Handheld Terminal HT 2

1

1.1 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If used in conjunction with the PN Plus terminal box, the HT 2 can simply be withdrawn and inserted during actual operation without initiating an emergency stop.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 right-handed and left-handed personnel as it has two enabling 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	Enabling button, emergency stop button, override rotary switch	6FC5303-0AA00-2AA0

The safety related accessories are market in the "Accessories" section with a *).

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
- 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

Right-hand side of the device

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

Left-hand side of the device:

- Enabling button (2-channel, 3-stage)

1.2 Operator control and display elements

1.2.1 Overview

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

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

1.2.2 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 a total of 20 keys each assigned 1 LED. Of which

- All 4 keys in the upper row of keys can be used as softkeys 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.

Table 1- 1 Standard symbols on the slide-in labels

-	(specific)	-	(specific)	-	(specific)	-	(specific)
	7001		7015		7048	X	7011
	7025		7026	+	7112	Y	7022
	7013		7124		7027	Z	7028
	7020		7021	—	7111	4 4TH AXIS	7029

Symbols that you specify can be printed on all of the slide-in labels. Blank films are available for this purpose.
Information on the order number for the blank films 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.

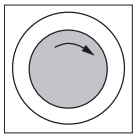
The handwheel operates with 100 pulses/revolution and has a cogging torque of approx. 1.5 Ncm (+/- 0.3). The max. speed is 1000 rpm

Emergency stop button

The red emergency stop mushroom pushbutton has a yellow ring.
Directly under the mushroom pushbutton, 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 into 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 connecting cable to the terminal box or the connection module and are available for further wiring.

Enabling button

The HT 2 has two enabling 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 enabling buttons comprise a 3-stage operator element and separate evaluation electronics. They have a 2-circuit configuration.

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

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

Switch position	Function	Enabling 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 enabling buttons.

Normal actuation

Zero position → X → Agreement → Y → Zero position

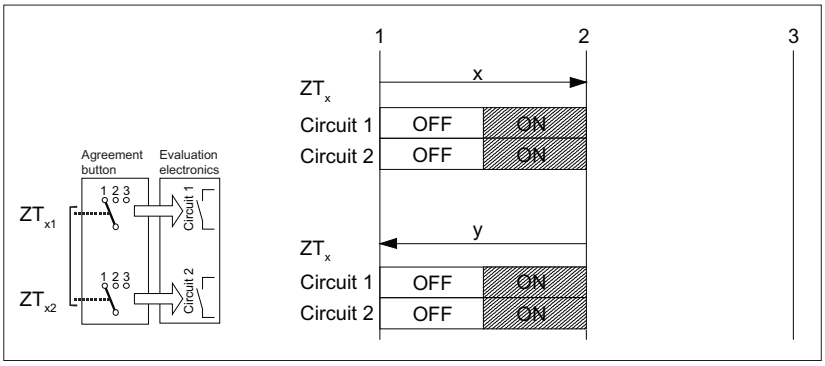


Figure 1-2 Switching distance diagram for normal actuation

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 → X → Agreement → U → Panic → Y → Zero position

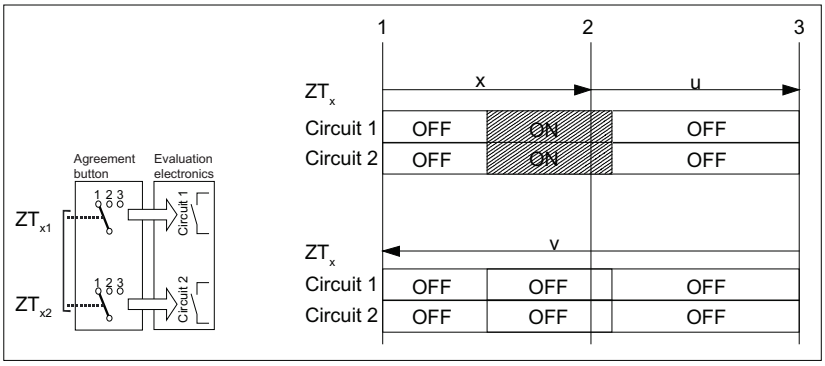


Figure 1-3 Switching distance diagram for panic actuation

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

⚠ WARNING
Danger of death resulting from the misuse of the enabling button
It is not permitted to fix the enabling button in the "Enable" position by mechanical means.

