Operating Instructions

PA-CONTROL

Single/Compact/Steuergerät

from version 5.24 upwards

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Modification History

Document code	Date	Modification
MAN_EN_1006925_PAC_CPU4_R1a.doc	March 2011	Release of this English document.
MAN_EN_1006925_PAC_CPU4_R1b.doc	October 2011	Formal modifications in regard to the page breaks.
MAN_EN_1006925_PAC_CPU4_R1c.doc	April 2014	Formal updating in regard of this document
MAN_EN_1006925_PAC_CPU4_R1d.doc	March 2015	- add LE3-80, LE8-80 and LC5100 *(see chapter 6.3.3, page 171)* - add PNOZmulti 2 *(see chapter 6.3.4, page 172)* - Add M550.4 5 phase stepping motor *(see chapter 7.7.6.1, page 283)*
MAN_EN_1006925_PAC_CPU4_R1e.doc	May 2015	Changing information of WINPAC in creating a projekt folder (*see chapter 4.6.2.1, page 112*)

We are always grateful for suggestions for improvements and notices of errors.

Contents

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1 Technical Information in brief

This operating instruction contains the necessary information for the intended use of the described product.

It should be used by technically qualified personnel who is specially trained or who possesses appropriate knowledge of measuring and control technology.

WARNING

These operating instructions should be read carefully before installing and starting-up the control system!

1.1 Design of the Device

1.1.1 Design of the Device PA-CONTROL Single

The PA-CONTROL Single is a one-axis stepping motor control system. Depending on the device type, the 19/2" module can be assembled with either 2, 3 or 5 phase stepping motor output stages with motor voltages of either 35V, 60V, 90V or 140V.

Performance Features:

- Comprehensive, high-performance command set
- Combines the advantages of NC-controls with those of an SPC
- Processing of I/O is possible during positioning
- 31 parallel programs with subroutine technology
- 800 kByte battery-buffered program storage
- 1 serial diagnosis port RS232
- 1 serial port RS232 (optionally up to 4)
- 1 CAN bus interface
- 24VDC/2A for external elements, brake and limit switch
- 16 inputs and outputs each, opto-decoupled (can be extended → see section *Inputs and Outputs of PA-CONTROL, page 24*)
- Output frequency up to 50kHz
- 1 built-in stepping motor output stage, optional:
  - 2 phases max. 12A phase current
  - 3 phases max. 5.5A phase current
  - 5 phases max. 2.8A phase current
- Multiple options such as AS-i, Profibus, etc.

The devices can be equipped with either a complete alphanumeric keyboard and a 2-line, illuminated LC display (2*40 characters) or a blind plate.

Devices with a complete alphanumeric keyboard contain a key-operated switch to protect the control console against unauthorized access.

All devices can be programmed using the WINPAC package on a PC under Windows NT/2000/XP. Devices without a keyboard are always programmed and installed with WINPAC.

The WINPAC package enables comfortable offline programming, diagnosis efficiency of the running programs and manual setting of the axes.

The descriptions of the individual menu levels, commands and system messages refer to a device with front plate including a keyboard and LC display.

1.1.2 Design of the Device PA-CONTROL Compact

The PA-CONTROL Compact is a two-axis stepping motor control system. Depending on the device type, the 19" module can be assembled with either 2, 3 or 5 phase stepping motor output stages with motor voltages of either 35V, 60V, 90V or 140V.

Performance Features:

- Comprehensive, high-performance set of commands
- Combines the advantages of NC-controls with those of an SPC
- Processing of I/O is possible during positioning
- 31 parallel programs with subroutine technology
- 800 kByte battery-buffered program storage
- 1 serial diagnosis port RS232
- 1 serial port RS232 (optionally up to 4)
- 1 CAN bus interface
- 24VDC/4A for external elements, brake and limit switch
- 16 inputs and outputs each, opto-decoupled (can be extended → see section *Inputs and Outputs of PA-CONTROL, page 24*)
- Output frequency up to 50kHz
- 2 built-in stepping motor output stages, optional
  - 2 phases max. 12A phase current
  - 3 phases max. 5.5A phase current
  - 5 phases max. 2.8A phase current
- Multiple options such as AS-i, Profibus, etc.

The devices can be equipped with either a complete alphanumeric keyboard and a 2-line, illuminated LC display (2*40 characters) or a blind plate.

Devices with a complete alphanumeric keyboard contain a key-operated switch to protect the control console against unauthorized access.

All devices can be programmed using the WINPAC package on a PC under Windows NT/2000/XP. Devices without a keyboard are always programmed and installed with WINPAC.

The WINPAC package enables comfortable offline programming, diagnosis efficiency of the running programs and manual setting of the axes.

The descriptions of the individual menu levels, commands and system messages refer to a device with front plate including a keyboard and LC display.

1.1.3 Design of the Device PA-CONTROL Steuer

The PA-CONTROL Steuer is a positioning and execution control system. This control system can be adjusted to different demands as regards the number of axes, the number of inputs and outputs as well as the installation surroundings. A maximum of 16 axes is possible.

NOTE The most varied axis configurations are possible with the PA-CONTROL. Stepping motors, servomotors and mixed axis configurations are all practicable. In this connection, axis 1 could be a stepping motor axis but also a servo-axis. Since 4 successive axes can be selected by means of a PLS7 or PLS9 card, the start addresses are always fixed (1, 5, 9 or 13), refer to section *PLS7/9 Card, page 202*).

The power output stages for the stepping motors are accommodated in an external device.

Performance Features:

- Comprehensive, high-performance set of commands
- Combines the advantages of NC-controls with those of an SPC
- Processing of I/O is possible during positioning
- 31 parallel programs with subroutine technology
- 800 kByte battery-buffered program storage
- 1 serial diagnosis port RS232
- 1 serial port RS232 (optionally up to 4)
- 1 CAN bus interface
- 16 inputs and outputs each, opto-decoupled (can be extended → see section *Inputs and Outputs of PA-CONTROL, page 24*)
- Positioning module for 4 axes for generation of the control signals for external stepping motor output stages (pulse and direction, F_{max}= 50 kHz, opto-decoupled). Up to 4 positioning modules, i.e. a maximum of 16 axes, can be used.
- Multiple options such as AS-i, Profibus, etc.

Devices for this type are available in a width of 19" or 19"/2.

The devices can be equipped with either a complete alphanumeric keyboard and a 2-line, illuminated LC display (2*40 characters) or a blind plate. Devices with a complete alpha-numeric keyboard contain a key-operated switch to protect the control console against unauthorized access.

All devices can be programmed using the WINPAC package on a PC under Windows NT/2000/XP. Devices without a keyboard are always programmed and installed with WINPAC.

The WINPAC package enables comfortable offline programming, diagnosis efficiency of the running programs and manual setting of the axes.

The descriptions of the individual menu levels, commands and system messages refer to a device with front plate including a keyboard and LC display.

1.2 Declaration of Conformity

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We hereby declare that the products referred to in the following

Designation of the products	Product no.
PA-CONTROL Single	1000244
PA-CONTROL Compact	1000245
PA-CONTROL Steuergerät	1000243
PA-CONTROL MP	1000759
PA-CONTROL servoTEC	1000598
PA-CONTROL Smart	1000927

are intended for installation in a machine. The initial plant start-up is prohibited until it has been ascertained that the machine in which these products are to be installed complies with the provisions of EC Directive 91/368/EEC

The following standards were applied:

No.	Designation
89/336/EEC	Electromagnetic Compatibility
EN 50081-1; EN 50082-2	Generic Emission Standard
pr EN 50082-1; pr EN 50082-2	Generic Immunity Standard

Test procedures:

No.	Designation
IEC 801-2 / Level 3	Immunity against Electrostatic Discharges (ESD)
IEC 801-3 / Level 3	Immunity against Electrostatic Fields
IEC 801-4 / Level 3	Immunity against Fast Transients (Burst)
IEC 801-5 / Level 3	Immunity against Surge Voltages (Surge)
EN 55011 / Class B	Limits and Methods of Measurement of Radio Disturbance Characteristics

Furtwangen, 01.09.2006 (Manfred Bär, managing director)

This declaration does not include a guarantee of properties. The safety and protection information in the operating manual must always be followed.
IEF-Werner GmbH has the following technical documentation available for inspection:

	User	EU authorities
• Operating manual	X	X
• Operator software	X	X
• Plans / software source code		X
• Description of the measures to guarantee conformity		X
• Test records		X
• Other technical documentation		X

1.3 Safety Instructions

Observe the instructions and warnings contained in the operating instructions. These are identified as follows:

WARNING

If these instructions and warnings are disregarded, hazards may arise from dangerous electrical voltages.

CAUTION

This sign indicates warnings and information about general hazards.

NOTE Gives additional information.

1.3.1 Connection Instructions

WARNING

Observe the discharging time for the condensers.

After disconnecting the control system, the condensers are charged with a high voltage for a short period of time. Do not handle the device until 5 minutes after switching it off.

NOTE Installation and start-up should only be carried out by qualified personnel.

Observe the general installation regulations for assembling and operating electrical operating systems (EN 60204).

Protective equipment for humans and machine should comply with local conditions and regulations.

Do not connect or disconnect power or control cables while the control system is still connected to the mains.

Plugs may only be connected and/or removed when voltage-free.

Control and power lines must be laid separately (ca 10 cm apart).

Protective system IP20.

WARNING

The controller must be de-energized when carrying out assembly, disassembly and repair work or replacing individual components or switching over the operating voltage.

1.3.2 Ambient Conditions

The limit values for the ambient temperature (min. 0°C to max. 40°C) must be adhered to.

No mist or water may be allowed to enter the controller.

Dust must be prevented from entering the controller.

The controller must be protected from aggressive gases and liquids.

Ensure that air can circulate freely (air inlet and outlet ports must be kept free).

1.3.3 Operating Instructions

CAUTION

It is imperative that the parameter values are checked for compliance with the actual conditions.

When using the program examples contained in the operating instructions, always check whether the program can be implemented on the machine in question.

1.4 Technical Data

1.4.1 Technical Data of the PA-CONTROL Single

Ambient temperature:	(0 to 40)°C
Connecting voltage:	230/115VAC; +/- 10% 50/60Hz
Power consumption:	Maximum 300 VA
Direct current output:	24VDC/2.5A for external circuit, brake, limit switches
14 signal inputs: (extendable up to 32, via AS-i up to a maximum of 140*) Inputs 15 and 16 of the I/O card are used for the limit switch of the stepping motor axes in the PA-CONTROL Single.	opto-decoupled 24 VDC Typ. current 5mA Low level (0-3) VDC High level (12-30) VDC
512 signal inputs: via CANopen bus	The characteristics of the inputs depend on the CANopen I/O module used
16 signal outputs: (extendable up to 32, via AS-i up to a maximum of 140*)	opto-decoupled switching positive 24 VDC/0.5 A (ohmic load) per card, i.e. all outputs max. 2A
512 signal outputs: via CANopen bus	The characteristics of the outputs depend on the CANopen I/O module used
Data security:	Lithium battery, minimum service life 5 years
Protection type:	IP20
Weight:	19/2" housing; 9 kg

* The maximum possible number of inputs and outputs may be limited due to additional option cards of the controller.

1.4.2 Technical Data of the PA-CONTROL Compact

Ambient temperature:	(0 to 40)°C
Connecting voltage:	230/115VAC +/- 10% 50/60Hz
Power consumption:	Maximum 750 VA
Direct current output:	24VDC/4A for external circuit, brake, limit switches
16 signal inputs: (extendable up to a maximum of 544* via ASI)	opto-decoupled 24 VDC Typ. current 5mA Low level (0-3) VDC High level (12-30) VDC
512 signal inputs: via CANopen bus	The characteristics of the inputs depend on the CANopen I/O module used
16 signal outputs: (extendable up to a maximum of 544* via ASI)	opto-decoupled switching positive 24 VDC/0.5 A (ohmic load) per card, i.e. all outputs max 2A
512 signal outputs: via CANopen bus	The characteristics of the outputs depend on the CANopen I/O module used
Data security:	Lithium battery, minimum service life 5 years
Protection type:	IP20
Weight:	19" housing; 17 kg

* The maximum possible number of inputs and outputs may be limited due to additional option cards of the controller. Additional devices connected via CANopen bus extend the possibilities for configuration with inputs and outputs (see section *1.4.4: Inputs and Outputs of PA-CONTROL, page 13*).

1.4.3 Technical Data of the PA-CONTROL Steuer

Ambient temperature:	(0 to 40)°C
Connecting voltage:	24VDC +/-15%, ripple < 10%
Power consumption:	maximum 30 VA
16 signal inputs: (extendable up to a maximum of 640***** via AS-i)	opto-decoupled 24 VDC Typ. current 5mA Low level (0-3) VDC High level (12-30) VDC
512 signal inputs: via CANopen-Bus	The characteristics of the inputs depend on the CANopen I/O module used
16 signal outputs: (extendable up to a maximum of 640***** via AS-i)	opto-decoupled switching positive 24 VDC/0.5 A (ohmic load) per card, i.e. all outputs max 2A
512 signal outputs: via CANopen bus	The characteristics of the outputs depend on the CANopen I/O module used
Stepping motor control signals: (pulse, direction)	opto-decoupled RS422 level
Stand-by input power circuit: (sum of 4 power circuits)	opto-decoupled (must be closed with a potential-free contact)
Limit switch inputs:	2 per axis, see signal inputs for specification
Data security:	Lithium battery, minimum service life 5 years
Protection type:	IP20
Weight:	19" housing; 4.8 kg 19/2" housing; 3.4 kg

1.4.4 Inputs and Outputs of PA-CONTROL

PA-CONTROL is equipped with 2048 inputs and outputs from CPU4 onwards. These inputs and outputs can be used in different ways.

There are maximum limits for free slots and thus for the expandability of the various executions of the PA-CONTROL. This is due to the physical conditions, the available slots on the EURO bus and the combination with other expansion cards, e.g. Profibus DP, A-D converter or COM port.

1.4.4.1 Table of the integrated Inputs

Input Number	Use	Special Application
1 – 16	I/O card 1	***1**
17 – 32	I/O card 2	
33 – 48	I/O card 3	
49 –64	I/O card 4	
65 – 80	I/O card 5	
81 – 96	I/O card 6	
97 – 112	I/O card 7	
113 – 128	I/O card 8	
129 - 132	AS-i master card 1, slave 0	
133 – 256	AS-i master card 1	
257 – 260	AS-i master card 2, slave 0	
261 – 384	AS-i master card 2	
385 – 388	AS-i master card 3, slave 0	
389 – 512	AS-i master card 3	
513 – 516	AS-i master card 4, slave 0	
517 – 640	AS-i master card 4	
641 – 656	Only for PA-CONTROL Steuer PLS7 / PLS9 card for axes 1 – 4	Free inputs, outputs, stand-by, axis limit switch ***2**
657 – 672	Only for PA-CONTROL Steuer PLS7 / PLS9 card for axes 5 – 8	Free inputs, outputs, stand-by, axis limit switch ***2**
673 – 688	Only for PA-CONTROL Steuer PLS7 / PLS9 card for axes 9 – 12	Free inputs, outputs, stand-by, axis limit switch ***2**
689 – 704	Only for PA-CONTROL Steuer PLS7 / PLS9 card for axes 13 – 16	Free inputs, outputs, stand-by, axis limit switch ***2**
705 - 720	Only for PA-CONTROL Compact PLS6 card	axis limit switch ***3**

***1** The last two inputs are provided for the two limit switches of the connected axis in the PA-CONTROL Single, see section *7.5.1.1: PLS8 Card, page 262*.

***2** Please refer to the Technical Appendix for the assignment of the inputs on the PLS7/PLS9 cards, see section *7.5.3.1: PLS7/9 Card, page 264*.

***3** Please refer to the Technical Appendix for the assignment of the inputs on the PLS6 card, see section *7.5.2.1: PLS6 Card, page 263*.

1.4.4.2 Table of the integrated Outputs

Output Number	Use	Special Application
1 – 16	I/O card 1	
17 – 32	I/O card 2	
33 – 48	I/O card 3	
49 –64	I/O card 4	
65 – 80	I/O card 5	
81 – 96	I/O card 6	
97 – 112	I/O card 7	
113 - 128	I/O card 8	
129 - 132	AS-i master card 1, slave 0	
133 - 256	AS-i master card 1	
257 – 260	AS-i master card 2, slave 0	
261 - 384	AS-i master card 2	
385 – 388	AS-i master card 3, slave 0	
389 – 512	AS-i master card 3	
513 – 516	AS-i master card 4, slave 0	
517 - 640	AS-i master card 3	
641 – 642	Only for PA-CONTROL Steuer PLS7 / PLS9 card for axes 1 – 4	Enable, RESET for pulse connect *
657 – 658	Only for PA-CONTROL Steuer PLS7 / PLS9 card for axes 5 – 8	Enable, RESET for pulse connect *
673 – 674	Only for PA-CONTROL Steuer PLS7 / PLS9 card for axes 9 – 12	Enable, RESET for pulse connect *
689 - 690	Only for PA-CONTROL Steuer PLS7 / PLS9 card for axes 13 – 16	Enable, RESET for pulse connect *
705 – 720	Not implemented	

* see section *7.5.3.1: PLS7/9 Card, page 264*.

1.4.4.3 Table of Inputs via CAN Bus

A maximum of 16 axes can be connected to a PA-CONTROL via CANopen bus.

Any axis connected via CANopen bus extends the number of available inputs and outputs as per the table below.

Only the inputs and outputs of existing axes are available.

Input Number	Use	Special Application
721 – 736	Axis 1	look I/O-Table type of Axis
737 – 752	Axis 2	look I/O-Table type of Axis
753 – 768	Axis 3	look I/O-Table type of Axis
769 – 784	Axis 4	look I/O-Table type of Axis
785 – 800	Axis 5	look I/O-Table type of Axis
801 – 816	Axis 6	look I/O-Table type of Axis
817 – 832	Axis 7	look I/O-Table type of Axis
833 – 848	Axis 8	look I/O-Table type of Axis
849 – 864	Axis 9	look I/O-Table type of Axis
865 – 880	Axis 10	look I/O-Table type of Axis
881 – 896	Axis 11	look I/O-Table type of Axis
897 – 912	Axis 12	look I/O-Table type of Axis
913 – 928	Axis 13	look I/O-Table type of Axis
929 – 944	Axis 14	look I/O-Table type of Axis
945 – 960	Axis 15	look I/O-Table type of Axis
961 – 976	Axis 16	look I/O-Table type of Axis
977 – 992	NOP	
993 – 1008	NOP	
1009 - 1024	NOP	
1025 - 1729	Inputs via CANopen-I/O-Module	
1730 – 2048	NOP	

1.4.4.4 Table of Outputs via CAN Bus

Output Number	Use	Special Application
721 – 736	Axis 1	look I/O-Table type of Axis
737 – 752	Axis 2	look I/O-Table type of Axis
753 – 768	Axis 3	look I/O-Table type of Axis
769 – 784	Axis 4	look I/O-Table type of Axis
785 – 800	Axis 5	look I/O-Table type of Axis
801 – 816	Axis 6	look I/O-Table type of Axis
817 – 832	Axis 7	look I/O-Table type of Axis
833 – 848	Axis 8	look I/O-Table type of Axis
849 – 864	Axis 9	look I/O-Table type of Axis
865 – 880	Axis 10	look I/O-Table type of Axis
881 – 896	Axis 11	look I/O-Table type of Axis
897 – 912	Axis 12	look I/O-Table type of Axis
913 – 928	Axis 13	look I/O-Table type of Axis
929 – 944	Axis 14	look I/O-Table type of Axis
945 – 960	Axis 15	look I/O-Table type of Axis
961 – 976	Axis 16	look I/O-Table type of Axis
977 – 992	NOP	
993 – 1008	NOP	
1009 - 1024	NOP	
1025 - 1729	Inputs via CANopen-I/O-Module	
1730 – 2048	NOP	

1.4.4.5 Inputs and Outputs of the PA-CONTROL-MP (CANopen-Slave)

Axis 1	Axis 2	Axis 3	Axis 4	Axis 5 -16	Input	Output
I/O 721	I/O 737	I/O 753	I/O 769		I1	O1
I/O 722	I/O 738	I/O 754	I/O 770		I2	O2
I/O 723	I/O 739	I/O 755	I/O 771		I3	O3
I/O 724	I/O 740	I/O 756	I/O 772		I4	O4
I/O 725	I/O 741	I/O 757	I/O 773		I5	O5
I/O 726	I/O 742	I/O 758	I/O 774		I6	O6
I/O 727	I/O 743	I/O 759	I/O 775		I7	O7
I/O 728	I/O 744	I/O 760	I/O 776		I8	O8
I/O 729	I/O 745	I/O 761	I/O 777		I9	-
I/O 730	I/O 746	I/O 762	I/O 778		I10	-
I/O 731	I/O 747	I/O 763	I/O 779		I11, negative limit switch	-
I/O 732	I/O 748	I/O 764	I/O 780		I12, positive limit switch	-
I/O 733	I/O 749	I/O 765	I/O 781		-	-
I/O 734	I/O 750	I/O 766	I/O 782		-	-
I/O 735	I/O 751	I/O 767	I/O 783		-	-
I/O 736	I/O 752	I/O 768	I/O 784		-	-

1.4.4.6 Inputs and Outputs of the LV-servoTEC

Axis 1	Axis 2	Axis 3	Axis 4	Axis 5 -16	Input	Output
I/O 721	I/O 737	I/O 753	I/O 769		Digital IN 1	-
I/O 722	I/O 738	I/O 754	I/O 770		Digital IN 2, (reference switch)	-
I/O 723	I/O 739	I/O 755	I/O 771		Digital IN 3, PSTOP	-
I/O 724	I/O 740	I/O 756	I/O 772		Digital IN 4, NSTOP	-
I/O 725	I/O 741	I/O 757	I/O 773		ENABLE	-
I/O 726	I/O 742	I/O 758	I/O 774		-	-
I/O 727	I/O 743	I/O 759	I/O 775		-	-
I/O 728	I/O 744	I/O 760	I/O 776		-	-
I/O 729	I/O 745	I/O 761	I/O 777		-	-
I/O 730	I/O 746	I/O 762	I/O 778		-	-
I/O 731	I/O 747	I/O 763	I/O 779		-	-
I/O 732	I/O 748	I/O 764	I/O 780		-	-
I/O 733	I/O 749	I/O 765	I/O 781		-	-
I/O 734	I/O 750	I/O 766	I/O 782		-	-
I/O 735	I/O 751	I/O 767	I/O 783		-	-
I/O 736	I/O 752	I/O 768	I/O 784		-	-

1.4.4.7 Inputs and Outputs of the IntelliMOT

Axis 1	Axis 2	Axis 3	Axis 4	Axis 5 -16	Input	Output
I/O 721	I/O 737	I/O 753	I/O 769		-	-
I/O 722	I/O 738	I/O 754	I/O 770		-	-
I/O 723	I/O 739	I/O 755	I/O 771		-	-
I/O 724	I/O 740	I/O 756	I/O 772		-	-
I/O 725	I/O 741	I/O 757	I/O 773		-	-
I/O 726	I/O 742	I/O 758	I/O 774		-	-
I/O 727	I/O 743	I/O 759	I/O 775		-	-
I/O 728	I/O 744	I/O 760	I/O 776		-	-
I/O 729	I/O 745	I/O 761	I/O 777		-	-
I/O 730	I/O 746	I/O 762	I/O 778		-	-
I/O 731	I/O 747	I/O 763	I/O 779		-	-
I/O 732	I/O 748	I/O 764	I/O 780		-	-
I/O 733	I/O 749	I/O 765	I/O 781		-	-
I/O 734	I/O 750	I/O 766	I/O 782		-	-
I/O 735	I/O 751	I/O 767	I/O 783		-	-
I/O 736	I/O 752	I/O 768	I/O 784		-	-

1.4.4.8 Inputs and Outputs of the DunMOT

Axis 1	Axis 2	Axis 3	Axis 4	Axis 5 -16	Input	Output
I/O 721	I/O 737	I/O 753	I/O 769		IN 0	-
I/O 722	I/O 738	I/O 754	I/O 770		IN 1	-
I/O 723	I/O 739	I/O 755	I/O 771		IN 2	-
I/O 724	I/O 740	I/O 756	I/O 772		IN 3	-
I/O 725	I/O 741	I/O 757	I/O 773		IN 4	-
I/O 726	I/O 742	I/O 758	I/O 774		-	-
I/O 727	I/O 743	I/O 759	I/O 775		-	-
I/O 728	I/O 744	I/O 760	I/O 776		-	-
I/O 729	I/O 745	I/O 761	I/O 777		-	-
I/O 730	I/O 746	I/O 762	I/O 778		-	-
I/O 731	I/O 747	I/O 763	I/O 779		-	-
I/O 732	I/O 748	I/O 764	I/O 780		-	-
I/O 733	I/O 749	I/O 765	I/O 781		-	-
I/O 734	I/O 750	I/O 766	I/O 782		-	-
I/O 735	I/O 751	I/O 767	I/O 783		-	-
I/O 736	I/O 752	I/O 768	I/O 784		-	-

1.4.4.9 Inputs and Outputs of the flexmoTEC

Axis 1	Axis 2	Axis 3	Axis 4	Axis 5 -16	Input	Output
I/O 721	I/O 737	I/O 753	I/O 769		X4.3	-
I/O 722	I/O 738	I/O 754	I/O 770		X4.4	-
I/O 723	I/O 739	I/O 755	I/O 771		X4.5	-
I/O 724	I/O 740	I/O 756	I/O 772		X4.6	-
I/O 725	I/O 741	I/O 757	I/O 773		X4.7, (reference switch)	-
I/O 726	I/O 742	I/O 758	I/O 774		X4.8, (limit switch- / out)	-
I/O 727	I/O 743	I/O 759	I/O 775		X4.9, (limit switch+ / in)	-
I/O 728	I/O 744	I/O 760	I/O 776		X4.10	-
I/O 729	I/O 745	I/O 761	I/O 777		-	-
I/O 730	I/O 746	I/O 762	I/O 778		-	-
I/O 731	I/O 747	I/O 763	I/O 779		-	-
I/O 732	I/O 748	I/O 764	I/O 780		-	-
I/O 733	I/O 749	I/O 765	I/O 781		-	-
I/O 734	I/O 750	I/O 766	I/O 782		-	-
I/O 735	I/O 751	I/O 767	I/O 783		-	-
I/O 736	I/O 752	I/O 768	I/O 784		-	-

1.4.4.10 Inputs and Outputs of the servoTEC S2

Axis 1	Axis 2	Axis 3	Axis 4	Axis 5 -16	Input	Output
I/O 721	I/O 737	I/O 753	I/O 769		DIN 0 [X1:19]	OUT 0 [X1:24]
I/O 722	I/O 738	I/O 754	I/O 770		DIN 1 [X1:7]	OUT 1 [X1:12]
I/O 723	I/O 739	I/O 755	I/O 771		DIN 2 [X1:20]	OUT 2 [X1:25]
I/O 724	I/O 740	I/O 756	I/O 772		DIN 3 [X1:8]	OUT 3 [X1:13]
I/O 725	I/O 741	I/O 757	I/O 773		DIN 8 [X1:23]	-
I/O 726	I/O 742	I/O 758	I/O 774		DIN 9 [X1:11]	-
I/O 727	I/O 743	I/O 759	I/O 775		-	-
I/O 728	I/O 744	I/O 760	I/O 776		-	-
I/O 729	I/O 745	I/O 761	I/O 777		DIN 6 [X1:22], limit switch negative	-
I/O 730	I/O 746	I/O 762	I/O 778		DIN 7 [X1:10], limit switch positive	-
I/O 731	I/O 747	I/O 763	I/O 779		-	-
I/O 732	I/O 748	I/O 764	I/O 780		Interlock, no Controller enable (DIN 5) or no Power stage enable (DIN 4)	-
I/O 733	I/O 749	I/O 765	I/O 781		-	-
I/O 734	I/O 750	I/O 766	I/O 782		-	-
I/O 735	I/O 751	I/O 767	I/O 783		-	-
I/O 736	I/O 752	I/O 768	I/O 784		-	-

1.4.5 Outside Measurements of PA-CONTROL Single

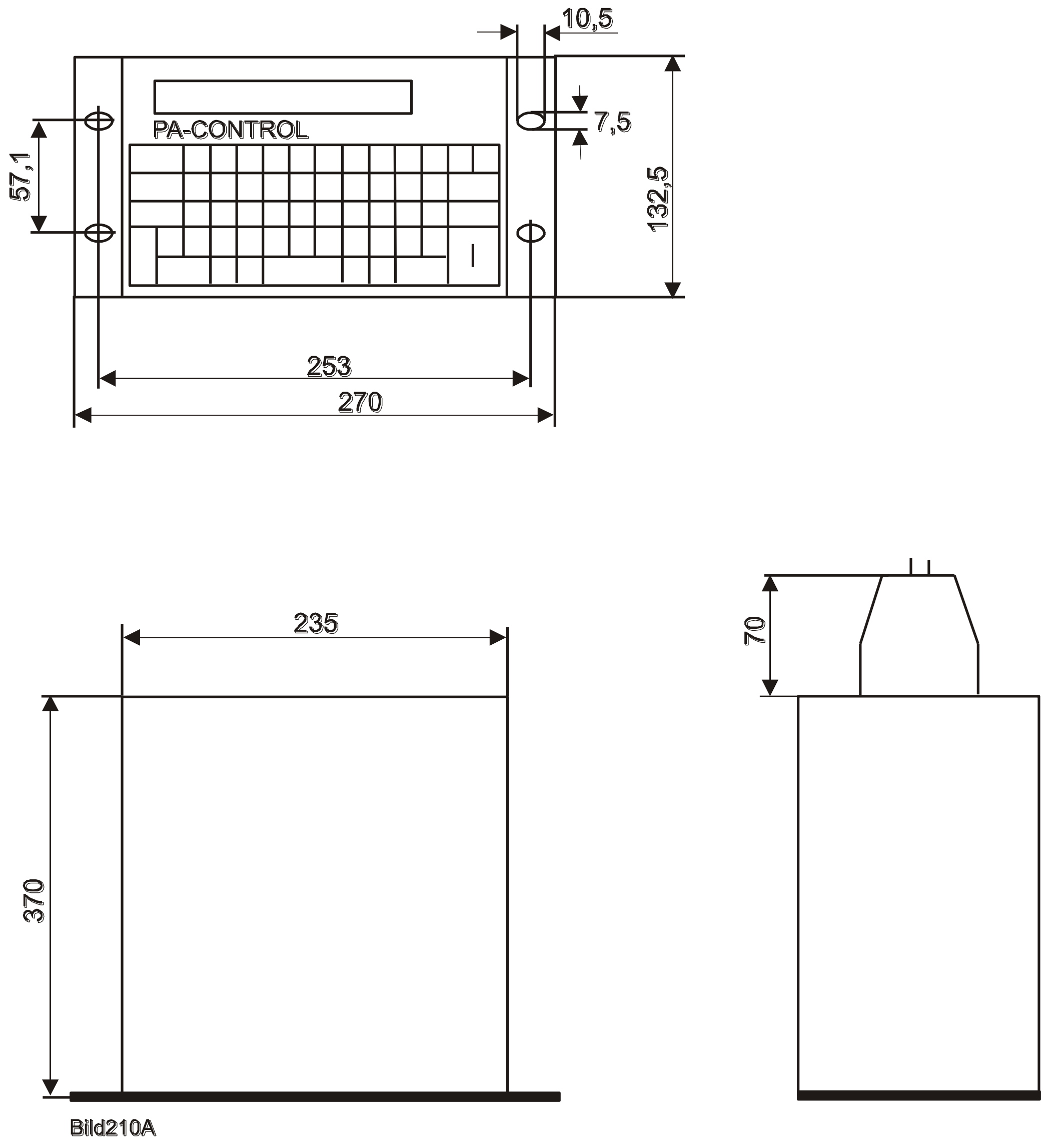

Figure 1: PA-CONTROL Single, Outside Measurements

If required, the device can be installed in a desktop housing.

1.4.6 Outside Measurements of PA-CONTROL Compact

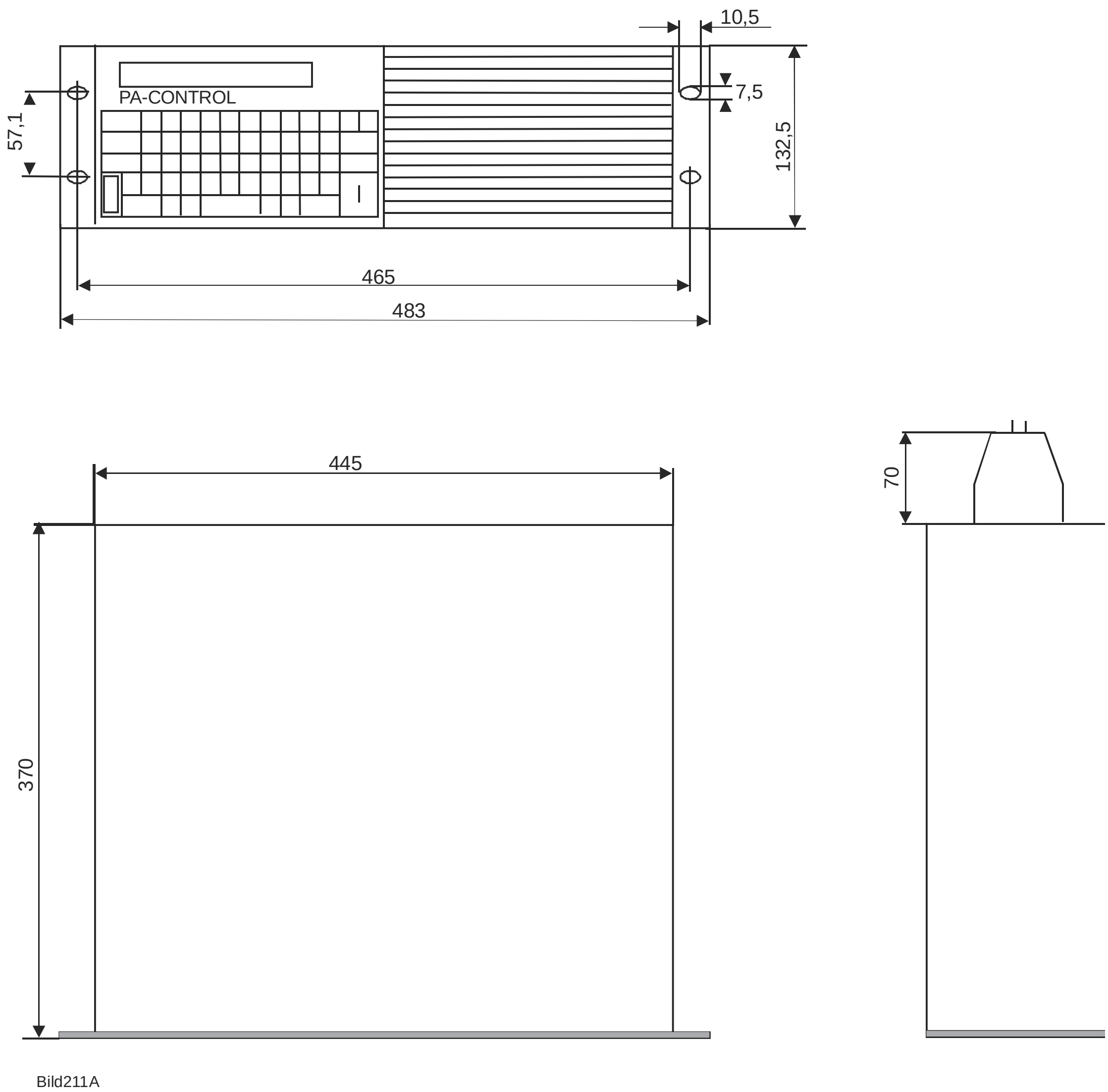

Figure 2: PA-CONTROL Compact, Outside Measurements

If required, the device can be installed in a desktop housing.

1.4.7 Outside Measurements of PA-CONTROL Steuer 19"/2

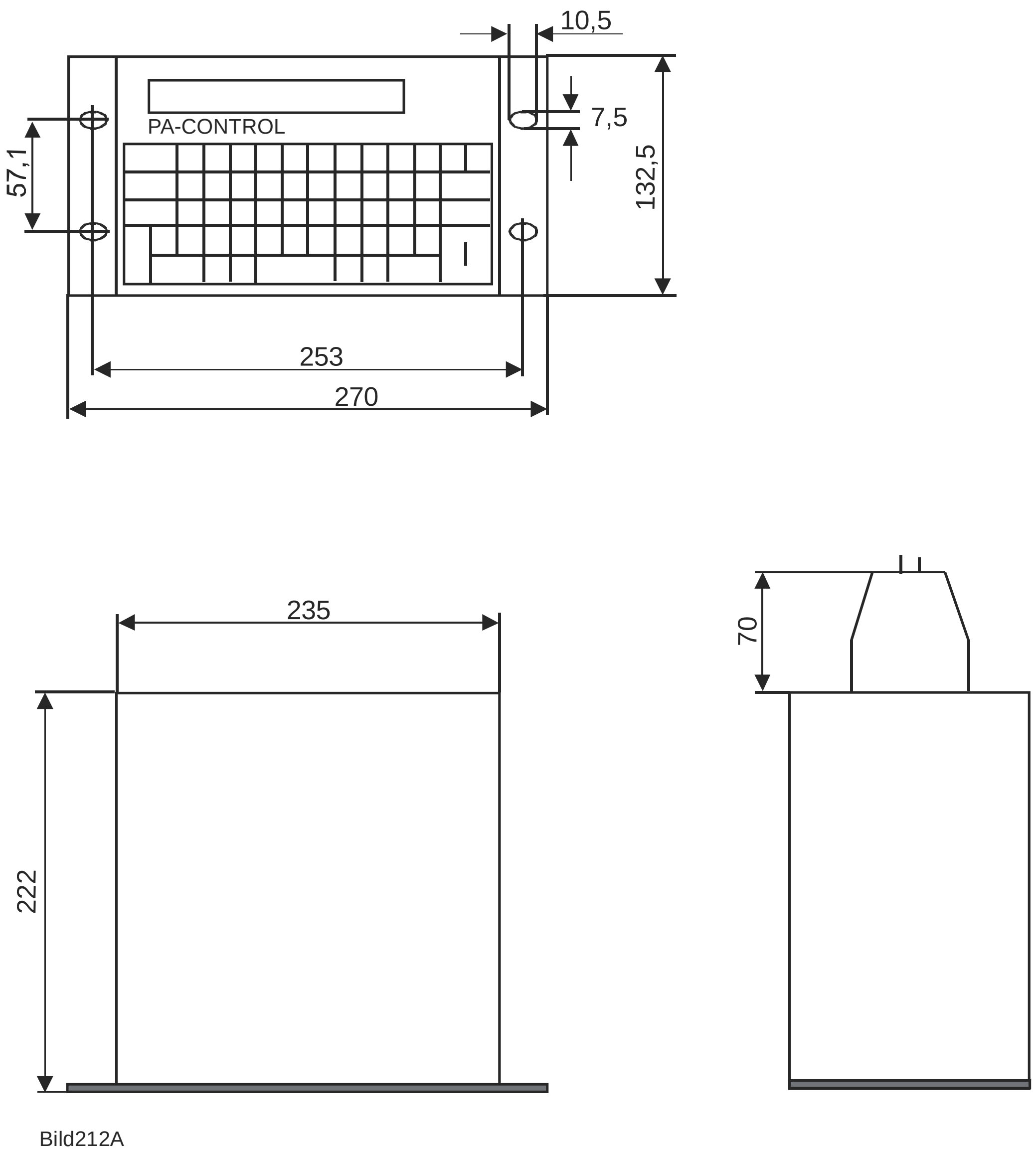

Figure 3: PA-CONTROL Steuer, Outside Measurements

If required, the device can be installed in a desktop housing.

1.4.8 Outside Measurements of PA-CONTROL Steuer 19"

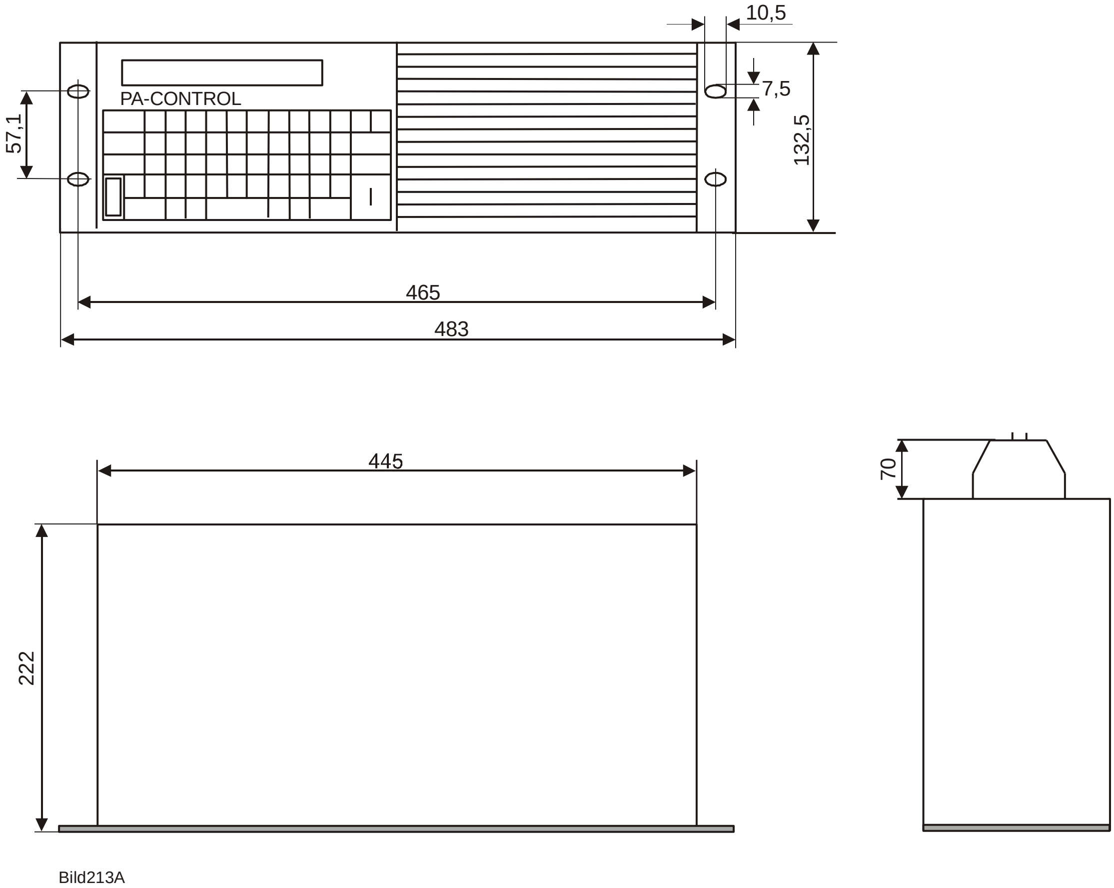

Figure 4: PA-CONTROL Steuer 19", Outside Measurements

If required, the device can be installed in a desktop housing.

1.5 Installation in a System Rack

1.5.1 Installation of PA-CONTROL Single

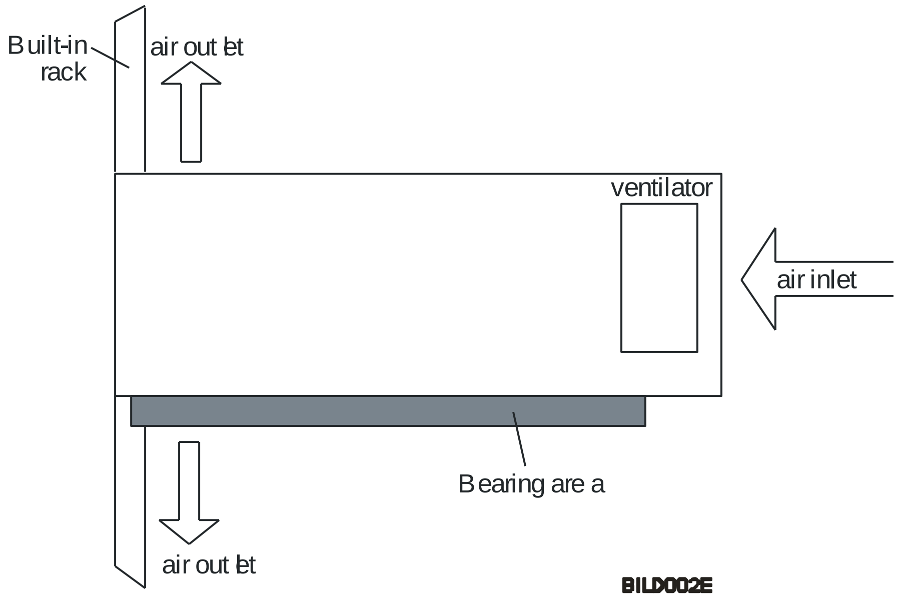

Figure 5: PA-CONTROL Single, Air Inlet / Air Outlet

CAUTION

Ensure that the air can enter and exit freely.

1.5.2 Installation of PA-CONTROL Compact

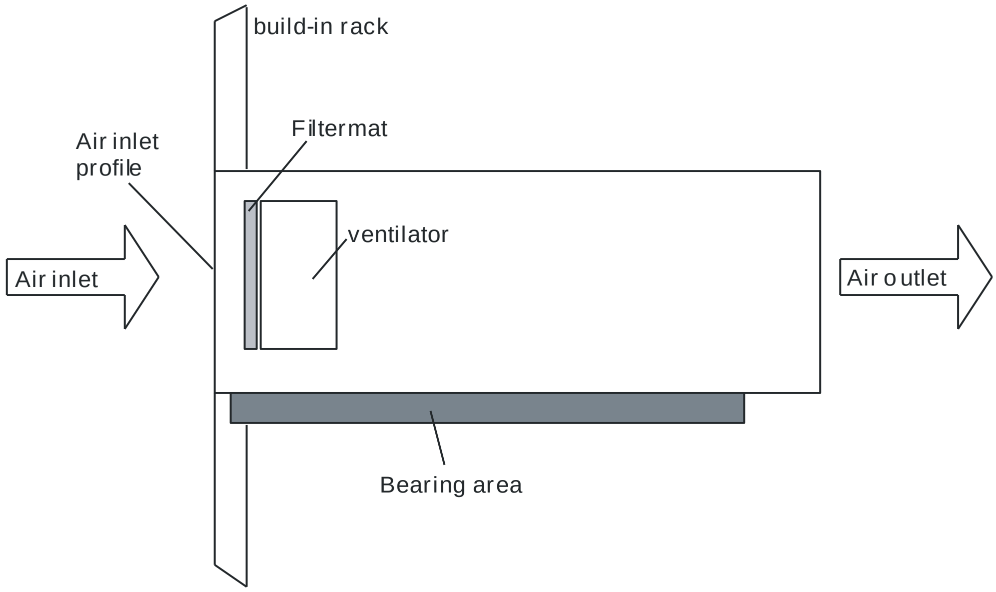

Figure 6: PA-CONTROL Compact, Air Inlet / Air Outlet

CAUTION

Ensure that the air can enter and exit freely.

1.5.3 Installation of PA-CONTROL Steuer

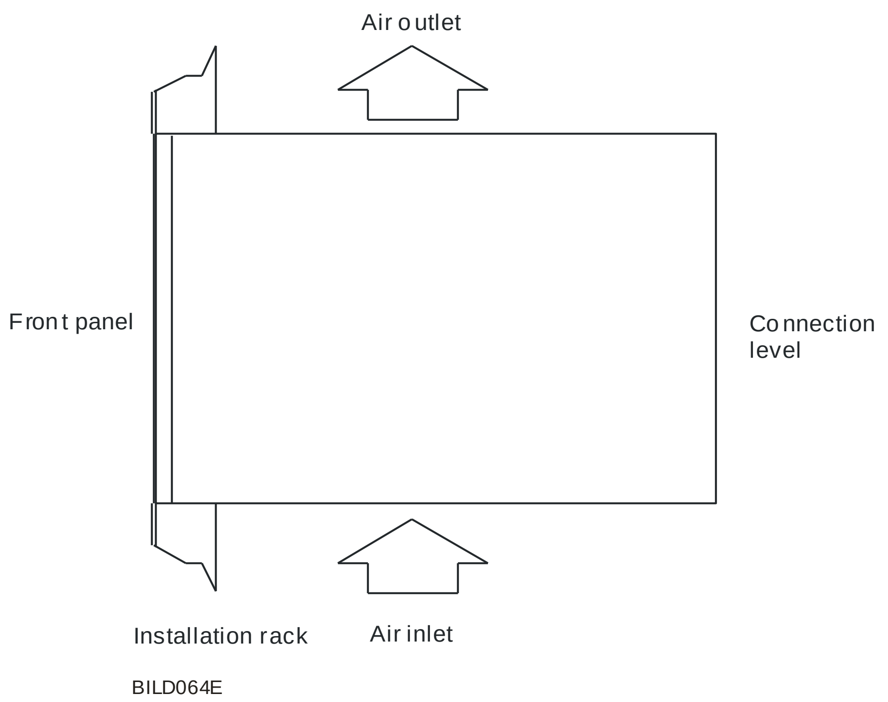

Figure 7: PA-CONTROL Steuer, Air Inlet / Air Outlet

CAUTION

Ensure that the air can enter and exit freely.

19" built-in rack

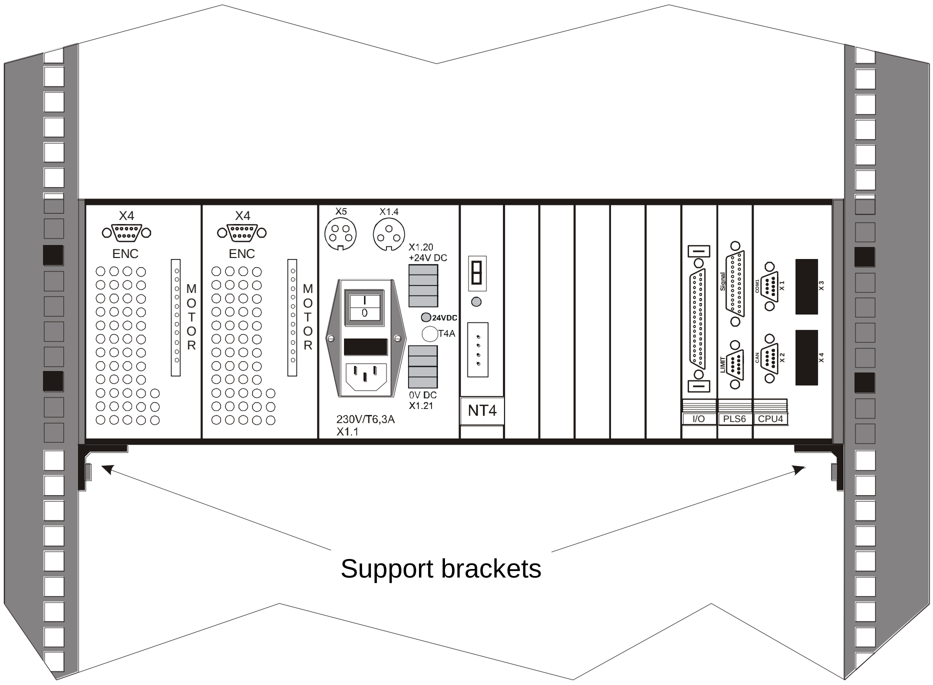

BILD203D

Figure 8: 19" Built-in Rack

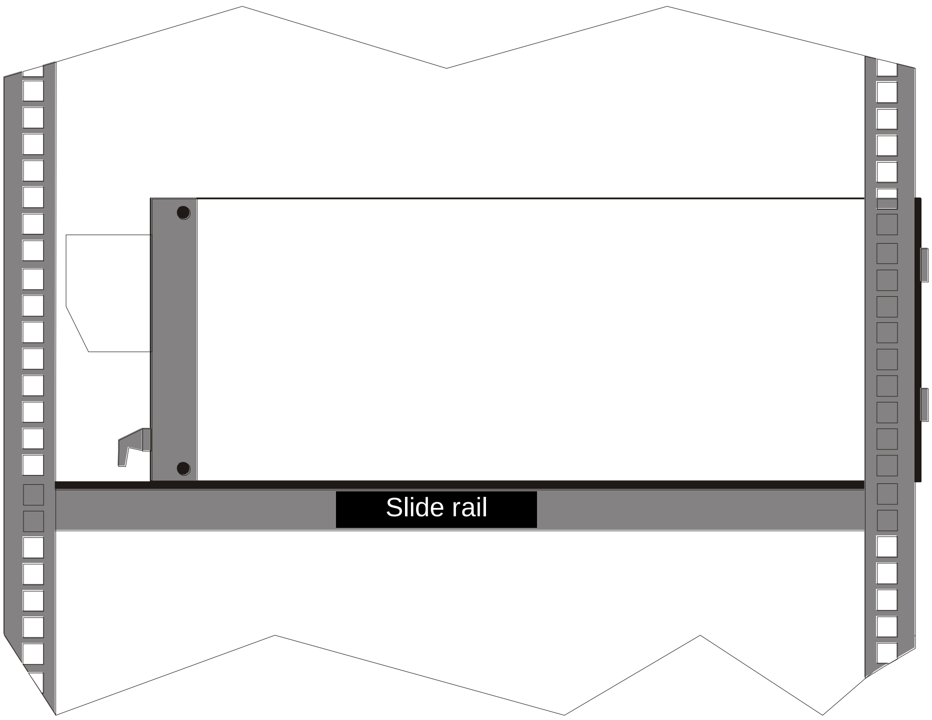

BILD204A

Figure 9: 19" Built-in Rack (Side View)

2 Operator Interface

2.1 The Keyboard

NOTE

In principle, each variant of PA-CONTROL can be operated with or without a keyboard.
While the ex works equipment of PA-CONTROL Single, Compact and Steuer usually includes a keyboard integrated in the front panel, this possibility is not provided for the PA-CONTROL servoTEC or PA-CONTROL MP versions.
However, these controllers can also be provided with this convenient display and input output tool through connection of the optional IEF control console (see section *6.14: IEF Control Console, page 203*).

As an alternative to connection of the IEF control, a control console can be connected via CANopen bus. The front plate of PA-CONTROL can be simulated by means of this console.

Figure 10: The Keyboard of PA-CONTROL

The key of the key-operated switch has been removed. This is only possible in the vertical position. As a result, PA-CONTROL is in the "Automatic" mode. Other modes are only accessible with the key inserted (i.e. in the horizontal position). The diagnosis port is located at the bottom left.

Keyboard Special Keys

PA-CONTROL has a complete alphanumeric keyboard (0-9, A-Z). There are also several special keys, whose functions are described in the following:

Special key	Name	Function
ESC	ESC key	Exit sub-menu, cancel input field
ALT	ALT key	no function assigned
CTRL	CTRL key	no function assigned
SHIFT	SHIFT key	Double assignment of keys, auxiliary key for cursor keys
↓	Arrow down key	Scrolling in the menu to next line (with autorepeat)
↑	Arrow up key	Scrolling in the menu to previous line (with autorepeat)
→	Arrow right key	Cursor one character to the right in the input field (with autorepeat)
←	Arrow left key	Cursor one character to the left (with autorepeat)
	Space bar	Inserts space in the editor
ENTER	Enter key	End input, end line in the editor, insert new line
INS	INS key	no function assigned
DEL	DEL key	Deletes the character on which the cursor is positioned
START	Start key	Starts automatic mode
STOP	Stop key	Stops automatic mode
Automatic | Program	Key-operated switch	Access lock for front plate (the key is removable in the position shown, only "Automatic" is possible)

2.2 General Operation

NOTE The menu structure differs depending on the equipment of the controller or the device type.

2.2.1 Switching-on a PA-CONTROL

After PA-CONTROL has been switched on, it first of all checks the hardware configuration. The extent of this check, and therefore also the messages which may be displayed, obviously depends on the configuration of PA-CONTROL. If a change is discovered, the following is displayed:

```
E127: Axis 1: new axis detected
Error Reset?                1=yes
```

If 1 is entered, i.e. Error Reset, PA-CONTROL displays the following menu:

```
System error - RE-Initialize
1 = reset error on system
```

```
2 = display list of errors
3 = display hardware configuration
4 = Communication via modem
```

NOTE With the key „SHIFT“ and „9“ and the key-operated switch in the position "Program" you may do RE-initialize of the PA-CONTROL.

```
Really  re-initialize PA-CONTROL
1  =  yes  /  key  =  no
```

```
delete all program and parameters ?
no = <ESC>   /   yes = <ENTER>
```

If the hardware configuration is correct, the devices on the CANopen bus are checked in the next step. The following is displayed during this check:

```
wait until all axis initialized
```

If an error occurs during the initialization, e.g. CAN axes not connected or a cable error, the following message is displayed after approx. 10sec.

```
A 1: Time-Out during wait for axis
1 =  repeat
```

```
2 = Cancel, continue without this axis
3 = Cancel all, continue without axes
```

After successful initialization, a check of the parameters for all the axes in an LV-servoTEC is carried out. If this check finds any differences, the following error message appears on the display, and the flashing 7-segment display on the LV-servoTEC also provides information about the error.

```
A1 : Parameters different
1 = Send to all axes
```

```
2 = Ignore for all axes
3 = Accept from all axes
4 = Ignore for this axis
5 = Accept parameters from axis
```

As a rule, the main menu appears on the display at the end of the switch-on sequence:

```
            PA-CONTROL  5.xx
1 = Automatic                        →
```

The operator interface of PA-CONTROL is arranged in a menu structure. The structure and handling of the main menu and the various sub-menus are based on the same principle.

2.2.2 The Menu Principle

```
Title of the menu
1 = First sub-menu item          →
```

```
2 = Second sub-menu item
3 = Third sub-menu item
...
...
9 = Ninth sub-menu item
```

The number of menu sub-options in the individual menus was customized to the respective requirements and restricted accordingly. If an arrow is displayed on the far right of the second line, a secondary menu item is available in this menu.

Since only two lines are available on the display, only the title of the current menu and one of the menu sub-options is displayed in each case.

Navigating through the menu interface:

Key:	Action / Effect:
Arrow down/Arrow right	next menu sub-option is displayed
Arrow up	previous menu sub-option is displayed
SHIFT + Arrow up	first menu sub-option is displayed
SHIFT + Arrow down	last menu sub-option is displayed
ENTER	The displayed menu sub-option is activated
ESC	Sub-menu is exited and the previous menu returned to (the first menu line is displayed in the main menu)

The input of the number prefixed to the menu item is another way of activating a menu item.

2.2.3 The Input Field

If the user is requested to enter a numerical value (parameter value, register value, or similar), an input field appears on the display.

The input field is bounded by two square brackets [_......]. The current value and cursor are located between these two brackets (blinking field in the display).

The user can update the entry by pressing the relevant keys.

Assignment of the keys in the input field:

Key:	Reaction / Effect:
Arrow left	Cursor one character to the left
Arrow right	Cursor one character to the right
SHIFT + DEL	Deletes character on the left of the cursor
DEL	Deletes character on which the cursor is positioned
ENTER	Conclusion of an entry; the entered value is checked and accepted if it is within the permitted limits. If is below or exceeds the limits, an error message is output and a new input expected.
ESC	Cancellation of the input, the old value is retained

2.2.4 Entry of a Program Name

If the controller expects the entry of a program name, the following appears in the display:

```
Please enter a new program name!
[ _                    ]
```

The cursor (blinking field in the display) is positioned at the first position of the input field. The user now enters the letters or numbers of the desired program name. After all the characters of the program name have been entered, the input is concluded by the pressing the "ENTER" key.

The input program name must fulfil certain conditions (see below) and is checked for these. In the event of a violation, the following message is displayed:

```
ERROR   : Program name illegal!
Program : START
```

The error message is acknowledged by pressing a key, and the user can correct the error in the input field.

The program name must fulfil the following conditions:

- A character can be a number or a letter
- Spaces are not allowed in the name
- The length is restricted to 20 characters
- Only "_" and "-" are practical as special characters
- Uppercase letters

Moving the cursor in the input field:

Key:	Reaction / Effect:
Arrow left	Cursor one character to the left
Arrow right	Cursor one character to the right
SHIFT + DEL	Deletes character on the left of the cursor
DEL	Deletes character on which the cursor is positioned
ENTER	Conclusion of an entry

2.2.5 Selection of a Name from the Program List

If the user wishes to access an existing program (e.g. change of the program, selection to define as the start-up program or similar), the user is provided with a list of the existing programs in alphabetical order with the possible program types.

```
Please select !  [                  ]
Program :    1  A_EXAMPLE.PNC
```

The user has two possibilities to make a selection:

1. The user can scroll in the list by means of the "Arrow up" and "Arrow down" keys until the desired program is displayed. The selection is concluded by pressing the "ENTER key" and the program is transferred for the action.
2. An empty input field ([   ]) is shown at the end of the first display line. The user can input the name of the desired program in this input field via the keyboard. The characters from the keyboard are only applied if a program name exists with the same character string. The display (second display line) is corrected according to the input field after each input character.

```
Please select !  [E                 ]
Program :   54 SETUPMODE.PNC
```

The selection is concluded by pressing the "ENTER key" and the program is transferred for the action.

The contents of the input field are deleted by pressing the "Arrow down" or "Arrow up" keys.

2.3 Display System Errors (in Home Position)

If the PA-CONTROL is not in AUTOMATIC mode an there will be an error the error is displayed.

```
CAN : Sync Time Out with axis 1
error reset, 1=yes
```

By input of “1” the message can be acknowledged what evokes the following menu:

```
System error – RE-Initialize
1 = reset error on system
```

```
2 = display list of errors
3 = display hardware configuration
4 = Communication via modem
```

The system error can be deleted here by choosing the “1 = reset error on system”.

NOTE With the key „SHIFT“ and „9“ and the key-operated switch in the position "Program" you may do RE-initialize of the PA-CONTROL.

```
Really  re-initialize PA-CONTROL
1  =  yes  /  key  =  no
```

```
delete all program and parameters ?
no = <ESC>   /   yes = <ENTER>
```

2.4 Menu Structure of a PA-CONTROL

The menu items from item 2 are only accessible with the key switch in the horizontal position.

Main Menu:	Menu Sub-options:
1 = Automatic	- Start - Stop
2 = Manual	1 = Approach to reference point 2 = Move axes manually via front plate
3 = Programming	1 = Display program directory 2 = Create new program 3 = Alter existing program 4 = Copy program 5 = Rename program 6 = Delete program 7 = Display program memory occupancy
4 = Diagnosis	1 = Limit switch / stand-by 2 = Inputs (I) 3 = Outputs (O) 4 = Flag (M) 5 = Real number register (R) 6 = Integer register (N) 7 = CANOpen Diagnosis / manual 8 = D-A converter (CANOpen)
5 = Run definitions	- Start program - Program at STOP - Program START after STOP - Program at MALFUNCTION - Heading - initial-state-program
6 = Parameters	1 = Edit system parameters 2 = Edit axis parameters 3 = Edit AS-i BUS [1] 4 = Edit servoTEC parameters
7 = Basic settings	1 = Boot system parameters 2 = Boot axis parameters 3 = Delete program memory 4 = Re-initialize PA-CONTROL
8 = System diagnosis	1 = Display hardware configuration 2 = Clock 3 = Keyboard test 4 = Stop key test 5 = Start key test 6 = Key switch test 7 = Test COM ports
9 = Communication via modem	1 = Activate connection 2 = Display connection status 3 = Terminate connection 4 = Edit modem settings 5 = Select modem type

[1] only if AS-i bus available

2.5 Automatic

The program defined as the start program is executed in automatic mode. Further programs can be invoked as subprograms or programs which are to be processed in parallel. A running program may be interrupted by "STOP". A program is started or an interrupted program is continued by means of "START". The required input is assigned at parameter level for the functions external START and external STOP (see section *5: Parameters, page 119*).

2.6 Manual

Overview of the manual menu

After selecting this menu item, the user is offered the following choice:

```
Manual
1 = Approaches to reference point
```

```
2 = Move axes manually via front plate
```

2.6.1 Approaches to Reference Point

After selecting this menu item, the user is informed:

```
"Wait until initialized    (ESC=Cancel)"
"Axis :. . . . . . . . (START=Continue)"
```

If an error occurs during the initialization of the axis, the following message is output via the display:

```
E900: A1 Parameter "VBUSBAL" different
Error, continue with <key>
```

If there is no error, the select menu for the axes is displayed:

```
Approach to reference point
1 = Axis 1
```

```
2 = Axis 2
..
n = Axis n
```

The number of axes available for selection depends on the configuration of PA-CONTROL (1, 2, 4, 8, 12, 16). After selection of the axis, the following is displayed:

```
Approach to reference point axis : 1
Start = <START>, Cancel = <key>
```

The user can start the approach to reference point by means of the "Start key", or return to the manual menu using any key. The following is displayed during the approach to reference point:

```
Approach to reference point axis : 1
Running, cancel with <STOP>
```

The approach to reference point can be cancelled at any time using the "Stop key".

If there is a malfunction, the following message may appear:

```
Approach to reference point axis : 1   E563
Limit switch reached   →      <Key>
```

Possible causes:

- The drive was at the positive limit switch before the approach to reference point.
- The drive moved to the positive limit switch during the approach to reference point, because the assignment of the rotational direction of the motor and the assignment of the limit switch do not coincide.

The drive can be run down from this position in manual mode.

2.6.2 Move Axes manually via Front Plate

After selecting this menu item, the user is informed:

```
"Wait until initialized    (ESC=Cancel)"
"Axis :. . . . . .     .(START=Continue)"
```

If an error occurs during the initialization of the axis, the following message is output via the display:

```
E900: A1 Parameter "VBUSBAL" different
Error, continue with <key>
```

If there is no error, the select menu for the axes is displayed:

```
Axis selection
1 = Axis 1
```

Select the axis to be manually traversed by pressing the key with the relevant axis number (1..16). Depending on the configuration of the device, selection is limited to 1, 2, 4, or 16. The following will then be displayed (example for axis 1):

```
A 1 =          0.000000        V=3200.00
1=320.00       2=3200.00       3=6400.00
```

The following assignment applies for the display:

1st line:

A1 = 0.000000 → Current absolute position of axis, here A1

V = 3200.00 → Currently selected traversing speed

2nd line:

1 = 320.00 → Traversing speed, taken from the creep speed parameter

2 = 3200.00 → Traversing speed, taken from the manual speed parameter

3 = 6400.00 → Traversing speed, taken from the reference speed parameter

The following key assignment is valid for this status:

Key:	Reaction / Effect:
Arrow left	Traverse in negative direction up to range limit (short actuation: single step; long actuation: continuous run)
Arrow right	Traverse in positive direction up to range limit (short actuation: single step; long actuation: continuous run)
SHIFT arrow left	Traverse in negative direction beyond range limit (short actuation: single step; long actuation: continuous run)
SHIFT arrow right	Traverse in positive direction beyond range limit (short actuation: single step; long actuation: continuous run)
Arrow down	To next axis
Arrow up	To previous axis
1	Set current traverse speed on value after 1= ...
2	Set current traverse speed on value after 2= ...
3	Set current traverse speed on value after 3= ...
ESC	End (back to previous menu)

2.7 Programming

Overview of programming menu

After selecting this menu item, the user is offered the following choice:

```
Programming
1 = Display program directory
```

```
2 = Create new program
3 = Alter existing program
4 = Copy program
5 = Rename program
6 = Delete program
7 = Display program memory occupancy
```

NOTE The application memory of PA-CONTROL is limited owing to the size of the RAM module on the CPU4. The free application memory can be displayed under menu item 7.

After activation of a menu sub-option in the programming menu, PA-CONTROL checks if there is enough free application memory for this action. If not, the activated function will not be executed and is cancelled with the following message display:

```
not enough free memory
```

Press any key to return to the menu.

If the user still wishes to create new programs, the free application memory must be expanded.

As an option, you can also expand the RAM.

Possibilities:

- Delete programs which are not required any more.
- Delete unimportant comments in the programs or transfer programs to PA-CONTROL without comments.

2.7.1 Display Program Directory

This menu item allows the user to scroll through the current program directory (in alphabetical order). The following display appears:

```
-No- --name.type --   Size S
  1   EXAMPLE.PNC    213 0
```

The following assignments apply:

No.: Consecutive numbering of the programs

Name: Program name

Type: Program type (PNC=NC program; PTX=Text program; PAB=Parallel run program)

Size: Number of ASCII characters in the program

S: Program status (0=write/read access possible; 1=write protected; 2=horizontal checksum error in ASCII area; 3=horizontal checksum error in the code area)

2.7.2 Create New Program

When activating this menu item, the user is asked to enter a new program name (Refer to the description for Entry of program name).

The user must then select the program type:

```
Select program type
1 = PNC
```

```
2 = PTX
3 = PAB
4 = PNX
```

PNC program :	Executable NC program with positioning and I/O commands
PTX program:	Text program for labelling of inputs, outputs, etc. (for more information refer to the sections *2.8: Diagnosis, page 60* and *2.9: Run Definitions, page 66*).
PAB program:	Executable NC program with positioning and I/O commands and PAB behaviour (see section *Commands of the PA-CONTROL-Family, page 87* and chapter *3 Commands of the PA-CONTROL-Family, in the separate document "MAN_EN_1086949_PAC_ProgrammersManual.pdf"*).
PNX program:	Executable NC program with positioning and I/O commands (for more information see section *3: Commands of the PA-CONTROL-Family, page 87* and chapter *3 Commands of the PA-CONTROL-Family, in the separate document "MAN_EN_1086949_PAC_ProgrammersManual.pdf"*)

After selection, the user finds himself in the 1st program line of the PA-CONTROL program editor (see section *Commands of the PA-CONTROL-Family, page 87* and chapter *3 Commands of the PA-CONTROL-Family*, in the separate document *"MAN_EN_1086949_ PAC_ProgrammersManual.pdf"* for a description of the program editor).

NOTE Once a program type has been selected, it cannot be subsequently altered in the PAC.

2.7.3 Altering an Existing Program

After activation of this menu item, a list of the available programs in alphabetical order is displayed. The user can scroll through the list and select the required program for programming by pressing the "ENTER key".

```
Please select ! [                  ]
Program :    1 EXAMPLE.PNC
```

After selection, the user finds himself in the PA-CONTROL program editor. The first two lines of the selected program are displayed.

See section *3: Commands of the PA-CONTROL-Family, page 87* and chapter *3 Commands of the PA-CONTROL-Family*, in the separate document *"MAN_EN_1086949_ PAC_ProgrammersManual.pdf"* for a description of the program editor.

2.7.4 Copy Program

Using this menu item, the user can copy the content of an existing program to a new program.

After activation of this menu item, a list of the available programs is displayed in alphabetical order. The user can scroll through the list and select the required program:

```
Please select ! [H                ]
Program :   21  MANUAL_RELEASE.PNC
```

After selection, the user is asked to enter a new program name. After correct entry, the program is copied and added to the directory as a further program.

NOTE The program type cannot be changed during copying.

2.7.5 Rename Program

The user can change the name of an existing program in this menu item.

After activation of this menu item, a list of the available programs is displayed in alphabetical order. The user can scroll through the list and select the required program:

```
Please select ! [STOE                ]
Program :   82  MALFUNCTION.PNC
```

After selection, the user is asked to enter a new program name. After entry, the program is added to the directory unaltered with a new name.

2.7.6 Delete Program

The user can delete an existing program (from the program memory) in this menu item.

After activation of this menu item, a list of the available programs is displayed in alphabetical order. The user can scroll through the list and select the required program:

```
Please select ! [L                    ]
Program :  44  L_LAMP.PAB
```

After selection, the user is again asked to confirm the selection and the deletion of the program:

```
Delete program  1=YES  /  Key=NO
L_LAMP.PAB
```

Pressing the "1" key will delete the program. Pressing any other key will cancel the selection and the program will not be deleted.

2.7.7 Program Memory Occupancy

The user can display the occupied and free bits of the application memory in this menu item.

```
ASCII free / occupied : 107949 / 507039
Code  free / occupied : 107949 / 202608
```

Press any key to return to the menu.

The maximum application memory available is divided into the areas ASCII format and Code format. In the ASCII area, the programs are stored in the originally created form. For faster execution, the programs are converted from ASCII to an internal code format.

NOTE The value for "free" varies depending on the development state and the equipment!

2.8 Diagnosis

Overview of the Program Test and Diagnosis menu

After selecting this menu item, the user is offered the following choice:

```
Diagnosis
1 = Limit switch / Stand-by                →
```

```
2 = Inputs (I)
3 = Outputs (O)
4 = Flag (M)
5 = Real number register (R)
6 = Integer number register (N)
7 = CANOpen
8 = D-A converter (CANOpen)
```

2.8.1 Limit Switch / Stand-by

This menu sub-option is used to check the limit switches of the individual axes as well as the stand-by of the motor power circuits. The displays vary in this menu item depending on the configuration of PA-CONTROL, because only the available motor axes are considered. After activation of this menu item, the following is displayed:

```
Selection of axis
1 = Axis 1                                 →
```

```
2 = Axis 2
..
n = Axis n
```

Select the axis by pressing the key with the relevant axis number (1..16). Depending on the configuration of the device, selection is limited to 1, 2, 4,...,16.

