



1-axis-controller MC1 series

MC1-10
MC1-20
MC1-30

Operating Instruction

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1 About this manual

All information, technical data and dimensions contained in this booklet correspond to the technical state at the moment of publication. However, possible misprints or mistakes cannot be ruled out. We will appreciate all suggestions for improvement and error notes.

We would like to point out that all used software and hardware names of the respective companies generally are subject to protection by brand, trademark and patent law.

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This booklet has been translated from the original German version into English language. It does not lay claim to completeness nor flawlessness. In case of doubt the German original has validity.

isel controllers are concurrent with CE norms and marked accordingly. Commissioning of all other parts or components, for which CE safety regulations apply, is prohibited until all respective requests are met.

isel Germany AG as the manufacturer cannot take over guarantee if you change the controller in any way.

The EMC test is valid only for the controllers original configuration ex works, i.e. the delivery state.

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Safety symbols



Attention

This symbol signalizes that there is danger for persons life and health.



Danger

This symbol signalizes that there is danger for material, machine and environment.



Information

This symbol signalizes important information.

Safety instructions



- The 1-axis-controllers MC1-10, MC1-20 and MC1-30 are designed to current technical and recognized rules.
- The device may only be used if it is in correct condition. Any faults have to be eliminated immediately. Neither children nor non-authorized persons are allowed to put the device into operation.
- The device may only be used for the intended use: control of a linear or rotational axis with brushed (MC1-10), brushless (MC1-20) DC servo motors or 3-phase stepper motors (MC1-30) up to 500 W and integrated incremental measurement system (encoder) in CNC or DNC mode.
- All work with the 1-axis controller MC1-xx, especially initial operation, installation as well as external wiring must be executed by authorized personal regarding electrical industry rules and accident prevention regulations.
- Assembly and use of operating material has to be according to machine directive 98/37/EC resp. Low voltage directive 73/23/EWC. In case of in proper use even the observation the respective rules and standards does not protect against physical damages and damage to property.
- Ambient temperature: +5°C to +40°C
- Storage temperature: -25°C to +70°C
- Pay attention that there is enough free zone on the louvers for air circulation. Ignoring this fact causes overheat and potential defect of the controller.
- Do not expose the device to high humidity or high vibrations.
- Please take care of the instruction manual. Be sure that all users know the instructions.
- Ignoring the instruction manual can lead to damage, heavy physical damage or to death.

2 Controller types

The 1-axis-controllers of series MC1-xx are compact desk devices for connection to the 115VAC / 230VAC public power supply net (50/60Hz).

All controllers are free programmable and destined for the use of linear or rotational axis with different motor types.

The MC1-xx series comprises the following controller types:

type	motor	power amplifier
<i>MC1-10</i> Part-No.: 381518 0010	brushed isel - DC-servo-motors (BB-DC)	IMD-10
<i>MC1-20</i> Part-No.: 381518 0020	brushless isel - DC-servo-motors (BL-DC)	IMD-20
<i>MC1-30</i> <i>(in preparation)</i> Part-No.: 381518 0030	isel - 3-phase-stepper-motors	IMD-30

All 1-axis-controller have to be used only with the compatible motor type.

Please read this operation instruction manual carefully before first use of the controller therewith you can:

- Work safely, fast and effective
- Keep away danger from persons
- Use all the power and features of the controller.

3 Technical data

3.1 Technical data of series

- Case dimensions: 204mm (L) x 150mm (W) x 300mm (H)
(without the holder for motor cable)
- Weight: 6550 g
- Safety class: IP20
- Power supply: 230 VAC, 50 Hz, fuse: 4 A
115 VAC, 60 Hz, fuse: 6 A
- Power consumption: power supply 48VDC: max. 500W,
power supply 24VDC: max. 2,5A (60W)
power supply 24VDC controller internally load 0,5 A (12W)
i.e. there is maximum 2A for external wiring of user In-/Outputs
(without a connected motor brake)
- Ambient temperature: 5°C to +40°C
- Storage temperature: -25°C to +70°C
- Humidity: max. 95%
- STOP category: 0 according to EN 60204-1:1997, 9.2.2

Operation modes:

- standard operation mode: CNC-mode (Stand alone, program download in flash memory)
- additional operation mode: DNC-mode (optional operation with PC)

User control interface:

- LC display 4 lines x 20 symbols, english character set (alphanumerical, dot matrix 5x7)
- foil keyboard: 4 keys F1 to F4 for softkey control, Start, Stop, Enter, ESC

Binary inputs:

- external program-start on E1.1 = Input 1 on controller back side
- external program-stop on E1.2 = Input 2 on controller back side
- positive / negative end switch, reference switch (for micro switch or initiator – opener means n.c.)
- 8 free user inputs (24VDC, optically isolated; load of the internal 24VDC/60W-power supply with 12,5 mA per input if high active input connection) with LED bargraph
- analog input (**future extension, not available in this version**)

Binary outputs:

- motor brake
- 8 free user relay outputs (24VDC / max. 700 mA per output) with LED bargraph
- 1,9 A maximum load of the internal 24V/60W power supply if all 8 outputs set to high (230 mA per output)



The user is responsible for dimensioning the current load of the binary outputs.

- PWM output (**future extension, not available in this version**)

Download memory for PALPC user programs (CNC mode)

- Flash memory for about 650 commands and separate memory for LCD text output (ca. 100 text lines by 20 ASCII characters)

Communication interfaces:

- RS232 interface for program download and parameterization of the power amplifier
- USB interface (**future extension, not available in this version**)
- CANopen interface (**future extension, not available in this version**)

Programming software:

- PALPC 2.1 for programming in CNC mode, program download
- ProNC / Remote for operation in DNC mode

Scope of delivery:

- 1-axis controller MC1-xx as desk device with integrated power amplifier IMD-xx
- Main cable (protection contact plug, IEC-60320 power connector)
- RS232 communication cable: PC-side: 9 pin Sub-D jack
Controller side: RJ45 plug
- Installation CD PAL-PC 2.1
- Installation CD isel-CAN-CNC-control with initial operation program
- Operation instruction manual in printed form

3.2 Technical data of the controller and power amplifier

3.2.1 1-axis-controller MC1-10

Controller:

- Controller for linear- or rotational axis with brushed DC servo motor
- Power supply for intermediate circuit: 48VDC / 500W with PFC
- Embedded controller MCF52223 with flash memory for firmware update and download of user programs (firmware update ex factory possible)
- Back side connector (8 pin remote plug) for integration in higher ranked security circuit
- Protection against short circuit, over- resp. under voltage, over temperature
- Back side connector for external Start- resp. Stop button or signal (PLC control)
- Back side connector for PWM output and analog input (**optional**)
- Back side USB jack (**future extension, load user programs from memory stick, not available in this version**)

Initial operation software:

- Parameterization of the motor power amplifier IMD10 (gear factor, encoder resolution, current-speed- and position control) over serial interface RS232-PC (RJ45-connector); PC based initial operation software "DCSetup.exe"

3.2.2 1-axis-controller MC1-20

Controller:

- Controller for linear- or rotational axis with brushless DC servo motor
- Power supply for intermediate circuit: 48VDC / 500W with PFC
- Motor current up to 12 A (digital current regulation)
- Embedded controller MCF52223 with flash memory for firmware update and download of user programs (firmware update ex factory possible)
- Back side connector (8 pin remote plug) for integration in higher ranked security circuit
- Protection against short circuit, over- resp. under voltage, over temperature
- Back side connector for external Start- resp. Stop button or signal (PLC control)
- Back side connector for PWM output and analog input (**optional**)
- Back side USB jack (**future extension, load user programs from memory stick, not available in this version**)

Initial operation software:

- Parameterization of the motor power amplifier IMD20 (gear factor, encoder resolution, current-speed-, position control) over serial interface RS232-PC (RJ45-connector); PC based initial operation software "ACSetup.exe"

3.2.3 1-axis-controller MC1-30

Controller:

- Controller for linear- or rotational axis with 3 phase stepper motor
- Power supply for intermediate circuit: 48VDC / 500W with PFC
- Motor current up to 10 A (digital current regulation)
- Embedded controller MCF52223 with flash memory for firmware update and download of user programs (firmware update ex factory possible)
- Back side connector (8 pin remote plug) for integration in higher ranked security circuit
- Protection against short circuit, over- resp. under voltage, over temperature
- Back side connector for external Start- resp. Stop button or signal (PLC control)
- Back side connector for PWM output and analog input (**optional**)
- Back side USB jack (**future extension, load user programs from memory stick, not available in this version**)

Initial operation software:

- Parameterization of the motor power amplifier IMD30 (gear factor, encoder resolution, current-speed-, position control) over serial interface RS232-PC (RJ45-connector); PC based initial operation software "StepSetup.exe"

4 Type independent hardware description of the MC1 series

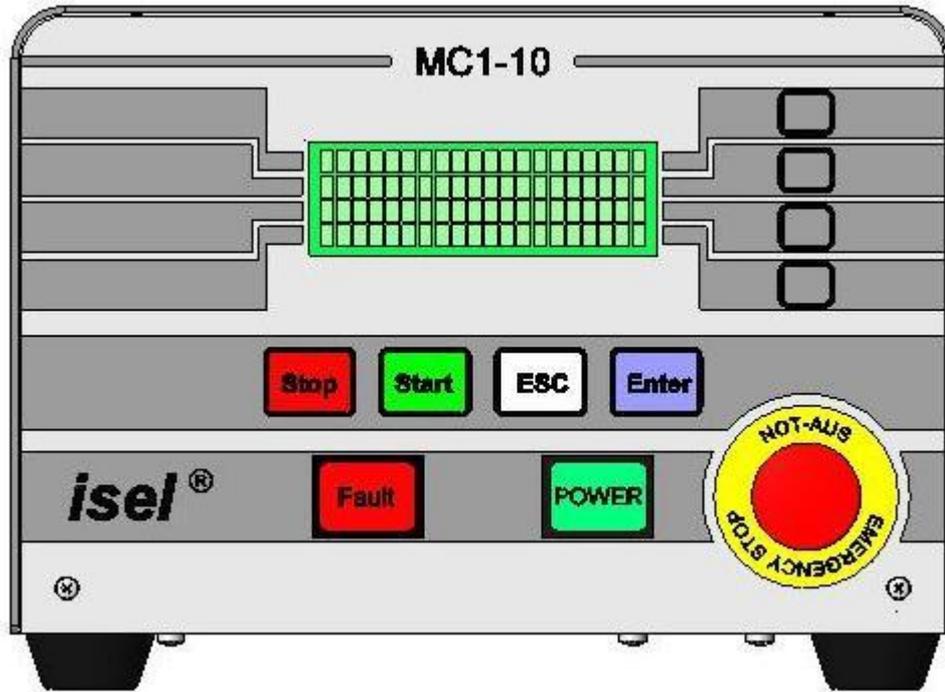


Image 1: front view (for example MC1-10)

4.1 Description of the base board for all types

The 1-axis-controller MC1 series base board consists of: user I/Os, embedded controller with LCD and keyboard interface, two serial interfaces (RS232 asynchronous to PC resp. Power amplifier) and security circuit functions (Emergency stop circuit). The base board is mounted in all controller types.

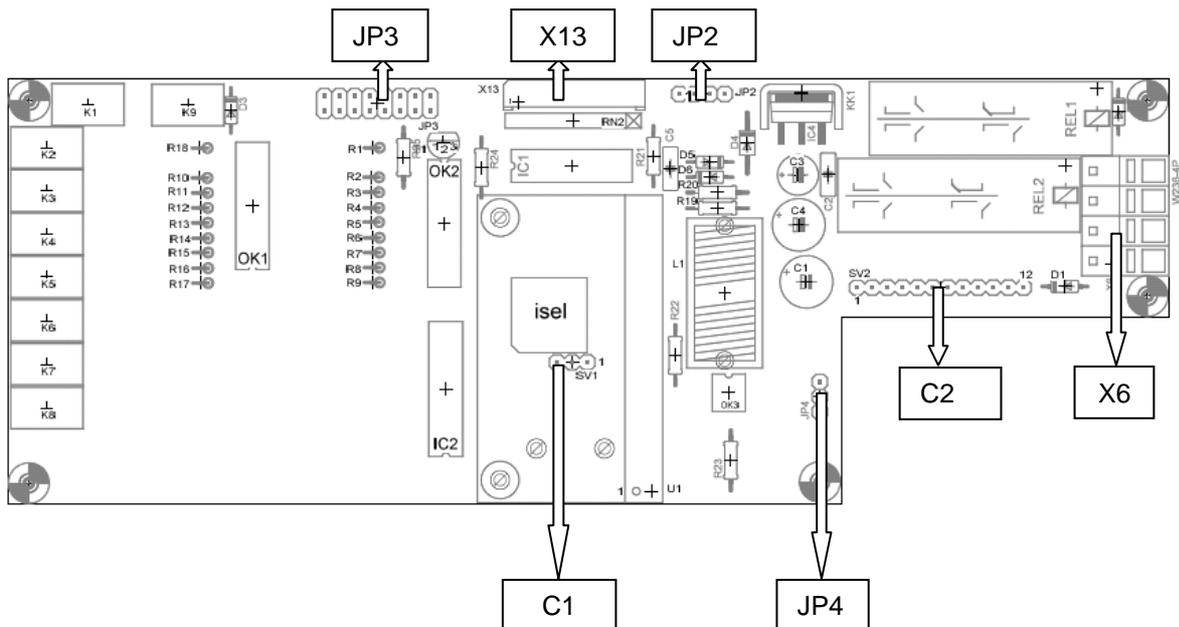


Image 2: base board layout

4.1.1 Base board pin assignment

C1: RS-232-connector to motor amplifier

1	-	RxD	Receive Data
2	-	TxD	Transmit Data
3	-	GND	

C2: Connection of POWER-button, FAULT-signal, Emergency-stop-button in the case front

