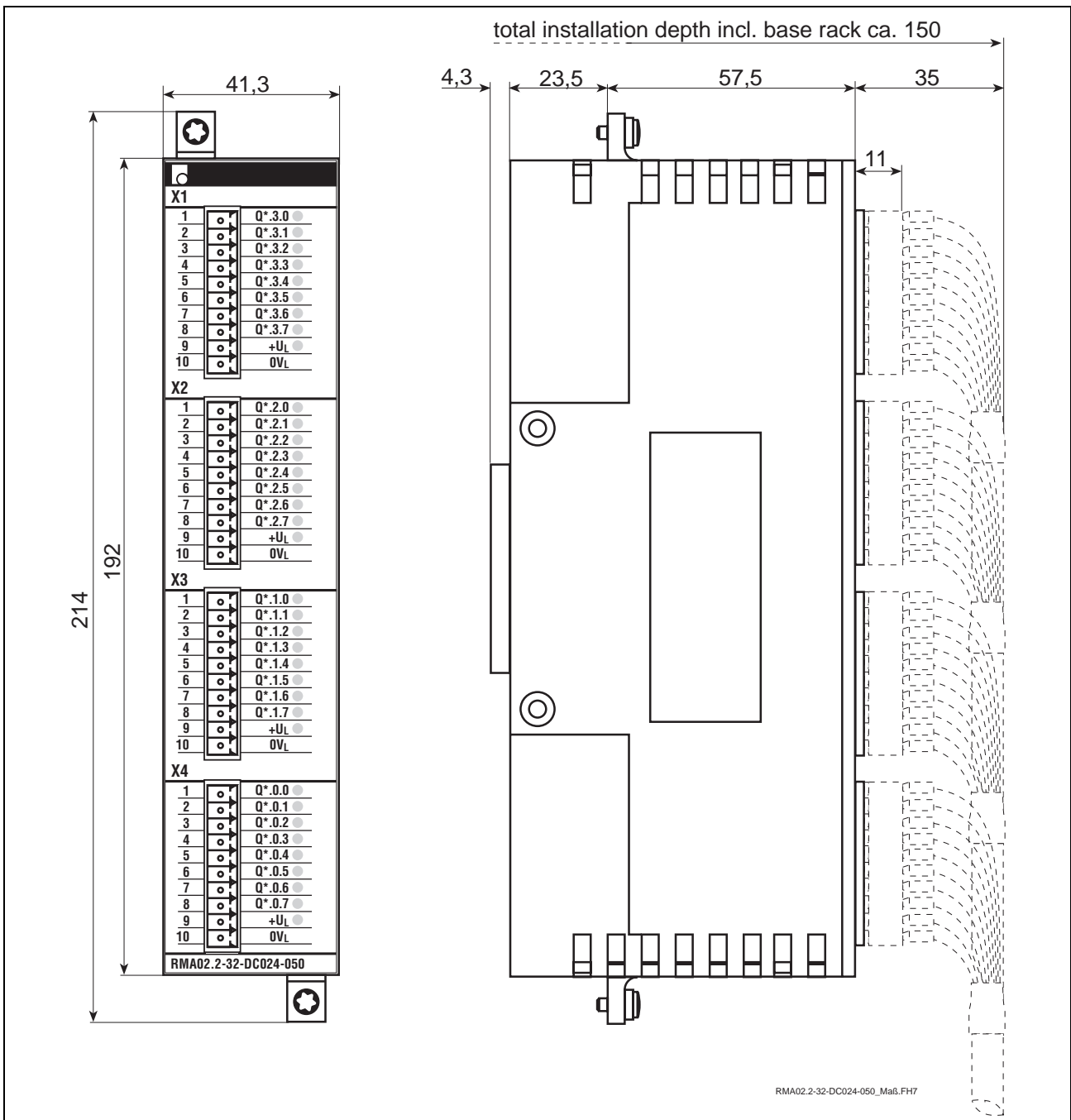


Figure 8-23: Mounting dimensions of RMA02.2-32-DC024-200

8.3 Pin Assignments

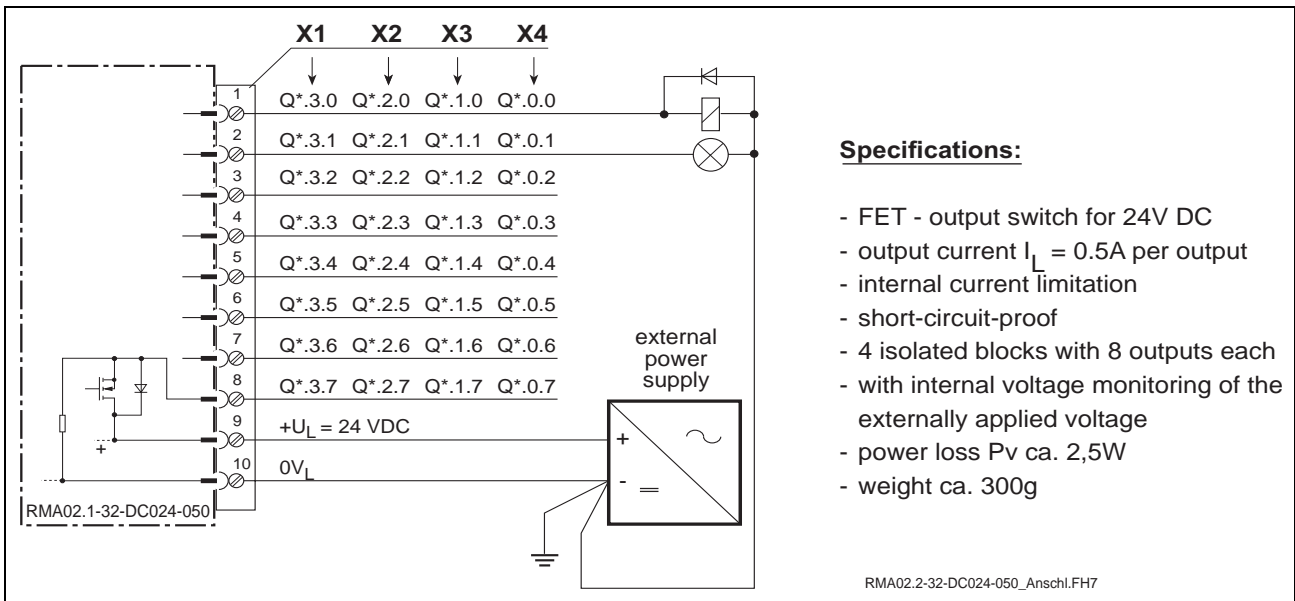


Figure 8-24: Wiring diagram of RMA02.2-32-DC024-200

9 RMA02.2-16-AC230-200 Output Module

9.1 Brief Description

The digital AC output modules are designed for the connection of digital actuators that operate on the mains voltage. The 16 active 1 switching outputs are arranged in 2 isolated groups of 8 outputs each. Each 230V AC output is able to source up to 2A.

