637

SSD DRIVES

Servo drive

Product Manual

07-02-08-03-E-V1204.doc

Further descriptions, that relate to this document:

UL:07-02-01 	Product - manual Rack 6 U and EMV
UL:07-02-02-01 	Product - manual Power supply plug-in module NE B
UL:07-05-02-03 	Product - manual SUCOnet K
UL:07-05-03-02 	Product - manual Bus interface CAN for 635 637 637+
UL:07-05-04-02 	Product - manual Bus interface DP for 635 637 637+
UL:07-05-05-02 	Product - manual Bus interface Interbus S for 635 637 637+
UL:07-05-07-02 	Product - manual I/O Interface for 635 637 637+
UL:07-05-08-02 	Product - manual Bus interface DeviceNet for 635 637 637+
UL:07-09-04-02 	Product - manual Supression aids EH

Further descriptions, that relate to this document.

UL:10-06-03 	Product - manual Serial transfer protocol 635 637 637+EASY-serial
UL: CD 	EASYRIDER® Windows - Software
UL:10-06-05 	Product - manual Software BIAS®
UL: 12-01 	Product - manual Accessories - Plugs
UL:12-02 	Product - manual Accessories - Cable
UL:12-03 	Product - manual Accessories - Brake resistances

Made in Germany, 2004

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The most important thing first

Thanks for your confidence choosing our product.

These operating instructions present themselves as an overview of the technical data and features.

Please read the operating instructions before operating the product.

If you have any questions, please contact your nearest SSD Drives representative.
Improper application of the product in combination with dangerous voltage can lead to injuries.
In addition, damage can also occur to motors or other products.
Therefore please observe our safety precautions strictly.

Safety precautions

We assume that, as an expert, you are familiar with the relevant safety regulations, especially in accordance with VDE 0100, VDE 0113,VDE 0160, EN 50178, the accident prevention regulations of the employers liability insurance company and the DIN regulations and that you are able to use and apply them.
As well, relevant European Directives must be observed.

Depending on the kind of application, additional regulations e.g. UL, DIN are subject to be observed.
If our products are operated in connection with components from other manufacturers, their operating instructions are also subject to be observed strictly.

Safety precautions

Attention !

The digital servo drives are in the sense of EN 50178/VDE 0160 power electronic equipments for regulating the flow of energy in electrical power installations.
They are exclusively for supplying SSD Drives (or SSD Drives approved) servomotors.
Handling, installation, operation, and maintenance are only permitted under the conditions of and in keeping with the effective and/or legal regulations, regulation publications and this technical document.

The operator must make sure that these regulations are strictly followed.

Concept of the galvanic separation and insulation:

Galvanically separation and insulation correspond to EN 50178/VDE 0160, amplified insulation.

In addition all digital signal inputs and outputs are galvanically separated either as a relay or via opto coupler. In this way an increased interference security and the limitation of damages in case of external incorrect connections is given.

The voltage level must not exceed the low safety voltage 60V DC or 25V AC, respectively in accordance with EN 50178/VDE 0160.

The operator must make sure that these regulations are strictly followed.

Danger !

High contact voltage !
Danger of getting shocked !
Danger to your life !

Caution !

Opening the servo drive by the operator is prohibited due to reasons of safety and guarantee. The requirement for problem-free operation of the servo drive is the expert configuring !

Safety precautions

Please observe !

Especially to be complied with:

The class of protection which is permitted: protective grounding; operation is only permitted when the protective conductor is connected according to regulations.
The operation of servo drives is not allowed under the sole use of a residual current operated protective device as protection against indirect touching.
The servo drive may only be used in the rack or in its compact enclousure. Furthermore the regulator is designed solely for control cabinet operation.
Work on or with the servo drive may only be carried out with insulated tools.
Installation work may only be done in a deenergized state. When working on the drive, do not only block the Active-input but separate the complete drive from the mains.
CAUTION - risk of electrical shock, wait 3 minutes after switching off, for discharging the capacitors.
Screws sealed with varnish fulfill an important protection function and may not be moved or removed.
It is prohibited to penetrate the inside of the unit with objects of any kind.
Protect the unit from falling parts (pieces of wire, fley, metal parts, etc.) during installation or other work in the control cabinet. Metal parts can lead to a short in the servo drive.
Before putting into operation, remove additional covers so that the unit does not overheat. With measurements at the servo drive it is absolutely necessary to observe the potential separation!

Stop !

SSD Drives GmbH is not liable for damages whith occur by not following the instructions or the applicable regulations !!

