SIEMENS

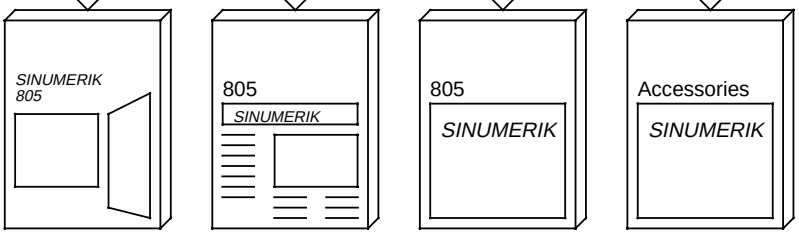
SINUMERIK 805
Software Version 4
Interface Description
Part 2: Connection Conditions

Planning Guide 05.93 Edition

Manufacturer Documentation

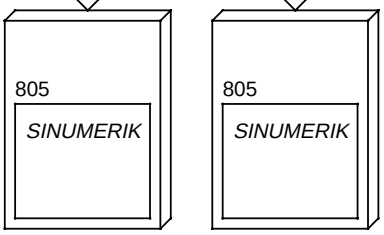
SINUMERIK 805

General Documentation



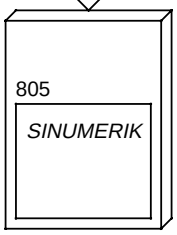
Sales Brochure | Technical Data | Catalog NC 34 | Catalog NC 90

User Documentation



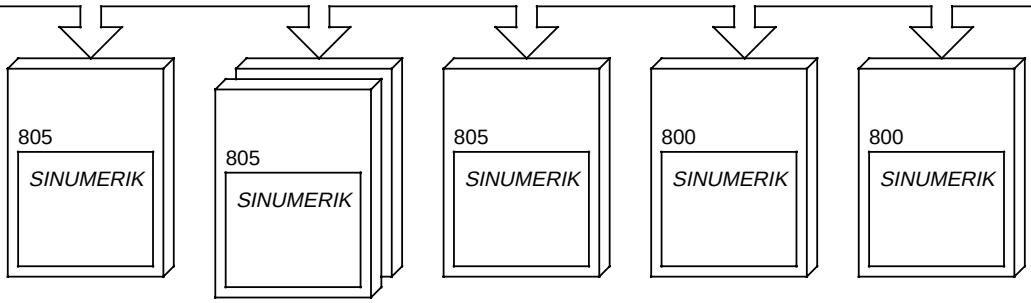
Operator's Guide | Programming Guide

User/Manufacturer and Service Documentation



Function Manual
SINEC L2 Interface Module

Manufacturer Documentation

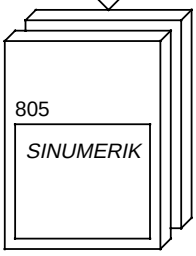


Instruction Manual

Interface:
- Signals
- Cables and Connections

PLC Programming | Universal Interface | CL 800 Language

Service Documentation



Installation Guide
- Instructions
- Lists

SINUMERIK 805
Software Version 4
Interface Description
Part 2: Connection Conditions

Planning Guide

Manufacturer Documentation

May 1993 Edition

SINUMERIK® documentation

Printing history

Brief details of this edition and previous editions are listed below.

The status of each edition is shown by the code in the "Remarks" column.

Status code in "Remarks" column:

A ... New documentation
B ... Unrevised reprint with new Order No.
C ... Revised edition with new status.
If factual changes have been made on a page since the last edition, this is indicated by a new edition coding in the header on that page.

Edition	Order No.	Remarks
03.90	6ZB5 410-0CR02-0BA0	**A**
08.90	6ZB5 410-0CR02-0BA1	**C**
01.91	6ZB5 410-0CR02-0AA2	**C**
11.91	6ZB5 410-0CR02-0AA3	**C**
05.93	6ZB5 410-0CR02-0AA4	**C**

Other functions not described in this documentation might be executable in the control. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

This publication was produced on the Siemens 5800 Office System.
Subject to change without prior notice.

Preliminary Remarks

General Remarks

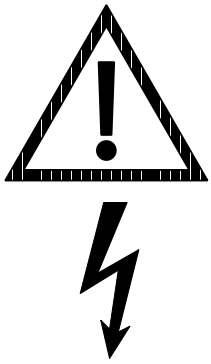
This manual contains the necessary information on hardware configuration and installation of the control with its components.

The documentation is directed at qualified technical personnel who have been specifically trained in or possess the requisite knowledge of instrumentation and control technology, referred to in the following as automation technology.

Familiarity with and technically correct observation of the safety instructions and warnings are essential for safe installation and start-up as well as for safety during operation and maintenance of the product. Only qualified personnel are in a position to correctly interpret and implement the safety instructions and warnings described in general terms in the documentation.

This documentation is valid for software version 4

Safety Guidelines

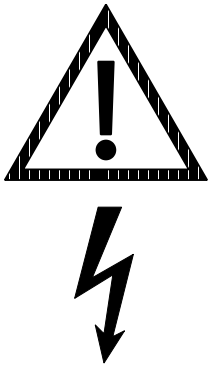


WARNING

When electrical devices are in operation, certain parts of them are inevitably subjected to hazardous voltages.

Improper interference with the device/system or failure to observe the warning advice can result in serious physical injury or material damage. Only appropriately **trained personnel** familiar with the assembly, installation, starting up or operation of the product are permited to interfere with this device/system.

Qualified personnel



WARNING

As far as the safety advice (contained in the documentation or as a sticker on the product) is concerned, ”qualified personnel” refers to persons who, for instance:

- have received training or instruction and authorization to energize and deenergize, earth and tag electric circuits and devices according to established safety practices.
- have received training or instruction according to established safety practices in the care, use and repair of appropriate safety equipment.
- have received training or instruction in working with electrostatically sensitive components or modules.
- have been instructed as operators to work with automation technology equipment and are familiar with the contents in the Operator's and/or Programming Guide referring to operation.

When planning, installing, starting up and operating the control, the personnel concerned must be familiar with the documentation relevant to their jobs.

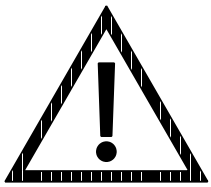
Notes on danger

The following notes are provided for your personal safety and to protect the product described here or connected devices and machines against damage.

Safety advice and warnings intended to avert danger to human life and health and to avoid material damage are highlighted in this Manual by the terms defined here. The terms have the following meanings in the context of this Manual and the remarks on the product itself:

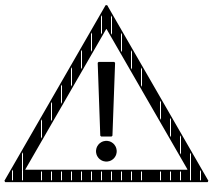
DANGER

As far as this Manual and the warning advice on the products themselves are concerned, ”danger” refers to instances where death, serious physical injury or considerable material damage **will** result if proper precautions are not taken.



WARNING

As far as this Manual and the warning advice on the products themselves are concerned, ”warning” refers to instances where death, serious physical injury or considerable material damage **can** result if proper precautions are not taken.



CAUTION

As far as this Manual and the warning advice on the products themselves are concerned, ”caution” refers to instances where slight physical injury or material damage can result if proper precautions are not taken.

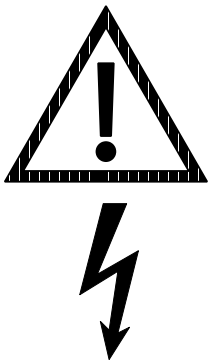
”Note” refers to important items of information about the product or the part of the Manual to which particular attention must be paid.

Proper Usage

- The equipment/system or the system components may only be used for the applications described in the catalog or the technical description, and only in combination with the equipment, components and devices of other manufactuers as far as this is recommended or permitted by Siemens.
- The product described has been developed, manufactured, tested and the documentation compiled in keeping with the relevant safety standards. Consequently, if the described handling instructions and safety guidelines described for planning, installation, proper operation and maintenance are adhered to, the product, under normal conditions, will not be a source of danger to property or life.

Active and passive faults in an automation system

- Depending on the type of automation system, both **active** and **passive** faults can be **dangerous**. In a drive control, for example, the active fault is generally dangerous because it results in the drive being switched on without authorization. By contrast, a passive fault can prevent a dangerous state of operation from being reported in the case of a signalling function.
- This distinction of possible faults and their task-specific characterization as dangerous or harmless is important for all safety considerations concerning the delivered product.



WARNING

Wherever faults in the automation equipment can cause substantial material damage or even physical injury, i.e. wherever dangerous faults can arise, additional external measures must be introduced or equipment must be provided to ensure or force safe operating conditions even if a fault occurs (e.g. by means of independent limit monitors, mechanical interlocks etc.).

Notes on configuring the product

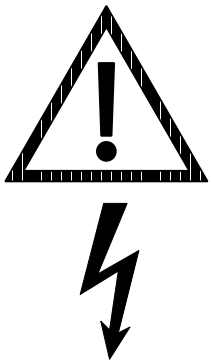
These notes are intended to serve as a guideline for avoiding dangers when integrating this product in its environment since the product is generally used as part of a greater system or plant.

The following facts are of particular importance:

Even if a maximum degree of safety has been incorporated in the design of automation equipment, e.g. by the use of multiple channels, it is still essential to meticulously follow the instructions given in the documentation because incorrect handling can make ineffective any measures that have been provided to prevent the occurrence of dangerous faults and additional hazards can result.

Additional Notes

If measuring or testing work is required on an active piece of equipment, the stipulations and implementation instructions of the VBG 4.0 accident prevention regulation, in particular § 8 ”Permissible deviations when working on active parts”, must be observed. Suitable electric tools must be used.



WARNING

- Repairs to equipment suppled by us must be made only by the **Siemens customer service** or by **repair services authorized by Siemens**. Use only parts contained in the Spare Parts List when renewing parts or components. Unauthorized opening and improper repairs can lead to fatal or serious physical injury and considerable material damage.
- Always pull out the mains connector or open the disconnecting switch before opening the device.
- Use only the specified types when renewing fuses.
- Do not throw batteries into fires and do not solder on the cell casing owing to the risk of explosion (max. temperature 100°C). Do not open and do not recharge lithium batteries or batteries containing mercury. Use only the same types when replacing.
- All types of batteries must be disposed of as special waste.
- When using monitors:

  Improper intervention, in particular changes to the high voltage or installation of a different type of picture tube, can lead to intensified X rays. Equipment modified in this way no longer complies with the approval and must not be used.

Contents

1 Cables and Devices

1.1 Range of application

The SINUMERIK 805 control is a CNC continuous/linear path control.

This control enables up to 4 axes and 1 spindle for standard machine tools and special applications (e.g. face grinding, loader, feeder, cutting-to-length attachments, etc.) to be easily and conveniently operated and programmed.

The basic control version consists of a central controller to which binary 24V inputs/outputs for NC and PLC sections are connected. Additional I/O devices can be connected via distributed machine peripherals (DMP).

Definitions:

Machine peripherals

General comprehensive term for inputs and outputs at the machine and the associated outputs and inputs at the SINUMERIK control (NC or PLC), chiefly binary with DC+24V levels.

Centralized peripherals

Input/output components (e.g. I/O submodules) accommodated in the central controller that can be activated by the PLC directory without a link.

Distributed peripherals

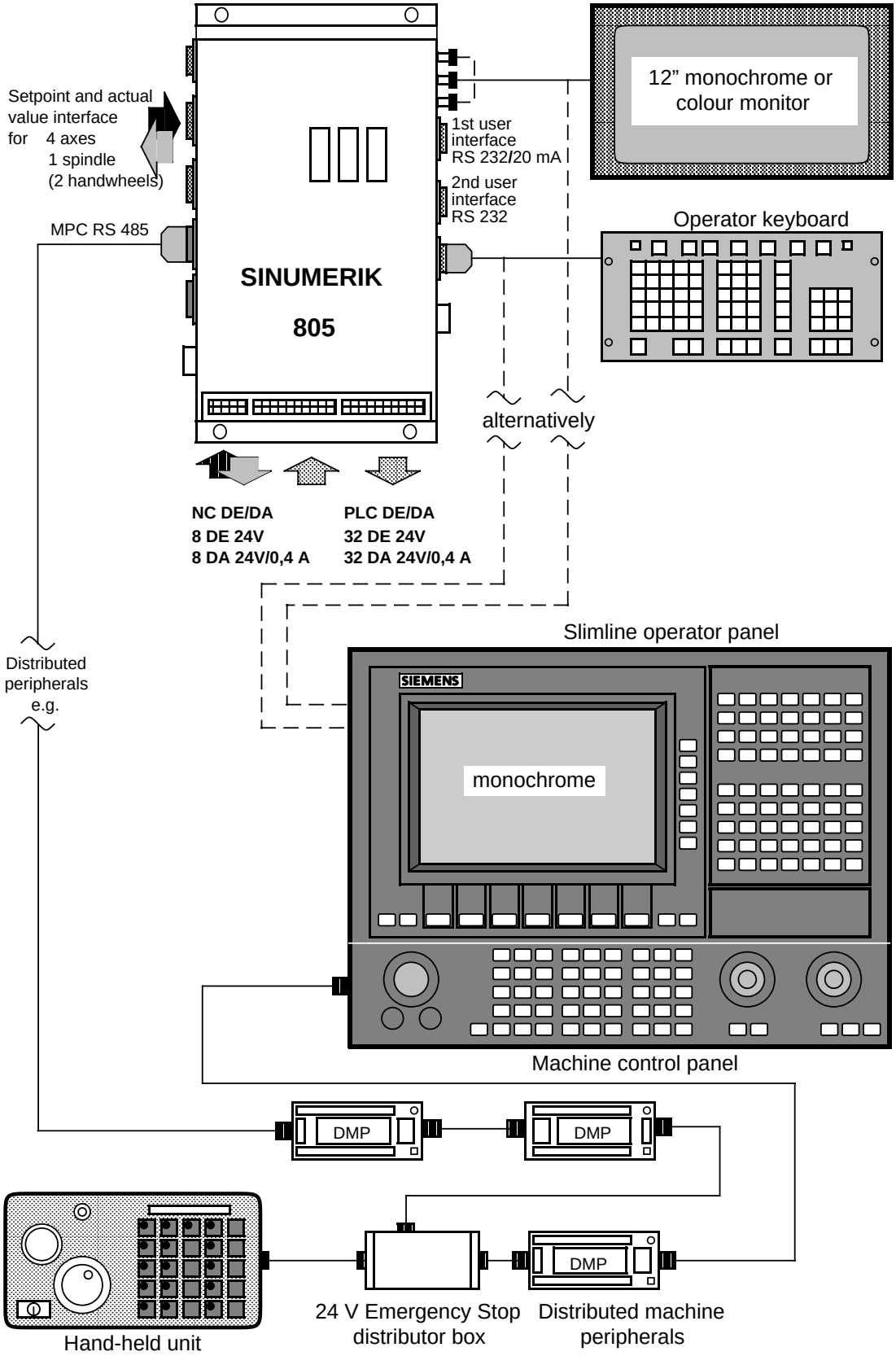
Input/output components (e.g. DMP) accommodated outside the central controller that can be activated by the PLC only via a link.

Operator keyboard peripherals

Input/output components (e.g. keyboard expansion submodules) accommodated outside the central controller and assigned to the operater keyboard that can be used only for connecting machine control panels etc.

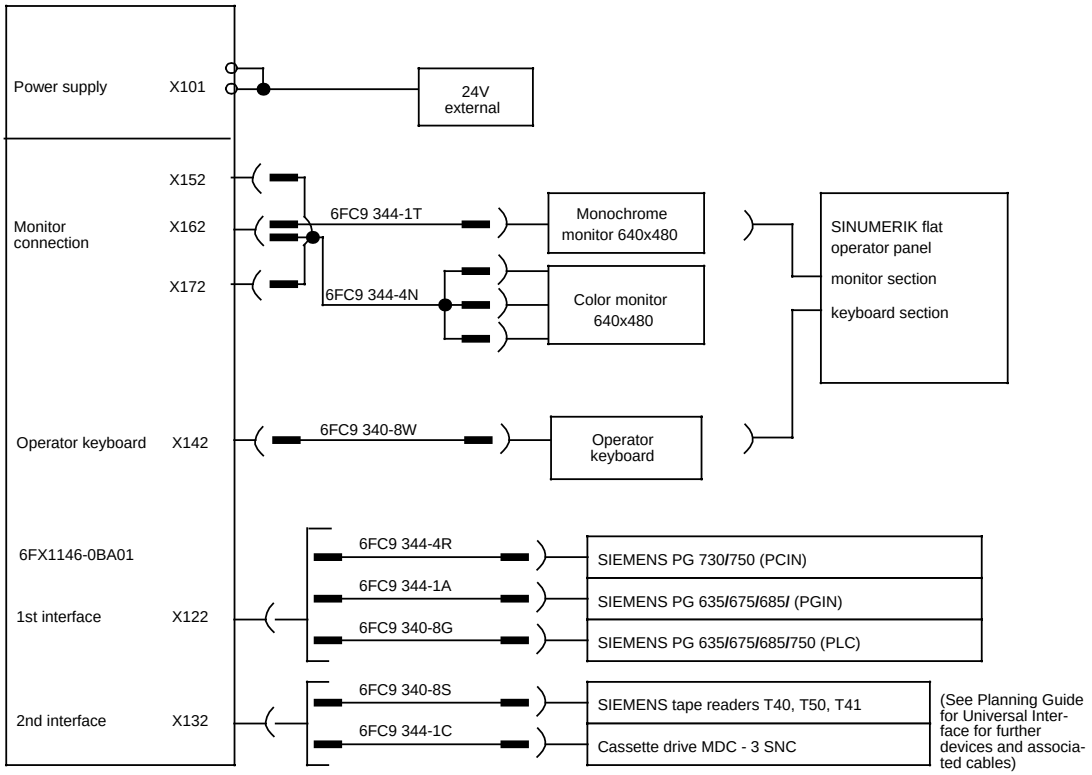
NC Numerical Control
PLC Programmable Logic Control
EU Expansion Unit
DMP Distributed Machine Peripherals

1.2 Overview of operator and PLC I/O components

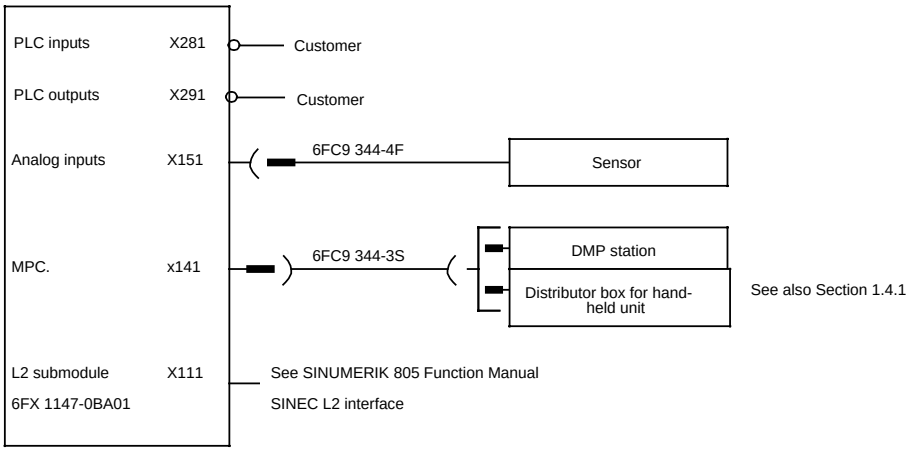


1.3 Connection options to central controller

Operator/display section

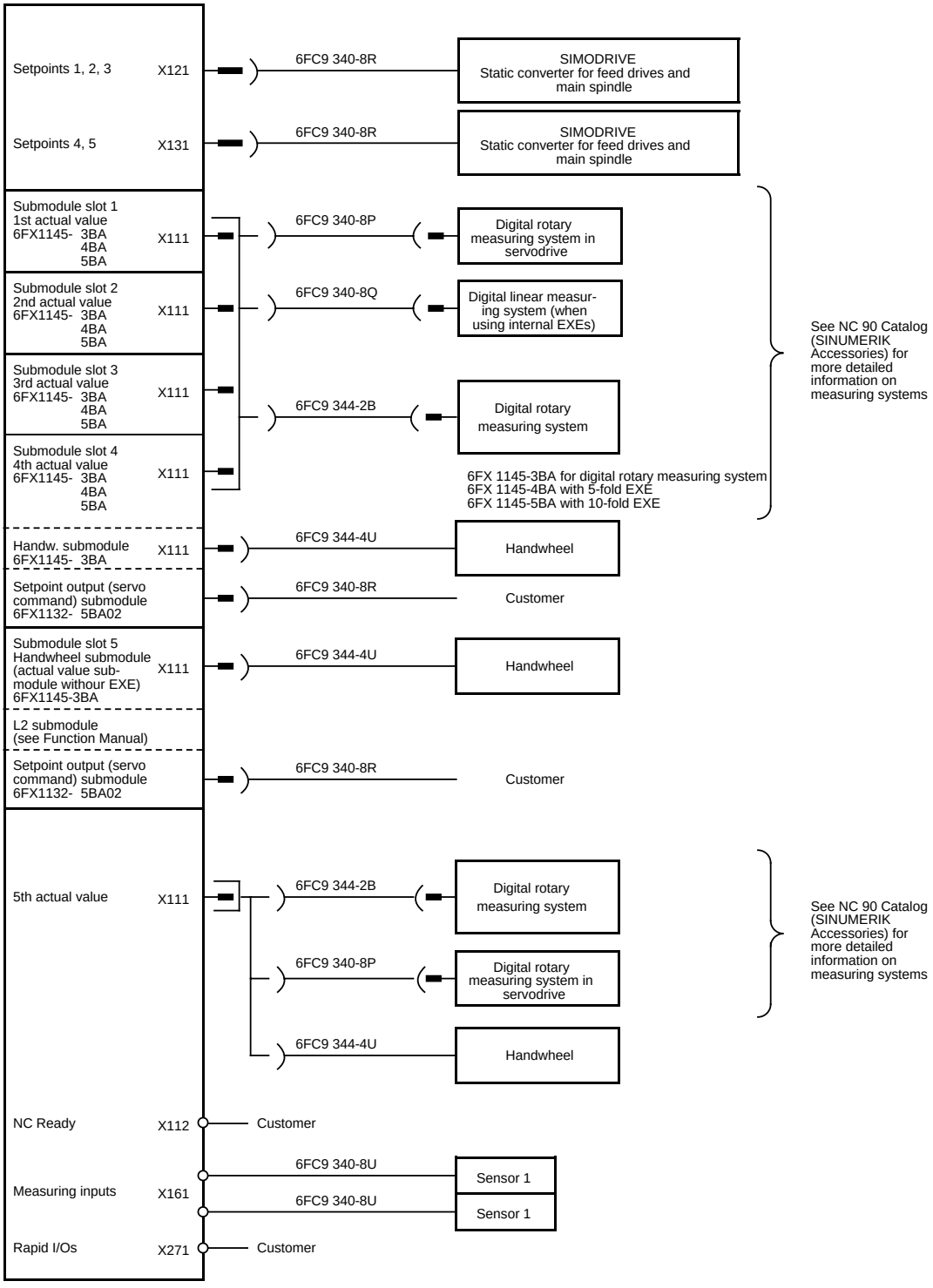


PLC Section



In the 5th submodule slot either an L2 submodule, a setpoint output submodule or an actual value submodule without EXE can be plugged as hand wheel submodule (for 2nd handwheel).

NC Section



The following the order number for cables (complete with connector) reserves space for specifying the cable length. See Section 3 ”Cable Lists” for standard cable lengths that can be ordered.

1.4 Connection options to PLC peripherals

On the basic control version, the centralized peripherals are available on the central controller.

The centralized peripherals include: 32 inputs, 24 V
32 outputs, 24 V, 400mA, short-circuit proof, non-floating

This I/O configuration can be expanded by options:
(All options can be used at the same time):

- Option Hand-held unit via MPC chain
  25 inputs, permanently assigned to the keys of the hand-held unit
  16 outputs, permanently assigned to the key LEDs of the hand-held unit
- Option DMP stations via MPC chain
  A maximum of 5 DMP stations are allowed (320I/320Q)
  The following DMP modules can be connected:
  – DMP module, 16I/16Q; 32I
  – DMP compact module (SW 4.2 and higher), 8 x (16I, 16Q, 8Q), max. 64I and 64Q
  – DMP IP65 module (SW 4.2 and higher), 8I/8Q or 16I
  – Integrated DMP module of the flat operator panel (64I/48Q) for the machine control panel (SW 4.2 and higher)
- Option Keyboard Expansion modules (incorporated in the operator keyboard)
  2×16 inputs, for customer operator panel etc.
  2×16 outputs, for customer operator panel etc.
- Option Analog inputs
  8 analog inputs , 0 ...+10 V

WARNING

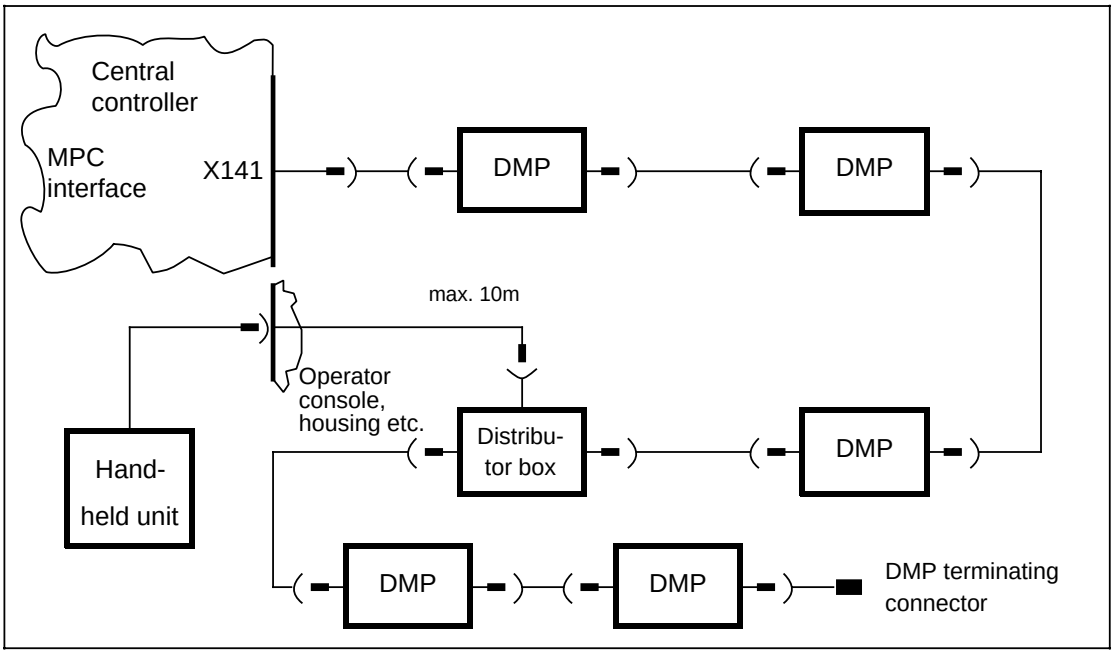
The capacitance of the outputs compensates only the inductances of the cables connected.

If contactors, relays, valves etc. are connected, additional interferance suppressors (e.g. RC circuit, free-wheeling diode) must be connected in parallel to these inductive loads (DIN IEC 550/DIN VDE 0113, Part 200).

Non-observance of this warning may cause the outputs to be destroyed.

1.4.1 Connection options to distributed peripherals

Hand-held unit and DMP stations (max. configuration)



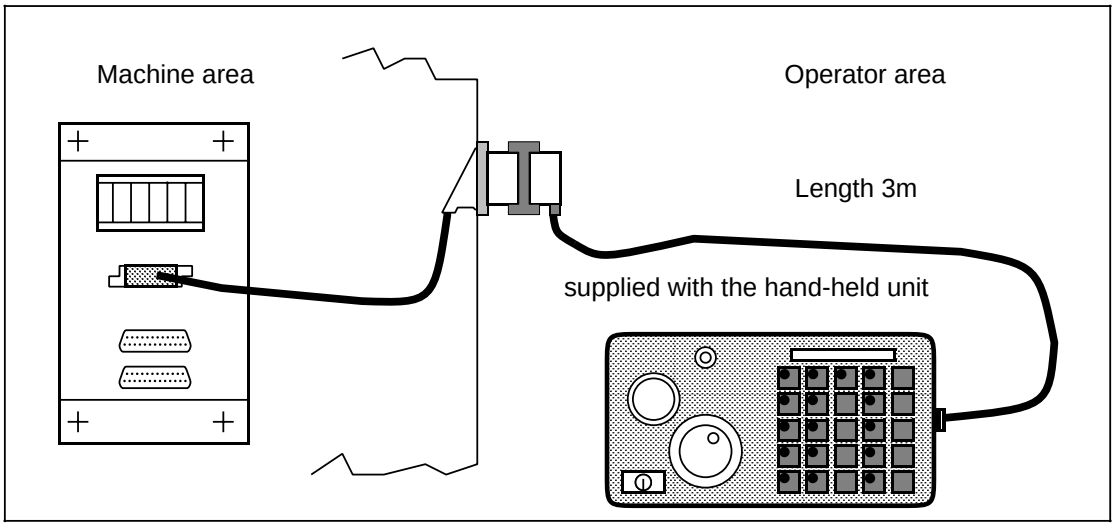
The order of the DMP stations (distributed machine peripherals) and the distributor box for the hand-held unit is irrelevant.

Cables:	DMP station connector cable	6FC9 344-3S
	DMP station intermediate cable	6FC9 344-3Q
	Hand-held unit intermediate connector cable	6FC9 344-4G
	DMP terminating connector	6FX 1145-2BA00

The total maximum cable length of all nodes is 50 m. The hand-held unit can only be connected to the distributor box via an intermediate cable . The machine control panel (hand-held unit without housing) is connected directly to the distributor box.

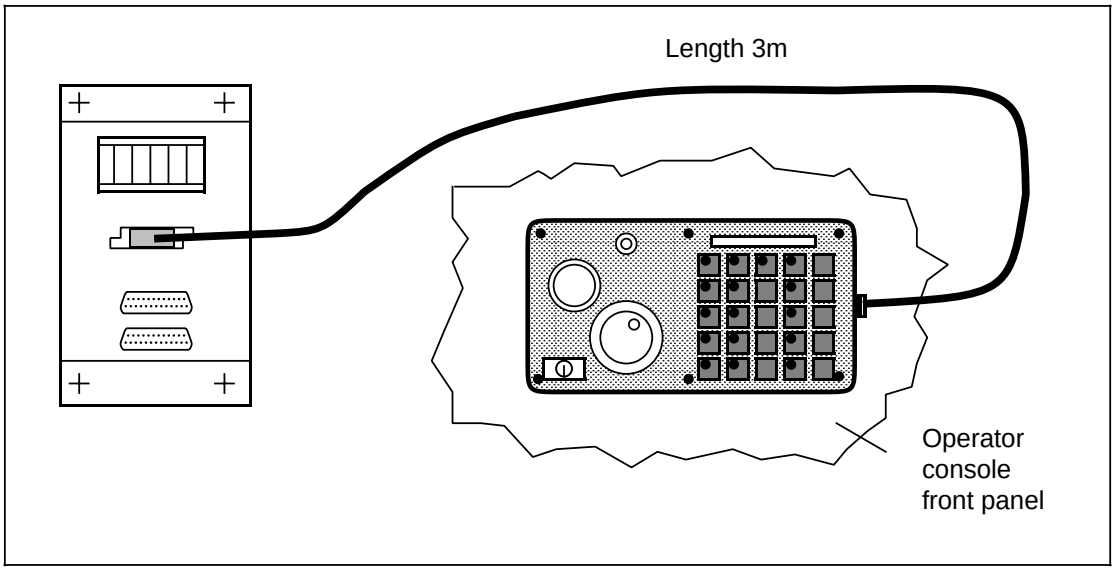
Connection of the hand-held unit to the distributor box

- Hand-held unit with housing (6FC5103-0AD20-0AA0)
  The hand-held unit is connected to the distributor box via a Harting coupling, which the manufacturer mounts on the operator console or equivalent. The Harting coupling is supplied with the hand-held unit and intermediate connector cable.

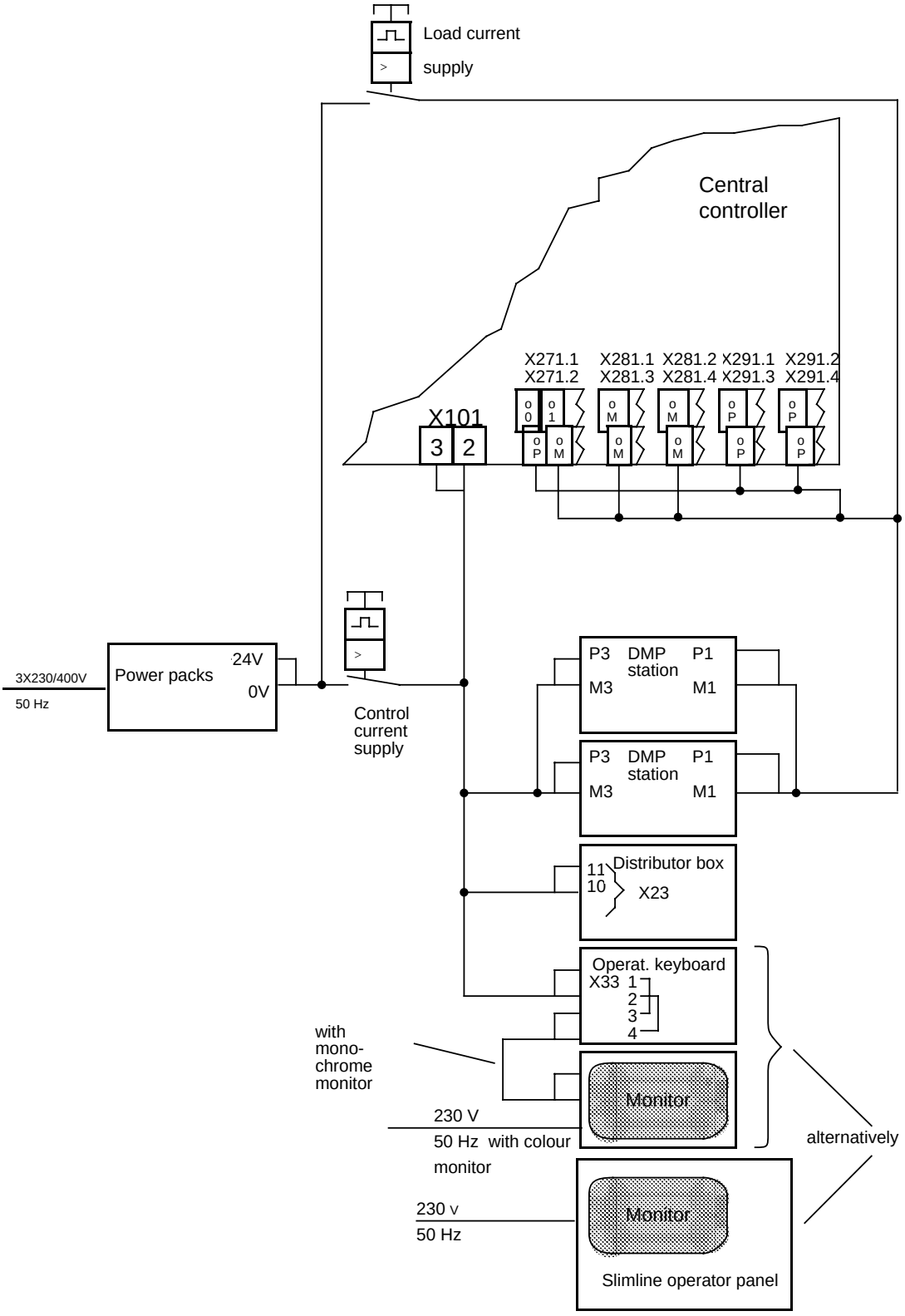


hand-held unit intermediate connector cable 6FC9 344-4G

- Hand-held unit without housing as a machine control panel (6FC5103-0AD21-0AA0).
  If the hand-held unit is used without the housing, e.g. for mounting in a console, it is directly connected to the distributor box via the cable supplied.



1.5 Overview of power supply

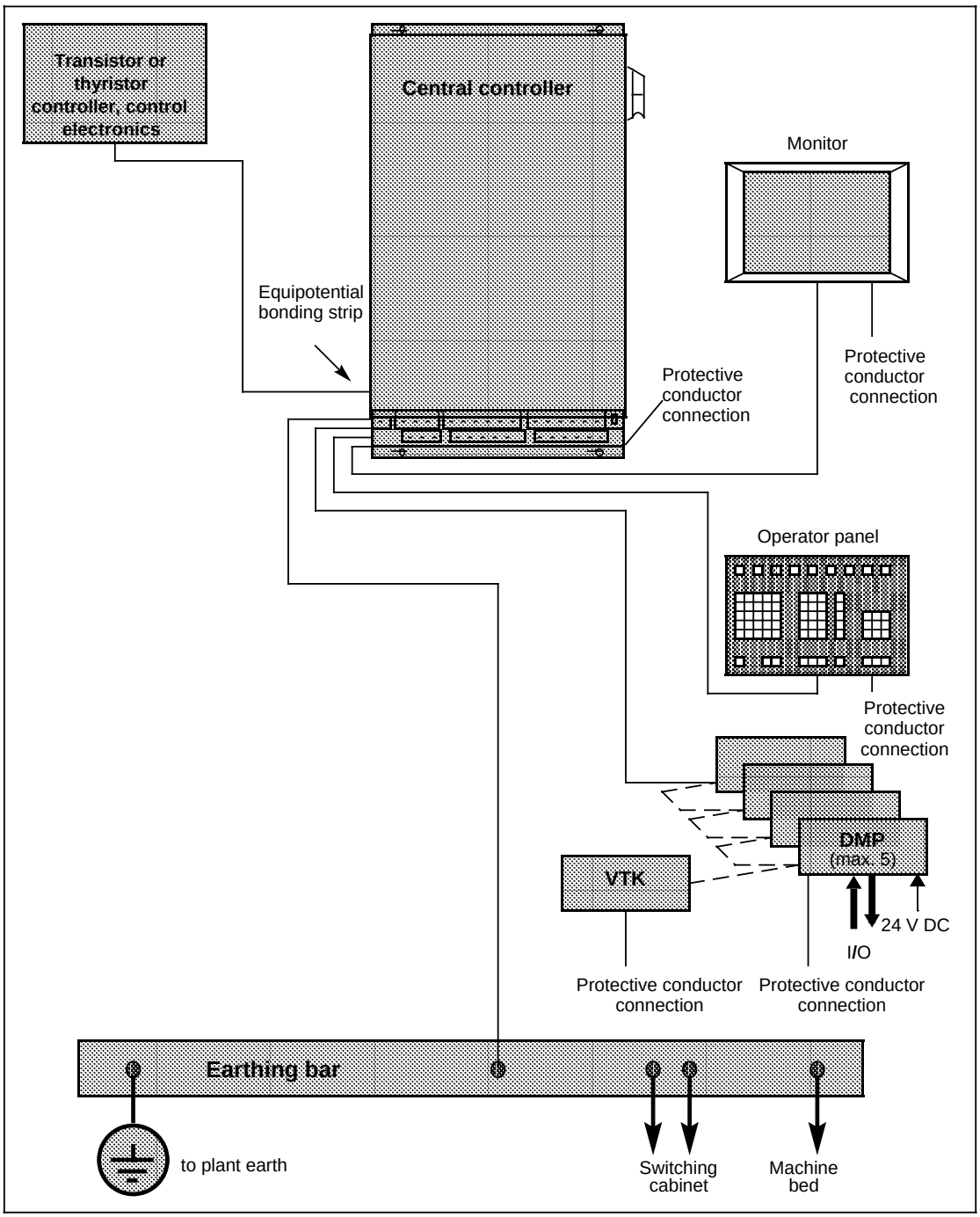


1.6 Overview of earthing

All plant units which are connected by signal cables must also be connected by equipotential bonding conductors (see EMC guidelines documentation, order No. 6FC3 9877DA, to be ordered from Gerätewerk Erlangen).

- The equipotential bonding of all components is implemented as a star with the central controller at the centre.
- The cross-section of all equipotential bonding conductors must be at least 10 mm^2.

Note: If the configuration shown in the diagram cannot be implemented, please seek advice from your local Siemens representative.

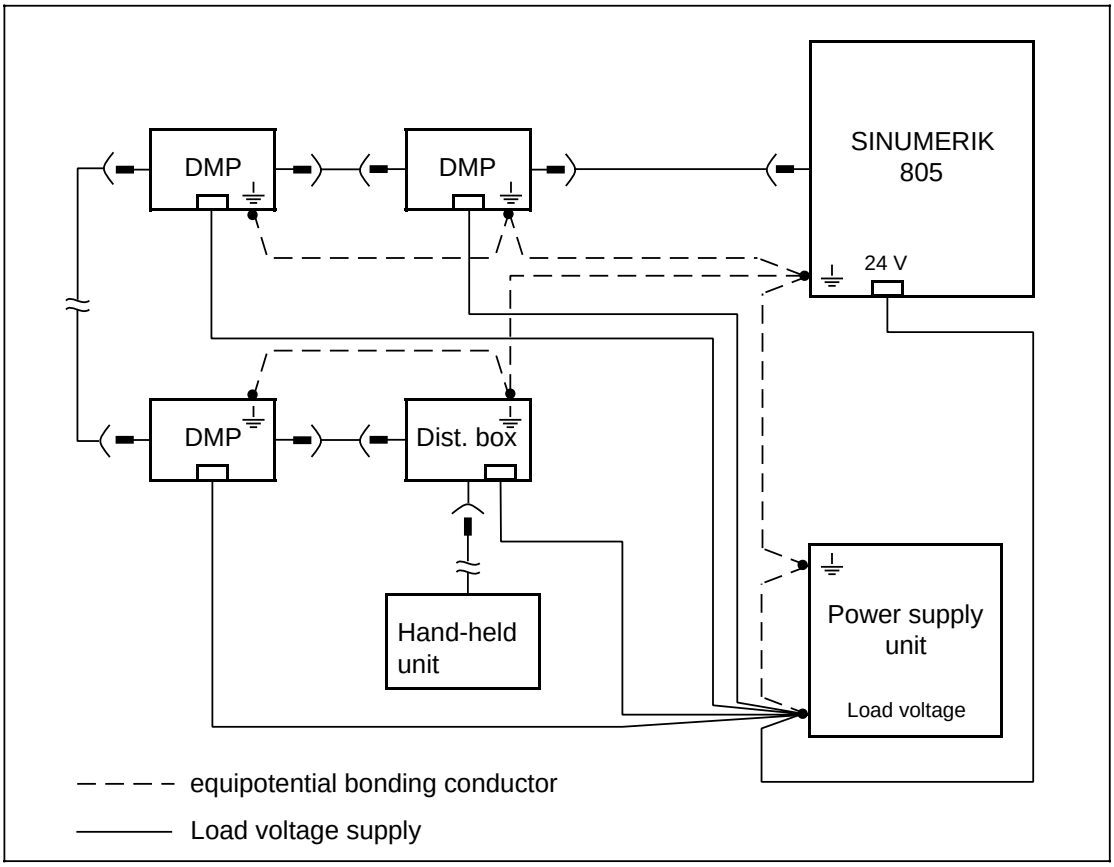


Example of how to configure equipotential bonding conductors

1.6.1 Earthing system for distributed machine peripherals

When configuring an MPC chain comprising DMP stations and the distributor box/hand-held unit, the following points must be noted concerning the equipotential bonding conductors and the 0V-cables:

- The 0V-cable for the load power supply should be at least 2.5 mm^2, preferably 4 mm^2. The load power supply cables should be configured as a star with the power supply unit at the centre. Jumpers between the stations are to be avoided.
- The equipotential bonding conductors should also be configured as a star with the central earthing point at the centre. The equipotential bonding conductor can be laid parallel to the signal lead (DMP cable) provided there is only a small distance between the installed stations (not more than 2m apart). Both the equipotential bonding conductors, i.e. incoming and outgoing to the next station, must be connected to one of the two earthing plates on one side of the rack. The equipotential bonding conductors must have a diameter of at least 6 mm.
- The power supply units used for the load power supply also require an equipotential bonding conductor. The 0V output from the power supply unit must be connected to this equipotential bonding conductor.

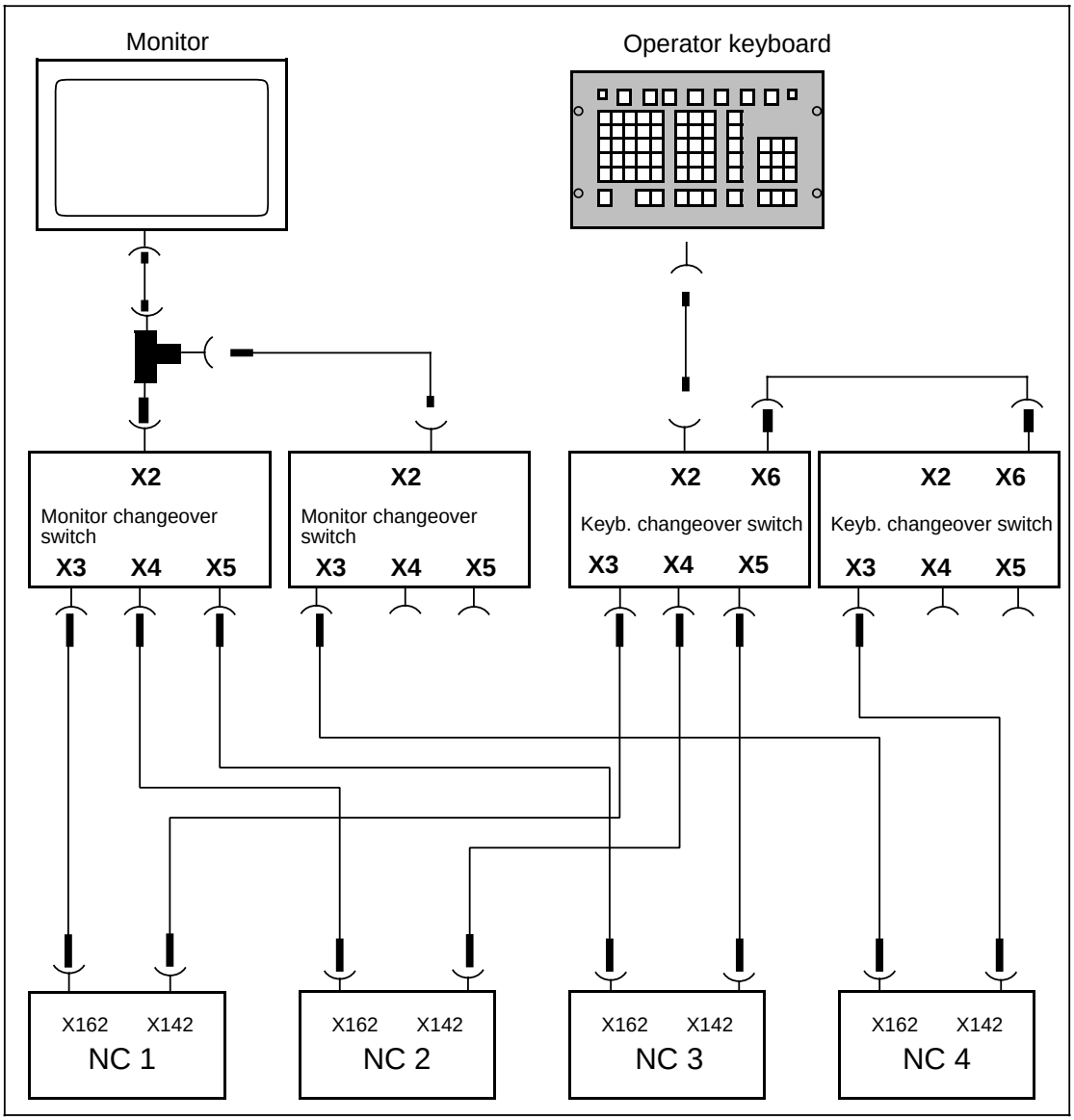


1.7 Connection options of monitor and operator keybord changeover switches

The monitor and operator keyboard changeover switches make it possible to operate several NCs with a single monitor and operator keyboard

The changeover switches can be installed one above the other on the baseplate. Identical changeover switch types can be linked as follows:

Monitor changeover switch:	The monitor signal is received at both changeover switches at X2 via a BNC T connector (75)
Operator keyboard changeover switches:	The changeover switches are connected to each other at X6 via the supplied ribbon cable so that the signals from the operator keyboard are also available at the other keyboard changeover switch.



Note:

The usual monitor and keyboard cables can be used.

2 Connection Conditions

2.1 Technical data

The SINUMERIK 805 control system has been manufactured in accordance with the DIN VDE 0160 requirements regarding the construction of equipment.

2.1.1 Electrical data

2.1.1.1 Overview

Device	Nominal voltage and tolerance	Max. connected load at nominal voltage	Typ. power loss at nominal voltage	Max. starting current
Central controller with power supply unit	24 V DC for binary inputs/outputs	154 VA	85 W	$20 \times I_N$ for 10 ms
	24 V DC for internal power supply unit	75 VA		
Operator keyboard	24 V DC	5 VA	5 W	$20 \times I_N$ for 10 ms
Monochrome monitor	24 V DC	Supply via operator panel (70 VA)	70 W	$20 \times I_N$ for 10 ms
Colour monitor	230 V AC 115 V AC 50/60 Hz	90 VA	80 W	$20 \times I_N$ for 10 ms
B/W LCD flatscreen	24 V DC	2.9 VA	2 W	$20 \times I_N$ for 10 ms
SINUMERIK slimline operator panel 19” subrack design 10” monochrome display	230 V AC	65 VA	45 W	$20 \times I_N$ for 10 ms
Machine control panel for flat operator panel	Supply and electronics section are implemented on the slimline operator panel.			
Hand-held unit	24 V DC	Supply via distributor box	5 W	$20 \times I_N$ for 10 ms
Distributed peripherals DMP submodule 16I/16Q incl. DMP terminal block	24 V DC	387.6 VA (50 % simul-taneity factor)	30.3 W	500 mA
Distributed peripherals DMP submodules 32I incl. DMP terminal block	24 V DC	10.8 VA	12.3 W	500 mA

Electrical data, overview

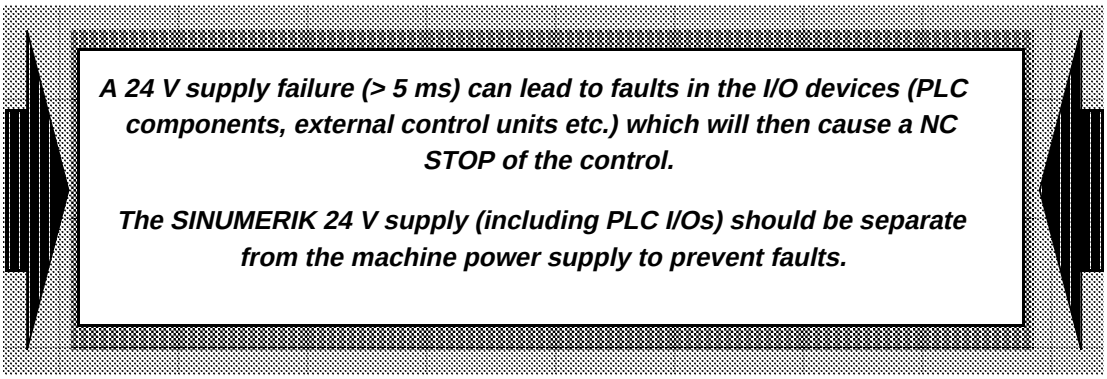
Device	Nominal voltage and tolerance	Max. connected load at nominal voltage	Typ. power loss at nominal voltage	Max. starting current
Distributed peripherals DMP compact terminal block	24 V DC			
Distributed peripherals 8 Q DMP compact module	24 V DC		2.5 W	
Distributed peripherals 16 Q DMP compact module	24 V DC		2.65 W per input 2.5 W per module	
Distributed peripherals 16 I DMP compact module	24 V DC	2.5 W	1.8 W	
Distributed peripherals DMP IP65 module incl. terminal block	24 V DC	3 W		
Distributor box	24 V DC	5 VA	0 W	$20 \times I_N$ for 10 ms

Elektrische Daten, Übersicht (Fortsetzung)

2.1.1.2 DC supply requirements

The DC supply voltage is always referred to ground and must not be generated by an autotransformer.

- **Nominal voltage** 24 V DC
  - Voltage range including ripple 20 V DC to 33 V DC
  - Voltage ripple at nominal voltage and current peak to peak 3.6 V
  - Ramp-up time at power up 100 ms
- **Harmonic content**
  In accordance with IEC 550, Section 6.5 and DIN VDE 0160, Section 5.3.1.2 10 %
- **Non-periodic overvoltages** 35 V
  - Duration of overvoltage 500 ms
  - Restoration time 50 s
  - Events per hour 10
- **Short voltage dips**
  referred to 24 V DC nominal voltage 14.25 V
  - Duration of voltage interruptions 5 ms
  - Restoration time 10 s
  - Events per hour 10



2.1.1.3 AC supply requirements

- **Nominal voltage** 230 V AC single-phase
  - Tolerance - 20%, +10% (184 V to 253 V)
  - Frequency 50/60 Hz ± 5 Hz
  - Ramp-up time at power up 100 ms
- **Harmonic content**
  In accordance with IEC 550, Section 6.5 and
  DIN VDE 0160, Section 5.3.1.2 10 %
- **Non-periodic overvoltages**
  In accordance with DIN VDE 0160 available soon
- **Short voltage dips**
  In accordance with IEC 550, Section 6.5 and
  DIN VDE 0160, Section 5.3.1.1
  - Voltage interruption at nominal voltage and current 10 ms
  - Restoration time 10 s
  - Events per hour 10

2.1.2 Mechanical data

2.1.2.1 Overview

Device	Dimensions Width Height Depth	Weight	Degree of protection in accordance with DIN 40050	Shock protection, safety class in accordance with DIN VDE 0160
Central controller with power supply unit	268 mm 510 mm 101 mm	5 kg	IP 20	I
Operator keyboard	340 mm 211 mm 60 mm	2.4 kg	Front IP 54 Rear IP 20	I

Mechanical data, overview

Device	Dimensions Width Height Depth	Weight	Degree of protection in accordance with DIN 40050	Shock protection, safety class in accordance with DIN VDE 0160
Monochrome monitor	340 mm 242 mm 310 mm	8.2 kg	Front IP 54 Rear IP 20	I
Colour monitor	340 mm 262 mm 382 mm	11.5 kg	Front IP 54 Rear IP 20	I
B/W LCD flatscreen	340 mm 262 mm 65 mm	2.45 kg	Front IP 64 Rear IP 20	I
SINUMERIK slimline operator panel 19” sub-rack design 10” monochrome display	482.6 mm 310,3 mm 77 mm	4.5 kg	Front IP 54 Rear IP 20	I
Machine control panel for slimline operator panel	482.6 mm 155 mm 53 mm	0.8 kg	Front IP 54 Rear IP 20	I
Hand-held unit	255 mm 188 mm 82 mm	1.5 kg	IP 54	II
Distributed peripherals DMP station 16I/16Q	257 mm 90 mm 162 mm	1.31 kg	IP 20	I
Distributed peripherals DMP station 32I	257 mm 90 mm 162 mm	1.05 kg	IP 20	I
Distributed peripherals DMP compact station			IP 20	
Distributed peripherals DMP IP65 station	172 mm 230 mm 70 mm	1.8 kg	IP 65	
Distributor box	105 mm 175 mm 32 mm	0.25 kg	IP 20	I

Mechanical data, overview (continued)

2.1.2.2 Vibration resistance

- **Vibratory load** (Section 2.2.7)
  - In operation — Severity 12 according to SN 29010, Part 1 *) for all components
  - When transported in original packaging — Severity 22 according to SN 29010, Part 2 *) for all components

- **Shock load**

  Test group I, test Ea according to DIN 40046, Part 7
  - Acceleration — 15 g (1 g = 9.81 m/s^2)
  - Duration of nominal shock — 11 ms

- **Free fall**

	Unpacked	In original packaging
– Central controller	50 mm	500 mm
– Operator keyboard	100 mm	1000 mm
– Monitor	50 mm	500 mm

2.1.3 Climatic environmental conditions

General requirements

- The packaging must be selected to suit the climatic conditions likely to be encountered on the shipping route and at the destination.
  - Register of destinations according to SN 69154 *)
  - Climatic overview map with sea routes according to SN 29080 *)
  - Climatic conditions before start-up according to SN 29081 *).

- If the specified limiting values cannot be maintained, a heat exchanger or an air conditioning unit must be provided.

2.1.3.1 Installation and operation

- **Temperature range**
  - Lower limit temperature — 0 °C
  - Upper limit temperature — +45 °C /+55 °C

*) SN = **S**iemens-**N**orm (**S**iemens **S**tandard) (see Section 2.2.7)

- **Dew point temperature t_d and relative air humidity U**
  - Annual average — U = 75 %, t_d = 17 °C
  - on 30 days (24 hours) per year — U = 95 %, t_d = 24 °C

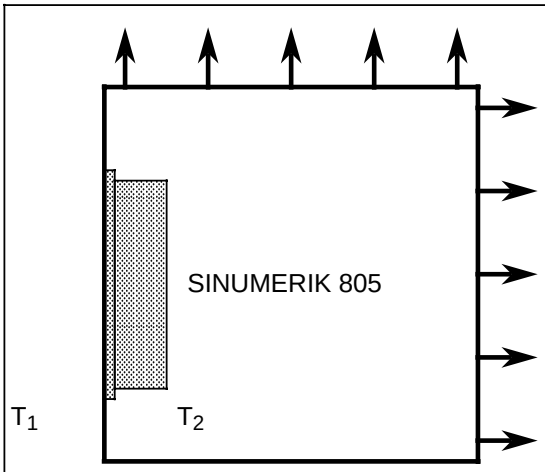
    These days should be distributed naturally over the year.
  - On the remaining days (< 24 hours) observing the annual average — U = 85 %, t_d = 20 °C
- **Condensation** — not allowed
- **Temperature variation**
  - Within one hour — 10 K
  - Within three minutes — 1 K
- **Atmosphere pressure** — 860 mbar to 1080 mbar (86 kPa to108 kPa)

The values specified apply to operation at an altitude of 1500 m above sea level.
For altitudes greater than 1500 m above sea level, the upper limit temperature must be reduced by 3.5 °/ 500 m.

