

# RECO-SPS ISP200-R

Project Planning Manual

SYSTEM200

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# 1 RECO-SPC ISP200-R

## 1.1 Brief Description of the ISP200-R

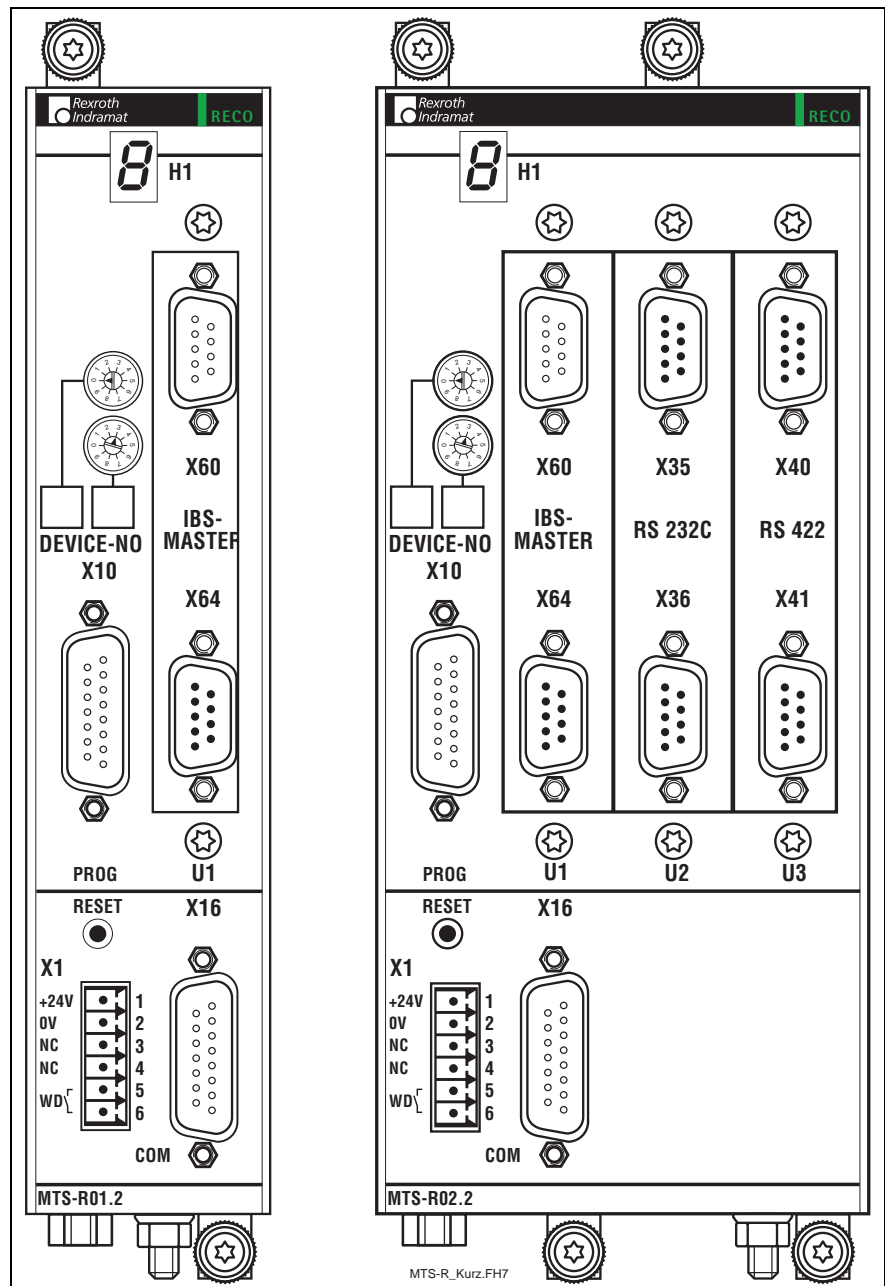


Fig. 1-1: MTS-R01.2 and MTS-R02.2

The ISP200-R RECO-SPC is an efficient SPC in RECO format, compatible with the SPC in the MTC200 control system. It can be used as a standalone SPC or, in connection with an MTC-R, as a slave SPC. The PROG interface, which can be operated in the RS232 or in the RS422 mode, allows connection to a PC or a programming device. The RS485 mode offers the additional possibility of operating several ISP200-R or MTC200-R controls in an RS485 bus system. The PROG interface can be parameterized via a DIP switch (see Fig. 4-7). In order to be able to address each ISP200-R directly from the PC, each ISP200-R is assigned its own device number ranging from 0 to 15.

The serial COM user interface (RS232), which is operated via the SPC user program, is provided for connection of a printer, a read-write mem-

ory, or an operating and visualization device, e.g. INDRAMAT BTV04/05. The SPC user program can also be used to parameterize the interface for all of the three operating modes (RS232/RS422/RS485) (see Chapter 4.2).

In addition, the ISP200-R is provided with a BT (**B**edien**T**erminal = operator terminal) bus, which can be used to operate up to 4 operator terminals (BTM15/16, BTA20, etc.). This can be achieved using cable lengths of up to 50 m (between the interbus connection and the last user).

The ISP200-R is mounted by means of a module carrier system, consisting of one RMB02.2-02 or one or several RMB02.2-04. The MTS-R01.2 requires one, the MTS-R02.2 two module spaces in the module carrier. In this carrier system, up to 16 additional I/O modules (RME02.2..., RMA02.2..., or RMC02.2...) can be operated by the ISP200-R. For communication with the NC control MTC200-R, which is also a part of the system, a separate internal adapter board must additionally be connected (SUP-E01-MTC200-R or SUP-E02-MTC200-R).

As an option, the ISP200-R can be fitted with the open field bus interfaces INTERBUS or PROFIBUS-DP. These can be used to connect decentralized peripheral I/O equipment, each with up to 4096 inputs and 4096 outputs. In addition, the MTS-R02 can be fitted with a serial interface module (2 x RS232 and 2 x RS422/RS485).

## 2 Important Instructions on Use

### 2.1 Intended Use

#### Introduction

The products by Rexroth Indramat are developed and manufactured according to the latest state of technology. Before they are delivered, all of these products are checked for operational reliability.

The products may be used only as intended. Any use of the products other than that intended may result in situations causing damage to property or personal injury.

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**Note:** Rexroth Indramat, as the manufacturer of the products, will not assume any warranty, liability or payment of damages in case of damage resulting from a non-intended use of the products. If he fails to use the products as intended, the user will be solely responsible for any resulting risks.

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Before using the products by Rexroth Indramat, the following requirements must be met to ensure that the products are used as intended:

- Any person handling one of our products in any manner must read and understand the corresponding safety regulations and the intended use.
- If the products concerned are hardware products, they must be left in their original state, i.e. they may not be modified in their structure. Software products may not be decompiled; their source codes may not be altered.
- Damaged or defective products may not be installed or put into operation.
- It must be ensured that the products are installed according to the regulations specified in this documentation.

## Fields of Use and Application

The MTS-R01.2 and the MTS-R02.2 by Rexroth Indramat are intended to be installed in the RECO02 module carrier system. The ISP200-R is intended for the following fields of application:

- Standalone SPC
- Matching control for the MTC200

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**Note:** The ISP200-R may only be used with the accessories and attached parts specified in this documentation. Components which are not explicitly mentioned may neither be attached nor connected. The same applies to cables and lines.

The unit may be operated only with the explicitly specified component configurations and combinations and only with the software and firmware specified in the appropriate functional description.

---

Before being put into operation, each ISP200-R must be programmed such that the SPC executes the application-specific functions.

The MTS-R01.2 and the MTS-R02.2 have been developed for use in electric control cabinets.

Configurations with various field busses and serial interfaces are available for the application-specific use of the ISP200-R.

Typical fields of application of the MTS-R01.2 and the MTS-R02.2 are as follows:

- Handling and mounting systems
- Packaging and food machines
- Printing and paper processing machines
- Machine tools

The ISP200-R may only be operated under the mounting and installation conditions specified in this documentation, in the position of use described, and under the ambient conditions specified (temperature, protection category, humidity, EMC, and the like).

## 2.2 Non-Intended Use

"Non-intended use" is interpreted as the use of the MTS-R01.2 and the MTS-R02.2 outside of the fields of application specified or under operating conditions and technical data other than those described and specified in this documentation.

The ISP200-R may not be used if

- it is subjected to operating conditions which fail to meet the ambient conditions specified, e.g. operation under water, under extreme temperature variations or under extreme maximum temperatures is forbidden;
- the applications intended have not explicitly approved by Rexroth Indramat. Please be sure to observe the statements in the general safety instructions!

## 3 Technical Data

### 3.1 General Notes

Permissible cable cross-section for supplying the supply voltage:	up to 1.5 mm <sup>2</sup>
Installation in the control cabinet:	by means of an RMB02.2 module carrier on a TS 35 x 27 x 15 top hat rail
Protection category:	IP 20, DIN VDE 0470, EN 60529
Humidity:	75 %, non-condensing (operation) 95 %, non-condensing (transport) DIN 40 040 Class F
Air pressure:	from 860 to 1080 hPa, 1500 m (operation) from 660 to 1080 hPa, 3500 m (transport)
Operating temperature:	from 0 to 50 °C, DIN 40 040 Class KV
Storage temperature:	from -25 °C to 70 °C
Housing dimensions (W x H x D)	
MTS-R01.1:	41.5 x 192 x 159
MTS-R02.1:	83.7 x 192 x 159
Weight (MTS-R01/MTS-R02):	1.0 kg / 1.65 kg

### 3.2 Supply Voltage

Nominal value:	24 VDC
Permissible ripple content:	4 V <sub>ss</sub> within the permissible voltage range
Permissible voltage range:	18 to 28 VDC, including ripple content
Max. power consumption (MTS-R01): (MTS-R02):	0.5 A (+ supply voltage for I/O modules of up to max. 2.6 A) 0.7 A (+ supply voltage for I/O modules of up to max. 2.6 A)

### 3.3 EMC

RFI emissions according to EN 55022	Class A (industrial environment)
Immunity according to IEC 1000-4-2 (ESD)	Assessment criterion B
Immunity according to IEC 1000-4-4 (burst)	Assessment criterion B
Immunity according to IEC 1000-5-5 (surge)	Assessment criterion B

### 3.4 Interfaces

Programming interface (PROG)	RS232/RS422/RS485 (D-SUB, 15 pins, female connector)
General serial interface (COM)	RS232/RS422/RS485 (D-SUB, 15 pins, female connector)
BT bus	Indramat BT bus (D-SUB, 9 pins, female connector)
Optional interfaces	INTERBUS (D-SUB, 9 pins, female connector) PROFIBUS-DP (D-SUB, 9 pins, female connector) 2 x RS232 and 2 x RS422/485 (D-SUB, 9 pins, male connector)

