SIEMENS

SINUMERIK

SINUMERIK ONE
Handheld units

Equipment Manual

Valid for:
Control
SINUMERIK ONE

11/2023
A5E53284668B AA

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

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.

Trademarks

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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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GERMANY

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Introduction 1

1.1 About SINUMERIK

From simple, standardized CNC machines to premium modular machine designs – the SINUMERIK CNCs offer the right solution for all machine concepts. Whether for individual parts or mass production, simple or complex workpieces – SINUMERIK is the highly dynamic automation solution, integrated for all areas of production. From prototype construction and tool design to mold making, all the way to large-scale series production.

Visit our website for more information SINUMERIK (https://www.siemens.com/sinumerik).

1.2 About this documentation

Validity

This Equipment Manual addresses SINUMERIK operating components "handheld units". This documentation is valid for the SINUMERIK ONE system.

Target group

This Equipment Manual addresses planners, installers and configuration engineers in the field of automation technology. The Equipment Manual enables the target group to install, assemble, test and operate the device professionally and safely.

Content and structure

After Chapter "Fundamental safety instructions", you are provided with important information about application planning.

The documentation then provides information about the following handheld units and their associated functions:

- HT 2 handheld terminal
- Mini handheld unit
- Portable electronic handwheel

Standard scope

This documentation only describes the functionality of the standard version. This may differ from the scope of the functionality of the system that is actually supplied. Please refer to the ordering documentation only for the functionality of the supplied drive system.

It may be possible to execute other functions in the system which are not described in this documentation. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

For reasons of clarity, this documentation cannot include all of the detailed information on all product types. Further, this documentation cannot take into consideration every conceivable type of installation, operation and service/maintenance.

The machine manufacturer must document any additions or modifications they make to the product themselves.

Websites of third-party companies

This document may contain hyperlinks to third-party websites. Siemens is not responsible for and shall not be liable for these websites and their content. Siemens has no control over the information which appears on these websites and is not responsible for the content and information provided there. The user bears the risk for their use.

1.3 Documentation on the internet

1.3.1 Documentation overview SINUMERIK operator components

Comprehensive documentation about the SINUMERIK operator components is provided in the Documentation overview SINUMERIK operator components (https://support.industry.siemens.com/cs/document/109783841/technische-dokumentation-zu-sinumerik-bedienkomponenten?dti=0&lc=en-WW).

You can display documents or download them in PDF and HTML5 format.

The documentation is divided into the following categories:

- Operator Panels
- Machine control panels
- Machine Pushbutton Panel
- Handheld Unit/Mini handheld devices
- Further operator components

An overview of the most important documents, entries and links to SINUMERIK is provided at SINUMERIK Overview - Topic Page (https://support.industry.siemens.com/cs/document/109766201/sinumerik-an-overview-of-the-most-important-documents-and-links?dti=0&lc=en-WW).

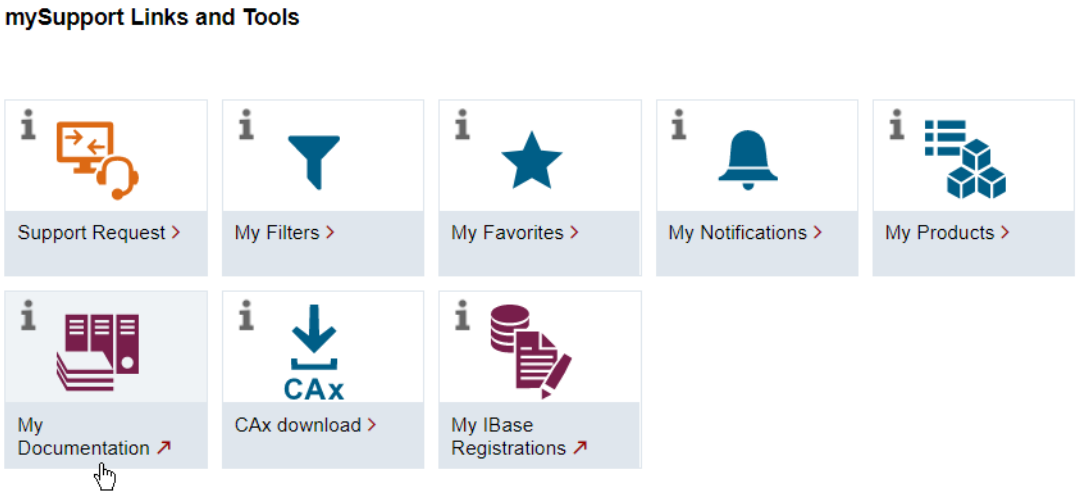
1.4 Feedback on the technical documentation

If you have any questions, suggestions, or corrections regarding the technical documentation published in the Siemens Industry Online Support, use the link "Give feedback" link which appears at the end of the entry.

1.5 mySupport documentation

With the "mySupport documentation" web-based system you can compile your own individual documentation based on Siemens content, and adapt it for your own machine documentation.

To start the application, click on the "My Documentation" tile on the "mySupport links and tools" (https://support.industry.siemens.com/cs/ww/en/my) portal page:



The configured manual can be exported in RTF, PDF or XML format.

Note

Siemens content that supports the mySupport documentation application can be identified by the presence of the "Configure" link.

1.6 Service and Support

Product support

You can find more information about products on the internet:

Product support (https://support.industry.siemens.com/cs/ww/en/)

The following is provided at this address:

- Up-to-date product information (product announcements)
- FAQs (frequently asked questions)
- Manuals
- Downloads
- Newsletters with the latest information about your products
- Global forum for information and best practice sharing between users and specialists

- Local contact persons via our Contacts at Siemens database (→ "Contact")
- Information about field services, repairs, spare parts, and much more (→ "Field Service")

Technical support

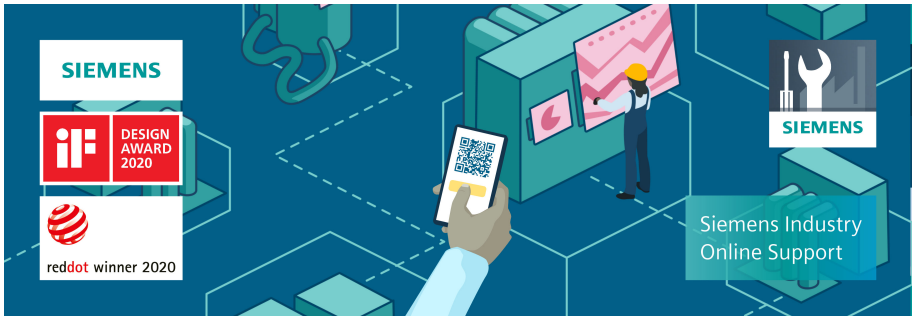
Country-specific telephone numbers for technical support are provided on the internet at address (https://support.industry.siemens.com/cs/ww/en/sc/4868) in the "Contact" area.

If you have any technical questions, please use the online form in the "Support Request" area.

Training

You can find information on SITRAIN at the following address (https://www.siemens.com/sitrain).
SITRAIN offers training courses for automation and drives products, systems and solutions from Siemens.

Siemens support on the go



With the award-winning "Industry Online Support" app, you can access more than 300,000 documents for Siemens Industry products – any time and from anywhere. The app can support you in areas including:

- Resolving problems when implementing a project
- Troubleshooting when faults develop
- Expanding a system or planning a new system

Furthermore, you have access to the Technical Forum and other articles from our experts:

- FAQs
- Application examples
- Manuals
- Certificates
- Product announcements and much more

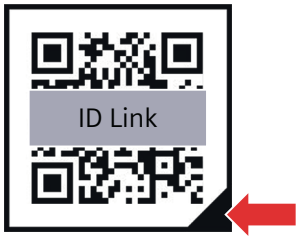
The "Industry Online Support" app is available for Apple iOS and Android.

Digital product information as QR code

The ID link according to IEC 61406 provides you with digital information about your product.

The ID link is a globally unique identifier and appears as a QR code on the product.

You can recognize the ID link by the frame with a black corner at the bottom right.



In addition to the digital nameplate you will find the following product information:

- Technical specifications
- FAQs
- Manuals
- Certificates
- Product announcements
- Application examples

1.7 Using OpenSSL

This product can contain the following software:

- Software developed by the OpenSSL project for use in the OpenSSL toolkit
- Cryptographic software created by Eric Young.
- Software developed by Eric Young

You can find more information on the internet:

- OpenSSL (https://www.openssl.org)
- Cryptsoft (https://www.cryptsoft.com)

1.8 Compliance with the General Data Protection Regulation

Siemens observes standard data protection principles, in particular the data minimization rules (privacy by design).

For this product, this means:

The product does not process or store any personal data, only technical function data (e.g. time stamps). If the user links this data with other data (e.g. shift plans) or if he/she stores person-related data on the same data medium (e.g. hard disk), thus personalizing this data, he/she must ensure compliance with the applicable data protection stipulations.

Fundamental safety instructions

2

2.1 General safety instructions

⚠ WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or severe injury.

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

Generally, the following steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

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

⚠ WARNING

Electric shock due to connection to an unsuitable power supply

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage. Contact with hazardous voltage can result in severe injury or death.

- 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

Electric shock due to equipment damage

Improper handling may cause damage to equipment. 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

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

Electric shock if there is no ground connection

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.

NOTICE

Damage to equipment due to unsuitable tightening tools.

Unsuitable tightening tools or fastening methods can damage the screws of the equipment.

- Only use screw inserts that exactly match the screw head.
- Tighten the screws with the torque specified in the technical documentation.
- Use a torque wrench or a mechanical precision nut runner with a dynamic torque sensor and speed limitation system.
- Adjust the tools used regularly.

WARNING

Spread of fire from built-in devices

Built-in devices can cause a fire and a pressure wave in the event of a fault. Fire and smoke can escape from the control cabinet and cause serious personal injury and property damage.

- Install built-in appliances in a robust metal control cabinet that is suitable for protecting people from fire and smoke.
- Only operate built-in devices with the control cabinet doors closed.
- Ensure that smoke can only escape via controlled and monitored paths.

CAUTION

Symptomatic respiratory and skin reaction to chemicals

A newly purchased product might contain traces of substances that are identified as sensitizers.

Sensitizers are substances which can cause sensitization in the lungs and skin after exposure to them.

Once sensitized, individuals can have severe reactions to further exposure, even in small amounts. In the most extreme cases, individuals might develop asthma or dermatitis respectively.

- If the product has a strong smell, keep it in a well-ventilated area for 14 days.

WARNING

Unexpected machine movement caused by radio devices or mobile phones

Using radio devices, cellphones, or mobile WLAN devices in the immediate vicinity of the components can result in equipment malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- Therefore, if you move closer than 20 cm to the components, be sure to switch off radio devices, cellphones or WLAN devices.
- Use the "SIEMENS Industry Online Support App" or a QR code scanner only on equipment that has already been switched off.

WARNING

Fire due to inadequate 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.

NOTICE

Overheating due to inadmissible mounting position

The device may overheat and therefore be damaged if mounted in an inadmissible position.

- Only operate the device in admissible mounting positions.

WARNING

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in 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 instructions for Safety Integrated

If you want to use Safety Integrated functions, you must observe the Safety instructions in the Safety Integrated documentation.

2.2 Equipment damage due to electric fields or electrostatic discharge

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

NOTICE

Equipment damage due to 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 of 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).

2.3 Warranty and liability for application examples

Application examples are not binding and do not claim to be complete regarding configuration, equipment or any eventuality which may arise. Application examples do not represent specific customer solutions, but are only intended to provide support for typical tasks.

As the user you yourself are responsible for ensuring that the products described are operated correctly. Application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

2.4 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/cert.

Further information is provided on the Internet:

Industrial Security Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/108862708)

WARNING

Unsafe operating states resulting from software manipulation

Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a state-of-the-art, integrated industrial cybersecurity concept for the installation or machine.
- Make sure that you include all installed products in the integrated industrial cybersecurity concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- Carefully check all cybersecurity-related settings once commissioning has been completed.

2.5 Residual risks of power drive systems

When assessing the machine or system-related risk in accordance with the respective local regulations (e.g. EC Machinery Directive), the machine manufacturer or system integrator 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 or system components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware faults and/or software errors in the sensors, control system, actuators, 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 electronic components
   - External influences/damage
   - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures inside and outside the components, including open flames, as well as emissions of light, noise, particles, gases, etc. due to fault conditions, e.g.:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage
   - Short circuits or ground faults in the intermediate DC circuit of the converter
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

6. Influence of network-connected and wireless communications systems, e.g. ripple-control transmitters or data communication via the network or mobile radio, WLAN or Bluetooth.
7. Motors for use in potentially explosive areas:
   When moving components such as bearings become worn, this can cause enclosure components to exhibit unexpectedly high temperatures during operation, creating a hazard in areas with a potentially explosive atmosphere.

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

Application planning 3

3.1 Electrical constraints

3.1.1 Power supply

Requirements for DC power supplies

⚠ WARNING

Electric shock due to connection of an unsuitable power supply

If equipment is connected to an unsuitable power supply and/or insufficiently grounded or rear cover, exposed components may carry a hazardous voltage that might result in serious injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltages acc. to UL 61010 for all connections and terminals of the electronics modules.

⚠ WARNING

Inadequately fused supply cables can be life-threatening

In the case of supply lines >30 m, protectors must be installed at the device input 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 3-1 Requirements of the DC power supply

Rated voltage	According to EN 61131-2 Voltage range (mean value) Voltage ripple, peak/peak Ramp-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

3.1.2 Grounding concept

Components

The SINUMERIK ONE system consists of several individual components that 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 Push Button Panel MPP
- Keyboard
- Operator panels (operator panel front + TCU / SIMATIC IPC for SINUMERIK)
- Distributor box and handheld unit
- S7-1500 I/O devices

Grounding measures

The individual modules are attached to a metal cabinet panel. Insulating paints on the mounting points must be removed.

It is permissible to have a cluster of operator components for ground connection / equipotential bonding.
Example: The control panel on the swivel arm.
It is sufficient in this instance to connect the ground connections of, for example, the SIMATIC IPC for SINUMERIK, TCU and operator panel front using a cable and to route a shared grounding conductor to the central ground connection in the control cabinet.

More information

More information about EMC installation guidelines can be found under:

- Configuration Instructions, EMC installation guideline (https://support.industry.siemens.com/cs/document/60612658/emc-design-guidelines-configuration-manual-01-2012?dti=0&lc=en-WW)

3.1.3 RI suppression measures

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

Shielded signal cables

- Use the specified cables to ensure safe and disturbance-free operation of the plant or system.
- For digital signal transmission, the shield must have a conductive connection at both sides of the housing.

Cable definitions

- Signal cables (example)
  - Data cables (Ethernet, PROFIBUS, PROFINET, sensor cables, etc.)
  - Digital inputs/outputs
  - Emergency Stop cables
- Power cables (example)
  - Supply voltage 1 x 230 VAC or 3 x 400 VAC
  - Motor cables

Rules for routing cables

In order to maximize noise immunity for the complete system (control, power unit, machine) the following EMC measures must be observed:

- A minimum distance of 200 mm is to be observed between the signal lines and power cables.
- If necessary, signal and load 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 NCU.
- Signal cables may 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).

More information

You can find more information on interference suppression measures and the connection of shielded cables here:

- Configuration Instructions, EMC installation guideline (https://support.industry.siemens.com/cs/document/60612658/emc-design-guidelines-configuration-manual-01-2012?dti=0&lc=en-WW)

3.1.4 SINUMERIK South Korea information

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.

3.1.5 EMF assessments for 24 V components

The 24 V components, e.g. control systems (NCU, MCU, PPU), PCUs/IPCs, operator panels, handheld terminals and machine control panels do not generate any appreciable electromagnetic fields.

No minimum clearance has to be maintained for 24 V components.

3.2 Climatic and mechanical environmental conditions

3.2.1 Transport and storage conditions

The components of the SINUMERIK ONE system exceed the requirements according to EN 61800-2 with regard to transport 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 3-2 Ambient conditions during storage and transport

Type of condition	Permissible range/class
Classification	EN 60721-3-1
Climate class	1K4
Ambient temperature	-20 °C ... +55 °C
Biological environmental conditions	1B1 [1)]
Chemically active environmental conditions	1C2 [2)]
Mechanical environmental conditions	Class 1M2 according to EN 60721-3-1, in product packaging [3)]
Maximum permissible temperature change	30 k/h
Relative humidity (without condensation)	5 to 95%
Precipitation, rain	Not permissible
Water other than rain	Not permissible [4)]
Height	Max. 4,000 m above sea level
Condensation, splash water, icing, salt spray	Not permissible [4)]

1) Mold growth, slime, animal pests, rodents, termites and other animal vermin are not permissible.

2) In marine- and weather-resistant transport packaging (container).

3) Product packaging (storage packaging) is an individual packaging for storage and does not satisfy the requirements for transport. As a consequence, product packaging is therefore not suitable for shipping.

4) For storage in the product packaging.

Note

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

3.2.2 Operating conditions

The components of the SINUMERIK ONE system are intended for installation at a fixed weatherproof 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.

Climatic ambient conditions	
Climate class according to EN 60721-3-3	Better than class 3K3
Temperature	0 ... 55° C (without derating)
Installation altitude	Up to 1000 m without derating From 1000 m to 3000 m with linear ambient temperature derating, -0.5 K per 100 m
Relative humidity	5 ... 95% (no condensation)
Oil mist, salt mist, ice formation, condensation, dripping water, spraying water, splashing water and water jets	Not permitted

Biological, chemical, electrical and mechanical influences, pollutants	
Biological environmental conditions	Class 3B1 according to EN 60 721-3-3: Mold, mold growth, slime, rodents, termites and other animal vermin are not permissible.
Chemically active environmental conditions	Class 3C1 according to EN 60721-3-3
Mechanically active environmental conditions	Class 3M1 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
Vibration test in operation	According to IEC 60068-2-6 test Fc (sinusoidal) • 10...57 Hz: 0.075 mm deflection amplitude • 57...150 Hz: 1 g acceleration amplitude • 10 frequency cycles per axis

Biological, chemical, electrical and mechanical influences, pollutants	
Shock test in operation	According to IEC 60068-2-27 test Ea (half-sine) • 5 g peak acceleration • 30 ms duration • 3 shocks in all three axes in both directions
Degree of contamination	2 (only use indoors)
EMC conducted / radiation	Class C2 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.

Note

In a residential environment, this product can cause high-frequency interference, which may make interference suppression measures necessary.

Have the installation and commissioning with appropriate radio interference suppression measures performed by qualified personnel.

3.3 Standards and approvals

Approvals

CE approval

Figure 3-1 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:

- 2014/30/EU "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 device.

Figure 3-2 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 13849-1:2015. 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 13849-1:2015
- Requirements of EN 60204-1:2018, 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. 1105/4

3.4 Recycling and disposal

For environmentally friendly recycling and disposal of your old device, please contact a company certified for the disposal of electrical and electronic waste and dispose of the device in accordance with the regulations in your country.

Handheld Terminal HT 2

4

4.1 Description

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

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

For mounting in the control cabinet, the HT 2 is connected with a connection module PN Basic.
The HT 2 is suitable for right-handed and left-handed personnel as it has two enabling buttons. The magnetic handwheel allows intuitive axis feed motion. All of the HT 2 keys can be freely configured and labeled.

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

Validity

The following description applies to the following components:

Name	Features	Article number
HT 2	Enabling button, emergency stop button, override rotary switch	6FC5303-0AA00-2AA0

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

Function blocks

In the unit:

- PCB with CPU, memory
- Ethernet controller

Device front:

- LC display (black / white)
  - Resolution: 128 x 64 pixels
  - LCD controller on board
  - 4 lines each with 16 characters can be displayed
- 20-key membrane keyboard
  - 16 machine control keys
  - 4 keys (upper row of keys) can be assigned as softkey or system key
- Emergency stop button, 2-channel
- Rotary override switch (19 positions)
- Magnetic handwheel

Device rear:

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

Right-hand side of the device

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

Left-hand side of the device:

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

4.2 Operator control and display elements

4.2.1 Overview

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

Figure 4-1 Operator control and display elements of the HT 2

4.2.2 Description

Display

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

Keyboard

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

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

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

One of these slide-in labels is not printed. The remaining four slide-in labels have standard symbols for the machine control printed on them.
The standard symbols used and their position on the slide-in labels are listed together with the corresponding symbol number in the table.

Table 4-1 Standard symbols on the slide-in labels

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

Symbols that you specify can be printed on all of the slide-in labels. Blank films are available for this purpose.
Information on the article number for the blank films and for printing as well as exchanging the slide-in labels is provided in Section "Accessories" → "Slide-in labels".

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.

Rotary override switch

The rotary override switch of the HT 2 has 19 positions.
The evaluation scale (0 to max.) is specified by the machine's manufacture in the form of machine data.

Handwheel

The HT 2 handwheel has magnetic bearings.

A turning knob is integrated in the handwheel knob. This allows fast rotary motion to be executed using a finger (run-on < 1 revolution).
Individual increments can be reliably moved at the machine – as the transition from one position to another can be clearly sensed.

