

SIEMENS

SINUMERIK

SINUMERIK 840D sl Handheld Terminal HT 8

Manual

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Valid for:
Control system
SINUMERIK 840D sl/840DE sl

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

DANGER

indicates that death or severe personal injury will result if proper precautions are not taken.
--

WARNING
--

indicates that death or severe personal injury may result if proper precautions are not taken.

CAUTION
--

indicates that minor personal injury can result if proper precautions are not taken.
--

NOTICE

indicates that property damage can result if proper precautions are not taken.
--

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

WARNING
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Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.
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Trademarks

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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General information and networking

1.1 Fundamental safety instructions

1.1.1 General safety instructions



DANGER

Danger to life due to live parts and other energy sources

Death or serious injury can result when live parts are touched.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, six steps apply when establishing safety:

1. Prepare for shutdown and notify all those who will be affected by the procedure.
2. Disconnect the machine from the supply.
 - Switch off the machine.
 - Wait until the discharge time specified on the warning labels has elapsed.
 - Check that it really is in a no-voltage condition, from phase conductor to phase conductor and phase conductor to protective conductor.
 - Check whether the existing auxiliary supply circuits are de-energized.
 - Ensure that the motors cannot move.
3. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water.
4. Isolate or neutralize all hazardous energy sources by closing switches, grounding or short-circuiting or closing valves, for example.
5. Secure the energy sources against switching on again.
6. Ensure that the correct machine is completely interlocked.

After you have completed the work, restore the operational readiness in the inverse sequence.



WARNING

Danger to life through a hazardous voltage when connecting an unsuitable power supply

Touching live components can result in death or severe injury.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.



WARNING

Danger to life when live parts are touched on damaged devices

Improper handling of devices can cause damage.

For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged devices.



WARNING

Danger to life through electric shock due to unconnected cable shields

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the cores of cables that are not used at one end at the grounded housing potential.



WARNING

Danger to life due to electric shock when not grounded

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.



WARNING

Danger to life due to fire spreading if housing is inadequate

Fire and smoke development can cause severe personal injury or material damage.

- Install devices without a protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire is prevented.
- Ensure that smoke can only escape via controlled and monitored paths.

**WARNING****Danger to life through unexpected movement of machines when using mobile wireless devices or mobile phones**

Using mobile wireless devices or mobile phones with a transmit power > 1 W closer than approx. 2 m to the components may cause the devices to malfunction, influence the functional safety of machines therefore putting people at risk or causing material damage.

- Switch the wireless devices or mobile phones off in the immediate vicinity of the components.

**WARNING****Danger to life due to fire if overheating occurs because of insufficient ventilation clearances**

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

**WARNING****Danger to life when safety functions are inactive**

Safety functions that are inactive or that have not been adjusted accordingly can cause operational faults on machines that could lead to serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

Note**Important safety notices for Safety Integrated functions**

If you want to use Safety Integrated functions, you must observe the safety notices in the Safety Integrated manuals.

1.1.2 Handling electrostatic sensitive devices (ESD)

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.



NOTICE

Damage through electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
 - Wearing an ESD wrist strap
 - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

1.1.3 Industrial security

Note

Industrial security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit this address (<http://www.siemens.com/industrialsecurity>).

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit this address (<http://support.automation.siemens.com>).

**WARNING****Danger as a result of unsafe operating states resulting from software manipulation**

Software manipulation (e.g. by viruses, Trojan horses, malware, worms) can cause unsafe operating states to develop in your installation which can result in death, severe injuries and/or material damage.

- Keep the software up to date.
You will find relevant information and newsletters at this address (<http://support.automation.siemens.com>).
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
You will find further information at this address (<http://www.siemens.com/industrialsecurity>).
- Make sure that you include all installed products into the holistic industrial security concept.

1.1.4 Residual risks of power drive systems

The control and drive components of a drive system are approved for industrial and commercial use in industrial line supplies. Their use in public line supplies requires a different configuration and/or additional measures.

These components may only be operated in closed housings or in higher-level control cabinets with protective covers that are closed, and when all of the protective devices are used.

These components may only be handled by qualified and trained technical personnel who are knowledgeable and observe all of the safety instructions on the components and in the associated technical user documentation.

When assessing the machine's risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example,
 - Hardware and/or software errors in the sensors, control system, actuators, and cables and connections
 - Response times of the control system and of the drive
 - Operation and/or environmental conditions outside the specification
 - Condensation/conductive contamination
 - Parameterization, programming, cabling, and installation errors
 - Use of wireless devices/mobile phones in the immediate vicinity of the control system
 - External influences/damage
2. In the event of a fault, exceptionally high temperatures, including an open fire, as well as emissions of light, noise, particles, gases, etc. can occur inside and outside the inverter, e.g.:
 - Component failure
 - Software errors
 - Operation and/or environmental conditions outside the specification
 - External influences/damage

Inverters of the Open Type/IP20 degree of protection must be installed in a metal control cabinet (or protected by another equivalent measure) such that contact with fire inside and outside the inverter is not possible.

3. Hazardous shock voltages caused by, for example,
 - Component failure
 - Influence during electrostatic charging
 - Induction of voltages in moving motors
 - Operation and/or environmental conditions outside the specification
 - Condensation/conductive contamination
 - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly

Note

The components must be protected against conductive contamination (e.g. by installing them in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12).

Assuming that conductive contamination at the installation site can definitely be excluded, a lower degree of cabinet protection may be permitted.

For more information about residual risks of the components in a drive system, see the relevant sections in the technical user documentation.

1.2 Application planning

1.2.1 Secondary electrical conditions

1.2.1.1 Power supply

Requirements for DC power supplies

 DANGER
Danger of death caused by unsafe power supply The DC power supply must be implemented as a circuit of Category PELV/DVC A according to EN 61800-5-1.
 WARNING
Inadequately fused supply cables can be life-threatening In the case of supply lines > 10 m, protectors must be installed at the device input in order to protect against lightning (surge). The DC power supply must be connected to the ground/shield of the NC for EMC and/or functional reasons. For EMC reasons, this connection should only be made at one point. As a rule, the connection is provided as standard in the S7-300 I/Os. In exceptional circumstances when this is not the case, the ground connection should be made on the grounding rail of the NC cabinet (also refer to /EMC/EMC Installation Guide.)

Table 1-1 Requirements of the DC power supply

Rated voltage	According to EN 61131-2 Voltage range (mean value) Voltage ripple, peak/peak Powering up time when switched on	24 VDC 20.4 VDC to 28.8 VDC 5% (unsmoothed 6-pulse rectification) any
Non-periodic overvoltages	Period of overvoltage Recover time Events per hour	≤ 35 V ≤ 500 ms ≥ 50 s ≤ 10
Transient voltage interruptions	Downtime Recovery time Events per hour	≤ 3 ms ≥ 10 s ≤ 10

1.2.1.2 Grounding concept

Components

The SINUMERIK 840D sl system consists of a number of individual components which have been designed so that the system complies with the appropriate EMC and safety standards. The individual system components are:

- Numerical Control Unit (NCU)
- Machine Control Panel (MCP), Machine Pushbutton Panel (MPP)
- Keyboard
- Operator panels (operator panel front + TCU/PCU)
- Distributor box and handheld unit
- S7-300 I/O with IM 153 interface module

Grounding measures

The individual modules are attached to a metal cabinet panel. Insulating paints on the mounting points (e.g. tension jacks) must be removed.

It is permissible to cluster the operator control components regarding connection/potential bonding.

Example: The control panel on the swivel arm.

It is sufficient in this instance to connect the ground connections of, for example, the PCU, TCU, and operator panel front using a cable and to route a shared grounding conductor to the central ground connection in the control cabinet.

Additional references

EMC Design Guidelines

1.2.1.3 EMC compatibility

In addition to the protective grounding of system components, special precautions must be taken to guarantee safe, trouble-free operation of the system. These measures include shielded signal lines, special equipotential bonding connections, and isolation and shielding measures.

Shielded signal cables

- For safe and fault-free operation of the system, the specified cables must be used.
- For digital signal transmission, the shield must have a conductive connection at both sides of the housing.

Cable definition

Definition:

- Signal cables (example)
 - Data cables (Ethernet, PROFIBUS, sensor cables, etc.)
 - Digital I/Os
 - Cables for safety functions (emergency stop, enabling)
- Power cables (example)
 - Low-voltage supply lines (230 VAC, +24 VDC, etc.)
 - Motor cables

Rules for routing cables

In order to achieve the greatest possible EMC compatibility for the complete system (control, power unit, machine), the following EMC measures must be carefully observed:

- If necessary, signal and power cables may cross one another (if possible at an angle of 90°), but must never be laid close or parallel to one another.
- Only use cables approved by SIEMENS for the signal lines from and to the Control Unit.
- Signal cables must not be routed close to strong external magnetic fields (e.g. motors and transformers).
- If signal lines cannot be routed a sufficient distance away from other cables, they must be installed in grounded cable ducts (metal).
- The operator panel fronts, MCPs, MPPs, and full keyboards must be installed in metallically enclosed EMC-compatible housings.

Note

For further information on interference suppression measures and the connection of shielded cables, please refer to the EMC Installation Guide.

EMC limit values in South Korea

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

For sellers or other users, please bear in mind that this device is an A-grade electromagnetic wave device.
This device is intended to be used in areas other than at home.

The EMC limit values to be complied with for South Korea correspond to the limit values of the EMC product standard for variable-speed electric drives EN 61800-3, Category C2, or limit value class A, Group 1 according to EN 55011. By applying suitable supplementary measures, the limit values according to Category C2 or according to limit value class A, Group 1, are maintained. Further, additional measures may be required, for instance, using an additional radio interference suppression filter (EMC filter).

The measures for EMC-compliant design of the system are described in detail in this manual respectively in the Installation Guideline EMC.

Please note that the final statement on compliance with the standard is given by the respective label attached to the individual unit.

1.2.2 Ambient climatic and mechanical conditions

1.2.2.1 Transport and storage conditions

The components of the SINUMERIK 840D sl system exceed the requirements according to EN 61800-2 with regard to shipping and storage conditions.

The following data applies under the following conditions:

- Long-term storage in the transport and product packaging:
At weather-protected locations that have continuous contact with outside air through openings.
- Transport in the transport packaging:
 - In unventilated containers under conditions not protected from weather effects.
 - In the "cold" in accordance with outside air.
 - Air transport in the air-conditioned cargo hold.

Table 1-2 Ambient conditions during storage and transport

Type of condition	Permissible range/class		
	Transport	Storage	
Classification	EN 60721-3-2	EN 60721-3-1	
Climate class	2K4	1K4	
Ambient temperature ¹⁾	-40° C ... +70° C	-25° C ... +55° C	
Biological environmental conditions	2B1 ²⁾	1B1 ²⁾	
Chemically active environmental conditions	2C2 ³⁾	1C2 ³⁾	
Maximum permissible temperature change	Direct interaction in air/air: -40°/+30° C at 95% relative humidity	30 k/h	
Relative humidity (without condensation)	5 to 95%		
Precipitation, rain	6 mm/min ²⁾	Not permissible	
Water other than rain	1 m/s and wet loading surfaces ⁴⁾	Not permissible ⁵⁾	1 m/s and wet loading surfaces ⁴⁾

Type of condition	Permissible range/class		
Height	Max. 4,000 m above sea level		
Condensation, splash water, icing, salt spray	Permissible	Not permissible ⁵⁾	Permissible ⁴⁾

- 1) Transport and storage of operator panel fronts and diskette drives: -20° C to +55° C.
- 2) Mold growth, slime, rodents, termites and other animal vermin are not permissible.
- 3) In marine- and weather-resistant transport packaging (container).
- 4) For storage in the transport packaging.
- 5) For storage in the product packaging.

Note

Remove the transport protective foil and packaging material before installing the components.

Shipping backup batteries

Backup batteries must only be shipped in the original packaging. No special authorization is required to ship backup batteries. The lithium content is approximately 300 mg.

Note

The backup battery is classified as a hazardous substance, Class 9 in accordance with the relevant air-freight transportation regulations.

Storage of backup batteries

Always store backup batteries in a cool and dry place. The batteries have a maximum shelf life of 10 years.

Rules for handling backup batteries

 WARNING
Incorrect handling of backup batteries can lead to a risk of ignition, explosion and combustion
The stipulations of DIN EN 60086-4, in particular regarding avoidance of mechanical or electrical tampering of any kind, must be complied with.

- Do not open a battery. Replace a faulty battery only with the same type.
- Obtain replacement batteries only from Siemens.
- Always try to return low batteries to the manufacturer or deliver these to a registered recycling company.

1.2.2.2 Operating conditions

The components of the SINUMERIK 840D sl system are intended for a weatherproof, fixed location. The documented environmental conditions apply to the climate in the immediate vicinity of the units and to the entry of the cooling air. They exceed the requirements according to EN 60204-1, EN 61800-2, EN 61131-2 and IEC 62477-1.

NOTICE

Damage to components by coolants and lubricants

The SINUMERIK operator components have been designed for industrial use, particularly on machine tools and production machines. This also takes into account the use of commercially available coolants and lubricants. The use of aggressive compounds and additives can damage components and result in their failure.

Contact between the operator components and coolants and lubricants should be avoided as far as possible, as resistance to all coolants and lubricants cannot be guaranteed.

Table 1-3 Ambient conditions for operation

Environmental conditions	Application areas	Remarks
Climatic environmental conditions		
Climate class	Better than class 3K3	According to EN 60721-3-3
Limit temperatures at 100% load	0 ... 45° C	All except PCU50.5; front-side for OP, MCP/MPP and CNC standard keyboards KB.
	0 ... 55° C	Rear-side for OP, MCP/MPP and CNC standard keyboards KB.
	5 ... 55° C	For PCU50.5
Relative humidity (without condensation)	5% to 95% (60% when corrosive gases and/or dusts are present)	
Condensation, formation of ice	Not permissible	
Dripping water, spray, splash water, jet-water	Not permissible	All components, except ...
	Permissible	For operator panel fronts, handheld units and machine control panels
Max. installation altitude	Up to 1,000 m above sea level	Without thermal derating
	1000 m ... 2000 m above sea level	With insulation
	2000 m ... 5000 m above sea level	Specified clearances have been dimensioned for an operating voltage of 50 V at 5000 m
Biological, chemical and mechanical influences, pollutants		
Biological environmental conditions		Class 3B1 according to EN 60 721-3-3: Mold, mold growth, slime, rodents, termite and other animal vermin are not permissible.
Chemically active environmental conditions		Class 3C1 according to EN 60721-3-3

Environmental conditions	Application areas	Remarks
Mechanically active environmental conditions		Class 3S1 according to EN 60721-3-3: Conductive dust not permissible.
Classification of the mechanical environment		3M3 for components on the machine 3M1/3M2 for components in the control cabinet
Degree of contamination		2
EMC conducted / radiation		Class C3 according to EN 61800-3

Note

The user must consider radio interference for the complete system. Particular attention should be paid to cabling. Please contact your sales representative for assistance and support.

If compliance with limit value class C2 is required, please contact your local sales representative.

1.2.2.3 Cooling

To calculate the heat dissipation, the total power loss $P_{V_{total}}$ of all heat-generating components in a housing must be taken into account.

Total power loss $P_{V_{total}} = P_{V_1} + P_{V_2} + P_{V_3} + \dots$ [W]

Convection surface area A [m²]:

The surface areas of the front and bottom sides are not included in the convection surface area calculation.

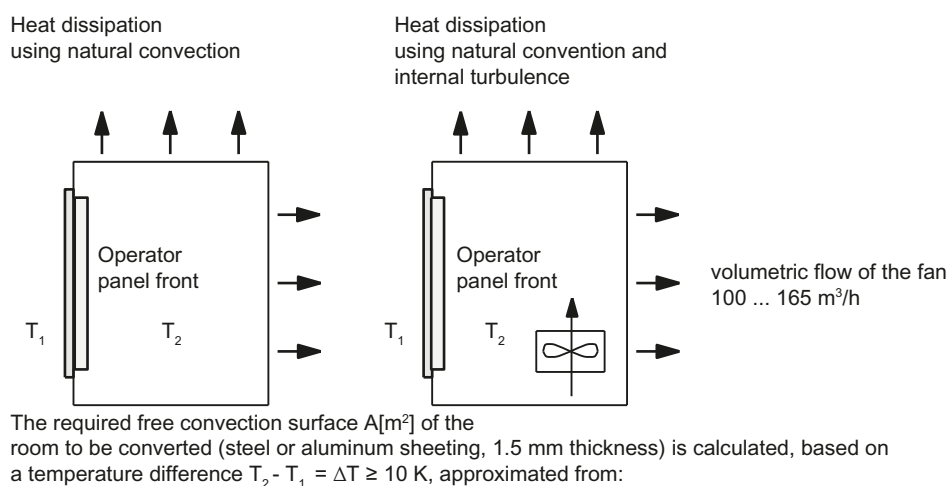
Note

A recommended value for the power loss of the operator control components is contained in the "Technical data" section of the associated component (see "Power consumption").

Means of heat dissipation

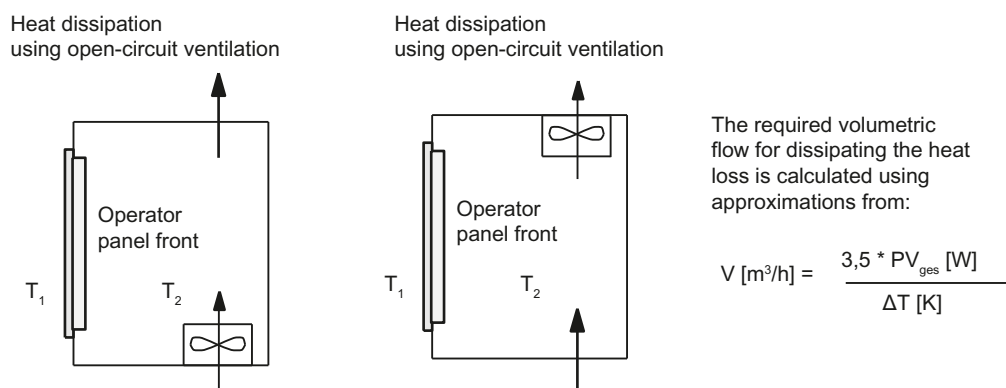
Heat dissipation can take place as follows:

- Heat dissipation by natural convection
- Heat dissipation by natural convection and internal air turbulence
- Heat dissipation by open-circuit cooling
- Heat dissipation by open-circuit ventilation



$$A [m^2] = \frac{PV_{ges} [W]}{5 * \Delta T [K]}$$

$$A [m^2] = \frac{PV_{ges} [W]}{10 * \Delta T [K]}$$



$$V [m^3/h] = \frac{3,5 * PV_{ges} [W]}{\Delta T [K]}$$

Figure 1-1 Means of heat dissipation

Fan design

- The fan must be positioned to produce an optimum heat dissipation. A clearance of 10 mm must be maintained in front of the fan.
- The inlet and outlet slots must remain free for the open-circuit ventilation.
- Air filters must be provided to maintain the permitted environmental conditions.

NOTICE

Damage to the operating components caused by temperatures that are too high or too low

Contaminated air filters impair the desired heat dissipation. For handling the air filters, pay attention to:

- Proper handling
- Regular replacement
- Correct disposal

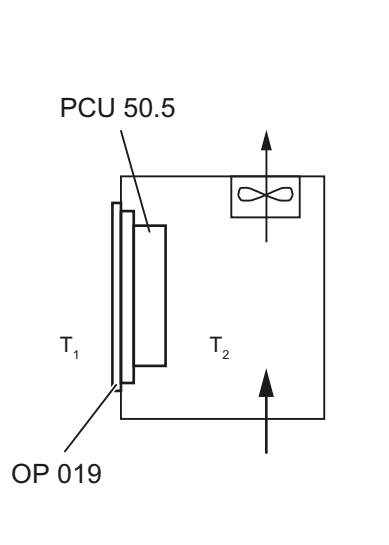
Guidelines

If the convection area A [m²] does not suffice for the "heat dissipation using natural convection", then use:

- "Heat dissipation using natural convection and internal turbulence" for hot spots and heat concentrations in housings subject to space constraints. The total power loss P_{Ltot} for thermally critical applications can be determined as follows:
 - Current measurement for a 24 V supply voltage
 - Power loss P_{Ltot} [W] = U (24 V) * |measured value in ampères|
- Heat dissipation using open-circuit ventilation

Calculation of the volumetric flow

The power loss (thermal) dissipated by the components in an operator unit is to be dissipated using open-circuit ventilation. The volumetric flow V required for this should be calculated at a difference in temperature of $T_2 - T_1 = \Delta T \geq 10K$.



Example for heat dissipation with open-circuit ventilation:
PCU 50.5 with OP 019

Calculation of the power loss
(including internal power supply unit):

OP 019	35 W
PCU 50.5	45 W
PV_{ges}	= 80 W
(max. 180 W)	

$$V = \frac{3,5 * PV_{ges} [W]}{\Delta T [K]} = 28 [m^3/h]$$

External temperature = $T_1 = 45^\circ C$
Internal temperature = $T_2 = 55^\circ C \Rightarrow \Delta T = 10 K$

Figure 1-2 Calculating heat dissipation for PCU 50.5 with OP 019

1.2.3 Standards and approvals

Approvals

CE approval



Figure 1-3 CE marking

The operator panels and the safety-relevant accessories satisfy the requirements and protection objectives of the following EC directives. The operator panels and the safety-relevant accessories comply with the harmonized European standards (EN), promulgated in the Official Journals of the European Community:

- 2004/108/EC "Electromagnetic Compatibility" (EMC directive)
- Directive 2006/42/EC of the European Parliament and Council of May 17, 2006, on machinery, and Directive 95/16/EC (amendment)

SIBE Switzerland Certification Service

For the HT 2 and HT 8 units.



Figure 1-4 Symbol of the certifying body

HT 2

The HT 2 operator panel and the safety-relevant accessories (is identified in the "Accessories" section for the respective devices) satisfy Category 3, PL d according to EN ISO 13849-1:2008. The safety function Enabling device for special mode control and the emergency stop button satisfy the following requirements:

- Category 3, PL d according to EN ISO 13849-1:2008
- Requirements of EN 60204-1:2006, when complying with the safety instructions in the relevant chapters of this documentation

HT 8

The HT 8 operator panel and the safety-relevant accessories (is identified in the "Accessories" section for the respective devices) satisfy Category 3, PL d according to EN ISO 13849-1:2008.

The emergency stop button meets the following requirements:

- Category 3, PL d according to EN ISO 13849-1:2008
- Requirements of EN 60204-1:2006, when complying with the safety instructions in the relevant chapters of this documentation

1.2 Application planning

The safety function Enabling device for special mode control satisfies the following requirements:

- Category 4, PL e according to EN ISO 13849-1:2008
- Requirements of EN 60204-1:2006, when complying with the safety instructions in the relevant chapters of this documentation

Address:

NSBIV AG, SIBE Switzerland, Brünigstrasse 18, CH-6005 Lucerne

Accreditation SCESp 0046 / Notified Body 1247

Number of the prototype test certificate: No. 1416

Risk assessment

The following standards must be used to perform the risk assessment:

- EN ISO 12100-1:2003 and EN ISO 12100-2:2003, General Design Guidelines for Machines
- EN ISO 14121-1:2007, Risk Assessment for Machinery
- EN ISO 13849-1:2008, Safety-related Parts of Machines

These considerations result in a category (B, 1, 2, 3, 4) and a performance level (PL a to e) in accordance with EN ISO 13849-1:2008 that ultimately dictate how the safety-related parts of the system to be monitored must be constructed.

The connection examples with different monitoring units in "Handheld units", Section: "HT 2", Section: "Connections" → "Connection examples for acknowledgment button and Emergency Stop button" can also be used for other operator panels and demonstrate how Category 3, PL d according to EN ISO 13849-1:2008 can be attained with the safety-related parts of the operator panels. Note that the overall concept of the installation must be designed with this in mind.

1.2.4 Recycling and disposal

Products should be disposed of corresponding to the relevant national regulations.

The products described in this manual can be mostly recycled due to the fact that they contain very few damaging substances. To recycle and dispose of your old device in an environmentally friendly way, please contact an appropriate disposal company.

1.3 Connecting

1.3.1 Pin assignment of the interfaces

The pins of the component interfaces are assigned as specified in the tables below. Any deviations are indicated at the relevant point.

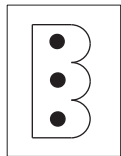
Signal type:

I	Input
O	Output
B	Bidirectional (inputs/outputs)
V	Power supply
-	Ground (reference potential) or N.C. (not connected)

Power supply interface

Connector type:	Terminal block, 3-pin plug connector
Max. cable length:	10 m

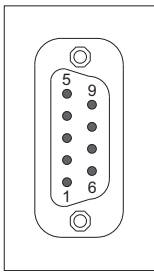
Table 1-4 Assignment of the power supply interface

	Pin	Name	Type	Meaning
	1	P24 (+)	-	24 VDC potential (20.4 to 28.8 VDC)
	2	M24 (-)	VI	Ground 24 V
	3	SHIELD (PE)		Shield potential

Serial interface COM1

9-pin sub-D connector

Table 1-5 Assignment of the serial interface COM1 (V.24/RS232)

Connector	Pin	Name	Type	Remark
	1	DCD (M5)	I	Receive signal level (carrier)
	2	RxD (D2)		Serial receive data
	3	TxD (D1)	O	Serial transmit data
	4	DTR (S1)		Data terminal ready
	5	GND (E2)	-	Ground (reference potential)
	6	DSR (M1)	I	Data Set Ready
	7	RTS (S2)	O	Request To Send
	8	CTS (M2)	I	Clear To Send
	9	RI (M3)		Incoming call

USB interfaces

The USB interfaces are implemented as sockets and comply with the generally valid standard. The version information (1.1, 2.0 etc.), the maximum velocity (low speed, full speed, etc.) and the socket type (A or B) are documented in the individual sections for the associated devices.

In principle, USB interfaces have the following characteristics:

- Integrated power supply up to 500 mA for each socket.
- Maximum cable length 3 m (Length including the supply cable to the hub and the connected terminal device; only 1 hub at maximum is permitted. It should be noted that some keyboards already have a hub.)

NOTICE

Cables that are too long can cause the screen to freeze

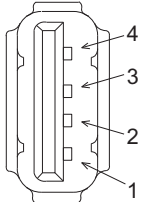
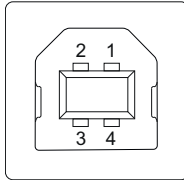
Observe the following restrictions for the USB front interface for connecting operator panels to the keyboard, mouse or USB FlashDrive:

- Maximum cable length: 1.8 m
 - Extension cables are not permissible
- Hot-plugging-capable devices are connected during operation and are identified automatically.

Note

Correct identification is only guaranteed for USB I/Os that comply to 100% with the USB specification.

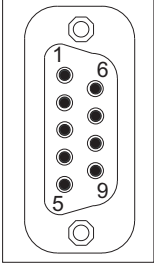
Table 1-6 Assignment of the USB interface

Type A socket	Type B socket	Pin	Name	Type	Remark
		1	P5V_fused	V	+ 5 V (fused)
		2	Data-	B	Data -
		3	Data+		Data +
		4	GND	V	Ground (reference potential)

PROFIBUS DP / MPI interface

Connector type:	9-pin sub-D socket
Max. data transmission rate:	12 Mbit/s
Max. cable length:	100 m

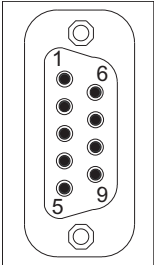
Table 1-7 Assignment of the PROFIBUS DP / MPI interface

Connector	Pin	Name	Type	Remark
	1,2	N.C.	-	Not connected
	3	LTG_B	B	Signal line B of MPI module
	4	RTS_AS	I	Control signal for receive data current. Signal 1 active if directly connected control is sending.
	5	M5EXT	V	Return line (GND) of 5 V supply. Current load from a load of 90 mA max. connected between P5EXT and M5EXT.
	6	P5EXT	V	5 V supply (current load see M5EXT)
	7	N.C.	-	Not connected
	8	LTG_A	B	Signal line A of MPI module
	9	RTS_PG	O	RTS signal of MPI module; signal is "1", when PG is sending
	Shield		-	On connector housing

PROFIBUS DP interface

Connector type:	9-pin sub-D socket
Max. data transmission rate:	12 Mbit/s
Max. cable length:	100 m

Table 1-8 Assignment of the PROFIBUS DP interface

Connector	Pin	Name	Type	Remark
	1,2	N.C.	-	Not connected
	3	RS_DP	B	RS-485 differential signal
	4	RTS_DP	O	Request To Send
	5	M5EXT	V	5 V external ground
	6	P5EXT	V	5 V external potential
	7	N.C.	-	Not connected
	8	XRS_DP	B	RS-485 differential signal
	9	N.C.	-	Not connected

Ethernet RJ45 interface

Connector type:	Standard RJ45 socket
Max. data transmission rate:	10/100/1000 Mbit/s
Max. cable length:	100 m

1.3 Connecting

Table 1-9 Assignment of the Ethernet RJ45 interface 10/100 Mbit/s

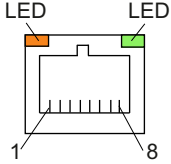
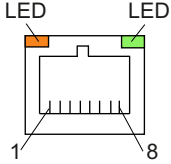
Connector	Pin	Name	Type	Remark
	1	TxD+	O	Transmit data
	2	TxD-		
	3	RxD+	I	Receive data
	4/5	GND	-	(terminated internally with 75 Ω; not required for data transmission)
	6	RD-	I	Receive data
	7/8	GND	-	(terminated internally with 75 Ω; not required for data transmission)
	Shield	-	-	On connector housing
	-	Green LED (right)	-	Lights up: 10 or 100 Mbit/s Off: No or faulty connection
	-	Orange LED (left)	-	Illuminated: Data exchange Off: No data exchange

Table 1-10 Assignment of the Ethernet RJ45 interface 1000 Mbit/s

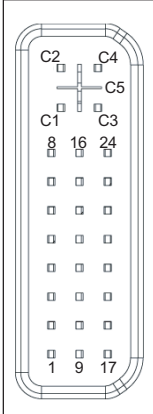
Connector	Pin	Name	Type	Remark
	1	DA+	B	Bidirectional pair A+
	2	DA-		Bidirectional pair A-
	3	DB+		Bidirectional pair B+
	4	DC+		Bidirectional pair C+
	5	DC-		Bidirectional pair C-
	6	DB-		Bidirectional pair B-
	7	DD+		Bidirectional pair D+
	8	DD-		Bidirectional pair D-
	Shield	-	-	On connector housing
	-	Green LED (right)	-	Illuminated orange: 1000 Mbit/s Off: No or faulty connection
	-	Orange LED (left)	-	Illuminated: Data exchange Off: No data exchange

Note

Connection only on LAN, not on telecommunication networks!

