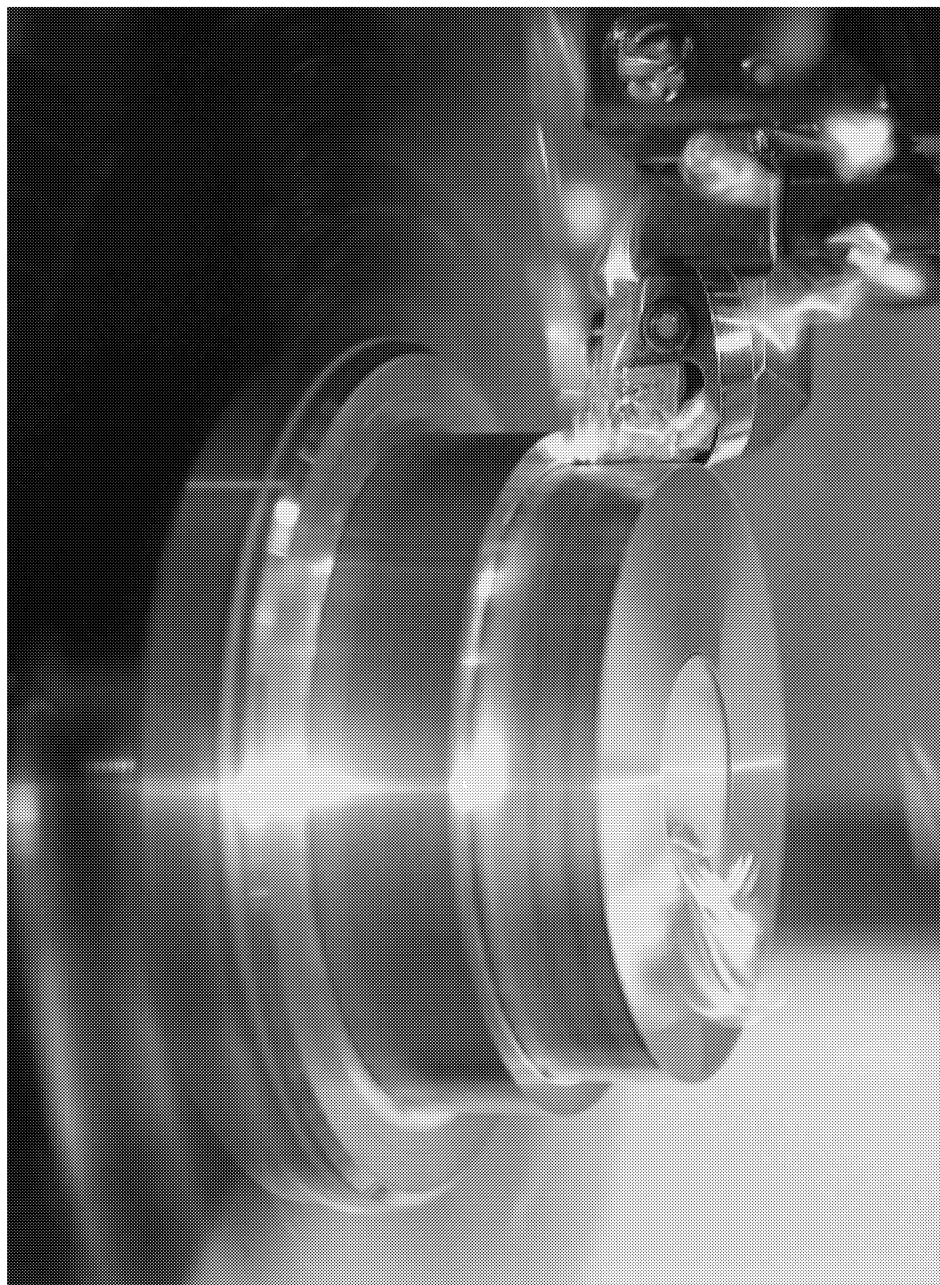


HEIDENHAIN



CNC PILOT 3190

Electroconstruction Manual

323953-20 07/98

HEIDENHAIN

Foreword

This electroconstruction manual is based on specifications from the machine tool manufacturer. It contains all the information necessary in respect of assembly, electrical connections and operation.

In the case of hardware modifications, either a supplement to the documentation or a revised version is supplied.

Extracts from this manual can be used to supplement the machine documentation.

No documentation is perfect! It needs to be changed constantly. So please do not hesitate to send us your suggestions, comments and ideas to help us change the documentation and make it even more effective.

CNC PILOT 3190 Electroconstruction Manual

Id. No.: 323953-20

Edition : 07/98

HEIDENHAIN

Niederlassung Hannover
Postfach 2240
D-30022 Hannover

- 1 Control System
- 2 Safety Notes
- 3 Installation and Operating Conditions
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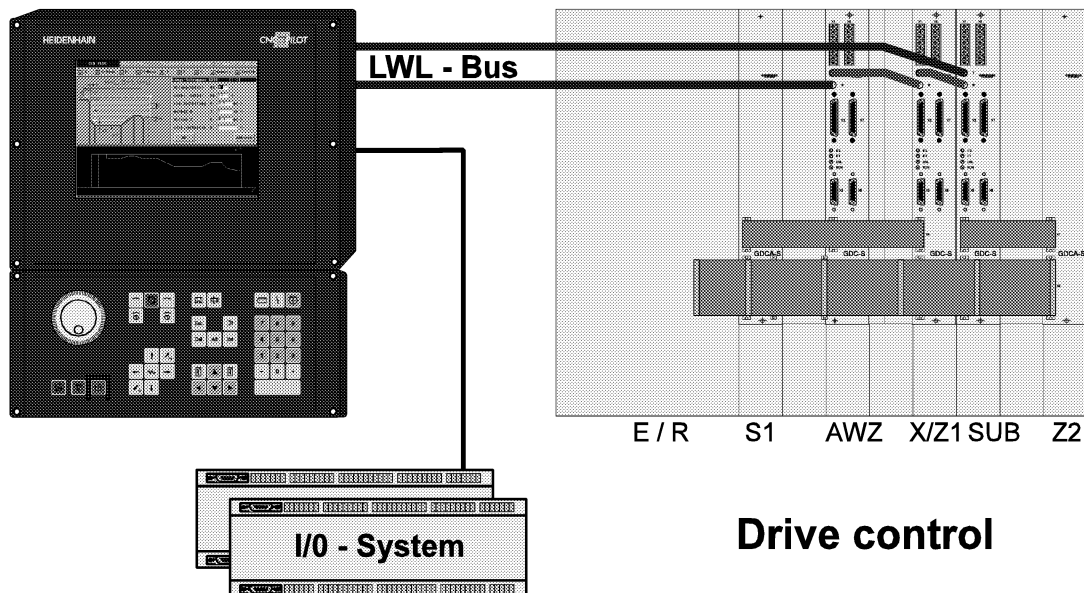
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1 Control System

1.1 Control overview



The front end of the CNC control 3190 has a compact, extremely space-saving design. The flat display monitor screen is in an integrated housing which contains the most important CNC components outside the machine switching cabinet:

- CPU on a PC basis (PC)
- Motion board with interpolator and PLC (PCMOEM)
- Hard disk for data retention

The operating keyboard is in a compact design and equipped with softkeys used to edit program data.

Slide, spindle and automatic operation keys are provided for machine operation. A handwheel is available with which to control feed, speed and overlay functions and for direct movement of all axes.

The decentralized I/O system is coupled, with a minimum amount of wiring, to the PLC via the ELTROMATIC field bus. Digital and analog inputs/outputs and measuring systems are provided here.

The spindle and slide drives are controlled by means of digital technology via optical waveguides.

In this way, the user is able to install this control system in the machine taking up a minimum amount of space.

1.2 Technical data overview

Display / Computer unit

Power supply	230 V \pm 15%, 48...62 Hz
Power consumption	300 mA
Ambient temperature in installation room	5°...45 °C
Shock (TFT monitor)	\leq 3 G
Vibration (TFT monitor)	\leq 0.5 G
Dispositive and coordiniating control level on a PC basis, with Windows 95 operating system.	
Interpolator	Max. 16 axes; Optical waveguide output to the power sections
PLC	Programmable complying with IEC1131; ELTROMATIC field bus to the decentralized I/O modules
Power supply output for the decentralized control components:	
Voltage	Vout = 7.75 V
Current	Iout \leq 2.75 A, short circuit resistant

CNC keyboard unit

Power supply	+6.5 V...+12.5 V
Power consumption	Approx. 330 mA with handwheel connected
Ambient temperature in installation room	5...50 °C

ELTROMATIC module**EA48**

Power supply	+6.5 V...+8.5 V
Power consumption	250 mA typical
Ambient temperature in installation room	5...45 °C
32 digital inputs	Each 20 mA input current using 24 V= ±15%
16 transistor outputs	1.5 A / 24 V= continuous load per output, simultaneity factor 50%; 2.2 A / 24 V= summation current per transistor pair, simultaneity factor 50%

EA-KOMBI

Power supply	+6.5 V...+8.5 V
Power consumption	1.25 A (without transmitter)
Ambient temperature in installation room	5...45 °C
2x8 digital inputs	Each 20 mA input current using 24 V= ±15%
2x4 dig. transistor outputs	1.5 A / 24 V= continuous load per output, simultaneity factor 50%; 2.2 A / 24 V= summation current per transistor pair, simultaneity factor 50%
4 analog inputs	10 bit resolution, conversion time 8.5 µs
2 analog inputs	12 bit resolution
2 incr. meas. trans. inputs	f _g 1.6 MHz with max. phase error of 45°

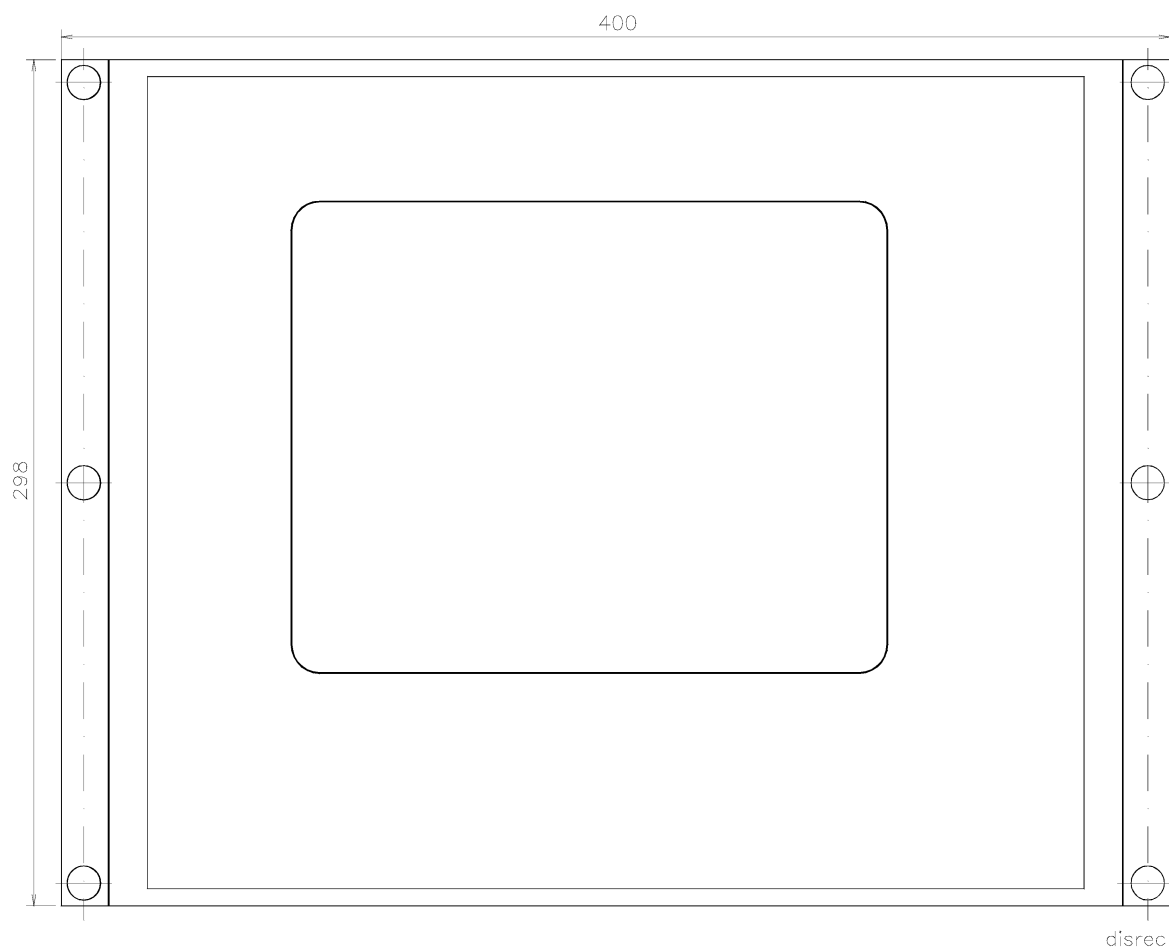
EA-AD16

Power supply	+6.5 V...+8.5 V
Power consumption	200 mA (typical)
Ambient temperature in installation room	5...45 °C
16 analog inputs	0...10 V, 15 bit resolution alternatively temperature sensor NTC can be connected

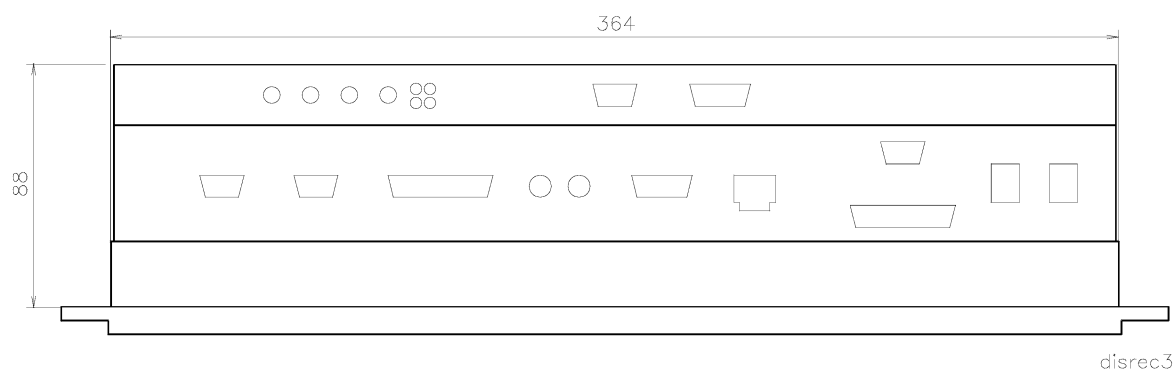
1.3 Dimensional drawings

1.3.1 Control unit

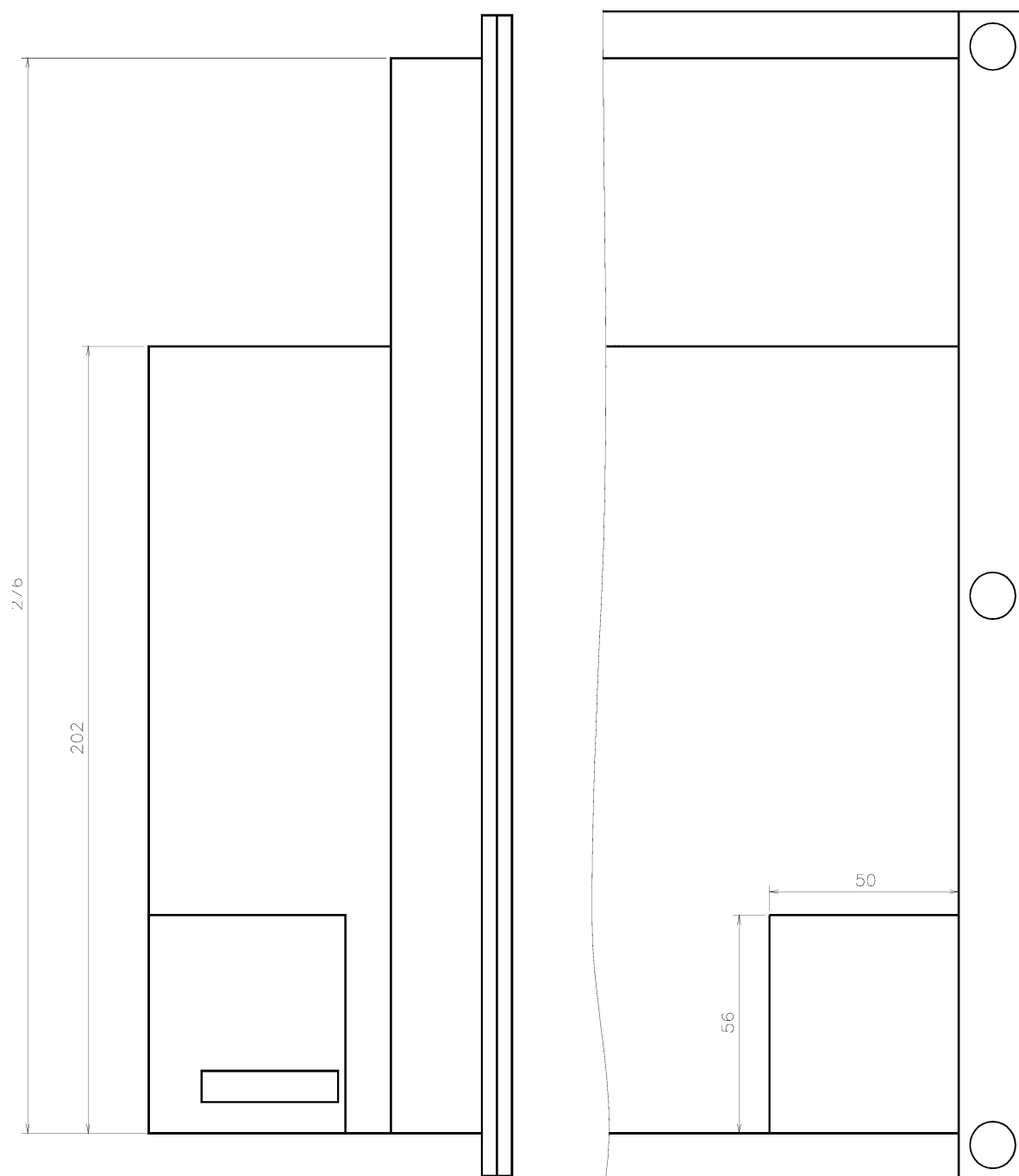
1.3.1.1 Front panel



1.3.1.2 Plan view

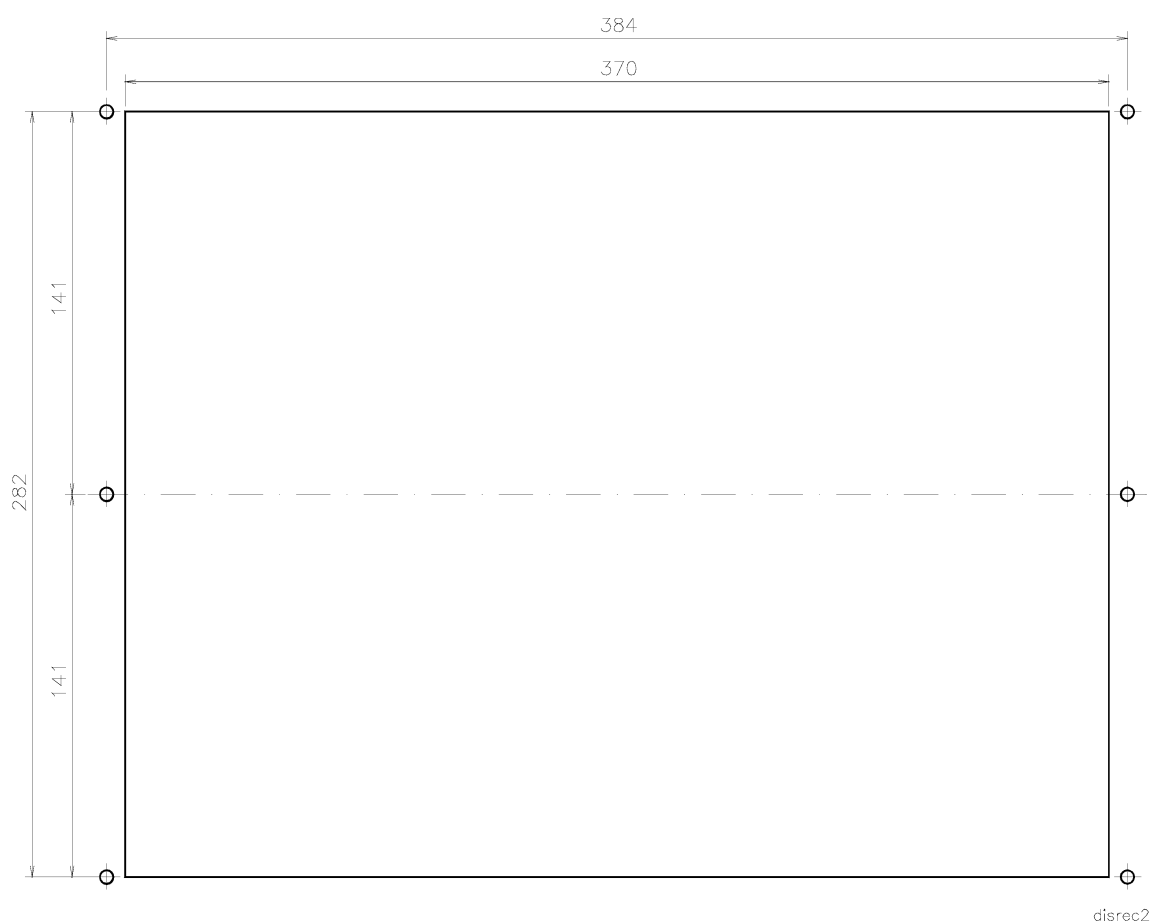


1.3.1.3 Side view and rear view section



disrec1

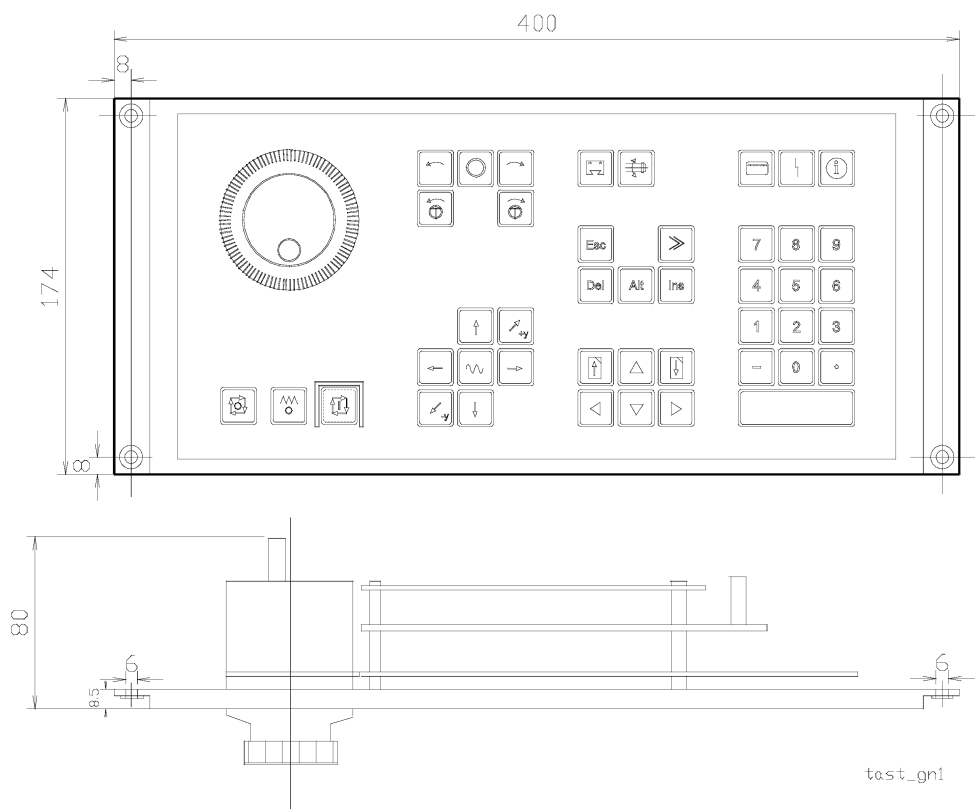
1.3.1.4 Cut-out for front panel assembly