9.2 Dimensions

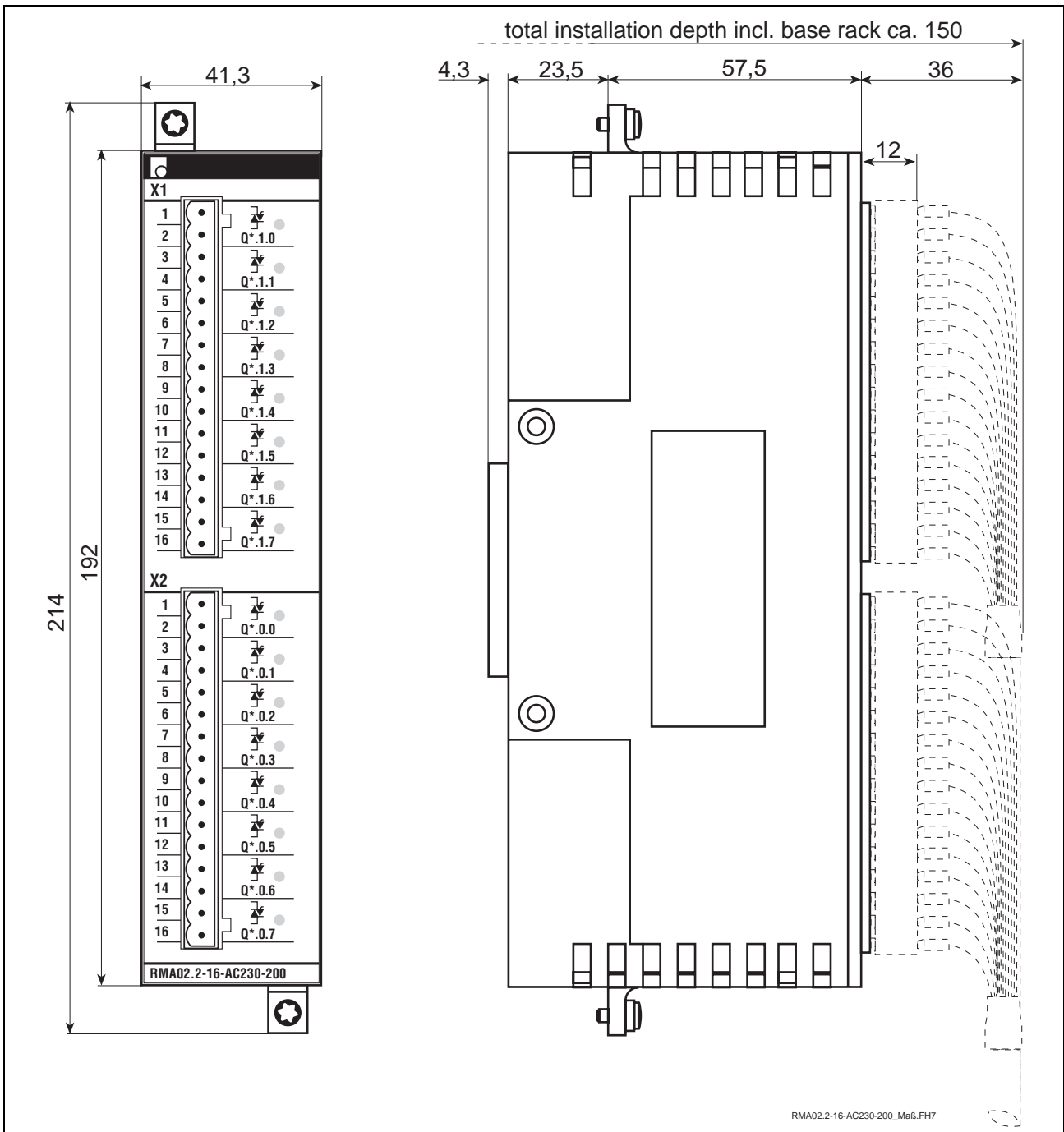


Figure 9-25: Mounting dimensions of RMA02.2-16-AC230-200

9.3 Pin Assignments

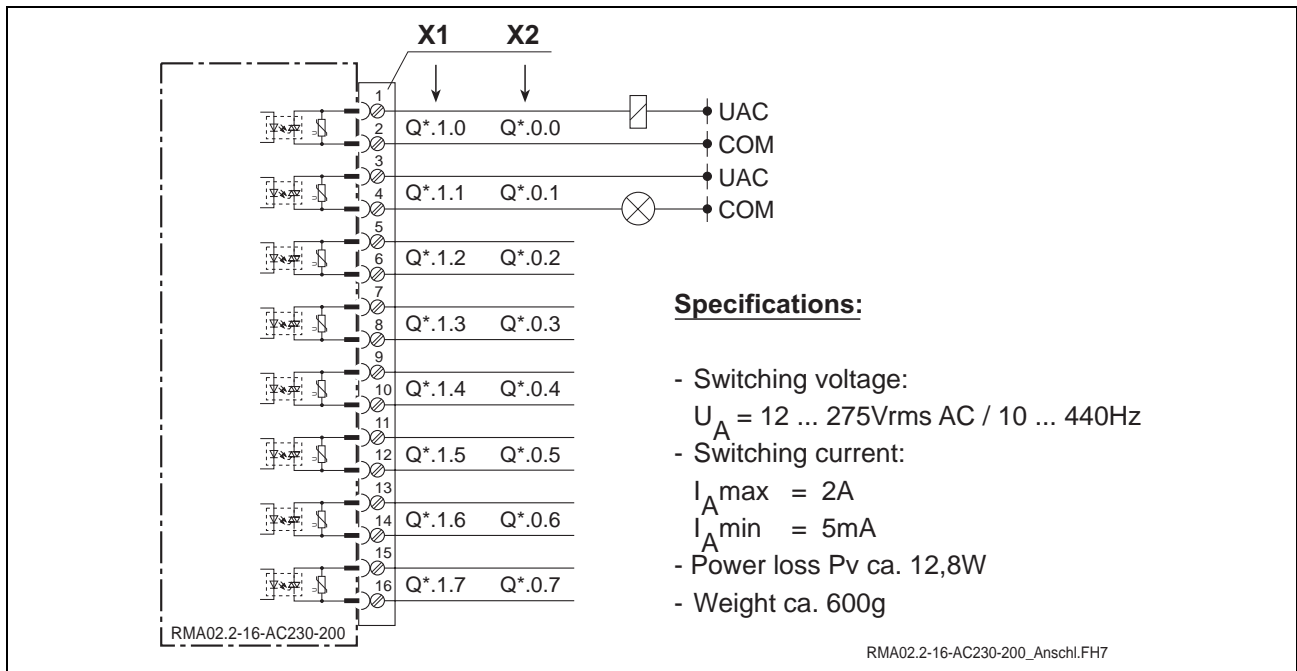


Figure 9-26: Wiring diagram of RMA02.2-16-AC230-200

10 RMA02.2-16-RE230-200 Output Module

10.1 Brief Description

The digital relay output modules are designed as floating switching contacts for AC and DC. The 16 active 1 switching outputs are arranged in 2 isolated groups of 8 outputs each. Depending on the load, the maximum switching capacity of each output is between 50W and 200W (Figure 10-28: Load-related output rating)

