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Operator panel
BTA15.1

Project Planning Manual

SYSTEM200

DOK-SUPPL*-BTA15.1****-PR01-EN-P

Rexroth
Indramat

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Purpose of Documentation This documentation describes …
- the hardwarefunctions of the BTA15
- the technical datas
- how connecting a BTA15

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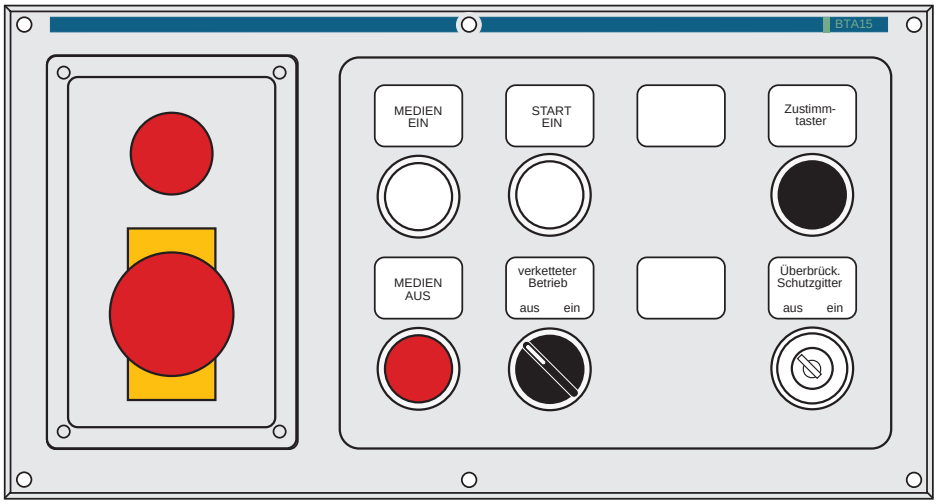
1 System Presentation

1.1 Brief Description



BTA15_Front.FH7

Fig. 1-1: BTA15 Front view

The BTA15 was especially designed for use in conjunction with the BTV05/06. In this way, a suitable machine control panel consisting of three components is provided for the user. This panel can be equipped as needed and ordered according to project requirements.

1.2 Exceptional Features

Minimum wiring with high flexibility

Wiring is reduced to a minimum due to the slots for 22,5mm standard built-in components of the ZB2 series of Telemecanique. Subsequently mounted circuit elements are directly connected to the INTERBUS. The right auxiliary contact can be wired potential free by jumpers if needed.

30-pin socket

All contacts required for the hard-wired connection are available on three 10 pin socket (X1-X3). These are:

- Emergency Stop,
- acknowledge circuit and
- a potential free contact of each standard built-in component, which can be connected from the bus to the socket via jumper.

Freely-configurable modules

Two emergency stop and three acknowledge circuits (for manual control units) are available on both module slots. Each module can be mounted left or right.

Integrated INTERBUS connection

The built-in INTERBUS adapter contains the entire, active electronics on a single printed circuit board. The BTA15 uses an I/O width of 3 words. Eight potential free 24V inputs and outputs are available for external connections (for example signal lamps, etc.).

Potential-free interface converter

The integrated interface converter serves the connection of the MTS-P's serial RS232 interface with the RS422 interfaces of the small human machine interface BTV05 or the manual control unit BTC06 without the need to equip the MTS-P with in additional interface board.

2 Important directions for use

2.1 Appropriate use

Introduction

Rexroth Indramat 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.

Note: Rexroth Indramat, 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.

Before using Rexroth Indramat 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 BTA15.1 is a suitable machine control panel provided for the user. This panel can be equipped as needed and ordered according to project requirements. The BTA15.1 terminal made by Rexroth Indramat is designed for use in the following cases:

- To operate control units of a machine.
- In especially realisations to connect a manual control unit BTC06.

Note: The BTA15.1 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.

Available for an application-specific use of the terminals are unit types with differing drive power and different interfaces.

Typical areas of application of a BTA15.1 are:

- lathes
- milling machines and
- machining centers.

The BTA15.1 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 motors 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 terminals may not be used if

- they are 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
- Rexroth Indramat has not specifically released them for that intended purpose. Please note the specifications outlined in the general Safety Instructions!

3 Safety Instructions for Electric Servo Drives and Controls

3.1 Introduction

Read these instructions before the equipment is used and eliminate the risk of personal injury or property damage. Follow these safety instructions at all times.

Do not attempt to install, use or service 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 Rexroth Indramat representative to send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

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

WARNING

Inappropriate 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 product damage, personal injury, severe electrical shock or death!

3.2 Explanations

The safety warnings in this documentation describe individual degrees of hazard seriousness in compliance with ANSI:

Warning symbol with signal word	Degree of hazard seriousness The degree of hazard seriousness describes the consequences resulting from non-compliance with the safety guidelines.
 **DANGER**	Bodily harm or product damage will occur.
 **WARNING**	Death or severe bodily harm may occur.
 **CAUTION**	Death or severe bodily harm may occur.

Fig. 3-1: Classes of danger with ANSI

3.3 Hazards by inappropriate use

DANGER

High voltage and high discharge current! Danger to life, risk of severe electrical shock and risk of injury!

DANGER

Dangerous movements! Danger to life and risk of injury or equipment damage by unintentional motor movements!

WARNING

High electrical voltage due to wrong connections! Danger to life, severe electrical shock and severe bodily injury!

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 inappropriate handling! Bodily injury caused by crushing, shearing, cutting and mechanical shock or improper handling of pressurized systems!

CAUTION

Risk of injury due to inappropriate handling of batteries!

3.4 General Information

- Rexroth Indramat GmbH is not liable for damages resulting from failure to observe the warnings given in these documentation.
- Order operating, maintenance and safety instructions in your language before starting up the machine. If you find that due to a translation error you can not 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.
- Trained and qualified personnel in electrical equipment:
  Only trained and qualified personnel may work on this equipment or within its proximity. Personnel are qualified if they have sufficient knowledge of the assembly, installation and operation of the product as well as an understanding of all warnings and precautionary measures noted in these instructions.
  Furthermore, they should be trained, instructed and qualified to switch electrical circuits and equipment on and off, to ground them and to mark them according to the requirements of safe work practices and common sense. 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 on commercial machinery.

European countries: see directive 89/392/EEC (machine guideline).

- The ambient conditions given in the product documentation must be observed.
- Use only safety features that are clearly and explicitly approved in the Project Planning manual.
  For example, the following areas of use are not allowed: Construction cranes, Elevators used for people or freight, Devices and vehicles to transport people, Medical applications, Refinery plants, the transport of hazardous goods, Radioactive or nuclear applications, Applications sensitive to high frequency, mining, food processing, Control of protection equipment (also in a machine).
- Start-up is only permitted once it is sure that the machine, in which the product is installed, complies with the requirements of national safety regulations and safety specifications of the application.
- 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 INDRAMAT document "EMC in Drive and Control Systems”.
  The machine builder is responsible for compliance with the limiting values as prescribed in the national regulations and specific EMC regulations for the application.

European countries: see Directive 89/336/EEC (EMC Guideline).

U.S.A.: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

- Technical data, connections and operational conditions are specified in the product documentation and must be followed at all times.

3.5 Protection against contact with electrical parts

Note: This section refers to equipment with voltages above 50 Volts.

Making contact with parts conducting voltages above 50 Volts could be dangerous to personnel and cause an electrical shock. When operating electrical equipment, it is unavoidable that some parts of the unit conduct dangerous voltages.

DANGER

High electrical voltage! Danger to life, severe electrical shock and severe bodily injury!

⇒ 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 electrical 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 if the ground wire is not permanently connected, even for brief measurements or tests.

⇒ Before working with electrical parts with voltage potentials higher than 50 V, the equipment must be disconnected from the mains voltage or power supply.

⇒ The following should be observed with electrical drives, power supplies, and filter components:

Wait five (5) minutes after switching off power to allow capacitors to discharge before beginning work. Measure the voltage on the capacitors before beginning 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 (r.c.d.) must not be used on an electric drive! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.

⇒ Equipment that is built into machines must be secured against direct contact. Use appropriate housings, for example a control cabinet.

European countries: according to EN 50178/1998, section 5.3.2.3.

U.S.A: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA) and local building codes. The user of this equipment must observe the above noted instructions at all times.

To be observed with electrical drives, power supplies, and filter components:

DANGER

High electrical voltage! High leakage current! Danger to life, danger of injury and bodily harm from electrical shock!

⇒ Before switching on power for electrical units, all housings and motors must be permanently grounded according to the connection diagram. This applies even for brief tests.

⇒ Leakage current exceeds 3.5 mA. Therefore the electrical equipment and units must always be firmly connected to the supply network.

⇒ Use a copper conductor with at least 10 mm² cross section over its entire course for this protective connection!

⇒ Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. High voltage levels can occur on the housing that could lead to severe electrical shock and personal injury.

European countries: EN 50178/1998, section 5.3.2.1.

USA: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must maintain the above noted instructions at all times.

3.6 Protection by protective low voltage (PELV) against electrical shock

All connections and terminals with voltages between 5 and 50 Volts on INDRAMAT products are protective low voltages designed in accordance with the following standards on contact safety:

- International: IEC 364-4-411.1.5
- EU countries: see EN 50178/1998, section 5.2.8.1.

WARNING

High electrical voltage due to wrong connections! Danger to life, severe electrical shock and severe bodily injury!

⇒ Only equipment, electrical components and cables of the protective low voltage type (PELV = Protective Extra Low Voltage) may be connected to all terminals and clamps with 0 to 50 Volts.

⇒ Only safely isolated voltages and electrical circuits may be connected. 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 or the connected motors. These causes are be various such as:

- unclean or wrong wiring of cable connections
- inappropriate or wrong operation of equipment
- malfunction of sensors, encoders and monitoring circuits
- defective components
- software errors

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

The monitors in the drive components make faulty operation almost impossible. Regarding personnel safety, especially the danger of bodily harm and property damage, this alone should not be relied upon to ensure complete safety. Until the built-in monitors become active and effective, it must be assumed in any case that some faulty drive movements will occur. The extent of these faulty drive movements depends upon the type of control and the state of operation.

DANGER

Dangerous movements! Danger to life and risk of injury or equipment damage!

⇒ Personnel protection must be secured for the above listed reason by means of superordinate monitors or measures.

These are instituted in accordance with the specific situation of the facility and a danger and fault analysis conducted by the manufacturer of the facility. All the safety regulations that apply to this facility are included therein. By switching off, circumventing or if safety devices have simply not been activated, then random machine movements or other types of faults can occur.

Avoiding accidents, injury or property damage:

⇒ Keep free and clear of the machine's range of motion and moving parts. Prevent people from accidentally entering the machine's range of movement:

- use protective fences
- use protective railings
- install protective coverings
- install light curtains or light barriers

⇒ Fences must be strong enough to withstand maximum possible momentum.

⇒ Mount the emergency stop switch (E-stop) 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 start-inhibit system to prevent unintentional start-up.

⇒ Make sure that the drives are brought to standstill before accessing or entering the danger zone.

⇒ Secure vertical axes against falling or slipping after switching off the motor power by, for example:

- Mechanically securing the vertical axes
- Adding an external brake / clamping mechanism
- Balancing and thus compensating for the vertical axes mass and the gravitational force

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

⇒ 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

⇒ Avoid operating high-frequency, remote control and radio equipment near electronics circuits and supply leads. If use of such equipment cannot be avoided, verify the system and the plant for possible malfunctions at all possible positions of normal use before the first start-up. If necessary, perform a special electromagnetic compatibility (EMC) test on the plant.

3.8 Protection against magnetic and electromagnetic fields during operations and mounting

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

WARNING

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

⇒ Persons with pacemakers, metal implants and hearing aids are not permitted to enter 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 pacemaker to enter such an area, then a physician must be consulted prior to doing so. Pacemaker, that are already implanted or will be implanted in the future, have a considerable deviation in their resistance to interference. Due to the unpredictable behavior 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 surfaces near the source of heat! Danger of burns!

⇒ Wait ten (10) minutes before you access any hot unit. Allow the unit to cool down.

⇒ Do not touch hot parts of the equipment, such as housings, heatsinks or resistors. Danger of burns!

3.10 Protection during handling and installation

Under certain conditions unappropriate handling and installation of parts and components may cause injuries.

CAUTION

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

⇒ Observe general instructions and safety regulations during handling installation.

⇒ Use only appropriate lifting or moving 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.

⇒ Wear appropriate protective clothing, e.g. safety glasses, safety shoes and safety gloves.

⇒ Never stay under suspended loads.

⇒ Clean up liquids from the floor immediately to prevent personnel from slipping.

3.11 Battery safety

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

CAUTION

Risk of injury through incorrect handling!

⇒ Do not attempt to reactivate discharged batteries by heating or other methods (danger of explosion and corrosion).

⇒ Never charge batteries (danger from leakage and explosion).

⇒ Never throw batteries into a fire.

⇒ Do not dismantle batteries.

⇒ Handle with care. Incorrect extraction or installation of a battery can damage equipment.

Note: 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 refuse. Observe the legal requirements given in the country of installation.

3.12 Protection against pressurized Systems

Certain Motors (ADS, ADM, 1MB etc.) and drives, corresponding to the information in the Project Planning manual, must be provided with and remain under a forced load such as compressed air, hydraulic oil, cooling fluid or coolant. In these cases, improper handling of the supply of the pressurized systems or connections of the fluid or air under pressure can lead to injuries or accidents.

CAUTION

Danger of injury when pressurized systems are handled by untrained personnel!

⇒ Do not attempt to disassemble, to open or to cut a pressurized system.

