Handheld Terminal HT 2 17

# 17.1 Description

The SINUMERIK HT 2 (Handheld Terminal 2) has been designed for manual operation of machine tools and distinguishes itself as a result of its ruggedness and ease of handling. The low weight and the ergonomic design make this unit easy to use, even over longer periods of time.

The HT 2 should be preferably used if it is necessary to be mobile while monitoring or controlling the machine tool (e.g. during setting-up procedures. In this case, the HT 2 can be connected at any system location via a PN Basic terminal box or a PN Plus terminal box . If used in conjunction with the PN Plus terminal box, the HT 2 can simply be withdrawn and inserted during actual operation without initiating an emergency stop.

For mounting in the control cabinet, the HT 2 is connected with a connection module PN Basic.

The HT 2 is suitable for both for righthanded and lefthanded personnel as it has two agreement buttons. The magnetic handwheel allows intuitive axis feed motion. All of the HT 2 keys can be freely configured and labeled.

The HT 2 can be mounted using a retaining magnet or an appropriate bracket. Both the retaining magnet as well as the holder are available as accessory (refer to Section: "Accessories").

#### Validity

The following description applies to the following components:

Name	Features	Order No.:
HT 2	Agreement button, Emergency Stop button,	6FC5303-0AA00-2AA0
	override rotary switch	

#### **Function blocks**

#### In the unit:

- PCB with CPU, memory
- Ethernet Controller

#### Device front:

- LC display (black / white)
  - Resolution: 168 x 72 pixels
  - LCD controller on board
  - 4 lines each with 16 characters can be displayed

#### 17.1 Description

- 20-key membrane keyboard
  - 16 machine control keys
  - 4 keys (upper row of keys) can be assigned as softkey or system key
- Emergency Stop button, 2-channel
- Rotary override switch (19 positions)
- Magnetic handwheel

#### Device rear side:

- · Recess for the bracket or retaining magnet
- Cable duct for the HT 2 connecting cable to
  - terminal box PN (Basic / Plus)
  - PN Basic connection module

#### Righthand side of the device

- Key-operated switch (3 positions, 2 keys)
- Agreement button (2-channel, 3-stage)

#### Lefthand side of the device:

• Agreement button (2-channel, 3-stage)

# 17.2 Operator control and display elements

## 17.2.1 Overview



- (1) Emergency Stop button (stop button)
- (2) Rotary override switch
- (3) Display
- (4) Keyboard
- (5) Handwheel
- (6) Agreement button (left)
- (7) Agreement button (right)
- (8) Opening for the cable entry
- (9) Cable duct cover
- (10) Type plate
- (11) Standard position retaining magnet (optional: mounting bracket)
- (12) Standard position mounting bracket (optional: Retaining magnet)
- (13) Key-operated switch

Figure 17-1 Operator control and display elements of the HT 2

# 17.2.2 Description

#### Display

The Handheld Terminal HT 2 is equipped with an LCD display (black / white). The display has a resolution of 168 x 72 pixels. This means that for a normal font of 16 pixels high, 4 lines each with 16 characters can be displayed.

## Keyboard

On the HT 2 there are total of 20 keys each assigned 1 LED. Of which

- All 4 keys in the upper row of keys can be used both as softkey as well as system keys.
- The remaining 16 keys are reserved for the machine control.

When supplied from the factory, the HT 2 has 5 horizontal slide-in labels.

One of these slide-in labels is not printed. The remaining four slide-in labels have standard symbols for the machine control printed on them.

The standard symbols used and their position on the slide-in labels are listed together with the corresponding symbol number in the table.

 Standard sy		
/ic:-\	/: <b>::</b> :-\	

-	(specific).	ı	(specific).	-	(specific).	ı	(specific).
₩ Jog	7001	AUTO	7015		7048	X	7011
FEED STOP	7025	FEED START	7026	+	7112	Υ	7022
SPINDLE STOP	7013	SPINDLE START	7124	<b>€</b>	7027	Z	7028
CYCLE STOP	7020	CYCLE START	7021	_	7111	4 4TH AXIS	7029

Symbols that you specify can be printed on all of the slide-in labels. Plain films are available for this purpose.

Information on the Order No. for the plain strips and for printing as well as exchanging the slide-in labels is provided in the following section: "Accessories" → "Slide-in labels".

#### Rotary override switch

The rotary override switch of the HT 2 has 19 positions.

The evaluation scale (0 to max.) is specified by the machine's manufacture in the form of machine data.

#### Handwheel

The HT 2 handwheel has magnetic bearings.

A turning knob is integrated in the handwheel knob. This allows fast rotary motion to be executed using a finger (run-on < 1 revolution).

Individual increments can be reliably moved at the machine – as the transition from one position to another can be clearly sensed.

The handwheel operates with 100 pulses/revolution and has a detent torque of approx. 1.8 Ncm (+/- 0.3).

#### **Emergency Stop button**

The red mushroom-shaped head of the Emergency Stop button is provided with a yellow ring.

Directly under the mushroom-shaped head, there is also a black ring which identifies the position status of the Emergency Stop button.

	State	
Ring (black)	Visible	not visible
Emergency Stop button	Not pressed	Pressed

If an Emergency Stop is triggered, the button locks into place.

If the button is locked in place, it can be unlocked by rotating it to the right.



#### **Emergency Stop button**

Press the red button in emergencies when

- people are at risk,
- there is the danger of machines or the workpiece being damaged.

As a rule, when operating the Emergency Stop button, all drives are brought to a standstill with max. braking torque.



## Machine manufacturer

For other reactions to the Emergency Stop: refer to the machine tool manufacturer's instructions!

The signals are sent via the the connecting cable to the terminal box or the connection module and are available for further wiring.

### Agreement button

The HT 2 has two agreement buttons that are logically grouped.

This allows the enabling function to be triggered by either the left or the right hand during normal operation.

The agreement buttons comprise a 3-stage operator element and separate evaluation electronics. They have a 2-circuit configuration.

The actuatior comprises 2 symmetrically arranged rockers whose position is determined using electrical sensors and which is transferred to the evaluation electronics.

The agreement buttons can assume one of three different switch positions.

Switch position	Function	Agreement button	Switching contact
1	Zero position	Not actuated	Off (open)
2	Agreement	Actuated	On (closed)
3	Panic	Pressed	Off (open)

The switching sequences, shown in the diagrams are possible for the agreement buttons.

#### Normal actuation

Zero position  $\rightarrow$  X  $\rightarrow$  Agreement  $\rightarrow$  Y  $\rightarrow$  Zero position

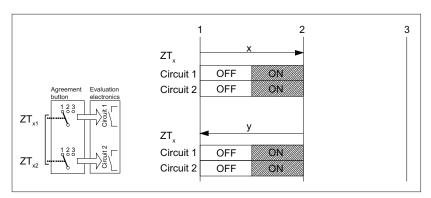


Figure 17-2 Switching distance diagram for normal actuation

#### Panic actuation

Completely pressing the actuator to the panic position is evaluated by the fact that when released, the agreement position is skipped.

Zero position  $\rightarrow$  X  $\rightarrow$  Agreement  $\rightarrow$  U  $\rightarrow$  Panic  $\rightarrow$  Y  $\rightarrow$  Zero position

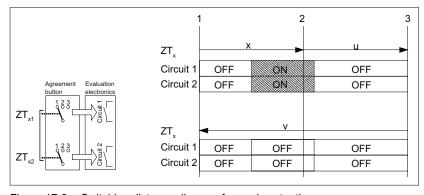


Figure 17-3 Switching distance diagram for panic actuation

The signals are sent via the the connecting cable to the terminal box or the connection module and are available for further wiring.



It is not permissible that the agreement button is fixed in the agreement position.

# Key-operated switch

The key-operated switch has three positions: I - 0 - II.

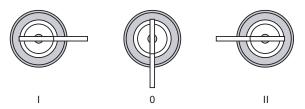


Figure 17-4 Key-operated switch positions

The key can be removed in the switch position 0.

Remove the key after use. This avoids possible damage to the key if the HMI device falls down.

#### Note

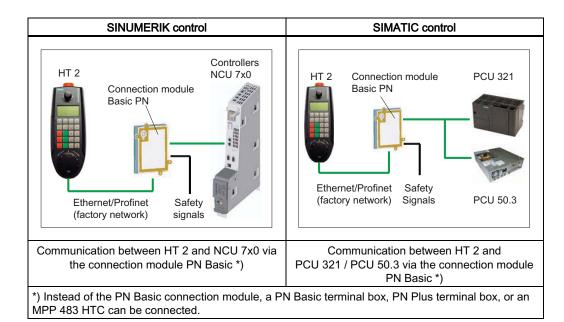
The key for the key-operated switch is provided with the HMI device. Its coding is not specific to the device. This means the key can be used on any Handheld Terminal HT 2.

