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KEMRO
KEBA MACHINE AND
ROBOT CONTROL

HT 401, HT 402

Handheld Terminal
User's Manual

General Information

V 2.0



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Notes on This Manual

At various points in this manual you will see notes and precautionary warnings regarding possible hazards. The meaning of the symbols used is explained below.



Failure to observe safety precautions identified by this symbol could result in personal injury and/or damage to machinery and equipment.



This symbol reminds you of the possible consequences of touching electrostatically sensitive components.

Notice

Notes on use of equipment and useful practical tips are identified by the "Notice" symbol. Notices do not contain any information that draws attention to potentially dangerous or harmful functions.

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Document version: V 2.0
Filename:401402_e.doc, last saving on: 20.7.2001, document number: 22376

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1 Brief Description

The HT 401 and HT 402 are portable controls and display terminals for industrial applications. Due to its field bus compatibility, the large display and the optimized ergonomics, the handheld terminal is suitable for a great variety of tasks:

- Operator panel for machines and plants
- Teach panel for the testing mode of robots
- Setup device for drives
- Handheld device for machine tools

Compared to the HT 401, the HT 402 features a larger memory and graphic functions for the HT display.

The HT 40x (HT 401 / HT 402) is programmed using the programming software supplied with. The handheld terminal is available in the following versions:

HT 401 - 4x20



Display with 4x20 characters, 40 keys

HT 401 - 8x20, HT 402



HT 401: Display with 8x20 characters, 36 keys
HT402: like HT401 and graphic functions

HT 401/NC - 4x20



In additon electronic handwheel (Numeric Control)

HT 401/NCO - 4x20



Like NC, but 32 keys and in addition two override potentiometers

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1.1 Construction

Housing

- CE conforming housing
- Housing form conceived for both left- and right-handers
- Impact-resistant plastic housing withstands oil, grease, alcohol, and condensates containing hydrochloric acid, nonflammability (UL94-V0)
- Rubber bushing at cable entry for cables with a diameter from 8 to 11 mm

Operating and display panel

- 40 membrane keys with tactile feedback, transparent key surface and rim embossing
- 40 2-color LEDs (red and green), 1 LED is assigned to each key
- 4 slots for individual key labeling
- Slot for individual device labeling (e.g. company logo)
  (except HT 401-8x20 and HT 402)
- Buzzer installed in the back of the device for keyclick and audible alarm
- LED-backlit supertwist LC display with 4 x 16 characters

Operating safety

- The devices meet the standards
  EN60204-1 (Safety of machinery - Electrical equipment of machines)
  EN61131-1 and -2 (Programmable controllers)
- EMC standards
  EN50081-2 (EMC - Generic Emission Standard) and
  EN50082-2 (EMC - Generic Immunity Standard)
- Emergency stop switch in accordance with EN418 (Safety of machinery):
  2 potential-free normally closed contacts for connecting external peripherals, nominal voltage 24 V (Safety low voltages in accordance with EN61131-2 and EN50178 (Electronic equipments for use in power installations)), maximum current 500 mA.
  The emergency stop switch can also be evaluated by the software.
- Enabling switches in accordance with EN 60204-1 in safety categories in accordance with EN 954-1:1996 (safety-related parts of control systems):
  2-channel, 3-position: safety category 3
  2-channel, 2-position: safety category 3
  1-channel, 2-position: safety category B

  2 potential-free normally open contacts for connecting external peripherals, nominal voltage 24 V DC (safety low voltage in accordance with EN 61131-2 and EN 50178), maximum current 500 mA DC.

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1.2 Hardware

- Microprocessor Hitachi H8/3002
- HT 401: 256k FLASH memory, 128k SRAM
  HT 402: 512k FLASH memory, 128k SRAM
- Interfaces, to be configured by the software:

Serial interface 1:	*	RS-232-C (without hardware handshake),
	*	20 mA Current Loop (transmitter and receiver can be configured active or passive using the DIP switches)
Serial interface 2: (*Option)*	*	RS-232-C (without hardware handshake),
	*	20 mA Current Loop (transmitter and receiver can be configured active or passive)
	*	RS-422-A / RS-485

Transmission rate up to 38400 Baud

Bus coupling (Option)	*	INTERBUS
	*	CAN
	*	Siemens S7 MPI
	*	PROFIBUS-DP

- Optical isolation of power supply
- All signals and voltages are connected to the connection board.

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1.3 Type Plate

Sample of HT type plate:



1.....product name:
a: number of enabling switches
b: number of positions (2 or 3) of enabling switch
c: enabling switch circuits for external evaluation
/d: designation of version (e.g.: NC, NCO,...)
-e: number of display lines (4 or 8)
/f: If the HT is equipped with an option (key switch, program loading connector,...) "O" will be indicated at this position.

Example of product name:

HT401-232/NCO-4/O

abc d e f

- 2 enabling switches
- 3-position enabling switch
- 2 enabling switch circuits for external evaluation
- Handwheel (**n**umeric **c**ontrol) and 2 **o**verride potentiometers
- Display with 4 lines
- Option (key switch, program loading connector,...)

2.....blank line for further information (e.g.: 3-position enabling switch)
3.....connection specifications
4.....KEBA serial number
5.....KEBA material number

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2 Safety Precautions

The instructions contained in this manual must be precisely followed in all circumstances. Failure to do so could result in the creation of potential sources of danger or the disabling of safety features integrated in the handheld terminal.

Apart from the safety instructions given in this manual, the safety precautions and accident prevention measures appropriate to the situation in question must also be observed.



- **Measures must be taken to ensure that in the event of power dips or power failures, an interrupted program can be properly restarted. In such situations, no dangerous operating conditions must be allowed to occur even temporarily.**
- **In all situations where faults occurring on the automation system could cause personal injury or significant damage to machinery and equipment, additional external safety measures must be taken in order to ensure the system as a whole remains in a safe operating condition even in the event of a fault.**
- **The functionality of safety-related parts (E-stop and enabling switches) must be tested regularly.**
- **Also after strong shocks (e.g. device falls to ground) of the device, the functionality of safety-relevant parts must be tested.**

2.1 Power Supply



The device meets the safety class III in accordance with EN61131-2 and EN50178. The 24V power supply for the equipment must be guaranteed through safe isolation of the low-voltage circuits from dangerous-contact voltage circuits (e.g. by safety transformers or similar facilities).

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2.2 Emergency Stop Switch (EN 418 - Safety of Machinery)

The emergency stop switch of the handheld terminal meets the requirements of the EN 418 standard, category 0 or category 1. The safety category (in accordance with EN 954) must be defined by means of the risk assessment of the machine according to EN 1050.



- **As long as the emergency stop switch is not correctly wired in the emergency stop circuit, store the handheld terminal on a place which is out of reach of the operator.**
  Take into account that the operator would automatically activate the nearest emergency stop in case of danger. This could have fatal consequences if the emergency stop did not function!
- **Emergency stop facilities must remain operational in all operating modes. Resetting an activated emergency stop facility must not result in uncontrolled start-up of machines or installations.**
- **The emergency stop switch does not replace all other safety facilities!**

2.3 Enabling Switches

At many machines the operator must enter the dangerous area from time to time in order to carry out programming, testing, setting and servicing jobs. This happens in the manual mode of the station, in which the guard is deactivated. This mode must be activated by means of a lockable selector. The enabling switches are used to enable commands for dangerous movements.

To meet the safety category 3 in accordance with EN 954-1:1996, the enabling switch must be realised with 2 channels. The draft of the C-standard of the machine tools and machining centres specifies as follows:

„An enabling device may be a 2-position device in conjunction with an emergency stop device or a 3-position device. The 3-position device is preferred.“

The EN 60204 describes the functioning of the enabling device. Due to the latest findings of analyses of accidents and since technical solutions are available, the 3-position enabling switch became the state of the art. The positions 1 and 3 of the enabling switch are OFF functions. Only the central position is used for enabling. The EN 60204-1:1997 is identical with the IEC 60204-1. So the 3-position enabling switch is of international importance.

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- **Enabling switches may only be used if the operator activating the enabling switch recognizes the dangerous situation in time so that he can immediately take the necessary measures to avoid such situations!**
- **The enabling switch is only used to enable commands for performing dangerous movements. The commands themselves must be activated by a separate operating element (key on HT). Only persons who are allowed to activate the enabling switch are also allowed to work in the dangerous area.**
- **2-position enabling switches may only be used in connection with an emergency stop facility.**
- **At the HT 40X, the enabling switches always feature 2 channels.**

To be able to assess what rules or what parts of the rules are to be observed regarding the safety-related parts of a machine, the risk assessment can be carried out.

2.4 Risk Assessment of Machinery

For the risk assessment the following standards must be applied:

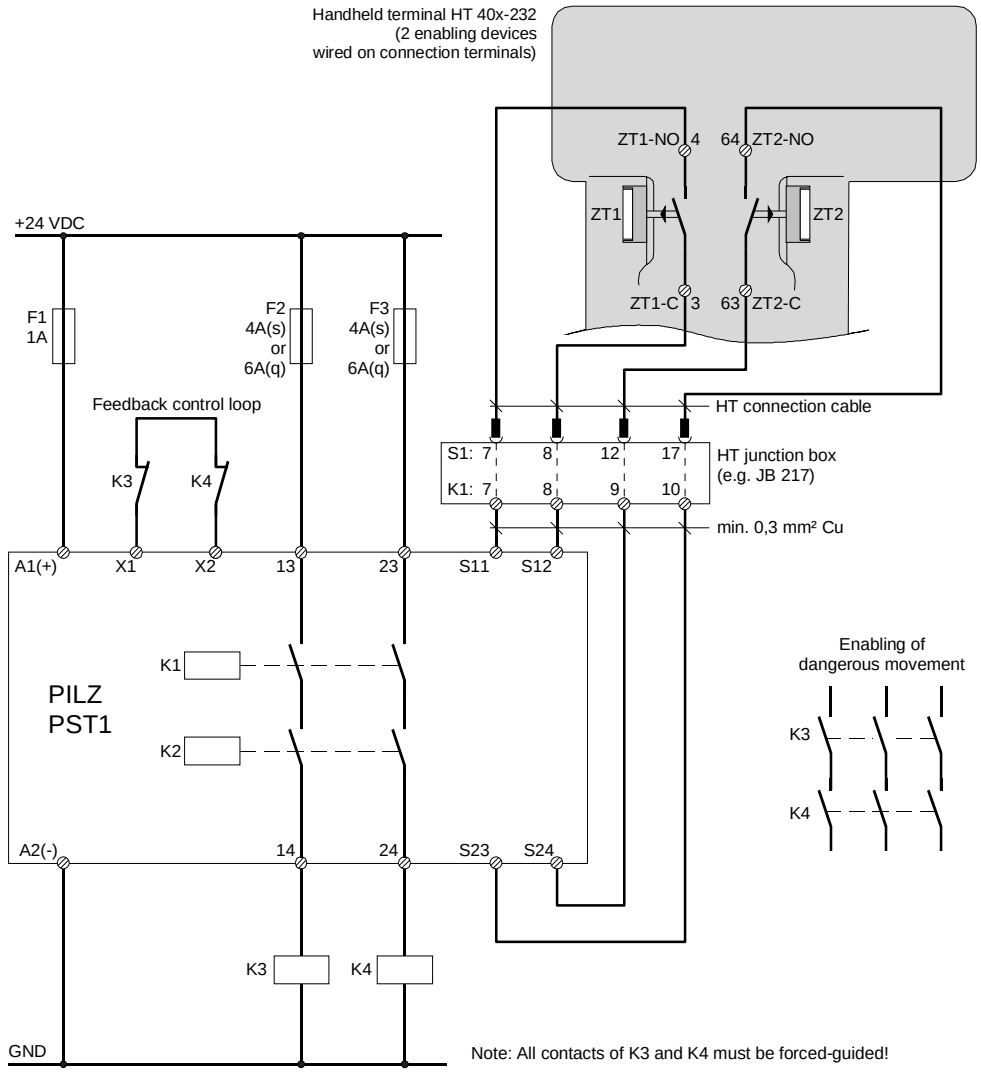
- EN 292 „General principles for design of machinery“
- EN 1050 „Principles for risk assessment of machinery“
- EN 954-1 „Safety-related parts of control systems“

The safety categories (B, 1, 2, 3, 4) which finally define the structure of safety-related parts of a machine result from this risk assessment.

The following wiring diagram shows how the **safety category 3** can be fulfilled with KEBA's handheld terminals and their safety-related parts. The entire concept of the machine must be laid out according to the principles of safety category 3.

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Example of Application with PILZ Control Relay PST1



Suggested wiring of enabling switches to fulfill safety category 3 with PILZ control relay. Also follow the instructions described in the PILZ operating manual about the PST1 device.

Functional procedure:

Only if both enabling switches ZT1 and ZT2 are activated „simultaneously“ both output relays K1 and K2 will energise and the output contacts 13-14 and 23-24 will close.

The output relays K1 and K2 will not energise if

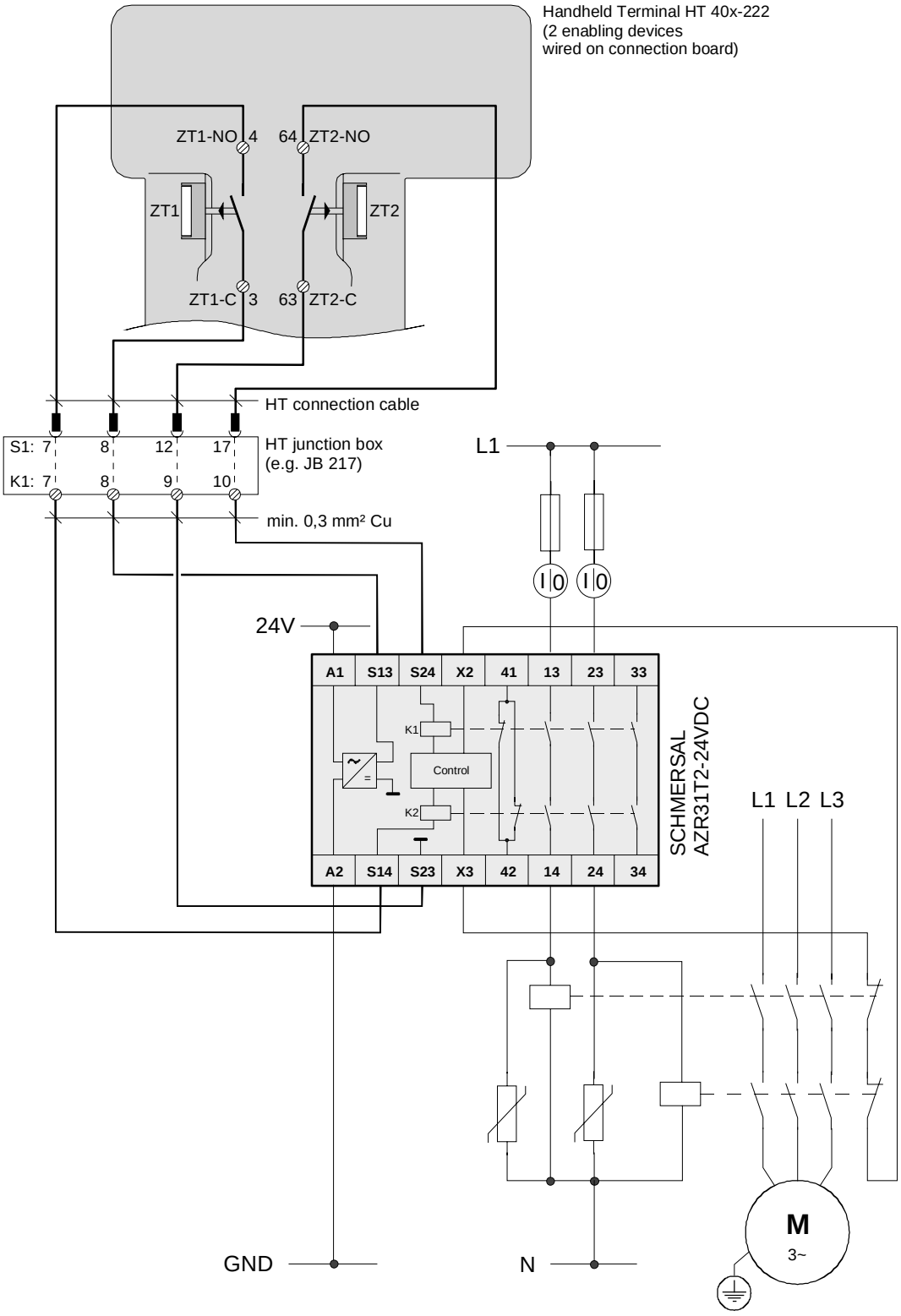
- only one enabling switch is activated,
- the simultaneity period is exceeded,
- the feedback control loop X1-X2 is open.

