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Rexroth



Manual control unit BTC06

Project Planning Manual

SYSTEM200

DOK-SUPPL*-BTC06******-PR03-EN-P

Rexroth Indramat

Title

Manual control unit

BTC06

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Purpose of Documentation This documentation describes …

- the hardwarefunctions of the BTC06 unit
- the technical datas
- how connecting a BTC06 unit

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1 Introduction

1.1 General

This functional description is intended for the users of portable, compact, type BTC06 control panels. This description does not include the functions of post-connected controllers or applications, e.g., for the evaluation of live-man contacts or emergency stop contacts.

1.2 Brief Description

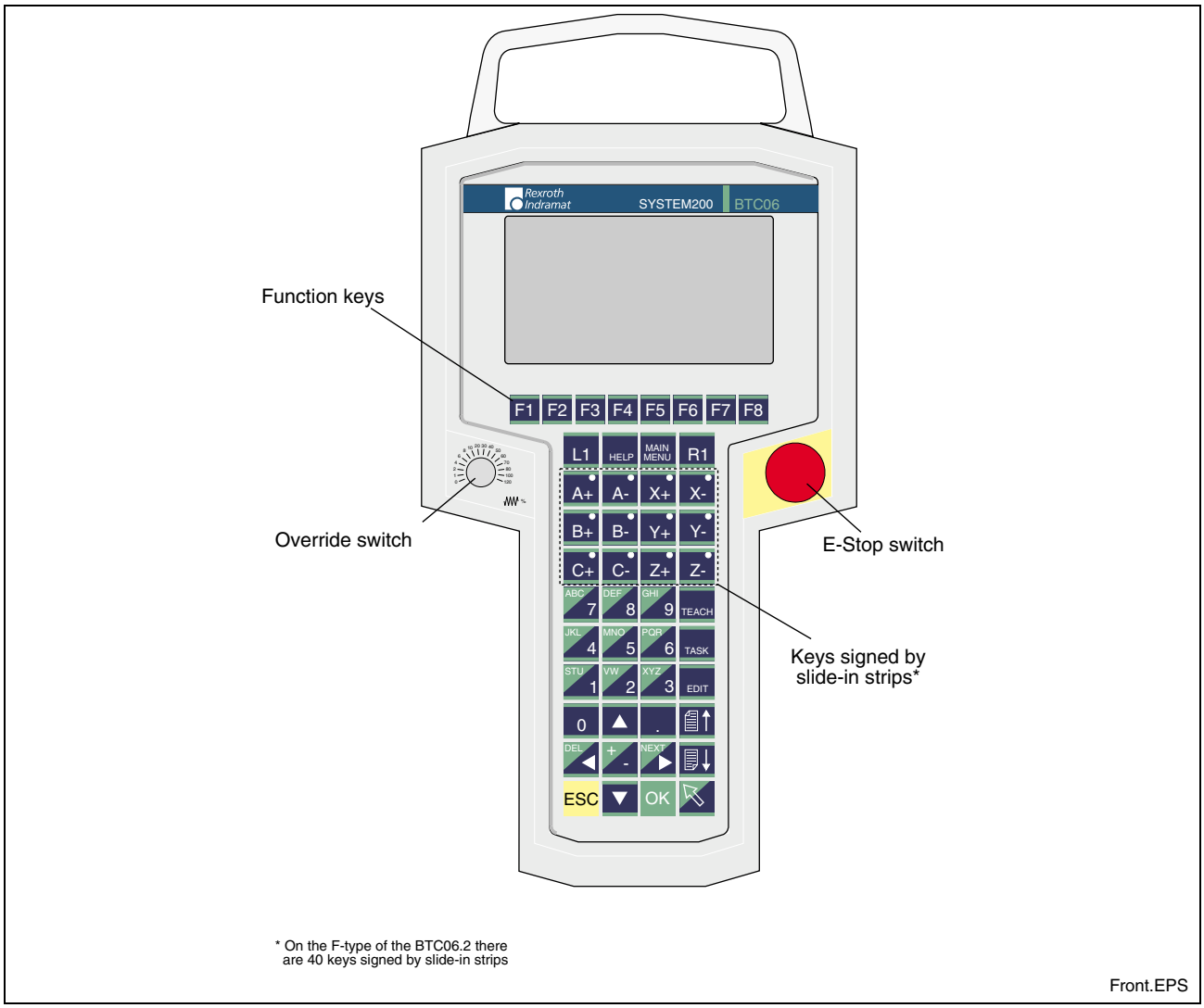


Fig. 1-1: BTC06 Front View

An RS485/422 combination interface allows connection of the BTC06 to all INDRAMAT controllers (MTS/P, MTS/R, CLC, DKC, DLC, CLM).

The universal Screen Manager Software allows the user to create user-defined applications, which are able to access the variables of all INDRAMAT controller families.

For the CLC, there are two additional pre-programmed applications (programming software for TRANS01D and VT100 for GPS) that replace the functions of the CTA10-1 and TPT.

1.3 Safety Concept

If the BTC06 is equipped with the appropriate optional features (emergency stop and live-man switch), it can be used for operation with industrial drive and robot controllers. It includes a dual-circuit 3-position, live-man switch. Both circuits are electrically isolated and operate redundantly. It is important that the subsequent control interprets the switch in accordance with the machine-specific or system-specific standards and rules.

If appropriate interlocks with the safety contacts of the drive or robot control are provided, hazardous movements in certain modes (e.g., manual or test mode) can only be activated if the live-man switch is held in the center (= enabled) position. If this switch is not depressed, or if it is pressed all the way down to the panic position, any movement will be stopped immediately. The return from the panic position is activated electrically, whereby the switch returns to the non-activated position. To start a new movement, enter a command and re-activate the live-man switch.

The live-man switch of the BTC06 provides integrated safety circuitry. A post-connected control must be used to ensure compliance with machine-specific or system-specific standards and rules. It must be linked to the control in a way that meets the safety requirements for the power circuits in accordance with EN775, EN60204, EN954-1, EN1088, VDI2853, and VDI2854.

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 manual control unit BTC06 made by Rexroth Indramat is designed for the mobile serve and control of machines and facilities and for informing the user visuell about the facilities he works.

Control and monitoring of the BTC06 may require additional sensors and actors.

Note: The BTC06 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.

The manual control unit BTC06 is designed for control tasks in an installation with one and multiple axes.

Available for an application-specific use of the BTC06 types with different realisations.

Typical areas of application of a BTC06 are:

- Handling and assembly systems
- Packaging and foodstuff machines and
- Machine tools.

The BTC06 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 BTC06 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 manual control unit BTC06 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 extremely high maximum temperatures or if
- Rexroth Indramat has not specifically released them for that intended purpose. Please note the specifications outlined in the general Safety Guidelines!

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 Rexroth Indramat 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.



WARNING

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
 **DANGER**	Death or severe bodily harm will occur.
 **WARNING**	Death or severe bodily harm may occur.
 **CAUTION**	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

- Rexroth Indramat GmbH 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.

- 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.
- 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 and drive components with voltages above 50 Volts.

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.



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 mm² 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 Indramat 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.



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 BTC06 Features

4.1 Enclosure, Controls and Display Elements

- Front panel with 48 keys
- 240x128 pixel graphic LCD with backlight LED
- Shock-proof, ergonomic enclosure, protection type IP65
- Plug-in interface cable
- Emergency shut-off with twist release and two floating contacts
- Three-position live-man switch with two floating contacts

⇒ Position 1 - Off

⇒ Position 2 - Live-Man

⇒ Position 3 - Panic

TÜV/BG certified integrated safety circuitry, category 4, according to EN954-1, ensure that the live-man switch will not be activated after a panic event when returning over position 2 to position 1.

4.2 Hardware Components

- Series 68000 micro-controller
- 1 MByte Flash
- 256 KByte SRAM
- RS-232 programming interface for downloading firmware and projecting
- Communications interface in accordance with Indramat standard, i.e. bus-capable RS485 and RS422

4.3 BG Test Certifications

- EN 60204 Part 1: "Safety of Machinery - Electrical Equipment of Industrial Machinery; Part 1: General Requirements"
- EN 775: "Industrial Robots Safety"
- EN 418: "Safety of Machinery - Emergency Shut-Off Equipment Functional Aspects, Design Guidelines"
- Integrated Safety Circuitry, Category 4, according to EN954-1 for Live-Man Switches

4.4 Optional Features

Override, Handwheel

The BTC06 may optionally be equipped with a 4-bit override switch and a 16-bit handwheel. Both are available when using the MTS as I/O information through a corresponding functional module.

Emergency Stop Switch

The emergency stop switch is designed to shut-off the system operation in any mode (stop category 0). For category 1 emergency stop functions, appropriate measures must be taken in addition to the electronic safety equipment (see 9.4, DIN EN 60204-1). The emergency stop button is a dual-circuit switch.

Live-Man Switch

The live-man switch is activated with the holding hand. Enclosure and shape of the live-man switch have been ergonomically optimized for right-hand and left-hand operation.

The live-man switch directly affects the post-connected system (drive amplifier, SPS, robot). It is designed to allow hazardous machine movement only upon intentional activation of the operator, when the operator has to work within the hazardous zone of the machine.

The BTC06 interface cable includes the power supply line for the device, the connection cable for the emergency stop button, and the live-man switch as well as the data cables for data transfers between the BTC06 and the controller.

When the user disconnects the connector, the emergency stop circuit and the live-man circuit will be interrupted. A special enabling function of the BTA20 machine control panel allows hot plugging without triggering the emergency shut-off function.

Labeling Keys with a Slide-in strip

In all of the BTC06.2 manual control units it is possible to label the keys that will be used in the axis control (A+, A-, B+, ... Z-) as needed by using a slide-in strip.

In the BTC06 type BTC06.2A-**F**-... all keys, with the exception of the function keys F1 to F8 can be individually labeled with a slide-in strip. A batch of empty strips is included in the overall delivery for this purpose. In this unit as well, all the keys are equipped with LEDs which means that even the empty strips have round windows for the display elements.

The next section of this document describes how to use these slide-in strips.

Replacing a slide-in strip

1. Lay the BTC06 on its front side.
2. Remove the BTC06's handle.

a) To do so, release both Phillip screws on the back of the BTC06 which hold the handle in place.

b) Pull the handle carefully up and away.

3. The BTC06 must now be screwed out by releasing the 10 Phillip screws that are on the back of the unit.
4. Now, place the BTC06 carefully on its back.
5. The front frame that is now on top must be lightly pulled up and folded open to the left (see Fig. 4-1).



Fig. 4-1: An open BTC06 with a view of the slide-in strips

6. Remove the slide-in strips in the unit by pulling them out sideways and then slowly insert the new labeled strips to the end.
7. Press the front frame onto the lower section.

Note: Make sure that no internal lines between the lower part of the housing and the front frame are in any clamped or separated.

8. Screw lower part of housing onto front frame.
   Make sure that the screw goes in evenly.
9. Replace handle and screw back into place.

Note: The Phillip screws have two different lengths. Use the two longer ones to screw in the handle.

10. Check whether the BTC06 is working or not by running a quick check. Especially check the safety functions such as the emergency stop.

Note: Only if the screws are properly in place will have housing retain its IP65 protection category level (IP65).

5 Technical Data

5.1 Basic BTC06 Unit

Basic BTC06 Unit	
Supply voltage	24 V (20 to 30 V) DC
Power consumption	max. 400 mA
Display	LCD 240 x 128 pixel, b/w, full graphics function LED backlight visible area 108 x 58 mm
Keyboard	Polyester film with 48 keys
Enclosure material	Polycarbonate
Protection	IP 65 (Main connection cable plugged in, RS-232 connector provided with protective cap)
Temperature range	0 to +55°C (Operation) -20 to +70°C (Storage)
Weight	ca. 1.3 Kg
Dimensions	315 x 180 x 57 (LxWxD) (363 x 180 x 57 incl. detachable handle)

Fig. 5-1: Electrical Data

Emergency Stop Switch

Emergency Stop	
Switch elements	Two floating N.C. contacts, electrically isolated
Rated voltage	24 V DC / 42 V AC
Rated current	2 A DC / 3 A AC
Operating cycles	> 100,000

Fig. 5-2: Emergency Stop Switch Data

Live-Man Switch

Live-Man Switch	
Switch elements	Two floating N.O. contacts, electrically isolated
Rated voltage	24 V DC / 42 V AC
Rated current	2 A DC / 3 A AC
Operating cycles	> 200 000 for Live-Man range > 100 000 for Panic position
Control category	4 in accordance with EN954-1

Fig. 5-3: Live-Man Switch Data

Handwheel

The handwheel has the following characteristics:

- Internal 16 bit absolute counter (in conjunction with Screenmanager software).
- A two-place relative counter from -99 to +99.
- Display reset by pressing the handwheel for an extended period (about two seconds).

Data of the BTC06 connecting cable

Connecting cable BTC06	
Oil consistency	to VDE 0472 / 9.71§ 803
Bending radius	
- unique	> 7,5 x cable diameter
- moving minimal	> 10 x cable diameter
- moving optimal	> 15 x cable diameter
Tensile load	< 180 Nm

Fig. 5-4: Data of the BTC06-connecting cable

5.2 BTC06 Wiring Diagram

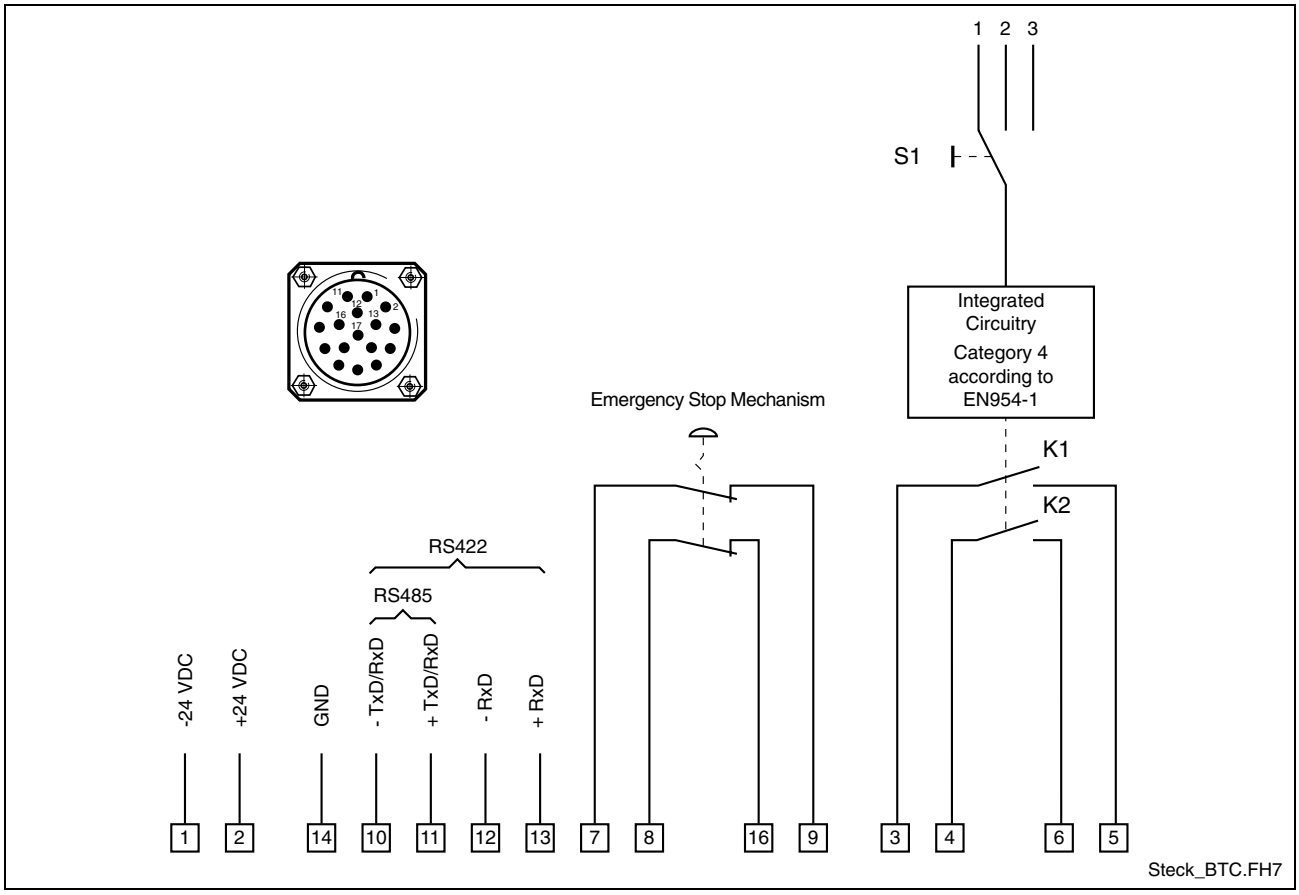


Fig. 5-5: BTC06 Wiring Diagram

The S1 switch has three positions:

1. OFF
2. Live-Man
3. Panic

The integrated circuitry of the live-man switch ensures that the N.O. contacts K1 and K2 are activated only when the previous condition was Position 1 (OFF). If the S1 switch is at Position 3 (Panic), a live-man setting is possible only after the switch has been moved back to Position 1 (OFF) first.