#### 17.3 I/Os

#### 17.3.1 Overview

The Handheld Terminal HT 2 communicates with the SIMATIC- / SINUMERIK control unit via

- PN Basic terminal box/PN Plus terminal box, or
- Connection module PN Basic (for control cabinet installation) or
- MPP 483 HTC



#### Note

The handwheel signals are only effective at a SINUMERIK control.

The system keys (machine control panel functionality / override) are transferred both to a SINUMERIK-PLC as well as also to a SIMATIC in a DB interface.

The safety signals for Emergency Stop and agreement are retrieved from the terminal box, the connection module or MPP 483 HTC via the connecting cable and connected to the safety relays in the control cabinet.

## 17.3.2 Terminal Box PN

#### 17.3.2.1 Features

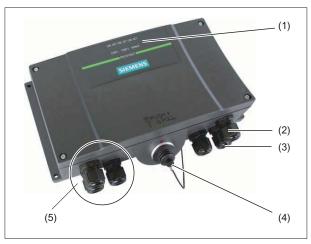


Figure 17-5 Terminal Box PN

- (1) LED displays
- (2) Screwed joint for power supply cable and shield
- (3) Screwed joint for cable with supplementary stop and agreement button signals and for PLC-accompanying signals
- (4) Connecting socket for the connector plug of the connecting cable (covered with dummy cap)
- (5) Screwed joint for process data line (Ethernet)

#### Note

Protection class IP65 at the terminal box is ensured with plugged-in HT 2 or plugged-in dummy cap.

The terminal box PN is available in two variants.

- PN Basic terminal box
- PN Plus terminal box

### Note

The exterior of the terminal box PN variants differ only in the printing on the side.

17.3 I/Os

#### PN Plus terminal box

The PN Plus terminal box features hot-plug capability. This means that it is possible to connect and disconnect during operation without any disruption.

The Emergency Stop circuit is automatically maintained during the switching of connectors.

The PN Plus terminal box is available under order no. 6AV6671-5AE11-0AX0.

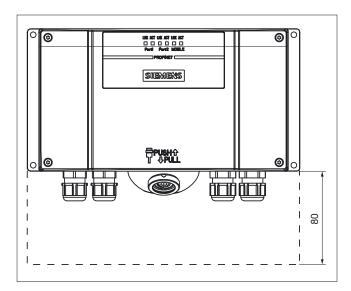
#### PN Basic terminal box

The PN Basic terminal box can be used if no hot-plug capability is required. The Emergency Stop circuit can be overridden here by external mechanisms.

The PN Basic terminal box is available under order no. 6AV6671-5AE01-0AX0.

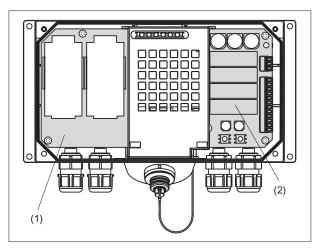
#### Clearance

The following clearances are required around the Terminal Box PN:



#### 17.3.2.2 PN Plus terminal box

The PN Plus terminal box differs from a PN Basic terminal box in that it has four relays mounted on the board.



- (1) Board
- (2) Relays

Figure 17-6 PN Plus terminal box

## Switching statuses of the Emergency Stop circuit

• With HT 2 connected with emergency stop button and PN Plus terminal box

HT 2	Emergency Stop button	Switch status, Emergency Stop circuit
connected	Not pressed	Emergency Stop circuit in the terminal box remains closed.
connected	Pressed	The Emergency Stop circuit in the terminal box is open. The system to be monitored is stopped.
<b>not</b> connected	-	Emergency stop circuit in the terminal box remains closed.



#### disconnect HT 2

If you disconnect the HT 2 from the PN Plus terminal box, the emergency stop circuit is closed, thereby clearing the stop state of the system to be monitored. This occurs irrespective of whether the Emergency Stop button has been pressed on the HT 2.

#### 17.3.2.3 PN Basic terminal box

In contrast to the PN Plus terminal box, the "Stop loop through" function is not implemented on the PN Basic terminal box. Relays are therefore not required.

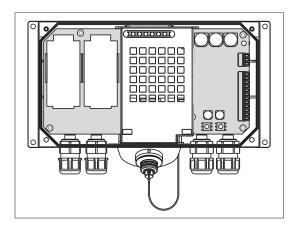


Figure 17-7 PN Basic terminal box

#### **CAUTION**

The Emergency Stop circuit is controlled via the Emergency Stop button when the HT 2 is connected. If the connecting cable of the HT 2 is disconnected from the PN Basic terminal box, the emergency stop circuit is interrupted. This leads to a reliable machine stop or an Emergency Stop of the system to be monitored.

#### Switching statuses of the emergency stop circuit

With HT 2 connected with emergency stop button and PN Basic terminal box

HT 2	EMERGENCY STOP button	Switch status EMERGENCY STOP circuit
connected	Not pressed	Emergency Stop circuit in the terminal box remains closed.
connected	Pressed	The Emergency Stop circuit in the terminal box is open. The system to be monitored is stopped.
<b>not</b> connected	-	The Emergency Stop circuit in the terminal box is open. The system to be monitored is stopped.



If you have shut down the system to be monitored, you can only release the Emergency Stop button or place the system to be monitored back into operation if the condition that triggered the Emergency Stop function has been corrected and a safe restart is carried out.

## 17.3.2.4 Interface assignments

Information concerning interface assignment on the PN terminal box can be found under

- SIMATIC HMI/HMI device Mobile Panel 177 (WinCC flexible)
- www.automation.siemens.com/simatic/portal/index\_00.htm

#### 17.3.3 Connection module Basic PN

#### 17.3.3.1 Features

The connection module Basic PN was specially developed for installation in the control cabinet. The terminating connector protrudes through the panel of the control cabinet so that the HT 2 can be connected from the outside.

The Connection module Basic PN is available under order no.6FC5303-0AA01-1AA0.

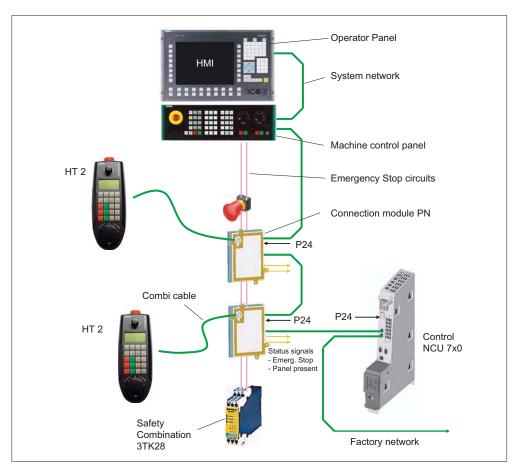


Figure 17-8 Block diagram - control cabinet installation

The connection module Basic PN is not hot plug-capable.

#### 17.3 I/Os

The Emergency Stop cables of the HT 2 are not monitored, but are directly connected to the Emergency Stop circuit.

To override the Emergency Stop circuit when inserting or withdrawing the HT 2, a key or key-operated switch is used (see Section: "Connecting/disconnecting during operation").

The HT 2 can either be connected directly to the NCU or to the PCU 321 / PCU 50.3 as a Thin Client.

# 17.3.3.2 Dimension drawing

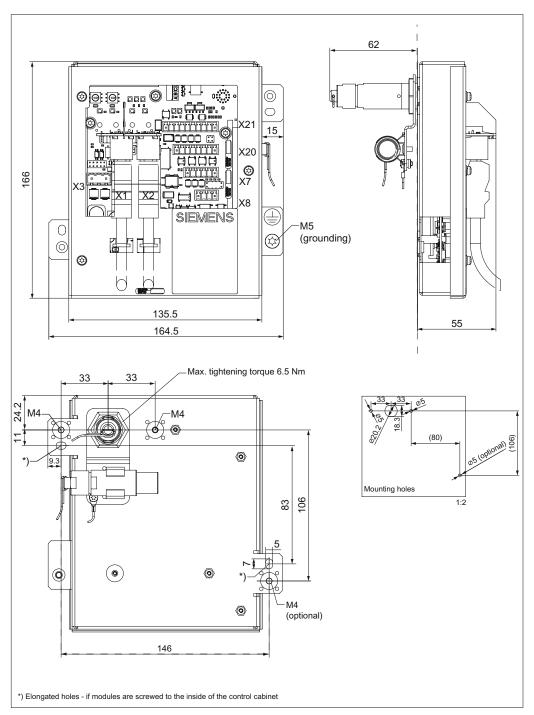
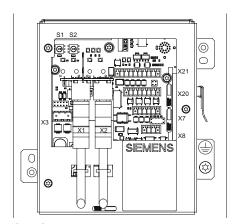


Figure 17-9 Connection module Basic PN - dimension drawing for control cabinet installation

#### 17.3.3.3 Interfaces

The HT 2 is connected to the connection module PN Basic via a round connector.

The interfaces of the connection module are located on the rear side (see figure).



