



MTC200 CNC Controller MTC200-R

Configuration

DOK-MTC200-MTS*R+MTC*R-PR01-EN-P

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Configuration control

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Contents

1 System Description	1-1
1.1 Brief Description.....	1-1
1.2 Versions	1-1
SPS module	1-1
NC module	1-2
1.3 Communication	1-3
with external peripherals	1-3
with the drives	1-3
1.4 Power Supply	1-3
1.5 Rechargeable Battery	1-4
1.6 Installation and Expansion of the Racks	1-4
Installing the racks	1-4
Expansion.....	1-5
Slot addressing of the racks.....	1-5
Configuration limits and typical configurations	1-6
Installing the modules	1-7
Typical application.....	1-8
2 MTC200-R Dimensions	2-1
2.1 Dimensions of the SPS Module MTS-R01	2-1
2.2 Dimensions of the SPS Module MTS-R02.....	2-1
2.3 Dimensions of the CNC Module MTC-R01	2-2
2.4 Dimensions of the CNC Module MTC-R02	2-2
2.5 Dimensions of the RMB02.2-0 Rack2.....	2-3
2.6 Dimensions of the RMB02.2-04 Rack.....	2-3
2.7 Installing Several Racks Side by Side.....	2-4
2.8 Installation Depth of CNC/SPS Controller and Rack	2-4
3 Specifications	3-1
3.1 General Specifications	3-1
3.2 Supply Voltage	3-1
3.3 Specifications MTS-R	3-1
3.4 Specifications MTC-R	3-2
3.5 Specifications RMB02.2.....	3-2
4 Electrical Connections	4-1
4.1 X1 Connector - Supply Voltage and Watchdog	4-1
4.2 Grounding	4-1

4.3 SPS Module MTS-R.....	4-2
Connector Locations	4-2
PROG interface X3	4-4
COM interface	4-5
Status displays and fault diagnosis	4-6
4.4 CNC Module MTC-R.....	4-7
Connector locations	4-7
SERCOS fiber optics loop.....	4-7
Status displays and fault diagnosis	4-9
5 Modules for SPS Module MTS-R	5-1
5.1 INTERBUS Master Interface.....	5-1
Brief description of the IBM 2 card	5-1
Setting the I/O address	5-2
Interface pin assignments	5-2
5.2 Profibus-DP Interfaces.....	5-3
Brief description of the Profibus master and slave interfaces	5-3
Setting the I/O addresses.....	5-4
Status and diagnosis indicators	5-4
Specifications	5-5
Interface pin assignments	5-5
5.3 Serial Interfaces	5-6
Brief description of the serial interface module	5-6
Addresses and interrupt selection.....	5-7
Function blocks	5-7
Specifications	5-8
Interface pin assignments	5-8
6 Module for CNC Module MTC-R	6-1
6.1 Brief Description of the Axis Processor Module.....	6-1
6.2 Setting the I/O Address.....	6-2
6.3 SERCOS Interface.....	6-2
Specifications of the fiber optics interface.....	6-2
Fiber optics cables	6-2
Accessories.....	6-4
Specifications of the fiber optics cables	6-5
General safety instructions.....	6-5
7 Interconnecting Several Controllers via the PROG Interface	7-1
7.1 Network Connections with BTV20/30	7-2
7.2 Network Connections with W&T RS485 ISA Bus Interface Card for Use with Industry PC (MN: 282 484).....	7-2
Settings on the RS485 interface card	7-3
8 Type code	8-1
8.1 MTS-R.....	8-1
8.2 MTC-R.....	8-1

8.3 MTC-R	8-2
8.4 MTC-R	8-2
9 SUP-E0*-MTC200-R Accessories	9-1
9.1 Brief Description.....	9-1
9.2 Versions	9-1
9.3 Selection Criterion.....	9-1
9.4 Installation Notes.....	9-2
10 List of Connectors and Cable Sets	10-1
11 Figures	11-1

1 System Description

1.1 Brief Description

The MTC200-R unit is a powerful CNC controller in IP 20 rating. Together with the RMB02.2 rack, it can be installed in a switchgear cabinet. The unit consists of the SPS module MTS-R0*.1 and the NC module MTC-R0*.1. The modules communicate with each other via a separate internal local bus that has been implemented on an adapter board. (see accessories in Chapter 9).

Together, these components provide a compact solution for a classical machine tool controller.

The largest configuration permits up to 32 drives to be controlled that can be distributed among as many as seven processes. The controller is of a modular structure and expandable. This permits its optimum adaptation to the individual tasks.



Figure 1-1: Typical configuration of MTS-R02 + MTC-R01 with I/O modules

1.2 Versions

SPS module

- MTS-R01** The MTS-R01 is a powerful miniature SPS with an additional module location U1 that can optionally be equipped.
- MTS-R02** The MTS-R02 is a powerful miniature SPS with three additional module locations U1, U2, U3, that can optionally be equipped with the open field bus interfaces INTERBUS, PROFIBUS-DP, or a serial interface module (2 x RS232 and 2 x RS422).

The following modules are currently available as an expansion option for the U1, U2, U3 slots:

- INTERBUS master module
- PROFIBUS-DP master module
- PROFIBUS-DP slave module
- serial interface module (2 x RS232 and 2 x RS422)

Note: The optional INTERBUS field bus interface permits distributed I/O of a maximum of 4096 inputs and 4096 outputs to be connected.

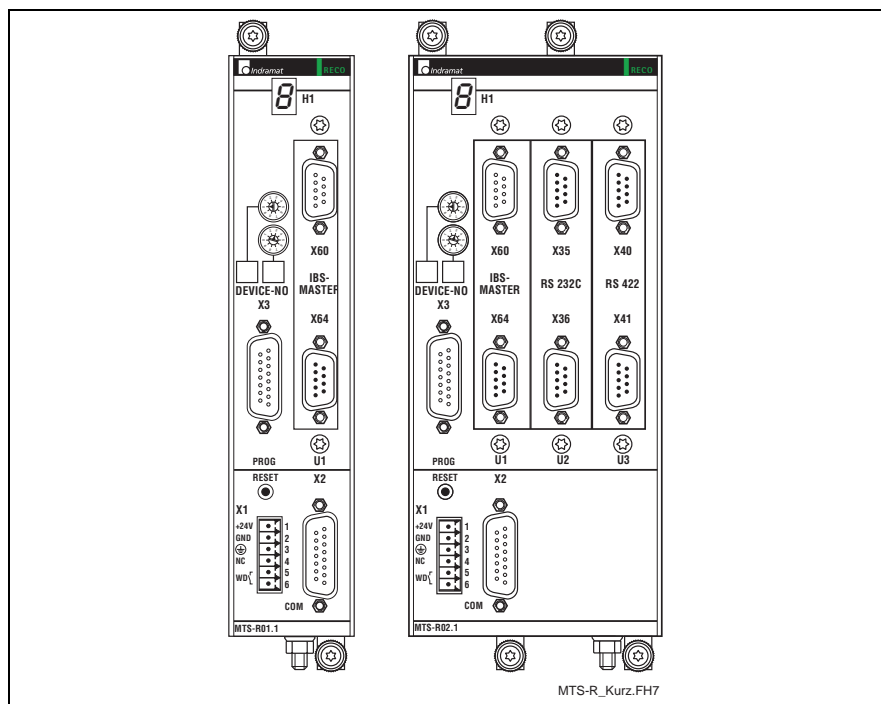


Figure 1-2: MTS-R01 + MTS-R02

NC module

MTC-R01 The MTC-R01 consists of a base unit that contains the CNC processor system and an integrated axis processor to which a maximum of 8 drives can be connected. An additional module (in slot U1), that contains another axis processor, permits another 8 drives to be controlled.

MTC-R02 The MTC-R02 consists of a base unit that contains the CNC processor system and an integrated axis processor to which a maximum of 8 drives can be connected. Three additional modules (in the slots U1, U2, U3), each containing another axis processor, permit another 8 drives to be connected to each module. Thus, the largest configuration is able to control a maximum of 32 drives.

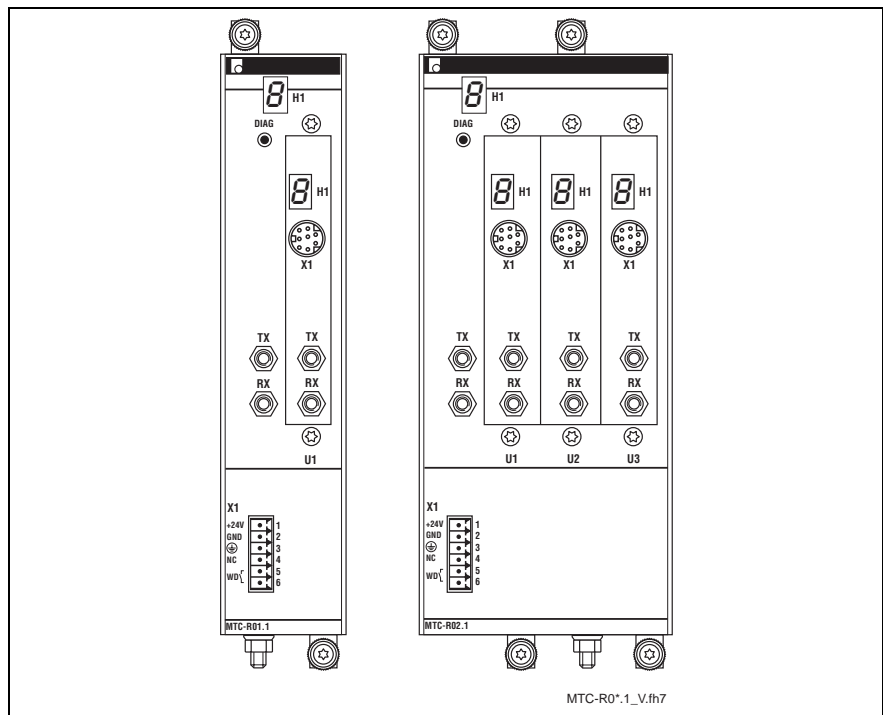


Figure 1-3: MTC-R01 + MTC-R02

1.3 Communication

with external peripherals

The programming interfaces in the RS-232/RS-485 format permit several SPS controllers to be interconnected in a network, and a programmer or PC to be connected. Each SPS has its own device number between 0 and 15 assigned so that each MTS-R can directly be addressed from the PC.

Another free serial interface (RS-232/RS-422/RS485) is available for connecting a printer, read-write memory, or visualization unit (e.g. BTV04/05).

with the drives

Communication with the drives takes place via the SERCOS interface using fiber optics. Up to 8 drives can be connected to a fiber optics loop. The maximum configuration requires four fiber optics loops that are able to control up to 32 drives.

1.4 Power Supply

The 24-VDC power supply connects to a screwed connector on the front panel.

1.5 Rechargeable Battery

User data may be lost if an MTS-R or MTC-R module is stored for more than 6 month without being used.

Data concerned in MTS-R

- SPS user program
- Retentive data

Data concerned in MTC-R

- Machine parameters
- Machine data
- Tool data
- NC program packages
- NC cycle packages
- Zero offsets
- Variables, events, D corrections

Battery loading time

Charging of the rechargeable battery begins when the module is put back into operation. The following charging times are required for a **completely discharged** battery.

Charging time: 1 h -> approximately 100 h backup time

fully charged: 50 h -> approximately 5000 h backup time (full battery)

Battery service life

Provided that the ambient conditions specified for the unit are adhered to, the typical service life of the rechargeable battery is between 7 and 10 years.

1.6 Installation and Expansion of the Racks

The CNC controller MTC-R and the SPS controller MTS-R are installed together on the RMB02.2 rack.

The rack is available in two different versions:

- As RMB02.2-02 with two slots
- As RMB02.2-04 with four slots

Installing the racks

The RMB02.2-02 and RMB02.2-04 racks are latched onto a TS 35x27x15 DIN rail and secured by a screw. Alternatively, they can be installed directly onto the mounting plate in the switchgear cabinet, using the holes provided in the rack (see Figure 2-14: RMB02.2-04 dimensions).

Note: MTC-R01 and MTS-R01 require **one** slot each. MTC-R02 and MTS-R02 require **two** slots each.

Expansion

One RMB02.2-02 and / or up to 4 RMB02.2-04 can be mounted side by side. Slot addressing requires the DIP switches on the bus boards of the RMB02.2-04 racks to be configured (see Figure 1-4: Setting the slot addresses).

Note: There is **no** addressing switch on the RMB02.2-02 rack. This means that bus couplers or I/O modules must not be installed in this rack. Due to the lack of slot addressing, these modules cannot be addressed specifically.

Slot addressing of the racks

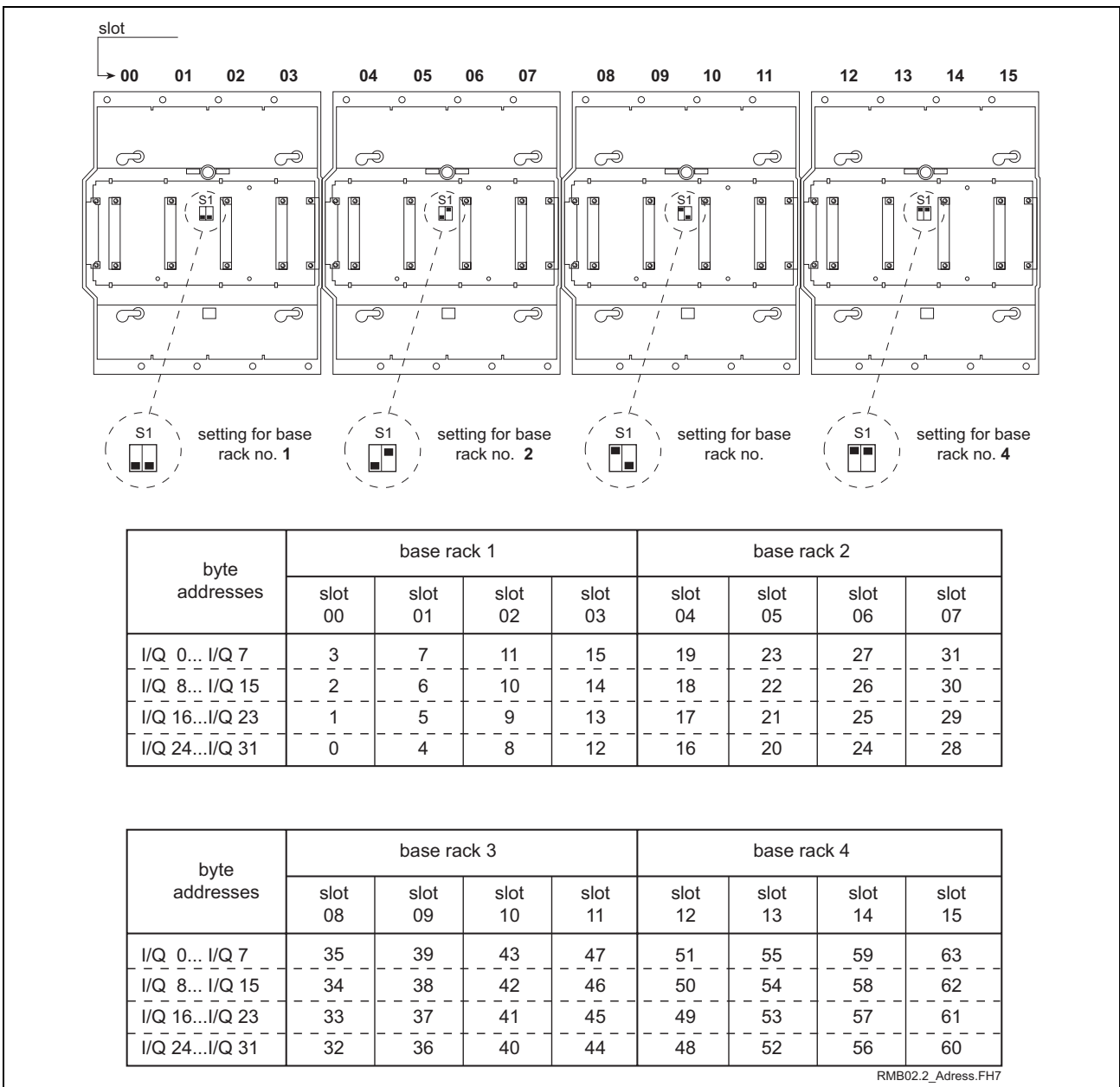


Figure 1-4: Setting the slot addresses

There is a DIP switch on the bus board of the racks that permits the maximum of four module racks to be addressed specifically. This DIP switch must be set according to the module concerned (Slot 00-03, see Figure 1-4: Setting the slot addresses). Each slot may only be selected once.

Configuration limits and typical configurations

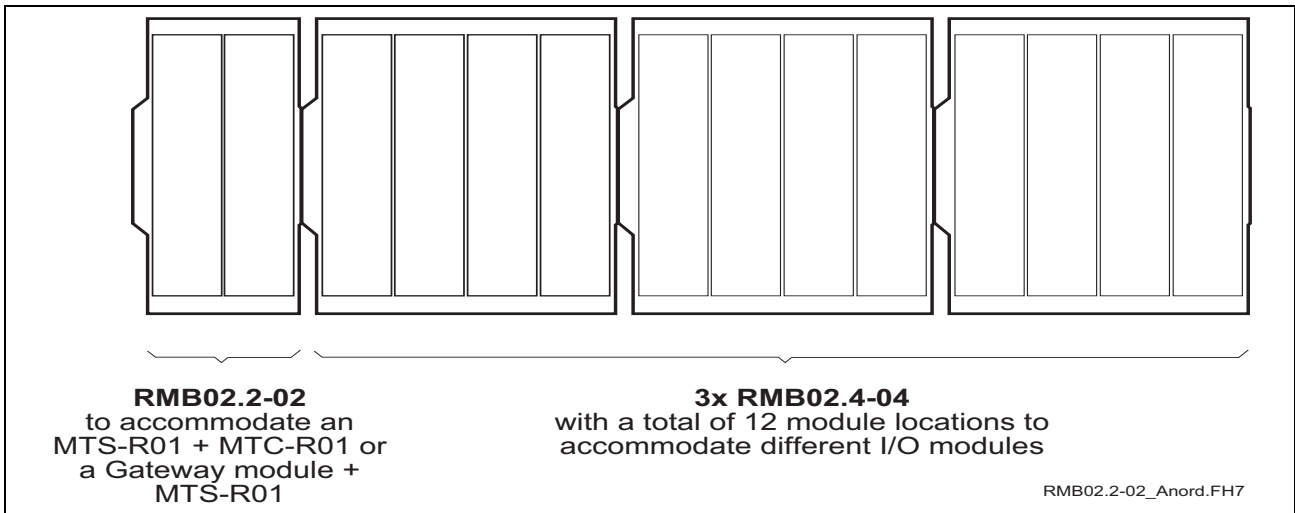


Figure 1-5: Maximum configuration with RMB02.2-02

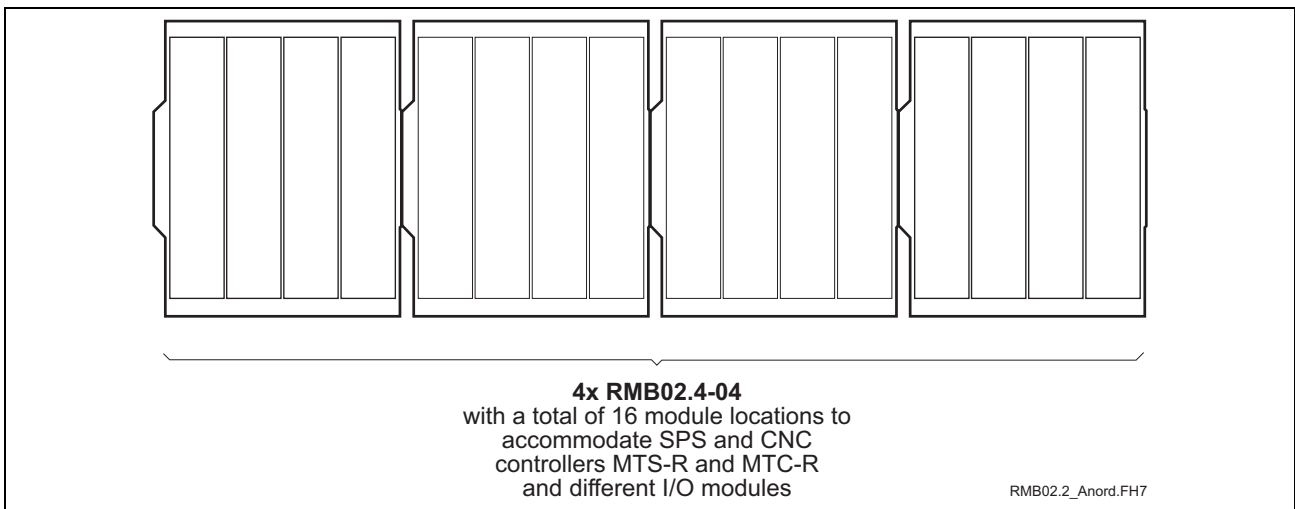


Figure 1-6: Maximum configuration with RMB02.2-04

Installing the modules

Starting with an MTS-R in slot 1 (left-hand side), the modules are installed in the RMB02.2-04 rack. Each module is secured with two screws. The I/O modules are installed in the slots 1 through 15 to the right of MTS-R or MTC-R. You may leave gaps between the modules in order to be able to install additional modules later.