5.3 Enclosure Dimensions

Outside Dimensions

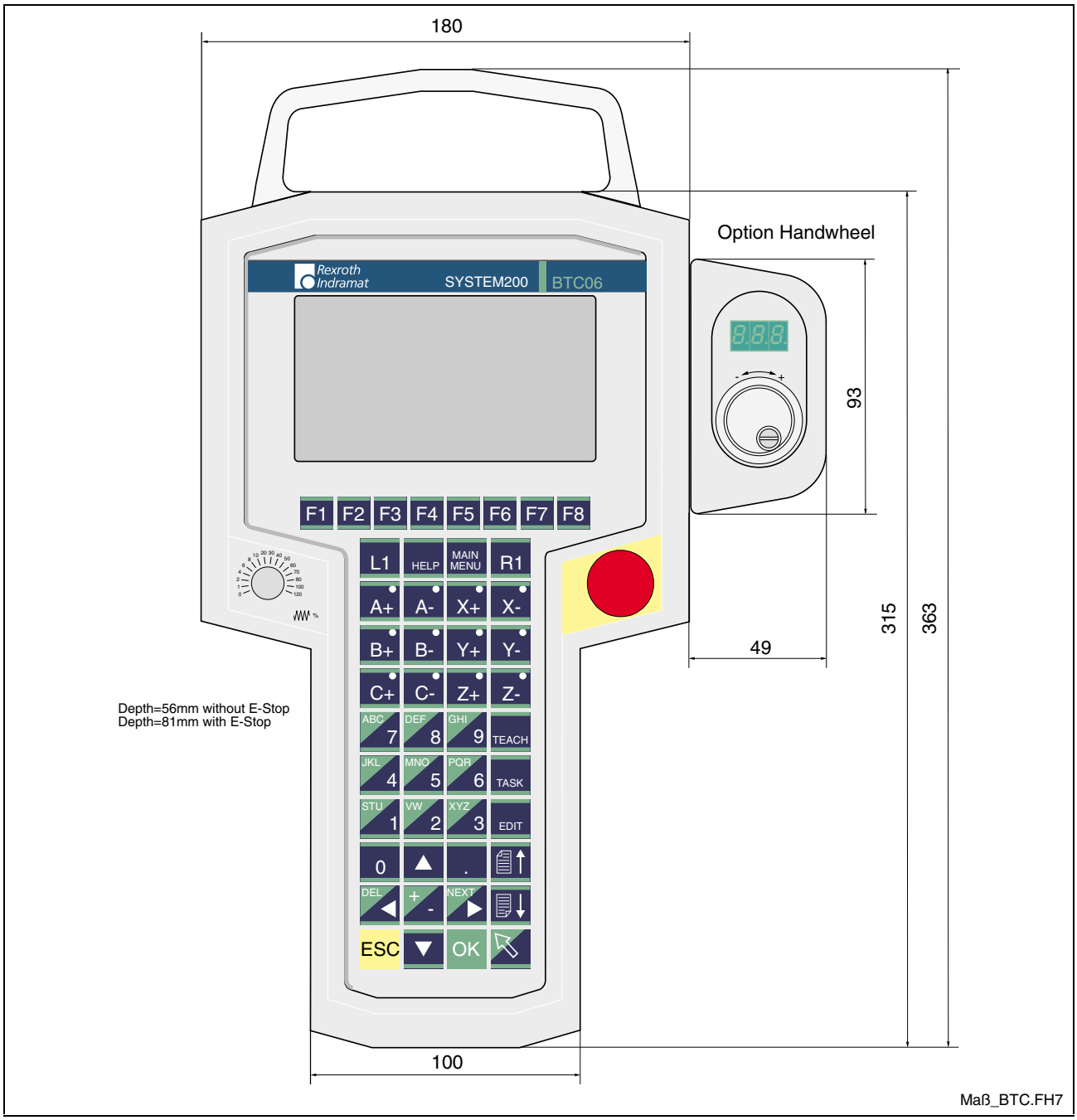


Fig. 5-6: Enclosure Dimensions

Rear View

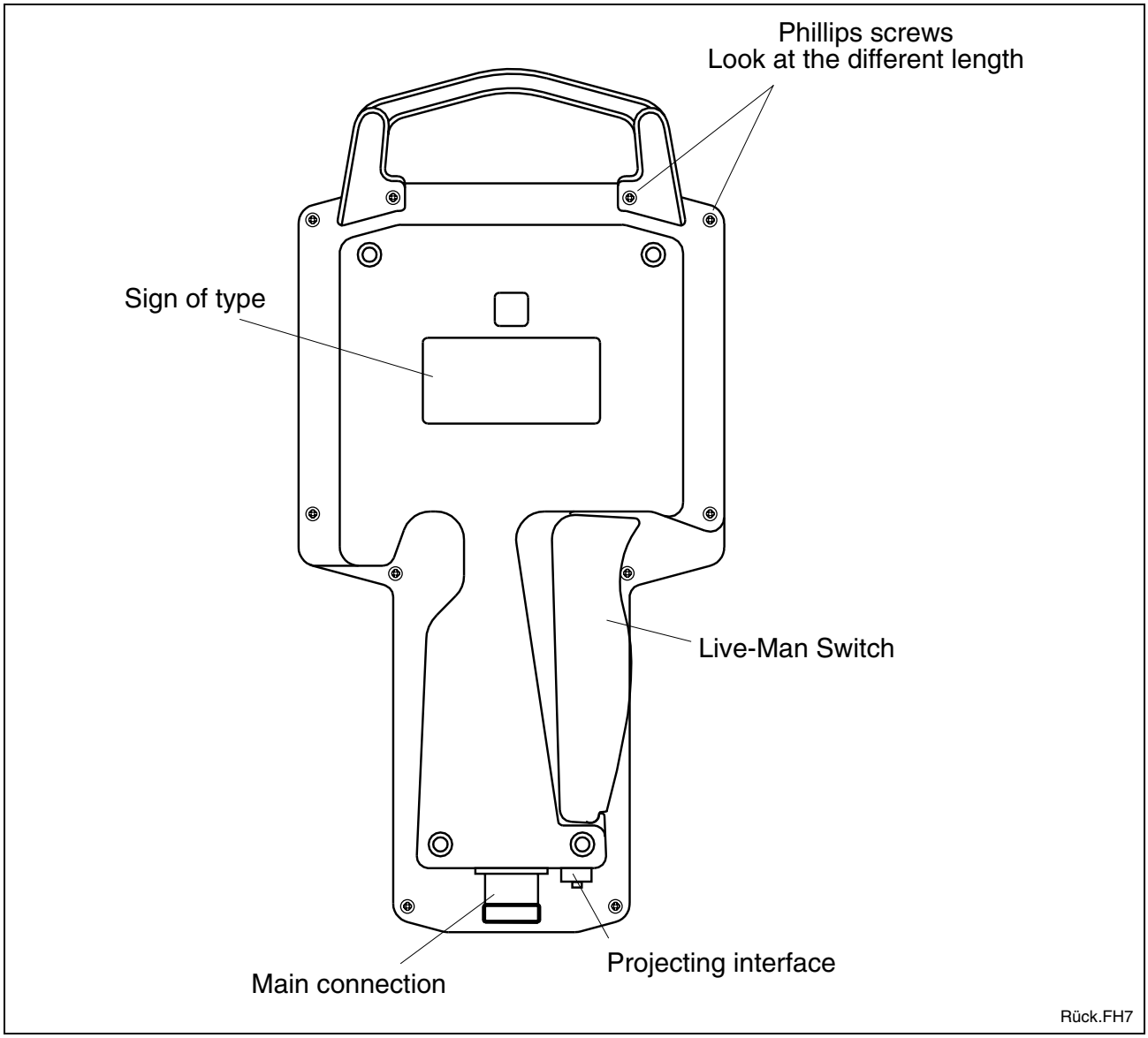


Fig. 5-7: Rear View

6 Connections

6.1 Connector Pin Assignments

Connector Locations

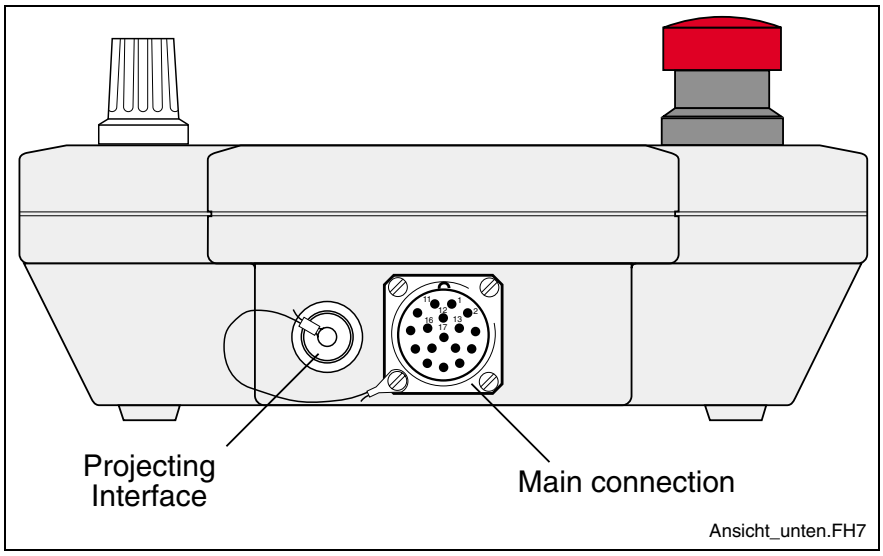


Fig. 6-1: Connector locations

Main Connection

Pin	Assignment	
1	0 V	
2	+ 24 V	
3	Live-man switch 1 in	
4	Live-man switch 2 in	
5	Live-man switch 1 out	
6	Live-man switch 2 out	
7	E-STOP 1 in	
8	E-STOP 2 in	
9	E-STOP 1 out	
10	RS422 TxD-	RS485 -
11	RS422 TxD+	RS485 +
12	RS422 RxD-	
13	RS422 RxD+	
14	Signal Ground	
15	N.C.	
16	E-STOP 2 out	
17	N.C.	

Fig. 6-2: Connector pin assignment of the 17-way connector

Firmware Download- and Projecting Interface

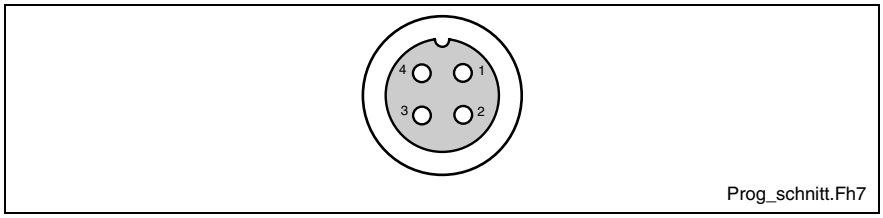


Fig. 6-3: RS232 Interface

Pin	Assignment
1	N.C.
2	TxD
3	RxD
4	Signal Ground

Fig. 6-4: Connector pin assignment of the RS232 Interface

6.2 Application Example

BTC06 with BTV20 and BTA10/20

Unit Arrangement

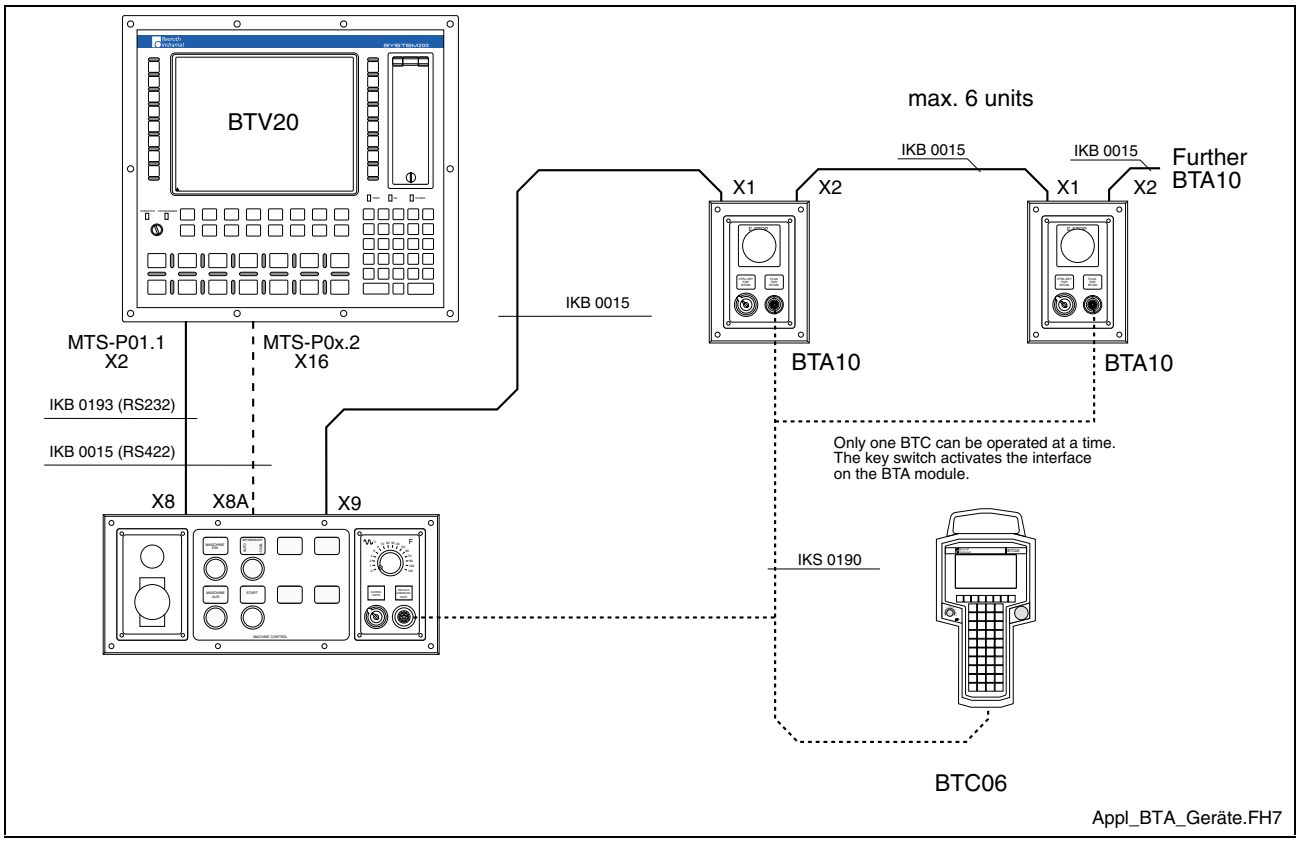


Fig. 6-5: Unit arrangement

In the case of this application especially note which version of the MTS-P generation is used in the BTV20.