If an enabling switch is released after being simultaneously activated, the output relays K1 and K2 will de-energise again. The forced-guided output contacts 13-14 and 23-24 will open. The output relays will energise again only after both enabling switches have been released and simultaneously operated once again.

In this way the enabling switches meet the requirement which consists in avoiding that one single error makes the safety function inoperational. A single error will be recognized at the next cycle at the latest.

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Example of Application with SCHMERSAL Control Relay AZR31T2-24VDC



Suggested wiring of enabling switches for safety category 3 with SCHMERSAL control relay. In addition follow the instructions of the operating manual by Schmersal about the device AZR31T2-24VDC.

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Functional procedure:

Only if both enabling switches ZT1 and ZT2 are activated „simultaneously“ both output relays K1 and K2 will energise and the output contacts 13-14 and 23-24 will close.

The output relays K1 and K2 will not energise if

- only one enabling switch is activated,
- the simultaneity period is exceeded,
- the feedback control loop X2-X3 is open.

If an enabling switch is released after being simultaneously activated, the output relays K1 and K2 will de-energise again. The forced-guided output contacts 13-14 and 23-24 will open. The output relays will energise again only after both enabling switches have been released and simultaneously operated once again.

In this way the enabling switch meets the requirement which consists in avoiding that one single error makes the safety function inoperational. A single error will be recognized at the next cycle at the latest.

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3 General Instructions

3.1 Intended Use of Handheld Terminal

The handheld terminal may only be used for the purposes mentioned in this manual.

The HT was developed, manufactured, tested and documented in accordance with the applicable safety standards. If you follow the instructions regarding safety and intended use as described in this manual, the product will neither cause personal injury nor damage to machinery and equipment.

Waste Disposal:

Observe the national regulations when disposing of electronic components!
When replacing components equipped with batteries, please put the batteries to special waste!

3.2 Handling of Handheld Terminal

You have chosen a high-quality handheld terminal that is equipped with highly sensitive state-of-the-art electronics.
In order to avoid malfunctions or damage through improper handling, follow in all circumstances these instructions during operation.

Notice:

Make sure that nobody can fall over the cable to avoid that the device falls to ground.

Take care not to squeeze and thus damage the cable with any object.

Do not lay the cable over sharp edges to avoid damaging the cable sheath.

If you do not use the device, lay/hang it into the bracket provided for storage.

Do not lay down the device with the operating side facing down to avoid damaging the operating elements, such like key switch, motor switch, etc.

Never lay the device onto unstable surfaces. It could fall to ground and thus be damaged.

If the device falls to ground, test in all circumstances if the emergency stop switch and the enabling switch function correctly.

Never lay the device close to heat sources or into direct sunlight.

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Avoid exposing the device to mechanical vibrations, excessive dust, humidity or to strong magnetic fields.

Never clean the device, operating panel and operating elements with solvents, scouring agent or scrubbing sponges. For cleaning the device, use a soft cloth with a bit of water or a mild cleaning agent.

Make sure that no foreign objects or liquids can penetrate into the device. Check periodically the protective covers of the device, if all housing screws are firmly tightened and if the housing or the cable entry is damaged.

If the device shows any defect, please send it to the after-sales service including a detailed description of the error.



Turn off the power supply before opening the housing of the handheld terminal. Otherwise the components could be destroyed or undefined signals could occur.



When the handheld terminal is open, it is sensitive to electrostatic discharge.

When removed from the housing, modules are sensitive to electrostatic discharge.
Before handling modules, touch a grounded metal object in order to discharge any static electricity from your body. Components on the modules should only be touched if it is absolutely unavoidable.

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3.3 CE Conformity

The CE mark indicates that the KEBA product is in conformity with the EMC Council Directives of the European Community. In addition the device meets the Council Directive 98/37/EC as safety component.

The device meets the following standards:

Standards according to EMC directive

EN50081-2	EMC - Generic Emission Standard, Industrial Environment
EN50082-2	EMC - Generic Immunity Standard, Industrial Environment

Standards according to directive regarding the safety of machinery

EN 954-1:1996	Safety-related parts of control systems
EN 292-1:1991	Basic concepts, general principles for design
EN 292-2:1991/A1:1995	Technical principles and specifications
EN 418:1992	Emergency stop equipment, functional aspects, principles for design
EN 60204-1:1997	Electrical equipment of machines, general requirements.

KEBA made a „Declaration of Conformity“ in accordance with the standards mentioned above. This Declaration may be consulted at KEBA, Linz, Austria.



This is a product of class A. In the residential environment, this product may cause high frequency interferences. In this case correction measures on the equipment concerned might be necessary.

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4 Shielding

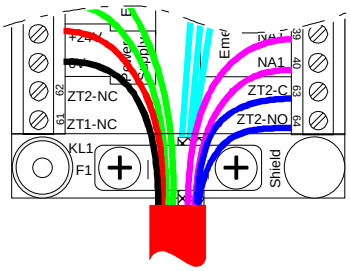
The handheld terminal is conceived for industrial applications. In this environment, considerable electromagnetic and electrostatic interferences may occur. For this reason, particular importance was attached to immunity to interferences and data security when the device was constructed.

- ❒ The coated HT housing protects the sensitive electronics against electromagnetic interferences.
- ❒ Due to its special construction, the HT cable ensures immunity to interferences in case of larger cable lengths.
  I.e. the *data lines* (communication signals) are shielded and routed separately from the *control lines* (power supply, enabling switch, E-stop, key switch, etc.) in the HT cable.
  The signal designations and the connection of data and control lines are described in the chapter „Basic Wiring Diagram“.
- ❒ Filtering of incoming power supply lines.
  Normally the power supply lines in the control cabinet are not shielded. Therefore they must be routed outside the HT cable shield to avoid that the sensitive data lines are disturbed by the other lines (e.g. power supply lines).

4.1 Shield Connections

The cable shield of the HT cable can be considered as extension of the HT shield housing to the shield housing of the communication partner (e.g.: PLC). In this way the shield connections of the cable shield to the shields of the devices essentially contribute to the immunity to interferences of the HT. Connections to ground are not required for shield connections.

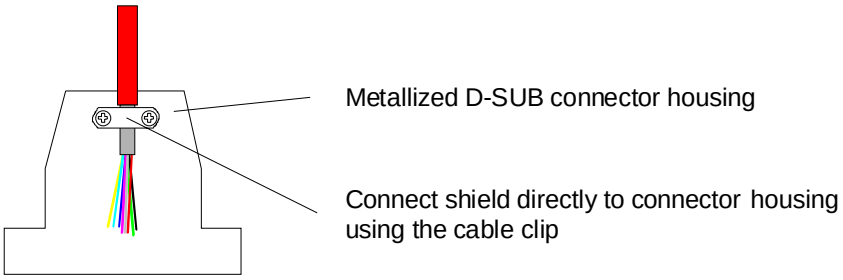
For the shield connection in the HT the cable clamp on the connection board is used.



Cable shield on connection board

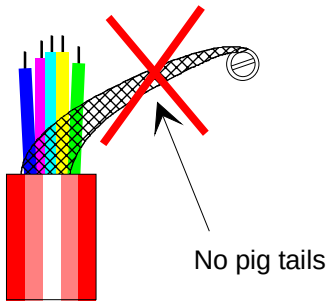
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At the PLC connector and in case of adapter plugs, connect the shield directly to the connector housing:



Correct shield connection in connector housing (e.g. PLC connector or adapter plug)

Pig tails to connect the shield to the pins or terminals are not suitable. The inductivity of such pig tails represents a high-ohmic resistance for high-frequency interferences. This seems to interrupt the cable shield. In this case interferences are not absorbed any more but directly affect the inner lines.



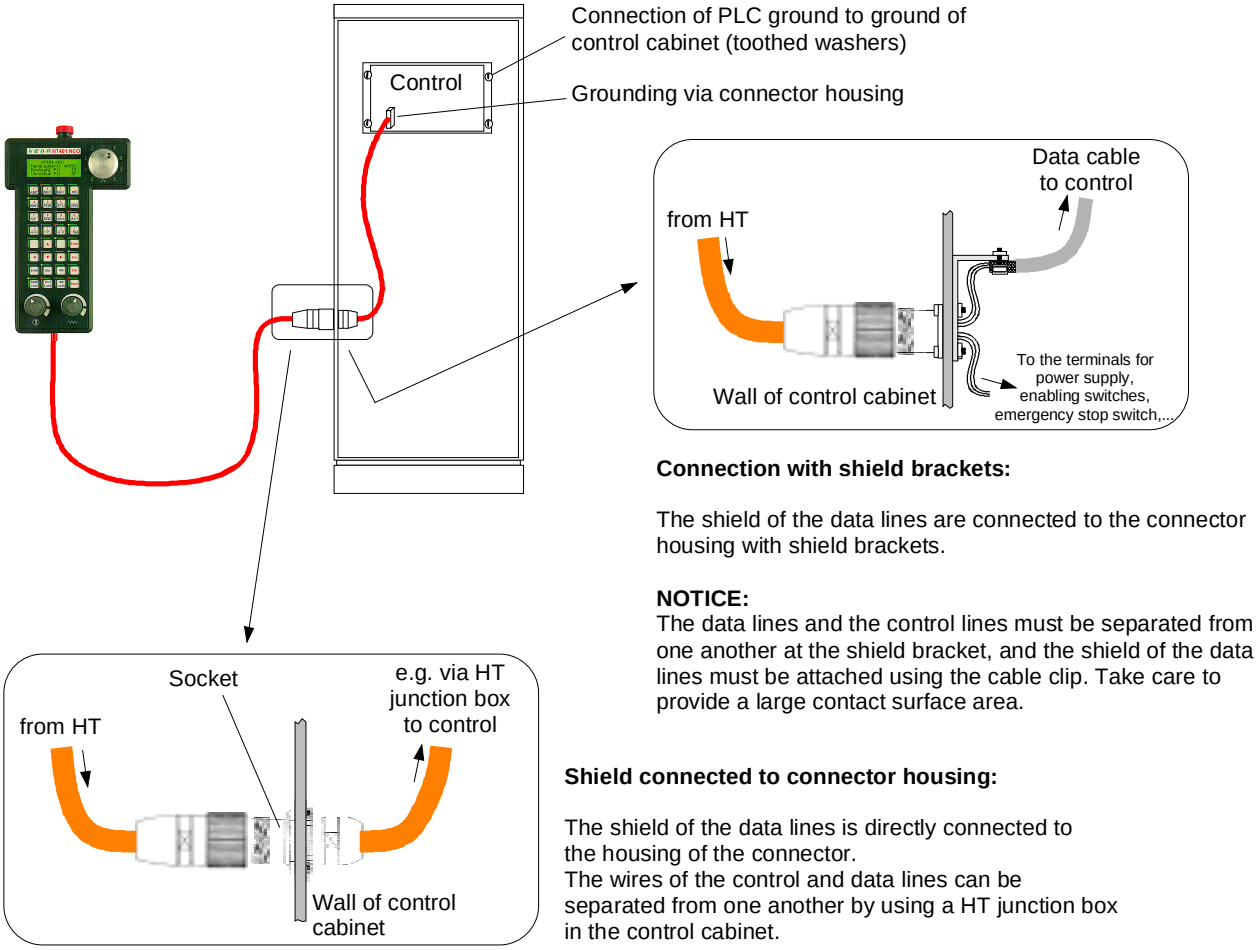
Insufficient connection of cable shield

Shield connections should only be realised with appropriate connectors enabling a large surface contact area.
Shield connections with cable clamps affect the shield damping. However the damping might still be sufficient for interference signals occurring in the industrial environment.
In all circumstances, avoid a shield connection via pig tails. In this case the shield damping of the HT cable would be reduced to insufficient values.

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4.2 Shielding inside the Control Cabinet

In many cases, several interference sources exist in the control cabinet, such as servo drive modules, transformers, contactors and relays.
Therefore it is necessary to continue the cable shield from the connector shell (control cabinet) up to the PLC (continuous connection from handheld terminal up to PLC).
This continuous connection is realised through the connection of the connector shell to the flange socket of the control cabinet, and inside the control cabinet through the connection of the cable shield to the control cabinet (using cable clips). The smaller the distance between connection of connector shell on the control cabinet and the cable clip of the control cabinet is, the better the shield damping will be.



Connection with shield brackets:

The shield of the data lines are connected to the connector housing with shield brackets.

NOTICE:
The data lines and the control lines must be separated from one another at the shield bracket, and the shield of the data lines must be attached using the cable clip. Take care to provide a large contact surface area.

Shield connected to connector housing:

The shield of the data lines is directly connected to the housing of the connector.
The wires of the control and data lines can be separated from one another by using a HT junction box in the control cabinet.