Heat removal

The climatic data, degree of protection and power loss for the SINUMERIK 805 control system are given under ”Technical data”.
The front and underside surfaces have not been included in the calculation of the convection surface.

1) Heat removal by natural convection



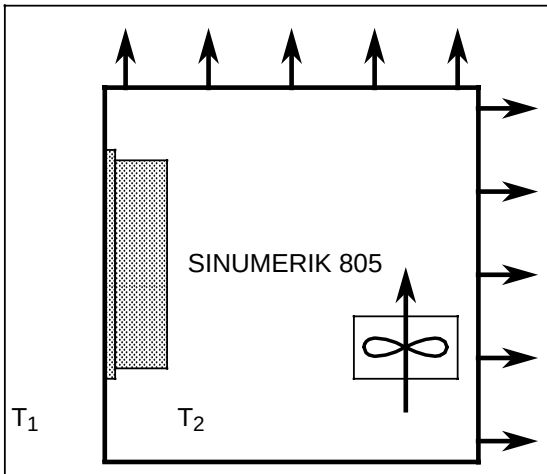
The necessary free convection surface of the surrounding space (steel or aluminium sheet, 1.5 mm thick) is determined, referred to a temperature difference $T_2 - T_1$ 10 K, approximately from:

$$A\ [m^2] = \frac{P_v\ [W]}{5\ T\ [K]}$$

Example: T_1 = 45 °C, T_2 = 55 °C
P_v = 80 W

A = 1.6 m^2

2) Heat removal by natural convection and internal air turbulance



The necessary free convection surface of the surrounding space (steel or aluminium sheet 1.5 mm thick) is determined referred to a temperature difference $T_2 - T_1$ 10 K, approximately from:

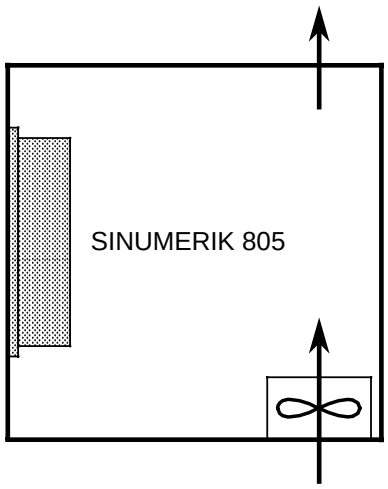
$$A\ [m^2] = \frac{P_v\ [W]}{10\ T\ [K]}$$

Fan volume flow: 100 to 165 m^3/h

Example: T1 = 45 °C, T2 = 55 °C
P_v = 80 W

A = 0.8 m^2

3) Heat removal by open-circuit ventilation



The air flow for removing lost heat is calculated from:

$$V\ [m^3/h] = \frac{3.5\ P_v\ [W]}{T\ [K]}$$

Example: Inlet air temp. 45 °C,
T=10 K,
P_v = 80 W

V = 28 m^3/h

Note: Air filters must be provided to maintain the permissible environmental conditions (see Section 2.3.4).

2.1.3.2 Transportation and storage

- **Temperature range**
  - – Lower limit temperature – 40 °C
  - – Upper limit temperature +70 °C
- **Dew point temperature t_d and relative air humidity U**
  - – Annual average U = 75 %
t_d = 17 °C
  - – On 30 days (24 hours) per year U = 95 %
t_d = 24 °C

    These days should be distributed naturally over the year.
  - – On the remaining days (< 24 hours) observing the annual average U = 85 %
t_d = 20 °C
- **Condensation** Rare, briefly, light

  Rare, brief and light condensation covers such cases for which the following conditions also apply
  - – Max. duration of a single condensation event 3 hours
  - – Frequency of condensations: Annual average 3
Maximum 10
  - – Shortest sequence of condensation cycles 1 day
- **Temperature variation**
  - – Within 1 hour 10 K
- **Atmosphere pressure** 660 mbar to 1080 mbar
(66 kPa to 108 kPa)

The values specified apply to a transportation altitude of up to 3500 m above mean sea level.

2.1.4 Exposure to contaminants

CAUTION

If the conditions given below cannot be maintained, proper functioning of the control cannot be guaranteed.

Applicable standards: DIN 40046, Part 36 and 37
DIN 40050

2.1.4.1 Gases

- **Sulphor dioxide** (SO_2)

  Test conditions:

Severity	1 cm^3/m^3, ± 0.3 cm^3/m^3
Temperature	25 °C, ± 2 °C
Relative air humidity	75 %, ± 5 %

- **Hydrogen sulphide** (H_2S)

  Test conditions:

Severity	1 cm^3/m^3, ± 0.3 cm^3/m^3
Temperature	25 °C, ± 2 °C
Relative air humidity	75 %, ± 5 %

2.1.4.2 Dust

When working in areas where there is an unacceptably high dust burden, the control must be operated in a cabinet with heat exchange or sufficient inlet air.

In addition, an air filter must be used when performing service work with the cabinet door open.

2.1.4.3 Clearance and creepage distances

It is the responsibility of the manufacturer to ensure that contamination degree 2 regarding clearance and creepage distances is maintained.

2.1.5 Electromagnetic compatibility

2.1.5.1 Interference suppression

The plant operator is responsible for interference suppression of the entire installation (control, drives, machine ...)

The SINUMERIK 805 control system complies with limiting values class A (DIN VDE 0871, Parts 1 and 2) at the mains power supply (24 V DC).

2.1.5.2 Immunity to noise

Relevant standards	IEC 801-2, 3 and 4

- **Immunity to noise carried in cables**

  Test in accordance with IEC 801-4

  – Power supply cables:

Test voltage	3 kV
Test duration	10 s

  – Signal cables:

Test voltage	2.5 kV
Test duration	10 s

- **Immunity to static discharging**

Test in accordance with IEC 801-2	
Test voltage	12 kV
Test duration	10 discharges at 1 discharge/s

- **Immunity to high frequency radiation**

Test in accordance to IEC 801-3	
Test field strength	10 V/m
Test duration	11 min/frequency decade

2.1.5.3 Protection against X-rays

- In many countries there are regulations concerning the use of equipment emitting X-rays (RÖV §5).
  Approval must generally be obtained.
- In the case of the SINUMERIK 805 control system, routine tests assure that such regulations are complied with. The X-rays generated by the SINUMERIK 805 control system are shielded adequately.

Acceleration voltage (typical)	12.5 kV
RÖV approval number	not required

2.1.6 Other data

2.1.6.1 Mean time between failures (MTBF)

- 0.2 failures/year
- The defined failure rate applies only:
  – For reproducible hardware faults and component failures whose causes are within our responsibility.
  – For controls supplied from the series production line.
  – Referred to the total number of controls delivered.
  – In 24-hours operation.

2.1.6.2 Colours

Application	Basic colour anthracite	
	colour	colour number*)
Housing, front panels for operator keyboards	anthracite	-614
Basic key colour	ergo grey	-611
Background colour for keys/key groups	medium grey	---
Keys for special functions ”Stop”	red	RAL 3018
Keys for special functions ”Start”	green	-506
Key for special function	yellow	RAL 1018
Symbols, lettering, outlines	black	RAL 9005
Surface underneath EMERGENCY STOP key	yellow	RAL 1021
EMERGENCY STOP key operating surface	red	RAL 3000
Siemens logo, label, if any	petrol	-615

Colours

2.1.6.3 Data save, backup times

For storage media requiring a backup power supply (volatile semi conductor memories), a stored energy time of 1 year is guaranteed.

The time commences on the day of delivery from the factory (date on factory delivery note).

Battery submodule

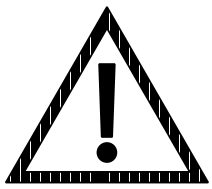
The battery submodule is located in the central processor at the top right. It contains 3 batteries connected in series. The battery voltage is cyclically monitored when the control is switched on. If the voltage falls below 2.9V, NC alarm 1 (battery fault) is displayed on the screen.

Battery type: 3×1.5 V round cell, (LR6, usual commercial)

Backup time: approx. 1 year

Note:

Change the battery only when the control is switched on.



CAUTION

Batteries must always be disposed of as special waste!

*) *Complete colour designation:*
for synthetics SN 30901 - SN 47030 Part 2 - xxx
for paints SN 30901 - SN 30920 - xxx
colour number
SN = Siemens-Norm (Siemens Standard)

2.1.7 Standards

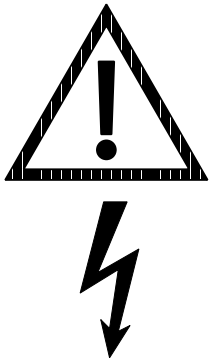
In addition to the relevant international and national standards, the Siemens standards (SN) listed in the table below have been observed in the design of the SINUMERIK 880 control system.

<table>
<tr><th>Siemens standard</th><th>Text</th><th>Part</th></tr>
<tr><td>SN 26555</td><td>Electrical interfaces
The definitions contained in this standard for DC voltage and current signal interfaces should be used with preference for applications of energy, process and drive technology as well as research and development in local information processing, metrology and control technology. The purpose of these interfaces is to unify function units, and to improve combinability and interworking of the function units.</td><td>1, 2, 3</td></tr>
<tr><td>SN 26556</td><td>Application classed for constructional units in electrical engineering
Air temperature, humidity, pressure
This standard contains application classes for constructional units in electrical engineering, e.g. in metrology and control technology. By considering the conditions to be expected in operation, during transportation and storage, constructional units can be selected in accordance with uniform considerations. An application class within the framework of this standard is formed by the values of the upper and lower limit temperature of the medium directly surrounding the constructional unit and humidity and air pressure which is created in this area.</td><td></td></tr>
<tr><td>SN 29010</td><td>Mechanical testing loads for electrical engineering
This standard covers severities of test loading for installations, equipment and constructional units in electrical engineering. With these severities, the resistance of the installations, equipment and constructional units against mechanical vibration can be determined.
<table>
<tr><th rowspan="2">Severity</th><th rowspan="2">Frequency range (Hz)</th><th colspan="2">Constant amplitude of</th></tr>
<tr><th>Deflection (mm)</th><th>Acceleration (m/s²)</th></tr>
<tr><td rowspan="2">12</td><td>10 to 58</td><td>0.075</td><td>—</td></tr>
<tr><td>58 to 500</td><td>—</td><td>9.8</td></tr>
<tr><td rowspan="2">22</td><td>5 to 8</td><td>3.5</td><td>—</td></tr>
<tr><td>8 to 500</td><td>—</td><td>9.8</td></tr>
</table></td><td>1, 2</td></tr>
<tr><td>SN 29080</td><td>Climatic resistance of electrical equipment
This standard includes a climatic overview map with sea routes.</td><td></td></tr>
<tr><td>SN 29081</td><td>Packaging recommendations for electrical equipment
Permissible climatic exposure before start-up
In this standard, the limits of climatic exposure are given that are permissible for electrical equipment during transportation and storage before start-up.</td><td></td></tr>
</table>

Siemens standard	Text	Part
SN 29500	Failure rates of construction elements Part 1: General The most frequently used quantity required for reliability calculations of modules and units is the failure rate. This standard contains explanations and should be used in conjunction with one of the following parts Part 2: Empirical values for integrated circuits. Part 3: Empirical values for discrete semiconductors. Part 4: Empirical values of passive components Part 5: Empirical values for electrical connection points. Part 6: Empirical values for printed circuit connectors. Part 7: Empirical values for relays Part 8: Empirical values for integrated circuit holders. Part 9: Empirical values for switches Part 10: Empirical values for pilot and signal lamps Part 11: Empirical values for contactors.	1 to 11
SN 30901	**Colour selection for products** Siemens colours and surfaces This standard serves to unify the colours of Siemens products and applies to surfaces affecting the outward appearance of the product. It covers plastic materials, paints and similar coatings.	
SN 30920	**Surface treatment** Paint finishes and similar coatings This standard governs the uniform designation of paint finishes and similar coatings within Siemens AG, without defining specific production processes. By applying this standard, it is possible to process surface designations on computers as Siemens item numbers.	
SN 47030	**Moulded materials, thermo-plastic moulding compounds** Specifications in documents, material selection This standard contains material specifications and details on the constitution of moulded-plastic components to be entered in production documents and also recommendations on material selection.	1
SN 47030	**Moulded materials, thermo-plastic moulding compounds** Colours This standard contains colour specifications for the moulding compounds mentioned in SN 47030 Part 1.	2
SN 69154	**Packaging recommendations for electrical equipment** Register of destinations This standard provides information relating to transportation to the listed destinations and the local conditions. This is a help for anyone involved with packaging to select the right packaging for the particular conditions.	

2.2 Safety when working with the control

Protection against direct contact in operational state is provided by the control being suitable for installation in closed electrical operating areas (DIN VDE 0160, Section 5.5, Section 6.5).



WARNING

Safe operation requires the control to be properly installed and put into operation by qualified personnel observing the warnings in this Instruction Manual.

In particular, both the general regulations for installation and the general safety regulations for performing jobs on power systems and equipment (e.g. DIN VDE) and the regulations concerning the appropriate use of lifting tackles and tools as well as the use of personal guards (safety goggles etc.) shall be observed.

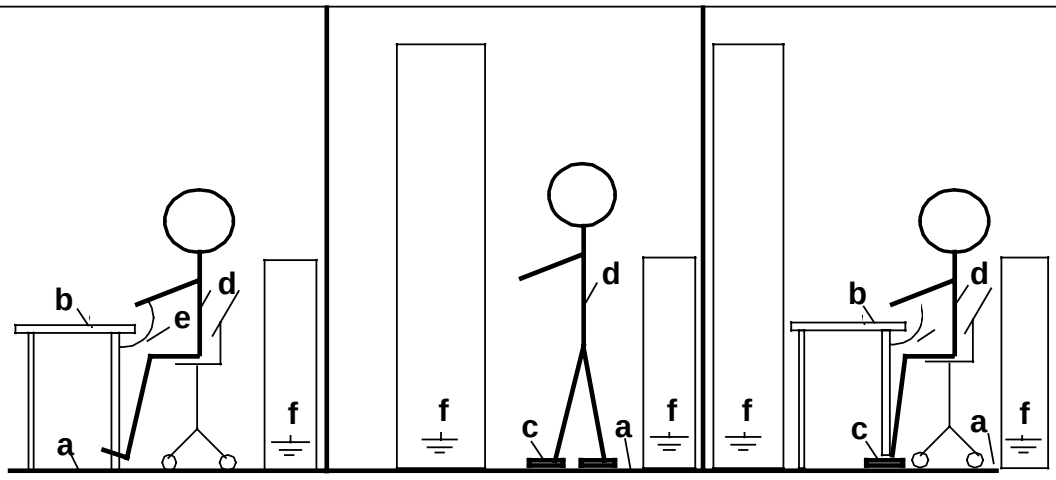
Non-observance may result in death, serious physical injury or considerable material damage.

National regulations for installation in the country of destination must be observed.

2.2.1 Electrostatically endangered components (EECs)

- As a general rule, electronic modules should only be touched in order to carry out essential work.
- The person's body must be discharged before touching electronic modules. The simplest way to achieve this is by touching a conductive, earthed object (e. g. bare metal on switching cabinet, socket outlet with earthing contact) immediately before handling the relevant module.
- Modules must not be brought into contact with highly insulating materials - such as plastic sheeting, insulating tabletops, items of clothing made of synthetic fibre.
- Modules must only be put down on conductive surfaces.
- Modules must always be off-load before being plugged in or removed.
- Signal voltages must be present only with the supply voltage switched on.
- The tip of the soldering iron must be earthed when carrying out soldering work on modules.

- Modules and components must always be stored and dispatched in conductive packaging (e. g. metallised plastic packages, metal boxes).
- If non-conductive packaging is used, modules must be enclosed in conductive material before packaging, e. g. using conductive foam rubber or domestic aluminium foil.
- The required EEC protective measures are illustrated in the drawing.



Seated Standing Standing/Seated

a= Conductive floor
b= Electrostatic-protected table
c= Electrostatic-protected shoes
d= Protective coat made from 100% cotton
e= Electrostatic-protected chain
f= Cabinet earthing connections

2.2.2 Interference suppression measures

Besides safety earthing of the system components in accordance with VDE regulations, additional special measures have to be taken to ensure safe, uninterrupted system operation. These include the use of screened signal cables and special equipotential bonding and earthing connections.

Screened signal cables

Screened signal cables must be used as shown in the individual diagrams to ensure safe, uninterrupted system operation. Only the connector types specified are approved for use as cable connectors. Siemens special connectors fully and systematically connect the cable screen to the component housing and thus to earth.

With digital signal transmission, the screen must always be connected to the housings at both ends.

Exceptions: a) If SINUMERIK/SIROTEC devices of other makes (printers, programmers etc.) are connected, standard screened cables connected at one end only can also be used. These devices must not, however, be connected to the control in normal operation. If operation with devices of other make is required, screens must be connected at both ends. In addition, these devices must be connected to the SINUMERIK/SIROTEC control via an equipotential bonding conductor.

b) With external ground potential differences between the components to be connected (e.g. between actual value encoder and measuring circuit module) it may be necessary in some cases to connect the shield to the housing potential on one end only (receiver end). In this case, to improve the screen effect, a capacitive connection can be established between the open shield end (transmitter side) and the housing potential.

Installation of signal and load cables

Definition:

- **Signal cables** (e.g.)
  - Command and actual value cable
  - Data cables (RS-232, RS-422,connections, sensor cables, . . .)
  - All NC power unit signalling and control cables
  - Binary inputs and outputs
  - EMREGENCY STOP cables
- **Load cables** (e.g.)
  - Low voltage supply cables (+24 V DC, . . .)
  - Power supply cables (110 V AC, 230 V AC, . . .) for NC, PLC, expansion units, drives, . . .
  - Leads to contactors (primary circuit and secondary circuit)

The following EMC measures must be observed to ensure optimum immunity to noise of the complete system (control and machine):

- The space between the signal and load cables should be as large as possible.
- If necessary, signal and load cables can cross over but they should never run close together in parallel.
- Signal cables from and to the NC or PLC should only be made up of cables offered by the NC or PLC manufacturer.
- Signal cables must never be installed in the vicinity of external magnetic fields (e.g. motors and transformers).
- High current/high voltage cables carrying pulses must always be laid completely separate from all other cables.
- If it is not possible to maintain an adequate distance between cables, signal cables must be shielded by laying them in cable ducts (metal).
- The distance between the following cables must be as small as possible:
  - signal cable and signal cable
  - signal cable and accompanying equipotential bonding conductor
  - equipotential bonding conductor and protected conductor incorporated in the cable.

Please refer to "EMC Guidelines for SINUMERIK and SIROTEC Controls" for additional advice regarding interference suppression measures and the connection of shielded cables.

Order No.: 6FC3987-7DA

Order from: Gerätewerk Erlangen

2.2.3 Cables and connectors

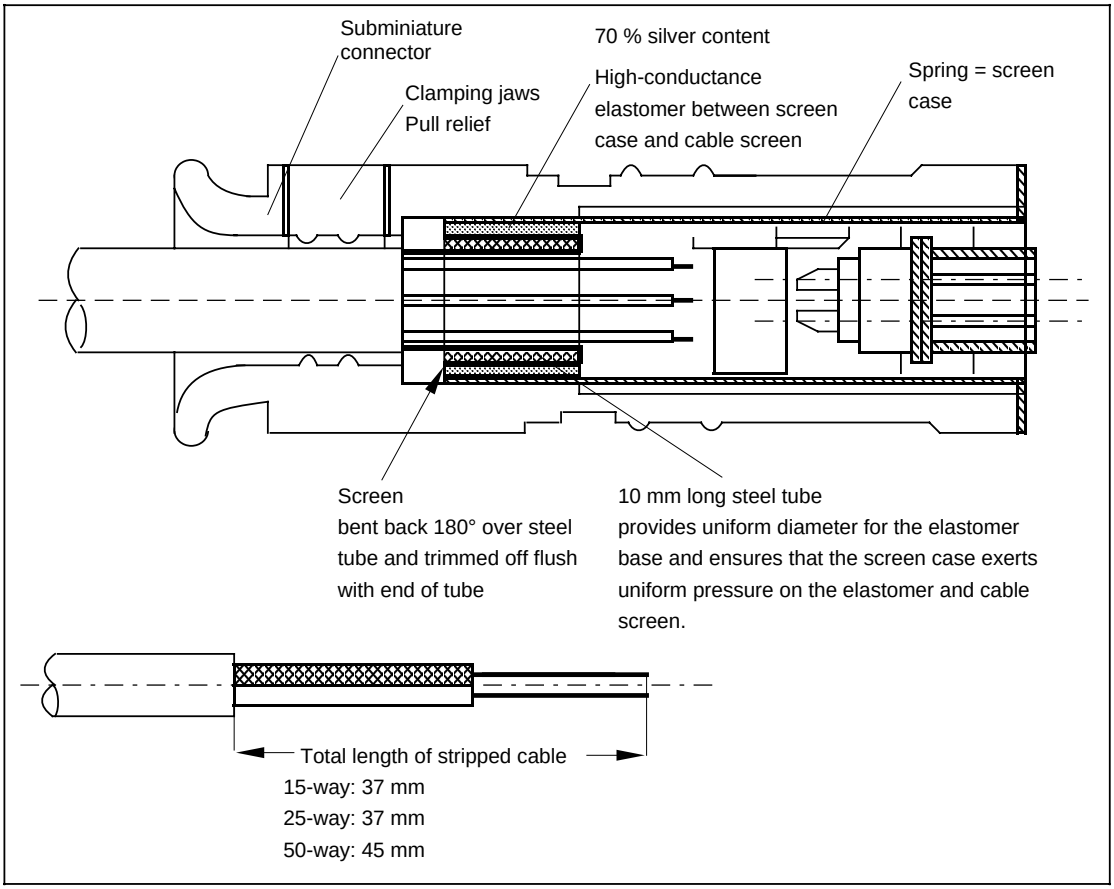
The individual components must be connected using only the cable types prescribed in the cables and devices overview.

The cables and devices overview states the maximum permissible cable lengths. The cable screen must be connected to the subminiature connector as shown in the assembly drawing.

Protect the cables against mechanical damage by using cable ducts or sheet metal covers, for example. Penetration by oil, coolant or chips must be avoided. Do not run low-voltage cables parallel to power cables. Cables not connected to the control must not be run through the central controller.

Screw all connectors securely to the front plates of the modules.

Assembly drawing: cable/subminiature connector, dimension drawing



Connector features

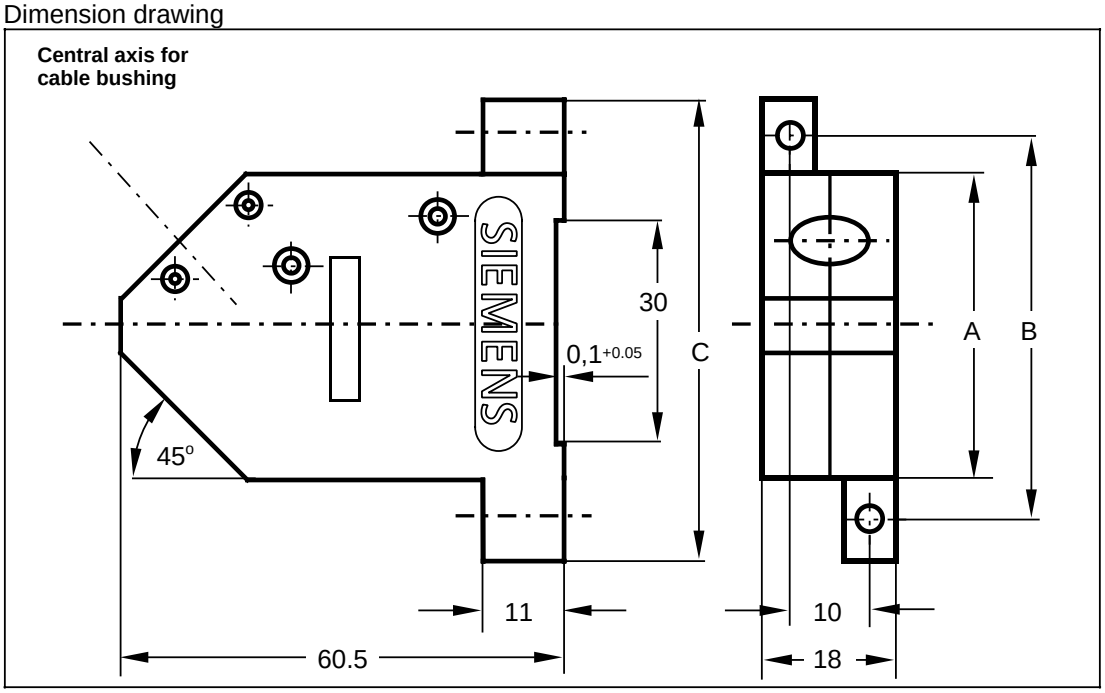
- Uniform international standard connector as 15, 25 and 50-way version with special SINUMERIK housing.
- Securing of the connector by means of captive screws on the front panels of the printed circuit boards.
- Cable strain relief in the connector.
- Plug-in coding for unmistakable connection of the cable connector.
- Perfect connection to frame between cable outside screen and in electronics of the SINUMERIK by means of springs fitted in the connector.

Installation rules

On the NC side, this SIEMENS subminiature connector must be used because no commercially available connector housing has these features. If the customer makes his own cable, the installation rules must definitely be followed, otherwise proper functioning cannot be guaranteed.

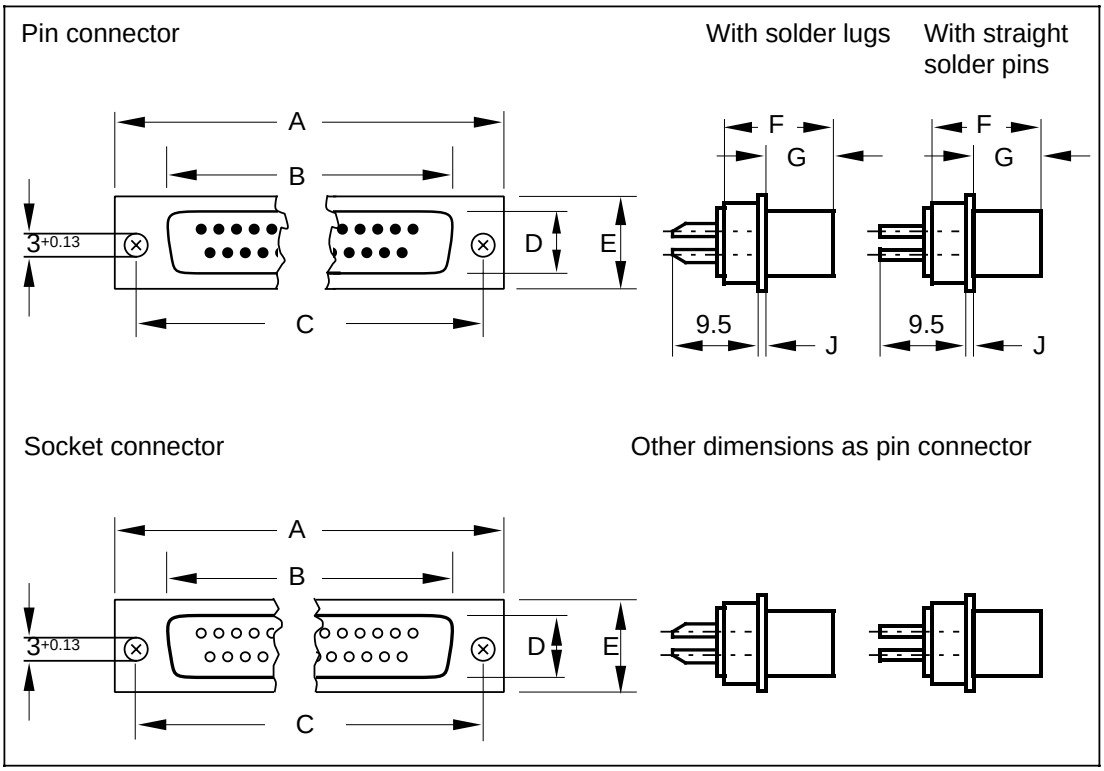
Subminiature connector with SINUMERIK housing

Dimension drawing



Subminiature connector	Dim. A	Dim. B	Dim. C	Order No.: (complete with housing)
15-way female	43	53	63	6FC9 341 - 1EC
25-way female	57	67	77	6FC9 341 - 1ED
50-way female	71	81	91	6FC9 341 - 1EE
15-way male	43	53	63	6FC9 341 - 1EU
25-way male	57	67	77	6FC9 341 - 2AB
50-way male	71	81	91	6FC9 341 - 1EH

Installation data

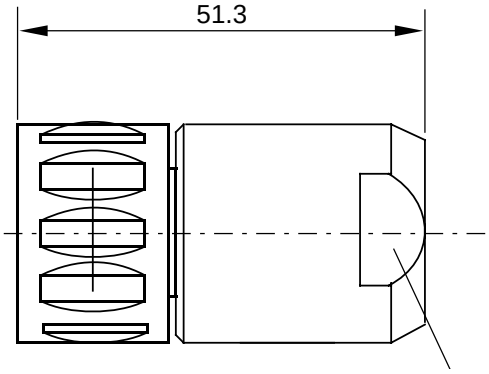


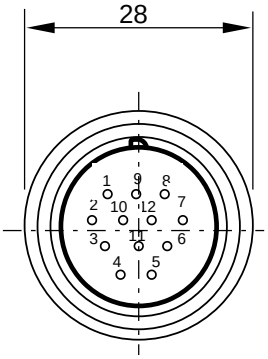
Number of pins	Con-nector	A in mm	B 1) in mm	C in mm	D 1) in mm	E in mm	F in mm	G in mm	J in mm
15	Pin	39.1	25.2	33.3	8.4	12.5	10.8	5.9	1.0
15	Socket	39.1	24.6	33.3	7.8	12.5	10.8	6.2	0.9
25	Pin	53.0	38.9	47.0	8.4	12.5	10.8	5.9	1.0
25	Socket	53.0	38.3	47.0	7.8	12.5	10.8	6.2	0.9
50 2)	Pin	66.9	52.8	61.1	11.1	15.4	10.8	5.9	1.0
50 2)	Socket	66.9	52.4	61.1	10.7	15.4	10.8	6.2	0.9

1) Dimensions are inside for pin connector and outside for socket connector

2) Three rows of pins/sockets

Siemens connector for rotary encoder

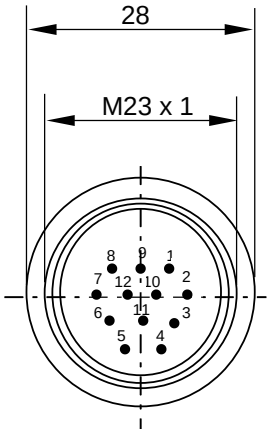




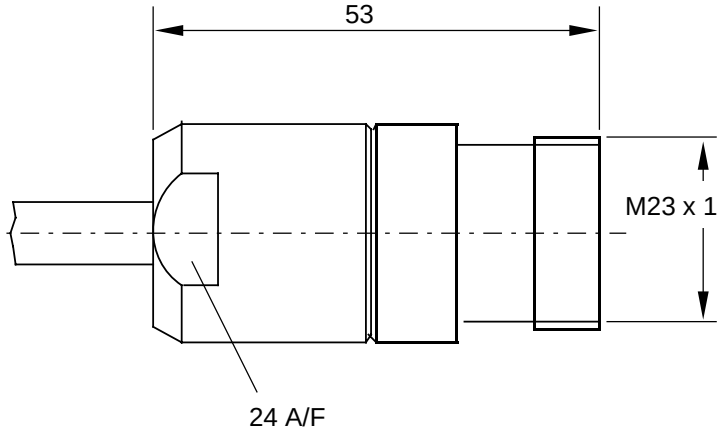
Pin diagram
Connection side

Male connector

Cable	Order No.	
10 mm	6FC9 341	- 1 FD
8 mm		- 1 FR
6 mm		- 1 FT



Pin diagram
Connection side



Female connector

Cable	Order No.	
10 mm	6FC9 341	- 1 FC
8 mm		- 1 FQ
6 mm		- 1 FS

2.3 Description of module labels

The following adhesive labels can be attached to the modules:

- **Type plate** (on bus connectors)
  Colour: white

SIEMENS Made in Germany Fert.-Nr. 222	Erzeugnisstand	A	B	C	D	E	F	G	H	
	570 320.9001.	00	01	02	03	04	05	06	07	

or

SIEMENS Made in Germany 730 695	Erzeugnisstand	A	B	C	D	E	F	G	H	
	570 320.9001.01	J	K	L	M	N	P	Q	R	

Example: Module number: 570 320.9001.01 (last cross)
Product release: E (last cross)
Production number: 222
} **Always required with technical enquiries!**

- **Order number label** (**with order number on front plate**)
  Colour: brown

6FX1126-0BB00 or **6FX1126 0BB00**

Always required with technical enquiries!

Module type; on memory submodules containing EPROMs that have been fitted and programmed in the factory, this also gives information on the software used.

- **Product release label** (on front plate)
  Colour: bright beige

C

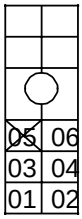
- **Test mark**
  Colour: blue/red

Kapuh A 39012 or SIEMENS/TESTED A/8801 530700

- **Inpection mark**
  Colour: white

QSV 17

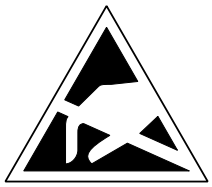
- **Software version** (on memory submodule front plate)
  Colour: white



Example: Software version 05

- **RAM label** (on RAM memory submodule front plate)
  Colour: white

- **EEC symbol**
  Colour: black/yellow



	CAUTION
	The module includes **e**lectrostatically **e**ndangered **c**omponents (EEC). Observe the protective measures specified in Section 2.2.

- **Temperature monitoring**
  Colour: yellow/white

3 Cable and Device Lists

3.1 Accessories, devices

The order numbers are correct as of 05.93.

Devices	Option	Retrofit Order No.
Central controller with integrated power supply unit		**6FC4 100-1AA00**
Measuring circuit module without EXE		**6FC4 600-0AK01**
Measuring circuit module with 5-fold EXE		**6FC4 600-0AK11**
Measuring circuit module with 10-fold EXE		**6FC4 600-0AK21**
Setpoint output submodule (SW 4.2 and higher)	**E33**	**6FC4 600-0AE33**
Operator keyboard	**S01**	**6FC4 600-1AS01**
Operator keyboard with 1 expansion module	**S01+J70**	
Operator keyboard with 2 expansion modules	**S01+J70 +J70**	
Expansion module 16I/16Q	**J70**	**6FC4 600-0AJ70**
Monochrome monitor	**R04**	**6FC4 600-1AR04**
Colour monitor (SW 4.1 and higher)	**R50**	**6FC4 600-0AR50**
LCD flatscreen (SW 4.2 and higher)	**R42**	**6FC4 600-0AR42**
SINUMERIK flat operator panel (SW 4.2 and higher) **19" subrack design, 10" monochrome display**		**6FC5 103-0AB02-0AA0**
Machine control panel (SW 4.2 and higher) for slimline operator panel M version T version		 **6FC5 103-0AD03-0AA0** **6FC5 103-0AD01-0AA0**
Set of machine control panel cables to slimline operator panel (SW 4.2 and higher)		**6FC5 147-0AA04-0AA0**
DMP terminal block (DMP TB) **DMP module 16 inputs/16 outputs** **DMP module 32 inputs** **DMP compact terminal block** (SW 4.2 and higher) **DMP compact module 8 outputs** (SW 4.2 and higher) **DMP compact module 16 outputs** (SW 4.2 and higher) **DMP compact module 16 inputs** (SW 4.2 and higher) **DMP IP65 terminal block** (SW 4.2 and higher) **DMP IP65 module** (SW 4.2 and higher)	**M30** **M33** **M34**	**6FC4 590-0AM30** **6FC4 590-0AM33** **6FC4 590-0AM34** **6FC5 111-0CA73-1AA0** **6FC5 111-0CA03-0AA0** **6FC5 111-0CA02-0AA0** **6FC5 111-0CA01-0AA0** **6FC5 111-0CA72-0AA0** **6FC5 111-0CA22-0AA0**
Hand-held unit, complete (front panel, housing, cable)		**6FC5 103-0AD20-0AA0**
Hand-held unit without housing (machine control panel)		**6FC5 103-0AD21-0AA0**
Distributor box for hand-held unit		**6FC5 147-0AA05-0AA0**
DMP terminator		**6FC4 590-0AM38**
SINEC L2 module (SW 4.1 and higher)		See SINEC L2 interface Function Manual

Devices	Option	Order No.
Base plate with mounting material (required for monitor and keyboard changeover switch)		**6FC9 310-1MA**
Monitor changeover switch, 3-way, 1-pin		**6FC9 310-1MC**
Monitor changeover switch, 3-way, 3-pin		**6FC9 310-1MD**
Keyboard changeover switch, 3-way		**6FC9 310-1MB**
Electronic handwheel, small		**6FC9 320-5DC**
Electronic handwheel, large		**6FC9 320-5DB**
Incremental rotary encoders[1)] and main spindle encoder with axial cable outlet 1024 pulses/rev 2000 pulses/rev 2500 pulses/rev 5000 pulses/rev		 **6FC9 320-3KB00** **6FC9 320-3KK00** **6FC9 320-3KN00** **6FC9 320-3KS00**
Incremental rotary encoders[1)] and main spindle encoder with radial cable outlet 1024 pulses/rev 2000 pulses/rev 2500 pulses/rev 5000 pulses/rev		 **6FC9 320-3MB00** **6FC9 320-3MK00** **6FC9 320-3MN00** **6FC9 320-3MS00**
Combined rotary encoder for spindle and C axis 1024/9000 pulses/rev		 **6FC9 320-1KT00**
Incremental rotary encoders for rotary axes ROD 250 RON 255		 **6FC9 320-3CM00** **6FC9 320-3CN00**
Clamping jaw [2)] **Spring coupling**		**6FC9 320-4GA** **6FC9 320-4GB**
Tape reader T40	**B02**	**6FC9 320-1FC**
Tape reader T41	**B21**	**6FC9 320-1GB**
Tape reader T50	**B03**	**6FC3 984-1FD**
Tape reader T60	**B01**	**6FC3 984-1FB**
3.5 disk drive		**6FC9 310-1JA**
Power pack Input 230V AC / Output 24V DC 10A		 **6EV1 334-4BK00**
Power pack Input 400V AC 3 phase / Output 24V DC 20A Input 400V AC 3 phase / Output 24V DC 40A		 **6EV1 353-5BK00** **6EV1 363-5BK00**

Note:

See Catalog NC 90 (SINUMERIK Accessories) for further information on measuring systems and accessories.

1) Without spring coupling and clamping jaws
2) 3 clamping jaws are required per encoder

3.2 Accessories, cables

Cables, complete	Max. possible length	Order No.
To servo drives and main spindle drive	50 m	
Length **5 m**		**6FC9 340-8RB**
Length **10 m**		**6FC9 340-8RC**
Length **18 m**		**6FC9 340-8RE**
Length **25 m**		**6FC9 340-8RF**
To digital rotary encoders and main spindle encoder (new version)	35 m	
Length **10 m**		**6FC9 344-2BC**
Length **18 m**		**6FC9 344-2BE**
Length **25 m**		**6FC9 344-2BF**
To digital linear measuring system (integral EXE)	17 m	
Length **5 m**		**6FC9 340-8QB**
Length **10 m**		**6FC9 340-8QC**
Length **17 m**		**6FC9 340-8QE**
To digital rotary encoder in servo drive (ROD 320)	35 m	
Length **5 m**		
Length **10 m**		**6FC9 340-8PB**
Length **18 m**		**6FC9 340-8PC**
Length **25 m**		**6FC9 340-8PE**
		6FC9 340-8PF
To probe	35 m	
Length **5 m**		**6FC9 340-8UB**
Length **10 m**		**6FC9 340-8UC**
Length **18 m**		**6FC9 340-8UE**
Length **25 m**		**6FC9 340-8UF**
Cable from electronic handwheel (old version) to central controller	25 m	
Length **5 m**		**6FC9 344-4EB**
Length **10 m**		**6FC9 344-4EC**
Length **18 m**		**6FC9 344-4EE**
Length **25 m**		**6FC9 344-4EF**
Cable from electronic handwheel (new version) to central controller	25 m	
Length **5 m**		**6FC9 344-4UB**
Length **18 m**		**6FC9 344-4UE**
SINUMERIK System 800, RS232C (operator panel)	30 m	
Length **2 m**		**6FC9 340-8WM**
Length **5 m**		**6FC9 340-8WB**
Length **10 m**		**6FC9 340-8WC**
Length **18 m**		**6FC9 340-8WE**
Length **25 m**		**6FC9 340-8WF**

Cables, complete	Max. possible length	Order No.
Monitor cables (monochrome)	30 m	
Length **2 m**		**6FC9 344-1TM**
Length **5 m**		**6FC9 344-1TB**
Length **10 m**		**6FC9 344-1TC**
Length **18 m**		**6FC9 344-1TE**
Monitor cables (colour)	30 m	
Length **2 m**		**6FC9 344-4NA**
Length **5 m**		**6FC9 344-4NB**
Length **10 m**		**6FC9 344-4NC**
Length **18 m**		**6FC9 344-4ND**
Connecting the 1st MPC node to the central controller MPC interface	30 m	
Length **1 m**		**6FC9 344-3SL**
Length **2 m**		**6FC9 344-3SM**
Length **5 m**		**6FC9 344-3SB**
Length **10 m**		**6FC9 344-3SC**
Length **18 m**		**6FC9 344-3SE**
Length **25 m**		**6FC9 344-3SF**
Round cables for connecting MPC nodes to each other	30 m	
Length **0.25 m**		**6FC9 344-3QA**
Length **0.5 m**		**6FC9 344-3QZ, Length 0.5 m**
Length **x m** (enter desired length)		**6FC9 344-3QZ, Length x m**
Length **1 m**		**6FC9 344-3QL**
Length **5 m**		**6FC9 344-3QB**
Length **10 m**		**6FC9 344-3QC**
Length **18 m**		**6FC9 344-3QE**
Length **25 m**		**6FC9 344-3QF**
Intermediate cables for hand-held unit distributor boxes	10 m	
Length **2 m**		**6FC9 344-4GM**
Length **5 m**		**6FC9 344-4GB**
Length **10 m**		**6FC9 344-4GC**

3.3 Accessories, connectors

For necessary accessories, see overview plan

Connector, complete	Order No.
Round connector, 12-way, receptacle (Siemens) 10 mm cable	**6FC9 341-1FD**
Round connector link, 9-way, receptacle (Siemens) 8 mm cable	**6FC9 341-1EW**
Round connector, 17-way, receptacle (Tuchel)	**6FC3 948-7AV01**
D subminiature connector, 15-way, receptacle (Siemens) with SINUMERIK-Shell	**6FC9 341-1EC**
D subminiature connector, 25-way, receptacle (Siemens) with SINUMERIK-Shell	**6FC9 341-1ED**
D subminiature connector, 25-way, plug (Siemens) with SINUMERIK-Shell	**6FC9 341-2AB**

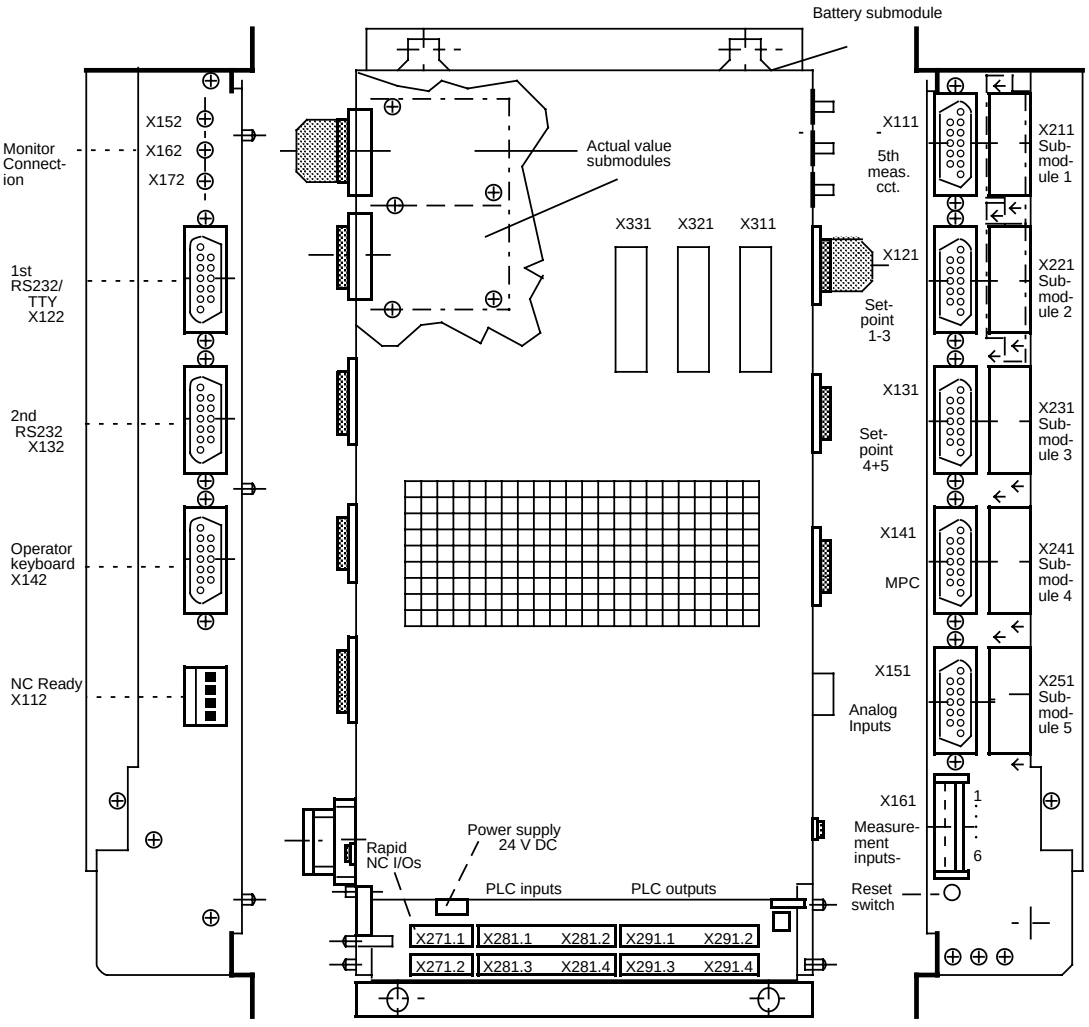
4 Devices

4.1 Central controller

Order No.: 6FC4 100-1AA00
Module name: 6FX1 146-0BA01

The central controller of the SINUMERIK 805 control consists of a large plate on which the submodules for actual value acquisition and the L2 interface can be plugged. The individual components of the complete control system are connected to the central controller.

The SINUMERIK 805 control is a single-processor control. The processor is supported by some, partly independently working special modules (e.g. for Graphics, STEP 5 interpretation, I/O link).



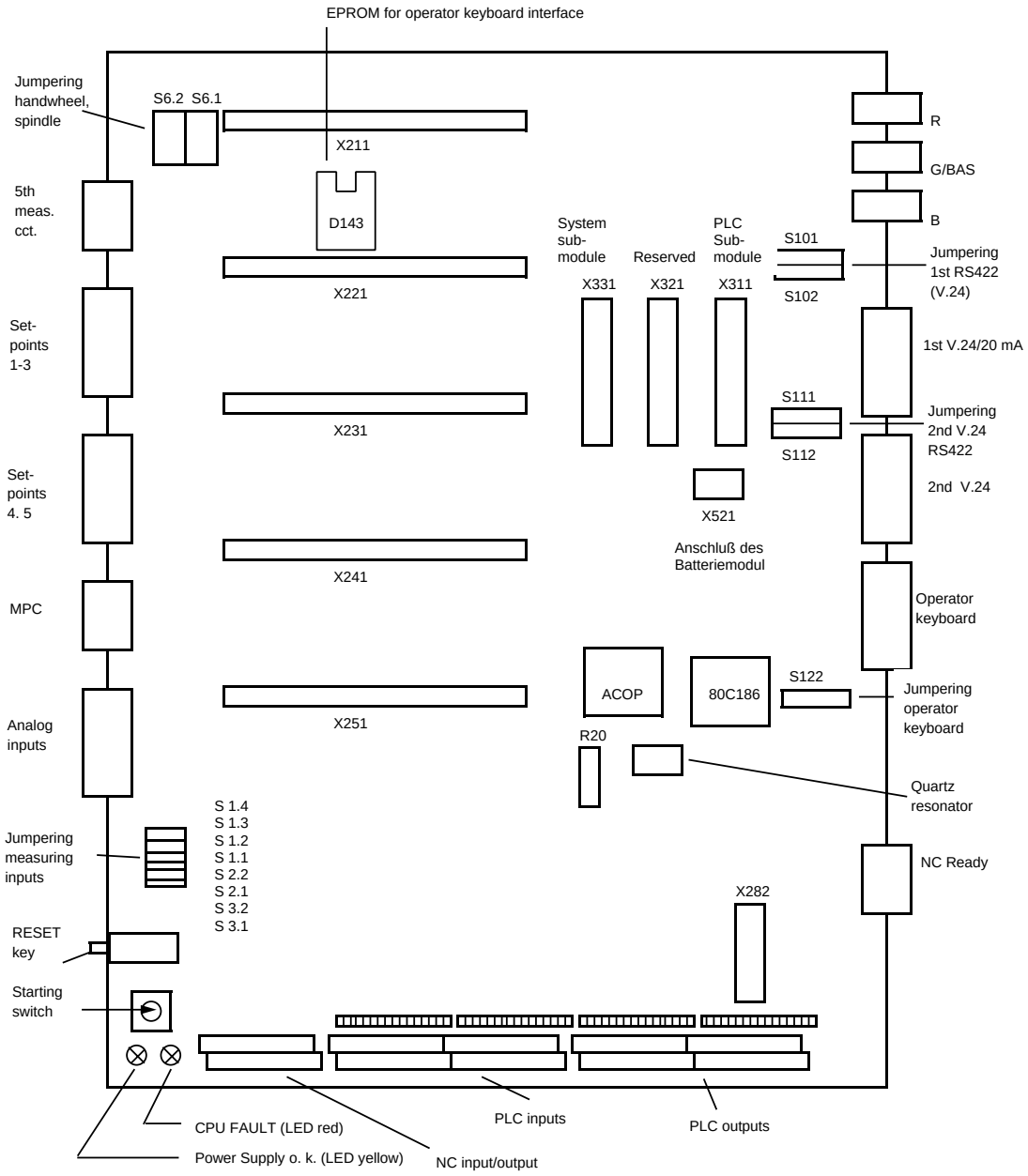
Note:

See SINEC L2 interface documentation for further information on the SINUMERIK 805 SINEC L2 interface.
Order No.: 6ZB5 410-0DQ02-0AA0

Further function blocks

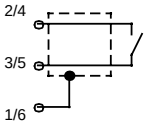
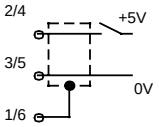
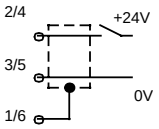
- Memory for NC/PLC system program
- 2 serial interfaces (RS-232-C)
- Servo area with a maximum of 5 measuring circuits and 8 rapid NC inputs/outputs
- Centralized PLC peripherals (32 outputs 0.4A; 32 inputs; 8 anolog inputs) expandable by distributed peripherals (MPC interface)
- Operator keyboard interface module with serial controller with standardized protocol
- Monitor interface module with VGA controller, 1 Mbyte display memory (resolution 640 x 480)

Central board



4.1.1 Jumperings on the central board

Measuring inputs:

DIP-FIX np switch (on central processing unit)			Sensor 1				Sensor 2				Control switch connection
			S1.1	S1.2	S2.1	S2.2	S1.3	S1.4	S3.1	S3.2	
Operating condition	Edge	Level	active level		Signal level (5V/24V)		active level		Signal level (5V/24V)		
Open collector Contact assembly	↓	open (+5V)	*		*	*	*		*	*	
	↑	closed (0V)		*	*	*		*	*	*	
TTL (5V)	↑	+5V	*		*	*	*		*	*	
	↓	0V		*	*	*		*	*	*	
24V	↑	+24V	*				*				
	↓	0V		*				*			

*≙ DIP-FIX switch closed

Jumpering of the 5th measuring circuit (on central processing unit)

The 5th measuring circuit can process signals from a handwheel or an encoder.
Jumpering is according to the following table with S6.1 and S6.2:

Operating condition	S6.1	S6.2	Signal
Encoder or handwheel with tracks A, $\overline{A}$, B, $\overline{B}$			Differential signal
Handwheel with tracks A, B.	x	x	TTL level

x≙ DIP-FIX switch closed

Start-up switch:

Position 0 ≙ normal
Position 2 ≙ start-up initialization mode

Jumpering of operator keyboard of 1st V.24 or 2nd V.24 interface

1st V.24 (X122)			2nd V.24 (X132)		Operator keyboard X142
Operating condition	S101	S102	S111	S112	S122
RS 232 (default setting)					
RS 422 (in conjunction with RS 422 adapter)	*	*	*	*	*

*≙ DIP-FIX switch closed

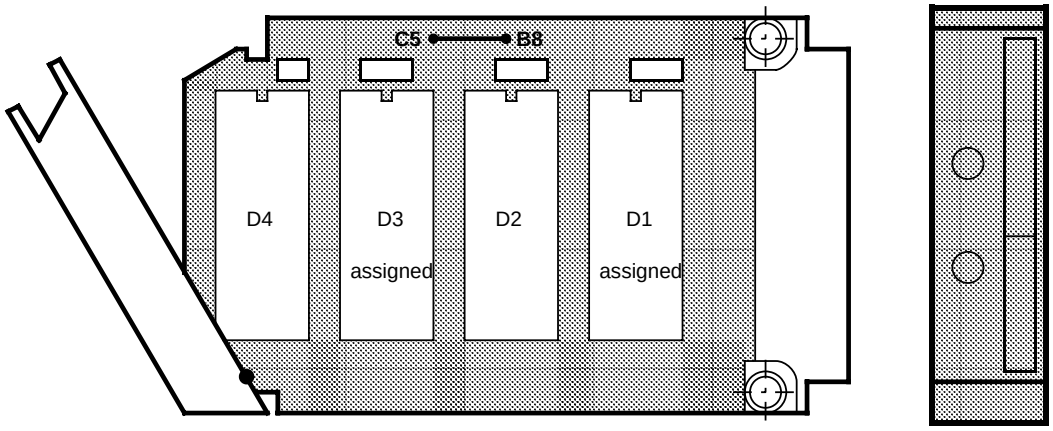
Jumpering switch R20

Standard jumpering: open

4.1.2 Memory submodules

PLC EPROM submodule (6FX1126-0BN00)

The submodule is fitted with two EPROMs 27256 (2 x 32 Kbytes).
Slot: X311

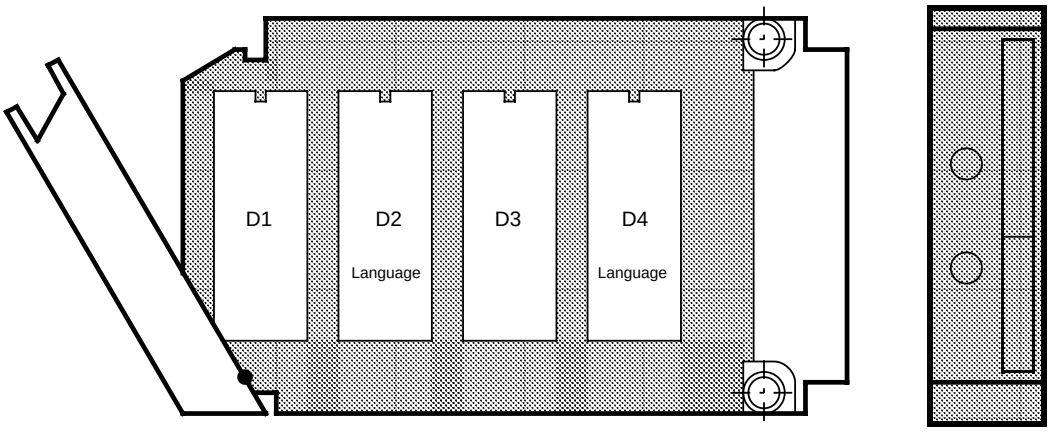


C5-B8 (jumper): closed

Note: The submodule identifier for reading/closing the submodule is: 162

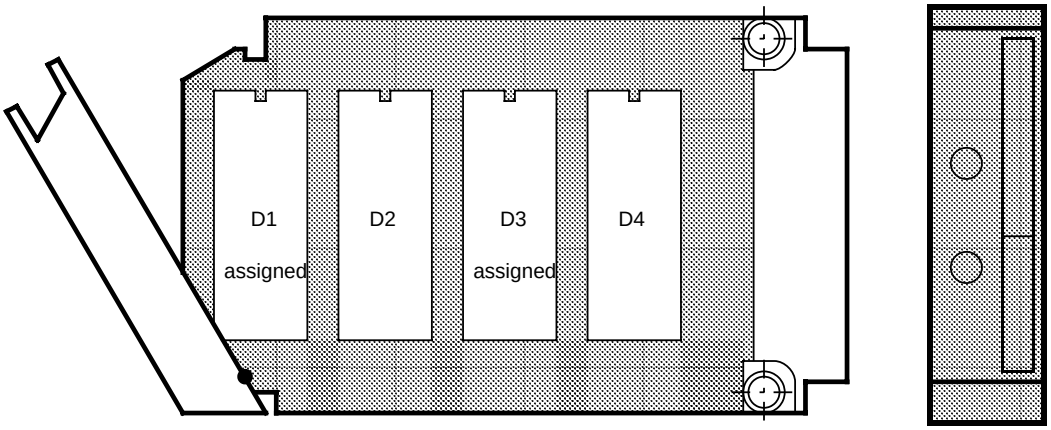
System EPROM submodule (6FX1122-6CA00)

The submodule contains the complete system software.
It is fitted with four EPROMs 27C020 (150 ns).
Slot: X331



EPROM submodule (6FX1122-6CB00)

The submodule is fitted with EPROMs 27C020 (150 ns).
Slot: X321

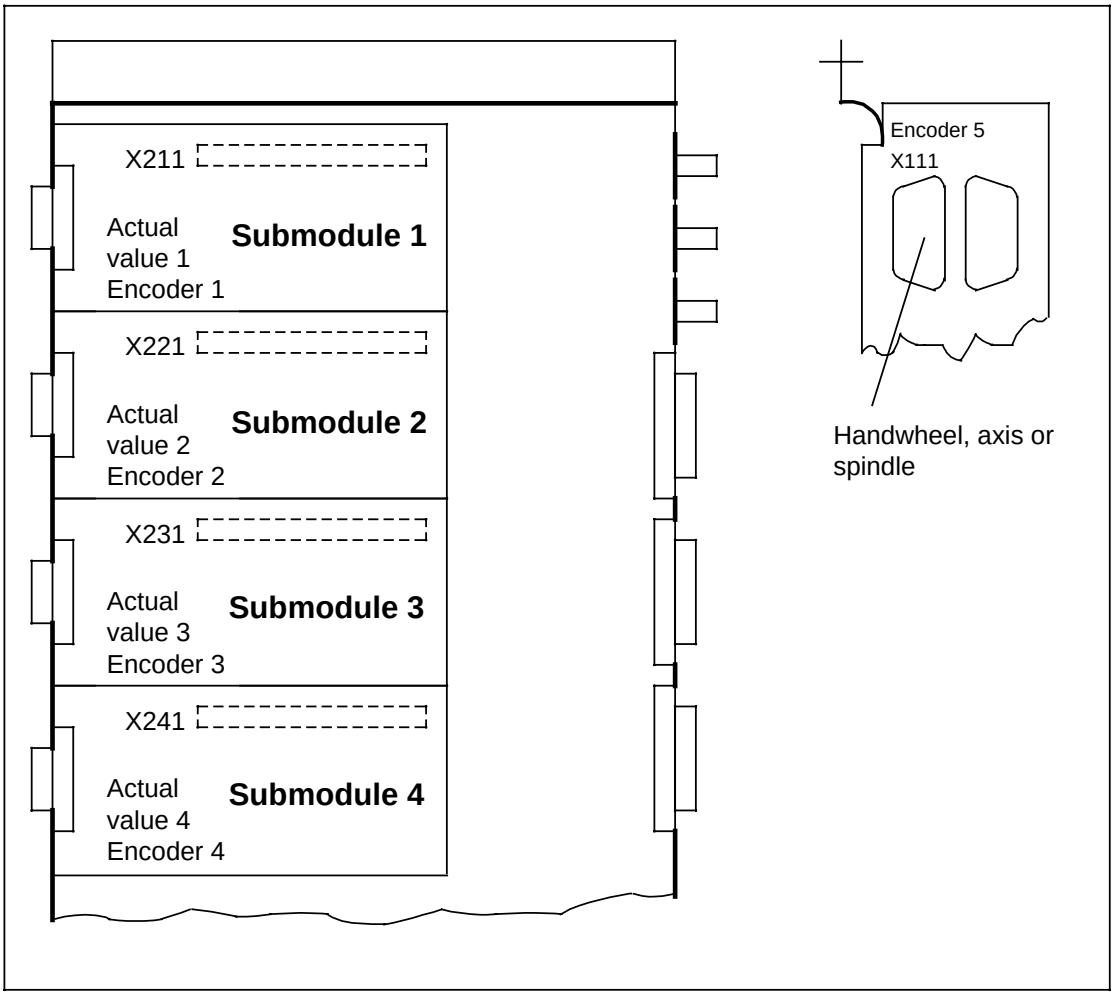


This submodule is not included in the basic version.