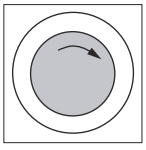
The handwheel operates with 100 pulses/revolution and has a cogging torque of approx. 1.5 Ncm (+/- 0.3). The max. speed is 1000 rpm

Emergency stop button

The red emergency stop mushroom pushbutton has a yellow ring.
Directly under the mushroom pushbutton, there is also a black ring which identifies the position status of the emergency stop button.

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

If an emergency stop is triggered, the button locks into place.
If the button is locked into place, it can be unlocked by rotating it to the right.



Emergency stop button
Press the red button in emergencies when

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

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

Machine manufacturer
For other reactions to the emergency stop:
Refer to the machine tool manufacturer's instructions!

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

Enabling button

The HT 2 has two enabling buttons that are logically grouped.
This allows the enabling function to be triggered by either the left or the right hand during normal operation.

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

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

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

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

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

Normal actuation

Zero position → X → Agreement → Y → Zero position

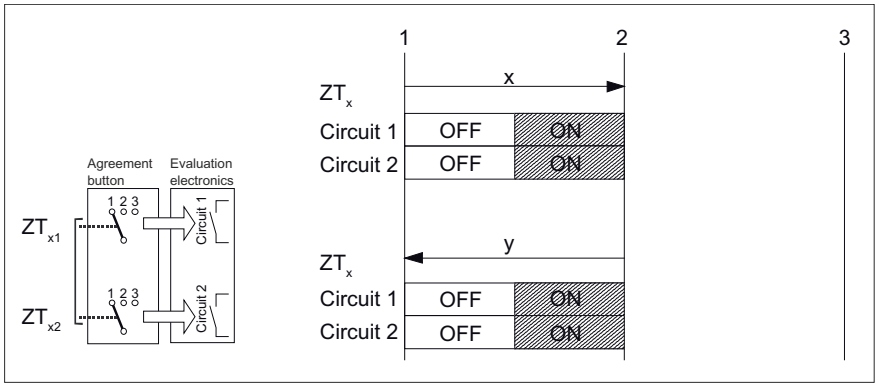


Figure 4-2 Switching distance diagram for normal actuation

Panic actuation

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

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

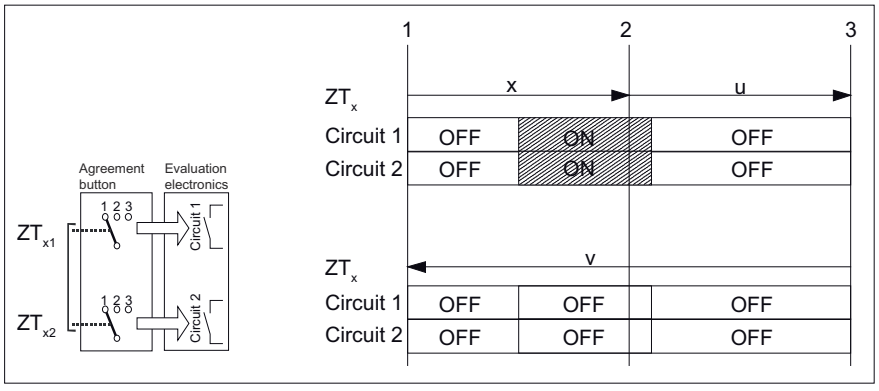


Figure 4-3 Switching distance diagram for panic actuation

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

WARNING

Danger of death resulting from the misuse of the enabling button

It is not permitted to fix the enabling button in the "Enable" position by mechanical means.

Key-operated switch

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

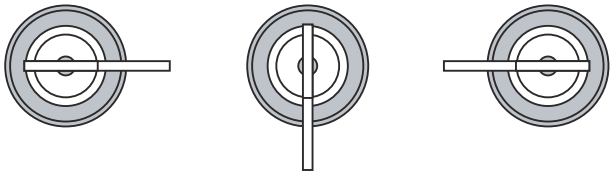


Figure 4-4 Key-operated switch positions

The key can be removed in the switch position 0.

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

Note

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

4.3 Connecting

4.3.1 Overview

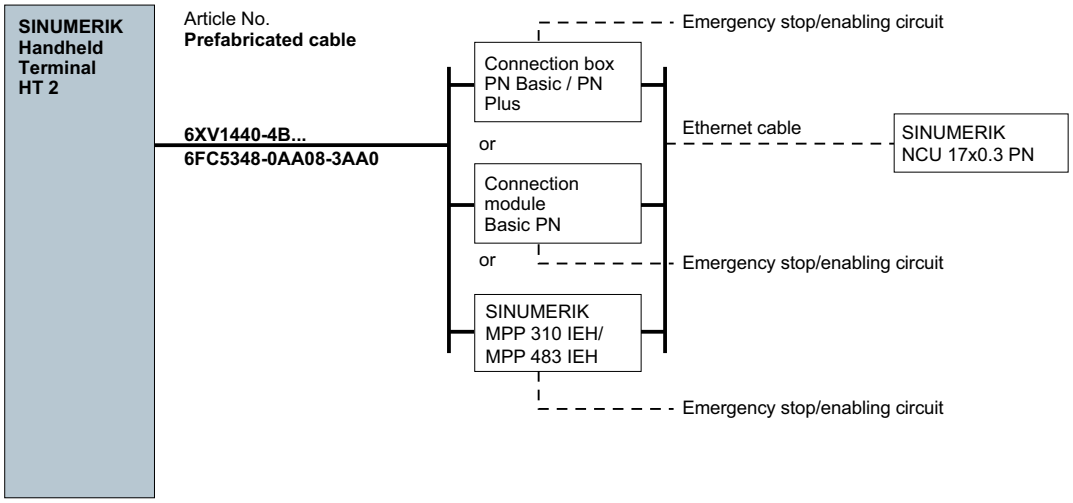


Figure 4-5 Connection overview HT 2

The Handheld Terminal HT 2 communicates with a control unit via

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

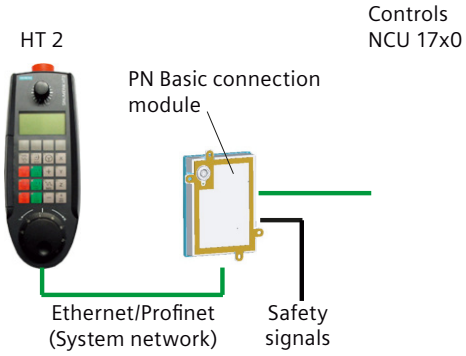


Figure 4-6 Example: Communication between HT 2 and NCU 17x0 via the PN Basic connection module

Note

The handwheel signals are only effective at a SINUMERIK control.

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

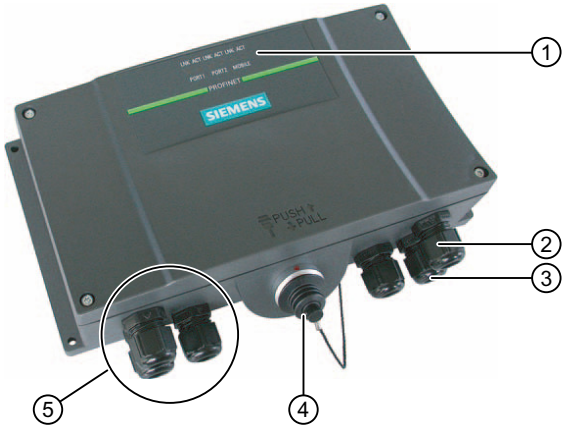
The safety signals for Emergency Stop and enabling are retrieved from the terminal box, the connection module or MPP via the connecting cable and connected to the safety relays in the control cabinet.

If no HT 2 is connected, observe the following:

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

4.3.2 Terminal Box PN

4.3.2.1 Description



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

Figure 4-7 Terminal Box PN

Note

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

The PN terminal box is available in two versions.

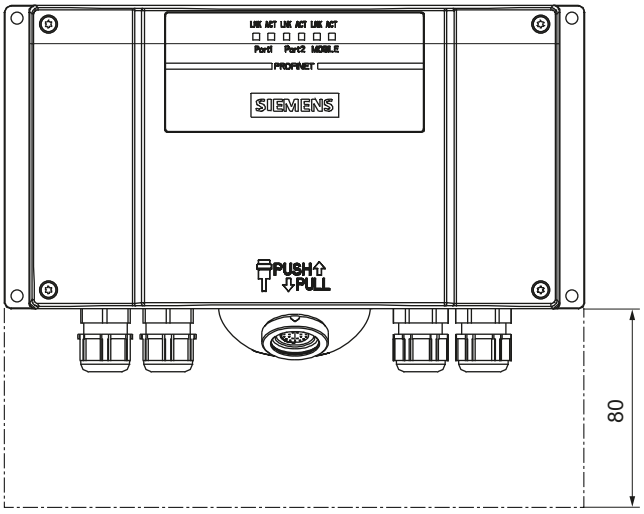
- PN Basic terminal box
  The PN Basic terminal box can be used if no hot-plug capability is required. The Emergency Stop circuit can be overridden here by external mechanisms.
- PN Plus terminal box
  The PN Plus terminal box features hot-plug capability. This means that disturbance-free hot-swapping is possible in operation. The Emergency Stop circuit is automatically maintained while switching over.

Note

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

Clearance

The following clearances are required around the PN terminal box:



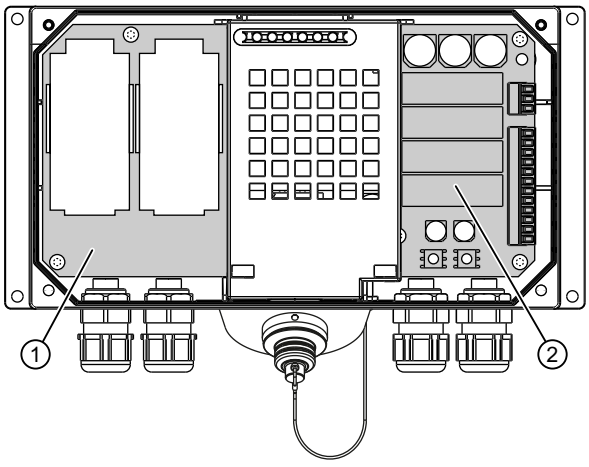
Additional references

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

4.3.2.2 PN Plus terminal box

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



① Board
② Relays

Figure 4-8 PN Plus terminal box

Switching states of the emergency stop circuit

HT 2	Emergency Stop button	Switching status, emergency stop circuit
Connected	Not pressed	Emergency Stop circuit in the terminal box remains closed.
Connected	Pressed	The emergency stop circuit in the terminal box is open. The system to be monitored is stopped.
Not connected	-	Emergency Stop circuit in the terminal box remains closed.

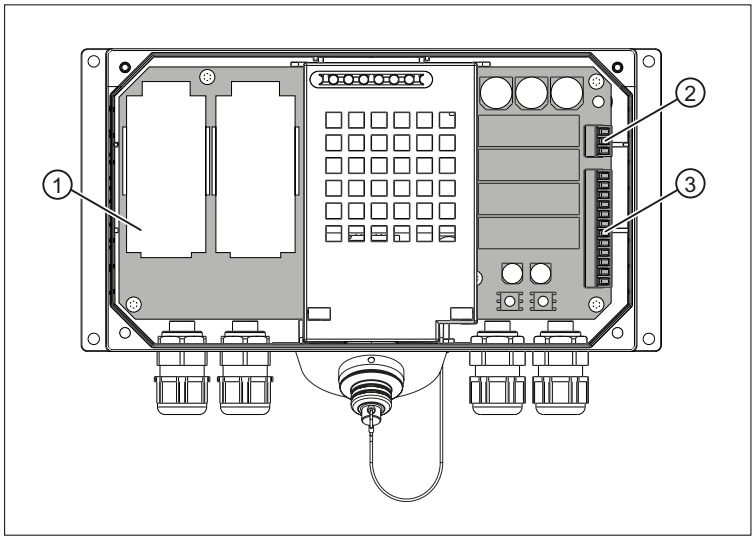
⚠ WARNING

Danger of death resulting from the inadvertent disconnection of the HT 2

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

4.3.2.3 Interface assignment on the PN Plus terminal box

Location of the interfaces



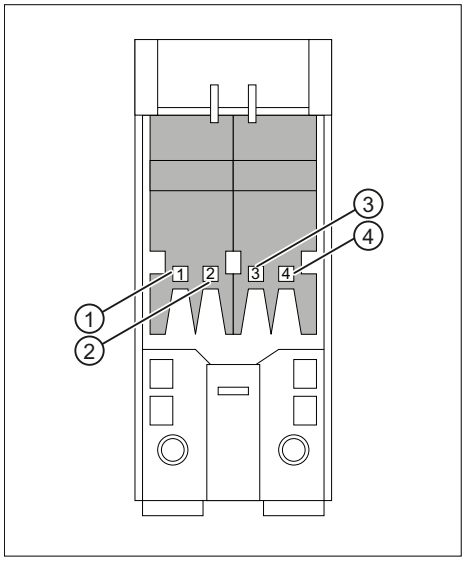
① Fast connector
② Terminal strip 1
③ Terminal strip 2

Note

The PN Basic connection box has the same interfaces.

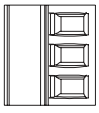
Fast Connector, 4-pin

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



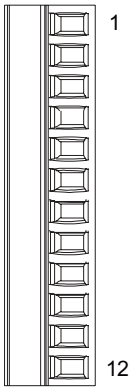
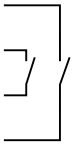
Pin	Signal name
1	RD+
2	TD+
3	RD–
4	TD–

Terminal strip 1, for power supply, 3-pin

	Pin	Signal name
	1	PE
	2	M24
	3	P24

Terminal strip 2, 12-pin

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

	Pin	Internal interconnection	Signal name	Circuit
	1		STOP13	Emergency Stop button
	2		STOP14	
	3		STOP23	
	4		STOP24	
	5		+24 V [1]	Accompanying control signals
	6		CTRL32 [1] [2]	
	7		PRESENT31 [3]	
	8		+24 V [1]	
	9		ENABLE2+	Enabling button
	10		ENABLE1–	
	11		ENABLE1+	
	12		ENABLE2–	

[1] Is only applicable for the PN Plus connection box

[2] Active, if the Emergency Stop pushbutton is pressed

[3] Active, if HT 2 is plugged in

HT 2 at the connection box	Signal at digital input of the control
Not connected	"0"
Connected	"1"

Note

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

Typical circuit diagrams for PN Plus terminal box

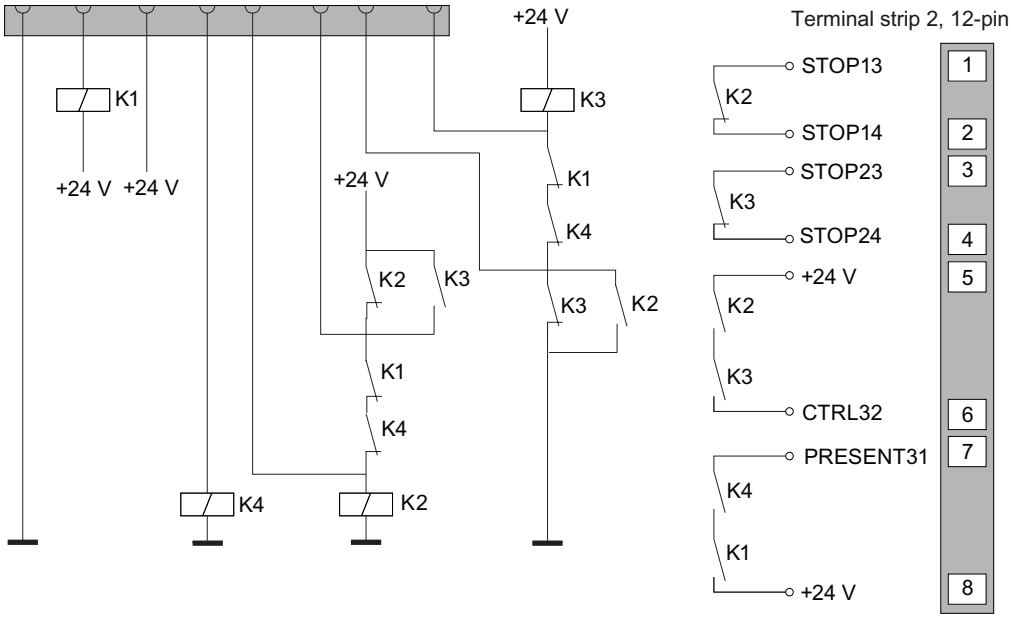


Figure 4-9 Circuit example 1: HT 2 not connected and power supply switched on:

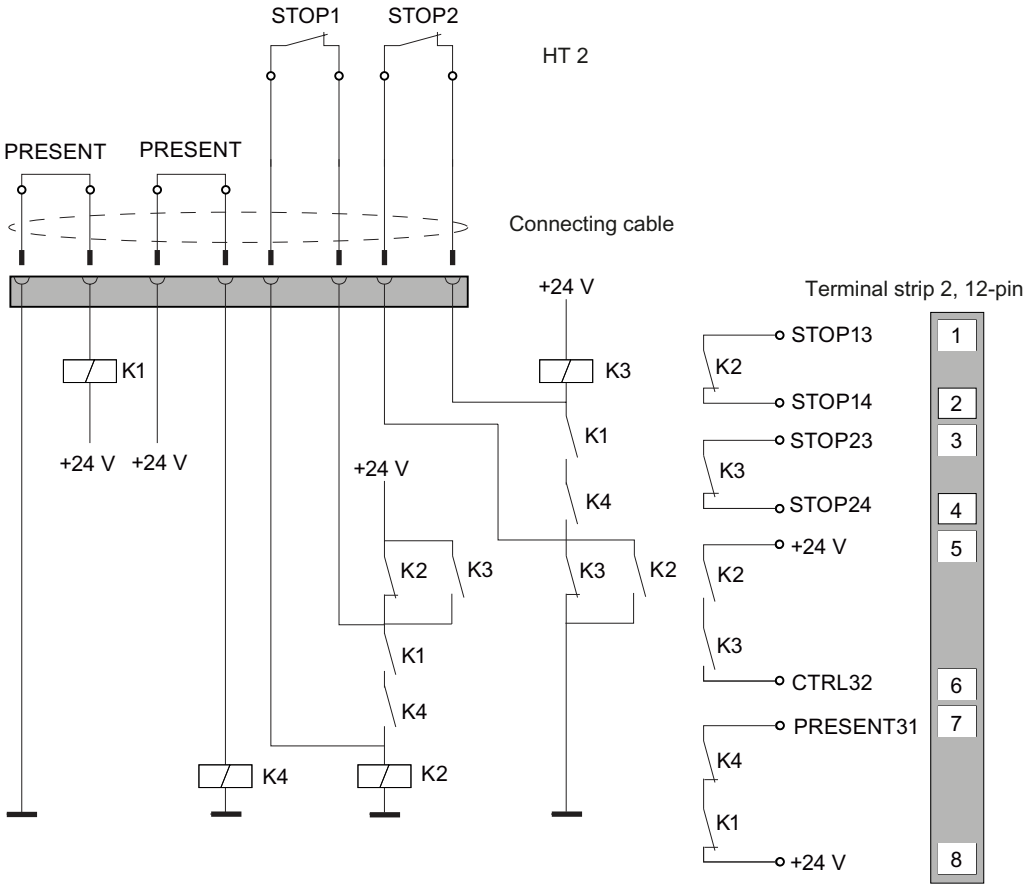


Figure 4-10 Circuit example 2: HT 2 connected, power supply switched on and emergency stop inactive