DVI-I interface

Table 1-11 Assignment of DVI-I interface

Connector	Pin	Name	Type	Remark
	S	GND	-	Ground
	S1	GND	-	Ground
	C1	R	O	Red
	C2	G		Green
	C3	B		Blue
	C4	HSYNC	O	Horizontal synchronizing pulse
	C5	GND	-	Ground
	CSA	GND	-	Ground
	1	TX2N	O	TDMS data 2-
	2	TX2P		TDMS data 2+
	3	GND	-	Ground
	4	N.C.	-	Not connected
	5	N.C.	-	Not connected
	6	DDC CLK	B	DDC clock
	7	DDC CLK		DDC data
	8	VSYNC	O	Vertical synchronizing pulse
	9	TX1N	O	TDMS data 1-
	10	TX1P		TDMS data 1+
	11	GND	-	Ground
	12	N.C.	-	Not connected
	13	N.C.	-	Not connected
	14	+ 5 V	VO	+ 5 V
	15	GND	VO	Ground
	16	MONDET	I	Hot plug detect
	17	TX0N	O	TDMS data 0-
	18	TXoP		TDMS data 0+
	19	GND	-	Ground
	20	N.C.	-	Not connected
	21	N.C.	-	Not connected
	22	GND	-	Ground
	23	TXCP	O	TDMS clock +
	24	TXCN		TDMS clock -

I/O USB interface

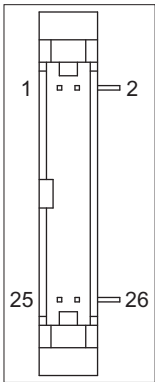
All signals required for connecting operator panel fronts, with the exception of the display interface, are assigned to this interface.

Associated interface cable: K1

Connector type: 2 x 13-pin socket connector

1.3 Connecting

Table 1-12 Allocation of the I/O USB interface

Connector	Pin	Name	Type	Meaning
	1	GND	VO	Ground
	2	P12C		+power supply for backlight inverter
	3	BL_ON	O	Backlight On
	4	P5V_fused	VO	+5 V VCC (fused in PCU/TCU)
	5	GND	VO	Ground
	6	P3V3_fused	VO	+3.3 V VCC (fused in PCU/TCU)
	7 - 10	N.C.	-	Not connected
	11	P5V_fused	VO	+5 V VCC (fused in PCU/TCU)
	12	USB_D1M	B	USB data- Channel 1
	13	USB_D1P		USB data+ Channel 1
	14	GND	VO	Ground
	15	LCD_SEL0	I	Display type select signal
	16	LCD_SEL1		
	17	LCD_SEL2		
	18	LCD_SEL3		
	19	RESET_N		Reset signal (low active)
	20	reserved	-	Reserved
	21	HD_LED	O	HD LED, anode with 1 kΩ in series on the motherboard
	22	DP_LED	O	MPI/DP LED, anode with 1 kΩ in series on the motherboard
	23	Ethernet_LED	O	Ethernet LED, anode with 1 kΩ in series on the motherboard
	24	TEMP_ERR	O	LED temperature sensor; anode with 1 kΩ in series on the board
	25	RUN_R *)	O	Watchdog error LED, anode with 1 kΩ in series on the motherboard
	26	RUN_G	O	Watchdog OK LED, anode with 1 kΩ in series on the motherboard

LVDS display interface channel 1

Used to connect operator panel fronts with TFT displays with 640 x 480 pixels (VGA), 800 x 600 pixels (SVGA) or 1024 x 768 pixels (XGA).

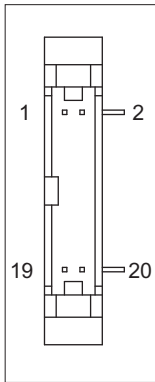
Associated interface cable:

K2, max. length: 0.5 m

Connector type:

2 x 10-pin socket connector

Table 1-13 Allocation of the LVDS display interface

Connector	Pin	Name	Type	Meaning	
	1/2	P5V_D_fused	VO	+5 V display supply voltage (fused in PCU/TCU)	
	3	RXIN0-	I	LVDS input signal	Bit 0 (-)
	4	RXIN0+			Bit 0 (+)
	5/6	P3V3_D_fused	VO	+3.3 V display supply voltage (fused in PCU/TCU)	
	7	RXIN1-	I	LVDS input signal	Bit 1 (-)
	8	RXIN1+			Bit 1 (+)
	9/10	GND	-	System ground (reference potential)	
	11	RXIN2-	I	LVDS input signal	Bit 2 (-)
	12	RXIN2+			Bit 2 (+)
	13/14	GND	-	System ground (reference potential)	
	15	RXCLKIN-	O	LVDS cycle clock signal	(-)
	16	RXCLKIN+			(+)
	17/18	GND	-	System ground (reference potential)	
	19/20	N.C.		Not connected	

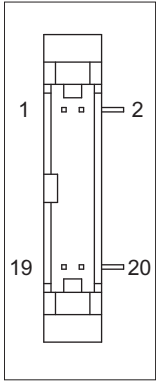
LVDS display interface channel 2

Used for expanding the LVDS display interface channel 1 to control TFT displays with 1280 x 1024 pixels (SXGA).

Associated interface cable: K3

Connector type: 2 x 10-pin socket connector

Table 1-14 Allocation of the LVDS display interface

Connector	Pin	Name	Type	Meaning	
	1/2	GND	-	System ground (reference potential)	
	3	RXIN10-	I	LVDS input signal	Bit 0 (-)
	4	RXIN10+			Bit 0 (+)
	5/6	GND	-	System ground (reference potential)	
	7	RXIN1-	I	LVDS input signal	Bit 1 (-)
	8	RXIN1+			Bit 1 (+)
	9/10	GND	-	System ground (reference potential)	
	11	RXIN2-	I	LVDS input signal	Bit 2 (-)
	12	RXIN2+			Bit 2 (+)
	13/14	GND	V	Ground	
	15	RXCLKIN-	O	LVDS cycle clock signal	(-)
	16	RXCLKIN+			(+)
	17	GND	V	Ground	
	18-20	P12VF	VO	+12 V fused	

Rotary switch: Feed override X30

Connector designation: **X30**
 Connector type: 2 x 5-pin plug connector, according to EN 60603-13 with coding
 Max. cable length: 0.6 m

Table 1-15 Assignment of X30 connector (on delivery)

Pin	Name	Type	Meaning
1	N.C.	-	Not connected
2	N.C.	-	Not connected
3	M	V	Ground
4	N.C.	-	Not connected
5	P5	V	5 V supply
6	OV_VS16	I	Override rotary switch value 16
7	OV_VS8		Override rotary switch value 8
8	OV_VS4		Override rotary switch value 4
9	OV_VS2		Override rotary switch value 2
10	OV_VS1		Override rotary switch value 1

Rotary switch: Spindle override X31

Connector designation: **X31**
 Connector type: 2 x 5-pin plug connector, according to EN 60603-13 with coding
 Max. cable length: 0.6 m

Table 1-16 Assignment of X31 connector (on delivery)

Pin	Name	Type	Meaning
1	N.C.	-	Not connected
2	N.C.	-	Not connected
3	M	V	Ground
4	N.C.	-	Not connected
5	P5	V	5 V supply
6	OV_SP16	I	Override rotary switch value 16
7	OV_SP8		Override rotary switch value 8
8	OV_SP4		Override rotary switch value 4
9	OV_SP2		Override rotary switch value 2
10	OV_SP1		Override rotary switch value 1

Optional customer buttons IN (X51 / X52 / X55)

Only switches (passive inputs) may be connected via the X51, X52 and X55 connectors. X51 and X52 are typically used for connecting illuminated pushbuttons. The lamps in the buttons are activated via X53 and X54. X55 has no corresponding outputs.

Note

Connection miniature handheld unit

Alternatively, at the inputs X51, X52 and X55, one miniature handheld unit may be operated. For details, please refer to the corresponding section.

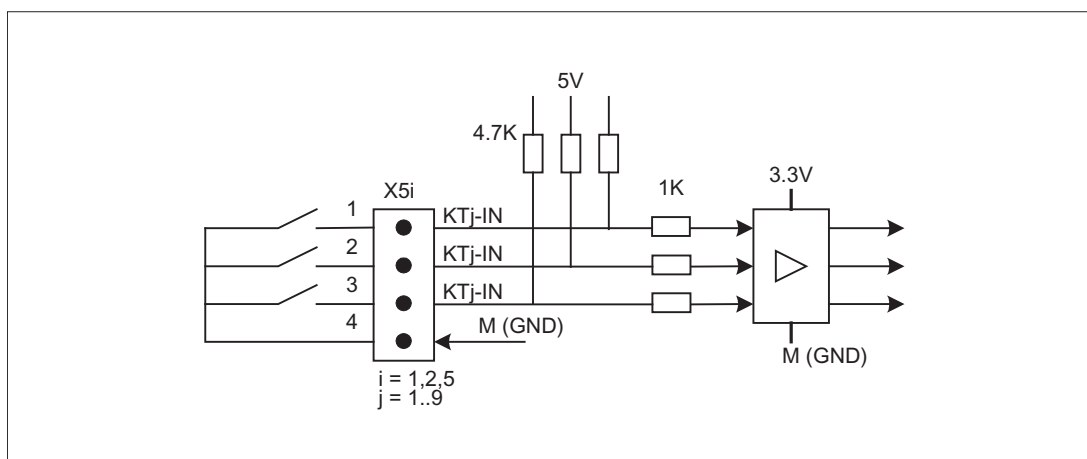


Figure 1-5 Main circuit diagram of the input circuit for X51, X52 and X55

Connector designation: **X51 / X52 / X55**
 Connector type: 4-pin plug connector
 Max. cable length: 0.6 m

Table 1-17 Assignment of connector X51

Pin	Name	Type	Meaning
1	KT-IN1	I	Customer key 1
2	KT-IN2		Customer key 2
3	KT-IN3		Customer key 3
4	M	V	Ground

Table 1-18 Assignment of connector X52

Pin	Name	Type	Meaning
1	KT-IN4	I	Customer key 4
2	KT-IN5		Customer key 5
3	KT-IN6		Customer key 6
4	M	V	Ground

Table 1-19 Assignment of connector X55

Pin	Name	Type	Meaning
1	KT-IN7	I	Customer key 7
2	KT-IN8		Customer key 8
3	KT-IN9		Customer key 9
4	M	V	Ground

Optional customer buttons OUT (X53 / X54)

The short-circuit-proof outputs X53/X54 are provided to control lamps in the keys. Lamps with 24 V and 2.4 W per output are recommended.

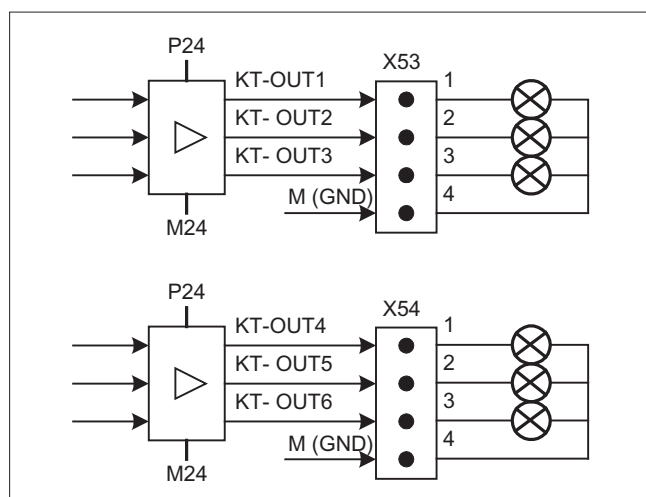


Figure 1-6 Main circuit diagram of the input circuit for X53 and X54

NOTICE

Damage to the electronics

Do not connect any relays, valves or other inductive loads.

Connector designation: **X53 / X54**
 Connector type: 4-pin plug connector
 Max. cable length: 0.6 m

Table 1-20 Assignment of connector X53

Pin	Name	Type	Meaning
1	KT-OUT1	O	Output 1 lamp
2	KT-OUT2		Output 2 lamp
3	KT-OUT3		Output 3 lamp
4	M	V	Ground

Table 1-21 Assignment of connector X54

Pin	Name	Type	Meaning
1	KT-OUT4	O	Output 4 lamp
2	KT-OUT5		Output 5 lamp
3	KT-OUT6		Output 6 lamp
4	M	V	Ground

Interfaces for two handwheels X60 / X 61

Interface:	Handwheel 1	Handwheel 2
Connector designation:	X60	X61
Connector type:	15-pin Sub-D socket	
Max. cable length:	25 m	

Table 1-22 Assignment of connectors X60/X61

Pin	Name	Type	Meaning
1	P5HW	V	5 V power supply
2	M	V	Ground
3	HW1_A / HW2_A	I	Handwheel pulses track A
4	HW1_XA / HW2_XA	I	Handwheel pulses track A (negated)
5	N.C.	-	Not connected
6	HW1_B / HW2_B	I	Handwheel pulses track B
7	HW1_XB / HW2_XB	I	Handwheel pulses track B (negated)
8	N.C.	-	Not connected
9	P5HW	V	5 V power supply
10	N.C.	-	Not connected
11	M	V	Ground

Pin	Name	Type	Meaning
12	N.C.	-	Not connected
13	N.C.	-	Not connected
14	N.C.	-	Not connected
15	N.C.	-	Not connected

Note

The handwheels can either be operated with TTL or differential signals. You set the signal type using S1 (wire bridge) on the COM board.

The handwheels are supplied with 5 V $\pm$ 5% and 100 mA via the interface.

Contour and velocity specification via handwheel are not supported.

Interfaces for direct keys

X11 on the operator panel (OP) fronts can be used to fetch the state of the direct keys. The connection of a 20-pin ribbon cable allows the direct keys to evaluate the following components:

- Direct key module (DTM)
- X70 in the machine control panels (MCP, MPP) and the handwheel connection module (HAM)
- X205 on the Thin Client Unit (TCU)

The signals are then forwarded to the control over the various communications networks. Note that DTM and HAM can be operated only with PROFIBUS DP.

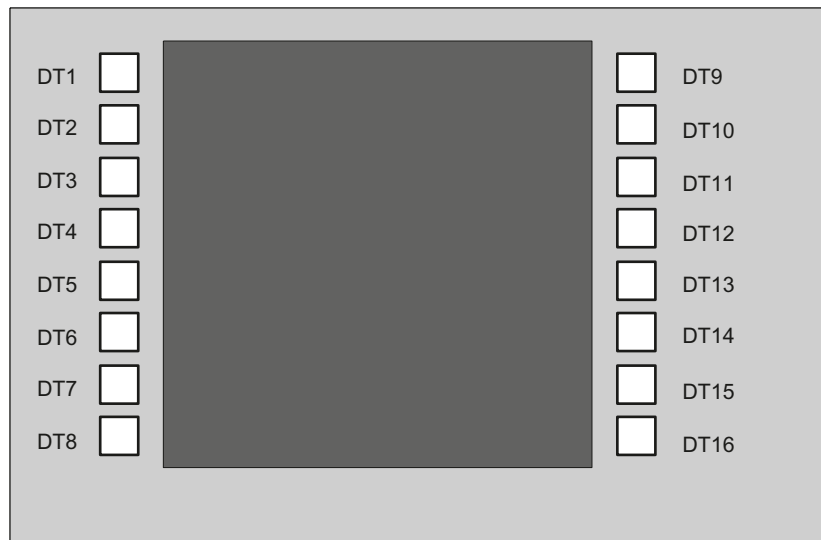


Figure 1-7 Assignment of the direct keys to the vertical softkeys of an operator panel front

16 digital inputs (5 V) can be fetched via the X11 connector.

Connector designation: **X11**
 Connector type: 20-pin plug connector
 Max. cable length: 0.85 m

Table 1-23 Assignment of connector X11

Pin	Name	Type	Meaning
1	DT1	O	Direct key 1
...	...		...
16	DT16		Direct key 16
17	P5V	V	+ 5 V (fused)
18	P5V		+ 5 V (fused)
19	GND		Ground
20	GND		Ground

16 digital inputs can be polled by the X70/X205/DTM connector.

Connector designation: **X70/X205/DTM**
 Connector type: 20-pin plug connector
 Max. cable length: 0.85 m

Table 1-24 Assignment of connector X70 (MCP, MPP, HAM) / X205 (TCU) / DTM

Pin	Name	Type	Meaning
1	DT1	I ¹⁾	Direct key 1
...	...		...
16	DT16		Direct key 16
17	P5V / CON1 ²⁾	V	+ 5 V input voltage ³⁾
18	P5V / CON2 ²⁾		+ 5 V input voltage ³⁾
19	GND		Ground
20	GND		Ground

¹⁾ The inputs are electrically isolated for MCP / MPP / HAM and DTM.

²⁾ For the TCU, it is evaluated whether the direct keys have been connected.

³⁾ Power consumption: 100 mA for MCP / MPP / HAM; 500 mA for DTM

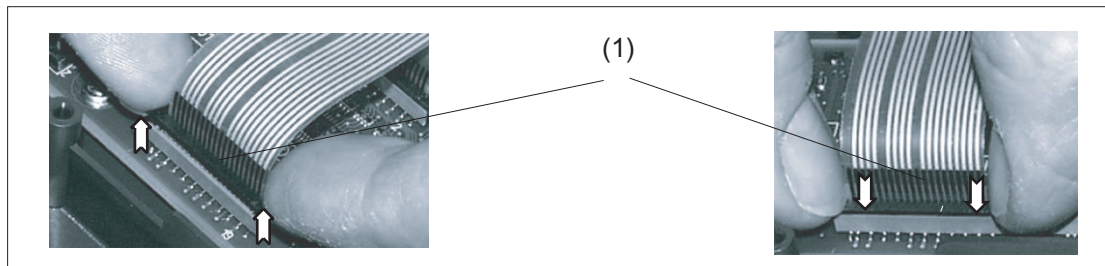
Table 1-25 Signal level

HIGH level:	5 V or open
Low level	<= 0.8 V

1.3.2 Handling membrane connectors

When replacing parts it can sometimes be necessary to disconnect membrane connectors from the boards and reconnect them again.

This should be done as follows:



(1) Clamping frame of socket

Figure 1-8 Removing (left) and attaching (right) a membrane connector

Unplugging the membrane connector

1. Loosen the dark clamping frame of the socket by pushing it up with your fingernails until it engages in its upper, unlocked position (Fig. left).
2. Carefully pull off the membrane connector upward.

Plugging in the membrane connector

1. With the clamping frame in the upper position, carefully plug the membrane connector into the socket.
2. Lock it in place by pushing down the clamping frame (Figure right).

1.4 Networking

1.4.1 System settings

1.4.1.1 Settings for SINUMERIK solution line

Range of validity

This description is valid for:

- NCU 7x0.3 PN with NCU-Basesoftware (Linux-based)
- PCU 50.5 with PCU-Basesoftware (Windows XP, Windows 7)

Introduction

This manual describes the structure and commissioning of the system network with SINUMERIK solution line control and operator components with Ethernet-based communication. The fundamentals of the system network are described first, details and special cases are described in subsequent chapters.

Fundamentals

The system network for SINUMERIK solution line is structured as a star topology with a central Ethernet switch, to which all Ethernet-based components of the system are connected.

For an NCU the connection is executed via the X120 Ethernet socket, for PCU it is executed via the "Ethernet 2" connection. There is no default for all other components with two Ethernet connections. These components have an internal 2-port switch and may be used to connect an additional operator component. Thus in this case there can be deviation from the strict star topology.

System network

In the system network the IP address 192.168.214.xxx with subnet mask 255.255.255.0 is pre-selected. Here there is precisely one DHCP server with DNS that can run on one NCU or one PCU. The server ensures assignment of IP addresses to the Ethernet components in the system network (DHCP clients) from a specified address band.

The following rules apply for assignment of IP addresses in the system network:

- For all NCUs and PCUs the commissioning engineer assigns fixed IP addresses in the associated address bands, as well as appropriate computer names (host names). All other (operator) components are automatically assigned an IP address from the DHCP server. Its name is generated automatically (for MCP, MPP, HT 8), or is entered at commissioning (TCU).
- If there are multiple NCU and/or PCU in the system network the system automatically (depending on the start-up sequence) specifies the DHCP server and automatically ensures synchronization of all necessary data so that the next time the system boots any other NCU or PCU could take on the role of DHCP server. However it is a good idea to specify a DHCP master. This is an NCU or PCU in the system network that is available at each system boot and which regularly takes over the task of the DHCP server and DNS server. Synchronization of data takes place in any event so that any other NCU or PCU can take over this task. All non-master NCU / PCU wait in the system boot an adjustable length of time for availability of the master.

Note

In a system network, on a boot server respectively - i.e. the NCU or PCU which accommodates the active DHCP server - a maximum of 30 operator stations may be operated simultaneously with a TCU.

A maximum of 10 operator stations with a TCU may connect up simultaneously with the same HMI application when powering up.

Connection to a company network

Each NCU can be connected via X130, and each PCU can be connected via "Ethernet 1" to the company network. The company network is used to exchange operating software with servers or to execute part-programs directly from servers in the company network. Company network and system network should always be logically and also physically separated.

Service interface X127

The service interface X127 of the NCU is used for direct connection of a PG/PC for service purposes. Here access with STEP 7 to the PLC, and with NCU 7x0.3 PN also to PROFINET is possible.

With direct connection (peer-to-peer) of a PG/PC to X127 it is absolutely necessary that the PG is operated as a DHCP client.

1.4.1.2 System boot with system network

System behavior at boot

As of NCU system software V2.4 SP1 and PCU-Basesoftware V8.1, system boot behavior is based on the following principle:

- For configuration of an NCU 7x0 with a PU 50, the default for a network configuration is as follows: The NCU keeps the default IP address 192.168.214.1 on X120, the PCU 50 keeps the default IP address 192.168.214.241 on Eth2.
- For a configuration of more than 1 NCU 7x0 without PCU, with one or several PCU 50, then a differentiation must be made between two cases:
 - At boot automatically all address conflicts and DHCP conflicts are resolved and the system is ready for operation. In this configuration there is **no** guarantee that all NCUs and PCUs will always receive the same IP address at each system boot.
 - If in the user's view there is a requirement that all NCUs, and possibly also the PCUs, get a defined constant IP address at each boot, for example because the IP address is entered in the respective PLC program, then the user must configure a fixed IP address for each NCU 7x0/PCU 50 in question, in the basesys.ini file.
- The user **can** specify a DHCP master in the basesys.ini file.
- Assigning names:
 - The user should assign meaningful names for all NCUs in the basesys.ini file; if not the names will be generated automatically.
 - A PCU 50 always has a computer name that can be changed as needed.
- The IP addresses of TCUs and MCPs are freely assigned within the specified address band at each boot. The MCPs are identified in the PLC via their DIP switch setting.

Using DNS name service

Availability of the DNS (Domain Name System) name service offers the following advantages for system network administration:

- The name service enables easier configuration with names instead of IP addresses for management of operating units: All components in the system network can be addressed via a symbolic computer name. This name can to some extent be freely assigned, to some extent it is derived automatically from a DIP switch setting (MCP, MPP, EKS, HT 8, HT 2).
- A computer node in the system network (NCU, PCU, TCU, MCP, HT 8, etc.) can be addressed solely through assignment of the IP address, either via a freely selectable name or via an internally generated name in the system network, and thus becomes independent from its network address in the system network. Thus a change in the network address does not necessarily necessitate a series of additional setting changes.
- In addition, the name service is used by the system for address resolution for MCP/MPP, direct keys, and EKS when changing the user authorization.

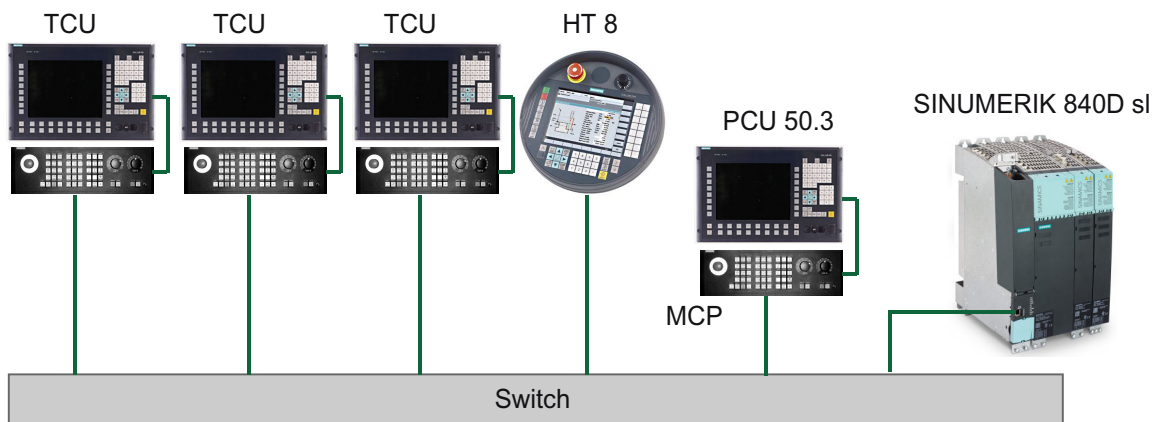
1.4.1.3 Thin Client Unit (TCU)

TCU overview

The Thin Client Unit (TCU) for the distributed configuration permits spatial separation of the SINUMERIK operator panel front (OP/TP) and the SINUMERIK PCU or NCU. On the SINUMERIK solution line, the TCU is used to display the user interface of the PCU 50 or the NCU.

It is possible to connect one TCU to several PCUs/NCUs. All TCUs and PCUs/NCUs that are connected to one another via a switch form the "system network". The user interface of a PCU/NCU is copied to several OPs with one TCU each. In other words, all of the TCUs display the same screen. Operator actions can only be performed on one TCU at a time. This TCU then has user authorization. The PCU can also have its own OP connected directly to it.

The following diagram shows a **configuration example** for a distributed topology:



The mobile SINUMERIK HT 8 handheld terminal works on the thin client principle and combines the functions of an operator panel with a machine control panel.

The configuration and cabling of the whole plant system based on a permissible configuration is described in the chapter 'Network configurations'.

Supplementary conditions

For operation of a TCU:

- In the system network, the number of **active** TCUs is limited:
 - a maximum of 2 TCUs: NCU 710.3 PN
 - a maximum of 4 TCUs: NCU 720.3 PN or NCU 730.3 PN
 - a maximum of 4 TCUs: PCU

Any number of TCUs can be operated in the system network.

- CompactFlash Cards cannot be used on the TCU.
- A 16 bit or 32 bit depth of color setting may be selected.
- If a PC keyboard is connected to the TCU, it is not possible to ensure that all special keys, e.g., multi-media keys, will be transferred to the software of the NCU / PCU.

- Machine control panels connected via a PROFIBUS network are not supported for switchover.
- Distributed memory media that are connected to the TCU via USB can be used.