⇒ Observe the operation restrictions of the respective manufacturer.

⇒ Before the disassembly of pressurized systems, lower pressure and drain off the fluid or gas.

⇒ Use suitable protective clothing (for example protective eyewear, safety shoes and gloves)

⇒ Remove any fluid that has leaked out onto the floor immediately.

Note: Environmental protection and disposal! The fluids used in the operation of the pressurized system equipment is not environmentally compatible. Fluid that is damaging to the environment must be disposed of separate from normal waste. Observe the national specifications of the country of installation.

4 Module Layout, Address Assignments

4.1 Base Module

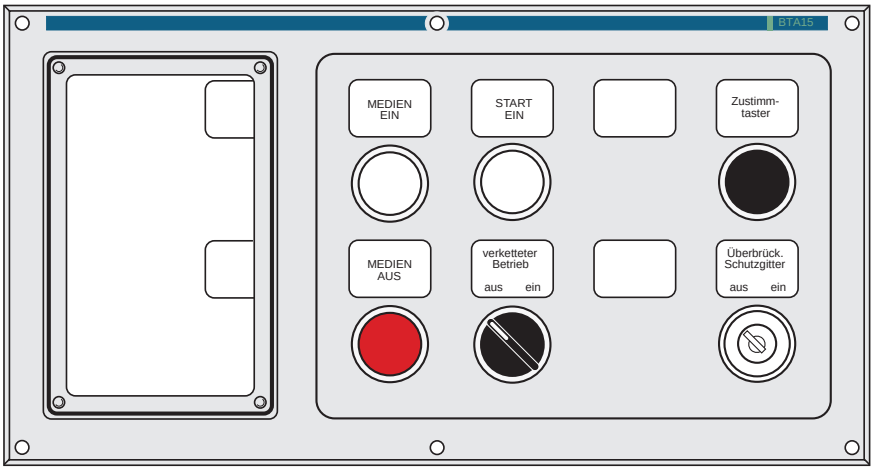


Fig. 4-1: BTA15 Basic module

The BTA15 base module permits a maximum of eight standard switching elements of the Telemecanique **ZB2-B...** program to be inserted (any elements). Each element features a maximum of two contacts and one indicator lamp. All knockouts in the front panel are pre-milled to 0.5 mm. The next section explains how such a knockout can be opened. Insert strips provide for key labeling.

Instructions for installing additional switches

ESD – electrostatic sensitive components!

⇒ Whenever you work in the open unit, your working position and the employed tools must comply with the ESD protective measures.

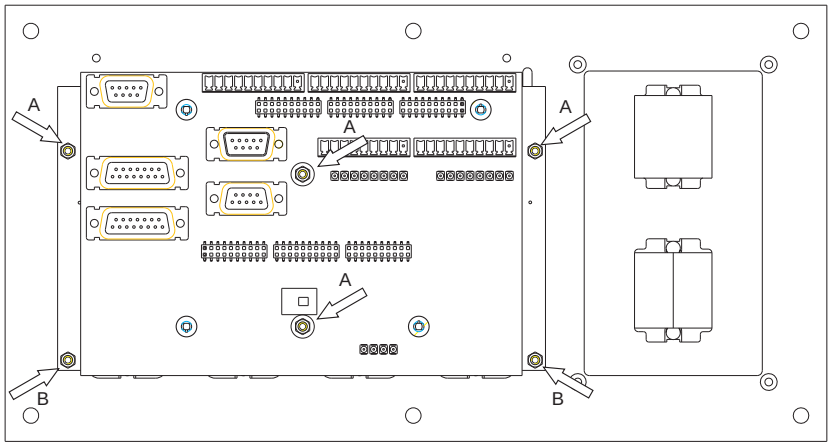
To insert an additional switch element in the front of the BTA15.3 unit, use the following procedure:

1. Unscrew the enclosure from the unit.
2. Dismantle the electronics unit.

a) Use a 5.5-mm socket wrench to loosen the six spacing bolts A and B (see Fig. 4-2).

Caution: There are different lengths !

b) Remove the electronics block with the LK-BIB and the main board.



A= spacing bolts M3 x 13,5
B= spacing bolts M3 x 18

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Fig. 4-2: Location of the spacing bolts

Note: Removing the electronics part is an important step. Removing the knockouts may produce chips that can be the cause of malfunctions.

3. Use a knife (scalpel) to cut the front film in the shape of the pre-milled knockout contour (see Fig. 4-3)

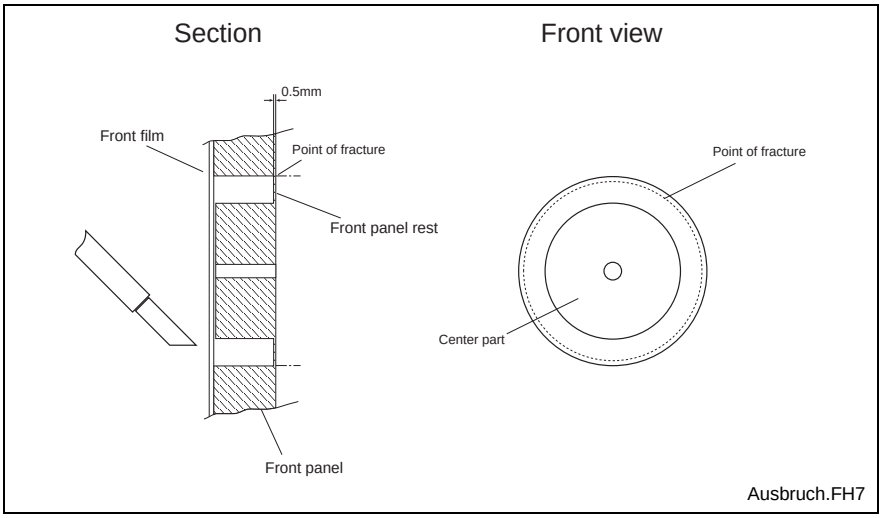

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Fig. 4-3: Front panel cross section

4. Using a knife, slightly scratch along the pre-milled front panel contour (0.5 mm thick).
5. Use your thumb to knock out the center part.
6. Remove the resulting burr and clean the chips off the front panel.
7. Insert the required front panel element (pushbutton, lamp, key switch) and screw it tight.
8. Plug the required switching elements (NC/NO contacts) onto the main board, and select the jumper positions for internal or external mode of the right-hand switching element.
9. Position the board block onto the switching elements.
10. Tighten the six spacing bolts.
11. Position the enclosure and tighten the retaining screws.

Main board configuration

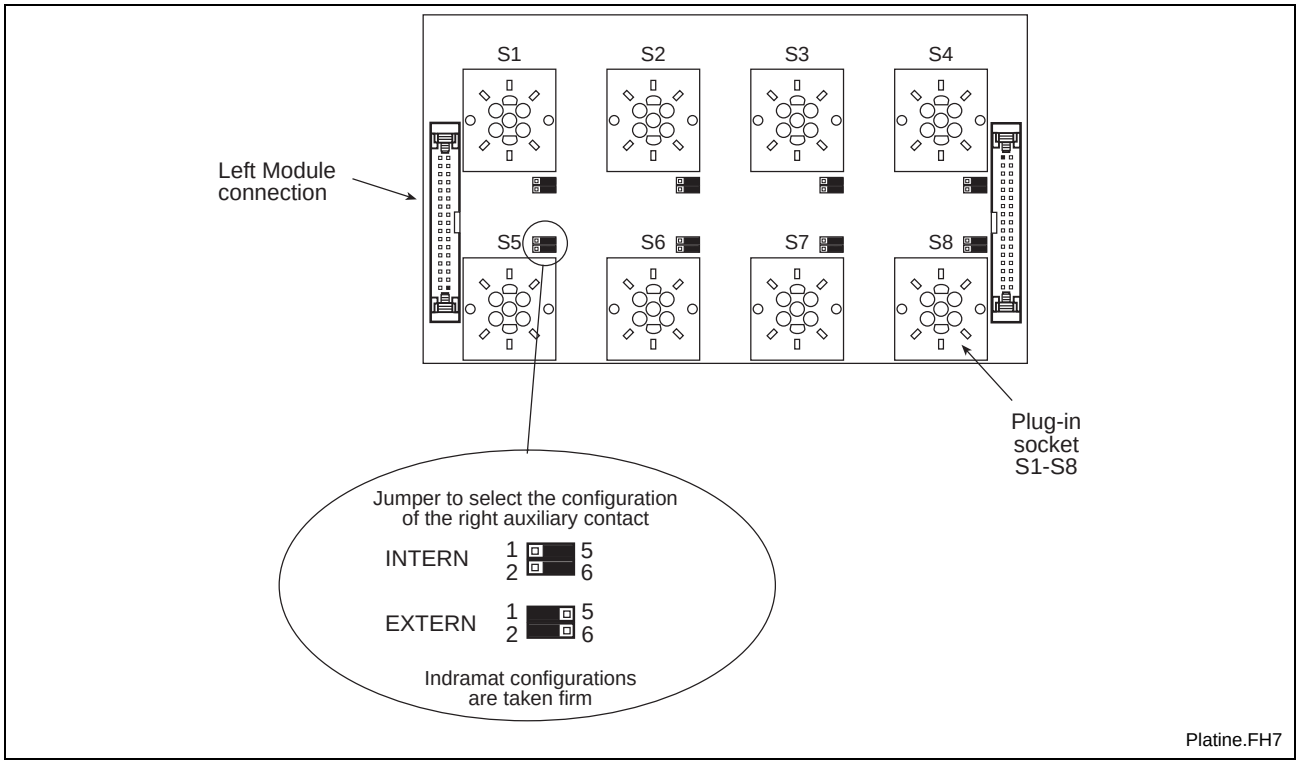


Fig. 4-4: Main board

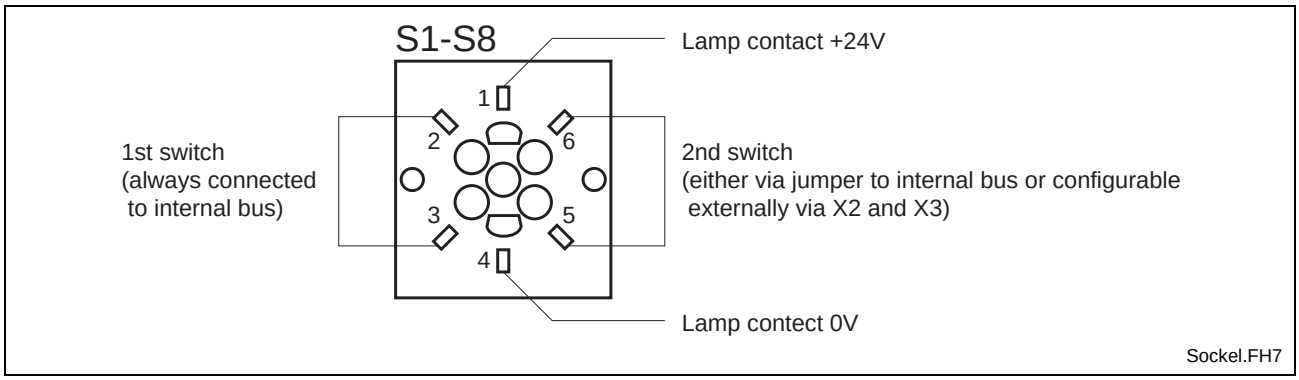


Fig. 4-5: Plug-in socket

The main board is equipped with eight plug-in sockets. Such a socket features two locations for switching contacts (NC/NO contacts) or lamp contacts. The first contact is used for internal bus operation. To support external wiring, jumpers permit the right-hand auxiliary contact of each switch to be set to either bus interface (internal) or X2 and X3 terminal bar (external). Illumination elements are controlled via pins 1 and 4 (as shown in the Figure).

Addressing

Outputs

Position	Address
Lamp S1	Q*0.0
Lamp S2	Q*0.1
Lamp S3	Q*0.2
Lamp S4	Q*0.3
Lamp S5	Q*0.4
Lamp S6	Q*0.5
Lamp S7	Q*0.6
Lamp S8	Q*0.7

Fig. 4-6: Lamp addresses within the basic module

Inputs

Circuit Element / Location	Address
S 1-left aux. contact	I*6.0
S 1-right aux. contact	I*6.1
S 2-left aux. contact	I*6.2
S 2-right aux. contact	I*6.3
S 3-left aux. contact	I*6.4
S 3-right aux. contact	I*6.5
S 4-left aux. contact	I*6.6
S 4-right aux. contact	I*6.7
S 5-left aux. contact	I*7.0
S 5-right aux. contact	I*7.1
S 6-left aux. contact	I*7.2
S 6-right aux. contact	I*7.3
S 7-left aux. contact	I*7.4
S 7-right aux. contact	I*7.5
S 8-left aux. contact	I*7.6
S 8-right aux. contact	I*7.7

Fig. 4-7: Addresses of the circuit elements with the basic module

Interface converter

In the normal state of the BTA15.1, the X8A and X9 connectors provide RS422 communication capability. The interface converter enables the data exchange between a BTC06 manual control unit or an PLC to be organized.

