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SIEMENS

SINUMERIK 810

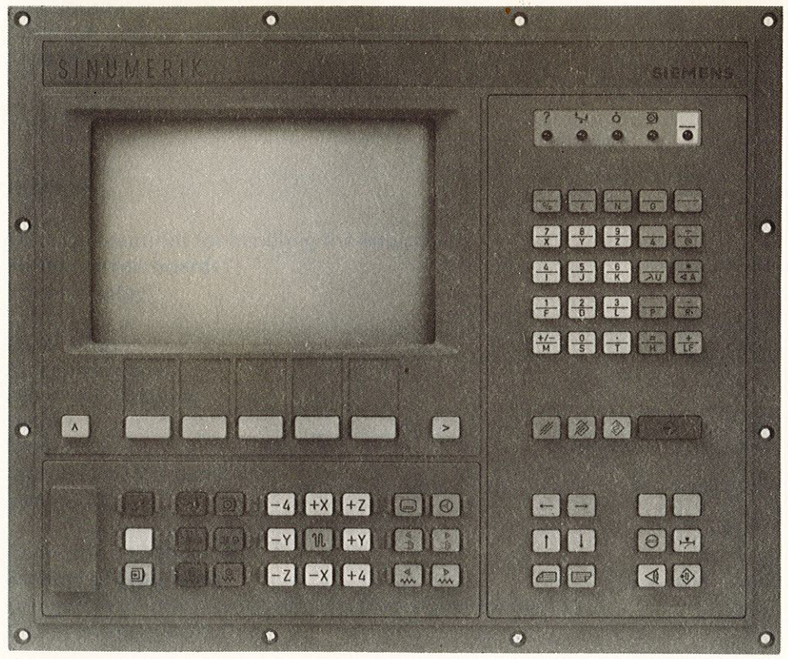
Instruction Manual

SINUMERIK

SIEMENS

SINUMERIK 810 T
SINUMERIK 810 M

Instruction Manual | Order No. GWE 570.030.9001.00 Jc-101



SINUMERIK 810

SINUMERIK® Documentation

Publication data

All issues prior to this present issue are listed below.

The "Changes" column shows which sections of the previous issue have been altered.

Issue	Order No.	Changes
12.86	GWE 570 030.9001.00 Ja-101	First issue
04.89	GWE 570 030.9001.00 Jc-101	1.3.2.1, 1.3.2.6, 1.3.3.1
10.89	GWE 570 030.9001.00 Jc-101	Unchanged reprint
04.90	GWE 570 030.9001.00 Jc-101	Unchanged reprint
08.90	GWE 570 030.9001.00 Jc-101	Unchanged reprint
10.90	GWE 570 030.9001.00 Jc-101	Unchanged reprint

Contents

1 Description of the equipment

1.1 Application

The SINUMERIK 810 is a compact CNC continuous-path control system for lathes (810 T version) and for drilling and milling machines (810 M version) suitable for both computer-aided programming and manual programming.

New, LSI electronic components and new methods of manufacture have enabled a competitively-priced compact unit to be produced which is easy to incorporate into the structure of the machine tool itself.

By also integrating the programmable interface control into the unit, the end result is a total, self-contained control system of exceptional flexibility for adaptation to many types of machine tool.

1.2 Configuration

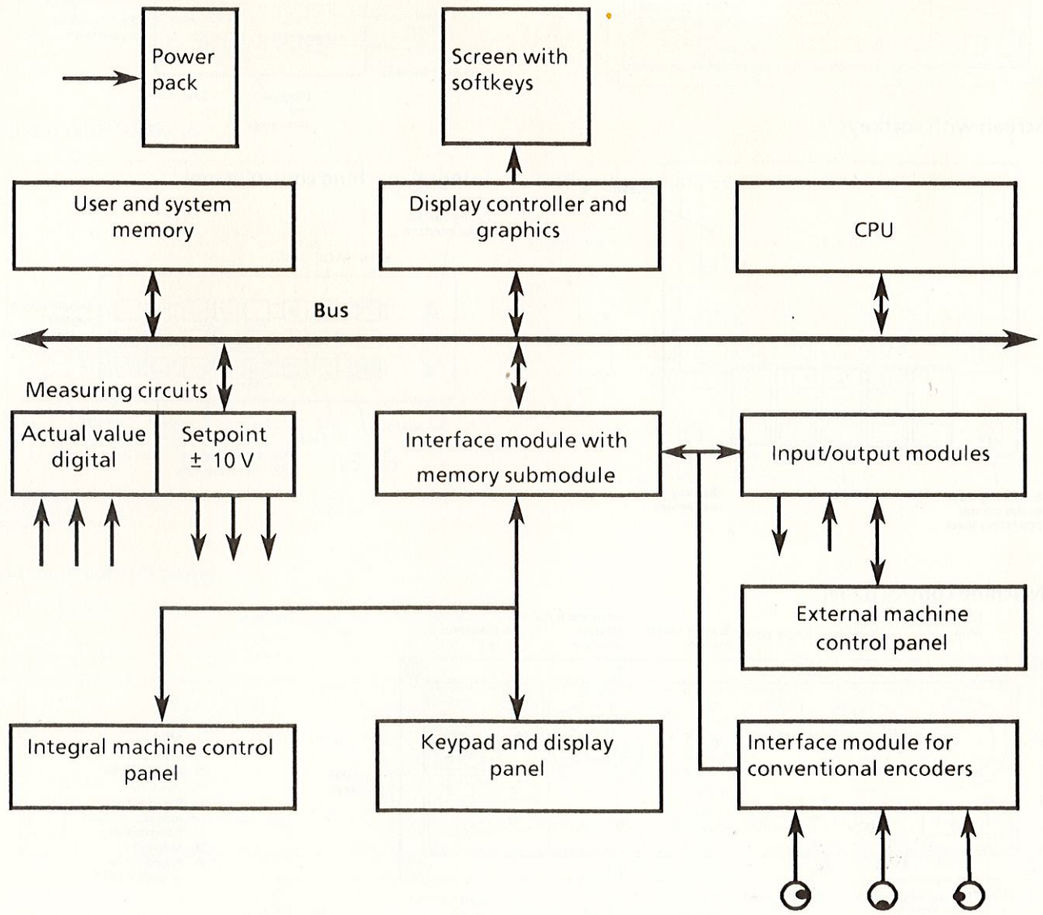
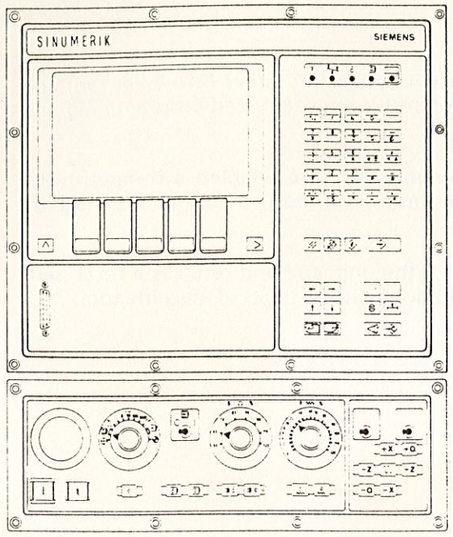


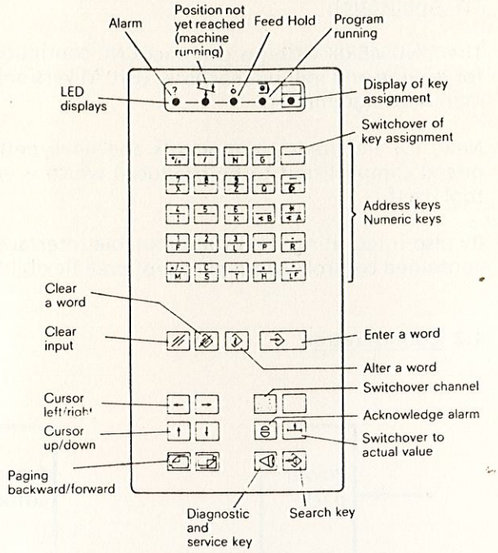
Fig. 1.1
Configuration of the control system

1.3 Construction

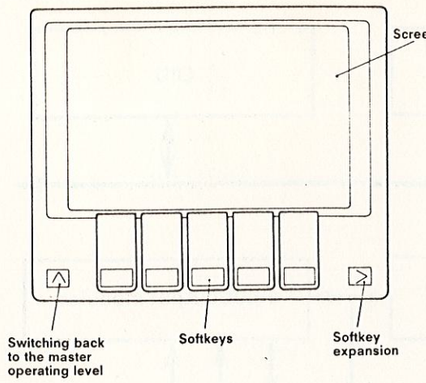
1.3.1 NC and machine control panels



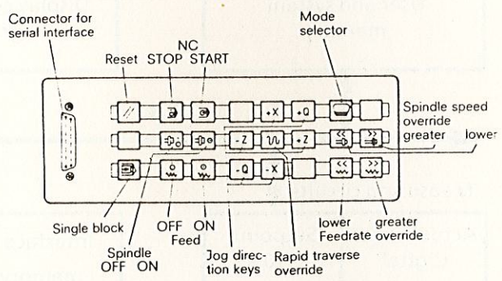
Keypad and display panel



Screen with softkeys



Integral machine control panel



Machine control panel

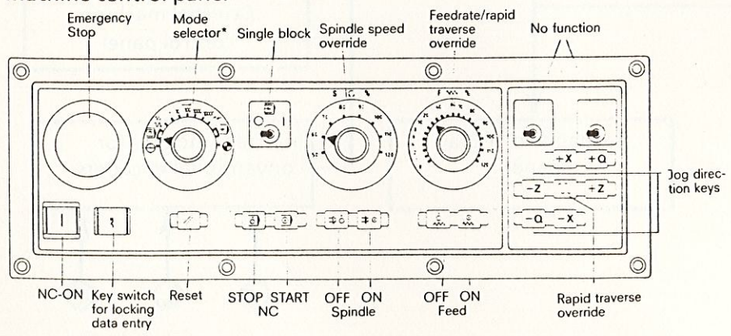
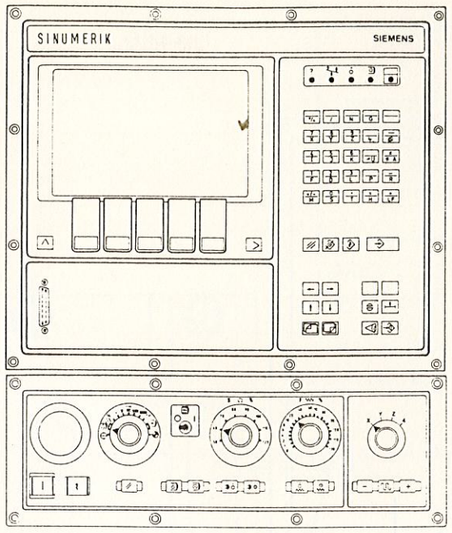
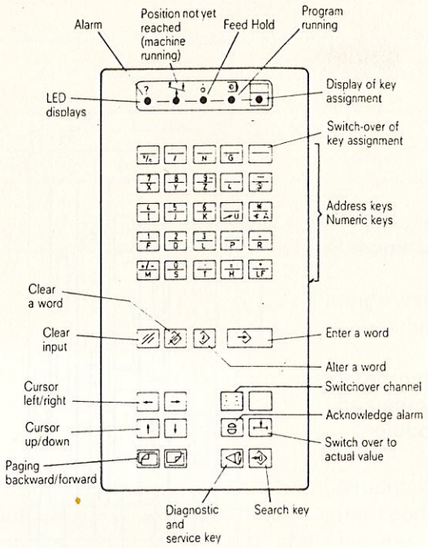


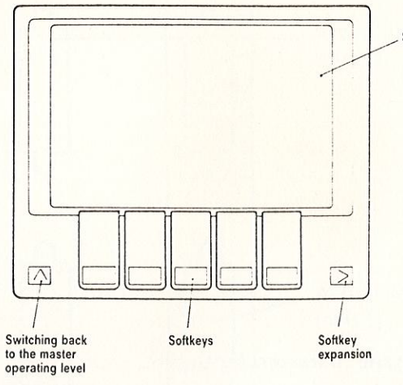
Fig. 1.2
SINUMERIK 810 T
NC and machine control panels



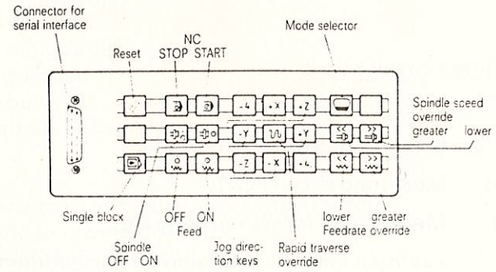
Keypad and display panel



Screen with softkeys



Integral machine control panel



Machine control panel

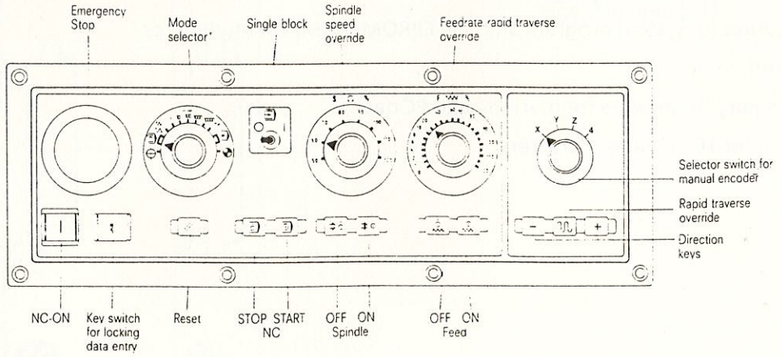


Fig. 1.3
SINUMERIK 810 M
NC and machine control panels

1.3.2 Control equipment complement

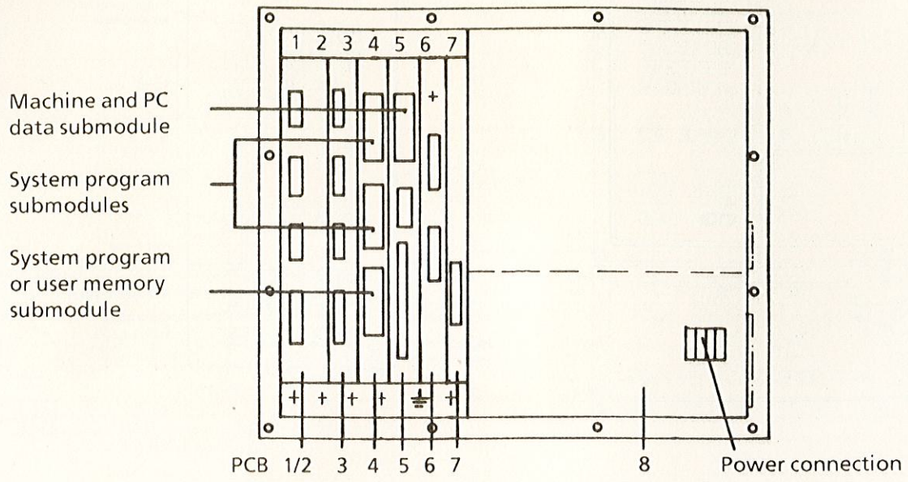


Fig. 1.3
Control equipment complement (rear view)

Printed-circuit boards:

(1/2) Measuring circuit PCB I

(3) Measuring circuit PCB II

(4) Memory PCB for system program
- without memory extension for part program
- with memory extension for part program totalling 48000 tape characters (option)

each having
- three EPROM submodules for system program or
- two EPROM submodules for system program and one EPROM (RAM) submodule for user memory (option)

(5) Interface PCB with memory submodule for machine and PC data

(6) CPU with part program for 16000 tape characters

(7) Graphics processor

(8) Power supply

1.3.2.1 Measuring circuit PCBs

	SINUMERIK 810 T	SINUMERIK 810 M
Measuring circuit I	Axes X,Z Spindle S	Axes X,Y,Z
Measuring circuit II	Auxiliary axes Q1, Q2 (option)	4th axis (option) Spindle axis S (option)

Table 1.1
Measuring circuit PCBs

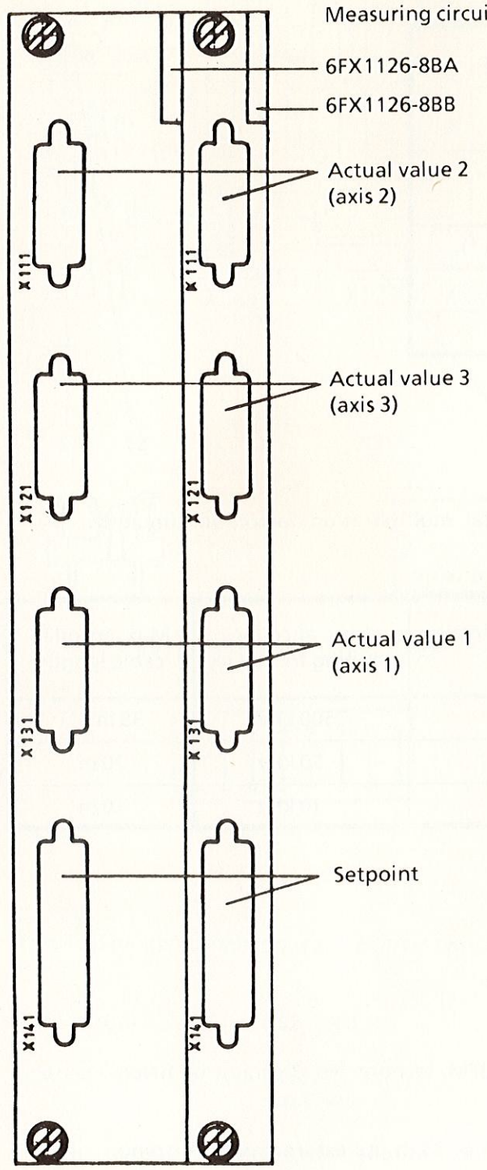


Fig. 1.5
Measuring circuit PCBs I, II
(frontplate)

The measuring circuit PCBs are the input/ output interfaces between the CNC system and the spindle and axis drives of the machine. The outputs supply the setpoints for the drive controllers.