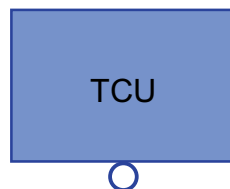
1.4.1.4 Factory default settings

Meaning of the symbols:

- Eth 1 as a DHCP client
- Eth 2 as a DHCP server
- Eth 2 with a fixed IP address

Preconfiguration of the TCU

The TCU is configured as a DHCP client and primarily accepts IP addresses from SINUMERIK components, from the DHCP server of such components that are inherent to SINUMERIK, for example, an NCU at X120 or a PCU on the system network or from a default DHCP server. The behavior of the TCU cannot be modified here.

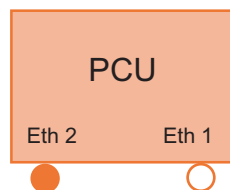


A TCU is a SINUMERIK DHCP client.
The TCU has a single Ethernet connection.

A TCU executes a boot via the network. The boot server is the computer node from which the TCU also obtains its IP address.

Pre-configuration of the PCU

A PCU has two Ethernet interfaces with default settings suitable for use with SINUMERIK solution line:



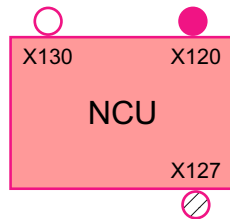
Eth 1 is pre-selected as a default DHCP client for connection to a company network.

Eth 2 is pre-selected as a SINUMERIK DHCP server for connection to a system network. On Eth 2 the fixed IP address 192.168.214.241 is pre-selected.

Preconfiguration of the NCU

On the X120, the NCU is preconfigured for the SINUMERIK DHCP protocol. The NCU is pre-selected here as a SINUMERIK DHCP server. On X120, the NCU occupies the fixed IP address 192.168.214.1 with the subnet mask 255.255.255.0 in its capacity as a DHCP server. The DHCP server of the NCU assigns IP addresses from the range 192.168.214.10 – 192.168.214.239 to the DHCP clients. The behavior of the NCU on X120 cannot be modified.

Restricting the available address band that is managed by the DHCP server of the NCU frees up IP addresses 192.168.214.2 to 192.168.214.9 as well as addresses 192.168.214.241 to 192.168.214.254 for network nodes with fixed IP addresses.



The NCU has three Ethernet connections:

- X120 to connect to the system network with an active DHCP server (Eth 0)
- X130 to connect to the company network as a default DHCP client (Eth 1)
- X127 as a service connection with an active DHCP server (Ibn 0)

On X130, the NCU is set as a default DHCP client for the address reference from a company network. The IP address received here is specified by the DHCP server from the company network.

On X127, an NCU is a standard DHCP server (in contrast to the SINUMERIK DHCP server). On X127, the NCU has the fixed IP address 192.168.215.1 with the subnet mask 255.255.255.224). The IP addresses 192.168.215.2 – 192.168.215.23 are dynamically assigned to the DHCP clients. The range 192.168.215.24 - 192.168.215.30 is reserved, and can be used by stations on the network with a fixed IP address, e.g. by a modem.

Reserved IP addresses for NCU and PCU

The following defaults apply on delivery:

- Connection to the system network with subnet mask 255.255.255.0:

IP address	Network station	Remark
192.168.214.1	NCU on X120	Default
192.168.214.2 – 9	For additional NCUs with a fixed IP address on the system network	Unassigned
192.168.214.10 – 239	For additional TCUs, subsequently for additional PCUs, NCUs, MCPs, MPPs	DHCP clients
192.168.214.240	Reserved for EKS (Electronic Key System)	Default
192.168.214.241	Fixed IP address of the PCU on Eth 2	Default
192.168.214.242 – 249	For additional PCUs with a fixed IP address	Unassigned
192.168.214.250 – 254	For PGs with a fixed IP address (service connection)	Unassigned

- Service connection with subnet mask 255.255.255.224:

IP address	Network station	Remark
192.168.215.1	NCU on X127	Default
192.168.215.2 – 23	for service purposes with PG, PC	DHCP clients
192.168.215.24 – 30	fixed IP address, for example for a modem	Unassigned

1.4.2 Commissioning TCU

1.4.2.1 Using the TCU's main menu

Key assignment

Functions of the keys and softkeys in the "Operator panel service system":

Softkey	Key on OP	External key-board	Description
	HSK1	<F1>	Moves the cursor down a row
	HSK2	<F2>	Moves the cursor up a row
Page 	HSK3	<F3>	Moves the cursor down a page
Page 	HSK4	<F4>	Moves the cursor up a page
Char 	HSK5	<F5>	Inserts text or digits
Char 	HSK6	<F6>	Inserts text or digits
Cancel	VSK7	←	Cancel / Return
Ok	VSK8	→	OK / Confirm
---		Pos1	Moves the cursor to the top row
---		End	Moves the cursor to the bottom row

Exceptions to the above are mainly the result of input fields. Where these are present, the left/right cursor keys move the input cursor rather than performing an OK/cancel function. The Return key takes you to the next field (like the "down" key) rather than closing the entire dialog with OK. There are also Backspace (deletes character to the left) and Delete (deletes character to the right) keys for editing text and numbers. The F5, F6, Backspace, Delete, and Select keys (between the cursor keys on the panel) can be used to switch between Yes/No fields.

Touch panels without any additional keys still have a special function which allows you to edit letters and numbers with HSK5/HSK6 by moving characters forwards or backwards. With a touch screen, you can activate all the softkeys and even select rows in a menu simply by touching them.

See also: How to calibrate a touch panel (Page 61)

"Main menu"



The dialog "Main menu (TCU1)" is started with the menu back key and the key <MENU SELECT>:

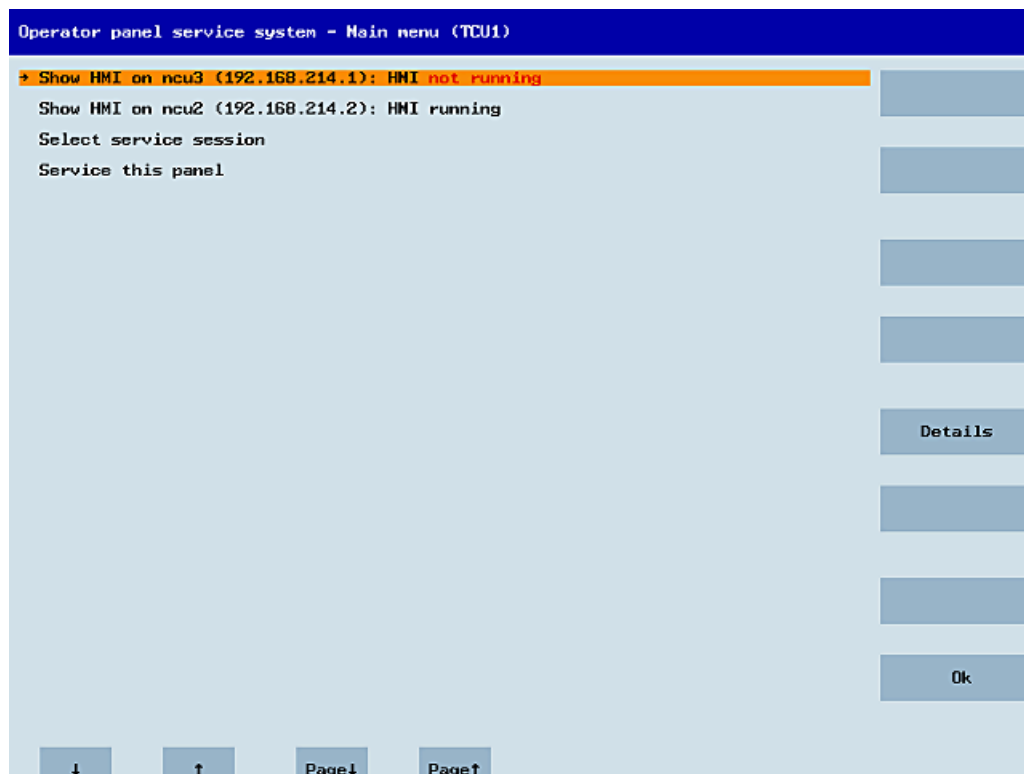


Figure 1-9 TCU menu: Main menu

The main menu contains:

- A "Main menu" title followed by the TCU name in brackets
- A central area listing the servers from config.ini. This is followed by two more fixed items, "Select service session" and "Service this panel".
 - The penultimate menu item, "Select service session", triggers a server scan which detects all the VNC servers in the local (system) network. These are then displayed in a session menu which largely reflects the main menu.
 - The last menu item on the main menu, "Service this panel", opens the "Service menu for operator panel" submenu.
- The right-hand side of the menu has a column containing 8 softkeys for use on a context-specific basis.
- The lower section of the menu has a row of 4 softkeys for navigating with the cursor.
- There is an error line for displaying error messages directly above the row of softkeys. Transient status messages also occasionally appear in this line.
- There is a further message line above this error line. The contents of this line can be set from the servers using HWS commands.

"Details" softkey

The following connection data for the selected device appears when the "Details" softkey is pressed:

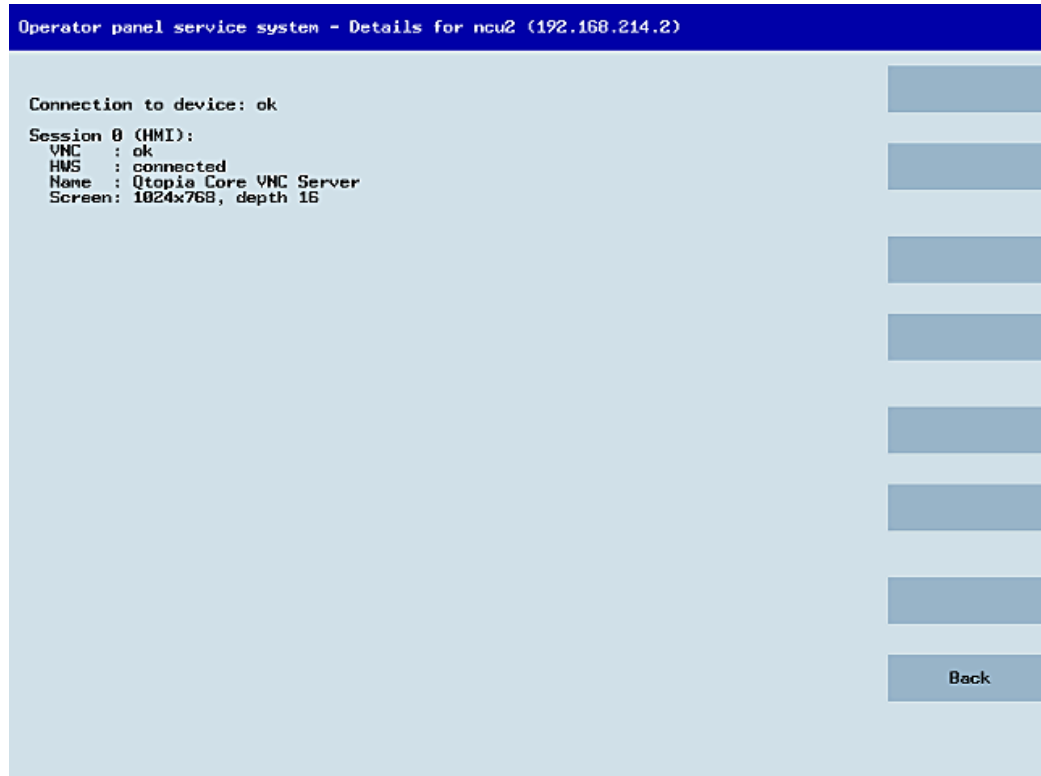


Figure 1-10 TCU menu: Connection data

1.4.2.2 Using additional TCU menus

"Service sessions" dialog

When "Select service session" is selected from the main menu, the resulting process begins by triggering a server scan:

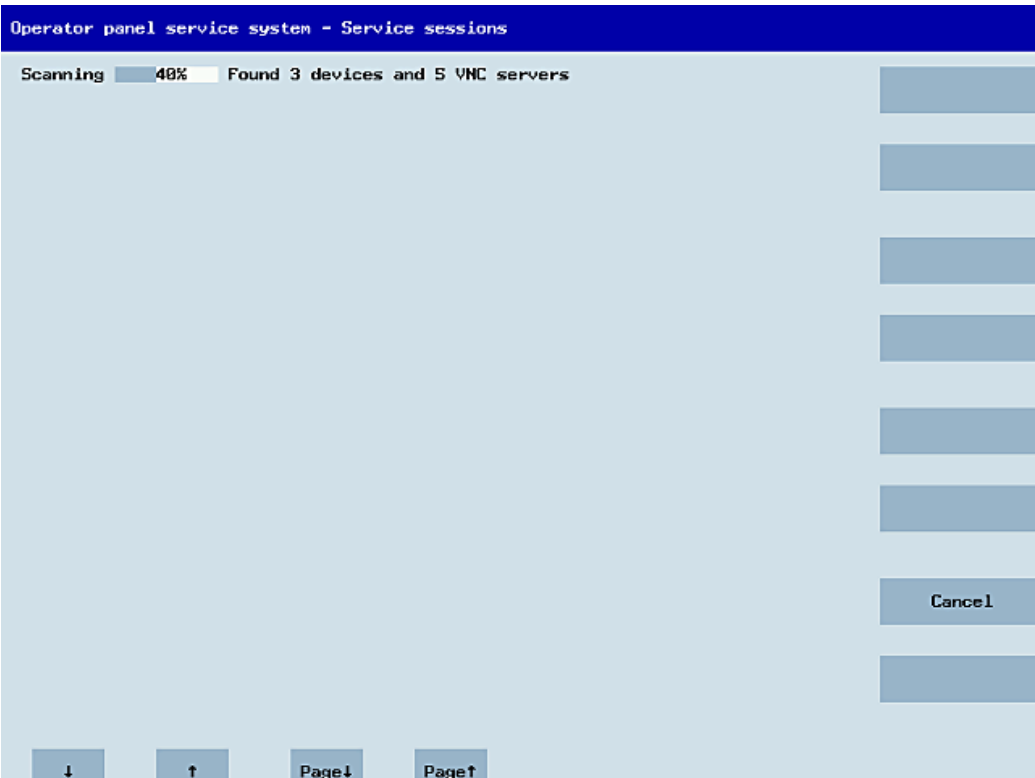


Figure 1-11 TCU menu: Scanning

After this, the following dialog appears:

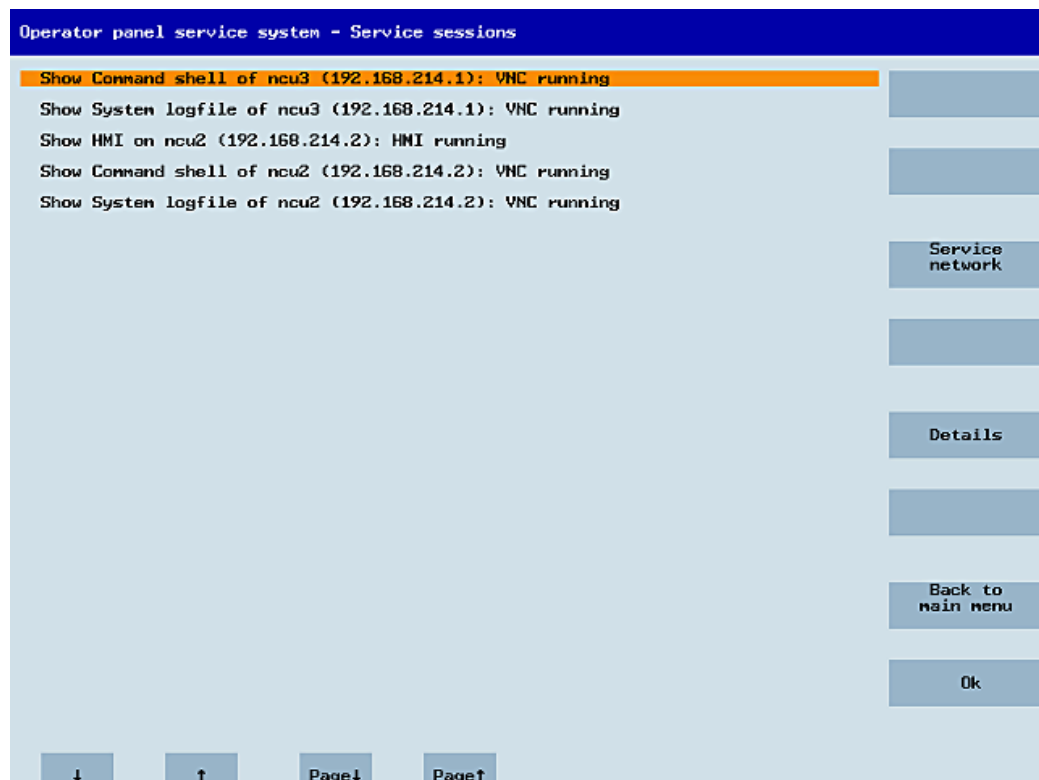


Figure 1-12 TCU menu: Active sessions

Central area with the server list:

The individual server lines contain either "Show WHAT on NAME (IP)" or the IP address only where the name is unknown.

Session number	VNC server
Session 0	HMI
Session 4	Command shell
Session 5	System logfile
Session 6	System Network Center (SNC)
...	
Session <N>	other server

These details are followed by a status message regarding the accessibility of the VNC server. "Connection not ok" appears if it is already impossible to access the VNC server from the IP side (if switched off, for example). If it can be accessed, a message shows whether an HMI-VNC server is also accessible ("HMI running/not running").

The VSK8, Return or right cursor keys can be used to launch a VNC viewer for the selected server.

Connection status:

Further details on the connection status can be called with the "Details" softkey. In the next dialog, "not ok" or "not running" are accompanied by an additional error message with more

precise details on the reason for the loss of function. With more favorable scenarios, the session name for the VNC server will also be specified along with its resolution.

The connection and HMI status are monitored on a regular basis in the background. This may mean that these details change spontaneously if a change is made on the relevant server (for example, it may be switched off, the HMI may become available, etc.).

"Service menu for operator panel (TCU)" dialog

The following dialog appears when "Service this panel" is selected from the main menu:

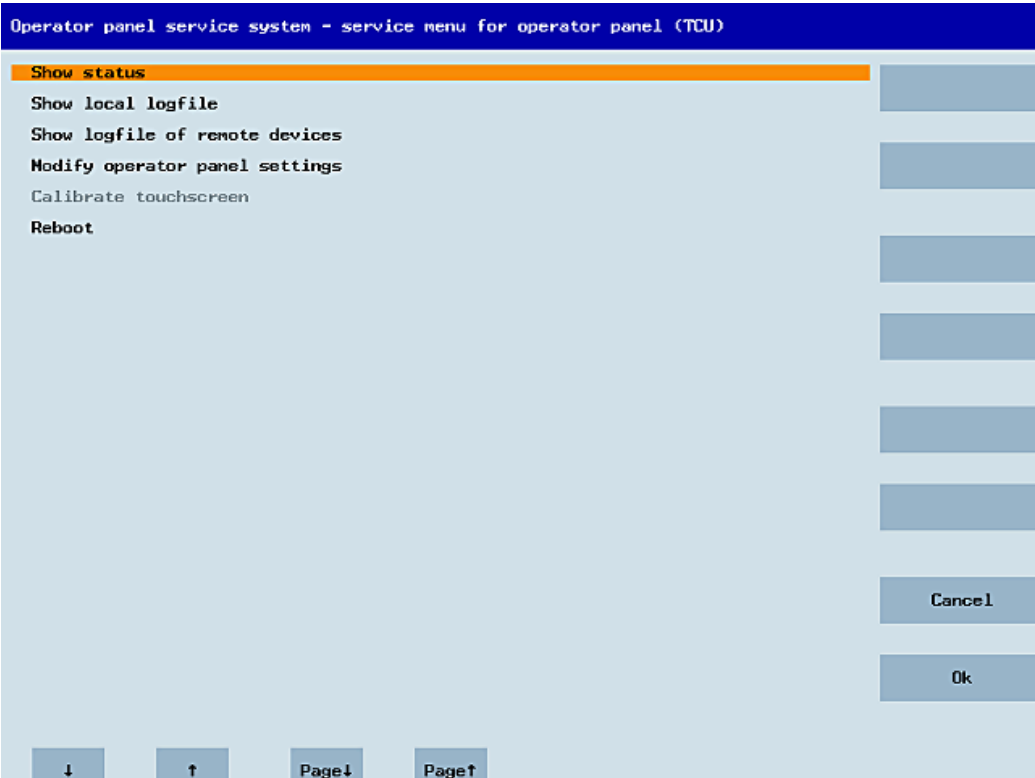


Figure 1-13 TCU menu: Service menu

The following menu items are available here:

- "Show status" displays status information including the software version, HW information, TCU network data, and the contents of the config.ini.

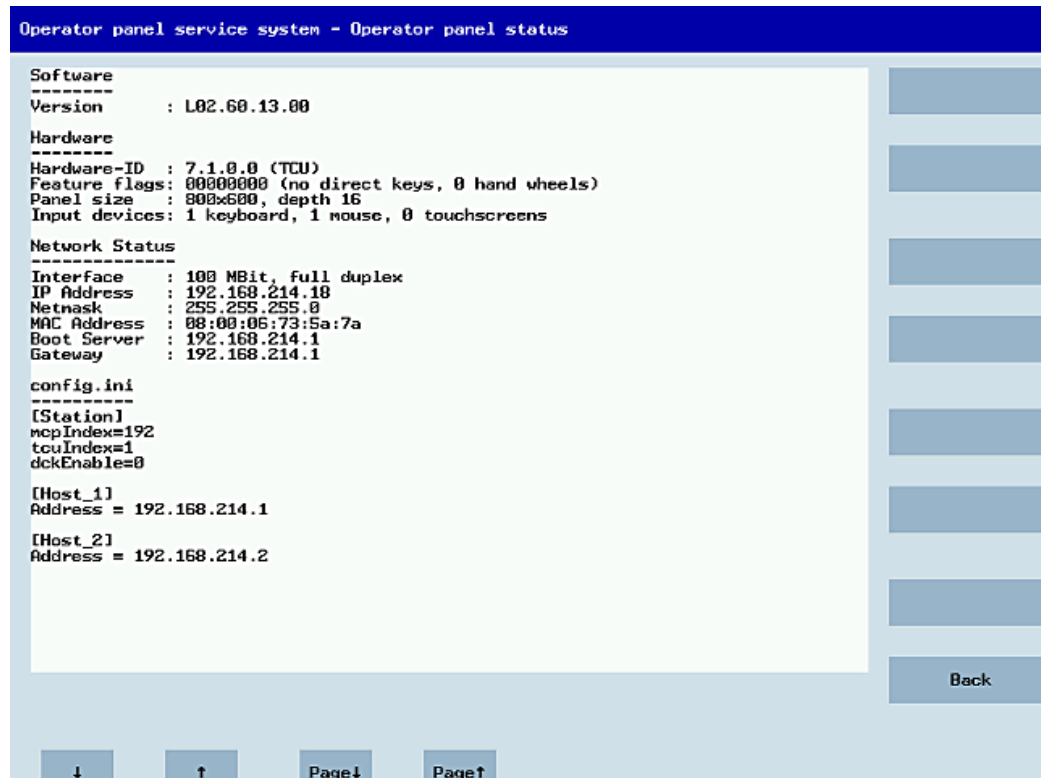


Figure 1-14 TCU menu: OP status

- "Show local logfile" displays a filtered version of the system logfile in the `/var/log/messages` directory containing local TCU messages only. Syslog messages received via the network are not displayed.

```

Operator panel service system - Local logfile

00:06:06 syslogd started: BusyBox v1.00 (2008.10.14-21:56+0000)
00:06:06 kernel: process `syslogd' is using obsolete setsockopt SO_BSDCOMPAT
00:06:06 udhcpd[821]: udhcp client (v0.9.7) started
00:06:08 udhcpd[821]: Lease of 192.168.214.18 obtained, lease time 864000
00:06:08 dhcpcd: eth0 bound to 192.168.214.18 (server: 192.168.214.1)
00:06:09 ntpd[973]: using NTP server ? (192.168.214.1)
00:06:09 ntpd[973]: NTP server is unsynchronized
00:06:12 sysinit: basic system initialization finished
00:06:13 kernel: i2c adapter i2c-0: timeout in state quick
00:06:13 tcodatad[1076]: i2c_write_1b: Input/output error
00:06:13 tcodatad[1076]: have eeprom: failure, assuming no EEPROM
00:06:13 tcodatad[1076]: no EEPROM and no CF card, nothing to do
00:06:13 sysinit: starting subsystem /system/vncviewer: VNC Viewer version 02.60.+
10.00
00:06:14 startvnc[1186]: waiting for default server (192.168.214.1:0) being avail+
able
00:06:14 startvnc[1186]: HMS connection to 192.168.214.2:0 established
00:06:14 startvnc[1186]: HMS connection to 192.168.214.1:0 established
00:06:31 ntpd[973]: NTP server is unsynchronized
00:06:47 lshd[1047]: lshd: publickey authentication for user root succeeded.
00:06:53 ntpd[973]: NTP server is unsynchronized
00:07:19 ntpd[973]: NTP server is unsynchronized
00:07:15 startvnc[1186]: default server connection aborted manually
00:07:37 ntpd[973]: NTP server is unsynchronized
00:07:59 ntpd[973]: NTP server is unsynchronized
00:08:21 ntpd[973]: NTP server is unsynchronized
00:08:25 lshd[1047]: lshd: publickey authentication for user root succeeded.
00:08:43 ntpd[973]: NTP server is unsynchronized
00:09:05 ntpd[973]: NTP server is unsynchronized
00:09:13 lshd[1047]: lshd: publickey authentication for user root succeeded.
00:09:27 ntpd[973]: NTP server is unsynchronized
00:09:49 ntpd[973]: no acceptable packets received
00:12:20 lshd[1047]: lshd: publickey authentication for user root succeeded.
00:13:20 lshd[1047]: lshd: publickey authentication for user root succeeded.
00:14:02 lshd[1047]: lshd: publickey authentication for user root succeeded.
00:14:39 last message repeated 1 times
  
```

Back

↓ ↑ Page↓ Page↑

Figure 1-15 TCU menu: Local logfile

- "Show logfile of remote devices" displays the logfile of the other devices in the network: The syslog messages of devices in the system network which send syslog messages by broadcast, such as NCU 7x0, ...
- "Modify operator panel settings" calls a further submenu. Please refer to the next section.
- "Calibrate touch screen" is only active if there is a touch screen. This menu item recalibrates the touch screen.
- "Reboot" restarts the TCU.

Note

Where the contents of a line exceed the space available, the remaining text runs onto the next line so that you do not have to waste time scrolling across. When this occurs, the line has a right-facing arrow at its right edge.

"Modify settings for operator panel (TCU)" dialog

The following dialog appears when "Modify settings" is selected from the main menu:

Operator panel service system - Modify settings for operator panel (TCU)

Operator panel index - TCU [0-255]	1
Machine control panel address - MCP [0-255]	192
Electronic key system index - EKS [0-255]	0
Enable direct keys	No

Ok

↓ ↑ Char↓ Char↑

Figure 1-16 TCU menu: Settings

The central area is for setting the TCU parameters:

- "HT 8 individual mode" (yes/no)
This is only visible with HT 8, and is used to switch between Auto Mode and Individual Mode.
There is no need to make any settings if an HT 8 is in Auto Mode, as the name is determined automatically: ("DIP<n>") the MCP address and TCU index are determined by the DIP setting ("DIP<n>").
It is possible, however, that another device is registered for the name selected. Such situations may only prove to be temporary, as is the case when DIP settings or two HT 8 have been confused. For this reason, this status is not reported as an error immediately, but identified as a possible problem instead ("potential name/DIP setting collision"). The text will only read ("Name/DIP settings collision") if the situation remains unchanged after some time has elapsed.
The process itself is unaffected, as the changes only relate to how the warning or error is displayed. The explanatory text informs the user that they have probably assigned the same DIP number twice and suggests they change one of them before rebooting the HT 8.
- "Operator panel index - TCU" (0-255)"
This specifies the TCU index. It matches the [Station] tculIndex setting from the config.ini file.

- "Machine control panel address - MCP" (0-255)
This specifies the address of the associated MCP. It matches the [Station] mcplIndex setting from config.ini.
- "Electronic key system index - EKS" (0-255)"
This specifies the index of the associated EKS. It matches the [Station] eksIndex setting from config.ini.
- "Enable direct keys" (yes/no)
This specifies whether direct keys (if present) should communicate with the PLC (yes) or be treated as ordinary keys (no).

"OK" saves any modified values to the config.ini file or to the Flashstore (HT 8 individual mode).

Parameters for the "config.ini" file

Two steps need to be performed:

1. Select "New" or "Replacement for existing panel".
2. Select what is to be replaced.

When an unknown TCU (i.e. not yet registered with the boot server) is started, a selection menu containing both the "New" and "Replacement for existing panel" items will appear. The accessibility of all the registered TCUs is tested in the background.

The status of this test process appears in the message line: "(0/3 panels inactive)".