S1 / S2 DIP Fix switches (rotary coding switch)



(1) Interfaces with attached connectors

Information on setting the bus addresses can be found in Chapter: "Networking".

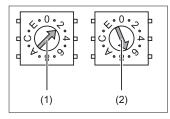
### Setting the box ID

You can use rotary coding switches S1 and S2 to set a unique ID on any connection module for station identification purposes.

Use a screwdriver to set the IDs.

The setting is entered in hexadecimal format. Equivalent decimal values of between 0 and 255 are supported.

By way of an example, the figure below illustrates address 27H, which corresponds to decimal address 39.



- (1) Rotary coding switch for higher-order bits (S1)
- (2) Rotary coding switch for lower-order bits (S2)

Figure 17-10 Example for the address "27H"

# Connector pin assignments

## Signal type:

I Input (Input)

O Output (Output)

**B** Bi-directional signals

P Potential

#### X3: Power supply

For the pin assignments of the power supply interface X3, refer to Section: "Connection conditions"  $\rightarrow$  "Secondary electrical conditions"  $\rightarrow$  "Pin assignments of the interfaces".

#### X7: Panel Present

Connector X7

designation:

Connector type: 6-pole Phoenix terminal

Table 17-2 Assignment of the interface Panel Present X7

Pin	Signal name	Signal type	Significance
1	PRES	0	"High": Panel (HT 8) plugged in
2	XCTL	0	"Low": Emergency Stop button pressed 1)
3	XFAULT	0	"Low": Error in Emergency Stop electronics 1)
4	N.C.	-	Unassigned
5	N.C.	-	Unassigned
6	M	Р	Ground

<sup>1)</sup> Function not implemented in PN Basic variant, output is not switched to "High"

# 17.3 I/Os

#### X8: Emergency Stop wiring terminal

Connector X8

designation:

Connector type: 4-pole Phoenix terminal

Table 17-3 Assignment of the Emergency Stop wiring terminal X8

Pin	Protective circuit
1	On-board jumper
2	between 1 and 2
3	On-board jumper
4	between 3 and 4

#### Note

Use this terminal for simple routing of the Emergency Stop cables, optional.

The connector is only used to assist looping through. The connected pins 1 and 2 as well as 3 and 4 have no additional function on the connection module.

#### X20: Enabling buttons

Connector X20

designation:

Connector type: 8-pole Phoenix terminal

Table 17-4 Assignment of the interface enabling buttons X20

Pin	Signal name	Signal type	Meaning
1	ZUST1P	I	Electronic agreement button 1 P
2	ZUST1M	0	Electronic agreement button 1 M
3	ZUST2P	I	Electronic agreement button 2 P
4	ZUST2M	0	Electronic agreement button 2 M
5	N.C.	-	Unassigned
6	N.C.	-	Unassigned
7	N.C.	-	Unassigned
8	N.C.	-	Unassigned

## X21: Emergency Stop and key-operated switch

Connector X21

designation:

Connector type: 10-pole Phoenix terminal

Table 17-5 Assignment of the interface Emergency Stop and key-operated switch X21

Pin	Signal name	Signal type	Meaning
1	STOP23		Emergency Stop circuit
2	STOP24		Emergency stop circuit
3	STOP13	В	Emergency stop circuit
4	STOP14		Emergency stop circuit
5	М	Р	Ground
6	N.C.	-	-
7	IN_E9		P24 switched by key-operated switches
8	P24_FILT	Р	Filtered 24V module power supply
9	IN_E9_EXT		"High": Key-operated switch actuated
10	IN_E12_EXT	0	"High": Terminating connector plugged in

# 17.3.3.4 Installing the terminating connector

#### Proceed as follows



(1) Retaining nuts



1. Unscrew the retaining nuts.



2. Attach the bracket for the terminating connector.



**3.** Tighten the retaining nut and insert the terminating connector into the bracket.

#### Note

If you never remove the HT 2 from the connection module, it is not necessary to attach the terminating connector.

# 17.3.4 Connection examples for the agreement button

The connection examples for the agreement button for safety category 3 according to EN 954-1 according to EN 954-1 are shown in the following diagrams.

#### NOTICE

In order to guarantee safety category 3 in accordance with EN 954-1, please also consider the operating instructions of the monitoring device used.

## Connection - Enabling button with evaluation unit

The diagram shows the connection of an evaluation unit with the enabling buttons of the HT 2.

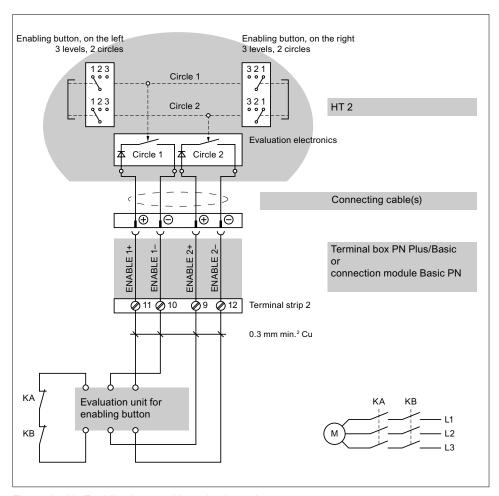


Figure 17-11 Enabling button with evaluation unit

All contacts of the safety relay (contactor) KA and KB are fitted with positively-driven contacts in accordance with EN 50205.

## Connection – Enabling button with safety switch

The diagram shows the connection of safety switch SIRIUS 3TK2841 with the enabling buttons of the HT 2.

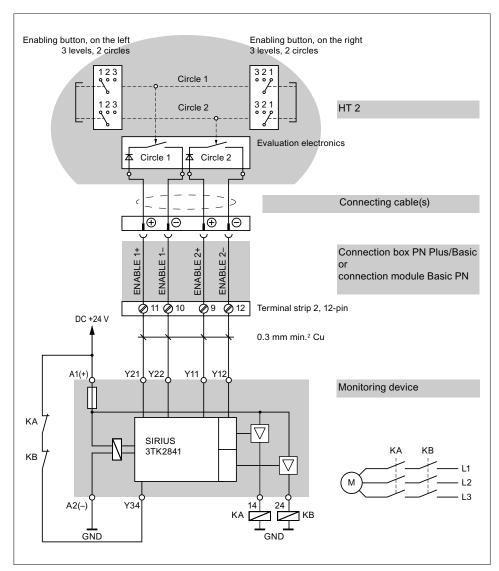


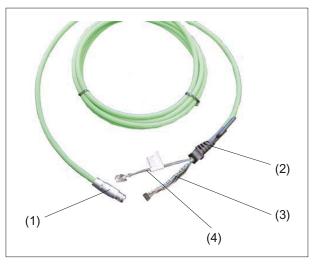
Figure 17-12 Enabling button with safety switch

All contacts of the safety relay (contactor) KA and KB are fitted with positively-driven contacts in accordance with EN 50205.

# 17.3.5 Connecting cable

The connecting cable is an industrial cable and, thus, resistant to many solvents and lubricants. The flexural strength is geared to the actual usage conditions.

The connecting cable is available in different lengths. You will find information in Section: "Accessories."



- (1) Metallic push-pull circular connector (ODU connector)
- (2) Strain relief and kink protection for connecting cable
- (3) Connector for agreement button, Emergency Stop, 24V and safety signals
- (4) RJ45 connector (Ethernet connection)

Figure 17-13 Connecting cable of the HT 2

The connecting cable is connected to the HT 2 via the RJ 45 connector (3) and the connector (4). The ODU connector (1) serves to connect the connecting cable to the terminal box PN or the connection module PN (control cabinet installation). The tightening torque for the nut of the ODU socket is 6.5 Nm.

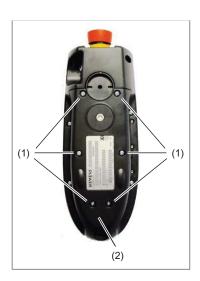
The HT 2 has one cable entry on its rear side for connecting the cable. It is located under the cover (see Section: "Control and display elements" → "Overview").

## Laying the connecting cable

# / CAUTION

Only open the connection slot when the power supply voltage is switched-out. Otherwise, components could be destroyed or non-defined signal states can occur.

When the connection slot is open, the Handheld Terminal HT 2 is sensitive with respect to electrostatic discharge.



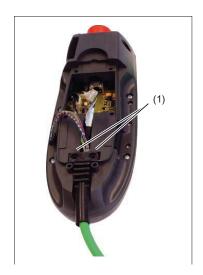
 Please the device down on a soft, horizontal surface so that the operator control components are not mechanically damaged.

Open the cable duct cover (2) by unscrewing the six PT screws (4 x 20 mm) approximately 1 cm (1). Use a size 2 Phillips screwdriver Ensure that you do not exceed the tightening torque of max. 0.4 - 0.5 Nm.