With an MTS-P**01.1** (identified in the configuration type code of the BTV20 with 1S, 2S or 1M, 2M) communication between the BTV and BTA20 looks as shown above, and uses cable IKB0193 via RS232. In the BTA20 it is converted to a data transmission on RS422 and then relayed to the units which follows (in this case, BTA10) (see Fig. 6-6).

In the MTS-P0**x.2** (identified with 2D in the configuration type code of the BTV20) a 15-pin Indramat standard interface bushing has already been integrated into the slot so that a BTA20 is connected to the BTV20 via cable IKB0015 (see Fig. 6-7).

Note: Only RS422 communications is possible between the units.

Cabling with MTS-P01.1 (BTV20)

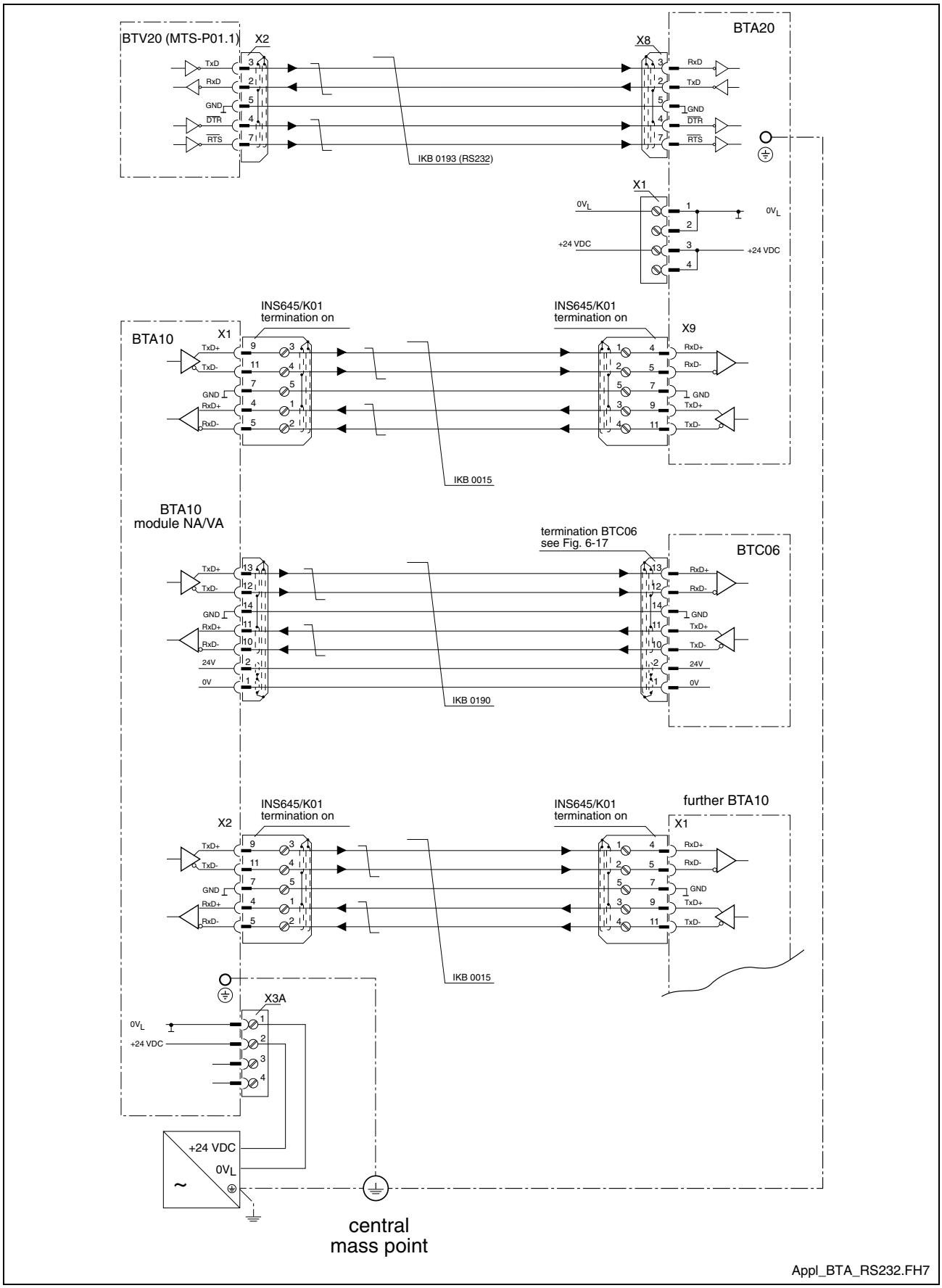


Fig. 6-6: Connecting the BTC06 to a BTV20 with BTA10/20

Cabling with MTS-P0x.2 (BTV20)

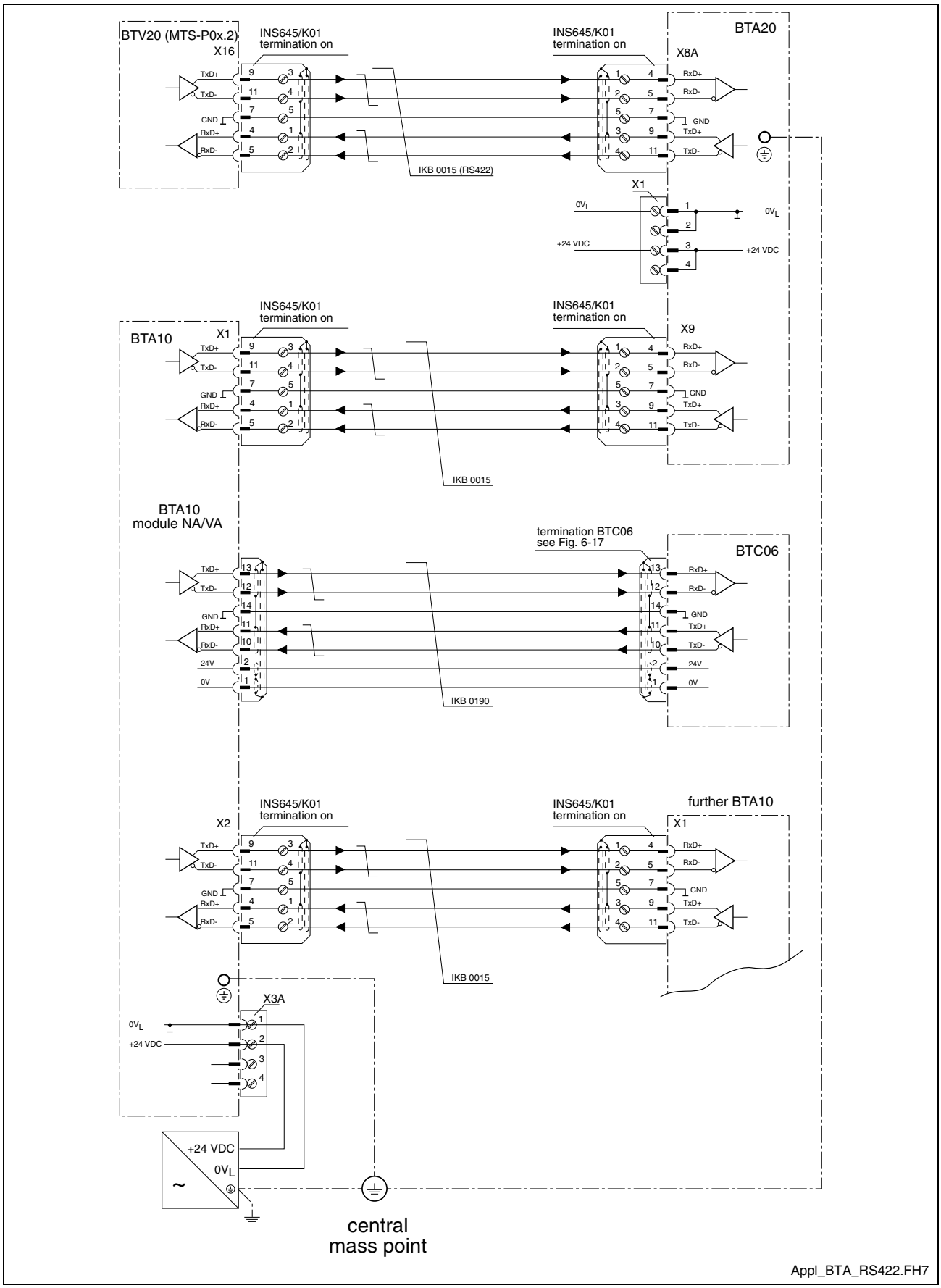


Fig. 6-7: Connecting the BTC06 to a BTV20 with BTA10/20

Cabling with BTV20 and Additional Interfaces

There is also the option of directly connecting the BTA10 to a BTV20. However a BTV20 configuration must be exist which makes two additional interface slots available. These slots are internally conducted to printed circuit board "SIO". This becomes obvious in the configuration type code of the BTV20 with the designation **S4**.

Example: CFG-BTV20.2C-E1-**S4**-B1-1S-A2-1C-NN-NN-NN

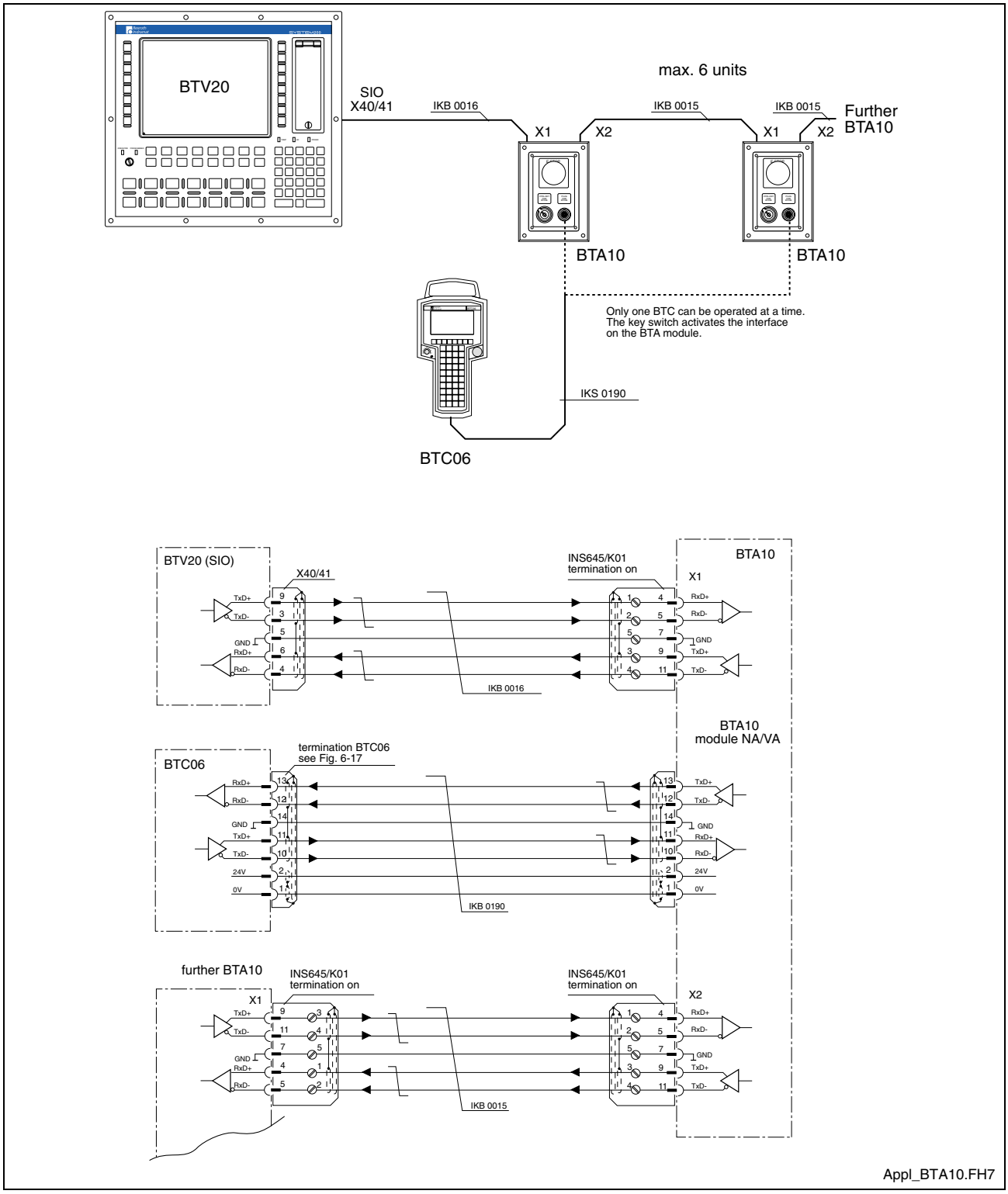


Fig. 6-8: Connecting the BTC06 to a BTV20 with SIO

BTC06 with CLC-GPS

To connect the BTC06 to the CLC-GPS additional components are needed:

- Junction box BTZ01.1
- Control cabinet leadthrough INS627 (optional)

Junction box BTZ01.1 is used to wire connections for live-man and emergency stop functions of the BTC06 in the control cabinet. The BTZ01.1 is discussed in detail in chapter 6.3.

Control cabinet leadthrough INS627

The control cabinet leadthrough INS627 can be used to conduct the internal cables of the cabinet outside in order to be able to connect the BTC06.

