

## RECO PLC ISP200-R/G2

Project Planning Manual

SYSTEM200

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ISP200-R/G2

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# 1 RECO PLC ISP200-R

## 1.1 Front View MTS-R01.2 and MTS-R02.2

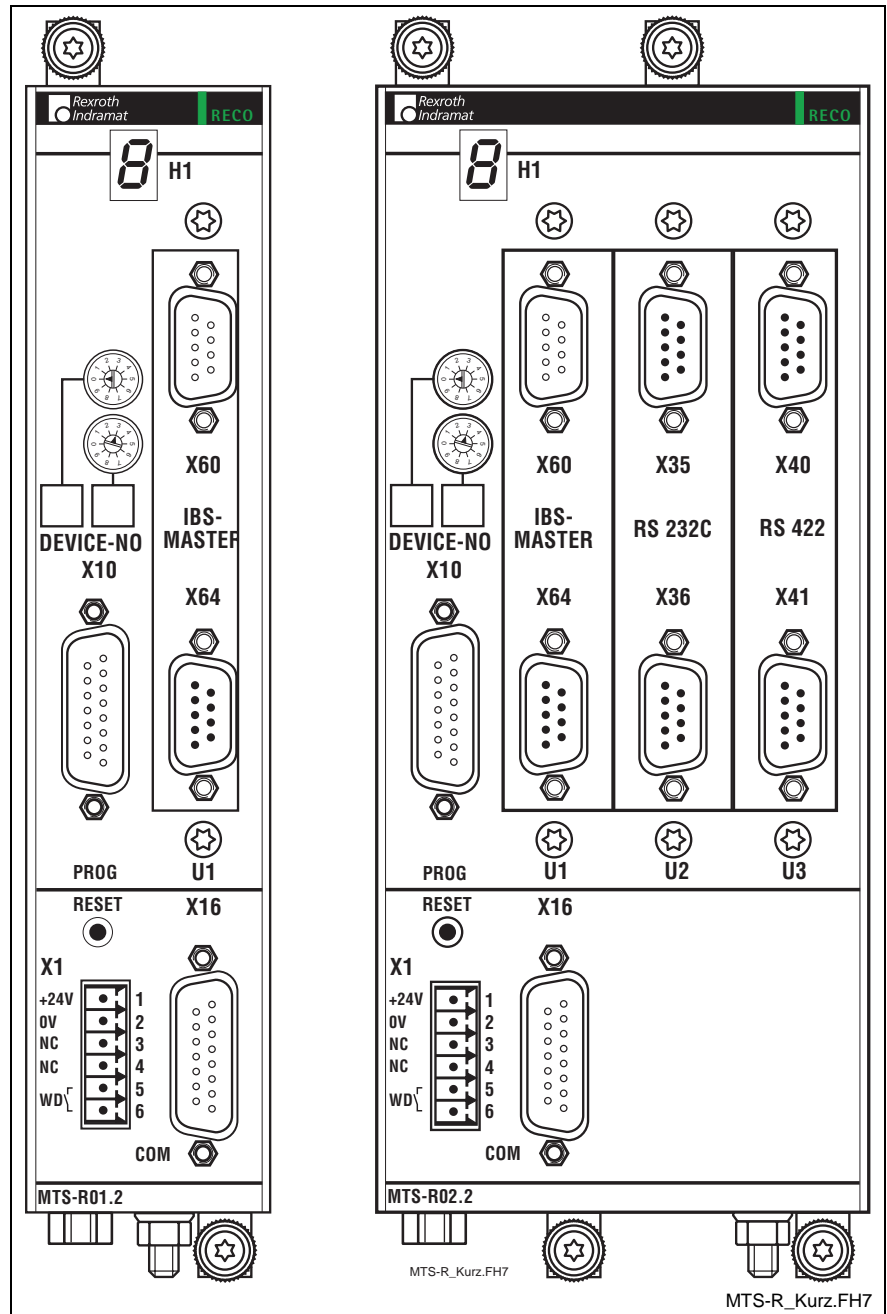


Fig. 1-1: MTS-R01.2 and MTS-R02.2

## 1.2 Brief Description of the ISP200-R

The ISP200-R RECO PLC is an efficient PLC in RECO format and is compatible with the PLC in the MTC200 control system. It can be used as stand alone PLC or, in connection with an MTC-R, as slave PLC. The PROG interface, which can be operated in the RS232 or in the RS422 mode, allows the connection to a PC or a programming device. Additionally, the RS485 mode allows to operate several ISP200-R or MTC200-R controls in an RS485 bus system. The PROG interface can be parameterized via a DIP switch (see Fig. 5-1). 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 PLC user program, is provided for connection of a printer, a read-write memory, or an operator terminal, e.g. the BTV04 or BTV05. The PLC user program can also be used to parameterize the interface for all of the three operating modes (RS232/RS422/RS485) (see chapter 5.2).

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, BTM16, 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 plug-in locations of 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. In conjunction with WinPCL maximum 256 bytes inputs and 256 bytes outputs are available. 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 fieldbus interfaces INTERBUS, PROFIBUS DP or DeviceNet. 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 Directions for Use

### 2.1 Appropriate Use

#### Introduction

Rexroth products represent state-of-the-art developments and manufacturing. They are tested prior to delivery to ensure operating safety and reliability.

The products may only be used in the manner that is defined as appropriate. If they are used in an inappropriate manner, then situations can develop that may lead to property damage or injury to personnel.

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**Note:** The Bosch Rexroth AG, as manufacturer, is not liable for any damages resulting from inappropriate use. In such cases, the guarantee and the right to payment of damages resulting from inappropriate use are forfeited. The user alone carries all responsibility of the risks.

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Before using Rexroth products, make sure that all the pre-requisites for appropriate use of the products are satisfied:

- Personnel that in any way, shape or form uses our products must first read and understand the relevant safety instructions and be familiar with appropriate use.
- If the product takes the form of hardware, then they must remain in their original state, in other words, no structural changes are permitted. It is not permitted to decompile software products or alter source codes.
- Do not mount damaged or faulty products or use them in operation.
- Make sure that the products have been installed in the manner described in the relevant documentation.

## Areas of Use and Application

The MTS-R01.2 and the MTS-R02.2 of Rexroth are intended to be plugged in the RECO02 module carrier system. The ISP200-R is designed for use in the following cases:

- Stand alone PLC
- Matching control for MTC200

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**Note:** The ISP200-R may only be used with the accessories and parts specified in this document. If a component has not been specifically named, then it may not be either mounted or connected. The same applies to cables and lines.

Operation is only permitted in the specified configurations and combinations of components using the software and firmware as specified in the relevant function descriptions.

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Before being commissioned each ISP200-R has to be programmed, so that the PLC executes the application-specific functions.

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

Typical areas 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 assembly, installation and ambient conditions as described here (temperature, system of protection, humidity, EMC requirements, etc.) and in the position specified.

## 2.2 Inappropriate Use

Using the MTS-R01.2 and the MTS-R02.2 outside of the above-referenced areas of application or under operating conditions other than described in the document and the technical data specified is defined as "Inappropriate use".

The ISP200-R may not be used if

- it is subject to operating conditions that do not meet the above specified ambient conditions. This includes, for example, operation under water, in the case of extreme temperature fluctuations or extreme maximum temperatures or if
- the Bosch Rexroth AG has not specifically released them for that intended purpose. Please note the specifications outlined in the general Safety Instructions!

## 3 Safety Instructions for Electric Drives and Controls

### 3.1 Introduction

Read these instructions before the initial startup of the equipment in order to eliminate the risk of bodily harm or material damage. Follow these safety instructions at all times.

Do not attempt to install or start up this equipment without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation of the equipment prior to working with the equipment at any time. If you do not have the user documentation for your equipment, contact your local Bosch Rexroth representative to send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

If the equipment is resold, rented or transferred or passed on to others, then these safety instructions must be delivered with the equipment.



**Improper use of this equipment, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, may result in material damage, bodily harm, electric shock or even death!**

### 3.2 Explanations

The safety instructions describe the following degrees of hazard seriousness in compliance with ANSI Z535. The degree of hazard seriousness informs about the consequences resulting from non-compliance with the safety instructions.

Warning symbol with signal word	Degree of hazard seriousness according to ANSI
	Death or severe bodily harm will occur.
	Death or severe bodily harm may occur.
	Bodily harm or material damage may occur.

Fig. 3-1: Hazard classification (according to ANSI Z535)

### 3.3 Hazards by Improper Use



**DANGER**

**High voltage and high discharge current!  
Danger to life or severe bodily harm by electric shock!**



**DANGER**

**Dangerous movements! Danger to life, severe bodily harm or material damage by unintentional motor movements!**



**WARNING**

**High electrical voltage due to wrong connections! Danger to life or bodily harm by electric shock!**



**WARNING**

**Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!**



**CAUTION**

**Surface of machine housing could be extremely hot! Danger of injury! Danger of burns!**



**CAUTION**

**Risk of injury due to improper handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock or incorrect handling of pressurized systems!**



**CAUTION**

**Risk of injury due to incorrect handling of batteries!**

## 3.4 General Information

- The Bosch Rexroth AG is not liable for damages resulting from failure to observe the warnings provided in this documentation.
- Read the operating, maintenance and safety instructions in your language before starting up the machine. If you find that you cannot completely understand the documentation for your product, please ask your supplier to clarify.
- Proper and correct transport, storage, assembly and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Only persons who are trained and qualified for the use and operation of the equipment may work on this equipment or within its proximity.
  - The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the equipment as well as an understanding of all warnings and precautionary measures noted in these instructions.
  - Furthermore, they must be trained, instructed and qualified to switch electrical circuits and equipment on and off in accordance with technical safety regulations, to ground them and to mark them according to the requirements of safe work practices. They must have adequate safety equipment and be trained in first aid.
- Only use spare parts and accessories approved by the manufacturer.
- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The equipment is designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Use only safety features and applications that are clearly and explicitly approved in the Project Planning Manual.

For example, the following areas of use are not permitted: construction cranes, elevators used for people or freight, devices and vehicles to transport people, medical applications, refinery plants, transport of hazardous goods, nuclear applications, applications sensitive to high frequency, mining, food processing, control of protection equipment (also in a machine).
- The information given in the documentation of the product with regard to the use of the delivered components contains only examples of applications and suggestions.

The machine and installation manufacturer must

  - make sure that the delivered components are suited for his individual application and check the information given in this documentation with regard to the use of the components,
  - make sure that his application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Startup of the delivered components is only permitted once it is sure that the machine or installation in which they are installed complies with the national regulations, safety specifications and standards of the application.
- Technical data, connections and operational conditions are specified in the product documentation and must be followed at all times.

- Operation is only permitted if the national EMC regulations for the application are met.  
The instructions for installation in accordance with EMC requirements can be found in the documentation "EMC in Drive and Control Systems".  
The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.

## 3.5 Protection Against Contact with Electrical Parts

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**Note:** This section refers to equipment and drive components with voltages above 50 Volts.

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Touching live parts with voltages of 50 Volts and more with bare hands or conductive tools or touching ungrounded housings can be dangerous and cause electric shock. In order to operate electrical equipment, certain parts must unavoidably have dangerous voltages applied to them.

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**DANGER**

### High electrical voltage! Danger to life, severe bodily harm by electric shock!

- ⇒ Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain or repair this equipment.
  - ⇒ Follow general construction and safety regulations when working on high voltage installations.
  - ⇒ Before switching on power the ground wire must be permanently connected to all electrical units according to the connection diagram.
  - ⇒ Do not operate electrical equipment at any time, even for brief measurements or tests, if the ground wire is not permanently connected to the points of the components provided for this purpose.
  - ⇒ Before working with electrical parts with voltage higher than 50 V, the equipment must be disconnected from the mains voltage or power supply. Make sure the equipment cannot be switched on again unintended.
  - ⇒ The following should be observed with electrical drive and filter components:
    - ⇒ Wait five (5) minutes after switching off power to allow capacitors to discharge before beginning to work. Measure the voltage on the capacitors before beginning to work to make sure that the equipment is safe to touch.
    - ⇒ Never touch the electrical connection points of a component while power is turned on.
    - ⇒ Install the covers and guards provided with the equipment properly before switching the equipment on. Prevent contact with live parts at any time.
    - ⇒ A residual-current-operated protective device (RCD) must not be used on electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.
    - ⇒ Electrical components with exposed live parts and uncovered high voltage terminals must be installed in a protective housing, for example, in a control cabinet.
-

To be observed with electrical drive and filter components:



**DANGER**

**High electrical voltage on the housing!  
High leakage current! Danger to life, danger of  
injury by electric shock!**

- ⇒ Connect the electrical equipment, the housings of all electrical units and motors permanently with the safety conductor at the ground points before power is switched on. Look at the connection diagram. This is even necessary for brief tests.
- ⇒ Connect the safety conductor of the electrical equipment always permanently and firmly to the supply mains. Leakage current exceeds 3.5 mA in normal operation.
- ⇒ Use a copper conductor with at least 10 mm<sup>2</sup> cross section over its entire course for this safety conductor connection!
- ⇒ Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. Otherwise, high voltages can occur on the housing that lead to electric shock.

### 3.6 Protection Against Electric Shock by Protective Low Voltage (PELV)

All connections and terminals with voltages between 0 and 50 Volts on Rexroth products are protective low voltages designed in accordance with international standards on electrical safety.



**WARNING**

**High electrical voltage due to wrong  
connections! Danger to life, bodily harm by  
electric shock!**

- ⇒ Only connect equipment, electrical components and cables of the protective low voltage type (PELV = Protective Extra Low Voltage) to all terminals and clamps with voltages of 0 to 50 Volts.
- ⇒ Only electrical circuits may be connected which are safely isolated against high voltage circuits. Safe isolation is achieved, for example, with an isolating transformer, an opto-electronic coupler or when battery-operated.

### 3.7 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of the connected motors. Some common examples are:

- improper or wrong wiring of cable connections
- incorrect operation of the equipment components
- wrong input of parameters before operation
- malfunction of sensors, encoders and monitoring devices
- defective components
- software or firmware errors

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring in the drive components will normally be sufficient to avoid faulty operation in the connected drives. Regarding personal safety, especially the danger of bodily injury and material damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.



**DANGER**

**Dangerous movements! Danger to life, risk of injury, severe bodily harm or material damage!**

- ⇒ Ensure personal safety by means of qualified and tested higher-level monitoring devices or measures integrated in the installation. Unintended machine motion is possible if monitoring devices are disabled, bypassed or not activated.
- ⇒ Pay attention to unintended machine motion or other malfunction in any mode of operation.
- ⇒ Keep free and clear of the machine's range of motion and moving parts. Possible measures to prevent people from accidentally entering the machine's range of motion:
  - use safety fences
  - use safety guards
  - use protective coverings
  - install light curtains or light barriers
- ⇒ Fences and coverings must be strong enough to resist maximum possible momentum, especially if there is a possibility of loose parts flying off.
- ⇒ Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Don't operate the machine if the emergency stop is not working.
- ⇒ Isolate the drive power connection by means of an emergency stop circuit or use a starting lockout to prevent unintentional start.
- ⇒ Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone. Safe standstill can be achieved by switching off the power supply contactor or by safe mechanical locking of moving parts.
- ⇒ Secure vertical axes against falling or dropping after switching off the motor power by, for example:
  - mechanically securing the vertical axes
  - adding an external braking/ arrester/ clamping mechanism
  - ensuring sufficient equilibration of the vertical axes

The standard equipment motor brake or an external brake controlled directly by the drive controller are not sufficient to guarantee personal safety!



- ⇒ Disconnect electrical power to the equipment using a master switch and secure the switch against reconnection for:
    - maintenance and repair work
    - cleaning of equipment
    - long periods of discontinued equipment use
  - ⇒ Prevent the operation of high-frequency, remote control and radio equipment near electronics circuits and supply leads. If the use of such equipment cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial startup. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.
- 

### 3.8 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated near current-carrying conductors and permanent magnets in motors represent a serious health hazard to persons with heart pacemakers, metal implants and hearing aids.

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**WARNING**

#### **Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!**

- ⇒ Persons with heart pacemakers, hearing aids and metal implants are not permitted to enter the following areas:
    - Areas in which electrical equipment and parts are mounted, being operated or started up.
    - Areas in which parts of motors with permanent magnets are being stored, operated, repaired or mounted.
  - ⇒ If it is necessary for a person with a heart pacemaker to enter such an area, then a doctor must be consulted prior to doing so. Heart pacemakers that are already implanted or will be implanted in the future, have a considerable variation in their electrical noise immunity. Therefore there are no rules with general validity.
  - ⇒ Persons with hearing aids, metal implants or metal pieces must consult a doctor before they enter the areas described above. Otherwise, health hazards will occur.
-

### 3.9 Protection Against Contact with Hot Parts



CAUTION

#### **Housing surfaces could be extremely hot! Danger of injury! Danger of burns!**

- ⇒ Do not touch housing surfaces near sources of heat! Danger of burns!
- ⇒ After switching the equipment off, wait at least ten (10) minutes to allow it to cool down before touching it.
- ⇒ Do not touch hot parts of the equipment, such as housings with integrated heat sinks and resistors. Danger of burns!

### 3.10 Protection During Handling and Mounting

Under certain conditions, incorrect handling and mounting of parts and components may cause injuries.



CAUTION

#### **Risk of injury by incorrect handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock!**

- ⇒ Observe general installation and safety instructions with regard to handling and mounting.
- ⇒ Use appropriate mounting and transport equipment.
- ⇒ Take precautions to avoid pinching and crushing.
- ⇒ Use only appropriate tools. If specified by the product documentation, special tools must be used.
- ⇒ Use lifting devices and tools correctly and safely.
- ⇒ For safe protection wear appropriate protective clothing, e.g. safety glasses, safety shoes and safety gloves.
- ⇒ Never stand under suspended loads.
- ⇒ Clean up liquids from the floor immediately to prevent slipping.

### 3.11 Battery Safety

Batteries contain reactive chemicals in a solid housing. Inappropriate handling may result in injuries or material damage.



**CAUTION**

#### **Risk of injury by incorrect handling!**

- ⇒ Do not attempt to reactivate discharged batteries by heating or other methods (danger of explosion and cauterization).
- ⇒ Never charge non-chargeable batteries (danger of leakage and explosion).
- ⇒ Never throw batteries into a fire.
- ⇒ Do not dismantle batteries.
- ⇒ Do not damage electrical components installed in the equipment.

**Note:** Be aware of environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air and sea transport in the sense of the legal requirements (danger of explosion). Dispose batteries separately from other waste. Observe the legal requirements in the country of installation.

### 3.12 Protection Against Pressurized Systems

Certain motors and drive controllers, corresponding to the information in the respective Project Planning Manual, must be provided with pressurized media, such as compressed air, hydraulic oil, cooling fluid and cooling lubricant supplied by external systems. Incorrect handling of the supply and connections of pressurized systems can lead to injuries or accidents. In these cases, improper handling of external supply systems, supply lines or connections can cause injuries or material damage.



**CAUTION**

#### **Danger of injury by incorrect handling of pressurized systems !**

- ⇒ Do not attempt to disassemble, to open or to cut a pressurized system (danger of explosion).
- ⇒ Observe the operation instructions of the respective manufacturer.
- ⇒ Before disassembling pressurized systems, release pressure and drain off the fluid or gas.
- ⇒ Use suitable protective clothing (for example safety glasses, safety shoes and safety gloves)
- ⇒ Remove any fluid that has leaked out onto the floor immediately.

**Note:** Environmental protection and disposal! The media used in the operation of the pressurized system equipment may not be environmentally compatible. Media that are damaging the environment must be disposed separately from normal waste. Observe the legal requirements in the country of installation.