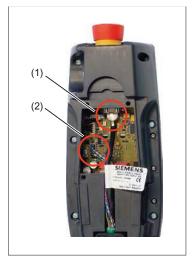


Cable duct cover open

(1) Cable entry



2. Insert the connecting cable into the cable entry. Gently press the cable downwards until it is completely retained by the retaining elements (1). Ensure that the cable doesn't sag away from the mounting surface, but is located flush to the mounting surface. Otherwise, the device could be pulled down to the floor and damaged. In order to avoid damaging the cable sheath, do not route it over sharp edges.



Connect the RJ-45 connector(1) to the Ethernet socket.

Press the plug connector (2) firmly into the power supply socket.

#### NOTICE

When plugging in the connector plug, ensure that all cables are lying straight in the cable guide. Otherwise, crushed wires can negatively impact the functionality.

Check that all of the conductors are aligned so that they are straight and ensure that the connector is firmly seated before you re-attach the cable duct cover. If the cable gland is incorrectly installed, then this could mean that the device is not properly sealed.

**4.** Put the cable duct cover on and secure it by tightening the six screws.

#### **NOTICE**

The housing of the HT 2 is made of plastic. Therefore, the mounting hole threads cannot handle the same amount of stress as a comparable metallic housing. Therefore, do not exceed 0.4 to 0.5 Nm of torque when tightening the screws (also for protecting the connecting cable).

If you use a power screwdriver, ensure the max. speed of 600 rpm is adhered to (torque: 1 Nm).

The screws of the cable duct cover may only be loosened or tightened a maximum of 20 times. Otherwise, there is the danger that the threads might become damaged and the seal of the housing will be compromised which could lead to failure of the device.

#### 17.3.6 MPP 483 HTC

The MPP 483 HTC variant of the machine control panel MPP 483 has an integrated connection module thereby providing a connection option for the HT 2.

## **Emergency Stop override**

For the MPP 483 HTC, the Emergency Stop circuit is overridden by a key-operated switch. The actuation of the key-operated switch is sent to the PLC, which generates a message after a certain period of time if the key-operated switch was held for too long or remains actuated due to a defect.

## 17.3.7 Power Supply

The HT 2 is supplied with power via the connecting cable of the terminal box PN or of the connection module PN.

The input voltage range is designed for +24 V DC.

# 17.4 Unplugging/plugging during operation

Trouble-free disconnection and connection of the HT 2 during machine operation requires the following:

- Release or override the HT 2 Emergency Stop
- Inserting the terminating connector after withdrawing the HT 2

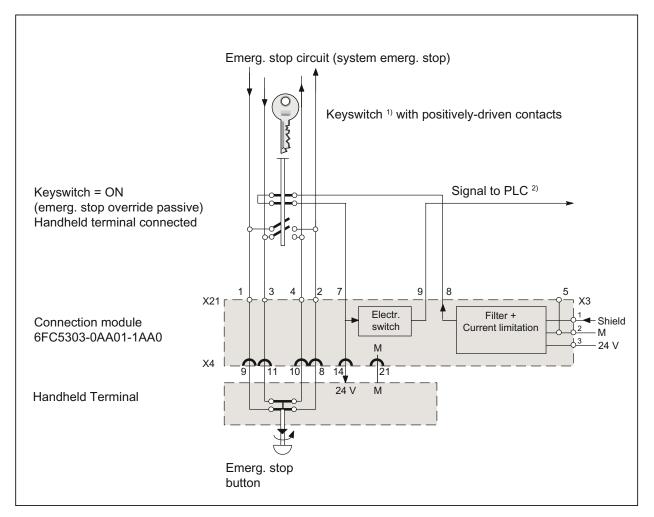
# DANGER

Emergency Stop switches that are inactive

- not recognizable or
- · not accessible

This is to prevent the Emergency Stop switch from being used inadvertently.

## Suggested circuit for emergency stop override with HT 2 connected



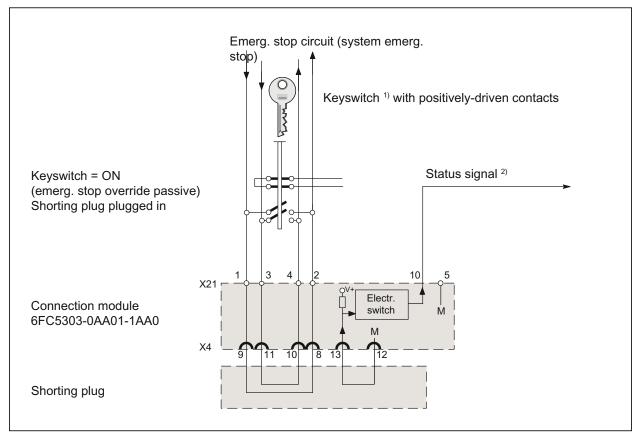
- 1) Keyswitch consisting of
  - 2 switching elements 3SB3400-0A and
  - Actuating element 3SB30 or 3SB36 (appropriate safety lock as required)
    - Catalog: Low-Voltage Controls and Distribution (LV 1)
- 2) Triggers time monitoring

If the signal level is still "Low" once the monitoring time has expired (approx. 5 minutes), the PLC has to trigger an EMERGENCY STOP.

If necessary, provide a pull-down resistor to control the signal level's HIGH-LOW transition.

Figure 17-14 The figure illustrates the "keyswitch = ON" state

## Emergency stop override with shorting plug connected



- Keyswitch consisting of
  - 2 switching elements 3SB3400-0A and
  - Actuating element 3SB30 or 3SB36 (appropriate safety lock as required)

Catalog: Low-Voltage Controls and Distribution (LV 1)

2) 24 V signal

Uses "High" level to indicate that the shorting plug is present.

If necessary, provide a pull-down resistor to control the signal level's HIGH-LOW transition.

Figure 17-15 The figure illustrates the "keyswitch = ON" state

## Disconnecting the HT 2

Key-operated switch is set to "ON" position, HT 2 connection at distributor is active (incl. Emergency Stop)

- 1. With the key-operated switch in the "OFF" position, the Emergency Stop circuits of the HT 2 are jumpered.
- 2. At the same time, the HT 2 supply voltage is disconnected and a monitoring signal to the PLC is set to the low level (provide a pull-down resistor if necessary). This HIGH-LOW transition starts a timer in the PLC, which opens the Emergency Stop circuit via the relevant PLC outputs and series-connected relays after the changeover period (approx. 5 min.) if the key-operated switch is not reset to its initial position within this period.
- 3. The HT 2 must be removed within the changeover period and the Emergency Stop circuit overridden using a shorting plug.

### Connecting the HT 2

Changeover from the terminating connector to HT 2 connection is carried out in the reverse sequence.

#### The ability to detect a connected HT 2 in the PLC

#### 1. HW solution:

The X7 interface of the connection module PN Basic signals "HT 2 Present" at pin 1 for the "active" connection module (see Section: "Connections" → "Connection module PN Basic" → "Interfaces").

If the connection module is "inactive", this signal is not set.

This makes the "active" connection module detectable in the PLC by wiring the abovementioned pins of all connection modules to digital I/Os on PLC I/O modules.

#### 2. Permanently configured MCPs / HT 2 on one control:

If there are only permanently configured MCPs / HT 2 on a control, removal of the MCP or HT 2 triggers the PLC alarm "400260 Machine Control Panel failed". Based on this, an "active" or "inactive" MCP / HT 2 in the PLC can be detected. The failure of an MCP / HT 2 is, however, only detected in the PLC if max. 2 MCP / HT 2 are permanently configured and no MCP changeover by means of FB9 (e.g. triggered by HMI when operator focus is switched).

# 17.5 Commissioning

#### 17.5.1 BIOS

# 17.5.1.1 BIOS powering up

After you have switched-in the power supply voltage of the HT 2, the BIOS initializes the hardware and boots the system.

All LEDs are briefly activated after the hardware has been initialized.

The HT 2 is ready for operation.

#### Note

If errors occur while booting, an appropriate message is displayed (see Section: "Error messages").

# 17.5.1.2 Settings in the BIOS menu

You can activate the BIOS menu by keeping the upper left key pressed while booting. The BIOS main menu is opened.

#### Main menu

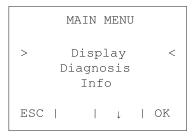


Figure 17-16 BIOS - main menu of the HT 2

The available sub-menus are displayed at the center of the screen.

The functions that can be executed with the 4 keys of the upper row of keys (softkeys) are listed in the bar at the lower edge.