Key-operated switch

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

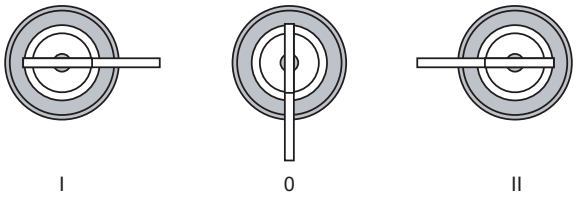


Figure 1-4 Key-operated switch positions

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.

1.3 I/Os

1.3.1 Overview

The Handheld Terminal HT 2 communicates with a control unit via

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

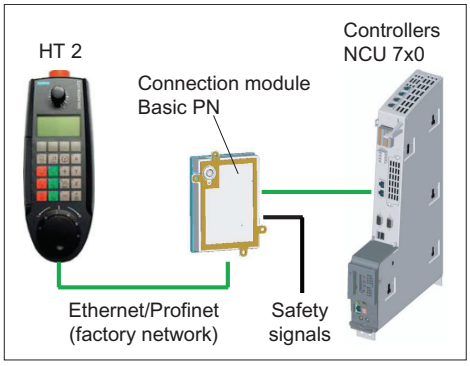


Figure 1-5 Example: Communication between HT 2 and NCU 7x0 via the PN Basic connection module

Note

The handwheel signals are only effective at a SINUMERIK control.

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

The safety signals for emergency stop and enabling 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.

If no HT 2 is connected, observe the following:

⚠ WARNING

Danger of death resulting from improper access

- After disconnection, the HT 2 must be locked away.
- Emergency stop buttons that are inactive must not be identified as such or must be inaccessible. This is to prevent the emergency stop button from being used inadvertently.

1.3.2 Terminal Box PN

1.3.2.1 Features

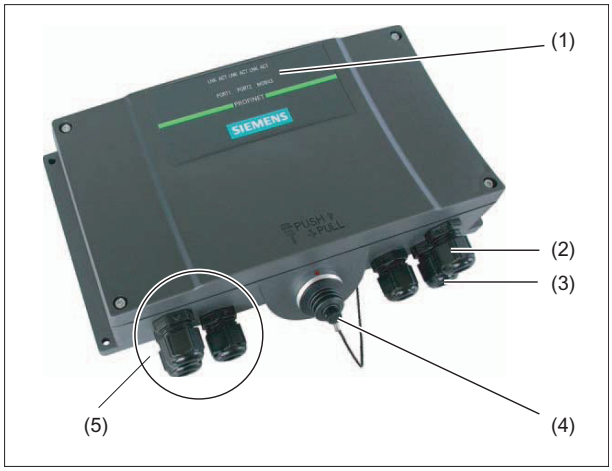


Figure 1-6 Terminal Box PN

(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.

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**.

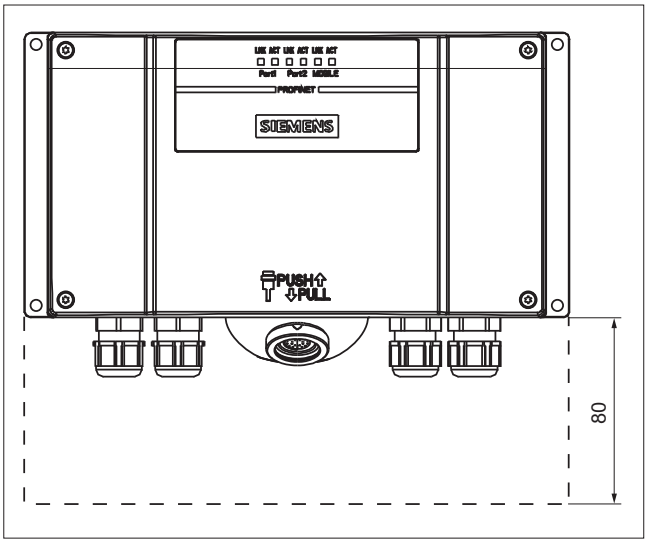
PN Basic terminal box

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**.