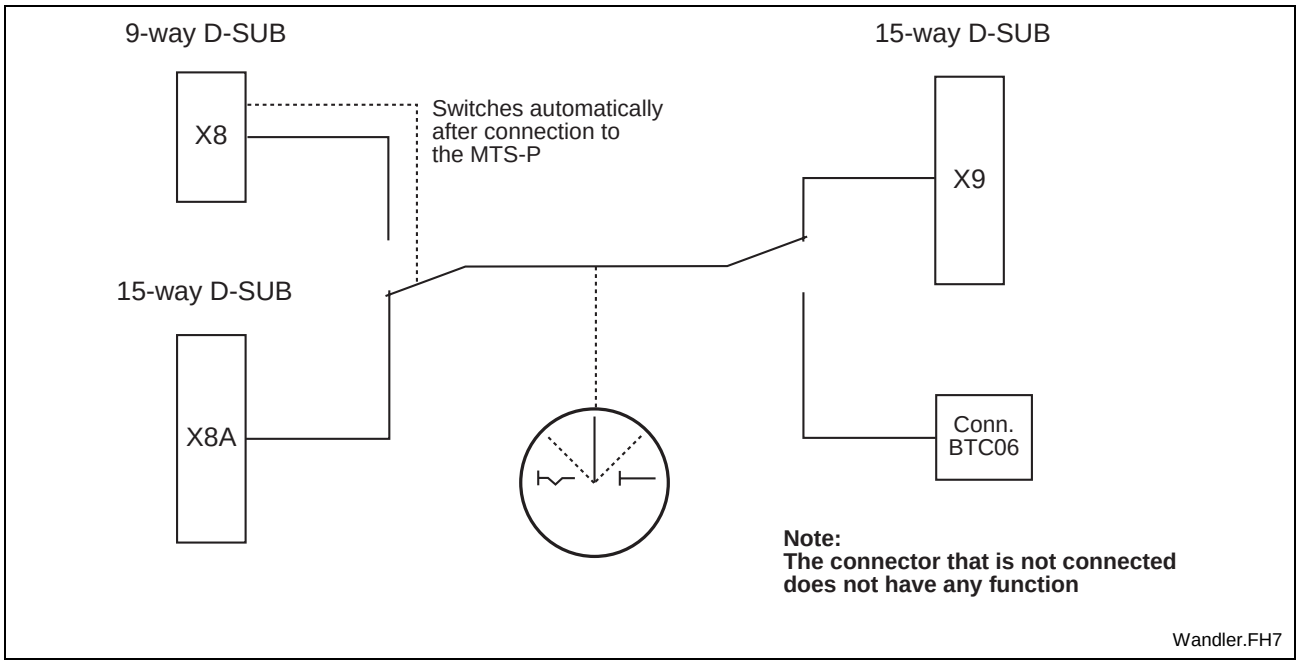


Fig. 4-8: Switching principle of the interface converter

As shown in the Figure, the converter has a switching function. In its normal position, there is a connection between RS422 IN and RS422 OUT. This means that data can be received and transmitted using the RS422 protocol. The converter will be needed to connect a RS232 port with a RS422 device. If an MTS-P module (PLC plug-in module at the BTV20 unit) is connected to a BTA15.1 unit, the converter automatically switches over and the X8 connection (RS232 IN) becomes operational. A prerequisite is the correct initialization of the MTS-P module. Devices connected to X9 may exchange data with the PLC.

Note: Thus, the X8A (RS422 IN) connector is without a function

Using a BTC06 unit requires the key switch on the NB or VA module. The manual control unit is connected with the SPS when the key switch is in its left-hand position.

Note: In this case, the X9 connector is without a function.

Using a BTC06 manual control unit and maintaining communication with other RS422 devices at the same time is not possible.

4.2 Type NA Emergency Stop Module

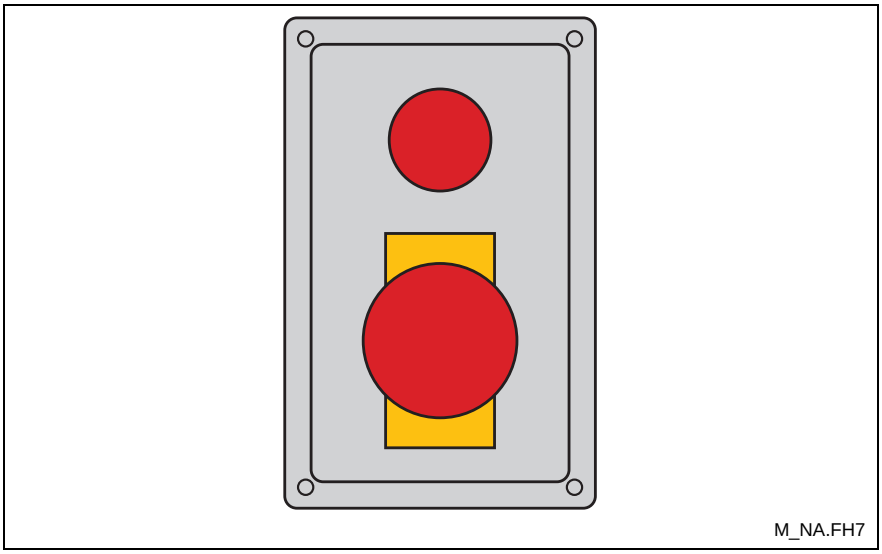


Fig. 4-9: Type NA emergency stop module

The NA emergency stop module possesses an emergency stop switch and a signal lamp that can be switched on via INTERBUS.

From the emergency stop switch, an NC contact is looped into each emergency stop circuit. Another NC contact is connected to the INTERBUS as an auxiliary contact; likewise is the signal lamp.

Addressing of the NA module

Outputs

Location	Address
Lamp	Q*1.0

Fig. 4-10 Address of the signal lamp within the E-stop module

Inputs

Circuit Element / Location	Address
Aux. contact E-stop	I*8.0

Fig. 4-11: Address of the auxiliary contact within the E-stop module

4.3 Type NB Emergency Stop Module

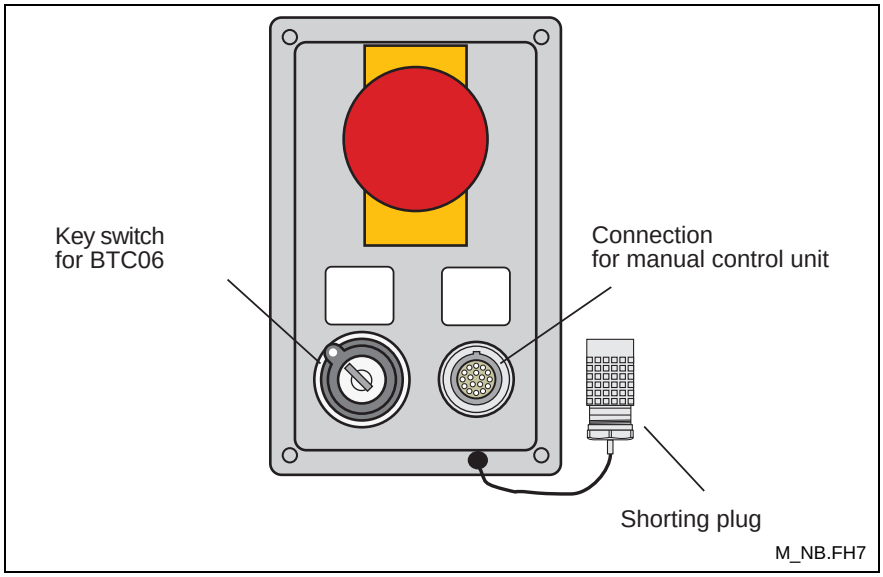


Fig. 4-12: Type NB emergency stop module

In addition to the emergency stop switch, the NB module features a connection for the BTC06 manual control unit, and a key switch that functionally connects the manual control unit (the switch positions are explained in Fig. 4-13).

From the emergency stop button, an NC contact is looped into each of the two emergency stop circuits. Another NC contact is connected to the INTERBUS as an auxiliary contact.

The connection for the manual control unit possesses two emergency stop circuits that are jumpered by the shorting plug during normal operation. When a manual control unit is connected, the emergency stop contacts of the socket are jumpered during the insertion process by setting the adjacent key switch to its right-hand position. This version employs two confirmation circuits; the third one is routed via the key switch.

Switching positions of the key switch

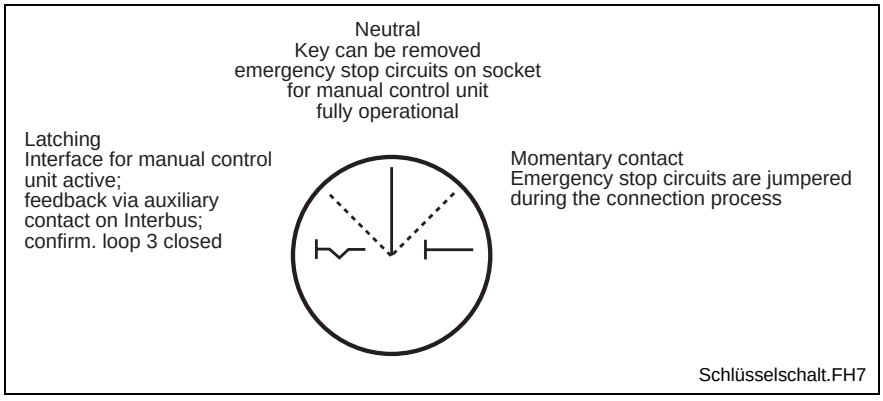


Fig. 4-13: Switching positions of the key switch

Switch for starting the BTC06 manual control unit

For starting a BTC06 manual control unit at the BTA15.1 it is necessary to take the switch on the backside of the unit (see Fig. 4-14) to the correctly position. The switch position **must** always be on module left.

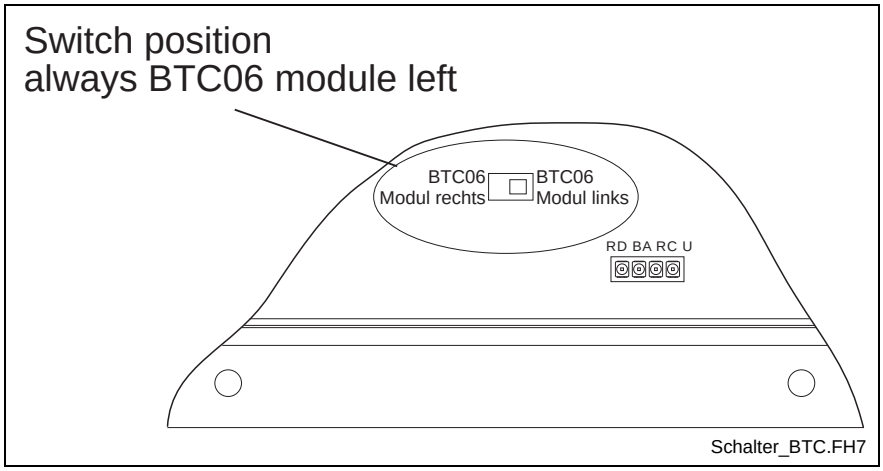


Fig. 4-14: Location of the switch for BTC06 connection

Addressing of the NB module

Inputs

Circuit Element / Location	Address
Aux. contact E-stop	I*8.0
Aux. contact keyswitch	I*8.4

Fig. 4-15: Address of the auxiliary contact within the E-stop module

4.4 Type VA Feed Module

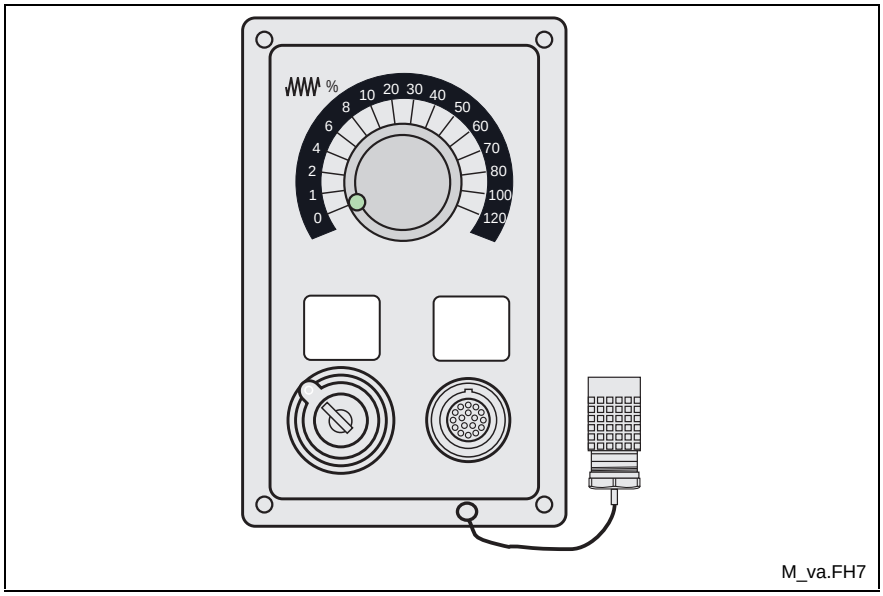


Fig. 4-16: Type VA feed module

This module features a Gray code override switch, a key switch, and a connection for a BTC06 manual control unit.

The connection for the manual control unit possesses two emergency stop circuits that are jumpered by the shorting plug during normal operation. When a manual control unit is connected, the emergency stop contacts of the socket are jumpered during the insertion process by the adjacent key switch. This version employs two confirmation circuits; the third one is routed via the key switch.