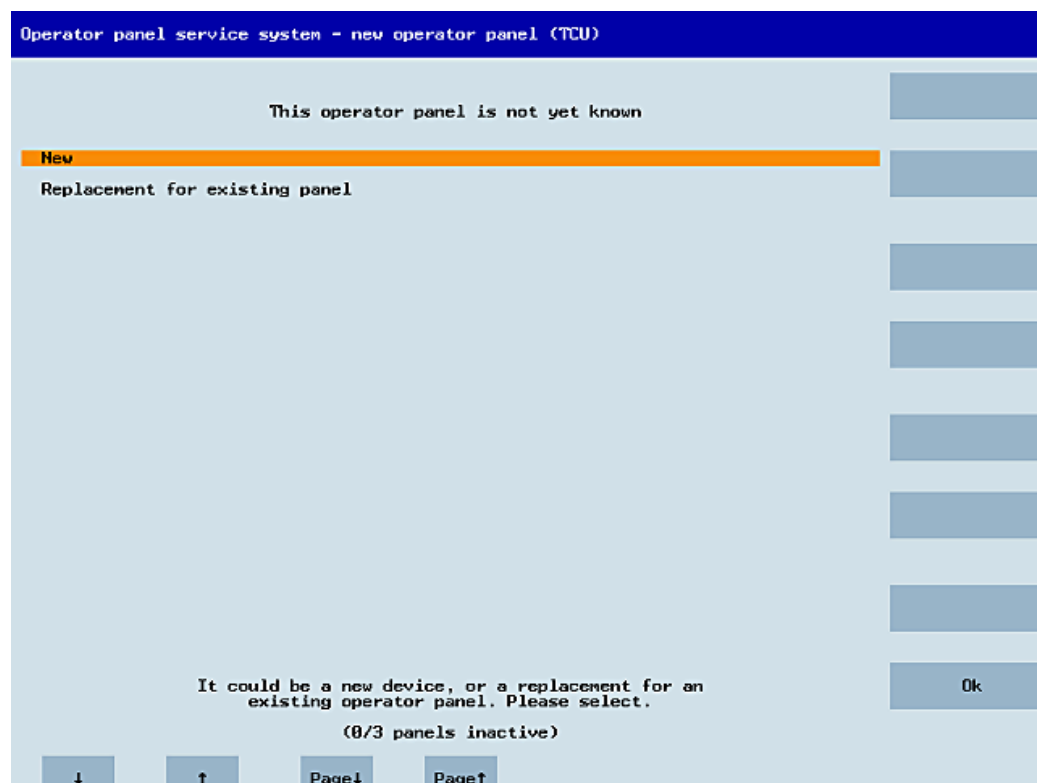


Figure 1-17 TCU menu: New TCU

If all the TCUs are active, the new one cannot be a replacement. The system will then automatically switch to the name assignment phase after a set period of time has elapsed.

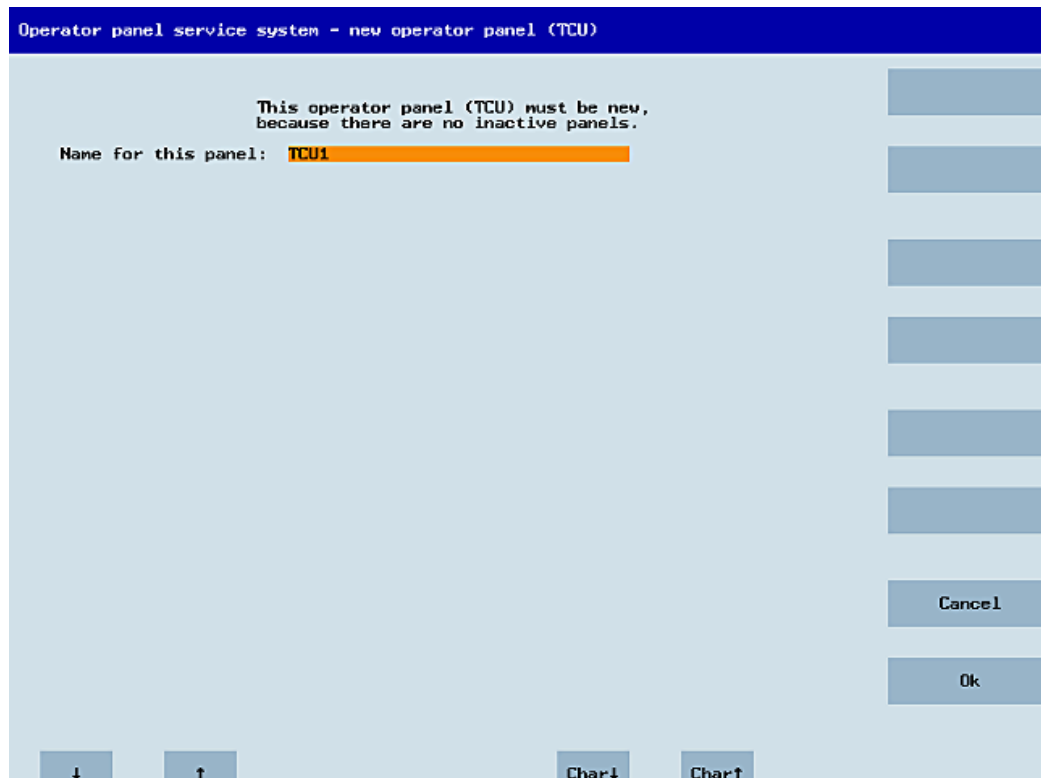


Figure 1-18 TCU menu: Name of TCU

Replacing a device

If "Replacement" is selected, all the registered TCUs will appear in a selection menu. Those which are active in the network will be grayed out. (As these are functioning, there should be no question of replacing them.) The cursor automatically defaults to the first row for selection.

As the accessibility test is still running in the background, the active status of the rows may change if panels are switched on or off.

If a name is ultimately chosen, it will be applied to the new TCU along with the associated saved settings.

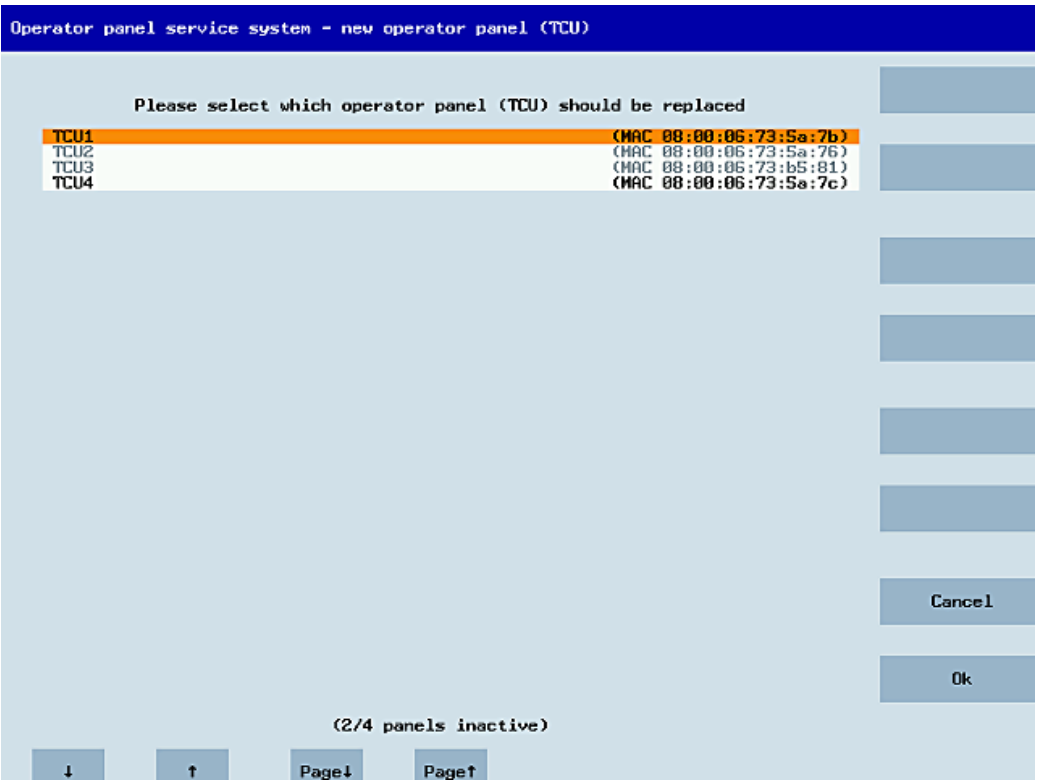


Figure 1-19 TCU menu: Spare TCU

Assigning a name

If, as described above, the system automatically follows the "New" path, an additional message will appear: "This operator panel (TCU) must be new, because there are no inactive panels." This message will not appear if "New" is selected manually.

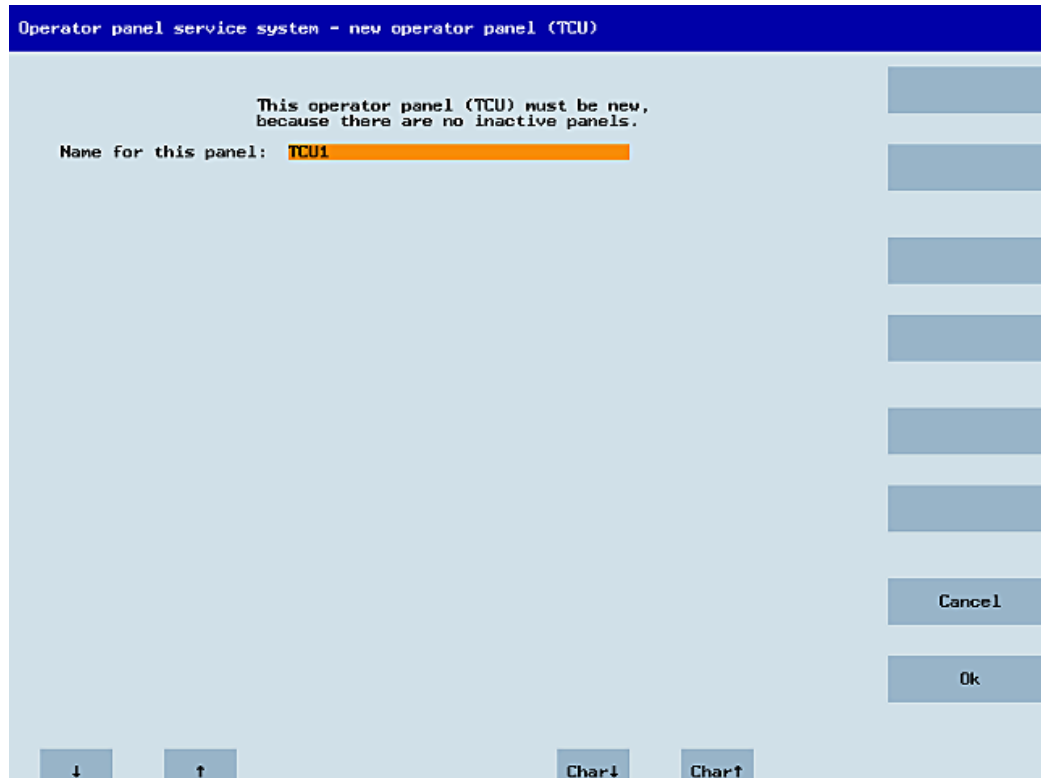


Figure 1-20 TCU menu: Name of TCU

An available TCU name is suggested in the input field, although the user is able to change this. The default name is "TCU<N>", where <N> is the lowest number yet to be used. If, however, the name is already allocated after the OK softkey has been pressed (which may happen if a number of TCUs log on at the same time) and the suggestion has not changed, a new and unused name will be specified.

If the name selected was still available, this will now be allocated, and the TCU settings can still be adapted if required. To enable any changes to be made, a new dialog will appear in which all the parameters have been pre-assigned their default values. You can make any changes you like or just select "OK" to accept the existing values.

1.4.2.3 How to register a TCU on the system network

Preconditions

The boot server (NCU or PCU 50) defined in the system network as a DHCP master, must be switched on and be available in the network.

Sequence for a TCU

Procedure:

- 1. Connect TCU.
This opens the dialog "New operator panel (TCU)".
- 2. Select "New" to connect a new TCU and "OK" to confirm.
- 3. In the next dialog, accept the name suggested by the system or enter a name and confirm this with "OK".

The following parameters are pre-selected for the TCU:

Operator panel index - TCU [0-255]	1
Machine control panel address - MCP [0-255]	192
Electronic key system index - EKS [0-255]	0
Enable direct keys	No

- 4. Restart the TCU to apply the new settings.
- 5. If you want to change the parameters, select "Main menu" → "Service this panel" → "Modify operator panel settings".

Sequence for the HT 8

Procedure:

1. Connect HT 8 to a connection module and calibrate the touch screen.
Additional softkeys are available for convenient touch panel operation:
 - "OK" has the same effect as the <INPUT> key
 - Select "DEF" to save the "Default" settings.
 - "Edit" has the same effect as the <F10> or <MENU SELECT> key.
2. Select HT 8 Individual Mode:
According to the default setting for an HT 8, "HT 8 Individual Mode" is deselected with "No". This means "Auto" mode is activated for automatic detection in the system network. The HT 8 is automatically detected based on its name "DIP_". If "HT 8 Individual Mode" is activated with "Yes", the HT 8 is identified by its MAC address on the system network.
3. For an HT 8, confirm the "DIP..." name proposed by the system or adapt the name. You can select any other characters.
Press the <INPUT> key to apply the following values as default settings for the HT 8:

HT8 Individual Mode	No
Operator panel index - TCU [0-255]	10
Machine control panel address - MCP [0-255]	10
Electronic key system index - EKS [0-255]	0
Enable direct keys	No

The following message will then appear: "New TCU 'DIP10' registered."

Note

The TCU index is used to evaluate the direct keys. Direct keys can only be activated by appropriate devices. For an HT 8 the TCU index cannot be set, but is assigned by the system.

Activate direct keys

The signals from pressing the direct keys are sent directly to the PLC. In the PLC, the keys appear as 16 digital inputs.

Additional information on programming the PLC is provided in:

References: Function manual basic functions, basic PLC program (P3 sl)

Definition: Operator panel

The term operator panel designates a unit that consists of an OP/TP, a TCU or PCU and a machine control panel (MCP), that are connected to each other via Ethernet.

All TCUs and PCU 50 can be used along with OP/TP with "integrated TCU", e.g.: OP 08T, OP 015T, TP 015AT.

Specifying settings without machine control panel

If a PCU or a TCU has no Machine Control Panel (MCP), you must set one of the two following options:

- MCP address = 0 or no entry
After the change of user authorization, there is no switchover of the machine control panel; the previously active MCP remains active.
- MCP address = 255
If the user authorization is transferred to this PCU or TCU, the previous machine control panel is deactivated and there is no active machine control panel from this point on.

Connecting a replacement TCU

Procedure:

1. Connect the new TCU.

The following dialog lists the TCUs on the system network along with their "active" or "inactive" status.

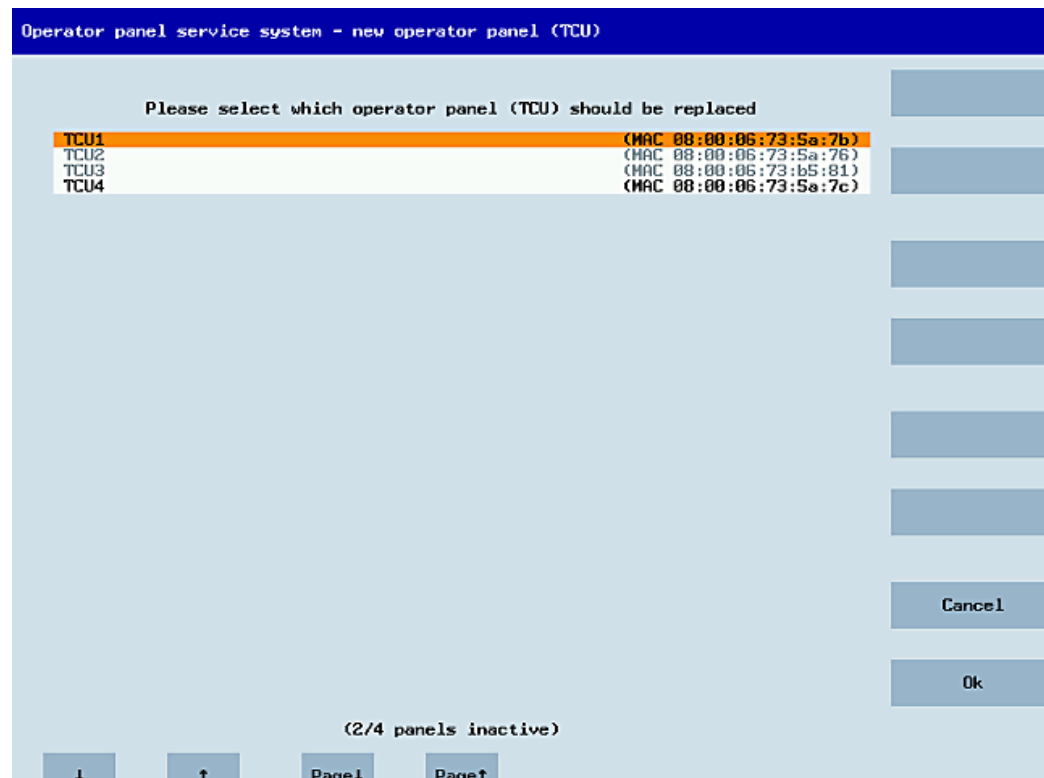


Figure 1-21 TCU menu: New operator panel (TCU)

2. Select the name previously assigned to the faulty TCU from the "New operator panel (TCU)" dialog. As a result, the new TCU is recognized on the network and acquires all of the configuration settings from the TCU that has been replaced.

See also

How to calibrate a touch panel (Page 61)

1.4.2.4 How to calibrate a touch panel**NOTICE****Service life of the touch screen**

Do not touch the operating elements of the display with pointed or hard objects. This may considerably reduce their service lives.

With each HT 8-device, a Touchpen (order no. 6FC5348-0AA08-4AA0) is delivered. This should be used for calibration purposes and during operation.

Calibrate touch screen

The calibration is automatically started after switching on HT 8.

1. Follow the instructions on the screen:
2. Press the three calibration items one after the other.
This completes the calibration.
3. Press the corresponding horizontal softkey on the touch screen to close the command shell and to re-establish the connection to the desired PCU.

Recalibrate touch screen

Procedure:

1. The key combination below can be used to initiate further TCU calibration during operation, if required: <F9> + <F10>.
This corresponds to the key combination on an OP: Menu back key + <MENU SELECT>.
2. Select the menu item "Calibrate touch screen" to start calibration.

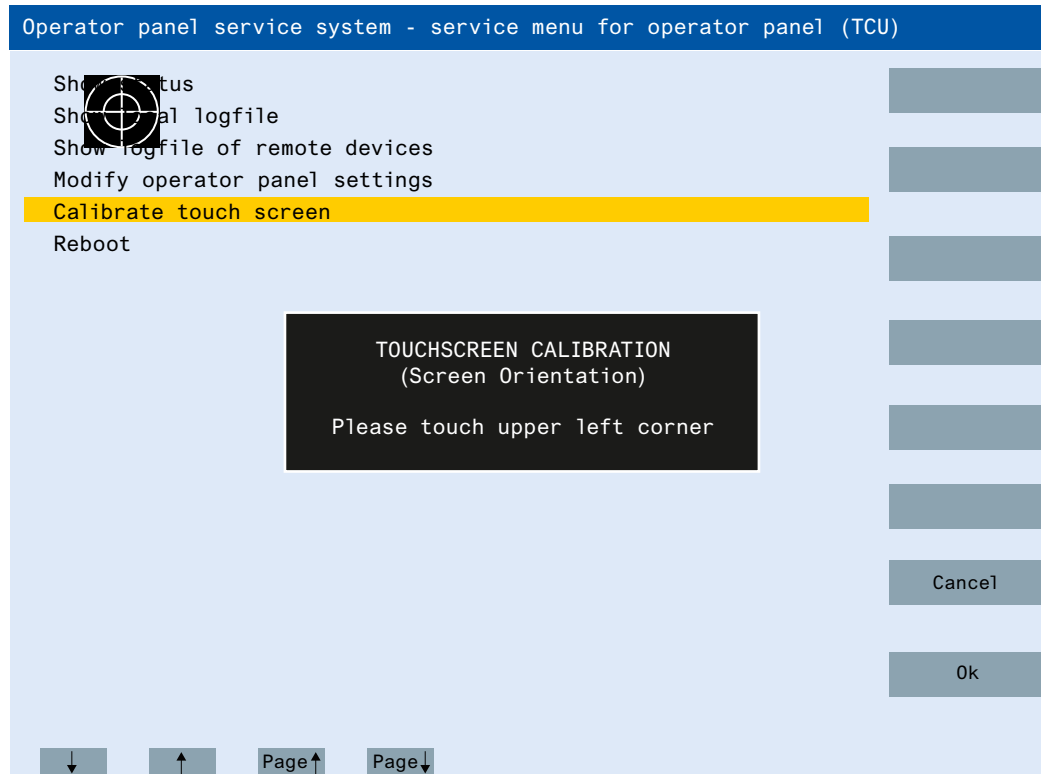


Figure 1-22 HT8 calibrating points

Note

The "Touchware" program, which is available with Windows XP, is deactivated on the TCU.

The calibration process on the HT 8 can alternatively be started with the following key combination: <Recall> + <MENU SELECT> and then the <U> key.

1.4.2.5 Connecting-up the SIMATIC Thin Client Touch Panel

Registration in the system network

The SIMATIC Thin Client Touch Panel behaves just like a TCU when connecting-up. When registering in "Operator Panel Service System" enter a name in the system network. After this, the device is available in the "Service Network Center" with the hardware ID "SIMATIC TC":

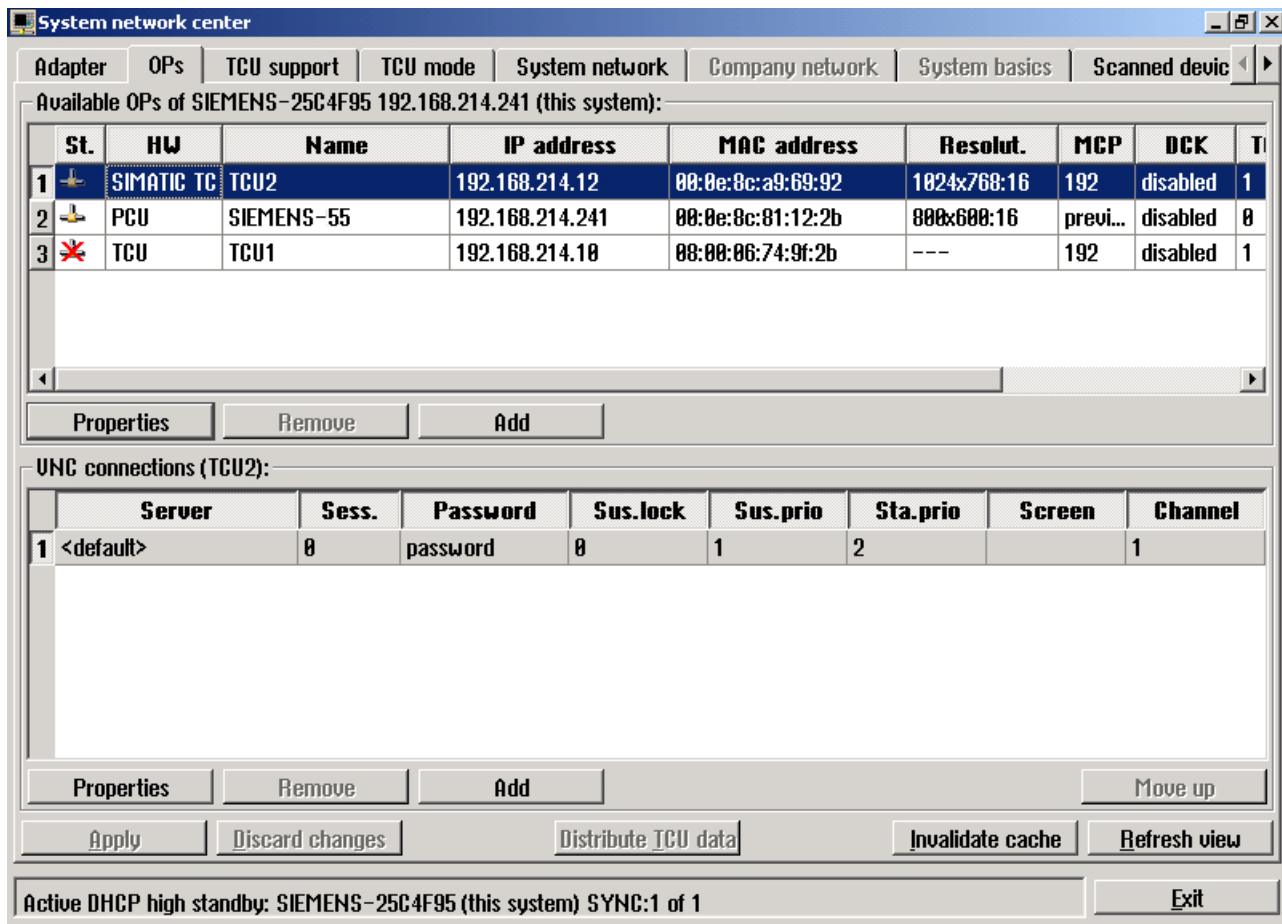


Figure 1-23 SIMATIC Thin Client

Note

The SIMATIC Thin Client Touch Panel has a USB connection at the rear, which behaves just like the USB connection X204 of a TCU.

An external keyboard is recommended for commissioning and to operate the "Operator Panel Service System".

Operating the Touch Panel

To operate the Touch Panel, use the integrated keyboard:

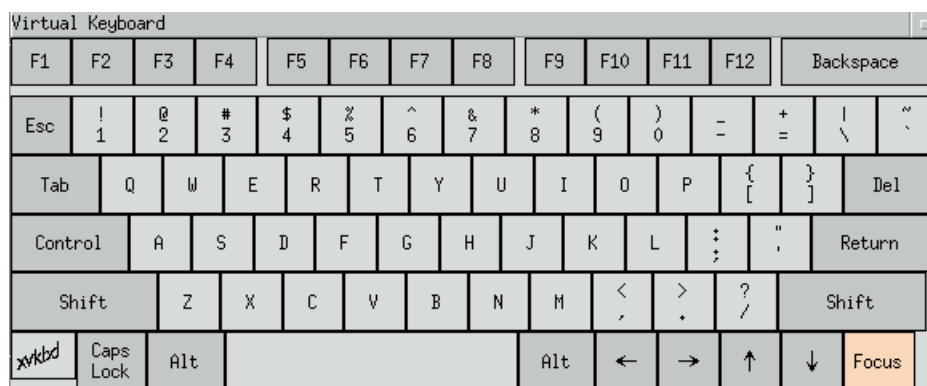


Figure 1-24 Virtual Keyboard

The integrated keyboard is activated using the button to the far right on the start bar.

See also

How to register a TCU on the system network (Page 57)

Using the TCU's main menu (Page 45)

Reference

SIMATIC HMI, Operating instructions: Thin Client, Thin Client PRO

1.4.2.6 This is how you configure the SIMATIC Thin Client Touch Panel

Operating the start bar

The following functions are available in the start bar of the SIMATIC Thin Client:

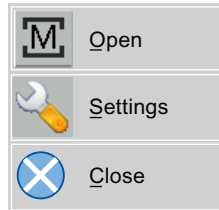
To select the SINUMERIK mode, press the button:



- The following buttons are important for operation as SINUMERIK operator panel:



To configure the SIMATIC Thin Client, press the button "Settings". You therefore open the "Operator panel service system":

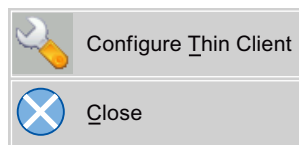


To exit the SINUMERIK mode, press the button "Close".

- To make the configuration settings, press the button:



Select "Configure Thin Client":



To exit the SIMATIC configuration menu, press the button "Close".

- Press the button to activate the integrated keyboard:



Preconditions

To make the following settings, you must be logged on as administrator.

1. Press the "Settings" button:



2. Log on as a administrator using the specified password.

Result: As administrator you can see the complete menu of the SIMATIC Thin Client.

Note

All changes only become effective after pressing the "Enter" button on the "Virtual Keyboard" on the relevant side.

SINUMERIK mode when restarting

In order to return to the SINUMERIK mode automatically after a restart, proceed as follows:

1. In the "Applications" menu, select the "Autostart client application" tab.
2. Select the "SINUMERIK" option.

Calibrate Touch Panel

To calibrate the Touch Panel, proceed as follows:

1. In the "Device setup" menu, select the "Touch calibration" tab.
2. Follow the instructions and touch the Touch Screen at the appropriate points to calibrate.