4.1.3 Measuring circuit actual value inputs

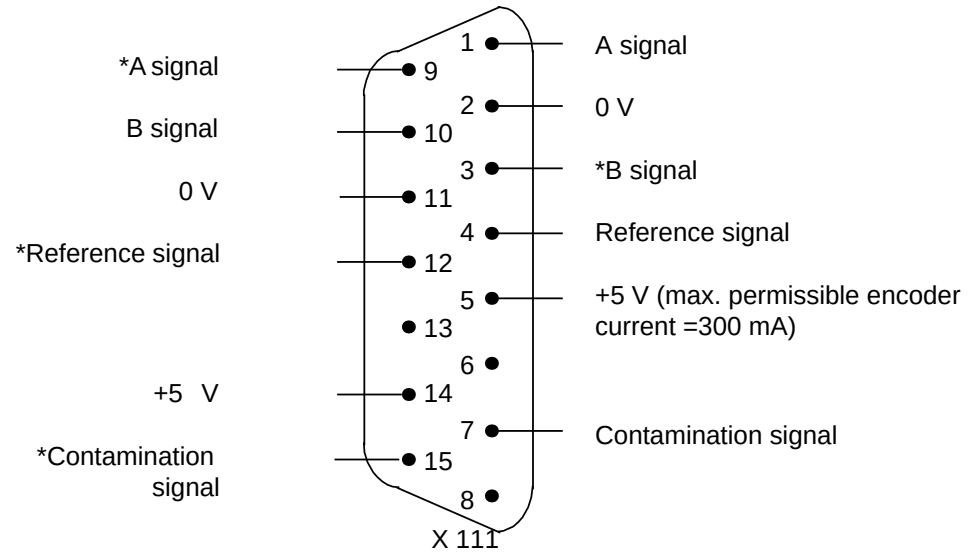
The actual values are supplied to the control via 15-way connectors.
An actual value input for encoders with rectagular output signals (i.e. the actual value input has no EXE) is located on the central processing unit. Its designation is encoder 5 or actual value input 5. The following types of actual value submodule can be plugged onto the first four submodule slots:

- Submodule 6FX1 145-3BA: for encoders with rectangular output signals (max. encoder sampling frequency: 1MHz)
- Submodule 6FX1 145-4BA: for encoders with sinusoidal output signals (5-fold EXE; max. encoder sampling frequency: 25 kHz)
- Submodule 6FX1 145-5BA: for encoders with sinusoidal output signals (10-fold EXE; max. encoder sampling frequency: 12 kHz)



Slots of actual value submodules

Connection: 15-way subminiature D pin connector



or input connector of actual value submodules

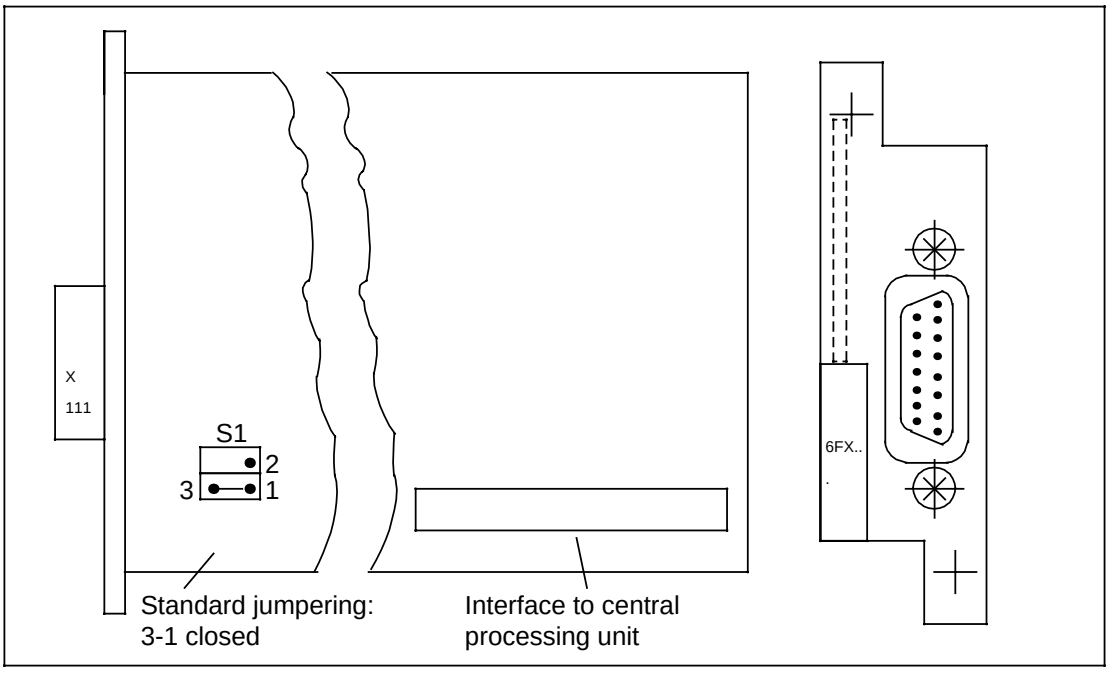
Actual value pin assignment

Technical data of 5th actual value input

Jumpered as actual value input for encoders or handwheels with tracks A, $\overline{A}$, B, $\overline{B}$				
Encoder supply – Short-circuit protection		None		
	Min.	Type	Max.	Unit
Encoder supply – Voltage – Ripple – Current for encoder	4.75		5.25 100 300	V mVpp mA
Input voltage – Difference – Permissible common-mode input voltage range – Ohmic input resistance – Dynamic input resistance	1.0 –2.0	 470 120	10.0 5.0	V V ohm ohm
Inputs – Frequency at 90° el A-B			1000	kHz

Jumpered as handwheel input for handwheels with tracks A, B.				
– Short-circuit protection (supply)		None		
	Min.	Type	Max.	Unit
Encoder supply – Voltage – Current	4.75		5.25 300	V mA
Input voltage ”H” Input voltage ”L”	3		 2	V V
Input current ”H” Input current ”L”			1.5 –1.5	mA mA
Input frequency at 90°el A to B			5 (SW4.1) 200 (>SW4.1)	kHz kHz

Technical data of actual value submodules



Jumpering option of actual value submodules

Jumpering options S1: 3–1 closed internal encoder supply (standard)
3–2 closed external encoder supply
(at a distance >35 m)

Interface X111 for incremental position encoders with rectangular output signals					
– Short-circuit protection (supply)	None				
	Design.	Min.	Type	Max.	Unit
Encoder supply – Voltage – Ripple – Current per encoder	+5 V	4.75		+5.25[4] 100 300[1]	V mVpp mA
Differential inputs A, B, R: – Differential-mode voltage – Permissible common-mode input voltage – Input impedance at 0 Hz 1MHz		±1.0 - 2.0	 470 120	+5.0	V V 0hm 0hm
Timing A, B, R: – Input frequency A, B – Edge spacing – Rise time Fall time – Normal mode – Reference signal edge spacing	 f_{max} t_{mf} t_{3d} t_{1d}	 200 - 100 - 100		 1000[3] 20 60	 kHz ns ns ns ns ns
Cable length to encoder				35[2]	m

1) Current not limited
2) When using SINUMERIK cables, encoder current load < 200 mA
3) With phase angle error 20°
4) Or adjustable to max. 6.5 V

Interface X111 for incremental position encoders with sinusoidal output signals					
– Short-circuit protection (supply)		None			
	Designation	Min.	Type	Max.	Unit
Encoder supply	+5 V				
– Voltage		+4.75		+5.25[4]	V
– Ripple				0.1	Vpp
– Current per encoder				300[1]	mA
Inputs A, B, R:					
– Input frequencies					
6FX1 145-4BA				25	kHz
6FX1 145-5BA				12	kHz
– Input resistance at f < 1 kHz		10			0hm
– Input current:					
Signals A and B		7			
Signal R		2		16	uA
Direct component of input current				8	uA
Gain				6.5	%
– Phase displacement between A and B signal at 1 kHz		80		1:0.8	
– Phase displacement of R signal with reference to A signal				100	°el
– Zero crossings of R signal with reference to A signal		90	135		°el
				270	°el
Cable length to encoder				20[2]	m

1) Current not limited
2) When using SINUMERIK cables, encoder current load<200 mA
4) Or adjustable to max. 6.5 V

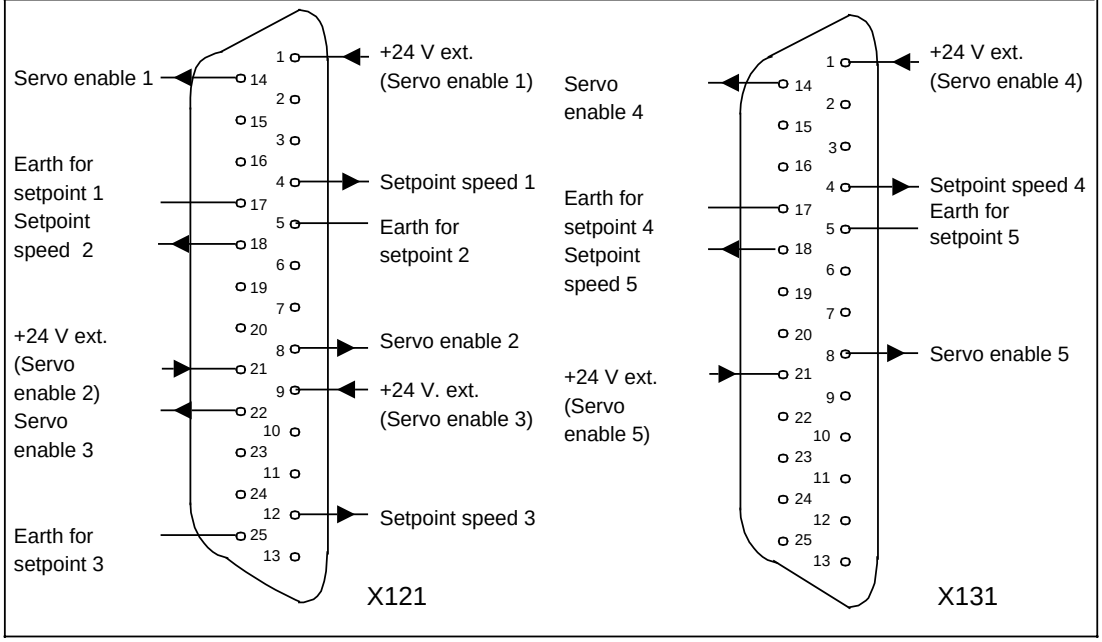
4.1.4 Measuring circuit set value output

The setpoint speeds and axis-specific servo enables (floating switching contact) are output by the control by means of two 25-way connectors on the central controller.

Connector assignment

X121	Setpoint connector	setpoints 1,2 and 3
X131	Setpoint connector	setpoints 4 and 5

Connection: male subminiature connector, 25-way



Setpoint terminal assignment

Characteristic values:

Setpoint:	Max. analog voltage Max. current Resolution	±10 V 2 mA 1.2 mV	(not short-circuit proof)
Servo enable:	Supply voltage Max. current	20 to 30 V 100 mA	(floating)

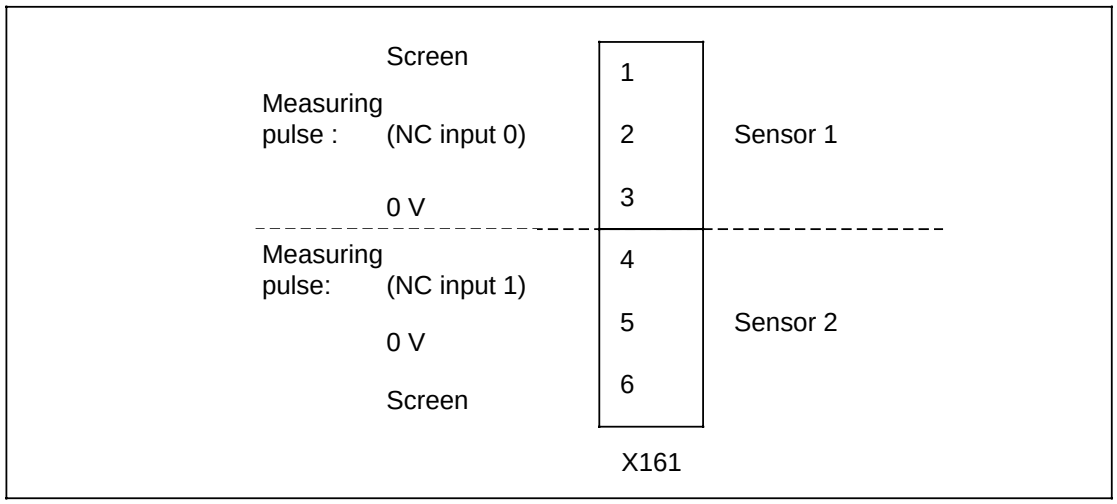
Assignment actual value submodule to setpoint output:

The 1st setpoint on X 121 is assigned to the 1st actual value submodule X 211.
The 2nd setpoint on X 121 is assigned to the 2nd actual value submodule X 221.
The 3rd setpoint on X 121 is assigned to the 3rd actual value submodule X 231.
The 4th setpoint on X 131 is assigned to the 4th actual value submodule X 241.
The 5th setpoint on X 131 is assigned to the 5th actual value (central processing unit).

4.1.5 NC inputs/outputs

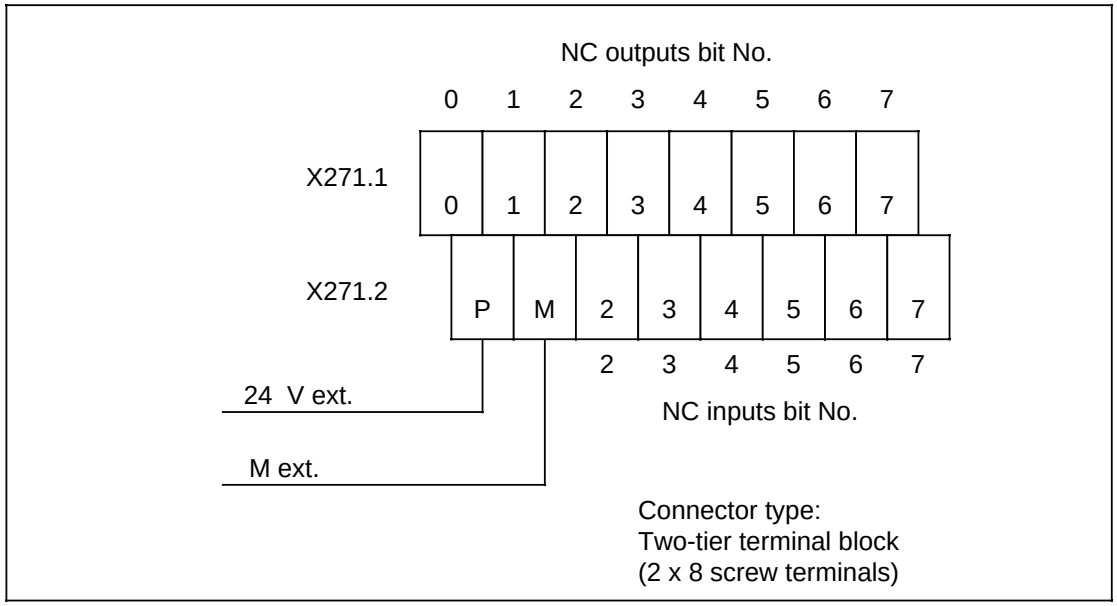
Sensor inputs 1 and 2

Connector type: terminal block (6 screw terminals)



See Section 4.1.1 for jumperings of sensor inputs.

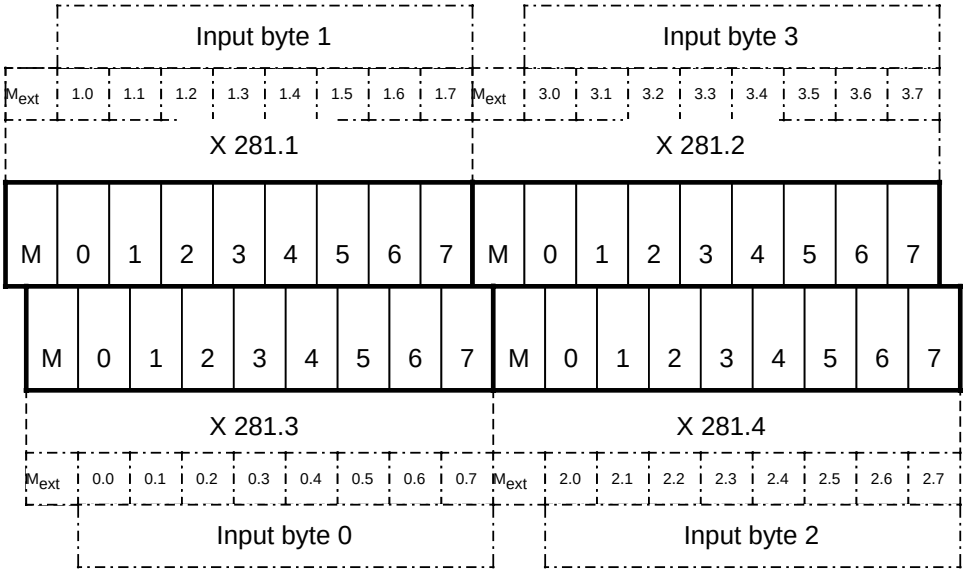
Fast NC inputs/outputs



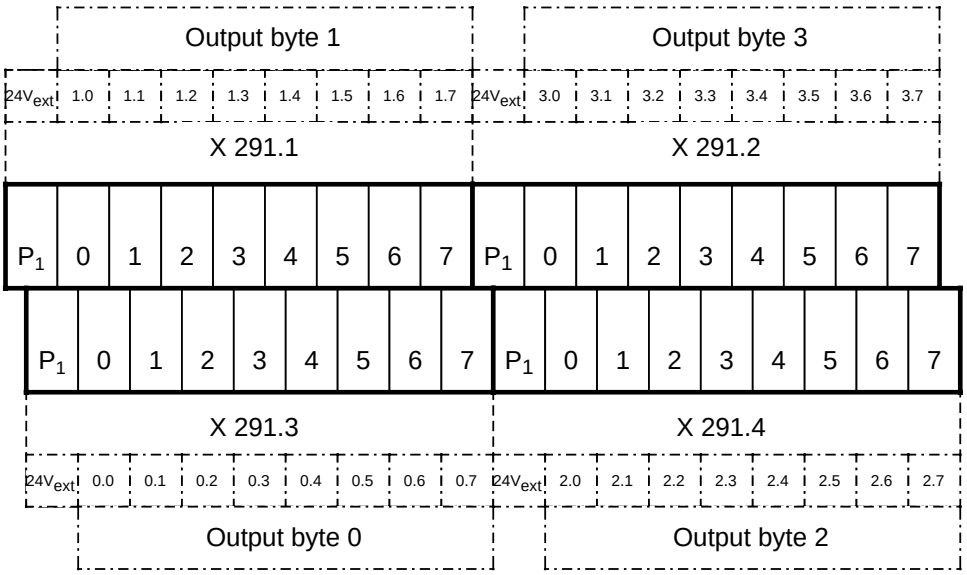
Characteristics:

NC outputs 0-7: 24 V, max. 400 mA, short-circuit proof, non-floating
NC inputs 2-7: active level 24 V, non-floating

4.1.6 Centralized peripherals



The following terminals are jumpered internally: M of IB0 and IB1
M of IB2 and IB3

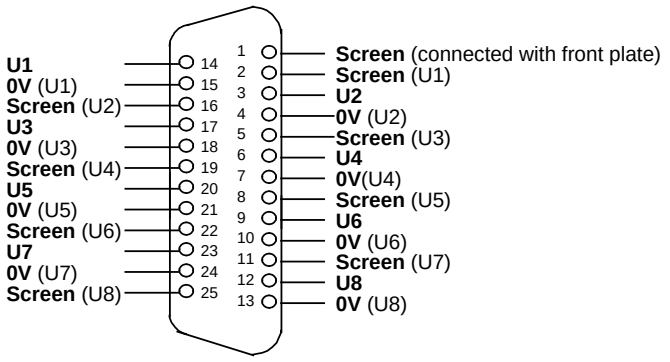


The following terminals are jumpered internally : P1 of OB0 and OB1
P1 of OB2 and OB3

Characteristics:

Inputs 24 V, LED status display, non-floating
Outputs 24 V, max. 400 mA, short-circuit proof, LED status display, non-floating
Connector type: Two-tier terminal block (2x9 screw terminals) each

4.1.7 Analog inputs



Subminiature D
socket
X151

Characteristics :

Measurable voltage 0 ... +10 V
Minimum voltage limit: -0.5 V
Maximum voltage limit: +10.5 V
Resolution: 8 bit (2^8 = 256 digits)
Protection against reverse voltage and overvoltage to avoid damage

The user must take care that the minimum

and maximum voltage limits are respected.

4.1.8 NC Ready

1	M_{ext}	Shield connection
2	NCRDYS	Signal cable
3	NCRDYC	Signal cable
4	M_{ext}	Shield connection

Terminal block with
4 screw terminals

Characteristics:

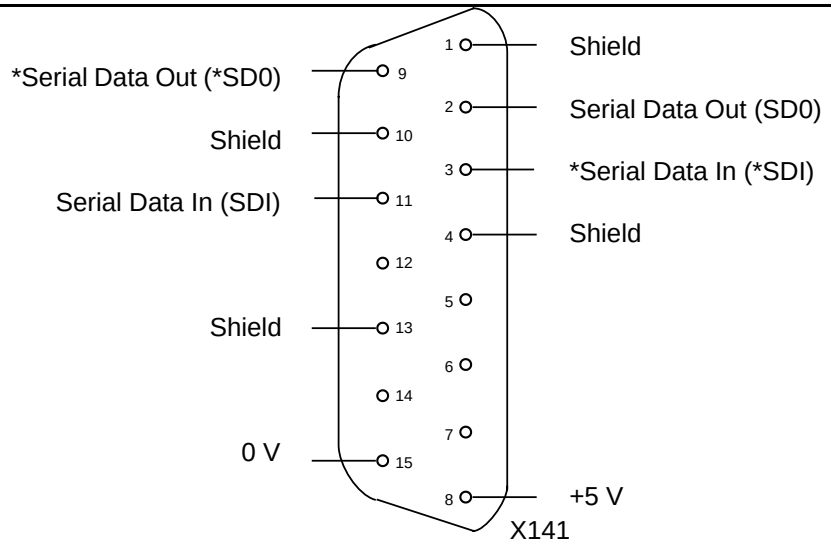
- Ampacity of the NC ready contact (make contact):
  – 1A (resistive load)
  – 0.5 A (inductive load)

- Voltage capacity: 48 V

4.1.9 MPC interface

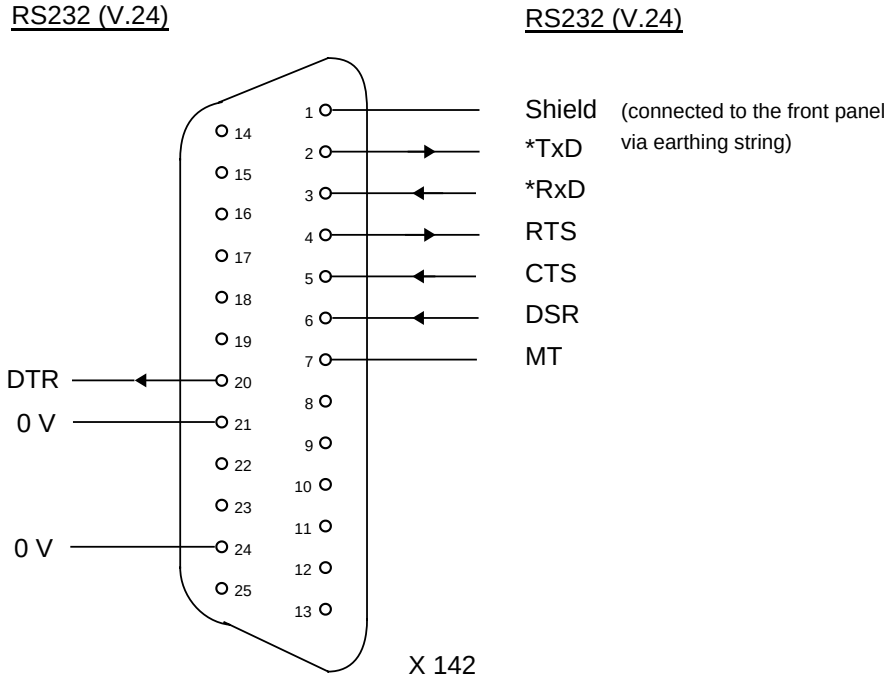
This interface is for data transmission between the control (MPC master) and distributed I/O devices (MPC slaves) in accordance with standard RS 485.

Connection: female subminiature connector, 15-way



4.1.10 Keyboard interface

Connection: 25-way subminiature D socket connector



4.1.11 Monitor interface

The monitor interface has been designed to ensure full compatibility with analog monitors. Either colour monitors with RGB analog (with composite synch on green) or monochrome monitors with G/"composite video (BAS)" can be connected.

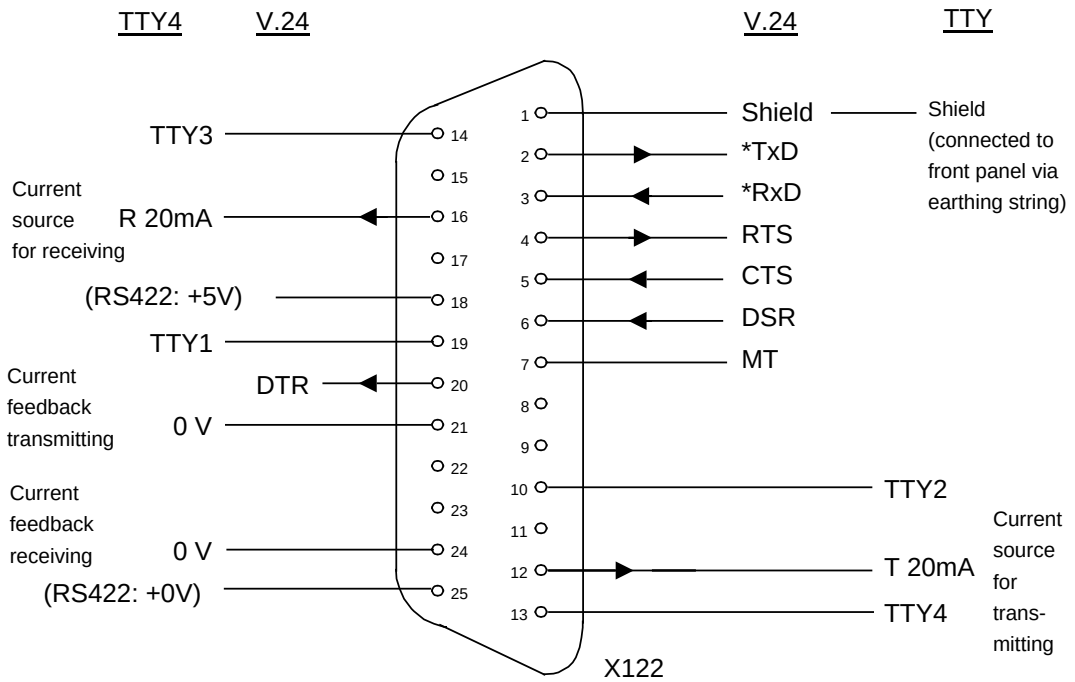
Connector designations: X 152 R (RED)
X 162 G (GREEN) **/** "composite video (BAS)"
X 172 B (BLUE)

Connector type: BNC sockets

4.1.12 1st user interface (V.24/TTY)

Usable for: V.24 (RS232/RS422) / TTY (20 mA)

Connection: female subminiature connector, 25-way



Pin assignment 1st interface

Characteristic values:

- V.24 Level ±12 V
  Signals *RxD and *TxD are low-active
- 20 mA: Active or passive (determined by pin assignment);
  only full duplex operation possible.

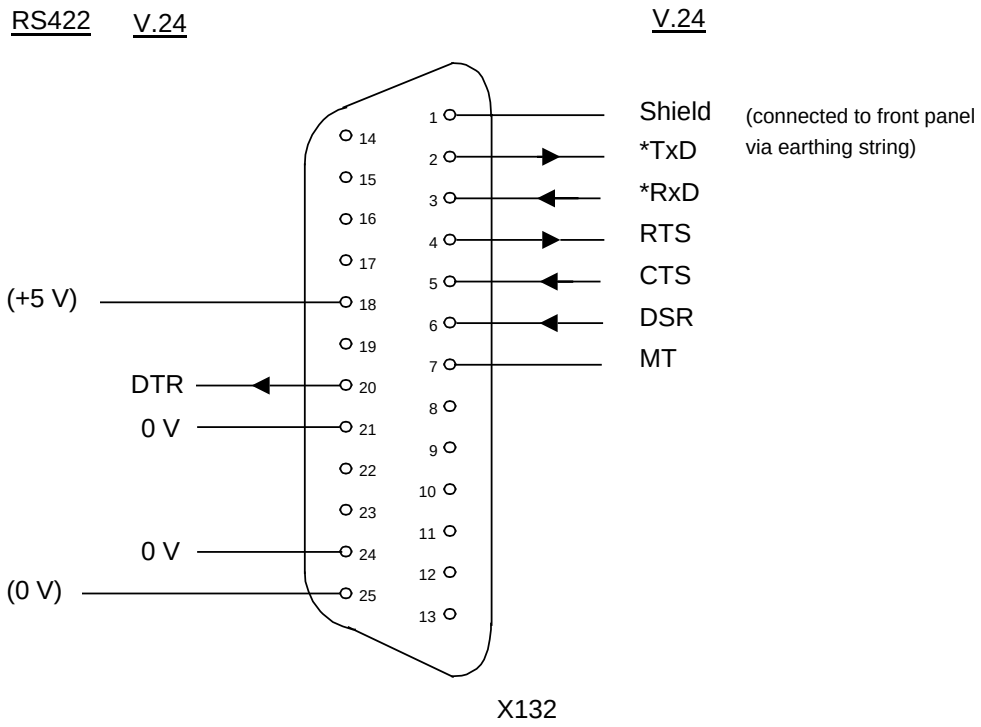
Note:

- When used as an RS422 interface, an RS422 adaptor
  (order No. 6FX 1137-2BA00) is placed directly onto the connector X132
- Jumpering for interface: see Section 4.1.1

4.1.13 2nd user interface (RS232/V.24)

Usable for: RS232 (V.24)/RS422 (with RS422 adapter)

Connection: female subminiature connector, 25-pin



Pin assignment 2nd interface

Note:

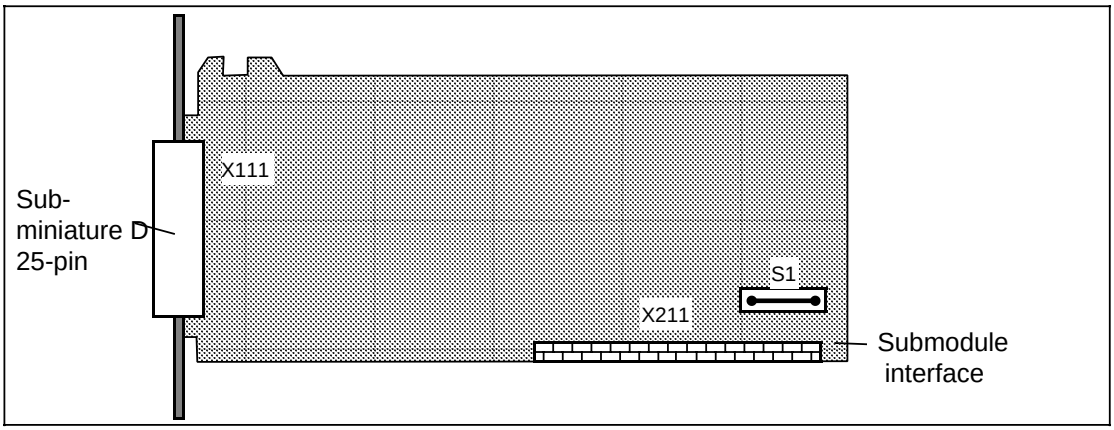
- For use as an RS422 interface, connect an RS422 adapter (order No. 6FX1137-2BA00) directly to connector X132 (see block diagram RS422).
- Jumpering for interface: see Section 4.1.1

4.1.14 Setpoint output submodule

The setpoint output submodule (servo command submodule) is used to output a maximum of 3 analog setpoints (±10 V) together with the associated servo enable contacts.

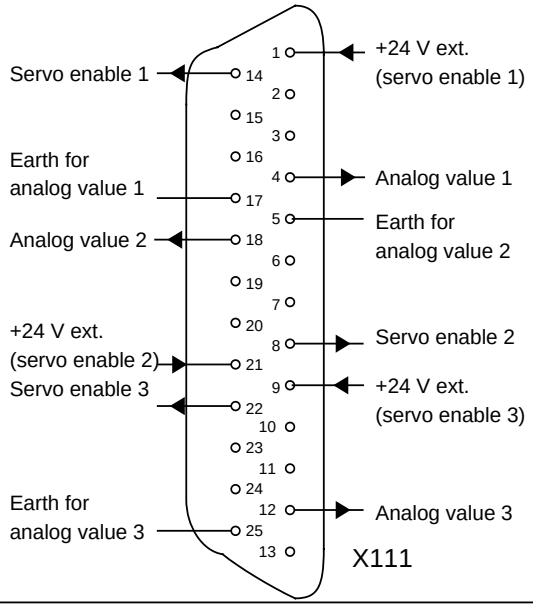
The submodule can be plugged onto the fourth or fifth submodule slot of the central controller (fur further information see Installation Instructions Section 11.12).

Module designation: 6FX1 132-5BA02



Jumpering: S1 always closed (submodule ready with SINUMERIK 805)

Connection: Male subminiature D connector, 25-pin



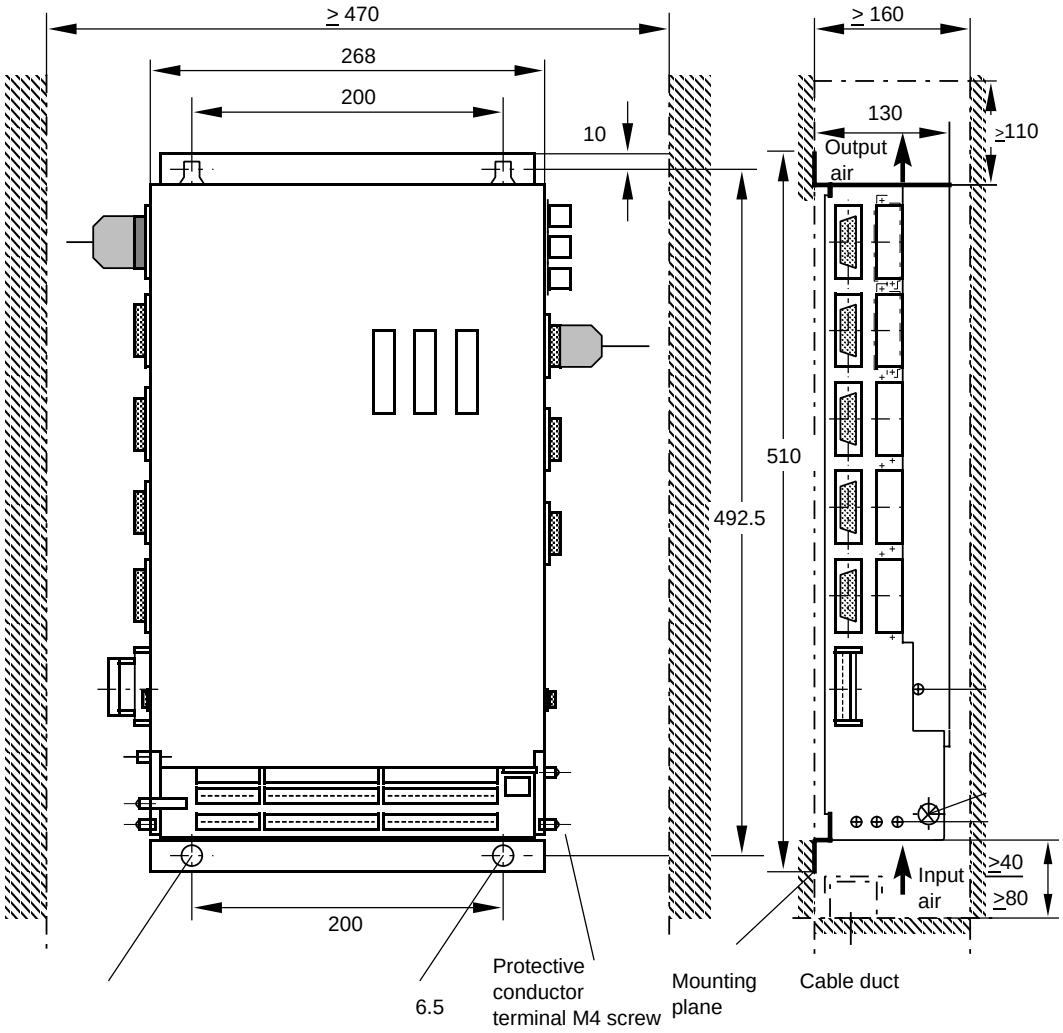
Characteristic values:

Setpoint:	Max. analog voltage Max. current Resolution	±10 V 2 mA 1.2 mV	(not short-circuit proof)
Servo enable:	Supply voltage Max. current	5 to 30 V 250 mA	(floating)

Note:

The setpoint output submodule outputs a voltage for a short time via the analog outputs when switching on/off. The servo enable contacts must therefore be used as enable signals for other connected devices (e.g. drive actuators).

4.1.15 Mounting dimensions



Air throughput 20 m^3/h, input air and ambient temperature 55 °C
Permissible relative humidity to humidity class F to DIN 40040
Temperature change: 10K/h; max. 1K/3 min
Input air without corrosive gases
Degree of protection to DIN 40050, JP 00
Weight: empty housing approx. 4 kg
Enclosed, without additional fan: required cabinet surface 1.5 m^2
Enclosed, with additional fan: required cabinet surface 0.75 m^2
Retaining screw M6
Cover can be removed by loosening the retaining screws
Earth connection M6
Earth connection 5 x M4
Maximum power loss 70 watts

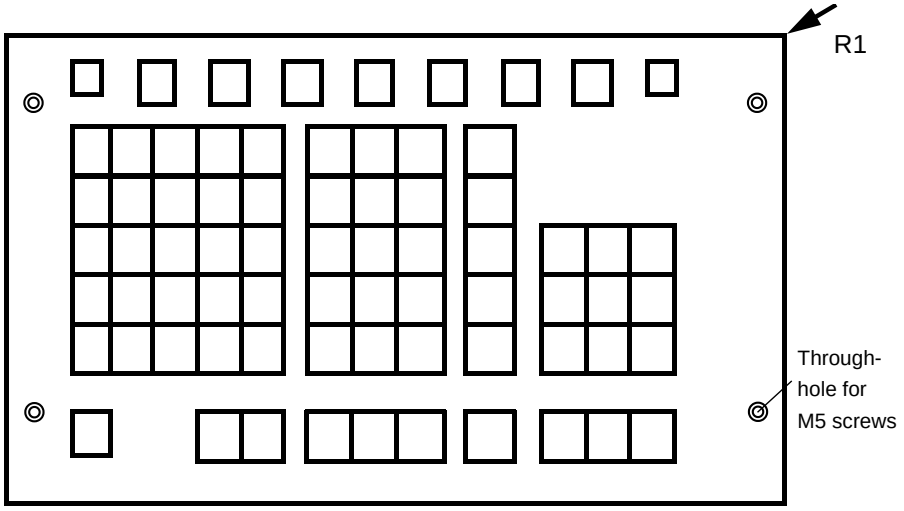
4.2 Operator keyboard

Order No.: 6FC4 600-1AS01
Module name: 6FC4 600-1AS01

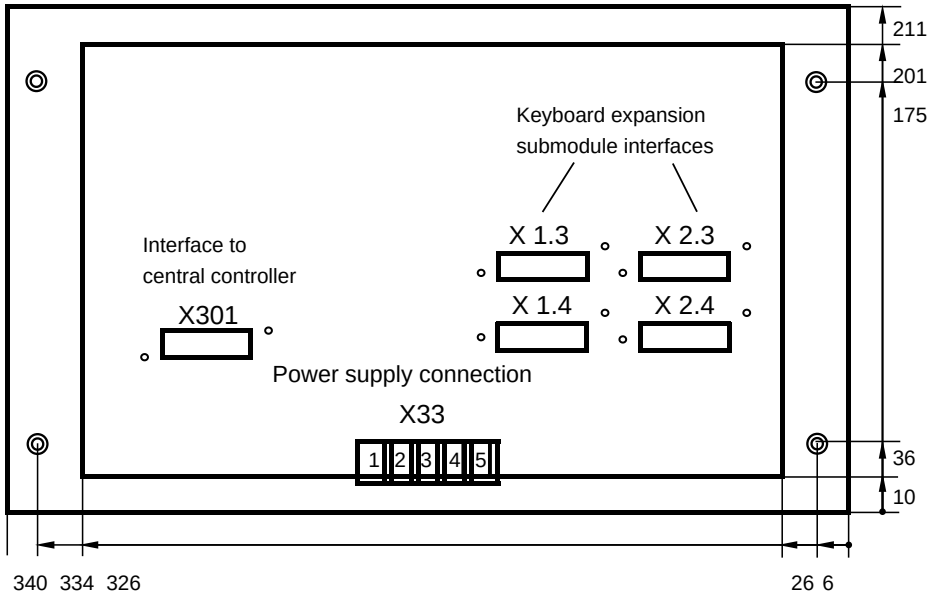
The operator keyboard incorporates a sealed keyboard with all key functions required for operating the SINUMERIK 805 control. Expansion submodules are available to connect machine-specific switches and indicators. These operate with 24 V level. Up to 2 expansion submodules with 16 inputs and 16 outputs each can be installed in the operator keyboard.

The keyboard is connected to the central controller via interface X301. This interface can also be mounted underneath the keyboard. It consists of a modified RS 232 interface onto which a RS 422 adaptor can be plugged.

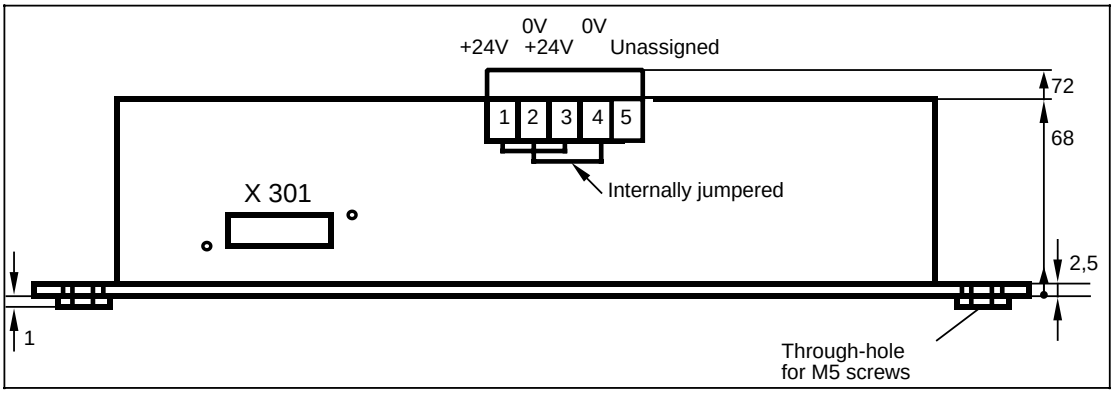
Front panel



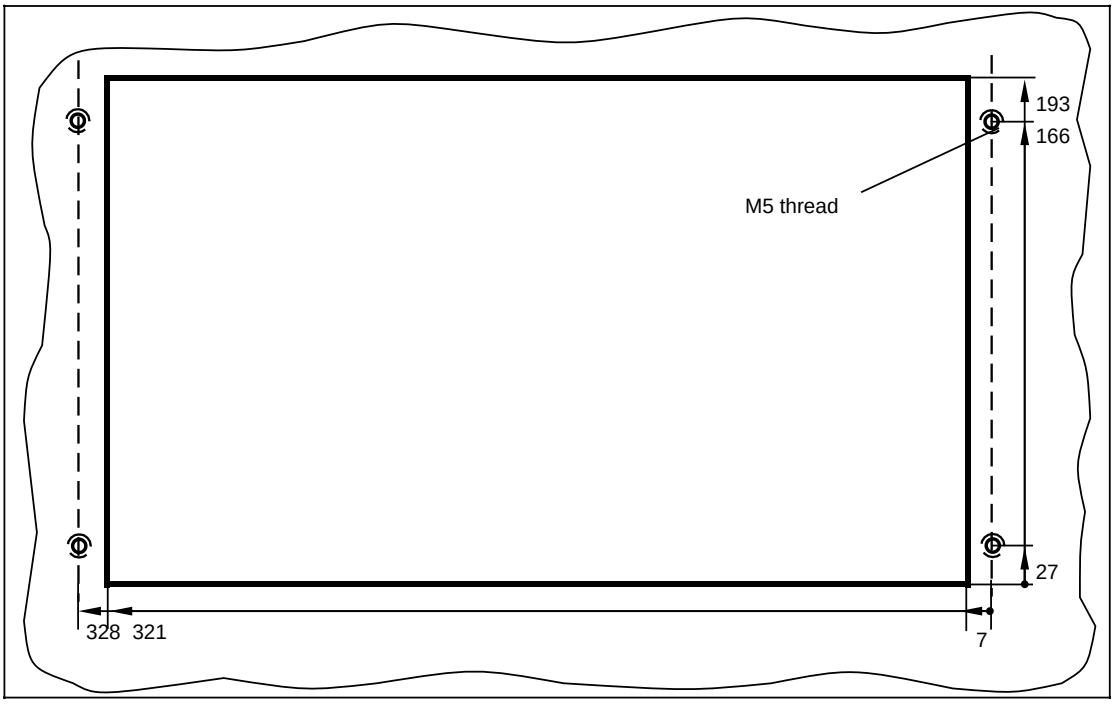
Rear panel



Underside



Panel mounting cutout



The keyboard printed circuit board (G33961-A3598-L001) has a DIL switch and 5 jumpered pins. The DIL switch must be jumpered as follows:

S130

	off	on
1	x	
2	x	
3	x	
4		x
5		x
6	x	
7	x	
8	x	

Pin jumpering:

X3: 1-2 open 2-3 closed
X4: 1-2 open 2-3 closed
X6: 1-2 closed 2-3 open
X10: 1-2 closed 2-3 open
X26: open

Note:

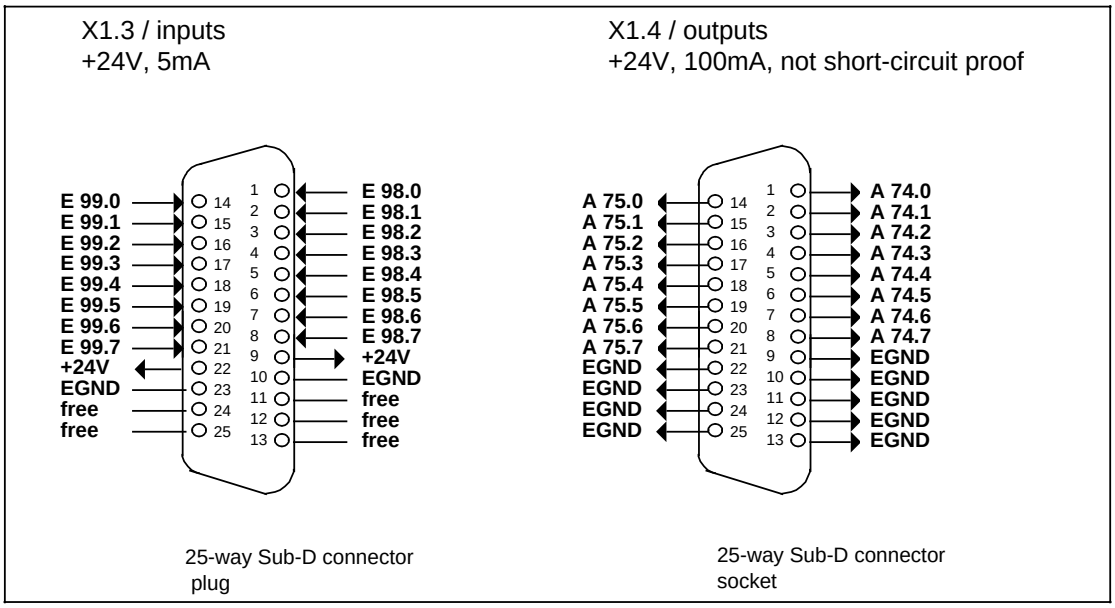
The electronics power supply is fused with a miniature fuse (medium/0.5 A)

4.3 Keyboard expansion submodule

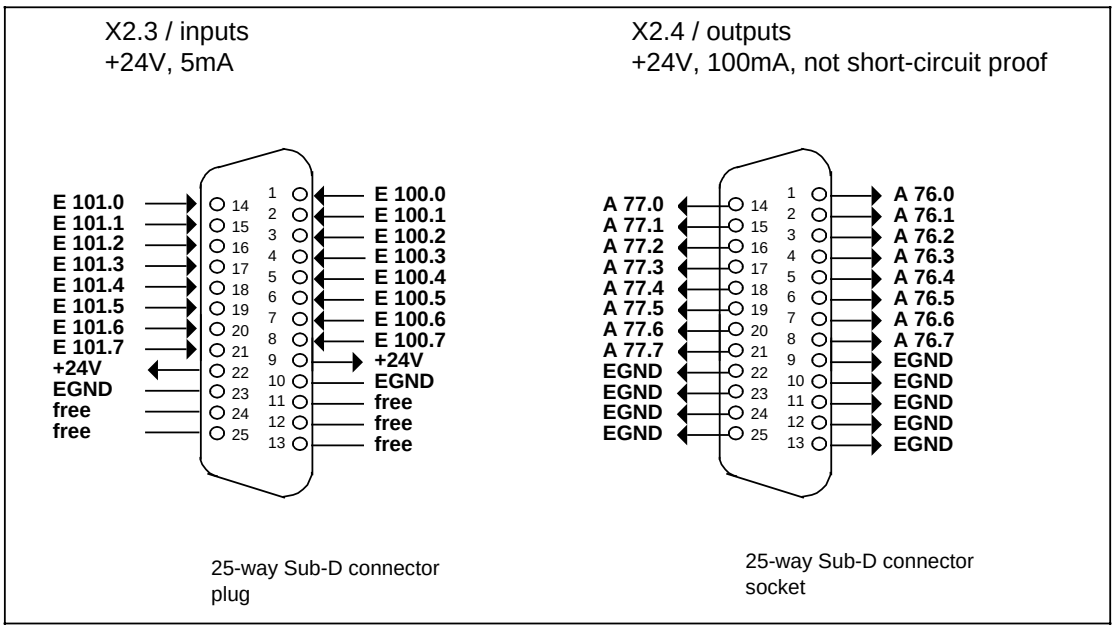
Order No.: 6FC4 600-0AJ70
Module name: 6FC4 600-0AJ70

SINUMERIK 805 has 2 keyboard expansion submodules each with 16 inputs and outputs. The two identical submodules are integrated in the operator keyboard and supplied internally with +24V/0V. The inputs and outputs are connected via connectors X1.3, X1.4 on submodule 1 and X2.3, X2.4 on submodule 2.