## Notes

## 4 Technical Data

### 4.1 General Features

Mounting in the control cabinet:	Module carrier RMB02.2 / RMB04.2	
Housing dimensions (W x H x D):	MTS-R01.2 = 41.5 x 192 x 150 mm MTS-R02.2 = 83.7 x 192 x 150 mm	
Weight:	MTS-R01.2 = 1.1 kg MTS-R02.2 = 1.3 kg	
Protection category:	IP 20, EN 60529	
Permissible temperature:	Operation	0...+55 °C
	Storage/temperature	-25...+70 °C
Relative humidity:	Operation	10...95 %, condensation to be avoided
	Storage/temperature	5...95 %, condensation to be avoided
Air pressure:	Operation	86...106 kPa
	Storage/temperature	70...106 kPa

### 4.2 Supply Voltage

Nominal value:	24 V <sub>DC</sub>
Tolerance:	-15 % / +20 % (according to EN 61131-2 1994)
Ripple percentage:	5 % max.
Permissible voltage range:	19,2...30 V <sub>DC</sub> (including ripple content)
Max. current consumption for 24 V <sub>DC</sub> (MTS-R01): (MTS-R02):	0.5 A 0.7 A (supply voltage for I/O bus is up to max. 2.3 A)
Required fuse in the supply cable:	Max. 4 A time-lag for 24 V
Cable cross-section for supply voltage:	0,75...1,5 mm <sup>2</sup> (depending on current demand)

### 4.3 I/O Bus Supply by the Control

Module supply 24 V:	Max. 2.2 A
Module supply 5 V:	Max. 3.0 A
Total power:	Max. 52 W (observe the derating)

### 4.4 Derating of the I/O Bus Supply

0 – 35 °C	100 % (52 W)
35 – 45 °C	85 % (44 W)
45 – 55 °C	75 % (39 W)

## 4.5 EMC

Emitted interference according to EN 55022	Class A (industrial environment)
Noise immunity according to IEC 61000-4-2 (ESD)	Assessment criterion B
Noise immunity according to IEC 61000-4-4 (burst)	Assessment criterion B
Noise immunity according to IEC 61000-5-5 (surge)	Assessment criterion B

## 4.6 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	Rexroth 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) DeviceNet (COMBICON, 5 pins, male connector) 2 x RS232 and 2 x RS422/485 (D-SUB, 9 pins, male connector)
1 Bb – Relay (ready for operation) (system monitoring)	NO contact $V_n = 24 \text{ VDC}$ , $I_{max} = 150 \text{ mA}$ min. 500 000 switching cycles (overcurrent-protected)

### 4.7 Dimensions

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

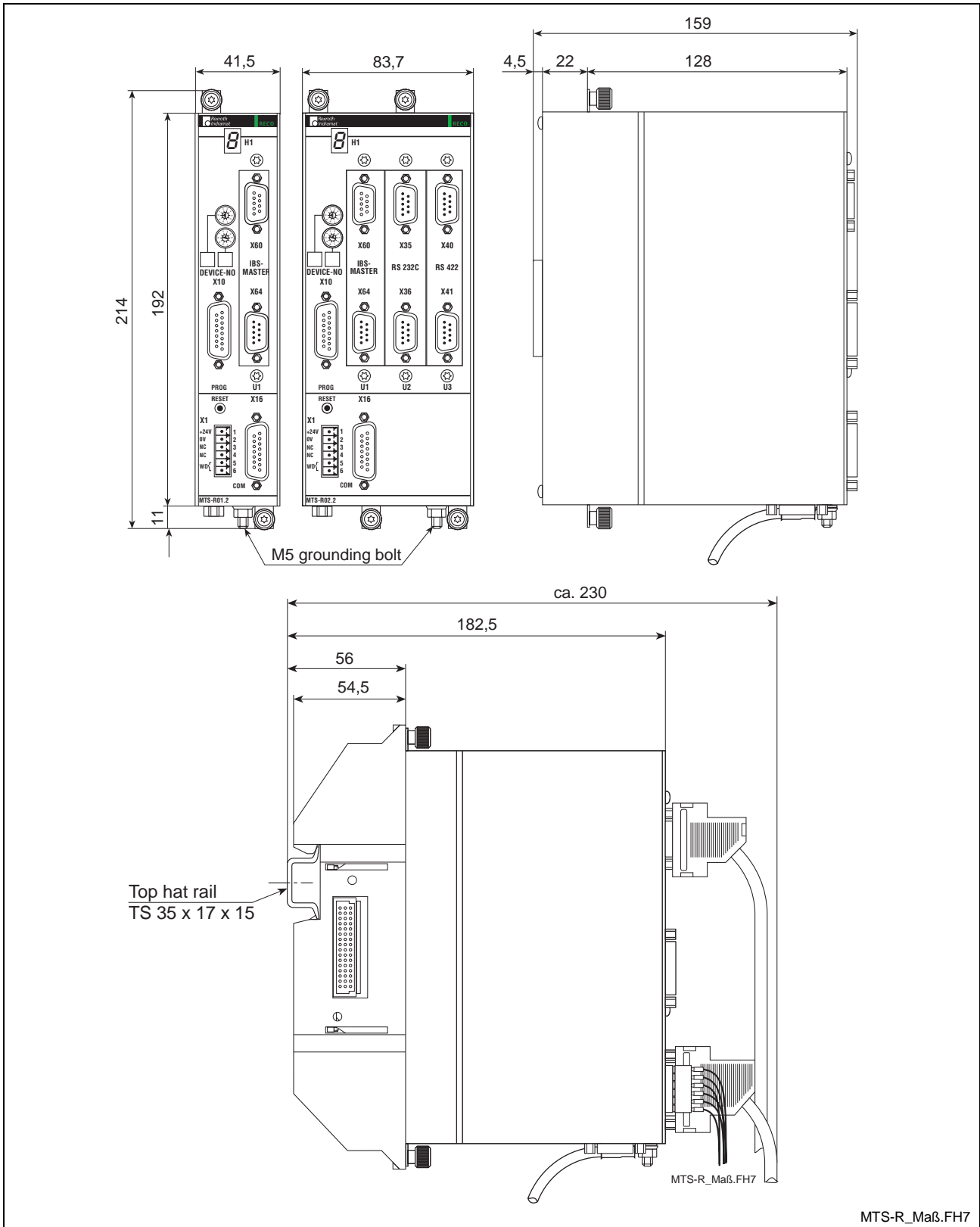


Fig. 4-1: Dimensional drawing of MTS-R01.2 and MTS-R02.2

### Installation Sizes of the RMB02.2-02 Module Carrier

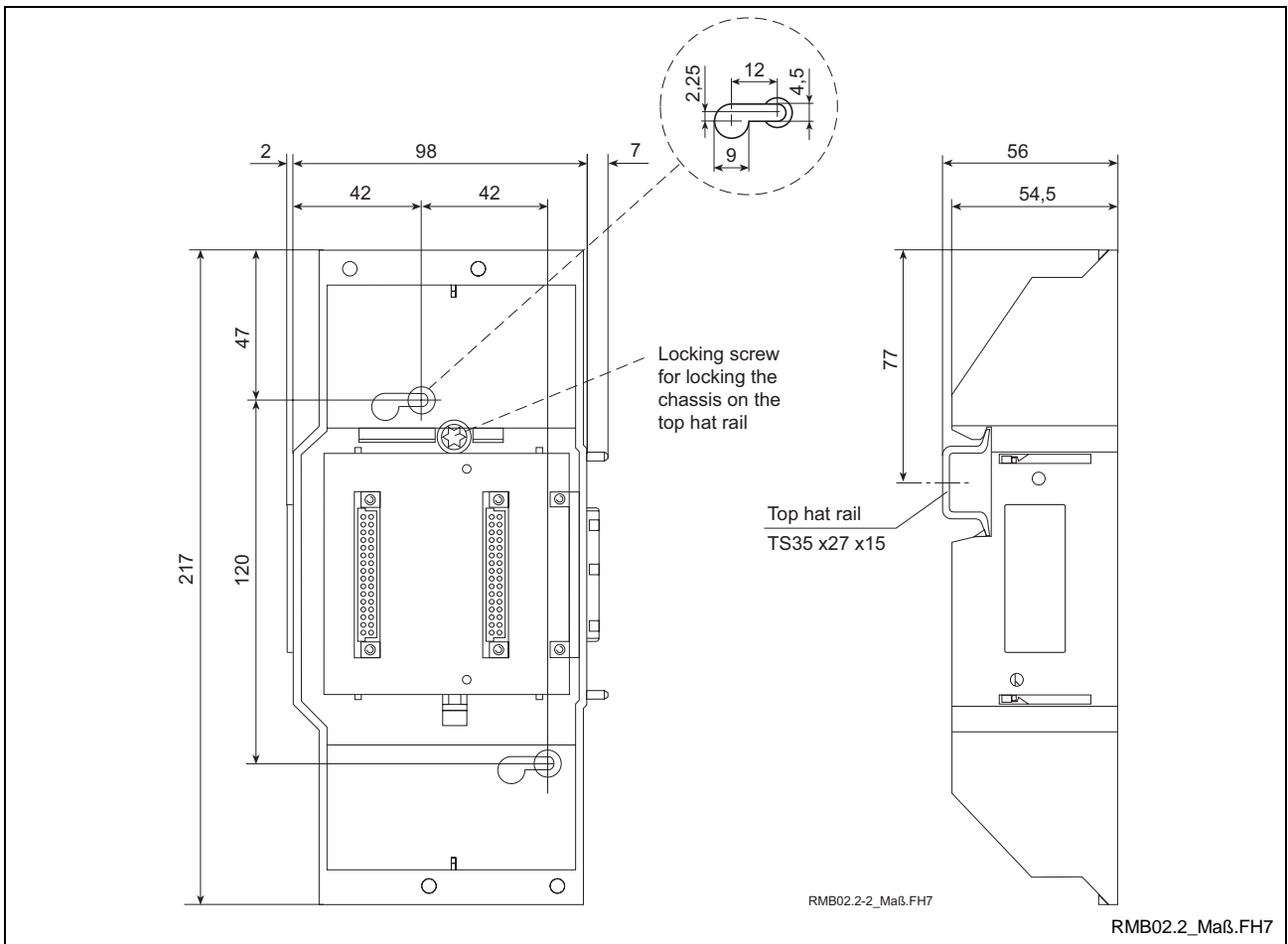


Fig. 4-2: RMB02.2-02 module carrier

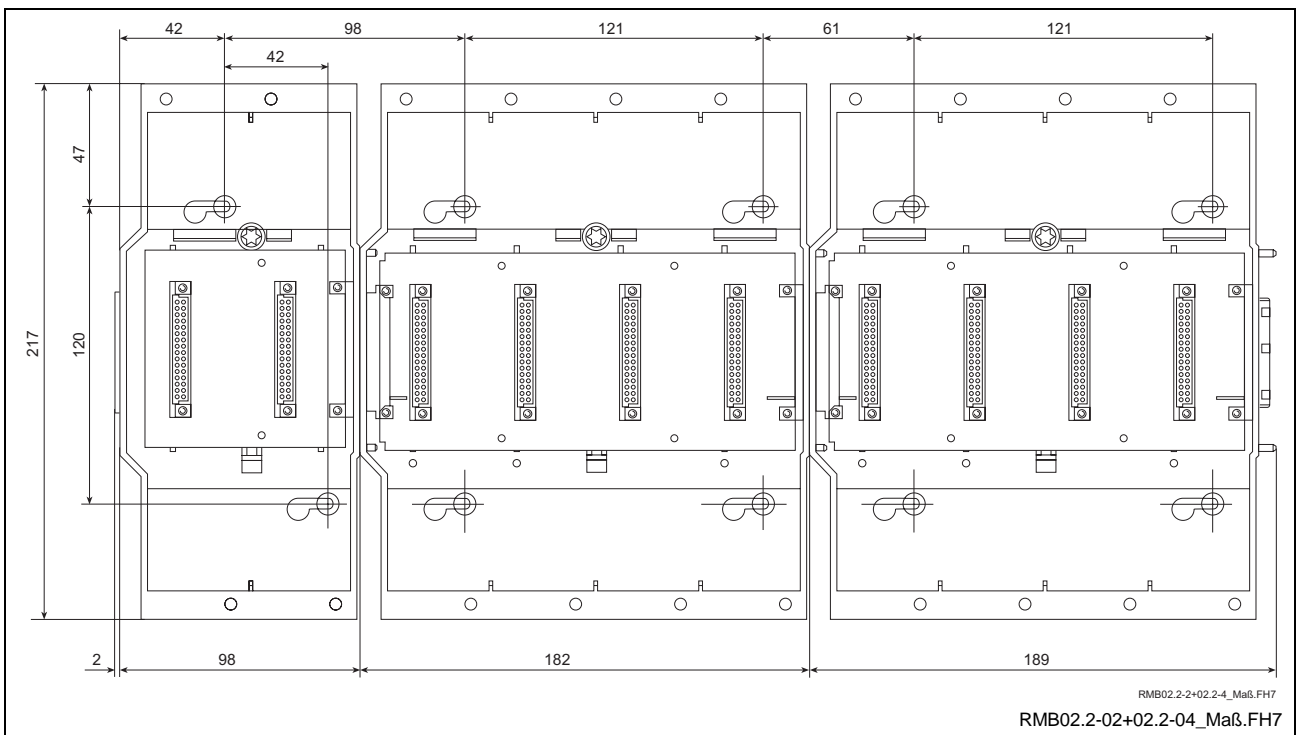


Fig. 4-3: Connection of one RMB02.2-02 and several RMB02.2-04 module carriers



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

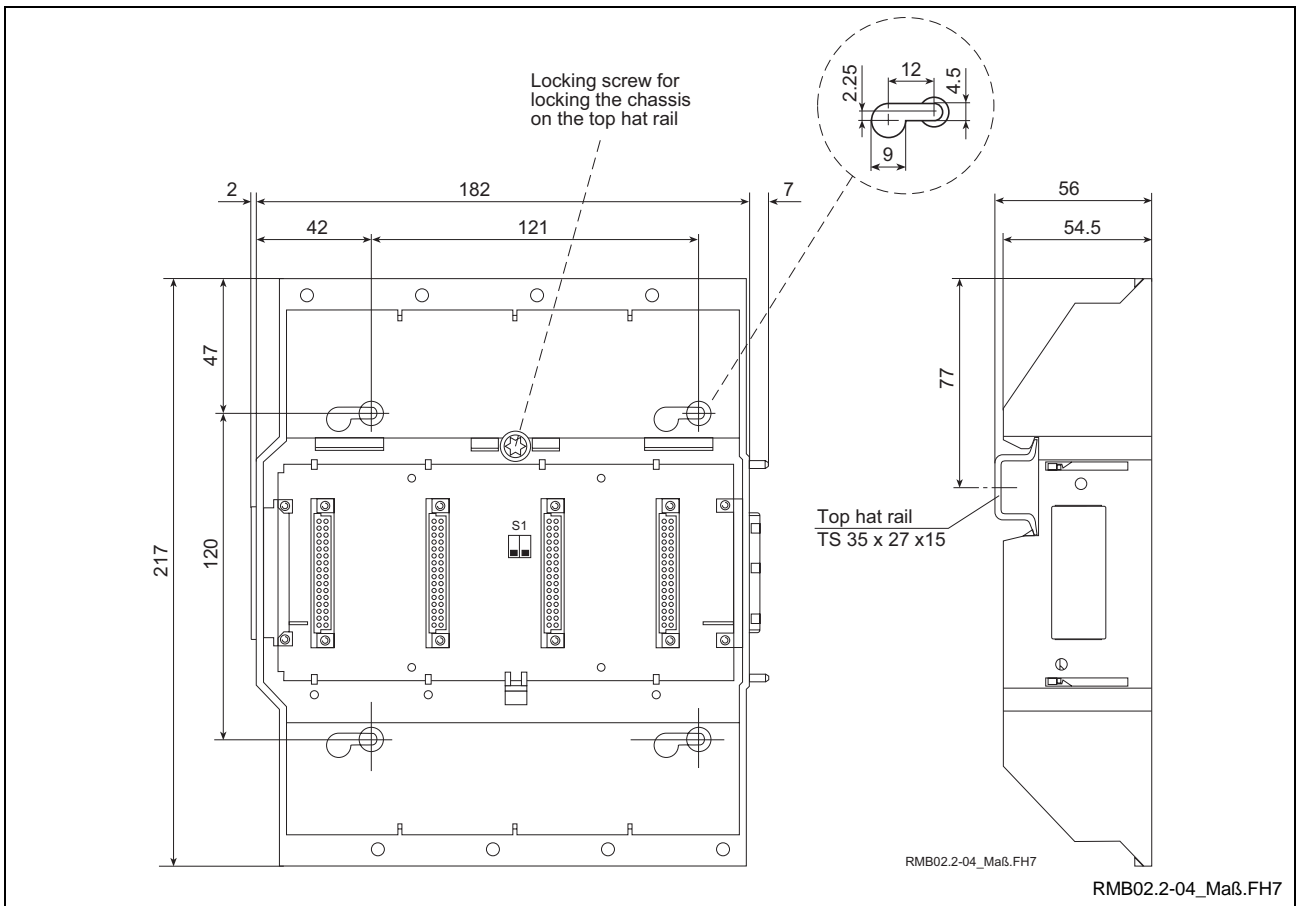


Fig. 4-4: RMB02.2-04 module carrier

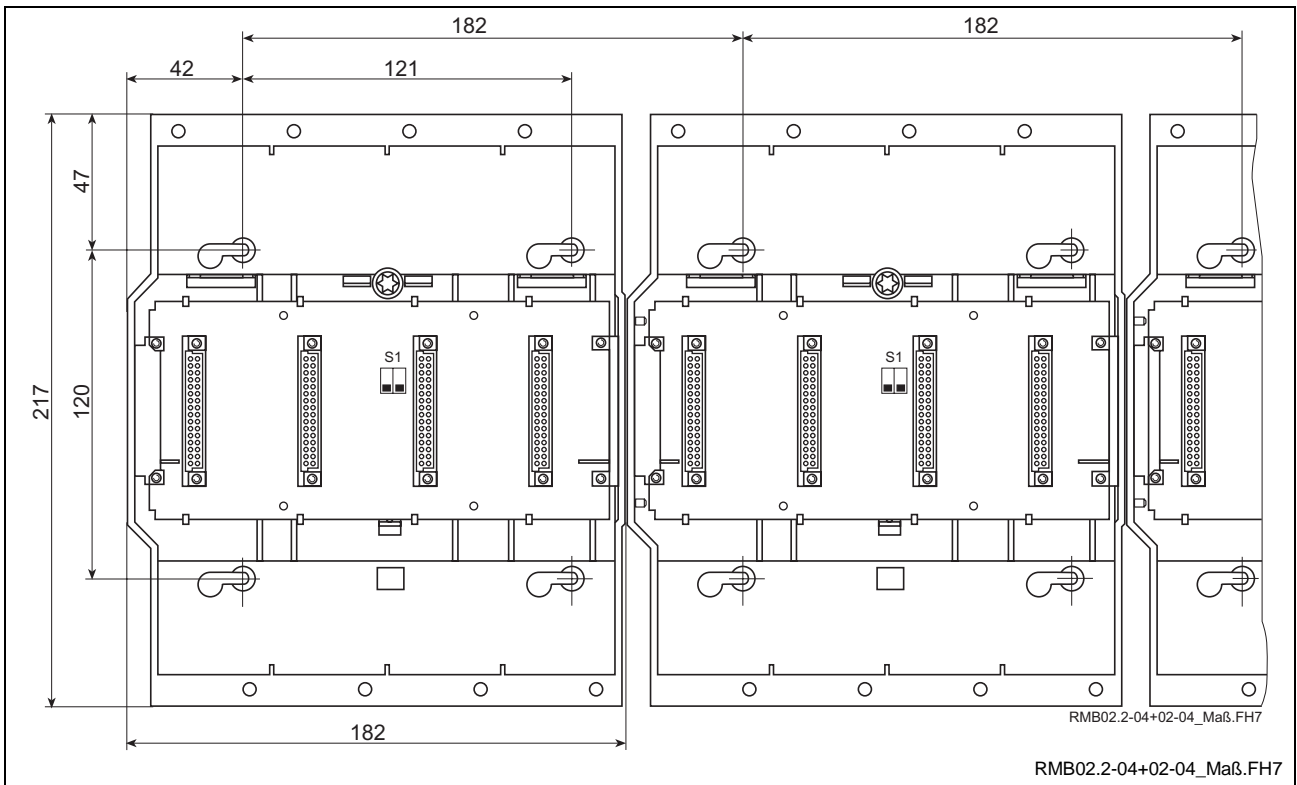


Fig. 4-5: Connection of several RMB02.2-04 module carriers



# 5 Communication

## 5.1 Parameterization of the PROG Interface

For setting the parameters of the PROG interface, a DIP switch (see Fig. 5-1) is provided on the upper side inside the housing of the ISP200-R. This DIP switch permits to set the operating mode (RS232/RS422/RS485, baud rate, etc.). 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. 5-2.