Switching positions of the key switch

Chapter 2.3 Emergency Stop Module type NB

Switch for starting the BTC06 manual control unit

Chapter 2.3 Emergency Stop Module type NB

Addressing of the VA module

Inputs

Circuit Element / Location	Address
Override bit 0	I*8.0
Override bit 1	I*8.1
Override bit 2	I*8.2
Override bit 3	I*8.3
Aux. contact keyswitch	I*8.4

Fig. 4-17: Addresses of the feedrate override switch

Gray-code table

The feedrate override switch outputs a 4-bit gray-code signal. The code is assigned to the scale value as shown in the table below:

Scale value	Bit 0	Bit 1	Bit 2	Bit 3
0 %				
1 %	X			
2 %	X	X		
4 %		X		
6 %		X	X	
8 %	X	X	X	
10 %	X		X	
20 %			X	
30 %			X	X
40 %	X		X	X
50 %	X	X	X	X
60 %		X	X	X
70 %		X		X
80 %	X	X		X
100 %	X			X
120 %				X

Fig. 4-18: Gray-code table of the VA module

4.5 Type VB Feed Module

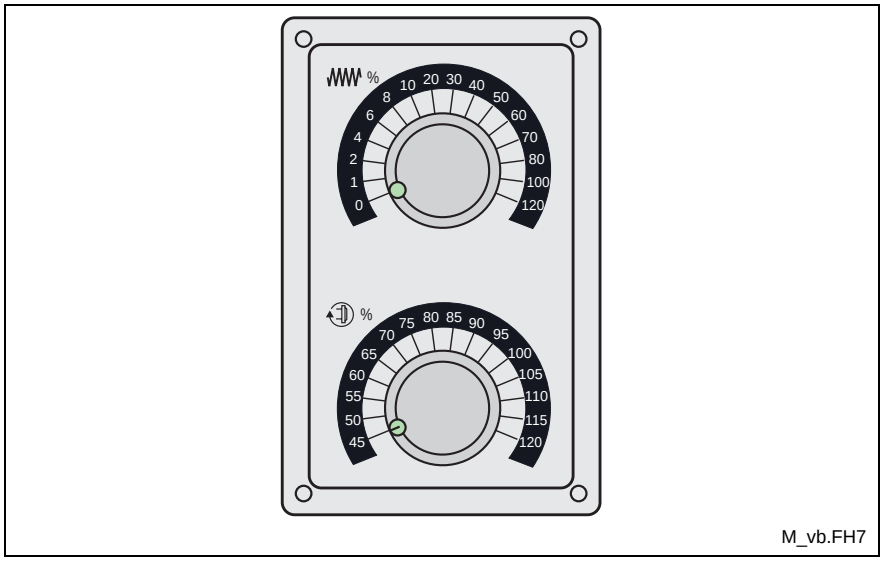


Fig. 4-19: Type VB feed module

This feed module for special machines features two Gray code override switches for feed and spindle.

Addressing of the VB module

Inputs

Circuit Element / Location	Address
Feedrate override bit 0	I*8.0
Feedrate override bit 1	I*8.1
Feedrate override bit 2	I*8.2
Feedrate override bit 3	I*8.3
Spindle override bit 4	I*8.4
Spindle override bit 5	I*8.5
Spindle override bit 6	I*8.6
Spindle override bit 7	I*8.7

Fig. 4-20: Addresses of the feedrate override switch (left)

Gray-code table The both feedrate override switch output a 4-bit gray-code signal. The code is assigned to the scale value as shown in the table below:

Scale value Feed (Bit 0-3)	Scale value Spindle (Bit 4-7)	Bit 0 / 4	Bit 1 / 5	Bit 2 / 6	Bit 3 / 7
0 %	45 %				
1 %	50 %	X			
2 %	55 %	X	X		
4 %	60 %		X		
6 %	65 %		X	X	
8 %	70 %	X	X	X	
10 %	75 %	X		X	
20 %	80 %			X	
30 %	85 %			X	X
40 %	90 %	X		X	X
50 %	95 %	X	X	X	X
60 %	100 %		X	X	X
70 %	105 %		X		X
80 %	110 %	X	X		X
100 %	115 %	X			X
120 %	120 %				X

Fig. 4-21: Gray-code table of the VB module

5 Bus systems

5.1 Overview

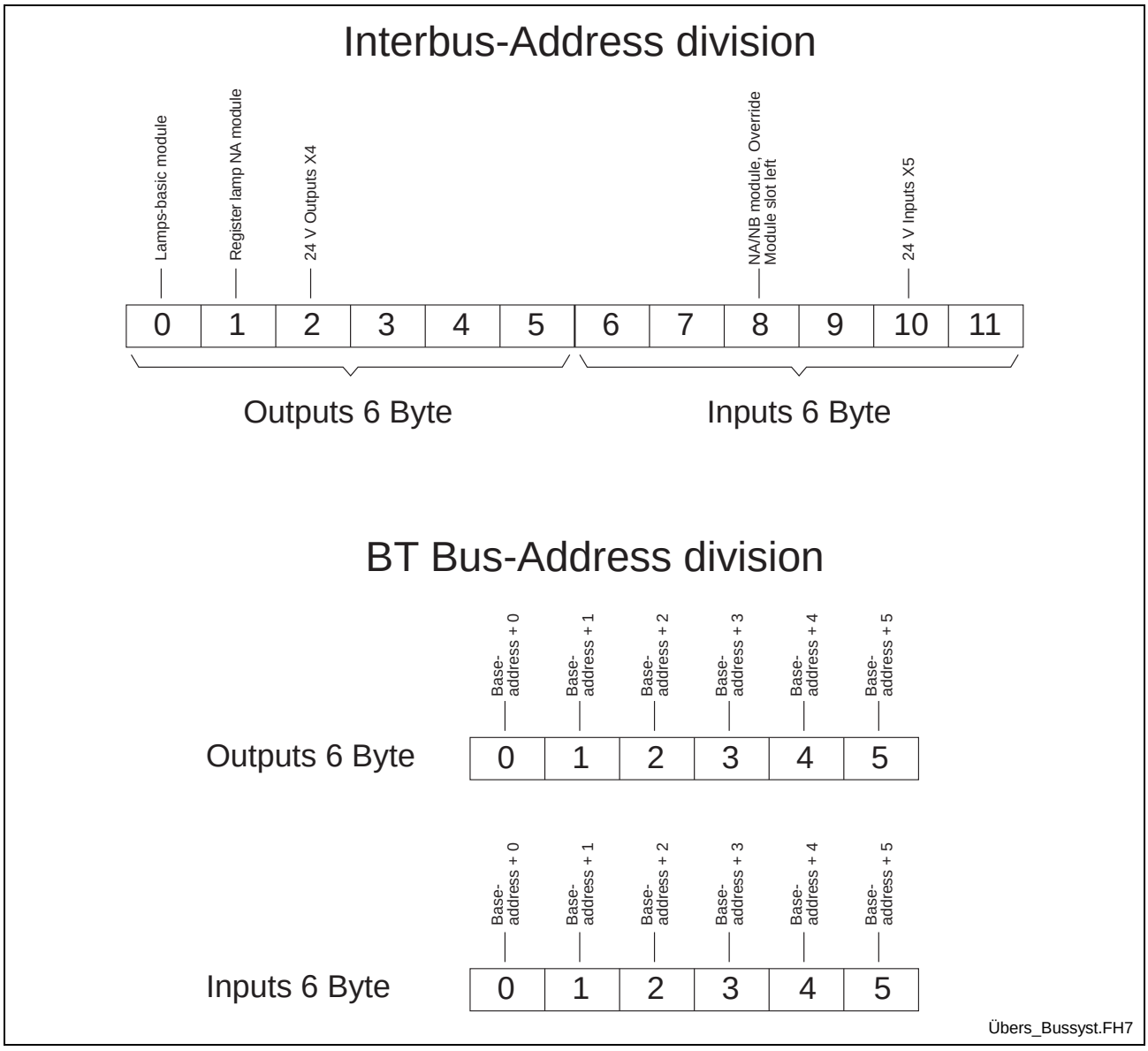


Fig. 5-1: Overview of the bus systems address divisions

5.2 INTERBUS-S

Characteristics of the INTERBUS Module

- INTERBUS-S ID-code 3 (Digital devices with inputs and outputs)
- Remote bus, 500 Kbaud with 2 conductors
- Three words data width of the module, i.e., 48 Bit.
  24 outputs, 40 inputs
- 24 Volt level for all inputs,
  32 inputs for internal modules and switching devices without physical separation,
  further 8 physically separated inputs (input byte 4) on a 9 pin terminal (X5) of the INTERBUS module.
- All 24 outputs at 24 Volt level,
  16 outputs for internal indicator lights and modules
  further 8 outputs as physically separated external outputs on a 10 pin terminal (X4) of the INTERBUS module.

Status Displays

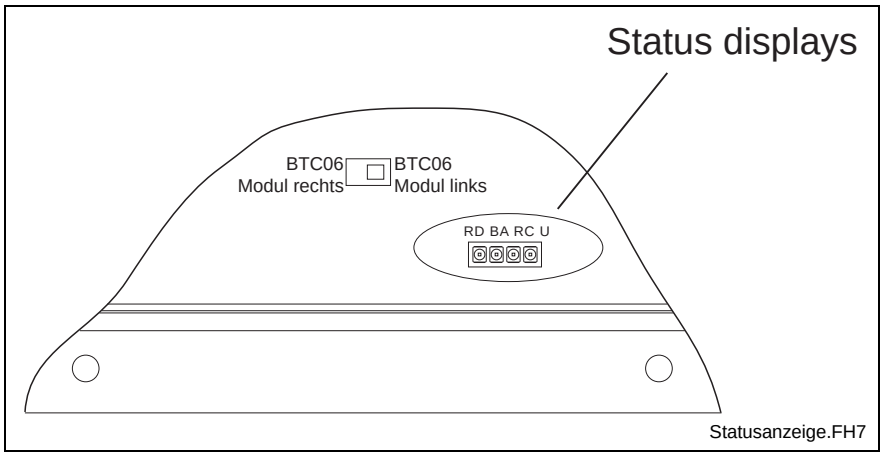


Fig. 5-2: Location of the status displays

LED	Meaning
RD, red	Remote bus disable is ON, if the remote bus is switched off.
BA, green	Bus active ON, if an INTERBUS-S transmission takes place.
RC, green	Remote bus check - monitoring of the incoming INTERBUS cable (X6). RC ON if the link is O.K. RC OFF in case of INTERBUS-S reset by the control
U, green	Supply voltage applied

Fig. 5-3: INTERBUS-S status LEDs

5.3 BT Bus

The BT bus can be used to connect up to four operator terminals of type BTM15/16 or BTA15. 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.

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. 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
BTA15	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.

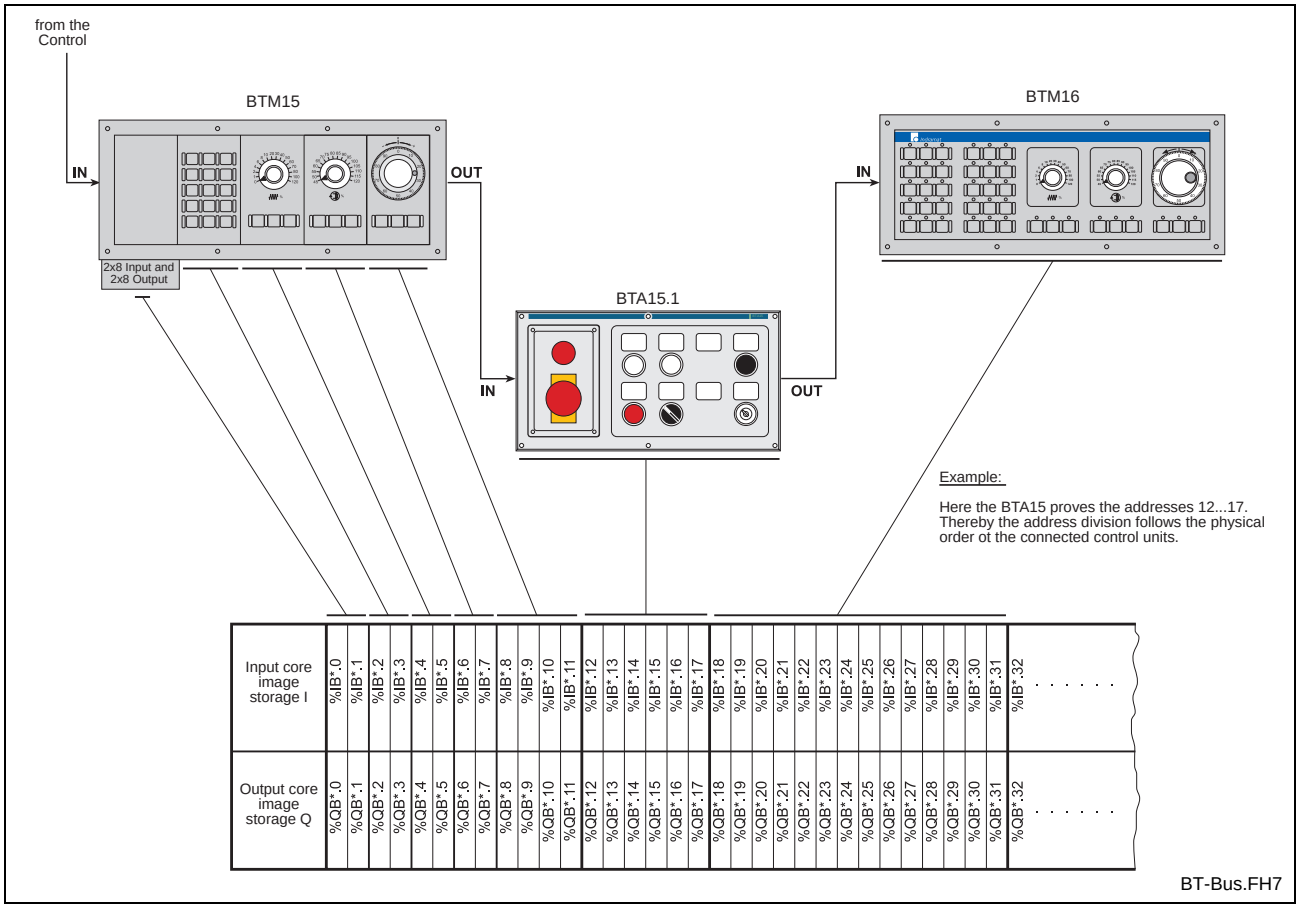


Fig. 5-5: Storage assignment of BT bus

6 Technical Data

6.1 General Technical Data

Weight	Approx. 2,2 kg	
Protection	Front plate, basic module IP65 Housing IP20 DIN40 050, IEC 529	
Maximum ambient temperature	Operation	+5°C to +45°C
	Transportation	-20°C to +60°C
Air pressure (Operation)	860 to 1060 hPa, 1500 m	
Max. heat dissipation	Approx. 10 W	
Front plate surface	Varnished aluminum and holohedrally let in polyester foil resistant against chemicals	
Color	RAL 7035 light gray	
24V inputs	U_{IN} = typ. 18-30V potential free	
	I_{IN} = min. 7mA	
24V outputs	U_{OUT} = typ. 18-30V potential free	
	I_{OUT} = typ. 200mA	
Max. internal current absorption	I_{Max} = approx. 1mA (with 8 lamps equipped)	
Acknowledge circuits	Rated voltage:	24V DC / 42 V AC
	Rated current	2A DC / 3A AC
Emergency Stop	Rated voltage:	24V DC / 42 V AC
	Rated current:	2A DC / 3A AC