The signals received from the position encoders are
- acquired
- monitored
- counted
- buffered

on the PCBs and then processed by the CPU.

The measuring circuit PCBs also perform the following tasks:
- setpoint output
- controller enabling signal output

For connector pin assignment see Figs. 2.10 and 2.11.

Application

- Basic version
  fitted with the 6FX1126-8BA board (40 mm wide).

- Option
  fitted with the measuring circuit expansion board 7FX1126-8BB (20 mm wide).

Each board has an input for encoders producing a sinusoidal output signal. The input signal is amplified and multiplied by means of integral or external pulse shaping circuits.

- The 6FX1126-8BA board fitted with integral pulse shaping circuits:

		Integral pulse shaping circuits Multiplication factor	
		5	10
PCB location	1	6FC3981-3HM	6FC3981-3FM *)
	2	6FC3981-3HM	6FC3981-3FM
	3	6FC3981-3HM	--------

Table 1.2
Integral pulse shaping circuits

Maximum encoder scanning frequency, maximum total multiplication factor, maximum encoder cable length

Encoder output signal	Integral pulse shaping circuits	Total multiplication factor	Max. encoder scanning frequency	Max. encoder cable length
Square-wave	-----	4	500 kHz	35 m **)
Sinusoidal	6FC3981-3HM	20	20 kHz	20 m
Sinusoidal	6FC3981-3FM	40	10 kHz	10 m

Table 1.3
Maximum encoder scanning frequency
Maximum total multiplication factor
Maximum encoder cable length

*) If PCB location No. 1 is fitted with the 6FC3981-3FM, location No. 3 cannot be fitted with integral pulse shaping circuits.

**) For cable lengths >10 or 20 m up to a maximum of 35 m use external pulse shaping circuits.

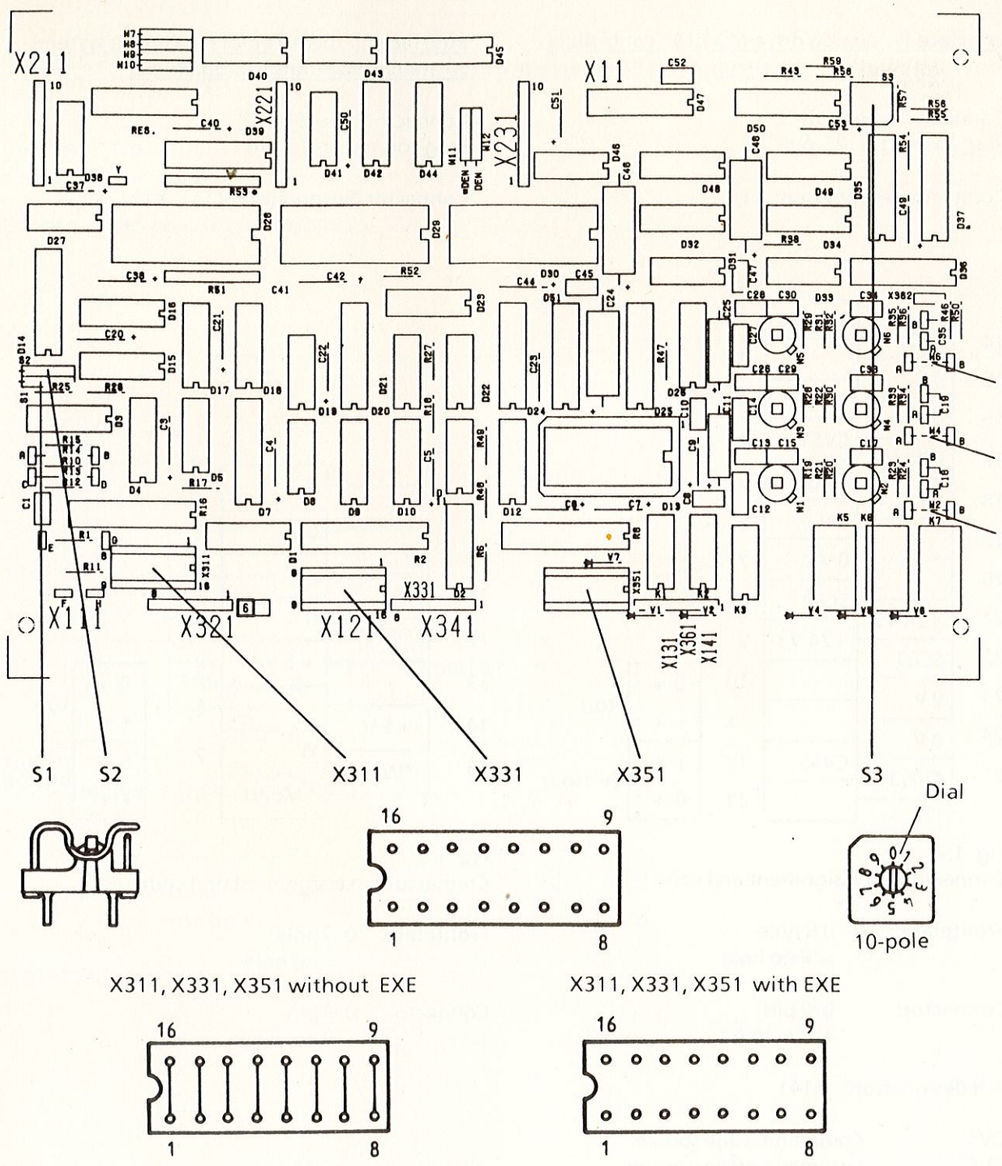


Fig. 1.6
Standard jumper connections and address switch settings

PCB identification: S1 and S2 open

Address switch S3: Board I position 0 Board II position 1

Setpoint output for thyristor controller with differential amplifier:
Jumpers: W2, W4 and W6 closed

Interface for analog drive thyristor controllers

Connector type: SUB-D
Plug connector, 25-pin

Connector designation: X141

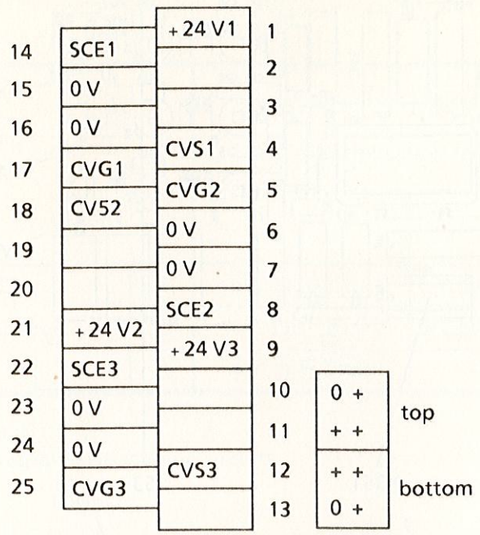


Fig. 1.7
Connector pin assignment and code

Frontplate: 0 ≙ hole
+ ≙ no hole

Connector: 0 ≙ pin
+ ≙ no pin

PIN designations: X141

CVS	Command value source
CVG	Command value ground
SCE	Speed controller enable

PIN designations: X111, X121, X131

A	Encoder signal A
B	Encoder signal B
R	Encoder reference signal
W	Encoder warning signal
MEPU	Measuring pulse
*	Low active

Interface for incremental measuring systems with sinusoidal output signals

Connector type: SUB-D,
Plug connector, 15-pin

Connector designation: X111, X121, X131

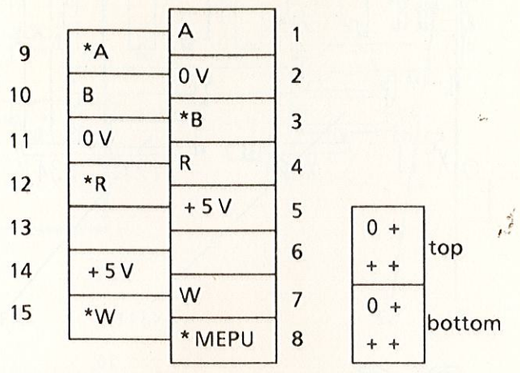


Fig. 1.8
Connector pin assignment and code

Frontplate: 0 ≙ hole
+ ≙ no hole

Connector: 0 ≙ pin
+ ≙ no pin

Interface for incremental measuring systems with square-wave output signals

Connector type: SUB-D,
Plug connector, 15-pin

Connector designation: X111, X121, X131

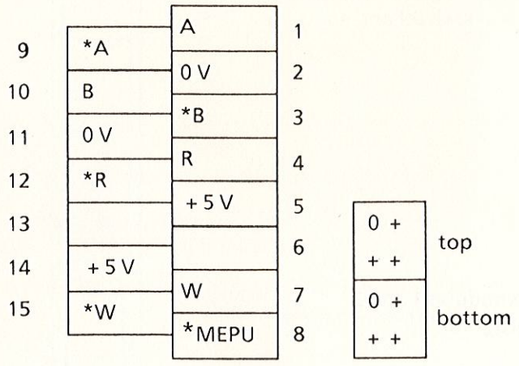


Fig. 1.9
Connector pin assignment and code

Frontplate: 0 = hole
+ = no hole

Connector: 0 = pin
+ = no pin

1.3.2.2 Memory PCB

The memory PCB can accept up to three memory submodules. The basic board contains a buffered CMOS RAM for the part program.

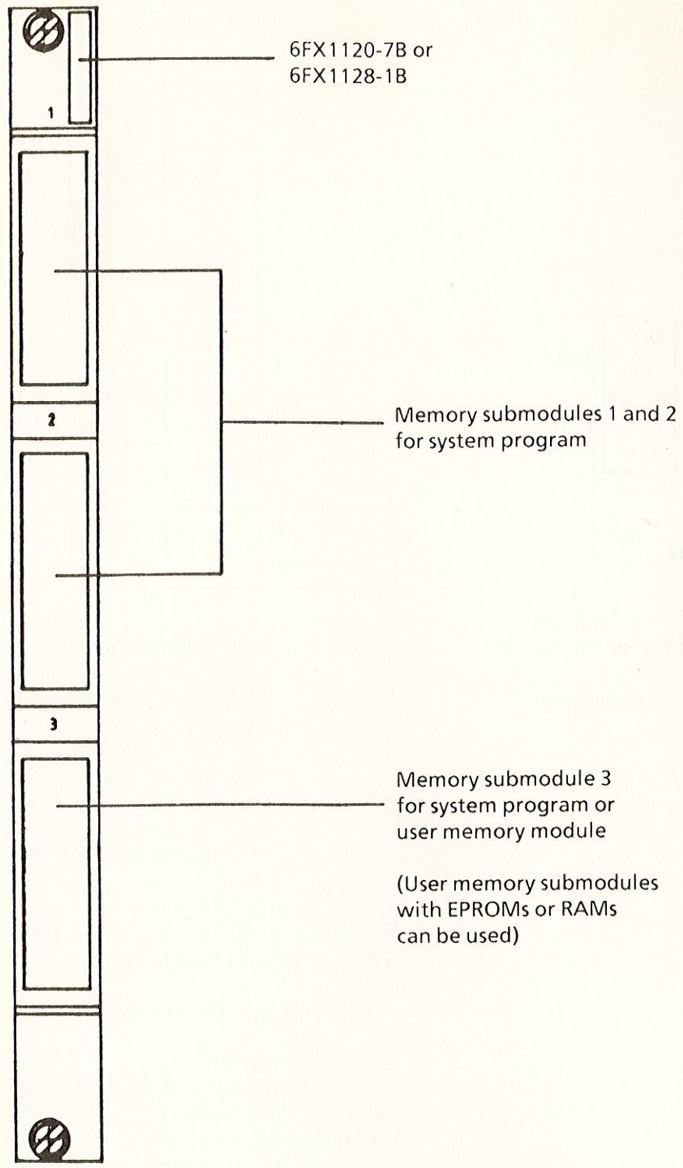
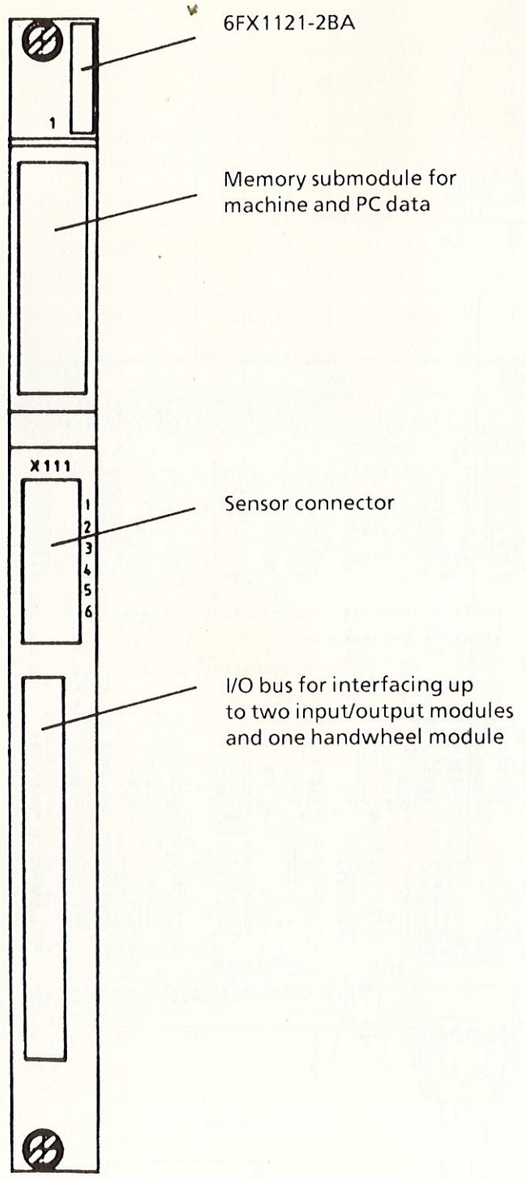


Fig. 1.10
Memory PCB (frontplate)

1.3.2.3 Interface PCB



The interface board performs the following functions:

- interface to control panel
- interface to input/output modules
- memory submodule for PC user program and machine data
- two interfaces for "Fast measuring"

Fig. 1.11
Interface PCB (frontplate)

PIN-No.	Signal
1	Shielding
2	MEPUS (Sensor 1)
3	MEPUC (Sensor 1)
4	MEPUS (Sensor 2)
5	MEPUC (Sensor 2)
6	Shielding