### 3.5 Dimensions

#### MTS-R01.2 and MTS-R02.2

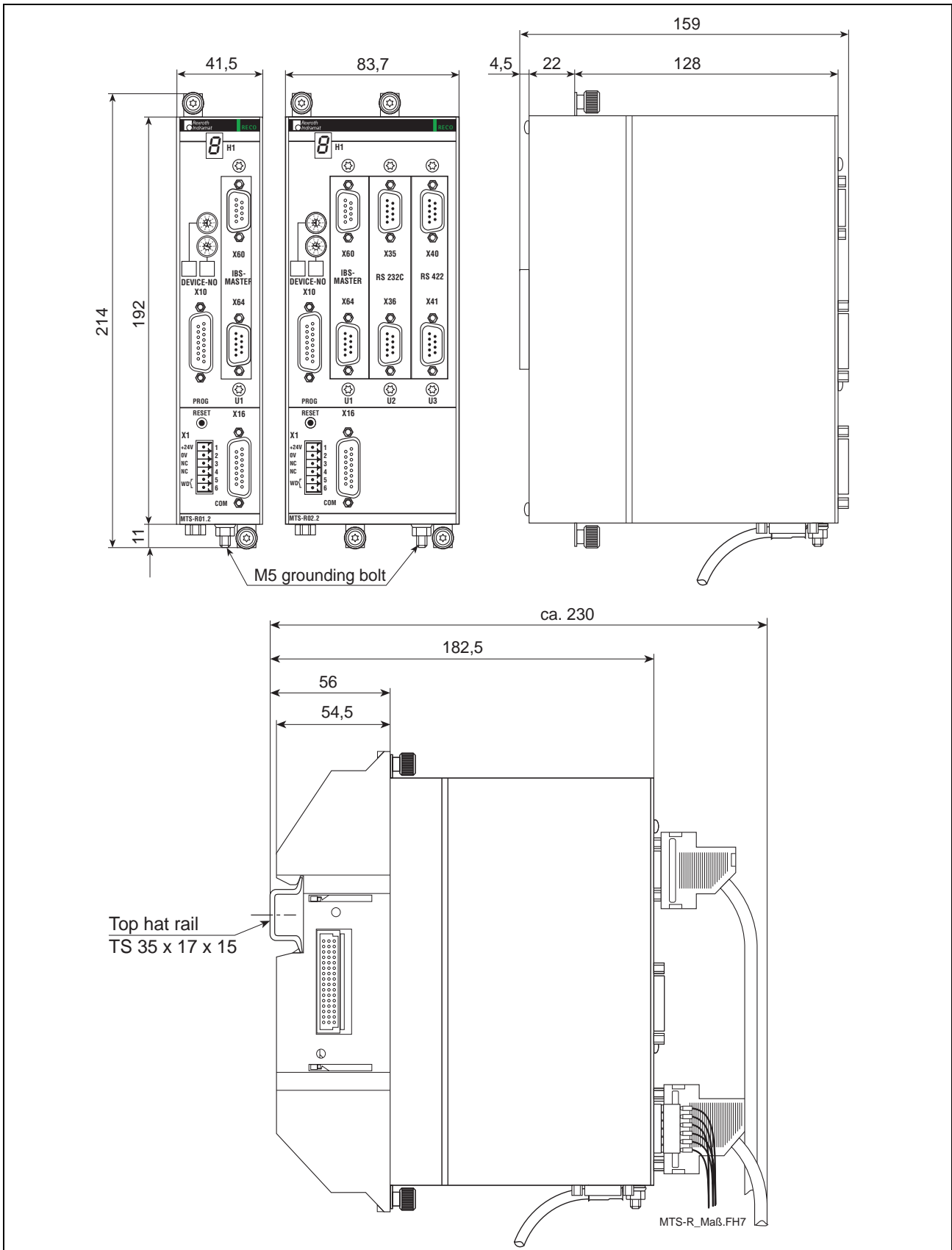


Fig. 3-2: Dimensional drawing of MTS-R01.2 and MTS-R02.2



### Installation Sizes of the RMB02.2-04 Module Carrier

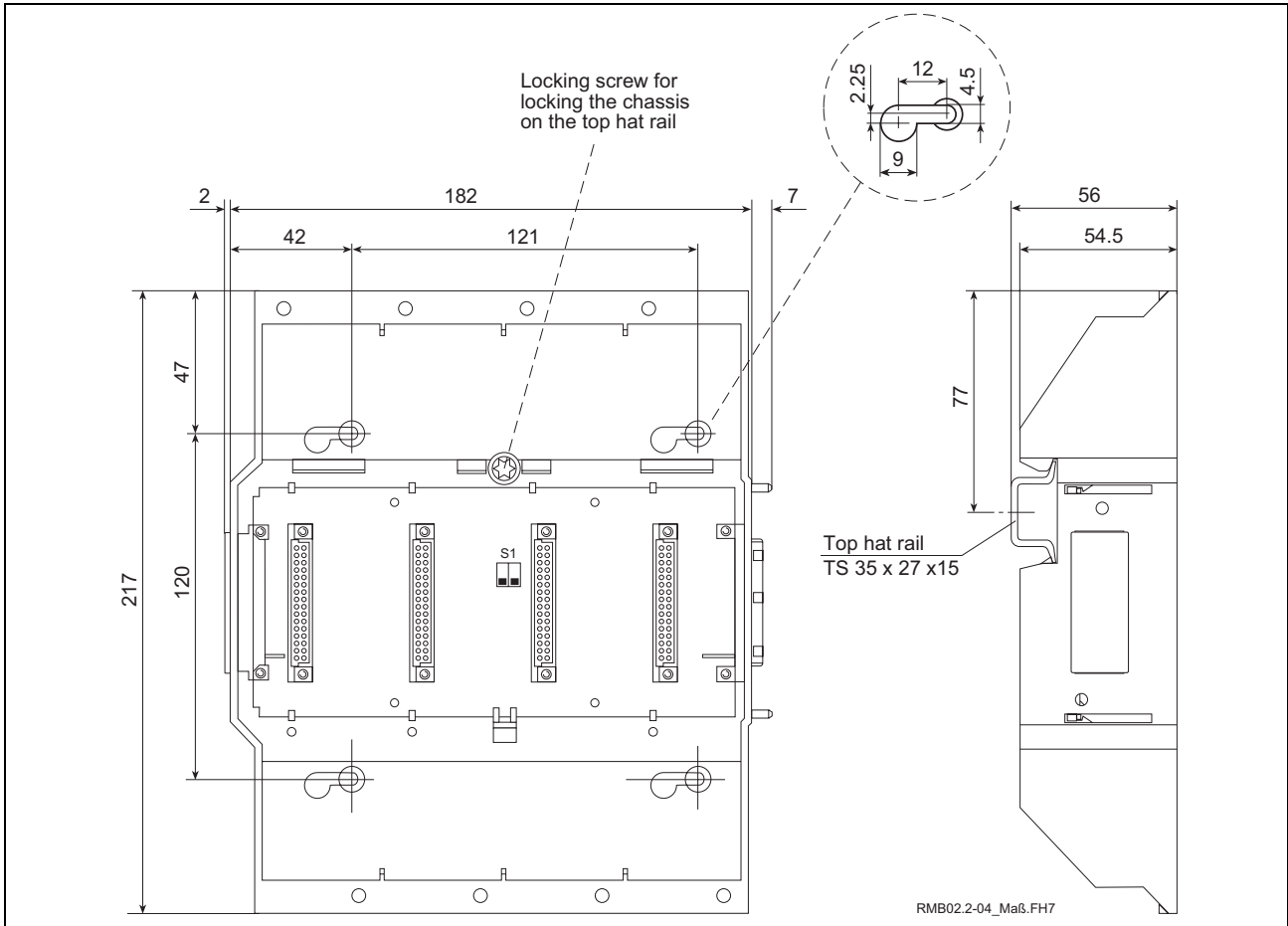


Fig. 3-5: RMB02.2-04 module carrier

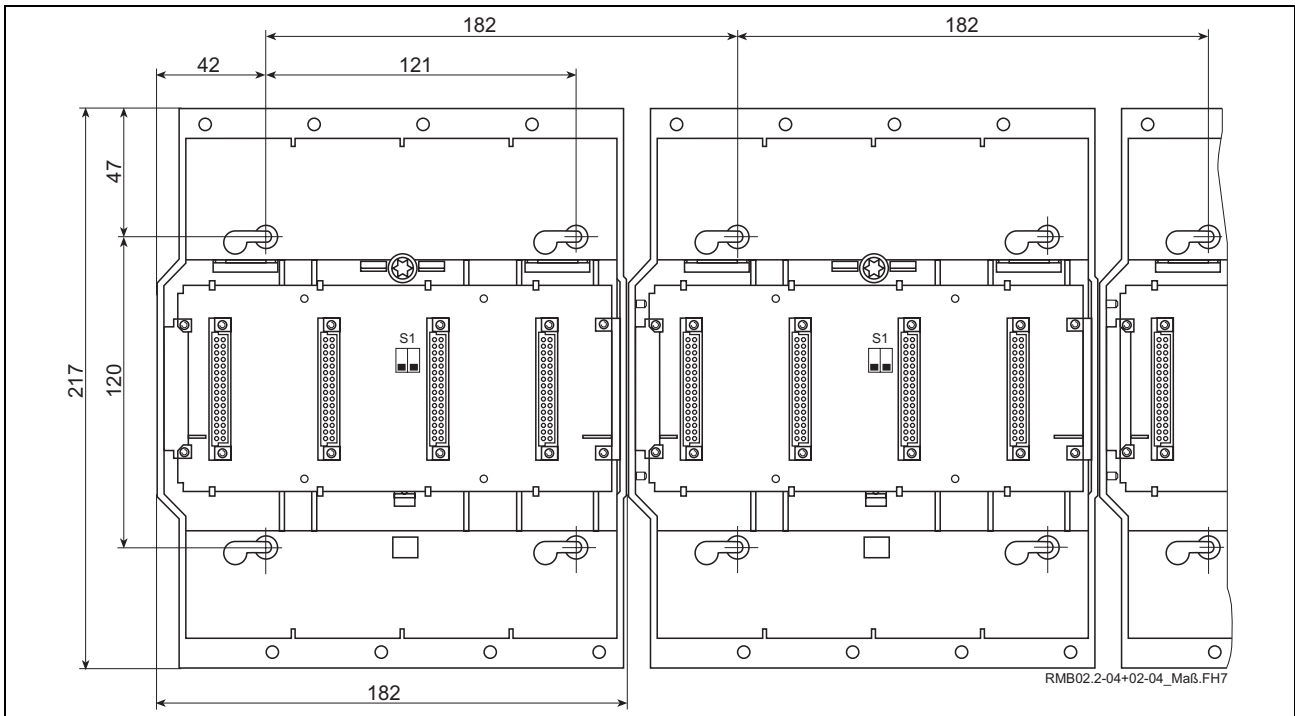


Fig. 3-6: Connection of several RMB02.2-04 module carriers

# 4 Communication

## 4.1 Parameterization of the PROG Interface

For setting the parameters of the PROG interface, a DIP switch (see Fig. 4-7) is provided on the upper side inside the housing of the ISP200-R. This DIP switch permits various settings, such as the operating mode (RS232/RS422/RS485). If an acute object (e.g. a small-size screwdriver) is used, the switch can even be reached with the housing closed.

If there are problems in reaching this switch with closed housing, there is the additional possibility of opening the housing completely. Before the housing is opened, it must be checked whether the control is non-conducting. The housing consists of two half shells which can be easily disassembled by removing the 4 screws on the rear and the lateral wall of the housing as well as the 2 threaded bolts of the BT bus.

As a standard, the PROG interface is delivered as an RS232 interface with a baud rate of 19.2 kbaud. Other settings are shown in Fig. 4-8.

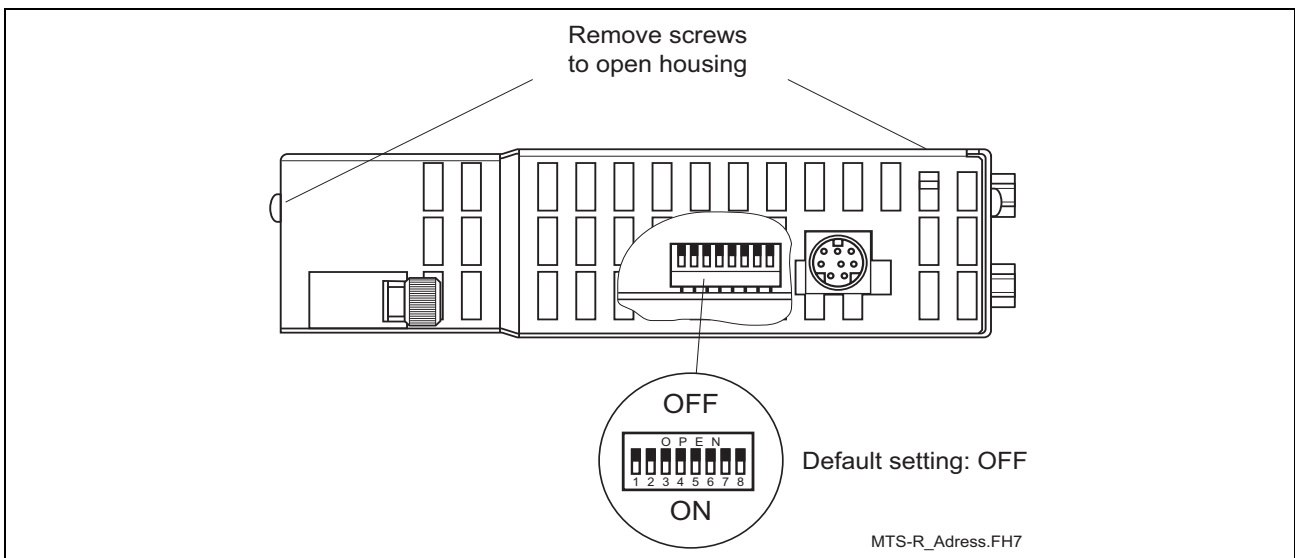


Fig. 4-7: DIP switch for parameterization of the PROG interface

Affected 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 lockout OFF	X	X	X	X	X	X	X	OFF
Boot lockout ON	X	X	X	X	X	X	X	ON

Fig. 4-8: Setting of the PROG interface for the MTS-R01.2 and the MTS-R02.2

## 4.2 Parameterization of the COM Interface

As a standard, the multimode COM user interface is delivered as an RS232 interface. The parameters for RS422/RS485 operation are set by programming the **OPEN\_COM** standard SPC function block and by assigning the **COM FB** input correspondingly. More detailed information can be found in the SPC programming instructions (DOK-CONTRL-SPS\*PRO\*V18-ANW1-DE-P).

## 4.3 BT Bus

The BT bus can be used to connect up to four operator terminals of type BTM15/16 or BTA20. The total maximum length of the BT bus may be up to **50 m**. This applies both to the connection of only one device and to the connection of the permissible maximum number of 4 devices. It is **not** possible to quickly access the I/O data of the operator terminals from the SPC (e.g. %IBP\*.\*).

The address assignments required for programming can be found in the respective documents of the devices to be connected.

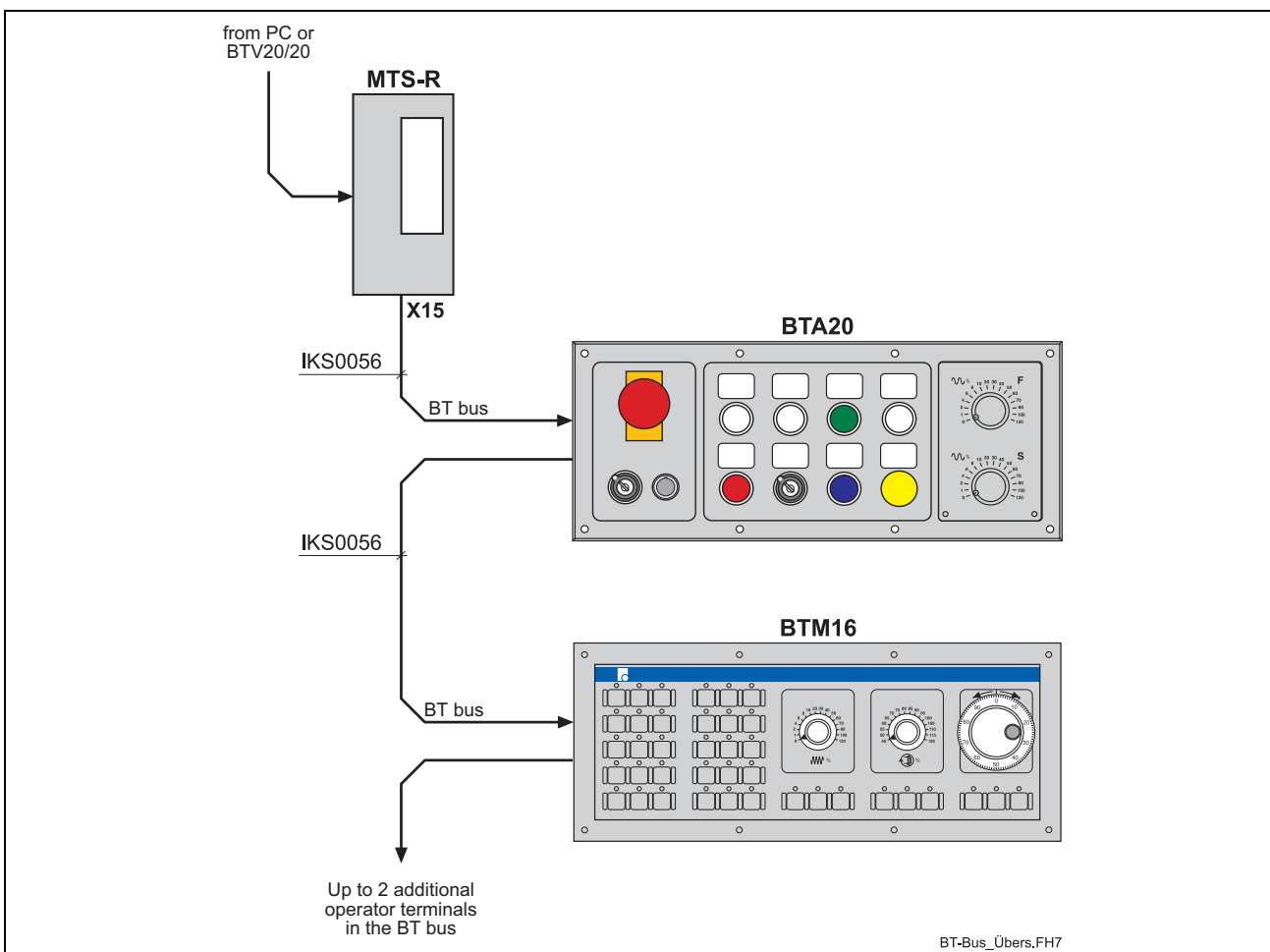


Fig. 4-9: BT bus overview

# Addressing

The BT bus is addressed by assigning a logic user number in the I/O editor of the SPC programming interface. Each input core image storage as well as each output core image storage is assigned its own logic address.

Each of the two core image storages has a size of 128 bytes, which are available for the operating devices connected. The number of bytes assigned in the core image storage depends on the operating device (see Fig. 4-10).

Type of device	Storage assignment in the input/output core image
BTM15	Depending on the configuration 2 bytes for digital I/Os (always assigned) 2 additional bytes for each module (except handwheel) 4 additional bytes for handwheel module
BTM16	14 bytes
BTA20	6 bytes

Fig. 4-10: Storage requirements of operating devices

Depending on the physical order of the operating devices connected to the BT bus, the addresses of the devices are assigned in the input and output core image storage without any gaps, according to the storage requirements of the operating devices. The example (Fig. 4-11) illustrates the principle of the storage assignment of the BT bus.

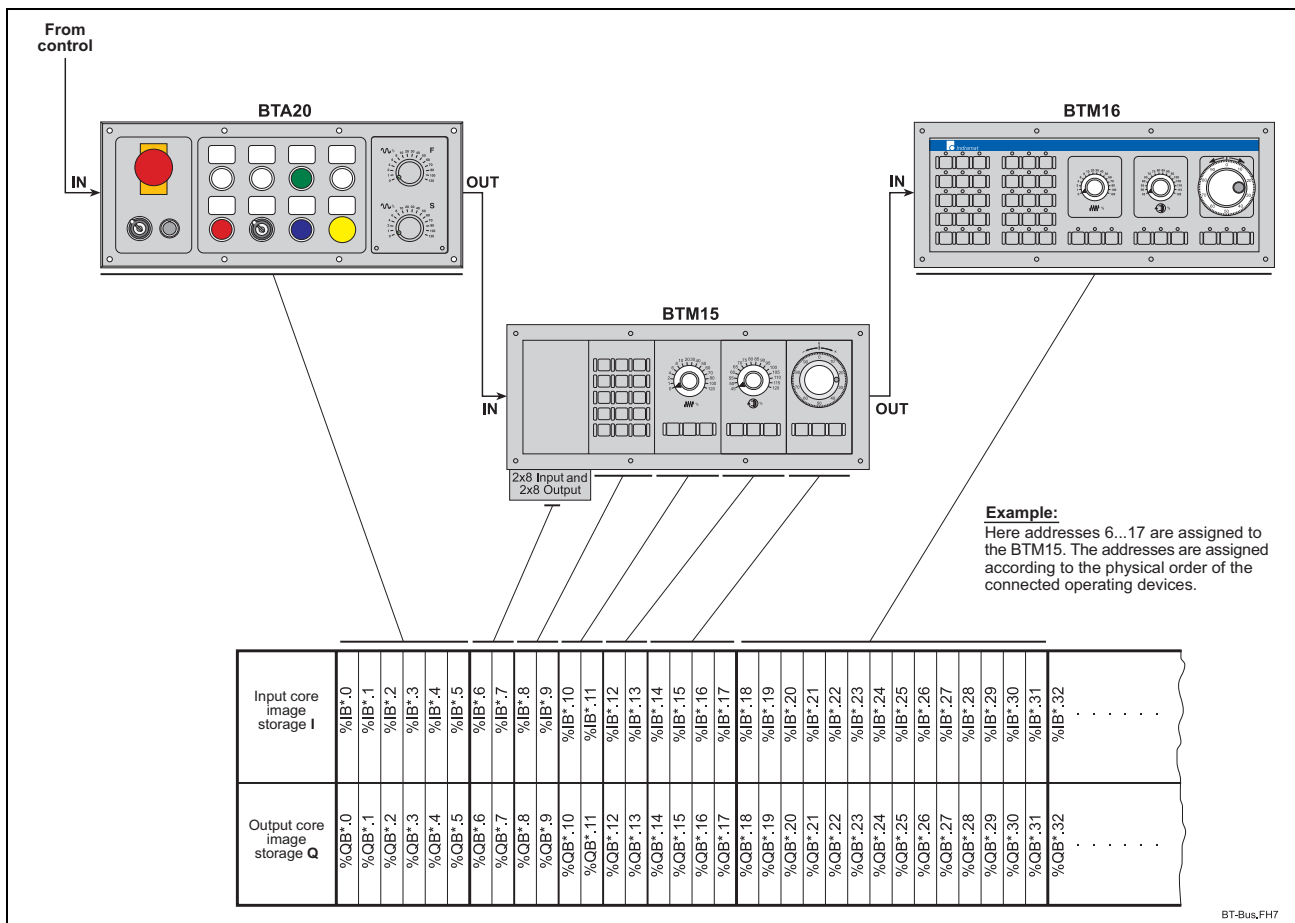


Fig. 4-11: Storage assignment of BT bus



# 5 Startup

## 5.1 Slot Addressing of the Module Carriers

Before installation of the modules, the slot addresses of the maximum 4 connectable RMB02.2-04 module carriers must be assigned. To achieve this, a DIP switch is provided on the bus board of the module carriers. Depending on the module concerned, this switch must be set to the corresponding module carrier number (module carrier address 00.03, see following graphic diagram). Each module carrier number may be set only once.

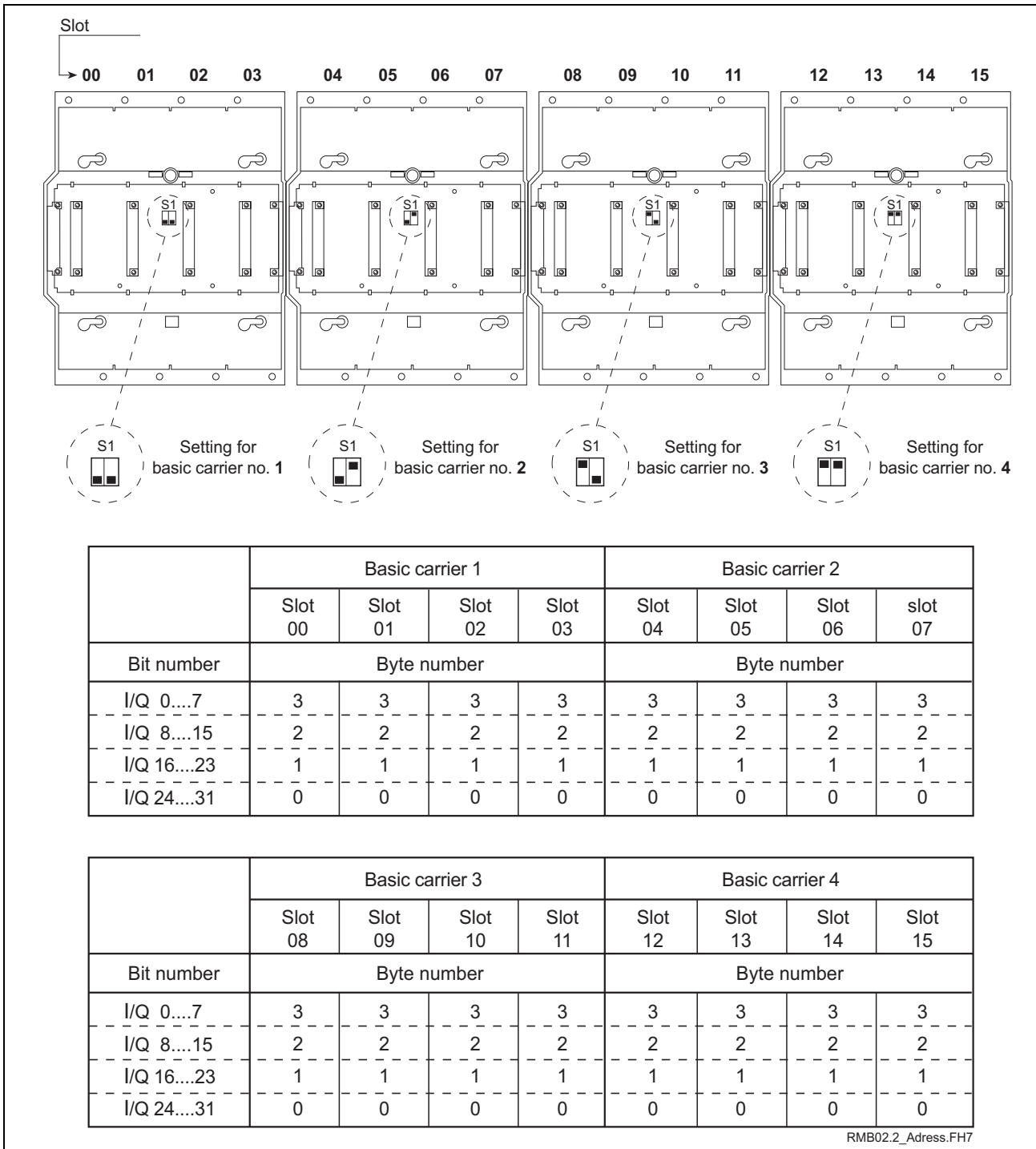


Fig. 5-12: Setting of slot addressing

## 5.2 Installation Instructions

Before the ISP200-R can be installed, the module carriers must first be mounted. These module carriers must be fitted with the ISP200-R and, as required, with the pertinent I/O modules (RECO02 modules).