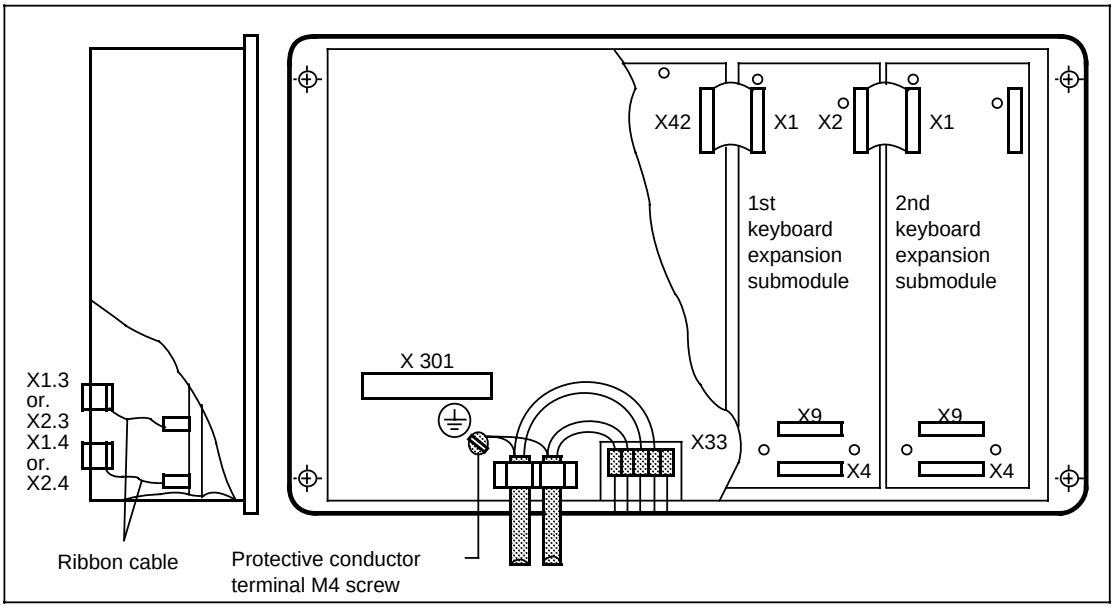
Pin assignments on 1st expansion submodule



Pin assignments on 2nd expansion submodule



Mounting instruction for keyboard expansion submodules



Operator keyboard, rear view

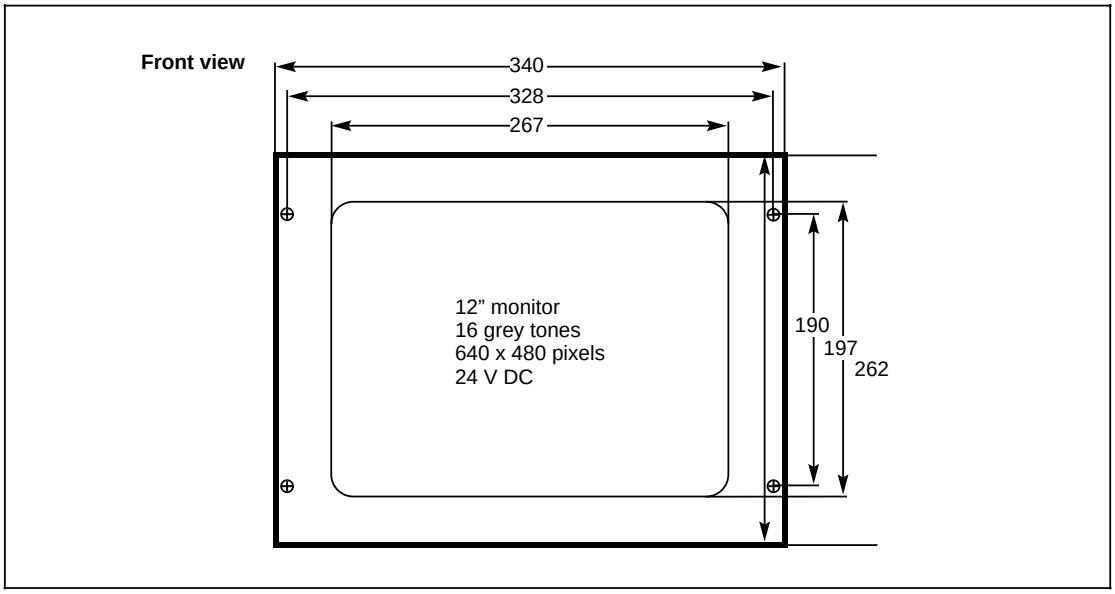
Notes:

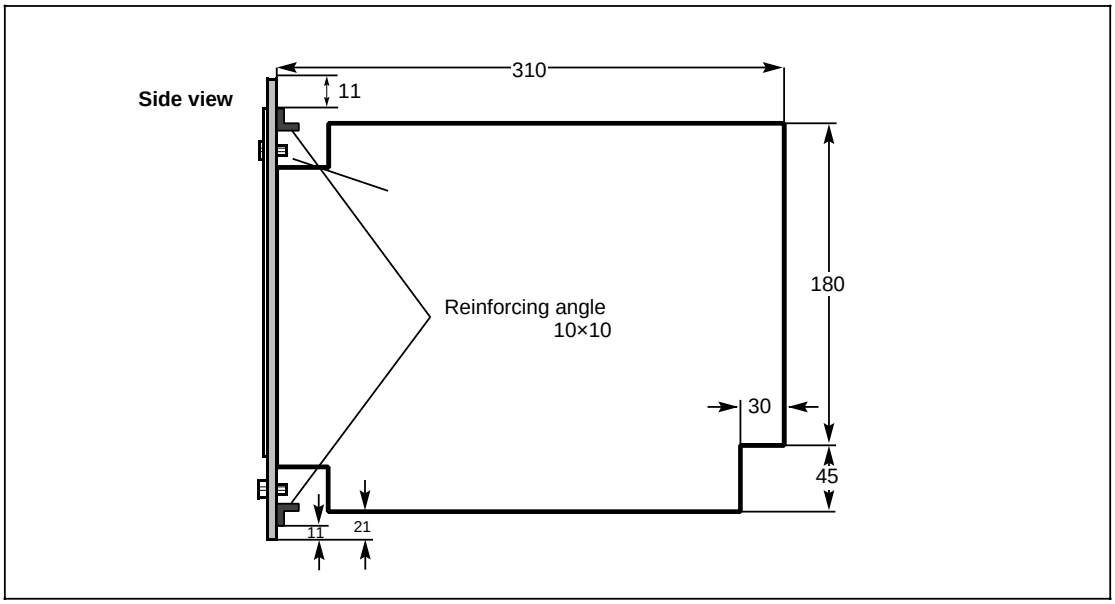
- Each keyboard expansion module has a fuse (medium 2A)
- Simultaneity factor within an output byte (in the case of 100 mA per output): 75 %

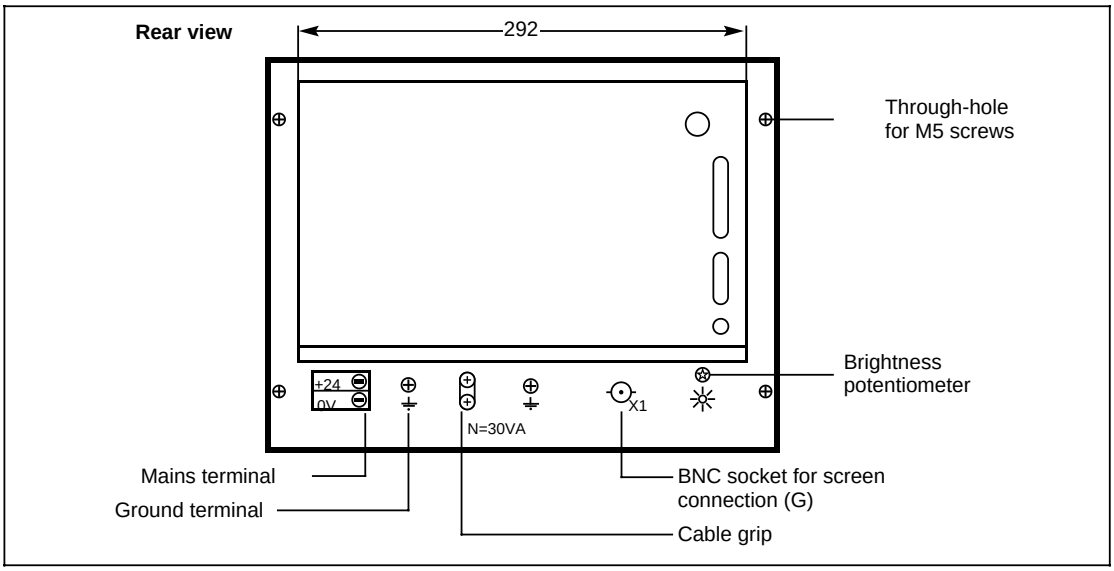
4.4 Monitors

4.4.1 Monochrome monitor

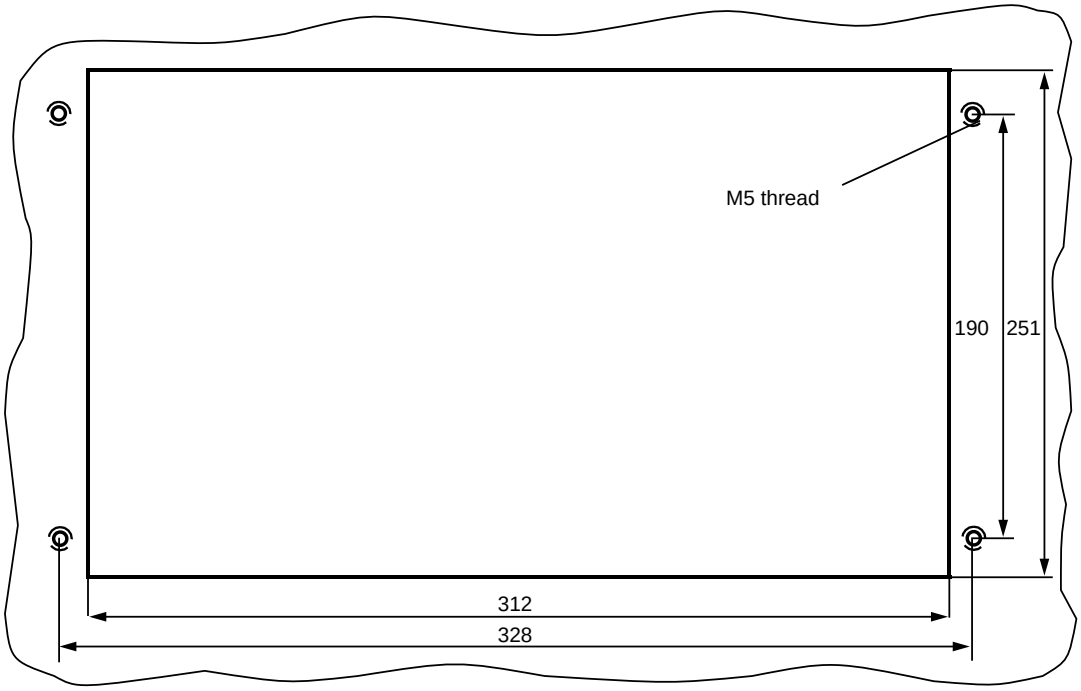
Order No.: 6FC4 600-1AR04
Module name: 6FC4 600-1AR04



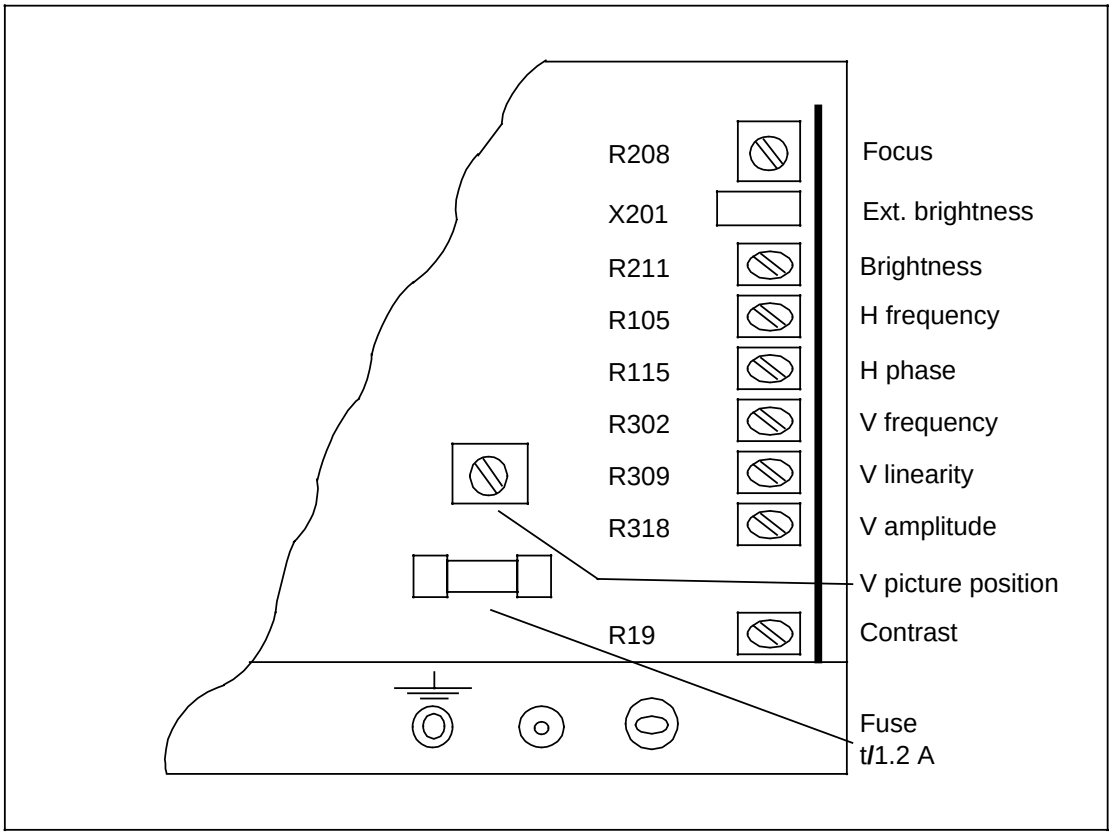




Panel mounting cutout



Rear view without cover:

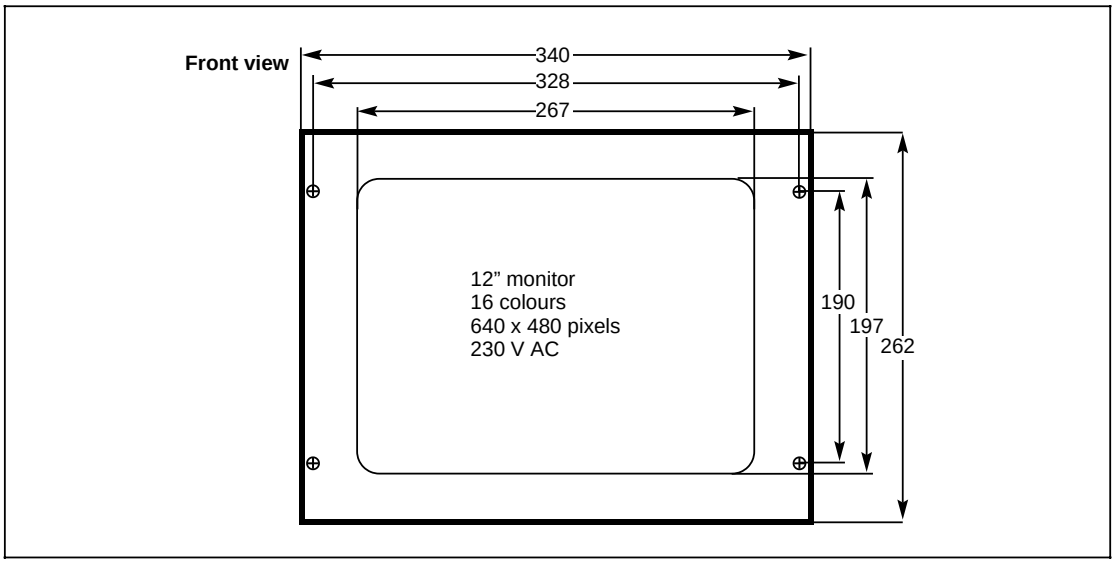


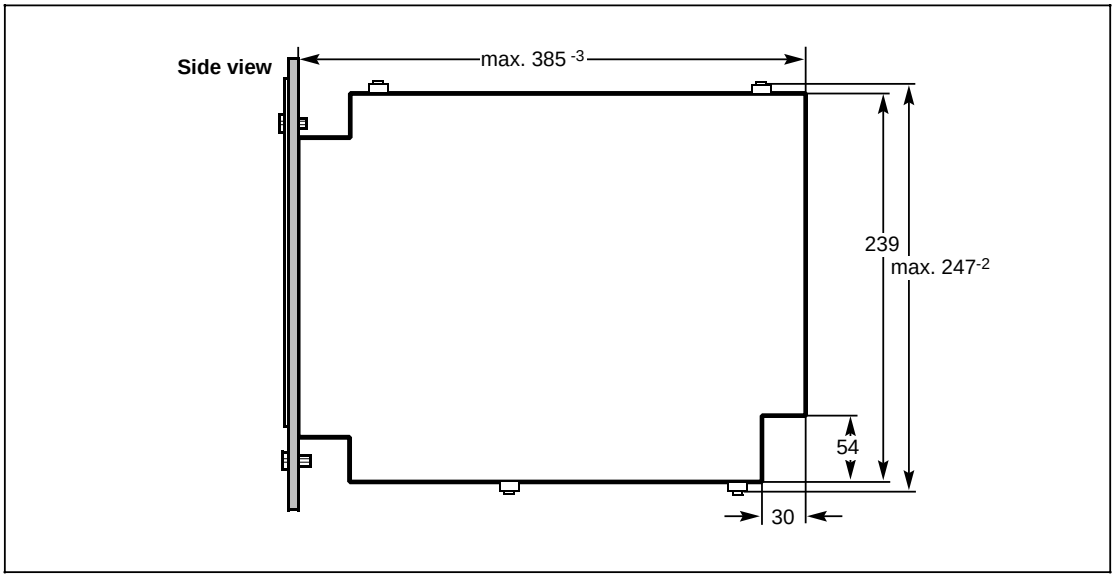
Note:

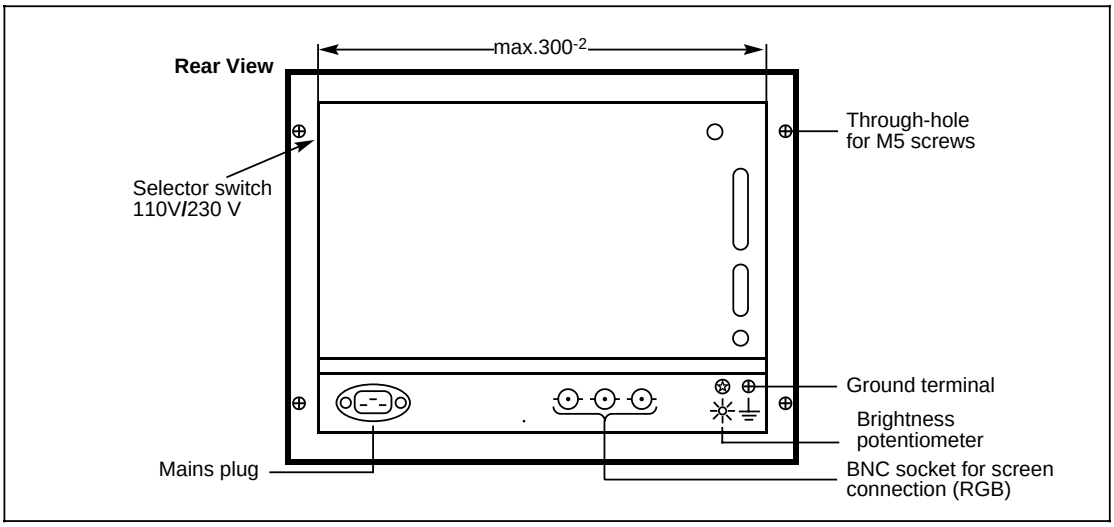
An additional fuse (2 A) is contained in the internal monitor power supply unit.

4.4.2 Colour monitor

Order No.: 6FC4 600-0AR50
Module name: 6FC4 600-0AR50

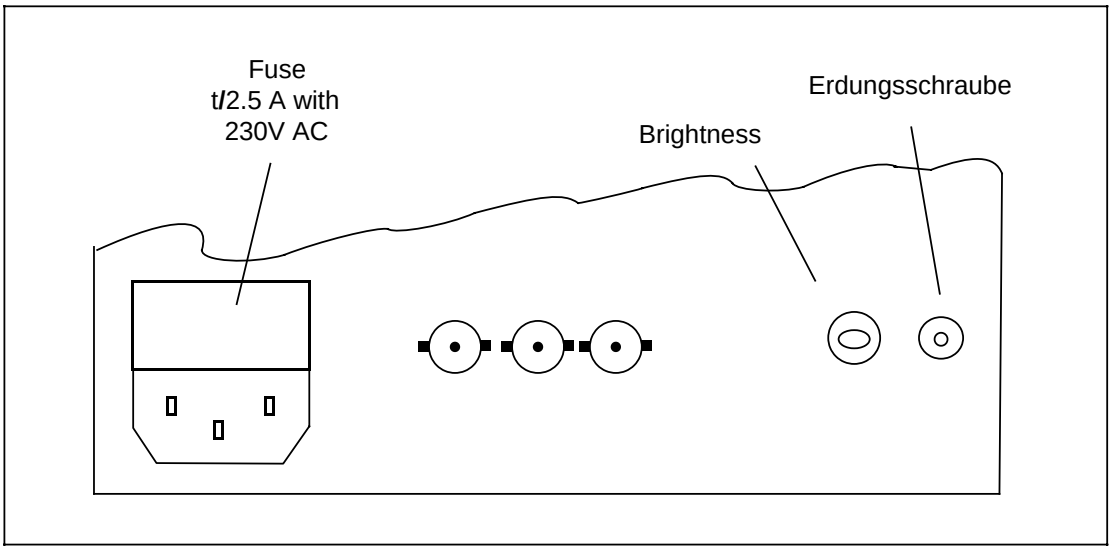






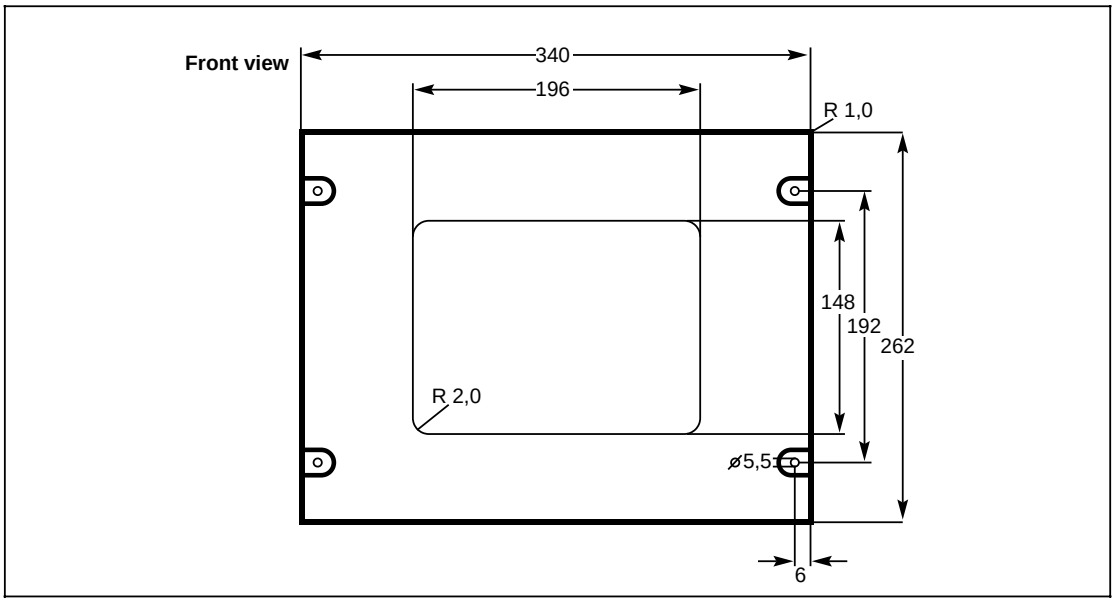
Installation cutout: see Section 4.4.1 Monochrome monitor

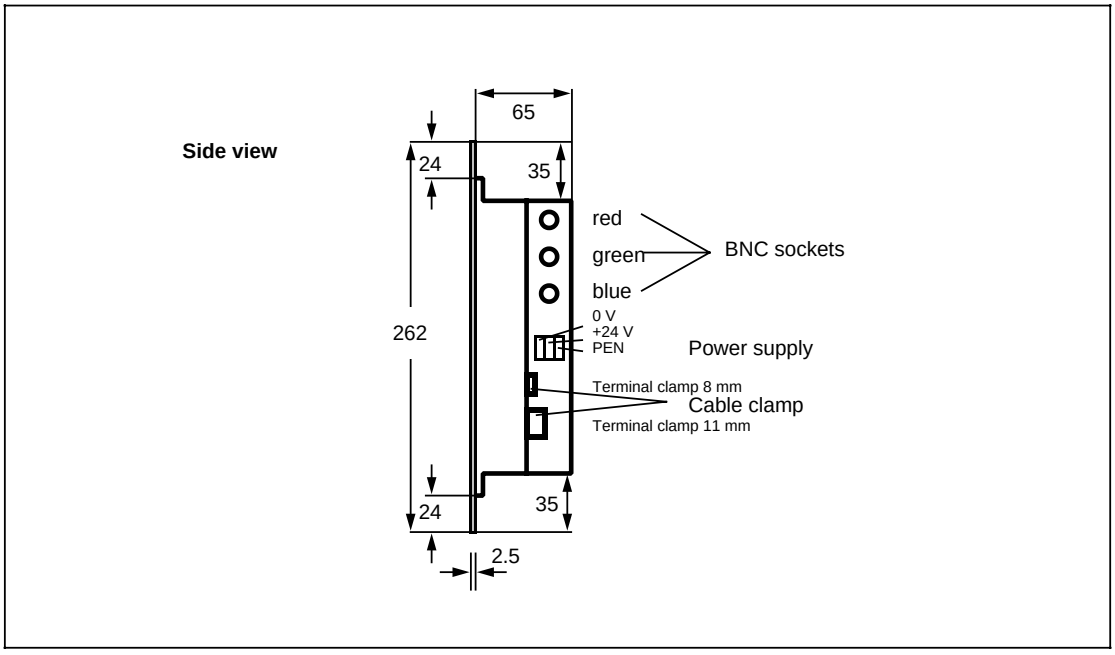
Rear view:
On the colour monitor, the potentiometers cannot be altered from outside. Only the brightness can be altered with the potentiometer below right.



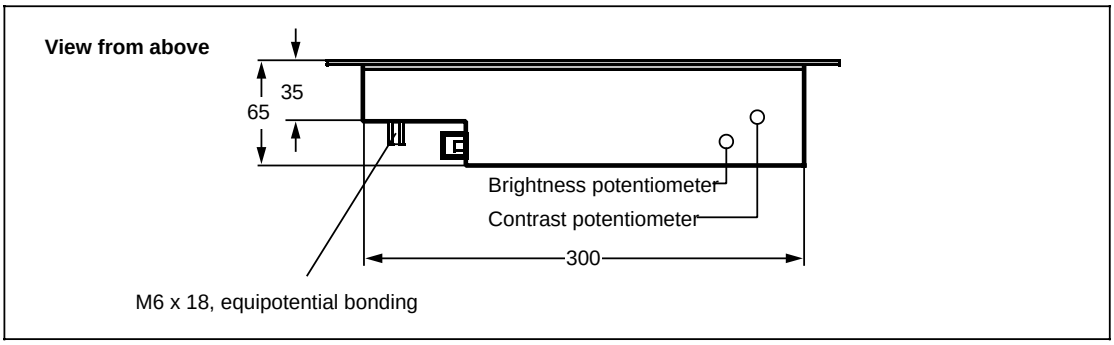
4.4.3 LCD flatscreen

Order No.: 6FC4 600-0AR42
Module name: 6FC4 600-0AR42





Order No. of required cable: 6FC9344-4N



Panel mounting cutout: See Section 4.4.1 Monochrome monitor.

Technical data

Power supply:	24 V DC
Power consumption:	120 mA, fused (500 mA F) in device
Temperature range:	0°C to+45°C during operation -25°C to+60°C during storage
Rel. humidity:	95% at 25°C, no condensation
Resolution:	640 x 480
Display size	9.7”; 8 grey scales
Viewing angle from	X (-20° ... +25°)
the perpendicular:	Y (-10° ... +25°)
Lifetime of back light:	approx. 5000 to 8000 hours

(can be replaced on shopfloor)

4.5 SINUMERIK slimline operator panel

4.5.1 SINUMERIK slimline operator panel, 19 ” subrack design, 10 ” monochrome display

The slimline operator panel can be used instead of the standard operator keyboard and monitor.

The slimline operator panel incorporates several function units:

- Full keyboard with NC special keys and soft key menus; additional connection option for an MF II keyboard
- Plasma flat-screen (monochrome)
- Integrated DMP submodule (64I/48Q) for connecting the associated machine control panel

For these function units 230V/50Hz must be connected as supply voltage from which all internal voltages are generated. The standard keyboard, monitor and DMP cables can be used as connector cables.

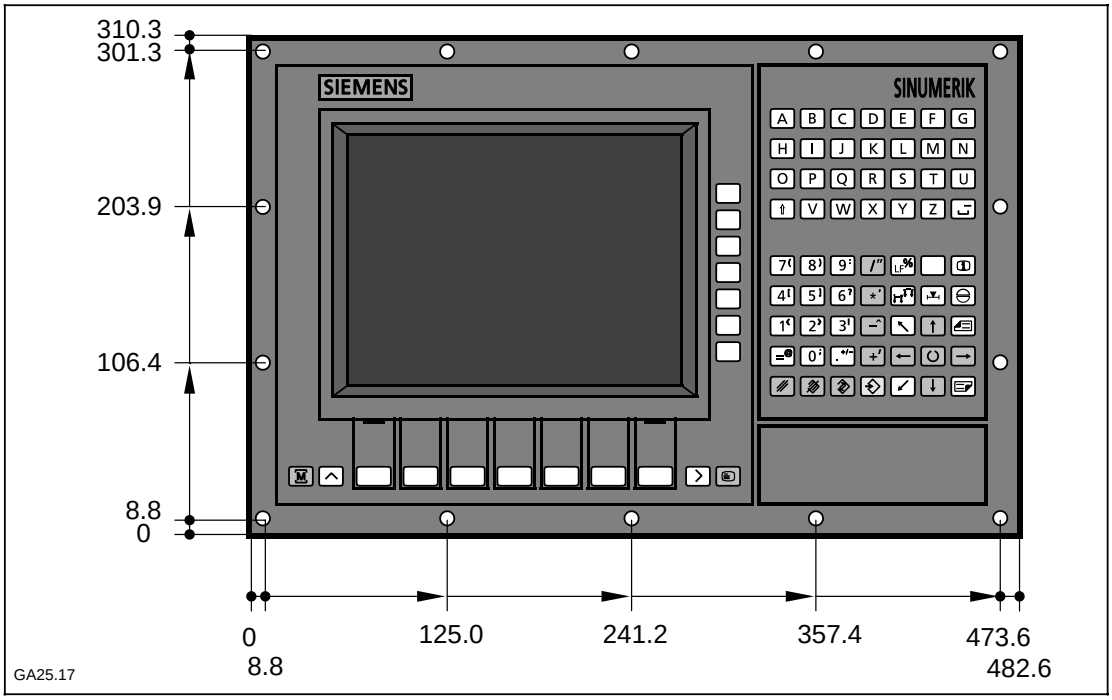
The integrated DMP submodule is provided with a connection option for 64 inputs and 48 outputs via ribbon cable connector for connecting the machine control panel of the slimline operator panel.
Characteristics of the integrated DMP submodule:

Inputs:	5 V, 10 mA
Outputs	5 V, 10 mA
	Simultaneity factor per byte 100%

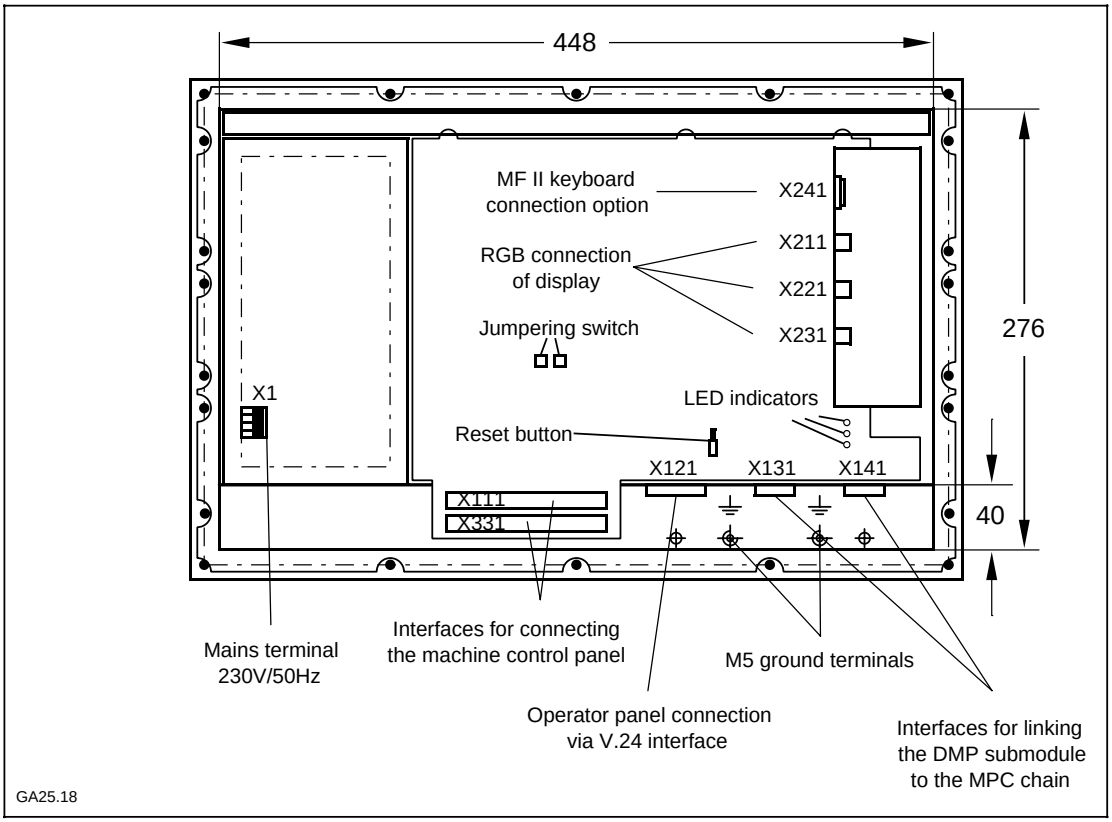
	**WARNING** The temperature range for storage/transportation is -20°C to +70°C, i.e. different from the data given in Section 2.1.3.2.

SINUMERIK slimline operator panel, 19” subrack design, 10” monochrome display
Order number: available soon
Module name:

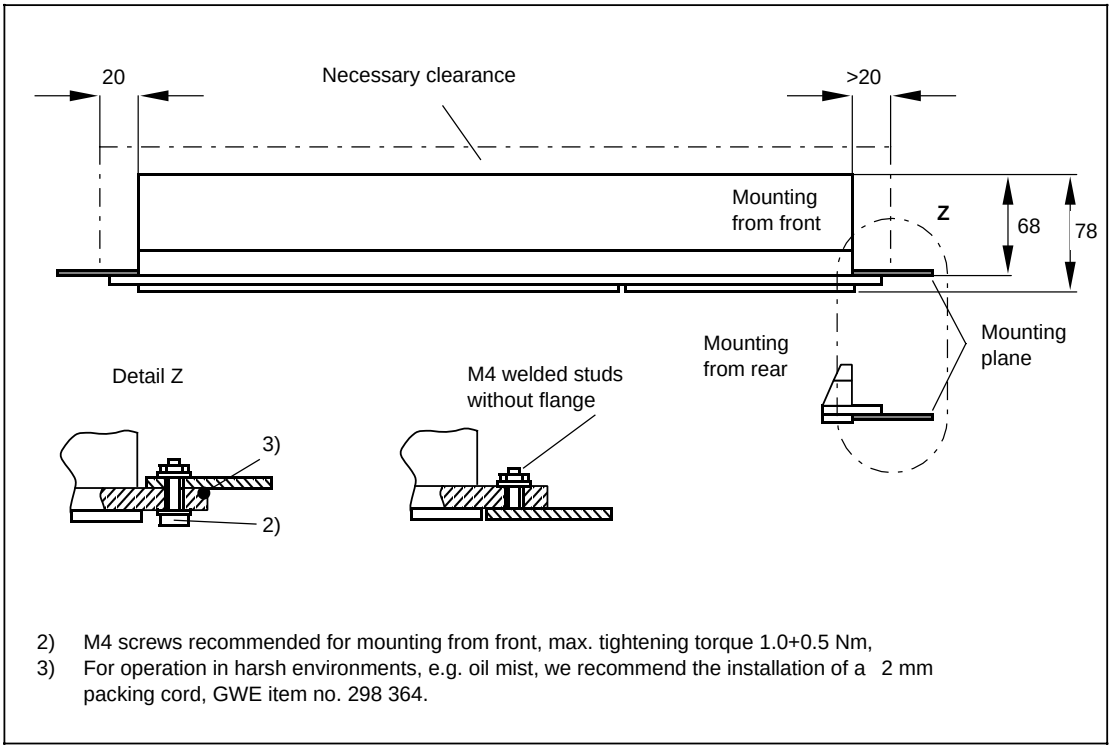
Front panel



Rear panel

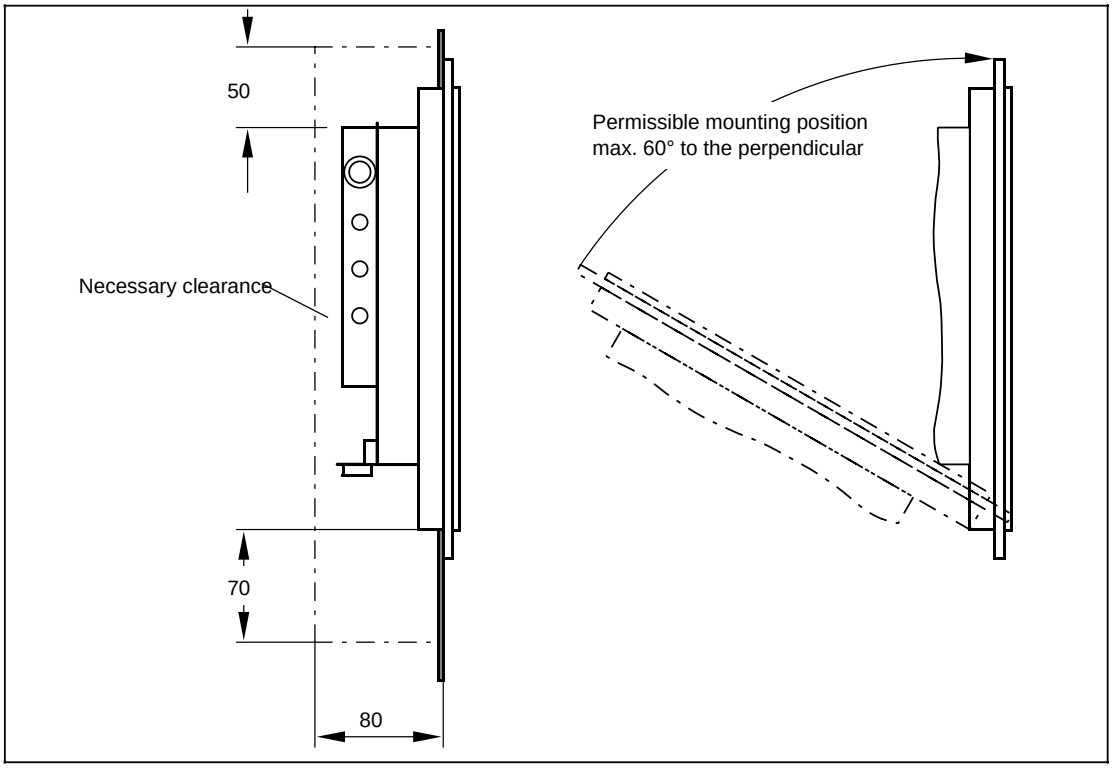


View from above

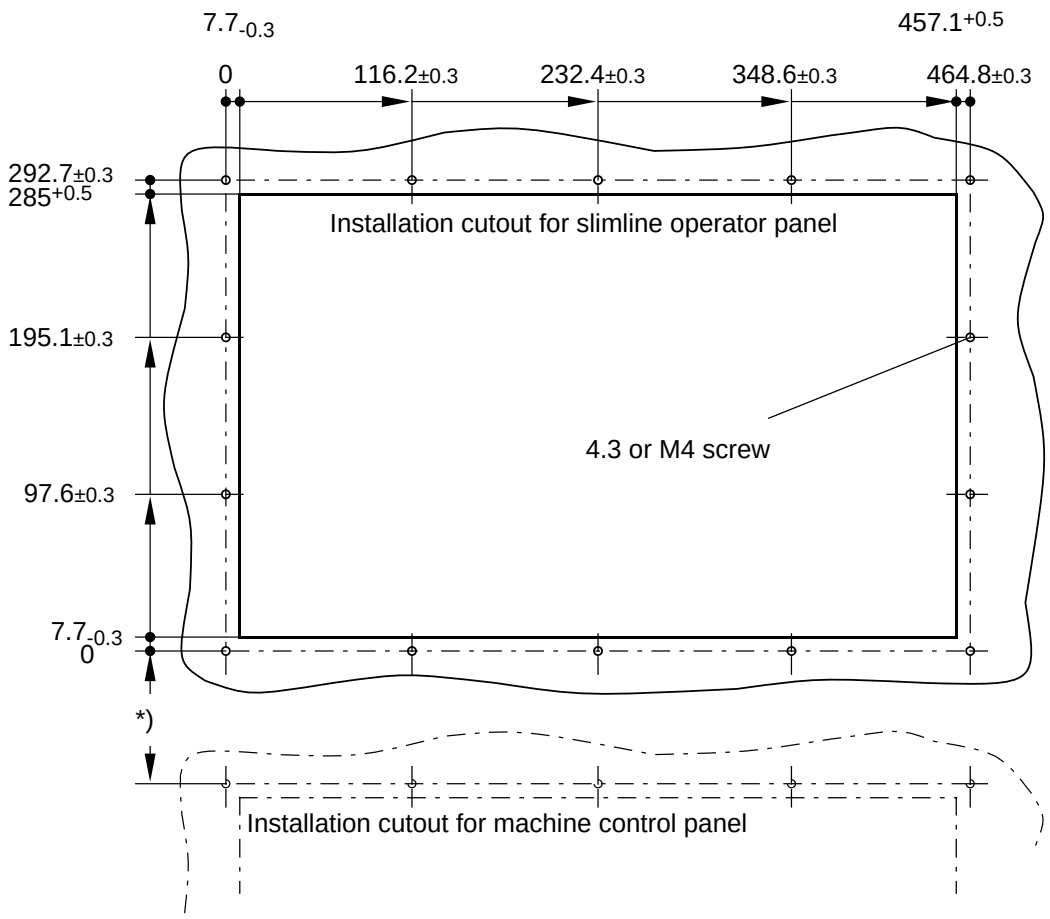


2) M4 screws recommended for mounting from front, max. tightening torque 1.0+0.5 Nm,
3) For operation in harsh environments, e.g. oil mist, we recommend the installation of a 2 mm packing cord, GWE item no. 298 364.

Side view



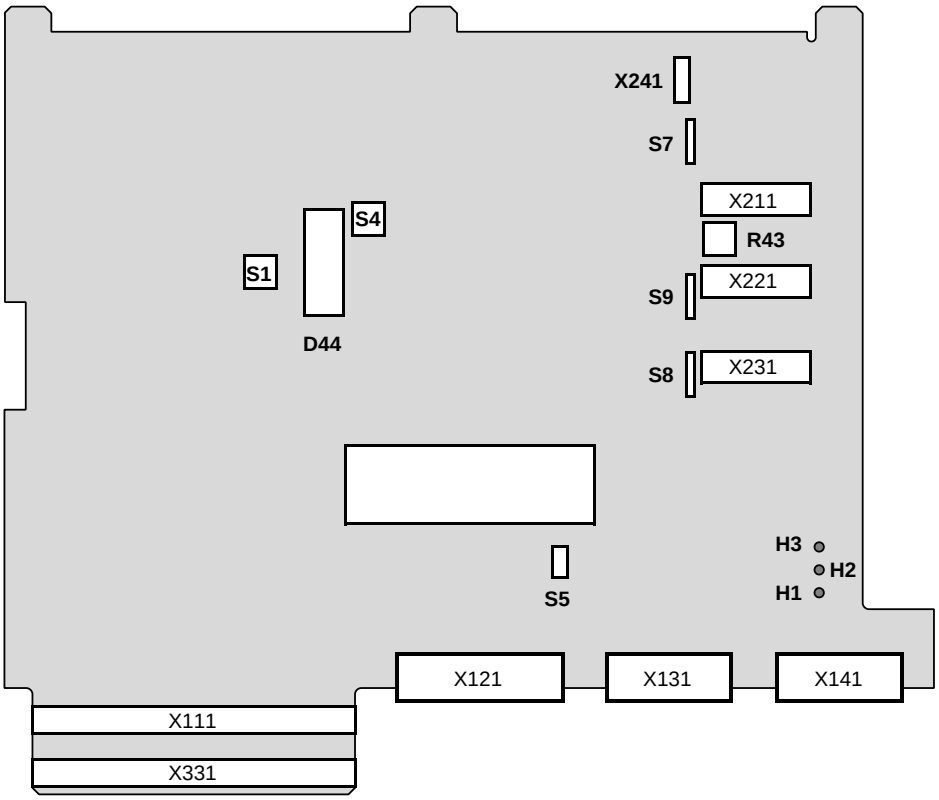
Installation cutout



*) Spacing between operator panel and machine control panel when mounted > 18

GA25.21

Position of interfaces, operator and display elements



Jumperings and operator elements:

Rotary switch S1: Selection of interface configuration, configuration version, video converter and firmware versions
always position 6 on SINUMERIK 805

Rotary switch S4: To select DMP station number; only numbers 2, 3, 4, 5 and 6 are possible.

Switch position S4	Station number
E	No. 14
D	No. 13
C	No. 12
. . .	. . .
2	No. 2
1	No. 1
0	No. 0

RESET key, S5: The operator panel electronics are reset when the RESET key is operated.

Jumpers S7, S8, S9: These jumpers must be closed. If the monitor signal is to be switched to additional monitors, the jumpers may only be connected to the last monitor.

Possible settings for grey scales, R43:

The potentiometer R43 for setting the grey scales is situated at the rear of the flatscreen.

WARNING

Parts carrying a voltage (230 V) are situated at the rear of the flatscreen.

Indicator elements of internal DMP module:

LED yellow, H2
LED goes out: Supply voltage less than 4.75V or RESET.

LED red, H3
LED lights up: MPC transfer error

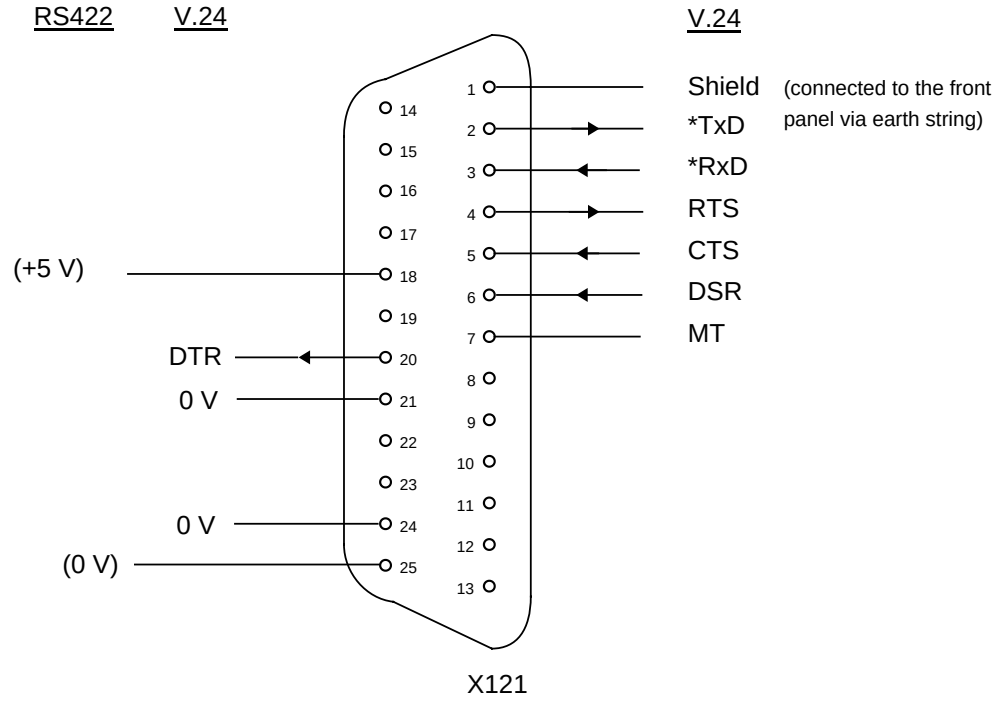
Keyboard indicator element:

LED green, H1
LED goes out: Incorrect program run of microcontroller (watch-dog responded).

Operator panel connection X121

The operator panel connection is designed as a serial interface according to standard specification RS232 and serves for transmitting the keyboard signals to the NC.

Connection: 25-way Sub-D socket connector



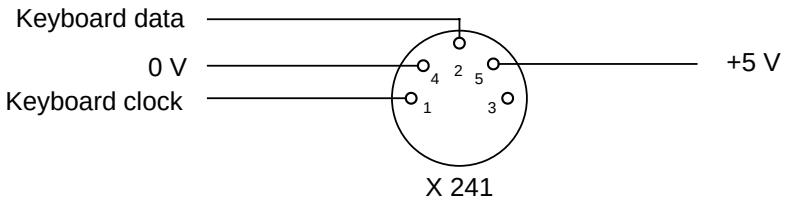
Note:

For use as an RS422 interface, an RS422 adapter (order No.: 6FX1 137-2BA00) is plugged directly on connector X 121.

MFII keyboard connection

It is possible to connect an additional MFII keyboard (AT keyboard) to the flat operator panel via the X241 interface.

Connection: 5-way DIN socket



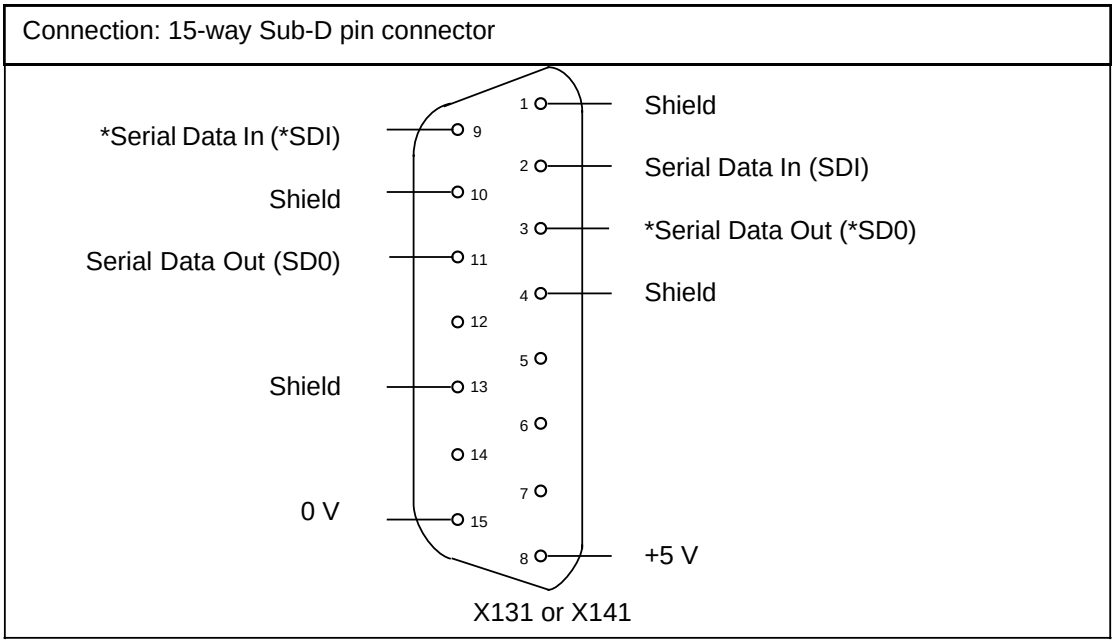
Monitor connection

The monitor connection is designed as an RGB analog video interface.

Connector designations:	X211 RED
	X221 GREEN/”composite video (BAS)”
	X231 BLUE
Connector type:	BNC sockets

MPC link of internal DMP submodule

The internal DMP submodule (machine control panel DMP) is introduced into the MPC chain via the X131 and X141 interfaces.

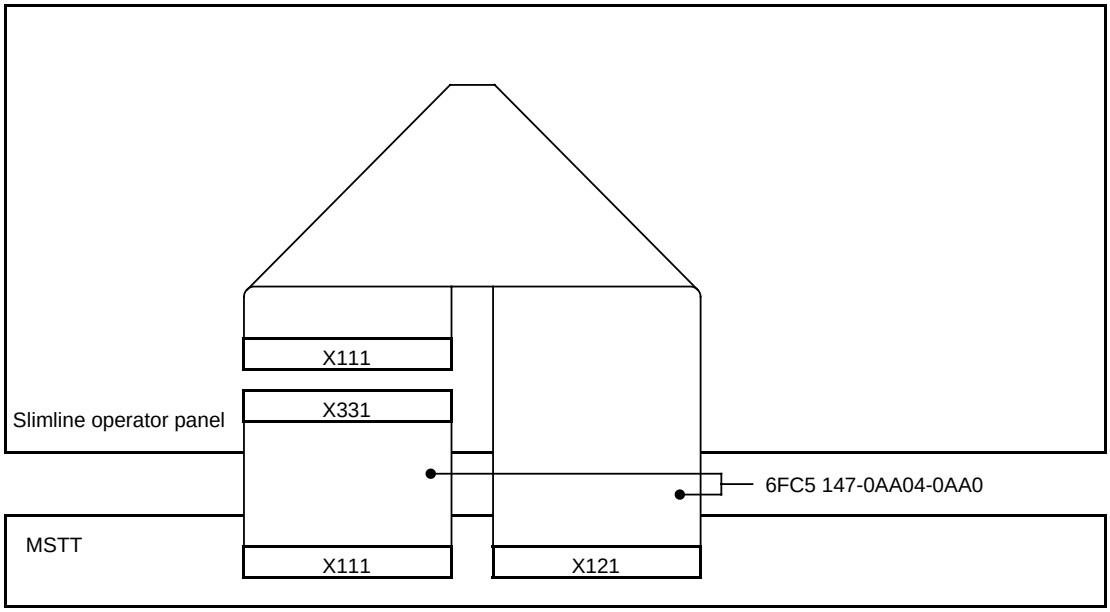


The interfaces are designed according to standard specification RS485 and are floating via optocoupler.

Connection of machine control panel to the integrated DMP submodule

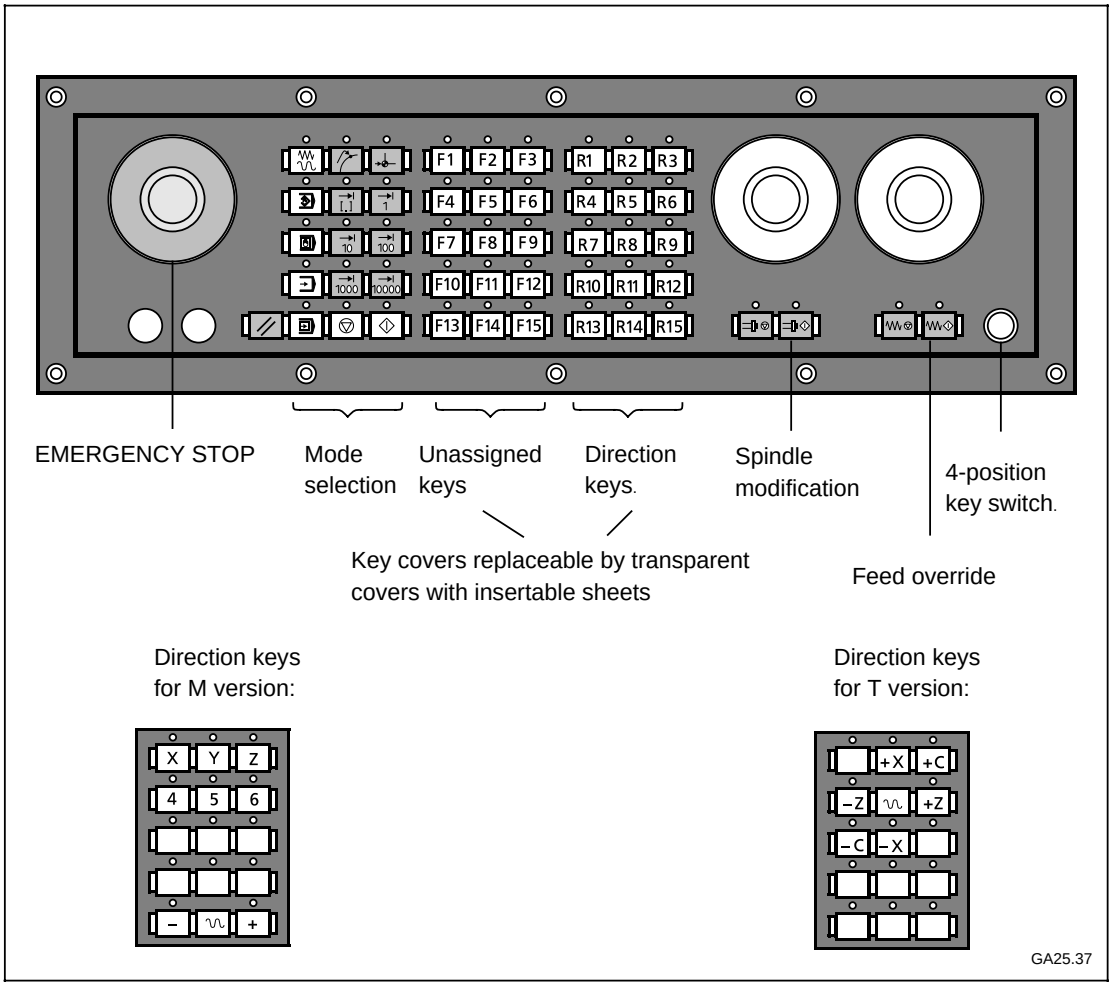
The machine control panel is connected to interfaces X111 and X331 of the slimline operator panel integrated in the DMP submodule using the enclosed ribbon cables.