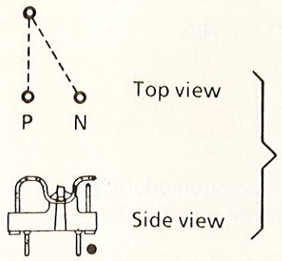
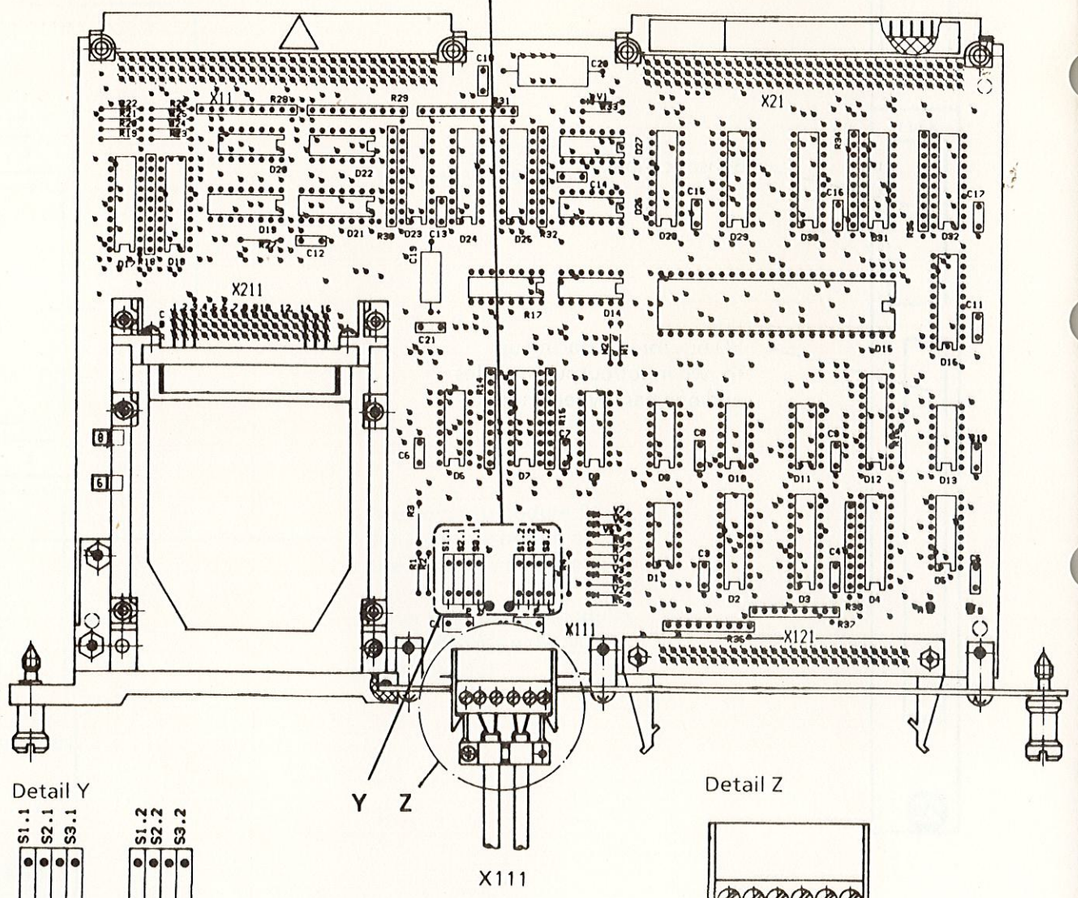


Fig. 1.12
Connector pin assignment,
sensor connector X111



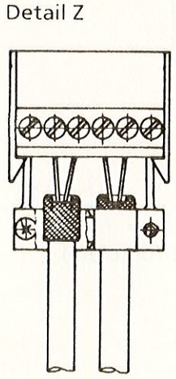


Fig. 1.13
Alternative circuitry for
matching to various sensors,
connector XIII

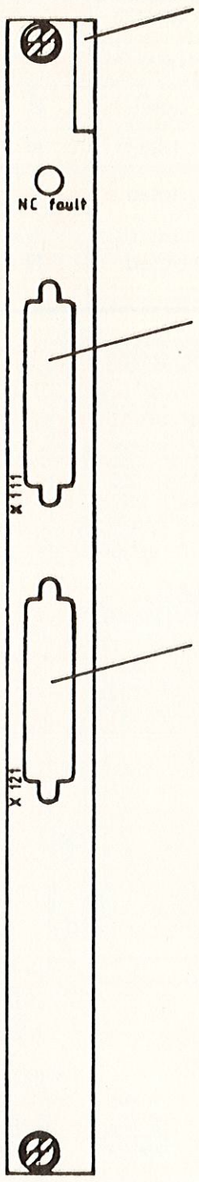
Sensor signal	Sensor 1			Sensor 2		
	S 1.1	S 2.1	S 3.1 switch position	S 1.2	S 2.2	S 3.2 switch position
24 V positive edge	open	open	N *)	open	open	N *)
24 V negative edge	open	open	P *)	open	open	P *)
TTL positive edge	closed	closed	P	closed	closed	P
TTL negative edge	closed	closed	N	closed	closed	N
**) Open collector positive edge	closed	closed	P	closed	closed	P
**) Open collector negative edge	closed	closed	N	closed	closed	N

Table 1.4
Jumpering of sensor inputs according to input signal level

*) The normal jumpering
**) The 5 V is supplied by the control system
I_{max} at 5 V ≤ 0,3 mA

1.3.2.4 CPU

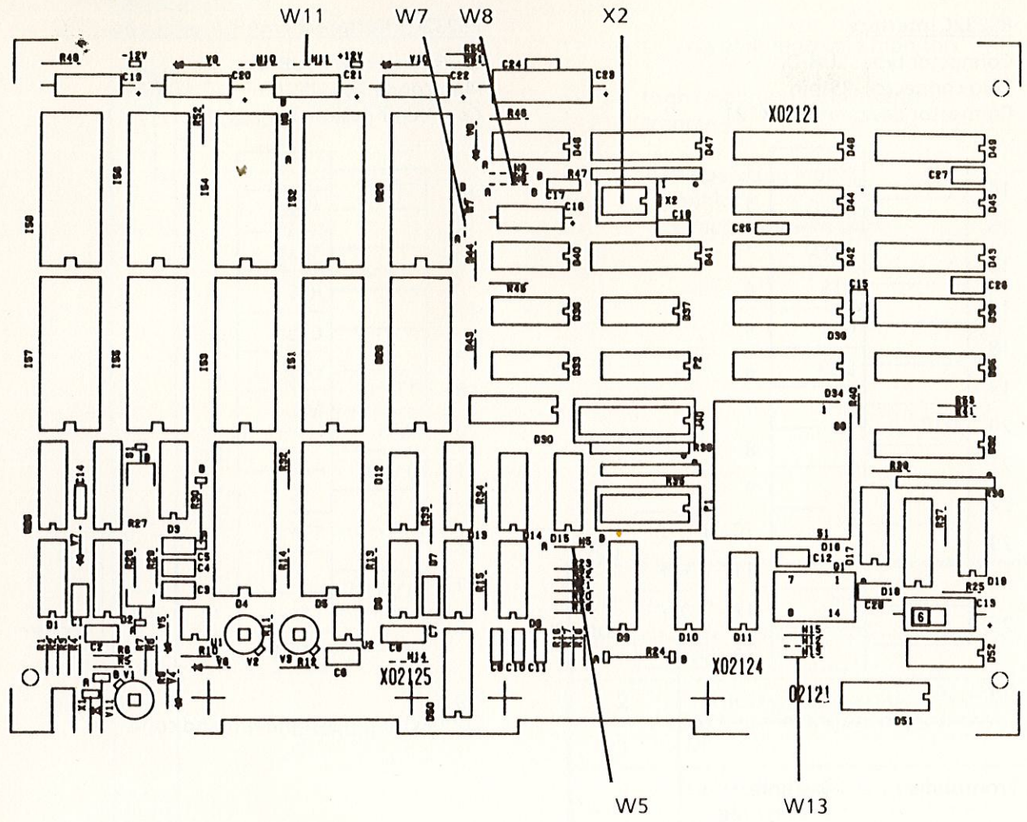
The CPU is a single-board computer.



It contains:

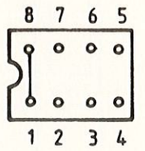
- active memory
- part program memory
- bootstrap loader
- cyclical temperature, battery and software monitoring
- two ports for RS232C serial interfaces, one of which can also be jumpered as a 20 mA current loop interface (TTY). X111 in connected to the frontplate through an internal cable.

Fig. 1.14
CPU (frontplate)



Fitted with 2764 EPROMs

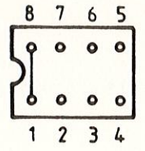
X2



Jumpers: W7, W8, W11, W13 closed

Fitted with 27256 EPROMs

X2



Jumpers: W5, W7, W8, W11, W13 closed

Fig. 1.15
Standard jumper settings

RS232C interface

Connector type: SUB-D,
Plug connector, 25-pin
Connector designation: X121

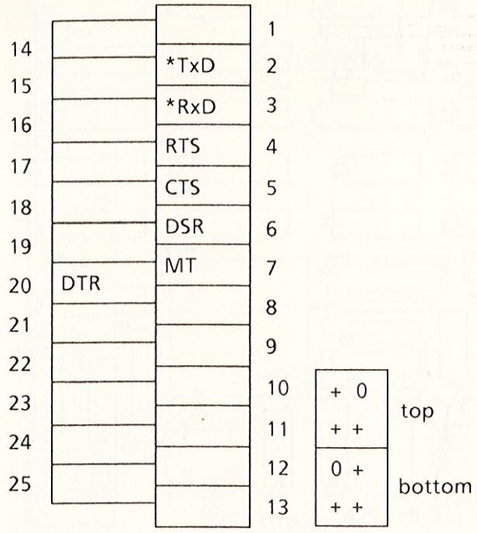


Fig. 1.16
Connector pin assignment and code

RS232C interface/20 mA current Loop (TTY)

Connector type: SUB-D,
Plug connector, 25-pin
Connector designation: X111

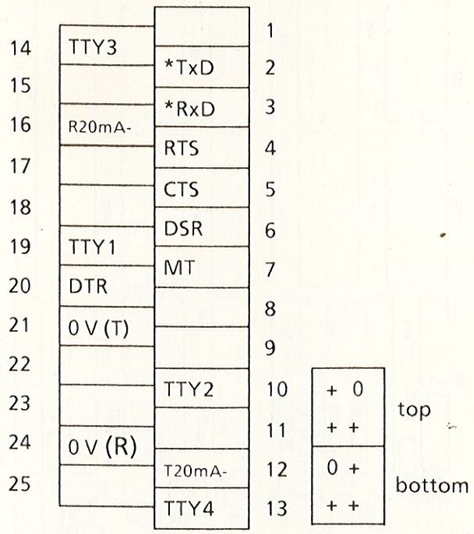


Fig. 1.17
Connector pin assignment and code

Frontplate: 0 = hole
+ = no hole

Connector: 0 = pin
+ = no pin

PIN designations:

*TxD	Control transmission data
*RxD	Control receiving data
RTS	Request to send, connect transmitter
CTS	Send enable, clear to send
DSR	Request to receive, ready
DTR	Ready to receive, connect line
TTY1	Control transmission data (driver -)
TTY2	Control transmission data (driver +)
TTY3	Control receiving data (receiver -)
TTY4	Control receiving data (receiver +)
T20 mA	Current loop source (transmit)
R20 mA	Current loop source (receive)
OV(T)	Current return
OV(R)	Current return
MT	Ground

1.3.2.5 Graphics processor

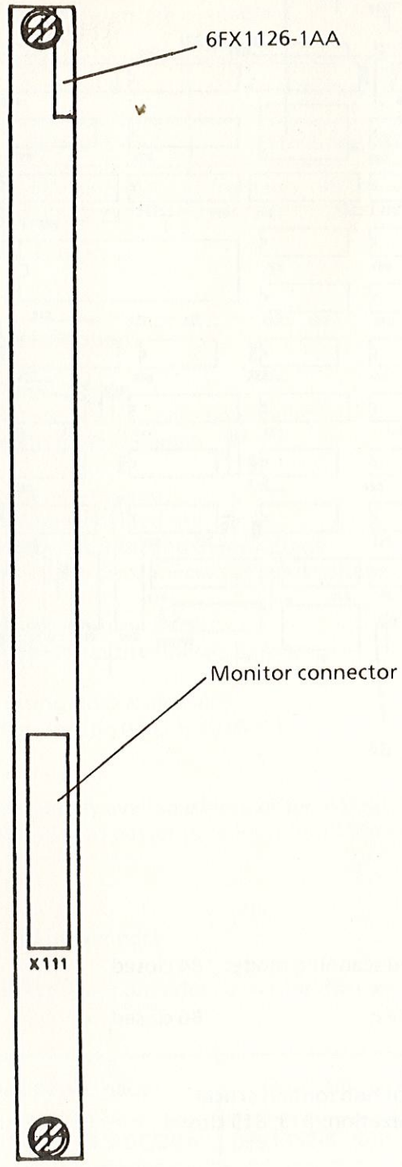
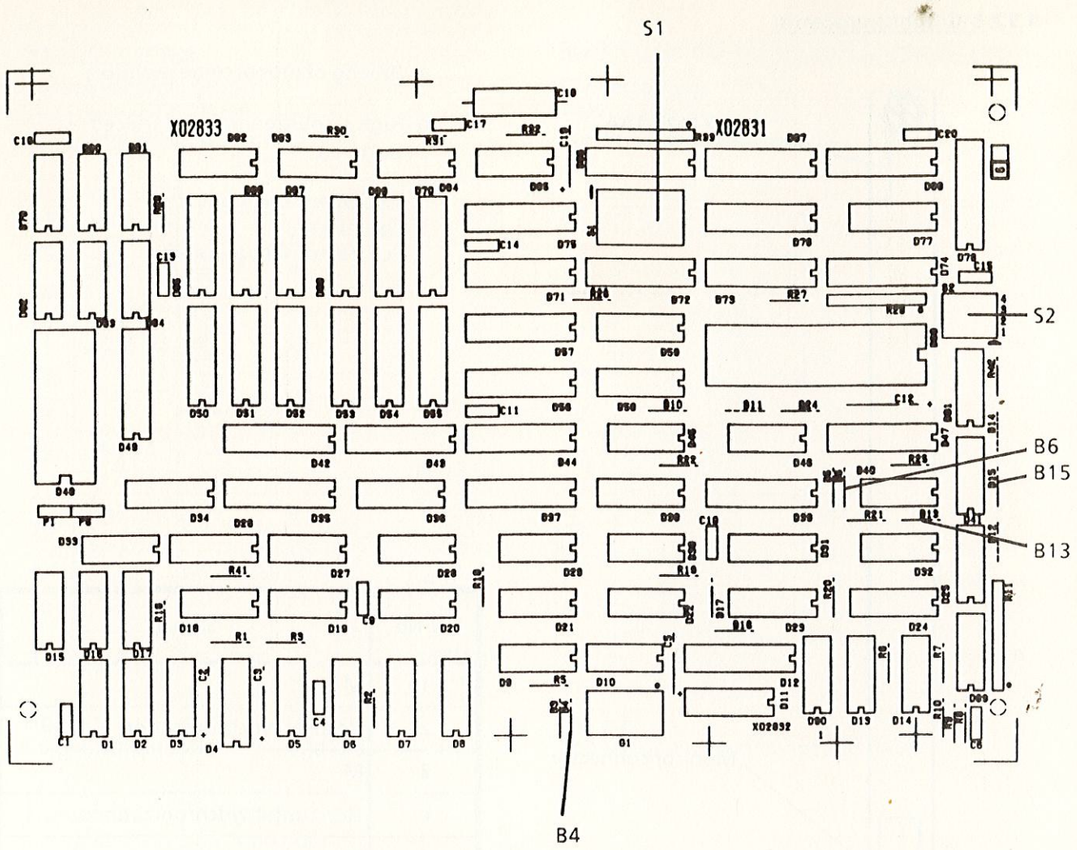


Fig. 1.18
Graphic processor (frontplate)

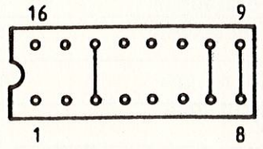
- o Driving of monocrome monitors
- o High resolution from interlaced scanning
- o Two operating modes:
  - graphics
  - character/semigraphics

PIN-No.	Signal
1	M
2	Vertical synchronization
3	M
4	Horizontal synchronization
5	M
6	
7	M
8	Green, black/white image
9	M
10	
11	M
12	
13	+ 5 V
14	+ 5 V
15	+ 15 V
16	+ 15 V

Fig 1.19
Connector pin assignment
monitor connector X111



Address coding



Interlaced scanning mode: B4 closed

Wait states: B6 closed

Polarity of horizontal/vertical synchronization: B13, B15 closed

Identification register, black/white operation

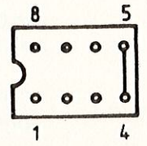


Fig. 1.20
Standard jumper settings

1.3.2.6 Power supply

Two power supply units are available:

	Order No.	Delivery
Type A	6EV3055-0AC	up to June 1987
Type B	6EV3055-0BC	from July 1987 onwards

Table 1.5a: Power supply units

Technical specifications

Nominal input voltage	24 V DC
Input voltage tolerance (including ripple)	20 V DC to 30 V DC
Ripple content (peak-to-peak)	3.6 V AC
Undervoltage monitoring:	
Power supply enabled at	
- rated input current and input voltage	≥ 20 V DC
- power supply disconnected at input voltage	≤ 20 V DC
Operating temperature range	0° C to + 55° C
Storage and transport temperature range	- 40° C to + 70° C
Humidity rating (to DIN 40 040*))	F
Degree of protection (to DIN 40 050*))	IP 00

If the power supply available has a different voltage, a suitable load power pack must be interposed. The interposed load power pack must fulfill the requirements of the power supply unit.