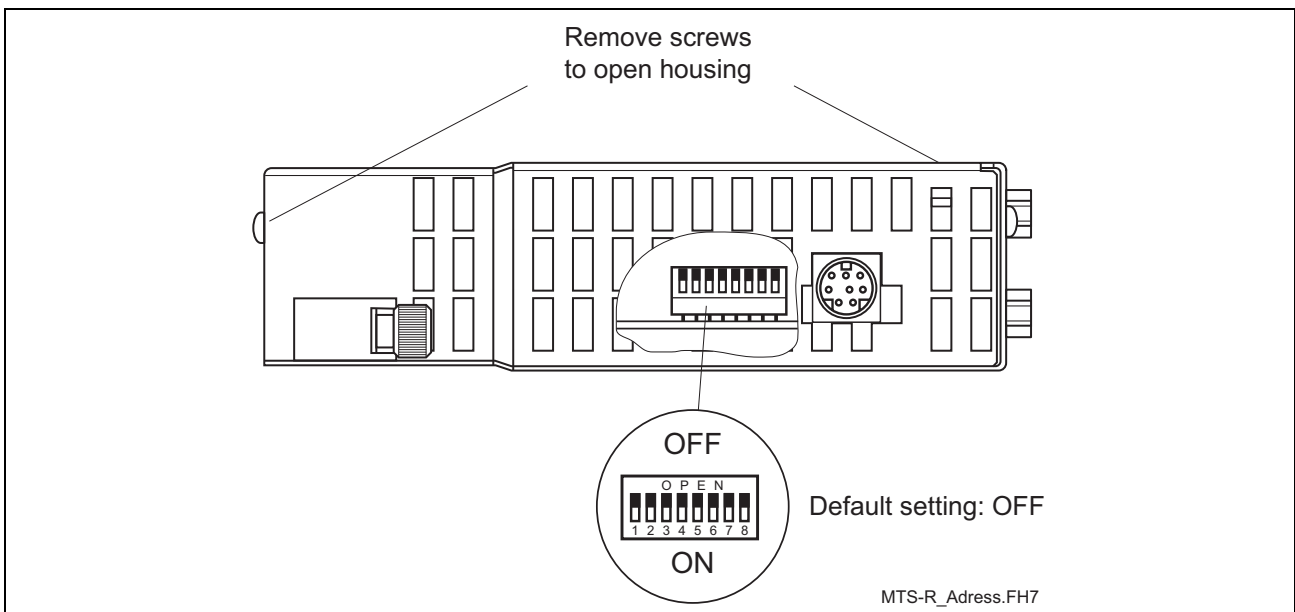


Fig. 5-1: DIP switch for parameterization of the PROG interface

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. 5-2: Setting of the PROG interface for the MTS-R01.2 and the MTS-R02.2

## 5.2 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 PLC function block and by assigning the **COM** FB input correspondingly. More detailed information can be found in the PLC programming instructions (DOK-CONTRL-WINPCL\*\_VRS\*-AW0\_-EN-P).

## 5.3 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 PLC (e.g. %IBP\*.\*).

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

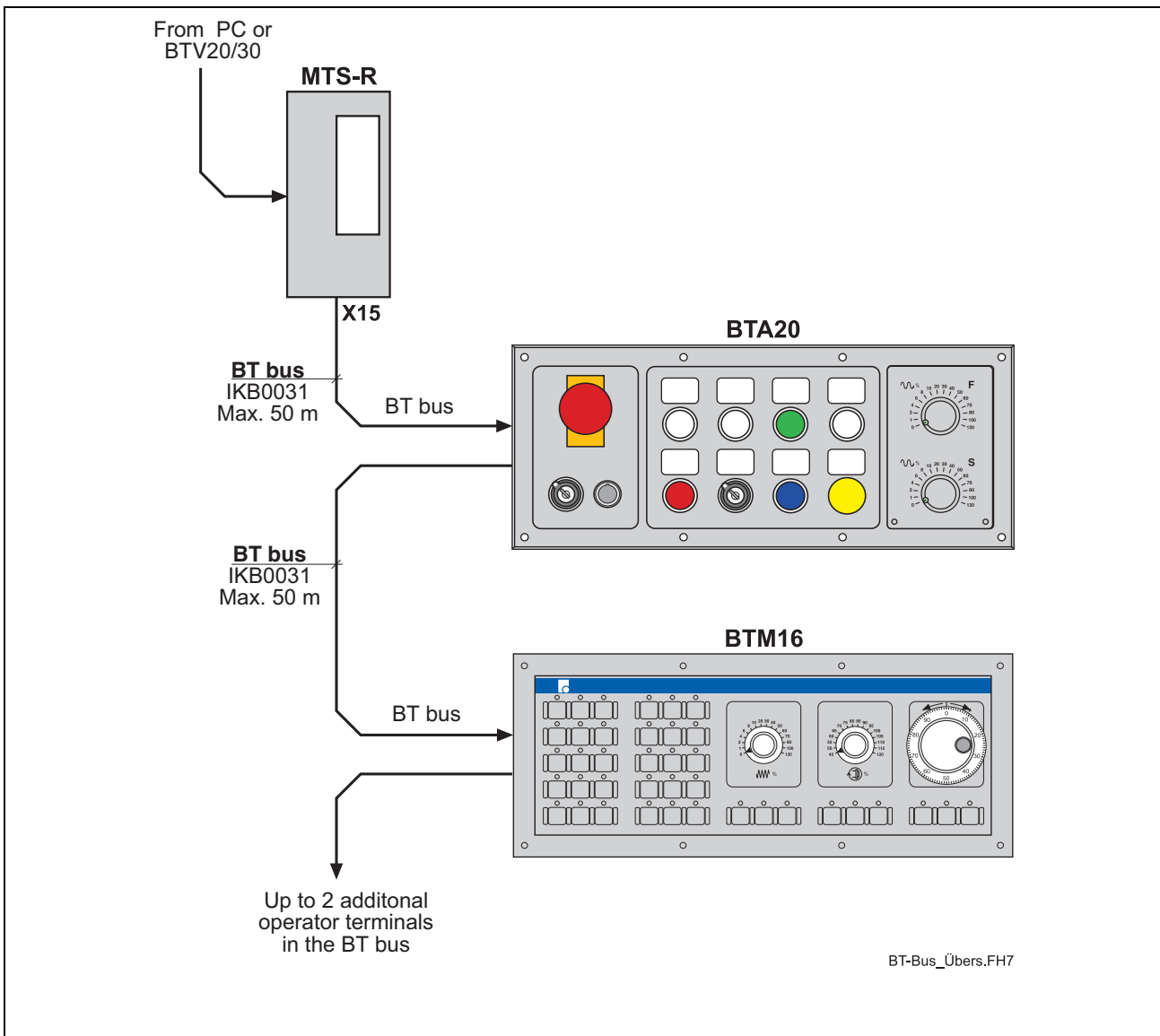


Fig. 5-3: BT bus overview

# Addressing

The BT bus is addressed by assigning a logic user number in the I/O editor of the PLC programming interface WinPCL. 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. 5-4).

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. 5-4: 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. 5-5) illustrates the principle of the storage assignment of the BT bus.

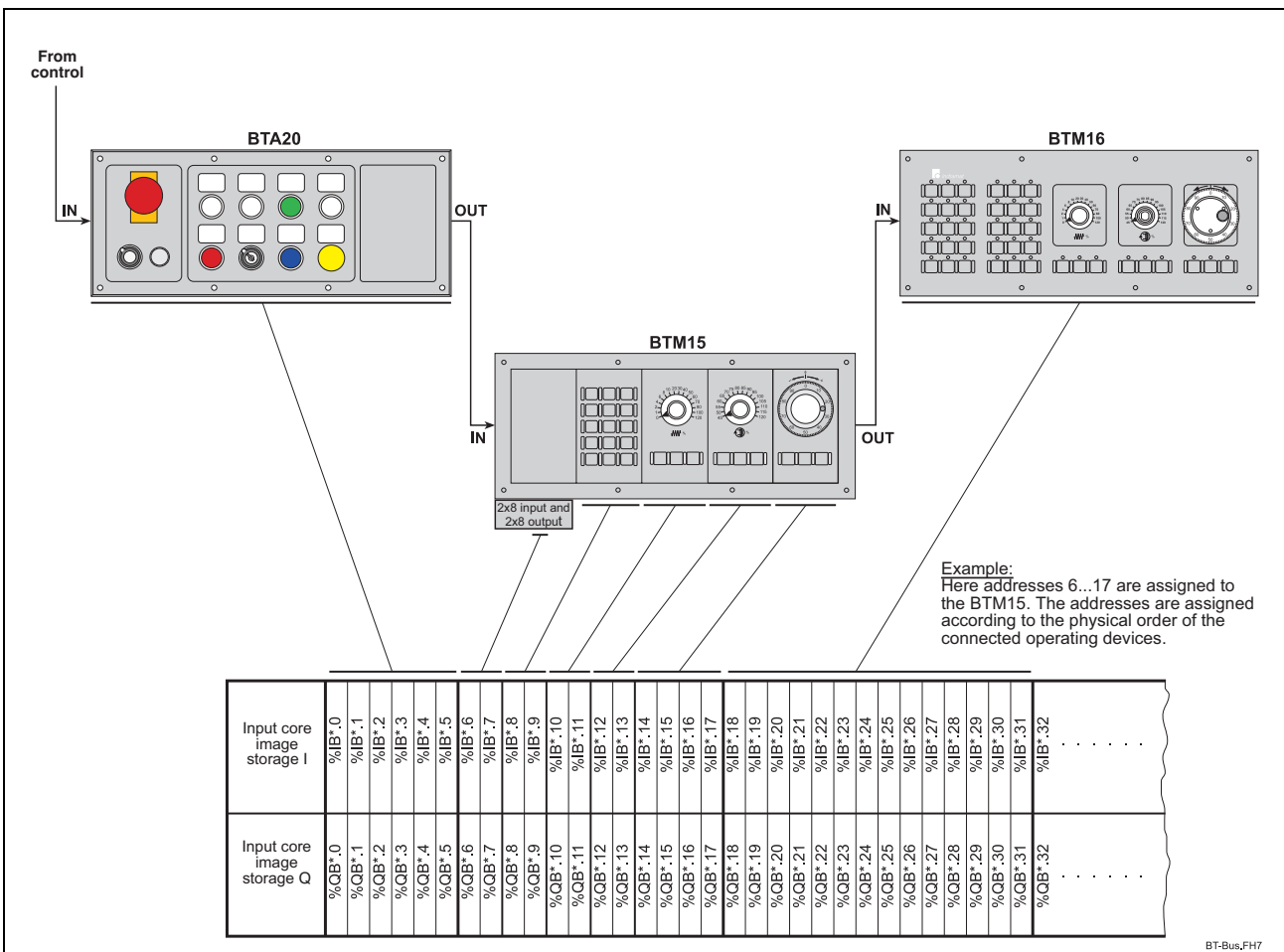


Fig. 5-5: Storage assignment of BT bus



# 6 Startup

## 6.1 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.

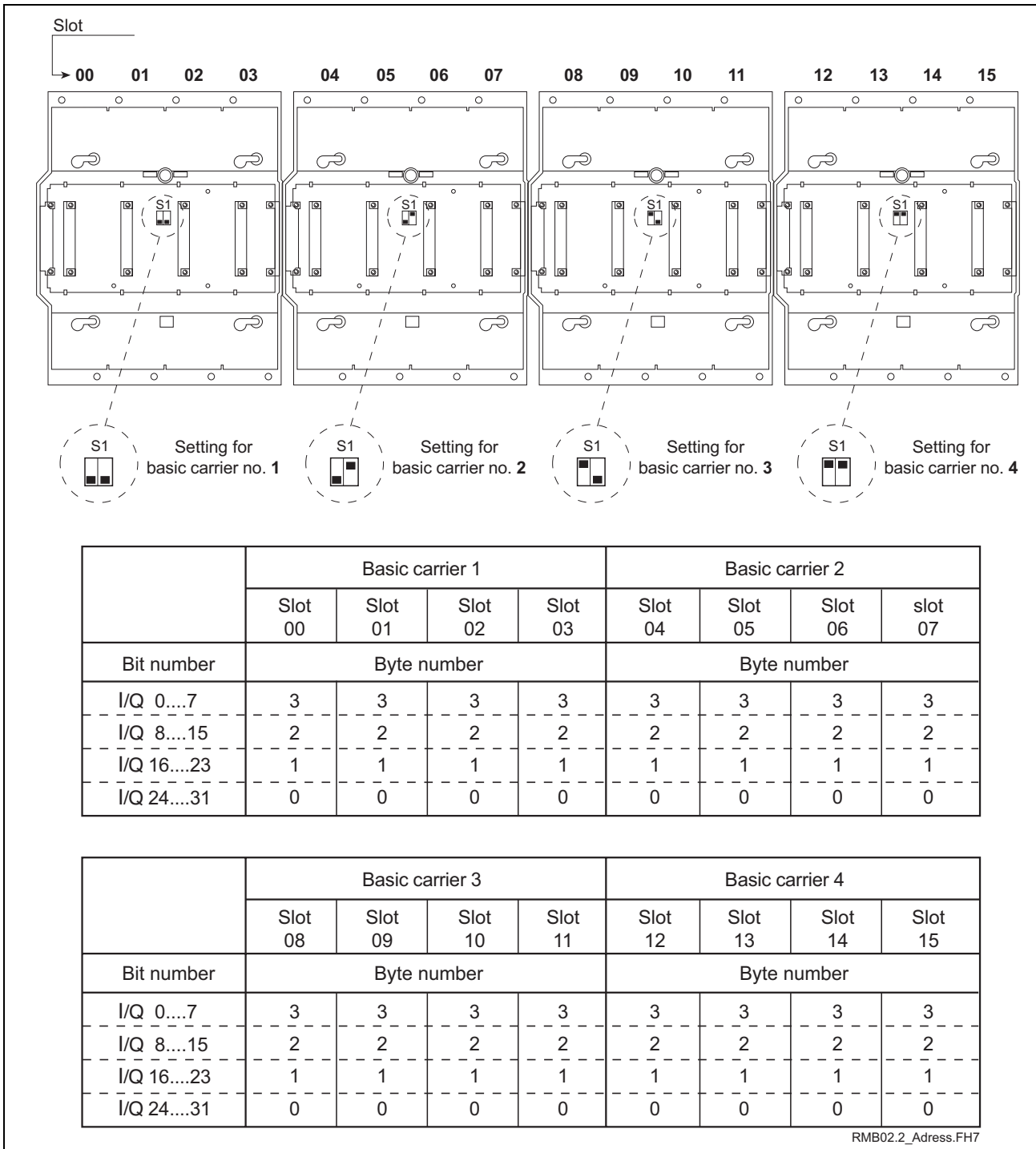


Fig. 6-1: Setting of slot addressing

## 6.2 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. 4-5 module carrier).

**Note:** The installation directly on the mounting plate is only possible, if the MTS-R is operated without additional controls like the MTC-R or the PPC-R. For the connection an additional backplane is required. Thus, there's the danger to cause a short-circuit between the backplane and the fixing screw.

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. 6-1: ). 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

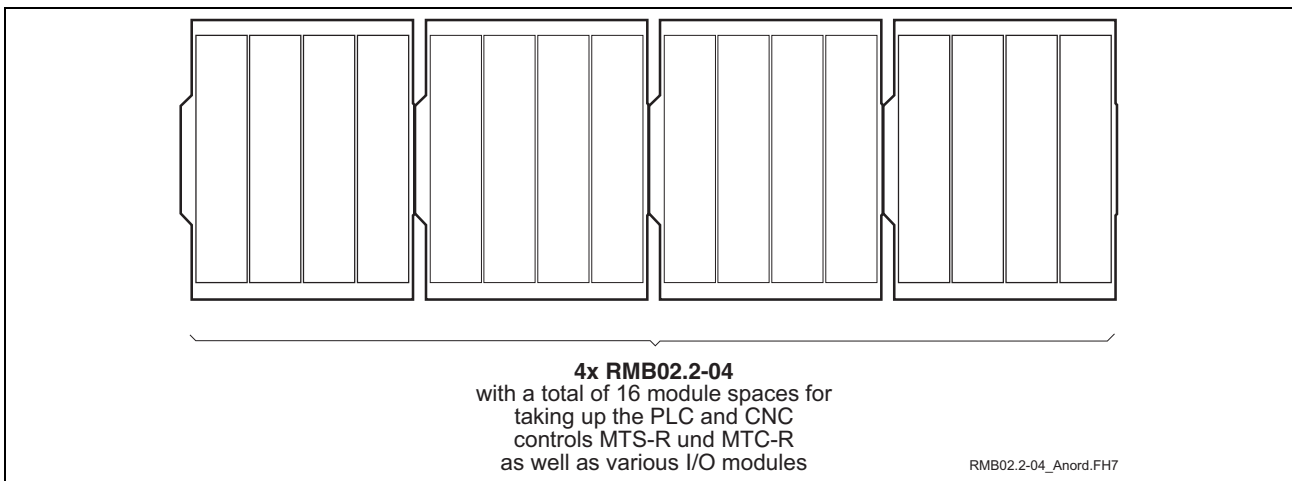


Fig. 6-2: Maximum number of RMB02.2-04 carriers fitted



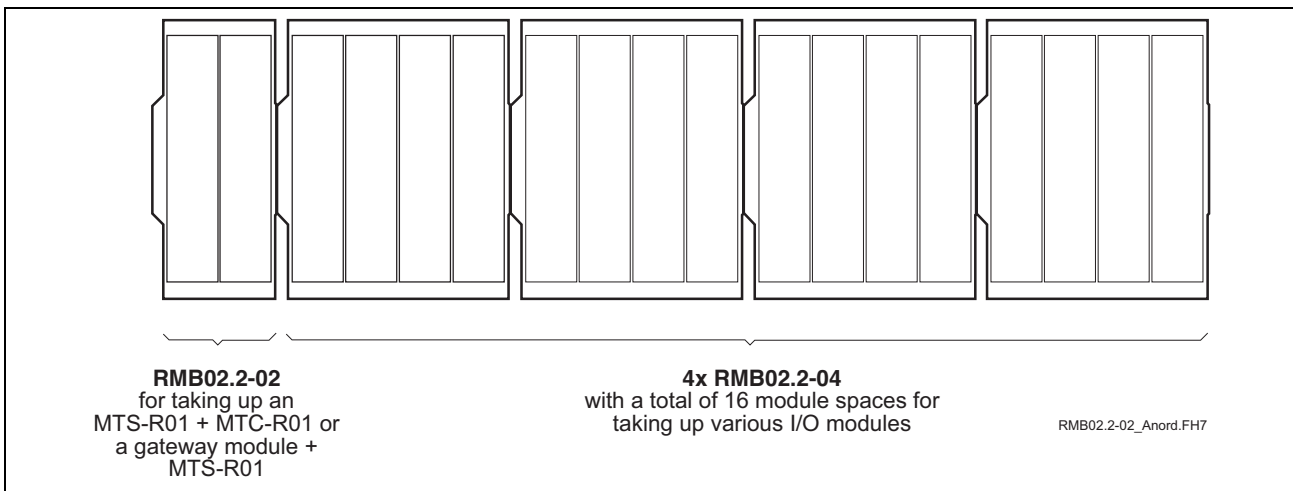


Fig. 6-3: Maximum number of RMB02.2-02 and RMB02.2-04 carriers fitted

### 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. 6-4: Fitting variants for RMB02.2-02

**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. 4-5)! 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 6 mm<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. 6-5).