1	-	GND	GND
2	-	24VDC	operating voltage from 24VDC power supply unit
3	-	Emergency stop Ch1 (11)	Emergency stop switch
4	-	Emergency stop Ch2 (12)	Emergency stop switch
5	-	Emergency stop Ch2 (21)	Emergency stop switch
6	-	Emergency stop Ch2 (22)	Emergency stop switch
7	-	Error Out	FAULT-notification
8	-	GND	FAULT-notification GND
9	-	Power (13)	POWER-button
10	-	Power (14)	POWER-button
11	-	Power lamp (cathode)	POWER lamp
12	-	Power lamp (anode)	POWER lamp

X6: Power switch (primary side 500W power supply unit for motor amplifier operating voltage)

1	-	L1
2	-	L1'
3	-	N
4	-	N'

X13: Connector for foil keyboard

1	-	Start key (3)	→	P0.7
2	-	Start key (4)	→	GND
3	-	Stop key (3)	→	P0.6
4	-	Stop key (4)	→	GND
5	-	Enter key (3)	→	P0.5
6	-	Enter key (4)	→	GND
7	-	Esc key (3)	→	P0.4
8	-	Esc key (4)	→	GND
9	-	F1 key (3)	→	P0.3
10	-	F1 key (4)	→	GND
11	-	F2 key (3)	→	P0.2
12	-	F2 key (4)	→	GND
13	-	F3 key (3)	→	P0.1
14	-	F3 key (4)	→	GND
15	-	F4 key (3)	→	P0.0
16	-	F4 key (4)	→	GND

4.1.2 Base board jumper settings

JP2: LC display connection (I2C-Bus)

1	-	+5V	
2	-	SDA	data
3	-	SCL	step
4	-	GND	

JP3: Motor amplifier connection

1	-	Analog IN+	type dependent used
2	-	Analog IN-	type dependent used
3	-	Digital GND	type dependent used
4	-	Analog GND	type dependent used
5	-	Enable	enable motor amplifier
6	-	Enable	enable motor amplifier
7	-	Ready IN	statically 24VDC
8	-	Ready OUT	FAULT signal
9	-	Homing	bridge end switch during reference run
10	-	Homing	bridge end switch during reference run
11	-	Limit IN	control current circuit (emergency stop circuit)
12	-	Limit OUT	control current circuit (emergency stop circuit)
13	-	Logic 24V	24VDC operation voltage
14	-	Logic 24V	24VDC operation voltage
15	-	Logic GND	reference operation voltage
16	-	Logic GND	reference operation voltage

JP4: Settings for switch on operation voltage of the power amplifier (internal/external)

Pin 1, 2 bridged:	Power On internal: front POWER button will be used
Pin 2, 3 bridged:	Power On external: contacts 7 and 8 of the Remote-connector will be used

4.2 Control display (MC1-10, MC1-20, MC1-30)

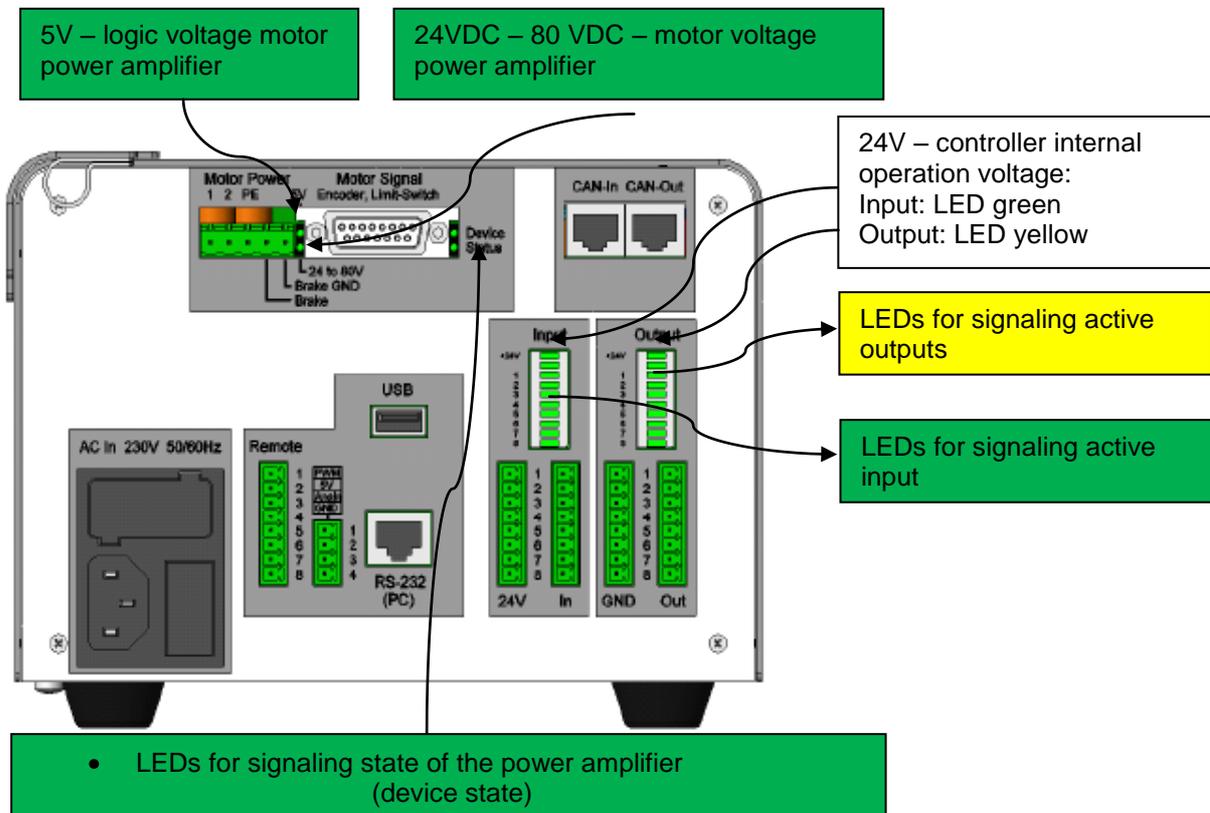
The controller MC1 has several control displays. These are:

Controller-front side:

- FAULT- lamp (red) -> error in motor power amplifier; no ready signal (READY, 1-aktive = HIGH) will be generated from the motor power amplifier
- POWER-lamp (green) is on -> motor power amplifier und DC-servo motor powered

Controller-back side:

- LEDs for signaling active outputs = 1-active / HIGH (yellow LED on)
- LEDs for signaling active input = 1-active / HIGH (green LED on)
- LEDs for signaling state of the power amplifier (blink codes look at IMD10-Manual /1/ or IMD20-Manual /2/)
- LEDs for signaling state of power supply:
 - 5V – logic voltage motor power amplifier
 - 24VDC – 80 VDC – motor voltage power amplifier
 - 24V – controller internal operation voltage for base board and user I/O



4.3 Binary user input wiring

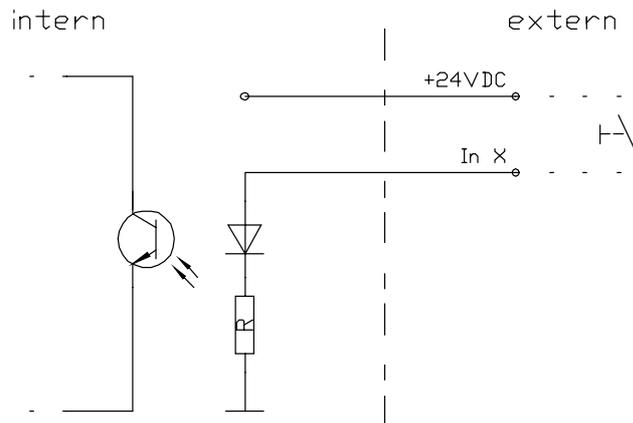
The binary user inputs 1 - 8 of the MC1 are realized using 24V-DC process voltage. The 24VDC reference potential is used from the controller internal 24VDC power supply unit. (**no galvanic separation !**).



Do not short 24VDC reference potential of the controller with GND or case ground.

The binary user inputs 1 – 8 must be wired as shown opposite. (InX means Input 1 to 8).

The load of the controller internal 24V/60W power supply unit amounts on 1-active state 12,5 mA per input.



4.4 Binary user output wiring

The binary user outputs of the MC1 switch 24VDC process voltage. The switched 24VDC reference potential for every external load will be used from the internal 24VDC power supply unit (**no galvanic separation!**).



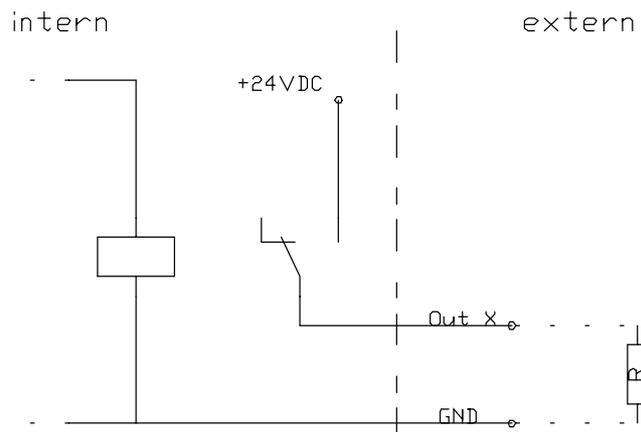
Do not short 24VDC reference potential of the controller with GND or case ground.

If you have pushed the emergency stop switch all states of the binary user outputs will be maintained and not reset!

The binary user output 1 – output 8 must be wired as shown opposite. (Out X means output 1 to 8).

The relay outputs output 1 – output 8 can be rated with 700 mA per output.

If all outputs are switched (1-active) the maximum load of the internal 24VDC power supply unit is 1,9 A (ca. 230mA per output)



The user is responsible for dimensioning the current load of the binary outputs.

5 Hardware description MC1-10

5.1 Overview

1-axis-controller MC1-10 contains the following modules:

- Base board with user I/O, embedded controller with LCD- and keyboard interface, 2 serial interfaces RS232, asynchronous to PC resp. motor power amplifier IMD10, security circuit functions (emergency stop circuit)
- Motor power amplifier IMD10
- Power supply unit 48VDC/500W, power supply unit 24VDC/60W
- Net input module with main switch, net filter and fuses
- 4 part mechanical chassis (ground plate, front side, back side, covering hood)
- Front side with LC-display, foil keyboard (soft keys: Stop, Start, ESC and ENTER)
- Back side with motor cable connector, power supply line, remote connector, PC connector (RS232), connectors for binary inputs and outputs

5.2 Pin assignment

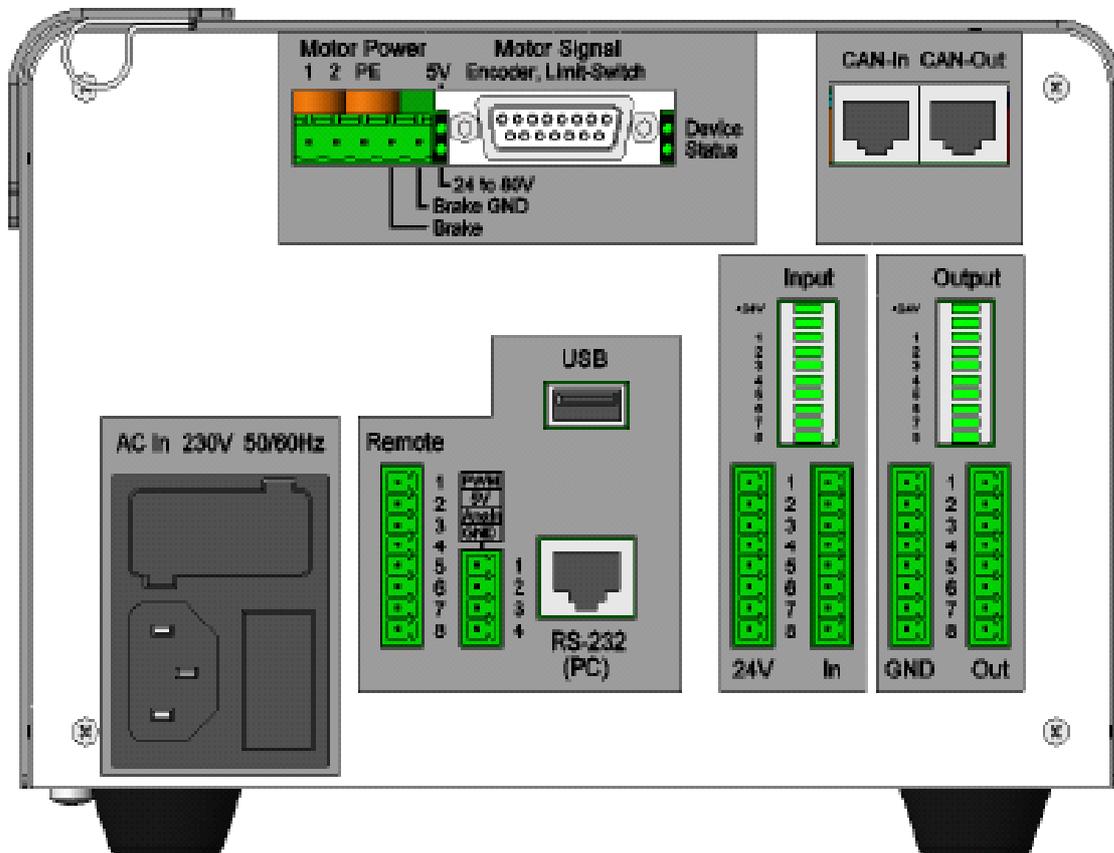


Image 3: Back side view controller MC1-10

5-pin motor power plug:

Pin (left → right)	Signal	Description
1	1	Motor line 1 (brown/green)
2	2	Motor line 2 (white/yellow)
3	PE	Protective ground
4	Brake	Output motor brake
5	Brake_GND	GND 24V (reference motor brake)

8-pin remote plug:

1	-	Potential free contact - output
2	-	Potential free contact - output
3	-	Emergency stop external Ch2
4	-	Emergency stop external Ch2
5	-	Emergency stop external Ch1
6	-	Emergency stop external Ch1
7	-	Power On external - input
8	-	Power On external - input



Contacts 1 and 2 will be bridged from the base board as far as the operation voltage of the motor power amplifier IMD10 is switched on.