24 V DC Load power pack

The load power pack provides power for the control system and the peripherals.

Load power pack	Order No.
220/380 V AC ; 24 V DC/20 A	6EV1352-5 . K00
220/380 V AC ; 24 V DC/40 A	6EV1362-5 . K00

Table 1.5b: Proposed load power packs

*) Section1.4

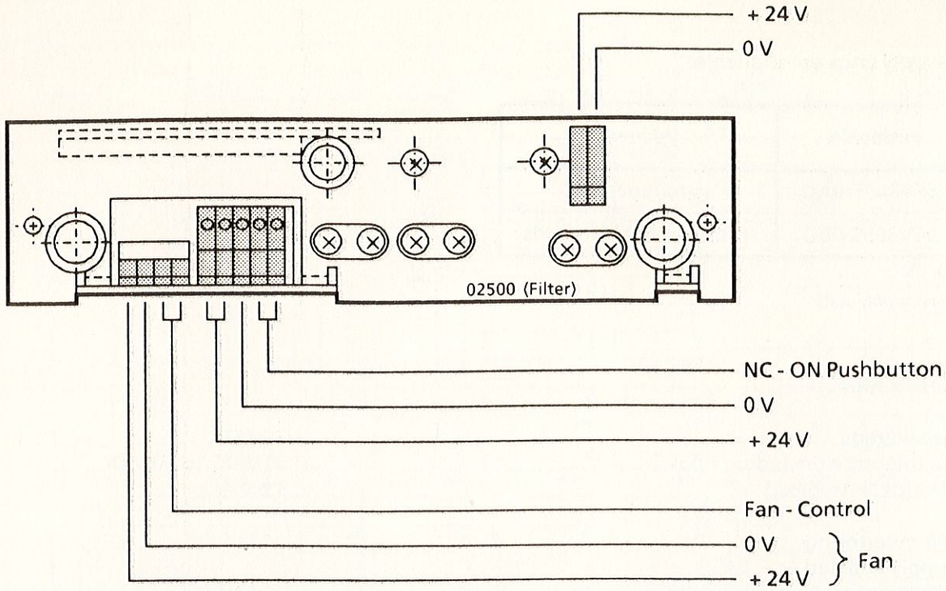


Fig. 1.21: Power supply type A, frontplate

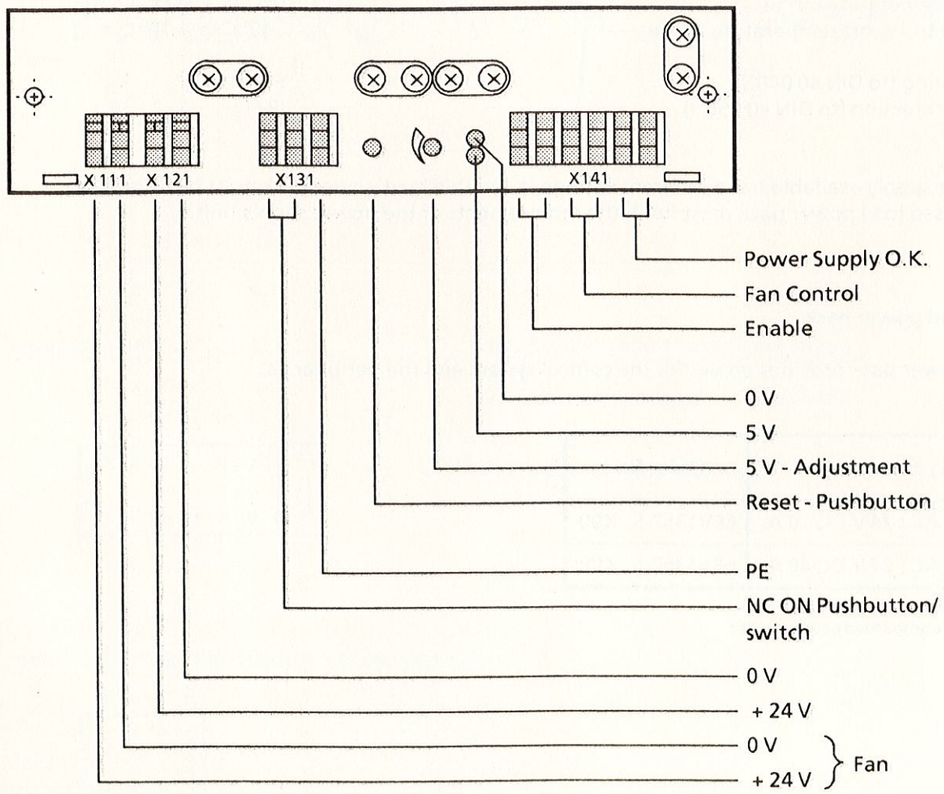


Fig. 1.22: Power supply type B, frontplate

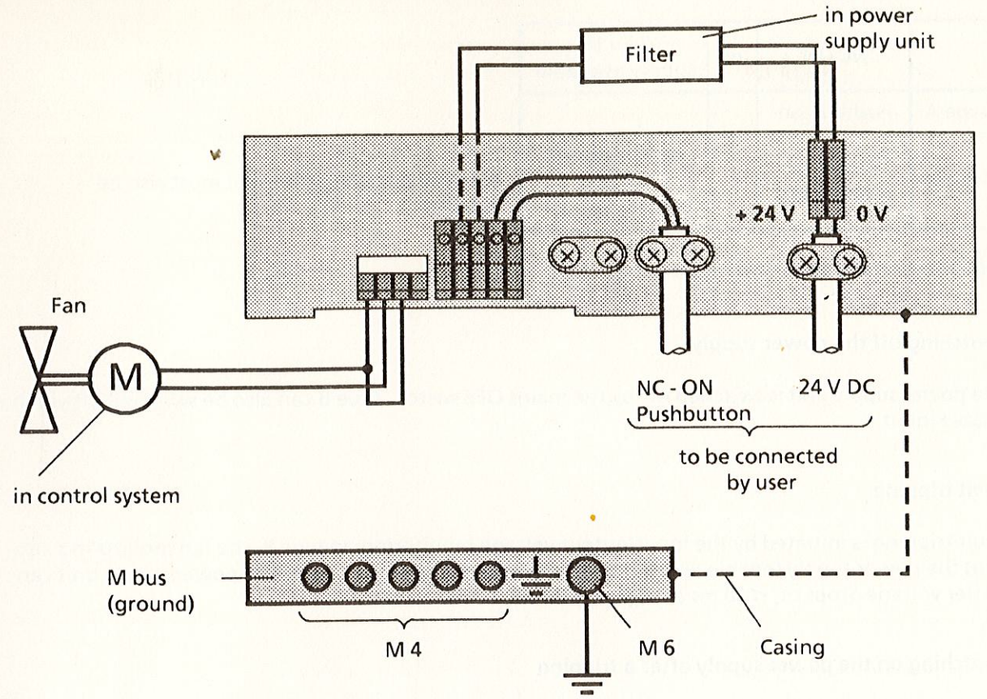


Fig. 1.23a: Power supply type A (connection diagram)

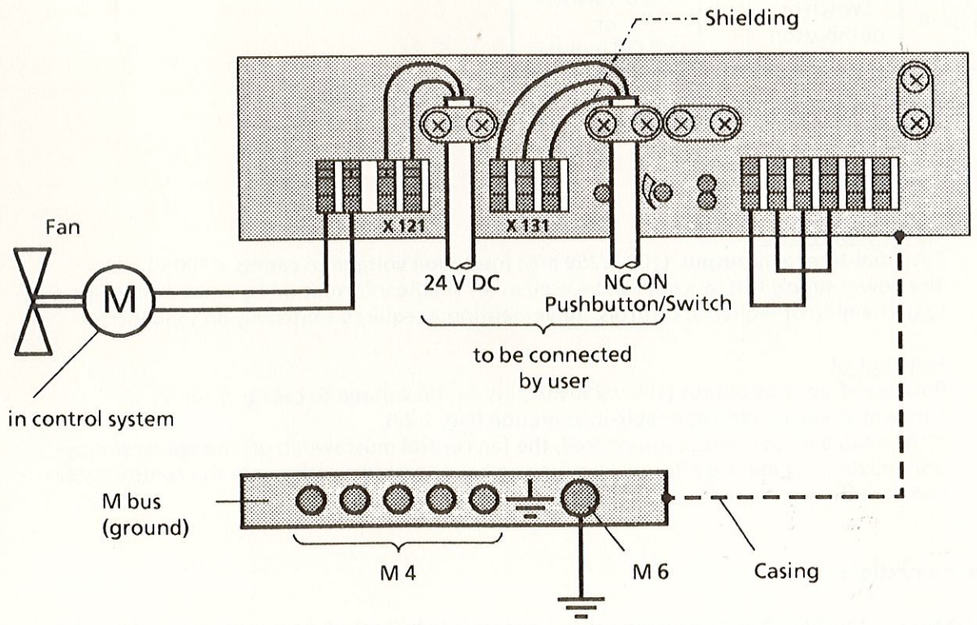


Fig. 1.23b: Power supply type B (connection diagram)

Switching on the power supply

	NC ON	or	24 V DC supply available
Type A	Pushbutton		
Type B	Switch or pushbutton		NC ON switch or NC ON jumper

For type B, the enable input must also be activated

Table 1.5c: Switching on the power supply

Switching off the power supply

The power supply unit is switched off by the mains OFF switch. Type B can also be switched off via the enable input.

Fault tripping

Fault tripping is initiated by the input/output voltage monitoring. In type B, the fan monitoring also trips the power supply (enable and fan control jumpered, see Fig. 1.23b). The power supply unit can buffer voltage drops of < 10 ms at $U_{INPUT} \geq 24$ V.

Switching on the power supply after a tripping

	NC ON	or	Mains OFF-ON
Type A	Pushbutton		
Type B	Switch or pushbutton		NC ON switch or NC ON jumper

Table 1.5d: Restoring supply after a tripping

Signalling outputs

- Power Supply O.K.
  Potential-free relay output (100 V/250 mA; insulation voltage to casing ≤ 100 V)
  The power supply O.K. output can be used as an enable information by another power supply (e.g. chaining of sequence controls, implementing a required switching-on sequence).

- Fan Control
  Potential-free relay output (100 V/250 mA; insulation voltage to casing ≤ 100 V)
  Fan control can be used as enable information (Fig. 1.23).
  If the enable input is directly jumpered, the fan control must switch off the power supply unit maximum 1 minute after the monitoring has operated as otherwise the controlsystem can become overheated.

Fan connections

If a power supply type A in an existing control system is to be replaced by a power supply type B, the fan must be connected via the frontplate as was also the case with power supply type A.

Notes:

1.3.3 External components of the system

1.3.3.1 Input/output module

The input/output module establishes the connection between the NC and machine control panels, and the inputs and outputs of the machine control system to the interface PCB.

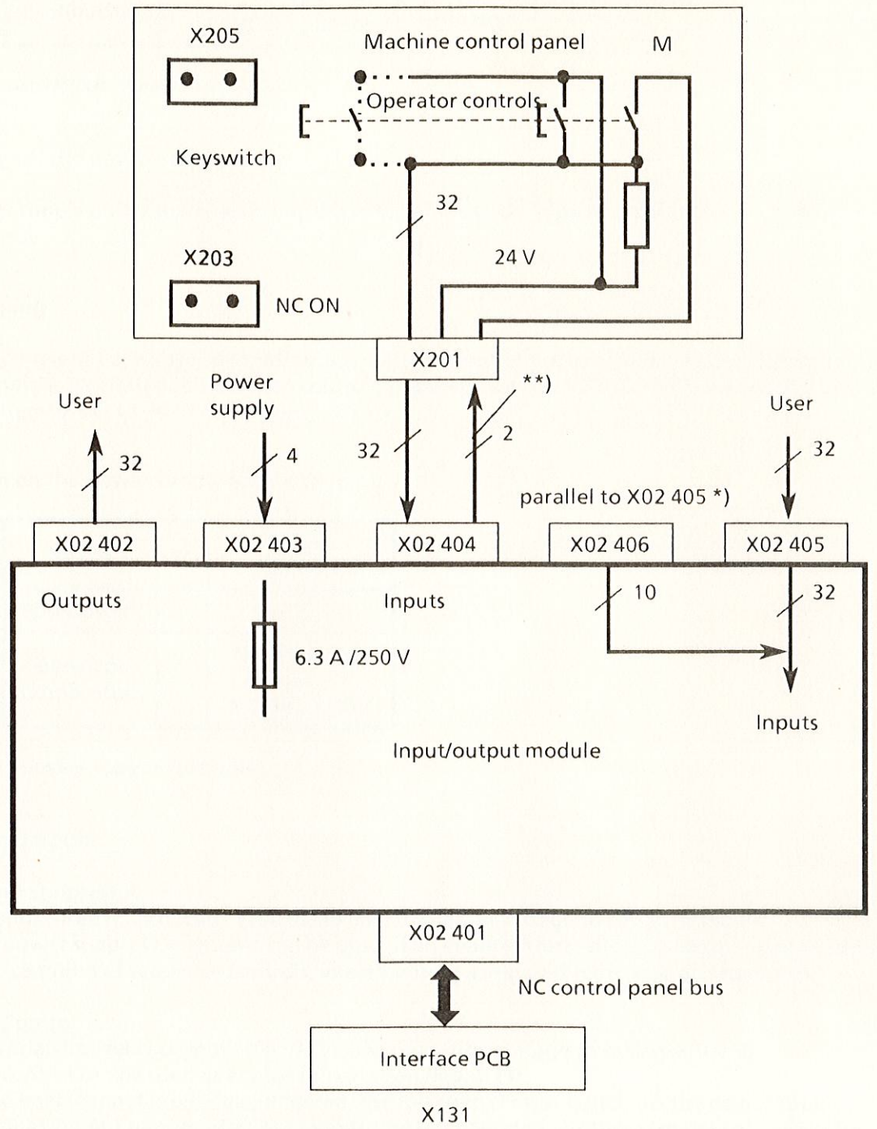
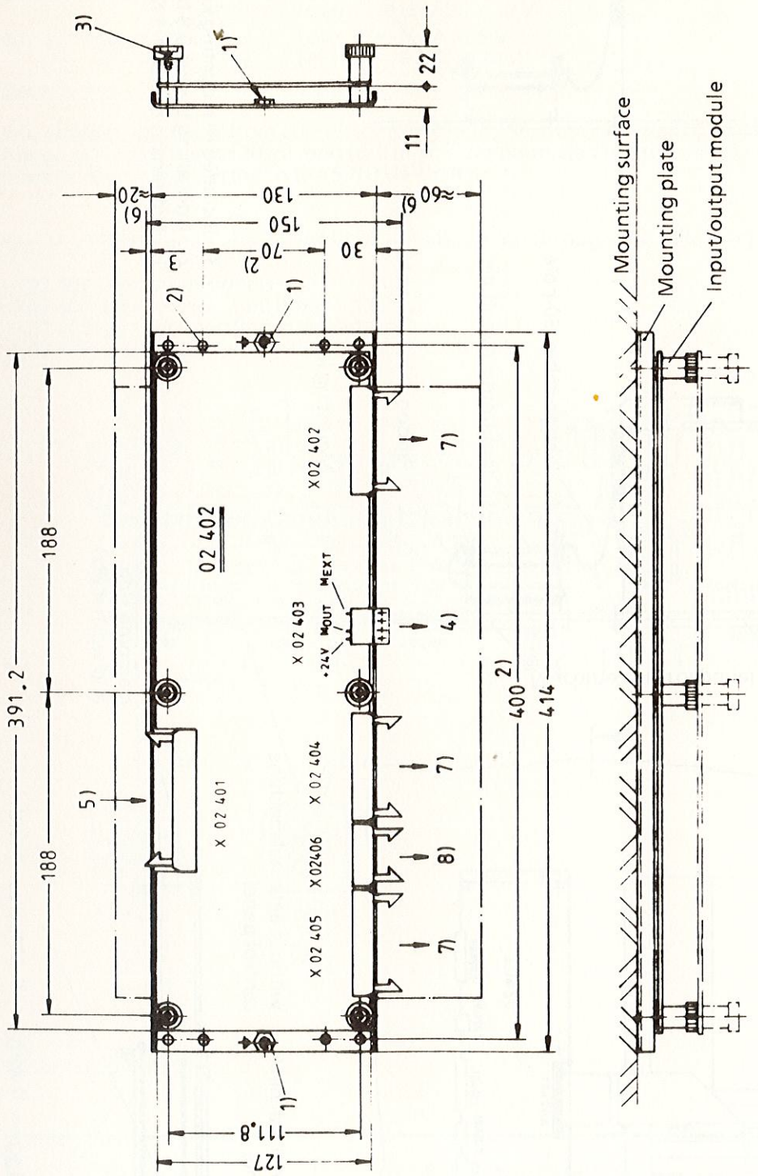