Functions		Key
< ESC >	Exiting the main menu	Left (outside)
< ↑ >	Scrolling upwards	Left (center)
< ↓ >	Scrolling downwards	Right (center)
< OK >	Activating the selected menu item	Right (outside)

# 17.5 Commissioning

# Submenu: Display

Submenu	Menu item	Significance			
Display	Brightness	Setting the display brightness			
	Contrast	Setting the display contrast			

# Submenu: Diagnostics

Submenu	Menu item	Significance	Notes
Diagnostics	LEDs	The LEDs are switched-in one after the other in the form of a running light.	With this test, ensure that all of the LEDs light up and no LED remains permanently lit up.
	Keyboard	Visualizing the pressed keys. Multiple keys can be simultaneously pressed. In addition, the LEDs of all pressed keys are lit.	The upper left key exits this test.
	Enabling switch	Displays the state of the two agreement button circuits "Off" - "Enabled" - "Panic"	This test only checks the functionality of the agreement button.  This test does not include any of the other safety-relevant components (e.g. correct connection of the agreement function at the machine)! If the state of a circuit is not correctly displayed, then the device must be immediately disabled.
	Override switch	Displays the position of the override rotary switch (value 0 to 18).	
	Key switch	Displays the key-operated switch position "Off" - "On (1)" - "On (2)	
	Handwheel	Displays the actual counter state of the handwheel.	Each time that this menu item is called, the counter state is reset to zero.

# Submenu: Info

Submenu	Menu item	Sub point	Significance	
		Memory	Displays the size of the main memory in MB	
		Flash	Displays the size of the flash module in MB	
		Supply Displays the power supply voltage in volt		
Software BIOS Displays the ver		Temperature	Displays the internal housing temperature in °C	
		BIOS	Displays the version number of the BIOS	
		Boot loader	Displays the version number of the boot loader	
		Coprocessor	Displays the version number of the coprocessor firmware	
	Counters	Hours counter	Operating hours counter (units: hours)	
		Power on	Power-on counter	

# 17.5.1.3 Error handling

# **Faults**

#	Problem	Cause	Sol	ution	
1	No display - all LEDs off	The power supply is interrupted.	If th	Check the power supply connection. If the fault remains, then the device is defective.	
2	No display - LEDs briefly flash once	The display contrast is incorrectly set.	1.	When powering-up, keep the lefthand (first) softkey pressed.	
			2.	Press once, one after the other - the righthand (fourth) softkey - the third softkey - the righthand (fourth) softkey	
			3.	Using the second and third softkeys, change the contrast until it is easy to read the display.	
3	No display - all LEDs flash permanently	The display is defective.			
4	Displays the message: "Testcommandhandler"	The "Testcommandhandler" was activated.	Re-boot the HT 2.		

# 17.5 Commissioning

# Error messages

#	Display	Description	Cause	Solution
1	SDRAM data line test failed!	An error has occurred while testing the SDRAM data lines.	The hardware is defective.	
2	SDRAM data line test failed!	An error has occurred while testing the SDRAM address lines.	The hardware is defective.	
3	SDRAM access test failed!	An error has occurred when accessing the SDRAM.	The hardware is defective.	
4	SDRAM fill test failed!	An error has occurred when writing a test pattern to the SDRAM.	The hardware is defective.	
5	Unexpected SDRAM size!	The size of the SDRAM determined, does not correspond to the expected size.	The hardware is defective.	
6	Wrong coprocessor version, update required!	The firmware of the ATmega88 is too old.	The BIOS was updated - however not the ATmega88 firmware.	Update the ATmega88 firmware.
7	Coprocessor communication error!	An error has occurred for the cyclic SPI communication with the ATmega88.		
8	BIOS code corrupted!	The BIOS checksum is invalid.	The BIOS has been corrupted due to an unsuccessful update or a defective flash module.	
9	Hardware info block invalid!	The hardware information block is invalid.	The block was corrupted when updating or the flash module is defective.	
10	Serial number not set!	The serial number is missing.	It is possible that the serial number was deleted while updating.	
11	MAC ID not set!	There is no MAC ID.	The MAC ID may have been deleted while updating.	
12	No bootloader present!	There is no bootloader.		
13	Bootloader code corrupted!	The bootloader checksum is invalid.	The bootloader has been damaged due to an unsuccessful update or a defective flash module.	
14	Pressed keys detected!	One or several keys are pressed.	The hardware is defective if no keys have been pressed.	
15	Display error!	Reading back the display status was unsuccessful.	The hardware is defective.	

# 17.5.2 Interface signals

#### PLC module

The FC13 "HHUDisp" supports the handling of the LC display. For a detailed description, please refer to:

Literature: /FB/, P3, "Basic PLC program".

## Note

The customer is responsible for programming the transfer of key signals to the interface in a PLC user program.

## User interface

Layout of keys and LEDs

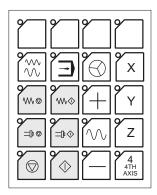


Figure 17-17 Operator keys, standard assignment

The first row of keys is not assigned as standard.

## Input image HT 2

You can tap the signals for the keys, feed rate override switch, key-operated switch and acknowledgment of the digital display at the input area. The address range is set by parameter assignment with STEP7 tools.

Byte no.	Input signals to PLC							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
EB m + 0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
EB m + 1	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
EB m + 2	Feed start	Free key	AUTO- MATIC	NC stop	Spindle stop	Feed stop	Free key	JOG
EB m + 3	Free key	Handwheel	4. Axis	Z	Y	Х	NC start	Spindle start
EB m + 4	Direction key -	Rapid traverse override	Direction key +	Free key				
EB	Acknowledgement		Rapid traverse/feed rate override switch					
m + 5	digital display	Key switch	Е	D	С	В	Α	

# Rotary switch positions HT 2

Position	%	EDCBA
0	0	00001
1	1	00011
2	2	00010
3	4	00110
4	6	00111
5	8	00101
6	10	00100
7	20	01100
8	30	01101
9	40	01111
10	50	01110
11	60	01010
12	70	01011
13	75	01001
14	80	01000
15	85	11000
16	90	11001
17	95	11011
18	100	11010

## Output image HT 2

The signals for controlling the LEDs, HHU mode, display signals and digital display are present at the output area.

Byte no.	Output signals to the HHU							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
AB m + 0	always <b>1</b>							
AB m + 1	New data for selected line						Selection lines 3, 4	Selection lines 1, 2
AB m + 2	Feed start	Rapid traverse override	AUTO- MATIC	NC stop	Spindle stop	Feed stop	Direction key +	JOG
AB m + 3	Direction key -	Handwheel	4. Axis	Z	Y	Х	NC Start	Spindle start

Lx = 1 → LED lights up

#### Note

Output byte  $AB\ m+0$ , bit 7 must always have the value '1'! This sets the display's output mode.

## Output image of digital display

Control of the digital display in the HT 2

Byte no.	Output signals to the HHU									
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0		
AB m + 4		Default setting of 1st character (right) of selected line								
AB m + 5		Default setting of 2nd character of selected line								
AB m + 6	Default setting of 3rd character of selected line									
AB m + 7	Default setting of 4th character of selected line									
AB m + 8	Default setting of 5th character of selected line									
AB m + 9	Default setting of 6th character of selected line									
AB m + 10	Default setting of 7th character of selected line									
AB m + 11			Default se	etting of 8th ch	naracter of sele	ected line				

#### 17.5 Commissioning

Byte no.	Output signals to the HHU							
AB m + 12	Default setting of 9th character of selected line							
AB	Default setting of 10th character of selected line							
m + 13	Default setting of Total character of selected line							
AB	Default setting of 11th character of selected line							
m + 14								
AB m + 15	Default setting of 12th character of selected line							
AB	Default setting of 13th character of selected line							
m + 16	Default Setting of 13th character of Selected line							
AB	Default setting of 14th character of selected line							
m + 17								
AB	Default setting of 15th character of selected line							
m + 18								
AB	Default setting of 16th character (left) of selected line							
m + 19								

### Display

The digital display is used as a 4-line alphanumeric display with 16 digits per line.

The display data is coded according to the character set given in the ASCII code table for the digital display via the ABm + 4...19 bytes. The decimal point is a separate character. The display always starts line by line right-justified with the byte ABm + 4 and is built up towards the left up to ABm + 19.

#### Selecting the line

ABm + 1, bit 0 and bit 1

This bit is used to select the line to be written.

Table 17- 6 Line selection

Bit 0	Bit 1	Selected line
0	0	1st line
1	0	2nd line
0	1	3rd line
1	1	4th line

#### New data for selected line

ABm + 1, bit 7

This bit is used to request writing in of new data into a line. The bit is set by the user program and can be reset on detection of the acknowledgment bit EBm + 5, bit 7.

Bit 7 = 0: Reset request.

Bit 7 = 1: Set request

## Acknowledgement digital display

EBm + 5, bit 7

This bit is set by the system after the new data has been accepted.

Bit 7 = 0: No new data

Bit 7 = 1: New data has been accepted

### Example of signal chart

Example of a signal chart when writing data for two lines 1 and 2

- 1. Selecting the line with ABm + 1, bit 0 and bit 1.
- 2. Writing new data with ABm + 4...19.
- 3. Set request: New data for selected line ABm + 1, bit 7
- 4. Acknowledgment digital display EBm + 5, bit 7, via system.
- 5. Reset request

#### Note

The request must be reset before a new line is written!