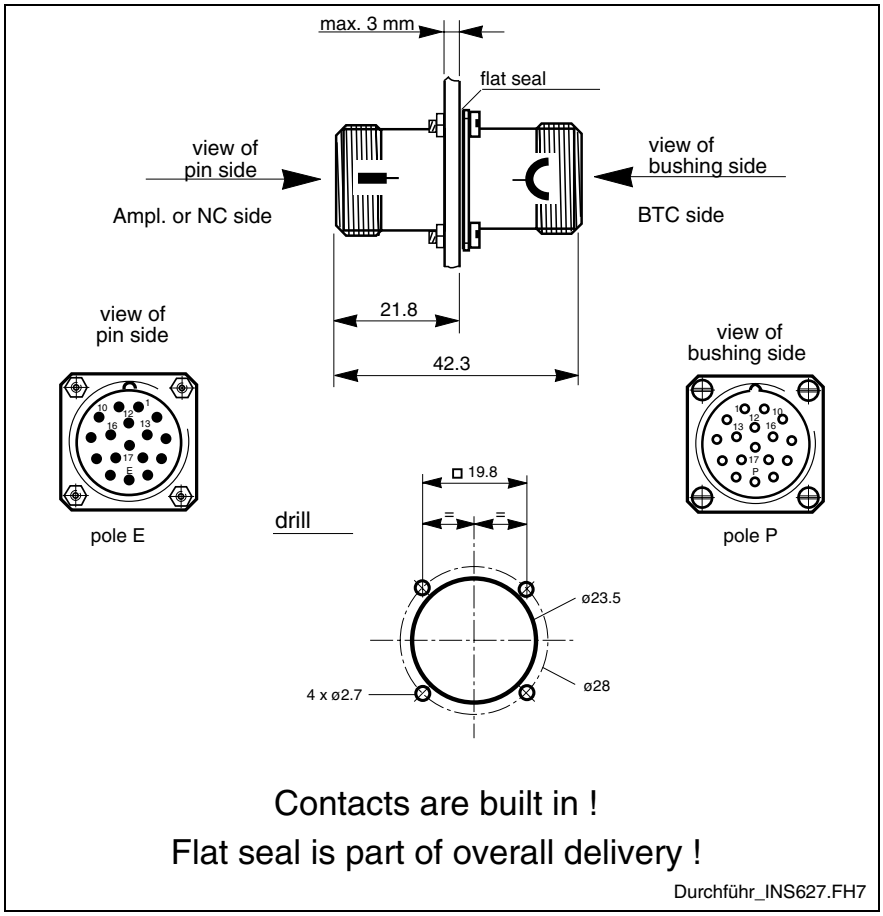


Fig. 6-9: Control cabinet leadthrough INS627

Cabling the BTC06 with CLC-GPS and BTZ01.1

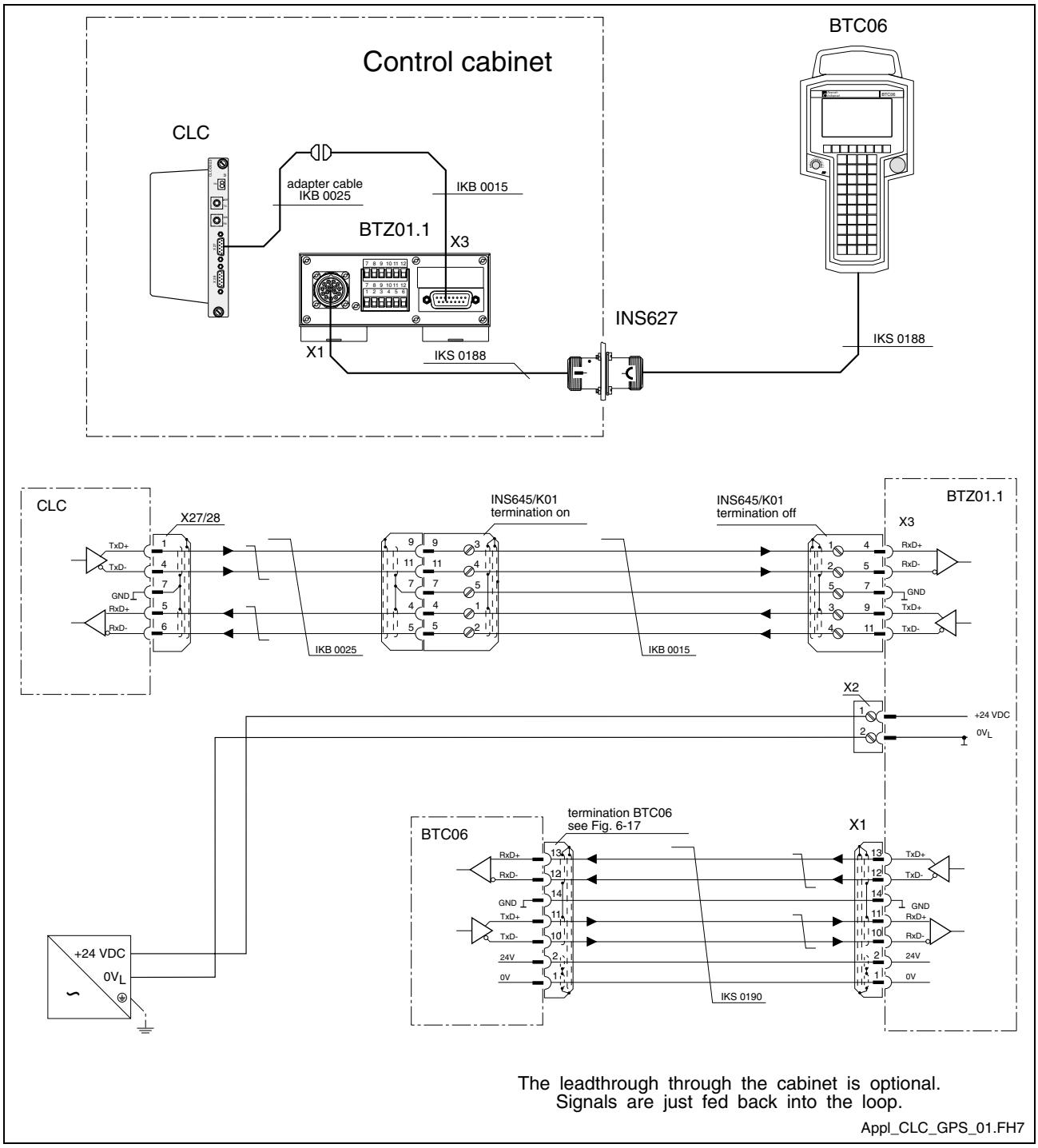


Fig. 6-10: Connecting the BTC06 to a CLC-GPS with BTZ01.1

Cabling the BTC06 with CLC-GPS and BTA10.1

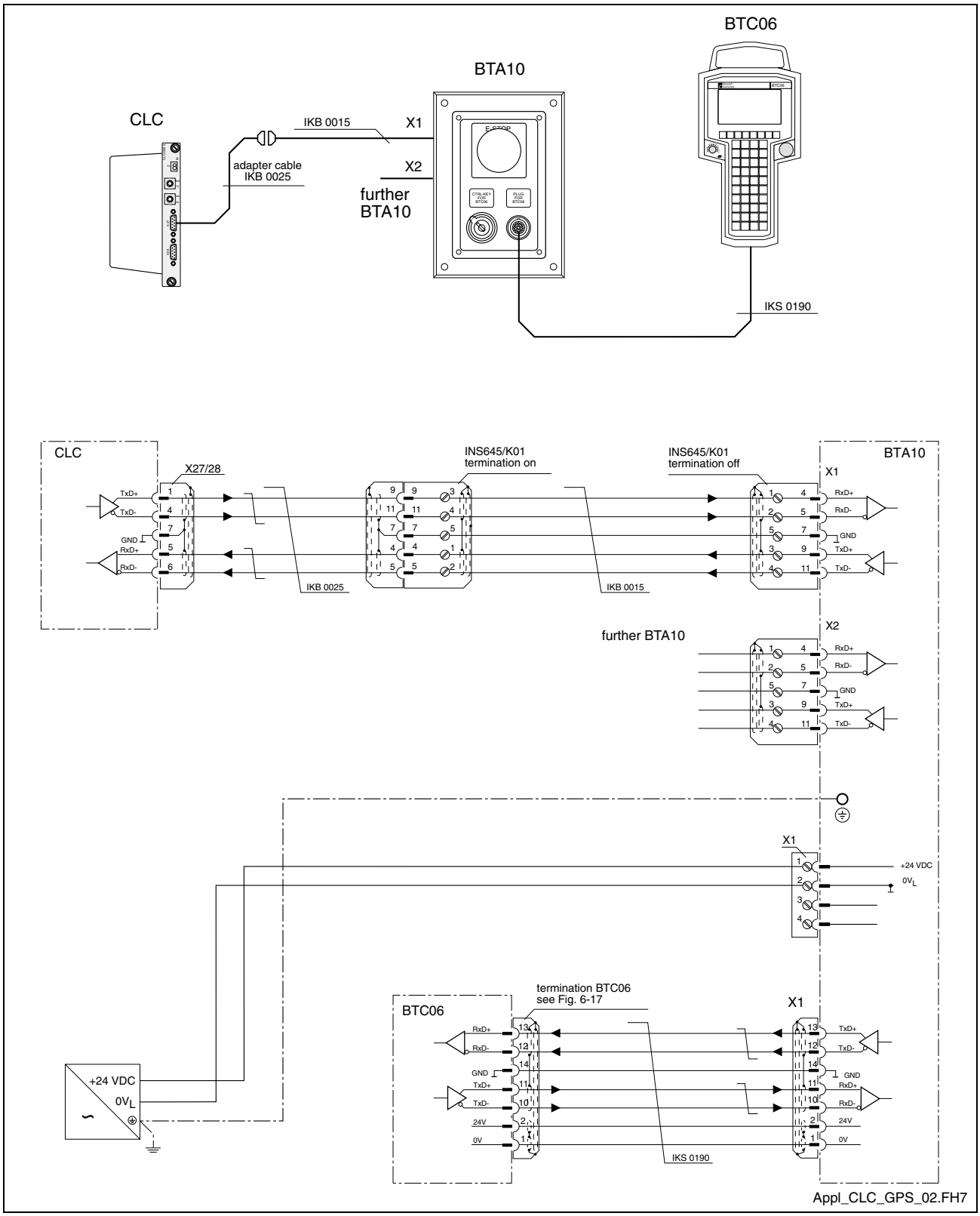


Fig. 6-11: Connecting the BTC06 to a CLC-GPS with BTA10.1

BTC06 with CLC-TRANS01 D

Below is the cabling for a BTC06 with the CLC-TRANS01D. Here, the BTC06.1A-T-NN2-FW is used with TRANS-specific keyboard layout without live-man switch and without emergency stop as manual programming unit for the TRANS01D.