The following key assignment applies for this status:

Key:	Reaction / Effect:
Arrow down	To next axis
Arrow up	To previous axis

The following will then be displayed (example for axis 2):

```
Axis  2      Limit switch positive : 1
Ready: 1     Limit switch negative : 1
```

The following assignments apply:

0 : Power circuit not ready, limit switch (opener) actuated
1 : Power circuit ready, limit switch (opener) not actuated

2.8.2 Inputs, Outputs, Flags

These menu sub-options are used to manually check or change the status of inputs, outputs and flags. After activation of these menu items, the following is displayed (example for inputs):

```
I   5:  -S01.04
I   1 →0000000000000000
```

The following assignments apply:

1st Line: The number after the "I" input corresponds to the input on which the cursor field is positioned. "-S01.04" indicates the icon name for input 5 stored in the icon file.
If the space bar is pressed, the assigned comment appears instead of the icon name, e.g. "Jog mode position 1"

2nd line: "I 1 →" means that, starting from input 1, the states of the next 16 inputs are displayed in this line. They are followed by the logic states of the inputs (0 or 1).

0: → Input cold, output or flag reset

1: → Input hot, output or flag set

Moving and actions in the display:

Key:	Reaction / Effect:
Arrow right	Cursor field one digit to the right (to next element)
Arrow left	Cursor field one digit to the left (to previous element)
SHIFT + Arrow right	Cursor on last cursor field of the row (last element)
SHIFT + Arrow left	Cursor on first cursor field of the row (first element)
Arrow down	Display next group (e.g. input 17-32)
Arrow up	Display previous group (e.g. input 1-16)
SHIFT + Arrow down	Display last group (e.g. input 2027-2048)
SHIFT + Arrow up	Display first group (e.g. input 1-16)
ENTER	Select element directly, enter the required element in the input field and display with ENTER
1	Set the output or flag on which cursor field is positioned
0	Reset the output or flag on which cursor field is positioned
ESC	Quit sub-option
Space bar	Exchange icon name in the display for comment

If you are in the display for inputs I1...16, the following option for input can be reached by means of ENTER:

```
Enter new number
   0 <=     [ 25    ] =< 2048
```

After input and confirmation of the required element number with ENTER, it will be displayed in its 16 group. This guarantees a targeted and rapid diagnosis.

The following is an example of a display for inputs 17 - 32:

```
I  25 : +8-X01.18/4
I  17 -> 0000000000000000
```

The information for diagnosis of outputs or flags is displayed in the same way.

The following is an example of a display for outputs 33 - 48:

```
O  34 : +9-a13
O  33 -> 0000000000000000
```

The following is an example of a display for flags 497 - 512:

```
M  504 :
M  497 -> 0000000100000000
```

NOTE The statuses of the outputs and flags are retained when the menu is exited! The number of actual inputs and outputs can vary depending on the equipment of the controller! See also section *1: Technical Information in brief, page 15* and section *1.4.4: Inputs and Outputs of PA-CONTROL, page 24*.

2.8.3 Real Number Register (R), Integer Register (N)

These menu sub-options are used to manually check or alter the contents of the real number and integer register. After activation of these sub-options, the following is displayed (example for real number register):

```
R   1 :Axis 1
R   1 = 2.50000
```

The following assignments apply:

1st Line: The number after "R" (real number register) is the number of the displayed register. "Axis 1" indicates the icon name for real number register 5 stored in the icon file. If the space bar is pressed, the assigned comment appears instead of the icon name, e.g. "Intermediate position in press DO"

2nd Line: R 1= 2.50000 is the content of the displayed register.

Moving and actions in the display:

Key:	Reaction / Effect:
Arrow down	Display next register
Arrow up	Display previous register
SHIFT + Arrow down	Display register number +10
SHIFT + Arrow up	Display register number -10
SHIFT + Arrow left	Last register
SHIFT + Arrow right	Display first register
ESC	Quit sub-option
Numeric key (1..9-+)	The character is applied at the first position of the displayed value (automatic activation of the input field)
Arrow right	Activation of the input field
ENTER	Conclude the input after input of a value
ENTER	Select element directly, enter the required element in the input field and display with ENTER
ESC	Cancel the input, the old value is retained
Space bar	Exchange icon name in the display for comment

See the section *2.1: The Keyboard, page 41* for the key assignment in the input field.

The input value is only transferred to the register if it is within the defined value limits (+/-8.000.000).

Example for the integer register:

```
N 465 : TEACH_hfkt. ST5
N 465 = 71
```

The following assignments apply:

1st Line:	The figure after "N" (= integer register) is the number of the displayed register. "TEACH-hfkt. ST5" indicates the icon name for integer register 465 stored in the icon file. If the space bar is pressed, the assigned comment appears instead of the icon name, e.g. "n+4 characters of string"
2nd Line:	N 4656 = 71 is the content of the displayed register.

2.8.4 CANopen

After selecting this menu item, the following messages are shown in the display:

```
CANOpen Diagnosis / Manual
1 = Display hardware configuration
```

```
2 = Reset all CAN axes
3 = Create list of current devices
```

Menu item "Display CANopen devices"

The user can view the current configuration of the axes as devices on the CANopen bus in this menu item.

Example:

The following devices were on the CANopen bus after booting PA-CONTROL:

- An LV-servoTEC with the address 1
- A PA-CONTROL-MP with the address 2 and
- An LV-servoTEC with the address 4

NOTE Only the devices which directly follow each other are transferred during booting. The LV-servoTEC with the address 4 is therefore not transferred to the configuration!

The following is displayed:

```
List of CANopen devices
Address 1 :CANopen servoTEC
```

```
Address 2 :CANOpen EP
Address 3 :-----
Address 4 : ----
```

Menu item "Reset all CAN axes"

The user has the possibility of activating a reset/cold start for the connected LV-servoTEC axes in this menu item. This resets possible errors.

Menu item "Create list of current devices"

A list of the current devices on the CANopen bus is created in this menu item. Here PA-CONTROL attempts to read the "device type" of addresses 1 to 20. The result is displayed as follows:

Example:

The following devices were on the CANopen bus after booting PA-CONTROL:

- An LV-servoTEC with the address 1
- A PA-CONTROL-MP with the address 2 and
- An LV-servoTEC with the address 4
- An unknown device at address 6

After selecting the menu item, the following message appears for approx. 2 seconds:

```
Current devices on the CANopen
--------------------    (ESC=cancel)
```

The search for the devices is activated and the following appears on the display:

```
Current devices on the CANopen
12.?...........A..   (ESC=cancel)
```

. no device

1 LV-servoTEC

2 PA-CONTROL-EP (as Slave)

A IO modules

? unknown device

2.8.5 D-A Converter (CANopen)

PA-CONTROL can operate up to 4 analog outputs (DA1 to DA4) via the CANopen bus (see section *6.3: CANopen Interface page 170*). The user can specify a new D-A value for the D-A converter in this menu item.

Example:

The value 2345 is to be specified

```
DA 1 :     2345
```

The D-A value to be output is "2345". The menu is exited by means of the ESC key.

2.9 Run Definitions

Overview of the run definition menu

Definitions for the automatic run of PA-CONTROL are set in this menu. After selecting this menu item, the user is offered the following choice:

```
           PA-CONTROL  4.xx
5 = Run definitions                 →
```

```
Start program
Program : START.PNC
```

```
Program at stop
Program start after stop
Program at malfunction
Heading
initial-state-program
```

Except for the start program, which always has to be defined, the other assignments can be optional.

NOTE The start program, program after stop, program start after stop, and program at malfunction must be different programs. In the case of double use of a program, the error message "Assignment not possible" is displayed at storage.

2.9.1 Start Program

The PA-CONTROL starts in automatic mode with this program. In principle, this program is the main program.

2.9.2 Program at Stop

Special actions (e.g. closing valves) can be carried out with this assignment when "STOP" is detected in automatic run. This program is run after the axes have been stopped.

CAUTION

In the program after stop, the set of commands has the following restriction:

1. This program may not invoke any further programs as subprograms or programs to be processed in parallel.
2. Positioning commands are not permissible in this program.
3. The commands "Wait for logical state of..." inputs, outputs and flags may not be used.
4. Any time monitoring which is still active is reset by the operating system without a message and is not reactivated at "Start".

NOTE

The following commands may not be used in the program "after STOP":

SUB, CASE.SUB
RUN, CASE.RUN
G22
Ai:=n, Ai:=Rn
G01
G25.A, G26.A
G212, G222

PA-CONTROL checks in automatic mode and generates the errors E506, E507 or E508 if an error is found

2.9.3 Program Start after Stop

If "STOP" has been activated during the automatic run of PA-CONTROL and the program is to be restarted with "START" (automatic mode has not been exited), the program "Start after Stop" will be executed before continuation of the interrupted program. This option can be used to reset actions which were triggered by a stop.

NOTE This program may not invoke any further programs as subprograms or programs to be processed in parallel. Positioning commands are not permissible in this program.

SUB, CASE.SUB
RUN, CASE.RUN
G22
Ai:=n, Ai:=Rn
G01
G25.A, G26.A
G212, G222

The PA-CONTROL checks in automatic mode and generates the errors E506, E507 or E508 if an error is found

2.9.4 Program at Malfunction

With this assignment, special actions (e.g. closing valves) can be implemented when a malfunction is detected during the program run (e.g. error messages such as value too large, power circuit not ready...).

NOTE This program may not invoke any further programs as subprograms or programs to be processed in parallel. Positioning commands are not permissible in this program.

2.9.5 Heading

The user can replace the title in the main menu "PA-CONTROL Vxx.xx" by a customised user-defined title. To do this, the user must create a text program (type: PTX) and assign this text program under the menu item "Title". The first program line of this text program is then displayed as a title in the main menu.

2.9.6 Initial-State-Program

This program will activated without changing to automatic mode.

Table of Commands they are not allowed in “initial-state-program” :

- A1:=, FA1:=, … (move of axis)
- SUB, G22, … (Subroutines)
- RUN,CANCEL,SLEEP, … (parallel tasks)

2.9.7 Activation of Run Definition

A list in alphabetical order of the possible programs of the type "PNC/PAB" is displayed after activation of these sub-options. The user can scroll through the list and select the required program with "Enter".

```
Please select !   [                    ]
Program :    1   SOLDER_MAIN.PNC
```

After selection has been made, a second confirmation is required.

If confirmation with 1=yes is not made, the "old" assignment remains in effect.

```
Apply changes ?        1=yes
```

NOTE This assignment has to be made with the utmost of care, because the complete machine run is influenced.

2.9.8 Deletion of Assignments

If the user wishes to delete an assignment (Start program,..., Text program), the assignment to be deleted must be displayed in the second line of the display. By pressing the "DEL" key, the user informs PA-CONTROL that this assignment is to be deleted. The user must confirm the action before the assignment is deleted.

```
Start program
Delete program assignment ?     1=Yes
```

2.10 Parameters

Overview of the parameter menu

After selecting this menu item, the user is offered the following choice:

```
Parameters
1 = System parameters                    →
```

```
2 = Axis parameters
3 = Edit AS-i BUS
4 = Edit servoTEC parameters
5 = drive parameters load
6 = drive parameters send
7 = drive parameters display
```

2.10.1 System- and Axis-Parameters

There are two types of parameter in PA-CONTROL, the system parameters and the axis parameters,.

The meaning of the individual parameters and their useful application is explained in section *5: Parameters, page 119*.

After entering the "System parameters" sub-option, the list of parameters is displayed as follows:

```
Parameters (definitions)
Min.val. <=: Act.val. <=Max.val.
```

The following is displayed for the first system parameter, language selection:

```
Language (1=Ger, 2=Eng, 3=Fre)
1        <=      1          =< 3
```

In this example, the set language is German.

The user can scroll through the parameter list and edit the required parameter by activating the input field by means of the corresponding numeric key or the cursor key "Arrow left". The input (altered) value must be within the min. and max. value limits, otherwise an error message is displayed after conclusion of the input. The input must be repeated or cancelled by "ESC".

Before entering the axis parameters, the user must first select the desired axis.

The submenu "Edit AS-i BUS" can only be called when one or more AS-i cards are connected. For further information on the configuration of the AS-i see section *6: Options, page 167*.

The submenu "Edit servoTEC parameters" can only be invoked if one or more LV-servoTECs are connected to PA-CONTROL via CANopen bus.

2.10.2 AS-i Parameters

After selecting this menu item, the following is displayed:

```
Edit AS-i BUS
1 = Apply actual configuration
```

```
2 = Display status
3 = Activate automatic programming
4 = Change mode
5 = Display configuration
6 = Program slave
7 = Transfer configuration to AS-i Master
```

2.10.2.1 Apply Current Configuration

```
Are you sure you want to apply the actual con-
figuration                           1=Yes
```

```
Key = no
```

2.10.2.2 Display Status

Example:

```
 OFL APF NORM PROJ Aavai Aakti LDs.0 OK
 0   0    1    1    0     1     0    1
```

OFL	:	Offline mode
APF	:	AS-i power supply is down
NORM	:	Normal mode
PROJ	:	Configuration mode
Aavai	:	Auto programming of the slave address is possible
Aakti	:	Auto programming of the slave address is active
LDs.0	:	Slave with address 0 exists
OK	:	There are no configuration errors

2.10.2.3 Activate Automatic Programming

```
 AS-i BUS Automatic slave programming
 Activated : yes (ENTER/ESC)
```

```
 Activated : no (ENTER/ESC)
```

You can toggle between yes and no by means of the Enter and the ESC key.

2.10.2.4 Change Mode

```
Protected mode (automatic)
Activated : no (ENTER/ESC)
```

2.10.2.5 Display Configuration

The configuration of the individual slaves on the AS-i bus is displayed in this menu item. You can scroll by means of the arrow keys, ESC means end.

Example:
Slave 0

```
ASi Actual : no
Activated  : yes (ENTER/ESC)
```

Example:
Slave 1

(detected and configured, 4 inputs and 4 outputs)

```
ASi Actual : yes 4E/4AI : 1100
1-1 Pro    : yes 4E/4°O : 0000
```

2.10.2.6 Program Slave

Only for changing a slave address

1.

```
ASi Slave is  Address [01]
```

2.

```
ASi Slave is   Address [1]
ASi Slave should be Address [12]
```

3.

```
ASi Slave is   Address [1]
ASi Slave should be Address [12] ENTER
```

4.

```
OK, continue with key
```

2.10.2.7 Transfer Configuration to AS-i Master

```
Transferring ASi configuration
Wait
```

```
Transferring ASi configuration
OK -> ESC
```

2.10.3 Edit servoTEC Parameters

After selecting this menu item, the following is displayed:

```
LV-servoTEC Parameters
1 = Display (all)
```

2.10.3.1 Display All

```
Display (all)
1 = Axis 1
```

```
2 = Axis 2
```

After selection of the desired axis, the user can display the current parameter values of the LV-servoTEC.

Example:

```
A1 LV-servoTEC Parameters
O (P)-No. 3500 (hex) MAXSDO = 0
```

```
O (P)-No. 3501 (hex) ACC = 10
O (P)-No. 3502 (hex) ACCR  = 200
…
O (P)-No. 3672 (hex) DRVCNFG = 0
```

Functions of the keys:

Key	Function
Arrow down	Next parameter (increment 1)
Arrow up	Previous parameter (increment -1)
SHIFT + Arrow down	Next parameter (increment +16)
SHIFT + Arrow up	Previous parameter (increment –16)
SHIFT + Arrow left	First parameter
SHIFT + Arrow right	Last parameter
ESC	Exit menu

2.11 Basic Settings

Overview of the basic settings menu

After selecting this menu item, the user is offered the following choice:

```
Basic settings
1 = Load system parameter default values→
```

```
2 = Load axis parameters default values
3 = Delete program memory
4 = Reinitialize PA-CONTROL
5 = CANopen baud rate
```

The user can set PA-CONTROL in a defined initial state by means of these functions.

NOTE On selection of these functions, all the current machine parameters will be overwritten and programs will be deleted.

These functions should only be selected by qualified and authorized personnel.

Always carry out a data backup beforehand using WINPAC or hardcopy!

Please refer to section *5: Parameters, page 119* for the values for setting the parameters.

2.11.1 Load System Parameter Default Values

The system parameters (language, PA-CONTROL address, etc.) are set to the default values (external stop input no.= 0; external start input no.= 0).

2.11.2 Load Axis Parameter Default Values

The parameters can either be set to default values for a selected axis or for all axes.

2.11.3 Delete Program Memory

All the programs in the program memory are deleted.

2.11.4 Reinitialize PA-CONTROL

PA-CONTROL is reinitialized in the following order:

- Determine the hardware configuration of PA-CONTROL
  - Number of axes, axis types
  - Number and type of IEF modules
  - Number of COM ports
  - Number of AS-i
  - Number of other hardware components
- Load default parameters (see section *5: Parameters, page 119*) as per the determined hardware configuration
- Delete complete contents of the program memory

HINWEIS External stop input no. = 0
External start input no. = 0
etc.
During this action, all flags are reset, all registers are et to 0, all programs are deleted and the parameters are loaded with the initial values.

Reinitialization of PA-CONTROL is essential in the following cases:

- For the initial start-up of the CPU4 for PA-CONTROL (carried out at IEF-Werner)
- After changing the battery on the CPU4
- Change of the hardware configuration (other cards and modules)

Example - Load System parameter default values:

The following appears on the display:

```
Load system parameter default values
1  = yes  /  Key = no
```

The user can start the boot of the system parameters by pressing the numeric key "1" or cancel the action by pressing any other key.

The user can also start this function via WINPAC (see section *2.11.5: Reinitialization for Devices without a Display and Keyboard, page 76*).

2.11.5 Reinitialization for Devices without a Display and Keyboard

Reinitialization of PA-CONTROL is also essential in the following cases:

- For the initial start-up of the CPU4 for PA-CONTROL (carried out at IEF-Werner)
- After changing the battery on the CPU4
- Change of the hardware configuration (other cards and modules)

Reinitialization can only be carried out by means of "WINPAC" and a PC via the serial port for devices with a 7 segment display.

Proceed as follows:

- Start WINPAC
- Select → "PA-CONTROL" and
- → "Reinitialize PA-CONTROL" in the "Settings" menu

NOTE During this action, all flags are reset, all registers are set to 0, all programs are deleted and the parameters are loaded with the initial values.

2.12 System Diagnosis

A further menu list is displayed after activation of this sub-option:

```
System Hardware Diagnosis
1 = Display hardware configuration    →
```

```
2 = Clock
3 = Keyboard test
4 = STOP key test
5 = START key test
6 = Key switch test
7 = Test COM port
```

2.12.1 Display Hardware Configuration

The user can call up the configuration of his PA-CONTROL in this sub-option.

```
PA-Control hardware configuration
Serial number           : 123456
```

Example:

```
PA-CONTROL Version           : 5.23
CPU Type                     : CPU 5
CPU Version                  : 2.0
ROM Size                     : 1024k*8
RAM Size                     : 1024k*8
Number of axes/AbsPoSys.     : 4/ 0
Axis types (A1)              : PLS7 V4.02.1
Profibus                     : 0
Number of AS-i Masters       : 1
Number of COMs               : 2
Number of AD converters      : 0
Interbus-S                   : 0
```

The current values are determined by the controller after reinitialization.

2.12.2 Clock

PA-CONTROL contains a battery-buffered clock module. The information for this module can be displayed and altered in this menu item.

```
Date     >DD<MM YYYY WD      Time HH MM SS
          02.05.2000 3-Wednesday 14:36:38
```

The selected element is framed by the characters > <. The individual elements (DD=day etc.) are selected by means of the keys → and ←. Information about the selected element is obtained by means of the ENTER key. It can then be modified in the input field.

2.12.3 Keyboard Test

After selection of this sub-option, the following is displayed:

```
Keyboard test, ESC = End!_
```

On actuation, the keys are shown on the display or executed according to their described function (see section *2.1: The Keyboard, page 41*). Exceptions: Arrow keys, INS, DEL, ENTER, START, STOP, ALT, CTRL.

2.12.4 Stop Key Test

After selection of this sub-option, the following is displayed:

```
Stop key test, ESC = End !
Actuated : no_
```

On pressing the stop key, the display switches from "no" to "yes". This function refers to the stop key on the front plate. The possible external stop input can be checked via diagnosis inputs.

2.12.5 System Diagnosis - Start Key Test

After selection of this sub-option, the following is displayed:

```
Start key test, ESC = End!
Start key actuated: no_
```

On pressing the start key, the display is toggled from "no" to "yes". This function refers to the start key on the front plate. The possible external start input can be checked via diagnosis inputs.

2.12.6 Key Switch Test

After selection of this sub-option, the following is displayed:

```
Key switch test, ESC = End !
is on : Program
```

On turning the key switch, the display is toggled from "program" to "automatic".

2.12.7 Test of the COM Port

The hardware connection (RS232 cable) as well as the setting of the serial port can be tested by means of this function.

After selection of this sub-option, the following is displayed:

```
Test of the COM Ports
1 = COM 1                                    →
```

The input window is switched to by means of the arrow keys or by entering a number between 1 and 4 of the port to be checked.

All characters received are output to the display. After pressing a key, they are immediately output via the port.

```
Test COM 1 (ESC=End)2211112233445566778
899aabbccddeeAABBCCDDEE
```

2.13 Communication via Modem

Communication between WINPAC and PA-CONTROL can be effected via modem. In this case, the operator can execute the following via the modem:

- Load and transfer programs
- Load and transfer parameters
- Load and transfer register values
- Diagnosis

The following functions are not available for safety reasons:

- Start / Stop of the PA-CONTROL
- Direct modification of outputs, flags and registers in PA-CONTROL
- Manual traversing of the axes of PA-CONTROL

The modem can be connected to PA-CONTROL via the diagnosis port. A remote user can access PA-CONTROL by this means. Connection can be activated by means of the menu sub-option `Activate connection` (keyboard) or using the input defined in the system parameters.

If a teleservice input has been defined (system parameters), the modem can be activated using the defined input. Depending on the setting, the service PC is called or the modem switches to reception. The connection can be started either in the main menu or during automatic run.

A defined teleservice output indicates the connection status:

- Fast flashing: PA-CONTROL is calling WINPAC (approx. 200ms)
- Slow flashing: PA-CONTROL is waiting for call (approx. 1 sec)
- Continuous light: Connection between PA-CONTROL and WINPAC has been established

2.13.1 Overview of the Modem Menu

After selecting menu item 9, the user is offered the following choice:

```
Modem
1 = Activate connection          →
```

```
2 = Display connection status
3 = Terminate connection
4 = Edit modem settings
5 = Select modem connection type
```

2.13.2 Activate Connection

```
Are you sure you want to activate modem
communication ?     1 = yes  / key = no
```

Once the modem has been connected and switched on, press key 1.
The connection is set up - the steps which are carried out are shown in the status display.

```
Status Communication via modem
7: Init OK, waiting for call
```

Any problems are indicated by the corresponding status number and a plain-text message, e.g.:

```
Status Communication via modem
17 : Error: modem not ready
```

Normally, the next message to be displayed is:

```
Status Communication via modem
8 : Call arrived, waiting for connect
```

After the connection has been successfully set up, the following is displayed:

```
Status Communication via modem
9: Connected, OK
```

The user must now return to the main menu by means of the **ESC** key, so that the modem communication can ensue without restriction.

```
           PA-CONTROL  5.xx
1 = Automatic                        →
```

2.13.3 Display Connection Status

The current status is indicated by the corresponding status number and a plain-text message.

```
Status Communication via modem
9: Connected, OK
```

2.13.4 Terminate Connection

If a connection is active, the following is displayed:

```
Terminate modem communication ?
1 = yes  /  Key = no
```

If there is no connection at this time, the following is immediately displayed:

```
Status Communication via modem
0: not activated
```

2.13.5 Edit Modem Settings

```
Modem: Connection type
: Extension
```

In this menu, the user can select the modem commands for the initialization of his modem using the ↑ ↓ keys.

The settings can be edited by means of the → key. You will need the manufacturer's specifications for the modem.

If modems supported by PA-CONTROL are used (refer to "Select modem type"), the initialization string is generated by PA-CONTROL.

```
Modem: Initialising
: AT&FX3S0=1
```

The initialisation string is transmitted to the modem when it is called. Refer to the operating instructions of the modem for details of the initialization commands. The initialization string can be extended depending on the type of telephone installation.

```
Modem:PA-CONTROL will call service PC(1=yes)
: 0
```

If PA-CONTROL is to call a service PC, select "**1**". PA-CONTROL initializes the modem and automatically dials the specified number of the service PC. If PA-CONTROL is to a call from the service PC, "**0**" is set, the modem is initialized and waits for an incoming call.

```
Modem: Service PC tel. no.
:07723-925180
```

If the PA-CONTROL setting is "PA-CONTROL will call service PC" = 1, the number specified here is called.

The command string is sent to the modem before the telephone number (refer to the manual of the modem manufacturer).

```
Modem: Dial prefix
: ATDT0W
```

The command string is sent to the modem after the telephone number (refer to the manual of the modem manufacturer).

```
Modem: Dial suffix
:
```

2.13.6 Select Modem Type

The basic settings for the recommended modems are stored for modem communication.

```
Are you sure you want to select another
connection type?     1 = yes / key = no
```

A list of modems recommended by us is displayed by pressing key **1**.

```
List types (connection type)
1 = User defined
```

```
2 = Public exchange connection
3 = Extension
4 = Extension, internal connection
```

Only analog modems are supported.

2.13.7 Examples of Communication Setup Sequences

Communication Example: Service calls customer (WINPAC → PA-CONTROL)

Service person with PC and WINPAC	Customer with PA-CONTROL
Set up connection from PC to the telephone network via modem and switch on the device. Select modem type Edit connection data (name, telephone number)	Connect PA-CONTROL to the telephone network via modem Execute modem settings "1 = activate connection" or make a remote connection using teleservice input.
Wait until customer is ready with PA-CONTROL	
"Select connection" using WINPAC (red telephone) and wait until message "Connected" (green LED) is displayed	
	The following message appears on the display of PA-CONTROL: Status communication via modem 9: Connected, OK The assigned output is permanently active with teleservice
PA-CONTROL can now be accessed via WINPAC.	If necessary, exit this menu item to allow all access options via WINPAC

Disconnection can be executed via WINPAC or PA-CONTROL (3=terminate connection or teleservice input).

Communication Example: Customer calls service (PA-CONTROL → WINPAC)

Customer with PA-CONTROL	Service person with PC and WINPAC
Connect PA-CONTROL to the telephone network via modem Execute modem settings (normally only needs to be carried out once)	Set up connection from PC to the telephone network via modem and switch on the device. Select modem type Activate WINPAC "Wait for call"
Wait until programmer is ready with WINPAC	
"1 = activate connection" or make a remote connection with teleservice input.	Wait for a connection
The following message appears on the display of PA-CONTROL: Status communication via modem 9: Connected, OK The assigned output is permanently active with teleservice	
If necessary, exit this menu item to allow all access options via WINPAC	PA-CONTROL can now be accessed via WINPAC.

Disconnection can be executed via WINPAC or PA-CONTROL (3=terminate connection or teleservice input).

3 Commands of the PA-CONTROL-Family

The commands of the PA-CONTROL-family are led from the document version from September 2008, exclusively in the Programmer's Manual named:

"MAN_EN_1086949_PAC_ProgrammersManual.pdf"

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4 Startup

4.1 Important Information

PA-CONTROL may only be operated in combination with motors approved by IEF-Werner. The earthing connection of the controller and the motors must be executed correctly. The cables and lead wires used must comply with EN60204.

All power lines and signal lines must be shielded. The shielding must have low impedance (large surface connection). Warranties for trouble-free operation only apply if original IEF cables are used.

Control cables and power cables must be laid separately at a minimum distance of 10 cm apart. Electrical connections on the device may only be disconnected in a no-voltage condition.

NOTE Installation and startup may only be carried out by qualified personnel in accordance with EN60204.

4.2 Installation of a PA-CONTROL

Ambient conditions such as temperature, dirt or humidity influence the perfect operation of PA-CONTROL. Limit values (temperature 0°C to 40°C) and certain conditions must be considered for the installation of PA-CONTROL. PA-CONTROL may not be placed near strong electric or magnetic fields (e.g. welding transformer) or be subject to mechanic interferences (e.g. vibrations).

Ensure that air can circulate freely (air inlet and outlet ports must be kept free, see section *Installation in a System Rack, page 37*).

NOTE Safety instructions must be followed to the letter (see section *Installation in a System Rack, page 37*).

WARNING

Protection from electric shock! The controller must be installed in accordance with EN 60204, in order to prevent personnel from coming into direct contact with it.

NOTE The fitting dimensions and instructions are described in the sections *1.4.5: Outside Measurements of PA-CONTROL Single, page 33* to *1.4.8: Outside Measurements of PA-CONTROL Steuer 19", page 36*.

4.3 Wiring of the Connections

Please refer to the section *7: Technical Appendix, page 232* for the assignment of the individual connectors. Connection examples for the individual connectors are also shown there.

The following connections must be made.

The grey fields indicate the connections which have to be made.

		Required	Important	Optional
PE conductor				
Power supply 230VAC				
Motor				
Rotary encoder				
Brake				
Limit switch				
IEF wiring module				
Inputs /outputs				
Stop input				
External 24V for I/O				
Diagnosis line				
IEF control console				
Profibus DP				
AS-i Master				
COM1,2,3,4				
A-D converter				

Original IEF cables must be used to ensure trouble-free operation. Furthermore, EMC-compatible screw connections (e.g. on motors) and EMC-compatible Sub-D housings (metallized) must be used.

WARNING

The housing <u>must</u> be connected to the PE conductor!

CAUTION

Connectors may only be inserted or removed in a no-voltage condition.

4.3.1 Wiring Structure of the PA-CONTROL Single

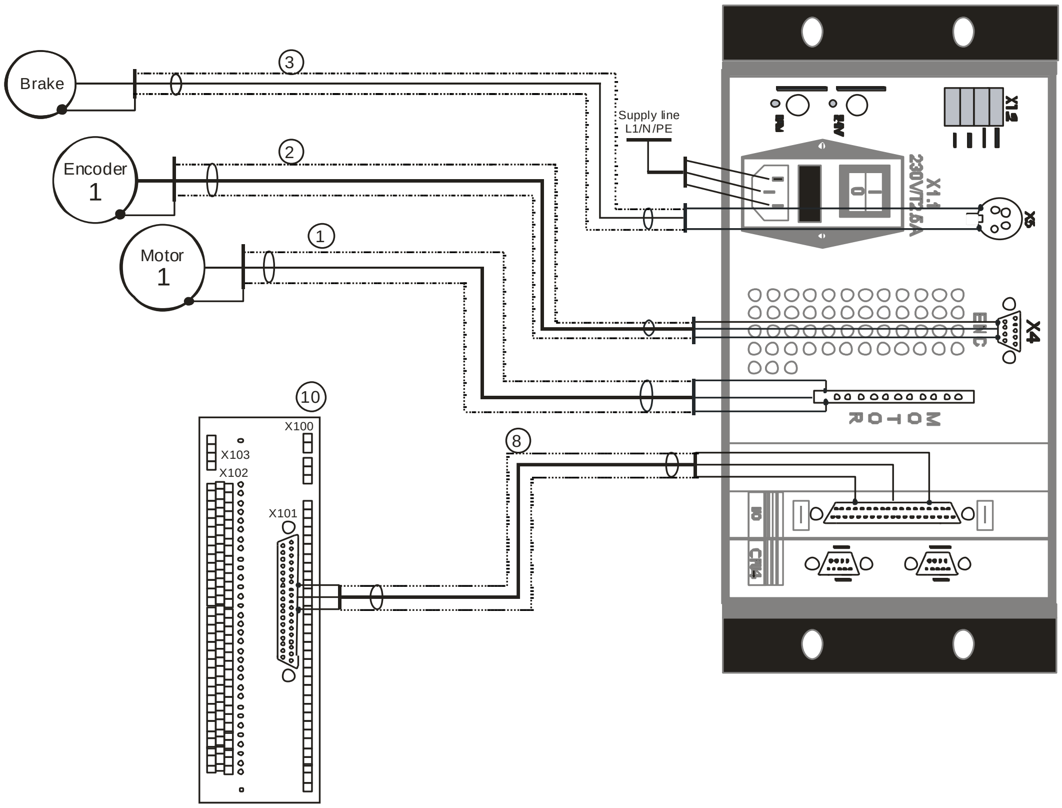


BILD306E

Figure 11: Wiring of the PA-CONTROL Single

4.3.2 Wiring Structure of the PA-CONTROL Compact

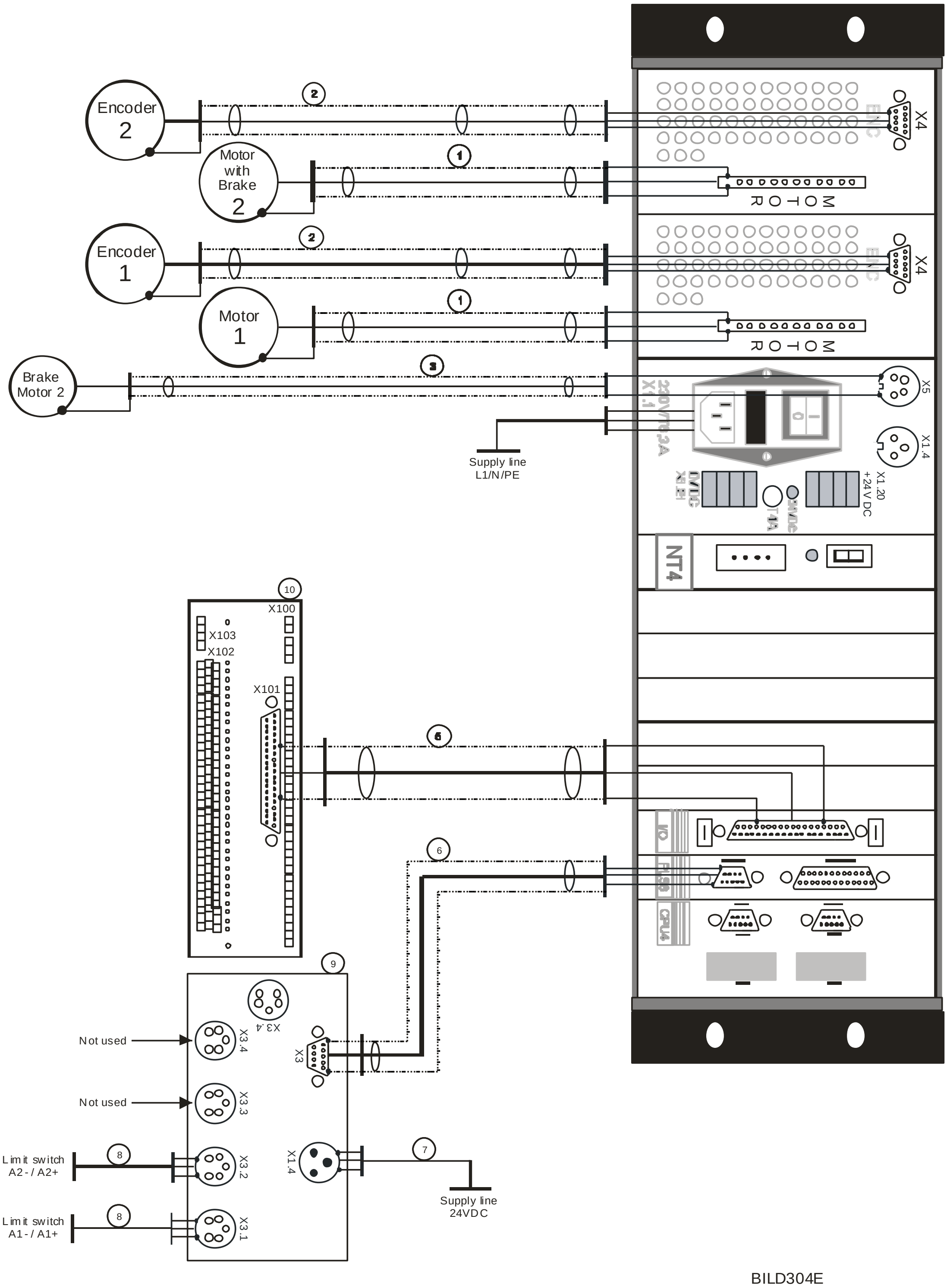


Figure 12: Wiring of the PA-CONTROL Compact

4.3.3 Wiring Structure of the PA-CONTROL Steuer

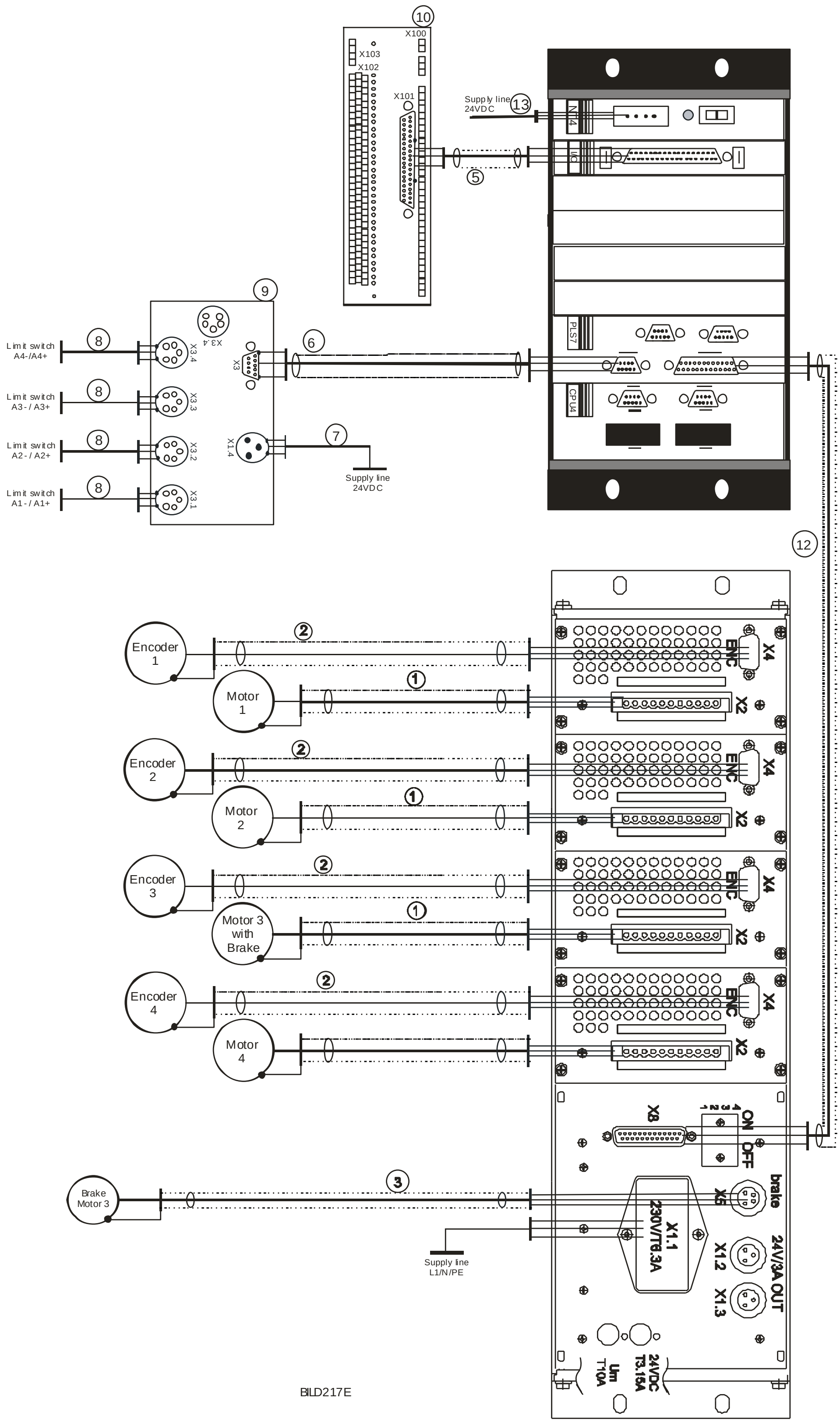


Figure 13: Wiring of the PA-CONTROL Steuer

4.3.4 List of Components

Axis wiring

PG-No. (Part Group Number): 1000063

No.	Description	Standard length 3m		Special length Xm	
		without connector	with connector	without connector	with connector
1	Motor cable 2 ph. up to 8A				
	Motor cable 2 ph. up to 12A				
	Motor cable 3 ph.				
	Motor cable 5 ph.				
8	Limit switch cable				
3	Brake cable				
2	Encoder cable				
6+7+9	Limit switch distributor box				
12	Control line				

IO wiring

PG-No.: 1000050

No.	Description	Standard length 3m		Special length Xm	
		without connector	with connector	without connector	with connector
5	IO cable				
10	Wiring module Type Varioface				

Options

PG-No.: 1000300

Option	A-D converter; 12 bit, twofold
Option	A-D converter; 12 bit, eightfold
Option	RS 232 port COM3
Option	RS 323 port driver COM2/COM4
Option	AS-i Master Interface
Option	Interbus S Slave Interface
Option	Profibus DP Slave Interface
Option	Additional IO card

4.4 Connector Assignments

4.4.1 Inputs and Outputs

4.4.1.1 Inputs and Outputs for PA-CONTROL Single

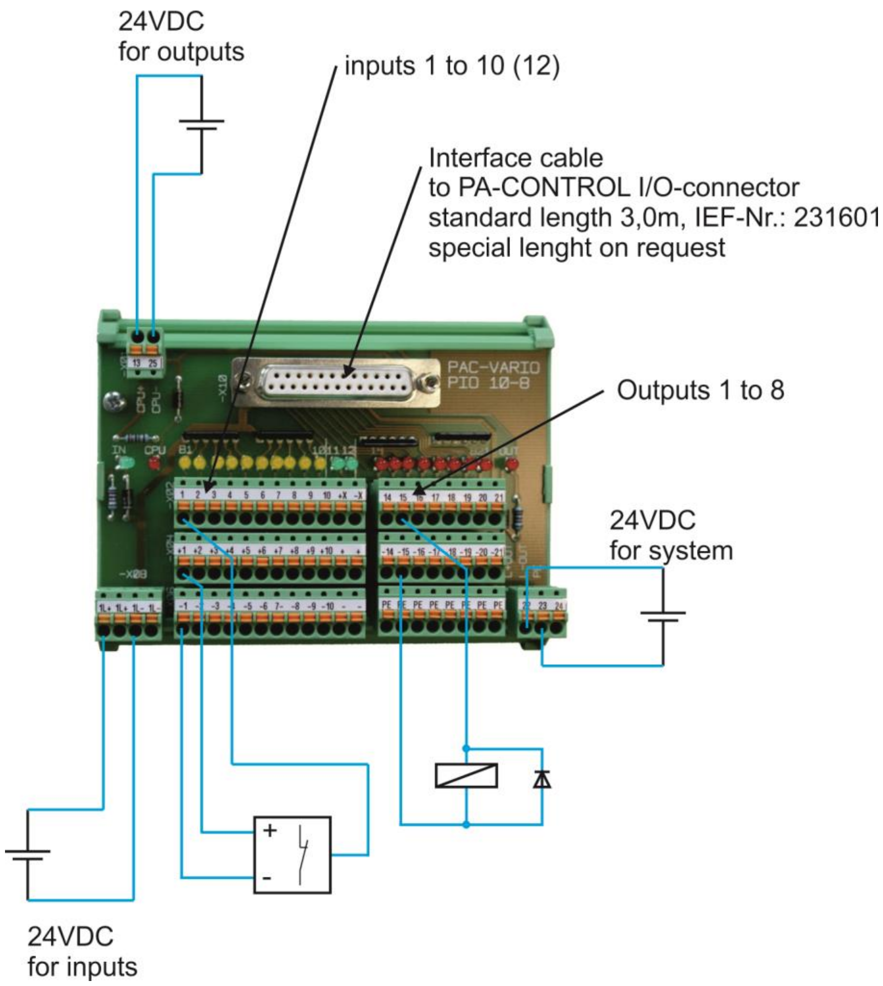


Figure 14: Assignment of inputs and outputs for PA-CONTROL Single

NOTE Inputs 15 and 16 are used for limit switches -X and +X in PA-CONTROL Single.

4.4.1.2 Inputs and outputs for PA-CONTROL Compact/Steuer

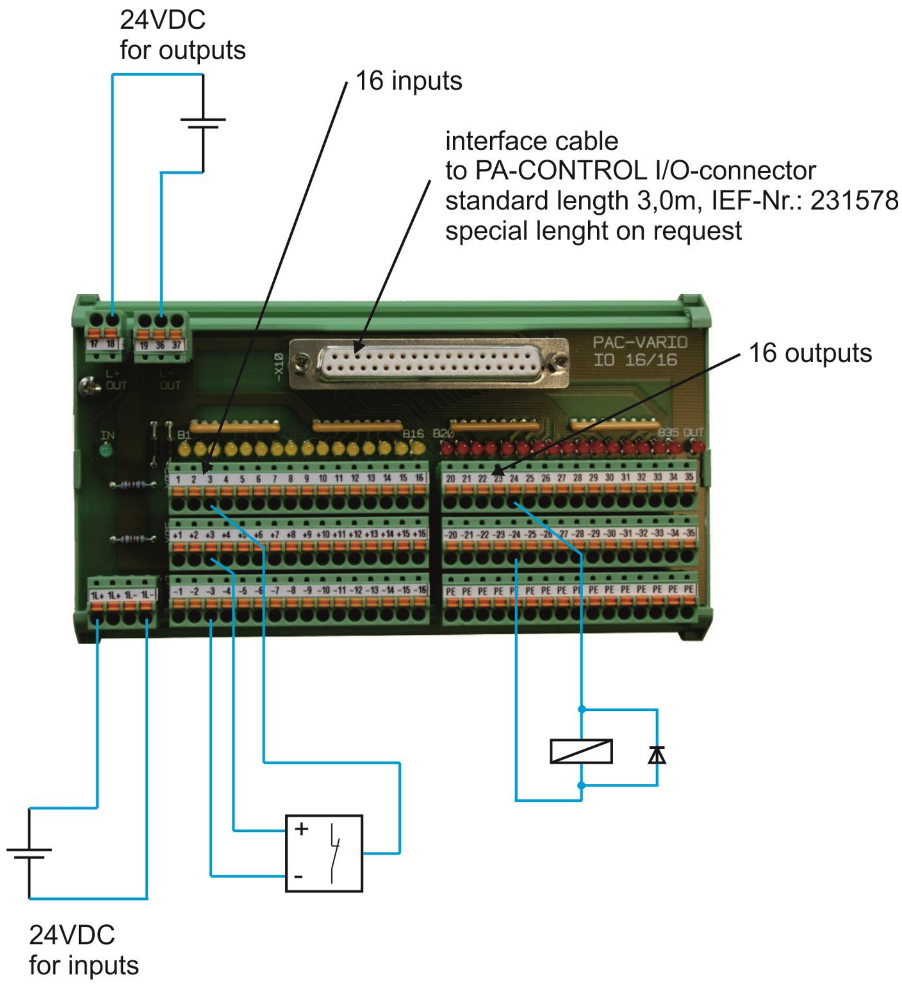


Figure 15: Assignment of the I/O`s for PA-CONTROL Compact / Steuer

4.4.2 Limit Switches for PA-CONTROL

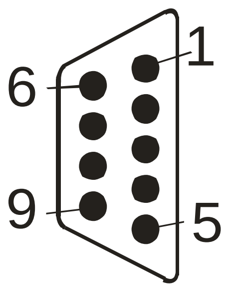
4.4.2.1 Limit Switches for PA-CONTROL Single

The limit switches are connected to the I/O card in this device. Refer to inputs/outputs for PA-CONTROL Single, section *7: Technical Appendix, page 232* and circuit diagrams.

4.4.2.2 Limit Switches for PA-CONTROL Compact/Steuer

The limit switches are connected to the limit switch box in these devices. The limit switch box is connected to the PLS6 card in the PA-CONTROL Compact via a cable. The limit switch box of the PA-CONTROL Steuer is connected to the PLS7.

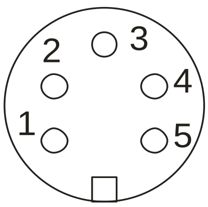
See also section *7: Technical Appendix, page 232* and the standard circuit diagrams.



Connector Assignment	Limit switch	PLS6	PLS7
	1	Limit switch A1 +	Limit switch A1 +
	2	Limit switch A1 -	Limit switch A1 -
	3	Limit switch A2 +	Limit switch A2 +
	4	Limit switch A2 -	Limit switch A2 -
	5		Limit switch A3 +
	6		Limit switch A3 -
	7		Limit switch A4 +
	8		Limit switch A4 -
	9	GND	GND

Figure 16: Connector Assignment Sub-D, 9 poles; pins

Limit switch box:



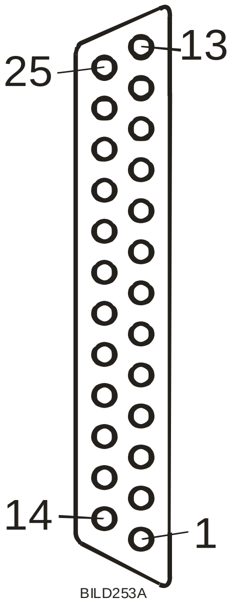
	1	24VDC
	2	Limit switch -
	3	GND
	4	Limit switch +
	5	N.C

Figure 17: Connector Assignment 5 poles; jack

4.4.3 PA-CONTROL Steuer PLS7 / PLS9 Control Line

The stepping motor output stages of the PA-CONTROL Steuer are mounted in an external device, e.g. LV-UNIT. Triggering of the external output stages is executed via pulse and direction signals of the PLS7/PLS9. A stand-by input is available for the feedback of the output stages.

PLS7 / PLS9:



1	+ Pulse A1	14	- Pulse A1
2	+ Direction A1	15	- Direction A1
3	+ Pulse A2	16	- Pulse A2
4	+ Direction A2	17	- Direction A2
5	+ Pulse A3	19	- Pulse A3
6	+ Direction A3	19	- Direction A3
7	+ Pulse A4	20	- Pulse A4
8	+ Direction A4	21	- Direction A4
9	+Reset (LV servoTEC) [1)]	22	not assigned
10	-Reset (LV servoTEC) [1)]	23	not assigned
11	+Enabling (LV servoTEC) [1)]	24	+ Stand-by
12	**-**Enabling (LV servoTEC) [1)]	25	- Stand-by
13	not assigned		

[1)] These signals are not assigned in the PLS7

Figure 18 : Connector Assignment Sub-D, 25 poles; socket

The control signals are opto-decoupled and correspond to the RS422 signal level. The signal stand-by must be executed as a potential-free relay contact. In the PLS9, the two outputs (reset, enabling) are automatically specified exclusively by the operating system. They can be used as an enabling signal and as a RESET for Pulse Connect for a servo amplifier (see section *5.7.1.1: Release Mode, page 134*).

4.4.4 Diagnosis Port

Figure 19: Front Plate of PA-CONTROL

Diagnosis port at bottom left:

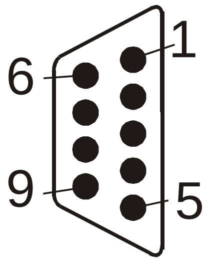
	1	DCD, Reception level
	2	RXD, Receive Data
	3	TXD, Transmit Data
	4	DTR, Terminal ready
	5	GND
	6	N.C.
	7	RTS, switch on transmitter
	8	CTS, ready for transmission
	9	RI, incoming call

Figure 20: Diagnosis Port, Sub-D, 9 poles; pins

NOTE The assignment corresponds to the asynchronous standard of the RS232 port. A shielded line must be used to ensure the troublefree exchange of data.

4.4.5 Rotation Monitoring

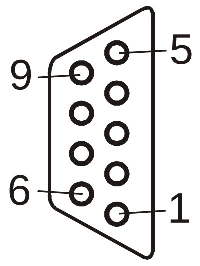
 BILD251A	1	A
	2	+5V / 100mA
	3	NC
	4	NC
	5	/B
	6	/A
	7	+5V / 100mA
	8	GND
	9	B

Figure 21: Connector Assignment, Sub-D, 9 poles; socket

4.4.6 Motor Connector

4.4.6.1 Motor Connector for 2 Phase Stepping Motors

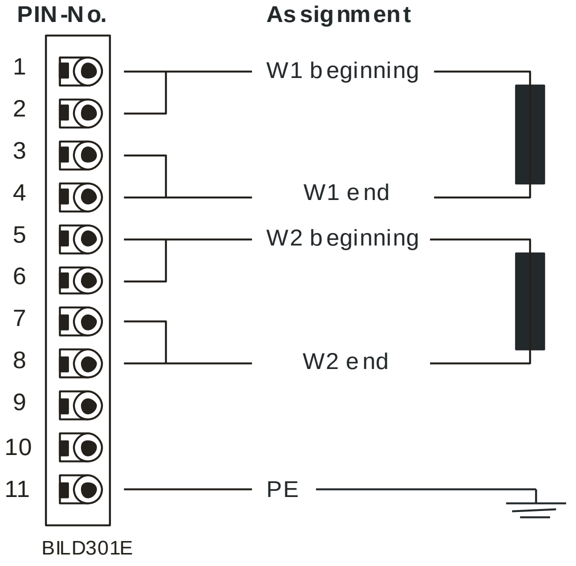


Figure 22: Contact Assignment for 2 Phase Stepping Motor

4.4.6.2 Motor Connector for 3 Phase Stepping Motors

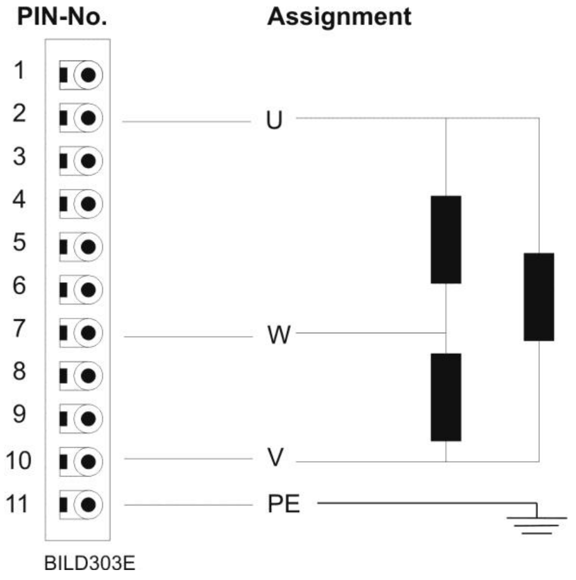


Figure 23: Contact Assignment for 3 Phase Stepping Motor

CAUTION

Connectors may only be inserted or removed in a no-voltage condition.

4.4.6.3 Motor Connector for 5 Phase Stepping Motors

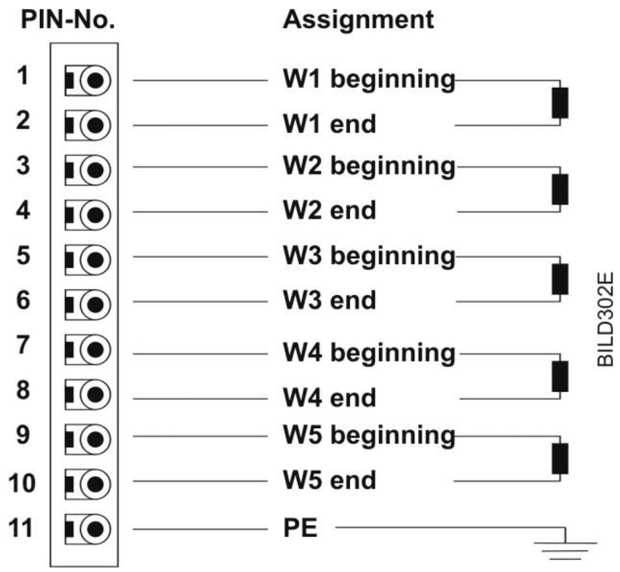


Figure 24: Contact Assignment for 5 Phase Stepping Motor

CAUTION

Connectors may only be inserted or removed in a no-voltage condition.

4.4.7 Brake Connector

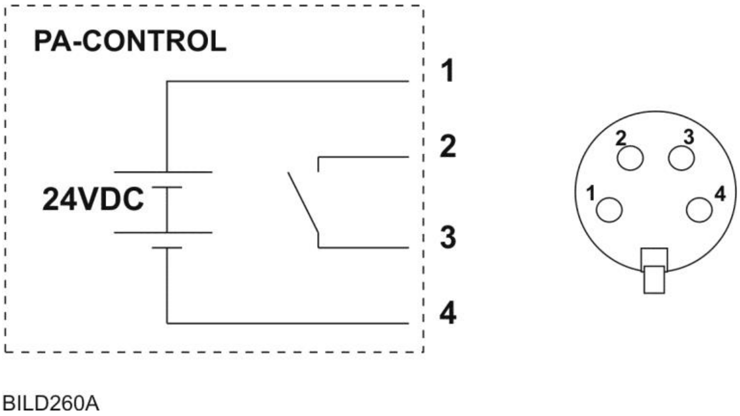


Figure 25: Connector Assignment, Assignment of Socket X5 for the Brake

Brakes can be controlled by an internal or an external supply voltage. In the following example, control is effected via the internal supply voltage (24VDC OUT) with a maximum current of 1A in the brake coil.

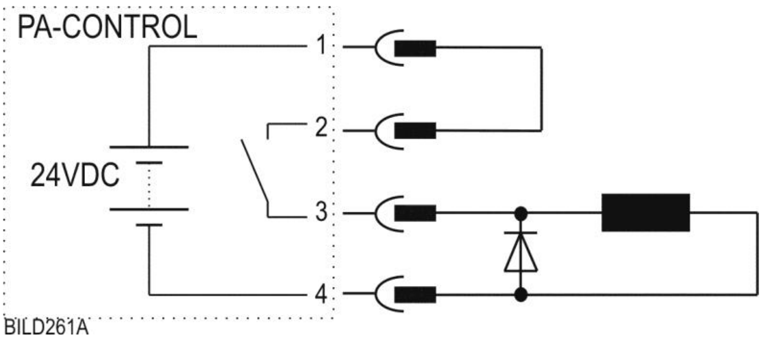


Figure 26: Circuitry of Socket X5 for the Brake using the internal Power Supply

CAUTION

Connectors may only be inserted or removed in a no-voltage condition.

4.4.8 COM1 RS232

4.4.8.1 COM1 Port

COM1 is a serial asynchronous port of the type RS232 and is always available on the CPU4 The port can be set by the user within a wide range of limits. Other devices in the plant can be communicated with in automatic mode by means of this port.

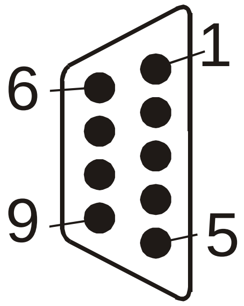
	1 N.C. 2 RXD, Receive data 3 TXD, Transmit data 4 N.C. 5 GND 6 N.C. 7 RTS, switch on transmitter 8 CTS, ready for transmission 9 N.C.

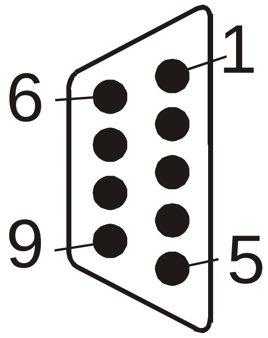
Figure 27: Connector Assignment for COM1: Sub-D, 9 poles; pins

The assignment corresponds to asynchronous standard RS232.

NOTE A shielded line must be used to ensure the troublefree exchange of data.

4.4.9 CAN Bus

Communication with other devices is possible via the CAN bus, e.g. LV-servoTEC.



1 N.C.
2 CAN_L
3 CAN_GND
4 N.C.
5 N.C.
6 (GND)
7 CAN_H
8 N.C.
9 (CAN_V+)

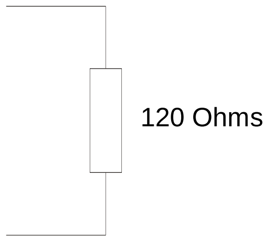


Figure 28: Connector Assignment for CAN bus, Sub-D, 9 poles; pins

NOTE DIN ISO 11898 must be complied with when the CAN bus is installed.

4.4.10 Profibus Option

PA-CONTROL can be integrated in a Profibus network by means of the Profibus option. Please refer to the "Profibus documentation" for further information.

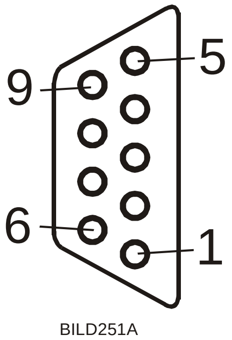
	1 N.C. 2 N.C. 3 B 4 RTS***** 5 GNDO***** 6 +5V***** 7 N.C. 8 A 9 N.C.

Figure 29: Connector Assignment for Profibus: Sub-D, 9 poles; socket

***** These signals are required if signal amplification is necessary owing to a bus extension.

It is advantageous if a terminating connector with integrated resistances and a selector switch is used, because the Profibus DP lines must be terminated with resistances at the beginning and end ("ON" position, see *Figure* , below). The bus line to terminals "A and "B is also dis-connected in this position. The switch is in the "OFF" position at all other nodes of the Profibus DP system, i.e. the signal is relayed to 2A/2B by 1A/1B.

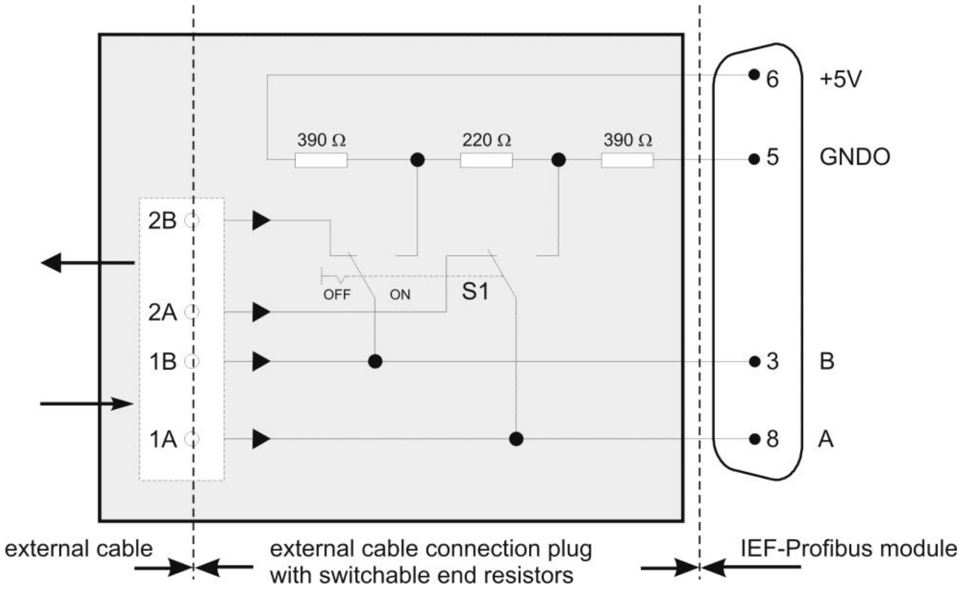


Figure 30: External Connection Circuit (integrated in the Connector)

NOTE EN 50170 and the Profibus-DP installation guidelines must be complied with when the Profibus option is installed.

4.5 Current Setup of the Stepper Motors

WARNING

The maximum phase current of the motors (see type plate) may not be exceeded.

If possible, the lowering of the current with 2-, 3- and 5-phases stepper motors should be used. Thus the thermal load of the motors sinks.

The current setup is made according to the regulations of the manufacturer directly at the inserted stepping motor final stage by a rotary switch. With the PA CONTROL Single the front plate must be removed, with the PA CONTROL Compact the exhaust element must be removed therefore. With the PA CONTROL Steuer the current setup must be executed directly at the external stepping motor final stages.

The setup of the phase current, stepper angle etc. will be described in section *7: Technical Appendix, page 232* and further.

CAUTION

Consider the safety regulations absolutely (see section *1.3: Safety Instructions, page 19*).

4.6 Function and Status Check

4.6.1 Functional Check of the Device via Keyboard

The inputs and outputs of PA-CONTROL can be checked using the sub-menu item "Diagnosis" (see section *2.8: Diagnosis, page 60* for a description).

The following checks must be carried out without fail:

Check	Menu item
Limit switches	Diagnosis → Limit switches, Stand-by
Inputs	Diagnosis → Inputs (I)
Outputs	Diagnosis → Outputs (O)
Motor control	Manual

4.6.1.1 Parameter Settings

Please refer to section *5: Parameters, page 119* for the parameter settings.

CAUTION

The parameters must be checked in accordance with the prevailing conditions!

4.6.1.2 Creating a PNC Program

The main menu must be exited to create a new PNC program. The PA-CONTROL program editor opens after selection of the menu items "Programming → Create new program (*see section 2.7.2: Create New Program, page 57*)" and entry of a program name of the type *.PNC.

An example of a simple PNC program, which carries out a small test on the A1 axis, is shown below.

The PNC program is to execute the following functions:

- Approach to reference point with axis A1
- Set the absolute measuring system
- Set positioning speed to 500 mm/s [AE/S]
- Traverse with axis A1 to position 100
- Wait 2 seconds
- Traverse with axis A1 to position 10, wait 1 second

The program will be named "EXAMPLE":

CAUTION

Check without fail that the program can be executed on the machine in question!

Use the following keys in the program editor to create this program:

Program: EXAMPLE

Program: Entry by pressing the keys:

G90.A1	G	9	0	ENTER						
G25.A1	G	2	5	.	A	1	ENTER			
FA1:=500	F	A	1	:	=	5	0	0	ENTER	
A1:=100	A	1	:	=	1	0	0	ENTER		
T200	T	2	0	0	ENTER					
A1:=10	A	1	:	=	1	0	ENTER			
T100	T	1	0	0	ENTER					
END	E	N	D	ENTER						

The program input is concluded and exited by pressing the "ESC" key and then confirming storage of the program.

ESC

- End editor: Enter "**1**"
- Store program: Enter "**1**"

If errors or incorrect commands were input during the program input, relevant error messages are output to the display.

These errors must be remedied, otherwise the program cannot be stored.

4.6.1.3 Specification of the Start Program

Before a created program can be processed, PA-CONTROL must be informed about which PNC/ PNX/ PAB program is to be used to start the automatic run.

This is specified in the menu item "Run definition → Start program" (see section *2.9.1: Start Program, page 66*).

4.6.1.4 Program Execution

PA-CONTROL must be switched to automatic mode to run a program (main menu 1st line). The program is executed after pressing the start key. It can be stopped by means of the stop key.

The following is displayed during the program run:

1st line: Program name

2nd line: Current program line number with the commands

Example:

```
EXAMPLE
1 G90.A1
```

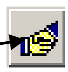
The program EXAMPLE from Section 4.6 executes the following steps:

Display (2nd line)	Execution of PA-CONTROL
G90.A1	The following positionings are executed in the absolute dimension system.
2 G25.A1	PA-CONTROL performs an approach to reference with axis A1.
3 FA1:=500	The traversing speed of axis A1 is set to 500 AE/sec.
4 A1:=100	PA-CONTROL moves with axis A1 to position 100.
5 T200	PA-CONTROL waits 2 seconds before the next command is executed.
6 A1:=10	The PA-CONTROL moves with axis A1 to position 10.
7 T100	PA-CONTROL waits 1 second before the next command is executed.
8 END	The automatic run is ended.

PA-CONTROL returns to the main menu.

4.6.2 Functional Check of the Device with WINPAC

The following information is provided to ensure that start-up is executed in a suitable sequence without danger for man or machine.

Check installation	In a no-voltage condition
Check protective conductor system	Protective conductor measurement to EN50178
Connect PA-CONTROL to PC and start WINPAC	The correct PC port must be entered in the WINPAC program.
Switch on 24V supply for inputs/outputs	When using the IEF wiring module, the LEDs IN (green) and OUT (red) are lit.
Switch on AC input power supply	
Connect the PC and PA-CONTROL via the manual button	 Button in the "WINPAC" menu bar. If the connection was successful, the message "ONLINE" appears at the bottom edge of the screen.
Create a project folder	
Apply hardware configuration from PA-CONTROL	
Set and transfer parameters	See section *5: Parameters, page 119*.
Check inputs/outputs and test stop input	See section *5: Parameters, page 119*. These inputs can be used as an option
Traverse axes manually	See section *2.6.2: Move Axes manually via Front Plate, page 53.*
Put optional subassemblies into operation.	See documentation of the subassemblies.
Create program and transfer to PA-CONTROL	See Programmer's Manual for programming tips (File "MAN_EN_1086949_PAC_Programmers Manual.pdf").

Good luck!

4.6.2.1 Creating a Project Folder

After wiring has been completed and the connections checked, the controller can be put into operation via "WINPAC", the program development system for PA-CONTROL.

To do this, a current project folder must first of all be created.

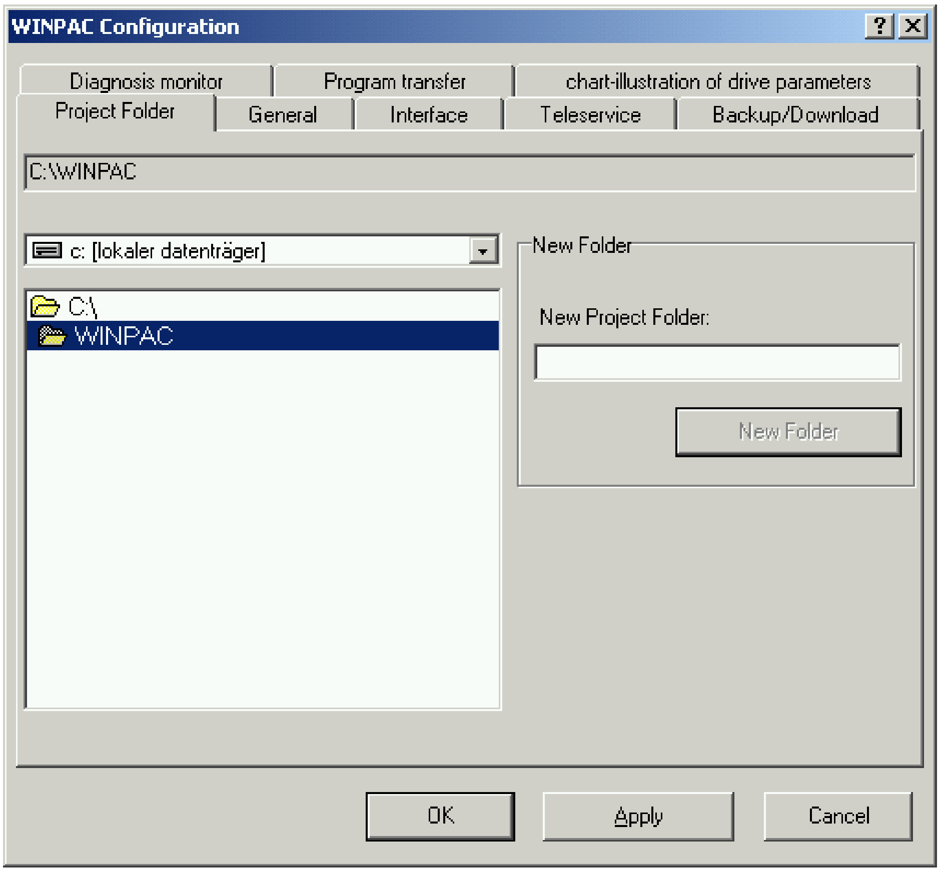


Figure 31: WINPAC, Setting the Project Folder

General settings for the configuration of WINPAC are stored in the new project folder.

For more information, see WINPAC-online help.
For this purpose, click the help tab, select manuals and open the desired manual.