### Installation of Module Carriers

Install the RMB02.2-02 and RMB02.2-04 module carriers by engaging them on a DIN TS 35x27x15 top hat rail and by fixing them by means of a locking screw. It is also possible to mount the module carriers directly on the mounting plate in the control cabinet through the holes provided in the module carrier (see Fig. 3-5: RMB02.2-04 module carrier).

One RMB02.2-02 and/or up to four RMB02.2-04 module carriers can be connected in series during assembly. If the RMB02.2-02 module carrier is used, it must always be mounted to the left of an RMB02.2-04 module carrier. For addressing the slots, the DIP switches on the bus boards of the RMB02.2-04 module carriers must be configured (see Fig. 5-12: ). The RMB02.2-02 module carrier, however, is **not** provided with an addressing switch, i.e. bus couplers or I/O modules may not be fitted because, owing to the missing slot addressing, they cannot be addressed selectively.

### Arrangement of Module Carriers

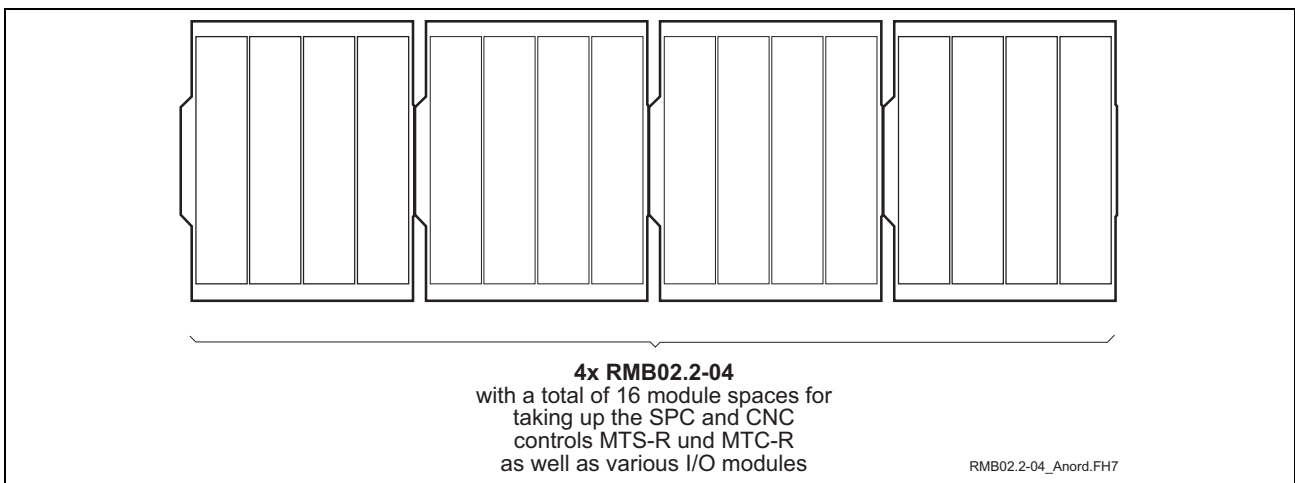


Fig. 5-13: Maximum number of RMB02.2-04 carriers fitted

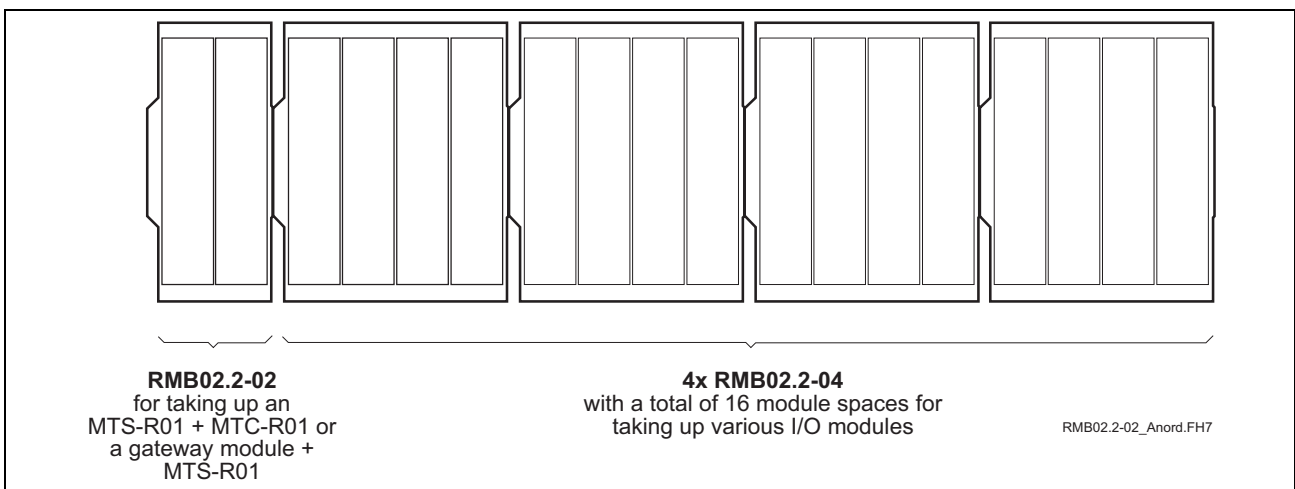


Fig. 5-14: Maximum number of RMB02.2-02 and RMB02.2-04 carriers fitted

## Installation of Modules

Starting with an MTS-R in slot 0 (to the left), the modules must be fitted in the RMB02.2-04 module carrier and fixed with 2 locking screws each. The I/O modules (RECO02.2 modules) must be fitted in slots 1 to 15 (0 to 15 if an RMB02.2-02 is used) to the right of the ISP200-R. When doing this, gaps may be left so that additional modules may be fitted at a later point.

Contrary to the RMB02.2-04 module carrier, the modules must **always be aligned to the right** if the RMB02.2-02 is used. Here, the following combinations can be made:

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

Fig. 5-15: Fitting variants for RMB02.2-02

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**Note:** Before startup, the locking screws of the module carriers must be tightened securely, so that the module carriers are prevented from moving sideways and, thus, the connectors between the module carriers from loosening (for the position of the screws see Fig. 3-5: RMB02.2-04)! In addition, the modules must be screwed to the module carrier. Connectors and modules may **not** be fitted or removed under tension!

---

## Grounding

For grounding the control and shielding the electronics, a grounding line of at least 6mm<sup>2</sup> must be wired from the grounding bolt of the control to the central grounding point of the machine. Wiring to further users of the machine must be established as star wiring (see Fig. 5-16).

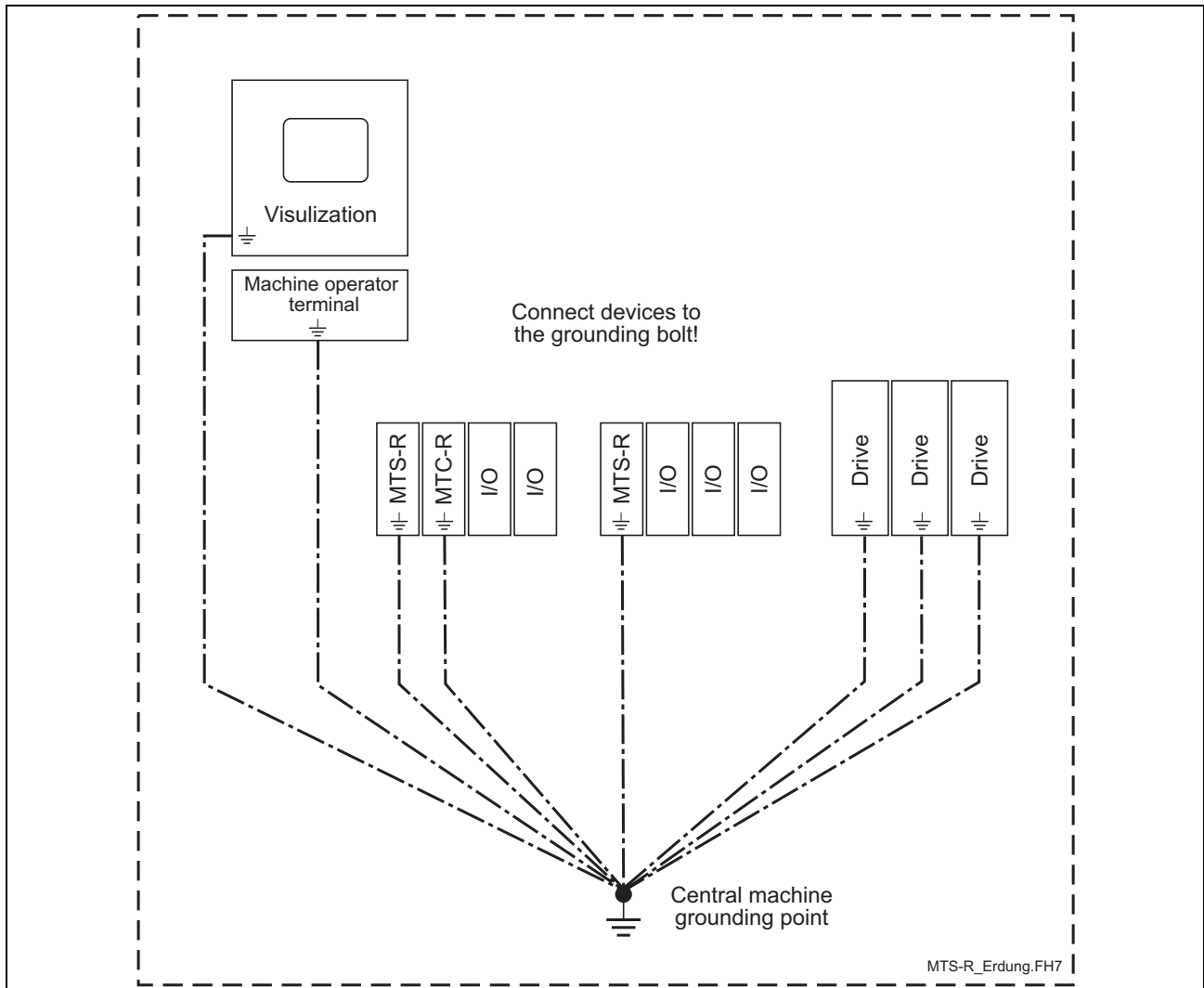


Fig. 5-16: System grounding in connection with the ISP200-R

### 5.3 Connection of Supply Voltage and Watchdog

In order to ensure correct operation of the ISP200-R, the supply voltage may, under no circumstances, drop below +18 VDC, since this would cause the POWER-FAIL signal to respond. This, in turn, would stop the SPC operating program and the seven-segment display would indicate a “minus” sign.

**Note:** Since the power supply unit of the ISP200-R is a switching power supply with startup currents of up to 20 A being possible, we warn against connecting a further ISP200-R to the same supply voltage during running operation. Owing to the high startup current, this might result in the supply voltage breaking down and, thus, in the POWER-FAIL signal being triggered.

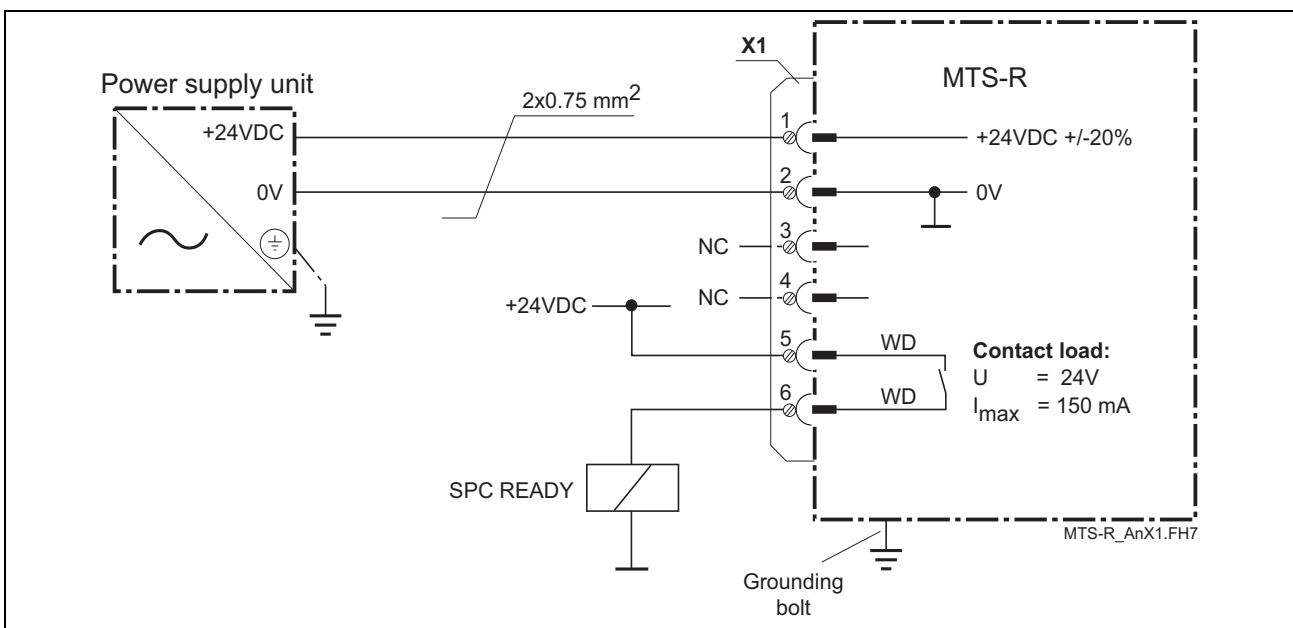


Fig. 5-17: Connection of the supply connector X1

## 5.4 RecoBus Diagnosis

For RecoBus diagnosis, the MTS-R provides a double word for input information (%ID\*.0). This double word serves to display error and status information. It is represented to the user in the SPC I/O editor in slot 0. This double word should always be a part of the SPC user program, thus allowing quick reactions to error messages of the RecoBus.

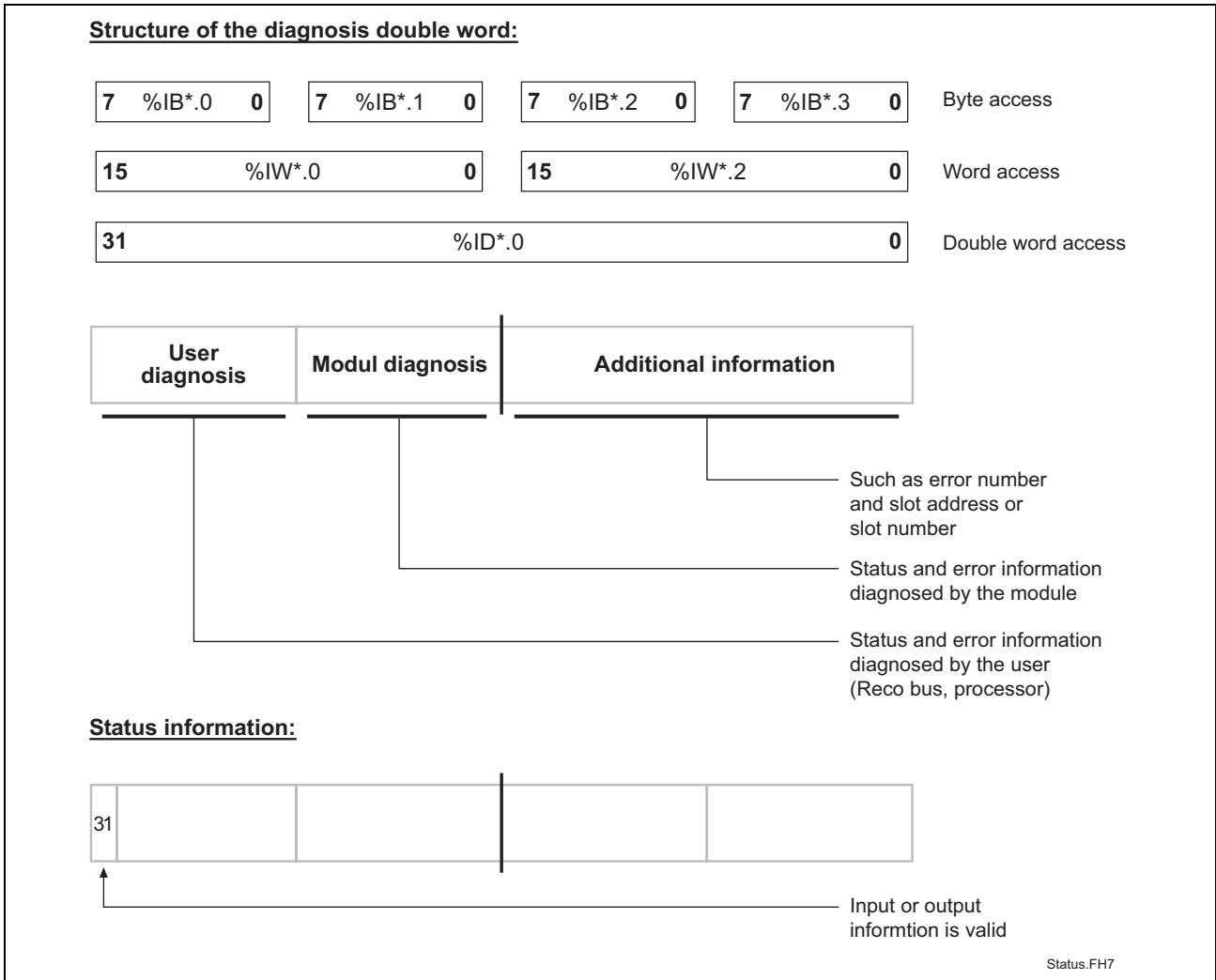


Fig. 5-18: Division of diagnosis double word / status information

Bit no.	Status	Explanation
31:	0	The input and output information of the I/O user is not valid. If a serious error is detected in the I/O user (e.g. module defective), this bit is set to "0" by the I/O user; this also applies to the corresponding bit in the low word for the slot concerned.
	1	Input information valid.