#### 17.5 Commissioning

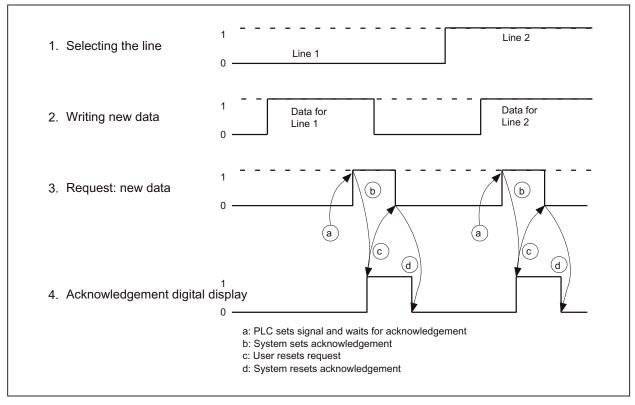


Figure 17-18 HT2 signal characteristic example for writing data into the HT 2 display

Proceed in the same way for the selection of line 3 and line 4

## ASCII code for digital display

Representation of characters on specifying the corresponding bit pattern or hexadecimal format in the bytes ABm + 4...19. The characters from Hex 20 to Hex 7F are default values.

0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111	²← Bit 7 4
20H	30H	40H	50H	60H	70H	A0H	вон	C0H	D0H	E0H	F0H	Bit 3 0
	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	•	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0000
21H	31H	41H	51H	61H	71H	A1H	B1H	C1H	D1H	E1H	F1H	
0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0 0	0001
22H	32H	42H	52H	62H	72H	A2H	В2Н	C2H	D2H	E2H	F2H	
0 0	0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0010
23H	33H	43H	53H	63H	73H	АЗН	взн	СЗН	D3H	E3H	F3H	
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0 0 0	0 0 0 0	0 0 0 0 0	000	0 0 0	0011
24H	34H	44H	54H	64H	74H	A4H	В4Н	C4H	D4H	E4H	F4H	
0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	•	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0100
25H	35H	45H	55H	65H	75H	A5H	B5H	C5H	D5H	E5H	F5H	
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0 0 0	0 0 0	0 0 0 0	0 0 0	0 0	0 0 0 0	0 0 0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	0101
26H	36H	46H	56H	66H	76H	A6H	В6Н	C6H	D6H	E6H	F6H	
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0110
27H	37H	47H	57H	67H	77H	A7H	В7Н	C7H	D7H	E7H	F7H	
0	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0 0	0111
28H	38H	48H	58H	68H	78H	A8H	В8Н	C8H	D8H	E8H	F8H	
0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0 0	1000
29H	39H	49H	59H	69H	79H	A9H	В9Н	С9Н	D9H	E9H	F9H	
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1001
2AH	3AH	4AH	5AH	6AH	7AH	AAH	BAH	CAH	DAH	EAH	FAH	
0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1010
2BH	3BH	4BH	5BH	6BH	7BH	ABH	BBH	СВН	DBH	EBH	FBH	
0 0 0 0	0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0 0 0 0 0	0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0	0 0	0 0 0 0 0	1011
2CH	3CH	4CH	5CH	6CH	7CH	ACH	BCH	CCH	DCH	ECH	FCH	

#### 17.5 Commissioning

0 0 0	0 0	0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1100
2Dh	3DH	4DH	5DH	6DH	7DH	ADH	BDH	CDH	DDH	EDH	FDH	
0000	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0 0 0	0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00000	1101
2EH	3EH	4EH	5EH	6EH	7EH	AEH	BEH	CEH	DEH	EEH	FEH	
0 0	0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0	• • •	0 0 0		1110
2FH	3FH	4FH	5FH	6FH	7FH	AFH	BFH	CFH	DFH	EFH	FFH	
•	0 0 0	0 0 0 0	0 0 0 0 0	0 0 0	0 0 0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1111

## 17.5.3 Application example for HT8 and HT 2 involving mixed operation

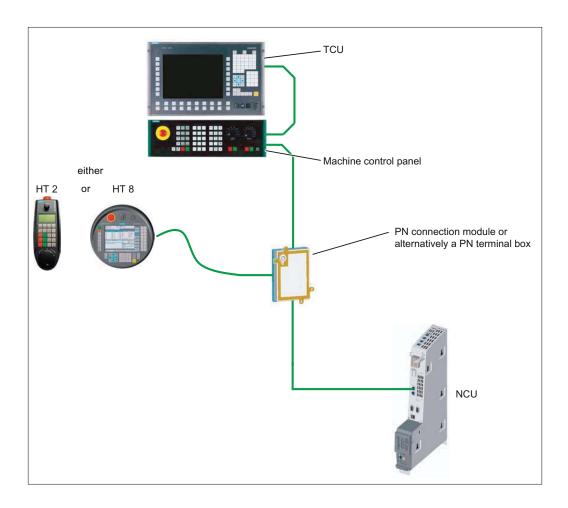
#### **Prerequisite**

The following example relates to an 840D sl plus TCU with MCP xxx IE or MCP xxx PN and an optional HT 8 or HT 2 connected to a PN box. All the components are connected to X120 of the NCU. The application example is equally valid for an MPP xxx IE H (with connection for HT 2/HT 8) instead of a connection module/terminal box.

The TCU and HT 8 function as "thin client units" and as soon as they assume the operating focus, they use their MCP address (db19.dbb123) and index (db19.dbb118) to register with the PLC.

This setting is specified for both devices during the initial connection and is stored on the NCU's CompactFlash card (config.ini).

By contrast, the HT 2 does not function as a "thin client unit". Consequently, it does not tell the PLC whether it is connected; it is addressed in the PLC via the DIP switch position of the connection point (PN box/module or MPP xxx IEH).



## Configuration involving HT 8

The following is assumed:

TCU: MCP address = 192, index = 7 HT 8: MCP address = 10, index = 10 PN box DIP switch position = 10

Depending on whether we are dealing with the TCU or HT 8, either the MCP xxx IE/MCP xxx PN or the integrated HT8\_MCP should now be activated.

To do this, perform the following on the PLC:

Depending on whether it is the TCU or the HT 8 that has the operating focus (db19.dbb123), the relevant MCP bus address must be modified in DB7 ("gp\_par"):

Deactivate MCP via "gp\_par".MCP1Stop = 1

Define MCP address via "gp\_par".MCP1BusAdr = db19.dbb123

Activate MCP via "gp\_par".MCP1Stop = 0

#### 17.5 Commissioning

### Configuration involving HT 2

To activate the HT 2, proceed as follows:

- Check whether the TCU has the operating focus (HT 8 disconnected/db19.dbb123==192).
- Activate the HT 2, e.g. via button using "gp\_par".BHGStop = 0.

#### Relevant entries in OB100:

```
CALL FB 1, DB 7
MCPNum :=
                           1
MCP1In :=
                           P#E 0.0
MCP1Out :=
                          P#A 0.0
MCP1StatSend :=
                          P#A 8.0
MCP1StatRec :=
                           P#A 12.0
MCP1BusAdr :=
                           10
                                                       //<<-- MCP_addr. for HT 8
                                                       corresp. TCU settings/or
                                                       for MCP 483 xxx IE /
                                                       MCP 483 xxx PN
MCPBusType :=
                           B#16#55
                                                       //55=Ethernet
BHG :=
                                                       //5=Ethernet = HT 2
BHGIn :=
                           P#M 300.0
BHGOut :=
                           P#M 320.0
BHGRecGDNo :=
                           10
                                                       //= DIP switch position on
                                                       PN box (or MPP xxx IE) to
                                                       which HT 2 is connected
```

## 17.5.4 Application example for two HT 2 units connected to SINUMERIK

#### **Prerequisite**

The following example relates to the operation of two HT 2 units on one network. The aim is two switch over from one HT 2 to the other. The following is assumed:

- There are two PN boxes on the network (with DIP switch positions 10 and 11).
- There is an HT 2 unit connected to each of these, but only one of them is activated.

The application example is equally valid for an MPP xxx IE H (with connection for HT 2) instead of a connection module/terminal box.

#### Activating an HT 2

The HT 2 that is being activated is addressed by specifying the DIP switch position in "gp\_par".BHGRecGDNo.