When you use the RMB02.2-02 rack, module installation must, in contrast to the RMB02.2-04 rack, be started **from the right-hand side**. The following combinations are possible:

Slot 1	Slot 2
MTS-R01.1	MTC-R01.1
Gateway	MTS-R01.1
empty	MTS-R01.1
MTS-R02.1	

Figure 1-7: RMB02.2-02 configuration variants

Note: In order to prevent the connectors from getting loose by lateral movements of the modules, you must tighten the retaining screws of the rack before you start commissioning. (Location of the screws Figure 2-14: RMB02.2-04 dimensions). The modules must also be screwed to the rack.

Never insert or remove a connector when power is applied to the unit.

Typical application

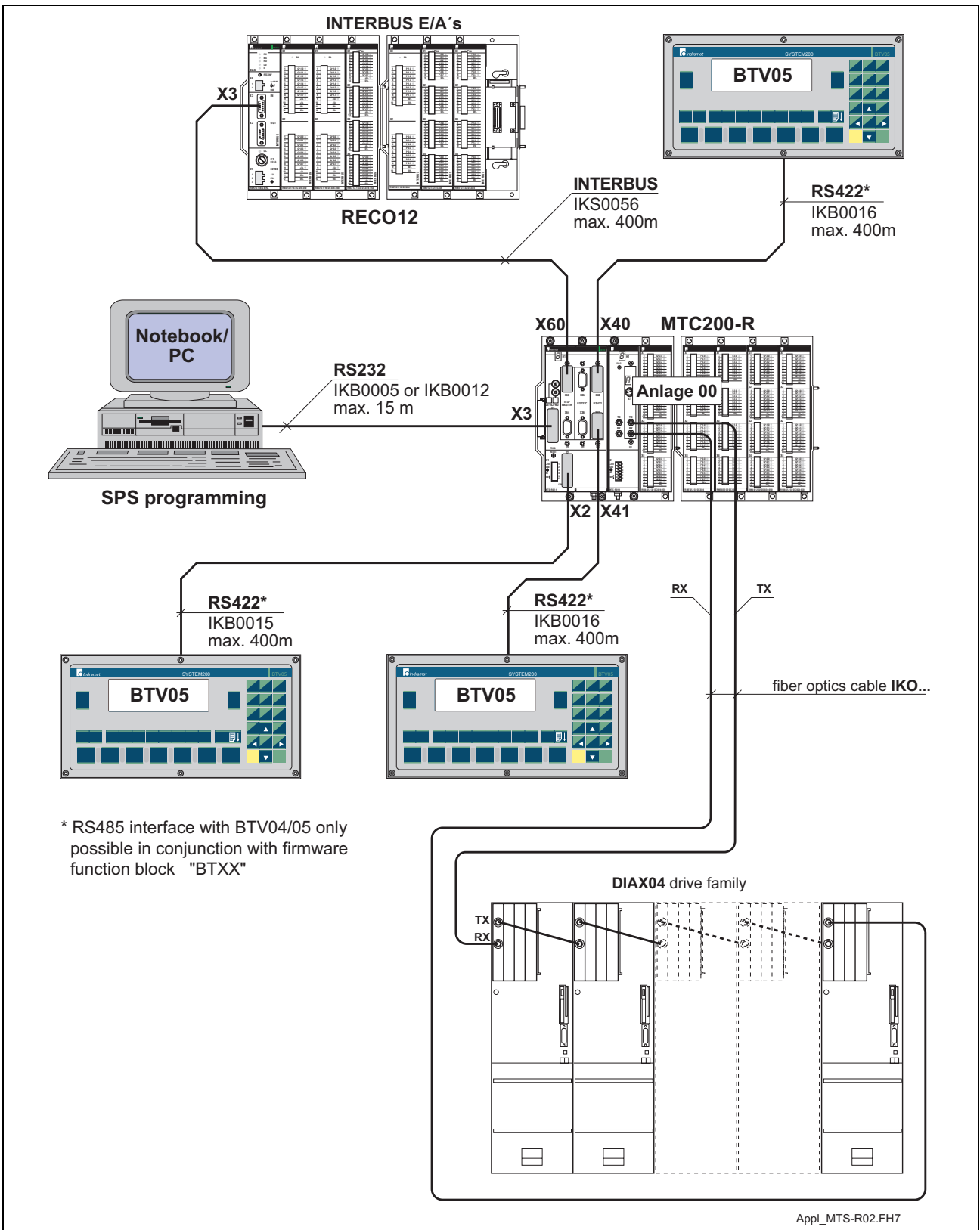


Figure 1-8: Typical application with MTC200-R

2 MTC200-R Dimensions

2.1 Dimensions of the SPS Module MTS-R01

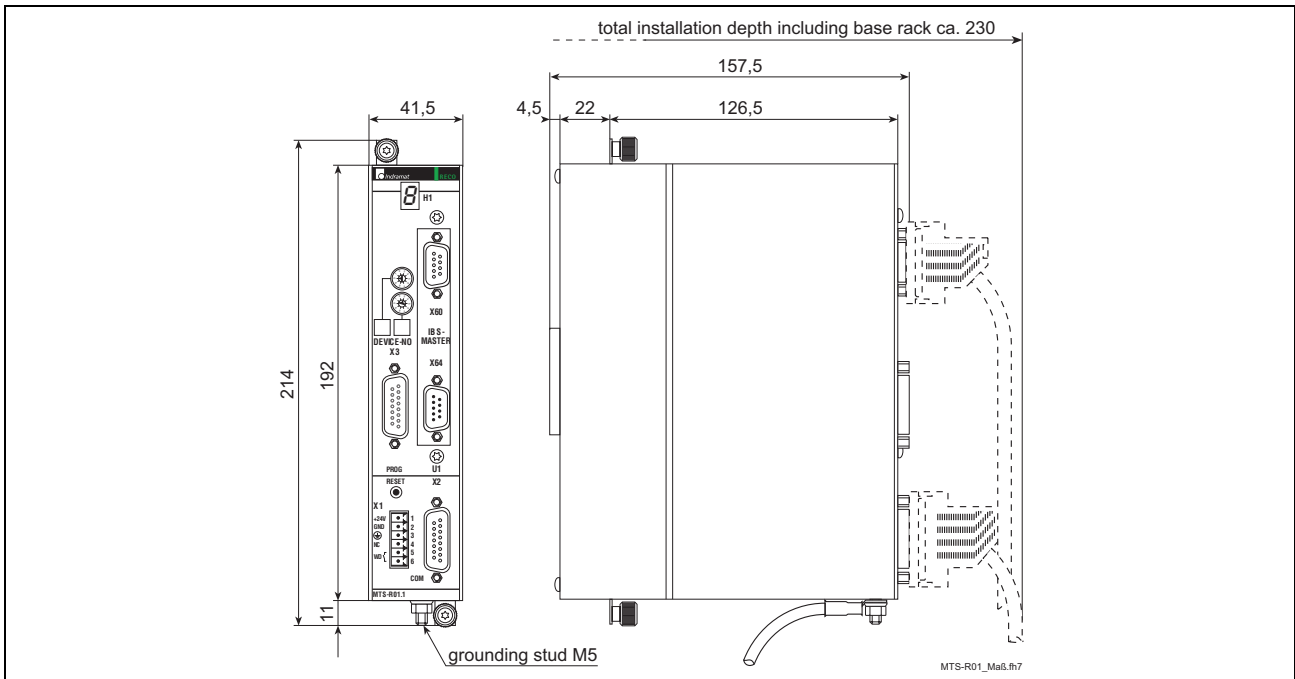


Figure 2-9: MTS-R01 dimensions

2.2 Dimensions of the SPS Module MTS-R02

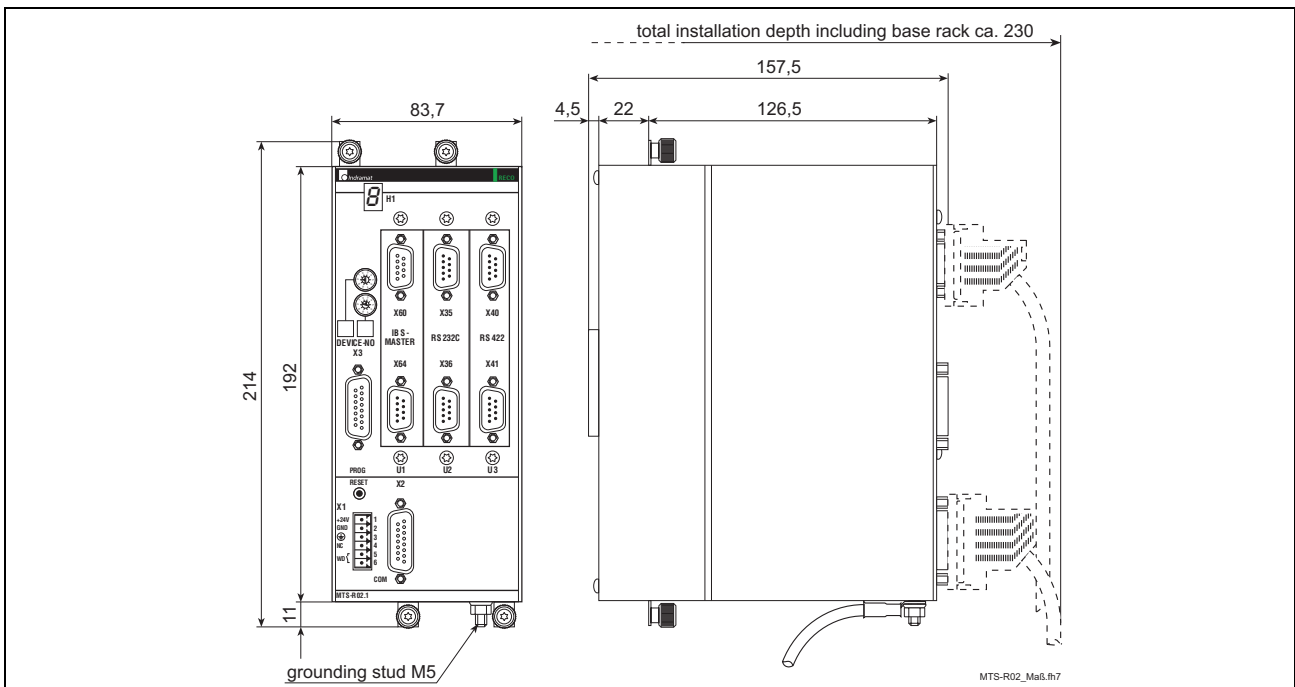


Figure 2-10: MTS-R02 dimensions

2.3 Dimensions of the CNC Module MTC-R01

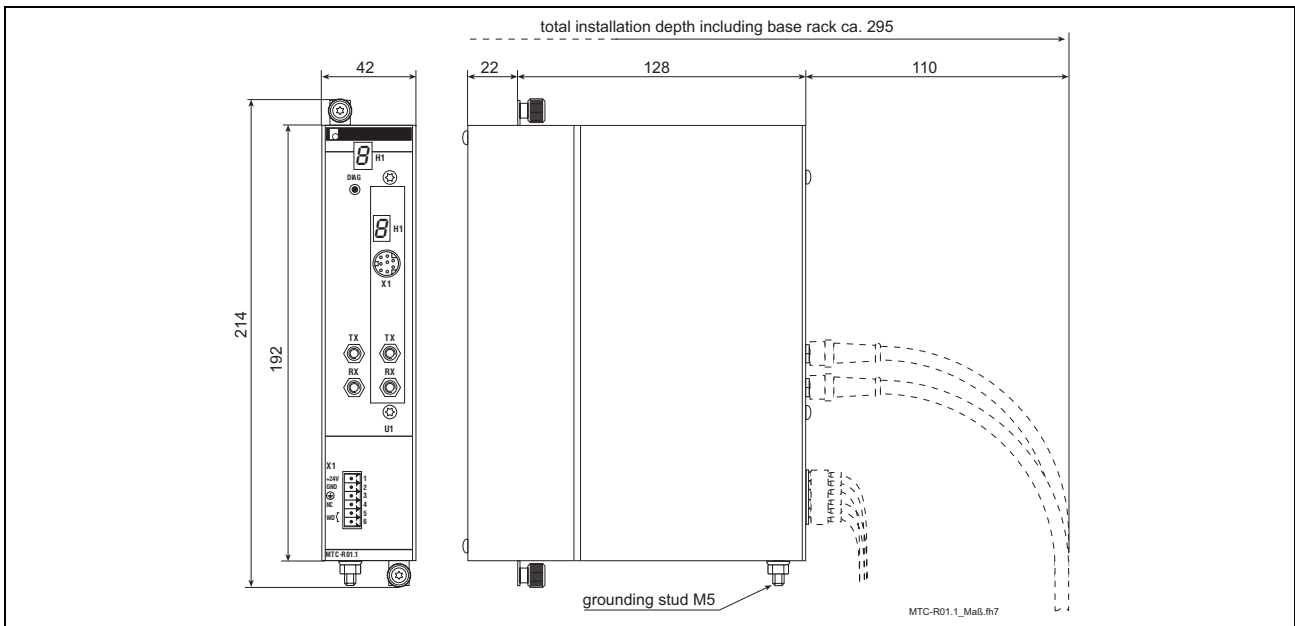


Figure 2-11: MTC-R01 dimensions

2.4 Dimensions of the CNC Module MTC-R02

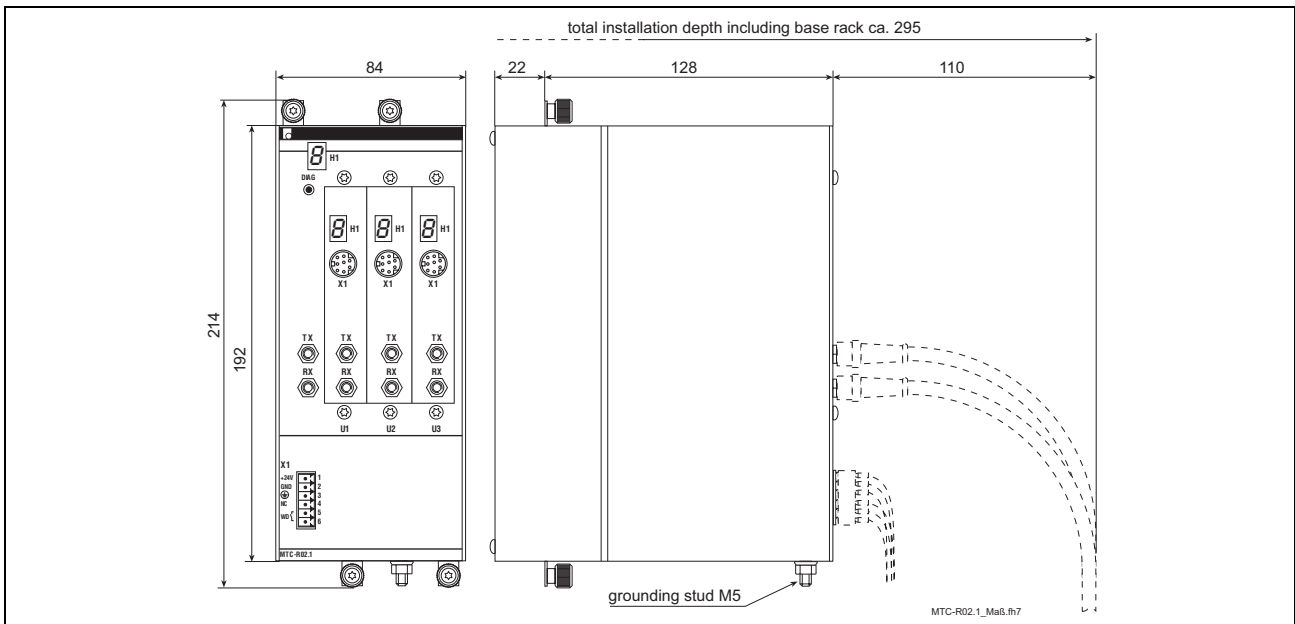


Figure 2-12: MTC-R02 dimensions

2.5 Dimensions of the RMB02.2-0 Rack2

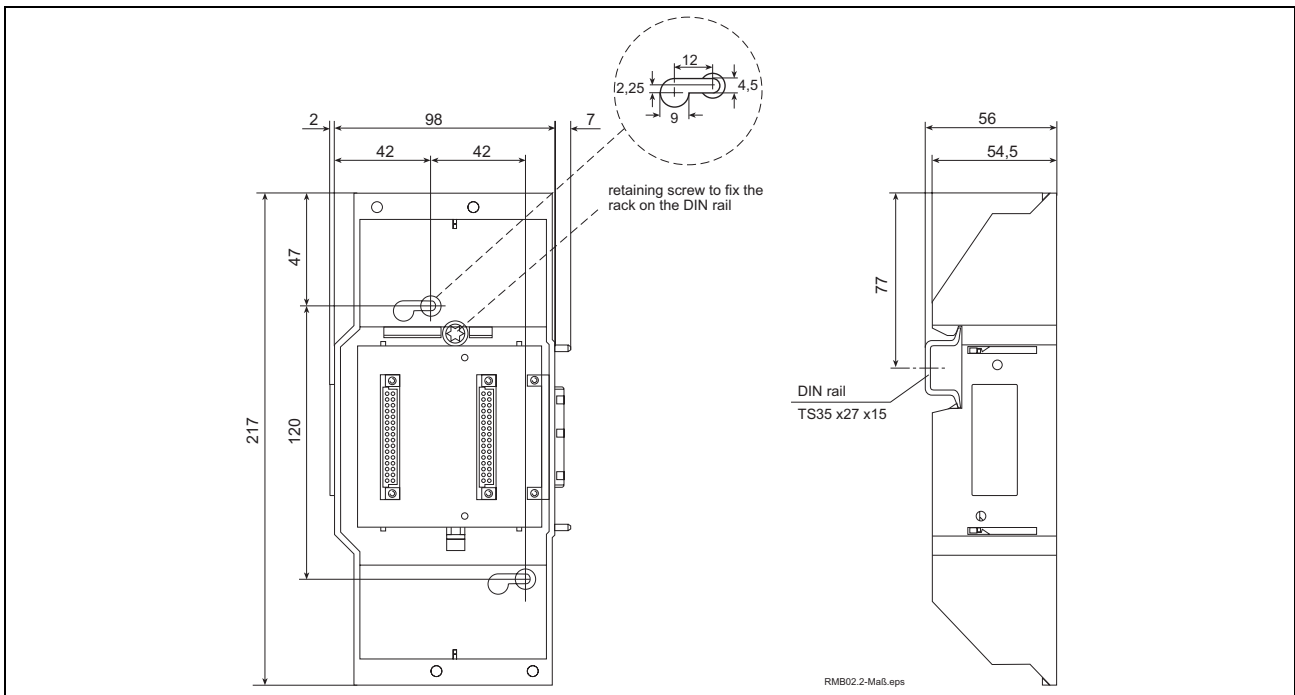


Figure 2-13: RMB02.2-02 dimensions

2.6 Dimensions of the RMB02.2-04 Rack

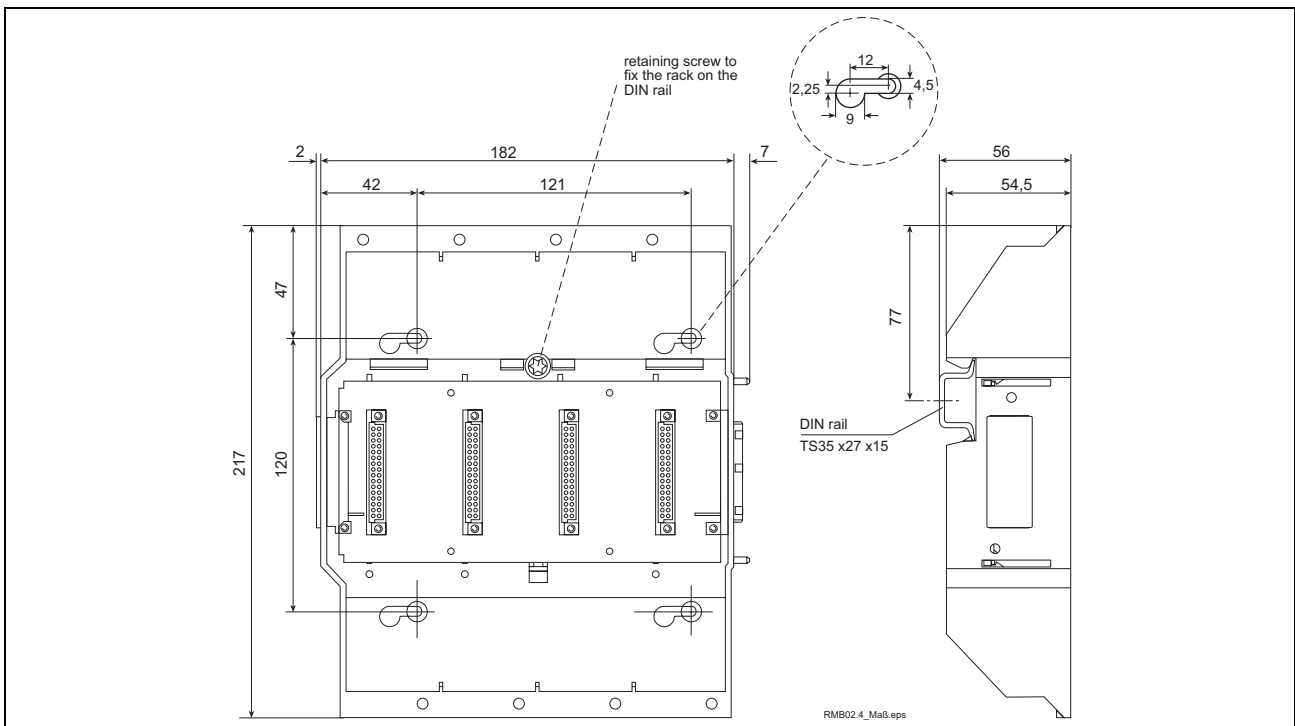


Figure 2-14: RMB02.2-04 dimensions

2.7 Installing Several Racks Side by Side

The RMB02.2-02 rack (2 slots) can only be installed at the left end. It accommodates the CNC controller MTC-R01 and/or the SPS controller MTR-R01. Furthermore, up to a maximum of four RMB02.2-04 racks (4 slots) can be mounted.