Fig. 5-19: Explanation of status bit 31

## Error Detection by the User

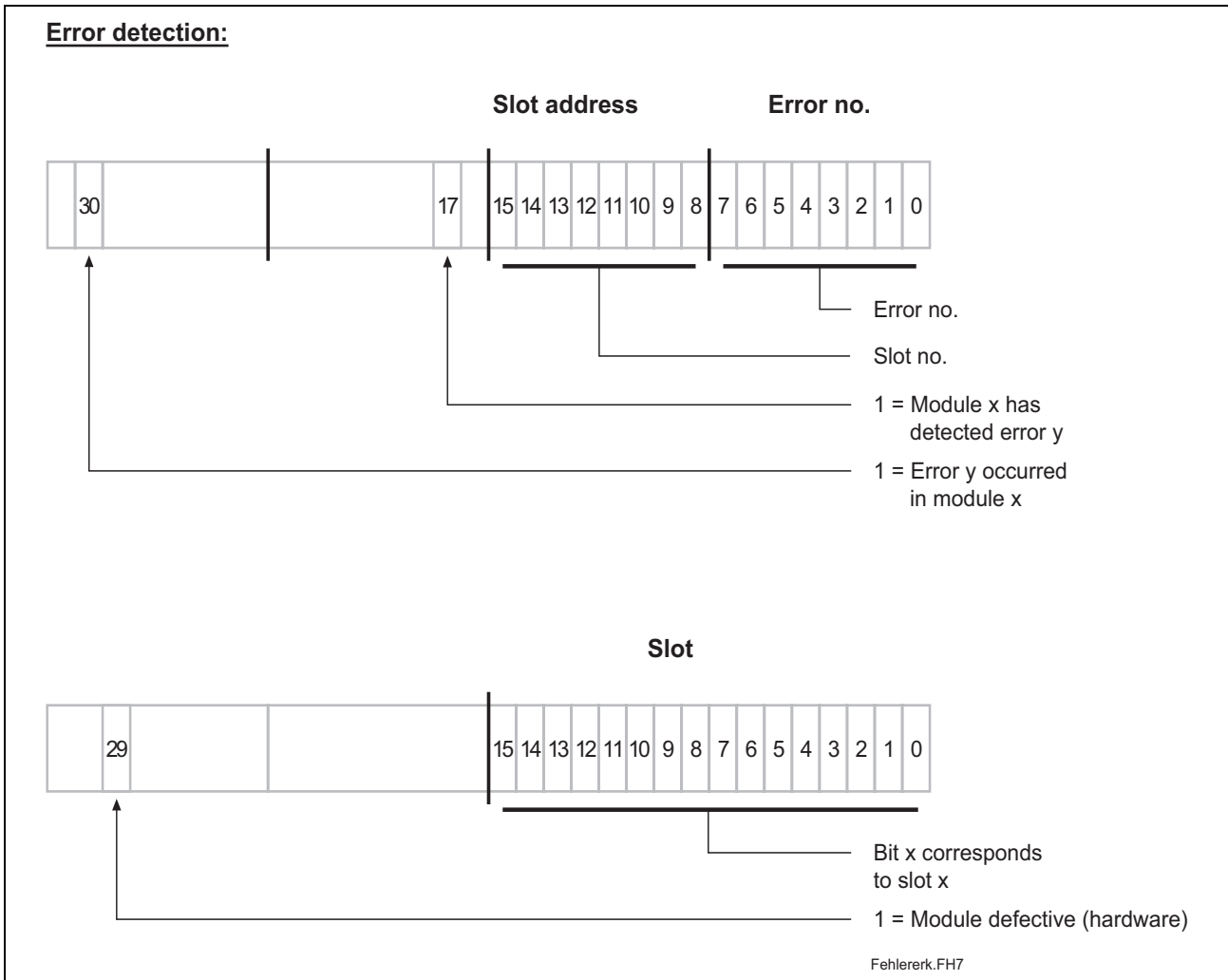


Fig. 5-20: Error detection

Value	Bit no.	Explanation
40.00.00.00 h	30	The I/O user signals an error. The slot number and an error number is delivered in the low word.
20.00.xx.xx h	29	The I/O user detected a defective module, i.e. the module is not fitted in the slot any longer or it is defective. This results in the output information of all of the output modules being set to "0".
21.00.xx.xx h	24+29	The programmed module is not the same as the physically fitted module.
00.01.xx.xx h	17	The intelligent module of the I/O user signals a module error.

Fig. 5-21: Explanation of the diagnosis bit

## External Voltage Monitoring

The transistor output modules RMA02.2-16-DC024-200 and RMA02.2-32-DC024-050 are provided with a 24-V voltage monitoring unit. One monitoring bit on a bit strip of 1-word width is made available per module. A “1” on bit 16 indicates that one or more 24-V supply voltages are missing (the bit number corresponds to the slot number). This status information is permanently updated; it is overwritten by an error message.

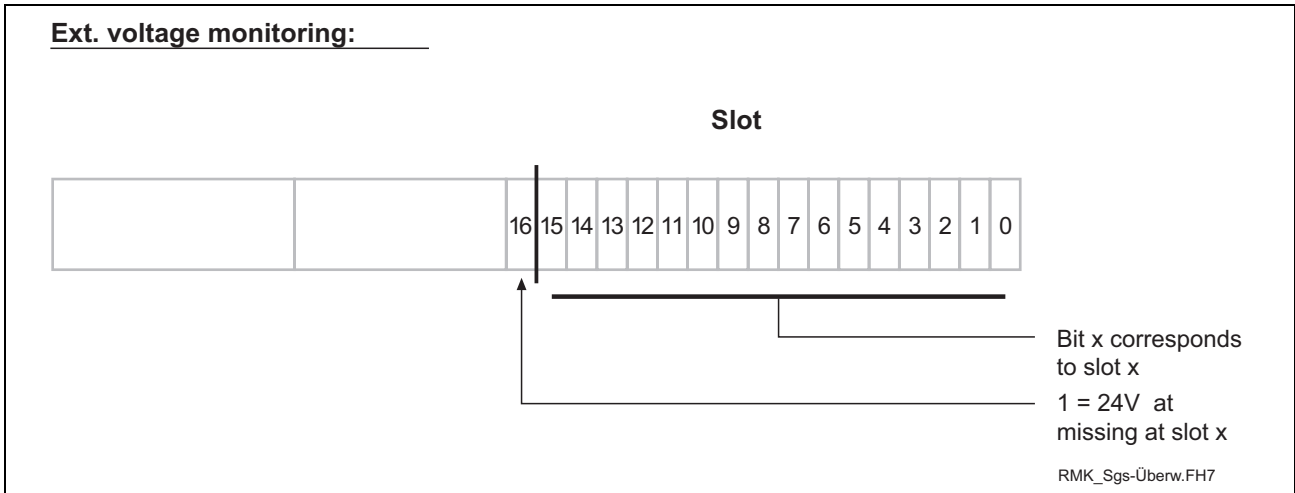


Fig. 5-22: Voltage monitoring

Value	Bit no.	Explanation
80.01.xx.xx h	16	“0” = the 24-V voltage applied to the output modules is “OK”. If the 24-V voltage fails, this bit and the corresponding bit in the low word for the slot concerned are set to “1”.

Fig. 5-23: Bit explanation

## Example of an External Power Failure

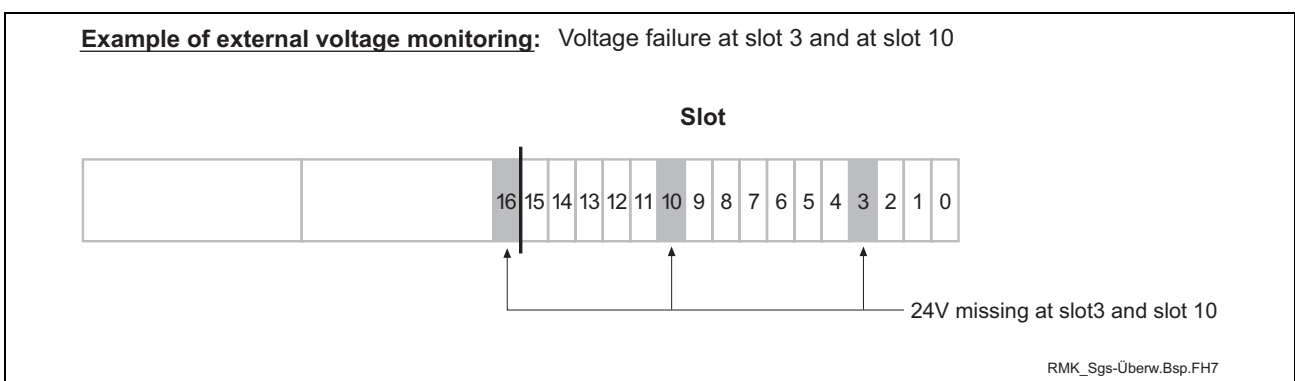


Fig. 5-24: Example of an external power failure

## 5.5 Status Information and Error Diagnosis

### Indication of Operating States

A diagnosis of the ISP200-R can be made using the seven-segment display H1. The various states are displayed via the one-digit error codes shown below.

Code	Description
-	Power-Fail signal triggered (the control must be reset)
<i>b</i>	Ready for operation (SPC is running)
<i>0.</i>	Startup state (reset test)
<i>F.</i>	Firmware in the Flash EPROM not valid
<i>J.</i>	Boot lockout for firmware activated
<i>5</i>	System stack overflow
<i>P</i>	Local bus not connected; 24-V voltage at MTC-R missing

Fig. 5-25: Operating states of the ISP200-R

**Note:** If any other one-digit code (followed by a full stop) is displayed, the customer service must be notified **immediately**.

### Indication of Errors

Error states are indicated by **three-digit** error codes on the successively flashing seven-segment display. The error codes represented correspond to the system error messages of the user interface BOF/GBO.

Code	Description
<i>007</i>	Software version error
<i>008</i>	Self-test unsuccessful
<i>052</i>	SPC program not valid
<i>055</i>	Max. cycle time of the SPC exceeded
<i>071</i>	Operating voltage of the SPC too low
<i>081</i>	Time exceeded 2-ms implementation
<i>082</i>	INTERBUS failure
<i>083</i>	INTERBUS storage overflow
<i>084</i>	INTERBUS configuration error
<i>085</i>	INTERBUS bus error
<i>086</i>	INTERBUS hardware / firmware error
<i>087</i>	INTERBUS module error of peripheral bus
<i>088</i>	INTERBUS not ready
<i>089</i>	INTERBUS general error of generation 4

Fig. 5-26: Error codes of the ISP200-R

## 5.6 Battery

If an ISP200-R is not operated or is stored for more than **6 months**, user-specific SPC data may get lost because of a self-discharge of the battery.

**Data involved** The following data is involved:

- SPC user program
- Remanent data

**Charging of the battery** The battery is charged during startup of an MTS-R. If the battery is **completely discharged**, the following charging times are applicable:

Charging time: 1 h -> approx. 100 h buffer time

Charging time: 50 h -> approx. 5000 h buffer time (battery fully charged)

Under normal operating conditions, the battery life is 7 to 10 years. Permanent charging of the battery does not affect its life (continuous control operation).

## 5.7 Interface Assignment

The assignments of the COM and PROG interfaces are shown in Fig. 5-27. The BT bus is shown in Fig. 5-28.

PIN	Signal name	PIN	Signal name
1	NC	2	Transmit Data (RS232)
3	Receive Data (RS232)	4	RS485+ or RxD+ (RS422)
5	RS485 or RxD- (RS422)	6	NC
7	GND	8	NC
9	TxD+ (RS422)	10	GND
11	TxD- (RS422)	12	+5V
13	Request To Send (modem)	14	Clear To Send (modem)
15	NC		

Fig. 5-27: Pin assignment of the PROG interface X10 and the COM interface X16

PIN	Signal name	PIN	Signal name
1	Data Out +	2	Data In +
2	GND	4	NC
5	+5V	6	Data Out -
7	Data In -	8	NC
9	Assignment detection		

Fig. 5-28: Pin assignment of the BT bus X15

# 6 RECO-SPS MTS-R01.2

## 6.1 Brief Description

The MTS-R01.2 is an efficient SPC in small-size format and in IP 20 design. It requires 1 slot in the RMB02.2 module carrier and can be used as a standalone SPC with the corresponding I/Os or together with motion control as a combined CNC-SPC system. Operating devices, e.g. BTM15/16 or BTA20, must be connected to the MTS-R01.2 using the BT bus. The optional slot U1 can be used to fit components on open field bus interfaces, such as the INTERBUS or the Profibus-DP.