Contacts 7 and 8 must be bridged to switch on operation voltage for motor power amplifier IMD10 (condition is that pin 2 and 3 of jumper JP4 are bridged to enable PowerOn external mode).

4-pin connector:

1	-	PWM-signal (output), 1 kHz
2	-	5V logic voltage
3	-	Analog signal (output)
4	-	GND logic voltage

15-pin SubD-connector for motor signals:

Pin	Signal	Description
1		
2	VCC	Digital +5V
3	/ENC_Z	Encoder line /Z
4	/ENC_B	Encoder line /B
5	/ENC_A	Encoder line /A
6	24V	Logic 24V
7	LIMIT_SW1	End switch 1
8	GND_24V	Logic GND
9		
10	DGND	Digital GND
11	ENC_Z	Encoder line Z
12	ENC_B	Encoder line B
13	ENC_A	Encoder line A
14	REF_SW	Reference switch
15	LIMIT_SW2	End switch 2

6 Hardware description MC1-20

6.1 Overview

1-axis-controller MC1-20 contains the following modules:

- Base board with user I/O, embedded controller with LCD- and keyboard interface, 2 serial interfaces RS232, asynchronous to PC resp. motor power amplifier IMD20, security circuit functions (emergency stop circuit)
- Motor power amplifier IMD20
- Power supply unit 48VDC/500W, power supply unit 24VDC/60W
- Net input module with main switch, net filter and fuses
- 4 part mechanical chassis (ground plate, front side, back side, covering hood)
- Front side with LC-display, foil keyboard (soft keys: Stop, Start, ESC and ENTER)
- Back side with motor cable connector, power supply line, remote connector, PC connector (RS232), connectors for binary inputs and outputs

6.2 Pin assignment

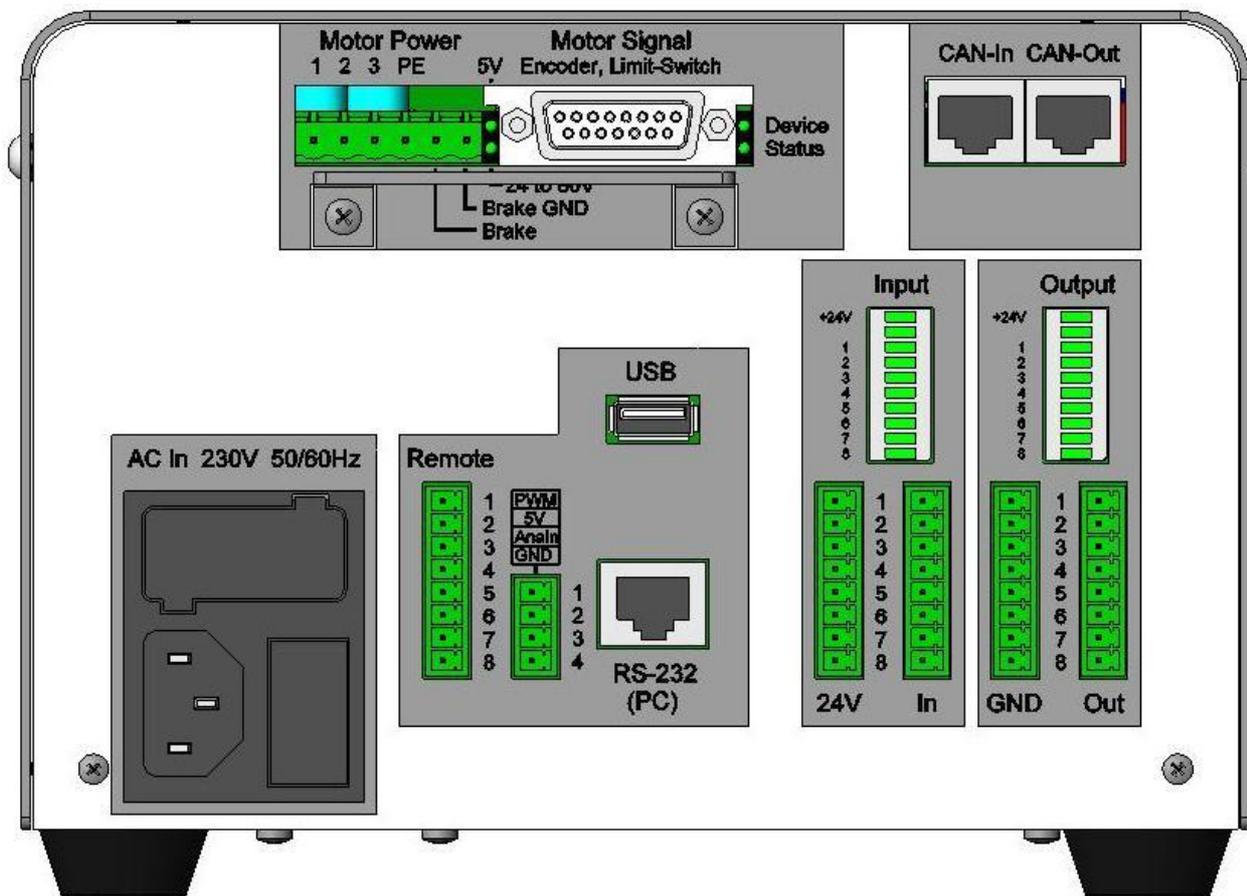


Image 4: Back side view controller MC1-20

6-pin motor power plug:

Pin (left → right)	Signal	Description
1	3	Motor line 3
2	2	Motor line 2
3	1	Motor line 1
4	PE	Protective ground
5	Brake	Output motor brake
6	Brake_GND	GND 24V (reference motor brake)

8-pin remote plug:

1	-	Potential free contact - output
2	-	Potential free contact - output
3	-	Emergency stop external Ch2
4	-	Emergency stop external Ch2
5	-	Emergency stop external Ch1
6	-	Emergency stop external Ch1
7	-	Power On external - input
8	-	Power On external - input



Contacts 1 and 2 will be bridged from the base board as far as the operation voltage of the motor power amplifier IMD20 is switched on.

Contacts 7 and 8 must be bridged to switch on operation voltage for motor power amplifier IMD20 (condition is that pin 2 and 3 of jumper JP4 are bridged to enable PowerOn external mode).

4-pin connector:

1	-	PWM-signal (output), 1 kHz
2	-	5V logic voltage
3	-	Analog signal (output)
4	-	GND logic voltage

15-pin SubD-connector for motor signals:

Pin	Signal	Description
1	HALL_A_IN	Hall signal A
2	VCC	Digital +5V
3	/ENC_Z	Encoder line /Z
4	/ENC_B	Encoder line /B
5	/ENC_A	Encoder line /A
6	24V	Logic 24V
7	LIMIT_SW1	End switch 1
8	GND_24V	Logic GND
9	HALL_B_IN	Hall signal B
10	DGND	Digital GND
11	ENC_Z	Encoder line Z
12	ENC_B	Encoder line B
13	ENC_A	Encoder line A
14	HALL_C_IN	Hall signal C
15	LIMIT_SW2	End switch 2

7 Hardware description MC1-30

7.1 Overview

1-axis-controller MC1-30 contains the following modules:

- Base board with user I/O, embedded controller with LCD- and keyboard interface, 2 serial interfaces RS232, asynchronous to PC resp. motor power amplifier IMD30, security circuit functions (emergency stop circuit)
- Motor power amplifier IMD30
- Power supply unit 48VDC/500W, power supply unit 24VDC/60W
- Net input module with main switch, net filter and fuses
- 4 part mechanical chassis (ground plate, front side, back side, covering hood)
- Front side with LC-display, foil keyboard (soft keys: Stop, Start, ESC and ENTER)
- Back side with motor cable connector, power supply line, remote connector, PC connector (RS232), connectors for binary inputs and outputs

7.2 Pin assignment

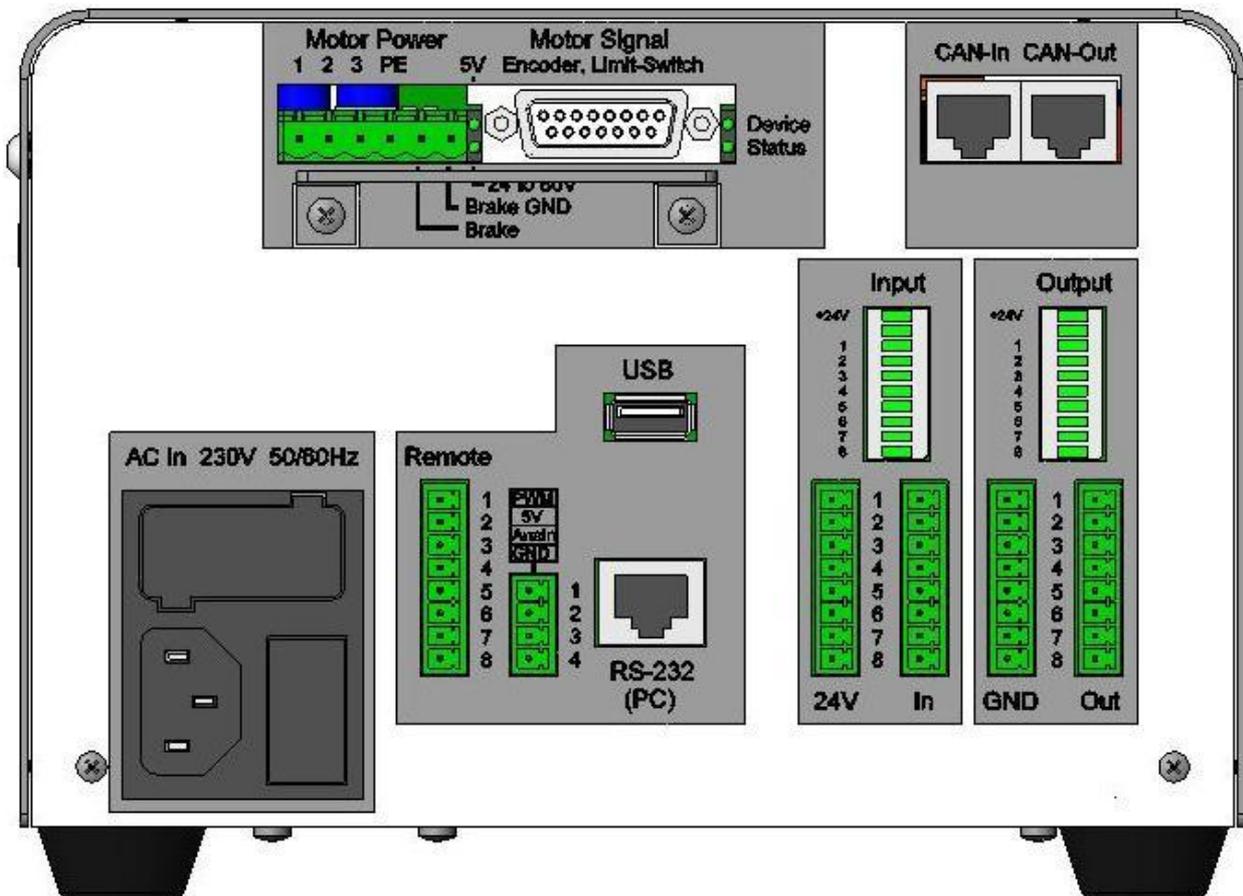


Image 5: Back side view controller MC1-30

6-pin motor power plug:

Pin (left → right)	Signal	Description
1	1	Motor line 1
2	2	Motor line 2
3	3	Motor line 3
4	PE	Protective ground
5	Brake	Output motor brake
6	Brake_GND	GND 24V (reference motor brake)

8-pin remote plug:

1	-	Potential free contact - output
2	-	Potential free contact - output
3	-	Emergency stop external Ch2
4	-	Emergency stop external Ch2
5	-	Emergency stop external Ch1
6	-	Emergency stop external Ch1
7	-	Power On external - input
8	-	Power On external - input



Contacts 1 and 2 will be bridged from the base board as far as the operation voltage of the motor power amplifier IMD30 is switched on.

Contacts 7 and 8 must be bridged to switch on operation voltage for motor power amplifier IMD30 (condition is that pin 2 and 3 of jumper JP4 are bridged to enable PowerOn external mode).

4-pin socket:

1	-	PWM-signal (output), 1 kHz
2	-	5V logic voltage
3	-	Analog signal (output)
4	-	GND logic voltage

15-pin SubD-socket for motor signals:

Pin	Signal	Description
1		
2	VCC	Digital +5V
3	/ENC_Z	Encoder line /Z
4	/ENC_B	Encoder line /B
5	/ENC_A	Encoder line /A
6	24V	Logic 24V
7	LIMIT_SW1	End switch 1
8	GND_24V	Logic GND
9		
10	DGND	Digital GND
11	ENC_Z	Encoder line Z
12	ENC_B	Encoder line B
13	ENC_A	Encoder line A
14	REF_SW	Reference switch
15	LIMIT_SW2	End switch 2

8 Operation modes and operation

8.1 MC1 operation modes

8.1.1 CNC mode

The CNC mode (automatic mode = CNC mode) is the program controlled mode of the 1-axis-controller. That means that a user program which is saved in the controller's memory (flash) will be executed till the end.