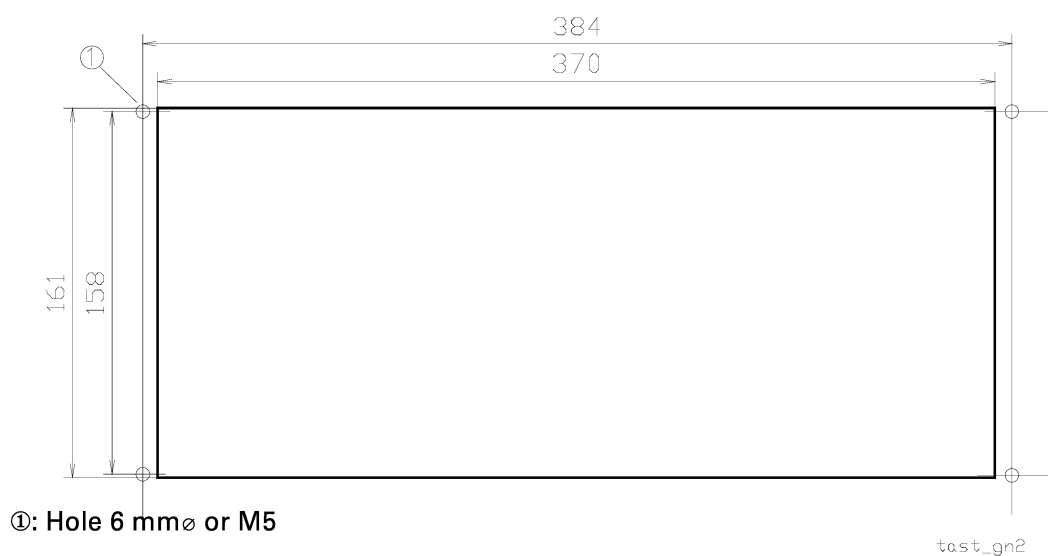
Fixation holes 6 mm \varnothing or M5

1.3.2 CNC keyboard

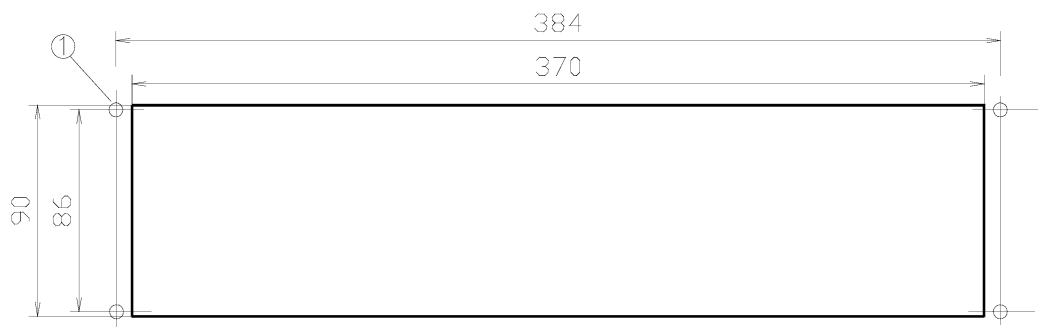
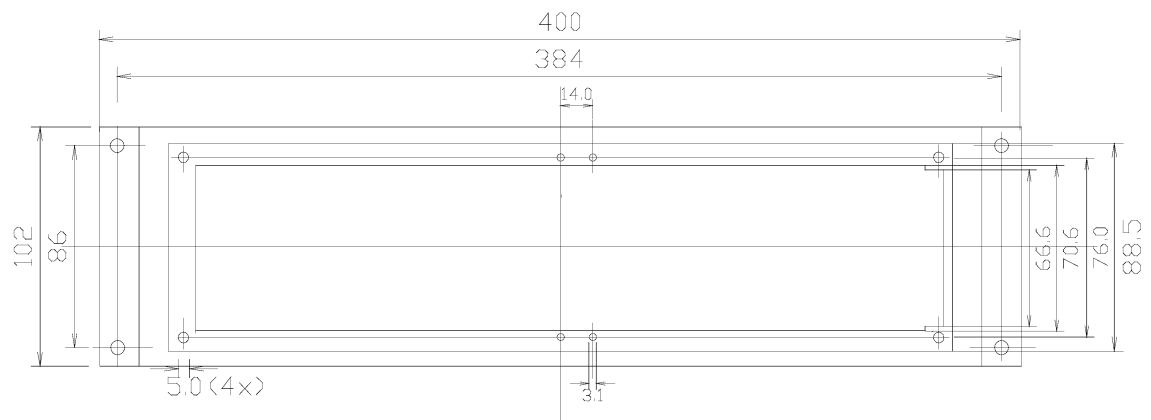
1.3.2.1 CNC keyboard, general view



1.3.2.2 Cut-out for CNC keyboard



1.3.3 Machine keyboard plate dimensions (example)



tast_gn3

Cut-out for machine keyboard

①: Hole 6 mm \varnothing or M5

2 Safety Notes

2.1 Notes

2.1.1 General information

This section is relevant to all personnel who are to operate the CNC control and machine tool:

A precondition for the safe operation of the machine tool and CNC control is a fundamental knowledge of these safety notes and safety regulations.

In addition, the following must be observed:

- the laws and regulations concerning accident prevention applicable at the installation site
- all notes in this operating instruction manual (since it contains the most important notes for correct, safe operation)
- the operating/programming instructions from the machine manufacturer with applicable safety notes.

2.1.2 Personnel

The equipment may only be initialized by specially trained, qualified personnel (e.g. service personnel from the machine or CNC control manufacturer). All relevant safety notes must be observed.

No person may work with the machine CNC control without the necessary training, even for a short period.

If individual pages of this instruction manual are unusable or illegible, the machine operator must immediately replace them by re-ordering the entire manual from the machine or CNC control manufacturer, specifying the identification number and software release.

2.2 Obligations

2.2.1 Machine manufacturer

The machine manufacturer is obliged only to allow reliable, suitably trained personnel to work on the machine, who:

- are familiar with the fundamental rules and regulations relating to occupational safety and accident prevention and are trained in the use of machine tools and CNC control,
- are familiar with the chapter on safety notes and the caution notes
 - in this operating instruction manual,
 - in the CNC control operating and programming manual, and
 - in the machine tool operating instructions
- have read and understood the safety notes and confirmed this with their signature.

The machine manufacturer is obliged to:

- constantly monitor the overall technical condition of the machine / for visible external faults and damage and changes in operating behavior,
- define the respective responsibilities of personnel concerned with transport, installation and operation, and CNC control observance of the definitions,
- regularly check that personnel work according to the safety regulations.

2.2.2 Personnel

All personnel contracted to work with the machine and its CNC control are obliged to:

- read and understand the basic regulations concerning safety and accident prevention at the place of work, the chapter on safety notes and the cautions notes in this operating instruction manual, the operating and programming instructions and machine tool manual, and confirm this with their signature,
- observe all the stated rules and regulations, notes and instructions during operation.

2.3 Using the machine/control

2.3.1 Dangers when using the machine

The CNC control has been constructed by the control manufacturer according to state-of-the-art technology and accepted technical safety rules, regulations and standards. However, when using the machine

- danger of personal or fatal injury for the user and third parties,
 - influences on the machine or to other material assets,
- still exists.

The machine tool control should only be used

- for its intended purpose,
- when in a technically safe condition.

Faults which may affect safety standards must be immediately cleared by qualified personnel, e.g. service personnel from the machine manufacturer or, in respect of control-orientated problems, from the CNC control manufacturer.

Otherwise, they may lead to **unforeseen dangers**:

- of fatal or personal injury,
- to the machine and other company and user assets.

2.3.2 Environmental protection, prevention of water pollution

The machine tool is a HBV system complying with the German household water law §19 (systems for using water-polluting materials); refer to the operating instructions provided by the machine manufacturer.

When the machine is in operation, idling, being disassembled or parts removed:

- observe the requirements of the prevention of water pollution laws (WHG),
- refer to details in the laws concerning systems using water-polluting materials (VAWS).

2.3.3 Using the CNC control for its intended purpose

The CNC control can perform the following machining processes, depending on its configuration:

- Turning
- Milling
- Drilling

Use for any purpose other than those listed above is considered improper. The CNC control manufacturer disclaims all liability for any damage resulting from such use.

Use for the intended purpose also includes observance of information in:

- the operating instructions,
- the operating instructions of the machine manufacturer,
- the operating and programming instructions of the CNC control manufacturer.

Faults which may affect safety standards must be immediately cleared by qualified personnel, e.g. service personnel from the machine manufacturer or, in respect of control-orientated problems, from the CNC control manufacturer.

Otherwise, they may lead to **unforeseen dangers**:

- of fatal or personal injury,
- to the machine and other company and user assets.

2.4 Warranty and liability

2.4.1 Conditions

Our "General Terms and Conditions of Business" are applicable. These are made available to the user on completion of the contract at the latest. Warranty and liability claims for personal and property damages are excluded if they are attributed to one or several of the following causes:

- Improper use of the machine tool or CNC control, usage deviating from the aforementioned points or other unintended use.
- Operating the machine or CNC control when in a technically imperfect state or failing to observe the notes on safety and dangers contained in the operating instructions
- Operating the machine with faulty, incorrectly fitted or non-functional safety and protective equipment.
- Incorrect assembly, commissioning, operation and maintenance of the CNC control.
- Faults which may be detrimental to safety and not cleared prior to initializing the machine.
- Failure to observe the operating instructions in respect of transport, storage, assembly, initialization, operation and maintenance of the CNC control
- Unauthorized constructional modifications to the CNC control
- Unauthorized modification, bridging or rendering inoperational machine equipment which serves for perfect functioning, unrestricted use and passive safety.
- Inadequate monitoring of machine parts subject to wear
- Incorrectly undertaken repairs

3 Installation and Operating Conditions

3.1 General information

3.1.1 Safety notes

The CNC is designed as a build-in unit for machine tools mainly for industrial purposes. The information in this manual and any applicable national laws and regulations must be observed for installation of the CNC control and relevant periphery equipment. During operation of the CNC control, certain parts are supplied with dangerously high voltage. Only experienced, qualified personnel may work on this equipment.

Danger with internal components!

Only connect or disconnect plugs when the equipment has been switched off!

Danger of electric shock!

Before opening the equipment, switch off the main switch or disconnect the power cable!

The CNC control must be driven via a control transformer with separate windings. Also refer to EN 60204.

Power supply to the sensors and actuators assigned to the PLC (input/output elements) must be provided via a voltage, properly insulated from the mains complying with EN 60742 and EN 50178.

After deactivating the CNC control, a minimum shutdown time of 15 seconds must elapse before switching it on again.

3.1.2 Standards

Electrical safety complying with VDE 0160, EN 50178

Interference suppression according to Class A complying with EN 55022.

Electrical protection class 1 complying with IEC 536 (VDE 0106)

Overvoltage resistance corresponding to Class 2 complying with DIN VDE 0160, Curve W2.

Protection type (against dust, moisture) complying with EN 60529

Monitor, when integrated: IP 54

Keyboard, when integrated: IP 54

IP 54: Dust and splash water protection.

Mechanical shock / vibration

Refer to the technical data of the respective components.

3.1.3 Relative humidity

In continuous operation	< 75%
For max. 30 days per year, naturally distributed	< 95%

In tropical regions, it is recommended not to turn the CNC off to prevent condensation forming on the PCB. The innate warming prevents condensation.

3.1.4 Electrical interference resistance

Foreseen location

The equipment is configured according to Class A complying with EN 55022 and is designed mainly for use for industrial purposes.

Note that the sensitivity to interference increases with faster signal processes and higher triggering sensitivity.

Protect the system from interference influences by observing the following regulations and recommendations.

Interference voltages are usually generated and transmitted by capacitive and inductive coupling. Interference can also be caused by lines and equipment inputs and outputs.

The following are often the source of interference:

- Strong magnetic fields from transformers or electromotors.
- Relay, protective and magnetic valves.
- High frequency equipment, pulse units and magnetic radiation fields from switching network sections.
- Power lines and tributary lines to the above mentioned equipment.

Electrical interference can be prevented:

- Minimum distances between logical units and their signal lines to
 - interfering units: > 200 mm
 - lines carrying interference signals: > 100 mm(If signal lines and interference signal lines are laid out in a common cable in a metallic cable duct, sufficient decoupling is achieved by means of an earthed partition.)
- Screening complies with EN 60742, EN 50178.
- Equipotential bonding line to CNC control : $\geq 6 \text{ mm}^2$.
- Implementation of original HEDENHAIN cables, connectors and couplings.

3.2 Control assembly

3.2.1 Installation room operating conditions

The maximum permissible ambient temperature in the installation room must not be exceeded (refer to Technical Data). The display/computer unit power loss generated, max. 45 Watt, must be taken into consideration. In order that the integrated fan can achieve a minimum air flow in the equipment, sufficient air circulation must be possible in the installation room. For this purpose, ensure a free space of at least 25 mm about the sides of the equipment.

During assembly of the control components, ensure the requirements defined in the following sections and the dimensional specifications are adhered to.

The user is obliged to ensure that the fixation parts on the front panel are sealed (blind mounting holes or sealing washers).

The 24 VDC supply to the switching cabinet must be electrically isolated from the mains supply according to the relevant safety regulations (twin-chamber transformer).

3.3 Cables and connectors

In order that the CNC control operates safely and all the functions are provided, select the connection cables and wiring channels according to the following criteria:

- Signal lines and power cable to the CNC control must not be laid parallel to high voltage cables but near the metal housing, if possible.
- Avoid intersections with high voltage cables. This is particularly important in the case of high voltage cables with thyristor and transistor amplifiers.
- Motor and path measuring transmitter cables must not be laid out close to each other and run parallel. Avoid laying the cables in the same cable channel.
- Only screened cable, and possibly twisted-pair cable, may be used for signal lines (**e.g. desired value and path transmitter**).
- Ensure the cable screening is connected properly.
- When installing the optical fiber cable LWL, observe the minimum bending radius (refer to Chapter 'Drive Control' for values).
The method of installation must ensure no damage and avoid kinking; therefore, the optical fiber cable should not be laid out in the same cable channels as the electrical cables. Excessive lengths should be rolled (loosely) and fixed on the side panels of the housing with cable ties.
The ends of the cables must be protected against being dirtied; therefore, the protective caps should not be removed during installation.

3.4 Equipotential bonding

- All CNC control components must be connected to the switching cabinet central grounding bar by the shortest route using equipotential bonding lines in a star-shaped arrangement.
- The equipotential bonding lines on the grounding bar in the switching cabinet must be grouped into signal-based sensitive units and power units.
- The grounding screw on the CNC control must be connected to the central grounding bar in the switching cabinet by means of a equipotential bonding line.

3.5 Screening

With regard to the screening of the CNC control periphery equipment, screening connection is made according to the following rules, where no other connection conditions are specified:

- Screen connection around the entire circumference (360° contact); (never use stub cable (pigtail) for screening).
- With analog signal transmission, single-side screening connection to the housing is necessary on the receiver side.
- If double screened cable is used, the outer screening must be connected to the housing on both sides. The rules for analog signal transmission are valid for the inner screening (receiver side screen connection).
- A 360° continuous contact must be ensured up to the periphery components.

3.6 Interference suppression measures

- Protective grounding complying to EN60204.
 - By construction of the switching cabinet components and CNC control.
 - All switching equipment must be provided with suitable suppression elements for interference elimination.
 - For switching 24 V sliders, an RC suppression directly on the valve is generally sufficient.
 - Motor suppression elements can be attached directly on the switching contact in the switching cabinet (0.5 m max. line length).
However, if switching equipment (e.g. pole changing switch) is attached outside the switching cabinet in front of the motor, suppression is essential behind this switching equipment.
 - Even equipment which is switched with the main switch or the command **"Machine control ON"** must have interference suppression.
 - Careful interference suppression of switching cabinet lighting implementing fluorescent lamps. Other types of lamps which have no gas discharge should be used in close proximity to the CNC control.
 - Service sockets in or on the switching cabinet must also be equipped with an RC suppression element. The sockets may only be used for service equipment up to max. 1 A, and never for drills, welding equipment, etc.!
- Attach appropriate warning labels!**

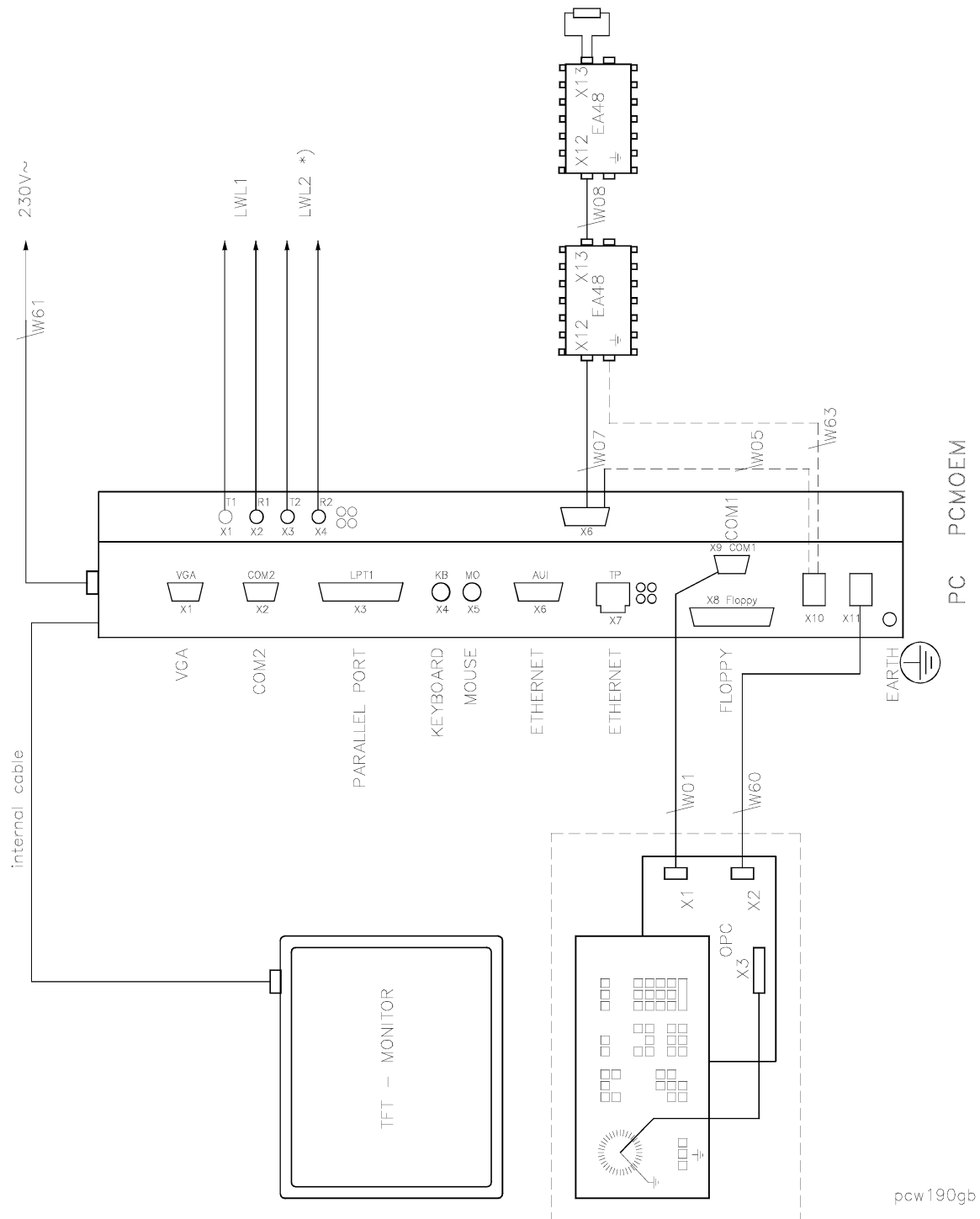
- RC suppression elements must not be switched without a load being applied.
Example: RC suppression element of the coolant pump must be connected to the pump when the tributary is fed via plug-in connectors.
- **Other solutions - e.g. using varistors - are not permitted (or only after authorization from the control manufacturer).**

Cables and lines:

- Cables must be laid out according to Section 'Cables and Connectors'.
- With regard to desired value lines and path transmission cables, observe the screening measures explained in sections 'Cables and Connectors' and 'Interference Suppression Measures'.

Screened cable must also be used where interference is expected as a result of cable installation problems.

4.2 Connection overview of the CNC



*) : LWL2 only available when test circuit number is > 6.

Danger for internal components!

Only connect or disconnect plugs when the equipment is switched off.

4.3 PC

4.3.1 PC performance data

- All-in-one CPU with the following functions

	Standard Equipment	Extension Possibilities
CPU	486DX4/133MHz	
DRAM	2 SIMM modules are available for memory extension 16 MB 64 MB	
Graphic controller	Local on CPU bus, for flat displays and CRT	
Video RAM	1 MB (640 X 480 Pixel, True Color / 24 bit possible)	
Interfaces	HDD (EIDE) and FDD, 1 x parallel interface (TTL) 1 x serial interface COM1 : RS422 1 x serial interface COM2 : RS232 Keyboard, mouse port (uses neither or both serial interfaces)	
Buffered SRAM	--	32 kB
ETHERNET	Controller and connection plug	

- HDD 2.5"



4.3.2 PC connectors

These interfaces fulfill the 'safe disconnection from main power' requirements set out in EN 60742, EN 50178.

VGA (X1) Connector type: 15-pin Mini-Sub-D, socket (PC standard)

Pin	Signal
1	Red (analog)
2	Green (analog)
3	Blue (analog)
6,7,8	GND (RGB)
5,10	GND (Sync)
13	HSYNC (TTL)
14	VSYNC (TTL)

COM1 (X9) **Keyboard connection**
Connector type: 9-pin SUB-D, pin

Pin	Signal RS422	
1	Bridge -> Pin 2	
2	Bridge -> Pin 1	
3	RxD-	
4	TxD-	
5	GND	
6	Bridge -> Pin 7	
7	Bridge -> Pin 6	
8	RxD +	
9	TxD +	

Parallel Port (X3)	connector type:	25-pin Sub-D, socket (PC standard)
Keyboard (X4)	connector type:	6-pin Mini DIN (PS/2 compatible)
Mouse (X5)	connector type:	6-pin Mini DIN (PS/2 compatible)
Ethernet (X6) (X7)	connector type:	AUI (10BASE5, ThickWire) RJ45 (10BASE-T, TwistedPair)
Floppy (X8)	connector type:	25 pol Sub-D, pins Only suitable for connecting an appropriate external disk drive unit. Cable length limitation ($\leq 0.75\text{m}$)

COM2 (X2)**Periphery interface**

Connector type: 9-pin SUB-D, pins (PC standard)

Pin	Signal RS232
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

Notes on data transfer:

As a result of a direct electrical connection with an external PC, different reference levels in the mains power supply can lead to interface faults.

Measure:

- If possible, use the service socket on the machine for the PC.
- Only connect/disconnect the connection when both machine and PC are switched off.
- Never exceed the permissible cable lengths (shorter lengths in high EMC interference environments).
- Recommendation: Use an adapter with electrical isolation.