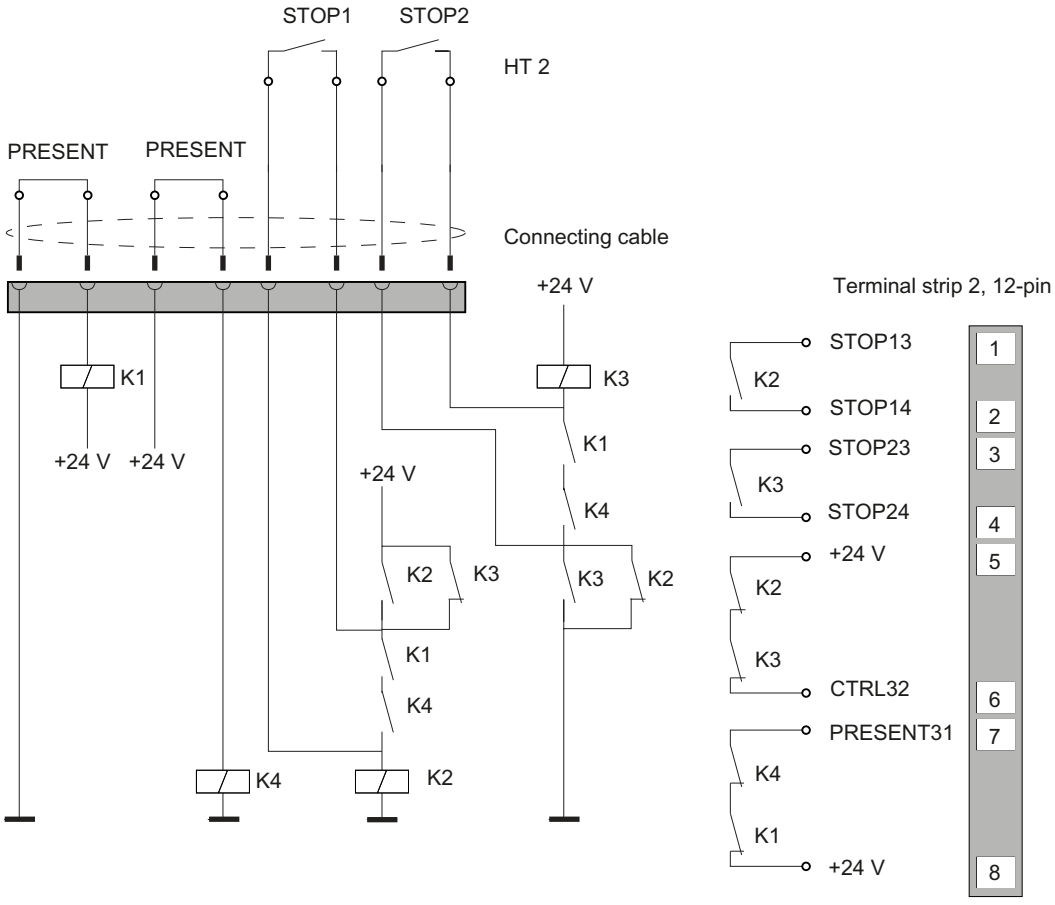


Figure 4-11 Circuit example 3: HT 2 connected, power supply switched on and emergency stop active

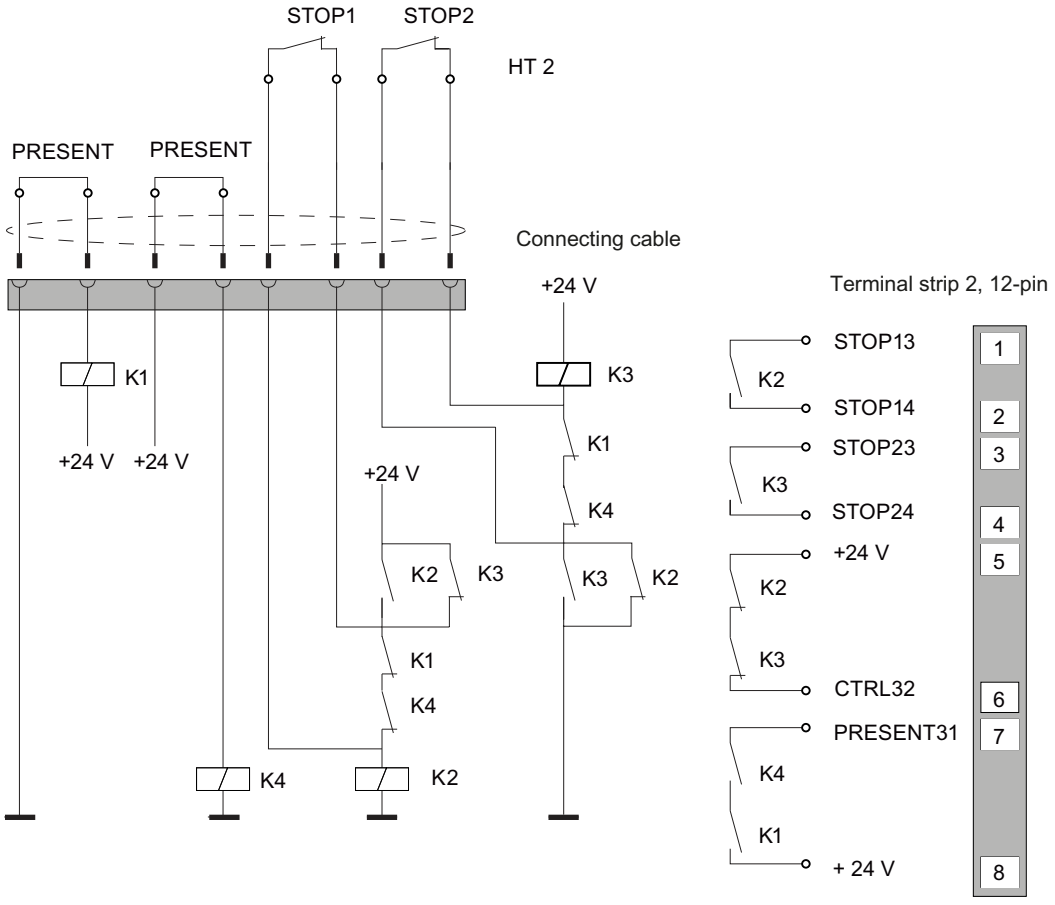


Figure 4-12 Circuit example 4: Power supply switched off

The "CTRL32 / STOP button pressed" signal is not present at the Basic connection box. The signal has no error detection facility and must, therefore, not be used for safety-critical applications.

Note the following when connecting signal "Present31 HT 2 / Panel Present connected":

- Connect Pin 7 of the connection box to the digital input of the control
- Basic connection box: Pin 8 of the connection box remains not assigned
- Plus connection box: +24 V must be supplied at Pin 8

4.3.2.4 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.

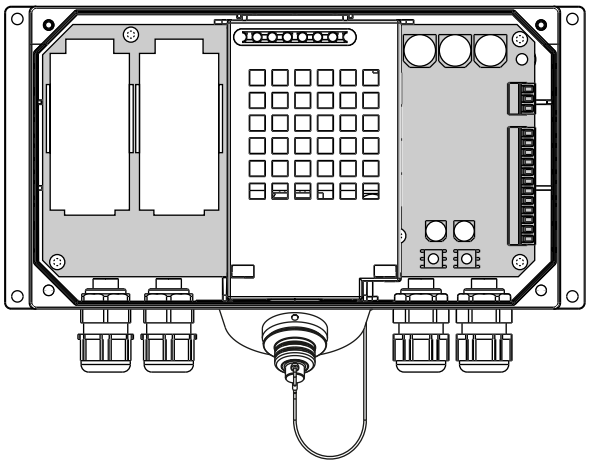


Figure 4-13 PN Basic terminal box

Note

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

Note

The "CTRL32 / STOP button pressed" signal is not present at the Basic connection box.

The signal has no error detection facility and must not be used for safety-critical applications.

Switching states of the emergency stop circuit

HT 2	Emergency Stop button	Switching status, emergency stop circuit
Connected	Not pressed	Emergency stop circuit in the terminal box remains closed.
Connected	Pressed	The emergency stop circuit in the terminal box is open. The system to be monitored is stopped.
Not connected	-	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.

4.3.3 Connection module Basic PN

4.3.3.1 Features

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

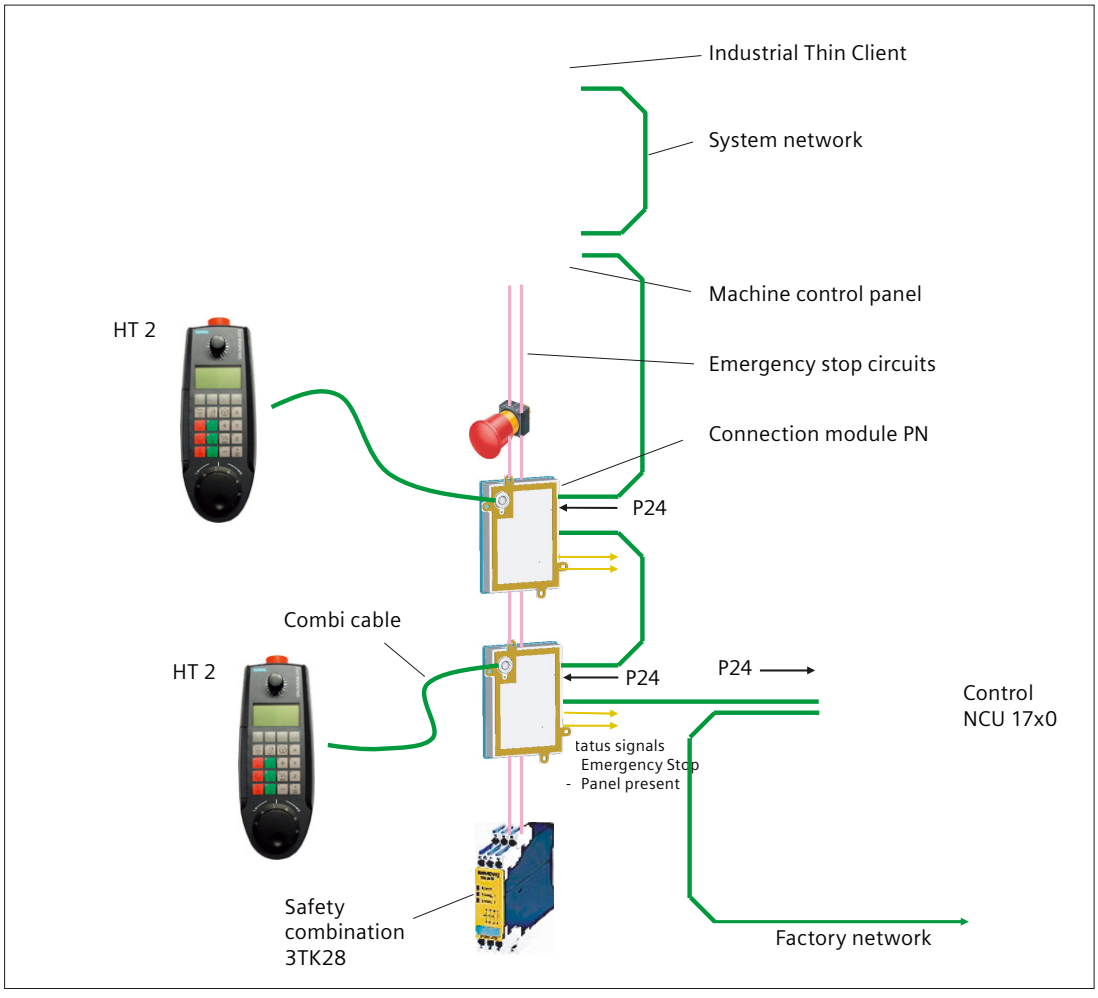


Figure 4-14 System configuration (example)

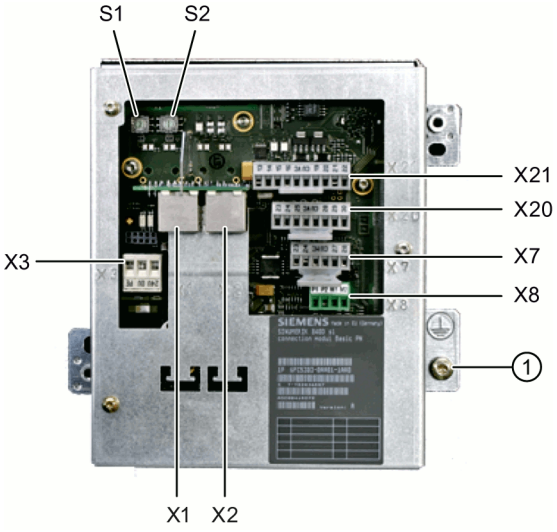
The connection module Basic PN is not hot plug-capable.

The HT 2 can either be connected at the NCU and also as thin client at the IPC.

4.3.3.2 interfaces

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

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



① Grounding screw M5 for potential equalization connection

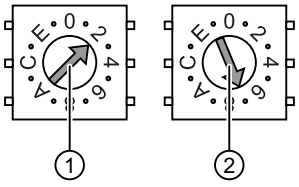
Figure 4-15 Rear of the Basic PN connection module

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 4-16 Example for address "27H"

Connector pin assignments

Signal type:

I Input
O Output
B Bi-directional signals
P Potential

X1, X2: Ethernet interfaces

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

Table 4-2 Assignment of the Ethernet RJ45 interface 10/100 Mbit/s

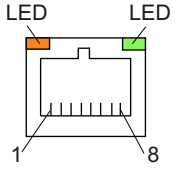
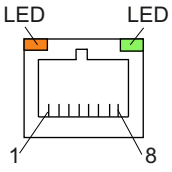
Connector	Pin	Name	Type	Remark
	1	TxD+	O	Transmit data
	2	TxD-		
	3	RxD+	I	Receive data
	4/5	GND	-	(terminated internally with 75 Ω; not required for data transmission)
	6	RD-	I	Receive data
	7/8	GND	-	(terminated internally with 75 Ω; not required for data transmission)
	Shield	-	-	On connector enclosure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

Table 4-3 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 enclosure
	-	Green LED (right)	-	Lights up orange: 1000 Mbit/s Off: No or faulty connection
	-	Orange LED (left)	-	Lit: Data exchange Off: No data exchange

Note

Only connect to a LAN, not to telecommunication networks!

X3: Power supply

Connector type: Terminal block, 3-pole
Max. cable length: 10 m

Table 4-4 Assignment of the power supply interface

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

X7: Panel Present

Connector designation: **X7**
Connector type: 6-pin Phoenix terminal

Table 4-5 Assignment of the interface Panel Present X7

Pin	Signal name	Signal type	Meaning
1	PRES	O	"High": Panel (HT 2) plugged in
2	XCTL	O	"Low": EMER STOP button pressed [1)]
3	XFAULT	O	"Low": Error in emergency stop electronics [1)]

Pin	Signal name	Signal type	Meaning
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 4-6 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 4-7 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 module supply voltage

Connector designation: **X21**
Connector type: 10-pin Phoenix terminal

Table 4-8 Assignment of the interface Emergency Stop and Module Supply Voltage

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	Connected P24 (jumpered to Pin8 during operation)
8	P24_FILT		Filtered 24V module power supply
9	IN_E9_EXT	O	Feedback signal via connected P24
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.

4.3.3.3 Dimension drawing

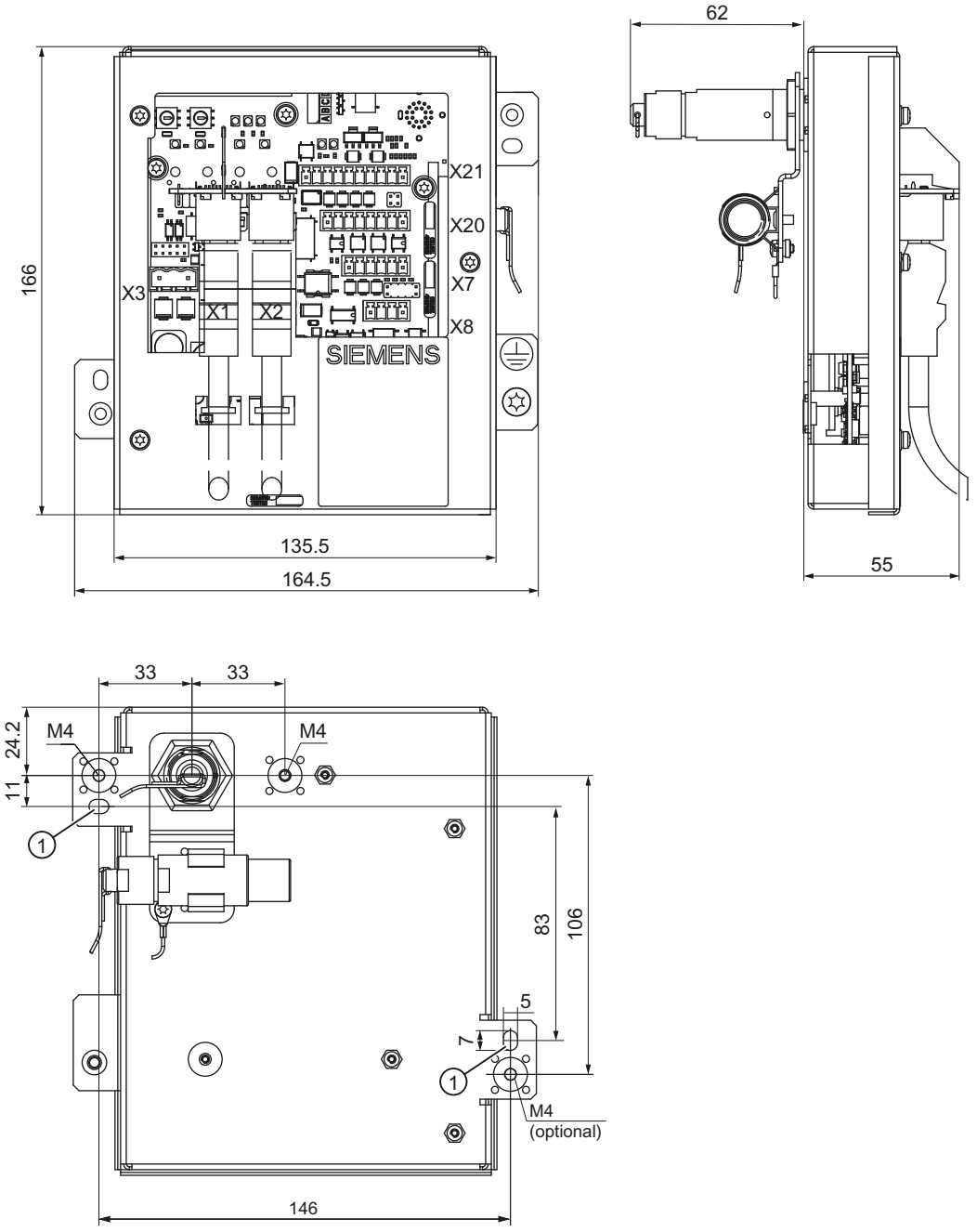


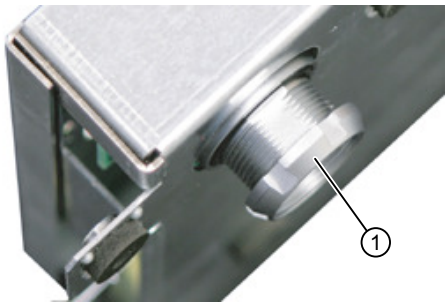
Figure 4-17 Connection module Basic PN - dimension drawing for control cabinet installation

4.3.3.4 Installing the terminating connector

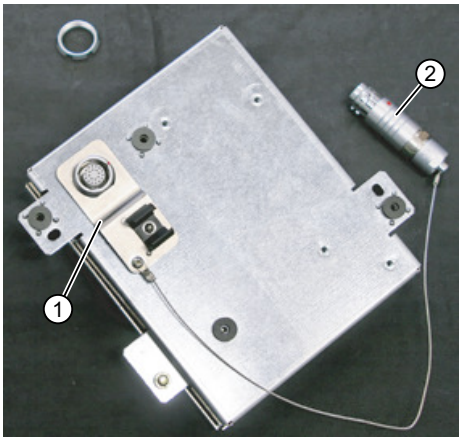
Procedure

Note

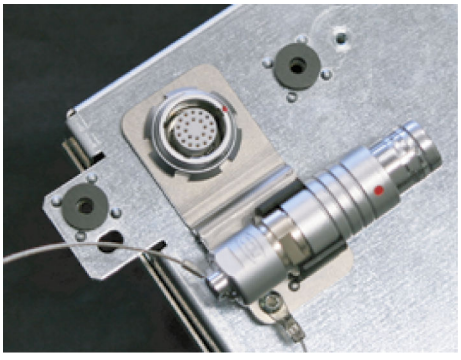
If you never remove the HT 2 from the connection module, it is not necessary to attach the terminating connector.



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.

4.3.4 Connection examples of enabling button and emergency stop button

This chapter contains connection examples for enabling and emergency stop buttons corresponding to Category 3 PL d in accordance with EN ISO 13849-1:2015.

Note

To ensure Category 3 PL d in accordance with EN ISO 13849-1:2015, carefully observe the operating instructions for the monitoring device being used.

The monitoring devices shown in the following examples satisfy Category 4 PL e in accordance with EN ISO 13849-1:2015.

The monitoring device and downstream components should be taken into consideration when calculating the overall "Enabling" safety function.