4.6.2.2 Parameters of PA-CONTROL

After a project folder has been successfully created, the configuration and the parameters must be loaded from PA-CONTROL. The following are then set:

- Axis parameters,
- Traversing parameters,
- Motor parameters

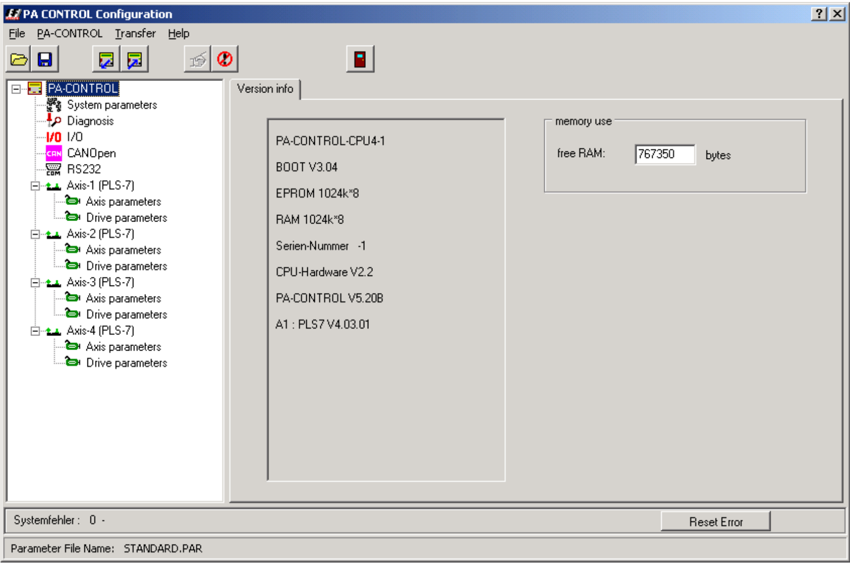


Figure 32: Main Screen, Setting the PA-CONTROL Parameters

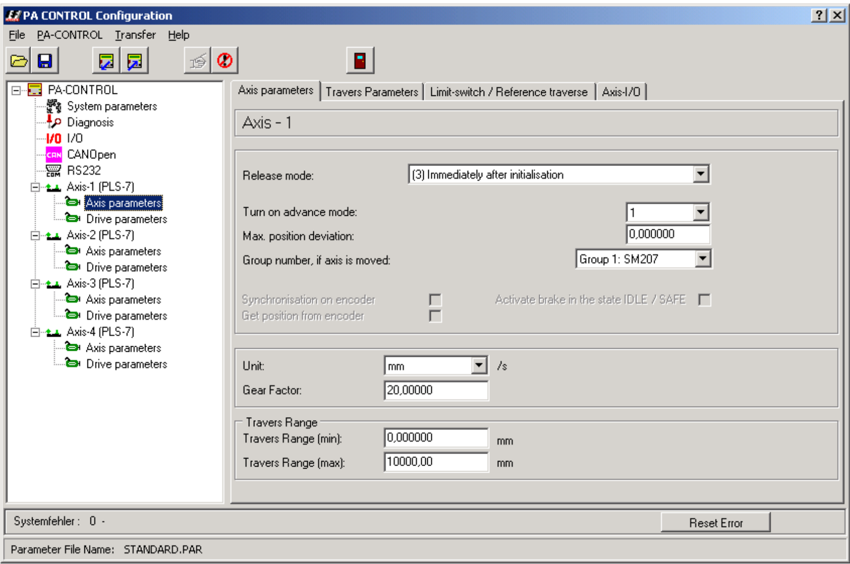


Figure 33: Setting the Axis Parameters

Refer to section *5: Parameters, page 119* for a description of the individual parameters.

After the desired parameters have been set, a connection to PA-CONTROL must be set up, in order to transfer the set parameters.

4.6.2.3 Function and Status Check

The function and status check is carried out by means of the program development system WINPAC or the optional IEF control console.

By means of WINPAC, you can check the following points for their function, value and status via the "Diagnosis" sub-menu:

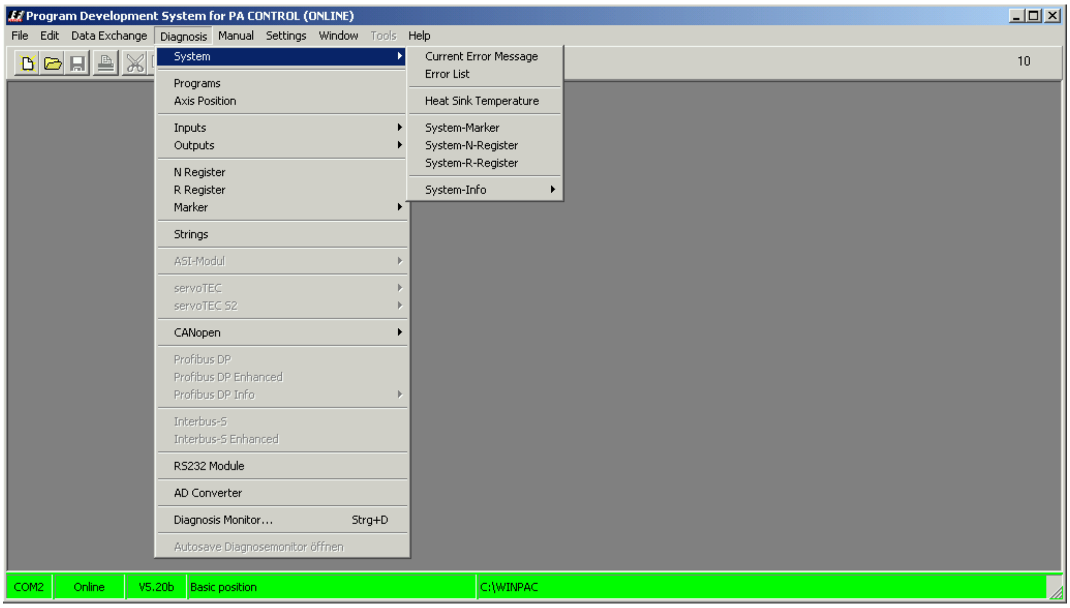


Figure 34: Diagnosis of PA-CONTROL

Function check:

- Programs
- Manual traversing
- System inputs (functions of the limit switches)
- Error message

Status check: (“0” “OFF“ or “1“ “ON“)

- Inputs
- Outputs (can be changed with right mouse button)
- Flags (can be changed with right mouse button)

Value check:

- N register (integer register)
- R register (real number register)

CAUTION

Ensure that no danger to the machine or personnel can arise if an output is incorrectly set or the drive does not move as intended.

CAUTION

Before the initial start-up of the motor, the function and position of the axis limit switches must be checked to ensure that they are correct.

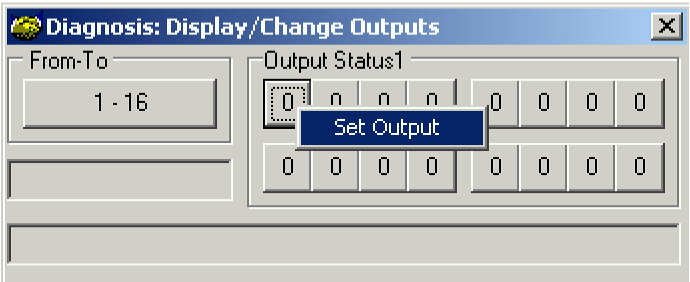


Figure 35: Changing an Output, Setting

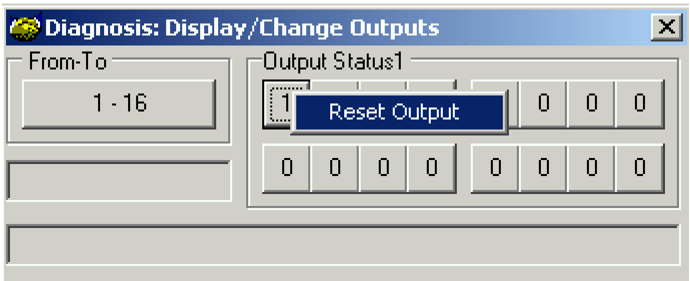


Figure 36: Changing an Output, Resetting

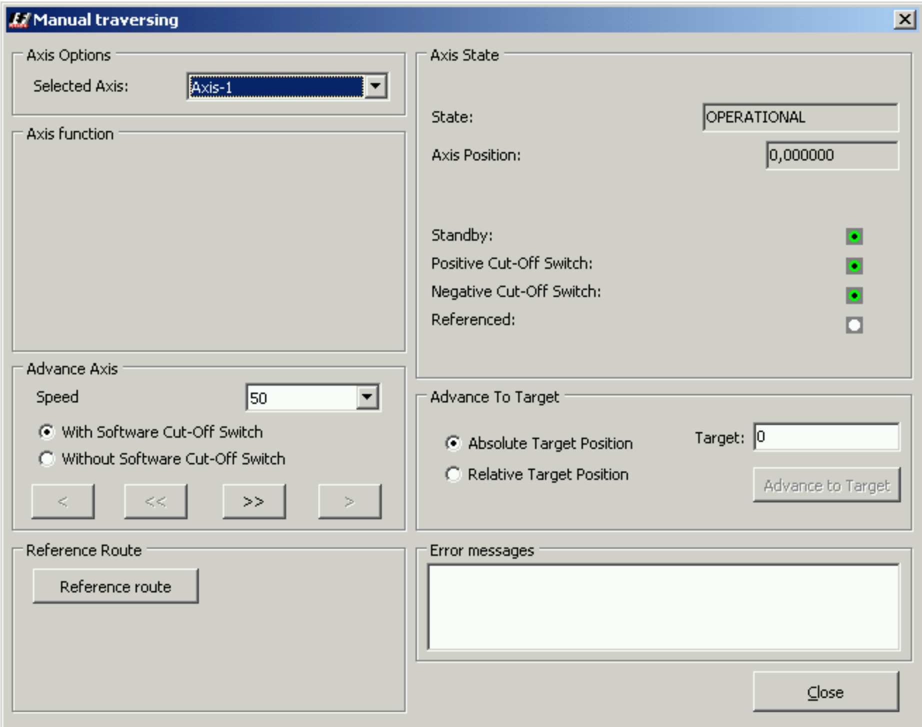


Figure 37: Example: Manual Traverse of an Axis

The motor can be manually moved continuously to the left or the right by clicking the two buttons << and >> with the left mouse button. The axis can be moved within the range of the two axis limit switches.

4.6.2.4 Error Diagnosis

Errors which occur during operation or start-up are stored in PA-CONTROL and can be read out and printed under WINPAC.

See *Figure 34, page 114* in this section.

4.6.2.5 First Help

The table below is for "First help". Depending on the conditions of use, there may be other causes of malfunctions.

Error	Possible Cause
No connection to PA-CONTROL possible	Diagnosis cable defective/not plugged in
	Incorrect PC port set in the project parameters in WINPAC
	PA-CONTROL is not switched on
Motor does not turn	Mechanical problems
	Motor cable not plugged in
	Motor incorrectly connected
	Limit switches A1+/A1- not active/transposed
	Axis is at limit switch
	Brake not opened
	Incorrect motor parameters
Motor stops after only a few steps	Motor incorrectly connected
	Rotary encoder not/incorrectly connected
	Axis is at limit switch
No connection to I/O level	I/O cable not plugged in or is defective
	Connect and/or check external 24V supply for I/O level
	IEF Vario module defective

Please refer to section *7: Technical Appendix, page 232* for further information on error messages.

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5 Parameters

5.1 General Information on Parameters

PA-CONTROL has several types of parameters:

- System parameters:
  Parameters that concern the general system, such as user language, serial port, etc.
- Drive parameters:
  Parameters that concern the axes, such as traversing speed, motor steps, acceleration, etc.
- Option parameters:
  Profibus, RS232, etc.

Various basic settings have to be made before an appropriate program run can take place. This means that differentiated settings have to be made for various axes which are variously dimensioned and have varying loads.

The conditions for acceleration, maximum speed, gear factor etc. also have to be set for the individual axes. There are several motor and axis parameters available depending on the number of axes.

All the parameters can be modified using the Winpac program, some of them on the front plate of the device. The parameters of the diagnosis port are an exception, as they cannot be altered.

NOTE Parameters in the Winpac program which are displayed on a grey background are not available depending on the version of PA-CONTROL.

This interface will be used for description purposes as all parameters can be altered using WINPAC. Access to the parameters via the front plate of the device is similar, but **not** possible for certain parameters

The configuration window is called by the following menu items to edit the parameters:

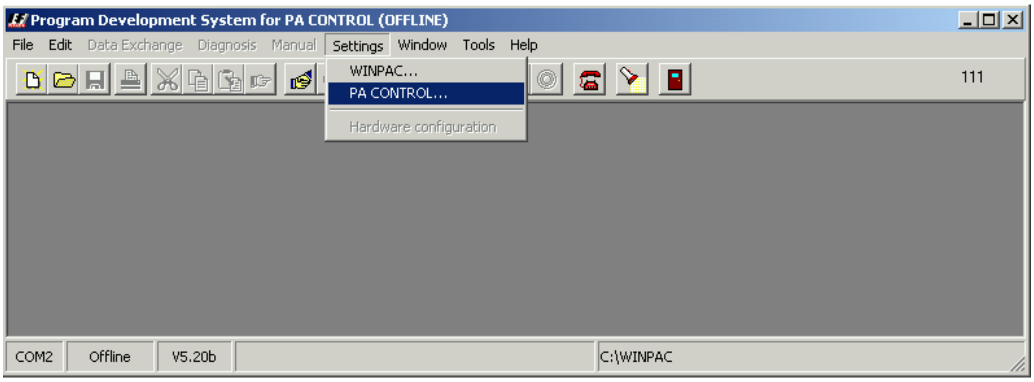


Figure 38: General Information

5.1.1 Configuration Window

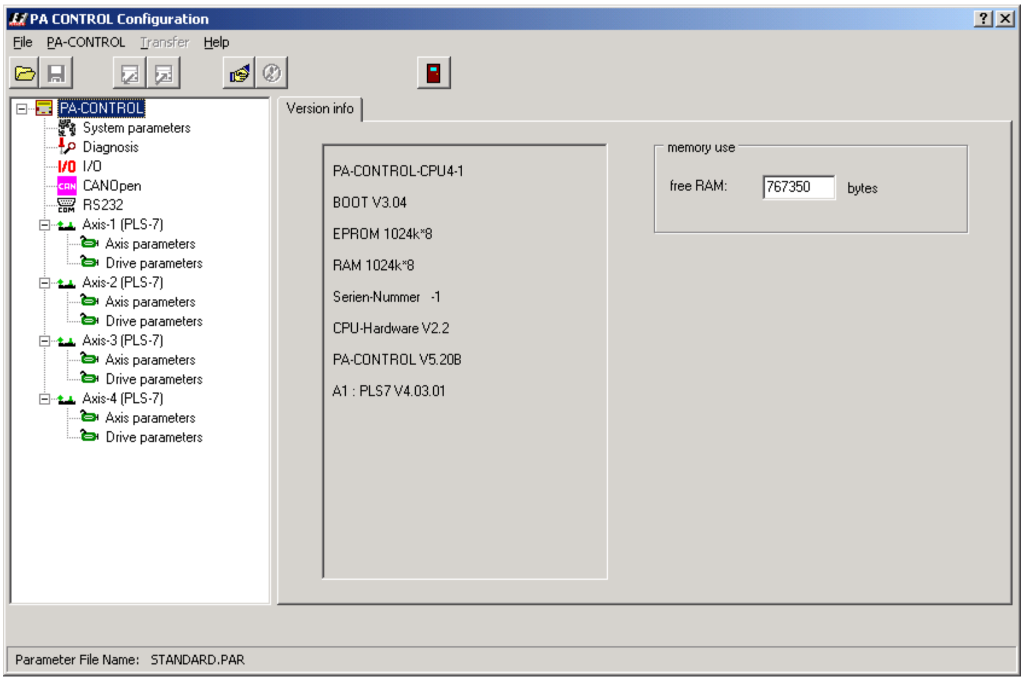


Figure 39: Configuration Window

All parameters of the PA-CONTROL are edited in this window.

5.2 System Parameter

5.2.1 System Parameter Tab

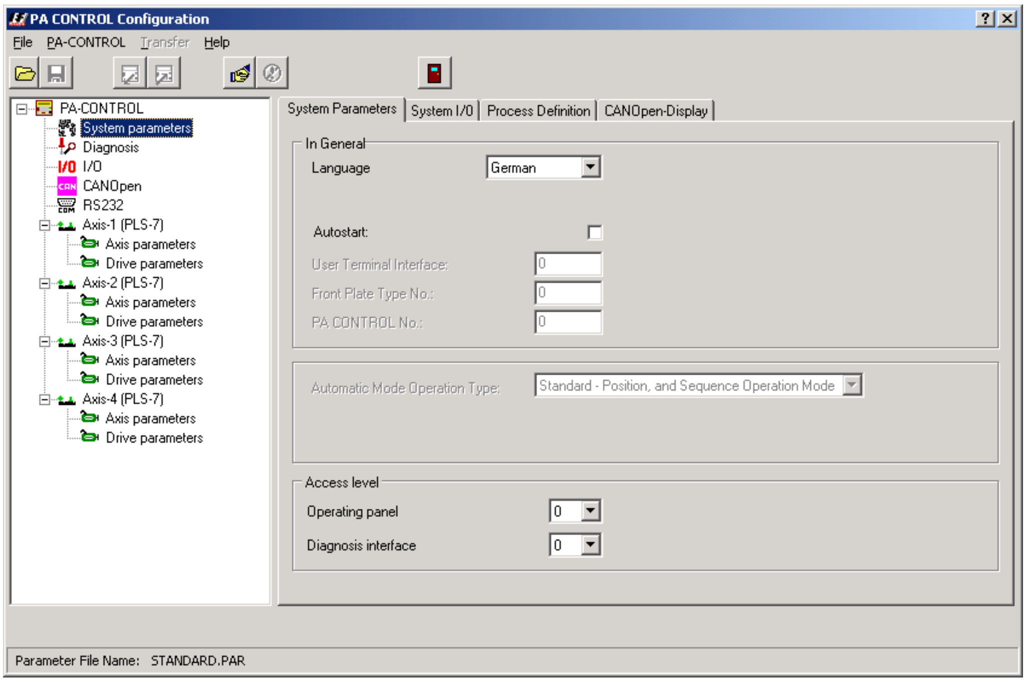


Figure 40: System Parameters

5.2.1.1 Language

Value of Parameter	Meaning
1	German
2	English
3	French

5.2.1.2 Autostart

Value of Parameter	Meaning
1	If the parameter Autostart is set to 1, PA-CONTROL begins to run the start program after being switched on (reset), i.e. it automatically switches into the automatic mode. **Prerequisites:** - Start program must be defined - An input must be defined as an external stop and be hot **NOTE**: The Autostart function is only executed once after switch-on (reset). If the program is to be executed several times, either an endless loop must be programmed or the program must be called again via a start input

5.2.1.3 Access Level

The system parameter "Control console access level" regulates the operator actions which can executed via a keyboard integrated in the device or via an IEF control console.

The system parameter "Access via diagnosis port" regulates the operator actions which can executed via the diagnosis port by means of the WINPAC program.

Both parameters are set to "0" on "Boot of PA-CONTROL". The parameter value can be altered in this status either via the integrated keyboard, the IEF control console or by means of the WINPAC program. If it is not equal to "0", it can only be reset by "Boot of PA-CONTROL". There are two possibilities here:

- By means of the WINPAC program or
- After switch-on, if a change in the hardware configuration is detected and the key-operated switch is in the "Program" position

Control console access level						
PA-CONTROL - Menu	**Note / Meaning**	**Value of Parameter**				
		0	**1**	**2**	**3**	**4**
1 = Automatic		-	-	-	-	-
2 = Manual		-	-	-	X	X
3 = Programming	type of Program : *.PNC, *.PAB, *.PTX	-	X	X	X	X
	type of Program : *.PNX	-	-	-	-	X
4 = Diagnosis		-	-	X	X	X
5 = Run definitions		-	X	X	X	X
6 = Parameters		-	X	X	X	X
7 = Basic settings		-	X	X	X	X
8 = System diagnosis		-	-	-	-	-
9 = Communication via modem	4 = Edit modem settings 5 = Select modem type	-	X	X	X	X
9 = Communication via modem	1 = Activate connection 2 = Display connection status 3 = Terminate connection	-	-	-	-	X
		- : access X : no access				

Diagnosis port access level	
Value of Parameter	**Meaning**
0	No restrictions
1	Programs cannot be loaded from PA-CONTROL
2 ... 255	No function at present

5.2.2 System I/O Tab

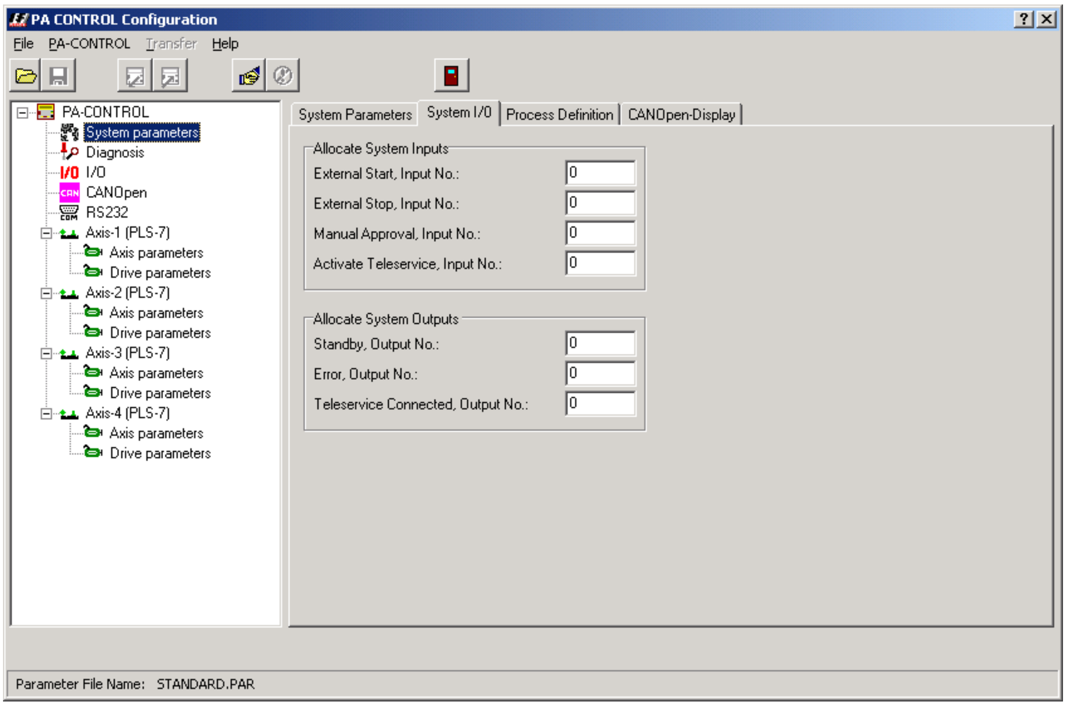


Figure 41: Display and Change of the System I/Os

NOTE Any input or output in the system can be used for the system I/Os.

5.2.2.1 <u>External Start, Input-No.</u>

Any input can be specified for the external start signal of PA-CONTROL. If 0 is entered, which is the standard value, there is no possibility for an external start.

The following applies for the start:

- The transition from cold to hot triggers the start, i.e. NO contact function, positive edge evaluation.

5.2.2.2 External Stop, Input-No.

CAUTION

Any input can be specified for the external stop signal of PA-CONTROL. If 0 is entered, which is the standard value, there is no possibility for an external stop.

The following applies for the stop:

If an external stop is defined, the selected input must be hot. Automatic mode is interrupted when the voltage supply is interrupted (principle of wire-break protection), i.e. NC contact function, status-driven.

The stop button stops **only** the tasks started as a PNC program as well as all positionings. Tasks started as a PAB program are not affected and continue to run!

5.2.2.3 Manual Release, Input-No.

Only active with "Manual via front plate"!

5.2.2.4 Standby, Output-No.

Any output can be specified for the output of stand-by in PA-CONTROL.

5.2.2.5 Malfunction, Output-No.

Any output can be specified for the output of a malfunction which has occurred in automatic mode in PA-CONTROL (e.g. limit switch actuated, value too high, etc.). If a malfunction occurs in automatic mode, the output is set. If the automatic mode is aborted and you return to the main menu, the output is reset.

5.2.2.6 Activate Teleservice, Input-No.

Any input can be specified in PA-CONTROL for activation of the teleservice function.
The function is activated when the input is hot.

5.2.2.7 Teleservice Connected, Output-No.

Any output in PA-CONTROL can be specified for the status display of the teleservice function.
Flashing indicates the connection set-up, steady light indicates connection.

5.2.3 Run Definitions

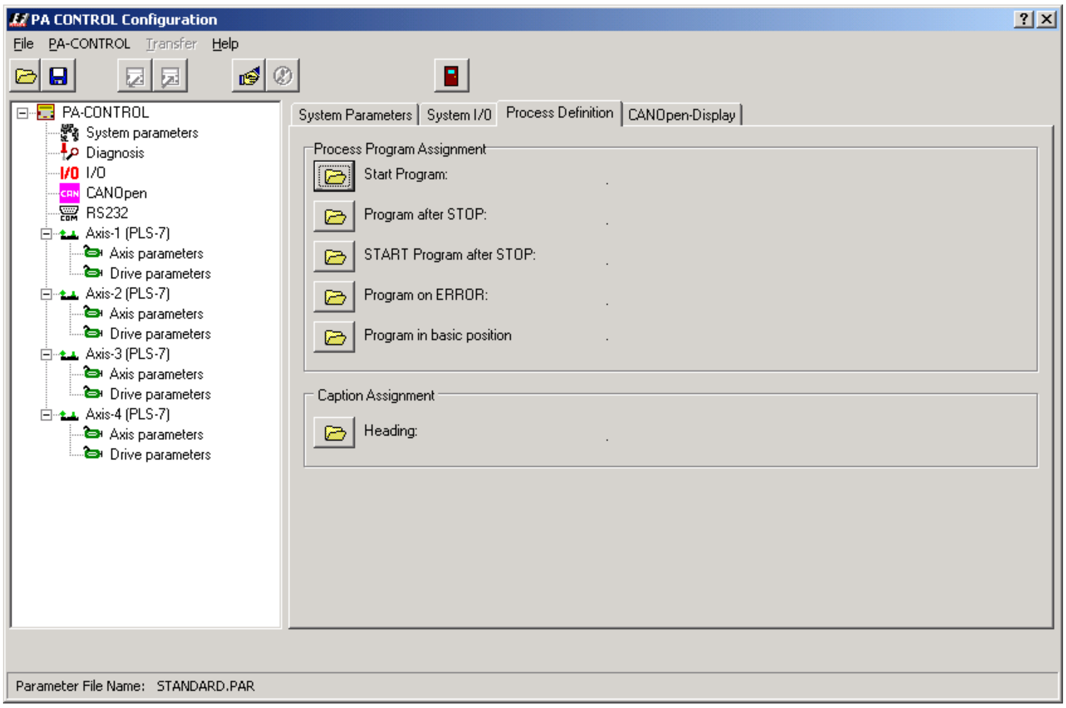


Figure 42: Display and Change of the Run Definition

NOTE Each program may only be registered once

NOTE Any PNC, PNX or PAB programs can be registered in each case.
EXCEPTION: Only a PTX program is allowed for the title.

5.2.3.1 <u>Start Program</u>

PA-CONTROL starts in automatic mode with this program. In principle, this program is the main program.

5.2.3.2 Program at Stop

Special actions (e.g. closing valves) can be carried out with this assignment when "STOP" is detected in automatic run. This program is run after the axes have been stopped.

CAUTION

The command set has the following restrictions in the Program after Stop:

1. This program may not invoke any further programs as subroutines or programs to be processed in parallel.
2. Positioning commands are not permissible in this program.
3. The commands "Wait for logical status of..." inputs, outputs and flags may not be used.
4. Any time monitoring which is still active is reset by the operating system without a message and is not reactivated at "Start".

NOTE The following commands may not be used in the program "after STOP":

SUB, CASE.SUB
RUN, CASE.RUN
G22
Ai:=n, Ai:=Rn
G01
G25.A, G26.A
G212, G222

PA-CONTROL checks in automatic mode and generates the errors E506, E507 or E508 if an error is found

5.2.3.3 Program Start after Stop

If "STOP" was actuated during the automatic run of PA-CONTROL and the program is then to be restarted with "START" (automatic mode has not been exited), the program "Start after Stop" is executed before continuation of the interrupted program. This option can be used to reset actions which were triggered by a stop.

NOTE This program may not invoke any further programs as subroutines or programs to be processed in parallel. Positioning commands are not permissible in this program.

SUB, CASE.SUB
RUN, CASE.RUN
G22
Ai:=n, Ai:=Rn
G01
G25.A, G26.A
G212, G222

PA-CONTROL checks in automatic mode and generates the errors E506, E507 or E508 if an error is found

5.2.3.4 Program at Malfunction

Special actions (e.g. closing valves) can be implemented with this assignment when a malfunction is detected during the program run (e.g. error messages such as: Value too large, power circuit not ready...).

NOTE This program may not invoke any further programs as subroutines or programs to be processed in parallel. Positioning commands are not permissible in this program.

5.2.3.5 Program in Basic Position (Program in Initial Position)

The "Program in initial position" is activated via the window "Display and change of the Run definition" (see section *5.2.3: Run Definitions, page 125*).

The following are not allowed in the "Program in initial position":

- Traversing of axes (G25, ..., A1:=, ...)
- Activation of parallel TASKS (RUN, ...)
- Use of subroutines (SUB, G22, ...)

The program itself is started in the following situations:

- After switch-on
- On exiting the automatic mode
- On exiting the manual mode
- On exiting the diagnosis

NOTE System flag SM67 is set after the initial position program has been processed

5.2.3.6 Heading

The title PA-CONTROL Vx.xx is replaced by the first line of the assigned *.PTX file.

5.2.4 CANopen Control Console

NOTE Only devices of SÜTRON & Co. are specified as control consoles on the CANopen bus of PA-CONTROL!

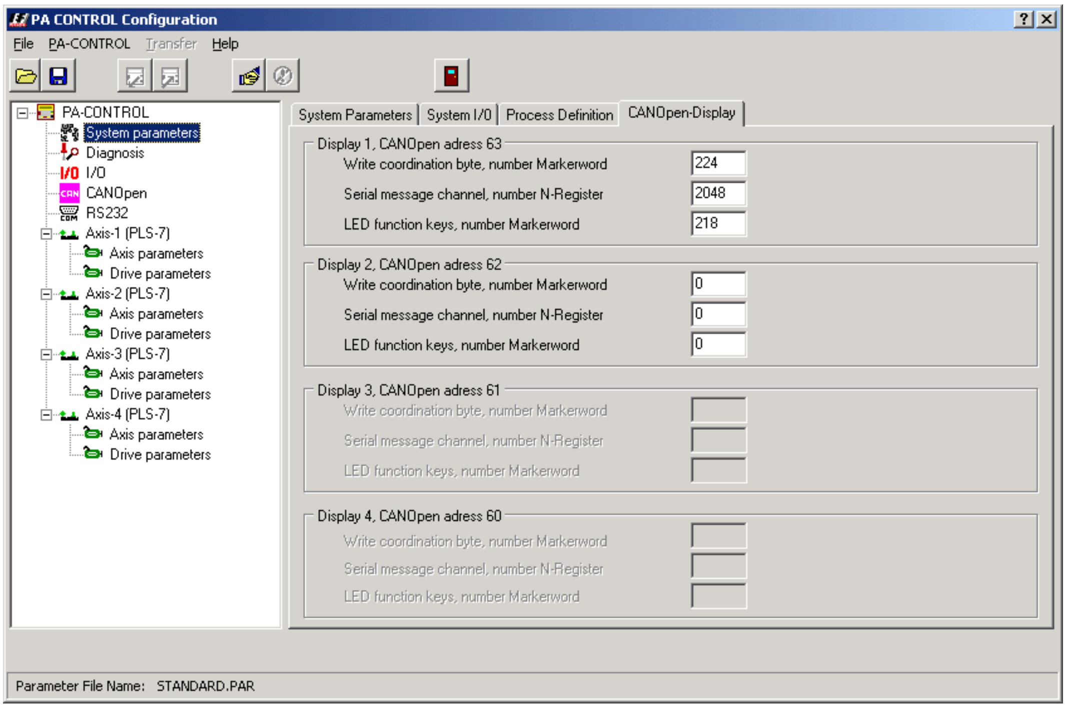


Figure 43: Display and Change

System parameters for the "poll range" are provided for control console 1 (CANopen address 63) and control console 2 (CANopen address 62) in PA-CONTROL.

Default settings after reinitialization of PA-CONTROL

Parameter	Type	Console 1	Console 0
Coordination byte	Number of flag word	224	0
Serial signalling channel	Number of N register	2048	0
LEDs function keys	Number of flag word	218	0

A tab for changing the default setting is available in the WinPAC program.

NOTE Please refer to the "SÜTRON control console" documentation for further information on the control console on the CANopen bus.

5.3 Diagnosis

5.3.1 System and Diagnosis Port Tab

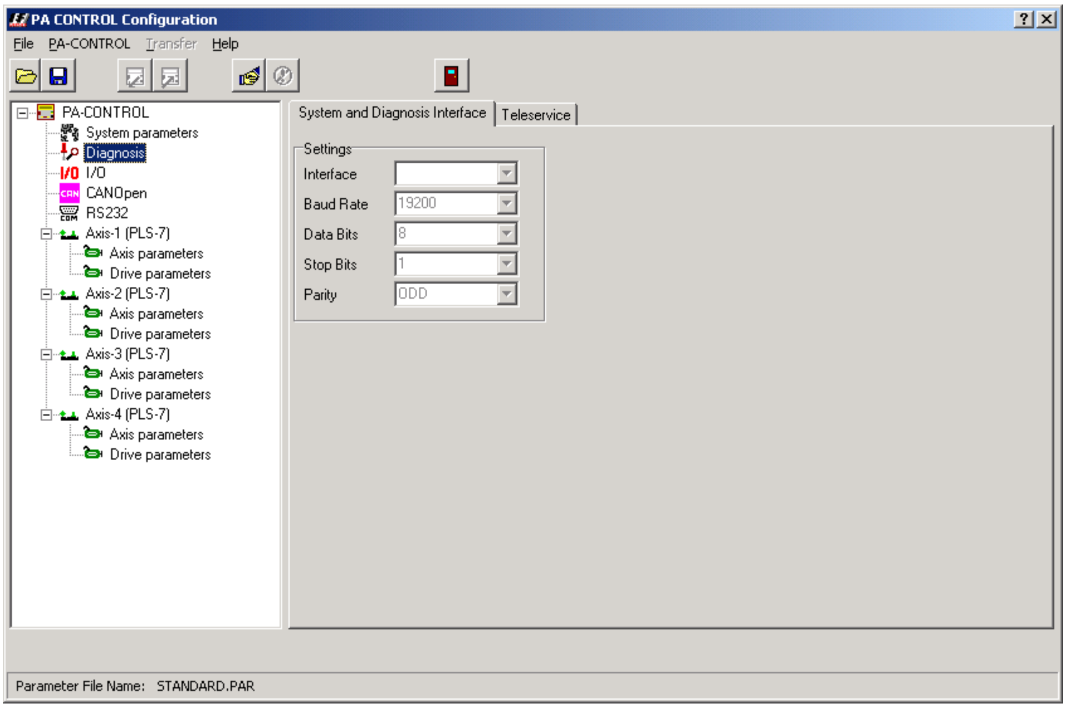


Figure 44: System and Diagnosis Port

System and diagnosis port

Parameter	Meaning
Port	Parameter is permanently set and can only be displayed and not changed
Baud rate	From V4.68 or higher, PA-CONTROL automatically adapts the baud rate of the port to the baud rate pre-selected in the WINPAC program. The baud rate can either be 19.2 or 57.6 Kbaud. The preset value is 19.2 Kbaud.
Data bits	Parameter is permanently set and can only be displayed and not changed
Stop bits	Parameter is permanently set and can only be displayed and not changed
Parity	Parameter is permanently set and can only be displayed and not changed

5.3.2 Teleservice Tab

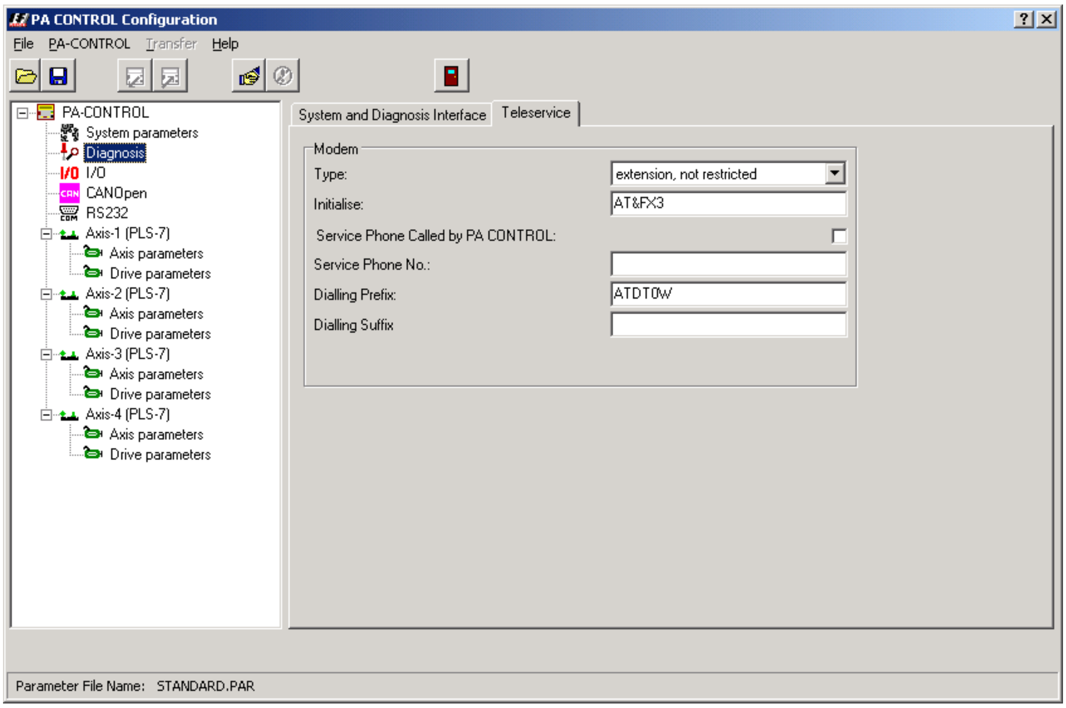


Figure 45: Setting the Teleservice Parameters

Teleservice

Parameter	Meaning
Type	Selected modem type
Initialise	Initialisation of modem
Service telephone no.:	Telephone number which is dialled by the modem
Dial prefix	String before telephone number
Dial suffix	String after telephone number

5.4 CANopen Bus Tab

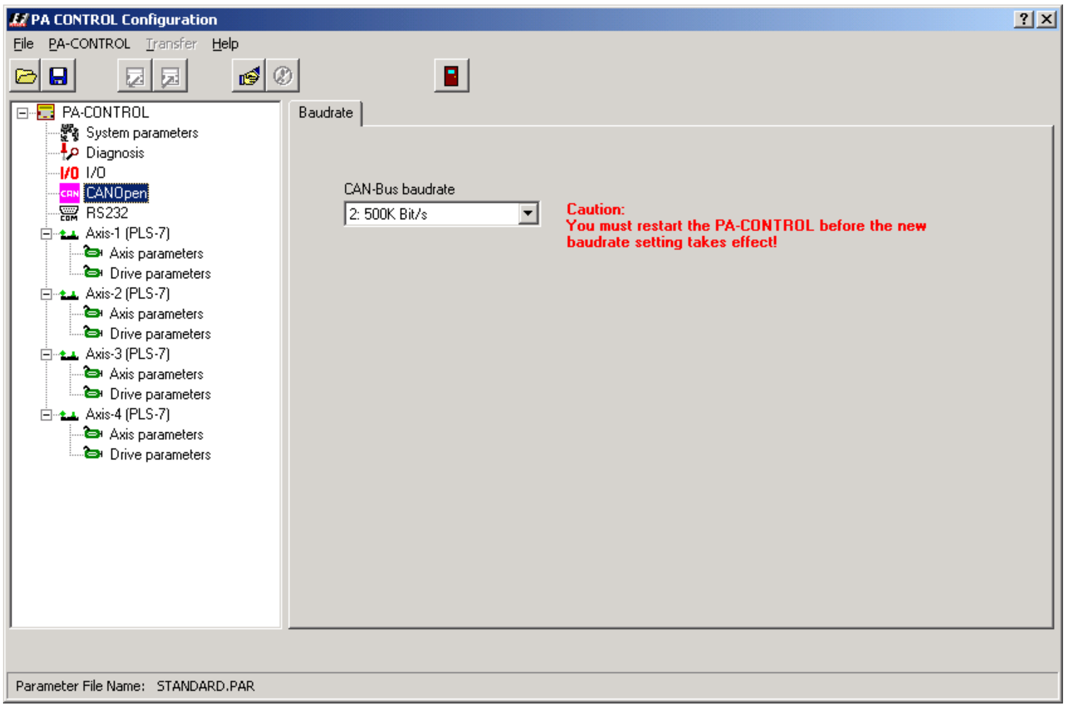


Figure 46: Setting the Baud Rate of the CANopen Bus

Baud rate of the CANopen bus

Parameter	Meaning
Baud rate	Standard = 500Kbaud, Selection: 125, 250, 500, 1000 Kbaud

5.5 RS232 Port Tab

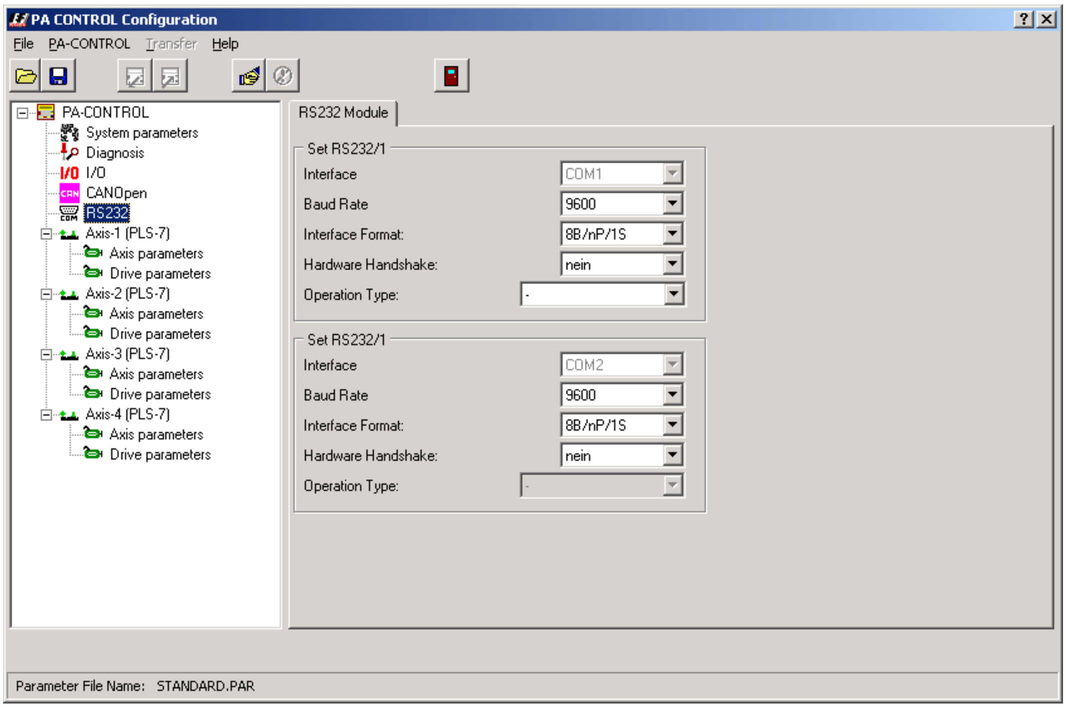


Figure 47: Setting the RS232/1 Port

5.5.1 COM1 Port

Parameter	Meaning
Baud rate	Standard = 9600Bd, Selection: 110,300, 1200, 2400, 4800, 9600, 19200.
Port format	Standard = 8B,nP,1S Selection: 8B,nP,1S or 7B,nP,1S or 7B,eP,1S or 7B,oP,1S
Hardware handshake	Standard : no Selection : yes/no
Mode	This port can be changed over for various modes. - 0 = Commands of the G500.xx group use this port - 1 = ONLINE command port (see interface manual) - 2 = Modem port (only for CPU4)

5.5.2 COM2 Port

Baud rate	Standard = 9600Bd, Selection: 110,300, 1200, 2400, 4800, 9600, 19200.
Port format	Standard = 8B,nP,1S Selection: 8B,nP,1S or 7B,nP,1S or 7B,eP,1S or 7B,oP,1S
Hardware handshake	Standard : no Selection : yes/no
Mode	Only commands of the G500.xx group use this port

5.6 Profibus Tab

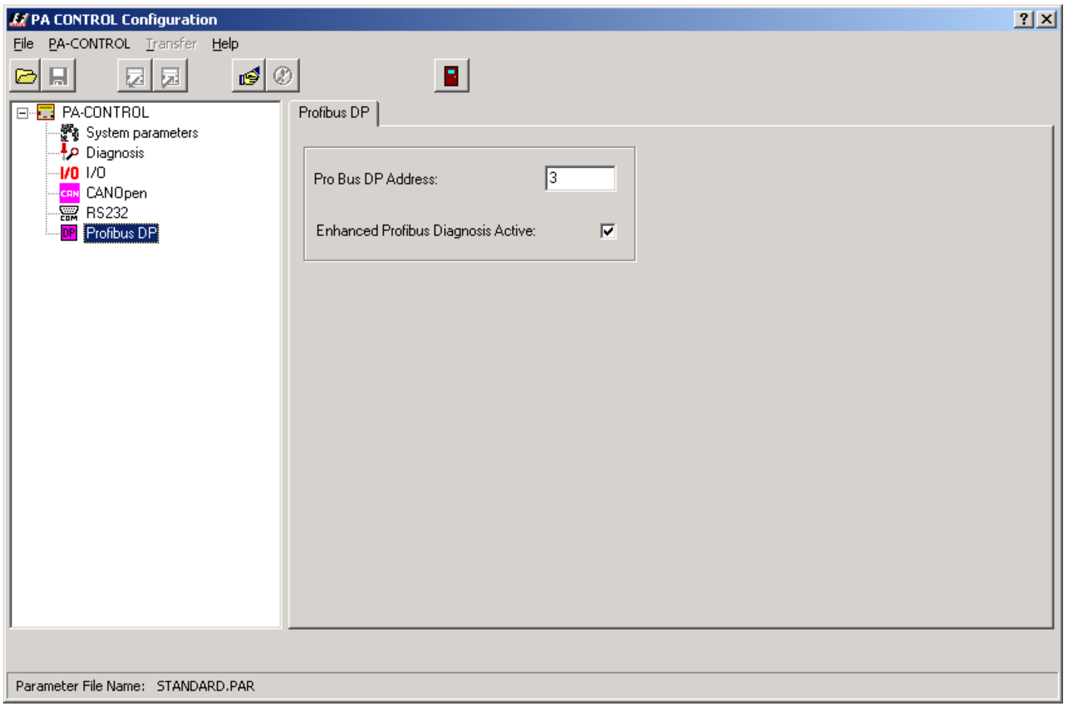


Figure 48: Setting the Profibus-DP Address

Setting the Profibus-DP address

Parameter	Meaning
Profibus-DP address	Standard = 0, i.e. no Profibus-DP module activated Selection: 2 to 126 **IMPORTANT**: Address 126 is only permitted for commissioning. User data may not be transferred using address 126!

WERNER

5.7 Axis Parameters

5.7.1 Axis Parameter Tab

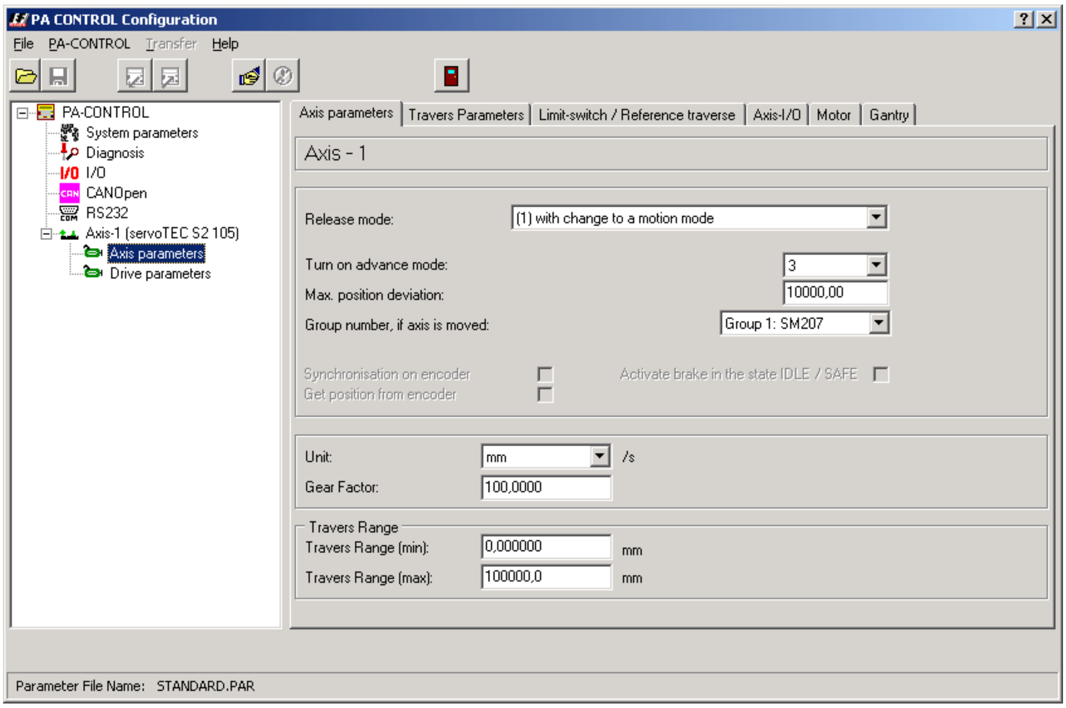


Figure 49: PA-CONTROL, Tab Axis Parameters

5.7.1.1 Release Mode

The enabling mode specifies the operating mode or the change of operating mode in which the axis is enabled.

Value of Parameter	Meaning
0	Axis disabled
1	Enabling of the axis on change-over to a traversing mode
2	Enabling of the axis at a command in AUTOMATIC operation (G140-G141 commands)
3	Enabling of the axis immediately after initialization
4	Enabling of the axis on change-over to a traversing mode and STOP or START in the AUTOMATIC and ONLINE operating mode

5.7.1.2 Turn on Advance Mode

The way in which the axis is traversed by the operating system after the axis has been switched from the status "IDLE / SAFE" to the status "OPERATIONAL" can be set in the "Switch-on traversing mode".

Irrespective of whether the axis was traversed (the OFF-AXIS function interrupted a traversing command) or the axis was in position, a decision is made for the respective axis according to the following criteria:

Value	Meaning
0	The axis stops and is not traversed, even if it was moved or a traversing command interrupted
1	(DEFAULT) A traversing command which was interrupted by the operating system with the "STOP" function is continued. Otherwise the axis stops where it is and the current position is transferred.
2	The operating system moves the axis to the position at which the axis was located before it was switched to the "IDLE / SAFE" status. A traversing command which was interrupted by the function "OFF-AXIS" is continued.
3	The operating system checks whether the axis was moved in the "IDLE / SAFE" status. If the difference is greater than the value specified in the axis parameter "Maximum deviation of position", a system error (Exxx) is generated. Otherwise the axis is traversed to the position it was located at before change-over to the "IDLE / SAFE" status, or the interrupted traversing command is continued.
4	The operating system checks whether the axis was moved in the "IDLE / SAFE" status. If the difference is greater than the value specified in the axis parameter "Maximum deviation of position", a system flag (SM191, SM192,...) is set. Otherwise the axis is traversed to the position it was located at before change-over to the "IDLE / SAFE" status, or the interrupted traversing command is continued. If this system flag is set, the axis cannot be traversed and a system error will be generated. If this option is selected, the system flag must be requested in the application in the program (LD SM191, G21 SM191, ...) This request resets the system flag.

5.7.1.3 Max. Position Deviation

This parameter can be used to specify the amount by which the axis position may deviate when the axis is switched from the "IDLE / SAFE" status to the "OPERATIONAL" status. The status of the axis (IDLE / SAFE / OPERATIONAL ...) is influenced by the following:

- System input OFF-AXIS / ON-AXIS
- Command OFF-AXIS / ON-AXIS
- STOP / START-AFTER-STOP in automatic operation (see further axis parameters)
- STOP / START in ONLINE (see further axis parameters)

The way in which the value is interpreted and what the following procedure should be are specified in the axis parameter "Switch-on traversing mode".

5.7.1.4 Group Number, if Axis is moved

If an axis was moved by more than the value specified in the axis parameter "Maximum deviation of position" during the change-over from the "IDLE / SAFE" status to the "OPERATIONAL" status, the associated system flag is set (axis[1…] – SM[191…])

Value of parameter	Group	System-Flag (SM)
0	no	
1	1	SM207
2	2	SM208
3	3	SM209
4	4	SM210

In the case of a multi-axis system, axes can be assigned to a group, in order to ensure that no axis continues to traverse as soon as an axis was moved beyond the maximum permitted deviation.

If the system axis flag (SM191,...) is set, the group flag is also set. As long as one of these two flags is set; the axis cannot be traversed. The flags are deleted by:

- Query in AUTOMATIC operation (LD SM191 ..., G21 SM191 ... , LD SM207 ...)
- Termination of AUTOMATIC operation or ONLINE

NOTE A group flag cannot be deleted directly. The group flag is deleted by deleting all the flags in the group.

5.7.1.5 Synchronisation on Encoder

One edge of the rotary encoder is synchronized to during referencing and when exiting the measuring mode, in order to increase the accuracy (resolution) for transfer of the position of the rotary encoder.

This parameter is only valid for PA-CONTROL EP/MP.

5.7.1.6 Get Position from Encoder

The current position of the rotary encoder is transferred as an axis position when the measuring mode is exited with the "G141 command".

This parameter is only valid for PA-CONTROL EP/MP.

5.7.1.7 Activate Brake in State IDLE / SAFE

Prevents a vertical axis from "falling through".

This parameter is only valid for PA-CONTROL EP/MP.

5.7.1.8 Unit

Setting for the desired display device. It is possible to add further units. The gear factor must be considered when setting the display device.

5.7.1.9 Gear Factor

Setting for the gear factor. See section *5.14.1: Gear Factor, page 164* for a calculation example.

5.7.1.10 Traversing Range (min.)

Lower traversing limit (software limit switch)

5.7.1.11 Traversing Range (max.)

Upper traversing limit (software limit switch)

5.7.1.12 Limit Values of the Axis Parameters

See section *5.8.4: Limit Values of the Axis Parameters, page 149.*

5.7.2 Limit Switches / Approach to Reference Point Tab

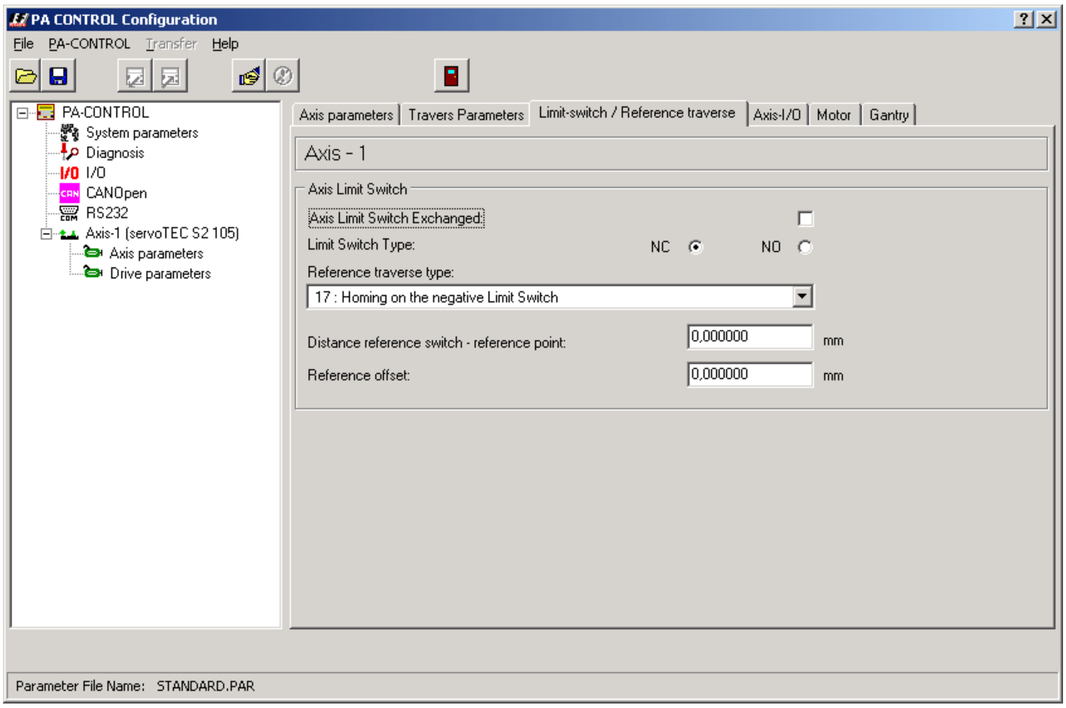


Figure 50: Limit switches and approach to Ref. Point for PA-CONTROL Compact

NOTE You will find a list of the minimum and maximum values and the standard value in section *5.8.4: Limit Values of the Axis Parameters, page 149*.

5.7.2.1 Axis Limit Switch interchanged

Positive and negative limit switches can be exchanged without changes to hardware.

5.7.2.2 Limit Switch Type

Selection of the contact type used:

- Normally closed contact
- Normally open contact

5.7.2.3 Distance of the Reference Switch Zero Point

Entry for zero shift after approach to reference point.

5.7.2.4 Reference Offset

Any desired absolute position can be assigned to the reference position (zero position) reached at the end of referencing by means of the parameter "Reference offset".

5.7.2.5 Limit Values of the Axis Parameters

See section *5.8.4: Limit Values of the Axis Parameters, page 149.*

5.7.3 Limit Switches / Approach to Reference Point for Axis Type servoTEC Tab

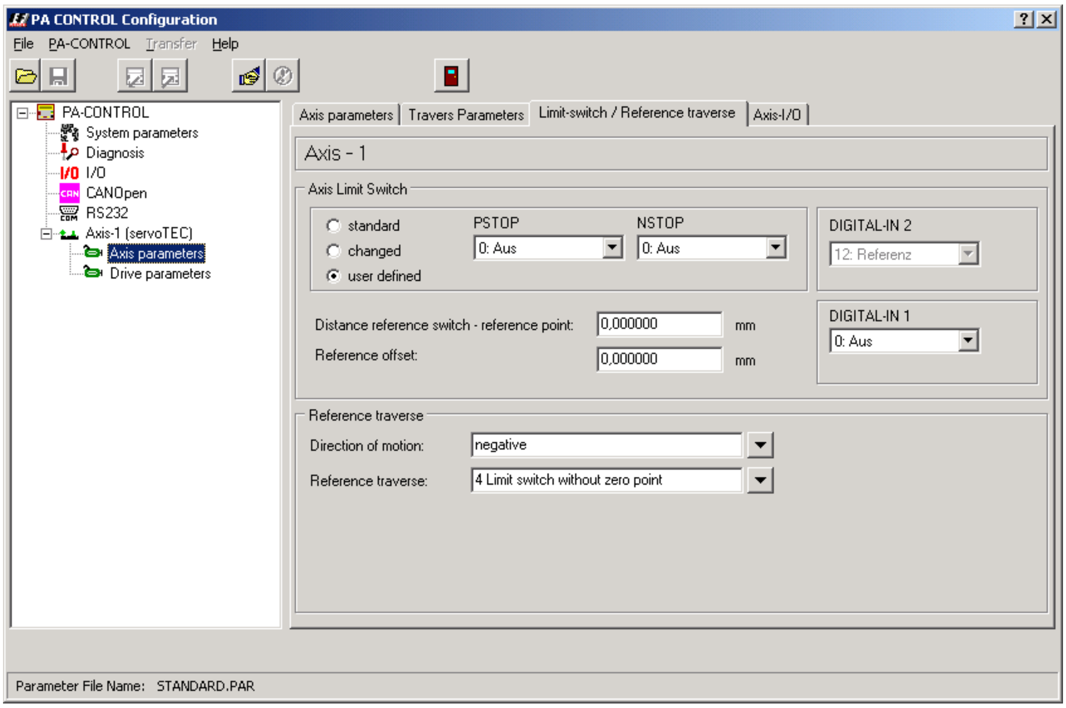


Figure 51: Limit Switches / Approach to Reference Point for Axis Type servoTEC

5.7.3.1 <u>Axis Limit Switches</u>

5.7.3.2 <u>Distance of the Reference Switch Zero Point</u>

Entry for zero shift after approach to reference point.

5.7.3.3 <u>Reference Traverse</u>

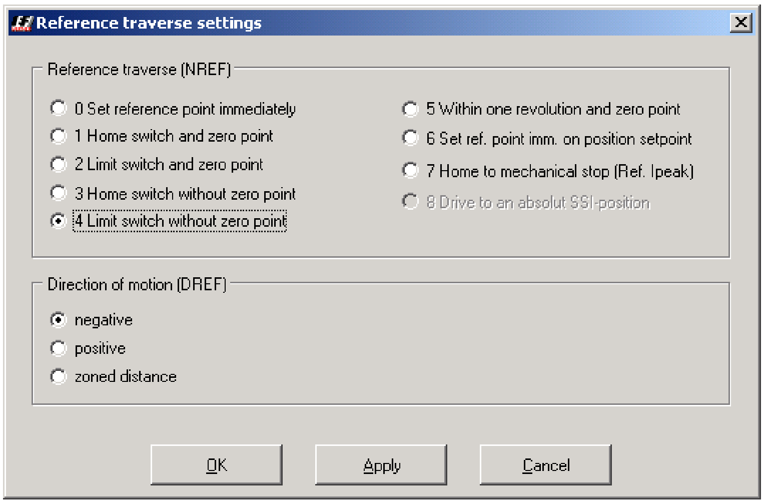


Figure 52: Reference Traverse Settings

5.7.3.4 Direction of Motion

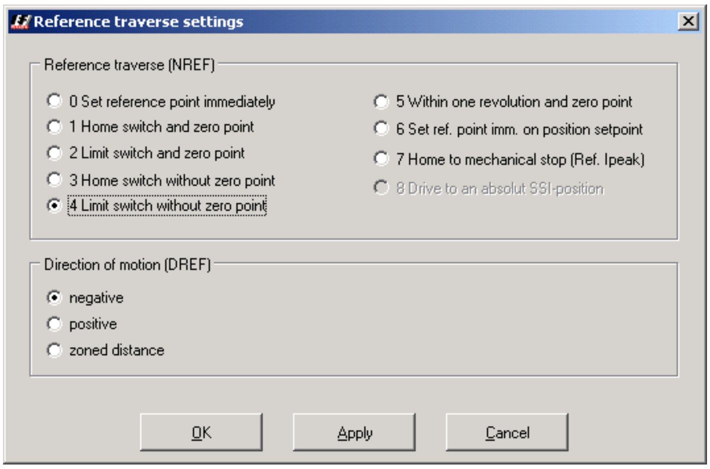


Figure 53: Direction of Motion Settings

5.7.3.5 Brake Ramp

Not applicable

5.7.3.6 Reference Offset

Any desired absolute position can be assigned to the reference position (zero position) reached at the end of referencing by means of the parameter "Reference offset".

5.7.3.7 Limit Values of the Axis Parameters

See section *5.8.4: Limit Values of the Axis Parameters, page 149.*

5.7.4 Axis-I/O

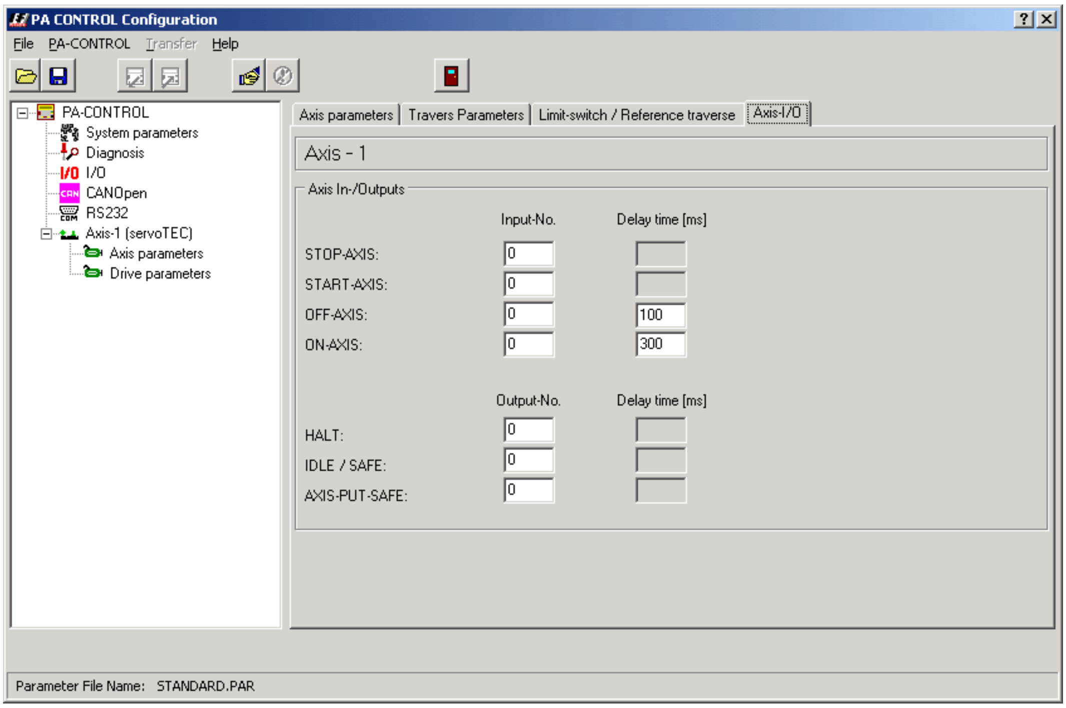


Figure 54: PA-CONTROL, Axis-I/O

5.7.4.1 STOP-Axis Input-No.

Number of a digital input which is to be used for this function (0 ... 2048)

If the value for this parameter is not equal to zero, the input must be under voltage if the axis is to be traversed in AUTOMATIC mode. Otherwise the traverse is not started or is interrupted if the input is not under voltage during the traverse.

The "STOP-AXIS" function is only active in the AUTOMATIC and ONLINE mode of PA-CONTROL.

5.7.4.2 START-Axis Input-No.

Number of a digital input which is to be used for this function (0 ... 2048)

If the value for this parameter is not equal to zero and the axis is in the "HALT WHILE OPERATIONAL" or "HALT WHILE ACTIVE" status, the axis can be restarted by supplying this input with voltage (STOP-AXIS input must be under voltage). If the axis was previously in the "IDLE / SAFE" status, the situation is checked in the switch-on traversing mode and the relevant procedure selected before axis START.

The "START-AXIS" function is only active in the AUTOMATIC and ONLINE mode of PA-CONTROL.

5.7.4.3 OFF-Axis Input-No.

This axis parameter can be used to specify whether and which digital input activates the "OFF-AXIS" function. The "OFF-AXIS" function is only active in the AUTOMATIC and ONLINE mode of PA-CONTROL. The input must be under voltage, otherwise the "OFF-AXIS" function is activated.

Function:

- If the axis is in the OPERATIONAL or HALT WHILE OPERATIONAL or HALT WHILE ACTIVE status, the axis is switched to the IDLE or SAFE status.
- If the axis is running, it is stopped immediately, i.e. the positioning is interrupted and the axis changes to the HALT WHILE ACTIVE status. The axis is subsequently switched to the IDLE or SAFE status.

5.7.4.4 ON-Axis Input-No.

This axis parameter can be used to specify whether and which digital input activates the "ON-AXIS" function. The "ON-AXIS" function is only active in the AUTOMATIC and ONLINE mode of PA-CONTROL.

Function:

- If the input is under voltage, the axis is switched from the IDLE or SAFE status to the HALT WHILE OPERATIONAL/ACTIVE status. The OPERATIONAL or ACTIVE status is subsequently changed over according to the axis parameter "Switch-on traversing mode".
- The function "ON-AXIS" can only be active if the "OFF-AXIS" function has not been activated (e.g.: "OFF-AXIS" input under voltage). The digital output IDLE / SAFE would blink in this case.

5.7.4.5 ON-Axis Delay Time

Time delay for ON-AXIS

5.7.4.6 OFF-Axis Delay Time

Time delay for OFF-AXIS

5.7.4.7 HALT Output-No.

Number of a digital output which is to be used for this function (0 ... 2048). If this axis output has been activated (parameter value not equal to zero), the output is set if the axis is in the HALT WHILE OPERATIONAL/ACTIVE status, otherwise it is reset. The output is only active in the AUTOMATIC and ONLINE mode of PA-CONTROL.

This output blinks if the "START-AXIS" function is active and the "STOP-AXIS" function is also still active.

5.7.4.8 IDLE / SAFE Output-No

Number of a digital output which is to be used for this function (0 ... 2048). If this value for the parameter is not equal to zero, the digital output is set if the axis has been switched to the IDLE or SAFE status by the "OFF-AXIS" function. If the "PUT-SAFE" function has been activated, the "AXIS IS IDLE/SAFE" output is not set until the "SAFE" status has been reached. The "AXIS IS IDLE/SAFE" function is only active in the AUTOMATIC and ONLINE mode of PA-CONTROL.

This output blinks if the "ON-AXIS" function is active and the "OFF-AXIS" function is also still active.

5.7.4.9 AXIS-PUT-SAFE

Number of a digital output which is to be used for this function (0 ... 2048)

The "AXIS-PUT-SAFE" function is only active in the AUTOMATIC and ONLINE mode of PA-CONTROL.

If this parameter has been activated (value not equal to zero), the axis is switched to the SAFE status and not to the IDLE status by the "OFF-AXIS" function.

In this respect, the enabling of the power amplifier is reset, the corresponding time allowed to elapse, the output "AXIS-PUT-SAFE" set (AS relay on servoTEC) and a waiting time of 100 milliseconds inserted before the axis receives the "SAFE" status.

A waiting time of 100 milliseconds is also inserted before the axis receives the OPERATION-AL or HALT status during switch-on of the axis, i.e. during change-over to the OPERATIONAL or HALT status.

NOTE	Each axis must have its own PUT-SAFE output. A PUT-SAFE output cannot be used for several axes.

5.7.4.10 Limit Values of the Axis Parameters

See section *5.8.4: Limit Values of the Axis Parameters, page 149.*

5.8 Travers Parameters

5.8.1 Travers Parameters Tab

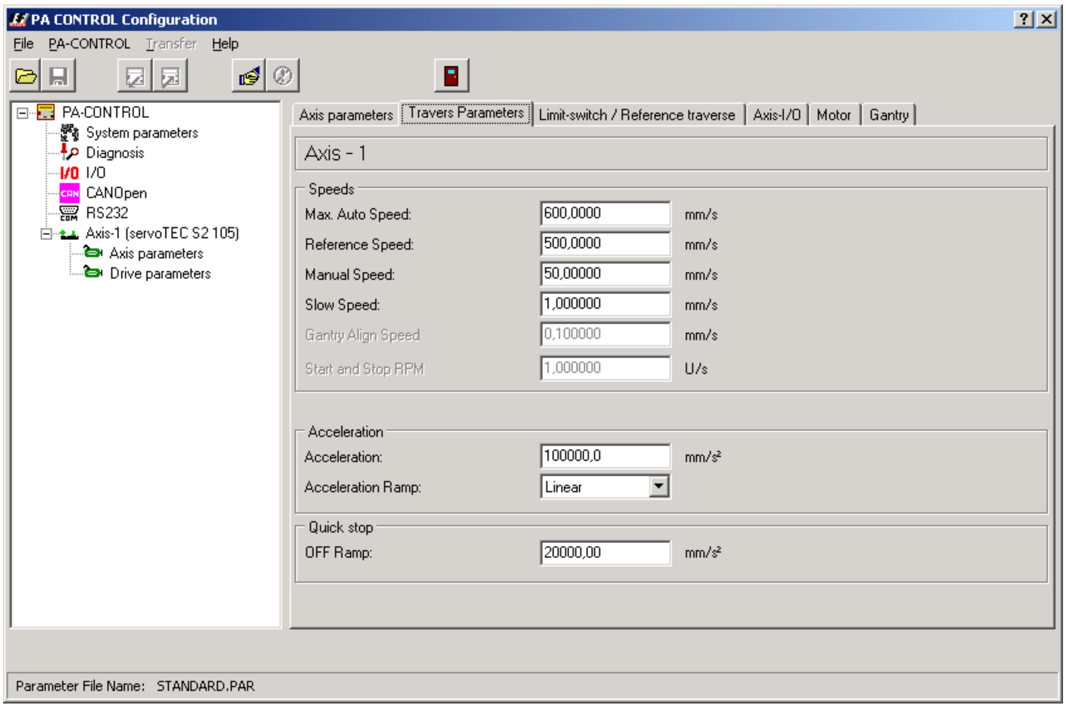


Figure 55: Travers Parameters

5.8.1.1 Traversing Speed

Maximum permissible traversing speed.

5.8.1.2 Reference Speed

Speed at which the approach to reference point is executed.

5.8.1.3 Manual Speed

Speed at which manual traversing is executed.

5.8.1.4 Slow Speed

Speed at which the limit switch is cleared during the approach to reference point.

5.8.1.5 Gantry Align Speed

5.8.1.6 Start/Stop Rotational Speed

Rotational speed at which the acceleration starts.

5.8.1.7 Acceleration

Change in speed per sec.

