Hardware Installation

1. Introduction

1.1 Composition of the modules

Module	Short name	Art. no.	Description in paragraph
Chassis			
Chassis 1 slot with double connector plug (for PLC CPU)		083579	2
Chassis 1 slot		083580	2
Chassis 2 slots		083581	2
Chassis 4 slots		083582	2
Chassis 8 slots		083583	2
Buffer battery	PB	083678	2
Bus terminal	BA	083679	2
Cover trim for empty slot		084 102	2
Potential neutralization		083 920	2
Coupling mudules	KOP	084 036	2
Power units			
Power unit 4 A	NG4	083314	3
Power unit 8 A	NG8	083547	3
Power unit 16 A	NG16	083548	3
Power unit 24 A	NG24	084242	3
Central units			
CNC 32Bit ETH Standard version	CNC	085003	4
CNC E 32Bit ETH Export version	CNC E	085008	4
CNC 64Bit ETH Standard version	CNC	085004	4
CNC E 64Bit ETH Export version	CNC E	086004	4
CNC 32Bit Standard version	CNC	083671	4
CNC E 32Bit Version with reduced function range	CNC E	088671	4
CNC 64Bit Standard version	CNC	084564	4
PLC 16k commands	PLC	083544	4
PLC 64k commands	PLC	084439	4
CEA 16 inputs, 8 outputs, power unit 4 A	CEA	083543	4

1.1 Composition of the modules (continued)

Module	Short name	Art. no.	Description in paragraph
Peripheral interface adapter			
Slot for operating panel	TTY - 20mA	083589	4
Slot for operating panel	RS232 - V24	083897	4
Slot for operating panel	RS422	084589	4
Slot for operating panel	RS422/485	084539	4
Axial modules			
1 axis, analog, passive, incremental	AAZ1	083637	5
2 axes, analog, passive, incremental	AAZ2	083705	5
4 axes, analog, passive, incremental	AAZ4	083549	5
2 axes, analog, passive, absolute, SSI	AZA2	083937	5
4 axes, analog, passive, absolute, SSI	AZA4	083936	5
8 axes, digital, passive	SERC	084544	5
3 axes, passive, step-motor module	ASM3	084079	5
POS modules			
3 axes, standard design, analog, incremental	POS	083545	6
3 axes, high-performance design, analog, incremental	POS	083672	6
3 axes, standard design, analog, SSI	POA	083673	6
3 axes, high-performance design, analog, SSI	POA	083674	6
3 axes, 1 spindle, standard design, digital	POD	083546	6
3 axes, 1 spindle, high-performance design, digital	POD	083675	6
3 axes, standard design, step-motor module	SMM	083676	6
3 axes, high-performance design, step-motor module	SMM	083677	6

1.1 Composition of the modules (continued)

Module	Short name	Art. no.	Description in paragraph
Digital input/output modules			
Input/output module, 16 inputs, 16 outputs (0.5A)	AEK	083950	7
Input/output module, 16 inputs, 16 outputs (0.5A), fast	SEA	084126	7
Input module, 32 inputs	EK	083946	7
Output module, 32 outputs (0.5A)	AK	083942	7
Output module, 16 outputs (2A)	AK2	083541	7
Relay module, 16 outputs	AKR	083540	7
Analog input/output modules			
Digital-analog converter, twofold	DAW2	083706	8
Digital-analog converter, fourfold	DAW4	083736	8
Analog-digital converter, fourfold	ADW4	083755	8
Communication modules			
Module for user specific records	COM	083708	9
Module for active EtherNet connection, SINEC H1 RJ45	ETH	084185	9
Module for active EtherNet connection, universal	ETH	084309	9
Module for AS interface with 1 master	AS-I	084187	9
Module for AS interface with 2 masters	AS-I2	084425	9
CAN applications	CAN	084489	9

1.1 Composition of the modules (continued)

Module		Short name	Art. no.	Description in paragraph
Operating panels CNC				
CNC with color LC display and Touch screen 6,5"		CNC 910	085002	10
CNC with color LC display and Touch screen 10"		CNC 920	800048	10
machine operating panel			800047	10
CNC with color LC display and Touch screen 10" and integrated industrial PC		CNC 930 / 10	800259	10
machine operating panel			800047	10
CNC with color LC display and Touch screen 15" and integrated industrial PC		CNC 930 / 15	800070	10
machine operating panel			800069	10
Operating device with color LC display		CNC 900		10
Operating device with color LC display and integrated industrial PC		CNC900C		10
Operating panels RC				
RC with color LC display and Touch screen 6,5"				
version	standard	RC 910	085001	10
version	with handwheel	RC 910	085005	10
version	with joystick	RC 910	085006	10

1.2 Technical data of the modules

Chassis	Having 1, 2, 4 and slots for plugging in the modules. The chassis can be combined optionally by means of plug-in connections.

Power units

NG4	+5V / 4A and ±15V / 0.2A
NG 8	+5V / 8A and ±15V / 0.5A
NG 16	+5V / 16A and ±15V / 1.0A
NG 24	+5V / 24A and ±15V / 1.5A

Central units

CNC 32Bit ETH CNC E 32Bit ETH	CPU for all CNC Functions and integrated PLC Functions, User memory 1,5MB for NC programs and parameters, Flag memory 60kB, Parameter 30,000, Channels 4, axes 16, Chassis with 1 slot (art. No. 083580)
CNC 64Bit ETH CNC E 64Bit ETH	CPU for all CNC Functions and integrated PLC Functions, User memory 3MB for NC programs and parameters, Flag memory 60kB, parameter 60,000, Channels 8, axes 32, Chassis with 1 slot (art. No. 083580)
CNC (32Bit) CNC E (32Bit)	CPU for complex CNC tasks as well as optionally for integrated PLC tasks, User memory of 1,5MB for NC programs and parameters, Flag memory 60kB, parameter 30,000, CNC: Channels 4, axes 16, CNC E: Channels 2, axes 8, Chassis with 1 slot, art. No. 083580
CNC (64Bit)	CPU for complex CNC tasks as well as optionally for integrated PLC tasks, User memory of 3MB for NC programs and parameters, Flag memory 60kB, parameter 60,000, Channels 8, axes 32, Chassis with 2 slots, art. No. 083581

1.2 Technical data of the modules (continued)

Central units

PLC (16k/64k)	CPU for the whole of PLC tasks as well as for NC tasks by means of POS modules, flag memory of 60kB, program memory for 16k/64k of instructions, Chassis with 1 slot with double connector, art. no. 083579
CEA	CPU for inferior PLC tasks as well as for NC tasks by means of POS modules, flag memory of 60kB, program memory for 16k of instructions, 16 inputs, 8 outputs (0.5A), integrated power unit for +5V / 4A and ±15V / 0.2A, chassis with 1, 2, 4 or slots, each time at the 1st slot.

Axial modules

AAZ1	Passive axial module for 1 analogly selected axis, incremental
AAZ2	Passive axial module for 2 analogly selected axes, incremental
AAZ4	Passive axial module for 4 analogly selected axes, incremental
AZA2	Passive axial module for 2 analogly selected axes, absolute
AZA4	Passive axial module for 4 analogly selected axes, absolute
SERC	Passive axial module for 8 digitally selected axes
ASM	for 3 step motors

POS modules

Standard design CPU for autonomous interpolation and positioning adjustment

High-performance design CPU with co-procesor for autonomous interpolation and positioning adjustment, tool offset compensation and parametric computation

POS	for 3 analogly selected axes by means of incremental measuring systems
POA	for 3 analogly selected axes by means of absolute measuring systems SSI
SMM	for 3 step motors

1.2 Technical data of the modules (continued)

Digital input / output modules

EK	32 inputs
AEK	16 inputs, 16 outputs (0.5A) input delay approx. 3ms
SEA	16 inputs, 16 outputs (0.5A) input delay approx. 0,15ms
AK	32 outputs (0.5A)
AK2	16 outputs (2A)
AKR	16 outputs

Analog input / output modules

DAW2	with 2 analog outputs
DAW4	with 4 analog outputs
ADW4	with 4 differential inputs for the digitization of an analog voltage

Communication modules

COM	Module for user specific records for connecting bar code readers, for particular serial coupling arrangements etc.
ETH	Module for active EtherNet connection
AS-I	Module for AS interface with 1 master
AS-I2	Module for AS interface with 2 masters
CAN	Module for CAN Applications

1.2 Technical data of the modules (continued)

Operating panels RC

RC 910	Standard design and version with handwheel as well as with joystick, Color LCD (TFT), VGA Graphic (640 x 480), 6.5", 256 off 4096 colours, Touch screen with resolution 1024 x 1024. Run-time memory DRAM with 16MB, Flash disk memory with 8MB for operating system and control surface. 42 function keys, of it 10 freely shapable, PLC keys with display on LCD Display. Emergency stop switch, key-operated switsch, Override Potentiometer. 1 EtherNet interface RJ45, 1 serial interface (V24 / RS422).

Operating panels CNC

CNC 910	Standard design Color LCD (TFT), VGA Graphic (640 x 480), 6.5", 256 off 4096 colours, Touch screen with resolution 1024 x 1024. Run-time memory DRAM with 16MB, Flash disk memory with 8MB for operating system and control surface. 42 function keys, of it 15 freely shapable, PLC keys with display on LCD Display. Emergency stop switch, key-operated switsch, Override Potentiometer. 1 EtherNet interface RJ45, 1 serial interface (V24 / RS422).
CNC 920	Standard design Color LCD (TFT), VGA Graphic (640 x 480), 10.4", 256 off 4096 colours, Touch screen with resolution 1024 x 1024. Run-time memory DRAM with 16MB, Flash disk memory with 8MB for operating system and control surface. 42 function keys, of it 15 freely shapable, PLC keys with display on LCD Display. 1 EtherNet interface RJ45, 1 serial interface (V24 / RS422). Separate machine operating panel Emergency stop switch, key-operated switsch, Override Potentiometer, illuminated push button.

1.2 Technical data of the modules (continued)

Operating panels CNC

CNC 930

Operating panels in two versions

CNC 930/10 LCD-Bildschirm TFT 10"
Resolution / colours 640 x 480 / 16Bit
Touch screen resolution 1024 x 1024

CNC 930/15 LCD-Bildschirm TFT 15"
Resolution / colours 1024 x 768 / 16Bit
Touch screen resolution 1024 x 1024

Processor	CPU Pentium compatibly	1 GHz
Memory	RAM memory	512 MB
	Hard disk	20 GB

42 function keys, of it 15 freely shapable
PLC Keys with display on the LCD Display

1 Ethernet 10/100 Mbit, 1 serial interface, 4 USB
1 PS/2 mouse / keyboard Potentiometer / handwheel / key-operated switsch
SVGA monitor

Machine operating panel separately
1 emergency stop, 1 key-operated switsch with CNC 930/10,
2 key-operated switsches with CNC 930/15, 2 potentiometers,
1 illuminated push button

1.2 Technical data of the modules (continued)

Operating panels CNC

CNC 900

Wide Color LCD (TFT), VGA Graphic (640 x 480),

Function keys, cursor keys and numeric key block,
Separate ones keys for the axis selection and keys for machine functions,
Peripheral device interface, connection for handbedienteil TP,

2 potentiometers and emergency-stop keys,
Front version in protective system IP65,
Supply voltages 24V DC or 22V AC

CNC 900C

Wide Color LCD (TFT), VGA Graphic (640 x 480),

CPU Pentium compatibly, RAM Saving 8MB,
Hard disk 1GB, floppy disk drive 3.5 “,
Function keys, cursor keys and numeric key block, ASCII foil keyboard,
Separate ones keys for axis selection and keys for machine functions,
Peripheral device interface, connection for handbedienteil TP,

1 parallel and 2 serial interfaces,
2 free slots,
2 potentiometers and emergency-stop keys,
Front version in protective system IP65,
Supply voltages 24V DC or 22V AC
Option: Power pack for no-break current supply.

Use of marketable software,
Free organization of control surfaces,
Integration of customer know-how,
Application of CAD software,
Workshop-oriented programming (WOP),
Integration of expert systems.

2. Chassis

2.1 General data

Configuration

The chassis have 1, 2, 4 and 8 slots for the accommodation of the modules.

The individual chassis can be put next to each other. Thus actual the BUS connection simply and fast manufactured. If the chassis must be arranged off space reasons among themselves, the BUS is connected with the ouple module KOP and a cable.

A CPU can address max. 32 EA slots. Those are 4 chassis with 8 slots each. So that with large EA requirement no addressing gaps result, those sollten of eight chassis together to be first always put. At the end (on the right) can follow then on more êr or on èr chassis.

Empty slots can be plugged to the protection with a shrouded-type panel.

The modules are located with 2 knurled screws in the chassis. Thus both a good bonding in the bus plug and the optimal contact of the cable screens are achieved.

Location

The chassis can be installed separately from the machine or be built in in the control cabinet of the machine. To pay attention with the installation actual to good heat dissipation (avoidance of warming esters). Devices, which emit much heat in the operation, are to be arranged above the chassis.

Environment conditions

Operating temperature	0 to +50 °C
Storage temperature	-10 to +60 °C
Dampness	10% to 90%, non-condensing

2.2 Chassis mounting

Installation of chassis

The **chassis** are attached together on two **mounting rails** DIN EN 60715, TS35x15 steel (before times DIN EN 50022). The rails are in the distance (light measure) by 190 mm, as in the dimensional drawings given to install on the mounting plate in the switchgear cabinet. To pay attention in the indicated distance actual to a fixed adjustment of the rails.

Usually becomes with the mounting of the left Chassis started.

The chassis becomes into the upper DIN rail from above coming easily diagonally hung up and then against the lower rail to Prefab wall swivelled.

With a Philips bolt one shifts turners in the area the lower DIN rail present Locking screw approx. 5 mm upward and it turns also 1 rotation to the right fixed.

Note: The Philips bolt before do not turn on to the left. Thus the default became ineffectivy and to problems the mounting lead.

2.2 Chassis mounting

Installation of chassis

When the assembling of a further chassis this becomes on the right in the distance from 2 cm hung up and afterwards to the left shifted up to locking the plug-in connection.
The protection becomes then over the locking screw how with the 1. Chassis made.
In this way all further chassis are mounted.
Absolutely actual on the justified connection of the particulars To note chassis.

The back-up battery becomes into the left bus plug of the 1. Chassis and the bus termination into the right plug the final chassis plugged in and attaches.

With one or more **ground bars** (Article No. 083920) become those Chassis connected and to protective grounding the control cabinet connected (see paragraph Safety precautions).

Further mechanical strength arises as a result of that Attach from fixing clips (Article No. 800117) at the bottom that individual chassis.
.

Expansion of chassis

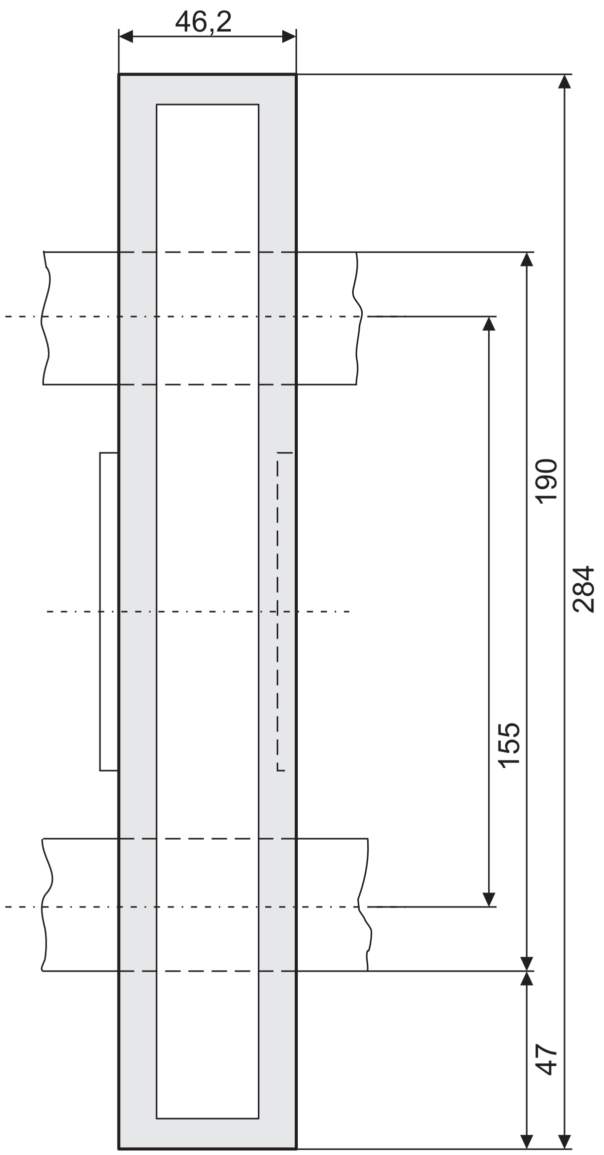
The backwall screw with a screwdriver if turners screw around approx. 1 rotation to the left turn, until on resistor noticeable becomes.

Then downwards and presses the chassis presses shift to the right laterally.

And pulls forward the chassis forward pulls release upward.

2.3 Chassis measurement

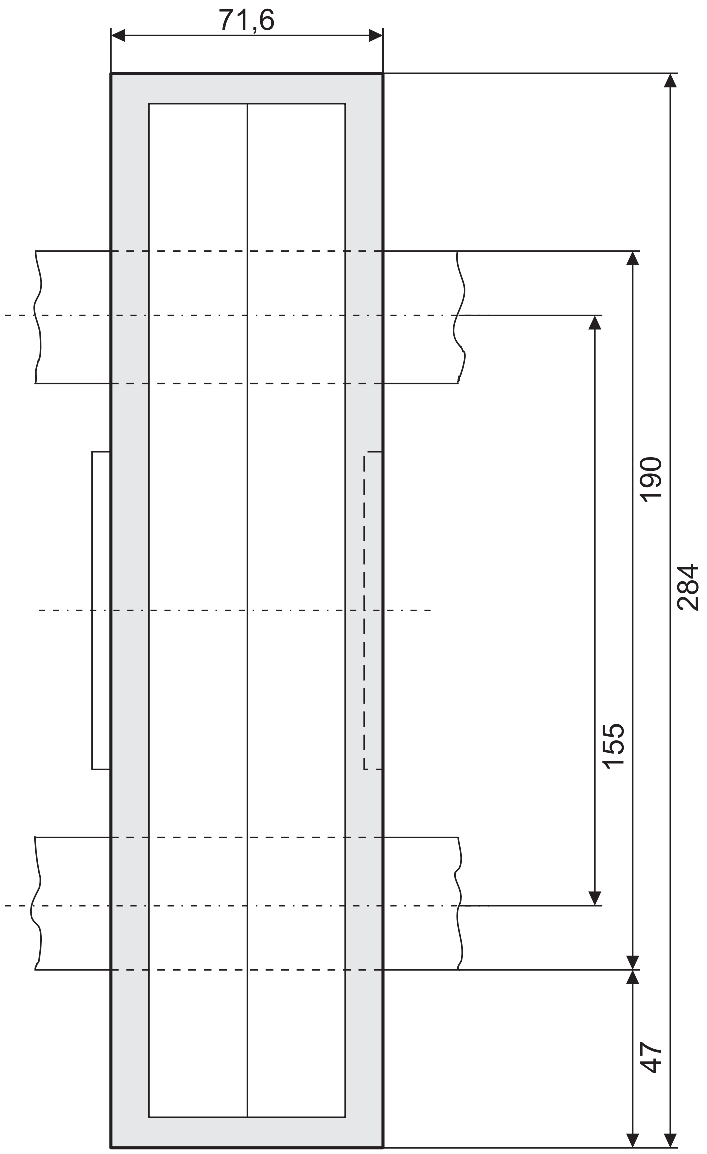
Chassis with 1 slot



Depth of 186.5 (without modules)

2.3 Chassis measurement

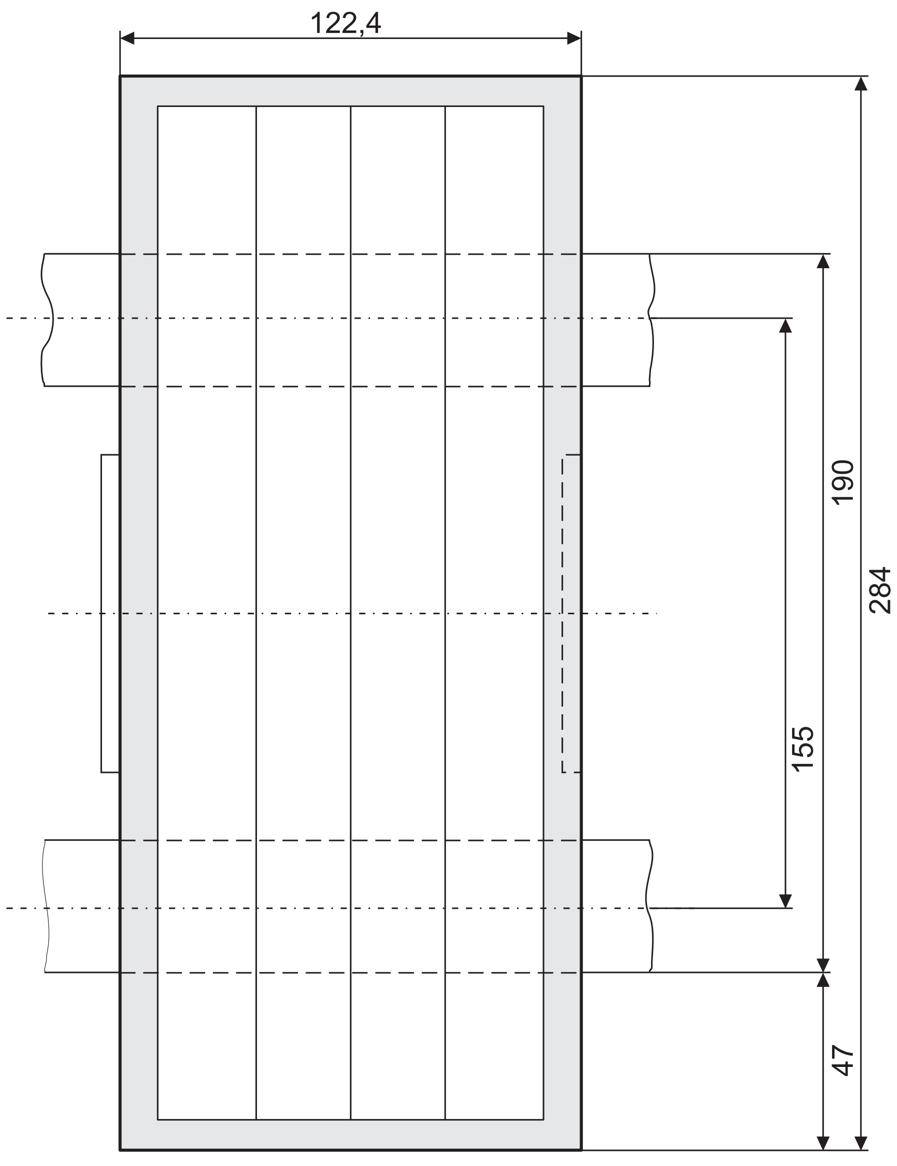
Chassis with 2 slots



Depth of 186.5 (without modules)

2.3 Chassis measurement

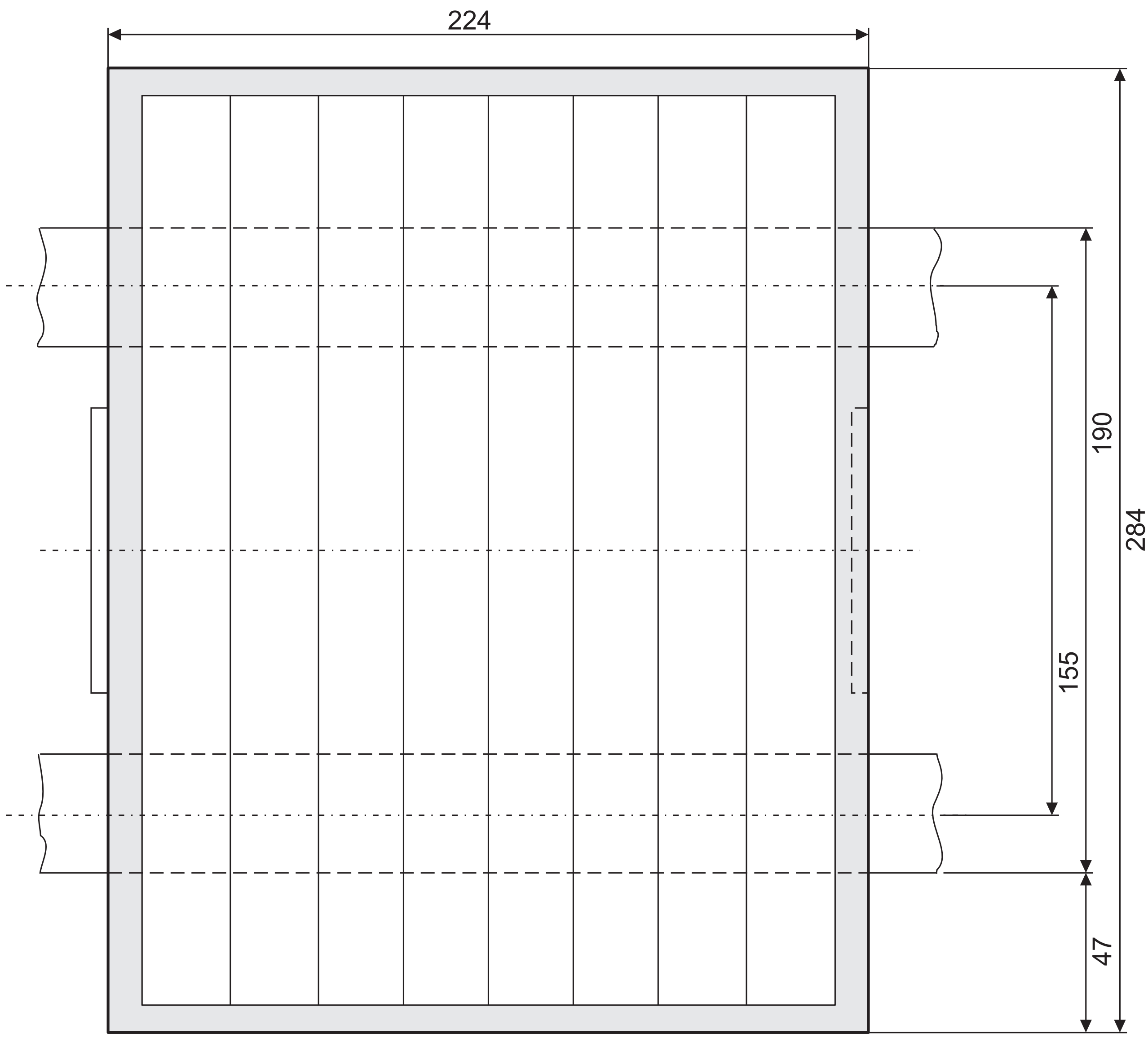
Chassis with 4 slots



Depth of 186.5 (without modules)

2.3 Chassis measurement

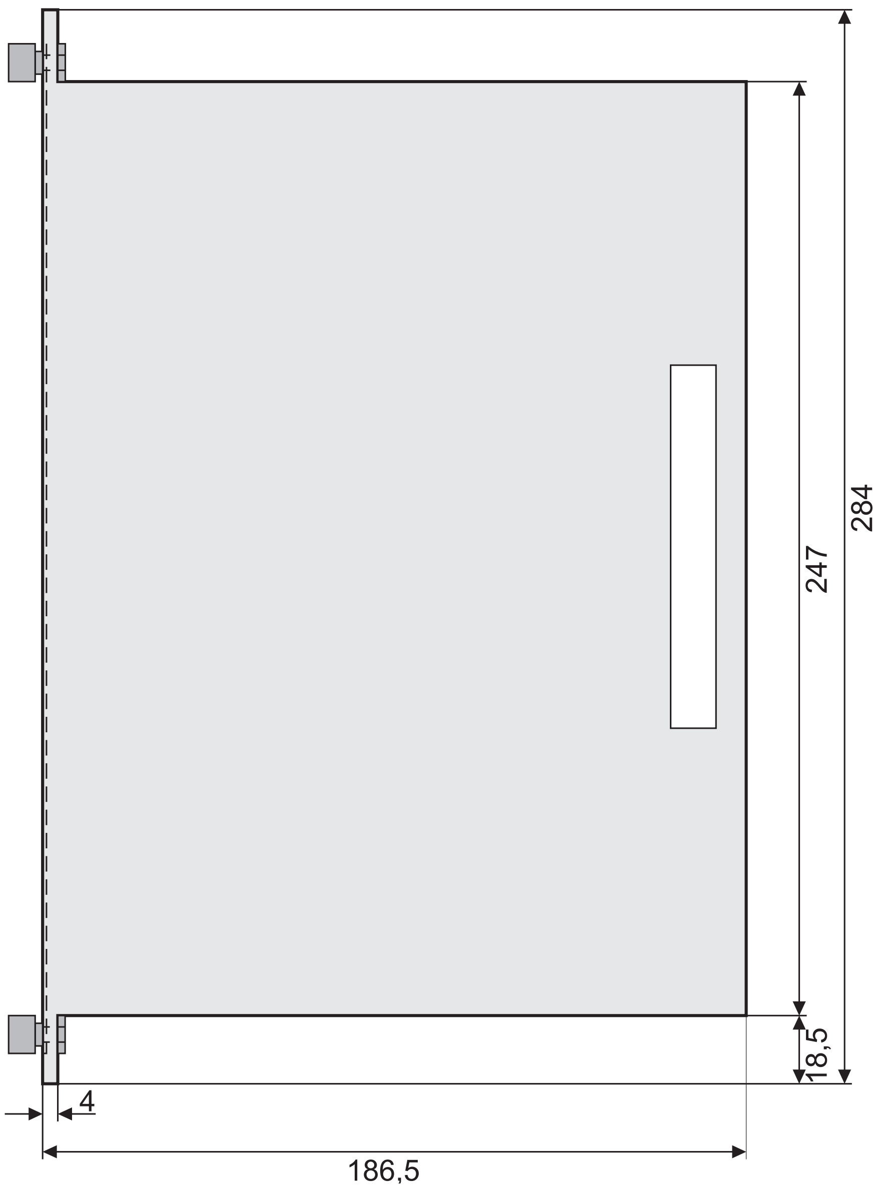
Chassis with 8 slots



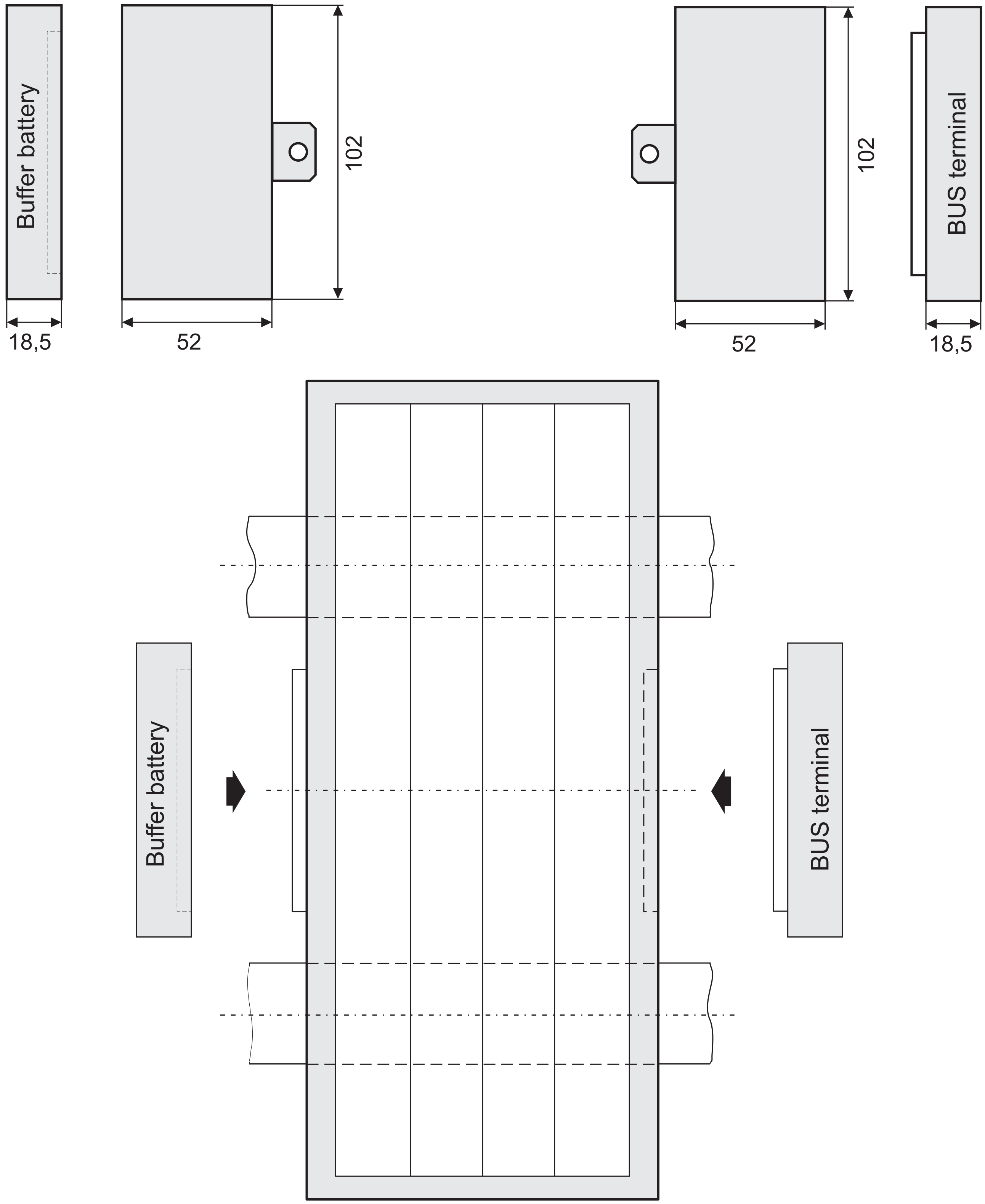
Depth of 186.5 (without modules)

2.3 Chassis measurement

Chassis, side view



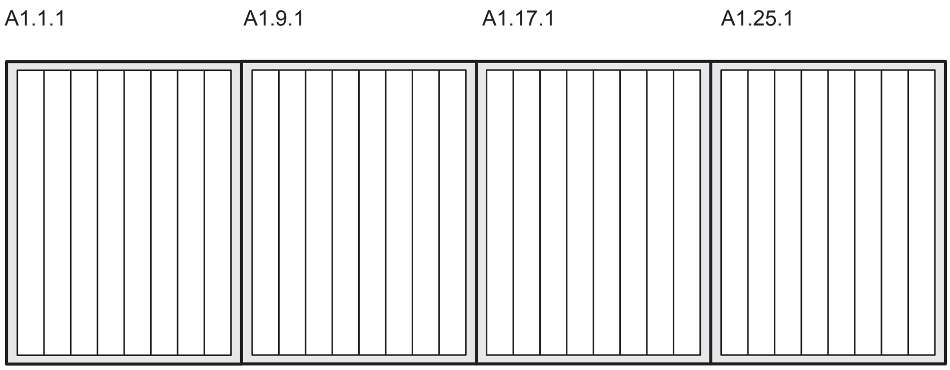
2.4 BUS terminal and buffer battery

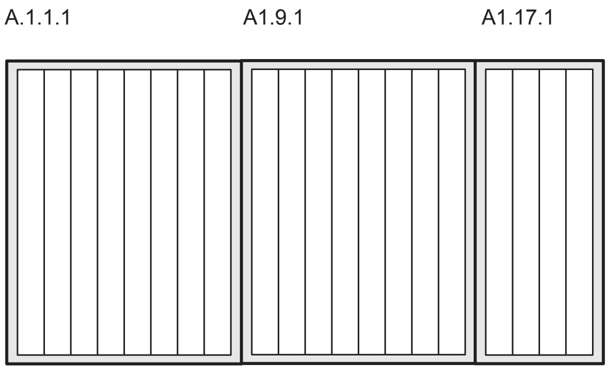


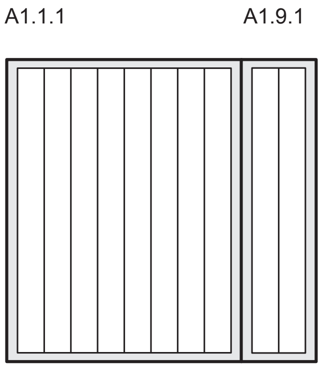
2.5 Addressing of the chassis slots

The individual chassis can by plugging together together to be gereiht.
So that with the E/A slots no addressing gaps result, those sollten of eight chassis to be first always used. At the end (on the right) can follow then on more êr or on èr chassis.

Examples of **chassis combinations *without* addressing gaps** with the I/O slots.

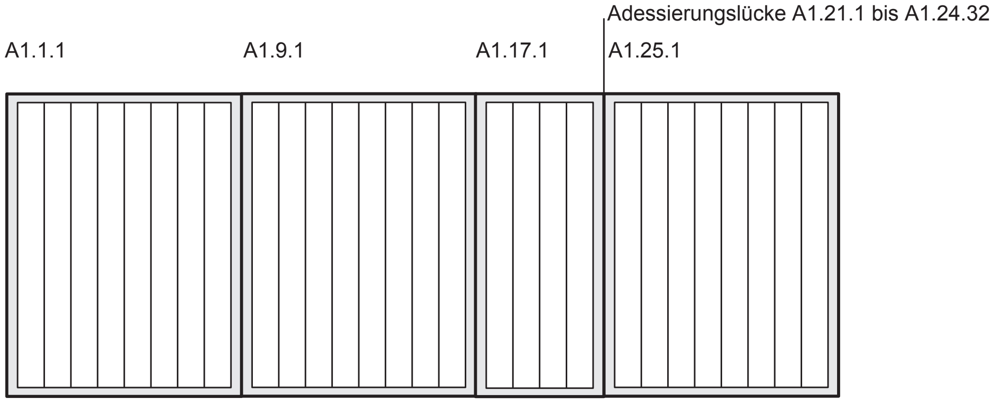


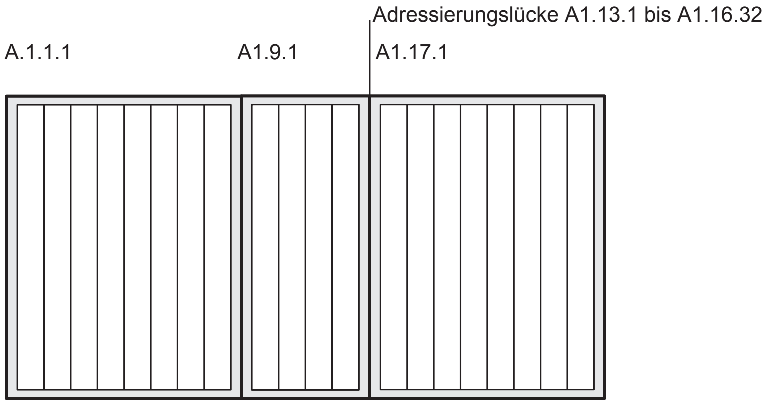


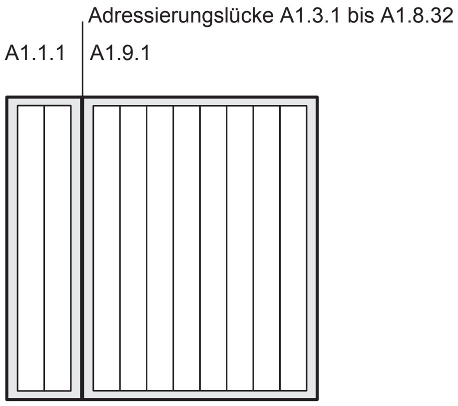


2.5 Addressing of the chassis slots

Examples of **chassis combinations *with* addressing gaps** with the I/O slots.







2.6 BUS system

The I/O BUS is the connecting element of all modules. This parallel bus is located within the address range of the selecting CPU module. The CPU selects the bus with a very high transmission rate resulting in a high system speed.

The following routes are available in the BUS systems:

1.	Data BUS:	Data lines D[0…31]
2.	Address BUS:	Address lines A[0…10] (address range of 2k)
3.	Control BUS:	Control signals for various bus cycles

Control BUS:

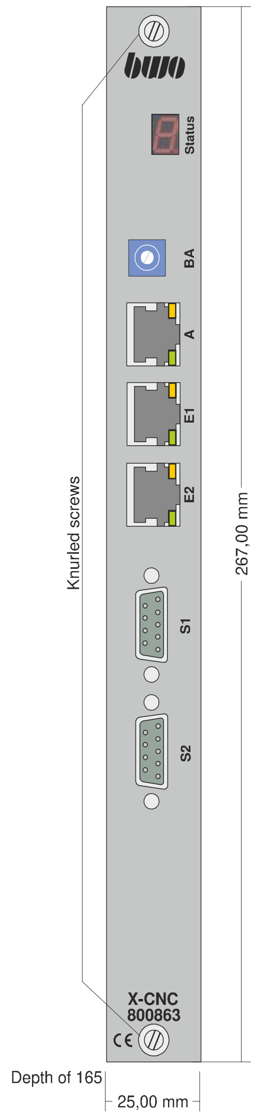
- SYSCLK	Processor clock
- AS*	Address strobe
- DRDY*	Data ready
- MXS*	Memory transactions start
- RD*	Read strobe
- RT*	Read transaction
- WR*	Write strobe
- INT*[0…3]	Interrupt inputs
- RESET	Reset signal
- PWRGD	Power-good signal from the power unit
- SYNC*	Synchronizes the take-over of count of several modules

The following operating voltages are available:
+5V
+15V
-15V
+3.6V battery voltage for RAM buffering

For regulating the +5V operating voltage, there is available a detector line (U_{detect}) on the BUS which is connected to +5V in the last chassis by plugging in the BUS terminal in order to guarantee levelling the voltage exactly at the most remote slot, too. All of the above voltages have a common ground contact!

2.7 Incasing the modules

Upon operating the modules, it has to be taken care that the two knurled screws for fixing the modules in the chassis are tightened. By fixing the modules it is guaranteed that the contact in the bus plug connection as well as the contact of the cable screening with the housing are optimal.



Connecting the modules

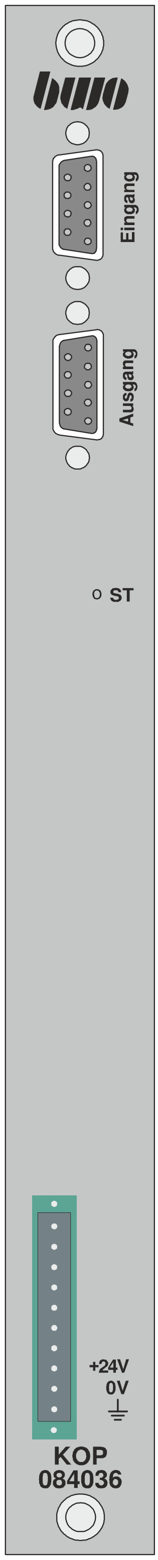
As a matter of principle, the following installation instructions have to be taken into consideration.

The lines of the measuring system and of the scheduled values are to be connected to the corresponding inputs resp. outputs by means of screened cables. The screenings should be skinned at both cable ends.

2.8 Coupling module KOP

Coupling of groups of chassis

with the ouple module KOP



Connections and display

Allocation 9pol. CD-Sub-socket input and output

Pin 1	screen
Pin 2	TXD+
Pin 3	TXD
Pin 4	freely
Pin 5	GND
Pin 6	VCC
Pin 7	RXD
Pin 8	RXD+
Pin 9	MSR

ST light emitting diode for status indication

displays the program and hardware status

- lamp on	Everything in order
- lamp off	CPU defectively, no voltage or lamp defectively
- lamp flashes	System error
flash frequency 1/10s	Hardware errors (module or connection failed)

2.8 Coupling module KOP (continued)

Coupling of chassis groups

The chassis groups are composed of individual chassis which are plugged together under normal conditions. Consequently, the BUS connection is realized simply and quickly.

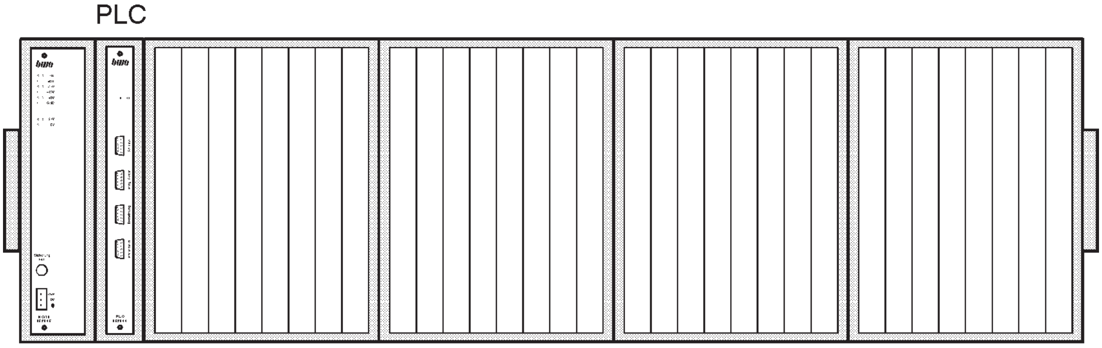
In case the chassis cannot be mounted side by side, the BUS connection has to be realized by means of the coupling module (having an integrated power unit) and the connection cable (art. no. 084077).

The chassis groups are divided into basic chassis and additional chassis. The basic chassis group contains the power unit, the central unit and the slots for the axial modules resp. the POS modules. The groups of the additional chassis consist of the coupling module and the slots for the I/O modules. The power supply is hereby performed by means of the integrated power unit of the coupling module.

The coupling module can be operated both in an 8-chassis and a separate 1-chassis. If there is used a separate chassis for the coupling module, all of the slots of the 8-chassis are available for I/O modules.

Notice:
The power supplies of the basic chassis and the additional chassis **must** always be switched on **simultaneously** !

Example 1:
A chassis group consisting of 4 x 8-chassis arranged in 1 group side by side.

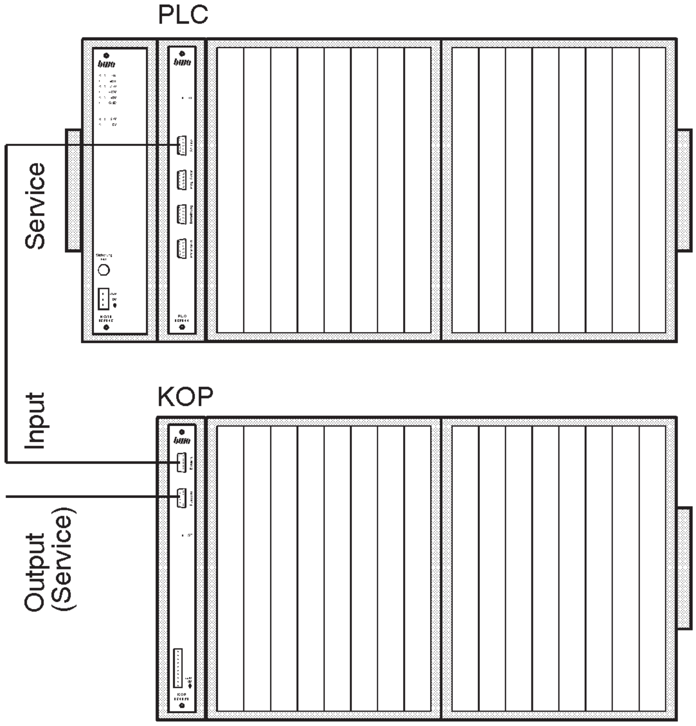


Chassis group with power unit and central unit

as well as slots for 8 axial modules or 8 POS modules and 24 I/O modules

2.8 Coupling module KOP (continued)

Example 2:
A chassis group consisting of 4 x 8-chassis arranged in 2 groups one under the other.



Basic chassis group

with power unit

and central unit

as well as slots
for 8 axial modules
or 8 POS modules

and 8 I/O modules

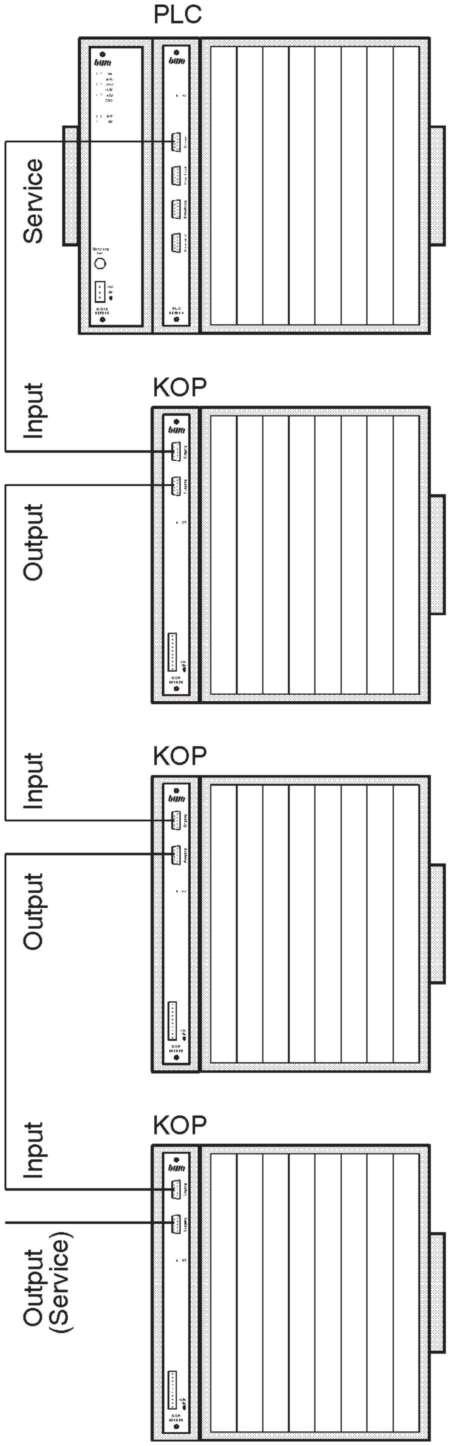
Group of additional chassis

with coupling module

and slots
for 16 I/O modules

2.8 Coupling module KOP (continued)

Example 3:
A chassis group consisting of 4 x 8-chassis arranged in 4 groups one under the other.



Basic chassis group

with power unit

and central unit

as well as slots
for 8 axial modules
or 8 POS modules

Group of additional chassis

with coupling module

and slots for
8 I/O modules

Group of additional chassis

with coupling module

and slots for
8 I/O modules

Group of additional chassis

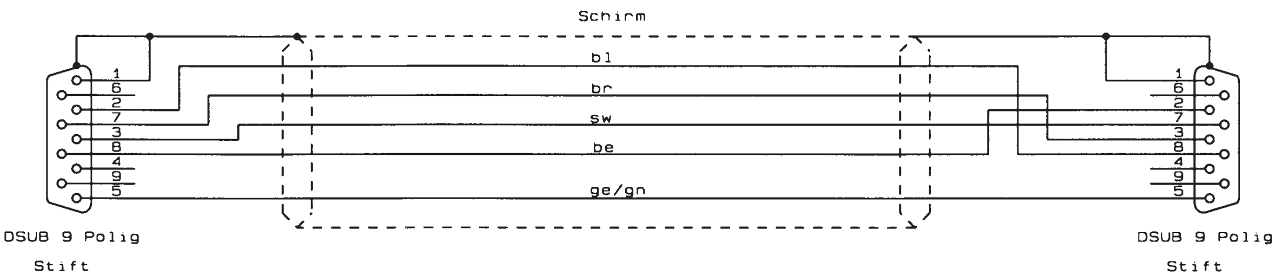
with coupling module

and slots for
8 I/O modules

2.8 Coupling module KOP (continued)

Connecting cable

There is available a ready-made cable of a length of 0.7 m, art. No. 084077, for connecting the individual chassis groups



Starting addresses of the groups of additional chassis

The function block KOPL serves for defining the starting addresses of the additional chassis.

KOPL		Example for addresses for 8-chassis for I/O and 1-chassis for KOP
S1	9	9 Starting address of 1st additional chassis
S2	17	17 Starting address of 2nd additional chassis
S3	25	25 Starting address of 3rd additional chassis

2.8 Coupling module KOP (continued)

KOP power unit

Input values

Input voltage	UI	24V= admissible range of 22V to 35V Three-phase bridge connection max. ripple $3V_{ss}$ max. rise time from 0V to 24V: 60ms
Input current	II	1.5A for UI 24V= and a load of 4A for 5V, of 0.2A for ± 15V

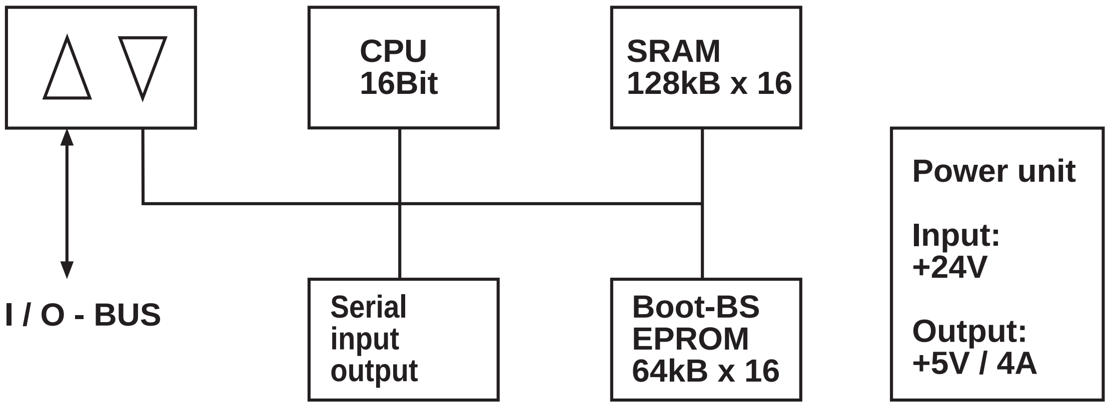
Output values

Output voltage	UO_{+5}	+ 5V
Output current	IO_{+5}	4A for convective aeration **permanently short circuit proof**
Output voltage	UO_{+15}	+ 15V
Output current	IO_{+15}	0.2A **permanently short circuit proof**
Output voltage	UO_{-15}	- 15V
Output current	IO_{-15}	0.2A **permanently short circuit proof**

The total load for + 5V and ± 15V must not exceed 25W. The load for each individual configuration of devices can be ascertained resp. verified with the tables ‘Current consumption of the modules’ on the pages 3-11 and 3-12.

2.8 Coupling module KOP (continued)

Block diagram

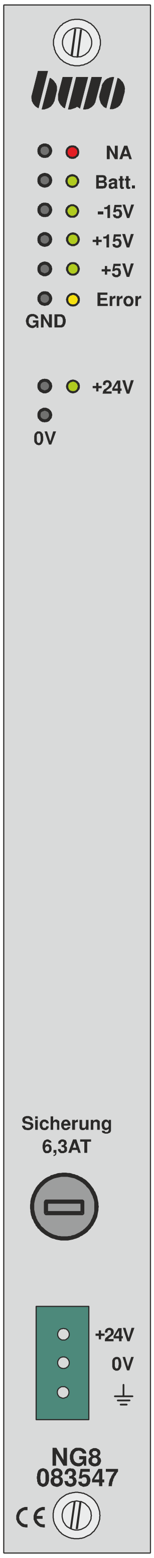


3. Power units

3.1 Power unit NG8

The power pack NG8 supplies to the operation the modules required voltages.

The NG8 requires on chassis also 1 slot (art. No. 083580).



Performance index J from
with LED for fault condition
and advanced features

Red LED	power failure signal
Green LED	back-up battery
Green LED	-15V
Green LED	+15V
Green LED	+ 5V
Yellow LED	fault condition
	0V secondary
Green LED	+24 V
	0V primary

Protection 6,0AT

Input
+24V
0V
Screen (housing)

3.1 Power unit NG8 (continuation)

The power pack actual as galvanically separate DC DC converter executed. The primary input 0V does not have an internal galvanic connection with the secondary output GND.
The input voltage UE always refers to 0V, the output voltages UA and the NA signal to GND.

Inputs

Input voltage	UE	$24V_{DC}$ admissible area $22V_{DC}$ to $35V_{DC}$ three-phase bridge, max. ripples $3V_{SS}$ max. rise time of 0V on 24V: 60ms
Input current	IE	4A with UE $24V_{DC}$ and a load with 5V of 8A and with ±15V of 0,5A

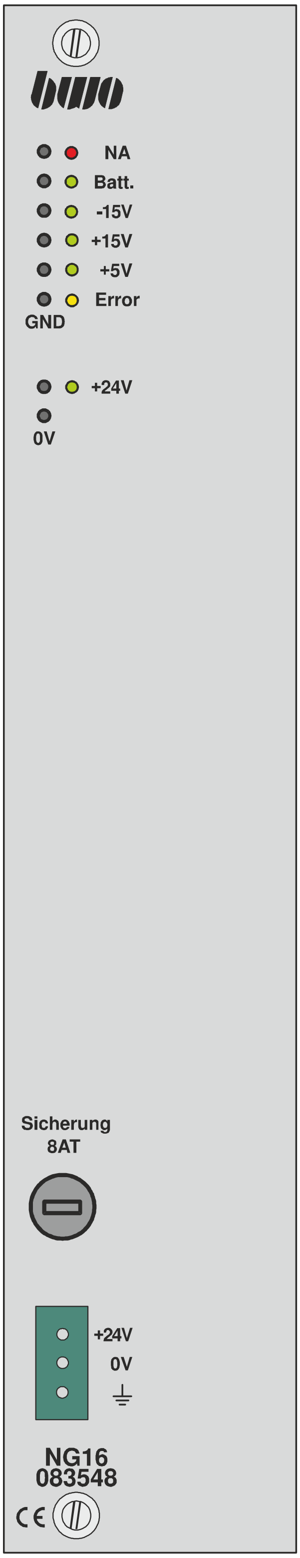
Outputs

Output voltage	UA_{+5}	+5,1V, ±2%	
Output current	IA_{+5}	8A,	durable short-circuit proof (switching off)
Output voltage	UA_{+15}	+15V, ±3%	
Output current	IA_{+15}	0,5A,	durable short-circuit proof (switching off)
Output voltage	UA_{-15}	-15V, ±3%	
Output current	IA_{-15}	0,5A,	durable short-circuit proof (switching off)

3.2 Power unit NG16

The power pack NG16 supplies to the operation the modules required voltages.

The NG16 requires on chassis also 2 slots (art. No. 083581).



Performance index J from with LED for fault condition and advanced features

Red LED	power failure signal
Green LED	back-up battery
Green LED	-15V
Green LED	+15V
Green LED	+ 5V
Yellow LED	fault condition
	0V secondary
Green LED	+24 V
	0V primary

Protection 8,0AT

Input
+24V
0V
Screen (housing)

3.2 Power pack NG16 (continuation)

The power pack actual as galvanically separate DC DC converter executed. The primary input 0V does not have an internal galvanic connection with the secondary output GND.
The input voltage UE always refers to 0V, the output voltages UA and the NA signal to GND.

Inputs

Input voltage	UE	24V $_{DC}$ admissible area 22V $_{DC}$ to 35V $_{DC}$ three-phase bridge, max. ripples 3V $_{SS}$ max. rise time of 0V on 24V: 60ms
Input current	IE	8A with UE 24V $_{DC}$ and a load with 5V of 16A and with ±15V of 1A

Outputs

Output voltage	UA $_{+5}$	+5,1V, ±2%	
Output current	IA $_{+5}$	16A,	durable short-circuit proof (switching off)
Output voltage	UA $_{+15}$	+15V, ±3%	
Output current	IA $_{+15}$	1A,	durable short-circuit proof (switching off)
Output voltage	UA $_{-15}$	-15V, ±3%	
Output current	IA $_{-15}$	1A,	durable short-circuit proof (switching off)

3.3 Security features for NG8 / NG16 from index J

Overtemperature protection

The power unit is provided with a temperature sensor, which to me the heat sink temperature is measured and can be switched on when required, the internal mini fan. The unit runs up to a temperature of 60 ° C without fan support. At temperatures above 60 ° C, the internal fans are switched on. Should rise by a lack of ventilation or excessive ambient temperature, the internal temperature to 90 ° C, the unit switches off.
There are tensions and set off all the signal to L-NA.
At the same error code is returned seventh. This state is maintained even when the temperature is again dropped in the meantime. A reset of the error message is only possible by turning off the set.

Over Voltage protection

The power supply detects voltages that exceed the maximum input voltage of 35V.
For overvoltage, all output voltages and set off the signal to L-NA, the same error code 8 is issued. This condition can only be reset by switching off the unit, even if the over Voltage in the meantime has fallen again.
If the voltage rises to more than 40V, it can blow the internal protection diode and the input fuse. In this case, the adapter needs to be returned for repair to BWO. If the supplying external power supply in the event a short circuit current of >9A in NG8 or >12A in NG16 can provide, the internal input fuse may not solve and can lead to severe fire damage inside the power supply.

Short circuit shutdown

All output voltages are short circuit proof. For short duration> 1s the corresponding output is switched off. To restart the power supply again after a short circuit, the operating voltage must be switched off. It has long been waiting to be switched on again until all LEDs are extinguished completely at least 2s.
Will be switched on again is not guaranteed that all monitoring circuits are reset. Can the power supply does not turn on despite adequate reset time, so there is an error.

Combination of the output voltages

The +5 V voltage is the leading power and is first launched.
Then ± 15V can be connected. The +15 V and -15V are interrelated and can only appear together.
The failure of a 15V voltage, the respective inverse voltage is also switched off.
With the failure of the +5 V, ± 15V voltage is switched off.

3.3 Security features for NG8 / NG16 from index J (continuation)

Sensor line

The power unit is provided with a sensor line input. This input controls from the voltage drop, which can exist at high currents on the 5V line to the modules.
Ensure that the scheme is working properly, the sensor cable must be connected to the chassis on the last +5 V line. This connection is made via the bus terminator (083 679).
Without the bus terminator to the network device may not work properly and it will shut down all voltages, simultaneously displayed error code 3 and set the signal to L-NA.

Internal communication error

Occur in communication between primary and secondary controller error, error code is issued one, the signal is set to L-NA and off all voltages.

'NA' Power failure signal

LED lights up when standing on level L.
LED turns off when level is at H.
The NA signal in the system is directly connected to all outputs. A low level of NA signal causes immediate shutdown of the outputs. The NA signal is designed as an open-drain output and can even be linked with other modules.

'Batt.' Buffer battery

LED lights up when the backup battery module (083 678) provides a sufficiently high voltage.
When changing the CPU, the LED may briefly be extinguished until the internal buffer capacitor is charged.

3.4 Diagnostics for NG8 / NG16 from index J

The power supplies have an index J from extended functionality.

The current internal control hardware has been replaced by a controller with two microcontrollers. A micro-controller on the primary side of the power supply monitors the input voltage, the NA-evaluation and the heat sink temperature. A second microcontroller monitors on the secondary side of the output voltages and the backup battery.

Both controllers are connected via a through galvanically isolated serial interface connected to each other. Can be connected to a yellow error LED by a different number
issued by flashing an error code pulses for 8 different fault conditions.
An error code consists of 1 to 8 flash pulses of 0.3 s length.
This is followed by an ad break of 1.3 s.
Arises between the ad breaks, the error code from the number of flashes.

Error code NG8 / NG16

- 1 An internal communication error, power supply is switched off, NA = L
- 2 Lower voltage at 24V input was available, power supply is switched off, NA = L
- 3 + 5V failure due to overload or missing bus termination, power supply is switched off, NA = L
- 4 + 15V failure due to overload, switch off ± 15V, NA state is not changed
- 5 - 15V fault caused by overload, switch off ± 15V, NA state is not changed
- 6 battery voltage has dropped below 2.5 V, power supply continues, NA condition is not changed
- 7 temperature ≥ 90 °C was present power supply is switched off, NA = L
- 8 ≥ 36V voltage at 24V input was available, power supply is switched off, NA = L

Status LEDs
The power supply is equipped with 7 LEDs that indicate the current operating condition visually. In addition to the LED test sockets are arranged, in which measured it with a multimeter, the voltage corresponding to about 2 mm test plugs can be.
About the test sockets may be removed no electricity, because the cross section is not designed for a current load!

24V LED (green)
LED lights up when the primary input voltage has reached the applicable internal workspace of > 20V. At voltages <18V, the LED goes out, the same error code is output 2 and set the signal to L-NA, +5 V and ± 15V are switched off.

+5V LED (green)
LED lights when the 5V output voltage has reached a value of >4.7V and disappears when the 5V voltage has dropped to <4.5V, at the same time, error code 3 and set the output signal to L-NA.

3.4 Diagnostics for NG8 / NG16 from index J (continuation)

+15 V LED (green)

The LED displays directly to the presence of the +15 V output voltage. If the voltage drops to <+13.5V, ±15V converter blocked, the same error code is 4 and the output signal remains at NA H.

-15 V LED (green)

The LED displays directly to the presence of the -15 V output voltage. If the voltage drops to <-13.5V, ±15V converter blocked, the same error code is 5 and the output signal remains at NA H.

Battery LED (green)

The LED shows a sufficiently high voltage of the backup battery module (083 678), which must be attached to the left side of the power supply chassis. The battery LED will turn off when the float voltage is dropped to <2.5 V, the same error code 6 is issued.
The buffer voltage monitor also works in case of failure of the +5 V supply.
In this case, the error code displayed in succession .. 6 + 3.

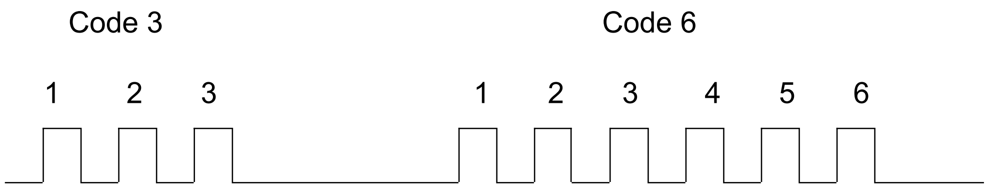
NA LED (red)

This LED indicates the status of the power failure signal.
LED on = low level, LED off = H level.
The NA signal in the system is directly connected to all output cards and analog outputs. A low level of NA signal causes immediate shutdown of the outputs. The NA signal is designed as an open-drain output and can be linked with other modules.
A system generated within the NA-L-level signal can now be recognized by the network device and turns on the LED-NA.

Error LED (yellow)

LED indicates a fault condition of the power supply.
LED off = normal mode, no error
LED flashing = error condition, number of flash pulses see Error Code

It can also be more error codes are displayed in a row. For example:
Code 3 and Code 6 This error condition occurs when a network device without a backup battery and is operated without bus termination.



3.4 Diagnostics for NG8 / NG16 from index J (continuation)

Further diagnostic function

The 0V test socket has a dual function and is designed as a switching jack. The various functions by inserting a test plug (2mm) is triggered in half or full length.

ATTENTION: This function tests may only take place without active drives!

- Normal function: test plug is inserted half = Error LED off
In this position, together with the +24 V input voltage, the primary test socket
the DC-DC converter can be measured. This voltage is smaller than that on the 24V
Jack on applied voltage.
The voltage drop caused by the existing internal filters and protection circuitry.

- Diagnostic function: test plug is inserted into full-length = Error LED is on
In this position, the fault Power supply shutdown and removed all memory errors are reset.
The power supply is now working in the current-limited mode and it can be determined by measuring the voltage at the test jacks, which of the three output voltages is not in order.
Is e.g. the +5 V power overloaded, and in normal operation, all voltages
off. Diagnosed with this cut-off function is canceled. It can be switched any existing tensions active.
By measuring the corresponding test sockets can now be determined, the incorrect voltage.