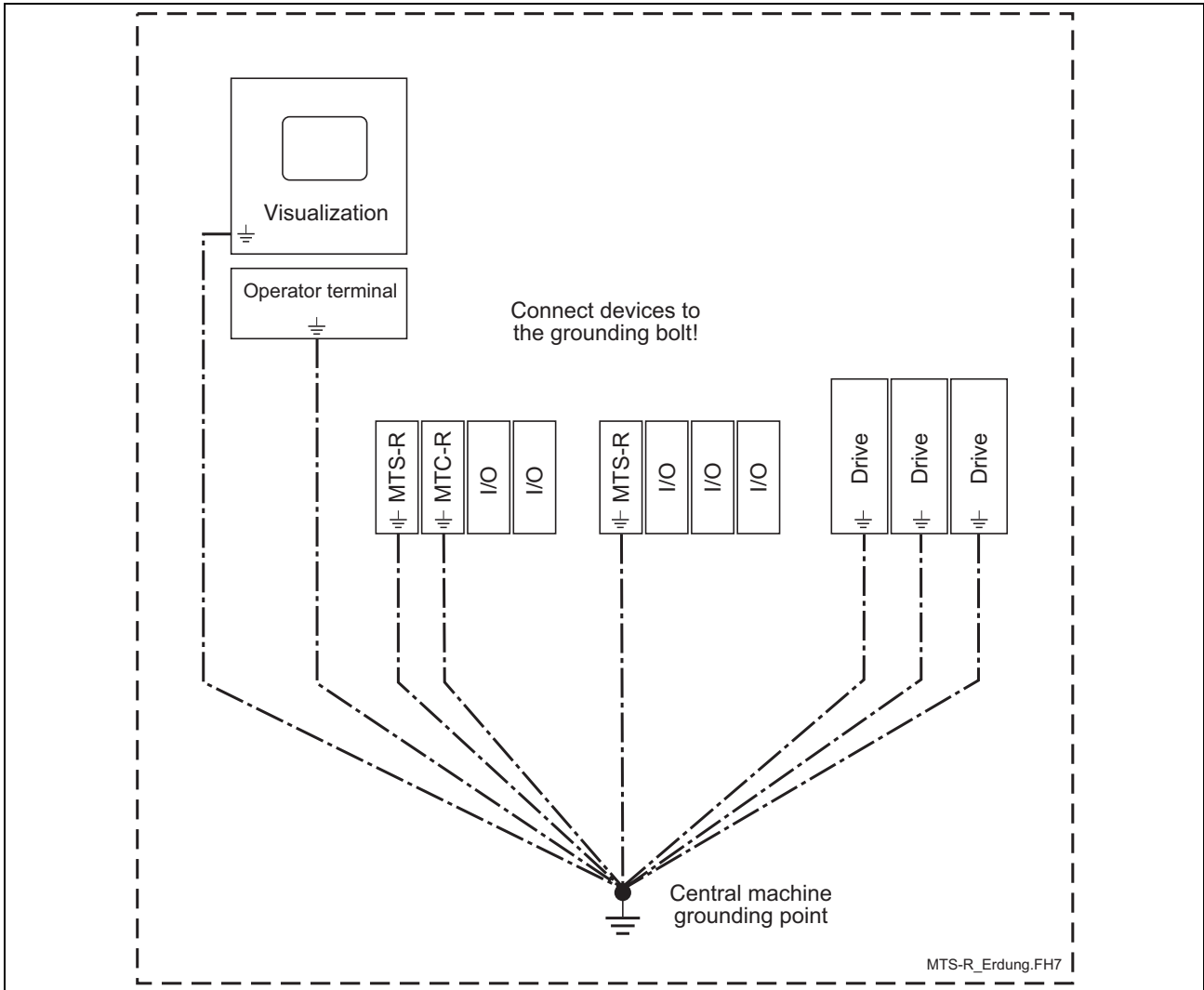


Fig. 6-5: System grounding in connection with the ISP200-R

## 6.3 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 PLC 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.

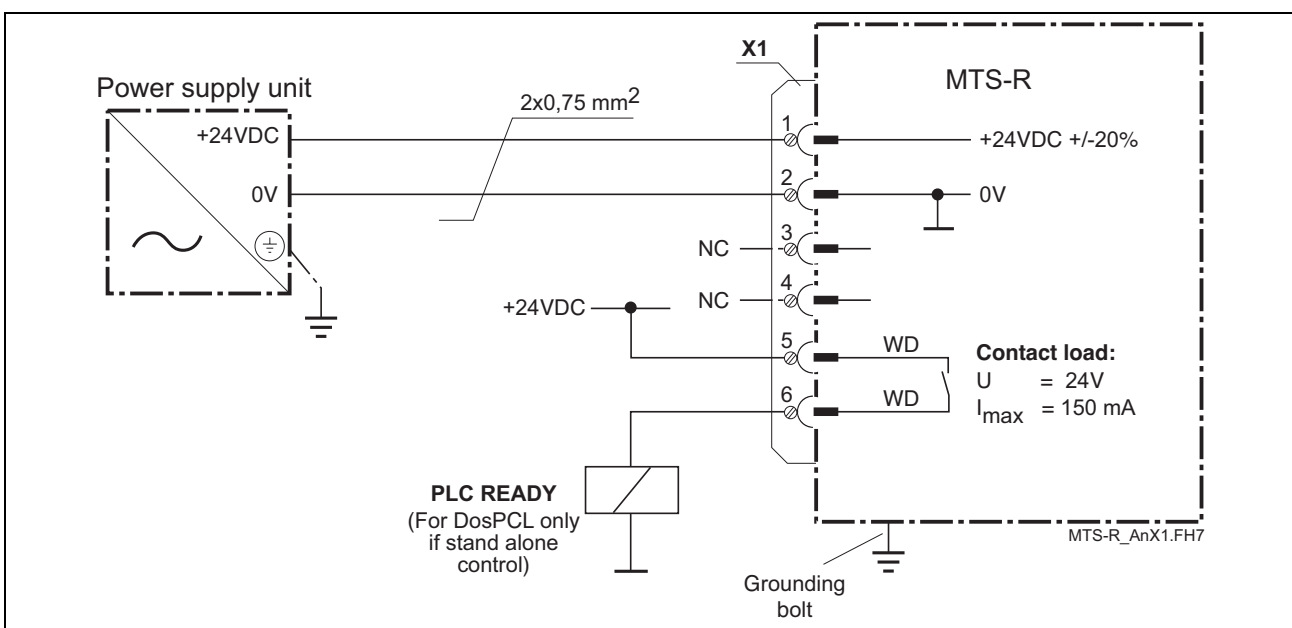


Fig. 6-6: Connection of the supply connector X1

## 6.4 RecoBus in the PLC Memory

As the I/Os in the PLC memory are gapless imaged some principles have to be considered while programming the inputs and outputs. The PLC always requires 4 bytes in the input area for the diagnostic double word. The diagnostic double word permits an exact diagnosis of the connected modules (see 6.5 RecoBus Diagnosis). Thus, the first input module is imaged as of byte position 4. The output modules are imaged in the output area of the PLC as of byte position 0. During the assembly of the module carriers it is possible to leave gaps, so that modules can be fitted later. For this, modifications in the PLC program in the declaration or the I/O editor have to be made, as the additional module inserted in a gap displaces the starting address of the following modules by the data width of the plugged-in module.

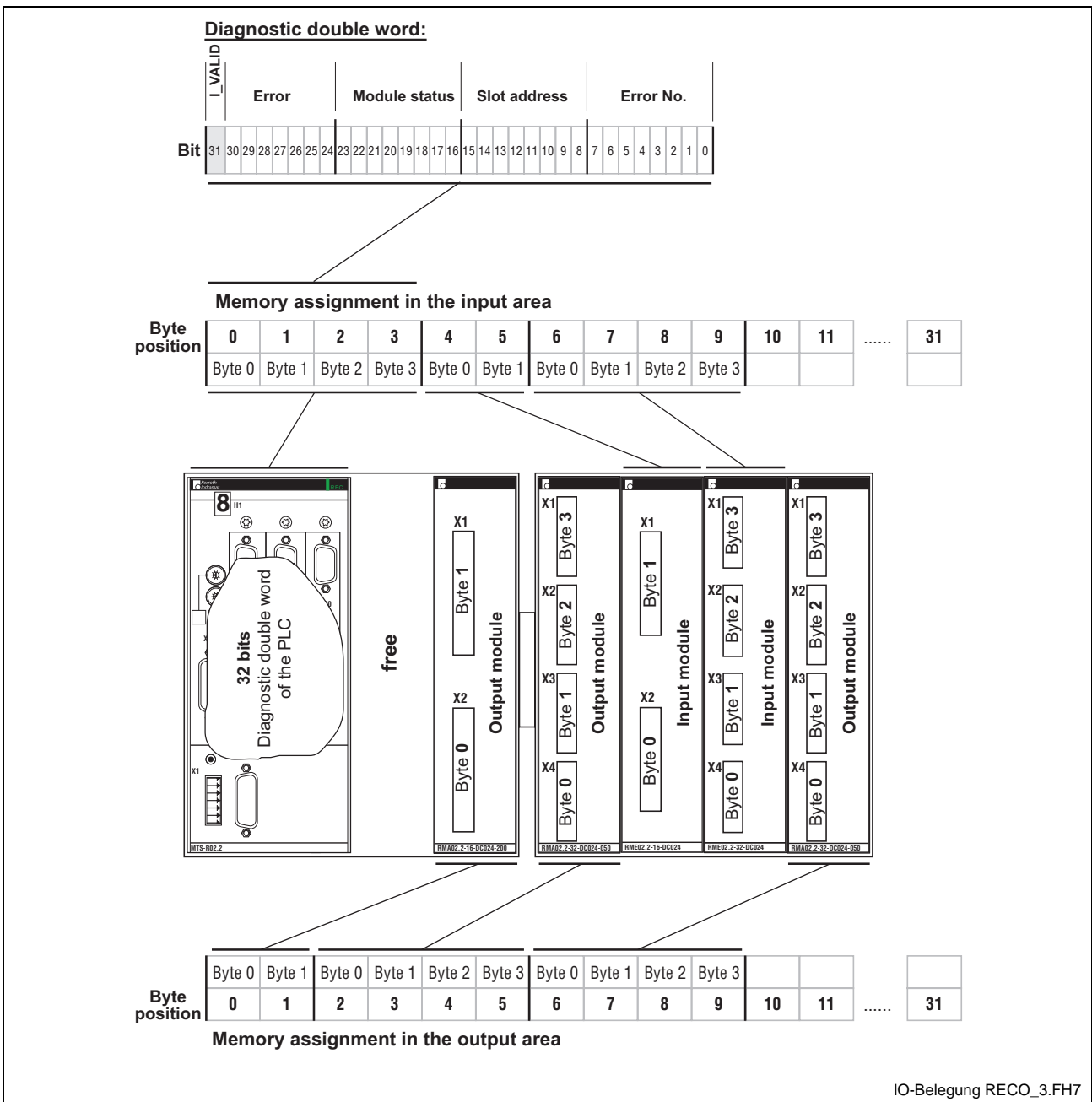


Fig. 6-7: RecoBus I/O modules in the memory of the PLC

## 6.5 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 PLC I/O editor on Byte 0-3. This double word should always be a part of the PLC user program, thus allowing quick reactions to error messages of the RecoBus.

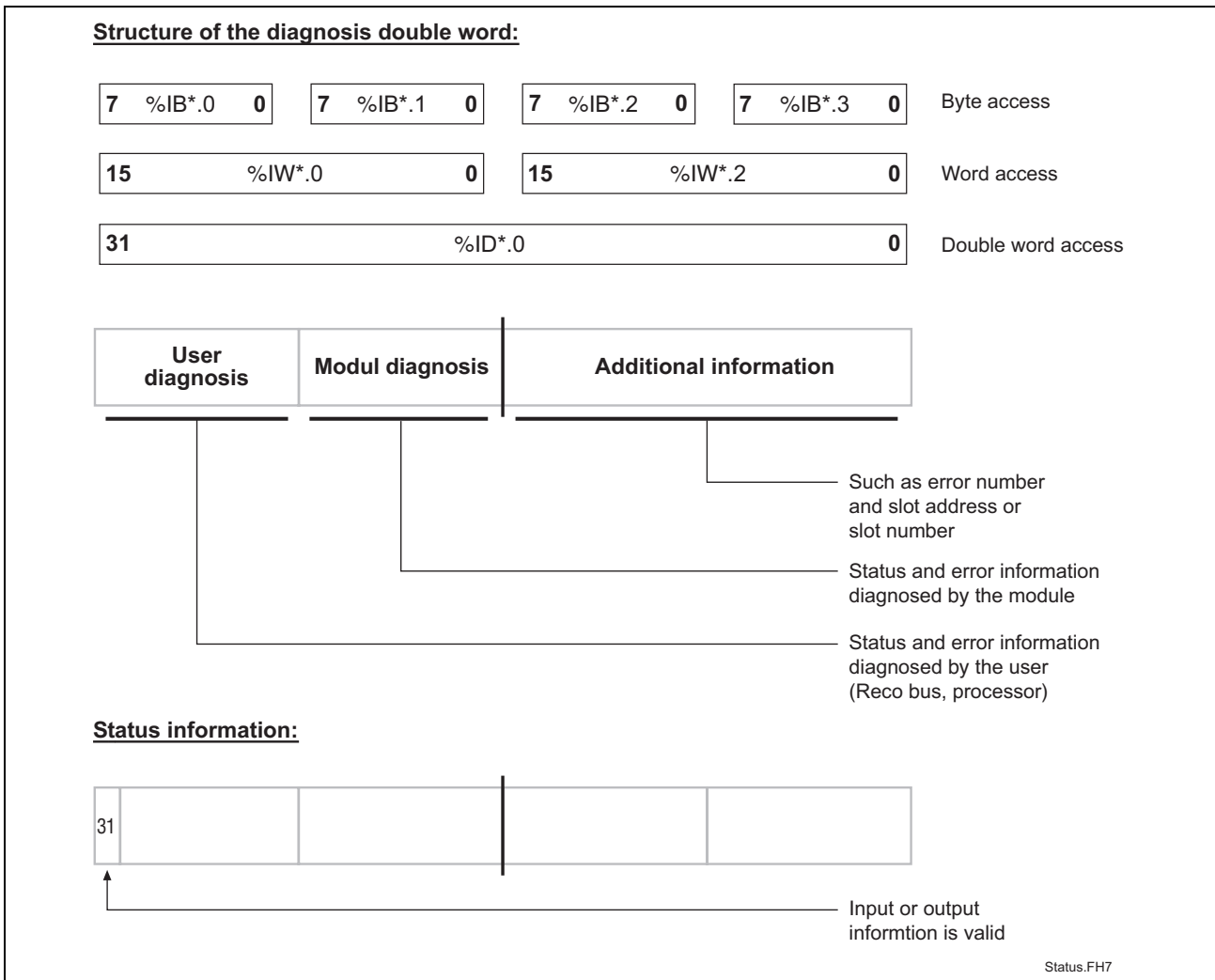


Fig. 6-8: Division of diagnosis double word / status information

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. 6-9: Explanation of status bit 31

## Error Detection by the User

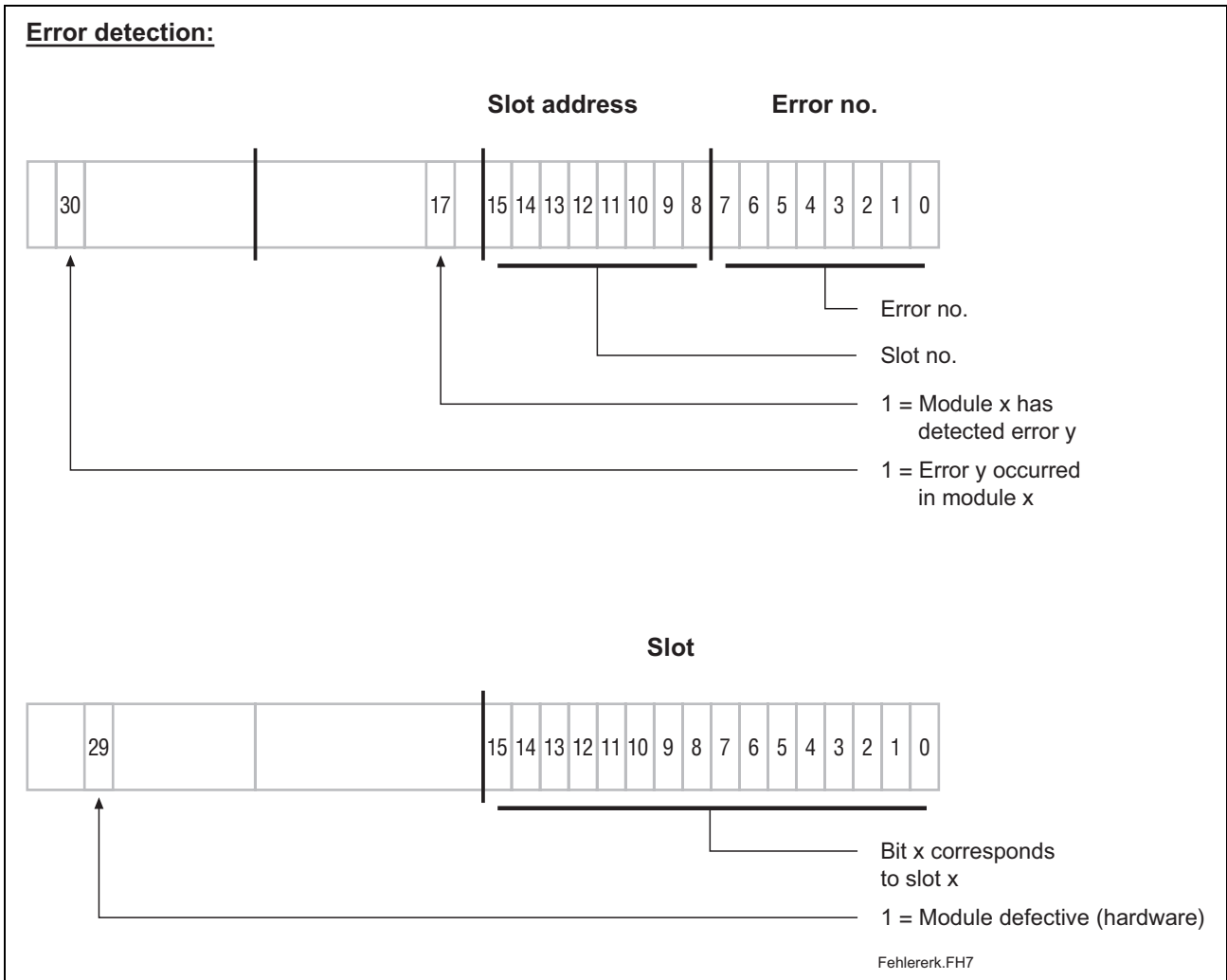


Fig. 6-10: Error detection

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. 6-11: 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.