(X10) (X11) Power supply output for ELTROMATIC and machine operating panel module

Connector type: 3-pin connector terminal

Pin	Signal	Funktion
1	GNDEXT	Supply ground
2	VEXT	Supply voltage (7.75V)
3	SCREEN	Cable screening

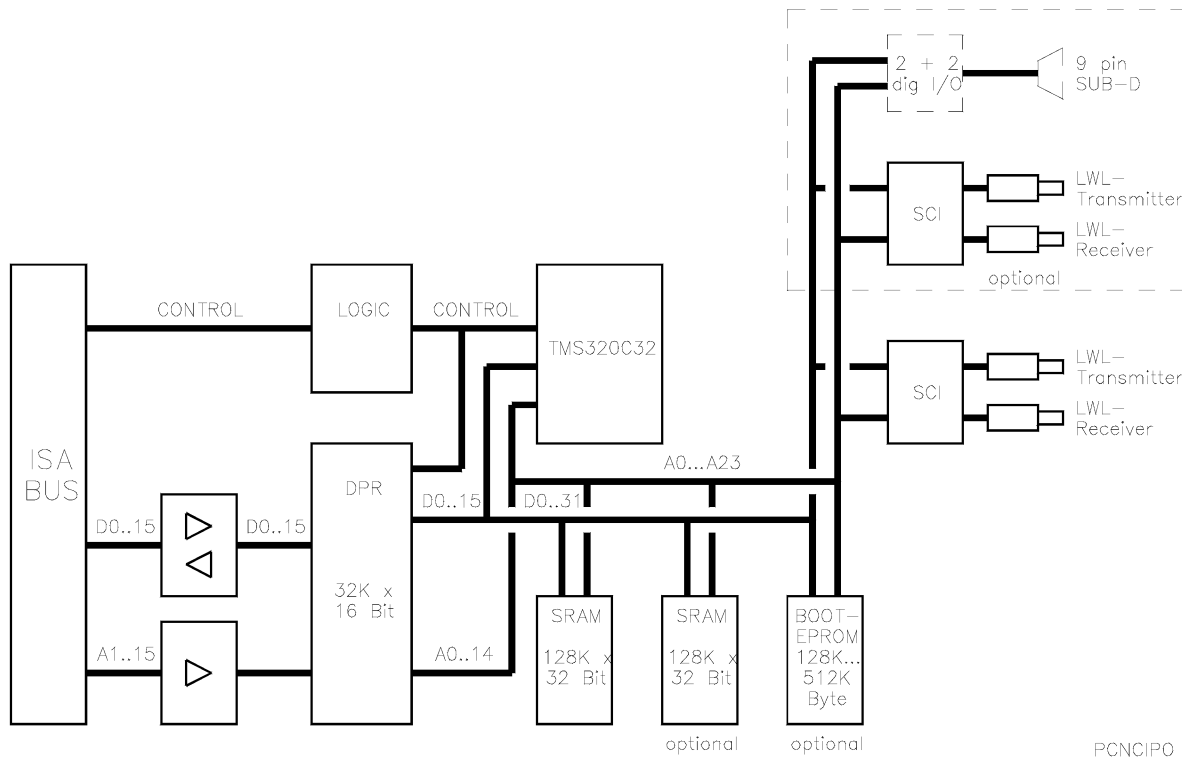
4.4 PCMOEM

PCMOEM = PC Motion Board with ELTROMATIC bus master

The PCMOEM board contains two processor systems for interpolation / position control and accepting PLCtasks as ELTROMATIC bus master.

4.4.1 Interpolation system PCMOem characteristics

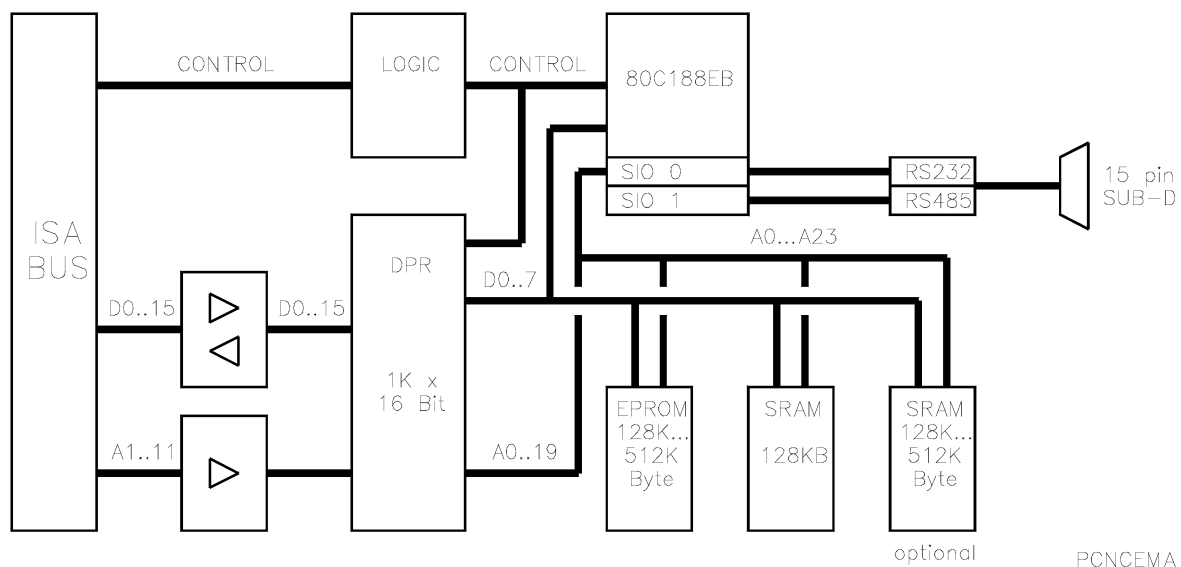
- Signal processor TMS320C32
- Serial Communication Interface SCI
- Drive control via SCI module on fiber optic rings (LWL)
- Control of max. 16 drives



Motion processor

4.4.2 ELTROMATIC bus master PCmoEM characteristics

- PLC processor
- μ P 80C188EB/16MHz
- ELTROMATIC field bus for coupling local I/O modules (EA48, EAMOC machine operating panel controller, EA-KOMBI, EA-AD16)



PLC processor, ELTROMATIC bus master

4.4.3 PCMOEM connectors

(X6) : ELTROMATIC bus connection

Signal	Pin	Function
RxD	1	RxD (RS232)
GNDV28	2	Signal ground (RS232)
DATA1+	3	DATA1+ connection / full duplex: TxD (RS485)
GNDEXT	4	Supply ground
GNDEXT	5	"
DATA2+	6	DATA2+ connection /full duplex: RxD (RS485)
GND485	7	Signal ground (RS485)
/OUTEN+	8	Output enable (RS485)
TxD	9	TxD (RS232)
DATA1-	10	DATA1- connection / half duplex: TxD and RxD (RS485)
VEXT	11	Supply voltage
VEXT	12	"
UBAT	13	External U_{bat} power feed
DATA2-	14	DATA2- connection / half duplex: n.c. (RS485)
/OUTEN-	15	Output enable (RS485)

(X1) (X2) (X3) (X4) Fiber optic cable bus LWL

LWL connector F-SMA for plastic fiber

(View from above)



Upper front panel

T :	LWL - Transmitter Ring 1
R1:	LWL - Receiver Ring 1
RS on:	RESET for Motion and PLC active
RS off:	RESET inactive
L on:	I/O signal AKT_PER causes LOW level (status after Reset)
L off:	I/O signal AKT_PER causes HIGH level
E1 on:	Transmission on LWL Ring 1 faulty
E1 off:	Transmission on LWL Ring 1 correct
E2 on:	Transmission on LWL Ring 2 faulty
E2 off:	Transmission on LWL Ring 2 correct

4.5 CNC keyboard unit

The keyboard is comprised of the following components:

- Operating panel controller OPC
- Handwheel
- Raised key keyboard with cover foil (dark gray)
- Keyboard frame

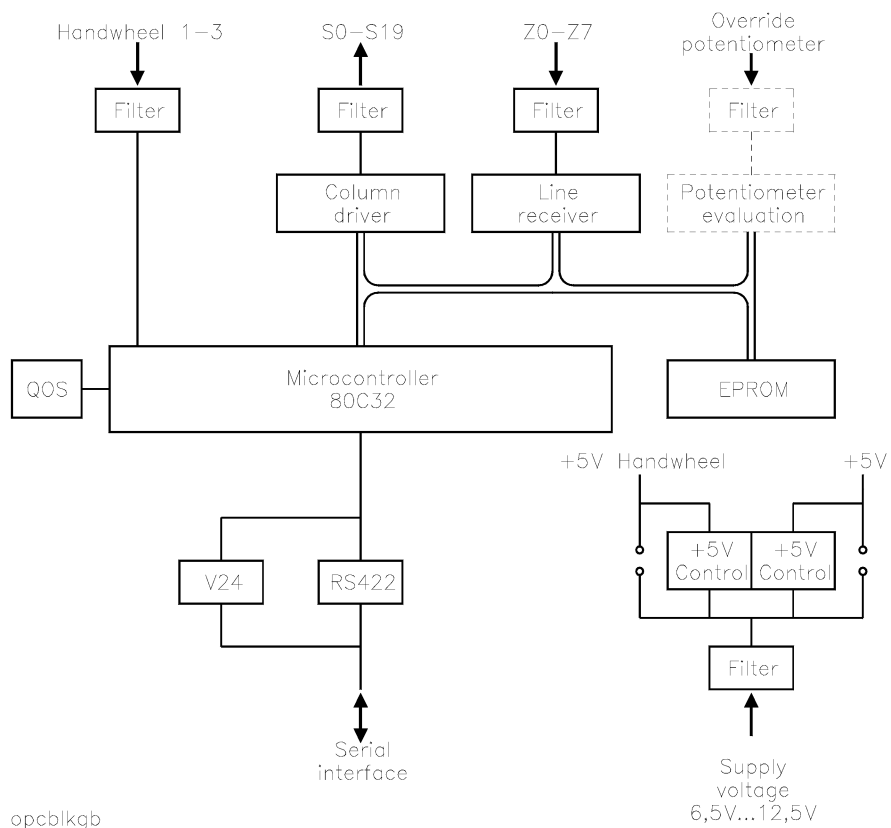
The keyboard is designed for industrial use.

A keyboard to implement Emergency Stop, Accept and PLC keys must be designed by the user.

4.5.1 Operating panel controller OPC characteristics

- Evaluation of keyboard and handwheel information
- RS422 interface to computer unit

Circuit diagram:



Supply voltage

Voltage: 6.5 V ... 12.5 V

Power consumption: Approx. 0.25 A without handwheel, each handwheel max. 80 mA

Screen connection

In order to screen the connectors, all the periphery equipment connector casings X1, X2, X3 and X6 are connected to each other via a screen grid which makes contact with the four fixation holes. A connection between this screen grid and 0 V system is not provided.

Periphery connectors

Serial interface

Connector type: 9-pin SUB-D pin, straight connector

Pin assignment: X1-
Pin 1 = GND (RS422, via 120 Ω or LC filter)
Pin 2 = RD (V24)
Pin 3 = TD (V24)
Pin 4 = RDB (RS422)
Pin 5 = GND (V24, via LC filter at 0 V)
Pin 6 = RDA (RS422)
Pin 7 = TDB (RS422)
Pin 8 = TDA (RS422)
Pin 9 = +5 V via Jumper VERS

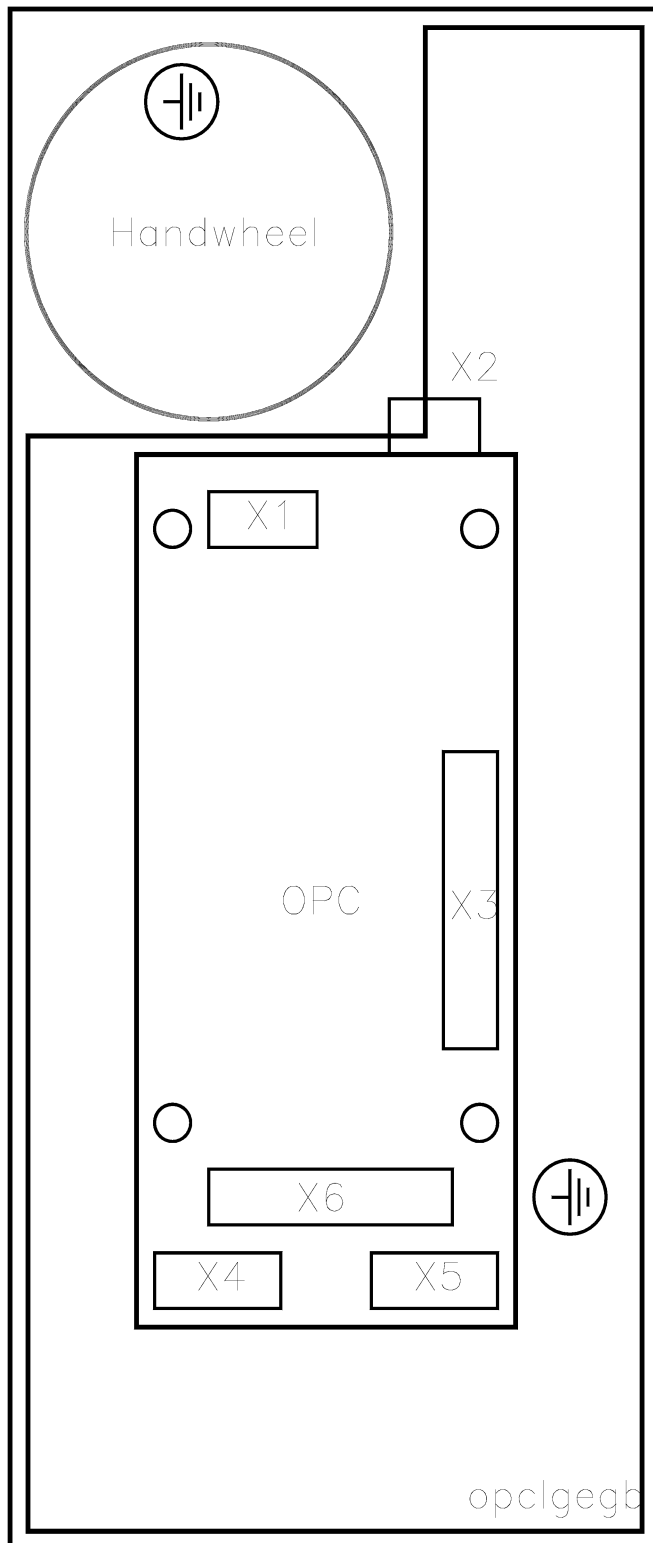
Power supply

Connector type: 3-pin connector (type: Phoenix MSTBA2,5)

Pin assignment: X2 -
Pin 1 = 0 V
Pin 2 = 6.5 V ... 12.5 V
Pin 3 = Screen

Caution: Observe polarity - note imprint on the PCB with X2!

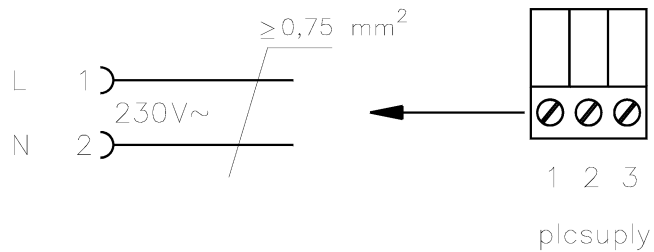
Rear view



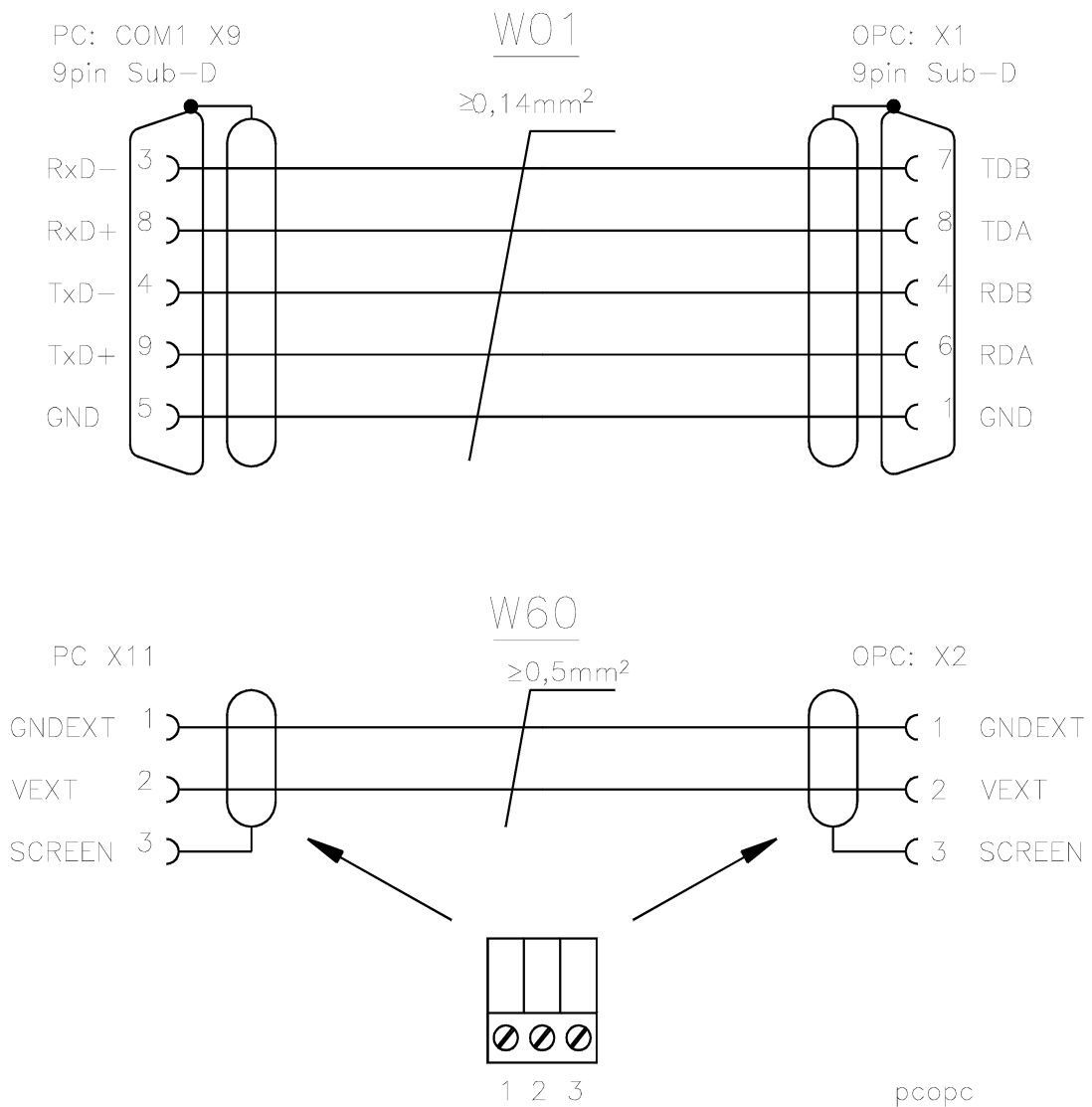
Danger to internal components!
Only connect/disconnect plugs when
the equipment is switched off.

4.6 Cable connections

4.6.1 W61: Power supply connection

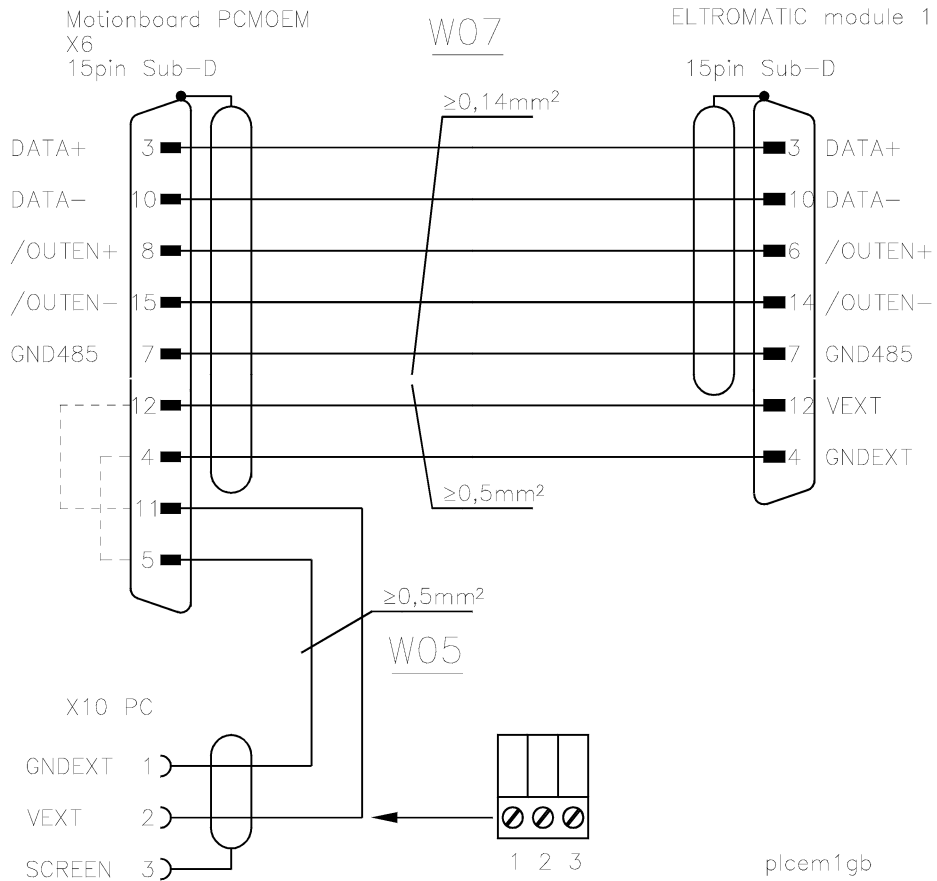


4.6.2 W01/W60: PC unit (PC) <--> keyboard controller (OPC)



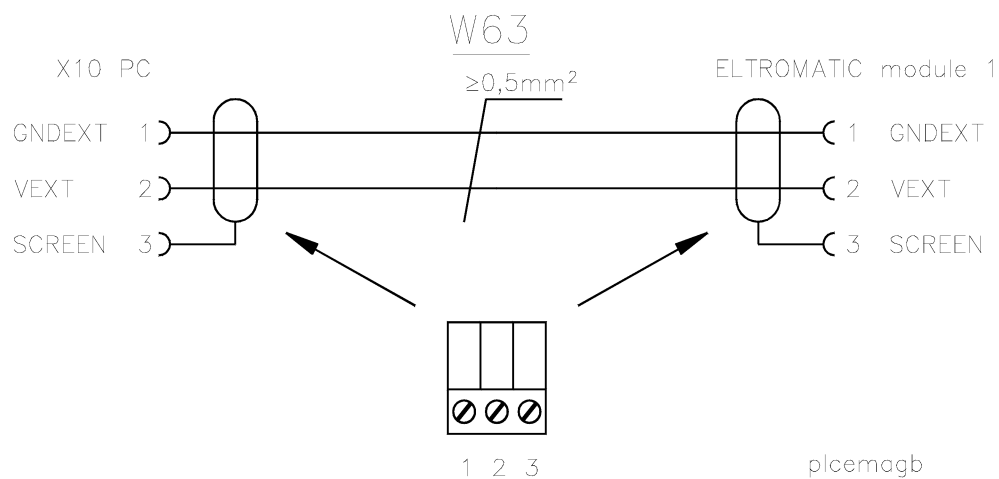
4.6.3 W07 / W05: PCMOEM X6 <--> ELTROMATIC module 1

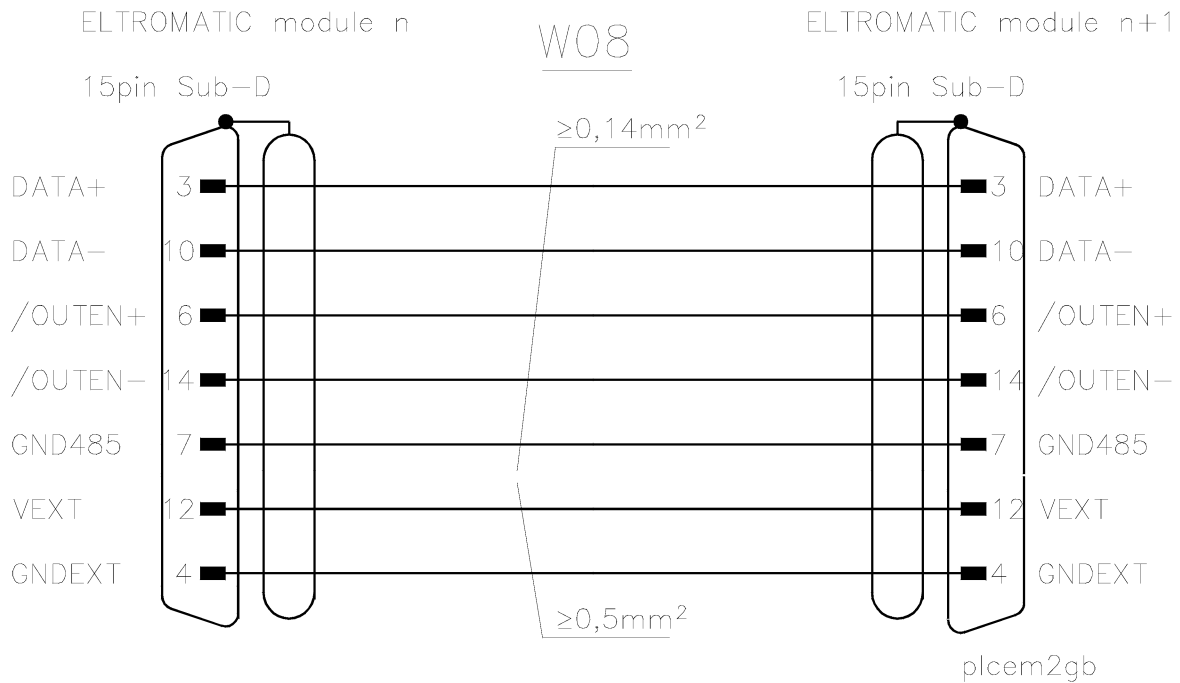
Common cable for data and power supply lines



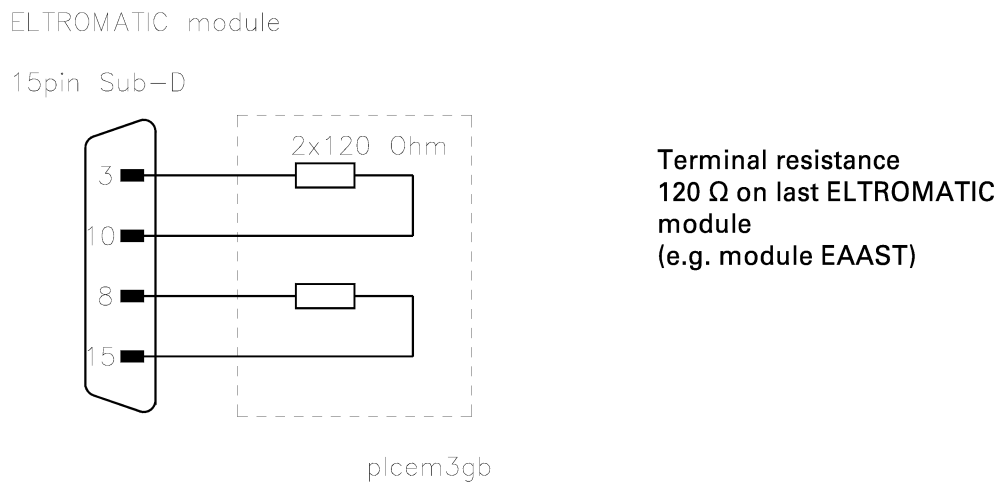
4.6.4 W07 / W63: PCMOEM X6 <--> ELTROMATIC module 1

Separate cable for data and power supply lines





4.6.6 Connection of the last ELTROMATICmodule

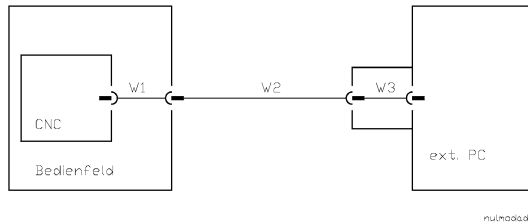


4.6.7 Null modem cable for direct cable connection PC-Direktverbindung

A null modem cable is necessary to guarantee safe data communication with an external computer system via Windows Direct Cable Connection.