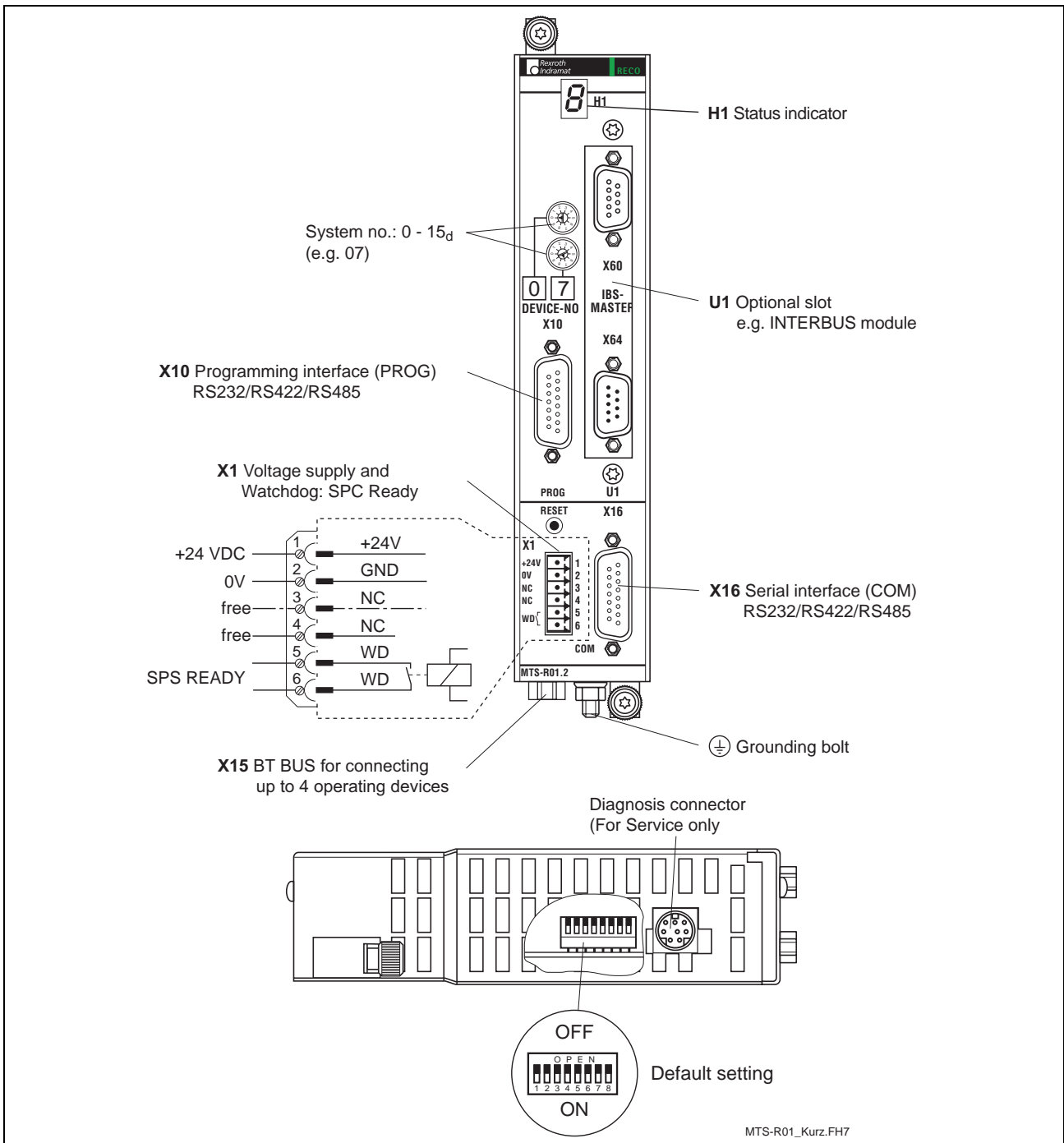


Fig. 6-1: MTS-R01.2

## 6.2 Application Example

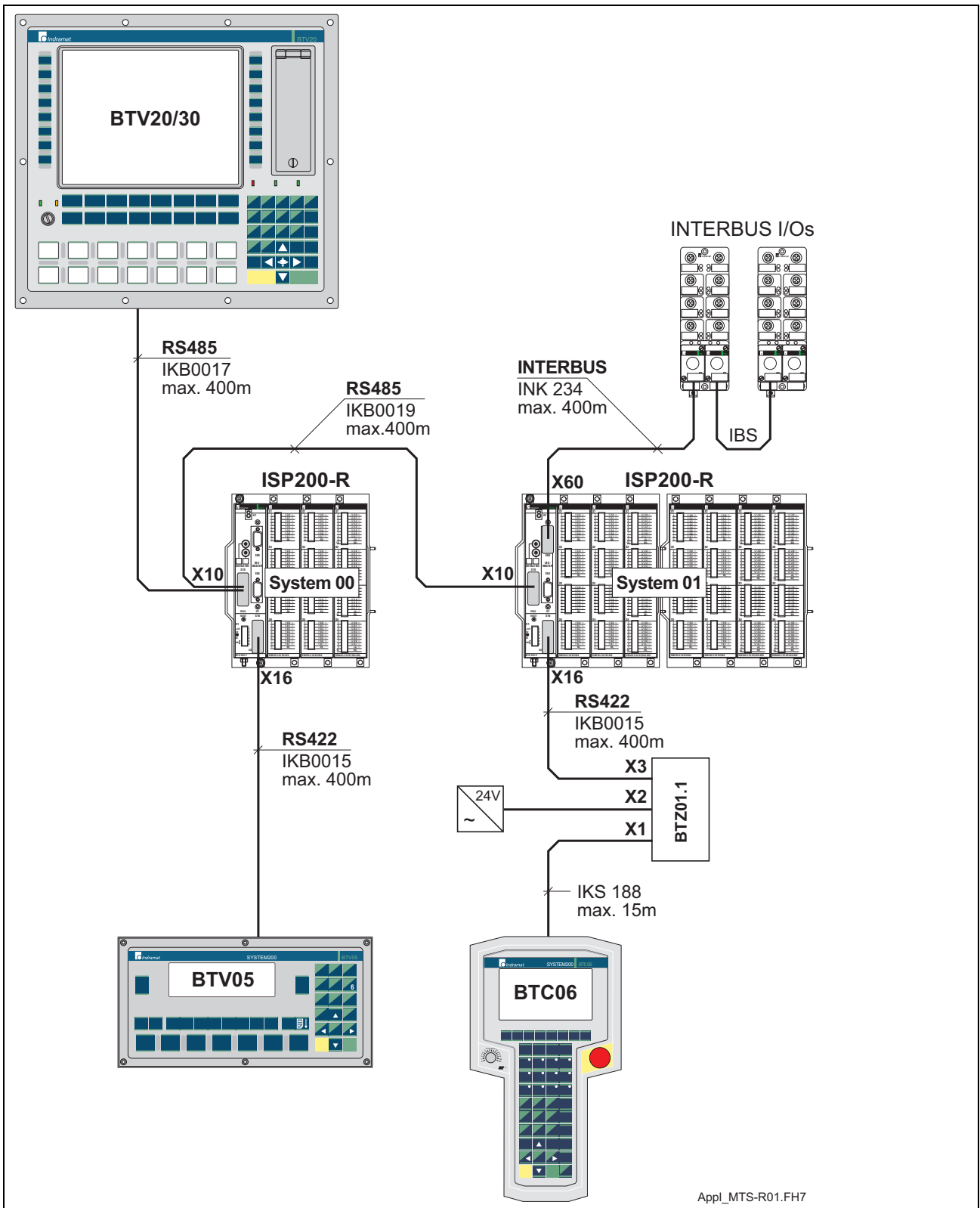


Fig. 6-2: MTS-R01.2 with INTERBUS connection

### 6.3 Type Code

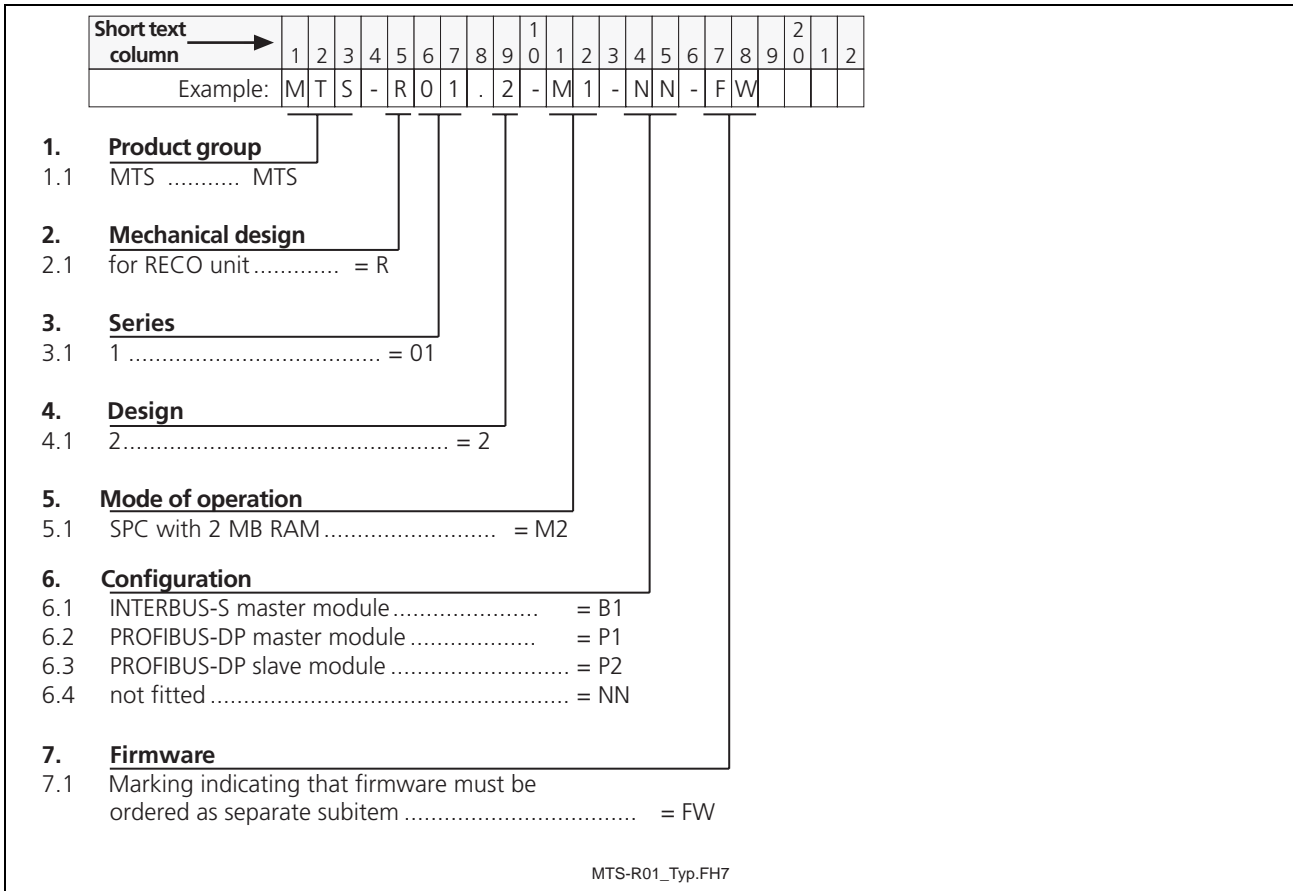


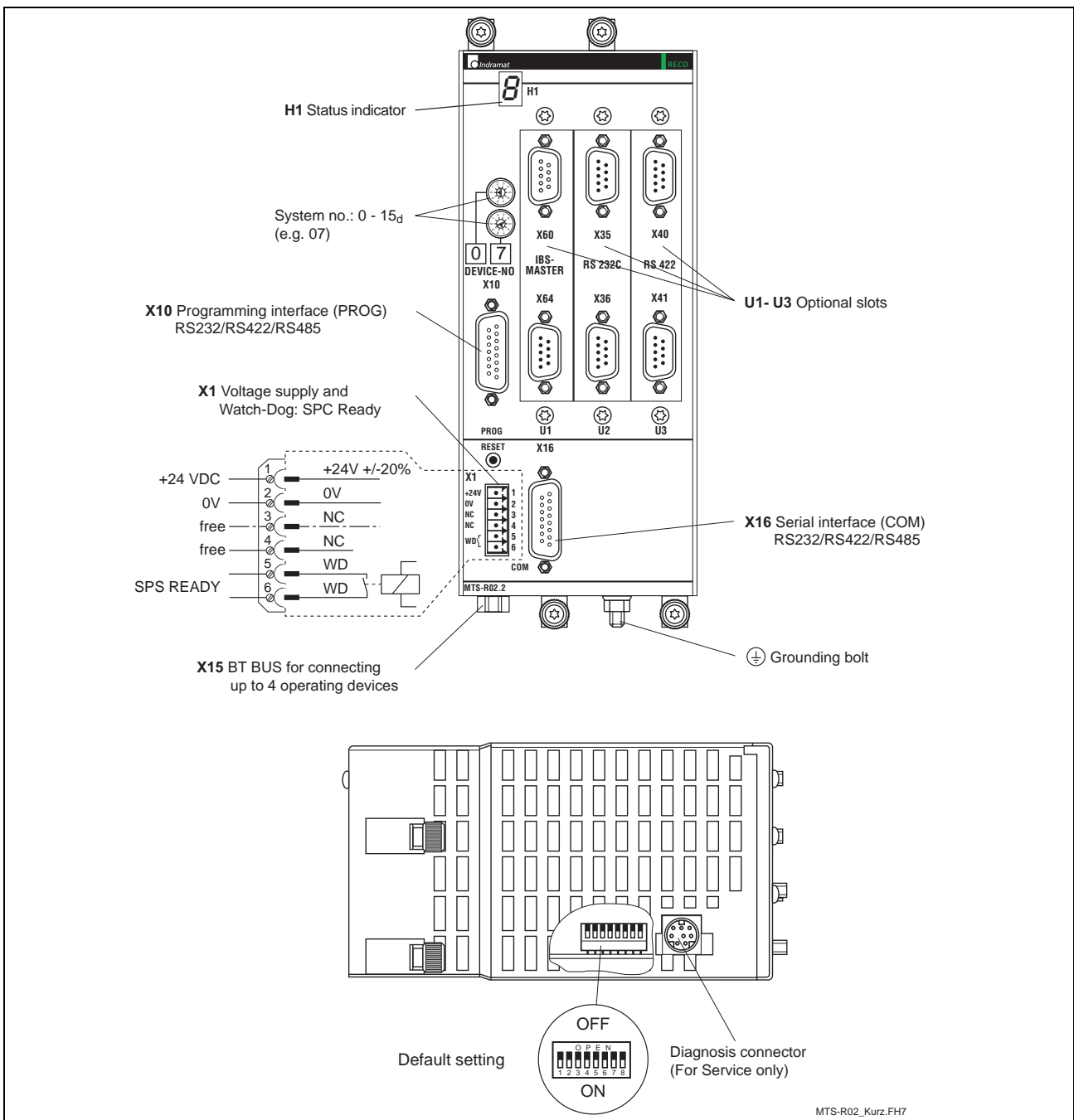
Fig. 6-3: MTS-R01.2 type code



# 7 RECO-SPS MTS-R02.2

## 7.1 Brief Description

The MTS-R02.2 is an efficient SPC in small-size format and in IP 20 design. It requires 2 slots in the RMB02.2 module carrier and can be used as a standalone SPC with the corresponding I/Os or together with motion control as a combined CNC-SPC system. Operating devices, e.g. BTM15/16 or BTA20, must be connected to the MTS-R02.2 using the BT bus. The optional slots U1 to U3 can be used to fit components on open field bus interfaces, such as the INTERBUS or the Profibus-DP, or on additional serial interfaces.



## 7.2 Application Example

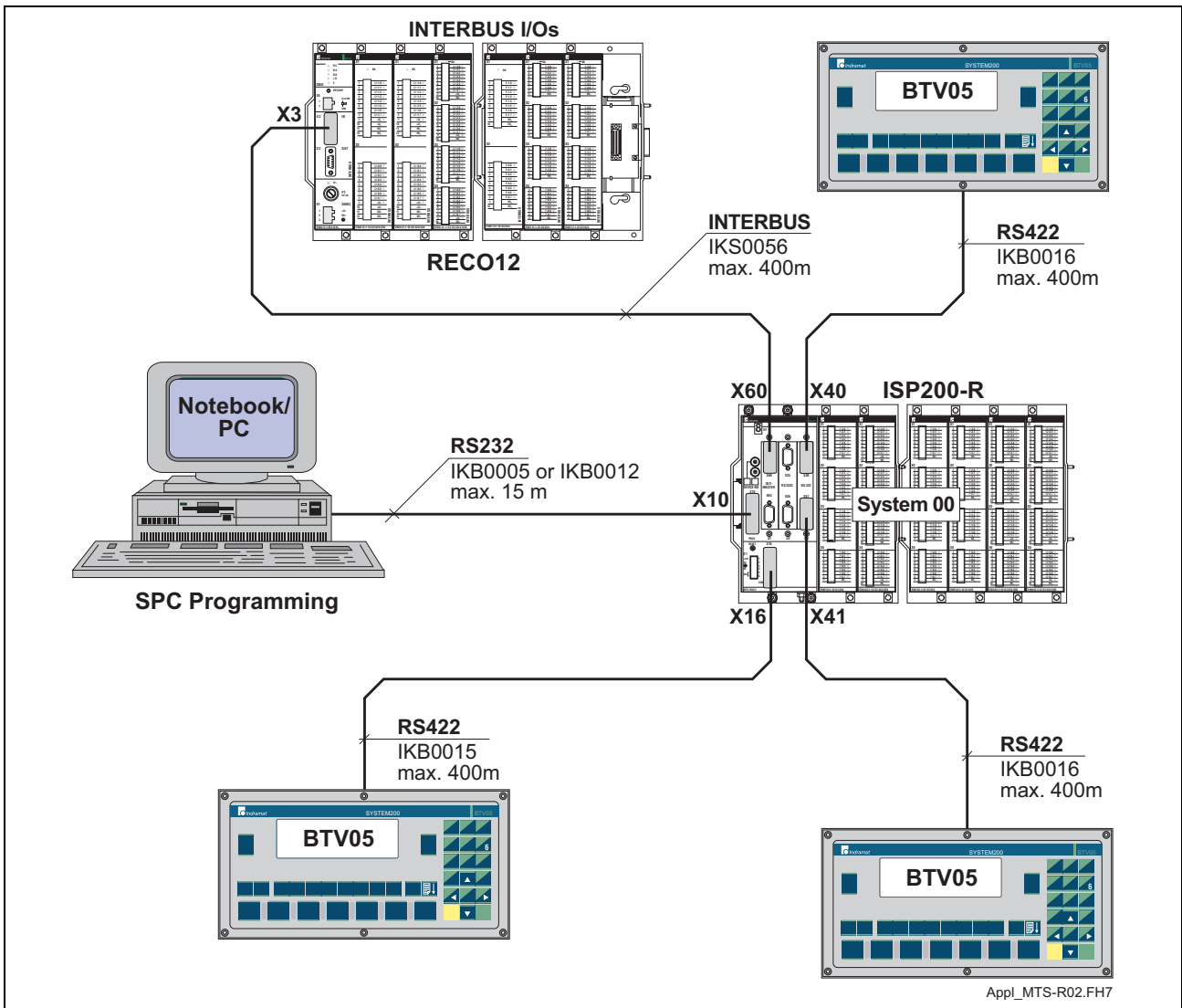


Fig. 7-5: MTS-R02.2 with INTERBUS connection and 4 serial interfaces

### 7.3 Type Code

Short text	Column	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
Example:		M	T	S	-	R	0	2	.	2	-	M	2	-	N	N	-	N	N	-	N	N	-	F	W		

- 1. Product group**
  - 1.1 MTS .....= MTS
  
- 2. Mechanical design**
  - 2.1 for RECO unit ..... = R
  
- 3. Series**
  - 3.1 2 ..... = 02
  
- 4. Design**
  - 4.1 2 ..... = 2
  
- 5. Mode of operation**
  - 5.1 SPC with 2 MB RAM ..... = M2
  
- 6. Configuration ①**
  - 6.1 B1-NN-NN
  - 6.2 B1-S4-NN
  - 6.3 P1-NN-NN
  - 6.4 P1-P2-NN
  - 6.5 P2-NN-NN
  - 6.6 NN-NN-NN
  
- 7. Firmware**
  - 7.1 Marking indicating that firmware must be ordered as separate subitem = FW

Remarks:

① Configuration

- B1 = INTERBUS-S master-module
- S4 = Serial interface-module (2xRS232 + 2xRS422/485)
- P1 = Profibus-DP master-module
- P2 = Profibus-DP slave-module
- NN = not fitted

MTS-R02\_Typ.FH7

Fig. 7-6: MTS-R02.2 type code



# 8 INTERBUS Master Connection

## 8.1 Brief Description

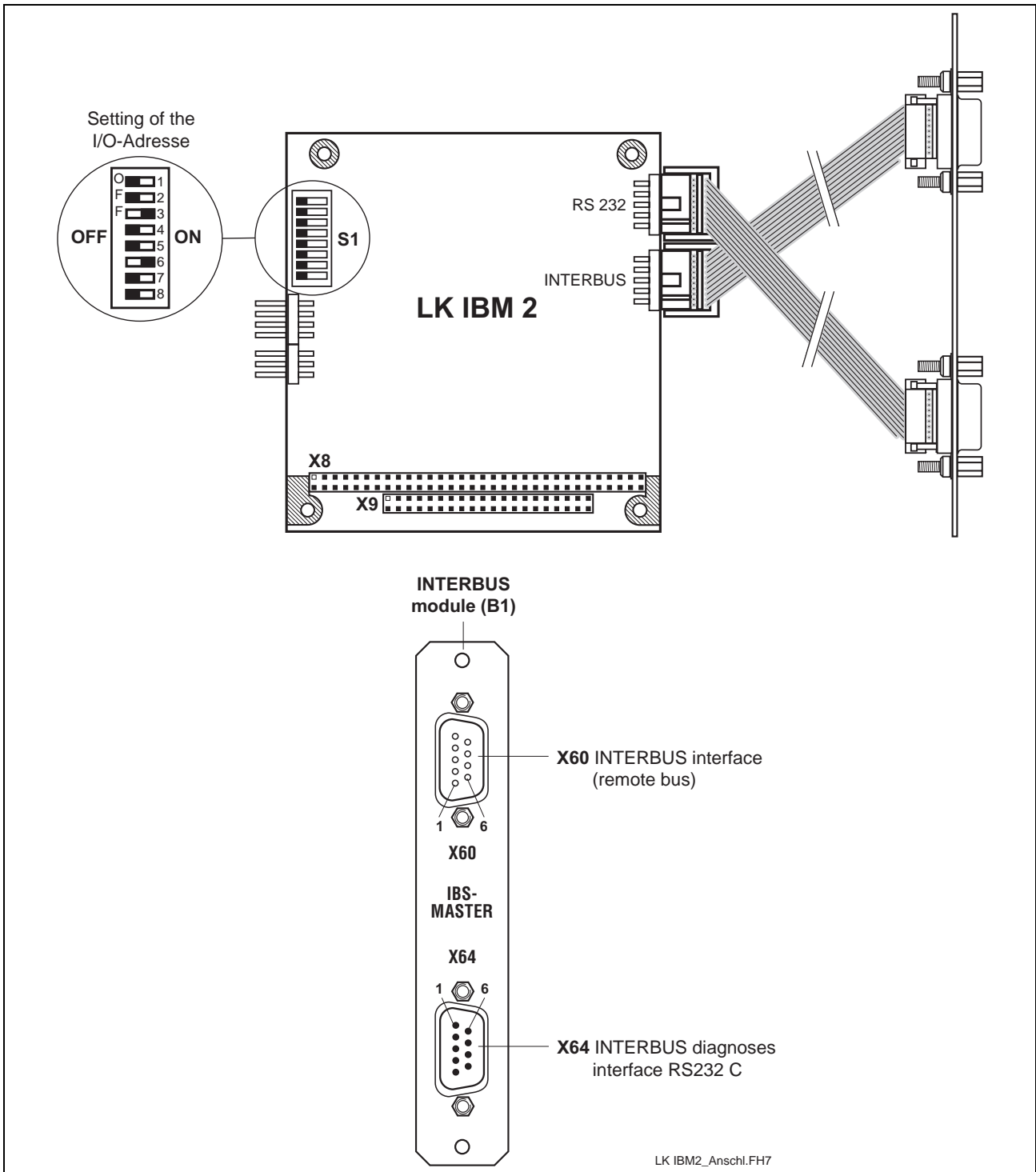


Fig. 8-1: P.C.B. LK IBM 2

The printed circuit board IBM 2 is an INTERBUS master connection of the 4<sup>th</sup> generation in PC104 format. It can be used for the connection of simple sensors and actuators as well as of intelligent field devices via the INTERBUS. The INTERBUS permits bridging of distances of up to 12.8 km (from the connection point to the last connected remote bus user), divided in segments of up to 400 m.