10.2 Dimensions

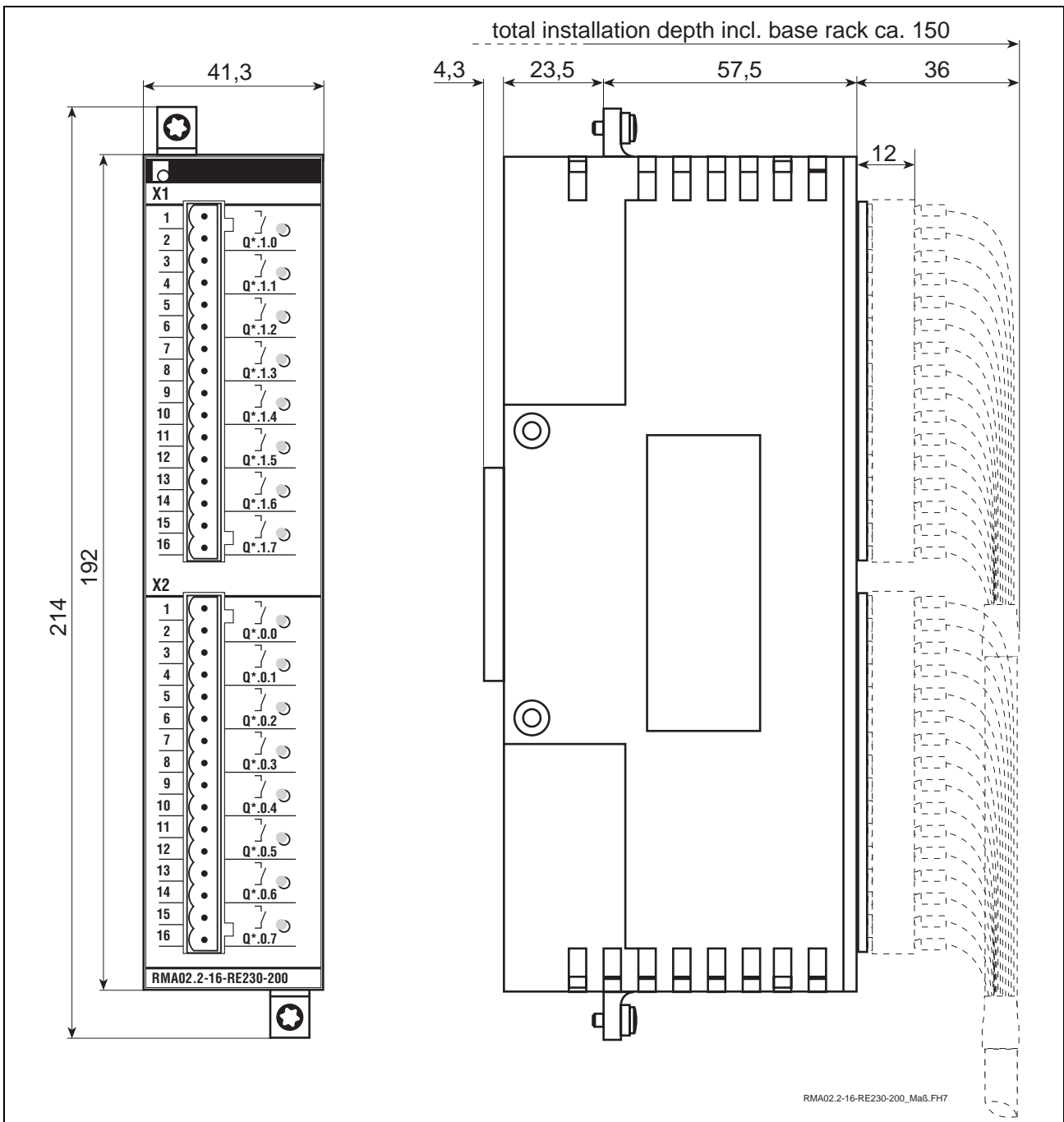


Figure 10-27: Mounting dimensions of RMA02.2-16-RE230-200

10.3 Load rating curve of the outputs

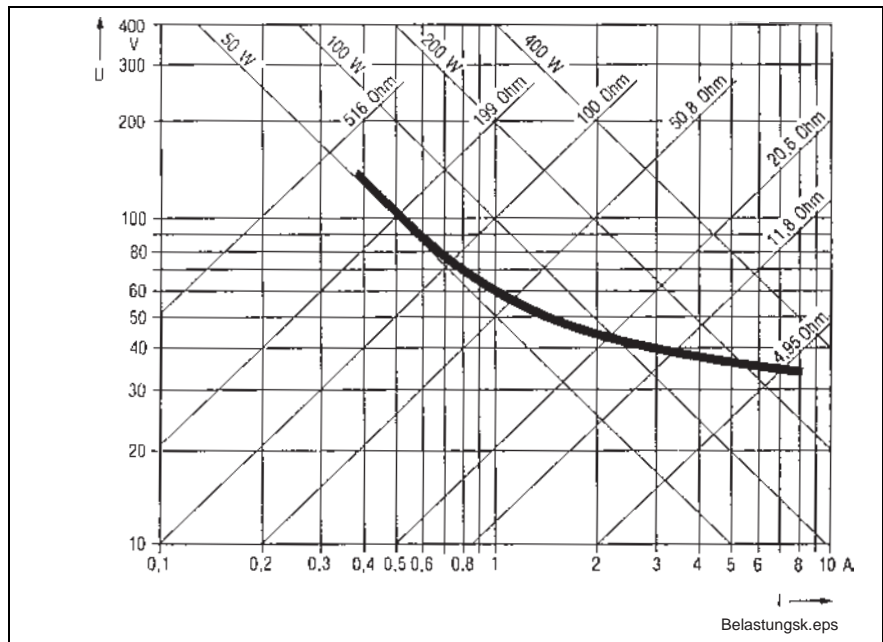


Figure 10-28: Load-related output rating

10.4 Pin Assignments

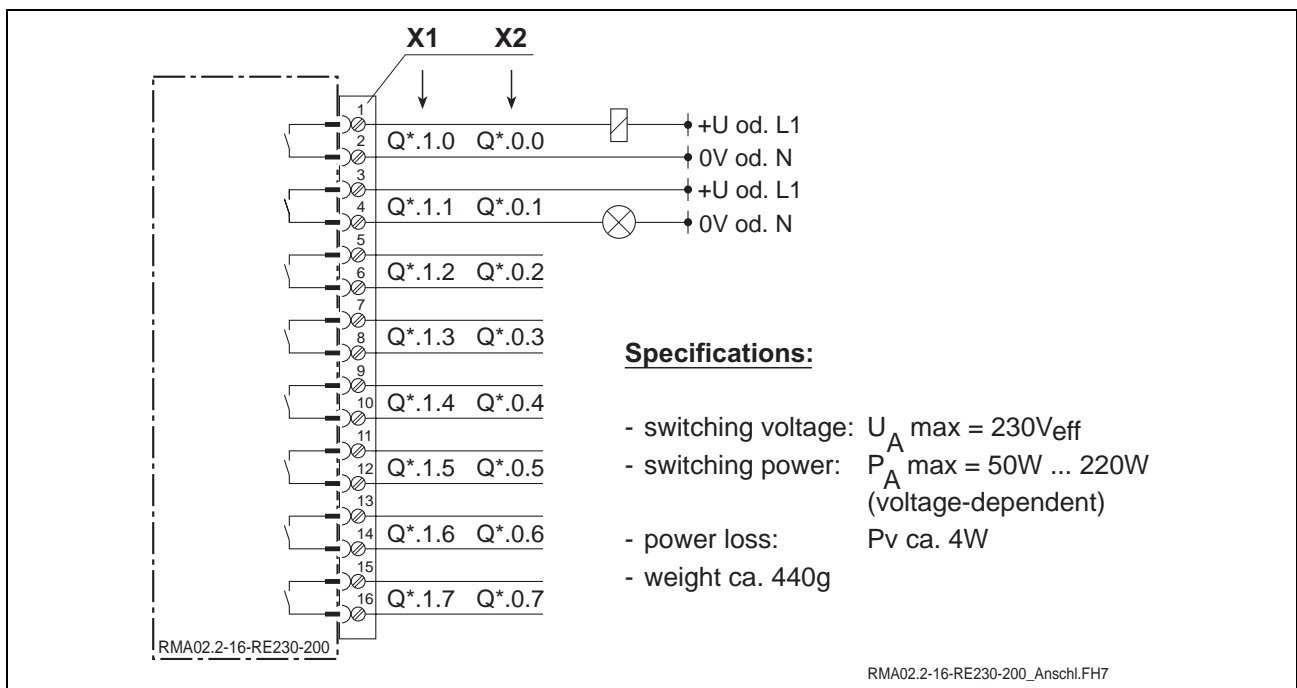


Figure 10-29: Wiring diagram of RMA02.2-16-RE230-200

11 SERCOS Analog Module RMC02.2-2E-1A

11.1 General

The RECO module RMC02.2-2E-1A is an analog I/O module for the SERCOS RECO system. The module is used in conjunction with the SERCOS communication module RMK02.2-LWL-SER in the RMB02.2 racks.

The module possesses 2 isolated input channels and one isolated output channel. 2- and 3-wire actuators and/or 2-/3- and 4-wire sensors can be connected to these outputs. Each input has a separate constant current source (2.5 mA) that eliminates the need for an external power supply for most sensors.

The analog output is available in parallel as a +/- 10V voltage output and a 0 - 20mA current output. Each input and output has its own connector.