Connection – enabling button with evaluation unit

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

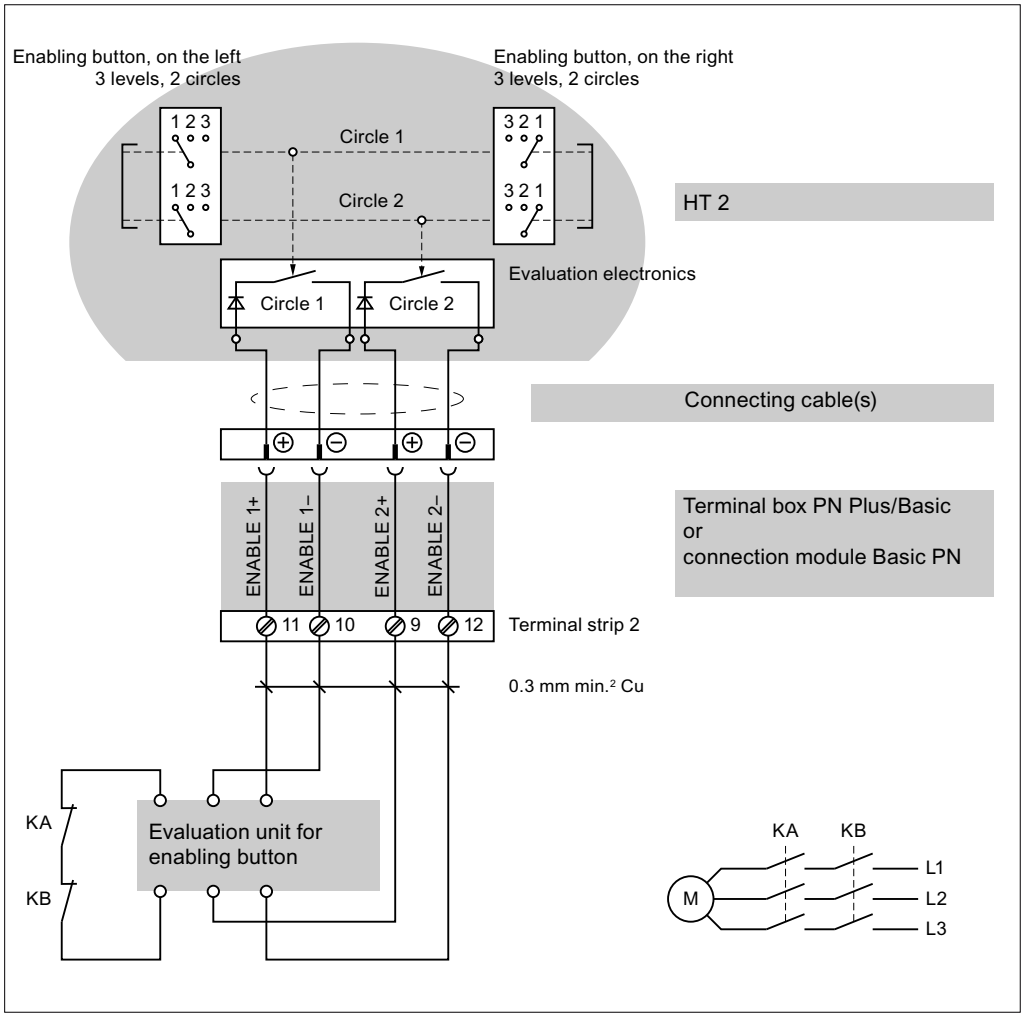


Figure 4-18 Enabling button with evaluation unit

All contacts of the safety relay (contactors) KA and KB have positively driven contacts in accordance with EN 61810-3:2015.

Connection – enabling button with safety relay

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

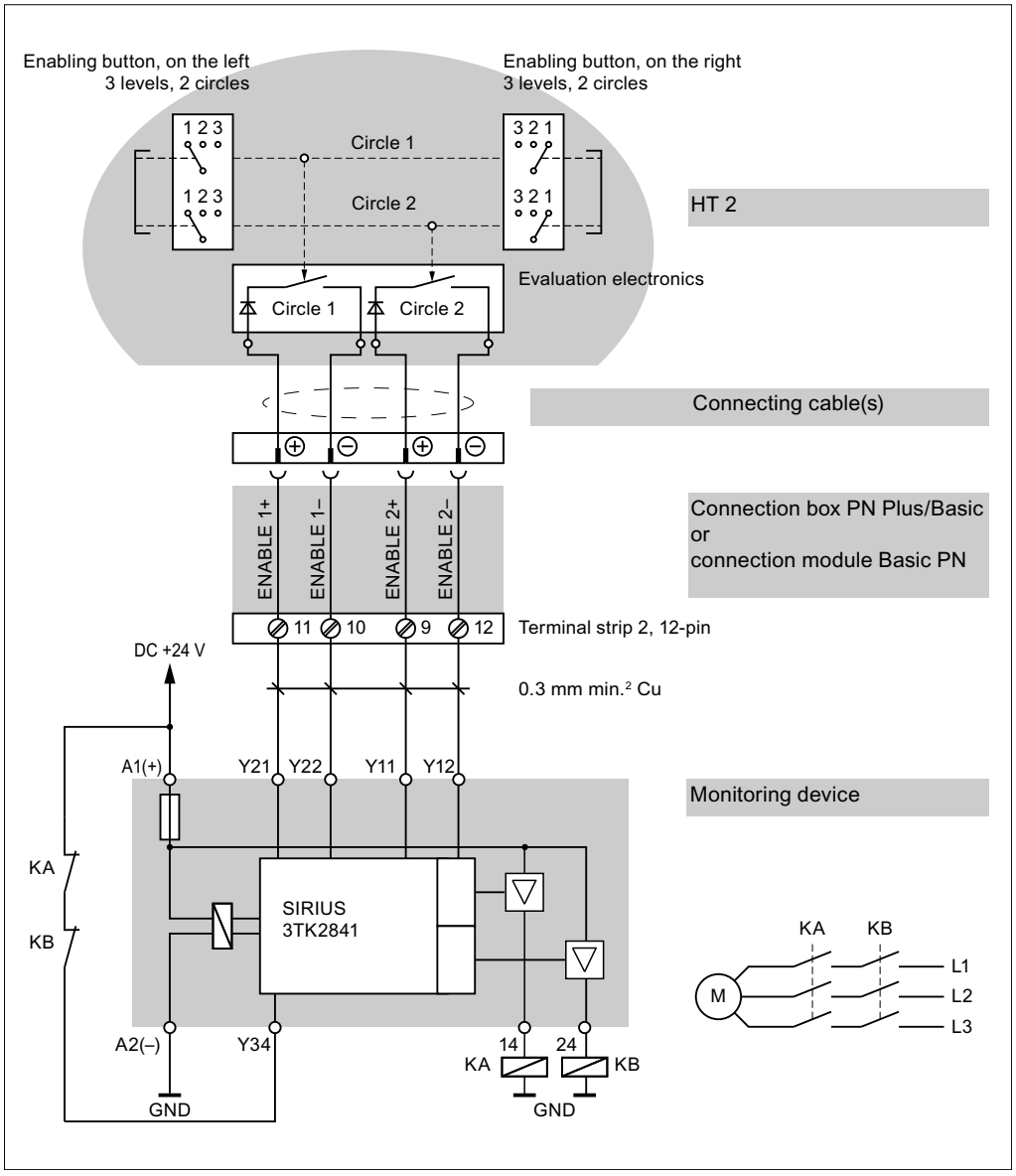


Figure 4-19 Enabling button with safety relay

All contacts of the safety relay (contactors) KA and KB have positively driven contacts in accordance with EN 61810-3:2015.

Connection - emergency stop button with safety relay

The following figure shows the connection of the SIRIUS 3TK2822 or SIRIUS 3TK2841 safety relay to the emergency stop button of the HT 2.

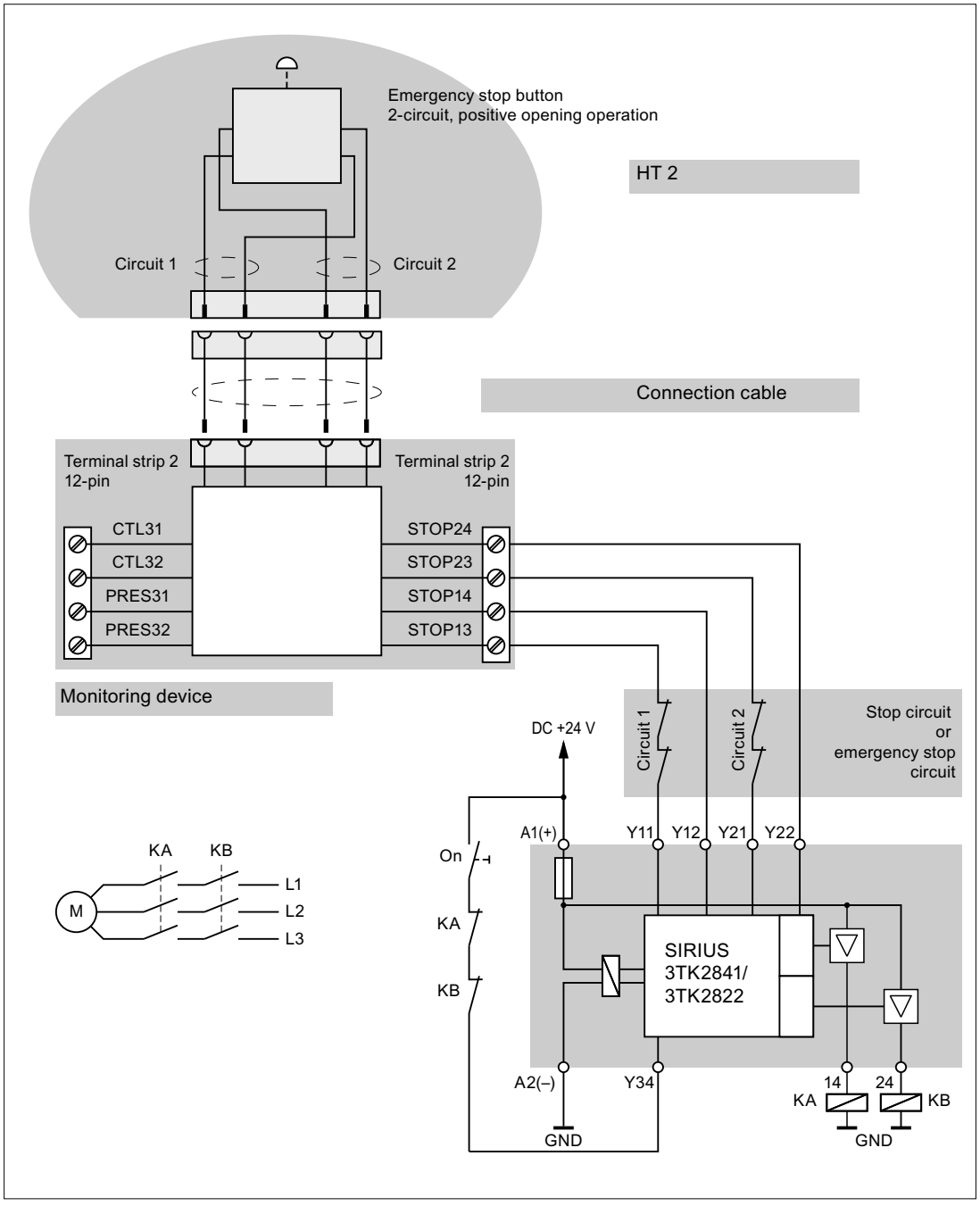


Figure 4-20 Emergency stop button with safety relay

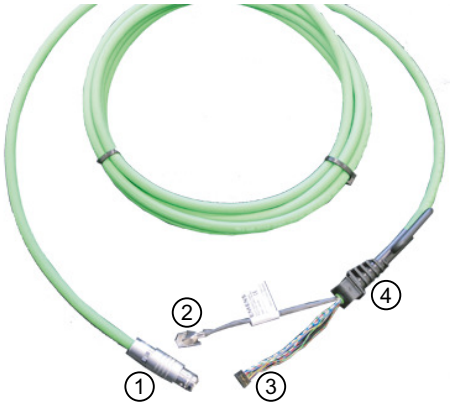
All contacts of the safety relay (contactors) KA and KB have positively driven contacts in accordance with EN 61810-3:2015.

Monitoring outputs may not be used for safety-related functions.

4.3.5 Connecting cable

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

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



① Metallic push-pull circular connector (ODU connector)
② Strain relief and kink protection for connecting cable
③ Plug connector for enabling button, emergency stop, 24 V and safety signals
④ RJ45 connector (Ethernet connection)

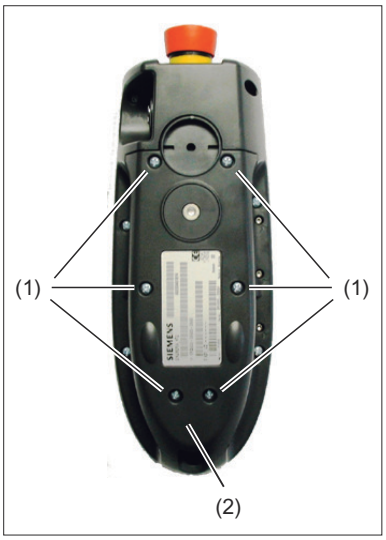
Figure 4-21 Connecting cable of the HT 2

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

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

Laying the connecting cable

NOTICE
Damage to components Only open the connection slot when the power supply voltage is switched off. Otherwise, components could be destroyed or non-defined signal states can occur. When the connection slot is open, the Handheld Terminal HT 2 is sensitive with respect to electrostatic discharge. Do not remove the ESD protection when opening the device.

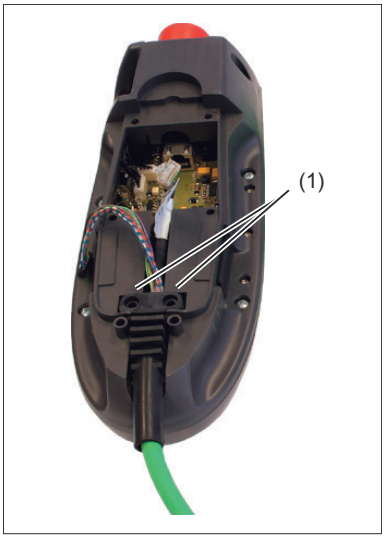


1. Place the device on a soft, horizontal surface so that the operator control components are not mechanically damaged.

Open the cable duct cover (2) by unscrewing the six PT screws (4 x 20 mm) approximately 1 cm (1). To do this, use a crosstip size 2 screw driver.

Cable duct cover open

(1) Cable entry

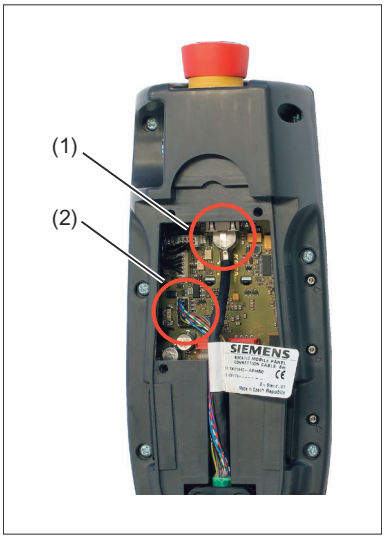


2. Insert the connecting cable into the cable entry.

Gently press the cable downwards until it is completely retained by the retaining elements **(1)**.

Ensure that the cable doesn't sag away from the mounting surface, but is located flush to the mounting surface. Otherwise, the device could be pulled down to the floor and damaged.

In order to avoid damaging the cable sheath, do not route it over sharp edges.



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

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

⚠ WARNING

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

When plugging in the connector plug, ensure that all cables are lying straight in the cable guide. Check to ensure that all wires are aligned and straight and check the firm seating of the plug connector before replacing the cable duct cover. Make sure that the cable sleeve is installed correctly.

Note

Check to see that the cable label is not jammed in the seal.

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

NOTICE
Damage to the thread in the fastening holes
The housing of the HT 2 is made of plastic. Therefore, the mounting hole threads cannot handle the same amount of stress as a comparable metallic housing. Therefore, do not exceed 0.4 to 0.5 Nm of torque when tightening the screws (also for protecting the connecting cable).
If you use a power screwdriver, ensure the max. speed of 600 rpm is adhered to (torque: 1 Nm).
The screws of the cable duct cover may only be loosened or tightened a maximum of 20 times. Otherwise, there is the danger that the threads might become damaged and the seal of the housing will be compromised which could lead to failure of the device.

4.3.6 Power Supply

The HT 2 is supplied with power via the connecting cable of the terminal box PN or of the connection module PN.
The input voltage range is designed for +24 VDC.

For further details, see: "Application planning" → "Secondary electrical conditions" → "Power supply".

4.3.7 Unplugging/plugging during operation

The ability to detect a connected HT 2 in the PLC

1. **HW solution:**
   The X7 interface of the connection module PN Basic signals "HT 2 Present" at pin 1 for the "active" connection module (see Section: "Connections" → "Connection module PN Basic" → "Interfaces").
   If the connection module is "inactive", this signal is not set.
   This makes the "active" connection module detectable in the PLC by wiring the above-mentioned pins of all connection modules to digital I/Os on PLC I/O modules.
2. **Permanently configured MCPs / HT 2 on one control:**
   If there are only permanently configured MCPs / HT 2 on a control, removal of the MCP or HT 2 triggers the PLC alarm "400260 Machine Control Panel failed".
   Based on this, an "active" or "inactive" MCP / HT 2 in the PLC can be detected.
   The failure of an MCP / HT 2 is, however, only detected in the PLC if max. 2 MCP / HT 2 are permanently configured and no MCP changeover by means of FB9 (e.g. triggered by HMI when operator focus is switched).

4.4 Commissioning

4.4.1 BIOS

4.4.1.1 BIOS powering up

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

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

The HT 2 is ready for operation.

Note

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

4.4.1.2 Settings in the BIOS menu

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

Main menu

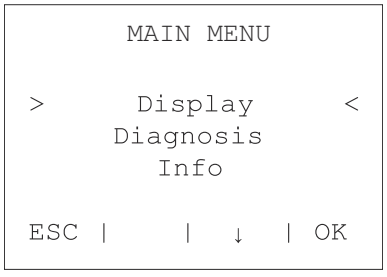


Figure 4-22 BIOS - main menu of the HT 2

The available sub-menus are displayed at the center of the screen.
The functions that can be executed with the four keys of the upper row of keys (softkeys) are listed in the bar at the lower edge.

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

Submenu: Display

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

Submenu: Diagnostics

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

Submenu: Info

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

4.4.1.3 Error handling

Faults

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

Error messages

#	Display	Description	Cause	Solution
1	SDRAM data line test failed!	An error has occurred while testing the SDRAM data lines.	The hardware is defective.	
2	SDRAM data line test failed!	An error has occurred while testing the SDRAM address lines.	The hardware is defective.	
3	SDRAM access test failed!	An error has occurred when accessing the SDRAM.	The hardware is defective.	
4	SDRAM fill test failed!	An error has occurred when writing a test pattern to the SDRAM.	The hardware is defective.	
5	Unexpected SDRAM size!	The size of the SDRAM determined, does not correspond to the expected size.	The hardware is defective.	
6	Wrong coprocessor version, update required!	The firmware of the ATmega88 is too old.	The BIOS was updated - however not the ATmega88 firmware.	Update the ATmega88 firmware.
7	Coprocessor communication error!	An error has occurred for the cyclic SPI communication with the ATmega88.		
8	BIOS code corrupted!	The BIOS checksum is invalid.	The BIOS has been corrupted due to an unsuccessful update or a defective flash module.	
9	Hardware info block invalid!	The hardware information block is invalid.	The block was corrupted when updating or the flash module is defective.	

#	Display	Description	Cause	Solution
10	Serial number not set!	The serial number is missing.	It is possible that the serial number was deleted while updating.	
11	MAC ID not set!	There is no MAC ID.	The MAC ID may have been deleted while updating.	
12	No bootloader present!	There is no bootloader.		
13	Bootloader code corrupted!	The bootloader checksum is invalid.	The bootloader has been damaged due to an unsuccessful update or a defective flash module.	
14	Pressed keys detected!	One or several keys are pressed.	The hardware is defective if no keys have been pressed.	
15	Display error!	Reading back the display status was unsuccessful.	The hardware is defective.	

4.4.2 Interface signals

PLC module

FC13 "LBP_HTCtrlHT2" supports handling the LC display. For a detailed description, please refer to:

Literature: SINUMERIK ONE PLC basic program.

Note

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

User interface

Layout of keys and LEDs

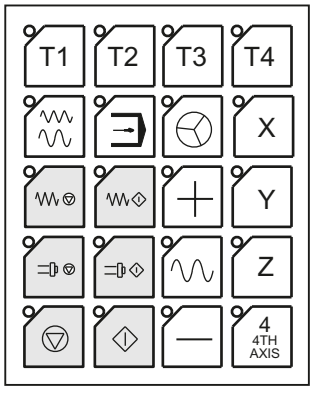


Figure 4-23 Operator keys, standard assignment

The first row of keys (free keys T1 ... T4) is not assigned as standard.