Fig. 1.24
Block diagram
Input/output module with interfacing components for machine control panel and interface PCB

*) Not used on SINUMERIK 810
**) Note: Do not touch! For internal use only (Supply for external machine control panel).



1) Ground terminal M5
2) Fixing holes for M4 screws
3) Tapped hole for M4 screw
4) X02403: connection for + 24 V, M_{out} and M_{ext} with plug connector max. 1.5mm² (AWG 15)
5) X02401 ribbon cable, 50-pole
6) Space for connector
7) X02402, X02404, X02405: ribbon cable connector, 34-pole
8) X04206: ribbon cable connector, 14-pole

Fig. 1.25
Dimension drawing of input/output module

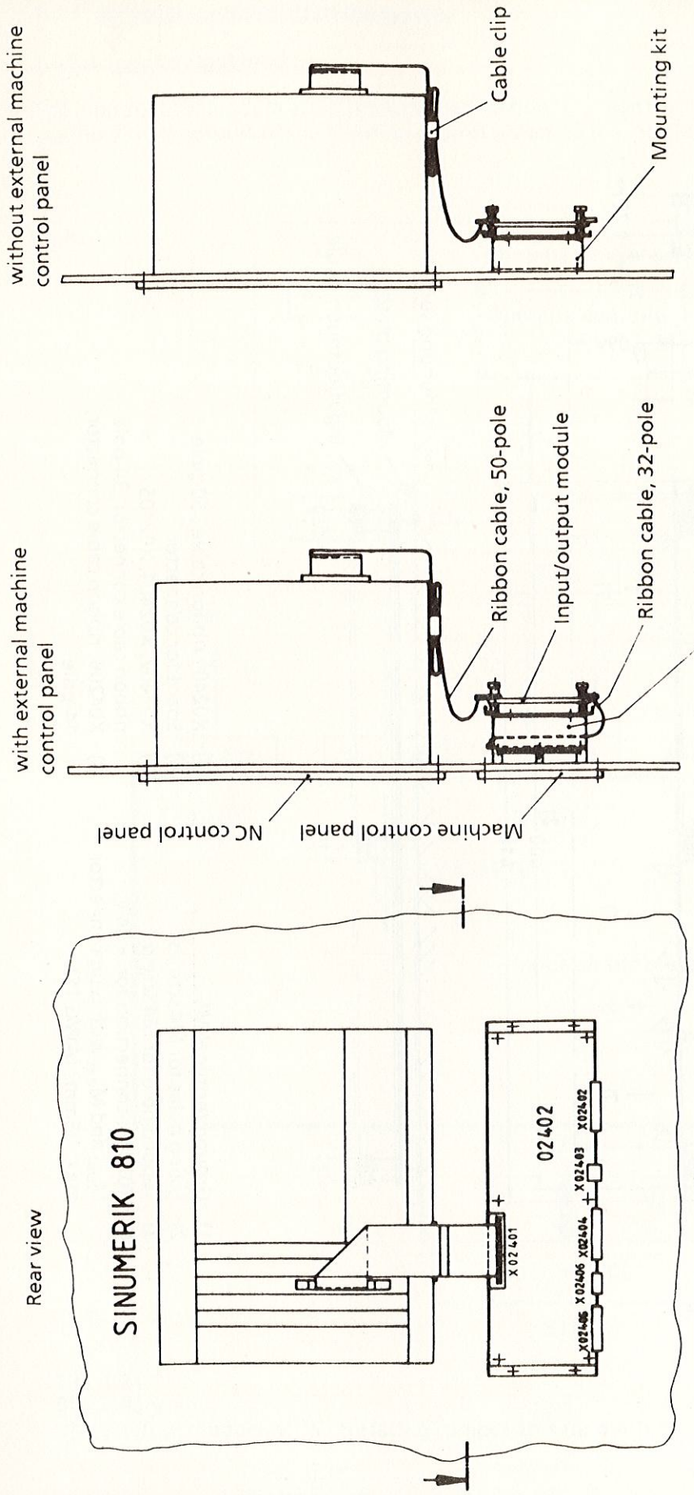


Fig. 1.26
Proposed mounting arrangement for input/output module

The module incorporates:

- 64 non-floating inputs, 24 V
- 24 non-floating outputs, 24 V/0.5 A, short-circuit-proof
- 8 non-floating outputs, 24 V/0.1 A

Input voltage level:	Low:	- 3 V to + 5 V
	High:	+ 13 V to + 30 V
Current consumption:	Low:	< 1 mA at 5 V
	High:	6 mA at 24 V
Delay time:		2.5 ms to 4.3 ms

The module is linked from connector X02 401 to the interface PCB (I/O bus port X131) by a 50-pole ribbon cable 500 mm or 20 in. long (the maximum permitted length). A maximum of two input/output modules can be connected to the SINUMERIK 810.

The 24 V input signals and 24 V output signals are fed through the following connectors:

- X02 402: 32 output signals
- X02 404: 32 user-specified input signals
- X02 405: 32 user-specified input signals
- X02 406: parallel assignment to connector X02 405

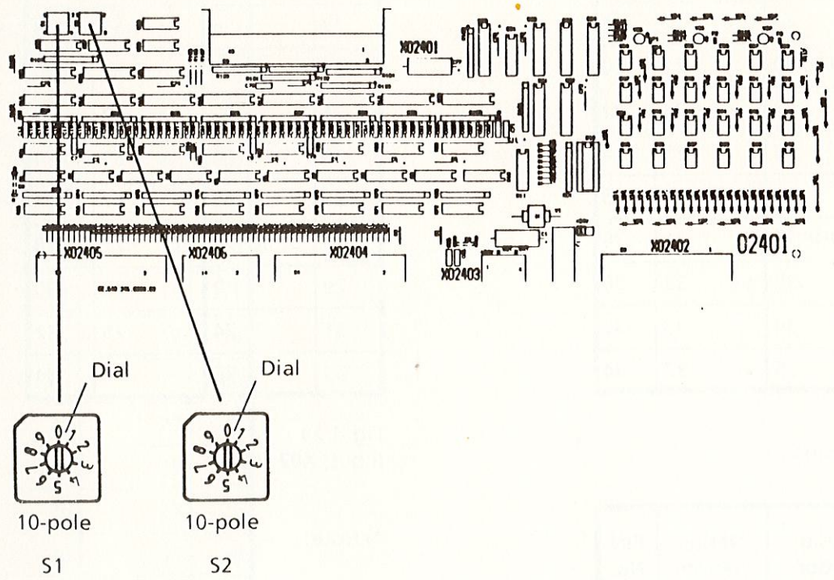


Fig. 1.27
Rotary switch settings

	Rotary switch setting	
	S1, inputs	S2, outputs
Input/output module I	0	0
Input/output module II	1	1

Table 1.6
Rotary switch settings

Connector pin assignment
- Outputs OUT 00 to 27; 0.5 A current-limited
- Outputs OUT 30 to 37; 0.1 A not current-limited

PIN No.	Desig-nation	Desig-nation	PIN No.
1	24 V *)	M_{ext} *)	2
3	INP 00	INP 01	4
5	02	03	6
7	04	05	8
9	06	07	10
11	INP 10	11	12
13	12	13	14
15	14	15	16
17	16	17	18
19	INP 20	21	20
21	22	23	22
23	24	25	24
25	26	27	26
27	INP 30	31	28
29	32	33	30
31	34	35	32
33	36	37	34

Fig. 1.28
Inputs X02 404

PIN No.	Desig-nation	Desig-nation	PIN No.
1	24 V *)	M_{ext} *)	2
3	INP 40	INP 41	4
5	42	43	6
7	44	45	8
9	46	47	10
11	INP 50	51	12
13	52	53	14
15	54	55	16
17	56	57	18
19	INP 60	61	20
21	62	63	22
23	64	65	24
25	66	67	26
27	INP 70	71	28
29	72	73	30
31	74	75	32
33	76	77	34

Fig. 1.29
Inputs X02 405

PIN No.	Desig-nation	Desig-nation	PIN No.
1	24 V *)	M_{ext} *)	2
3	INP 40	INP 41	4
5	42	43	6
7	44	45	8
9	46	47	10
11	INP 50	51	12

Wired parallel to X02 405; not used on SINUMERIK 810

Fig 1.30
Inputs X02 406

*) Note:

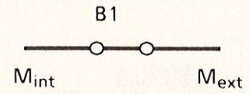
Do not touch! For internal use only (supply for external machine control panel)

Terminal No.	Desig-nation
1	24 V
2	M_{ext}
3	M_{ext}
4	M_{ext}

Fig. 1.31
Inputs X 02 403

PIN No.	Desig-nation	Desig-nation	PIN No.
1	-----	-----	2
3	OUT 00	OUT 01	4
5	02	03	6
7	04	05	8
9	06	07	10
11	OUT 10	11	12
13	12	13	14
15	14	15	16
17	16	17	18
19	OUT 20	21	20
21	22	23	22
23	24	25	24
25	26	27	26
27	OUT 30	31	28
29	32	33	30
31	34	35	32
33	36	37	34

Fig. 1.32
Outputs X02 402



Jumper B1 (fitted as standard) can be removed if isolation of M_{int} from M_{ext} on the board appears necessary for interference reasons.

	Order No
Input/output expansion module	6FC 3984-3RB
64 inputs, 24 V 24 outputs, 24 V; 0.5 current-limited 8 outputs, 24 V; 0.1 A	
Input expansion module	6FC 3984-3RC
64 inputs, 24 V	

1.3.3.2 Interface module for conventional encoders

Up to three conventional encoders can be connected to the interface module (connectors X02 842, X02 843, X02 844).
A 50-pole ribbon cable (maximum length 500 mm , connector X02 841) establishes the connection to the bus.

Connecting the interface module to the control system and to the encoders.

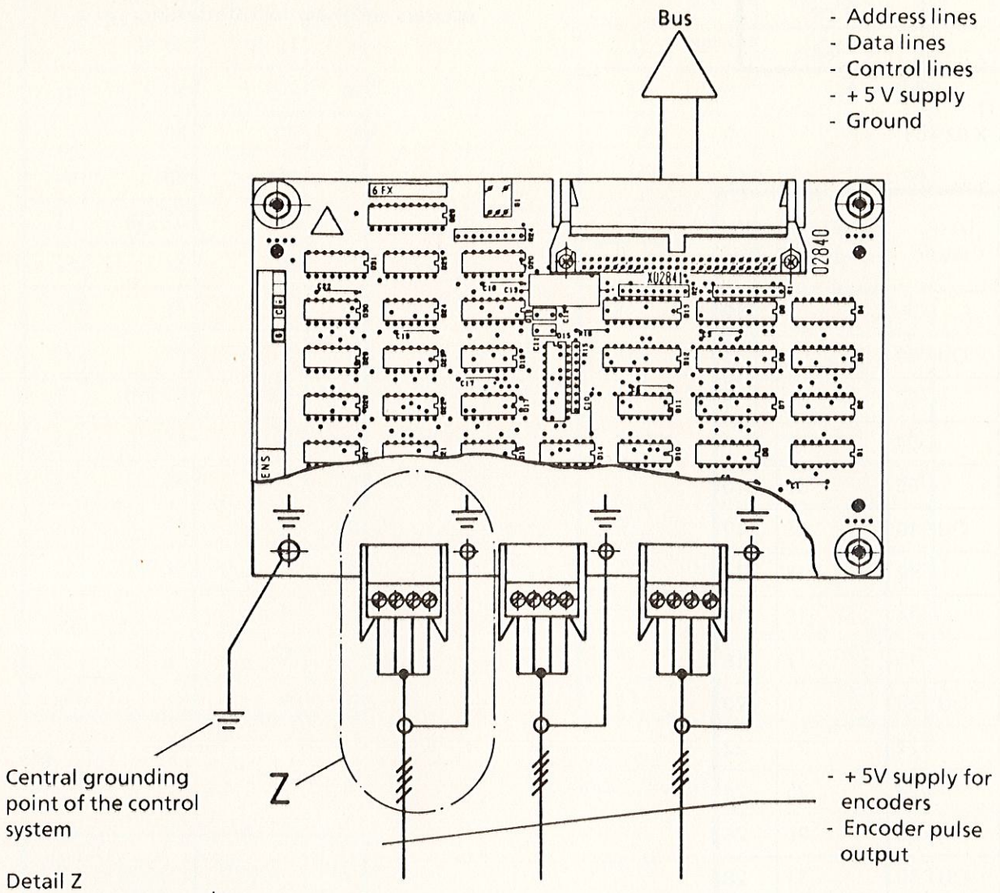


Fig. 1.33
Connecting the interface module

The maximum cable length between encoder and NC system is 50 m.

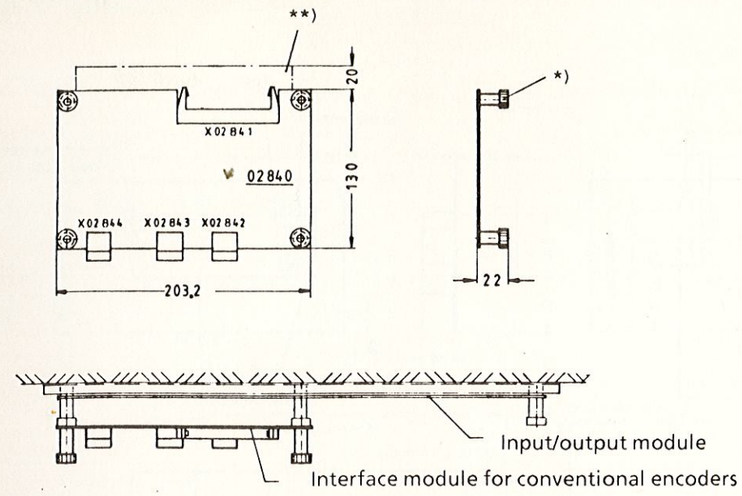


Fig. 1.34
Dimension drawing of the interface module for conventional encoders

PIN No.	Designation	
1	+ 5 V	Power supply for encoder
2	M	
3	KPG B ***)	Output pulses of encoder
4	KPG A ***)	

Fig 1.35
Connector pin assignment X02 842 to X02 844

Diagram of pulse output

When changing from one indexing position to the next, the encoder delivers two pulses A and B at 90° to each other (1:1 mark-space ratio).