1.4.2.7 Settings in the "config.ini" file

Boot server

The active boot server (DHCP server) is detected and displayed in the System Network Center (SNC). The boot server accesses this configuration file accordingly. Changes to the config.ini file do not become effective until the relevant TCU or PCU is next booted.

Note

If too much time (> 15 min.) elapses between commands when the user is making entries (e.g. TCU name) as part of the initial TCU log-on process, the time-out error will be suppressed. No error message will appear and the FTP connection will be reopened.

The config.ini file is created in the following directories:

NCU: `/user/common/tcu/<TCU name>/common/tcu/`
 PCU (Windows XP): `F:\user_base\common\tcu\<TCU name>\common\tcu\`
 PCU (Windows 7): `C:\ProgramData\Siemens\MotionControl\user\common\tcu\<TCU name>\common\tcu\`

Configuration of the config.ini file

The config.ini file has the following configuration:

Parameter	Range of values	Default setting	Meaning
[Station]			
tcuIndex = Number	0 ... 255	DIP 1	for TCU
mcpIndex = Number	1 ... 254	DIP 192	for MCP via Industrial Ethernet
eksIndex = Number	0 ... 255	DIP 0	for EKS
dckEnable = 0	0 or 1	0	for DCK
MaxHostIndex = Number		Number of nodes (NCU, PCU or PC) to which you can switch over.	
[DEFAULT]			

Parameter	Range of values	Default setting	Meaning
SessionNumber = Number			
Password = String			
SuspendLock = Number	0 or 1	0	0: No displacement disable 1: Displacement disable set
SuspendPriority = Number	1 ... 10	1	1: Lowest priority 10: Highest priority
StartupPrio = Number			Boot sequence: The lower the number the higher the priority
ScreenOnFocus = String Number		Not relevant	
ChannelOnFocus = Number		Not relevant	
[host_1]			
Address = [hostname IP-Adresse]			From data file structure
SessionNumber = NUMBER			
Password = STRING			
SuspendLock = NUMBER	0 or 1	0	0: No displacement disable 1: Displacement disable set
SuspendPriority = NUMBER	1 ... 10	1	1: Lowest priority 10: Highest priority
StartupActive = 0	0 or 1		Display screen after boot
StartupPrio = NUMBER	0 ... not too high		Boot sequence: The lower the number the higher the priority
ScreenOnFocus = STRING NUMBER		Not relevant	
ChannelOnFocus = NUMBER		Not relevant	
[host_2]			
...			
[host_MaxHostIndex]			
[T2M2N]			
SK1 = ch_grp x	2 x 8 characters	Empty	Softkey inscription (2 lines)
SK2 = ch_grp x	2 x 8 characters	Empty	Softkey inscription (2 lines)
SK3 = ch_grp y	2 x 8 characters	Empty	Softkey inscription (2 lines)
...			
SK32 = ch_grp z	2 x 8 characters	Empty	Softkey inscription (2 lines)
...			

Note

Connecting an MCP via PROFIBUS

If an MCP is connected via PROFIBUS, then the MCP Index = 0 should be set.

Compatibility of software versions

If a "config" file is available for the TCU, the data file structures of older versions are transferred to the config.ini file and the data file structure is then deleted.

Comment

In the config.ini file comment lines are indicated by the # character preceding a line.

1.4.2.8 Settings in the "TCU.ini" file

Directories

The tcu.ini files is created in the following directories:

NCU:	/siemens/system/etc/tcu.ini /user/system/etc/tcu.ini /oem/system/etc/tcu.ini
PCU (Windows XP):	F:\addon_base\system\etc\tcu.ini F:\user_base\system\etc\tcu.ini F:\oem_base\system\etc\tcu.ini
PCU (Windows 7):	C:\ProgramData\Siemens\MotionControl\siemens\System\etc\tcu.ini C:\ProgramData\Siemens\MotionControl\user\System\etc\tcu.ini C:\ProgramData\Siemens\MotionControl\oem\System\etc\tcu.ini

Note

Only the following entries are evaluated by SINUMERIK Operate:

- VNCServer/VetoMode
 - VNCServer/AlarmBoxTimeOut
 - VNCServer/FocusTimeout
 - VNCServer/AdaptResolution
 - VNCServer/MaxActiveTCUs
 - VNCViewer/ExternalViewerSecurityPolicy
-

Structure and content

In the tcu.ini file comment lines are indicated by the # character preceding a line.

[VNCServer]

```
# VETO MODE
# VetoMode enabled:
# VNC server notifies the HMI regie before another
# panel gets the focus.
# VetoMode disabled:
# Focus timeout mode enabled (implicitly; see FOCUS TIMEOUT)
# (0=DISABLE, 1=ENABLE)
VetoMode=1

# FOCUS TIMEOUT
# Guaranteed time period (in sec) a panel can hold the
# focus at least before another panel can get the focus.
# The time period starts from the moment the panel has
# gained the focus.
FocusTimeout=10

# ALARMBOX TIMEOUT
# The time period (in sec) a messagebox is shown (i.e. is
# operable) in the case of VetoMode=1; no meaning else
AlarmBoxTimeOut=5

# RESOLUTION
0 = SYSTEM
1 = AUTO_OP_1 (default)
2 = AUTO_OP_2
3 = AUTO_MON_1
4 = AUTO_MON_2
5 = 640X480
6 = 800X600
7 = 1024X768
8 = 1280X1024

# RESOLUTION ADAPTION
# AdaptResolution enabled:
```

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```
# At system runtime, the system resolution is automatically
# adapted to the resolution of that panel which
# currently owns the focus.
# AdaptResolution disabled:
# The system resolution is set at system startup phase.
# At system runtime, system resolution remains unchanged
# whichever resolution the currently focused panel owns.
# (0=DISABLE, 1=ENABLE)
AdaptResolution=1

# COLOR DEPTH
# The value the system color depth is set at system
# startup phase
# ColorDepth SYSTEM:
# System color depth remains unchanged whichever value
# the color depth is currently set to.
# ColorDepth 16_BIT
# System color depth is set to 16 bit.
# ColorDepth 32_BIT
# System color depth is set to 32 bit.
# (0=SYSTEM, 1=16_BIT, 2=32_BIT)
ColorDepth=1

# INIT TIMEOUT
# Guaranteed time period (in sec) the HMI manager waits
# for VNC server initialization.
InitTimeout=300

# PCU STARTUP TIMEOUT
# Attention: The parameter is only provided for a PCU
# configuration with local attached OP !
#
# The startup phase is completed if this timeout period
# has passed and no registration of a TCU has been car-
# ried out at this time.
```

```
PCUStartupTimeout = 90
```

```
# TCU STARTUP STEP TIME
```

```
# The startup phase starts at the first TCU registration.
```

```
# The startup phase is completed if the TCUStartupStepTime
```

```
# period has passed and no registration of another TCU has
```

```
# been carried out at this time.
```

```
TCUStartupStepTime = 30
```

[VNCViewer]

```
# EXTERNAL VIEWER MAX CONNECTIONS
```

```
# Maximum number of external Viewer Connections (1 or 2)
```

```
# ExternalViewerMaxConnections=2
```

```
ExternalViewerMaxConnections=1
```

```
# EXTERNAL VIEWER SECURITY POLICY
```

```
# The user rights, assigned to an external VNCViewer
```

```
# ExternalViewerSecurityPolicy=0 : no external viewers allowed
```

```
# ExternalViewerSecurityPolicy=1 : Guest Mode (View-Only)
```

```
# ExternalViewerSecurityPolicy=2 : Administrator Mode
```

```
# ExternalViewerSecurityPolicy=1
```

```
# EXTERNAL VIEWER MAX REFUSED REQUEST
```

```
# Number of refused external viewer requests, after which
```

```
# a timeout period is carried out for the viewer.
```

```
ExternalViewerMaxRefusedRequest=3
```

```
# EXTERNAL VIEWER CONNECTION TIMEOUT
```

```
# Timeout Period in seconds, after MaxRefusedRequest
```

```
# is reached. No viewer request is possible during the
```

```
# Timeout Period.
```

```
ExternalViewerConnectionTimeout=240
```

```
# EXTERNAL VIEWER REQUEST TIMEOUT
```

```
# The time period (in sec) the request-messagebox is shown (i.e. is
```

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```
# operable)
ExternalViewerRequestTimeout=20

# EXTERNAL VIEWER REQUEST TIMEOUTMODE
# The behaviour if request-timeout elapsed
# ExternalViewerReqTimeoutMode=0 : dismiss request
# ExternalViewerReqTimeoutMode=1 : accept request
ExternalViewerReqTimeoutMode=1

# REMOTE ACCESS IP-ADDRESS
# IP-V4-format
X127RemoteAccessIP=192.168.215.29

# MODEM IP-ADDRESS
# IP-V4-format
X127ModemIP=192.168.215.30

# SERVICE HOST
# NCU with teleservice adapter on its X127 interface
# Use "Self" for your own X127 interface
# IP-V4-format or DNS-Name or Self
X127ServiceHost=Self

[PingService]
# PING SERVICE MODE
# (0=DISABLE, 1=ENABLE)
PingServiceMode=0

# PING SERVER IP-ADDRESS
# IP-V4-format
PingServerIP=

# PING SENDING DATA
PingTransmissionData=
```

```
# PING SERVER PORT-NUMBER
```

```
PingServerPort=
```

```
# PING TRANSMISSION PERIOD
```

```
# Period in minutes, in which transmission data will be sent
```

```
PingTransmissionPeriod=2
```

```
# PING TRANSMISSION INTERVAL
```

```
# Time interval in seconds between two pings
```

```
PingTransmissionInterval=5
```

[externalTcu]

```
# EXTERNAL TCU IP-ADDRESSES
```

```
# List of accepted TCUs in IP-V4-format (index 1 to maximal 16)
```

```
ExternalTcuIP_1=
```

[TCU_HWSService]

```
# TCU CONNECT TIMEOUT
```

```
# Guaranteed time period (in sec) the HMI manager waits
```

```
# for TCUs recognized as connected TCUs by the TCU_HWS
```

```
# service.
```

```
TCUConnectTimeout=30
```

```
# TCU CONNECT TIMEOUT FOR HEADLESS STARTUP
```

```
# Guaranteed time period (in sec) the HMI manager waits
```

```
# for TCUs recognized as connected TCUs by the TCU_HWS
```

```
# service, if a PCU panel doesn't exist and no TCUs are
```

```
# connected till now. This time period is effective ad-
```

```
# ditionally to the time period TCUConnectTimeout.
```

```
HeadlessTCUConnectTimeout=60
```

Prerequisite

Note

The "Operation without SINUMERIK OP" option is required when using more than 1 external VNC Viewer.

Operator control without SINUMERIK OP

If the "Operation without SINUMERIK OP" option is set, then a list of viewers that can be assigned in tcu.ini is handled by the system just like internal viewers (=TCU); this means that these viewers have full user authorization and participate in the user rights management. Towards the outside, they behave just the same as the viewer on the SINUMERIK operator panels.

Restrictions

Restrictions for such external operator control units are:

- Neither MCP and direct keys nor an EKS system can be assigned. This also means that these devices cannot be activated to be an operator control unit in the system.
- Direct control keys cannot be triggered, i.e. the softkeys to the direct keys can be triggered in the operating software. However, the keys do not appear in the direct key image to the PLC.
- There is no configuration file config.ini, as for a TCU, i.e. the settings to be made to a TCU are not possible for such an operator control unit (power-up behavior, displacement, t:m:n); however, the displacement mechanism to the external operator control units is effective.
- An external operator control unit is never signaled as active operator station in the PLC.

Configuring the external operator control units in the tcu.ini file in section:

```
[externalTcu]
# EXTERNAL TCU IP-ADDRESSES
# List of accepted TCUs in IP-V4-format (index 1 to maximal 16)
ExternalTcuIP_1=
```

The desired screen resolution can also be set in the file tcu.ini:

```
[VNCServer]
Resolution = ...
```

1.4.2.9 Displacement mechanism for TCUs

Supplementary conditions

The following supplementary conditions apply when operating the TCU:

2 active TCU connected in parallel to NCU 710.3 PN

4 active TCU connected in parallel to NCU 720.3 PN, NCU 730.3 PN

4 active TCU connected in parallel to PCU

To operate a machine with more operating stations than the maximum number the displacement mechanism ensures that **only the permitted number of TCUs are active** in shadowing grouping. The remaining TCUs are switched to a passive mode, which means they no longer represent a load relative to the resources. Thus the number of TCUs that can be connected to one HMI application is practically no longer limited, the limitation is the number of concurrently active TCUs.

Configuration

There are two new entries in the config.ini file for a TCU for the displacement mechanism:

- **SUSPENDLOCK:** controls whether the TCU can be displaced via the displacement mechanism.
SUSPENDLOCK = 0 means that a displacement disable is not set (preset), i.e. the TCU may be displaced by any other TCU.
SUSPENDLOCK=1 means that this TCU can never be displaced.
- **SUSPENDPRIORITY:** This entry specifies a priority for the displacement mechanism to the TCU. In a displacement process the TCUs among the active TCUs with the lowest priority that do not have a displacement disable will be displaced. The priority is specified as numeric value in the range 1 - 10.
The preset is 1 (lowest priority).

Note

If you set a displacement disable for a TCU then specification of a displacement priority is unnecessary because it never is used due to the displacement disable.

Displacement rules

The TCU can assume the following states:

- **The TCU is active and has user authorization:** This can be identified as the TCU shows the screen of the operating software and the screen is bright.
- **The TCU is active,** however, in the monitoring mode (i.e. it presently has no user authorization): This can be identified as the TCU shows the screen of the operating software, however, it is darkened in comparison to the TCU with user authorization.
- **The TCU is passive:** The TCU shows the selection menu of the possible connections instead of a screen of the operating software, and the softkey for selection of the last active connection of the TCU is shown in color.

When a TCU boots, the TCU always attempts to establish the first connection specified in its config file. The TCUs from a shadowing group establish their specified connection one after the other as long as the maximum number of permissible active operator units is not exceeded.

If a TCU encounters the situation that this number is already reached in its power up, then it attempts to obtain a connection via the displacement mechanism. If it can displace a formerly

active operator unit then it takes on the active status itself, otherwise it transitions to passive status immediately after booting.

1.4.2.10 Disable switchover between TCU via PLC

Overview

The TCU switchover disable offers the option of dynamically disabling switchover from one TCU to the next when the system is running via the PLC. For the duration of the disable, a user authorization request to change user authorizations between TCUs will be ignored by the system and rejected.

The rejected user authorization request causes a message to be output in the dialog line of the HMI, in the form of a feedback message for the requester. The message disappears after five seconds.

HMI ↔ PLC data interface

The “switchover disable” function is always active and does not have to be switched on explicitly. The function is controlled by a data bit in the PLC. The HMI transfers the active OP to the PLC, thus forming the basis of the control function in the PLC.

The control bits and control information for this function are stored in the m:n data interface of the PLC. In terms of m:n, this function can be operated separately for the currently overridden HMIs in both m:n online interfaces (DB19.DBW120 ff for HMI1 and DB19.DBW130 ff for HMI2). If a system is not running an m:n, only the first m:n online interface is used for this function.

Switchover disable is controlled by a TCU_SHIFT_LOCK bit, managed by the user, on each HMI in the PLC. The bit address for the first HMI is DB19.DBB126.6 and DB19.DBB136.6 for the second HMI.

The PLC m:n online interface is expanded so that byte DB19.DBB118 is still added to the first interface and byte DB19.DBB119 to the second. These bytes acquire the index of the active TCU (of the active OP) for the appropriate HMI. The byte is called TCU_INDEX. The appropriate HMI uses the TCU index configured for the active TCU to describe the TCU_INDEX byte.

The TCU_SHIFT_LOCK bit is monitored by the appropriate HMI. A value = 1 triggers the switchover disable; switchover is enabled if the value returns to 0. The TCU_SHIFT_LOCK bit can be set, for example, to the PLC by the user pressing a key or it can be managed by the PLC user program according to its own logic. The TCU_SHIFT_LOCK bit is managed in the PLC exclusively by the user; the HMI only accesses this bit in read-only mode.

The HMI assigns the configured index of the TCU or PCU whose OP currently possesses user authorization in the shadow grouping. If no OP is active, a value of 0 is entered in TCU_INDEX.

If no TCU index is configured for the active TCU (active OP), the value 255 = undefined is presented as the TCU index. This means that the values 0 and 255 may not be configured as the TCU index.

Configuration

The TCU index and machine control panel address (MCP address) are configured on the PCU. The TCU index is set in the "OP Properties" dialog of the "System Network Center" program.

Operating principle

If the TCU_SHIFT_LOCK bit is set for switchover disable, a user authorization request is not carried out independently of the mode set on the HMI for allocation of user authorizations (veto mode), i.e., a change of user authorization is rejected.

This message appears on all OPs for approximately 5 seconds:

"No switchover: Switchover disable set in current PLC."

While this message is displayed, operations on the OP with the user authorization can still be carried out unaffected.

Note

The switchover disable only relates to changing the user authorization on the OPs in a shadowing grouping on a PCU.

Active switching from one OP to another PCU is not prevented.

Special features

The following special cases should be noted:

- Even if switchover disable is set, the TCU_INDEX field value may change in the PLC. This is the case if:
 - The OP in possession of the user authorization is actively switched to another PCU. Depending on whether another TCU takes on the user authorization or whether no TCU is currently active, either the index of the TCU or the PCU itself (if its directly connected OP becomes active) is entered, in exactly the same way as when there is a user authorization switchover. This can also be the value 255, if no TCU index is available for the OP. 0 is entered if an OP is no longer available in the shadow grouping.
 - An m:n switchover is in progress. The HMI program of the incoming PCU deactivates the HMI program which is active on it. An OP from the shadow grouping of the new (incoming) PCU must receive the user authorization. The TCU index of this OP is entered in the TCU_INDEX field.
 - A PCU is disconnected from a NCK/PLC in the context of m:n. No HMI program and, therefore, no OP with user authorization is then available on the exited NCK/PLC. This is signaled independently of a switchover disable by entering the value 0 into the TCU_INDEX field.
- If a TCU is actively switched over to another PCU, it can be deactivated there, i.e. it does not obtain the user authorization, if a switchover disable is set for the destination PCU.

- With an m:n PCU switchover – the PCU is switched to another NCK and, therefore, to another PLC – the PCU takes on the switchover disable settings of that PLC.
- The m:n interlock options on the PLC side have priority over the TCU switchover disable, so that a set TCU switchover disable cannot prevent an m:n switchover. If necessary, the m:n interference options should be synchronized here with those for the TCU in the PLC. It may, for example, be practical to set or remove the m:n displacement disable simultaneously with the TCU switchover disable.

Obtaining user authorization

On a TCU that has no user authorization, the first key that is pressed serves exclusively to request the user authorization, i.e. this key is not evaluated by the operating software.

The settings for the right to veto are stored in file tcu.ini and are only effective if the operating software is installed on the PCU. At the OP of the TCU, the operating software can be operated in exactly the same way as an OP directly connected to the PCU.

Note

These operator input sequence steps must only be carried out by qualified personnel!

1.4.2.11 Example: How to select the behavior of the TCUs during boot up

Example: Distributing boot support across two PCUs

To distribute boot support over two PCUs, "Boot support runtime and configuration only (TFTP/FTP)" must be selected on PCU_1 and "Boot support IP address only (DHCP)" must be selected on PCU_2.

The "No boot support" configuration must be selected on PCU_3:

Table 1-26 "TCU support" settings

TCU_1	TCU_2	TCU_3	TCU_4
192.168.214.10	192.168.214.11	192.168.214.12	192.168.214.13
VNC connections:	VNC connections:	VNC connections:	VNC connections:
192.168.214.241	192.168.214.241	192.168.214.241	192.168.214.241
192.168.214.242	192.168.214.243	192.168.214.243	192.168.214.242
192.168.214.243			
Switch to system network			
PCU_1	PCU_2	PCU_3	
192.168.214.241	192.168.214.242	192.168.214.243	

Services: X DHCP ✓ TFTP ✓ FTP ✓ VNC	Services: ✓ DHCP X TFTP X FTP ✓ VNC	Services: X DHCP X TFTP X FTP ✓ VNC
Company network		

In this case, PCU_2 serves as the DHCP server which provides the IP addresses for the connected TCUs. PCU_3 is not involved in booting the TCUs, it is however displayed by the TCUs using VNC.

1.4.3 Network configuration

1.4.3.1 Permissible network topologies

Ethernet connection

A SINUMERIK 840 D sl can only be operated as a network within which the individual components communicate with one another via Ethernet connections. This network must be set up.

The individual components are factory-set so that the most frequently occurring standard configurations can be operated without changing the settings related to the network.

Division into system network and company network

On the SINUMERIK solution line, the components are generally split into a company network on the one hand and a system network on the other.

The connection to the company network provides access to the network drives, for example. On the system network, process data communication and image transmission runs from the components with operator software to the display units – the respective TCU.

This split is performed physically by means of the prescribed use of the Ethernet interfaces on the components:

- A TCU is connected exclusively to the system network.
- An NCU is always connected to the system network via X120.
- Ethernet interface Eth 2 of the PCU is preconfigured for connection to the system network; while Ethernet interface Eth 1 is used for connection to the company network.
- An NCU is connected to the company network via X130.

Meaning of the connections:

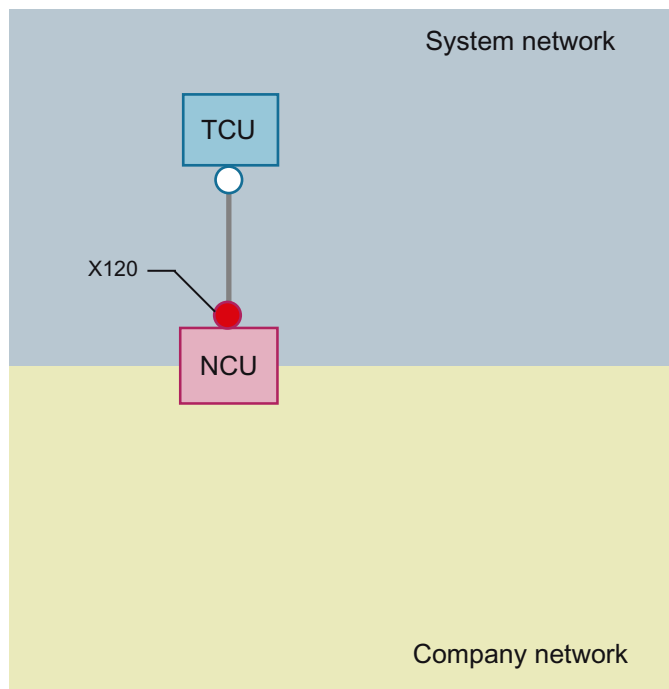
- Eth 1 as a DHCP client
- Eth 2 as a DHCP server
- Eth 2 with a fixed IP address

Green connection	Uncrossed Ethernet cable
Gray connection	Crossed Ethernet cable (crossover)

1.4.3.2 Networks without connection to the company network

Configuration 1: NCU and TCU

Description



A direct Ethernet connection is used to connect a TCU to X120 of the NCU. NCU and TCU are suitably preconfigured with IP addresses.

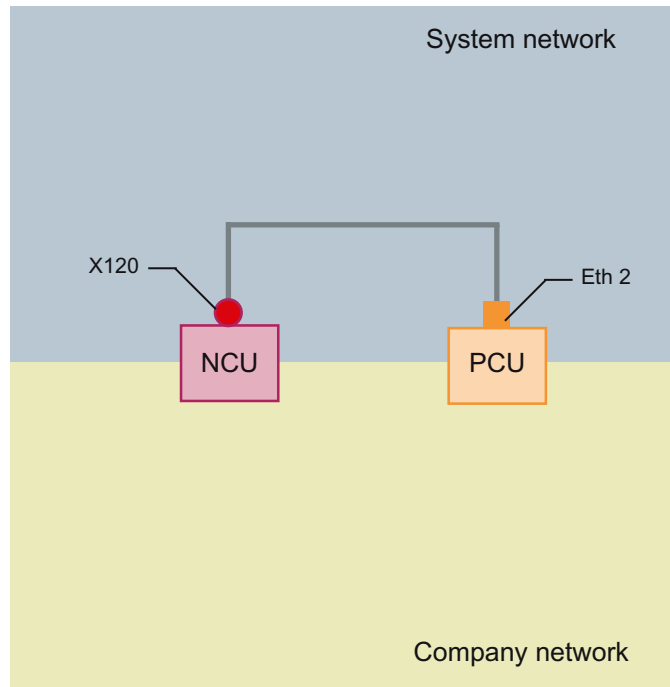
The IP addresses are not significant for further operation.

The TCU is connected to the NCU via a **crossed** Ethernet cable.

The direct connection of the NCU via X120 to the TCU automatically forms a simple system network consisting of two computer nodes.

Configuration 2: NCU and PCU with direct OP

Description



The NCU and PCU are connected via a **crossed** Ethernet cable.

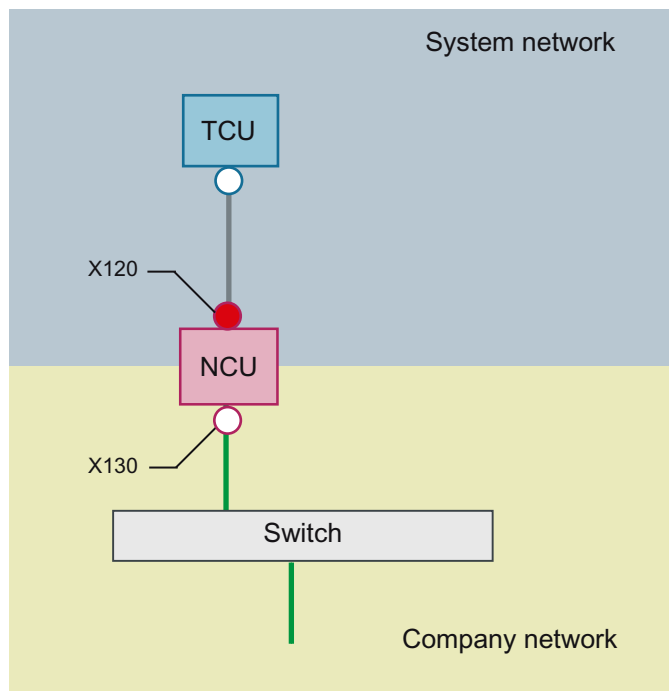
The NCU is the DHCP server with the IP address 192.168.214.1.

For this Eth 2 configuration, the PCU is assigned a fixed IP address in the range 192.168.214.241 – 192.168.214.249 with a subnet mask 255.255.255.0 .

1.4.3.3 Networks with NCU connection to the company network

Configuration 3: NCU and TCU

Description



The TCU is connected to the NCU (directly) using a **crossed** Ethernet cable. On X130, the NCU is connected to a switch to the company network with a straight cable.

As in configuration 1, there is a direct Ethernet connection between a TCU and X120 of the NCU. NCU and TCU are suitably preconfigured with IP addresses. The IP addresses used here are not significant for further operation.

IP configuration: DHCP server on the company network

On X130, the NCU is set to the address reference via DHCP. If the company network has a DHCP server that provides the NCU with an IP address (IP configuration), the NCU is integrated into the company network.

Depending on the infrastructure available or the level of network administration of the company network, the following network parameters must be set for the NCU on X130:

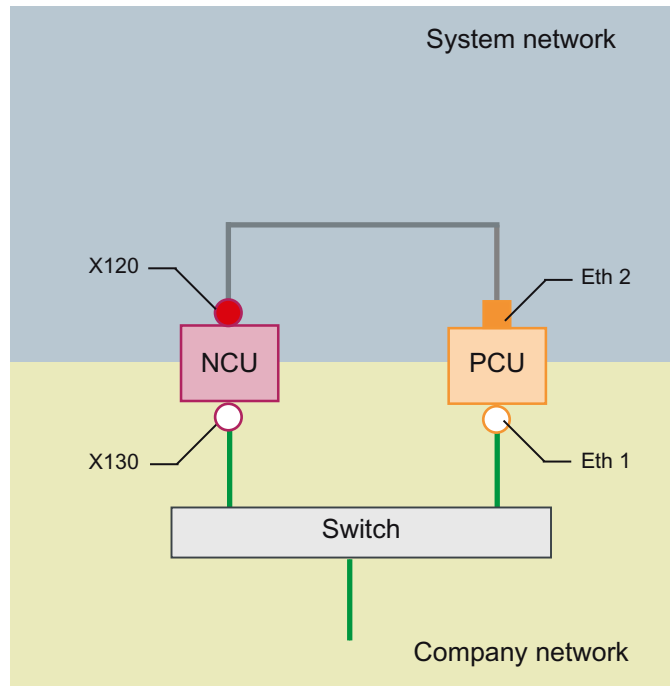
- Computer name on the company network
- Address of a DNS server
- Address of a gateway (default router)

The IP address of the NCU to this connection is also assigned via network administration.

If the company network offers a low level of administration (in the worst case scenario the network has only one DHCP server that assigns the addresses from a predefined address range) the NCU receives an IP address that is initially unknown.