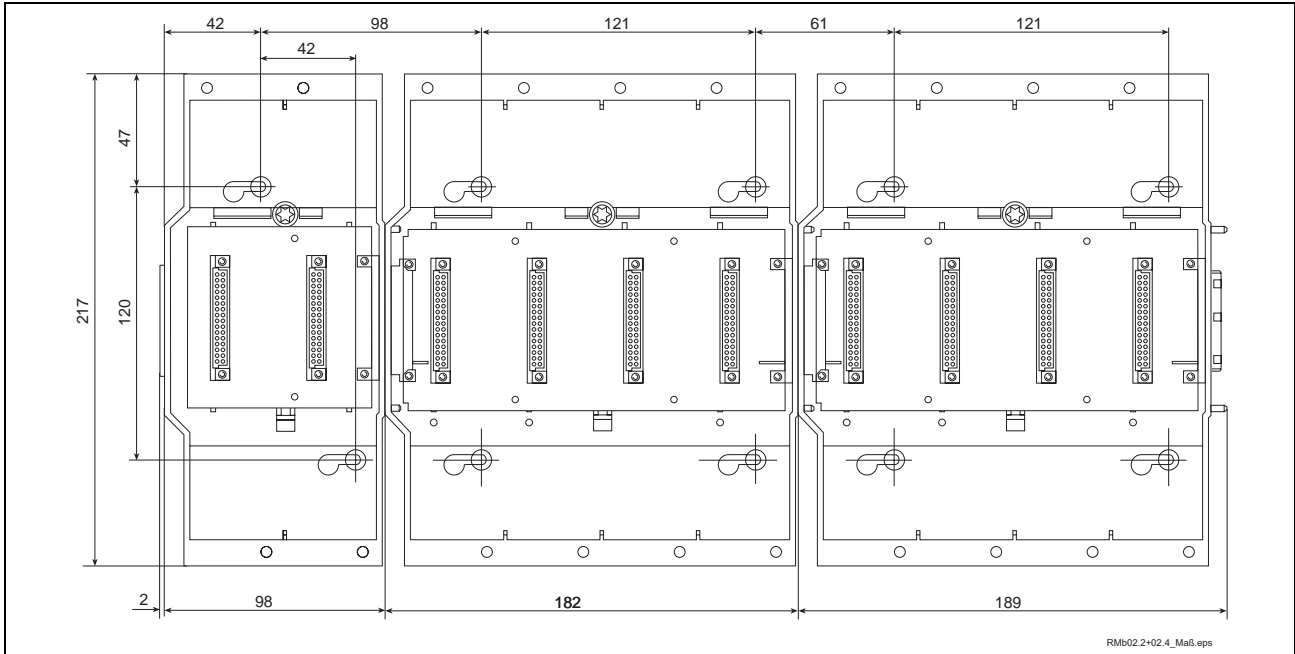


Figure 2-15: Installing several racks side by side

2.8 Installation Depth of CNC/SPS Controller and Rack

The following installation depth dimensions result when a CNC controller and an SPS controller are installed in a rack.

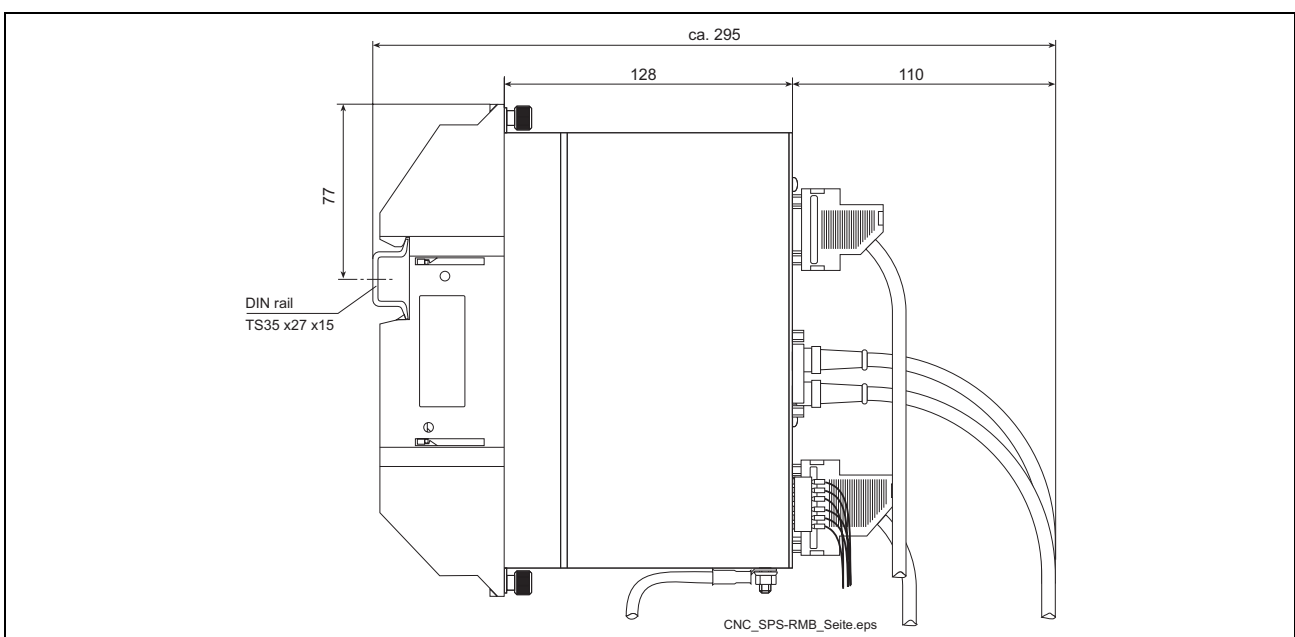


Figure 2-16: Installation depth of CNC/SPS controller and rack

3 Specifications

3.1 General Specifications

Permissible cable cross-section for supply voltage:	max. 1.5 mm ²
Installation in the switchgear cabinet:	Using RMB02.2 racks on TS 35 x 27 x 15 DIN rail
Protection rating:	IP 20, DIN VDE 0470, EN 60529
Humidity:	75 %, no condensation (operation) 95%, no condensation (transport) DIN 40 040 Class F
Air pressure:	from 860 to 1080 hPa, 1500 m (operation) from 660 to 1080 hPa, 3500 m (transport)
Maximum ambient temperature: Operation: Storage/transport	from 0°C to 55°C, DIN 40 040 Class KV from -25°C to 70°C
Color:	RAL 7035 light gray

Figure 3-17: General specifications

3.2 Supply Voltage

Nominal value:	24 VDC
Permissible ripples:	4 Vpp within the permissible voltage range
Permissible voltage range:	18 ... 28 VDC, including ripples
Max. current consumption MTC200-R:	1.6 A (+ supply voltage for I/O modules with up to 3.5 A)

Figure 3-18: Specifications - supply voltage

3.3 Specifications MTS-R

Max. heat loss: MTS-R01.1: MTS-R02.1:	12.6 W 19.6 W
Max. current consumption: MTS-R01.1: MTS-R02.1:	450 mA 700 mA
Weight: MTS-R01.1: MTS-R02.1:	1.00 kg 1.65 kg
Enclosure dimensions (W x H x D): MTS-R01.1: MTS-R02.1:	41.5 x 192 x 156 83.7 x 192 x 156
Interfaces: Programming interface (PROG) General serial interface (COM) Optional interfaces:	RS-232/RS-485 (D-SUB, 15-way female) RS-232/RS-422 (D-SUB, 15-way female) INTERBUS (D-SUB, 9-way female) Profibus-DP (D-SUB, 9-way female) 2 x RS-232 and 2 x RS-422 (D-SUB, 9-way male)

Figure 3-19: Specifications - MTS-R

3.4 Specifications MTC-R

Max. heat loss:	
MTC-R01.1:	14.3 W
MTC-R02.1:	26 W
Max. current consumption:	
MTC-R01.1:	510 mA
MTC-R02.1:	930 mA
Weight:	
MTC-R01.1:	1.00 kg
MTC-R02.1:	1.65 kg
Enclosure dimensions (W x H x D):	
MTC-R01.1:	41.5 x 192 x 152 mm
MTC-R02.1:	83.7 x 192 x 152 mm

Figure 3-20: Specifications - MTC-R

3.5 Specifications RMB02.2

Weight:	
RMB02.2-02:	210 g
RMB02.2-04:	360 g
Space required (W x H)	
RMB02.2-02:	107 x 217 mm
RMB02.2-04:	191 x 217 mm

Figure 3-21: Specifications - RMB02.2

4 Electrical Connections

4.1 X1 Connector - Supply Voltage and Watchdog

Faultless operation of the MTC200-R requires the supply voltage to fulfill the following requirements:

- The Supply voltage must **never** drop below +18 VDC. The POWER-FAIL signal would respond in this case, and the SPS operating program would be stopped.

Note: The power supply unit of the MTC200-R is a switched-mode power supply that can produce inrush currents of up to 20 A. You should therefore never connect another MTC200-R unit to the same supply voltage during operation. The high inrush current may cause the supply voltage to drop and, consequently, the power fail signal to respond.

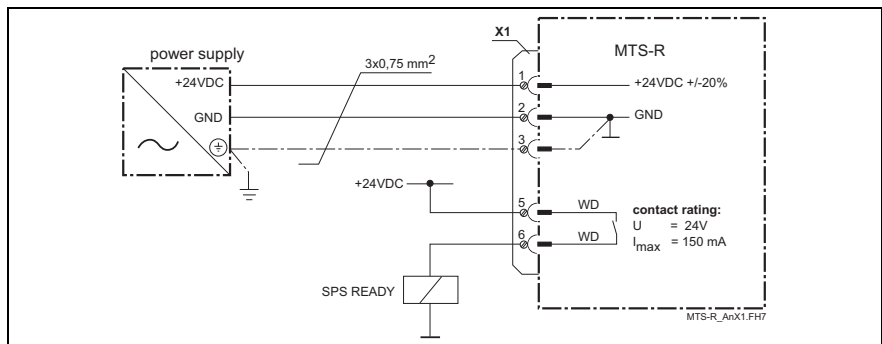


Figure 4-22: Connecting the X1 power supply connector to the MTS-R

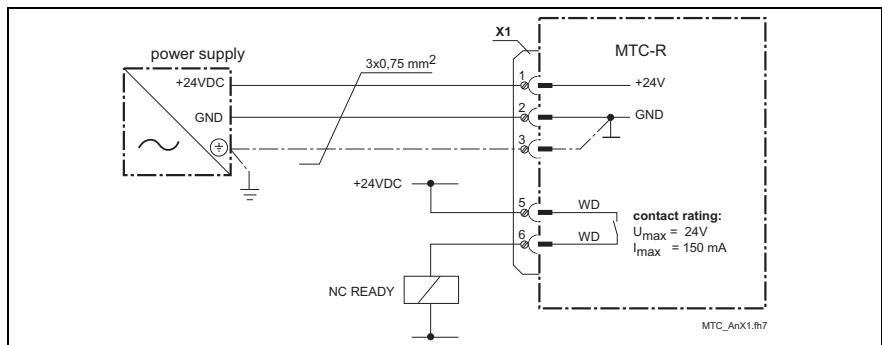


Figure 4-23: Connecting the X1 power supply connector to the MTC-R

Note: Connectors may only be removed or inserted after the power has been switched off.

4.2 Grounding

To ground the controller and to screen the electronics, connect a wire of a minimum cross-section of 6 mm² between the grounding stud and the central grounding point of the machine.

4.3 SPS Module MTS-R

Connector Locations

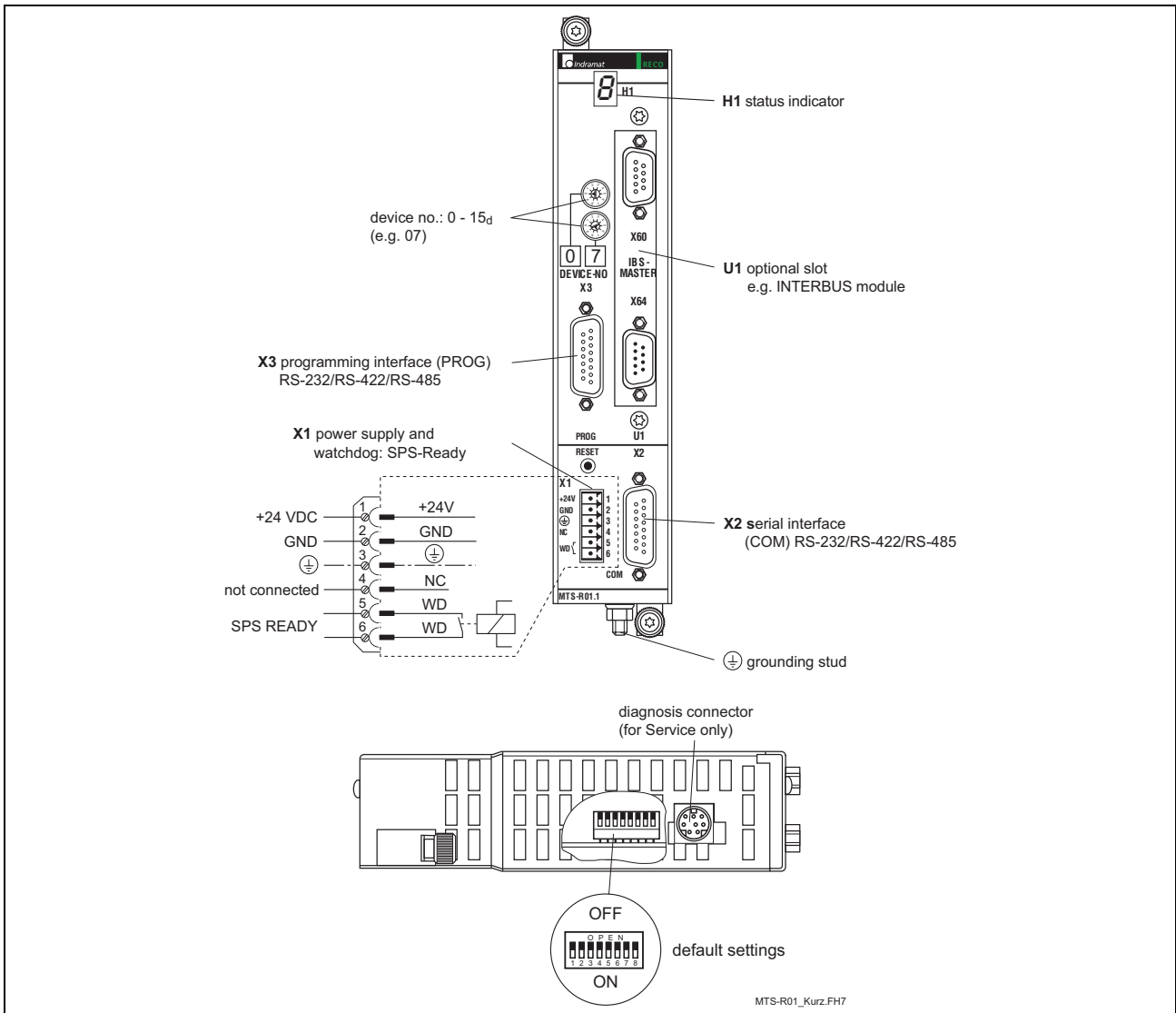


Figure 4-24: MTS-R01 front view

The two interfaces COM (X2) and PROG (X3) have the following pin assignments:

Pin	Signal name	Pin	Signal name
1	Protected Ground	2	Transmit Data (RS232)
3	Receive Data (RS232)	4	RS485+ or RxD+ (RS422)
5	RS485- or RxD- (RS422)	6	Data Set Ready (Modem)
7	Signal Ground	8	Data Carrier Detected (Mod.)
9	TxD+ (RS422)	10	GND
11	TxD- (RS422)	12	+ 5V
13	Request To Send (Modem)	14	Clear To Send (Modem)
15	Data Terminal Ready (Mod.)		

Figure 4-25: Connector pin assignments of PROG interface **X3** and COM interface **X2**

PROG interface X3

The PROG interface of the MTS-R can be used either for point-to-point connections (RS232) or for bus connections (RS485). The INS0619 connector is available for setting up bus operation. The connector pin assignments are shown in the following diagram (Figure 4-26: RS485 connection with INS0619 connector).

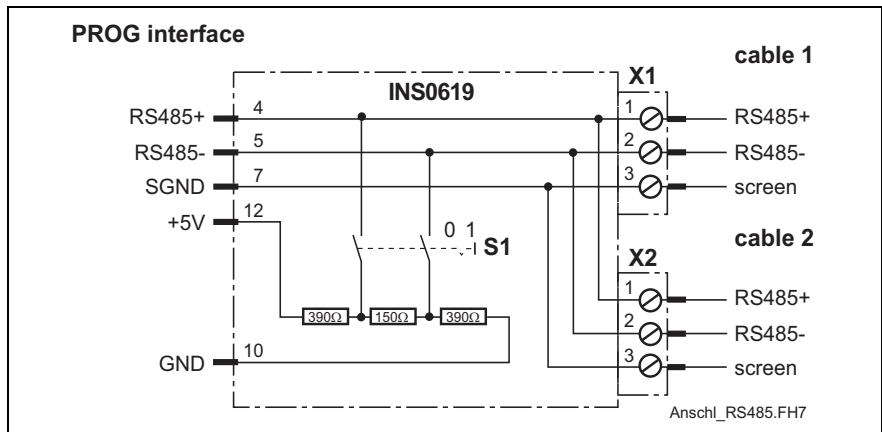


Figure 4-26: RS485 connection with INS0619 connector

Setting the parameters

Inside the enclosure, there is a DIP switch at the top that permits the parameter values of the PROG interface on the MTS-R to be assigned (see Figure 4-27: DIP switch for the parameter value assignment of the PROG interface). Using a pointed tool (small screwdriver, etc.), this DIP switch can be reached even when the enclosure is closed.

If this proves difficult when the box is closed, you may open the enclosure completely. It consists of two half-shells that come easily apart when you remove the two screws from the rear of the enclosure and detach the locking element. The locking elements can be detached manually or using a screwdriver.