5.8.1.8 Ramp Type (Acceleration)

Sets the form of the Ramp

- Linear
- $Sin^2(t)$

5.8.1.9 OFF-Ramp

Change in speed if switching the axis OFF

5.8.2 Motor Tab

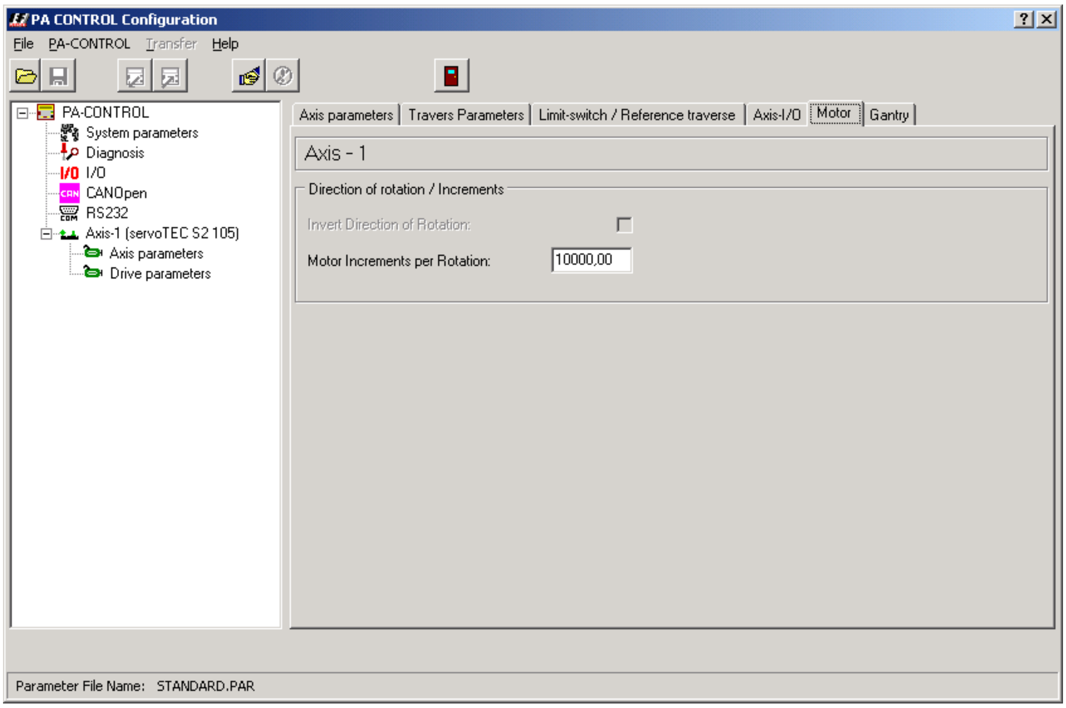


Figure 56: Motor

5.8.2.1 Invert Direction of Rotation

Reversal of the rotational direction of the motor.

5.8.2.2 Motor Increments per Rotation

Number of motor steps for the electromagnetic design.

5.8.3 Gantry Tab

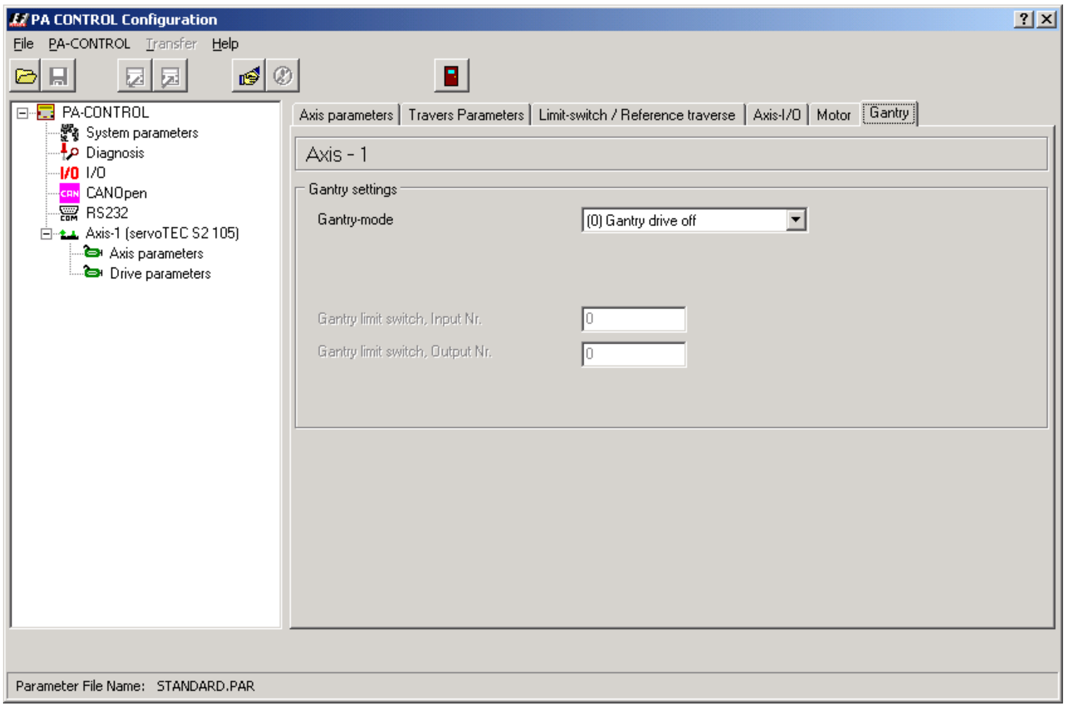


Figure 57: Gantry

5.8.3.1 Gantry Mode

Type of Axis	Gantry system 1	Gantry system 2	Gantry system 3
Stand-alone Axis	00	00	00
Gantry system MASTER-Axis	11	21	31
Gantry system SLAVE-Axis	12	22	32

5.8.3.2 Gantry Limit Switch, Input-No.

The number of the digital input, where the “gantry-limit switch” is connected.

5.8.3.3 Gantry Limit Switch, Output-No.

The number of the output, which is connected to the negative limit switch of drive assembly.

5.8.4 Limit Values of the Axis Parameters

No.	Parameter name	Display device	Minimum value	Standard value	Maximum value
1	Traversing speed "1"	AE/s	0.0005 "3"	600.0	10000000 "3"
2	Reference speed "1"	AE/s	0.0005 "3"	100.0	10000000 "3"
3	Manual speed "1"	AE/s	0.0005 "3"	50.0	5000000 "3"
4	Creep speed "1"	AE/s	0.0005 "3"	10.0	1000000 "3"
5	Motor start/stop rotational speed "1"	rev/s	0.0	0.5	10
6	Acceleration "1"	AE/s²	0.08 "3"	2000.0	134217727
7	Gear factor	-	0.001	100.0	20000.0
8	Traversing range, minimum	AE	-8000000"3"	0.0	8000000 "3"
9	Traversing range, maximum	AE	-8000000"3"	10000.0	8000000 "3"
24	Rotational direction	CW/CCW "2"	0	0	1
26	Motor steps per revolution	Steps/rev	200.0	3200.0	20000.0
27	Motor full steps/revolution	Full steps/rev	200.0	200.0	500.0
28	Axis limit switch exchanged	0 or 1	0	0	1
32	Limit switch type NOC	0 or 1	0	0	1
33	Distance of the zero point to the limit switch	AE	0.0	0.0	10000.0
37	Absolute dimension system activated	0 or 1	0	0	1

"1" The marked parameters have purely theoretical values (min. / max.) The values change if the gear factors for PLS6 / 7 / 8 / 9 change as shown in the following tables for gear factors 1 to 40:

"2" CW=clockwise; CCW=counter clockwise

"3" These values are theoretical limit values which change depending on the gear factor.

Application example 1:

Parameter	Gear factor = 1		Gear factor = 10	
	Minimum	Maximum	Minimum	Maximum
Traversing speed [AE/s]	10	50000	1	5000
Reference speed [AE/s]	10	50000	1	5000
Manual speed [AE/s]	10	50000	1	5000
Creep speed [AE/s]	10	50000	1	5000
Motor start/stop rotational speed [U/s]	0	10	0	10
Acceleration [AE/s^2]	7000	1500000	700	150000

Application example 2:

Parameter	Gear factor = 20		Gear factor = 40	
	Minimum	Maximum	Minimum	Maximum
Traversing speed [AE/s]	0.5	2500	0.25	1250
Reference speed [AE/s]	0.5	2500	0.25	1250
Manual speed [AE/s]	0.5	2500	0.25	1250
Creep speed [AE/s]	0.5	2500	0.25	1250
Motor start/stop rotational speed [U/s]	0	10	0	10
Acceleration [AE/s^2]	3500	75000	1750	37500

5.9 Drive Parameters Stepper Motor Axis

5.9.1 Motor Parameters of a Stepper Tab

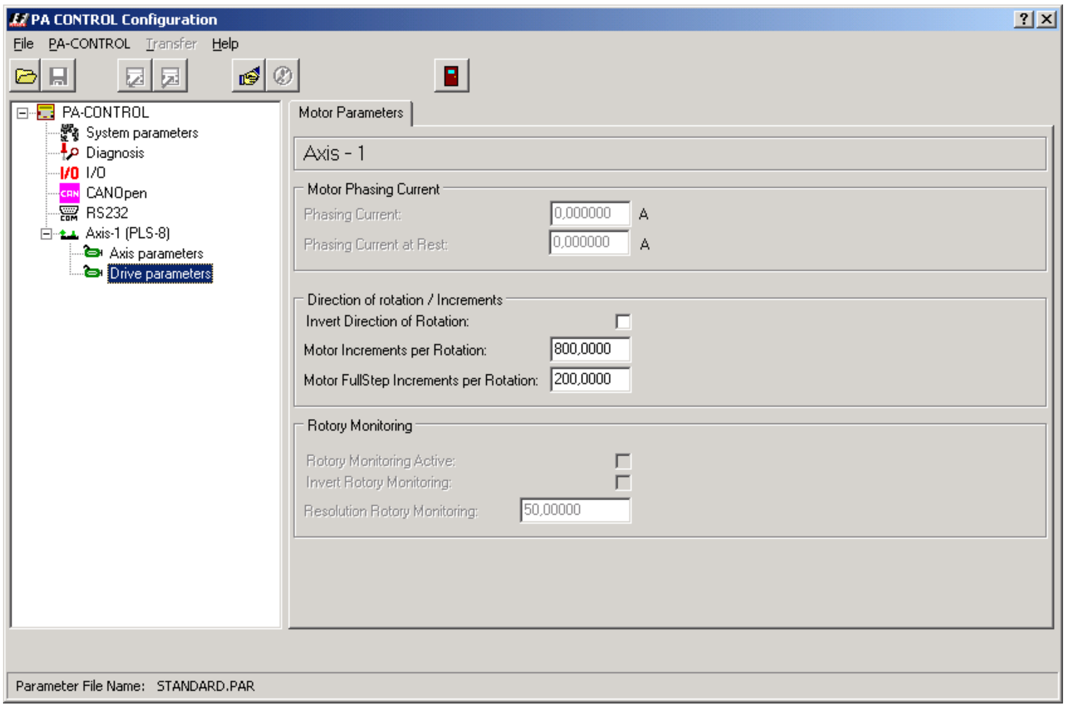


Figure 58: Motor Parameters of a Stepper

5.9.1.1 Motor Phase Current

Maximum phase current, the setting can be found on the rating plate of the connected motor.

5.9.1.2 Motor Phase Current at Rest (Standstill)

Motor current at standstill, i.e. the PA-CONTROL MP is switched on and ready or a defined position is being maintained.

5.9.1.3 Invert Direction of Rotation

Reversal of the rotational direction of the motor.

5.9.1.4 Motor Steps per Revolution

Permanently set at 3200 steps/revolution in the PA-CONTROL MP.

5.9.1.5 Motor Full Steps per Revolution

Number of motor steps possible as a result of the electromagnetic model (Standard is 200).

5.9.1.6 Rotation Monitoring active

Activation of the rotation monitoring.

5.9.1.7 Invert Rotary Encoder

Change in the counting direction of the rotary encoder.

5.9.1.8 Resolution of the Rotary Encoder

Resolution of the rotary encoder in increments per revolution.

5.10 Drive Parameters servoTEC S2 Axis

5.10.1 General Configuration Tab

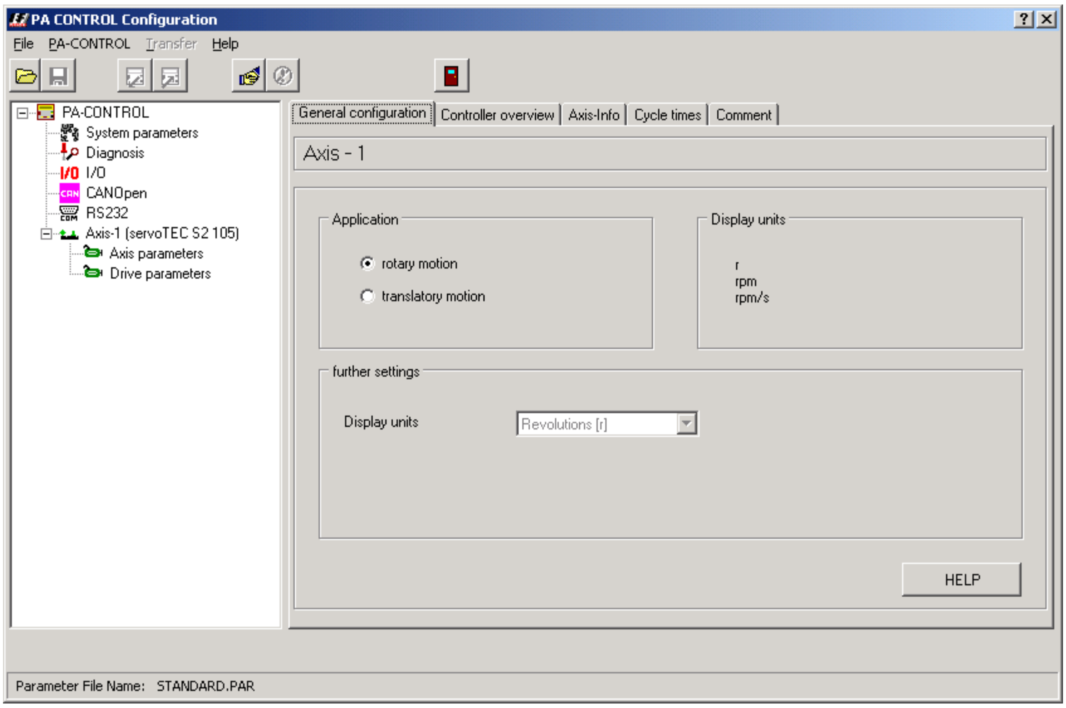


Figure 59: Drive Parameters

More information you may get in the Help of WINPAC.

5.10.2 Drive Parameters of servoTEC

5.10.2.1 Drive Parameters for Positioning

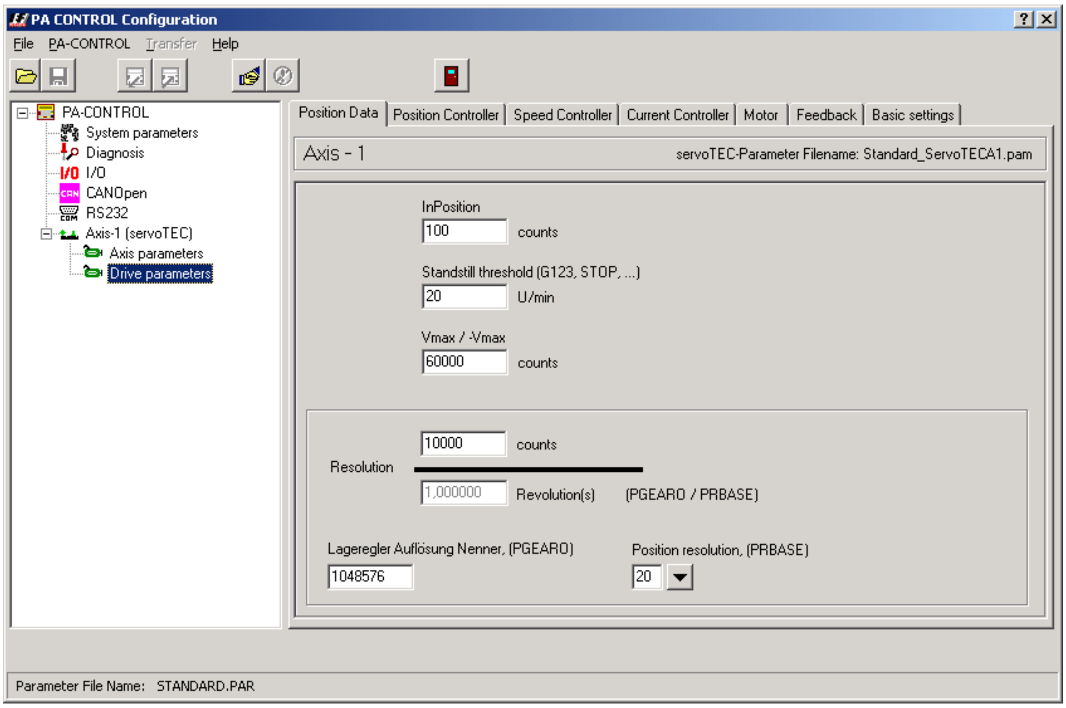


Figure 60: Drive Parameters for Positioning

WINPAC Parameters	Designation in the ASCII Object Reference	Short Description
In Position	**PEINPOS**	Status message for traversing job
Standstill threshold	**VEL0**	Speed threshold for standstill message
V_{max}	**PVMAX**	Maximum speed which may not be exceeded by a traversing set
Resolution	**PGEARI**	Increments per motor revolution

5.10.2.2 Drive Parameters for Position Controller

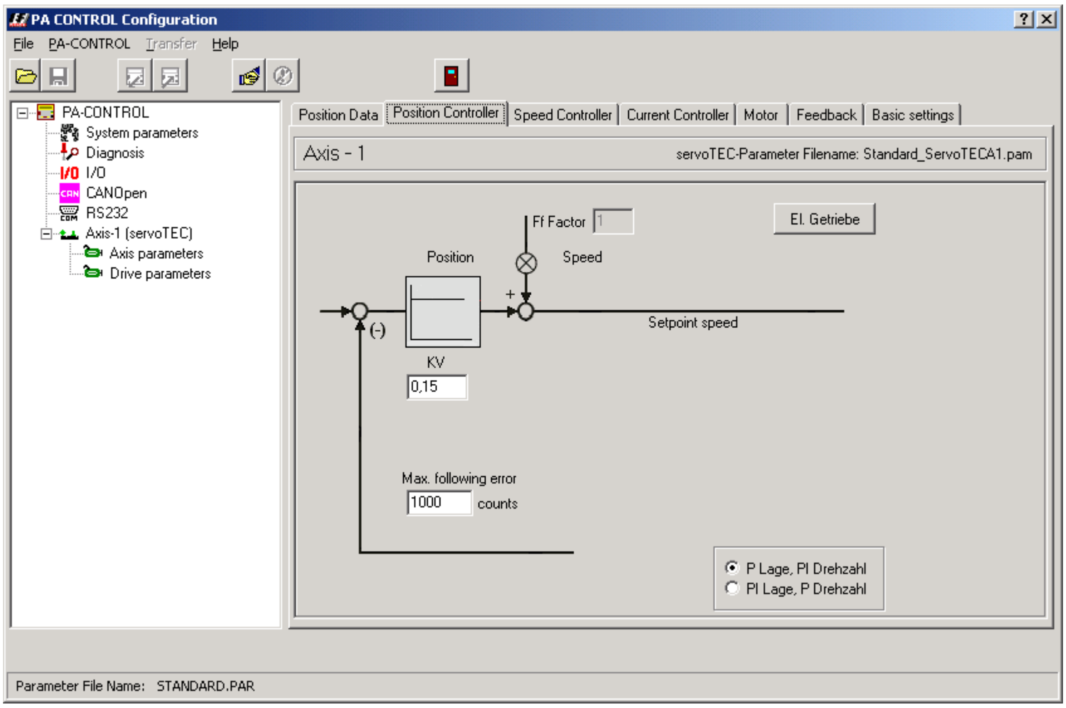


Figure 61: Drive Parameters for Position Controller

WINPAC Parameters	Designation in the ASCII Object Reference	Short Description
KV	**GP**	Position controller: proportional gain
KP	**GPV**	Amplification of the speed controller when using the PI position controller
Tn [ms]	**GPTN**	Position controller: integral-action time
Max. tracking error	**PEMAX**	Tracking error monitoring

5.10.2.3 Drive Parameters for Speed Controller

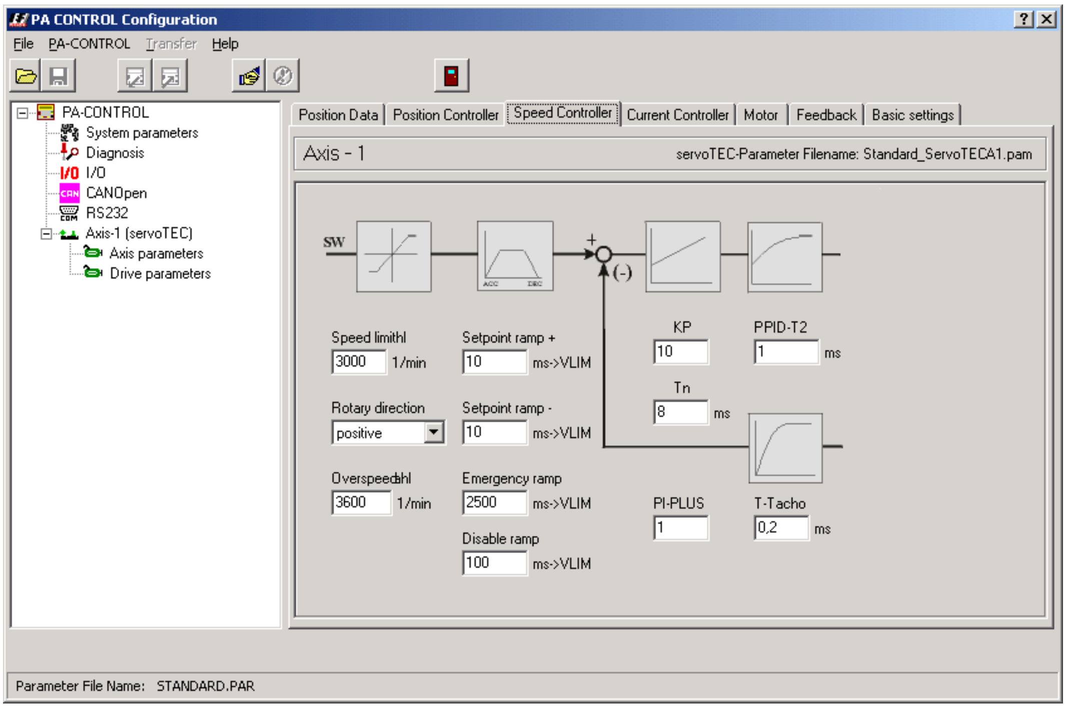


Figure 62: Drive Parameters for Speed Controller

WINPAC Parameters	Designation in the ASCII Object Reference	Short Description
Maximum speed	**VLIM**	Maximum speed for speed control
Direction of rotation	**DIR**	DIR=1, positive counting direction – positive rotational speed, speed and current settings cause the motor shaft to turn in a clockwise direction DIR=0, negative counting direction
Overspeed	**VOSPD**	Definition of the tripping threshold for error message F08 (overspeed)
SW ramp +	**ACC**	Acceleration ramp of the speed controller in msec
SW ramp -	**DEC**	Braking ramp of speed controller in msec
Emergency ramp	**DECSTOP**	Ramp for emergency stop - Error - Emergency stop input
Disable ramp	**DECDIS**	Speed of braking ramp on disabling the output stage, enable=0

5.10.2.4 Drive Parameters for Current Controller

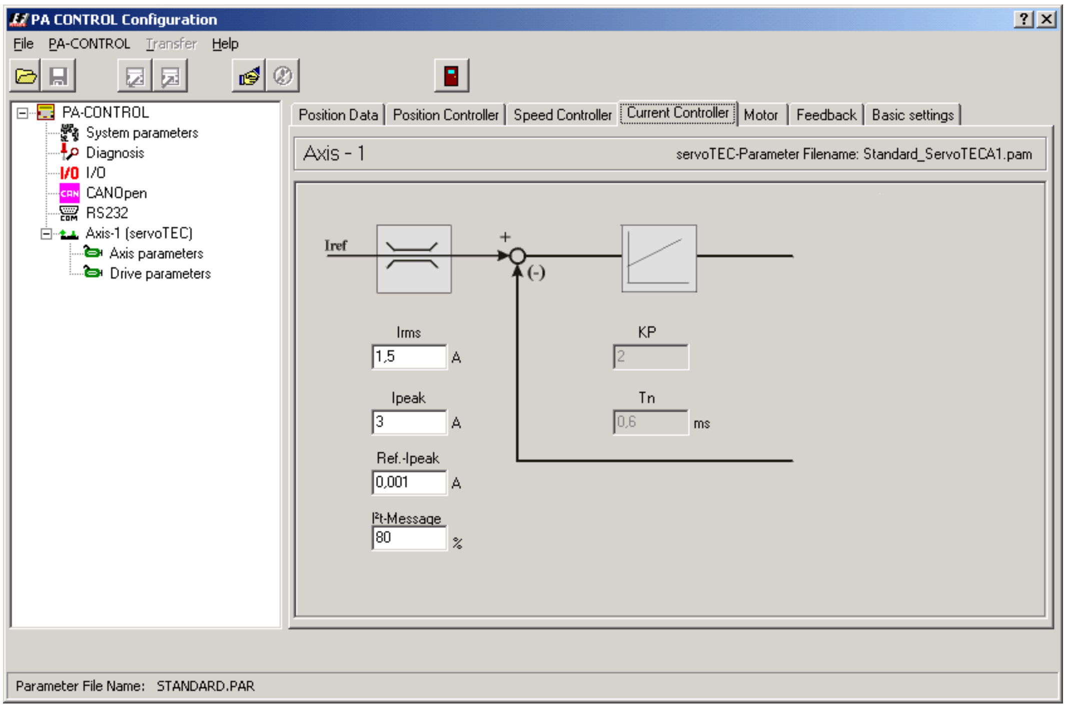


Figure 63: Drive Parameters for Current Controller

WINPAC Parameters	Designation in the ASCII Object Reference	Short Description
I_{ms}	**ICONT**	The constant current required by the application, corresponds to 100% I^2T current
I_{peak}	**IPEAK**	Sets the desired maximum current
Ref.-I_{peak}	**REFIP**	Definition of the peak current for the reference point approach to stop
I^2t message	**I2TLIM**	I^2t message threshold

5.10.2.5 Drive Parameters for Motor

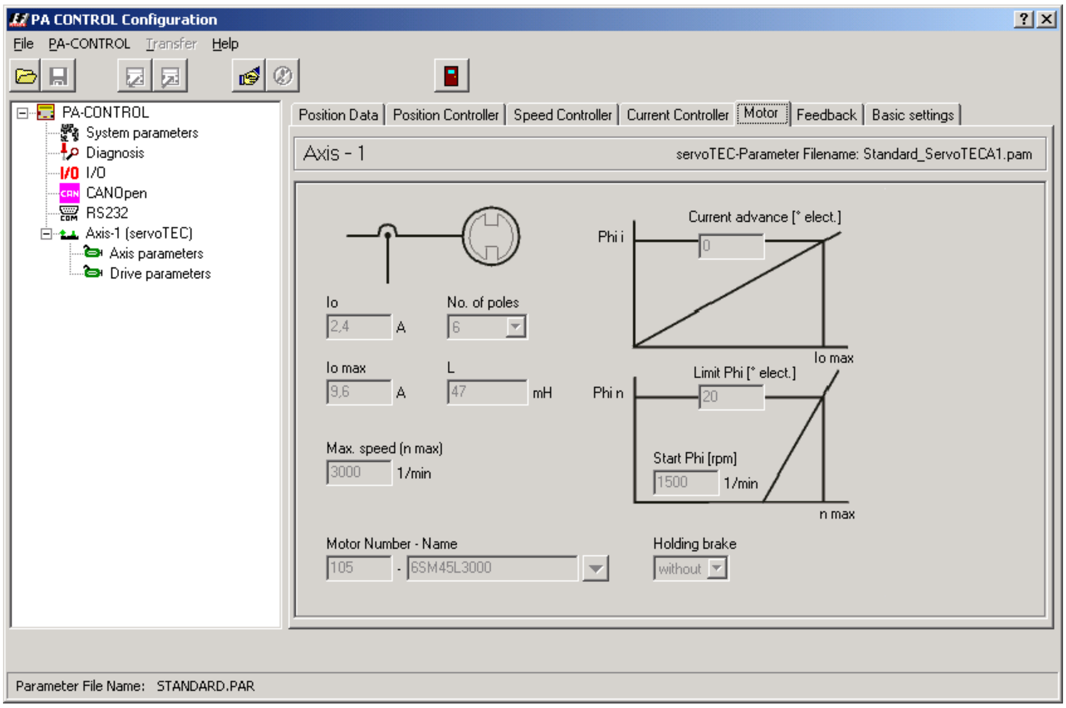


Figure 64: Drive Parameters for Motor

WINPAC Parameters	Designation in the ASCII Object Reference	Short Description
I_O	**MICONT**	Rated current of the motor
$I_{O\ max}$	**MIPEAK**	Peak current of the motor
Number of poles	**MPOLES**	Number of motor poles
L	**L**	Stator inductivity of the motor
Limit speed	**MSPEED**	Maximum speed of the motor
Motor no. name	**MNUMBER/MNAME**	Loading of a motor data set / motor name
Current advance	**MTANGLP**	Current advance
Final value Phi	**MVANGLF**	Speed-dependent advance (Final value Phi)
Service	**MVANGLB**	Speed-dependent advance (Service Phi)
Brake	**MBRAKE**	Preselection for motor brake

5.10.2.6 Drive Parameters for Feedback

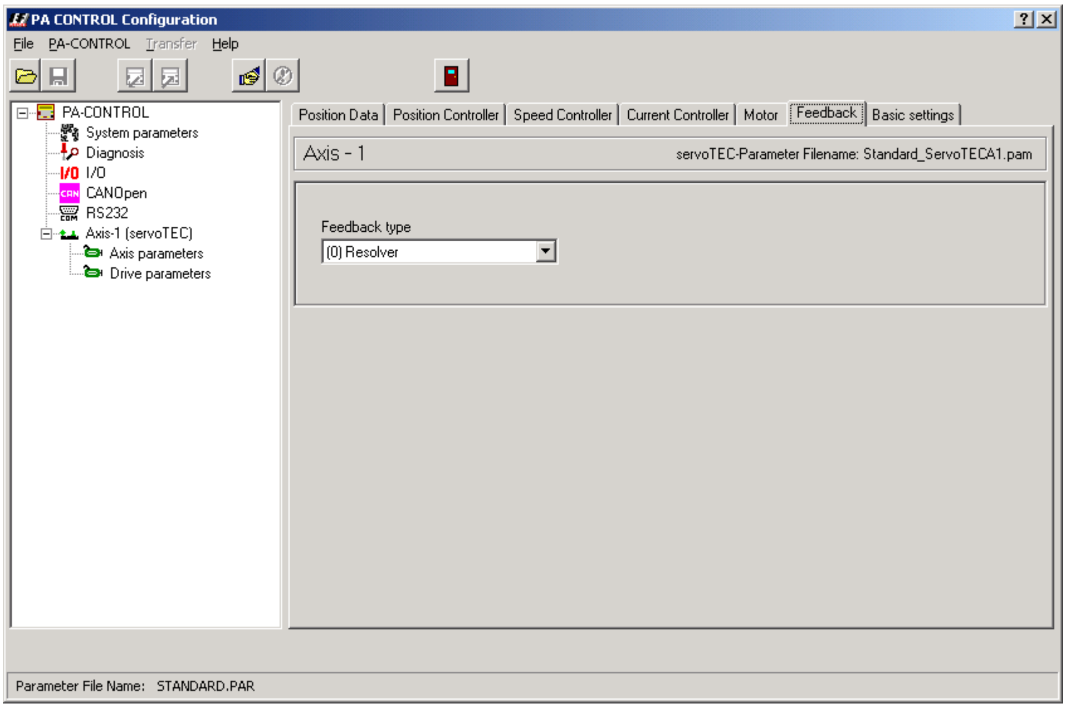


Figure 65: Drive Parameters for Feedback

WINPAC Parameters	Designation in the ASCII Object Reference	Short Description
Feedback	**FBTYPE**	Preselection of the feedback unit

5.10.2.7 Drive Parameters for Basic Settings

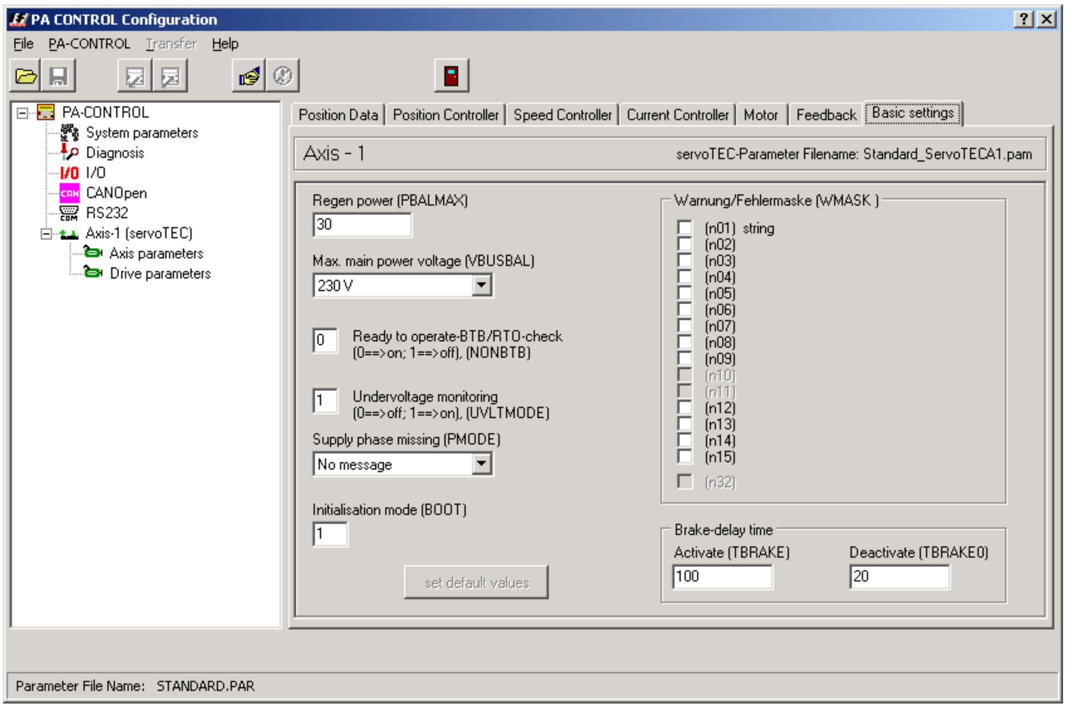


Figure 66: Drive Parameters for Basic Settings

WINPAC Parameters	Designation in the ASCII Object Reference	Short Description
Ballast performance	**PBALMAX**	Maximum ballast performance
Max. supply voltage	**VBUSBAL**	Maximum supply voltage
Check supply system BTB	**NONBTB**	Check BTB for supply system on/off
Undervoltage monitoring	**UVLTMODE**	Undervoltage mode
Warning/fault mask	**WMASK**	Warning/fault mask
Initialization type for amplifier	**BOOT**	Type of initialization at the start of the amplifier
Mains phase missing	**PMODE**	Mains phase mode
Brake reaction time	**TBRAKE**	Disable delay time for braking
Deactivate	**TBRAKE0**	Brake release time

5.11 Drive Parameters flexmoTEC

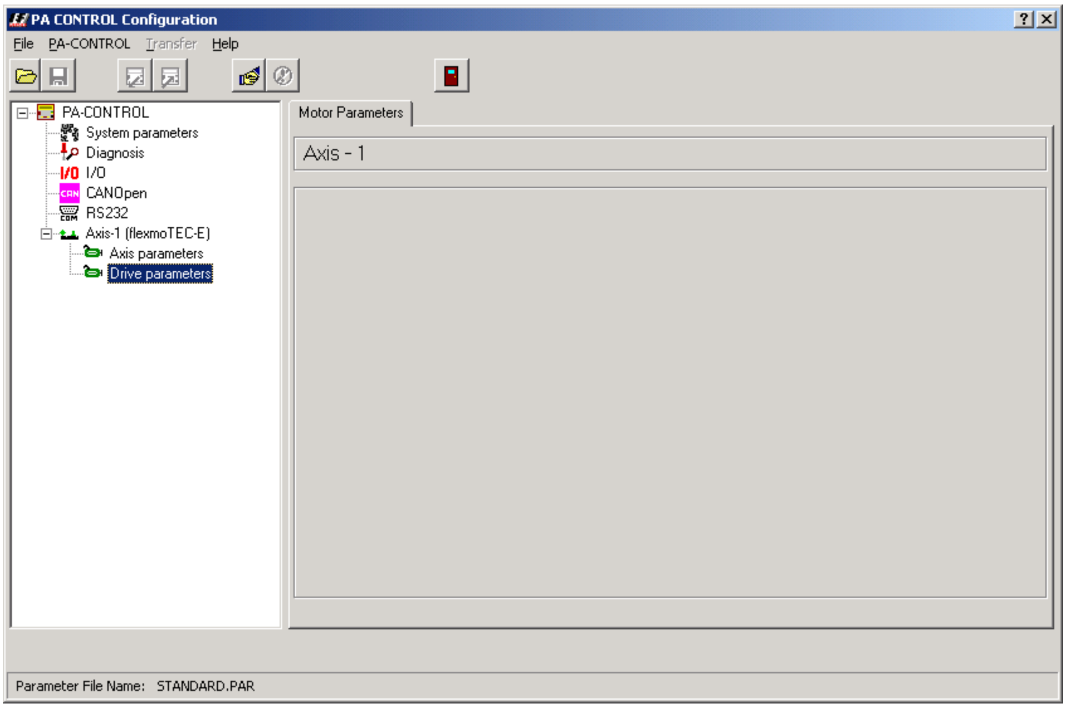


Figure 67: Drive Parameters flexmoTEC

NOTE For the axis type flexmoTEC the drive parameters are edited in LinMot-Talk.

5.12 Drive Parameters intelliMOT

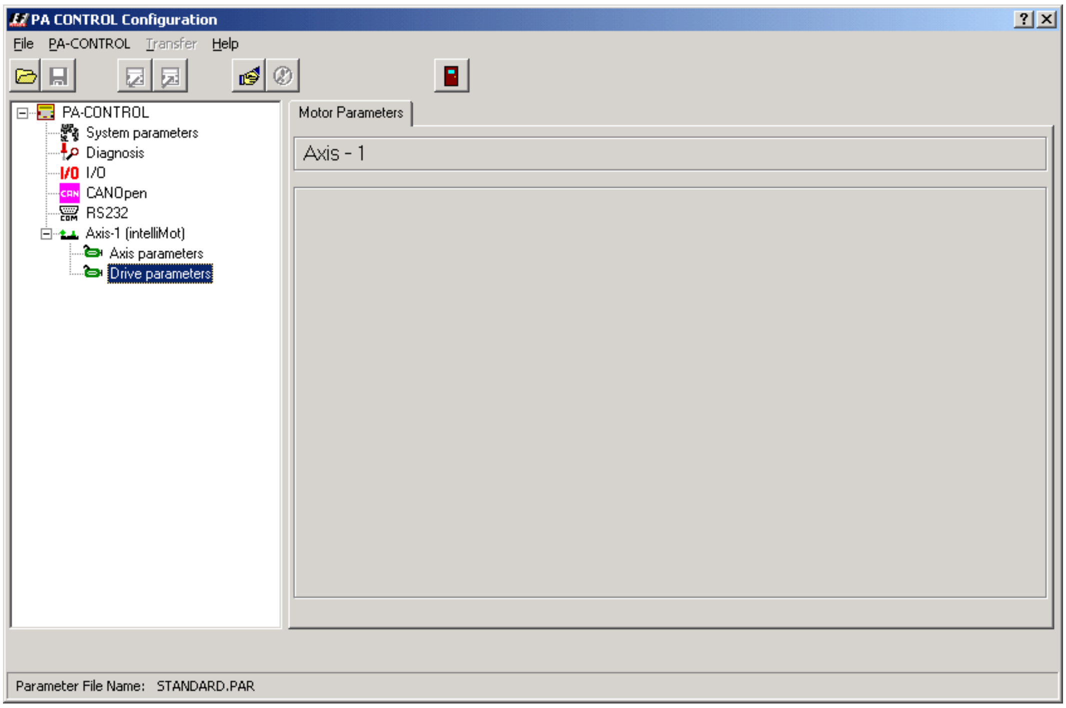


Figure 68: Drive Parameters intelliMOT

NOTE For the axis type intelliMOT the drive parameters are edited in intelliTool.

5.13 Drive Parameters dunMOT

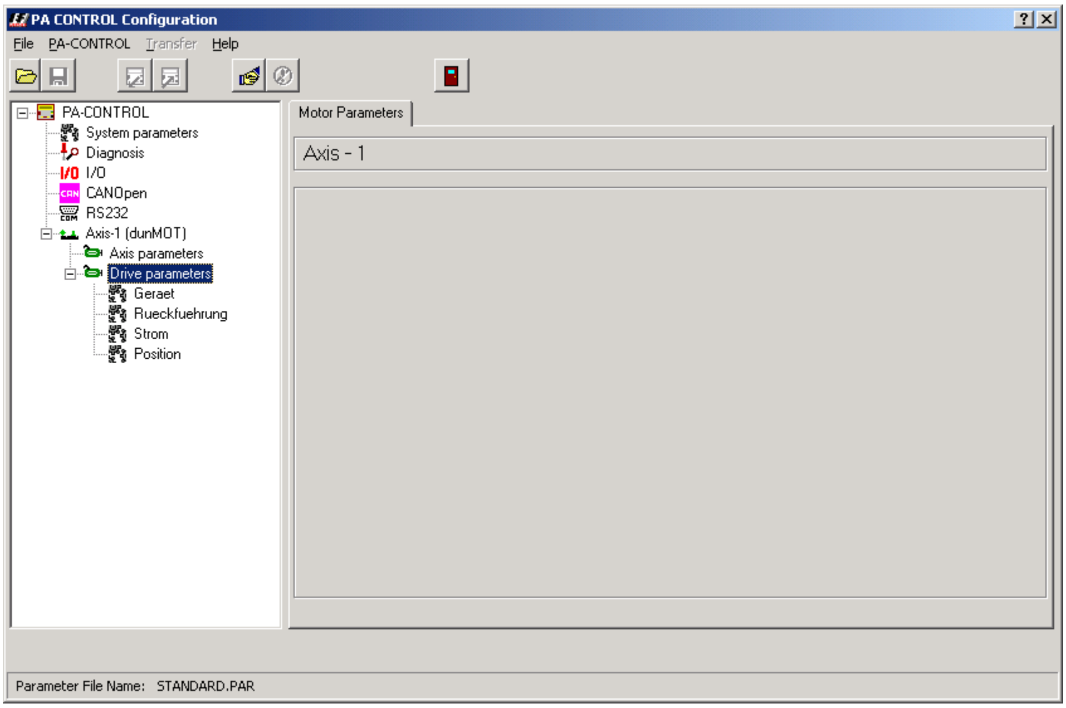


Figure 69: Drive Parameters dunMOT

NOTE For the axis type dunMOT the drive parameters are edited in „drive-Assistant".

5.14 Parameter Calculation

5.14.1 Gear Factor

The program input can be effected in mm, inches, degrees, etc. by means of this parameter. The following formula is used to determine this parameter:

Example 1 (without gear):

$$\text{Gear factor (GF)} = \frac{\text{Steps per revolution}}{\text{Feed per motor revolution}}$$

- Set resolution per revolution, 800
- Spindle pitch, 5mm
- Entry in mm

$$GF = \frac{800}{5\text{mm}} = 160 \text{ steps/mm}$$

Example 2 (with gear):

$$\text{Gear factor (GF)} = \frac{\text{Steps per revolution x gear ratio}}{\text{Feed per motor revolution}}$$

- Set resolution per revolution, 800
- Feed per motor revolution 100 mm
- Entry in mm
- Gear ratio 5:1

$$GF = \frac{800 \text{ st. x } 5}{100 \text{ mm}} = 40 \text{ steps/mm}$$

Example 3 (without gear):

$$\text{Gear factor (GF)} = \frac{\text{Steps per revolution}}{\text{Feed per motor revolution}}$$

- In PA-CONTROL MP, non-adjustable resolution per revolution, 3200
- Spindle pitch, 5 mm
- Entry in mm

$$GF = \frac{3200 \text{ st.}}{5 \text{ mm}} = 640 \text{ steps/mm}$$

5.14.2 Traversing Speed

The following formula is used to determine this parameter:

Max. traversing speed =	Revolutions per second x feed per motor revolution

- Motor with 3000 revolutions/min = 50 revolutions/sec.
- Feed per motor revolution 5mm

Max. traversing speed =	50 rev/s x 5 mm	= 250 mm/s

This side was left empty consciously!

6 Options

6.1 Options of PA-CONTROL

The functional scope of PA-CONTROL can be extended by numerous options. These expansions are implemented by means of plug-in IEF modules or plug-in boards in euroformat on the internal EURO bus system.

In line with the basic equipment of the device and the free installation space, not all options are possible simultaneously.

Description of the option		PA-CONTROL			
		CPU4	servoTEC	MP	
	CANopen	X	X	X	
IEF Modules	COM 1 / 2 port		X	X	
	COM 3 / 4 port	X	X	X	
	Profibus-DP	X	X	X	
	A-D converter	X	X	X	
	SSI	X	X	X	
EURO BUS card	I/O card 16/16	X			
	AS-i Master card	X			
	Interbus	X			
	EURO bus supporting board with SSI	X			
	EURO bus-carrier board with COM	X			
	PLS7	X			
	PLS9	X			
RAM extension *1	RAM4 – 1Mbyte IEF-Nr. 1055894	X			
	RAM4 – 2Mbyte IEF-Nr. 1055895	X			

*1 PA-CONTROL from version 4.75

NOTE According to the table below 8 serial interfaces COM1 to COM 8 are possible with the PA-CONTROL.
The number of interfaces are reduced to maximum 3 COM1 to COM 3 by PA-CONTROL MP because of the space conditions and for the same reason the interfaces are reduced to 2 COM 1 and COM 2 by PA-CONTROL servoTEC.

6.2 Expansions of the PA-CONTROL CPU4

The CPU4 can be equipped with partial front plates which vary in width (5, 9 and 13 width units). The partial front plate to be used depends on the number of expansions with an IEF module. 2 slots are available for IEF modules. COM2 can also be made accessible by means of the RS 232 port driver.

From version 4.75 it can be used additionally the memory expansions RAM4.

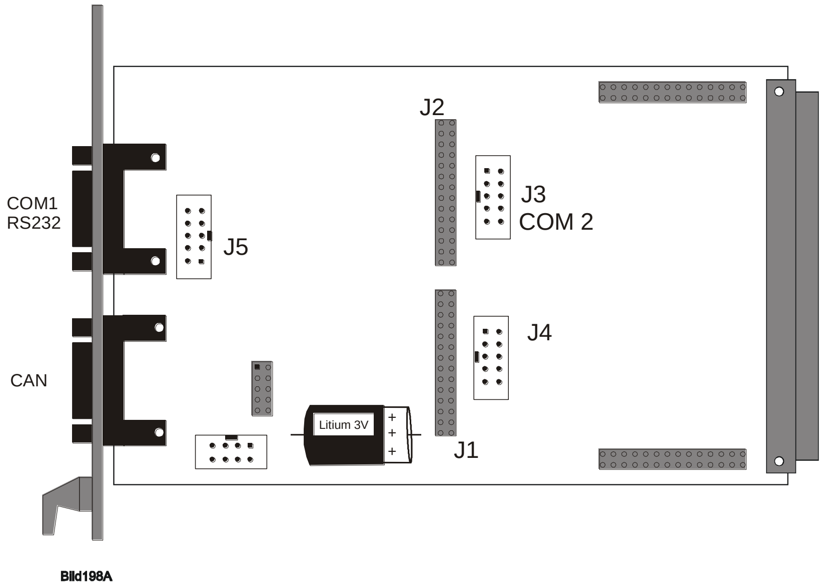


Figure 70: View of CPU4

Possible additional components for the CPU4:

Slot J1	All IEF modules except Profibus
Slot J2	All IEF modules
Slot J3	COM2 with RS 232 port driver

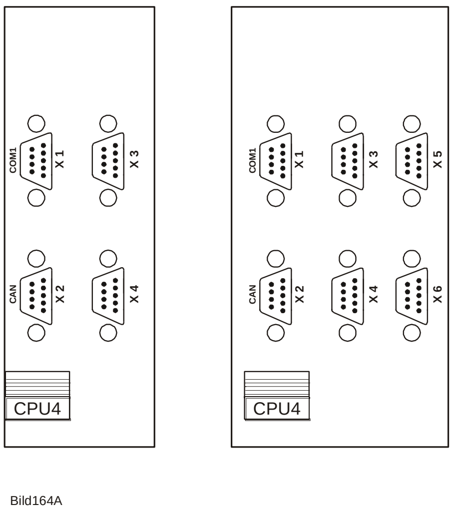


Figure 71: View of the Front Plate for CPU4 with 9 and 13 width units

The figure below shows the CPU4 – 9 width units with installed options.

An IEF module is connected to connector J2 (background).

The RS 232 port driver is mounted in the foreground. This is connected to J3.
COM2 is thereby realized on the CPU4.

Connection J1 is not used here.

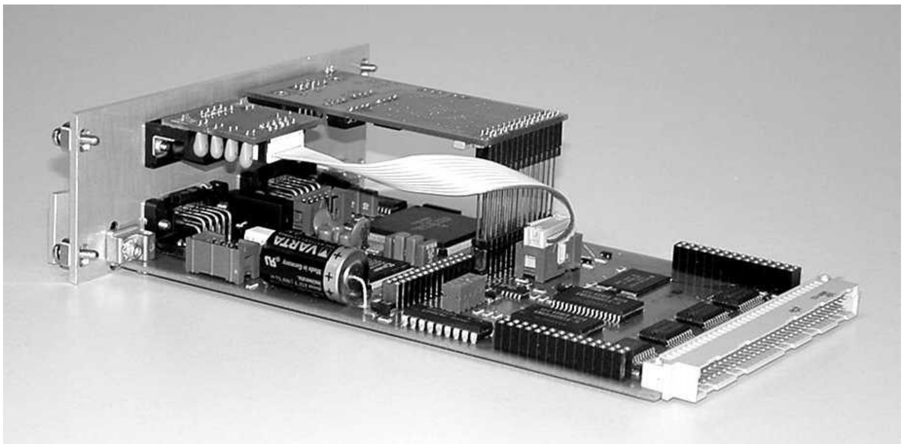


Figure 72: CPU4, view with installed Options

NOTE You will find information on the IEF modules in section *6: Options, page 167*.

6.3 CANopen Interface

PA-CONTROL has been provided with a CANopen interface. This interface is used for the optional expansion of PA-CONTROL.

Technical Data:

- Baud rate: 500kBits/s, can be altered
- Max. bus cable length: 66m

To ensure operator-friendliness and an uncomplicated initial start-up (Plug&Play), some specifications have been made for the connection of instruments to the CANopen bus and their addresses (ID numbers).

6.3.1 CANopen Devices with a permanent Assignment

PA-CONTROL assumes the role of master as it were for the devices with a permanent assignment in the CANopen. It detects the devices on the CANopen bus after reinitialization, transfers them to the hardware configuration of PA-CONTROL and monitors the devices in the various modes.

The devices with a permanent assignment are controlled by the operating system of PA-CONTROL and made available to the user as an axis, input or output.

6.3.2 CANopen Devices without a permanent Assignment

Any CANopen device which meets the technical requirements (address, baud rate, ...) can be connected as a device without a permanent assignment.

These devices are not addressed and not supported by the operating system. Commands (G700 group) are available in the AUTOMATIC mode for communication with such devices.

The devices can be

- initialized (NMT)
- parameterized (SDO)
- monitored (EMCY)
- written to (PDO) and
- read (PDO)

by the programs in AUTOMATIC mode by means of these commands.

The WINPAC program provides various windows for support in diagnosis and commissioning.

6.3.3 Overview of the CAN IDs

CAN ID	Function in PA-CONTROL	Possible component
1	Driving axis 1	- LV-servoTEC - LV-servoTEC S2 - PA-CONTROL-MP - flexmoTEC-E - flexmoTEC-B - intelliMOT - dunMOT - EPOS - LE3-80 - LE8-80
2	Driving axis 2	
3	Driving axis 3	
4	Driving axis 4	
5	Driving axis 5	
6	Driving axis 6	
7	Driving axis 7	
8	Driving axis 8	
9	Driving axis 9	
10	Driving axis 10	
11	Driving axis 11	
12	Driving axis 12	
13	Driving axis 13	
14	Driving axis 14	
15	Driving axis 15	
16	Driving axis 16	
17	Digital inputs/outputs (I/O1025 - I/O1088) Analog inputs/outputs (AD1 - AD4 / DA1 - DA4)	BECKHOFF : - "BK5120", "BK5150", "LC5100", - "IL2301-B510", - "IP1001-B518" MURR Elektronik : - "MBM55900" FESTO : - "CPV", - "CPX - FB14"
18	Digital inputs/outputs (I/O1089 - I/O1152) Analog inputs/outputs (AD5 - AD8 / DA5 - DA8)	
19	Digital inputs/outputs (I/O1153 - I/O1216) Analog inputs(AD9 – AD12)	
20	Digital inputs/outputs (I/O1217 - I/O1280) Analog inputs(AD13 – AD16)	
21	Digital inputs/outputs (I/O1281 - I/O1344) Analog inputs(AD17 – AD20)	
22	Digital inputs/outputs (I/O1345 - I/O1408) Analog inputs(AD21 – AD24)	
23	Digital inputs/outputs (I/O1409 - I/O1472) Analog inputs(AD25 – AD28)	
24	Digital inputs/outputs (I/O1473 - I/O1536) Analog inputs(AD29 – AD32)	
49	Access via G700 commands in AUTOMATIC	- any CANopen device
50	Access via G700 commands in AUTOMATIC	
51	Access via G700 commands in AUTOMATIC	
52	Access via G700 commands in AUTOMATIC	
60	BUS access to PA-CONTROL	- IEF-Touch-Screen console
61	BUS access to PA-CONTROL	
62	BUS access to PA-CONTROL System parameters available for "polling range"	
63	BUS access to PA-CONTROL System parameters available for "polling range" Time monitoring for access	

6.3.4 Control system PNOZmulti 2

The control system “PNOZmulti 2“ consisting of a basic “PNOZ mB0“ unit which will be equipped with the CANopen fieldbus module “PNOZ m ES CANopen”.

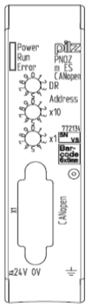
Up to 4 expansion modules can be connected as required.

When connecting the “PNOZ m ES CANopen” module to the PA-CONTROL, the CAN-adress of 53 and the baud rate of 500kbaud have to be set.

Rotary switch „DR“ : 6 = 500kBaud

Rotary switch „adress X10“ : → 5

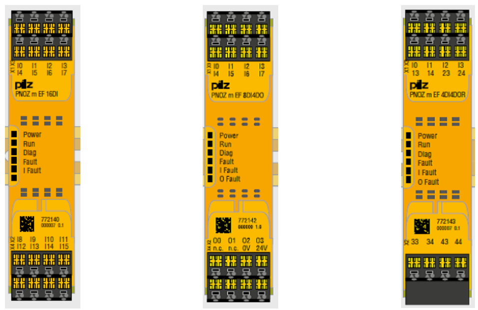
Rotary switch „adress X1“ : → 3



Up to 4 expansion modules can be connected as required.

For expample:

PNOZ EF 16DI 16 safe inputs
PNOZ EF 8DI4DO 8 safe inputs, …
PNOZ EF 4DI4DOR 4 safe inputs,…



The communication of PA-CONTROL with PNOZmulti 2 is performed only via digital inputs and outputs (I/O 2049 … 2304).

PA-CONTROL	PNOZmulti 2
I/O 2049 … 2176	Virtual inputs and outputs of PNOZmulti
I 2177 … 2184 (O without function)	LED status of PNOZmulti
I/O 2185 … 2192	Table number
I/O 2193 … 2200	Segment number
I 2201 … 2304 (O without function)	Reproduce the data (13 Byte) of configured table- and segment numbers

6.3.4.1 Digital inputs

Digital inputs	
PNOZmulti 2	PA-CONTROL
Virtual outputs o0 … o127	I2049 … I2176
o0 →	I2049
o1 →	I2050
o2 →	I2051
…	…
o127 →	I2176
LED status	I2177 … I2184
	I2177: LED OFAULT illuminate or blinks
	I2178: LED IFAULT illuminate or blinks
	I2179: LED FAULT illuminate or blinks
	I2180: LED DIAG illuminate or blinks
	I2181: LED RUN illuminate or blinks
	I2182 …I2184: reserved
configured table number	I2185 … I2192 (I2185 → Bit 2^0 , …)
configured segment number	I2193 … I2200 (I2193 → Bit 2^0 , …)
Byte 0 to Byte 12 of user data. Depending on configured table- and segment number. Different information will be displayed in the user data.	I2201 … I2304

6.3.4.2 Digital outputs

Digital outputs	
PA-CONTROL	PNOZmulti 2
O2049 … O2176	Virtual inputs i0 … i127
O2049 →	i0
O2050 →	i1
O2051 →	i2
…	…
O2176 →	i127
O2177 … O2184	Not used (reserved)
O2185 … O2192(O2185 → Bit 2^0 , …)	Setting of table number
O2193 … O2200 (O2193 → Bit 2^0 , …)	Setting of segment number
O2201 … O2304	Not used (reserved)

6.3.4.3 Status request of digital inputs and outputs of PNOZmulti 2 devices

The PNOZmulti 2 provides several tables. In these tables the status of digital inputs and outputs of the basic device and the expansion modules of PNOZmulti 2 are stored amongst other things. The tables were divided in segments, because the amount of data in the table is bigger than 13 byte.

By selecting the table- and segment number via digital outputs O2185 to O2200 of PA-CONTROL the table content can be read out with the help of the inputs I2201 to I2304.

PNOZmulti 2		
Device name	Table number	Segment number
Basic device	20	0
First expansion module right	21	0
Second expansion module right	21	3
Thirt expansion module right	21	6
Fourth expansion module right	21	9

Program example for setting the table number and segment number for the second expansion module right:

```
…
N100:=21  ; table number=21
N101:=3   ; segment number=3
G600.N100.2185.8
G600.N101.2193.8
;
$waittillactivated
G603.N103.2185.8
M101:=N101<>N103; table active
G21 M101.1 waittillactivated
;
G603.N103.2193.8
M101:=N102<>N103; segment active
G21 M101.1 waittillactivated
…
```

PNOZmulti 2	PA-CONTROL
Status of the element of the selected device	Displayed onto the digital input
Input i0	I2201
Input i1	I2202
Input i2	I2203
Input i3	I2204
Input i4	I2205
Input i5	I2206
Input i6	I2207
Input i7	I2208
Input i8	I2209
…	…
Input i31	I2232
Output o0	I2233
Output o1	I2234
Output o2	I2235
Output o3	I2236
Output o4	I2237
Output o5	I2238
Output o6	I2239
Output o7	I2240
Output o8	I2241
…	…
Output o31	I2264

6.4 RS 232 Port Driver

The RS 232 port driver only executes the signal level adjustment from 5V to the RS232 level of the COM port.

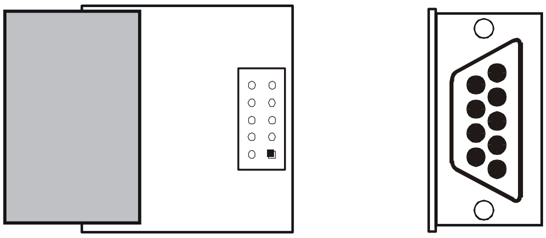
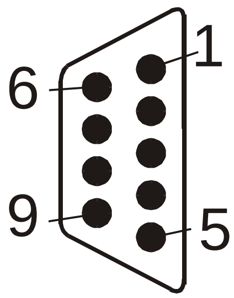


Figure 73: RS 232 Port Driver



1 N.C.
2 RXD, Receive Data
3 TXD, Transmit Data
4 N.C.
5 GND
6 N.C.
7 RTS, switch on transmitter
8 CTS, ready for transmission
9 N.C.

Figure 74: Assignment of the RS 232 port (Sub-D, 9 poles; pins)

Use:

Use on:	Application for:	Connection to:
CPU4	COM2	J3
IEF module RS232 port	COM2 / COM4	J2
PA-CONTROL servoTEC	Control console connection	X6
PA-CONTROL-MP	Control console connection	X5

6.5 IEF Module RS 232 Port

A COM1 and 2 or COM3 and 4 port can be implemented by means of the IEF module RS 232 port. This module occupies an IEF module slot.

A COM2 or COM4 port comes into being by means of the RS232 port driver, which is connected to the RS232 port module via connector J2.

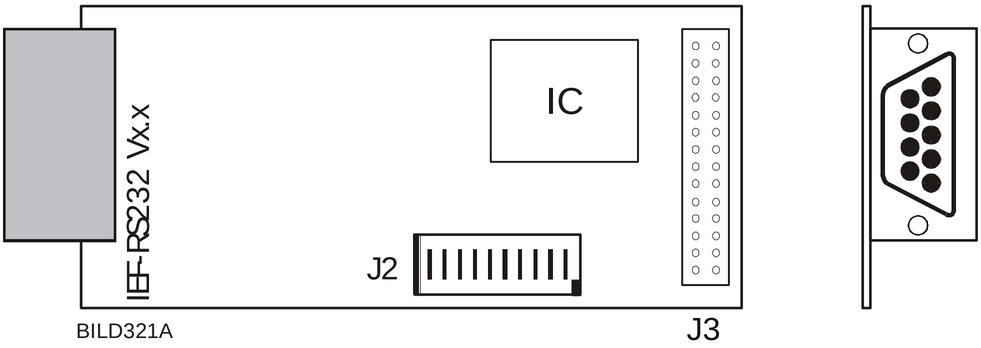


Figure 75: RS 232 Port Module

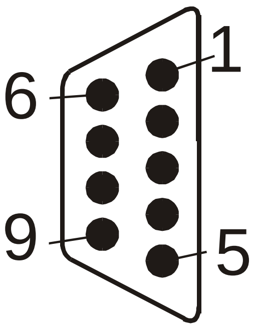
	1 N.C. 2 RXD, Receive Data 3 TXD, Transmit Data 4 N.C. 5 GND 6 N.C. 7 RTS, switch on transmitter 8 CTS, ready for transmission 9 N.C.

Figure 76: Assignment of the RS 232 Port (Sub-D, 9 poles; pins)

6.6 IEF Module Profibus DP

PA-CONTROL can be integrated as a slave in a Profibus network by means of the Profibus option. Please refer to the "Profibus documentation" and the interface manual for further information.

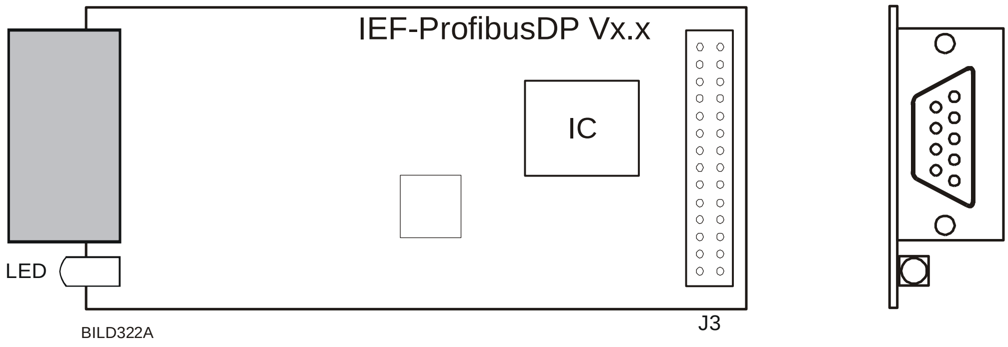


Figure 77: IEF Module Profibus DP

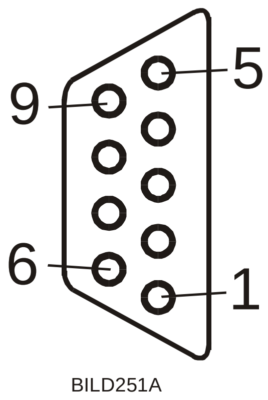
	1 N.C. 2 N.C. 3 B 4 RTS ***** 5 GNDO ***** 6 +5V ***** 7 N.C. 8 A 9 N.C.

Figure 78: Connector Assignment (Sub-D, 9 poles, socket)

* These signals are required when the signal must be amplified for a bus extension.

NOTE EN50170 and the general installation guidelines for Profibus DP must be complied with when the Profibus option is installed.

6.7 IEF Module A-D Converter

This module is available in executions with 2 or 8 channels. In principle, the connector assignment is the same for both executions. See also the A-D converter manual.

Technical data:

- 12 bit converter
- 160 µsec/channel
- Input voltage ranges: (0-10) V or +/-10V
- Input resistance: 1MΩ in the 10V range

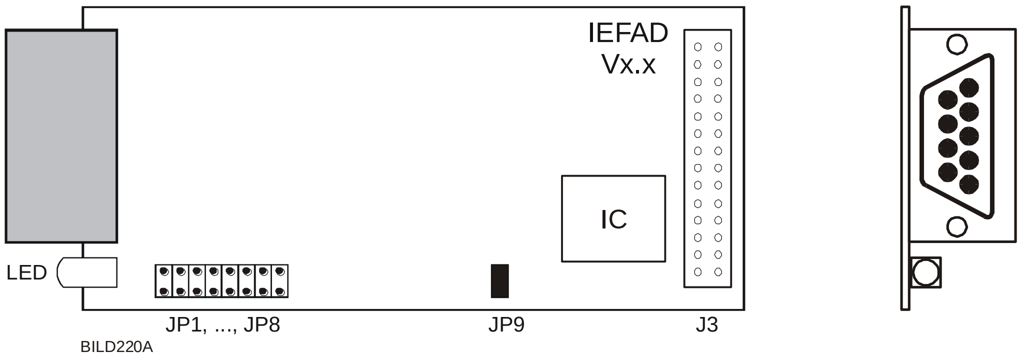
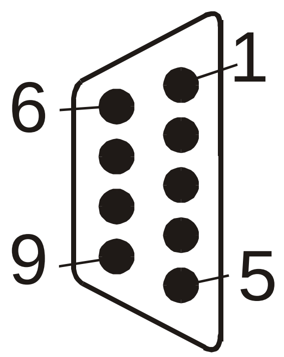


Figure 79: IEF Module A-D Converter



1 Analog input value channel 1
2 Analog input value channel 2
3 Analog input value channel 3
4 Analog input value channel 4
5 Analog input value channel 5
6 Analog input value channel 6
7 Analog input value channel 7
8 Analog input value channel 8
9 GND

Figure 80: Connector Assignment (Sub-D, 9 poles, pins)

NOTE Inputs not connected to signal sources must be connected to GND.

6.8 IEF Module SSI Interface

6.8.1 General

PA-CONTROL offers the user the option of assigning the axes with an absolute positioning system. As a result, the approach to reference point for the respective axis can be dispensed with and the position of the axes taken from the absolute value system.

The absolute positioning system is implemented by an IEF module.

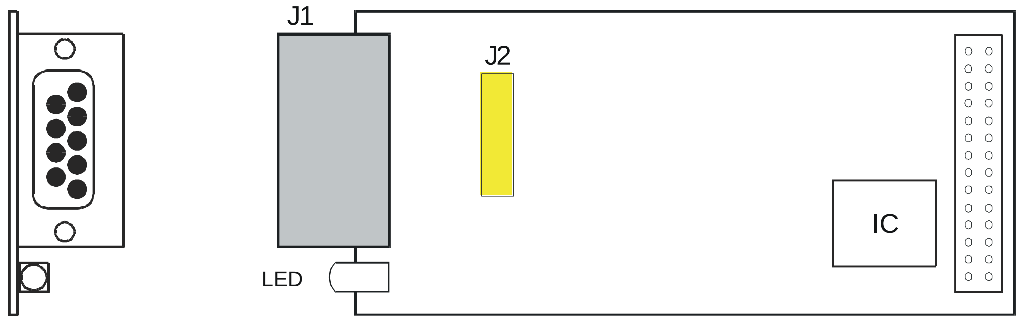


BILD600A

Figure 81: IEF Module SSI Interface

Up to two absolute positioning systems can be implemented with one module. The first one, Channel A, is wired up to plug-in connector J1. The second one, Channel B, is wired up to plug-in connector J2. From there, the signals are transmitted to an exterior 9 pole SUB D socket connector via a ribbon cable.

Assignment of the plug-in connectors J1 /J2 (Channel A/B)

Type: SUB D socket connector, 9 poles

Pin.No.	Signal direction	Signal name
1	→	SSIClk+
2	→	SSIClk-
3	←	SSIData+
4	←	SSIData-
5		Gnd
6	→	+5VDC (supply for rotary encoder max. 100 mA)
7		
8		
9		

6.8.2 Detection and Assignment

The "Absolute positioning system SSI interface" modules can be inserted in all possible IEF module slots in PA-CONTROL. Since there are 2 channels in a module, the number of modules which are detected and subsequently processed is restricted to 8. As a result, an absolute positioning system can be assigned to each of the 16 possible axes.

The modules are detected and applied during the reinitialization of PA-CONTROL.
The modules are checked every time PA-CONTROL is switched on.

6.8.2.1 Sequence for the Detection of the Modules

PA-CONTROL searches in the following order:

- IEF module slot 1 (CPU4/MP/servoTEC)
- IEF module slot 2 (CPU4/MP/servoTEC)
- Euro supporting board 1, IEF module slot 1
- Euro supporting board 1, IEF module slot 2

etc. up to

- Euro supporting board 4, IEF module slot 2

In doing so, PA-CONTROL first of all executes the following assignment between the absolute positioning systems and the axes.

Detected module	Assigned axis
Number 1, Channel A	Axis 1
Number 1, Channel B	Axis 2
Number 2, Channel A	Axis 3
Number 3, Channel B	Axis 4
etc. up to	
Number 8, Channel A	Axis 15
Number 8, Channel B	Axis 16

The assignment can be changed by means of WINPAC when setting the parameters.