Configuration 4: NCU and PCU with direct OP

Description



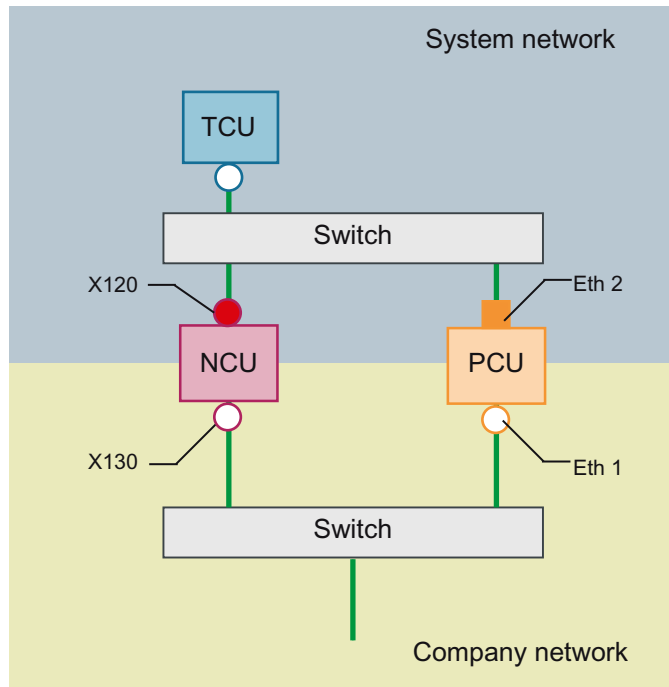
The NCU and PCU are connected via a **crossed** Ethernet cable.

On X120, the NCU occupies the fixed IP address 192.168.214.1 in its capacity as a DHCP server (not used in this configuration). For this Eth 2 configuration, the PCU is assigned a fixed IP address in the range 192.168.214.241 – 192.168.214.249 with a subnet mask 255.255.255.0 .

The observations made for configuration 3 also apply here in relation to the connection to the company network. The connection to a switch on the company network is made via a **non-crossed** Ethernet cable.

Configuration 5: PCU with TCU on NCU

Description



In this configuration, a switch is also required for the system network. All components are connected using straight Ethernet cables.

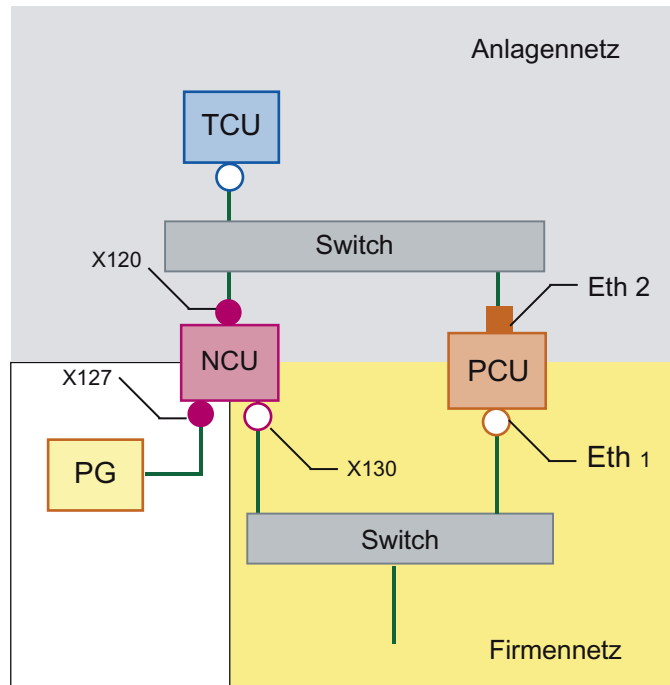
In terms of address allocation and the settings that need to be made, this configuration is identical to that of configuration 4. However, in this case, the DHCP server of the NCU actually supplies the TCU with an IP address and serves as a boot server for the TCU.

The observations made for configuration 3 also apply here in relation to the connection to the company network. The connection to a switch on the company network is made via a **straight** Ethernet cable.

To connect one TCU to both HMI systems you must create an additional connection to the NCU for the TCU, as described in the following chapter:

Connecting the programming device (PG) to the NCU

Description



For service purposes a programming device is connected to the NCU at X127 as a standard DHCP client (automatically obtain an IP address). An NCU is a standard DHCP server on X127. On X127, the NCU occupies the fixed IP address 192.168.215.1 with the subnet mask 255.255.255.224.

At X127, IP addresses from 192.168.215.2 onwards are assigned via DHCP; e.g. to connect a programming device. This is the reason that a fixed IP address must not be set at the programming device.

1.4.3.4 Example: Configuring a VNC connection to a PC

Requirements

In order to use a TCU to get visual access to a computer from a SINUMERIK system via VNC, the following requirements apply:

- The boot server (active DHCP server) in the system network must be an NCU.
- This NCU must be integrated via X130 or X120 into the network to which the computer to be monitored is connected.

- The computer to be monitored must be configured in the config.ini configuration file of the TCU according to the general configuration for a TCU in a separate host section as a switchover target for this TCU.
Where necessary, a password has to be specified in the configuration, if the VNC server requires one on the target system (see below).
- To ensure that the TCU recognizes the new switchover target, the TCU requires a restart and reboot.
- The screen resolution of the computer to be monitored must be adjusted to the conditions of the TCU, since otherwise the TCU scales the image received to its possible range of representation, which would adversely affect the representation on the TCU.

Configuration

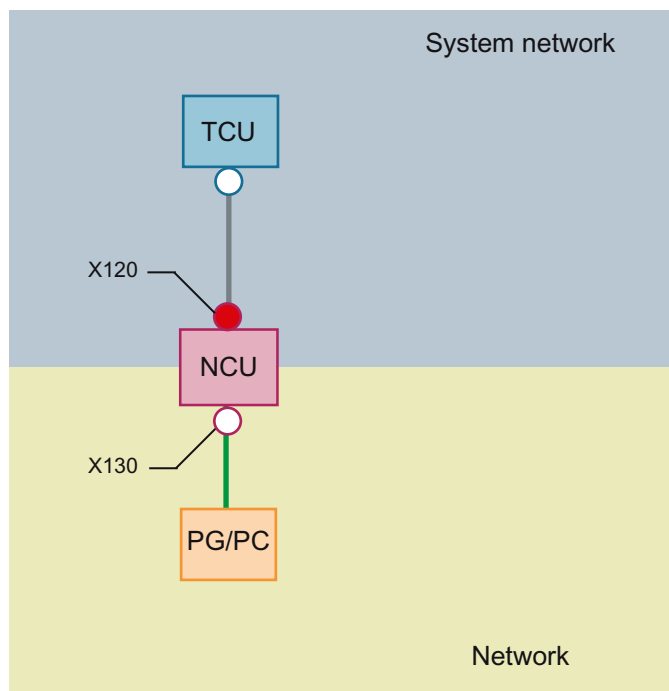


Figure 1-25 Configuration example

Configuration

The config.ini file is located in the following directory:

NCU: /user/common/tcu/<TCU name>/common/tcu
 PCU (Windows XP): F:\user_base\common\tcu\<TCU name>\common\tcu
 PCU (Windows 7): C:\ProgramData\Siemens\MotionControl\user\common\tcu\<TCU name>\common\tcu

The config.ini file must be stored on the boot server (active DHCP).

Example:

```

[Station]

maxhostindex=2          /* Number of nodes that are defined under
[host_1] and [host_2].

mcpIndex=192
tcuIndex=1
eksIndex=0

[host_1]

Address=192.168.214.1    /* Address of the NCU to which the
connection is established during booting.

[host_2]

Address=157.163.230.202  /* Address of the PC

password=123456          /* Password of the VNC server on the PC

```

Switching over between the nodes



With the "Menu back" + MENU SELECT keys, the following actions are triggered:

- In the header of the displayed window you will see the TCU name, for example TCU1.
- A selection list for connecting to the other nodes will be displayed on the TCU.

See also

Settings in the "config.ini" file (Page 66)

1.4.3.5 Application example

Application

The configuration is suitable for the following application: Machine with concurrent operating option to two operator panels , a full-featured operating panel with PCU and an operator panel reduced to tool management.

Parallel operation of HMI-Advanced or SINUMERIK Operate on the PCU 50.3 and SINUMERIK Operate as component of the CNC software on the SINUMERIK 840D sl NCU:

Any OP connected to PCU 50.3 and any OP connected to the NCU can be simultaneously operated: in the example, OP 08T.

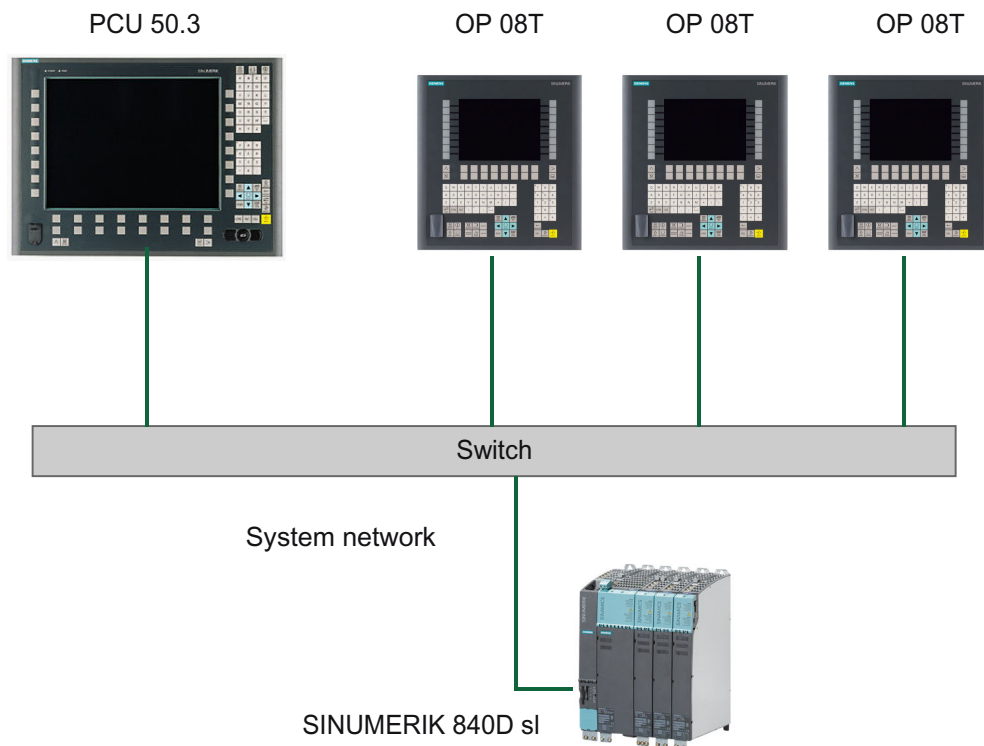


Figure 1-26 Configuration example

Proceed as follows

To configure the application example, proceed as follows:

1. PCU 50.3 with HMI Advanced
Deactivate the DHCP server on the PCU: For this select the option "Boot support runtime and configuration only (TFTP/FTP)" on the "TCU support" tab of the "System Network Center" program.
2. SINUMERIK 840D sl from CNC software, version 2.4 and higher
The `systemconfiguration.ini` configuration file is included on the SINUMERIK 840D sl product DVD.
3. OP 08T operator panel
Once the installation of the OP 08T operator panel with SINUMERIK Operate has been completed, copy the `systemconfiguration.ini` file from the `/Siemens/sinumerik/hmi/appl/systemconfig/tm/` directory to the `/oem/sinumerik/hmi/cfg/` directory. After this, a system restart is necessary.

Note

Subsequent changes

Once the file has been copied, no further settings (e.g. changing language) can be implemented on the SINUMERIK Operate. If you want or need to implement changes later, the `systemconfiguration.ini` file can be renamed (e.g., as `systemconfiguration.save`). After this, a system restart is necessary. Following the restart, the full functional scope of SINUMERIK Operate is available once again.

1.4.4 Service and diagnostics

1.4.4.1 Booting of the TCU

Messages when booting

While the TCU is booting, progress is displayed after the BIOS has booted and before the operating system is loaded. In addition to messages, the current booting status is also indicated by a progress bar. While the IP address is being determined via DHCP and the TFTP is being downloaded (boot image), a progress bar indicates that booting of the TCU is not yet complete, or that a fault has occurred.

The structure of these messages is shown below:

```
Thin Client Boot loader                                V04.50.11.00

IP address

<1/F1>  diagnosis window
```

You can see the current boot phase in the third line. Below that you are told whether you can call up information via <F1> if a fault occurs.

Diagnostics options during booting

In the following cases, the diagnostics window is displayed and booting of the TCU is interrupted:

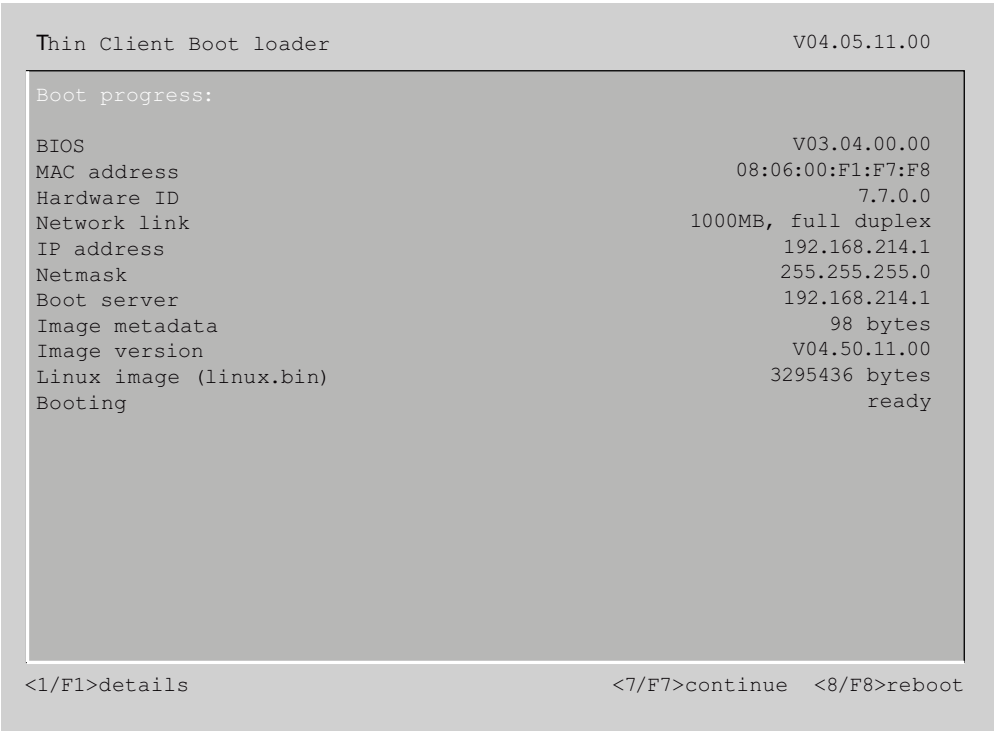
- When the <1 / F1> function is selected during booting
- When a warning message is displayed
- When a fault occurs

Note

You can select the <1 / F1> to <F8> functions shown below using the horizontal softkeys on the OP. For example, to select <F7>, press the horizontal softkey 7.

Press the appropriate key <1> for <F1> at an HT8.

Calling up the diagnostics window with <1 / F1>



Key / text	Meaning
F1 details	Display detailed information
F7 continue	Continue booting of the TCU
F8 reboot	Restart the TCU

Press <1 / F1> to continue

If you select function <F1> in the diagnostics window, the, detailed diagnostic information is output.

Key / text	Meaning
F1 ... F6	Navigate within the window (alternatively, the relevant keys on the OP can be used).
F7 +	Display more information
F8 -	Display less information
F9 back	Return to diagnostics window

Description

The HT 8 mobile handheld terminal combines the functions of an operator panel and a machine control panel in one device, permitting complete operator control and monitoring of machines. It can be used according to the principle of a thin client (also see "Operator panels", Chapter: "Thin client unit") as a supplementary main operator panel or as a secondary control panel.

The optional touch pen with a holding loop permits easy operation of the touch screen, even when operators are wearing gloves. Its safety concept permits working in the hazardous area of the machine, which is necessary, for example, when teaching in.

Note

Siemens declares that this device complies with the requirements and other regulations of the directives 2006/42/EC (machinery directive) and 2004/108/EC (EMC guideline).

The full declaration can be found on the Internet (<https://support.industry.siemens.com/cs/document/109476859?dti=0&lc=en-WW>).

Features

- Operator control via touch screen and membrane keys
- Fully graphic 7.5" TFT color display
- Emergency Stop button and two enabling buttons for left-handed and right-handed operators
- Easy hot swapping during operation (hot plug and play), without triggering the emergency stop in combination with the PN Plus connection box and without an additional, manual actuating element / keyswitch

The HT 8 can be safely kept and operated in a stationary manner in the wall holder (accessory).

Validity

The following description applies to the following components:

Designation	Features	Article number
HT 8	Enabling button, emergency stop button, override rotary switch	6FC5403-0AA20-0AA1
HT 8	Enabling button, emergency stop button, override rotary switch, handwheel	6FC5403-0AA20-1AA1

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

Function blocks

In the unit:

- PCB with CPU, memory
- Ethernet controller

Device front:

- LC display as touch screen
 - 640 x 480 (VGA) Color TFT
 - Inverter on board
- 52-key membrane keyboard
 - 24 machine control keys
 - 28 control keys (number pad, cursor pad, function keys)
- Emergency Stop button, 2-channel
- Rotary override switch (19 positions)
- Handwheel (optional)

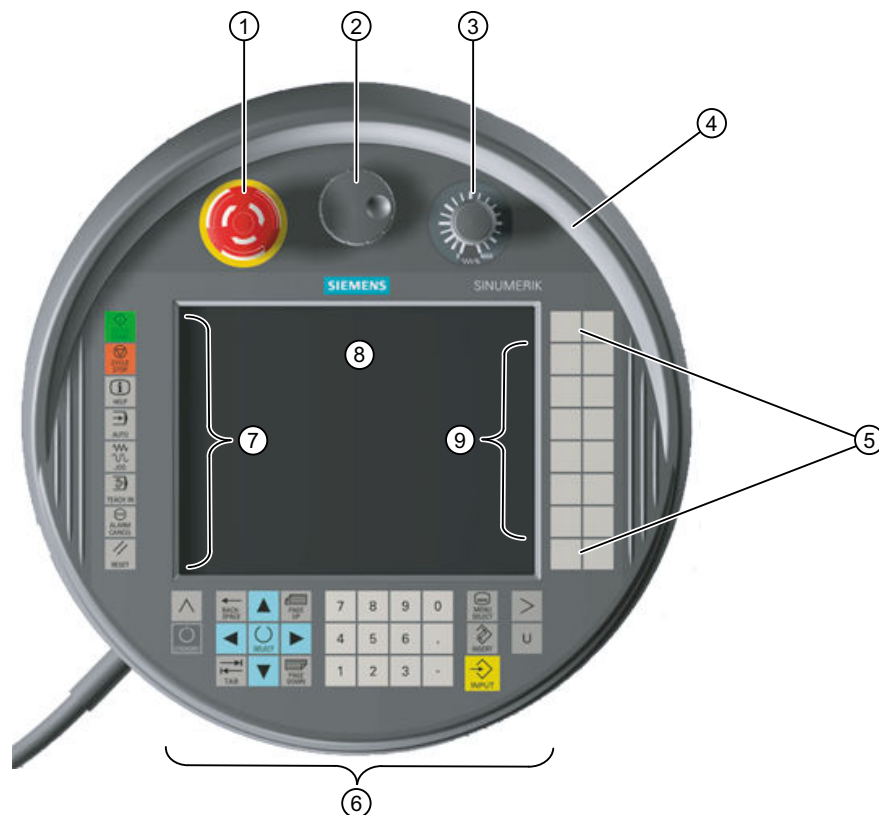
Device rear:

- 2 enabling buttons (2-channel, 3-stage)
- Serial interfaces:
 - HT 8 connection cable to terminal box / connection module
 - USB interface (with dummy plugs)
- Power supply (+24 V)

Operator control and display elements

3.1 View

Front



- ① Emergency Stop button
- ② Handwheel
- ③ Rotary override switch
- ④ Protective collar
- ⑤ Customer keys (user-defined)
- ⑥ HMI control keys
- ⑦ Function keys machine control panel
- ⑧ Display / touch screen
- ⑨ Traversing keys

Figure 3-1 User interface of the HT 8 with handwheel

3.1 View

Rear

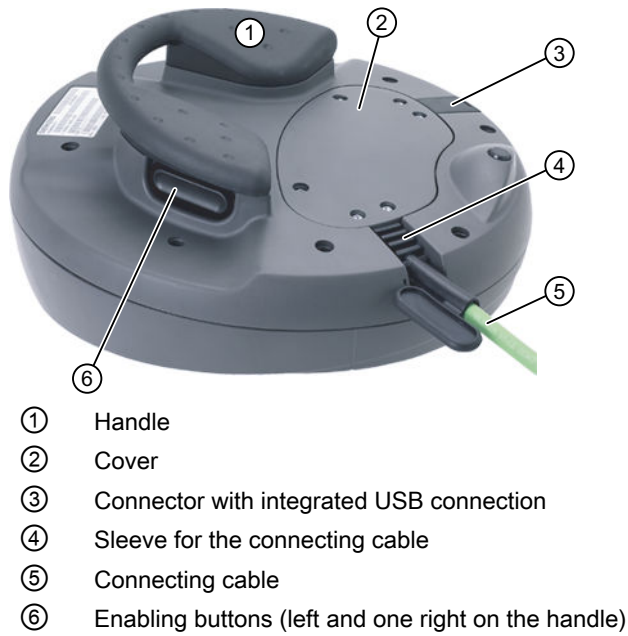


Figure 3-2 Connections and operator controls at the rear of the HT 8

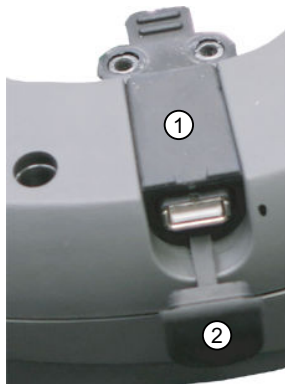


Figure 3-3 USB connection of the HT 8

Holes



The HT 8 consists of a double-walled housing with upper shell ① and lower shell ③

On the lower shell, the HT 8 has three small holes ②. These drill-holes are attached for the purpose of diverting the liquid that can penetrate into the space between the double-walled housing if the malleable protective shroud on the upper shell is pushed through.

3.2 Description

Display / touch screen

The display has LED background lighting.

All the application-specific functions are displayed on the touch-sensitive display. The particular function is initiated by your finger or an optional touch pen at the appropriate location in the display.

NOTICE
Damage to the display by pointed or hard objects
Do not touch the operating elements of the display with pointed or hard objects, as this can damage it, sometimes beyond repair.

In order to achieve precise assignment by pixels, the touch-sensor must be calibrated and adjusted to the touch screen.

Information for calibrating the touch screen of the HT 8 can be found in:
"General information and networking", Chapter: "Networking"

Note

Calibration of the touch sensor may also become necessary during operation, because the resistance values of the touch membrane change when there is a temperature change.

Membrane keyboard

On the front of the HT8, 52 keys are arranged in several key blocks (see View (Page 93)).

NOTICE
Damage to the keys when using pointed or hard objects
Only use your fingers to touch the membrane keyboard and not sharp or hard objects, which can damage or even destroy the keys. Further, please note that the touch pen is also not suitable for using the membrane keyboard.

Function keys machine control panel

- Left: START, STOP, RESET, AUTO, JOG, TEACH, ALARM CANCEL
- Bottom: U (User button)
- Right: 2 x 6 traversing keys, 4 user keys (can be freely assigned)

HMI control keys

- The number pad contains the numbers 1-9, the decimal point and the minus sign
- The cursor pad is used to navigate on the screen.
- Seven keys for
 - Input
 - Menu change
 - Switch-over of the softkey bars
 - Help function

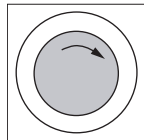
Emergency Stop button

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	
	Visible	Not visible
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 responses 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.

Rotary override switch

The rotary override switch of the HT 8 has 19 positions.

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

Enabling button

The HT 8 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 are configured as 2-channel, 3-position switches for the following button positions:

- Released (no activation)
- Enabling (center position) - enabling for channel 1 and 2 is on the same switch.
- Panic (completely pushed through)

Note

Monitoring the enabling function

- The enabling duration is monitored to avoid that the enabling button is permanently bypassed. The enabling outputs are opened after max. 30 min permanent enabling. The enabling outputs are only closed again after first releasing the enabling button and then actuating it again. The enabling time of 30 min can be extended by switching to the second enabling button before the 30 min expires.
 - The system checks the synchronism of the two enabling button circuits of the mechanical enabling button. The two enabling button circuits (of the button) must be closed within 2 seconds. As a consequence, it is not possible to actuate just one enabling circuit and therefore provoke a fault.
-

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

Connection examples of the enabling and emergency stop button can be found in Chapter: "HT 2", Section: "Connections" → "Connection examples of enabling button and emergency stop button"

Handwheel

The HT 8 is available with a handwheel.

The handwheel operates with 50 pulses/revolution.

HT 8 operated with the handwheel

An HT 8 with a handwheel behaves in the same way as an MCP 483C PN (in Ethernet mode) with a handwheel. The handwheel pulses are transferred via Ethernet to the NCK using the HT 8 MCP process image.

NOTICE
Lack of care for traversing can cause damage to the tool/workpiece
The increments per revolution for a handwheel on a mobile HT 8 amount to 50 increments/revolution; for a stationary unit, it is 100 increments/revolution. A different length of the traverse path results from this difference.

3.3 Screen brightness control

If a screen with high contrast is displayed unchanged for longer than 1 hour, the screen brightness control must be activated (screen switched dark) in order to protect the TFT display against a phenomenon known as "burn-in" of the last displayed screen.

For more information see:

- IM9 Commissioning Manual SINUMERIK Operate
- IM4 HMI-Advanced Commissioning Manual

NOTICE
You may do irreversible damage to your TFT display if the screen brightness control is not activated.

3.3 Screen brightness control

Interfaces

4.1 Overview

The following diagram shows the connection options at the HT 8.

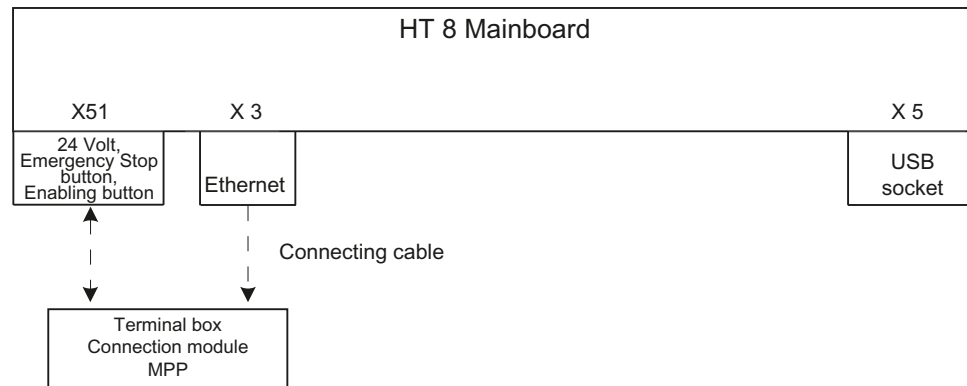


Figure 4-1 Block diagram of HT 8 interfaces

4.2 Description

Signal type

B Bi-directional signal

O Signal output

V Supply voltage

I Signal input

VI Voltage input

VO Voltage output

K Contact

X3: Ethernet connection

The Ethernet interface is compatible to the 10/100/1000BASE-T IEEE 802.3 standard, without crossover function.

Connector designation: **X3**

Connector type: 8-pole RJ45-socket with interlock (above)

Pin assignment The pin assignment corresponds to the standard, see "General information and networking" → "Connecting".

X5: USB interface

The USB interface corresponds to the USB 1.1 specification with full speed data rate.

Connector designation: **X5**

Connector type: Type A socket

Pin assignment The pin assignment corresponds to the standard, see "General information and networking" → "Connecting".