Is measured, for example on the 5V jack only 3.5 V, then by subtracting the individual
Modules from the chassis, the control module to determine the cause of the overload. The voltage should then rise again to 5V.
The same applies for the ± 15V voltages.

If after these tests with the function modules is still an incorrect voltage is measured, the power supply can be faulty.
The power supply should be given for repair.

The diagnosis function may only be used temporarily for troubleshooting purposes.
The operation of the CNC controller with plugged test plug is not permitted!

3.5 Selection of the power pack

For the selection of a suitable power supply, the sum of the current set of modules is determined.

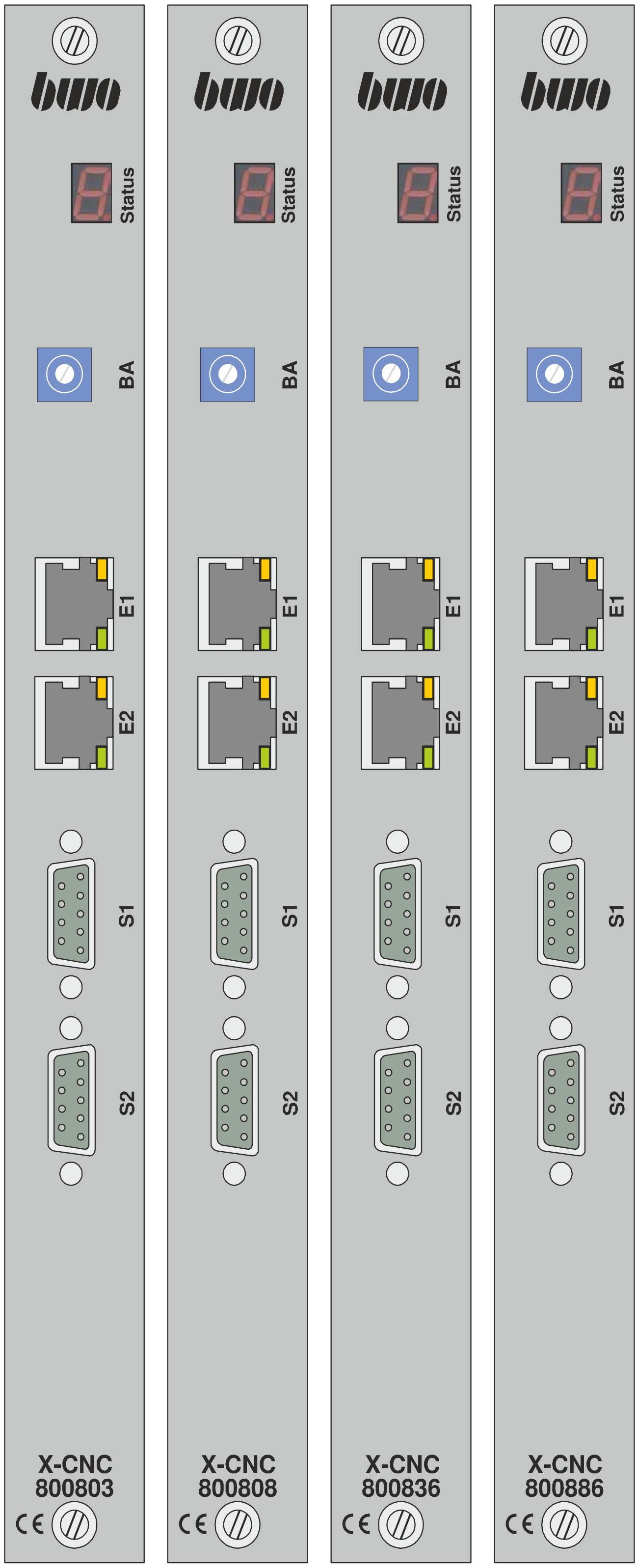
Current consumption of the modules. All entries for DC current in mA

Modules	Art.-NO.	+5V		+15V	-15V	Buffer-battery 3,6V
X-CPU modules						
X-CNC 32Bit	800803	2000		6	6	0,01
X-CNC 32Bit ETH	800833	2000		6	6	0,01
X-CNC 64Bit	800836	2300		6	6	0,01
X-CNC 64Bit ETH	800863	2300		6	6	0,01
X-CNC fanless	800884	2100		6	6	0,01
CNC-axes modules						
AAZ1	083637	400	*	40	18	
AAZ2	083705	420	*	29	50	
AAZ4	083549	630	*	58	100	
AZA2	083937	500	*	28	40	
AZA4	083936	700	*	50	70	
ASM3	084079	400	*	50	35	
SERC	084544	500	*	--	--	
Positioning modules						
POS	083545 / 083672	1200 / 1300	*	42	70	0,01
POA	083673 / 083674	1200 / 1300	*	42	70	0,01
SMM	083676 / 083677	1050 / 1160	*	50	30	0,01
I/O-modules						
AEK / SEA	083950 / 084126	140 / 250	Ausgänge aus / ein	--	--	
EK	083946	110		--	--	
AK	083942	155 / 380	Ausgänge aus / ein	--	--	
AK2	083541	145 / 250	Ausgänge aus / ein	--	--	
AKR	083540	150 / 250	Ausgänge aus / ein	--	--	
ADW4 /ADW4E	083755 / 084647	320		20	3	
ADWI4	088755	320		20	3	
DAW2	083706	320		29	50	
DAW4	083736	320		58	100	
Communication modules						
COM	083708	980		--	--	
ETH	084185 / 084309	1150		0 / 500	--	
AS-I 1 Master	084187	475		4	4	
AS-I 2 Master	084425	565		4	4	
BUS terminal / Interfaces						
Bus terminal	083679	170		--	--	
20mA	083589	10		40	--	
RS232	083897	1		15	--	
RS422/485	084539 / 08458	1		--	--	

* Additionally, the power consumption of the connected measuring systems are considered.
The total power consumption may not cross the nominal output current of the used power supply unit.

4. Central units

4.1 Central unit CNC X-CNC 32Bit and 64Bit



Connections and display

Standard design	32Bit CPU art.-no. 8008003
Export version	32Bit CPU art. no. 800808
Standard design	64Bit CPU art. no. 800836
Export version	64Bit CPU art. no. 800886

Status display 7 segment

switch mode

LEDs on RJ45

Green lights up:	Cable puts, connection actual in order
Yellow lights up:	CPU transmits

Connections

E1 EtherNet RJ45
Standard interface for operating consoles RC910 and operating panels CNC910 / CNC920 / CNC930

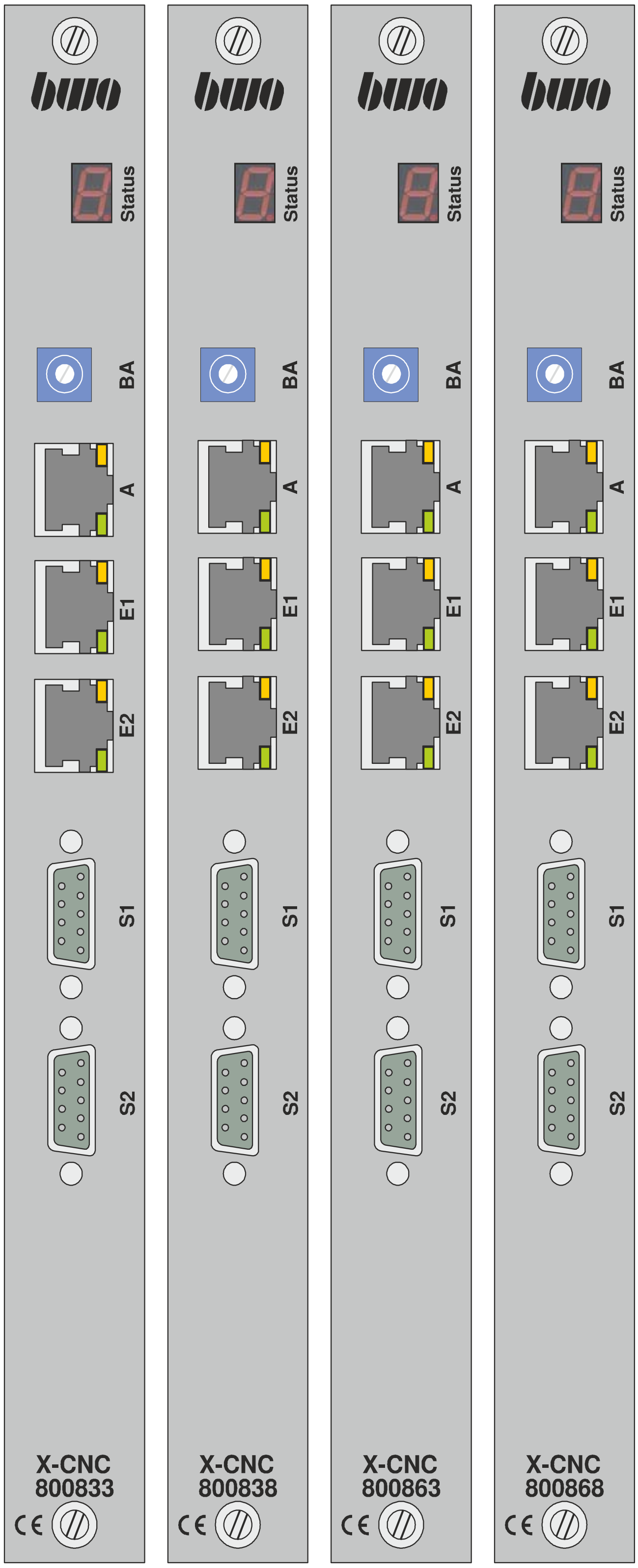
E2 EtherNet RJ45
standard interface
for programmers and servers

S1 9-polige D-SUB-socket
Serial interface for programming devices with 20mA Adapter

S2 9-polige D-SUB-socket
Serial interface for operating panels

20mA	32Bit CPU (option)
RS422/485	64Bit CPU (option)

4.1 Central unit X-CNC 32Bit and 64Bit ETH- CNC axis control



Connections and display

Standard design	32Bit CPU art. no. 800833
Export version	32Bit CPU art. no. 800838
Standard design	64Bit CPU art. no. 800863
Export version	64Bit CPU art. no. 800868

Status display 7 segment

switch mode

LEDs on RJ45

Green lights up:	Cable puts, connection actual in order
Yellow lights up:	CPU transmits

Connections

A Ethernet RJ45 10/100 MBit
Axis control for digital drive buses

E1 EtherNet RJ45
Standard interface for operating consoles RC910 and operating panels CNC910 / CNC920 / CNC930

E2 EtherNet RJ45
standard interface
for programmers and servers

S1 9-polige D-SUB-socket
Serial interface for programming devices with 20mA Adapter

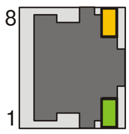
S2 9-polige D-SUB-socket
Serial interface for operating panels

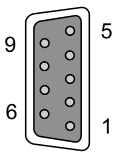
20mA	32Bit CPU (option)
RS422/485	64Bit CPU (option)

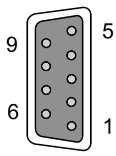
4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

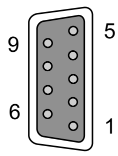
Interfaces and socket allocation

A und **E1** und **E2** 8-polige socket RJ45	**S1** and **S2** with(Option) 20mA-Adapter 9-polige D-SUB-socket		**S1** and **S2** with (Option) RS422/485-Adapter 9-polige D-SUB-socket		**S1** and **S2** with(Option) V24/RS232 Adapter 9-polige D-SUB-socket	
	1	shield	1	shield	1	shield
	2	transmitter+	2	-	2	RX
allocation	3	transmitter-	3	transmitter+	3	TX
see	4	20mA-Power source	4	-	4	DTR
down	5	GND	5	transmitter-	5	GND
	6	20mA-Power source	6	-	6	DCD
	7	acceptor -	7	acceptor -	7	RTS
	8	acceptor +	8	acceptor +	8	CTS
	9	GND	9	GND	9	-









EtherNet Sockets A and E1 and E2

- with all terminals, like PC, operating panel, CNC CPU, the allocation of the RJ45 equal socket.
- Hub's have a turned allocation.

If the devices are connected over a stroke (interlaced), then 1:1 **cable is** required.

If those are directly **interconnected** to device, then turned **cables** (CROSS over) are to be used.
- direct connection used with operating panel < - > CNC,
- or if no stroke available actual also with CNC < - > PC (Labtop).

There are colored plug housings. Thus the cables can be also visually differentiated.
BWO uses blue plugs with 1:1 cable and red plugs with turned cable.

Allocation RJ45 plug operating panel CNC E2

1	OP	\	
2	ON	|	
3	IP	|	
4	-	|>>	The assignment is in the sockets A and E1 and E2 are the same
5	-	|	
6	IN	|	
7	-	|	
8	-	/	

4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

Interfaces and socket allocation

Schnittstellen

A **Ethernet RJ45 10/100 Mbit**
Axis control: Digital drive buses
to drive digital axes and
IO modules
SERCOS III [1], PROFINET [1], ETHERCAT [1]
(1 are registered trademarks of the companies: SERCOS International eV, Siemens, Beckhoff)

E1 **Ethernet RJ45 10/100 MBit**
Standard interface
for control panels and RC910,
for the panels CNC910, CNC920, CNC930

E2 **Ethernet RJ45 10/100 MBit**
Standard interface
for programming devices and servers

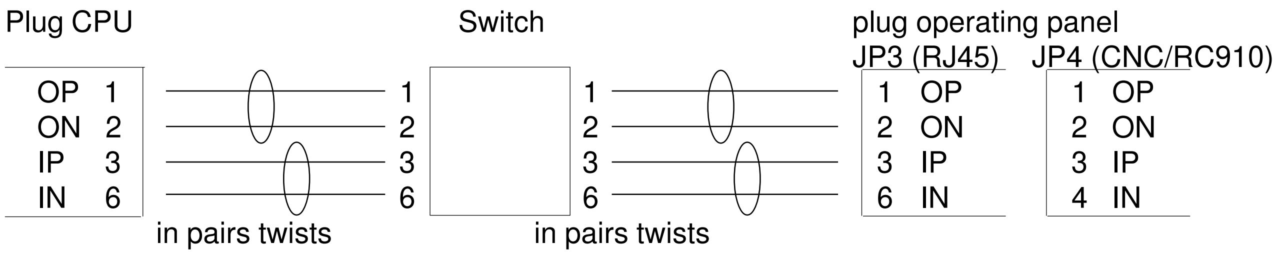
S1 **9-polige D-SUB-socket**
Free serial interface
20mA, RS422/485, RS232

S2 **9-polige D-SUB-socket**
Free serial interface
20mA, RS422/485, RS232

4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

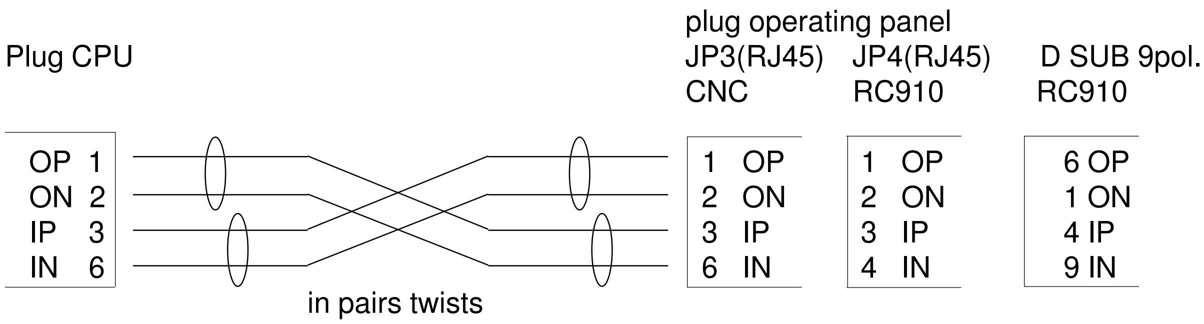
Interfaces and socket allocation

1:1 cable for networking CNC CPU < - > stroke (plug colour blue)



Alternatively, a direct connection is possible even without a switch!

Turned cable for direct connection CNC CPU < - > operating panel,
Operating panel < - > PC and CNC CPU < - > PC (plug colour red



The pins 5, 7, 8 may not be used when using the socket E1 on the X CNC CPU.

Operating mode selector switch

0 Normal operation(Flashboot)
1 Fixed IP address 172.16.20.180
2 RBOOT (CPU boots via Panel)
3 - not assigned
4 Panel on S2 (z.B.: CNC900C)
5 - not assigned
6 - not assigned
7 CMD 2 PLC-flag an overall reset
8 Diagnostic mode / monitor in RAM
9 Diagnosis mode / monitor in the EPROM, screen via S2 (9600/8/1/n)

4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

Data for standard and export versions

Execution	X-CNC 32Bit ETH		X-CNC 64Bit ETH	
	Standard	**Export**	**Standard**	**Export**
Item number	800803	800808	800836	800886
dto. (with ETH-axis control)	800833	800838	800863	800868
Clock speed	500 MHz		1 GHz	
Flag memory	60 kB		60 kB	
NC memory	8 MB		64 MB	
NC memory	ca. 400 MB		ca. 400 MB	
Parameter	30 000		60 000	
Channels	4		8	
Axes	16		32	
Linear interpolation in axes	16	4	32	4
Circular interpolation axes in	3 +13	2+1	3 + 29	2+1
Screws interpolation axes	2 +14	*	2 + 30	*
Spline-Interpolation	•	*	•	*
Polynom-Interpolation	•	*	•	*

• Function is only available for standard versions

* Function is not possible with export-version

4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

Weitere Eigenschaften und Funktionen

- Spline interpolation *
- Polinom interpolation *
- Several spindles
- Tangential axis
- Couple, reflect and exchange axes
- Restarting after discontinuation
- Feed, corner, county and contour dynamics
- Electronic gear
- Handwheel
- Digital and analog drives
- Polar coordinate system
- Polar-Transformation
- Robot-Transformation ** / Tool / workpiece coordinate
- Robot transformation folding arm, SCARA, etc.
- Axes and graphics simulation
- Rotate, reflect and move coordinates
- Measuring and adapting cycles
- Interpolation levels
- Tool radius path correction
- Automatic selection of linear and circular interpolation
- Zero points / zero point offset
- Contour short programming
- Parameter calculation
- Diagnostic functions
- Free programmable cycles
- Freie Konnektivität zu Netzwerk- Servern / Internet
- Programmable in DIN 66025 or in high-level programming language C

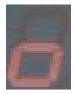
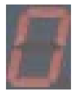
* not possible with export-version

** with max. 4 axes at export-version

4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

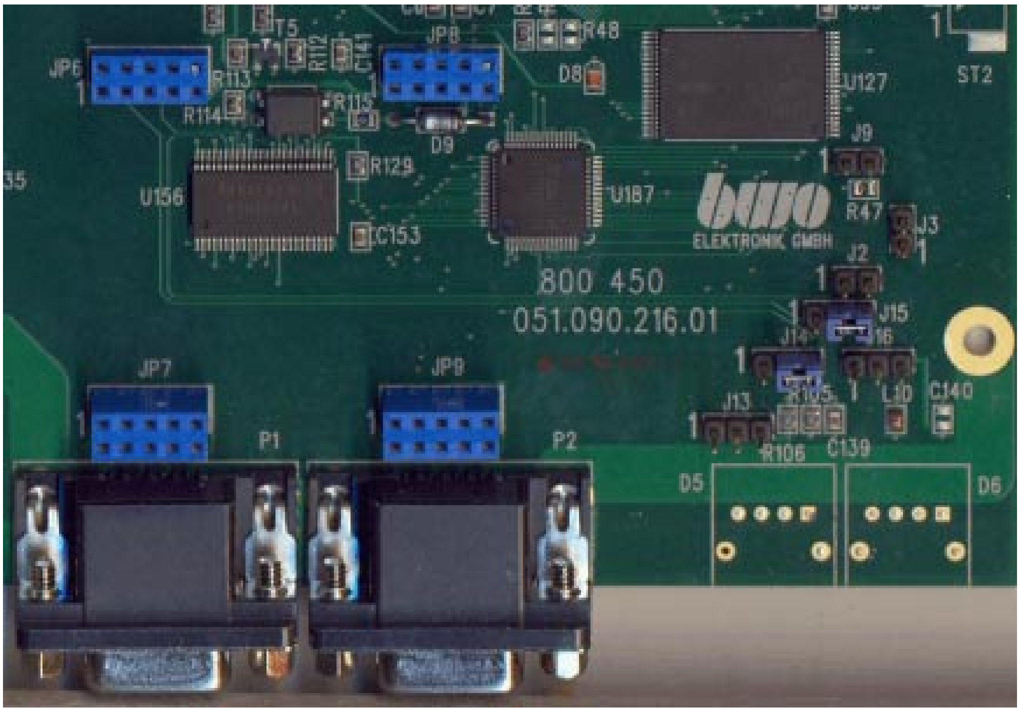
Status diagnosis function

The 7-segment display 'Status' indicates the hardware state of the CPU.

Display	Function
Bottom four segments circle	- all right - The power-on routine is not finished yet. 
Outer circle six segments circle	- all right, everything goes 'round' - The power-on routine is finished. 
off	CPU defectively, no voltage, display defectively.
0	CPU in the monitor operation.
8.	Hardware-reset.
1 - 9	Hardware test after that boats. If status remains 1 - 9, if the hardware test was not ok - > CPU defective.
E blinks	Error while the loading of the operating system.
E1	Fatal error, please contact BWO.
E2	Fatal error, please contact BWO.
E3	Fatal error, please contact BWO.
F	Operating system is loaded from the flash.
F0	Hardware failure, module or network is down.
F1	Buffer battery is defective.
F2	Voltage ± 15V defective.
F3	Buffer battery and voltage ± 15V defective.
F4	CPU fan failure.

4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

jumper settings



Extradition status: S1 serial, S1 is active, J14 PIN 2 and 3 closed
J15-PIN 2 and 3 close

4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

assembly view

Mode switch position 4
(S2 when using the control
Panel is connected)

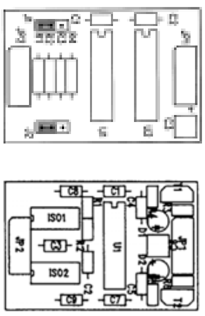
Position of the interfaces

A

E1

E2

CNC panel



S1

S2

Port A only for version "CNC axis control drive" is available.

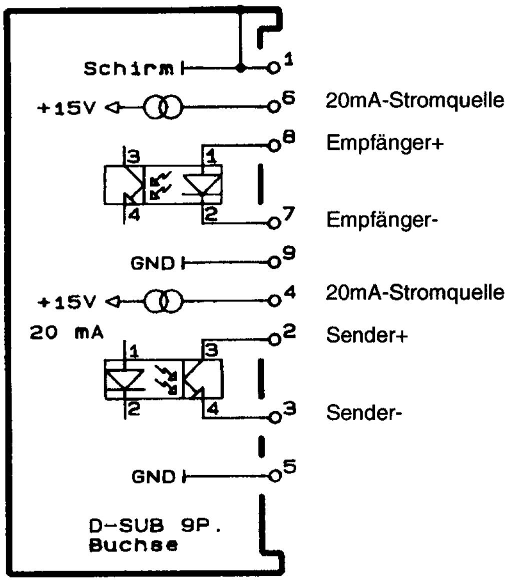
4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

Interface adapter for connection socket 'Control Panel' / 'networking'

TTY / 20mA - Interface

art. no. 083589

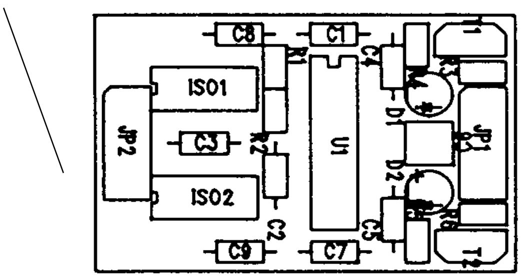
circuit



Assembly

The adapters are by their male protected from Twisted touchdown.

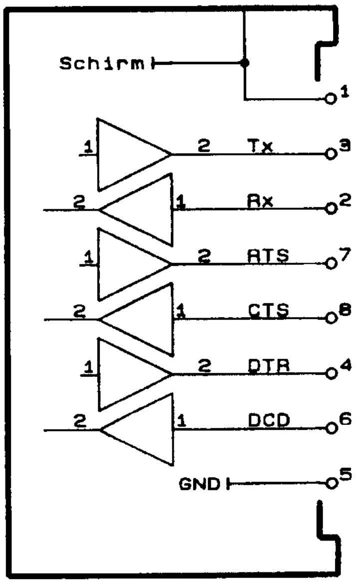
This page shows the module front.



RS232 / V24 - Interface

art. no. 083897

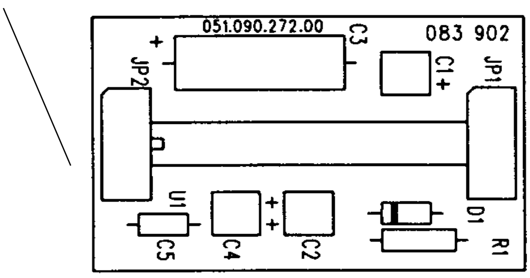
circuit



Assembly

The adapters are by their male protected from Twisted touchdown.

This page shows the module front.



4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

Interface adapter for connection socket 'Control Panel' / 'networking'

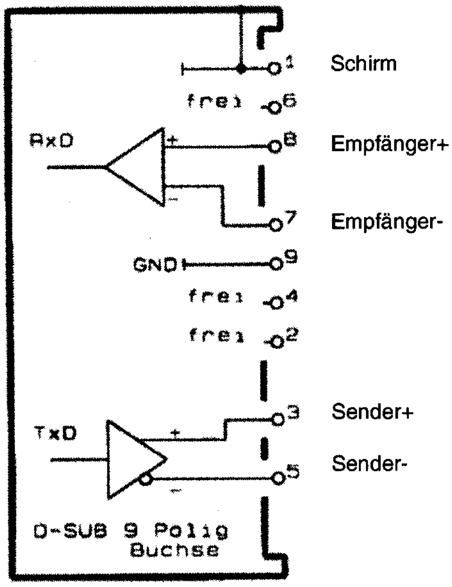
RS422 - Interface untagged

art. no. 084589
Data transfer with 9600B

RS422 - Interface with identifier

art. no. 084539
Data transfer with 115KB

circuit



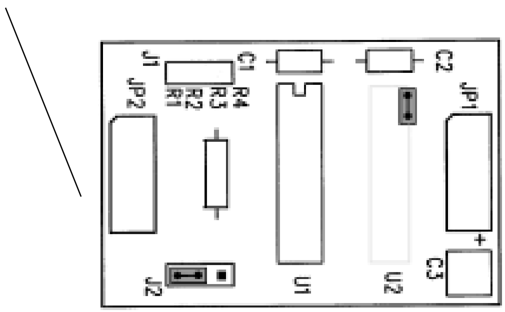
Betriebsartenauswahl

J1	RS422	RS485	RS485
J2	vollduplex	Halbduplex	vollduplex

Assembly

The adapters are by their male protected from Twisted touchdown.

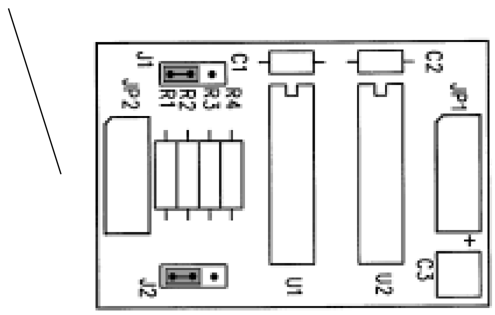
This page shows the module front.



Assembly

The adapters are by their male protected from Twisted touchdown.

This page shows the module front.



4.1 Central unit X-CNC 32Bit and 64Bit (continuation)

Schnittstellen und Buchsenbelegung

Assignment of 9-pin. Sockets 'S1' / 'S2'
with TTY - 20mA - Adapters
Sender und Empfänger wahlweise aktiv oder passiv in Stecker brücken

Pin 1	shield
Pin 2	Sender+
Pin 3	Sender-
Pin 4	20mA-Stromquelle
Pin 5	GND
Pin 6	20mA-Stromquelle
Pin 7	Empfänger-
Pin 8	Empfänger+
Pin 9	GND

Assignment of 9-pin. Sockets 'S1' / 'S2'
with RS422/485 - Adapters

Pin 1	shield
Pin 2	-
Pin 3	Sender+
Pin 4	-
Pin 5	Sender-
Pin 6	-
Pin 7	Empfänger-
Pin 8	Empfänger+
Pin 9	GND

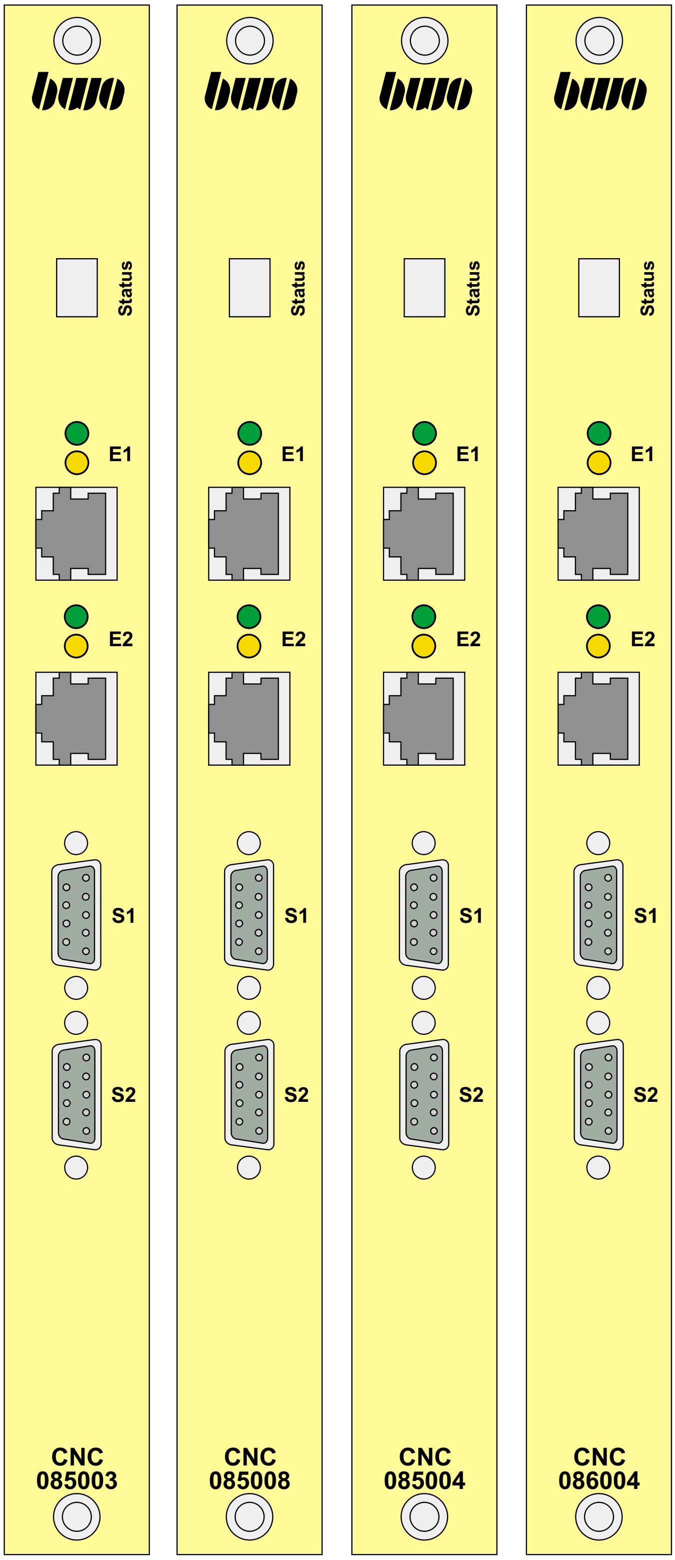
Assignment of 9-pin. Sockets 'S1' / 'S2'
with V24 - RS232 - Adapters

Pin 1	shield
Pin 2	Rx
Pin 3	Tx
Pin 4	DTR
Pin 5	GND
Pin 6	DCD
Pin 7	RTS
Pin 8	CTS
Pin 9	-

4.2 Central unit CNC ETH

Connections and display

Standard design	32Bit CPU art. no. 085003
Export version	32Bit CPU art. no. 085008
Standard design	64Bit CPU art. no. 085004
Export version	64Bit CPU art. no. 086004



Status indication

Light emitting diodes

Green lights up: Cable puts, connection actual in order

Yellow lights up: CPU transmits

Connections

E1 EtherNet RJ45
Standard interface for operating consoles RC910 and operating panels CNC910 / CNC920

E2 EtherNet RJ45
standard interface for programmers and servers

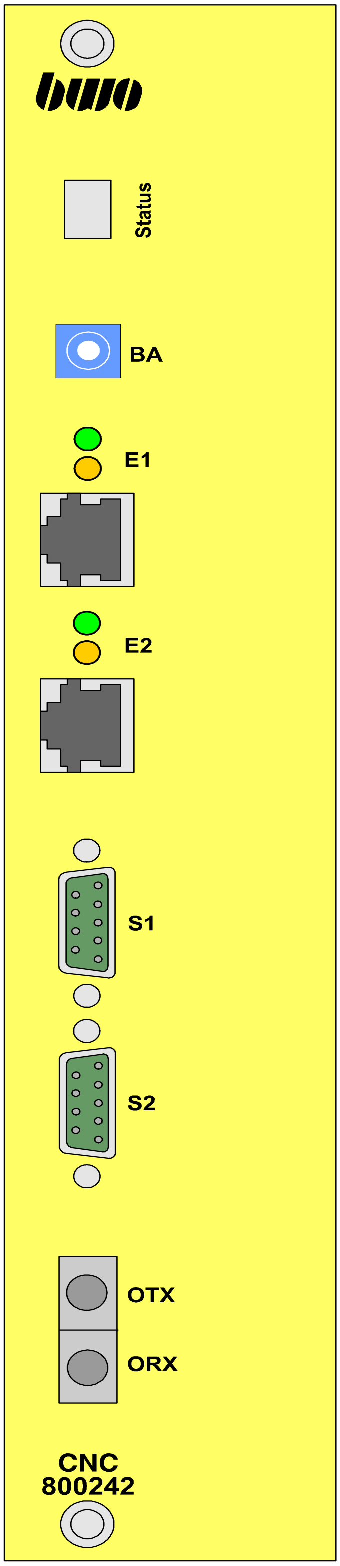
S1 9-polige D-SUB-socket
Serial interface for programming devices with 20mA Adapter

S2 9-polige D-SUB-socket
Serial interface for operating panels
20mA 32Bit CPU (option)
RS422/485 64Bit CPU (option)

4.2 Central processing unit CNC ETH high performance 64Bit

Connections and display

High Performance version 64Bit CPU
art. no. 800242



Status indication

Light emitting diodes

Green lights up: Cable puts, connection actual in order

Yellow lights up: CPU transmits

Connections

Interfaces

E1 **Ethernet RJ45** 10/100 MBit
standard interface
for the operating panels CNC920, CNC930/10, CNC930/15

E2 **Ethernet RJ45** 10/100 MBit
standard interface
for programmers and servers

S1 **9-polige D-SUB-socket**
for serial interface (option)

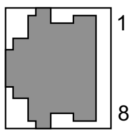
S2 **9-polige D-SUB-socket**
for serial interface (option)

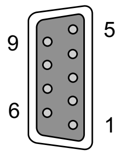
OTX **serial output visually**
ORX **serial input visually**
alternative with S1

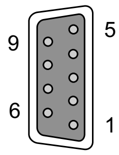
4.2 Central unit CNC ETH (continuation)

Interfaces and socket allocation

E1 and **E2** 8-polige socket RJ45	**S1** and **S2** (with 32Bit) with 20mA Adapter (option) 9-polige CD-SUB-socket		**S2** (with 64Bit) with RS422/485 Adapter (option) 9-polige CD-SUB-socket	
	1	shield	1	shield
	2	transmitter +	2	-
allocation	3	transmitter -	3	transmitter +
see	4	20mA Power source	4	-
down	5	GND	5	transmitter -
	6	20mA Power source	6	-
	7	acceptor -	7	acceptor -
	8	acceptor +	8	acceptor +
	9	GND	9	GND







EtherNet Sockets E1 and E2

- with all terminals, like PC, operating panel, CNC CPU, the allocation of the RJ45 equal socket.
- Hub's have a turned allocation.

If the devices are connected over a stroke (interlaced), then 1:1 **cable is** required.

If those are directly **interconnected** to device, then turned **cables** (CROSS over) are to be used.
- direct connection used with operating panel < - > CNC,
- or if no stroke available actual also with CNC < - > PC (Labtop).

There are colored plug housings. Thus the cables can be also visually differentiated.
BWO uses blue plugs with 1:1 cable and red plugs with turned cable.

Allocation RJ45 plug operating panel CNC E2

1	OI
2	ON
3	IP
4	-
5	-
6	IN
7	-
8	-

4.2 Central unit CNC ETH (continuation)

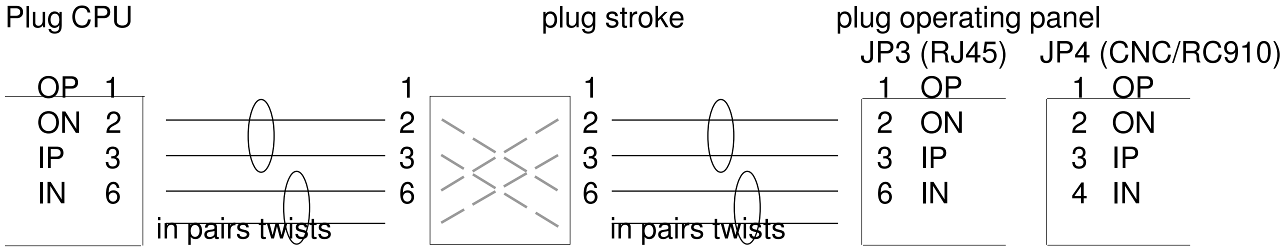
Interfaces and socket allocation

Allocation RJ45 plug CNC E1

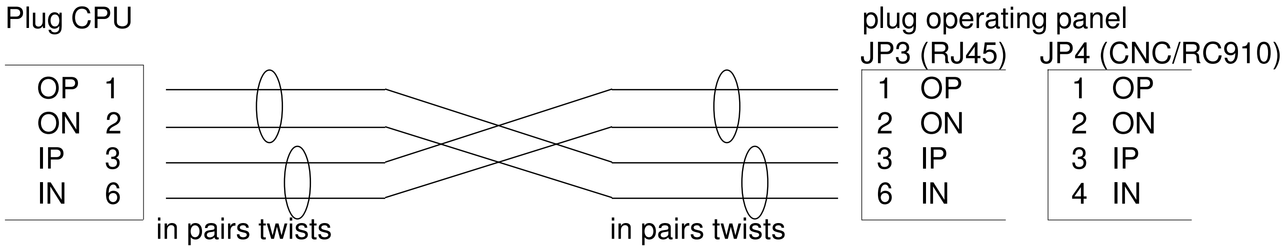
1	OI	
2	ON	
3	IP	
4	-	
5	Debug	With low the CPU reacts to default IP addresses, e.g. 172.16.20.180
6	IN	
7	RESET	With low hardware RESETS of the CPU
8	GND	

Note: With the socket E1 additional signals are available. The pins 5, 7, 8 may not be connected in the cable, since otherwise interferences can impair the function of the CNC CPU.

1:1 cable for networking CNC CPU < - > stroke (plug colour blue



Turned cable for direct connection CNC CPU < - > operating panel,
Operating panel < - > PC and CNC CPU < - > PC (plug colour red



The pins 5, 7, 8 may not be occupied on use of the socket E1 on the CNC CPU.

4.2 Central unit CNC ETH (continuation)

Data for Standard and Export version

Version	**CNC 32Bit ETH**		**CNC 64Bit ETH**		**CNC 64Bit ETH**
	Standard	**Export**	**Standard**	**Export**	**High Performance**
Item No	085003	085008	085004	086004	
Clock frequency	240MHz		240MHz		1 GHz
Flag memory	60kB		60kB		60 KB
NC memory	1,5MB		3MB		8 MB
Flash- Saving	-		-		512MB
Memory instructions	16ki		64ki		64 ki
Parameter	30 000		60 000		60 000
Channels	4		8		8
Axis	16		32		3,2
Linear nterpolation in axis	16	4	32	4	32
Circular interpolation in axis	3 +13	2+1	3 + 29	2+1	3 + 29
Screw interpolation in axis	2 +14	-	2 + 30	-	2 + 30
Spline interpolation	•	-	•	-	•
Polynom interpolation	•	-	•	-	•

• Function is only possible by standard design

- Function is not possible by export version

4.2 Central unit CNC ETH (continuation)

- Several spindles
- Tangential axis
- Axes couple, reflect and exchange
- Restarting after abort
- Feed, corners, circle and outline dynamics
- Electronic gears
- Handwheel
- Digital and analog drives
- Polar coordinates system
- Polar transformation
- Robot transformation ** / tool coordinates / workpiece coordinates
- **Robot transformation for 6 axes folding arm, SCARA *****
- Axes and graphic simulation
- Coordinates turn, reflect and shift
- Measuring cycles and processing cycles
- Interpolation plane selection
- Tool radius path correction
- Automatic selection of linear and circular interpolation
- Zero points / zero point shift
- Outline path short programming
- Parameter calculation
- Diagnostic functions

** with max. 4 axes by export version

*** only for CPU 64 bits high performance

4.2 Central unit CNC ETH (continuation)

Diagnostic function status

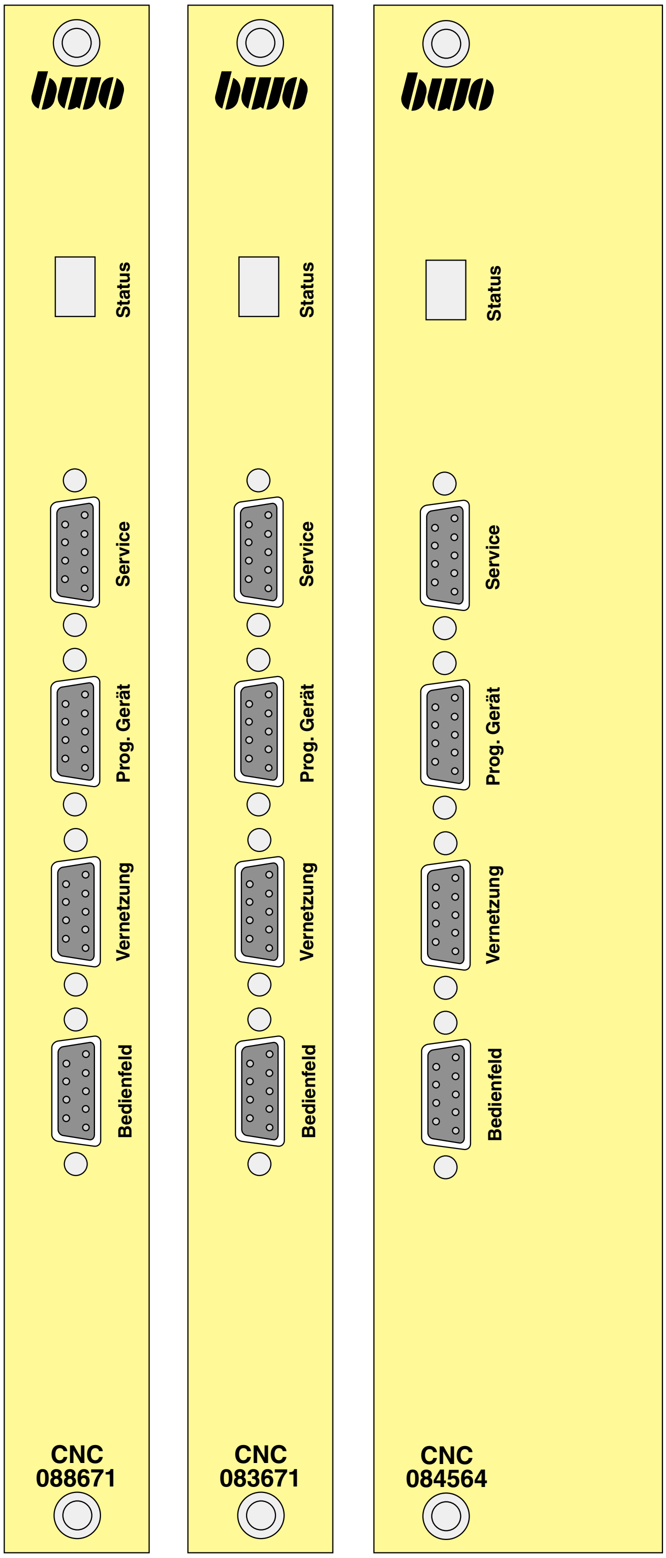
The 7 section display ‘ status ‘ shows the hardware status of the CPU on.

Display	Function
Segments circle	everything in order, everything runs ‘ approximately ‘.
off	CPU defectively, no voltage, display defectively.
0	CPU in the monitor operation.
8.	Hardware RESET.
1 - 9	Hardware test after that boats. If status remains 1 - 9, if the hardware test was not ok - > CPU defective.
b	Writing in the flash, do not switch off.
E blinks	Error while the loading of the operating system.
E1	Fatal error, please contact BWO.
E2	Fatal error, please contact BWO.
F	Operating system is loaded from the flash.
F0	Hardware failure, module or network is down.
F1	Buffer battery is defective.
F2	Voltage ± 15V defective.
F3	Buffer battery and voltage ± 15V defective.
F4	CPU fan failure.

4.3 Central unit CNC

Connections and display

Version with reduced Function range	CNC E 32Bit art. NR. 088671
Standard design	CNC 32Bit art. NR. 083671
Standard design	CNC 64Bit art. NR. 084564



Status indication

Connections

Service
9-pin D-Sub-socket
Interface RS422/485

Prog. device
9-pin D-Sub-socket
Interface 20mA

Networking *
9-pin D-Sub-socket
Interface standard without adapters
alternatively with adapter RS422/485
or with adapter RS232

Operating panel
9-pin D-Sub-socket
Interface standard with adapter 20mA
alternatively adapter RS422/485

* Networking not with CNC E (088671)

4.3 Central unit CNC

Interfaces and socket allocation

Service

allocation of the 9-pin Socket ' service '

pin 1	shield
pin 2	TXD+
pin 3	TXD-
pin 4	-
pin 5	GND
pin 6	VCC
pin 7	RXD
pin 8	RXD+
pin 9	MSR

Operating panel and Networking *

allocation of the 9-pin Sockets ' operating panel ' / ' networking '
with TTY - 20mA - adapter,
transmitters and acceptors alternatively actively or passively
in plugs bridge

pin 1	shield
pin 2	transmitter +
pin 3	transmitter -
pin 4	20mA Power source
pin 5	GND
pin 6	20mA Power source
pin 7	acceptors -
pin 8	acceptors +
pin 9	GND

allocation of the 9-pin Sockets ' operating panel ' / ' networking '
with RS422/485 - adapters,

pin 1	shield
pin 2	-
pin 3	transmitter +
pin 4	-
pin 5	transmitter -
pin 6	-
pin 7	acceptor -
pin 8	acceptor +
pin 9	GND

allocation of the 9-pin Sockets ' operating panel ' / ' networking '
with V24 - RS232 - adapter

pin 1	shield
pin 2	Rx
pin 3	Tx
pin 4	DTR
pin 5	GND
pin 6	DCD
pin 7	RTS
pin 8	CTS
pin 9	-

* Networking not with CNC E (088671)

4.3 Central unit CNC (continued)

Data

Version	**CNC E (32Bit)** reduction function range	**CNC (32Bit)** standard	**CNC (64Bit)** standard
Article number	088671	083671	084564
Clock frequenzy	33MHz	33MHz	133MHz
Flag memory	60kB	60kB	60kB
NC memory	1,5MB	1,5MB	3MB
Parameter	30 000	30 000	60 000
Channel	2	4	8
Axes	8	16	32
Linear interpolation in axes	4	16	32
Circular interpolation in axes	2 + 1	3 + 13	3 + 29
Screw interpolation in axes	*	2 + 14	2 + 30
Spline interpolation	*	•	•
Polynom interpolation	*	•	•

- • function actual only possible during standard design
- * function actual not possible with version with reduced function range

4.3 Central unit CNC (continued)

- Several spindles
- Tangential axis
- Axes couple, reflect and exchange
- Restarting after abort
- Feed, corners, circle and outline dynamics
- Electronic gears
- Handwheel
- Digital and analog drives
- Polar coordinates system
- Polar transformation
- Robot transformation ** / tool coordinates / workpiece coordinates
- Axes and graphic simulation
- Coordinates turn, reflect and shift
- Measuring cycles and processing cycles
- Interpolation plane selection
- Tool radius path correction
- Automatic selection of linear and circular interpolation
- Zero points / zero point shift
- Outline path short programming
- Parameter calculation
- Diagnostic functions

** with max. 4 axes by reduced function range version

4.3 Central unit CNC (continued)

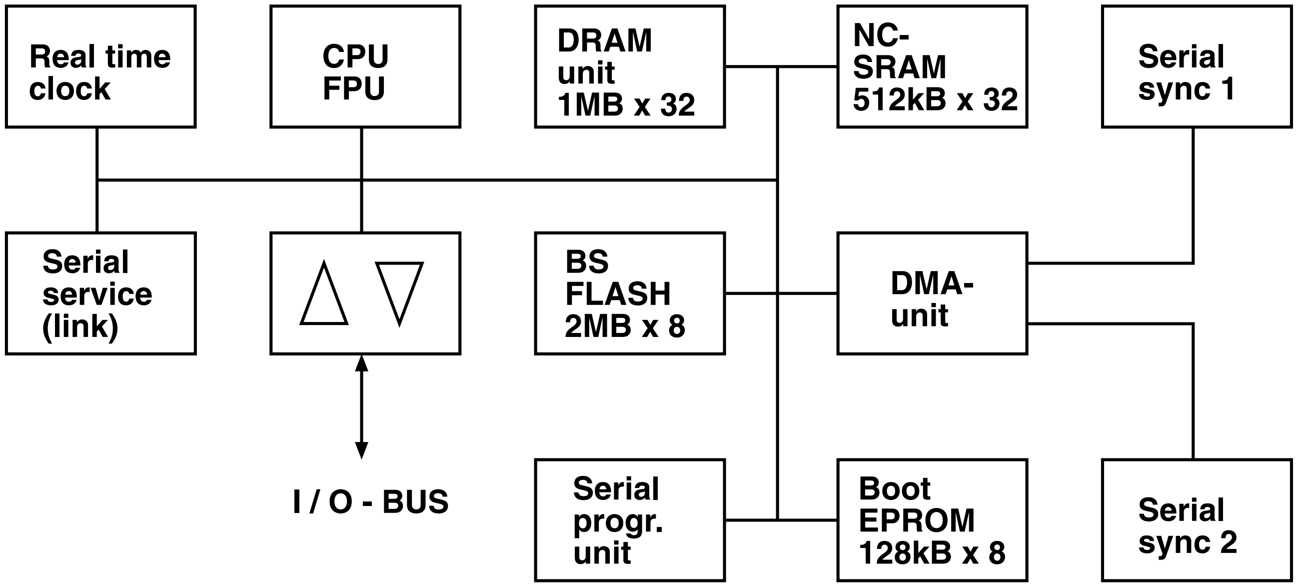
Diagnostic function status

The 7 section display ' status ' shows the hardware status of the CPU on.

Display	Function
Segments circle	everything in order, everything runs ' approximately '.
out	CPU defectively, no voltage, display defectively.
0	CPU in the monitor operation.
8.	hardware RESET.
1 - 9	hardware test after that boats. if status remains 1 - 9, if the hardware test was not ok - > CPU defectively.
b	writing in the flash, do not switch off.
E flashes	error while the loading of the operating system.
E1	fatal error, please at BWO turn.
E2	fatal error, please at BWO turn.
F	operating system is charged from the flash.
F0	hardware error. Module or network failed.
F1	back-up battery defectively.
F2	voltage ±15V defectively.
F3	back-up battery and voltage ±15V defectively.
F4	CPU fan defectively.

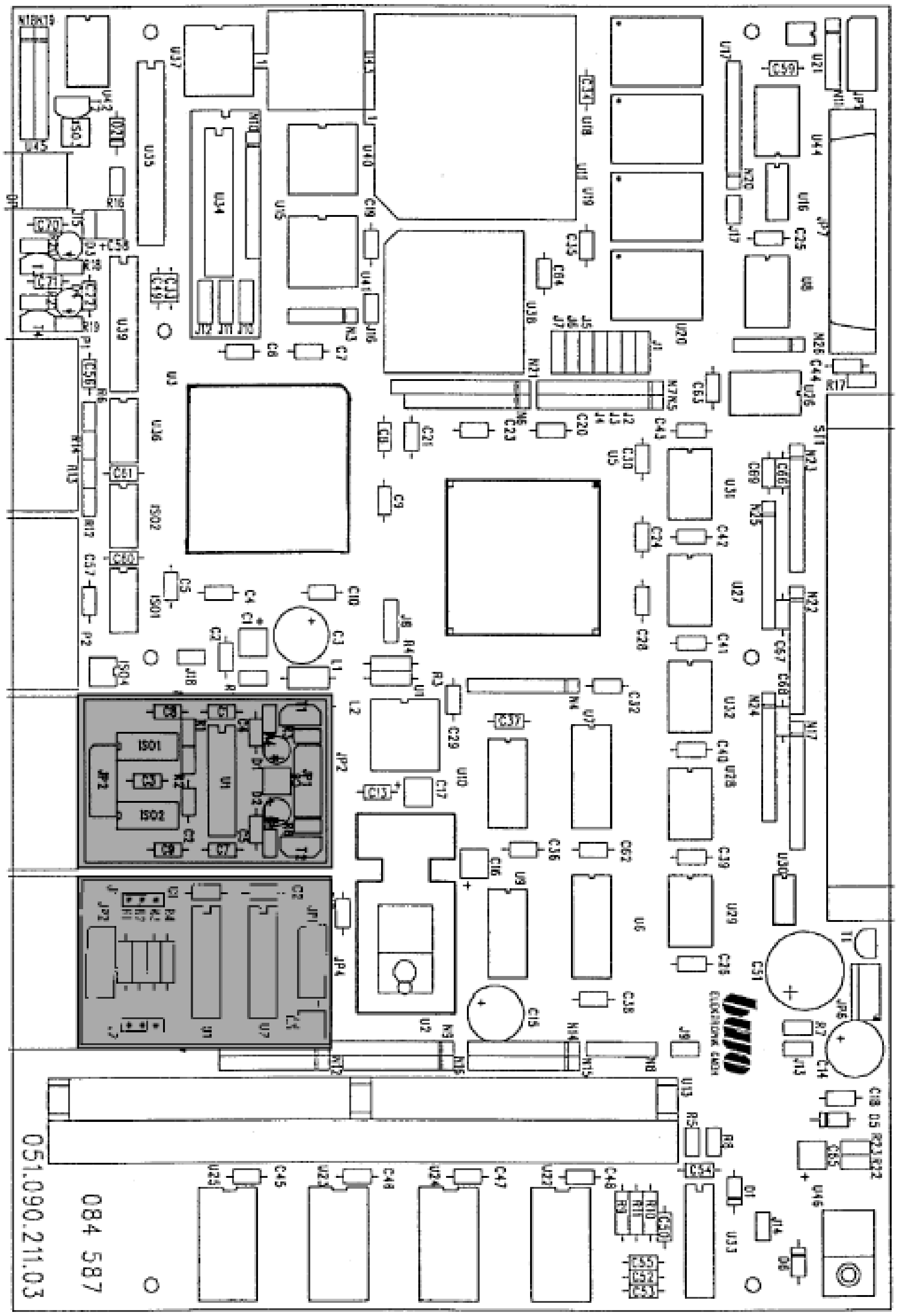
4.3 Central unit CNC (continued)

Block diagram



4.3 Central unit CNC (continued)

Components layout CNC 32Bit



Position of the peripheral interface adapters

Networking

Operating panel

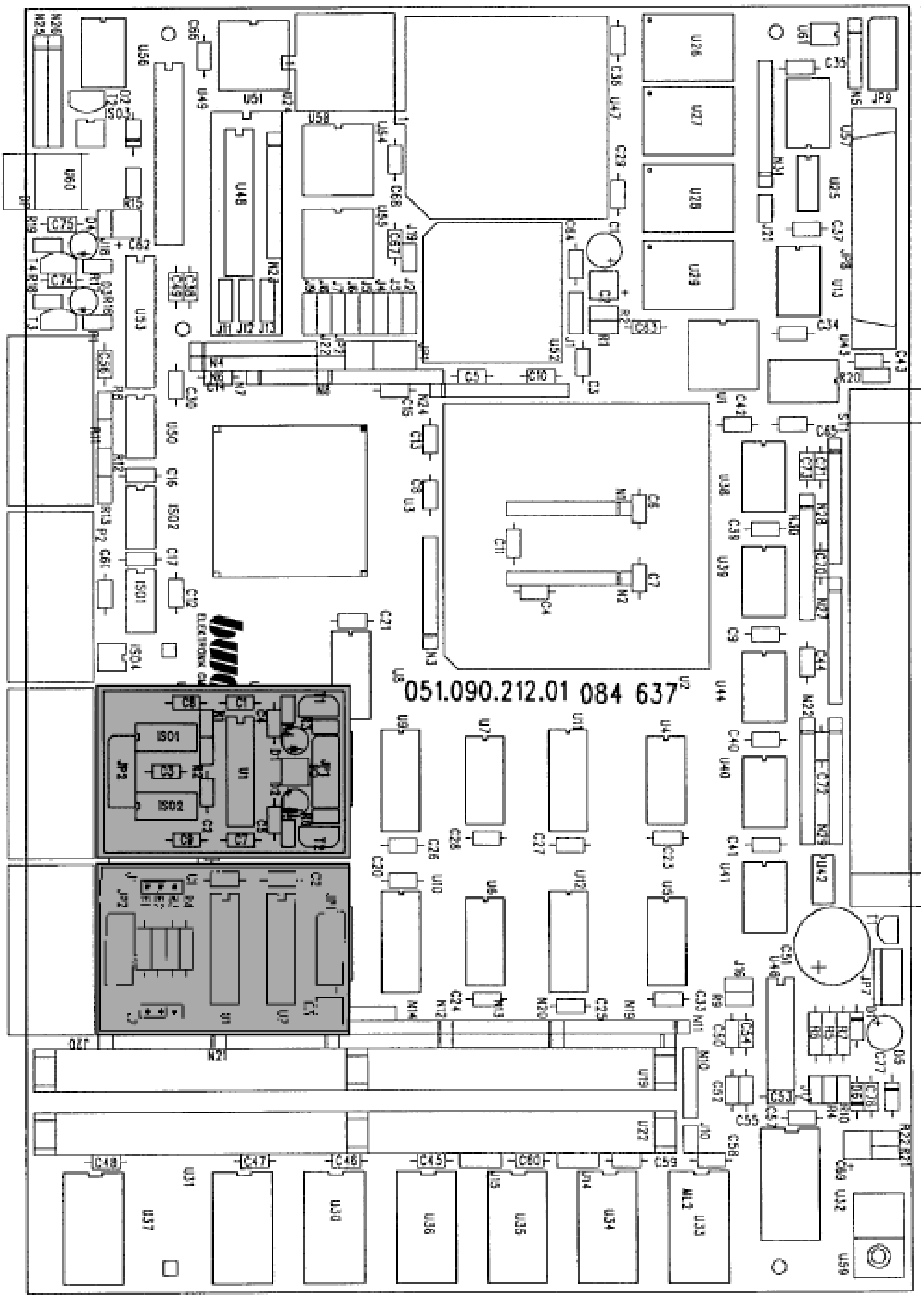
4.3 Central unit CNC (continued)

Components layout CNC 64Bit

Position of the peripheral interface adapters

Networking

Operating panel



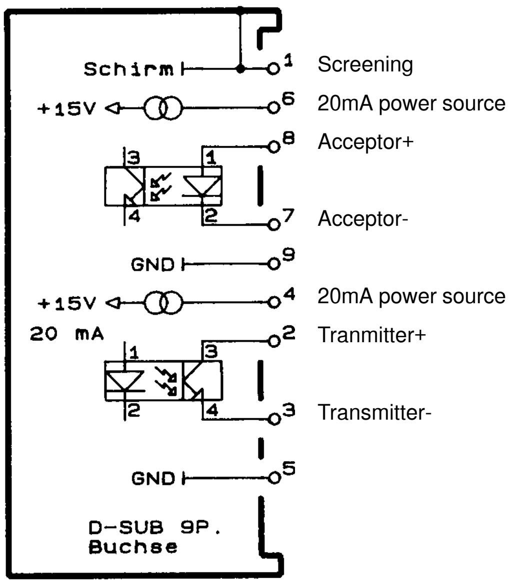
4.3 Central unit CNC (continued)

Peripheral interface adapter for the connecting socket of the operating panel

TTY / 20mA interface

See for pin assignment also on page 4-2/3.

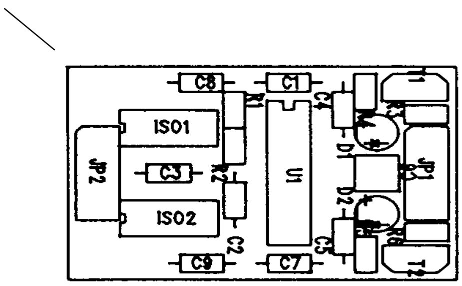
Circuit diagram



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

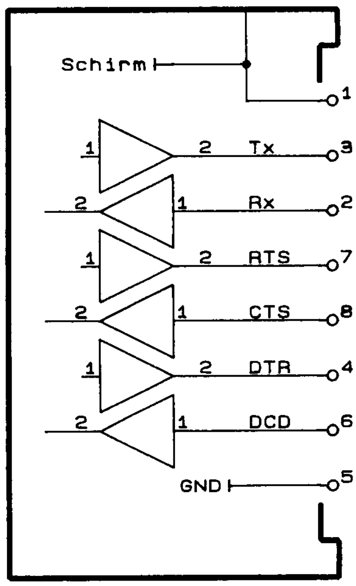
This page shows to the module front.



RS232 / V24 interface

See for pin assignment also on page 4-2/3.

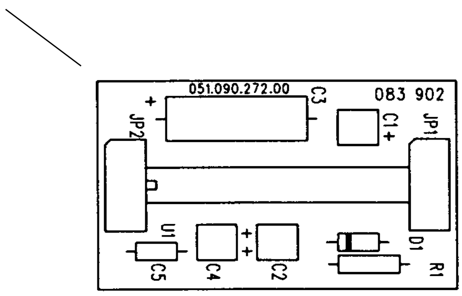
Circuit diagram



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

This page shows to the module front.



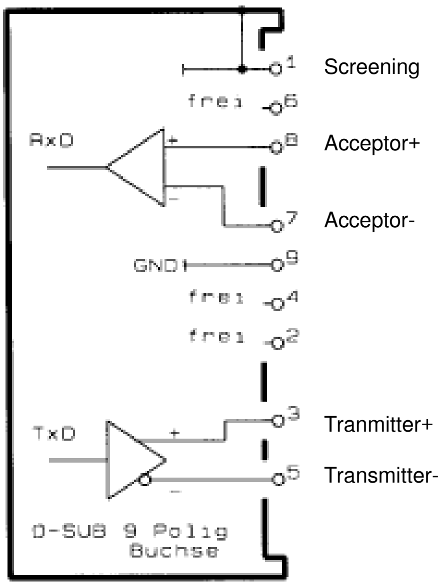
4.3 Central unit CNC (continued)

Peripheral interface adapter for the connecting socket of the operating panel

RS422 - interface without perception
Data transfer 9600B

See for pin assignment also on page 4-2/3.

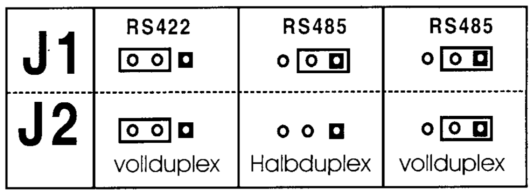
Circuit diagram



RS422 - interface with perception
Data transfer 115KB

See for pin assignment also on page 4-2/3.

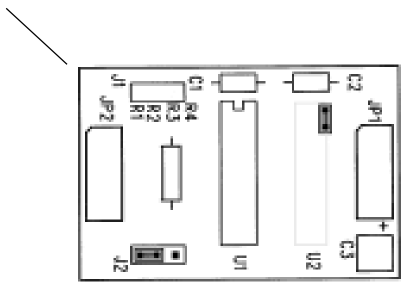
Selection of operation mode



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

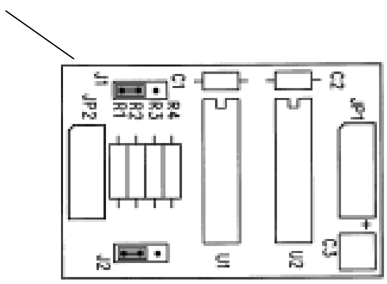
This page shows to the module front.



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

This page shows to the module front.



4.3 Central unit CNC (continued)

Interface of operating panel CNC 900C

The Interface of operating panel supports 3 different standards of interfaces (siehe auch 10-30):
- TTY (TTY active / passive fixed)
- RS422
- RS485

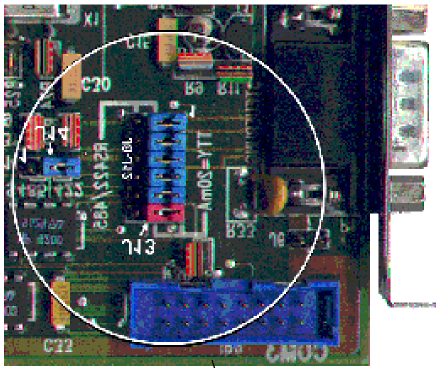
A Jumper block switch over between the interfaces TTY and RS422/485.
If block J[8..12] on Pin 1 <—> Pin 2 , than TTY interface.
If block J[8..12] on Pin 2 <—> Pin 3 , than RS422/485 inteerface.

If jumper J13on Pin 2 <—> Pin 3, than RS422 (084539) with perception.

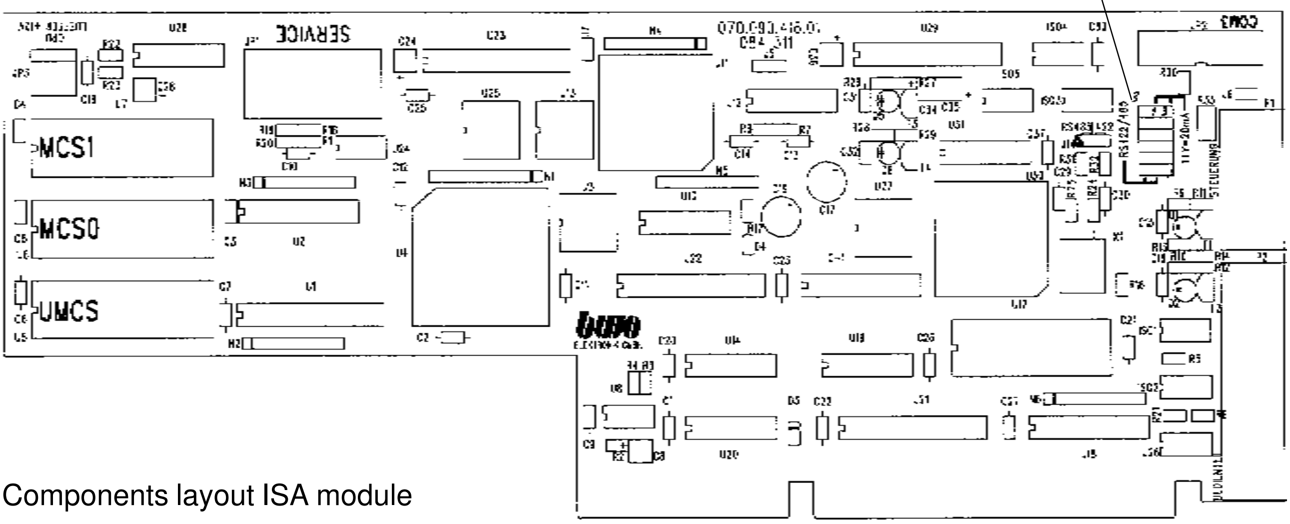
If J14 on Pin 1 <—> Pin 2 , than conclusion for RS485.
If J14 on Pin 2 <—> Pin 3 , than conclusion for RS422.