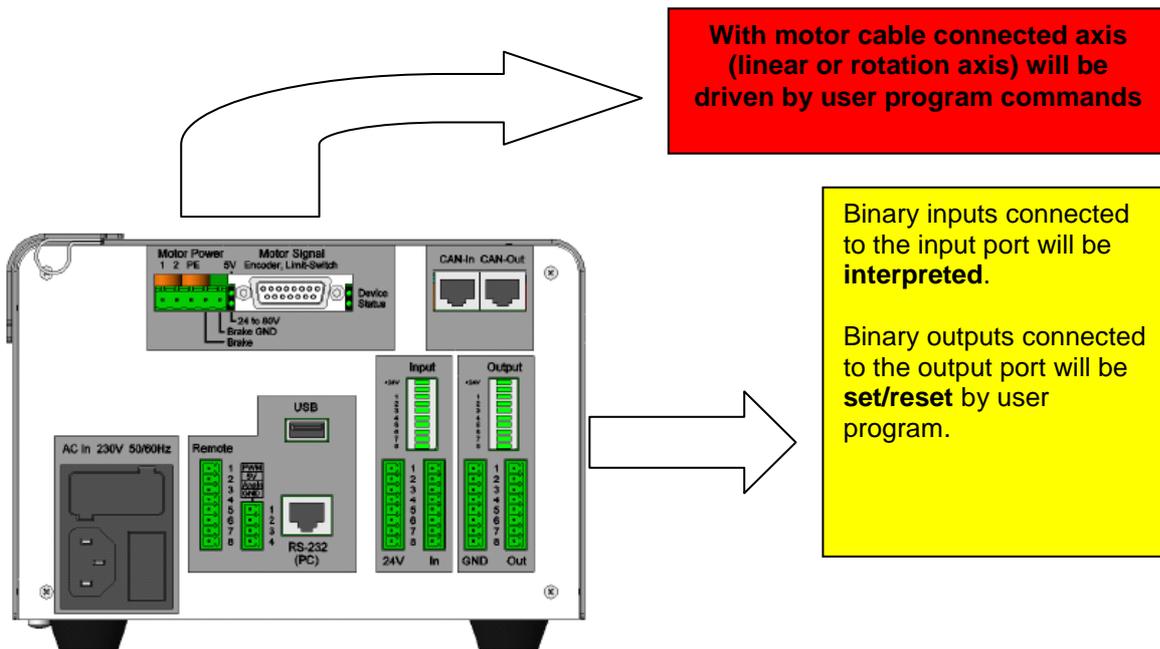
During the automatic mode (CNC mode) you can stop the execution of the active user program by pressing the STOP - soft key or by using the external Stop input E1.2. A following operation off he START-soft-key on the front side of the controller or the activation (1-active) of the external input E1.1 effects the resumption of the automatic mode (active user program, see also chapter 8.2)

In addition the controller can be used **with or without** a connected axis (linear or rotational axis). These option can be set by: CONTROL-Option **IOonly**:

CNC mode with CONTROL-Option **IOonly = Off (id est.: passive, switched off)**

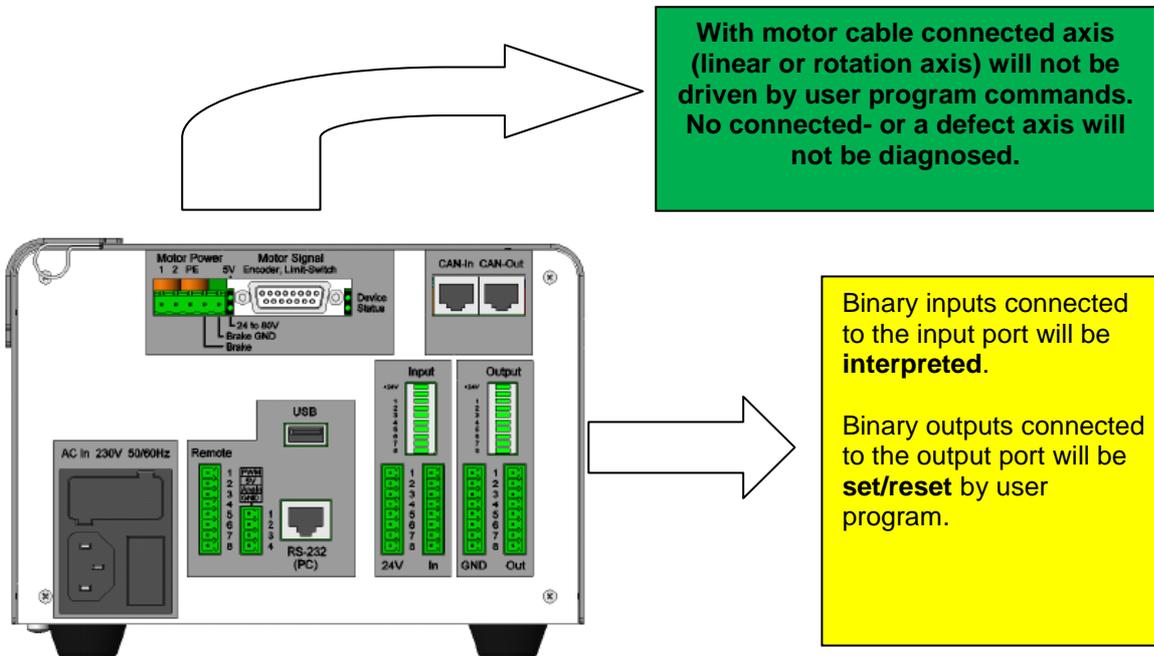
➔ A servo axis (linear or rotational axis) with end switches must be connected to the controller:

- all motion commands in the user program (e.g. reference motion, absolute or relative motions) will be **executed**
- all I/O commands in the user program (e.g. read inputs, set outputs) will be executed



CNC mode with CONTROL-Option **Only = On** (id est.: active, switched on)

- No servo axis (linear or rotational axis) with end switches must be connected to the controller
- A connected axis will not be driven!
- All motion commands in the user program (e.g. reference motion, absolute or relative motions) will be **ignored, id est. not executed**
- all I/O commands in the user program (e.g. read inputs, set outputs) will be executed



In CNC mode you can use the controller (e.g. test and demonstration) like a PLC (programmable logic control).

8.1.2 DNC mode

In DNC mode the controller MC1 is connected permanently via RS-232 interface with a control PC (IBM compatible PC or Notebook).

A user program stored in flash memory will not be executed. The commands to execute an action/motion (e.g. reference motion, motion of the axis or I/O actions) will be sent by user software from the PC with the new ProNC motion control for 1-axis-controller.

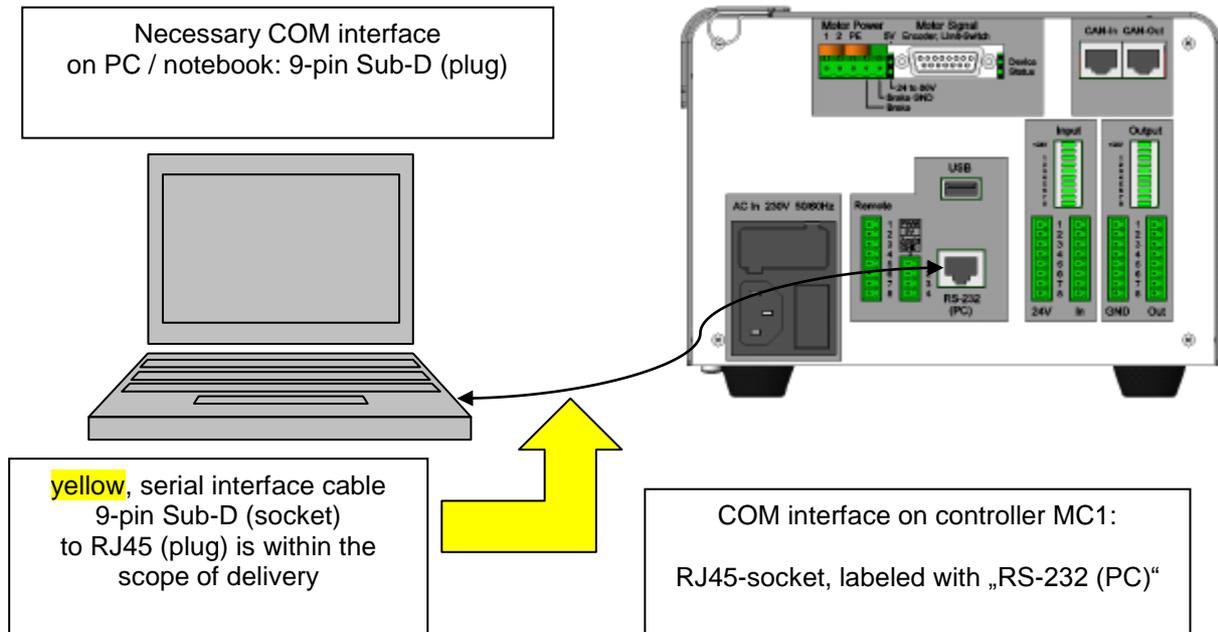


Image 6: Serial connection (RS232) via interface cable of PC / Notebook to MC1

Likewise in this configuration can be done:



PALPC 2.1 user program download into the flash memory of the controller MC1 (COM Interface for PALPC: 19200 Bit/sec, PalPC.exe)

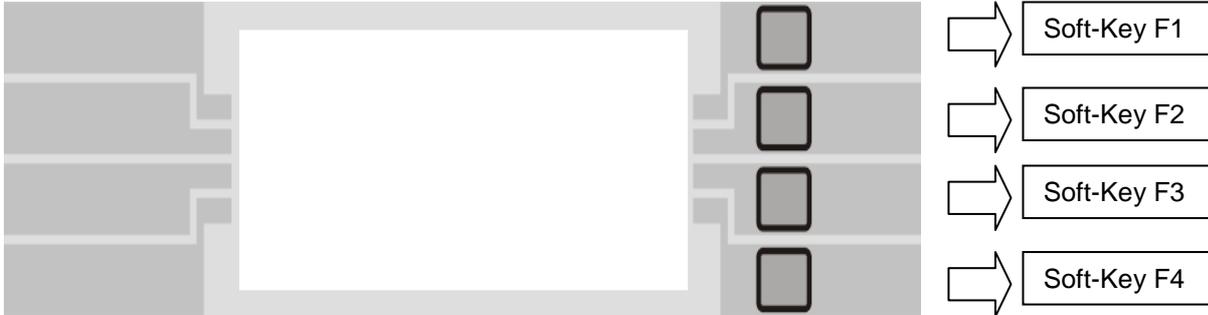
Initial operation / parameterization of motor power amplifiers IMDxx (COM Interface for parameterization software: 57600 Bit/sec, e.g. DCSetup.exe)

8.2 Operation (menu driven)



General information for menu driven operation:

- The symbol  in the most right LC display column signalsizes that the assigned key (so called soft-key) in case of hitting activates the assigned sub menu
 → the soft-keys will be indicated with F1 till F4



- Use the ESC-key to return from a sub menu in the higher ranking menu

Following are shown the most important menus:

Power on menu / PowerOn-menu MC1:

*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		M	C	1	-	1	0		V	1	.	0	1	.	0	7			
		(	c	)	i	s	e	l		G	e	r	m	a	n	y		A	G
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

This menu is shown on the LC display (for about 2 seconds) after switching on the power switch or a software reset of the controller.

In dependence on controller mode setting (menu **SETUP CONTROL**)

- IOonly = On ⇒ controller **is not connected** with an axis
- IOonly = Off ⇒ controller **is connected** with an axis (linear or rotational axis)

serial communication with motor power amplifier will be checked and initialized.

Base menu MC1-xx: CONTROL-Option IOonly = Off

M	C	1	-	1	0													P	r	o	g	r	a	m	▶	
																				M	a	n	u	a	l	▶
																					S	e	t	u	p	▶
?	P	o	w	e	r																					

This menu is shown on LC display if serial communication to motor power amplifier IMDxx works after their faultless initialization by power on switch or after software reset.

After switching on motor power amplifier operation voltage (POWER button) the controller is ready to operate. In this state it's possible to download user programs out of the PALPC user interface into the MC1 flash memory.

Base menu MC1-xx: CONTROL-Option IOonly = On

M	C	1	-	1	0														P	r	o	g	r	a	m	▶	
																					M	a	n	u	a	l	▶
																						S	e	t	u	p	▶
!	I	O	o	n	l	y																					

→No servo axis (linear or rotational axis) with end switches must be connected to the controller. A connected axis will not be driven!

→All motion commands in the user program (e.g. reference motion, absolute or relative motions) will be **ignored, id est. not executed**

→All I/O commands in the user program (e.g. read inputs, set outputs) will be **executed**

- In CNC mode you can use the controller (e.g. test and demonstration) like a PLC (programmable logic control).

Base menu MC1-xx (faultless state): CONTROL-Option IOonly = On

M	C	1	-	1	0														P	r	o	g	r	a	m	▶	
																					M	a	n	u	a	l	▶
																						S	e	t	u	p	▶
!	I	O	o	n	l	y																					



Error states after power on refer to chapter 10: Troubleshooting

Base menu MC1-xx (faultless state): CONTROL-Option IOonly = Off

M	C	1	-	1	0															P	r	o	g	r	a	m	▶	
																						M	a	n	u	a	l	▶
																						S	e	t	u	p	▶	

Operating actions on Base menu MC1-xx: CONTROL-Option IOonly = On/Off (faultless state):

Activate soft key	Effect
Soft-Key F1	activates menu PROGRAM
Soft-Key F2	activates menu MANUAL
Soft-Key F3	activates menu SETUP

8.2.1 Menu PROGRAM: program driven (automatic mode)

Menu PROGRAM:

P	R	O	G	R	A	M						C	N	C	m	o	d	e	▶
												D	N	C	m	o	d	e	▶
	?	E	S	C					-	>		B	a	c	k				

Operating actions in menu PROGRAM:

Activate soft key	Effect
	activate menu PROGRAM-CNC
	activate menu PROGRAM-DNC
	Exit menu PROGRAM ; return to base menu MC1-xx

Menu PROGRAM-DNC:

P	R	O	G	R	A	M	-	D	N	C									
	?	S	t	a	r	t			-	>		S	t	a	r	t			
	?	E	S	C					-	>		B	a	c	k				

Operating actions in menu PROGRAM-DNC:

Activate soft key	Effect
	activate DNC mode = MC1 controlled by PC software (ProNC)
	Exit menu PROGRAM-DNC ; return to menu PROGRAM

Activated DNC-mode:

D	N	C	-	M	O	D	E												
!	C	o	m	m	a	n	d		i	n		P	r	o	g	r	e	s	s

8.2.2 Menu MANUAL: Manual operation (initial operation mode)

This mode allows the use of controller's basic functions (reference run, absolute and relative positioning, set and reset outputs) by foil keyboard (soft keys F1 – F4).