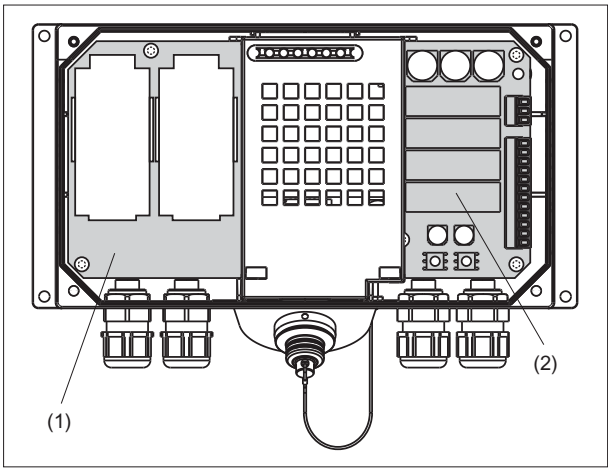
Clearance

The following clearances are required around the Terminal Box PN:



1.3.2.2 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 1-7 PN Plus terminal box

Switching states of the emergency stop circuit

HT 2	Emergency stop button	Switching 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.
Not connected	-	Emergency stop circuit in the terminal box remains closed.

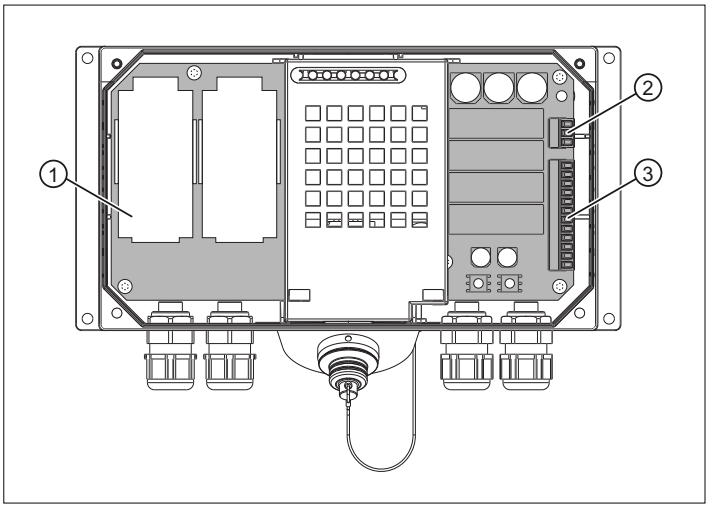
⚠WARNING

Danger of death resulting from the inadvertent disconnection of the 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.

1.3.2.3 Interface assignment on the PN Plus terminal box

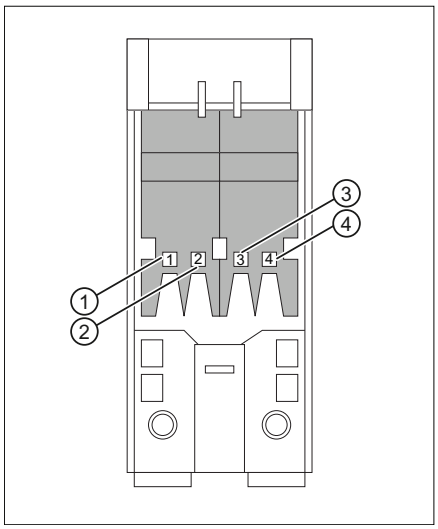
Location of the interfaces



① Fast connector
② Terminal strip 1
③ Terminal strip 2

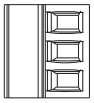
Fast Connector, 4-pin

The terminal box contains two fast connectors for connecting the PROFINET data cables. The figure below illustrates the assignment of the fast connector:



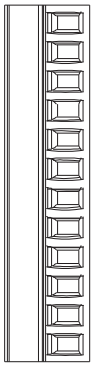
Pin	Signal name
1	TD+
2	RD+
3	TD–
4	RD–

Terminal strip 1, for power supply, 3-pin

	Pin	Signal name
	1	PE
	2	M24
	3	P24

Terminal strip 2, 12-pin

The safety and additional functions are connected to this terminal strip. The terminal strip is mechanically coded to prevent it from being confused with terminal strip 1.