Jumper	TTY	RS422/485
J8	1-2	2-3
J9	1-2	2-3
J10	1-2	2-3
J11	1-2	2-3
J12	1-2	2-3
J13	1-2	2-3

	Abschluß	
Jumper	RS485	RS422
J14	1-2	2-3



J13	DCD-Bit	Interface	Transfer	RS422
1<—>2	0	TTY/RS422	9600B	without perception
2<—>3	1	RS422/485	115KB	with perception

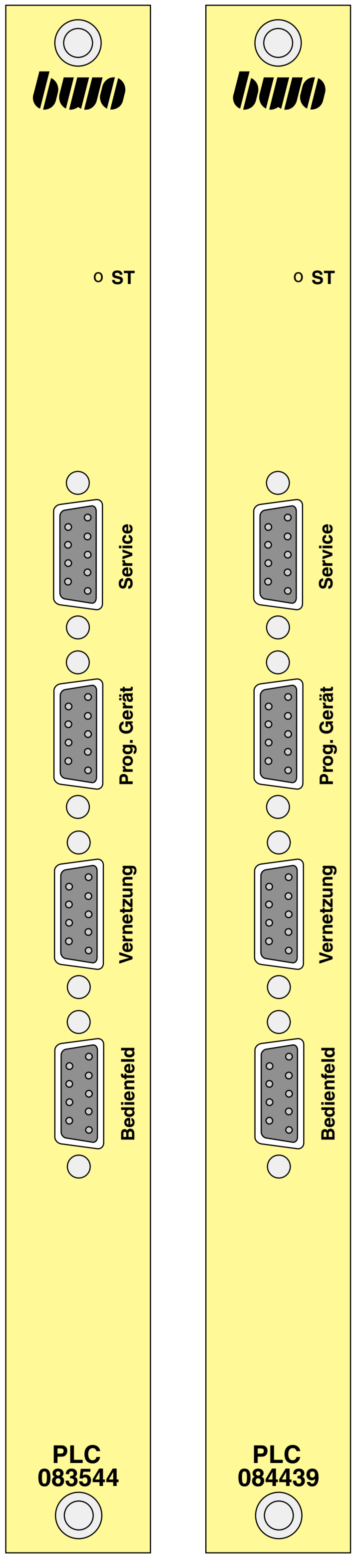


Components layout ISA module

4.4 Central unit PLC

Connections and display

Version	PLC 16ki	art. no.	083544
	PLC 64ki	art. no.	084439



Status indication

Connections

Service
9-pin D-Sub-socket
Interface RS422/485

Prog. device
9-pin D-Sub-socket
Interface 20mA

Networking
9-pin D-Sub-socket
Interface standard without adapters
Alternatively with adapter RS422/485
or with adapter RS232

Operating panel
9-pin D-Sub-socket
Interface standard with adapter 20mA
alternatively adapter RS422/485

4.4 Central unit PLC (continued)

Interfaces and socket allocation

Service

allocation of the 9-pin Socket ‘ service ‘

pin 1	shield
pin 2	TXD+
pin 3	TXD-
pin 4	-
pin 5	GND
pin 6	VCC
pin 7	RXD
pin 8	RXD+
pin 9	MSR

Operating panel and

Networking

allocation of the 9-pin Sockets ‘ operating panel ‘ / ‘ networking ‘

with TTY - 20mA - adapter,
transmitters and acceptors alternatively actively or passively in plugs bridge

pin 1	shield
pin 2	transmitter +
pin 3	transmitter
pin 4	20mA Power source
pin 5	GND
pin 6	20mA Power source
pin 7	acceptor -
pin 8	acceptor +
pin 9	GND

allocation of the 9-pin Sockets ‘ operating panel ‘ / ‘ networking ‘

with RS422/485 - adapters,

pin 1	shield
pin 2	-
pin 3	transmitter +
pin 4	-
pin 5	transmitter
pin 6	-
pin 7	acceptor
pin 8	acceptor +
pin 9	GND

allocation of the 9-pin Sockets ‘ operating panel ‘ / ‘ networking ‘

with V24 - RS232 - adapter

pin 1	shield
pin 2	Rx
pin 3	Tx
pin 4	DTR
pin 5	GND
pin 6	DCD
pin 7	RTS
pin 8	CTS
pin 9	-

4.4 Central unit PLC (continued)

Data

	PLC (16k)	PLC (64k)
Article number	083544	084439
Flag memory	60kB	60kB
Program memory for	16k commands	64k commands
Functions with POS modules		
Linear interpolation in	3 axes	3 axes
Circular interpolation in	2 axes	2 axes

4.4 Central unit PLC (continued)

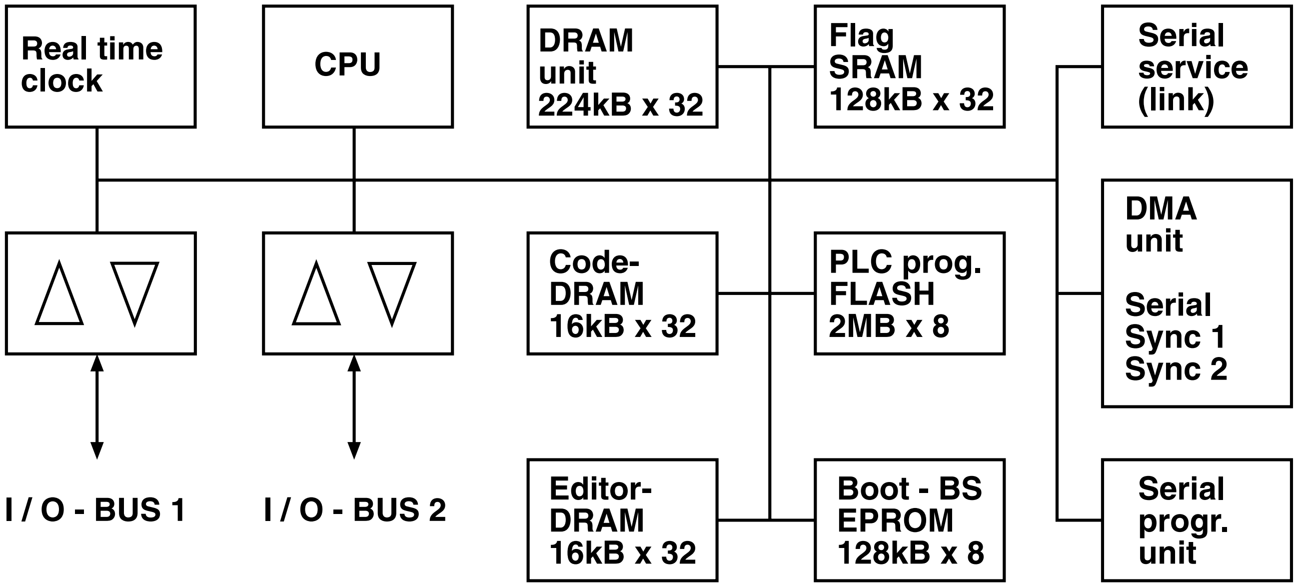
Status display

The light-emitting diode shows the program and hardware status.

Lamp is lit	Everything in order	
Lamp is off	CPU is defective, no voltage or lamp is defective	
Lamp is flashing	System error	
	Flash frequency of 2s	EEPROM contents is defective or EEPROM is empty
	Flash frequency of 1s	Buffer battery is defective, to be exchanged
	Flash frequency of 1/4s	Voltage of ± 15V is defective (The AD converter and the operating panels do not work anymore)
	Flash frequency of 1/10s	Hardware error (Module or network has failed)

4.4 Central unit PLC (continued)

Block diagram



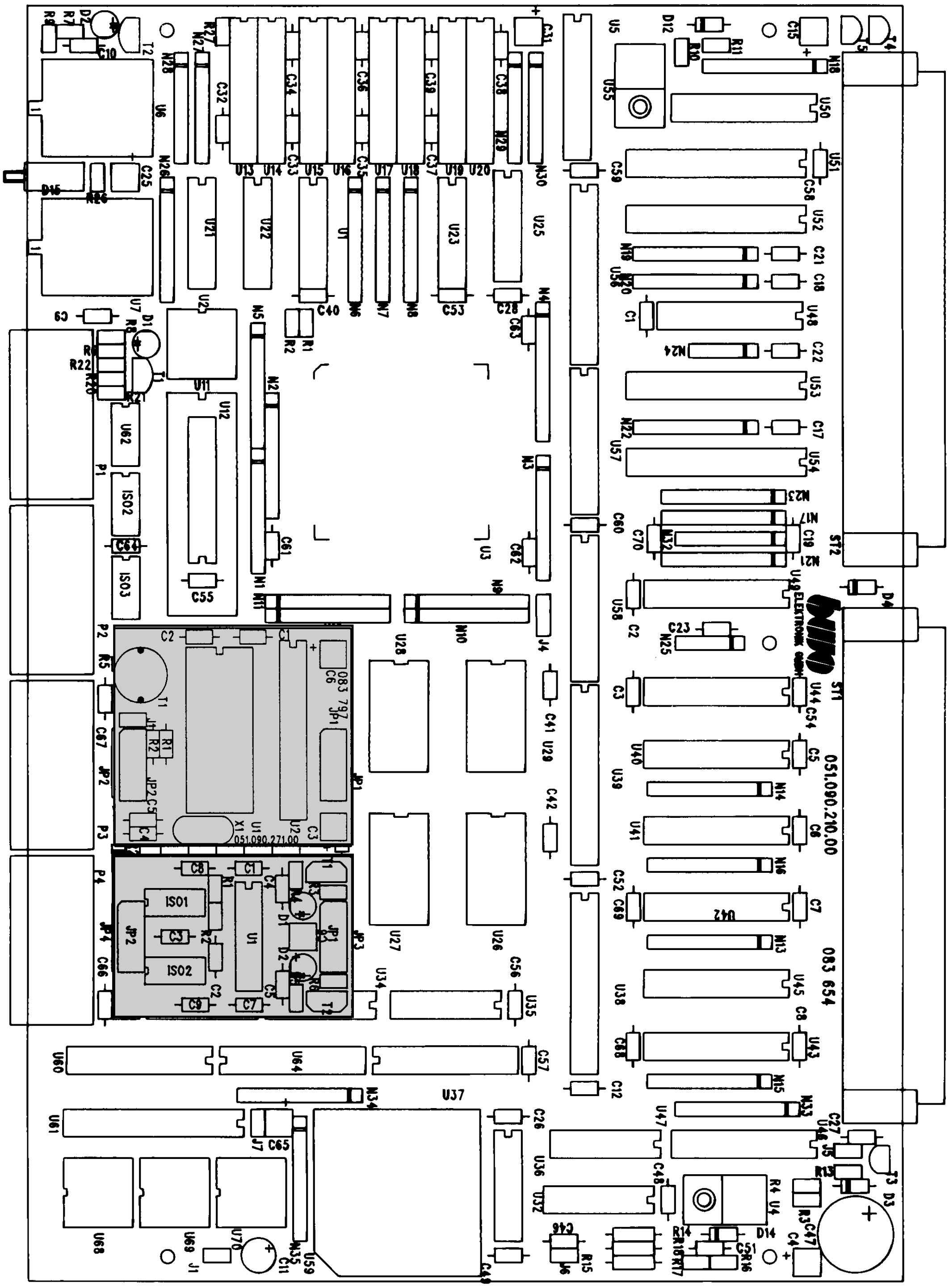
4.4 Central unit PLC (continued)

Components layout

Position of the peripheral interface adapters

Networking

Operating panel



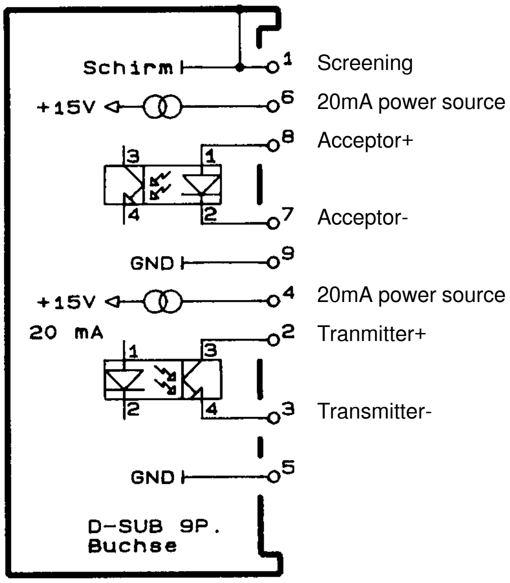
4.4 Central unit PLC (continued)

Peripheral interface adapter for the connecting socket of the operating panel

TTY / 20mA interface

See for pin assignment also on page 4-12.

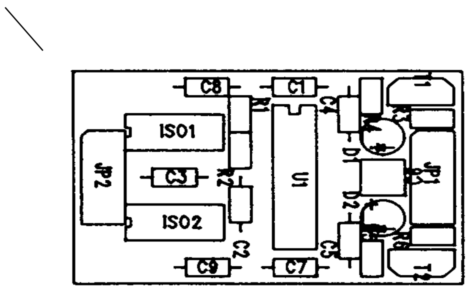
Circuit diagram



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

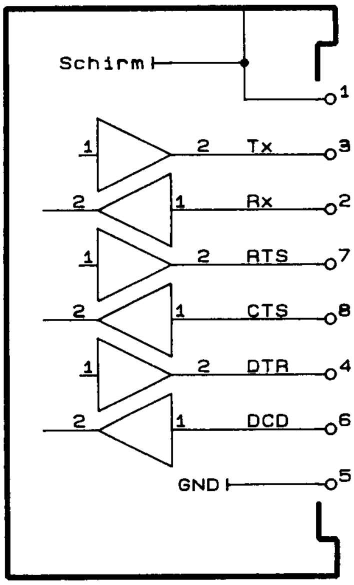
This page shows to the module front.



RS232 / V24 interface

See for pin assignment also on page 4-12.

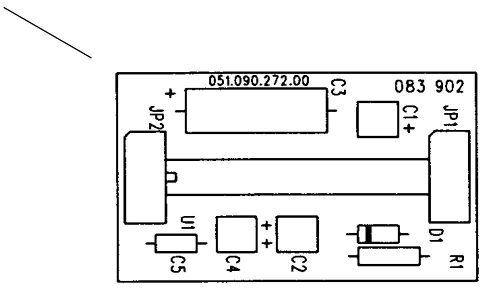
Circuit diagram



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

This page shows to the module front.



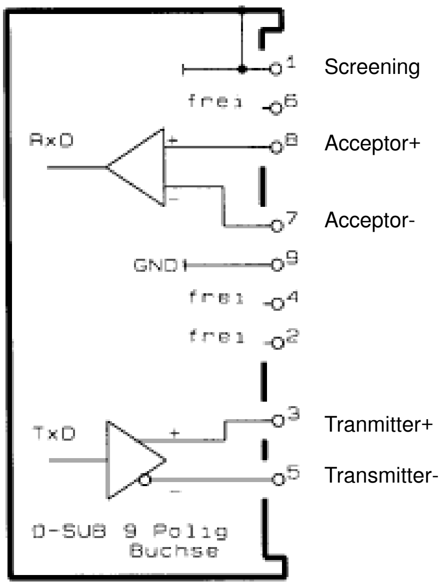
4.4 Central unit PLC (continued)

Peripheral interface adapter for the connecting socket of the operating panel

RS422 - interface without perception
Data transfer 9600B

See for pin assignment also on page 4-12.

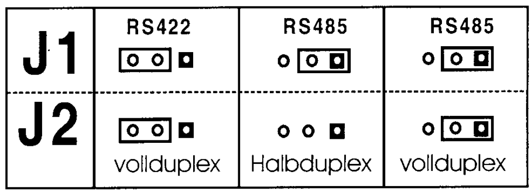
Circuit diagram



RS422 - interface with perception
Data transfer 115KB

See for pin assignment also on page 4-12.

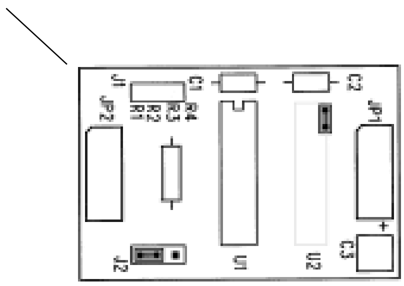
Selection of operation mode



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

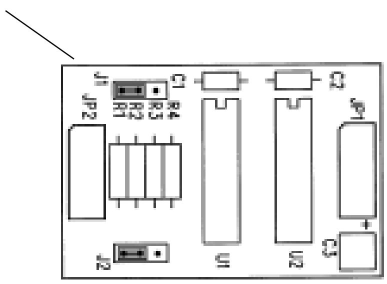
This page shows to the module front.



Components layout

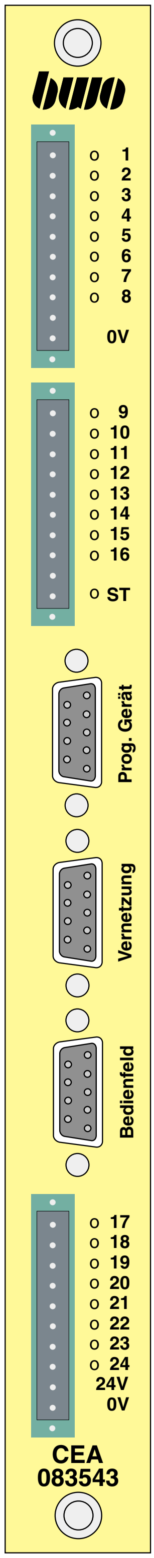
The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

This page shows to the module front.



4.5 Central unit CEA

Connections and display



Standard design CEA
art. no. 083543

Status indication

Connections

Pro g. device
9-pin D-Sub-socket
Interface 20mA

Networking
9-pin D-Sub-socket
Interface standard without adapters
Alternatively with adapter RS422/485
or with adapter RS232

Operating panel
9-pin D-Sub-socket
Interface standard with adapter 20mA
alternatively adapter RS422/485

4.5 Central unit CEA (continued)

Interfaces and socket allocation

Operating panel and Networking

allocation of the 9-pin Sockets ‘ operating panel ‘ / ‘ networking ‘
with TTY - 20mA - adapter,
transmitters and acceptors alternatively actively or passively in plugs bridge

pin 1	shield
pin 2	transmitter +
pin 3	transmitter
pin 4	20mA Power source
pin 5	GND
pin 6	20mA Power source
pin 7	acceptor -
pin 8	acceptor +
pin 9	GND

allocation of the 9-pin Sockets ‘ operating panel ‘ / ‘ networking ‘
with RS422/485 - adapters,

pin 1	shield
pin 2	-
pin 3	transmitter +
pin 4	-
pin 5	transmitter
pin 6	-
pin 7	acceptor
pin 8	acceptor +
pin 9	GND

allocation of the 9-pin Sockets ‘ operating panel ‘ / ‘ networking ‘
with V24 - RS232 - adapter

pin 1	shield
pin 2	Rx
pin 3	Tx
pin 4	DTR
pin 5	GND
pin 6	DCD
pin 7	RTS
pin 8	CTS
pin 9	-

4.5 Central unit CEA (continued)

Technical data

Data of in and outputs

- 16 inputs
- visual check by LED
- galvanic separation over opto couplers
- switching levels of inputs with approx. 5 V
- protection against negative voltage peaks
- hysteresis of inputs approx. 1 V
- input current 7 mA
- pro input ever on filters
- input delay approx. 3ms

- 8 outputs
- fatigue strength 0,Ä, 100% at the same time loadable
- visual check by LED
- galvanic separation over opto couplers
- short circuit proof
- current limiting
- over-temperature disconnection
- internal cut-off diode for inductive loads, max. 200mJ
- 8 outputs over own inlet for separate fuse protection
- output delay approx.. 7,5µs when switching on on
  approx. 29µs when switching off

Diagnosis

For 8 outputs on diagnostic bit is available. Are monitored:

- undervoltage
- wire break
- short-circuit against 0 and 24v
- over-temperature

4.5 Central unit CEA (continued)

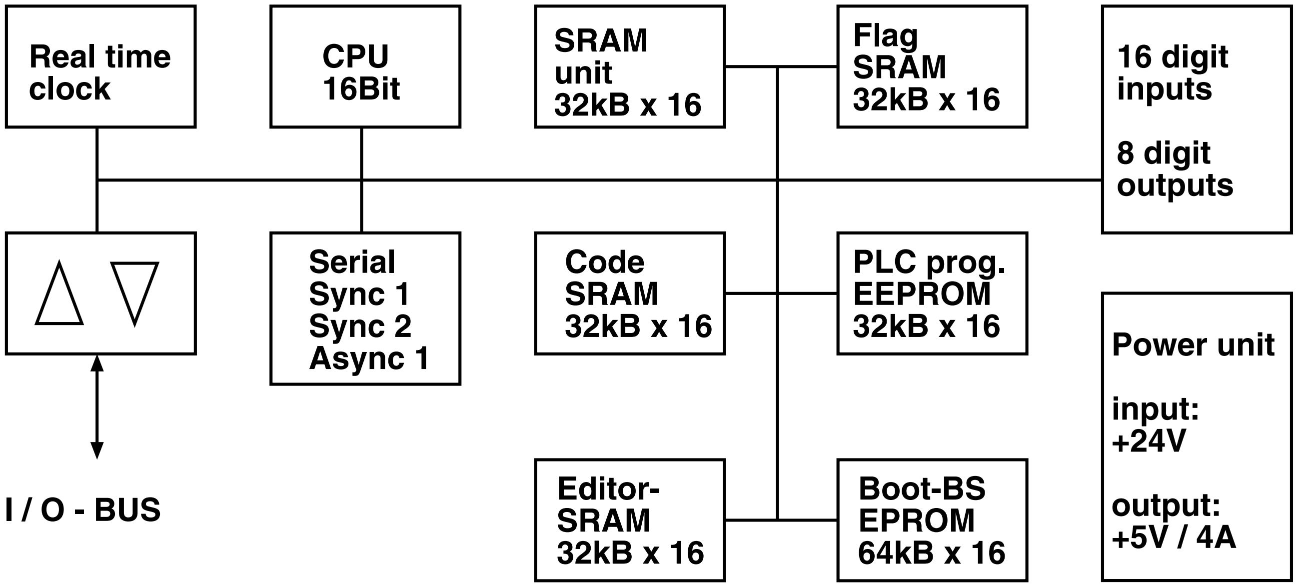
Status display

The light-emitting diode shows the program and hardware status.

Lamp is lit	Everything in order	
Lamp is off	CPU is defective, no voltage or lamp is defective	
Lamp is flashing	System error	
	Flash frequency of 2s	EEPROM contents is defective or EEPROM is empty
	Flash frequency of 1s	Buffer battery is defective, to be exchanged
	Flash frequency of 1/4s	Voltage of ± 15V is defective (The AD converter and the operating panels do not work anymore)
	Flash frequency of 1/10s	Hardware error (Module or network has failed)

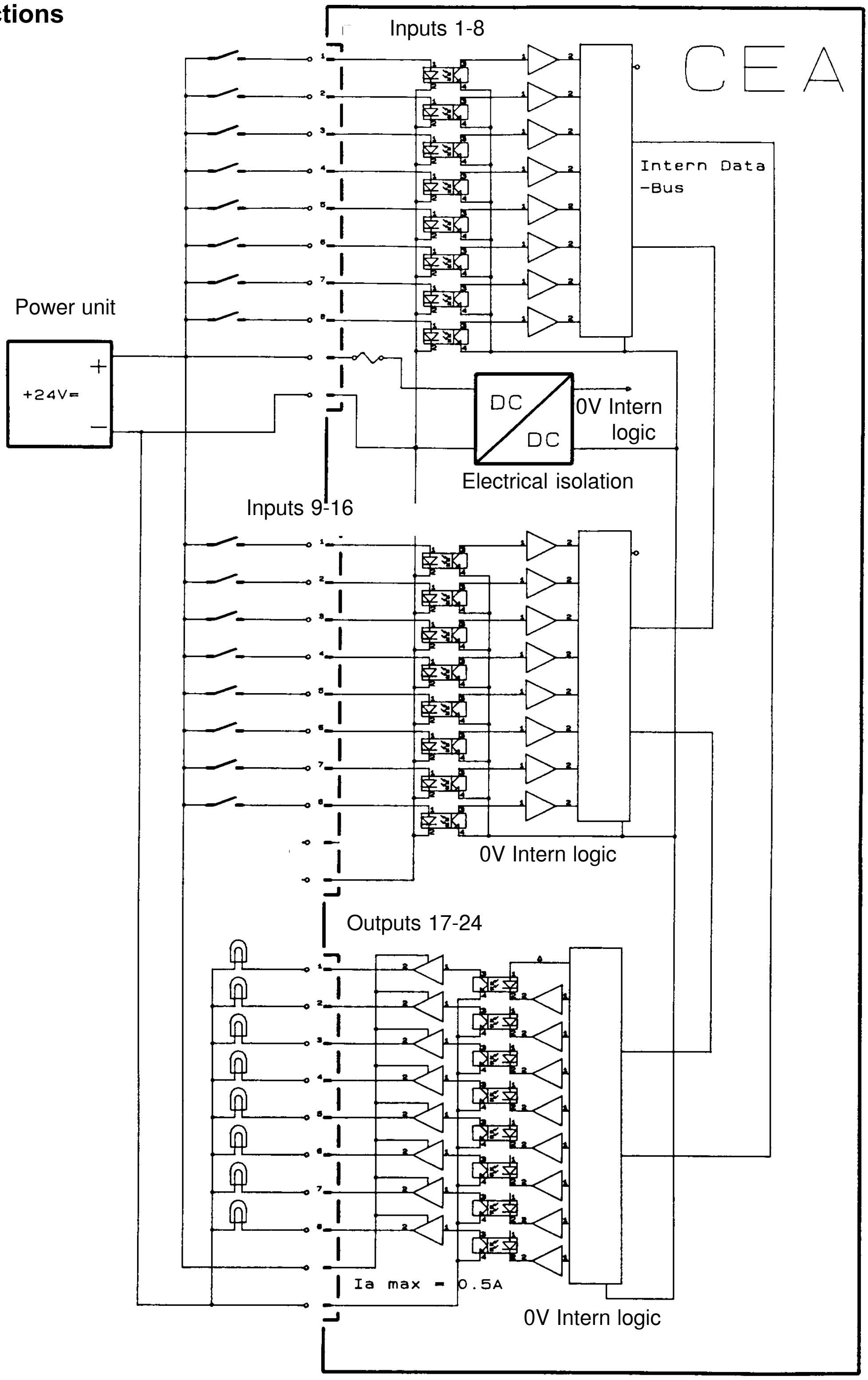
4.5 Central unit CEA (continued)

Block diagram



4.5 Central unit CEA (continued)

Block diagram connections
Inputs and outputs



4.5 Central unit CEA (continued)

CEA power unit

Input values

Input voltage	UI	24V= admissible range of 22V to 35V Three-phase bridge connection max. ripple $3V_{ss}$ max. rise time from 0V to 24V: 60ms
Input current	II	1.5A at UI 24V= and a load of 4A at 5V, of 0.2A at ± 15V

Output values

Output voltage	UO_{+5}	+ 5V
Output current	IO_{+5}	4A for convective aeration permanently short circuit proof
Output voltage	UO_{+15}	+ 15V
Output current	IO_{+15}	0.2A **permanently short circuit proof**
Output voltage	UO_{-15}	- 15V
Output current	IO_{-15}	0.2A **permanently short circuit proof**

The central processing unit CEA uses 910mA (outputs off) or 950mA (outputs on). Less this on gene requirement then still approx. Á is available for the supply of other modules.

The performance is still enough to the operation of max. 1 positioning module and 6 EA modules. The total cost with +5V and ±15V may not exceed 25W. The load for the respective device configuration can using the tables ‘ current consumption of the modules ‘ in Hardware, 3,6 Selection of the power pack cut off to be determined or checked.

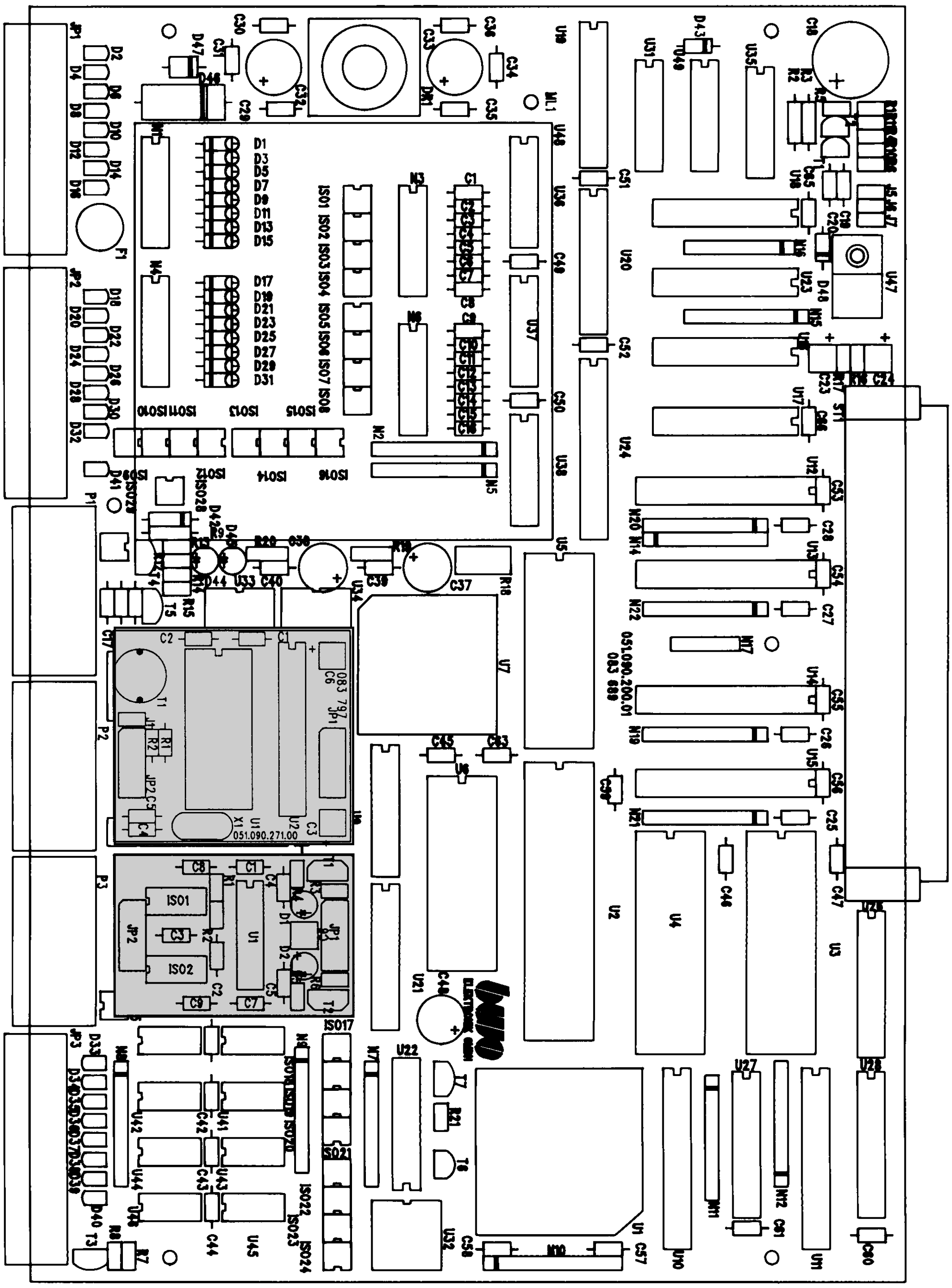
4.5 Central unit CEA (continued)

Components layout

Position of the peripheral interface adapters

Networking

Operating panel



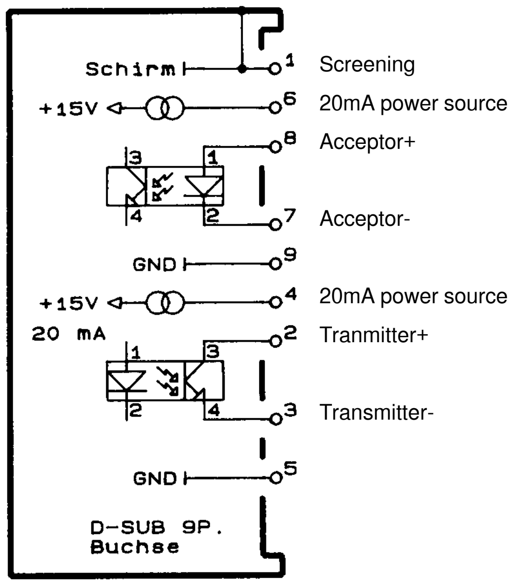
4.5 Central unit CEA (continued)

Peripheral interface adapter for the connecting socket of the operating panel

TTY / 20mA interface

See for pin assignment also on page 4-21.

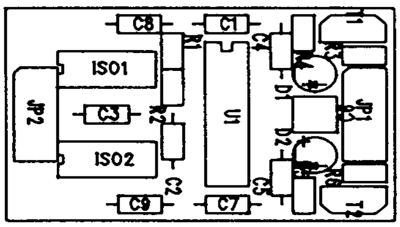
Circuit diagram



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

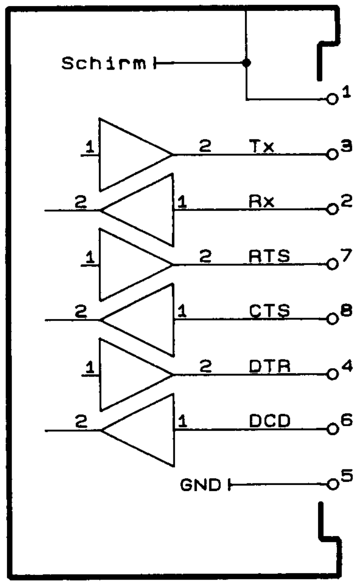
This page shows to the module front.



RS232 / V24 interface

See for pin assignment also on page 4-21.

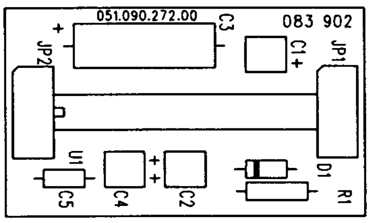
Circuit diagram



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

This page shows to the module front.



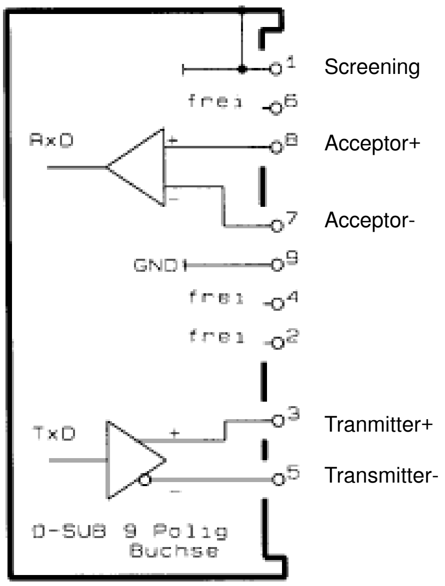
4.5 Central unit CEA (continued)

Peripheral interface adapter for the connecting socket of the operating panel

RS422 - interface without perception
Data transfer 9600B

See for pin assignment also on page 4-12.

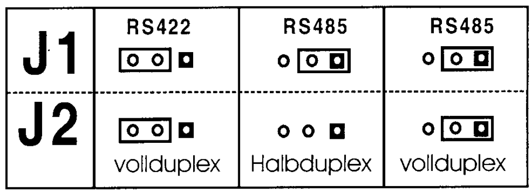
Circuit diagram



RS422 - interface with perception
Data transfer 115KB

See for pin assignment also on page 4-12.

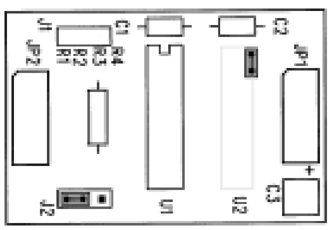
Selection of operation mode



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

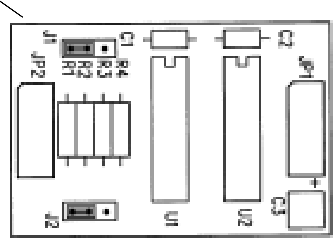
This page shows to the module front.



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

This page shows to the module front.



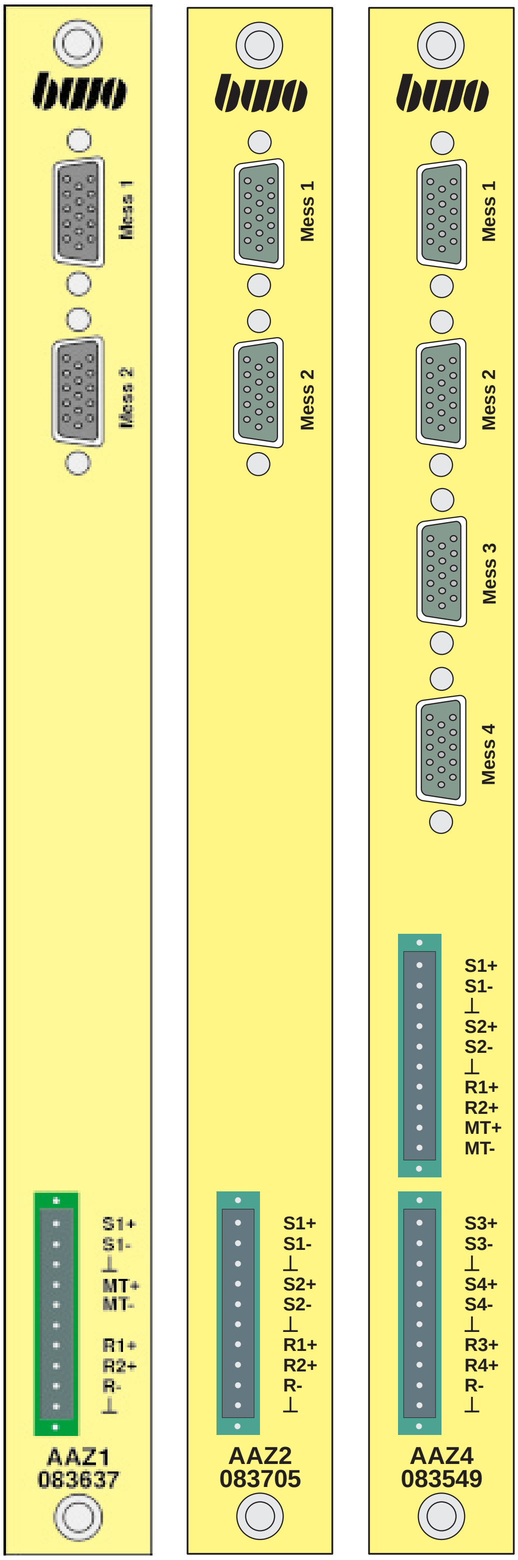
5. Axis modules

5.1 Analog axis modules AAZ1 / AAZ2 / AAZ4

Passive axis modules

for 1, 2 or 4 analog triggered axis

with incremental measuring system



Allocation of the 15-pin HD Sub sockets
‘ measuring 1 ‘ to ‘ measuring 4 ‘

Pin 1	T1
Pin 2	sensor line 0V
Pin 3	/ T2
Pin 4	T0
Pin 5	sensor line 5V
Pin 6	screen
Pin 7	Uas (error signal)
Pin 8	-
Pin 9	/ T1
Pin 10	T2
Pin 11	0V
Pin 12	/ T0
Pin 13	-
Pin 14	+5V
Pin 15	/ Uas (error signal)

5.1 Analog axis modules AAZ1 / AAZ2 / AAZ4 (continued)

allocation of the 10-pin Terminal strip with AAZ1

Pin 1	S1 +	command value 1
Pin 2	S1 -	
Pin 3	⊥	screen
Pin 4	MT+	Messtaster +
Pin 5	MT-	Messtaster -
Pin 6		-
Pin 7	R1	reference 1
Pin 8	R2	reference 2
Pin 9	R-	reference -
Pin 10	⊥	screen

Allocation of the 10-pin Terminal strip with AAZ2

Pin 1	S1+	command value 1
Pin 2	S1	
Pin 3	⊥	screen
Pin 4	S2+	command value 2
Pin 5	S2	
Pin 6	⊥	screen
Pin 7	R1	reference 1
Pin 8	R2	reference 2
Pin 9	R	reference -
Pin 10	⊥	screen

allocation of the 10-pin Terminal strip with AAZ4

upper Klemmleis

Pin 1	S1+	command value 1
Pin 2	S1-	
Pin 3	⊥	screen
Pin 4	S2+	command value 2
Pin 5	S2-	
Pin 6	⊥	screen
Pin 7	R1	reference 1
Pin 8	R2	reference 2
Pin 9	MT+	sensor
Pin 10	MT-	

lower terminal strip

Pin 1	S3+	command value 3
Pin 2	S3-	
Pin 3	⊥	screen
Pin 4	S4+	command value 4
Pin 5	S4-	
Pin 6	⊥	screen
Pin 7	R3	reference 3
Pin 8	R4	reference 4
Pin 9	R-	reference -
Pin 10	⊥	screen

5.1 Analog axis modules AAZ1 / AAZ2 / AAZ4 (continued)

Technical characteristics

The axis modules do not possess own intelligence, are thus not in the layer the axes automatically to be controlled. The interpolation and position adjustment are executed rather by the central processing unit in special tasks. The drive is triggered over an analog interface.

	AAZ1	AAZ2	AAZ4
controllable axes	1	2	4

AAZ1 offers also the possibility of 2 handwheels to connect and the D/A transducer for a spindle axis to use.

Technical data

Inputs

- path measuring system	Interface for on incremental measuring system per axis (line receiver RS422 with differential inputs) max. Input frequency 2,5MHz, analysis fourfold, max. Counting rate 10MHz; Input impedance 150 Ω
- disturbance signal	of the measuring system (e.g. by contamination)
- reference input	optically decoupled 24V-Eingang for each axis
- sensor input	optically decoupled 24V-Eingang for each axis

Outputs	on analogue output per axis; Resolution 16bit; voltage range -10V to +10V (max. 5mA)

5.1 Analog axis modules AAZ1 / AAZ2 / AAZ4 (continued)

Technical data (continuation)

Safety functions

- Watchdog	on the CPU created RESET signal stops all axes.
- ±15V-Ueberwachung	stops all axes in the event of an error, if message creates
- NA signal	stops all axes with power failure
- end positions	per axis two software limit switches are programmable
- measuring system monitoring	wire break input frequency ≤ 2,5MHz input for disturbance signal (Uas) of the measuring system

Switching level

Measuring system inputs			
T0, /T0, T1, /T1, T2, /T2	low:	min. - 1,0V	max. +1,2V
Uas, /Uas	high:	min. +2,8V	max. +5,5V
Reference input	low:	min. - 1,0V	max. +14,0V
	high:	min. +17,0V	max. +30,0V
Sensor input	low:	min. - 1,0V	max. +14,0V
	high:	min. +17,0V	max. +30,0V

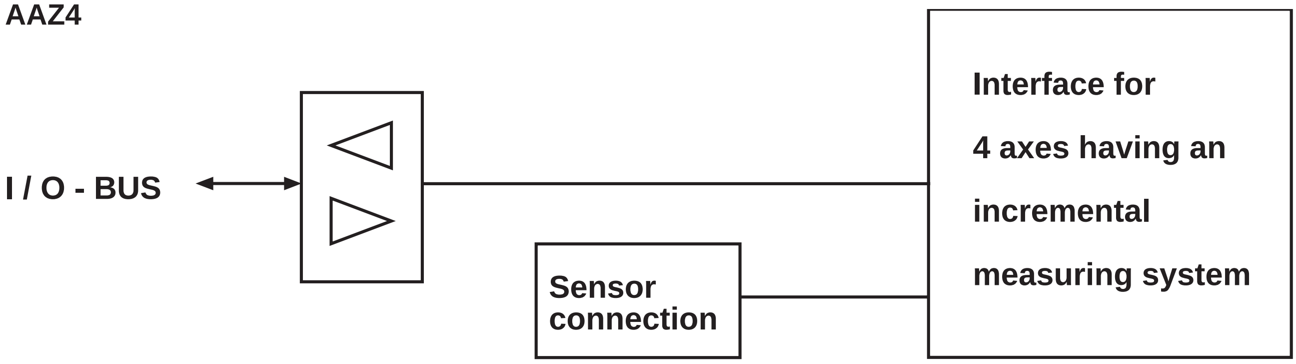
5.1 Analog axis modules AAZ1 / AAZ2 / AAZ4 (continued)

Block diagramm

AAZ1

AAZ2

AAZ4

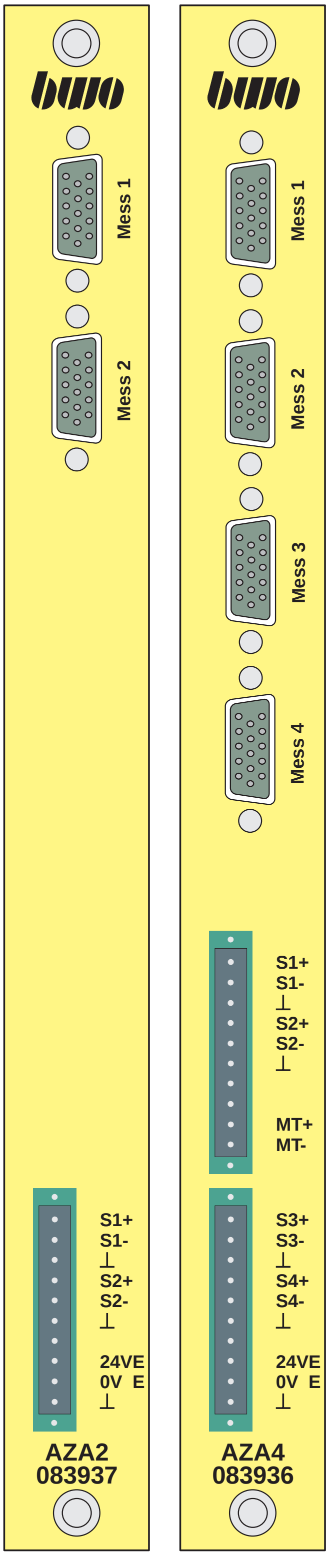


5.2 Analog axis modules AZA2 / AZA4

The passive axis module

for 2 and 4 analog triggered axes

with absolute measuring system



<u>Allocation of the 15-pin HD Sub sockets ‘ measuring 1 ‘ to ‘ measuring 4 ‘</u>

Pin 1	clock +
Pin 2	0V
Pin 3	clock -
Pin 4	-
Pin 5	+5V
Pin 6	screen
Pin 7	-
Pin 8	24V Encoder
Pin 9	data +
Pin 10	data -
Pin 11	0V
Pin 12	-
Pin 13	0V Encoder
Pin 14	+5V
Pin 15	-

5.2 Analog axis modules AZA2 / AZA4 (continued)

Allocation of the 10-pin Terminal strip with AZA2

Pin 1	S1+	command value 1
Pin 2	S1-	
Pin 3	⊥	screen
Pin 4	S2+	command value 2
Pin 5	S2-	
Pin 6	⊥	screen
Pin 7		-
Pin 8	24V E	Encoder
Pin 9	0V E	
Pin 10	⊥	screen

Allocation of the 10-pin upper terminal strip with AZA4

upper terminal strip

Pin 1	S1+	command value 1
Pin 2	S1-	
Pin 3	⊥	screen
Pin 4	S2+	command value 2
Pin 5	S2-	
Pin 6	⊥	screen
Pin 7		-
Pin 8		-
Pin 9	MT+	sensor
Pin 10	MT-	

lower terminal strip

Pin 1	S3+	command value 3
Pin 2	S3-	
Pin 3	⊥	screen
Pin 4	S4+	command value 4
Pin 5	S4	
Pin 6	⊥	screen
Pin 7		-
Pin 8	24V E	encoder
Pin 9	0V E	
Pin 10	⊥	screen

5.2 Analog axis modules AZA2 / AZA4 (continued)

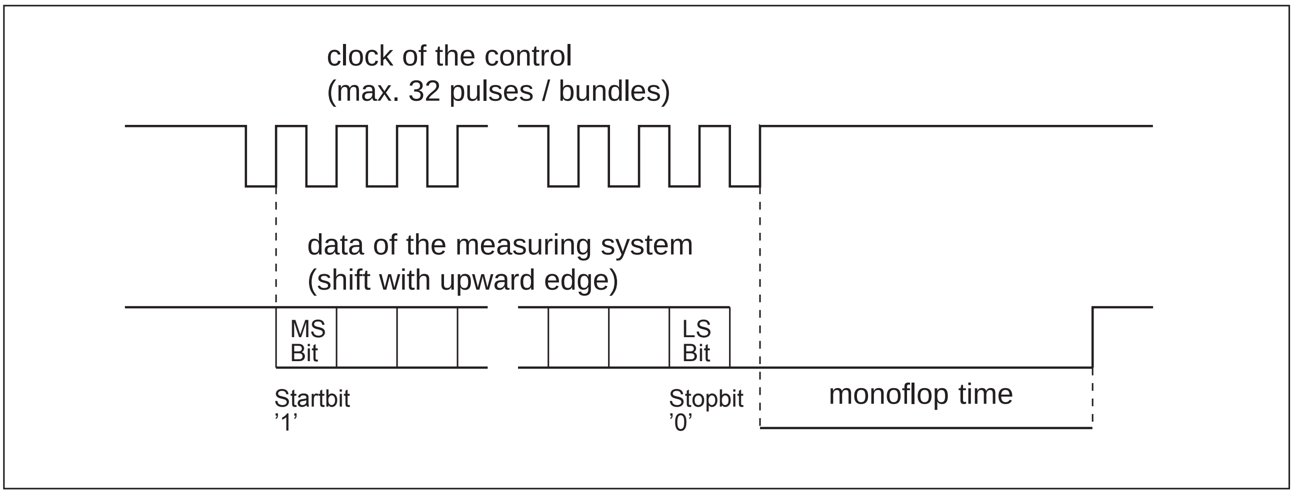
Technical characteristics

The analog axis modules are conceived for the activation of servo-drives with absolute measuring systems with SSI Interface. Each channel possesses on programmable synchronous-serial INTERFACE. The module does not possess own intelligence; to control it actual thus in the layer the axes automatically. The interpolation and position adjustment are executed rather by the central processing unit in special tasks. The drive is triggered over an analog interface.

	AZA2	AZA4
controllable axes	2	4

Synchronous-serial transfer (SSI)

The data communication from the Encoder to the control is controlled by one in the axis module generated clock. In a state of rest the signals clock and data are situated on ‘ high ‘. With the first falling clock edge the transmitter (in the Encoder) saves the current measured value. The data communication takes place starting with the rising edges, with the MSBit (max. 32 clocks). Actual the final (niederwertigste) data bit transferred, is switched the data line to ‘ low ‘, to the Encoder for a new measured value ready actual. The duration of this Low phase actual dependent on the internal monoflop time of the Encoders.



Voltage supply of the measuring systems

To create for the supply of the measuring systems actual at the clips 24VE and 0VE an external voltage (operating voltage of the measuring systems).

5.2 Analog axis modules AZA2 / AZA4 (continued)

Technical data

Inputs

- path measuring system	interface for on absolute measuring system (SSI) per axis. programmable transfer frequencies 250kHz, 330kHz, 500kHz, 1MHz. programmable data format max. 32Bit. software related switching Gray /Binaer code
- sensor input	optically decoupled 24V-Eingang for each axis
Outputs	on analogue output per axis; Resolution 16bit; voltage range -10V to +10V (max. 5mA)

Safety functions

- Watchdog	on the CPU created RESET signal stops all axes.
- ±15V-Ueberwachung	stops all axes in the event of an error, if message creates
- NA signal	stops all axes with power failure
- end positions	per axis two software limit switches are programmable

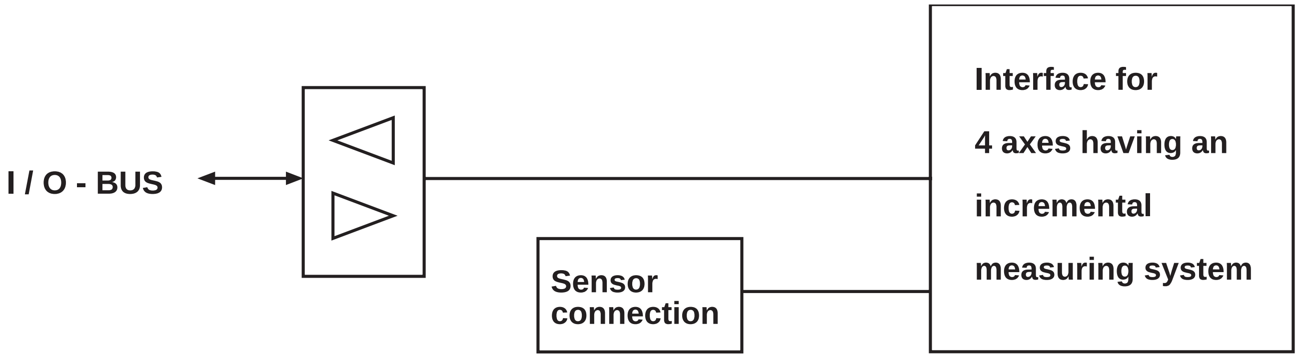
Switching level

- measuring system signals Takt+, clock	low: min. - 1,0V high: min. +2,8V reference potential = 0V of the control	max. +1.2V max. +5,5V
- measuring system signals Daten+, data	low: min. - 1,0V high: min. +2,8V reference potential = 0V externally	max. +1.2V max. +5,5V
- sensor input	low: min. - 1,0V high: min. +17,0V reference potential = 0V of the control	max. +14,0V max. +30,0V

5.2 Analog axis modules AZA2 / AZA4 (continued)

Block diagram

AZA2

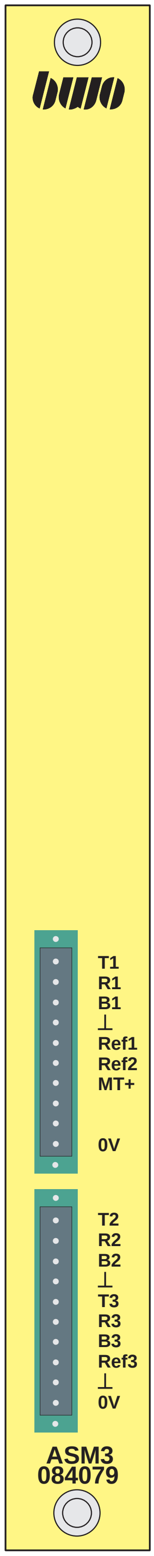


AZA4

5.3 Stepper motor module ASM

The passive axis module

for 3 stepping motors



Allocation of the 10-pin upper terminal strip with ASM

upper terminal strip

Pin 1	T1	clock 1
Pin 2	R1	direction 1
Pin 3	B1	Boost 1
Pin 4	⊥	screen
Pin 5	Ref1	reference switch 1
Pin 6	Ref2	reference switch 2
Pin 7	MT+	sensor
Pin 8		freely
Pin 9		freely
Pin 10	0V	(externally 0V)

lower terminal strip

Pin 1	T2	clock 2
Pin 2	R2	direction 2
Pin 3	B2	Boost 2
Pin 4	⊥	screen
Pin 5	T3	clock 3
Pin 6	R3	direction 3
Pin 7	B3	Boost 3
Pin 8	Ref3	reference switch 3
Pin 9	⊥	screen
Pin 10	0V	(externally 0V)

5.3 Stepper motor module ASM (continued)

Function

The stepper motor module is designed for selecting out of three stepper motor power ranges. Each channel has the control signals 'Clock pulse', 'Direction' and 'Boost' as well as three inputs for reference switch and measuring sensor. All inputs and outputs are electrically isolated by means of an optical coupler.

Connection

The module is connected to the system bus and the operating voltages by means of an 96-pin plug-type connector (VG bar).

All peripheral signals for the stepper motor power units as well as the reference switch and the sensor signals are connected by means of two 10-pin screwed plug-type connectors at the front side of the module.

Power supply

The ASM module is supplied via the system bus with the required operating voltages +5V, +15V, -15V.

5.3 Stepper motor module ASM (continued)

Technical data

Module identification character	23H, inquirable at address 80H
BUS interface	The data transfer to the system bus is performed via the lower half of the bus (D0 - D15).
Interface for the stepper motor power unit	The control signals 'Clock pulse', 'Direction' and 'Boost' are realized as optically separated open-collector outputs (28V, 30mA). The signals are connected to pin 10 (0V) each. The maximum clock rate is 60 kHz.
Inputs	
- Reference inputs	optically decoupled 24V input for each axis
- Sensor input	optically decoupled 24V input for each axis
Control outputs	On-state: I_{max}=30mA / I_{min} = 5mA, U_{cemax}=2,2V
'Clock pulse', 'Direction' and 'Boost'	Off-state: I≤1mA, U_{cemax}=28V

Safety functions

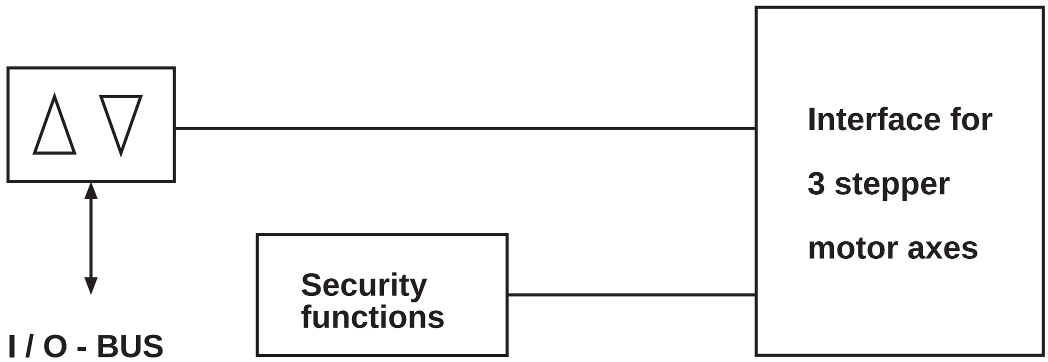
- ±15V supervision	stops all axes in case of failure, sends message
- NA signal	stops all axes in case of power failure

Switching level

Reference inputs	low:	min. -1.0V	max. +14.0V
	high:	min. +17.0V	max. +30.0V
Sensor input	low:	min. -1.0V	max. +14.0V
	high:	min. +17.0V	max. +30.0V

5.3 Stepper motor module ASM (continued)

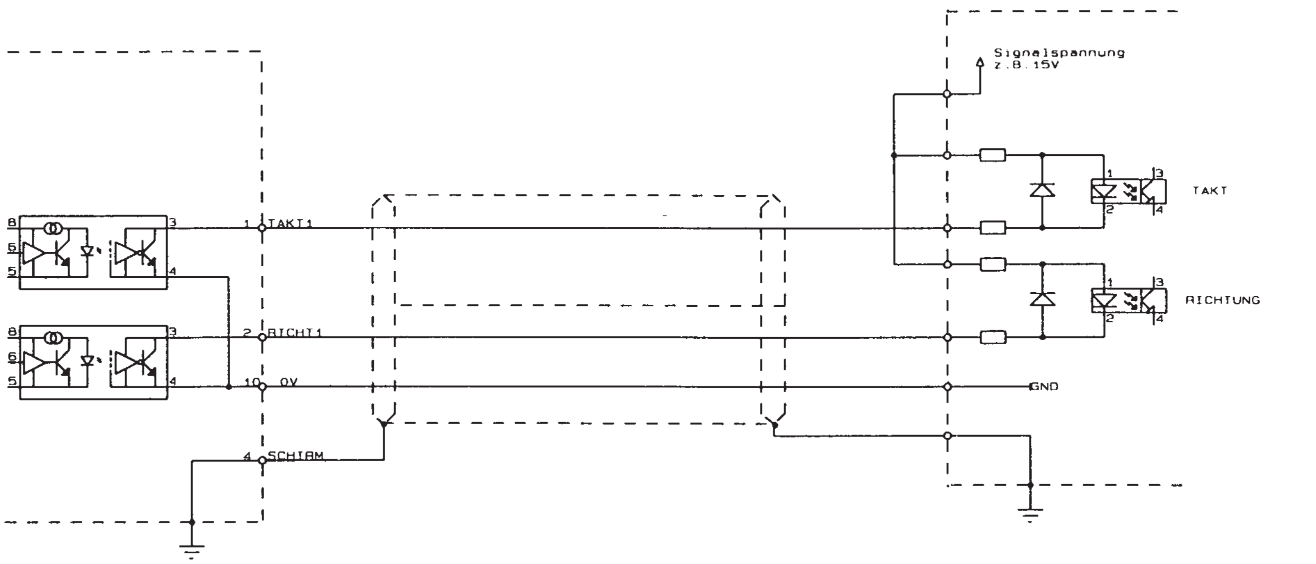
Block diagram

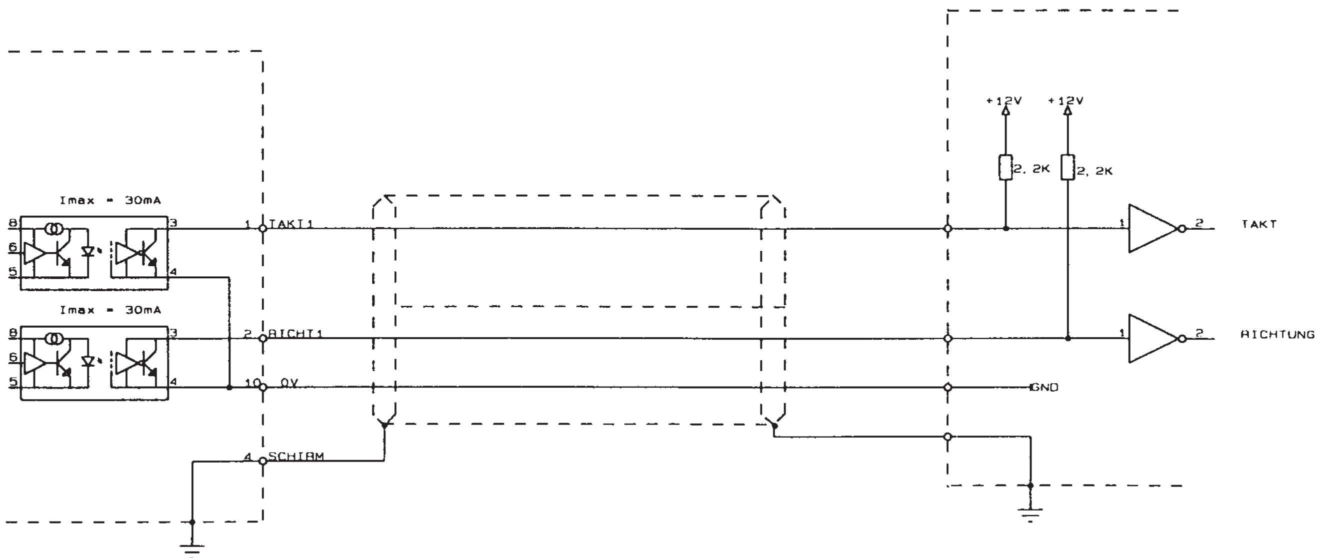


5.3 Stepper motor module ASM (continued)

Connection scheme (examples)

ASM module | Power unit





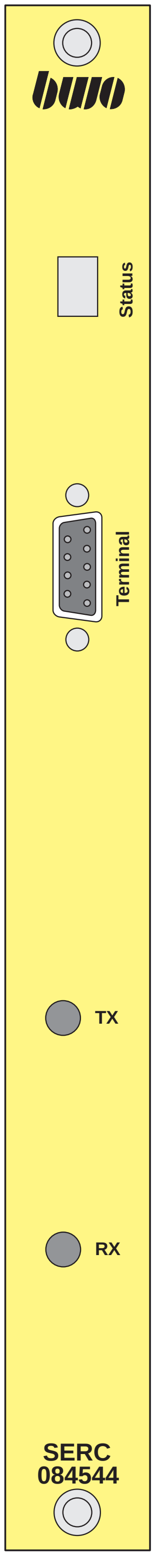
A cable having screened pairs of wires is recommended for connecting. The cable screenings can be skinned and connected at the power unit or on both ends.

5.4 Digital axis module SERC

Passive axis module

for 8 digitally triggered axes

with SERCOS LWL Interface



<u>Allocation 9pol. CD-Sub-socket ‘ terminal ‘</u>

Pin 1	screen
Pin 2	TXD+
Pin 3	TXD
Pin 4	-
Pin 5	GND
Pin 6	VCC
Pin 7	RXD
Pin 8	RXD+
Pin 9	MSR

5.4 Digital axis module SERC (continuation)

Technical characteristics

The application of digitally controlled drives in numerical controlled machines requires a digital interface to the numerical control, which is and Istwerte apart from the transfer also additional functions permitted.

The total synchronisation for all connected drives with the control is achieved by a cyclic data exchange with accurate equidistant time.

In the event of an error is and Istwerte by cyclic communication automatically corrected. Up to the next cycle with the final valid are and Istwerten continued to work. Afterwards two successive incorrect transfers switch the drives off

The data between the control and the drives are exchanged over fiber-optic cables. Thus any opposite-acting disturbing influence is avoided.

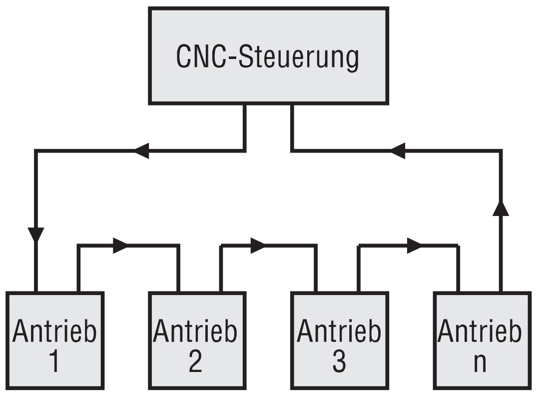
SERCOS (Serielles real time Communikations System) enables the transfer of performance data as well as operating modes with extended data scope.

The interface permits the connection of up to 8 drives at a fiber-optic cable ring. The number of drives for each control actual by the use of several fiber-optic cable rings expandable.

During the initialization dependent on capability characteristics on control and drives the function of the interfaces of a ring is determined, whereby speed and position adjustment are assigned to the CNC Control with BWO.

5.4 Digital axis module SERC (continuation)

Example of SERCOS Ringstruktur



5.4 Digital axis module SERC (continuation)

Error and diagnostic description

Occurrence the appearance of certain error or exceptional cases the program branches out to specific error routines with defined reactions.

Internal errors

After switching on of the SERC Module on the internal hardware components are checked. Possible errors are displayed over the 7-Segment-Anzeige.

System error

With system errors the system parameter „ system error „ is settinged accordingly and indicated this the control about the INTERRUPT status register with the value 0x4000.
The error code is entered in the parameter Y-0-0011.

With system errors SERC always switches 0 into the phase and enables the elimination of errors. After clearing the error SERC starts a renewed phase build-up.

Axis-specific errors

In the case of axis-specific errors the diagnostic status is settinged and indicated this the control about the INTERRUPT status register with the value 0x01nn (nn: Axis structure bit). Some axis-specific errors cause additionally a system error.