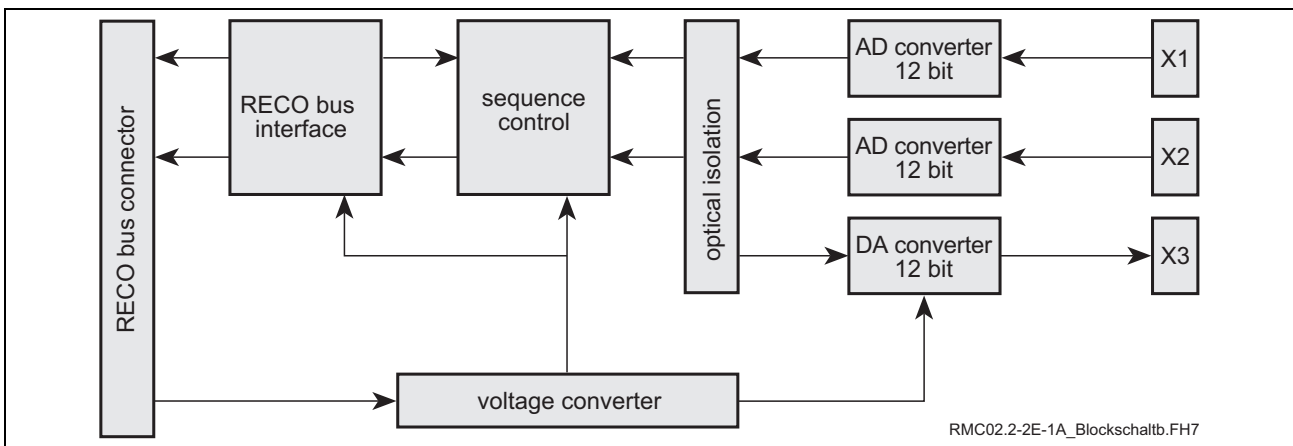


Figure 11-30: Block diagram

11.2 Dimensions

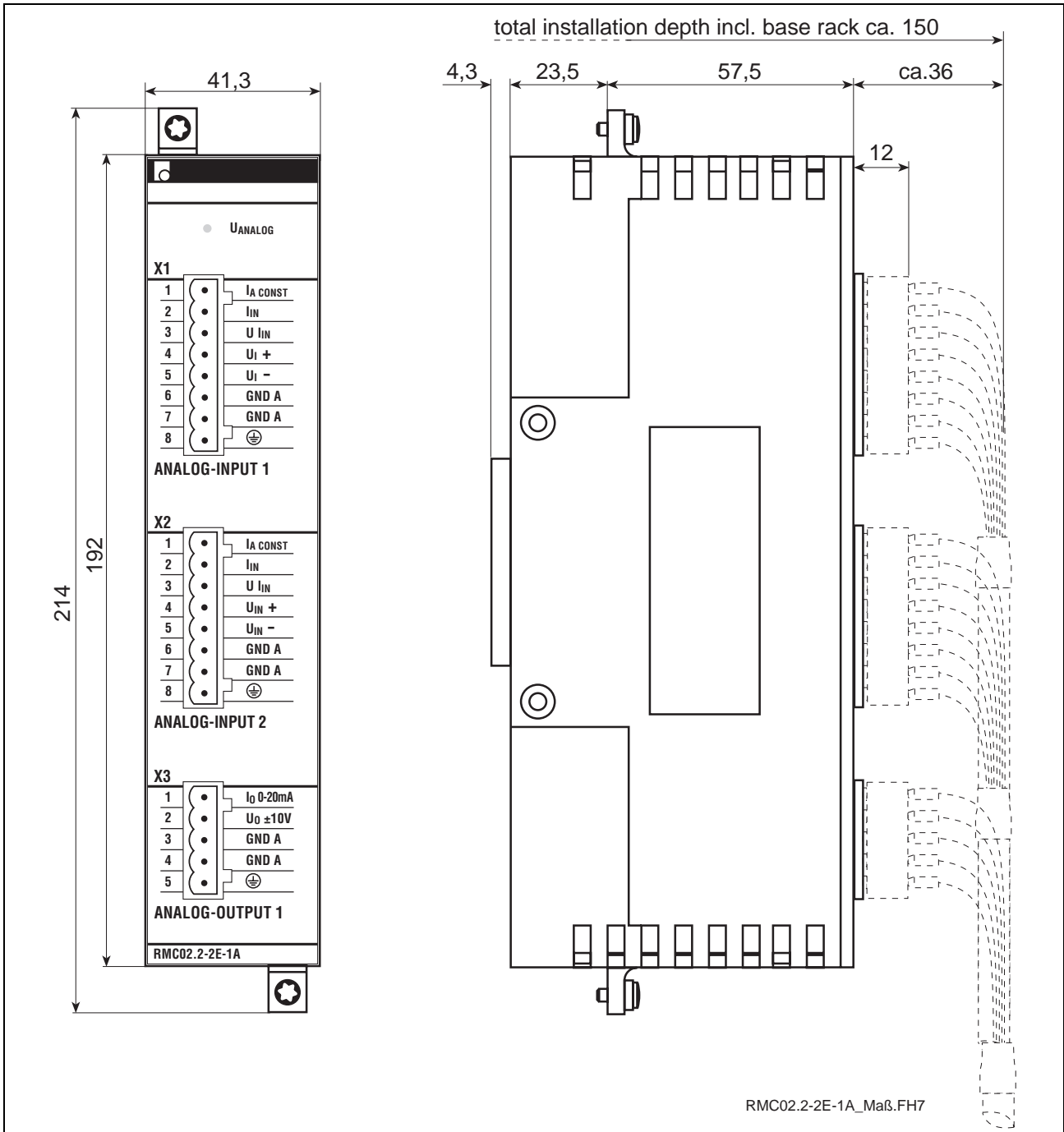


Figure 11-31: Mounting dimensions of RMC02.2-2E-1A

11.3 Analog Value Inputs X1 and X2

To suppress the influence of long lines, the X1 and X2 analog inputs are set up as differential inputs with a high common-mode rejection value. Thus, the influence of the line length can be neglected.

The measuring range of the inputs can be programmed through parameters.

Input ranges	
Bipolar input voltage range:	$\pm 0,5V$; $\pm 1V$; $\pm 5V$; $\pm 10V$
Bipolar input current range:	$\pm 20mA$
Resistance measurement:	0 - 2000 Ω (internal current source) 0 < 20K Ω (external voltage source)
Temperature measurement:	Pt 100: -100°C....+850°C
Output ranges	
Bipolar output voltage range:	$\pm 10V$
Unipolar output current ranges:	0 - 20mA

11.4 Entering the Analog Values

The analog value conversion is performed by an AD converter with a resolution of 16 bits that employs the successive approximation method. The conversion time is approximately 35 μs .

The following measuring inaccuracies occur inside the ambient temperature range 0...50°C:

- Voltage:
 - Measuring range 0.5V: 0.4% MEW (upper range limit)
 - Measuring range 1V: 0.4% MEW
 - Measuring range 5V: 0.2% MEW
 - Measuring range 10V: 0.2% MEW
- Current:
 - Measuring range 20mA: 0.3% MEW
- Resistance:
 - Measuring range 200 Ω : 0.6% MEW
 - Measuring range 400 Ω : 0.6% MEW
 - Measuring range 2000 Ω : 0.4% MEW
- Temperature (Pt100):
 - Measuring range -100...266°C: 1.3% MEW
 - Measuring range -100...850°C: 1.0% MEW

The digital value is provided as a 16-bit word in 2's complement representation via the SERCOS RECO.