	Pin	Signal name	Circuit
	1	STOP13	Emergency stop button
	2	STOP14	
	3	STOP23	
	4	STOP24	
	5	CTL31 [1]	PLC accompanying signals
	6	CTL32 [1]	
	7	PRESENT31 [2]	
	8	PRESENT32	
	9	ENABLE2+	Enabling button
	10	ENABLE1–	
	11	ENABLE1+	
	12	ENABLE2–	

[1] Active if emergency stop pressed

[2] Active if HT 2 plugged in

Note

The "Emergency stop button pressed" signal has no error detection facility and must, therefore, not be used for safety-critical applications.

Typical circuit diagrams for Plus terminal box

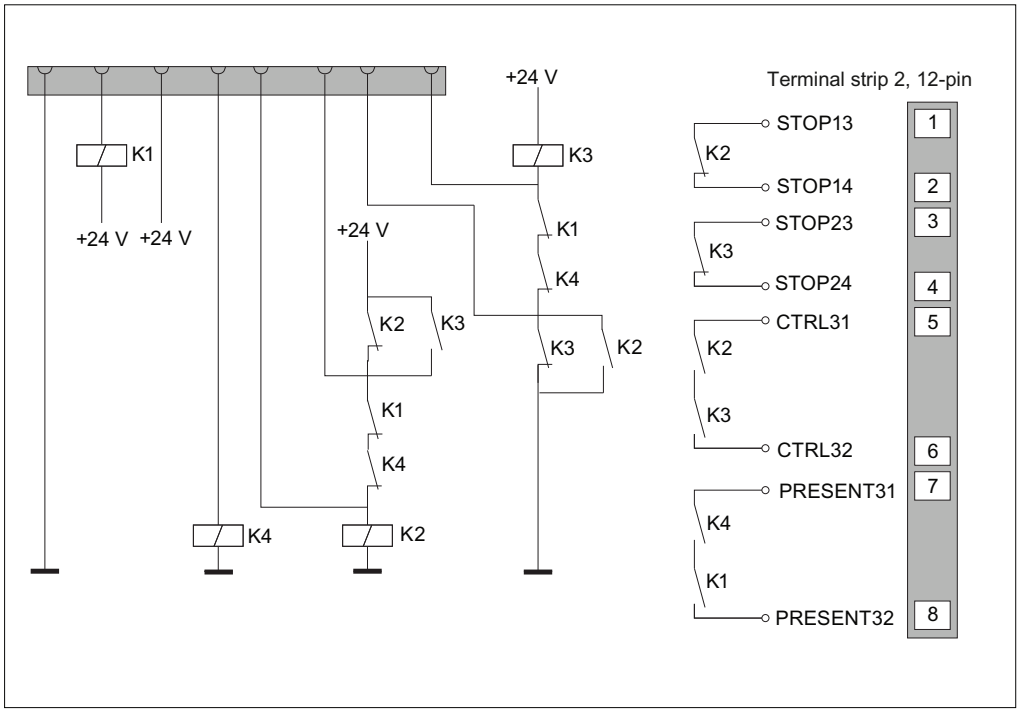


Figure 1-8 Circuit example: HT 2 not connected and power supply switched on:

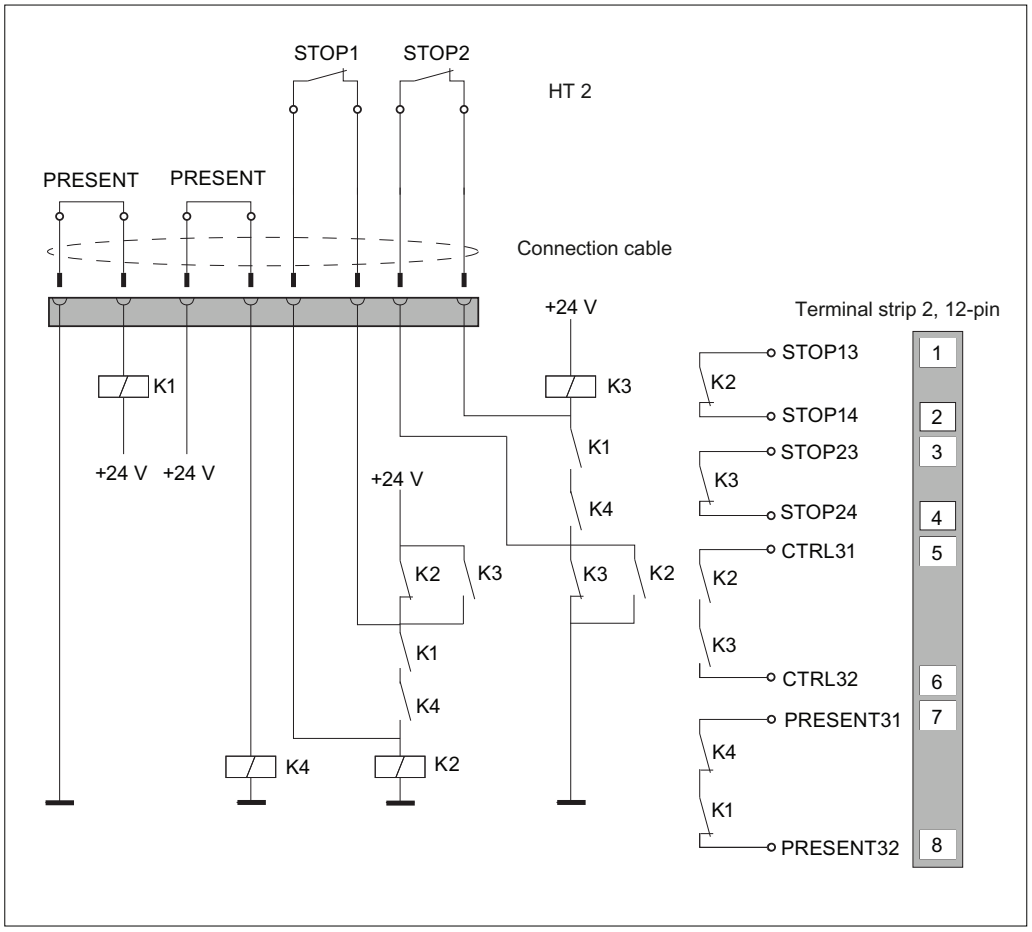


Figure 1-9 Circuit example: HT 2 connected, power supply switched on and emergency stop inactive