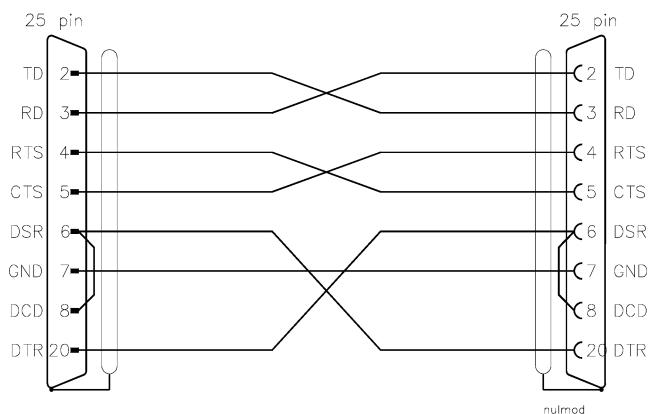
In the following it is assumed that the machine or the operating panel is equipped with a 25-pin COM connection.

An adapter is required to connect with the 9-pin COM connection on the CNC control. An adapter is also required to reach the 9-pin COM connection on the external PC processor.



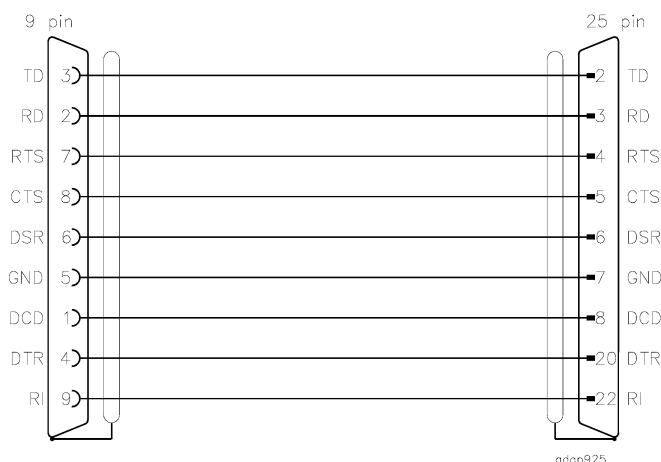
Nullmodem-Kabelplan

- W1 : Adapter of the CNC COM2 interface, 9-pin to 25-pin, without crossings
- W2 : Null modem cable 25-pin with crossings
- W3 : Adapter 25-pin to 9-pin, without crossings



Nullmodemkabel 25 polig

The following components are available from Heidenhain and can be taken from the cable overview in this **Electroconstruction Manual**:
Internal extension cable (9-pin to 25-pin).
Housing adapter (25-pin).
External null modem cable (25-pin).



Adapter 9 polig auf 25 polig

For correct functioning of the data transfer, you must ensure that that entire connection distance between CNC and external processor corresponds to the null modem specification.

5 ELTROMATIC System

5.1 System overview

5.1.1 ELTROMATIC bus

Function: Serial RS485 ELTROMATIC interface, half duplex without bus termination for data exchange between the ELTROMATIC bus master and a decentral EA module.
GND connection via LC filter

Transmission rate: 500 kbit/s, determined by the software

5.1.2 Addressing the EA modules

The I/O modules installed on the ELTROMATIC field bus must have individual addresses. Each EA module is equipped with a hex-rotary switch for this purpose. Position 1 = Module address 1 etc.

5.1.3 ELTROMATIC power supply

Together with the power feed from the PLC is the power supply (+6.5..+8.5 V) which is regulated to +5 V on the EA module. The 15-pin Sub-D connector permits a maximum current of 5 A. With a current <5 A, ELTROMATIC modules can be connected via the ELTROMATIC bus connector. If a current >5 A is required (larger numbers of I/O modules), the power supply must be external and configured star-shaped.

Since voltage drops can be expected at the connectors and via the cable, a voltage supply of $\geq +6.5$ V must be provided at the last module to ensure problem-free operation.

The data and control lines must be fed via the 15-pin Sub-D connector and serially looped through all the ELTROMATIC modules.

5.1.3.1 Supply voltage

Voltage: +6.5 V to +8.5 V

5.1.3.2 ELTROMATIC power supply

A 3-pin connector terminal serves for feeding the power supply (only with star-shaped supply).

On different ELTROMATIC modules this connector terminal is marked like the following:

EA48 : X11
EAAD16 : X11
EA-KOMBI : X14

Pin	Name	Function
1	GNDEXT	Power supply ground
2	VEXT	Voltage supply feed
3	SCREEN	Cable screening

5.1.4 ELTROMATIC bus connection on the I/O modules

Connector type: 15-pin Sub-D connector with straight connection

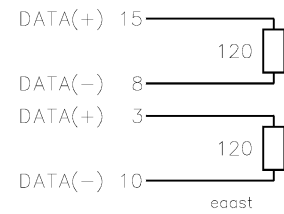
Pin assignment: XE1, XE3 / X12, X13

XE1, XE3 / x12, x13

Signal	Pin	Function
SCR	1	PE/Screen grid connection
GNDEXT	4	Power supply ground (VGND)
GNDEXT	5	"
VEXT	11	Voltage supply feed +6.5V..+8.5V
VEXT	12	"
DATA1+	3	RS485 DATA1+ connection / half duplex: TxD and RxD
DATA1-	10	RS485 DATA1- connection /half duplex: TxD and RxD
DATA2+	15	Strip conductor connection between XE1 and XE3
DATA2-	8	Strip conductor connection between XE1 and XE3
/OUTEN+	6	Strip conductor connection between XE1 and XE3
/OUTEN-	14	Strip conductor connection between XE1 and XE3
GND485	7	Signal ground

5.1.5 Bus terminal connector

In order to comply with the RS485 standards, the data lines (DATA(+),(-)) on the last ELTROMATIC module must have a terminal resistance of (120 Ω) (e.g. by means of the terminal connector EAAST).



5.2 EA 48

5.2.1 Module description

- Local ELTROMATIC I/O module
- ELTROMATIC field bus connection to the PLC (PCMOEM)

Inputs

- 32 digital inputs, addressable in 4 groups of 8 bits, electrically isolated.
- 20 mA input current at 24 V= $\pm 15\%$
- De-bouncing under software control
- 1 status LED per input
- Connector strip terminal can be coded

Outputs

- 16 transistor outputs, divided into 8 blocks of 2 outputs
Digital outputs are not electrically isolated by diode connections in 0 V range
- 1.5 A / 24 V= continuous load per output, simultaneity factor 50%
- 2.2 A / 24 V= summation current per transistor pair, simultaneity factor 100%
- 1 status LED per output
- Short circuit and overtemperature protection, request transistor status
- All outputs disconnected from power supply following RESET or fault
- Suppression elements must be applied to the load
- Connector strip terminal can be coded

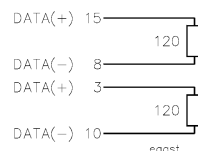
Electronic section

- 80C32 - 16 MHz, 32 KByte EPROM (27C256 or 27C512) and 32 KByte SRAM
- RS485 serial interface (half/full duplex operation)
- Power supply via voltage regulator with on-board voltage monitoring
- Adjustable module addresses via HEX-switch

ELTROMATIC interface

- The ELTROMATIC bus interface and power supply are connected via X12.
X13 serves to couple (loop on) further EA modules.

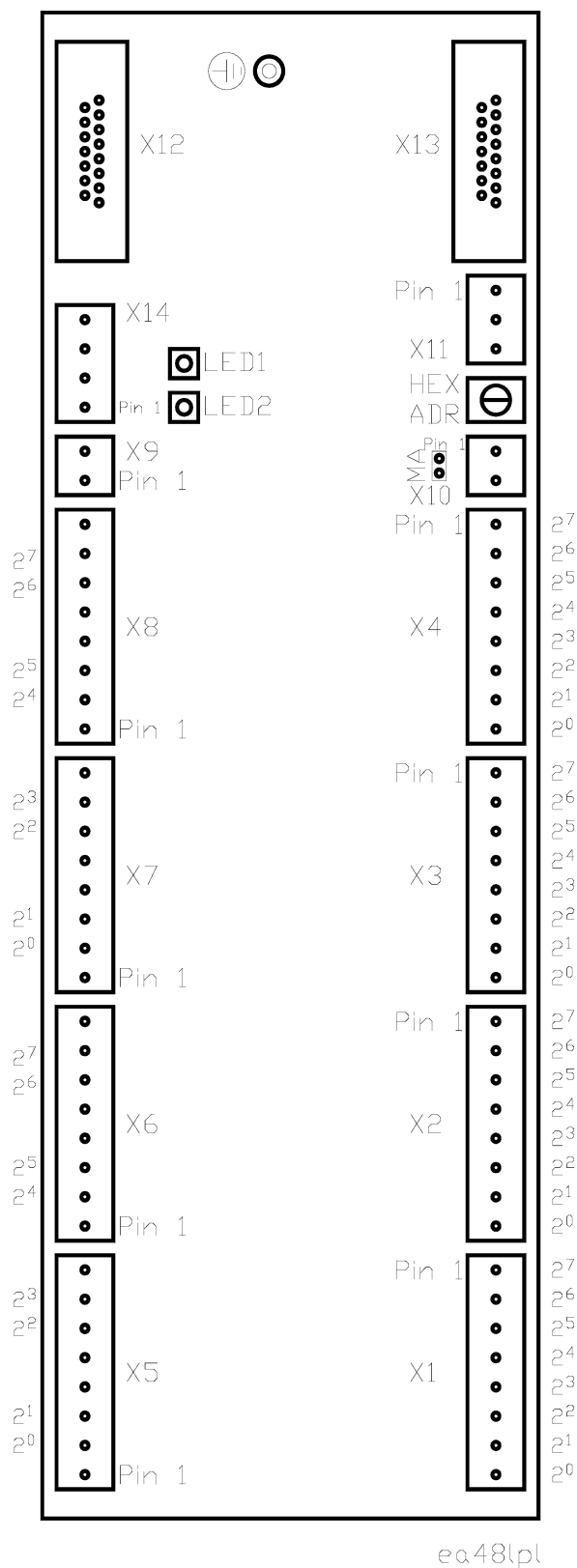
In order to comply with the RS485 standards, the data lines (DATA(+),(-)) on the last ELTROMATIC module must have a terminal resistance of (120 Ω) (e.g. by means of the terminal connector EAAST).



Current consumption

$$I = 200\text{mA}$$

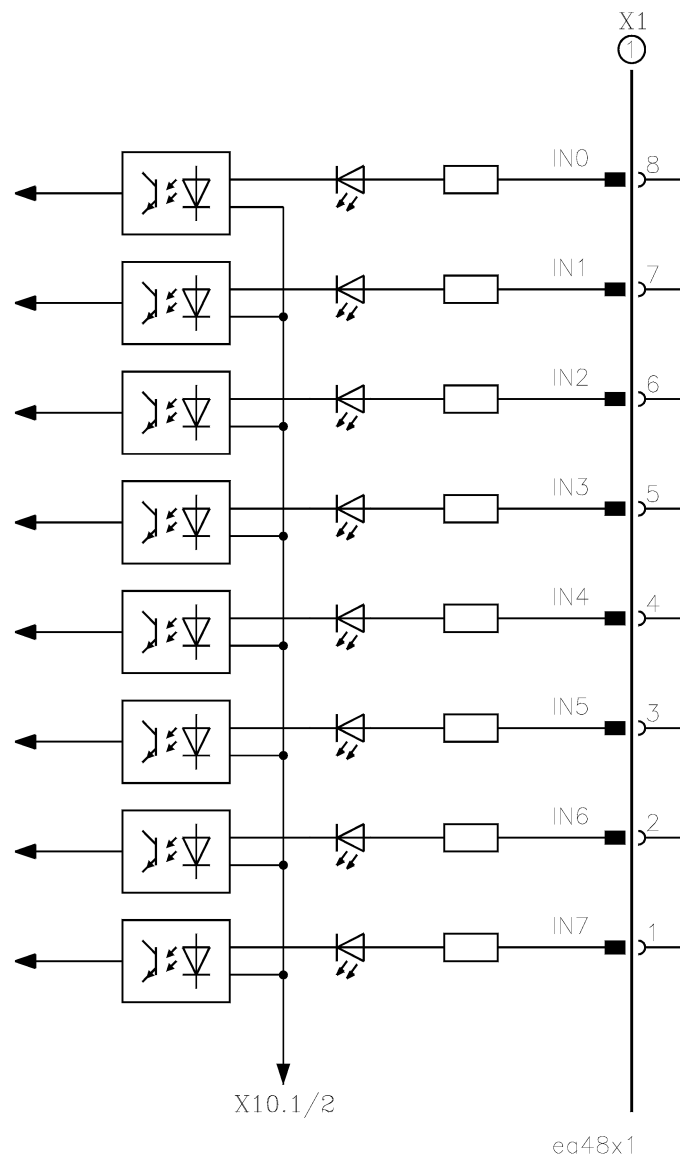
5.2.2 General plan EA48



5.2.3 Digital inputs

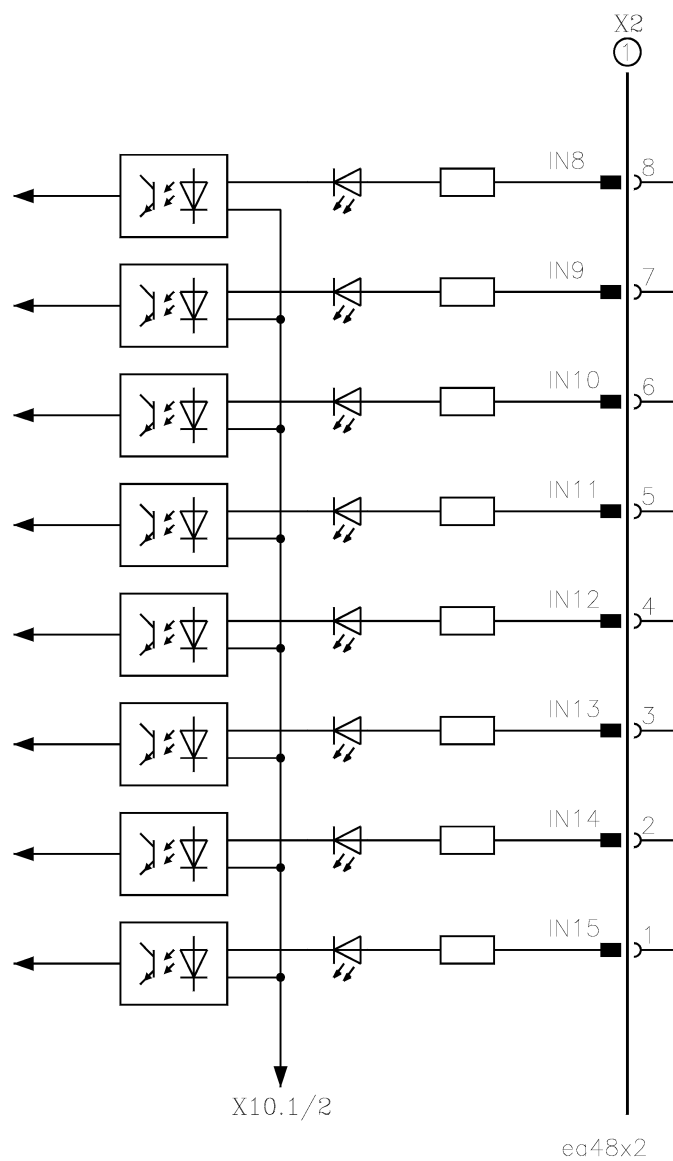
The connectors X1 - X4 provide the digital inputs with 20 mA input current.