6.8.3 Parameters

6.8.3.1 Device Parameters

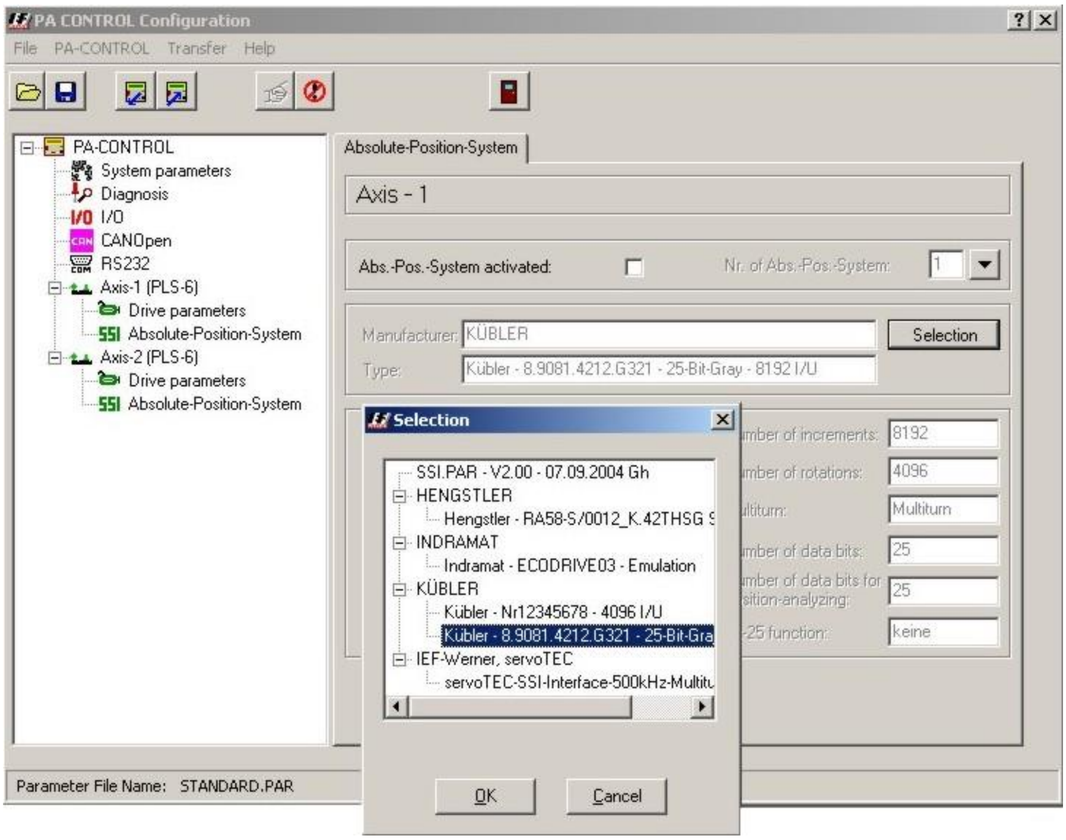


Figure 82: Selection of absolute Position Encoders

Parameter name	**Description**
No. of absolute positioning systems	Is the number of the existing absolute positioning systems in PA-CONTROL (No. of modules * 2) (Can only be read via the diagnosis port)
Assigned axis number	Access number associated with this absolute positioning system (Channel). 0 : none Axis 1 : Axis 1 2 : Axis 2 ... (Can be read and written to via the diagnosis port)

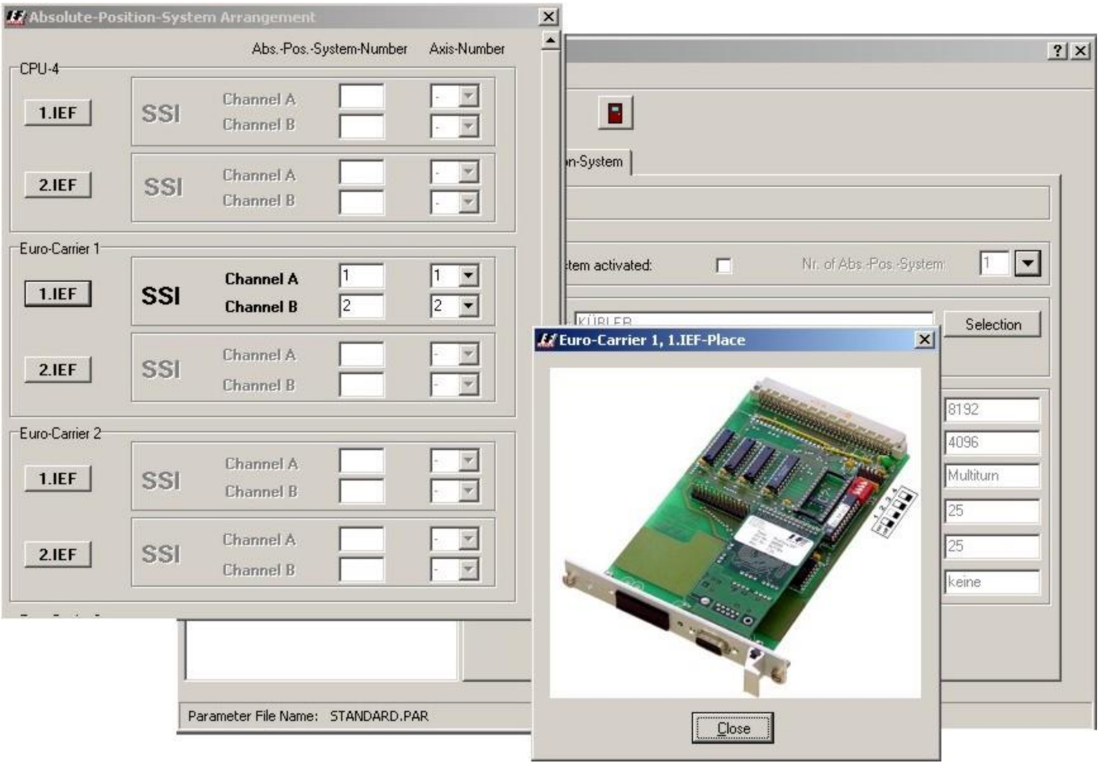


Figure 83: Assignment of the absolute Positioning System

Slot number	Number of the slot in which the module is inserted. (Can only be read via the diagnosis port)

6.8.3.2 Axis Parameters

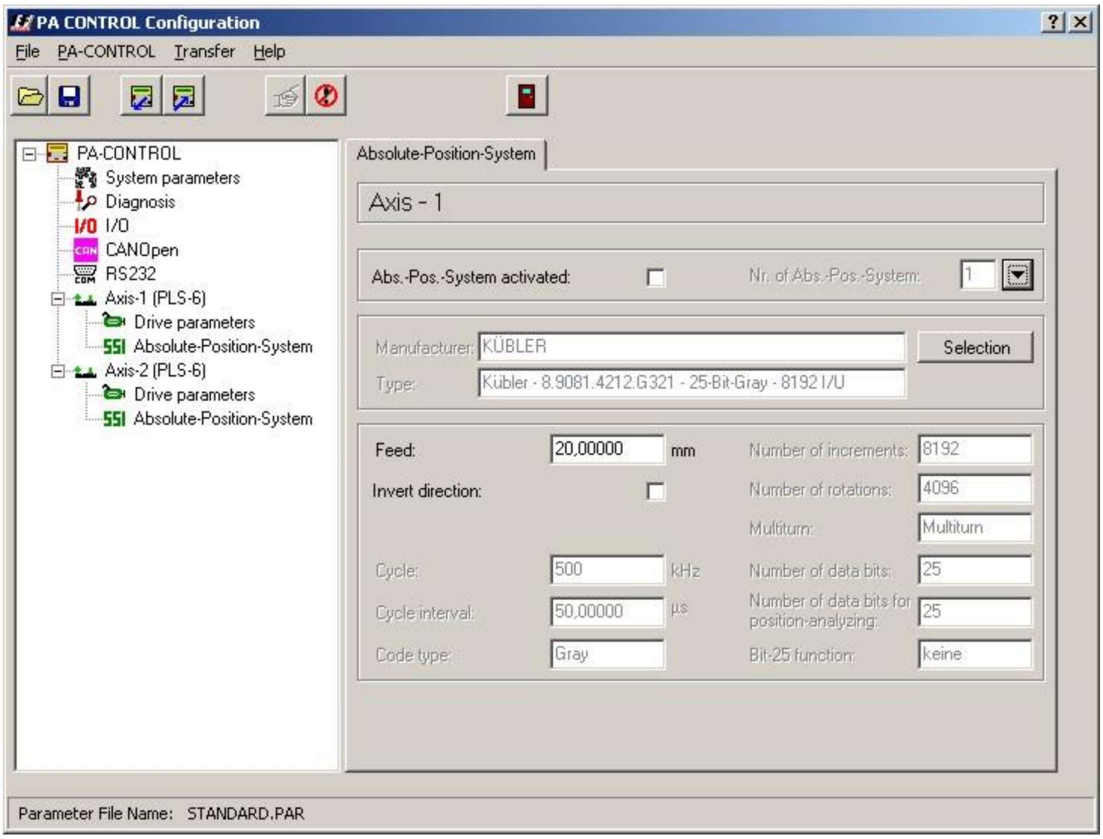


Figure 84: Activation of the Absolute Positioning System

Parameter name	**Description**
Absolute positioning system activated	Activation desired yes/no
AbsPoSys Transmission clock pulse scaler	Setting the frequency of the clock pulse of the SSI. Formula : F = 2MHz/ 2*n 0 : 1MHz 1 : 500KHz 2 : 333KHz ... max. 32 :
AbsPoSys Pause time scaler	Setting the clock pulse space after which a value package was retrieved Formula : T = n * 0.5µs 2 : 1µs 4 : 2µs 20 : 10µs max. 128 :

AbsPoSys Evaluation code variant	The data format of an absolute positioning system can vary. Common data formats: 0 : Gray code 1 : Binary code 2 : BCD code 3 : Gray excess code
AbsPoSys Multiturn	There are absolute positioning systems for one or more revolutions 0 : Singleturn - one revolution 1 : Multiturn - several revolutions
AbsPoSys Number of data bits	States the number of data bits which are to be received via the SSI interface e.g.: 25 : Indramat ECODRIVE3 max. 32 :
AbsPoSys Number of data bits for position	States the number of data bits which are used for the position evaluation.
AbsPoSys Function of data bit 25	Data bit 25 can have different meanings in different absolute positioning systems. 0 : No separate evaluation, is data bit 2^0 1 : Ignore, do not use as a data bit 2 : Parity bit 3 : Power Fail Bit (PFB)
AbsPoSys Resolution factor	Depending on the application, the increments of the absolute positioning system are to be variably evaluated. The resolution factor is the conversion factor, so that the position of the absolute positioning system is identical to the axis position.
AbsPoSys Offset to the reference point	The zero point of the absolute positioning system and the axis is synchronized by this value.
AbsPoSys Direction inverted	The counting direction of the absolute positioning system can be inverted and the counting direction of the axis can be aligned by this means.
AbsPoSys Increments per revolution	Resolution in increments for one revolution of the absolute position encoder.
AbsPoSys max. number of revolutions	Maximum number of revolutions of the absolute position encoder.

6.8.4 Application

On entering a traversing mode (MANUAL, AUTOMATIC, ONLINE), PA-CONTROL checks the settings in relation to the absolute positioning system.

- If an absolute positioning system has been activated in the parameters for an axis, but no system has been assigned, an error message is output and the operating mode cannot be executed.
- If the absolute positioning system does not function correctly after initialisation (SSI module does not report READY), an error message is output and the operating mode cannot be executed.
- On reception of the axis parameters, PA-CONTROL checks the change of the parameter "Absolute positioning system activated".
  If the Parameter changes from "activated" to "deactivated", the "Reference flag" of this axis is reset.

6.8.4.1 Reinitialization of PA-CONTROL

The following data is reset after reinitialization of PA-CONTROL and may have to be set again.

- Assignment of the absolute positioning System to an axis
- Axis parameters for the absolute positioning system
- Flag of absolute positioning system is "referenced"

6.8.4.2 Referencing the Absolute Positioning System

The synchronization between an axis and the absolute positioning system is executed by an approach to reference point. The approach to reference point can be carried out in any traversing mode.

An automatic alignment between the axis system and the absolute positioning system is carried out at the end of an "APPROACH TO REFERENCE POINT". The calculated offset is stored in the axis parameter "AbsPoSys Offset to the reference point". The absolute positioning system is set to " referenced".

If the position data cannot be correctly transferred from the absolute positioning system at the end of the "APPROACH TO REFERENCE POINT" (no encoder connected, encoder data not complete, etc.), an error message is output. If PA-CONTROL is in the AUTOMATIC or ONLINE mode, an "Exxx" message is output and the operating mode cannot be continued.

These settings and data are retained and are only deleted through a reinitialization of PA-CONTROL.

6.8.4.3 Traversing Axes manually when Abs. Positioning System is activated

On entering the "MANUAL" mode, a check is carried out as to whether the absolute positioning system has been "referenced".

- **Yes** : The current position is transferred from the absolute positioning system.
- **No** : The position of the axes is not changed.

6.8.4.4 Axes in the AUTO/ONLINE Mode when Abs. Pos. System is activated

On entering the "AUTOMATIC" or "ONLINE" mode, a check is carried out as to whether the absolute positioning system has been "referenced".

- **Yes** : The current position is transferred from the absolute positioning system. Traversing can be executed without further referencing of the axis.
- **No** : The position of the axes is not changed. The axis is not referenced and cannot be traversed without further referencing of the axis.

6.8.4.5 Measuring Mode "G140 / G141" when Abs. Pos. System is activated

If an absolute positioning system has been installed and activated for an axis, the absolute positioning system has priority over the rotary encoder.

Irrespective of the settings for the measuring mode (synchronisation to rotary encoder, transfer of the rotary encoder position, etc.), the position is transferred from the absolute positioning system.

The actions for "Synchronisation to rotary encoder" (if activated) are not executed.

NOTE See the detailed description of the commands in section *3: Commands of the PA-CONTROL-Family, page 87* and file “MAN_EN_1086949_PAC_ ProgrammersManual.pdf”

6.8.5 WINPAC and the Absolute Positioning System

6.8.5.1 Diagnosis

The diagnosis for the absolute positioning system takes place in the diagnosis window for the "Axis position" via the button "Extension of the absolute positioning system". The counter (incremental value) and the position of the absolute positioning system are displayed in this extended window.

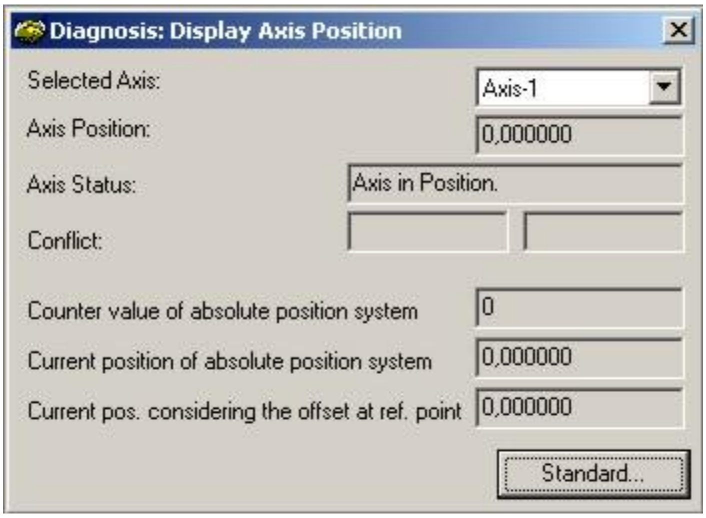


Figure 85: Display of the incremental Value and Position

6.8.5.2 Setting the Axis Parameters

The tab "Absolute positioning system" is available in the field "Axis" in the "PA-CONTROL configuration" window.

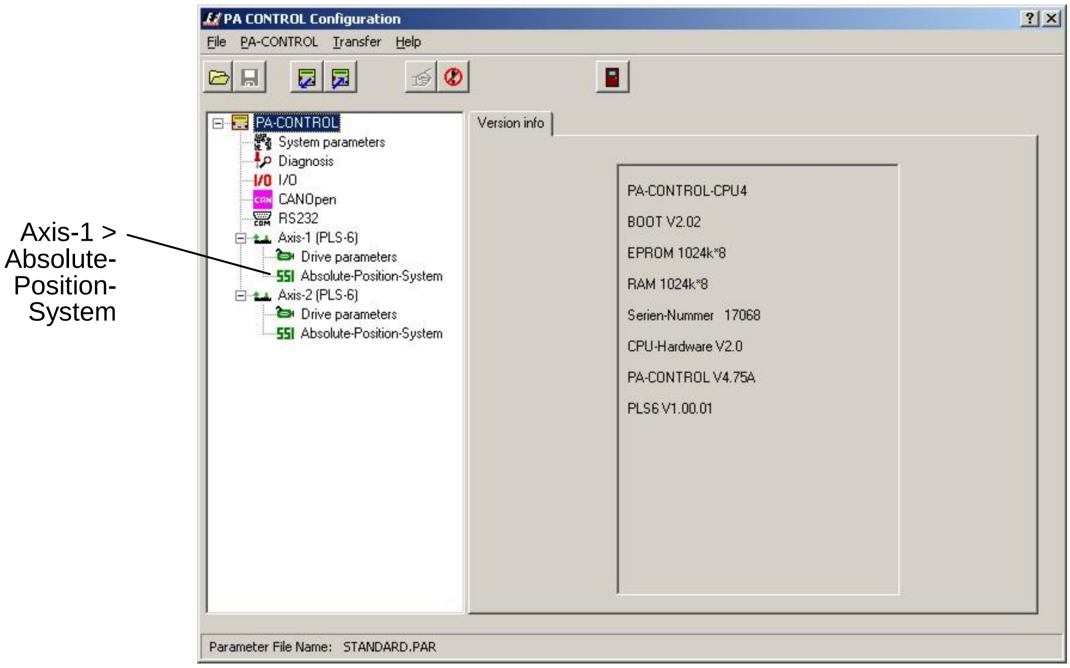


Figure 86: Selection of the tab "Absolute Positioning System"

The set parameters are displayed in this tab.

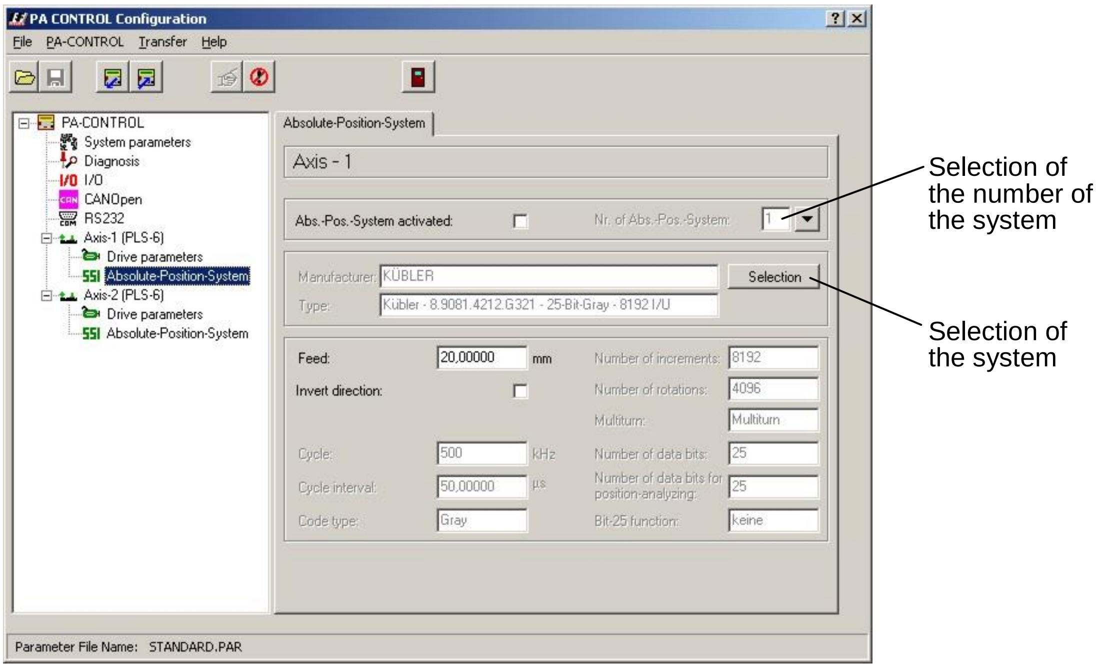


Figure 87: Display of the Set Parameters

Setting the parameter values

These parameters can only be changed by selecting another absolute positioning system (*see Figure 87, page 188*).

A selection can be made from a number of absolute position encoders stored in a special file in the "Selection of absolute position encoders" window. The selection file was created by IEF-Werner and is regularly updated.

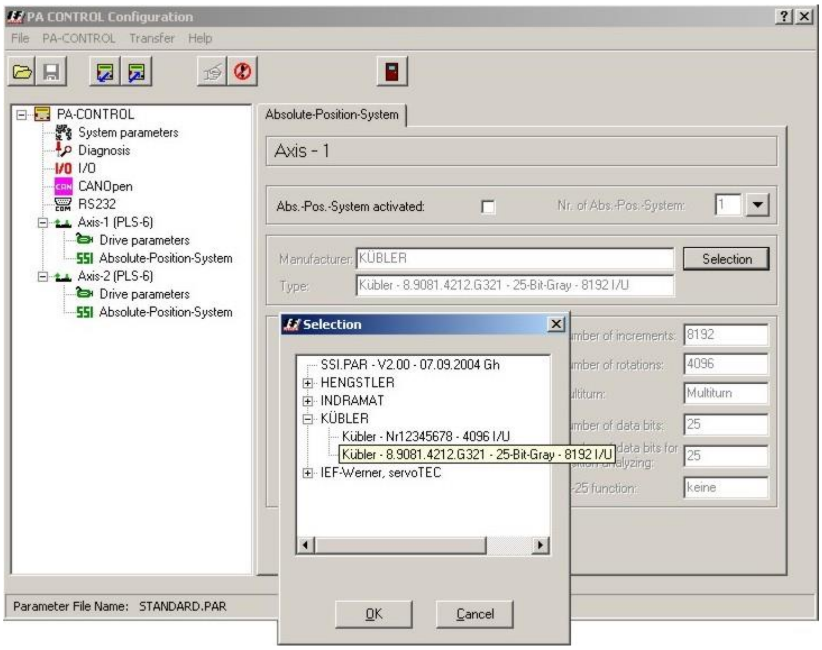


Figure 88: Selection of a stored Positioning System

Selection of the Slot

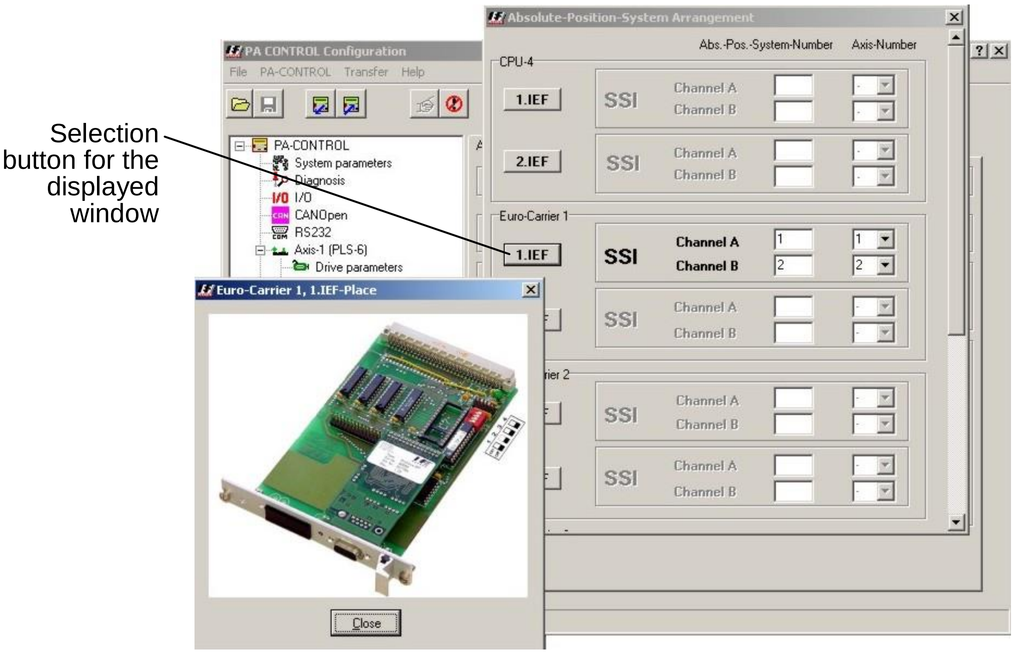


Figure 89: Selection of the Slot on a CPU4

6.9 EURO Bus Supporting Board with SSI

The EURO bus supporting board can only be used in the PA-CONTROL Single, Compact and Steuer.

The number of possible expansions with IEF modules can be considerably increased by means of the EURO bus supporting board. An application possibility is shown in *Figure 90, below*.

A maximum of 4 supporting boards can be used in PA-CONTROL, depending on the other components of the EURO bus of PA-CONTROL.

NOTE Please note the correct position of the address selector switch on the supporting board.

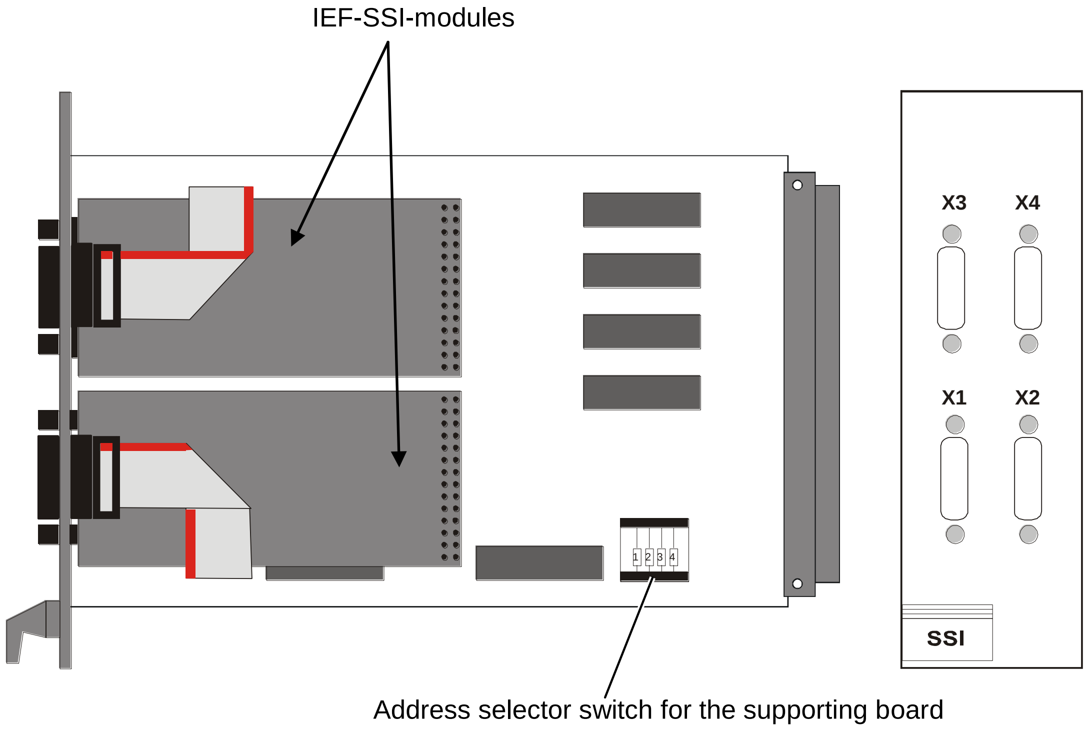


Figure 90: Supporting Board with a mounted IEF SSI Module

Up to two absolute positioning systems can be implemented with one module. The first system is connected via the fixed-mounted SUB D socket, and the second system via the ribbon cable. All the slots are assigned in the above figure, i.e. four absolute positioning systems are implemented. The addressing is carried out in accordance with table below.

	J3/1	J3/2	J3/3	J3/4
Card 1	OFF	OFF	OFF	OFF
Card 2	ON	OFF	OFF	OFF
Card 3	OFF	ON	OFF	OFF
Card 4	ON	ON	OFF	OFF

You will find further information on the IEF SSI module in section *6.8: IEF Module SSI Interface, page 179.*

6.10 I/O Card 16 Inputs / 16 Outputs

The I/O card can be used in the various versions of PA-CONTROL Single, Compact and Steuer. All the versions are normally equipped with one I/O card in the basic configuration. They can be expanded by means of additional I/O cards depending on the number of free slots (see section *7.2: Basic Equipment of PA-CONTROL, page 252*)

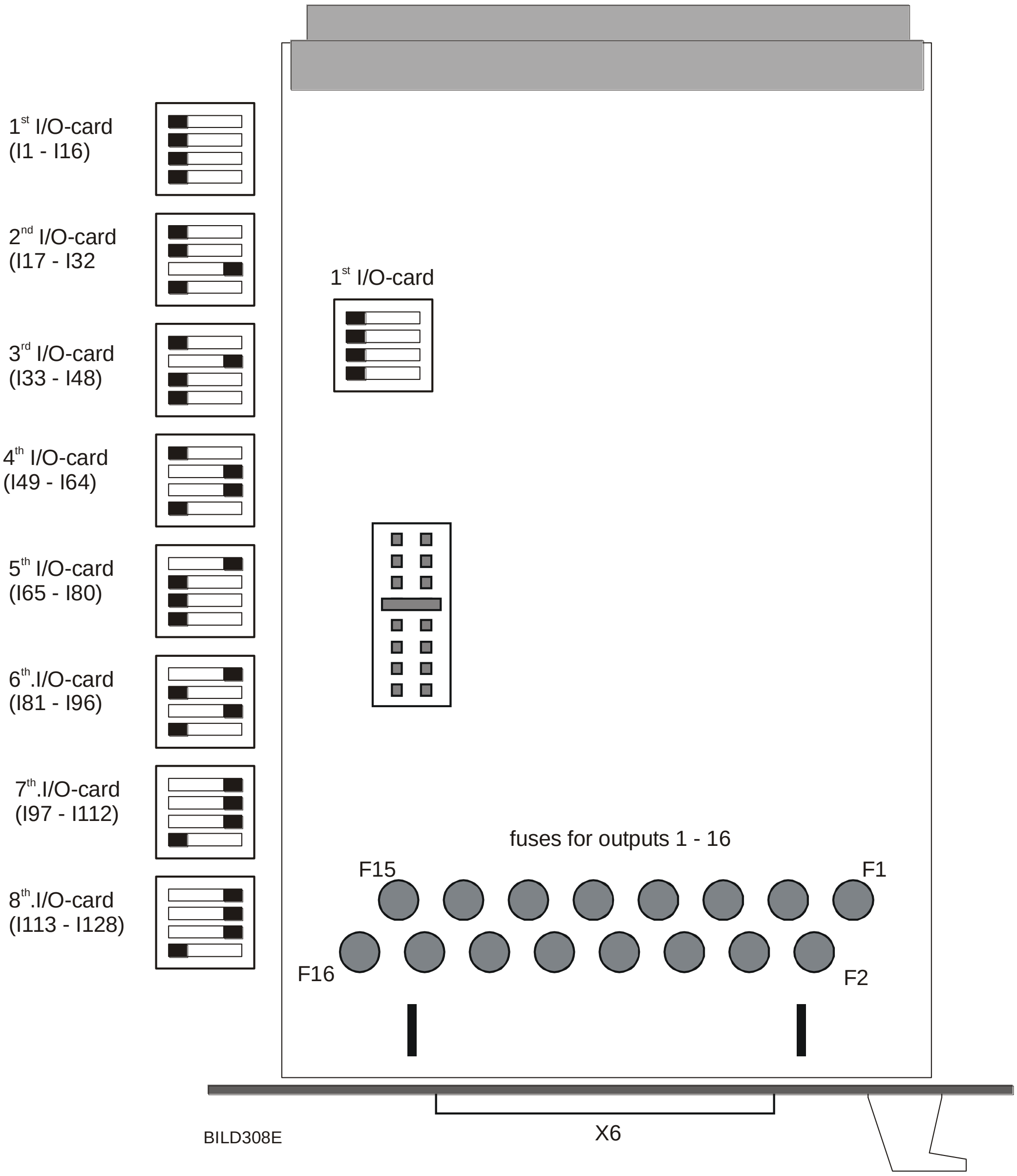


Figure 91: I/O Card, Addressing of the Card in the CPU4

Please refer to the section *7.4: I/O Card, page 259* for a detailed description of the I/O card.

6.11 AS-i Connection

If the optional **A**ctuator-**S**ensor-**i**nterface card is used in the devices of the PA-CONTROL family, a maximum of 124 additional inputs/outputs can be administered by each AS-i card. It is also possible to connect up to 4 AS-i master cards in the bus of a PA-CONTROL Single, Compact or Steuer.

The bus system comprises a two-wire line for the data and power supply of the bus devices (slaves). Due to this wiring principle, the wiring is reduced to a minimum of the conventional wiring.

6.11.1 AS-i: Technical Data

- Topology: Tree structure
- Bus medium: Unshielded two-wire line for data and power
- Line length: max. 100m, extension via repeater possible
- Number of slaves: Up to 31 per AS-i string
- Number of AS-i strings: Up to 4 cards in PA-CONTROL
- Number of devices: Combination of 31 intelligent or 124 binary devices per AS-i Bus string (max. 124 inputs and 124 outputs)
- Power supply: one AS-i power supply unit per string
- Cycle time: max. 5ms
- Addressing: fixed unique address in the slave (E2PROM), addressing via master possible

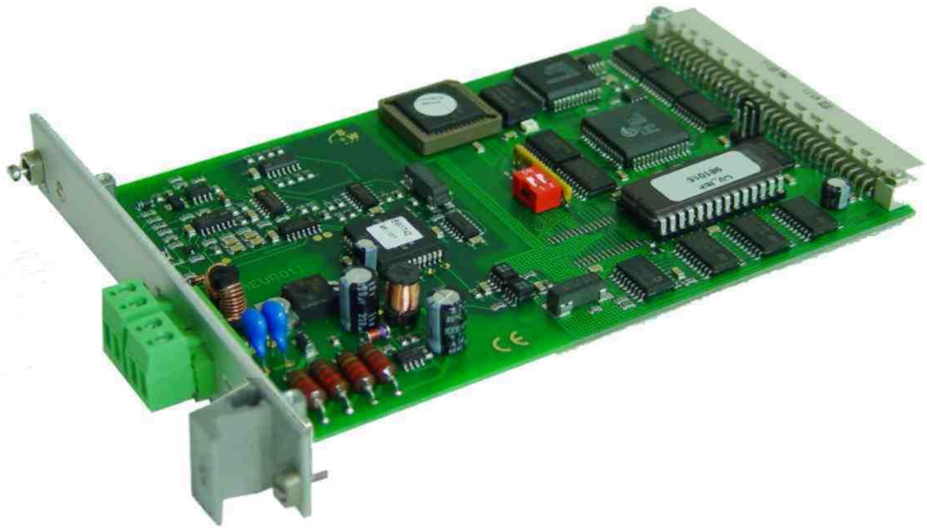


Figure 92: AS-i Card

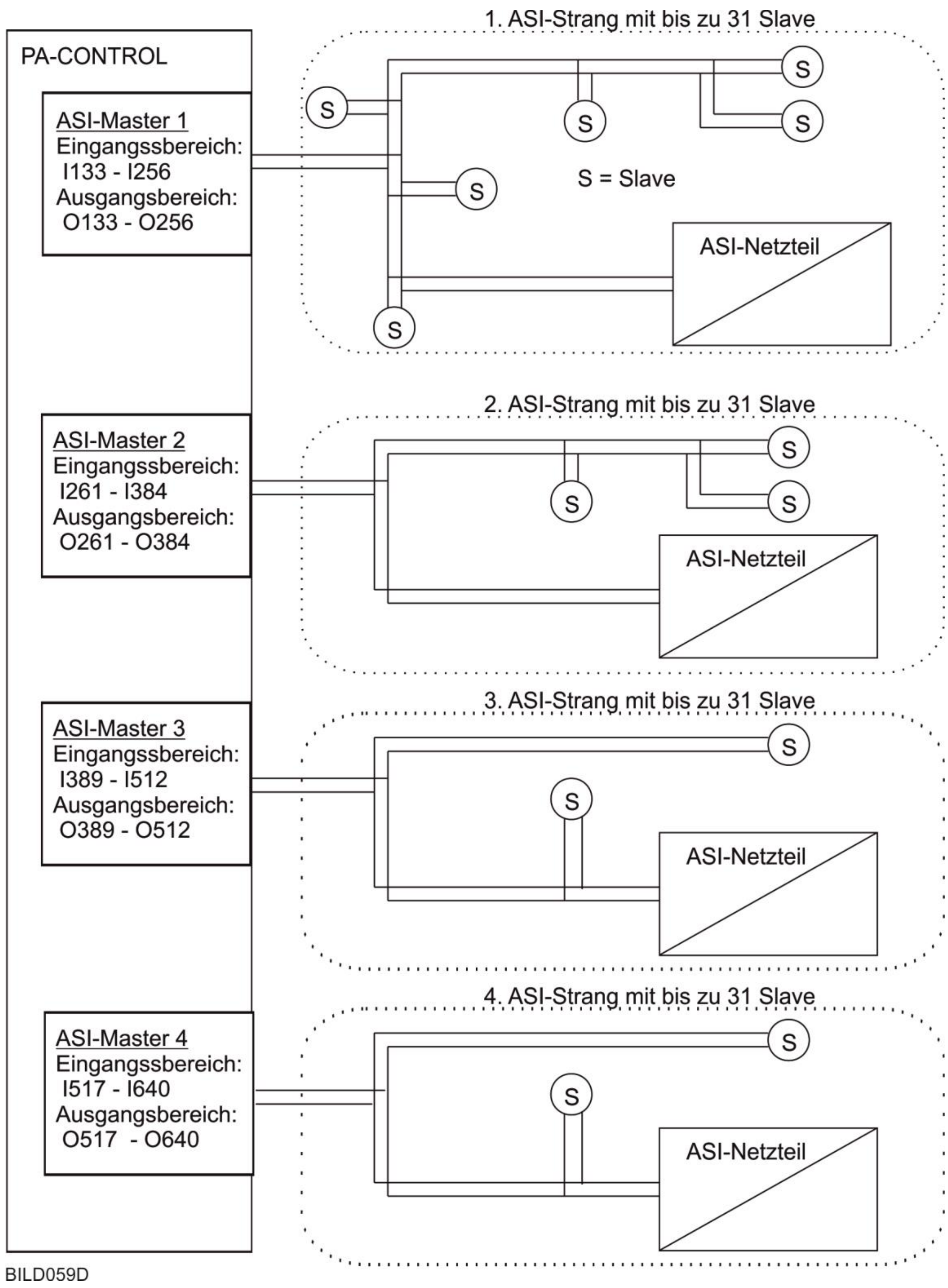


Figure 93: AS-i Topology

6.11.2 Application Example

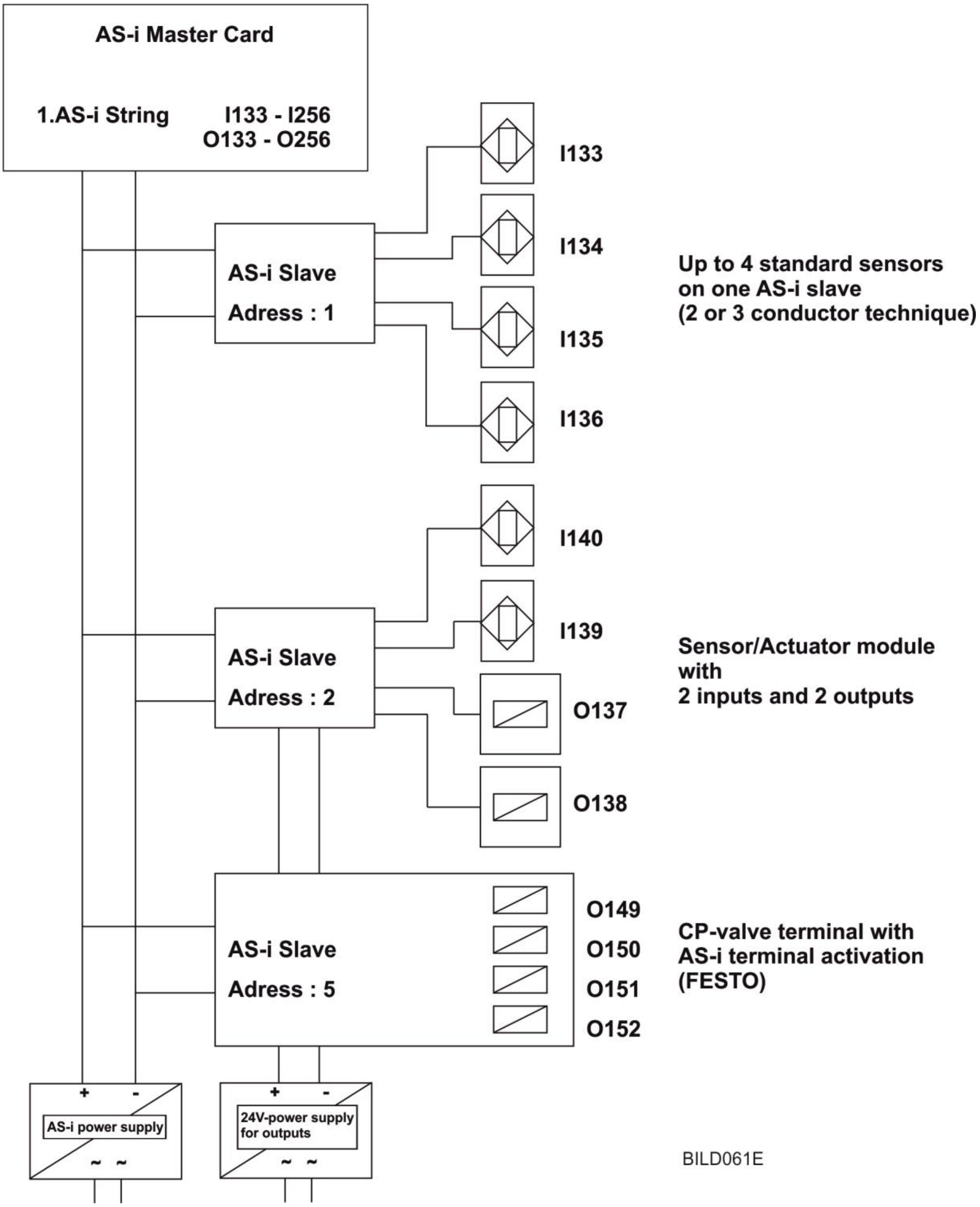


Figure 94: Example of AS-i addressing

6.11.3 Addressing of the AS-i Master Card

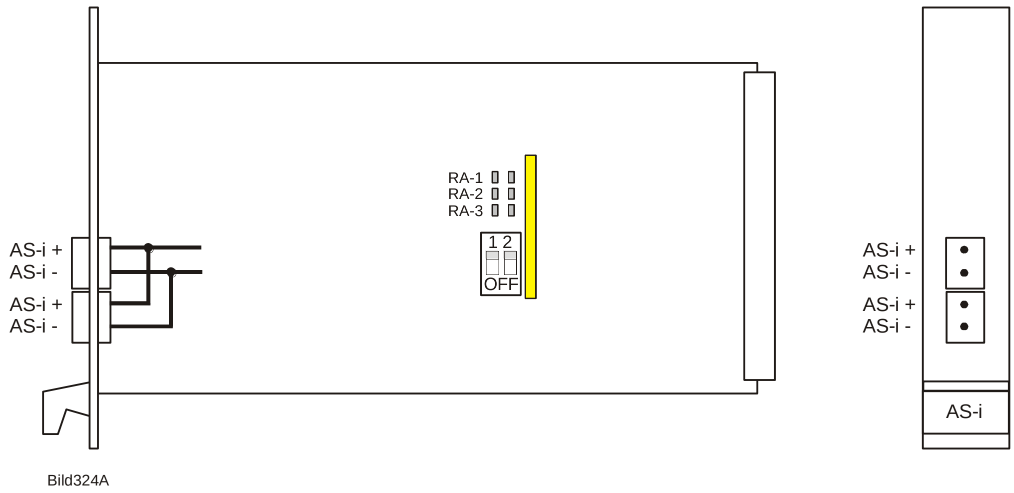


Figure 95: AS-i Master Card, Addressing

Addressing of the AS-i Master Card

AS-i Master	Address	
	DIP 1	DIP 2
1	ON	ON
2	ON	OFF
3	OFF	ON
4	OFF	OFF

Sequence:

- AS-i master inserted in PA-CONTROL
- Supply of the AS-i Master cards with the AS-i supply voltage via the bus line
- Re-initialization of PA-CONTROL

NOTE If the connected AS-i Masters are not correctly addressed, they will not be recognized when PA-CONTROL is re-initialized.

If a connected AS-i Master has no AS-i supply voltage, PA-CONTROL displays a configuration error when the program starts.

At least one AS-i device must be connected to the bus for the automatic operation of PA-CONTROL. A malfunction will result if this rule is disregarded.

6.11.4 Menu Expansion of AS-i Bus

The slave devices on the AS-i bus are individually addressed before installation.

This can either be executed by means of a special programming device (e.g. Festo) or directly by means of PA-CONTROL using Winpac.

A detailed description can be found in the operating instructions of the Winpac program. As a third possibility, addressing can also be carried out via the front plate of PA-CONTROL (see below).

Operating the AS-i bus on PA-CONTROL.

Expansion of the PAC-Menu:

1st Menu level	2nd Menu level	3rd Menu level
6 = Parameters	1 = System parameters	
	2 = Axis parameters	
	3 = Edit AS-i-BUS	1 = Apply current configuration (see section: *6.11.5, below*).
		2 = Display status (see section: *6.11.6, page 197*).
		3 = Activate automatic programming (see section: *6.11.7, page 198*).
		4 = Change operating mode (see section: *6.11.8, page 198*).
		5 = Display configuration (see section: *6.11.9, page 198*)
		6 = Programming the slave (see section: *6.11.10, page 198*)

Only the respective submenus are displayed for the installed AS-i cards.

6.11.5 Apply current Configuration

```
sure, apply actual configuration ?
1 = Yes  /  Key = no
```

On calling this function, the AS-i master polls all slaves connected to the string and stores the configuration . If the configuration is subsequently changed but not transferred (e.g. a slave removed or added), the stored and the connected configuration data no longer correspond. In the status display, the configuration bit **OK** is equal to '0'.

6.11.6 Display Status

```
OFL  APF   NORM  PROJ  Aavai Aakti LDS.0 OK
0    0     1     1     0     0     0     1
```

OFL: **OFFLINE mode**

0: AS-i Master is ready and waiting for communication with the CPU

1: AS-i Master works internally, no communication with the CPU possible

APF: **Error AS-i supply voltage**

0: Supply voltage is OK

1: No supply voltage for the AS-i

NORM: **protected mode**

0: Normal operation not active

1: Normal operation active (protected mode)

The AS-i master only communicates with the configured slaves in protected mode. Each change to the AS-i bus generates a message. This AS-i master operation mode is intended for the automatic operation mode of PA-CONTROL.

PROJ: **Configuration mode**

0: Not active

1: Active

Aavai: **Automatic programming of the slave address possible**

0: no

1: yes

If a programmed AS-i module fails during operation, it can be replaced without renewed programming.

Replace the defective module by a similar AS-i module with the bus address 0 and activate the option **Aakti.** The AS-i master recognizes the new AS-i module at address 0 and automatically addresses the new AS-i module with the configured address.

If the new module is not identical, no addressing takes place.

Aakti: **Automatic programming of the slave address**

0: Not active

1: Active

LDS.0: **Slave with address 0**

0: does not exist

1: exists

OK: **Configuration of the AS-i BUS**

0: not OK

1: OK

6.11.7 Activate Automatic Programming

The AS-i bus offers the possibility of "automatic programming". If an AS-i slave has failed or is defective, it must be replaced by a new one. When "automatic programming" is activated, the AS-i master recognizes the slave with the address 0 after switch-on. If this slave has the same configuration data as the failed or defective one, the AS-i master automatically programs the slave to the missing address.

```
Activate automatic programming
activated:  yes  (ENTER/ESC)
```

6.11.8 Change Operating Mode

(see AS-i Status: NORM / PROJ)

```
Protected operation mode (automatism)
activated:  yes  (ENTER/ESC)
```

6.11.9 Display Configuration

The user can display the slaves (slave 0 to slave 31) of an AS-i master.

```
AS-i  Actual   :   yes  4I/0O  I  : 1010
1-3   Conf     :   yes  4I/0O  O  : 0000
```

The above figure shows:

- AS-i master 1 with slave 3
- Slave 3 is available on the bus, has 4 inputs and no outputs
  the status of inputs is "I:1010"
  the status of outputs is "O:0000"
- Slave 3 is configured with the data for 4 inputs and 0 outputs

Use the arrow keys to scroll to the next AS-i slaves.

6.11.10 Programming the Slave

The address of an AS-i slave can be changed. In the following example, slave 0 is to be reprogrammed as slave 2.

```
AS-i slave actual address[0 ]
```

```
AS-i slave actual address: 0
AS-i slave new address     [ 2 ]
```

```
AS-i slave actual address: 0
AS-i slave new address     : 2 (ENTER)
```

6.11.11 WinPAC, AS-i Bus Parameters

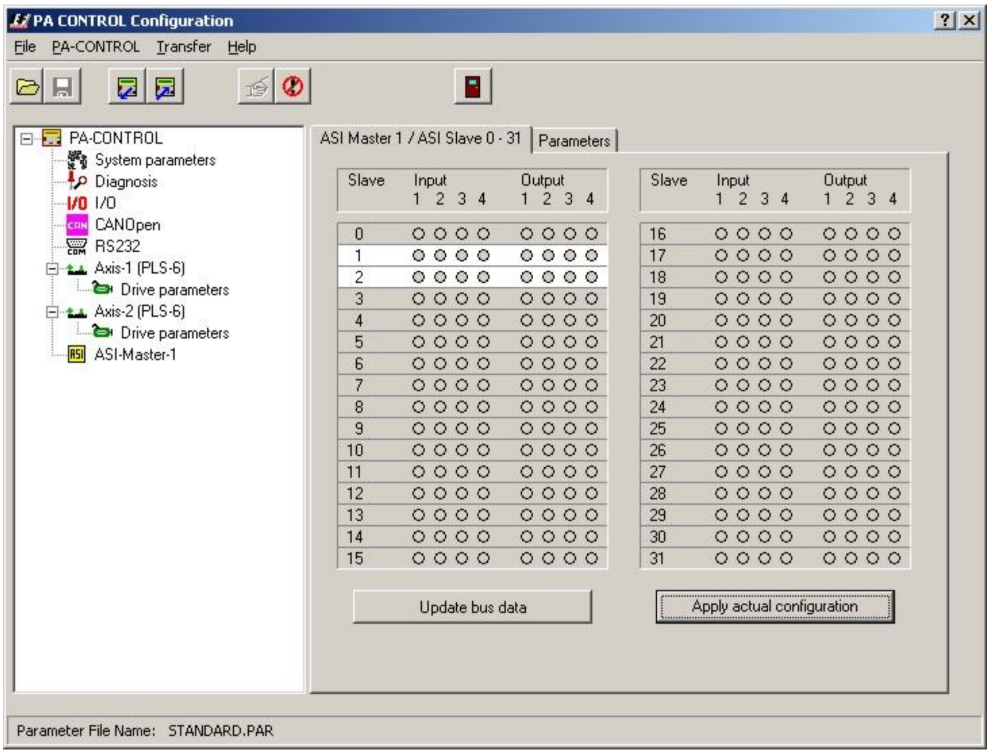


Figure 96: AS-i Bus Parameters

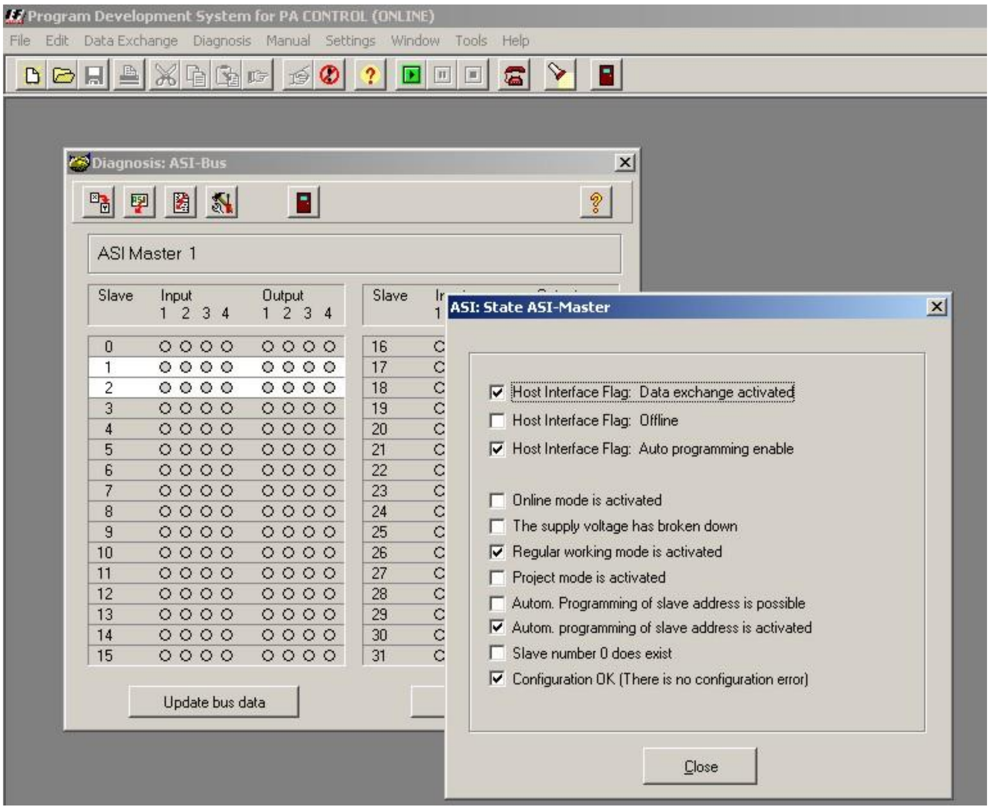


Figure 97: AS-i Diagnosis Status

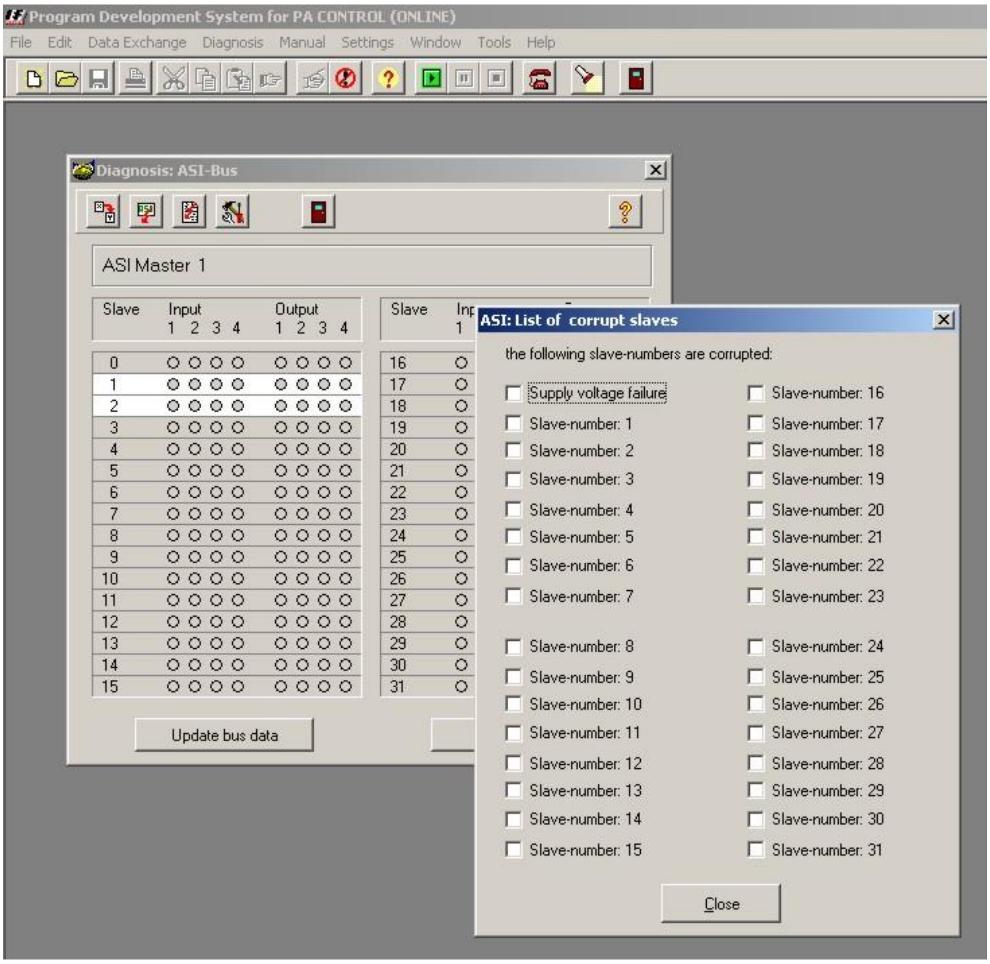


Figure 98: AS-i Diagnosis Error Counter

6.12 Interbus Card

This expansion card can be used in the PA-CONTROL Single, Compact or Steuer. An extended range of applications is obtained through the installation of an Interbus-S card in the devices of the PA-CONTROL family (see Manual for IEF ports).

The Interbus-S card is a EURO-BUS card and can be fitted at any desired position in the EURO bus of the PA-CONTROL CPU4. It is automatically detected on switching on PA-CONTROL.

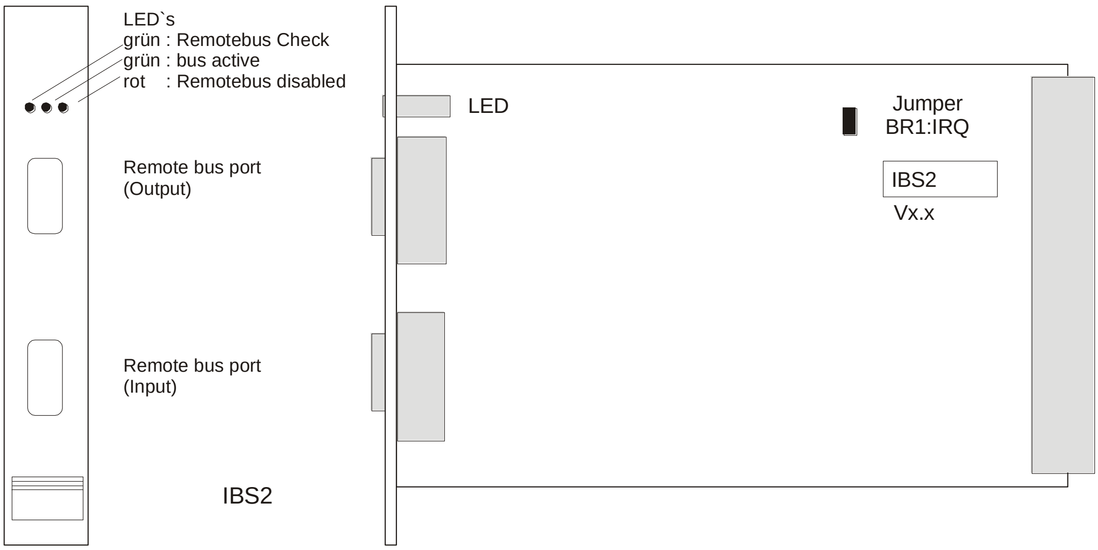


Figure 99: IEF Interbus-S Card

PA-CONTROL is integrated in the Interbus-S system as a slave in the 2-wire remote bus. PA-CONTROL occupies 64 bits and data points in the Interbus-S.

Pin assignment	Remote bus port 1	Pin assignment	Remote bus port 2
1	TPDO2	1	TPDO2
2	TPDI1	2	TPDI2
3	GND	3	GND
4	not assigned	4	not assigned
5	not assigned	5	BR
6	/TPDO1	6	/TPDO2
7	/TPDI1	7	/TPDI2
8	not assigned	8	not assigned
9	not assigned	9	BR

NOTE Always use a remote bus cable in accordance with the specification of Phoenix Contact & Co.

6.13 PLS7/9 Card

The PLS7/9 card can only be used in the PA-CONTROL Steuer.

The PLS7/9 card generates the pulse and directional signals for up to 4 stepping motor output stages. These signals are available at the connector, Signal 1-4, at the RS422 level. The common ready signal of the controlled output stages is also connected to this connector. The limit switches of the controlled axes are connected via the connectors Limit 1-4.

Up to 4 PLS7/9 cards can be installed in a PA-CONTROL Steuer.

The PLS7 card is used in PA-CONTROL control devices to control the stepping motor output stages. The PLS9 card is used in conjunction with the LV-servoTEC. The only difference from the PLS7 card is that it has two additional signals, ENABLE and RESET, which are important for the control of servo-axes.

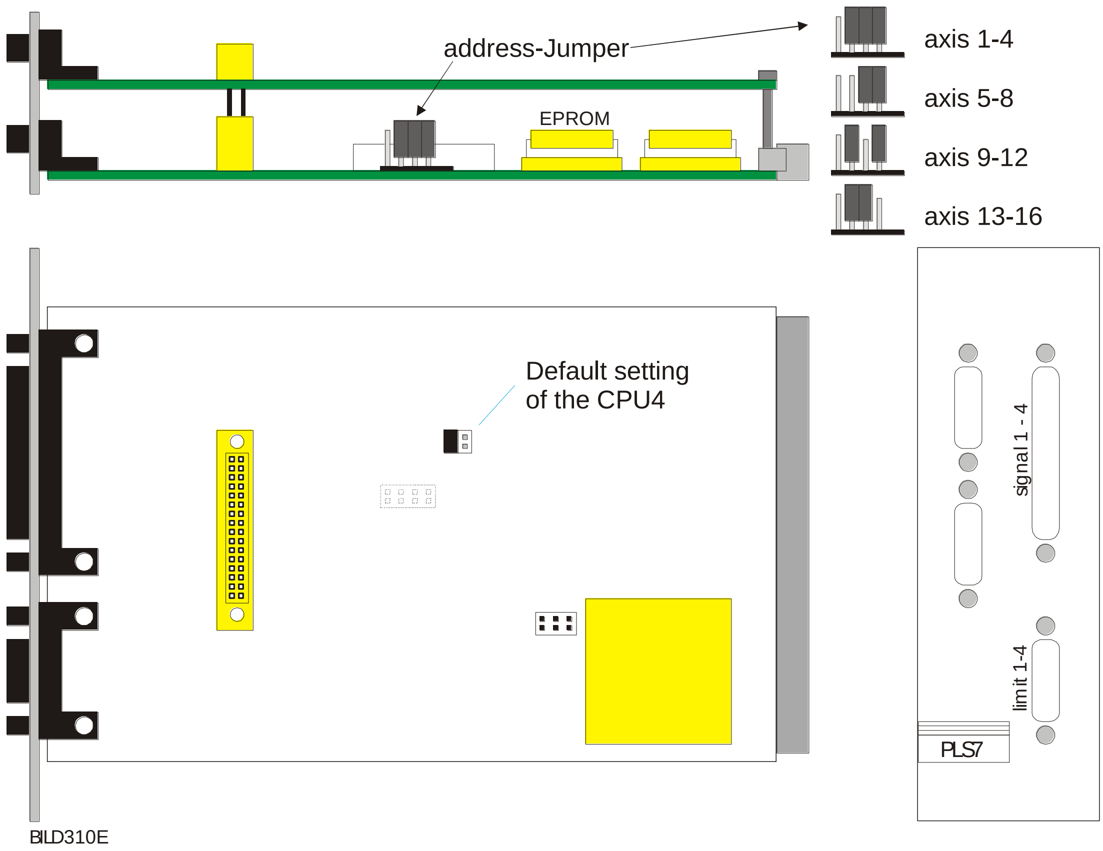


Figure 100: Overview of the PLS7/9 Card

You will find further information on the pulse generation cards in section *7.5: Pulse Generation of PA-CONTROL, page 262*.

6.14 IEF Control Console

6.14.1 General

Figure 101: IEF Control Console, view and connections

The IEF control console is one of the numerous options for PA-CONTROL. It is used in the versions of PA-CONTROL which do not have their own keyboard.

In addition to the connection for the internal power supply (circular plug connection series 718 M8x1 / M8), the IEF control console has another three possibilities for connection via a 9 pole Sub-D plug connection:

- Diagnosis port, input / cable connection to the PC
  (9 pole connector on the front)
- Diagnosis port, output / cable connection to PA-CONTROL
  (9 pole socket at the bottom or on the back)
- Port for control console (9 pole socket at the bottom or on the back)

The respective connections must be provided on the controllers to enable connection of the IEF control console to the various versions of PA-CONTROL.

PA-CONTROL Single, Compact, Steuer	Additional front plate on EURO bus with Sub-D plug connection required
PA-CONTROL EP / MP	Expansion with RS232 port driver required
PA-CONTROL servoTEC	Expansion with RS232 port driver required

IEF WERNER

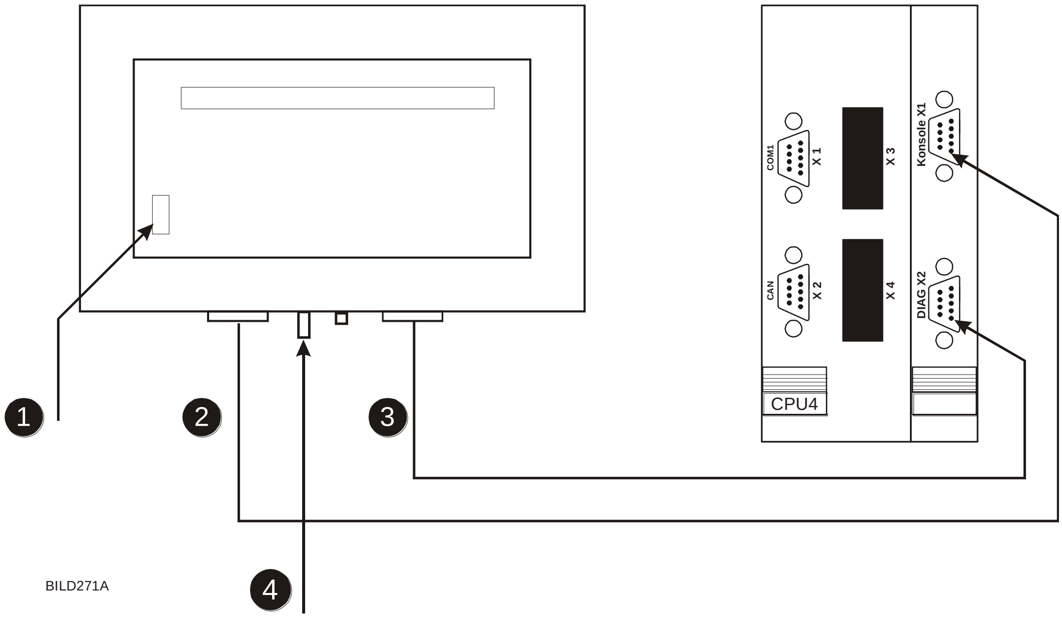


Figure 102: IEF Control Console with cable connections

The following are part of the scope of supply of the IEF control console:

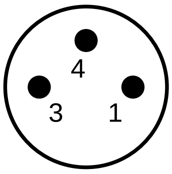
Description	IEF no. (standard length, 3m)	IEF no. (special length, max. 20m)
Interface cable (connection of the diagnosis port to the PC)	Not in the scope of supply	Not in the scope of supply ❶
Interface cable (data to and from the console)	231 766	on inquiry ❷
Interface cable (connection of the diagnosis port to PA-CONTROL)	231 585	on inquiry ❸
Power supply cable (5m)	732145	on inquiry ❹

Pin assignment of cables ❶ to ❸

IEF control console	PA-CONTROL
Pin 1 SCLK	Pin 4
Pin 2 MOSI	Pin 3
Pin 3 MISO	Pin 2
Pin 4 /STOP	Pin 1
Pin 5 GND	Pin 5
Pin 6	
Pin 7 BER	Pin 8
Pin 8 SEL	Pin 7

Pin assignment of the 24VDC supply (looking at the contact pins of the console)

Pin 1	24VDC
Pin 3	GND
Pin 4	Not assigned



The following colour assignments apply if the IEF power supply cable, order number 732145, is used:

Brown	24VDC
Blue	GND
Black	not assigned

The IEF control console is available in two modifications, for installation in a control panel and in an aluminium housing as a surface-mounting device. In both cases, the cable connections can point vertically downwards or to the rear. This possibility is provided by a rotatable cover.

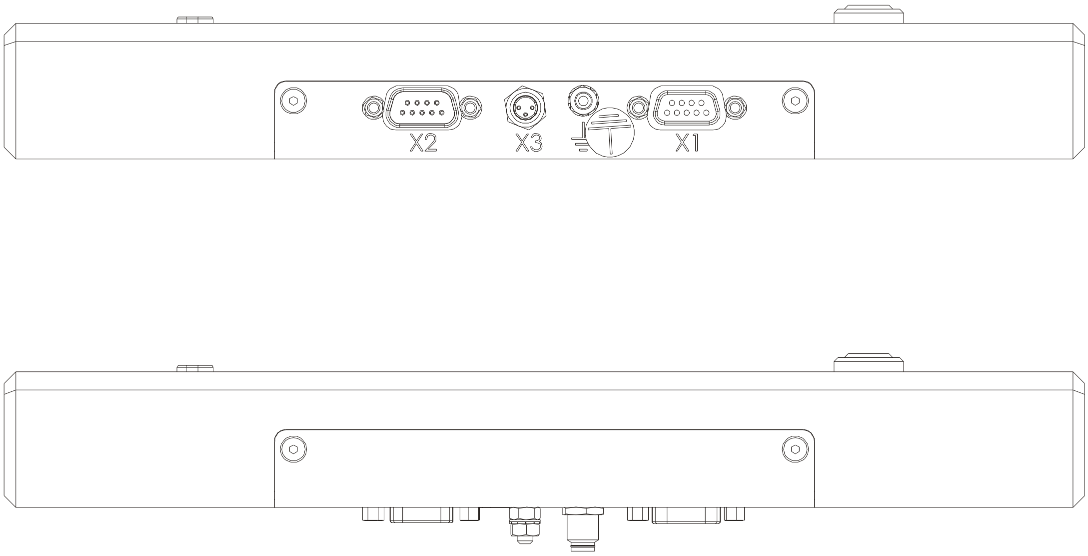


Figure 103: IEF Control Console, Connections

6.14.2 IEF Control Console - Version for Panel Mounting

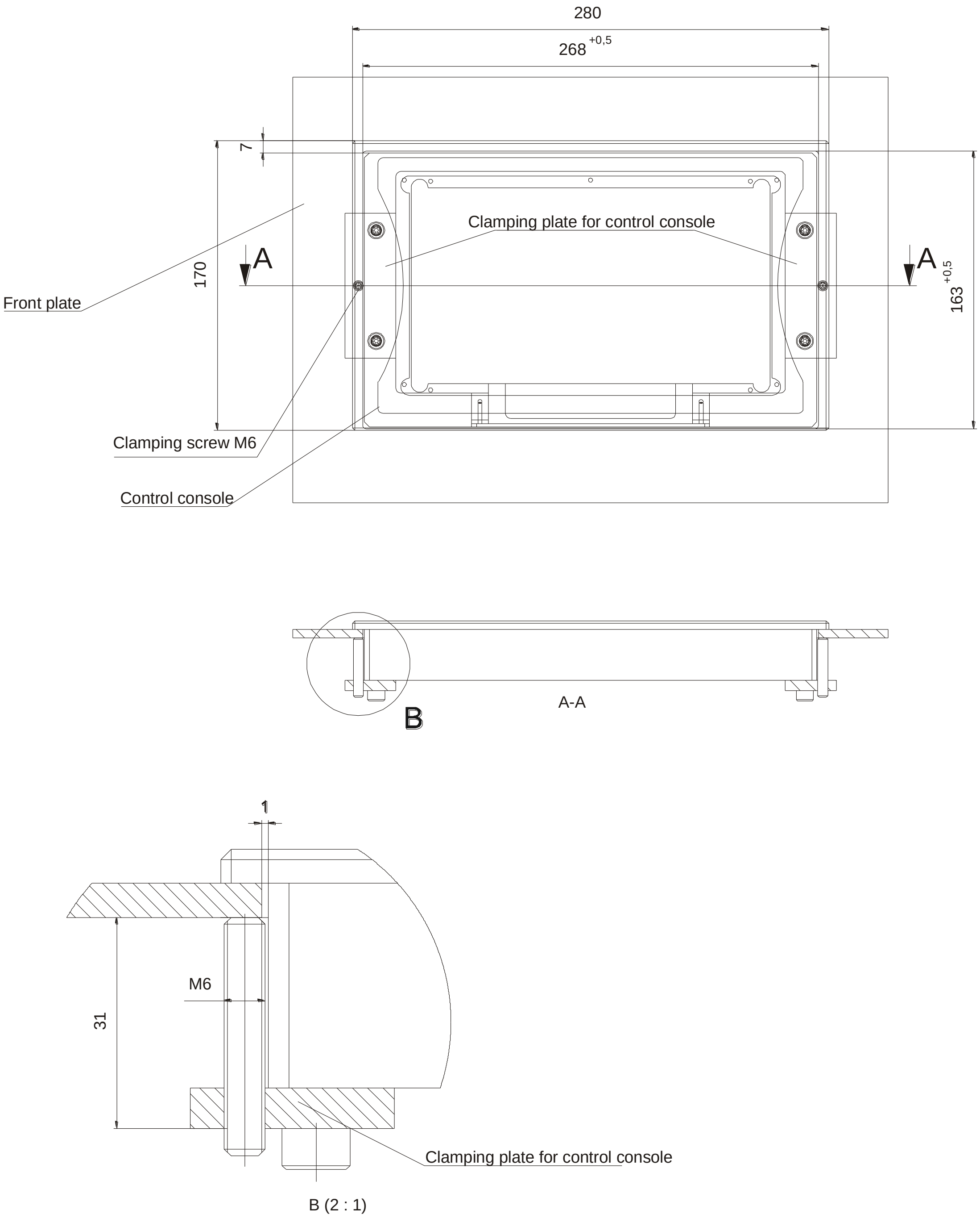


Figure 104: IEF Control Console – Mounting Specification

6.14.3 IEF Control Console - Standard Version

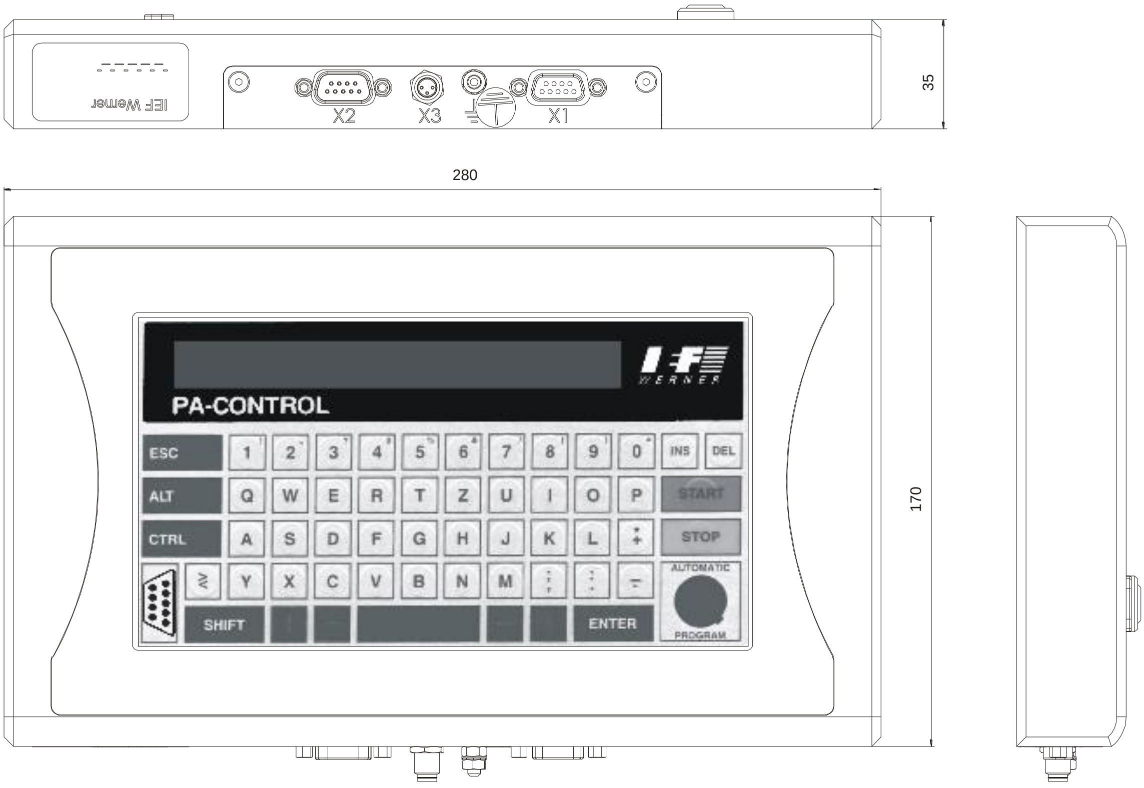


Figure 105: IEF Control Console, Mounting Dimensions

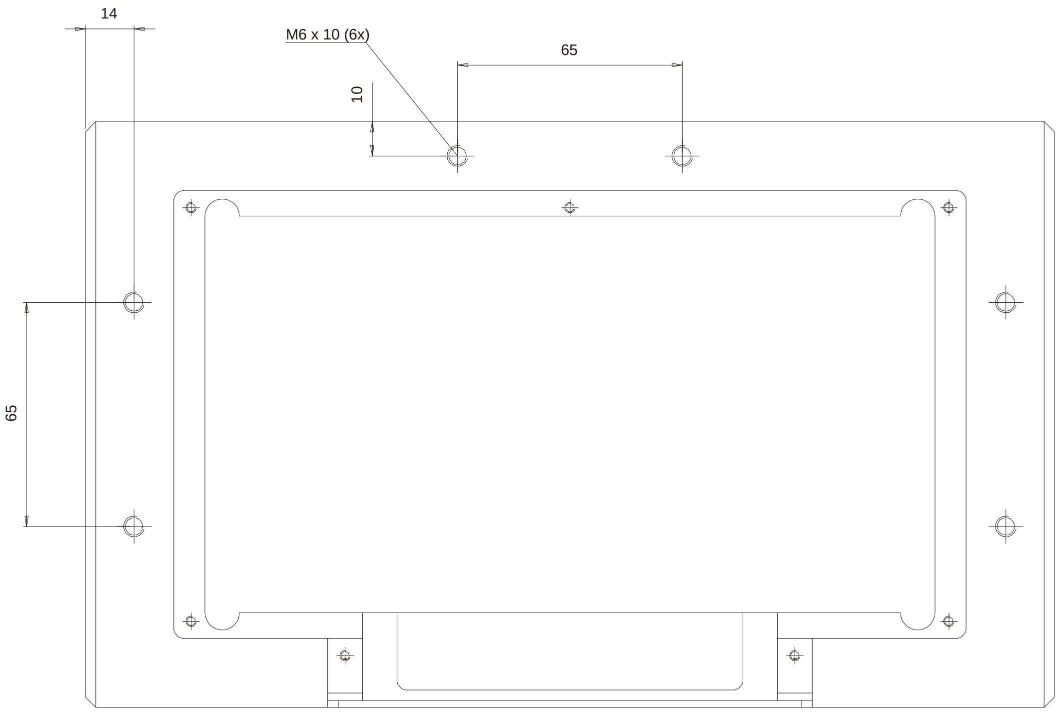


Figure 106: IEF Control Console, Hole Pattern for Standard Version

6.15 IEF-Touch-Screen Console via CANopen Bus

An interface for the connection of up to 4 control consoles is provided on the CAN bus of PA-CONTROL for the connection of the control consoles IEF-Touch-Screen to PA-CONTROL.