NOTICE

Damage to the plug by missing protective cap

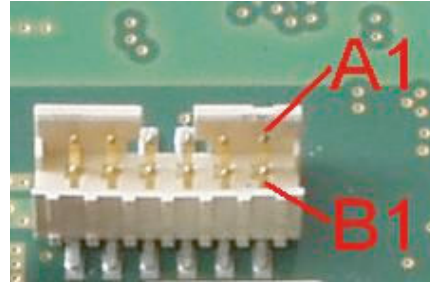
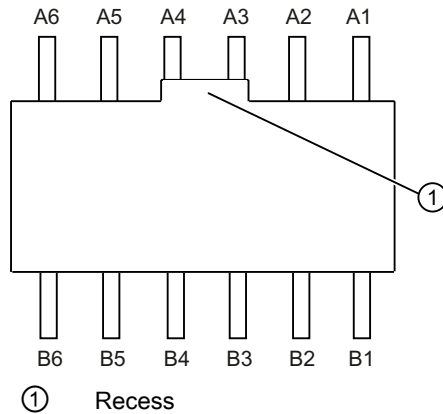
Replace the USB connector if its protective cap is torn, because in this case, the connector is no longer protected from dirt.
--

NOTICE

Damage to the inserted USB FlashDrive should the HT 8 fall

A plugged-in USB FlashDrive can be damaged or broken off if the device falls.

X51: Connection of the safety signals, power supply



Connector designation: **X 51**

Connector type: 12-pole connector plug with coding and locking

Pin	Signal	Signal type	Meaning
A1	IDENT_P	-	Box ID transfer +
A2	ENABLE 2+	I	Enabling button channel 2, digital
A3	ENABLE 1+		Enabling button channel 1, digital
A4	STOP -13	K	Emerg. Stop circuit 2
A5	STOP -23		Emerg. Stop circuit 1
A6	P24	VI	+24 V power supply

Pin	Signal	Signal type	Meaning
B1	IDENT_N	-	Box ID transfer -
B2	ENABLE 2-	O	Enabling button channel 2, digital
B3	ENABLE 1-		Enabling button channel 1, digital
B4	STOP -14	K	Emerg. Stop circuit 2
B5	STOP -24		Emerg. Stop circuit 1
B6	M24	VI	External ground

Connecting

5

5.1 Overview

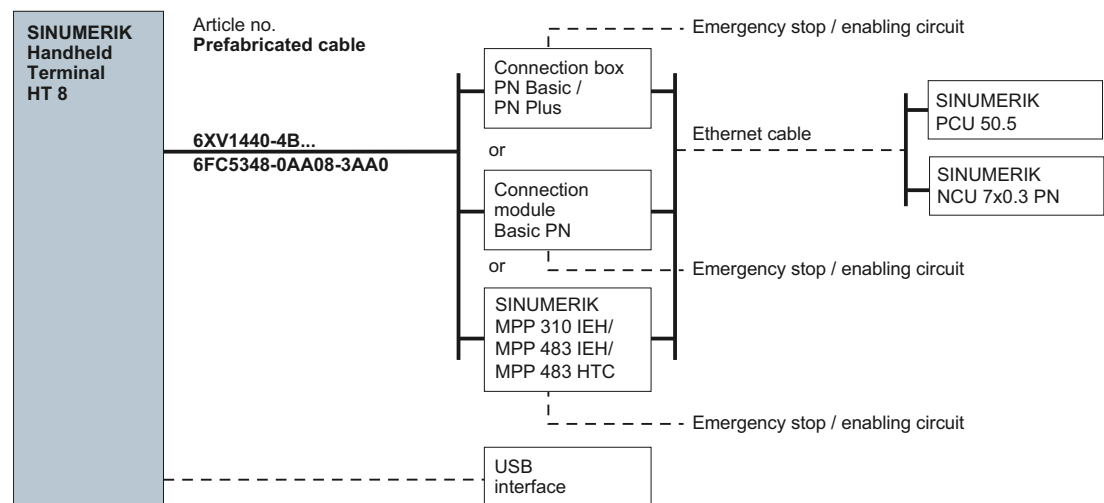


Figure 5-1 Connection overview HT 8

The HT 8 is designed for communication in an Ethernet network. The following connection options are available:

- PN Basic terminal box/PN Plus terminal box
- PN Basic connection module (for control cabinet installation) or
- MPP 310 IEH / MPP 483 IEH / MPP 483 HTC

HT 8 with		
PN Basic/PN Plus terminal box	PN Basic connection module	MPP 483 HTC

Connection via the PN Plus terminal box allows quick connection and disconnection during machine operation without an emergency stop being triggered.

If no HT 8 is connected, observe the following:



WARNING

Danger of death resulting from improper access

- After disconnection, the HT 8 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.

Note

An example of TCU and MCP xxx PN as well as optionally an HT 8 or HT 2 on a PN box / PN module can be found in Chapter: "HT 2", Section: "Commissioning" → "Application example of HT8 and HT 2 in mixed operation".

5.2 Terminal Box PN

5.2.1 Description

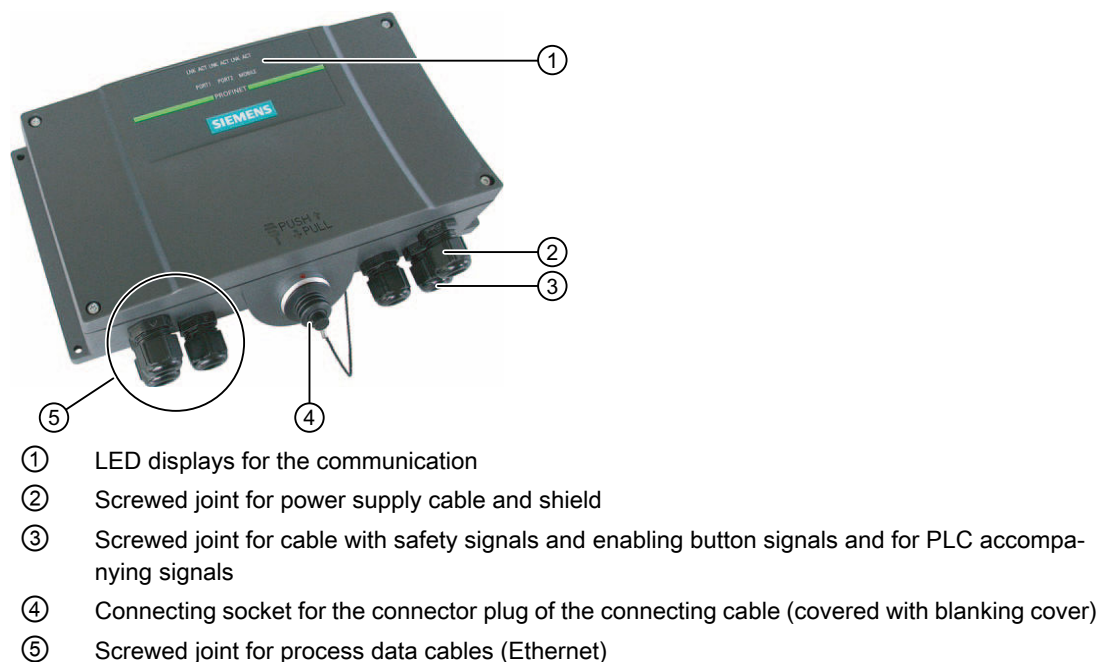


Figure 5-2 View of the PN terminal box

Note

Degree of protection IP65 at the terminal box is ensured with plugged-in HT 8 or plugged-in dummy cap.

The PN terminal box is available in two versions.

- **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.
- **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.

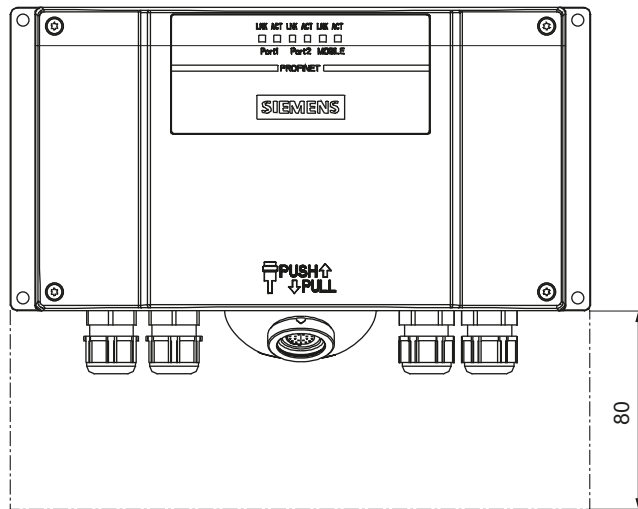
Note

The exterior of the PN terminal box versions only differs in terms of what is printed on the side.

The terminal boxes feature two rotary coding switches (S1 and S2) so that a unique ID can be set for the purpose of station identification. See Chapter interfaces (Page 112).

Clearance

The following clearances are required around the PN terminal box:



Additional references

You can find a detailed description in the operating instructions (compact) of the Mobile Panel 177 HMI device (WinCC flexible):

<http://support.automation.siemens.com/WW/view/de/22166637>

5.2.2 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.

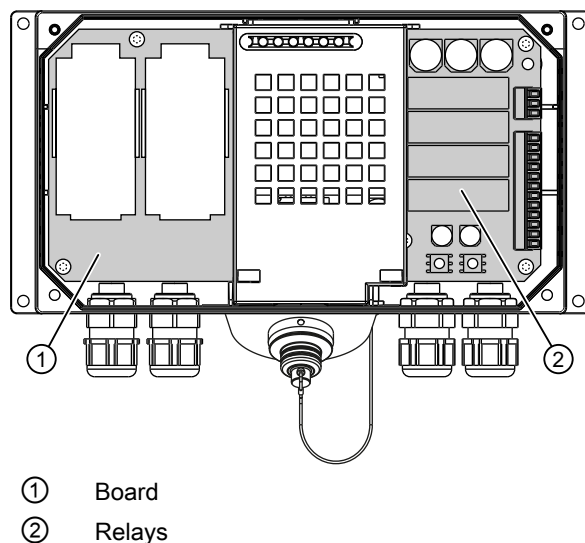


Figure 5-3 Inner view of the PN Plus terminal box

Switching states of the emergency stop circuit

HT 8	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 8

If you disconnect the HT 8 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 8.

5.2.3 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 so not required.

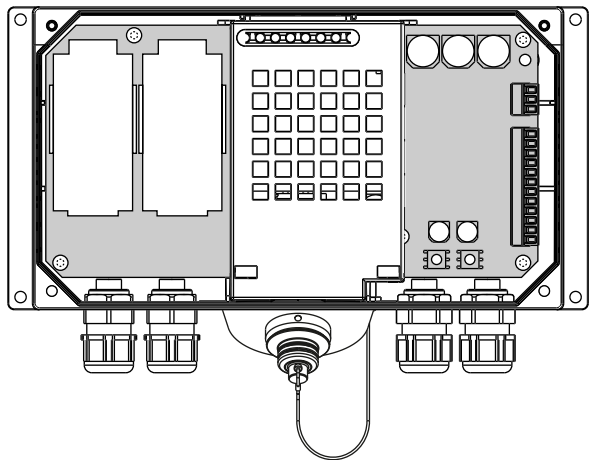


Figure 5-4 PN Basic terminal box

Note

The emergency stop circuit is controlled via the emergency stop button when the HT 8 is connected. If the connecting cable of the HT 8 is disconnected from the PN Basic terminal box, the emergency stop circuit is interrupted. This leads to a safe machine stop or an Emergency Stop of the system to be monitored.

Switching states of the emergency stop circuit

HT 8	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	-	The emergency stop circuit in the terminal box is open. The system to be monitored is stopped.

 **WARNING**

Danger of death resulting from the premature emergency stop unlocking
If you have shut down the system to be monitored, you can only release the emergency stop button or put 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.

5.2.4 Interfaces

Information about the interface assignment on the PN terminal box can be found in the "Handheld Terminal HT 2" manual under "Connecting" → "Terminal Box PN" → "Interface assignment on the PN Plus terminal box" connection.

5.3 PN Basic connection module

5.3.1 Description

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 8 can be connected from the outside.

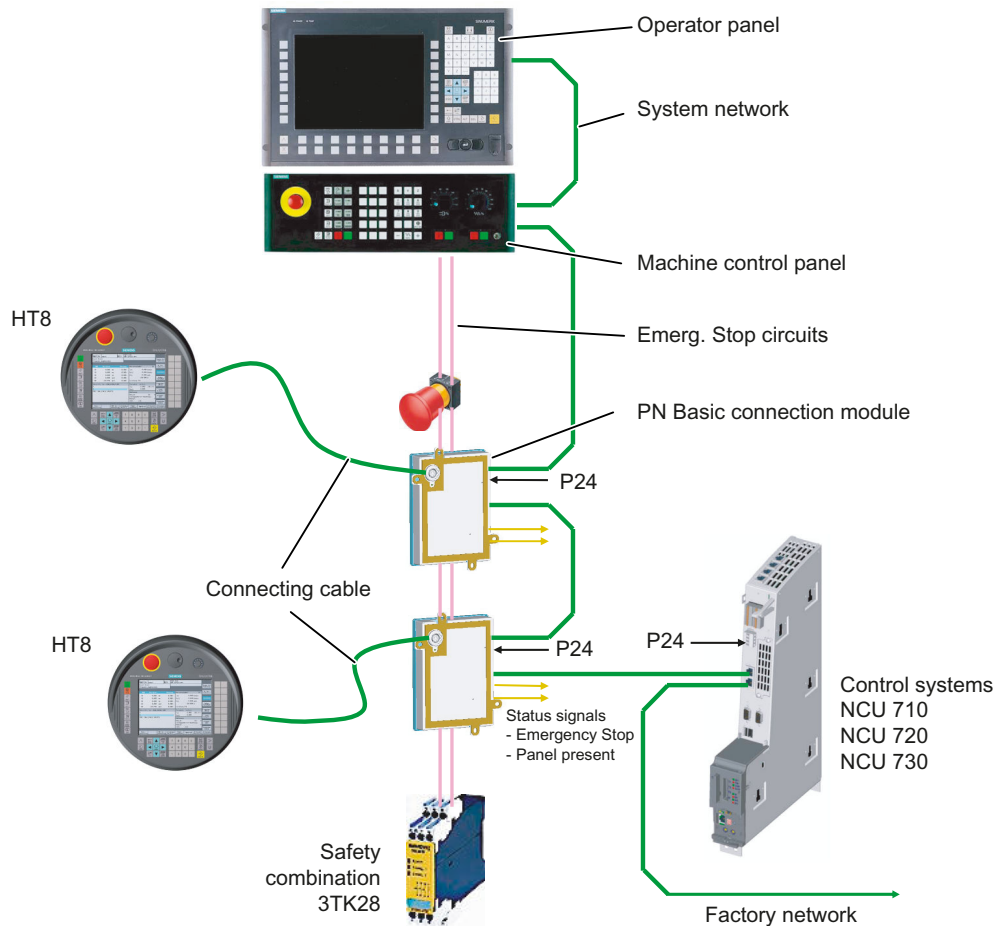


Figure 5-5 System configuration (example)

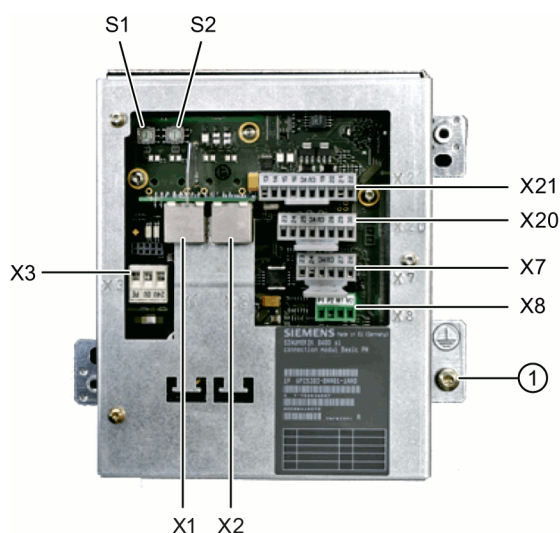
The connection module Basic PN is not hot plug-capable.

The HT 8 can either be connected directly to the NCU or to the PCU as thin client.

5.3.2 interfaces

The connector for the HT 8 is provided at the front of the PN connection module.

The other interfaces of the connection module are located at the rear:



- ① Grounding screw M5 for potential equalization connection

Figure 5-6 Rear of the Basic PN connection module

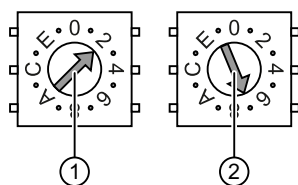
Setting the box ID

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. Values in the decimal format between 0 and 255 can be entered.

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 5-7 Example for address "27H"

Connector pin assignments

Signal type:

- I Input
- O Output
- B Bi-directional signals
- P Potential

X1, X2: Ethernet interfaces

The pin assignment of the Ethernet interfaces X1, X2 can be found in "General information and networking", Chapter: "Connecting", Section: "Pin assignment of the interfaces".

X3: Power supply

The pin assignment of the power supply interface X3 can be found in "General information and networking", Chapter: "Connecting", Section: "Pin assignment of the interfaces".

X7: Panel Present

Connector designation: **X7**

Connector type: 6-pin Phoenix terminal

Table 5-1 Assignment of the interface Panel Present X7

Pin	Signal name	Signal type	Meaning
1	PRES	O	"High": Panel (HT 8) plugged in
2	XCTL	O	"Low": EMER STOP button pressed ¹⁾
3	XFAULT	O	"Low": Error in emergency stop electronics ¹⁾
4	N.C.	-	Not connected
5	N.C.	-	Not connected
6	M	P	Ground

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

X8: Emergency Stop wiring terminal

Connector designation: **X8**

Connector type: 4-pin Phoenix terminal

Table 5-2 Assignment of the emergency stop wiring terminal X8

Pin	Protective circuit
1	On-board jumper between 1 and 2
2	
3	On-board jumper between 3 and 4
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 designation: **X20**

Connector type: 8-pin Phoenix terminal

Table 5-3 Assignment of the interface enabling buttons X20

Pin	Signal name	Signal type	Meaning
1	ZUST1P	I	Electronic enabling button 1 P
2	ZUST1M	O	Electronic enabling button 1 M
3	ZUST2P	I	Electronic enabling button 2 P
4	ZUST2M	O	Electronic enabling button 2 M
5	N.C.	-	Not connected
6	N.C.	-	Not connected
7	N.C.	-	Not connected
8	N.C.	-	Not connected

X21: Emergency Stop and key-operated switch

Connector designation: **X21**

Connector type: 10-pin Phoenix terminal

Table 5-4 Assignment of the interface Emergency Stop and key-operated switch X21

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

Note

Pins 7 and 8 must be jumpered in order to supply a handheld terminal with power.

5.3.3 Dimension drawing

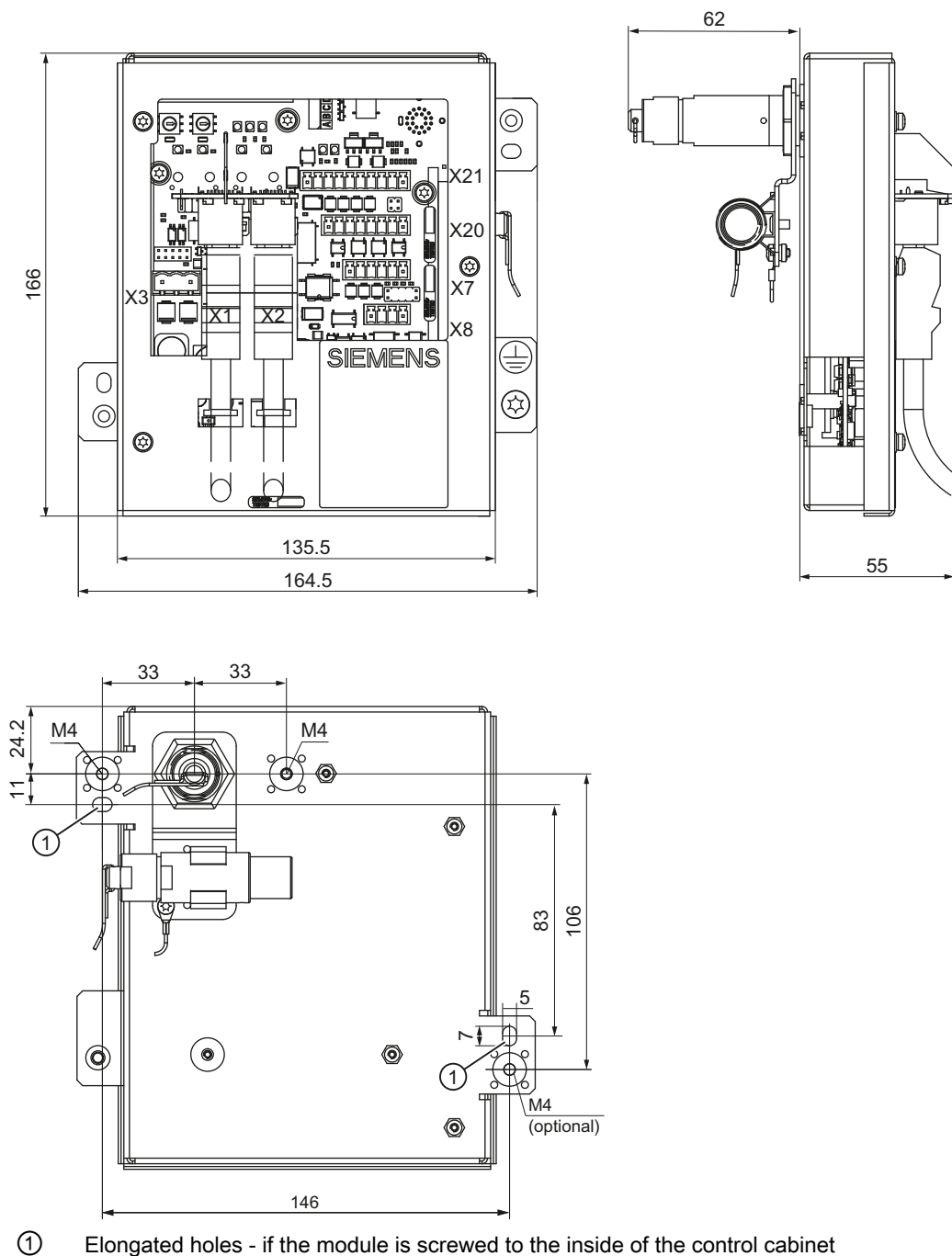


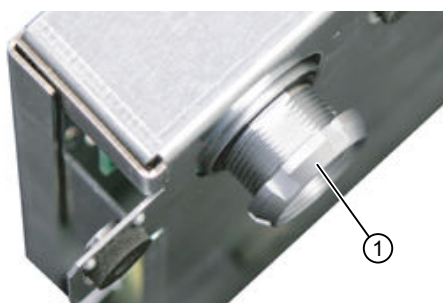
Figure 5-8 Connection module Basic PN - dimension drawing for control cabinet installation

5.3.4 Installing the terminating connector

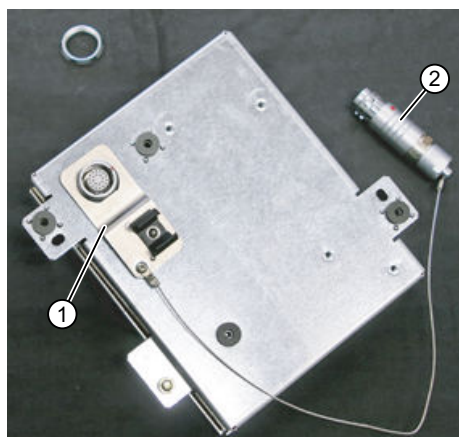
Procedure

Note

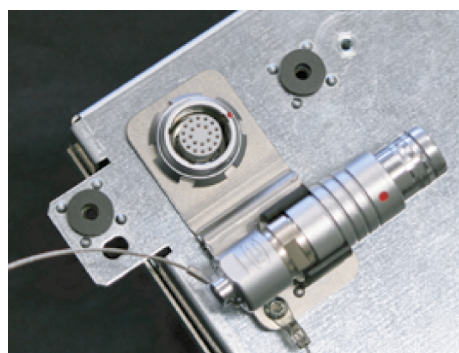
If you never remove the HT8 from the connection module, it is not necessary to attach the terminating connector.



1. Unscrew the fixing nut ①.



2. Attach the bracket ① for the terminating connector ②.

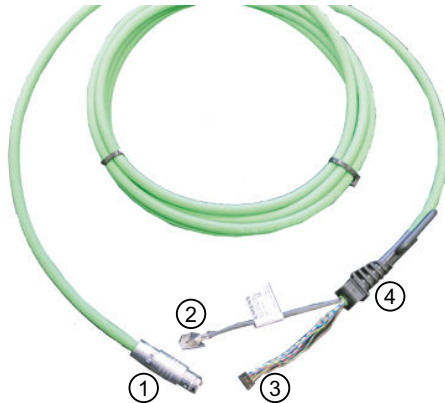


3. Tighten the retaining nut and insert the terminating connector into the bracket.

5.4 Connecting cable

The connecting cable is an industrial cable, can tolerate bending in-line with what is required in practice – and is resistant to many solvents and lubricants.

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



- ① Metallic push-pull round connector (ODU connector)
- ② RJ45 plug to connect to the Ethernet
- ③ Plug connector for enabling button, Emergency Stop, 24 V and safety signals
- ④ Strain relief device and kink protection

Figure 5-9 Connecting cable for the HT 8

The connecting cable is connected to the HT 8 using the RJ45 plug connector ② and plug connector ③. ODU plug connector ① is used to connect the connecting cable with the terminal box/connecting module MPP. The tightening torque for the nut of the ODU socket is 6.5 Nm.

The HT 8 has two cable entries at the rear for connecting the cable. This makes it possible to attach the connecting cable at either the right or left side.

One of the cable entries is closed at the factory by a connector in which a USB connection is integrated (with IP65 cover).

Routing the connecting cable



1. Open the cover by unscrewing the six PT screws (4 x 20 mm) approximately 1 cm. To do this, use a Phillips size 2 screwdriver.



2. Insert the connecting cable in the appropriate entry (left or right).

Press the cable downward slightly until it rests completely on the fastening lugs

Insert a plug in the cable entry that you do not intend to use.



3. Press the plug connector firmly into the power supply socket.



4. Connect the RJ-45 connector to the Ethernet socket.



WARNING

Improper installation of the cable can result in failure of the safety functions.

Please observe the following before you reattach the cover:

- Check to ensure that all of the conductors are aligned and straight and check the firm seating of the plug connector.
- Make sure that the connecting cable sleeve is installed correctly.

Correctly routed connecting cable

Connecting cable, left



Connecting cable, right



5. Attach the cover by tightening the six PT screws.

NOTICE

Damage to the housing

The housing of the HT 8 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 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.

5.5 Power Supply

The HT 8 is supplied with power via the terminal box/connection module.
The input voltage range is designed for +24 VDC.

For further details, see: "General notes and interconnection" → "Operational planning" →
"General electrical conditions" → "Power supply".

5.6 Unplugging/plugging during operation

The ability to detect a connected HT 8 in the PLC

1. **HW solution:**

Interface X7 of the Basic PN connection module signals "HT 8 Present" at pin 1 for the "active" connection module (see interfaces (Page 112)).

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

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

2. **Permanently configured MCPs / HT 8 connected to one control:**

If there are only permanently configured MCPs / HT 8 that a control, removal of the MCP or HT 8 triggers the PLC alarm "400260 Machine Control Panel failed".

Based on this, an "active" or "inactive" MCP / HT 8 in the PLC can be detected.

The failure of an MCP / HT 8 is, however, only detected in the PLC if max. 2 MCP / HT 8 are permanently configured and no MCP switchover using FB9 (e.g. triggered when operator focus is switched at the operator panel).

Note

Removing an HT 8 where the integrated machine control panel is active

Depending at which interface in the PLC (FB1: MCP1 or MCP2) the HT 8 is configured, before removing the HT 8, the transfer of the machine control panel signals must be stopped.

This is possible as direct axis via data block DB7 (instance of the FB1).

To do this, set the corresponding interface signal to "true":

- 1. Interface: DB7.DBX62.1 (MCP1Stop)
- 2. Interface: DB7.DBX62.2 (MCP2Stop)

If the machine control panel signals are not stopped, then the message "400260 machine control panel x failed" is displayed at the user interface:

Transfer of the machine control panel signals can be restarted after inserting the HT 8. To do this, set e.g. the PLC interface signal DB7.DBX62.1 (MCP1Stop) to "false".

Commissioning

6.1 SINUMERIK Operate

6.1.1 Activating/deactivating the virtual keyboard

The virtual keyboard is configured in the file "slguiconfig.ini".

Procedure

1. Copy the "slguiconfig.ini" file from the folder **/siemens/sinumerik/hmi/template/cfg**.
2. Paste the copy of the file into the following directory:
/oem/sinumerik/hmi/cfg or **/user/sinumerik/hmi/cfg**.
3. Open the file in the editor.
4. To activate or deactivate the keyboard, make the following settings:
 - Activating the virtual keyboard:
In the section [TouchPanel], EnableTouch = true
In the section [Keyboard], EnableVirtualKeyBoard = true
 - Deactivating the virtual keyboard:
In the section [TouchPanel], EnableTouch = true
In the section [Keyboard], EnableVirtualKeyBoard = false
5. Double click in the input field to display the keyboard.