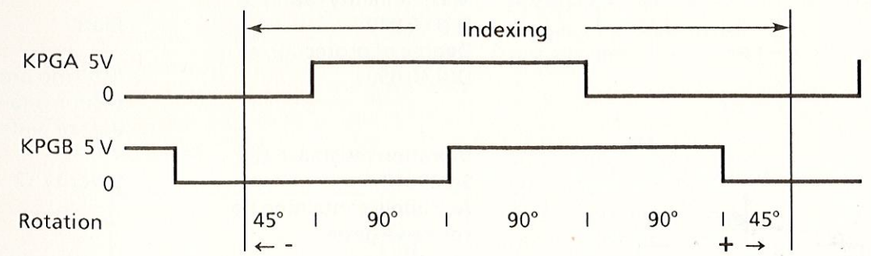


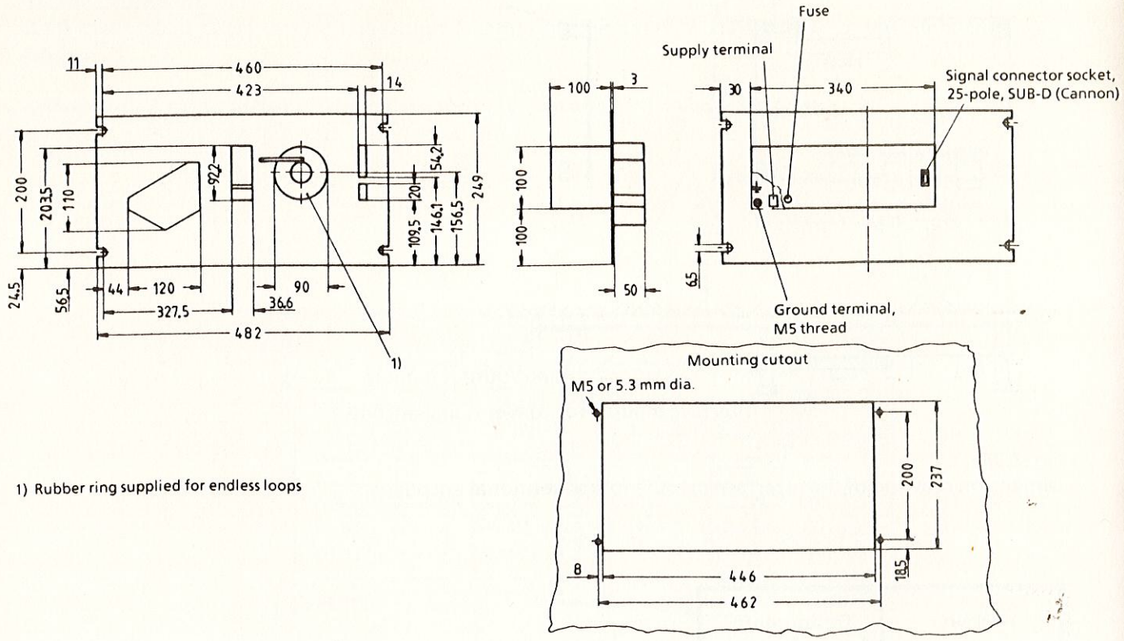
Fig. 1.36
Pulse output

Maximum speed of encoder 3000 rev/min

*) Tapped hole for M4 screw
**) Space for connector
***) Conventional encoder - Signal B, Signal A (Fig. 1.36)

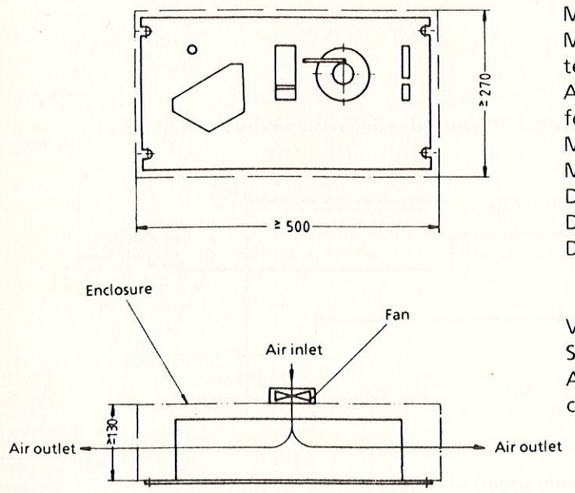
1.3.3.3 Tape reader

a) Tape reader without winder



1) Rubber ring supplied for endless loops

Fig. 1.37
Dimension drawing of tape reader without winder



Max. power loss	30 W
Max. air supply or ambient temperature in operation	0°C to 55°C
Ambient temperature range for storage	-40°C to + 70°C
Max. temperature change rate	1.1 K/min
Max. humidity rating to DIN 40 040	Class F
Degree of protection to DIN 40 050	IP 00 (no protection against dust or water
Vibration resistance to SN 29010	Severity 12
Air supply containing no corrosive gases	

Fig. 1.38
Proposed mounting arrangement for tape reader without winder

b) Tape reader with winder

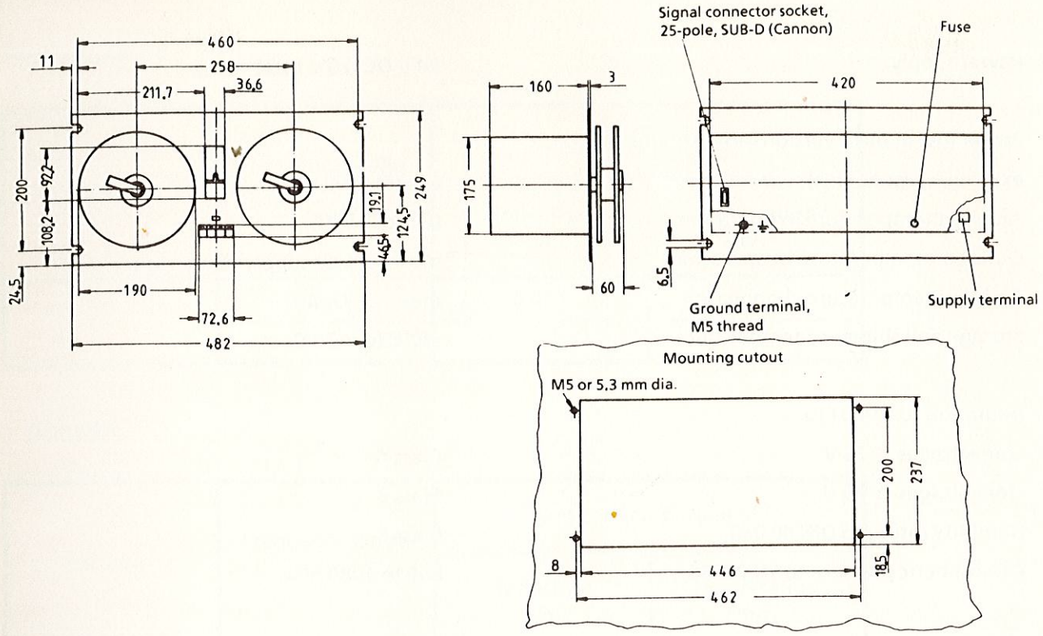
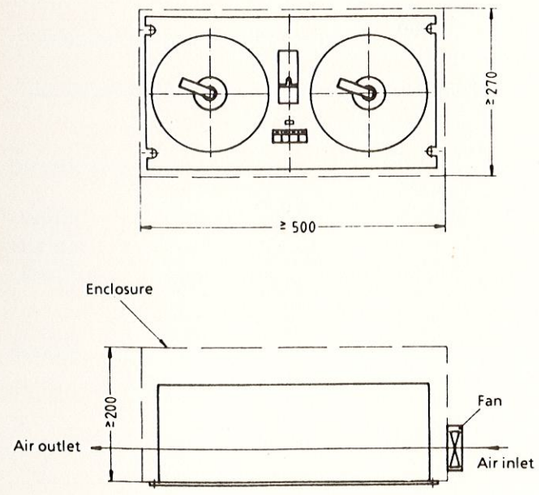


Fig. 1.39
Dimension drawing of tape reader with winder



Max. power loss	110 W
Max. air supply or ambient temperature in operation	0°C to 55°C
Ambient temperature range for storage	-40°C to + 70°C
Max. temperature change rate	1.1 K/min
Max. humidity rating to DIN 40 040	Class F
Degree of protection to DIN 40 050	IP 00 (no protection against dust or water)
Vibration resistance to SN 29010	Severity 12
Air supply containing no corrosive gases	

Fig. 1.40
Proposed mounting for tape reader without winder

1.4 Technical specifications

Power supply	24 V DC (20 V to 30 V DC)
Power loss of basic version (no external components), typically	approx. 100 W
Ambient temperature in operation	0°C to + 55°C
Outlet air temperature in operation	max. 10 K air supply temperature
Ambient temperature change rate	max. 1.1 K/min
Storage and shipment temperature	-40°C to + 70°C
Insulation to DIN 0110	
for voltages ≤ 30 V	Class A
for voltages ≥ 30 V	Class B
Humidity rating to DIN 40 040	Class F
Atmospheric pressure to SN 26556	860 to 1080 hPa
Degree of protection to DIN 40 050:	
- Front of NC control panel	IP 54 (dust-proof and splash-proof)
- Rear of NC control panel	IP 00 (no protection against dust or water)
- Front of external machine control panel	IP 54
- Rear of external machine control panel	IP 00
- Input/output module	IP 00
- Interface module for conventional encoders	IP 00

Shock and vibration stress severity to SN 29010

- When installed

Severity	Frequency range Hz	Constant amplitude of	
		deflection mm	acceleration m/s^2
12	10 bis 58	0.075	
	über 58 bis 500		9.8

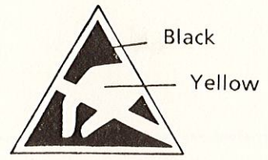
- Transport

Severity	Frequency range Hz	Constant amplitude of	
		deflection mm	acceleration m/s^2
22	5 to 9	3.5	
	over 9 to 500		10

Electromagnetic compatibility tested to DIN VDE 0847	
- Immunity to AC power line-borne noise	3 kV
- Immunity to signal line-borne noise	1.5 kV
- Discharge of static electricity to structural parts	10 kV
Dimensions:	
- Width	420 mm
- Height	350 mm
- Depth	280 mm
Weight	approx. 12 kg

2 Operation

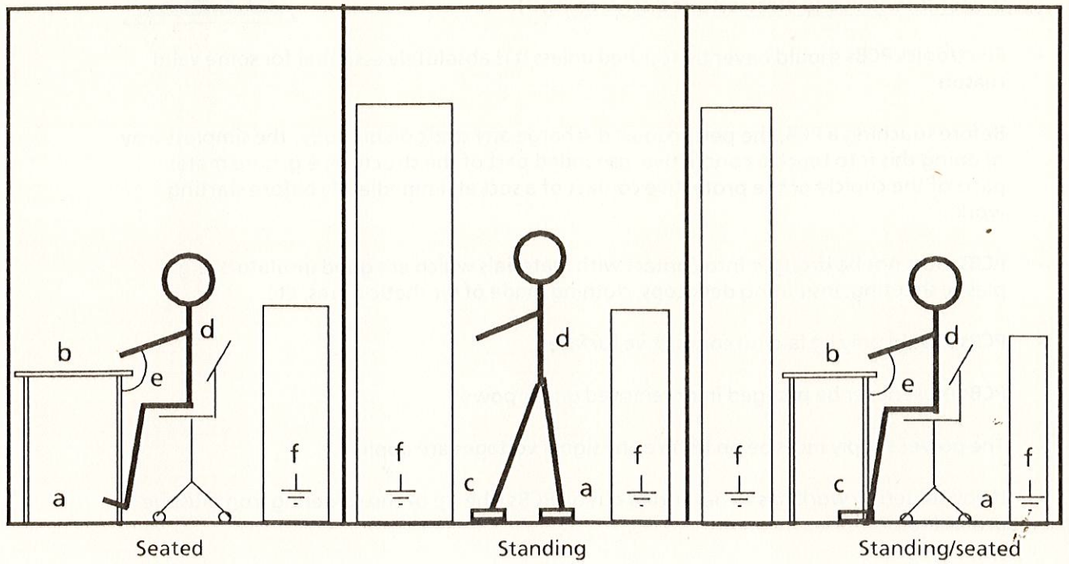
2.1 Safety precautions for handling the equipment



2.1.1 Printed-circuit boards

Components sensitive to electrostatic discharge (ESD)

- Electronics PCBs should never be touched unless it is absolutely essential for some valid reason.
- Before touching a PCB, the person must discharge any static on his body; the simplest way of doing this is to touch a conductive, grounded part of the structure, e.g. bare metal parts of the cubicle or the protective contact of a socket, immediately before starting work.
- PCBs must not be brought into contact with materials which are good insulators, e.g. plastic sheeting, insulating desk tops, clothing made of synthetic fibres, etc.
- PCBs should only be laid on conductive surfaces.
- PCBs must never be plugged in or removed under power.
- The power supply must be on before any signal voltages are applied.
- If any soldering work has to be carried out on PCBs, the tip of the soldering iron must be grounded.
- PCBs and components must always be stored and carried in conductive packaging such as metallized plastic boxes or metal containers.
- If the packaging is not conductive, the PCBs must be wrapped in a conductive material, such as conductive foam rubber or aluminium cooking foil, before being packed.
- The necessary precautions against electrostatic discharges are illustrated again in Fig. 2.1.



a = Conductive floor covering
b = ESD protected table
c = ESD protected shoes
d = 100% cotton overall
e = ESD protective chain
f = Cubicle grounding

Fig. 2.1
Precautions against electrostatic discharge

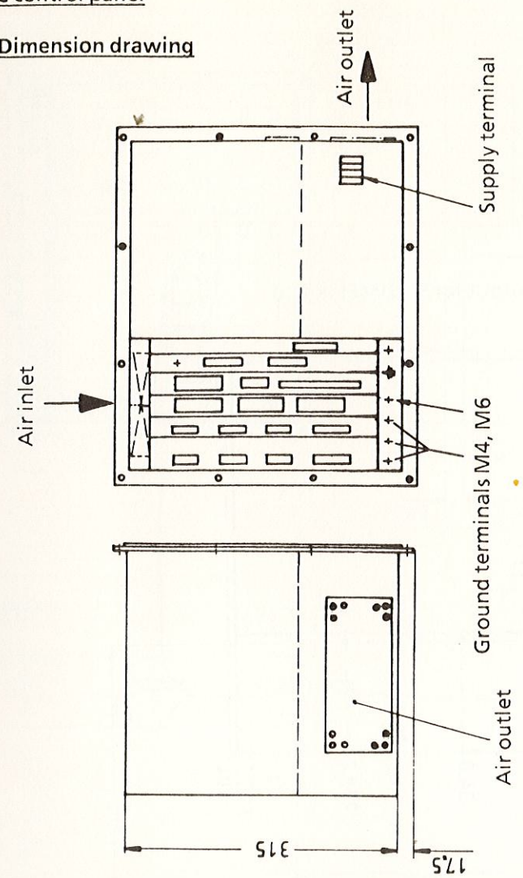
2.1.2 Screen display

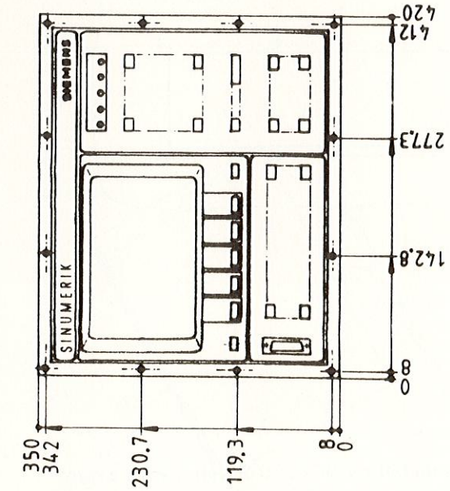
Electromagnetic fields can affect the monitor and cause the screen display to flicker. Equipment such as transformers, fans, and any equipment producing electromagnetic fields (switches, cables) must be more than 300 mm away from the monitor.