Grounding of cable shield in a control cabinet

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5 Connection

The standard HT 40x is equipped with one serial interface. It is optionally available with a second serial interface **or** a field bus coupling:

Bus coupling:

	Profile:
❑ INTERBUS	MMI-COM
❑ CAN	MMI-COM
❑ PROFIBUS-DP	MMI-COM
❑ Siemens Simatic S7 MPI	

Serial interface(s) for connecting the HT 40x to:

	Protocol/Profile:
❑ Siemens Simatic S5 programmer port	AS511
❑ Siemens Simatic S5 CP524/525	RK512/3964R
❑ PC, NC + CNCs,...	KEBA standard protocol, MMI-COM
❑ INTERBUS Gatewaybox	MMI-COM
❑ Matsushita NAIS FP1 programmer port	Mewtocol-COM

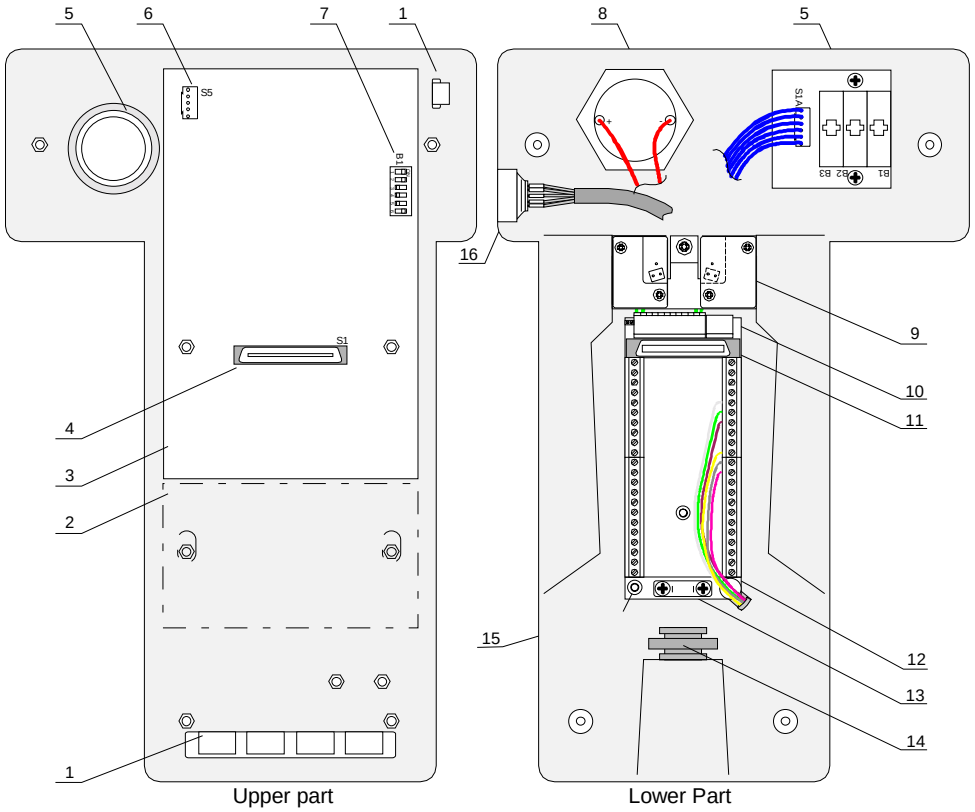


To ensure the correct functioning of the handheld terminal, the housing must be assembled with all 8 screws.
Use the following screwdriver:
Phillips size 1 (typ. diameter 4,5 mm). Do not use a screwdriver with insulation because the diameter of the screwdriver would be too big.

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5.1 Location of Connections

The following drawing shows the location of the connections when the housing is open. The upper part and the lower part are electrically connected by the connecting plug. The connecting cable must be connected to the terminals on the board according to the requested interface (see next chapter).



1.....labels
2.....location for optional module for a second serial interface OR a field bus coupling
3.....main board with CPU
4.....connecting plug to connection board in lower part
5.....emergency stop switch
6.....connector for handwheel (only in use at the versions HT 401/NC and -/NCO)
7.....DIP switch for configuration of serial interface 1 (Current Loop -> ACTIVE/PASSIVE)
8.....buzzer
9.....2 enabling switches
10.....connector for digital inputs (e.g. key switch)
11.....connecting plug to main board in upper part
12.....connection board
13.....shield connection
14.....strain relief
15.....threaded bolt (for mounting the shield plate at PROFIBUS-DP couplings)
16.....program loading connector

Location of connections in HT 40x-232

Notice

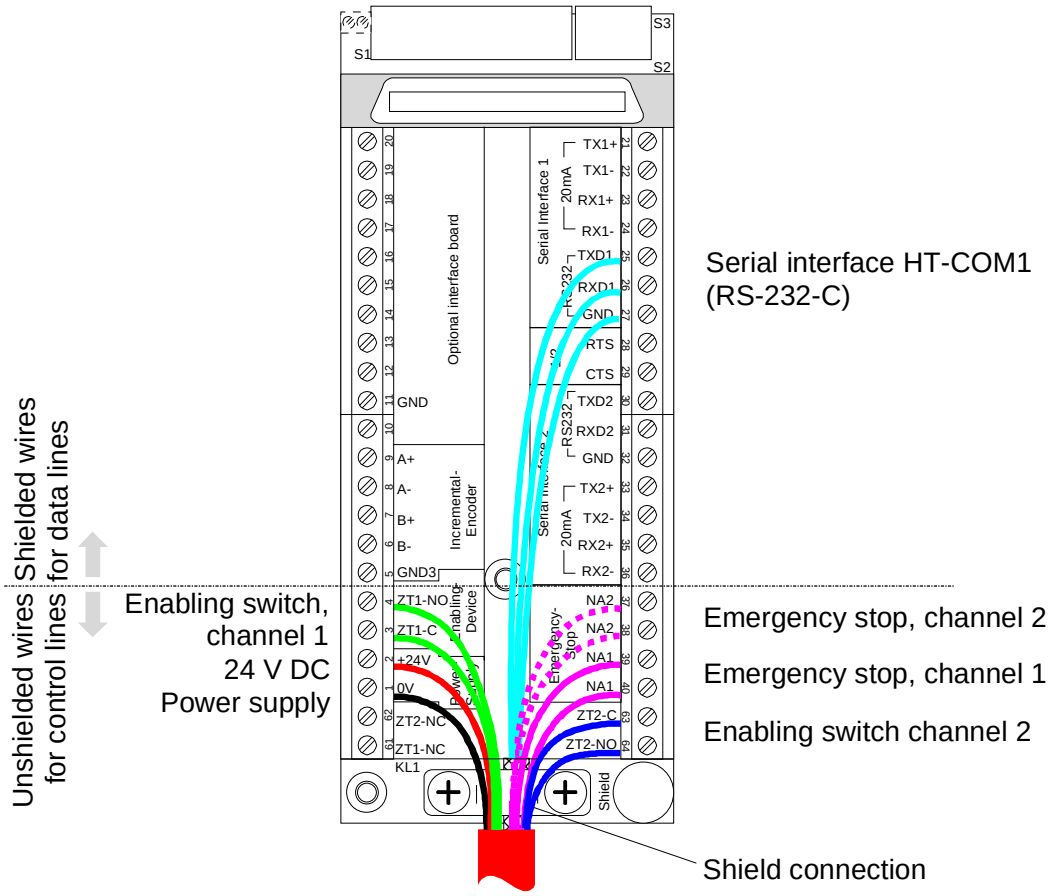
Before closing the housing, make sure that in the upper part of the housing the connectors between main board and keyboard are firmly plugged in, and that no wires are squeezed in.

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Basic Wiring Diagram

The following drawing shows the basic wiring of the connection board. The serial interface 1 (RS-232-C) can be used for example for loading the project from the programming PC into the HT 40x. The basic wiring includes the following connections:

- ❏ 24V DC power supply
- ❏ Serial interface HT-COM1
- ❏ Emergency stop switch
- ❏ Enabling switch



Connection board with basic wiring

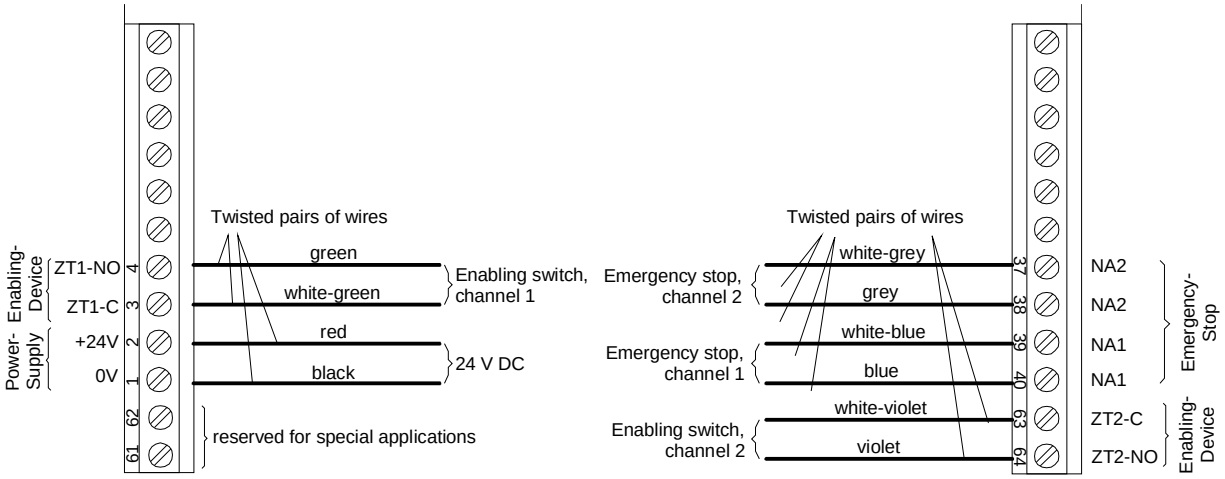
Notice

For the terminals on the connection board, use a screwdriver with a width of 2,5 mm. A too large screwdriver could damage the terminals. When the HT 40x is delivered, the terminals are firmly screwed down.

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Power Supply and Operating Elements

The following drawing shows the colors of the basic wires without data lines.



Power supply and operating elements on connection board

The handheld terminal meets the safety class III in accordance with EN61131-2 and EN50178.

When connecting the handheld terminal, make sure that all voltages connected to the handheld terminal are safety low voltages and isolated from the low voltage supply system by a safety transformer or a similar facility.

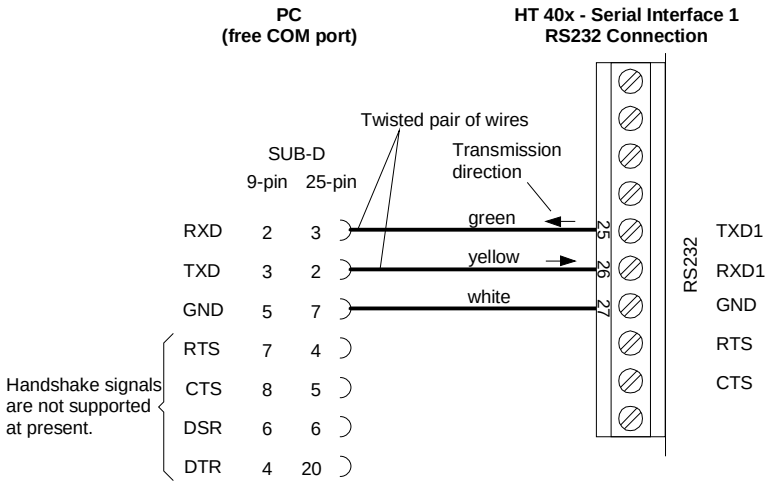
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5.2 Serial Interface HT-COM1

The HT-COM1 is available in the standard version of the HT 40x and does not require any additional interface module. The two possible interface types are distinguished as follows:

RS-232-C (PC) via HT-COM1

This interface can for example be used for loading the program from the programming PC into the HT 401.



Example of connection: RS-232-C with PC connection via HT-COM1

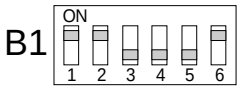
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Current Loop via HT-COM1

This interface mode is configured ACTIVE or PASSIVE by means of the DIP switch B1 provided on the main board. A setting table on the main board helps setting the DIP switch. When the HT 40x is supplied, the switch is set to Tx=ACTIVE and Rx=PASSIVE. These switch positions are put into brackets [ ] on the table:

Hinweis

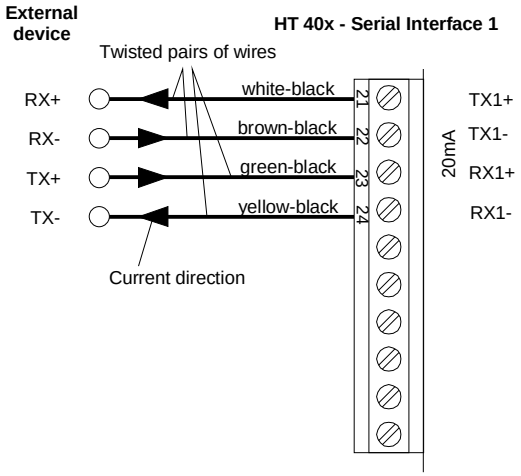
For the 20 mA Current Loop interface, only a transmission rate of 9600 Baud is allowed.



TX	1	2	3
AKT	[ON]	[ON]	[OFF]
PASS	OFF	OFF	ON

RX	4	5	6
AKT	ON	ON	OFF
PASS	[OFF]	[OFF]	[ON]

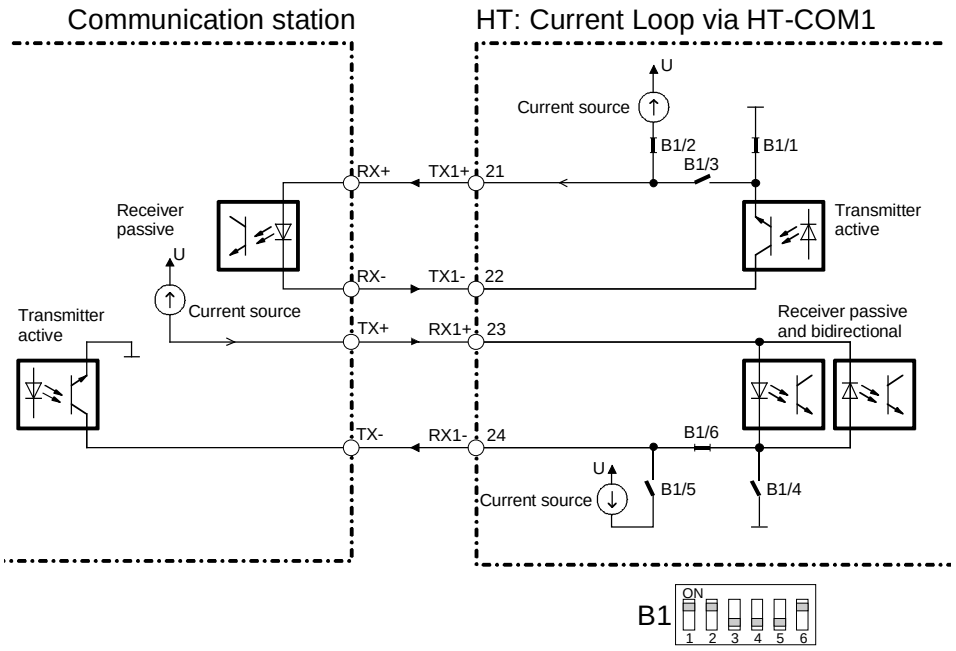
DIP switch B1 on main board



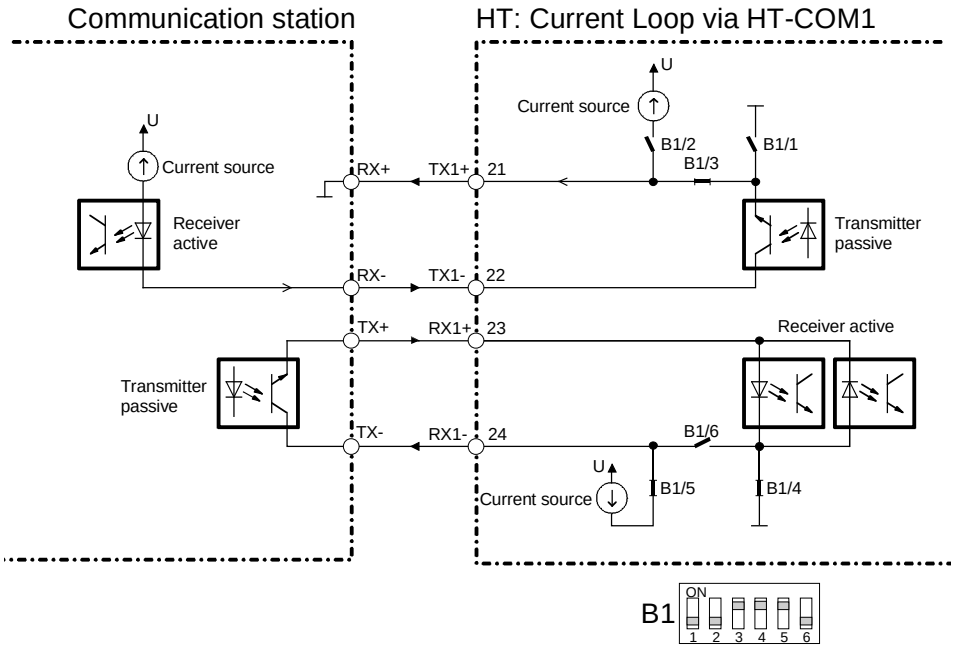
Current Loop via HT-COM1

The following two drawings show examples of connections of the Current Loop mode. In the first example, the transmitter is ACTIVE and the receiver PASSIVE, in the second example vice-versa.