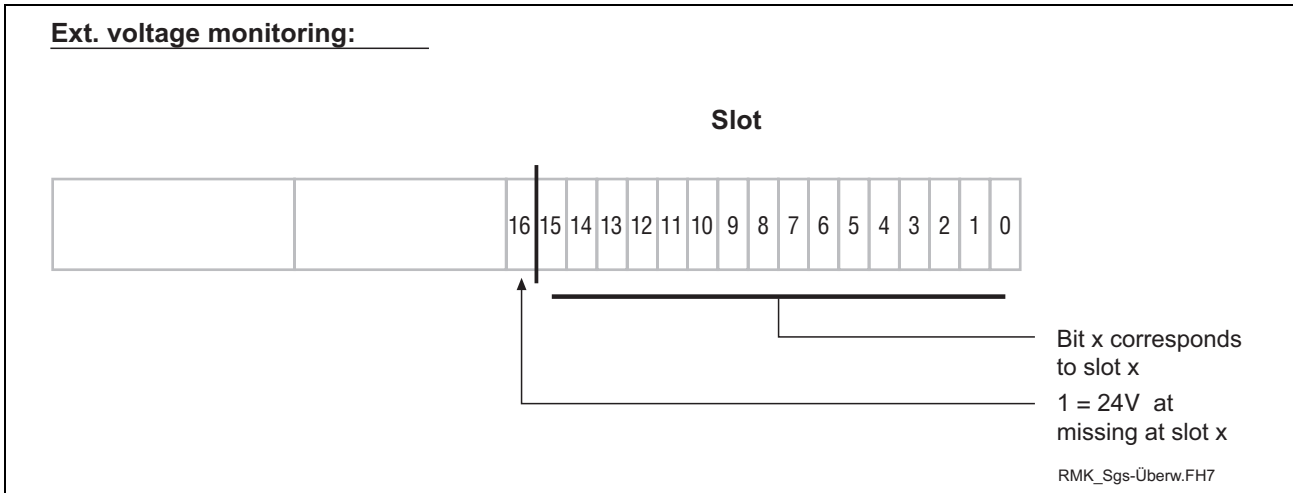


Fig. 6-12: Voltage monitoring

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. 6-13: Bit explanation

## Example of an External Power Failure

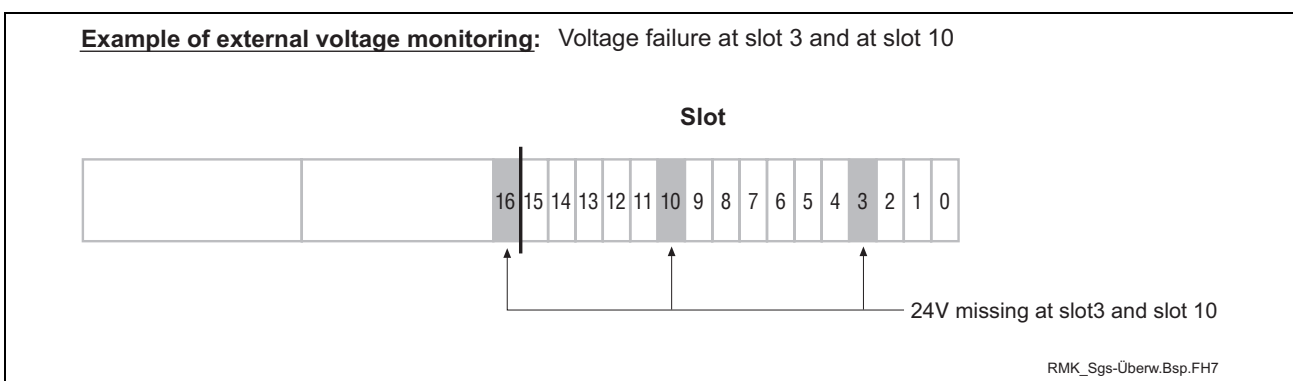


Fig. 6-14: Example of an external power failure

## 6.6 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)
b	Ready for operation (PLC is running)
0.	Startup state (reset test)
F.	Firmware in the Flash EPROM not valid
J.	Boot lockout for firmware activated
S	System stack overflow
P	Local bus not connected; 24-V voltage at MTC-R missing

Fig. 6-15: 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/GB0.

Code	Description
007	Software version error
008	Self-test unsuccessful
052	PLC program not valid
055	Max. cycle time of the PLC exceeded
071	Operating voltage of the PLC too low
081	Time exceeded 2-ms implementation
082	INTERBUS failure
083	INTERBUS storage overflow
084	INTERBUS configuration error
085	INTERBUS bus error
086	INTERBUS hardware / firmware error
087	INTERBUS module error of peripheral bus
088	INTERBUS not ready
089	INTERBUS general error of generation 4
090	PROFIBUS error during initialization
091	Synax/Visual Motion 'Initialization error'
092	Initialization error on RECO bus
093	BT bus error

Fig. 6-16: Error codes of the ISP200-R



## 6.7 Battery

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

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

- PLC 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).

## 6.8 Interface Assignment

The assignments of the COM and PROG interfaces are shown in Fig. 6-17. The BT bus is shown in Fig. 6-18.

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. 6-17: 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. 6-18: Pin assignment of the BT bus **X15**



# 7 RECO PLC MTS-R01.2

## 7.1 Brief Description

The MTS-R01.2 is an efficient PLC 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 stand alone PLC with the corresponding I/Os or together with motion control as a combined CNC-PLC 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 INTERBUS, PROFIBUS DP or DeviceNet.

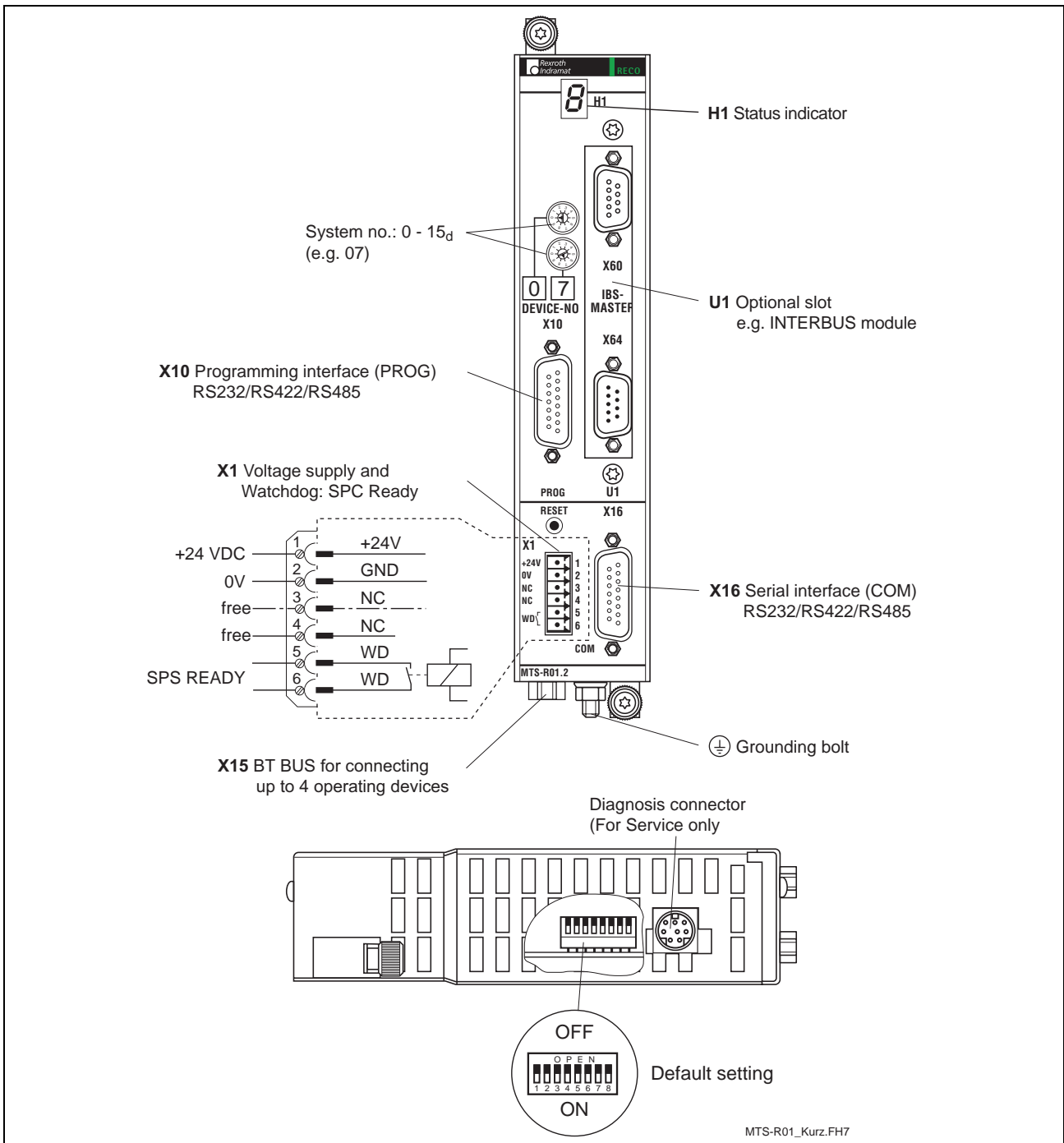


Fig. 7-1: MTS-R01.2

## 7.2 Application Example

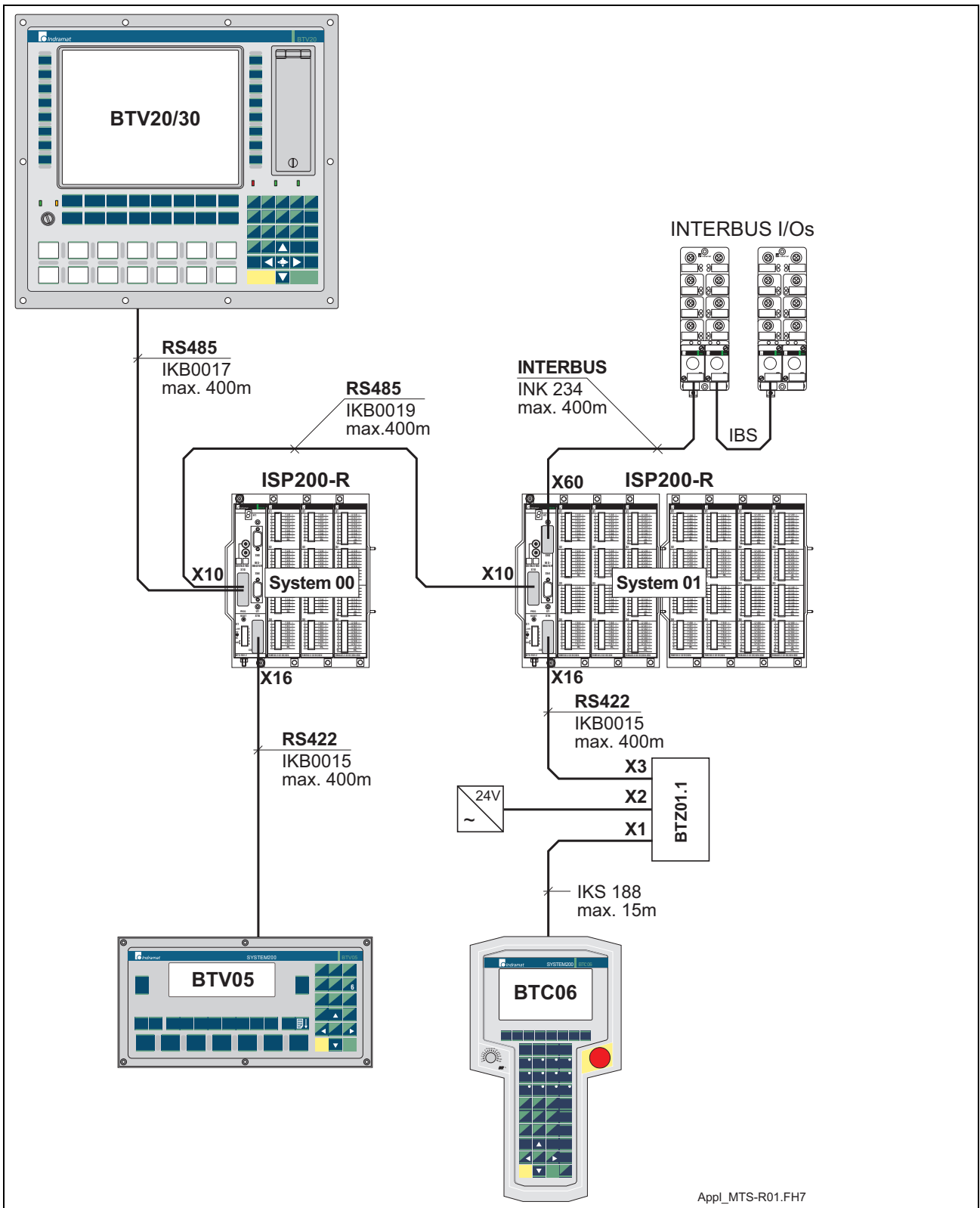


Fig. 7-2: MTS-R01.2 with INTERBUS connection

### 7.3 Type Code

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

- 1. Product**
- 1.1 MTS . . . . . = MTS
  
- 2. Housing design**
- 2.1 for RECO unit . . . . . = R
  
- 3. Line**
- 3.1 1 . . . . . = 01
  
- 4. Design**
- 4.1 2 . . . . . = 2
  
- 5. Operating mode**
- 5.1 PLC with 2 MB RAM . . . . . = M2
  
- 6. Configuration**
- 6.1 INTERBUS-S master module . . . . . = B1
- 6.2 not equipped . . . . . = NN
- 6.3 PROFIBUS-DP master module . . . . . = P1
- 6.4 PROFIBUS-DP slave module . . . . . = P2
- 6.5 DeviceNet master module . . . . . = V1
  
- 7. Firmware**
- 7.1 Denotes that Firmware must be ordered as separate subposition = FW

**Illustration example: MTS-R01.2**

Fig. 7-3: MTS-R01.2 type code



# 8 RECO PLC MTS-R02.2

## 8.1 Brief Description

The MTS-R02.2 is an efficient PLC 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 stand alone PLC with the corresponding I/Os or together with motion control as a combined CNC-PLC 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 INTERBUS, PROFIBUS DP and DeviceNet, or on additional serial interfaces.