5.2.3.1 EA48 X1, 8 digital inputs

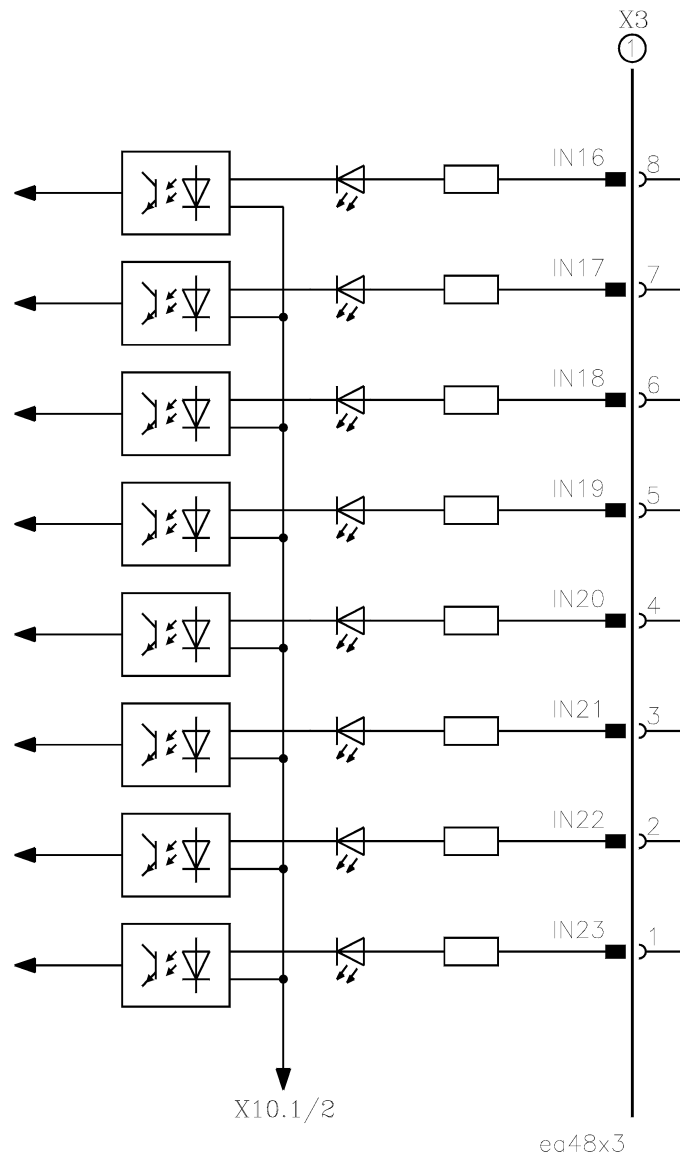


① : 8-pin connector terminal

5.2.3.2 EA48 X2, 8 digital inputs

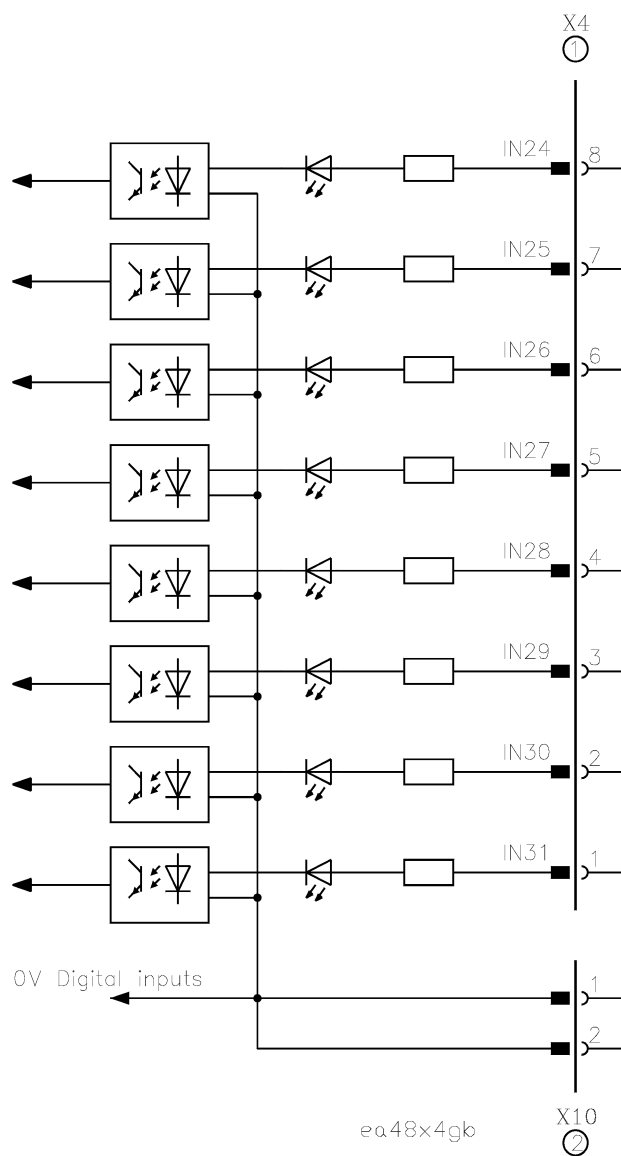


① : 8-pin connector terminal

5.2.3.3 EA48 X3, 8 digital inputs

① : 8-pin connector terminal

5.2.3.4 EA48 X4, X10, 8 digital inputs



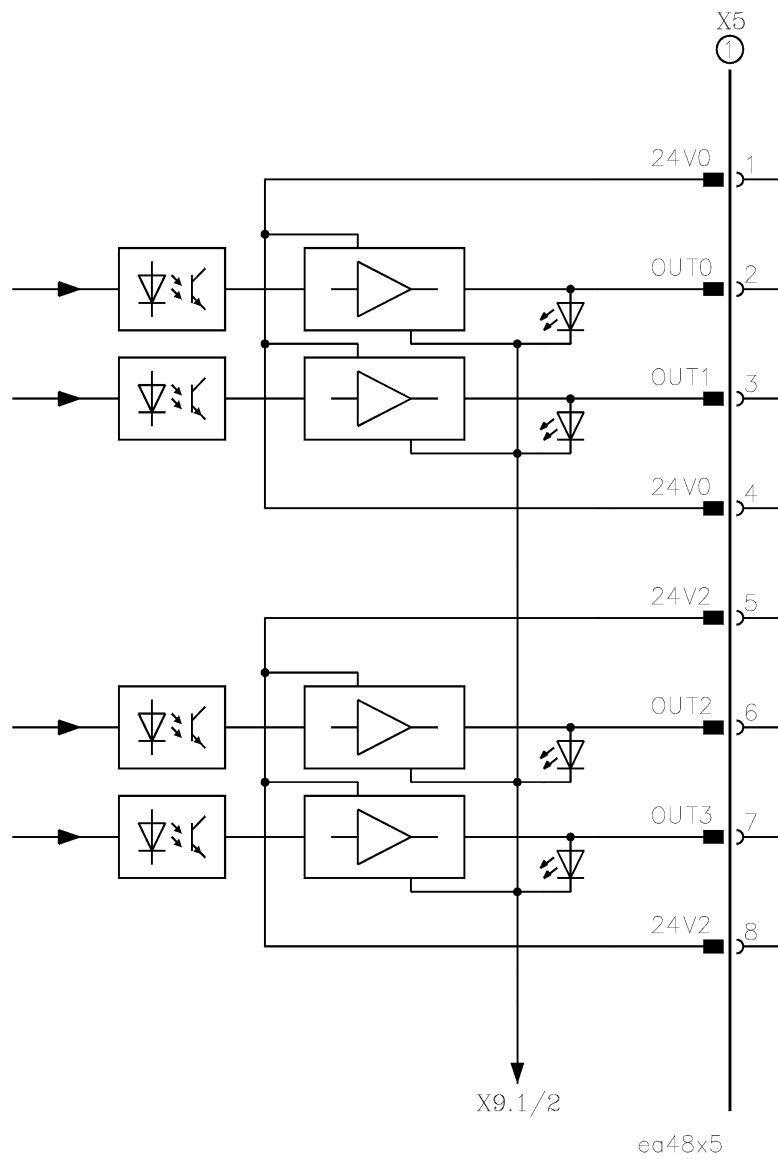
① : 8-pin connector terminal

② : 2-pin connector terminal

5.2.4 Digital outputs

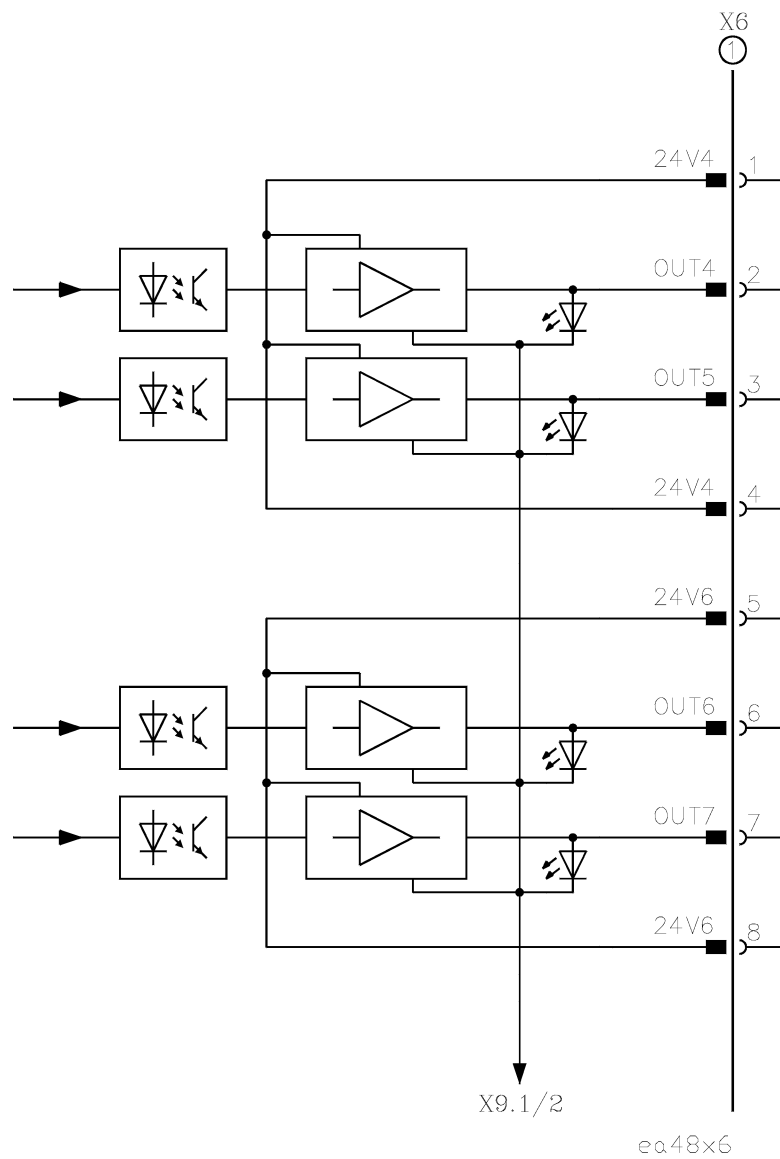
The connectors X5...X8 provide the transistor outputs and their 24 V power supply.

5.2.4.1 EA48 X5, 4 digital outputs



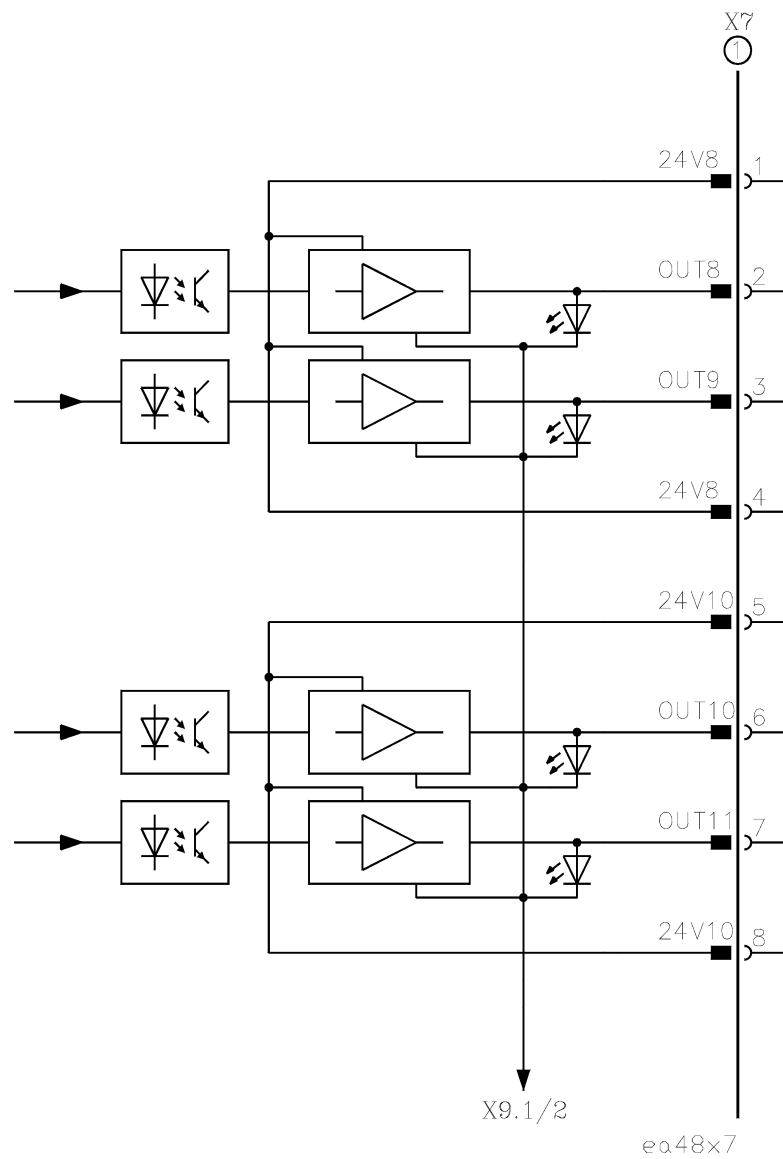
① : 8-pin connector terminal

5.2.4.2 EA48 X6, 4 digital outputs



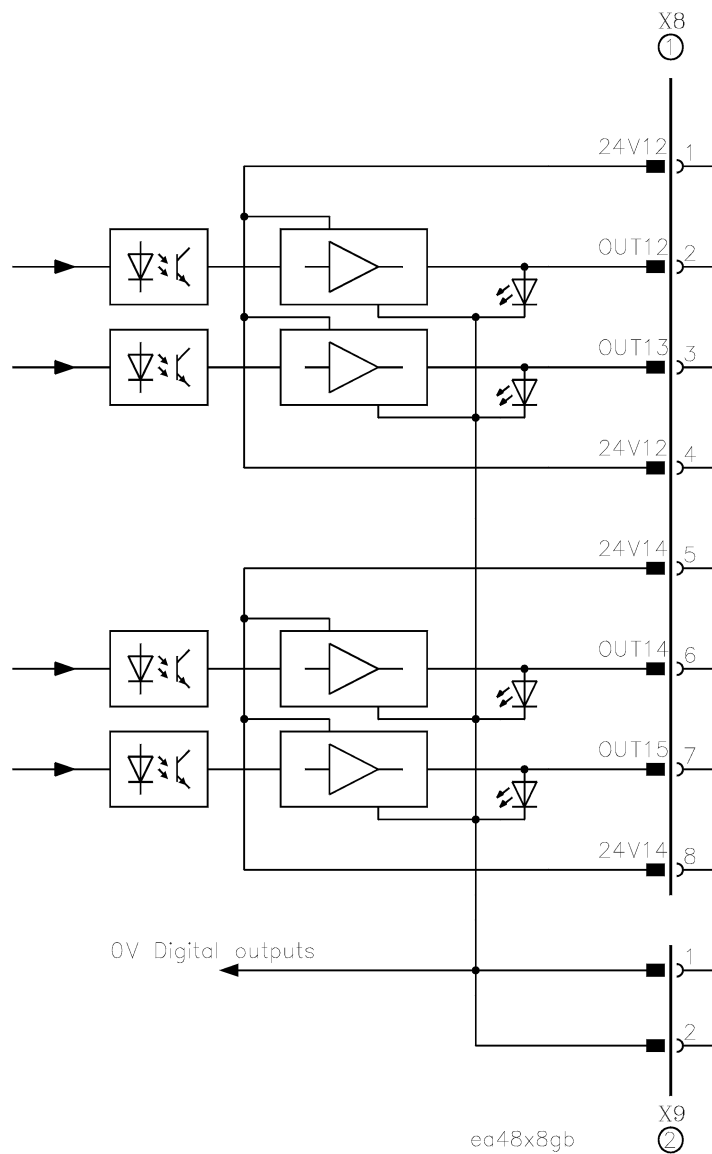
① : 8-pin connector terminal

5.2.4.3 EA48 X7, 4 digital outputs



① : 8-pin connector terminal

5.2.4.4 EA48 X8, X9, 4 digital output



① : 8-pin connector terminal

② : 2-pin connector terminal

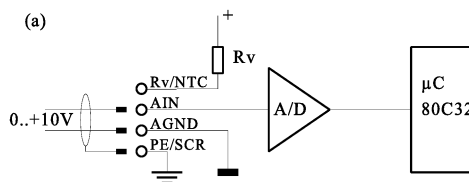
5.3 EA-AD16

5.3.1 Module description

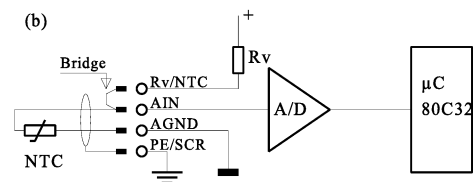
- Local ELTROMATIC I/O module with 16 analog inputs
- ELTROMATIC field bus coupling to the PLC (PCMOEM)

Analog inputs

- 16 single-ended analog inputs
 - (a) 0...+10 V, 15 bit resolution, alternatively
 - (b) Temperature sensor NTC is connectable (configure using PLC software)
- A/D converter: ADS7807; 1 LSB : 305 μ V
- Analog MUX: MAX306 / 16:1 single-ended
- PE screening connection for each analog input
- Connector terminal can be coded with screw connection
- Analog inputs are not electrically isolated



Analog input voltage



Connection of temperature sensor (NTC)

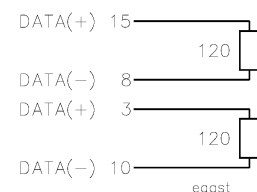
Electronic section

- 80C32 - 16 MHz, 32 KByte EPROM (27C256 or 27C512) and 32 KByte SRAM
- RS485 serial interface (half/full duplex operation)
- Power supply via voltage regulator with on board voltage monitoring
- Adjustable module address einstellbar via HEX switch

ELTROMATIC interface

- The ELTROMATIC bus interface and power supply are connected via X12. X13 serves to couple (loop on) further EA modules.

In order to comply with the RS485 standards, the data lines (DATA(+),(-)) on the last ELTROMATIC module must have a terminal resistance of (120 Ω) (e.g. by means of the terminal connector EAAST).

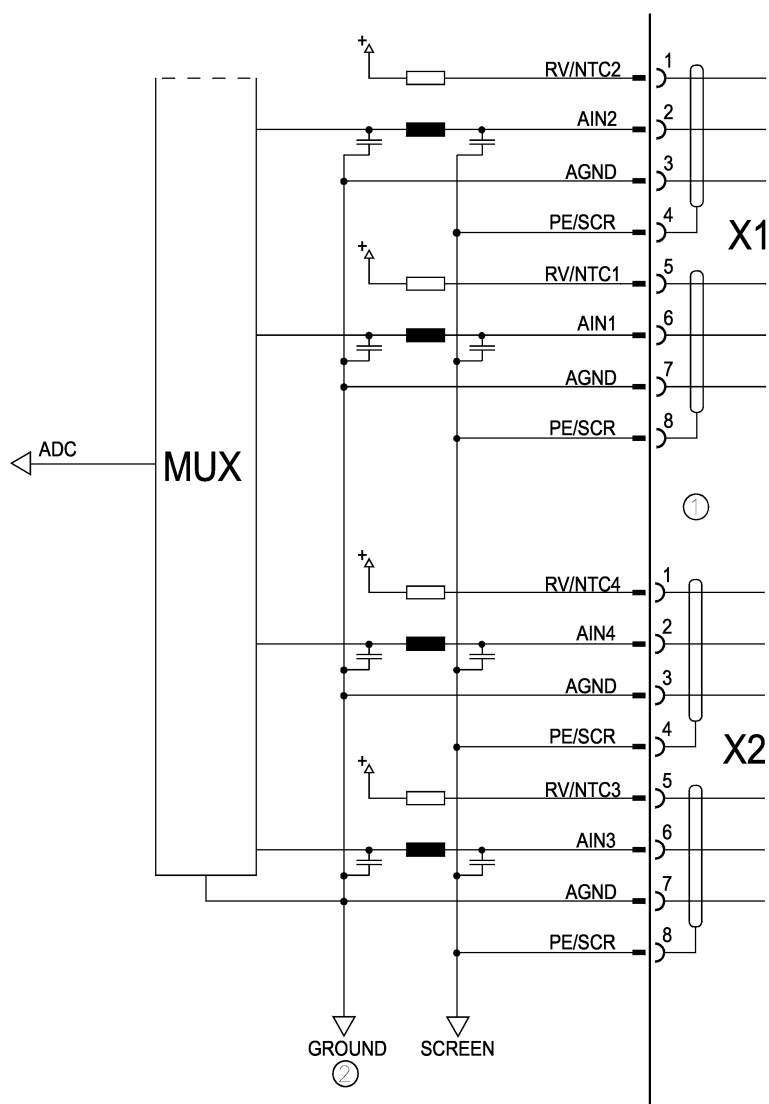


Current consumption

$$I = 200\text{mA}$$

5.3.3 Analog inputs

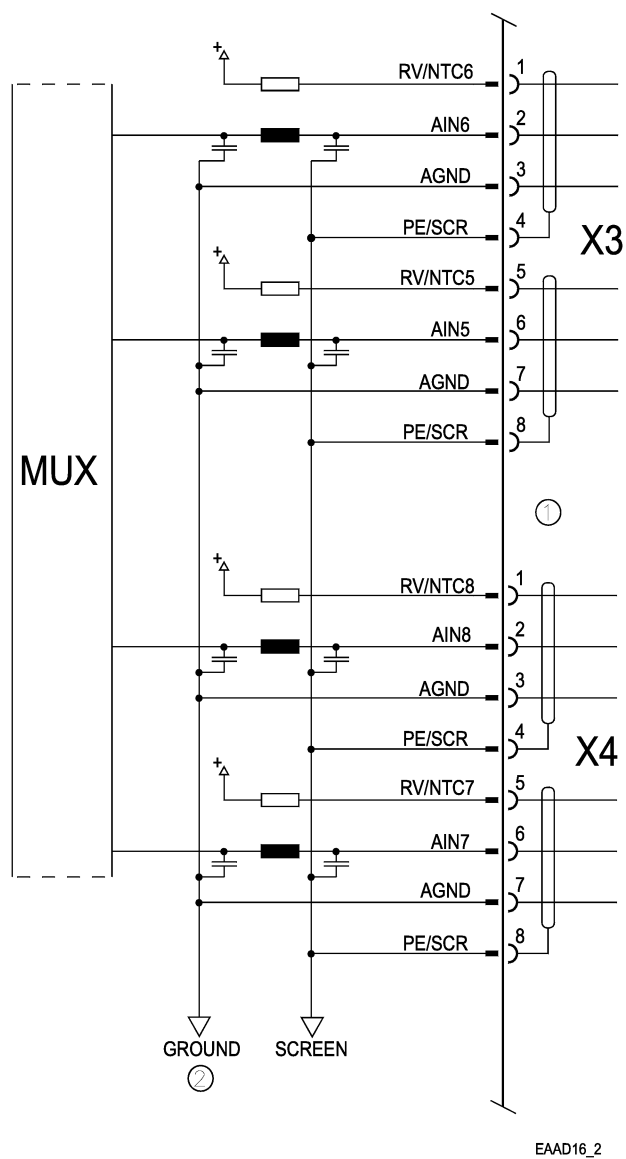
5.3.3.1 EA - AD16 X1, X2, 4 analog/NTC inputs



EAAD16_1

- ① : 8-pin connector terminal
 ② : Neutral point

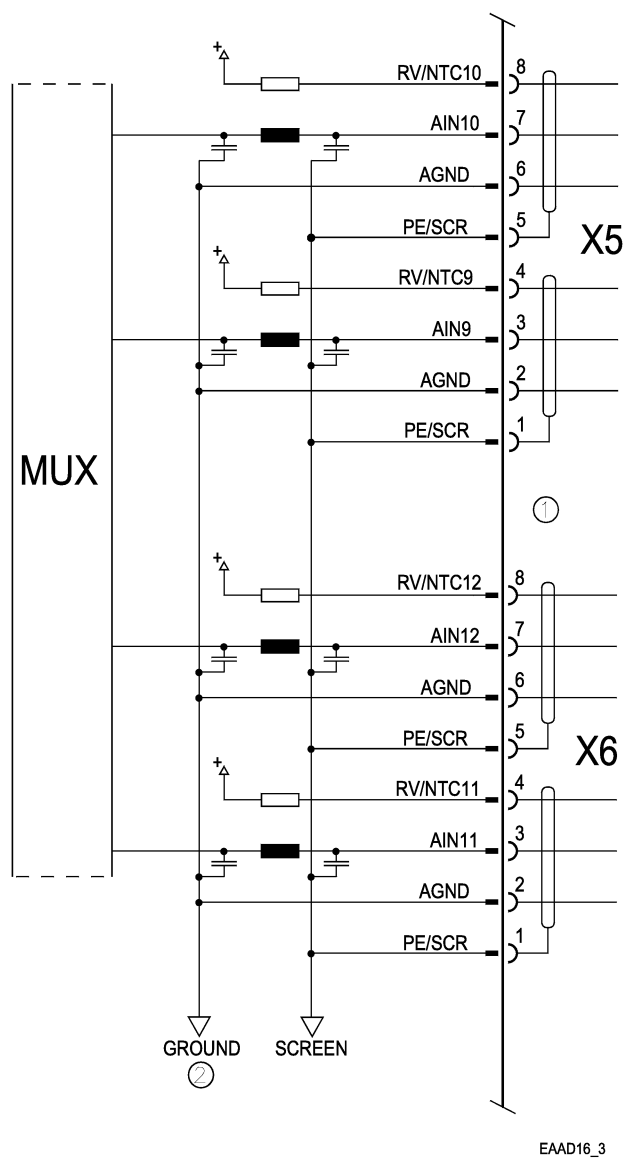
5.3.3.2 EA - AD16 X3, X4, 4 analog/NTC inputs



① : 8-pin connector terminal

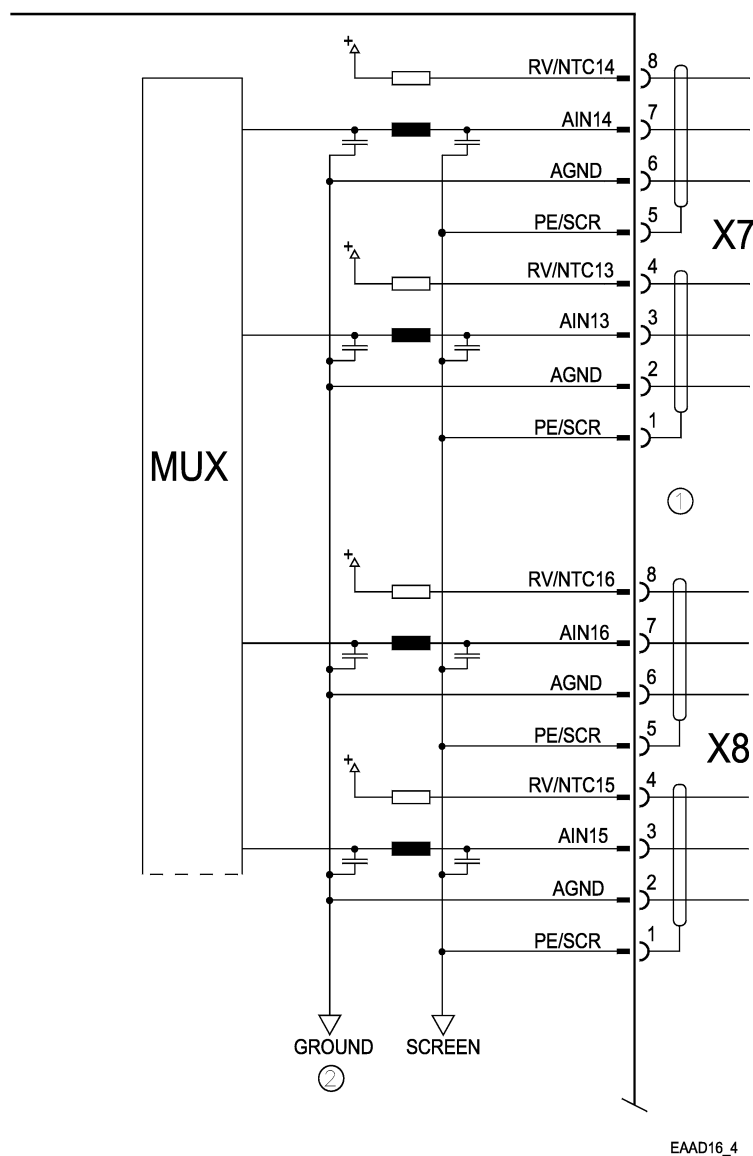
② : Neutral point

5.3.3.3 EA - AD16 X5, X6, 4 analog/NTC inputs



- ① : 8-pin connector terminal
 ② : Neutral point

5.3.3.4 EA - AD16 X7, X8, 4 analog/NTC inputs



- ① : 8-pin connector terminal
 ② : Neutral point

5.3.4 PE / Screening connection

A screen grid is provided on the EA-AD16, near the I/O connector, for EMC reasons. The screen grid can be connected to PE via two 2-pin connector terminals.