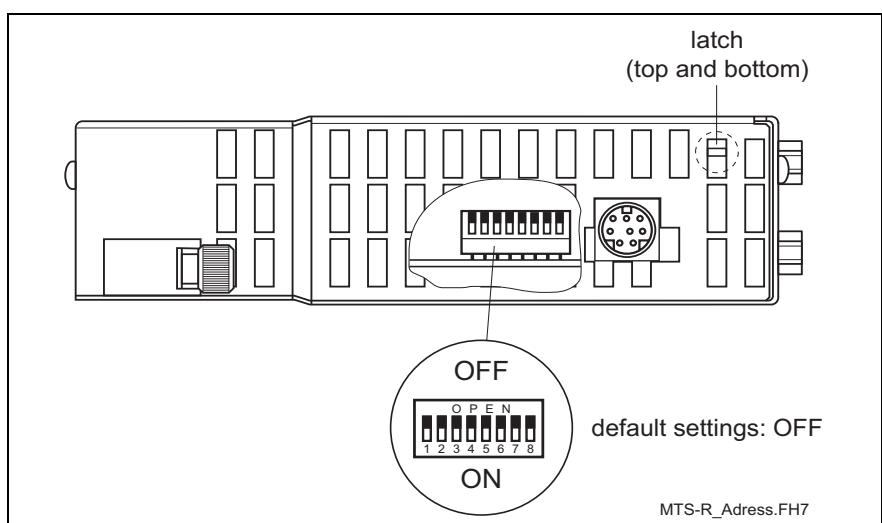


Figure 4-27: DIP switch for the parameter value assignment of the PROG interface

The following table shows the possible settings and the related DIP switch configurations.

Influenced parameters	1	2	3	4	5	6	7	8
Baud rate 9600	ON	ON	ON	X	X	X	X	X
Baud rate 19200	OFF	OFF	OFF	X	X	X	X	X
Baud rate 38400	ON	OFF	OFF	X	X	X	X	X
Baud rate 57600	OFF	ON	OFF	X	X	X	X	X
Baud rate 115200	ON	ON	OFF	X	X	X	X	X
No Parity	X	X	X	OFF	X	X	X	X
Even Parity	X	X	X	ON	X	X	X	X
RS 232	X	X	X	X	OFF	OFF	X	X
RS 485	X	X	X	X	ON	OFF	X	X
RS 422	X	X	X	X	OFF	ON	X	X
Boot lock OFF	X	X	X	X	X	X	X	OFF
Boot lock ON	X	X	X	X	X	X	X	ON

Figure 4-28: DIP switch settings for MTS-R01.1 and MTS-R02.1

COM interface

The COM interface can only be used as a point-to-point connection (RS422/RS485). A connector (Figure 4-29: RS422 connection with INS0645 connector) is available that can be used for producing an RS422 connection. RS485 operation with BTV04/05 and BTC06 via the COM interface is only possible in conjunction with the „BTXX“ function block.

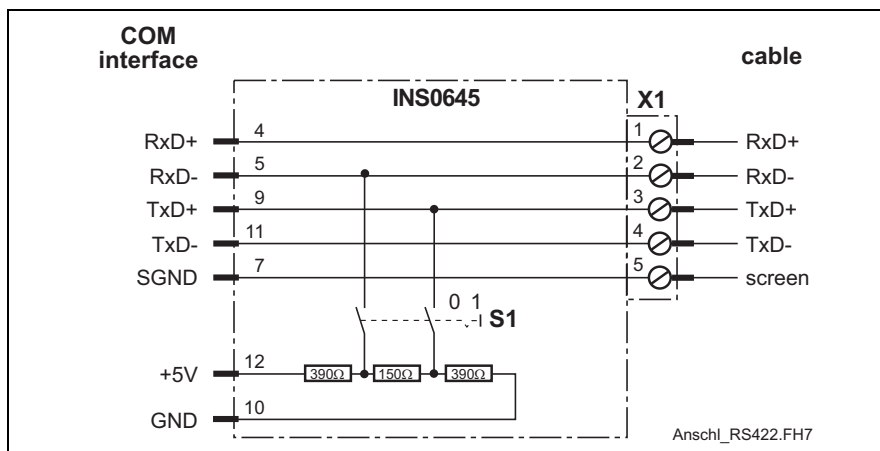


Figure 4-29: RS422 connection with INS0645 connector

Setting the parameters

In contrast to the PROG interface, the parameter values of the COM interface cannot be assigned via the hardware. Parameter value assignment is done using the COM data type in conjunction with the OPEN_COM or CLOS_COM function blocks, and via the SPS user program. Please refer to the SPS Programming Instructions for details.

Note: In RS422 and RS485 mode of the PROG and COM interface, the distance between the first and the last device can be up to 400 m.

Status displays and fault diagnosis

Operating state display

The diagnosis display shows the state of the SPS. The following states are displayed as a **single-digit** code.

Status codes

Code	Meaning/brief description
b	Operational (SPS is running)
0.	Power-on state (reset test)
F.	Firmware in Flash EPROM invalid
J.	Boot lock for firmware active
P.	Local bus is not connected

Figure 4-30: Operating states of the MTC200-R

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

Error indication

A **three-digit** decimal number that flashes in succession is used for diagnosing error states. The shown error codes correspond to the system error messages of the user interface (GUI/MUI).

Error codes

Code	Meaning/brief description
007	Software version error
008	Self-test failed
052	Invalid SPS program
055	Maximum SPS cycle time exceeded
071	SPS operating voltage is low
081	Time-out 2 ms implementation
082	Interbus malfunction
083	Interbus memory overflow
084	Interbus configuration error
085	Interbus bus error
086	Interbus hardware / firmware error
087	Interbus I/O bus module error
088	Interbus not ready
089	Interbus general generation 4 error

Figure 4-31: Error codes MTC200-R

4.4 CNC Module MTC-R

Connector locations

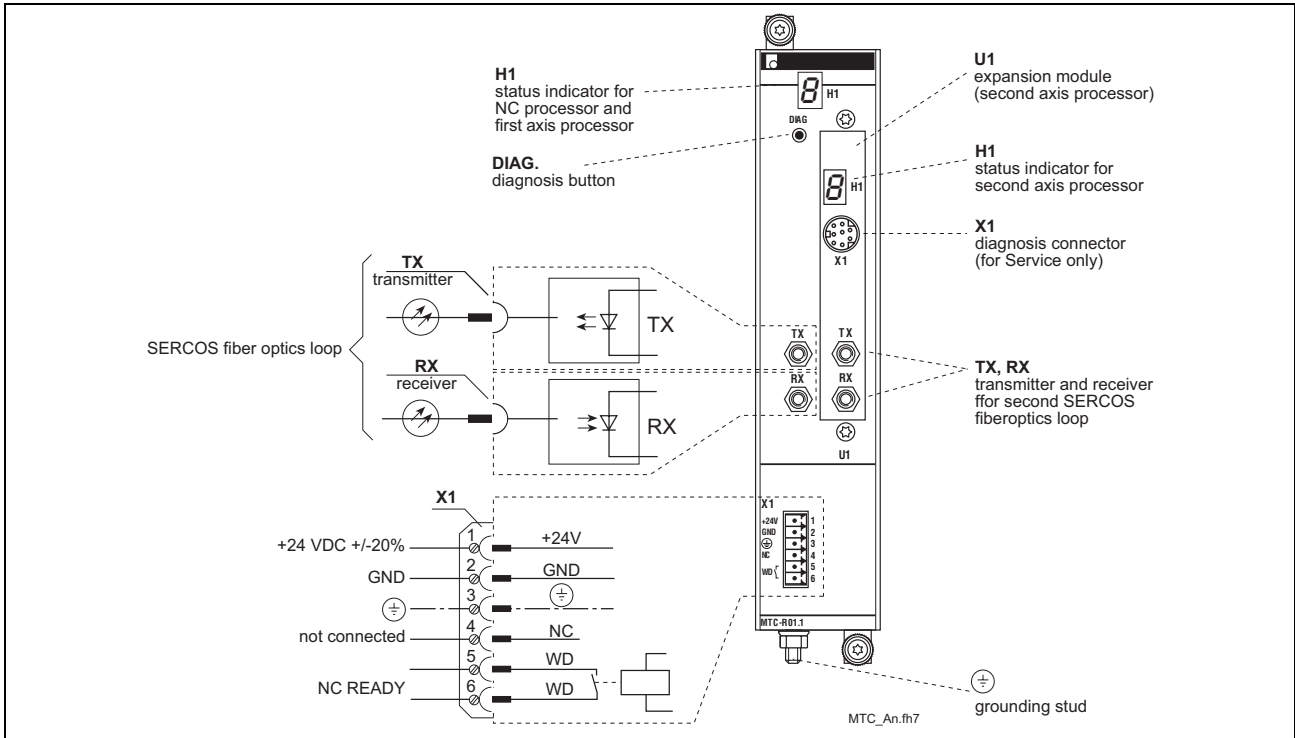


Figure 4-32: MTC-R01 front view

SERCOS fiber optics loop

The MTC-R controller permits drives to be used that are compatible with the SERCOS interface. The connection between the controller (MTC-R) and the digital drives (such as DIAx04) is established via fiber optics cables.

The employed topology is a loop structure according to the SERCOS specification (IEC 1491). Up to 8 drives can be connected to a loop.

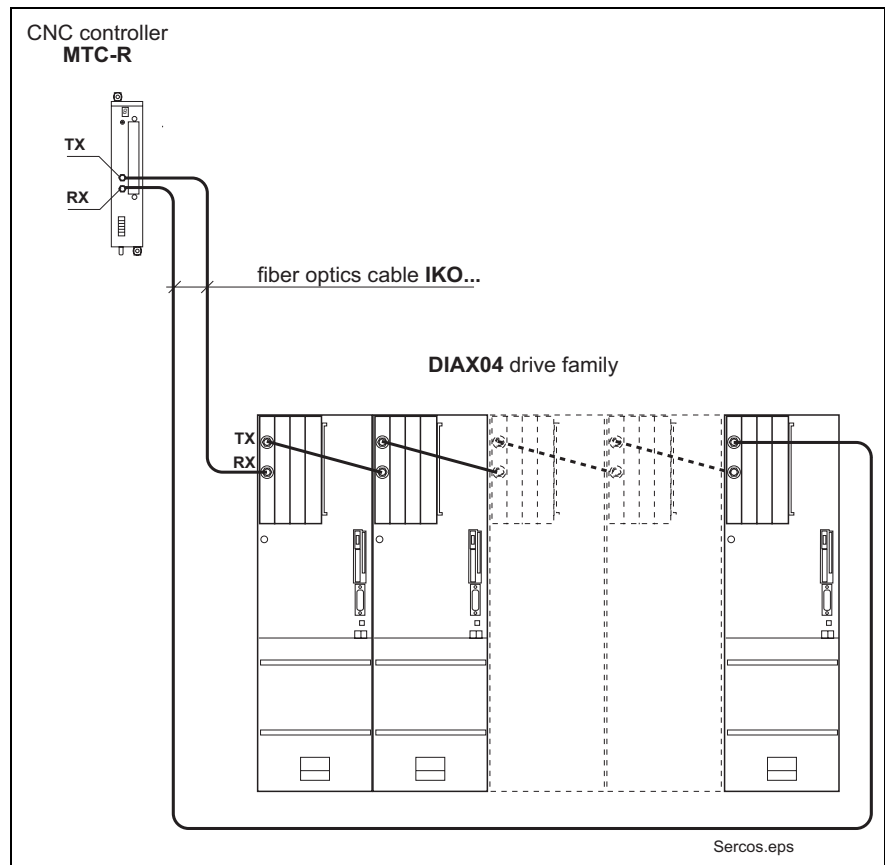


Figure 4-33: SERCOS fiber optics loop

The loop begins and ends at the controller. The optical output of the controller (TX) is connected to the optical input of the first drive (RX). The output of the first drive is connected to the input of the next drive, etc.. The output of the last drive is connected with the controller input.

Drive address

Each drive has its unique drive address. This address can be selected independently of the position in the fiber optics loop. Rotary switches at the drive are used for setting the drive address.

Status displays and fault diagnosis

Arrangement of the diagnosis display

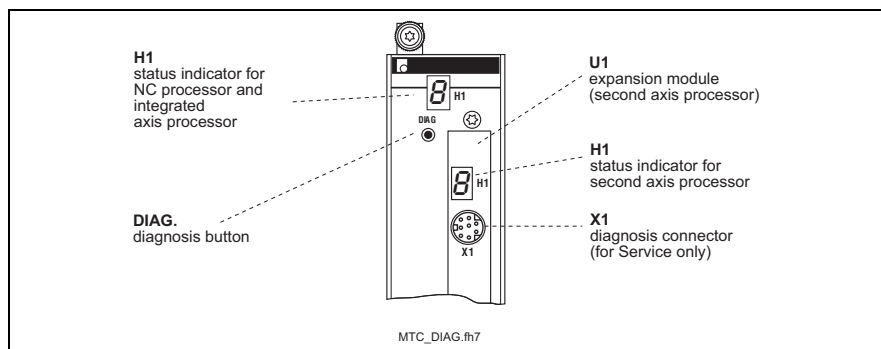


Figure 4-34: Diagnosis display

„H1" diagnosis display“

The MTC-R controller is equipped with a diagnosis system that permits diagnoses of all operating states and malfunctions to be made.

Note: The H1 diagnosis display (a single-digit 7-segment display) is located on the controller's front panel.

„DIAG“ diagnosis button

The MTC-R controller is equipped with a diagnosis button. As long as this diagnosis button is pressed, the diagnosis of the integrated axis processor is activated instead of the CNC processor diagnosis.

Note: Any additionally installed axis processor modules (slots U1 through U3) are diagnosed by their own error and status displays (H1).

Operating state display

The H1 status display shows the state of the controller. The following states are displayed as a **single-digit** code.

Status codes

Code	Meaning/brief description
b	Operational
0.	Power-on state (reset test)
F.	Firmware in Flash EPROM invalid
J.	Boot lock for firmware active

Figure 4-35: Status codes

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

Error indication

A **three-digit** decimal number whose digits flash in succession is used for diagnosing error states. The shown error codes correspond to the system error messages of the user interface (GUI/MUI).

Error codes	Code	Meaning/brief description
	007	Software version error
	008	Self-test failed
	017	Invalid data memory in the CNC
	019	CNC battery is low
	023	Incomplete CNC parameter set
	024	Invalid data memory in the CNC
	028	Invalid parameter revision
	029	Data memory is full
	030	The controller supports a maximum of four axes
	033	Error in the axis processor module initialization
	034	Axis processor module - watchdog function
	035	The axis processor cannot be addressed
	036	Axis processor in slot ? is missing
	049	Error during SPS initialization
	050	The SPS processor cannot be addressed
	051	SPS watchdog function
	052	Invalid SPS program
	055	Maximum SPS cycle time exceeded
	071	SPS battery voltage is low
	081	Time-out 2 ms implementation
	082	Interbus malfunction
	083	Interbus memory overflow
	084	Interbus configuration error
	085	Interbus bus error
	086	Interbus hardware / firmware error
	087	Interbus I/O bus module error
	088	Interbus not yet ready
	089	Interbus general generation 4 error

Figure 4-36: Error codes

5 Modules for SPS Module MTS-R

5.1 INTERBUS Master Interface

Brief description of the IBM 2 card

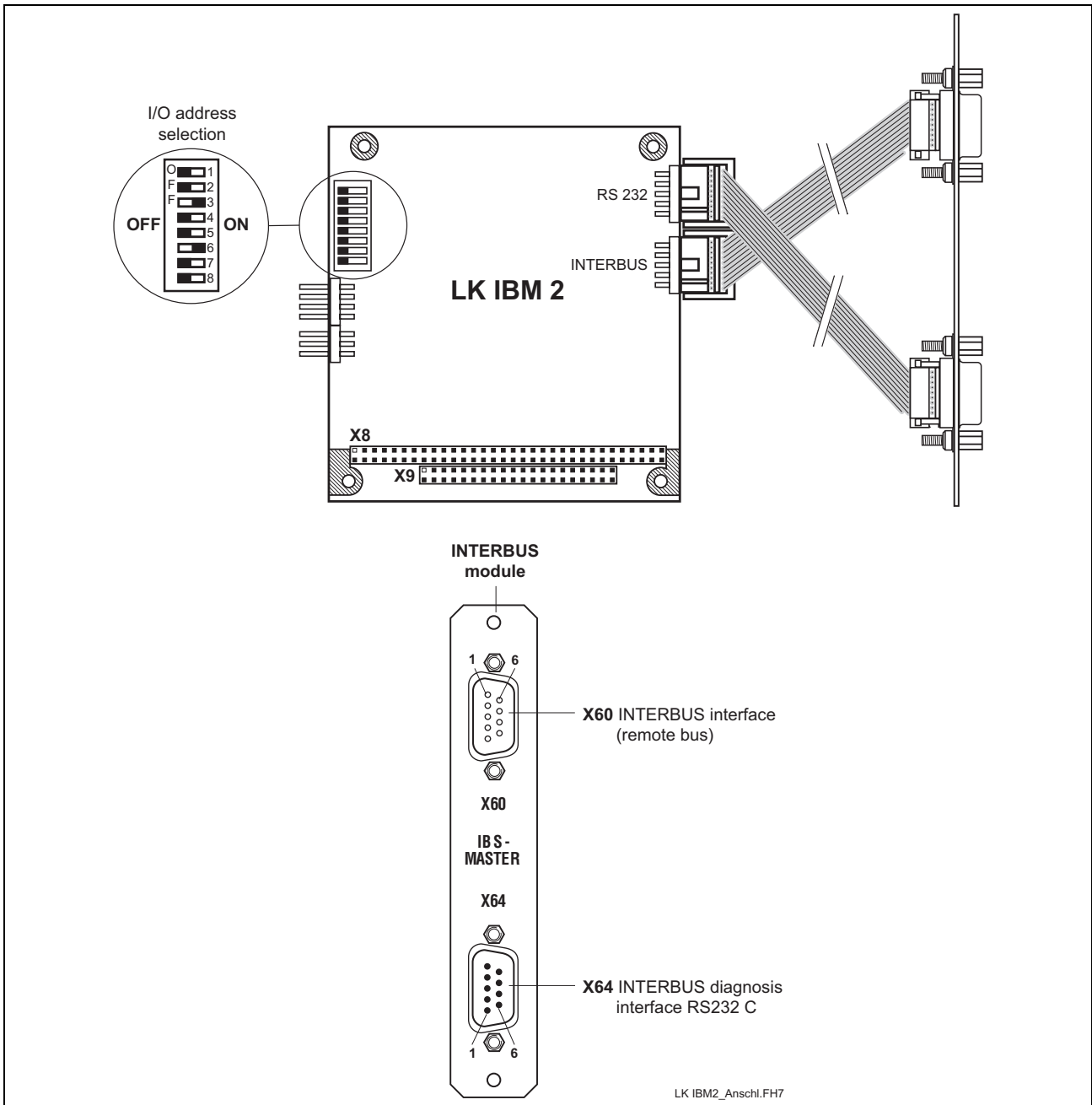


Figure 5-37: LK IBM 2

The IBM 2 printed circuit board is an INTERBUS master interface of generation 4 in the PC104 format. It is suitable to provide for the INTERBUS connection of units that range from simple sensors and actuators up to smart field devices. The INTERBUS permits distances up to 12.8 km to be covered (from the interface up to the last remote bus device on the link), split into segments of up to 400 m.

The IBM 2 card has the following features:

INTERBUS protocol (DIN E 19 258)

- up to 256 bus segments
- up to 16 device levels
- up to 512 devices per configuration
- up to 4096 inputs and 4096 outputs per configuration
- up to 32 INTERBUS loop devices per bus segment
- CMD G4 support

Configuration and parameter value assignment of the INTERBUS is performed directly via the I/O configurator that is integrated in the SPS programming interface.

In addition to the integrated INTERBUS diagnosis, the IBS CMD SWT G4 software (Phoenix-Contact) can be used via the diagnosis interface.

Note: Configuring the INTERBUS via the IBS CMD SWT G4 software is not possible.