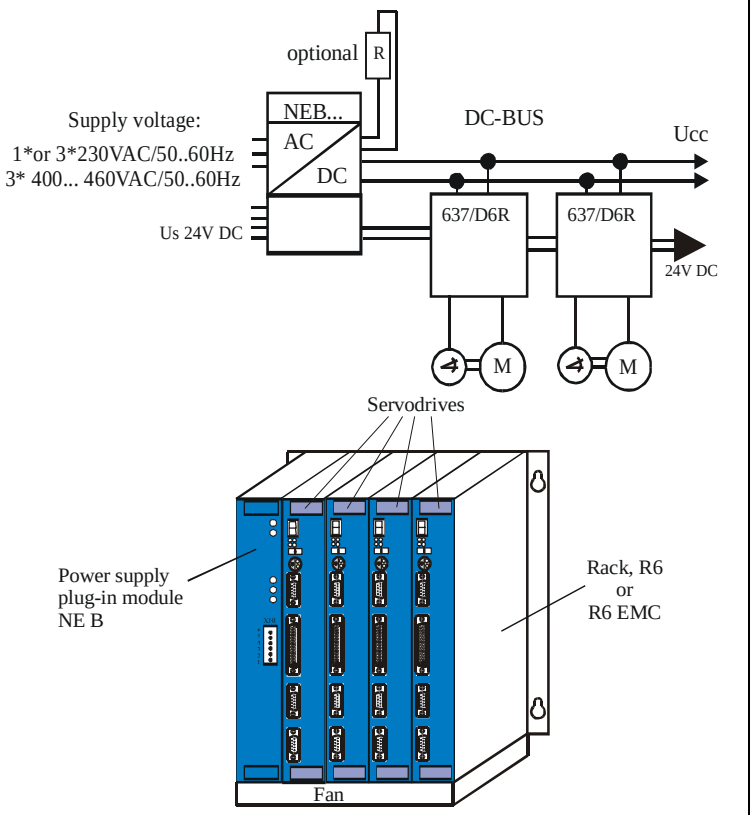
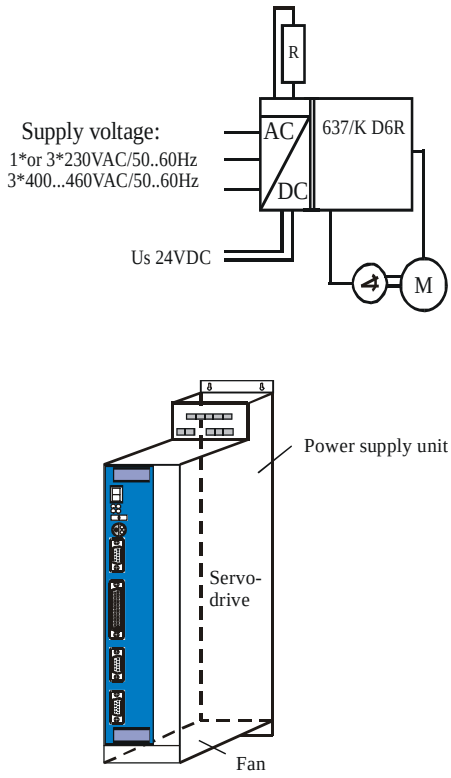
1 General

1.1 System description

The digital servo drive serves the 3rd generation to regulate the current, speed and position of **AC servo motors,**(standard: with resolver)

All servo controls and functions are realized digitally.

System variants

Rack-version: 637/D6R....	Compact-version: 637/K D6R....
	

Explanations to rack and power supply modules are documented in separate description.

If required, the returned braking energy can be drawn off into additional external ballast resistors.

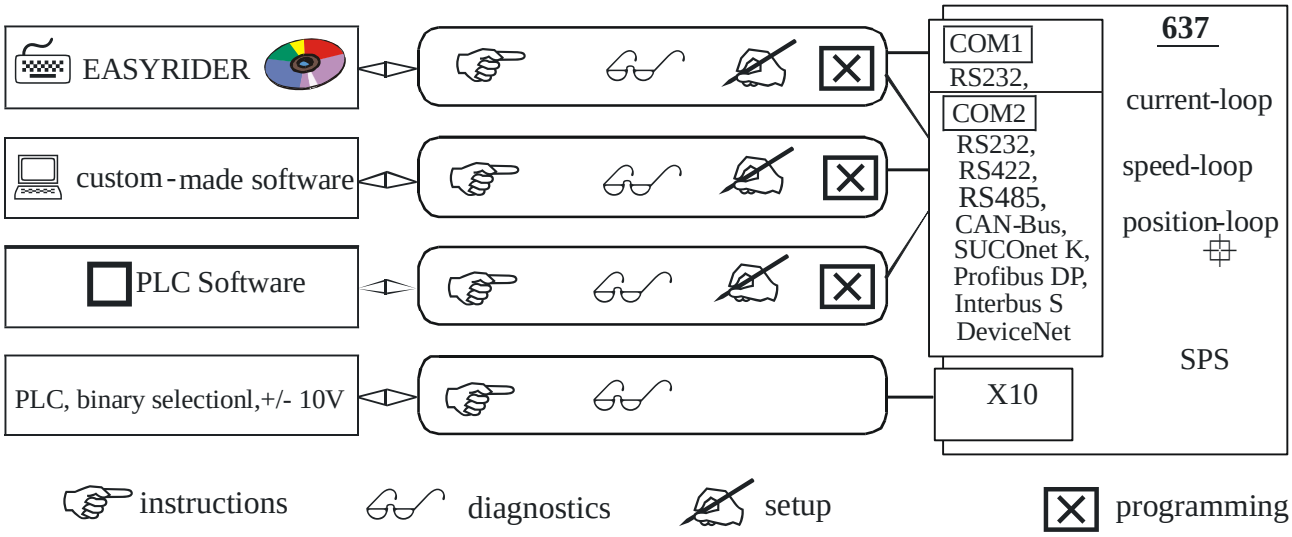
The AC-supply voltage is fed directly or via transformer to the associated power supply module.