All variants of the control consoles of IEF-Touch-Screen equipped with a CAN bus interface (e.g. BT8, HT06, TP22, ...) can be connected to PA-CONTROL.

The user interface is generated on the control consoles by means of the "TSwin" software (V4.20 or more recent).

Figure 107: IEF-Touch-Screen Console

6.15.1 CAN Addresses and Monitoring

Up to four control consoles can be connected to PA-CONTROL at the same time.

Number of control console	CANopen address	Number of the system flag "Control console active"	Time monitoring of access by PA-CONTROL
1	63	27	Yes
2	62	28	No
3	61	29	No
4	60	30	No

System flags are provided, so that a check can be made in PA-CONTROL in automatic mode as to whether a IEF-Touch-Screen console has been connected and is active. The system flag assigned to a console is set every time it is accessed and reset five seconds after the last access.

The control console with the ID63 is time-monitored by PA-CONTROL (5 seconds). If the control console was active and becomes inactive for any reason (cable breakage, switched off, ...), error "E322 = TIME OUT with the IEF-Touch-Screen console " is set.

6.15.2 TSwin Configuring Software

Templates are provided for the operating consoles of IEF-Touch-Screen console.".

A template is provided by IEF-Werner for each of the different control consoles.

6.15.2.1 Directory Structure for Storage of the IEF Templates

The user should create a directory "IEF" under "...\Program\Tswin...\Templates" and copy the IEF templates to this. The IEF templates are stored on the IEF CD and can be copied from there.

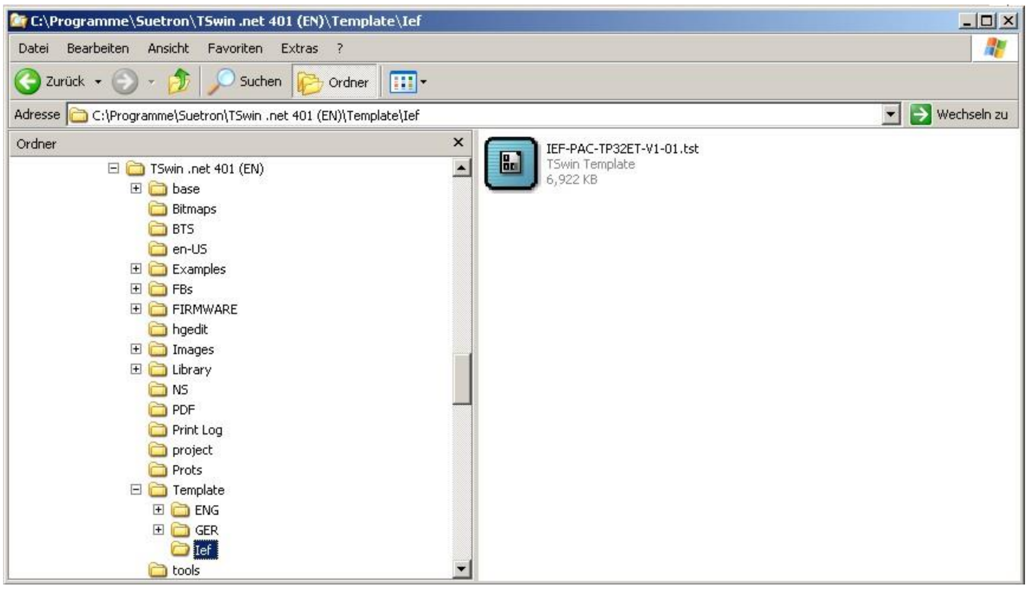


Figure 108: Directory Structure

6.15.2.2 New Project with IEF Template

The IEF templates are offered for selection when a new project is created.

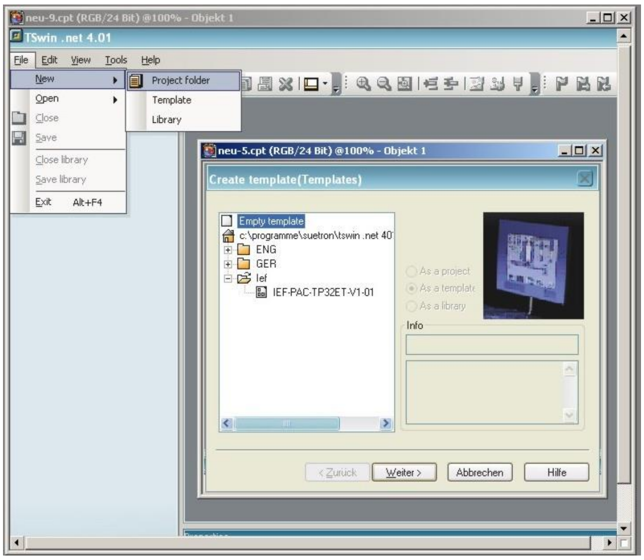


Figure 109: Template Selection

6.15.2.3 CAN Bus Settings with the TSwin Configuring Software

The settings for the CANopen communication have already made been in all IEF templates. Only the CAN address "Terminal module number" or the baud rate need to be customized as required.

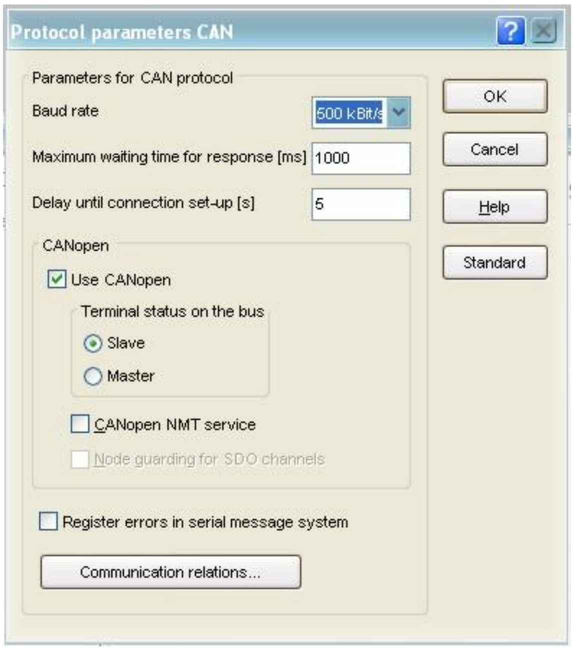


Figure 110: Protocol Parameters

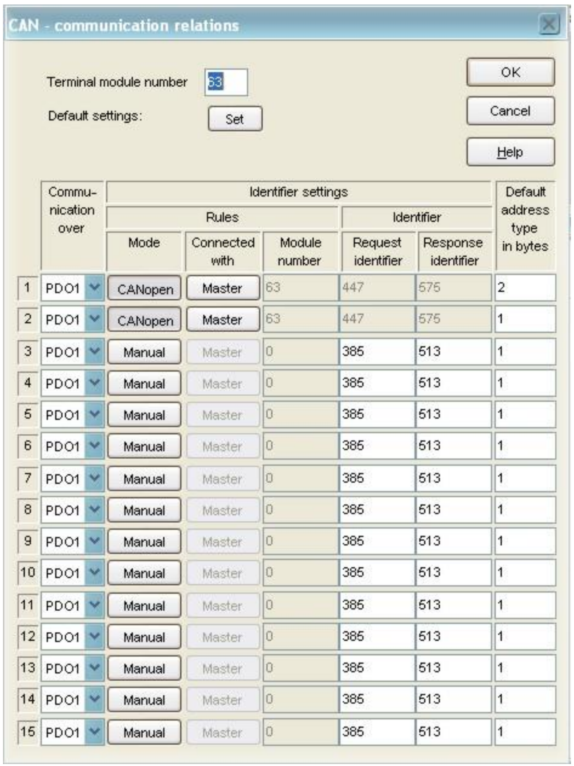


Figure 111: Communication Relationships

Communication between the control console and PA-CONTROL only takes place via PDO1 (no SDO communication, no node guard, no ...).

The strings and display lines are accessed "in byte mode" in communication 2. Further access takes place in word mode in communication 1.

6.15.3 List of Variables in the Control Console

Only a fraction of the possible variables for the inputs, outputs, flags, N registers and R registers are entered in the IEF templates. All other variables are complete in accordance with the version.

CAN-PA-CONTROL

	Variable name	Address:	Com. relations:	Low bit no.	High bit no.
0	PA-CONTROL				
1	Betriebsart	DW 8192:1	1		
2	Automatik-STAF	DW 8192:2	1		
3	Automatik-STOF	DW 8192:3	1		
4	Automatik-ABBF	DW 8192:4	1		
5	Pollbereich	W 8208:0	1		
6	Fehlertext-Syste	BY 8224:0	2		
7	Fehlertext-Ablau	BY 8225:0	2		
8	N-Register				
9	N0001	DW 12289:0	1		
10	N0002	DW 12289:1	1		
11	N0003	DW 12289:2	1		
12	N0004	DW 12289:3	1		
13	N0005	DW 12289:4	1		
14	N0006	DW 12289:5	1		
15	N0007	DW 12289:6	1		
16	N0008	DW 12289:7	1		
17	N0009	DW 12289:8	1		
18	N0010-Summe a	DW 12289:9	1		
19	N0011-Gutteil-Zä	DW 12289:10	1		

Figure 112: List of Variables

The lists of all variables for PA-CONTROL are available as EXCEL files. The supplements to the variables can be copied from this file as required.

- TSwin-ControlVariable-Outputs-PA-CONTROL-V1-00.xls
- TSwin-ControlVariable-Inputs-PA-CONTROL-V1-00.xls
- TSwin-ControlVariable-FlagWords-PA-CONTROL-V1-00.xls
- TSwin-ControlVariable-FlagWords-PA-CONTROL-V1-00.xls
- TSwin-ControlVariable-NRegister-PA-CONTROL-V1-00.xls
- TSwin-ControlVariable-RRegister-PA-CONTROL-V1-00.xls

Figure 113: Reference for Variables

6.15.3.1 Object List through Access of the Data of PA-CONTROL

Object List Part 1/6

Index (hex)	Index (dec)	Sub-index (hex)	Name	Type	Access
2000	8192	0	Number of SUB index 2000	Signed 32	RO
		1	Operating status of PA-CONTROL	Signed 32	RO
		2	Automatic START	Signed 32	WO
		3	Automatic STOP	Signed 32	WO
		4	Automatic ABORT	Signed 32	WO
2010	8208		Polling range:		
		0	Coordination byte	Unsigned 16	RW
		1	Serial signalling channel	Unsigned 16	RW
		2	LEDs of function keys 1-8	Unsigned 16	RW
		3	LEDs of function keys 9-16	Unsigned 16	RW
		4	LEDs of function keys 17-24	Unsigned 16	RW
		5	LEDs of function keys 25-32	Unsigned 16	RW
		6	LEDs of function keys 33-40	Unsigned 16	RW
		7	LEDs of function keys 41-48	Unsigned 16	RW
2011	8209	0	Date-Time-String	Unsigned 8	RW
2020	8224	0- (3C)	System error text	Unsigned 8	RO
2021	8225	0 - (3C)	Run error text	Unsigned 8	RO
2100	8448	0	Number of input words	Unsigned 16	RO
2100	8448	1	Diagnosis Inputs: number of Input	Unsigned 32	RW
2100	8448	2	Diagnosis inputs: state of input	Unsigned 16	RO
2101	8449	0-7F	Input word 1- 128 (I1 - I2048)	Unsigned 16	RO
2200	8704	0	Number of output words	Unsigned 16	RO
2200	8704	1	Diagnosis outputs: number of the output	Unsigned 32	RW
2200	8704	2	Diagnosis outputs: value of the output	Unsigned 16	RW
2201	8705	0-7F	Output word 1-128 (O1 - O2048)	Unsigned 16	RW

RO = read only
WO = write only
RW = read / write

Object List Part 2/6

Index (hex)	Index (dec)	Sub-index (hex)	Name	Type	Access
2800	10240	0	Number of flag words	Unsigned 16	RO
2800	10240	1	Diagnosis flags: number of the flag	Unsigned 32	RW
2800	10240	2	Diagnosis flags: value of the flag	Unsigned 16	RW
2801	10241	0-FF	Flag word flag 1-256 (M1 - M4096)	Unsigned 16	RW
2810	10256	0 – FF	Flag word 1-256 (M1 - M4096)	Unsigned 16	RW
2811	10257	0 - FF	Flagword 256-512 (M4097 – M8192)	Unsigned 16	RW
3000	12288	0	Number of N registers	Unsigned 16	RO
3000	12288	1	Diagnosis N-Register: Number	Unsigned 32	RW
3000	12288	2	Diagnosis N-Register: Value	Signed 32	RW
3001	12289	0-FF	N1 – N256	Signed 32	RW
3002	12290	0-FF	N257 – N512	Signed 32	RW
3002	12291	0-FF	N513 – N768	Signed 32	RW
3003	12291	0-FF	N513 – N768	Signed 32	RW
3004	12292	0-FF	N769 – N1024	Signed 32	RW
3005	12293	0-FF	N1025 – N1280	Signed 32	RW
3006	12294	0-FF	N1281 – N1536	Signed 32	RW
3007	12295	0-FF	N1537 – N1793	Signed 32	RW
3008	12296	0-FF	N1793 – N2948	Signed 32	RW
3009	12297	0-FF	N2049 – N2304	Signed 32	RW
300A	12298	0-FF	N2305 – N2560	Signed 32	RW
300B	12299	0-FF	N2561 – N2816	Signed 32	RW
300C	12300	0-FF	N2817 – N3072	Signed 32	RW
300D	12301	0-FF	N3073 – N3328	Signed 32	RW
300E	12302	0-FF	N3329 – N3584	Signed 32	RW
300F	12303	0-FF	N3585 – N3840	Signed 32	RW
3010	12304	0-FF	N3841 – N4096	Signed 32	RW
3011	12305	0-FF	N4097 – N4352	Signed 32	RW
3012	12306	0-FF	N4353 – N4608	Signed 32	RW
3013	12307	0-FF	N4609 – N4864	Signed 32	RW
3014	12308	0-FF	N4865 – N 5120	Signed 32	RW
3015	12309	0-FF	N5121 – N5376	Signed 32	RW
3016	12310	0-FF	N5377 – N5632	Signed 32	RW
3017	12311	0-FF	N5633 – N5888	Signed 32	RW

Object List Part 3/6

Index (hex)	Index (dec)	Sub-index (hex)	Name	Type	Access
3018	12312	0-FF	N5889 – N6144	Signed 32	RW
3019	12313	0-FF	N6145 – N6400	Signed 32	RW
301A	12314	0-FF	N6401 – N6656	Signed 32	RW
301B	12315	0-FF	N6657 – N6912	Signed 32	RW
301C	12316	0-FF	N6913 – N7168	Signed 32	RW
301D	12317	0-FF	N7169 – N7424	Signed 32	RW
301E	12318	0-FF	N7425 – N7680	Signed 32	RW
301F	12319	0-FF	N7681 – N 7936	Signed 32	RW
3020	12320	0-FF	N7937 – N 8192	Signed 32	RW
3081	12417	0-FF	N1 – N256 (word access)	Signed 16	RW
3082	12418	0-FF	N257 – N512 (word access)	Signed 16	RW
3083	12419	0-FF	N513 – N768 (word access)	Signed 16	RW
3084	12420	0-FF	N769 – N1024 (word access)	Signed 16	RW
3085	12421	0-FF	N1025 – N1280 (word access)	Signed 16	RW
3086	12422	0-FF	N1281 – N1536 (word access)	Signed 16	RW
3087	12423	0-FF	N1537 – N1793 (word access)	Signed 16	RW
3088	12424	0-FF	N1793 – N2948 (Word access)	Signed 16	RW
3089	12425	0-FF	N2049 – N2304 (Word access)	Signed 16	RW
308A	12426	0-FF	N2305 – N2560 (Word access)	Signed 16	RW
308B	12427	0-FF	N2561 – N2816 (Word access)	Signed 16	RW
308C	12428	0-FF	N2817 – N3072 (Word access)	Signed 16	RW
308D	12429	0-FF	N3073 – N3328 (Word access)	Signed 16	RW
308E	12430	0-FF	N3329 – N3584 (Word access)	Signed 16	RW
308F	12431	0-FF	N3585 – N3840 (Word access)	Signed 16	RW
3090	12432	0-FF	N3841 – N4096 (Word access)	Signed 16	RW
3091	12433	0-FF	N4097 – N4352 (Word access)	Signed 16	RW
3092	12434	0-FF	N4353 – N4608 (Word access)	Signed 16	RW
3093	12435	0-FF	N4609 – N4864 (Word access)	Signed 16	RW
3094	12436	0-FF	N4865 – N 5120 (Word access)	Signed 16	RW
3095	12437	0-FF	N5121 – N5376 (Word access)	Signed 16	RW
3096	12438	0-FF	N5377 – N5632 (Word access)	Signed 16	RW
3097	12439	0-FF	N5633 – N5888 (Word access)	Signed 16	RW
3098	12440	0-FF	N5889 – N6144 (Word access)	Signed 16	RW

Object List Part 4/6

Index (hex)	Index (dec)	Sub-index (hex)	Name	Type	Access
3099	12441	0-FF	N6145 – N6400 (Word access)	Signed 16	RW
309A	12442	0-FF	N6401 – N6656 (Word access)	Signed 16	RW
309B	12443	0-FF	N6657 – N6912 (Word access)	Signed 16	RW
309C	12444	0-FF	N6913 – N7168 (Word access)	Signed 16	RW
309D	12445	0-FF	N7169 – N7424 (Word access)	Signed 16	RW
309E	12446	0-FF	N7425 – N7680 (Word access)	Signed 16	RW
309F	12447	0-FF	N7681 – N 7936 (Word access)	Signed 16	RW
30A0	12448	0-FF	N7937 – N 8192 (Word access)	Signed 16	RW
3100	12544	0	Number of R registers	Unsigned 16	RO
3100	12544	1	Diagnosis R-Register: number	Unsigned 32	RW
3100	12544	2	Diagnosis R-Register: value	Float 32	RW
3101	12545	0-FF	R1 – R256	Float 32	RW
3102	12546	0-FF	R257 – R512	Float 32	RW
3103	12547	0-FF	R513 – R768	Float 32	RW
3104	12548	0-FF	R769 – R1024	Float 32	RW
3105	12549	0-FF	R1025 – R1280	Float 32	RW
3106	12550	0-FF	R1281 – R1536	Float 32	RW
3107	12551	0-FF	R1537 – R1793	Float 32	RW
3108	12552	0-FF	R1793 – R2948	Float 32	RW
3109	12553	0-FF	R2049 – R2304	Float 32	RW
310A	12554	0-FF	R2305 – R2560	Float 32	RW
310B	12555	0-FF	R2561 – R2816	Float 32	RW
310C	12556	0-FF	R2817 – R3072	Float 32	RW
310D	12557	0-FF	R 3073 – R3328	Float 32	RW
310E	12558	0-FF	R3329 – R3584	Float 32	RW
310F	12559	0-FF	R 3585 – R3840	Float 32	RW
3110	12560	0-FF	R 3841 – R4096	Float 32	RW
3111	12561	0-FF	R 4097 – R4352	Float 32	RW
3112	12562	0-FF	R 4353 – R4608	Float 32	RW
3113	12563	0-FF	R 4609 – R4864	Float 32	RW
3114	12564	0-FF	R 4865 – R5120	Float 32	RW
3115	12565	0-FF	R 5121 – R5376	Float 32	RW
3116	12566	0-FF	R 5377 – R5632	Float 32	RW

Object List Part 5/6

Index (hex)	Index (dec)	Sub-index (hex)	Name	Type	Access
3117	12567	0-FF	R 5633 – R5888	Float 32	RW
3118	12568	0-FF	R 5889 – R6144	Float 32	RW
3119	12569	0-FF	R 6145 – R6400	Float 32	RW
311A	12570	0-FF	R 6401 – R6656	Float 32	RW
311B	12571	0-FF	R 6657 – R6912	Float 32	RW
311C	12752	0-FF	R 6913 – R7168	Float 32	RW
311D	12573	0-FF	R 7169 – R7424	Float 32	RW
311E	12574	0-FF	R 7425 – R7680	Float 32	RW
311F	12575	0-FF	R 7681 – R7936	Float 32	RW
3120	12576	0-FF	R 7937 – R8192	Float 32	RW
3200	12800	0 – (3C)	Diagnosis String: value of the string	Unsigned 8	RW
3200	12800	FE	Diagnosis String: number of the string	Signed 32	RW
3200	12800	FF	Number of PA-CONTROL strings	Signed 32	RO
3201	12801	0 - (3C)	S1 (global String 1)	Unsigned 8	RW
3202	12802	0 - (3C)	S2 (global String 2)	Unsigned 8	RW
3203	12803	0 - (3C)	S3 (global String 3)	Unsigned 8	RW
3204	12804	0 - (3C)	S4 (global String 4)	Unsigned 8	RW
3205	12805	0 - (3C)	S5 (global String 5)	Unsigned 8	RW
3206	12806	0 - (3C)	S6 (global String 6)	Unsigned 8	RW
3207	12807	0 - (3C)	S7 (global String 7)	Unsigned 8	RW
3208	12808	0 - (3C)	S8 (global String 8)	Unsigned 8	RW
3209	12809	0 - (3C)	S9 (global String 9)	Unsigned 8	RW
320A	12810	0 - (3C)	S10 (global String 10)	Unsigned 8	RW
320B	12811	0 - (3C)	S11 (global String 11)	Unsigned 8	RW
320C	12812	0 - (3C)	S12 (global String 12)	Unsigned 8	RW
320D	12813	0 - (3C)	S13 (global String 13)	Unsigned 8	RW
320E	12814	0 - (3C)	S14 (global String 14)	Unsigned 8	RW
320F	12815	0 - (3C)	S15 (global String 15)	Unsigned 8	RW
3210	12816	0 - (3C)	S16 (global String 16)	Unsigned 8	RW
3300	13056	0	Number of system flags	Signed 32	RO
3300	13056	1	Diagnosis Systemflag: number of the flag	Unsigned 32	RW
3300	13056	3	Diagnosis Systemflag: state of the flag	Unsigned 8	RO

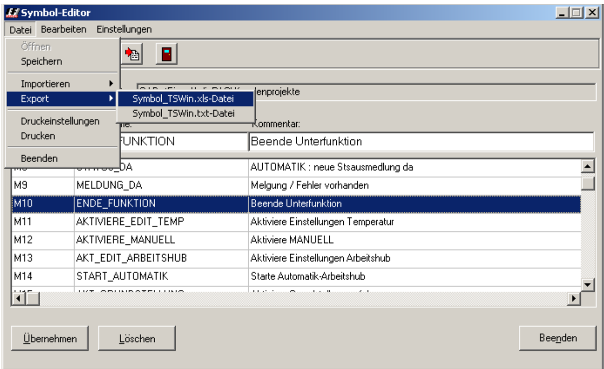
Object List Part 6/6

Index (hex)	Index (dec)	Sub-index (hex)	Name	Type	Access
3301	13057	0 - ...	SM1 – SM256	Unsigned 8	RO
3302	13058	0 - ...	SM257 - ...	Unsigned 8	RO
3400	13312	0	Number of system N registers	Signed 32	RO
3400	13312	1	Diagnosis System-N-Register: number	Unsigned 32	RW
3400	13312	2	Diagnosis System-N-Register: value	Signed 32	RO
3401	13313	0 - ...	SN1 - ...	Signed 32	RO
3500	13568	0	Number of system R registers	Signed 32	RO
3500	13568	1	Diagnosis System-R-Register: number	Unsigned 32	RW
3500	13568	2	Diagnosis System-R-Register: value	Float 32	RO
3501	13569	0 - ...	SR1 - ...	Float 32	RO
3801	14337	0 - (28)	Display PA-CONTROL front plate line 1	Unsigned 8	RO
3802	14338	0 - (28)	Display PA-CONTROL front plate line 2	Unsigned 8	RO
3803	14339	0	Key control console	Unsigned 8	WO
3804	14340	0	STOP key control console	Unsigned 8	WO
3805	14341	0	Control console is activated	Unsigned 8	RO
3806	14342	0	SHIFT key control console	Unsigned 8	WO
4000	16384	0	Current number of axes	Unsigned 8	RO
4001	16385	0 - F	Current axis position	Float 32	RO
4002	16386	0 - F	axis ready	Unsigned 8	RO
4003	16387	0 - F	Axis status (in position / running / stopped)	Unsigned 8	RO
4004	16388	0 - F	Status of negative limit switches	Unsigned 8	RO
4005	16389	0 - F	Status of positive limit switches	Unsigned 8	RO

6.15.3.2 Export List of Variables with WINPAC and import with TSwin

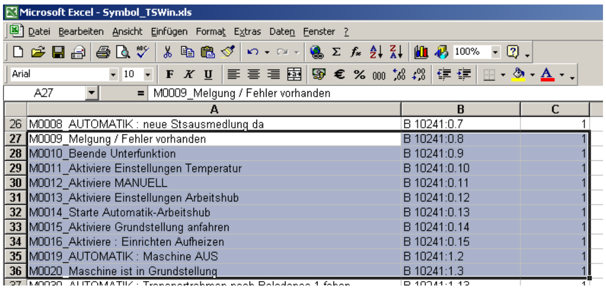
Generate and export the list with the symbol editor within Winpac.

Figure 114:



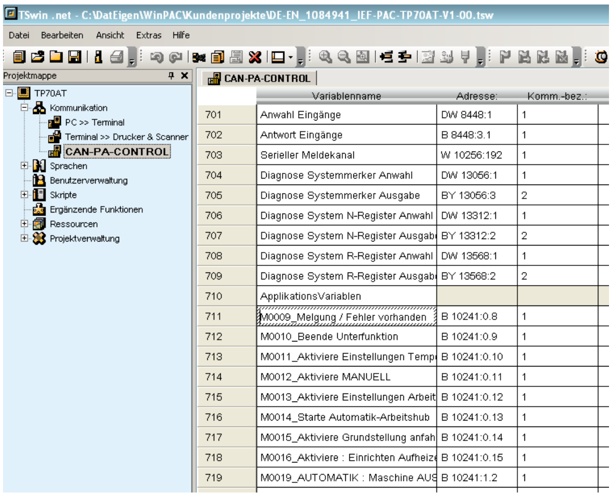
Open the file with EXCEL, mark the variables and copy them.

Figure 115:



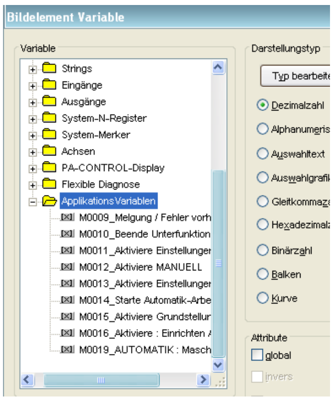
Within TSwin paste lines and columns out of the EXCEL-file into the list of variables.

Figure 116:



The access (buttons/switch areas,…) can be made as follows.

Figure 117:



6.15.4 Serial Signalling System with Polling Range

The serial signalling system of SÜTRON control consoles consists of the following elements:

- Writing of coordination byte
- Serial signalling channel and
- Status of the LEDs of the function keys

The three elements are combined in the variable "Polling range" for communication via CAN bus.

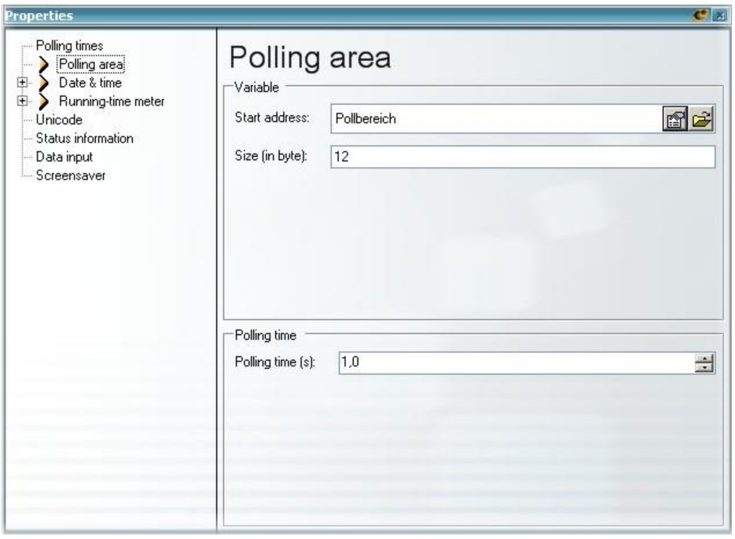


Figure 118: Polling Range

NOTE Only the setting "with 1 variable" can be used in TSwin for the polling range for communication via CAN

The polling range is applied to flags and N registers in PA-CONTROL. The N registers and flags used are assigned in the system parameters, so that customisation to the application is possible.

If the system parameters are set to 0, data fields are not used in PA-CONTROL.

System parameters for the polling range for control console 1 (CANopen address 63) and control console 2 (CANopen address 62) are provided in PA-CONTROL.

Default setting (after initialization of PA-CONTROL):

Control console	Number of flag word "Write" Coordination byte	Number of N register Serial signalling channel	Number of flag word LEDs of function keys
1 (ID63)	224	2048	218
2 (ID62)	0	0	0

A tab is available in the WinPAC program for setting the parameters for the polling range (*see Figure 119*).

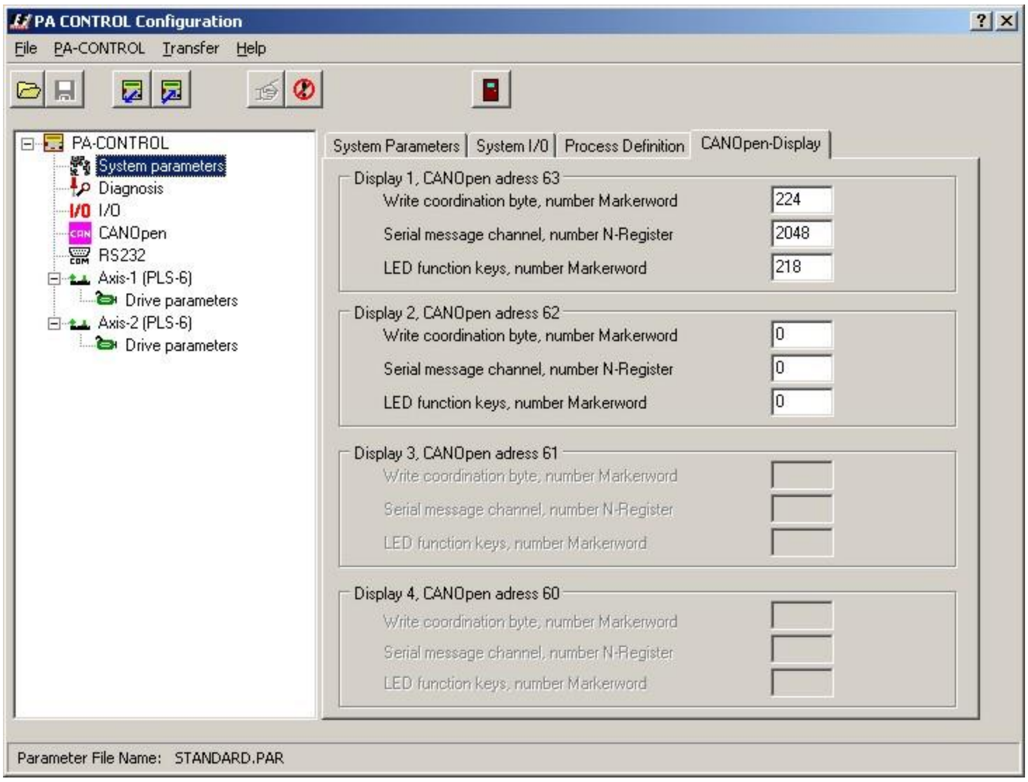


Figure 119: Tab for "Polling Range"

6.15.4.1 Serial Signalling Channel

The serial signalling channel is stored in an N register. N register N2048 is used as the default setting in PA-CONTROL.

PA-CONTROL stores a 16 bit message number in this N register. The operator panel cyclically retrieves the entire polling range from PA-CONTROL and transmits the serial message at the same time.

As soon as a message (message number > 0) is detected, it is stored in the internal message store of the operator panel, and the N register in PA-CONTROL is reset to zero as an "acknowledgment".

External masks and message masks are addressed in the same way. As soon as the transferred number corresponds to a mask number, it is shown on the display. If the number has a mask and a message text, the mask (message mask, full-page error text) is shown on the display and the associated message text entered in the message store.

6.15.4.2 Coordination Byte

The coordination byte exists as "Read coordination byte" and "Write coordination byte". Both use a flag word in PA-CONTROL:

- Write coordination byte means that PA-CONTROL writes this byte (flag)
- Read coordination byte means that PA-CONTROL reads this byte (flag)

6.15.4.2.1 Write Coordination Byte

"Write coordination byte" is associated with the polling range. The number of the flag word in which the coordination byte "Write" is stored is specified in a system parameter of PA-CONTROL (see above).

Flag word 224 (M3569 - M3584) is used in PA-CONTROL as the default setting for "Write coordination byte". This results in the following assignment:

Write coordination byte (PA-CONTROL writes)	
M3584	Free
M3583	Free
M3582	Free
M3581	Data set download enable (DDF bit)
M3580	Ready flag (LM bit)
M3579	Reset password, delete (PL bit)
M3578	Refresh acknowledgement (RQ bit)
M3577	External data enabling (ED bit)

6.15.4.2.2 Read Coordination Byte

The "Read coordination byte" is set with its own variable in the TSwin program. A flag word should be used as a variable.

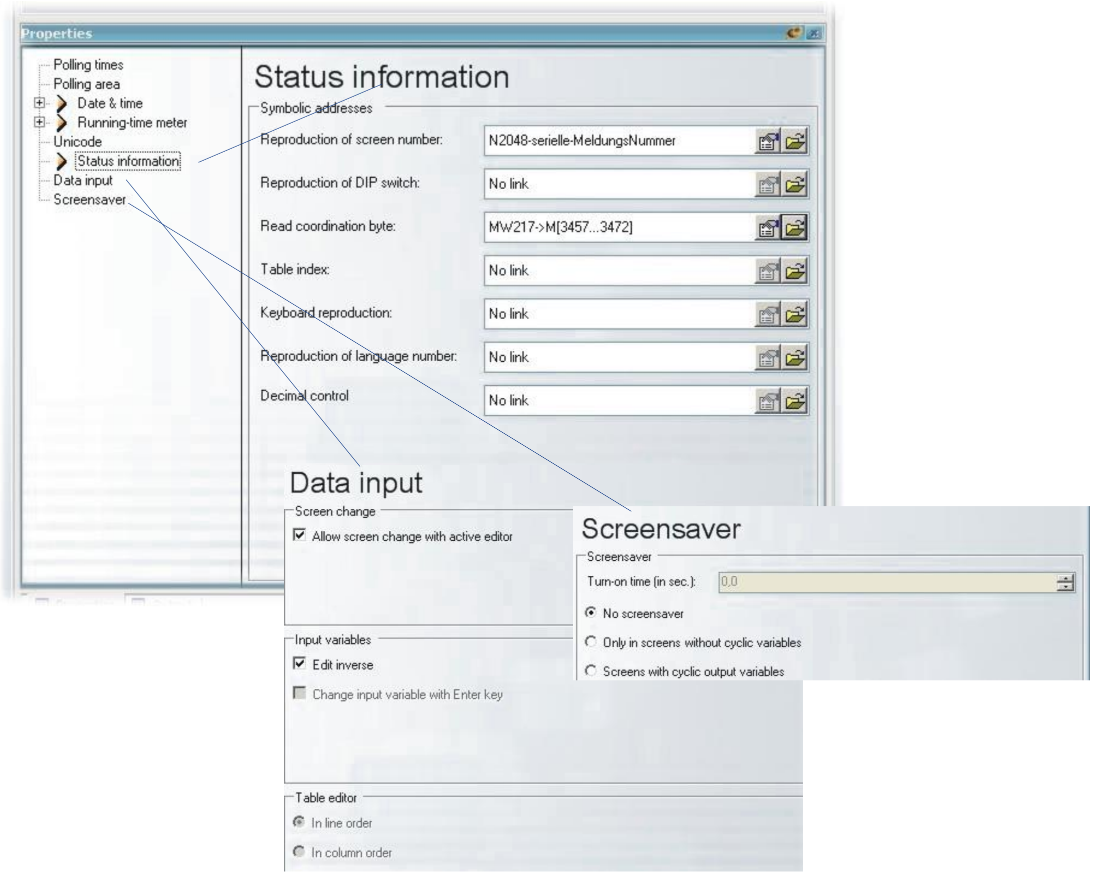


Figure 120: Setting the Read Coordination Byte

The flag word 217 (M3457 ... M3472) is used in the above example.
This results in the following assignment:

Read coordination byte (PA-CONTROL reads)	
M3464	Free
M3463	Free
M3462	Free
M3461	Data set download active
M3460	Ready flag (LM bit)
M3459	Refresh request bit (RA bit)
M3458	Editing status bit (EZ bit)
M3457	Editing request bit (EA bit)

6.15.4.3 LEDs of Function Keys

Number of the flag word starting from which the status of the LEDs of the function keys is stored.

The LEDs of the function keys use a varying number of flag words depending on the setting in the control console.

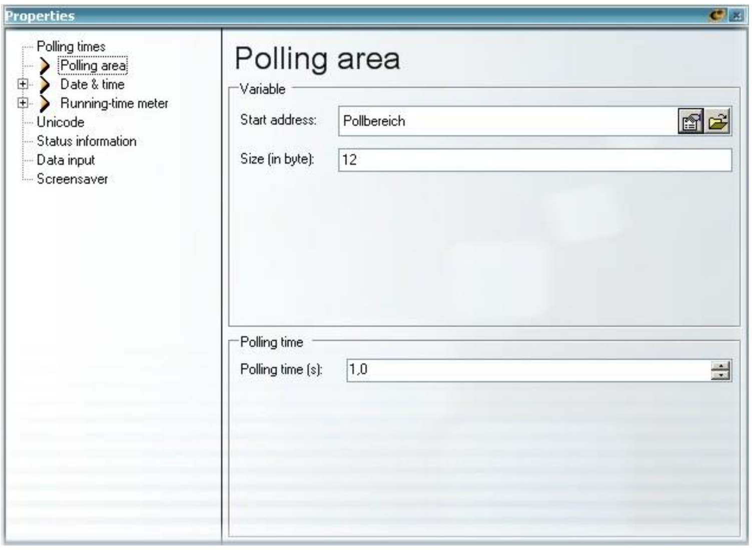


Figure 121: Setting the Polling Range

Note on size:

12 bytes → 6 Words: 1 Flag word for coordination byte
1 N register for signalling channel
4 Flag words for LEDs of function keys

10 Bytes → 5 Words: 1 Flag word for coordination byte
1 N register for signalling channel
3 Flag words for LEDs of function keys

The flag word 218 (M3488 - M3568) is used as the default setting in PA-CONTROL.

Assignment of the LEDs of the function keys to the flags of PA-CONTROL in the default								
MW218	M 3473 LED 1 on / off	M 3474 LED 1 flashing	M 3475 LED 2 on / off	M 3476 LED 2 flashing	M 3477 LED 3 on / off	M 3478 LED 3 flashing	M 3479 LED 4 on / off	M 3480 LED 4 flashing
	M 3481 LED 5 on / off	M 3482 LED 5 flashing	M 3483 LED 6 on / off	M 3484 LED 6 flashing	M 3485 LED 7 on / off	M 3486 LED 7 flashing	M 3487 LED 8 on / off	M 3488 LED 8 flashing
MW219								
MW220								
MW221								
MW222								
MW223	M 3553 LED 45 on / off							M 3568 LED 48 flashing

6.15.5 Parallel Signalling System

The parallel signalling system is applied in the flag area (flag words) of PA-CONTROL.

The user must ensure that the settings are possible in PA-CONTROL and that the ranges for status and acknowledgement do not overlap.

256 parallel messages are implemented in the following example

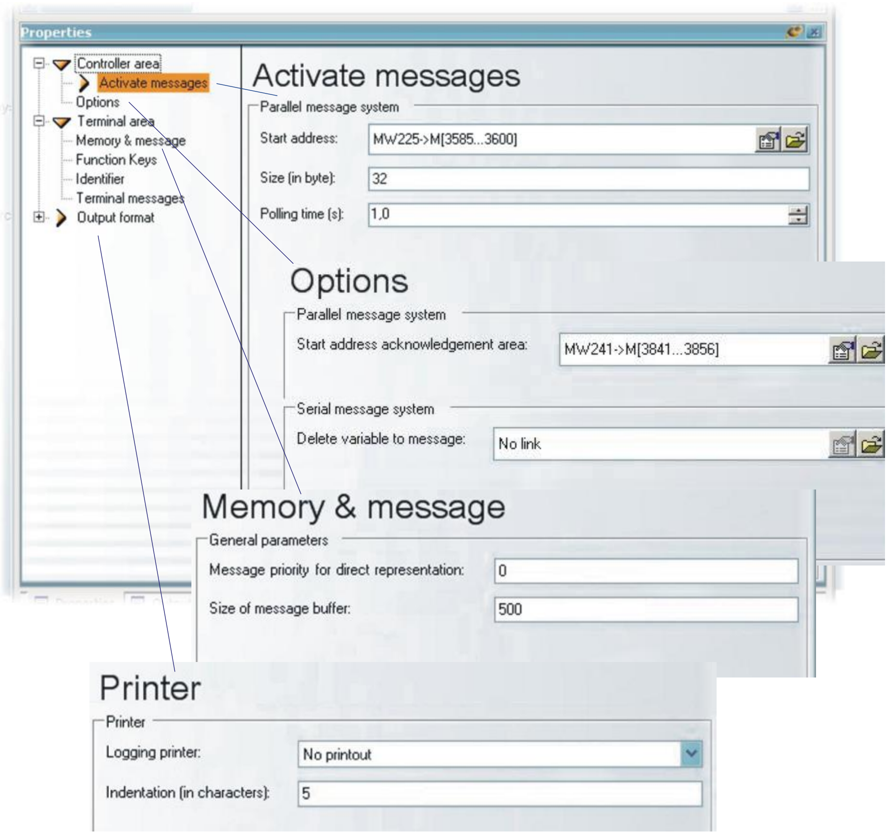


Figure 122: Setting the parallel Signalling System

This results in the following assignment:

Status of the parallel signalling system	
M3585	Message 1
M3586	Message 2
...	
M3601	Message 17
...	...
M3839	Message 255
M3840	Message 256

Acknowledgement of the parallel signalling system	
M3841	Acknowledgement message 1
M3842	Acknowledgement message 2
M3857	Acknowledgement message 17
...	...
M4095	Acknowledgement message 255
M4096	Acknowledgement message 256

6.15.6 Supplementary Functions

6.15.6.1 Status Information

The picture number can be taken out of the N-register in form of a 16-byte-acces via the menu “Complementary functions” (Ergänzende Funktionen) > “Status Information” (Statusinformationen).

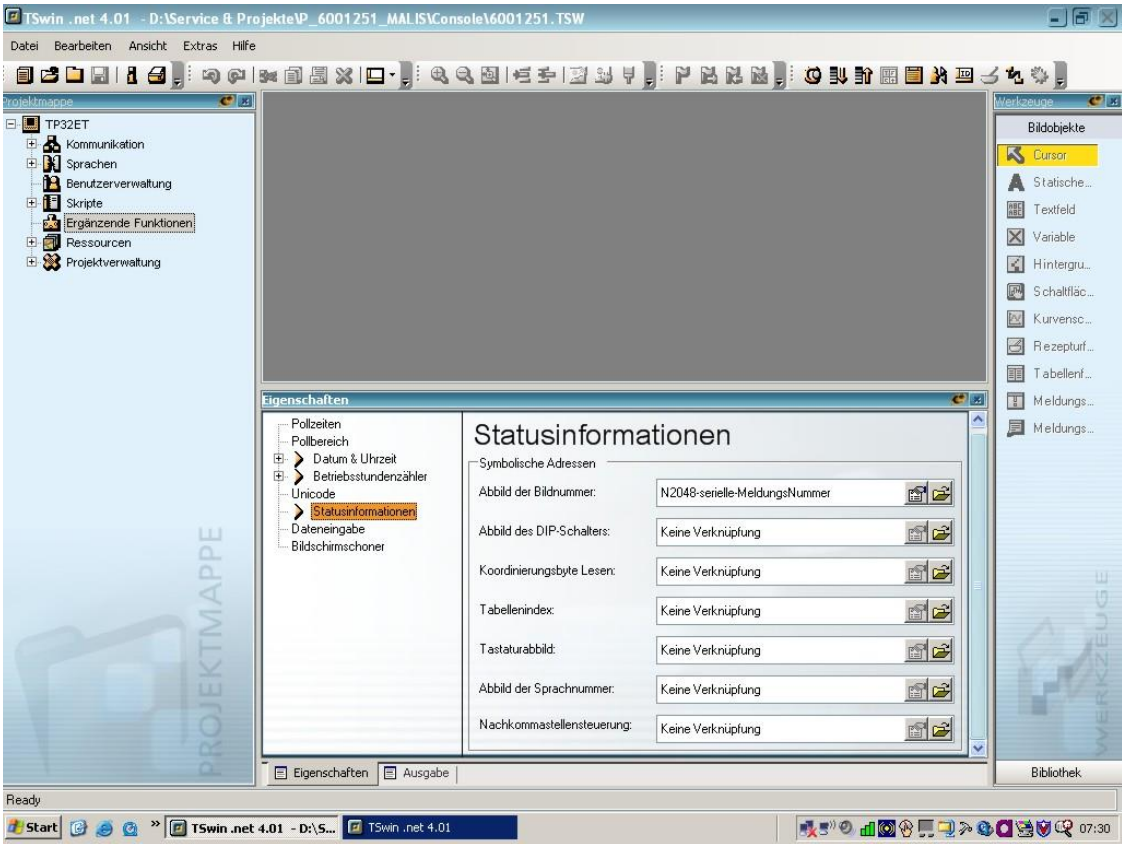


Abbildung 123: Complementary functions > Status Information (Statusinformationen)

6.15.6.2 Date and Time of Day

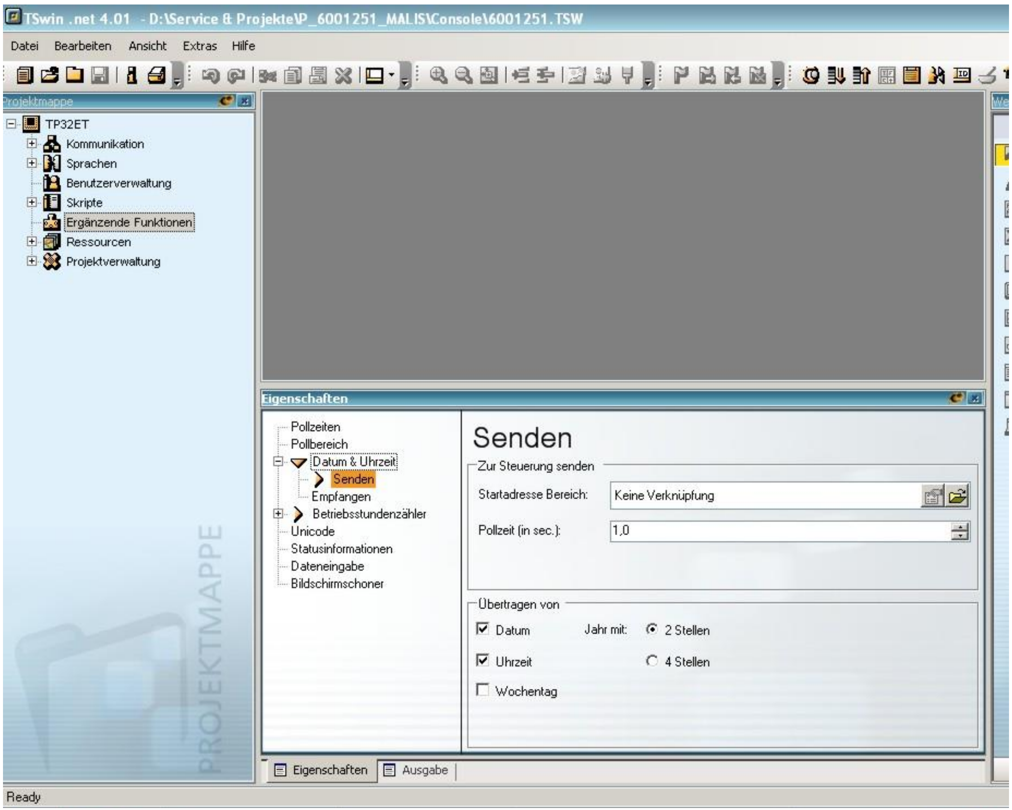


Abbildung 124: Supplementary Function „Date & Time“

6.15.7 Simulation of the PA-CONTROL Front Plate

Special access options were created, in order to display the front plate of PA-CONTROL, and therefore all the operating possibilities provided by the front plate of PA-CONTROL, on the user interface of the control console.

Index (hex)	Index (dec)	Sub-index (hex)	Name	Type	Access
3801	14337	0 - (28)	Display PA-CONTROL front plate line 1	Unsigned 8	RO
3802	14338	0 - (28)	Display PA-CONTROL front plate line 2	Unsigned 8	RO
3803	14339	0	Key control console	Unsigned 8	WO
3804	14340	0	STOP key control console	Unsigned 8	WO
3805	14341	0	Control console is activated	Unsigned 8	RO
3806	14342	0	SHIFT key control console	Unsigned 8	WO

Any existing PA-CONTROL front plate is disabled by accessing (reading) the display lines (Index 3801/3802).

PA-CONTROL front plates are implemented ready for use in the IEF templates:

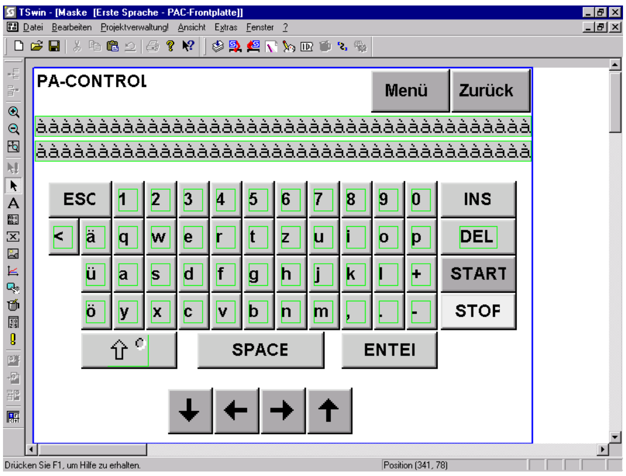


Figure 125: Template for "IEF Front Plate"

NOTE The font for the display line must be set to "COURIER 10", so that the special characters (ä,ü, ...) are displayed correctly.

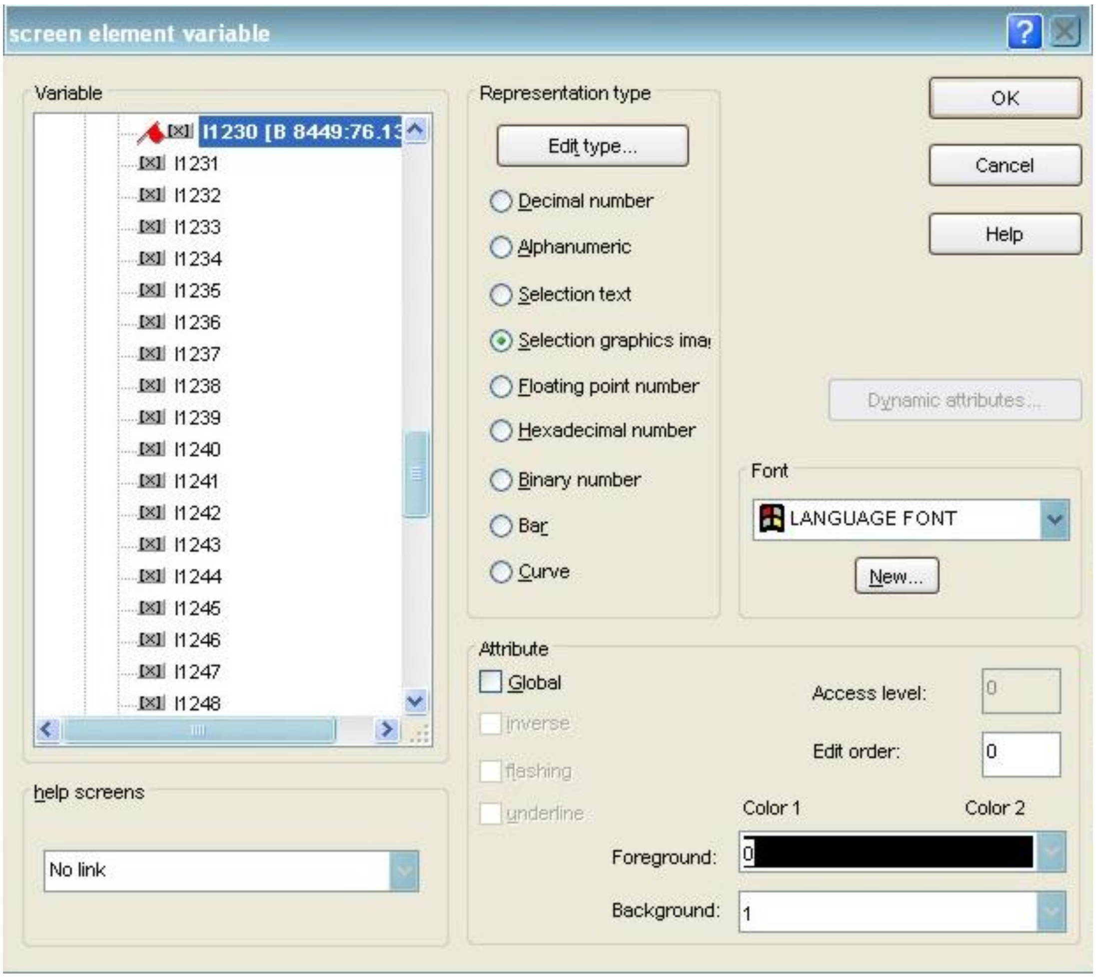


Figure 126: Setting the Font

6.15.7.1 <u>Key Code for Cursor Keys</u>

Index (hex)	Index (dec)	Sub-index (hex)	Name	Type	Access
3804	14340	0	STOP key control console	Unsigned 8	WO

Since the control console can only generate one code between 0 and 255 for keys, the cursor keys were assigned with the following values. The standard ASCII characters are transferred with their standard code.

Key Designation	Code (dec)
CURUP	1
CURDOWN	2
CURRIGHT	3
CURLEFT	4
BACKSPACE	8
POS1	9
POSEND	10
PGUP	11
PGDOWN	12
ENTER	13
INS	14
DEL	15
ESC	27
ASCII character set for example: 0 1 2	???? 48 49 50
STARTKEY	222

7 Technical Appendix

7.1 Messages of PA-CONTROL

PA-CONTROL continuously monitors the function of its components and the program execution. Status and operating conditions as well as error and fault signals are generated as a result of this monitoring.

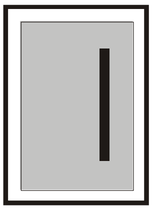
This information can be requested in all devices by means of the program development system WINPAC (see section *4: Startup, page 89* and documentation of WINPAC).

The error and fault signals are displayed in plain language on the operator terminal of devices which are equipped with this.

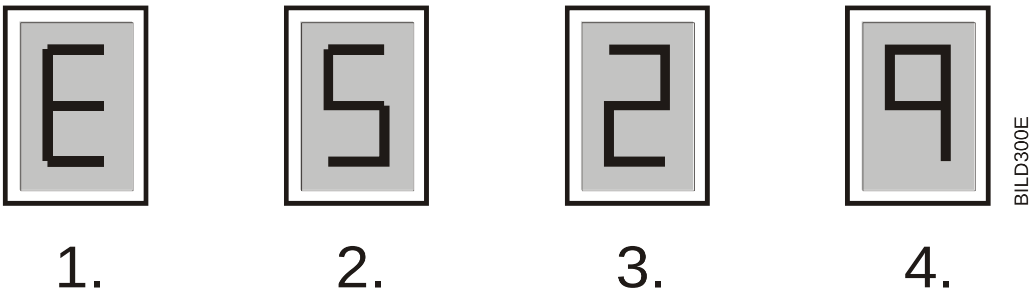
A status or error code is also output via the single digit 7-segment display of the NT8 of the PA-CONTROL in the devices of the type "Steuer" or "Compact".

The error and fault signals are displayed as numbers. In this connection, only the first digit of the number is displayed in the status and operating status display. In the case of error and fault signals, the individual digits of the number (three-figure) starting with an "**E**" (error) are displayed alternately.

The following examples show a 7-segment display on the NT8 of the PA-CONTROL Compact and PA-CONTROL Steuer.



Example: Initial position



Example: The display **E 5 2 9** signalises the error **"run against positive limit switch**“

Figure 127: Example of the Display via the 7-Segment Display

7.1.1 Status and Operational Status Messages

No. Dec	No. Hex	Operational Status	Further Information - Troubleshooting
00	00	no communication	Controller in an undefined status
01	01	Initial position	After switch-on
02	02	Manual operation	Front plate
03	03	Manual operation	Traversing of the axes
10	0A	Automatic started	START command initiated
11	0B	Automatic running	The program defined as the "START program" is processed
12	0C	Automatic and "STOP" detected	Front plate, external STOP or bus STOP
13	0D	Automatic and process "STOP" program	Waits for an event in the “STOP-program”
15	0F	Automatic and stopped	Front plate, external STOP or bus
16	10	Automatic and process program "START" after "STOP"	Waits for an event in the “START-after-STOP program”
17	11	Automatic and malfunction detected	
18	12	Automatic and process "Malfunction program"	Waits for an event in the malfunction program
19	13	Automatic with malfunction and stopped	The program defined as the "START program" has been stopped, no further program will be processed.
20	14	Manual traversing via serial port	Motor or axis is manually traversed via WINPAC
31	1F	Online	
35	23	Online stopped	
39	27	Online stopped with malfunction	
PA-CONTROL MP CANopen slave mode			
50	32	CANopen slave mode started	
51	33	CANopen slave mode, running	
52	34	CANopen slave mode, STOP detected	
55	37	CANopen slave mode, stopped	
56	38	PA-CONTROL MP is working in measuring mode	
57	39	CANopen slave mode, malfunction detected	
59	3B	CANopen slave mode, malfunction detected and stopped	

7.1.2 Error and Fault Signals

7.1.2.1 CPU Error Messages

Code	CPU Error Messages	Further Information - Troubleshooting
002	Bus error	CPU faulty
003	Address error	see above
004	Unimplemented command	see above
005	Division by zero	see above
006	Command chk	see above
007	Command Trapv	see above
008	Privilege violation	see above
009	Trace	see above
010	Emulator 1	see above
011	Emulator 2	see above
012	reserved	see above
013	Uninitialized interrupt	see above
014	Incorrect interrupt	see above
015	Uninitialized auto-vector1	see above
016	Uninitialized auto-vector2	see above
017	Uninitialized auto-vector3	see above
018	Uninitialized auto-vector4	see above
019	Uninitialized auto-vector5	see above
020	Uninitialized auto-vector6	"Boot" PA-CONTROL on switch-on
021	Uninitialized auto-vector7	"Boot" PA-CONTROL on switch-on
022	Uninitialized nonauto interrupt	"Boot" PA-CONTROL on switch-on
023	Uninitialized trap vector	"Boot" PA-CONTROL on switch-on
024	Uninitialized co-processor vector	"Boot" PA-CONTROL on switch-on
099	Incompatible operating system	The version of the boot system and the loaded operating system do not match. Eliminate the error by loading another version of the operating system

7.1.2.2 System Error Hardware

System Error Hardware - Part 1/3:

Code	Error Message	Further Information - Troubleshooting
E100	Keyboard port time-out	Keyboard removed, keyboard switched off
E101	Keyboard not ready	see above
E102	Short circuit in stepping motor output stage	Motor cable defective, motor defective
E103	Motor voltage incorrect / absent	230VAC not connected to the system? Bridge inserted in the motor connector? Motor power supply defective?
E104	Auxiliary voltages incorrect	Power supply defective
E105	Temperature in heat sink too high	Ventilation defective, ventilation clogged
E106	Motor rotation monitoring actuated	Motor run against mechanical stop, motor acceleration too high, rotary encoder wiring
E107	Phase sequence monitoring – no motor	Check motor wiring
E108	Axis type not defined	Non-existent axis addressed
E109	Axis type incorrectly defined	Hardware configuration changed
E110	Hardware configuration M-module slot	Module was exchanged, "boot" PA-CONTROL
E111	Hardware configuration IEF slot 1	Module was exchanged, "boot" PA-CONTROL
E112	Hardware configuration IEF slot 2	Module was exchanged, "boot" PA-CONTROL
E113	PLS7 interface different version	PLS7 is more recent than the operating system, match versions
E114	Axis power circuit not ready	LV-UNIT rotation monitoring error, wiring defective, LV-servoTEC supply voltage
E115	Axis module PLS7 does not exist	Hardware not connected
E116	PLS7 reports system error no.xxx	See table on page for further information
E117	PLS7 TIMEOUT	PLS7 card defective, exchange card
E118	Hardware configuration AS-i Master 1	AS-i master card defective or not connected
E119	Hardware configuration AS-i Master 2	AS-i master card defective or not connected
E120	Hardware configuration AS-i Master 3	AS-i master card defective or not connected
E121	Hardware configuration AS-i Master 4	AS-i master card defective or not connected

System Error Hardware - Part 2/3:

Code	Error Message	Further Information - Troubleshooting
E122	Axis module PLS6 does not exist	Check card
E123	Axis module PLS8 does not exist	Check card
E124	PLS6 / PLS8 TIMEOUT on loading PIC	Hardware error in the PLS card, exchange card
E125	More than 16 axes detected	Check axis configuration
E126	Another axis type detected	Check hardware configuration, "boot" PA-CONTROL if necessary
E127	New axis type detected	Check hardware configuration, "boot" PA-CONTROL if necessary
E128	Different axis types detected	Different cards which are not permissible together are present in system. (PLS6 combined with PLS7 or servo-axis with axis number of a PLS7 card)
E129	PLS6 / PLS8 PIC not ready	Hardware error in the PLS card, exchange card.
E130	PLS6- / PLS8 PIC error checksum	Hardware error in the PLS card, exchange card
E131	EURO TP1 IEF module 1 not possible	Module not permissible on this slot
E132	EURO TP1 IEF module 2 not possible	Module not permissible on this slot
E133	EURO TP2 IEF module 1 not possible	Module not permissible on this slot
E134	EURO TP2 IEF module 2 not possible	Module not permissible on this slot
E135	EURO TP3 IEF module 1 not possible	Module not permissible on this slot
E136	EURO TP3 IEF module 2 not possible	Module not permissible on this slot
E137	EURO TP4 IEF module 1 not possible	Module not permissible on this slot
E138	EURO TP4 IEF module 2 not possible	Module not permissible on this slot
E139	EURO TP1 IEF module 1 change	Check hardware configuration, "boot" PA-CONTROL if necessary
E140	EURO TP1 IEF module 2 change	Check hardware configuration, "boot" PA-CONTROL if necessary
E141	EURO TP2 IEF module 1 change	Check hardware configuration, "boot" PA-CONTROL if necessary
E142	EURO TP2 IEF module 2 change	Check hardware configuration, "boot" PA-CONTROL if necessary
E143	EURO TP3 IEF module 1 change	Check hardware configuration, "boot" PA-CONTROL if necessary

System Error Hardware - Part 3/3:

Code	Error Message	Further Information - Troubleshooting
E144	EURO TP3 IEF module 2 change	Check hardware configuration, "boot" PA-CONTROL if necessary
E145	EURO TP4 IEF module 1 change	Check hardware configuration, "boot" PA-CONTROL if necessary
E146	EURO TP4 IEF module 2 change	Check hardware configuration, "boot" PA-CONTROL if necessary
E147	Permissible internal temperature of the device exceeded	See technical data
E148	Too many absolute positioning systems detected	More IEF SSI modules are connected than the number of axes
E149	Warning: discharge degree of the battery	Check battery and exchange if necessary

7.1.2.3 System Error RAM Contents Group

Code	Hardware Error Message	Further Information - Troubleshooting
E150	System parameters outside range	"Boot" system parameters, "boot" PA-CONTROL if necessary
E151	Axis parameters outside range	"Boot" axis parameters, "boot" PA-CONTROL if necessary
E152	Horizontal checksum error in the ASCII program	Delete program, "boot" PA-CONTROL if necessary
E153	Horizontal checksum error in the Code program	Delete program, "boot" PA-CONTROL if necessary
E154	Warning: discharge degree of the battery of the RAM-Module (only CPU4)	Check battery and exchange if necessary

7.1.2.4 Field Bus Error Messages

Code	BUS Error Message	Further Information - Troubleshooting
E200	Profibus-DP error IO length	Incorrect configuration (GSD file?)
E201	Profibus-DP init error	Incorrect configuration (GSD file?)
E202	Profibus-DP unknown error	Incorrect configuration (GSD file?)
E203	RS232-CMD init error	RS 232 setting incorrect
E204	RS232-CMD hardware interrupt	Check transmission path (cable & connector)
E205	Rotary switch outside range	Incorrect setting of the rotary switch
E206	Malfunction on reading the rotary switch	Hardware error (CPU, rotary switch)

7.1.2.5 AS-i System Error and CMD Error Messages

Code	Hardware Error Message	Further Information - Troubleshooting
E250	AS-i: Error on execution of host job	AS-i master could not execute the command
E251	AS-i: No error on execution of host job	AS-i master could execute the command
E252	AS-i: Slave does not exist	Device with the address xx does not exist
E253	AS-i: Slave address 0 exists	The address 0 is not permissible in automatic or online mode
E254	AS-i: Slave address already in use	Selection of another address for programming
E255	AS-i: The AS-i slave cannot be programmed to address 0	Check error on execution of host job
E256	AS-i: The address could not be assigned to the AS-i slave	Check address
E257	AS-i: Address could not be stored in the EEPROM of the AS-i slave	Problem with the programming of the address, repeat operation
E258	AS-i: Unknown error	Repeat
E259	AS-i: Timeout for transfer of command	Check AS-i master card
E260	AS-i: No supply voltage	Check AS-i power supply
E261	AS-i: Slave 0 is here	Invalid address for automatic and online mode
E262	AS-i: Configuration error	Slaves on the bus do not coincide with the stored configuration

7.1.2.6 CANopen Bus, Communication Errors / Warnings

Code	Hardware Error Message	Further Information - Troubleshooting
E300	Bus offline	Too many bad CANopen frames, implement EMC-compatible system design
E301	Timeout for SDO communication with CANopen module (axis, IO module)	Axis switched off, CAN connector removed
E302	Error during SDO communication with CANopen module (axis, IO module)	Axis switched off, CAN connector removed
E303	Unknown warning at the axis	Device sets warning flag, but does not describe the error.
E304	Unknown error at the axis	Device sets warning flag, but does not describe the error.
E305	Axis does not answer the SYNC frame	Axis switched off, CAN connector removed
E306	Timeout at stop of an axis	Optimize parameter "VEL0"
E307	Axis not ready	Axis switched off, motor supply voltage unavailable
E308	Version of LV servoTEC operating system incorrect	The version of the operating system of LV-servoTEC is not up-to-date
E309	Different parameters in PA-CONTROL and LV-servoTEC	Match parameters
E310	Communication error with CANopen module (axis, IO module)	Axis switched off, CAN connector removed
E311	IO module does not answer NODE GUARD frame	IO module switched off, break in the cabling
E312	Index of the object does not exist	Incorrect command/parameter
E313	SUB-index of the object does not exist	Incorrect command/parameter
E314	Parameter value too high	Check parameter value in the file of the servoTEC parameters
E315	Parameter value too low	Check parameter value in the file of the servoTEC parameters
E316	Service parameters inconsistent	Error in the operating system
E317	Object may only be read	Error in the operating system
E318	Counter TX error too high	Bus malfunction (terminating resistor, cable length)
E319	Counter RX error too high	Bus malfunction (terminating resistor, cable length)
E320	"SYNC message" cannot be sent	- Bus malfunctions, - Error in the operating system
E321	Not all CAN axes or CAN IO modules have been initialized	- CAN device connected ? - Not switched on ? - at error ?