Menu MANUAL:

M	A	N	U	A	L					R	e	f	e	r	e	n	c	e	▶				
																		M	o	v	e	▶	
										S	e	t	O	u	t	p	u	t	▶				
	?	E	S	C						-	>		B	a	c	k							

Operating actions in menu MANUAL:

Activate soft key	Effect
	activate menu REFERENCE MOVE
	activate menu MOVE Continuous
	activate menu SET OUTPUT
	Exit menu MANUAL , return to base menu MC1

Menu REFERENCE MOVE: CONTROL-Option IOonly = Off

R	E	F	E	R	E	N	C	E		M	O	V	E										
	?	S	t	a	r	t				-	>		S	t	a	r	t						
	?	E	S	C						-	>		B	a	c	k							

Operating actions in menu REFERENCE MOVE:

Activate soft key	Effect
	start reference run of the connected axis (linear or rotational axis)
	Exit menu REFERENCE MOVE return to menu MANUAL

Menu MOVE Continuous: CONTROL-Option IOonly = Off; LCD line 2 in column 1 marked with 

	M	O	V	E		C	o	n	t	i	n	u	o	u	s			●	↕
●	M	o	v	e														+	▶
	S	p	e	e	d								4	5			-	▶	
P	o	s	(	m	m	)	:						1	2	3	.	0	0	

In this menu you can drive the axis continuously with the current displayed velocity (LCD line 3) by pressing soft keys **F2 (positive direction)** and **F3 (negative direction)**.

Operating actions in menu MOVE Continuous: LCD line 2 in column 1 marked with 

Activate soft key	Effect
	Change marker  in LC display column 1 in following order: 1 -> 2 -> 3 -> 1 ...
	Move axis in positive direction as long as soft key is pressed
	Move axis in negative as long as soft key is pressed
	Exit menu MOVE Continuous return to menu MANUAL

Menu **MOVE Continuous**: LCD line 3 in column 1 marked with 

	M	O	V	E		C	o	n	t	i	n	u	o	u	s				●	↕
	M	o	v	e															+	▶
●	S	p	e	e	d								4	8				-	▶	
P	o	s	(	m	m	)	:								0	.	0	0		

In this menu you can change the current displayed velocity (line 3) by pressing soft keys **F2 (increase velocity)** and **F3 (reduce velocity)**. Pressing the ENTER button affects that the standard values 1, 5, 10, 20, 30, 40, 50 or 100 will be set (multiple pressing is possible).

Operating actions in menu **MOVE Continuous**: LCD line 3 in column 1 marked with 

Activate soft key	Effect
	Change marker position  in LCD column 1 order 1 -> 2 -> 3 -> 1 ...
	Increase velocity value in line 3 (pressing soft key longer than 2 seconds affects a faster increasing of the velocity value)
	Reduce velocity value in line 3 (pressing soft key longer than 2 seconds affects a faster reducing of the velocity value)
	Set the velocity to a standard value
	Exit menu MOVE Continuous Return to menu MANUAL

Menu **MOVE Continuous**: LCD line 1 in column 1 marked with 

●	M	O	V	E		C	o	n	t	i	n	u	o	u	s			●	↕
	M	o	v	e														+	▶
	S	p	e	e	d								4	8				-	▶
P	o	s	(	m	m	)	:								0	.	0	0	

In this menu you can switch with soft keys **F2 (forward)** and **F3 (backward)** between the different motion types.

- MOVE Continuous** = continuous axis motion
- MOVE Pendular** = pendular axis motion from current position at a positive or negative value
- MOVE RelPositive** = relative axis motion in positive direction
- MOVE RelNegative** = relative axis motion in negative direction
- MOVE Absolut** = absolute axis motion to a destination position

Operating actions in menu **MOVE Continuous**: LCD line 1 in column 1 marked with 

Activate soft key	Effect
	Change marker position  in LCD column 1 in order 1 -> 2 -> 3 -> 1 ...
	Switch forward between the different motion types in order: MOVE Continuous -> MOVE Pendular -> MOVE RelPositive -> MOVE RelNegative -> MOVE Absolut
	Switch backward between the different motion types in order: MOVE Continuous -> MOVE Pendular -> MOVE RelPositive -> MOVE RelNegative -> MOVE Absolut
	Exit menu MOVE Continuous Return to menu MANUAL

Menu MOVE Pendular: CONTROL-Option IOonly = Off; LCD line 1 marked

●	M	O	V	E					P	e	n	d	u	l	a	r	●	↕		
	D	i	s	t					0	.	0	0					+	▶		
	S	p	e	e	d						1	0					-	▶		
P	o	s	(m	M)	:										0	.	0	0

or:

Menu MOVE Pendular: CONTROL-Option IOonly = Off; LCD line 2 marked

	M	O	V	E					P	e	n	d	u	l	a	r	●	↕		
●	D	i	s	t					0	.	0	0					+	▶		
	S	p	e	e	d						1	0					-	▶		
P	o	s	(m	m)	:										0	.	0	0

or:

Menu MOVE Pendular: CONTROL-Option IOonly = Off; LCD line 3 marked

	M	O	V	E					P	e	n	d	u	l	a	r	●	↕		
	D	i	s	t					0	.	0	0					+	▶		
●	S	p	e	e	d						1	0					-	▶		
P	o	s	(m	m)	:										0	.	0	0

In this menu, the axis can be positioned as an **endless pendular motion** relative to the current position (LCD line 4).

Pressing the START key with the distance value

Dist (current value in LCD line 2, linear axis: mm, rotation axis degree)

and the velocity value

Speed (current value in LCD line 3, linear axis: mm/sec, rotational axis degree/sec) .

starts the endless pendular motion.

If value of **Dist** > 0 the motion starts in positive direction.

If value of **Dist** < 0 the motion starts in negative direction.

Dependent on which LCD line is marked with ● the soft keys F2 and F3 have following effect:

Line 1 marked: Switch between the different motion types

Line 2 marked: increase or reduce the current **Dist** value

Line 3 marked: increase or reduce the current **Speed** value

Operating actions in menu **MOVE Pendular**: CONTROL-Option IOnly = Off

Activate soft key	Effect
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Soft-Key F1</div>	Change marker position □ in LCD column 1 in order 1 -> 2 -> 3 -> 1 ...
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Soft-Key F2</div>	Line 1 marked: Switch forward between the different motion types in order: MOVE Continuous -> MOVE Pendular -> MOVE RelPositive -> MOVE RelNegative -> MOVE Absolut Line 2 marked : Increase current Dist value Line 3 marked : Increase current Speed value
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Soft-Key F3</div>	Line 1 marked: Switch forward between the different motion types in order: MOVE Continuous -> MOVE Absolut -> MOVE RelNegative -> MOVE RelPositive -> MOVE Pendular Line 2 marked : Reduce current Dist value Line 3 marked : Reduce current Speed value
<div style="background-color: #008000; color: white; border-radius: 10px; padding: 10px; text-align: center; width: fit-content; margin: auto;">Start</div>	Start / Restart pendular motion to destination position (start position + Dist)
<div style="background-color: #FF0000; color: white; border-radius: 10px; padding: 10px; text-align: center; width: fit-content; margin: auto;">Stop</div>	Stops a active relative motion
<div style="background-color: #0000FF; color: white; border-radius: 10px; padding: 10px; text-align: center; width: fit-content; margin: auto;">Enter</div>	Line 2 marked: Set current value for Dist to standard values 0.01...100, -100 ... -0.01 Line 3 marked: Set current value for Speed to standard values 1...100
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">ESC</div>	Exit menu MOVE Pendular Return to menu MANUAL

Menu MOVE RelPositive: CONTROL-Option IOonly = Off; LCD line 1 marked

●	M	O	V	E		R	e	I	P	o	s	i	t	i	v	e	●	↕	
	D	i	s	t								0	.	0	0		+	▶	
	S	p	e	e	d									1	0		-	▶	
P	o	s	(m	m)	:									0	.	0	0

or:

Menu MOVE RelPositive: CONTROL-Option IOonly = Off; LCD line 2 marked

	M	O	V	E		R	e	I	P	o	s	i	t	i	v	e	●	↕	
●	D	i	s	t								0	.	0	0		+	▶	
	S	p	e	e	d									1	0		-	▶	
P	o	s	(m	m)	:									0	.	0	0

or:

Menu MOVE RelPositive: CONTROL-Option IOonly = Off; LCD line 3 marked

	M	O	V	E		R	e	I	P	o	s	i	t	i	v	e	●	↕	
	D	i	s	t								0	.	0	0		+	▶	
●	S	p	e	e	d									1	0		-	▶	
P	o	s	(m	m)	:									0	.	0	0

In this menu the axis can be positioned in **positive direction** relative to the current position (LCD line 4).

Pressing the START key with the distance value

Dist (current value in LCD line 2, linear axis: mm, rotation axis degree)

and the velocity value

Speed (current value in LCD line 3, linear axis: mm/sec, rotation axis degree/sec) .

starts the positioning in positive direction.

Dependent which LCD line is marked with ● the soft keys F2 and F3 have following effect:

Line 1 marked: Switch between the different motion types

Line 2 marked: increase or reduce the current **Dist** value

Line 3 marked: increase or reduce the current **Speed** value

Operating actions in menu **MOVE RelPositive**: CONTROL-Option IOnly = Off

Activate soft key	Effect
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Soft-Key F1</div>	Change marker position □ in LCD column 1 in order 1 -> 2 -> 3 -> 1 ...
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Soft-Key F2</div>	Line 1 marked: Switch forward between the different motion types in order: MOVE Continuous -> MOVE Pendular -> MOVE RelPositive -> MOVE RelNegative -> MOVE Absolut Line 2 marked : Increase current Dist value Line 3 marked : Increase current Speed value
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Soft-Key F3</div>	Line 1 marked: Switch forward between the different motion types in order: MOVE Continuous -> MOVE Absolut -> MOVE RelNegative -> MOVE RelPositive -> MOVE Pendular Line 2 marked : Reduce current Dist value Line 3 marked : Reduce current Speed value
<div style="background-color: #008000; color: white; border-radius: 10px; padding: 10px; text-align: center; width: fit-content; margin: auto;">Start</div>	Start / Restart motion in positive direction to destination position (start position + Dist)
<div style="background-color: #FF0000; color: white; border-radius: 10px; padding: 10px; text-align: center; width: fit-content; margin: auto;">Stop</div>	Stops an active relative motion
<div style="background-color: #00BFFF; color: white; border-radius: 10px; padding: 10px; text-align: center; width: fit-content; margin: auto;">Enter</div>	Line 2 marked: Set current value for Dist to standard values 0.01...100, -100 ... -0.01 Line 3 marked: Set current value for Speed to standard values 1...100
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">ESC</div>	Exit menu MOVE RelPositive Return to menu MANUAL

Menu MOVE ReINegative: CONTROL-Option IOnly = Off; LCD line 1 marked

●	M	O	V	E		R	e	I	N	e	g	a	t	i	v	e		●	↕
	D	i	s	t									0	.	0	0		+	▶
	S	p	e	e	d										1	0		-	▶
P	o	s	(	m	m	)	:									0	.	0	0

or:

Menu MOVE ReINegative: CONTROL-Option IOnly = Off; LCD line 2 marked

	M	O	V	E		R	e	I	N	e	g	a	t	i	v	e		●	↕	
●	D	i	s	t										0	.	0	0		+	▶
	S	p	e	e	d										1	0		-	▶	
P	o	s	(	m	m	)	:									0	.	0	0

or:

Menu MOVE ReINegative: CONTROL-Option IOnly = Off; LCD line 3 marked

	M	O	V	E		R	e	I	N	e	g	a	t	i	v	e		●	↕	
	D	i	s	t										0	.	0	0		+	▶
●	S	p	e	e	d										1	0		-	▶	
P	o	s	(	m	m	)	:									0	.	0	0

In this menu the axis can be positioned in **negative direction** relative to the current position (LCD line 4).

Pressing the START key with the distance value

Dist (current value in LCD line 2, linear axis: mm, rotation axis degree)

and the velocity value

Speed (current value in LCD line 3, linear axis: mm/sec, rotation axis degree/sec) .

starts the positioning in negative direction.

Dependent which LCD line is marked with **●** the soft keys F2 and F3 have following effect:

Line 1 marked: Switch between the different motion types

Line 2 marked: increase or reduce the current **Dist** value

Line 3 marked: increase or reduce the current **Speed** value

Operating actions in menu **MOVE RelNegative**: CONTROL-Option IOnly = Off

Activate soft key	Effect
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Soft-Key F1</div>	Change marker position  in LCD column 1 in order 1 -> 2 -> 3 -> 1 ...
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Soft-Key F2</div>	Line 1 marked: Switch forward between the different motion types in order: MOVE Continuous -> MOVE Pendular -> MOVE RelPositive -> MOVE RelNegative -> MOVE Absolut Line 2 marked : Increase current Dist value Line 3 marked : Increase current Speed value
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Soft-Key F3</div>	Line 1 marked: Switch backward between the different motion types in order: MOVE Continuous -> MOVE Absolut -> MOVE RelNegative -> MOVE RelPositive -> MOVE Pendular Line 2 marked : Reduce current Dist value Line 3 marked : Reduce current Speed value
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto; background-color: #008000; color: white; text-align: center;">Start</div>	Start / Restart motion in negative direction to destination position (start position + Dist)
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto; background-color: #ff0000; color: white; text-align: center;">Stop</div>	Stops a active relative motion
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto; background-color: #00bfff; color: white; text-align: center;">Enter</div>	Line 2 marked: Set current value for Dist to standard values 0.01...100, -100 ... -0.01 Line 3 marked: Set current value for Speed to standard values 1...100
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">ESC</div>	Exit menu MOVE RelNegative Return to menu MANUAL

Menu MOVE Absolut: CONTROL-Option IOonly = Off; LCD line 1 marked

●	M	O	V	E					A	b	s	o	l	u	t			●	↕
	D	i	s	t								0	.	0	0			+	▶
	S	p	e	e	d									1	0			-	▶
P	o	s	(	m	m	)	:									0	.	0	0

or:

Menu MOVE Absolut: CONTROL-Option IOonly = Off; LCD line 2 marked

	M	O	V	E					A	b	s	o	l	u	t			●	↕
●	D	i	s	t								0	.	0	0			+	▶
	S	p	e	e	d									1	0			-	▶
P	o	s	(	m	m	)	:									0	.	0	0

or:

Menu MOVE Absolut: CONTROL-Option IOonly = Off; LCD line 3 marked

	M	O	V	E					A	b	s	o	l	u	t			●	↕
	D	i	s	t								0	.	0	0			+	▶
●	S	p	e	e	d									1	0			-	▶
P	o	s	(	m	m	)	:									0	.	0	0

In this menu the axis can be positioned to an **absolute position** (LCD line 4).