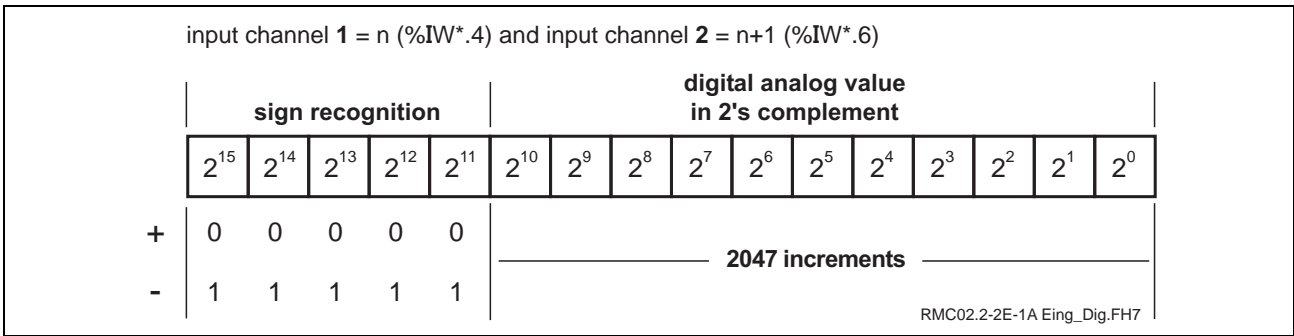


Figure 11-32: Representation of the input channels 1 and 2

11.5 Current Measurement

In current measurement, the current that is to be measured is conducted via an inbuilt 250Ω precision resistor, and the voltage drop across this resistor is measured.

The measuring error is 0.3% of the upper range limit.

11.6 Analog Value Output X3

The D/A converter for analog value output has a resolution of 12 bits and a conversion time of < 5μs.

Current output runs in parallel to the voltage output (0V....10V) at a resolution of 2047 steps.

- +10V = 20mA provides a resolution of 9.77μA/increment
- 0V = 0mA
- -10V = 0mA

Note: The current resolution error in the temperature range 0...50°C is 0.2% of the limit value; the voltage resolution error is 1% of the output value.

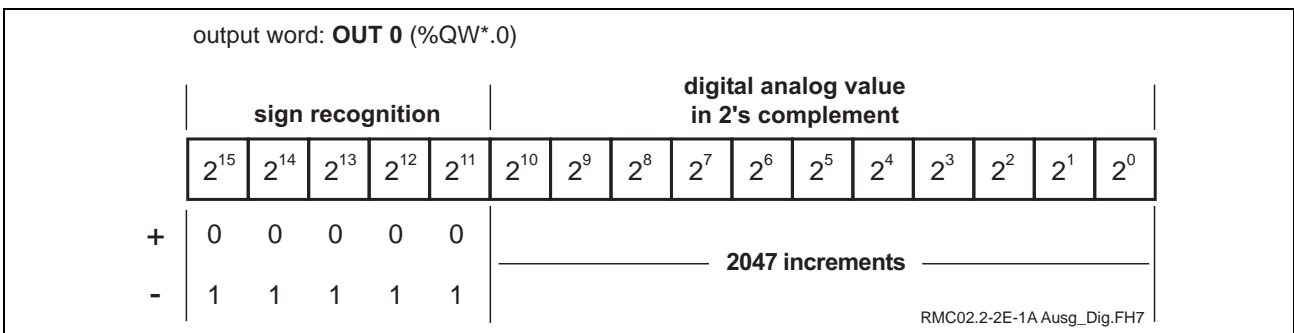


Figure 11-33: Representation of the OUT 0 output word

11.7 Programming the Input Measuring Ranges

The parameters for the input measuring ranges are transferred in the 2nd output word of the SERCOS transmission. It must be ensured that the parameters have been set accordingly before input measurement is started.

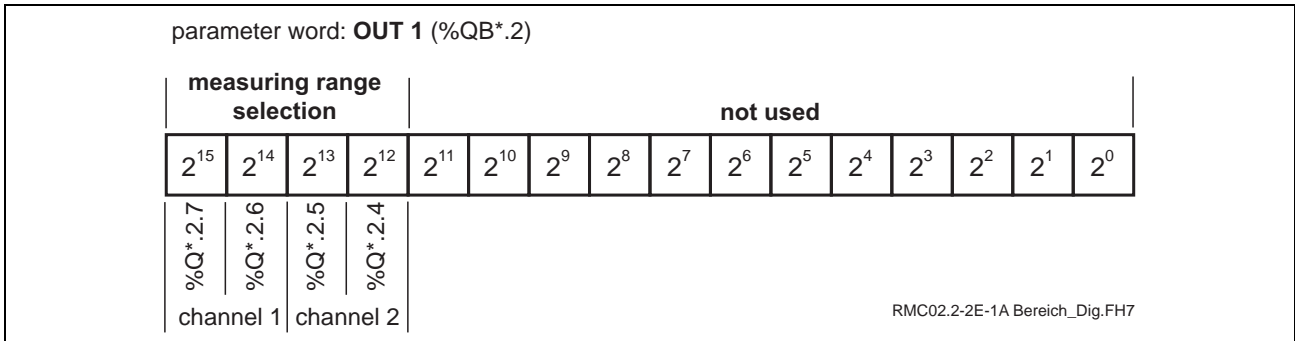


Figure 11-34: Representation of the OUT 1 parameter word

Channel 1		Channel 2		Voltage:	Current	Resistance	Temperature
0	0	0	0	±0.5V	----	200Ω	-100°C ... +266°C
0	1	0	1	±1.0V	----	400Ω	-100°C ... +850°C
1	0	1	0	±5.0V	0 - 20mA	2000Ω	----
1	1	1	1	±10.0V	----	----	----

Figure 11-35: Overview of the selectable measuring ranges

11.8 Structure of the Module Registers

Word M	Word M + 1	
Analog value channel 1 (%IW*.4)	Analog value channel 2 (%IW*.6)	IN register
Output word OUT 0 (%QW*.0)	Parameter OUT 1 (%QB*.2)	OUT register

Figure 11-36: Register structure

11.9 Diagnosis Indicators

U_{Analog}	LED green	±15V indication
	ON:	±15V present
	OFF:	±15V supply out of tolerance

11.10 Connector Pin Assignments

1	$I_{A \text{ CONST}}$	2.5 mA constant current source for sensor power supply
2	I_{IN}	Current measuring input
3	$U_{I_{IN}}$	Voltage measurement at $I_{A \text{ CONST}}$
4	U_{I+}	Non-inverting voltage input
5	U_{I-}	Inverting voltage input
6	GND A	Analog ground
7	GND A	Analog ground
8	Screen	Pin for additional screening