Continuation - CANopen Bus, Communication Errors / Warnings:

Code	Hardware Error Message	Further Information - Troubleshooting
E322	Timeout for the communication with the control console	- Control console connected ? - Not switched on ? - at error ?
E323	Emergency message received from IO module	- Power supply switched off - Error in IO module - Short circuit of an output Please note error code of the module, e.g. - 30xx-xx : Voltage, ... - 4xxx-xx : Temperature, ... - 81xx-xx : Communication, ... - 90xx-xx : External error, ...
E324	CAN axis at "EMERGENCY STOP" on traversing	EMERGENCY STOP input of the axis actuated
E325	CAN axis not ON	
E326	Error CAN LinMOT-Axis	
E327	Error CAN intelliMOT Axis	
E328	Error Can ecostep axis	
E329	Error PLS-EP axis	
E330	CAN Error, parameter out of range	
E331	CAN Error : no Entry on this Access	
E332	Error CAN dunMOT Axis	
E333	Error CAN dunMOT axis during homing	
E334	CAN error Object Index does not exist	
E335	CAN error Object Sub-Index does not exist	
E336	CAN Error drive-parameter out or range	
E337	CAN Error drive-parameter value to high	
E338	CAN Error drive parameter value to low	
E339	CAN Error drive-parameter service-parameter inconsistent	
E340	CAN Error drive-parameter read only	
E341	CAN Error no entry access	
E342	CAN-Modbus error of module	
E343	CAN –Time out at START Operational Mode	
E344	CAN Error at Access IEF-Touch-Screen	
E345	CAN-Error servoTEC s2 axis	
E346	CAN-Error servoTEC S2 parameter to high	
E347	CAN-Error servoTEC S2 parameter to low	

Continuation - CANopen Bus, Communication Errors / Warnings:

Code	Hardware Error Message	Further Information - Troubleshooting
E348	CAN Error EPOS axis	
E349	CAN Error flexmoTEC–B axis	

7.1.2.7 CANopen Bus Error Axis (servoTEC)

Part 1/4

Code	Hardware Error message	Further Information - Troubleshooting
E400	Unknown error, not detailed	
E401	Error reset, error no longer present	
E402	Generic error	
E403	Not ready	e.g. initialization not yet completed, ready (BTB) signal is not available on switch-on
E404	Fault to ground (F22)	Only with 40/70 ampere devices
E405	No supply system, not ready (F16)	Controller enabling was present, although no supply voltage was present, check mains supply.
E406	Overvoltage DC link (F02)	Ballast performance limit was reached, use external ballast resistor with higher performance and alter ballast performance parameters. Supply voltage too high, use mains transformer.
E407	Undervoltage DC link (F05)	Supply voltage not available or too low for enabled servo amplifier, enable servo amplifier with at least 500ms delay.
E408	Loss of a phase of the supply system (F19)	Can be switched off for operation on two phases.
E409	Internal temperature exceeded (F13)	Upgrade ventilation
E410	Temperature of heat sink exceeded (F01)	Limit value permanently set at 80°C by the manufacturer. Upgrade ventilation
E411	Motor temperature exceeded (F06)	Thermostatic switch of motor has actuated, allow motor cool to down and check why motor is overheating Connector of the feedback unit loose or feedback line interrupted, secure connector or replace feedback line.
E412	Error in auxiliary supply (F07)	The auxiliary voltage internally generated in the LV-servoTEC is defective, send LV-servoTEC to the manufacturer for repair.

Continuation CANopen Bus Error Axis (servoTEC) - Part 2/4

Code	Hardware Error Message	Further Information - Troubleshooting
E413	Error A-D converter (F17)	Error in the A-D conversion, usually an EMC disturbance, reduce EMV disturbances and check screen and grounding Possibly also hardware defect of the regulator
E414	Output stage error (F14)	Motor supply cable has a short circuit, exchange cable Motor has a ground fault or short circuit, exchange motor Output stage module has overheated; upgrade ventilation Defect of the output stage module Send servo amplifier to the manufacturer for repair. Ground fault or short circuit in the circuit of the external ballast resistor, eliminate ground fault or short circuit.
E415	Error ballast resistor (F18)	Ballast circuit defective or setting incorrect
E416	Error in application of the AS option (F27)	Activation of the AS option and the ENABLE signal are present at the same time
E417	Checksum serial EEPROM (F09)	Might be remedied by re-storage of the parameters (SAVE)
E418	Flash EEPROM (F10)	Checksum error
E419	Watchdog caused software reset (F32)	System software does not react correctly
E420	BCC error (Table)	**1)**
E421	BCC error, (system macro)	E420-E426: lead to F32,
E422	BCC error, (EEPROM serial)	Breakdown of the various
E423	FPGA error	causes only through output via the
E424	Error (Table)	serial port
E425	User software BCC	
E426	Defective user software BCC (F32)	System software does not react correctly
E427	Parameter error	Incorrect parameter value via PDO

1) Defective drive firmware, might be fixed by download of firmware.

The error codes F01 to F32 in brackets correspond to error messages of LV-servoTEC. See the LV-servoTEC operating instructions, *chapter 6.3: Error Messages, page 75 and further, document "MAN_EN_1032037_LV-servoTEC.pdf"*.

Continuation CANopen Bus Error Axis (servoTEC) - Part 3/4

Code	Hardware Error Message	Further Information - Troubleshooting
E428	Error brake (F11)	Cable break, short circuit or ground fault of the brake line
E429	Commutation error (F25)	Motor commutation not correct, check motor cable, check parameters MPHASE, VCOMM
E430	LV-servoTEC could not be enabled	HW Enable unavailable, or error status of the servo
E431	Command only allowed if LV-servoTEC not enabled	
E432	Defective feedback unit (F04)	Cable break, short circuit or ground fault
E433	Handling error (F21)	Software error of the expansion card
E434	Response monitoring	Node-guarding error, can be reset via control word
E435	CANopen bus not ready	Faulty CAN bus communication?
E436	State machine is not operation-enabled	Control word used incorrectly
E437	Incorrect mode	Preselect correct mode
E438	Torque setting incorrect (F15)	Preset RMS current value exceeded, e.g. as a result of a stiff mechanical system, check mechanical system
E439	Overspeed (F08)	Set overspeed reached motor has possibly run away
E440	Tracking error (F03)	Message of the position controller
E441	Invalid traverse job number started	Selected traversing set was not defined
E442	Error external trajectory (F28)	Setpoint step change too large Only in SERCOS systems
E443	Fatal exception error (F32)	System software does not react correctly
E444	Error in a PDO component	Incorrect value
E445	Incorrect operating mode	Only for Rx-PDO 22
E446	Slot error (F20)	Error of the expansion card Only in servos with slot cards
E447	Warning display as error (F24)	Warning display is evaluated as an error (user-defined)
E448	Error in approach to reference point (F26)	Hardware limit switch reached
E449	Sercos error (F29)	Only in SERCOS systems
E450	Sercos	Only in SERCOS systems

The error codes F01 to F32 in brackets correspond to error messages of LV-servoTEC. See the LV-servoTEC operating instructions, *chapter 6.3: Error Messages, page 75 and further, document "MAN_EN_1032037_LV-servoTEC.pdf"*.

Continuation CANopen Bus Error Axis (servoTEC) - Part 4/4

Code	Hardware Error Message	Further Information - Troubleshooting
E460	I^2T message threshold crossed	If necessary, reduce motor current, acceleration or traversing speed
E461	Ballast performance reached	
E462	Tracking error	Change drive parameter "tracking error" or, if necessary, reduce motor current, acceleration or traversing speed
E463	Response monitoring active	
E464	No mains phase	Check mains wiring or deactivate mains monitoring (PMODE)
E465	Software limit switch 1 has actuated	
E466	Software limit switch 2 has actuated	
E467	Bad traversing job started	Error in the operating system
E468	No reference point	Reference axis (G25…)
E469	Positive limit switch active	
E470	Negative limit switch active	
E471	Motor default values have been loaded	Setting of the motor parameters not yet complete
E472	Expansion card is not functioning correctly	
E473	Motor phase	
E474	Incorrect VCT entry	
E475	Warning n17 – n31	Display warning using the WINPAC-program Diagnosis -> servoTEC -> error statistics
E481	Positive limit switch actuated	
E482	Short circuit	Motor cable defective, motor defective
E483	Voltage for stepping motor output stage incorrect	230VAC not connected to the supply? Bridge inserted in the motor connector? Motor power supply defective?
E484	Auxiliary voltages incorrect	Power supply defective
E485	Temperature in the heat sink too high	Ventilation defective, ventilation clogged
E486	Motor rotation monitoring was actuated	Motor run against mechanical stop, motor acceleration too high, rotary encoder wiring
E487	Phase sequence monitoring! – no motor	Check motor wiring

7.1.2.8 Error Messages in Automatic Mode

Part 1/4

Code	Run Error Message	Further Information - Troubleshooting
E501	External stop input not defined	Parameter
E502	External stop input cold	Stop input, no connection?
E503	STOP program unavailable	Run definition
E504	START-AFTER-STOP prog. unavailable	Run definition
E505	MALFUNCTION program unavailable	Run definition
E506	STOP program illegal command	Only use permissible commands (see section *3: Commands of the PA-CONTROL-Family, page 87*)
E507	START after STOP prog. illegal command	Only use permissible commands (see section *3: Commands of the PA-CONTROL-Family, page 87*)
E508	MALFUNCTION program illegal command	Only use permissible commands (see section *3: Commands of the PA-CONTROL-Family, page 87*)
E509	Reserve	
E510	Reserve	
E511	Start program not defined	Run definition
E512	Start program unavailable	Run definition
E513	Program unavailable	Run definition
E514	Unknown command	Syntax error
E515	Nesting depth too large	Too many subroutines
E516	Too many processes started	More than 31 programs opened
E517	Value too low	Value less than e.g. the min. traverse
E518	Value too high	Value greater than e.g. the max. traverse
E519	Flag number too low	Value outside range 1-1024
E520	Flag number too high	Value outside range 1-1024
E521	Register number too low	Value outside range 1-1024
E522	Register number too high	Value outside range 1-1024
E523	Axis still running	Traversing command is still being processed
E524	Axis overrun	Axis outside traversing range
E525	No axis reference point	Reference switch defective?
E526	Data channel not initialized	Port available ?
E527	Display unavailable	IEF control terminal available
E528	Command at the data channel not possible	Port available ?

Continuation Error Messages in Automatic Mode - Part 2/4

Code	Run Error Message	Further Information - Troubleshooting
E529	Positive limit switch actuated	Switch actuated or cable break ?
E530	Negative limit switch actuated	Switch actuated or cable break ?
E531	Limit switch actuated	Switch actuated or cable break ?
E532	Value outside range	Value outside traversing range
E533	System error, cause unknown	Error message of the operating system
E534	Profibus-DP communication switched off	Interruption of Profibus (connector, cable)
E535	AP traversing speed too high	Check setting of the parameters
E536	AP traversing speed too low	Check setting of the parameters
E537	AP reference speed too high	Check setting of the parameters
E538	AP reference speed too low	Check setting of the parameters
E539	AP manual speed too high	Check setting of the parameters
E540	AP manual speed too low	Check setting of the parameters
E541	AP creep speed too high	Check setting of the parameters
E542	AP creep speed too low	Check setting of the parameters
E543	AP Start-Stop speed too high	Check setting of the parameters
E544	AP Start-Stop speed too low	Check setting of the parameters
E545	AP acceleration too high	Check setting of the parameters
E546	AP acceleration too low	Check setting of the parameters
E547	SLEEP program not running	Program is not being executed at present
E548	Assignment of axis type for interpolation	Interpolation not possible with this hardware (only with PLS7, PLS9)
E549	PLS7 negative acknowledgement at card command	Hardware error
E550	PLS7 incorrect card mode	Hardware error
E551	COM port busy	COM1 used as RS232-OnlineCMD
E552	Axes already used by interpolation	Interpolation command uses all four axes of this PLS card during interpolation
E553	IPO – path traversing speed too high	Check parameters
E554	IPO – path traversing speed too low	Check parameters
E555	IPO – path Start-Stop speed too high	Check parameters
E556	IPO – path Start-Stop speed too low	Check parameters
E557	IPO – path acceleration too high	Check parameters
E558	IPO – path acceleration too low	Check parameters
E559	Input field too small	Error in user program

Continuation Error Messages in Automatic Mode - Part 3/4

Code	Run Error Message	Further Information - Troubleshooting
E560	Rotary encoder error on synchronization	Hardware error
E561	Program already running	Program can only be started once
E562	RS232 communication was disconnected	Check cabling, handshake lines
E563	Manual approach to reference point: positive limit switch actuated	Rotational and limit switch direction incorrect
E564	Incorrect program type	Call of an incorrect program (PTX)
E565	INTERBUS_S emergency stop	INTERBUS_S was disconnected
E566	Axis not ready	Check standby power section
E567	Increments of axis range greater than 31 bits	Check definition of traversing range
E568	Approach to reference point not possible	Check servoTEC communication
E569	STORE command executed incorrectly	Check placeholder for characters in the program
E570	Number of revolutions greater than maximum	Check definition of traversing range **Formula for calculation of the speed N:** $N = \frac{(\text{traversingrangemax} - \text{traversingrangemin}) * Gearfactor}{PGEARI}$ (PGEARI – servoTEC parameters) **IMPORTANT**: The following applies up to version V4.72: - No. of rev. < 1024
E571	Command not possible with this axis	Program error
E572	Reserve, not assigned at present	
E573	Any CANopen device SDO TIME-OUT	Check whether CANopen device connected
E574	String too long	The result string would be longer than 80 characters if strings are added
E575	Traversing speed greater than 16 bits	The value would be greater than a 16 bit value in the case of a traversing command for a servoTEC axis
E576	Value cannot be read stably	
E577	Incorrect jump target	The commands JMP-LINE or JMP-LINE-IPO jump to an invalid program line
E578	Traverse of the servoTEC axis too long	The traverse for a traversing command is limited to a number of revolutions - up to V4.73I : 1022 revolutions - from 4.74 or higher → see E570

Continuation Error Messages in Automatic Mode - Part 4/4

Code	Run Error Message	Further Information - Troubleshooting
E579	Command not allowed in the initial position program	A command is to be executed in the "initial position" program which is not enabled for this program type e.g.: - A1:= - RUN
E580	ServoTEC axis, PRBASE wrong	
E581	Name of program with illegal characters	
E582	Axis was moved in state IDLE/SAFE	
E583	Axis not in state DRIVE ENABLED	
E584	Axis not in state HALT	
E585	Axis , time out at stop axis	
E586	Axis in state DISABLED	
E587	Temperature controller not exist	
E588	AD-converter not exist	
E589	Counter not exist	
E590	Command not executable	
E591	Axis release mode = 4, not usable with IPO-commands	
E592	Gantry-mode out of range	
E593	Gantry-SLAVE-Axis cannot be moved by a command	
E594	G183- and G700-commands cannot be used at the same time	

7.1.2.9 Communication Errors

Code	Run Error Message	Further Information - Troubleshooting
E600	IEF module slot number not allowed	Insert module in permissible slot
E601	COM port number not allowed	Programming error
E602	COM port not installed	Addressed COM port unavailable
E603	COM port not initialized	Programming error
E604	COM port not empty for sending	Previous transmission not yet ended Programming error, Port disabled, hardware handshake
E605	COM port hardware handshake disabled	Check parameter setting and device
E606	COM port data format incorrect	Parameter setting
E607	COM port hardware not empty for sending	Previous transmission not yet ended Programming error, Port disabled, hardware handshake

7.1.2.10 Errors of the Absolute Dimension System

Code	Run Error Message	Further Information - Troubleshooting
E620	Absolute positioning system unavailable	SSI hardware error
E621	Absolute positioning system not referenced	Carry out approach to reference point
E622	Reserve, not assigned at present	
E623	Absolute positioning system SSI module not ready	Check SSI module (connection and wiring)
E624	Absolute positioning system DIN-T0 error	Parameter error
E625	Absolute positioning system DIN-Tn+ error	Parameter error
E626	Absolute positioning system initialization timeout error	Check SSI module (connection and wiring)

7.1.2.11 Error Drive Parameter File

Code	Error Message	Further Information - Troubleshooting
E880	Axes types are different	
E881	The date of the drive parameter file is erroneous	
E882	The parameter line of the drive parameter file is erroneous	

7.1.2.12 CANopen LV-servoTEC Errors

Code	Run Error Message	Further Information - Troubleshooting
E900	Different parameters in PA-CONTROL and LV-servoTEC	Adjust parameter value
E901	Different obligatory parameters in PA-CONTROL and LV-servoTEC	Adjust parameter value
E902	Different reference parameters in PA-CONTROL and LV-servoTEC	Adjust parameter value

7.1.2.13 Error Message Gantry Axes

Code	Process Error Message	Further Information - Troubleshooting
E910	Gantry axis parameter unequal: Gear factor	
E911	Gantry axis parameter unequal: Motor steps per revolution	
E912	Gantry axis parameter unequal: Release mode	
E913	Gantry axis parameter unequal: start-up procedure mode	
E914	Gantry axis parameter unequal: OFF-ramp	
E915	Gantry axis parameter unequal: STOP axis input number	
E916	Gantry axis parameter unequal: START axis input number	
E917	Gantry axis parameter unequal: OFF axis input number	
E918	Gantry axis parameter unequal: ON axis input number	
E919	Gantry axis not defined: Gantry limit switch input number	
E920	Gantry axis not defined: Gantry limit switch output number	
E921	Gantry-axis parameter: Distance from the reference point to zero point is not equal to zero	
E922	Too less memory to generate the PNX-programme list for the IEF-Touch	

7.1.2.14 PLS7- Run Error Messages

Code	CPU-Run Error Message	Further Information - Troubleshooting
2	Bus error	Change the PLS7-card
3	Address error	- „ -
4	Unimplemented command	- „ -
5	Division by zero	- „ -
6	Command chk	- „ -
7	Command Trapv	- „ -
8	Privilege violation	- „ -
9	Trace	- „ -
10	Emulator 1	- „ -
11	Emulator 2	- „ -
15	Uninitialized interrupt	- „ -
24	Incorrect interrupt	- „ -
101	Uninitialized auto-vector1	- „ -
102	Uninitialized auto-vector2	- „ -
103	Uninitialized auto-vector3	- „ -
104	Uninitialized auto-vector4	- „ -
105	Uninitialized auto-vector5	- „ -
106	Uninitialized auto-vector6	- „ -
107	Uninitialized auto-vector7	- „ -
110	Uninitialized nonauto interrupt	- „ -
120	Uninitialized trap vector	- „ -
130	Uninitialized co-processor vector	- „ -
401	Generator 1 load “Time out”	- „ -
402	Generator 2 load “Time out”	- „ -
403	Generator 3 load “Time out”	- „ -
404	Generator 4 load “Time out”	- „ -
501	Checksum error at load generator 1	- „ -
502	Checksum error at load generator 2	- „ -
503	Checksum error at load generator 3	- „ -
504	Checksum error at load generator 4	- „ -
999	Software-Watchdog	- „ -

7.2 Basic Equipment of PA-CONTROL

7.2.1 Basic Equipment of the PA-CONTROL Single

The basic equipment of a PA-CONTROL Single (viewed here from the rear) consists of the following components:

- 1 Stepping motor output stage
- 1 Power supply
- 1 I/O card
- 1 PLS8 card (not visible from the outside)
- 1 CPU4 card
- 1 free connector location

The free connector location is available for a further I/O card or other options (Detail see section *6.1: Options of PA-CONTROL , page 167*).

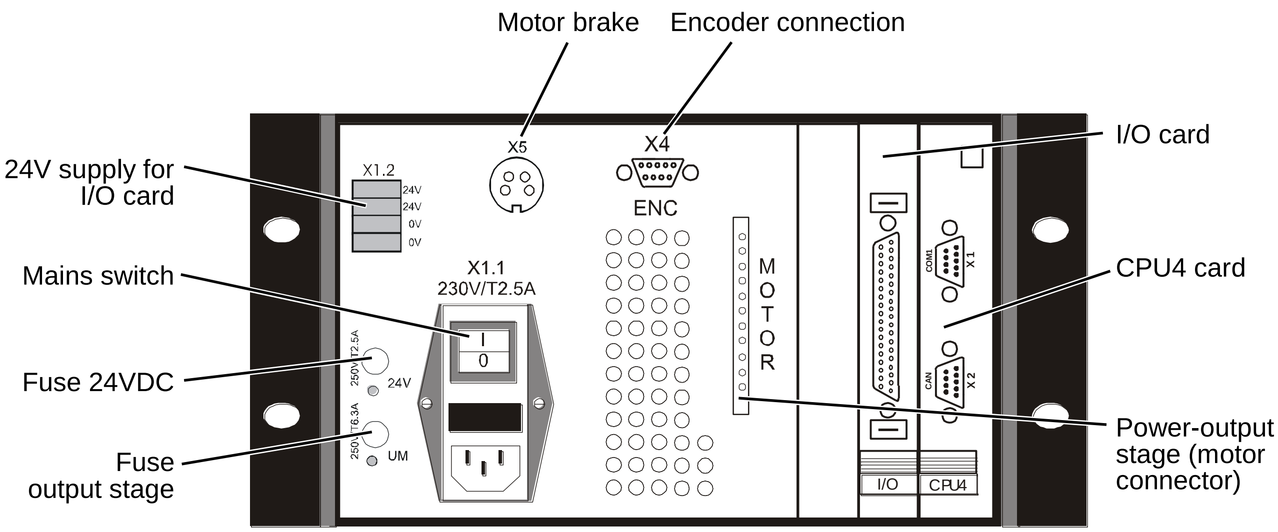


BILD207A

Figure 128: PA-CONTROL Single, rear view

The 5V DC voltage for the supply of the CPU is fused via a fuse on the power supply board. The fuse can be accessed after removal of the top housing cover.

7.2.2 Basic Equipment of the PA-CONTROL Compact

The basic equipment of a PA-CONTROL Compact (viewed here from the rear) consists of the following components:

- 2 Stepping motor output stages
- 1 Wiring card
- 1 Power supply card (NT)
- 1 I/O card
- 1 PLS6 card
- 1 CPU4 card
- 5 free connector locations

The free connector locations are available for extra I/O cards and/or other options (Details see section *6.2: Expansions of the PA-CONTROL CPU4, page 168*).

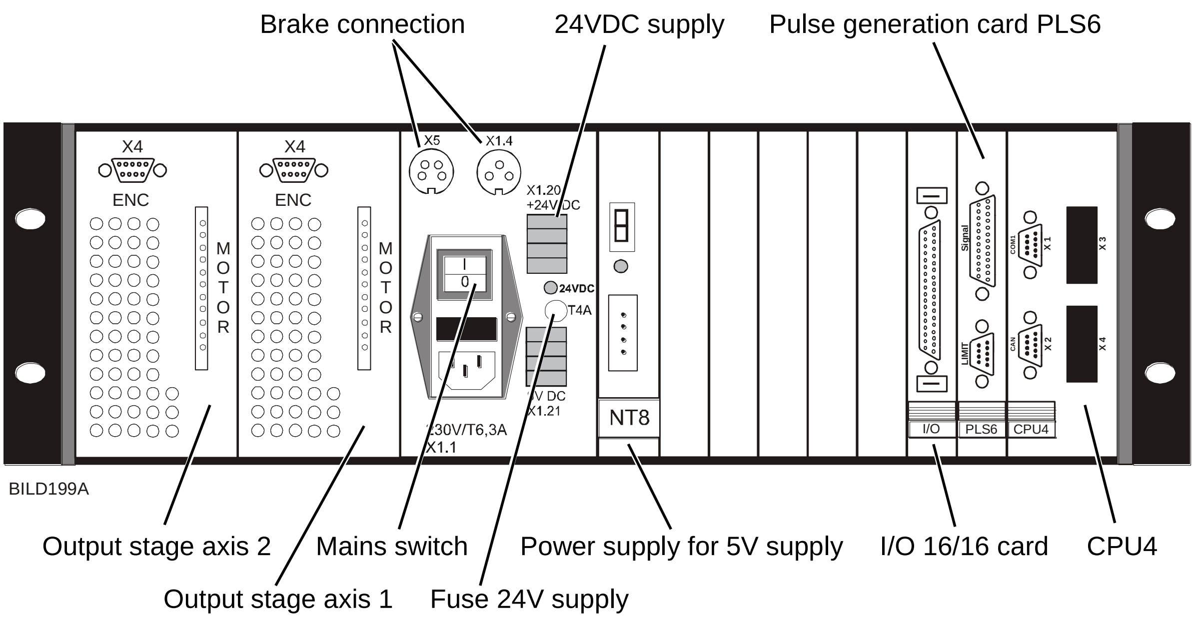


Figure 129: PA-CONTROL Compact, rear view

7.2.3 Basic Equipment of the PA-CONTROL Steuer

The basic equipment of a PA-CONTROL Steuer (viewed here from the rear) consists of the following components:

- 1 Power supply N T4
- 1 I/O card
- 1 PLS7/9 card
- 1 CPU4 card

The PA-CONTROL is available in the installation widths 19“ and 19“/2. The number of free connector locations is the same in both variants.

The free connector locations are available for extra I/O cards and/or other options (Detail see section *6.1: Options of PA-CONTROL , page 167*).

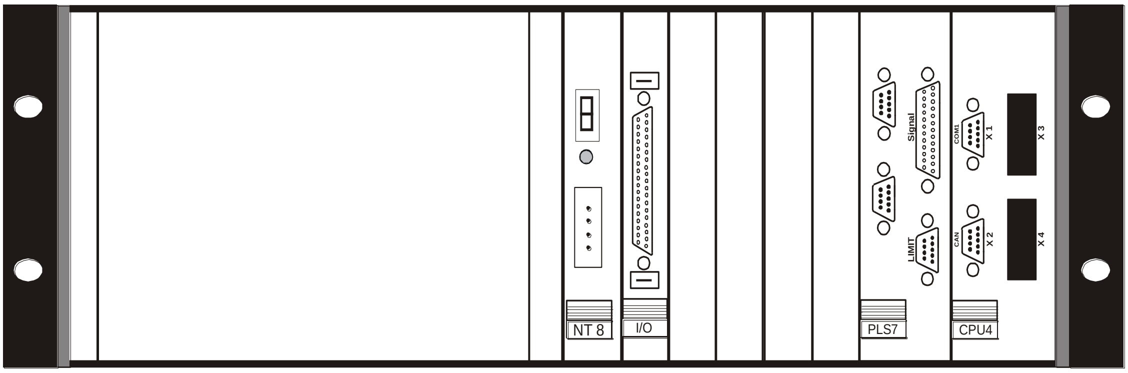


BILD219A

Figure 130: PA-CONTROL CPU4 / 19" execution, rear view

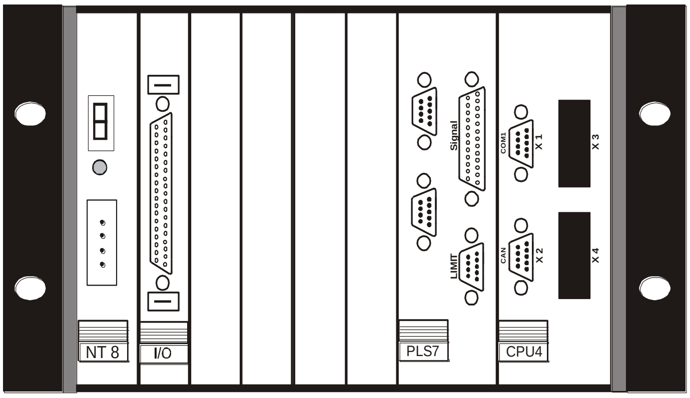


BILD216A

Figure 131: PA-CONTROL CPU4 / 19/2" execution, rear view

In order to be able to utilize all the possible configuration options to a high degree, e.g. connection of 16 axes, the PA-CONTROL Steuer can also be supplied with a EURO bus expanded to 20 slots.

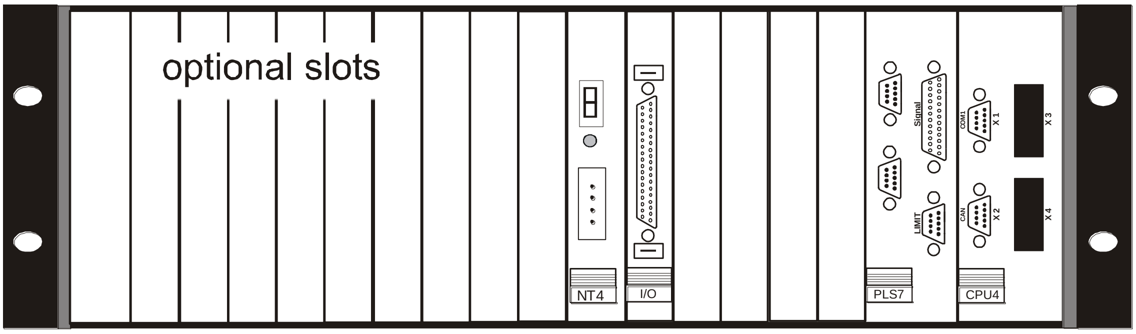


BILD215E

Figure 132: PA-CONTROL CPU4 / 19" execution (20 slot bus), rear view

7.3 CPU4

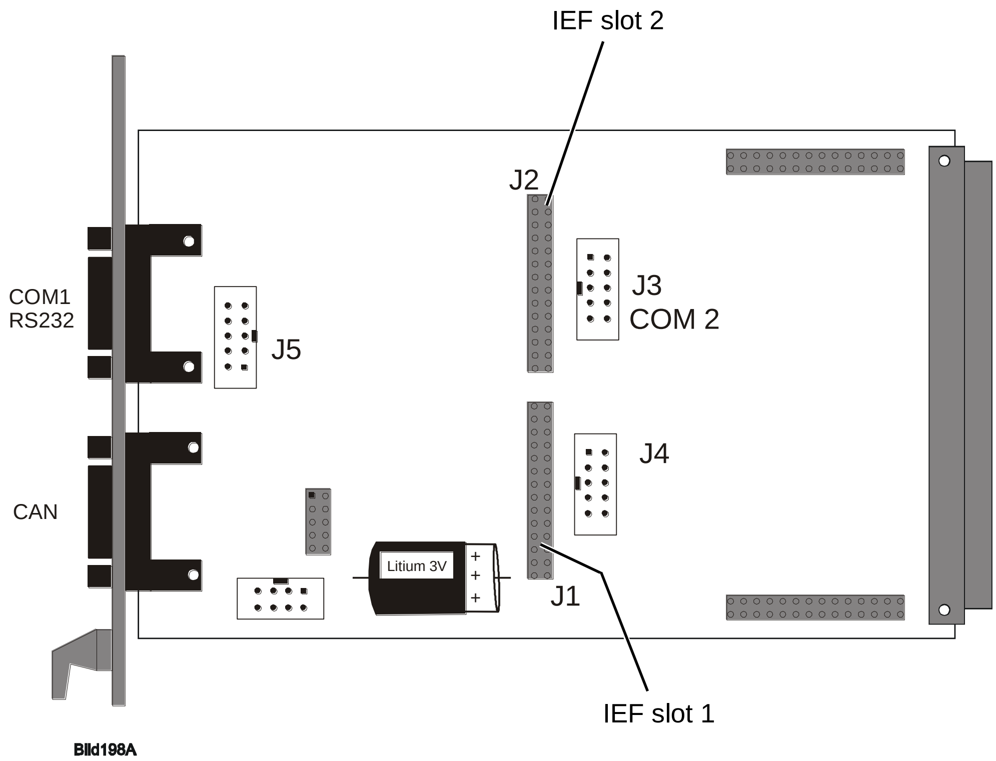


Figure 133: CPU4

NOTE The lifetime of the battery is approx. 7 years. This value depends on the temperature. To avoid data loss, it is recommended that the battery is changed after approx. 5 years.

The CPU4 is equipped with the following:

- Micro controller 68376
- 1024 kB RAM, approx. 800 kB of this available to the user
- Diagnosis port
- COM1 as RS232
- CANOpen connection
- Battery for data conservation in the RAM
- Real time clock
- Installation width 9 width units, optionally 5 units or 13 units

The slots J1 and J2 can be equipped with IEF modules. COM2 can be used on J3 via the RS232 port driver. For this variant, the option should be equipped with a front plate with 13 width units.

Example: CPU4 (9TE) with fitted options

IEF module on module slot J2 (background)

RS232 port driver for COM2 on J3 (foreground)

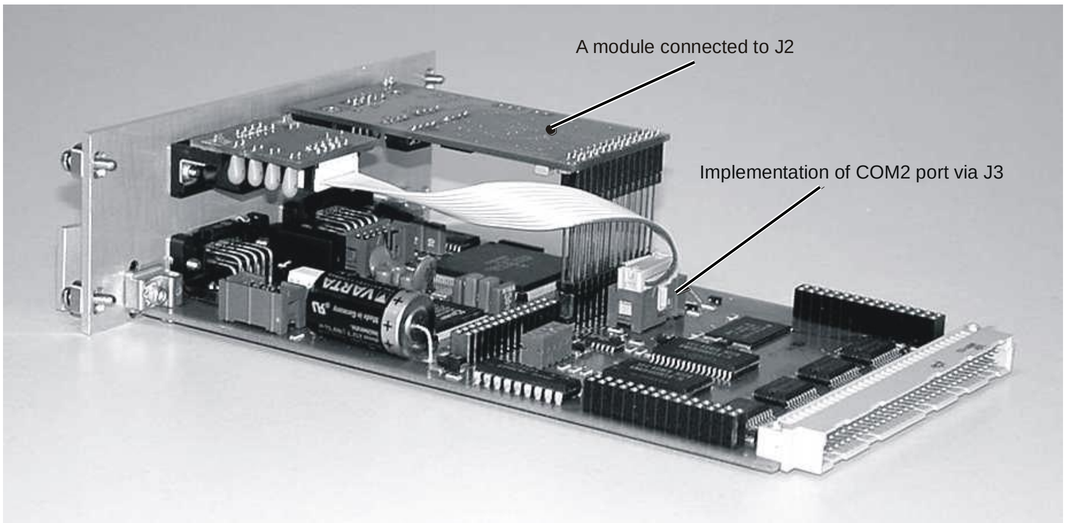
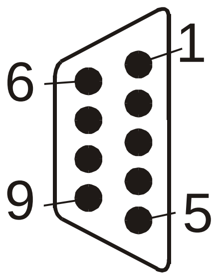


BILD182E

Figure 134: Standard Equipment of CPU4

Communication with other devices is possible via the CAN bus.

See the "CAN bus documentation" for further information.



1	N.C.
2	CAN_L
3	CAN_GND
4	N.C.
5	N.C.
6	(GND)
7	CAN_H
8	N.C.
9	(CAN_V+)

Figure 135: Connector Assignment for CANopen Bus, Sub-D, 9 poles; pins

NOTE DIN ISO 11898 must be complied with for use of the CAN bus.

7.3.1 COM1 Port

COM1 is a serial asynchronous port of the type RS232 and is always available on the CPU4. The port can be set by the user within wide limits. Other devices in the plant can be communicated with in automatic mode (program) by means of this port.

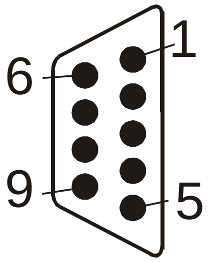
	1	N.C.
	2	RXD, Receive Data
	3	TXD, Transmit Data
	4	N.C.
	5	GND
	6	N.C.
	7	RTS, switch on transmitter
	8	CTS, ready for transmission
	9	N.C.

Figure 136: Connector Assignment for COM1, Sub-D, 9 poles; pins

NOTE Assignment corresponds to asynchronous standard RS232!
A shielded line must be used to guarantee the trouble-free exchange of data.

7.4 I/O Card

7.4.1 Addressing of the I/O Card

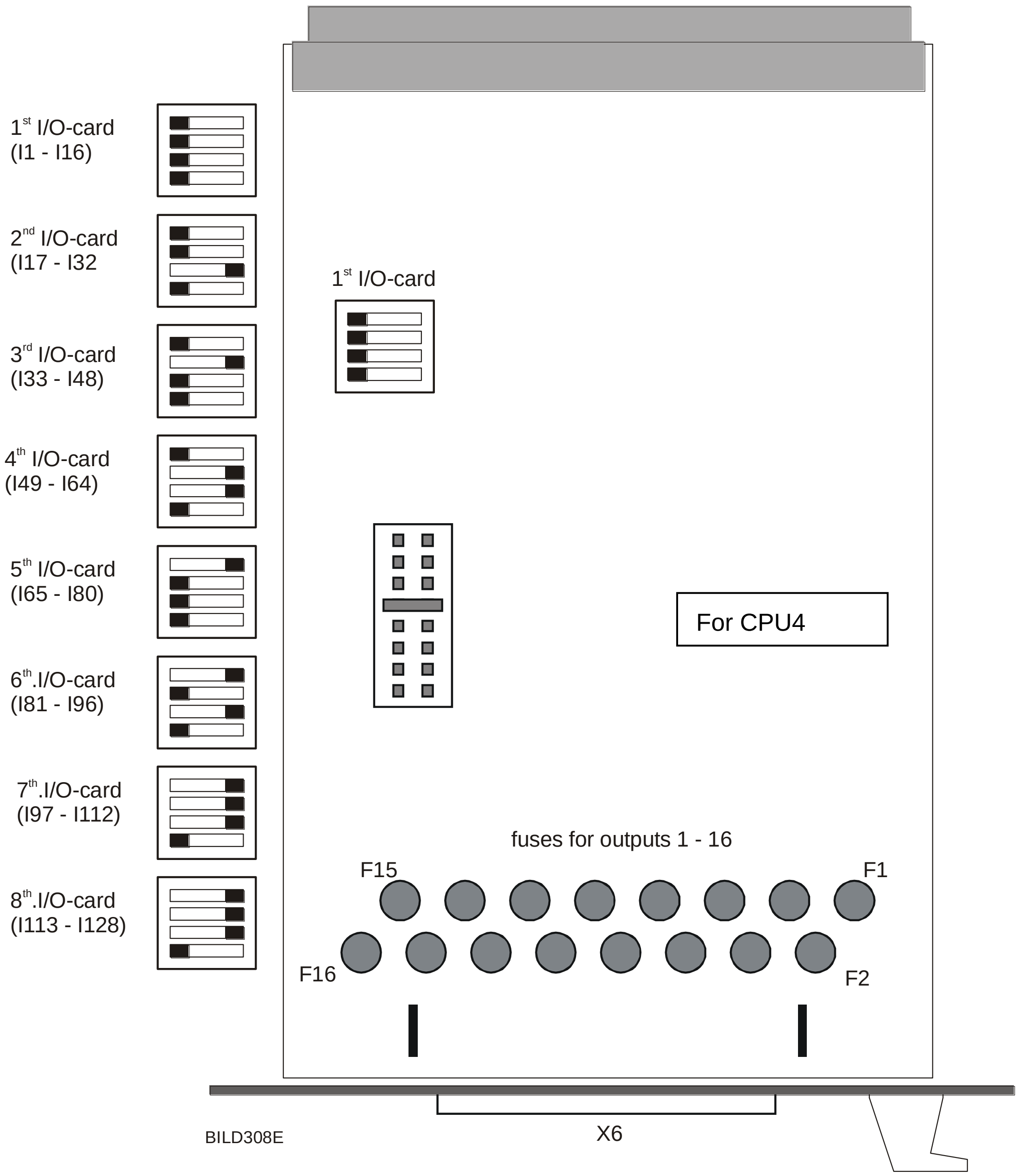
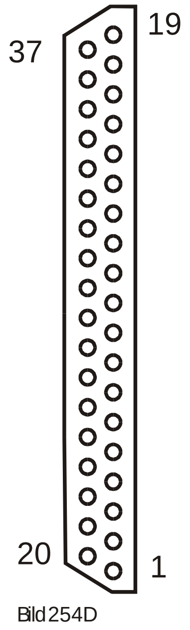


Figure 137: I/O Card, Address Setting

7.4.2 Connector Assignment of the I/O Card



1	Input 1	20	Output 1
2	Input 2	21	Output 2
3	Input 3	22	Output 3
4	Input 4	23	Output 4
5	Input 5	24	Output 5
6	Input 6	25	Output 6
7	Input 7	26	Output 7
8	Input 8	27	Output 8
9	Input 9	28	Output 9
10	Input 10	29	Output 10
11	Input 11	30	Output 11
12	Input 12	31	Output 12
13	Input 13	32	Output 13
14	Input 14	33	Output 14
15	Input 15	34	Output 15
16	Input 16	35	Output 16
17	+24VDC	36	GND
18	+24VDC	37	GND
19	GND		

Signal input:

→ opto-decoupled

→ 24VDC

→ typ. input voltage 5mA

→ Low level (0-3) VDC

→ High level (10-30) VDC

Signal output:

→ opto-decoupled

→ positive switching

→ 24VDC/0.5A (ohmic load)

→ per card, sum of all outputs; max. 2A

Figure 138: Connector Assignment of the I/O Card

NOTE In the PA-CONTROL Single, inputs 15 and 16 of the I/O card are used for the limit switches of the stepping motor axis, i.e. only 14 free inputs are available!

In this case, input 15 is used as a positive limit switch and input 16 as a negative one.

7.4.3 Connection Example

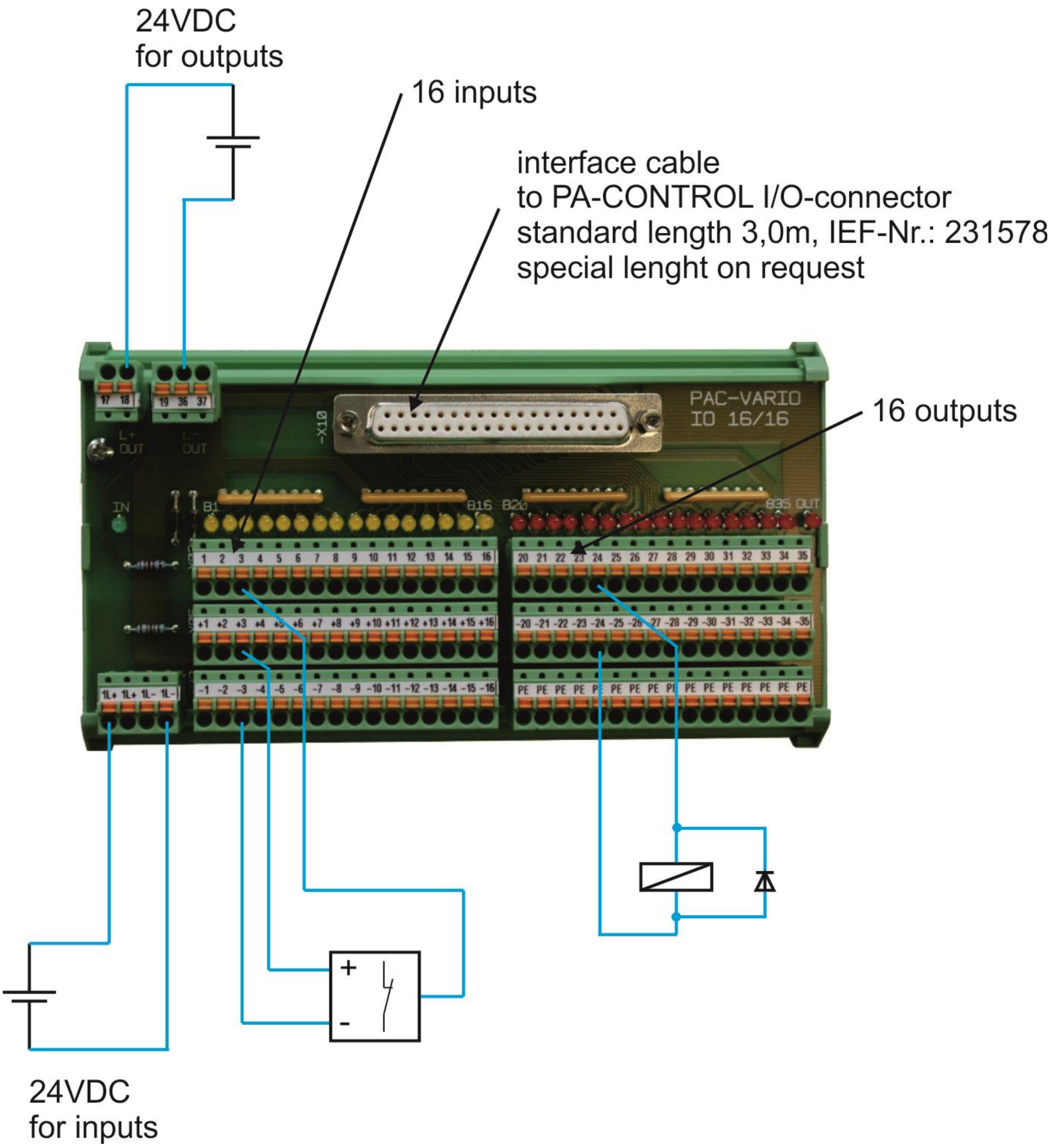


Figure 139: I/O Card, Connection Example

7.5 Pulse Generation of PA-CONTROL

Pulse generation is used to trigger the stepping motor output stages.

7.5.1 Pulse Generation of the PA-CONTROL Single

7.5.1.1 PLS8 Card

This card is used for pulse generation in the PA-CONTROL Single. The PLS8 is not visible from outside as a result of the space-saving installation.

NOTE The limit switches necessary for axis monitoring are located on the I/O card in the PA-CONTROL Single (Input 15 +16).

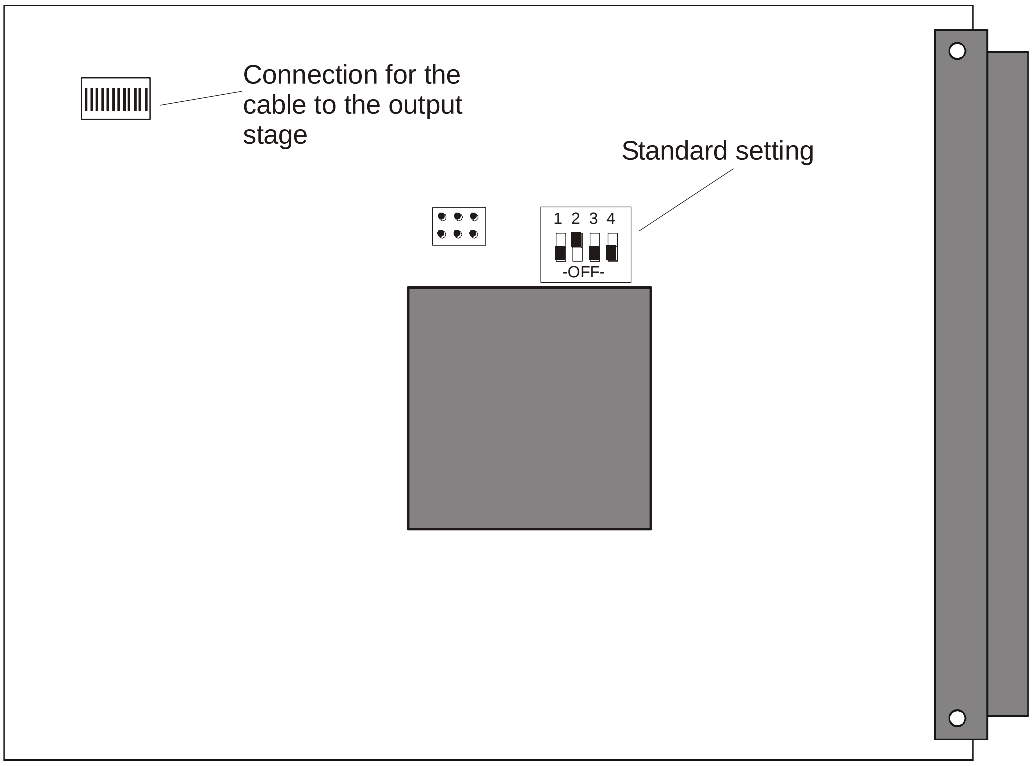


Bild309E

Figure 140: PLS8 Card

7.5.2 Pulse Generation of the PA-CONTROL Compact

7.5.2.1 PLS6 Card

The PLS6 generates the pulse and direction signals for 2 stepping motor output stages. This card is only installed in the PA CONTROL Compact.

The pulse, direction and stand-by signals, which can be picked up via the connector on the board and also via the 25 pin socket connector, are assigned internally in this application and may not be externally connected on any account!

NOTE Note the address setting when exchanging the card.

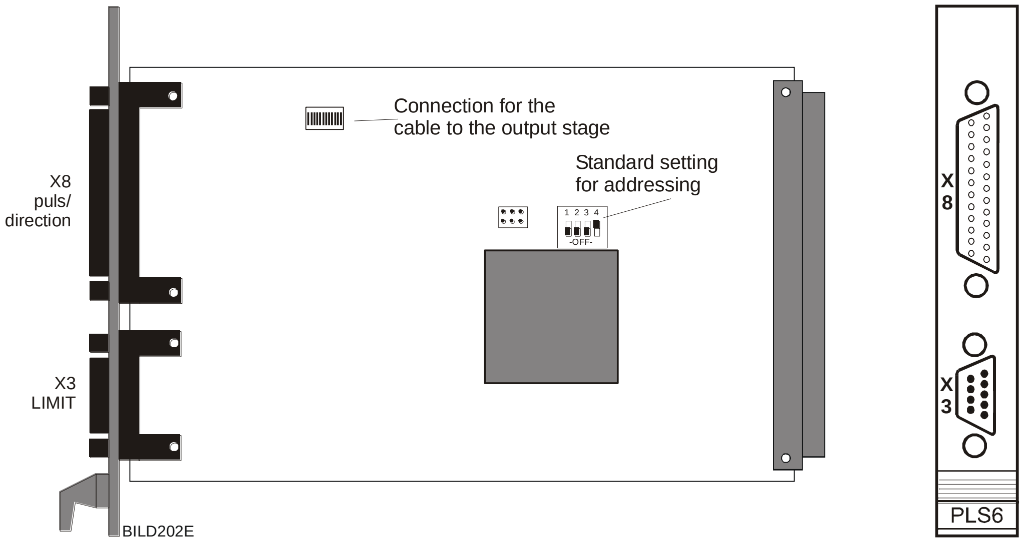
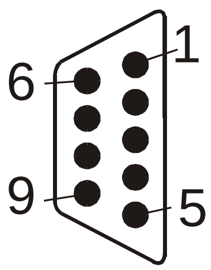


Figure 141: Connection and Addressing of the PLS6 Card



1	Limit switch A1 +	I 717
2	Limit switch A1 -	I 718
3	Limit switch A2 +	I 719
4	Limit switch A2 -	I 720
5		
6		
7		
8		
9	GND	

Figure 142: Connector Assignment of the limit switch PLS 6, Sub-D, 9 poles; male

7.5.3 Pulse Generation of the PA-CONTROL Steuer

7.5.3.1 PLS7/9 Card

The PLS7/9 generates the pulse and direction signals for up to 4 stepping motor output stages. These signals are available at the connector, signal 1-4, at the RS422 level. The common stand-by signal of the triggered output stages is also connected to this connector. The limit switches of the triggered axes can also be connected to the connector Limit 1-4 (two per axis).

Up to 4 PLS7/9 cards can be installed in a PA-CONTROL Steuer. The corresponding address settings are shown below. The addressing must be continuous, starting with axis 1-4.

Jumper Setting:	Axes called:
A1 – A4	Axis 1 to axis 4
A5 – A8	Axis 5 to axis 8
A9 – A12	Axis 9 to axis 12
A13 - A16	Axis 13 to axis 16

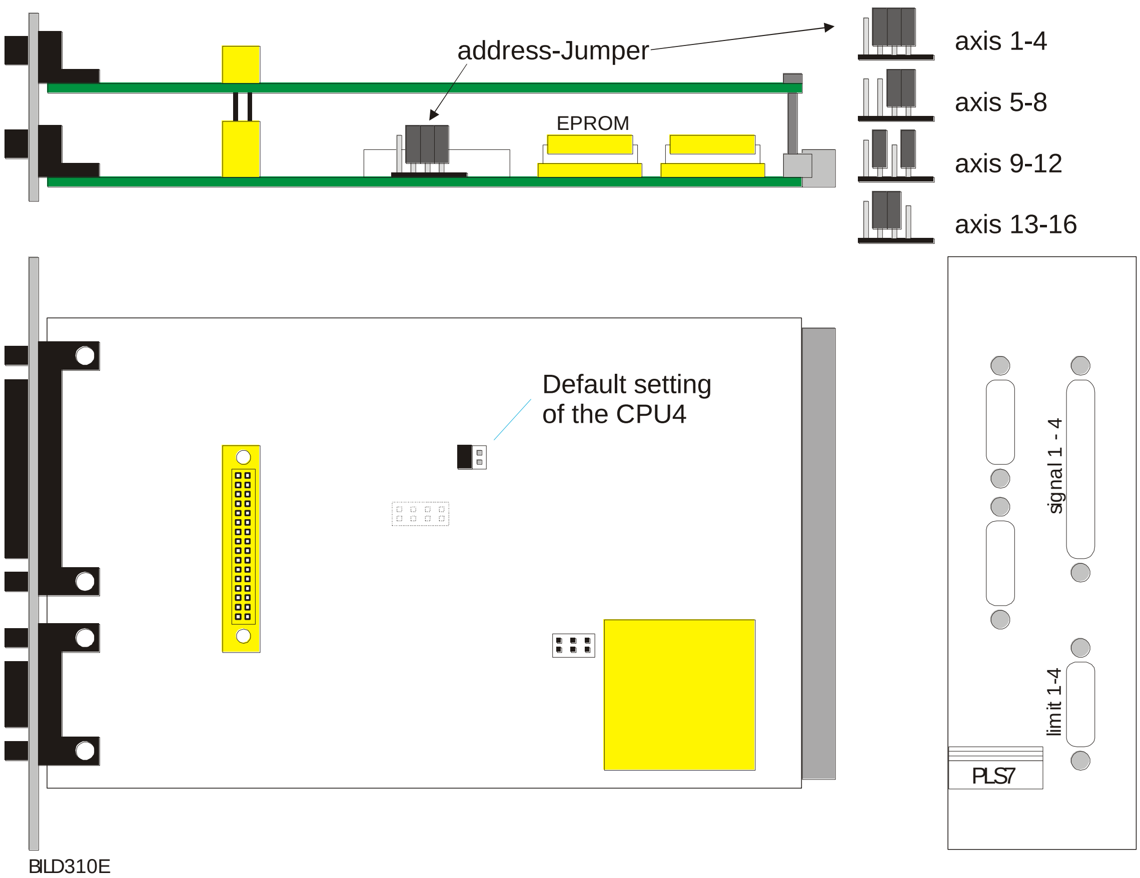


Figure 143: PLS7/9 Card, Addressing

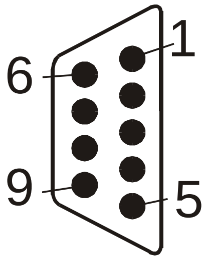
Limit 1 - 4			PLS card Axis 1-4	PLS card Axis 5-8	PLS card Axis 9-12	PLS card Axis 12-16
	1	Limit switch A1 +	I649	I665	I681	I697
	2	Limit switch A1 -	I650	I666	I682	I698
	3	Limit switch A2 +	I651	I667	I683	I699
	4	Limit switch A2 -	I652	I668	I684	I700
	5	Limit switch A3 +	I653	I669	I685	I701
	6	Limit switch A3 -	I654	I670	I686	I702
	7	Limit switch A4 +	I655	I671	I687	I703
	8	Limit switch A4 -	I656	I672	I688	I704
	9	GND				

Figure 144: Limit Switches of PLS7 / PLS9, Limit X3, Sub-D, 9 poles; pins

NOTE The limit switches of the connected axes can be scanned internally as inputs. Please use the above table.

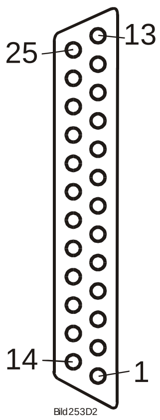
Signal 1 - 4	PIN	PLS7	PLS9	PIN	PLS7 / PLS9
	1	+ Pulse 1	+ Pulse 1	14	- Pulse 1
	2	+ Direction 1	+ Direction 1	15	- Direction 1
	3	+ Pulse 2	+ Pulse 2	16	- Pulse 2
	4	+ Direction 2	+ Direction 2	17	- Direction 2
	5	+ Pulse 3	+ Pulse 3	18	- Pulse 3
	6	+ Direction 3	+ Direction 3	19	- Direction 3
	7	+ Pulse 4	+ Pulse 4	20	- Pulse 4
	8	+ Direction 4	+ Direction 4	21	- Direction 4
	9	not assigned	+ RESET (LV-servoTEC)	22	not assigned
	10	not assigned	- RESET (LV-servoTEC)	23	not assigned
	11	not assigned	+Enabling (LV-servoTEC)	24	+ Stand-by
	12	not assigned	- Enabling (LV-servoTEC)	25	- Stand-by
	13	not assigned	not assigned		

Figure 145: Signal of PLS7 / PLS9 # Signal X8 Sub-D, 25 poles; socket

	PLS card Axis 1-4	PLS card Axis 5-8	PLS card Axis 9-12	PLS card Axis 12-16
Stand-by signal	I645	I661	I677	I693

NOTE The stand-by signal of the connected power amplifiers can be scanned internally as inputs. Please use the above table.

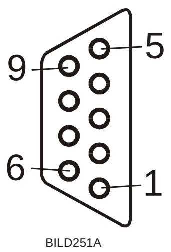
X13			PLS card Axis 1-4	PLS card Axis 5-8	PLS card Axis 9-12	PLS card Axis 12-16
	1	+ 24V		I		
	2	IP1	I641	I657	I673	I689
	3	OP2	O642	O658	O674	O690
	4					
	5					
	6	GND				
	7	OP1	O641	O657	O673	O689
	8					
	9					

Figure 146: Connector Assignment PLS7 / PLS9 # X13

NOTE Additional inputs and outputs are available on the PLS7 / PLS9 card via the plug-in connections X13 and X14.
Possibilities for expansion which can be programmed in the usual manner are available as a result. The inputs and outputs comply with the IEF specification for signals.

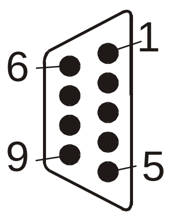
X14			PLS card Axis 1-4	PLS card Axis 5-8	PLS card Axis 9-12	PLS card Axis 12-16
	1	+ 24V		I		
	2	IP2	I642	I658	I674	I690
	3	IP4	I644	I660	I676	I692
	4					
	5					
	6	GND				
	7	IP3	I643	I659	I675	I691
	8					
	9					

Figure 147: Connector Assignment PLS7 / PLS9 # X14

7.6 PA-CONTROL 5V Supply

7.6.1 PA-CONTROL Single

In this device, the 5V current for the internal supply is generated in the power supply module.

7.6.2 PA-CONTROL Compact

In this device, the 5V current for the internal supply is generated in the NT4 subassembly. The green LED indicates that 5V is available.

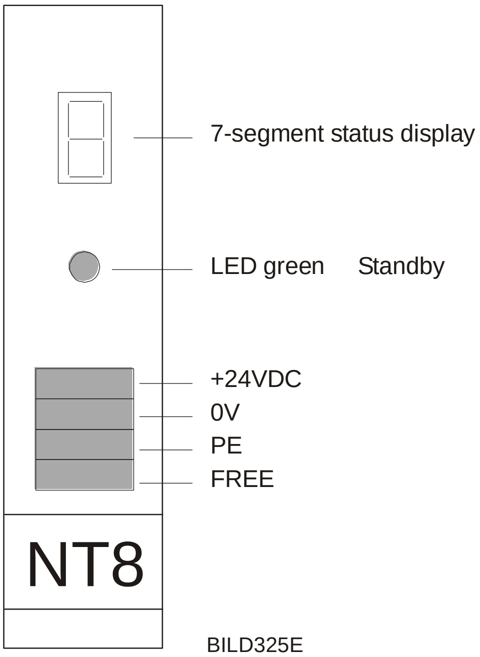


Figure 148: NT8

Status and error messages are shown on the 7-segment status display. See section *7.1.1: Status and Operational Status Messages, page 233*.

7.6.3 PA-CONTROL Steuer

In this device, the 5V current for the internal supply is generated in the NT8 subassembly. The green LED indicates that 5V is available.

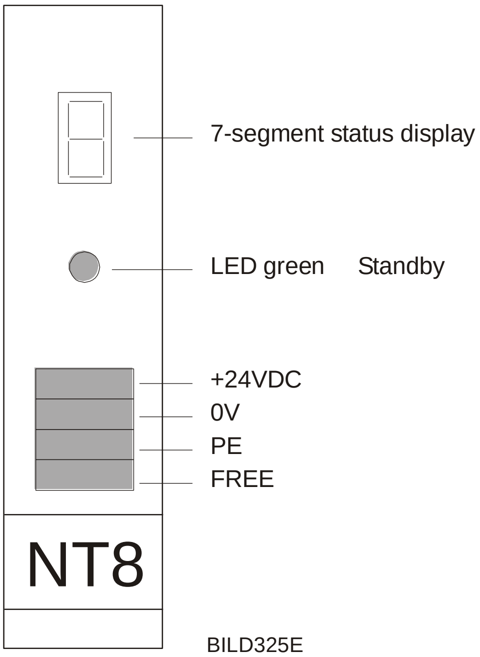


Figure 149: NT8

Status and error messages are shown on the 7-segment status display. See section *7.1.1: Status and Operational Status Messages, page 233.*

7.7 Stepping Motor Output Stages

Depending on the requirements, different stepping motor systems can be driven by means of PA-CONTROL.

Output stages for 2, 3 or 5 phase stepping motors can be used.

7.7.1 2 Phase Power Output Stage LE4-40E

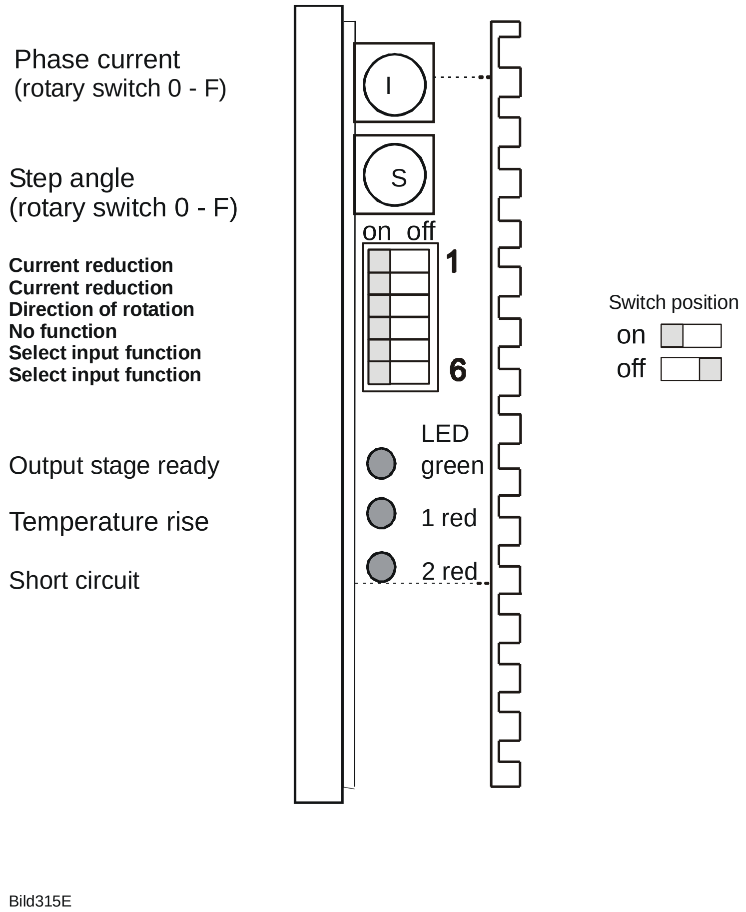


Figure 150: View of the 2 Phase Power Output Stage LE4-40

Dimensions: 100 x 160 (Euro-card format)

NOTE The settings of the switches are only applied once after application of the operating voltage!

Step angle (Rotary switch "S")

Step angle	200	400	500	800	1000	1600	-	-	-	-
Switch position	0	1	2	3	4	5	6	7	8	9

Phase current (Rotary switch "I")

Phase current (A)	0	0	0.9	1.1	1.3	1.6	1.8	2.0
Switch position	0	1	2	3	4	5	6	7

Phase current (A)	2.25	2.5	2.75	3.0	3.25	3.5	3.75	4.0
Switch position	8	9	A	B	C	D	E	F

Current reduction

S1	S2	Current Reduction (active at a Pulse Frequency < 10Hz)
Off	Off	no current reduction ($I = I_N$)
On	Off	Current reduction 75% ($I = I_N \times 0.75$)
Off	On	Current reduction 50% ($I = I_N \times 0.5$)
On	On	Current reduction 25% ($I = I_N \times 0.25$)

Direction of rotation (S3, S4)

S3	On	Direction of rotation in a clockwise direction, when "Direction" input is cold
	Off	Direction of rotation in an anticlockwise direction, when "Direction" input is cold
S4		no function

Select input function (S5, S6)

S5	On	Reset when selection input is hot (reset output stage)
	Off	Function switched off (motor disconnected)
S6	On	De-energize when selection input is hot
	Off	Function switched off

The functions of the selection input are not served by PA-CONTROL!

Basic settings, Settings of the output stage on delivery:

Step angle	Rotary switch S	Switch position 3 (800)
Phase current	Rotary switch I	Switch position 0 (0A)
Current reduction	S1 and S2	OFF
Direction of rotation	S3 and S4	OFF
Select input function	S5 and S6	OFF
Input signal level	Soldering bridge 1, 2, 3	closed (5V)

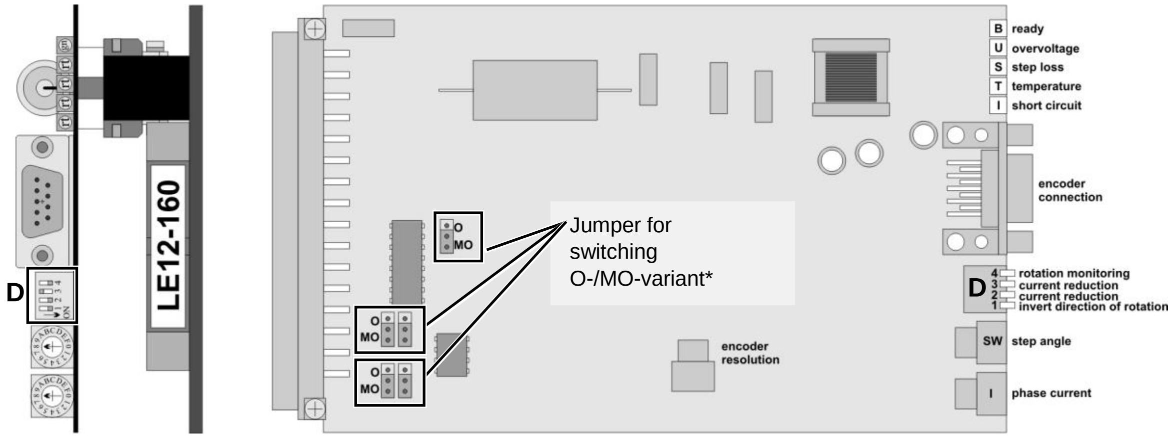
Diagnosis

The three LEDs on the board of the power output stage indicate the current operating status of the LE4-40E.

LED green	LED 1 red	LED 2 red	Operating Status
On	off	off	Output stage ready
Off	off	on	Short circuit
Off	on	on	Temperature rise

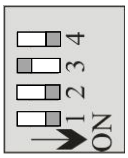
7.7.2 2 phases Power Output Stage LE12-160

(compatible with LE12-140-MO and LE12-140-O)



*) = Factory settings for O-/MO-variant: MO = with opto-coupler

Figure 151: View of the stage from top and right

D						
 **)	4	Rotation monitoring	ON = active	OFF = inactive		
		I_{nom} x	100% (none)	75%	50%	25%
	3	Current reduction	OFF	OFF	ON	ON
	2	Current reduction	OFF	ON	OFF	ON
	1	Invert direction of rotation	ON = active	OFF = inactive		

**) = Factory settings

Step angle settings

Step angle	200	400	800**	1600					500	1000
Switch position	0	1	2	3	4	5	6	7	8	9

Phase current settings

Phase current (A)	1,0**	1,7	2,5	3,2	4,0	4,6	5,4	6,1
Switch position	0	1	2	3	4	5	6	7

Phase current (A)	6,8	7,5	8,3	9,0	9,7	10,4	11,3	12,0
Switch position	8	9	A	B	C	D	E	F

Encoder settings (encoder resolution of the motor)

Must be set when rotation monitoring is active and motor with encoder is used

Phase current (A)	50**	100	200	500	1000	
Switch position	0	1	2	3	4	5 - F

7.7.3 2 Phase Power Output Stages LE12-140-MO

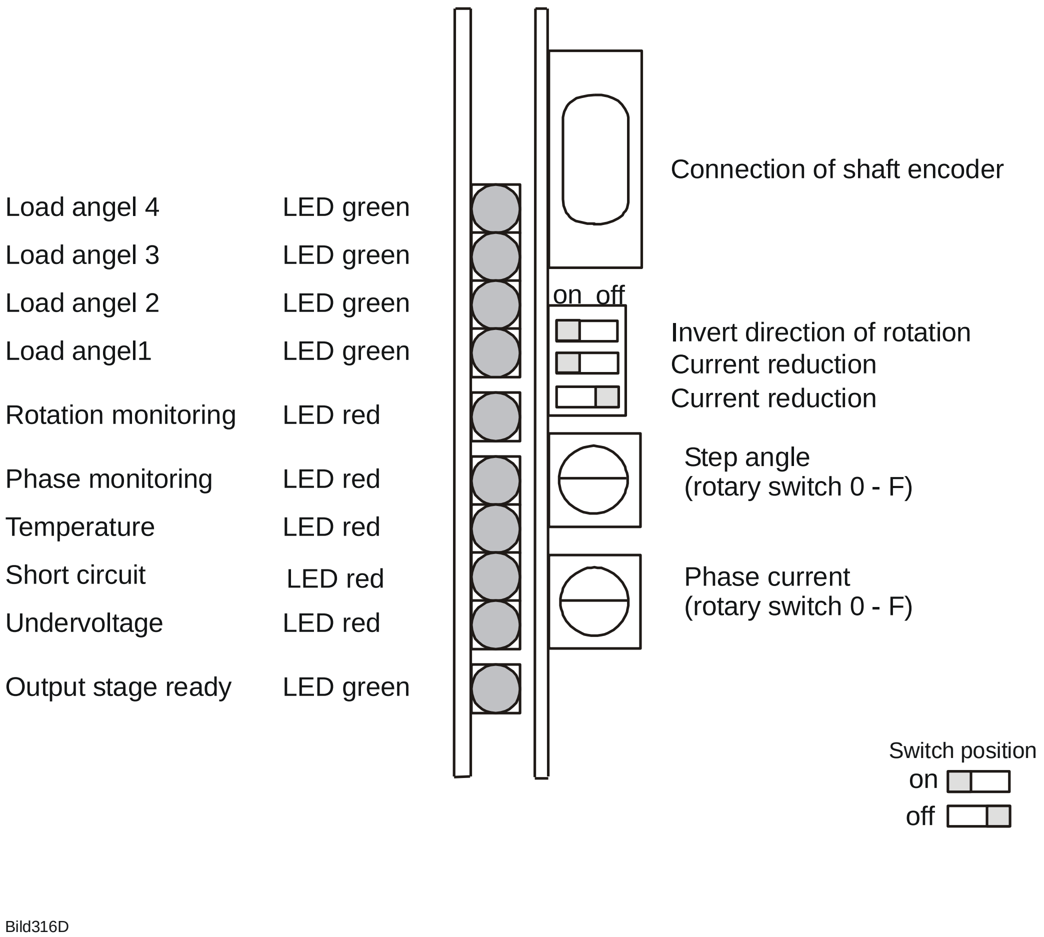


Figure 152: Front View of the Output Stage

Setting of the step angle

Step Angle	200	400	800	1600					500	1000
Switch position	0	1	2	3	4	5	6	7	8	9

Setting of the phase current

Phase Current (A)	1.0	1.7	2.5	3.2	4.0	4.6	5.4	6.1
Switch position	0	1	2	3	4	5	6	7

Phase Current (A)	6.8	7.5	8.3	9.0	9.7	10.4	11.3	12.0
Switch position	8	9	A	B	C	D	E	F

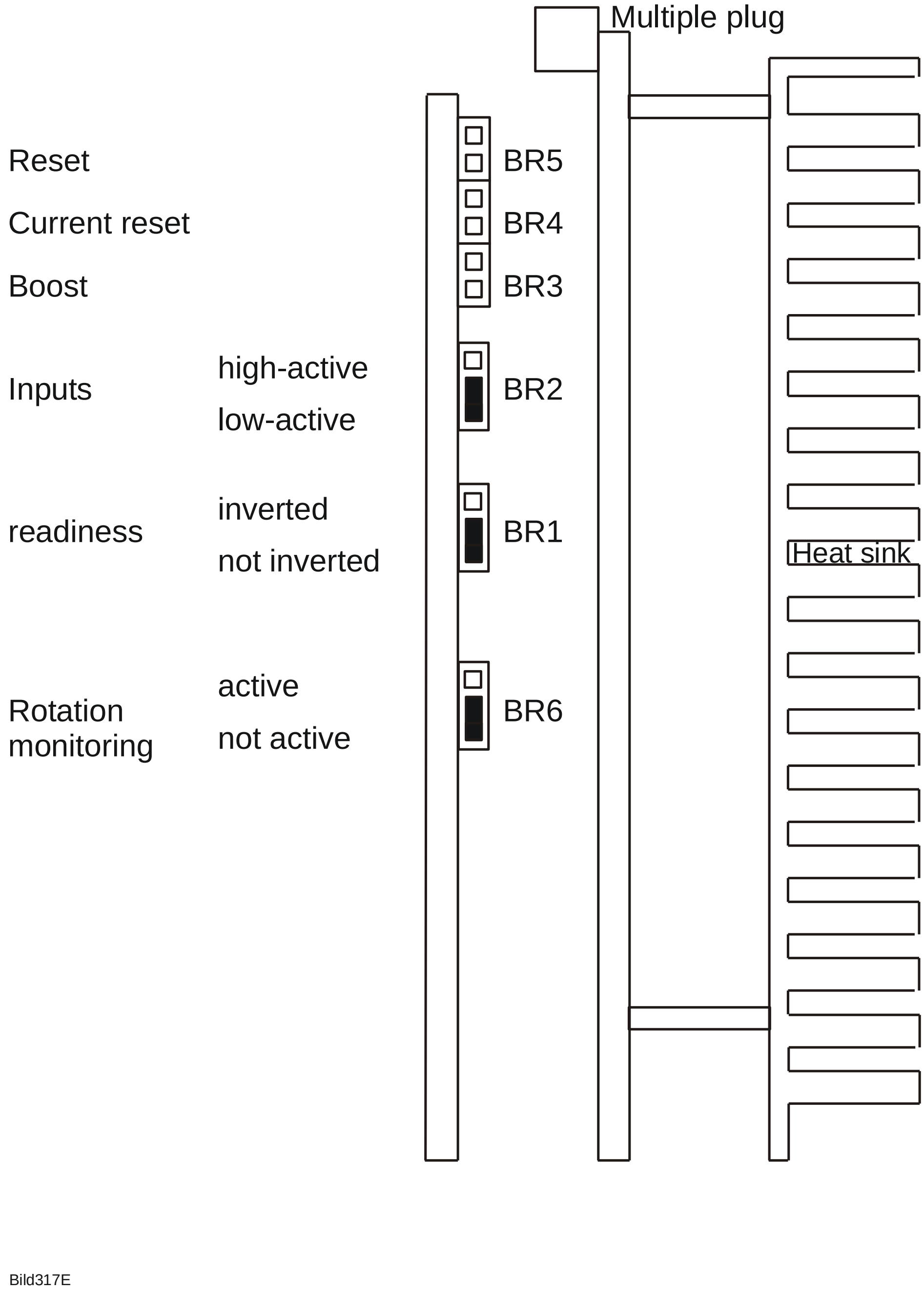


Figure 153: Setting of the LE12-140

BR3, BR4 and BR5 can be triggered via the “Selection“ input as an alternative.