Pressing the START key with the distance value

Dist (current value in LCD line 2, linear axis: mm, rotation axis degree)

and the velocity value

Speed (current value in LCD line 3, linear axis: mm/sec, rotation axis degree/sec) .

starts the absolute positioning.

Dependent which LCD line is marked with ● the soft keys F2 and F3 have following effect:

Line 1 marked: Switch between the different motion types

Line 2 marked: increase or reduce the current **Dist** value

Line 3 marked: increase or reduce the current **Speed** value

Operating actions in menu **MOVE Absolut**: CONTROL-Option IOnly = Off

Activate soft key	Effect
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: auto;">Soft-Key F1</div>	Change marker position □ in LCD column 1 in order 1 -> 2 -> 3 -> 1 ...
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: auto;">Soft-Key F2</div>	Line 1 marked: Switch forward between the different motion types in order: MOVE Continuous -> MOVE Pendular -> MOVE RelPositive -> MOVE RelNegative -> MOVE Absolut Line 2 marked : Increase current Dist value Line 3 marked : Increase current Speed value
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: auto;">Soft-Key F3</div>	Line 1 marked: Switch backward between the different motion types in order: MOVE Continuous -> MOVE Absolut -> MOVE RelNegative -> MOVE RelPositive -> MOVE Pendular Line 2 marked : Reduce current Dist value Line 3 marked : Reduce current Speed value
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto; background-color: #008000; color: white; text-align: center;">Start</div>	Start / Restart motion to absolute destination position
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto; background-color: #ff0000; color: white; text-align: center;">Stop</div>	Stops an active motion to an absolute destination position
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto; background-color: #00bfff; color: white; text-align: center;">Enter</div>	Line 2 marked: Set current value for Dist to standard values 0.01...100, -100 ... -0.01 Line 3 marked: Set current value for Speed to standard values 1...100
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto; text-align: center;">ESC</div>	Exit menu MOVE Absolut Return to menu MANUAL

Menu SET OUTPUT:

S	E	T		O	U	T	P	U	T					A	1	.	1	▶		
														O	n	/	O	f	f	▶
A	1	=		0	1	0	1	0	1	0	1	b			5	5	h	e	x	
	?	E	S	C					-	>		B	a	c	k					

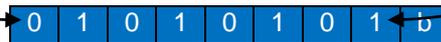
In this menu you can manually switch on/off the binary outputs (output 1 – output 8) of the MC1 output port (A1).

LCD line 3 shows the current state of the output port A1

binary

MSB = Most Significant Bit A1.8
left

LSB = Least Significant Bit A1.1
right



resp. hexadecimal.



Operating actions in menu SET OUTPUT:

Activate soft key	Effect
Soft-Key F1	Select output to switch in order: 1,2,3,4,5,6,7,8,1 ..
Soft-Key F2	Set (On) resp. Reset (Off) of selected output. The state of the output port A1 in line 3 will be updated.
ESC	Exit menu SET OUTPUT Return to menu MANUAL



When Exit the menu SET OUTPUT the current state of the output port A1 will not be changed or set to a default value!

Menu SETUP DRIVER: CONTROL-Option IOnly = Off

S	E	T	U	P		D	R	I	V	E	R								
	?	S	t	a	r	t		-	>		S	t	a	r	t				
	?	E	S	C				-	>		B	a	c	k					

In this menu the initial operation / parameterization of motor power amplifier IMDxx can be prepared (refer to section DNC mode).

Proceed as follows:

1. Connect the serial interface RS-232 (PC) on the back of the controller with the supplied yellow interface cable to the COM port of the PC / notebook
2. Press START button on the front of the controller -> the activated communication (setup active) between PC / notebook and the motor amplifier IMDxx will appear on the LCD display:

S	E	T	U	P		D	R	I	V	E	R								
				S	e	t	u	p		a	c	t	i	v	e				
	?	S	t	o	p			-	>		S	t	o	P					

3. On the PC, start setup program (e.g. DCSetup.exe), for the selected COM port set the data transfer rate to 57600 bits / sec = 57600 Baud
4. Initial operation / Parameterization of the power amplifier IMDxx
5. On the PC, quit the setup program
6. Press STOP button on the front page of the controller → menu SETUP DRIVER exits
7. Press ESC button on the front page of the controller → return to the SETUP menu

Operating actions in menu SETUP DRIVER: CONTROL-Option IOnly = Off

Activate soft key	Effect
	Sets the data transfer rate of the serial interface RS-232(to PC) on the back side of the controller to 57000 bits/sec and guarantees the faultless communication between power amplifier IMDxx and PC.
	Quit serial communication between PC and power amplifier IMDxx Menu SETUP DRIVER Setup active exits
	Exit menu SETUP DRIVER Return to menu SETUP

Menu SETUP CONTROL:

S	E	T	U	P	C	O	N	T	R	O	L	=	O	f	f	▲
					I	O	o	n	l	y	=	O	f	f		▶
		C	N	C	d	i	s	p	l	a	y	=	O	f	f	▶
	?	E	S	C				-	>	B	a	c	k			▼

Choose this menu to activate / deactivate the following control options.



To arrive at the upper and lower menu entries use the soft keys F1 and F4 for scrolling up and down.

Control option	State = On (activated, on)	State = Off (deactivated, off)
IOnly (refer to chapter CNC-Mode)	All motion commands in the user program will not be executed in CNC mode; the controller works without a connected axis (linear or rotational axis)	All motion commands in the user program will be executed in CNC mode; the controller works with a connected axis (linear or rotational axis)
CNCdisplay	During program execution LCD line 1 shows the current program line number and line 3 shows the actual position of the axis	During program execution the LCD lines 1 and 3 show no information (program line number and actual position); they can be programmed by user with his own LCD messages
CNCautostart	After switching on (power switch and POWER button) the 1-axis-controller executes the user program currently stored in the flash memory without additional user action If option CNCautostart and DNCautostart is activated (On), DNCautostart is favored and activated on next Power On Reset. If this option is activated operators must be instructed regarding possible danger!	After switching on (power switch and POWER button) the 1-axis-controller a program execution of stored user program must be started from menu PROGRAM (additional action by user)
DNCautostart	After switching on (power switch and POWER button) the 1-axis-controller operates in DNC mode . Use this option to control 1-axis controller with ProNC via a serial connection. If option CNCautostart and DNCautostart is activated (On), DNCautostart is favored and activated on next Power On Reset.	After switching on (power switch and POWER button) the 1-axis-controller operates in CNC mode .

EXTstart	An active rising edge (Low-High) on input E1.1 = Input 1 starts or restarts a stopped program execution	Program execution will be started or restarted by pressing the START-button on the controller front side
EXTstop	An active rising edge (Low-High) on input E1.2 = Input 2 stops the program execution	Program execution will be stopped by pressing the STOP-button on the controller front side

Operating actions in Menu SETUP CONTROL:

Activate soft key	Effect
Soft-Key F1	Control options shown in LCD line 2 and 3 will be scrolled up one line
Soft-Key F2	Switch on (On) or off (Off) marked control option shown in LCD line 2
Soft-Key F3	Switch on (On) or off (Off) marked control option shown in LCD line 3
Soft-Key F4	Control options shown in LCD line 2 and 3 will be scrolled down one line
ESC	Exit menu SETUP CONTROL ; Return to menu SETUP

9 Software

9.1 Initial operation and parameterization power amplifiers IMDxx

Initial operation / parameterization of motor power amplifiers inside the 1-axis-controller MC1 will be realized with the following initial operation software

DCSetup.exe	brushed DC-servo-motors
ACSetup.exe	brushless DC-servo-motors
STEPSetup.exe	3-phase stepper motors (future extension with IMD30)

in DNC mode of the controller.

9.1.1 Installing setup programs

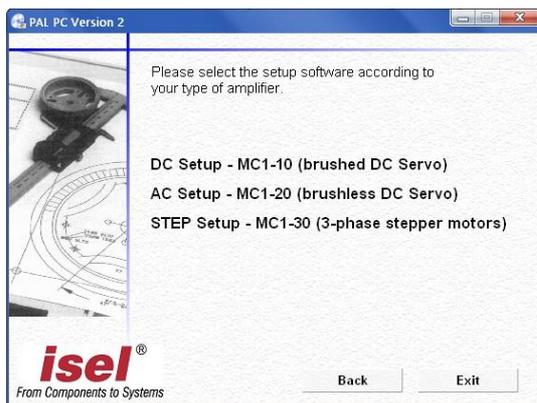
Install as follows:

1. PALPC 2.1 (Part.-No.: Z11-331810) installation CD in your PCs / Notebooks CD/DVD drive
2. The following window will be shown.



If this window is not shown start Windows Explorer and open the root directory of the CD/DVD drive and double click on file "autorun.exe".

3. Click on the entry "Install Setup programs"



Select the initial operation software for your motor type. Click on the entries to start installation.

Follow the instructions of the installation assistant.

After successful installation close the Auto-Start dialog by clicking button "Exit".

9.1.2 Starting setup software and serial connection

DCSetup.exe, ACSetup.exe and STEPSetup.exe are PC based dialog programs (operating system Windows 2000, XP or Vista) for parameterization motor amplifiers IMDxx of 1-axis-controller MC1 via serial interface (RS232). The use of these complex setup programs is described in manuals /1/ and /2/.

For initial operation do as follows:

1. Set: MC1-xx: CONTROL-Option, IOOnly = Off
2. Activate: MC1-xx: menu SETUP DRIVER

S	E	T	U	P		D	R	I	V	E	R								
	?	S	t	a	r	t		-	>	S	t	a	r	t					
	?	E	S	C				-	>	B	a	c	k						

3. Connect serial interface RS232 (PC) on controller back side with a COM interface of your PC / Notebook. Therefore use the delivered yellow interface cable.

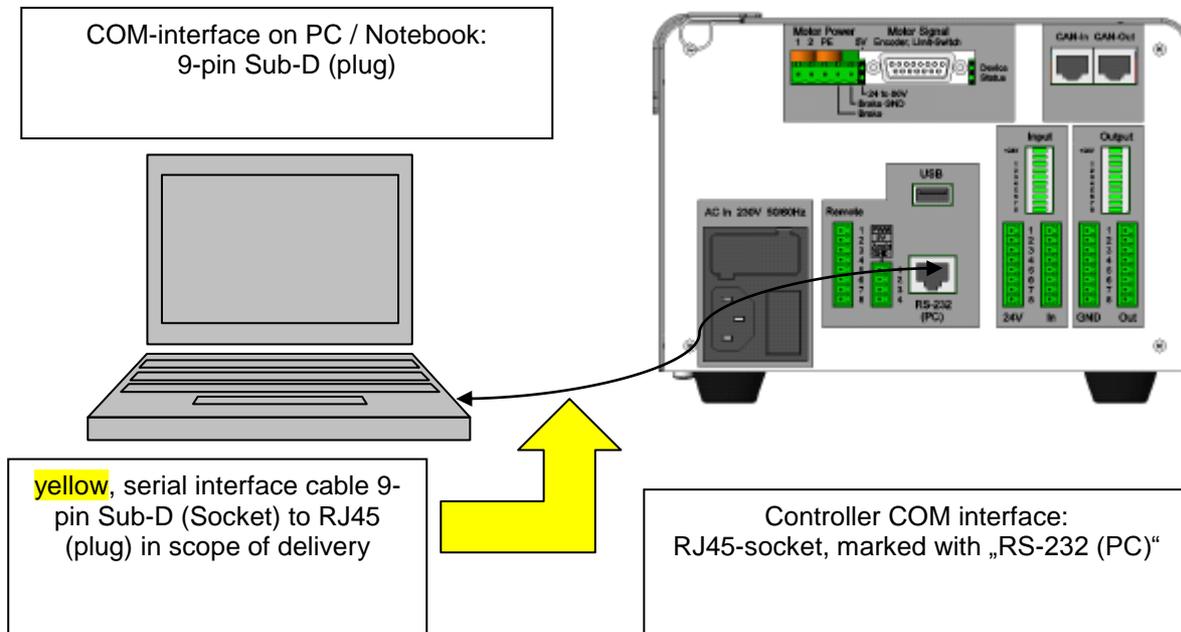
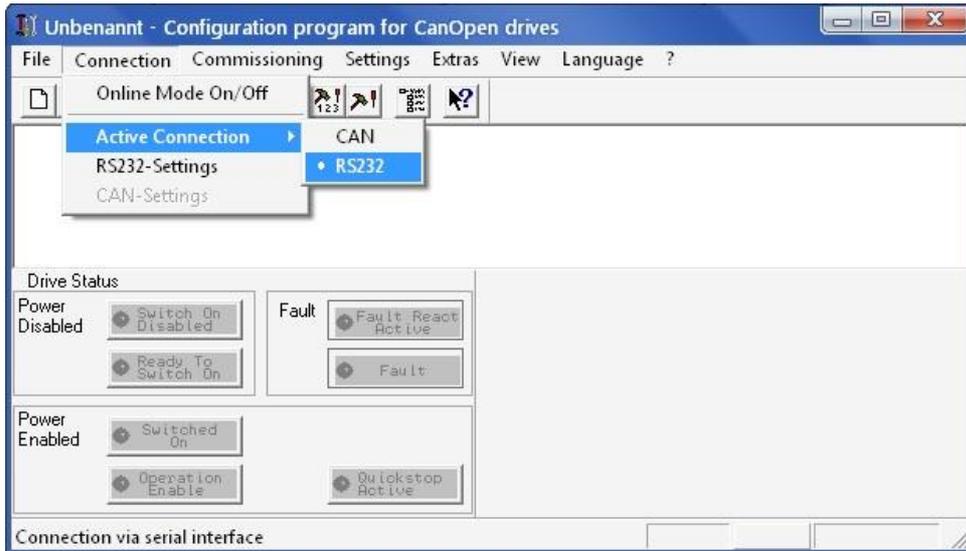