The P.C.B. LK IBM 2 possesses the following features:  
 INTERBUS protocol (DIN E 19 258),  
 up to 256 bus segments,  
 up to 16 user levels,  
 up to 512 users per configuration,  
 up to 4096 inputs and 4096 outputs per configuration (512 bytes),  
 up to 32 INTERBUS loop users per bus segment,  
 CMD G4 support.

The INTERBUS is configured and parameterized directly by means of the I/O configurator integrated in the SPC programming interface.

In addition to the integrated INTERBUS diagnosis, it is also possible to use the IBS CMD SWT G4 (Phoenix Contact) software via the diagnosis interface.

**Note:** It is not possible to configure the INTERBUS using the IBS CMD SWT G4 software.

## 8.2 Setting of the I/O Address

The setting of the DIP switch S1 must be as follows (default setting), so that the P.C.B. IBM 2 can be addressed via the PC/104 bus:

1	2	3	4	5	6	7	8	Address
OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	120 <sub>h</sub>

Fig. 8-2: Setting of DIP switch S1

## 8.3 Interface Assignment

Pin	Signal name	Pin	Signal name
1	NC	2	$\overline{\text{TxD}}$ - Transmit Data
3	$\overline{\text{RxD}}$ - Receive Data	4	NC
5	SGND - Ground	6	NC
7	RTS - Ready To Send	8	CTS - Clear To Send
9	NC		

Fig. 8-3: Pin assignment of the INTERBUS diagnosis interface X64 (RS232 C)

Pin	Signal name	Pin	Signal name
1	DO	2	DI
3	COM	4	GND
5	+5V	6	$\overline{\text{D}\overline{\text{O}}}$
7	$\overline{\text{D}\overline{\text{I}}}$	8	Vcc
9	RBST		

Fig. 8-4: Pin assignment of the INTERBUS interface X60 (remote bus)

# 9 PROFIBUS-DP Connection

## 9.1 Brief Description of Master and Slave Connection

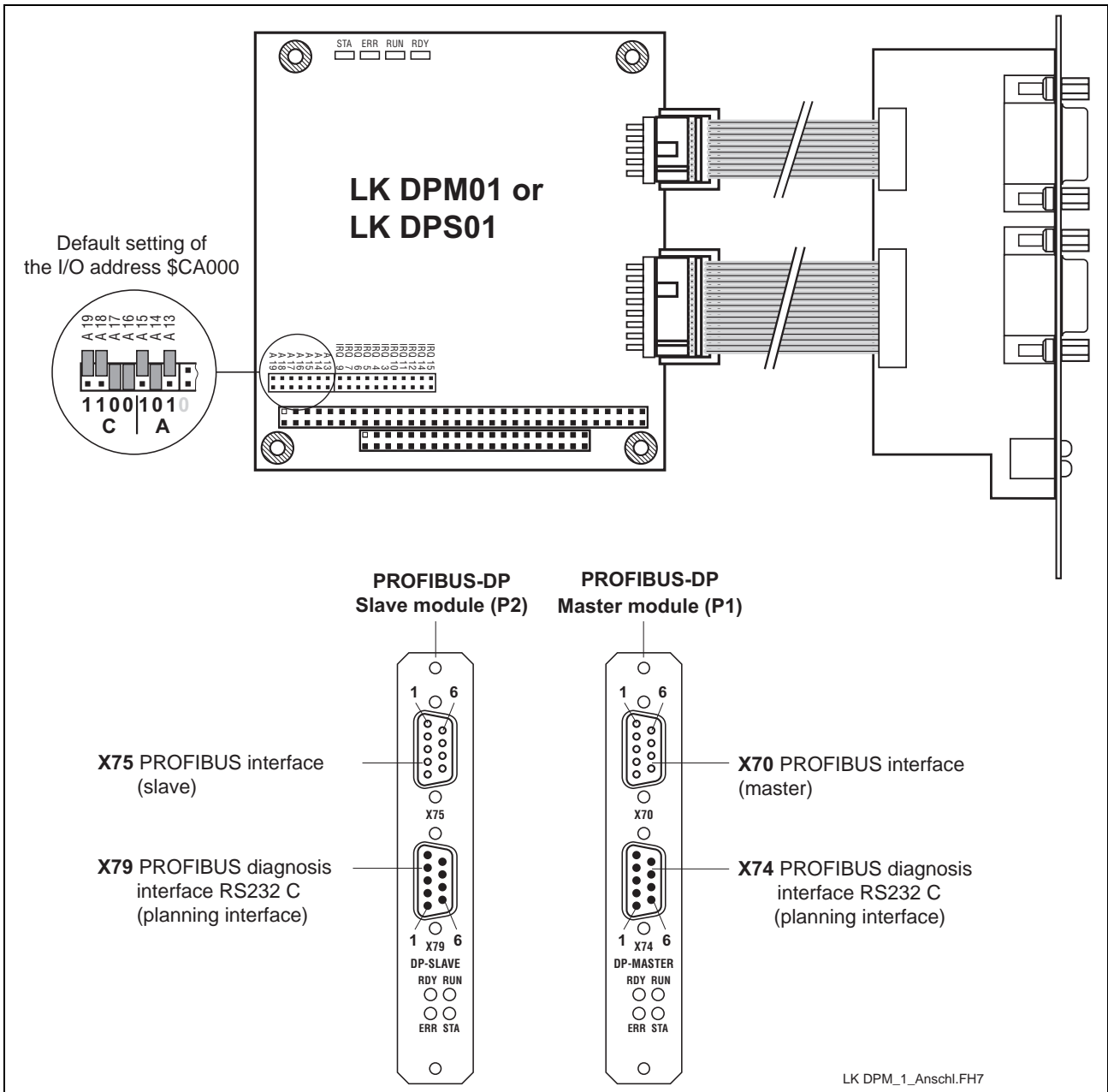


Fig. 9-5: Profibus connections

The P.C.B.s DPM01 (master) and DPS01 (slave) are intelligent PROFIBUS-DP connections in PC104 format. They are used to process the protocols of the data transfer between the SPC and the decentralized Profibus input and output units. The built-in microprocessor allows automatic execution of the entire data transfer, thus relieving the SPC of real-time tasks.

Data exchange between the SPC and the P.C.B.s DPM01 and DPS01 is implemented via an 8-kbyte dual-port memory (DPM). The DPM is a memory which can be simultaneously accessed by the SPC and the microprocessor of the P.C.B.s DPM01 and DPS01.

The PROFIBUS-DP master connection P.C.B. DPM01 permits connection of up to 32 PROFIBUS-DP users within one bus segment. If several bus segments are connected to each other via a repeater, a maximum of 125 slaves can be operated with maximum configuration. Each repeater in use reduces the maximum number of slaves within one segment, with the repeater as a passive user being not assigned any user address.

In the process image, a maximum of 368 I/O bytes can be made available to the DP slave. Here, max. 244 bytes may be I or O. 512 I/O bytes each in the process image are available to the DP master. In relation to the set data transfer rate, link lengths of up to 1200 m can be realized between the PROFIBUS-DP users. With a data transfer rate of 1.5 Mbaud, the link lengths are reduced to max. 200 m, with a rate of 12 Mbaud to max. 100 m.

**Note:** In order to ensure proper functioning of the PROFIBUS interface, only cables meeting the PROFIBUS specification RS485 (cable type A) may be used.

## 9.2 Setting the I/O Addresses

The bus address is set using the jumpers of plugboard J2. The address line is specified next to each jumper.

Depending on the expansion slot, the addresses must be set as follows (X = jumper fitted):

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

Fig. 9-6: Setting of the I/O address

## 9.3 Status and Diagnosis Information

After having been switched on, the P.C.B.s DPM01 and DPS01 perform a self-test. After the initialization phase of this test (2 to 3 seconds), the two LEDs ERR and STA turn dark, and the yellow RDY LED emits light if the test is completed successfully. If not, the RDY LED starts flashing, and processing of the program is stopped. The further meanings of the indicators during the initialization phase are listed below.

<b>RDY</b>	Yellow LED	<b>Ready</b>
	On:	DPM01 or DPS01 ready for operation
	Flashes in cycles:	Bootstrap loader active
	Flashes irregularly:	Hardware or system error
	Off:	Hardware defective

<b>RUN</b>	Green LED	<b>RUN (communication)</b>
	On:	Communication is running
	Flashes in cycles:	Ready for communication
	Flashes irregularly:	Wrong configuration
	Off:	No communication

<b>ERR</b>	Red LED	<b>Error</b>
	On:	Error of the communication interface
	Off:	Communication interface OK
<b>STA</b>	Yellow LED	<b>Status</b>
	On:	Data exchange with slaves active (master)
		Data exchange with master active (slave)
	Off:	No data exchange

## 9.4 Technical Data

<b>Supply</b>	
Operating voltage:	+5 VDC, $\pm 5\%$ / 650 mA
<b>Interface data</b>	
Communication interface:	PROFIBUS-DP, max. 12 Mbaud, potential-free
Diagnosis interface:	RS 232C, 9600 baud
<b>Operating conditions</b>	
Operating temperature:	0 °C to +55 °C
Storage temperature:	-25 °C to +70 °C
Air humidity:	max. 75%, non-condensing

## 9.5 Interface Assignment

The assignments of the interfaces of the Profibus connections are as follows:

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

Fig. 9-7: Pin assignment of the diagnosis interface RS232C (X74, X79)

PIN	Signal name	PIN	Signal name
1	RGND - Reference ground	2	NC
3	RxD/TxD-P - Send/receive	4	NC
5	DGND - Reference potential	6	VP - Supply voltage plus
7	NC	8	RxD/TxD-N - Send/receive
9	NC		

Fig. 9-8: Pin assignment of the PROFIBUS interface (X70, X75)



# 10 Serial Interfaces

## 10.1 Brief Description

The P.C.B. SIO 04-B provides the SPC user program with up to four serial interfaces (RS232 and RS422/485) for general use. Operation of the serial interfaces is interrupt-controlled via the SPC firmware.

The send and receive data of each interface are made available in buffers of 256 bytes length each. Using these buffers, the SPC user program indirectly communicates with the interfaces via available function blocks.

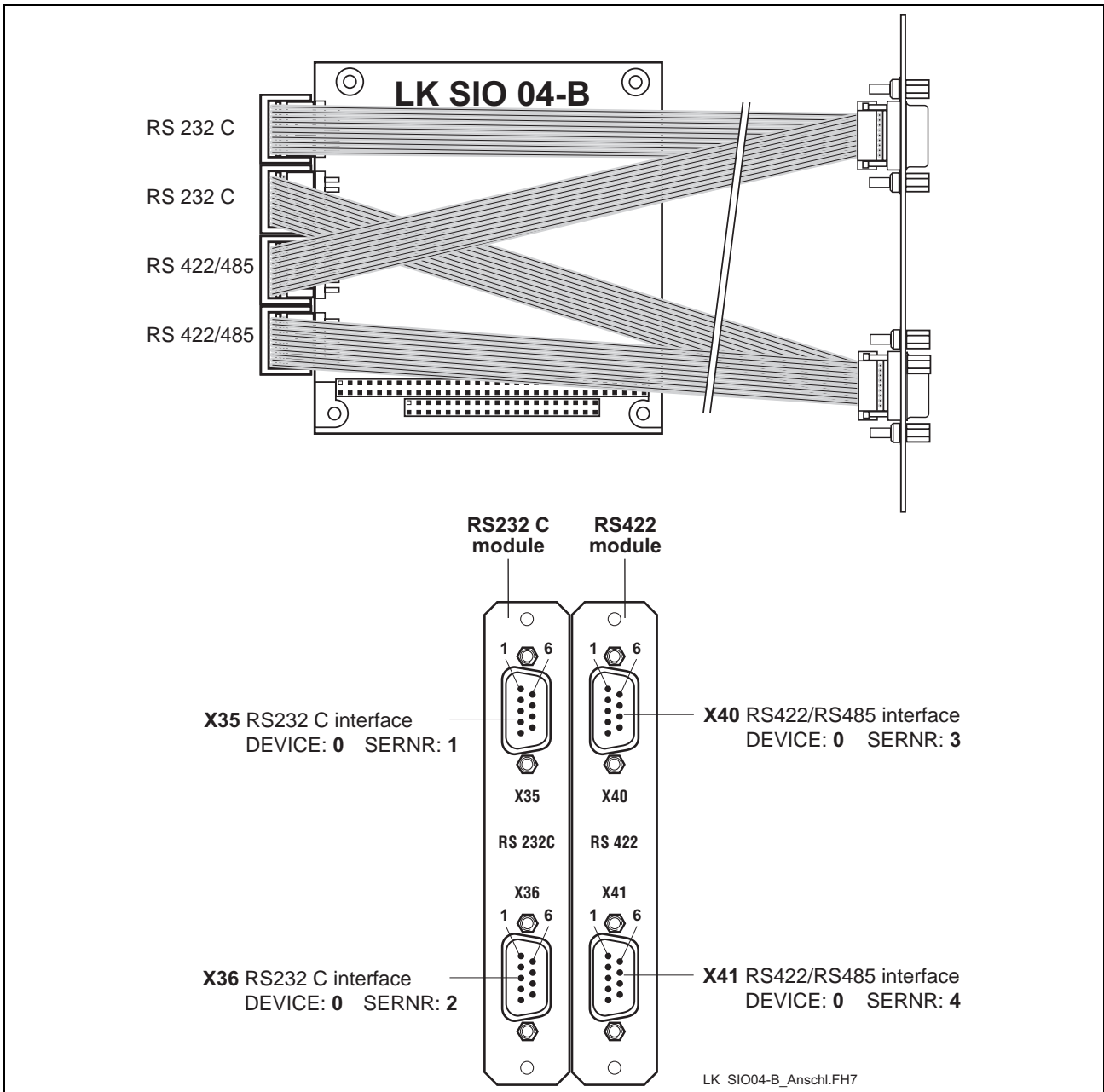


Fig. 10-9: P.C.B. SIO 04-B

## 10.2 Address and Interrupt Settings

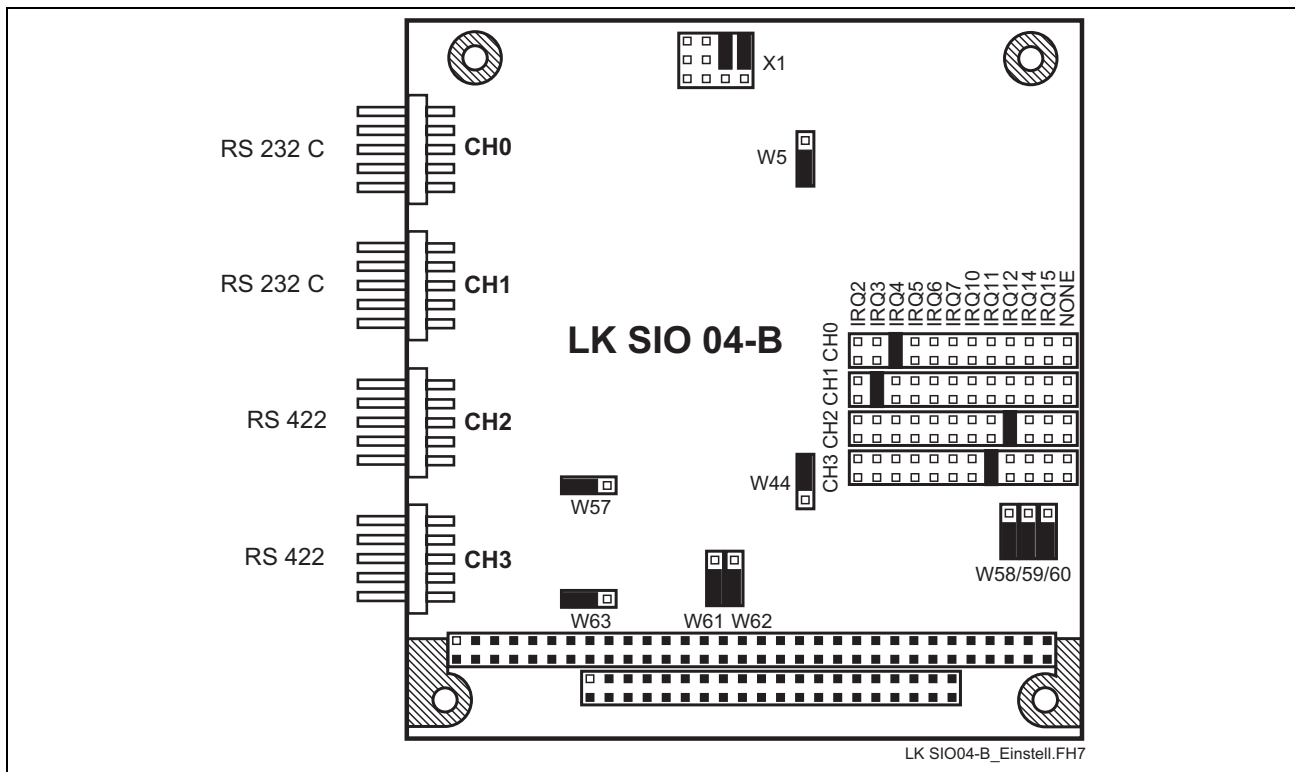


Fig. 10-10: Jumper settings on the P.C.B. SIO 04-B

## 10.3 Function Blocks

Using the following function blocks, the SPC program permits access to the serial interface.

Name	Description
OPEN_COM	Parameterizing and opening a serial interface
CLOSE_COM	Closing a serial interface
RD_BYTE	Reading a byte from the serial interface
WR_BYTE	Writing a byte to the serial interface
RD_STRING	Reading a string from the serial interface
WR_STRING	Writing a string to the serial interface
BTXX	Communication module for the operating and visualization devices BTV04/05 and BTC06
MODBUS	Communication module for the MODBUS protocol

Fig. 10-11: Function blocks for interface handling

The COM data type, which describes the serial interface in more detail (e.g. DEVICE, SERNR, BAUDRATE, etc.), is required for parameterizing the blocks. For a more detailed description of the function blocks see the "Instruction Set" documentation.