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Example of connection Current Loop with TRANSMITTER ACTIVE and RECEIVER PASSIVE via HT-COM1

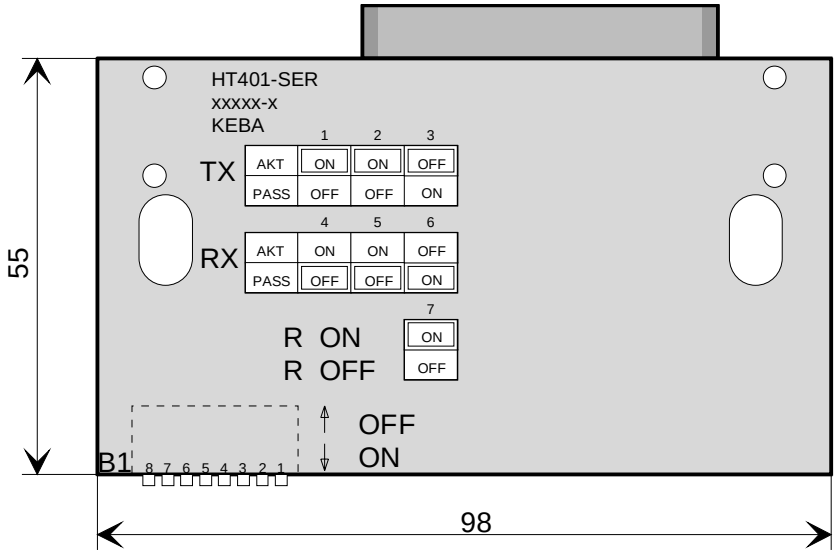


Example of connection Current Loop with TRANSMITTER PASSIVE and RECEIVER ACTIVE via HT-COM1

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5.3 HT 401-SER (M-No.: 19832)

The serial interface module HT 401-SER enables operating a second serial interface HT-COM2 on the handheld terminal and selecting an RS-232-C, Current Loop, RS-422-A or RS-485 line driver.



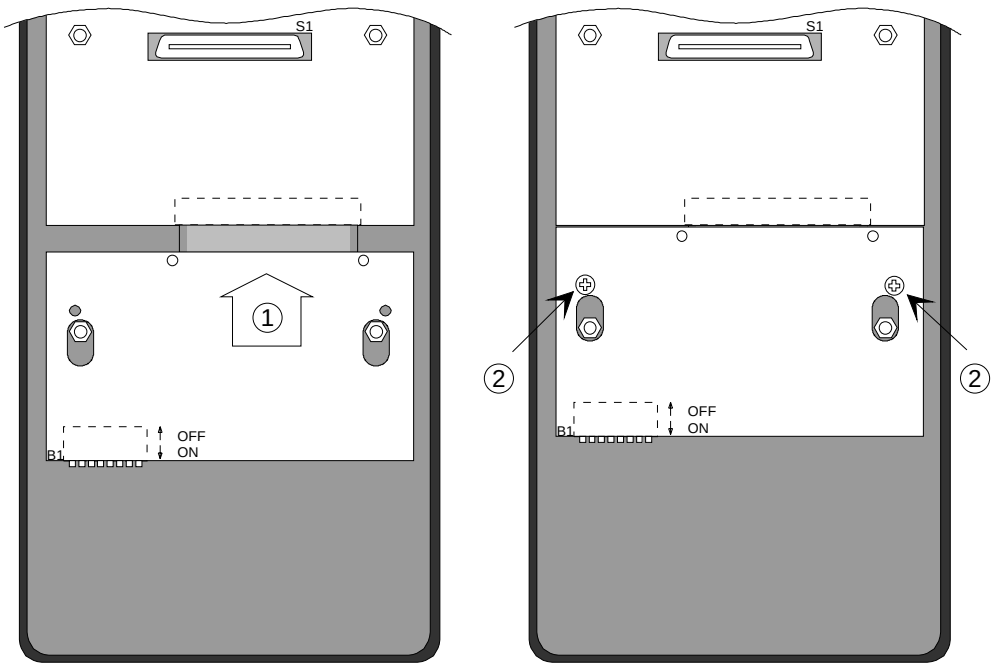
HT 401-SER soldering side

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Mounting

Open the HT 40x and:

① Plug the HT 401-SER module into the CPU main board.
② Fix the screws M3x6.



Mounting of HT 401-SER module

Make sure that the module is firmly plugged into the main board of the HT. In order to ensure that the connection between the module and the main board is electrically correct and mechanically stable, the module must be screwed down at the bottom of the upper part of the HT 40x housing.

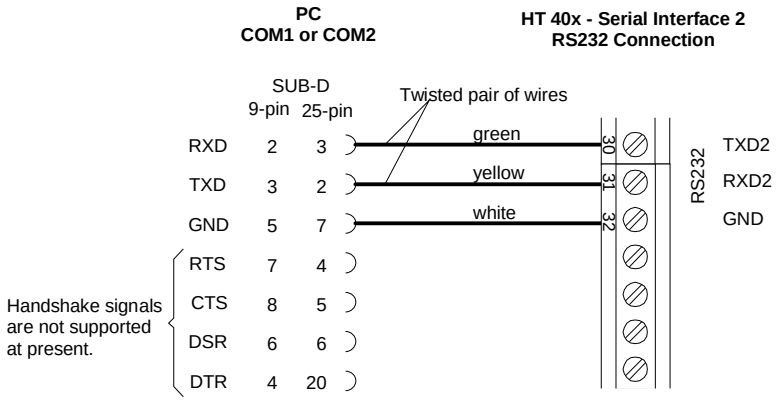
Notice

Before closing the housing, make sure that in the upper part of the housing the connector between main board and keyboard is firmly plugged in, and that no wires are squeezed in.

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RS-232-C via HT-COM2

Like RS-232-C via HT-COM1, but other terminals are used on the connection board:



Example of connection: RS-232-C with PC connection via HT-COM2

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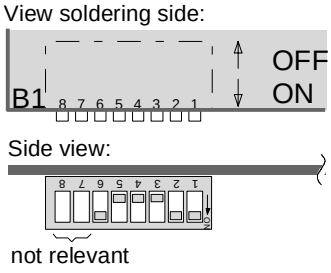
Current Loop via HT-COM2

Like Current Loop via HT-COM 1, but other terminals are used on the connection board. The interface mode is configured ACTIVE or PASSIVE by means of the DIP switch B1 provided on the additional interface board. A setting table on this interface board helps setting the DIP switch. When the HT 40x is supplied, the switch is set to Tx=ACTIVE and Rx=PASSIVE.

These switch positions are framed ☐ on the table:

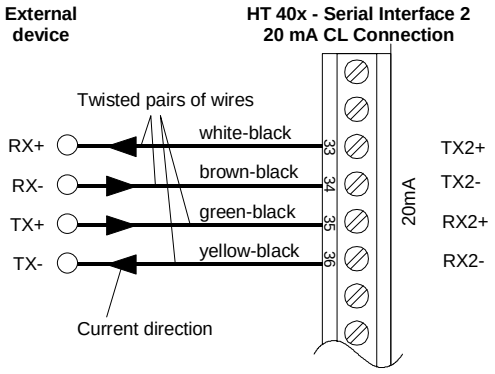
Notice

For the 20 mA Current Loop interface, only a transmission rate of 9600 Baud is allowed.



		1	2	3
TX	AKT	ON	ON	OFF
	PASS	OFF	OFF	ON
		4	5	6
RX	AKT	ON	ON	OFF
	PASS	OFF	OFF	ON

DIP switch B1 on serial interface module

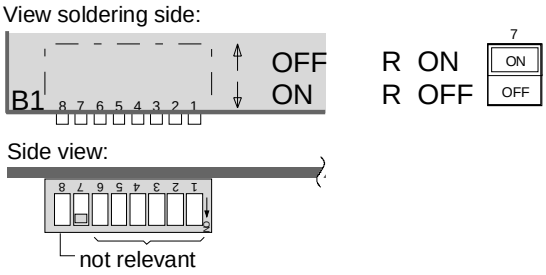


Example of connection: Current Loop via HT-COM2

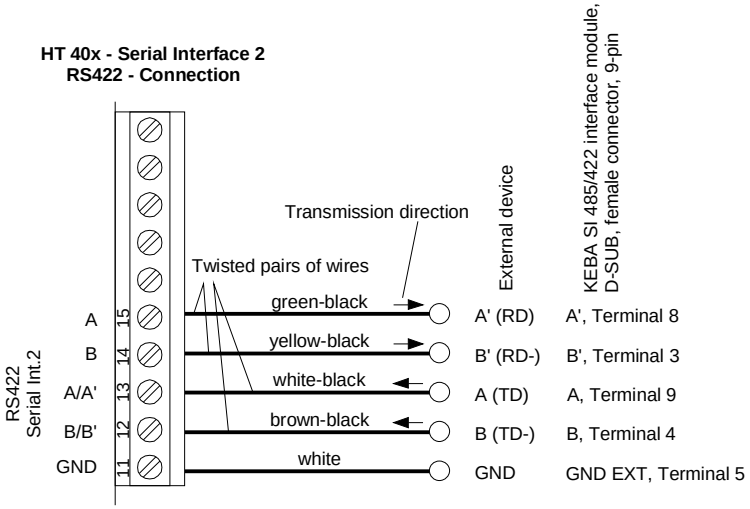
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RS-422-A via HT-COM2

If the RS-422-A interface is used, always set the terminating resistor R (by means of DIP switch B1, switch 7) on the serial interface module to ON:



DIP switch B1 on serial interface module



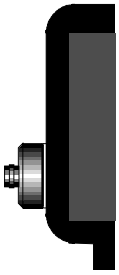
Example of connection: RS-422-A via HT-COM2

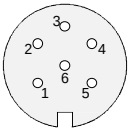
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5.4 Program Loading Connector (B)

As standard, the RS-232-C line drivers of the HT-COM1 and HT-COM2 interfaces are connected to this connector.
The program loading connector can also be connected to another interface on the connection board. It can be used for loading programs or connecting a programmer if the integrated S5-PG-MUX function is used.

If the HT-COM2 interface is used, the HT 401-SER module must be installed.



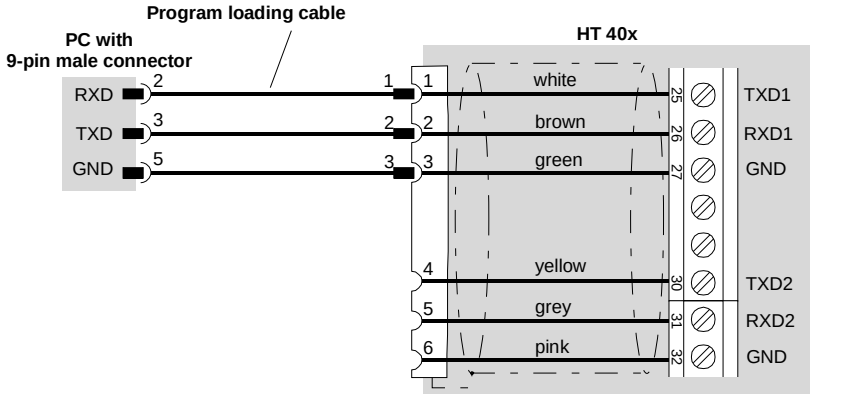


6-pin socket in accordanc with DIN 45322, front view.

Socket for loading the program or connecting a programming device

Pin assignment

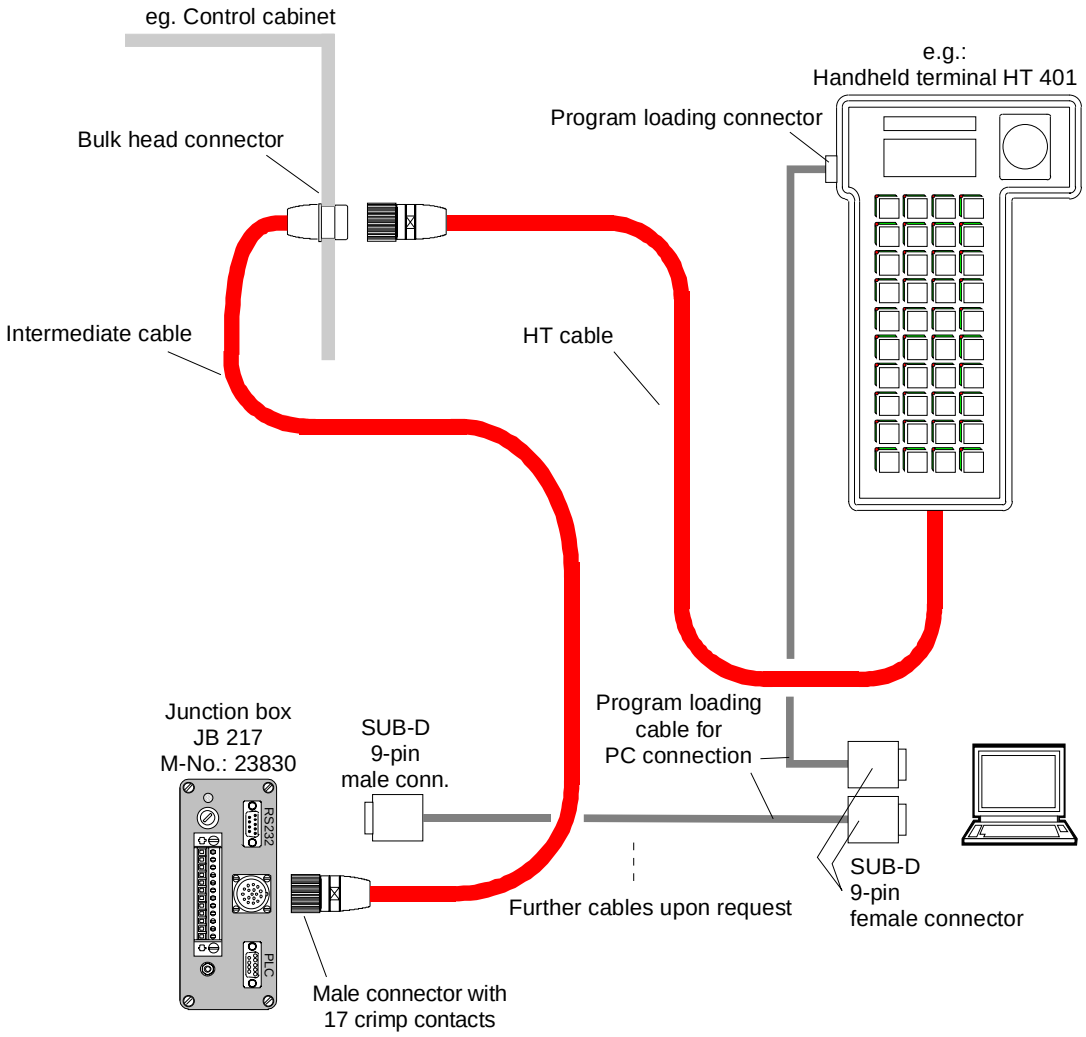
The following figure shows the pin assignment of the socket in the handheld terminal and a program loading cable to the programming PC.