Input image HT 2

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

<table>
<tr><th>Byte no.</th><th colspan="8">Input signals to PLC</th></tr>
<tr><th>Byte</th><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
<tr><th>EB m + 0</th><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td></tr>
<tr><th>EB m + 1</th><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td></tr>
<tr><th>EB m + 2</th><td>Feed start</td><td>Free T2 key</td><td>AUTO-MATIC</td><td>NC stop</td><td>Spindle stop</td><td>Feed stop</td><td>Free T1 key</td><td>JOG</td></tr>
<tr><th>EB m + 3</th><td>Free T3 key</td><td>Handwheel</td><td>4th axis</td><td>Z</td><td>Y</td><td>X</td><td>NC Start</td><td>Spindle start</td></tr>
<tr><th>EB m + 4</th><td>Direction key -</td><td>Rapid traverse override</td><td>Direction key +</td><td>Free T4 key</td><td></td><td></td><td></td><td></td></tr>
<tr><th rowspan="2">EB m + 5</th><td rowspan="2">Acknowl-edgement digital display</td><td rowspan="2">Keyswitch</td><td colspan="5">Rapid traverse / feed rate override switch</td><td rowspan="2"></td></tr>
<tr><td>E</td><td>D</td><td>C</td><td>B</td><td>A</td></tr>
</table>

Rotary switch positions HT 2

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

Position	%	EDCBA
17	95	11011
18	100	11010

Output image HT 2

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

Byte no.	Output signals to the HHU							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
AB m + 0	always **1**				Free T4 key	Free T3 key	Free T2 key	Free T1 key
AB m + 1	New data for selected line						Selection lines 3, 4	Selection lines 1, 2
AB m + 2	Feed start	Rapid traverse override	AUTOMATIC	NC stop	Spindle stop	Feed stop	Direction key +	JOG
AB m + 3	Direction key -	Handwheel	4th axis	Z	Y	X	NC Start	Spindle start

Note

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

Output image of the digital display

Control of the digital display in the HT 2

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

Byte no.	Output signals to the HHU							
AB m + 10	Default setting of 7th character of selected line							
AB m + 11	Default setting of 8th character of selected line							
AB m + 12	Default setting of 9th character of selected line							
AB m + 13	Default setting of 10th character of selected line							
AB m + 14	Default setting of 11th character of selected line							
AB m + 15	Default setting of 12th character of selected line							
AB m + 16	Default setting of 13th character of selected line							
AB m + 17	Default setting of 14th character of selected line							
AB m + 18	Default setting of 15th character of selected line							
AB m + 19	Default setting of 16th character (left) of selected line							

Display

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

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

Selecting the line

ABm + 1, bit 0 and bit 1
This bit is used to select the line to be written.

Table 4-9 Line selection

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

New data for selected line

ABm + 1, bit 7
This bit is used to request writing in of new data into a line. The bit is set by the user program and can be reset on detection of the acknowledgement bit EBm + 5, bit 7.
Bit 7 = 0: Reset request.
Bit 7 = 1: Set request

Acknowledgement of the digital display

EBm + 5, bit 7
This bit is set by the system after the new data has been accepted.
Bit 7 = 0: No new data
Bit 7 = 1: New data has been accepted

Example of a signal chart

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

1. Select the line with ABm + 1, bit 0 and bit 1.
2. Write new data with ABm + 4...19.
3. Set request: New data for selected line ABm + 1, bit 7

4. Acknowledgement digital display EBm + 5, bit 7, via system.
5. Reset request

Note

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

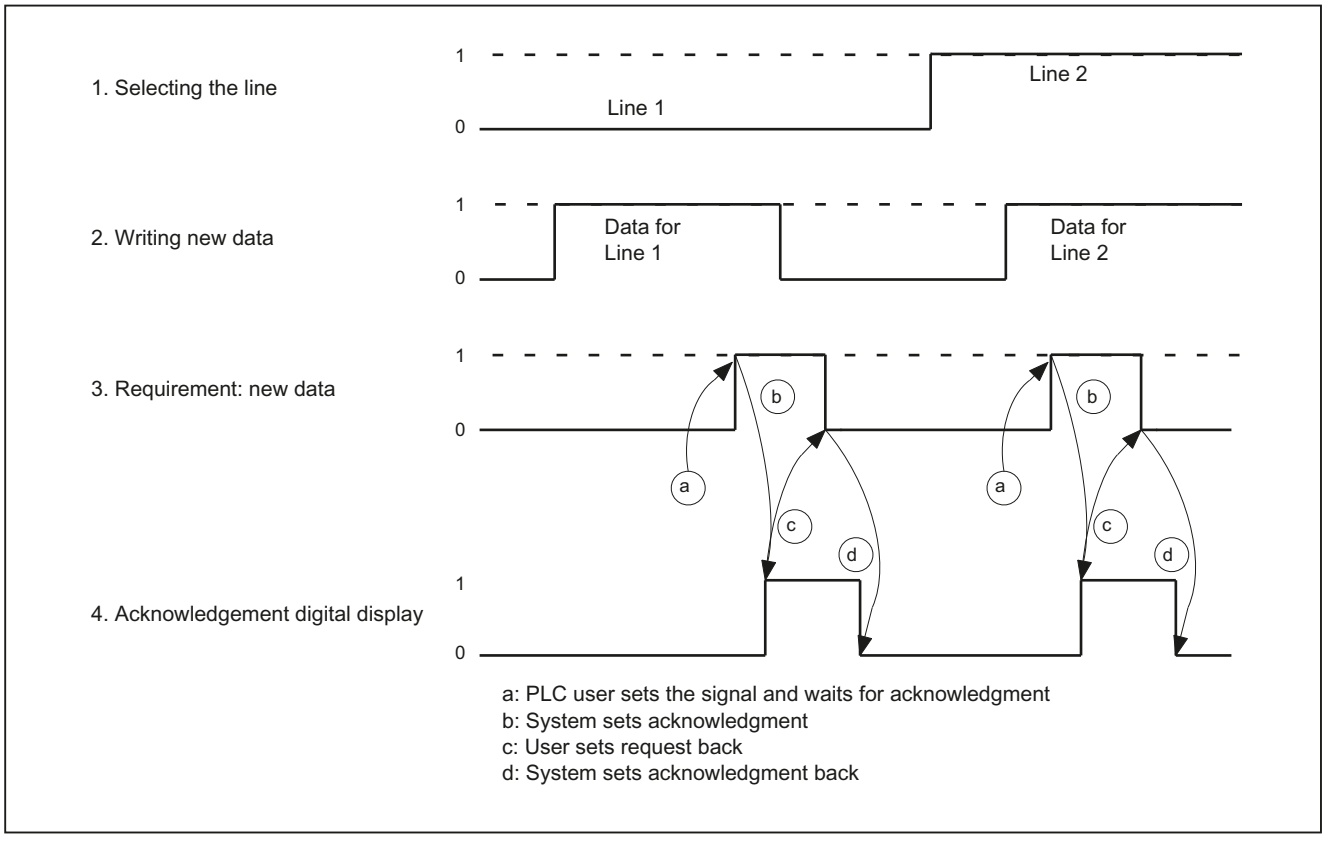


Figure 4-24 HT2 signal characteristic example for writing data into the HT 2 display

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

ASCII code for digital display

Representation of characters by specifying the corresponding number system (hexadecimal/ decimal) in the bytes ABm + 4...19. The characters from hex 20 to hex 7F are default values.

Table 4-10 Standard character set

ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character
20 / 32	[1]	30 / 48	0	40 / 64	@	50 / 80	P	60 / 96	`	70 / 112	p
21 / 33	!	31 / 49	1	41 / 65	A	51 / 81	Q	61 / 97	a	71 / 113	q
22 / 34	"	32 / 50	2	42 / 66	B	52 / 82	R	62 / 98	b	72 / 114	r
23 / 35	#	33 / 51	3	43 / 67	C	53 / 83	S	63 / 99	c	73 / 115	s
24 / 36	$	34 / 52	4	44 / 68	D	54 / 84	T	64 / 100	d	74 / 116	t

ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character
25 / 37	%	35 / 53	5	45 / 69	E	55 / 85	U	65 / 101	e	75 / 117	u
26 / 38	&	36 / 54	6	46 / 70	F	56 / 86	V	66 / 102	f	76 / 118	v
27 / 39	'	37 / 55	7	47 / 71	G	57 / 87	W	67 / 103	g	77 / 119	w
28 / 40	(	38 / 56	8	48 / 72	H	58 / 88	X	68 / 104	h	78 / 120	x
29 / 41	)	39 / 57	9	49 / 73	I	59 / 89	Y	69 / 105	i	79 / 121	y
2A / 42	*	3A / 58	:	4A / 74	J	5A / 90	Z	6A / 106	j	7A / 122	z
2B / 43	+	3B / 59	;	4B / 75	K	5B / 91	[	6B / 107	k	7B / 123	{
2C / 44	,	3C / 60	<	4C / 76	L	5C / 92	\	6C / 108	l	7C / 124	|
2D / 45	-	3D / 61	=	4D / 77	M	5D / 93	]	6D / 109	m	7D / 125	}
2E / 46	.	3E / 62	>	4E / 78	N	5E / 94	^	6E / 110	n	7E / 126	~
2F / 47	/	3F / 63	?	4F / 79	O	5F / 95	_	6F / 111	o	7F / 127	[2]

[1] Space

[2] Not defined

Table 4-11 Extended character set

ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character	ASCII Hex/dec	Character
A0 / 160	[1]	B0 / 176	°	C0 / 192	À	D0 / 208	Đ	E0 / 224	à	F0 / 240	ð
A1 / 161	¡	B1 / 177	±	C1 / 193	Á	D1 / 209	Ñ	E1 / 225	á	F1 / 241	ñ
A2 / 162	¢	B2 / 178	²	C2 / 194	Â	D2 / 210	Ò	E2 / 226	â	F2 / 242	ò
A3 / 163	£	B3 / 179	³	C3 / 195	Ã	D3 / 211	Ó	E3 / 227	ã	F3 / 243	ó
A4 / 164	¤	B4 / 180	´	C4 / 196	Ä	D4 / 212	Ô	E4 / 228	ä	F4 / 244	ô
A5 / 165	¥	B5 / 181	µ	C5 / 197	Å	D5 / 213	Õ	E5 / 229	å	F5 / 245	õ
A6 / 166	¦	B6 / 182	¶	C6 / 198	Æ	D6 / 214	Ö	E6 / 230	æ	F6 / 246	ö
A7 / 167	§	B7 / 183	·	C7 / 199	Ç	D7 / 215	×	E7 / 231	ç	F7 / 247	÷
A8 / 168	¨	B8 / 184	¸	C8 / 200	È	D8 / 216	Ø	E8 / 232	è	F8 / 248	ø
A9 / 169	©	B9 / 185	¹	C9 / 201	É	D9 / 217	Ù	E9 / 233	é	F9 / 249	ù
AA / 170	ª	BA / 186	º	CA / 202	Ê	DA / 218	Ú	EA / 234	ê	FA / 250	ú
AB / 171	«	BB / 187	»	CB / 203	Ë	DB / 219	Û	EB / 235	ë	FB / 251	û
AC / 172	¬	BC / 188	¼	CC / 204	Ì	DC / 220	Ü	EC / 236	ì	FC / 252	ü
AD / 173	[2]	BD / 189	½	CD / 205	Í	DD / 221	Ý	ED / 237	í	FD / 253	ý
AE / 174	®	BE / 190	¾	CE / 206	Î	DE / 222	Þ	EE / 238	î	FE / 254	þ
AF / 175	¯	BF / 191	¿	CF / 207	Ï	DF / 223	ß	EF / 239	ï	FF / 255	ÿ

[1] Protected space

[2] Conditional separator

4.5 Dimension drawing

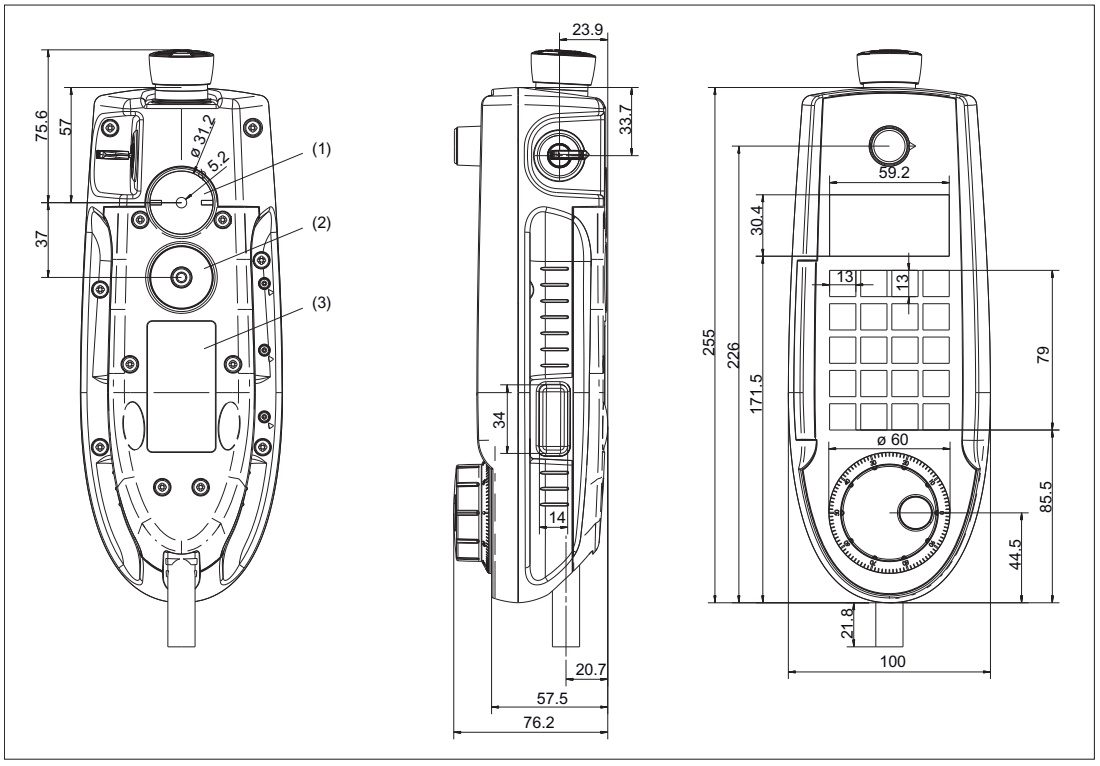


Figure 4-25 HT 2 - dimension drawing

(1) Standard position mounting bracket (optional: Retaining magnet)

(2) Standard position retaining magnet (optional: mounting bracket)

(3) Position for the type plate

4.6 Maintenance and Service

Cleaning the device

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

Checking the device

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

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

Protect the device from environmental effects

Protect the HT 2 against

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

Checking the emergency stop button 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 2

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).

4.7 Technical data

4.7.1 Handheld Terminal HT 2

Handheld Terminal HT 2

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:	0 - 500 mA / 2-channel, 3-stage
	Emergency Stop button:	1 - 1000 mA / 2-channel
Power consumption, max.	Approx. 2.5 W	
Mechanical data		

Dimensions	Height (without operator control elements): 76.2 mm	Width: 100 mm	Depth: 255 mm
Weight	0.69 kg		
Fall height, max.	1.20 m		
Display			
Resolution	128 x 64 pixels		
Climatic ambient conditions			
Condensation and ice formation	Not permissible		
Dripping water, spray, splash water, jet-water	Permissible		
	Operation		**Storage and transport**
Applicable standards	EN 60721-3-3		EN 60721-3-1 / -3-2
Permiss. ambient temperature	0 ... 50° C		-25 ... 60° C
Limit values for relative humidity at 25° C	5 ... 65%		5 ... 95%

Emergency Stop button

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

Output type	Solid-state output
Nominal voltage that can be switched	24 VDC (voltage tolerance 19.2 VDC up to 30 VDC according to EN 61131-2)
Rated current that can be switched	500 mA (max.)
Switch-off current (max.)	
Circuit1	1.5 mA
Circuit2	0.8 mA
Inductive load (max.)	
Circuit1 / circuit2	145 mJ / 1.16 H @ 24 VDC, 500 mA (comparable, DC 13 according to EN 60947-5-1)
Reverse polarity protection	
Circuit1 / circuit2	Yes
Short-circuit and overload protection	
Circuit1	Yes (integrated in the output FET)
Circuit2	Yes (using a protective circuit)
Operating cycles	
Switch position 2	10^5
Switch position 3	10^4
Actuation forces	
From switch position 1 to 2, typically	6 N
From switch position 2 to 3, typically	12 N
PFH_d	$1.35 * 10^{-7}$
Service life	20 years
Forced dormant error detection interval (mechanical actuation to the test the enable and panic position)	1 year
Category	3
Performance Level	PL d

Note

The PFH_d value only applies if the technical properties of the acknowledgment button and the quantitative conditions specified here (e.g. operating period) are observed. Mechanical switches such as the acknowledgment button are subject to wear due to use.

The wear-related service life should be determined on the basis of typical operating actions and, if possible, compared with values obtained in practice.

Handwheel

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

General machine data:
MD 11350 $MN_HANDWHEEL_SEGMENT[0] = 7
MD 11351 $MN_HANDWHEEL_MODULE[0] = 1
MD 11352 $MN_HANDWHEEL_INPUT[0] = 5

4.7.2 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 2)	0.12 A	
	5 status signals (X7 and X21)	2.5 A (0.5 A each)	
	Total:	2.92 A	
Max. total power consumption	Approx. 70 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 provided in Chapter "Application planning".

4.7.3 PN terminal box

General data	
Weight without packaging	Approx. 700 g
Degree of protection according to EN 60529	IP65 (with connected HT 2 or with inserted blanking cover)
Electrical data	
Rated voltage Range, permissible	+24 V DC 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 2 • Typical • Continuous current, maximum • Inrush current I^2t	 • Approx. 100 mA • Approx. 150 mA • Approx. 0.5 A^2s
Current consumption of PN with HT 2, typical	Approx. 100 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.

4.8 Spare parts

The following service set is available for SIMATIC connecting boxes PN Basic and PN Plus:

Designation	Remark	Quantity	Article number
Service set for mobile panels	Dummy plugs for cable compartment	1	6AV6574-1AA04-4AA0
	PG screw glands for connection box	2	
	Blanking cover for connecting a handheld terminal	1	
	Terminal strips for connection box	3	

4.9 Accessories

4.9.1 Overview

The following accessories are available for the HT 2:

Designation	Remark	Quantity	Article number
PN Basic terminal box	**Without** automatic emergency stop override for mounting in the system	1	6AV6671-5AE01-0AX0 *)
PN Plus terminal box	**With** automatic emergency stop override for mounting in the system	1	6AV6671-5AE11-0AX0 *)
PN Basic connection module	**Without** automatic emergency stop override for mounting in the control cabinet	1	6FC5303-0AA01-1AA0 *)

Designation	Remark	Quantity	Article number
Connecting cable	Length: 2 m	1	6XV1440-4BH20 *)
	Length: 5 m	1	6XV1440-4BH50 *)
	Length: 8 m	1	6XV1440-4BH80 *)
	Length: 10 m	1	6XV1440-4BN10 *)
	Length: 15 m	1	6XV1440-4BN15 *)
	Length: 20 m	1	6XV1440-4BN20 *)
	Length: 25 m	1	6XV1440-4BN25 *)
Spiral connecting cable	Length: 1.5 m, can be expanded to 3.5 m	1	6FC5348-0AA08-3AA0 *)
Set of keys	Set of 5	1 set	6AV6574-1AG04-4AA0
Retaining magnet for HT 2		2	6FC5348-0AA08-0AA0
Holder for HT 2	For safekeeping, also suitable for stationary operation	2	6FC5348-0AA08-1AA0
Slide-in labels	Can be labeled (3 films, DIN A4)	1 set	6FC5348-0AA08-2AA0

*) Safety related accessories

4.9.2 Mount

Note

There is no counterpiece to the holder on the HT 2 in the scope of delivery and must be provided by the customer depending on the circumstances.

The HT 2 can be retained using the mounting rack.