6.1.2 Configuring the traversing keys

The traversing keys of the HT 8 are not labeled as their type of action is not predefined. The labeling of the traversing keys should adapt dynamically to the type of action of the keys. To recognize the type of action of the traversing keys, they are shown within the display in the vertical softkey area.

The menu of the traversing keys consists of two vertical rows each with eight keys so that up to 16 texts can be configured. The top and bottom traversing key row remain empty and can be assigned other functions.

The following data can be displayed:

- Machine axis name
- Alias name for machine axis
- Any language-dependent text
- Symbol

The following user-specific files are required. You can use the sample files as template:

File	Meaning
"sljkconfig.ini" configuration file	File in which the traversing keys are configured.
Text file "oem_sljk_XXX.ts"	File for labeling traversing keys in a foreign language, XXX = language code

"sljkconfig.ini" configuration file

Entries	Meaning
[State_1]	Labeling type - changed via the PLC.
ParamText_x_y	Text of the traversing key that is made up of parameters. Two-line labeling is possible, whereby max. five characters are possible per line. x: Specifies the position of the key within the row (2 to 7). y: Specifies the key row (1 or 2).
	%m1 The machine axis name of the first axis is referenced and displayed as text. The current active axis number is read out from data block DB10. The name from the machine data is determined via this index.
	%n Defines the position in the text for the line break.
	%a1 The alias axis name of the first axis is referenced and displayed as text. The current active axis number is read out from data block DB10. The name from the "oem_sljk_eng.ts" text file is determined via this index.
TextId_x_y	Text of the traversing key that is read from the text file (target language text).
Picture_x_y	File name of the icon to be displayed. The files with the icons must be located in the following directories: /oem/sinumerik/hmi/ico and depending on the resolution of the subdirectories: /ico640 /ico800 /ico1024 /ico1280

Procedure

1. Copy the "sljkconfig.ini" configuration file from the folder /siemens/sinumerik/hmi/template/cfg
2. Place the copy into the folder /oem/sinumerik/hmi/cfg or /user/sinumerik/hmi/cfg
3. Open the copy in the Editor and define the traversing key labeling.

Example of a "sljkconfig.ini" configuration file

12 axes are defined in the example, with text for softkey 1 and softkey 2, as well as an image on softkey 3 and softkey 4.

```
[Settings]
FileType = INI
```

```
; A few examples for further configuration options
; Alias names of machine-axes (%a1, %a2, etc.), from oem_sljk_deu.ts
(example)

[State_1]
TextId_1_1 = OEM_JK_TEXT_1
TextId_1_2 = OEM_JK_TEXT_2
ParamText_2_1 = %a1%n-
ParamText_2_2 = %a1%n+
ParamText_3_1 = %a2%n-
ParamText_3_2 = %a2%n+
ParamText_4_1 = %a3%n-
ParamText_4_2 = %a3%n+
ParamText_5_1 = %a4%n-
ParamText_5_2 = %a4%n+
ParamText_6_1 = %a5%n-
ParamText_6_2 = %a5%n+
ParamText_7_1 = %a6%n-
ParamText_7_2 = %a6%n+
Picture_8_1 = AlarmCancel.png
Picture_8_2 = AlarmNCReset.png
```

"oem_sljk_eng.ts" text file

Entries	Meaning
name	Freely selectable name of the text context. In the text file template, the name of the text context is "SIJkLabels" and stands for the traversing key labeling (solution line jog key labels). This identifier is already stored in the configuration file.
source	Traversing key identifier of the respective axis. This text ID is referenced in the "sljkconfig.ini" configuration file with the "TextId_2_1". The text IDs for the alias names (JK_AXISNAME_2 to JK_AXISNAME_7) must not be changed.
translation	Input of the foreign language text for the axis specified in <source>.

Language code in file names "xxx"

Language	Language code
German	deu
English	eng

Language	Language code
French	fra
Spanish	esp
Italian	ita
Chinese	chs

Procedure

1. You can copy the sample file "oem_sljk_deu.ts" from the following directory: **/siemens/sinumerik/hmi/template/lng**.
2. Store or create the file in the **/oem/sinumerik/hmi/lng** or **/user/sinumerik/hmi/lng** directory.
3. Give the file a name, e.g. for German texts: "sljk_deu.ts".
If you wish to set-up the labeling for additional languages, a separate file must be created for each language. Save the file with the appropriate language code in the file name. To do this, use the language codes specified above.
4. Open the file and in the `<message>` and `</message>` area, define the labeling.
5. Restart the HMI.
In order that the labeling is displayed during the program runtime, the file must be converted into a binary format. This conversion is only executed when the HMI powers up.

Example of a text file "sljk_deu.ts"

12 axes are defined in the example, with text for softkey 1 (SF1) and softkey 2 (SF2):

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE TS>
<TS>
  <context>
    <name>SlJkLabels</name>
    <!-- Alias names for machine axis (%a1, %a2, etc.) -->
    <!-- Do not change the text ID (JK_AXISNAME_1, etc.) -->
    <message>
      <source>JK_AXISNAME_1</source>
      <translation>X</translation>
    </message>
    <message>
      <source>JK_AXISNAME_2</source>
      <translation>Y</translation>
    </message>
    <message>
      <source>JK_AXISNAME_3</source>
      <translation>Z</translation>
    </message>
```

```
<message>
  <source>JK_AXISNAME_4</source>
  <translation>A</translation>
</message>
<message>
  <source>JK_AXISNAME_5</source>
  <translation>B</translation>
</message>
<message>
  <source>JK_AXISNAME_6</source>
  <translation>C</translation>
</message>
<message>
  <source>JK_AXISNAME_7</source>
  <translation>U</translation>
</message>
<message>
  <source>JK_AXISNAME_8</source>
  <translation>V</translation>
</message>
<message>
  <source>JK_AXISNAME_9</source>
  <translation>W</translation>
</message>
<message>
  <source>JK_AXISNAME_10</source>
  <translation>UV1</translation>
</message>
<message>
  <source>JK_AXISNAME_11</source>
  <translation>UV2</translation>
</message>
<message>
  <source>JK_AXISNAME_12</source>
  <translation>UV3</translation>
</message>
<!-- User defined language dependent text (example) -->
<message>
  <source>OEM_JK_TEXT_1</source>
  <translation>SF1</translation>
</message>
<message>
```

```

        <source>OEM_JK_TEXT_2</source>
        <translation>SF2</translation>
    </message>
</TS>

```

6.1.3 Configuring user-specific key labeling

Labeling the keys for the HT 8

The texts of the CPF menu (CPF: Control Panel Function) for the HT 8 can be labeled with your own texts in the particular language of the country.

The texts are created in the "slck_XXX.ts" file.

"XXX" = language code for the corresponding language-specific labeling.

You can create and edit this file using the HMI or also externally on a PC.

Note

If you wish to create or edit the file on a PC, use an editor that supports UTF-8 coding.

Language code in file names "XXX"

Language	Language code
German	deu
English	eng
French	fra
Spanish	esp
Italian	ita
Chinese	chs

Creating key labeling

Tag	Meaning
source	Designation for the user softkey. "SK_USERKEY1" to "SK_USERKEY16" are possible, whereby the names may not be changed.
comment	User-specific description of the key assignment.
translation	Text that should be shown on the key. - A maximum of 10 characters are possible per line. 2-line labeling is possible, whereby the line break is set using "%n".
remark	Remark for key assignment.
chars	Number of characters. A maximum of 10 characters per line are possible.
lines	Number of lines. 2 lines are possible.

Procedure

1. You can copy the sample file "oem_slck_deu.ts" from the following directory: **/siemens/sinumerik/hmi/template/lng**.
2. Store or create the file in the **/oem/sinumerik/hmi/lng** or **/user/sinumerik/hmi/lng** directory.
3. Give the file a name, e.g. for German texts: "slck_deu.ts".
If you wish to create the key labeling for additional languages, then a separate file must be created for each language. Save the file with the appropriate language code in the file name. To do this, use the language codes specified above.
4. Open the file and in the **<message>** and **</message>** area, define the key labeling.
5. Restart the HMI.
In order that the key labeling is displayed during the program runtime, the file must be converted into a binary format. This conversion is only executed when the HMI powers up.

Example of a key label

```
<!DOCTYPE TS><TS>
<context>
  <name>SlCkDialog</name>
  <message>
    <source>SK_USERKEY1</source>
    <comment></comment>
    <translation>U1</translation>
    <remark>User key 1</remark>
    <chars>10</chars>
    <lines>2</lines>
    <languageIndependent>true</languageIndependent>
  </message>
  <message>
    <source>SK_USERKEY2</source>
    <comment></comment>
    <translation>U2</translation>
    <remark>User key 2</remark>
    <chars>10</chars>
    <lines>2</lines>
    <languageIndependent>true</languageIndependent>
  </message>
  <message>
    .....
  </message>
</context>
</TS>
```

6.1.4 Configuring the function display at user-specific keys (U keys)

Function

Active functions can be displayed at the configurable user keys via the PLC. For instance, small LEDs can be emulated on the softkeys.

You configure the function in the "slckcpf.ini" file.

Interface signals

The PLC bits are in the output image of the PLC-HT 8 interface and are analog to those in the input image.

Signals to the MCP1 (or MCP2) Interface PLC → HT 8								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
AB n + 1		U4	U3		U2	U1		
AB n + 4	U9	U10	U11	U12	U13	U14	U15	U16
AB n + 5		U8	U7	U6	U5			

Adapt the display in the "slckcpf.ini" file

Section	Description
UserKeyLEDIcon	Name of the icon file. Standard entry: led_green.png
	OFF Deactivates the icon display.
	PRESSED Displays the active functions by pressing down the softkey.
UserKeyLEDIconAlignment	Specifies the position of the icon. Standard position: AlignLeft AlignTop Horizontal and vertical alignments can be combined. The two names are separated by the " " character. The following alignments are possible:
	AlignLeft Left
	AlignRight Right
	AlignHCenter Horizontal, center
	AlignTop Top
	AlignBottom Bottom
	AlignVCenter Vertical, center
UserKeyLEDMap	Specifies the start address of the output image. Entries can be made in the following form: "DBx.DBBy", "ABx", "MBx". Default setting: The start address is determined using DB7 MCP1Out (or MCP2Out).

Section	Description	
U1LED ... U16LED	The status bit address can be defined - different from the output image - using these entries. Note: The offsets from the HT 8 output image, for one or several softkeys, are not taken into consideration.	
VarIncLED		
SBLLED		
WCSLED		
showVarIncLED	true	When the increment mode is active, the icon is also displayed on the "[VAR]" softkey.
	false	The icon is not displayed.
showSBLLED	true	When the SingleBlock mode is active, then the icon is also displayed on the "Single Block" softkey.
	false	The icon is not displayed.
showWCSLED	true	When the SingleBlock mode is active, then the icon is also displayed on the "Single Block" softkey.
	false	The icon is not displayed.

1. You can copy the sample file "slckcpf.ini" from the following directory: **/siemens/sinumerik/hmi/template/cfg**
2. Store the file in the **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg** directory.
3. If you use your own icon, then locate it together with the corresponding resolution for HT 8 directory: **/oem/sinumerik/hmi/ico/ico640** or **/user/sinumerik/hmi/ico/ico640**.
4. Open the file and make the appropriate settings.

Sample file "slckcpf.ini"

```

Template for the configuration of the
; HT8 control panel function menu
;
; To activate the settings remove the
; commentary ';' at the beginning of the line
;; Display settings of the user key softkey leds
[UserKeyLED]
; Filename of the LED icon
;UserKeyLEDIcon = led_green.png
; Alignment of the LED icon
;UserKeyLEDIconAlignment= AlignLeft | AlignTop

; Use following led map start address instead of calculating
DB7.MCP1Out
;UserKeyLEDMap = AB0

```

```
; Use the following settings to use this status bits instead of the
led map for a specific sk
;U1LED=/channel/parameter/R[U1,1]
;....
;U16LED=/channel/parameter/R[U1,16]
;VarIncLED = DB11.DBX8.5
;SBLLED = DB21.DBX0.4
;WCSLED = DB19.DBX0.7

; Show a LED for the var inc sk
;showVarIncLED = true
; Show a LED for the var single block sk
;showSBLLED = true
; Show a LED for the var wcs/mcs sk
;showWCSLED = true
```

6.1.5 Troubleshooting

If errors occur while booting, an appropriate message is displayed.

For further information, see Chapter "General information and networking" → "Networking" → "Diagnostics and service".

6.2 HMI-Advanced

6.2.1 Configuring the traversing keys of the HT 8

Prerequisite

In order to display or skip the labeling of the traversing keys, the HT 8 must have user authorization.

Parameterizing the MCP signals of the HT 8 in the PLC

HT 8-relevant blocks in the PLC program are FB 1 for HT 8/PLC communication and FC 26 for NCK/PLC communication.

Display/skip the labeling of traversing keys on HT 8

In order to inscribe the traversing keys, the names of the first six axes are established from the machine data 10000: AXCONF_MACHAX_NAME_TAB (indexed using DB 10, bytes 8 to 13).

The LED image of HT 8 serves as the interface for displaying the labeling by the PLC. The PLC sets a bit in the LED image of the HT 8 to display or skip the traversing keys:

Signal AB n+6 bit 7 = **1** for displaying

Signal AB n+6 bit 7 = **0** for skipping

Note

To ensure that the labeling of the traversing keys is displayed correctly, the names of the axes must not exceed 10 characters.

Example with labeling of traversing axes displayed:

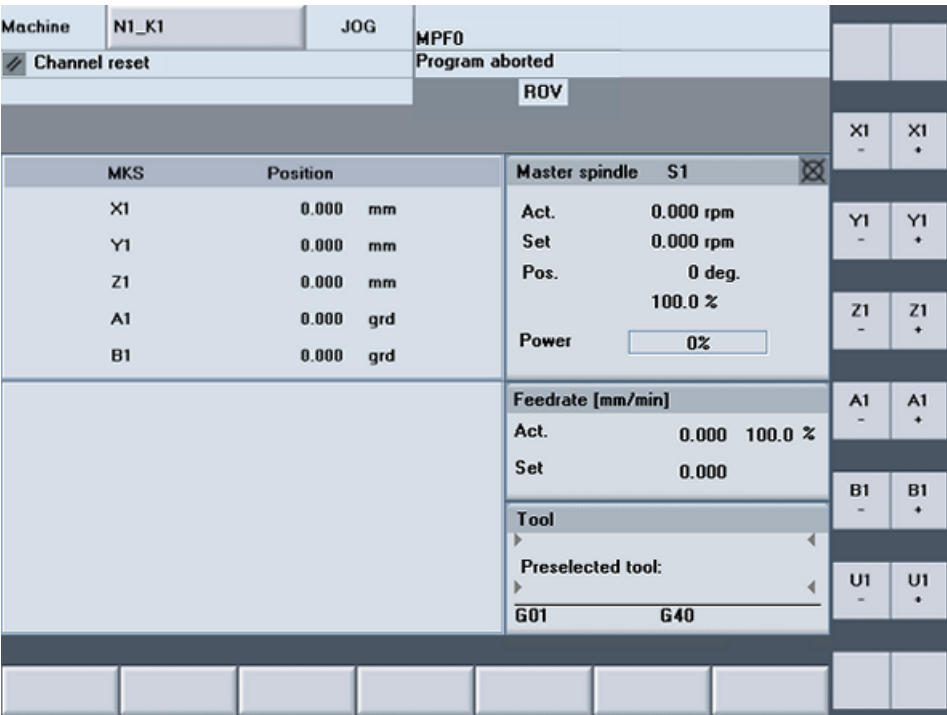


Figure 6-1 Traversing axes displayed

Acknowledging display/skipping by HMI on PLC

The HMI communicates to the PLC whether the traversing keys are displayed or hidden. This is done using bit 7 in byte 72 of DB 10:

Displayed: DB10.DBX72.7 = 1
Skipped: DB10.DBX72.7 = 0

User keys

The user keys (the 2 keys at the top and bottom) can be assigned in any way. User keys, which can be used to trigger a wide range of machine functions, are evaluated directly by the PLC program.

See also:

You will find additional information on the HT 8 in:

- Function Manual Basic Functions, basic PLC program (P3 sl)
- You will find a description of the machine data in:
Detailed Machine Data Description
- Operating Manual HMI-Advanced

6.2.2 Configuring user-specific key labeling

Labeling the keys for the HT 8

The texts of the CPF menu (CPF: Control Panel Function) for the HT 8 and the traversing keys can be labeled by the user with his own texts in his specific language.

A language-dependent file ht8_xx.ini is provided in directory \mmc2\language for this purpose. Only edit a copy of this original file and place this copy in one of the following directories:

- user\language
- oem\language
- addon\language

There are two sections in file ht8_xx.ini; one for the CPF menu ([CPFSOftkeyText]) and one for a maximum of 31 traversing keys ([AxiskeyText]). With no entry (e.g. U2="") or for the value <empty> (e.g. U2=<empty>) no labeling text is displayed on a softkey or on a traversing key (-/+).

- The entries for the CPF keys are pre-assigned as standard with U1 ... U16.
- The texts for the traversing keys are not activated as default setting for the following reason: If no traversing key text is read, the name is determined from the machine data – with the axis number as index – and correspondingly output: ("/ACC/NC_TEA/\$MN_AXCONF_MACHAX_NAME_TAB[" & chAxisNbr(k%) & "]", chAxisName(k%))

Note

It is not possible to combine the labeling texts – e.g. a part of the name from the INI file and another part from the machine data.

Configuration file

Example of a key labeling (ht8_xx.ini):

[CPFSOftkeyText]

```
U1 = "User%nKey 1"           ; 2*10 → Text is two lines due to %n
U2 = "UserKey 2"             ; 2*10 characters
U3 = "UserKey 3"             ; 2*10 characters
U4 = "UserKey 4"             ; 2*10 characters
U5 = "UserKey 5"             ; 2*10 characters
U6 = "UserKey 6"             ; 2*10 characters
U7 = "UserKey 7"             ; 2*10 characters
U8 = "UserKey 8"             ; 2*10 characters
U9 = "ETC-UKey 9"            ; 2*10 characters
U10 = "ETC-UKey 10"          ; 2*10 characters
U11 = "ETC-UKey 11"          ; 2*10 characters
U12 = "ETC-UKey 12"          ; 2*10 characters
```

```

U13 = "ETC-UKey 13"           ; 2*10 characters
U14 = "ETC-UKey 14"           ; 2*10 characters
U15 = "ETC-UKey 15"           ; 2*10 characters
U16 = "ETC-UKey 16"           ; 2*10 characters

```

```

[AxiskeyText]                  ; here, a line break is obtained with
                               ; 2 blanks.
SF1 = "sf_1"                   ; 2*10 characters
SF2 = <EMPTY>                   ; 2*10 characters
SF3 = "sf_3"                   ; 2*10 characters
SF4 = "sf_4"                   ; 2*10 characters
AX1 = "Wx"                     ; 2*5 characters
AX2 = "Xx"                     ; 2*5 characters
AX3 = <empty>                   ; 2*5   No text is displayed on the
                               ;       traversing key (-/+).
AX4 = <EMPTY>                   ; 2*5 characters
AX5 = "Yx"                     ; 2*5 characters
AX6 = "Zx"                     ; 2*5 characters

```

Traversing keys

As standard, keys for axes 1 to 6 are displayed. If the 2nd vertical softkey is pressed in the CPF menu (change over traversing keys), then the next time that the traversing keys are displayed, keys 7 to 12 are displayed; after pressing the 2nd vertical softkey in the CPF menu, then axis keys 1 to 6 are displayed again, etc.

Note

Switch off CPF menu

The CPF_Disabled entry is evaluated in the [CONTROL] section of the MMC.INI configuration file: If the value = 1, the CPF menu will not be displayed.

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 8.

Checking the device

In order to prevent foreign bodies or liquids entering the HT 8, 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 8 against

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

Checking the emergency stop button and the enabling button

Check the emergency stop button regularly to ensure that it functions correctly.

Check the enabling button regularly to ensure that it functions correctly in the enable and panic position.



WARNING

Danger of death caused by damaged HT 8

Immediately check the functioning of the emergency stop button and the enabling button if the device was subject to significant shock (e.g. because it was dropped).

Technical specifications

8.1 Handheld Terminal HT 8

HT 8 handheld terminal

Safety		
Safety class	III according to EN 61131-2 / EN 50178	
Degree of protection according to EN 60529	IP65	
Approvals	CE / cULus	
Electrical data		
Input voltage	24 V DC	
Current carrying capacity	Enabling button:	10 - 250 mA / 2-channel, 3-stage
	Emergency Stop button:	10 - 1000 mA / 2-channel
Max. current carrying capacity	USB interface:	100 mA
Power consumption, max.	Approx. 13 W	
Mechanical data		
Dimensions	Diameter: Approx. 290 mm	Height: Approx. 126 mm
Weight	Approx. 1730 g	
Fall height, max.	1.20 m	
Display		
Size	7.5" TFT	
Resolution	640 x 480 pixels	
Service life	At ambient temperatures of > 40° C and long periods of non-use, it is advisable to activate the screen saver function.	

Note

Information about the climatic and mechanical environmental conditions is contained in the associated section under:

"General notes and interconnection" → "Operational planning".

Emergency Stop button

Rated voltage	24 V DC
Current rating, max.	1 A
Current rating, min.	10 mA
Switching capacity	DC 13 according to EN 60947-5-1

8.1 Handheld Terminal HT 8

Conditional rated short-circuit current	1000 A, 6A gL/gG according to EN 60947-5-1
B _{10d} (if no PN terminal box used)	100 000
When the PN Plus connection box is used:	
PFH _d	1.01 * 10 ⁻⁷
Service life	20 years
Forced dormant error detection interval (mechanical actuation to the test the emergency stop)	1 year
Category	3
Performance Level	PL d

Note

The quantitative assessment of the emergency stop safety function must be based on the B_{10d} value corresponding to the used standards (e.g. ISO 13849-1) under consideration of the respective application (frequency of the actuation, service life, diagnostics by the evaluation unit, etc.). The B_{10d} value only applies when the technical properties of the emergency stop button are taken into account.

When using the PN Plus terminal box, the specified failure probability (PFH_d) must be taken into account. This value only applies when the technical properties of the PN Plus terminal box and the quantitative conditions specified here (e.g. service life) are observed.

Enabling button

		2-circuit , 3-stage
Supply voltage		24 V DC
Current rating, max.:		250 mA
Current rating, min.:		0 A
Operating cycles	Switch position 2	10 ⁵
	Switch position 3	5 * 10 ⁴
Actuation forces	From switch position 1 to 2, typically	3 N
	From switch position 2 to 3, typically	17 N
Functional safety		
EN ISO 13849-1:2008	Category	4
	Performance Level (PL)	PL e
	Proof test interval (operating duration)	20 years
EN 61508	Safety Integrity Level (SIL)	SIL 3
	PFH _d	5.07 * 10 ⁻⁹
Forced dormant error detection interval (mechanical actuation to the test the enable and panic position)		1 year

Note

The PFH_d value only applies when the technical properties of the enabling button and the quantitative conditions specified here (e.g. service life) are observed.
The permissible number of switching cycles must also be observed in the application.

8.2 Connection module Basic PN

Safety			
Safety class	III according to IEC 60536		
Degree of protection according to EN 60529	IP54		
Approvals	CE / cULus		
Electrical data			
Input voltage	24 VDC (via X3 connector)		
Current carrying capacity	Enabling button contacts (X20 connector)	max. each 0.5 A / 2-channel	
	Emergency stop button contacts (X21 connector)	max. each 0.5 A / 2-channel	
Max. power consumption	Connection module without external loading	0.3 A	
	Panel (HT 8)	1.6 A	
	5 status signals (X7 and X21)	2.5 A (0.5 A each)	
	Total:	4.4 A	
Max. total power consumption	105.6 W		
Mechanical data			
Dimensions	Height (without holder for terminating connector): 66 mm	Width: 165 mm	Length: 166 mm
Weight	0.75 kg		
Fall height, max.	1.20 m		

Note

Information about the climatic and mechanical environmental conditions is contained in the associated section under:

"General notes and interconnection" → "Operational planning".

8.3 PN terminal box

General data	
Weight without packaging	Approx. 700 g
Degree of protection according to EN 60529	IP65 (with connected HT 8 or with inserted blanking cover)
Electrical data	
Rated voltage	+24 V DC
Range, permissible	20.4 to 28.8 V (–15%, +20%)
Transients, maximum permissible	35 V (500 ms)
Time between two transients, minimum	50 s
Current consumption of PN terminal box without HT 8	
• Typical • Continuous current, maximum • Inrush current I^2t	• Approx. 100 mA • Approx. 150 mA • Approx. 0.5 A²s
Current consumption of PN with HT 8, typical	Approx. 550 mA
Fuse, internal	Electronic
Current load PLC-accompanying signals	Max. 100 mA

Note

Recovery time

Wait for approximately one second after withdrawing the connecting cable from the connection box before reinserting.

After power failures lasting less than one second the connecting cable has to be disconnected.

Spare parts

The following spare parts are available for the HT 8:

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

Accessories

10.1 Overview

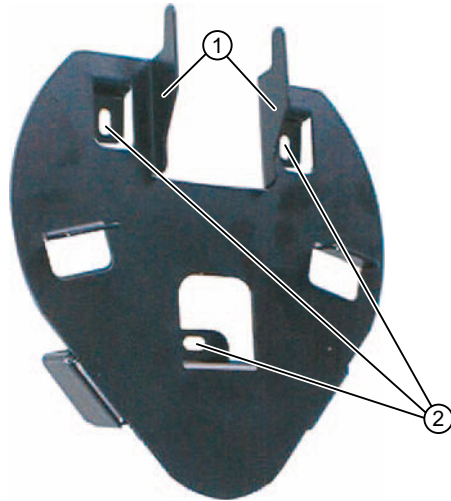
The following accessories are available for the HT 8:

Designation	Remark	Quantity	Article number
PN Plus terminal box	With automatic emergency stop override for mounting in the system	1	6AV6671-5AE11-0AX0 *)
PN Basic terminal box	Without automatic emergency stop override for mounting in the system	1	6AV6671-5AE01-0AX0 *)
PN Basic connection module	Without automatic emergency stop override for mounting in the control cabinet		6FC5303-0AA01-1AA0 *)
Wall holder	For safekeeping, also suitable for stationary operation	1	6AV6574-1AF04-4AA0
Touch pen	with holding loop	1	6FC5348-0AA08-4AA0
Protective membrane	for 8" touch display, type 10	2	6AV6671-5BC00-0AX0
Straight 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 connection cable	1.5 m long, can be extended to 3.5 m	1	6FC5348-0AA08-3AA0

*) Safety related accessories

10.2 Wall holder

The HT 8 can be safely kept and operated in a stationary manner in the wall holder.



- ① Hook for the grip on the handheld unit
- ② Drill holes for screw fixing

Figure 10-1 HT 8 wall holder - view

Ensure that you position the wall holder in such a manner that

- the display of the hung-in HT 8 is not exposed directly to the sun's rays.
- the HT 8 can be hung in based on ergonomic considerations. Therefore, choose a suitable mounting height.

Dimension drawing

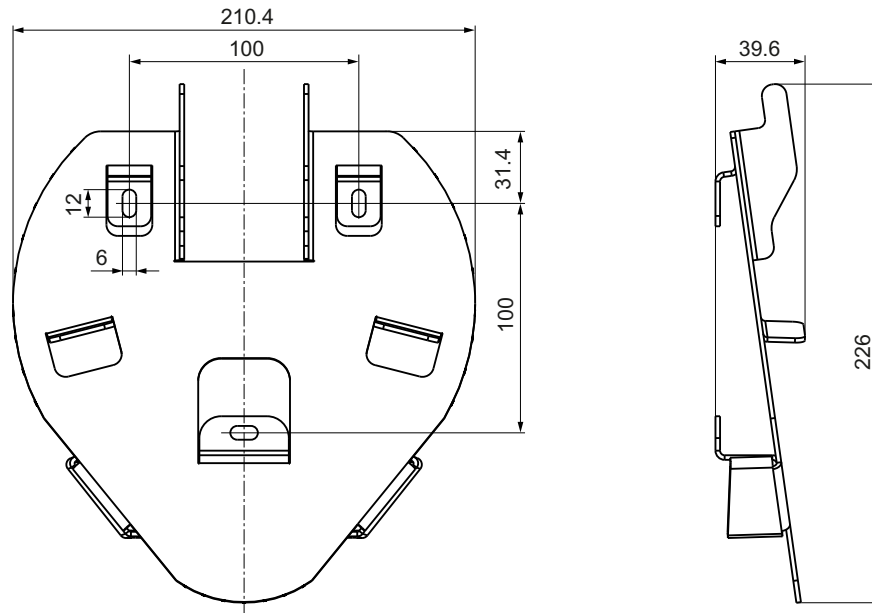


Figure 10-2 HT 8 wall holder - dimension drawing

Note

Please note that the holder is smaller than the HT 8 ($\varnothing$ approx. 290 mm). You must keep sufficient clearance around the holder to ensure convenient handling.

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