Figure 11-37: Analog input connectors X1, X2

1	$I_A \text{ 0 - 20 mA}$	Adjustable current output
2	$U_A \pm 10V$	Adjustable voltage output
3	GND A	Analog ground
4	GND A	Analog ground
5	Screen	Pin for additional screening

Figure 11-38: Analog output connector X3

11.11 Typical Applications

$\pm 10V$ voltage output

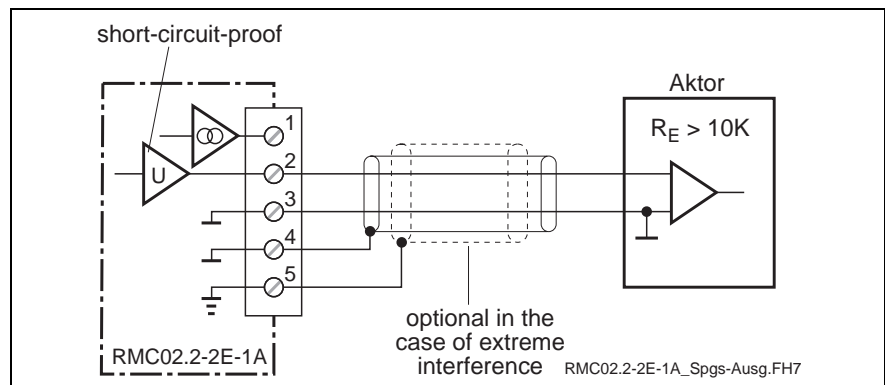


Figure 11-39: Typical wiring of voltage output

±10V voltage measurement ($R_{in} > 1M\Omega$)