7.7.3.1 Rotation Monitoring

Rotation monitoring can be activated via bridge BR6. For active rotation monitoring, a rotary encoder with 50 increments per motor revolution must be connected to the plug connector "Connection of rotary encoder".

A power supply of 5V with a current of up to 150mA is available for the rotary encoder. The rotary encoder output signal channels A and B are square-wave signals out of phase by 90°. They must be executed as 5V push-pull signals (RS422 agreement).

The following is to be considered for use of the rotation monitoring:

- The motor wiring and encoder connection must be connected in accordance with the documentation at hand. Any changes in the direction of rotation may only be made by means of the switch-over facility on the output stage and not by rewiring a motor winding.
- The rotation monitoring remains in a special monitoring mode for approx. 1.5 sec. during the switch-on phase. During this time, only the encoder pulses are processed, no control pulses can be applied to the output stage. In the case of vertical drives, this allows a smoothing phase for the drive in connection with a holding brake. Inadmissible "fall through" of the drive (max. one motor revolution) is monitored by the rotation monitoring and if an error occurs, stand-by is switched off again.

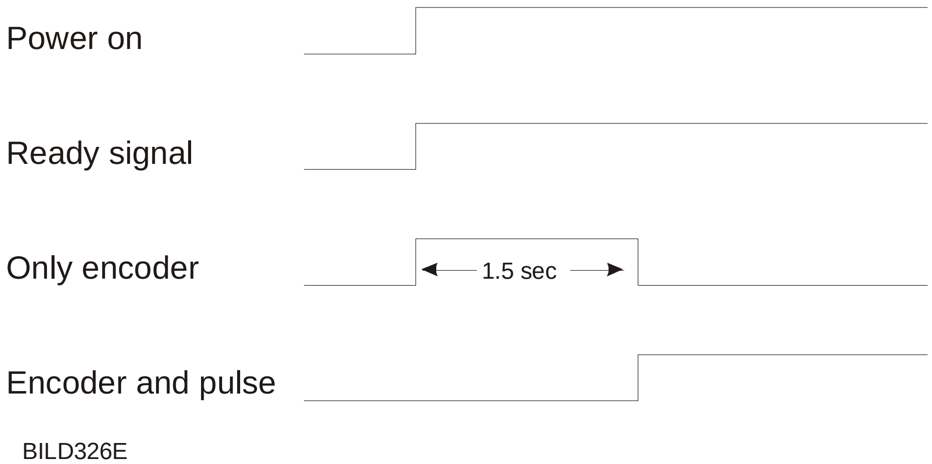
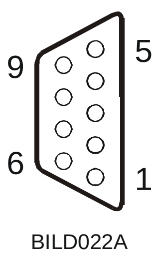


Figure 154: Switch-on of the LE12-140, normal Progression



1	A	6	$\overline{A}$
2	+5V / 100mA	7	+5V / 100mA
3	GND	8	GND
4	GND	9	B
5	$\overline{B}$		

Figure 155: Connection of Rotary Encoder, Connector Assignment; Sub-D, 9 poles; socket

7.7.3.2 Display of Load Angle

The dynamic status of the actuation can be assessed by means of the LEDs "Load angle 1-4". If the demands on the drive system are low, only the LEDs "Load angle 1" and "Load angle 2" are lit when the motor is running. When the LEDs "load angle 1-3" are lit simultaneously, the drive has reached its upper limit.

7.7.3.3 Display of Rotation Monitoring

The red LED "Rotation monitoring" provides the following information:

- If the LED "Rotation monitoring" is continuously lit together with the LEDs "Load angle 2 and 4", the rotation monitoring module indicates that the maximum permissible load angle has been exceeded.
- If only the red LED "Rotation monitoring" is continuously lit, the final output is in the reset state.
- If the red LED "Rotation monitoring" is flashing together with the green LEDs "Load angle 1-4" in a sequence, the rotation monitoring is not active

Display of phase monitoring, temperature, short circuit, undervoltage:

These LEDs indicate malfunctions and errors. Diagnosis with a non-functioning power output stage is considerably simplified.

7.7.3.4 Programming Switch

The direction of rotation can be inverted and the value for current reduction can be set by means of the programming switch.

The following possibilities for current reduction exist (in this example, the direction of rotation is set to inversion):

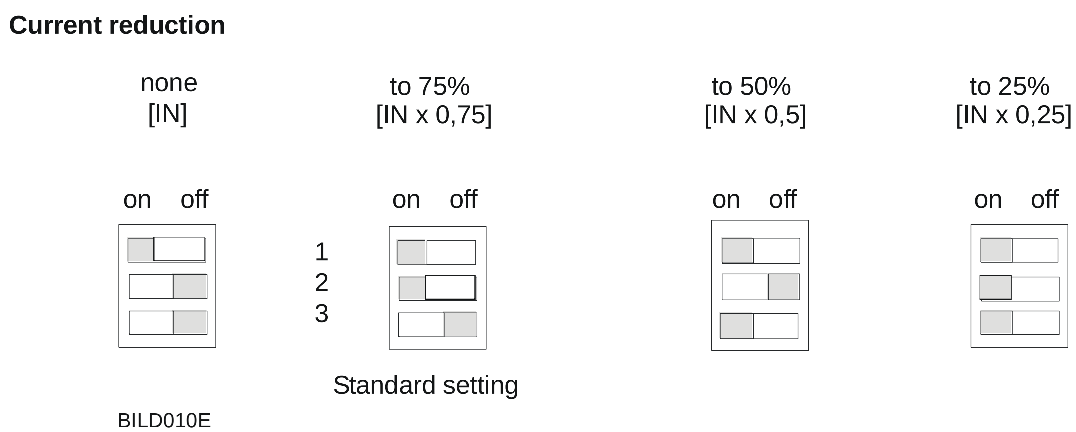


Figure 156: Programming Switch, Setting Possibilities

NOTE Any changes in the direction of rotation must be made through the switch-over facility on the output stage and not by rewiring a motor winding.

7.7.3.5 Connection of LE12-140

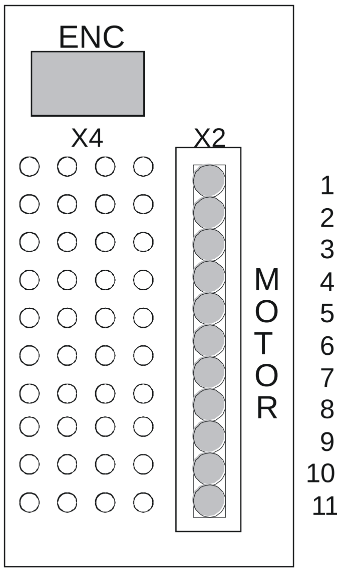


BILD074A

Figure 157: Connection of a 2 Phase Stepping Motor

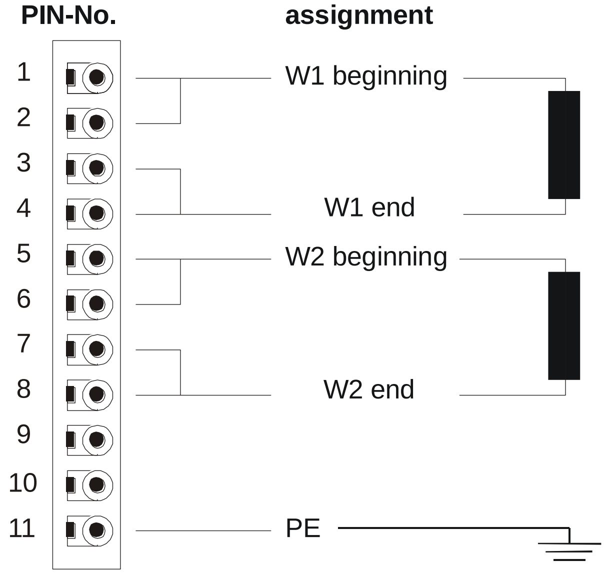


BILD301E

Figure 158: Connection Diagram

NOTE

Both plug pins must be assigned for the beginning and end of the winding in the motor connector (bridge).

The connector housing must be fixed to the device with both screws.

Motor connectors may only be connected and removed in a no-voltage condition!

7.7.4 3 Phase Power Output Stage D900

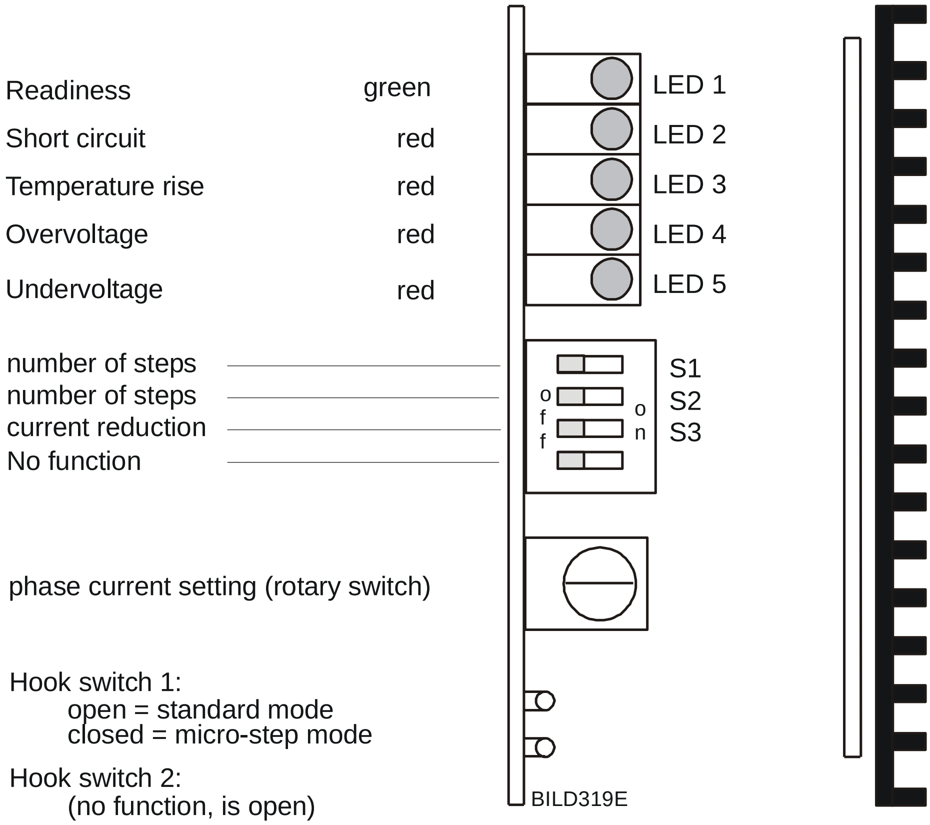
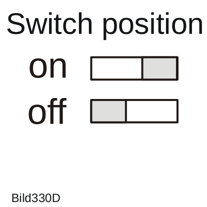


Figure 159: Front view of Power Output Stage D900

Basic settings: 3 phase power output stage D900

S1	OFF	Number of steps
S2	OFF	Number of steps
S3	OFF	Current reduction
S4	OFF	No function



Setting of the number of steps:

Number of steps (S6 open)	**200**	**400**	**500**	**1000**
Number of microsteps (S6 closed)	**2000**	**4000**	**5000**	**10000**
DIP switch S1	ON	ON	OFF	OFF
DIP switch S2	OFF	ON	ON	OFF

Phase current setting:

Phase current (A)	**1.35**	**1.65**	**1.90**	**2.20**	**2.45**	**2.75**	**3.00**	**3.30**
Switch position (S5)	0	1	2	3	4	5	6	7

Phase current (A)	**3.60**	**3.90**	**4.15**	**4.40**	**4.70**	**5.00**	**5.20**	**5.50**
Switch position (S5)	8	9	A	B	C	D	E	F

7.7.4.1 Connection of 3 Phase Stepping Motor

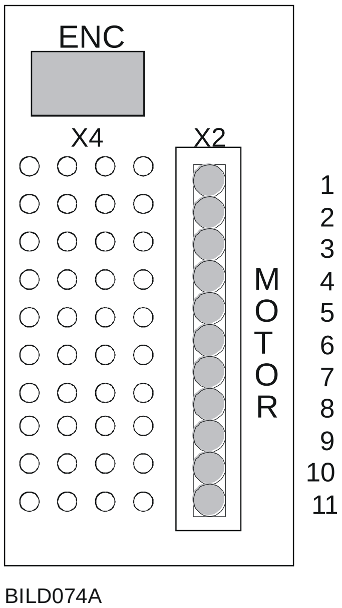


Figure 160; Connection of 3 Phase Stepping Motor

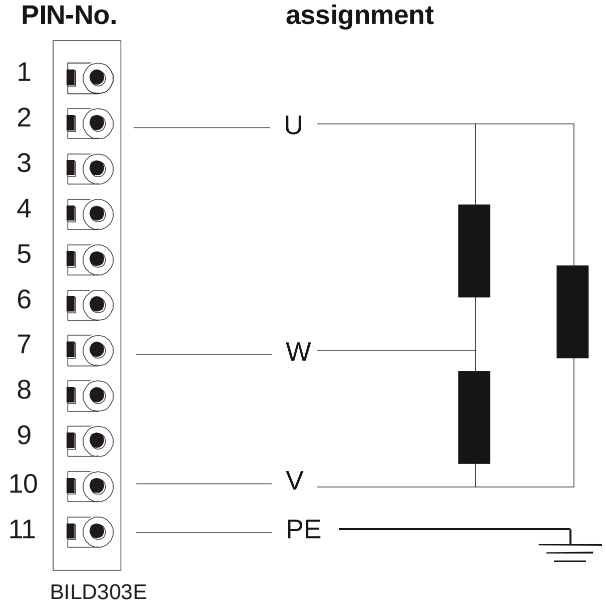


Figure 161: Connection Diagram

NOTE The connector housing must be fixed to the device with both screws.
The motor connector may only be connected and removed in a no-voltage condition!

7.7.5 5 Phase Power Output Stage D550.04

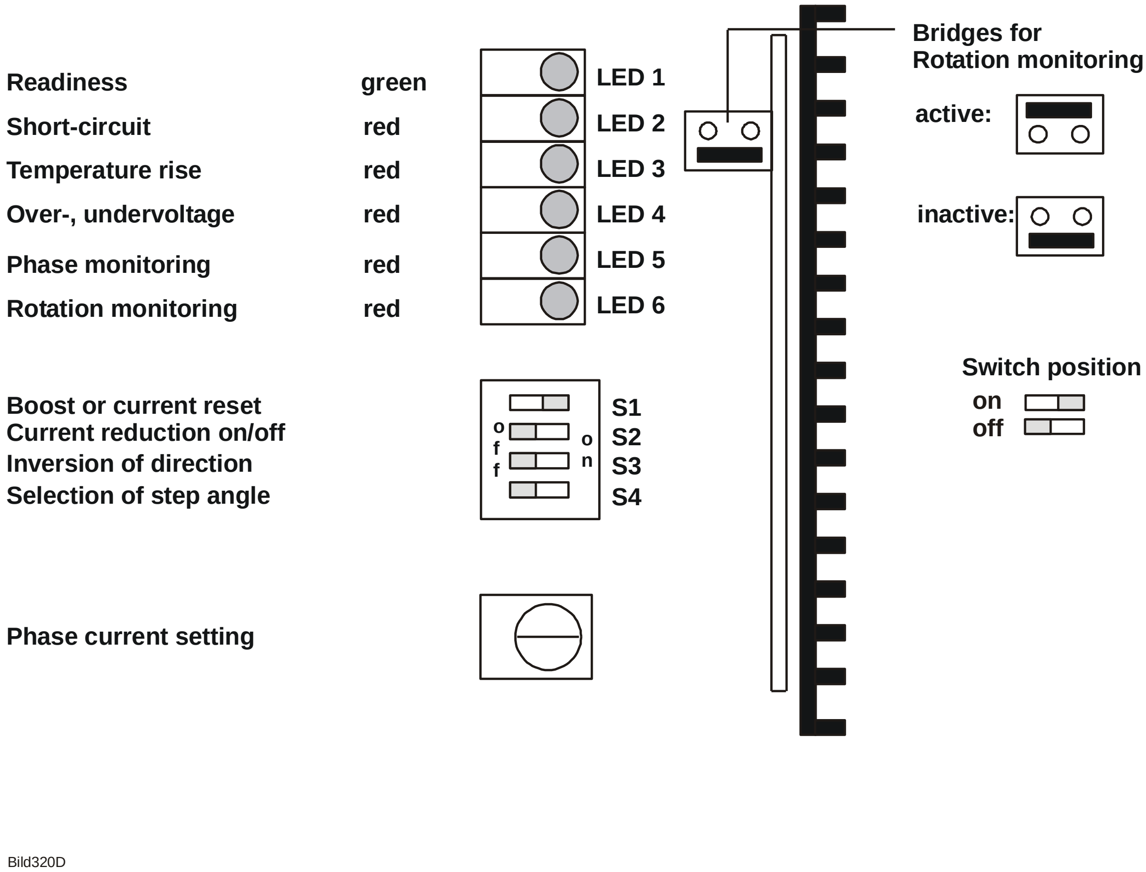


Figure 162: Front view of Power Output Stage D550.4,

Basic settings:

S1	ON	Current reset
S2	OFF	Current reduction at standstill to approx. 70%
S3	OFF	Direction of rotation clockwise
S4	OFF	Step angle of half step

Phase current setting:

Phase current (A)	0.55	0.70	0.85	1.00	1.15	1.30	1.45	1.60
Switch position	0	1	2	3	4	5	6	7

Phase current (A)	1.75	1.90	2.05	2.20	2.35	2.50	2.65	2.80
Switch position	8	9	A	B	C	D	E	F

7.7.5.1 Connection of 5 Phase Stepping Motor

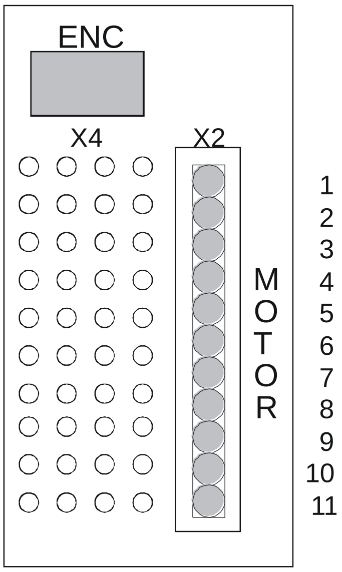


BILD074A

Figure 163: Connection of 5 Phase Stepping Motor

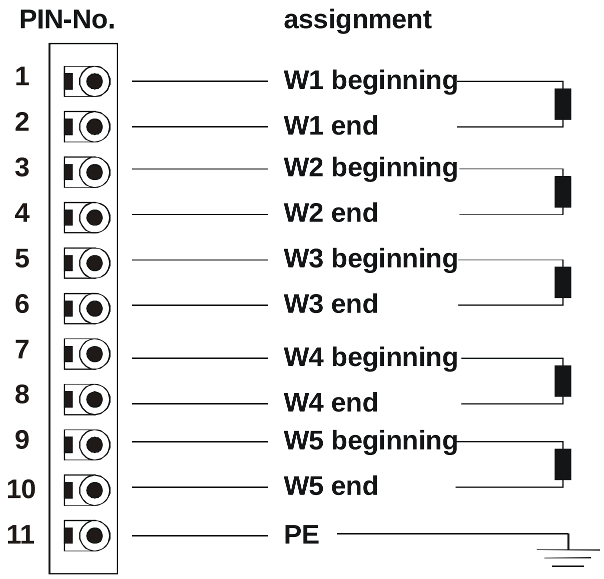


BILD302E

Figure 164: Connection Diagram

NOTE The connector housing must be fixed to the device with both screws.
The motor connector may only be connected and removed in a no-voltage condition!

7.7.6 5 Phase Power Output Stage M550.04

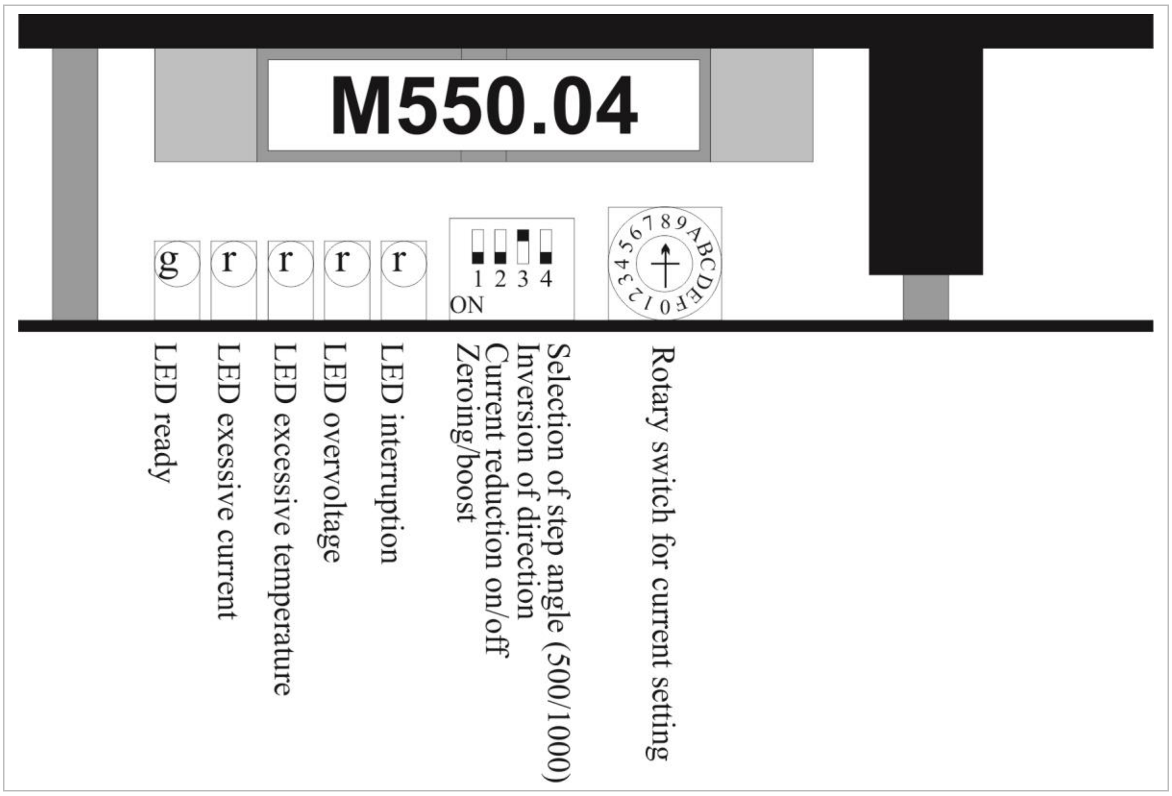


Figure 165: Front view of Power Output Stage D550.4

Basic settings:

S1	ON	Current zeroing (input will not be operated) no function
S2	ON	Current reduction active, during standstill at approx. 60%
S3	OFF	Direction of rotation clockwise
S4	ON	Step angle half step (1000S/U)

Phase current setting:

Phase current (A)	0,8	1,0	1,15	1,3	1,45	1,55	1,7	1,85
Switch position	0	1	2	3	4	5	6	7

Phase current (A)	2,0	2,1	2,25	2,35	2,45	2,6	2,7	2,80
Switch position	8	9	A	B	C	D	E	F

7.7.6.1 Connection of 5-Phase Stepping Motor

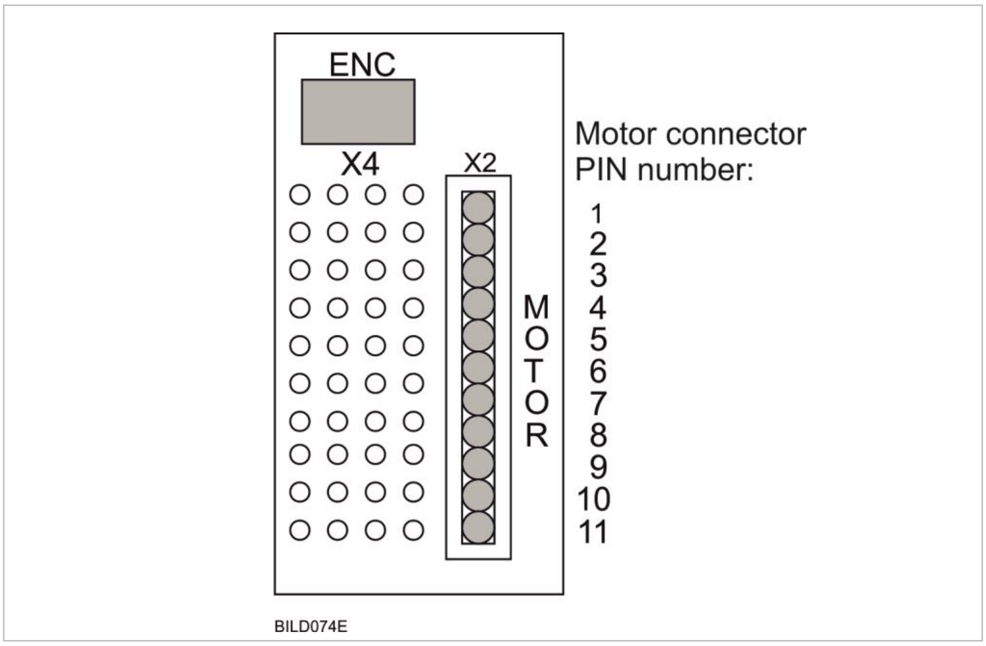


Figure 166: Connection of 5-Phase Stepping Motor

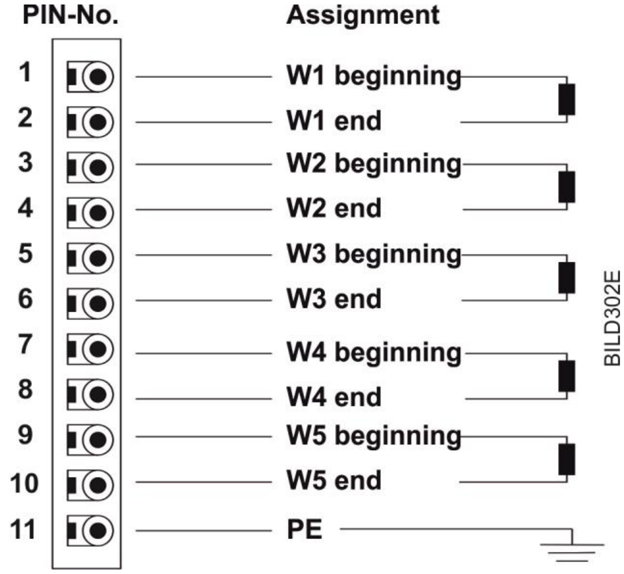


Figure 167: Connection diagram 5-Phases stepping motor

Note The connector housing must be fixed to the device with the both screws. The motor connector must only be connected and removed in a no-voltage condition!

7.8 Switch-over from 115VAC / 230 VAC

7.8.1 Switch-over of PA-CONTROL Single

The PA-CONTROL Single is set at 230VAC supply voltage on delivery. The switch-over to 115VAC is effected inside the device at terminal block MK3/6.

Procedure:

- Switch off the device and remove the power plug
- Wait for the electrolytic capacitors to discharge
- Remove the cover plate
- Change the wiring in accordance with the configuration of the terminal block (see below)
- Close the device

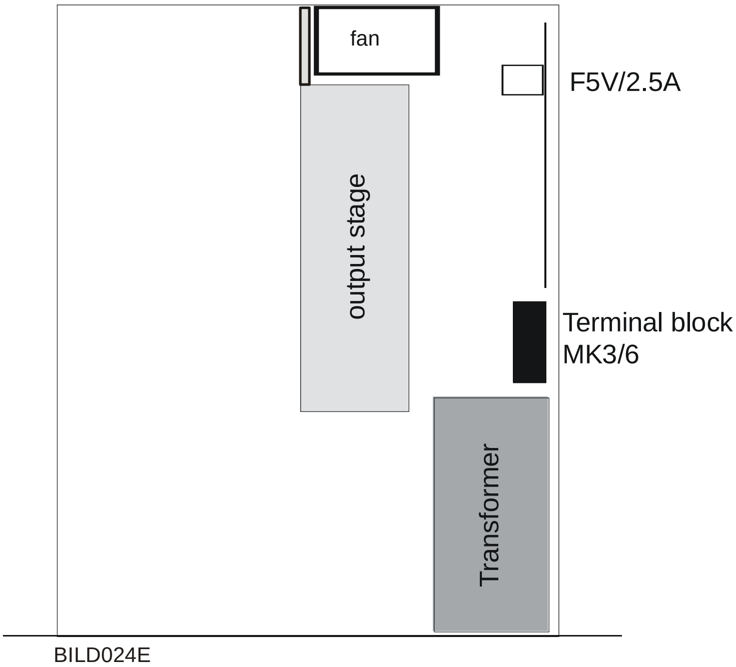
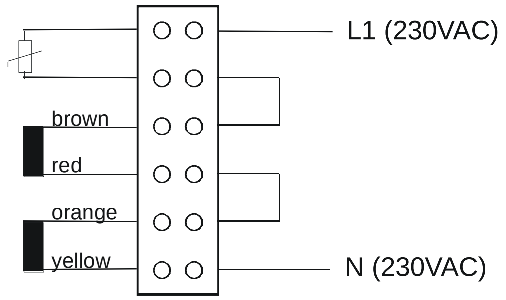


Figure 168: PA-CONTROL Single, Top View of the Device

230VAC



115VAC

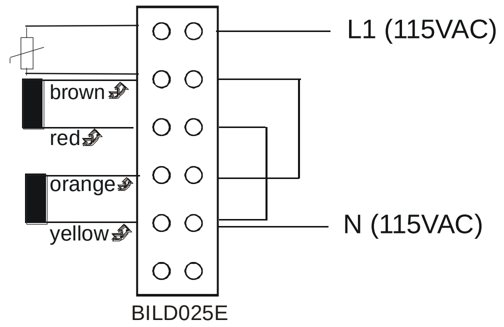


Figure 169: Configuration of the Terminal Block MK3/6

NOTE Please mark clearly the devices with the new connection voltage!

Use the correct mains fuse for the set supply voltage in mains plug X1.1!

→ 230VAC : 2 pcs fuse T2.5A
→ 115VAC : 2 pcs fuse T6.3A

7.8.2 Switch-over of PA-CONTROL Compact

The PA-CONTROL Compact is set at 230VAC supply voltage on delivery. The switch-over to 115VAC is effected inside the device at terminal block MK3/6.

Procedure:

- Switch off the device and remove the power plug
- Wait for the electrolytic capacitors to discharge
- Remove the cover plate
- Change the wiring in accordance with the configuration of the terminal block (see below)
- Close the device

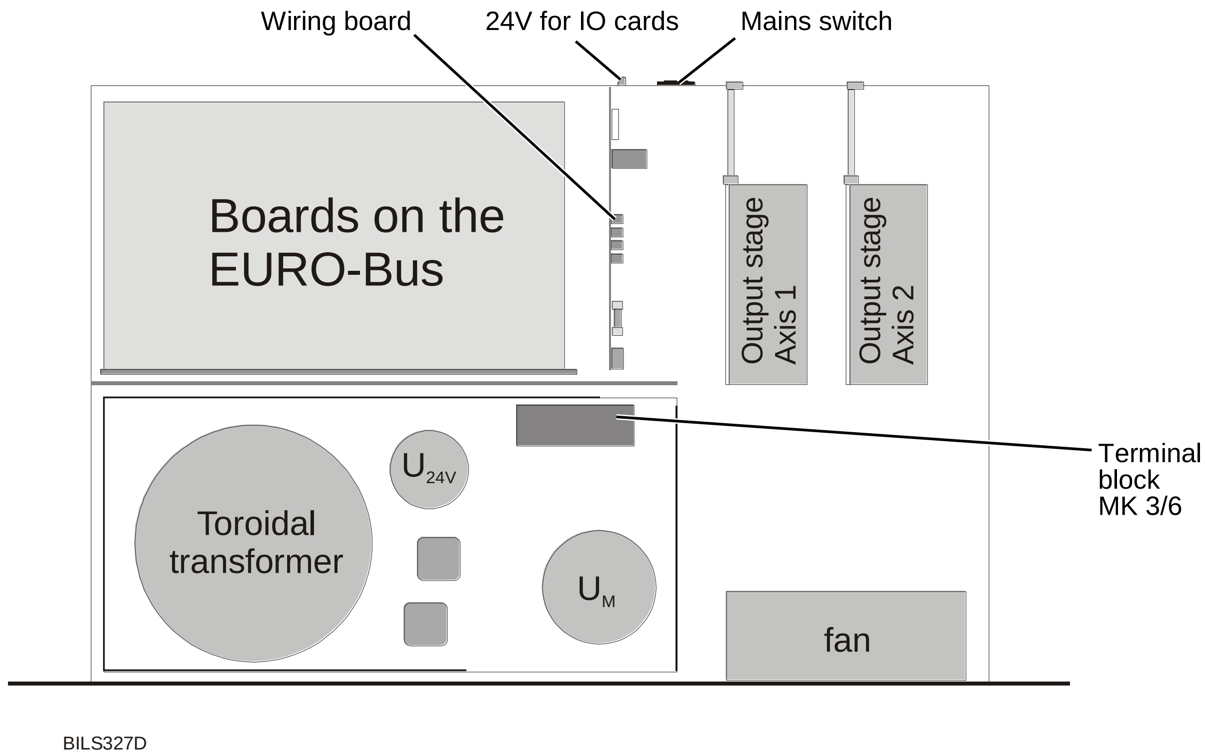


Figure 170: Top View of the Device

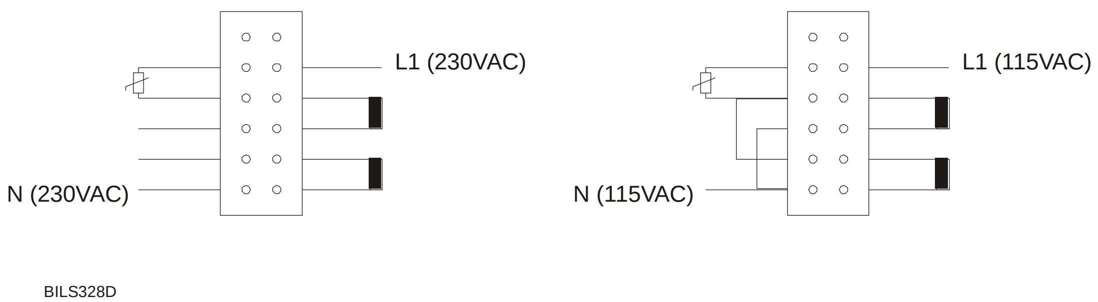


Figure 171: Configuration of the Terminal Block MK3/6

NOTE Please clearly mark the devices with the new connection voltage!

Use the correct mains fuse for the set supply voltage in mains plug X1.1!

→ 230VAC : 2 pcs fuse T6.3 A
→ 115VAC : 2 pcs fuse T10 A

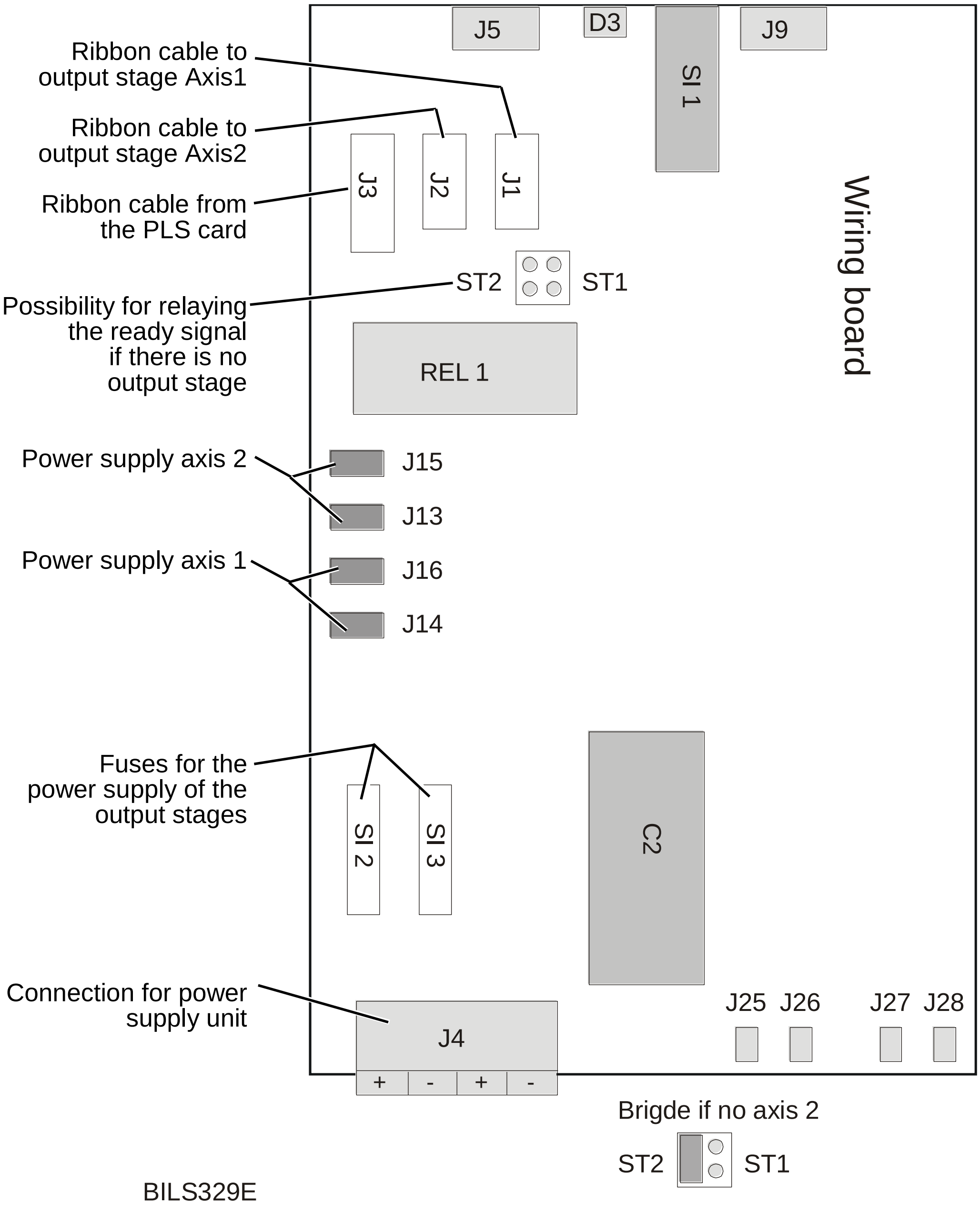


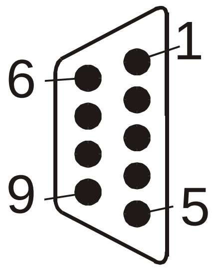
Figure 172: Wiring Board for PA-CONTROL Compact

7.9 Connector Assignments

7.9.1 Diagnosis Port

The diagnosis port is a serial asynchronous port of the type RS232. The port is permanently set to 19.2K baud, 1 stop bit, 8 data bits and 1 parity bit (odd). The diagnosis port is reserved for diagnostic purposes and cannot be used to communicate with other devices in the plant in the automatic mode (program).

Regardless of the operating mode of the device, it can be accessed via the diagnosis port at any time. Some actions cannot be executed via the diagnosis port, depending on the operating mode of the device.



1	DCD, Reception level
2	RXD, Receive Data
3	TXD, Transmit Data
4	DTR, Terminal ready
5	GND
6	N.C.
7	RTS, switch on transmitter
8	CTS, ready for transmission
9	RI, incoming call

Figure 173: Connector Assignment, Sub-D, 9 poles; pins

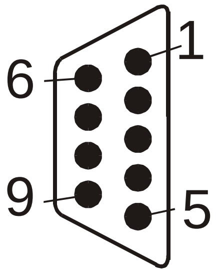
NOTE Assignment complies with asynchronous standard RS232!
A shielded line must be used to guarantee the trouble-free exchange of data.

Example: Connection cable between PA-CONTROL and PC:

PA-CONTROL			PC (9 poles)	
DCD	1	-	DTR	4
RXD	2	-	TXD	3
TXD	3	-	RXD	2
DTR	4	-	DCD	1
GND	5	-	GND	5
N.C.	6			6
RTS	7	-	CTS	8
CTS	8	-	RTS	7
RI	9	-	RI	9

7.9.2 COM 1, 2, 3 and 4

The connector assignments of COM1, 2, 3, and 4 are identical.

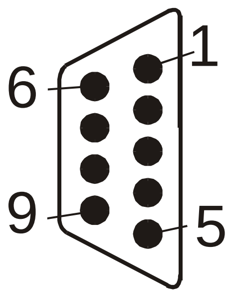


1	N.C.
2	RXD, Receive Data
3	TXD, Transmit Data
4	N.C.
5	GND
6	N.C.
7	RTS, switch on transmitter
8	CTS, ready for transmission
9	N.C.

Figure 174: RS232 Port, Connector Assignment, Sub-D, 9 poles; pins

7.9.3 CAN Bus

Communication with other devices is possible via the CAN bus. Please refer to the "CAN bus documentation" for further information.



1	N.C.
2	CAN_L
3	CAN_GND
4	N.C.
5	N.C.
6	(GND)
7	CAN_H
8	N.C.
9	(CAN_V+)

Figure 175: CANopen Bus, Connector Assignment, Sub-D, 9 poles; pins

NOTE DIN ISO 11898 must be complied with when the CAN bus is installed.

7.9.4 Rotation Monitoring

A power supply of 5V with a current of up to 100mA is available for the rotary encoder.
The rotary encoder output signal channels A and B are square-wave signals out of phase by 90°. They must be executed as 5V push-pull signals (RS422 agreement).

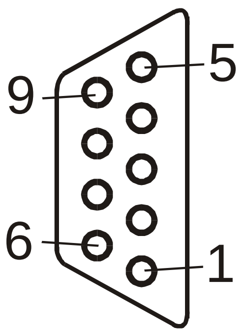


BILD251A

1	A
2	5VDC 100mA
3	NC
4	NC.
5	/B
6	/A
7	5VDC 100mA
8	GND
9	B

Figure 176: Connector Assignment, Sub-D, 9 poles; socket

7.9.5 Brake Connector

The PA-CONTROL Single and the PA-CONTROL Compact offer the possibility of operating motors with brakes. The PA-CONTROL Steuer offers this possibility with the LV-UNIT.

After the motor test has been successfully completed, the brake is opened, i.e. a contact internally connects PIN 2 to PIN3. If a malfunction occurs, the brake is taken off current.

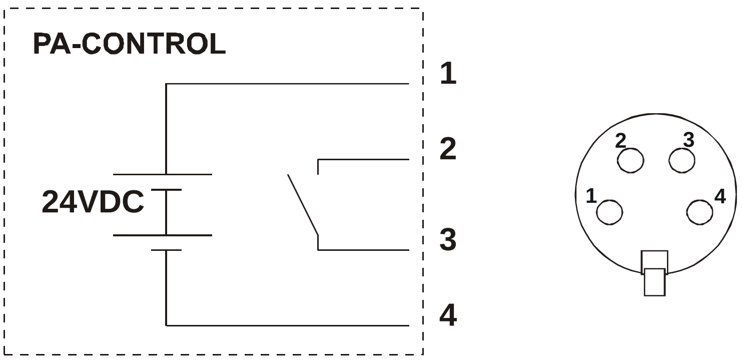
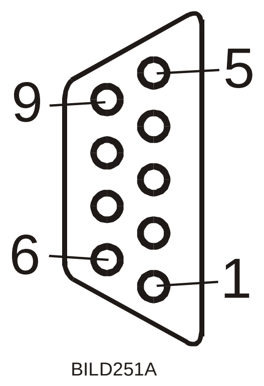


BILD260A

Figure 177: Connection of the Brake, Contact Assignment

7.9.6 Profibus DP Option

The PA-CONTROL can be integrated in a Profibus network by means of the Profibus option. Please refer to the "Profibus documentation" for further information.



1	N.C.
2	N.C.
3	B
4	RTS *****
5	GNDO *****
6	+5V *****
7	N.C.
8	A
9	N.C.

Figure 178: Connector Assignment, Sub-D, 9 poles; socket

***** These signals are required when the signal has to be amplified for a bus extension.

NOTE EN50170 and the general installation guidelines for Profibus DP must be complied with when the Profibus option is installed.

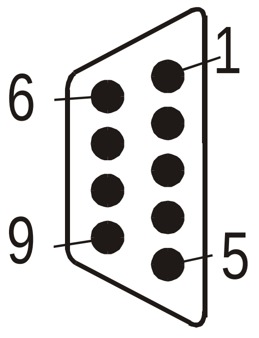
7.9.6.1 Diagnostic interface

The diagnostic interface is an asynchronous serial interface of the type RS232.

The interface is permanently set to 19.2K-Baud, 1Stop-Bit, 8 data-Bit and 1 Parity-Bit (odd). The diagnostic interface is reserved for diagnostic purposes and cannot be used to communicate with other system participants in automatic operation (program).

Via the diagnostic interface the device can be accessed at any times, regardless of its operation mode.

According to the operation mode of the device some activities can not be executed via the diagnostic interface.



1	DCD, receive level
2	RXD, received data
3	TXD, transmit data
4	DTR, terminal ready
5	GND
6	N.C.
7	RTS, switch on transmitter
8	CTS, ready for transmision
9	RI, incoming call

Figure 179: Connector assignment, Sub-D, 9 poles; pins

NOTE The assignment corresponds to the asynchronous RS232 standard!
To assure a trouble free data flow, a shielded wire has to be used.

7.9.6.2 Interface problems by using an USB serial adapter

If there are eventually error messages like “PA-CONTROL has no contact”, “wrong sequence begin” or similar when using the USB serial adapter, the following settings can be made in the system control:

- Switching off FIFO-buffer
- Reducing the latency period

7.10 Overview of Accessories and Spare Parts

7.10.1 List of Accessories and Spare Parts

7.10.1.1 Axis Wiring

PG-No. (Part Group Number): 1000063

No.:	Description	Standard length 3 m		Special length X m	
		Without Connector	With Connector	Without Connector	With Connector
1	Motor cable 2 ph. up to 8A				
	Motor cable 2 ph. up to 12A				
	Motor cable 3 ph.				
	Motor cable 5 ph.				
8	Limit switch cable				
3	Brake cable				
2	Encoder cable				
6+7+9	Limit switch distributor box				
12	Control line				

7.10.1.2 I/O Wiring

PG-No.: 1000050

No.:	Description	Standard length 3 m		Special length X m	
		Without Connector	With Connector	Without Connector	With Connector
5	I/O cable				
10	Wiring module Type Varioface				

7.10.1.3 Options

PG-No.: 1000300

Option	A-D converter; 12 bit, double
Option	A-D converter; 12 bit, eightfold
Option	RS232 port COM3
Option	RS323 port driver COM2 / COM4
Option	AS-i master interface
Option	Interbus S Slave Interface
Option	Profibus DP Slave Interface
Option	Additional I/O card

7.10.2 Connection between PC and PA-CONTROL

7.10.2.1 Zero-Modem Cable

The connection between PC and PA CONTROL is realised over a zero-modem cable. On the PC side the zero-modem cable is put to an COM interface (RS232). On the PA CONTROL side the zero-modem cable is put to the diagnosis interface. The zero-modem cable can be ordered at IEF-Werner comp. under the article number: 231766.

Figure 180: Zero-Modem Cable Typ 143, Art.-No.: 231766

PA-CONTROL			PC (9 PINs)	
DCD	1	-	DTR	4
RXD	2	-	TXD	3
TXD	3	-	RXD	2
DTR	4	-	DCD	1
GND	5	-	GND	5
N.C.	6			6
RTS	7	-	CTS	8
CTS	8	-	RTS	7
RI	9	-	RI	9

7.10.2.2 USB Serial Adapter

If there is no COM interface (RS232) available at the PC or at the laptop, an additional USB serial adapter can be used. The USB serial adapter can be ordered at IEF-Werner comp. under the article number: 1078302.

Figure 181 : USB Serial Adapter, Art.-No.: 1078302

7.11 Service

NOTE Service work may only be carried out by authorized personnel!

7.11.1 Exchange of the Battery on the CPU Board

The internal battery has a guaranteed service life of 5 years. The battery should be replaced before the end of this time, in order to prevent data loss.

Procedure:

- Order an exchange CPU4 board from IEF-Werner (new battery)
- Carry out a data backup (programs and parameters) by means of the WINPAC program
- Switch off the device and remove the power plug
- Exchange the CPU4 board
- Switch on the device and follow the instructions on the two-line display, boot if required
- Transfer the program and parameters from the PC using WINPAC (download)

Remark:

Your own service personnel can exchange the battery on the CPU4 board, of course. However, we do not recommend this. The basic procedure corresponds to the above description.

7.11.1.1 PA-CONTROL up to V4.46

Not applicable

7.11.1.2 PA-CONTROL V4.46 onwards

Not applicable

7.11.2 Exchange of the Filter Mat

The PA-CONTROL Single is operated without a filter mat.

In the case of the PA-CONTROL Compact, the cooling air is drawn in from the front of the device. The filter mat should be exchanged half-yearly, also earlier depending on the degree of clogging.

Procedure:

- Switch off the device and remove the power plug
- Open the ventilation grille on the front by undoing the 4 screws set in the edges of the ventilation grille
- Exchange the filter mat
- Reassemble the ventilation grille

7.11.3 Exchange of a Power Output Stage

The power output stages have a robust construction. However, if an exchange should be necessary, proceed as described in the following.

Procedure for the PA-CONTROL Single:

- Switch off the device and remove the power plug
- Remove the front plate by undoing the 4 screws set in the edges of the front plate
- Exchange the power output stage
- Reassemble the front plate

Procedure for the PA-CONTROL Compact:

- Switch off the device and remove the power plug
- Remove the ventilation grille on the front by undoing the 4 screws set in the edges of the ventilation grille
- Remove the ventilators
- Exchange the desired power output stage(s)
- Reassemble the ventilators and ventilation grille

NOTE The same settings are to be made for the newly installed power output stage as for the removed power output stage!

7.12 Outside Measurements

7.12.1 Outside Measurements of PA-CONTROL Single

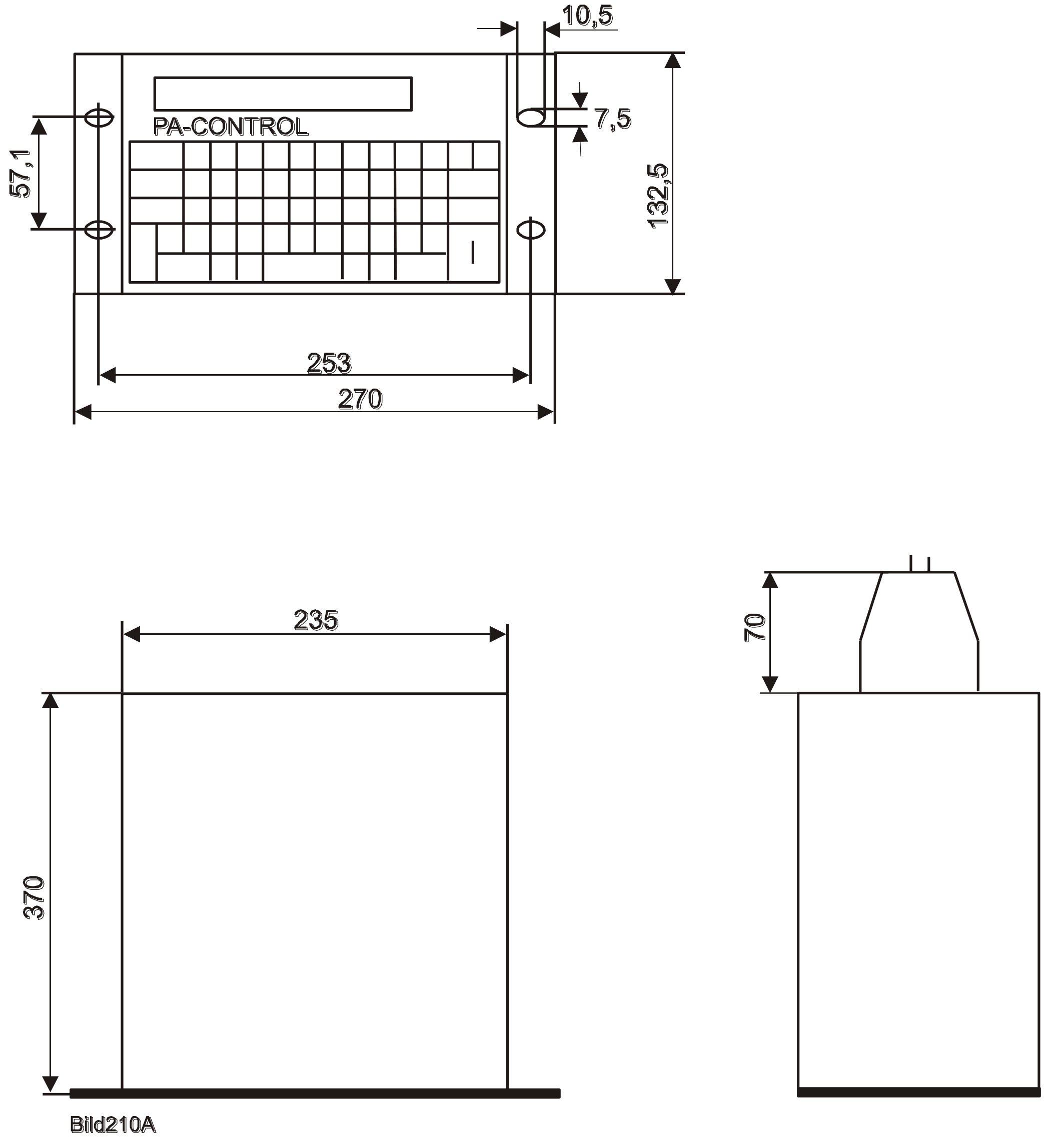


Figure 182: Outside Measurements of PA-CONTROL Single

7.12.2 Outside Measurements of PA-CONTROL Compact

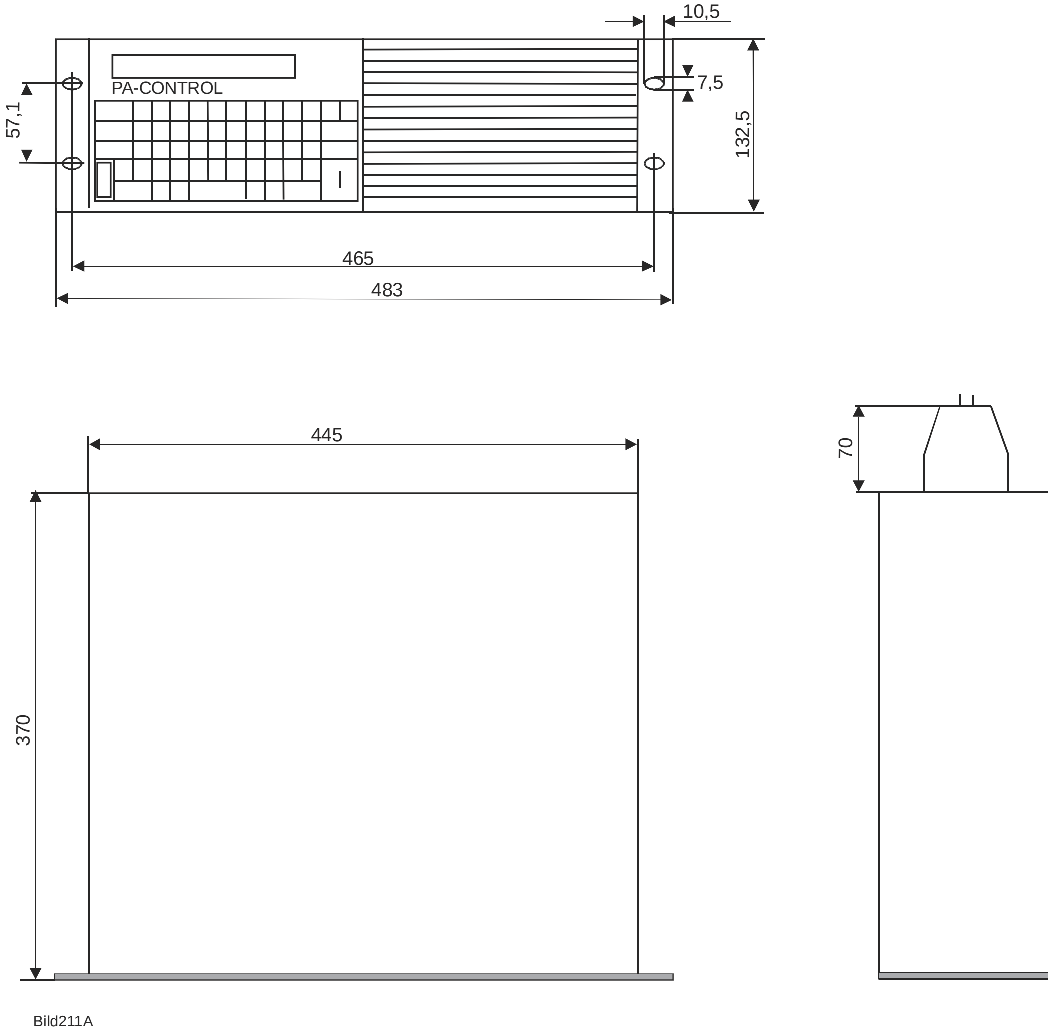


Figure 183: Outside Measurements of PA-CONTROL Compact

7.12.3 Outside Measurements of PA-CONTROL Steuer 19"

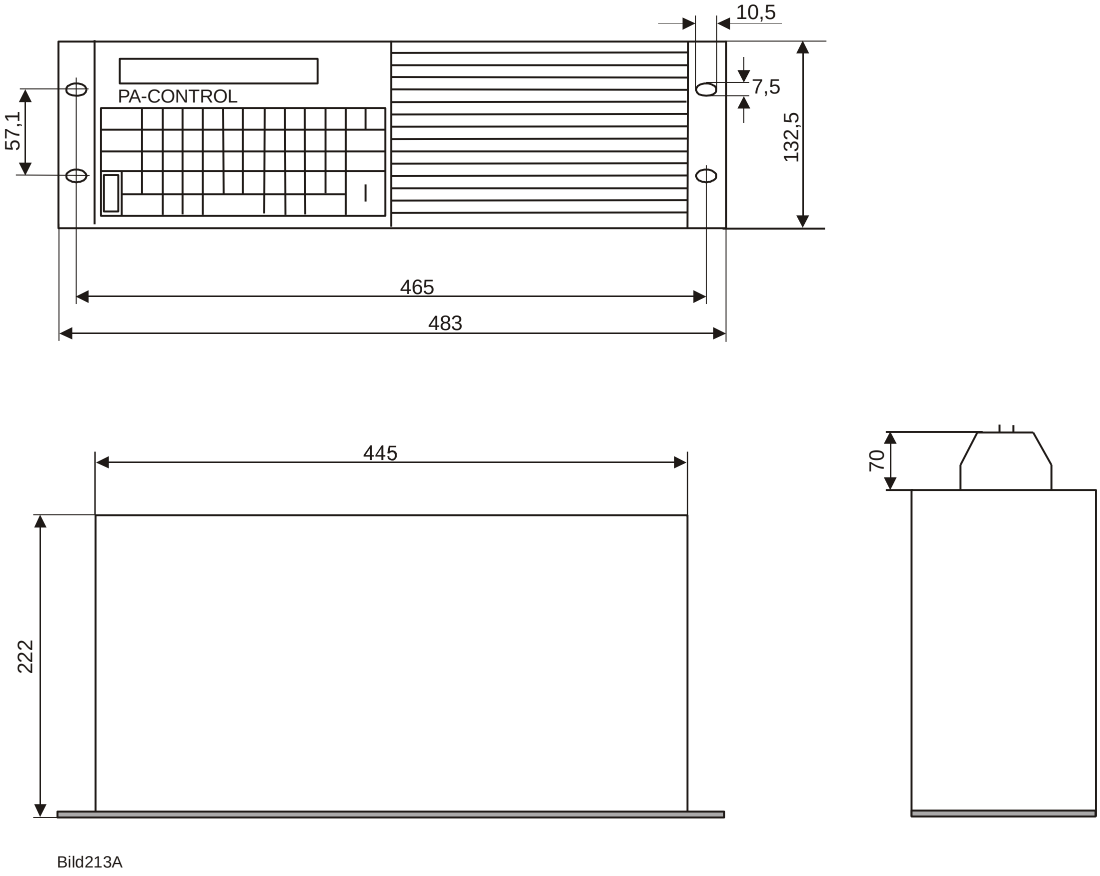


Figure 184: Outside Measurements of PA-CONTROL Steuer 19"

7.12.4 Outside Measurements of PA-CONTROL Steuer 19/2"

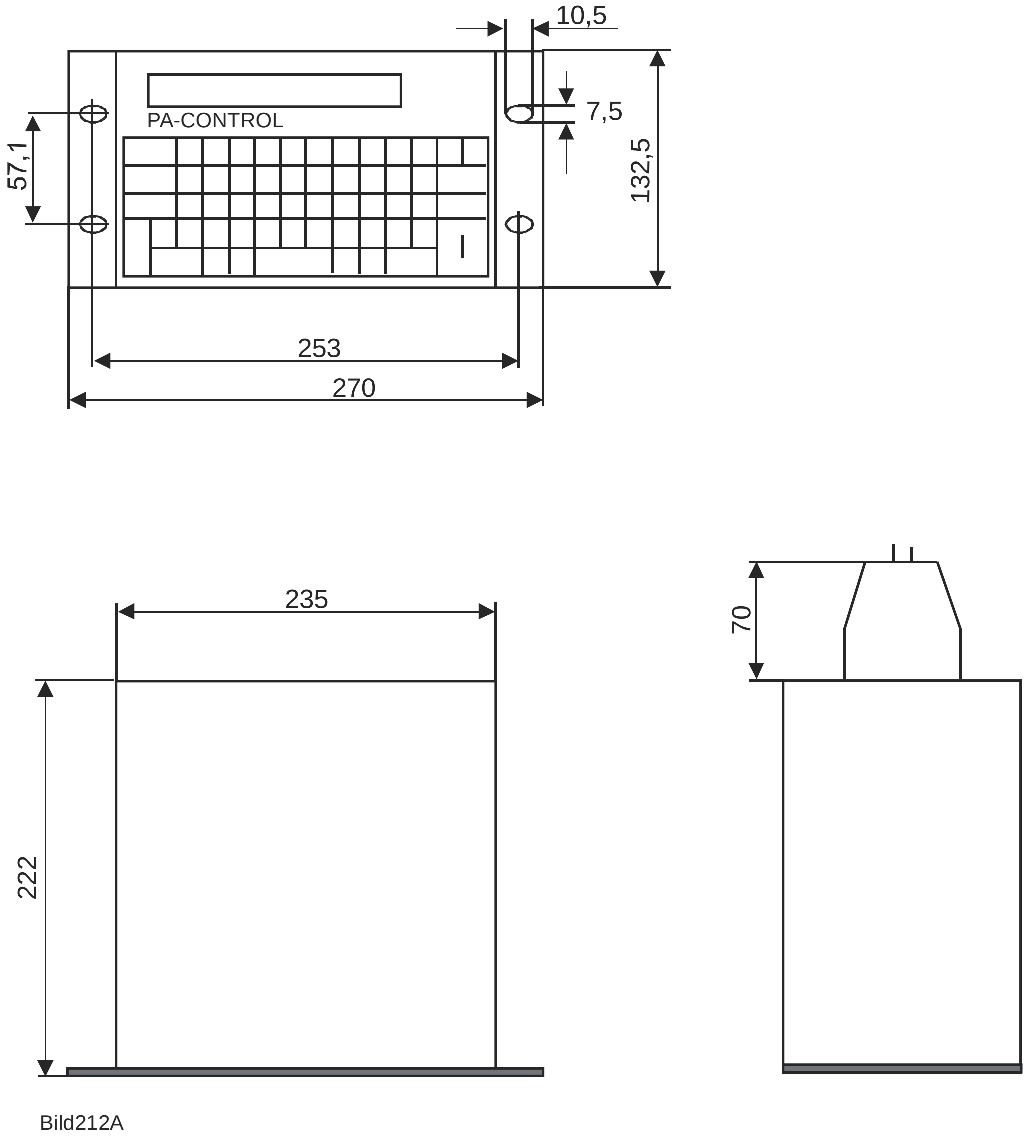


Figure 185: Outside Measurements of PA-CONTROL Steuer 19/2"

7.13 PA-CONTROL key code (+ ASCII character set to ISO/IEC 8859-15)

Dec	Hex	Character	PAC Keyboard
0	0	NUL	
1	1	SOH	
2	2	STX	
3	3	ETX	
4	4	EOT	
5	5	ENQ	
6	6	ACK	
7	7	BEL	
8	8	BS	Shift+DEL
9	9	HT	
10	A	LF	
11	B	VT	
12	C	FF	
13	D	CR	ENTER
14	E	SO	
15	F	SI	
16	10	DLE	
17	11	DC1	
18	12	DC2	
19	13	DC3	
20	14	DC4	
21	15	NAK	
22	16	SYN	
23	17	ETB	
24	18	CAN	
25	19	EM	
26	1A	SUB	
27	1B	ESC	ESC/Shift+ESC
28	1C	FS	
29	1D	GS	
30	1E	RS	
31	1F	US	
32	20	SP	SPACE BAR
33	21	!	Shift+1
34	22	„	Shift+2
35	23	#	
36	24	$	Shift+4
37	25	%	Shift+5
38	26	&	Shift+6
39	27	‘	
40	28	(	Shift+8
41	29	)	Shift+9
42	2A	*	Shift++
43	2B	+	+
44	2C	,	,
45	2D	-	-
46	2E	.	.

Dec	Hex	Character	PAC Keyboard
47	2F	/	Shift+7
48	30	0	0
49	31	1	1
50	32	2	2
51	33	3	3
52	34	4	4
53	35	5	5
54	36	6	6
55	37	7	7
56	38	8	8
57	39	9	9
58	3A	:	Shift+ .
59	3B	;	Shift+ ,
60	3C	<	<
61	3D	=	Shift+0
62	3E	>	Shift+<
63	3F	?	Shift+3
64	40	@	Ctrl+Q
65	41	A	Shift+A
66	42	B	Shift+B
67	43	C	Shift+C
68	44	D	Shift+D
69	45	E	Shift+E
70	46	F	Shift+F
71	47	G	Shift+G
72	48	H	Shift+H
73	49	I	Shift+I
74	4A	J	Shift+J
75	4B	K	Shift+K
76	4C	L	Shift+L
77	4D	M	Shift+M
78	4E	N	Shift+N
79	4F	O	Shift+O
80	50	P	Shift+P
81	51	Q	Shift+Q
82	52	R	Shift+R
83	53	S	Shift+S
84	54	T	Shift+T
85	55	U	Shift+U
86	56	V	Shift+V
87	57	W	Shift+W
88	58	X	Shift+X
89	59	Y	Shift+Y
90	5A	Z	Shift+Z
91	5B	[	Ctrl+8
92	5C	\	
93	5D	]	Ctrl+9

Dec	Hex	Character	PAC Keyboard
94	5E	^	
95	5F	_	Shift+ -
96	60	´	
97	61	a	A
98	62	b	B
99	63	c	C
100	64	d	D
101	65	e	E
102	66	f	F
103	67	g	G
104	68	h	H
105	69	i	I
106	6A	j	J
107	6B	k	K
108	6C	l	L
109	6D	m	M
110	6E	n	N
111	6F	o	O
112	70	p	P
113	71	q	Q
114	72	r	R
115	73	s	S
116	74	t	T
117	75	u	U
118	76	v	V
119	77	w	W
120	78	x	X
121	79	y	Y
122	7A	z	Z
123	7B	{	Ctrl+7
124	7C	|	
125	7D	}	Ctrl+0
126	7E	~	
127	7F	DEL	
128	80	PAD	
129	81	HOP	
130	82	BPH	
131	83	NBH	
132	84	IND	
133	85	NEL	
134	86	SSA	
135	87	ESA	
136	88	HTS	
137	89	HTJ	
138	8A	VTS	
139	8B	PLD	
140	8C	PLU	

Dec	Hex	Character	PAC Keyboard
141	8D	RI	
142	8E	SS2	
143	8F	SS3	
144	90	DCs	
145	91	PU1	
146	92	PU2	
147	93	STS	
148	94	CCH	
149	95	MW	
150	96	SPA	
151	97	EPA	
152	98	SOS	
153	99	SGCI	
154	9A	SCI	
155	9B	CSI	
156	9C	ST	
157	9D	OSC	
158	9E	PM	
159	9F	APC	
160	A0	NBSP	
161	A1	¡	
162	A2	¢	
163	A3	£	
164	A4	€	
165	A5	¥	
166	A6	Š	
167	A7	§	
168	A8	š	
169	A9	©	
170	AA	ª	
171	AB	«	
172	AC	¬	
173	AD	SHY	
174	AE	®	
175	AF	¯	
176	B0	°	
177	B1	±	
178	B2	²	
179	B3	³	
180	B4	Ž	
181	B5	µ	
182	B6	¶	
183	B7	·	
184	B8	ž	
185	B9	¹	
186	BA	º	
187	BB	»	

Dec	Hex	Character	PAC Keyboard
188	BC	Œ	
189	BD	œ	
190	BE	Ÿ	
191	BF	¿	
192	C0	À	
193	C1	Á	
194	C2	Â	
195	C3	Ã	
196	C4	Ä	Alt+A
197	C5	Å	
198	C6	Æ	
199	C7	Ç	
200	C8	È	
201	C9	É	
202	CA	Ê	
203	CB	Ë	
204	CC	Ì	
205	CD	Í	
206	CE	Î	
207	CF	Ï	
208	D0	Ð	
209	D1	Ñ	
210	D2	Ò	
211	D3	Ó	
212	D4	Ô	
213	D5	Õ	
214	D6	Ö	Alt+O
215	D7	×	
216	D8	Ø	
217	D9	Ù	
218	DA	Ú	
219	DB	Û	
220	DC	Ü	Alt+U
221	DD	Ý	
222	DE	Þ	START
223	DF	ß	
224	E0	à	
225	E1	á	
226	E2	â	
227	E3	ã	
228	E4	ä	Ctrl+A
229	E5	å	
230	E6	æ	
231	E7	ç	
232	E8	è	
233	E9	é	

Dec	Hex	Character	PAC Keyboard
234	EA	ê	
235	EB	ë	
236	EC	ì	
237	ED	í	
238	EE	î	
239	EF	ï	
240	F0	ð	
241	F1	ñ	
242	F2	ò	
243	F3	ó	
244	F4	ô	
245	F5	õ	
246	F6	ö	Ctrl+O
247	F7	÷	
248	F8	ø	
249	F9	ù	
250	FA	ú	
251	FB	û	
252	FC	ü	Ctrl+U
253	FD	ý	
254	FE	þ	
255	FF	ÿ	

7.13.1 In Addition

Dec	Hex	PAC Keyboard
294	126	Alt+L
327	147	Shift+Arrow left
328	148	Arrow up
329	149	Shift+Arrow up
331	14B	Arrow left
333	14D	Arrow right
335	14F	Shift+Arrow right
336	150	Arrow down
337	151	Shift+Arrow down
338	152	INS Shift+INS
339	153	DEL
		Ctrl+Arrow left
		Ctrl+Arrow right
397	18D	Ctrl+DEL

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