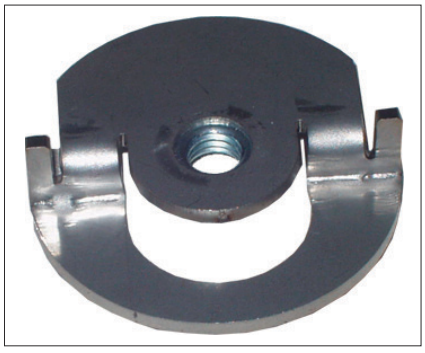


Figure 4-26 HT 2 mounting bracket

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

Note

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

Dimension drawing

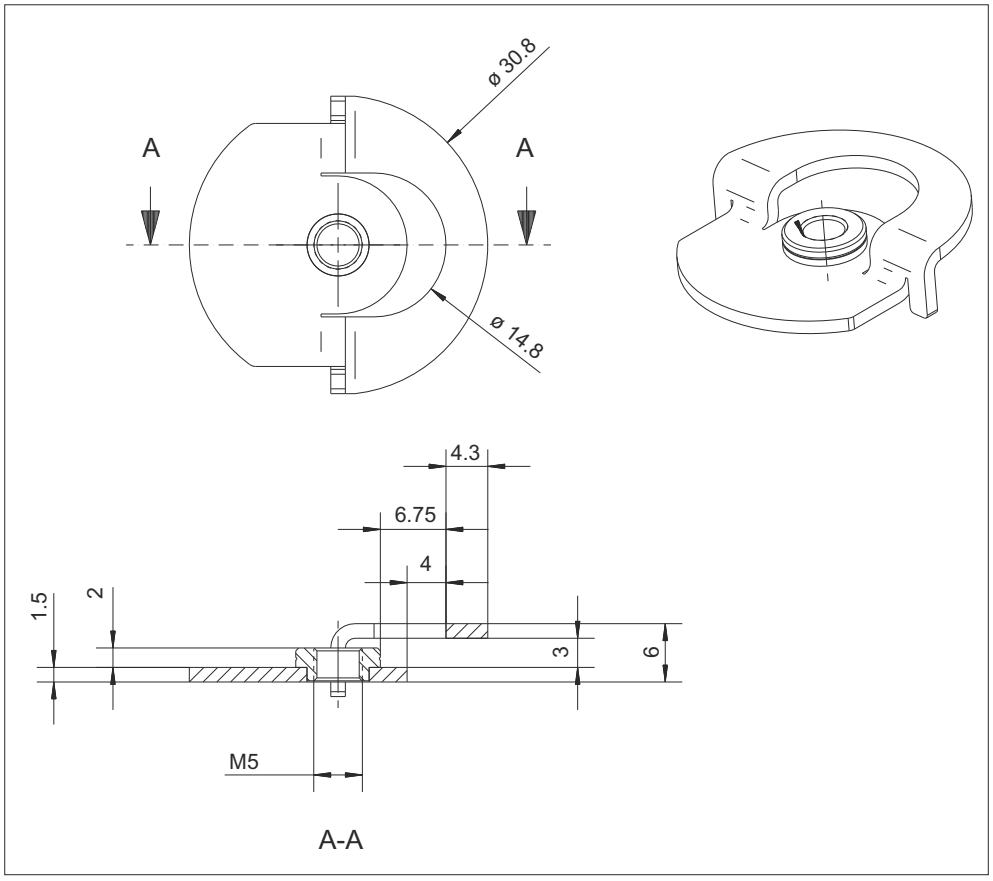


Figure 4-27 Dimension drawing of the HT 2 mounting bracket

4.9.3 Retaining magnet

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

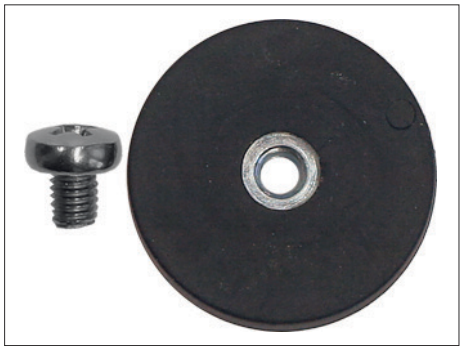
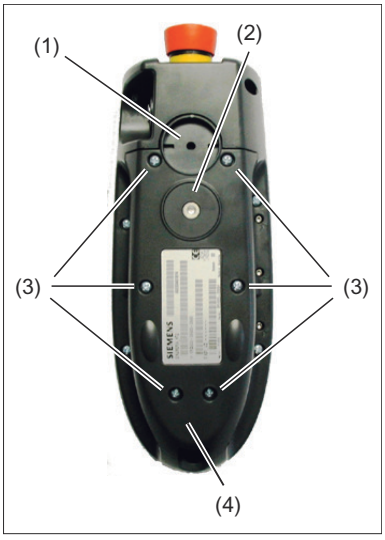


Figure 4-28 HT 2 retaining magnet

Mounting the retaining magnets

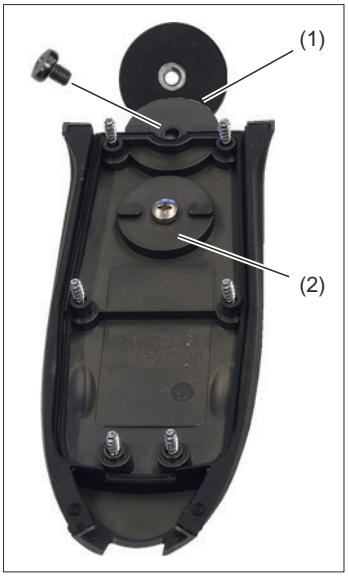
Note

A second magnet can be mounted at position (2) to increase the holding forces.



1.	Open the cable duct cover by unscrewing the six PT screws approximately 1 cm. To do this, use a crosstip size 2 screw driver.

(1)	Standard position retaining magnet (optional: Mounting bracket)
(2)	Standard position mounting bracket (optional: Retaining magnet) A second retaining magnet can be used when required.
(3)	PT screws (4 x 20 mm)
(4)	Cable duct cover



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

(1)	Retaining magnet with retaining screw
(2)	Retaining magnet mounted

Working with retaining magnets

⚠ CAUTION

Danger of injury from flying sparks

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

⚠ WARNING

Danger of death due to strong magnetic fields

Even at a considerable distance apart, magnets can be attracted to one another, repel one another or splitter when they collide. This involves strong forces.
This is the reason that you should avoid that magnets collide and work with the appropriate protection in order to prevent skin crushing and other injuries.

Strong magnetic fields can destroy electronic or mechanical elements and devices.
This also applies to heart pacemakers.
Therefore observe the necessary safety clearances. Information on this is provided in the documentation of the corresponding devices.

Carefully observe the appropriate packing regulations when shipping by air.

4.9.4 Slide-in label

4.9.4.1 Labeling the slide-in labels

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

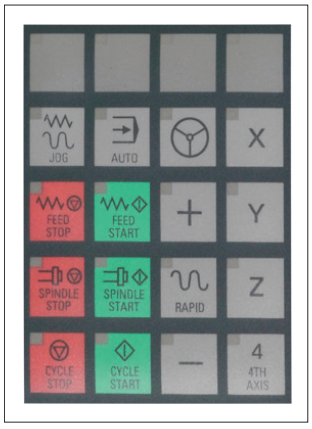


Figure 4-29 HT2 slide-in labels

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

Files for printing the blank film

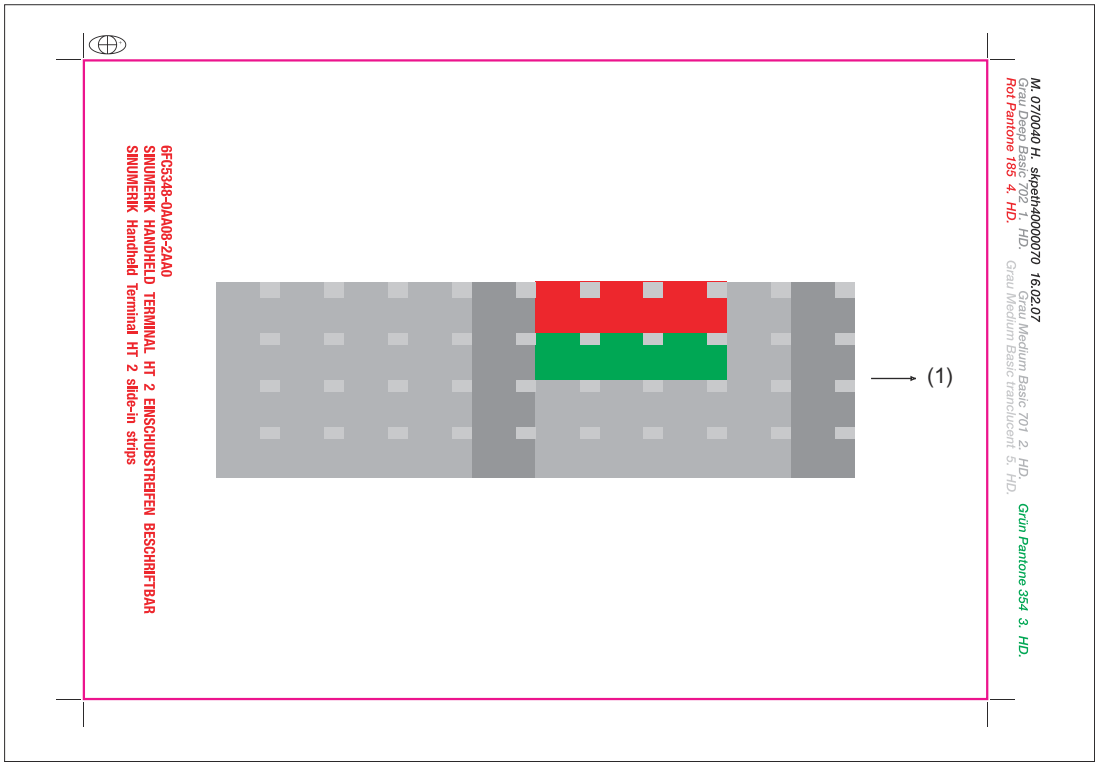


Figure 4-30 Blank film HT 2 [printing direction (1)]

There is a template file and symbol file for the HT2 as ZIP file in the "Slide-in/Labeling Templates" folder on the DOConCD for printing the blank film:

The template file provides a template for the exact positioning of the symbols on the printable film.

Note

More information about the slide-in labels is available in the Internet: https://support.industry.siemens.com/cs/ww/en/view/107745917

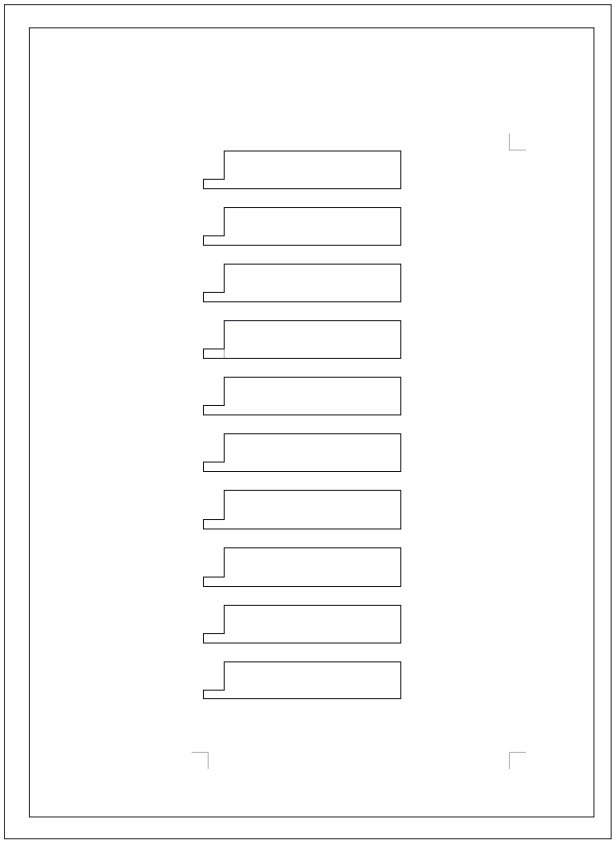


Figure 4-31 Template file [blank template for film)

The symbol file contains a broad range of key symbols.
An overview of these can be found via "Operator panels" > "OP 08T operator panel front" > "Accessories" > "Labeling the slide-in labels".

Preparing slide-in labels

1. Open the template and symbol files in the MS Word text processing program.
2. Select a key symbol from the symbol file by left-clicking.
3. Copy the desired symbol to the clipboard via "Edit" → "Copy" or "Ctrl + C"
4. Then return to the template file.
5. Position the cursor before the insertion point in the desired table cell.
6. Insert the key symbol via "Edit" → "Paste" or "Ctrl + V".
7. To format the graphics, double click on the inserted symbol with the lefthand mouse key.
   - Select the "size" tab and set the symbol height to 1.1 cm.
   - Click on <OK> to accept the change.
8. Repeat steps 2. to 7. until you have inserted all the key symbols.

Printing the slide-in labels

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

Note

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

4. Cut the slide-in labels out of the film along the edges (see Fig.: template file).
5. Round off the corners of the slide-in labels approx. 3 mm to facilitate insertion.

Dimension drawings

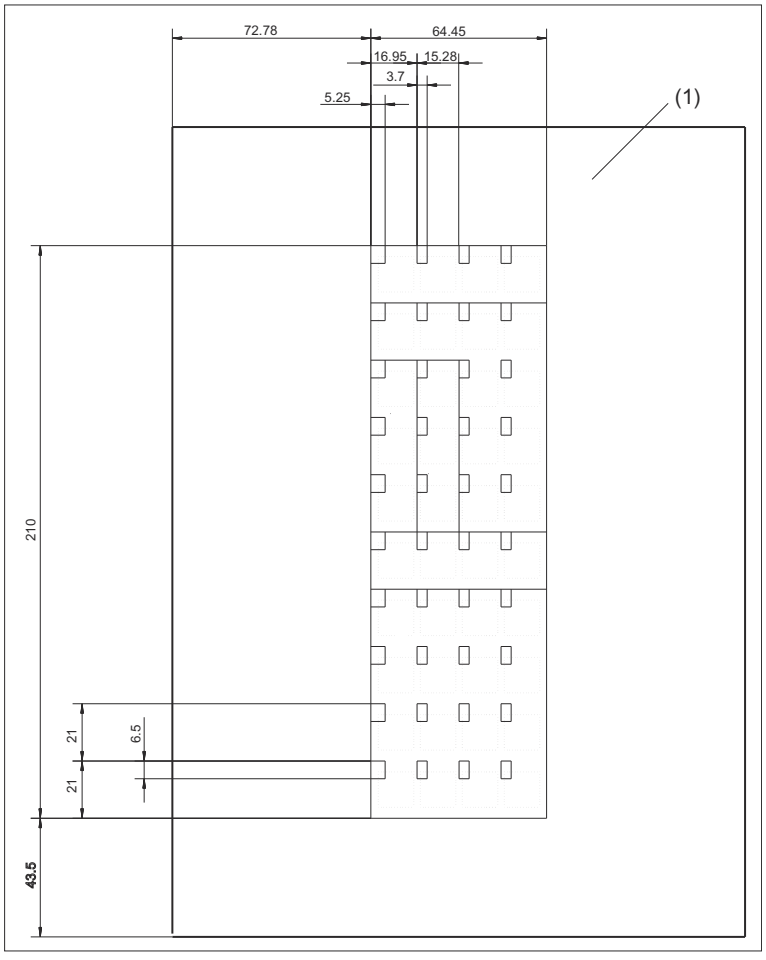


Figure 4-32 Dimensions for slide-in labels

Creating your own symbols

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

4.9.4.2 Replacing the slide-in labels

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

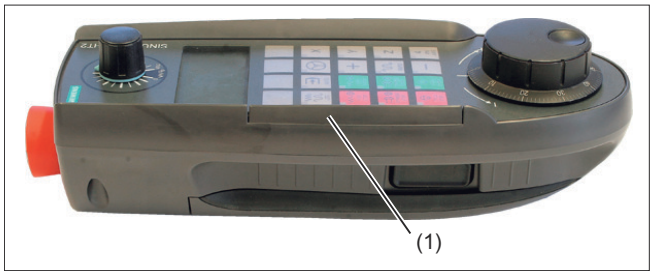
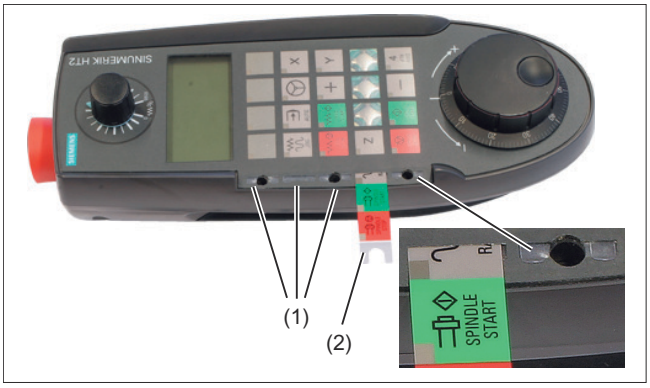


Figure 4-33 Cover of the slide-in labels (1)

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

1. Remove the three Phillips screws (5x14) using a screwdriver, size PH1.
2. Remove the cover.



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

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

Mini-handheld unit

5

5.1 Description

The mini handheld unit (Mini HHU) is an easy-to-handle and ergonomic unit for setting up and operating simple machines in the JobShop area or similar applications.

Since coarse, medium and fine infeed can easily be graduated, the operator control concept offers fast, increment-precise positioning. The signals are sent parallel to the CNC.

Features

- The mini HHU features a robust metal connector and is suitable for right-handed as well as left-handed operators.
- Key labeling can be customized using slide-in labels.
- The mini handheld unit can be fixed on metal surfaces by means of the integrated magnetic clamp. A holder shell is available as an option.

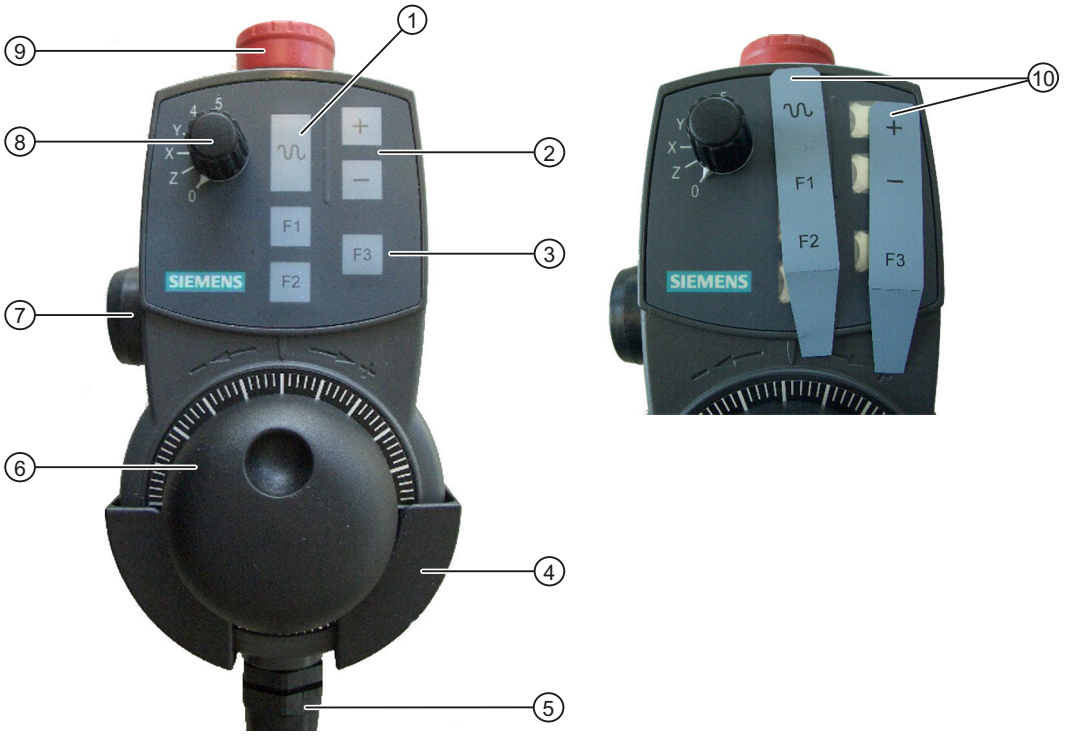
Validity

This description applies to:

Designation	Features	Article number
Mini HHU	With spiral connection cable, Emergency Stop button (2-channel), enabling button (3-stage), metal connector, handwheel with magnetic latching	6FX2007-1AD03
	With straight cable, Emergency Stop button (2-channel), enabling button (3-stage), metal connector, handwheel with magnetic latching	6FX2007-1AD13

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

5.2 Operator controls



① Rapid traverse key for high-speed travel with traversing keys or handwheel
② Traversing keys +/- direction
③ F1, F2, F3 function keys for customer-specific applications (freely assignable)
④ Holder shell (optional)
⑤ Connecting cable
⑥ Handwheel
⑦ Enabling button, 2-channel, 3-stage
⑧ Axis selector switch for 5 axes and neutral position
⑨ Emergency Stop button, 2-channel
⑩ Slide-labels for ①, ② and ③

Figure 5-1 View of mini handheld unit

Emergency Stop button

Press the red Emergency Stop button in emergencies when

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

Turn the Emergency Stop button clockwise to unlatch it.

⚠ WARNING

Danger of death due to premature restart

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.

Note

Emergency Stop

As a rule, when operating the Emergency Stop button, all drives are brought to a standstill with max. braking torque. For other responses to emergency stop, refer to the information supplied by the machine tool manufacturer.

Enabling button

The enabling button is designed as a 3-way switch. This must be held in its central position for traversing movements to be triggered.

Axis selector switch

You can select up to five axes with the axis selector switch. It is coded using Gray code.

Table 5-1 Coding of axis selection switch

Plug connector			Switch position	Function
Pin 8	Pin 9	Pin 10		
0	0	0	-	Mini HHU not connected
1	1	0	0	No axis selected
0	1	0	Z	Z axis selected
0	1	1	X	X axis selected
1	1	1	Y	Y axis selected
1	0	1	4	Axis 4 selected
0	0	1	5	Axis 5 selected

Function keys

The function keys can be used to trigger machine-specific functions.

Traversing keys

The + and - traversing keys can be used to trigger traversing movements on the axis selected via the axis selector switch.

Handwheel

The handwheel can be used to initiate movements at the axis that has been selected with the axis selector switch. The handwheel supplies two track signals with 100 increments/revolution.