In the case of axis-specific errors SERC remains in the current phase and enables the elimination of errors. After clearing the error the control or the control surface must activate on a shifting of the phase up.

5.4 Digital axis module SERC (continuation)

Meaning of the status messages (overall view)

Status 7-Seg.	Supervisor state	Status message in the system parameter , supervisor state ‘ (Y-0-0015)
0	0xE001	Phase 0
0	0xE011	Phase 0, phase switching actively
1	0xE002	Phase 1
1	0xE012	Phase 1, phase switching actively
2	0xE003	Phase 2
2	0xE013	Phase 2, phase switching actively
3	0xE004	Phase 3
3	0xE014	Phase 3, phase switching actively
b	0xE005	,,ready for use“
5.	0xE006	test operation: Zero-bit stream
6.	0xE007	test operation: Steady light
7	0xE008	LWL ring not closed
8.	0x0000	Reset

5.4 Digital axis module SERC (continuation)

Meaning of the system errors (overall view)

Status 7-Seg.	Error in phase	Reaction	System-error	Error messages in the system parameter , system error “ (Y-0-0011)
A	1	Phase 0	0x8005	drive addresses not correctly
C	3-4	Phase 0	0x8007	double AT failure
C	3-4	Phase 0	0xF008	double MST failure
L	1-4	Phase 0	0x8009	LWL ring interrupted
n	2	Phase 0	0xF001	configuration errors (command / actual channel)
o	2	Phase 0	0xF002	errors in the time protection calculation
P	0-4	Phase 0	0xF003	false phase specification of the numerical control
r	0-4	Phase 0	0xF004	SERC: internal error
U	4	Phase 0	0xF005	error life counter
u	2	Phase 0	0xF006	copying times too long
y	0	Phase 0	0xF007	check total errors (Y parameter)
c	2-4	Phase 0	0xF008	SYNCIN signal incorrectly (ESD, spike, missing)
J	0-4	keine	0xF009	Errors with system parameter store or system parameter modified. The examination of the Min4Max-Wene failed.
J	0-4	keine	0XF00A	One or several parameters actual / are write protected (see, control instructions in more Interruptregister “.

5.4 Digital axis module SERC (continuation)

Meaning of the axis-specific errors (overall view)

Status 7-Seg.	Error in phase	Reaction	Diagnostic status	Error messages in the diagnostic text the eight axis-specific diagnostic channels
d	2-4	Phase 0	0x8006	HS timeout
E	2	Phase 2	0xD002	switching phase 2 - > 3 not possible
F	3	Phase 3	0xD003	switching phase 3 - > 4 not possible
H	2-4	Phase 2-4	0xD004	command in the drive not executably
H	0-1	Phase 0-1	0xC003	command channel at present not actively
h	2-4	Phase 2-4	0xD00I	drive error (status class 1, S-0-0011)

5.4 Digital axis module SERC (continuation)

Status-display	Meaning of the status messages	
0	**Phase 0**	phase switching actively
1	**Phase 1**	phase switching actively
2	**Phase 2**	phase switching actively
3	**Phase 3**	phase switching actively
b	**Phase 4**	„ ready for use „ The performance can be connected and the drives be traversed.

5. Test operation zero-bit stream

The test operation, “ zero-bit stream “ was selected.

Reaction by SERC
SERC transmits zero-bit stream and prevents the phase build-up.

A cause
Test operation over DIP SWITCH SD1 switch 1 activates.

Remedial action
DIP SWITCH SD1 switch 1 switch off.

6. Test operation steady light

The test operation, ‘ steady light ‘ was selected.

Reaction by SERC
SERC transmits steady light and prevents the phase build-up.

A cause
Test operation over DIP SWITCH SD1 switch 2 activates.

Remedial action
DIP switch SD1 switch 2 switch off.

5.4 Digital axis module SERC (continuation)

Status-display	Meaning of the status messages
7	**LWL Ring not closed** After a hardware RESET of SERC the SERCOS Ring was not closed. SERC cannot receive 10 sequential MST Telegrams of the phase 0. <u>Reaction by SERC</u> SERC remains not closed in the status, LWL ring “ to the fiber-optic cables closed actual and leads afterwards automatically a build-up into the target phase through. <u>A cause</u> - fiber-optic cable interchanges or not correctly screwed on. - defective fiber-optic cable ring. - data rates of the drives and adjusted by SERC differently. - the visual transmitting power of a user in the SERCOS Ring actual falsely adjusted. - defective drive. <u>Remedial action</u> - all fiber-optic cables check. - data rates check, Drives: see description of application of the drive manufacturer - visual transmitting power of all users in the SERCOS Ring of the actual LWL length adapt.
8.	**Reset** SERC is in the RESET status. It actual no communication with SercTop possible. <u>A cause</u> The control did not setting in the Config registers 2 or PC control register the bit 0. <u>Remedial action</u> In the Config registers 2 or PC control registers the bit 0 setting or the RESET behavior adjust with automatic build-up.

5.4 Digital axis module SERC (continuation)

Status-display	Meaning of the error messages
C	**Double AT failure or double MST Failure** Became two successive drive-put-ram (RK) a drive or two successive master synchronisation telegrams (MST) of SERC do not receive. <u>Reaction by SERC</u> phase resetting in communication phase 0. <u>A cause</u> - fiber-optic cables not correctly screwed on. - defective fiber-optic cable ring. - defective drive. - the visual transmitting power of a user in the SERCOS Ring actual falsely adjusted. <u>Remedial action</u> - all fiber-optic cables check. - visual transmitting power of all users in the SERCOS Ring of the actual LWL length adapt.
d	**NC/MMI Servicekanal HS Timeout** On drive does not have with a request over the service channel within 10 SERCOS cycles the bit 0 in the drive status getoggelt. <u>Reaction by SERC</u> Phase resetting in communication phase 0. <u>A cause</u> Defective drive. <u>Remedial action</u> Drive exchange. Turns it itself to the service of the drive manufacturer.

5.4 Digital axis module SERC (continuation)

Status-display	Meaning of the error messages
E	**Switching: Phase 2 > 3 not possible** SERC cannot execute the phase switching of phase 2 after phase 3. <u>Reaction by SERC</u> SERC leaves the switching command settinged and terminates the phase build-up. Diagnosis of the suitable drive is written into the diagnostic channel. <u>A cause</u> At least on drive refuses switching into the phase 3 with that Command, switching preparation on communication phase 3 “. <u>Remedial action</u> Errors in the suitable drive recover (see help of the drive manufacturer).
F	**Switching phase 3 > 4 not possible** SERC cannot execute the phase switching of phase 3 after phase 4. <u>Reaction by SERC</u> SERC leaves the switching command settinged and terminates the phase build-up. Diagnosis of the suitable drive is written into the diagnostic channel. <u>A cause</u> At least on drive refuses switching into the phase 4 with that Command, switching preparation on communication phase 4 “. <u>Remedial action</u> Errors in the suitable drive recover (see help of the drive manufacturer)

5.4 Digital axis module SERC (continuation)

Status-display	Meaning of the error messages

H **Command in the drive not executably or kommandokanal at present not actively.**
Over the kommandokanal of SERC on SERCOS Command activated the numerical controls. This actual in the drive concerned not feasible.

<u>Reaction by SERC</u>
SERC leaves the command settinged and writes the diagnosis of the suitable drive into the diagnostic channel.

<u>A cause</u>
Diagnostic status D004: During the command version on error stepped up in the drive
Diagnostic status C003: The numerical controls tried 1 has on in communication phase 0 or to start command.

<u>Remedial action</u>
Diagnostic status D004: It checks you whether the boundary conditions are correct thereby drive can execute the command.

Diagnostic status C003: Switches you into the communication phase 2 or 4 and starts them the command again.

h **Drive error**
On drive announces a drive error by settinging the static status bit for the status class 1 in the drive status.

<u>Reaction by SERC</u>
The diagnosis of the suitable drive is written into the diagnostic channel.

<u>A cause</u>
In the drive actual on errors occurred.

<u>Remedial action</u>
Parameter "status class 1"(s 0 0011) "diagnosis" (S-0-0095) and "diagnostic number" (S-0-0390) analyse, error cause recover.

5.4 Digital axis module SERC (continuation)

Status-display	Meaning of the error messages

A **Drive addresses not correctly**
The phase shifting off phase 0 cannot be executed, because in
, list of the drive addresses „ (Y-0-0012) entered drive addresses in the ring not were found.

Reaction by SERC
Phase resetting in communication phase 0.

A cause
In the Y-0-0012 actual at least one drive address entered, those in the ring not one found.
After SERC detected that the LWL Ring became closed actual, the LWL Ring in phase 1 again interrupted.

Remedial action
Drive addresses check. It actual admissible the fact that drive addresses are in the ring, which not in, is entered to list of the drive addresses „ (Y-0-0012).
LWL Ring check.
Data rates check,
SERC: see parameter Y-0-0003,
Drives: see description of application of the drive manufacturer

L **LWL Ring** interrupted
The LWL Ring was interrupted, after it was already detected that it was closed

Reaction by SERC
Phase resetting in communication phase 0.

A cause
Defective fiber-optic cable ring.
The visual transmitting power of a user in the SERCOS Ring actual falsely adjusted.
Defective drive.

Remedial action
All fiber-optic cables check.
Visual transmitting power of all users in the SERCOS Ring of the actual LWL length adapt.

5.4 Digital axis module SERC (continuation)

Status-display	Meaning of the error messages

n **Configuration error (command / actual value channel)**

With the configuration of the cyclic telegram data with the entries off the command - / actual on errors actual value channels occurred.

<u>Reaction by SERC</u>
Phase resetting in communication phase 0.

<u>A cause</u>
There is too many is or actual value configures.
In the Y-0-0039 or Y-0-0040 actual the bit 15 settinged and in the Low byte the entered length actual too largely.

<u>Remedial action</u>
Reduce you the number of cyclic data
(see parameter S-0-0016, S-0-0024 in the drives).
Reset you Y-0-0039 or Y-0-0040 or modify to you the length specification of the being or actual value channel.

o **Error in the time slot calculation**

With the calculation of the times for the SERCOS Transfer in phase 4 actual on errors occurred.

<u>Reaction by SERC</u>
Phase resetting in communication phase 0.

<u>A cause</u>
The configured command soll-oder did not Istwerte become from at least one drive supports (see parameter Y-0-0021 - to Y-0-0036), because the parameter number not available actual or cannot be configured cyclically.
In SERC the command value generator was activated and an operating mode adjusted for SERC automatically cyclic parameters to configure does not want, those in the drive are available or cyclically to configure do not leave themselves. Thus support e.g.. some drives the operating mode, drive-internal interpolation „ not.

<u>Remedial action</u>
It checks you whether the parameter entered in the suitable being actual value channel from the drive for the cyclic over conference is certified.
Command value generator switch off or other operating mode select.

5.4 Digital axis module SERC (continuation)

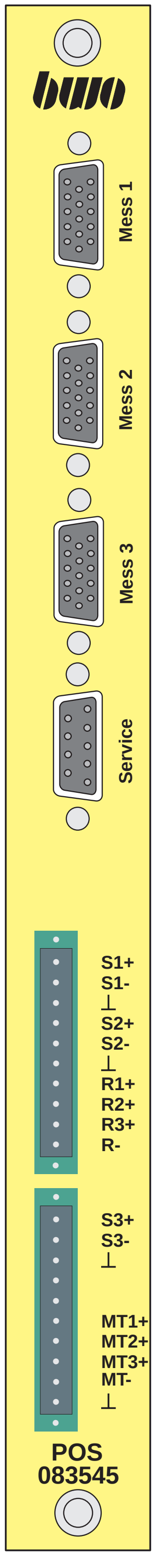
Status-display	Meaning of the error messages
P	**False phase specification of the numerical control** The NC as SERCOS phase a target phase gave not equal to 0, 1, 2, 3 or 4. Reaction by SERC Phase resetting in communication phase 0. A cause In the parameter, phase specification “ (Y-0-0014) became a target phase not equal 0, 1, 2, 3 or 4 given and in more Interruptsteuerregister the instruction, “phase modifies “ (value 0x2000) released. Remedial action Parameters, phase specification “ (Y-0-0014) phase specification with valid value describe.

6. Positioning modules

6.1 Positioning module POS

Active axis module

for 3 analogue-controlled axes with incremental measuring system



Standard version art. NR. 083545

CPU for automatic interpolation and position adjustment

High performance version art. NR. 083672

CPU with coprocessor
for automatic interpolation and position adjustment,
Tool offset compensation and parameter calculation

<u>Allocation of the 15-pin HD Sub sockets</u>
<u>‘ measuring 1 ‘ to ‘ measuring 4 ‘</u>

Pin 1	T1
Pin 2	sensor line 0V
Pin 3	/ T2
Pin 4	T0
Pin 5	sensor line 5V
Pin 6	screen
Pin 7	Uas (error signal)
Pin 8	-
Pin 9	/ T1
Pin 10	T2
Pin 11	0V
Pin 12	/ T0
Pin 13	-
Pin 14	+5V
Pin 15	/ Uas (error signal)

6.1 Positioning module POS (continued)

Allocation of the 9-pin Socket ‘ service ‘

Pin 1	screen
Pin 2	TXD+
Pin 3	TXD
Pin 4	-
Pin 5	GND
Pin 6	VCC
Pin 7	RXD
Pin 8	RXD+
Pin 9	MSR

Allocation of the 10pol. Terminal strip with POS

upper terminal strip

Pin 1	S1+	command value 1
Pin 2	S1-	
Pin 3	⊥	screen
Pin 4	S2+	command value 2
Pin 5	S2-	
Pin 6	⊥	screen
Pin 7	R1	reference 1
Pin 8	R2	reference 2
Pin 9	R3	reference 3
Pin 10	R-	(0V)

lower terminal strip

Pin 1	S3+	command value 3
Pin 2	S3-	
Pin 3	⊥	screen
Pin 4		-
Pin 5		-
Pin 6	MT1	sensor 1
Pin 7	MT2	sensor 2
Pin 8	MT3	sensor 3
Pin 9	MT-	(0V)
Pin 10	⊥	screen

6.1 Positioning module POS (continued)

Function

The positioning module POS has been designed for selecting three servo-motors having an incremental measuring system. Each channel has its own counter having a counting maximum frequency of 10 MHz (fourfold edge evaluation) as well as a 16bit D/A converter for writing out the scheduled value within a range of ± 10V.

Components

The module contains the following components:

Processor containing the operating system ‘POS’ (EEPROM)
Battery-buffered RAM memory for system data and NC programs
Memory for processing cycles (EEPROM)
System interface for the PLC
Servicing interface
Three analog outputs
Three path-measuring system inputs for incremental and reference signals
Three measuring signal inputs for connecting sensors

Connection

The whole of the peripheral signals are connected by means of plug-type connectors at the front side of the module. There are available three 15-pin HD-Sub plug-type connectors for the incremental measuring systems. The scheduled values as well as the reference and sensor signals are connected by means of two 10-pin screwed plug-type connectors. A 9-pin D-Sub plug-type connector is provided for the servicing interface.

Power supply

The POS module is supplied via the system bus with the required operating voltages + 5V, + 15V, -15V and the buffer voltage of ± 3.6V. The operating voltage for the measuring systems (+ 5V) is available in the 15-pin HD-Sub socket.

6.1 Positioning module POS (continued)

Technical data

Processor	20MHz clock frequency, additionally coprocessor during high performance version	
Module identifier	10H, requestable in address 80H	
Save		
- for operating system	EEPROM,	196kB
- for parameters and NC programs	EEPROM, 60kB	
- for parameters	RAM, 64kB	, with back-up battery ($U_{battery.}$ min. 2,4V)
- for NC data	RAM, 96kB	, with back-up battery ($U_{battery.}$ min. 2,4V) the data in RAM Saving remain also with out approx. 2 hours to pulled module receive.
Interfaces		
- service for operating system development and diagnosis	RS422 snaps - interface, max. Data transmission rate 20Mbit/s, connection over 9pol. CD-Sub-plug at the front side.	
- BUS	the interface to the system bus consists off two 32bit-Registern over those the datentransfer between that central processing unit and the internal processor take place. the datentransfer runs interrupt-controlled over two handshake flag, those during writing and reading that register to be settinged automatically or reset.	
Axes	the module knows 3 servo axes in different operating modes trigger: - linear interpolation in 3 axes and - circular interpolation in 2 axes.	
Tool offset compensation	during high performance version possible	

6.1 Positioning module POS (continued)

Technical data (continued)

Inputs

- path measuring system	interface for on incremental measuring system per axis (line receiver RS422 with differential inputs) max. Input frequency 2,5MHz, analysis fourfold, max. Counting rate 10MHz; Input impedance 150 Ω
- disturbance signal	of the measuring system (e.g. by contamination)
- reference input	optically decoupled 24V-Eingang for each axis
- sensor input	optically decoupled 24V-Eingang for each axis
Outputs	on analogue output per axis; Resolution 16bit; voltage range -10V to +10V (max. 5mA)

Safety functions

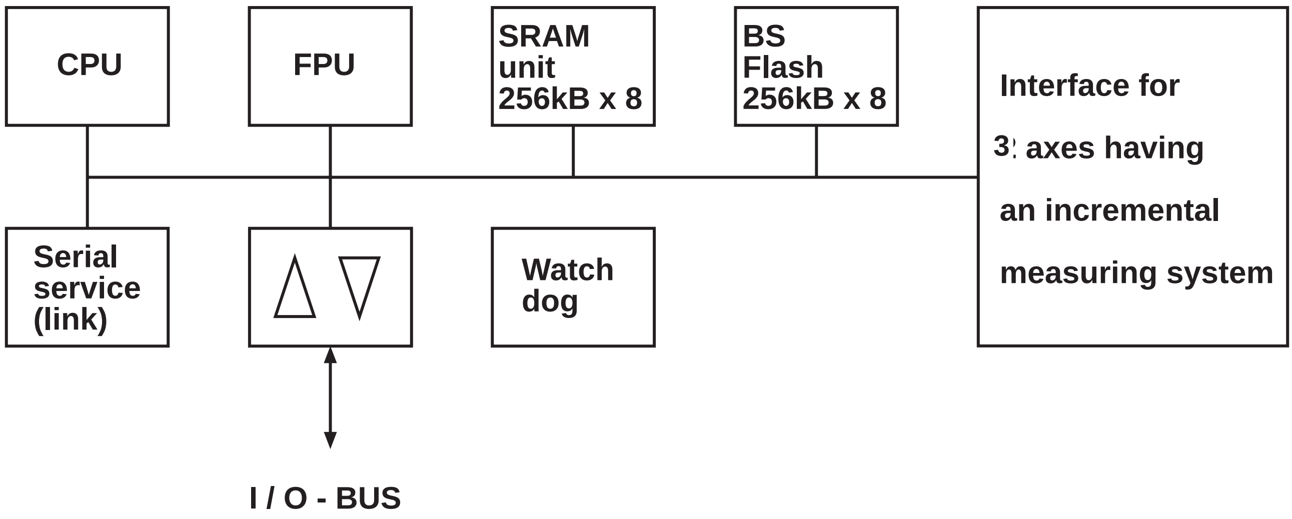
- Watchdog	monitors the internal processor and stops the axes in the event of an error
- +5V-Ueberwachung	if U_{CC} < 4,65V is created RESETS
- ±15V-Ueberwachung	stops all axes in the event of an error, if message creates
- battery monitoring	message creates if $U_{battery.}$ < 2,4V
- NA signal	stops all axes with power failure
- end positions	per axis two software limit switches are programmable
- measuring system monitoring	wire break input frequency ≤ 2,5MHz input for disturbance signal (Uas) of the measuring system

Switching level

Measuring system inputs T0,/T0, T1,/T2, T2,/T2	low: min. - 1.0V	max. + 1.2V
	high: min. + 2.8V	max. + 5.5V
Reference input	low: min. - 1.0V	max. + 14.0V
	high: min. + 17.0V	max. + 30.0V
Sensor input	low: min. - 1.0V	max. + 14.0V
	high: min. + 17.0V	max. + 30.0V

6.1 Positioning module POS (continued)

Block diagram



6.2 Positioning module POA

Active axis module

for 3 analog triggered axes

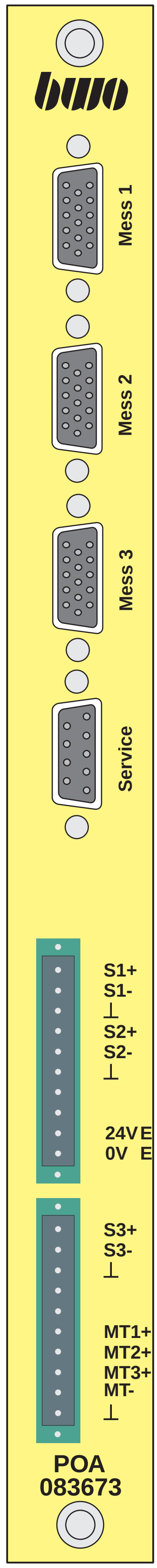
with absolute measuring system

Standard version art. NR. 083673

CPU for automatic interpolation and position adjustment

High performance version art. NR. 083674

CPU with coprocessor
for automatic interpolation and position adjustment,
Tool offset compensation and parameter calculation



<u>Allocation of the 15-pin HD Sub sockets</u>
<u>‘ measuring 1 ‘ to ‘ measuring 4 ‘</u>

Pin 1	clock +
Pin 2	0V
Pin 3	clock -
Pin 4	-
Pin 5	+5V
Pin 6	screen
Pin 7	-
Pin 8	24v Encoder
Pin 9	data +
Pin 10	data -
Pin 11	0V
Pin 12	-
Pin 13	0V Encoder
Pin 14	+5V
Pin 15	-

6.2 Positioning module POA (continued)

Allocation of the 9pol. Socket ' service '

Pin 1	screen
Pin 2	TXD+
Pin 3	TXD
Pin 4	-
Pin 5	GND
Pin 6	VCC
Pin 7	RXD
Pin 8	RXD+
Pin 9	MSR

Allocation of the 10pol. Terminal strip with POA

upper terminal strip

Pin 1	S1+	command value 1
Pin 2	S1-	
Pin 3	⊥	screen
Pin 4	S2+	command value 2
Pin 5	S2-	
Pin 6	⊥	screen
Pin 7		-
Pin 8		-
Pin 9	24v E	24v Encoder
Pin 10	0V E	0V Encoder

lower terminal strip

Pin 1	S3+	command value 3
Pin 2	S3-	
Pin 3	⊥	screen
Pin 4		-
Pin 5		-
Pin 6	MT1	sensor 1
Pin 7	MT2	sensor 2
Pin 8	MT3	sensor 3
Pin 9	MT-	(0V)
Pin 10	⊥	screen

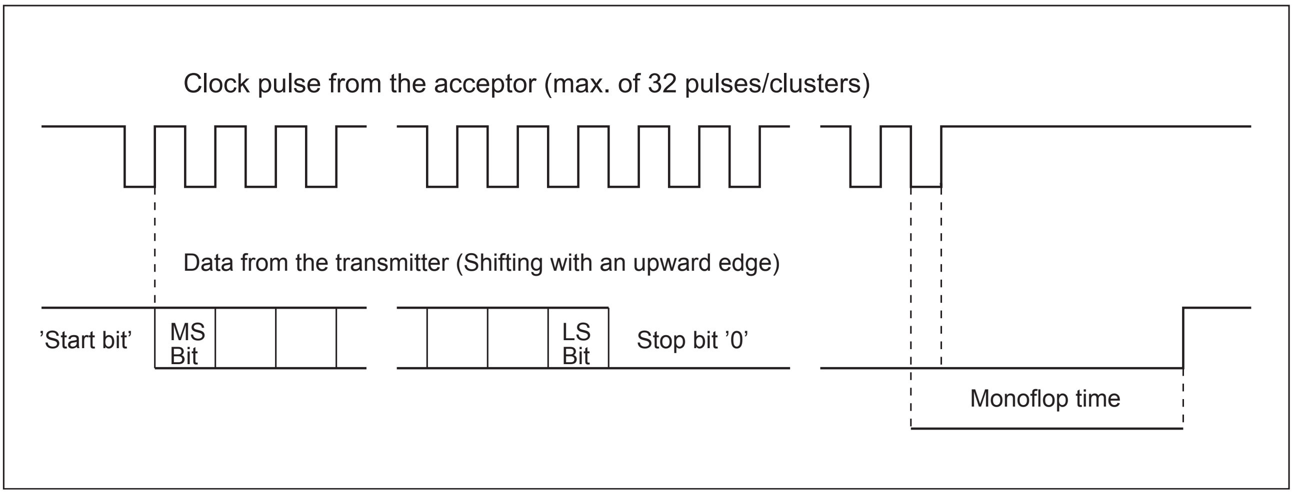
6.2 Positioning module POA (continued)

Function

The positioning module POA has been designed for selecting three servo-motors having an absolute measuring system with SSI interface. Each channel has a programmable synchronous-serial interface. Outputting the scheduled value is performed via a 16-bit D/A converter within a range of ± 10V.

Synchronous-serial transmission

The data transmission from the encoder to the control unit is regulated by a clock pulse that is generated in the positioning module. In the resting state, the signals clock pulse and data are ‘high’. Upon the first clock pulse edge decreasing, the transmitter (in the encoder stores the current measured value. The data transmission is performed with increasing edges starting with the MSbit (max. of 32 clock pulses). As soon as the last (low-order) data bit is transmitted, the data line is switched to ‘low’ until the encoder is ready for a new measured value. The duration of this low-phase is depending on the internal monoflop time.



6.2 Positioning module POA (continued)

Components

The module contains the following components:

Processor containing the operating system ‘POS’ (EEPROM)
Battery-buffered RAM memory for system data and NC programs
Memory for processing cycles (EEPROM)
System interface for the PLC
Servicing interface
Three analog outputs
Three path-measuring system inputs for incremental and reference signals
Three measuring signal inputs for connecting sensors

Connection

The whole of the peripheral signals are connected by means of plug-type connectors at the front side of the module. There are available three 15-pin HD-Sub plug-type connectors for the incremental measuring systems. The scheduled values as well as the reference and sensor signals are connected by means of two 10-pin screwed plug-type connectors. A 9-pin D-Sub plug-type connector is provided for the servicing interface.

Power supply

The POA module is supplied via the system bus with the required operating voltages + 5V, + 15V, -15V and the buffer voltage of $\pm$ 3.6V. The operating voltage for the measuring systems (+ 5V) is available in the 15-pin HD-Sub socket.

Power supply of the measuring systems

For supplying the measuring systems, an external voltage (operating voltage of the measuring systems) has to be fed through the terminals 24VI and 0VI.

6.2 Positioning module POA (continued)

Technical data

Processor	20MHz clock frequency, additionally coprocessor during high performance version
Module identifier	12H, requestable in address 80H
Save	
- for operating system	EEPROM, 196kB
- for parameters and NC programs	EEPROM, 60kB
- for parameters	RAM, 64kB , with back-up battery ($U_{battery.}$ min. 2,4V)
- for NC data	RAM, 96kB , with back-up battery ($U_{battery.}$ min. 2,4V) the data in RAM Saving remain also with out approx. 2 hours to pulled module receive.
Interfaces	
- service for operating system development and diagnosis	RS422 snaps - interface, max. Data transmission rate 20Mbit/s, connection over 9pol. CD-Sub-plug at the front side.
- BUS	the interface to the system bus consists off two 32bit-Registern over those the datentransfer between that central processing unit and the internal processor take place. the datentransfer runs interrupt-controlled over two handshake flag, those during writing and reading that register to be settinged automatically or reset.
Axes	the module knows 3 servo axes in different operating modes, among other things. Linear and circular interpolation trigger.
Tool offset compensation	only during high performance version possible

6.2 Positioning module POA (continued)

Technical data (continuation)

Inputs

- path measuring system	interface for on absolute measuring system (SSI) per axis. programmable transfer frequencies 250kHz, 330kHz, 500kHz, 1MHz. programmable data format max. 32Bit. software related switching Gray /Binaer code
- sensor input	optically decoupled 24V-Eingang for each axis

Outputs	on analogue output per axis; Resolution 16bit; voltage range -10V to +10V (max. 5mA)

Safety functions

- Watchdog	monitors the internal processor and stops the axes in the event of an error
- +5V-Ueberwachung	if U_{CC} < 4,65V is created RESETS
- ±15V-Ueberwachung	stops all axes in the event of an error, if message creates
- battery monitoring	message creates if $U_{battery.}$ < 2,4V
- NA signal	stops all axes with power failure
- end positions	per axis two software limit switches are programmable

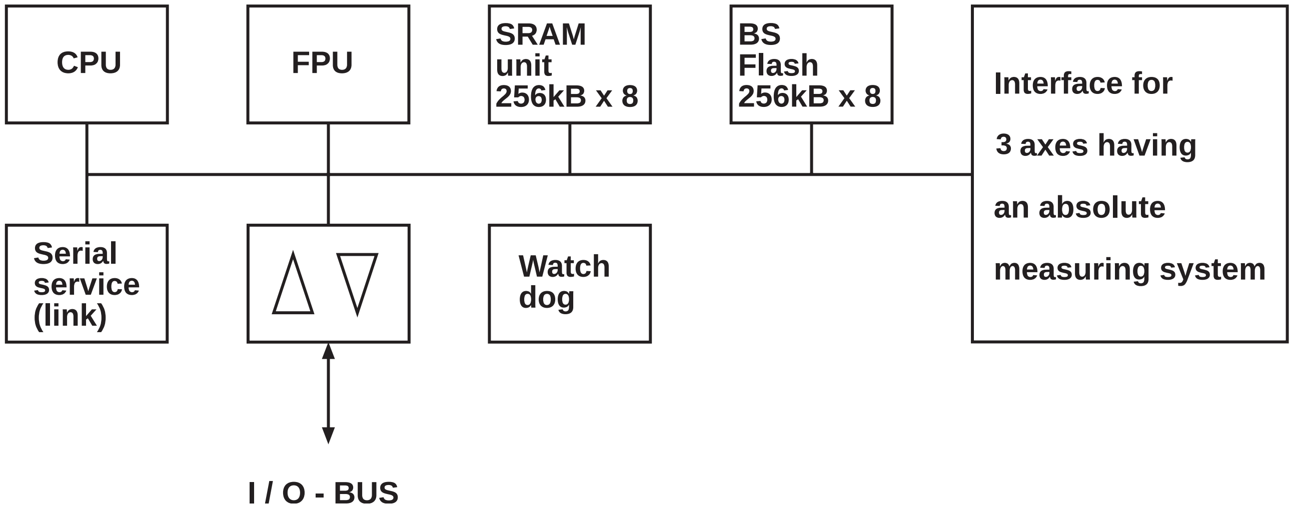
6.2 Positioning module POA (continued)

Switching level

Inputs	
Measuring system signals	
Pulse+, pulse-	low: min. - 1.0V max. + 1.2V
	high: min. + 2.8V max. + 5.5V
	Reference potential = 0V of the control unit
Measuring system signals	
Data+, data-	low: min. - 1.0V max. + 1.2V
	high: min. + 2.8V max. + 5.5V
	Reference potential = 0V external
Sensor input	low: min. - 1.0V max. + 14.0V
	high: min. + 17.0V max. + 30.0V

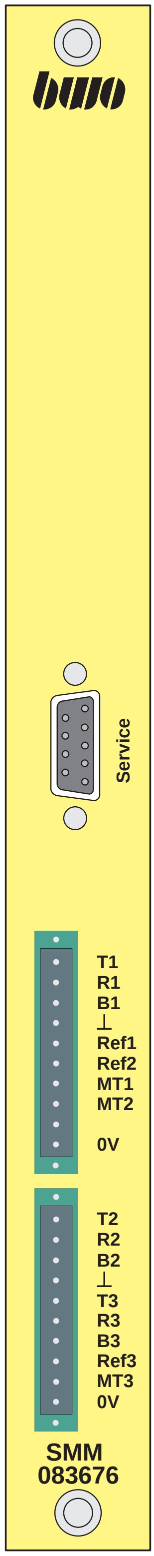
6.2 Positioning module POA (continued)

Block diagram



6.3 Step motor module SMM

Active axis module for 3 stepping motors



Standard version art. NR. 083676

CPU for automatic interpolation and position adjustment

High performance version art. NR. 083677

CPU with coprocessor
for automatic interpolation and position adjustment,
Tool offset compensation and parameter calculation

6.3 Step motor module SMM (continued)

Allocation of the 9-pin Socket ‘ service ‘

Pin 1	screen
Pin 2	TXD+
Pin 3	TXD-
Pin 4	-
Pin 5	GND
Pin 6	VCC
Pin 7	RXD-
Pin 8	RXD+
Pin 9	MSR

Allocation of the 10-pin upper terminal strip with ASM

upper terminal strip

Pin 1	T1	clock 1
Pin 2	R1	direction 1
Pin 3	B1	Boost 1
Pin 4	⊥	screen
Pin 5	Ref1	reference switch 1
Pin 6	Ref2	reference switch 2
Pin 7	MT1	sensor 1
Pin 8	MT2	sensor 2
Pin 9	-	
Pin 10	0V	(externally 0V)

lower terminal strip

Pin 1	T2	clock 2
Pin 2	R2	direction 2
Pin 3	B2	Boost 2
Pin 4	⊥	screen
Pin 5	T3	clock 3
Pin 6	R3	direction 3
Pin 7	B3	Boost 3
Pin 8	Ref3	reference switch 3
Pin 9	MT3	sensor 3
Pin 10	0V	(externally 0V)

6.3 Step motor module SMM (continued)

Function

The step motor module SSM is designed for selecting the step motor power range out of three. Each channel has the control signals ‘Clock pulse’, ‘Direction’ and ‘Boost’ as well as inputs for reference and measuring sensors. All inputs and outputs are electrically isolated by means of an optical coupler.

Components

The module has the following components:

Processor containing the operating system ‘POS’ (EEPROM)
Battery-buffered RAM memory for system data and NC programs
Memory for processing cycles (EEPROM)
System interface for the PLC
Servicing interface
Three interfaces for step motor power unit
Three inputs for reference signals
Three measuring signal inputs for connecting sensors

Connection

The whole of the peripheral signals are connected by means of plug-type connectors at the front side of the module. The control signals for the step motor power units as well as the reference and sensor signals are connected by means of two 10-pin screwed plug-type connectors. There is provided a 9-pin D-sub plug-type connector for the servicing interface.

Power supply

The SMM module is supplied via the system bus with the required operating voltages + 5V, + 15V, - 15V and the buffer voltage of ± 3.6V.

6.3 Step motor module SMM (continued)

Technical data

Processor	20MHz clock frequency, additionally coprocessor during high performance version	
Module identifier	16H, requestable in address 80H	

Save

- for operating system	EEPROM, 196kB	
- for parameters and NC programs	EEPROM, 60kB	
- for parameters	RAM, 64kB	, with back-up battery ($U_{battery.}$ min. 2,4V)
- for NC data	RAM, 96kB	, with back-up battery ($U_{battery.}$ min. 2,4V) the data in RAM Saving remain also with out approx. 2 hours to pulled module receive.

Interfaces

- service for Operating system development and diagnosis	RS422 snaps - interface, max. Data transmission rate 20Mbit/s, connection over 9pol. CD-Sub-plug at the front side.
- BUS	the interface to the system bus consists off two 32bit-Registern over those the datentransfer between that central processing unit and the internal processor take place. the datentransfer runs interrupt-controlled over two handshake flag, those during writing and reading that register to be settinged automatically or reset.
- to stepping motor service section	The control signals ‘ clock ‘, ‘ direction ‘ and ‘ Boost ‘ are as visual separate open collector outputs (28V, 30mA) implements. The signals are connected through in each case to the pin 10 (0V). The max. clock frequency is 60kHz.

Tool offset compensation only during high performance version possible.

6.3 Step motor module SMM (continued)

Technical data (continued)
Technical data (continuation)

Inputs

- reference input	optically decoupled 24V-Eingang for each axis
- sensor input	optically decoupled 24V-Eingang for each axis

Controlling outputs ‘ clock ‘, ‘ direction ‘ and ‘ Boost ‘

ein status:	I_{max} = 30mA / I_{min} = 5mA, U_{cemax} = 2,2V
out status:	$I \leq$ 1mA, U_{cemax} = 28V

Safety functions

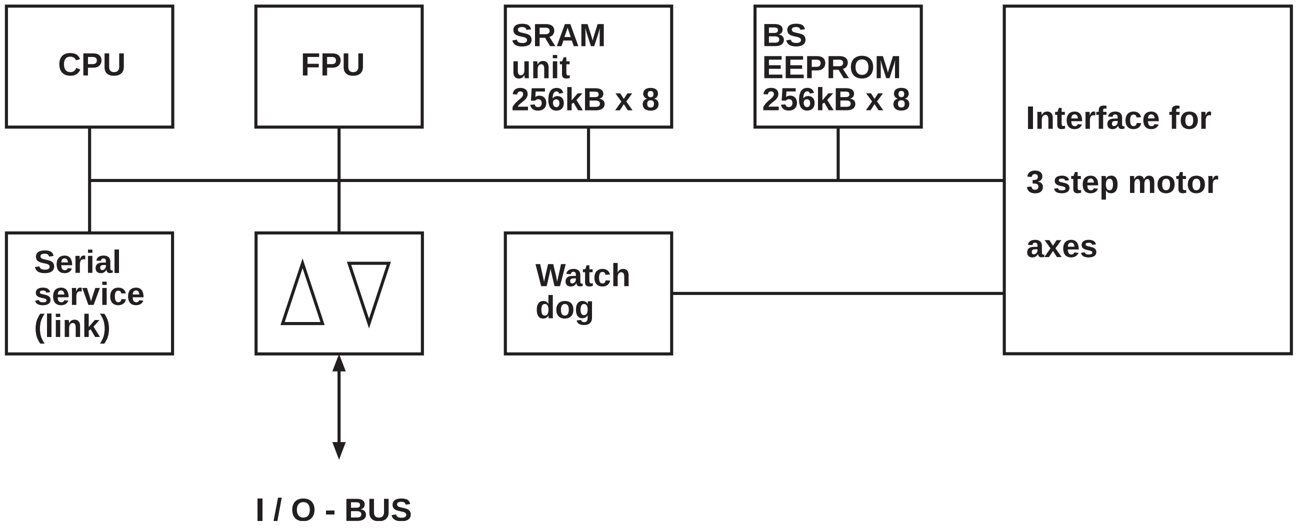
- Watchdog	monitors the internal processor and stops the axes in the event of an error
- +5V-Ueberwachung	if U_{CC} < 4,65V is created RESETS
- ±5V-Ueberwachung	stops all axes in the event of an error, if message creates
- battery monitoring	message creates if $U_{battery.}$ < 2,4V
- NA signal	stops all axes with power failure
- end positions	per axis two software limit switches are programmable

switching levels

Reference input	low: min. - 1.0V	max. + 14.0V
	high: min. + 17.0V	max. + 30.0V
Sensor input	low: min. - 1.0V	max. + 14.0V
	high: min. + 17.0V	max. + 30.0V

6.3 Step motor module SMM (continued)

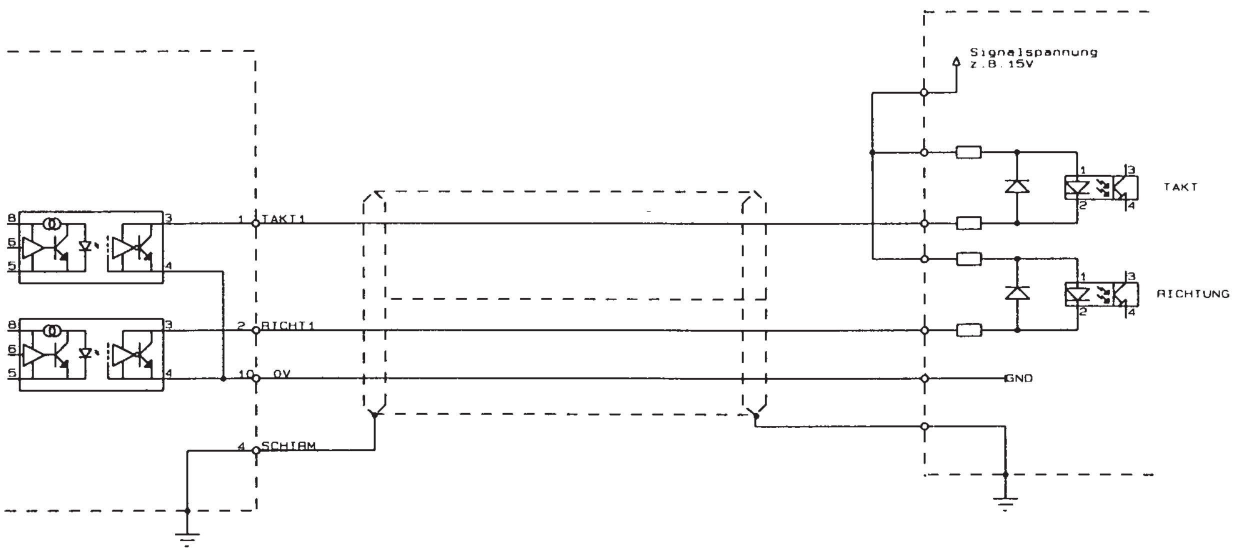
Block diagram

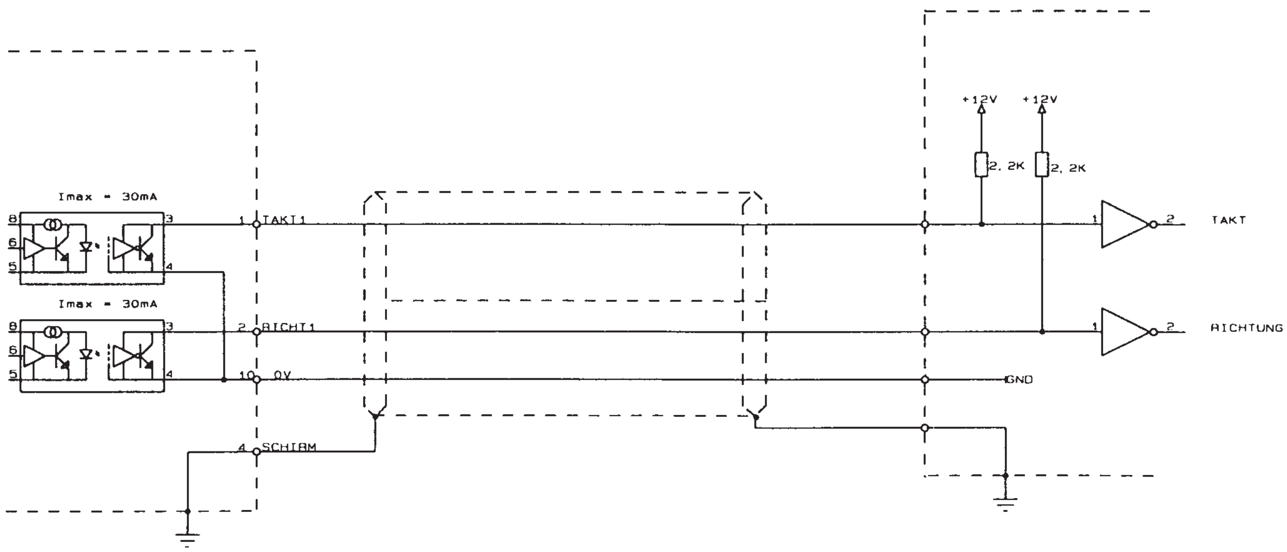


6.3 Step motor module SMM (continued)

Connection scheme (examples)

SSM module Power unit





A cable having screened pairs of wires is recommended for connecting. The cable screenings can be skinned and connected at the power unit or on both ends.

7. Digital input/output modules

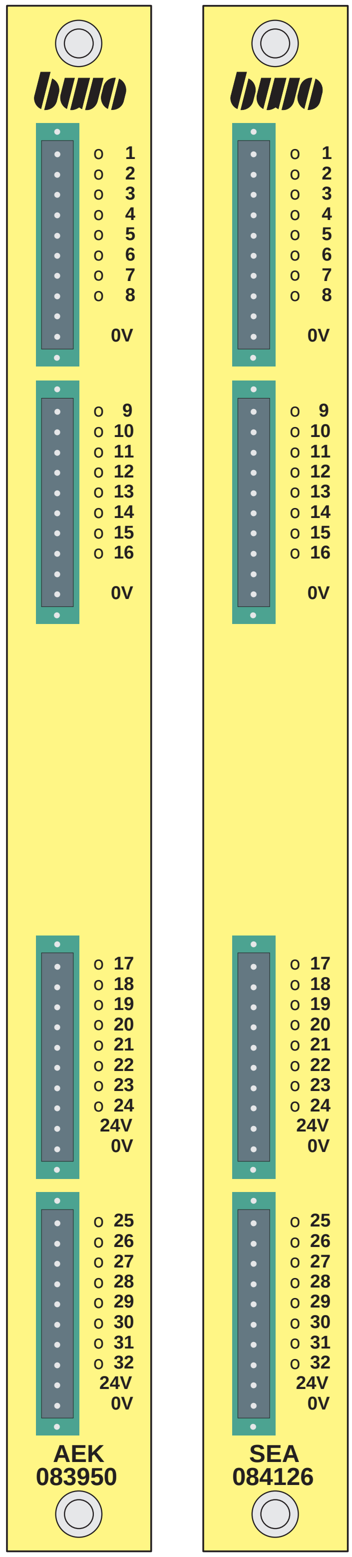
7.1 Input/output module AEK / SEA

In / output module AEK / SEA

with 16 inputs and 16 outputs

Input delay

with AEK approx. 3ms
with SEA approx. 0,15ms



Allocation of the 10-pin Terminal strips **of inputs**

	first terminal strip		second terminal strip	
Pin 1	1	input	9	input
Pin 2	2	input	10	input
Pin 3	3	input	11	input
Pin 4	4	input	12	input
Pin 5	5	input	13	input
Pin 6	6	input	14	input
Pin 7	7	input	15	input
Pin 8	8	input	16	input
Pin 9	-		-	
Pin 10	0V	for 1. Block	0V	for 2. Block

Allocation of the 10-pin Terminal strips **of outputs**

	third terminal strip		fourth terminal strip	
Pin 1	17	output	25	output
Pin 2	18	output	26	output
Pin 3	19	output	27	output
Pin 4	20	output	28	output
Pin 5	21	output	29	output
Pin 6	22	output	30	output
Pin 7	23	output	31	output
Pin 8	24	output	32	output
Pin 9	24V	for 3. Block	24V	for 4. Block
Pin 10	0V	for 3. Block	0V	for 4. Block

7.1 Input/output module AEK / SEA (continued)

Technical characteristics

Module identifier		07 H, requestable in address 80 H

Inputs

Inputs		16
Input voltage		max. 30V
Switching level of inputs with		approx. 5 V
Hysteresis of inputs		approx. 1 V
Input current		7mA
Per input		ever on filters
Input delay	**AEK**	approx. 3ms
	SEA	approx. 0,15ms
Protection against negative voltage peaks		yes
0V-Potential		internally separately in blocks to ever 8 inputs

7.1 Input/output module AEK / SEA (continued)

Technical characteristics

Outputs

Outputs	16
External supply voltage the output blocks	min. 20V max. 30V
Admissible permanent current	0,5A, 100% at the same time loadable
Visual check	by LED
Galvanic separation	over opto couplers
0V-Potential	internally separately in blocks to ever 8 outputs
Short circuit proof	
Current limiting	
Over-temperature disconnection	
Internal cut-off diode for inductive loads	max. 200mJ
Fuse protection	ever 8 outputs over own inlet for separate fuse protection
Output delay	approx. 7,5µs when switching on on approx. 29µs when switching off

Diagnosis

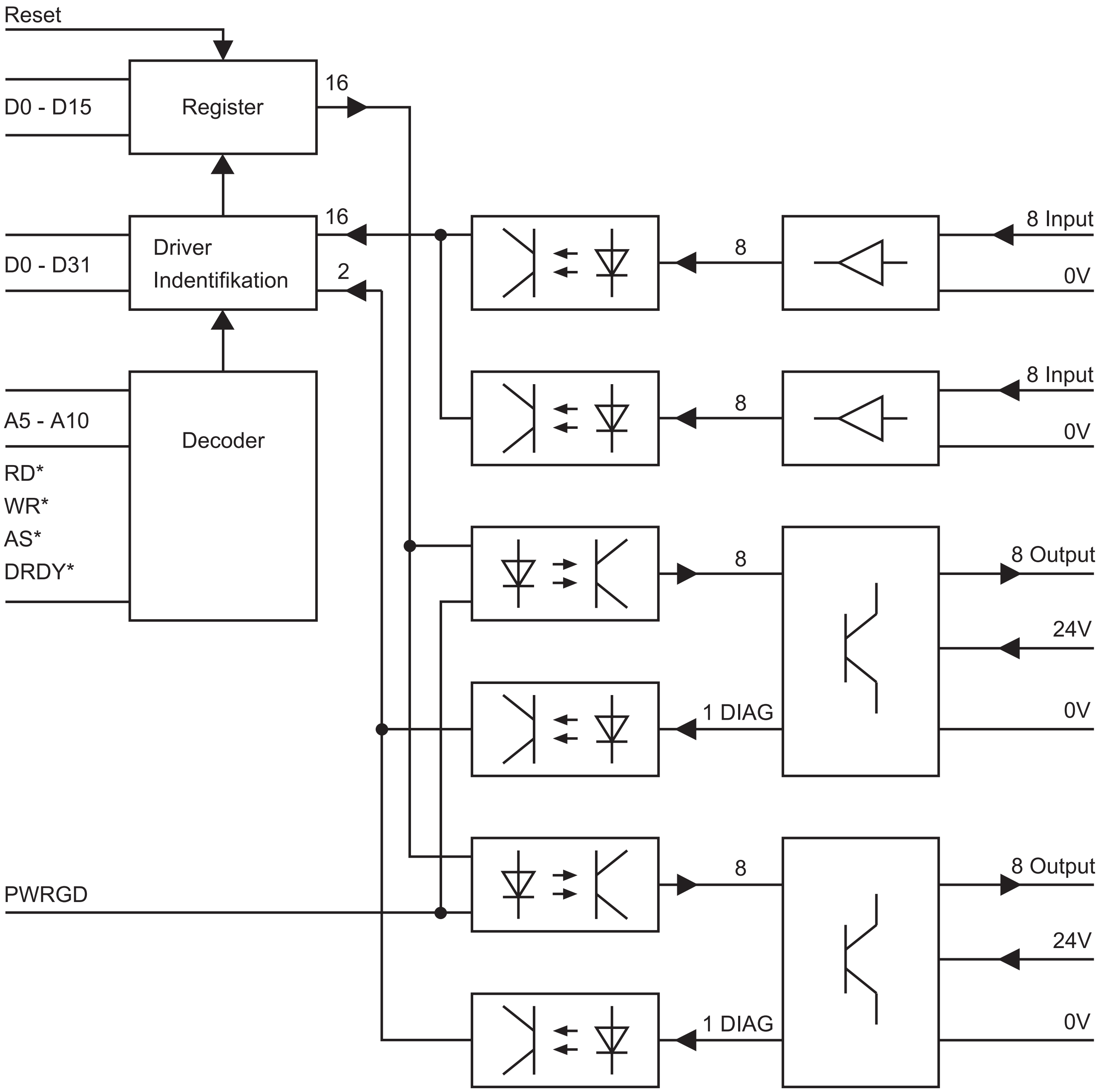
For 8 outputs each on diagnostic bit is 2. at the disposal, altogether

Are monitored:

- undervoltage
- wire break
- short-circuit against 0 and 24v
- over-temperature

7.1 Input/output module AEK / SEA (continued)

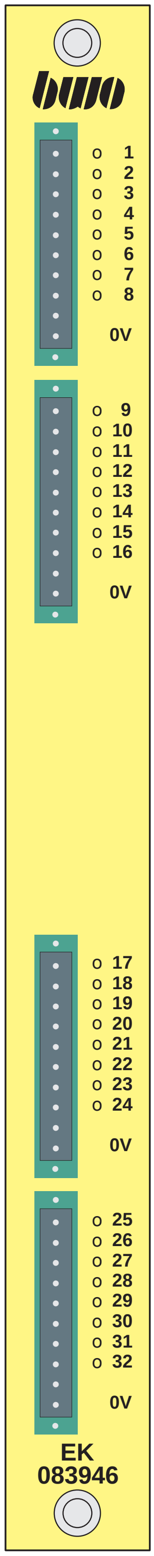
Block diagram



7.2 Input module EK

Input module

with 32 inputs



Allocation of the 10-pin Terminal strips **of inputs**

	first terminal strip		second terminal strip	
Pin 1	1	input	9	input
Pin 2	2	input	10	input
Pin 3	3	input	11	input
Pin 4	4	input	12	input
Pin 5	5	input	13	input
Pin 6	6	input	14	input
Pin 7	7	input	15	input
Pin 8	8	input	16	input
Pin 9	-		-	
Pin 10	0V	for 1. Block	0V	for 2nd block

Allocation of the 10-pin Terminal strips **of inputs**

	third terminal strip		fourth terminal strip	
Pin 1	17	input	25	input
Pin 2	18	input	26	input
Pin 3	19	input	27	input
Pin 4	20	input	28	input
Pin 5	21	input	29	input
Pin 6	22	input	30	input
Pin 7	23	input	31	input
Pin 8	24	input	32	input
Pin 9	-			-
Pin 10	0V	for 3. Block	0V	for 4. Block

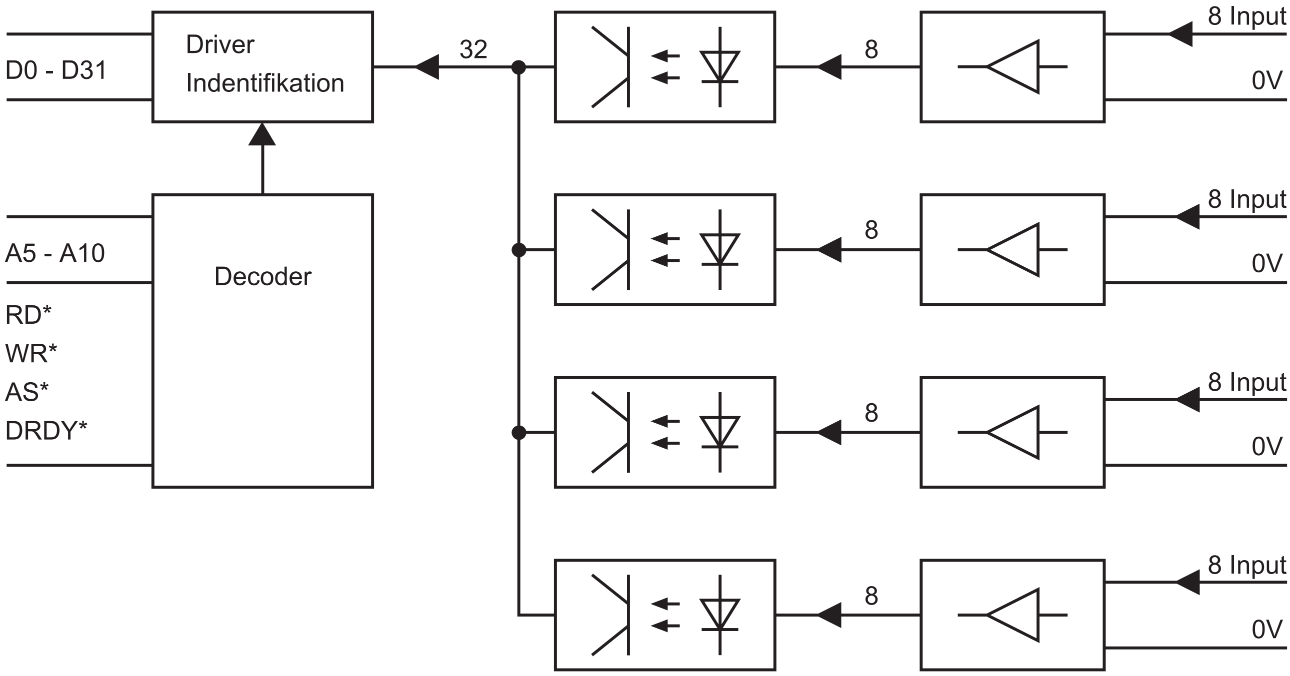
7.2 Input module EK (continued)

Technical characteristics

Module identifier	00 H, requestable on Adesse 80 H
Inputs	32
Input voltage	max. 30V
Visual check	by LED
Galvanic separation	over opto couplers
Switching level with	approx. 5V
Hysteresis	approx. 1V
Input current	7mA
Per channel ever on input filters	
Input delay	approx. 3ms
Protection against negative voltage peaks	yes
0V-Potential	internally separately in blocks to ever 8 inputs

7.2 Input module EK (continued)

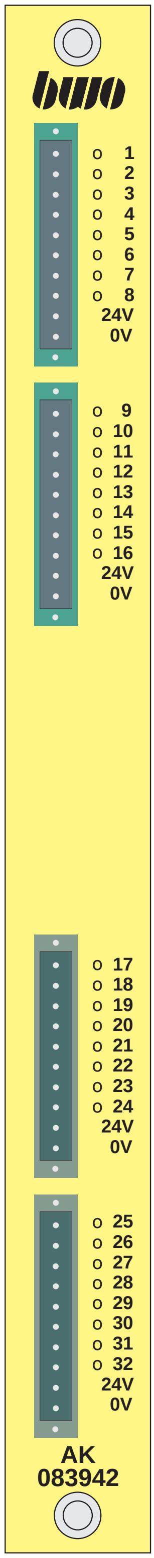
Block diagram



7.3 Output module AK

Output module

with 32 outputs with for each 0,5A



Allocation of the 10-pin Terminal strips **of outputs**

	first terminal strip		second terminal strip	
Pin 1	1	output	9	output
Pin 2	2	output	10	output
Pin 3	3	output	11	output
Pin 4	4	output	12	output
Pin 5	5	output	13	output
Pin 6	6	output	14	output
Pin 7	7	output	15	output
Pin 8	8	output	16	output
Pin 9	24V	for 1. Block	24V	for 2. Block
Pin 10	0V	for 1. Block	0V	for 2. Block

Allocation of the 10-pin Terminal strips **of outputs**

	third terminal strip		fourth terminal strip	
Pin 1	17	output	25	output
Pin 2	18	output	26	output
Pin 3	19	output	27	output
Pin 4	20	output	28	output
Pin 5	21	output	29	output
Pin 6	22	output	30	output
Pin 7	23	output	31	output
Pin 8	24	output	32	output
Pin 9	24V	for 3. Block	24V	for 4. Block
Pin 10	0V	for 3. Block	0V	for 4. Block

7.3 Output module AK (continued)

Technically characteristics

Module identifier	08 H, requestable in address 80H
Outputs	32, 100% at the same time loadable
Fatigue strength for each output	0,5A
External supply voltage the output blocks	min. 20V max. 30V
Visual check	by LED
Galvanic separation	over opto couplers
Short circuit proof	yes
Current limiting	yes
Over-temperature disconnection	yes
Internal cut-off diode	max. 200mJ
Fuse protection	ever 8 outputs over own inlet for separate fuse protection
Output delay	approx. 7,5µs when switching on on approx. 29µs when switching off
0V-Potential	internally separately in blocks to ever 8 outputs

Diagnosis

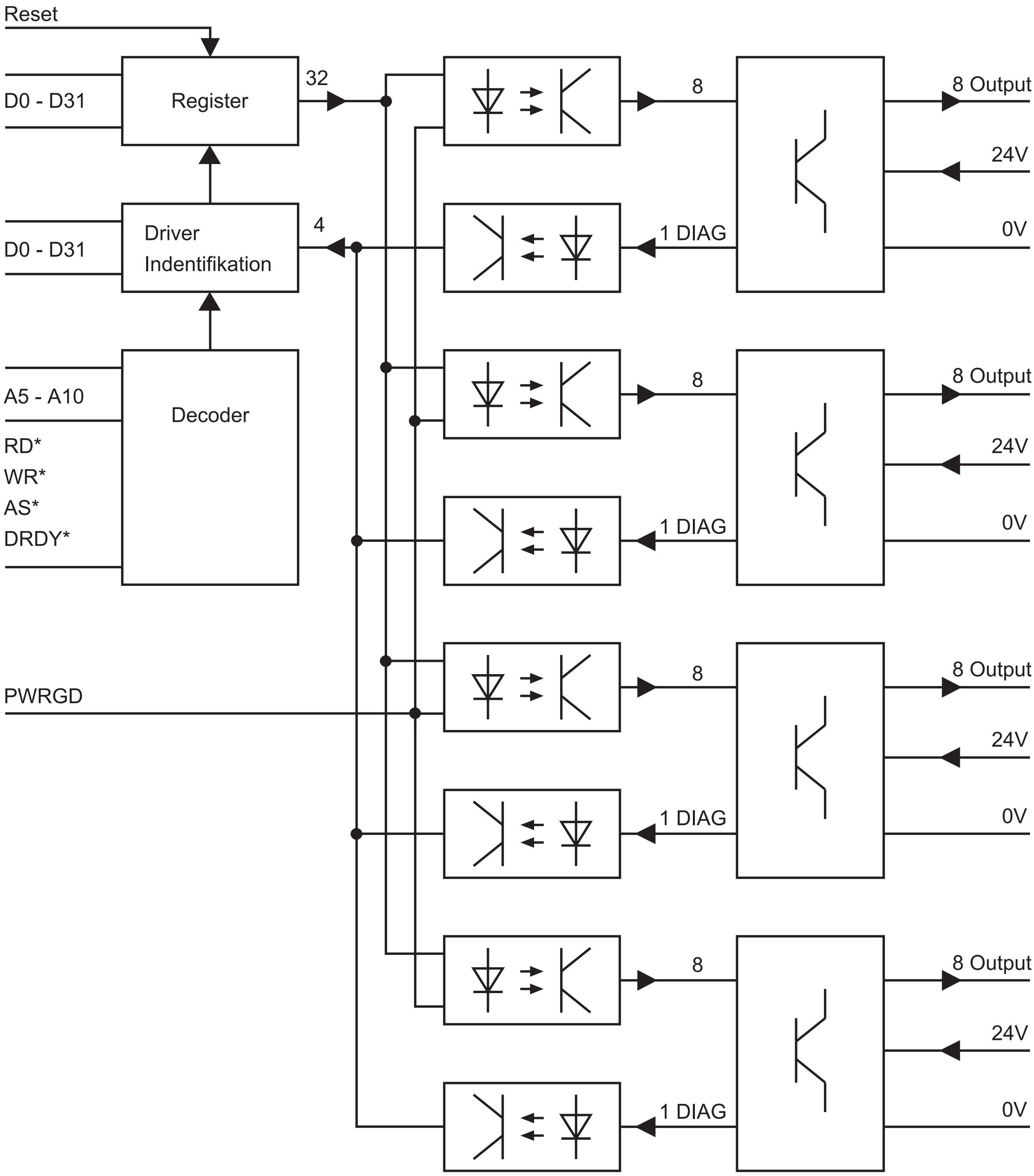
For 8 outputs each on diagnostic bit is to 4 at the disposal, altogether.

Are monitored:

- undervoltage
- wire break
- short-circuit against 0 and 24V
- over-temperature

7.3 Output module AK (continued)

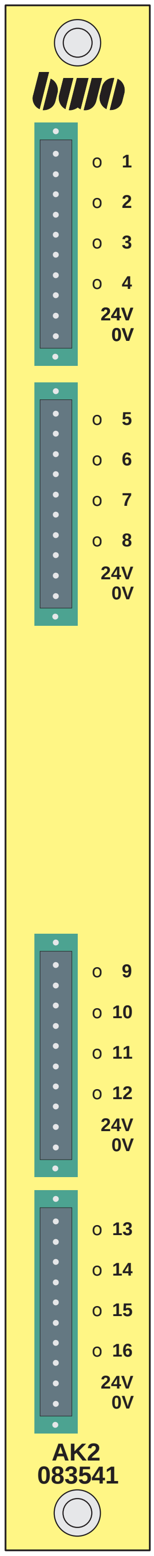
Block diagram



7.4 Output module AK2

Output module

with 16 outputs with for each 2A



Allocation of the 10-pin Terminal strips **of outputs**

	first terminal strip		second terminal strip	
Pin 1 Pin 2	1	Output	5	Output
Pin 3 Pin 4	2	Output	6	Output
Pin 5 Pin 6	3	Output	7	Output
Pin 7 Pin 8	4	Output	8	Output
Pin 9	24V	for 1. Block	24V	for 2. Block
Pin 10	0V	for 1. Block	0V	for 2. Block

Allocation of the 10-pin Terminal strips **of outputs**

	first terminal strip		second terminal strip	
Pin 1 Pin 2	9	Output	13	Output
Pin 3 Pin 4	10	Output	14	Output
Pin 5 Pin 6	11	Output	15	Output
Pin 7 Pin 8	12	Output	16	Output
Pin 9	24V	for 3. Block	24V	for 4. Block
Pin 10	0V	for 3. Block	0V	for 4. Block

7.4 Output module AK2 (continued)

Technical characteristics

Module identifier	0A H, requestable in address 80H
Outputs	16
Fatigue strength for each output	2A
Per plug (4 outputs)	max. 8A
External supply voltage the output blocks	min. 20V max. 30V
Visual check	by LED
Galvanic separation	over opto couplers
Short circuit proof	yes
Current limiting	yes
Over-temperature disconnection	yes
Internal cut-off diode	max. 1J
Fuse protection	ever 4 outputs over own inlet for separate fuse protection
Output delay	approx. 7,5µs when switching on on approx. 29µs when switching off

Note: Pin 1+2, 3+4, 5+6, 7+8 the plug are connected.