The devices are designed to be operated on networks which are grounded on centre point (TN networks) !

1.1.1 Digital communication

Diagnose / Setup
General: by 7-segment display
Comfortable: via PC by EASYRIDER® Windows - Software
(serial interface RS232)

Communication
The serial-communication-protocol is free documented.
(Explanation see seperate documentation)
Every user has unrestricted acces to all functions and parameters.



1.1.2 Operation configurations

There are opportunities ranging from simple current and speed control to programmable position control processes (PLC), supported by the 1500 BIAS- command blocks.
"BIAS" User shell for intelligent drive controls

see:
chapter 3 Operating modes
chapter 13.2 BIAS - commands
chapter 13.3 Extended BIAS – commands

1.1.3 Compatibility to SSD Drives-6 U analog regulator FRR AC S

(Not required for new projects)

The digital servo drives are to a great extent pin- and function compatible to the analog devices of the FRR AC S series.
The EASYRIDER® Windows - Software allows the adaption to your existing equipment.
(**see:** chapter 3 Operating modes)
Further adaptions can be done by solder-jumpers (**see:** chapter 7.1 Jumper)

Compatibility restrictions:

Restriction
1 External current limiting due to analog input at X10.19 In the PC configuration menu the function speed regulator parameter (freely scaled) can be activated. In few cases the internal Pull-Up resistor with FRR AC S was loaded with an external Pull-Down resistor in order to reach a current limiting. The Pull-Up resistor on the D6R+K D6R can be activated via the solder strip **JP101**.
2 Incremental encoder output-zero offset With FRR AC S a zero drift was possible by means of DIP switch. This function is not realized with 637/D6R+K D6R.
3 Temperature monitoring output T2 (only with FRR AC S with corresponding option circuit) T2 is no more signalized.
4 Reference potential all digital in- and output signals on X10 are referred to X10.9.
5 Temperature monitoring PTC (only with FRR AC S with corresponding option circuit) Before switching off for approx 3 seconds "WARNING" is signalized.
6 Reset Connector X10.2 is no more assigned with reset function.
7 n/I-Switch over Connector X10.11 is not reference potential for n/I-switch over anymore, but X10.9.
8 Warning Connector X10.7 is not reference potential for warning output anymore, but X10.9.
9 The **max. operating voltage** on all signal outputs of X10 is DC 45V DC.
10 Pin 26 on X50 is not assigned internally and must be free !

One cannot completely rule out the possibility that with special designs of FRR AC S devices additional adjustments have to be made.

1.2 Typecode

Marking Typ:	Standard						optional	
		a	b	c	d	e	f	g
	XXX/	X	D6R	XX	.S3	-X	-X	-XXX

Marking	Description
	XXX/ = **637** ≅ SSD Drives- design (blue)
a	K = 1 axis compactdigital servo drive system = (is not used with model plug-in device)
b	D6R = Digital 6U Regulator
c	Rated current: 02 = 2 amperes 04 = 4 amperes 06 = 6 amperes 10 = 10 amperes 16 = 16 amperes 22 = 22 amperes 30 = 30 amperes
d	.S3 = Digital drive 3 th generation
e	Intermediate circuit rated voltage: -3 = 325V (230V AC) 16..30A only as for rack version possibly -7 = 650V (460V AC)
f	-E = with EMC-Clip -0 = without EMC-Clip
g	additional optionmodules on the drive for communication via COM2 -232 = RS 232 interface -422 = RS 422 interface -485 = RS 485 interface -CAN = CAN - bus -DEV = CAN - bus / DeviceNet -SUC = SUCOnet K -PDP = Profibus DP -IBS = Interbus S (Attention: changed front plate) –EA5 = I/O - interface (5E, 2A) COM2 –EAE = I/O - Interface (14E, 10A) X200 (Attention: changed front plate) –XXE = Combination of communication interface and I/O interface EAE (the first two places of com.-interface + E for I/O-interface EAE)