Connector type: X111 and X331 64-way ribbon cable connector (DIN 41651)



4.5.2 Machine control panel for SINUMERIK slimline operator panel

The machine control panel consists of a front panel to which a keyboard with keys, LEDs and switches is attached. This machine control panel can be connected to the integrated DMP submodule (machine control panel DMP) of the slimline operator panel using the enclosed ribbon cables.



The keyswitch used is an authorization keyswitch with 4 possible withdrawal positions.

Position 0: Normal position, otherwise as for position 1

Position 1: Withdrawal position obtained with black, green and red key

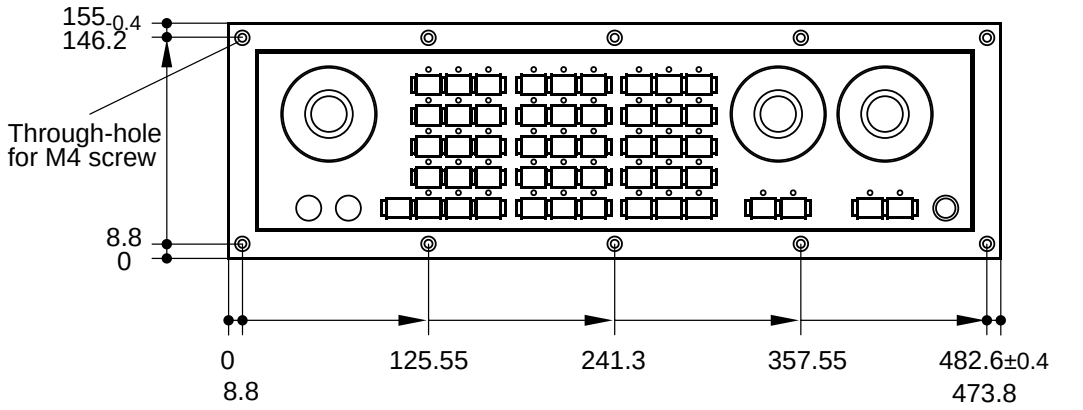
Position 2: Withdrawal position obtained with green and red key

Position 3: Withdrawal position obtained with red key

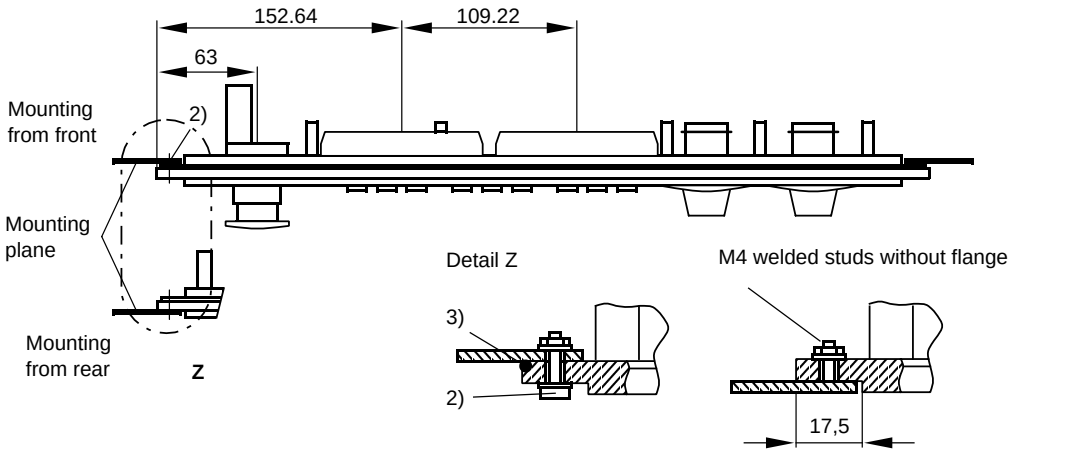
All keys, switches and LEDs are shown only as standard input/outputs in the I/O section of the PLC. It is up to the manufacturer to make provisions for implementation of the relevant key functions etc. in his PLC program.
The keys/LEDs are assigned to the input/output bytes using rotary switch S4 on the slimline operator panel. The PLC MDs 10 to 19 then refer to the switch position set.

Order No.: 6FC5 103-0AD03-0AA0 (M-Version)
6FC5 103-0AD01-0AA0 (T-Version)

Front view

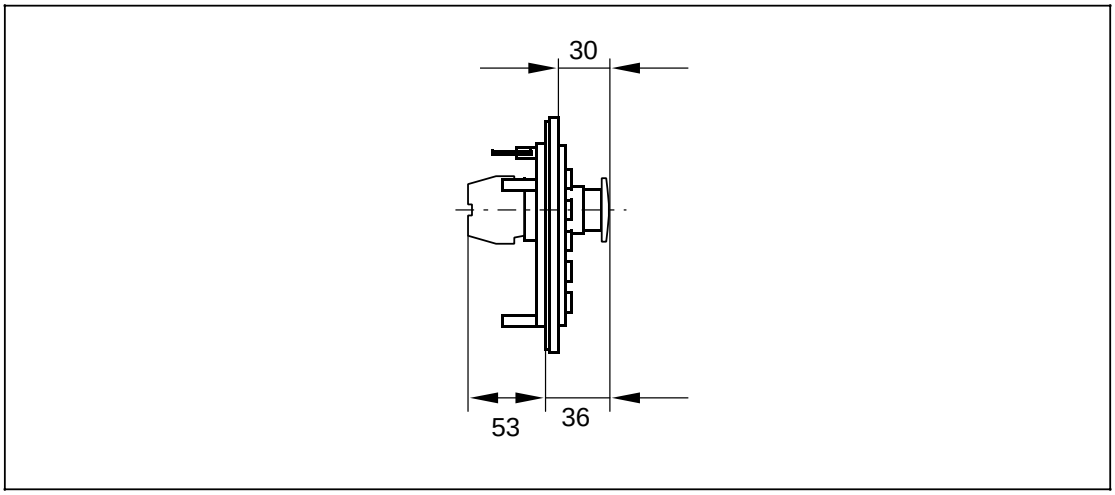


View from above

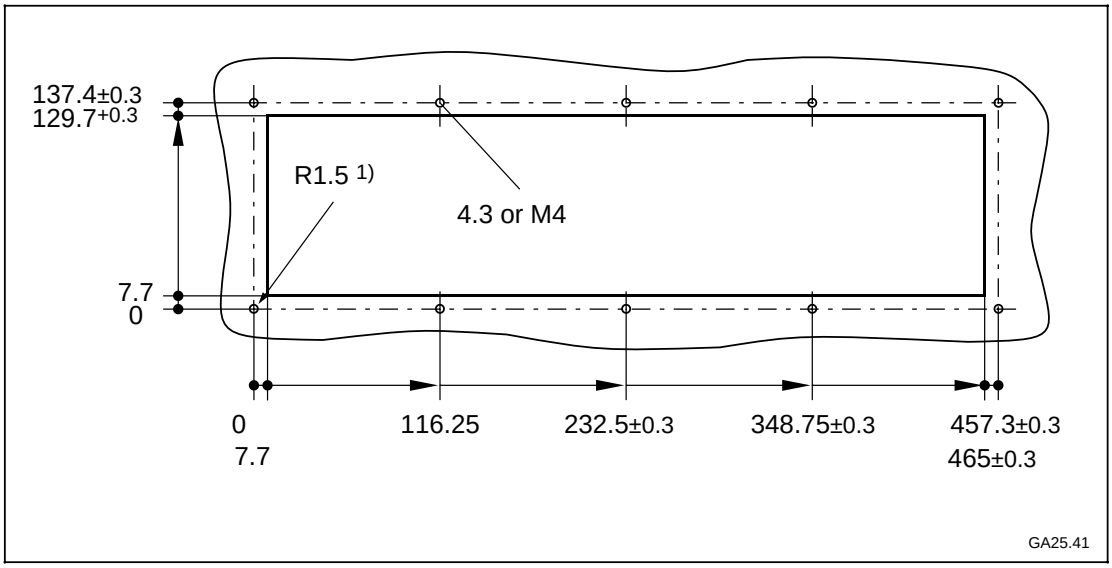


2) M4 screws recommended for mounting from front, max. tightening torque 1.0+0.5 Nm,
3) For operation in harsh environments, e.g. oil mist, we recommend the installation of a 2 mm packing cord, GWE item no. 298 364.

Side view



Installation cutout



Input assignments

Machine control panel basic key group

Byte No.	Bit No. 7	6	5	4	3	2	1	0
IB m	Spindle override D	C	B	A	JOG key	TEACH IN key	MDA key	AUT key
IB m +1	REPOS key	REF key	VAR	10 000	1 000	100	10	1
IB m +2	Keyswitch position 0	Keyswitch position 2	Spindle Start	Spindle * Hold	Feed Start	Feed * Hold	NC Start	* NC Stop
IB m +3	Reset	Keyswitch position 1	Single block	Feed/rapid override E	D	C	B	A

Machine control panel axis key group

Byte-No.	Bit No. 7	6	5	4	3	2	1	0
IB m +4	R15 key	R13 key	R14 key	Keyswitch position 3	R1 key	R4 key	R7 key	R10 key
IB m +5	R2 key	R3 key	R5 key	R12 key	R11 key	R9 key	R8 key	R6 key

m = 1st used input byte of machine control panel DMP submodule (PLC MDs 10 to 19)

Machine control panel customer key group								
Byte No.	**Bit No.**							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
IB m +6	F9 key	F10 key	F11 key	F12 key	F13 key	F14 key	F15 key	
IB m +7	F1 key	F2 key	F3 key	F4 key	F5 key	F6 key	F7 key	F8 key

Output assignments

Machine control panel basic key group								
Byte No.	**Bit No.**							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
QB n					LED JOG	LED TEACH IN	LED MDA	LED AUT
QB n +1	LED REPOS	LED REF	LED VAR	LED 10 000	LED 1 000	LED 100	LED 10	LED 1
QB n +2			LED Spindle start	LED Spindle stop	LED Feed start	LED Feed hold	LED NC Start	LED NC Stop
QB n +3			LED Single block					

Machine control panel axis key group								
Byte No.	Bit No. 7	6	5	4	3	2	1	0
QB n +4	R15 LED	R13 LED			R1 LED	R4 LED	R7 LED	R10 LED
QB n +5	R2 LED	R3 LED	R5 LED	R12 LED	R11 LED	R9 LED	R8 LED	R6 LED

Machine control panel customer key group								
Byte No.	Bit No. 7	6	5	4	3	2	1	0
QB n +6	F9 LED	F10 LED	F11 LED	F12 LED	F13 LED	F14 LED	F15 LED	
QB n +7	F1 LED	F2 LED	F3 LED	LEDF4	F5 LED	F6 LED	F7 LED	F8 LED

n= 1st used output byte of machine control panel DMP submodule (PLC MDs 10 to 19)

4.6 Distributed Machine I/Os (DMP)

DMP is a range of devices enabling I/O devices (e.g. digital input and output modules) to be used in different places on the machine. Distributed configuration means that the the SINUMERIK 805 control and the input/output points at the process level may be far apart. Those distances can be covered by a serial bus (four-wire cable).

Distributed machine I/Os can be connected both optionally or additionally to the inputs/outputs in the central controller (central I/O devices). Like central I/O devices, inputs/outputs of the DMP can be accessed via the PLC program.

The DMP stations must be connected to the MPC interface of the central controller (see Section 1.4.1 Connection options to distributed peripherals).

A station number (≙ user address) must be assigned to each of the individual DMP stations using a rotary switch. The following station numbers can be used: 2, 3, 4, 5 and 6.

PLC MDs 10 - 19, in which the DMP stations are assigned their specific 1st input byte and 1st output byte, refer to the station numbers.

The DMP stations consist of the module and the terminal block onto which the module is plugged. Exception: The integrated DMP module of the slimline operator panel is part of the slimline operator panel.

The following DMP modules can be connected:

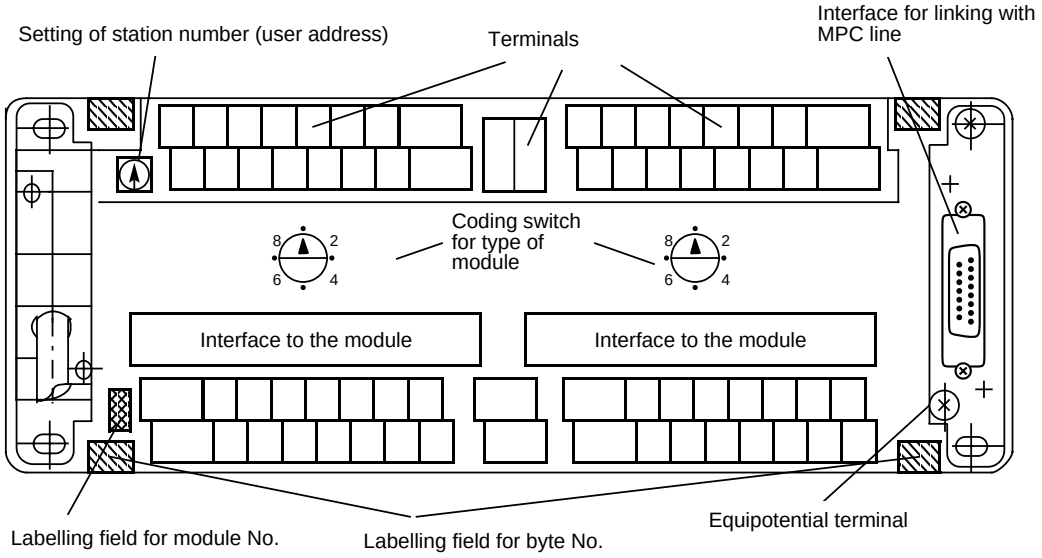
- DMP module 16I**/**16Q
- DMP module 32I
- Integrated DMP module for slimline operator panel (64I/48Q) for the machine control panel (SW 4.2 and higher)
- DMP compact module (16I, 16Q, 8Q), (SW 4.2 and higher)
- DMP IP65 module (8I/8Q or 32I), (SW 4.2 and higher)

4.6.1 DMP station (16I/16Q or 32I)

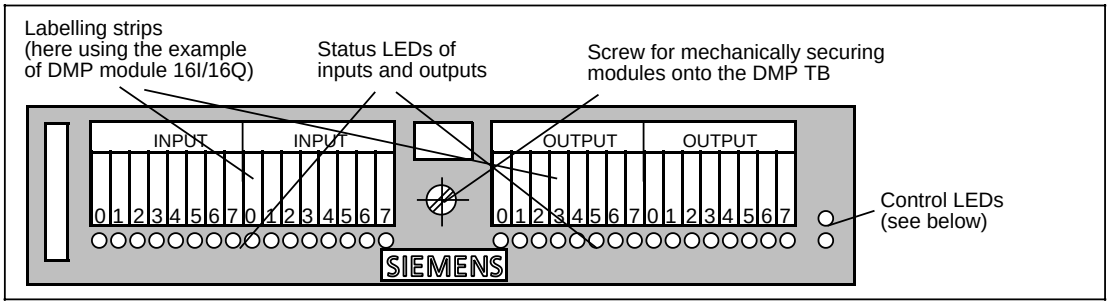
The DMP module must be plugged onto a DMP terminal block (DMP TB) which incorporates the necessary terminals. The significance and the jumpers of the terminals on the DMP terminal block alter depending on the module that has been plugged onto the DMP terminal block.

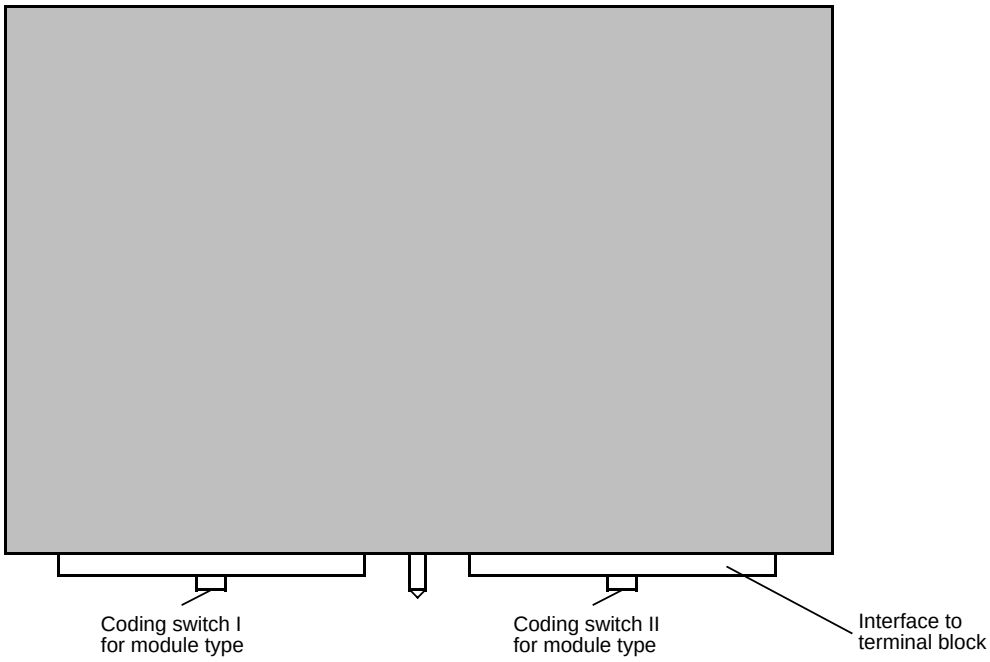
DMP terminal block

(6FX1 142-1BA01 for floating modules,
6FX1 142-1BA00 for non-floating modules)



DMP module 16I/16Q (6FX1 142-4BA), DMP module 32I (6FX1 142-2BA)





Coding switch	Coding switch	Module type
1	6	16I/16Q to 6FX1 142-4BA02
1	7	16I/16Q from 6FX1 142-4BA04 *)
3	2	32I to 6FX1 142-2BA01
1	8	32I from 6FX1 142-2BA02 *)

*) with electrically isolated inputs/outputs

The coding switches for the type of module can only be set on the terminal block to agree with the module that has been plugged in. It is **not** possible to alter the switch position on the modules.

An electrically isolated module must not be plugged onto an old terminal block (6FX1 142-1BA00, for modules which are not electrically isolated) if the station is the last in the MPC line, i.e. a DMP terminator must be plugged into it.

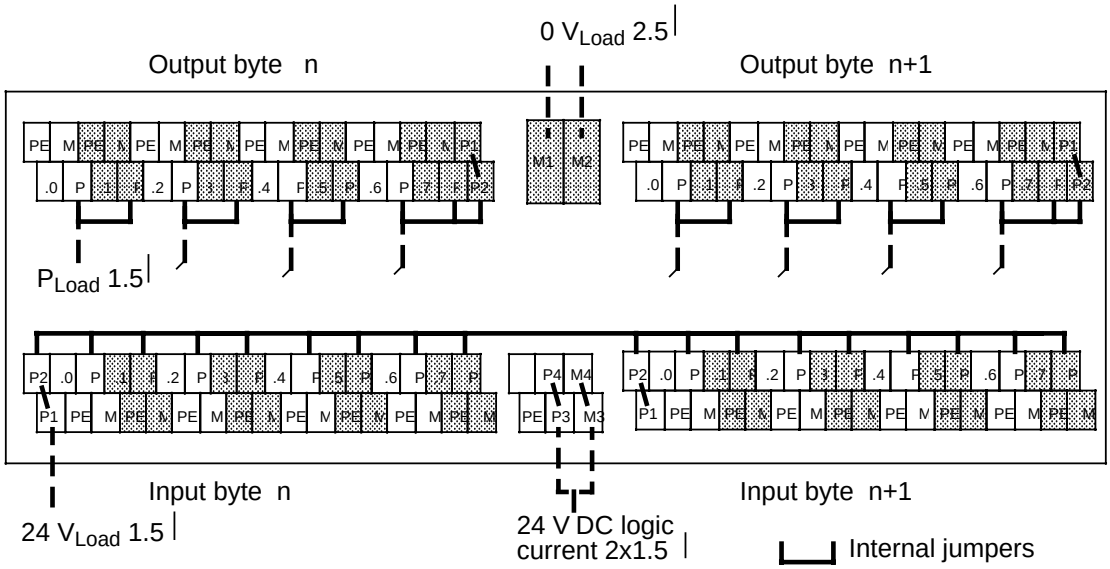
Meaning of check LEDs:

Red LED lights up:
- The 24V electronics power supply has dropped below 15V
- Transmission error

Yellow LED lights up:
- The 5V logic supply voltage generated from the 24V electronics supply voltage is within the tolerance range (4.75V ... 5V)

DMP submodule 16I/16Q (6FX1 142-4BA0)

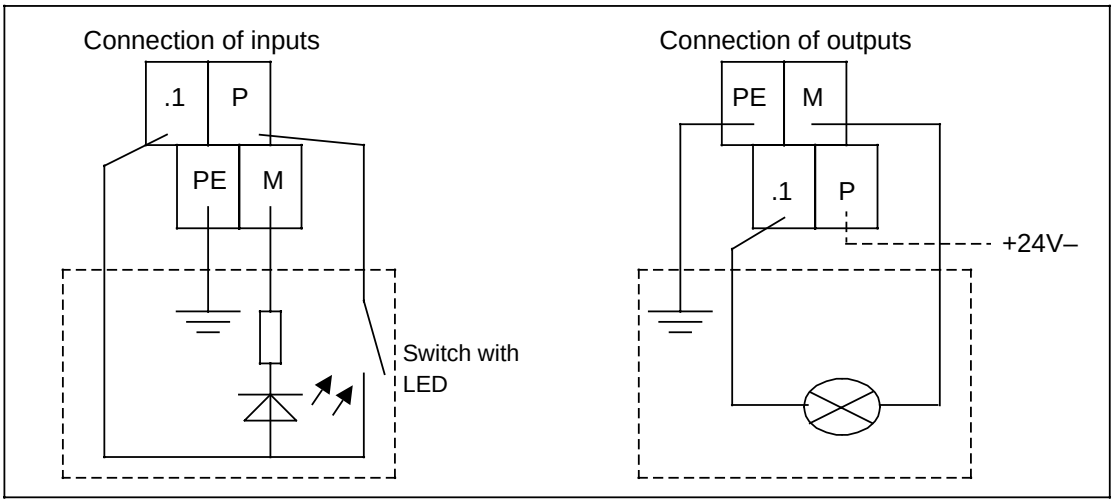
The following terminals are internally connected via jumpers:
all PE terminals,
all M1, M2, M terminals,
all other jumpers are shown in the diagram.



This DMP module requires two power supplies:
A 24V DC logic power supply and a 24V DC load current supply.

The 24V/0V logic power supply is connected to P3 (P4) and M3 (M4).

The 0V potential for the load current supply for inputs/outputs must be connected to M1 (M2) and is thus applied to all M terminals via the internal jumpers of the DMP carrier module. For the two input bytes, the +24V (load current supply) needs to be connected only once to P1 (P2). The +24V potential is thus supplied to all P terminals of the input bytes via internal jumpers of the DMP module.
The P terminals of the output bytes are arranged in pairs by means of jumpers in the DMP module. The +24 (load current supply) must thus be connected only to every second terminal.

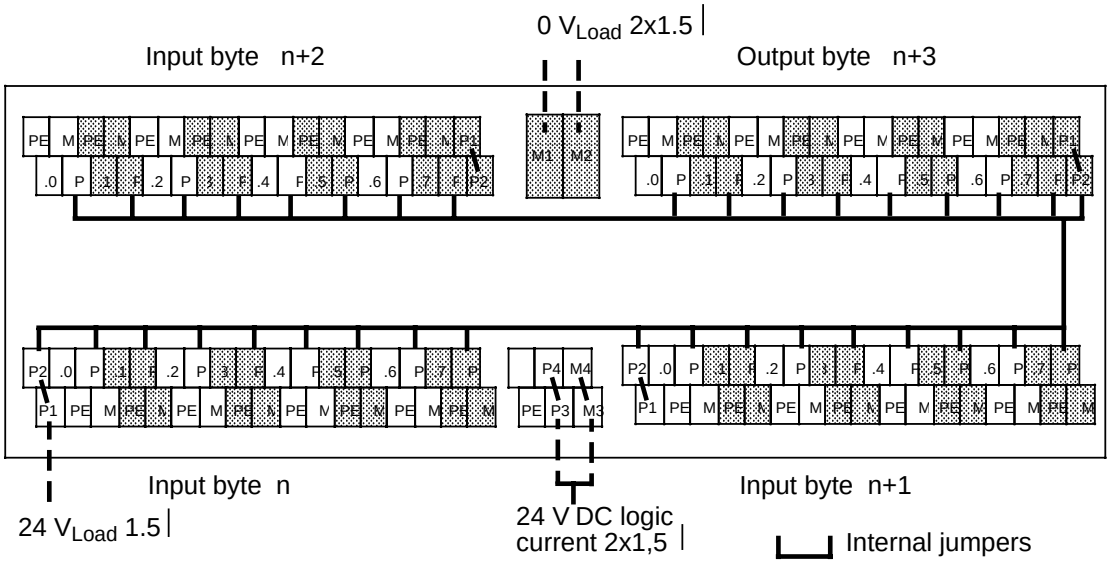


Connections of inputs and outputs

Technical data:
Inputs: +24V, 10 mA; H level > 13 V, L level < 5 V
Outputs: +24V, 2 A short-circuit proof, simultaneity factor per byte: 0.5

DMP submodule 32E, M34 (6FX1 142-2BA0)

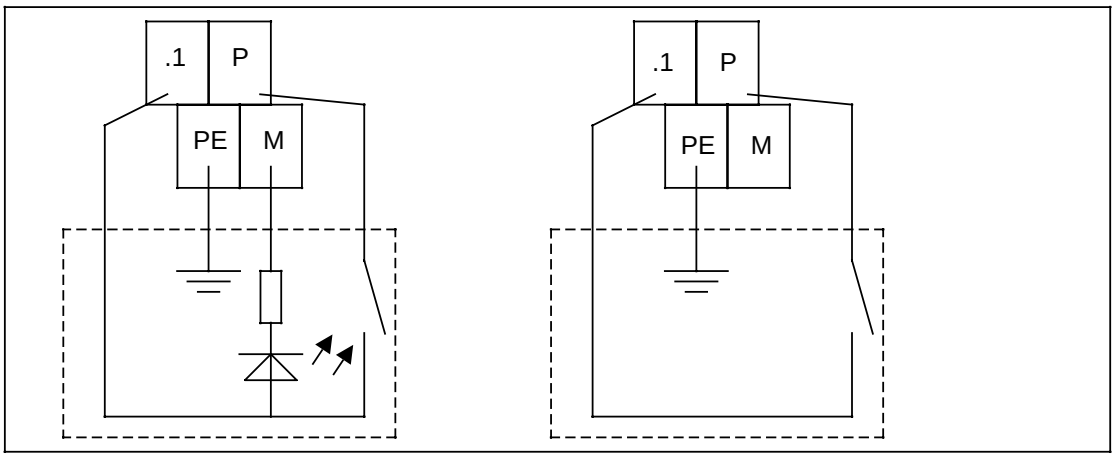
The following terminals are internally connected to one another via jumpers:
All PE terminals
all M1, M2, M terminals
all other jumpers are shown in the diagram.



The DMP module requires two power supplies:
A 24V DC logic power supply and a 24V DC load current supply.

The 24V/0V logic power supply is connected to P3 (P4) and M3 (M4).

The 0V potential for the load current supply of the inputs must be connected to M1 (M2) and is thus applied to all M terminals via the internal jumpers of the DMP carrier module. For all input bytes, the +24V load current supply needs to be connected only once to P1 (P2). The +24V potential is thus applied to all P terminals of the input bytes via internal jumpers on the DMP module.

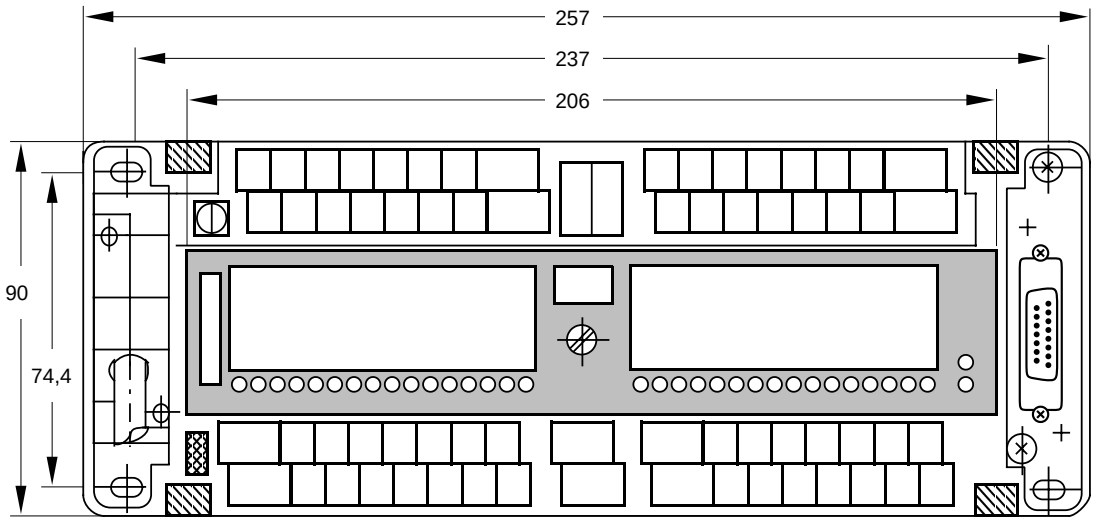


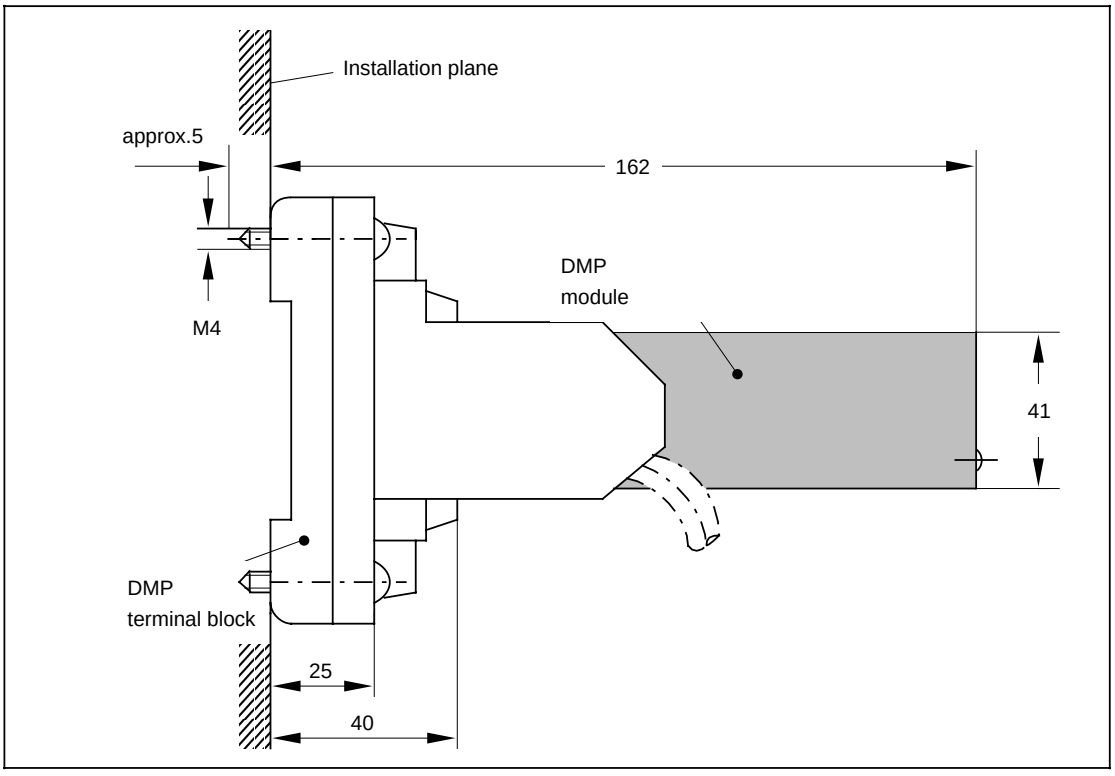
Input connections

Technical data:
Inputs: +24 V, 10 mA; H level > 13 V, L level < 5 V

Size and mounting dimensions of the complete DMP station

(Terminal block with plugged module)
The dimensions shown apply to both DMP modules.





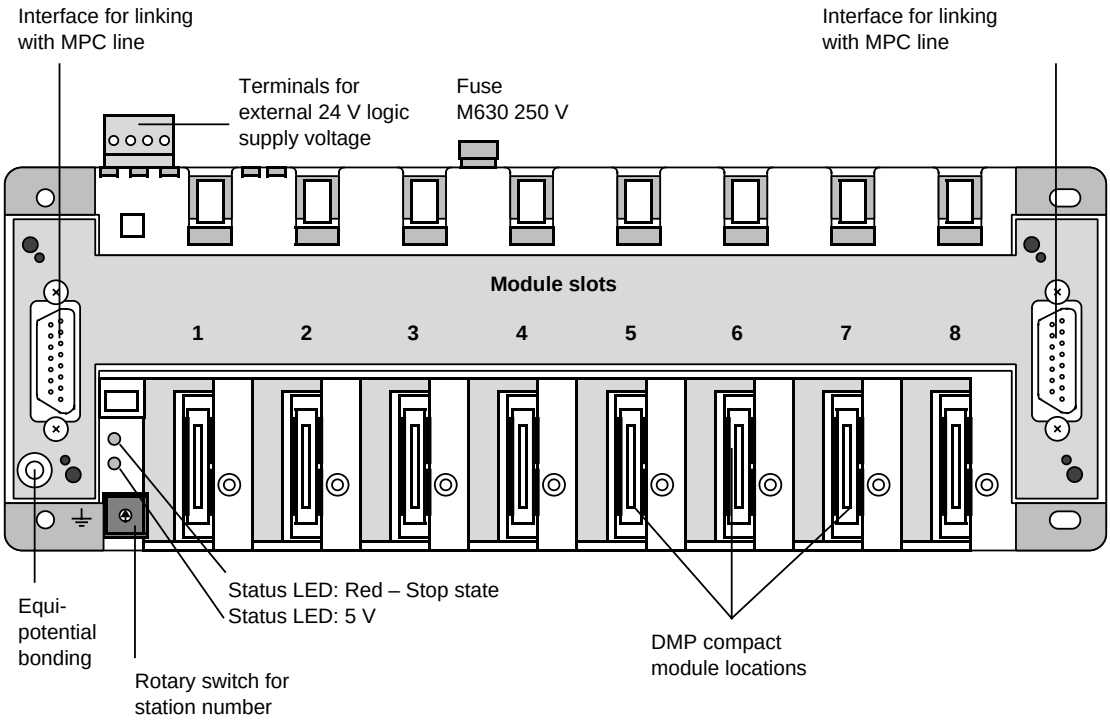
4.6.2 Machine control panel DMP module 64I/48Q for SINUMERIK slimline operator panel

This DMP module is integrated in the SINUMERIK slimline operator panel. See Section 4.5 ”SINUMERIK Slimline Operator Panel, 19” Subrack Design, 10” Monochrome Display” for more details on the DMP module and the associated machine control panel.

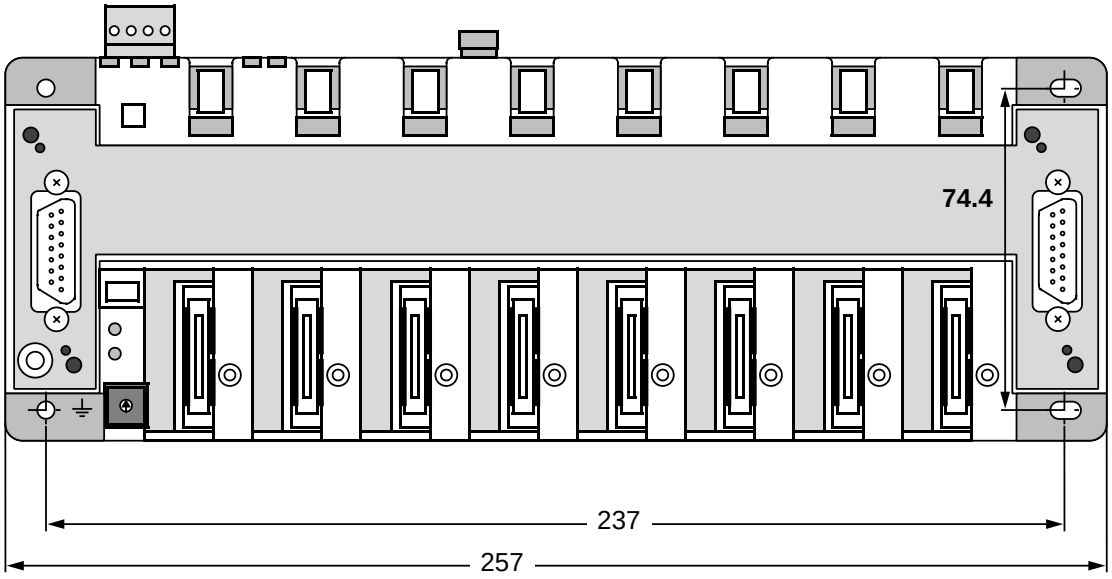
4.6.3 DMP compact station

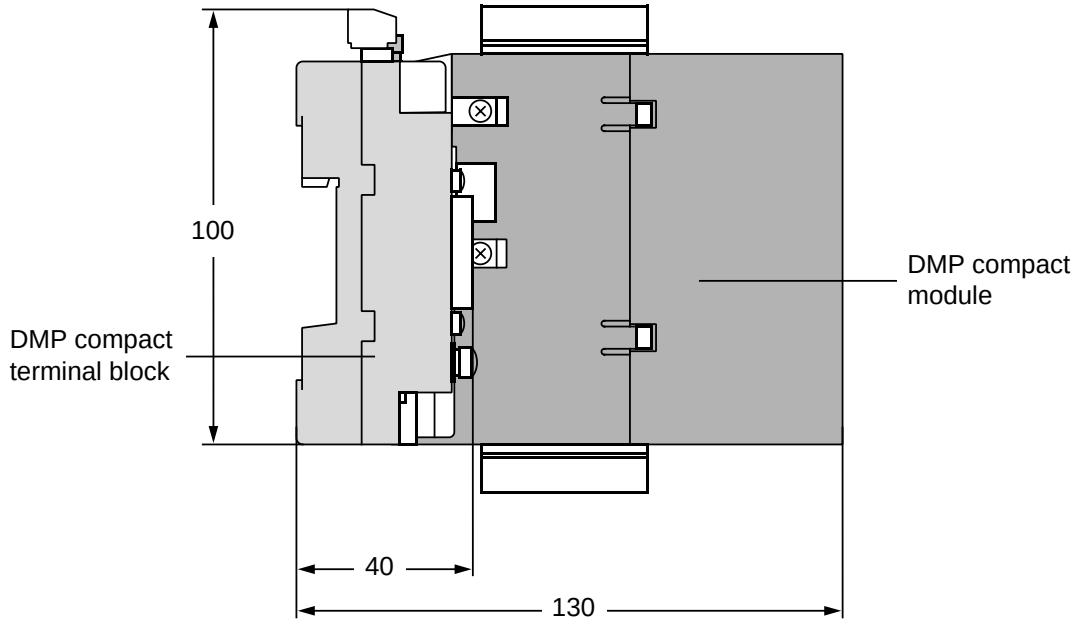
4.6.3.1 DMP compact terminal block 6FC5 111-0CA73-1AA0

The DMP compact terminal block is used as a terminal block for the DMP compact modules (16I, 16Q or 8Q). Up to 8 DMP compact modules with I/O peripheral circuits can be connected to the DMP compact terminal block.



	CAUTION
	The DMP compact modules must not be removed or inserted during operation. Make sure that the DMP compact modules are properly plugged in.





Interfaces:

- Two 15-way Sub D male connectors for connection to MPC line
- Voltage supply via 24 V DC terminal block
  P1—P2 jumpered
  M1—M2 jumpered to ”loop through” the current supply
- Eight 30-way socket connectors for plugging on the input/output modules. (The plug-on modules are supplied and addressed via these female connectors.)

Meaning of the control LEDs:

Red LED is lit:

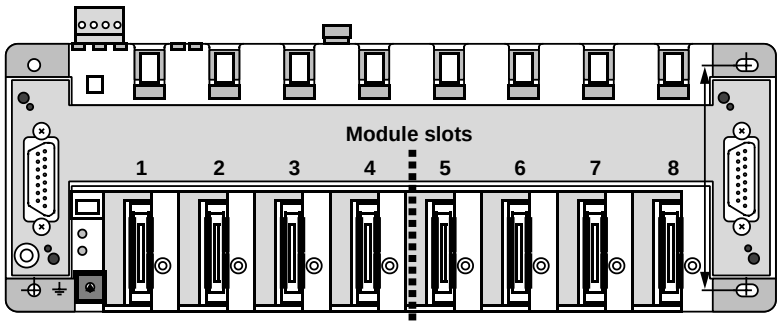
- The 24 V logic supply voltage has sunk below the value of approx. 17 V
- Transmission error

Yellow LED is lit:

- The 5 V supply voltage generated from the 24 V logic supply voltage is within the tolerance range of 4.75 V to 5.25 V.

Note:

- If a DMP compact station is used, the modules must be plugged in according to the following rules:



Input area

0 to 4 modules of the following type

- DMP compact module 16 inputs, pluggable

Output area

0 to 4 modules of the following type

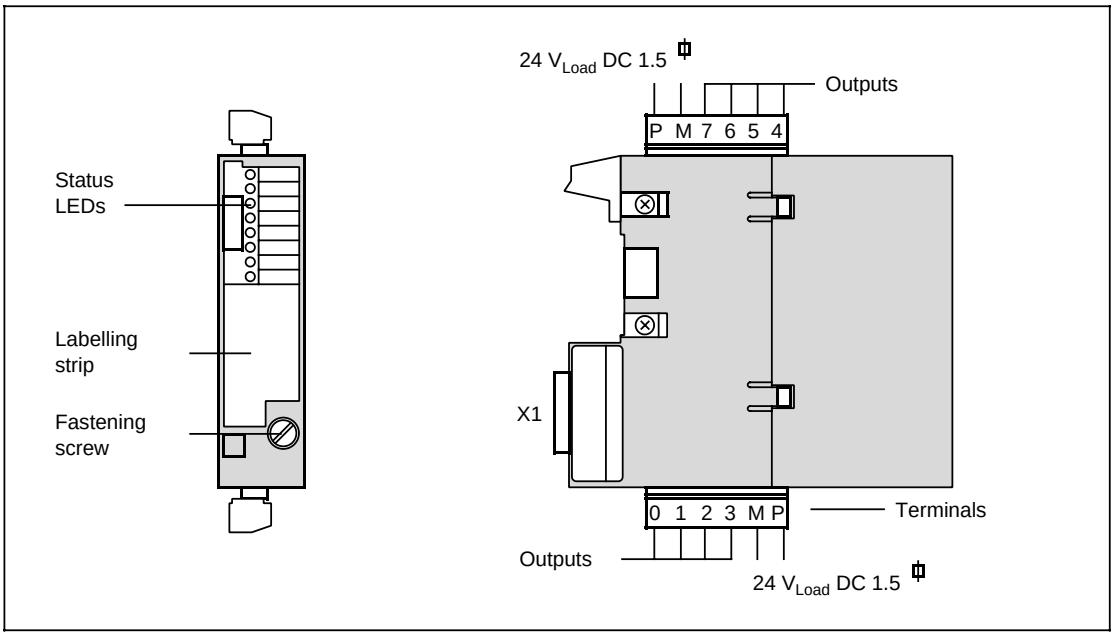
- DMP compact module 8 outputs
- DMP compact module 16 outputs

pluggable,
mixed complement possible

The maximum addressing capability is 64 inputs and 64 outputs. The output bytes of these 8-byte input and output blocks are defined by PLC MDs 10 - 19. The PLC system program always reserves 8 bytes for the inputs and 8 bytes for the outputs for each initialized DMP compact station even if the terminal block does not have its full complement.

4.6.3.2 DMP compact module 8 outputs 6FC5 111-0CA03-0AA0

The DMP compact module 8 outputs is an encapsulated module. It can be inserted into a slot on the DMP compact terminal block.



Interfaces:

- A 30-way connector X1 for connection to the DMP compact terminal block.
- Two 6-terminal blocks for connection of the 8 outputs and the load power supply
- The terminals can be plugged in and coded.

Display elements:

Eight LEDs as status display for the logic states of the outputs.

Technical data:

Outputs: +24 V, short-circuit proof, electrically isolated

The module has 8 outputs which are designed for load voltages of 24 V (max. 30 V) and a current load of max. 2 A (= 48 VA typ. per output). Either ohmic, inductive or lamp loads can be operated.

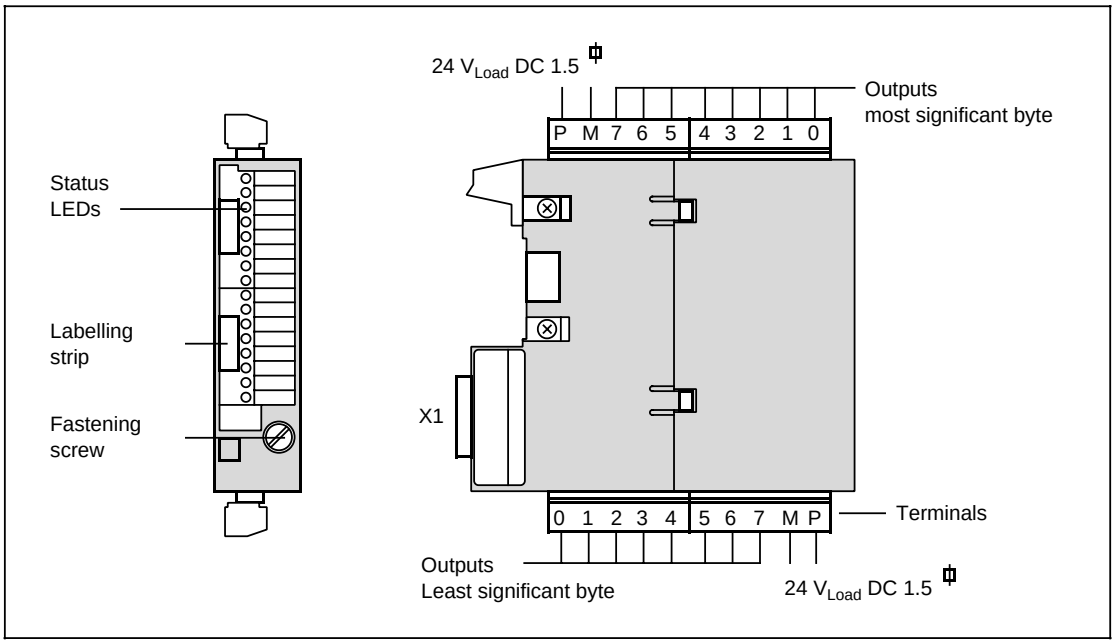
Four outputs are supplied by one power supply. For each group of four outputs (outputs 0 to 3 and 4 to 7), the sum of output currents must not exceed 4 A (this corresponds to a simultaneity factor of 50 % if all outputs are fully loaded). For example, all eight outputs can be loaded with 1 A.

Note:

When inductive loads are used, switching voltage peaks have to be suppressed by external free-wheeling diodes!

4.6.3.3 DMP compact module 16 outputs 6FC5 111-0CA02-0AA0

The DMP compact 16 outputs is an encapsulated module. It can be inserted into a slot on the DMP compact terminal block.



Interfaces:

- A 30-way connector X1 for connection to the DMP compact terminal block.
- Two 10-terminal blocks for connection of the 16 outputs and the load power supply.
- The terminals can be plugged in and coded.

Display elements:

16 LEDs as status display for the logic states of the outputs.

Technical data:

Outputs: +24 V, short-circuit proof, electrically isolated

The module has 16 outputs. These outputs are designed for load voltages of 24 V (max. 30 V) and a current load of max. 0.5 A (= 12 VA typ. per output). Either ohmic, inductive or lamp loads can be operated.

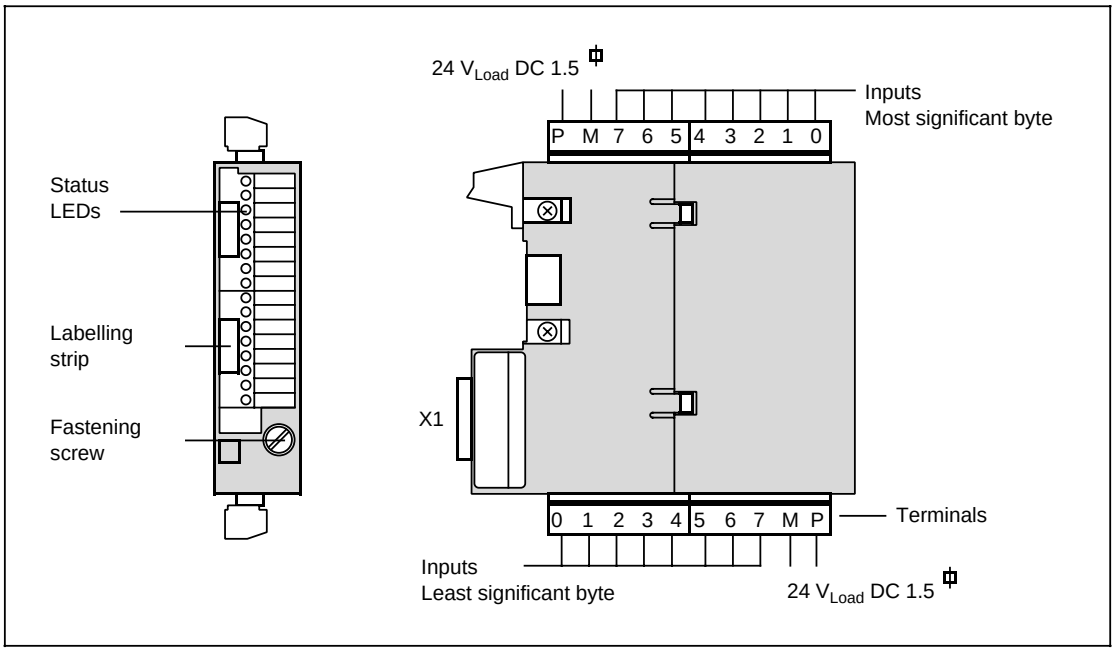
Eight outputs are supplied by one power supply. For each group of 8 outputs (2 x outputs 0 ...), the sum of output currents must not exceed 2 A (this corresponds to a simultaneity factor of 50 % if all outputs are fully loaded). For example, all 16 outputs may be loaded with 0.25 A.

Note:

When inductive loads are used, switching voltage peaks have to be suppressed by external free-wheeling diodes!

4.6.3.4 DMP compact module 16 inputs 6FC5 111-0CA01-0AA0

The DMP compact module 16 inputs is an encapsulated module. It can be plugged into a slot on the DMP compact terminal block.



Interfaces:

- A 30-way connector X1 for connection to the DMP compact terminal block.
- Two 10-terminal blocks for connection of the 16 inputs and the load power supply.
- The terminals can be plugged in and coded.

Display elements:

16 LEDs as status display for the logic states of the inputs.

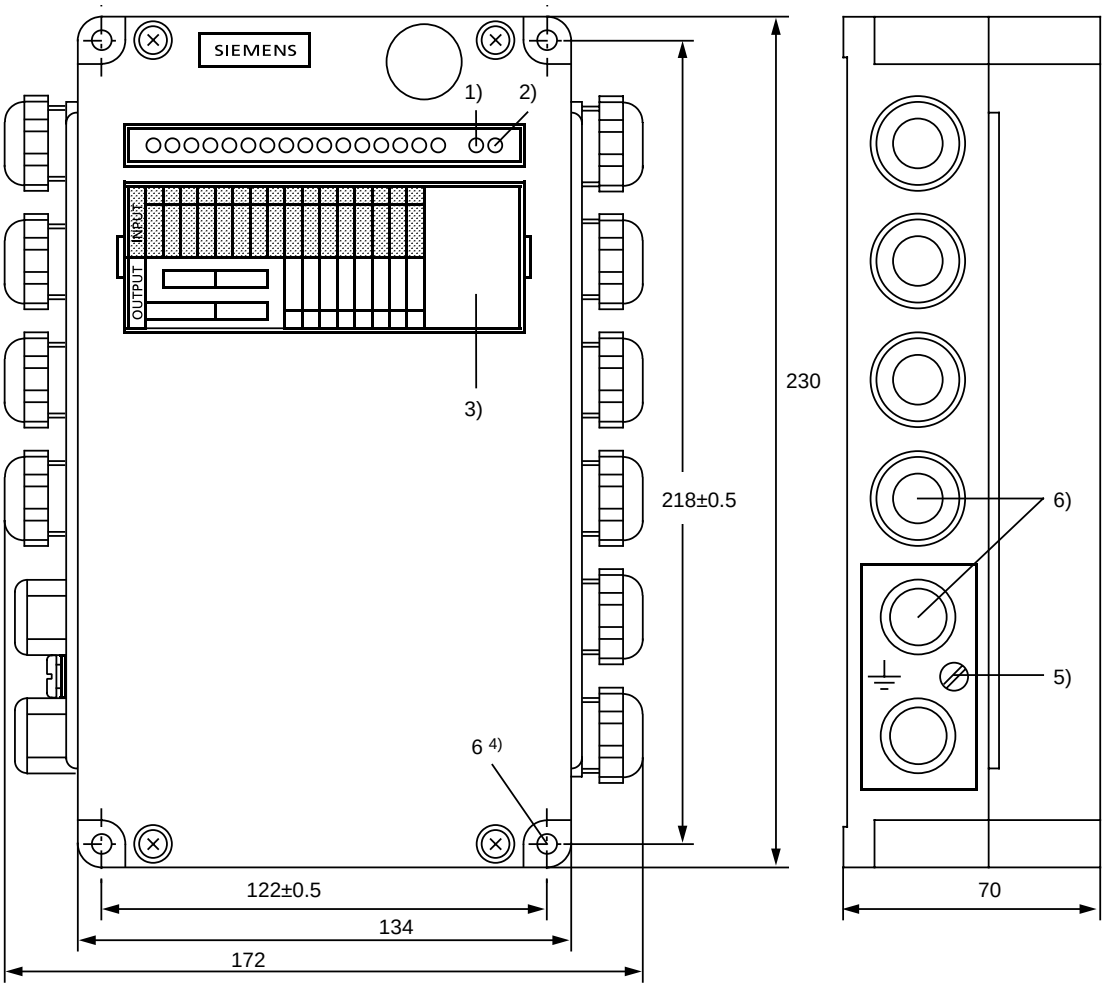
Technical data:

Inputs:	+24 V, 3 ...6 mA	
Operating points:	H level	>13 V
	L level	<5 V
Operating times:	<1 ms	

The module can process sixteen 24 V inputs. The input data (0V/24V) present is electrically isolated and passed on to the DMP compact terminal block.

4.6.4 DMP terminal block with DMP module in IP 65 design

6FC5 111-0CA72-0AA0
6FC5 111-0CA22-0AA0

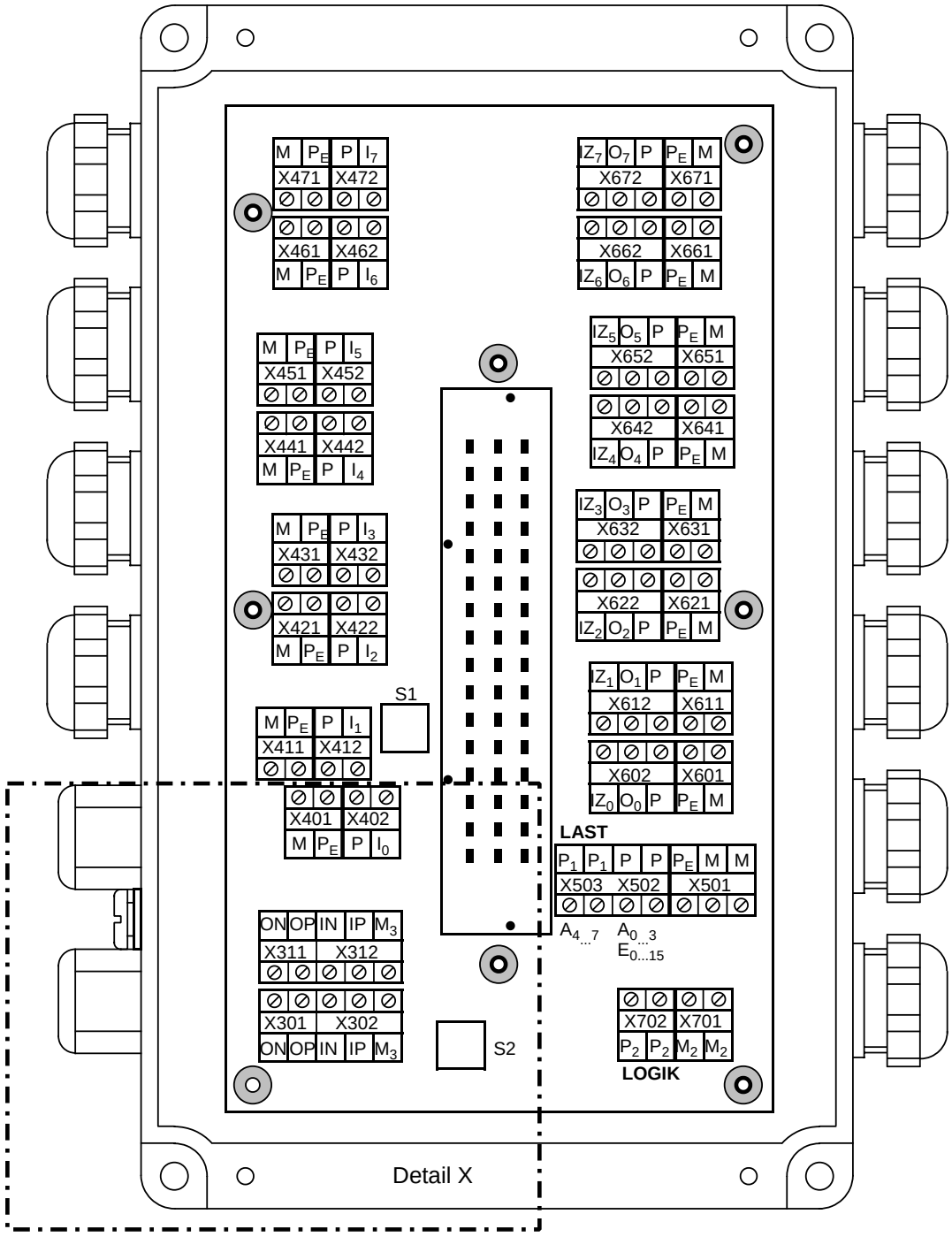


1) Alarm/fault (check LED)
2) Operation indicator (control LED)
3) Replaceable labelling strip
4) Fastening screws for M5 screws
5) M5 ground terminal
6) Use enclosed sealing material if no cable connected, if necessary, remove inner cone before connecting metal cable entry gland (push out of gland from the inside).