Cabling

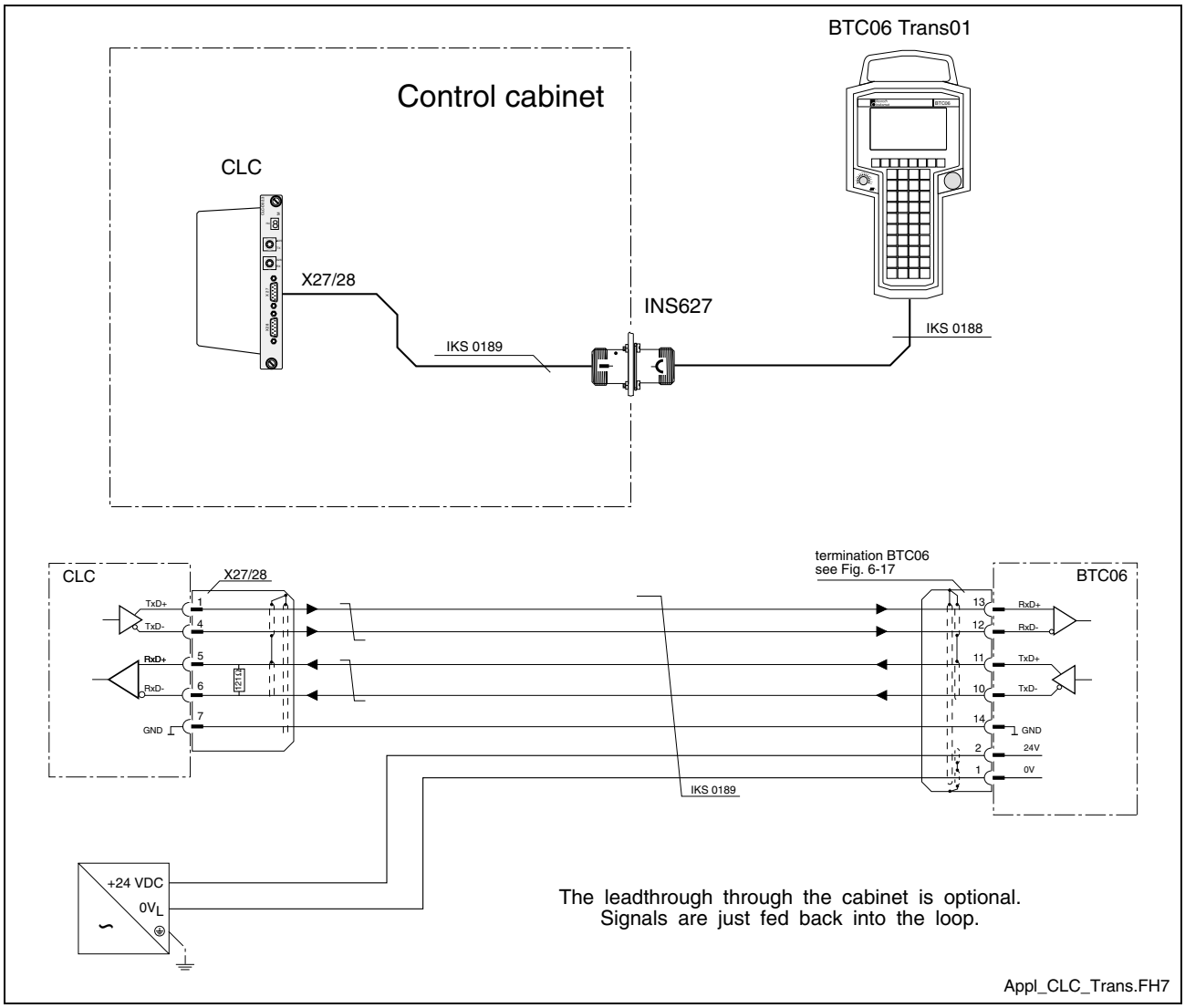


Fig. 6-12: Connecting the BTC06 to a CLC-TRANS01D

BTC06 with RECO PLC

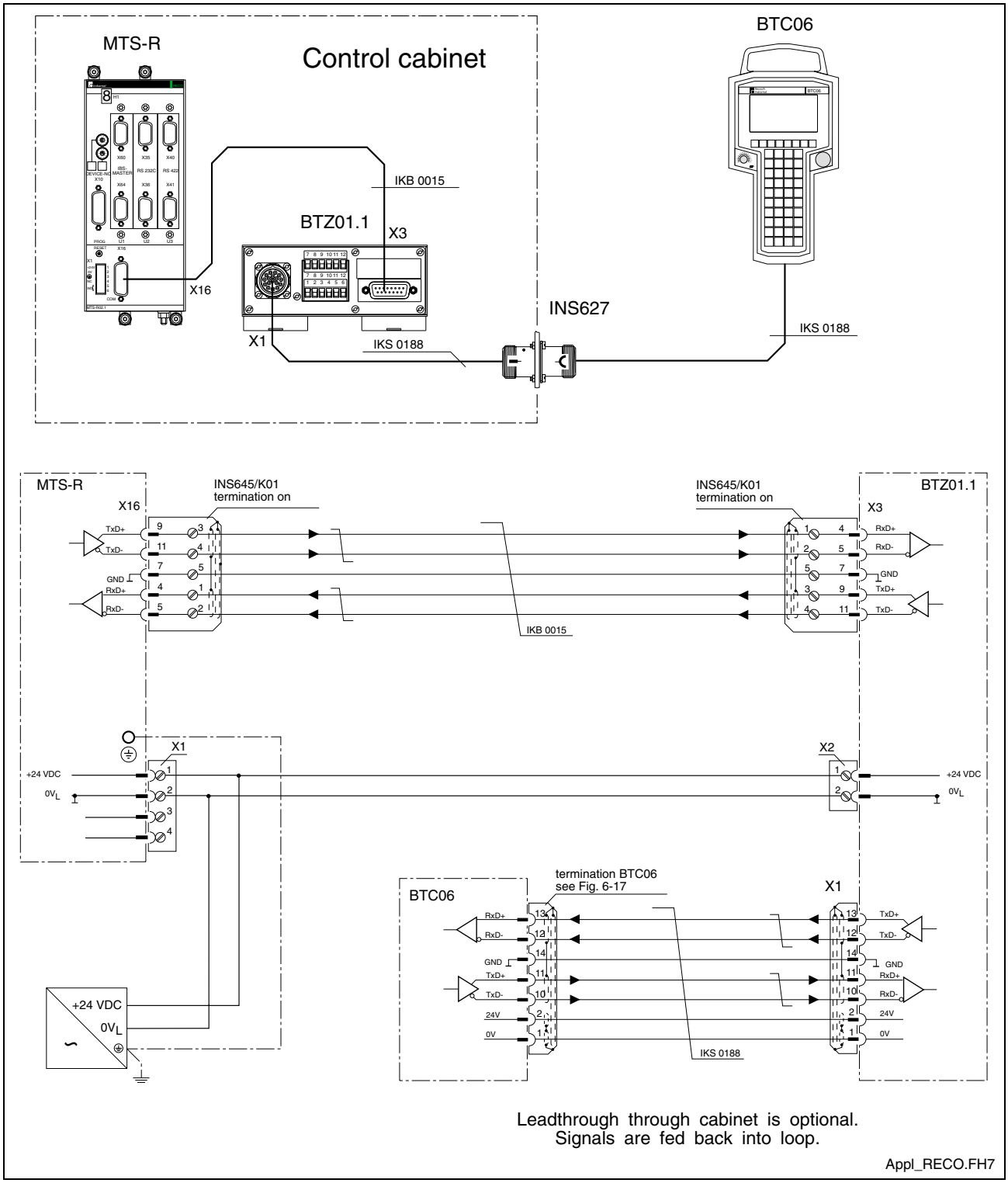


Fig. 6-13: Connecting the BTC06 to a MTS-R

Instead of using a junction box BTZ01.1 to connect a BTC06 it is possible to use a BTA10.1. The IKS0190 cable must, however, be used to cable the BTA to the BTC06.

BTC06 with PPC-R

Cabling the BTC06 with PPC-R and BTZ01.1

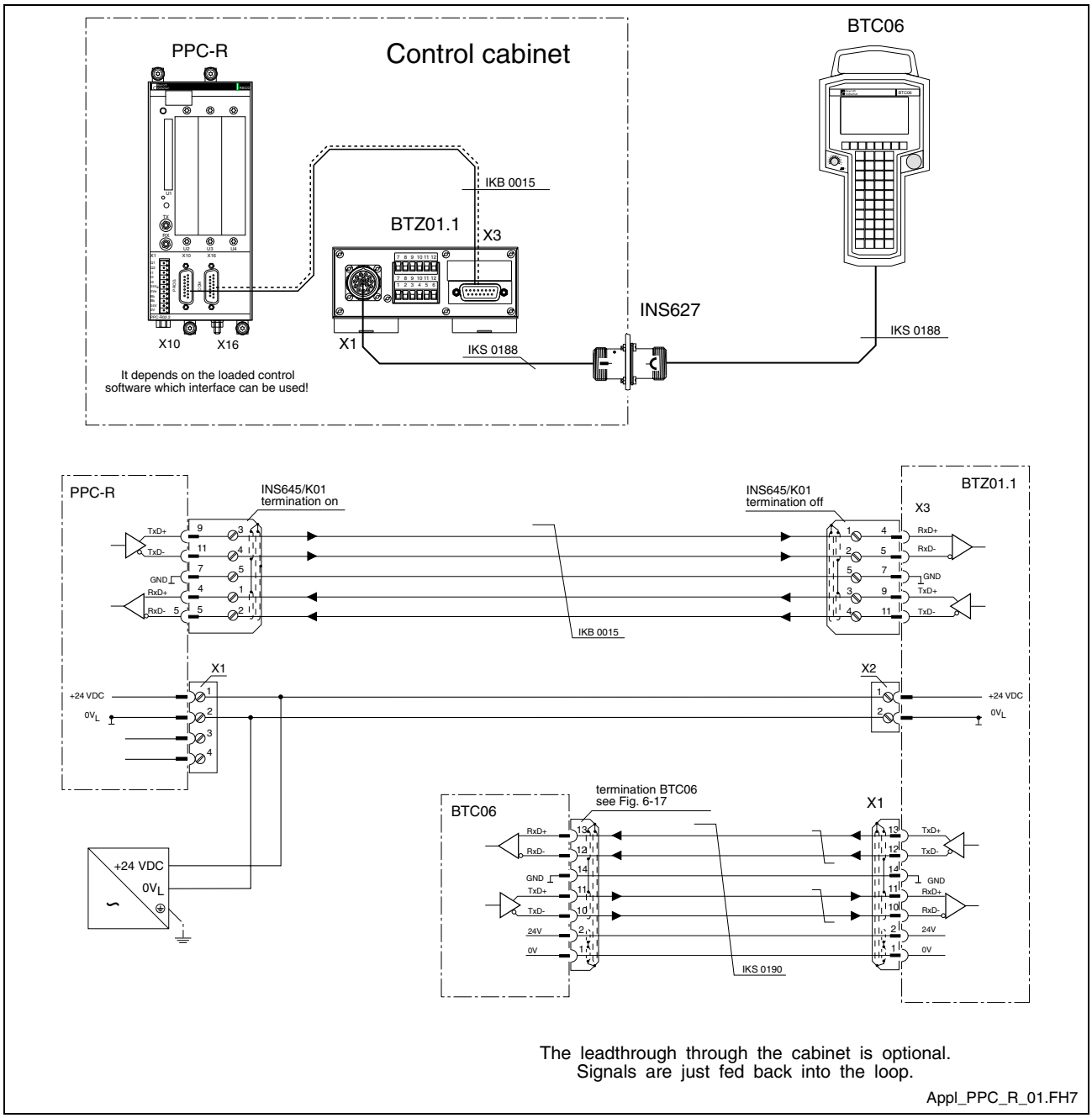


Fig. 6-14: Connecting the BTC06 to a PPC-R with BTZ01.1

Cabling the BTC06 with PPC-R and BTA10.1

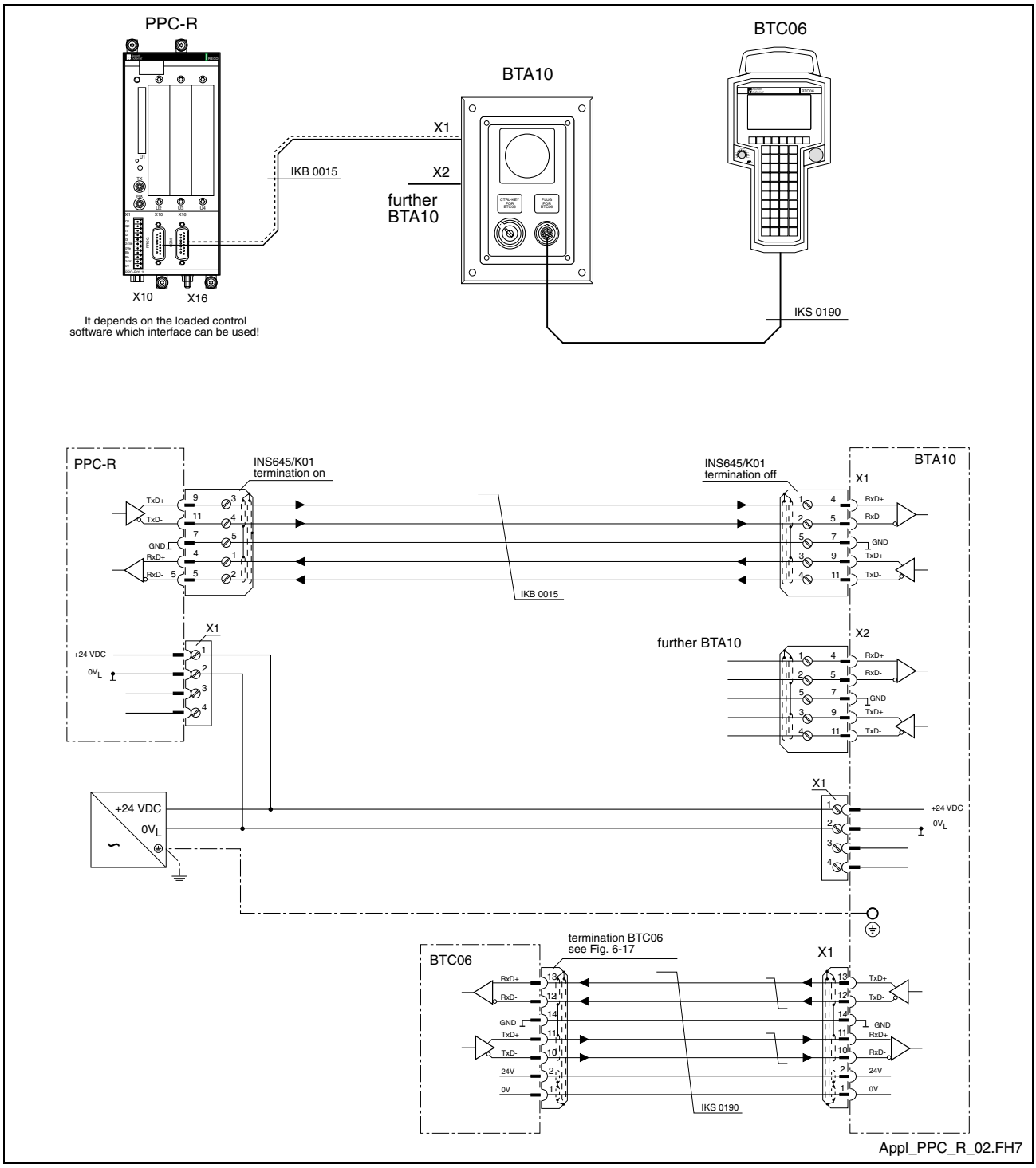


Fig. 6-15: Connecting the BTC06 to a PPC-R with BTA10

BTC06 with DLC

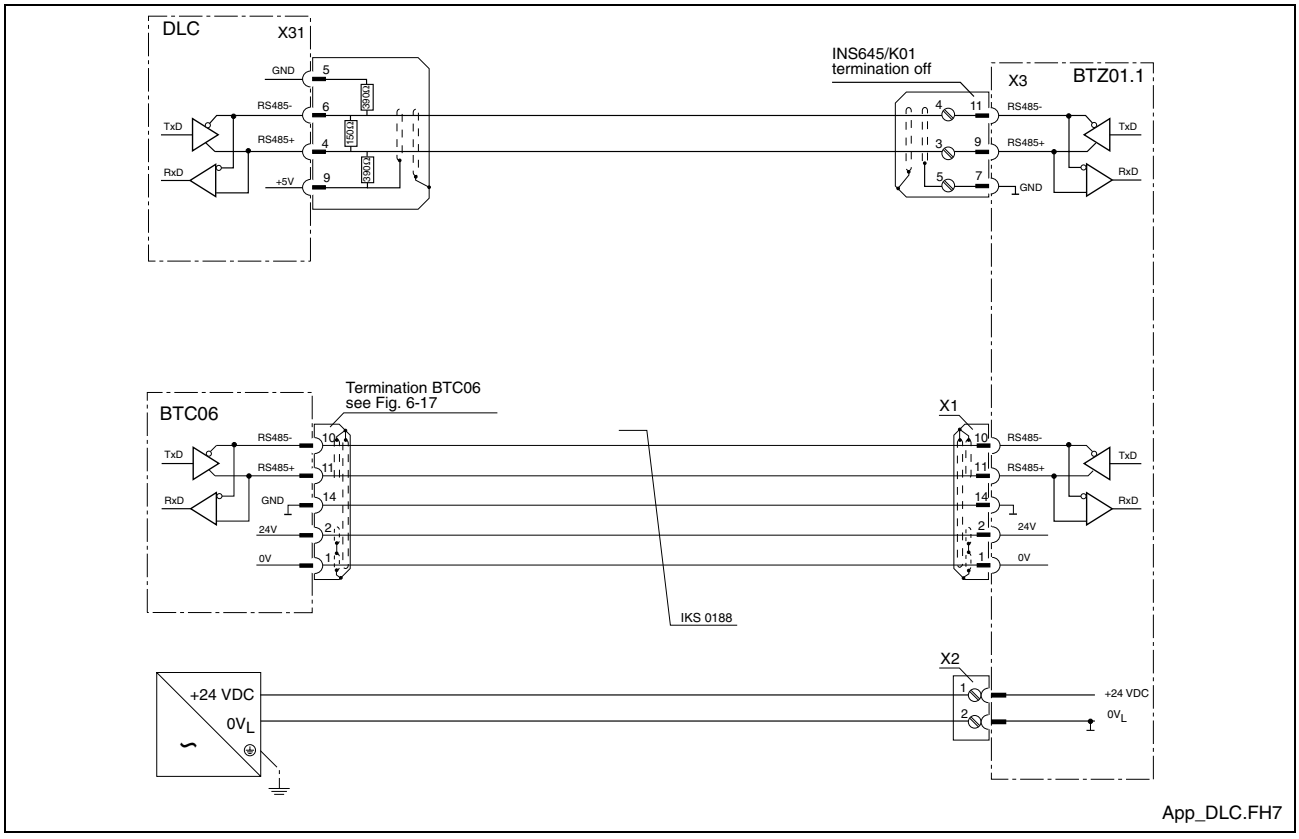


Fig. 6-16: Connecting the BTC06 to a DLC

Termination of the BTC06

The interface of the BTC06 unit is terminated inside the device. All of the preceding applications are not represented with a termination. The realisation of the termination is shown in Fig. 6-17. Further the galvanic separation of the interface is represented in the drawing. The power supply is also realized potential free to the internal supply.