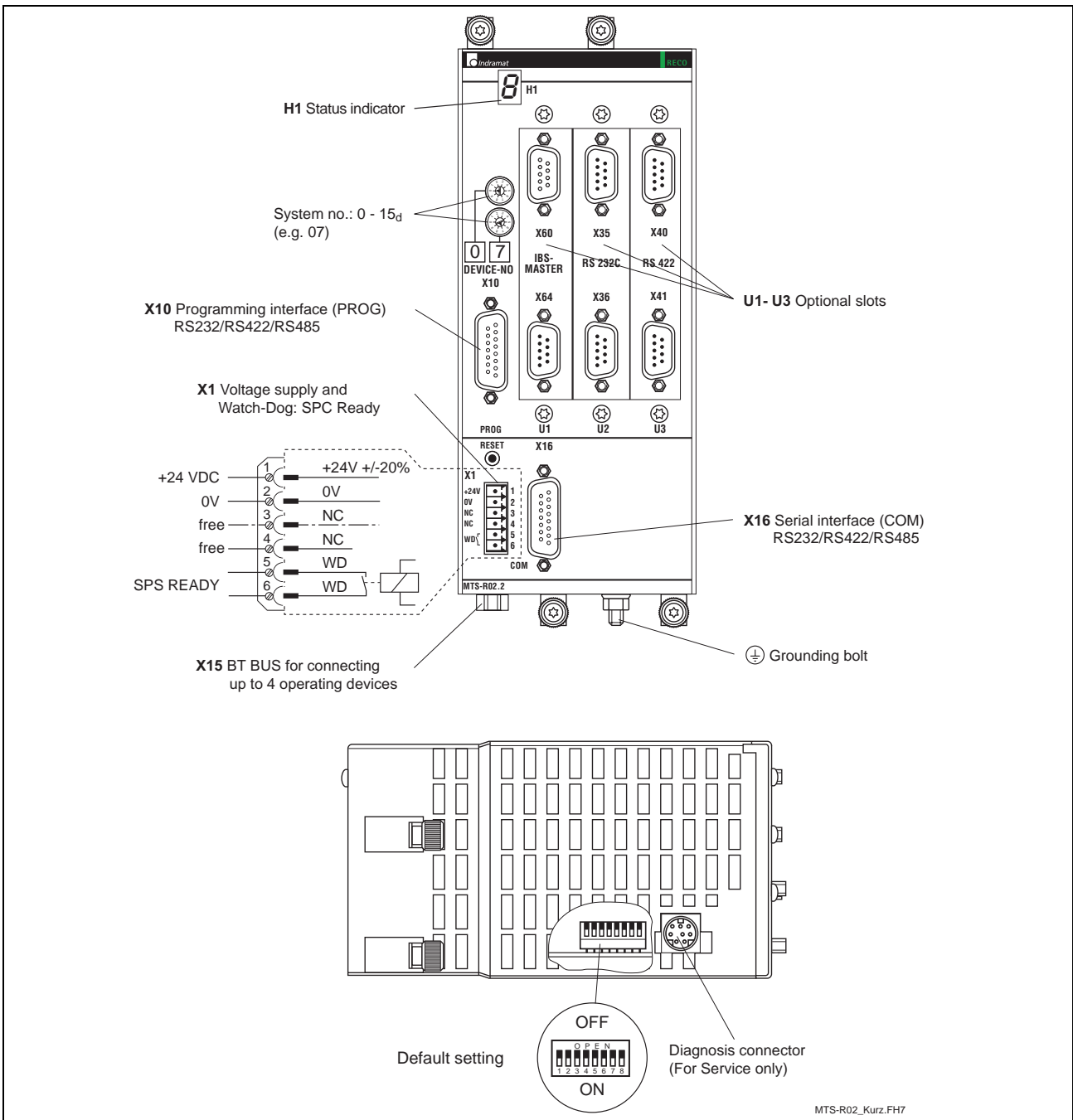


Fig. 8-1: MTS-R02.2

## 8.2 Application Example

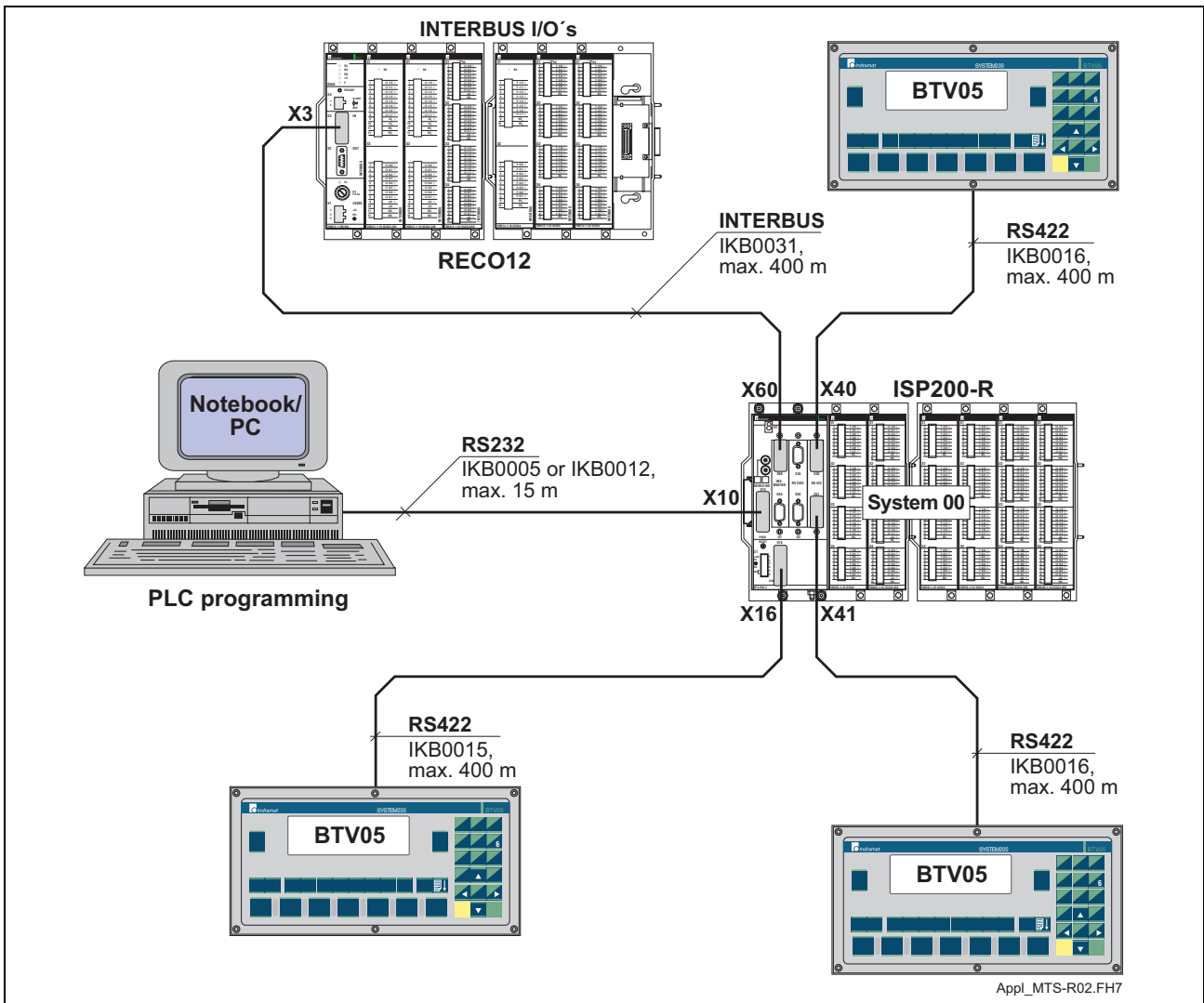


Fig. 8-2: MTS-R02.2 with INTERBUS connection and 4 serial interfaces







# 9 INTERBUS Master Connection

## 9.1 Brief Description

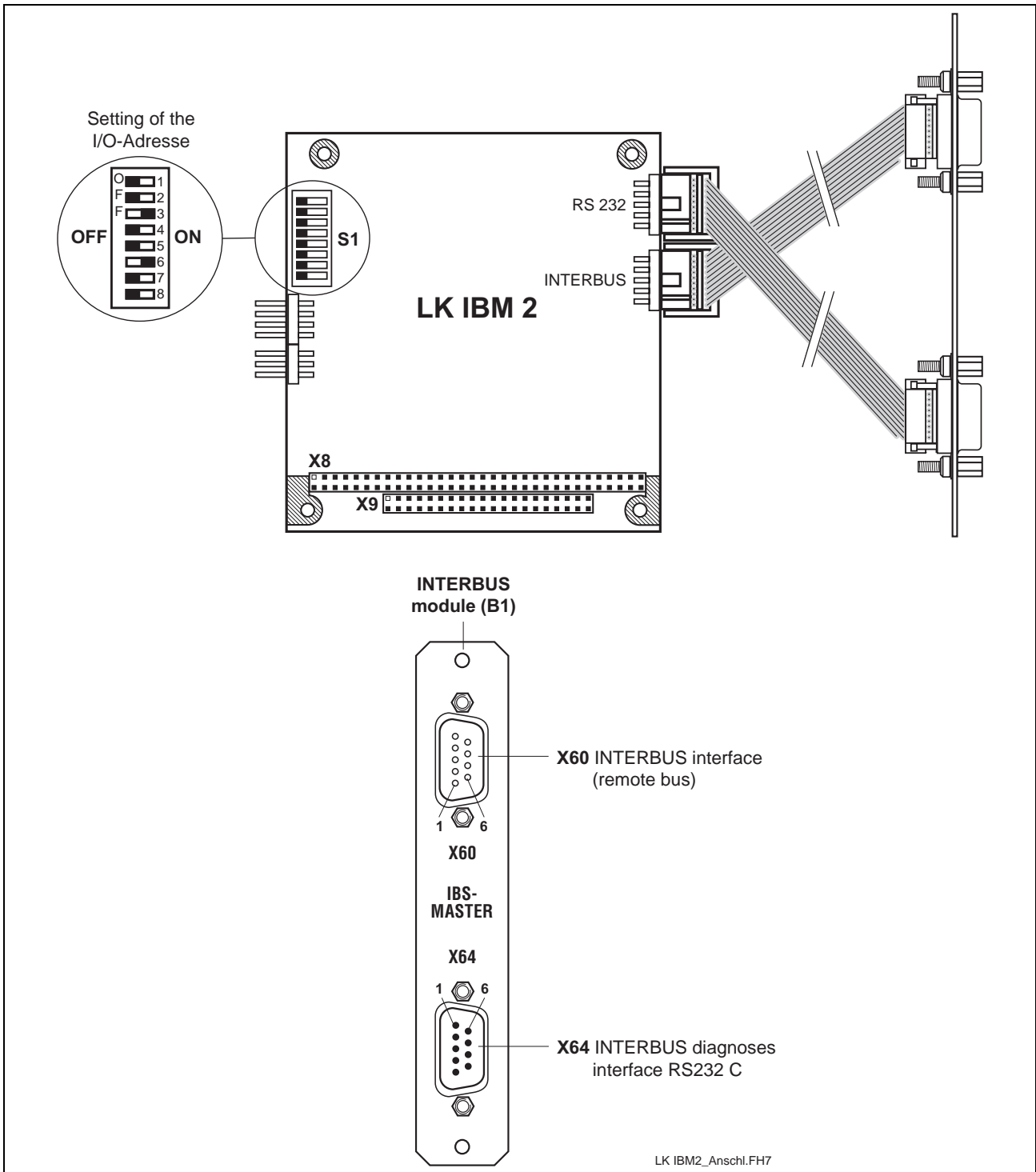


Fig. 9-1: P.C.B. LK IBM 2

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 configuration and commissioning of the INTERBUS occurs by the INTERBUS configurator IBS CMD G4 (see DOK-CONTRL-IBS\*CMD\*\*\*\*-AW...) and the I/O editor of the WinPCL programming interface (see DOK-CONTRL-WINPCL\*4VRS-AW...). For the configuration the interface cable IKB0030 is required.

## 9.2 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. 9-2: Setting of DIP switch S1

## 9.3 Technical Data

<b>Supply</b>	
Operation voltage:	+5 VDC, 5 % / 400 mA
<b>Interface data</b>	
Communication interface:	2-line remote bus, RS422, without electrical isolation
Diagnostic interface:	RS232C
<b>Operation conditions</b>	
Operation temperature:	0 °C - + 55 °C
Storage temperature:	-25 °C - +70 °C
Relative humidity:	Max. 75 %, condensation to be avoided

Fig. 9-3: Technical data

## 9.4 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. 9-4: 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	$\overline{\text{DO}}$
7	$\overline{\text{DI}}$	8	Vcc
9	RBST		

Fig. 9-5: Pin assignment of the INTERBUS interface **X60** (remote bus)



# 10 PROFIBUS DP Connection

## 10.1 Brief Description of Master and Slave Connection

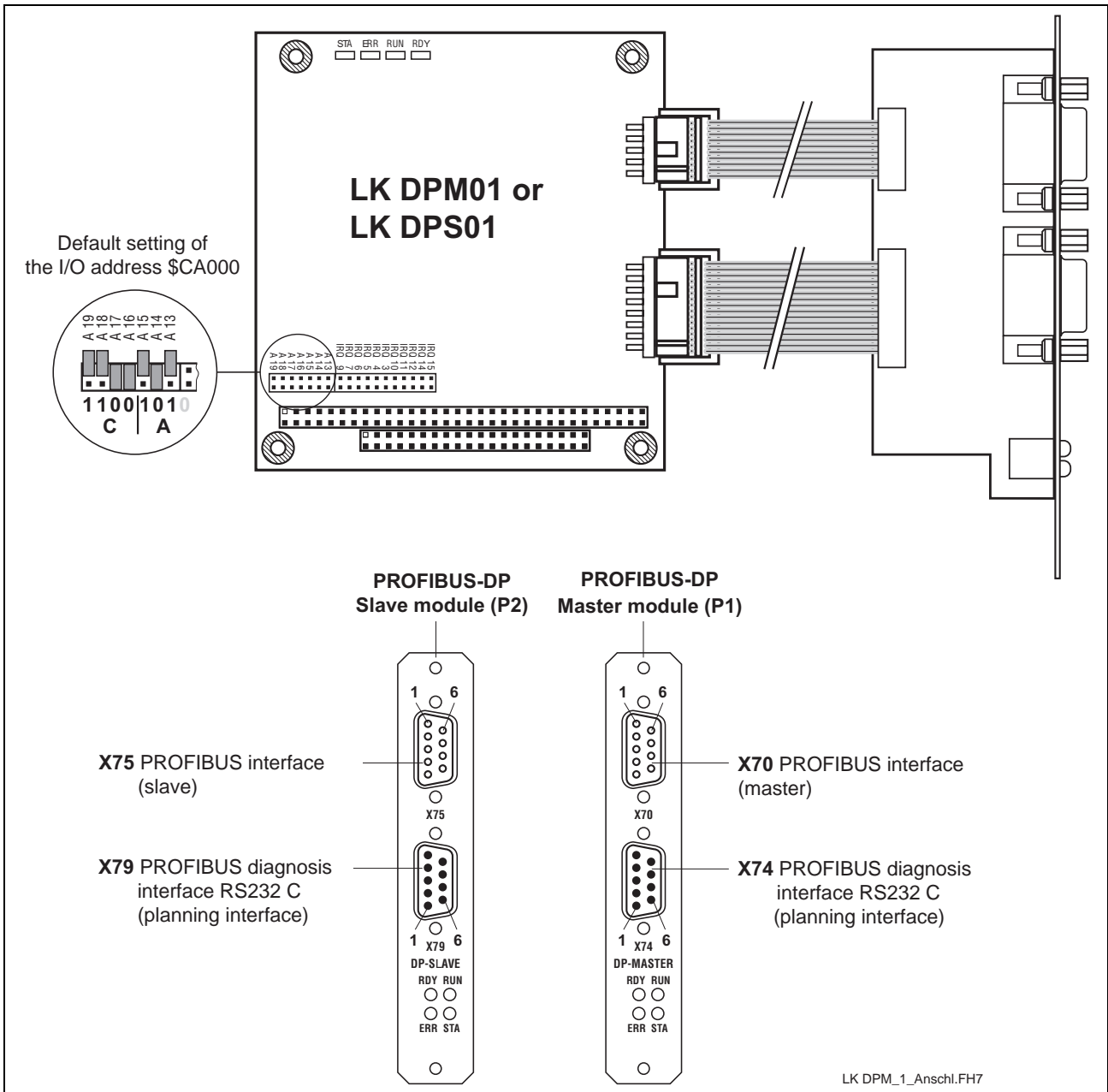


Fig. 10-1: PROFIBUS connections

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 PLC and the decentralized PROFIBUS input and output units. The built-in microprocessor allows automatic execution of the entire data transfer, thus relieving the PLC of real-time tasks.

Data exchange between the PLC 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 PLC and the microprocessor of the P.C.B.s DPM01 and DPS01.

The configuration and commissioning of the LK DPM/DPS01 occurs by the system configurator SyConPB (see DOK-CONTRL-SYCON\*\*\*\*DP). For the configuration the interface cable IKS0106 is required. 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 relation to the set data transfer rate, link lengths of up to 1200 m can be realized between the PROFIBUS DP devices. 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.

The master LK DPM01 can be connected with maximum 244 bytes inputs and maximum 244 bytes outputs. The sum of inputs and outputs of all slaves must not exceed 512 bytes.

The slave LK DPS01 has to be configured in a manner that the sum of the inputs or outputs of the single modules is maximum 244 bytes. It must be considered that the sum of the inputs and outputs of all modules does not exceed 368 bytes.

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

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## 10.2 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):

Controller board	Address	A19	A18	A17	A16	A15	A14	A13
<b>Master</b>	\$CA000			X	X		X	
<b>Slave</b>	\$CC000			X	X			X

Fig. 10-2: Setting of the module type



## 10.3 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 cyclically:	Bootstrap loader active
	Flashes irregularly:	Hardware or system error
	Off:	Hardware defective
<b>RUN</b>	Green LED	<b>RUN (communication)</b>
	On:	Communication runs
	Flashes cyclically:	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

## 10.4 Technical Data

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

## 10.5 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. 10-3: 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. 10-4: Pin assignment of the PROFIBUS interface (**X70, X75**)

# 11 DeviceNet Master Connection

## 11.1 Brief Description

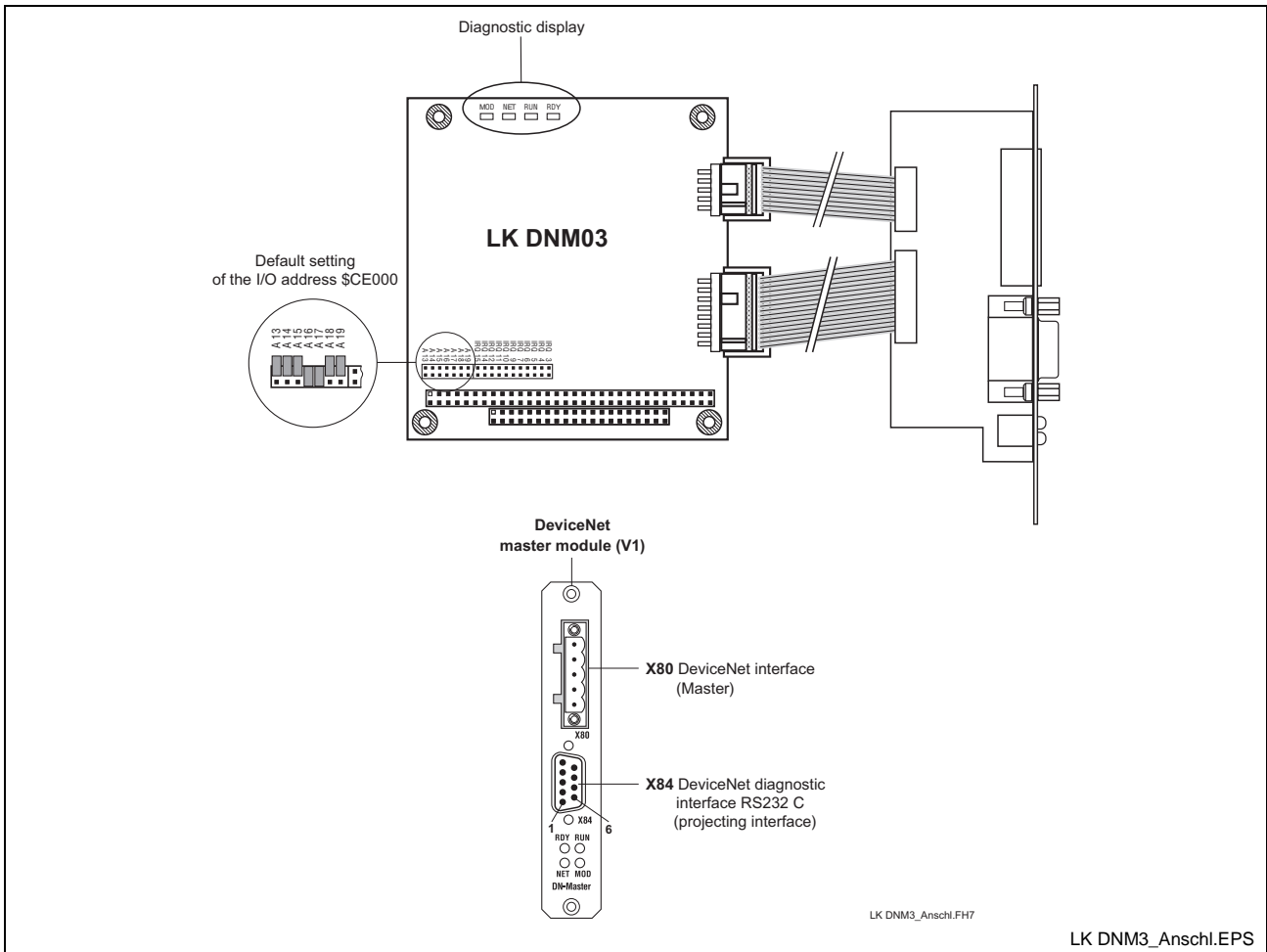


Fig. 11-1: LK DNM03

The printed circuit board DNM03 is an intelligent DeviceNet master connection in PC104 format. As master it provides for data exchange at the DeviceNet network between the bus devices and an internal process image and thus, does not affect the PLC. The process image is stored in the dual port memory and is directly available for the application. Using the LK DNM03 it is possible to operate up to 63 DeviceNet slaves with maximum 256 bytes inputs and outputs respectively per slave with the bus cable with branch lines (max. 7 kbyte)

The total length of the bus cable depends on the cable type or on the transmission rate and must not exceed the following lengths:

Baud rate	Max. cable length for cable type		
	Thick cable	Thin cable	Thick/thin cable
125 kbits/s	500 m	100 m	$L_{\text{thick}} + 5 \times L_{\text{thin}}$ 500 m
250 kbits/s	250 m	100 m	$L_{\text{thick}} + 2,5 \times L_{\text{thin}}$ 250 m
500 kbits/s	100 m	100 m	$L_{\text{thick}} + L_{\text{thin}}$ 100 m

Fig. 11-2: Maximum cable lengths dependent on the used cable

**Note:** To ensure that the function of the DeviceNet interface is faultless, use only cable according to the DeviceNet specification. Furthermore, it is obligatory that both cable ends of the bus segment are terminated with 120 Ohm.

Individual branch lines must not exceed a length of 6 m. The total length of all branch lines must not exceed 156 m for 125 kbaud, 78 m for 250 kbaud and 39 m for 500 kbaud.

The configuration and commissioning of the LK DNM03 occurs by the system configurator SyConDN (description see DOK-CONTRL-SYCON\*\*\*\*DN). It communicates via a serial connection between the COM port of the PC and the diagnostic interface X84 of the LK DNM03. The configuration is stored on the LK DNM03 and is thus immediately available when it is started.

The technical data of the LK DNM03 are as follows:

- Process image with maximum 7 kbytes (inputs and outputs)
- 16 bit processor with interrupt and DMA controller
- 8 kb DPM, 512 kb flash and 128 kb RAM
- CAN controller SJA 1000
- Isolated DeviceNet interface according to ISO 11898, max. 500 kbaud
- Non-isolated diagnostic interface RS232C, 9600 Baud

## 11.2 Setting of the I/O Address

The setting of the start address occurs via jumpers of the plugboard J4. Thereby, the corresponding address line is specified besides every plug-in jumper.

When using the board in conjunction with WinPCL the starting address has to be set as follows (X = jumper plugged in).

Address	A13	A14	A15	A16	A17	A18	A19
\$CE000				X	X		

Fig. 11-3: Setting of the I/O address

## 11.3 Status and Diagnostic Displays

With the start of the DNM03 a self-test is started, whereby the yellow RDY LED lights up after the initialization time (2-3 seconds) after an error-free test cycle. Otherwise, the RDY LED starts to flash and the program execution is interrupted. The further meanings of the indicators during the initialization phase are listed below.

<b>RDY</b>	LED yellow:	<b>Ready</b>
	ON:	DPM01 or DPS01 ready for operation
	Flashes cyclically:	Bootstrap loader active
	Flashes irregularly:	Hardware or system error
	OFF:	Hardware defective
<b>RUN</b>	LED green:	<b>RUN (communication)</b>
	ON:	Communication runs
	Flashes cyclically:	Communication stopped
	Flashes irregularly:	Missing or wrong configuration
	OFF:	No communication
<b>NET</b>	ON green:	Communication at the bus established
	Flashes green:	No communication at the bus
	ON red:	Critical connection error
	Flashes red:	Time monitoring error
	OFF:	No operating voltage, not at the bus
<b>MOD</b>	ON green:	Device works
	Flashes green:	Ready for operation
	ON red:	Non-correctable error
	Flashes red:	Subordinated error
	OFF:	No operating voltage

## 11.4 Technical Data

<b>Supply</b>	
Operating voltage:	+5 V $\pm$ 5 % / 650 mA
Op. voltage DeviceNet interface:	+11 V – +25 V / 55 mA
<b>Interface data</b>	
Communication interface:	ISO 11898, max. 500 kbaud, isolated
Diagnostic interfaces:	RS232C, 9600 baud, non-isolated
<b>Operating conditions</b>	
Operating temperature:	0 °C - +55 °C
Storage temperature:	-25 °C - +70 °C
Relative humidity:	Max. 75%, condensation to be avoided

## 11.5 Interface Assignment

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

Fig. 11-4: Pin assignment of the DeviceNet diagnostic interface **X84**

Pin	Signal name	Signal color
1	Ground	Black
2	CAN_LOW	Blue
3	Shield	--
4	CAN_HIGH	White
5	+24 V	Red

Fig. 11-5: Pin assignment of the DeviceNet interface **X80**

# 12 Serial Interfaces

## 12.1 Brief Description

The P.C.B. SIO 04-B provides the PLC 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 PLC firmware.