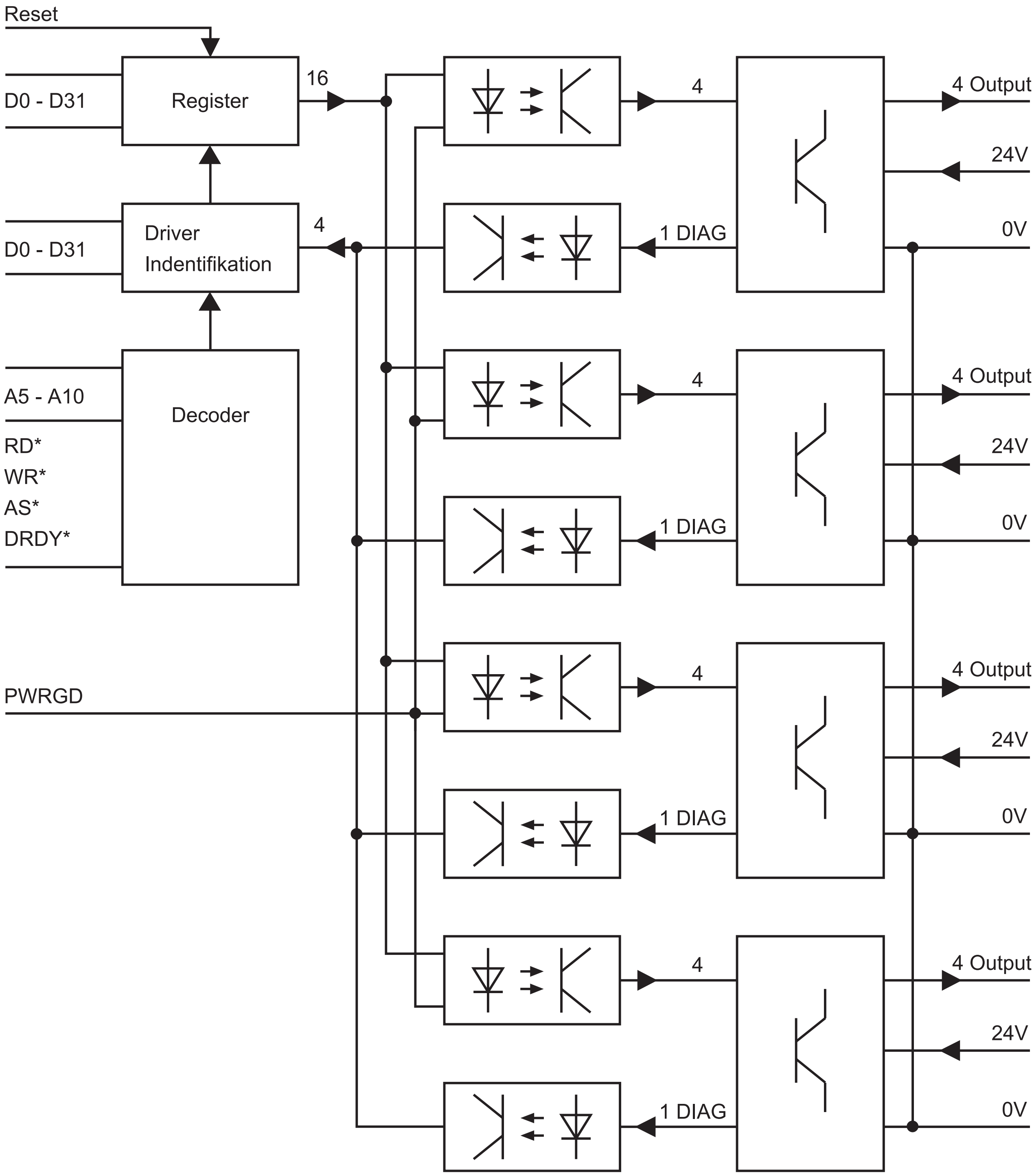
Diagnosis

For 4 outputs each on diagnostic bit is 4. at the disposal, altogether

Are monitored:
- undervoltage
- wire break
- short-circuit against 0 and 24v
- over-temperature

7.4 Output module AK2 (continued)

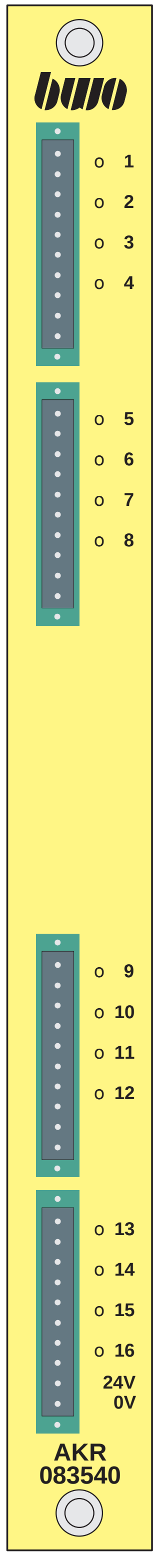
Block diagram



7.5 Relay module AKR

Output module

with 16 relay outtputs
with for each 2A



Allocation of the 10-pin Terminal strips **of outputs**

	first terminal strip		second terminal strip	
Pin 1	1	Relay	5	Relay
Pin 2				
Pin 3	2	Relay	6	Relay
Pin 4				
Pin 5	3	Relay	7	Relay
Pin 6				
Pin 7	4	Relay	8	Relay
Pin 8				
Pin 9	-		-	
Pin 10	-		-	

Allocation of the 10-pin Terminal strips **of outputs**

	first terminal strip		second terminal strip	
Pin 1	9	Relay	13	Relay
Pin 2				
Pin 3	10	Relay	14	Relay
Pin 4				
Pin 5	11	Relay	15	Relay
Pin 6				
Pin 7	12	Relay	16	Relay
Pin 8				
Pin 9	-		24V	for Relay
Pin 10	-		0V	for Relay

7.5 Relay module AKR (continued)

The relay module actual suitably for machine couplings and general switching from low voltages (max. 35V) with absolute galvanic separation.

The pins 9 (24v externally) as well as the pins 10 (0V) the front plug are among themselves bridged.

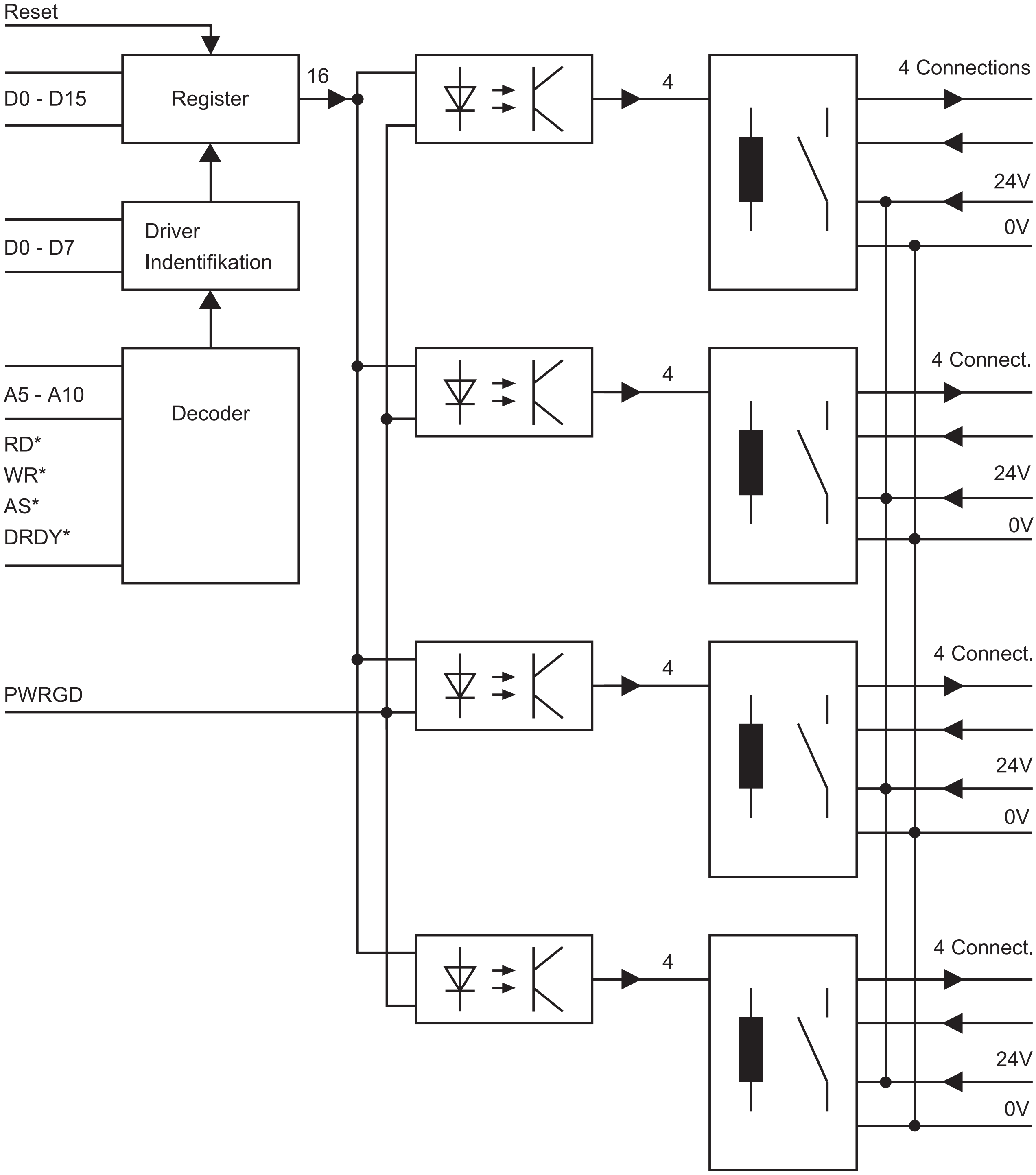
In case of failure of supply voltages both for the control and for the relays falls the normally open contact off.

Technically characteristics

Module identifier	0C H, requestable in address 80 H
Outputs	16
Visual check	by LED
Galvanic separation	over opto couplers and relays
Admissible permanent current with 24V ≅	2A
Admissible crest current with 10% OD (max. 4s)	15A
Admissible max. Bias-reducing potential	35V
External supply voltage the output blocks	min. 20V max. 30V
Output delay	approx. 6ms when switching on on approx. 2,5ms when switching off
Current consumption with 5V (all outputs switched on)	250mA
Current consumption 24V (external) (all outputs switched on)	300mA

7.5 Relay module AKR (continued)

Block diagram

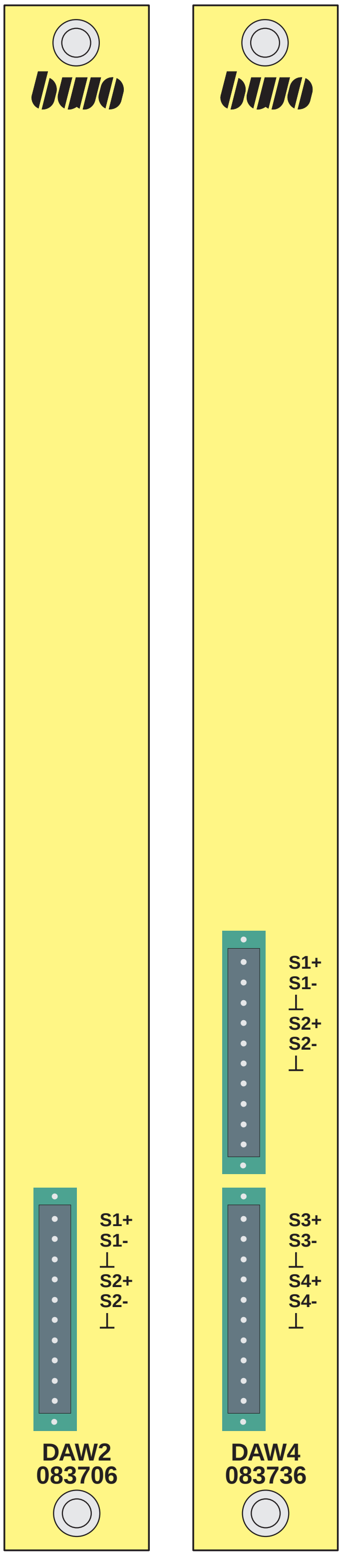


8. Analog input/output modules

8.1 Digital-analog converter DAW2 / DAW4

Output module with

2 analog outputs with DAW2
and
4 analog outputs with DAW4



8.1 Digital-analog converter DAW2 / DAW4 (continued)

Allocation of the 10-pin Terminal strip with **DAW2**

Pin 1	S1+	command value 1
Pin 2	S1-	
Pin 3	⊥	screen
Pin 4	S2+	command value 2
Pin 5	S2-	
Pin 6	⊥	screen
Pin 7	-	
Pin 8	-	
Pin 9	-	
Pin 10	-	

Allocation of the 10-pin Terminal strip with **DAW4**
upper terminal strip

Pin 1	S1+	command value 1
Pin 2	S1-	
Pin 3	⊥	screen
Pin 4	S2+	command value 2
Pin 5	S2-	
Pin 6	⊥	screen
Pin 7	-	
Pin 8	-	
Pin 9	-	
Pin 10	-	

8.1 Digital-analog converter DAW2 / DAW4

Technical characteristics

Outputs

2 analog outputs with DAW2 4 analog outputs with DAW4	to the analog output of a digital signal
Voltage range	-10V to +10V
Output current	max. 5mA
Output impedance	0.1 Ω

Accuracy

Resolution	16Bit
max. linearity errors	±4LSB
max. offset errors	±0,3mV

Protective functions

- protective circuit	against positive and negative voltage peaks as well as against external voltage
- safety disconnection	the outputs with power failure by power Good signal
- safety disconnection	the outputs by CPU Watchdog

8.1 Digital-analog converter DAW2 / DAW4 (continued)

Block diagram

DAW2

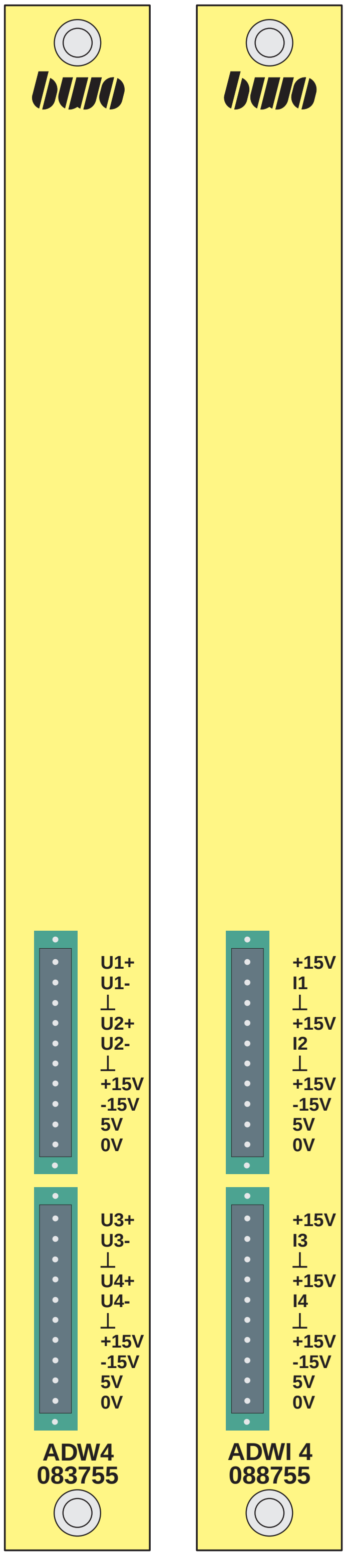
DAW4

8.2 Analog-digital converter ADW4 / ADW4E / ADWI4

Input module

with 4 differential inputs
to the digitization

an analog voltage with ADW4 / ADWÊ
or an analog current with ADWI4



8.2 Analog-digital converter ADW4 / ADW4E / ADWI4 (continued)

allocation of the 10-pin Terminal strip with **ADW4 / ADWÊ**

upper terminal strip

Pin 1	S1+	analogue value 1
Pin 2	S1-	
Pin 3	⊥	screen
Pin 4	S2+	analogue value 2
Pin 5	S2-	
Pin 6	⊥	screen
Pin 7	+15V	supply
Pin 8	-15V	for ext. Devices
Pin 9	5V	
Pin 10	0V	

lower terminal strip

Pin 1	S3+	analogue value 3
Pin 2	S3-	
Pin 3	⊥	screen
Pin 4	S4+	analogue value 4
Pin 5	S4-	
Pin 6	⊥	screen
Pin 7	+15V	supply
Pin 8	-15V	for ext. Devices
Pin 9	5V	
Pin 10	0V	

Allocation of the 10-pin Terminal strip with **ADWI4**

upper terminal strip

Pin 1	+15V	
Pin 2	I1	analogue value 1
Pin 3	⊥	screen
Pin 4	+15V	
Pin 5	I2	analogue value 2
Pin 6	⊥	screen
Pin 7	+15V	supply
Pin 8	-15V	for ext. Devices
Pin 9	5V	
Pin 10	0V	

lower terminal strip

Pin 1	+15V	
Pin 2	I3	analogue value 3
Pin 3	⊥	screen
Pin 4	+15V	
Pin 5	I4	analogue value 4
Pin 6	⊥	screen
Pin 7	+15V	supply
Pin 8	-15V	for ext. Devices
Pin 9	5V	
Pin 10	0V	

8.2 Analog-digital converter ADW4 / ADW4E / ADWI4 (continued)

Technical characteristics ADW4 / ADWÊ

Inputs

4 differential inputs		to the digitization of an analog voltage
Voltage range		-10V to +10V
Input impedance with	U+	100k Ω
	U-	10k Ω
Transformation time per channel		50µs

Accuracy ADW4

Resolution	12Bit
max. linearity errors	±1,5LSB

Accuracy ADWÊ

Resolution	16Bit

Protective functions

Overvoltage protection	at the inputs

Supply voltages

Led additionally outward Supply voltages	+5V, ±15V, 50mA

8.2 Analog-digital converter ADW4 / ADW4E / ADWI4 (continued)

technical characteristics ADWI4

Inputs

4 differential inputs	to the digitization of an analog current
Current area	0 - 20 mA
Transformation time per channel	50µs

Accuracy ADWI4

Resolution	12Bit
max. linearity errors	±1,5LSB

Protective functions

Overvoltage protection	at the inputs

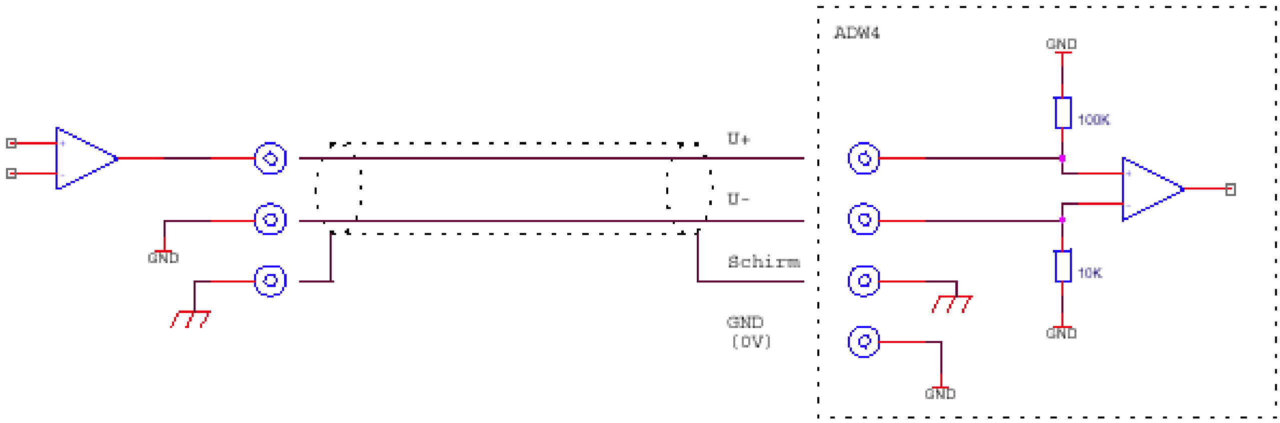
Supply voltages

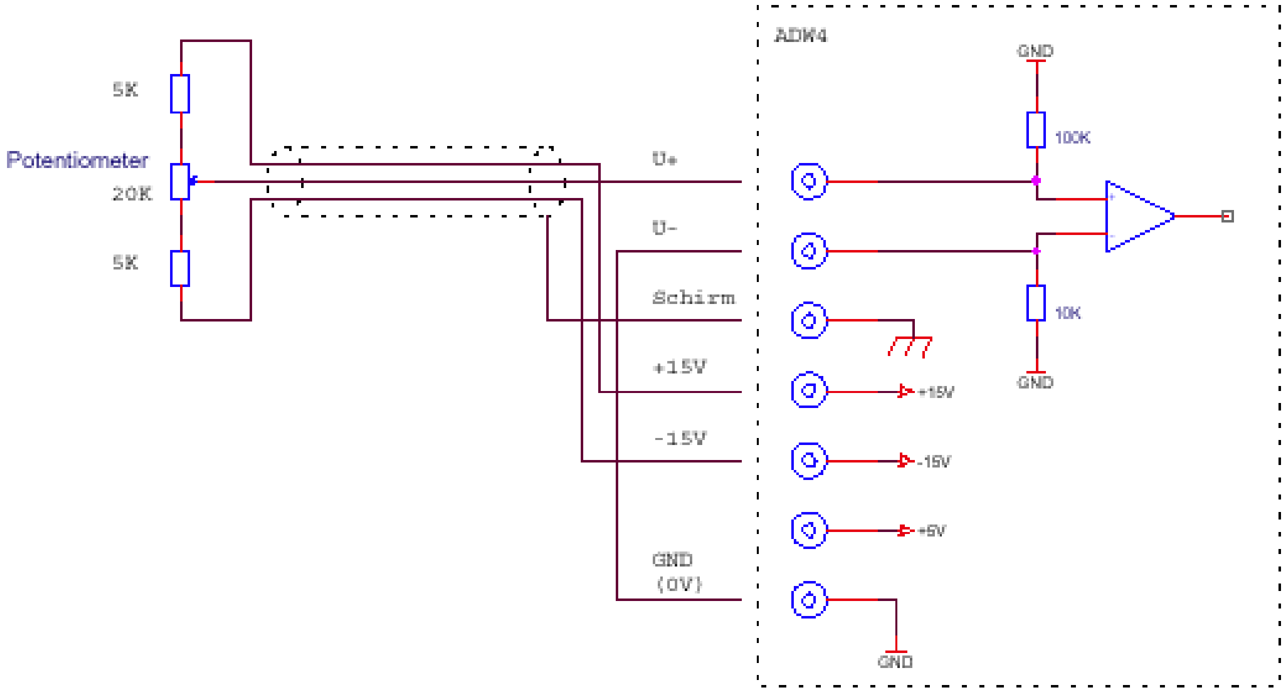
Led additionally outward Supply voltages	+5V, ±15V, 50mA

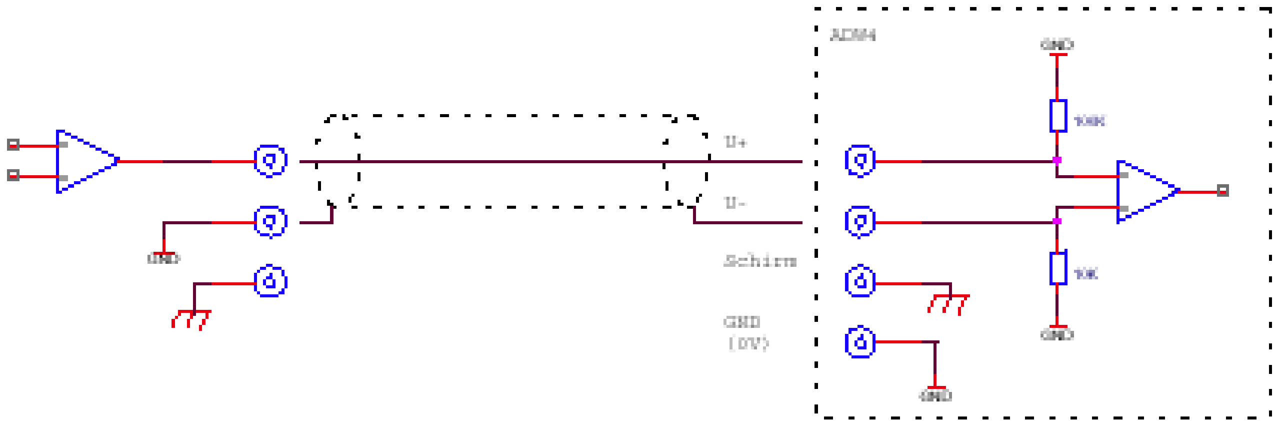
8.2 Analog-digital converter ADW4 / ADW4E / ADWI4 (continued)

Block diagram

8.2 Analog-digital converter ADW4 / ADW4E / ADWI4 (continued)



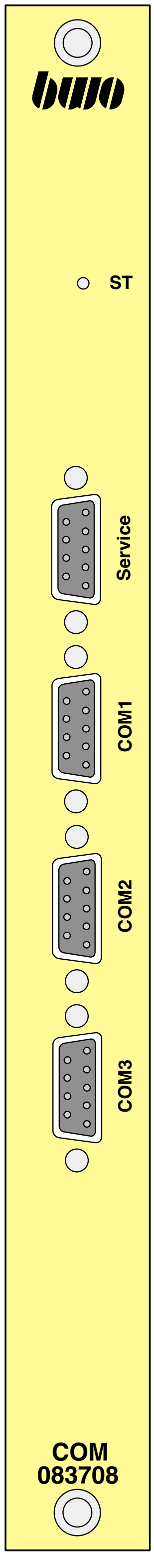




9. Communication modules

9.1 Communication module COM

Module for user specific Logs



Light emitting diode ST Status indication

Service Allocation of the 9-pin Socket ' service '

Pin 1	screen
Pin 2	TXD+
Pin 3	TXD
Pin 4	-
Pin 5	GND
Pin 6	VCC
Pin 7	RXD-
Pin 8	RXD+
Pin 9	MSR

COM Allocation of the 9-pin Sockets ' COM1 ', ' COM2 ' and ' COM3 '
with TTY - 20mA - adapter,
Transmitter and acceptor alternatively
in plugs bridge actively or passively

Pin 1	screen
Pin 2	Sender+
Pin 3	Sender-
Pin 4	20mA Power source
Pin 5	GND
Pin 6	20mA Power source
Pin 7	acceptor -
Pin 8	acceptor +
Pin 9	GND

Allocation of the 9-pin Sockets ' COM1 ', ' COM2 ' and ' COM3 '
with V24 - RS232 - adapter

Pin 1	screen
Pin 2	Rx
Pin 3	Tx
Pin 4	DTR
Pin 5	GND
Pin 6	DCD
Pin 7	RTS
Pin 8	CTS
Pin 9	-

9.1 Communication module COM (continued)

Function

COM is programmable processor module for the customer's specific applications such as

for connecting bar code readers

for special serial interconnections

Components

The module contains the following components:

EEPROM memory for the operating system
RAM memory (buffered)
EEPROM memory
Interface COM1 asynchronous
Interfaces COM2 and COM3 switchable asynchronous / synchronous
Interface for developing an operating system (serivicing)
System interface PLC ↔ COM 32bit

Data safeguarding

The RAM memory is supplied by the power unit from the central buffer when the module is plugged into the chassis. When the module is plugged out, the built-in buffer continues the supply of the RAM memory for a short time.

9.1 Communication module COM (continued)

Technical data

Processor	20 MHz clock pulse
Memory for operating system Memory for free availability Memory for system data	EEPROM, 128kB EEPROM, 256kB RAM, 256kB
Interface COM1 asynchronous	can be optionally provided with 20mA or V24 adapter, transmission rate max. 38400 baud
Interfaces COM2 and COM3 asynchronous or synchronous	can be optionally provided with 20mA or V24 adapter, transmission rate max. 38400 baud
Servicing interface for developing an operating system and diagnostics	Fast RS422 interface It is possible to load a program that is compiled with Turbo Pascal 6.0 and converted with Romcode into the EEPROM by means of the servicing interface.
BUS interface	to the PLC
NA signal	Stops the program in case of power failure and safeguards the memory contents
Power supply	+ 5V (± 5 %), 980mA

The COM module is supplied without peripheral interface adapter.

9.1 Communication module COM (continued)

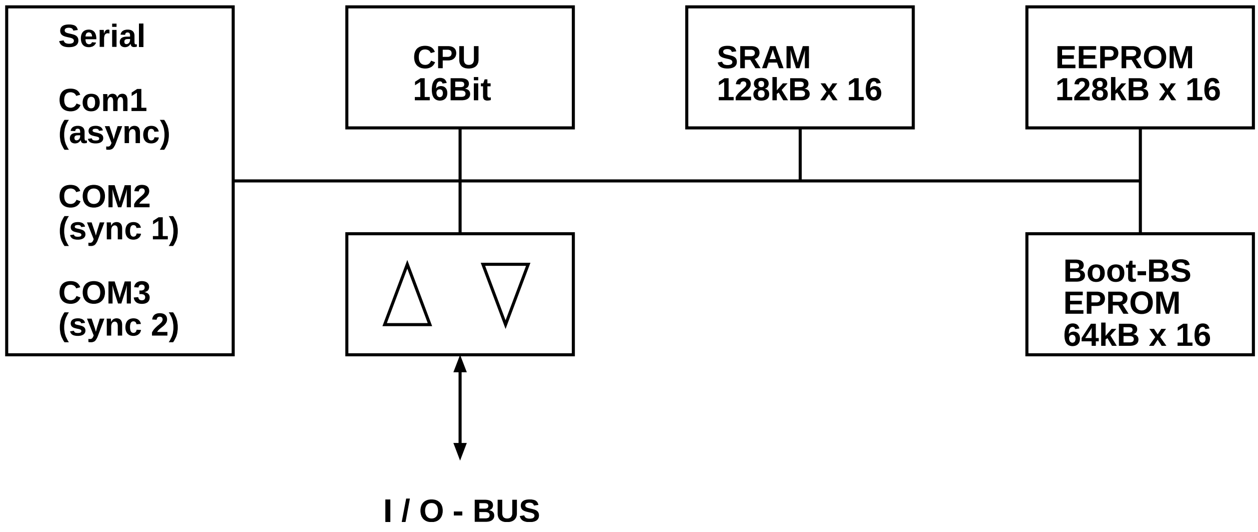
Status display

The light-emitting diode shows the program and hardware status.

Lamp is lit		Everything in order
Lamp is off		CPU is defective, no voltage or lamp is defective
Lamp is flashing	System error	
	Flash frequency of 1s	Buffer battery is defective, to be exchanged
	Flash frequency of 1/4s	Voltage of ± 15V is defective (The AD converter and the operating panels do not work anymore)
	Flash frequency of 1/10s	Hardware error (Module or network has failed)

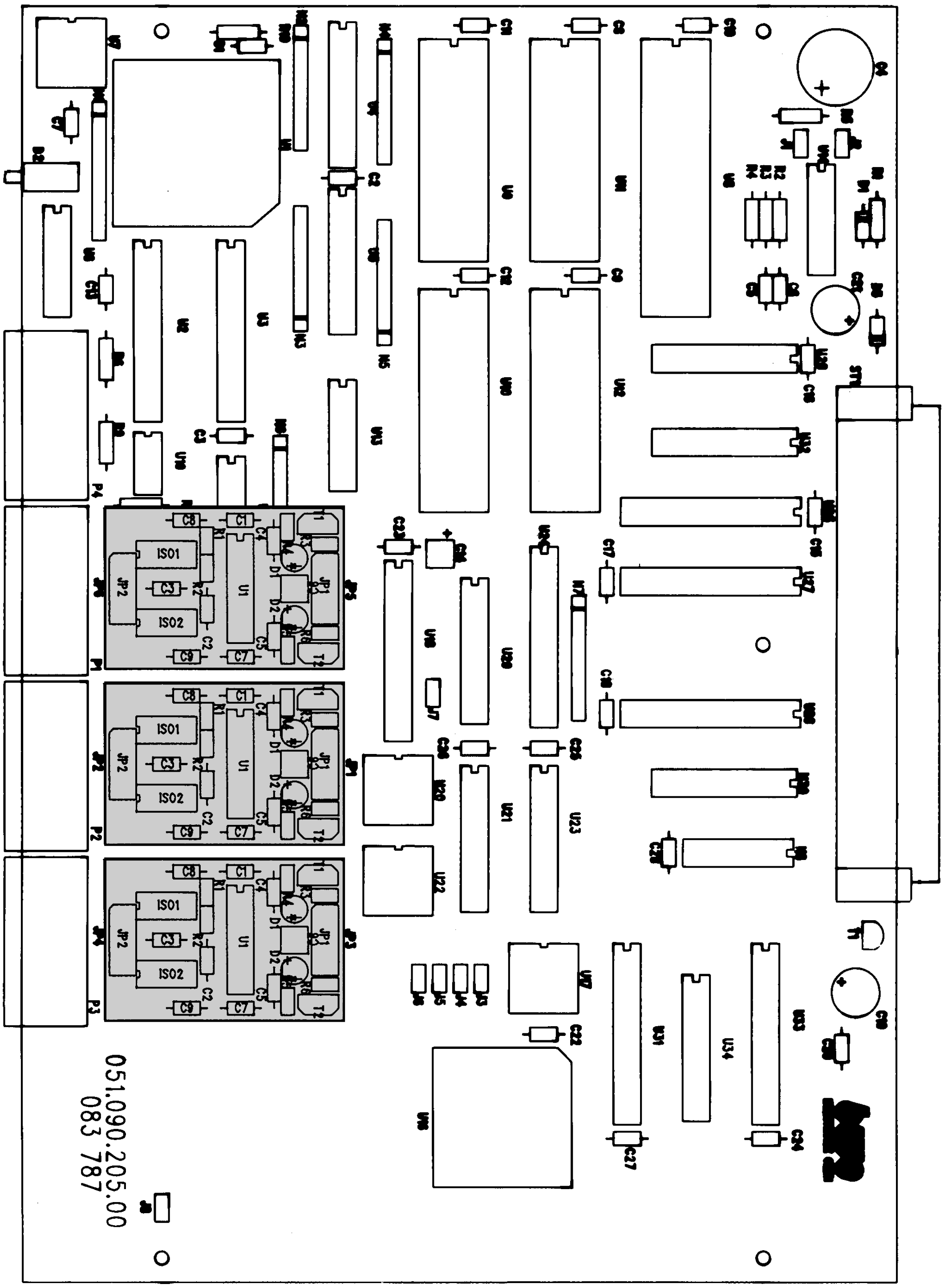
9.1 Communication module COM (continued)

Block diagram



9.1 Communication module COM (continued)

Components layout



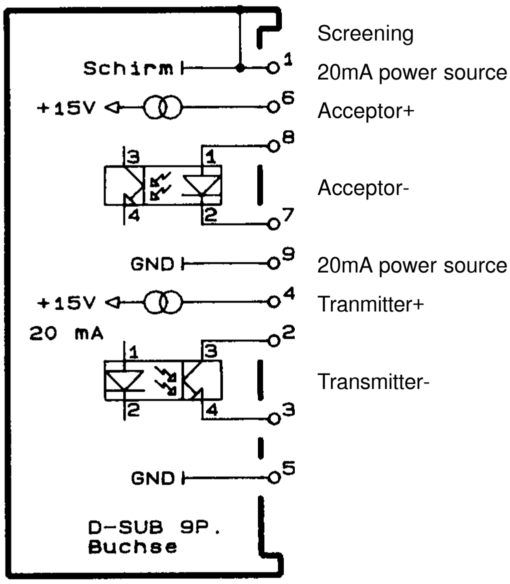
9.1 Communication module COM (continued)

Peripheral interface adapter for the connecting socket of the operating panel

TTY / 20mA interface

See for pin assignment also on page A4-2.

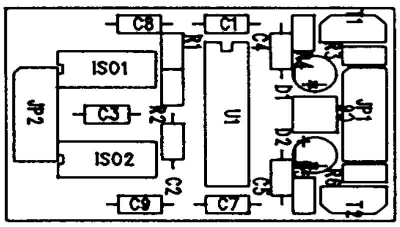
Circuit diagram



Components layout

The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

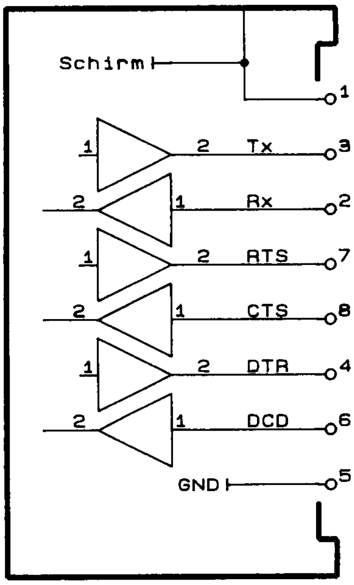
This page shows to the module front.



RS232 / V24 interface

See for pin assignment also on page A4-2.

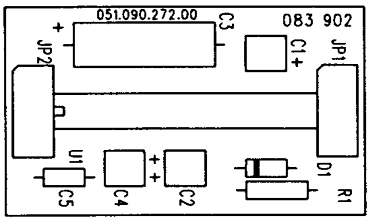
Circuit diagram



Components layout

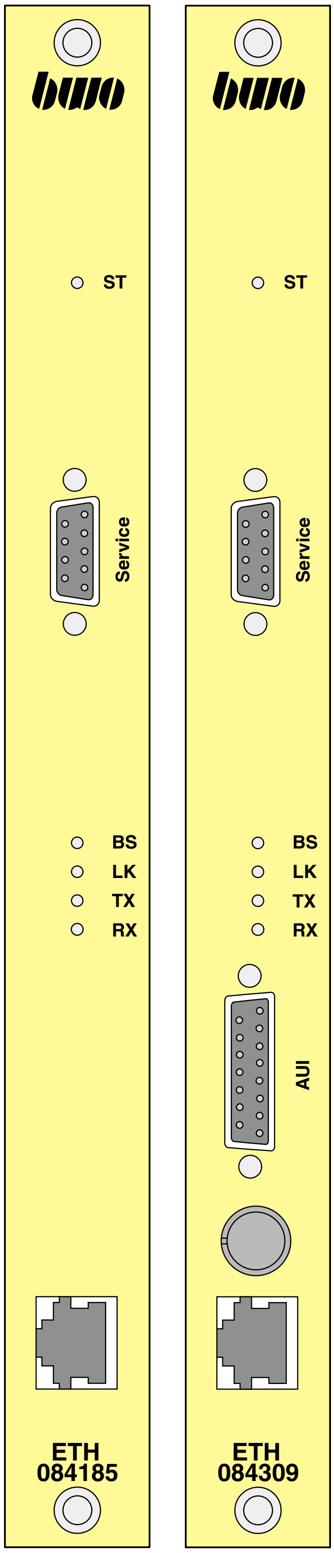
The plugs of the peripheral interface adapters are protected against being interchanged erroneously.

This page shows to the module front.



9.2 Active EtherNet connection ETH

Module for active EtherNet Connection
for all logs for all logs, usual
with EterNet connection RJ45



Light emitting diodes

ST status indication

BS reading/write access
internal Przessor on EtherNet Controllers

LK distance check with RJ45

TX module transmits

RX module receives

Allocation of the 9-pin Socket ‘ service ‘

Pin 1	screen
Pin 2	TXD+
Pin 3	TXD
Pin 4	-
Pin 5	GND
Pin 6	VCC
Pin 7	RXD-
Pin 8	RXD+
Pin 9	MSR

9.2 Active EtherNet connection ETH (continued)

Allocation of the socket ‘ RJ45 ‘

Pin 1	TPETXP+TPETXDP
Pin 2	TPETXN+TPETXDN
Pin 3	TPERXP
Pin 4	-
Pin 5	-
Pin 6	TPERXN
Pin 7	-
Pin 8	-

Allocation of the 15-pin Socket ‘ AUI ‘

Pin 1	screen
Pin 2	COLP
Pin 3	TXP
Pin 4	screen
Pin 5	RECP
Pin 6	GND
Pin 7	-
Pin 8	screen
Pin 9	COLN
Pin10	TXN
Pin11	screen
Pin12	RECN
Pin13	+12V
Pin14	screen
Pin15	-

9.2 Active EtherNet connection ETH (continued)

Function

In PLC controls for the exchange of the data blocks and the user programs.
In CNC controls also for the management of the work piece programs.

Hardware construction

Connection of a 8-pin socket RJ45 (10BASE-T) for EtherNet.

Connections at the module:

- **Service**	9pin socket of the BWO service interface	
- **AUI**	25pin socket for EtherNet	(only by ETH 084309)
- **BNC** (10BASE-2)	2pin socket for EtherNet	(only by ETH 084309)
- **RJ45** (10BASE-T)	8pin socket for EtherNet	

Status and diagnostic display:

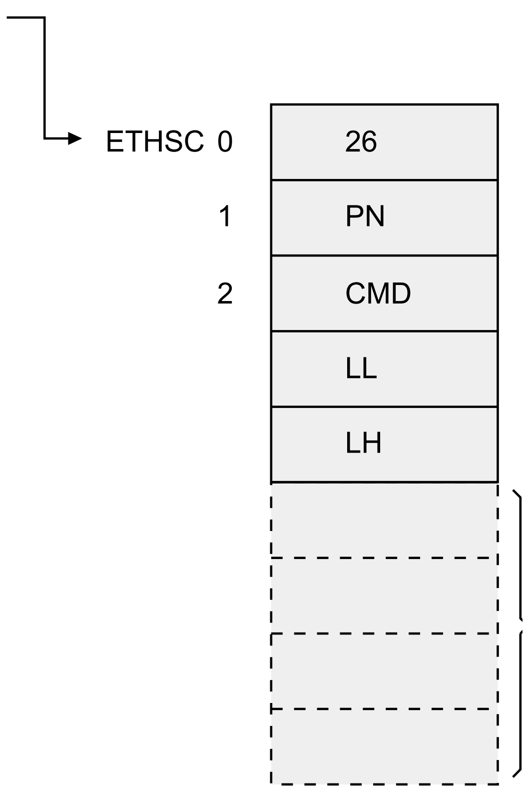
- **ST**	Status display
- **BS**	Read or write access of the internal processor
- **LK**	Line section check by RJ45
- **TX**	Module is transmitting
- **RX**	Module is receiving

9.2 Active EtherNet connection ETH (continued)

Software interface

The data interface to ETH is defined from the systemcall number 26.

Example LCS ETHSC
SC



PN report no.

0 initiation of ETH
1 IPX
2 HI
3 down load

CMD command

0 write on ETH
1 read of ETH

LL	length low	data 16Bit	(L=0 : not data)
LH	length high	data 16Bit	(L=0 : not data)

DATA data with variable length

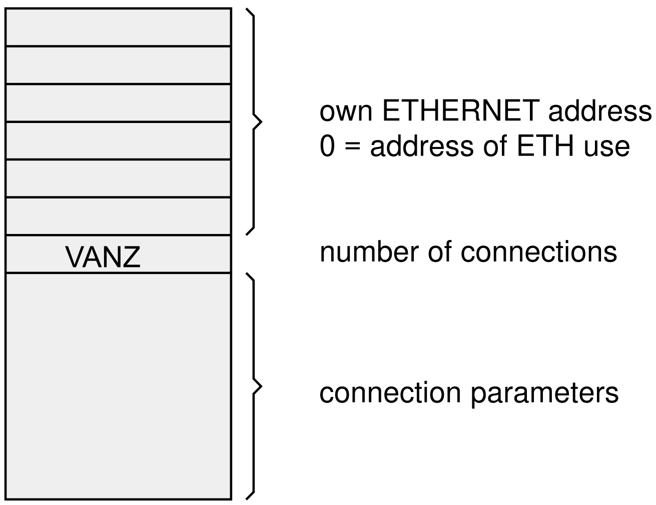
9.2 Active EtherNet connection ETH (continued)

Software interface

Reports

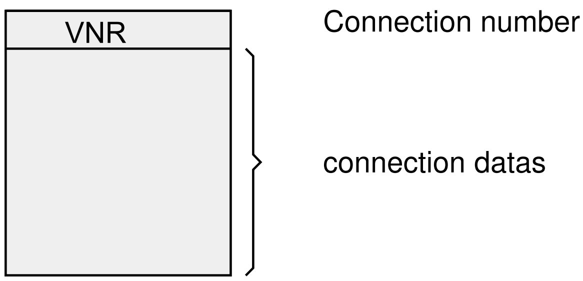
PN = 0 **initiational report connection construction**

Data



PN = 1...N

Data



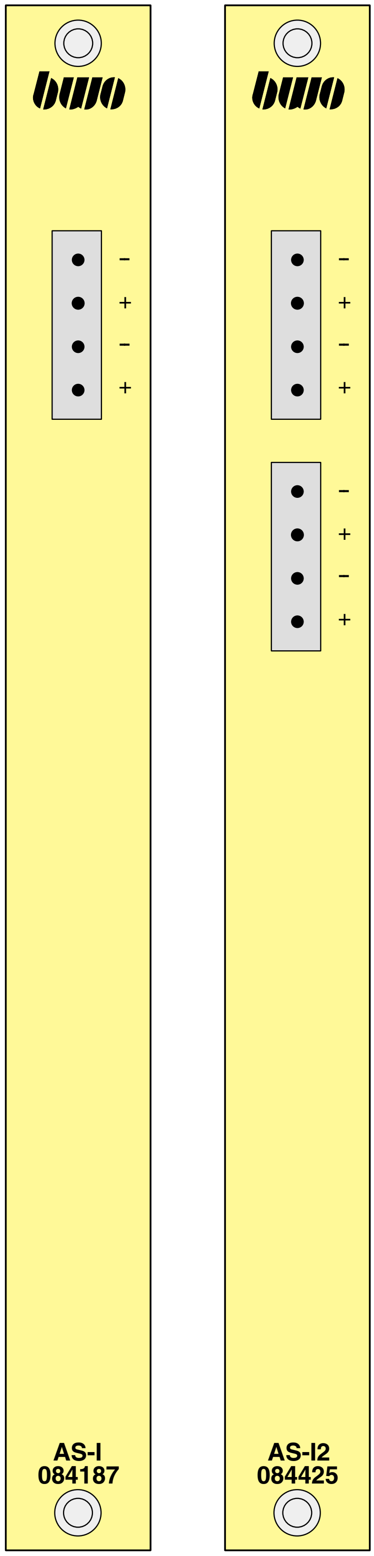
9.3 Decentral peripheral Interface AS-I

Module AS I (084187) with 1 master circuit board

for 124 inputs and outputs

Module AS2-I (084425) with 2 master circuit boards

for 248 inputs and outputs



9.3 Decentral peripheral Interface AS-I (continued)

General information

The actuator sensor interface, briefly AS i, replaces the cable harness in the machine and equipment construction in the automation level, i.e. simple, machine-oriented binary cells are interlaced such as push-buttons, reed switches, valves and relays with the control.
AS i consists off a master module (master), Slave modules (Slaves), a AS i power pack for voltage supply with approx. 30V DC, and the ungeschirmten 2-Leiter-Kabel, which interconnects the AS i Items.

To a AS i masters can be connected max. 31 Slaves with the 2-Leiter cable. The master can transfer e.g. four output and four up to four data bits, thus initial conditions per Slave. Thus on master module 31*4=124 output or input cards replaces and ensprechend many cables.

The AS i Slaves are available in differently versions, e.g. as control cabinet modules or as " intelligent " sensor/actuators. Your function is enough from the simple bi-directional I/O module (4 inputs, 4 outputs) up to complex system approaches, e.g. to the control of three-phase current synchronous engines. The 2-Leiter-Kabel transmits data and energy between the modules. It actual geometrically coded and is installed by means of penetration technique. AS i requires 5ms per data exchange cycle in the maximum configuration (31 Slaves at the master) max.. Data security actual by continuous monitoring of network and peripheral devices as well as by special diagnostic possibilities ensures. Actual no programming work on master or Slave necessarily, verdrahtungsfehler are to a large extent impossible.

Actuator sensor interface for BWO system 900

AS i for system 900 is supported by the central processing units CEA and PLC. The coupling of the control at AS i is made hardware related by the BWO hardware Modules ASI (with a AS i master) and ASI2 (with two AS i mastern). Depending upon hardware module 124 or 248 inputs and outputs will transfer to the control. Master modules can be tied up up to four AS i, i.e. the system 900 supports up to four ASI or two ASI2 cards. The addresses Eingaenge-und of outputs can be determined by the user arbitrarily within the I/O area of the control, likewise the data area to the diagnosis of AS i within the flag area. Closer information in addition is in the paragraph PLC900, 9,4 process.

9.3 Decentral peripheral Interface AS-I (continued)

System structure for example

The following components are needed for an Aktuator-Sensor-Interface with BWO System 900:

- Board AS-I with one AS-i master module for connection of 31 slave modules or board AS-I2 with two AS-i master modules for connection of 62 slave modules

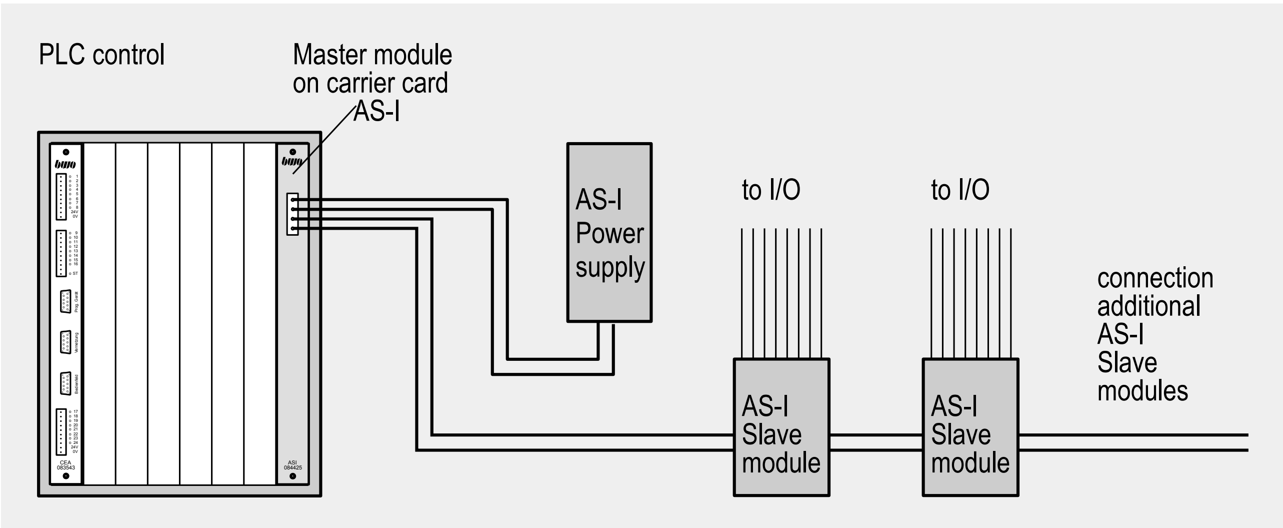
- AS-i pin connection with stress relief for the connection of 2 AS-i flat cables

- AS-i power supply for AS-i standard *

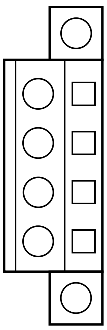
- AS-i 2 conductor cable for AS-i standard *

- ever for application up to 31 AS-i slave modules, e.g. with ever 4 inputs and 4 outputs *

The with '*' marked hardware components are deliverable from other producer.



Occupation of
AS-I pin connection
with AS-I flat cable



AS-I -	blue
AS-I +	brown
AS-I -	blue
AS-I +	brown

9.3 Decentral peripheral Interface AS-I (continued)

Exemplary system structure

Since each AS i master module supports 124 Eíngaenge and 124 outputs, by the ASI card the initially or output images is occupied by four INPUT CLUTCH or AK modules. This address area can be defined over the SPS program by specification of the first initially or original address freely.

Example: Input address E1.1.1 is determined as base address.
Thus the input addresses E1.1.1 to E1.8.16 are occupied.
In this area no EK module may naturally be.
For the next AS i module may do as base address only E1.9.1 will use.

Closer information for the definition Eingangs-und original addresses as well as to the diagnosis of AS i bus systems with PLC 900 is in the paragraph PLC900, 9,4 process.

9.3 Decentral peripheral Interface AS-I (continued)

Binding actuator sensor Interface to the system 900

For the binding of the AS I must be indicated to the control, in which area AS I data or write may read. In addition four defined storage areas in the central processing unit must be reserved:

- input image for 124 inputs per AS I master module

- output image for 124 outputs per AS I master module

- status flag image for AS I diagnosis

- controlling flags, which release or lock certain functions on the AS I

The reserved storage areas start with a symbolic address, which is defined by those the user.

- AS__EB for the input image

- ASI_AB for the output image

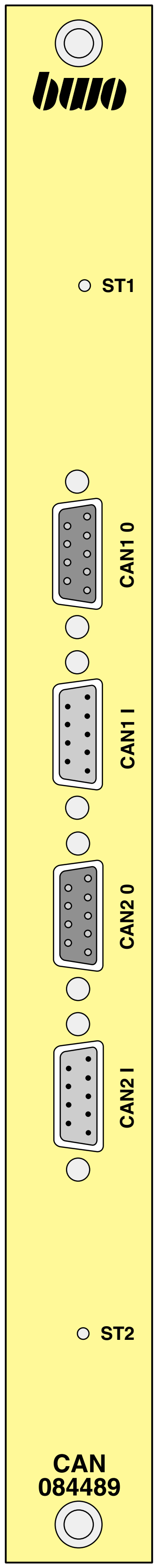
- ASI_MB for the status and controlling flags

These three symbolic addresses must be created in the flag area starting with the symbolic address ASI_SC (defined in the example of flags, Mg.n"), as follows:

Mg.n	AS__SC
Mg.n +1	ASI_EB
Mg.n +2	-
Mg.n +3	-
Mg.n +4	-
Mg.n +5	ASI OFF
Mg.n +6	-
Mg.n +7	-
Mg.n +8	-
Mg.n +9	ASI_MB
Mg.n + 10	-
Mg.n + 11	-
Mg.n + 12	-

The three base addresses can be defined now over a functional module by the SPS user freely.

9.4 Module for CAN Applications



Light emitting diodes

ST1	status indication CAN1	LED on	CAN of ok
ST2	status indication CAN2	LED off	error

CAN

Allocation 9pol. Bush-type plug / pin-type plug

pin 1	-
pin 2	CAN low
pin 3	CAN GND
pin 4	-
pin 5	screen
pin 6	CAN GND
pin 7	CAN high
pin 8	-
pin 9	-
housing	Screen

CAN1 0 and CAN1 I as well as CAN2 0 and CAN2 I are internally interconnected in each case 1:1

9.4 Module for CAN Applications (continuation)

CAN Functions

That, CONTROLLER AREA network ' (CAN) actual internationally standardized (150 11898).

With CAN equal stations (controllers, sensors and actuators) are interconnected by a serial bus.

The bus actual a symmetrical or asymmetric two-wire line, which is protected depending upon request or designed ungeschirmt. The electrical parameters of the physical transfer are likewise in ISO 11898 determined.

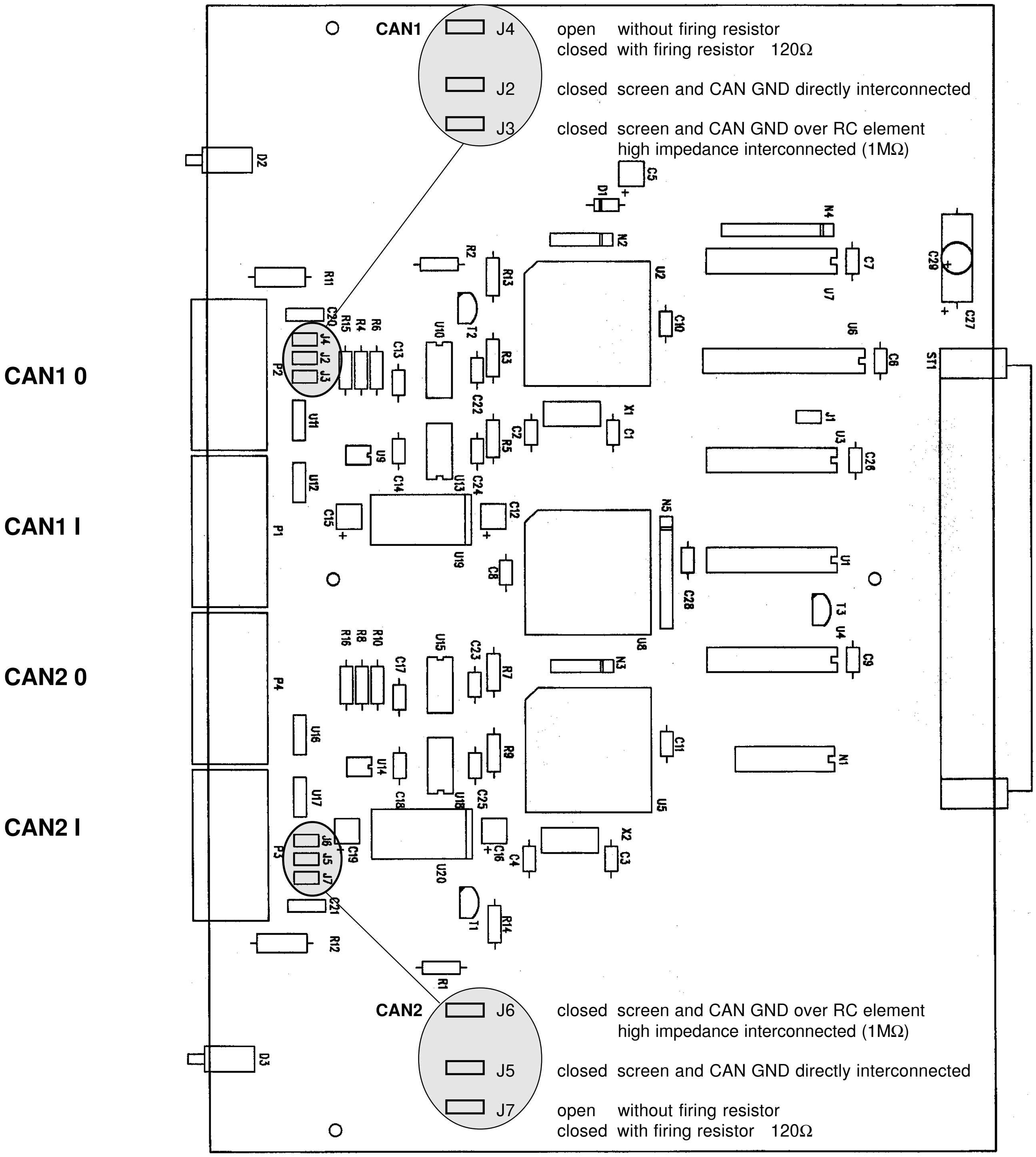
The CAN Log corresponds to the real time request. In contrast to the cable harness and corrects the network protokol detects transfer errors, which are caused by electromagnetic irradiation.

The serial bus system is suitable in particular for the networking of, intelligent ' on - / output units as well as sensors and actuators in a system or a machine, which communicate with modular control systems in real time.

The CAN System can be used today everywhere favourably, where high safety requirements are to be fulfilled.

9.4 Module for CAN Applications (continuation)

Components layout

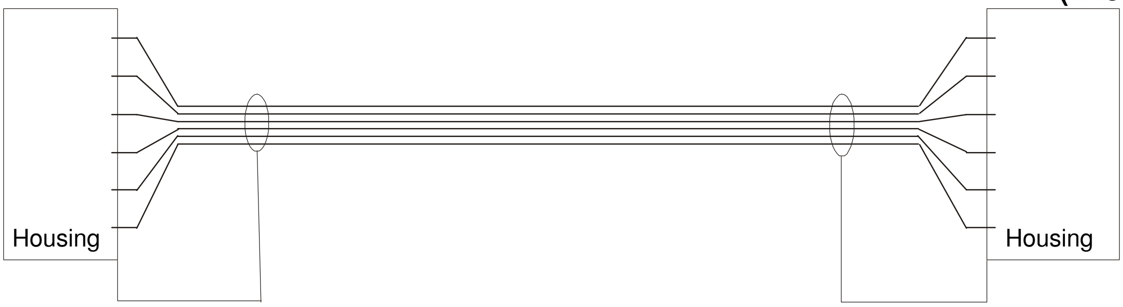


9.4 Module for CAN Applications (continuation)

leads for AMK drives with CAN Bus
Important: Use only Twisted-Pair-cable or Fire-Wire-cable

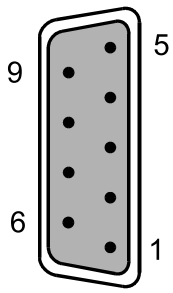
BWO CAN Module

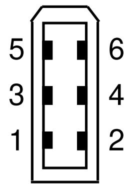
AMK regulators (X136 / X236)
(X137 / X237)



9pin D-SUB
bush-type plugs
and pin-type plugs

viewing
from the front





6pin plugs
(Fire-Wire)
viewing
from the front

Allocation 9pol. Socket / pin-type plug

Pin 1	-
Pin 2	CAN-low
Pin 3	CAN-GND
Pin 4	SYNC-low
Pin 5	shield
Pin 6	CAN-GND
Pin 7	CAN-high
Pin 8	SYNC-high
Pin 9	-
Housing	shield

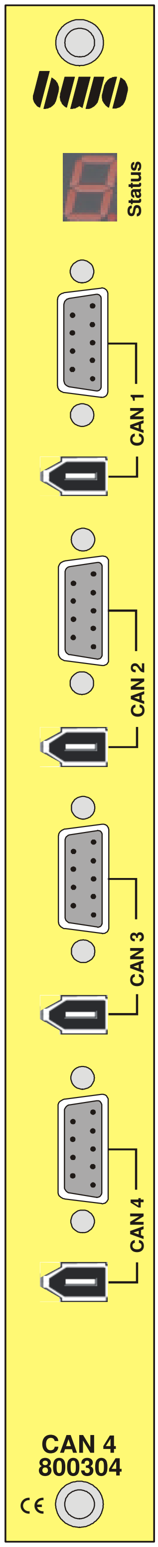
Allocation of the plug **X136** / **X236**

Pin 1	-
Pin 2	CAN-GND
Pin 3	SYNC-high
Pin 4	SYNC-low
Pin 5	CAN-high
Pin 6	CAN-low
Housing	shield

Allocation of the plug **X137** / **X237**

Pin 1	-
Pin 2	CAN-GND
Pin 3	CAN-high
Pin 4	CAN-low
Pin 5	SYNC-high
Pin 6	SYNC-low
Housing	shield

9.5 Module for CAN applications, 4-way active



CAN funktions

The Controller Area Network (CAN) is subject to international standards (ISO11898).

A CAN links stations with equal rights (control devices, sensors and actuators) using a serial bus.

The CAN protocol corresponds to real-time requirements.

Unlike a cable harness, the network protocol detects and corrects transfer errors caused by electromagnetic interference.

The serial bus system is particularly suitable for networking “intelligent” input / output units, sensors and actuators inside a system or machine which communicate in real time using modular control systems.

The expenditure for the wiring is small thereby and it can at any time further components be attached.

Nowadays the CAN system can be used to advantage wherever there are stringent security requirements.

4 way active CAN Module (800304)

- 4 CAN connections (DSUB or IEEE-1394)
- arm 7 microcontrollers 32 bits
- up to 32 Axes per CAN module
- 8 Axes per CAN channel possible
- up to 20 CAN I/O nodes per CAN module
- up to 5 CAN I/O nodes per channel

- 32 bits of data bus
- protocol CANopen
- diagnosis over 7 segment display
- firmware about WINBV programmable newly

- CAN Connectors with DSUB and IEEE-1394
  are internally 1:1 connected

9.5 Module for CAN applications, 4-way active (continuation)

7-segment status displays

8.	CAN module in reset
4	No hardware synchronisation
8	CAN module waiting for approval from CNC
5	CAN module waiting for one or more interfaces to initialise
b	CAN module ready for operation (operating state)

If „F“ and „I“ appear alternately in the display, the firmware is defective and needs to be reprogrammed. The firmware can be transferred by WINBV. For this to happen, the “canfirmware” file must be saved in the root directory. If this is done, the CAN module loads the “latest firmware” every time the CNC control system is booted up.
To prevent the firmware from being reloaded every time the system is booted, remove the “canfirmware” file from the root directory after programming is complete.

In pre-operational state the following characters are displayed one after the other with a time difference of around one second:

P2c1 where:

P:	Pre- operational
2:	state
c:	channel
1:	channel / plug number between 1...4

In the event of an error, the display is similar. The following characters are displayed one after the other with a time difference of around one second:

F1c1 where:

F:	error
1:	error state Cyclical CAN communication interrupted
c:	channel
1:	channel / plug number between 1... 4

CAN **Pin Configuration 9 pins Connector**

Pin 1	-
Pin 2	CAN low
Pin 3	CAN ground
Pin 4	-
Pin 5	Shielding
Pin 6	CAN ground
Pin 7	CAN high
Pin 8	-
Pin 9	-
Casing	Shielding

9.5 Module for CAN applications, 4-way active (continuation)

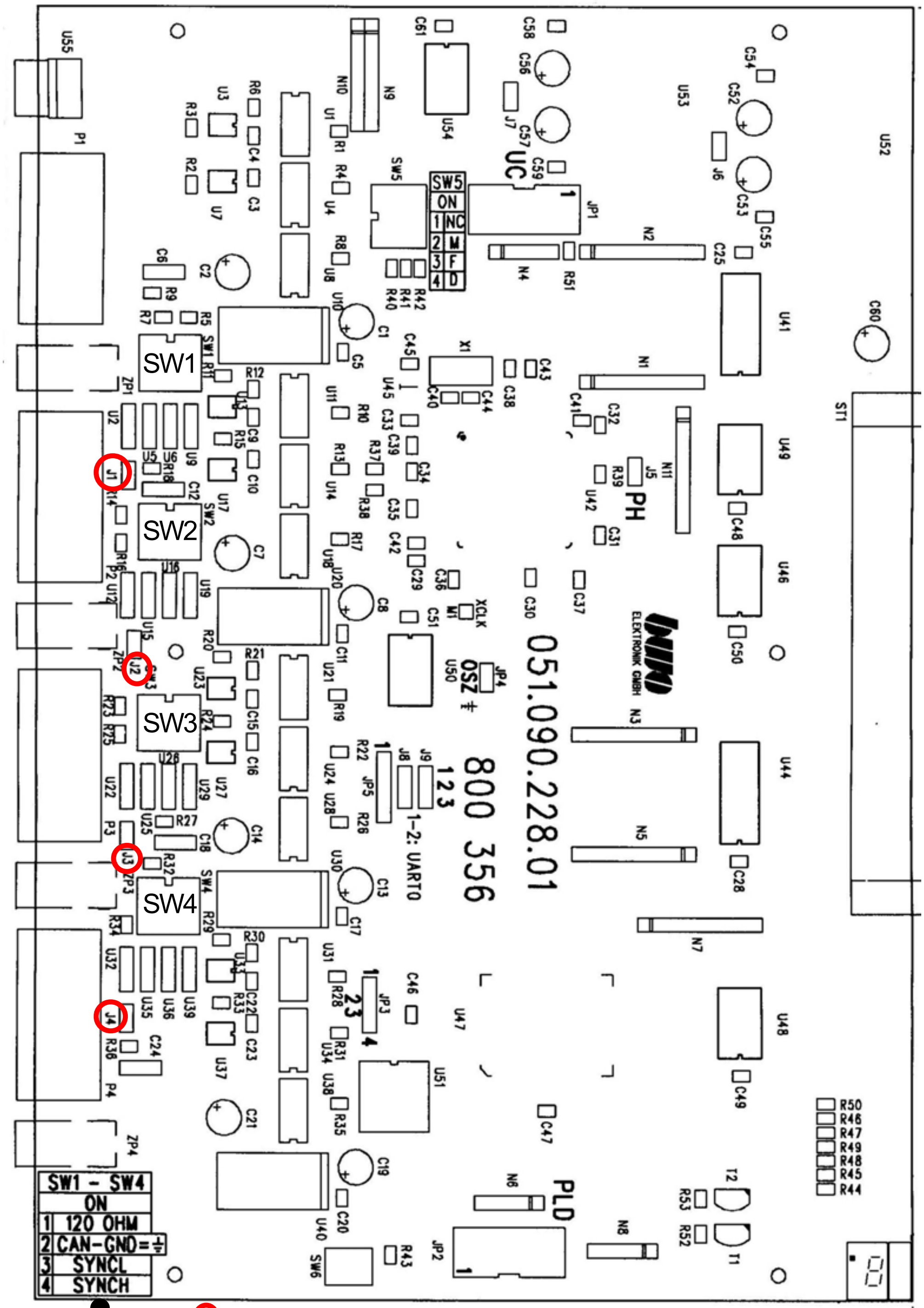
Layout diagram

CAN 1

CAN 2

CAN 3

CAN 4



J1 to J4 = 5V also at DSUB PIN9

Configuration SW1 to SW4

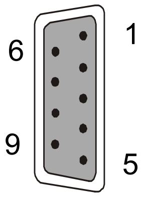
9.5 Module for CAN applications, 4-way active (continuation)

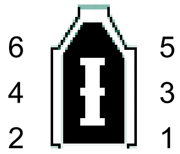
Connection cable for AMK Drives with CAN Bus system
Caution: Excluding protected Twisted Pair cable or cable IEEE-1394 from that AMK final drive accessories use!