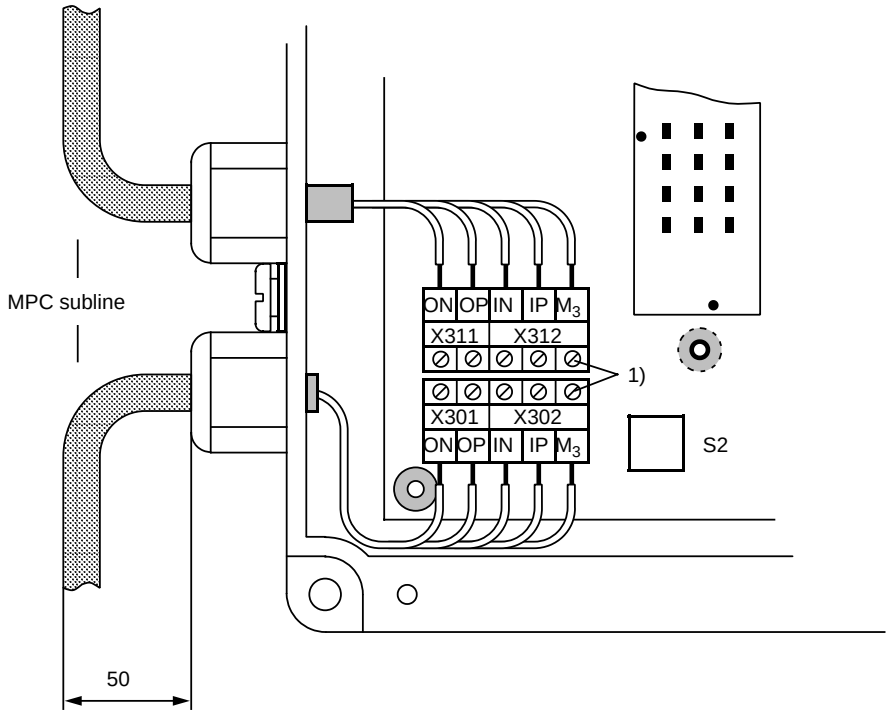
Temperature in enclosed space:	55 °C
Temperature change to SN 26556:	10 K/h; max. 1 K/3 min.
Degree of protection to DIN 40050 :	IP 65
Maximum power loss:	3 W
Total weight:	1.8 kg

The DMP terminal block and DMP module in IP 65 version comprises two integrated parts, the DMP terminal block and the DMP module. The DMP terminal block is the lower part of the whole assembly with terminals (s. diagram on next page). Here, the user switching elements and sensors are directly connected according to the permanent wiring principle. The DMP module is in the upper part. By putting on the upper part you close contacts of the connector electrically and the DMP station mechanically.

The DMP station number is set using a hexadecimally coded rotary switch. A four-jumper DIP-FIX switch is located on the DMP terminal block to connect the termination circuit (all jumpers must be closed on the DMP station that is the last in the MPC line).



IZ_0 ... IZ_7 IN, additional IN_0 ... IN_7 (additional input 0 ... 7)
I_0 ... I_7 IN_0 ... IN_7 (Inputs 0 ... 7)
O_0 ... O_7 OUT_0 ... OUT_7 (Outputs 0 ... 7)
ON/IN OUT/INPUT negated – for RS-485/MPC interface
OP/IP OUT/INPUT normal - for RS-485/MPC interface
S1 Setting of DMP station number
S2 Acts in place of termination connector
– open: If DMP line continued
– closed: If DMP line **not** continued (last module)



1) Note:
Tightening torque of terminal screws should conform to DIN VDE 0609 Part 1, Table 1 (applies to all terminals in the terminal block).

Detail X

Interface assignment:

Connector No.	Designation/signal type	Signal name
X301	ON/Output negated OP/Output normal	SDOX SDO
X302	IN/Input negated IP/Input normal M_3/Ground for RS 485 (must not be connected)	SDIX SDI 2M
X311	ON/Output negated OP/Output normal	SDOX SDO
X312	IN/Input negated IP/Input normal M_3/Ground for RS 485 (need not be connected)	SDIX SDI 2M

Interface assignment (continued):

Connector	Designation/signal type	Signal name
X401	M/Common ground of 24 V supply P_E/Protective earth	MEXT PE
X402	P/Distribution of +24 V supply voltage I_0/Input 0	1P24 EXT IN
X411	M/Common ground of 24 V supply P_E/Protective earth	MEXT PE
X412	P/Distribution of +24 V supply voltage I_1/Input 1	1P24 EXT IN
X421	M/Common ground of 24 V supply P_E/Protective earth	MEXT PE
X422	P/Distribution of +24 V supply voltage I_2/Input 2	1P24 EXT IN
⋮	⋮	⋮
X472	P/Distribution of +24 V supply voltage I_7/Input 7	1P24 EXT IN
X501	M/Common ground of 1st and 2nd load supply P_E/Protective earth	1 MEXT PE
X502	P/+24 V of 1st load supply for outputs O_0 ... O_3 and inputs	1P24 EXT
X503	P_1/+24 V of 2nd load supply for outputs O_4 ... O_7	2P24 EXT
X601	P_E/Protective earth M/Common ground of 24 V supply	PE MEXT
X602	IZ_0/Additional input 1 O_0/Output 0 P/+24 V of 1st load supply	IN OUT 1P24 EXT
X611	P_E/Protective earth M/Common ground of 24 V supply	PE MEXT
X612	IZ_1/Additional input 1 O_1/Output 1 P/+24 V of 1st load supply	IN OUT 1P24 EXT
⋮	⋮	⋮
X672	IZ_7/Additional input 7 O_7/Output 7 P/+24 V of 1st load supply	IN OUT 1P24EXT
X701	M_2/Ground of logic supply of DMP module	3MEXT
X702	P2/+24 V of logic supply of DMP module	3P24 EXT

This DMP station requires two different supply voltages:

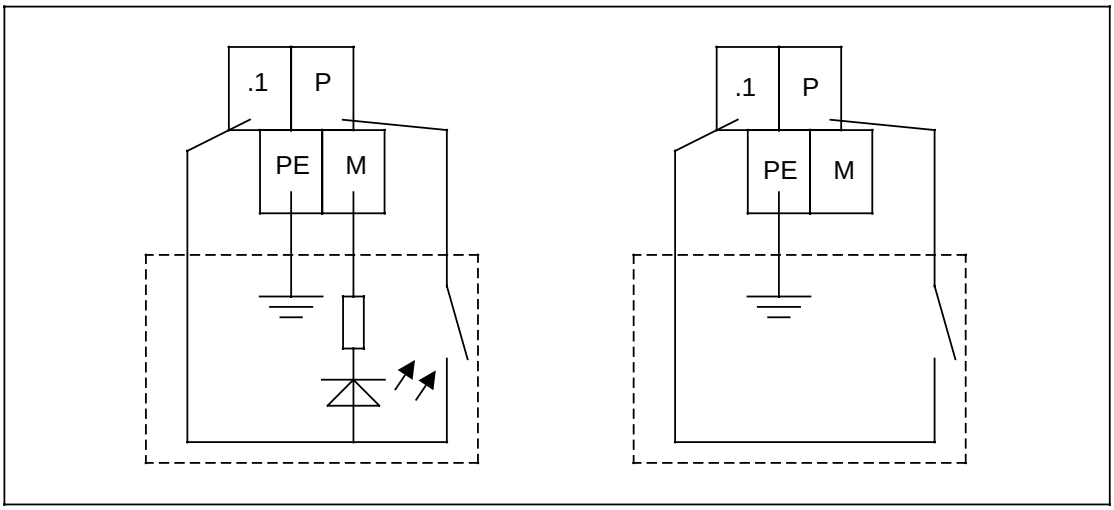
- Logic supply voltage, 24 V DC

  The 24 V/0 V logic supply voltage is connected to X701 and X702.

- Load supply voltage, 24 V DC

  The 0 V potential must be connected to X501 and is thus supplied to all M (ground) terminals via internal jumpers on the DMP terminal block.

  Two 24 V load supply voltages are available at P_1 (outputs 0 to 3) and P_2 (outputs 4 to 7) (X502 and X503).



Connection of inputs

Technical data:

Inputs:	+24 V, 3 ... 10 mA
Operating point:	H level >13 V
	L level <5 V
Operating time:	<1 ms
Inputs/outputs:	+24 V, 2 A short-circuit proof, floating, simultaneity factor per byte: 50 %

Note:

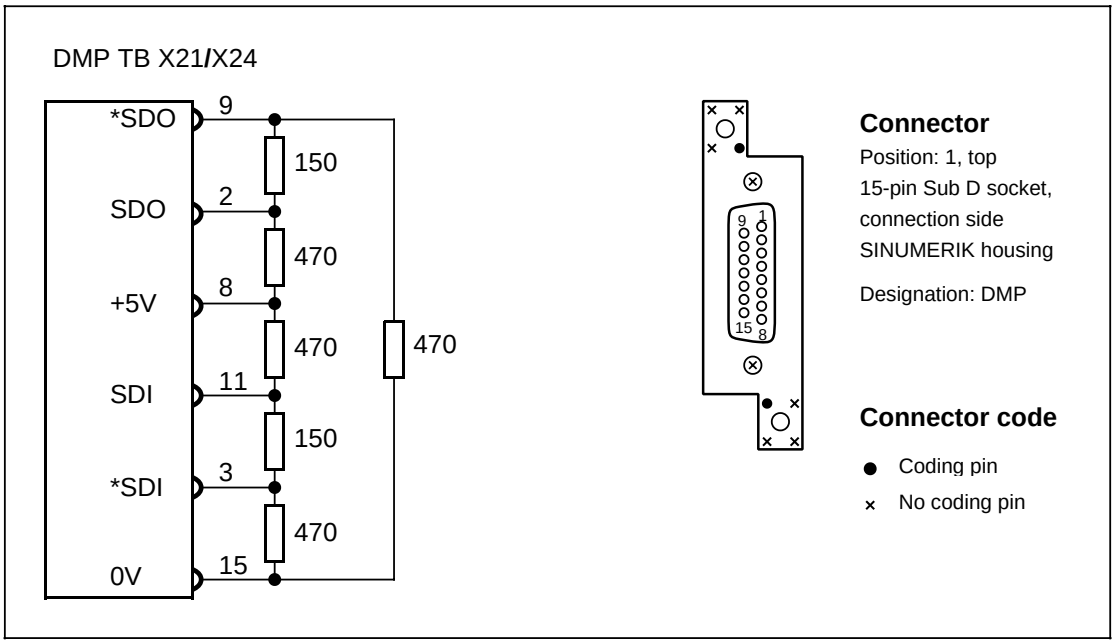
Eight of the 16 I/O channels are permanently assigned as inputs; another eight channels can either be inputs or outputs.

When using terminals IZx:	Channel x is an input
When using terminals Ox:	Channel x is an output

The unassigned terminals can be used, for example, for jumpers within the DMP terminal block.

4.6.5 DMP termination connector 6FX1 145-2BA00

To terminate the bus, the DMP termination connector must be plugged onto the second (free) MPC interface connector of the last terminal block.



Note:

In the case of the DMP modules with degree of protection IP 65, the termination is obtained by closing the DIP-FIX switches. The termination must be carried out on the master side!

A DMP termination connector must be plugged onto the free connector of the last DMP station at the end of each DMP line!

4.7 Hand-held unit with distributor box

Two versions of the hand-held unit are available:

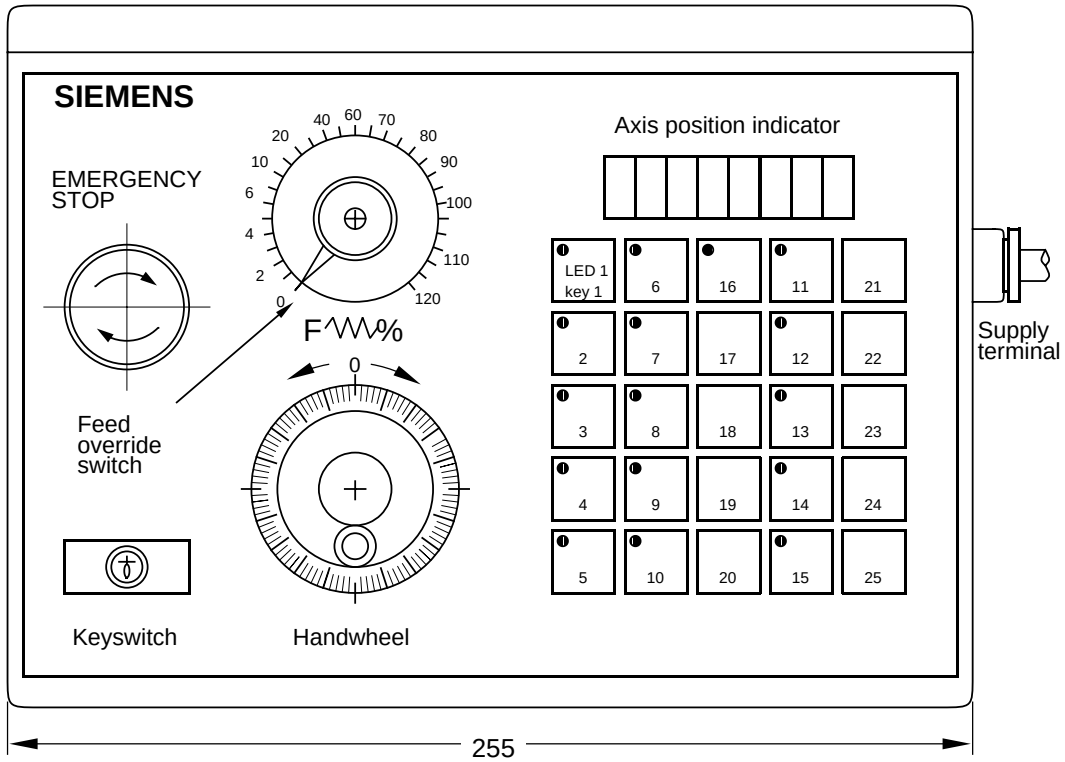
- Portable version with housing
- Panel-mounted version without housing (machine control panel)

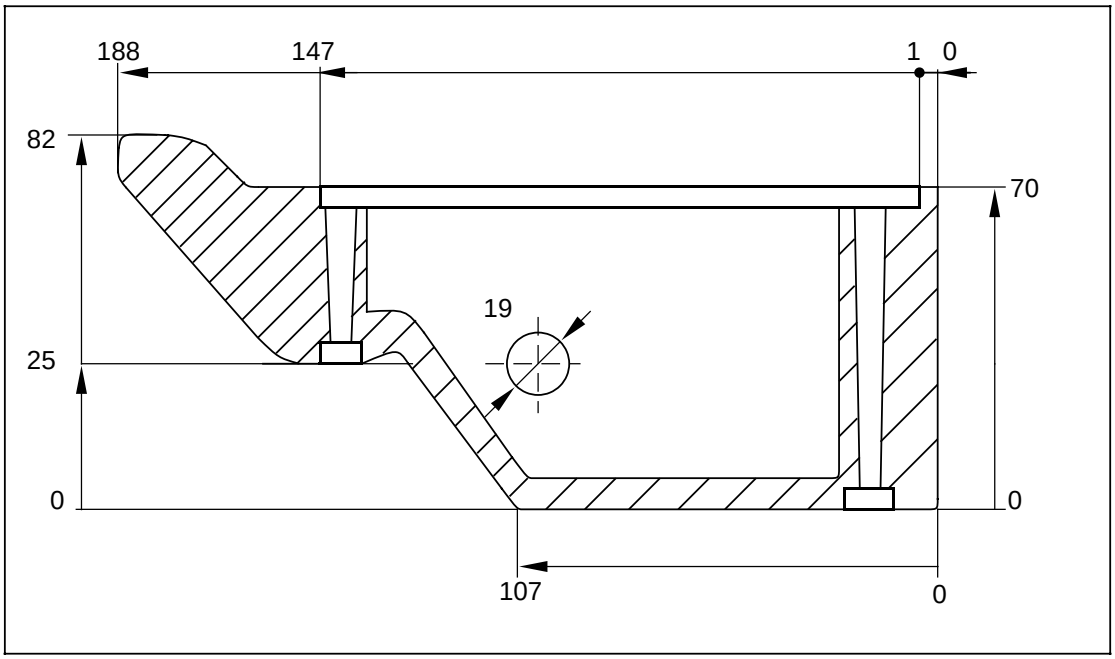
You can use the hand-held unit to select axis feed motions on machine tools. The unit incorporates keys and LEDs for freely configurable function selection, an excess position indicator, a handwheel, a keyswitch, an Emergency Stop switch and feed override switch.

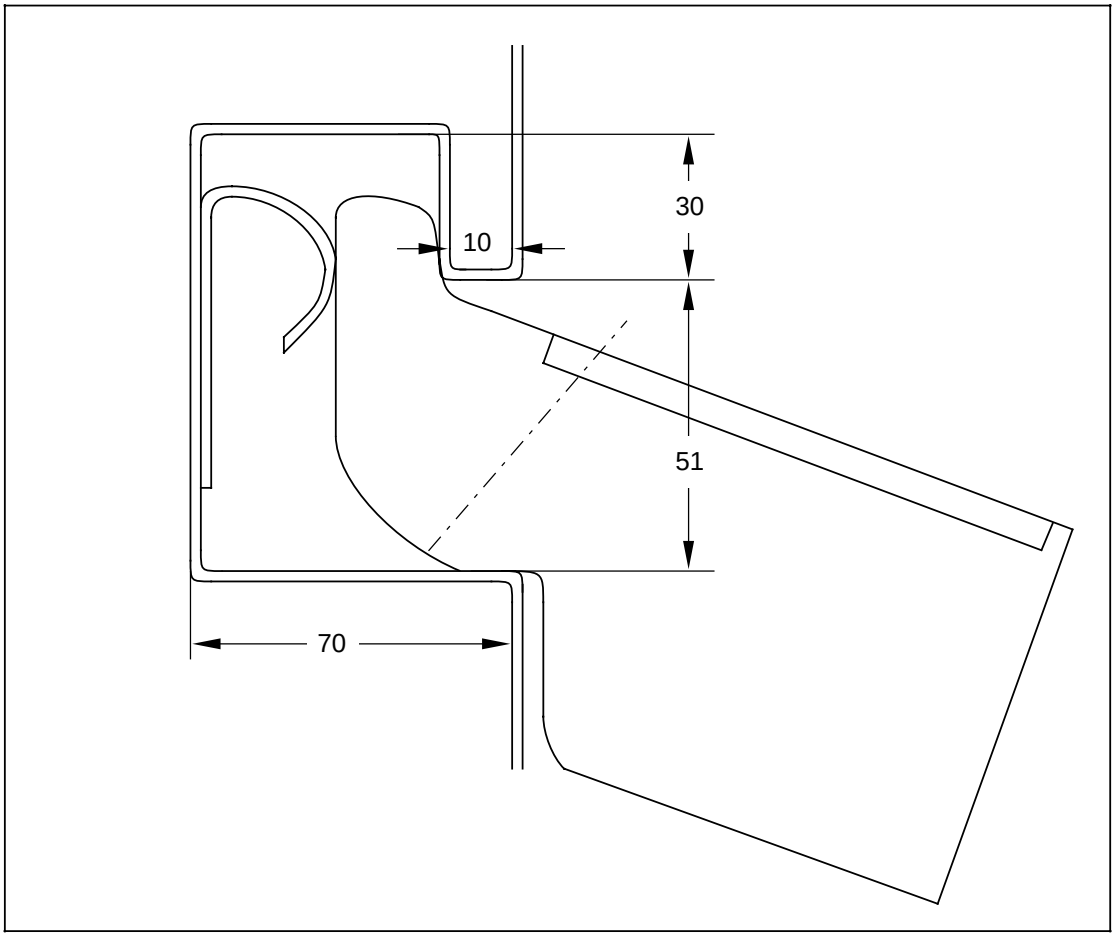
The hand-held unit is connected to the MPC chain via a distributor box and supplied with 24V.

4.7.1 Hand-held unit with housing

Order No.: 6FC5 103-0AD20-0AA0
Module name: 6FC4 600-0AT01 or 6FC5 103-0AD20-0AA0

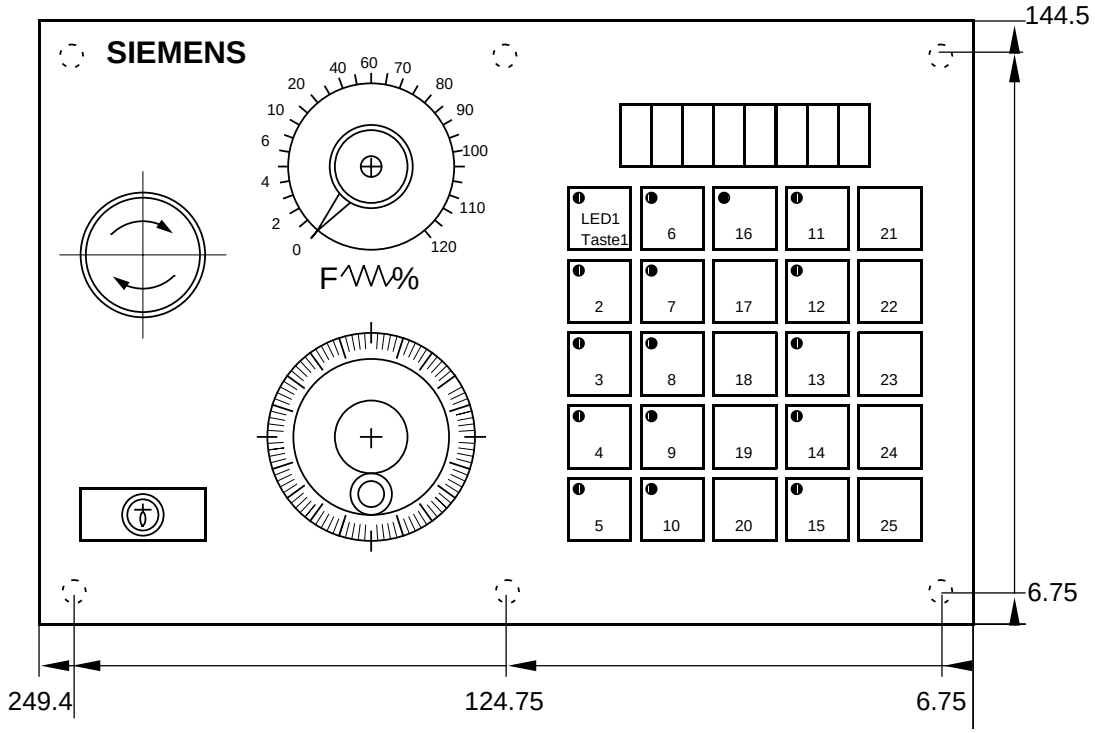


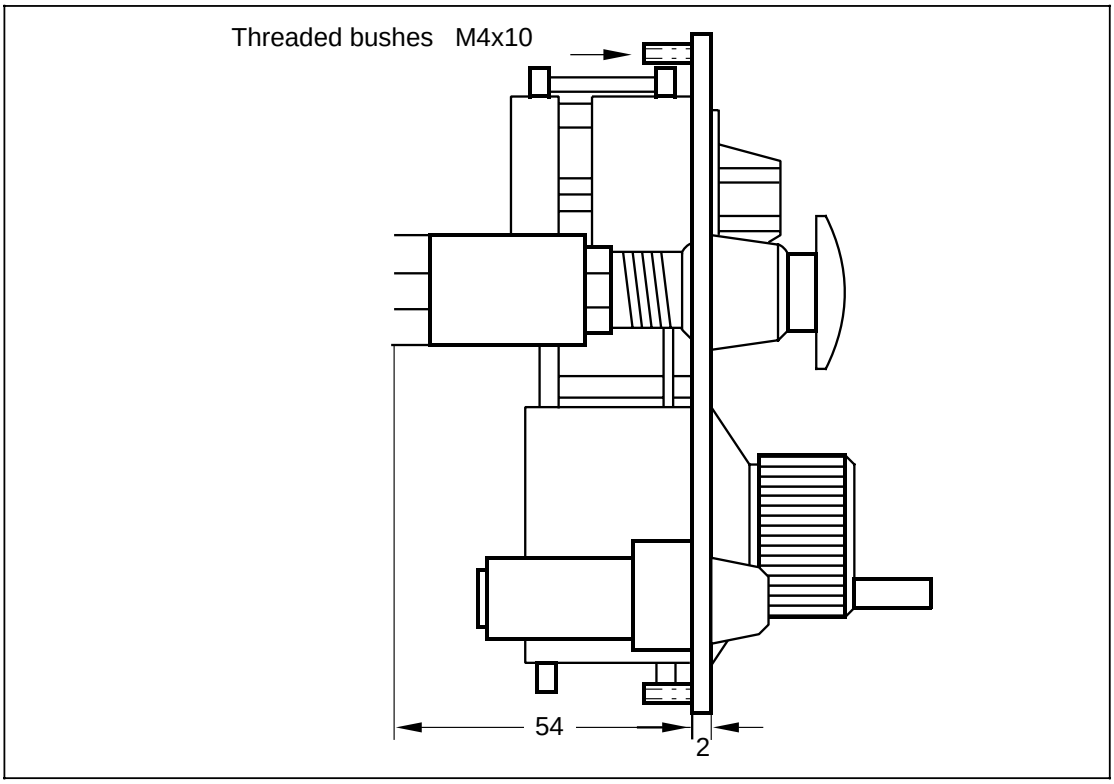




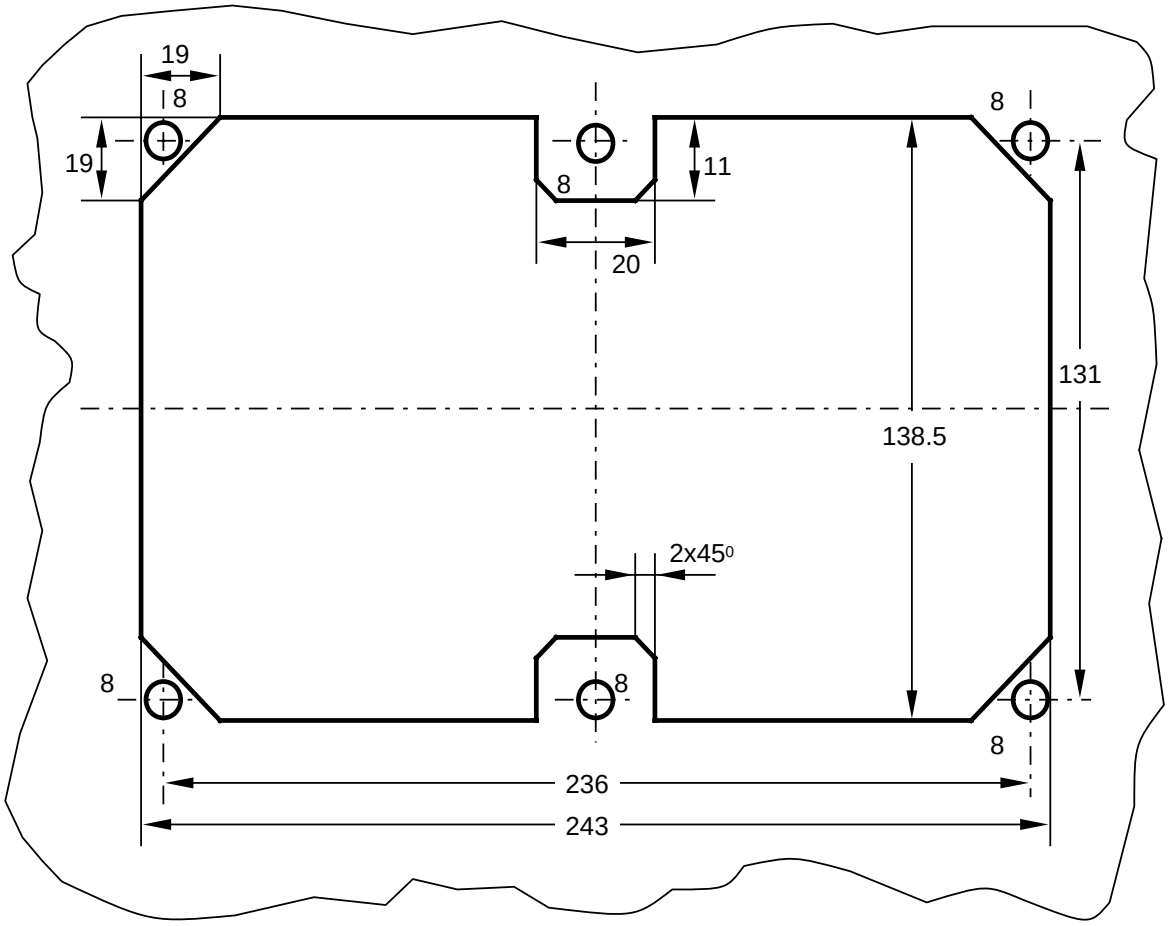
4.7.2 Hand-held unit without housing for panel mounting (machine control panel)

Order No: 6FC5 103-0AD21-0AA0
Module name: 6FC4 600 0AT02 or 6FC5 103-0AD21-0AA0



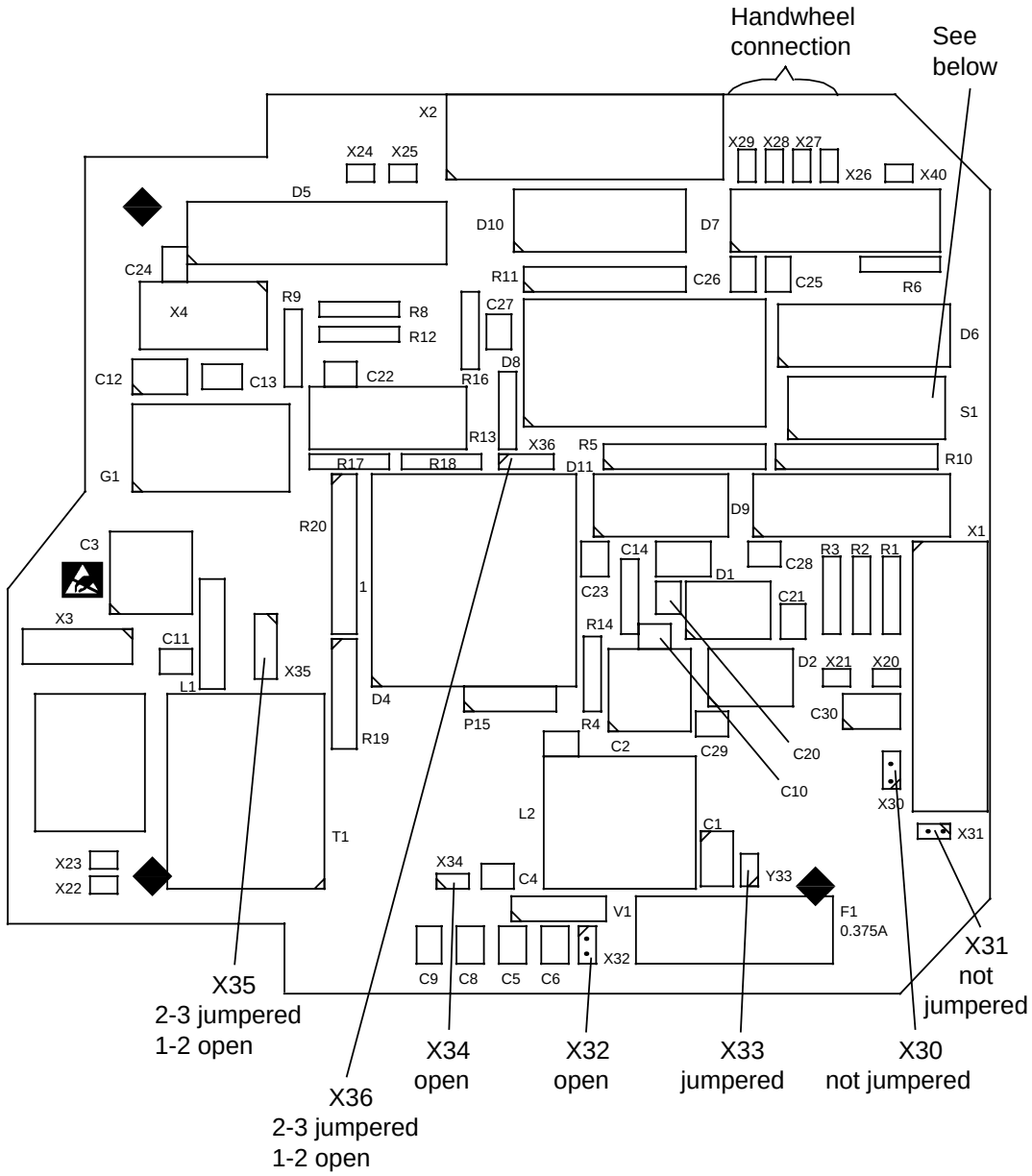


Cutout for machine control panel (hand-held unit without housing)



4.7.3 Jumpering

The following jumpers exist on the circuit board of the hand-held unit:



Addressing of S1 (module code):

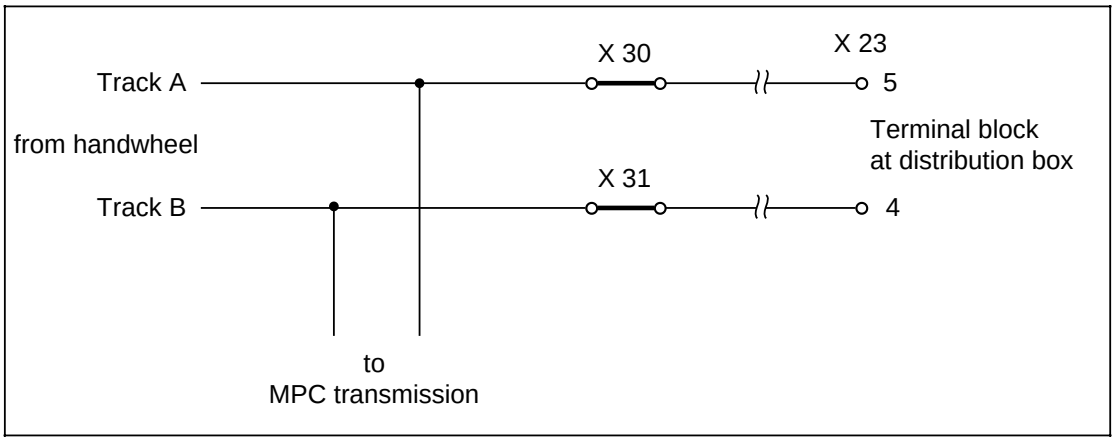
3 4 5		on
1 2	6 7 8	off
2^0	2^7	

$\hat{=} 1C_{Hex}$

In the case of a hand-held unit with distribution box, it is possible to pick up the handwheel pulses at terminals 4 and 5 (as standard, the handwheel pulses are also transmitted along the MPC cable).

These handwheel pulses can then be used in the same way as pulses received from an external handwheel.

Prerequisite: jumper X30 closed
X31 closed

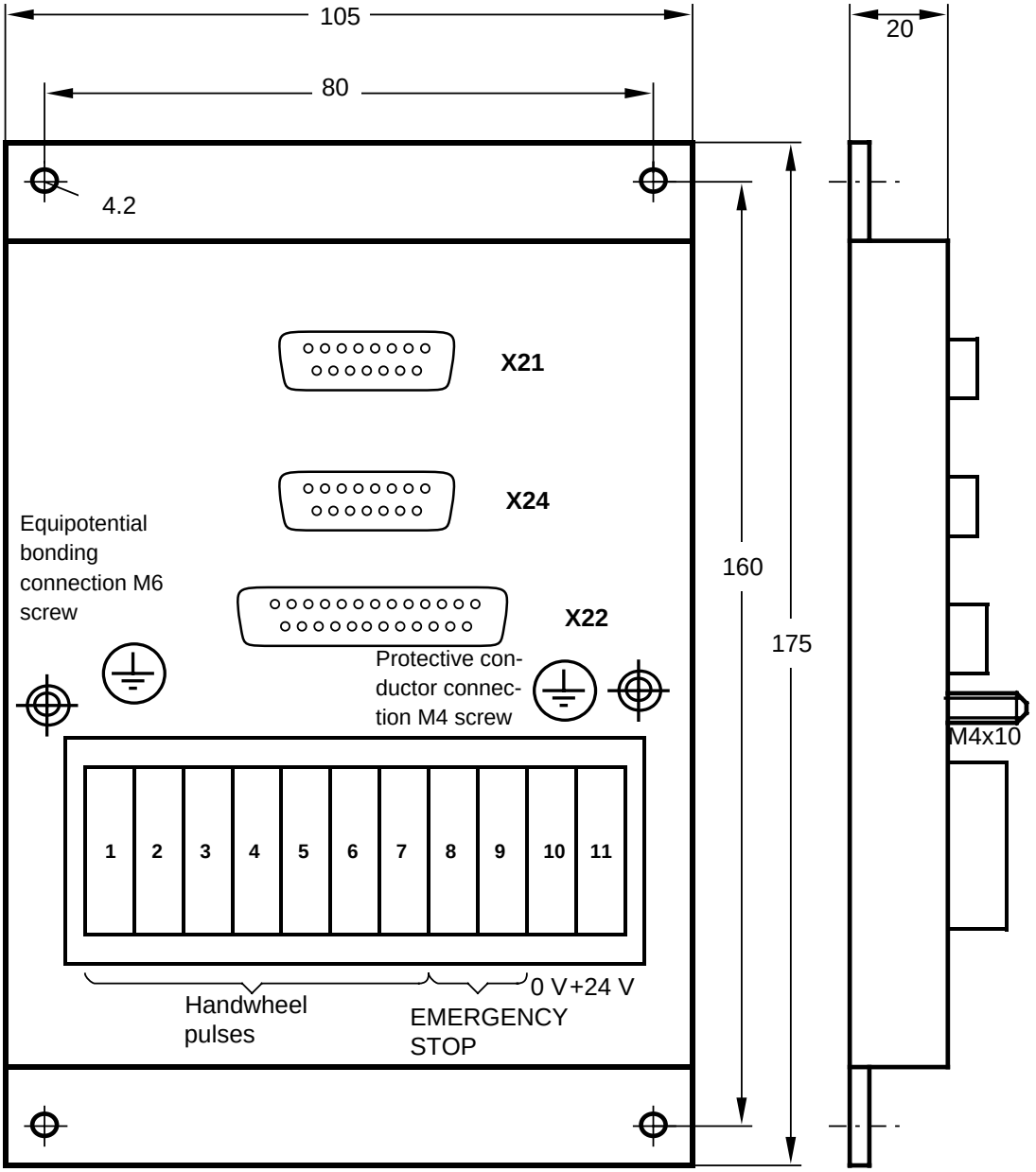


Note:

When the option ”External handwheel on 5th actual value input” is active, handwheel pulse transmission via the MPC cable is disabled.

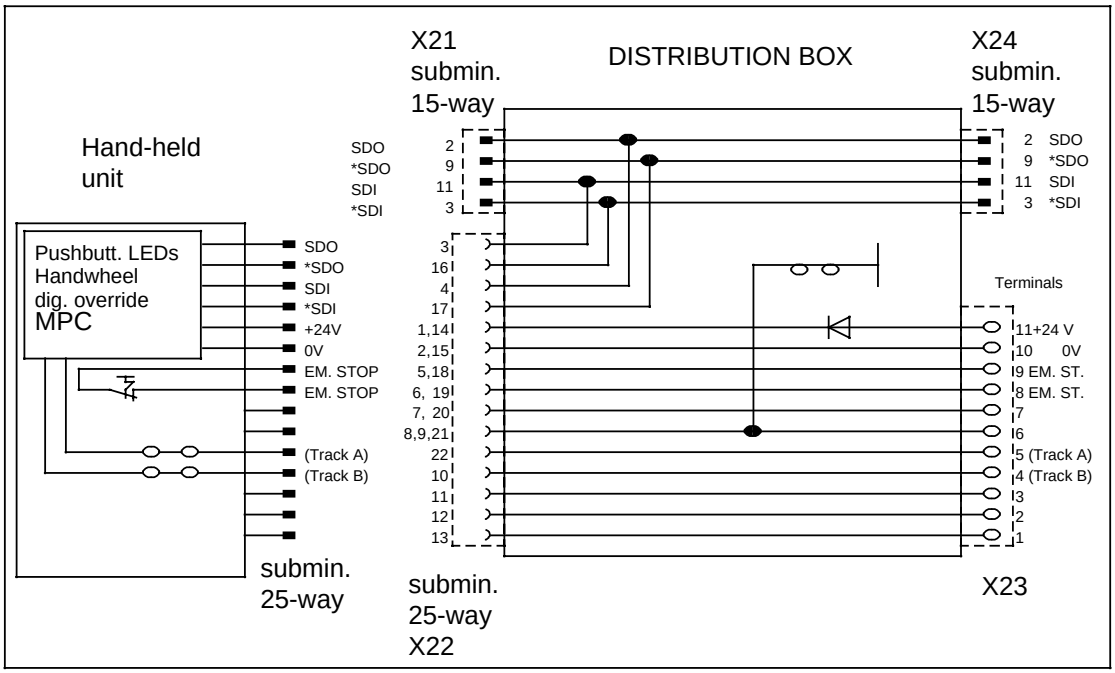
4.7.4 Distributor box for hand-held unit

Order No.: 6FC5 147-0AA05-0AA0
Module name: 6FC4 600-0AJ67 or 6FC5 147-0AA05-0AA0



X21, X24: Interfaces to the MPC line
X22: Interface for connecting the hand-held unit or machine control panel
X23: Connection terminal block

Switching capacity of the EMERGENCY STOP loop to the hand-held unit: 24 V/2 A



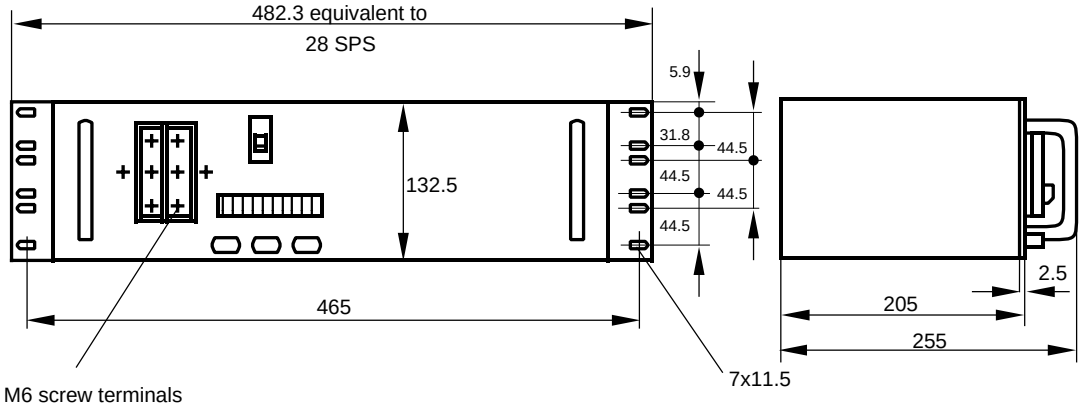
Block diagram of hand-held unit with distribution box

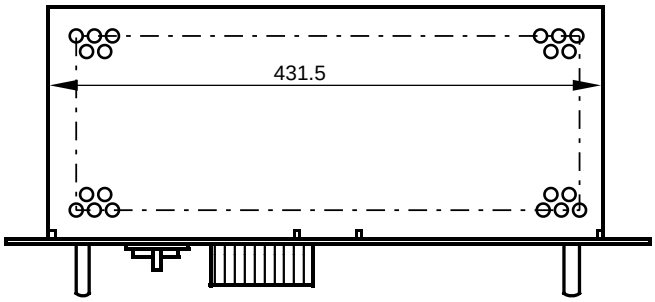
4.8 Power supply units

4.8.1 Power packs (110 V/230 V)

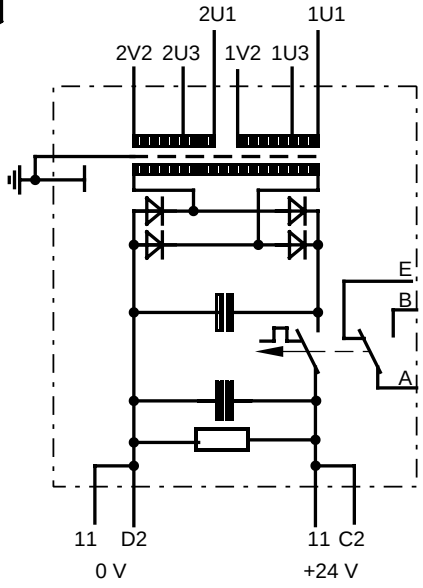
Type: 6EV1 334-4BK00

For connection to power supply of 230 V AC or 110 V AC





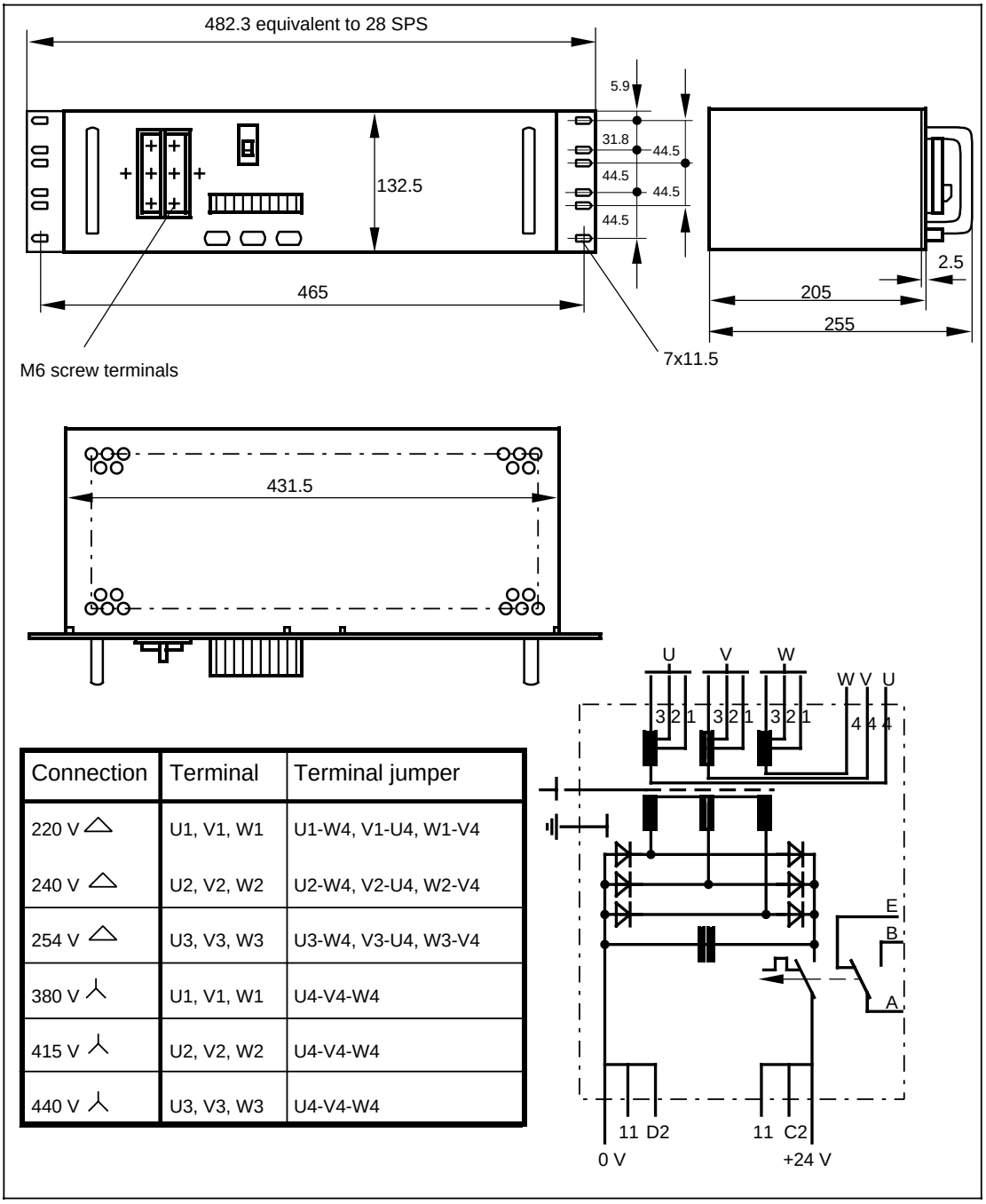
Connection	Terminal	Terminal jumper
110 V	1U3, 2V2	1U3-2U3, 1V2-2V2
120 V	1U1, 2V2	1U1-2U1, 1V2-2V2
220 V	1U3, 2V2	2U3-1V2
240 V	1U1, 2V2	2U1-1U3



4.8.2 Power packs (230 V/400 V)

20 A: Type : 6EV1 352-5BK00
Order No. : 6FC9 304-0AC
40 A: Type : 6EV1 362-5BK00
Order No. : 6FC9 304-0AD

For connection to power supply of 400 V AC



Connection	Terminal	Terminal jumper
220 V △	U1, V1, W1	U1-W4, V1-U4, W1-V4
240 V △	U2, V2, W2	U2-W4, V2-U4, W2-V4
254 V △	U3, V3, W3	U3-W4, V3-U4, W3-V4
380 V Y	U1, V1, W1	U4-V4-W4
415 V Y	U2, V2, W2	U4-V4-W4
440 V Y	U3, V3, W3	U4-V4-W4

4.9 Monitor and operator keyboard changeover switches

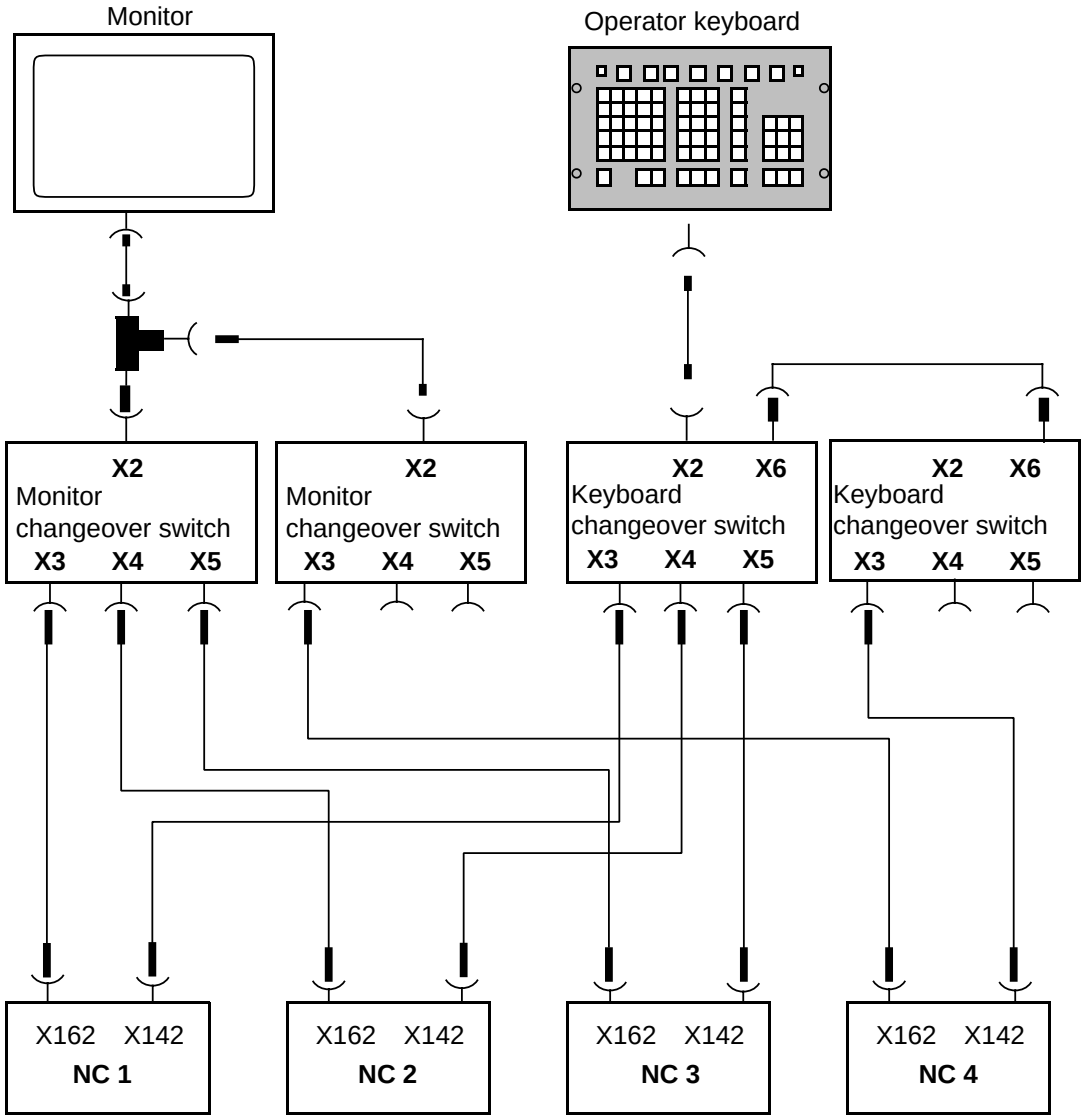
Monitor and operator keyboard switches make it possible to operate several NCs with one monitor and one operator keyboard (see also Section 1.3).

The changeover switches can be mounted one on top of the other on the baseplate. Changeover switches of the same type can be linked as follows:

Monitor changeover switches:	The monitor signals are relayed to both switches at X2 via a BNC tee.
Keyboard changeover switches:	The changeover switches are connected to each other at X6 by means of the ribbon cable supplied. The operator keyboard signals are thus relayed to the additional keyboard changeover switch via this cable.

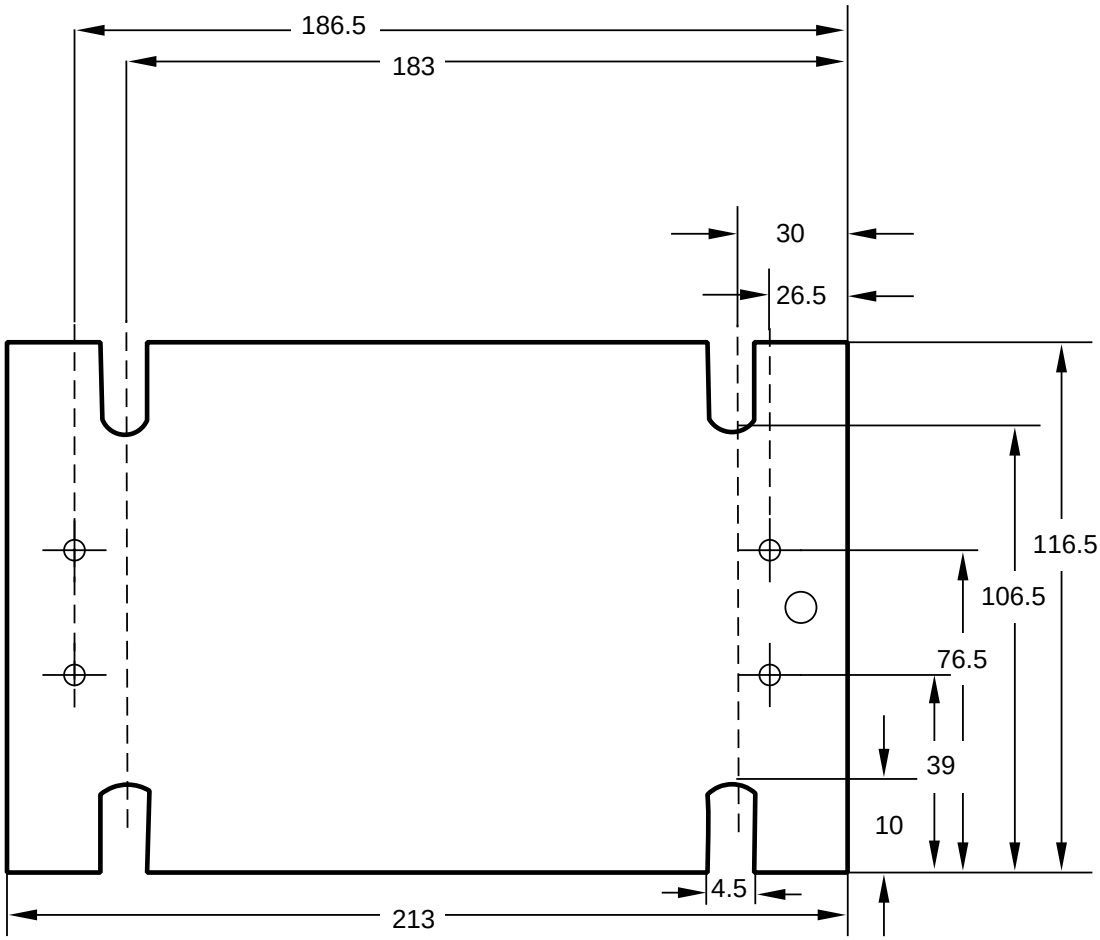
Note:

The PLC signals KEYBOARD LOCK and SCREEN DARK should be active in the relevant PLCs during the changeover process.