Connection of program loading cable to socket B

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5.5 Connecting Accessories

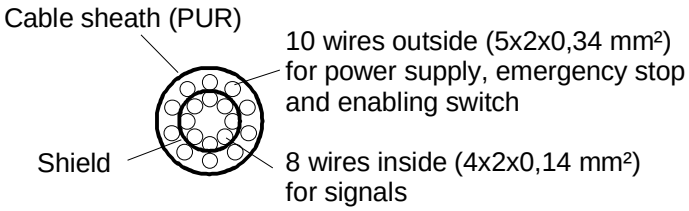


Overview of accessories for HT 40x

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HT Cable

To ensure the immunity to interferences in case of longer connections, a special cable must be used (e.g. isolation of emergency stop signals from other lines through special cable construction, shielded signal lines, etc. -> see following drawing)
This cable can be ordered at KEBA in the required length (connection cable for INTERBUS, see INTERBUS manual).

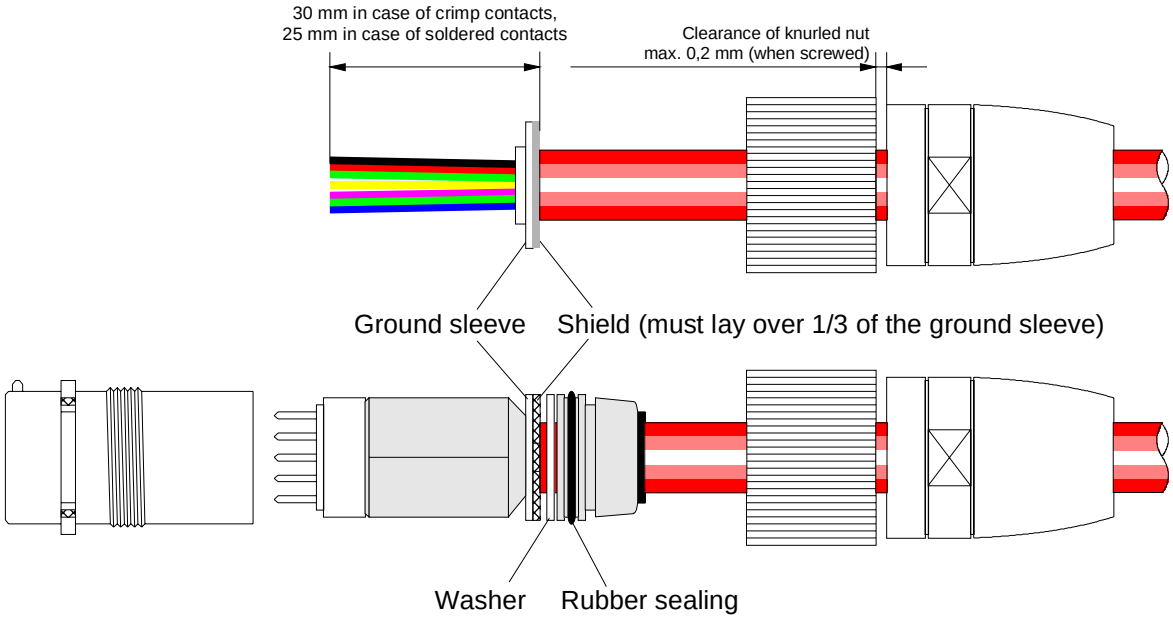


Cross section of HT cable

17-pin circular connector with crimp contacts

The following drawing shows the order in which the connector elements are assembled.

To meet the requirements of the protection system IP54, both parts of the connector housing must be firmly screwed down using a special tool available at KEBA.



17-pin circular connector

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HT Junction Box JB 217 (M-No.: 23830)

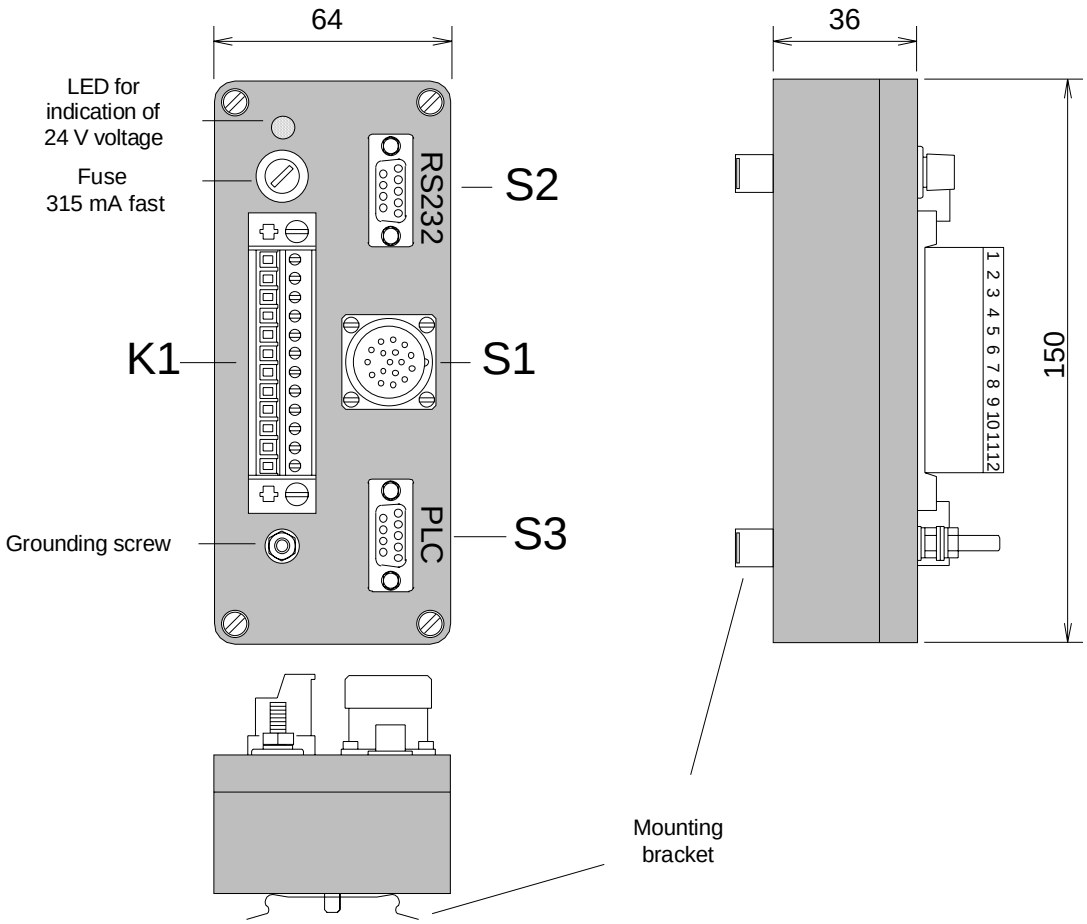
The junction box is used to integrate the KEBA handheld terminal into the machine/plant. The following connectors are provided for that purpose:

S1 17-pin flange socket for connecting the handheld terminal assembled by KEBA.

S2 9-pin SUB-D female connector for connecting a program loading cable (RS-232-C interface).

S3 9-pin SUB-D female connector for connecting a PLC connecting cable.

K1 12-pin terminal block for connecting power supply, emergency stop switch and enabling switches.



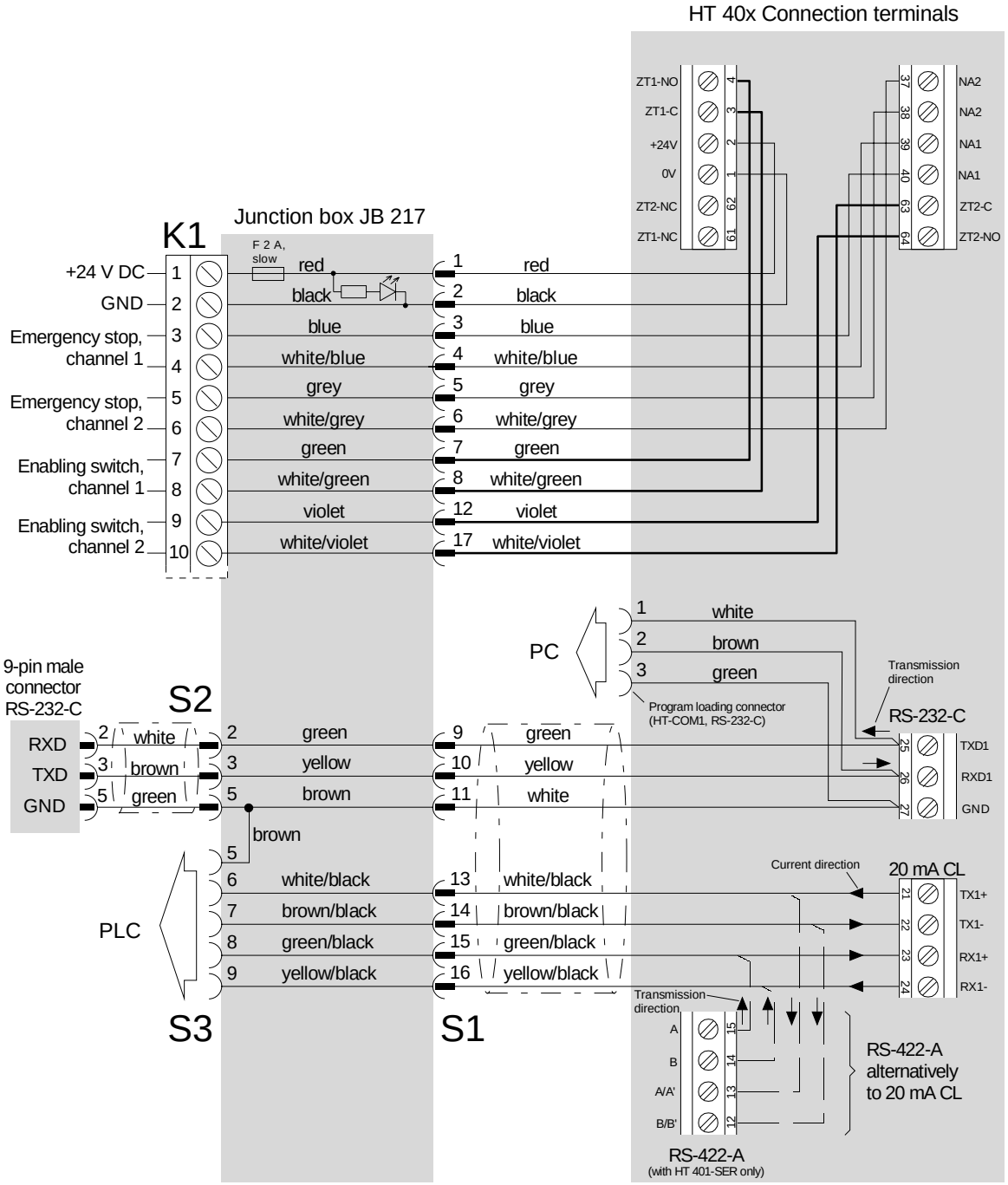
Junction box JB 217

The handheld terminal meets the safety class III in accordance with EN61131-2 and EN50178.

When connecting the handheld terminal, make sure that all voltages connected to the handheld terminal are safety low voltages and isolated from the low voltage supply system by a safety transformer or a similar facility.

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Serial connection with 2-channel enabling switch



HT 40x with serial connection and 2-channel enabling switch

Notice

If two wires must be connected to one terminal (e.g. socket cable + HT program loading cable, terminals 25, 26, 27) the sleeves of the wires must be removed, and both wires must be twisted.

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6 Programming the HT

For setting the configuration of the device and for generating texts and the keyboard layout, a programming software executable under MS-Windows (3.11, 95, NT,...) is supplied.

This software provides functions for creating configuration data, for editing text lines and the keyboard layout and for loading the program. The operation of the software is menu-driven.

6.1 Hardware Required

For programming the device configuration, the following hardware components are required:

- ❏ HT 40x
- ❏ Programming PC with HT4xx programming software (HTWIN)
- ❏ 24V DC power unit for HT 40x power supply
- ❏ Connection cable between serial interface (RS-232-C) HT-COM1 or HT-COM2 on HT 40x and one free serial interface on the programming PC (COM1, COM2,...)

The electrical connections required are described in the chapter „Basic Wiring Diagram“.

For connecting the HT 40x, a junction box (see chapter „Serial connection with 2-channel enabling switch“) can be used alternatively.

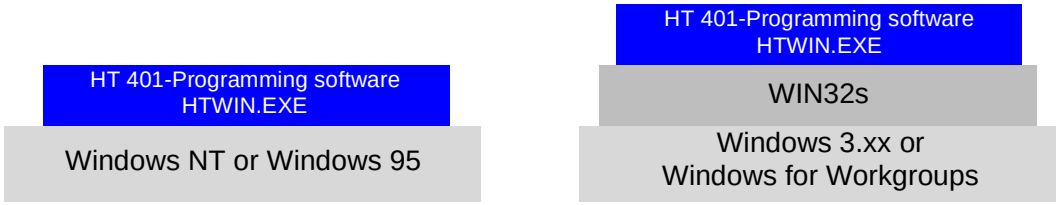
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6.2 HT4xx Programming Software (HTWIN)

The programming software under Windows is delivered on several floppy disks.

Installation procedure:

- Insert the first floppy disk into your programming PC and invoke the automatic installation program SETUP.EXE under Windows.
- The programming software (HTWIN.EXE) was particularly developed for "Windows NT" and "Windows 95" (32-bit operating systems).
  Should the programming software run under "Windows 3.xx" and "Windows for Workgroups" (16-bit operating systems) the operating system extension Win32s (version V 1.3c and higher), which provides the 32-bit API (Application Interface), must be installed.



Restrictions under Windows 3.xx and Windows for Workgroups:

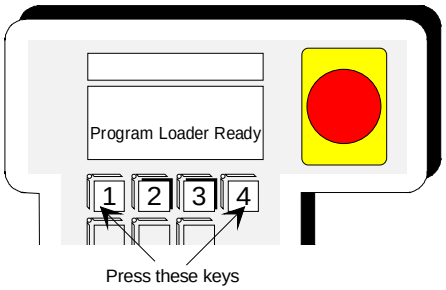
Since Win32s does not support the COM-API (Communication Application Interface), the serial interface cannot be activated.
Loading files into or from the HT 414 can also be performed by means of a terminal program which provides the XMODEM protocol (e.g. Windows standard terminal program TERMINAL.EXE).

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6.3 Data Transmission from and to the HT

The programming software provides several functions for transmitting data from or to the handheld terminal.

Data transmission from or to the handheld terminal is only possible in the loading mode "Program loader ready". To switch the device over to this mode, press and hold the keys 1 and 4 simultaneously **while turning on** the HT until the loading mode is indicated on the display:



Keys 1 and 4 when turning on the HT:

loading mode

The following mask is displayed:

```
KEBA HT40x      Vt.t

Program loader ready
#u vvvvv wwwww x y z
```

t..... version of boot software
u..... number of interface port (1or 2)
v..... interface type (RS-232-C, RS-422-A)
w..... baudrate
x..... parity
y..... data bits
z..... stop bit

The handheld terminal is in the loading mode now, and the data transmission can be activated via the programming software. Depending on the transmission direction, the following is displayed:

```
KEBA HT40x      Vt.t

  *load........  x
```

t..... version of boot software
* ..... down(load): PC -> HT or
up(load): PC <- HT
x..... rotating bar during transmission or OK when
transmission has been completed successfully.