Rapid traverse key

The rapid traverse key increases the traversing speed of the axis that has been selected with the axis selector switch. The rapid traverse key affects traversing commands issued via the +/- keys as well as handwheel signals.

5.3 Dimension drawing

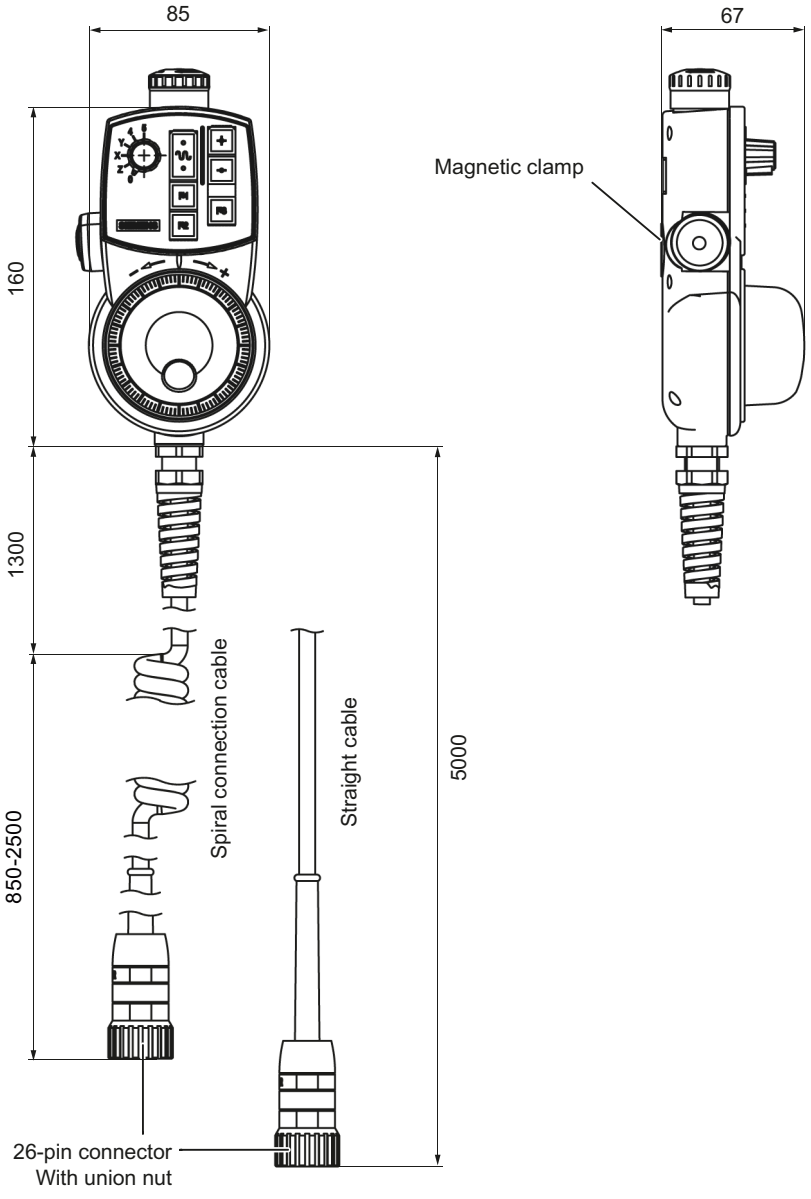


Figure 5-2 Dimensions of the mini handheld unit

5.4 Connecting

Basic procedure

A connection kit is required to connect the mini HHU.

- You can use the preassembled connection kit to connect to an MCP. When doing this please note that for the PROFIBUS version of the machine control panels, X55 is not available. However, X70 is suitable for freely connecting the conductors if you do not require a direct key connection.
- The non-assembled connection kit is available for free wiring. An angled socket is available for this connection kit to change the cable outlet direction. This allows the flange socket of the connection kit to be mounted 90° rotated.

This connection kit contains a metal flange socket for installation at the machine and a terminating connector for overriding the emergency stop circuit when the mini HHU is not connected.

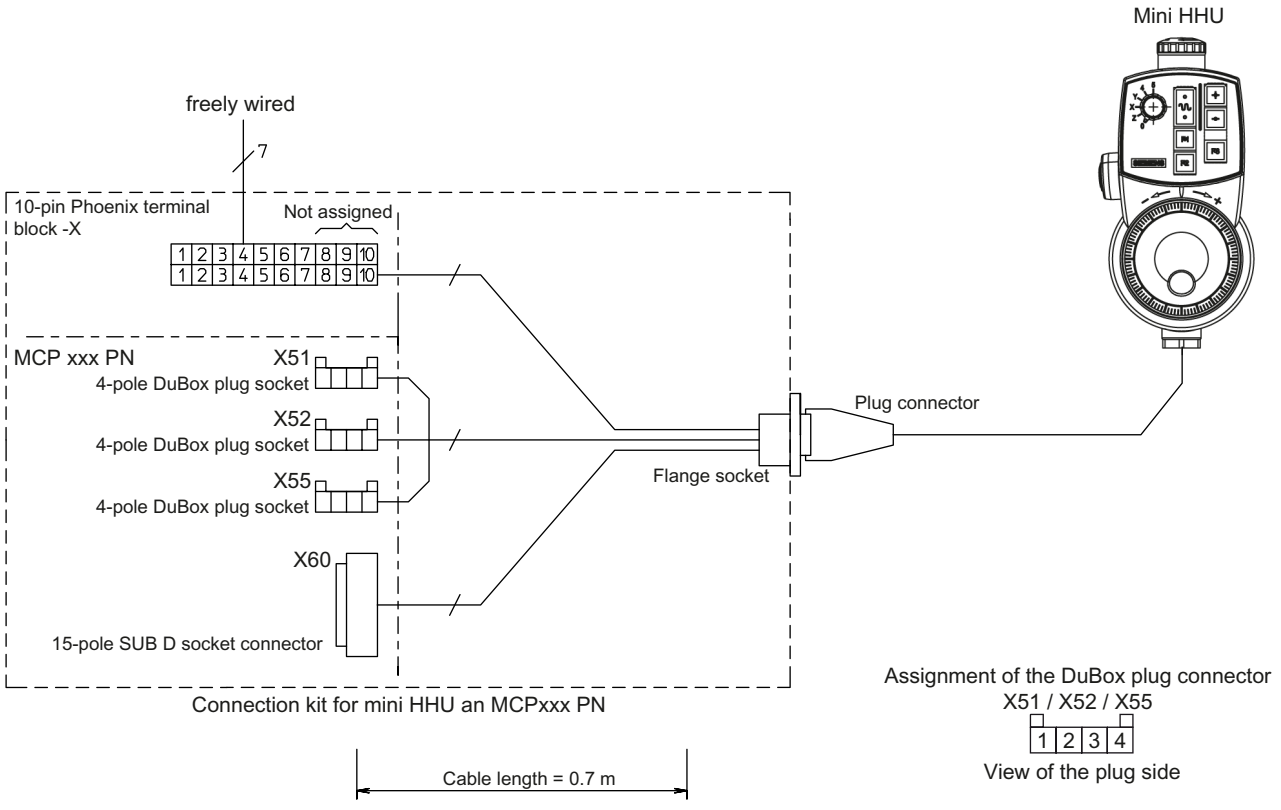


Figure 5-3 Connection diagram

1. Position the drilling pattern.
2. Route all the connecting cables through the large drill hole.
3. Mount the flange socket (with seal).

4. Plug the connecting cable into the mating connector according to the connector labeling.
5. Wire up the connections (at the machine) of the emergency stop and enabling button at terminal block -X (see the circuit diagrams).

Drilling pattern for the flange socket mounting

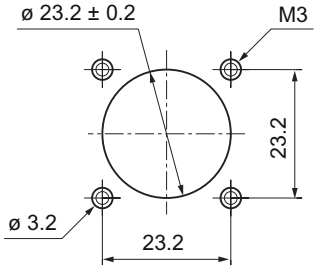


Figure 5-4 Drilling pattern for mounting

Flange socket

The mini HHU is connected using a flange socket. There is no need for an additional connection distributor.

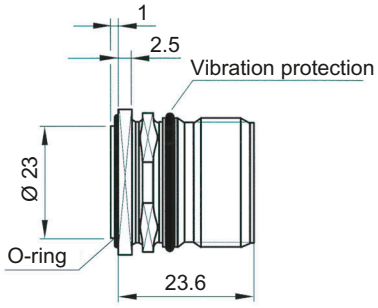


Figure 5-5 Flange socket

1. Plug the connector of the mini HHU (or the terminating connector) into the detent lugs/ guideways of the flange socket.
2. Tighten the screw cap to secure the connector.

Note

Failure to insert the connectors correctly can result in damage to the contacts.

If no mini HHU is connected, observe the following:

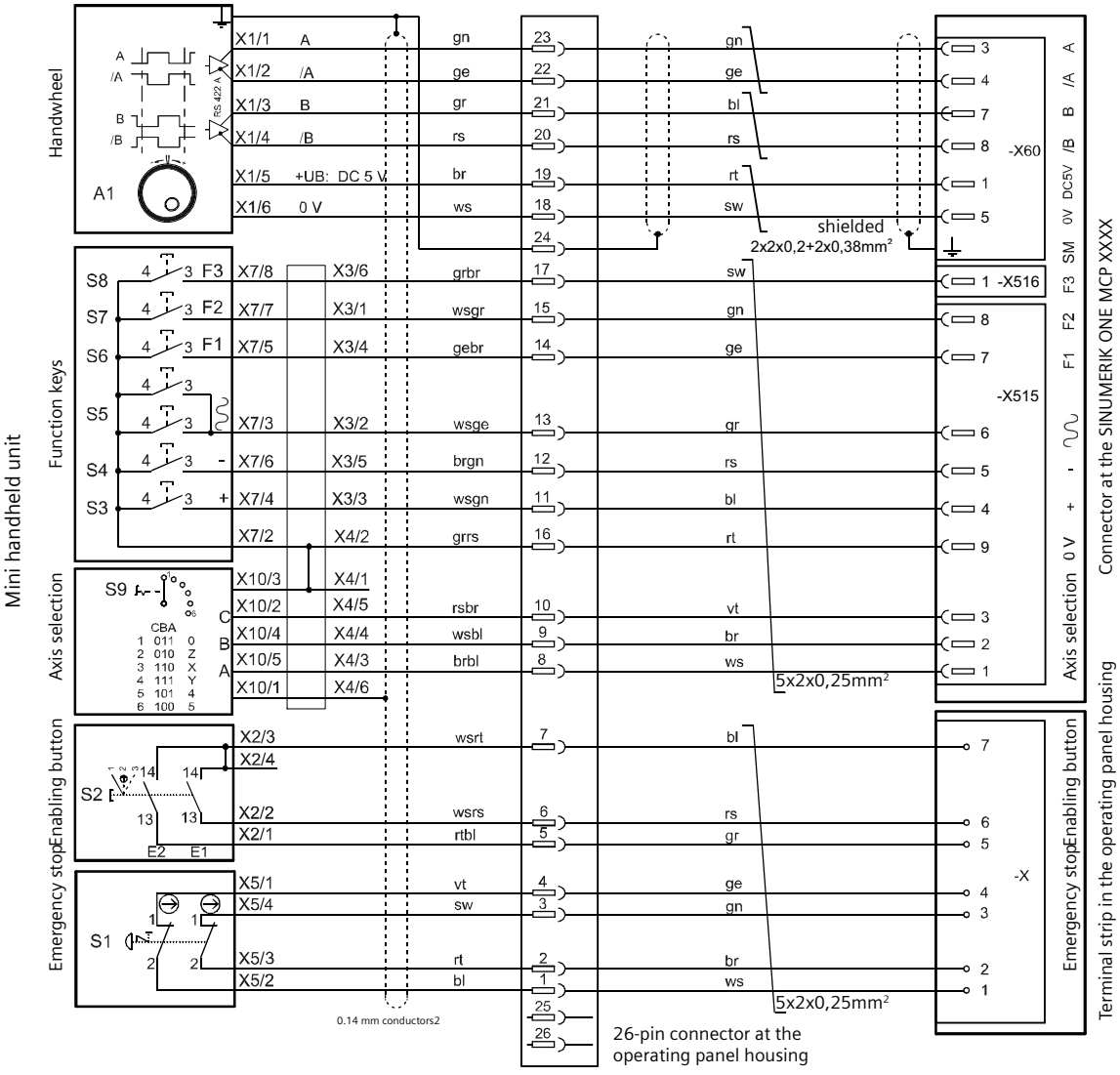
WARNING

Danger of death resulting from improper access

- After disconnection, the mini HHU 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.

Circuit diagrams

Circuit diagram for connection to the MCP



bl	Blue	sw	Black	rsbr	Pink-brown
br	Brown	vt	Violet	rtbl	Red-blue
ge	Yellow	ws	White	wsbl	White-blue
gn	Green	brbl	Brown-blue	wsge	White-yellow
gr	Gray	gebr	Yellow-brown	wsgr	White-gray
rs	Pink	grbr	Gray-brown	wsrs	Pink-white
rt	Red	grrs	Gray-pink	wsrt	White-red

Figure 5-6 Connecting the mini HHU at MCP xxx using the preassembled connection kit

Circuit diagram for custom-specific wiring

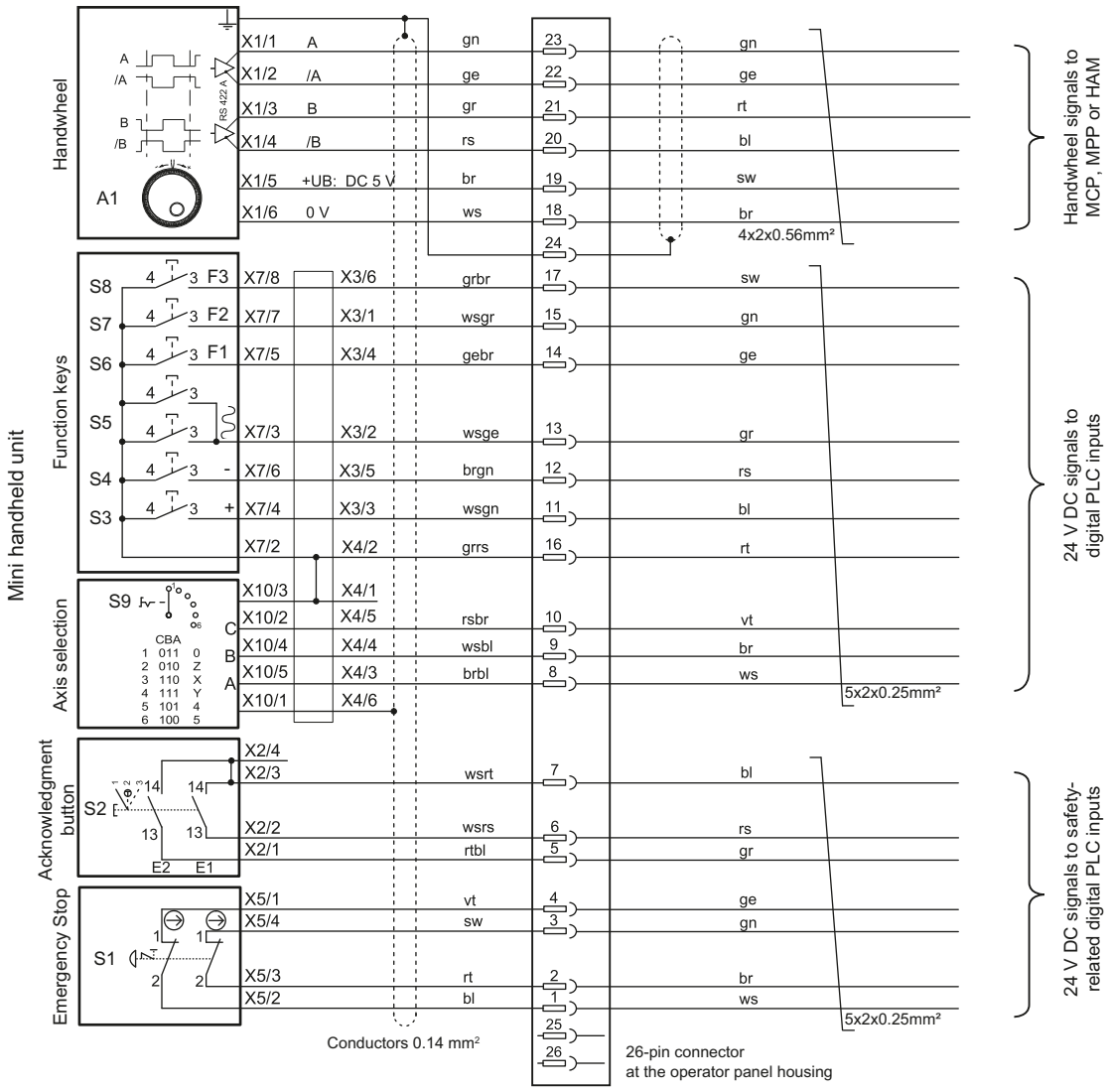


Figure 5-7 Principle connection of a mini HHU using the non-assembled connection kit

Note

Take care of the 0 V and the supply voltage wiring when connecting the axis selection switch and the function keys. Also observe the max. switching power of the contact blocks.

The handwheel can also be routed to the MCP PN interface.

5.5 Configuration

Configuring the mini HHU involves setting FB1 parameters in OB100 of the basic PLC program: See Function Manual Basic Functions, Basic PLC Program (P3 sl)

Example: Connecting a mini HHU to an MCP xxx PN

The mini HHU is connected to connectors X51, X52, X55 and X60 of an MCP xxx PN.

The customer keys (X51 - X55) of the MCPs then cannot be used for other applications.

Information concerning the coding of the machine functions on the mini HHU and details of the connection to the customer keys are provided in the tables below.

Table 5-2 Coding of axis selection switch X51:

2^1 X51.1 KT-IN1	2^2 X51.2 KT-IN2	2^3 X51.3 KT-IN3	Switch position	Function
0	0	0	-	Mini HHU not connected
1	1	0	0	No axis selected
0	1	0	Z	Z axis selected
0	1	1	X	X axis selected
1	1	1	Y	Y axis selected
1	0	1	4	Axis 4 selected
0	0	1	5	Axis 5 selected

Table 5-3 X52 traversing keys / rapid traverse key coding:

	Pin	Button	Function
KT-IN4	X52.1		Travel key + direction
KT-IN5	X52.2		Travel key - direction
KT-IN6	X52.3		Rapid traverse key

Table 5-4 X55 function keys coding:

	Pin	Button	Function
KT-IN7	X55.1	F1	Function keys
KT-IN8	X55.2	F2	
KT-IN9	X55.3	F3	

Note

For the assignment of the customer keys to the input images, refer to the appropriate section of the particular machine control panel.

5.6 Maintenance and Service

Cleaning the device

Use a soft cloth moistened either with water or a mild cleaning agent to clean the housing and operator control elements of the mini HHU.

Checking the device

In order to prevent foreign bodies or liquids entering the mini HHU, 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 mini HHU 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 resulting from damaged mini-handheld device 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).

5.7 Technical specifications

Table 5-5 Mini handheld unit

General data	
Approvals	CE / cULus

Degree of protection	IP65 - according to DIN EN 60529		
Mechanical data			
Dimensions approx.	Height: 180 mm	Width: 90 mm	Depth: 67 mm
Weight	Approx. 0.5 kg without connecting cable Approx. 1.3 kg with connecting cable		
Environmental conditions	Operation	Storage/transport	
Temperature ranges	0 ... 55° C	-20 ... 60° C	
Relative humidity	Max. 80% (condensation not permissible)		

Table 5-6 **Control elements**

	Emergency Stop button	**Enabling buttons**	**Handwheel**	**Function keys**	**Axis selector switch**
General	2 channel, according to EN ISO 13850	2-channel, 3-stage	according to RS 422	-	-
Contact block	2 x NC contact	2 x NO contacts	100 increments/ revolution	NO contact	Gray code
Switching voltage	24 V DC	24 V DC	5 VDC ± 5%	max. 30 V DC	max. 25 V DC
Switching current	2 A		90 mA	Max. 0.1 A	-
Contact rating	-		-	Max. 1 VA	Max. 0.2 VA
Reliability	B_{10d} = 100 000	B_{10d} = 750 000	-	-	-

Note

The quantitative assessment of the emergency stop and enabling safety functions 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} values only apply when the technical properties of the emergency stop and enabling buttons are taken into account.