BWO CAN Module **AMK Drive Controller (X136 / X236) (X137 / X237)**

9 Pins DSUB Connector

Top view





6 Pins Connector IEEE-1394

Top view

Pin Configuration 9 pins Connector

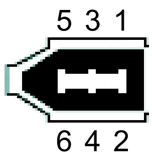
Pin 1	-
Pin 2	CAN low
Pin 3	CAN ground
Pin 4	Sync low
Pin 5	Shielding
Pin 6	CAN ground
Pin 7	CAN high
Pin 8	Sync high
Pin 9	-
Casing	Shielding

Pin Configuration **X136 / X236 AMK**

Pin 1	-
Pin 2	CAN ground
Pin 3	Sync high
Pin 4	Sync low
Pin 5	CAN high
Pin 6	CAN low
Casing	Shielding

6 Pins Connector IEEE-1394

Top view



Pin Configuration **X137 / X237 AMK**

Pin 1	-
Pin 2	CAN ground
Pin 3	CAN high
Pin 4	CAN low
Pin 5	Sync high
Pin 6	Sync low
Casing	Shielding

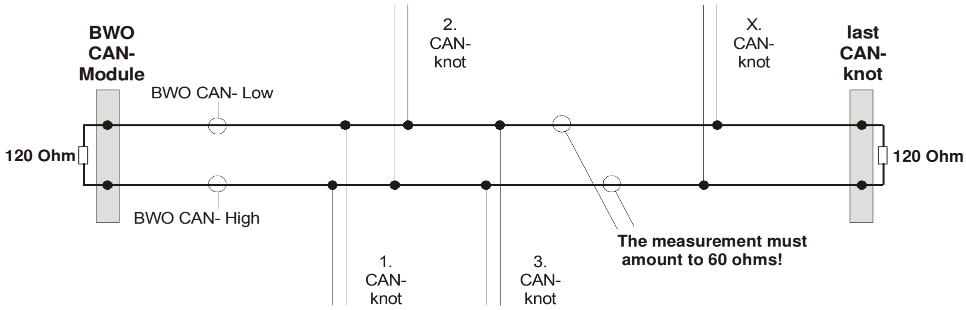
9.5 Module for CAN applications, 4-way active (continuation)

Jumper

J1, J2, J3, J4 5 V on the plug P1… 4 (DSUB9) pin 9

Switch SW1, SW2, SW3, SW4

SW1: 120 Ohm Termination Resistor at Pin two and Pin seven (Timing data bus)



Caution: realize that a 120 Ohm Termination at both sides of the cable (only there) causes an impedance of 60 Ohm to be measured!

SW2: Release galvanic isolation CAN-GND (Pin3, Pin6) = GND

SW3: Sync Low at Pin 4
SW4: Sync High at Pin 8
The Sync signal for the axles is insertable over switches 3 and 4.
Thus the synchronisation impulses for the AMK- drive- modules take place.

CAN Module as CAN I/O module

CAN module can be used also to the control of CAN I/O modules (input/output modules).

Here the following is valid:
- up to 20 CAN- I/O nodes per CAN module
- up to 5 CAN- I/O nodes per channel

For each nodes are supported:
- max. 64 digital inputs
- max. 64 digital outputs

or

- 2 input module analogous (AD- transducer)
- 2 autput module analogous (DA- transducer)

Cable lengths and Baud rates

With drives data transmission rates of 1 Mbits/s and 40 m cable length are possible.
With I/O modules are possible for data transmission rates of 500 Kbits/s and 130m cable length.

Master / Slave

The BWO CAN module represents the master in the network.
All other data- bus participants is to be regarded than Slave.

9.5 Module for CAN applications, 4-way active (continuation)

canconf

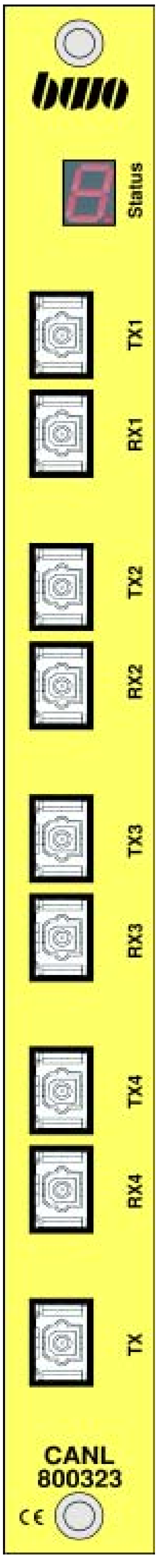
In the file " canconf" the configuration of the BUS- system is put down.
This file is processed when starting of application.
Here the values stand for the data, data transmission rate, the sync timer (I/O) and the number of the nodes and their addresses.

```
#################################################
##  Manufacturer : BWO Technik Gmbh und CoKG    ##
##  Machine-No.  : AZ65                         ##
##  Date         : 29.05.2008 bz.               ##
##                                              ##
##  CAN-Konfiguration for WAGO-IO-Module        ##
##  =========================================   ##
##  Nodes 1 — Machine / Switchboard —           ##
##  5 Input-Module 750-401 (2 Inputs)           ##
##  5 Output-Module 750-501 (2 Outputs)         ##
##                                              ##
##                                              ##
#################################################
#
## Baudrate 0=1000kB, 1=800kB, 2=500kB, 3=250kB, 4=125kB, 5=100kB ##
[baudrate]
2
#
## Sync timer (ms) to heading for the outputs and reading the inputs in. ##
[synctimer]
10
#
## Nodeguardtimer, (ms) to the monitoring of the CAN modules. ##
## SDO (0x100c), Guard-Time ##
[nodeguardtimer]
20
#
## Nodes 1-20, Disable Nodeguarding)
[disablenodeguardingfor]
#1
#
## Nodes 1-20, PDO addresses digital inputs ##
## Input-PDO: slot, socket ##
[input_pdos]
1:4,1
#2:4,2
#
## Nodes 1-20, PDO addresses digital outputs ##
```

9.5 Module for CAN applications, 4-way active (continuation)

```
## Output PDO: slot, socket ##
[output_pdos]
1:4,1
#2:4,2
#
## Nodes 1-20, digital inputs and outputs ##
## Allocation of the BWO I/O addresses ##
##
#
## Switchboard
## WAGO-Clamp
## 5 WAGO-Clamp 750-401 (2 Inputs)
## 5 WAGO-Clamp 750-501 (2 Outputs)
#
[pdo_1_io]
i2,E1.1.1
i2,E1.1.3
i2,E1.1.5
i2,E1.1.7
i2,E1.1.9
#
o2,A1.1.1
o2,A1.1.3
o2,A1.1.5
o2,A1.1.7
o2,A1.1.9
#
## Nodes 1-20, SDO addresses ##
## node,idx,subidx,lun,value ##
[sdo_io]
#WAGO
1,0x100c,0,2,400    ## Guard-Time(ms) = Nodeguardtimer * Maximum number of
nodes(20)
1,0x100d,0,1,2      ## Life-Time-Faktor
#
#
## Nodes 1-20, SDO addresses ##
## node,idx,subidx,lun,value ##
#[sdo_io]
#WAGO
#2,0x100c,0,2,400    ## Guard-Time(ms) = Nodeguardtimer * Maximum number of
nodes(20)
#2,0x100d,0,1,2      ## Life-Time-Faktor
#
#
```

9.6 Module for CAN applications, 4-way active, optical fibre



CAN functions

The Controller Area Network (CAN) is subject to international standards (ISO11898).

A CAN links stations with equal rights (control devices, sensors and actuators) using a serial bus.

The CAN protocol corresponds to real-time requirements.

Unlike a cable harness, the network protocol detects and corrects transfer errors caused by electromagnetic interference.

The serial bus system is particularly suitable for networking “intelligent” input / output units, sensors and actuators inside a system or machine which communicate in real time using modular control systems.

Nowadays the CAN system can be used to advantage wherever there are stringent security requirements.

The advantage of a opticl fibre- connection is the potential separation of the equipment components.

Opticl fibre are insensitive in relation to electrical and magnetic influences of noise.

CAN module 4-way active, optical fibre (800323)

- 4 CAN connections light wave conductor (toslink)
- 1 Sync connection light wave conductor
- arm 7 microcontrollers 32 bits
- up to 32 axes per CAN module
- 8 axes per CAN channel possible
- up to 20 CAN-EA knots per CAN module
- up to 5 CAN-EA knots per channel

- 32 bits of data bus
- protocol CANopen
- diagnosis over 7 segment display
- firmware about WINBV programmable newly

9.6 Module for CAN applications, 4-way active, optical fibre (continuation.)

7-segment status displays

8. CAN module in reset
4 No hardware synchronisation
8 CAN module waiting for approval from CNC
5 CAN module waiting for one or more interfaces to initialise
b CAN module ready for operation (operating state)

If „F“ and „I“ appear alternately in the display, the firmware is defective and needs to be reprogrammed.
The firmware can be transferred by WINBV. For this to happen, the “canfirmware” file must be saved in the root directory. If this is done, the CAN module loads the “latest firmware” every time the CNC control system is booted up.
To prevent the firmware from being reloaded every time the system is booted, remove the “canfirmware” file from the root directory after programming is complete.

In pre-operational state the following characters are displayed one after the other with a time difference of around one second:

P2c1 where:
P: Pre-operational
2: state
c: channel
1: channel / plug number between 1 ... 4

In the event of an error, the display is similar. The following characters are displayed one after the other with a time difference of around one second:

F1c1 where:
F: error
1: error state Cyclical CAN cummunication interruptet
c: channel
1: channel / plug number between 1 ... 4

9.6 Module for CAN applications, 4-way active, optical fibre (continuation.)

Optical fibre baud rates
Optical fibre is for optical signal transmissions and works at BWO with 1Mb/s.

Optical fibre lengths
The Optical fibre length is co-ordinated with the light achievement of the transmitter and amounts to minimum 0.20 meters and maximally 15 meters.

Master / Slave
The BWO CAN module optical fibre represents the master in the network.
All other data- bus participants is to be regarded than Slave.

10. Operating panels

10.1 Operating panels CNC910

Mass and weight

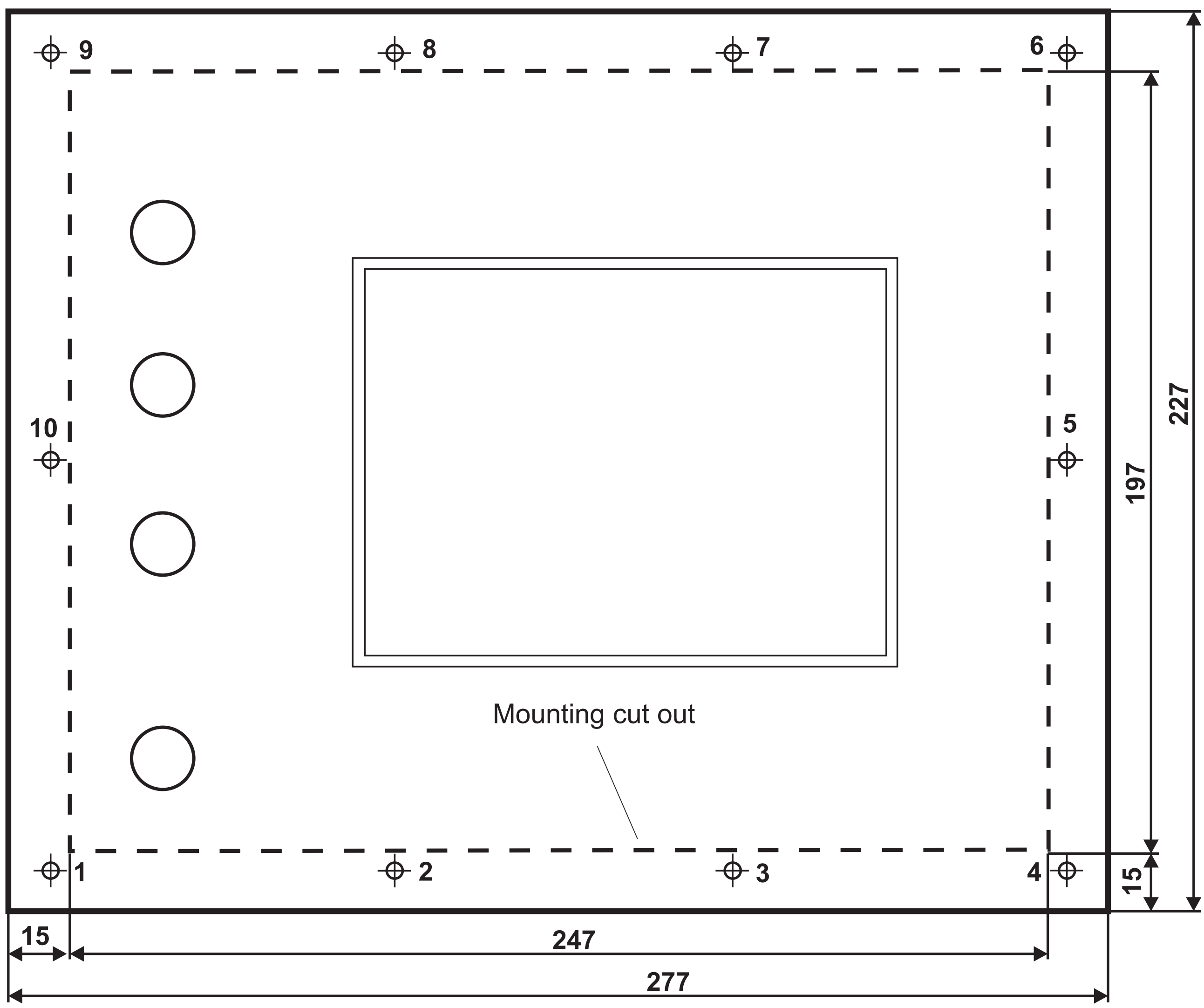
Dimensions (width x height)		277mm x 227mm
max. depth of the rear edge of the front plate to the rear		55mm
max. depth of the front edge of the front plate forward		25mm
Strength of the front plate	approx.	4mm
Weight	approx..	1,6kg

10.1 Operating panels CNC910 (continuation)

Panel cut out 247mm x 197mm (width x height)

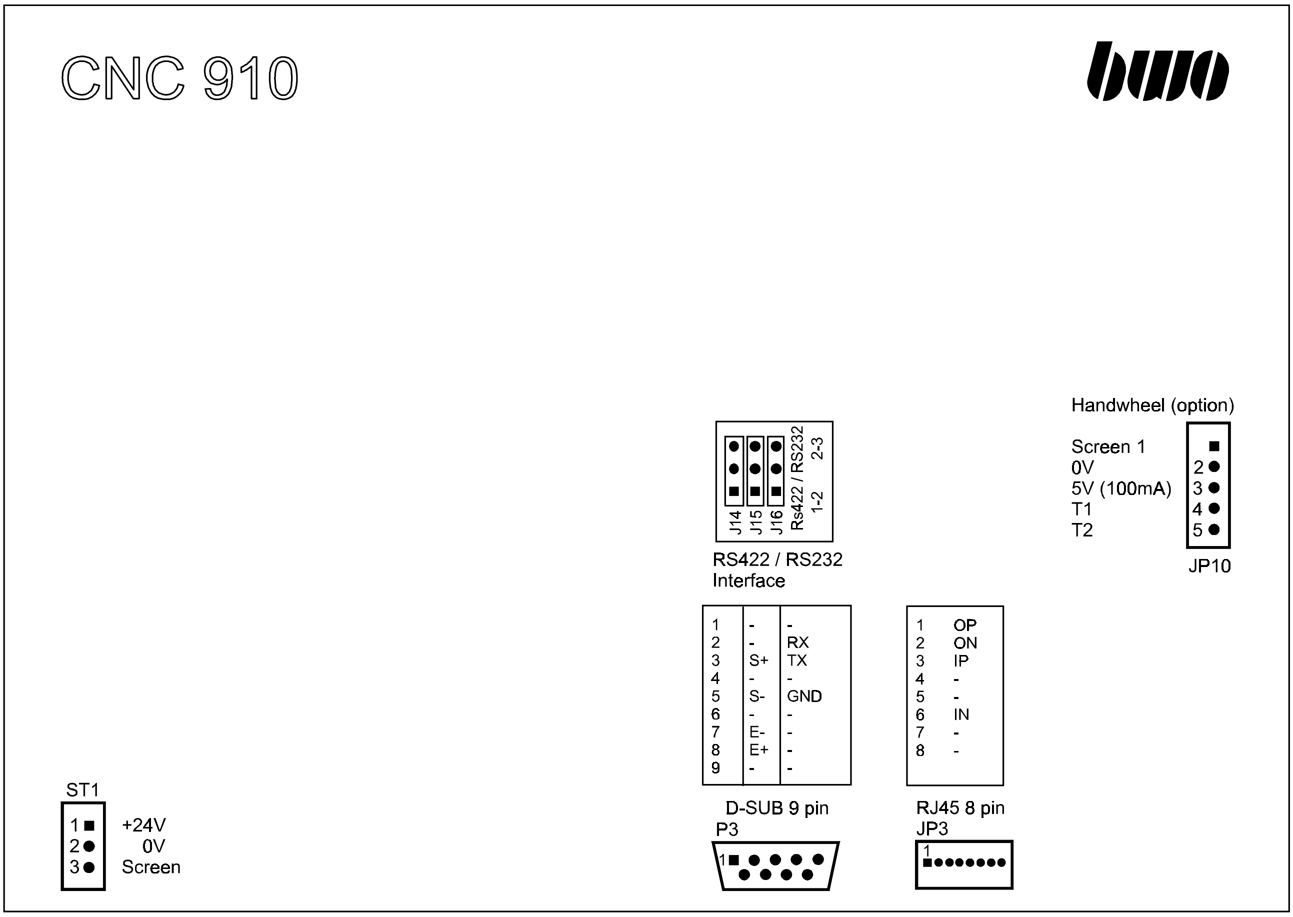
Mounting with 10 threaded bolts M4 x 8, grounding rear side M4

Nr.	X	Y	Nr.	X	Y
1	10,0	10,0	6	267,0	217,0
2	95,7	10,0	7	181,3	217,0
3	181,3	10,0	8	95,7	217,0
4	267,0	10,0	9	10,0	217,0
5	267,0	113,5	10	10,0	113,5



10.1 Operating panels CNC910 (continuation)

Plug contacts

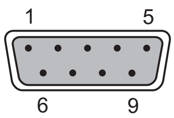


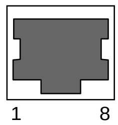
St1	3 pin plug	Power supply
P3	9 pin D-SUB pin-type plug	RS422 or RS232 interface
J14, J15, J16	Selection of the interface P3	1 with 2 bridged = RS422 (preset) 2 with 3 bridged = RS232
JP3	8 pin socket	Connection with host over RJ45
JP10	5 pin plug	Connection handwheel (option)

10.1 Operating panels CNC910 (continuation)

Plug contacts

Power supply 3 pin plug ST1		RS422 / RS232 interface 9 pin D-SUB pin-type plug P3	RS422	RS232	TCP/IP Host 8 pin RJ45 JP3 EtherNet (socket)	
1	+24V	1	-	-	1	OP
2	0V	2	-	RX	2	ON
3	Screen	3	S+	TX	3	IP
		4	-	-	4	-
		5	S-	GND	5	-
		6	-	-	6	IN
		7	E-	-	7	-
		8	E+	-	8	-
		9	-	-		

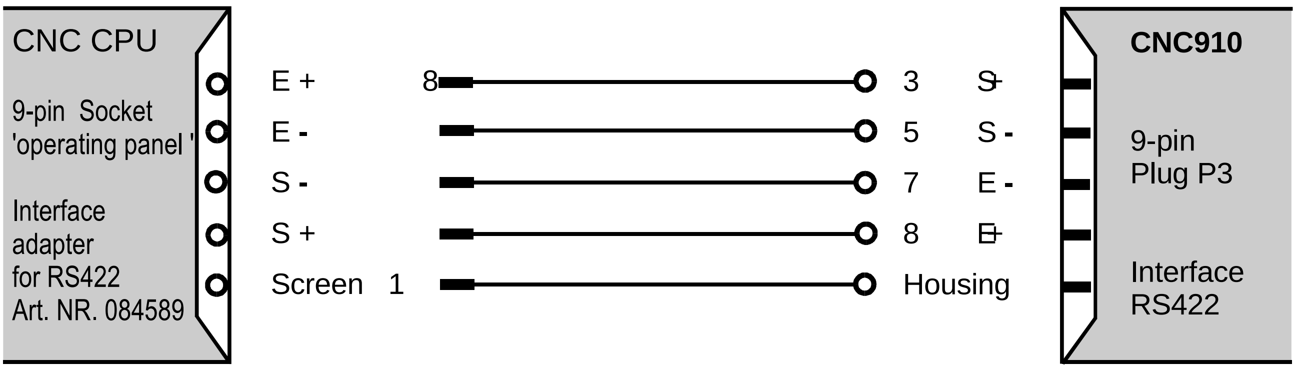




Allocation cable connection CNC Control - Operating panel CNC910

CNC Control
(only with CPU with Art. Nr.
088671 / 083671 / 084564)

Operating panel
CNC910



10.1 Operating panels CNC910 (continuation)

Data

Display

LCD Display TFT	640 x 480
	256 off 4096 colours
Touch screen with resolution	1024 x 1024
Size	6.5“

Save

Run-time memory DRAM	16MB
Flash disk memory	8MB

for operating system and control surface

Switch

1 emergency stop switch
1 key-operated switsch
2 potentiometers

Keys

42 function keys, of it 15 freely shapable
PLC Keys with display on LCD Display

Interfaces

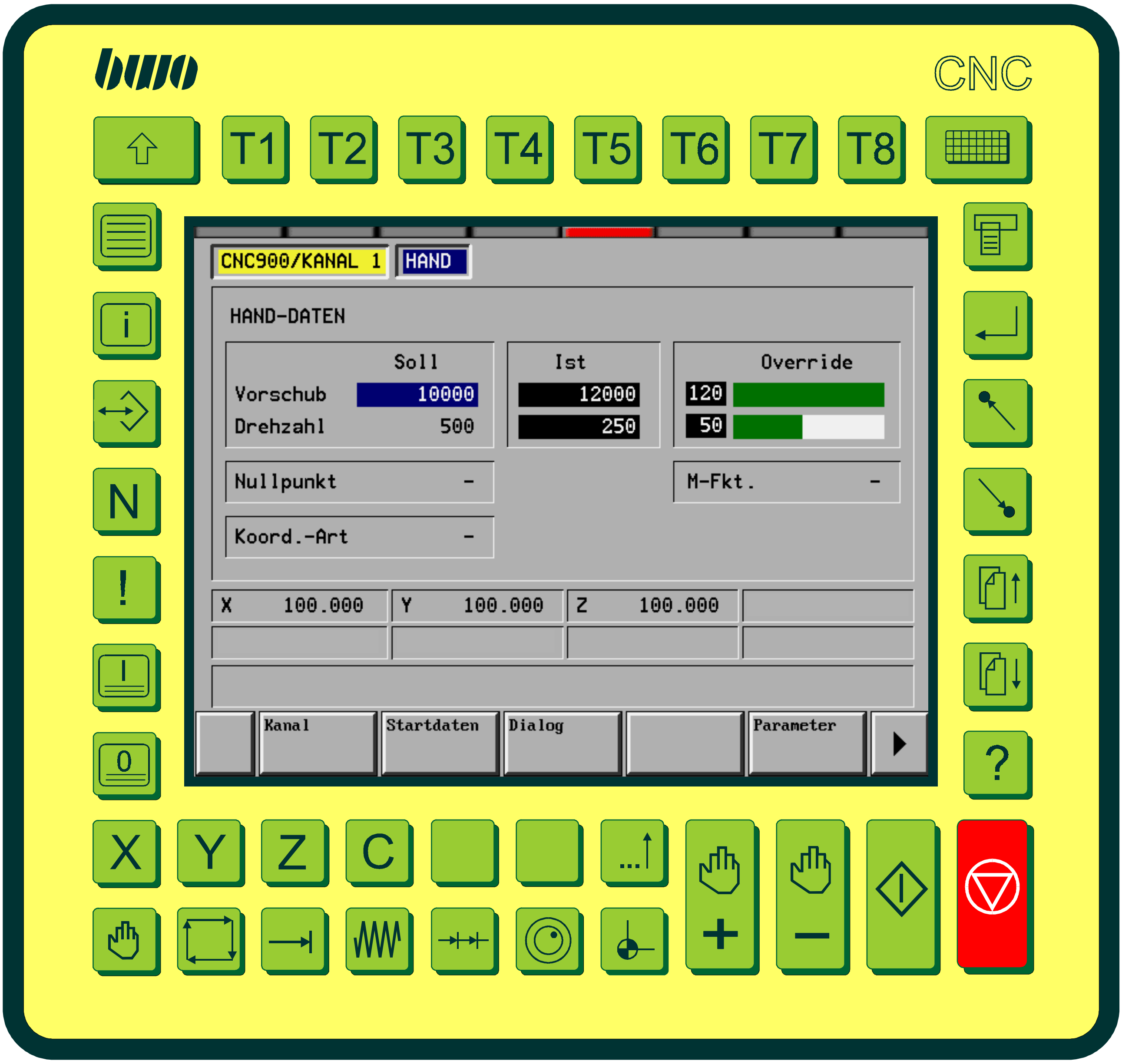
1 EtherNet RJ45
1 Serial interface (RS232 / RS422)

10.2 Operating panels CNC920

Mass and weight

Dimensions (width x height) 328mm x 310mm
max. depth of the rear edge of the front plate to the rear 55mm
Strength of the front plate approx. 4mm

Weight approx. 2kg

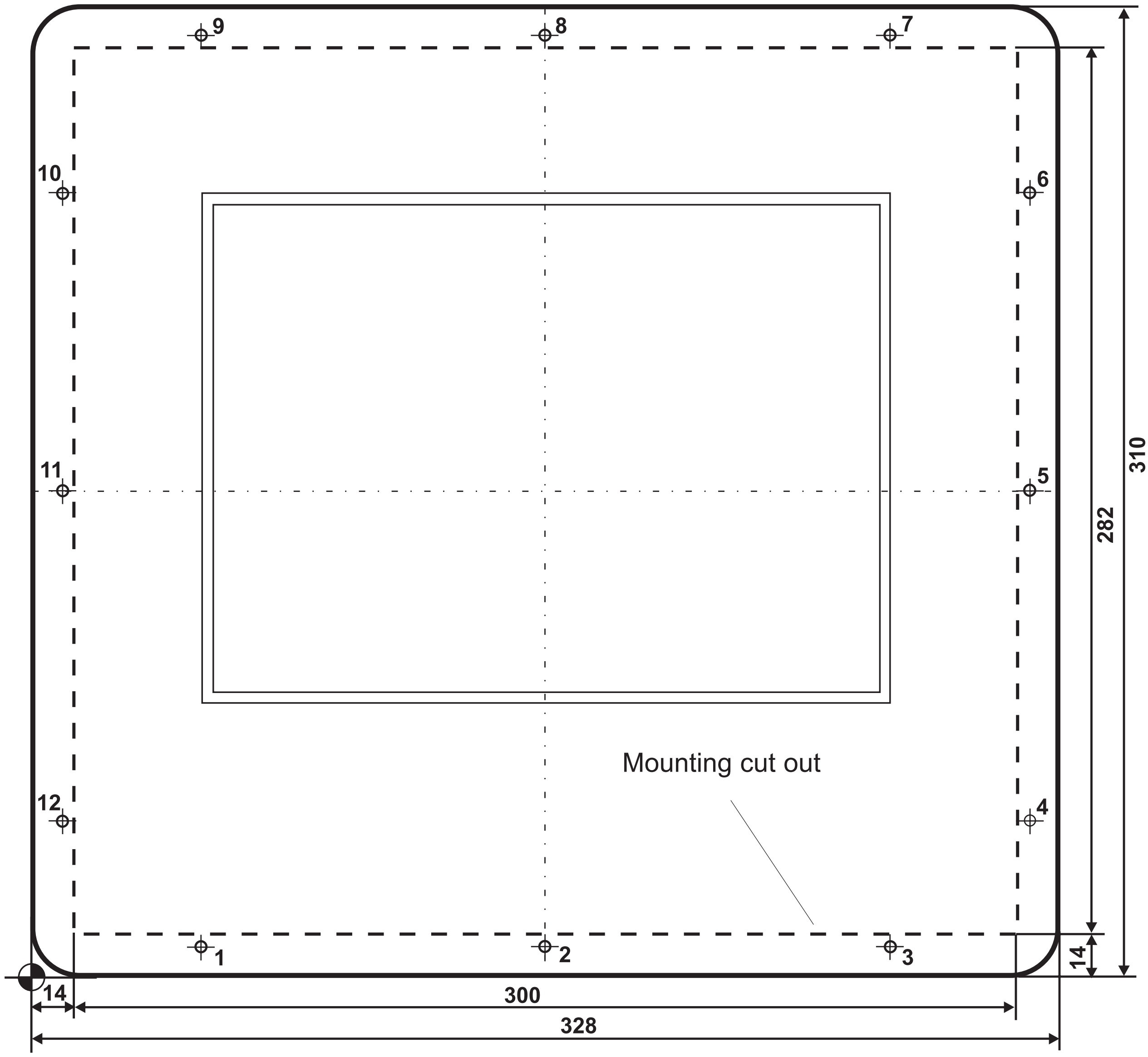


10.2 Operating panels CNC920 (continuation)

Mounting cut out 300mm x 282mm (width x height).

Fixing with 12 threaded bolts M4 x 8, grounding rear side M4

No.	X	Y	Nr.	X	Y
1	54,0	10,0	7	274,0	300,0
2	164,0	10,0	8	164,0	300,0
3	274,0	10,0	9	54,0	300,0
4	318,0	50,0	10	10,0	250,0
5	318,0	155,0	11	10,0	155,0
6	318,0	250,0	12	10,0	50,0

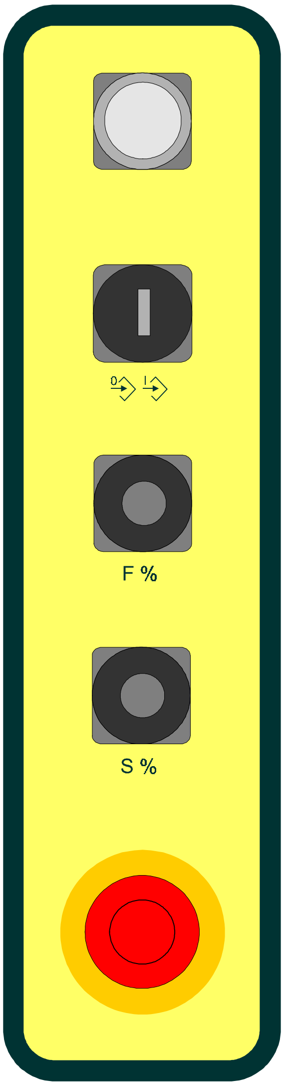


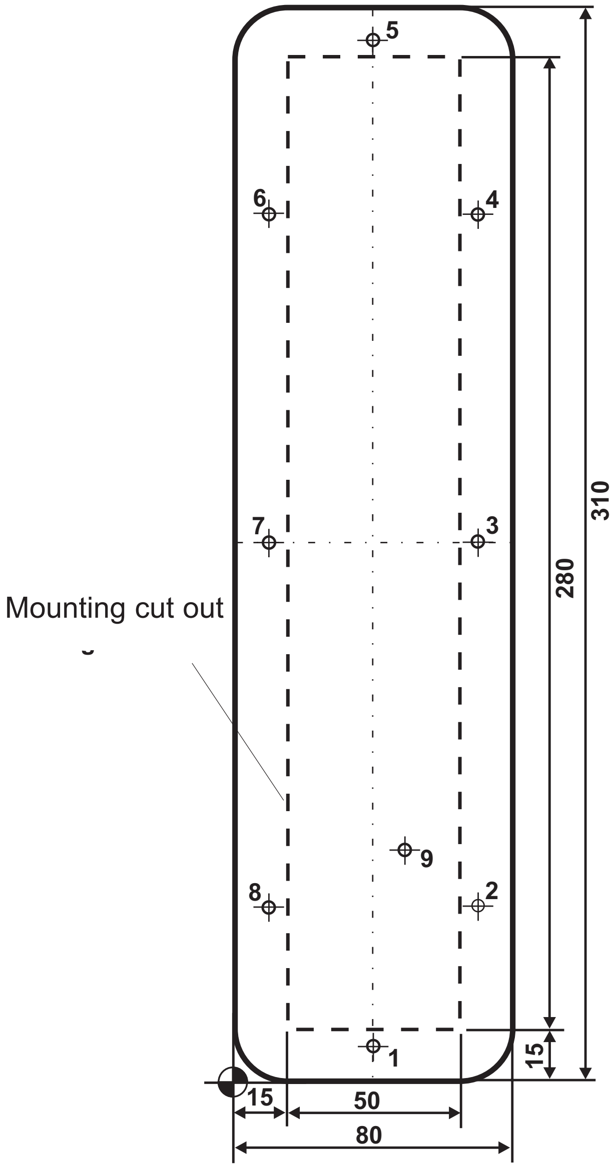
10.2 Operating panels CNC920 (continuation)

Mounting cut out 50mm x 280mm (width x height).

Fixing with 12 threaded bolts M4 x 8, grounding threaded bolt 9

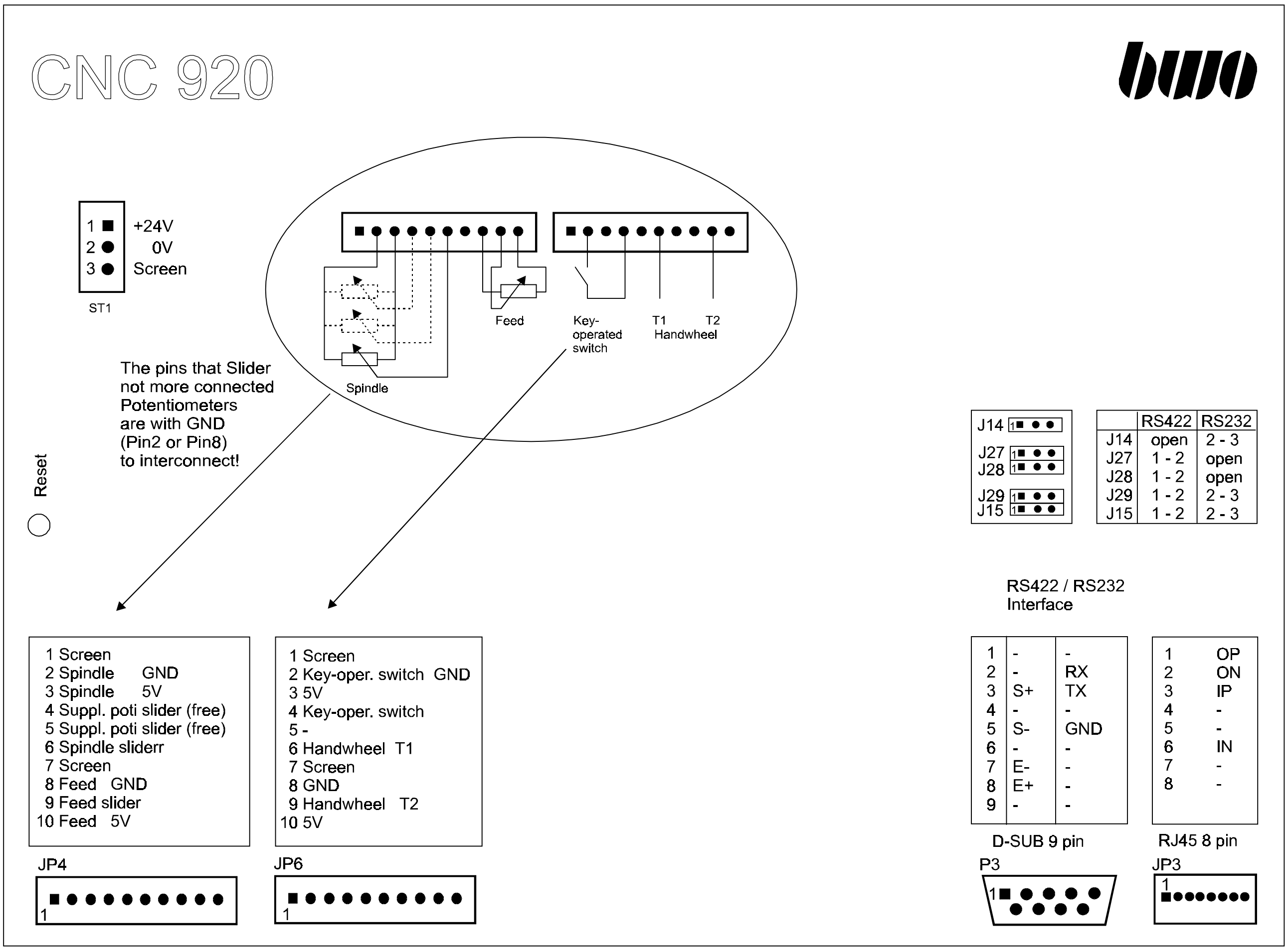
Nr.	X	Y	Nr.	X	Y
1	40,0	10,0	5	40,0	300,0
2	70,0	50,0	6	10,0	250,0
3	70,0	155,0	7	10,0	155,0
4	70,0	250,0	8	10,0	50,0





10.2 Operating panels CNC920 (continuation)

Plug contacts

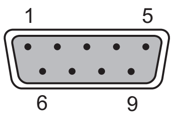


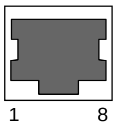
JP4 / JP6	10 pin terminal strip	externel potentiometers and key-operated switches		
P3	9 pin D-SUB pin-type plug	RS422 or RS232 interface		
J14, J15 and J27, J28, J29	Selection of Interface RS422 preset	RS422	J14 J15, J27, J28, J29	open bridge1 - 2
		RS232	J27, 28 J14, J15, J29	offen Brückr 2 - 3
JP3	8 pin socket	connection with host by RJ45		

10.2 Operating panels CNC920 (continuation)

Plug contacts

Power supply 3 pin plug ST1		RS422 / RS232 interface 9 pin D-SUB pin-type plug P3			TCP/IP Host 8 pin RJ45 JP3 EtherNet (socket)	
			RS422	RS232		
1	+24V	1	-	-	1	OP
2	0V	2	-	RX	2	ON
3	screen	3	S+	TX	3	IP
		4	-	-	4	-
		5	S-	GND	5	-
		6	-	-	6	IN
		7	E-	-	7	-
		8	E+	-	8	-
		9	-	-		





	10 pin terminal strip JP4	10 pin terminal strip JP6
1	Screen	Screen
2	Spindle GND	key-operated switch GND
3	Spindle 5V	5V
4	Suppl. poti slider (free)	key-operated switch
5	Suppl. poti slider (free)	-
6	Spindle slider	Handwheel T1
7	Screen	Screen
8	Feed GND	GND
9	Feed slider	HandwheelT2
10	Feed 5V	5V

10.2 Operating panels CNC920 (continuation)

Data

Display

LCD Display TFT	640 x 480
	256 off 4096 colours
Touch screen with resolution	1024 x 1024
Size	10,4“

Memory

Run-time memory DRAM	16MB
Flash disk memory	8MB

for operating system and control surface

Connections for external items:
1 key-operated switsch
4 potentiometers
1 handwheel

Keys
42 function keys, of it 15 freely shapable
PLC Keys with display on LCD Display

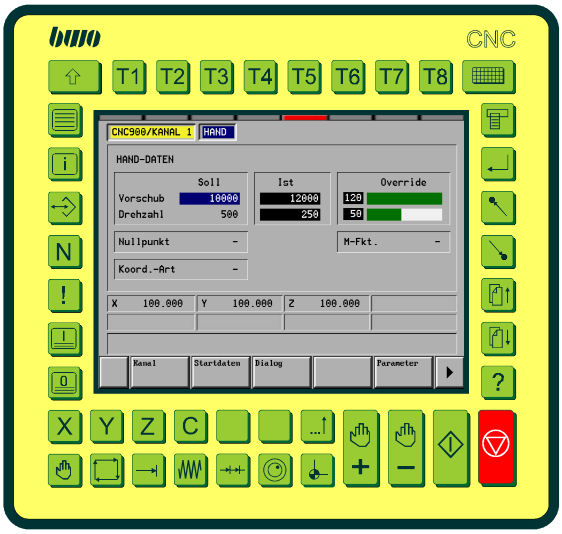
Interfaces
1 EtherNet RJ45
1 Serial interface (RS232 / RS422)

10.3 Operating panel CNC930

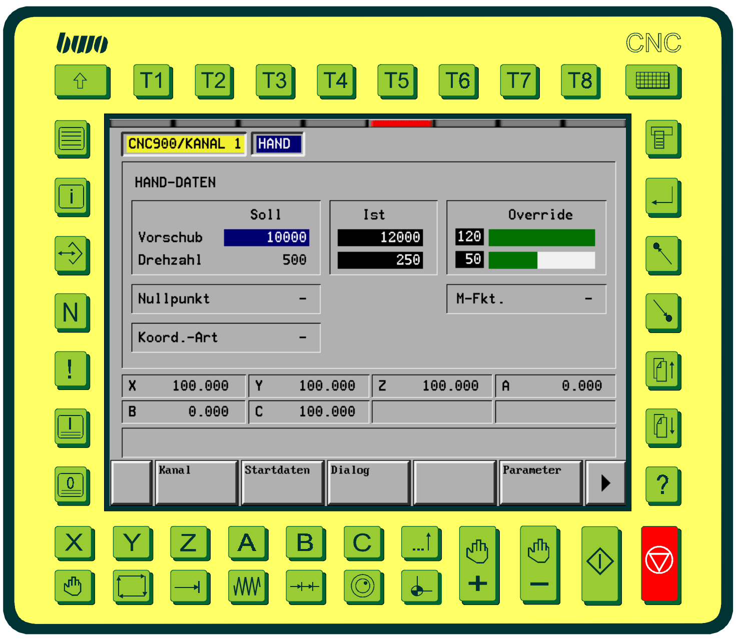
The operating panels CNC930 are available in two versions, which differ only by the different sceen size and concomitantly by the dimensions:

CNC930/10	Sceen size 10"	Dimensions B x H in mm	328 x 310
CNC930/15	Sceen size 15"	Dimensions B x H in mm	430 x 370

CNC 930 /10



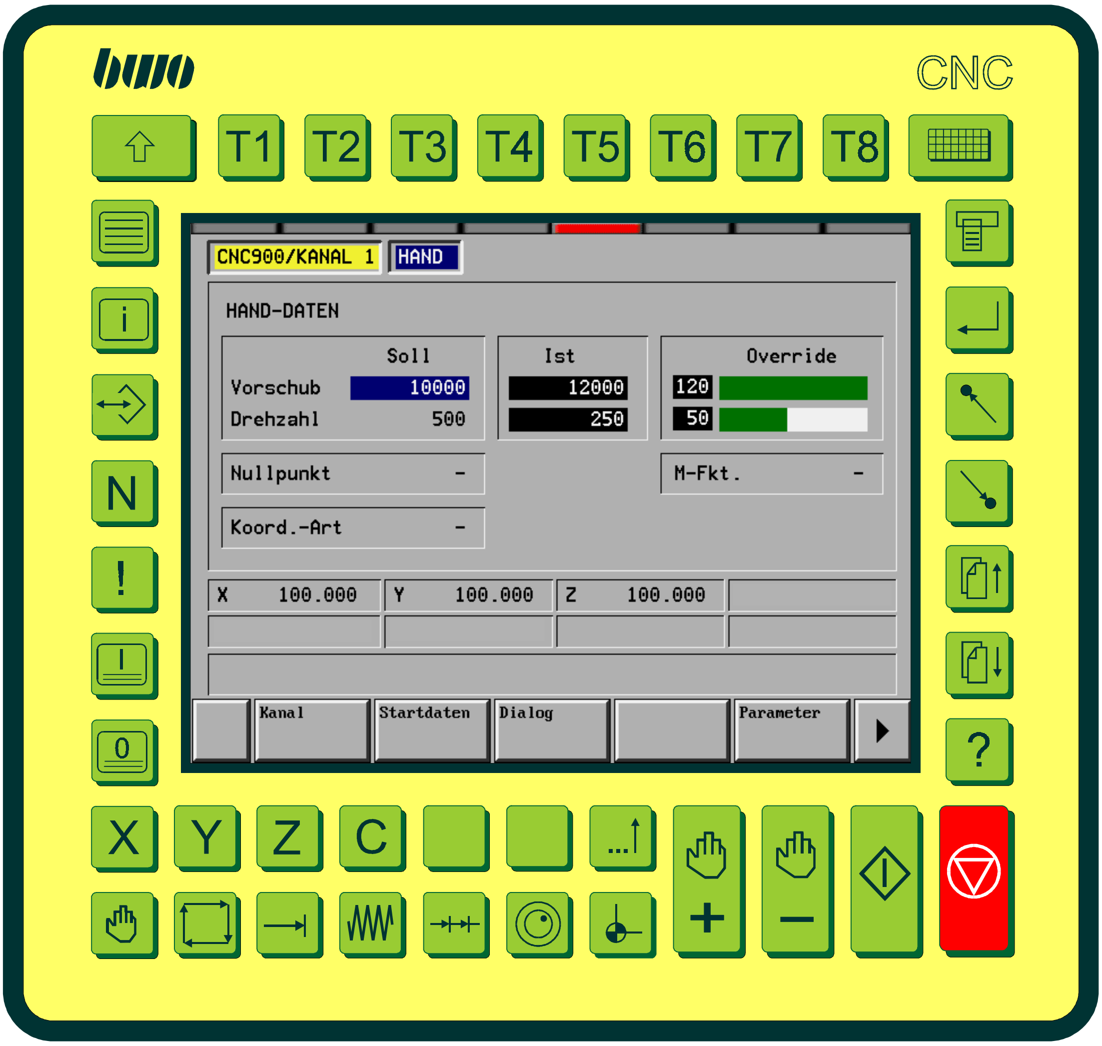
CNC 930 /15



10.3 Operating panel CNC930/10

Mass and weight CNC930/10

Dimensions	(width x height)		328mm x 310mm
Deep one	(of the rear side of the mother board after rear up to the end of the dust cover)		55mm
Strength of the front plate		approx.	4mm
Weight		approx.	2kg

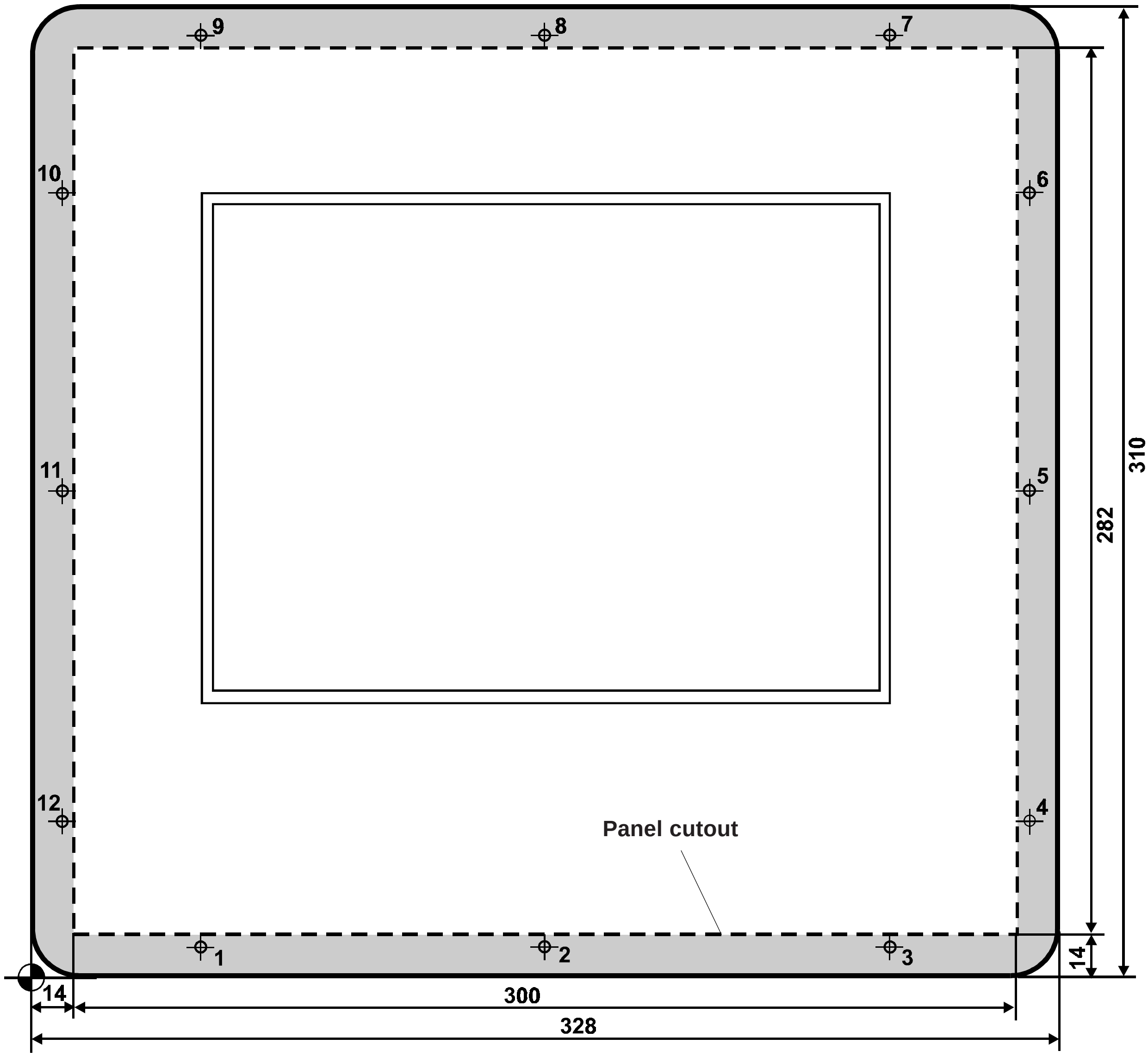


10.3 Operating panel CNC930/10 (continuation)

Panel cutout CNC930/10 (width x height) 300mm x 282mm

Mounting with 12 threaded bolts M4 x 8, grounding rear side M4

No.	X	Y	No.	X	Y
1	54,0	10,0	7	274,0	300,0
2	164,0	10,0	8	164,0	300,0
3	274,0	10,0	9	54,0	300,0
4	318,0	50,0	10	10,0	250,0
5	318,0	155,0	11	10,0	155,0
6	318,0	250,0	12	10,0	50,0

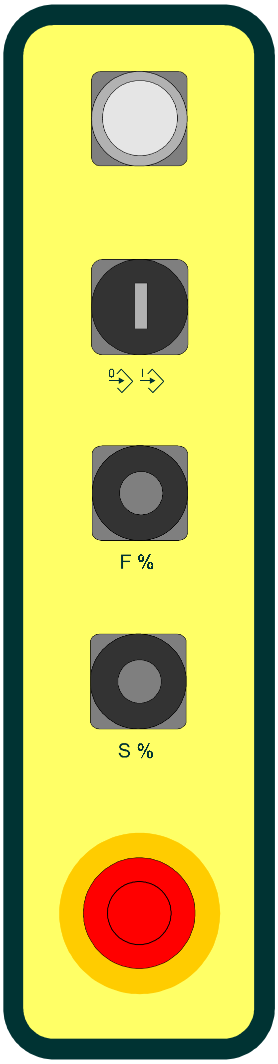


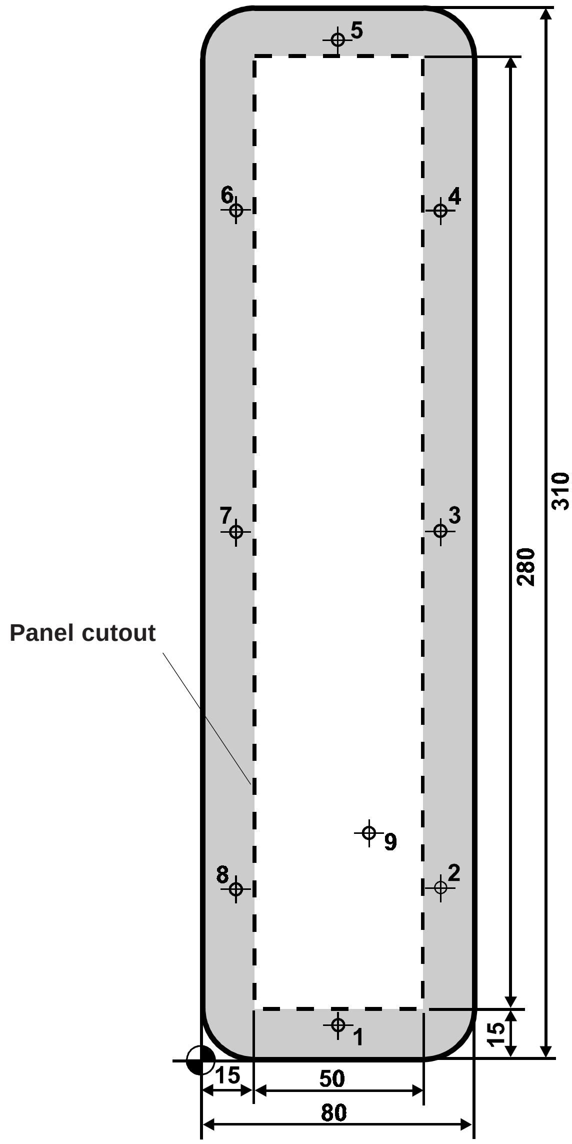
10.3 Operating panel CNC930/10 (continuation)

Panel cutout machine operating panel (width x height) 50mm x 280mm

Mounting with 8 threaded bolts M4 x 8, grounding threaded bolt 9

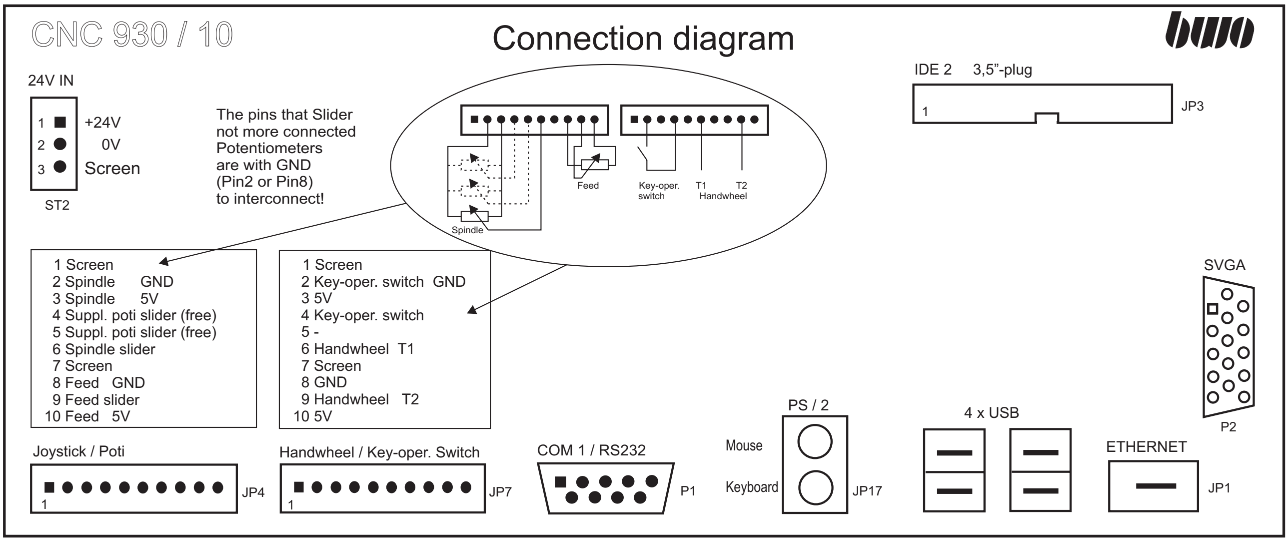
No.	X	Y	No.	X	Y
1	40,0	10,0	5	40,0	300,0
2	70,0	50,0	6	10,0	250,0
3	70,0	155,0	7	10,0	155,0
4	70,0	250,0	8	10,0	50,0





10.3 Operating panel CNC930/10 (continuation)

Plug allocation

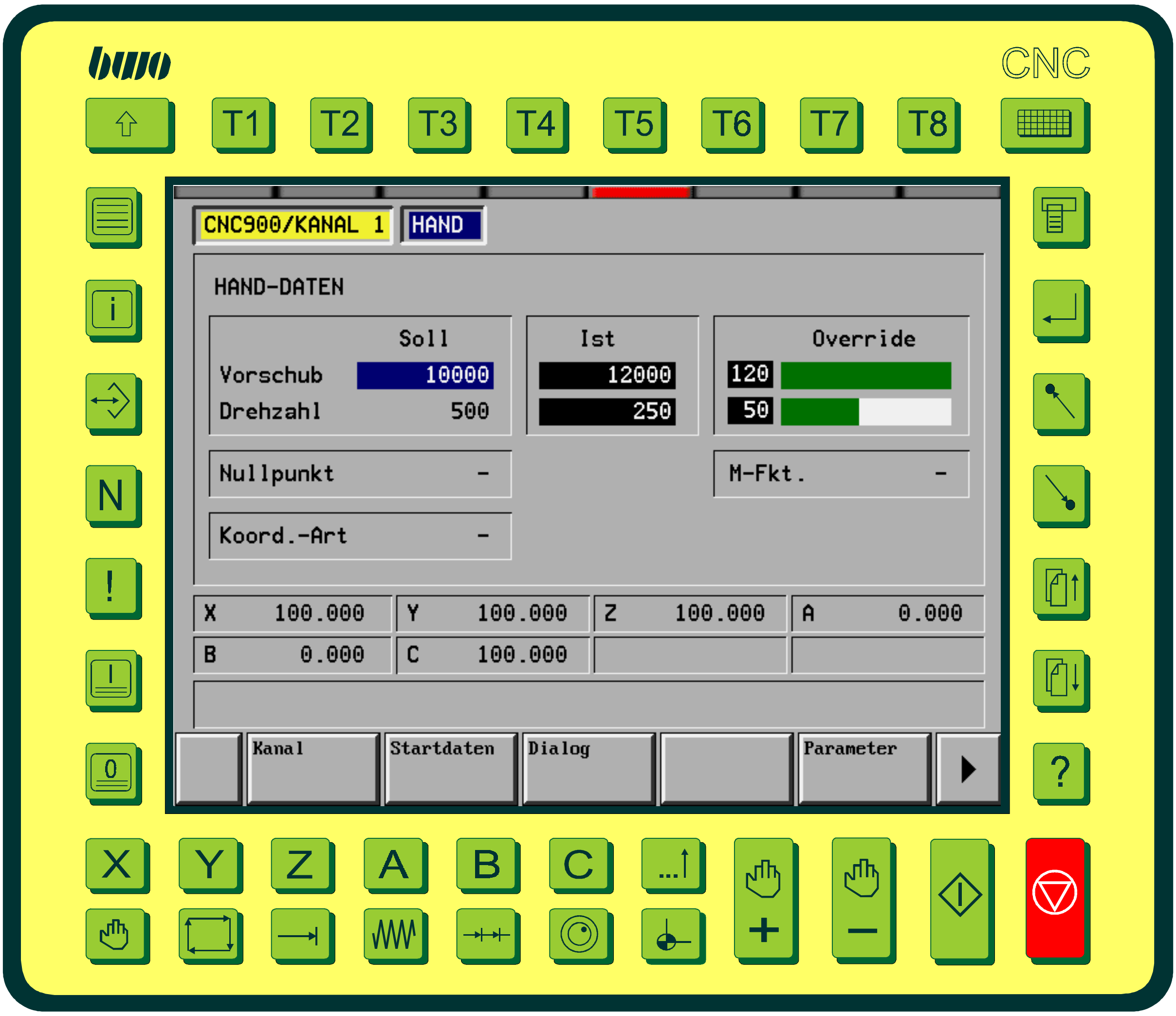


JP4 / JP7	10 pin terminal strip	External potentiometers and key-operated switsches
P1	9 pin CD-SUB-pin-type plug	COM 1 / RS232 Interface
JP17	PS / 2	Mouse / Keyboard
	4 x USB	
JP1	ETHERNET	
P2	15-poliger CD-SUB-bush-type plug	SVGA
JP2	3,5"-Stecker	IDE 2

10.3 Operating panel CNC930/15

Mass and weight CNC930/15

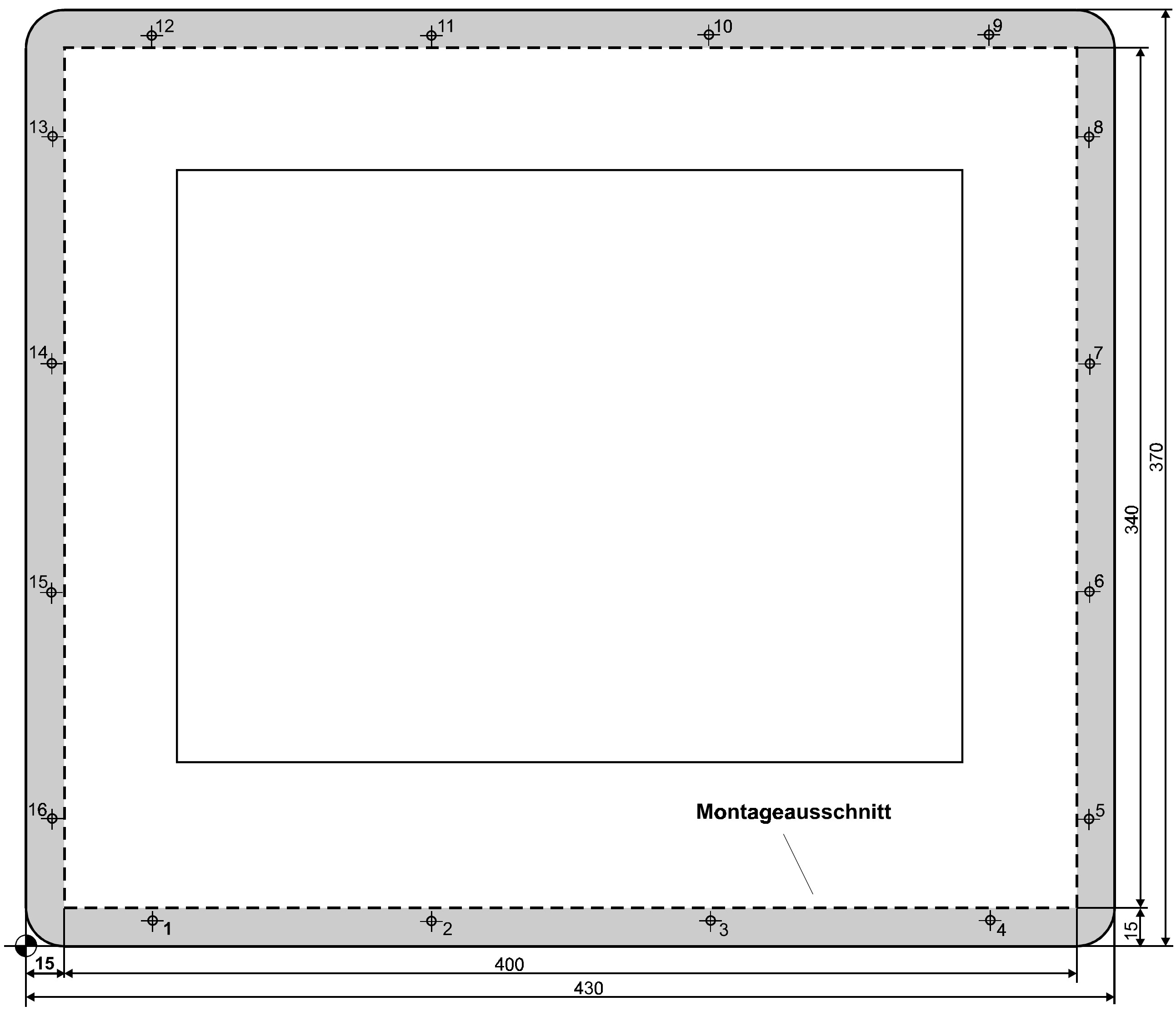
Dimensions	(width x height)		430mm x 370mm
Deep one	(of the rear side of the mother board after rear up to the end of the dust cover)		100mm
Strength of the front plate		approx.	4mm
Weight		approx.	3kg



10.3 Operating panel CNC930/15 (continuation)

Panel cutout CNC930/15 (width x height) 400mm x 340mm
Mounting with 16 threaded bolts M4 x 8, grounding rear side M4

No.	X	Y	No.	X	Y
1	50	10	9	380	360
2	160	10	10	270	360
3	270	10	11	160	360
4	380	10	12	50	360
5	420	50	13	10	320
6	420	140	14	10	230
7	420	230	15	10	140
8	420	320	16	10	50

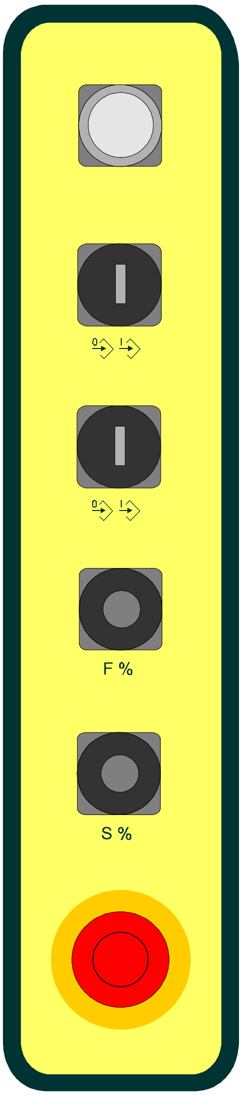


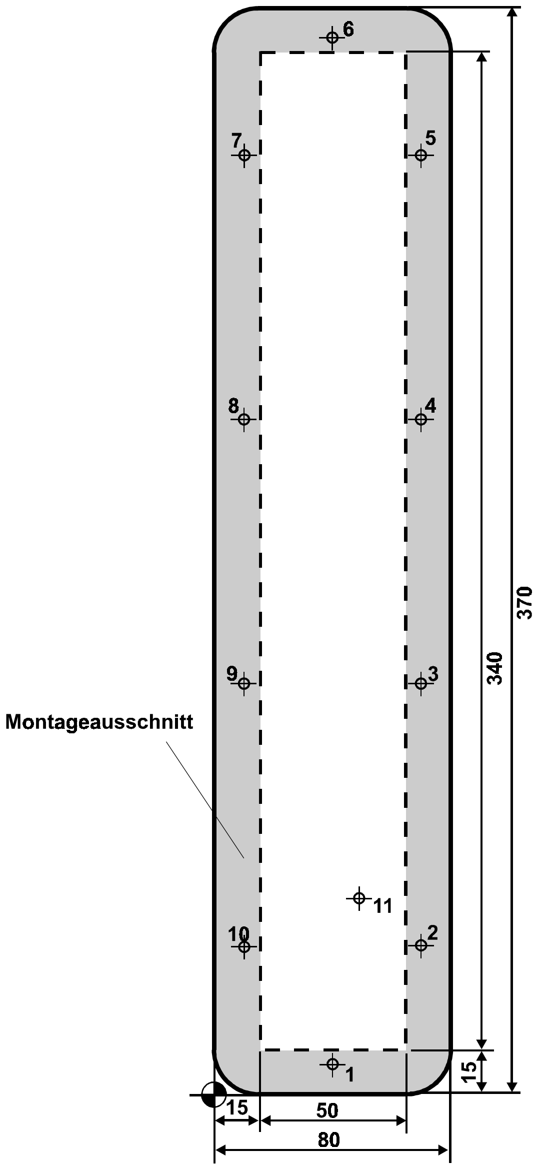
10.3 Operating panel CNC930/15 (continuation)