Setting the I/O address

In order to be able to address the IBM 2 printed circuit board in a defined manner, the S1 DIP switch must be set to the following positions:

1	2	3	4	5	6	7	8	Address
OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	120 _h

Figure 5-38: Settings of DIP switch **S1**

Interface pin assignments

Pin	Signal name	Pin	Signal name
1	DCD - Data Carrier Detect	2	RxD - Receive Data
3	TxD - Transmit Data	4	DTR - Data Terminal Ready
5	SGND - ground	6	DSR - Data Set Ready
7	RTS - Ready To Send	8	CTS - Clear To Send
9	RI - Ring Indicator		

Figure 5-39: Connector pin assignments of the INTERBUS diagnosis interface **X64** (RS232 C)

Pin	Signal name	Pin	Signal name
1	DO	2	DI
3	GND - ground	4	NC
5	+ 5V	6	\overline{DO}
7	\overline{DI}	8	NC
9	RBST		

Figure 5-40: Connector pin assignments INTERBUS interface **X60** (remote bus)

5.2 Profibus-DP Interfaces

Brief description of the Profibus master and slave interfaces

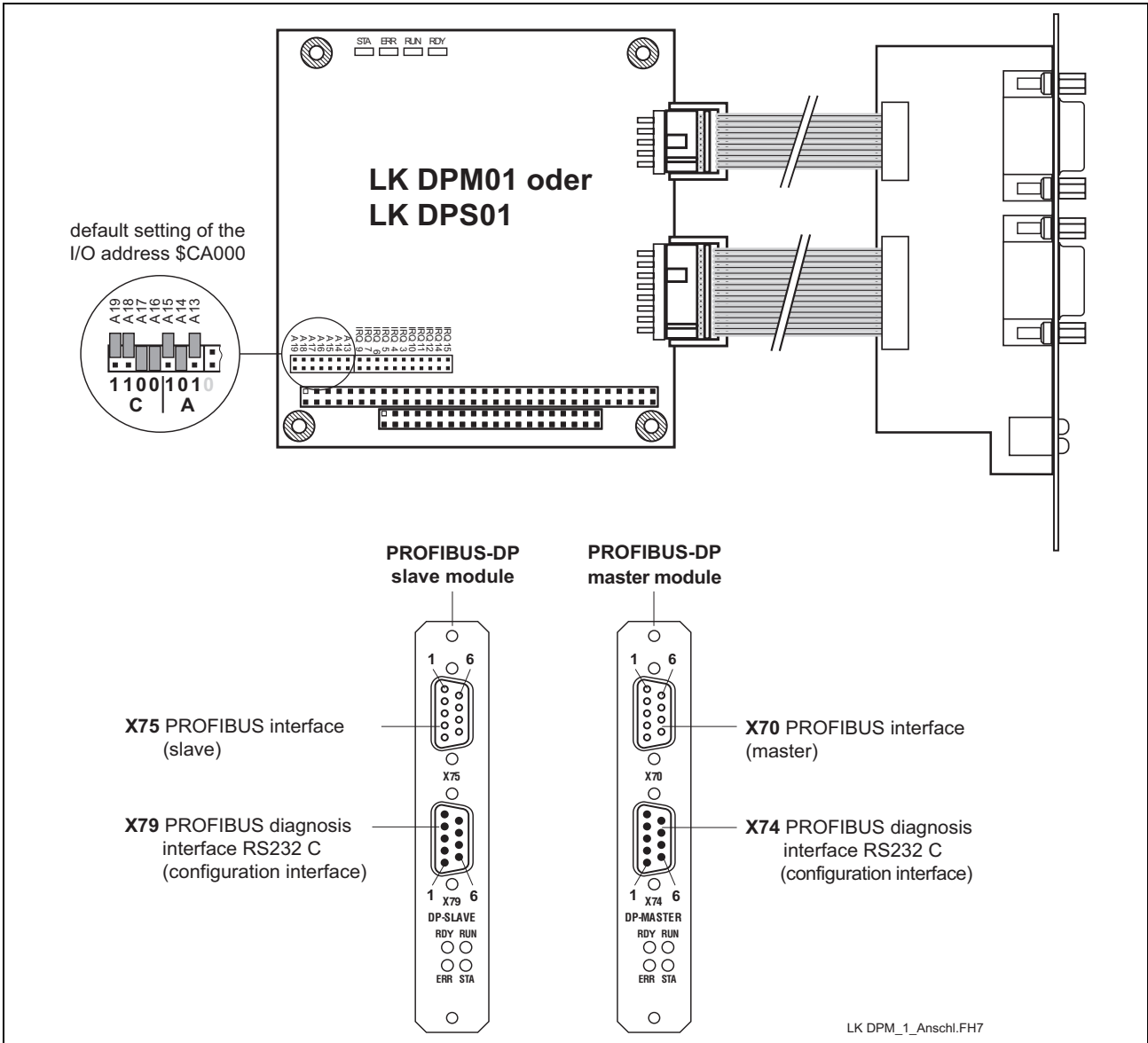


Figure 5-41: LK DPM01 and DPS01

The DPM01 (Master) and DPS01 (Slave) printed circuit boards are smart PROFIBUS-DP interfaces in the PC104 format. They are used for handling the transfer protocols between the SPS and remote I/O units. The integrated microprocessor provides for autonomous handling of the entire data transfer, thus relieving the SPS of time-critical tasks.

The data is exchanged between the SPS and the DPM01 and/or DPS01 printed circuit boards via an 8-kB dual-port memory (DPM). This is a memory that can simultaneously be accessed by the SPS and the microprocessor of the DPM01 and DPS01 printed circuit boards.

The PROFIBUS-DP master interface LK DPM01 permits up to 32 PROFIBUS-DP devices to be connected within a bus segment. If several bus segments are interconnected via repeaters, a maximum of 125 slaves can be controlled in the maximum configuration. Each employed repeater reduces the maximum number of slaves within the segment. Since the receiver is a passive device, it does not have a device address assigned.

The DP slave can have a maximum of 368 bytes I/O assigned in the process image; with a maximum of 244 bytes thereof being I or O. The DP master has 512 bytes I/O in the process image. The baud rate ranges from 9.6 kbits/s to 12 Mbits/s. The maximum distance between the PROFIBUS-DP devices depends on the selected baud rate and can be up to 1200 m. At a baud rate of 1.5 Mbits/s, the distance is reduced to a maximum of 200 m, and to a maximum of 100 m at 12 Mbits/s.

Setting the I/O addresses

The bus address is selected via the plug-in jumpers of the J2 jumper array. The related address lines are specified next to the individual jumpers.

According to the expansion slot, the addresses must be set as follows (X = jumper inserted):

Slot	Address	A19	A18	A17	A16	A15	A14	A13
1	\$CA000			X	X		X	
2	\$CC000			X	X			X

Figure 5-42: Setting the I/O address

Status and diagnosis indicators

The DPM01 and DPS01 printed circuit boards perform a self-test after they have been switched on. The two LEDs ERR and STA go OFF after the initialization phase (2-3 seconds), and the yellow RDY LED goes ON after faultless execution. If the self-test fails, the RDY LED starts blinking and program execution is aborted. The following overview shows the other meanings of the indicators during initialization.

RDY	Yellow LED	Ready
	ON:	DPM01 and/or DPS01 ready for operation
	Blinks rhythmically	Bootstrap loader is active
	Blinks irregularly	Hardware or system fault
	OFF:	Hardware defect
RUN	Green LED	RUN (communication)
	ON:	Communication is running
	Blinks rhythmically:	Ready for communication
	Blinks irregularly:	Communication faults
	OFF:	No communication
ERR	Red LED	Error

ON: Fault on communication interface
 OFF: Communication interface OK

STA Yellow LED **Status**
 ON: Data exchange with slave is active (Master)
 (Slave) Data exchange with master is active
 OFF: No data exchange

Specifications

Power supply	
Operating voltage:	+5VDC, ±5% / 650 mA
Interface data	
Communication interface:	PROFIBUS-DP, max. 12 Mbits/s, floating
Diagnostics interface:	RS 232C, 9600 bits/s
Operating conditions	
Operating temperature:	0°C - +55°C
Storage temperature:	-25°C - +70°C
Humidity:	max. 75%, no condensation

Figure 5-43: Specifications of Profibus-DP interface

Interface pin assignments

The Profibus interfaces have the following pin assignments:

Pin	Signal name	Pin	Signal name
1	NC	2	RxD - Receive Data
3	TxD - Transmit Data	4	DTR - Data Terminal Ready
5	GND - signal ground	6	NC
7	RTS - Ready To Send	8	CTS - Clear To Send
9	NC		

Figure 5-44: Connector pin assignments of diagnostics interface RS 232C (**X74**, **X79**)

Pin	Signal name	Pin	Signal name
1	RGND - reference potential	2	NC
3	RxD/TxD-P - transmit/receive	4	NC
5	DGND - reference potential	6	VP - supply power - plus
7	NC	8	RxD/TxD-N -transmit/receive
9	NC		

Figure 5-45: Connector pin assignments of PROFIBUS interface (**X70**, **X75**)

5.3 Serial Interfaces

Brief description of the serial interface module

Up to four general-purpose serial interfaces can be made available to the SPS user program via the SIO 04-B card. The serial interfaces are handled in an interrupt-controlled way through the SPS firmware.

The transmit and/or receive data of the individual interfaces is available in 256-byte buffers. Using function blocks provided, the SPS user program employs these buffer for communicating indirectly with the interfaces.

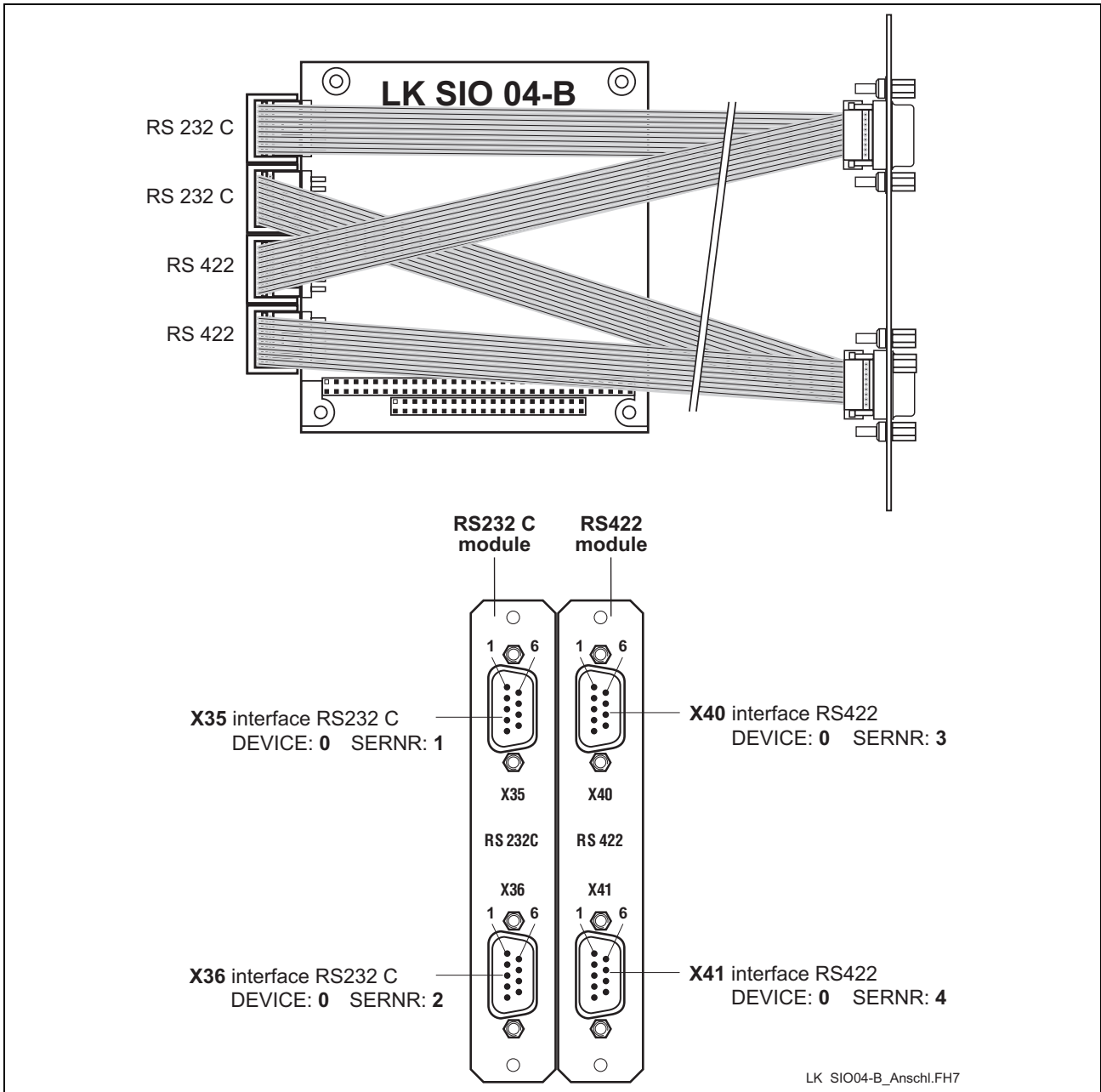


Figure 5-46: LK SIO 04-B

Addresses and interrupt selection

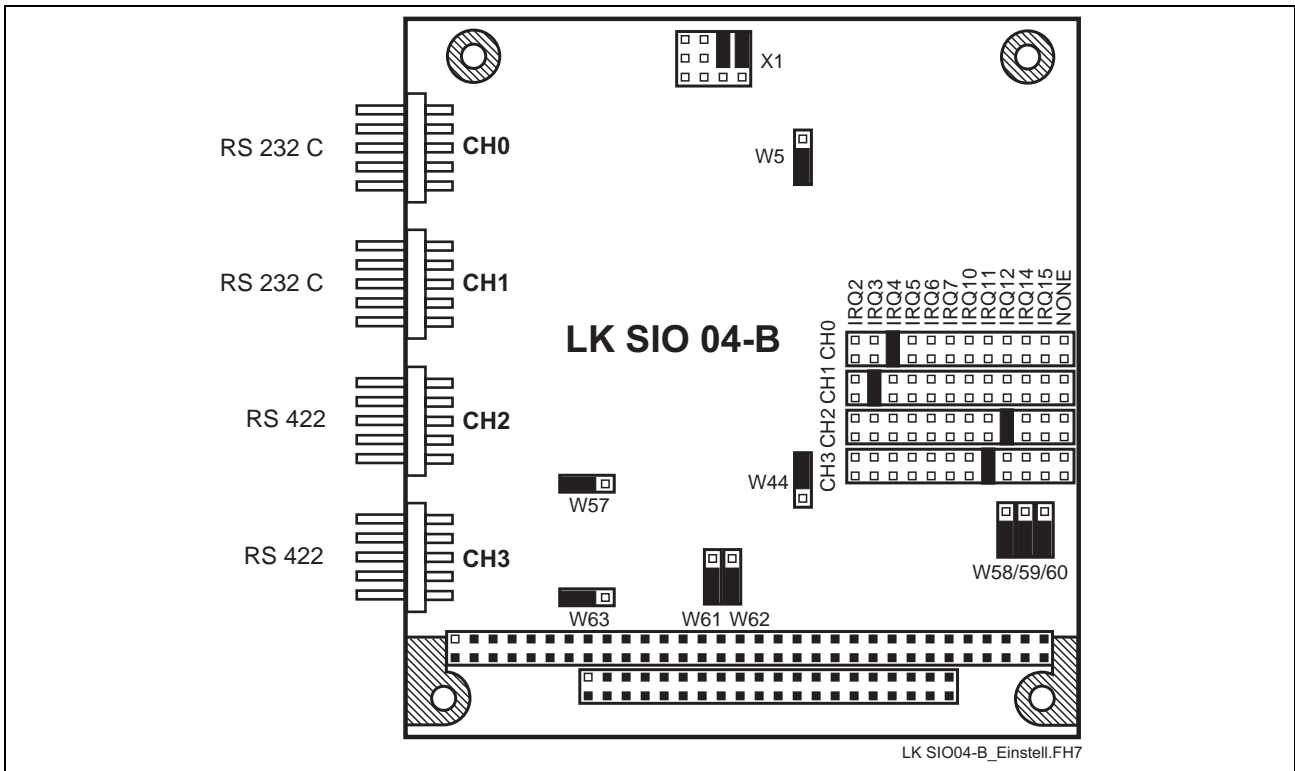


Figure 5-47: Jumper settings on the LK SIO 04-B board

Function blocks

Name	Comment
OPEN_COM	Opens a serial interface
CLOSE_COM	Closes a serial interface
RD_BYTE	Reads a byte from the receive buffer
WR_BYTE	Writes a byte to the transmit buffer
RD_STRING	Reads a string from the receive buffer
WR_STRING	Writes a string to the transmit buffer

Figure 5-48: Function blocks for interface handling

The COM data type is required for assigning the parameter values of the blocks. This data type gives a detailed description of the serial interface (e.g. DEVICE, SERNR, BAUDRATE etc.). Please refer to the "SPS Instruction Set" document for a detailed description of the function blocks.

Specifications

Power supply	
Supply voltage:	4.5 - 5.5 VDC
Current consumption:	max. 250 mA
Interface data	
Input capacitance:	max. 15 pF
Input leakage current:	max. 5 μ A
Output capacitance:	min. 150 pF
Output current (active 0 switching):	min. 12 mA

Figure 5-49: Specifications of interface module

Interface pin assignments

The four serial interfaces have the following pin assignments:

Pin	Signal name	Pin	Signal name
1	DCD - Data Carrier Detect	2	$\overline{\text{Rx}}\text{D}$ - Receive Data
3	$\overline{\text{Tx}}\text{D}$ - Transmit Data	4	DTR - Data Terminal Ready
5	SGND - ground	6	DSR - Data Set Ready
7	RTS - Ready To Send	8	CTS - Clear To Send
9	RI - Ring indicator		

Figure 5-50: Connector pin assignments RS 232C **X35, X36**

Pin	Signal name	Pin	Signal name
1	GND - Frame ground	2	No connection
3	TxD A - Transmit Data	4	RxD A - Receive Data
5	SGND - Signal ground	6	RxD B - Receive Data
7	RTS - Ready To Send	8	CTS - Clear To Send
9	TxD B - Transmit Data		

Figure 5-51: Connector pin assignments RS422 **X40, X41**

6 Module for CNC Module MTC-R

6.1 Brief Description of the Axis Processor Module

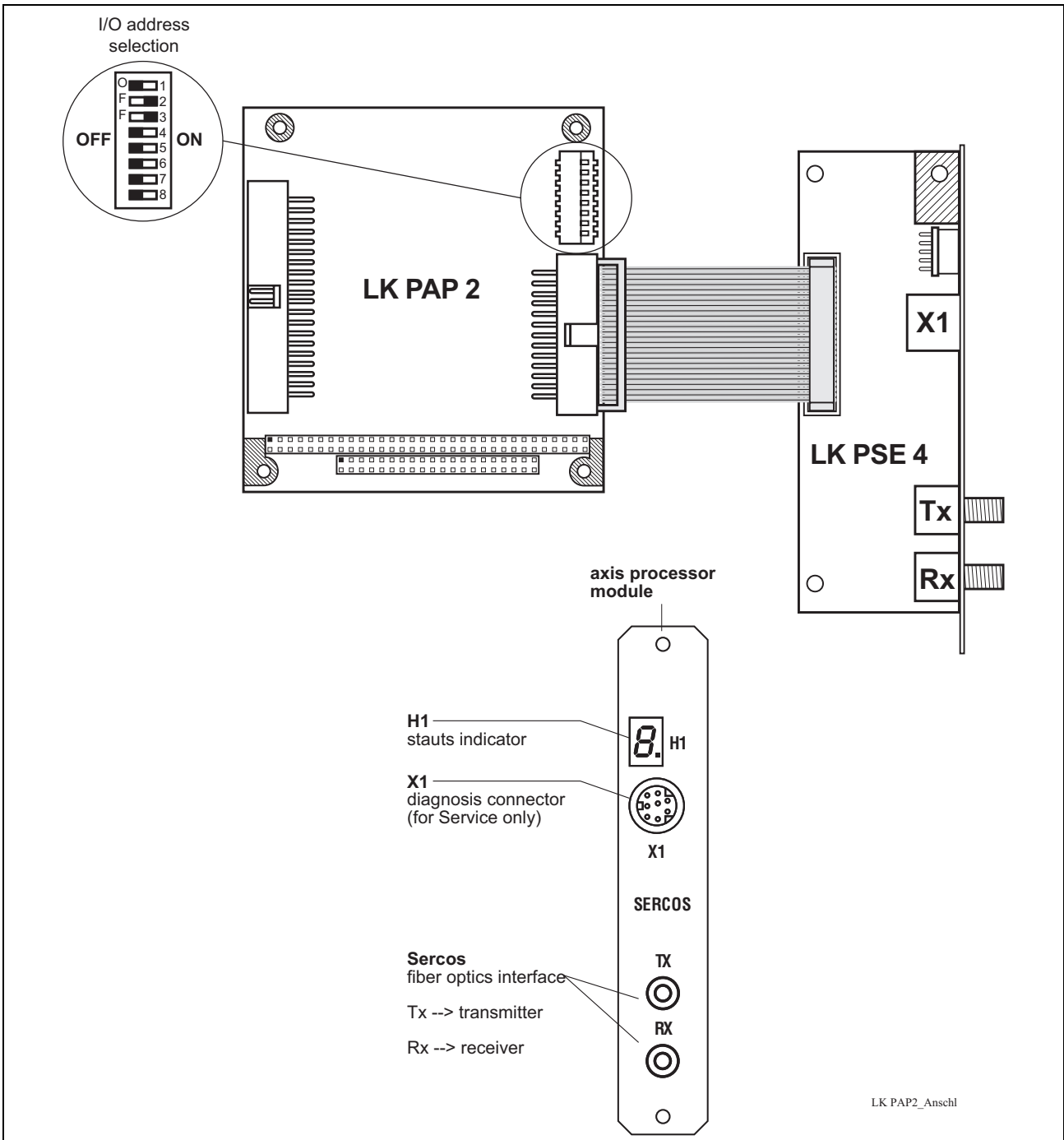


Figure 6-52: LK PAP2

The PAP 2 axis processor module is used for the communication exchange between the controller and the digital drive controllers via the SERCOS interface.