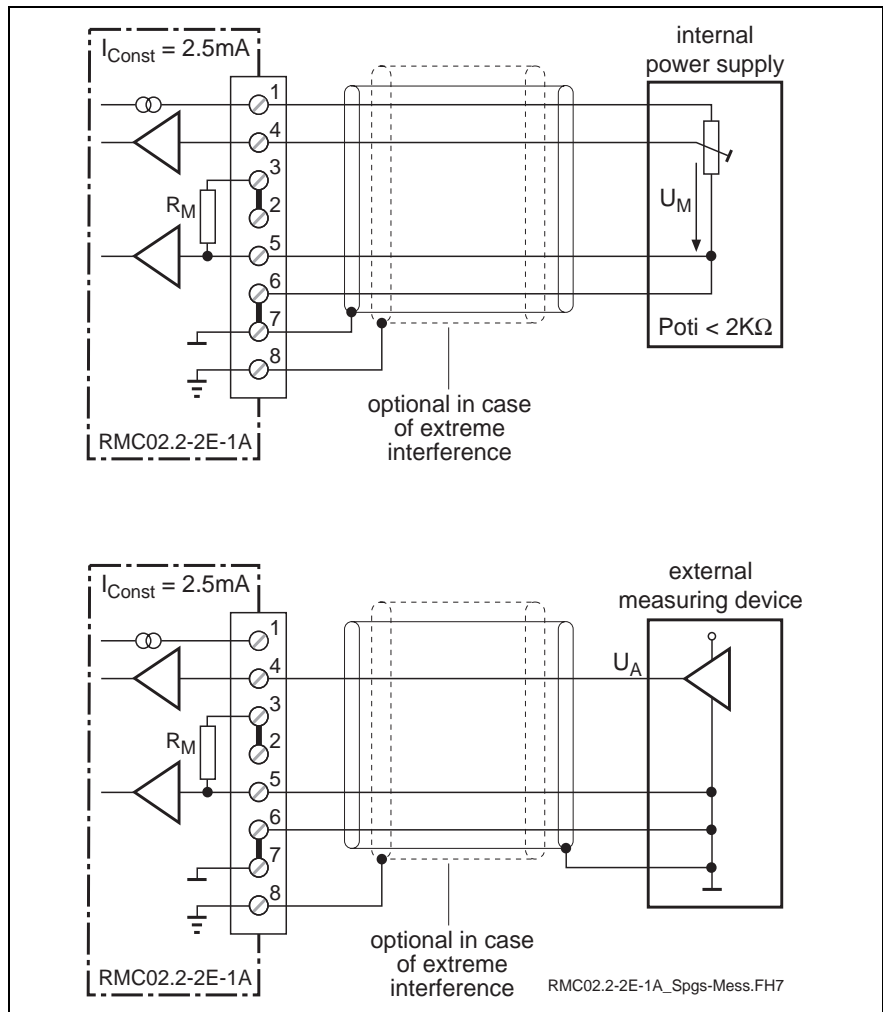


Figure 11-40: Typical wiring of voltage measurement

0 - 20mA current output

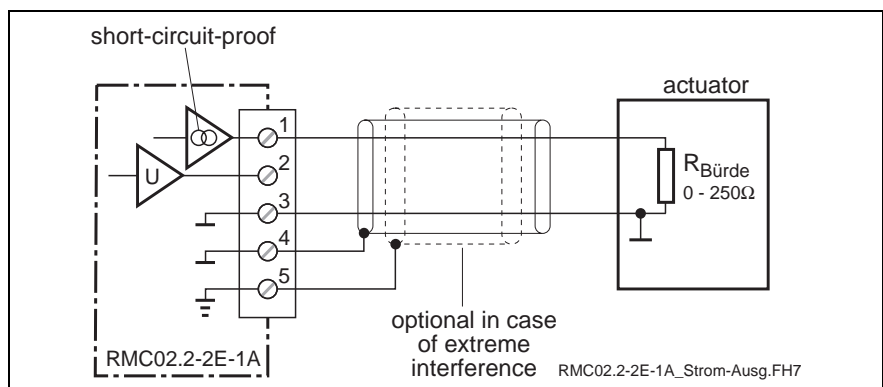


Figure 11-41: Typical wiring of current output

0 - 20mA current measurement

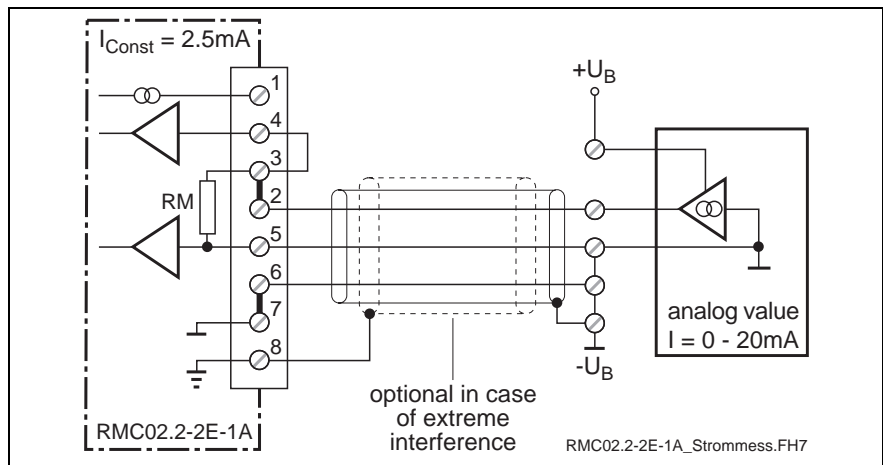


Figure 11-42: Typical wiring of current measurement

Temperature measurement using Pt 100 element

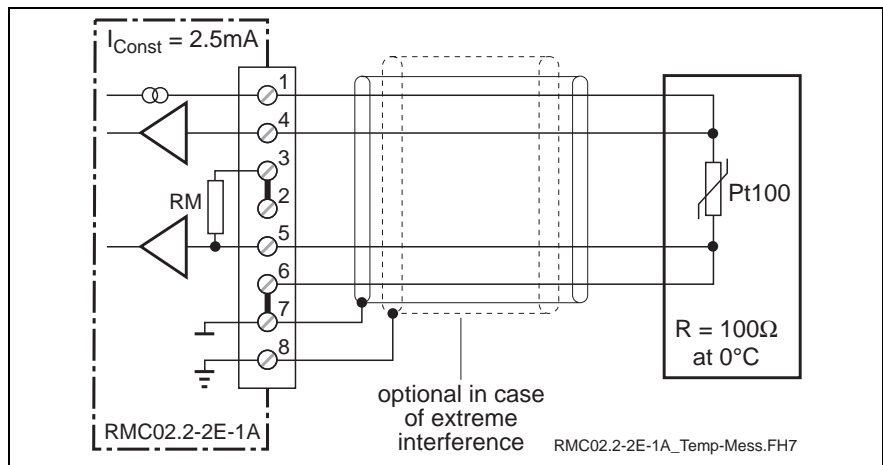


Figure 11-43: Typical connections for temperature measurement using Pt 100 element

12 RECO02.2 Configuration Limits

12.1 General

The maximum number of modules is limited to one RMK02.2-LWL-SER module and 15 I/O modules. With some modules, however, the maximum number of a specific module type must be taken into account.

The following modules can only be used in a limited number when all outputs are triggered at the same time:

RMA02.2-16-RE230-200 max. 8 modules

RMA02.2-32-DC024-050 max. 8 modules

RMA02.2-16-AC230-200 max. 8 modules

If the given limits must be exceeded, the number of outputs that can be switched simultaneously is reduced accordingly.

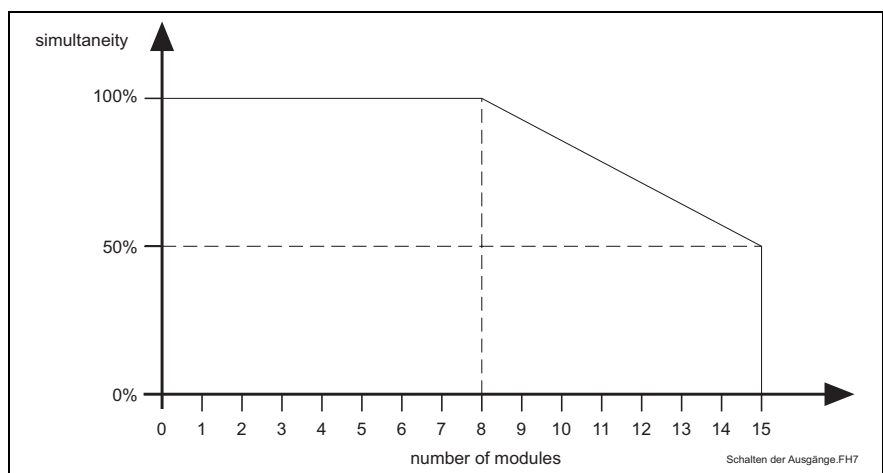


Figure 12-44: Maximum number of outputs that can be switched simultaneously.

12.2 Configuration-Related Current Consumption of the Bus Coupler Unit

The maximum current consumption of the entire RECO02.2 unit depends on the employed modules. The total current requirement of a configuration can easily be determined using the following table:

The power supply unit of the bus coupler module can provide a maximum of 2.5 A for the electronics of the modules. The power supply to the modules is not taken into account here; the corresponding modules must be fed separately.