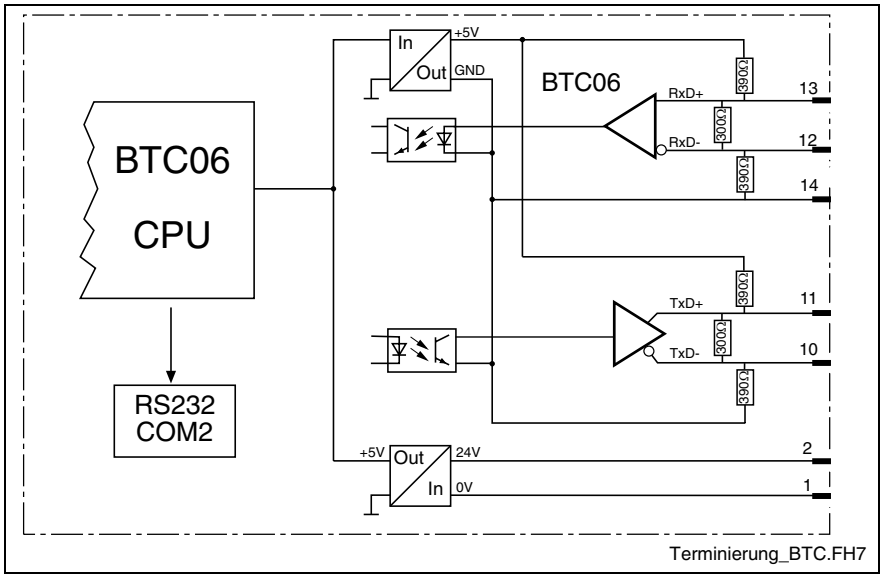


Fig. 6-17: Termination and galvanic separation of the BTC06 interface

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. 6-18).

Which connector housing is to be used with which interface cable is specified in chapter 8.2 (accessories) per the table.

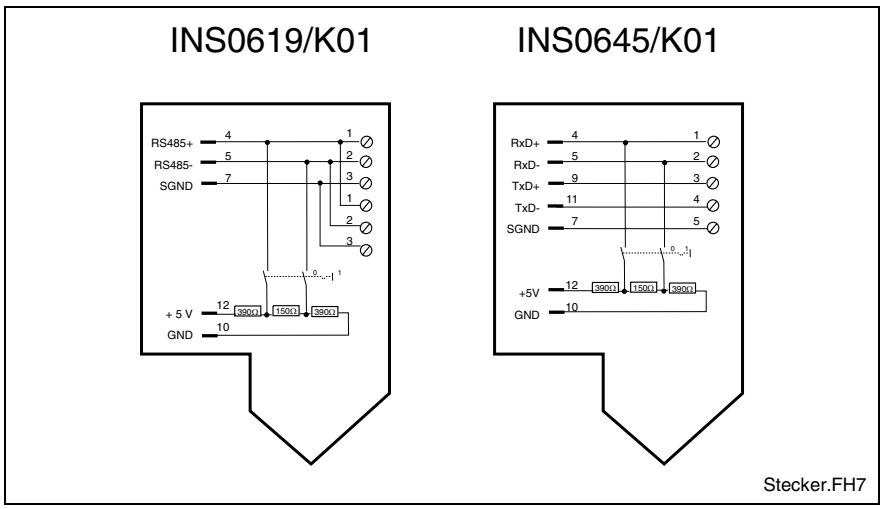
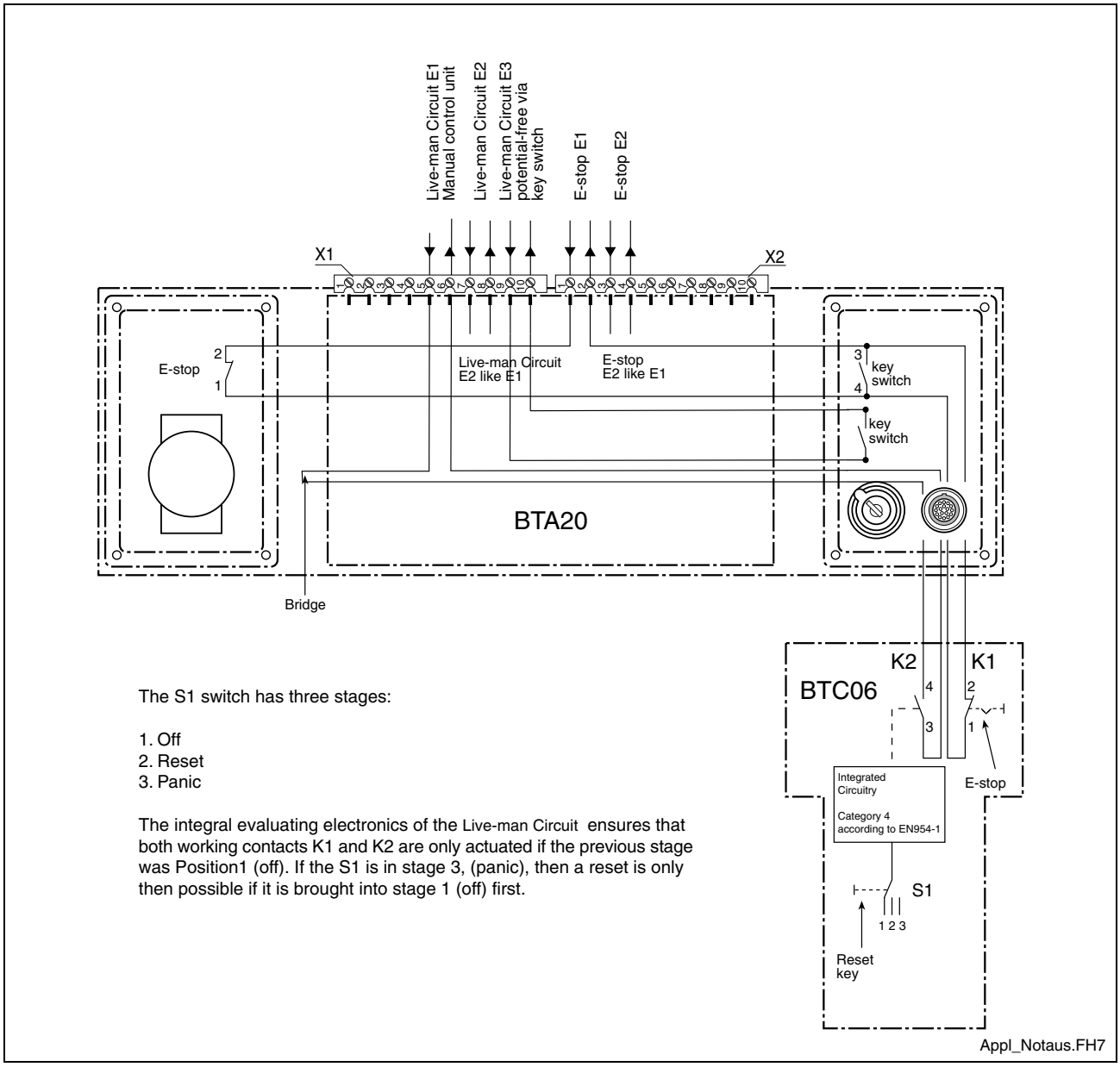


Fig. 6-18: Connector assignment of the standard connector housing

Termination can be added by using the appropriate switch.

BTC06 with Emergency stop and Live-man circuits



The S1 switch has three stages:

1. Off
2. Reset
3. Panic

The integral evaluating electronics of the Live-man Circuit ensures that both working contacts K1 and K2 are only actuated if the previous stage was Position1 (off). If the S1 is in stage 3, (panic), then a reset is only then possible if it is brought into stage 1 (off) first.

Fig. 6-19: Application example of the Emergency stop and Live-man circuits

6.3 Junction box BTZ01.1

In the previous application examples, the junction box BTZ01.1 was used.

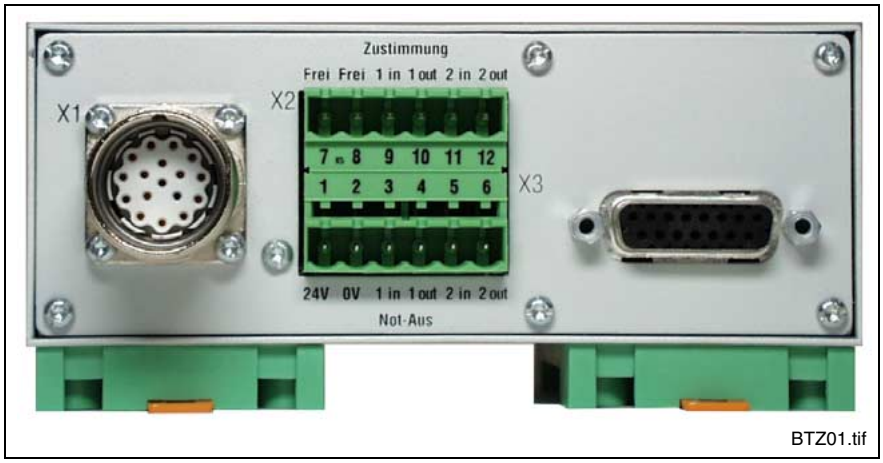


Fig. 6-20: Junction box BTZ01.1

The junction box BTZ01.1 is used if both the emergency stop loop and the live-man are to fully used and present in an application (such as is the example with CLC-GPS). The plug-in connectors mounted to the front make the connections for emergency stop and live-man externally available (see Fig. 6-20).

A 12-pin Phoenix plug-in clamp (X2) make it possible to continue both the live-man and emergency stop function loops.

The 15-pin D-subminiature plug-in connector (X3) is wired to conform with Indramat standards and implements the serial communication of the BTC06 with other components.

Coming from the manual control unit, all signals are first applied to a 17-pin interconnection bushing (X1) and then internally relayed within the unit. The BTC06 receives its power via this plug-in connector.

Dimensions

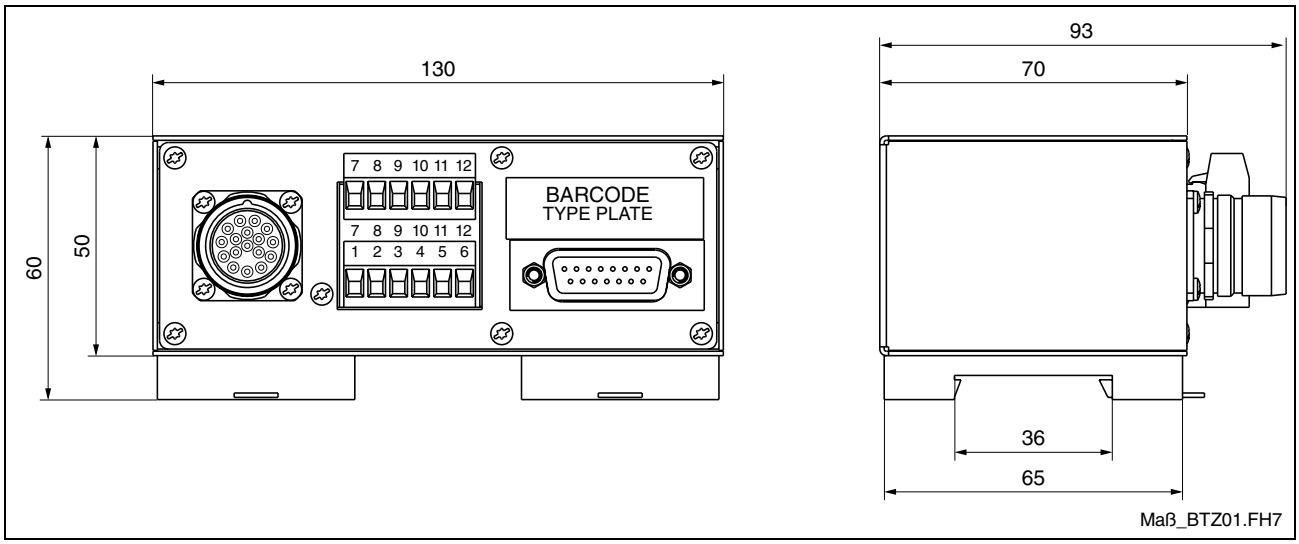


Fig. 6-21: Exterior dimensions of BTZ01.1

Connector Assignment

Bushing X1

Pin	Assignment	
1	0 V	
2	+ 24 V	
3	Live-man switch 1 in	
4	Live-man switch 2 in	
5	Live-man switch 1 out	
6	Live-man switch 2 out	
7	E-STOP 1 in	
8	E-STOP 2 in	
9	E-STOP 1 out	
10	RS422 TxD-	RS485 -
11	RS422 TxD+	RS485 +
12	RS422 RxD-	
13	RS422 RxD+	
14	Signal Ground	
15	N.C.	
16	E-STOP 2 out	
17	N.C.	

Fig. 6-22: Assigning the interconnection bushing X1

Bushing X2

Pin	Assignment	Pin	Assignment
1	24 V	2	0 V
3	E-STOP 1 in	4	E-STOP 1 out
5	E-STOP 2 in	6	E-STOP 2 out
7	N.C.	8	N.C.
9	Live-man 1 in	10	Live-man 1 out
11	Live-man 2 in	12	Live-man 2 out

Fig. 6-23: Assigning the Phoenix bushing X2

Bushing X3

Pin	Assignment	Pin	Assignment
1	N.C.	2	N.C.
3	N.C.	4	RS422 RxD+
5	RS422 RxD-	6	N.C.
7	Signal Ground	8	N.C.
9	RS422 TxD+ / RS485+	10	N.C.
11	RS422 TxD- / RS485-	12	N.C.
13	N.C.	14	N.C.
15	N.C.		

Fig. 6-24: Assigning the D-subminiature bushing X3 as per Indramat standards

7 Commissioning

After the unit has been switched on for the first time, the firmware that comes with the unit on floppy disks must be loaded into the unit. To do this, you must connect the unit to a PC via the RS232 cable IKB0010.

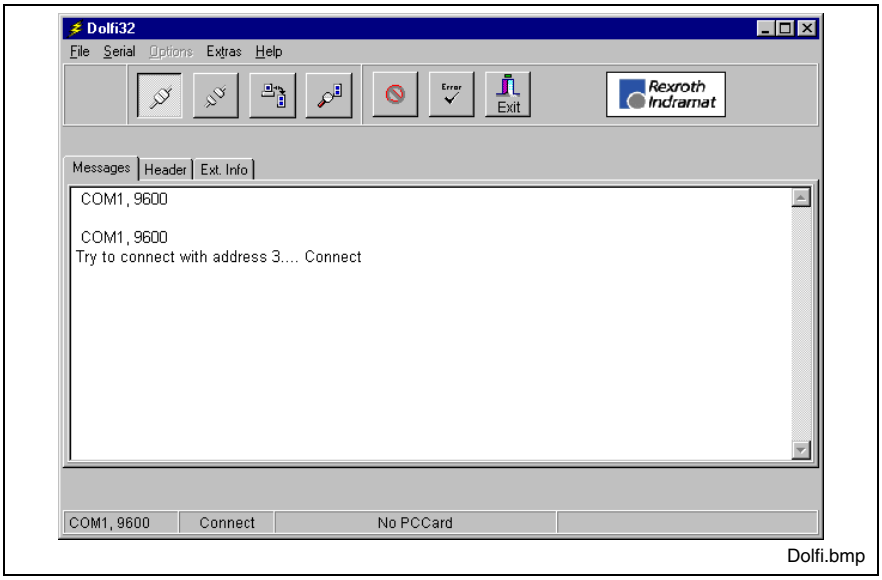


Fig. 7-1: INDRAMAT Flashtool "Dolfi"

7.1 Brief Description of the First-Time Commissioning Procedure

What do you need?

To put the unit into operation, you need the following items:

(1) An operational BTC06 unit that is connected with the system that shall be controlled, and is fed with the 24 V operating voltage.

(2) The PC connecting cable IKB0010

(3) The application software for the BTC06 unit on floppy disk.

(4) A PC with Windows 3.11 or a 32-Bit Windows (e.g. 95, 98 or NT) and the INDRAMAT flash loading tool “Dolfi“ installed (included in the scope of delivery of the BTC06 application software).