## 10.4 Technical Data

Supply	
Supply voltage:	4.5 to 5.5 VDC
Power consumption:	max. 250 mA
Interface data	
Input capacity:	max. 15 pF
Input leakage current:	max. 5 $\mu$ A
Output capacity:	min. 150 pF
Output current (switching actively 0):	min. 12 mA

## 10.5 Interface Assignment

The assignments of the serial interfaces are as follows:

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		

Fig. 10-12: Pin assignment of RS 232C X35, X36

PIN	Signal name	PIN	Signal name
1	GND / Frame Ground	2	NC
3	TxD A (-) / Transmit Data	4	RxD A (-) / Receive Data
5	SGND / Signal Gound	6	RxD B (+) / Receive Data
7	RTS / Ready To Send	8	CTS / Clear To Send
9	TxD B (+) / Transmit Data		

Fig. 10-13: Pin assignment of RS422/485 X40, X41



# 11 Networking

## 11.1 Networking via the PROG and COM Interfaces

The PROG interface of the ISP200-R can be operated as a point-to-point connection (RS232/RS422) and as a bus (RS485). Using the RS485 bus, a maximum of 16 controls can be networked. This is achieved by assigning a device number between 0 and 15. These device numbers serve to directly address the controls from a programming device or a PC. The COM interface can only be operated as a point-to-point connection (RS232/RS422/RS485). The Rexroth INDRAMAT cables IKB0017 and IKB0019 as well as the connector INS0619 (Fig. 11-1) can be used to establish the RS485 connection.

The RS422 connection can be established by means of the Rexroth INDRAMAT cables IKB0015 and IKB0016 or the connector INS0945 (Fig. 11-2).

In RS422 and RS485 operation, the distance between the first and the last user can be **max. 400 m**.

If several controls are networked via an RS485 interface, it must be ensured that each first and last physical user must be terminated in the bus. This is achieved by means of the switch on the INS0619 connectors.

Switch position 1 = bus terminated.

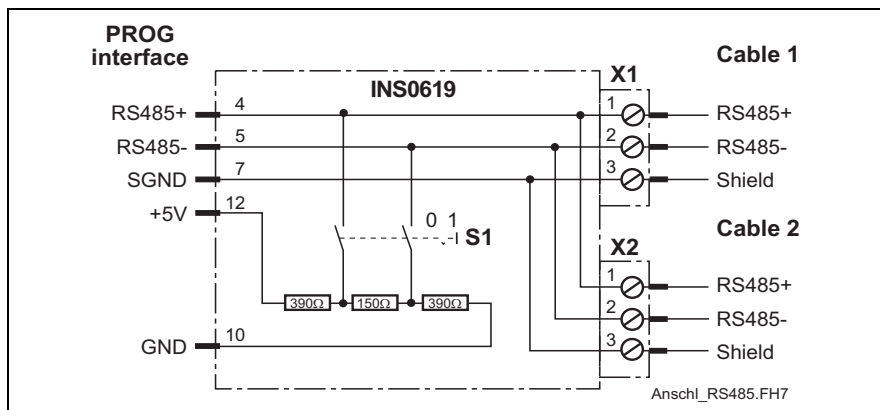


Fig. 11-1: RS485 connection with INS0619 connector

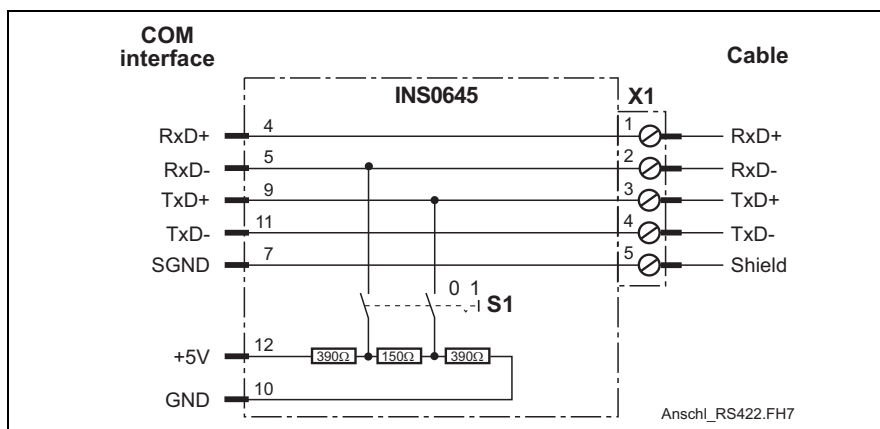


Fig. 11-2: RS422 connection with INS0645 connector

## 11.2 ISP200-R in Connection with the BTV20/30

The BTV20/30 is equipped with a Rexroth INDRAMAT SIS interface (SIS = serial Indramat interface), which permits networking of a BTV20/30 with several ISP200-R. This interface can be used to establish an RS485 bus system (see Fig. 11-3).

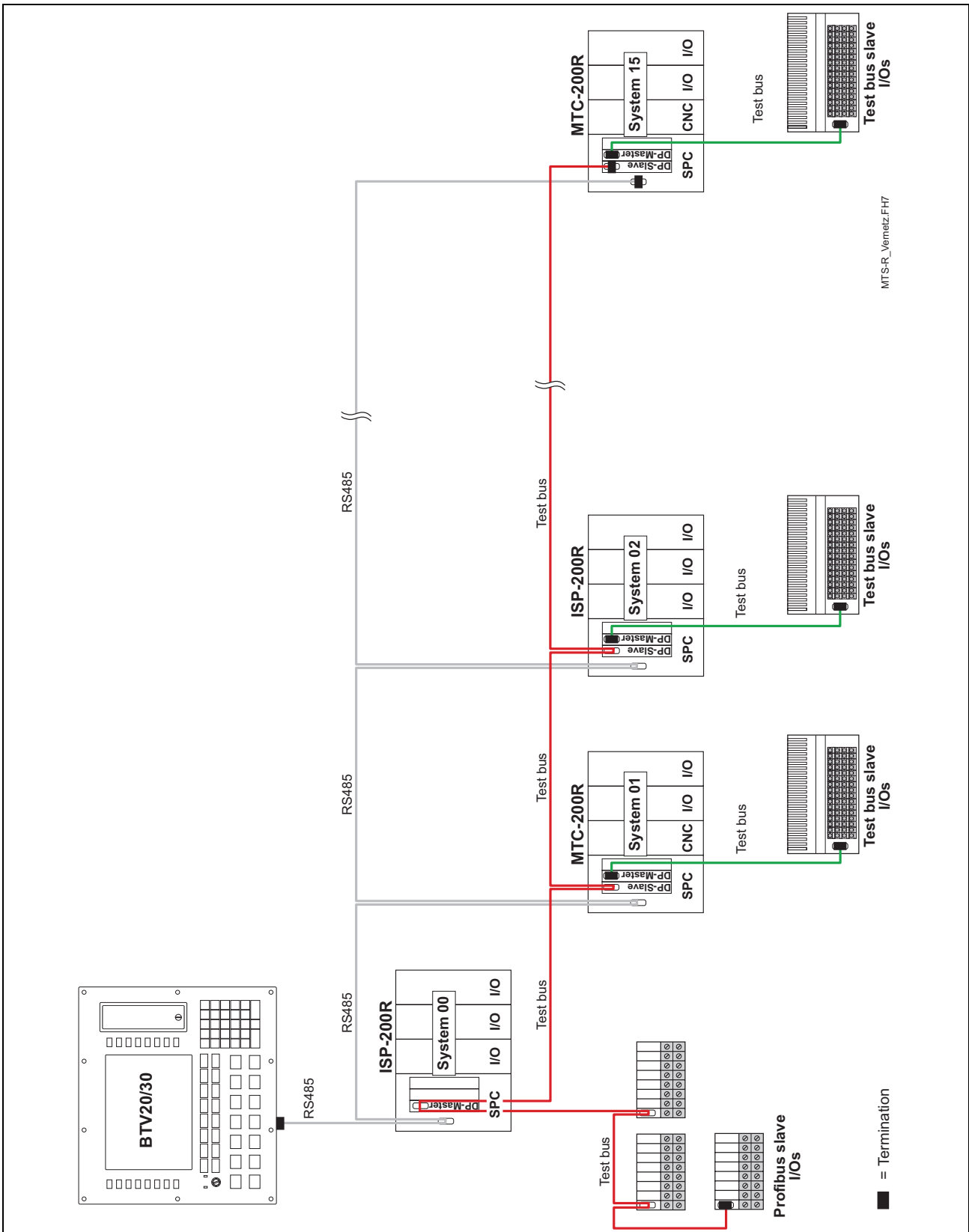


Fig. 11-3: ISP200-R networking with BTV20/30

# 12 Connection of HMI Control Panels

## 12.1 Applications with the BTV04/05/06

As required, the HMI control panels BTV04/05/06 are connected via the serial interfaces X16 and X40/41, which permit RS422 or RS485 operation. Only **one** HMI control panel can be connected to an RS422 interface (see Fig. 12-4).

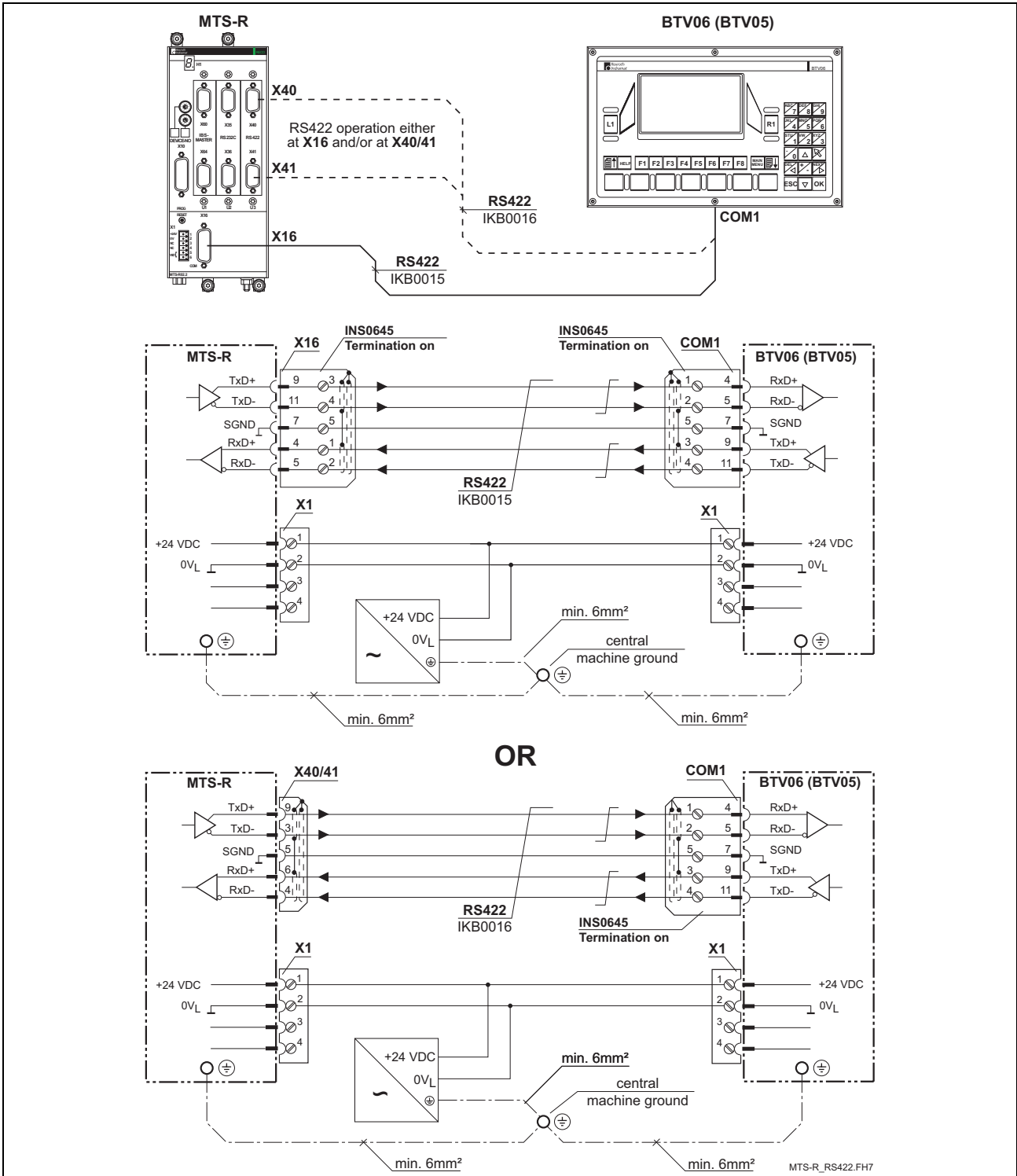


Fig. 12-4: MTS-R with HMI control panels via an RS422 interface

During RS485 operation, 2 control panels can be connected in cascade per interface (see Fig. 12-5). Hence, a maximum of 6 HMI control panels can be connected during RS485 operation.

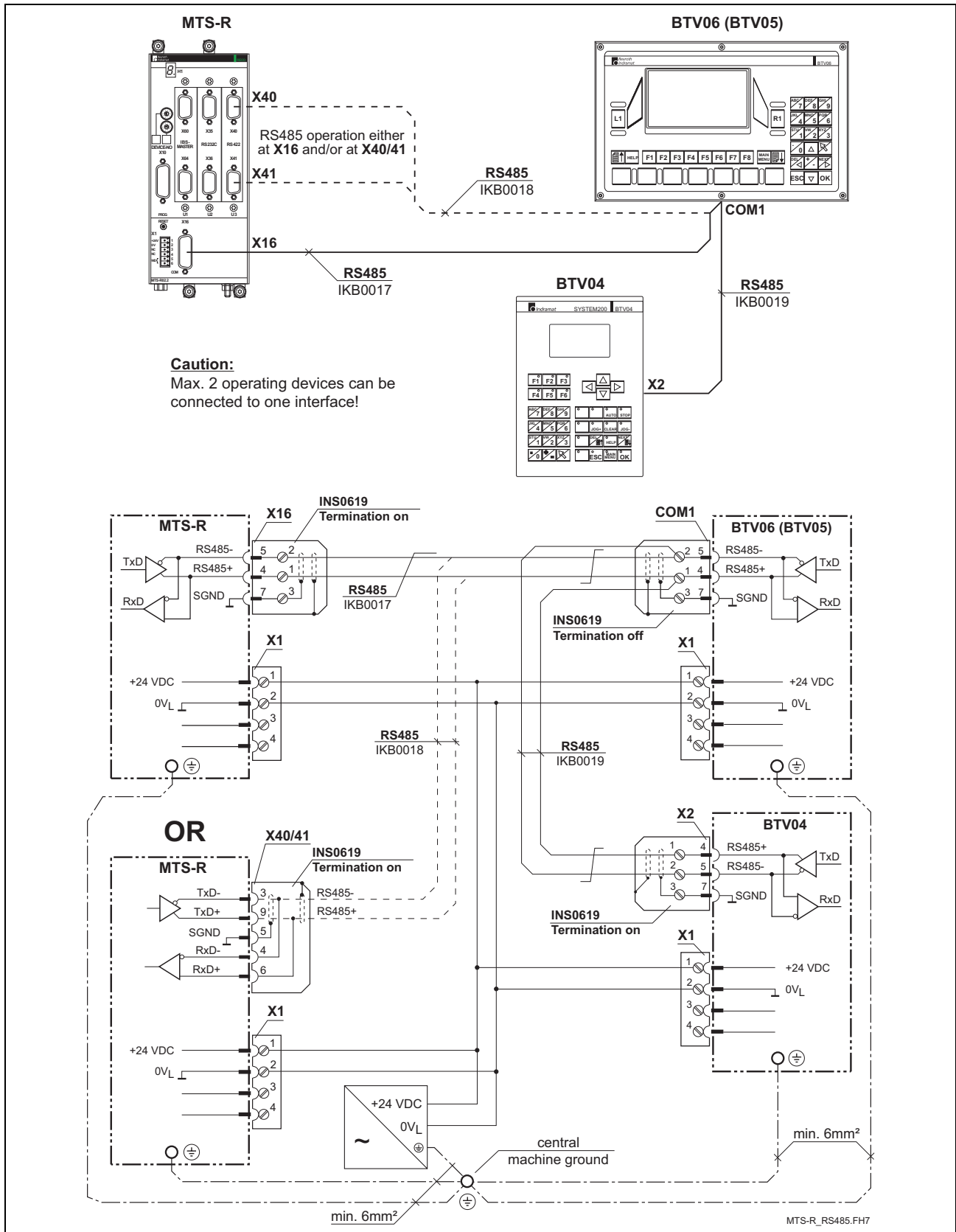


Fig. 12-5: MTS-R with HMI control panels via an RS485 interface

## 12.2 Applications with the BTC06

The hand-held terminals BTC06 are exclusively connected via the machine control panels BTA10 or BTA20. RS232 operation is converted to RS422 operation by means of the interface converter integrated in the BTA10/20 (see Fig. 12-6). RS422 operation with the BTC06 is also only possible via the BTA 10/20. Here, however, there is no interface conversion, but only an adaptation of the interface connectors to the BTC06 connector (see Fig. 12-7).