Each axis processor module is able to control up to 8 drives. The maximum configuration of the MTC-R02.1 permits another three modules to be fitted. Thus, up to 32 drives can be controlled that can be distributed among seven processes.

6.2 Setting the I/O Address

In order to be able to address the PAP 2 printed circuit board in a defined manner, the S1 DIP switch must be set to the following positions:

1	2	3	4	5	6	7	8	Module location
OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	U1
OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	U2
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	U3

Figure 6-53: Settings of DIP switch S1

6.3 SERCOS Interface

Specifications of the fiber optics interface

TX Transmitter interface

Name	Mnemonic	Unit	Value
max. transmission power at optical Low level	PSmaxL	dBm/ μ W	-28.2/1.5
min. transmission power at High level	PSminH	dBm/ μ W	-7.5/180
max. transmission power at optical High level	PSmaxH	dBm/ μ W	-3.5/450
Transmitter diode wavelength:			
Peak wavelength	λ_p	nm	640...675 nm (0°C...55°C)
spectral bandwidth	λ_p	nm	< 30 nm (25°C)

Figure 6-54: Specifications of the fiber optics transmitter

RX receiver interface

Name	Mnemonic	Unit	Value
Max. input power for optical Low level	PEmaxL	dBm/ μ W	-31.2/0.75
Min. input power for optical High level	PEminH	dBm/ μ W	-20/10
Max. input power for optical High level	PEmaxH	dBm/ μ W	-5/320
Max. attenuation of the transmission link	PSminH...PEminH	dB	12.5

Figure 6-55: Specifications of the fiber optics receiver

Fiber optics cables

Configuration notes

When fiber optics cables are configured it must be ensured that the maximum length of the transmission link must not be exceeded. Joints reduce the maximum length of the fiber optics links. Between transmitter and receiver, either only plastic fiber (IKO 982 or IKO 985) or only glass fiber (IKO0002) cables may be used. Changing from plastic to glass fiber or vice versa is not permitted at joints.

Handling the fiber optics cables

'Storage	When fiber optics cables are stored it must be ensured that the protective caps are screwed on and that the mechanical and thermal limit values are not exceed.
Laying and pulling	<p>When you lay or pull in fiber optics cables you must ensure that the installation stress will not damage the cables. This is particular important with respect to the maximum tensile force, the minimum bending radius and the maximum lateral pressure resistance.</p> <p>Do not lay the fiber optics cables across sharp edges or on rough and uneven surfaces. Avoid twisting the fiber optics cable during installation. In its final position, the cable must always be free of stress.</p> <p>Never pull at the connector when you pull in a glass fiber optics cable (IKO0002). With plastic fiber optics cables (IKO 982 and IKO 985) you can thread a pull rope through the lateral hole in the protective cap. The maximum tensile force of 100 N must not be exceeded.</p> <p>Furthermore, you must comply with the requirements of DIN VDE 0899, part 4.</p>
Transmitters and receivers	The transmitter and receiver connectors at the units must be closed with a protective cap when the fiber optics cables are not connected.
Connection	Never exceed the maximum tightening torque of 0.8 N when you connect a fiber optics cable to a transmitter or receiver connector.
	Note: Use a torque wrench (see accessories)

Fiber optics cable types

While plastic fiber optics cables can be used for distances up to 40 m, glass fiber optics cables are suitable for distances up to 500 m.

There are three different types of fiber optics cables available.

Plastic fiber optics cable 2.2 mm	Plastic fiber optics cables of 2.2 mm diameter for the installation in a switchgear cabinet.
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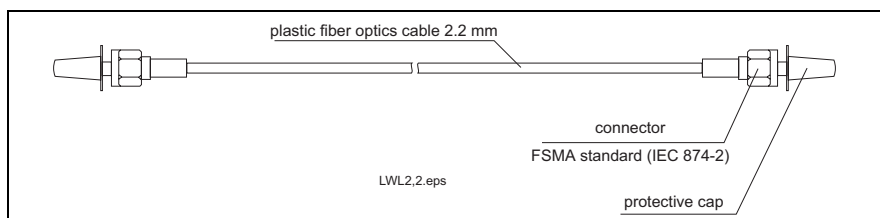


Figure 6-56: 2.2 mm plastic fiber optics cable (IKO 982)

Plastic fiber optics cable 6 mm	Plastic fiber optics cable with reinforced sheath and a diameter of 6 mm for applications inside and outside of switchgear cabinets.
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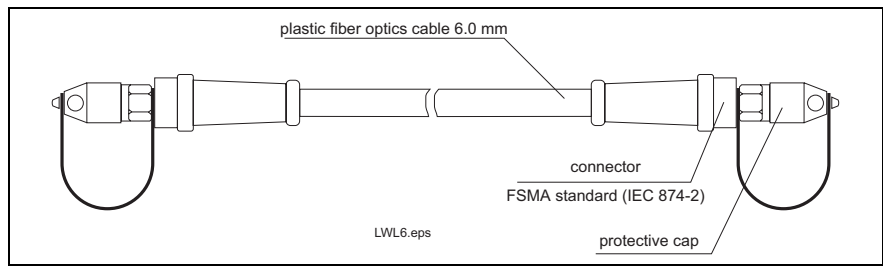


Figure 6-57: 6 mm plastic fiber optics cable (IKO 985)

**Glass fiber optics cable
3 mm**

Glass fiber optics cable with reinforced sheath and a diameter of 3 mm for applications inside and outside of switchgear cabinets, and over long transmission distances.

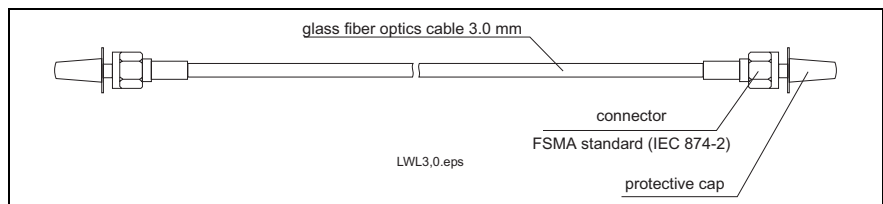


Figure 6-58: 3 mm glass fiber optics cable (IKO0002)

Ordering information

Cable designation	Order number
2.2 mm plastic fiber optics cable	IKO 982/xx
6 mm plastic fiber optics cable	IKO 985/xx
3 mm glass fiber optics cable	IKO0002/xx

Figure 6-59: Fiber optics cables (xx: length in meters)

Accessories

The following accessories are available:

Cabinet grommet

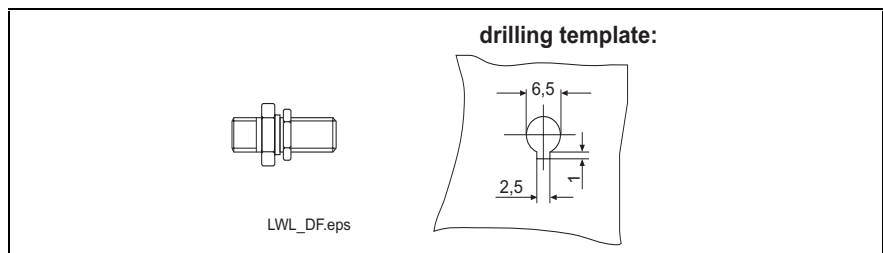


Figure 6-60: Cabinet grommet

Socket wrench

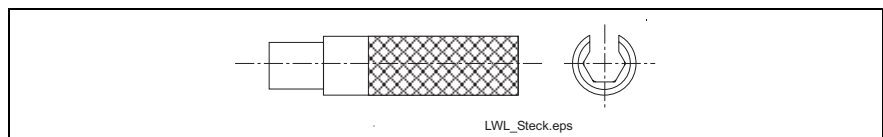


Figure 6-61: Socket wrench for FSMA connectors

Torque wrench

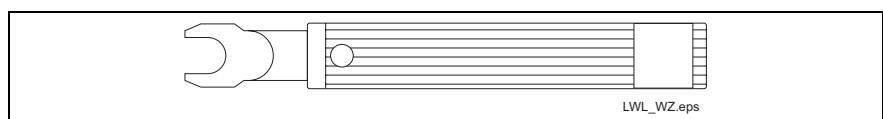


Figure 6-62: Torque wrench for FSMA connectors

Designation	Order number
Fiber optics cable cabinet grommet	STECK-LWL DF
Socket wrench for FSMA connectors	WERKZEUG-STECKSCHLUESSEL LWL-FSMA
Torque wrench	WERKZEUG-DREHMOMENTSCHLUESSEL 74Z 0,8NM

Figure 6-63: Accessories

Specifications of the fiber optics cables

	IKO 982	IKO 985	IKO0002
Outside sheath	Polyamide (PA)	Polyurethane (PUR)	Polyurethane (PUR)
Overall diameter	2.2 mm +/- 0.07 mm	6.0 mm +/- 0.2 mm	3.0 mm +/- 0.x mm
Bending radius	> 50 mm	> 80 mm	> 100 mm
Bend radius of pulled cables	---	> 100 mm	---
Tensile strength, transient	150 N	150 N	330 N
Tensile strength, permanent	100 N	100 N	245 N
Lateral pressure resistance	450 N/cm	100 N/cm	1000 N/cm
Alternating bending stress	> 8000 cycles at +/-90°	> 100000 cycles +/-90°	> 10000 cycles +/-90°
Temperature range - storage	-40 °C...+85 °C	- 20 °C...+70°C	-40 °C...+85 °C
Operation	- 20 °C...+70°C	0 °C...+70°C	-40 °C...+85 °C
Core diameter of optical fiber	1000 µm	1000 µm	400 µm
Specific optical attenuation	< 250 dB/km	< 250 dB/km	
Attenuation per connection	1.5 dB	1.5 dB	1.0 dB
Maximum cable length	40 m	40 m	500 m
Length reduction per additional connection	7.0 m	7.0 m	125 m

Figure 6-64: Specifications of the fiber optics cables

General safety instructions



CAUTION

High-energy laser light

Blindness, eye injuries

⇒ Do not look into the light beam (transmitter output and/or end of the fiber optics cable)



CAUTION

Improper handling or installation

The fiber optics components can be mechanically damaged.

⇒ Do not let fiber optics cables kink.

⇒ Do not exceed the maximum torque when you tighten the fiber optics connectors.

7 Interconnecting Several Controllers via the PROG Interface

The PROG interface can be used for interconnecting up to 16 controllers via RS485 links. This is done by assigning a device number between 0 and 15. The device number enables the controllers to be addressed directly from a programmer or PC.

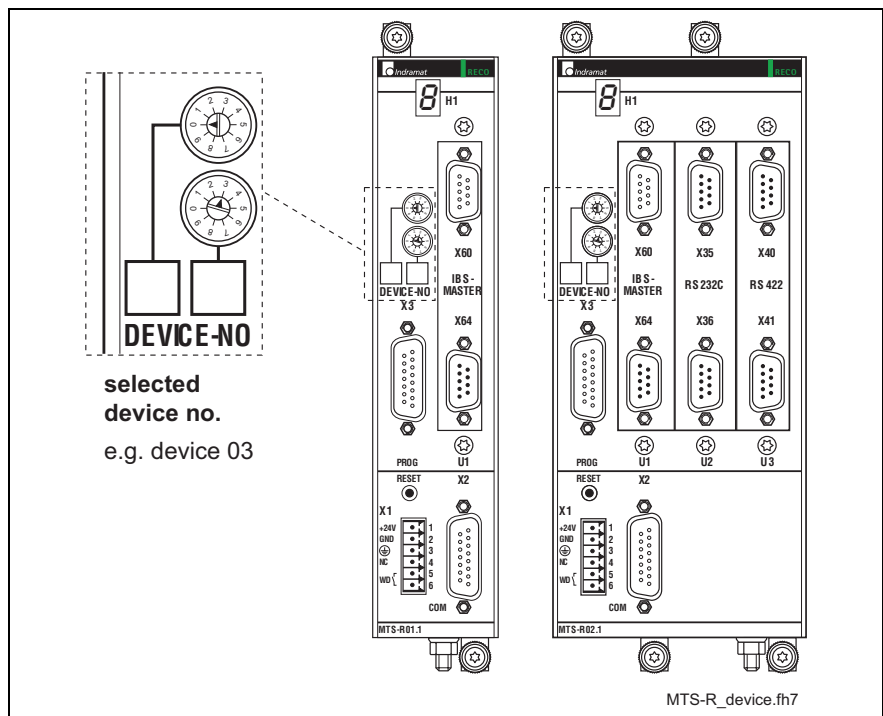


Figure 7-65: Setting the device number

Note: When several controllers are interconnected via an RS485 interface, the **first** and the **last** physical device on the bus must be terminated. This is done using the switch on the INS0619 connectors.

Switch position 1 on the INS0619 connector means
= bus termination is active.

In RS485 operation, the maximum distance between the first and the last device is **400 m**.

7.1 Network Connections with BTV20/30

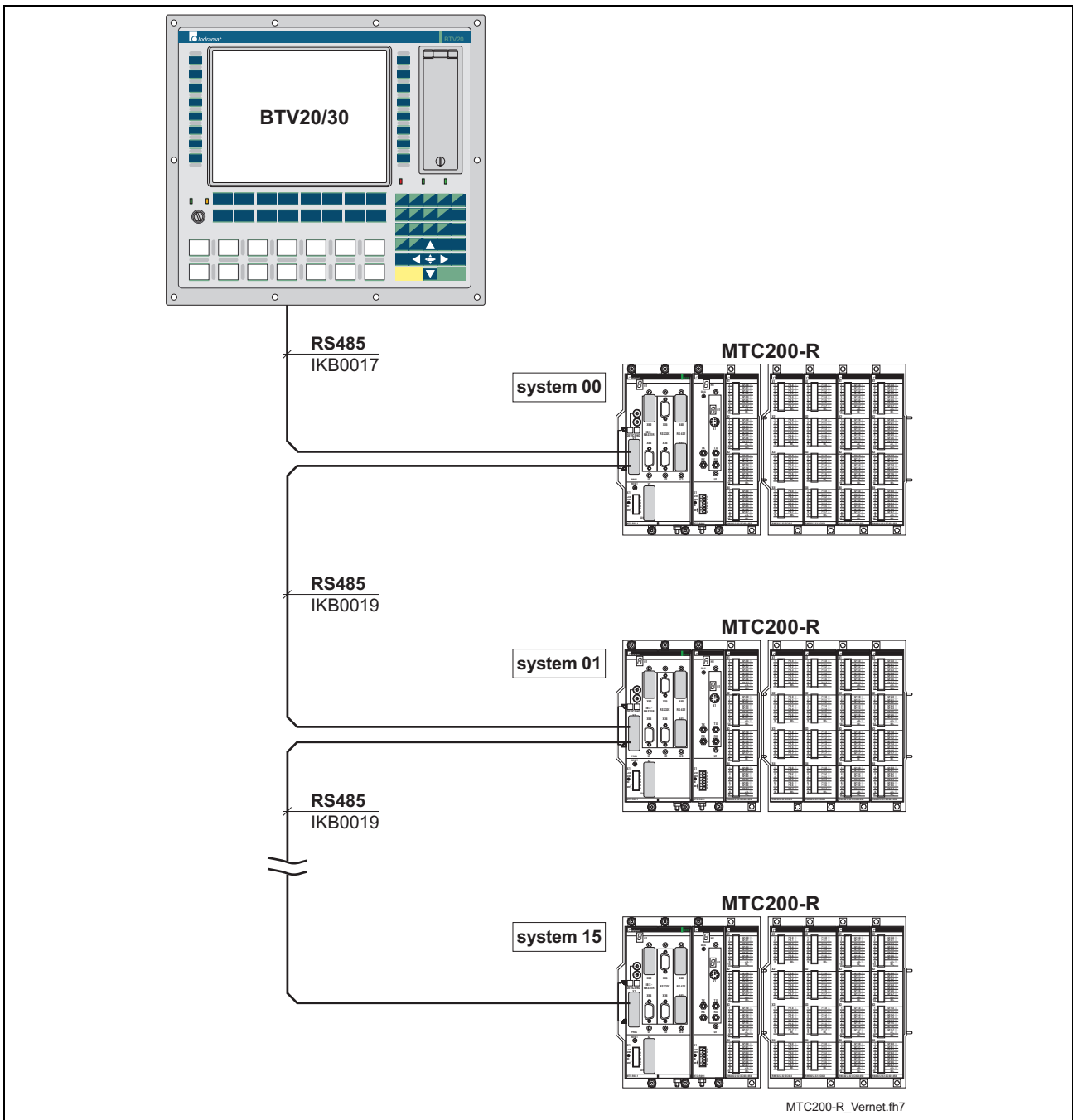


Figure 7-66: Network connections with BTV20/30

7.2 Network Connections with W&T RS485 ISA Bus Interface Card for Use with Industry PC (MN: 282 484)

An RS485 interface card in the ISA bus plug-in module format is available from Indramat that can be used with an industry PC.

The interface card provides two isolated and independent serial RS485 interfaces. However, only one RS485 interface can be used in conjunction with the Indramat user interface.

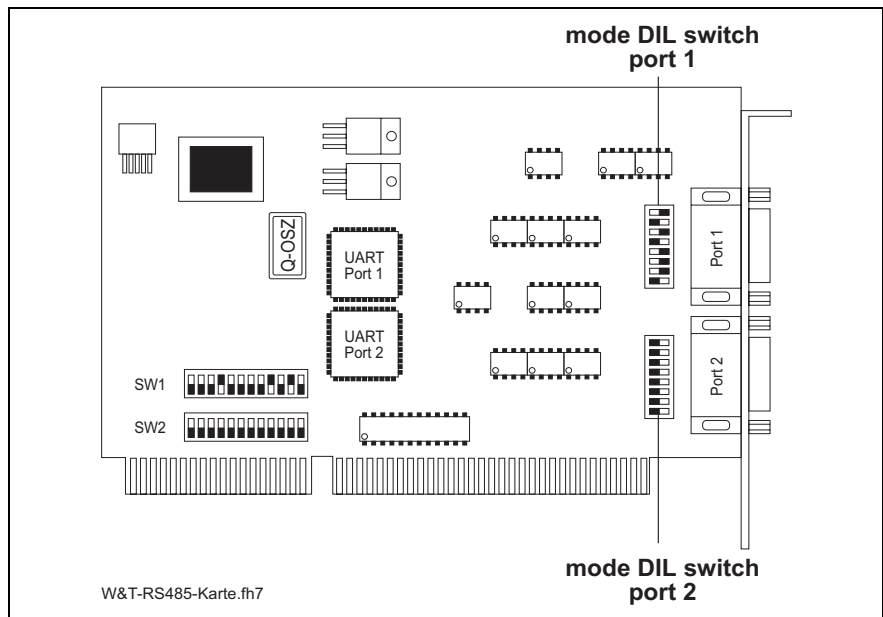


Figure 7-67: W&T-RS485 interface card

Settings on the RS485 interface card

Base address and employed interrupt lines are selected via the DIL switches **SW1 (Port 1)** and **SW2 (Port 2)** at the lower edge of the card.

Interrupt settings

IRQ	SW 1.1	SW 1.2	SW 1.3	SW 1.4	SW 1.5	SW 1.6	SW 1.7	SW 1.8
-	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
4	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
5	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
7	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
9	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
10	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
11	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
12	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Figure 7-68: Settings of interrupt port 1

IRQ	SW 2.1	SW 2.2	SW 2.3	SW 2.4	SW 2.5	SW 2.6	SW 2.7	SW 2.8
-	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
4	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
5	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
7	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
9	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
10	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
11	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
12	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Figure 7-69: Settings of interrupt port 2

Base addresses

The base addresses are selected via the DIL switches SW*.9 - SW*.11.

Note: DIL switch SW*.12 is without function.

Port 1		SW 1.9	SW 1.10	SW 1.11
Disabled		X	X	OFF
COM1	03F8H	OFF	OFF	ON
COM2	02F8H	ON	OFF	ON
COM3	03E8H	OFF	ON	ON
COM4	02E8H	ON	ON	ON

Figure 7-70: Setting the base addresses of port 1

Port 2		SW 2.9	SW 2.10	SW 2.11
Disabled		X	X	OFF
COM1	03F8H	OFF	OFF	ON
COM2	02F8H	ON	OFF	ON
COM3	03E8H	OFF	ON	ON
COM4	02E8H	ON	ON	ON

Figure 7-71: Setting the base addresses of port 2

Note: Identical address selections of the two interfaces must be avoided.