When the data transmission has been completed successfully, the device performs a reset and starts the cyclic execution of the user program.

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6.4 Functions of Programming Software

Select Protocol

Before starting the programming, the requested coupling must be selected. The following protocols are available:

INTERBUS MMI-COM	See User's Manual „HT 401-IBS for HT 401, HT 402 and HT 414“.
CAN MMI-COM	See User's Manual „HT 401-CAN for HT 401, HT 402 and HT 414“.
PROFIBUS-DP MMI-COM	See User's Manual „HT 401-PB/DP for HT 401, HT 402 and HT 414“.
Serial/INTERBUS MMI-COM (Gateway)	See User's Manual „HT 401-IBS for HT 401, HT 402 and HT 414“.
Serial MMI-COM	See User's Manual „HT 401, HT 402 and HT 414-Serial MMI-COM Coupling“.
Serial KEBA Standard Protocol	See User's Manual „HT 401, HT 402 and HT 414 KEBA Standard Protocol“.
Serial S5 CP (RK512)	For connection to Siemens communication processors (see User's Manual "HT 401 Siemens S5 Coupling").
Serial S5 PG (AS511)	For connection to Siemens S5 central processors via the programmer port. See User's Manual "HT 414 Siemens S5 Coupling".
Seriell NAIS FP1 PG (Matsushita)	See User's Manual „HT 401 Matsushita NAIS FP1 PG Coupling“
MPI S7	For connection to Siemens Simatic S7 controls via the MPI interface. See User's Manual „HT 401-PB/MPI for HT 401“.

Bitmap memory (for HT 402 only)

Up to 1000 bitmaps can be stored in the bitmap memory of the HT 402. These bitmaps can displayed by a simple PLC command.
For displaying the bitmaps, take into account the following points:

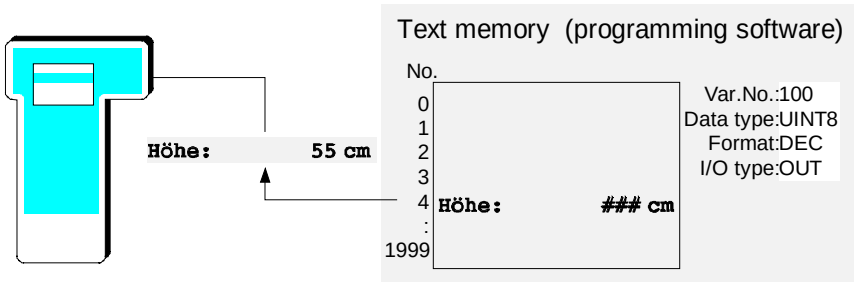
- ❑ Maximum memory for the 1000 bitmaps: 192 kB.
  Bitmaps filling the entire display (128 x 64 pixels) require a memory of approx. 1 kB.
  If only bitmaps of this size are used, it will not be possible to store 1000 bitmaps in the memory since the maximum storage capacity of 192 kB is exceeded.

- ❑ Only uncompressed, 2-color (b/w) Windows 3.x bitmaps can be used.

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Texts

This function enables you to define up to 2000 message texts with a length of 1 line each. These texts are stored in the HT 40x and can be displayed on the HT 40x by means of a simple PLC command.



Text call from text memory

Variables in a text line

It is possible to display several variables in a text line. The positions of the variables must be identified by specific characters for input or output fields:

Field type	I/O type of variable	Characters for fields	Representation on HT 40x display (without numerical value)
Output field	„OUT“	‘#’ or ‘@’ *)	Blank
Input field	„IN“	‘_’ or ‘~’ *)	‘ ’
Input/output field	„IN/OUT“	‘_’ or ‘~’* *)	‘ ’

*) These alternative characters enable placing one variable field after the other (e.g. # # # @ @ @ # # # or _ _ ~~ # #).

During operation, the numerical values are displayed in the variable fields. If the value of the variable is too long so that it cannot be displayed in the programmed field, ‘*’ characters will be displayed (e.g. two-digit output field: ##, value to be displayed: 100,
=> output: ‘**’).

Variables may be programmed with a maximum of 7 decimal places.

Defining variables

For input and output fields in a text line, the corresponding variable must be defined by a variable number, a data type, the format and the I/O type.

Var.No. The value range depends on the type of coupling and is described in the corresponding user's manual. For the „KEBA Standard Protocol“ and for the „Serial MMI-COM Coupling“ the value to be entered must range between 100-65535 (exception STRING variable: 0-255).

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Data word Data words must only be indicated at Siemens couplings. The data word contains the PLC variable and corresponds to the input field „Var.No.“ at the other coupling types.

Data type Selection possibilities:

Data type	Length	Value range
UINT8	1 byte	0...255
SINT8	1 byte	-128...+127
UINT16	2 bytes	0...65535
SINT16	2 bytes	-32768...+32762
UINT32	4 bytes	0...4294967295
SINT32	4 bytes	-2147483648...+2147483647
FLOAT32	4 bytes	$-3,4*10^{-38}$...$+3,4*10^{38}$
STRING	n bytes	-

Format Selection possibilities:

Format	Description
DEC	decimal (0...9)
HEX	hexadecimal (0...9, A...F)
BIN	binary (0, 1)
BCD	„Binary Coded Decimal“ (0...9)
INVISIBLE	Entry of passwords. Each character entered is displayed as '✳' (possible with I/O type "IN" and data type "STRING" only).
TEXT	The variable format „TEXT“ enables calling a text from the internal text memory via variables. Depending on the text number, the data type „UINT 8 / 16 or 32“ must be used (only allowed with I/O type „OUT“). If the data type „STRING“ is used the contents of the variable will be displayed/read in on the HT as ASCII character string and transmitted to the control after pressing the Enter key.

I/O type

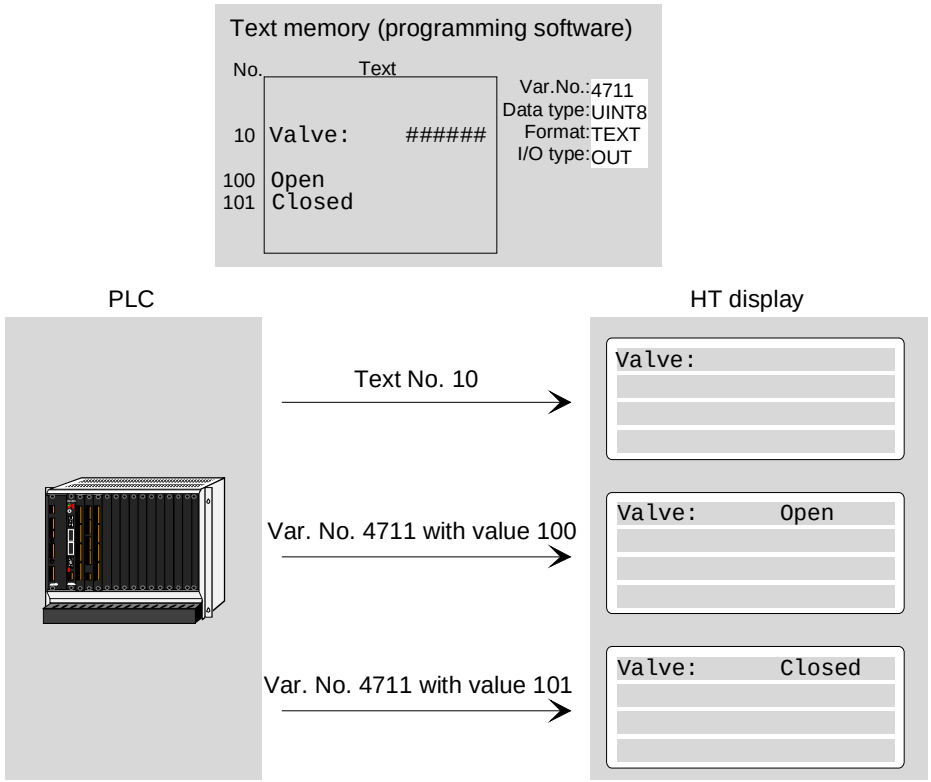
OUT = output. The variable is read from the PLC or written by the PLC and displayed in the corresponding variable format. The output field must be identified by the characters '#'.

IN = input. An empty input field is displayed. Pressed keys appear on the display one after the other.
After pressing Enter, the key string entered is evaluated and transmitted to the PLC. Pressing the "Esc" key cancels the editing process, and the value in the PLC remains unchanged. The input field must be identified by the characters '_'.

IN/OUT = combination of input+output. The variable can be written by the PLC, but also entered on the HT and transmitted to the PLC. Pressing Enter completes the editing process, and the value entered is transmitted to the PLC. Pressing the "Esc" key cancels the editing process, and the value in

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the PLC remains unchanged. The field for the I/O type "IN/OUT" must be identified by the characters '_'.



Display of text in output field

Examples of output fields for variables

Output field for variables	Data type	Format	I/O type	Value of variable (decimal)	Display
##	UINT8	DEC	OUT	99	'99'
##.##	UINT16	DEC	OUT	100 5	' 1.00' ' 0.05'
	SINT16	DEC	OUT	-1	'-0.01'
	FLOAT32	DEC	OUT	1.234 100.1	' 1.23' '**.**'
#####	FLOAT32	DEC	OUT	-1.5 43.78	' -1.5' '43.78'
########	UINT8	BIN	OUT	32 85	00100000 01010101
####	UINT16	HEX	OUT	31548 45054	'7B3C' 'AFFE'

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Keyboard Assignment

One, two, three or four codes may be assigned to each key. Following the functioning of a PC keyboard, one of the 80 keys must be assigned as "Shift" key in case of a double assignment. In case of a triple assignment, an additional "Ctrl" key must be defined. In case 4 codes are assigned to one key, an additional "Alt" key is required.

Programmable Keys

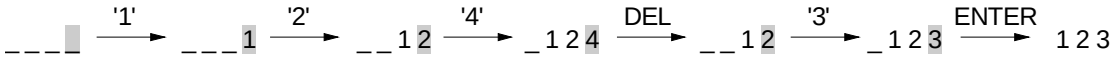
The keys with characters indicated in . „Display Character Set“ and the following special keys can be programmed:

Shift	Selects a character of the 2nd keyboard layout level (pressing Shift and the corresponding key simultaneously).
Shift Lock	Switches over to the 2nd keyboard layout level and remains activated until the Lock key is pressed once again or another Lock key (Ctrl Lock, Alt Lock) is pressed.
Ctrl	Selects a character of the 3rd keyboard layout level (pressing Ctrl and the corresponding key simultaneously).
Ctrl Lock	Switches over to the 3rd keyboard layout level and remains activated until the Lock key is pressed once again or another Lock key (Shift Lock, Alt Lock) is pressed.
Alt	Selects a character of the 4th keyboard layout level (pressing Alt and the corresponding key simultaneously).
Alt Lock	Switches over to the 4th keyboard layout level and remains activated until the Lock key is pressed once again or another Lock key (Shift Lock, Ctrl Lock).
Enter	Takes over a variable entered (following that, the cursor jumps to the next input field). The value is sent to the PLC.
ESC	Deletes the current input. The old contents of the field (before the input) are displayed again (cursor remains in current input field).
Delete	Deletes a character entered.
, , ,	Cursor control in case several input fields are available.

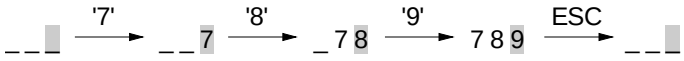
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Examples of function of variable editor in the HT 40x

Example 1:



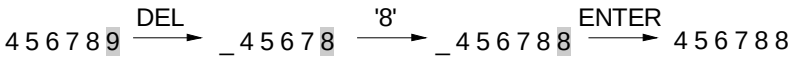
Example 2:



Example 3:



Example 4:



Example 5: Password entry (data type: STRING, format: INVISIBLE)



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7 Labelling of Keys

Since different functions can be assigned to the keys of the HT 401, you have the possibility to label the operator panel according to your specific requirements. Drawing foils or paper strips are suitable for that purpose. The desired symbols are drawn onto the visible fields.

Notice

Paper labels: We recommend using paper with a size of 115 g/m².

Foil labels: We recommend using the following products by Folex:

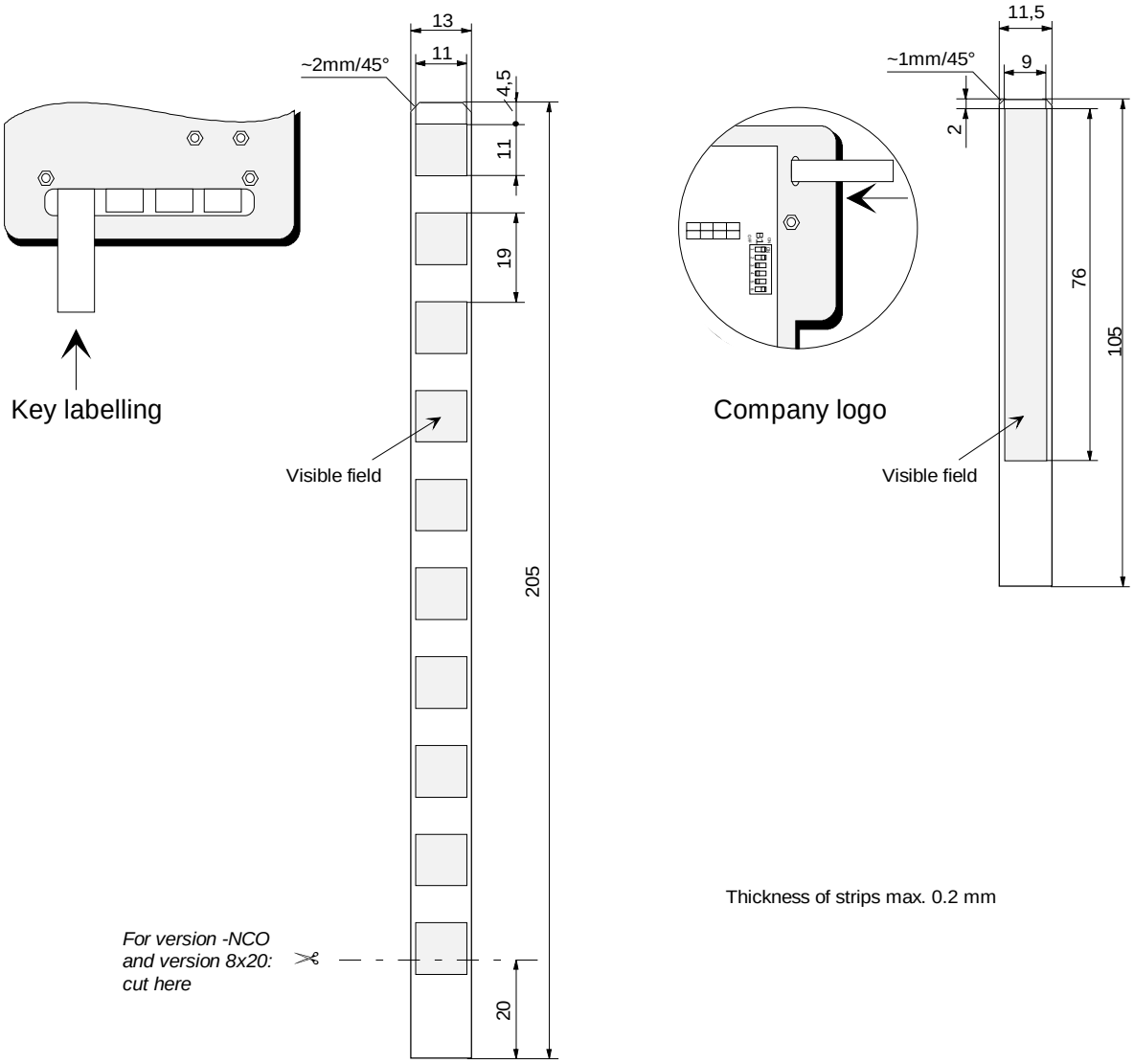
X-350 wo (white opaque)	suitable for color copier	100 µm
X-360 wo (white opaque)	suitable for color copier	125 µm
BG 32 wo (white opaque)	suitable for ink jet printer	100 µm

TIP:

To facilitate the inserting of the label, insert also a foil (e.g. company logo) below the label step by step. Once the label is completely inserted, remove the foil.
When removing the foil, press on the membrane keyboard to avoid that the label is removed as well.