4.9.1 Baseplate

Order No.: 6FC 9310-1MA
Module name: 6FC 9310-1MA



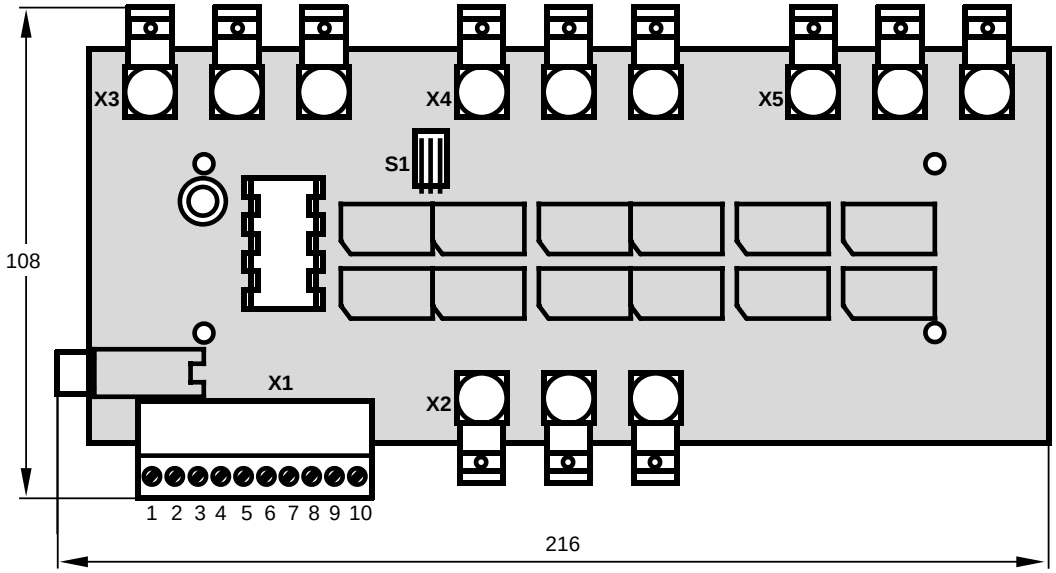
Height of mount:	Baseplate	18 mm
	Monitor changeover switch	32 mm
	Keyboard changeover switch	22 mm

Note:

Any number of changeover switches can be mounted one on top of the other.
e.g. with two switches of each type, the total height would be 126 mm.

4.9.2 Monitor changeover switch

	1-way/monochrome	3-way/colour
Order No.:	6FC9 310-1MC	6FC9 310-1MD
Module name:	6FC9 310-1MC	6FC9 310-1MD



Note:

The static shielding connection of X2-X3, X2-X4, X2-X5 can be interrupted at S1.

- Also supplied: 30 mm spacer studs, 4
- Connectors: X2, X3, X4, X5: BNC socket 75 ohms
  X1: Screw terminals, plug-in terminal block

Control:

The switching relays are activated via X1. The direct voltage fed to X1/1 (20-30V) is regulated to 24.V and made available at X1/2. Using this regulated voltage or a 24.V direct voltage which is regulated externally, the connection from X2 to inputs X3, X4 and X5 can be activated via X1/5, X1/7 and X1/9.

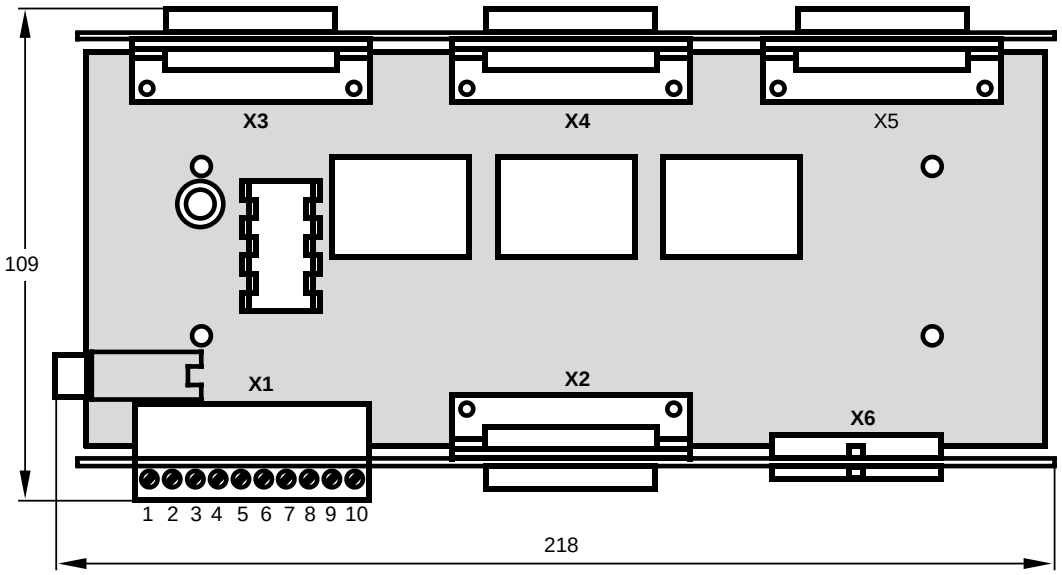
The screen should be switched to dark when the monitor changeover switch is being operated (PLC signal).

Assignments within X1:

1	≙	External power supply of 24 V for voltage regulator
2	≙	Regulated voltage of 24 V for driving X3, X4 and X5
3,4	≙	Ground for terminals 1,2
5	≙	Drive X3
6	≙	Acknowledgement from drive X3
7	≙	Drive X4
8	≙	Acknowledgement from drive X4
9	≙	Drive X5
10	≙	Acknowledgement from drive X5

4.9.3 Keyboard changeover switch

Order No.: 6FC 9310-1MB
Module name: 6FC 9310-1MB



Note:

Further changeover switches can be connected at X6 using the ribbon cable with two connectors provided. Their changeover inputs need not be relayed to X1.

- Also supplied: - 30 mm spacer studs, 4
  - Ribbon cable
- Connectors: X2, X3, X4, X5: 25-way Sub-D connector, socket
  X6: 20-way ribbon cable connection, in 2 rows, plugs
  X1: Screw terminals, plug-in terminal block

The interface signal KEYBOARD DISABLE must be active in all controls during the changeover process.

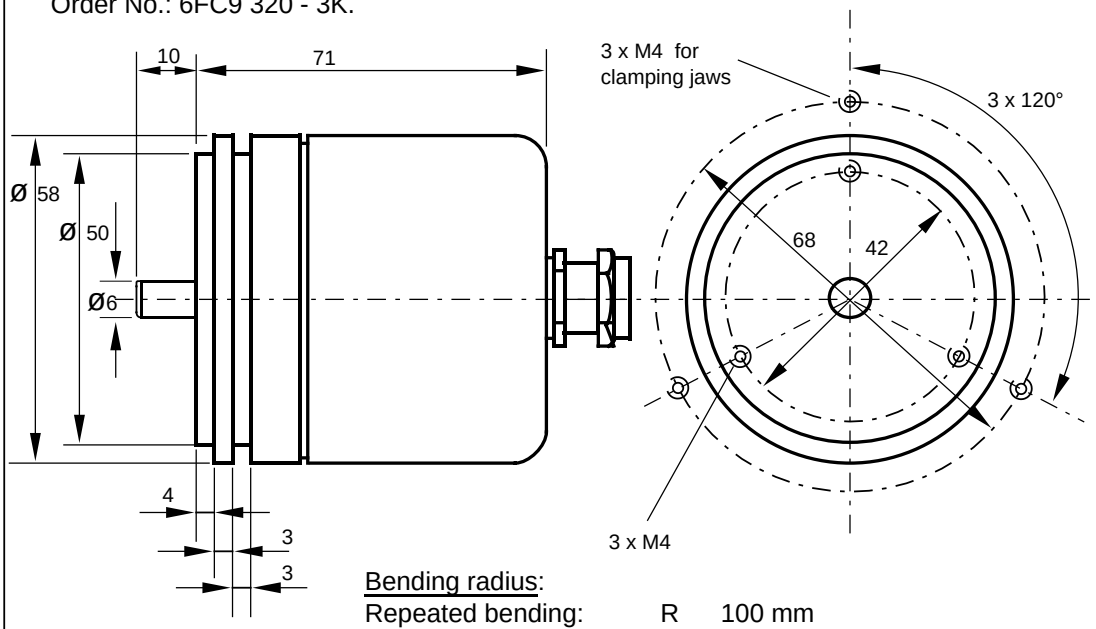
Assignments within X1:

1	≙	External power supply of 24 V
2	≙	Regulated voltage of 24 V for driving X3, X4 and X5
3,4	≙	Ground for terminals 1,2
5	≙	Drive X3
6	≙	Acknowledgement from drive X3
7	≙	Drive X4
8	≙	Acknowledgement from drive X4
9	≙	Drive X5
10	≙	Acknowledgement from drive X5

4.10 Incremental encoder

4.10.1 Rotary encoders and main spindle encoder

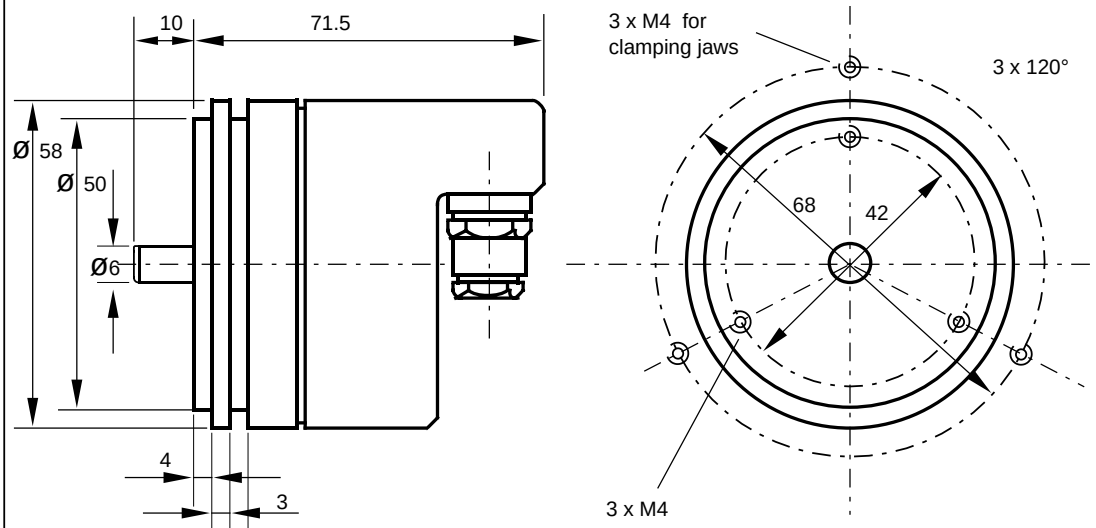
- Axial cable outlet:
  Order No.: 6FC9 320 - 3K.



Bending radius:
Repeated bending: R 100 mm
Bending once: R 40 mm

- Radial cable outlet:
  Order No.: 6FC9 320 - 3M.

Bending radius:
Repeated bending: R 100 mm
Bending once: R 40 mm

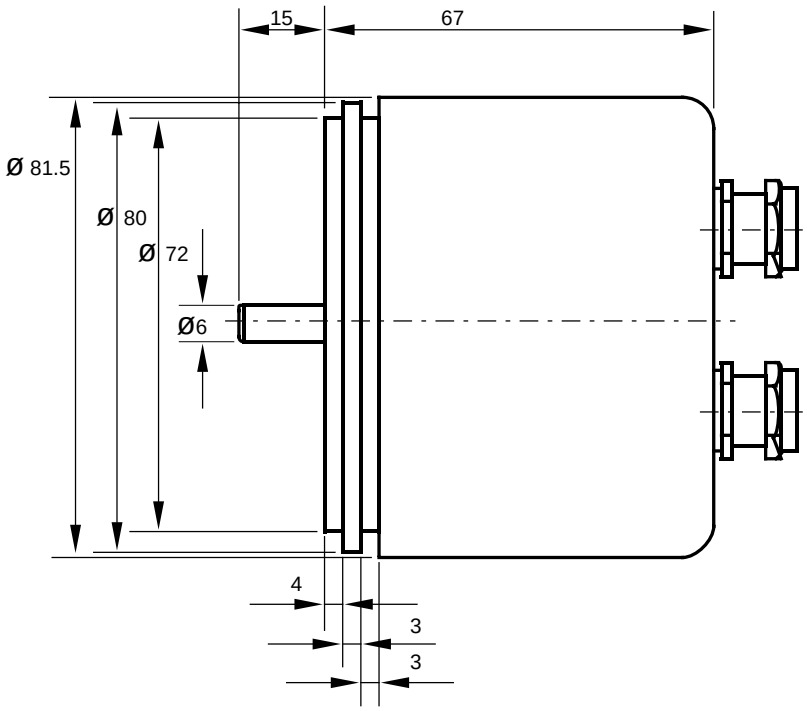


Pulse rate	Order No.
1024 pulses/rev	6FC9 320 - 3KB / - 3MB
2000 pulses/rev	6FC9 320 - 3KK / - 3MK
2500 pulses/rev	6FC3 230 - 3KN / - 3MN
5000 pulses/rev	6FC9 320 - 3KS / - 3MS

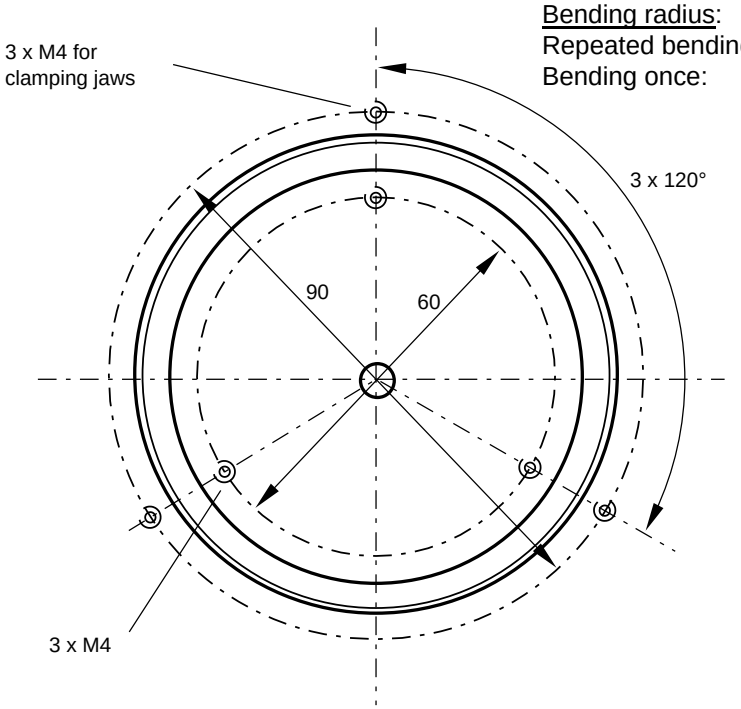
4.10.2 Combined rotary encoder for spindle and C axis

Order No.: 6FC9 320 - 3KT00

Pulse rate - spindle : 1024 pulses/rev
Pulse rate - C axis : 9000 pulses/rev

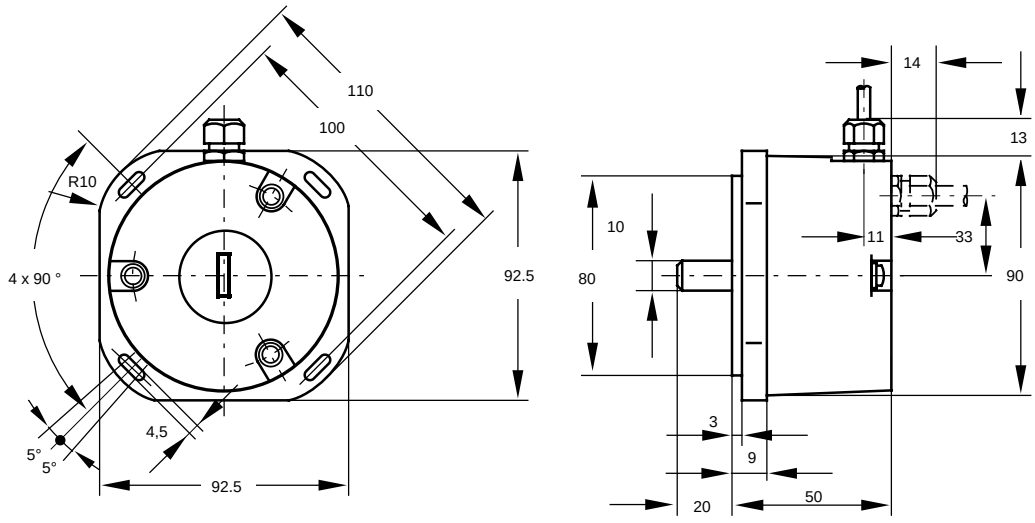


Bending radius:
Repeated bending: R 100 mm
Bending once: R 40 mm

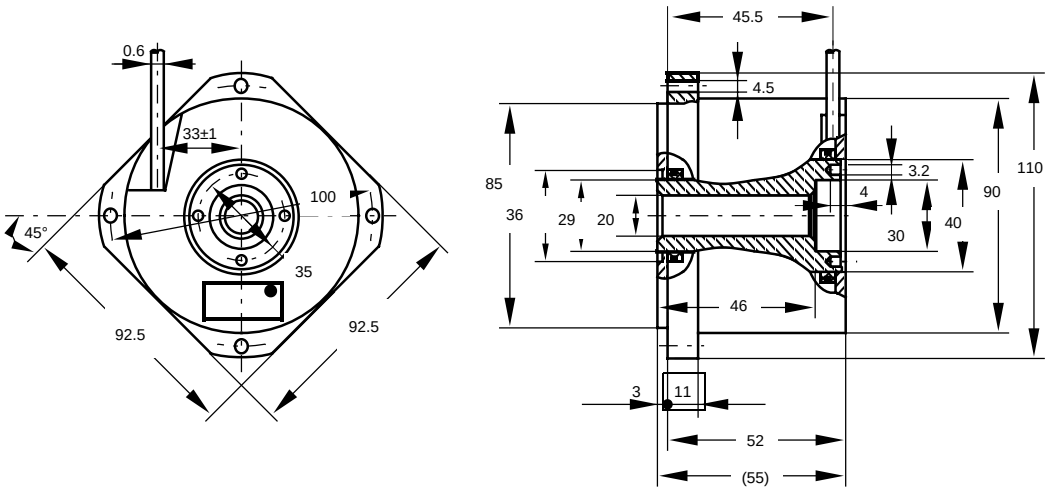


4.10.3 High-resolution rotary encoder for rotary axes

ROD 250
Order No.: 6FC9 320 - 3CM00

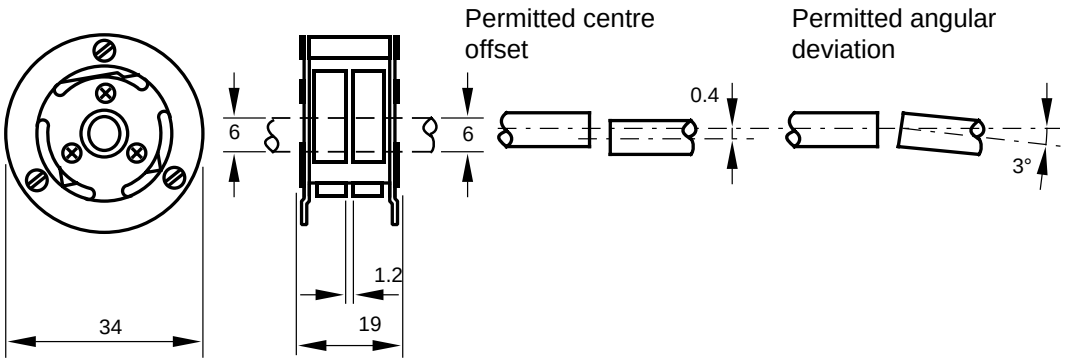


RON 255
Order No.: 6FC9 320 - 3CN00

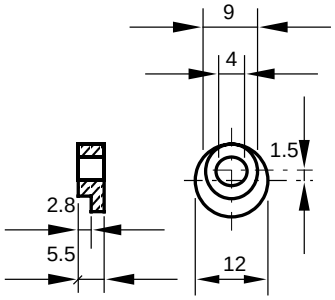


4.10.4 Spring disk coupling/clamping jaws

- Spring disk coupling
  Order No.: 6FC9 320-4GB



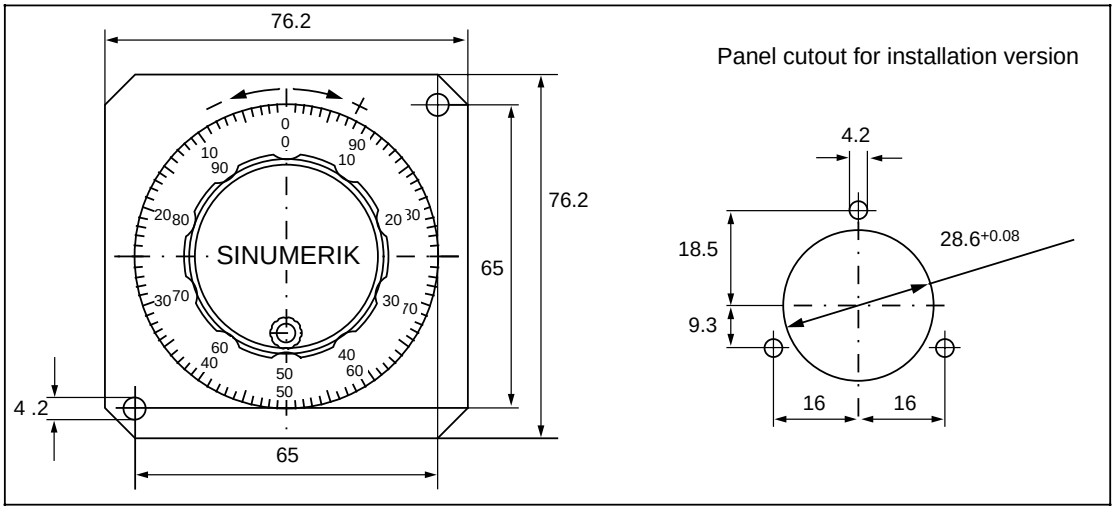
- Clamping jaws
  Order No.: 6FC9 320 - 4GA

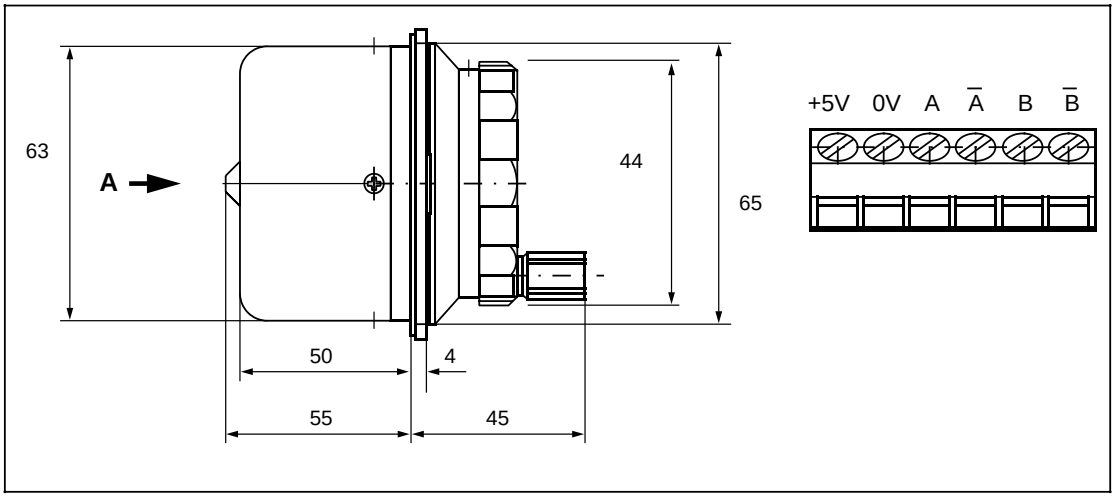


4.11 Electronic handwheel

4.11.1 Electronic handwheel, small

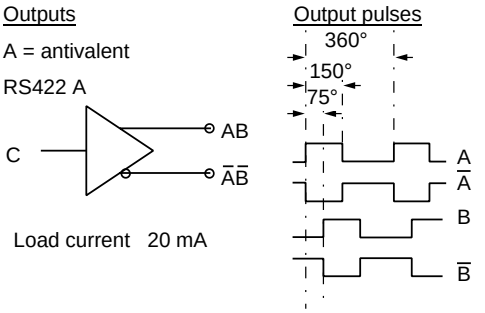
Order No.: 6FC9 320-5DC





Technical data:

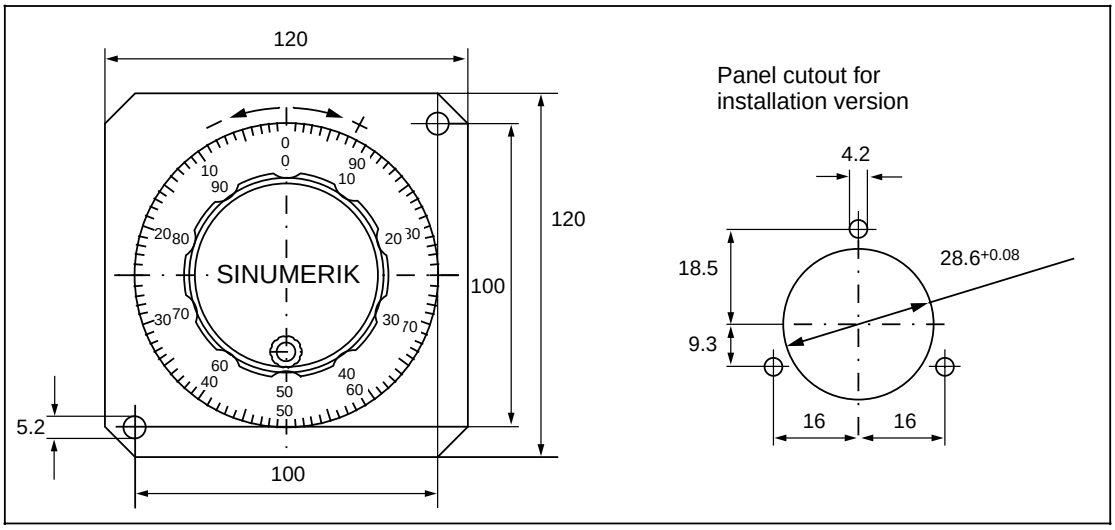
Signals:	2×100 pulses/rev
Operating voltage:	5V±5 %
Output circuit to RS422 A	
Housing, front panel	Light metal bright anodized
and handwheel	Colour engraving
Degr. of protection	Front panel IP65
to DIN 40050:	Back panel IP50
Connection:	Small Schraeg print terminal

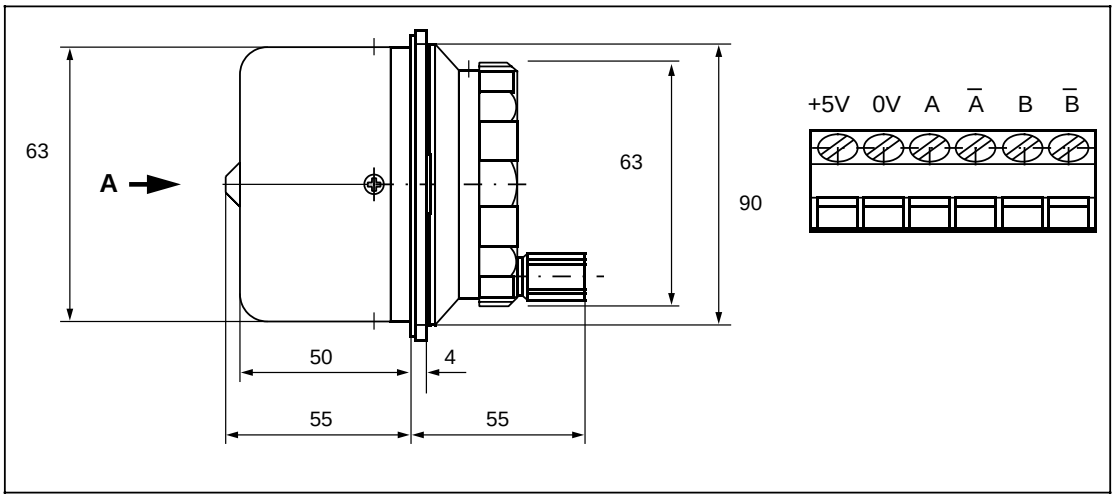


Order No. of cable required: 6FC9 344-4U

4.11.2 Electronic handwheel, large

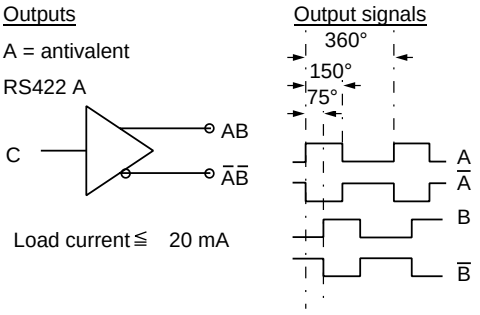
Order No.: 6FC9 320-5DB





Technical data:

Signals:	2 x 100 pulses/revolution
Operating voltage:	5V±5%
Output circuit to RS422 A	
Housing, front panel	Light metal, bright anodized
and handwheel	Colour engraving
Degree of protection	Front panel IP 65
to DIN 40050	Back panel IP 50
Connection:	Small Schraeg print terminal

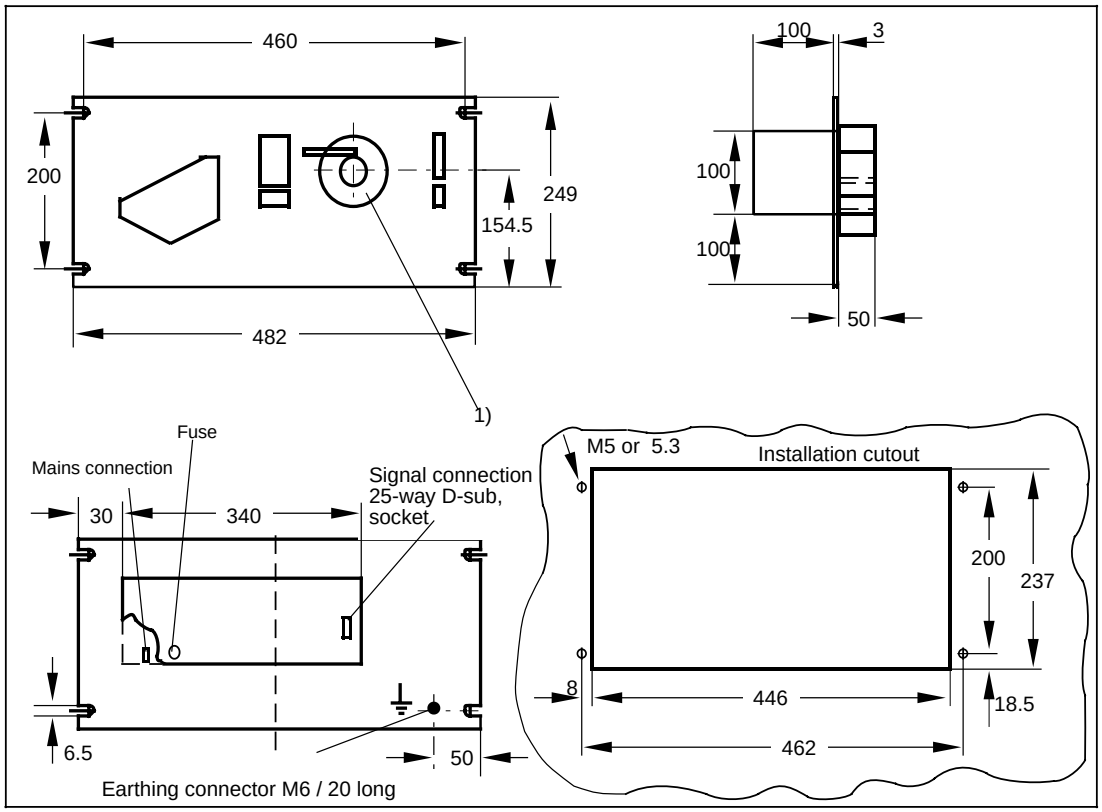


Order No. of cable required: 6FC9 344-4U

4.12 Tape readers

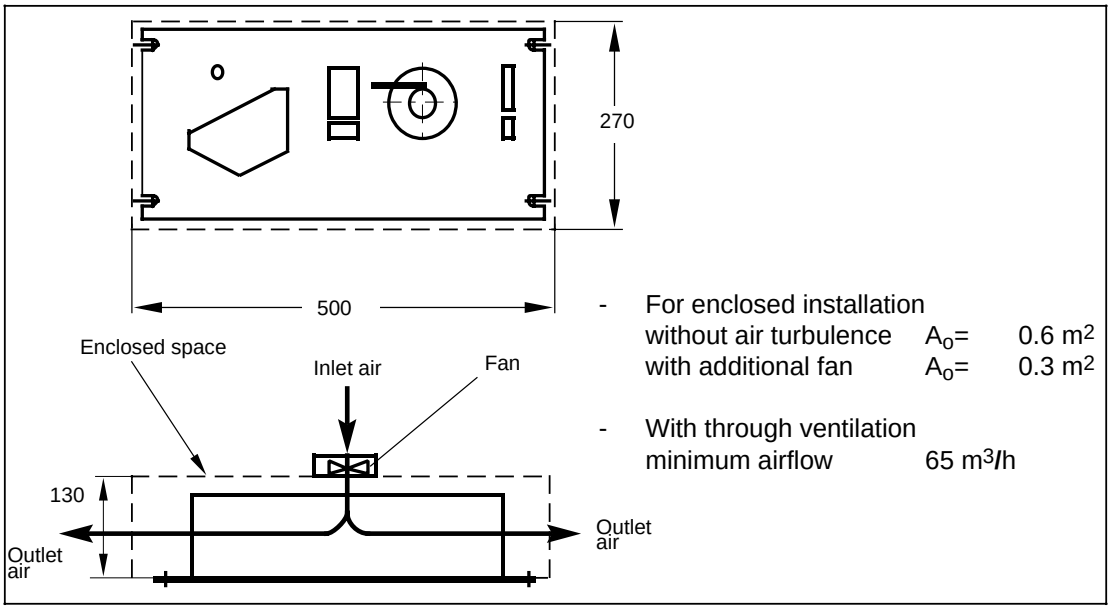
4.12.1 Reader T40, with take-up reel

Order No.: 6FC3 984-1FC



1) Rubber ring for endless loop enclosed
2) Mains cable 1.5 m long, free wires with end ferrules
3) Earth symbol DIN 30600 according to DIN 40011 Supp. 8

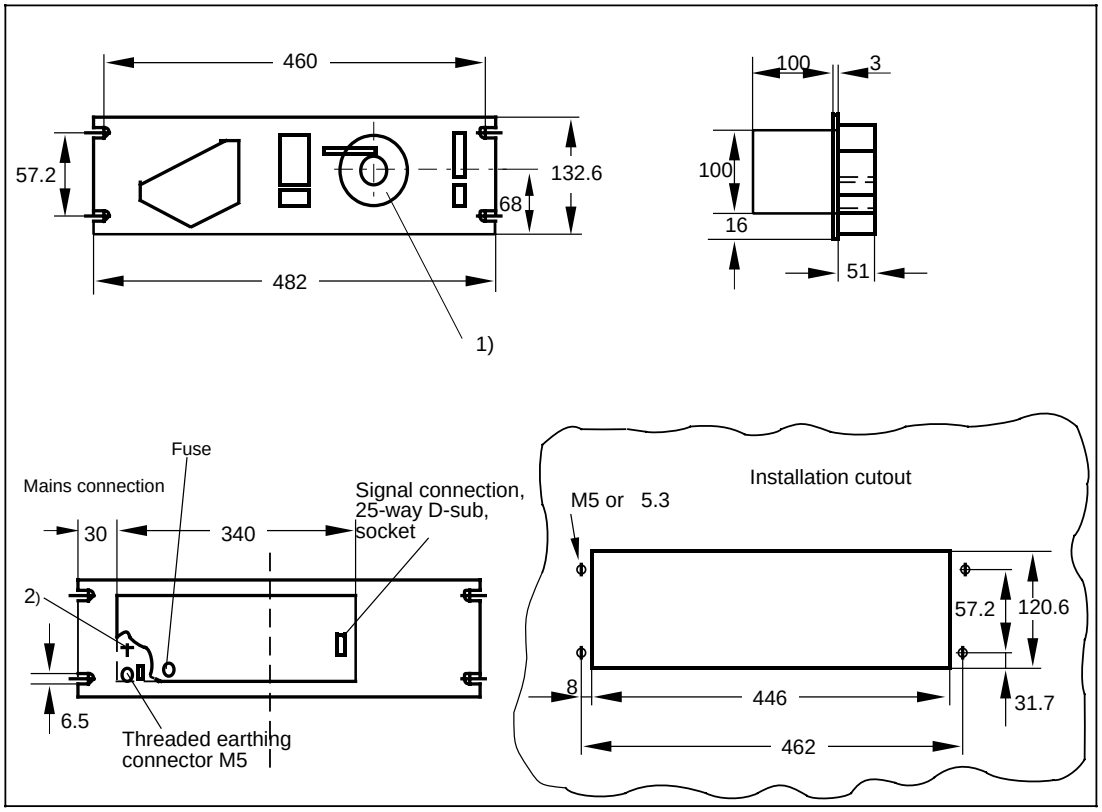
Mounting suggestion:



Order No. of the required cable: 6FC9 340-8S

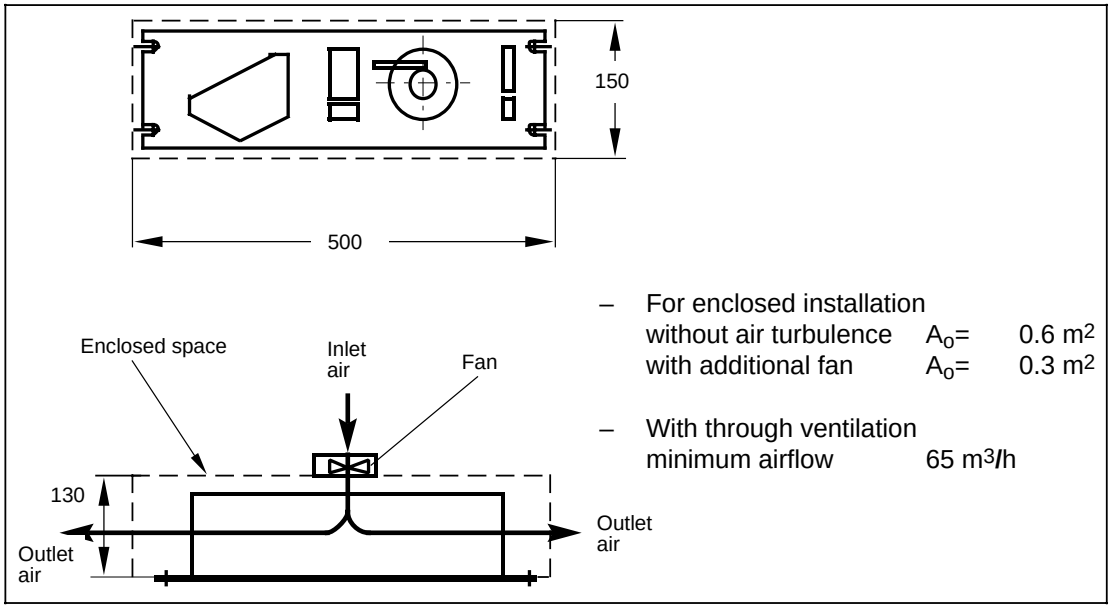
4.12.2 Reader T41, with take-up reel and smaller front panel

Order No.: 6FC3 984-1GB



1) Rubber ring for endless loop enclosed
2) Earth symbol DIN 30600 acc. to DIN 40011 Supp. 8

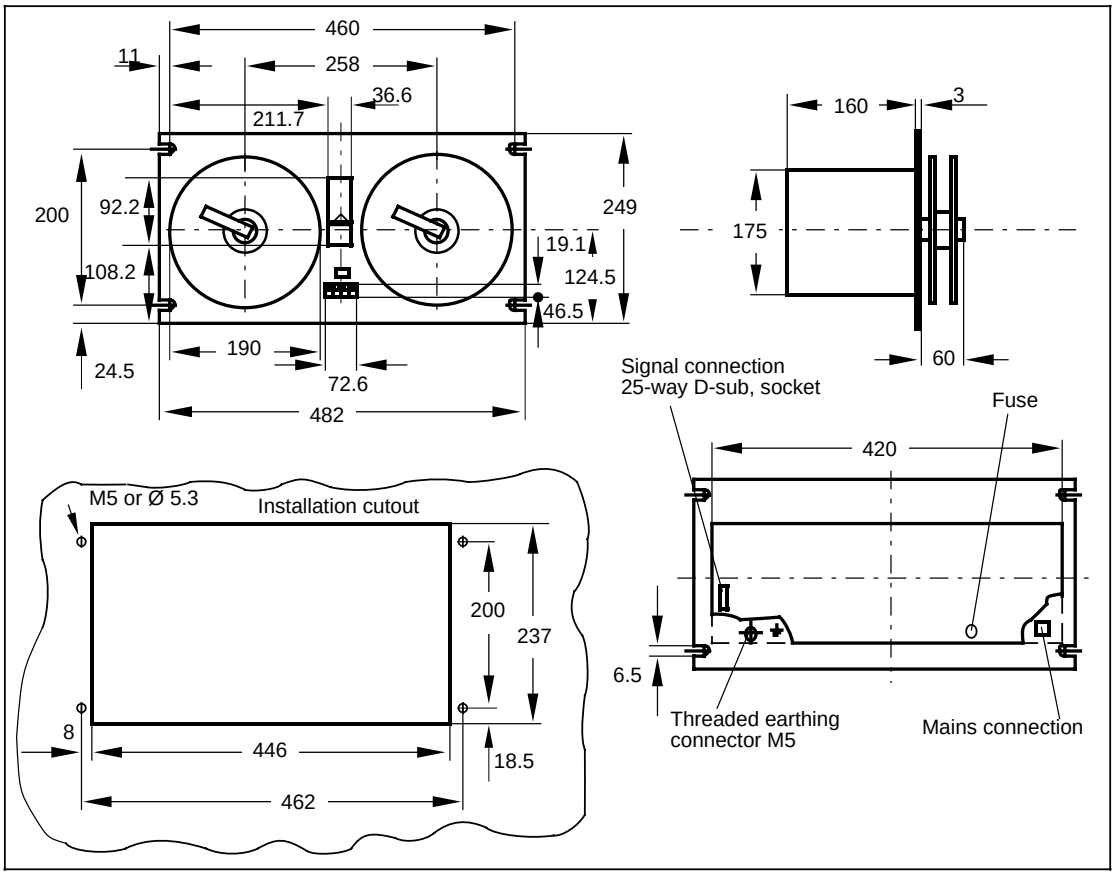
Mounting suggestion:



Order No. of the required cable: 6FC9 340-8S

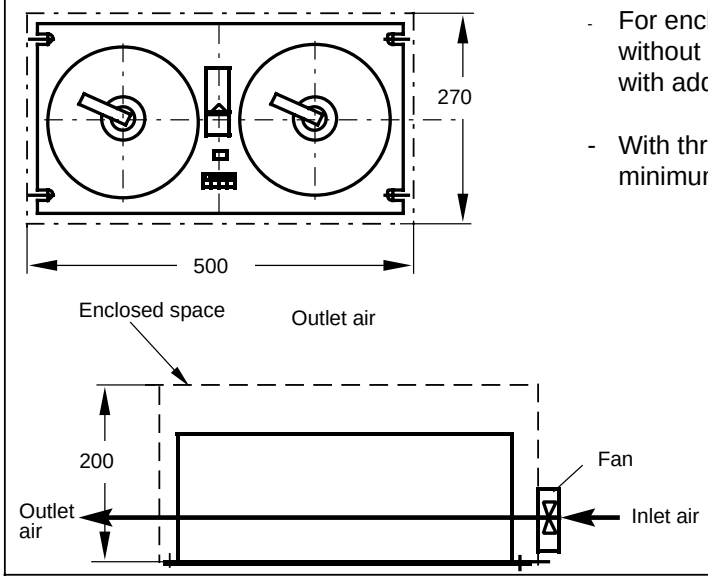
4.12.3 Reader T50, with winder

Order No.: 6FC3 984-1FD



1) Mains cable 1.1 m long, free wires with end ferrules
2) Earth symbol DIN 30600 acc. to DIN 40011 Supp. 8

Mounting suggestion:

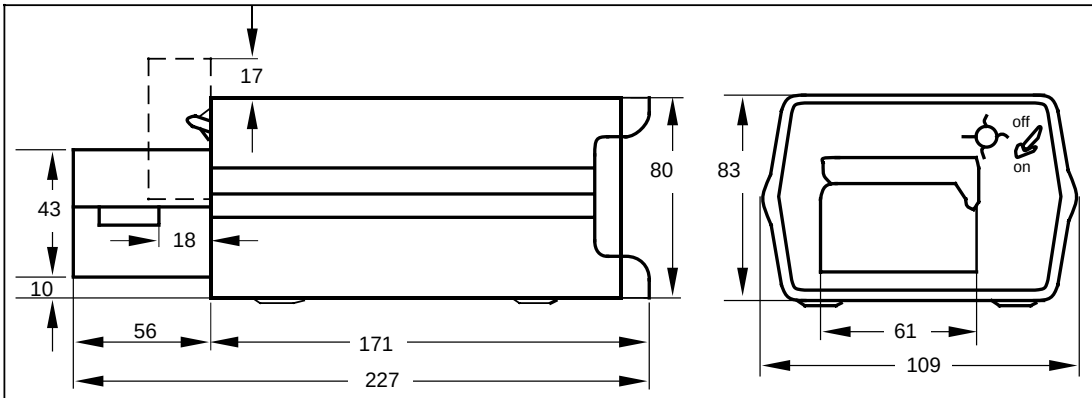


- For enclosed installation
  without air turbulence $A_o = 2.2\ m^2$
  with additional fan $A_o = 1.1\ m^2$
- With through ventilation
  minimum airflow 65 m^3/h

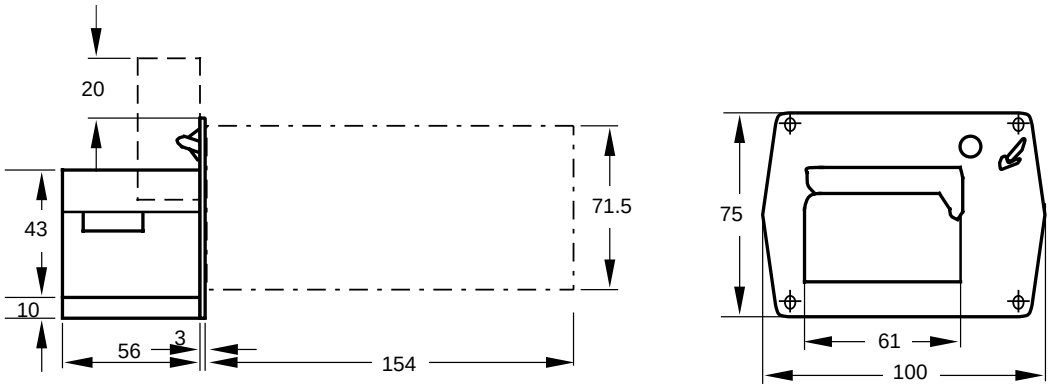
Order No. of the required cable: 6FC9 340-8S

4.12.4 Reader T60, portable

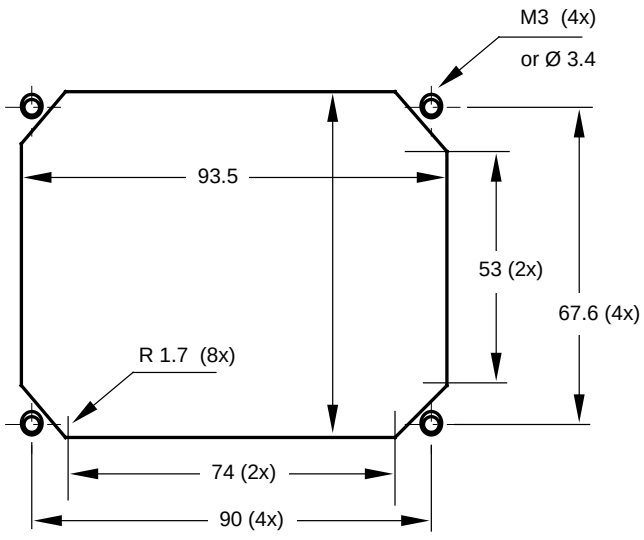
Order No.: 6FC3 984-1FB



Reader T60
Portable version



Reader T60
Panel-mounted version, with housing removed

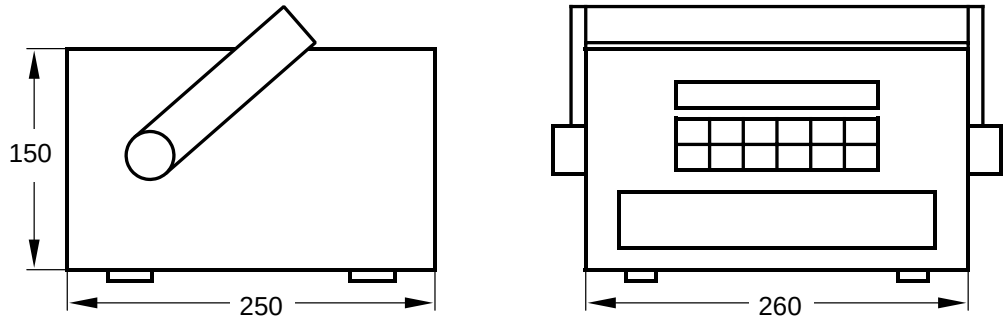


Installation cutout T60

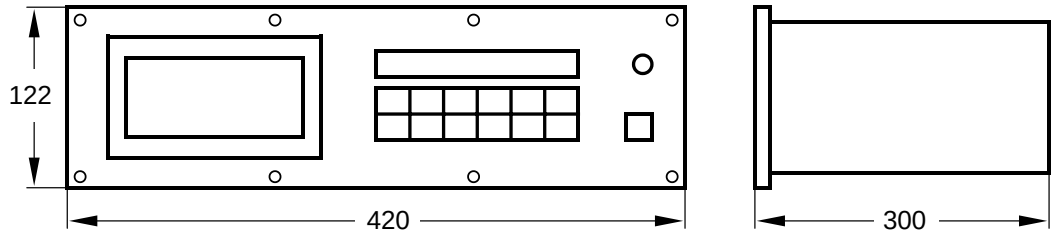
Order No. of the required cable: 6FC9 344-2C

4.12.5 DSG-3.5 disk drive

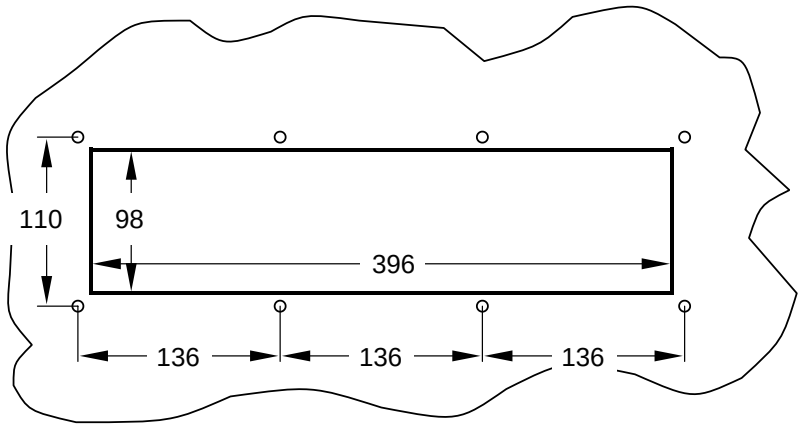
Portable version, Order No.: 6FC9 310-1JA



Panel-mounted version, Order No.: 6FC9 310-1KA



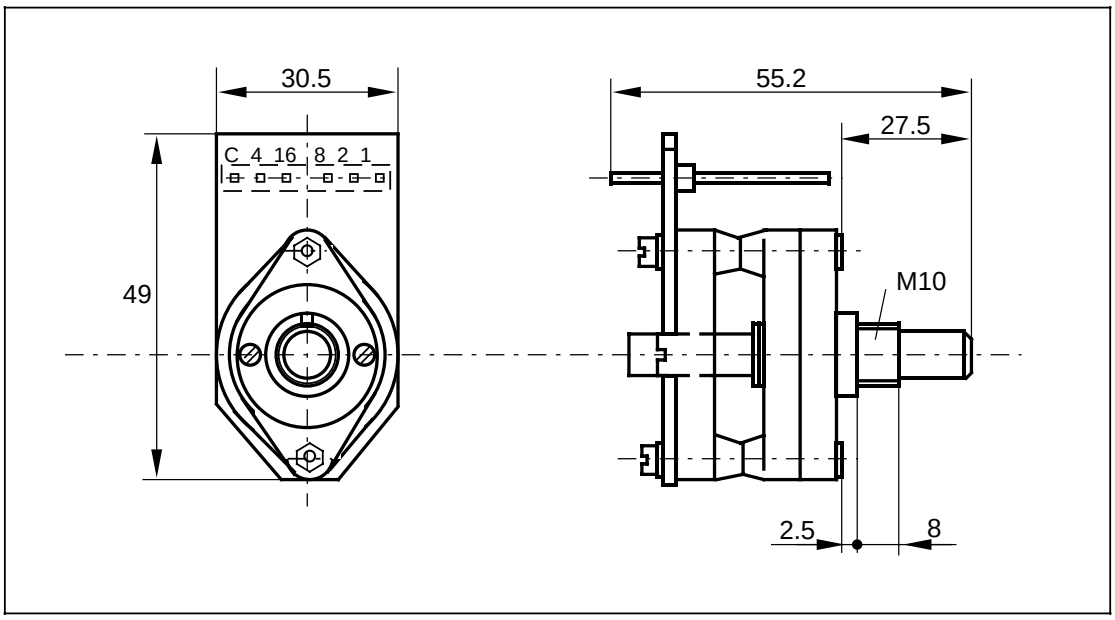
Installation cutout



Cable required: DSG-NC connecting cable, Order No.: 6FC9 344-2P

5 Individual Elements for Machine Control Panels

5.1 Encoded selector switch



For use in machine control panel as ...	Switch positions available	in use	Switching angle	Order No.
Operating mode switch	16	13	15°	6FC9 301 - 0AE
Spindle speed override switch	16	15	15°	6FC9 301 - 0EC
Feedrate override switch	23	23	11.25°	6FC9 301 - 0BC
Rapid traverse override switch	16	4	15°	6FC9 301 - 0CD
Rapid traverse override switch [1)]	8	4	30°	6FC9 301 - 0CC
Axis selector switch	8	4	30°	6FC9 301 - 0DC

The machine manufacturer can use this switch to design his own machine control panel.

---

1) When using this switch, a code conversion to the NC/PLC user interface is required in the PLC user program.

5.2 Operating mode switch coding

Order No.: 6FC9 301-0AE

The operating mode switch on the machine control panel transfers the following code (Gray code) to the input byte in accordance with the switch position:

Position	Code 8	4	2	1
1	0	0	0	1
2	0	0	1	1
3	0	0	1	0
4	0	1	1	0
5	0	1	1	1
6	0	1	0	1
7	0	1	0	0
8	1	1	0	0
9	1	1	0	1
10	1	1	1	1
11	1	1	1	0
12	1	0	1	0
13	1	0	1	1

5.3 Spindle speed override switch coding

Order No.: 6FC9 301-0EC

The spindle speed override switch on the machine control panel transfers the following code (Gray code) to the input byte in accordance with the switch position:

Position	Code 8	4	2	1
1	0	0	0	1
2	0	0	1	1
3	0	0	1	0
4	0	1	1	0
5	0	1	1	1
6	0	1	0	1
7	0	1	0	0
8	1	1	0	0
9	1	1	0	1
10	1	1	1	1
11	1	1	1	0
12	1	0	1	0
13	1	0	1	1
14	1	0	0	1
15	1	0	0	0

5.4 Feed and rapid traverse override switch coding

Order No.: 6FC9 301-0BC

The feedrate/rapid traverse override switch on the machine control panel transfers the following code (Gray code) to the input byte in accordance with the switch position:

Position	Code 16	8	4	2	1
1	0	0	0	0	1
2	0	0	0	1	1
3	0	0	0	1	0
4	0	0	1	1	0
5	0	0	1	1	1
6	0	0	1	0	1
7	0	0	1	0	0
8	0	1	1	0	0
9	0	1	1	0	1
10	0	1	1	1	1
11	0	1	1	1	0
12	0	1	0	1	0
13	0	1	0	1	1
14	0	1	0	0	1
15	0	1	0	0	0
16	1	1	0	0	0
17	1	1	0	0	1
18	1	1	0	1	1
19	1	1	0	1	0
20	1	1	1	1	0
21	1	1	1	1	1
22	1	1	1	0	1
23	1	1	1	0	0

5.5 Rapid traverse override switch coding

Order No.: 6FC9 301-0CD

The rapid traverse override switch supplies the following code (Gray code) in accordance with the switch position:

Position	Code 4	2	1
1	0	0	1
2	0	1	1
3	0	1	0
4	1	1	0

5.6 Rapid traverse override switch coding

Order No.: 6FC9 301-0CC

The rapid traverse override switch supplies the following code (Gray code) in accordance with the switch position:

Position	Code 8	4	2	1
1	0	0	1	1
(i)	0	0	1	0
2	0	1	1	0
(i)	0	1	1	1
3	0	1	0	1
(i)	0	1	0	0
4	1	1	0	0

When this switch is used, the PLC user program must contain a code conversion to the NC/PLC user interface.