Mode

For communication with the MTC200-R unit, the **mode DIL switches** must be set as follows:

Mode	1	2	3	4	5	6	7
RS485, 2-wire without echo, RTS control	ON	OFF	ON	OFF	ON	ON	ON

Figure 7-72: Setting the mode

Termination

In RS485 mode, the bus system must be terminated with a termination network that ensures a defined idle state in the high-impedance phases of bus operation.

This termination is established by setting the DIL switches 6 and 7 of the **mode DIL switch** to "ON". Thus, termination in the connecting cable connector is not necessary.

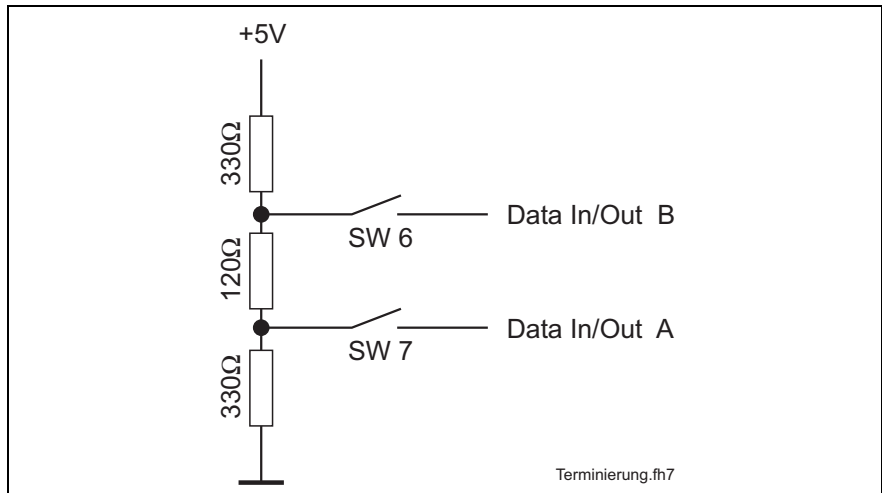


Figure 7-73: W&T module termination

Interface pin assignments

Pin	Function
1	Data Out A (-)
2	Data In A (-)
3	Handshake Out A (-)
4	Handshake In A (-)
5	Signal ground
6	Data Out B (+)
7	Data In B (+)
8	Handshake Out B (+)
9	Handshake In B (+)

Figure 7-74: Interface pin assignments of W&T module

Typical application

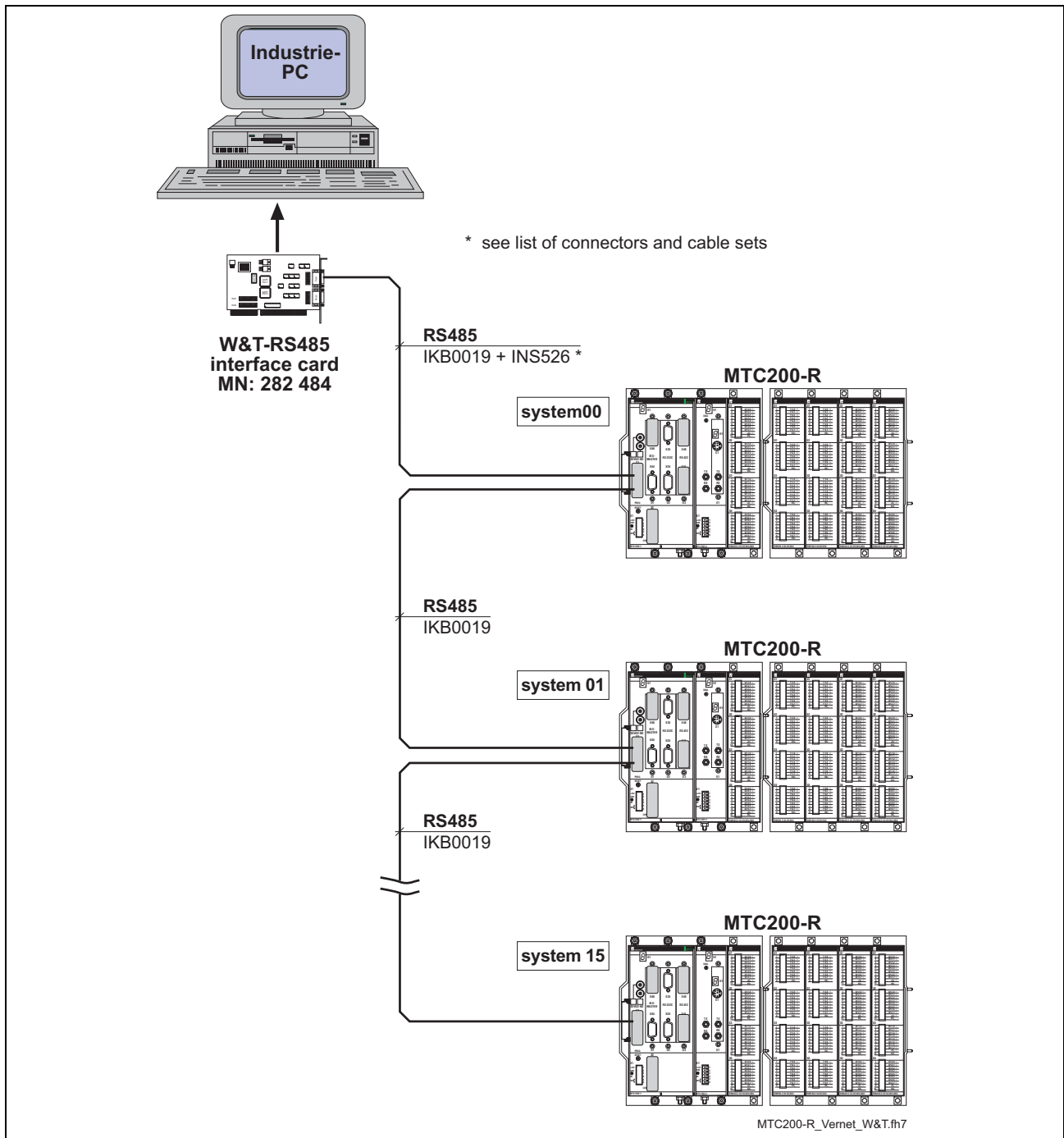


Figure 7-75: Interconnection using W&T-RS485 interface module

8 Type code

8.1 MTS-R

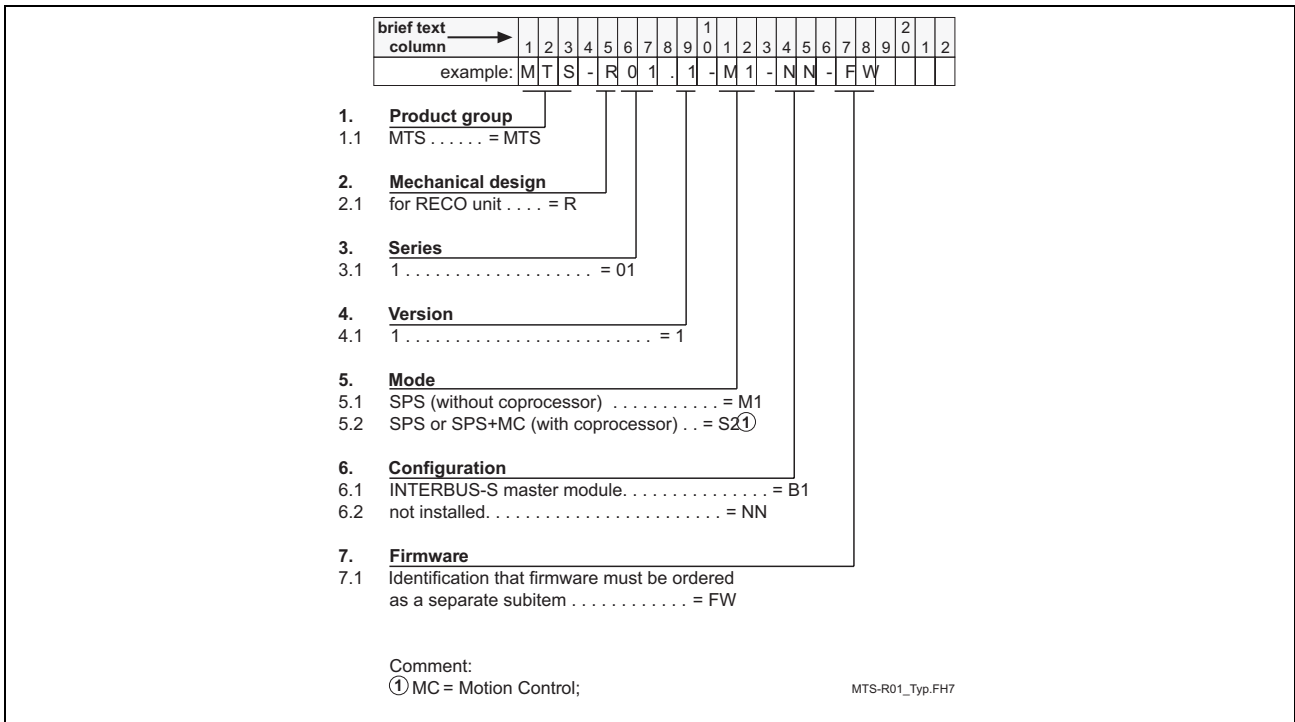


Figure 8-76: Type code MTS-R01

8.2 MTS-R

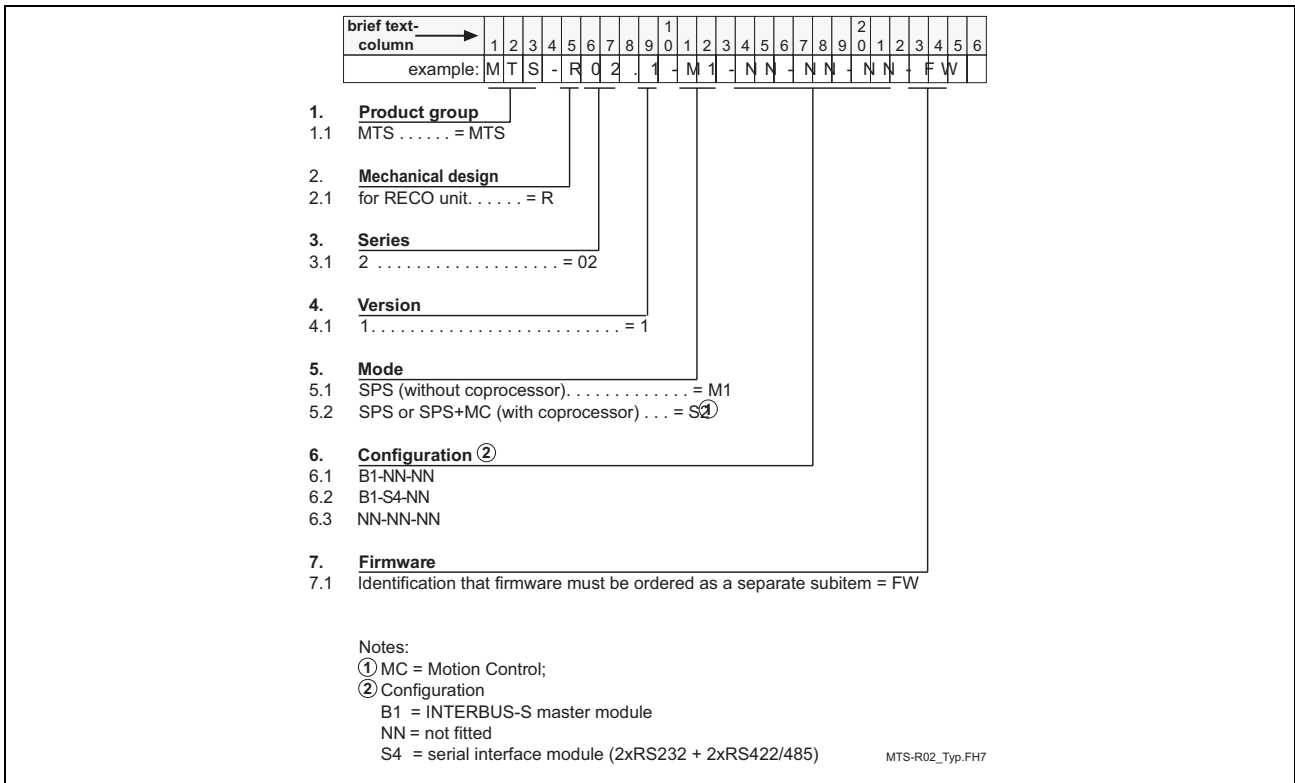


Figure 8-77: Type code MTS-R02

8.3 MTC-R

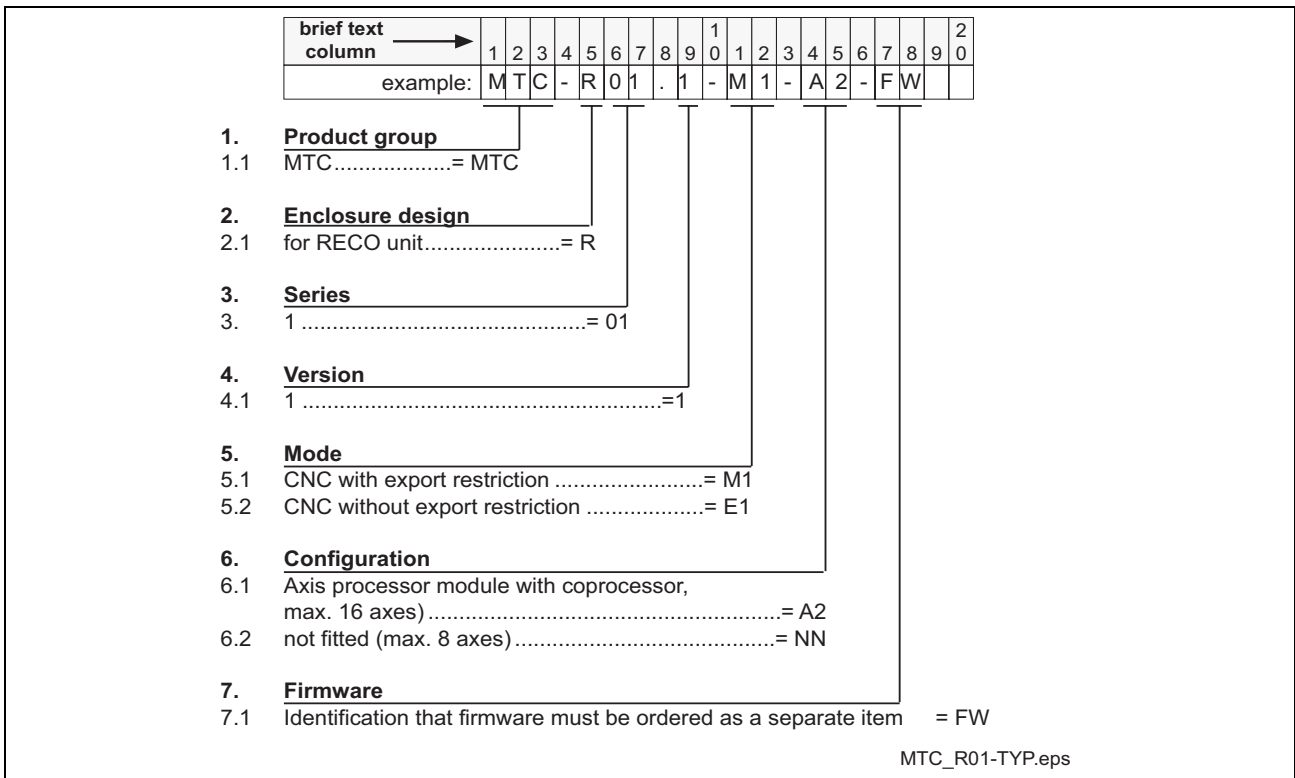


Figure 8-78: Type code MTC-R01

8.4 MTC-R

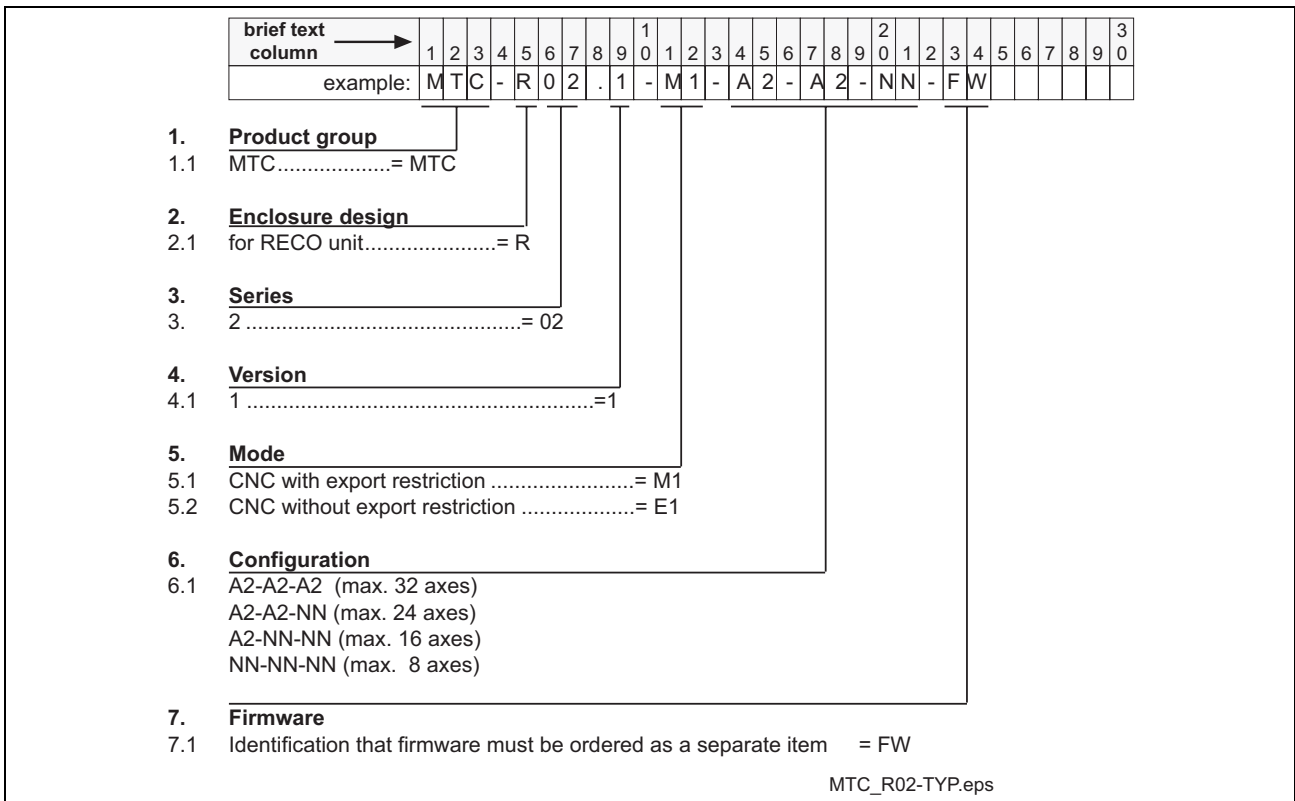


Figure 8-79: Type code MTC-R02

9 SUP-E0*-MTC200-R Accessories

9.1 Brief Description

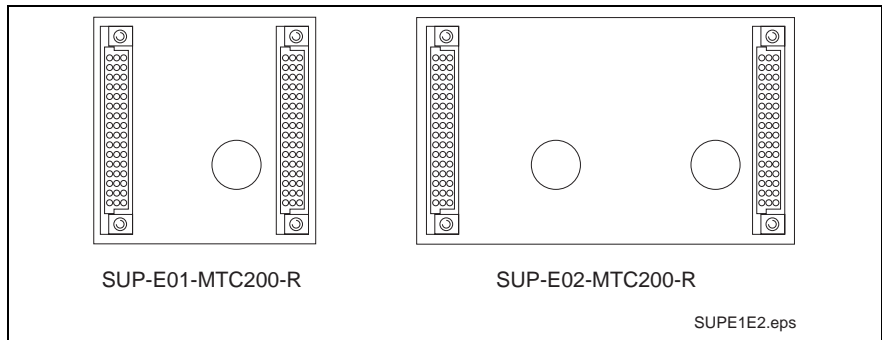


Figure 9-80: Local bus boards SUP-E01-MTC200 and SUP-E02-MTC200-R

The electrical connection between the SPS module MTS-R and the CNC module MTC-R is established via a local bus. This local bus is implemented in the form of a local bus board, and is required as an accessory part of the CNC module MTC-R.