5.8 Spare parts / accessories

The following accessories and spare parts can be supplied:

Item name	**Article number**	**Can be used with 6FX2007-**	
		-1AD03	**-1AD13**
6-pos. selector switch with accessories	104899	X	X
Emergency Stop button	104900 *)	X	X
ZXE-104833 (3-stage enabling button)	104901 *)	X	X
Protective cap and nut for ZXE	104902 *)	X	X
3.5 m spiral connecting cable	104903 *)	X	
5 m straight connecting cable	104904 *)		X
5 m (straight) extension cable	103832 *)	X	X

Item name	Article number	Can be used with 6FX2007-	
		-1AD03	-1AD13
10 m (straight) extension cable	103833 *)	X	X
15 m (straight) extension cable	103834 *)	X	X
Connecting adapter (0.5 m adapter cable; metal coupling on mini HHU side to T+B plastic coupling on panel side)	103835 *)	X	X
Connector disassembly tool	105037	X	X

*) Safety-related

Ordering address

Euchner GmbH + Co. KG
Vertrieb Technik
Kohlhammerstr. 16
70771 Leinfelden-Echterdingen
Germany

Phone +49 (0) 711 7597-0
Fax +49 (0) 711 7597-303

Table 5-7 Further accessories

Component	Article number	Remark
Connection kit	6FX2006-1BG11 *)	Assembled, metal version, with terminating connector
Connection kit	6FX2006-1BG03 *)	Non-assembled, metal version, with terminating connector
Angled socket	6FX2006-1BG56 *)	Metal version, for non-fabricated connection kit
Adapter plate	6FX2006-1BG45	Plastic to metal version
Retaining shell	6FX2006-1BG70	including 3 M4 screws

*) Safety-related

Retaining shell

Optionally, the mini handheld unit can be stored in a screw-on retaining shell. The retaining shell is mounted using three M4 screws (included in scope of delivery).

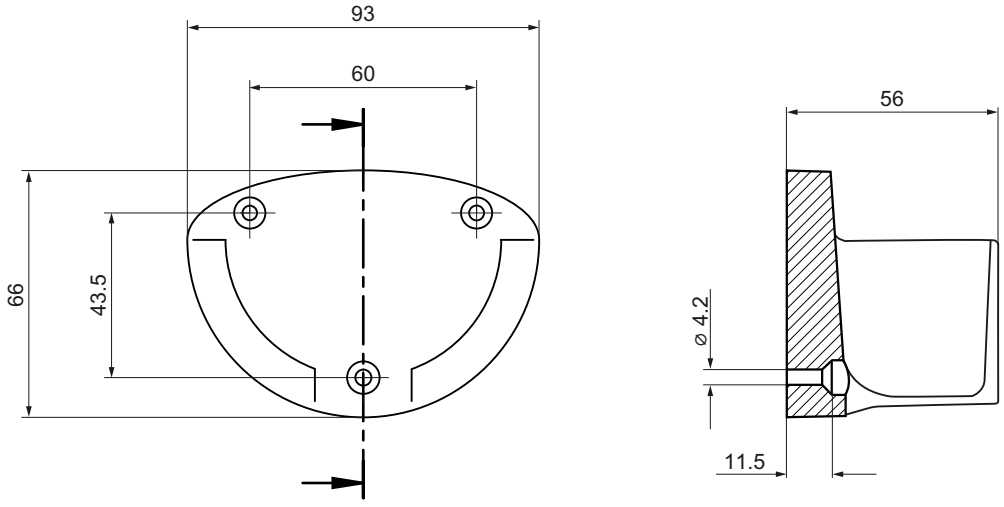


Figure 5-8 Dimension drawing for mounting the retaining shell

Angled socket

An angled socket is available as an option, which permits the cable outlet direction to be rotated through 90°.

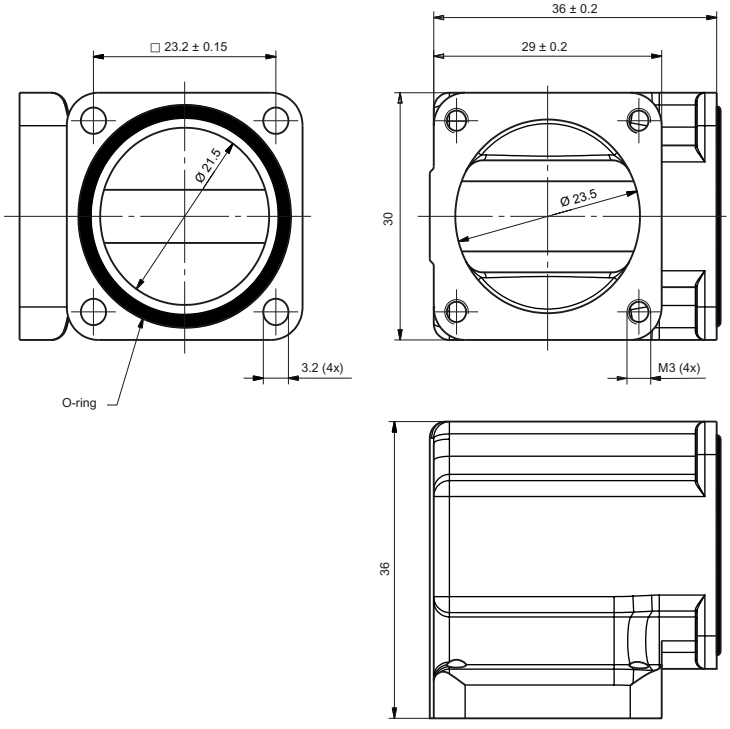


Figure 5-9 Dimension drawing of angled socket

Adapter plate

The adapter plate is only required if the metal flange socket is being mounted at an installation location intended for plastic flange sockets.

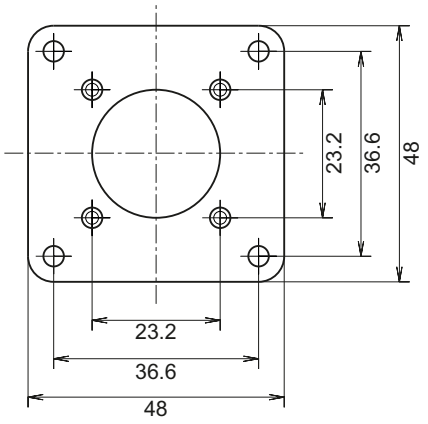


Figure 5-10 Dimension drawing of the adapter plate

Slide-in labels

The slide-in labels can be replaced. To do this, you must unscrew the six TORX screws on the rear of the housing. The housing can now be taken apart. The slide-in labels can now be pulled out of the guide on the front plant and replaced, if required.

Make sure that no connection cables are pinched during the re-assembly.

Electronic handheld handwheel

6

6.1 Description

The handheld handwheel is intended for use in conjunction with machines. A magnetic bracket and spiral connection cable can be found on its enclosure. The magnetic bracket (retaining magnet) enables the handwheel to be attached to metallic surfaces. So that it can also be safely stored on non-magnetic surfaces, there is also a retaining shell available (see Section: "Accessories").

The electronic handheld handwheel is an incremental encoder that generates signals according to how the manually operated wheel is rotated.

The handwheel's magnetic latching facility makes for an extremely precise incremental process. The axis selected via the control can be positioned so that the axes are parallel.

The handheld handwheel offers a PPR count of 100 S/R.

Validity

The description applies to the following electronic handheld handwheel:

Designation	Interface	Article number
Electronic handheld handwheel	5 VDC, RS 422	6FC9320-5DE02

Display

① Handwheel
② Spiral connection cable
③ 9-pin connector

Figure 6-1 View of electronic handheld handwheel

6.2 Dimension drawing

Front view and side view

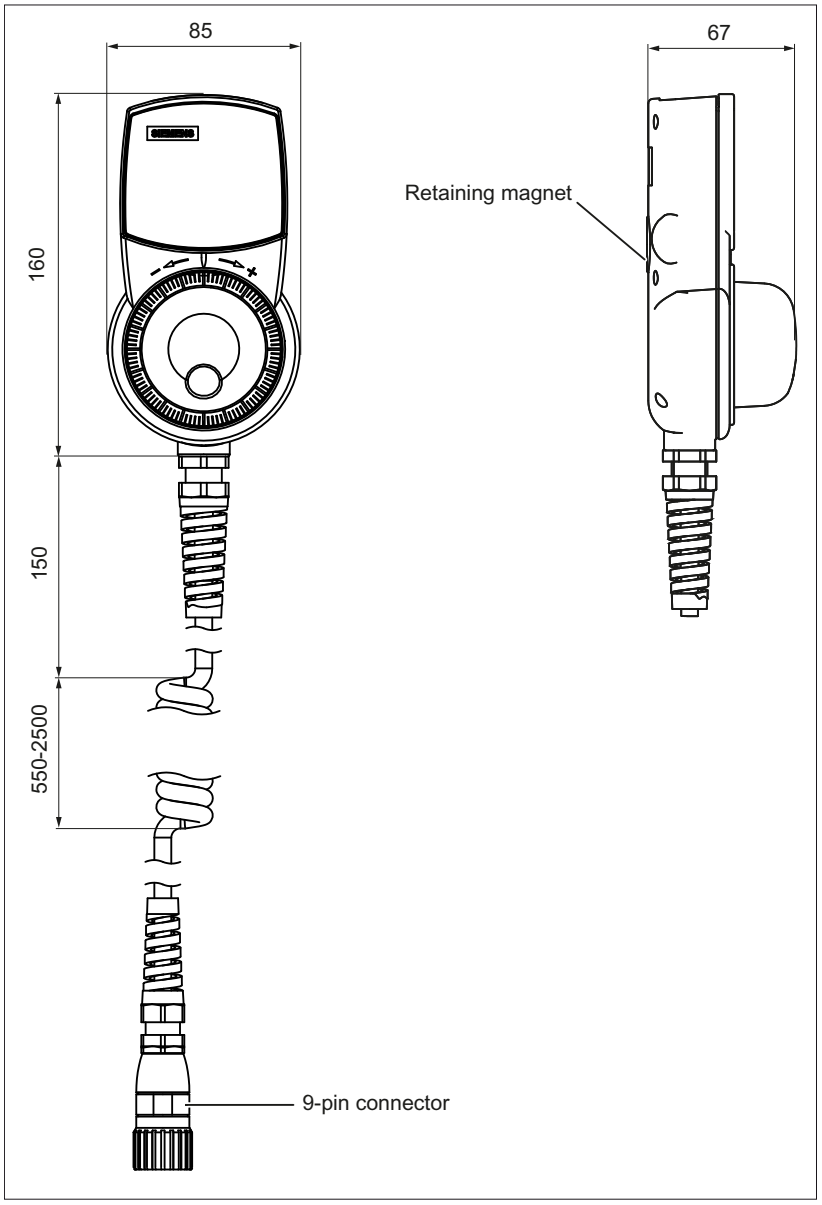
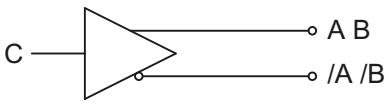


Figure 6-2 Dimensions of the electronic handheld handwheel

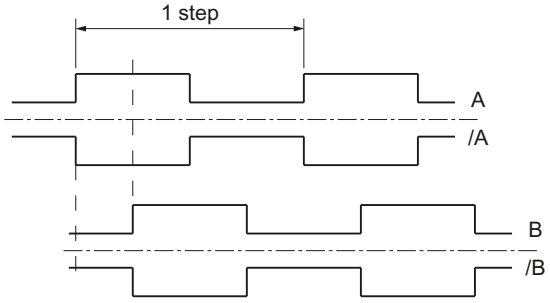
Outputs

RS 422 A



Load current ≦ 20 mA

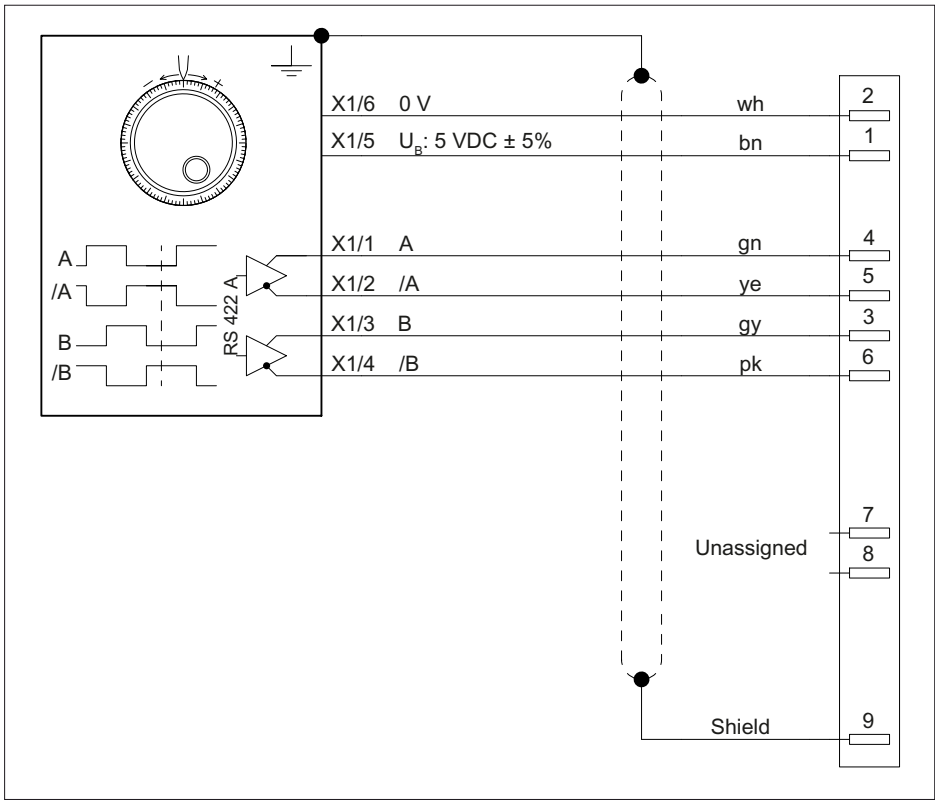
Pulse diagram



6.3 Connection

The handheld handwheel is connected via a flange socket using the spiral connection cable. The article numbers for the recommended flange can be found in Section "Accessories".

Electrical connection diagram



Note

When a connected handwheel triggers pulses from its idle position or in the event of a slight touch, connect it so that the label is facing the wrong way.

Swap:

- The wires of terminal A with those of terminal /A
- The wires of terminal B with those of terminal /B

6.4 Technical specifications

Table 6-1 Portable electronic handwheel

Safety			
Safety class	I		
Degree of protection according to EN 60529	IP65		
Electrical data			
Operating voltage	5 VDC ± 5%		
Current consumption	Max. 80 mA		
Limit frequency	10 kHz		
Number of pulses	100 increments/revolution		
Displacement of phase A to B	Typ. 90° electrical		
Interface	RS 422		
Mechanical data			
Dimensions approx.	Height: 160 mm	Width: 85 mm	Depth: 67 mm
Weight	0.3 kg (without spiral connection cable)		
Housing material	Thermoplastic		
Distance to NCU	20 m		
Actuating force	4 Ncm		
Speed	Max. 1,000 rpm		

Note

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

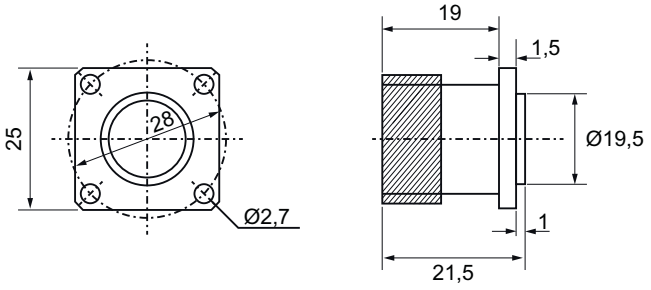
"Application planning"

6.5 Accessories

The following components are available as accessories for the electronic handheld handwheel:

Component	Description	Article number
Flange socket	9-pin flange socket	6FC9341-1AQ
Holder	Providing a place to store the handwheel in the case of non-metallic surfaces	6FX2006-1BG70
Signal connector	9-pin signal connector	

Dimension drawing of the flange socket



Pin assignment	
Pin	Signal
1	5 V
2	0 V
3	B
4	A
5	*A
6	*B
9	Shield

Dimension drawing of the holder

Optionally, the handheld electronic handwheel can be stored in a screw-on holder. The holder is mounted using three M4 screws (included in the scope of delivery).

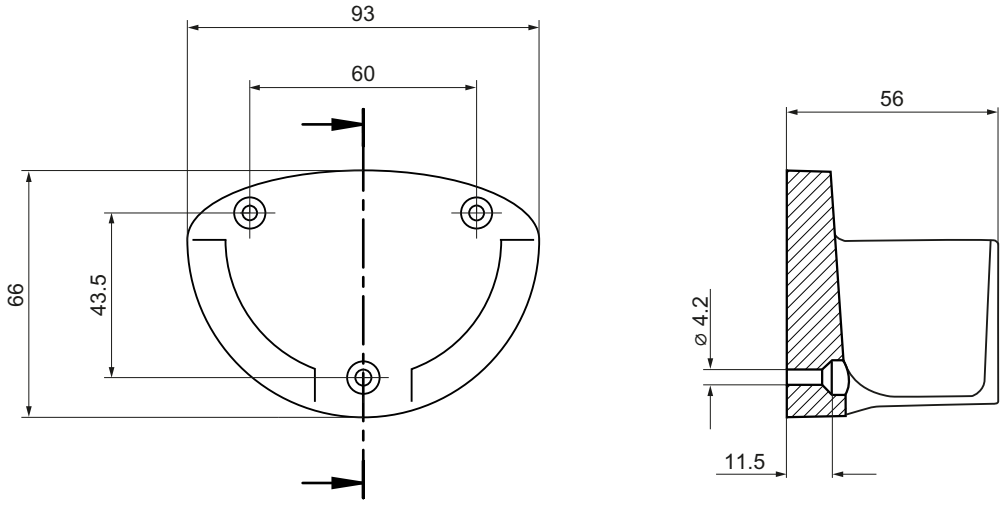


Figure 6-3 Dimension drawing for mounting the holder

Appendix

A

A.1 Abbreviations

AC	Alternating Current
AWG	American Wire Gauge
BERO	Proximity limit switch
CAT5	Quality class (category) for shielded twisted-pair cables. Class 5 states that these cables have a particularly low damping factor, making them suitable for 100 Mbit/s-FastEthernet networks.
CCC	China Compulsory Certification
CE	Conformité Européenne: European Conformity
CNC	Computerized Numerical Control: computerized numerical control
CPU	Central Processing Unit: central processing unit
CRC	Cyclic Redundancy Check: checksum validation
CSA	Canadian Standards Association
cULus	UL (Underwriters Laboratories) tested for Canada and USA
DC	Direct Current
DCP	Discovery and basic Configuration Protocol (standard for assigning IP addresses)
DIN	Deutsche Industrie Norm (German Industry Standard)
DIP	Dual In–Line Package: dual in-line arrangement
DMC	DRIVE-CLiQ Module Cabinet (Hub)
DME	DRIVE-CLiQ Module External (Hub)
DP	Distributed I/O
DRAM	Dynamic Random Access Memory
DRIVE-CLiQ	Drive Component Link with IQ
DVC A	Decisive Voltage Category A
EAC	Eurasian Conformity
EC	European Conformity
EGB	Electrostatic Sensitive Devices
EMC	Electromagnetic compatibility
EN	European standard
ESD	Electrostatic discharge: electrostatic discharge
GPL	General Public License
HLA	Hydraulic Linear Actor
HMI	Human Machine Interface: SINUMERIK operator interface for operating, programming and simulation
HT	Handheld Terminal
IE	Industrial Ethernet
IO or I/O	Input/output
IPC	Industrial PC
IRT	Isochronous Realtime: data exchange with isochronous mode
ISO	International Standards Organization

KC	Korean Certification
LAN	Local Area Network
LED	Light-Emitting Diode: light-emitting-diode display
LGPL	Lesser General Public License
MAC	Media Access Control
MCP	Machine Control Panel
MPP	Machine Pushbutton Panel
NCK	Numerical Control Kernel: NC kernel with block preparation, traversing range, etc.
NCU	Numerical Control Unit: NCK hardware unit
NVRAM	Non-Volatile Memory: non-volatile memory
NX	Numerical eXtension (axis extension module)
OP	Operator Panel: operator panel front
OPC UA	Open Platform Communications Unified Architecture: industrial communication protocol
OSS	Open source software
PCU	PC Unit: computer unit
PELV	Protective Extra Low Voltage
PG	Programming device
PLC	Programmable Logic Control: programmable logic control (component of the CNC)
PN	PROFINET
PP	I/O modules
PTC	Positive Temperature Coefficient
RAM	Random Access Memory: program memory that can be read and written into
RCM	Regulatory Compliance Mark
RFC	Request for Comments
RSS	Really Simple Syndication
RT	Realtime: data exchange without isochronous mode
SD	Secure Digital: secure digital memory card
SELV	Safe Extra Low Voltage
SIOS	Siemens Industry Online Support
SME	Sensor Module External
SSH	Secure Shell
TCU	Thin Client Unit (communication with operator panels)
TCP	Transmission Control Protocol
TS	Teleservice
UDP	User Datagram Protocol
UL	Underwriters Laboratories
USB	Universal Serial Bus
VDE	Association of Electrical Engineering, Electronics and Information Technology (Germany)
VNC	Virtual Network Computing
Full duplex	An Ethernet/PROFINET port can simultaneously transmit and receive data.

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