Image: Serial connection (RS-232) PC / Notebook with MC1 via interface cable

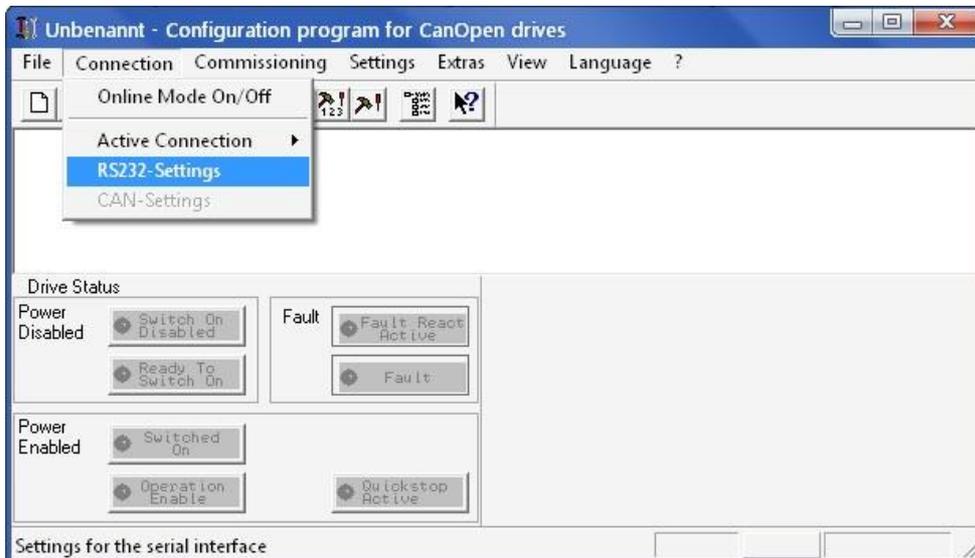
4. Press: MC1-xx: START button -> the activated communication (Setup active) between PC / Notebook and motor power amplifier IMDxx is shown on LC display:

S	E	T	U	P		D	R	I	V	E	R								
			S	e	t	u	p		a	c	t	i	v	e					
	?	S	t	o	p			-	>	S	t	o	p						

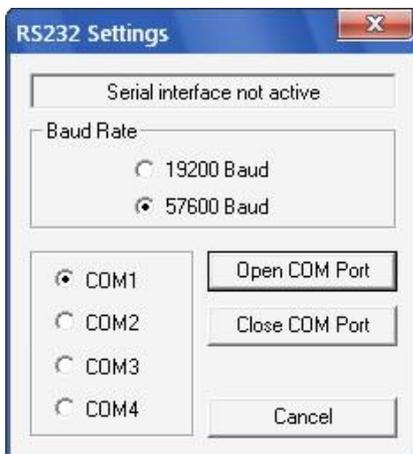
5. Start setup program (e.g. DCSetup.exe) from PC / Notebook and set active connection to RS232:



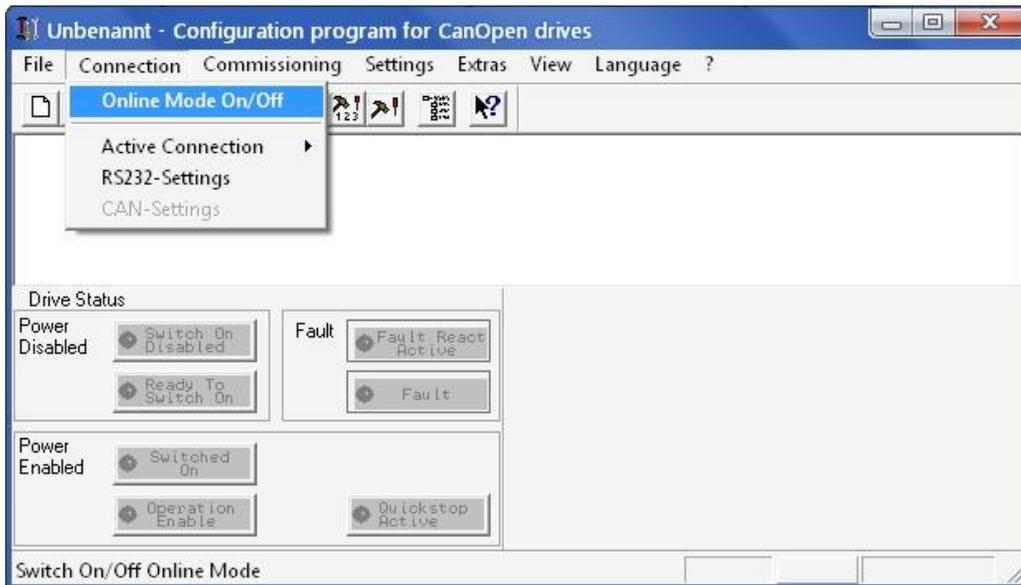
6. In main menu click on Connection → RS232-Settings:



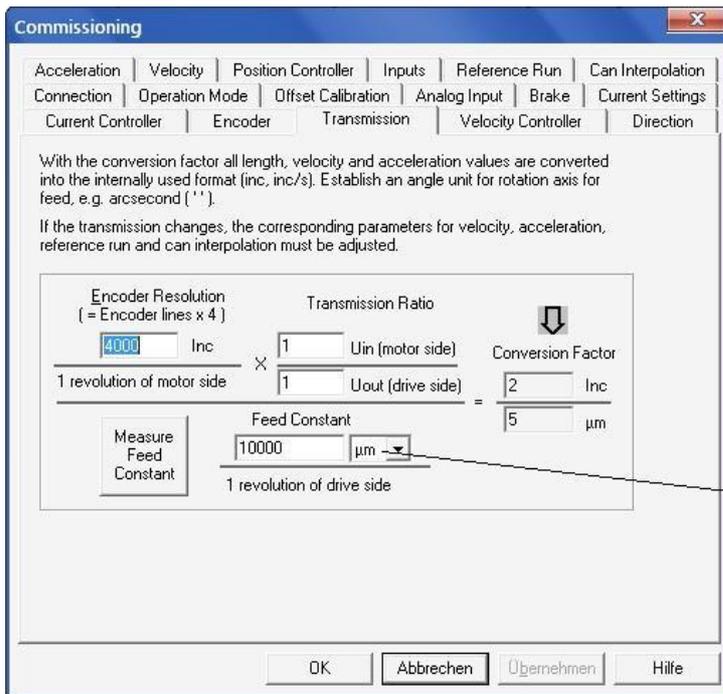
7. Set the used PC/Notebook COM interface (COM1...COM4) and baud rate to 57600 baud. Close settings dialog by clicking on button "Open COM Port":



8. Click on Entry: Connection → Online Mode On/Off and start parameter Upload from IMDxx:

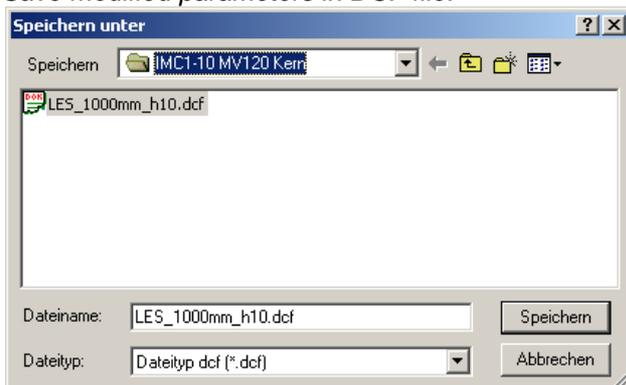


9. Do initial operation / parameterization IMDxx (refer to /1/ /2/) e.g. dialog window "Transmission" for setup encoder resolution, transmission ratio or feed constant:



linear axis = µm
rotation axis = arcseconds "

10. Save modified parameters in DCF file:



11. Close setup program on PC/Notebook.

12. Press MC1-xx: STOP-button on the controller front side

S	E	T	U	P		D	R	I	V	E	R								
				S	e	t	u	p		a	c	t	i	v	e				
	?	S	t	o	p				-	>		S	t	o	p				

→ Communication between PC/Notebook and IMDxx deactivated, menu SETUP DRIVER is activated

S	E	T	U	P		D	R	I	V	E	R								
	?	S	t	a	r	t				-	>		S	t	a	r	t		
	?	E	S	C						-	>		B	a	c	k			

13. Press MC1-xx: ESC-button on the controller front side → Return to menu SETUP:

S	E	T	U	P									D	r	i	v	e	r	▶	
													C	o	n	t	r	o	l	▶
	?	E	S	C						-	>		B	a	c	k				

14. Press MC1-xx: ESC-button on the controller front side → Return to base menu:

M	C	1	-	1	0								P	r	o	g	r	a	m	▶
														M	a	n	u	a	l	▶
														S	e	t	u	p	▶	
	?	P	o	w	e	r														

9.2 PALPC: User programming for CNC mode and download

Creating user programs for 1-axis-controller MC1 is realized with the software PALPC.exe. The implementation method is simple and described in /3/.

Analyze technological problem definition:

- Layout program algorithm (solve problem definition)
- Implementation of the control algorithm into a PALPC source program *.ppc; edit code with text editor
- Compile PALPC source file with PALPC compiler; on faultless translation an output file *.out is created by the compiler
- Download output file *.out into the flash memory of 1-axis-controller MC1
- Start program and check control behavior regarding technological problem definition

9.2.1 Install programming software PALPC.exe

To install PALPC software do the following:

1. Insert PALPC 2.1 (Part.-No.: Z11-331810) installation CD in your PCs / Notebooks CD/DVD drive. The following window will be shown.



2. Click on "Install PAL PC" and follow the installation instructions.

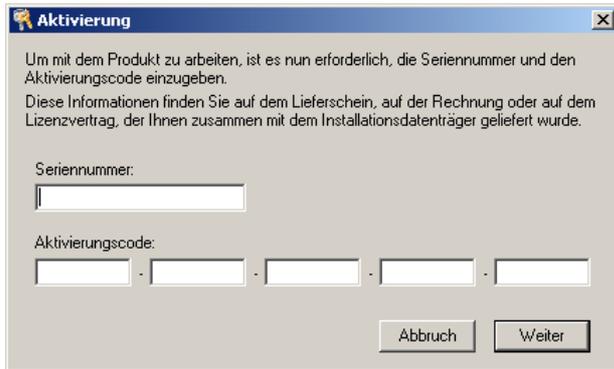
info

If this window is not shown start Windows Explorer and open the root directory of the CD/DVD drive and double click on file "Autorun.exe".

PALPC installation assistant → installation dialog:



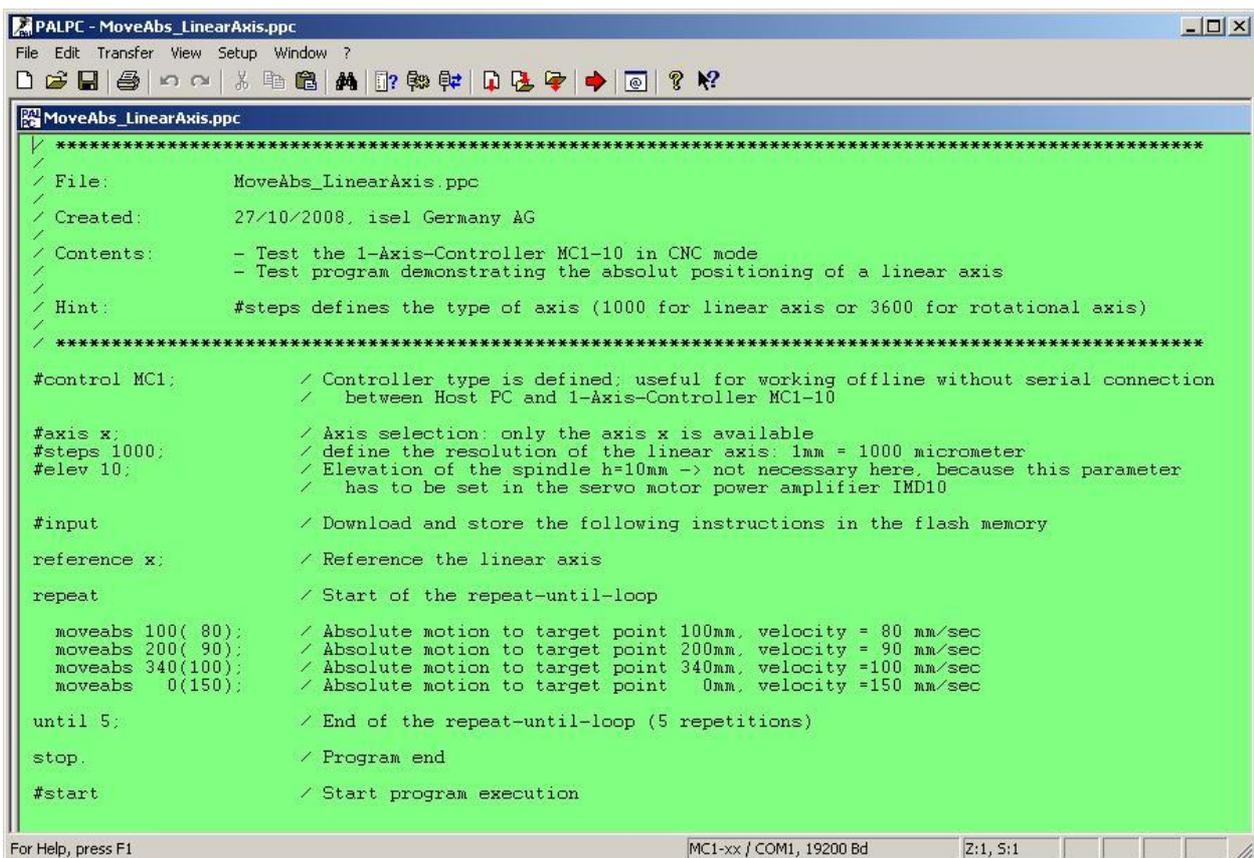
- Start PALPC.exe via start menu entry or desktop shortcut. On first startup an activation window will be shown. Enter delivered registration data (serial number and activation code) into the dialogs edit fields.