6.2 Interface Converter

Baudrate	0 to 38400 Baud
Input voltage RS232	±5 to ±12V
Output voltage RS422/485	0/5 V, 5V diff., max. 60mA
+5V Output for bus connection	max. 50mA

7 Connections

7.1 Location of the Terminal Connectors

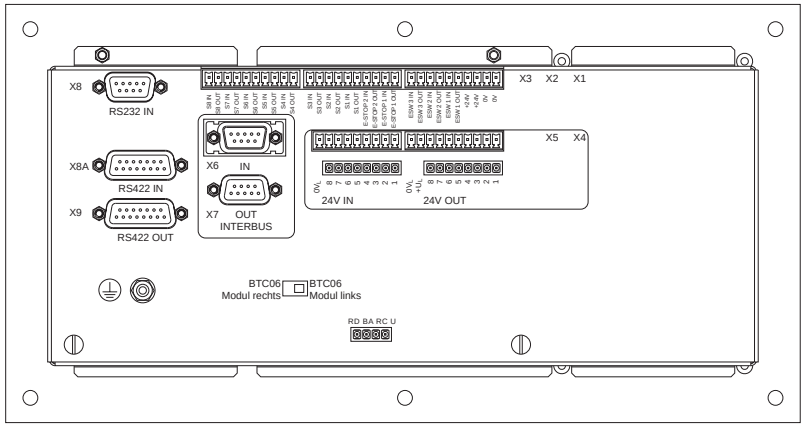


Fig. 7-1: Location of the terminal connectors

7.2 24V Outputs X4 (potential free)

Addressing

Terminal	Address
X4 - 1	O *.2.0
X4 - 2	O *.2.1
X4 - 3	O *.2.2
X4 - 4	O *.2.3
X4 - 5	O *.2.4
X4 - 6	O *.2.5
X4 - 7	O *.2.6
X4 - 8	O *.2.7

Fig. 7-2: Addressing of the 24V outputs (X4)

7.3 24V Inputs X5 (potential free)

Addressing

Terminal	Address
X5 - 1	I *.10.0
X5 - 2	I *.10.1
X5 - 3	I *.10.2
X5 - 4	I *.10.3
X5 - 5	I *.10.4
X5 - 6	I *.10.5
X5 - 7	I *.10.6
X5 - 8	I *.10.7

Fig. 7-3: Addressing of the 24V inputs (X5)

7.4 INTERBUS-S Interface IN (X6)

Pin	Signal	Pin	Signal
1	DO1 Data Out 1	2	DI1 Data in 1
3	GND	4	N. C.
5	N. C.	6	/DO1 Data Out 1
7	/DI1 Data in 1	8	N. C.
9	N. C.		

Fig. 7-4: INTERBUS IN (X6)

7.5 INTERBUS-S Interface OUT (X7)

Pin	Signal	Pin	Signal
1	DO2 Data Out 2	2	DI2 Data in 2
3	GND	4	N. C.
5	+ 5 V out	6	/DO2 Data Out 2
7	/DI2 Data in 2	8	N. C.
9	RBST		

Fig. 7-5: INTERBUS OUT (X7)

7.6 Interface RS232 IN (X8)

Pin	Signal	Pin	Signal
1	Shield	2	/TxD
3	/RxD	4	DTR
5	GND	6	
7	RTS	8	
9			

Fig. 7-6: RS232 pin assignment X8

The interface converter's RS232 input is directly wired (socket and plug) to the MTS-P's modem interface.

7.7 Interface RS422 IN (X8A)

Pin	Signal	Pin	Signal
1	Shield	2	N. C.
3	N. C.	4	RS422 RxD+
5	RS422 RxD-	6	N. C.
7	Signal Ground	8	N. C.
9	RS422 TxD+	10	Ground
11	RS422 TxD-	12	+5 V out
13	N. C.	14	N. C.
15	N. C.		

Fig. 7-7: RS422 pin assignment X8A

7.8 Interface RS422 OUT (X9)

Pin	Signal	Pin	Signal
1	Shield	2	N. C.
3	N. C.	4	RS422 RxD+
5	RS422 RxD-	6	N. C.
7	Signal Ground	8	N. C.
9	RS422 TxD+	10	Ground
11	RS422 TxD-	12	+5 V out
13	N. C.	14	N. C.
15	N. C.		