5.7 Axis selector switch coding

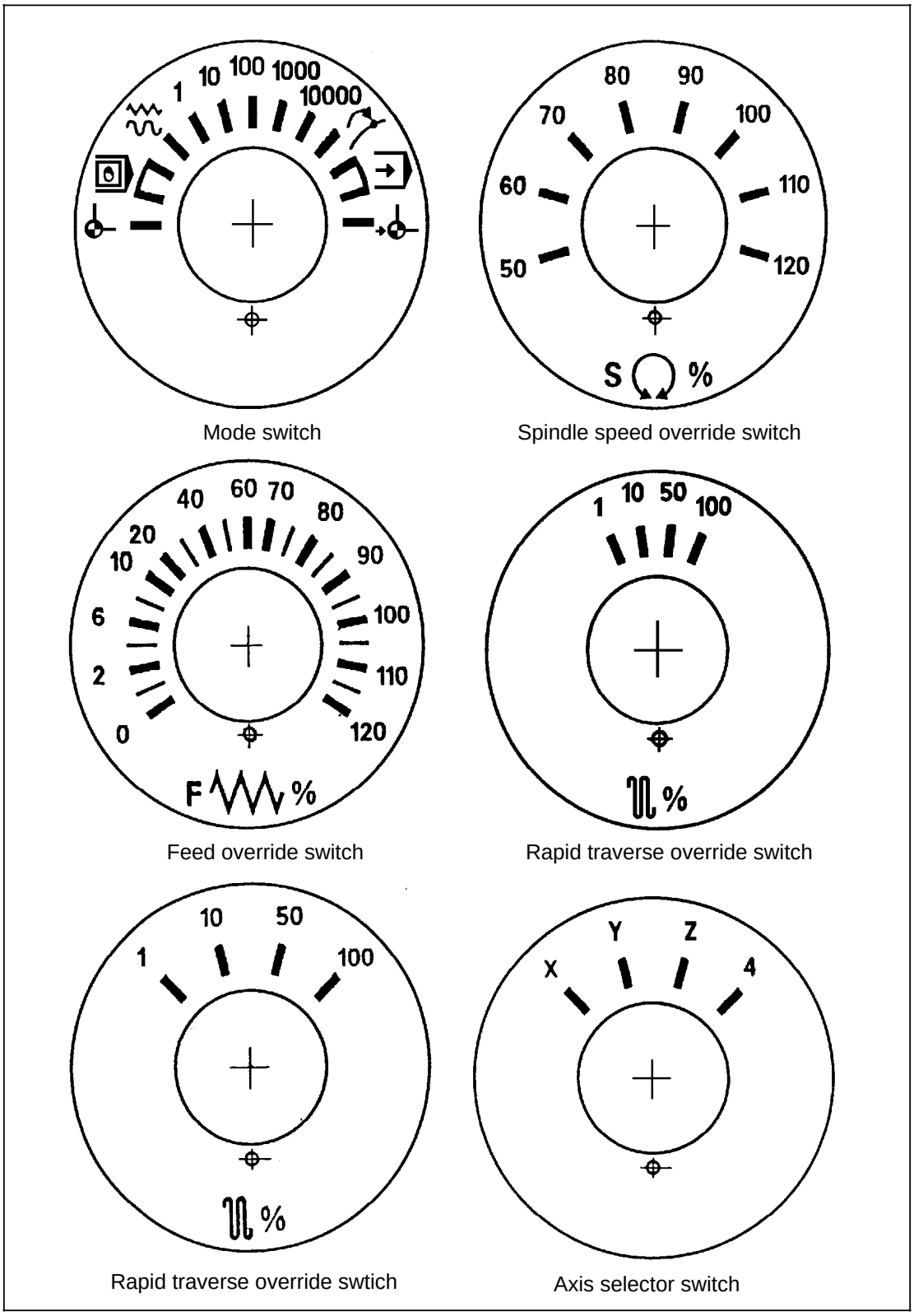
Order No.: 6FC9 301-0DC

The axis selector switch supplies the following code (Gray code) in accordance with the switch position:

Position	Code E	D	C	B	A
1	0	0	0	1	1
(i)	0	0	0	1	0
2	0	0	1	1	0
(i)	0	0	1	1	1
3	0	0	1	0	1
(i)	0	0	1	0	0
4	0	1	1	0	0

i = intermediate position

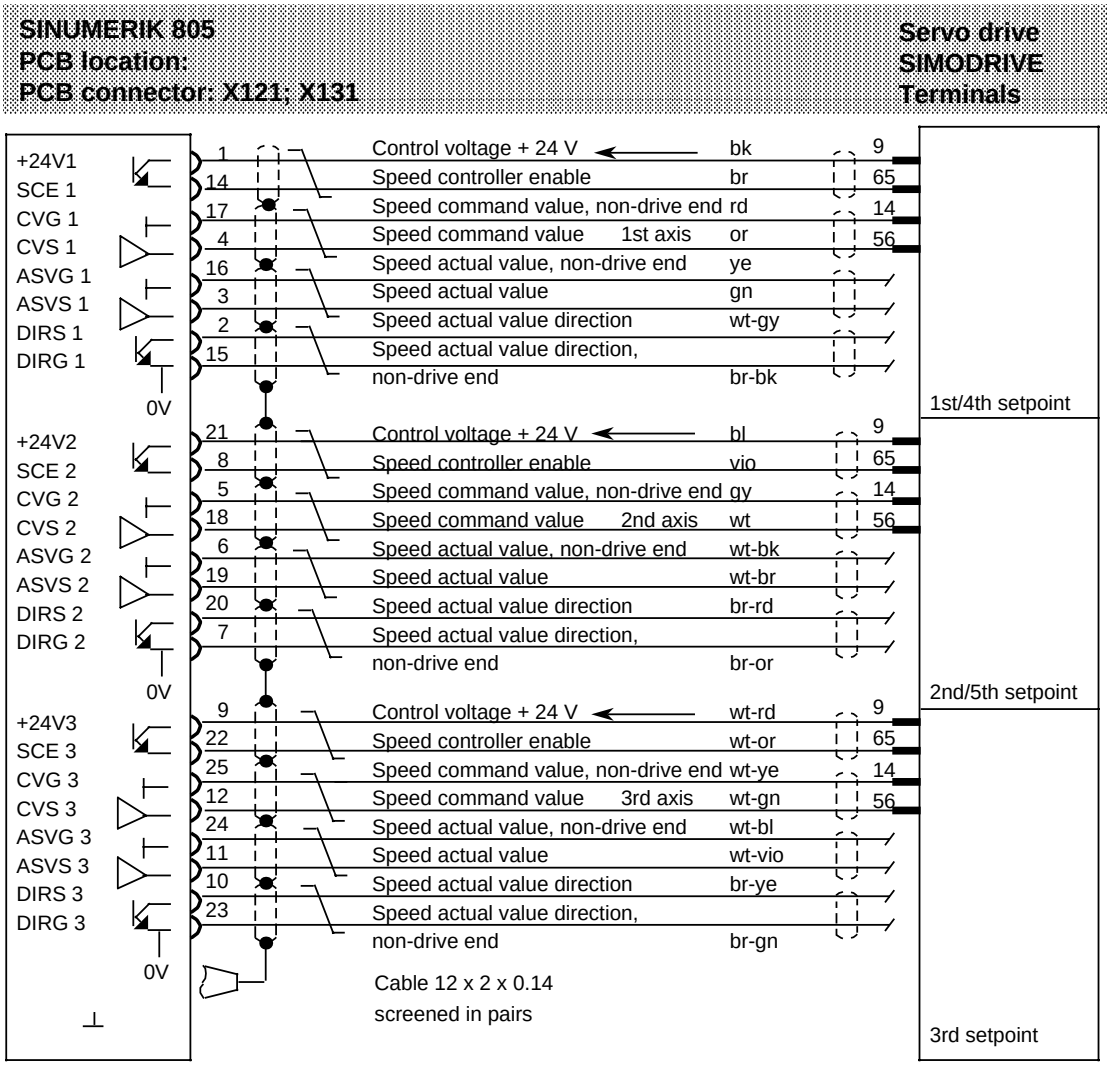
5.8 Engravings

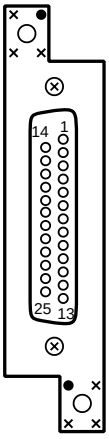


6 Cable Diagrams

6.1 Setpoint cable

Cable name: Servo drive
Order No.: **6FC9 340-8R**





Connector
Position: 1 above
25-way D-Sub socket
Connection side
SINUMERIK shell
6FC9 341-1ED

Connector code

- ● coding pin
- × no coding pin

Ready-made cable end

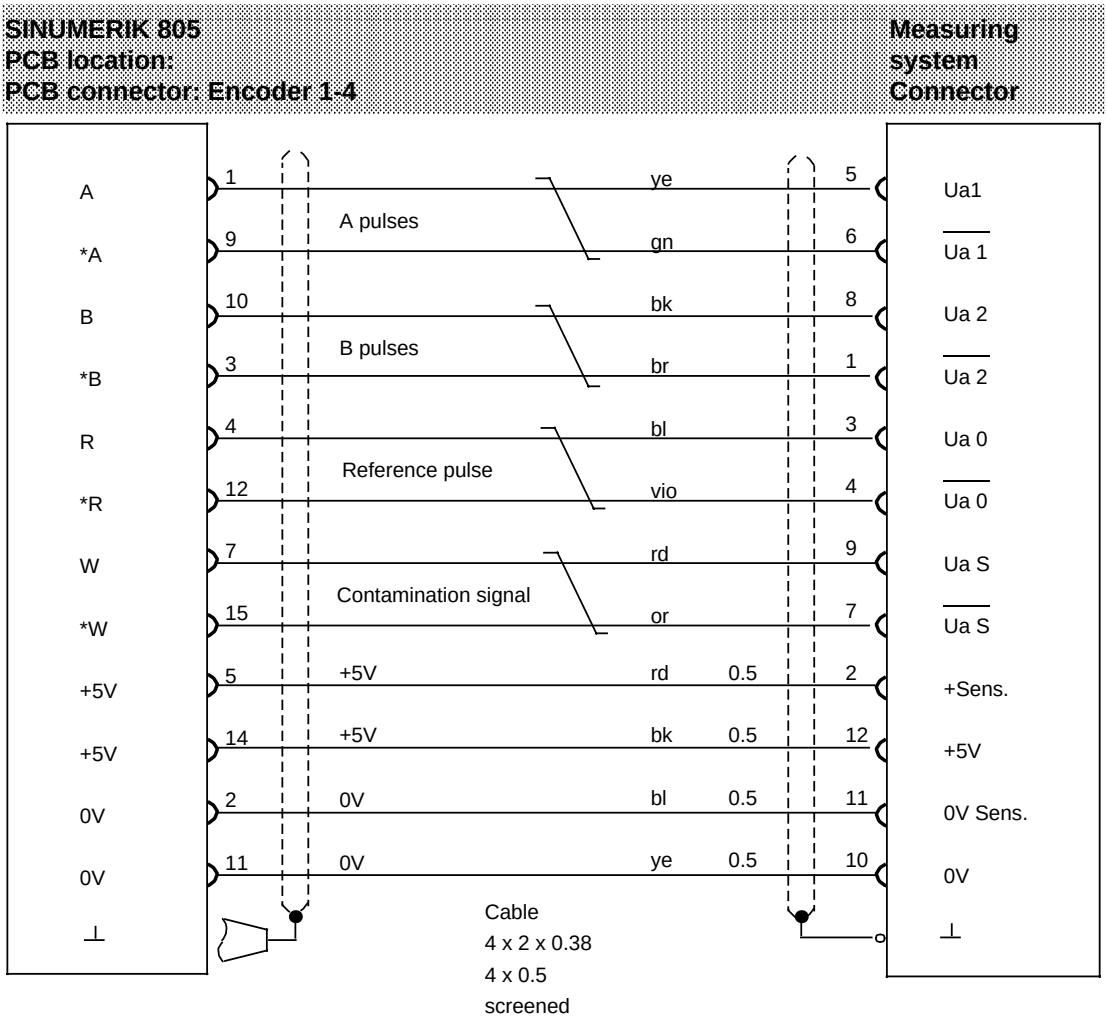
Outer sheath stripped back 400 mm

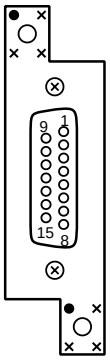
30 mm tails

Plug connector + terminal designation on designated wires

6.2 Measuring system cable

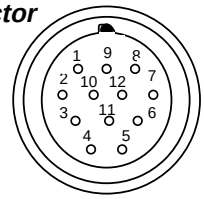
Cable name: Digital rotary measuring system (new version)
Linear measuring system via EXE 60. SI
Order No.: **6FC9 344-2B**





Connector
Position: 1 above
15-way D-Sub
socket
SINUMERIK shell
6FC9 341-1EC

Round connector
12-way socket
SIEMENS
10 mm cable dia.
Connection side

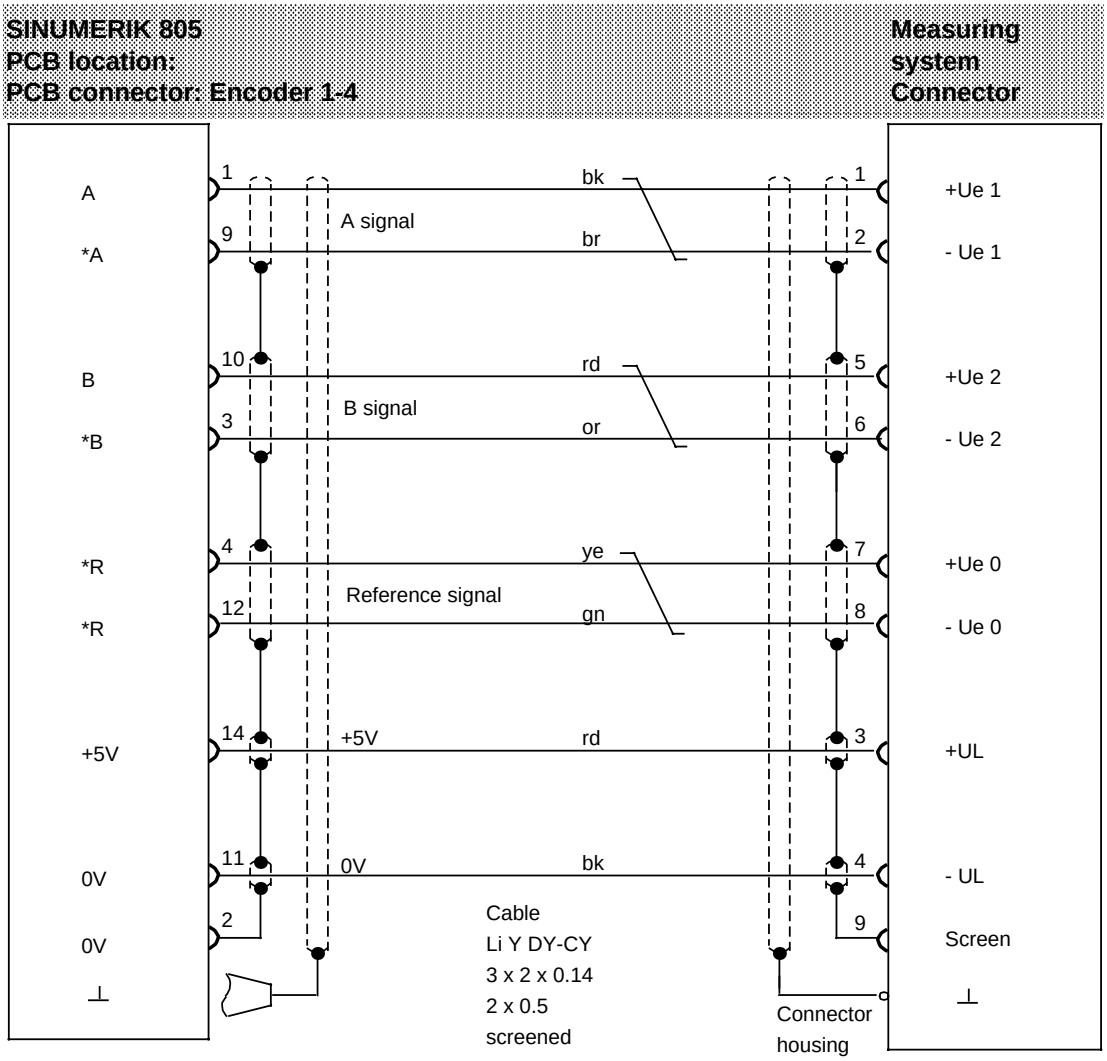


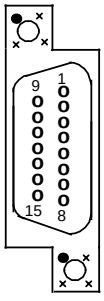
6 FC9 341-1FD

Connector code

- ● coding pin
- × no coding pin

Cable name: Digital linear measuring system with integrated EXE
Order No.: **6FC9 340-8Q**





Connector

Position: 1 above
15-way D-Sub
socket
Connection side
SINUMERIK shell
6FC9 341-1EC

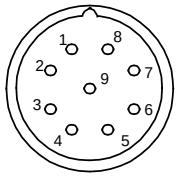
Connector code

● coding pin
× no coding pin

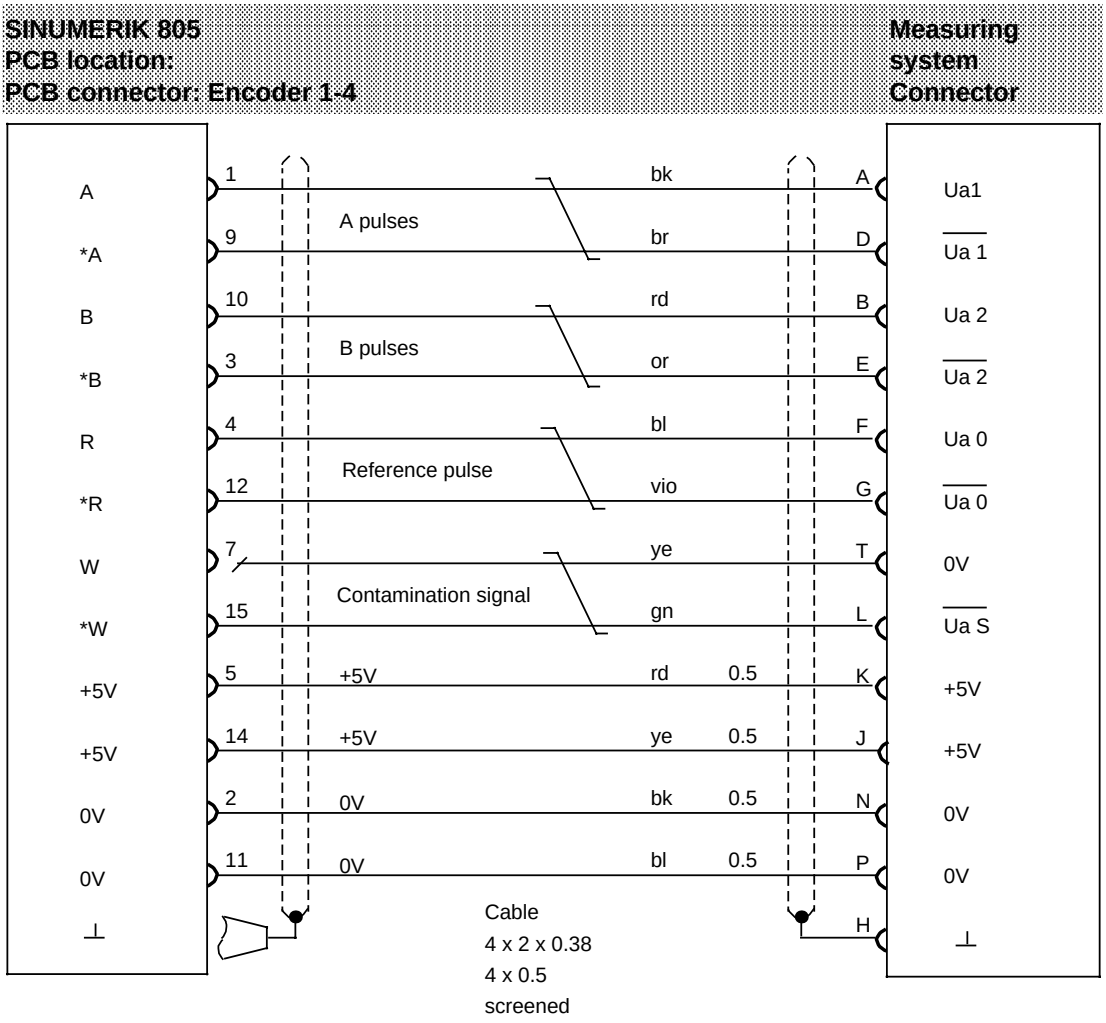
Connector coupling

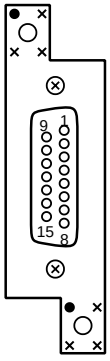
9-way socket
SIEMENS
8 mm cable dia
Connection side

6 FC9 341-1EW



Cable name: Digital rotary measuring system in the servo drive
Order No.: 6FC9 340-8P





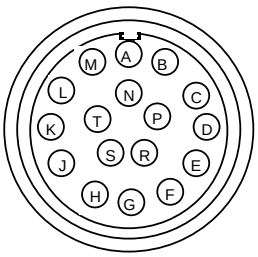
Connector
Position: 1 above
15-way D-Sub
socket
Connection side
SINUMERIK shell
6FC9 341-1EC

Connector code

- ● coding pin
- × no coding pin

Connector
17-way socket
Tuchel
CA 08-20-295
Connection side

6 FC9 341-1AC

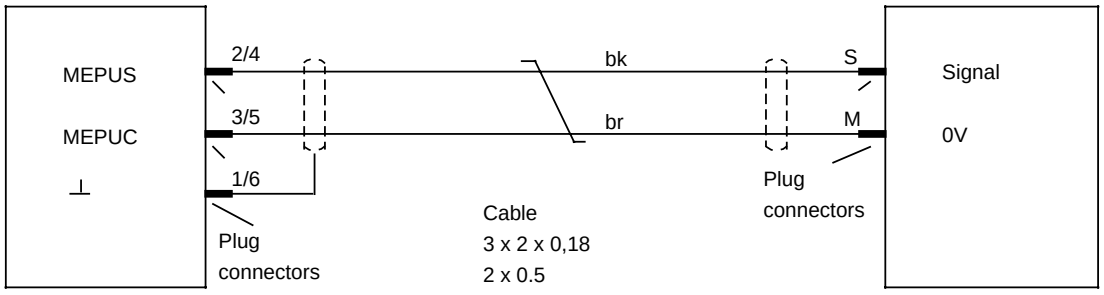


6.3 Sensor cable

Cable name: Sensor
Order No.: **6FC9 340-8U**

SINUMERIK 805
PCB location:
Terminal block X161

Sensor
Terminals



Ready-made cable end

30 mm tails

Plug connector+
terminal designation
on designated wires

Designation: NC

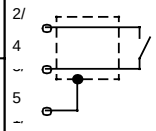
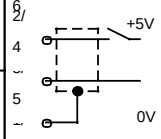
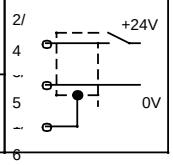
Terminal designation on NC:
Terminals 1, 2, 3: Sensor 1,
Terminals 4, 5, 6: Sensor 2
Measuring with 2 sensors requires 2 cables

Ready-made cable end

30 mm tails

Plug connector+
terminal designation
on designated wires

Measuring input wiring

DIP-FIX switch (on CPU board)			Sensor 1				Sensor 2				Connection of the inspection probe
			S1.1	S1.2	S2.1	S2.2	S1.3	S1.4	S3.1	S3.2	
Operating status	Edge	Level	Active level		Signal level (5V/24V)		Active level		Signal level (5V/24V)		
open collector relay contact	↓	open (+5V)	*		*	*	*		*	*	
	↑	closed (0V)		*	*	*		*	*	*	
TTL (5V)	↑	+5V	*		*	*	*		*	*	
	↓	0V		*	*	*		*	*	*	
24V	↑	+24V	*				*				
	↓	0V		*				*			

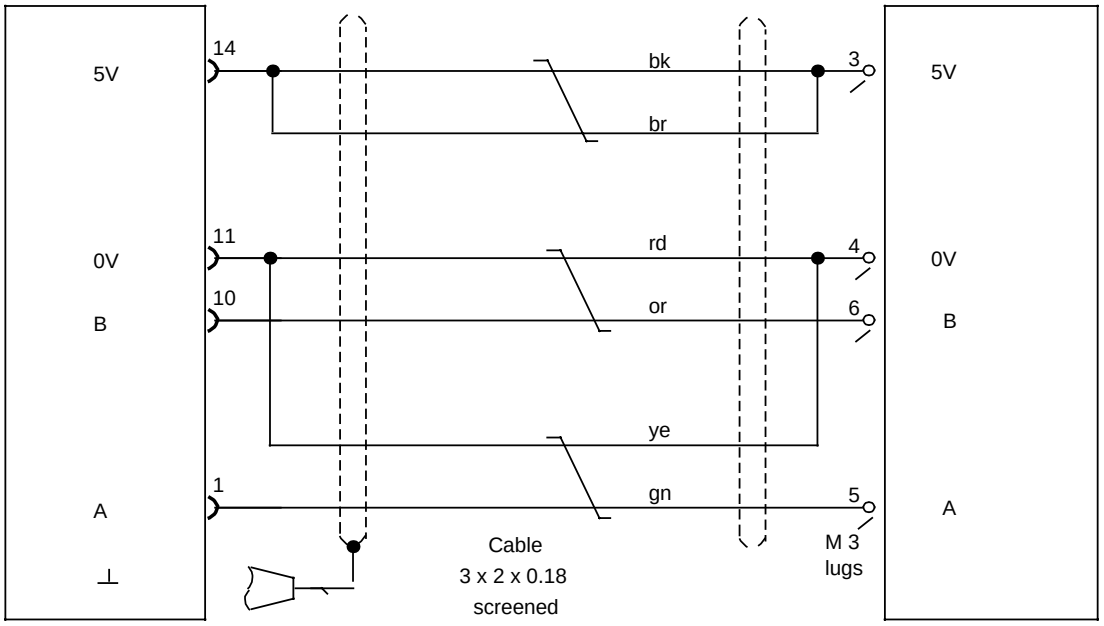
* *Dip-Fix closed*

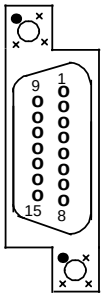
6.4 Handwheel cables

6.4.1 Handwheel cable, old version

Cable name: Electronic handwheel
Order No.: **6FC9 344-4E**

SINUMERIK 805		**Handwheel**
PCB slot:	**Central controller**	**Terminals**
PCB connector:	**Encoder 5**	





Connector
Position: 1 above
15-way D-Sub
socket
Connection side
SINUMERIK shell
6FC9 341-1EC

Connector code

- ● coding pin
- × no coding pin

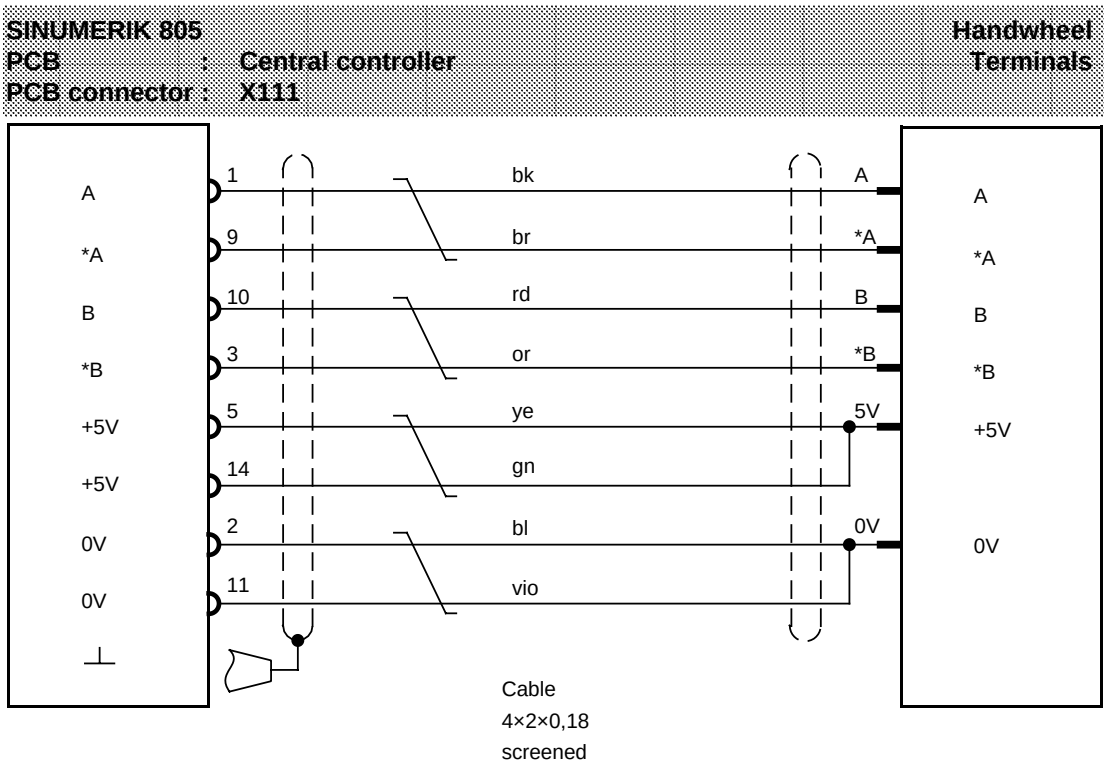
Ready-made cable end

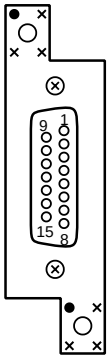
50 mm tails

M3 lugs +
terminal designation
on designated wires

6.4.2 Handwheel cable, new version

Cable name: External electronic handwheel
Order No..: **6FC9 344-4U**





Connector

Position 1 top
15-way D-Sub socket
Connection side
SINUMERIK shell
6FC9 341-1EC

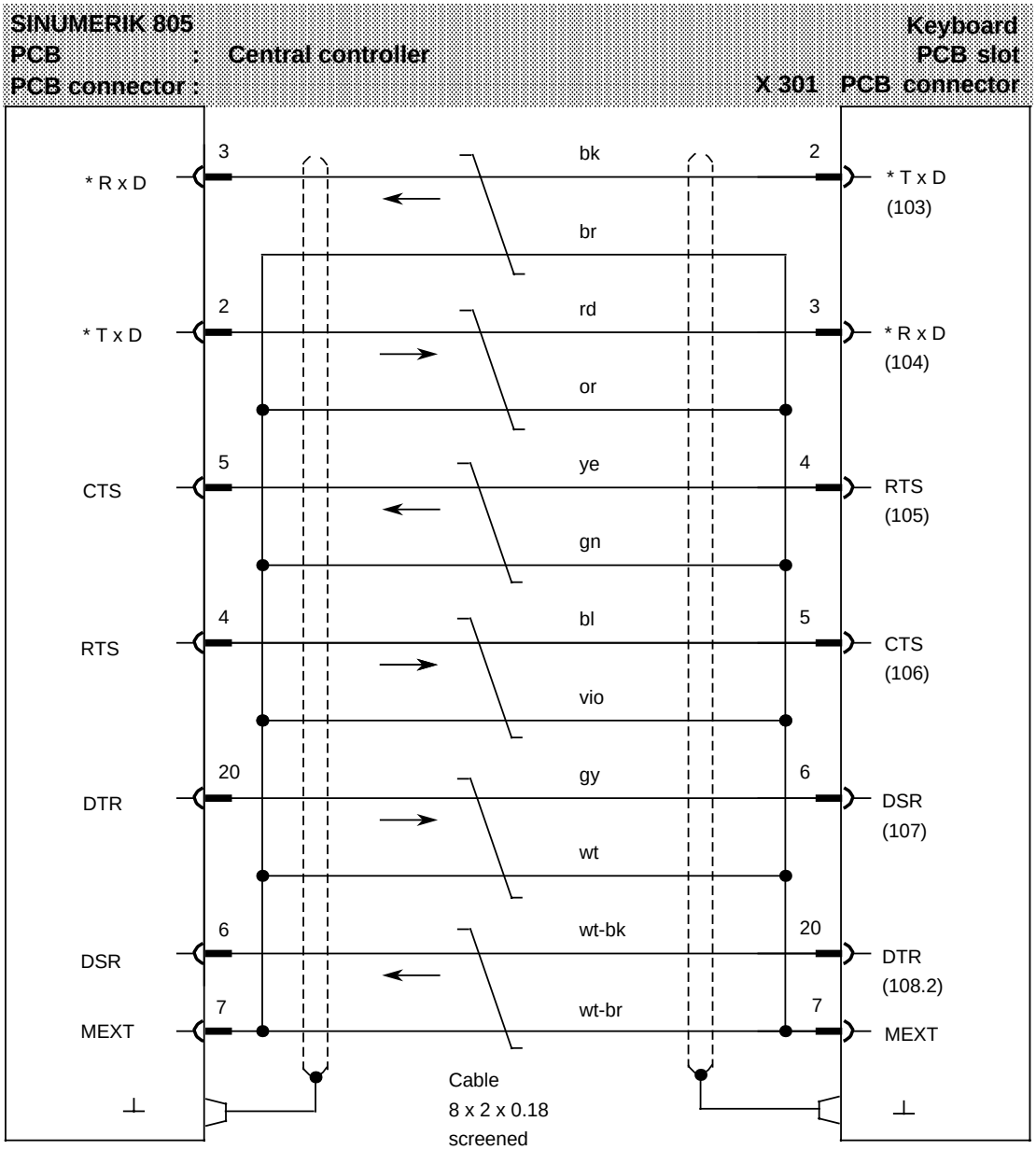
Connector code

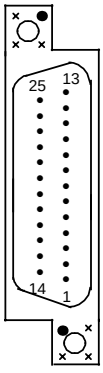
- ● Coding pin
- × No coding pin

Ready-made cable end
40 mm tails
Connector +
Terminal designation on
designated wires

6.5 Keyboard cable, NC NC link

Cable name: SINUMERIK System 800, RS232C
Use: Keyboard connection, NC NC link Order No.:**6FC9 340-8W**



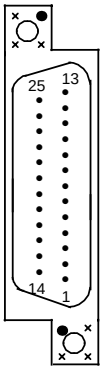


Connector
Position 1 below
25-way D-Sub plug
Connection side
SINUMERIK shell
6FC9 341-2AB
Designation: NC 1

Connector code
● coding pin
× no coding pin

Connector
Position 1 below
25-way D-Sub plug
Connection side
SINUMERIK shell
6FC9 341-2AB
Designation: NC 2

Connector code
● coding pin
× no coding pin

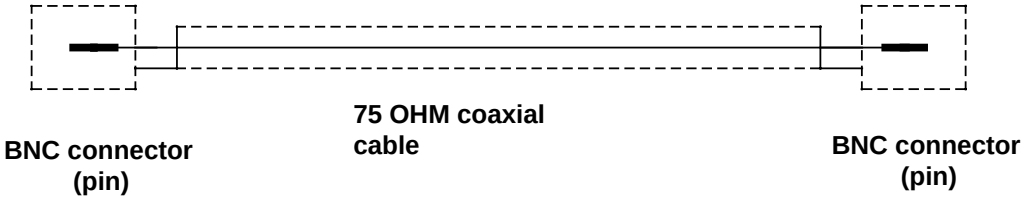


6.6 Monitor cable

6.6.1 Monochrome monitor cable

Cable Name:
Order No.: **6FC9 344-1T**

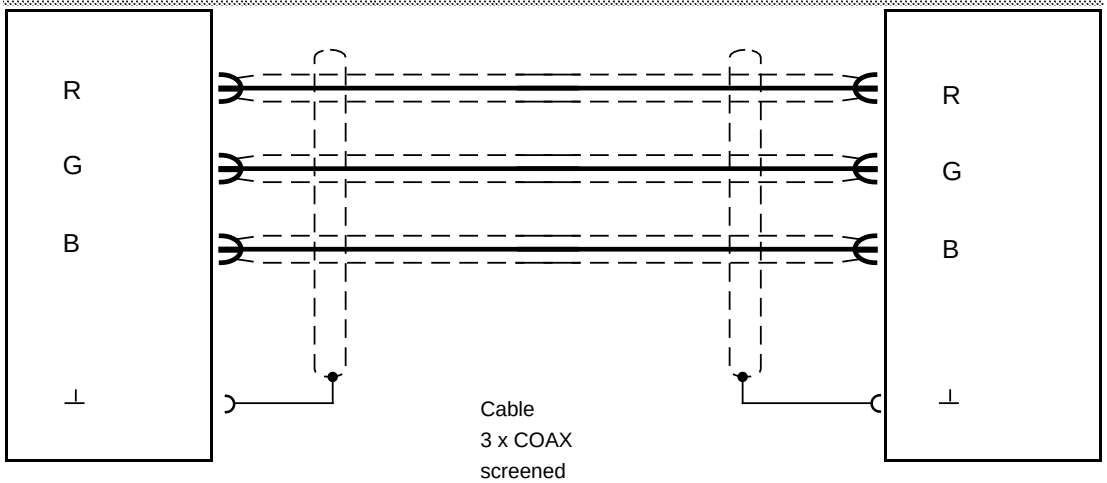
SINUMERIK	**: 805**	**Monochrome monitor**
PCB.	**:**	**PCB**
PCB connector	**: G**	**PCB connector**



6.6.2 Colour monitor cable

Cable Name: Monitor RGB
Order No.: **6FC9 344-4N**

SINUMERIK : 805 **Colour monitor**
PCB location : **R, G, B**
PCB connector : X152 (R), X162 (G), X172 (B)



Cable
3 x COAX
screened
6FC9 343-0AX

Connector
BNC sockets

Outer sheath
80 mm
stripped back

Shield connection
80 mm
with M3 plug connector
Tails
marked red, green, blue

Connector
BNC sockets

Outer sheath
80 mm
stripped back

Shield connection
80 mm
with M3 terminal
connector
Tails
marked red, green, blue

Cable characteristics:

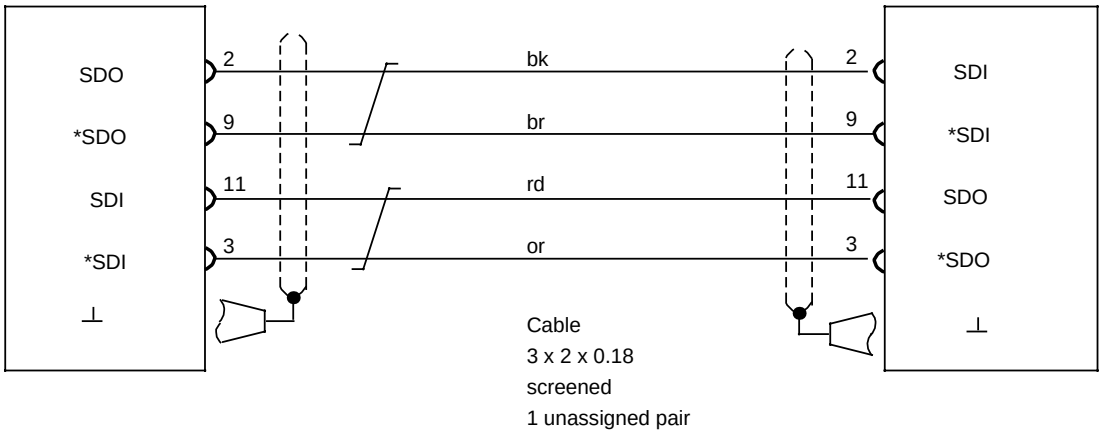
3 x single coaxial cable, PVC sheath, polyurethane sheath, additional overall sheath

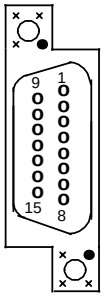
Connector:	BNC
Temperature range:	-40 °C to 90 °C
Resistant to:	Oil, coolant according to VDE 472/804
Minimum bending radius:	150 mm

6.7 DMP station connecting cable

Cable name: DMP link
Use: Connecting the 1st MPC node to the central controller
Order No.: **6FC9 344-3S**

SINUMERIK:	**805**		**DMP module**
PCB:	**Central controller**	**DMP TB**	**:PCB**
PCB connector:	**X141**	**X21/X24**	**:PCB connector**





Connector
Position 1 above
15-way D-Sub
socket
Connection side
SINUMERIK shell
6FC9 341-1EC

Designation: NC

Connector code

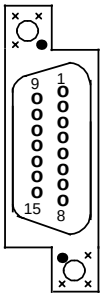
- ● coding pin
- × no coding pin

Connector
Position 1 above
15-way D-Sub
socket
Connection side
SINUMERIK shell
6FC9 341-1EC

Designation: DMP

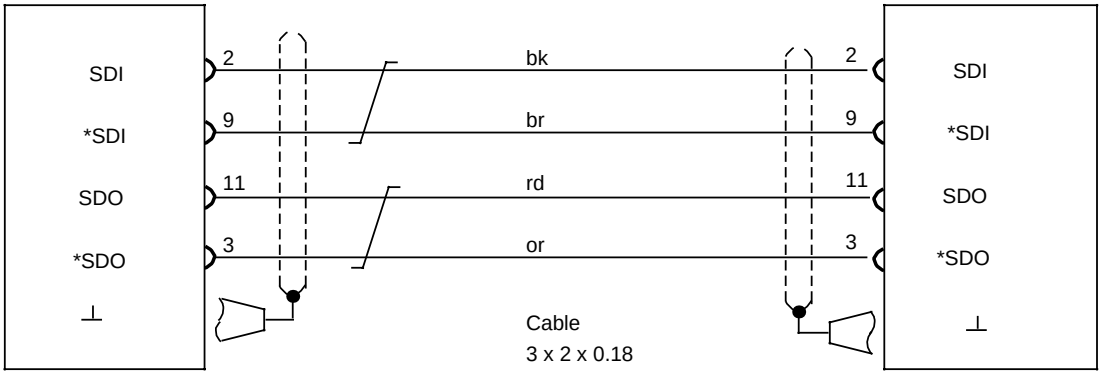
Connector code

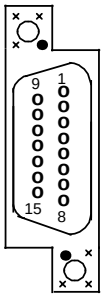
- ● coding pin
- × no coding pin



Cable name: DMP terminal block (round cable)
Use: Connecting cable from MPC node to MPC node (DMP station, distributor box)
Order No.: **6FC9 344-3Q**

SINUMERIK:		**SINUMERIK**
PCB: DMP TB		**DMP TB : PCB**
PCB connector: X21/X24		**X21/X24 : PCB connector**





Connector
Position 1 above
15-way D-Sub
socket
Connection side
SINUMERIK shell
6FC9 341-1EC

Designation: DMP

Connector code

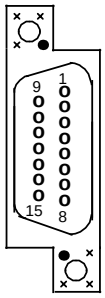
● coding pin
× no coding pin

Connector
Position 1 above
15-way D-Sub
socket
Connection side
SINUMERIK shell
6FC9 341-1EC

Designation: DMP

Connector code

● coding pin
× no coding pin

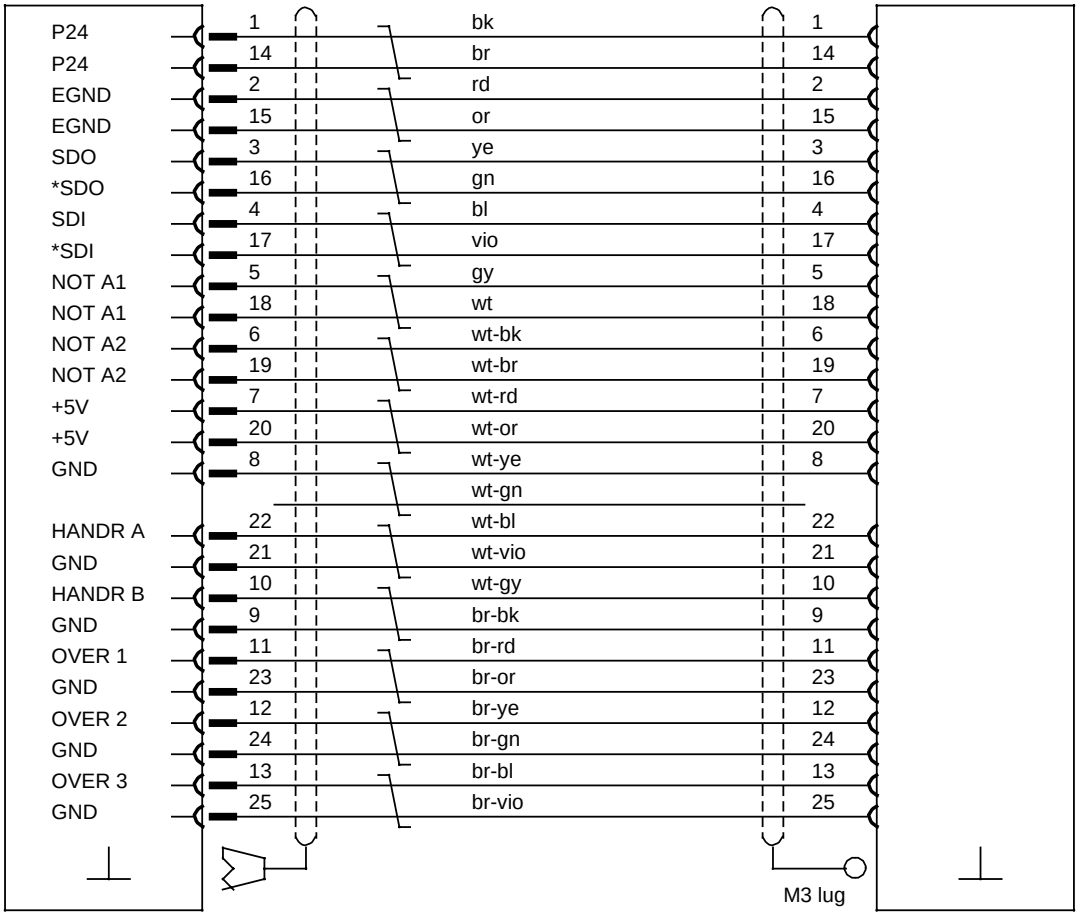


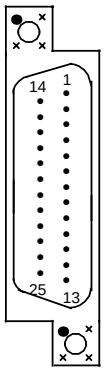
6.8 Hand-held unit intermediate connector cable

Cable name: Hand-held unit
Order No.: **6FC9 344-4G**

SINUMERIK : 805
PCB : Distributor box
PCB slot : X22

Hand-held unit intermediate connector

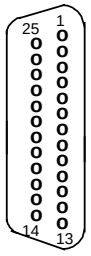




Connector
Position 1 below
25-way D-Sub
plug
Connection side
SINUMERIK shell
6FC9 341-2AB

Designation: BCX

Connector
Position 1 below
25-way D-Sub
socket
Connection side
without shell
with projections and nuts
Designation: BHG
+ shell
ID No. 40013583
+ adapter blocks for
D sub connector ID No. 40038511

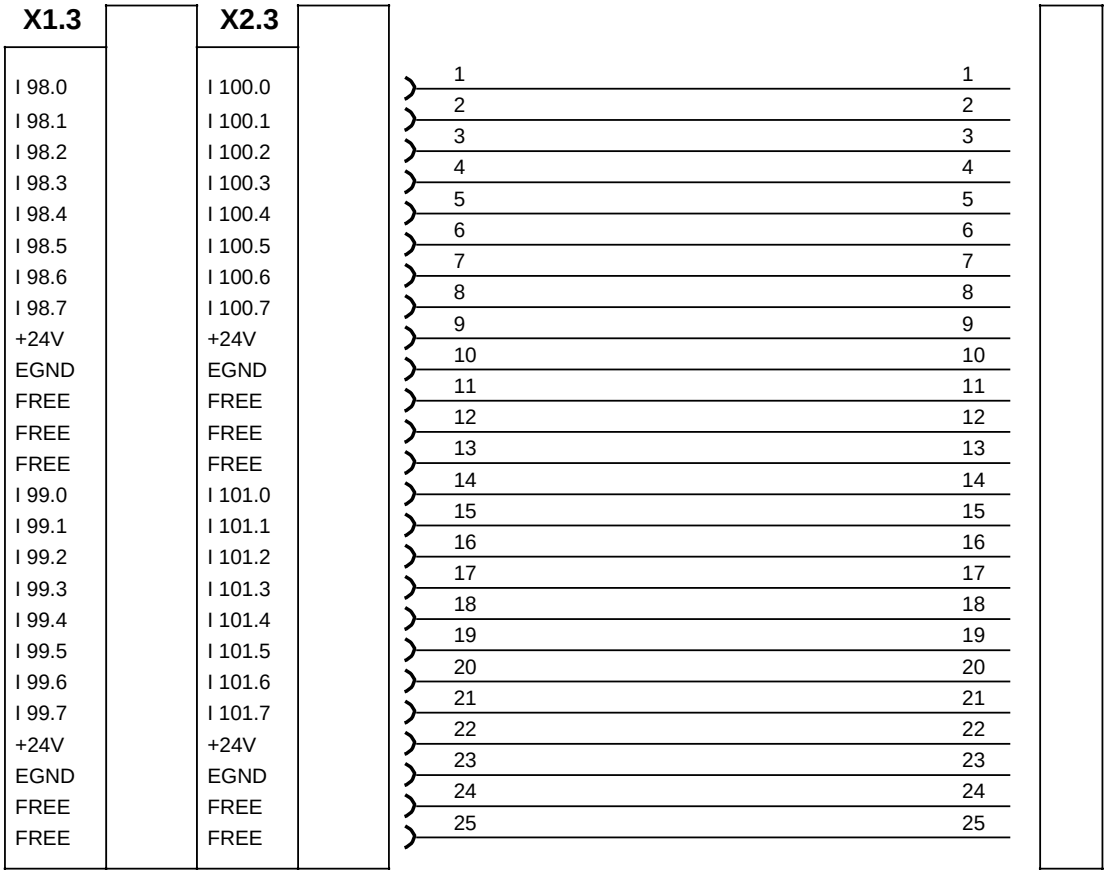


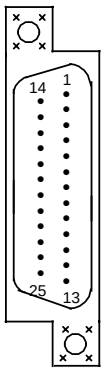
6.9 Keyboard expansion module cable

Cable name: Expansion module for inputs
Use: Connection of customer-specific pushbuttons, switches etc. on the keyboard expansion module
Order No.: Made by customer

SINUMERIK 805
PCB slot: Operator keyboard
PCB connector: X1.3 or X2.3

Customer
Operator panel





Connector

Position: 1 above
25-way D-Sub
socket
Connection side
SINUMERIK shell
6FC9 341-1ED

Connector code

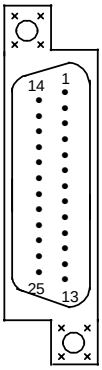
● coding pin
× no coding pin

Cable name: Expansion submodule for outputs
Use: Connection of customer-specific lamps, LEDs, etc. on the keyboard expansion submodule
Order No.: Made by customer

SINUMERIK 805
PCB slot: Operator keyboard
PCB connector: X1.4 or X2.4

Customer
Operator panel

X1.4	X2.4		
Q 74.0	Q 76.0	1	1
Q 74.1	Q 76.1	2	2
Q 74.2	Q 76.2	3	3
Q 74.3	Q 76.3	4	4
Q 74.4	Q 76.4	5	5
Q 74.5	Q 76.5	6	6
Q 74.6	Q 76.6	7	7
Q 74.7	Q 76.7	8	8
EGND	EGND	9	9
EGND	EGND	10	10
EGND	EGND	11	11
EGND	EGND	12	12
EGND	EGND	13	13
Q 75.0	Q 77.0	14	14
Q 75.1	Q 77.1	15	15
Q 75.2	Q 77.2	16	16
Q 75.3	Q 77.3	17	17
Q 75.4	Q 77.4	18	18
Q 75.5	Q 77.5	19	19
Q 75.6	Q 77.6	20	20
Q 75.7	Q 77.7	21	21
EGND	EGND	22	22
EGND	EGND	23	23
EGND	EGND	24	24
EGND	EGND	25	25



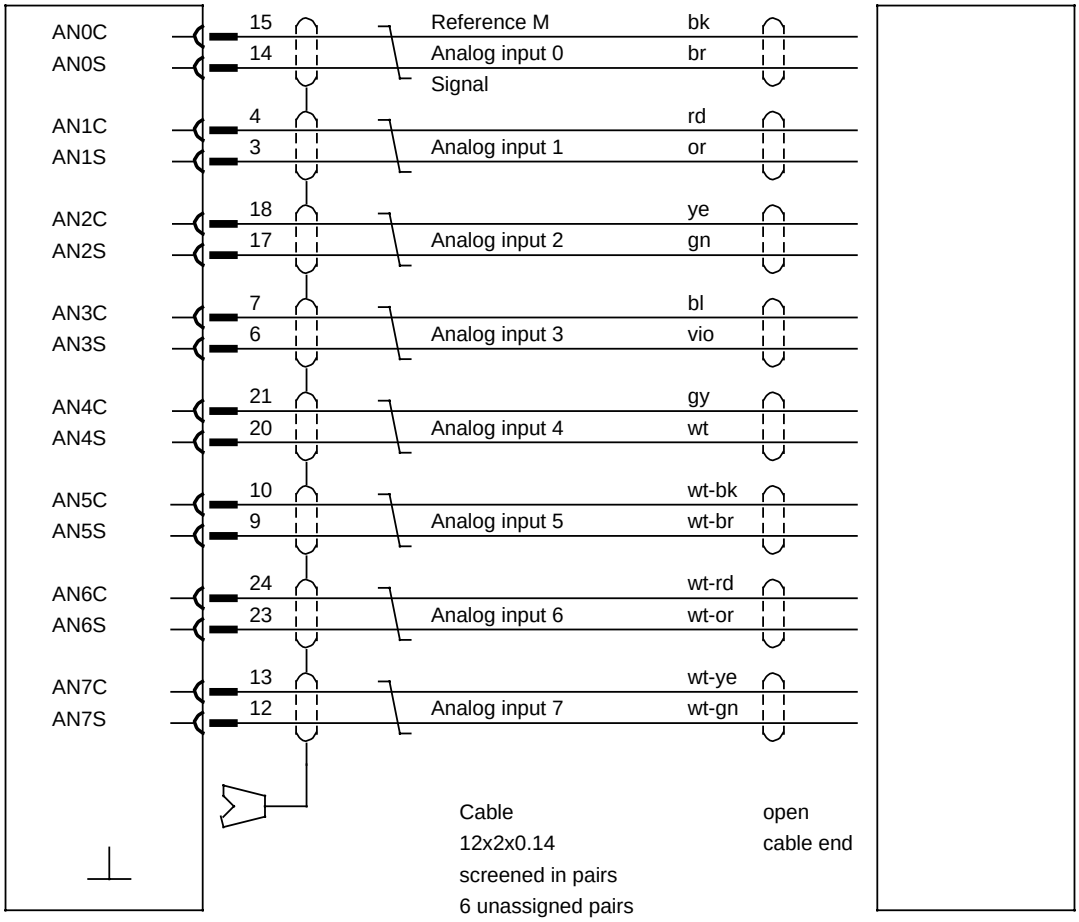
Connector
Position: 1 above
25-way D-Sub
socket
Connection side
SINUMERIK shell
6FC9 341-2AB

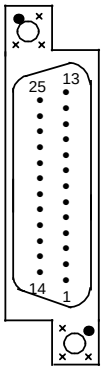
Connector code
● coding pin
× no coding pin

6.10 Cable for analog inputs

Cable name: Machine control analog input
Order No.: **6FC9 344-4F**

SINUMERIK : 805
PCB : Distributor box **Machine control**
PCB connector : X151





Connector
Position: 1 above
25-way D-Sub
socket
Connection side
SINUMERIK shell
6FC9 341-2AB

Designation: NC

Designation: ANAL - E

Siemens AG

AUT V250
P.O. Box 31 80
D-91050 Erlangen
Federal Republic of Germany

Suggestions

Corrections

For Publication/Manual:

SINUMERIK 805
Software Version 4
Interface Description
Part 2: Connection Conditions
Planning Guide

Manufacturer Documentation

Order No.: 6ZB5 410-0CR02-0AA4
Edition: May 1993

From:

Name

Company/Dept.

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Suggestions and/or corrections

Siemens AG
Automation Group
Automation Systems
for Machine Tools, Robots
and Special Purpose Machines
P.O Box 31 80, D-91050 Erlangen
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