1.2.1 Example

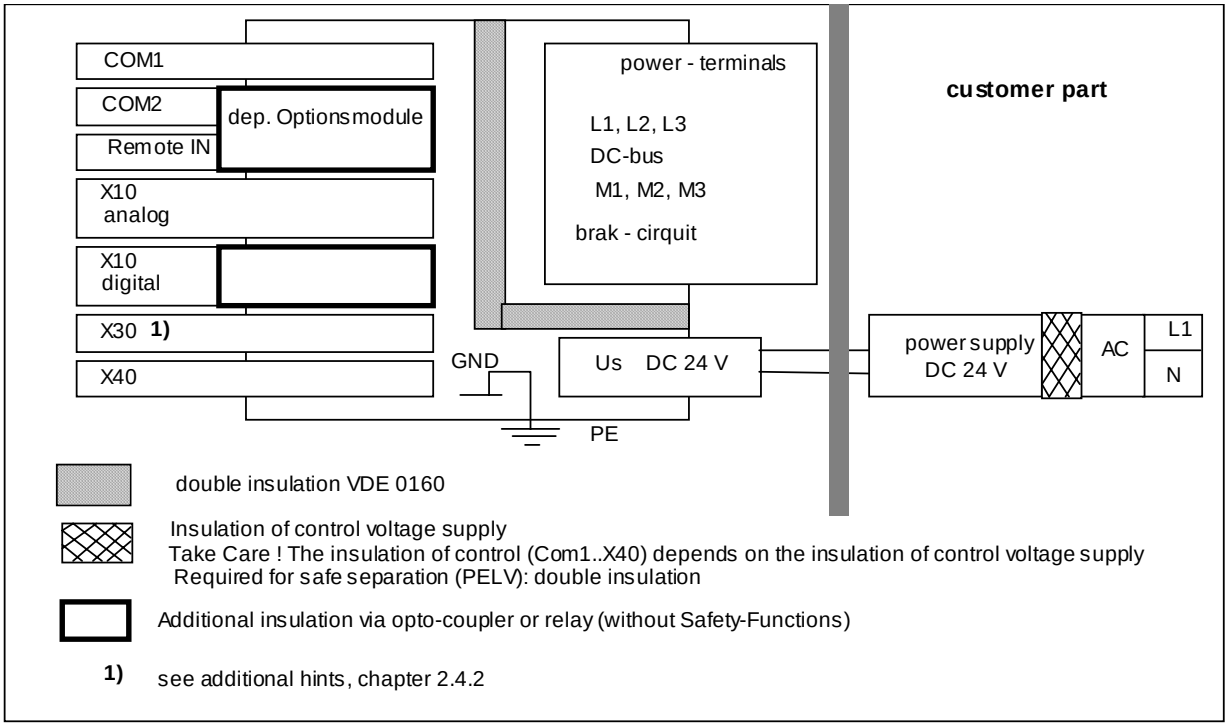
Typical example of an order of a 1-axis- compact device in SSD Drives-design

Type: 637/K D6R 02.S3-7-CAN

637/	=	SSD Drives-design (blue)
K	=	1 axis compact device
D6R	=	**D**igital **6**U Regulator
02	=	**2** amperes Regulator rated current
.S3	=	Digital drive **3**th generation
-7	=	650V UCCN
-CAN	=	CAN- bus – Optionsmodule insertion

1.3 Range data

1.3.1 Insulation concept



1.3.2 General Datas

Enclosure Rating (for mounting in cubicle)		IP20
operating temperature range		EN 50178 / VDE 0160, Klasse 3K3
storage temperature range		-25°...+55° C
air pressure		86 kPa - 106 kPa
Humidity		5 % - 85% 40°C
Opertating Temp		0...40°C
reduced operation derating of the output current	1)	>40°...< 50°C 2% /°C
Altitude h		h ≤ 1000m
reduced operation Derating of the output current	1)	h > 1000...≤ 4000m 1% / 100m
Safety Overvoltage-category of power circuit		EN 50178 / VDE 0160, UL, cUL III,
Pollution degree for mounting in cubicle		VDE / UL: 2
Vibration test in accordance with DIN IEC 68-2-6, test FC Condition for testing Frequency range Amplitude Acceleration Test time per axis Frequency sweep speed		 10...57Hz 57...150Hz 0,075 mm 1g 10 Frequenzzyklen 1 Oktave/min

1) Use only fan-cooled devices. For reduced operating conditions, no UL-Approbation are available.

Range data

1.3.3 Compact units 637/K D6R

Compact units			637 /	K D6R 02 .S3		K D6R 04 .S3		K D6R 06 .S3		K D6R 10 .S3		K D6R 16 .S3	K D6R 22 .S3	K D6R 30 .S3
				-3	-7	-3	-7	-3	-7	-3	-7	-7	-7	-7
Input														
supply voltage 50..60 Hz		min.	[V]	14										
		Un	[V]	230	460	230	460	230	460	230	460	460	460	460
		max.	tolarance	+ 10%										
phases				1;3	3	1;3	3	1;3	3					
supply-preparation				Fuses, contactors, filters see chapter 5.6										
power-on current limit		Type		NTC 4 Ohm								NTC 2 Ohm		
control voltage	1)	Us	[V]	21,5....24....29, attention: insulation-concept chapter 1.3.1										
control current incl. Fan		Is DC	[A]	Continuous: max. 1,2A Power-On-Peak: nom. 3A; max.. 6A / 0,8 mS, 2,5A / 25 mS								Continuous: max 1,5A Power-On-Peak: nom. 3A; max. 6A / 0,8 mS, 3A / 25 mS		
Output														
sine-wave volt. At Un		Unr	[Veff]	220	447	220	447	220	447	220	447	447	447	447 3)
derating of Unr				depending on load and single or 3-phase supply. (**see** chapter 1.3.5)										
rated current RMS		Inr	[A]	2		4		6		10		16	22	30 3)
max. current RMS		Imaxr	[A]	4		8		12		20		32	44	60
time for Imax	4)	min.	Sec	5		5		5		5		5	5	5
min. motor inductance (terminal / terminal)		Lph/ph	[mH]	6,0	12,0	3,0	6,0	2,0	4,0	1,2	2,4	2,0	1,1	0,8
Brake circuit														
Setpoint DC		Ub	[V]	375	730	375	730	375	730	375	730	730	730	730
max. power		Pbmax	[kW]	4,5	8,7	4,5	8,7	6,7	13,0	11,2	21,7	29,0	34,8	34,8
continuous power		Pbnenn	[W]	≤ 560										
internal resistor		Rbint	[Ω]	100	300	100	300	100	300	100	300	------		
		Pd	[W]	30	30	30	30	30	30	30	30			
		Pmax	[kW]	1,4	1,7	1,4	1,7	1,4	1,7	1,4	1,7			
min. external resistor	2)	Rbextmin	[Ω]	47	82	47	82	27	47	15	27	20	15	15
General														
power loss fan, electronic		PE loss	[W]	29	29	29	29	29	29	29	29	36	36	36
fan models 24V DC			[V]	2 Piece L 024 / (12TE * 25) 1 Piece L 024 / (12TE * 15)								2 Piece L 024 / (16TE x 25) 1 2 Piece L 024 / (16TE x 20)		
power stage per A			[W/A]	9	12	9	12	9	12	9	12	12	12	12
weight			[kg]	5,0								8,8		
further data				**see:** chapter 11										