2.2 Installation

2.2.1 NC control panel

2.2.1.1 Dimension drawing





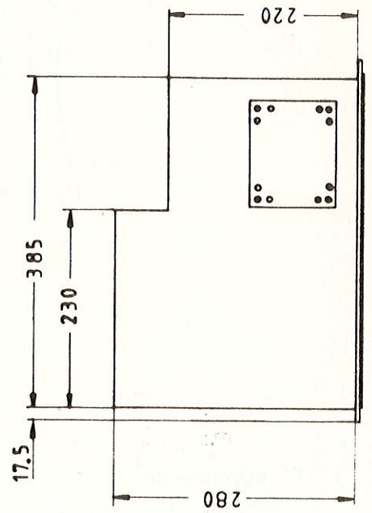
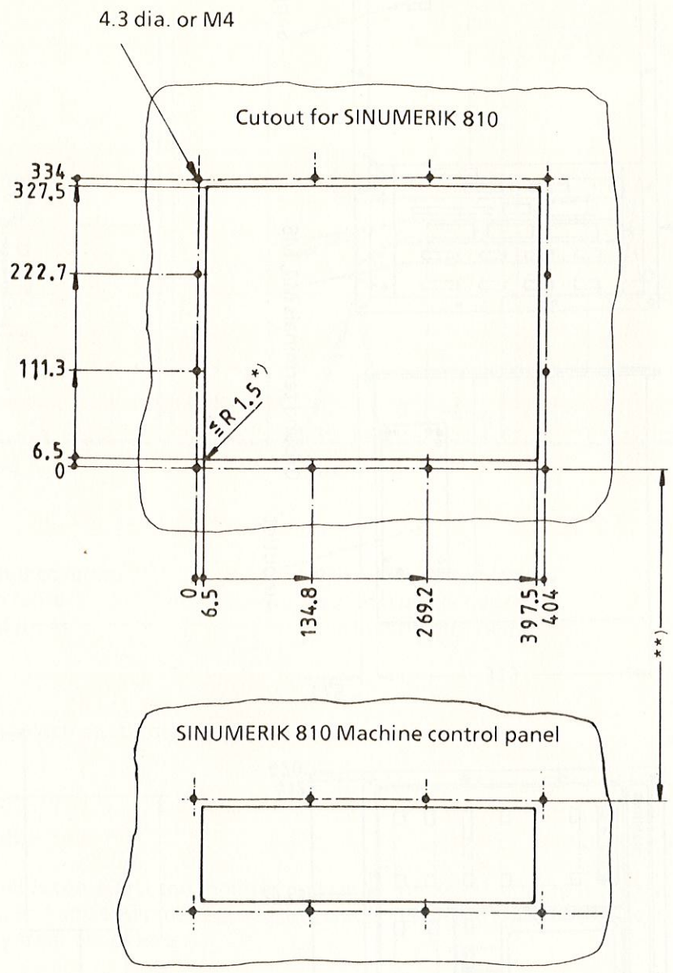


Fig. 2.2
Dimension drawing of NC control panel

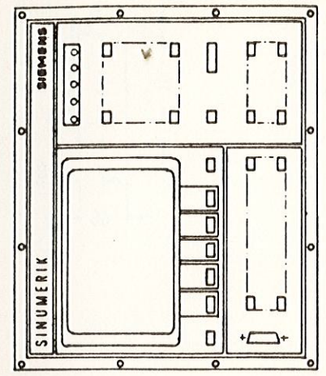
2.2.1.2 Cutout

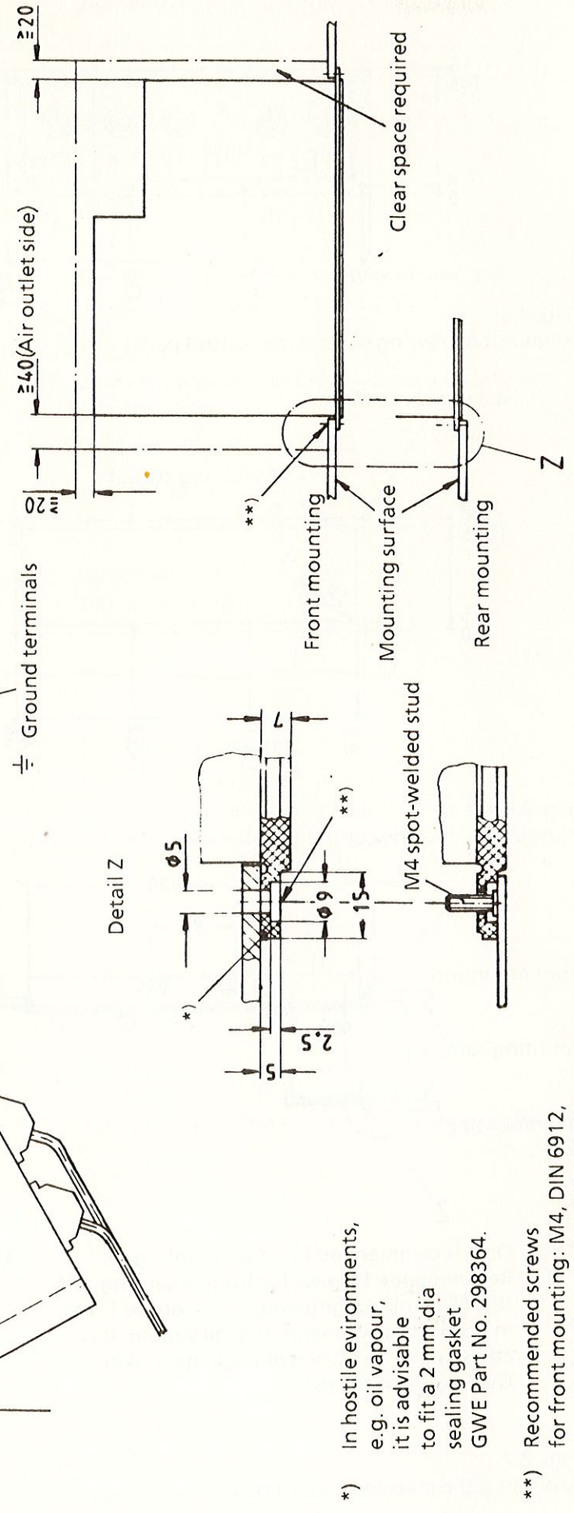


*) Only recommended for rear mounting
**) Separation when machine control panel below NC control panel ≧ 16.5 mm

Fig. 2.3
Cutout for NC control panel

2.2.1.3 Mounting
(for ventilation see 2.3.4)





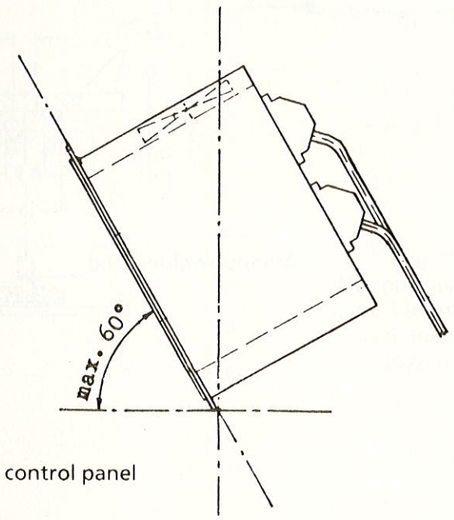
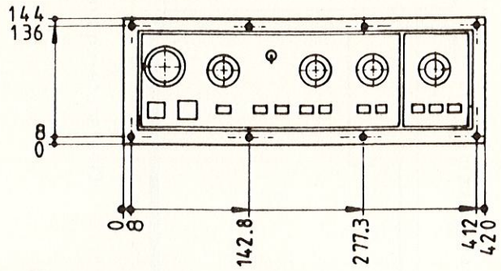


Fig. 2.4
Mounting the NC control panel

*) In hostile evironments, e.g. oil vapour, it is advisable to fit a 2 mm dia sealing gasket GWE Part No. 298364.

**) Recommended screws for front mounting: M4, DIN 6912, max. tightening torque 1.5 + 0.5Nm

2.2.2 Machine control panel



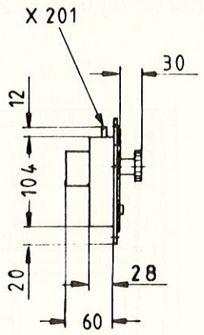


Fig. 2.5
Dimension drawing of machine control panel

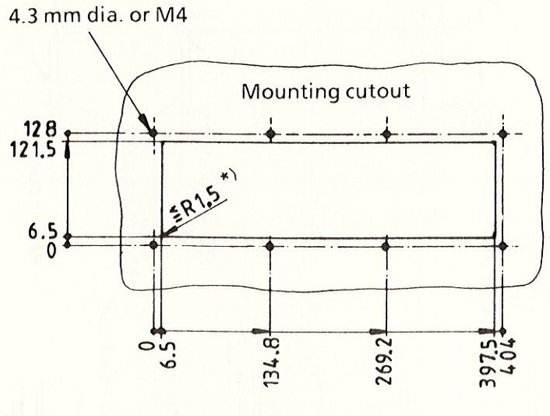
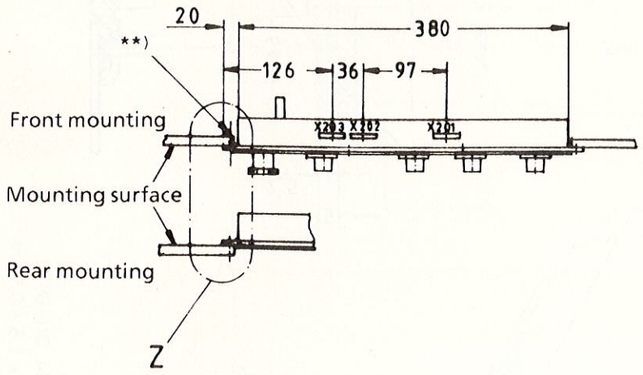
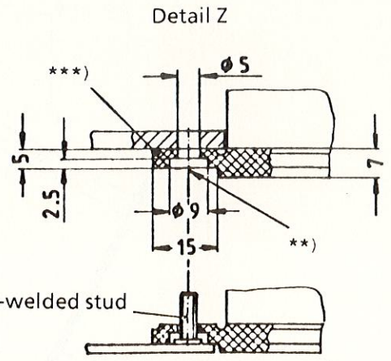


Fig. 2.6
Cutout for machine control panel

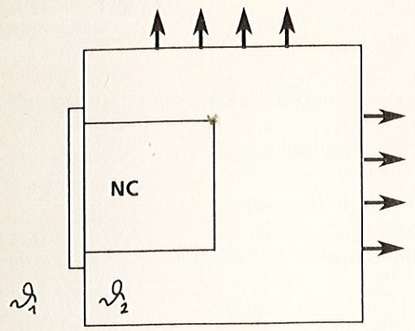




*) Only recommended for rear mounting
**) Recommended screws for front mounting: M4, DIN 6912, max. tightening + 0.5 torque 1.5 Nm
***) In hostile environments, e.g. oil vapour, it is advisable to fit a 2 mm dia. sealing gasket GWE Part No. 298364.

Fig. 2.7
Mounting the machine control panel

2.2.3 Ventilation

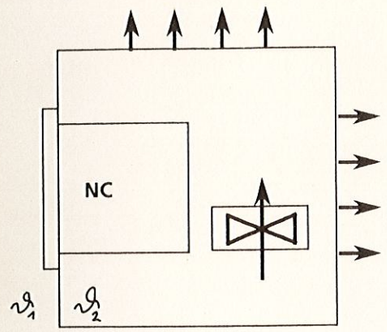


1) Ventilation by natural convection

The exposed surface area of the enclosure (steel or aluminium sheet 1.5 mm thick) required for convection, referred to a temperature difference $\vartheta_2 - \vartheta_1 \geq 10$ K, can be calculated approximately

from: $A\,[m^2] = \dfrac{P_V\ [W]}{5\,\Delta t\ [K]}$

The areas of the front and bottom are not taken into account in the calculation.

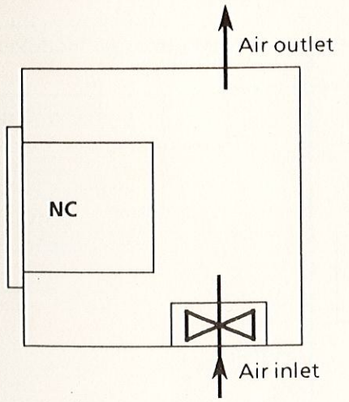


2) Ventilation by natural convection and internal air circulation

As 1), except:

$$A\,[m^2] = \frac{P_V\ [W]}{10\,\Delta t\ [K]}$$

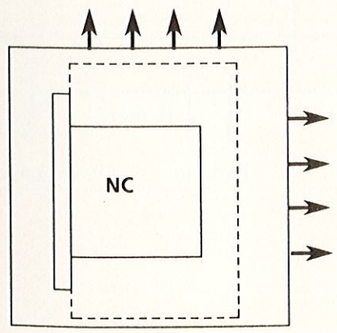
Fan capacity:
100 to 165 m^3/h



3) Through-ventilation

Air inlet temperature: ≤ 55 °C
The flow rate needed to dissipate the heat loss can be calculated from:

$$V\,[m^3/h] = \frac{3.5\,P_V\ [W]}{\Delta t\ \ [K]}$$



4) Ventilation as 1) to 3)

Apply the same basic methods of calculation.

Bild 2.8
Ventilation

2.3 Connection arrangments

2.3.1 Method of grounding

- The grounding complies with the requirements of DIN VDE 0160.
- There is a common method of grounding for NC, PC, drives and machines (Fig. 2.9).
- The actual ground connections are made at the ground terminals (see 2.2).
- The ground connections are brought radially to a central grounding point.
- The equipotential bonding strip provides potential equalization for the external components of the system.
- Protective conductor (PE) connection.