9.2.2 User programming for CNC mode and download

The use of PALPC and user programming are described in /3/.

For 1-axis-controller MC1 series note following specialties:



- The declaration

```
#control MC1;
```

defines target controller as 1-axis-controller MC1 type, thereby you can use controller specific commands e.g. LC display output commands.

2. The declaration

```
#steps 1000;
```

defines that the connected axis is a **linear axis**. All data for positions / move operations (absolute or relative) were specified in **mm** resp. **mm/sec**.

```
#steps 3600;
```

defines that the connected axis is a **rotation axis**. All data for positions / move operations (absolute or relative) were specified in **degree** resp. **degree/sec**.

3. The declaration

```
#elev value_spindle_pitch;
```

will be ignored because the transmission parameters are set and stored during initial operation (see chapter 9.1 **Initial operation and parameterization power amplifiers IMDxx**)

4. Syntax for command(s) to clear LCD line(s):

```
lcd_clear;                / clear all LCD lines (1 to 4)
lcd_clear 1;              / clear LCD line 1
lcd_clear 2;              / clear LCD line 2
lcd_clear 3;              / clear LCD line 3
lcd_clear 4;              / clear LCD line 4
```

5. Instruction to write text on LC display, e.g.

```
lcd_write 3,1," Request soft keys ";
```

Syntax:

Command code: lcd_write
1. Parameter: line number (1 ... 4)
2. Parameter: column number (1 ... 20)
3. Parameter: text (maximum 20 character, enclosed by „ ...“)

6. Instruction to define an abort of a following absolute or relative axis motion, e.g.

```
abort_cond 0,1=1;        / Port 0, binary input 1 will be tested on logic 1 = high
abort_cond 0,128=0x0F;   / Port 0, binary inputs 1 to 4 will be tested on logic 1 = high,
                        / binary inputs 5 to 8 will be tested on logic 0 = low
```

Syntax:

Command code: abort_cond
1. Parameter: port number (0 for user inputs Input 1...8, 1 for Soft-Keys F1...F4)
2. Parameter: bit number (1...8 for user input 1...8, 128 for whole port)
3. Parameter: comparison value (0 or 1 for testing, whether input is low or high active; hexadecimal, binary or decimal values >=0 resp. <= 255 for testing whole port with the comparison value)

The following example programs should help to demonstrate 1-axis-controller specific programming.



These demo and other user programs you can find on PALPC installation disc in the directory:

CD-root: \PALPC\Samples\MC1-xx



Get status of soft keys 1 - 4 and text output on LC display:

```

/ *****
/ File:          OnKeyEng.ppc
/ Controller:    1-Axis-Controller MC1-10 with motor amplifier IMD10 (CNC mode)
/ Contents:      Test program for CNC mode -> request the soft keys F1 to F4
/ Created:       27/10/2008, isel Germany AG
/ *****
#control MC1;          / Declare the target controller
#axis x;              / Declare that only x axis is available
#steps 1000;          / Resolution of linear axis (1mm=1000micrometer)
#define DELAY_TO_CLEAR 10; / Time until current LCD row will be cleared
#input flash          / Download and store the following instructions to
flash

lcd_clear;            / Clear LCD rows 1 to 4
                      / Write LCD rows 1 to 4

lcd_write 1,1,"-----";
lcd_write 2,1,"MC1-10 Test program ";
lcd_write 3,1," Polling Soft-Keys ";
lcd_write 4,1,"-----";
delay 20;             / Wait 2 seconds (20*100msec)
lcd_clear;            / Clear LCD rows 1 to 4
MAIN_LOOP:           / Main loop with polling the Soft-Keys F1 to F4
    set_port 0,128=0x00; / Reset all 8 outputs in Port A1 (A1.1 to A1.8)
    on_key 1,F1_PRESSED; / If F1 pressed jump to label F1_PRESSED
    on_key 2,F2_PRESSED; / If F2 pressed jump to label F2_PRESSED
    on_key 3,F3_PRESSED; / If F3 pressed jump to label F3_PRESSED
    on_key 4,F4_PRESSED; / If F4 pressed jump to label F4_PRESSED
goto MAIN_LOOP;      / Jump to label MAIN_LOOP

F1_PRESSED:
set_port 0,1=1;      / Set output A1.1
lcd_write 1,1,"F1 pressed"; / Write LCD row 1
delay DELAY_TO_CLEAR ; / Wait
lcd_clear 1;         / Clear LCD row 1
goto MAIN_LOOP;     / Jump to label MAIN_LOOP
F2_PRESSED:
set_port 0,2=1;      / Set output A1.2
lcd_write 2,1,"F2 pressed"; / Write LCD row 2
delay DELAY_TO_CLEAR ; / Wait
lcd_clear 2;         / Clear LCD row 2
goto MAIN_LOOP;     / Jump to label MAIN_LOOP
F3_PRESSED:
set_port 0,3=1;      / setze Ausgang A1.3
lcd_write 3,1,"F3 pressed"; / Write LCD row 3
delay DELAY_TO_CLEAR ; / Wait
lcd_clear 3;         / Clear LCD row 3
goto MAIN_LOOP;     / Jump to label MAIN_LOOP
F4_PRESSED:
set_port 0,4=1;      / setze Ausgang A1.4
lcd_write 4,1,"F4 pressed "; / Write LCD row 4
delay DELAY_TO_CLEAR ; / Wait
lcd_clear 4;         / Clear LCD row 4
goto MAIN_LOOP;     / Jump to label MAIN_LOOP
stop.                / End of statements / program

```



Send synchronization characters and wait for synchronization characters

```

/ *****
/ File:          SendWaitEng.ppc
/ Controller:    1-Axis-Controller MC1-10 with power amplifier IMD10
/               (CNC mode)
/ Contents:     Test program in CNC mode
/               -> Send      synchronisation character
/               -> Wait for synchronisation character
/ Created:      27/09/2008, isel Germany AG
/ *****

#control MC1;          / Declare MC1 as target controller
#axis x;              / Declare that only x axis is available
#steps 1000;         / Resolution of linear axis (1mm=1000micrometer)

#input               / Download and store the following instructions to
flash

lcd_clear;           / Clear LCD rows 1 to 4
lcd_write 1,1,"MC1-10 Test program ";
lcd_write 2,1," send and wait for ";
lcd_write 3,1," synchronisation ";
lcd_write 4,1," character-----";
delay 20;           / Wait 2 seconds
lcd_clear;          / Clear LCD rows 1 to 4

MAIN_LOOP:

send 'A';           / Send character 'A' over the RS232 serial
interface          / to a Terminal or Controller

wait 'B',RX_OK;    / Wait for receiving a character over the RS232
                  / serial interface; if the character 'B'
                  / was received, branch to label RX_OK;
                  / if another character was received,
goto MAIN_LOOP;    / branch to label MAIN_LOOP

RX_OK:
                  / Write text to LCD row 4
lcd_write 4,1,"Char B received ...";
delay 10;          / Wait 1 second
lcd_clear 4;       / Clear LCD row 4
goto MAIN_LOOP;   / Jump to label MAIN_LOOP

stop.

```



Send synchronization characters and wait for synchronization characters

```

/*****
/ File:          AbortCondEng.ppc
/
/ Created:       27/10/2008, isel Germany AG
/
/ Contents:     - 1-Axis-Controller MC1-10 with motor amplifier IMD10
/                (CNC mode)
/                - Test program to demonstrate a motion abort when
/                  defining an abort condition
/ Hint:         #steps defines the type of axis (1000 for linear axis or
/                3600 for rotational axis)
/ *****/

#control MC1;          / Controller type is defined; useful for working
                        / offline without serial connection
                        / between Host PC and 1-Axis-Controller MC1-10
#axis x;              / Axis selection: only the axis x is available
#steps 1000;          / define the resolution of the linear axis: 1mm =
1000 micrometer
#elev 10;            / Elevation of the spindle h=10mm -> not necessary
                        / here, because this parameter
                        / has to be set in the servo motor power
                        / amplifier IMD10
#input               / Download and store the following instructions in
                        / the flash memory
reference x;          / Reference the linear axis
repeat               / Start of the repeat-until-loop

  abort_cond 0,128=0x0F; / Condition for motion abort: port 0, whole
                        / port value (1 Byte),
                        / compare value: 0x0F = 15 decimal
                        / Hint: this abort condition is valid only
                        / for the immediately
                        / following motion instruction (absolute or
                        / relative);
                        / if the condition will never become true
                        / during motion
                        / (i.e. never is logically true), the motion
                        / will continue until
                        / the target position in the next motion
                        / instruction (absolute or relative)
                        / will be reached
  moveabs 500(100);   / Absolute motion to target position 500mm
                        / velocity = 100 mm/sec

  abort_cond 0,1=1;   / Abort condition: Port 0, Bit 1 = Input 1
                        / will be tested to be High=logically 1
                        / (i.e. connected to 24VDC)
                        / Hint: this abort condition only refers to
                        / the immediately
                        / following motion instruction (absolute or
                        / relative);
  moveabs 100(200);  / Absolute motion to target position 100mm,
                        / velocity = 200 mm/sec

until 5;             / End of the repeat-until-loop (5 repetitions)
stop.                / Program end

```

For transfer of the source file created in the translation target file (with the default extension *.out) into the flash memory of the 1-axis-controller (download data transmission rate of the COM port: 19200 bits / sec) the connection between PC / notebook and MC1 is required.

Image on Page 47:
Serial connection (RS-232) PC / Notebook with MC1 via interface cable

11 EC Declaration of Conformity

EG -Konformitätserklärung

Der Hersteller
The manufacturer**isel Germany AG** **Bürgermeister-Ebert-Str. 40**
D-36124 Eichenzellerklärt hiermit, dass folgendes Produkt
hereby declares that the following product

Geräteart:	1-Achs-Controller	
<i>Device:</i>	1-axis controller	
Typ:	für bürstenbehaftete DC-Servomotoren	MC1-10
	bürstenlose DC-Servomotoren	MC1-20
<i>Type:</i>	for brushed DC servo motors	MC1-10
	for brushless DC servo motors	MC1-20
Art.-Nr.:	MC1-10: 381518 0010	
<i>Product - No.:</i>	MC1-20: 381518 0020	

mit den Vorschriften folgender Europäischer Richtlinien übereinstimmt:
complies with the requirements of the European Directives:

EG-Richtlinie 2004/108/EG <i>EC-Directive 2004/108/EC</i>	EMV Richtlinie <i>EMC directive</i>
EG-Richtlinie 73/23/EWG <i>EC-Directive 73/23/ECC</i>	Niederspannungsrichtlinie <i>low voltage directive</i>

Folgende harmonisierte Normen wurden angewandt:
Following harmonized standards have been applied:

EN 61000-6-2:2005	EMV - Fachgrundnorm - Störfestigkeit für Industriebereich <i>EMC - Generic standards - Immunity for industrial environments</i>
EN 61000-4-2:2007	EMV - Prüf- und Messverfahren - Prüfung der Störfestigkeit gegen Entladung statischer Elektrizität (ESD) <i>EMC - Testing and measurement techniques; Electrostatic discharge immunity test</i>
EN 61000-4-4:2004	EMV - Prüf- und Messverfahren - Prüfung der Störfestigkeit gegen schnelle transiente elektrische Störgrößen (Burst) <i>EMC - Testing and measurement techniques - Electrical fast transient/burst immunity test</i>
EN 61000-4-5:2006	EMV - Prüf- und Messverfahren - Prüfung der Störfestigkeit gegen energiereiche Impulse (Surge) <i>EMC - Testing and measurement techniques - Surge immunity test</i>
EN 61000-4-11:2004	EMV - Prüf- und Messverfahren - Prüfung der Störfestigkeit gegen Spannungseinbrüche / Spannungsunterbrechungen <i>EMC - Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests</i>
EN 61000-6-4:2007	EMV - Fachgrundnorm - Störaussendung Industriebereich <i>EMC - Generic standards - Emission standard for industrial environments</i>
DIN EN 55011:2007	Industrielle, wissenschaftliche und medizinische Hochfrequenzgeräte (ISM-Geräte) - Funkstörungen - Grenzwerte und Messverfahren Industrial scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement

Dermbach, 13.01.2009

Hugo Isert, Vorstandsvorsitzender / chairman

The 1-axis-controller MC1-10 / MC1-20 is intended for use with brushed / brushless DC servo motors and the appropriate peripheral circuitry determines which he is a complete end product or system. Compliance with the safety and EMC regulations is dependent by correct installation and configuration of the power amplifiers IMD10 / IMD20 including concretely DC-servo motor as a component of a mechanical loaded linear or rotational axis.

The controller may be installed, configured and programmed only by professionals, which are well informed with the applicable safety and EMC regulations. Those persons ensure that the final product or system is in accordance with the relevant statutory provisions of the country, in which it is used.

Definition of minimal operating quality

The manufacturer isel Germany AG defines the minimal operating quality for immunity testing for 1-axis-controller MC1-10 / MC1-20 as follows:

Allowable loss of operating quality:

It is allowed that the linear or rotational axis that is connected to 1-axis-controller **during** EMC immunity stops and will no longer be moved, even if the user program is active (executed). Furthermore it is possible that the function keys on the front of the 1-axis-controller will not react if pressed at this time.

- ➔ The 1-axis-controller MC1-10 / MC1-20 must work, after switching the main power supply off and on again (Power On Reset), in the correct operation mode and without data loss (user program in controller flash memory).

Unallowable loss of operating quality:

- data loss (user program in controller memory) is not allowed
- automatically change of operation mode is not allowed
- it is not allowed that the connected linear or rotational axis continues moving in case of function failure

12 Bibliography

- /1/ DC-Servo positioning module with CANopen-Interface, 11/2007
- /2/ AC-Servo positioning module with CANopen-Interface, 12/2008
- /3/ PAL-PC 2.0 programming instruction, 06/2004

13 Index

#

#control	52
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