X9

Signal	Pin	Function
PE/SCR	1	PE/Screen grid connection
PE/SCR	2	PE/Screen grid connection

X10

Signal	Pin	Function
PE/SCR	1	PE/Screen grid connection
PE/SCR	2	PE/Screen grid connection

5.3.5 Indicator and switching elements

The EA-AD16 module is provided with two freely programmable LEDs. The EA-AD16 module address (1H..0FH) can be set by means of the HEX rotary switch. When the jumper MA is plugged, the module address (10H..1FH) can be extended. Module address 0H activates the Stand-Alone Diagnostics Mode.

5.3.6 External power supply

Refer to the explanations regarding the EA module EA48.

5.4 EA-KOMBI

5.4.1 Module description

- Local ELTROMATIC module for PLC attitude regulation test circuit
- ELTROMATIC field bus coupling to the PLC (PCMOEM)

Analog inputs

- 4 analog inputs (4 x MUX), not electrically isolated
- 10 bit resolution 0...10 V
- 1 LSB: 9.76 mV
- Conversion time: 8.5µs
- Connector terminal codable with screw fitting

Analog output

- 2 x D/A conversion
- 12 bit resolution -10 V...+10 V
- 1 LSB : 4.88 mV
- Connector terminal codable with screw fitting

Test system input

- Input receiver: 26LS32
- Line termination: 150 Ω, 2n2 between signal pairs, warning signal without termination
- f_g test system signal: 1.6 MHz with max. Phase errors of 45°
- Transmitter and related evaluation technology cannot be buffered externally if the power supply fails.

Digital inputs

- 2x8 digital inputs, plus 2 test probe and two reference cam inputs.
- Inputs are electrically isolated
- Input voltage: +24 V= ±15%
- Input current : 20 mA
- De-bouncing: Digital inputs via Software,
Test probe and two reference cam inputs via hardware
- Input level: Test probe active +24 V;
Reference cams active +24 V or 0 V,
can be software-projected

Digital outputs

- 2x4 transistor outputs, electrically separated into 4 blocks of 2 outputs
- Outputs are not electrically isolated by the diode connections in the 0 V range
- Output current: 1.5 A/+24 V= per output, simultaneity factor 50%.
2.2 A/+24 V= summation current per transistor pair,
simultaneity factor 100%.
Short circuit and overtemperature protection
- Operating voltage : +24 V= ±15%.
- Suppression elements must be located on the load

Attitude control overview

- Input for incremental test system (e.g. ROD 426B) with transmitter monitoring
- 1 D/A converter with 12 bit resolution, -10 V...+10 V
- 8 digital inputs plus 1 reference and test probe input
- 4 transistor outputs, electrically isolated

Electronic section

- 80C188EB - 16 MHz, socket for 128 K and 512 KByte EPROM, 64 KByte SRAM.
- RS485 serial interface (half/full duplex operation)
- V28 interface for terminal connection
- Power supply via voltage regulator with on-board voltage monitoring
- Adjustable module address using HEX rotary switch

ELTROMATIC interface

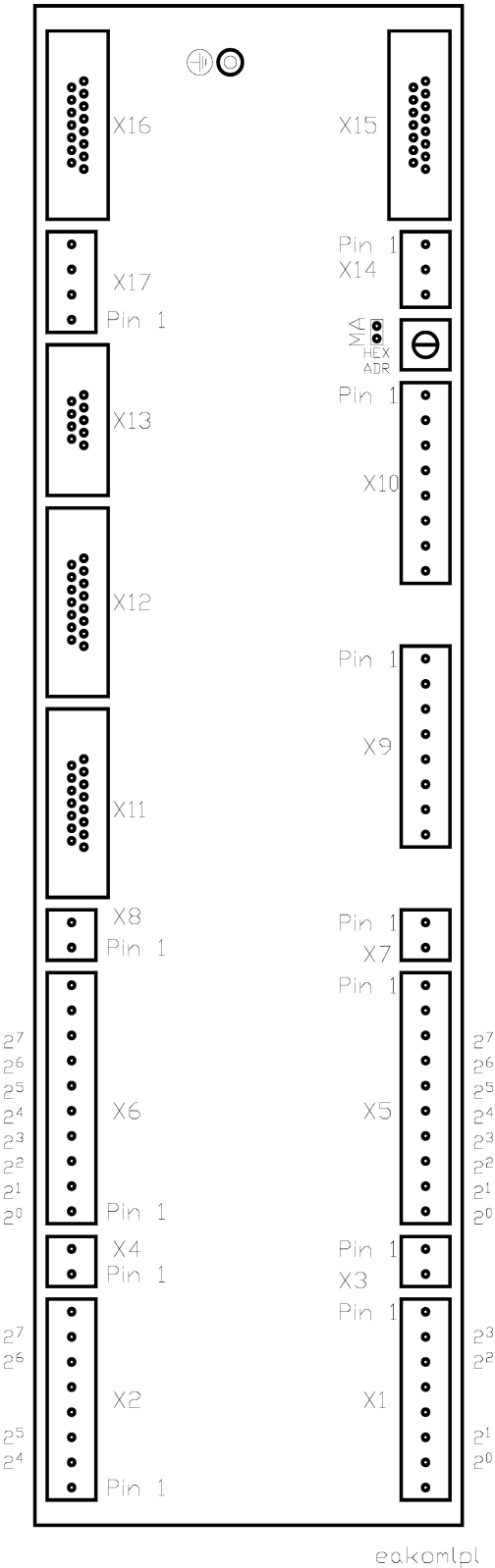
- The ELTROMATIC bus interface and power supply are connected via X15. X16 serves for coupling (looping on) further EA modules.

Current consumption

$I = 1.25A$

Current increases for 150mA for each external encoder.

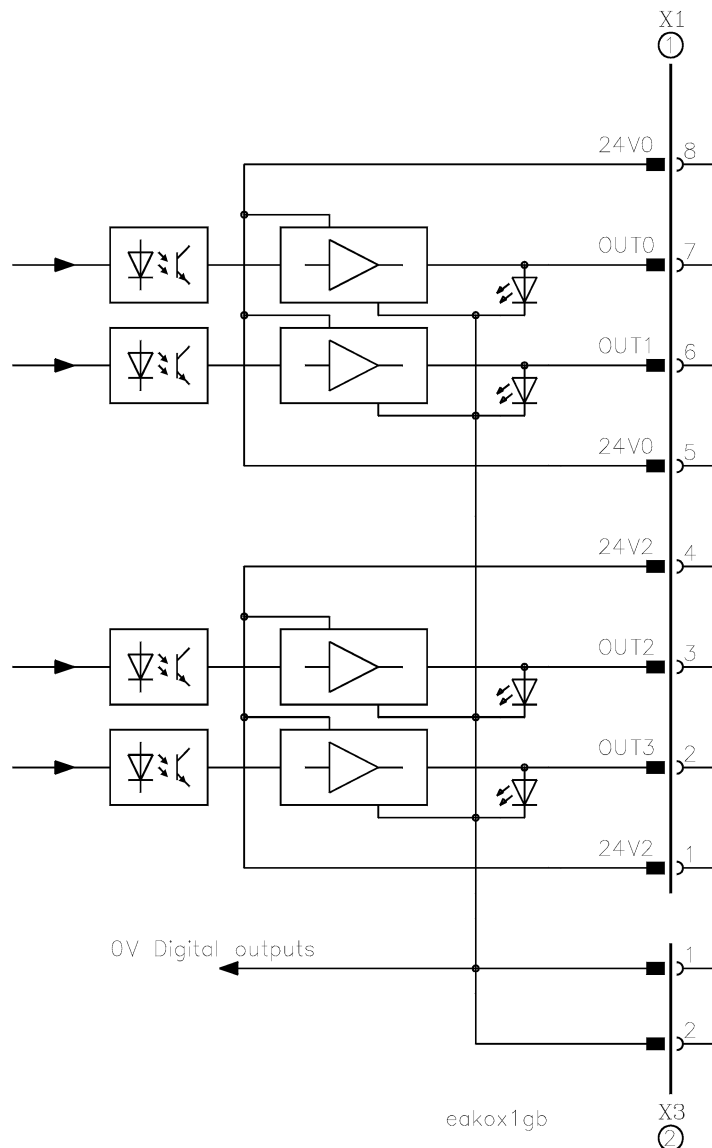
5.4.2 General plan EA-KOMBI



5.4.3 Digital outputs

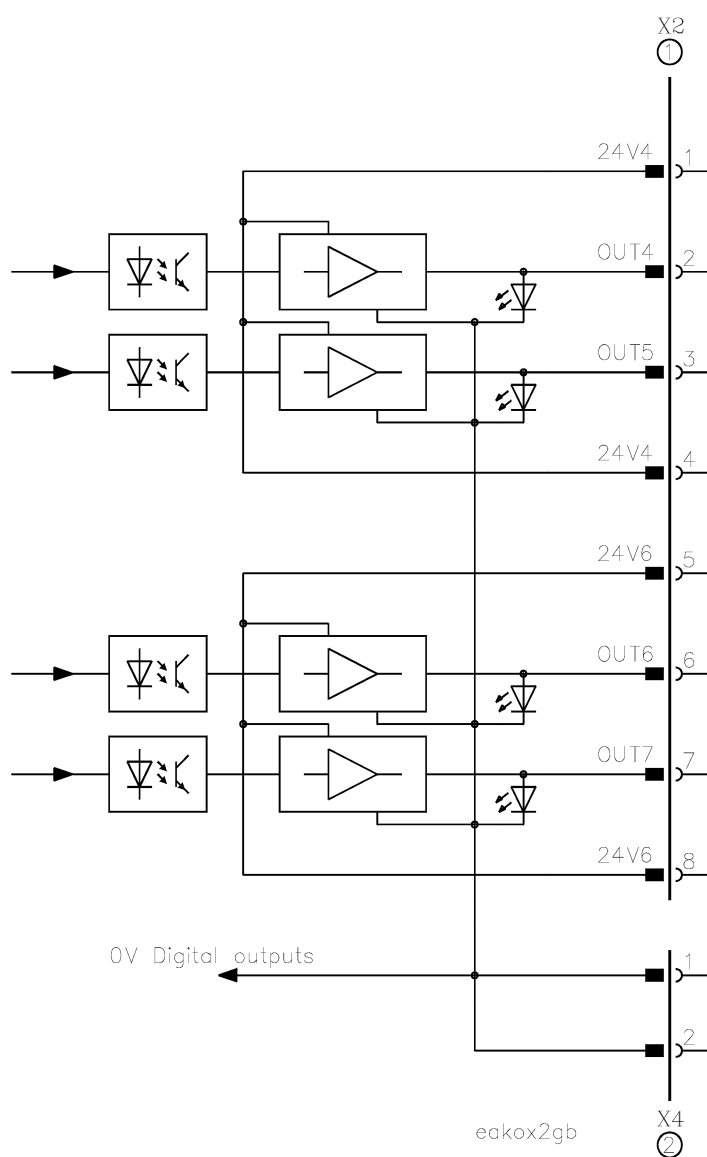
Connectors X1/2 provide the transistor outputs and their 24 V power supply.
Connector X3 serves as a 0 V connection for outputs OUT0..3 and connector X4 for outputs OUT4..7.

5.4.3.1 EA-KOMBI X1, X3, 4 digital outputs



- ① : 8-pin connector terminal
- ② : 2-pin connector terminal

5.4.3.2 EA - KOMBI X2, X4, 4 digital outputs



① : 8-pin connector terminal

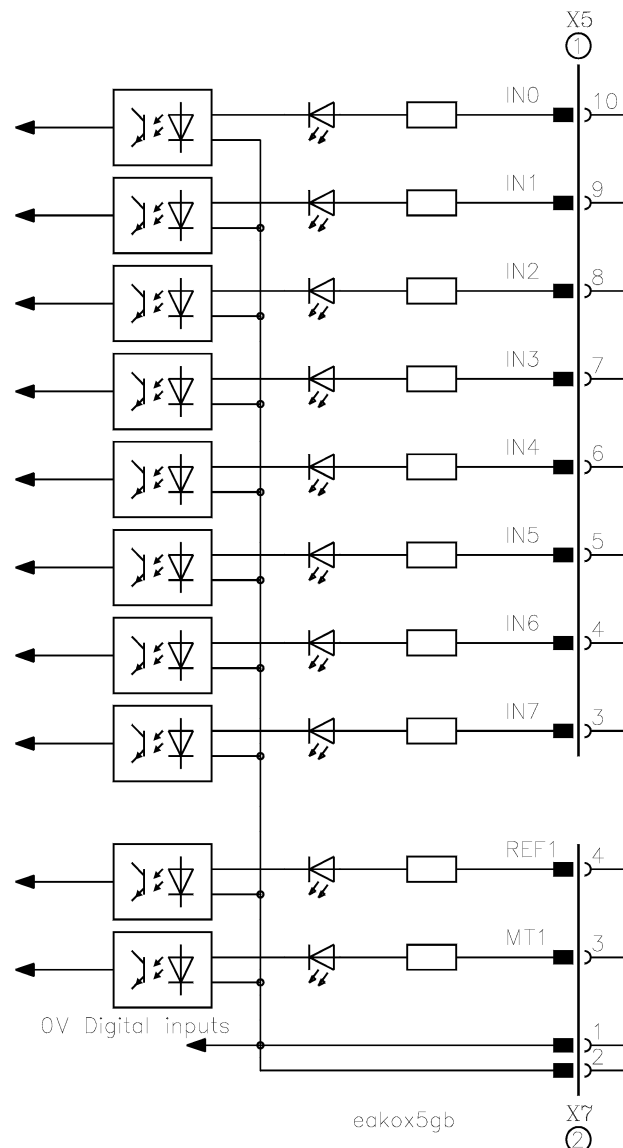
② : 2-pin connector terminal

5.4.4 Digital inputs

The 10-pin connector terminals X5 - X6 provide the digital inputs with 20 mA input current.

Connector X7 serves as a 0 V connection for inputs IN0..7, REF1 and MT, and connector X8 for inputs IN8..15, REF2 and MT2.

5.4.4.1 EA-KOMBI X5, X7, 8+2 digital inputs



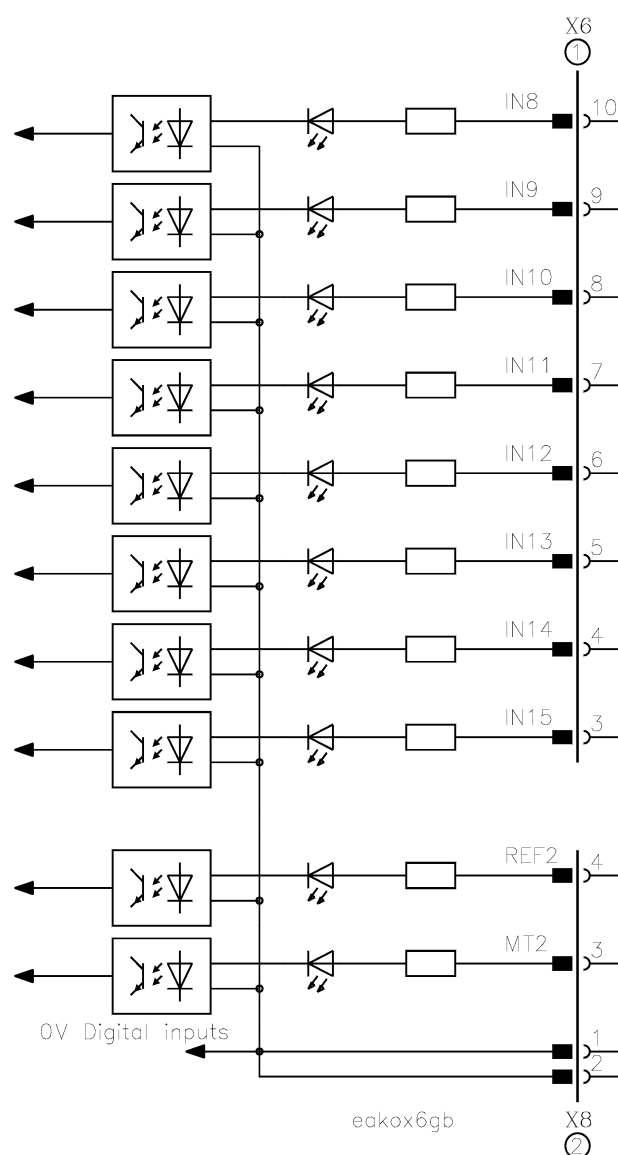
① : 8-pin connector terminal

② : 2-pin connector terminal

REF1: Reference cam input

MT1 : Test probe input

5.4.4.2 EA-KOMBI X6, X8, 8+2 digital inputs



① : 8-pin connector terminal

② : 2-pin connector terminal

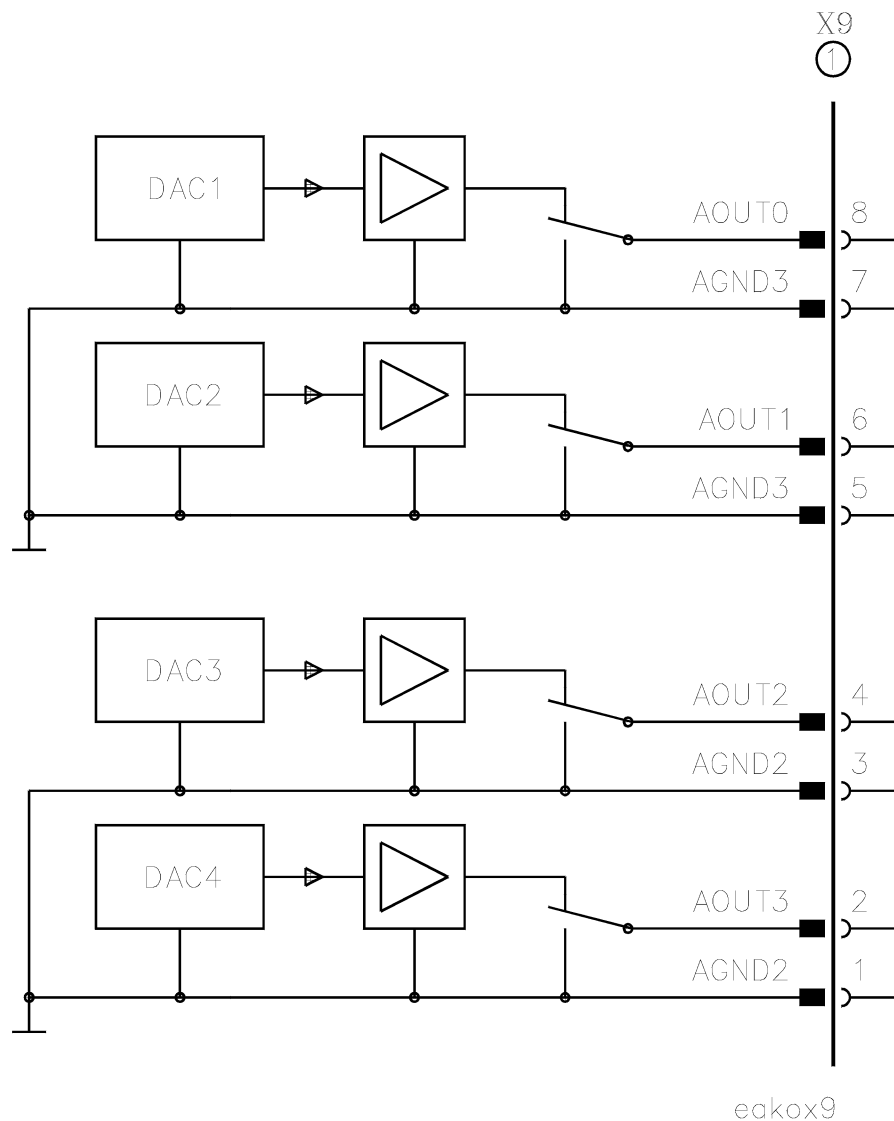
REF2: Reference cam input

MT2 : Test probe input

5.4.5 Analog outputs

The analog outputs are provided by means of the 8-pin connector terminal X9. The grounding lines for analog outputs 0..1 are potentially bound on the board as AGND3 and outputs 2..3 as AGND2.

5.4.5.1 EA-KOMBI X9, 4 analog outputs



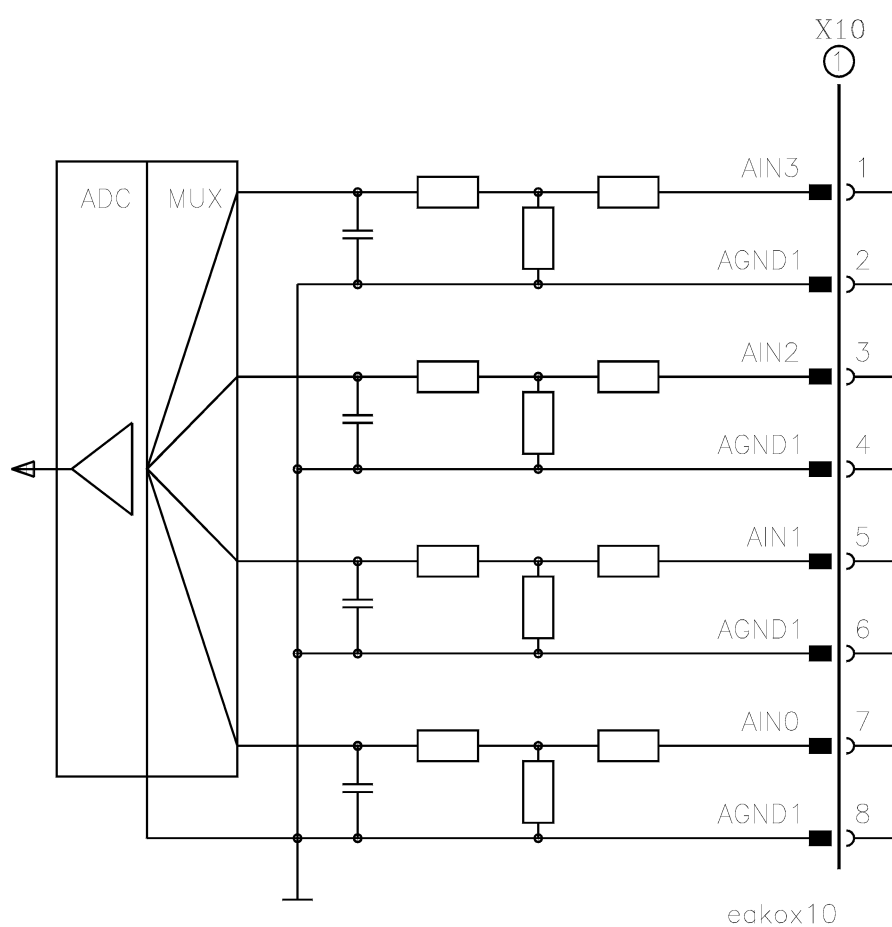
① : 8-pin connector terminal

5.4.6 Analog inputs

The analog inputs are connected to the analog converter via an 8-pin connector terminal.

The grounding lines for analog inputs 0..3 are potentially bound on the board as AGND.