Fig. 7-8: RS422 pin assignment X9

7.9 Terminal Connectors X1...X3

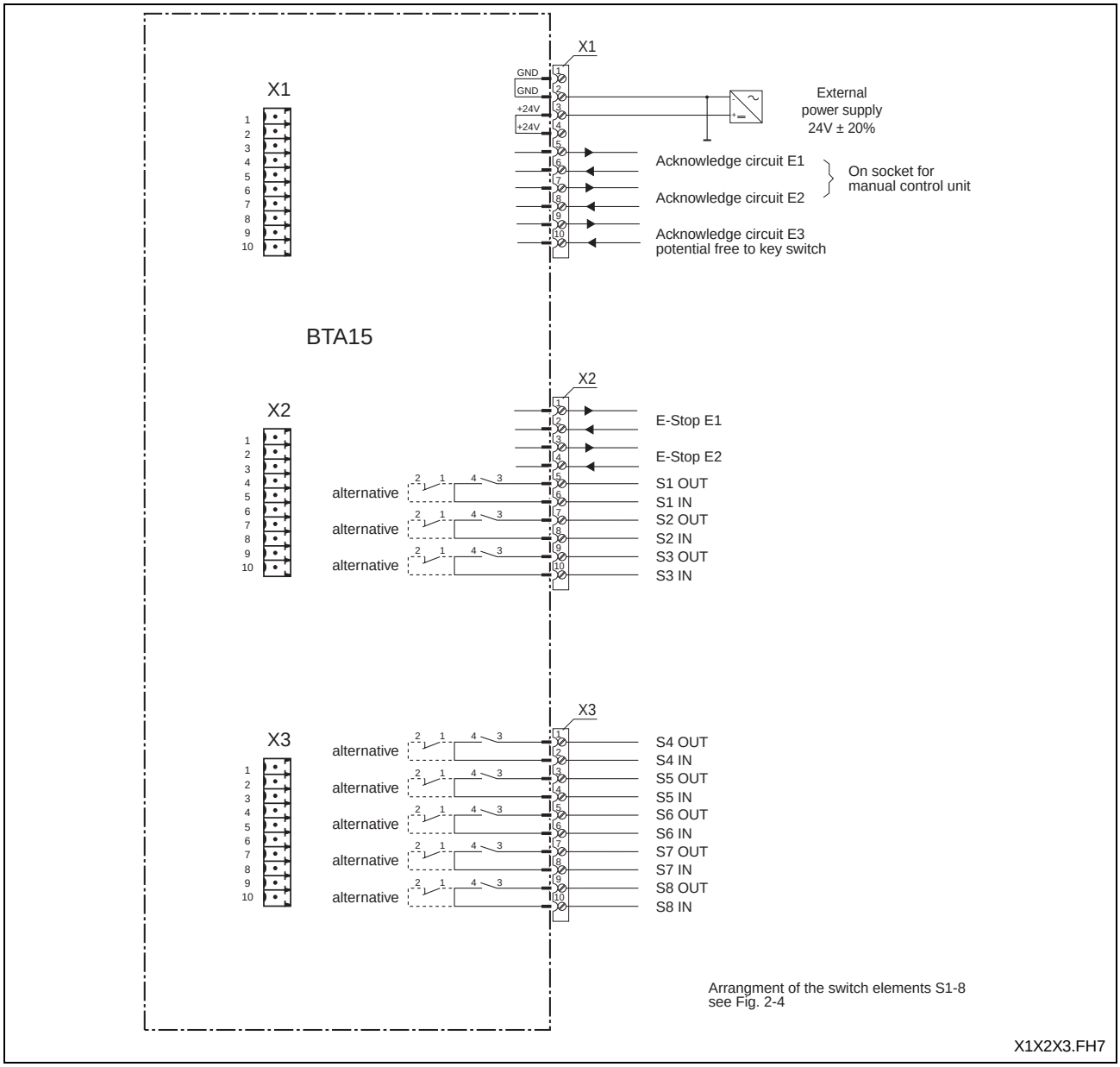


Fig. 7-9: Terminal connectors X1...3

7.10 Terminal Connectors X4 and X5

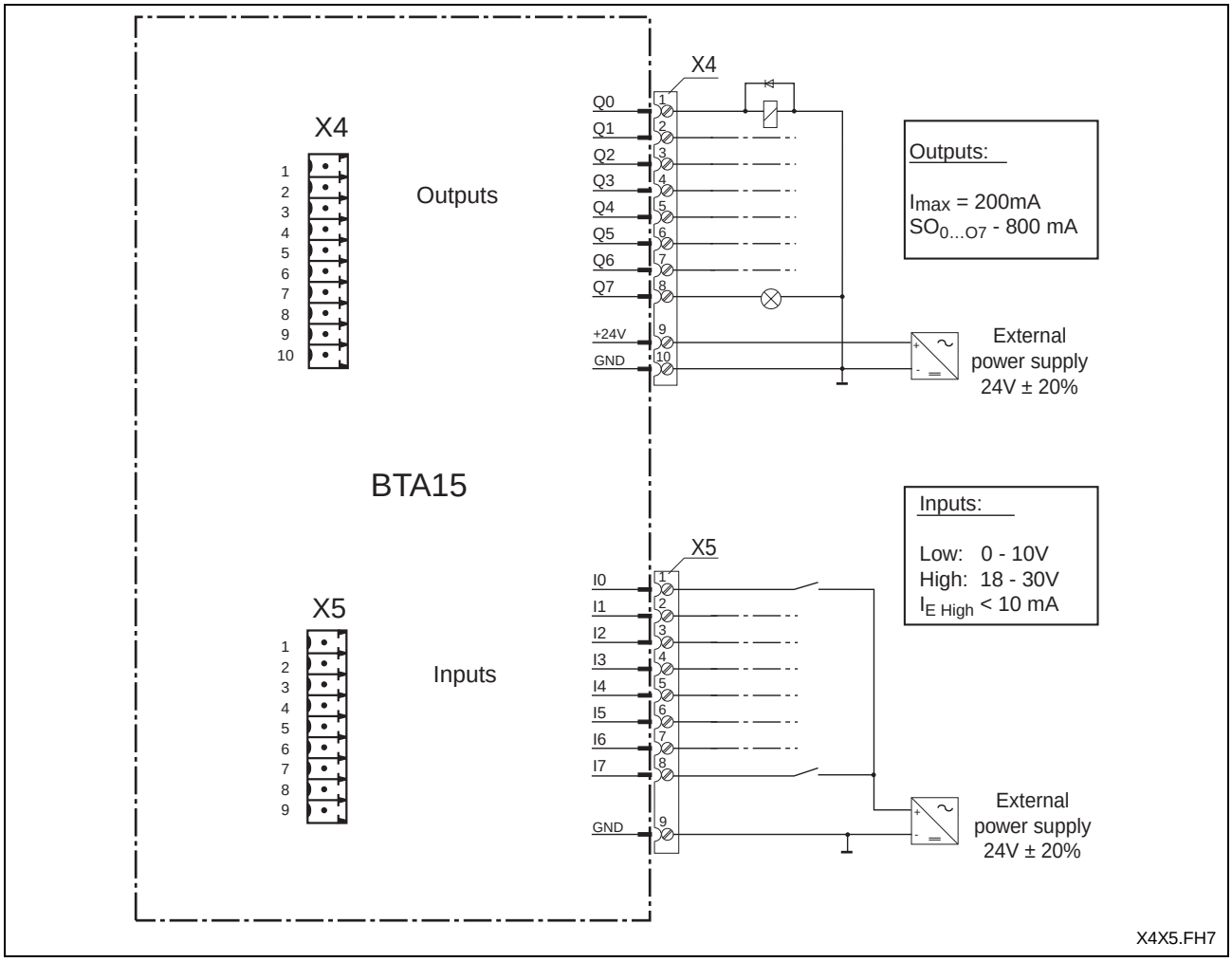


Fig. 7-10: Terminal Connectors X4 and X5

7.11 E-Stop and Acknowledge Circuits

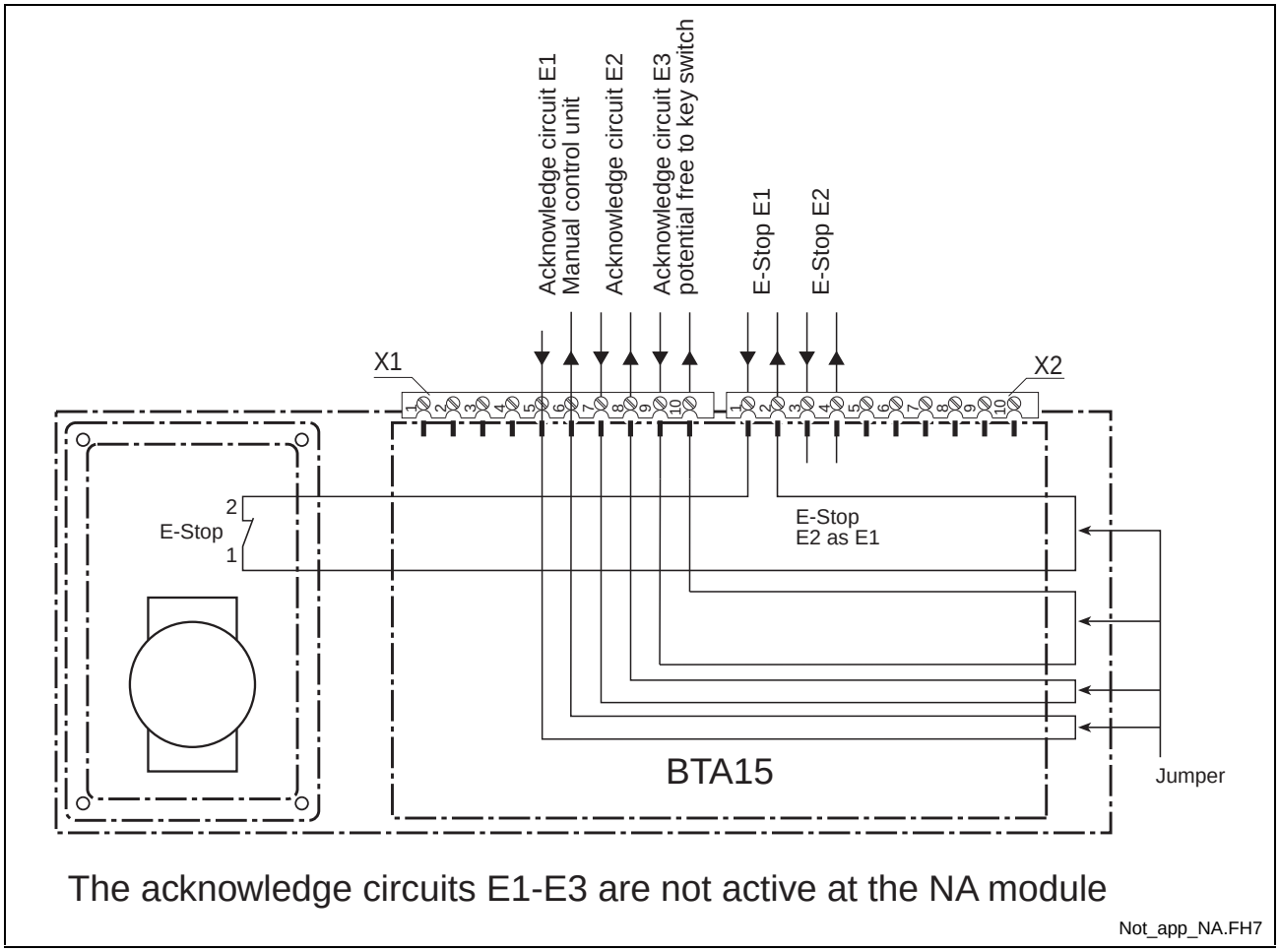


Fig. 7-11: Application example E-Stop and acknowledge circuits

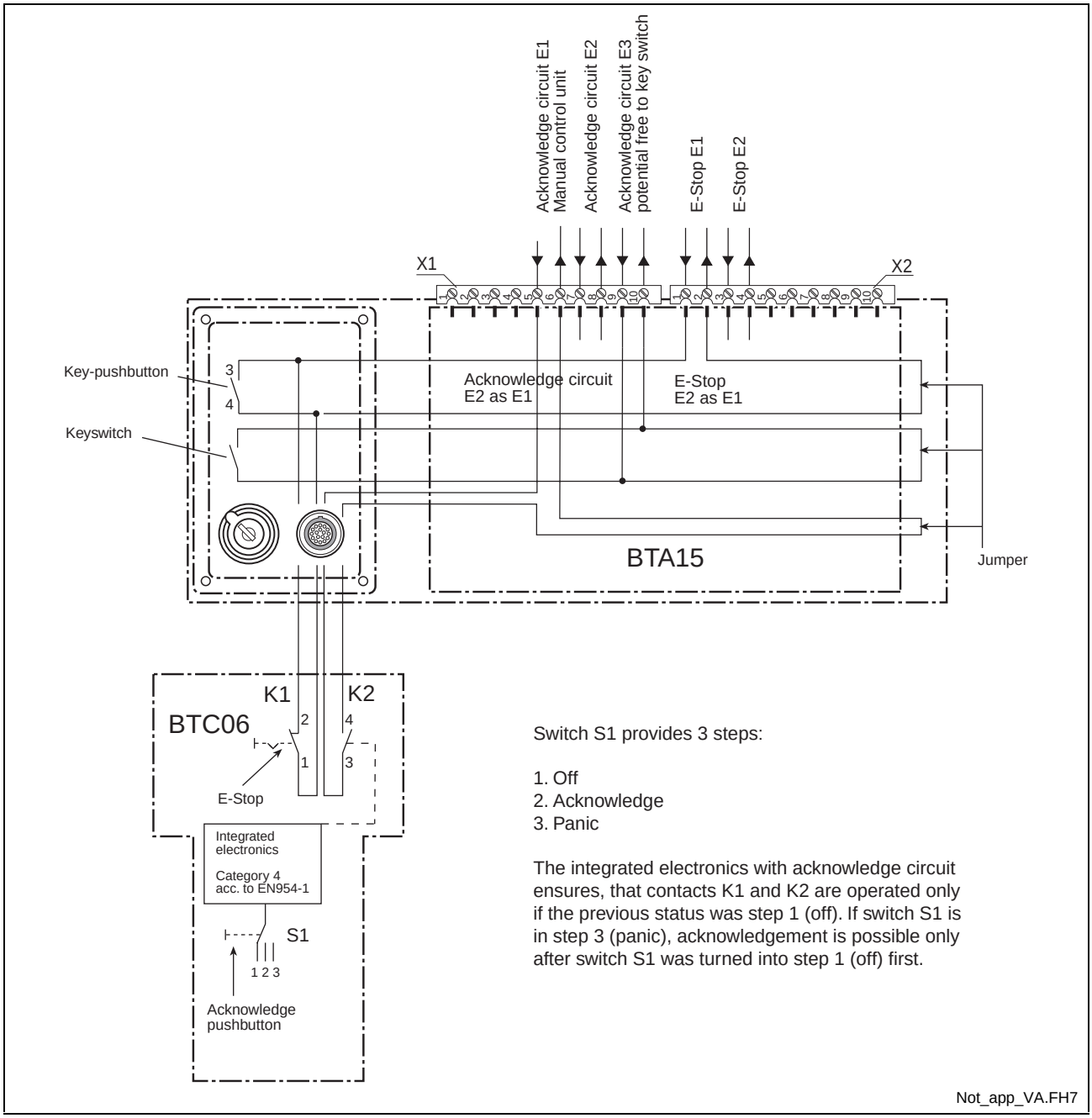


Fig. 7-12: Application example E-Stop and acknowledge circuits at connection of a BTC06

In this example, the BTA15 is shown together with a BTC06. For a better overview only one circuit is displayed. Two acknowledge circuits are used for modules NB and VA together with the BTC06. The third circuit can be used alternative by the customer.