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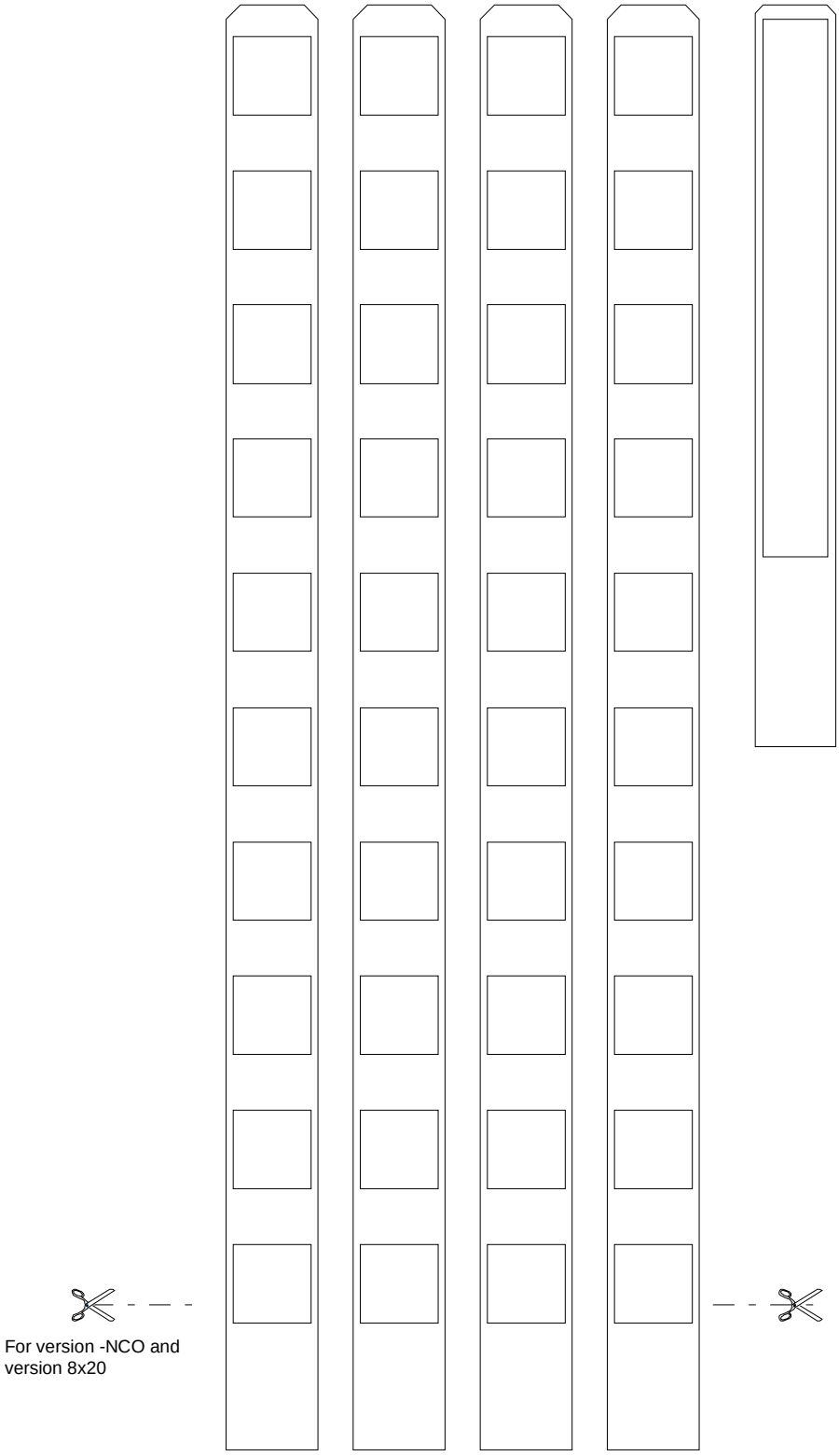
The following drawing shows the dimensions of the labels as well as their location in the HT 40x casing. The labels are inserted into the slots provided for that purpose.



Dimensions of labels

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Pattern of labels, scale 1:1:



Labels

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8 Basic Functions

8.1 Power-On Self-Test

The HT 40x automatically performs a power-on self-test. The safety functions are not tested in this case. If no error occurs the test steps (marked by " ") will be carried out one after the other in brief sequences.

The internal signal buzzer of the handheld terminal triggers a short audible signal.

The program is checked.
Normally the following message is displayed:

```
KEBA HT40x      Vx.x

     Selftest 1
Program ......... OK
```

x .....version of boot software

The message

```
KEBA HT40x      Vx.x

     Selftest 1
Program .......error
```

will be displayed for 2 s if an error has been recognized in the program or if the program is not available in the handheld terminal. Then the device changes to the loading mode (the display indicates "Program Loader ready"). See also chapter "Data Transmission from and to the HT“.

The following messages are only displayed in case of errors:

Checking the ROM contents.

The message

```
KEBA HT40x      Vx.x

     Selftest 1
ROM .........  error
```

will be displayed if a ROM error has been recognized. The device remains in this error condition. A new start is only possible after turning off and on the device.

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Checking the FLASH type.

The message

```
KEBA HT40x      Vx.x

     Selftest y
Flashtyp ..... error
```

y .....1 or 2

will be displayed if an unkown FLASH type has been entered in the configuration data. The device remains in this error condition. A new start is only possible after turning off and on the device.

Checking the configuration data checksum.

The message

```
KEBA HT40x      Vx.x

     Selftest y
Configuration  error
```

y .....1 or 2

will be displayed for approx. 2 s if the checksum is not correct. The device changes to the "Configuration Loader" mode. A new start is only possible after turning off and on the device.

Checking the keyboard matrix for pressed keys.

The message

```
KEBA HT40x      Vx.x

     Selftest 2
Keyboard ..... error
```

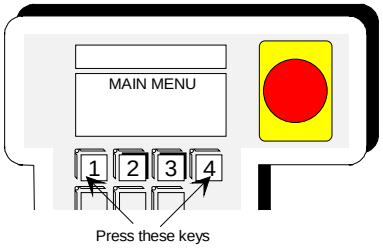
will be displayed if one or more pressed keys have been found during testing. The device remains in this condition as long as the keys remain pressed. After the keys are released, the handheld terminal continues performing the self-test.

After the flash memory test, the system program is invoked. What will be displayed further depends on the program.

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8.2 Menu

To enter the main menu, press the keys 1 and 4 simultaneously **after turning on the** handheld terminal**.** The headline "MAIN MENU" appears. After you release the keys, the menu itself is displayed.



Key 1 and key 4 after turning on the HT:

MAIN MENU

For the following menus, the keys of the first row on the handheld are available as softkeys. The last display line indicates the functions assigned to the keys of the first row.

Notice

The access to the main menu can also be deactivated. For details about the deactivation, refer to the specific coupling manual.

In all menus the key 1 always has the function of an ESC key. Apart from few exceptions, the keys 2,3 are used to move the brackets "> <", that identify the menu line to be selected, up and down. The key 4 (OK) confirms the selection.

The main menu provides the following functions:

MAIN MENU
Diagnosis
Setup
Info
System Reset

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Diagnosis Menu

The diagnosis menu is a submenu of the main menu and provides different test functions:

DIAGNOSIS MENU
Keyboard Test
Buzzer Test
I/O Status
COM Test
LED Test
Software

Keyboard Test Tests the HT keyboard. Apart from key 1 that acts as ESC key, all keys pressed are displayed one after the other in the line "Pressed Key:".

Buzzer Test The buzzer remains turned on until you quit the menu by pressing ESC.

I/O STATUS The following display is continuously updated:

```
    I/O Status
AI1:xx Handwh.:xxxxx
AI2:xx DI:uvw Stop:x
Esc
```

AIx A/D input (override potentiometer). The value range 0 to 63 is displayed according to the position of the override potentiometer. At devices without override potentiometer, the value displayed is 0.

Handwh Count of handwheel. Each lock-in position increments or decrements the count. 100 lock-in positions =1 revolution. The counter values range from 0 to 65535.

DI Digital inputs. Indicate the current status of the 3 digital inputs:
u ..... DI 1
v..... DI 2
w..... DI 3
At present, only DI 1 is used. It indicates the status of the key switch:
DI 1 = 1..... not actuated
DI 1 = 0..... actuated
DI 2 and DI 3 are reserve inputs.

Stop Status of emergency stop switch of HT (1=activated)

Esc Back

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COM Test

All interfaces available in the handheld terminal can be selected for testing. They can be tested without being connected to the PLC:

COM Test
COM1: RS-232-C
COM1: 20 mA
COM2: RS-232-C
COM2: 20 mA
COM2: RS-422-A

At the interface to be tested, the transmitter and the receiver must be linked together (e.g. directly on connection board or on-site at the end of the signal lines).

The terminal and signal designations of the following table refer to the connection board:

COM1	
RS-232-C	20 mA CL
25 TXD1 26 RXD1	21 TX1+ 22 TX1- 23 RX1+ 24 TX1-

COM2		
RS-232-C	20 mA CL	RS-422-A
30 TXD2 31 RXD2	33 TX2+ 34 TX2- 35 RX2+ 36 RX2-	15 A 14 B 13 A/A' 12 B/B'

For the Current-Loop test, the DIP switch of the corresponding interface must be set to transmitter active and receiver passive (or vice-versa).

The interface test is performed with the interface parameters set during programming. The following settings apply to couplings without serial interface (e.g. CAN, INTERBUS, PROFIBUS-DP, MPI):

9600 Baud, no parity, 8 data bits, 1 stop bit.

During the interface test, the selected interface appears on the display:

```
   COMx: y
    Transmit:  a
    Receive :  b
Esc
```

x..... interface 1 or 2
y..... interface type (RS-232-C, 20 mA CL, RS-422-A)

Transmit

The HT 40x sends the ASCII characters "0" (30H) to "z" (7AH) one after the other at intervals of one second. The characters sent are displayed at the position a.

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Receive The characters just sent are received one after the other and displayed at the position b. Should the send/receive line or the interface be defective, nothing will be displayed.

LED Test The LEDs are flashing alternately green and red at one second intervals. The corresponding status is displayed.

Software Certain warnings are logged for diagnostic purposes and assist KEBA's service engineer in analysing errors. Normally the display indicates the message "No warnings!". The entries in this message storage are only for information. Most warnings refer to handling errors caused by the user.

Setup Menu

The setup menu is a submenu of the main menu and provides the following functions:

SETUP MENU
Contrast Program Loader

Contrast LCD contrast setting of display for optimum angle of view.

Program Loader This function is used to set the parameters of the interface via which the program is loaded from the PC into the handheld terminal. These parameters are only relevant during the loading process.

This menu item does **not** start the loading process.

To switch the handheld terminal over to the loading mode, press and hold the keys 1 and 4 simultaneously when turning on the HT until the message "Program loader ready" appears on the display (see chapter "")

Info Menu

The info menu is a submenu of the main menu and provides the following functions:

INFO MENU
Hardware COM parameter

Hardware This menu item displays essential data of the device hardware.

COM parameter This menu item displays the defined interface parameters.

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System Reset

The menu item "System Reset" included in the main menu restarts the handheld terminal.

This process corresponds to a turning on and off of the device. Pressing the keys 1 and 4 switches the device over to the loading mode.

8.3 System Errors

Fatal system errors can be caused by a defective hardware or an error in the system software (no handling error).
In case a fatal error occurs the following is displayed:

```
Error:a/b
Modul:c d.d
Line :e, f
Info :g
```

a..... component number
b..... error number
c..... module name
d..... module revision
e..... line number in source code
f..... task name
g..... possible additional information

Notice

*Since fatal errors are not stored in the device, please note the **complete** text displayed and contact a service engineer of KEBA.*



If a system error occurs in the handheld terminal, the handheld terminal will not respond to incoming telegrams any more.

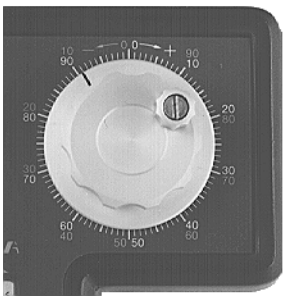
To rectify this error condition, turn the handheld terminal off and then on again.

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9 Options

9.1 Handwheel (NC, Numeric Control)

The HT 401/NC features an incremental encoder, a so-called electronic handwheel (**N**umeric **C**ontrol). In this HT version, the emergency stop switch is mounted at the narrow side at the top of the device.



Handwheel on HT 401/NC

Main features

- 100 lock-in positions / revolution
- 1 pulse / lock-in position
- Output signals: 2 channels: A, $\overline{A}$, B, $\overline{B}$ (A, B 90 ° phase quadrature)
- Output circuit: RS-422-A / optically isolated
- Max. load: 20 mA per output

The incremental encoder can be evaluated internally or externally.

Internal Evaluation

If the encoder is evaluated internally by the HT 401 the PLC must only read the pulse count from the HT.

The handwheel pulses are evaluated by the processor and can be read by the PLC via a register.

100 pulses are counted per revolution. Turning the handwheel clockwise increments the count, turning the handwheel counter-clockwise decrements the count (0 - 65535, 16-bit value).

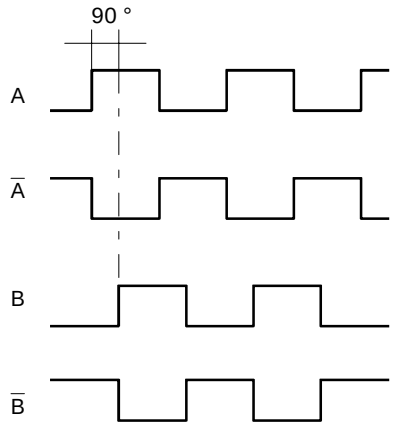
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External Evaluation

For the external evaluation, the connections of the incremental encoder are optically isolated and connected to the terminals of the connection board via a driver.

Pulse diagram

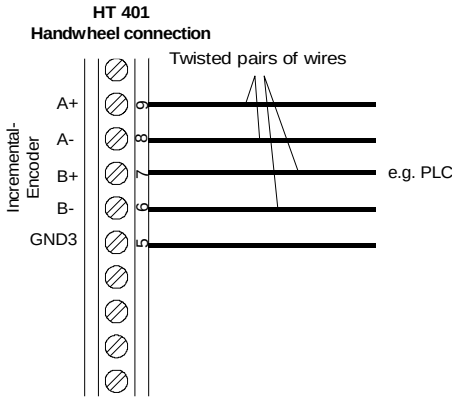
The following pulse diagram shows the corresponding output signal of the channels A, $\overline{A}$ and B, $\overline{B}$ when the handwheel is turned clockwise.