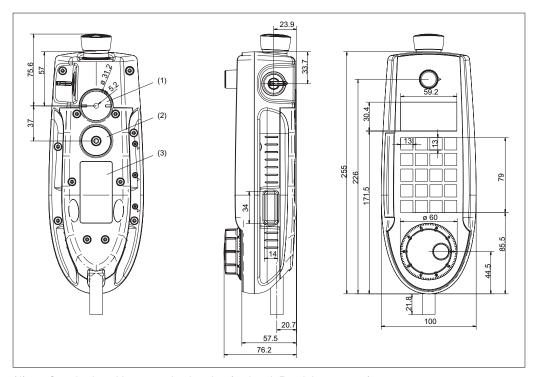
Switchover during operation:

Deactivate HHU via "gp\_par".BHGStop = 1
 Modify the PN box assignment via "gp\_par".BHGRecGDNo = 10 or 11
 Activate HHU via "gp\_par".BHGStop = 0

If there is only one HT 2, it is sufficient to specify these parameters by means of FB1 parameter assignment in OB100 (DIP switch position 10):

```
CALL FB 1, DB 7
MCPNum :=
MCP1In :=
                            P#E 0.0
MCP1Out :=
                             P#A 0.0
MCP1StatSend :=
                            P#A 8.0
MCP1StatRec :=
                            P#A 12.0
MCP1BusAdr :=
                             10
                                                         //<<-- MCP addr. for HT 8
                                                         corresp. TCU settings/or
                                                          for MCP 483 xxx IE /
                                                         MCP 483 xxx PN
MCPBusType :=
                             B#16#55
                                                          //55=Ethernet
BHG :=
                                                          //5=Ethernet = HT 2
                             P#M 300.0
BHGIn :=
BHGOut :=
                            P#M 320.0
BHGRecGDNo :=
                             10
                                                          //= DIP switch position on
                                                          PN box (or MPP xxx IE) to
                                                          which HT 2 is connected
```

## 17.6 Dimension drawing



- (1) Standard position mounting bracket (optional: Retaining magnet)
- (2) Standard position retaining magnet (optional: mounting bracket)
- (3) Position for the type plate

Figure 17-19 HT 2 - dimension drawing

### 17.7 Maintenance and Service

#### Cleaning the device

Use a soft cloth moistened either with water or a mild cleaning agent to clean the housing, display and operator control elements of the HT 2.

### Checking the device

In order to prevent foreign bodies or liquids entering the HT 2, regularly check the device

- that all the housing screws are in place and tight
- for damage to the housing
- for damage to the cable cover or cable entry

#### Protect the device from environmental effects

Protect the HT 2 against

- · direct solar radiation and heat sources
- · mechanical vibration and shock
- dust
- · moisture, and
- strong magnetic fields

#### Checking the Emergency Stop button

Check the Emergency Stop button at least once every six months to ensure that it is functioning correctly by pressing it and observing whether the machine shuts down.

#### **NOTICE**

Immediately check the functioning of the Emergency Stop button if the device was subject to significant shock (e.g. because it was dropped).

## 17.8 Technical data

## 17.8.1 Handheld Terminal HT 2

## Handheld Terminal HT 2

Safety						
Protection class	III to EN	16113	1-2 / EN 5	0178		
Degree of protection to EN 60529	IP65					
Certifications		CE /	cULus			
Electrical data						
Input voltage	24 V DC (via HT 2	2 cable	e, via cabl	e terminal box)		
Current carrying capacity	Agreement button:	10 - 9	500 mA / 2	2-channel, 3-stage		
	Emergency Stop button	10 - <sup>-</sup>	1000 mA /	2-channel		
Power consumption, max.		Approx	k. 2.5 W			
Mechanical data						
Dimensions (mm)	Height (without operator control elements)	٧	Vidth	Depth		
	76.2		100	255		
Weight			9 kg			
Fall height, max.	<b>2</b> "	1.2	20 m			
Mechanical ambient conditions	Operation	Operation		Transport		
\(\text{\text{i}}\)	40 5011 0.45		(in transport packaging)			
Vibratory load	10 – 58 Hz: 0.15 mm 58 - 200 Hz: 2g 3M6 according to EN 60068-2-6		5 – 9 Hz: 6,2 mm 9 - 200 Hz: 2g 2M3 according to EN 60068-2-6			
Shock load	25g, 6ms, 18 shocks		30 g, 6 ms, 18 shocks			
Climatic environmental conditions						
Cooling	By r	natural	convectio	n		
Condensation, spraying water and icing		Not pe	ermitted			
Supply air	Without cau	stic ga	ases, dust	s and oils		
	Operation			torage/shipping ansport packaging)		
Applicable standards	EN 60721-3-3		EN	I 60721-3-1 / -3-2		
Climate class	3K5			1K3 / 2K4		
Temperature limits	0 50 °C			-25 60 °C		
Rate of temperature change	Max. 10 K/h			Max. 18 K/h		
Limits for relative humidity	5 65% at +25°C		5	95% at 25 °C		
Permissible change in the relative air humidity	the relative max. 0.1 % / min					

Display	
Resolution	168 x 72 pixels

## **Emergency Stop button**

Rated voltage	24 V DC
Current magnitude, max.	1 A
Current magnitude, min.	10 mA
Switching capacity	DC 13 to EN 60947-5-1
Conditional rated short-circuited current	1000 A, 6A gL/gG to EN 60947-5-1

## Agreement button

Output type	Solid-state output
Rated voltage that can be switched	24 V DC (voltage tolerance 19.2 V DC up to 30 V DC to EN 61131-2)
Rated current that can be switched	500 mA (max.)
Switch-off current (max.)	
Circuit1	1.5 mA
Circuit2	0.8 mA
Inductive load ( max.)	
Circuit1 / circuit2	145 mJ / 1.16 H @ 24 V DC, 500 mA (comparable, DC 13 to EN 60947-5-1)
Reverse polarity protection	
Circuit1 / circuit2	Yes
Short-circuit and overload protection	
Circuit1	Yes (integrated in the output FET)
Circuit2	Yes (using a protective circuit)

#### Handwheel

The handwheel of HT 2 is operated in the system as 3rd handwheel

### General machine data:

MD 11350 \$MN\_HANDWHEEL\_SEGMENT[0] = 7 MD 11351 \$MN\_HANDWHEEL\_MODULE[0] = 1 MD 11352 \$MN\_HANDWHEEL\_INPUT[0] = 5

## 17.8.2 Connection module Basic PN

Safety							
Safety class	III according	g to IEC 605	36				
Degree of protection according to EN 60529	1	IP54					
Certificates and approvals	CE	/ cULus					
Electrical data							
Input voltage	24 VDC (via	X3 connect	tor)				
Current carrying capacity	Enabling button contacts (X20 co	nnector)	0.5 A	Max. each / 2-channel			
	Emergency stop button contacts connector)	(X21	0.5 A	Max. each / 2-channel			
Max. power consumption	Connection module without exter	nal loading	0.3 A				
	Panel (HT 2)		0.12 A				
	5 status signals (X7 and X21)		2.5 A (	0.5 A each)			
	Total:		2.92 A				
Max. total power consumption	Appr	ox. 70 W					
Mechanical data							
Dimensions (mm)	Height (without holder for Width Le terminating connector)						
	66 165 166						
Weight	0.	75 kg					
Fall height, max. 1.20 m							
Mechanical environmental conditions	Operation	Transport (in transport packaging)					
Vibration stressing	10 – 58 Hz: 0.075 mm 58 – 500 Hz: 10 m/s <sup>2</sup> 3M3 according to EN 60721-3-3	5 – 9 Hz: 3 9 – 500 Hz: 2M2 accord	9.8 m/s	s <sup>2</sup> EN 60721-3-2			
Shock stressing	150 m/s², 11 ms 18 shocks according to EN 60068-2-27	250 m/s <sup>2</sup> , 6 6000 shock according t	S ms				
Climatic environmental condition	ons						
Cooling	By natura	al convection	1				
Condensation, spraying water and icing	Not p	ermitted					
Supply air	Without caustic gases, dusts and oils						
	Operation Storage/shipping (in transport packaging)						
Applicable standards	EN 60721-3-3 EN 60721-3-1 / -3-2						
Climate class	3K5 1K3 / 2K4						
Temperature limits	0 55° C		-40 7	70° C			
Temperature change	Max. 10 K/h Max. 20 K/h						
Limits for relative humidity	5 90% 5 95%						
Permissible change in the relative air humidity	ssible change in the max. 0.1 % / min						

# 17.9 Spare parts

The following spare parts are available for the HT 2:

Designation	Remark	Quantity	Order number	
	Dummy plugs for cable compartment	1		
Service pack	PG screw glands for connection box	2		
Connection box	1 set of screws for connection box cover	1	6XV6574-1AA04-4AA0	
	Terminal strips for connection box	2	1	

## 17.10 Accessories

## 17.10.1 Overview

The following accessories are available for the HT 2:

Designation	Remark	Number	Order No.
PN Basic terminal box	without automatic Emergency Stop override for mounting in the system	1	6AV6671-5AE01-0AX0
PN Plus terminal box	with automatic Emergency Stop override for mounting in the system	1	6AV6671-5AE11-0AX0
Connection module PN Basic	without automatic Emergency Stop override for mounting in the system		6FC5303-0AA01-1AA0
Connecting cable	Length: 2 m	1	6XV1440-4BH20
	Length: 5 m	1	6XV1440-4BH50
	Length: 8 m	1	6XV1440-4BH80
	Length: 10 m	1	6XV1440-4BN10
	Length: 15 m	1	6XV1440-4BN15
	Length: 20 m	1	6XV1440-4BN20
	Length: 25 m	1	6XV1440-4BN25
Spiral connecting cable	Length: 1.5 m, can be expanded to 3.5 m	1	6FC5348-0AA08-3AA0
Set of keys	Set of 5	1 set	6AV6574-1AG04-4AA0
Retaining magnet for HT 2		1	6FC5348-0AA08-0AA0
Holder for HT 2	for safekeeping, also suitable for stationary operation	1	6FC5348-0AA08-1AA0
Slide-in label	Can be labeled (3 films, DIN A4)	1 set	6FC5348-0AA08-2AA0

## 17.10.2 Mount

The HT 2 can be retained using the mounting rack.