What is to be done?

To load the software, use the following procedure:

(1) Connect the BTC06 unit with a PC via the PC connecting cable.

(2) Provide the BTC06 unit with power (switch on the control voltage).

(3) Start Flashtool Dolfi on the PC and click on the "Messages" field there.

(4) Select the menu item “Options - COM-Port":

- Select the COM port
- Select a baud rate of 9600 bits/s (default value)
- Set the download baud rate to 38,400 bits/s
- Address for receiver = 03 (default)

(5) Select the menu item “Serial - Connect“.

(6) Select the menu item “Serial - Send“. Use the “Open“ dialog to select the required software.

(7) **In the case of a software update, you should always make a backup copy of the software that is contained in the unit. To do this, select the option “Backup“ from the subsequent “Send“ dialog. To confirm the two subsequent dialogs, click on “Save“ and “OK“.** This starts the backup process Its progress is shown by a moving bar at the bottom margin. To start the download process proper, you must again select the “Serial - Send“ menu item and choose the software.

(8) Click on “Send“ to confirm the “Send“ dialog. This starts the download process. Its progress is shown by a moving bar at the bottom margin.

(9) Once the download has successfully been completed, Dolfi issues the message “Programming all modules successfully, restart with Serial - Disconnect".

(10) The "Serial - Disconnect" menu item clears down the connection BTC06 - PC and starts the application software in the BTC06 unit for the first time.

The loaded software will now always be started automatically when the BTC06 supply voltage is applied.

7.2 Functions of the BTC06 Bootloader

Procedures After Power-Up

First of all, the Indramat logo appears on the screen, and all LEDs of the BTC06 unit are ON.

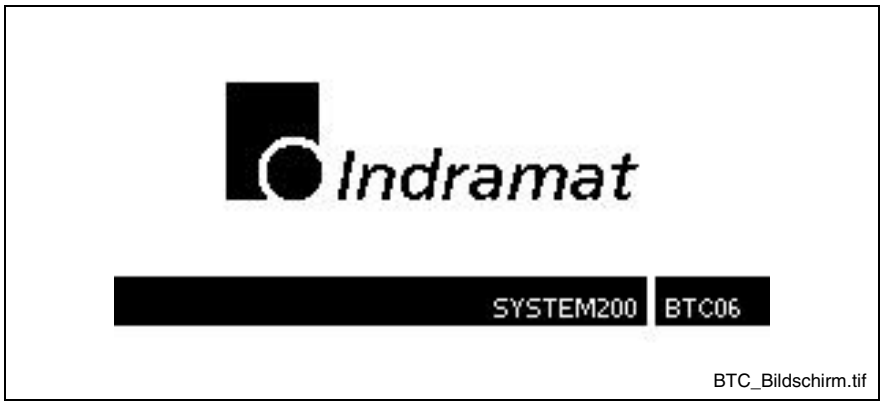


Fig. 7-2: Screen after power-on

The bootloader searches the flash memory for existing software. This process is commented by the footer line „test program CRC“. The search is performed by interrogating the program header and verifying the CRC checksums. A header is a program element that contains information about the employed hardware and firmware. If, for example, firmware has not yet been loaded when first-time commissioning is started, or if the memory content is corrupted, only the bootloader itself will be recognized. The message “dolfi loader active“ is displayed in this case and the unit is immediately ready for receiving software from the PC.

Note: Once a valid software has been loaded, the LEDs are extinguished one by one and the software is started. Up to this point in time you can still press and release the F1 key to abort the software startup and to remain in the Dolfi Loader. The display then shows the versions of bootloader and loaded software (service mode).

7.3 Dolfi Functions

The Dolfi user interface is used for loading the delivered software via the RS232 interface of the BTC06 unit into the unit. Please refer to the documentation that comes with the Dolfi product for a detailed description of the Dolfi functions.

Messages from Dolfi

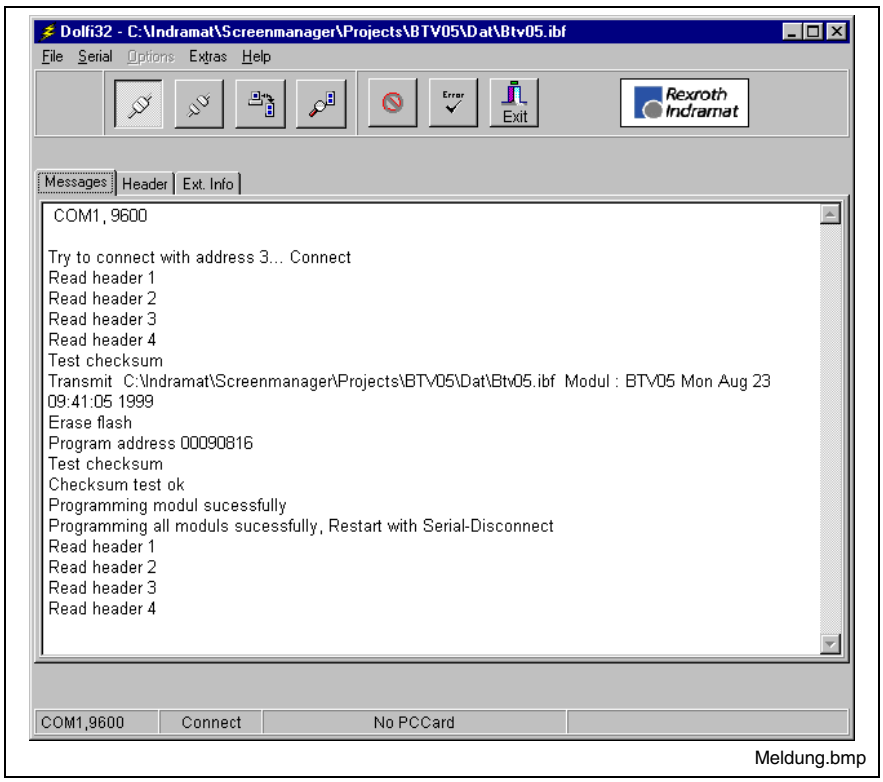


Fig. 7-3: INDRAMAT Flash tool "Dolfi"

Dolfi permits one out of three main windows to be selected: Messages Header and Extended Informations. Messages informs about the currently running operations and issues error messages (if there are any). The Header button displays information about the software loaded into the BTC unit and the contained bootloader.

Header Information

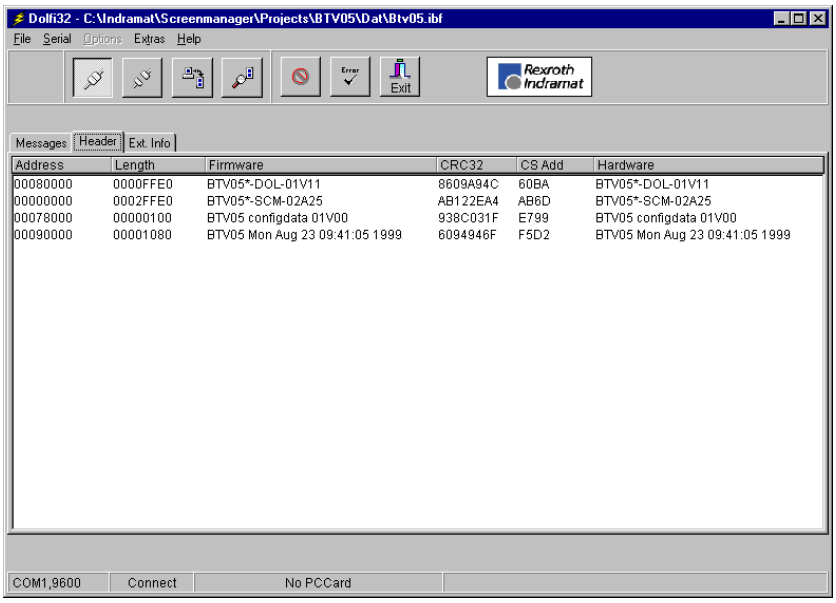


Fig. 7-4: Header list with four modules

After the connection has been established and the Option "Serial - Firmwareinfo has been selected, the “Header“ menu item shows the software and data modules that have been located in the BTC06 unit. Addresses, lengths, and hardware and software names are specified here at the same time.

Interface Settings

To establish communications, the serial COM2 interface of the unit is connected with a PC via the RS232 cable IKB0010. In addition, the matching selections for data transfer must be made. The „Options“ menu item permits the employed interface, the baud rate, the addresses and the required language to be selected. The figure below shows the compatible settings for the BTC06 unit.

The standard baud rate for establishing the connection is always 9600 bits/s. For the BTC06 unit, the increased baud rate for the download is usually 38,400 bits/s.

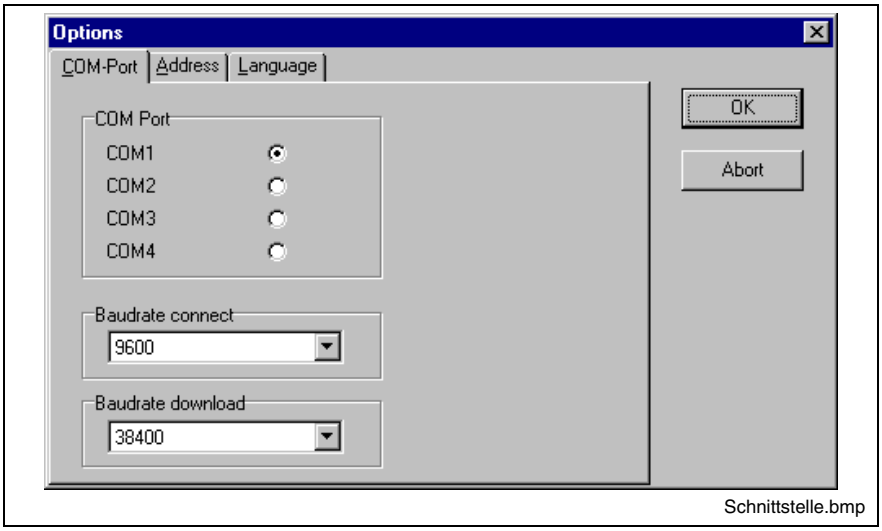


Fig. 7-5: Interface settings

With the BTC06 unit, the address selection is always receiver = 03 (default).

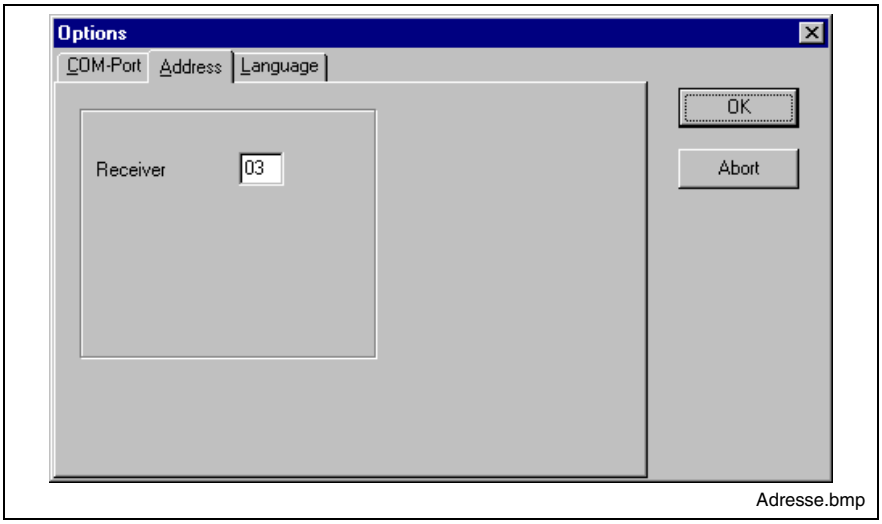


Fig. 7-6: Address selection

Reading Software from the BTC06 unit

The "Serial - Send" menu item starts a firmware loading process. A window is opened in which Dolfi enables the user to compare a previously loaded software with the new one. While “File info“ shows the information about the selected file, "Module info" shows the information about the firmware found in the BTC06 unit. With the option "Backup" the file will be read out of the unit.

Note: This is the last opportunity of saving the software that is contained in the unit before a new software is downloaded from the PC. This must be done before a new software update is loaded.

This is the only possibility of loading the old file back into the unit if the new software does not work properly. The read file has automatically the extension ‘.BAK’ assigned.

Loading Software

The "Serial - Send" menu item starts the firmware loading process. The software transfer begins when you select the "Send" option.

If the software that is displayed here is not the one you wish to load, abort the process and use "File/Open" to select and confirm the required IBF file. A window “FWA“ is displayed now that contains information about the firmware. It is now possible to download the selected file. For this you must select the option “Send“.

Note: If you wish to reload a saved file, you must select the file type ‘All *.*’ to make this extension visible. After a read process, you must start the download again via the corresponding icon.

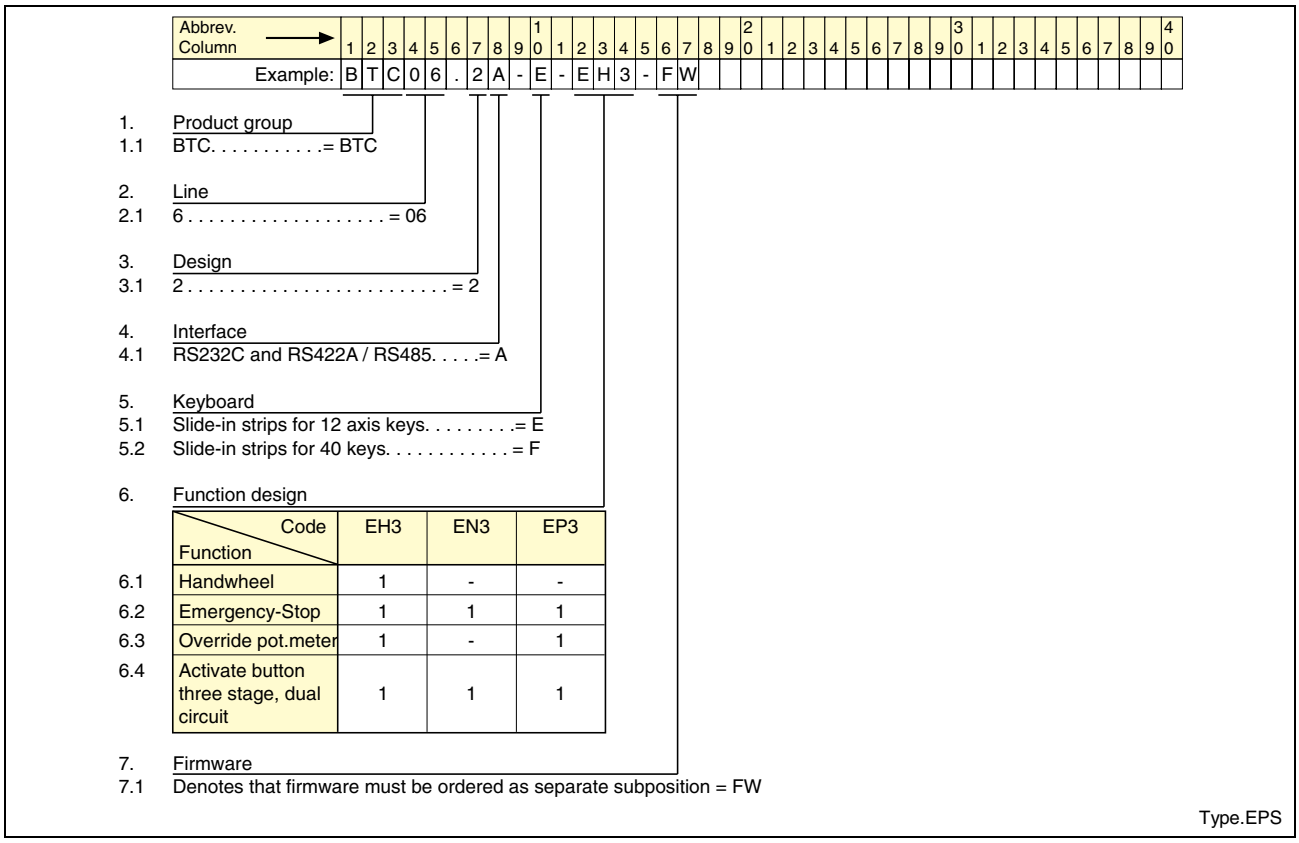
The progress of the transfer is shown by the moving bar with percent indication at the lower screen margin and in the message window. The BTC06 unit shows a corresponding status information in the bottom screen line.