1) suggested: transformer-based supply
2) use only SSD Drives-released types
3) max. continuous performance derated to 80%, **see** chapter 1.3.6
4) References chapter 1.3.6

Range data

1.3.4 Plug-in modules 637/D6R

Plug-in modules			637/	D6R 02 .S3		D6R 04 .S3		D6R 06 .S3		D6R 10 .S3		D6R 16 .S3		D6R 22 .S3		D6R 30 .S3	
				-3	-7	-3	-7	-3	-7	-3	-7	-3	-7	-3	-7	-3	-7
Input																	
DC-BUS rated		min.	[V]	20													
		Ug	[V]	325	650	325	650	325	650	325	650	325	650	325	650	325	650
		max.	berance	+ 10%													
control voltage		Us	[V]	24V DC +20% -10%, attention: insulation-concept chapter 1.3.1													
control current	1)	Is DC	[A]	Continuous: max 0,8A Power-On-Peak: nom. 2A; max 5A / 0,8 mS, 2A / 25mS													
Fan	2)	Typ		---	L220 K	---	L220K					L220G					
Output																	
sine-wave volt. at Un		Unr	[Veff]	220	447	220	447	220	447	220	447	220	447	220	447	220	447 3)
derating of Unr				depending on load and single or 3-phase supply (**see** chapter 1.3.5)													
rated current RMS		Inr	[A]	2		4		6		10		16		22		30 3)	
max. current RMS time for Imax		Imaxr	[A] min.	4 5 Sec		8 5 Sec		12 5 Sec		20 5 Sec		32 5 Sec		44 5 Sec		60 5 Sec	
min. motor inductance (terminal / terminal)		Lph/ph	[mH]	6,0	12,0	3,0	6,0	2,0	4,0	1,2	2,4	1,0	2,0	0,55	1,1	0,4	0,8
Brake-Circuit																	
setpoint DC		Ub	[V]	375	730	375	730	375	730	375	730	375	730	375	730	375	730
max. power		Pbmax	[kW]	4,5	8,7	4,5	8,7	6,7	13,0	11,2	21,7	15,0	29,0	18,0	34,8	18,0	34,8
continuous rating		Pbnenn	[W]	≤ 560													
min. external resistor	2)	Rbextmin	[Ω]	33	63	33	63	22	43	12	24	10	20	8,2	15	8,2	15
General																	
power loss electronic output stage per A		PEloos	[W] [W/A]	20 9	20 12	20 9	20 12	20 9	20 12	20 9	20 12	20 9	20 12	20 9	20 12	20 9	20 12
weight			[kg]	1,5								4,0					
further data				**see** chapter 11													

1) suggested: transformer-based supply
2) use only SSD Drives-released types
3) max. continuous performance derated to 80%, **see** chapter 1.3.6
4) References chapter 1.3.6

1.3.5 Single- and three-phase supply

Due to the line-ripple of DC-Bus, the rate of usable output voltage is derated like follows.
This deration effects the max. reachable speed of the applied motor.

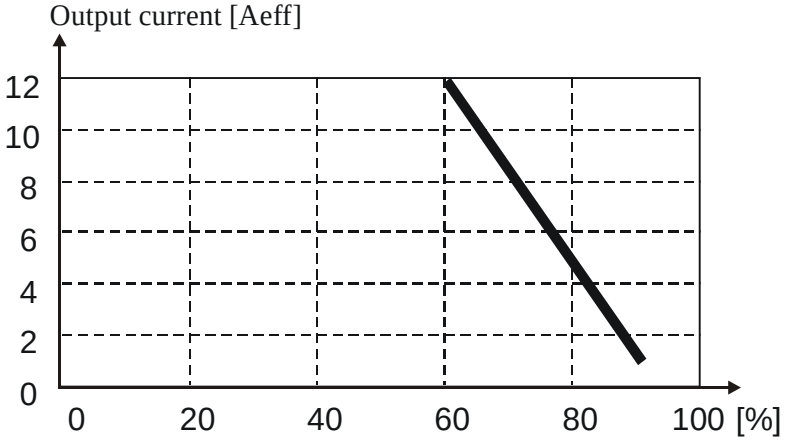
Three-phase-supply:
the unloaded output voltage will be derated to approx. 90%, maximum 85 %

Single-phase: supply: 50 – 60Hz

only drive 637 / ..02 up to 06

see following diagram:

Derating of servo drive output voltage in case of single-phase supply



Output voltage in % of unloaded condition

Hints for setup:
To avoid unexpected tripping of undervoltage threshold
(EASYRIDER® Windows - Software), this value should be set to default.