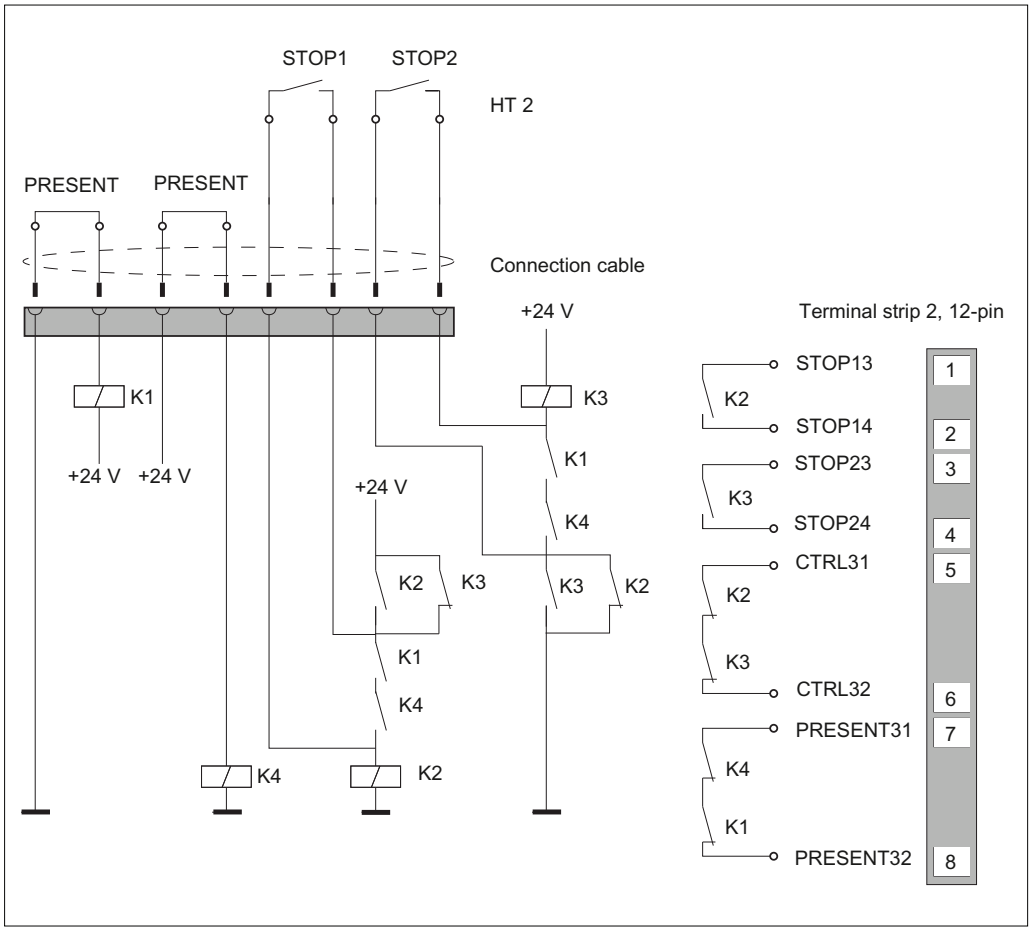


Figure 1-10 Circuit example: HT 2 connected, power supply switched on and emergency stop active

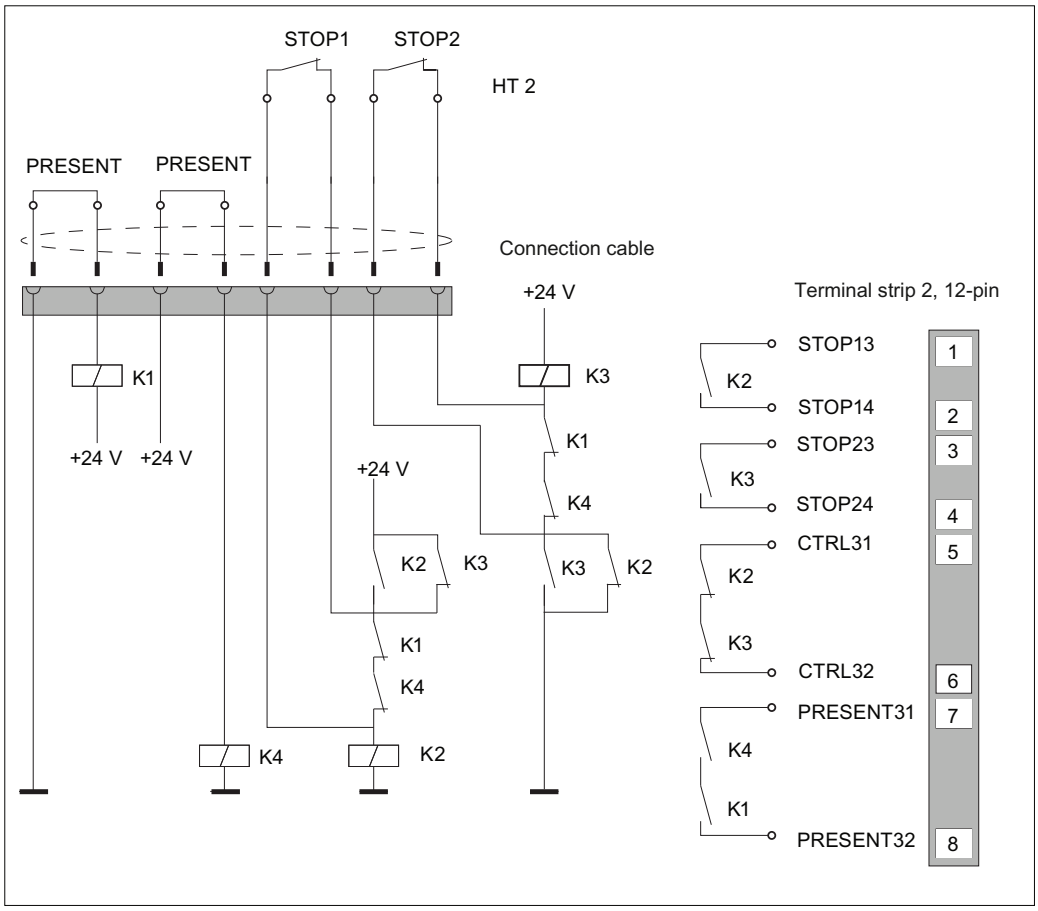


Figure 1-11 Circuit example: Power supply switched off