Module type	Current consumption	Quantity	Total (mA)
RMK02.2-LWL-SER-FW (basic consumption)	approximately 100mA	1	100
RME02.2-16-DC024	approximately 5 mA		
RME02.2-32-DC024	approximately 10 mA		
RME02.2-16-AC115	approximately 5 mA		
RMA02.2-16-DC024-200	approximately 30 mA		
RMA02.2-32-DC024-050 (max. 8 units)	approximately 60 mA		
RMA02.2-16-AC230-200 (max. 8 units)	approximately 60 mA		
RMA02.2-16-RE230-200 (max. 8 units)	approximately 160 mA		
+U _L total current consumption:			

Figure 12-45: Power consumption of a RECO configuration

13 Accessories

13.1 Additional Annotation

A transparent carrier sheet that is glued to a side of the module can be used to provide the individual RECO I/O modules with additional annotations. This foil can be glued to the left-hand or to the right-hand side of the module housing. The carrier sheets are provided with an adhesive surface. The sheet is intended to accommodate the prepunched stickers that come in quantities of six on an A4 foil.

The moisture-insensitive stickers can be printed on in a standard laser printer. A word processing program is available that makes annotation easier. This program is a Word 7.0 template for Windows NT that permits 1 through 6 modules per sticker to be labelled. It can be selected whether it is a 16-bit, or 32-bit, an input or an output module, and whether the sticker shall be glued to the right-hand or to the left-hand side of the module.

Designation	Type	Material no.
Carrier sheet	RECO annotation film	281 697
Annotation film	RECO annotation film DIN A4 white	281 696
Annotation software	SWD-CONTRL-REC-BESCH-MS-C1,44-WIN*NT	281 691

Figure 13-46: Annotation accessories

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