During the load process, the required area in the flash is cleared first, before the program is written to it. Once loading is completed, a CRC and addition checksum is verified. Dolfi shows the status of the transfer on the screen.

The “Disconnect“ icon interrupts the connection between PC and BTC06 and starts the firmware in the unit.

8 Ordering Information

8.1 Type Code BTC06.2

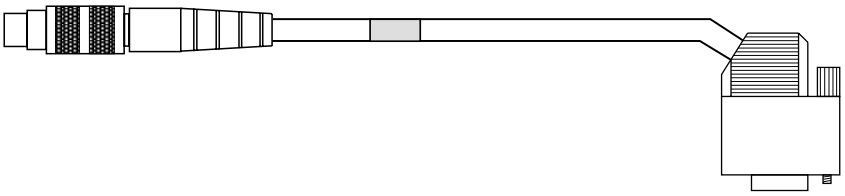
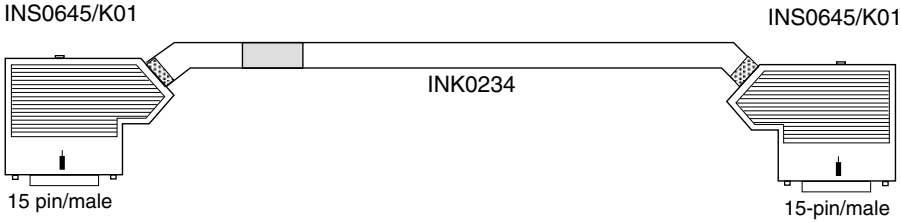
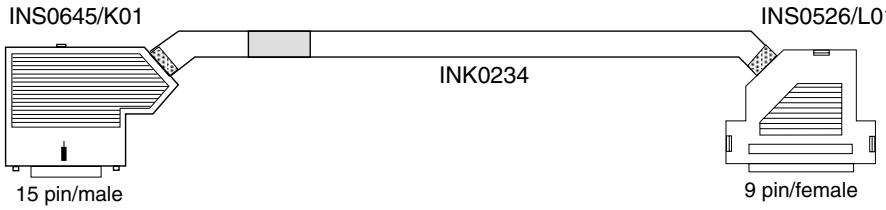
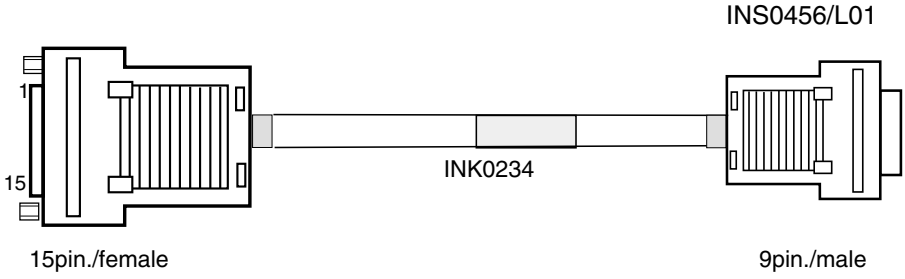
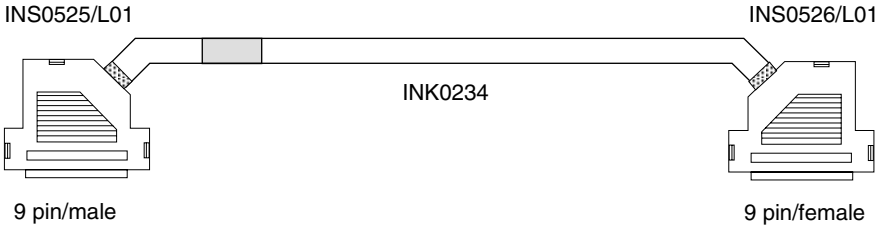
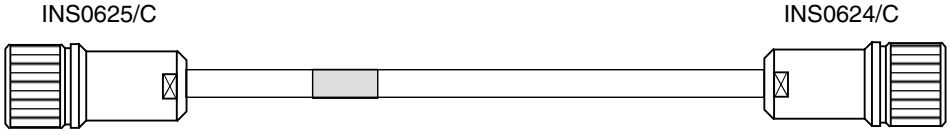
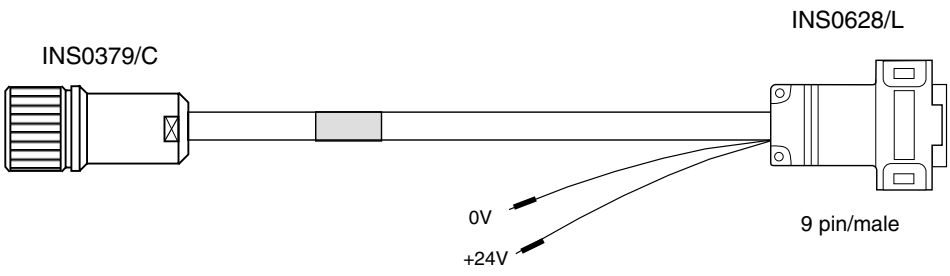


	Code / Function	EH3	EN3	EP3
6.1	Handwheel	1	-	-
6.2	Emergency-Stop	1	1	1
6.3	Override pot.meter	1	-	1
6.4	Activate button three stage, dual circuit	1	1	1

Fig. 8-1: BTC06.2 Typecode

8.2 Accessories

Connectors and Standard Cables

Order designation of standard cables	Matching connector of unit	INDRAMAT cable	Cable end type
IKB0010/005,0 MN: 277 733 (RS232)			
IKB0015/000,0 MN: 282 870 (RS422, max 400m)			
IKB0016/000,0 MN: 282 871 (RS422, max 400m)			
IKB0025/00,15 MN: 286165 (Adapter RS422)			
IKB0193/000,0 MN: 282 041 (RS232, max 2m)			
IKS0188/000,0 Standard interface cable Connection BTC06			
IKS0189/000,0 Standard interface cable Connection BTC06 on Trans01D			

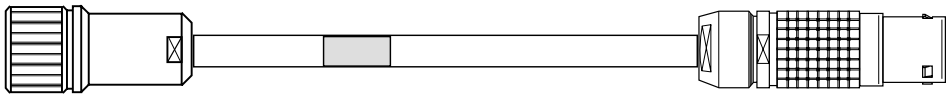
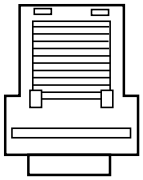
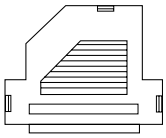
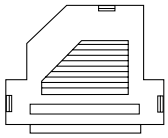
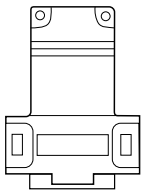
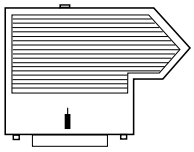
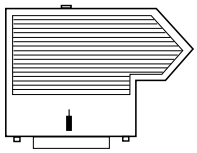
IKS0190/000,0 Standard interface cable Connection BTC06	INS0624/C INS0631/C 
INS0456/L01 MN: 257046	 D-subminiature plug-in connector INS0456/L01 (9 pin/male)
INS0525/L01 MN: 259 759	 D-subminiature plug-in connector INS0525/L01 (9 pin/male)
INS0526/L01 MN: 259 762	 D-subminiature plug-in connector INS0526/L01 (9 pin/female)
INS0628/L MN: 279 408	 D-subminiature plug-in connector INS0628/L (9 pin/male)
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. 8-2: Connector and cable accessories of the BTC06

SUP-M02-BTC06 Wall-Mounting Bracket

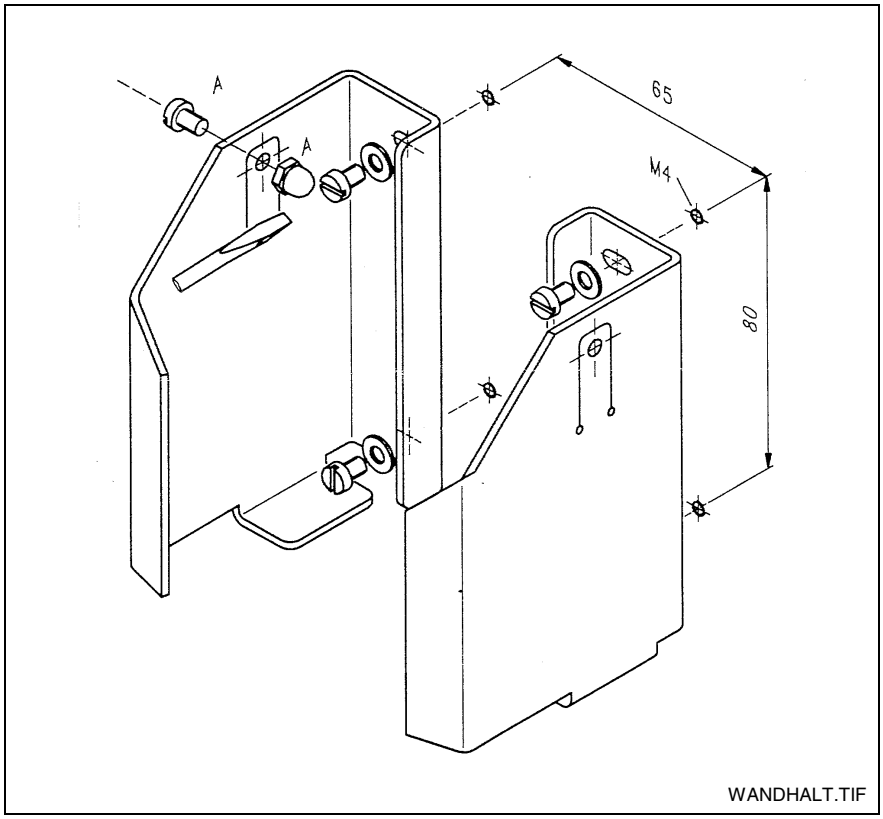


Fig. 8-3: Wall-Mounting Bracket

The mounting bracket is provided to attach the BTC06 to a wall or to a machine part. When fastened at the proper height, the display can be read and the device can be operated without removing it from the bracket. The user can mount the two-piece wall bracket so that the live-man switch is enabled when the device is inserted into the bracket. However, this mounting method should be used only if the device is mounted outside of a hazardous zone. In this case, the system must have provisions in accordance with DIN EN 775 to ensure that no persons can be present within the room that is equipped with protective safety features.

Software

Performance / Control	Software designation
ScreenManager for: MTS/P, MTS/R, CLC	SWA-BTC06*-SCM-01VRS-MS (Runtime) SWA-BTC06*-SCM-02VRS-MS (Runtime) SWA-BTC06*-SCM-03VRS-MS (Runtime) SWA-BTC06*-SCM-04VRS-MS (Runtime) SWA-SCM*PC-INB-04VRS-MS (PC-programming tool)
VT100 Terminal for CLC-GPS	SWA-BTC06*-VT*-01VRS-MS
Program software for CLC with TRANS01D	SWA-BTC06*-T01-01VRS-MS
Download tool Dolfi for PC	SWD-DOL*PC-INB-01VRS-MS-C1,44

Fig. 8-4: BTC06 Software

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11 Service & Support

11.1 Helpdesk

Unser Kundendienst-Helpdesk im Hauptwerk Lohr am Main steht Ihnen mit Rat und Tat zur Seite. Sie erreichen uns

- 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**

11.2 Service-Hotline

Außerhalb der Helpdesk-Zeiten ist der Service direkt ansprechbar unter

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

After helpdesk hours, contact our service department directly at

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

11.3 Internet

Unter **www.indramat.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.

*) http://www.indramat.de/de/kontakt/adressen
Die Angaben in der vorliegenden Dokumentation können seit Drucklegung überholt sein.

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☐ offices providing service

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

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

11.4 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.

11.5 Kundenbetreuungsstellen - Sales & Service Facilities

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from abroad: don't dial (0) after country code!

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Bosch Rexroth AG Vertrieb Deutschland Regionalzentrum West Borsigstrasse 15 40880 Ratingen Tel.: +49 (0)2102 409-0 Fax: +49 (0)2102 409-406	Bosch Rexroth AG Regionalzentrum Mitte Waldecker Straße 13 64546 Mörfelden-Walldorf Tel.: +49 (0) 61 05 702-3 Fax: +49 (0) 61 05 702-444	Bosch Rexroth AG Walsroder Str. 93 30853 Langenhagen Tel.: +49 (0) 511 72 66 57-0 Fax: +49 (0) 511 72 66 57-95	Bosch Rexroth AG Kieler Straße 212 22525 Hamburg Tel.: +49 (0) 40 81 955 966 Fax: +49 (0) 40 85 418 978

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from abroad: don't dial (0) after country code, Italy: dial 0 after country code

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France - Frankreich Bosch Rexroth S.A. Division Rexroth Indramat 91, Bd. Irène Joliot-Curie 69634 Vénissieux – Cedex Tel.: +33 (0)4 78 78 53 65 Fax: +33 (0)4 78 78 53 62	Italy - Italien Bosch Rexroth S.p.A. Via G. Di Vittoria, 1 20063 Cernusco S/N.MI Tel.: +39 02 2 365 270 Fax: +39 02 700 408 252378	Italy - Italien Bosch Rexroth S.p.A. Via Paolo Veronesi, 250 10148 Torino Tel.: +39 011 224 88 11 Fax: +39 011 220 48 04	Italy - Italien Bosch Rexroth S.p.A. Via del Progresso, 16 (Zona Ind.) 35020 Padova Tel.: +39 049 8 70 13 70 Fax: +39 049 8 70 13 77
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Sweden - Schweden Rexroth Mecman Svenska AB Indramat Support Ekvändan 7 254 67 Helsingborg Tel.: +46 (0) 42 38 88 -50 Fax: +46 (0) 42 38 88 -74	Switzerland West - Schweiz West Bosch Rexroth Suisse SA Département Rexroth Indramat Rue du village 1 1020 Renens Tel.: +41 (0)21 632 84 20 Fax: +41 (0)21 632 84 21	Switzerland East - Schweiz Ost Bosch Rexroth Schweiz AG Geschäftsbereich Indramat Hemrietstrasse 2 8863 Buttikon Tel. +41 (0) 55 46 46 205 Fax +41 (0) 55 46 46 222	

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