Required motor-terminal-voltage forspecified speed.

Approximation: (up to 3000RPM)

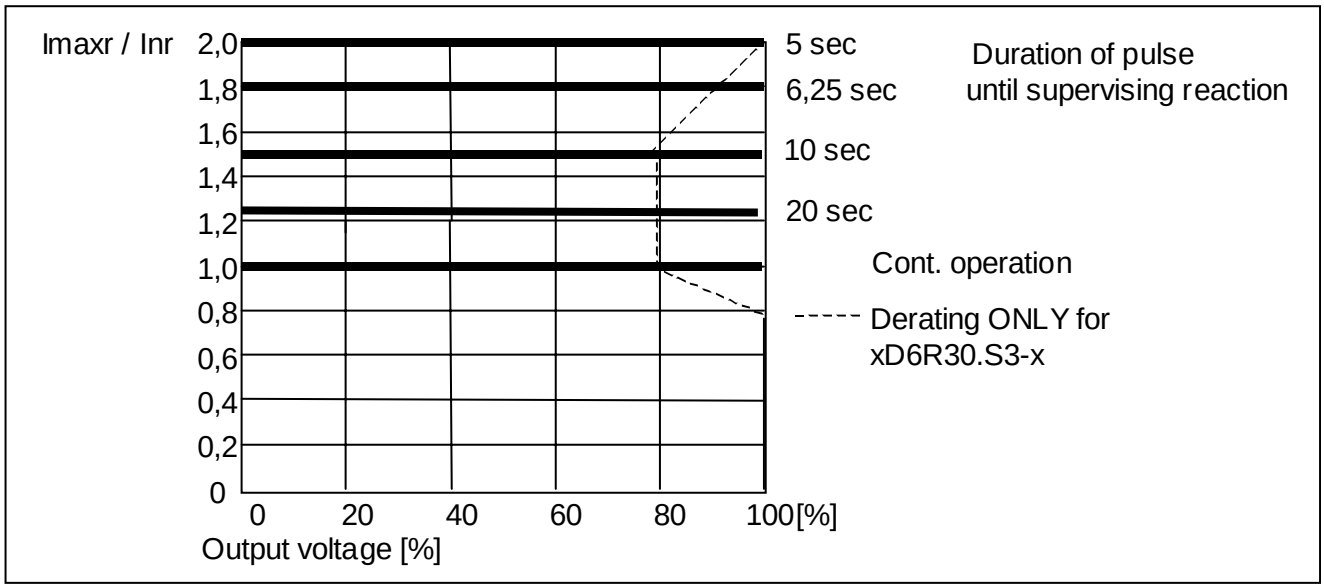
Ukl = 1,2 * (EMF * n / 1000) + I * (Rph + RL) [V]

Ukl	required motorvoltage [V RMS]
EMF	Back-EMF of motor [V RMS] / 1000 RPM
Rph	resistance of motor (between terminals) [Ω]
RL	line resistance of motor cable [Ω]
I	motor-current [A RMS]