Pulse diagram of handwheel

Connection

The handwheel signals are directly available on the connection board. The connection to the counter input of the PLC is established by shielded lines.



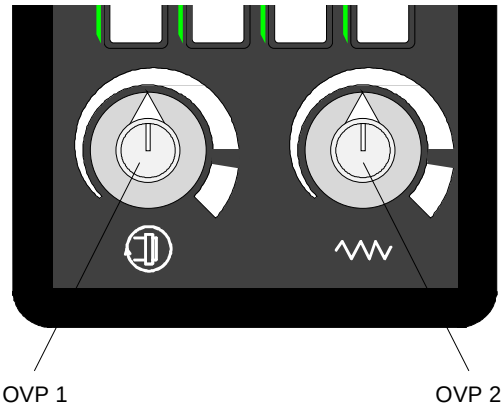
Handwheel signals on connection board

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9.2 Handwheel and Override Potentiometer (NCO)

In addition to the built-in handwheel, the HT 401/NCO features override potentiometers. The two override potentiometers are evaluated in the handheld terminal by the software and can be read by the PLC. They can be used for example for setting the number of spindle revolutions and the forward feed on machine tools.

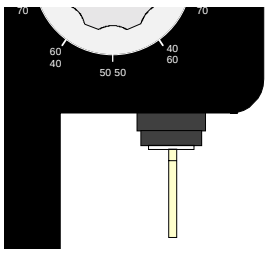
Resolution: each potentiometer 0 - 63, linear



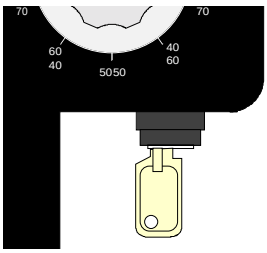
2 override potentiometers on the HT 401/NCO

9.3 Key Switch (SS)

Optionally, all HTs are also available with a key switch (SS). The key switch is connected to the digital input DI 1 and can be read by the PLC.



DI 1 = TRUE



DI 1 = FALSE

Signal states of key switch

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10 Accessories

10.1 Accessories for Dismounting the Emergency Stop Switch

If the emergency stop switch is not required, it can be dismounted from the handheld terminal.

Notice

When the emergency stop is dismounted, the BIA certification will not be valid any more.

For covering the bore hole in the handheld terminal, the following accessories are available at KEBA:

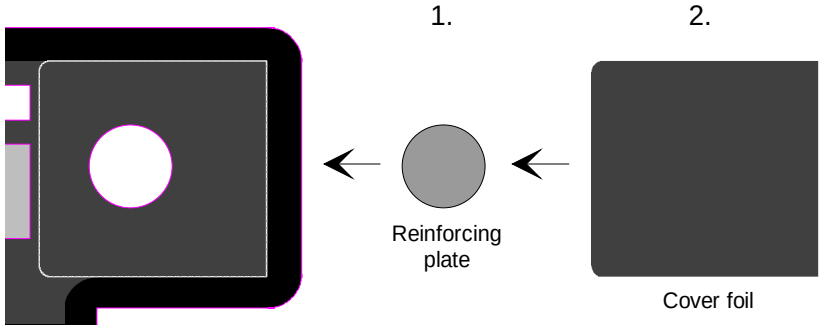
- ❏ Reinforcing plate for E-stop blind cover (M-No. 22210)
- ❏ Cover foil (M-No. 20593)

After having dismounted the emergency stop switch, cover the bore hole as follows:

Glue the reinforcing plate into the bore hole.

Clean the surface in the glue area with alcohol.

Glue on the cover foil.



Covering the emergency stop bore hole

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10.2 Magnetic plates

To attach the handheld terminal on ferrometallic surfaces, a specific magnetic plate is available. According to the application field of the handheld terminal, the following magnetic plates can be chosen:



Standard magnetic plate (M-No. 22383)



Oil-resistant magnetic plate (M-No. 53967)

Magnetic plates for fixing the handheld terminal

10.3 Hand Strap (M-No. 20846)

As accessory for the handheld terminal, a hand strap which is made of imitation leather and individually adjustable is available. An antigliss strip prevents the HT from slipping off on smooth surfaces.



Hand strap for handheld terminal

For fixing the hand strap on the handheld terminal, 2 fastening bows and 3 screws are supplied with the device.

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10.4 Wall Bracket (M-No. 56913)

The plastic-coated black wall bracket is used for stationary operation or for storing the handheld terminal. The wall bracket is also suitable for handheld terminals with hand straps.



Wall bracket for handheld terminal

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11 Display Character Set

The following list provides an overview of the ASCII characters that can be displayed on the handheld terminal.

Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII
32	20	SPACE	68	44	D	105	69	i
33	21	!	69	45	E	106	6A	j
34	22	"	70	46	F	107	6B	k
35	23	#	71	47	G	108	6C	l
36	24	$	72	48	H	109	6D	m
37	25	%	73	49	I	110	6E	n
38	26	&	74	4A	J	111	6F	o
39	27	´	75	4B	K	112	70	p
40	28	(	76	4C	L	113	71	q
41	29	)	77	4D	M	114	72	r
42	2A	*	78	4E	N	115	73	s
43	2B	+	79	4F	O	116	74	t
44	2C	,	80	50	P	117	75	u
45	2D	-	81	51	Q	118	76	v
46	2E	.	82	52	R	119	77	w
47	2F	/	83	53	S	120	78	x
48	30	0	84	54	T	121	79	y
49	31	1	85	55	U	122	7A	z
50	32	2	86	56	V	123	7B	{
51	33	3	87	57	W	124	7C	|
52	34	4	88	58	X	125	7D	}
53	35	5	89	59	Y	129	81	ü
54	36	6	90	5A	Z	130	82	é
55	37	7	91	5B	[	131	83	â
56	38	8	93	5D	]	132	84	ä
57	39	9	94	5E	^	133	85	à
58	3A	:	95	5F	_	136	88	ê
59	3B	;	96	60	`	138	8A	è
60	3C	<	97	61	a	140	8C	î
61	3D	=	98	62	b	142	8E	Ä
62	3E	>	99	63	c	147	93	ô
63	3F	?	100	64	d	148	94	ö
64	40	@	101	65	e	150	96	û
65	41	A	102	66	f	151	97	ù
66	42	B	103	67	g	153	99	Ö
67	43	C	104	68	h	154	9A	Ü

On the 4-line display, the character ô (DEC 147, HEX 93) is displayed as u and the character û (DEC 150, HEX 96) as o.

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12 Technical Data

General Data

Power supply:	24 V DC
Power supply range:	18 V DC to 32 V DC
Current consumption:	typ. 0,3 A, measured at 24 V DC (inrush current may have several amperes)
Safety class:	III in accordance with EN 61131-2 and EN 50178

Environmental Conditions

Temperature range (operation):	0 °C to 45 °C
Storage temperature:	0 °C to 60 °C
Relative air humidity (non condensing):	5 % to 95 %
Vibration resistance (operation):	1 g (IEC 68-2-6)
Shock resistance (operation):	15 g / 11 ms (IEC 68-2-27)
Bump resistancet (Betrieb):	25 g / 6 ms (IEC 68-2-29)

Housing

Dimensions in mm (H x W x D):	280 x 180 x 61 mm
Protection system:	IP54
Weight:	approx. 1,0 kg
Display	
Type	Supertwist LCD
Background lighting	LED
Size (WxH)	76 x 25 (62 x 43) mm
Resolution	4 x 20 (8x20) Zeichen
Accessories:	
	- hand strap - magnetic plate - wall bracket for stationary operation or for storage - programming software for generating the program and for loading the HT 40x - connecting cable and connector - HT junction box
Basic functions:	
	- power-on self-test - menu control (diagnosis, setup, info, contrast...)
Options:	
	- second serial interface HT-COM2 - SS.....key switch with 2 positions - NC.....electronic handwheel - NCO....2 override potentiometers + electronic handwheel

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Standards

The device meets the following standards:

General	
UL 508N	Industrial Control Equipment
EMC	
EN50081-2	EMC generic emission standard, industrial environment
EN50082-2	EMC generic immunity standard, industrial environment
Operating safety	
EN61131-1 (IEC1131-1)	General information
EN61131-2 (IEC1131-2)	Equipment requirements and test
EN60204-1	Safety of machinery - electrical equipment of machines
Enabling switch in accordance with	
EN60204-1:1997	Safety of machinery - electrical equipment of machines
Emergency stop switch in accordance with	
EN418	Safety of machinery (emergency stop)

Certifications

Underwriters Laboratories Inc.	
c UL us listed 21YA ind. cont. EQ	File E176666
Deutsche Berufsgenossenschaft	
BG-PRÜFZERT BIA 980126	See chapter „BG Certification“.
SIBE Schweiz	
	See chapter „SIBE-Baumusterbescheinigung (Design Certificate). (currently only applies to HT 401)

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13 BG Certification

Prüf- und Zertifizierungsstelle
im BG-PRÜFZERT

BIA
Berufsgenossenschaftliches Institut für Arbeitssicherheit

Hauptverband der gewerblichen Berufsgenossenschaften

BG-Prüfbescheinigung

980126
Bescheinigungs-Nummer

Name und Anschrift des Bescheinigungsinhabers: (Auftraggeber)	Keba GmbH & Co Gewerbegebiet Urfahr A-4041 Linz, Österreich
Name und Anschrift des Herstellers:	Keba GmbH & Co Gewerbegebiet Urfahr A-4041 Linz, Österreich

Zeichen des Auftraggebers:	Zeichen der Prüf- und Zertifizierungsstelle:	Ausstellungsdatum:
mf/ocl	1998 23767-01 Apf/Zil/Fk	22.10.1998

Produktbezeichnung:	Handbediengerät mit integriertem, zweistufigem Zustimmungsschalter und Not-Aus-Befehlsgerät
Typ:	HT X *) - 222 / Y *) (nähere Angaben siehe Anlage)
Bestimmungsgemäße Verwendung:	Bedien- und Anzeigegerät für Maschinen, Anlagen, Roboter
Prüfgrundlage:	- EN 418 / 1.93 - GS-ET-22 / Entwurf / 7/97
Bemerkungen:	---

Das geprüfte Baumuster entspricht der oben angegebenen Prüfgrundlage.
Der Bescheinigungsinhaber ist berechtigt, das umseitig abgebildete BG-PRÜFZERT-Zeichen an den mit dem geprüften Baumuster übereinstimmenden Produkten anzubringen, und zwar mit dem unter 'Bemerkungen' genannten Hinweis.
Diese Bescheinigung wird spätestens ungültig am:

30.11.2003

Weiteres über die Gültigkeit, eine Gültigkeitsverlängerung und andere Bedingungen regelt die Prüf- und Zertifizierungsordnung vom Oktober 1997

Leiter der Zertifizierungsstelle
(Dr.-Ing. Joachim Lambert)

Fachzertifizierer
(Dipl.-Ing. Ralf Apfeld)

Postadresse:
53754 Sankt Augustin

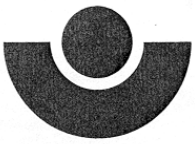
Hausadresse:
Alte Heerstraße 111
53757 Sankt Augustin

Tel: 0 22 41/2 31-02
Fax: 0 22 41/2 31-22 34

PZB08
10.98

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BIA

Berufsgenossenschaftliches Institut für Arbeitssicherheit

Hauptverband der gewerblichen Berufsgenossenschaften

[an76701.doc]

St. Augustin, den 29.10.1998
Apf/Zil/Fk, E-Nr.1998 23767-01

Anlage zur BG-Prüfbescheinigung Nr. 980126 vom 22.10.1998

Typenschlüssel:

Typ: HT X*) - 222/Y *)

*) wahlweise

X = 2
Ausführung mit Display 2 x 16 Zeichen
Tasten auf Aluminiumträger
ohne LED's
ohne Textspeicher
Schnittstelle RS-232-C, 20 mA-CL
Prozessor: Intel 80 C 32

X = 2+
Ausführung mit Display 2 x 16 Zeichen
Tasten auf Aluminiumträger
ohne LED's
ohne Textspeicher
Schnittstellen RS-232-C, RS-422-A/RS-485
20 mA-CL
Prozessor: Intel 80 C 32

X = 3+
Ausführung mit Display 2 x 16 Zeichen
Tasten auf Aluminiumträger
ohne LED's
mit Textspeicher (2000 Zeilen)
Schnittstellen RS-232-C, RS-422-A/RS-485
20 mA-CL
Prozessor: Intel 80 C 32

X = 4
Ausführung mit Display 4 x 16 Zeichen
Tasten auf Leiterplattenträger
mit LED's
mit Textspeicher (2000 Zeilen)
Schnittstellen RS-232-C, RS-422-A/RS-485
20 mA-CL
Prozessor: Intel 80 C 32

X = 401
Ausführung mit Display 4 x 20
oder 8 x 20 Zeichen
Tasten auf Leiterplattenträger
mit LED's
mit Textspeicher (2000 Zeilen)
Schnittstellen RS-232-C, RS-422-A, 20 mA-CL
Prozessor: Hitachi H 8/3002

Y = 0
Ausführung mit Option
Schlüsselschalter, Handrad,
Buchse usw.

Y = -
Ausführung ohne Option

Leiter der Zertifizierungsstelle

Dr.-Ing. Joachim Lambert

Fachzertifizierer

Dipl.-Ing. Ralf Apfeld

Postadresse:
53754 Sankt Augustin

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IK: 120 591 481

Zuschriften bitte an
das Institut richten, nicht
an Einzelpersonen

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14 SIBE-Baumusterbescheinigung (Design Certificate)

S CE S SCHWEIZERISCHER ZERTIFIZIERUNGSDIENST
SERVICE SUISSE DE CERTIFICATION
SERVIZIO SVIZZERO DI CERTIFICAZIONE
SWISS CERTIFICATION SERVICE

SCES 046

Zertifizierungsstelle
SIBE Schweiz

Akkreditierte Zertifizierungsstelle SIBE Schweiz nach EN 45011

Baumusterbescheinigung Nr. 1021

Produkt	Befehlsgerät Handterminal mit Zustimmungseinrichtung mit 3 Stellungen
Marke	Keba
Type	HT 401 - 232 .. dabei bedeutet 232: 2 Zustimmtaster; 3-stufige Zustimmtaster; 2 nach aussen geführte Kreise des Zustimmtasters
Sicherheitsangaben	genügt der Sicherheits - Kategorie 3 nach EN 954-1 Zur Gewährleistung der Sicherheit, welche mit dieser Sonderbetriebs-steuerung erreicht wird, sind die Ausführungen im Benutzerhandbuch strikte zu befolgen. Die Zustimmungseinrichtung dieses Handterminals genügt den Anforderungen entsprechend EN 60204-1.
Herstelleradresse	Keba AG Gewerbepark Urfahr A-4041 Linz
Gesuchstelleradresse	Keba AG Gewerbepark Urfahr A-4041 Linz
Ablaufdatum	31. Dezember 2004

Das überprüfte Baumuster entspricht den einschlägigen Bestimmungen des Rates vom 22. Juni 1998 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten für Maschinen (98/37/EG) und deren Änderungen vom 27. August 1998 (98/79/EG).

Diese Bescheinigung gilt zusammen mit den allenfalls vorstehend erwähnten Beilagen sowie den auf der Rückseite aufgeführten allgemeinen Bestimmungen.

Ausstelldatum

29. Oktober 1999

Die Zertifizierungsstelle:

NSBIV AG
Zertifizierungsstelle SIBE Schweiz
Postfach 3918
CH-6002 Luzern

Der Sicherheitsingenieur

M. Luzzatto

Der Zertifizierungsleiter

A. Retsch

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