Figure 17-20 HT 2 mounting bracket

The mounting bracket is mounted the same way as the retaining magnets. A description about this can be found in the section: "Retaining magnet".

#### Note

Please ensure that the HT can be ergonomically mounted. Therefore, choose a suitable mounting height.

## **Dimension drawing**

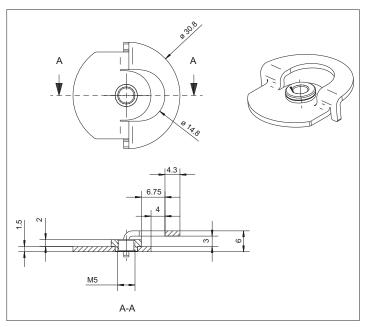


Figure 17-21 Dimension drawing of the HT 2 mounting bracket

## 17.10.3 Retaining magnet

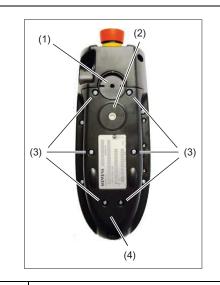
The HT 2 can be mounted onto all sheet metal parts using the retaining magnets.

1.



Figure 17-22 HT 2 retaining magnet

## Mounting the retaining magnets



Open the cable duct cover by unscrewing the 6 PT screws approximately 1 cm.

To do this, use a slotted size 2 screw driver.

- (1) Standard position mounting bracket (optional: Retaining magnet)
- (2) Standard position retaining magnet (optional: mounting bracket)
- (3) PT screws (4 x 20 mm)
- (4) Cable duct cover



- Locate the retaining magnets under the cable duct cover and retain them from the rear using the screw.
  - To do this, use a slotted size 4 screwdriver.
  - Re-attach the cable duct cover of the HT 2. Ensure that the tightening torque does not exceed max. 0.4 - 0.5 Nm.

- (1) Retaining magnet with retaining screw
- (2) Retaining magnet mounted at the standard position

#### Working with retaining magnets

## / WARNING

Do not install the magnets in hazardous locations as they can cause arcing and sparking.

3.

## /\(\)CAUTION

Even at a considerable distance apart, magnets can be attracted to one another, repel one another or splitter when they collide. This involves strong forces.

This is the reason that you should avoid that magnets collide and work with the appropriate protection in order to prevent the skin being injured and other injuries.

Strong magnetic fields can destroy electronic or mechanical elements and devices. This also applies to heart pacemakers.

Therefore observe the necessary safety clearances. Information on this is provided in the documentation of the corresponding devices.

Carefully observe the appropriate packing regulations when shipping by air.

#### 17.10.4 Slide-in label

## 17.10.4.1 Labeling the slide-in labels

In the factory, the Handheld Terminal HT 2 is supplied with five horizontal slide-in labels. With the exception of the slide-in label for the first row of keys, standard symbols for the machine control are printed on the slide-in labels.



Figure 17-23 HT2 slide-in labels

When requested, an accessory package with three blank slide-in labels can be ordered, so that these strips can be printed with the key symbols according to your specifications (see Section: "Accessories"  $\rightarrow$  "Overview").

## Files for printing the blank film

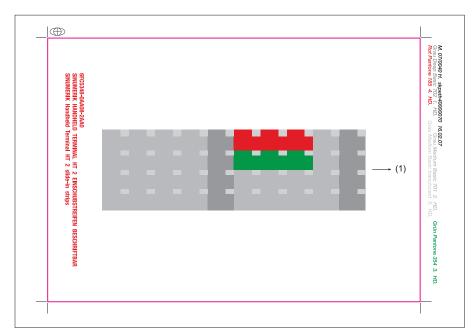


Figure 17-24 Blank film HT 2 [printing direction (1)]

The DOConCD / Catalog NC 61 (CD enclosed) contains two files for printing the blank films:

- Template\_HT2\_13.doc
- Symbols\_OP08T\_13.doc

The file "Template\_HT2\_13.doc" is a template for the exact positioning of the symbols on the printable film.

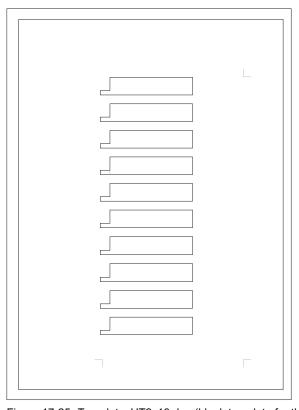


Figure 17-25 Template\_HT2\_13.doc (blank template for the film)

The file "Symbols\_OP08T\_13.doc" contains a broad range of key symbols. An overview of these is given in the Appendix of this Manual.

#### Preparing slide-in labels

- 1. Open the files "Template\_HT2\_13.doc" and "Symbols\_OP08T\_13.doc" in MS Word.
- 2. Select a key symbol from the file "Symbols\_OP08T\_13.doc" by left-clicking.
- 3. Copy the desired symbol to the clipboard via "Edit" → "Copy" or "Ctrl + C"
- Return to the template file "Template\_HT2\_13.doc"
- 5. Position the cursor before the insertion point in the desired table cell.
- 6. Insert the key symbol via "Edit" → "Paste" or "Ctrl + V".

#### 17.10 Accessories

- 7. To format the graphics, double click on the inserted symbol with the lefthand mouse key.
  - Select the "size" tab and set the symbol height to 1.1 cm.
  - Click on <OK> to accept the change.
- 8. Repeat steps 2. to 7. until you have inserted all the key symbols.

### Printing the slide-in labels

- Place the blank film in the printing direction in the slot of your laser printer (see Fig.: "Blank film HT 2").
- 2. Select "film" as the printable medium if your printer allows this setting.
- 3. Start the printing process using MS Word.

#### Note

For labeling the slide-in labels, HP Color Laser Jet film C2936A is used. Make a test print on paper before you print on the film. Allow the film to cool after printing so that the ink can dry.

- 4. Cut the slide-in labels out of the film along the edges (see Fig.: "Template\_HT2\_13.doc").
- 5. Round off the corners of the slide-in labels approx. 3 mm to facilitate insertion.

### **Dimension drawings**

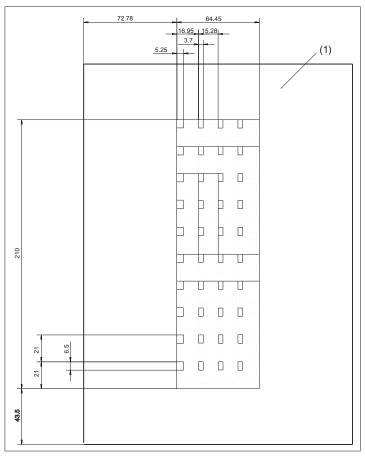


Figure 17-26 Dimensions for slide-in labels

### Creating your own symbols

- Drawing in a vector program (e.g. Designer, Freehand, CorelDraw):
  - Draw a 13 x 13 mm square, fill with the color white and give it an invisible border line.
  - Place the symbol in the center of this square.
  - Group the square and symbol together and add this group in the MS Word document Template\_HT2\_13.doc.
- Drawing in an image editing program (e.g. Photoshop, Picture Publisher, Paint)
  - Draw a square 13x13 mm (37x37 pixel), filled with the color white.
  - Draw the symbol in the center of this square.
  - Copy the symbol and the square together and add the group in the MS Word document Template\_HT2\_13.doc.

## 17.10.4.2 Replacing the slide-in labels

The slots to insert the slide-in labels are located under a cover on the lefthand side of the HT 2 that is integrated into the device design.

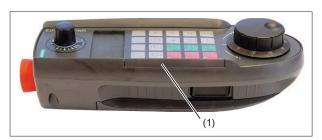


Figure 17-27 Cover of the slide-in labels (1)

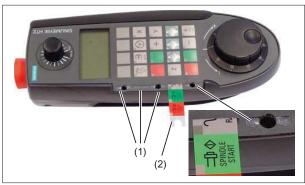
The retaining screws of the cover are accessible from the rear of the HT 2.



 Release the three slotted screws M4.
 Each of the screws (1) has a marking (2).



2. Remove the cover.



- 3. Withdraw the required slidein label.
- 4. Insert the new slide-in labels.
- 5. Re-attach the cover and screw it into place.

- (1) Slide-in labels inserted
- (2) Slide-in labels withdrawn