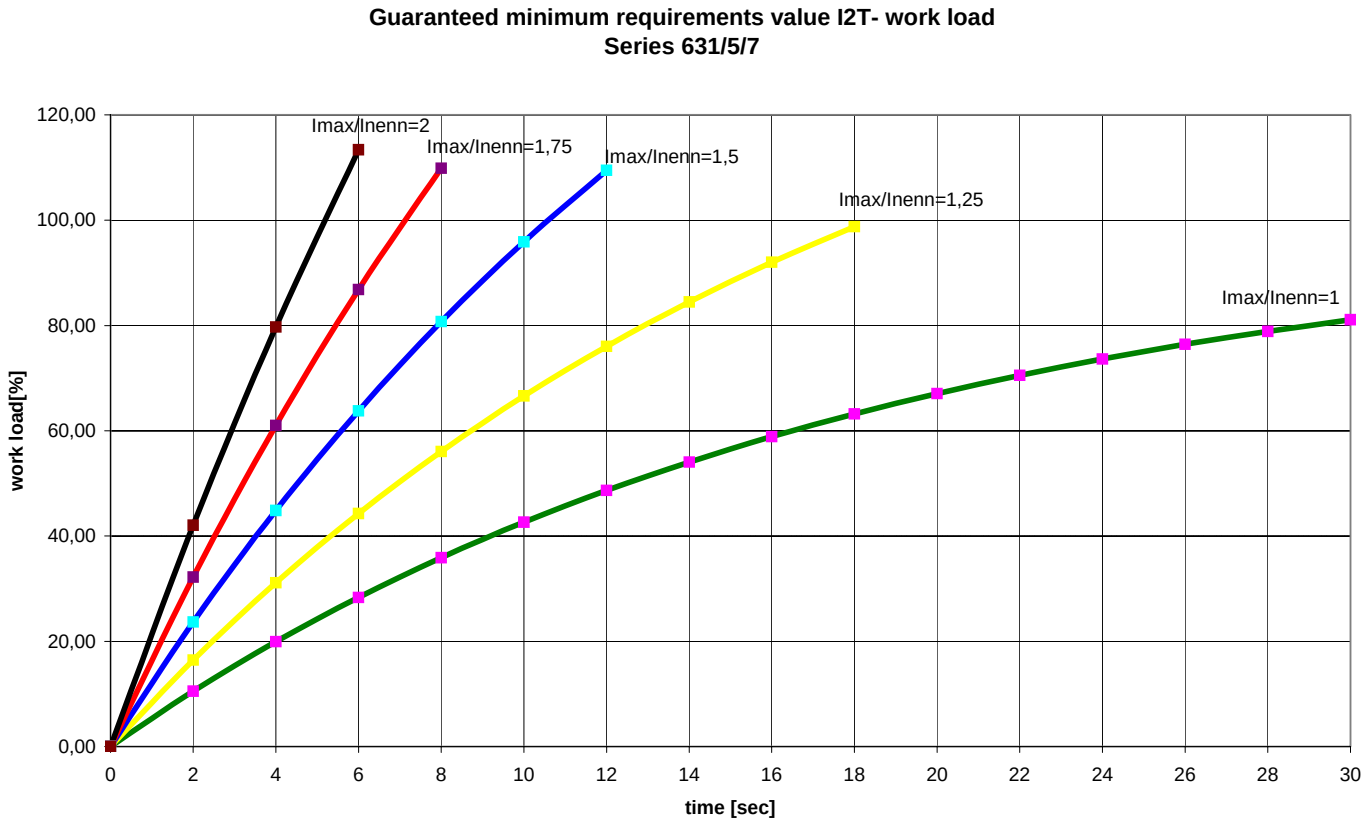
Range data

1.3.6 Output power

In case of continuous operation in the range of full-load the limits like shown in the diagram have to be respected.
Typical servo applications are not effected by this restriction. (S3-operation: Start/Stop)