5.4.6.1 EA-KOMBI X10, 4 analog inputs

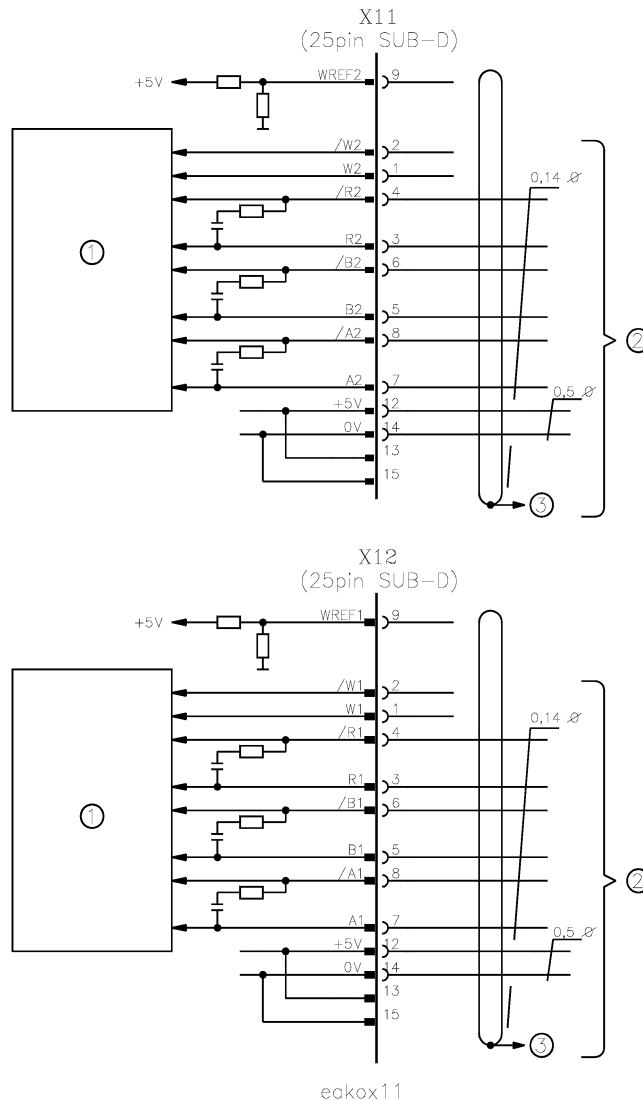


① : 8-pin connector terminal

5.4.7 Test system connection

The incremental test system (incremental transmitter) and the +5 V transmitter power supply are connected via two 15-pin Sub-D connectors (pins). X12 is assigned to transmitter 1 and X11 to transmitter 2. (Refer to Chapter 4 for pin assignment.)

5.4.7.1 EA-KOMBI X11, X12 (incremental transmitter)



Neighboring lines must be used for signal pairs.

When using transmitters which have interfering signals, an unused W or /W input must be connected to WREF.

5.4.8 RS 232 connection

The 9-pin Sub-D connector (pins) X13 provides an RS232 interface to the TxD and RxD signals.

9-pin Sub-D connector (pins) X13:

Pin	Name	Function
1	RxD	Receive signal RS232
2	TxD	Transmit signal RS232
3	GNDV28	Ground RS232

5.4.9 Power supply

Refer to EA48.

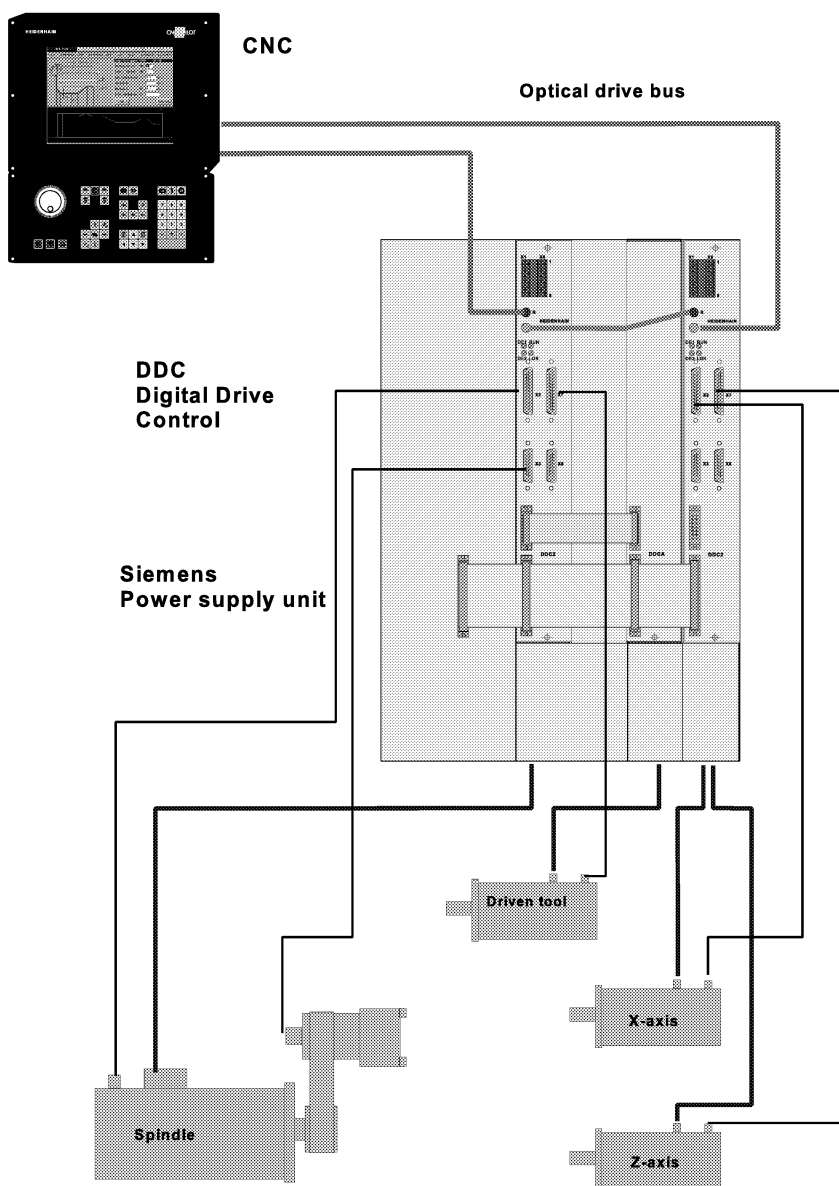
6 DDC Digital Drive Control

6.1 System overview

The **DDC** system (**D**igital **D**rive **C**ontrol) is comprised of the two-axis control **DDC2** and adapter **DDCA** and designed as a plug-in unit for the Siemens power amplifier.

The DDC2 has a fully digital, field-orientated control integrated for regulating spindle and feed drives. The digital interface to the NC is provided by an interference-protected fiber optic ring.

When using the DDC2 in a single axis power amplifier unit, the second axis can be used in a separate amplifier unit controlled via the adapter board DDCA.



DDC_OVE.wpg

6.2 Function features

DDC2: Digital, 2-axis control as plug-in unit for Siemens power amplifiers*

- Digital, field-orientated drive control for asynchronous and synchronous motors
- Control of two axes in a 2-axis power amplifier unit or via the adapter board DDCA in separate 1-axis power amplifier units
- High-Performance position-, speed- and current-control.
Cycle times: Position 0.2 - 0.4 ms
 Speed 0.1 - 0.4 ms
 Current 0.05 - 0.2 ms
- 2 Encoder inputs per drive with interface for all modern encoders:
 - Standard encoder with sinusoidal signals 1 Vpp
 - Single/Multiturn absolute encoder with synchronous or asynchronous interface
 - Gear encoder and linear scale
 - Resolution of 4 mio. Increments/revolution using a 2048 encoder
- Digital interface to NC via fiber optic ring with 2 MBaud transmission rate.
 - Desired/Actual values for position, speed, torque with 32 bit data width
 - Parameterization, initialization and diagnosis using NC screen
 - Selection of participant address via the hex-rotary switch
- System safety through integrated monitoring and additional functions:
 - Watchdog monitoring
 - Run-up block via safety relay with forced acknowledgment contacts
 - On-board temperature monitoring
 - Heat-sink monitoring
 - Determination of motor winding temperature for monitoring, parameter and overload adaptation
 - Integrated control for braking relay for 2 axes
- Digital inputs for measuring probe, reference cams and emergency stop, electrically isolated
- Status information indication via LED display
- Integrated electronics supply via Siemens equipment bus

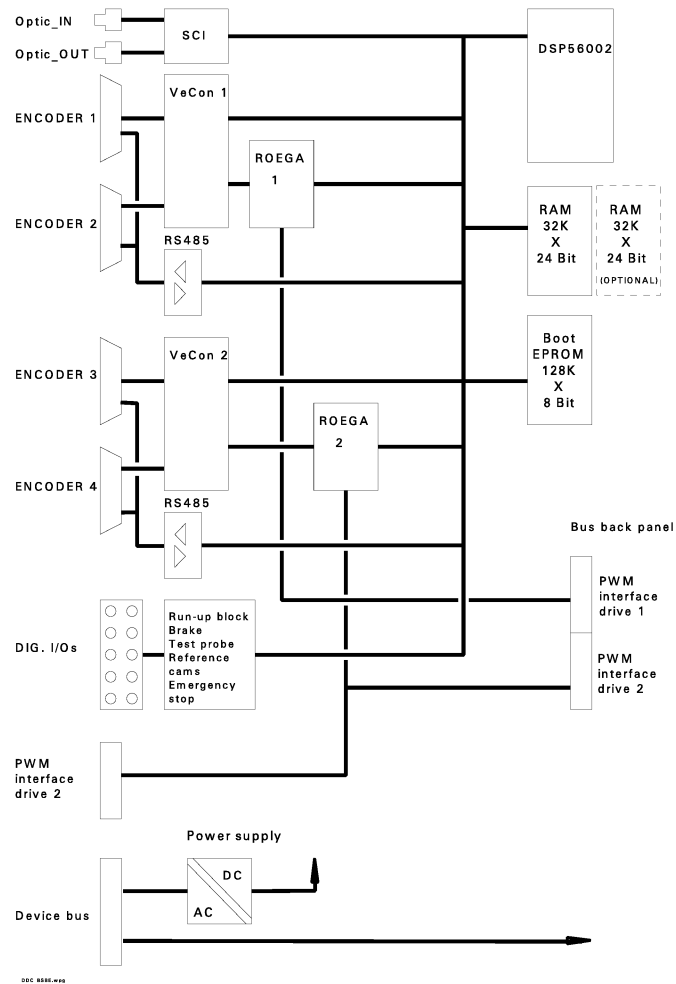
DDCA: Adapter board as plug-in unit in a 1-axis Siemens power amplifier*

- Used in combination with the DDC2 to control a second axis via the PWM interface located on the front side.

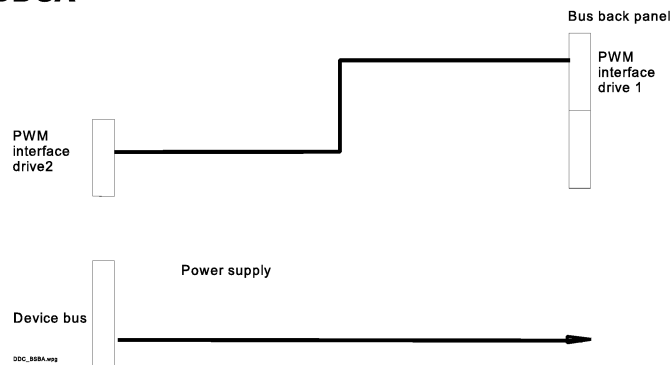
*** Planning, installation and operating instructions provided by the power amplifier manufacturer must be observed.**

6.2.1 Circuit diagrams

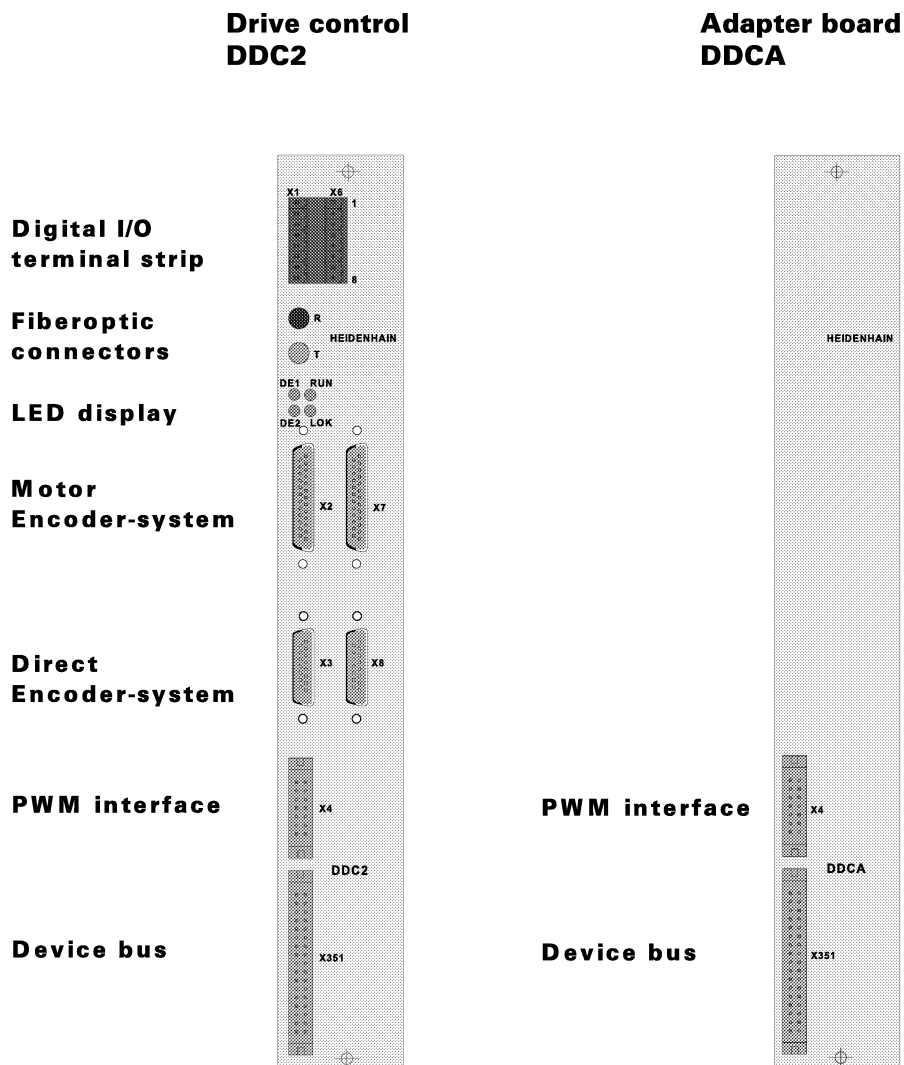
Digital drive control DDC2



Adapter DDCA



6.2.2 Front panel view



DDC_FPVE.wpg

6.3 Connector and display elements

6.3.1 Digital input/output signals

The 2x8-pin connector terminals X1, X6 provide the DCC2 digital inputs/outputs.

Connector X1

Pin	Signal name	Function
1	REF1	Reference input 1
2	REF2	Reference input 2
3	MTIN	Measuring probe input
4	MTOUT	Measuring probe input
5	BR1(+)	Switching contact to motor brake 1 (closer)
6	BR1(-)	Grounding conn. motor brake 1 (intern. conn. with X6 Pin 8)
7	SSTOP	Emergency stop input
8	+24V	Power supply for motor brake +24 V=

Connector X6

Pin	Signal name	Function
1	ASIN(+)	Input contact for run-up blocking (relay coil +24 V=)
2	ASIN(-)	Input contact for run-up blocking (relay coil ground 24 V)
3	ASOUT(+)	Acknowledgement contact for run-up blocking (opener)
4	ASOUT(-)	Acknowledgement contact for run-up blocking (opener)
5	BR2(+)	Switching contact to motor brake 2 (closer)
6	BR2(-)	Grounding conn. motor brake 2 (intern. conn. with X6 Pin 8)
7	DGND	Grounding connection for digital I/Os
8	GND24V	Power supply for motor brake ground connection 24 V=

Counter connector

Ident. no	Description
0.880.880	Socket connector coded for DDC2 Connector X1
0.880.879	Socket connector coded for DDC2 Connector X6

6.3.2 Fiber optic cable connection

Communication between the drive control and NC is realized by means of a fiber optic ring. The connectors used comply with the FSM standard IEC 874-2.

Connector Description	Function
R Receiver	Receiver input
T Transmitter	Transmitter output

6.3.3 Encoder connection

The DDC2 is equipped with two encoder connectors for each drive. Differentiation is made between the Direct Encoder-system and Motor Encoder-system. The connector type and pin assignment are based on Heidenhain standards and are compatible with the SIEMENS-611D System.

Connector Name		Connector Type	Function
Axis 1	Axis 2		
X2	X7	25-pin Sub-D	Input for Motor Encoder-system
X3	X8	15-pin Sub-D	Input for Direct Encoder-system

6.3.3.1 Direct test system pin assignment

X3, X8: 15-pin Sub-D connector, pins on the DDC2 side

Pin	Signal	Function
1	P Encoder	Encoder power supply +5.25 V
2	M Encoder	Encoder power supply 0 V
3	A	Sinusoidal signal A 1 V _{pp}
4	/A	Sinusoidal signal /A 1 V _{pp}
5	DATA	ENDAT: RS485 data / SINCOS: RS485 data
6	B	Sinusoidal signal B 1 V _{pp}
7	/B	Sinusoidal signal /B 1V _{pp}
8	/DATA	ENDAT: RS485 data / SINCOS: RS485 data
9	+5V Sense	+5 V sensing line (internally connected with Pin1)
10	R	Signal reference pulse R1 0.5V _{pp}
11	0V-Sense	0 V sensing line (internally connected with Pin2)
12	/R	Signal reference pulse /R1 0.5V _{pp}
13	Screen	Inner screening
14	CLOCK	ENDAT: RS485 clock
15	/CLOCK	ENDAT: RS485 clock

6.3.3.2 Motor test system pin assignment

X2, X7: 25-pin Sub-D connector, pins on the DDC2 side

Pin	Signal	Function
1	P-Encoder	Encoder power supply +5.25 V
2	M-Encoder	Encoder power supply 0 V
3	A	Sinusoidal signal A 1 V _{pp}
4	/A	Sinusoidal signal /A 1 V _{pp}
5	Inner screen	Inner screening
6	B	Sinusoidal signal B 1 V _{pp}
7	/B	Sinusoidal signal /B 1 V _{pp}
8	Inner screen	Inner screening
9	N.C.	Not connected
10	N.C. CLOCK	Standard: Not connected ENDAT: RS485 clock
11	N.C.	Not connected
12	N.C. /CLOCK	Standard: Not connected ENDAT: RS485 clock
13	+TEMP	Motor temperature signal (+)
14	+5V-Sense	+5 V sensing line (internally connected with Pin 1)
15	N.C. DATA	Standard: Not connected ENDAT: RS485 data / SINCOS: RS485 data
16	0V-Sense	0 V sensing line (internally connected with Pin 2)
17	R	Signal reference pulse R2 0.5 V _{pp}
18	/R	Signal reference pulse /R2 0.5 V _{pp}
19	C	Absolute track C2 1 V _{pp}
20	/C	Absolute track /C2 1 V _{pp}
21	D	Absolute track D2 1 V _{pp}
22	/D	Absolute track /D2 1 V _{pp}
23	N.C. /DATA	Standard: Not connected ENDAT: RS485 data / SINCOS: RS485 data
24	Screen	Inner screen
25	-TEMP	Motor temperature signal (-)

6.3.4 PWM interface

When using the DDC2 in a 1-axis power amplifier unit, the second axis can be controlled via a separate power amplifier unit by implementing the adapter board DDCA. In this case, the control board DDC2 and adapter board DDCA must be connected via the

PWM interface connector X4, located on the front side (also refer to Chapter Cable Connections).

Connector X4: 14-pin FBK connection with ejection lever

Pin	Signal	Function
1	SCR	Screening connection for flatband cable with screen grid
2	BS	Grounding connection for phase currents
3	I22	Phase current I2, drive 2
4	I21	Phase current I1, drive 2
5	GND	Grounding connection
6	P5I	+5 V voltage supply for the optocoupler
7	TKK	Heat-sink temperature from DDCA (external power amplifier unit)
8	PU23	PWM signal 3 (lower switch)
9	PO23	PWM signal 3 (upper switch)
10	PU22	PWM signal 2 (lower switch)
11	PO22	PWM signal 2 (upper switch)
12	PU21	PWM signal 1 (lower switch)
13	PO21	PWM signal 1 (upper switch)
14	SCR	Screening connection for flatband cable with screen grid

6.3.5 Equipment bus

The equipment bus serves to supply the electronics of the DDC boards and for power supply unit status signal transmission. The cable connections for the equipment bus are part of the material supplied with the Siemens power amplifier unit.

Connector X351: 34pol. FBK connection with ejection lever

Pin	Signal	Function
1	HF1	Power supply for DDC2, 20 KHz/+30 V
2	HF2	Power supply for DDC2, 20 KHz/+30V
3	HF1	Power supply for DDC2, 20 KHz/+30V
4	HF2	Power supply for DDC2, 20 KHz/+30V
5	M	0 V reference potential for electronics
6	PW	Not connected
7	P24	Not connected
8	RESET	Reset pulse
9	P15	+15 V power supply for electronics
10	REIMSP	Central control/pulse blocking
11	P15	+15 V power supply for electronics
12	SO	Central desired value blocking
13	N15	-15 V power supply for electronics
14	EINR	Central setup operation command
15	N15	-15 V power supply for electronics
16	I2T_TMP	Not connected
17	N.C.	Not connected
18	P27	+24 V power supply for fan
19	M27	0 V power supply for fan
20	M	0 V reference potential for electronics
21	UZW	Actual value of intermediate circuit voltage
22	M	0 V reference potential for electronics
23	FR+	Not connected
24	M	0 V reference potential for electronics
25	FR-	Not connected
26	M	0 V reference potential for electronics
27	P5	+5 V power supply for electronics
28	M	0 V reference potential for electronics
29	P5	+5 V power supply for electronics
30	M	0 V reference potential for electronics
31	SIM_RDY	Not connected
32	N.C.	Not connected
33	N.C.	Not connected
34	N.C.	Not connected

6.3.6 LED display

Four LEDs (green) are provided for displaying status information.

LED Description	Function
RUN	Run / Processor is active
LOK	Light OK / Light signal provided
DE1	Drive Enable / Pulse release Axis 1
DE2	Drive Enable / Pulse release Axis 2

Hints to RUN-LED :

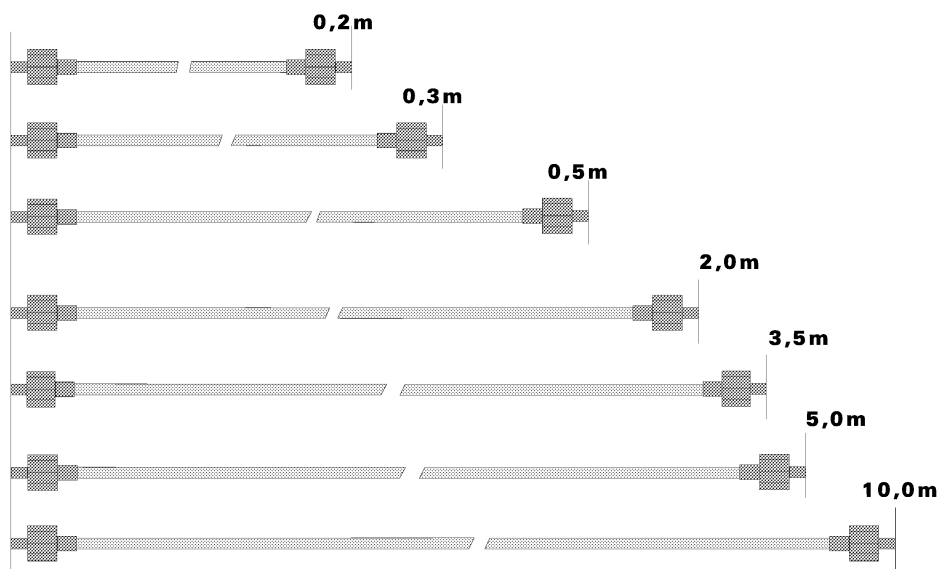
With changing of flash frequency during start up additional informations are given.

POWER-UP	Flash frequency appr. 10Hz, interrupted with flash display of hex-switch position. Hex-switch position 0 => phase od darkness Hex-switch position 1 => 1 * flash appr. 0.5 sec :: Hex-switch position 7 => 7 * flash appr. 0.5 sec
DOWNLOAD	After finished software download reducing of flash frequency from 10 Hz to appr. 3 Hz.
DDC-INIT	After finished DDC-initialization reducing of flash frequency from 3 Hz to appr. 1 Hz.