Panel cutout machine operating panel (width x height) 50mm x 340mm

Mounting with 10 threaded bolts M4 x 8, grounding threaded bolt 11

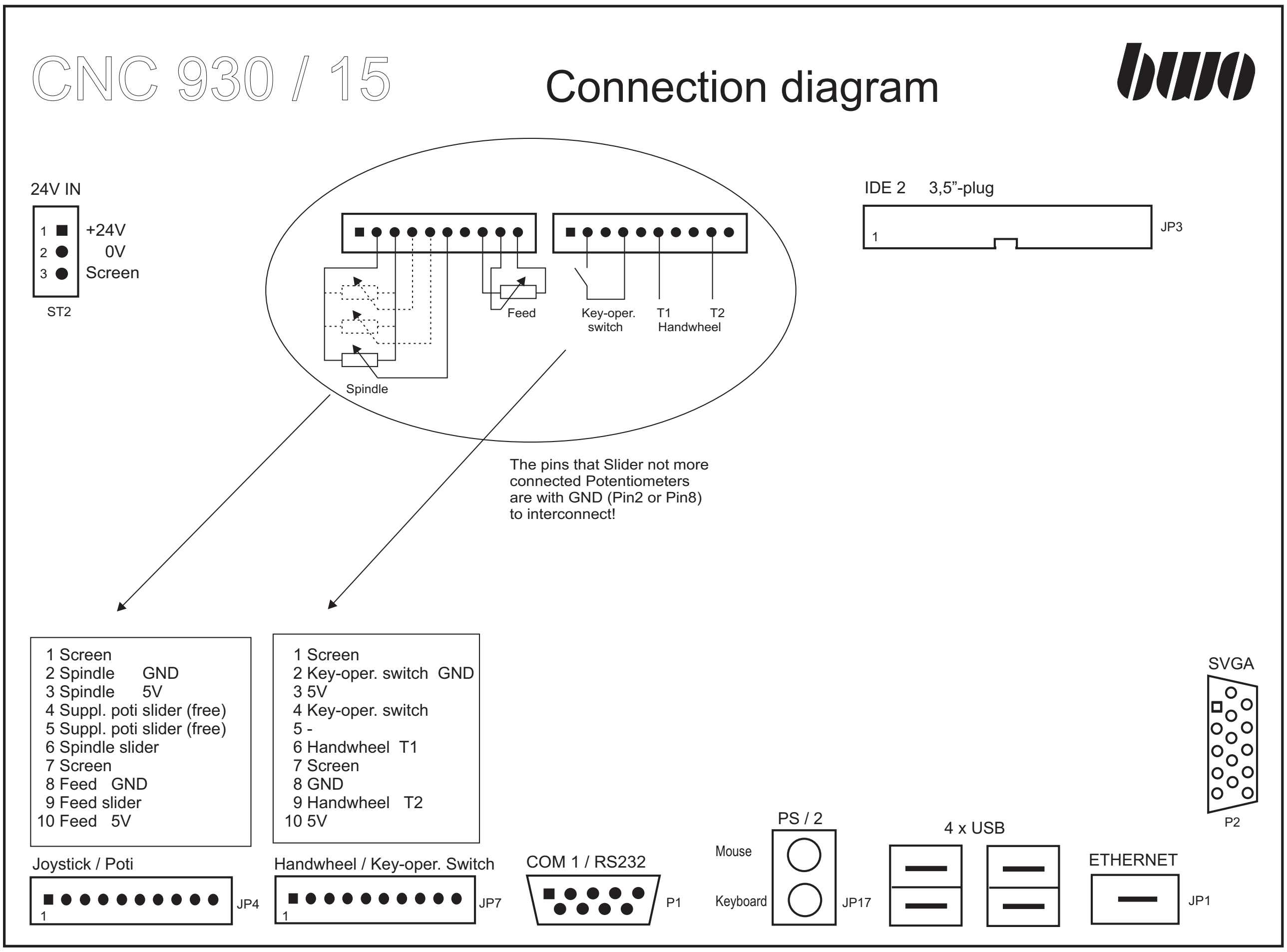
No.	X	Y	No.	X	Y
1	40,0	10,0	6	40,0	360,0
2	70,0	50,0	7	10,0	320,0
3	70,0	140,0	8	10,0	230,0
4	70,0	230,0	9	10,0	140,0
5	70,0	320,0	10	10,0	50,0





10.3 Operating panel CNC930/15 (continuation)

Plug allocation



JP4 / JP7	10 pin terminal strip	external potentiometers and key-operated switsches
P1	9 pin CD-SUB-pin-type plug	COM 1 / RS232 Interface
JP17	PS / 2	mouse / keyboard
	4 x USB	
JP1	ETHERNET	
P2	15-poliger CD-SUB-bush-type plug	SVGA
JP2	3,5"-Stecker	IDE 2

10.3 Operating panel CNC930

Data

Operating panels in two versions		Dimensions	(B x H in mm)
CNC 930/10 LCD-Bildschirm TFT **10"**		Operating panel	328 x 310
Resolution / colours	640 x 480 / 16Bit	Machine operating panel	80 x 310
Touch screen resolution	1024 x 1024		
CNC 930/15 LCD-Bildschirm TFT **15"**		Operating panel	430 x 370
Resolution / colours	1024 x 768 / 16Bit	Machine operating panel	80 x 370
Touch screen resolution	1024 x 1024		

Processor
CPU Pentium compatibly 1,50 GHz

Memory
RAM memory 512 MB / 32MB shared Memory for Graphic
Hard disk 2,00 GB Flash Drive or
= > 120 GB Harddisk

Keys
42 function keys, of it 15 freely shapable
PLC Keys with display on the LCD Display

Connections
1 Ethernet 10/100 Mbit
1 serial interface
4 USB 2.0
1 PS/2 mouse / keyboard
Potentiometer / handwheel / key-operated switsch
SVGA monitor / onboard Graphiccontroller

Operating system: Windows XP embedded

Machine operating panel (optional)
1 emergency stop
1 key-operated switsch with CNC 930/10
2 key-operated switsches with CNC 930/15
2 potentiometers
1 illuminated push button

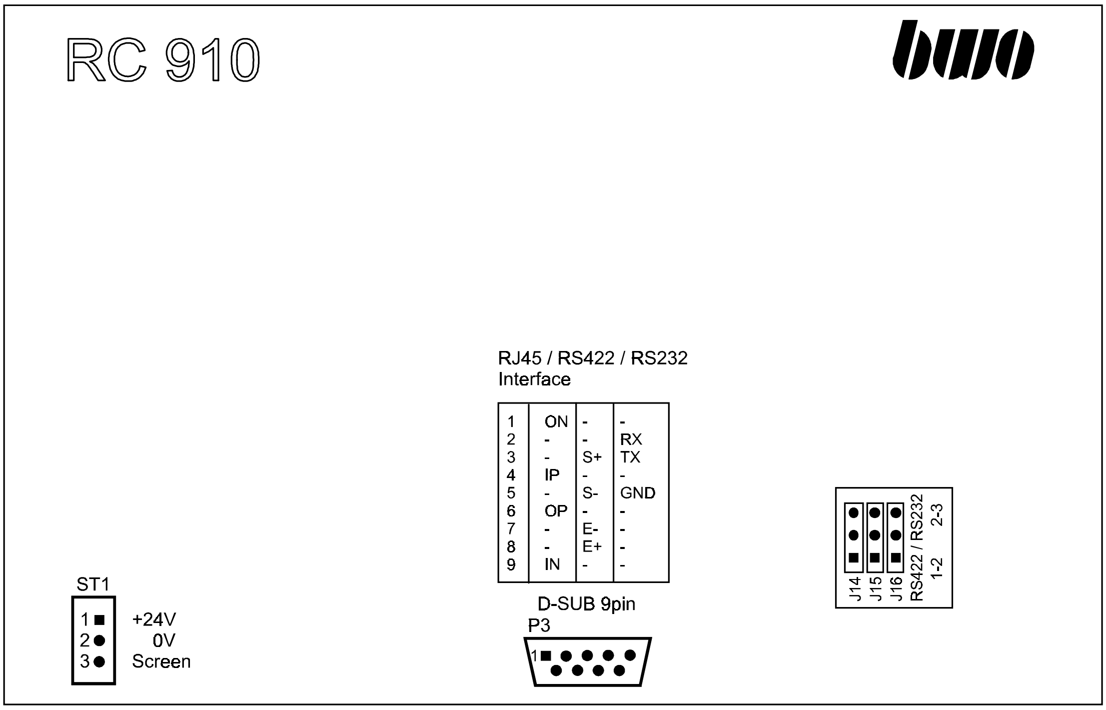
10.4 Operating panels RC910

Mass and weight

Dimensions	(width x height x depth)		310mm x 240mm x 60mm
Weight		approx.	2kg

10.4 Operating panels RC910 (continuation)

Plug contacts

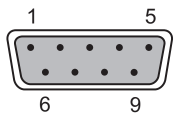


St1	3 pin plug	Power supply
P3	9 pin D-SUB pin-type plug	RS422 or RS232 interface
J14, J15, J16	Selection of the interface P3	1 with 2 bridged = RS422 (preset) 2 with 3 bridged = RS232

10.4 Operating panels RC910 (continuation)

Plug contacts

Power supply		RS422 / RS232 interface			
3 pin plug ST1		9 pin D-SUB pin-type plug P3	RS422	RS232	RJ45
1	+24V	1	-	-	ON
2	0V	2	-	RX	-
3	Screen	3	S+	TX	-
		4	-	-	IP
		5	S-	GND	-
		6	-	-	OP
		7	E-	-	-
		8	E+	-	-
		9	-	-	IN



10.4 Operating panels RC910 (continuation)

Data

Display

LCD Display TFT	640 x 480
	256 off 4096 colours
Touch screen with resolution	1024 x 1024
Size	6.5“

Memory

Run-time memory DRAM	16MB
Flash disk memory	8MB

for operating system and control surface

Switch

1 emergency stop switch
1 key-operated switsch
1 release button
1 potentiometer

Keys

42 function keys, of it 15 freely shapable
PLC Keys with display on LCD Display

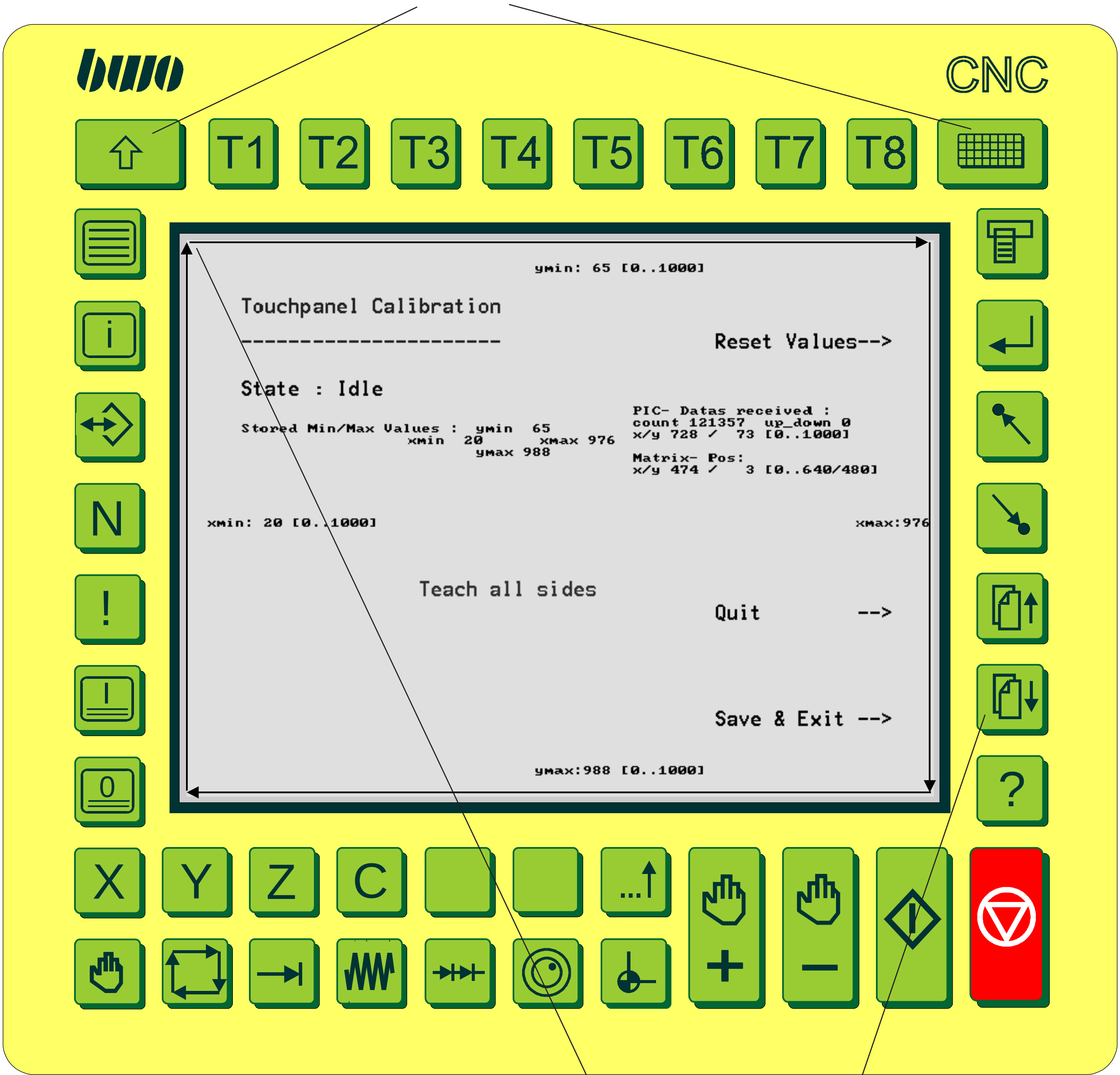
Interfaces

1 EtherNet RJ45
1 Serial interface (RS232 / RS422)

10.5 Touch-Screen calibration

The Touch screen is calibrated in the factory before the distribution. Being after some time malfunctions occur, can be repeated the calibration.

For calibrating the two keys simultaneous press. Then this picture appears.



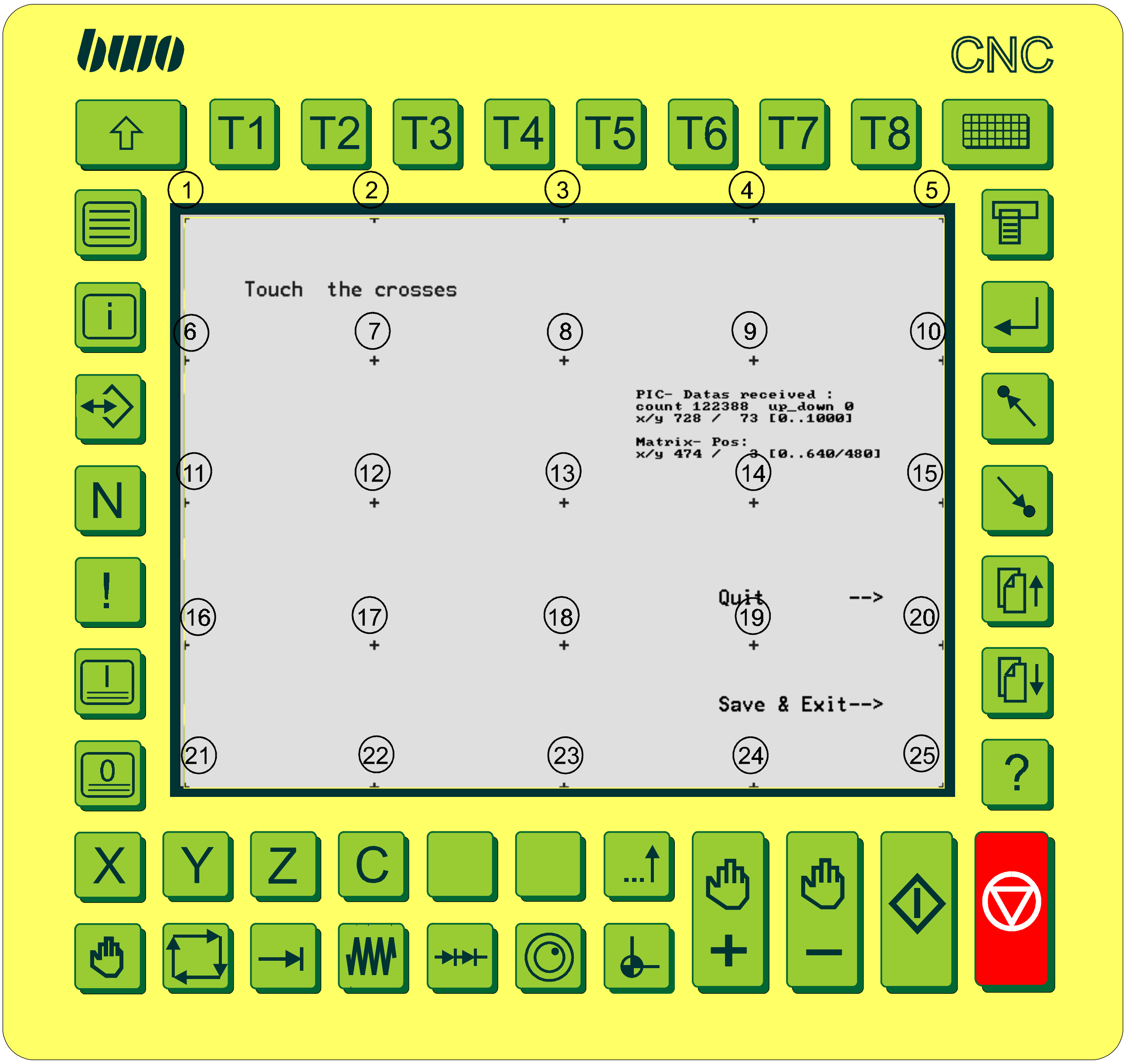
Touch screen area (Xmin - Xmax / Ymin - Ymax) determine:
In addition with a pointed soft item from on the left of above close at the edge in direction of arrow around the display drive.

With key ‘Save & Exit‘ the next picture appears.

10.5 Touch-Screen calibration

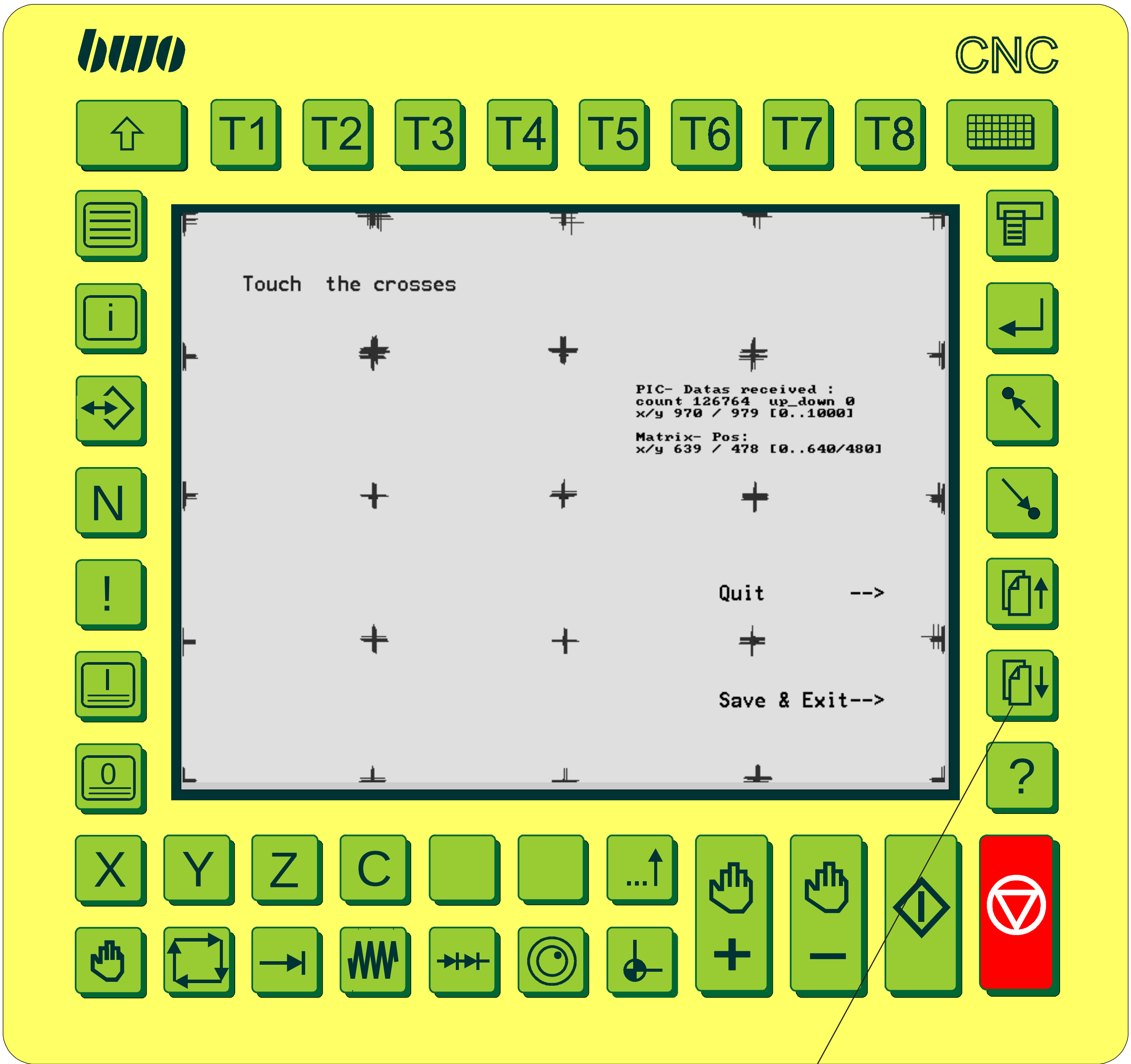
In this picture the **calibration points** appear. The total area actual into 16 subranges divided. The markings (crosses) of the subranges with a pointed soft item touched lightly in the order

1 - 2 - 7 - 6 - 1
2 - 3 - 8 - 7 - 2
3 - 4 - 9 - 8 - 3
4 - 5 - 10 - 9 - 4
etc.



10.5 Touch-Screen calibration

It is recorded when each touching lightly on cross. This cross command as close ones as possible at the given mark point (cross) is situated.
The marking process can be repeated, in order to keep the dispersion as small as possible.

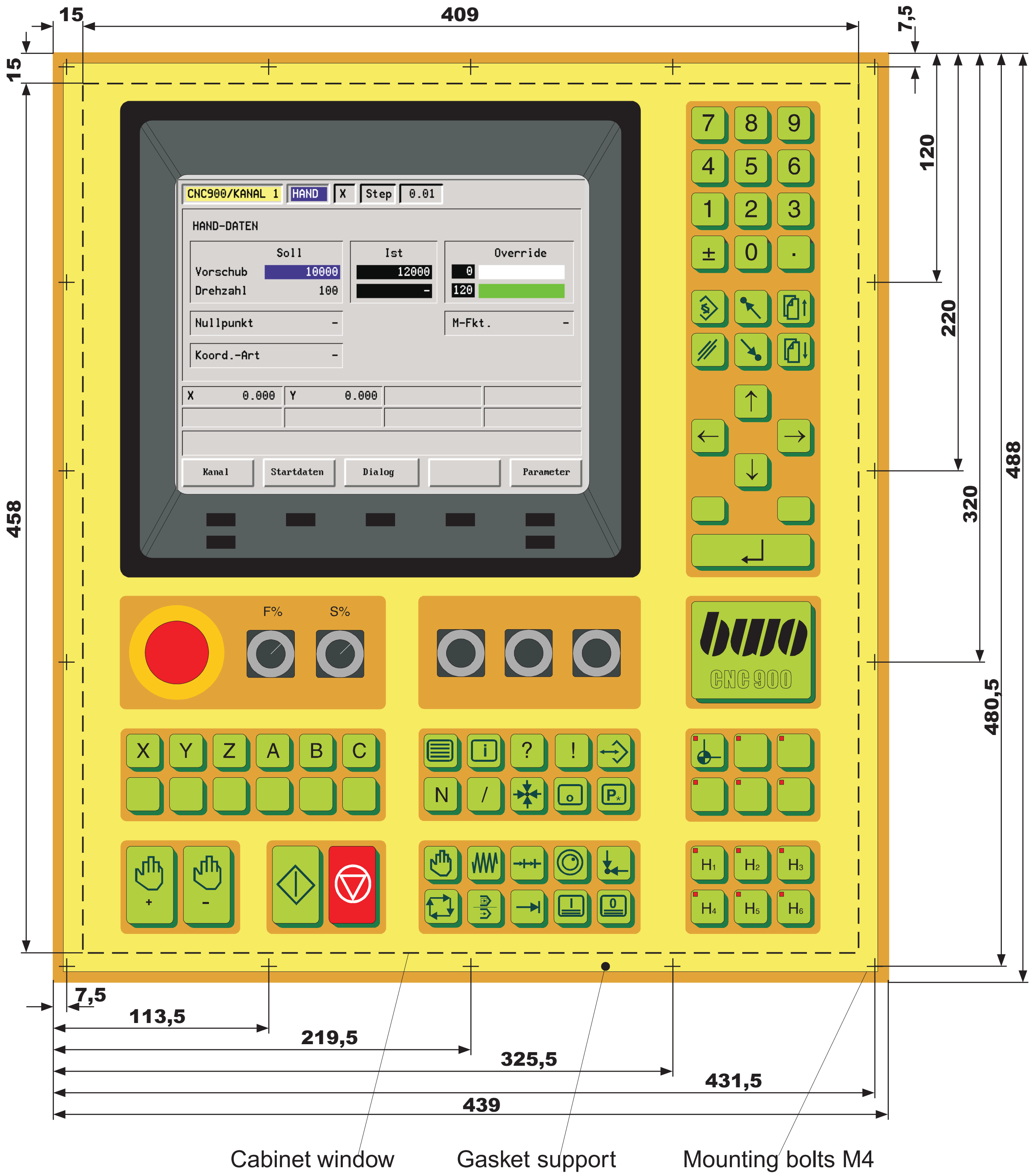


The calibration is terminated with press the keys ‘Save & Exit‘.

To net curtain aborted with key ‘Quit‘ the process without saving.

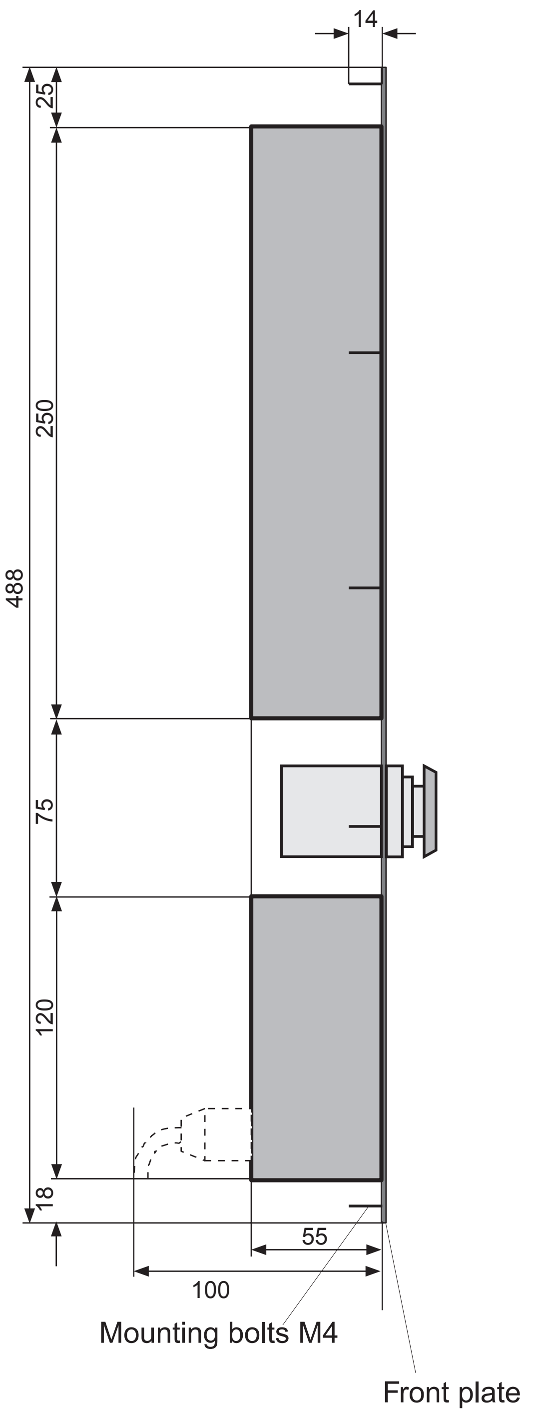
10.6 Operating panel CNC 900

Mounting view



10.6 Operating panel CNC 900 (continued)

Side view



10.6 Operating panel CNC 900 (continued)

Technical data

Processor	CPU 80C188 / 20MHz
Graphics	For selecting a passive color LCD-(STN)
Color LCD	Color VGA (640 x 480) with function keys in the display frame
Memory	256 kbyte EEPROM for PROMA pictures 256 kbyte operating system EEPROM 256 kbyte S-RAM
Inputs/outputs	3 override inputs 1 input for manual operating panel 4 switch inputs 1 serial input/output 20 mA, connection of manual operating panel 1 serial input/output 20 mA, connection of control unit 1 serial input/output 20 mA or V24 input/output for periphery interface, IO-traffic CNC or programming interface for flash EEPROM 1 serial input/output RS422 for servicing purposes
Keyboard	For control functions with cursor keys and numerical key field
Front	In IP65 design with 2 potentiometers and emergency power-off switch
Power unit	Operating voltage 24V= or 22V~, admissible range from 22V to 35V, current consumption 1.6A for 24V=. The primary and secondary voltages are electrically isolated in the power unit. Therefore, an isolating transformer is not required.
Working temperature	up to + 40°C

10.6 Operating panel CNC 900 (continued)

Operational characteristics

The operating panel CNC 900 offers the possibility of operating the CNC by means of a graphical surface created in PROMA.
It is possible to switch from the PROMA pictures to the CNC masks (surface of the mask PROM) and vice versa by means of the graphic / normal key after running through the CNC switch-on routine.

Loading the PROMA surface into the operating panel

the individual pictures of the PROMA project are united in a file upon generating them. This file has the name : **SHOW_E**
The file SHOW_E is loaded within the PROMA program by means of the function **Load** into the operating panel via the serial interface of the PC and saved in a flash EEPROM. For this purpose, a V24 connecting cable having a bridge (pin 15 to pin 21) and leading from the PC to the periphery socket of the operating panel has to be plugged in before switching on the unit. When being switched on, the operating panel recognized this bridge and initializes the periphery interface as a programming interface and waits within a CNC diagnostic picture. In this state, the CNC can be attended, too. With the CNC being active, it is possible to switch to the new PROMA pictures after loading a new SHOW_E file into the operating panel by means of the graphic / normal key. By doing so, the programming interface is reprogrammed for the IO interface of the CNC.

By pressing the keys F6 and F7 simultaneously, it is possible to switch from a PROMA picture to the CNC mask. By pressing the keys F6 and F7 once more simultaneously, it is possible to switch from the CNC mask to the CNC diagnostic picture in the text mode. Various diagnostic windows can be overlaid and various hardware tests can be called in this picture.

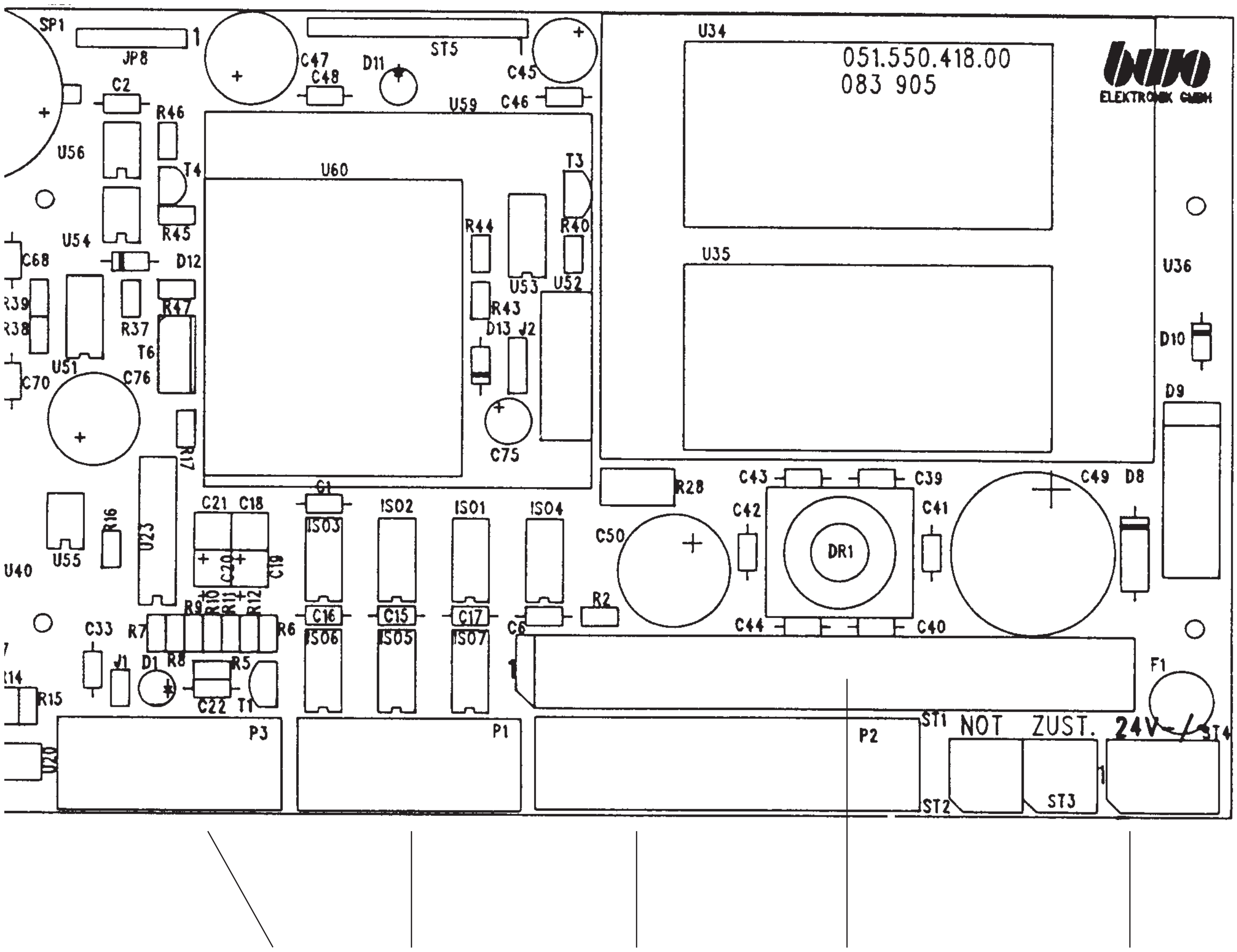
10.6 Operating panel CNC 900 (continued)

Motherboard

3 serial interfaces:	BWO - I/O periphery control	25-pin SUB-D socket
	BWO - control unit connection	9-pin SUB-D PLUG
	BWO - servicing connection	9-pin SUB-D socket
Connecting blocks for :	4 detachable-key switches	5 pins
	3 potentiometers	5 pins
	1 emergency power-off switch	2 pins
	1 okay-key on manual panel	2 pins
Plug-type binding post	For connecting the manual operating panel	16 pins
Supply:	Plug-type binding post at the power unit	3 pins

10.6 Operating panel CNC 900 (continued)

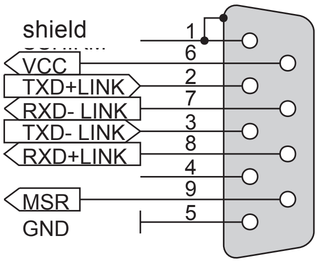
Connections



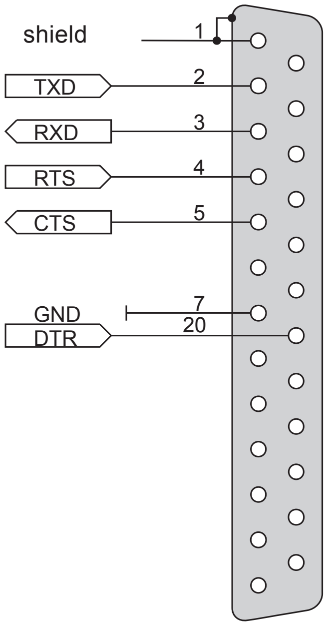
Connections: Service | Control unit | Periphery | Manual operating panel | 22V= / 22V~

10.6 Operating panel CNC 900 (continued)

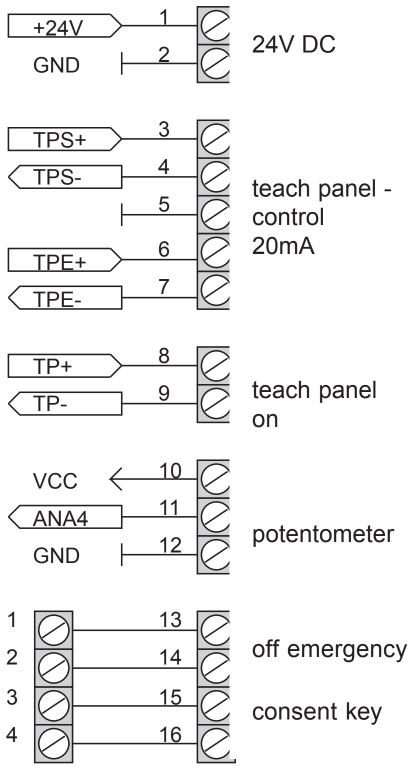
Plug/socket document viewing from device internal side (pointer: direction of the signals)



Service
9 pole SUB-D socket

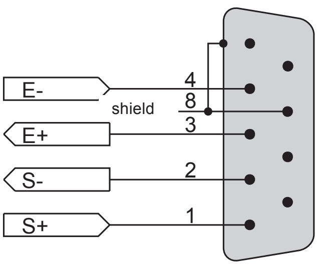


Peripherie interface (V24)
25 pole SUB-D socket



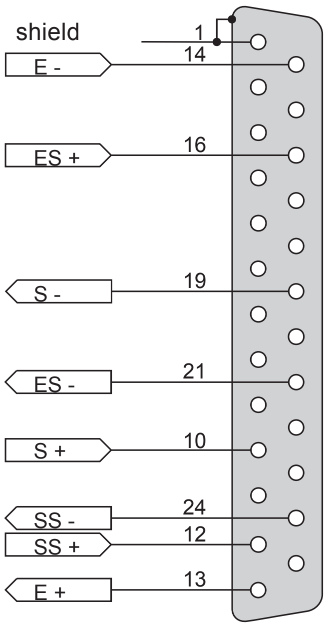
Teach panel
16 pole plug pin bar

Off emergency switch
and consent key
4 pole plug pin bar



CNC control (20mA)
9 pole SUB-D plug

Transmitter active -
receiver passive
fixed adjusted

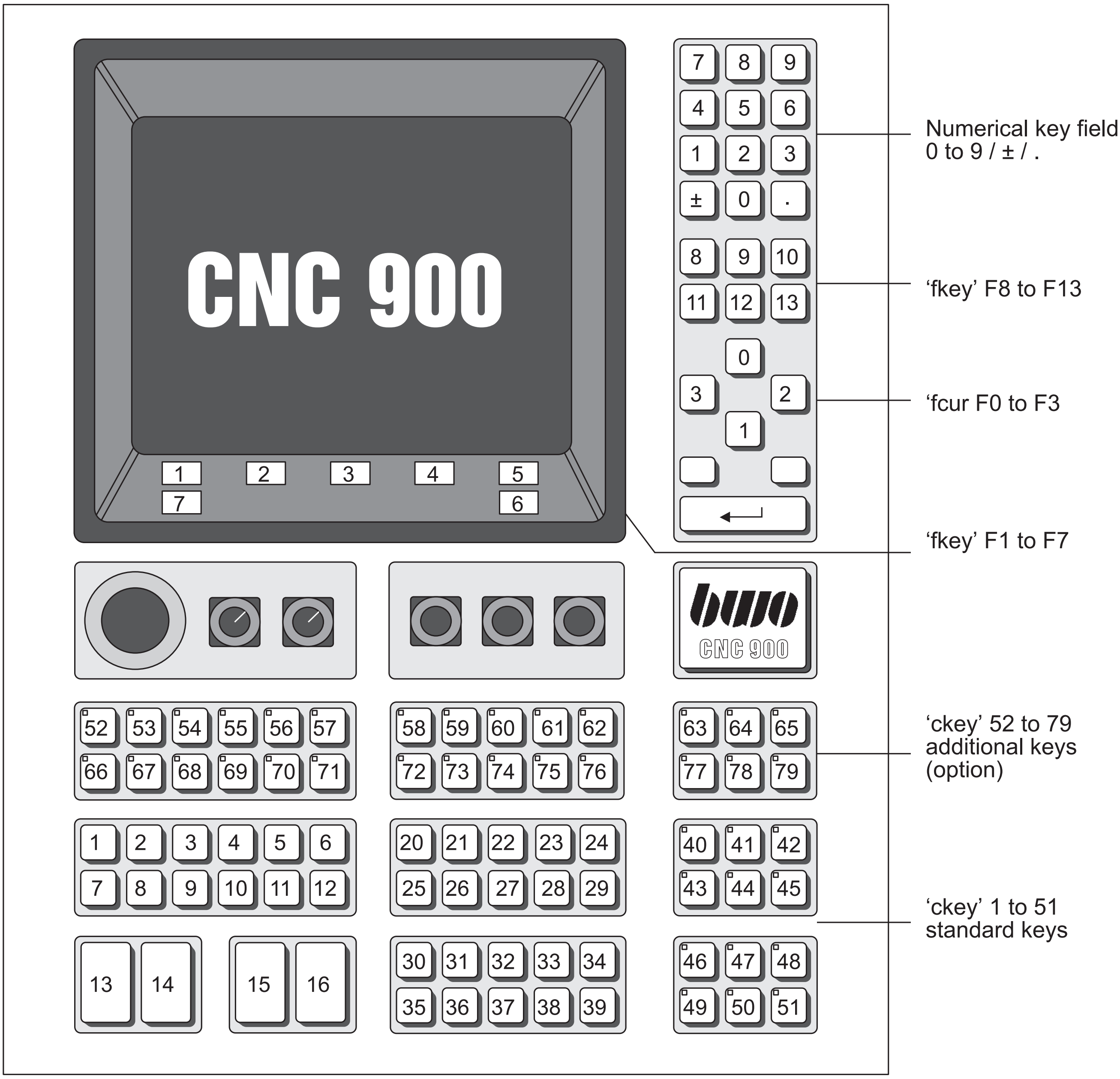


Peripherie interface (20mA)
25 pole SUB-D socket

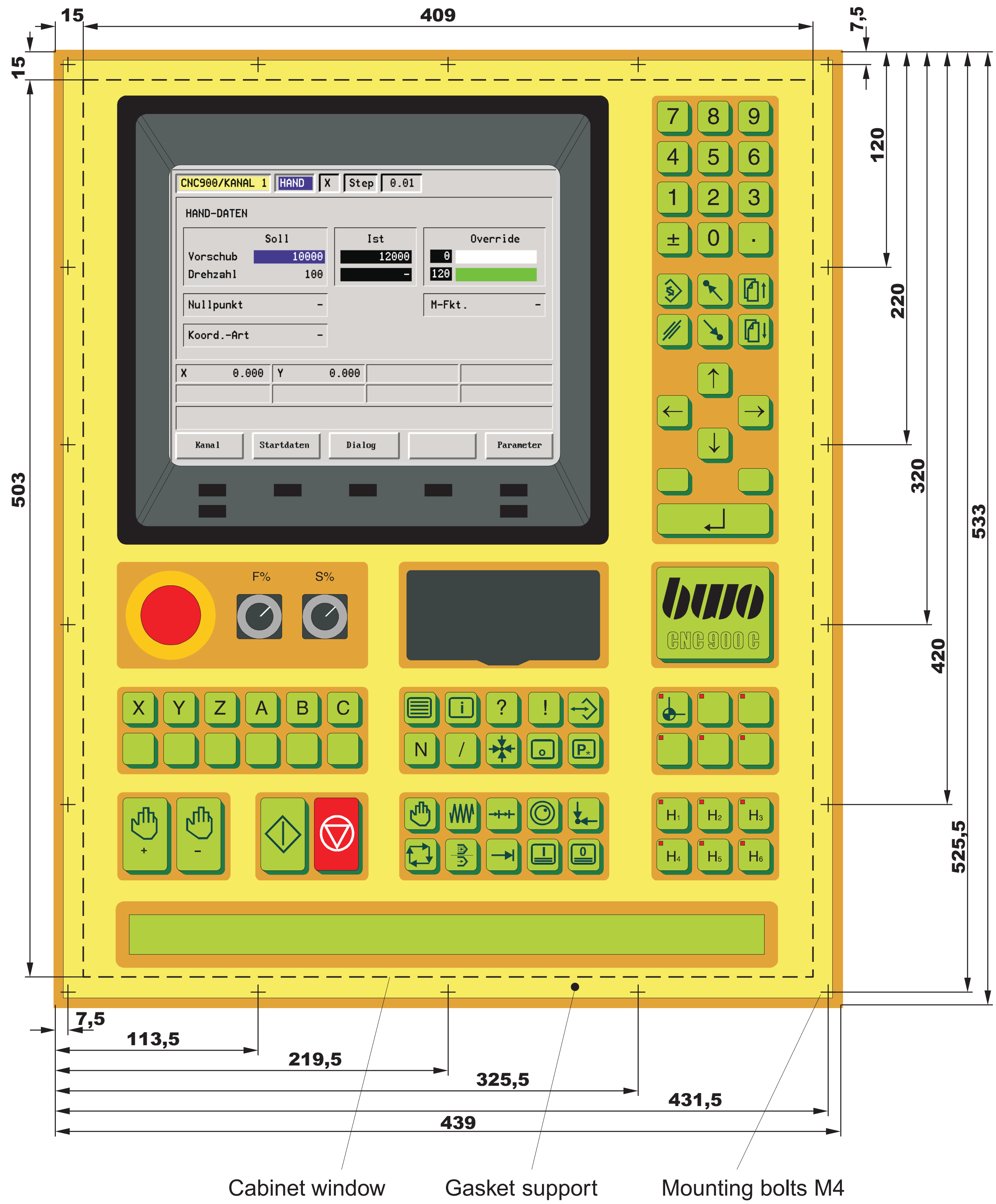
Transmitter active or passive-
receiver active or passive
ever for cable circuit

10.6 Operating panel CNC 900 (continued)

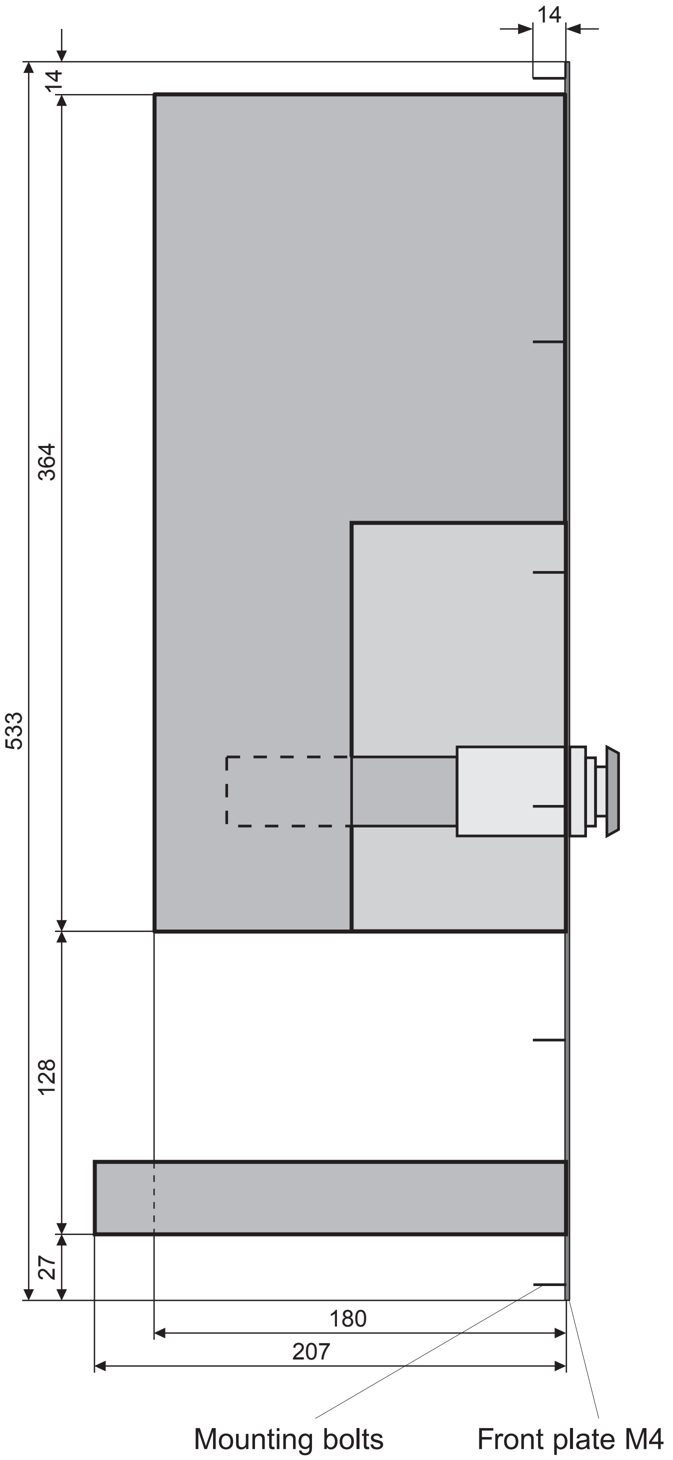
Layout of the CNC keyboard (key codes that are sent to PROMA)



10.7 Operating panel CNC 900 C



10.7 Operating panel CNC 900 C (continued)



10.7 Operating panel CNC 900 C (continued)

Technical data

Power unit	Operating voltage 24V DC or 22V AC permissible range DC 22V to 35V permissible range AC 20V to 24V current consumption typ. 1,5A, max. 5A, fuse 6,3AT, galvanic separated, no disconnecting transformer required
Work temperature	up to +40°
Front	in IP65 design

PC-compatible hardware

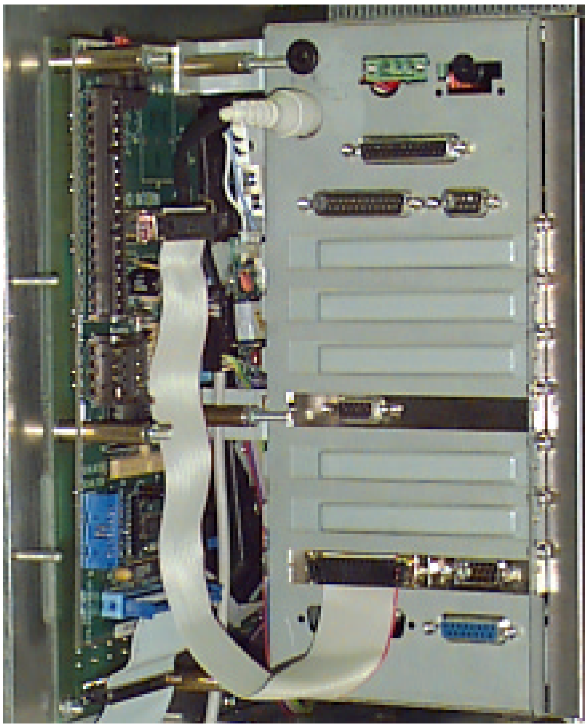
Processor module	CPU ETX ETE Module, 400MHz clock rate		
Color display	TFT, 640 x 480, Execution TTL and LVDS, integrated function keys		
RAM memory	256 MB gross; The restriction is under MS-DOS on 640K		
Hard disk	≥40 GByte, 2,50 Zoll		
Disk drive	1.44MB, 3,5"		
PC plastic-poil keyboard	MF2	5 pole circular connector	
Mouse	Option		
Interfaces	COM1	9 pole SUB-D plug	(V24)
	COM2	25 pole SUB-D plug	(V24)
	COM3	15 pole SUB-D socket	(V24 + 20mA)
	LPT1	25 pole SUB-D socket, Execution in PCI or ISA	
Free slots	0 - 1 x ISA 16Bit	dependent on LPT1	
	2 - 3 x PCI	dependent on LPT1	

BWO specific hardware

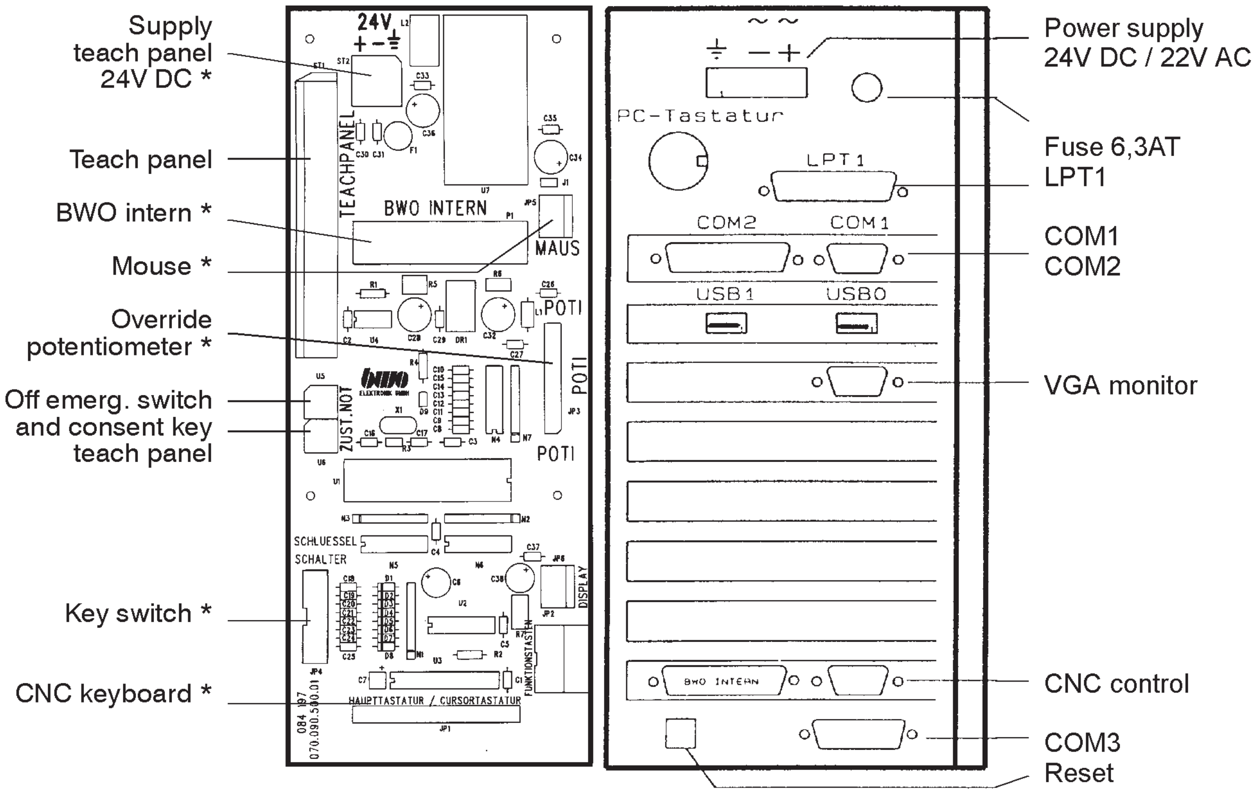
ISA 16Bit module with PIC keyboard control ic board	8 x A/D converter 8Bit for override potentiometer 8 x key switch	
Keyboard	Cursor keys, numerical key field	
Interfaces	CNC control	9 pole SUB-D plug (20mA / RS422)
	Teach panel	16 pole plug pin bar
	Off emergency switch and consent key	4 pole plug pin bar
Software	MS DOS 6.22, WIN 98	

10.7 Operating panel CNC 900 C (continued)

Position of the plugs and sockets

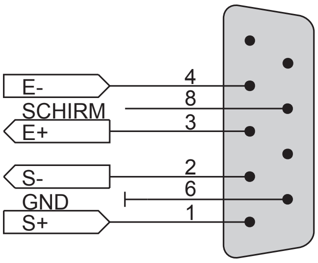


The marked components (with *) are already lay wires.



10.7 Operating panel CNC 900 C (continued)

Plug/socket document viewing from device internal side (pointer: direction of the signals)

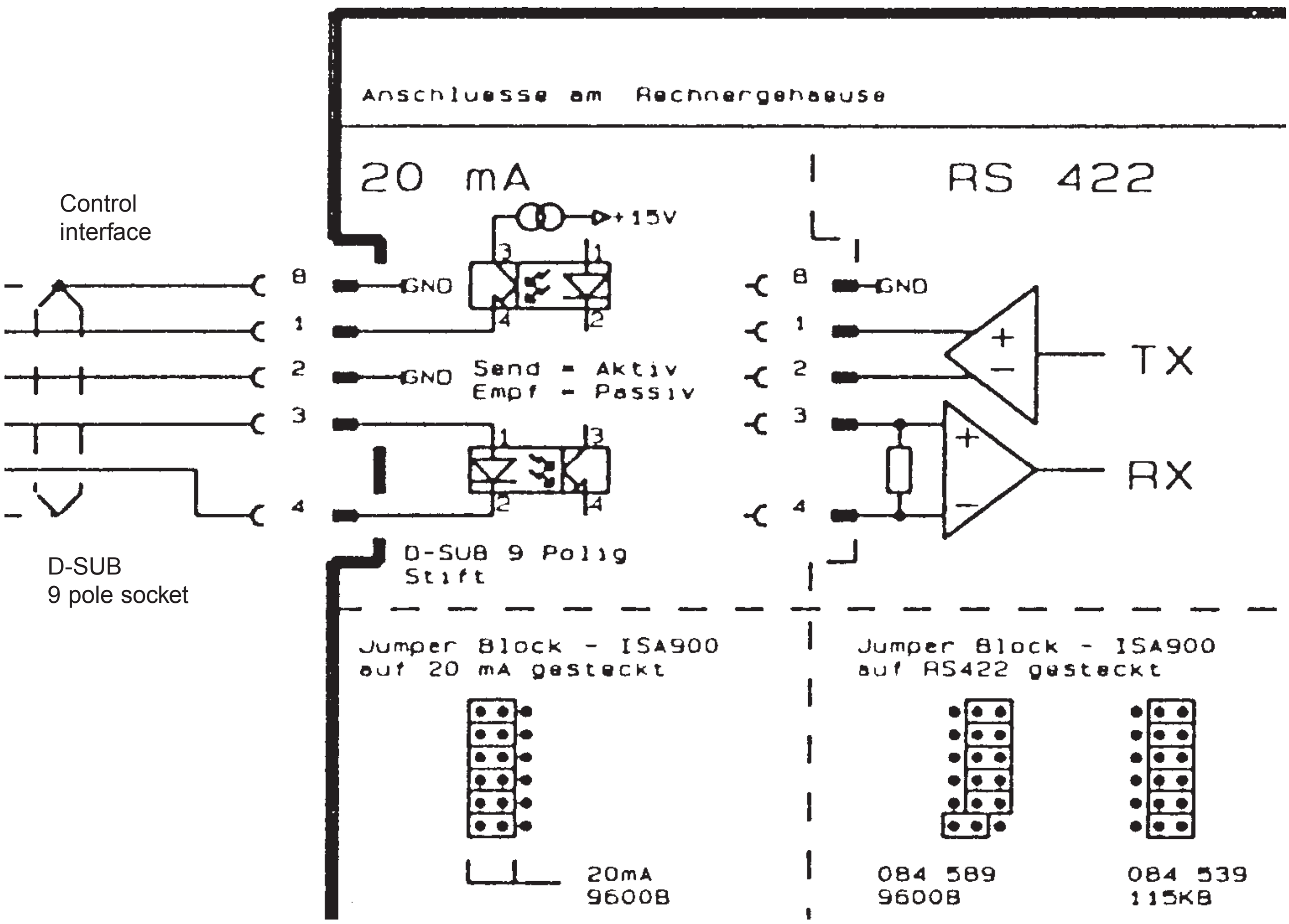


CNC control
9 pole SUB-D plug

20mA
Transmitter active -
receiver passive
fixed adjusted

or

RS422/485



10.7 Operating panel CNC 900 C (continued)

Interface of operating panel CNC 900C

The Interface of operating panel supports 3 different standards of interfaces (siehe auch 10-30):
- TTY (TTY active / passive fixed)
- RS422
- RS485

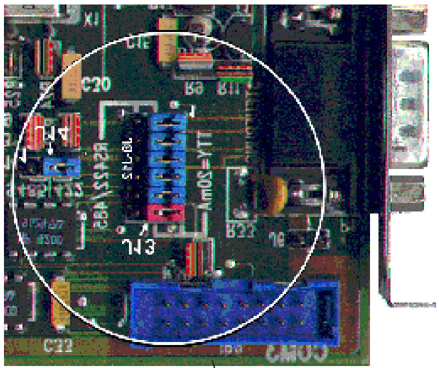
A Jumper block switch over between the interfaces TTY and RS422/485.
If block J[8..12] on Pin 1 <—> Pin 2 , than TTY interface.
If block J[8..12] on Pin 2 <—> Pin 3 , than RS422/485 inteerface.

If jumper J13on Pin 2 <—> Pin 3, than RS422 (084539) with perception.

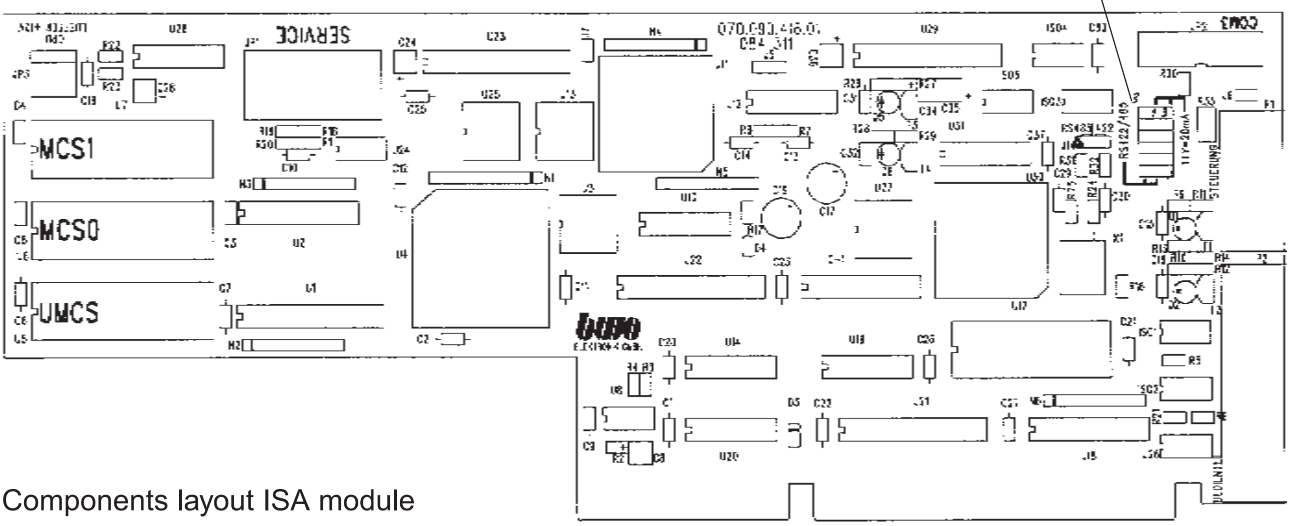
If J14 on Pin 1 <—> Pin 2 , than conclusion for RS485.
If J14 on Pin 2 <—> Pin 3 , than conclusion for RS422.

Jumper	TTY	RS422/485
J8	1-2	2-3
J9	1-2	2-3
J10	1-2	2-3
J11	1-2	2-3
J12	1-2	2-3
J13	1-2	2-3

	Abschluß	
Jumper	RS485	RS422
J14	1-2	2-3



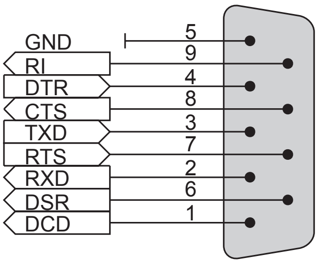
J13	DCD-Bit	Interface	Transfer	RS422
1<—>2	0	TTY/RS422	9600B	without perception
2<—>3	1	RS422/485	115KB	with perception



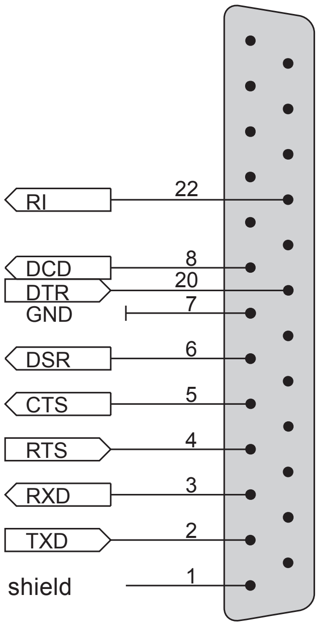
Components layout ISA module

10.7 Operating panel CNC 900 C (continued)

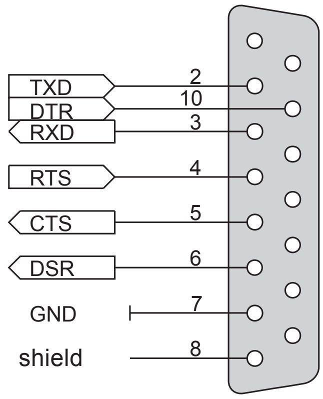
Plug/socket document viewing from device internal side (pointer: direction of the signals)



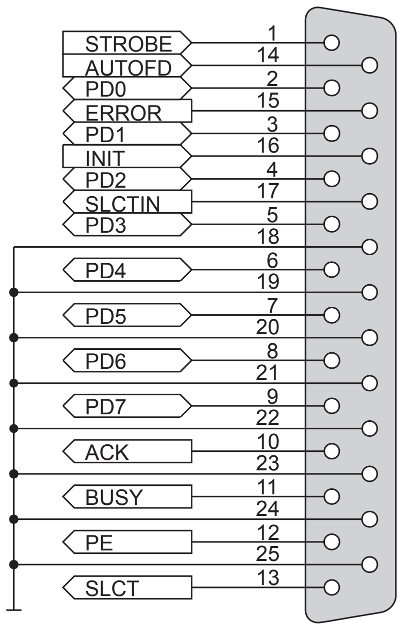
COM 1 (V24)
9 pole SUB-D plug



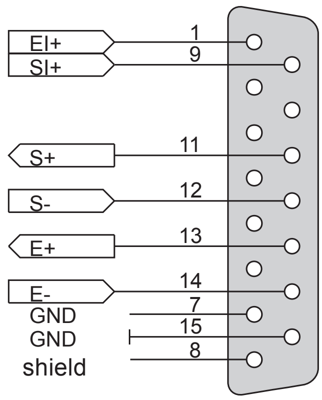
COM 2 (V24)
25 pole SUB-D plug



COM 3 (V24)
15 pole SUB-D socket



LPT 1
25 pole SUB-D socket



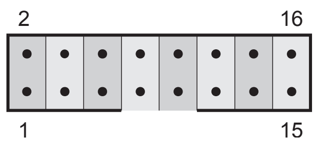
COM 3 (20mA)
15 pole SUB-D socket

Transmitter active or passive-
receiver active or passive
ever for cable circuit

10.7 Operating panel CNC 900 C (continued)

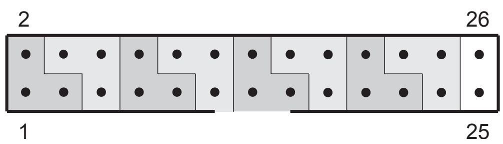
Plug/socket document viewing from device internal side (pointer: direction of the signals)

Schlüssel-schalter	1	2	3	4	5	6	7	8
Pin	1	3	5	7	9	11	13	15
Pin	2	4	6	8	10	12	14	16



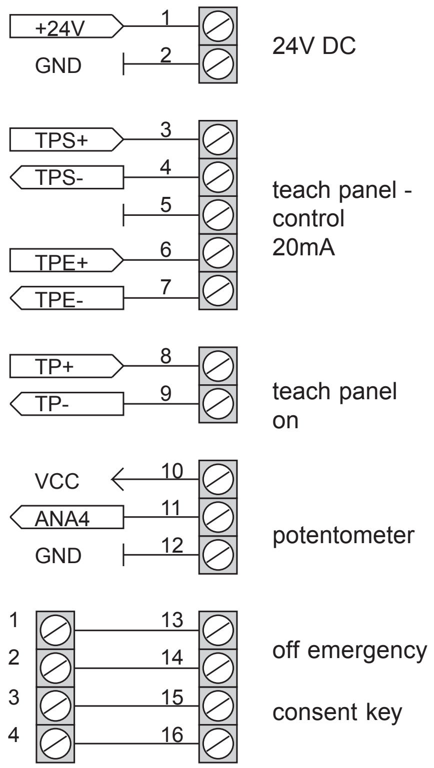
key switch connection
16 pole plug

Potentio-meter	1	2	3	4*	5	6	7	8
+5V	1	4	7	10	13	16	19	22
Analog	2	5	8	11	14	17	20	23
GND	3	6	9	12	15	18	21	24



Potentiometer connection
26 pole plug

* Attention:
When a teach panel is connected,
then it is internal on pin 4.