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

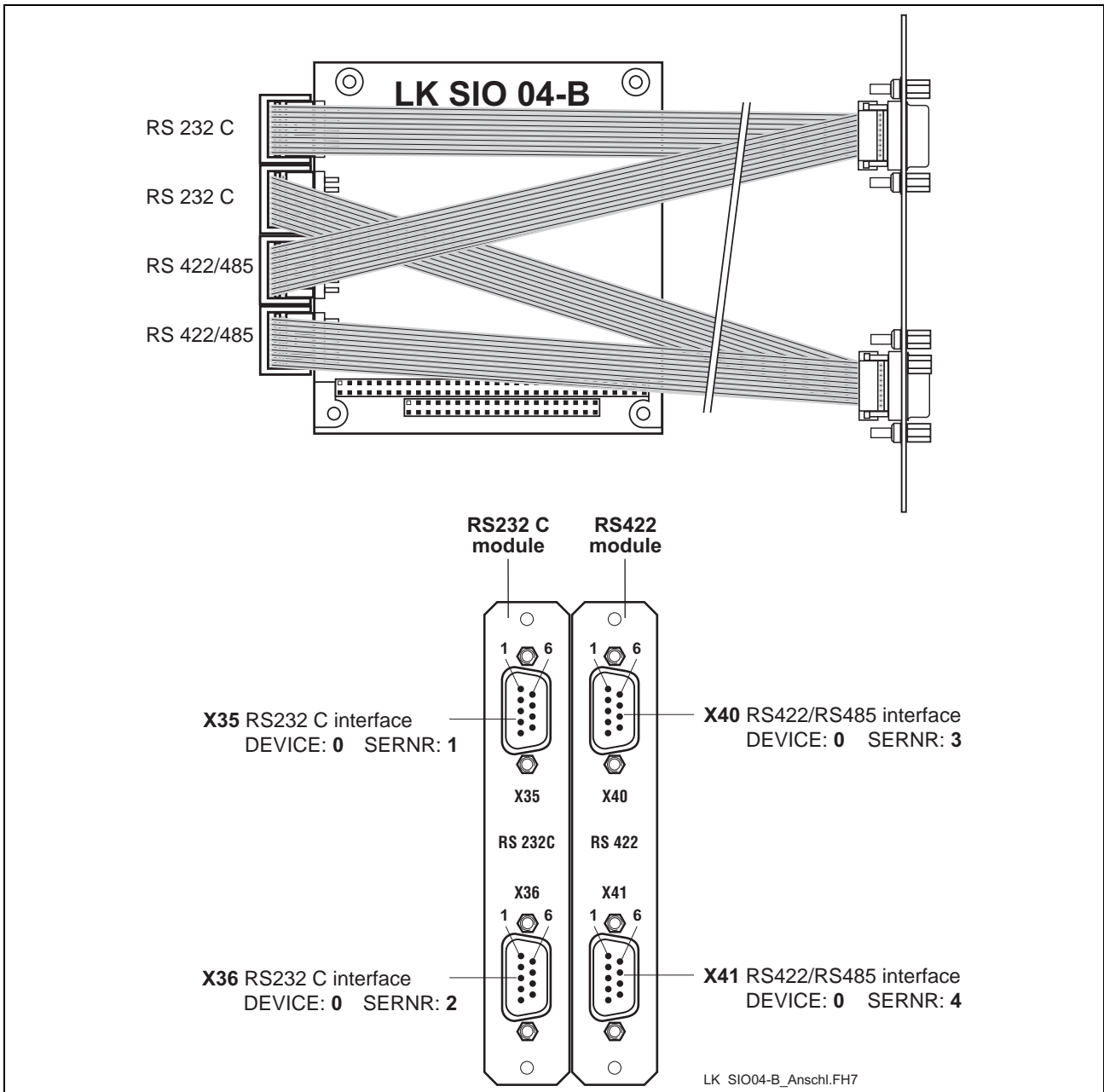


Fig. 12-1: P.C.B. SIO 04-B

## 12.2 Address and Interrupt Settings

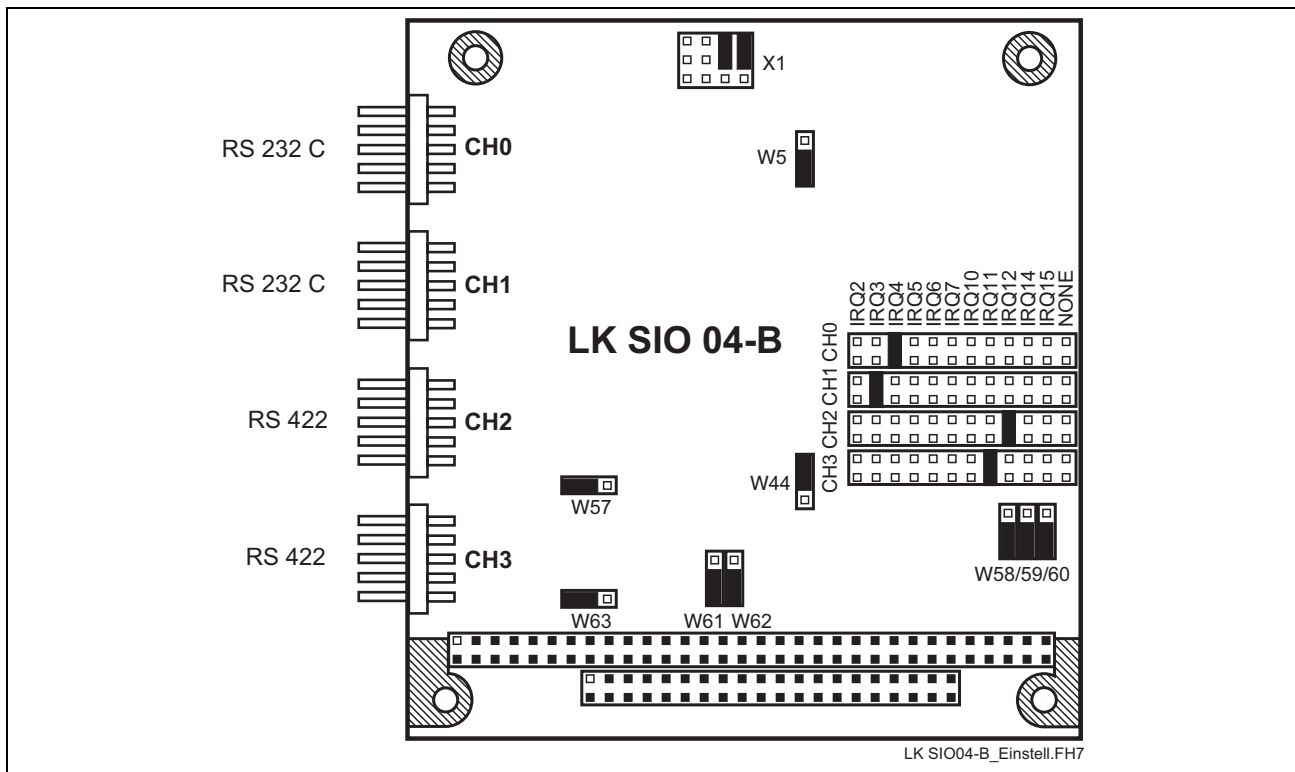


Fig. 12-2: Jumper settings on the P.C.B. SIO 04-B

## 12.3 Function Blocks

To be able to address the serial interfaces of the peripheral equipment the PLC programming system provides the following firmware function blocks:

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_STR	Reading a string from the serial interface
WR_STR	Writing a string to the serial interface
CTRL_COM	Finding out the status of the serial interface
CLR_COM	Finding out the transmitter and receiver buffer of the serial interface
BTXX	Communication module for the operator terminals BTV04/05 and BTC06

Fig. 12-3: 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 application description DOK-CONTRL-WINPCL\*4VRS.



## 12.4 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

## 12.5 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. 12-4: 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. 12-5: Pin assignment of RS422/485 X40, X41



# 13 Networking

## 13.1 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 cables IKB0017 and IKB0019 (see Fig. 15-1) as well as the connector INS0619 (Fig. 13-1) can be used to establish the RS485 connection.

The RS422 connection can be established by means of the Rexroth cables IKB0015 and IKB0016 (see Fig. 15-1) or the connector INS0945 (Fig. 13-2).

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.

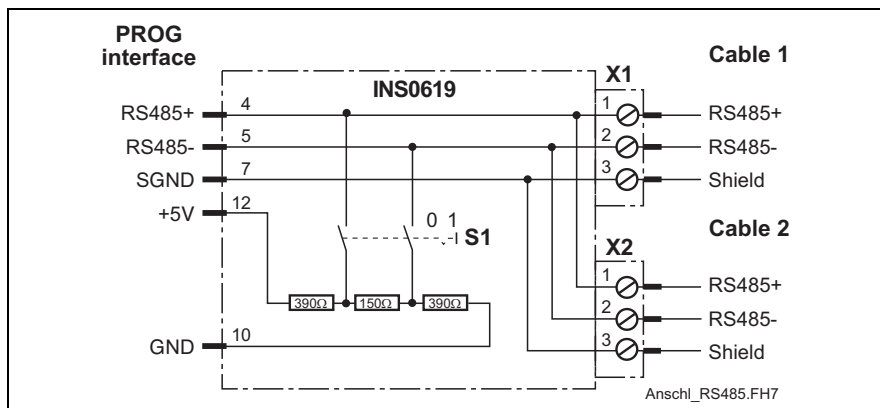


Fig. 13-1: RS485 connection with INS0619 connector

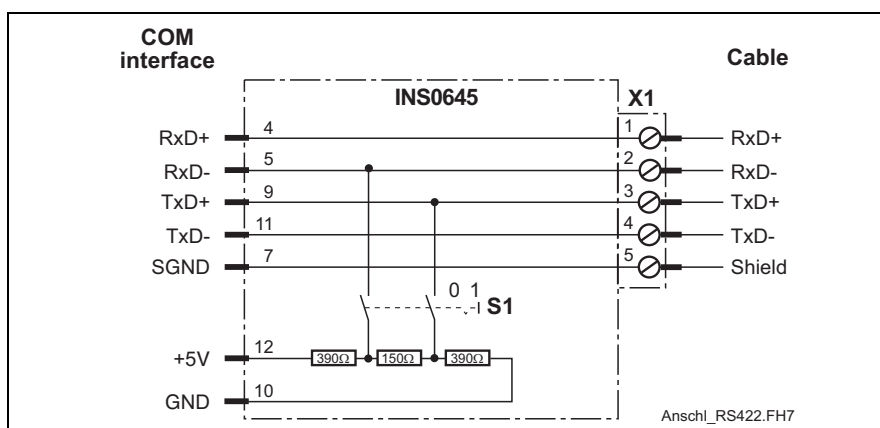


Fig. 13-2: RS422 connection with INS0645 connector

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

The BTV20/30 is equipped with a Rexroth SIS 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. 13-3).

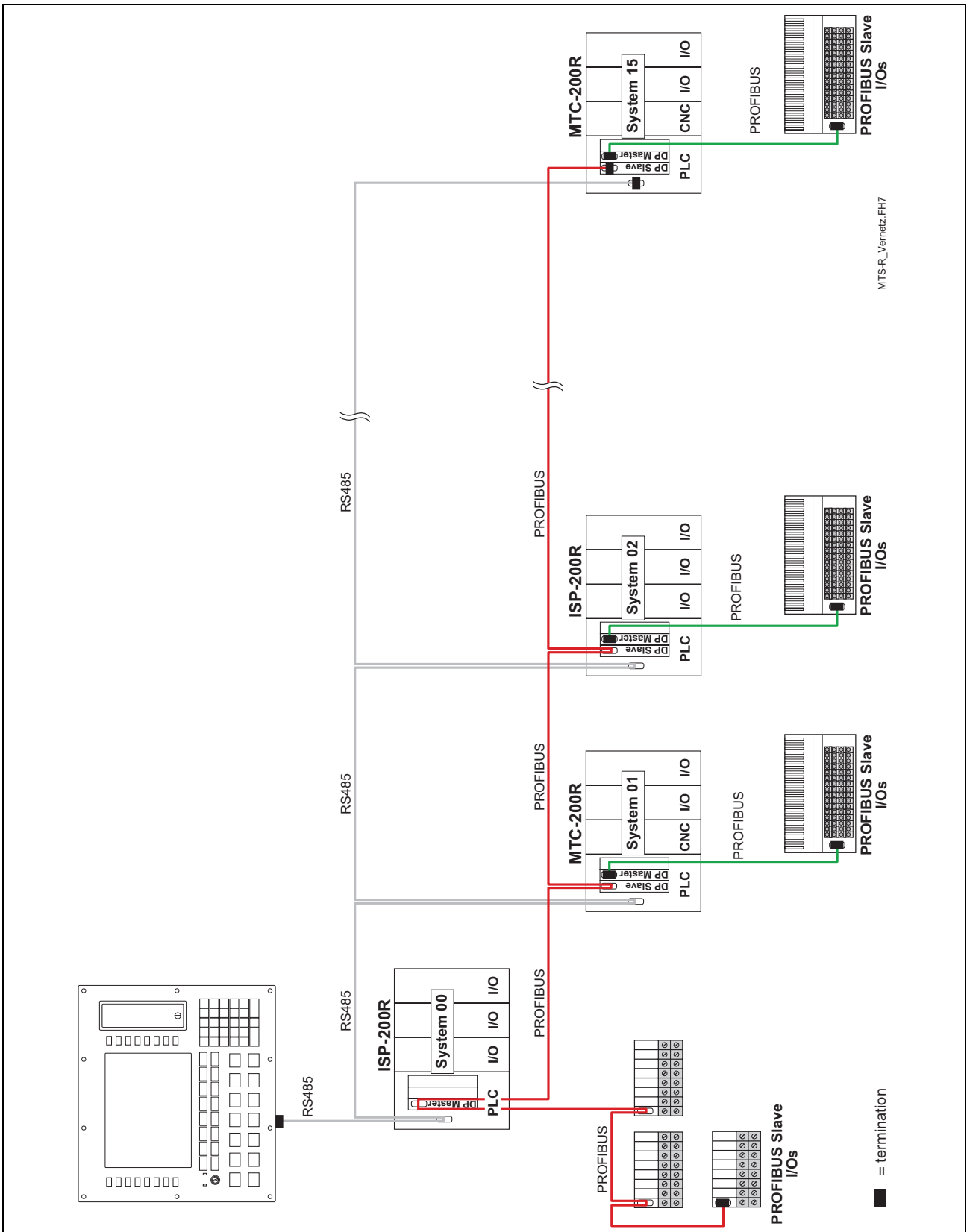


Fig. 13-3: ISP200-R networking with BTV20/30

# 14 Connection of Operator Terminals

## 14.1 Applications with the BTV04/05/06

As required, the compact operator terminals BTV04/05/06 are connected via the serial interfaces X16 and X40/41, which permit RS422 or RS485 operation. Only **one** compact operator terminal can be connected to an RS422 interface (see Fig. 14-1).

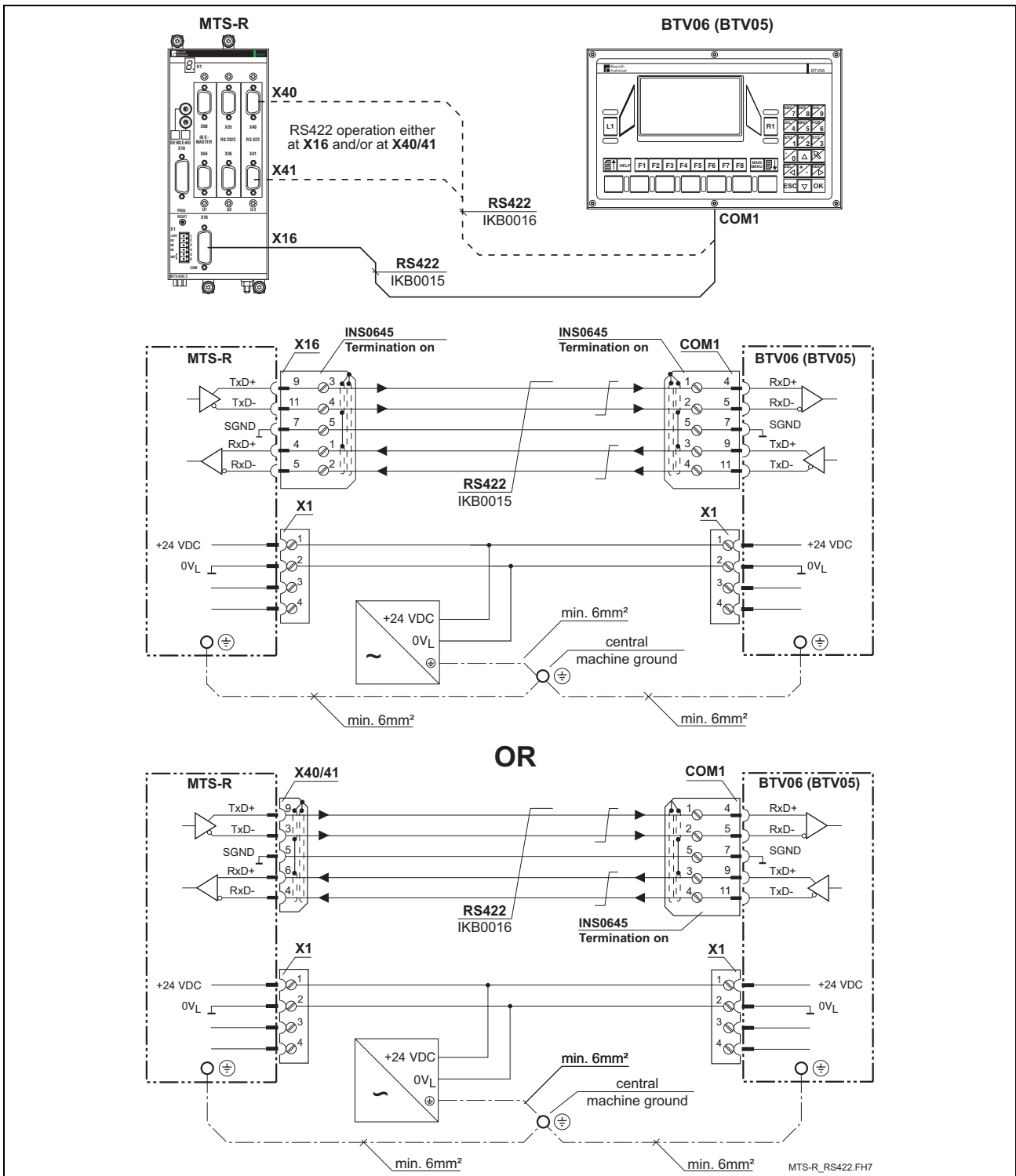


Fig. 14-1: MTS-R with compact operator terminals via an RS422 interface

During RS485 operation, two operator terminals can be connected in cascade per interface (see Fig. 14-2). Hence, a maximum of six operator terminals can be connected during RS485 operation.