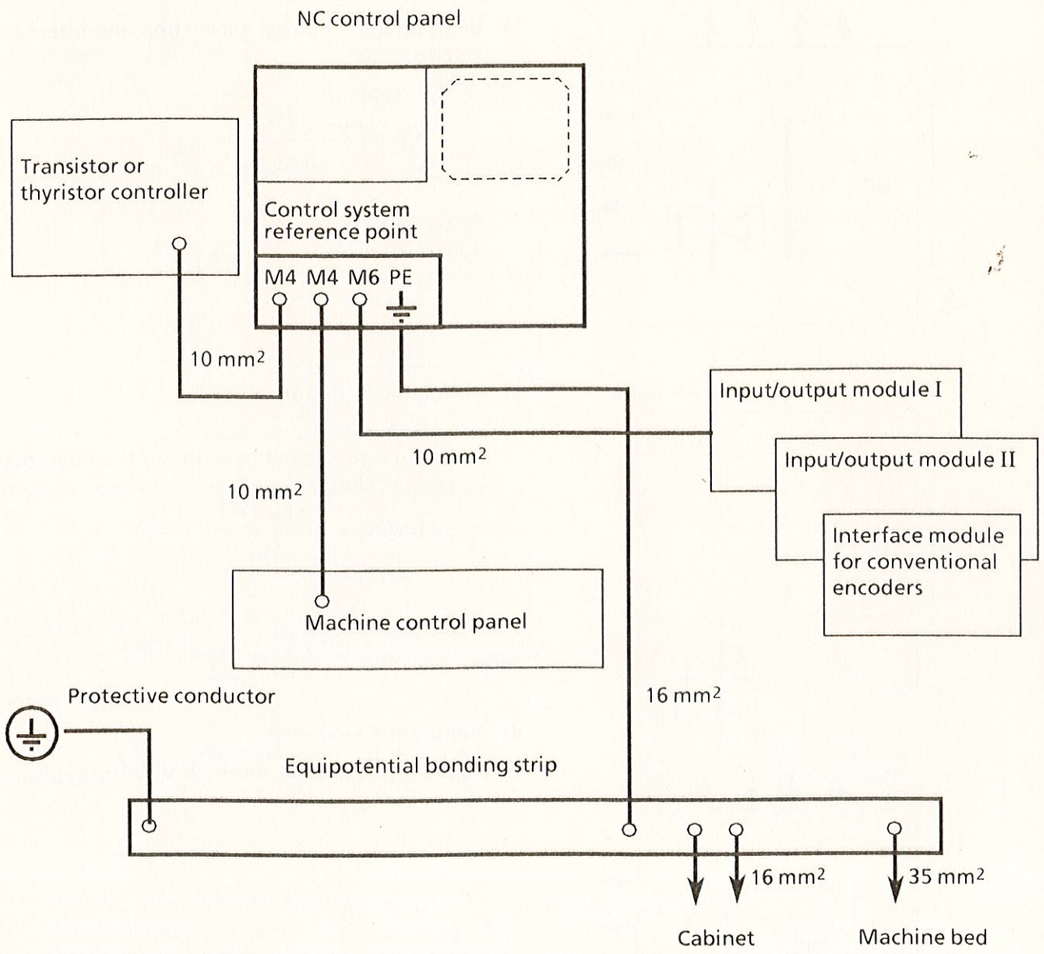


Fig. 2.9
Typical arrangement of equipotential bonding strip (method of grounding)

2.3.2 Grounding of interference currents from signal conductors

Shielded cabling gives noise immunity to the signal conductors; the interference currents are grounded through the large-area contacts of the subminiature connectors to the equipment cabinet.

2.3.3 Cables and connectors

The components of the system must be linked by means of the types of cable and connectors indicated in the diagrams below.

The stated lengths of cable must not be exceeded. Light-current cables must not be run parallel to heavy-current cables. Cables having no connection with the control system must not be run through any of the components of the system.
The connectors must be screwed firmly to the frontplates of the printed-circuit boards.

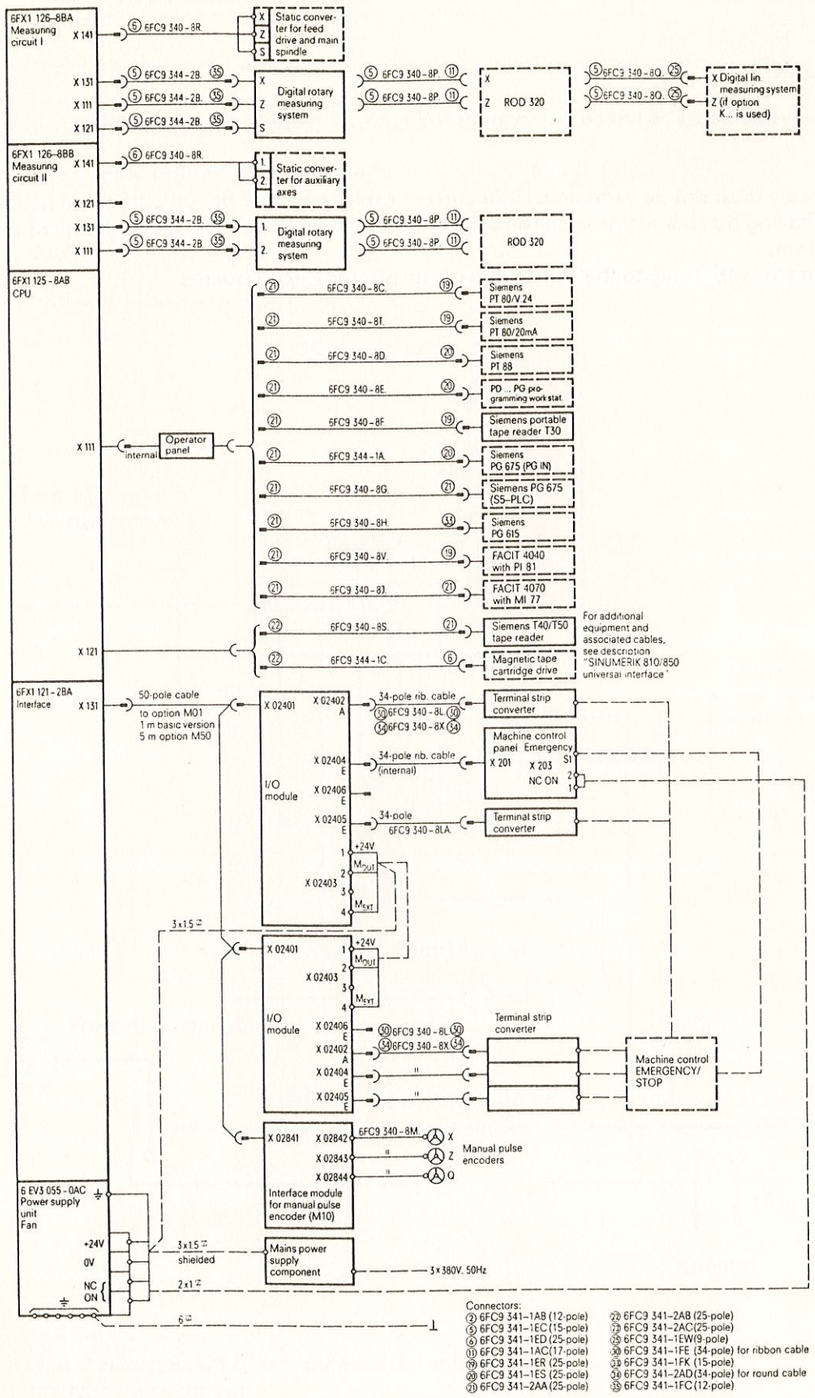


Fig 2.10
Basic circuit diagram for cables and equipment (SINUMERIK 810 T)

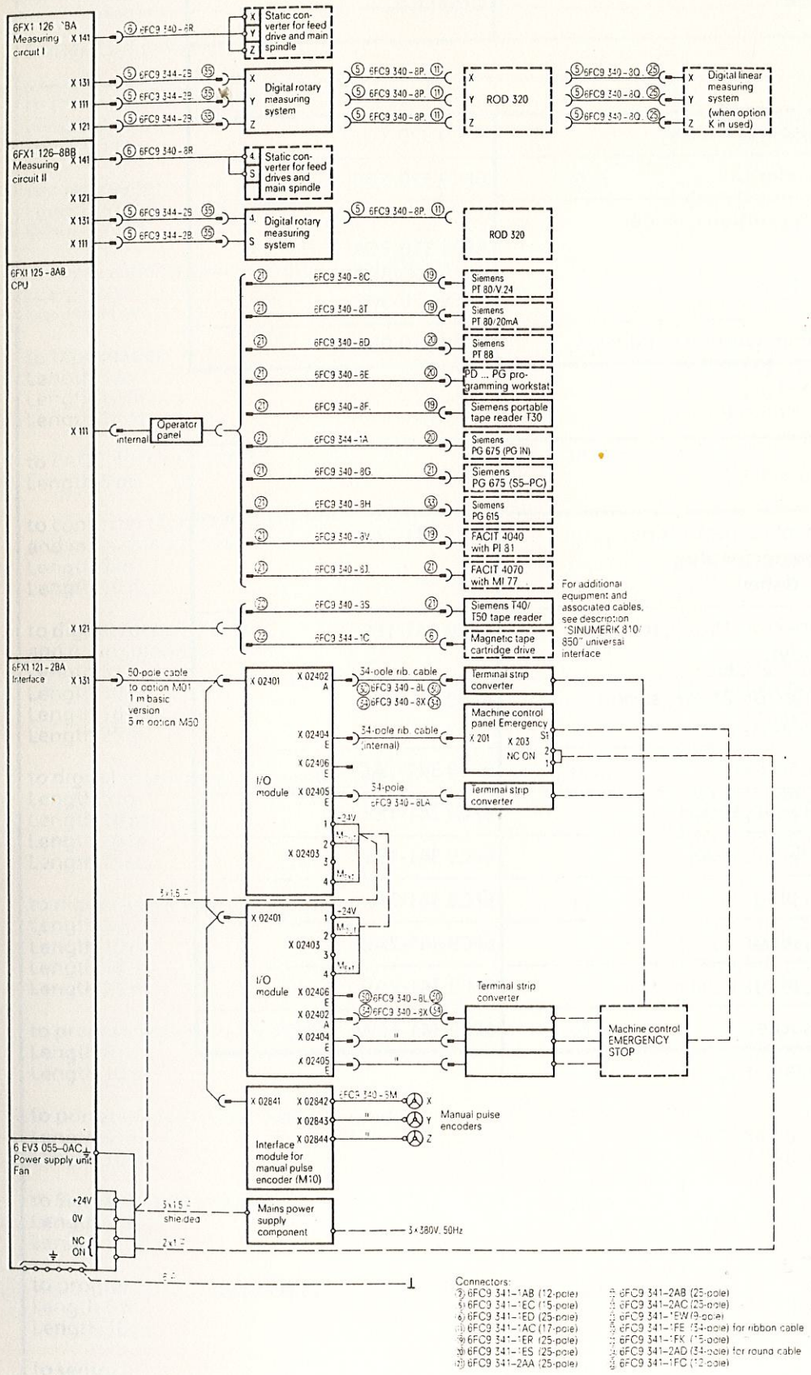


Fig. 2.11
Basic circuit diagram for cables and equipment (SINUMERIK 810 M)

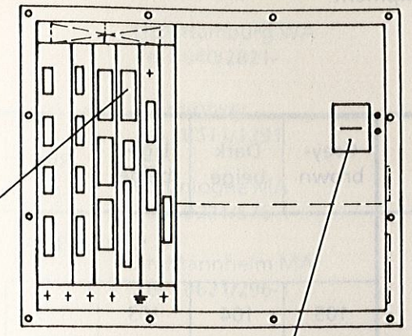
Required accessories	Order No.
Equipment	
Encoder, 1024 pulses/revolution	6FC9 320-1DA
Conventional encoder	6FC9 320-5DA
Incremental rotary position encoder 2000 pulses/rev 2500 pulses/rev 5000 pulses/rev	 6FC9 320-3CA 6FC9 320-3CB 6FC9 320-3CC
Portable tape reader, without winder	6FC9 310-0BA

Connectors	
Connector, 12-pin, plug, comprising: 6FC9 198-4BF00 connector plug 6FC9 198-4BF10 end shell	6FC9 341-1AB
Subminiature connector, 15-pin, socket (complete with body)	6FC9 341-1EC
Subminiature connector, 25-pin, socket (complete with body)	6FC9341-1ED
Connector, 17-pin, socket	6FC9 341-1AC
Cable connector, 25-pin, socket	6FC9 341-1ER
Cable connector, 25-pin, plug	6FC9 341-1ES
Connector, 25-pin, plug	6FC9 341-2AA
Connector, 25-pin, plug	6FC9 341-2AB
Connector, 25-pin, plug	6FC9 341-2AC
Connector, 9-pin, socket	6FC9 341-1EW

Required accessories	Max. permitted length	Order No.
Cables, complete		
to conventional encoder Length 1 m Length 5 m	25 m	 6FC9 340-8MA 6FC9 340-8MB
to tape reader/punch Siemens PT 80 (V.24) Length 5 m Length 10 m	30 m	 6FC9 340-8CB 6FC9 340-8CC
to tape reader/punch Siemens PT 80 (20 mA) Length 5 m Length 10 m	30 m	 6FC9 340-8TB 6FC9 340-8TC
to tape reader Length 5 m Length 10 m Length 18 m	30 m	 6FC9 340-8SB 6FC9 340-8SC 6FC9 340-8SE
to FACIT 4070 with MI 77 Length 5 m	30 m	 6FC9 340-8JB
to converters for feed drives and main spindle drive Length 5 m Length 10 m	50 m	 6FC9 340-8RB 6FC9 340-8RC
to digital rotary encoders and main spindle encoder Length 5 m Length 10 m Length 18 m Length 25 m	35 m	 6FC9 340-8NB 6FC9 340-8NC 6FC9 340-8NE 6FC9 340-8NF
to digital rotary position encoder ROD 320 Length 5 m Length 10 m Length 18 m Length 25 m	35 m	 6FC9 340-8PB 6FC9 340-8PC 6FC9 340-8PE 6FC9 340-8PF
to digital linear measuring system Length 5 m Length 10 m Length 18 m Length 25 m	35 m	 6FC9 340-8QB 6FC9 340-8QC 6FC9 340-8QE 6FC9 340-8QF
to programming console PD/PF Length 5 m Length 10 m	30 m	 6FC9 340-8EB 6FC9 340-8EC
to portable tape reader without winder Length 5 m Length 10 m	30 m	 6FC9 340-8FB 6FC9 340-8FC
to Siemens PT 88 printer Length 5 m Length 10 m	30 m	 6FC9 340-8DB 6FC9 340-8DC
to programmer Siemens PG 675 Length 5 m Length 10 m	10 m	 6FC9 340-8GB 6FC9 340-8GC
to sensor Length 5 m Length 10 m Length 18 m Length 25 m	35 m	 6FC9 340-8UB 6FC9 340-8UC 6FC9 340-8UE 6FC9 340-8UF
between I/0 module and terminal strip adapter, ribbon cable	0.5 m	6FC9 340-8LA

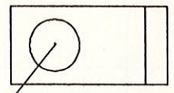
3 Maintenance

3.1 Changing the back-up batteries



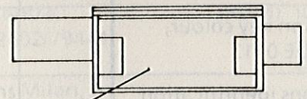
Location of memory submodule for machine and PC data

Location of battery



Battery: 3.6 V/1.0 Ah
Back-up time ≥ 5 years

This battery provides backing for the machine data memory and PC user memory in the interface PCB.



Battery: 3.4 V/5 Ah
Back-up time ≥ 1year

This battery provides backing of the RAMs for part program and main memory.

The back- up battery voltage is monitored by the control system

When the battery life has expired, the whole memory submodule must be changed.

The battery can only be changed by the manufacturer.

When the alarm is given, the battery must be changed within a week.

In order to change the battery, the control system must be switched on or a voltage of 3.4 V DC must be applied to the Standby Voltages sockets.

Ensure the correct polarity when fitting the new battery.

Ensure proper location in the guides when inserting the battery holder.

Fig. 3.1
Changing the back-up batteries

Safety precautions when handling batteries

The memory submodule containing the 3.6 V/1.0 Ah battery is insulated at the bottom. However, never lay the submodule on a conductive surface.

The exhausted batteries must be disposed of in accordance with the regulations applicable to the place of installation of the equipment.

3.2 Colour scheme

Application	Grey-brown	Dark beige	Light beige	Red	Green	Ochre	Black
	*)SN 30920-						
	105	104	103	119	101	100	128
Frontplate	X						
Normal key colour		X	X				
Special-function key colour, DIN VDE 0113				X	X		
Colour of Siemens identification strips						X	
Colour of symbols							X

Table 3.1
Colour scheme

3.3 Cleaning

The front of the monitor and the surface of the control panels can be cleaned using a normal commercial washing-up liquid or an industrial cleaner when the dirt is relatively easy to remove. These cleaners also remove dirt containing graphite.

Stronger cleaning materials containing one or more of the following constituents may be used infrequently and for short periods:

- Diluted mineral acids
- Bases
- Alcohol
- Organic hydrocarbons
- Detergent solutions
- Greases and oils
- Petrol

*) A colour chart can be obtained from Department ZT TVN München P

4 Service Centres

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(ROK) Siemens Seoul,
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Tel.: 778-3431

(RSA) Siemens Johannesburg
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Tel.: 011/715-2745

(SGP) Siemens Engineering
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Union building
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37, Jalan Pemimpin
Singapore 2057
Tel.: 2518518

(TJ) China National
Aero Technology
Import and
Export Corp.
Peking China

(USA) General
(MEX) Numeric Corp.
(CAN) 390 Kent Avenue
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Service Dept.
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(YV) Siemens Caracas
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