6.4 Cable connections

6.4.1 Fiber optic ring

Ready-made fiber optic cables of various lengths are available to set up the fiber optic ring between the NC and control board DDC2.



DDC_LW3.wpg

Ident. No.	Name	Length [m]	Outer ϕ [mm]	Bending radius [mm]
Short connection DDC<->DDC				
318921-92	LWL cable	0.2	2.2	50
318921-93	LWL cable	0.3	2.2	50
318921-95	LWL cable	0.5	2.2	50
Long connection DDC<->CNC				
318921-02	LWL cable	2.0	3.6	60
318921-03	LWL cable	3.5	3.6	60
318921-05	LWL cable	5.0	3.6	60
318921-10	LWL cable	10.0	3.6	60
318921-15	LWL cable	15.0	3.6	60

Other lengths on request

6.4.2 Encoder cable

6.4.2.1 Motor Encoder-system

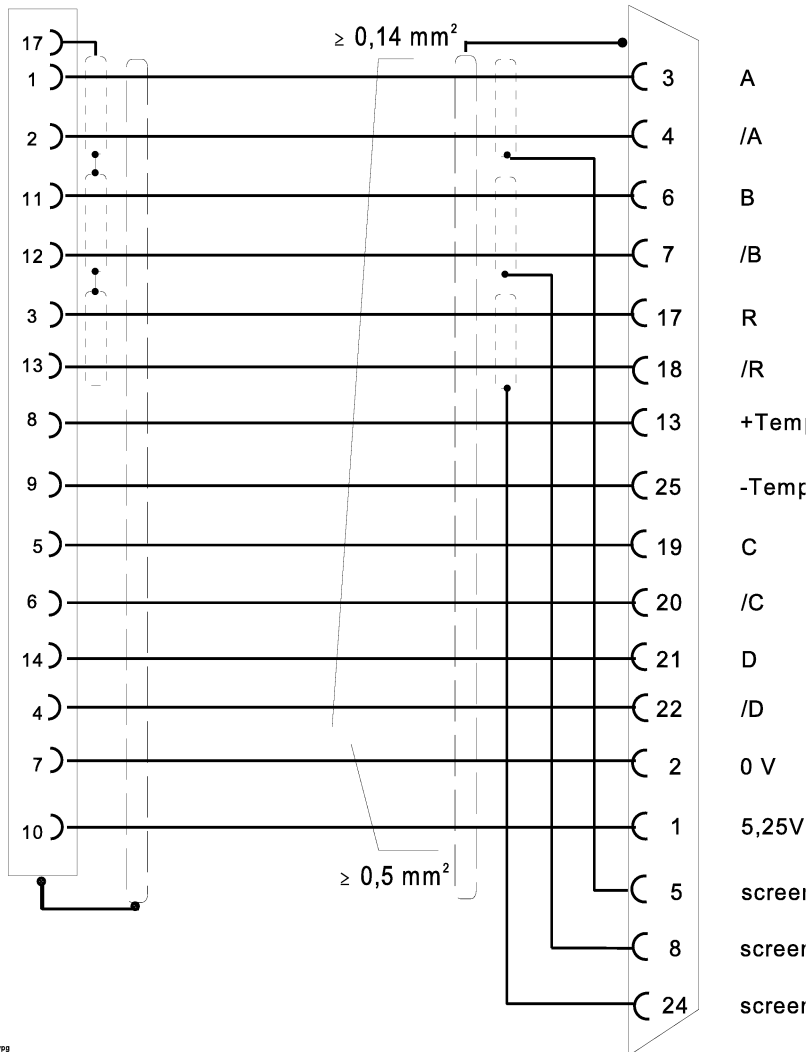
Motor connector Siemens <--> **DDC2 Connector X2, X7**
(Motor Encoder-system input)

Round connector

Sub-D-connector

17 pin (socket)

25 pin (socket)



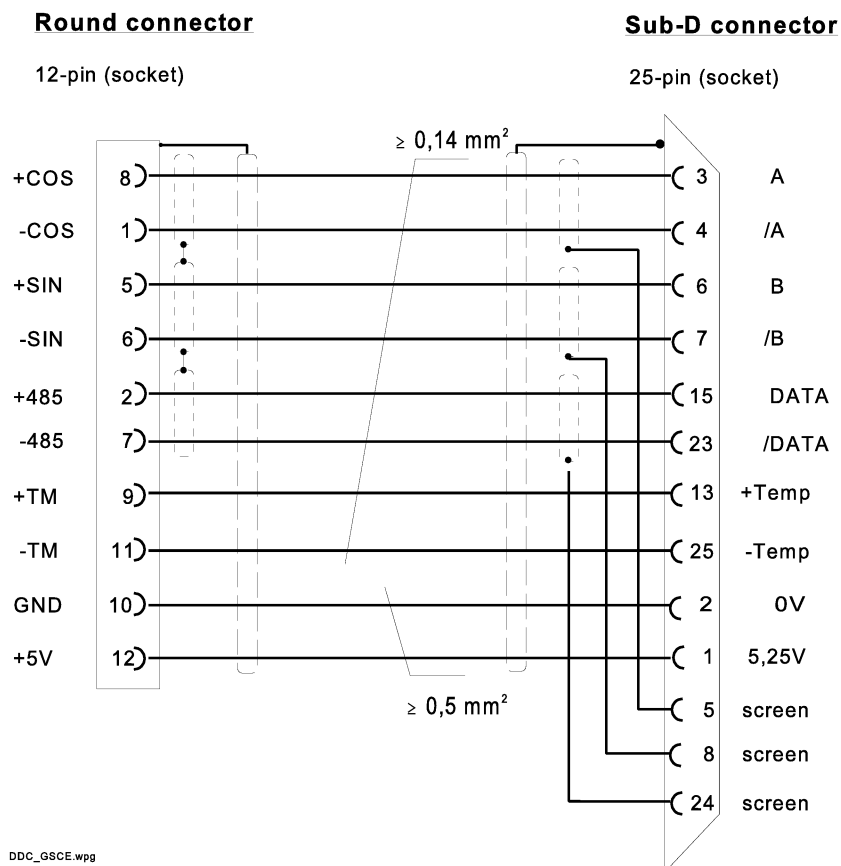
DDC_GX2E.wpg

Com.: Signals for the absolute track (C ,/C, D, /D) must only be connected in the case of synchronous motors (1FT6.., 1FK6..). These signals are not evaluated with asynchronous motors (1PH6.., 1PH7..).

Ident. No.	Description
	Ready-made Heidenhain cables on request

Motors with SINCOS encoder

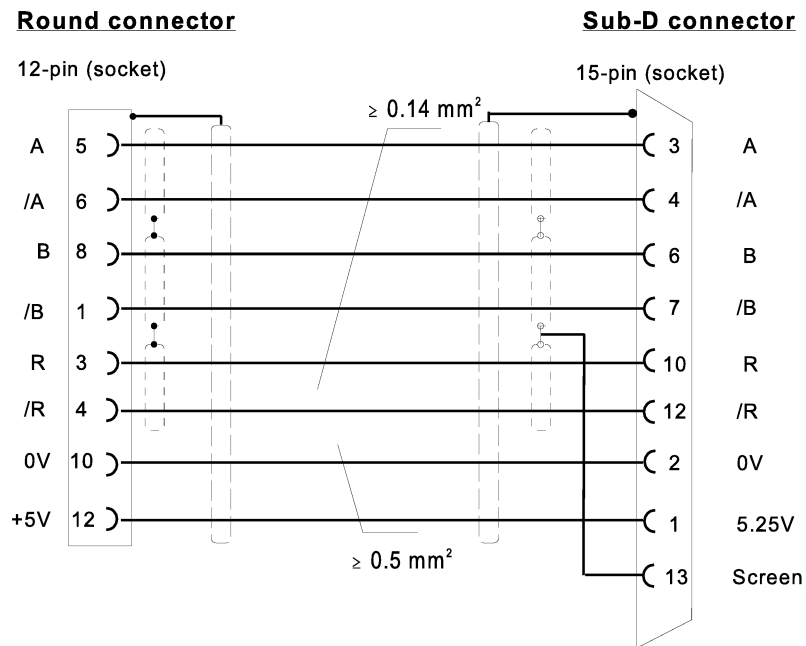
Motor connector Baumüller <--> **DDC2 connector X2, X7**
(Motor Encoder-system)



Ident. No.	Description
	Ready-made Heidenhain cables on request

6.4.2.2 Direct Encoder-system

Encoder connector ROD486 <--> **DDC2 connector X3, X8**
(Direct Encoder-system)



DDC_Gx3.wpg

Ident. No.	Description
	Ready-made Heidenhain cables on request

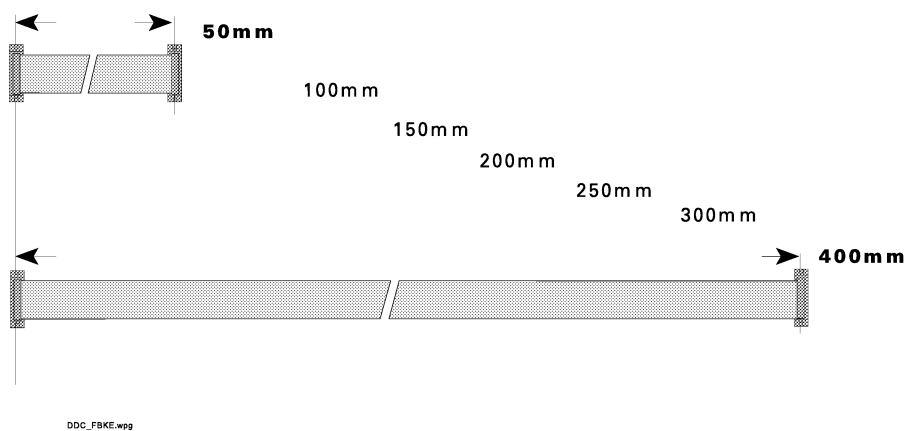
6.4.3 PWM interface

If the DDC2 is used in a 1-axis power amplifier unit, a further axis can be controlled in a separate power amplifier by implementing the adapter board DDCA.

Ready-made flatband cables are available to connect the control board DDC2 with the adapter board DDCA.

The different lengths correspond to the distances between the connectors (50 mm matrix) on the power amplifier plug-in unit. It is recommended to use the shortest connection routes possible.

Connector distance between DDC2 and DDCA



Ident. No.	Description
31892005	14-pin flatband cable for connector dist. 50mm
31892010	14-pin flatband cable for connector dist. 100mm
31892015	14-pin flatband cable for connector dist. 150mm
31892020	14-pin flatband cable for connector dist. 200mm
31892025	14-pin flatband cable for connector dist. 250mm
31892030	14-pin flatband cable for connector dist. 300mm
31892040	14-pin flatband cable for connector dist. 400mm

Other lengths on request

6.4.4 Equipment bus

The cable connections for the equipment bus are part of the material supplied with the Siemens power amplifier unit.

6.5 Technical data

Information in the planning, installation and operating instructions from the power supply unit manufacturer must be observed.

6.5.1 Power supply to the electronics

The DDC2 is supplied with power via the SIEMENS equipment bus.

Supply voltage :	HF1 - HF2	120 V _{pp} /20 KHz	± 5 %
	P27 - M27	+ 24 V	± 5 %
	P5 - M	+ 5 V	± 2 %
Power consumption:	HF1 - HF2	≤ 150 mA (without encoder)	
	P27 - M27	≤ 45 mA	
	P5 - M	≤ 5 mA (without power supply unit)	

6.5.2 Power supply to the Encoder-system

The DDC2 provides the short circuit-proof encoder power supply at the encoder interface. Higher voltage can be selected for longer line lengths via Jumper J9 on the DDC2.

Encoder power supply:	+ 5.25 V	± 5 %	Jumper J9 open
	+ 5.75 V	± 5 %	Jumper J9 plugged
Current supply:	≤ 600 mA	Summation current of all encoders	

6.5.3 Brake relay

The DDC2 is equipped with two brake relays (1 brake per axis).

Supply/Output voltage:	+ 24 V ± 25 %
Relay contact:	I _{typ} 3 A (continuous current limit)
	I _{max} 8 A (max. switching current)

6.5.4 Digital input signals

Four digital input signals, comprising one measuring probe, two reference cams and one emergency stop signals, are available. The inputs are electrically isolated.

Input voltage:	+ 24 V ± 25 %
Input current:	10 mA For measuring probe the input current is reduced to 5mA (!only with Hardware-Revision > = AES7!) else 10mA.
De-bouncing:	Reference cams and emergency stop signals: RC element Measuring probe: digital filter
Polarity:	Measuring probe and reference cams: active high Emergency stop input: active low

6.5.5 Run-up blocking

The run-up blocking feature is a safety facility which prevents inadvertent starting of the motor. The supply voltage for the control electronics in the power amplifier unit is switched on via a safety relay with forced contacts.

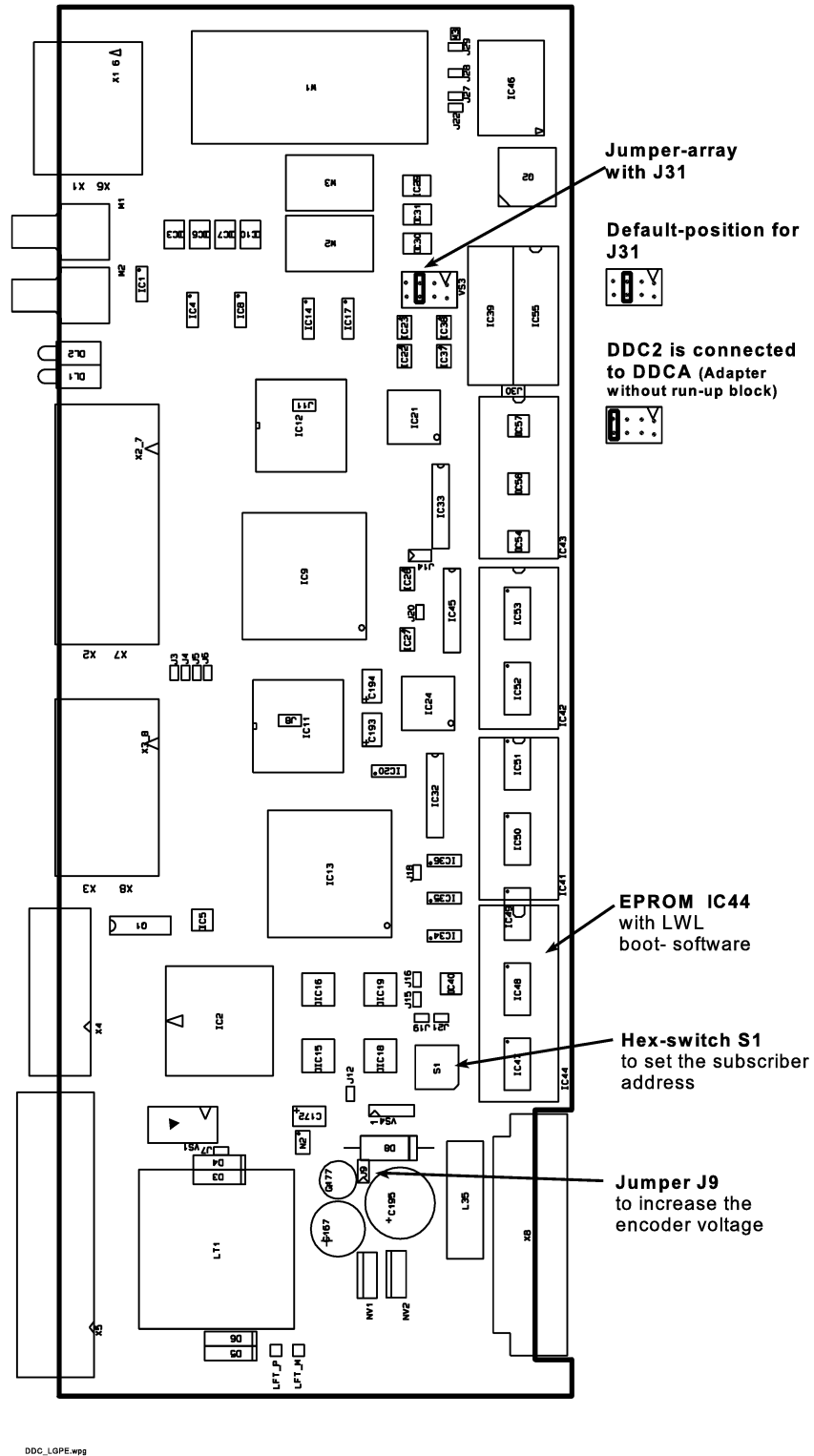
An externally fed +24 V control signal at terminals ASIN(+) and ASIN(-) releases the module-specific run-up block.

Switching of the run-up block is acknowledged via the opener terminals ASOUT(+) and ASOUT(-). The terminals and their connection lines are fully insulated for 250V_{AC} against each other, ground and any other potential existing on the module. Thus, the conditions for Overvoltage Category III and contamination level 2, complying with DIN VDE 0110/1.89 for air gaps and creeping distances, are fulfilled.

Input voltage:	+ 24 V \pm 25%
Input current:	\leq 30 mA
Input level:	Release active --> + 24 V
De-bouncing:	None

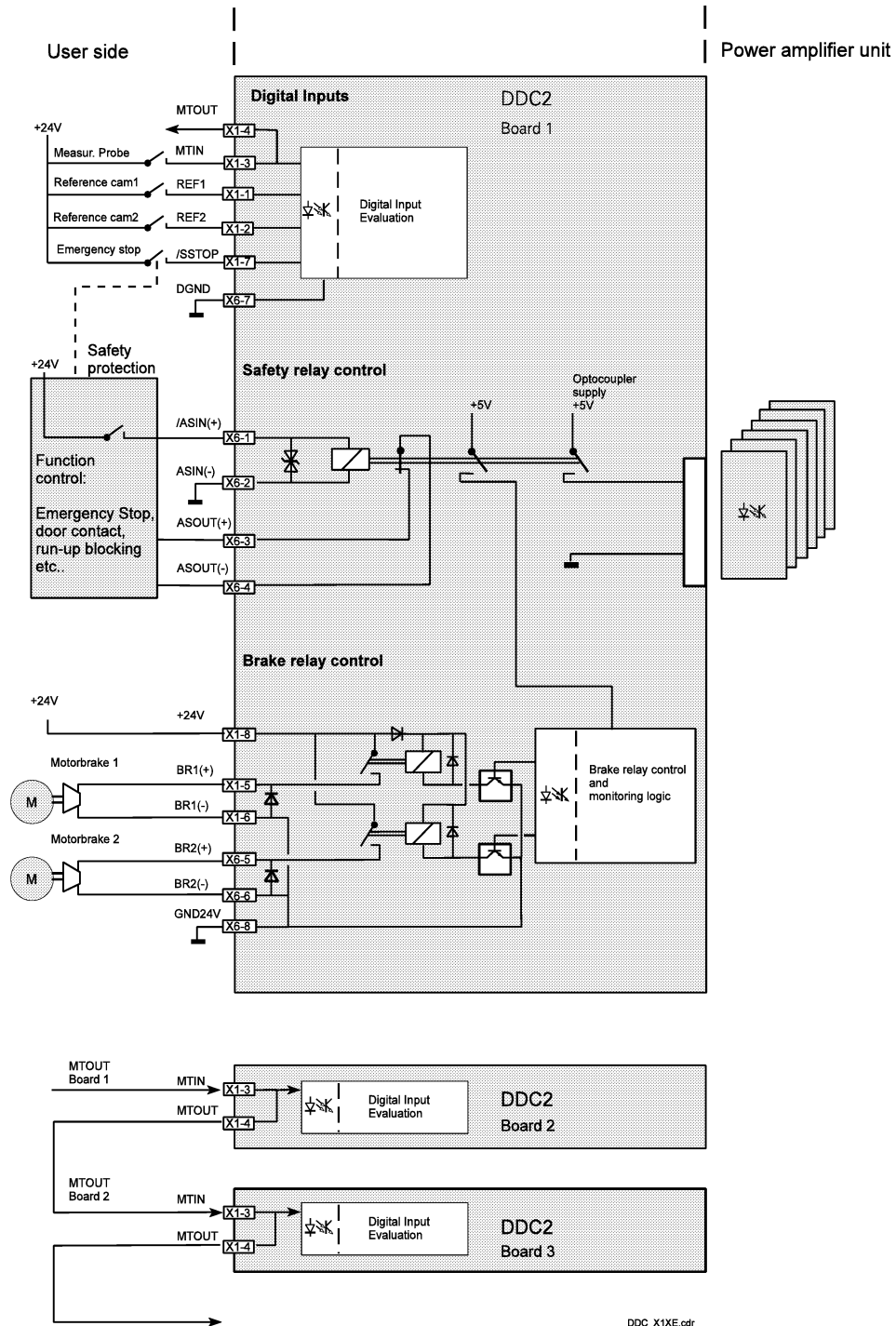
Opener contact:	
Max. switch-on/continuous/	10 A/4 A/
switch-off current:	4 A
Switching power:	Max. 150W

6.6 General plan



6.7 Cabling example for digital I/Os

The following diagram represents an example of cabling for digital input/output signals via connector X1 / X6 on the DDC2.





PCMOEM . . . 1 - 1, 4 - 7-4 - 9, 4 - 15, 4 - 16, 5 - 4, 5 - 14, 5 - 21
PE 5 - 2, 5 - 14, 5 - 20
PLC 1 - 1, 1 - 2, 3 - 1, 4 - 8, 4 - 10, 4 - 11, 5 - 1, 5 - 4, 5 - 14, 5 - 21
Power consumption 1 - 2, 1 - 3, 4 - 12, 6 - 17
power supply 1 - 2, 1 - 3, 3 - 1, 4 - 5, 4 - 6, 4 - 12, 4 - 14-4 - 16, 5 - 1, 5 - 2, 5 - 4, 5 - 10, 5 - 14, 5 - 20-5 - 22, 5 - 24, 5 - 30, 5 - 31, 6 - 5, 6 - 7, 6 - 8, 6 - 10, 6 - 17
power supply unit 6 - 10, 6 - 17
PWM interface 6 - 2, 6 - 9, 6 - 16
RC suppression 3 - 4, 3 - 5
reference cams 5 - 21, 6 - 2, 6 - 17
RS232 4 - 3, 4 - 5, 4 - 9, 5 - 31
RS422 4 - 3, 4 - 4, 4 - 11, 4 - 12
RxD 4 - 4, 4 - 5, 4 - 9, 5 - 2, 5 - 31
Safety notes 3, 2 - 1, 2 - 2, 3 - 1
safety relay 6 - 2, 6 - 18
screen . . . 1 - 1, 3 - 4, 4 - 6, 4 - 12, 5 - 2, 5 - 20, 6 - 2, 6 - 7-6 - 9
screen connection 3 - 4, 4 - 12
screening . . . 3 - 2-4 - 6, 5 - 2, 5 - 14, 5 - 20, 5 - 30, 6 - 7-6 - 9
Signal lines 3 - 2, 3 - 3
Signal processor 4 - 7
Suppression elements 3 - 4, 3 - 5, 5 - 4, 5 - 21
temperature sensor 1 - 3, 5 - 14
terminal connector 5 - 3, 5 - 4, 5 - 14
test probe 5 - 21, 5 - 22, 5 - 26, 5 - 27
Test system input 5 - 21
TxD 4 - 4, 4 - 5, 4 - 9, 5 - 2, 5 - 31
VGA 4 - 4
Video RAM 4 - 3
voltage monitoring 5 - 4, 5 - 14, 5 - 22
voltage regulator 5 - 4, 5 - 14, 5 - 22
Warranty 2 - 4


HEIDENHAIN


DR. JOHANNES HEIDENHAIN GmbH


Dr.-Johannes-Heidenhain-Straße 5


D-83301 Traunreut, Deutschland

 (0 86 69) 31-0 ·  56 832

 (0 86 69) 50 61

 **Service** (0 86 69) 31-12 72


 TNC-Service (0 86 69) 31-14 46


 (0 86 69) 98 99

HEIDENHAIN Niederlassung Hannover

Max-Müller-Straße 23

D-30179 Hannover, Deutschland

 (05 11) 67 07-01

 (05 11) 67 07-5 46