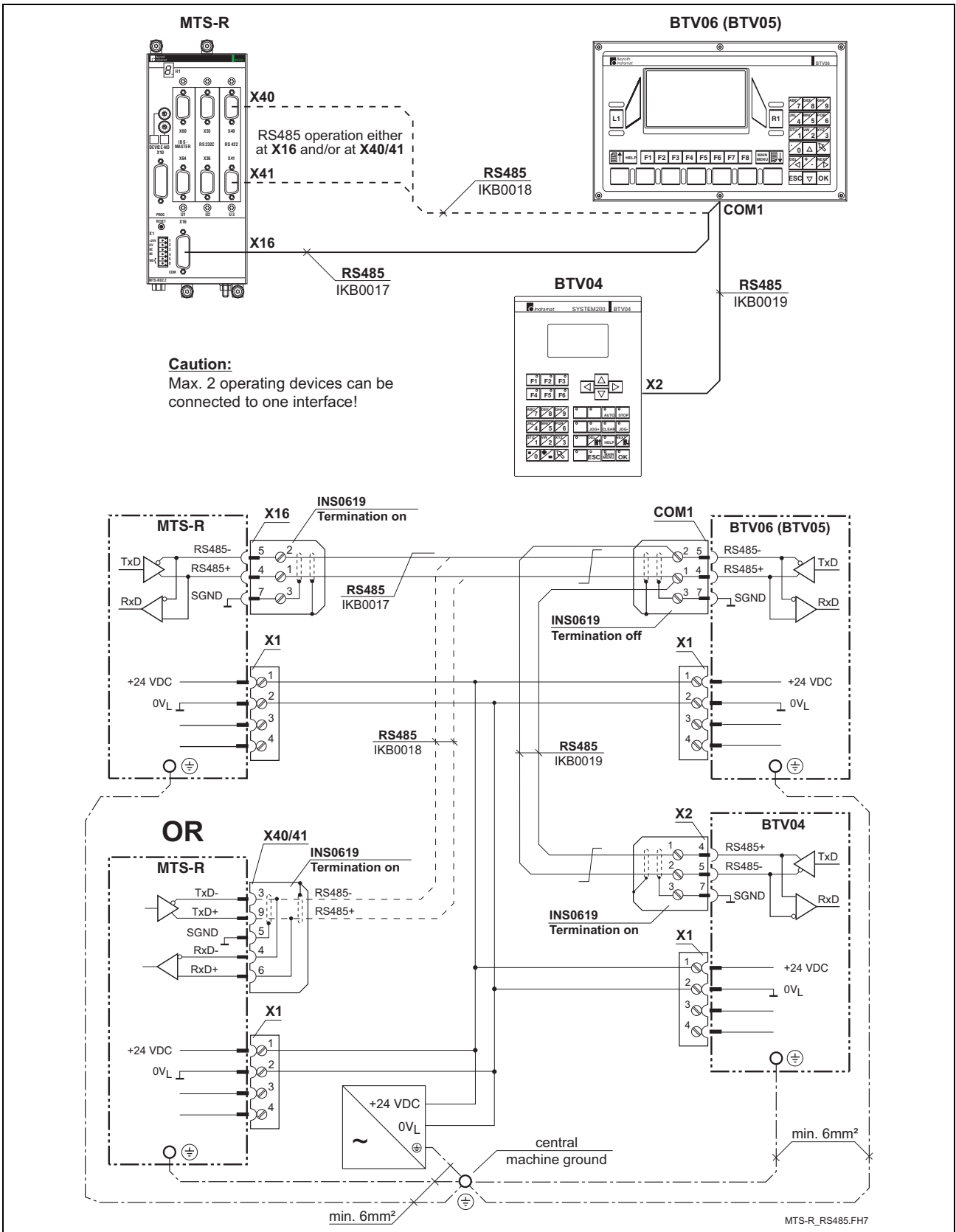


Fig. 14-2: MTS-R with compact operator terminals via an RS485 interface

## 14.2 Applications with the BTC06

The mobile operator terminals BTC06 are exclusively connected via the operator panels BTA10 or BTA20. RS232 operation is converted to RS422 operation by means of the interface converter integrated in the BTA10/20 (see Fig. 14-3). 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. 14-4).

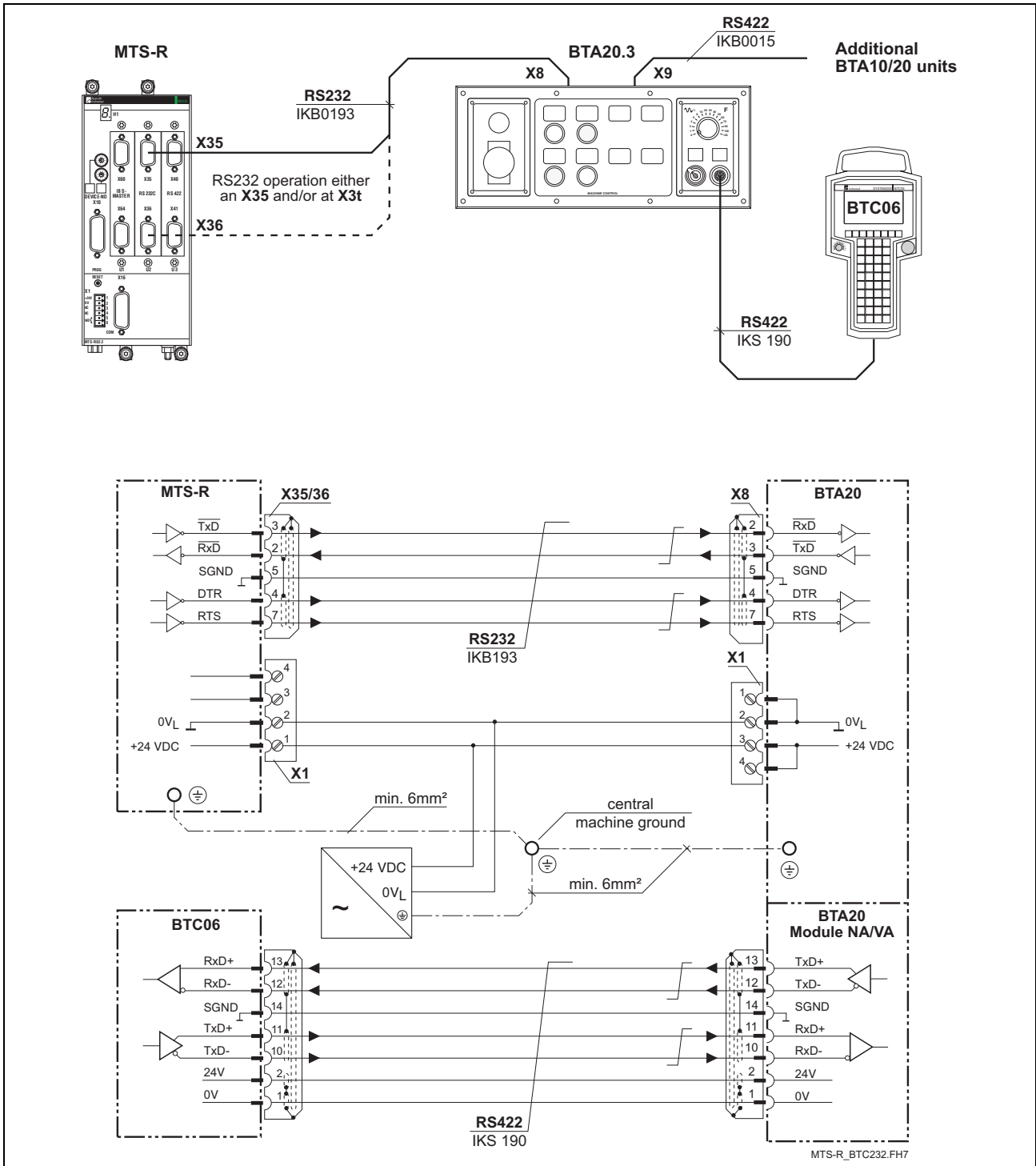


Fig. 14-3: MTS-R with BTC06 via an RS232 interface

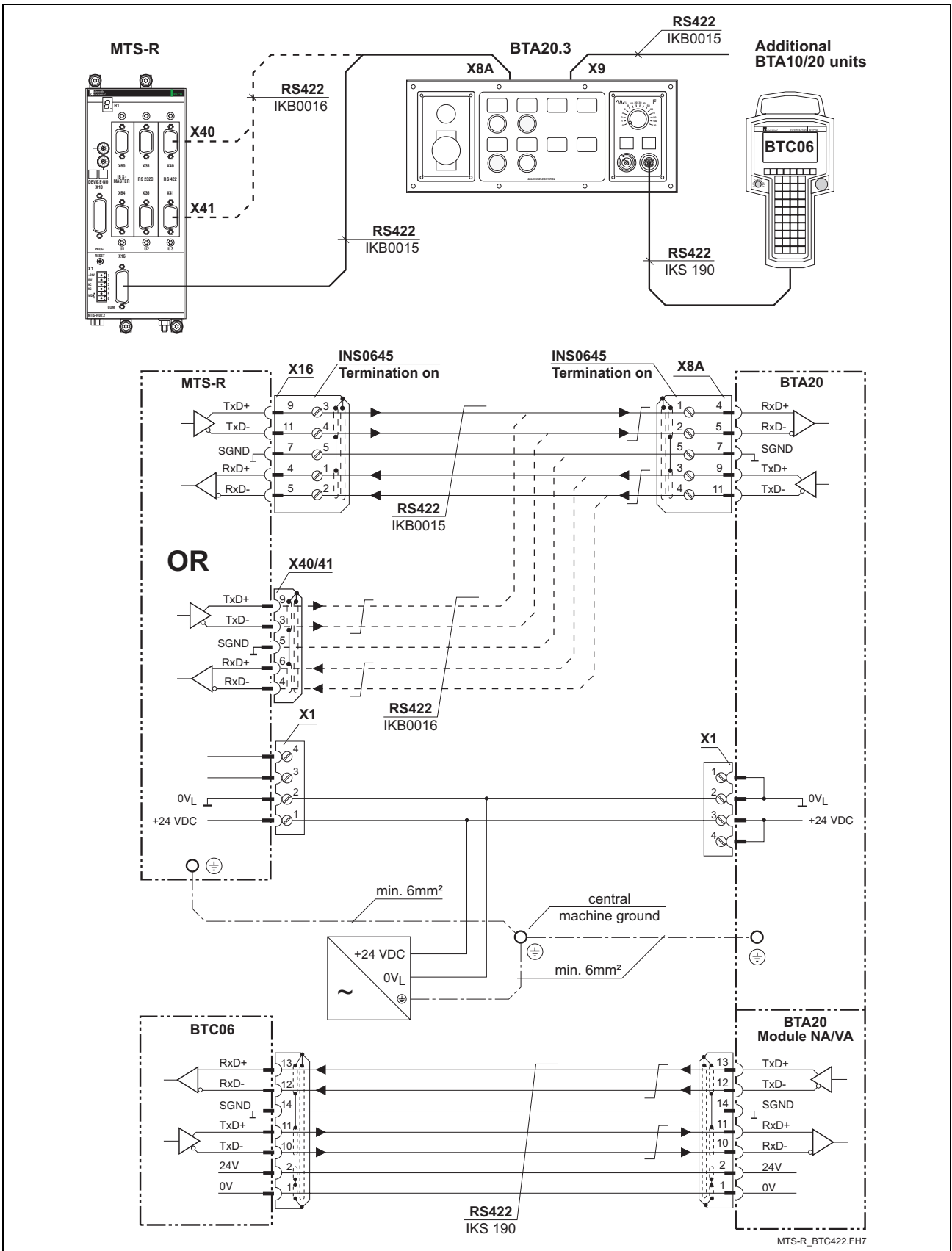
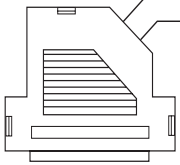


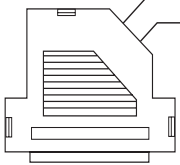

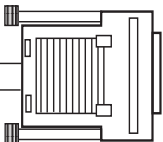
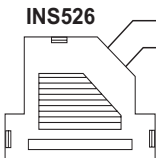
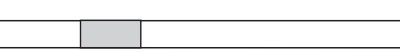
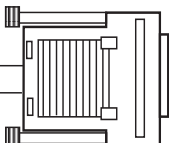
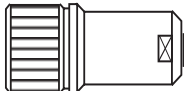
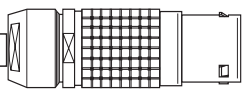
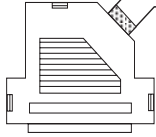


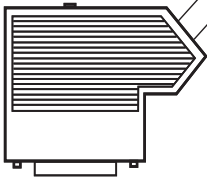

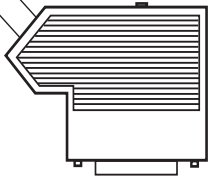


Fig. 14-4: MTS-R with via an RS422 interface



# 15 Accessories

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

Ordering name of ready-made cables	Counter-connector on the device	REXROTH 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>IKB0030/000,0</b>                  MN: 291 736                  (Configuration INTERBUS, max. 15 m)</p>	<p>INS0702/L01                  9-pin female connector</p> <p>INS0702/L01                  9-pin female connector</p> <p>INK0572</p> <p>IKB0030</p> <p>IKB0030</p>
<p><b>IKB0031/000,0</b>                  MN: 291 805                  (INTERBUS, max. 400 m)</p> <p><b>IKB0031/000,5</b>                  MN: 291 806                  (INTERBUS, 0,5 m)</p>	<p>INS0703/L01                  9-pin male connector</p> <p>INS0702/L01                  9-pin female connector</p> <p>INK0699</p> <p>IKB0031</p> <p>IKB0031</p>
<p><b>IKB0032/000,0</b>                  MN: 291 807                  (INTERBUS, max. 400 m)</p>	<p>INS0703/L01                  9-pin male connector</p> <p>Connector sleeves</p> <p>INK0699</p> <p>IKB0032</p> <p>IKB0032</p>

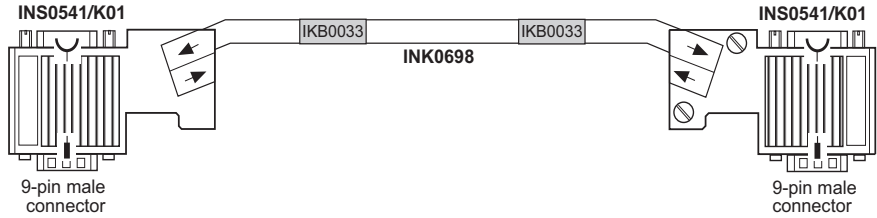
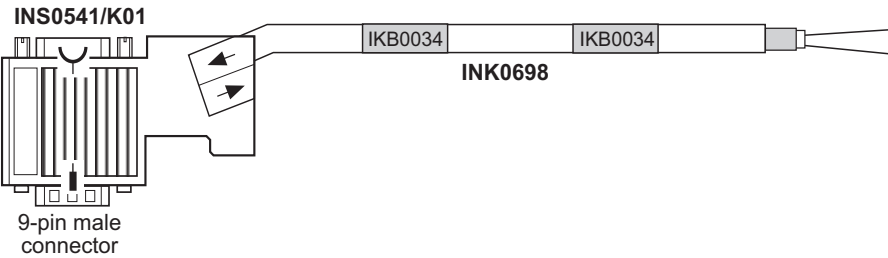
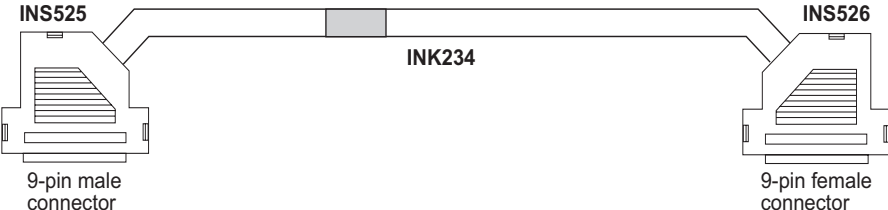
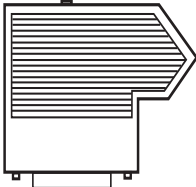
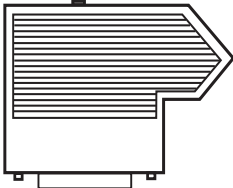
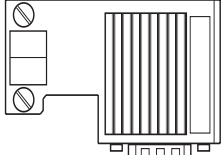
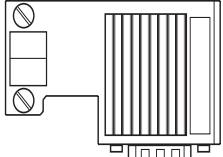
<p><b>IKB0033/000,0</b>                  MN: 291 808                  (PROFIBUS, max. 1000 m)</p>	 <p>INS0541/K01                  9-pin male connector</p> <p>INS0541/K01                  9-pin male connector</p>
<p><b>IKB0034/000,0</b>                  MN: 291 809                  (PROFIBUS, max. 1000 m)</p>	 <p>INS0541/K01                  9-pin male connector</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><b>INS0619/K01</b>                  MN: 279 583</p>	 <p>Y-connector for self-finishing with termination</p> <p>INS0619/RS485                  (15-pin male connector)</p>
<p><b>INS0645/K01</b>                  MN: 282 040</p>	 <p>Connector for self-finishing with termination</p> <p>INS0645/RS422</p>
<p><b>INS0540/K01</b>                  MN: 279 538</p>	 <p>PROFIBUS connector for self-finishing with termination</p> <p>INS0540/Profibus (male)</p>
<p><b>INS0541/K01</b>                  MN: 279 539</p>	 <p>PROFIBUS connector for self-finishing with termination (attachable)</p> <p>INS0540/Profibus (male)</p>

Fig. 15-1: MTS-R accessories

## 15.2 Labeling of I/O Modules

A labeling package (SUP-M03-RECO) is available for additionally labeling the RECO02 I/O modules. This package consists of 16 carrier foils, 10 labeling foils with 6 adhesive strips each, and the labeling 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 labeling foil in A4 size.

The moisture-resistant labeling foils (SUP-M02-RECO) are suitable for labeling with a commercially available laser printer. The adhesive foils are labeled by means of the enclosed labeling program, which is designed on Word basis and permits labeling of 1 to 6 modules per labeling 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 labeling 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
Labeling foil	SUP-M02-RECO	281 696
Labeling package	SUP-M03-RECO	286 977

Fig. 15-2: Labeling accessories

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## 17 Service & Support

### 17.1 Helpdesk

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- telefonisch: **+49 (0) 9352 40 50 60**  
über Service Call Entry Center Mo-Fr 07:00-18:00
- per Fax: **+49 (0) 9352 40 49 41**
- per e-Mail: **service@indramat.de**

Our service helpdesk at our headquarters in Lohr am Main, Germany can assist you in all kinds of inquiries. Contact us

- by phone: **+49 (0) 9352 40 50 60**  
via Service Call Entry Center Mo-Fr 7:00 am - 6:00 pm
- by fax: **+49 (0) 9352 40 49 41**
- by e-mail: **service@indramat.de**

### 17.2 Service-Hotline

Außerhalb der Helpdesk-Zeiten ist der Service direkt ansprechbar unter

oder **+49 (0) 171 333 88 26**  
**+49 (0) 172 660 04 06**

After helpdesk hours, contact our service department directly at

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**+49 (0) 172 660 04 06**

### 17.3 Internet

Unter [www.boschrexroth.de](http://www.boschrexroth.de) finden Sie ergänzende Hinweise zu Service, Reparatur und Training sowie die **aktuellen** Adressen \*) unserer auf den folgenden Seiten aufgeführten Vertriebs- und Servicebüros.

- Verkaufsniederlassungen
- Niederlassungen mit Kundendienst

Außerhalb Deutschlands nehmen Sie bitte zuerst Kontakt mit unserem für Sie nächstgelegenen Ansprechpartner auf.

\*) Die Angaben in der vorliegenden Dokumentation können seit Drucklegung überholt sein.

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- sales agencies
- offices providing service

Please contact our sales / service office in your area first.

\*) Data in the present documentation may have become obsolete since printing.

### 17.4 Vor der Kontaktaufnahme... - Before contacting us...

Wir können Ihnen schnell und effizient helfen wenn Sie folgende Informationen bereithalten:

1. detaillierte Beschreibung der Störung und der Umstände.
2. Angaben auf dem Typenschild der betreffenden Produkte, insbesondere Typenschlüssel und Seriennummern.
3. Tel./Faxnummern und e-Mail-Adresse, unter denen Sie für Rückfragen zu erreichen sind.

For quick and efficient help, please have the following information ready:

1. Detailed description of the failure and circumstances.
2. Information on the type plate of the affected products, especially type codes and serial numbers.
3. Your phone/fax numbers and e-mail address, so we can contact you in case of questions.

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