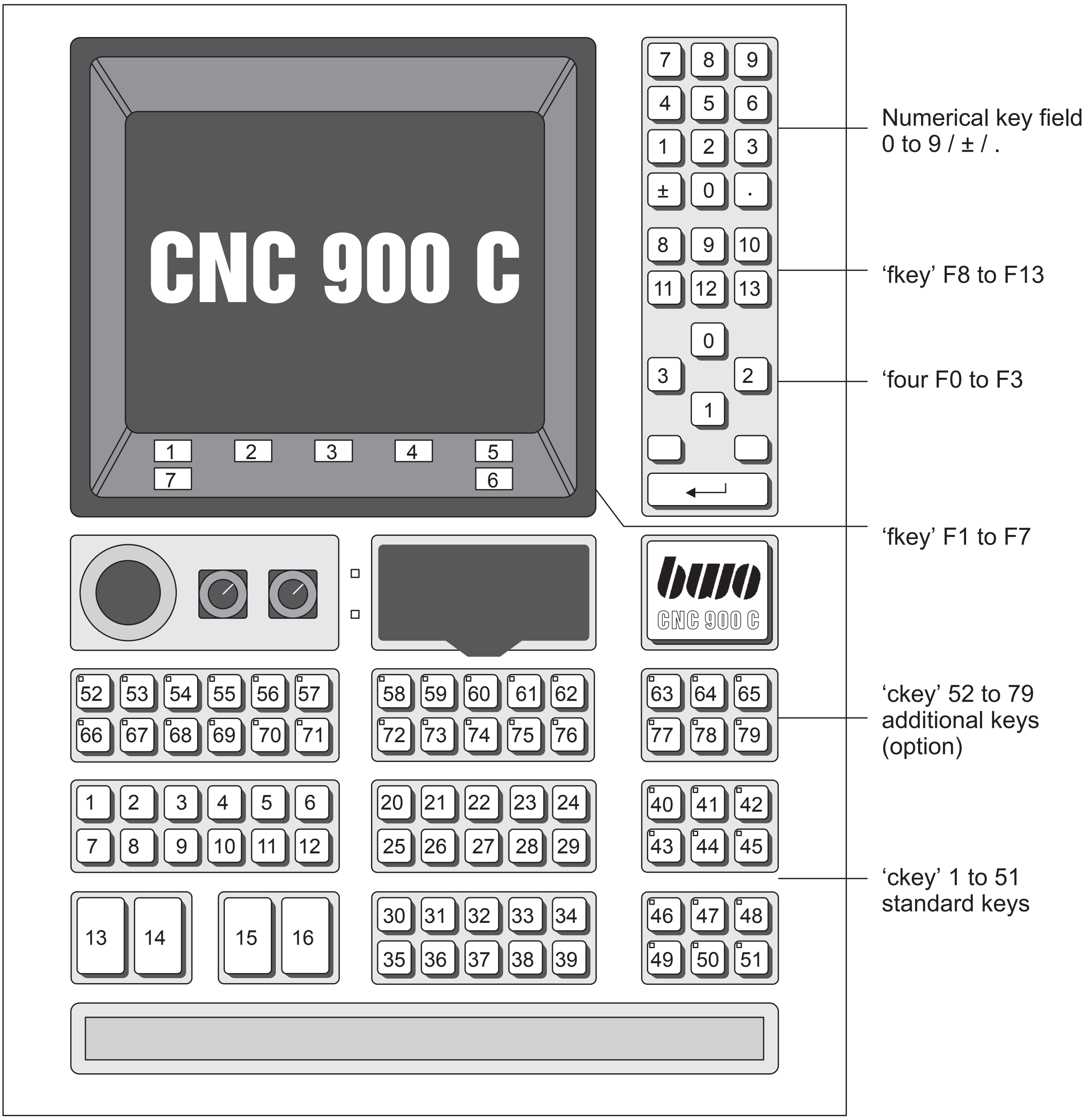


Teach panel
16 pole plug pin bar

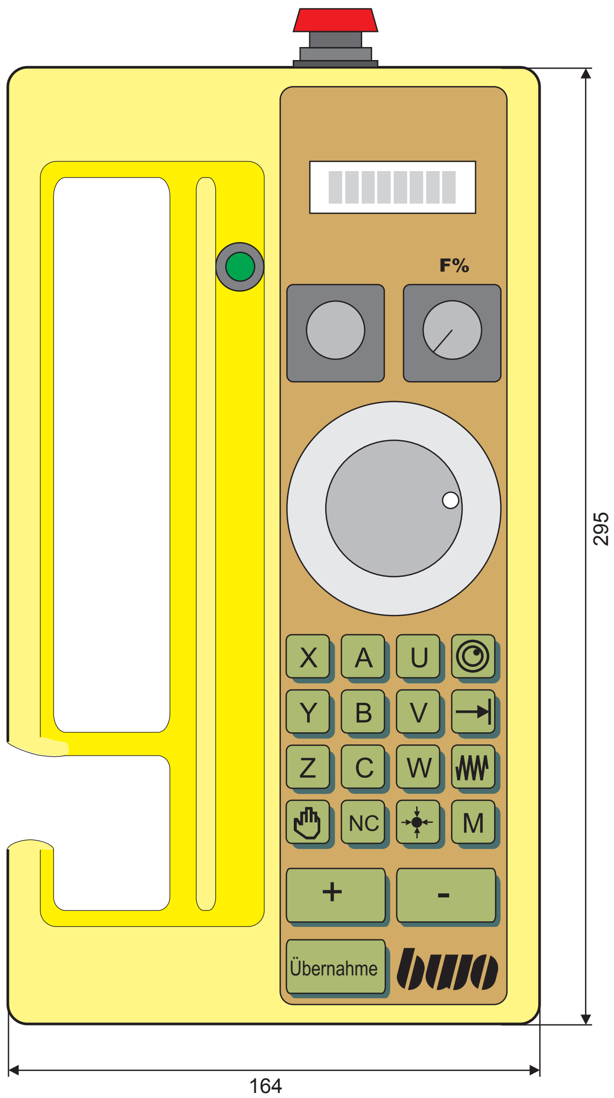
Off emergency switch
and consent key
4 pole plug pin bar

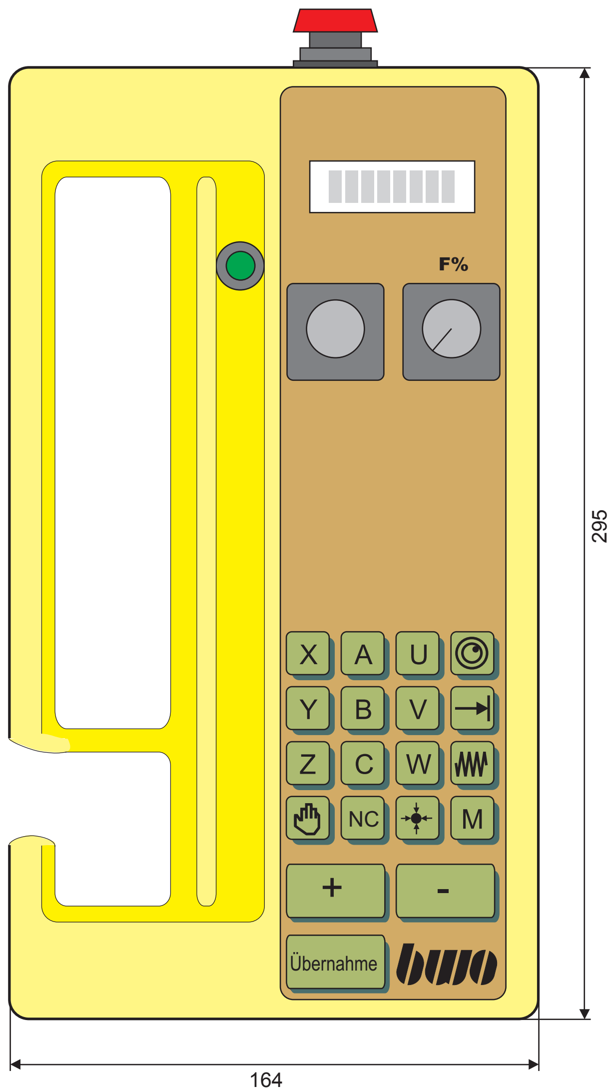
10.7 Operating panel CNC 900 C (continued)

Layout of the CNC keyboard (key codes that are sent to PROMA)



10.8 Teachpanel





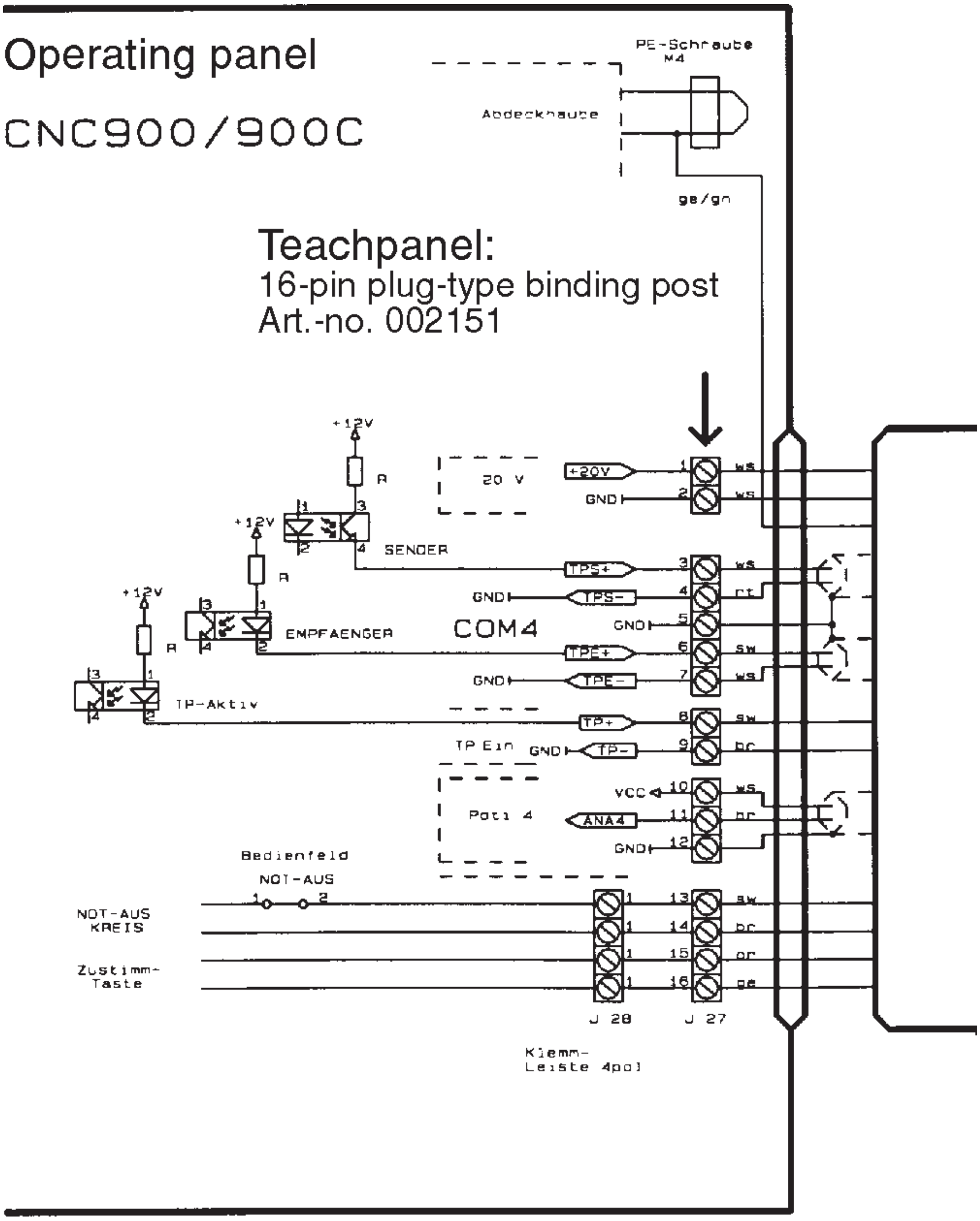
Depth 94

Teachpanel provided with handwheel

Teachpanel without handwheel

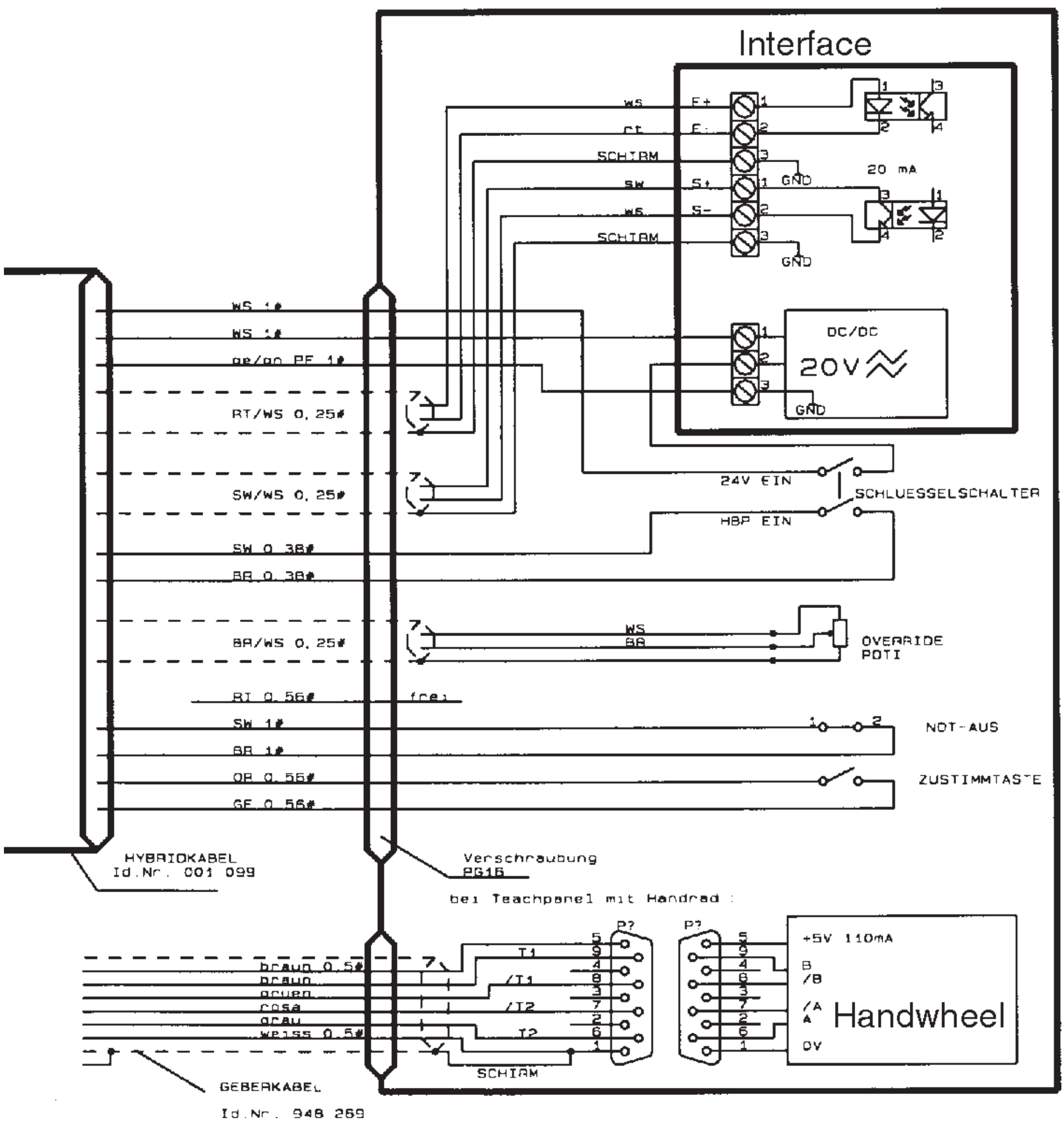
10.8 Teachpanel (continued)

Connection schedule for the teachpanel



10.8 Teachpanel (continued)

Teachpanel



10.8 Teachpanel (continued)

Technical data

LCD display	Alphanumeric display of 8 digits
Keyboard	Function keys, keys for the axes, operating mode keys
Design	Compact in a metal housing
Front	In IP65 design, okay key, emergency power-off switch, detachable-key switch and override potentiometer
Current supply	20V~ from Operating panels CNC 900 and CNC 900 C
Connections	Operating panels and current supply via hybrid cable at the Operating panels CNC 900 and CNC 900 C, handwheel via transmitting cable to the sensing element
Working temperature	up to + 40 °C

Note!

Off safety reasons may the manual operating console only with switched off machine to the main operating console to be connected or from it separated.

10.9 Power pack for no-break current supply USV for CNC 900C

The buffered power pack USV enables also with power failure a controlled termination of the programs, like it required for the operating systems Windows 95 / 98, Windows NT, Unix or similar networkable program products to actual.
All files can be closed and the initial position be started.
The operating voltage is only then switched off by the computer.

Function description

The power pack USV consists the off following organs:

- input 24V DC / 21V AC
- undervoltage monitor
- lead akku buffering
- charging circuit for akku
- switching logic with service section for akku charge / on supply
- serial communication interface to the computer

24V AC/DC input

The power supply unit is supplied with 24v DC or 21V AC.
DC/DC transducers provide for galvanic separation between primary - and secondarily circle.

Undervoltage monitor

Starting from DC voltage < 19V signals the monitoring circuit a mains failure.
The Akkus is switched into buffering.
If the load operation actively actual, these interrupted.

Lead akku

As Akku 2 lead akku blocks with 12V / 1,2Ah are used.
In the load operation they are situated parallel; in the buffering in series.

Charging circuit for akku

The load management is organized by a PIC processor in connection with a drawer IC. Further functions of the sequence control are integrated.

10.9 Power pack for no-break current supply USV (continuation)

Switching logic with service section for akku charge / on supply

For the circuit there are 4 different operating conditions:

- line operation
- line operation with supporting buffering
- test operation (pure buffering)
- load operation

The respective operating condition becomes in Abhaenigkeit of the input voltage in connection with monentan called program between the computer and the PIC processor coordinates.
The PIC controls over on in its program determined timing the suitable BUZ transistors and relay contacts of the power stage.

Serial communication interface to the computer

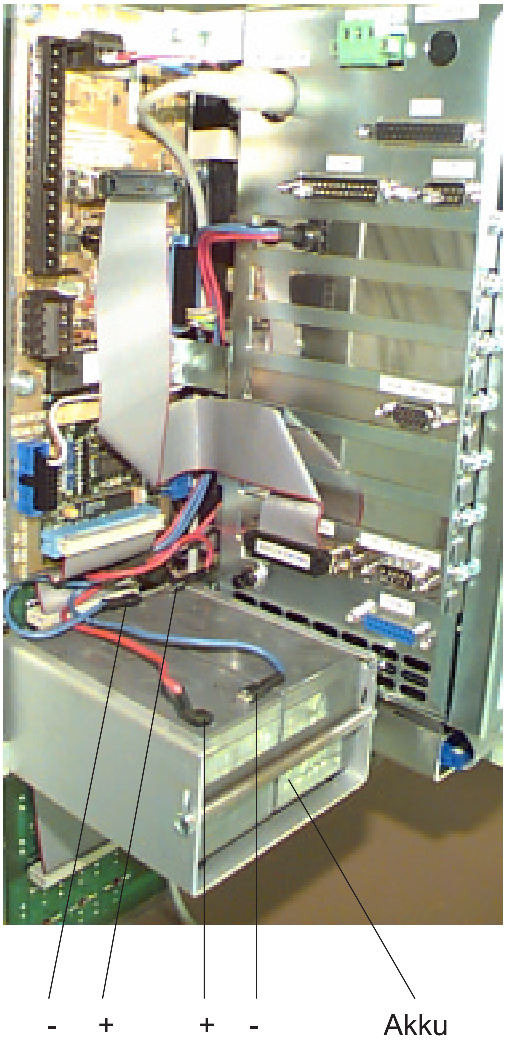
Data exchange between USV and computer is made by a serial interface on the USV and in the 1. Quilt over the COM 3 the BWO plugging in card. In 2. Quilt COM3 by on registers on this card one replaces, in order to be able to use these for other applications again. The signals are galvanically separately transferred. The following status information is processed:

- mains failure
- akku charges was entitled (fully loaded)
- akku test (capacity examination, inlet i.O.?)
- buffering actively
- buffering terminate (controlled or after fixed time of 2min)

10.9 Power pack for no-break current supply USV (continuation)

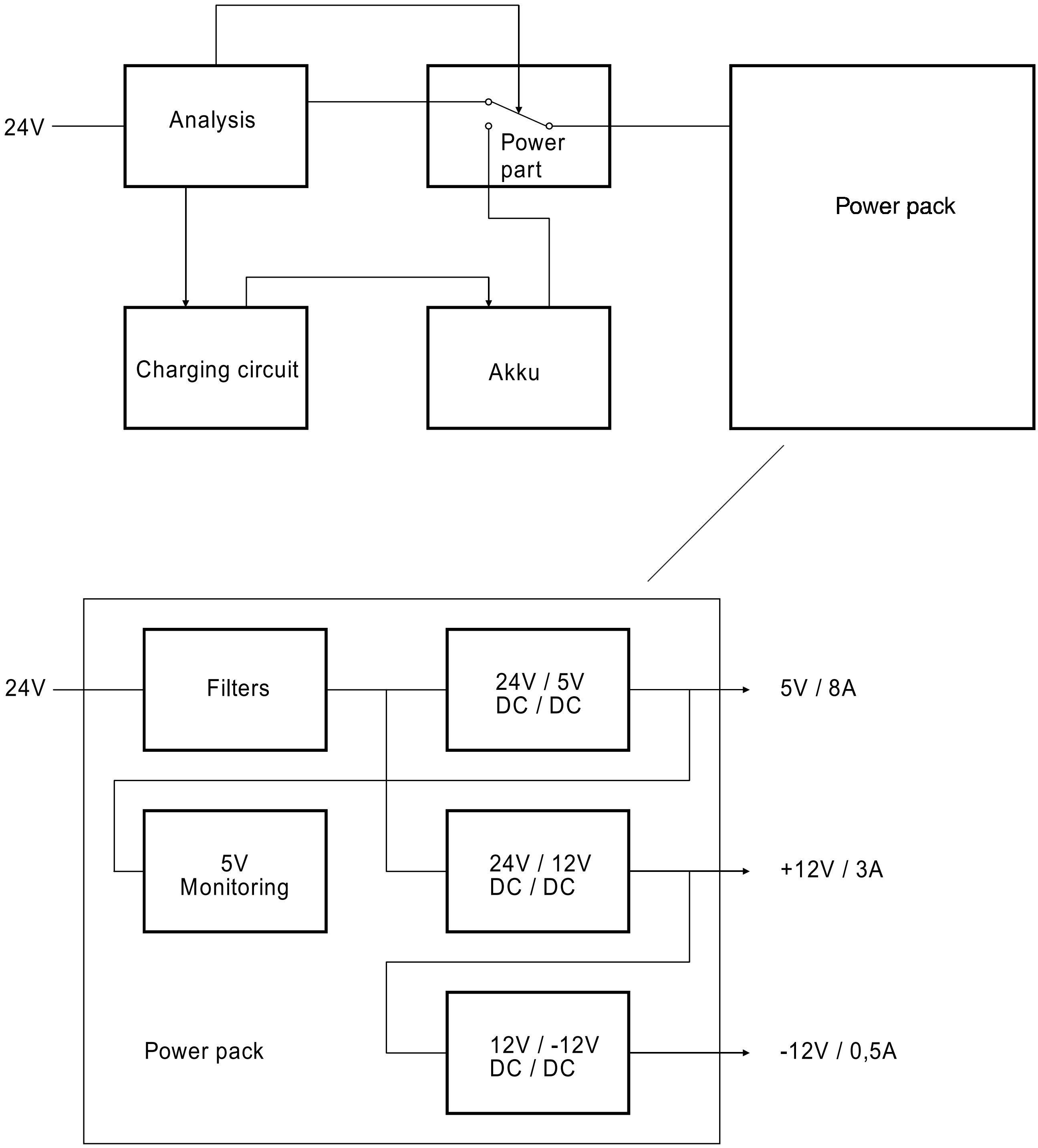
Technical data

Input	24V DC or 21V AC
Output	5V / 8A ±0,2% +12V / 3A -12V / 0,5A
Akku	Dryfit A 512
Nominal voltage	12V
Connections	plug
Float	max. 8min
Standard	2min with 4 repeating rates within 8min, then 6h loading time
Mains failures	max. 4 one on the other following



10.9 Power pack for no-break current supply USV (continuation)

Block diagram



11. Connection cables

11.1 Networking

The individual stations of the control system 900 can interconnected by means of the high-performance network BWO-NET. The data transmission rate at which the I/O states and the data of the individual stations are transmitted, is 1MBit /s. In one network segment there are allowed up to 128 logical participants. For the purpose of operating the network sockets of CEA / PLC and CNC, a network adapter board (with transformer and adaptation) has to be installed in the individual modules (art. no. 083796). The modules CEA , PLC and CNC are supplied without network adapter boards.

T-pieces

The network sockets of the individual stations (CEA / PLC / CNC) are parallelly interconnected by means of a cable. For plugging in two cable ends in one network socket, there are used special T-pieces having two sockets.

Bus terminal

The bus cable (twin core twisted, surge impedance = 78 Ω) is occluded at the first and at the last station by means of a terminal resistor. This terminal is realized by means of a bridge between pins 5 and 9 in the terminal plug of the first and the last station.

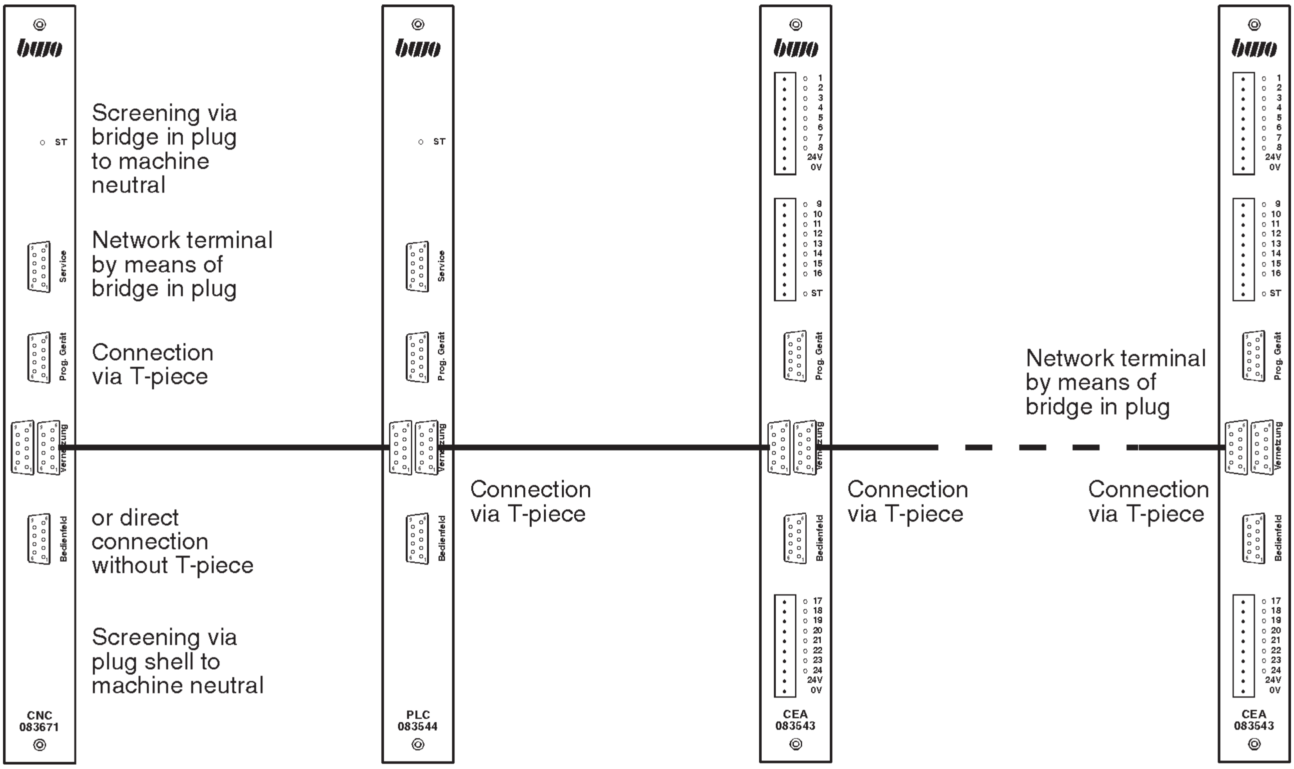
Cable screening

The cable screening is connected conductively to the housing potential at the first station by means of the bridge between pins 1 and 4 in the terminal plug. For doing so, the terminal plug has to plugged into the left socket of the T-piece (on the left side, pin 4 has the screening potential). In all other stations, the cable screening is connected through conductively in the T-piece and is only electrostatically coupled to the housing potential. Thus a potential transient current is prevented from flowing through the cable screening of the data cable. It has to be taken care that the cable screenings are not connected to the shells of the D-Sub plugs (do not use any conductive caps; connect the screening only to pin 1). The terminal plug has to be plugged into the right socket of the T-piece at the last station (on the right side, pin 4 is not assigned).

If there is soldered a bridge between pins 5 and 9 in the plug of the data cable at the first station, the cable can be plugged into the net socket directly. In this case, the T-piece and the terminal plug can be dispensed with at the first station.

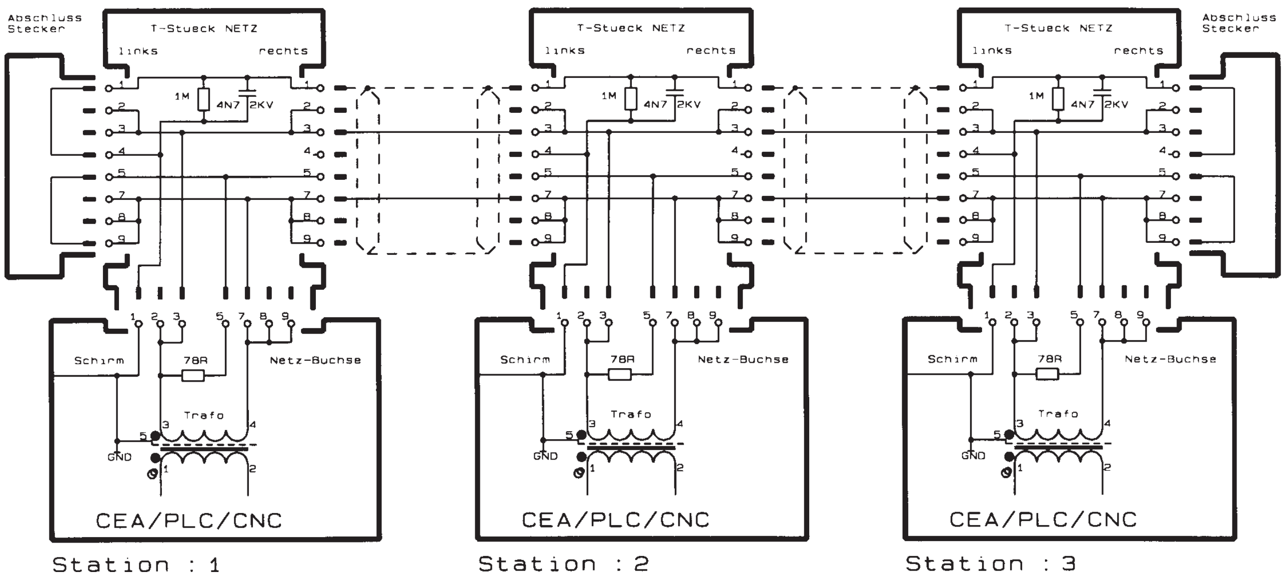
11.1 Networking (continued)

Example for interconnecting a network



11.1 Networking (continued)

BWO-NET connector cable and interfaces

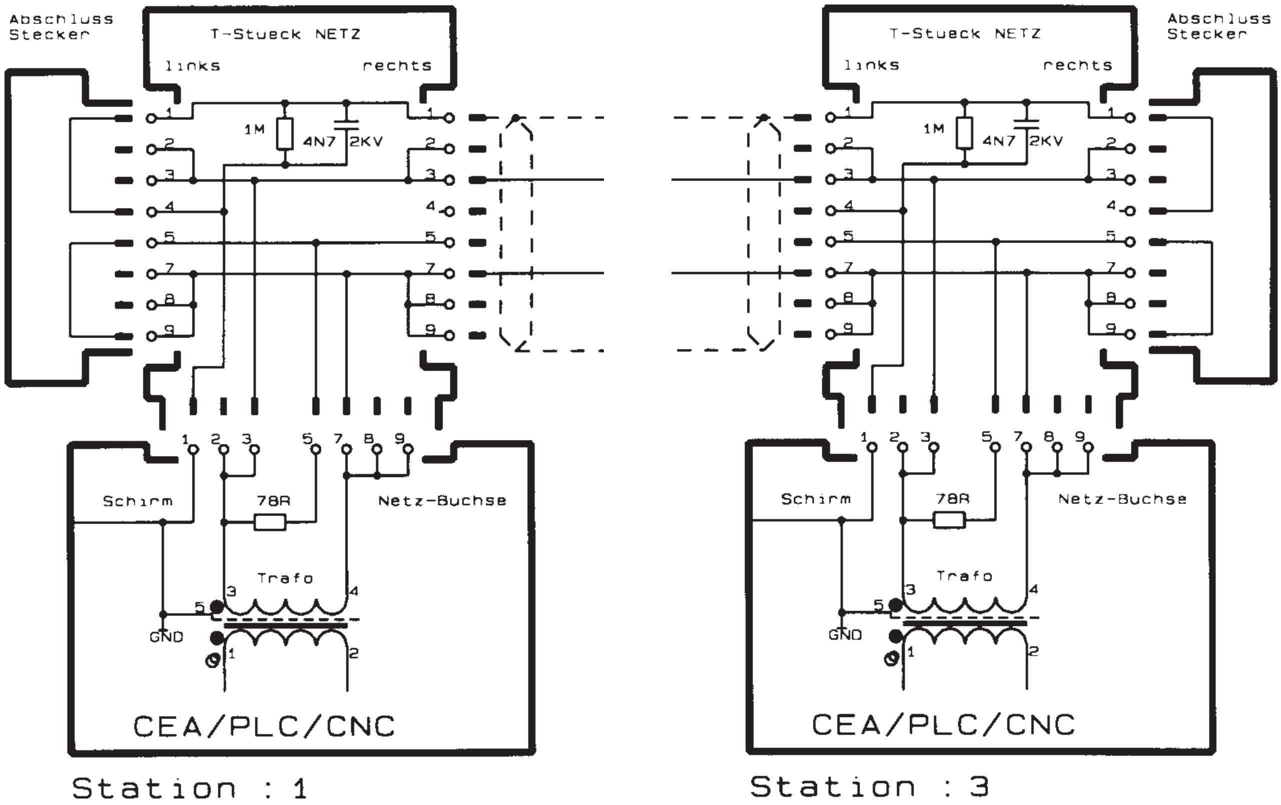


Composition of the connector cable

Article	Article number
Data cable twin-core twisted, surge impedance 78W, screened, yard ware	002670
T-piece for plugging in 2 data cables (2 sockets for data cable, 1 plug for socket networking) including 2 9-pin D-Sub-plugs and 2 caps	083878
9-pin S-SUB pin plug (single) Cap (single)	001305 001415

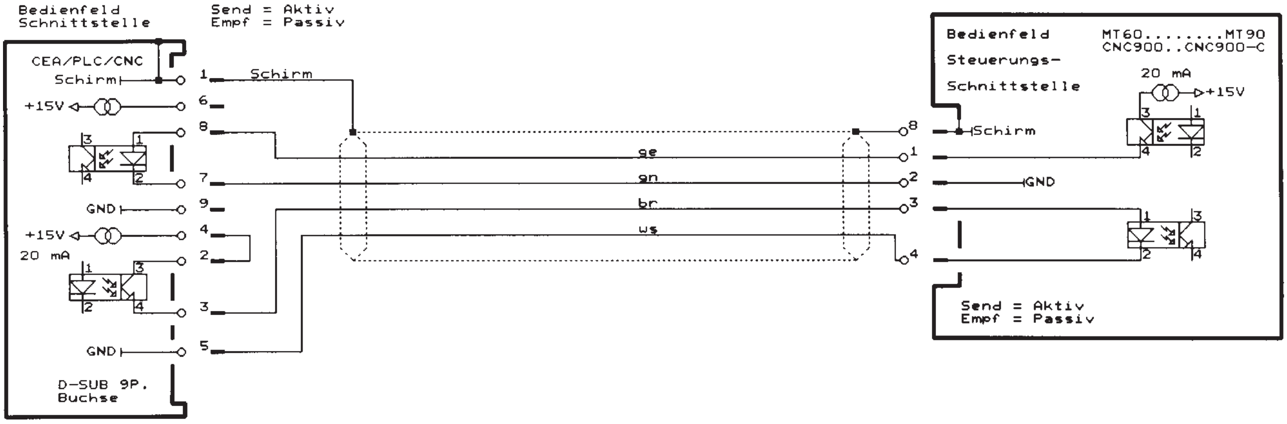
11.1 Networking (continued)

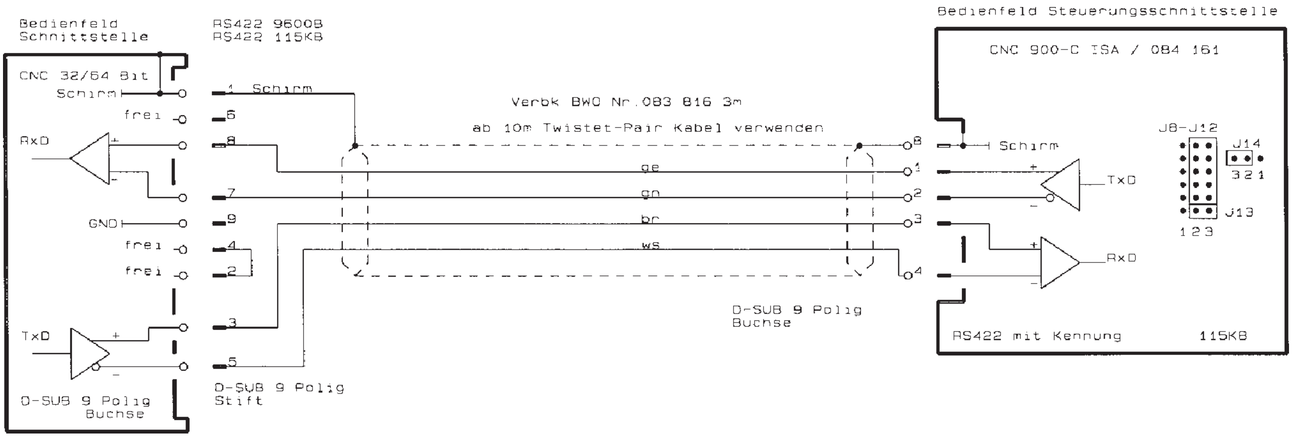
BWO-NET connector cable and interfaces (enlarged section)



11.2 Connector cables

11.2.1 Operating panel



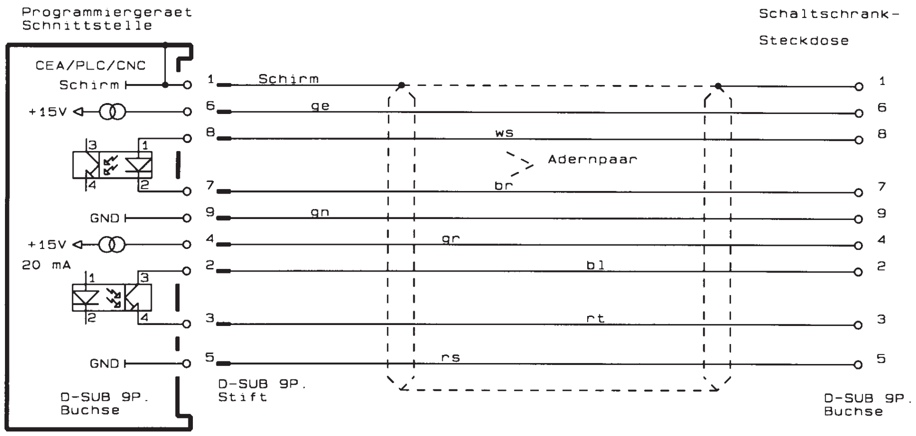


Connector cable

from module CNC / PLC / CEA socket ‘Operating panel’	9-pin D-SUB pin plug
to operating panel MT60 / MT90 / CNC900 / CNC 900C	9-pin D-SUB female plug

Article	Length of cable	Article number
Connector cable central unit - operating panel	1m	083864
	3m	083816
	10m	083887
	20m	083881

11.2.2 Extension cable for programming device



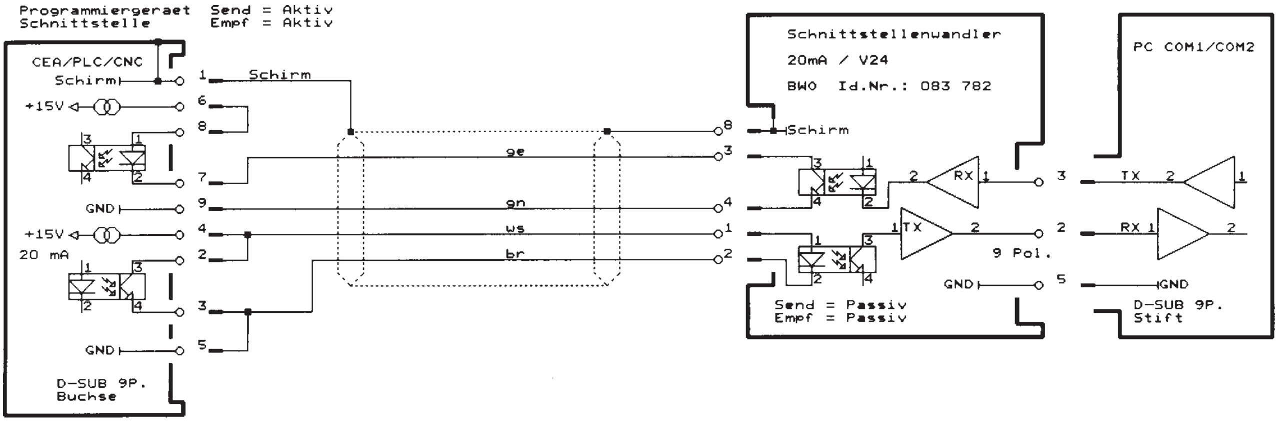
Extension cable

If there is a larger distance between the switch cupboard and the machine (operating panel), an extension cable may be used resp. embedded for connecting the programming device.

From module CNC / PLC / CEA socket ‘Programming device’	9-pin D-SUB pin plug
to the switch cupboard	9-pin D-SUB female plug

Article	Length of cable	Article number
Connector cable central unit - switch cupboard	10m 25m	083910 083911

11.2.3 Programming device (continued)



Converter set

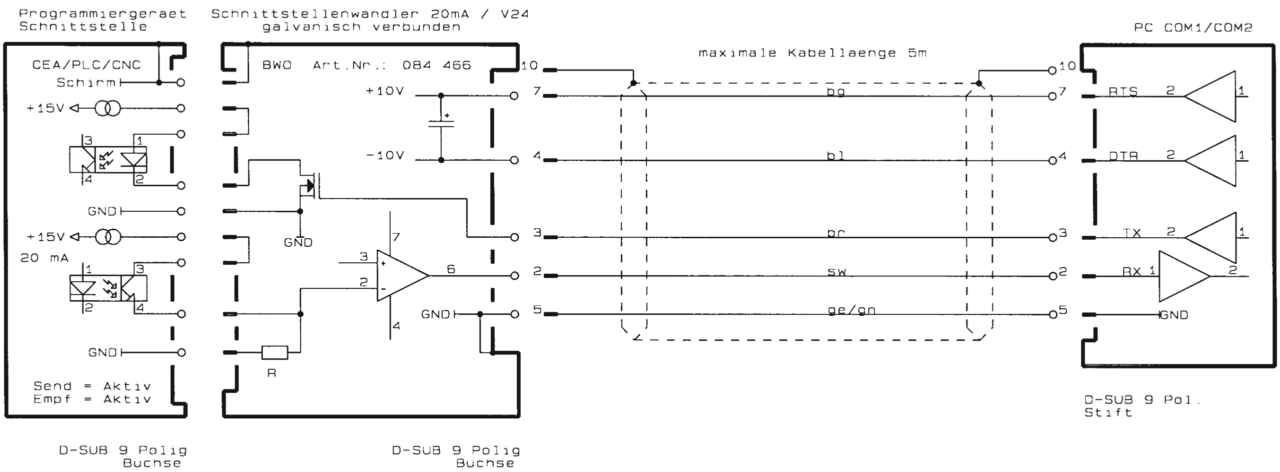
consisting of

Interface converter 20mA / V24 BWO

Connector cable
from module CNC / PLC / CEA socket ‘Programming device’ — 9-pin D-SUB pin plug
to the interface converter — 9-pinD-SUB female plug

Article	Length of cable	Article number
Converter set contains		083839
Interface converter 20mA / V24 BWO		(083782)
Connector cable central unit - converter	3m	(083818)

11.2.3 Programming device (continued)



Transducer set galvanically not separately

consisting off

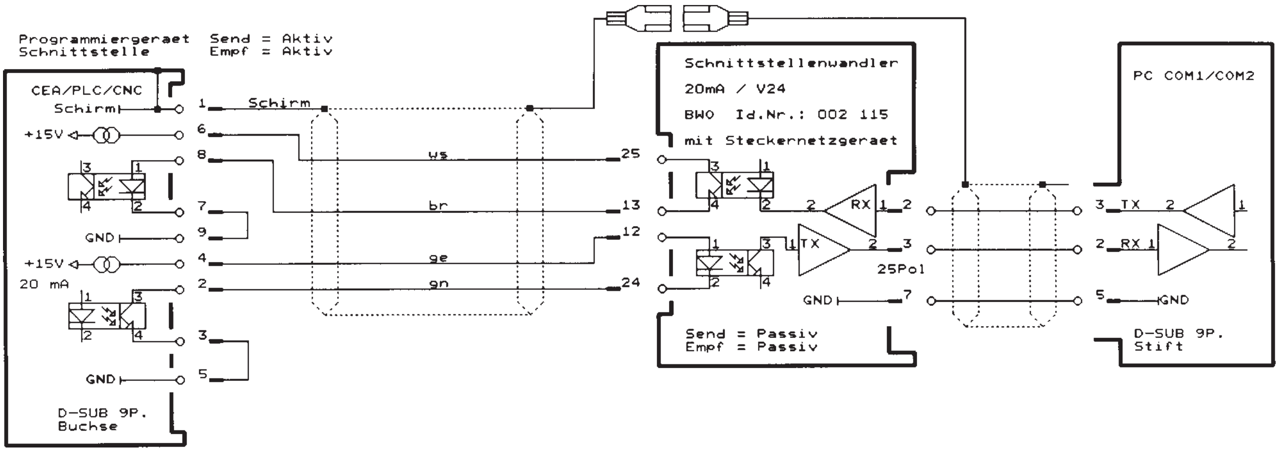
- Interface transducers 20mA / V24 BWO
  on the module CNC / PLC / CEA are plugged in

- Connection cable
  from interfaces the transducer to the ' programmer '

CD-SUB-pin-type plug 9pin
CD-SUB-bush-type plug 9pin

Item	Cable length	Article number
Transducer set contains		084469
- Interface transducers 20mA / V24 BWO		(084466)
- Connection cable central processing unit - transducers	3m	(084468)

11.2.3 Programming device (continued)



Converter set

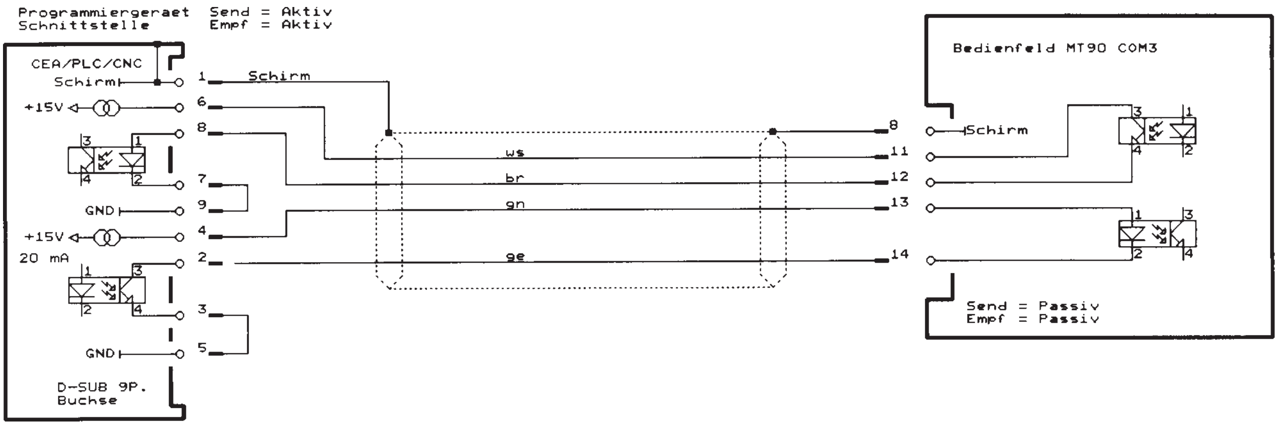
consisting of

Interface converter 20mA / V24 with plug-in power unit 220V

Connector cable	
from module CNC / PLC / CEA socket ‘Programming device’	9-pin D-SUB pin plug
to the interface converter	25-pinD-SUB pin plug
Connector cable	
from the interface converter	25-pin D-SUB female plug
to the programming device	9-pin D-SUB female plug

Article	Length of cable	Article number
Converter set contains		083840
Interface converter 20mA / V24 with plug-in power unit 220V		(002115)
Connector cable CPU - interface converter	3m	(083819)
Cable interface converter - programming device	0.4m	(082861)

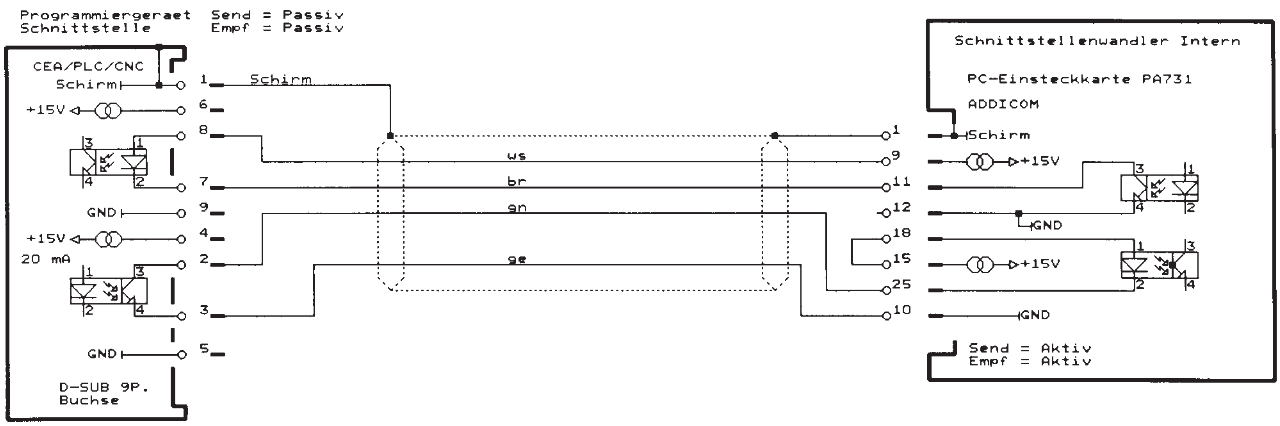
11.2.3 Programming device (continued)



Connector cable

from module CNC / PLC / CEA socket 'Programming device'		9-pin D-SUB pin plug
to the programming device		15-pin D-SUB pin plug
Article	Length of cable	Article number
Cable central unit - programming device	3m	083821
	5m	084120
	20m	083846

11.2.3 Programming device (continued)

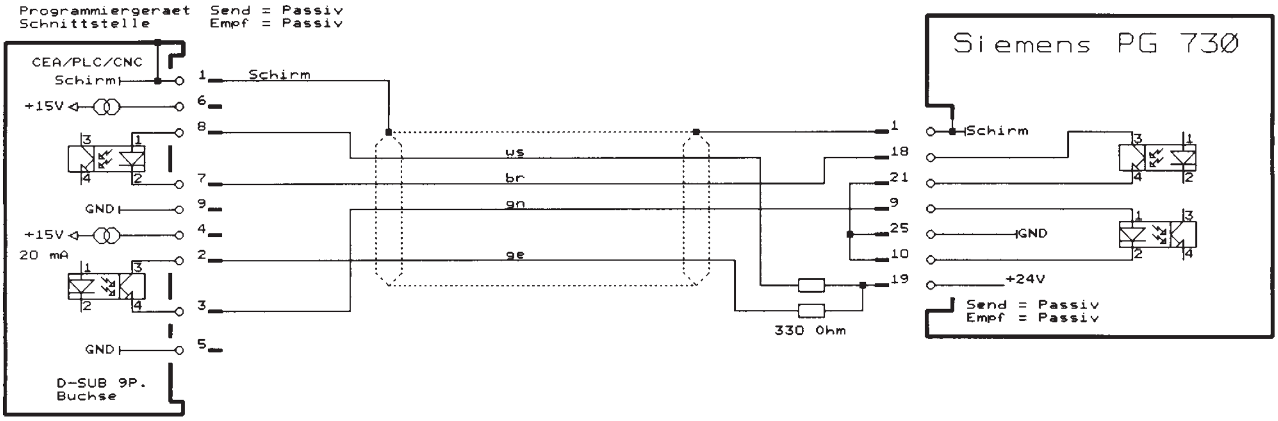


Connector cable

from module CNC / PLC / CEA socket ‘Programming device’		9-pin D-SUB pin plug
to the internal interface converter plug		25-pin D-SUB female

Article	Length of cable	Article number
Cable central unit - interface converter	3m	083820

11.2.3 Programming device (continued)

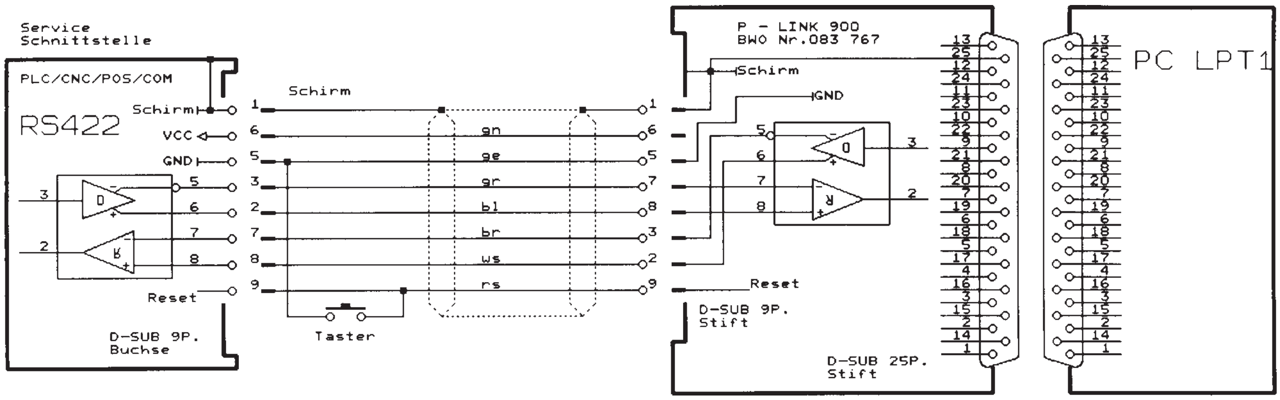


Connector cable

from module CNC / PLC / CEA socket 'Programming device'	9-pin D-SUB pin plug
to the Siemens PG 730	25-pin D-SUB pin plug

Article	Length of cable	Article number
Cable central unit - Siemens PG 730	3m	083822

11.2.4 Service



Converter set

consisting of

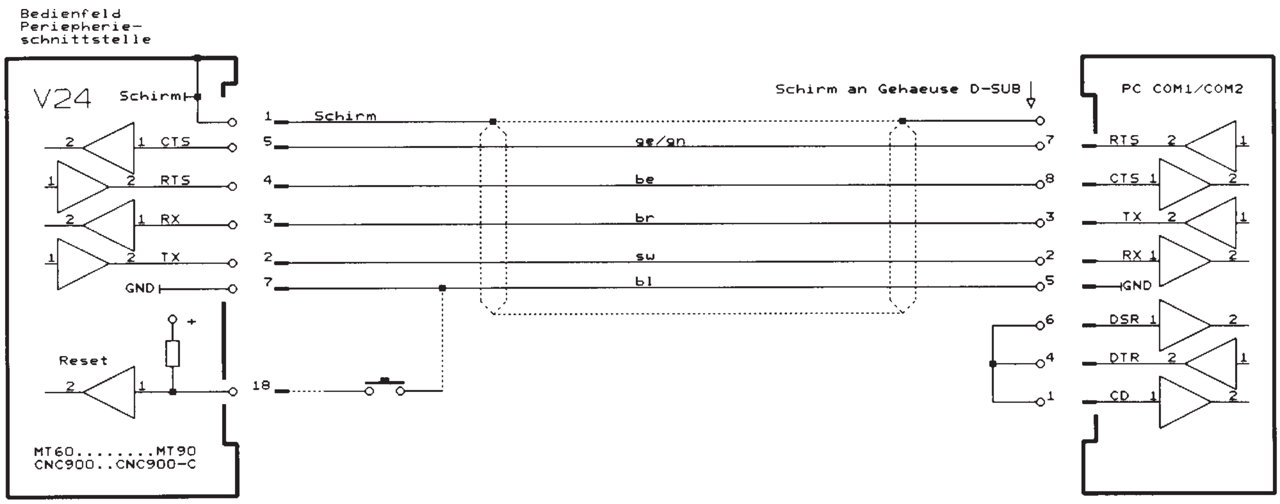
P - LINK 900

Connector cable

from module CNC / PLC / CEA socket ‘Service’	9-pin D-SUB pin plug
to the P - LINK 900	9-pinD-SUB female plug

Article	Length of cable	Article number
Converter set contains		083841
P - LINK 900		(083767)
Connector cable MODULE - P - LINK 900	1.8m	(083823)

11.2.5 Peripheral devices



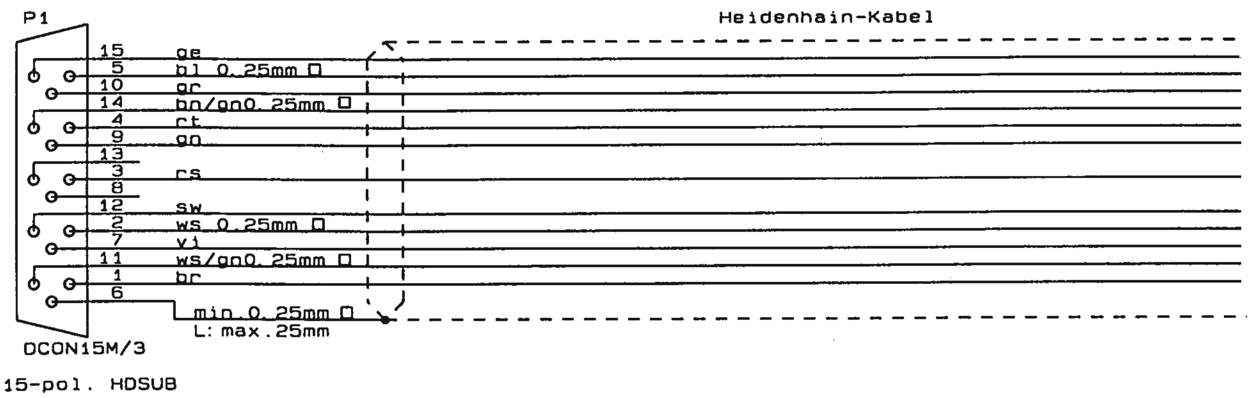
Connector cable V24

from operating panel MT60 / MT70/80 / MT90 / CNC900 / CNC 900C	25-pin D-SUB pin plug
to peripheral device - data input / output	9-pin D-SUB female plug

Article	Length of cable	Article number
Cable operating panel - peripheral device	3m 5m	083817 083861

11.2.6 Measuring system

Incremental measuring system



Connection cable

of axis modules AAZ, POS	CD-Sub-pin-type plug 15pin
to the incrementalen measuring system	open end

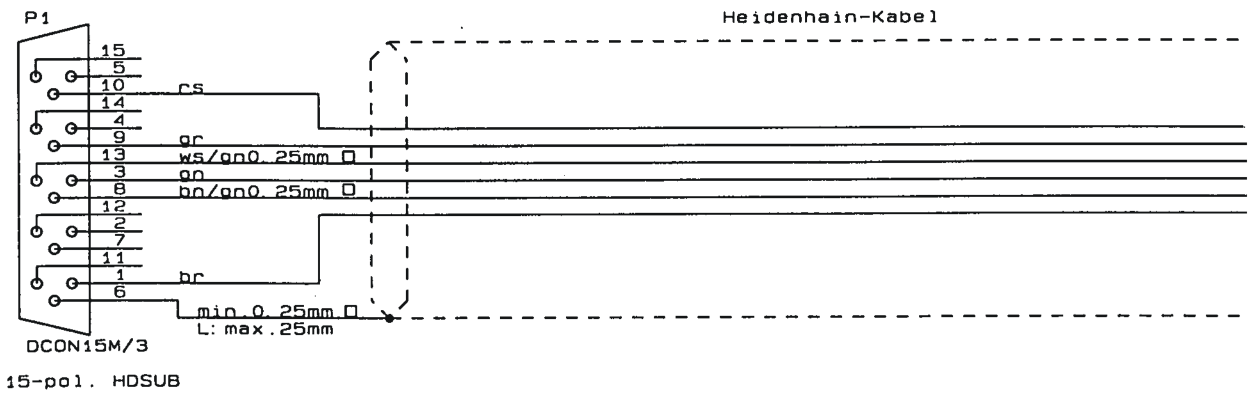
Item	Cable length	Article number
Cable axis module - measuring system	5m	083921

Allocation of the 15pin sockets on AAZ and POS

Pin1 T1
Pin2 Sensor line 0V
Pin3 /T2
Pin4 T0
Pin5 Sensor line 5V
Pin6 Screen
Pin7 Uas (error signal)
Pin8 -
Pin9 /T1
Pin10T2
Pin110V
Pin12/T0
Pin13-
Pin14+5V
Pin15/Uas (error signal)

11.2.6 Measuring system (continuation)

Absolute measuring system



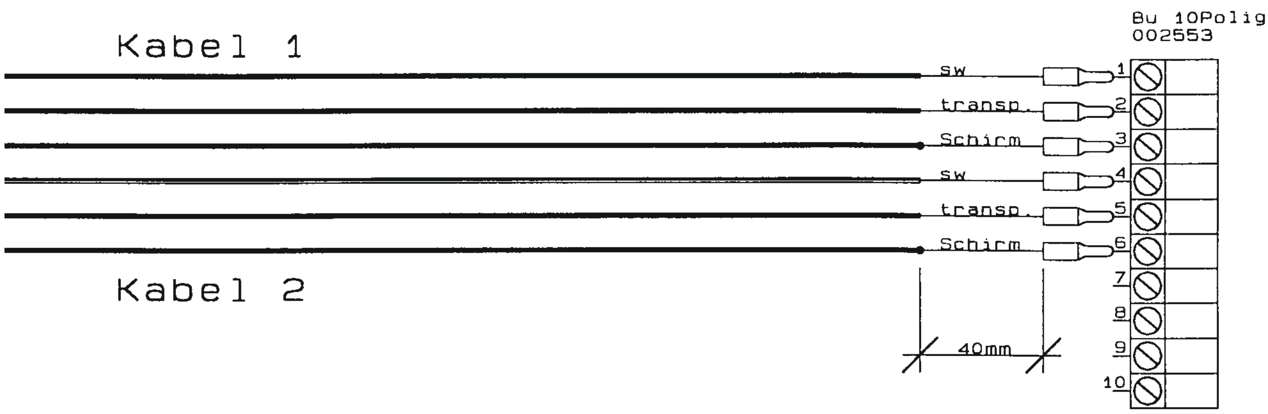
Cable connection

of axis modules AZA, POA		CD-Sub-pin-type plug 15pin
to the absolute measuring system		open end
Item	cable length	article number
Cable axis module - measuring system	5m	084327

Allocation of the 15pol. Sockets on AZA and POA

Pin1	Takt+
Pin2	0V
Pin3	Takt-
Pin4	-
Pin5	+5V
Pin6	Screen
Pin7	-
Pin8	24V (encoder)
Pin9	Data+
Pin10	Data-
Pin11	0V
Pin12	-
Pin13	0V (encoder)
Pin14	+5V
Pin15	-

11.2.7 ADW / DAW

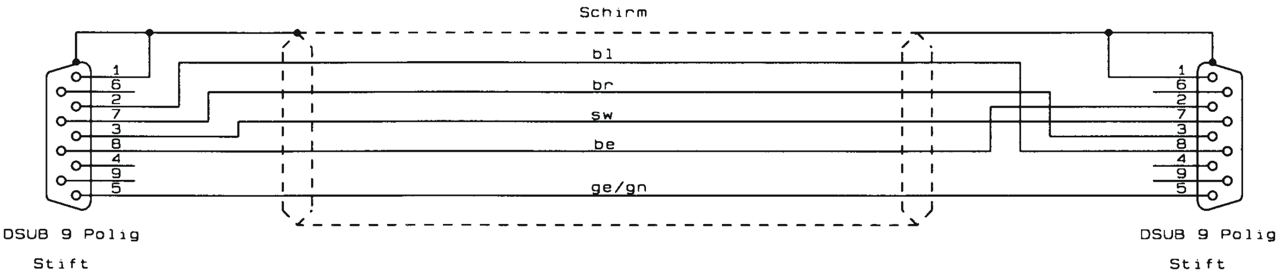


Cable connection

of axis modules ADW / DAW	plug 10polig
to the machine	open end

Item	cable length	article number
Cables ADW / DAW - machine	3m 5m	083888 083898

11.2.8 Coupling of groups of chassis



Cable connection

of module CNC / PLC socket ' service '	CD-SUB-pin-type plug 9pin
to the couple module KOP socket ' input '	CD-SUB-pin-type plug 9pin
or.	
of the couple module KOP socket ' output '	CD-SUB-pin-type plug 9pin
to the next couple module KOP socket ' input '	CD-SUB-pin-type plug 9pin

Item	Cable length	Article number
Cable connection central processing unit - couple module or couple module - couple module	0,7m	084077