8 Dimensions

8.1 Enclosure Dimensions

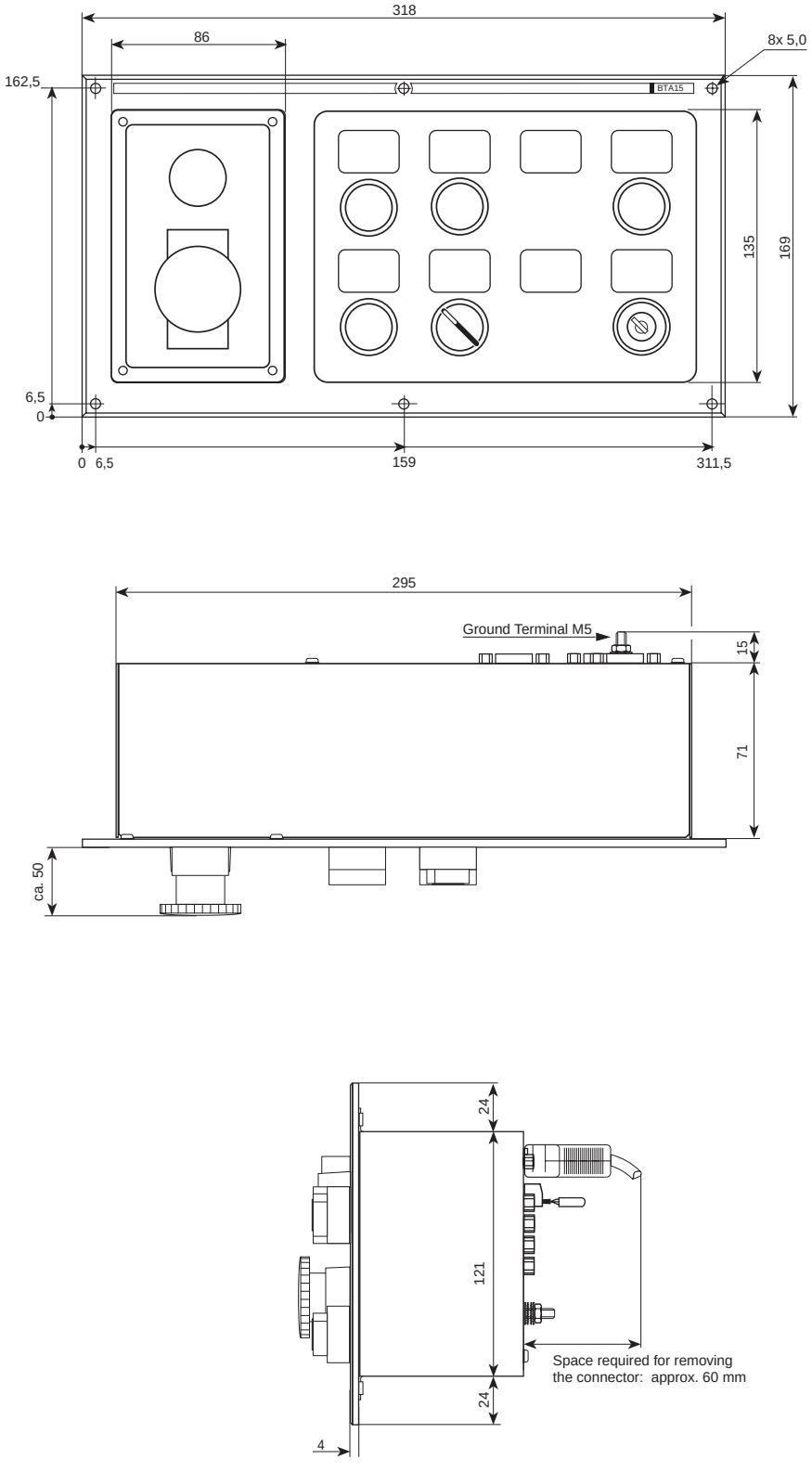


Fig. 8-1: Enclosure dimensions

8.2 Mounting Dimensions

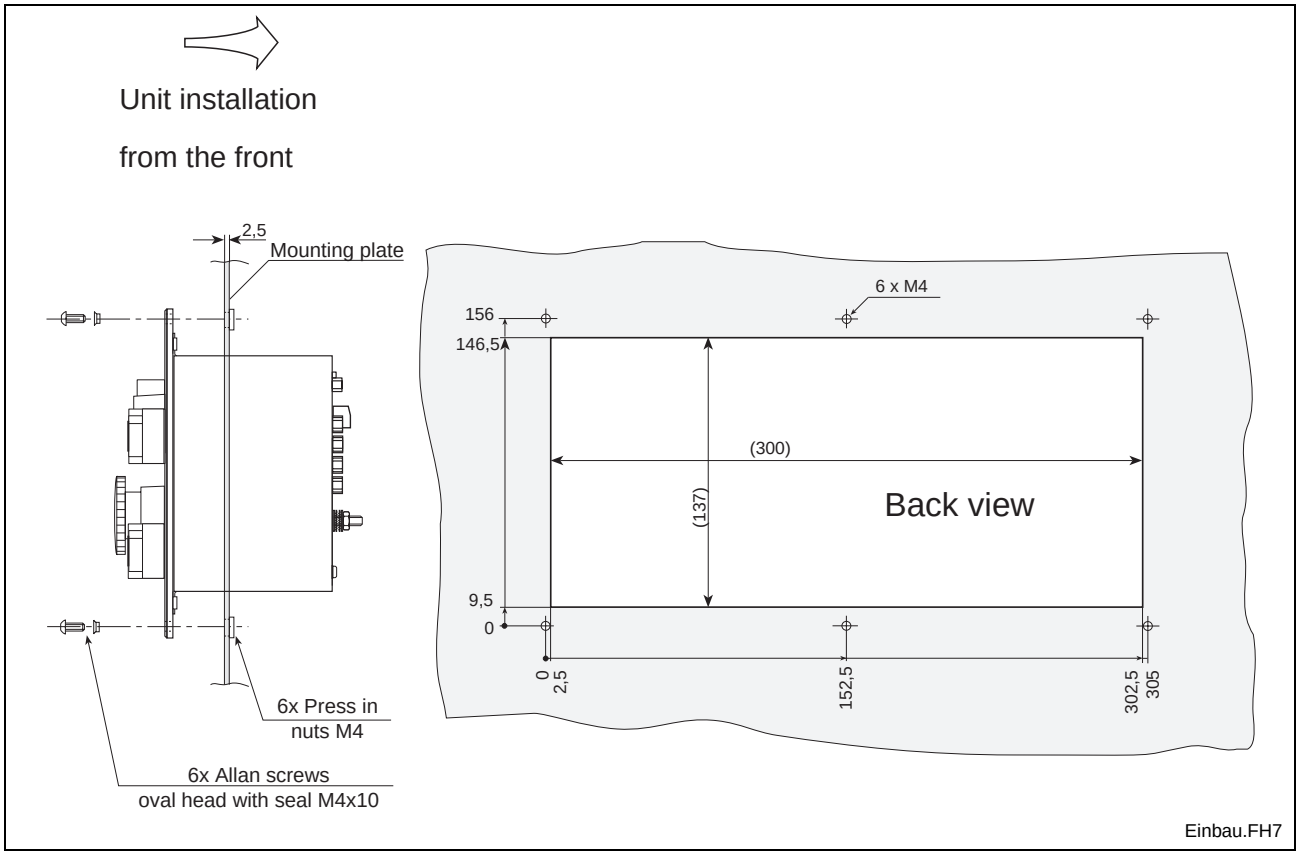


Fig. 8-2: Mounting dimensions

9 Typical Applications

9.1 INTERBUS-S-Connection

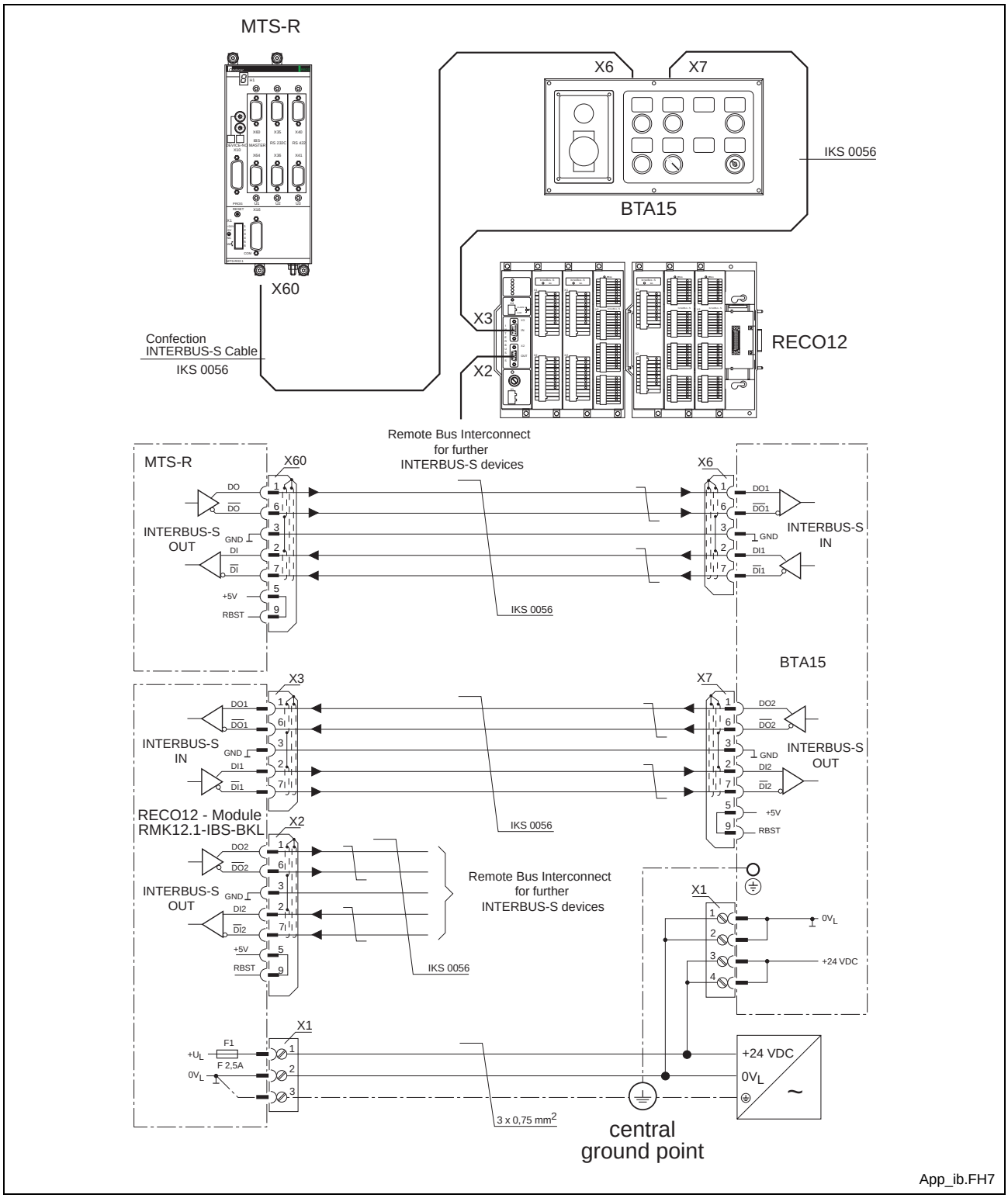


Fig. 9-1: INTERBUS-S connection example

9.2 BT Bus Connection

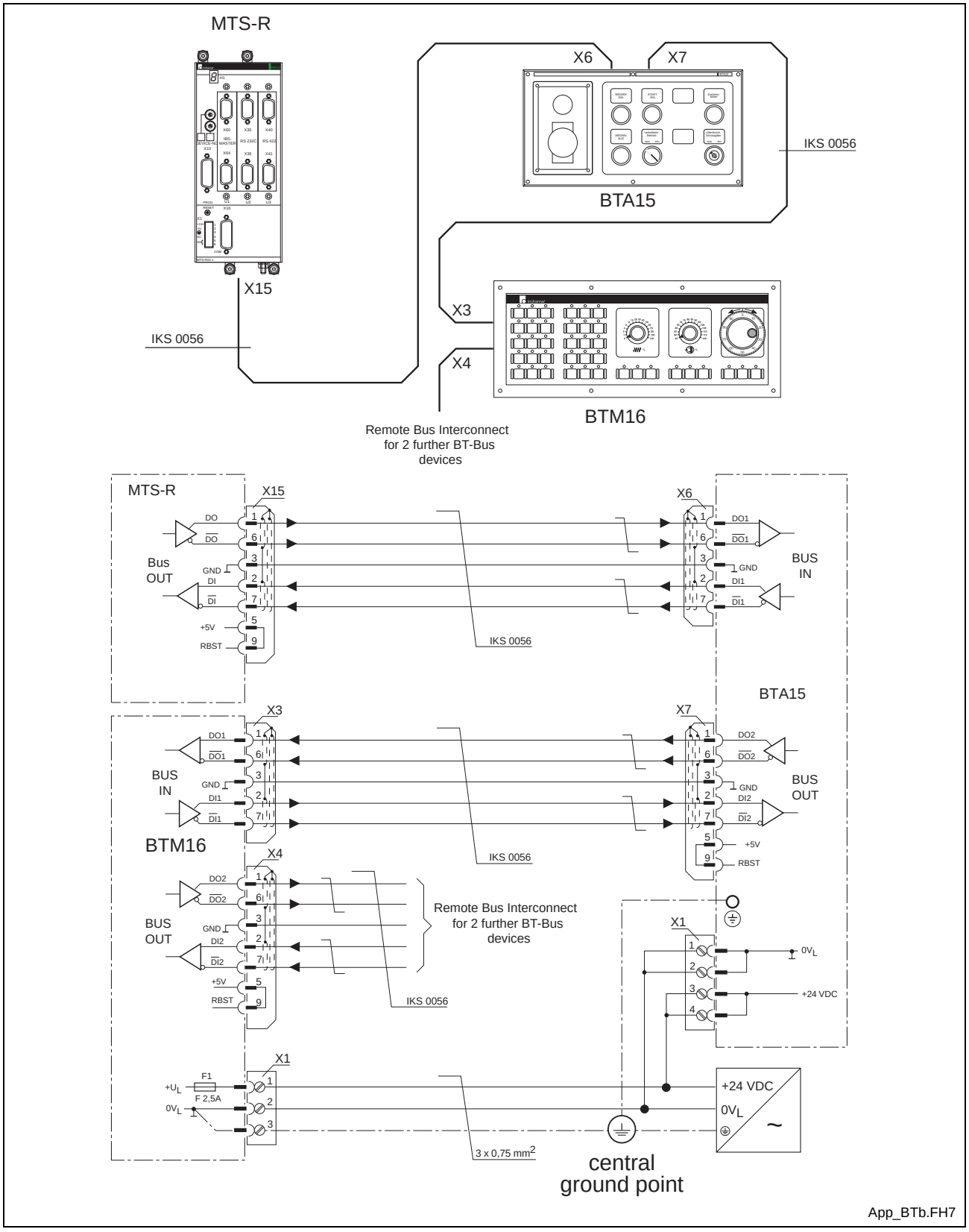


Fig. 9-2: BT Bus connection example

9.3 RS422 wiring with BTV06, MTS-R and BTC06

Unit Arrangement

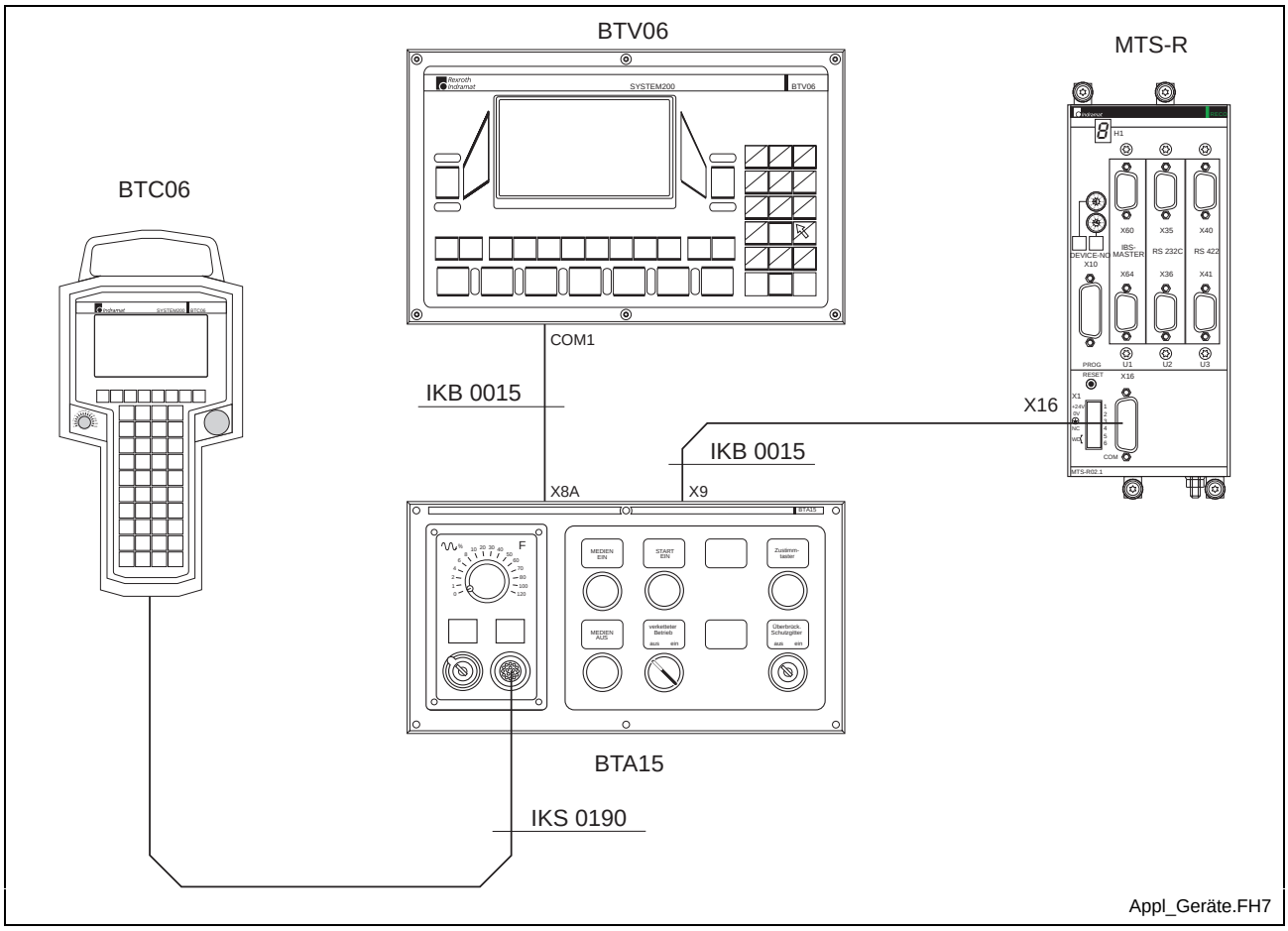


Fig. 9-3: Application example for RS422 connection with BTV06 and MTS-R

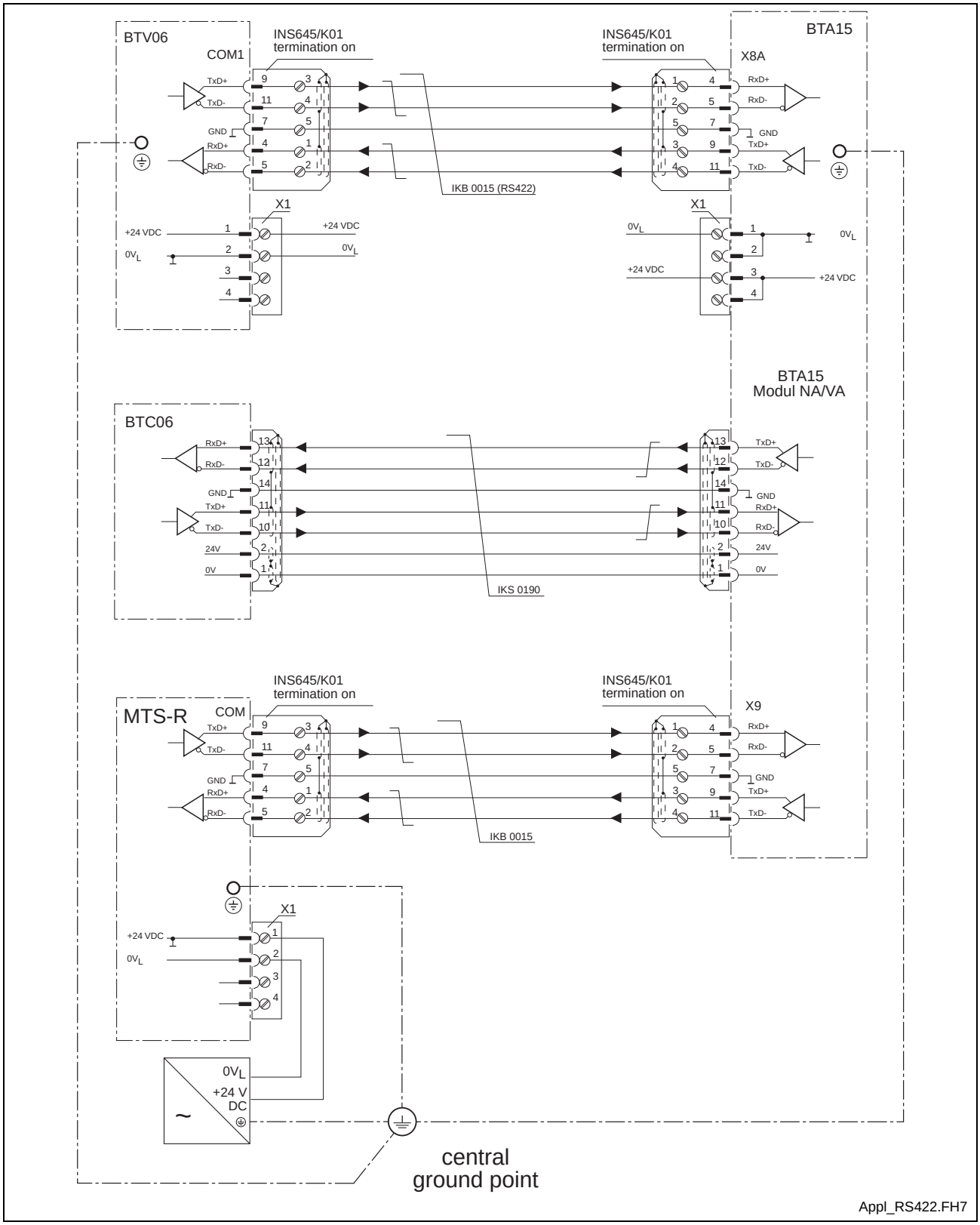


Fig. 9-4: Wiring of the RS422-Application

Standard Interface connectors

There are appropriate connectors available for both RS422 and RS485 communication. These include termination in the housing already. The cable can be mounted with the use of screw-in clamps. Pin assignment of both connectors is illustrated (see Fig. 9-5).

Which connector housing is to be used with which interface cable is specified in chapter 10.2 (accessories) per the table.

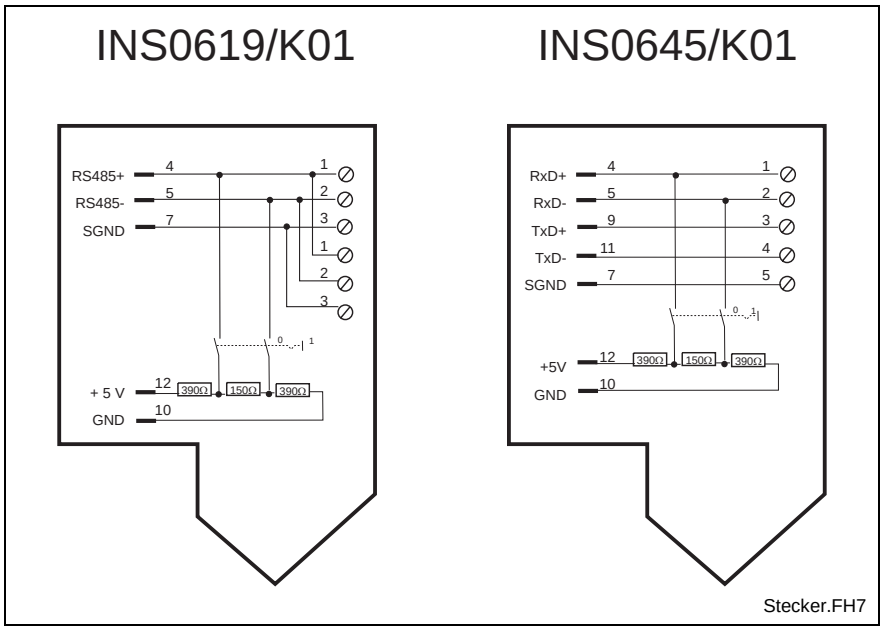


Fig. 9-5: Connector assignment of the standard connector housing

Termination can be added by using the appropriate switch.

10 Ordering Information

10.1 Type code

Abbrev. Column	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1	2	3	4	5	6	7	8	9	40
Example:	B	T	A	1	5	.	1	-	N	A	-	W	K	-	B	S																										

1. Product group
1.1 BTA . . . . . = BTA

2. Line
2.1 15 . . . . . = 15

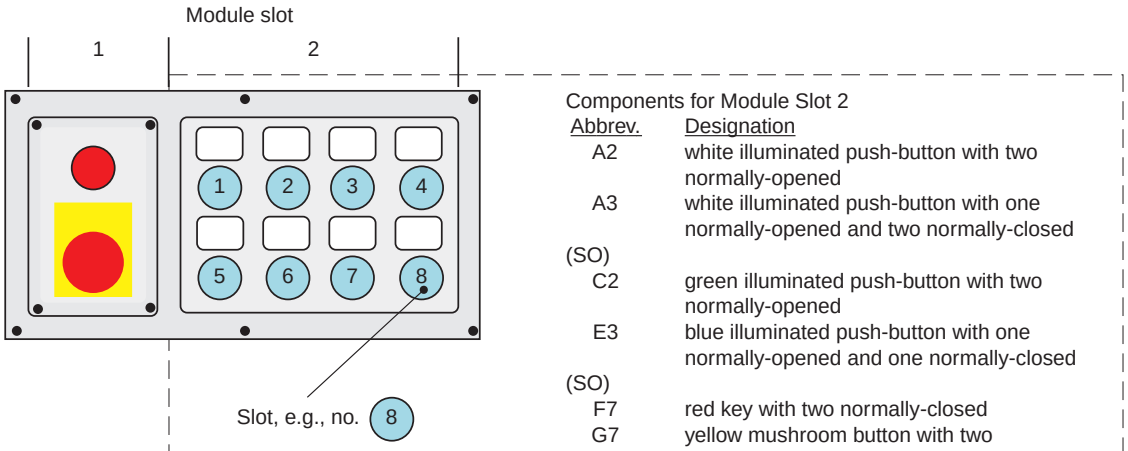
3. Design
3.1 1 . . . . . = 1

4. Configuration ①
fixed and documented by Rexroth Indramat.
4.1 e.g., NA-WK . . . . . = NA-WK
(Columns: 9...10 = Module slot 1
12...13 = Module slot 2)

5. Communications bus
5.1 INTERBUS-S / BT-BUS. . . . . = BS
5.2 without communications bus . . . . . = NN

Note:
① Type and design of module slot 1 --> see INN 48.11, attachment 1, "Modules for machine control board"

Illustration example: BTA15.1



Components for Module Slot 2

Abbrev.	Designation
A2	white illuminated push-button with two normally-opened