9.2 Versions

There are two versions of the local bus board available:

- As SUP-E01-MTC200-R, 59 mm long
- As SUP-E02-MTC200-R, 100 mm long

9.3 Selection Criterion

The following figure show the possible applications of the local bus boards.

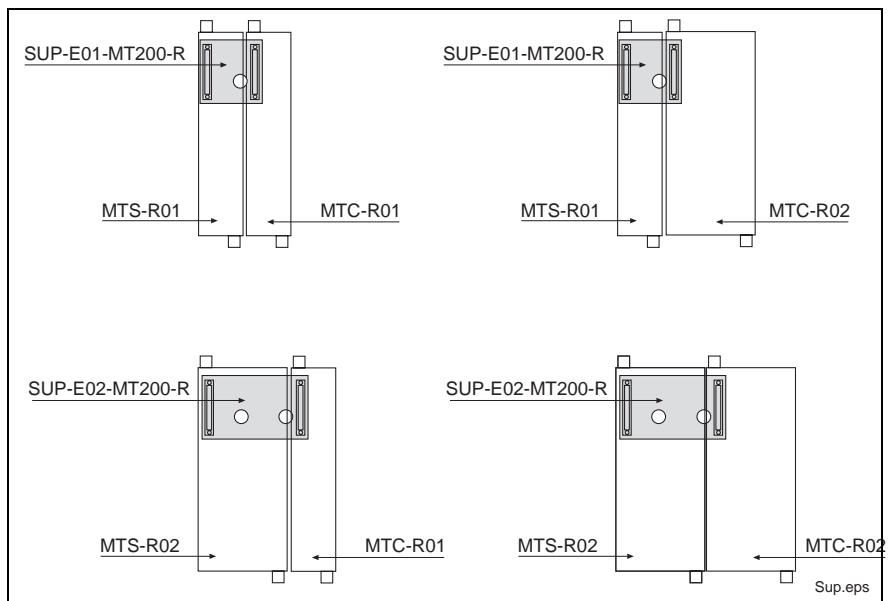


Figure 9-81: Selection

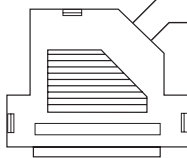

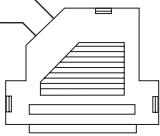
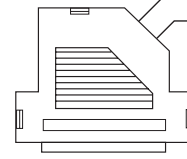

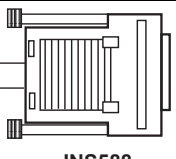
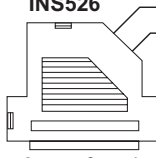

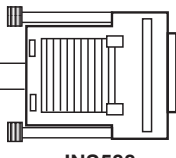
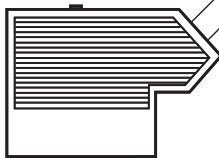

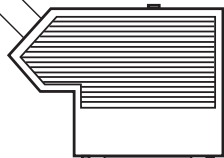
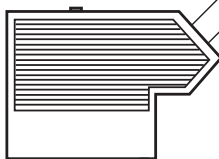


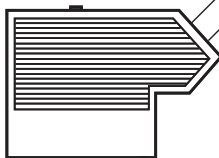

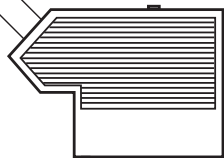
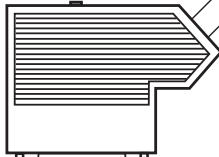


9.4 Installation Notes

The SUP-E0*-MTC200-R local bus board must be installed at the rear of SPS module MTS-R and CNC module MTC-R. Once this has been done, the two modules can be installed in the RMB02.2 rack.

When a module is removed from the RMB02.2 rack, the retaining screws of **both** modules (MTS-R and MTC-R) must be removed and **both** modules must be removed from the rack **at the same time**.

Note: The local bus board may be damaged if the two modules are not removed simultaneously.

10 List of Connectors and Cable Sets

Cable set order no.	Unit connector	INDRAMAT cable	Cable end
IKB0005 MN: 278 141; 2 m MN: 278 144; 5 m MN: 278 142; 10 m MN: 278 143; 15 m (RS232, max. 15 m)	INS439  15-way male		INS526  9-way female
IKB0012/000,0 MN: 281 715 (RS232, max. 15 m)	INS439  15-way male		 INS588 9-way female
IKS0106/000,0 MN: 260 838 (RS232, max. 15 m)	INS526  9-way female		 INS588 9-way female
IKB0015/000,0 MN: 282 870 (RS422, max. 400 m)	INS645  15-way male		INS645  15-way male
IKB0016/000,0 MN: 282 871 (RS422, max. 400 m)	INS645  15-way male		INS526  9-way female
IKB0017/000,0 MN: 282 872 (RS485, max. 400 m)	INS619  15-way male		INS619  15-way male
IKB0018/000,0 MN: 282 874 (RS485, max. 400 m)	INS619  15-way male		INS526  9-way female


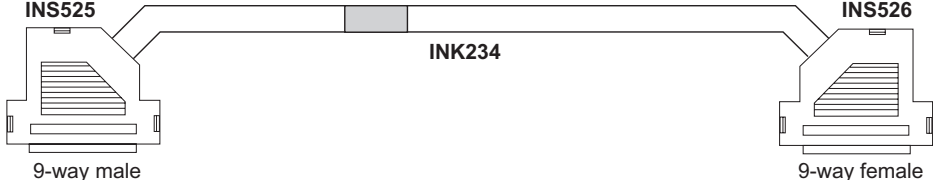
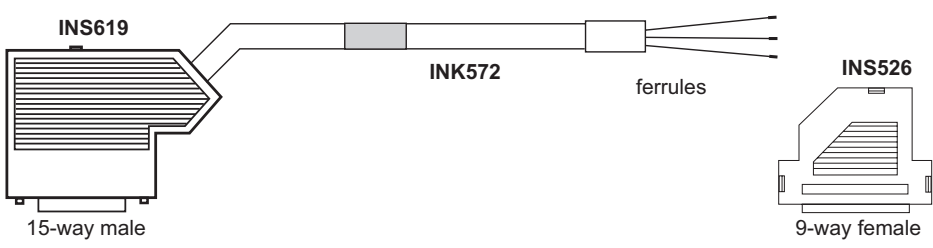
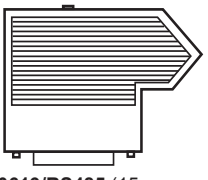
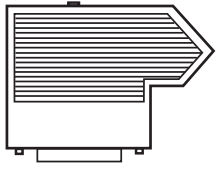
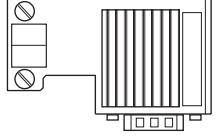
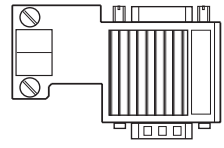
<p>IKB0019/000,0 MN: 282 875 (RS485, max. 400 m)</p>	 <p>INS619 15-way male INK572 ferrules</p>
<p>IKS0056/000,0 MN: 255 968 (INTERBUS, max. 400 m)</p>	 <p>INS525 9-way male INK234 INS526 9-way female</p>
<p>IKB0019/000,0 MN: 282 875 + INS526 MN: 259 762 (RS485 with W&T, max. 400 m)</p>	 <p>INS619 15-way male INK572 ferrules INS526 9-way female</p>
<p>INS0619/K01 MN: 279 583</p>	 <p>INS0619/RS485 (15-way male) Y connector for building customized cables with active termination</p>
<p>INS0645/K01 MN: 282 040</p>	 <p>INS0645/RS422 Connector for building customized cables with active termination</p>
<p>INS0540/K01 MN: 279 538</p>	 <p>INS0540/Profibus (male) Profibus connector for building customized cables with active termination</p>
<p>INS0541/K01 MN: 279 539</p>	 <p>INS0541/Profibus (male/female) Profibus connector for building customized cables with active termination (side-by-side installation)</p>

Figure 10-82: MTS-R accessories

11 Figures

Figure 1-1: Typical configuration of MTS-R02 + MTC-R01 with I/O modules	1-1
Figure 1-2: MTS-R01 + MTS-R02	1-2
Figure 1-3: MTC-R01 + MTC-R02	1-3
Figure 1-4: Setting the slot addresses	1-5
Figure 1-5: Maximum configuration with RMB02.2-02	1-6
Figure 1-6: Maximum configuration with RMB02.2-04	1-6
Figure 1-7: RMB02.2-02 configuration variants	1-7
Figure 1-8: Typical application with MTC200-R	1-8
Figure 2-9: MTS-R01 dimensions	2-1
Figure 2-10: MTS-R02 dimensions	2-1
Figure 2-11: MTC-R01 dimensions	2-2
Figure 2-12: MTC-R02 dimensions	2-2
Figure 2-13: RMB02.2-02 dimensions	2-3
Figure 2-14: RMB02.2-04 dimensions	2-3
Figure 2-15: Installing several racks side by side	2-4
Figure 2-16: Installation depth of CNC/SPS controller and rack	2-4
Figure 3-17: General specifications	3-1
Figure 3-18: Specifications - supply voltage	3-1
Figure 3-19: Specifications - MTS-R	3-1
Figure 3-20: Specifications - MTC-R	3-2
Figure 3-21: Specifications - RMB02.2	3-2
Figure 4-22: Connecting the X1 power supply connector to the MTS-R	4-1
Figure 4-23: Connecting the X1 power supply connector to the MTC-R	4-1
Figure 4-24: MTS-R01 front view	4-2
Figure 4-25: Connector pin assignments of PROG interface X3 and COM interface X2	4-3
Figure 4-26: RS485 connection with INS0619 connector	4-4
Figure 4-27: DIP switch for the parameter value assignment of the PROG interface	4-4
Figure 4-28: DIP switch settings for MTS-R01.1 and MTS-R02.1	4-5
Figure 4-29: RS422 connection with INS0645 connector	4-5
Figure 4-30: Operating states of the MTC200-R	4-6
Figure 4-31: Error codes MTC200-R	4-6
Figure 4-32: MTC-R01 front view	4-7
Figure 4-33: SERCOS fiber optics loop	4-8
Figure 4-34: Diagnosis display	4-9
Figure 4-35: Status codes	4-9
Figure 4-36: Error codes	4-10
Figure 5-37: LK IBM 2	5-1
Figure 5-38: Settings of DIP switch S1	5-2
Figure 5-39: Connector pin assignments of the INTERBUS diagnosis interface X64 (RS232 C)	5-2
Figure 5-40: Connector pin assignments INTERBUS interface X60 (remote bus)	5-2
Figure 5-41: LK DPM01 and DPS01	5-3
Figure 5-42: Setting the I/O address	5-4
Figure 5-43: Specifications of Profibus-DP interface	5-5
Figure 5-44: Connector pin assignments of diagnostics interface RS 232C (X74, X79)	5-5
Figure 5-45: Connector pin assignments of PROFIBUS interface (X70, X75)	5-5
Figure 5-46: LK SIO 04-B	5-6
Figure 5-47: Jumper settings on the LK SIO 04-B board	5-7
Figure 5-48: Function blocks for interface handling	5-7
Figure 5-49: Specifications of interface module	5-8
Figure 5-50: Connector pin assignments RS 232C X35, X36	5-8
Figure 5-51: Connector pin assignments RS422 X40, X41	5-8
Figure 6-52: LK PAP2	6-1

Figure 6-53: Settings of DIP switch S1	6-2
Figure 6-54: Specifications of the fiber optics transmitter	6-2
Figure 6-55: Specifications of the fiber optics receiver	6-2
Figure 6-56: 2.2 mm plastic fiber optics cable (IKO 982)	6-3
Figure 6-57: 6 mm plastic fiber optics cable (IKO 985)	6-4
Figure 6-58: 3 mm glass fiber optics cable (IKO0002)	6-4
Figure 6-59: Fiber optics cables (xx: length in meters)	6-4
Figure 6-60: Cabinet grommet	6-4
Figure 6-61: Socket wrench for FSMA connectors	6-4
Figure 6-62: Torque wrench for FSMA connectors	6-4
Figure 6-63: Accessories	6-5
Figure 6-64: Specifications of the fiber optics cables	6-5
Figure 7-65: Setting the device number	7-1
Figure 7-66: Network connections with BTV20/30	7-2
Figure 7-67: W&T-RS485 interface card	7-3
Figure 7-68: Settings of interrupt port 1	7-3
Figure 7-69: Settings of interrupt port 2	7-3
Figure 7-70: Setting the base addresses of port 1	7-4
Figure 7-71: Setting the base addresses of port 2	7-4
Figure 7-72: Setting the mode	7-4
Figure 7-73: W&T module termination	7-5
Figure 7-74: Interface pin assignments of W&T module	7-5
Figure 7-75: Interconnection using W&T-RS485 interface module	7-6
Figure 8-76: Type code MTS-R01	8-1
Figure 8-77: Type code MTS-R02	8-1
Figure 8-78: Type code MTC-R01	8-2
Figure 8-79: Type code MTC-R02	8-2
Figure 9-80: Local bus boards SUP-E01-MTC200 and SUP-E02-MTC200-R	9-1
Figure 9-81: Selection	9-1
Figure 10-82: MTS-R accessories	10-2

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<p>Argentina <input checked="" type="checkbox"/> V/S <input type="checkbox"/> Service</p> <p>Mannesmann Rexroth S.A.I.C. Division INDRAMAT Acassusso 48 41/7 RA - 1605 Munro (Buenos Aires)</p> <p>Phone: +54 (0)1/756 01 40 +54 (0)1/756 01 36</p>	<p>Argentina <input type="checkbox"/> V/S <input checked="" type="checkbox"/> Service</p> <p>NAKASE Asesoramiento Tecnico Calle 49, No. 5764-66 RA - 1653 Villa Balester Provincia de Buenos Aires</p> <p>Phone: +54 (0) 1/768 24 13 Fax: +54 (0) 1/768 36 43</p>	<p>Australia <input checked="" type="checkbox"/> V/S <input checked="" type="checkbox"/> Service</p> <p>AIMS - Australian Industrial Machinery Services Pty. Ltd. Unit 3/45 Horne ST Campbellfield 3061 AUS - Melbourne, VIC</p> <p>Phone: +61 (0)3/93 59 02 28 Fax: +61 (0)3/93 59 02 66</p>	<p>Brazil <input checked="" type="checkbox"/> V/S <input checked="" type="checkbox"/> Service</p> <p>Mannesmann Rexroth Automação Ltda. Divisão INDRAMAT Rua Georg Rexroth, 609 Vila Padre Anchieta BR - 09951-270 Diadema-SP [Caixa Postal 377] [BR-09901-970 Diadema-SP]</p> <p>Phone: +55 (0)11/745 90 60 +55 (0)11/745 90 70 Fax: +55 (0)11/745 90 50</p>
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<p>China <input checked="" type="checkbox"/> V/S <input type="checkbox"/> Service</p> <p>Mannesmann Rexroth (China) Ltd. A-5F., 123 Lian Shan Street Sha He Kou District PRC - Dalian 116 023</p> <p>Phone: +86 411/46 78 930 Fax: +86 411/46 78 932</p>	<p>Hong Kong <input checked="" type="checkbox"/></p> <p>V/S <input checked="" type="checkbox"/> Service</p> <p>Rexroth (China) Ltd. 19 Cheung Shun Street 1st Floor, Cheung Sha Wan, Kowloon, Hong Kong</p> <p>Phone: +852 27/41 13 51/-54 or +852 27/41 14 30 Fax: +852 27/86 07 33</p>	<p>India <input checked="" type="checkbox"/> V/S <input checked="" type="checkbox"/> Service</p> <p>Mannesmann Rexroth (India) Ltd. INDRAMAT Division Plot. 96, Phase III Peenya Industrial Area IND - Bangalore - 560058</p> <p>Phone: +91 (0)80/8 39 21 01 Fax: +91 (0)80/8 39 43 45</p>	<p>India <input checked="" type="checkbox"/> V/S <input checked="" type="checkbox"/> Service</p> <p>Mannesmann Rexroth (India) Ltd. INDRAMAT Division Plot. A-58, TTC Industrial Area Thane Turbhe Midc Road Mahape Village IND - Navi Mumbai - 400 701</p> <p>Phone: +91 (0)22/7 61 46 22 Fax: +91 (0)22/7 68 15 31</p>
<p>Indonesia <input checked="" type="checkbox"/> V/S <input type="checkbox"/> Service</p> <p>PT. Rexroth Wijayakusuma Jl. Raya Bekasi Km 21 Pulogadung RI - Jakarta Timur 13920</p> <p>Phone: +62 21/4 61 04 87 +62 21/4 61 04 88 Fax: +62 21/4 60 01 52</p>	<p>Japan <input checked="" type="checkbox"/> V/S <input checked="" type="checkbox"/> Service</p> <p>Rexroth Automation Co., Ltd. INDRAMAT Division 1F, I.R. Building Nakamachidai 4-26-44 Tsuzuki-ku, Yokohama-shi J - Kanagawa-ken 224-004</p> <p>Phone: +81 459/42-72 10 Fax: +81 459/42-03 41</p>	<p>Korea <input checked="" type="checkbox"/> V/S <input checked="" type="checkbox"/> Service</p> <p>Mannesmann Rexroth-Seki Co Ltd. 1500-12 Da-Dae-Dong ROK - Saha-Ku, Pusan, 604-050</p> <p>Phone: +82 (0)51/2 60 06 18 Fax: +82 (0)51/2 60 06 19</p>	<p>Korea <input checked="" type="checkbox"/> V/S <input checked="" type="checkbox"/> Service</p> <p>Seo Chang Corporation Ltd. Room 903, Jail Building 44-35 Yeouido-Dong Yeoungdeungpo-Ku C.P.O.Box 97 56 ROK - Seoul</p> <p>Phone: +82 (0)2/7 80 82 08 +82 (0)2/7 80 82 09 Fax: +82 (0)2/7 84 54 08</p>
<p>Mexico <input checked="" type="checkbox"/> V/S <input type="checkbox"/> Service</p> <p>Rexroth Mexico S.A. de C.V. Calle Neptuno 72 Unidad Ind. Vallejo MEX - 07700 Mexico, D.F.</p> <p>Phone: +52 5 754 17 11 +52 5 754 36 84 +52 5 754 12 60 Fax: +52 5 754 50 73 +52 5 752 59 43</p>		<p>South Africa <input checked="" type="checkbox"/> V/S <input checked="" type="checkbox"/> Service</p> <p>HYTEC Automation (Pty) Ltd. 28 Banfield Road, Industria North RSA - Maraisburg 1700</p> <p>Phone: +27 (0)11/673 20 80 Fax: +27 (0)11/673 72 69</p>	<p>Taiwan <input checked="" type="checkbox"/> V/S <input type="checkbox"/> Service</p> <p>Rexroth Uchida Co., Ltd. No.1, Tsu Chiang Street Tu Cheng Ind. Estate Taipei Hsien, Taiwan, R.O.C.</p> <p>Phone: +886 2/2 68 13 47 Fax: +886 2/2 68 53 88</p>

Service agencies outside Europe

Outside Europe / USA

<p>USA <input type="checkbox"/> V/S <input type="checkbox"/> Service</p> <p>Mannesmann Rexroth Corporation INDRAMAT Division 5150 Prairie Stone Parkway USA -Hoffman Estates, IL 60192-3707 Phone: +1 847/6 45 36 00 Fax: +1 847/6 45 62 01</p>	<p>USA <input type="checkbox"/> V/S <input type="checkbox"/> Service</p> <p>Mannesmann Rexroth Corporation INDRAMAT Division Central Region Technical Center USA - Auburn Hills, MI 48326 Phone: +1 248/3 93 33 30 Fax: +1 248/3 93 29 06</p>	<p>USA <input type="checkbox"/> V/S <input type="checkbox"/> Service</p> <p>Mannesmann Rexroth Corporation INDRAMAT Division Southeastern Technical Center 3625 Swiftwater Park Drive USA - Suwanee Georgia 30174 Phone: +1 770/9 32 32 00 +1 770/9 32 19 03</p>	<p>USA <input type="checkbox"/> V/S <input type="checkbox"/> Service</p> <p>Mannesmann Rexroth Corporation INDRAMAT Division Northeastern Technical Center 99 Rainbow Road USA - East Granby, Connecticut 06026 Phone: +1 860/8 44 83 77 +1 860/8 44 85 95</p>
<p>USA <input type="checkbox"/> V/S <input type="checkbox"/> Service</p> <p>Mannesmann Rexroth Corporation INDRAMAT Division Charlotte Regional Sales Office 14001 South Lakes Drive USA - Charlotte, North Carolina 28273 Phone: +1 704/5 83 97 62 +1 704/5 83 14 86</p>			

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