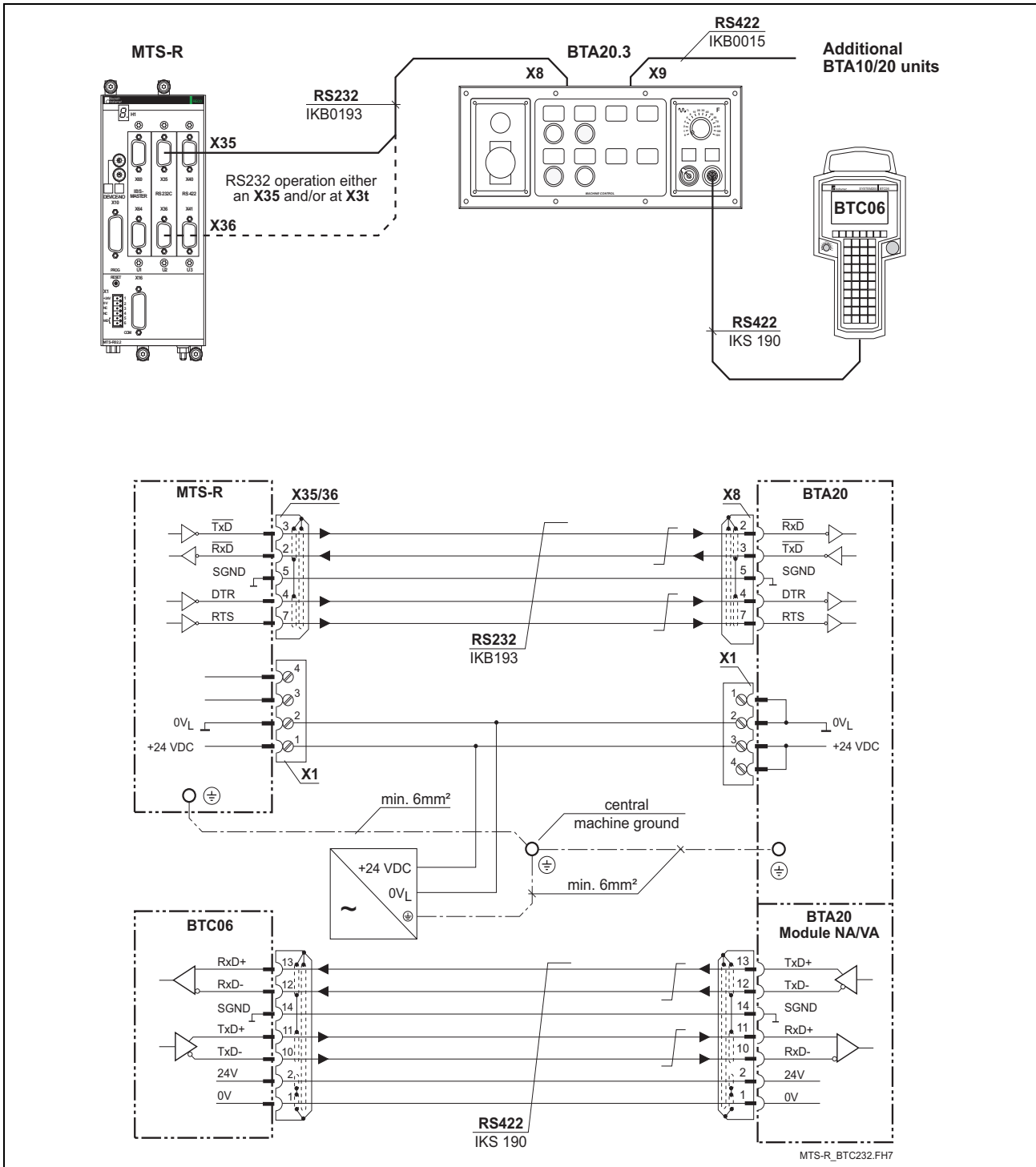


Fig. 12-6: MTS-R with BTC06 via an RS232 interface

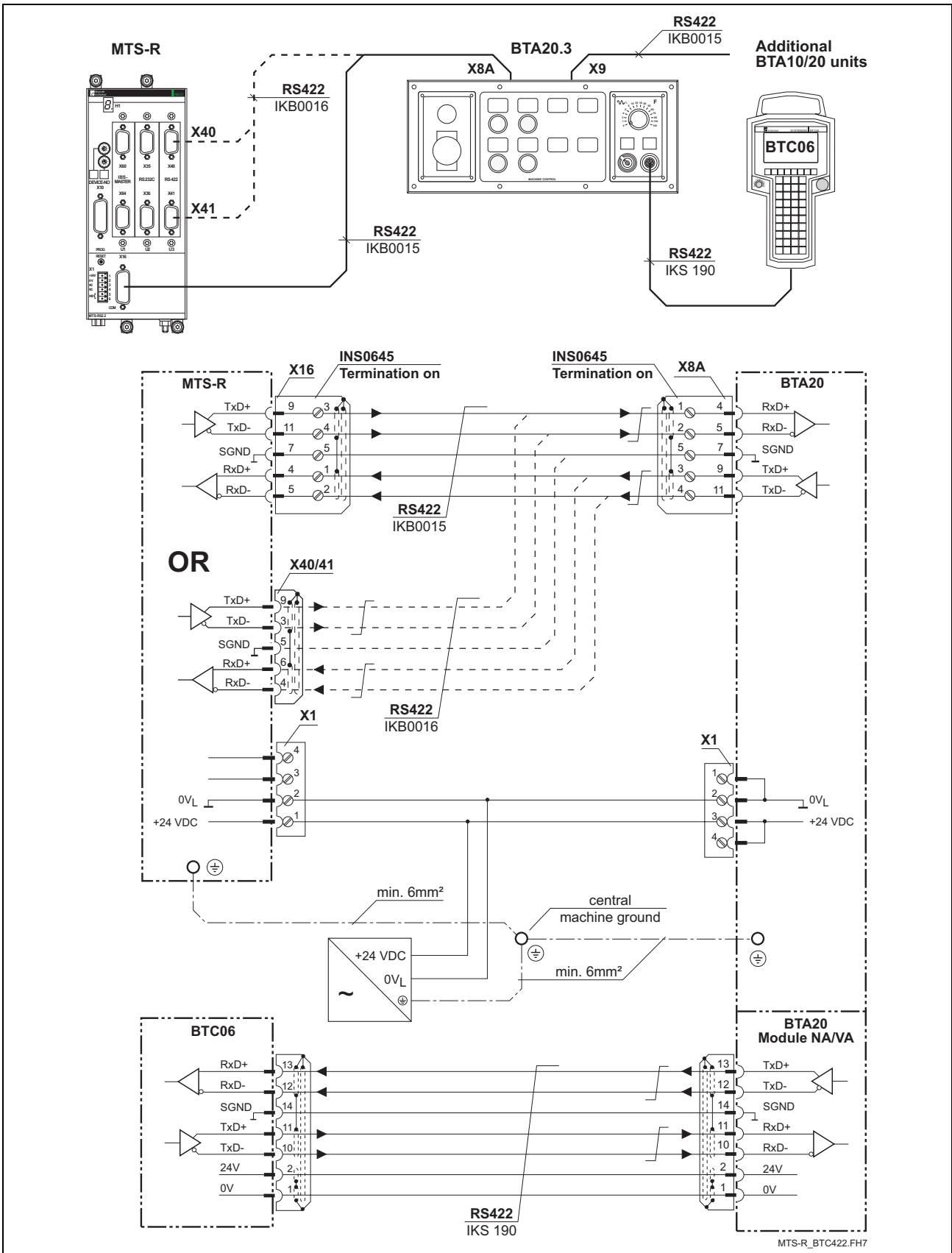
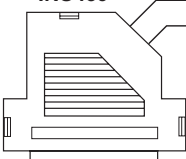
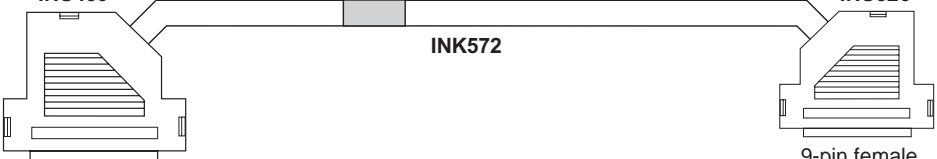

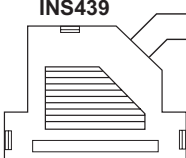
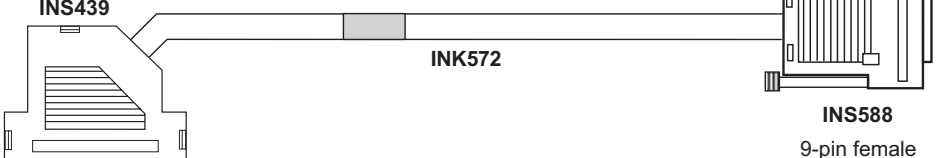
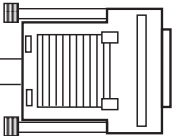
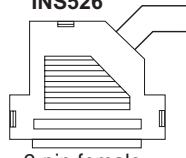
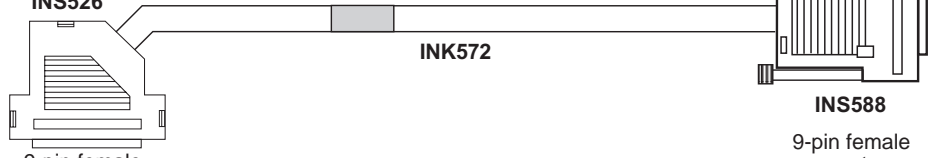
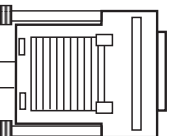
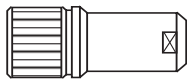
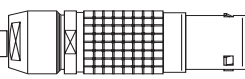
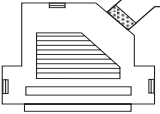
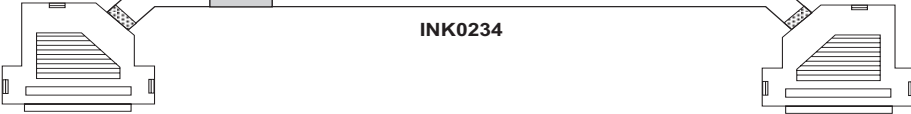
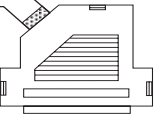
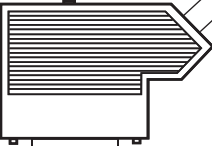
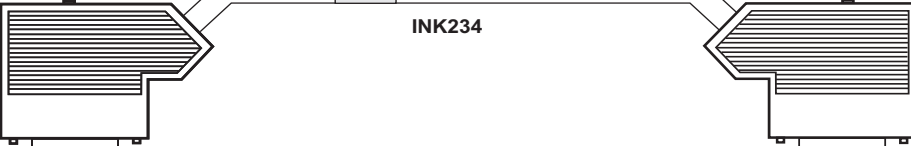
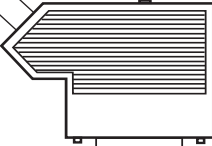
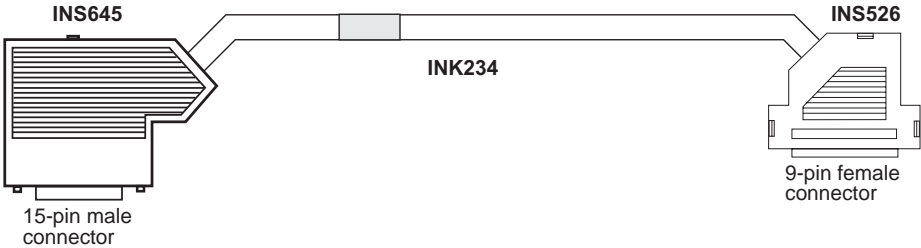
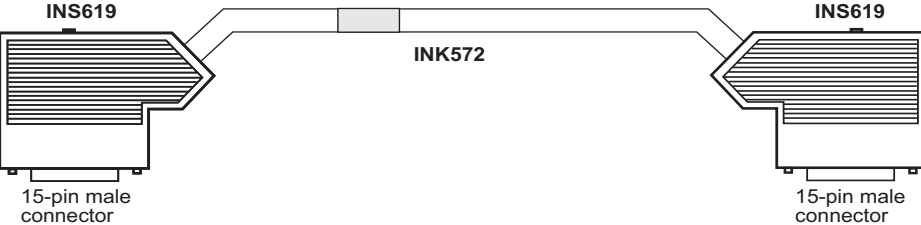
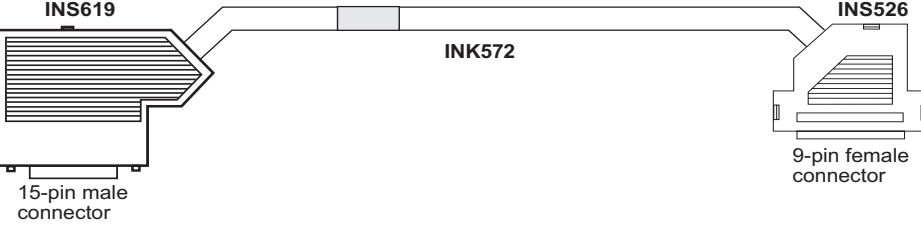
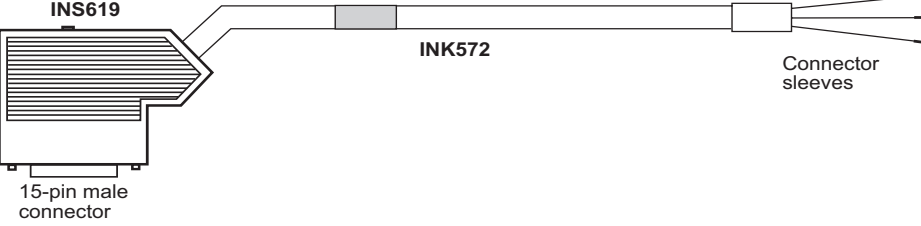
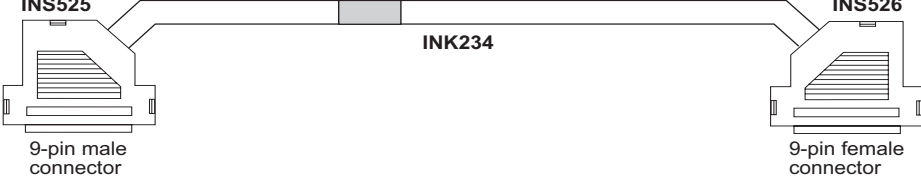
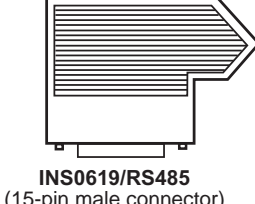
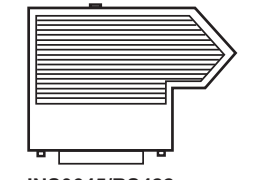
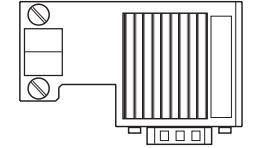


Fig. 12-7: MTS-R with via an RS422 interface

# 13 Accessories

## 13.1 Selection List of Connectors and Ready-Made Cables

Ordering name of ready-made cables	Counter-connector on the device	INDRAMAT cable	Execution of cable end
<p><b>IKB0005</b>                      MN: 278 141, 2 m                      MN: 278 144, 5 m                      MN: 278 142, 10 m                      MN: 278 143, 15 m                      (RS232, max. 15 m)</p>	<p><b>INS439</b>                        15-pin male connector</p>	<p><b>INK572</b>  </p>	<p><b>INS526</b>                        9-pin female connector</p>
<p><b>IKB0012/000,0</b>                      MN: 281 715                      (RS232, max. 15 m)</p>	<p><b>INS439</b>                        15-pin male connector</p>	<p><b>INK572</b>  </p>	<p><b>INS588</b>                        9-pin female connector</p>
<p><b>IKS0106/000,0</b>                      MN: 260 838                      (RS232, max. 15 m)</p>	<p><b>INS526</b>                        9-pin female connector</p>	<p><b>INK572</b>  </p>	<p><b>INS588</b>                        9-pin female connector</p>
<p><b>IKS0190</b>                      MN: 279 743, 3 m                      MN: 279 743, 5 m                      MN: 279 744, 10 m                      MN: 279 745, 15 m                      (RS422, max. 15 m)</p>	<p><b>INS0624/C</b>  </p>	<p><b>INS0631/C</b>  </p>	
<p><b>IKB0193</b>                      MN: 282041                      (RS232, max. 15 m)</p>	<p><b>INS0525/L01</b>                        9-pin male connector</p>	<p><b>INK0234</b>  </p>	<p><b>INS0526/L01</b>                        9-pin female connector</p>
<p><b>IKB0015/000,0</b>                      MN: 282 870                      (RS422, max. 400 m)</p>	<p><b>INS645</b>                        15-pin male connector</p>	<p><b>INK234</b>  </p>	<p><b>INS645</b>                        15-pin male connector</p>

<p><b>IKB0016/000,0</b>                  MN: 282 871                  (RS422, max. 400 m)</p>	 <p>INS645 15-pin male connector</p> <p>INS526 9-pin female connector</p> <p>INK234</p>
<p><b>IKB0017/000,0</b>                  MN: 282 872                  (RS485, max. 400 m)</p>	 <p>INS619 15-pin male connector</p> <p>INS619 15-pin male connector</p> <p>INK572</p>
<p><b>IKB0018/000,0</b>                  MN: 282 874                  (RS485, max. 400 m)</p>	 <p>INS619 15-pin male connector</p> <p>INS526 9-pin female connector</p> <p>INK572</p>
<p><b>IKB0019/000,0</b>                  MN: 282 875                  (RS485, max. 400 m)</p>	 <p>INS619 15-pin male connector</p> <p>Connector sleeves</p> <p>INK572</p>
<p><b>IKS0056/000,0</b>                  MN: 255 968                  (INTERBUS, max. 400 m)</p>	 <p>INS525 9-pin male connector</p> <p>INS526 9-pin female connector</p> <p>INK234</p>
<p><b>INS0619/K01</b>                  MN: 279 583</p>	 <p>INS0619/RS485 (15-pin male connector)</p> <p>Y-connector for self-finishing with termination</p>
<p><b>INS0645/K01</b>                  MN: 282 040</p>	 <p>INS0645/RS422</p> <p>Connector for self-finishing with termination</p>
<p><b>INS0540/K01</b>                  MN: 279 538</p>	 <p>INS0540/Profibus (male)</p> <p>Profibus connector for self-finishing with termination</p>

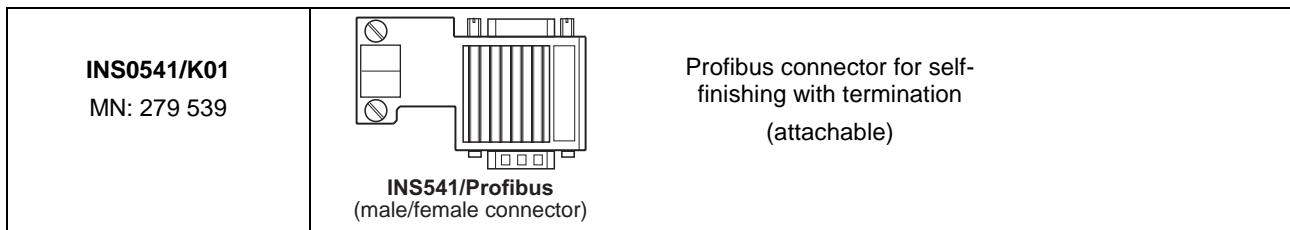


Fig. 13-1: MTS-R accessories

## 13.2 Labelling of I/O Modules

A labelling package (SUP-M03-RECO) is available for additionally labelling the RECO02 I/O modules. This package consists of 16 carrier foils, 10 labelling foils with 6 adhesive strips each, and the labelling software. The carrier foil can be glued on the left or right of the module housings. It is intended to take up the prepunched adhesive strips, six of which are provided on each labelling foil in A4 size.

The moisture-resistant labelling foils (SUP-M02-RECO) are suitable for labelling with a commercially available laser printer. The adhesive foils are labelled by means of the enclosed labelling program, which is designed on Word basis and permits labelling of 1 to 6 modules per labelling foil. When doing this, the user can select whether the module concerned is a 16-bit, a 32-bit, an input or an output module and whether the label is to be adhered onto the left or onto the right side of the module. To ensure correct operation of the labelling program, it must be filed in the templates folder of Microsoft Office. The program is started by executing <File/New> in Word.

Depending on the printer driver, the format of the template may be slightly different. To achieve best results, we recommend to use Xerox DocuTech 135 PS2.

Description	Type	Material no.
Carrier foil	SUP-M01-RECO	281 697
Labelling foil	SUP-M02-RECO	281 696
Labelling package	SUP-M03-RECO	286 977

Fig. 13-2: Labelling accessories



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