A3	white illuminated push-button with one normally-opened and two normally-closed
(SO)	
C2	green illuminated push-button with two normally-opened
E3	blue illuminated push-button with one normally-opened and one normally-closed
(SO)	
F7	red key with two normally-closed
G7	yellow mushroom button with two normally-closed
H6	key switch BG2 with one normally-opened and one normally-closed
J4	key switch BG6 with one normally-opened

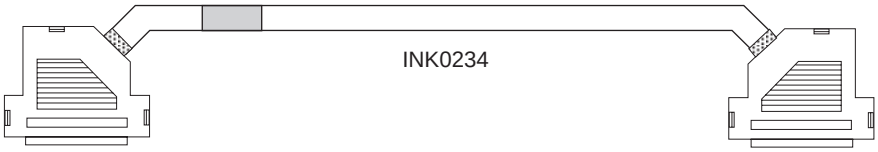
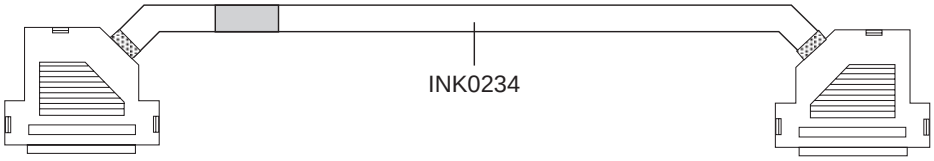
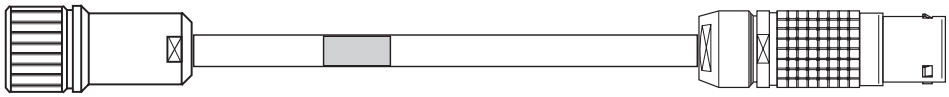
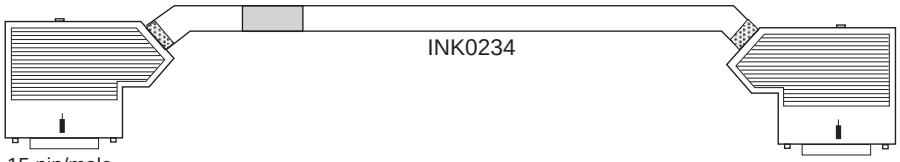
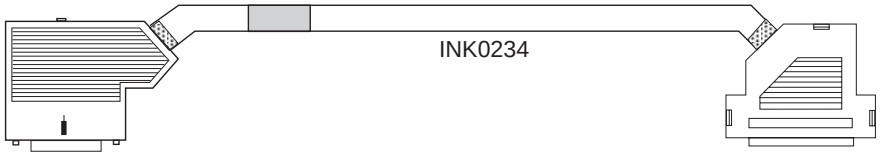
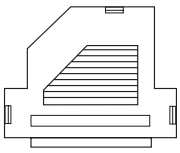
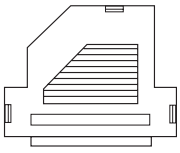
Configuration Type code Columns 12...13	Component slot							
	1	2	3	4	5	6	7	8
WK	A2	A2	NN	NN	F7	K6	NN	NN

Type.FH7

Fig. 10-1: Type code BTA15.1

10.2 Accessories

Connectors and Standard Cables

Order designation of standard cables	Matching connector of unit	INDRAMAT cable	Cable end type
IKB0193/000,0 MN: 282 041 (RS232, max 2m)	INS0525/L01 — INK0234 — INS0526/L01  9 pin/male — 9 pin/female		
IKS0056/000,0 MN: 255 968 (Interbus cable)	INS0525/L01 — INK0234 — INS0526/L01  9pin./male — 9pin./female		
IKS0190/000,0 Standard interface cable Connection BTC06	INS0624/C — INS0631/C 		
IKB0015/000,0 MN: 282 870 (RS422, max 400m)	INS0645/K01 — INK0234 — INS0645/K01  15 pin/male — 15 pin/male		
IKB0016/000,0 MN: 282 871 (RS422, max 400m)	INS0645/K01 — INK0234 — INS0526/L01  15 pin/male — 9 pin/female		
INS0525/L01 MN: 259 759	 INS0525/L01 (9 pin/male)	D-subminiature plug-in connector	
INS0526/L01 MN: 259 762	 INS0526/L01 (9 pin/male)	D-subminiature plug-in connector	

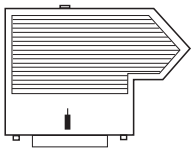
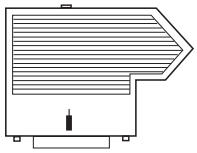
INS0619/K01 MN: 279 583	 Y-connector for customer connection with termination INS0619/K01 RS485 (15 pin/male)
INS0645/K01 MN: 282 040	 Connector for customization with termination. INS0645/K01 RS422 (15 pin/male)

Fig. 10-2: Connector and cable accessories of the BTA15

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