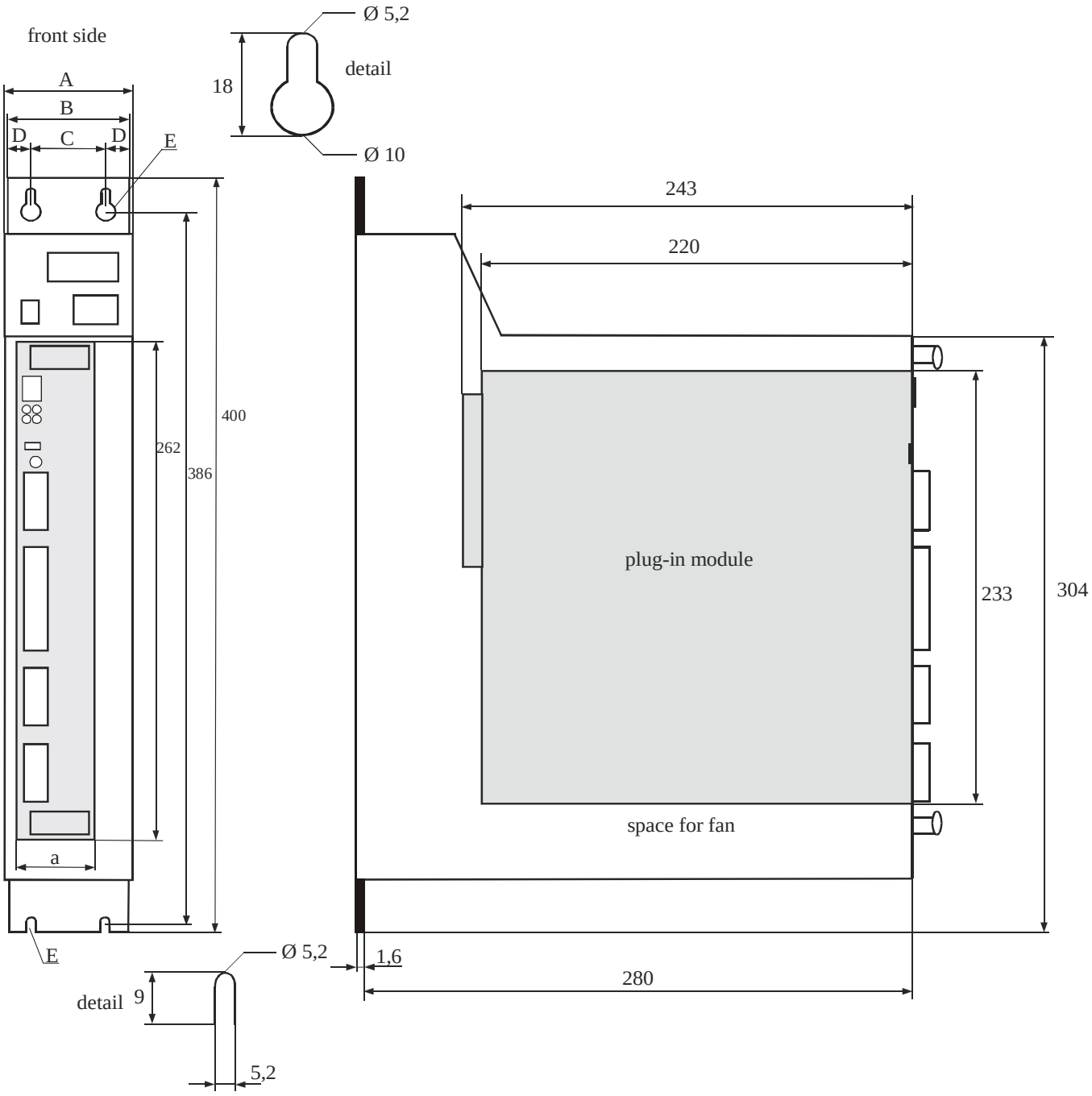


1.3.7 Rated current / max. current – period



1.4 Dimensions and layout

1.4.1 Dimensions for compact device and plug-in module



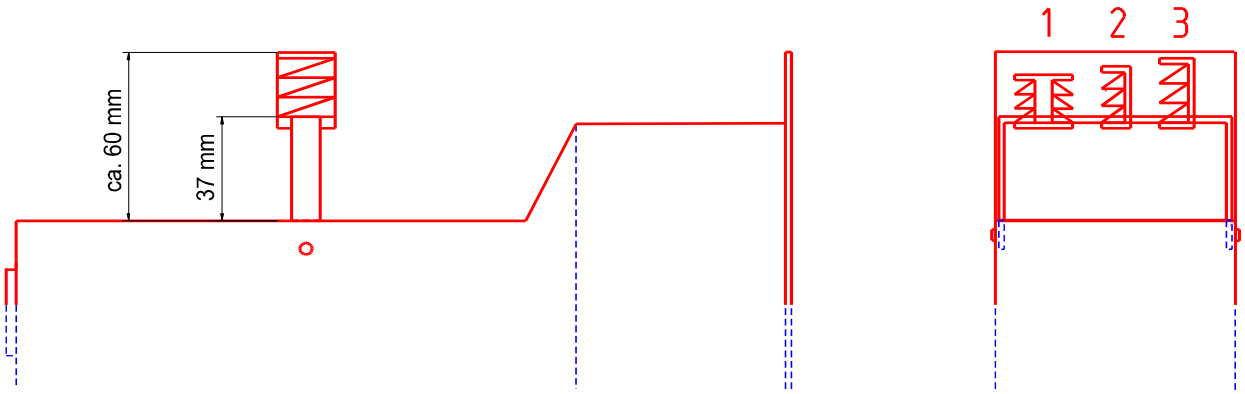
	637/K D6R 02...10	width	637/K D6R 16...30	width
A	65,0 mm	14 HP	104,6 mm	20 HP
B	60,0 mm		100,0 mm	
C	30,0 mm		71,0 mm	
D	14,5 mm		14,5 mm	
a	40,2 mm	8 HP	80,4 mm	16 HP

1 HP ≈ 5,08mm

Important:
Make sure you need an additional space of approx. 70 mm on the front side for the signal mating plugs !

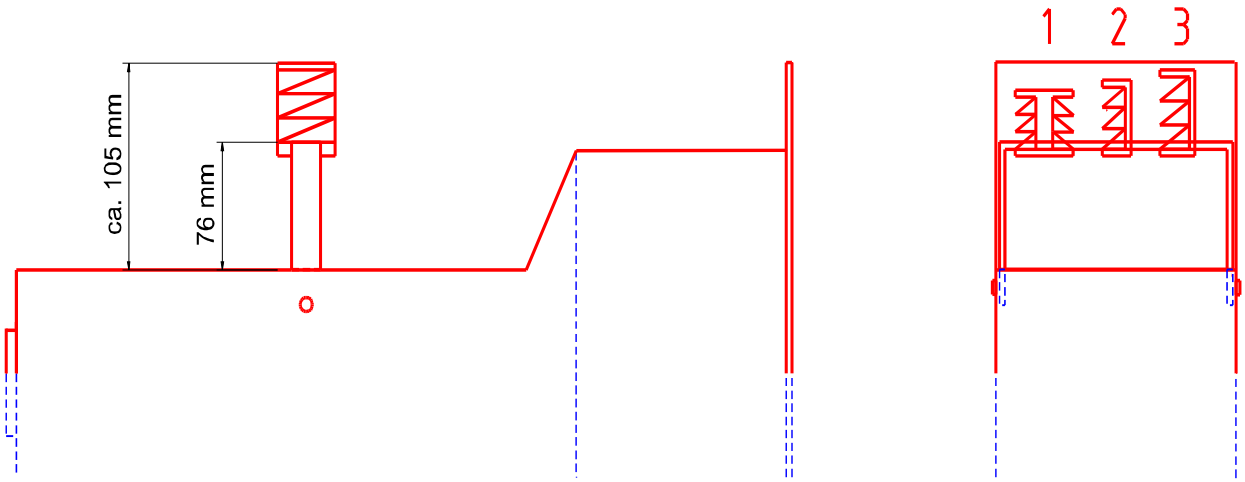
1.4.2 EMC-Clip (optional)

1.4.2.1 for 8 HP drive



side view front view

1.4.2.2 for 16 HP drive



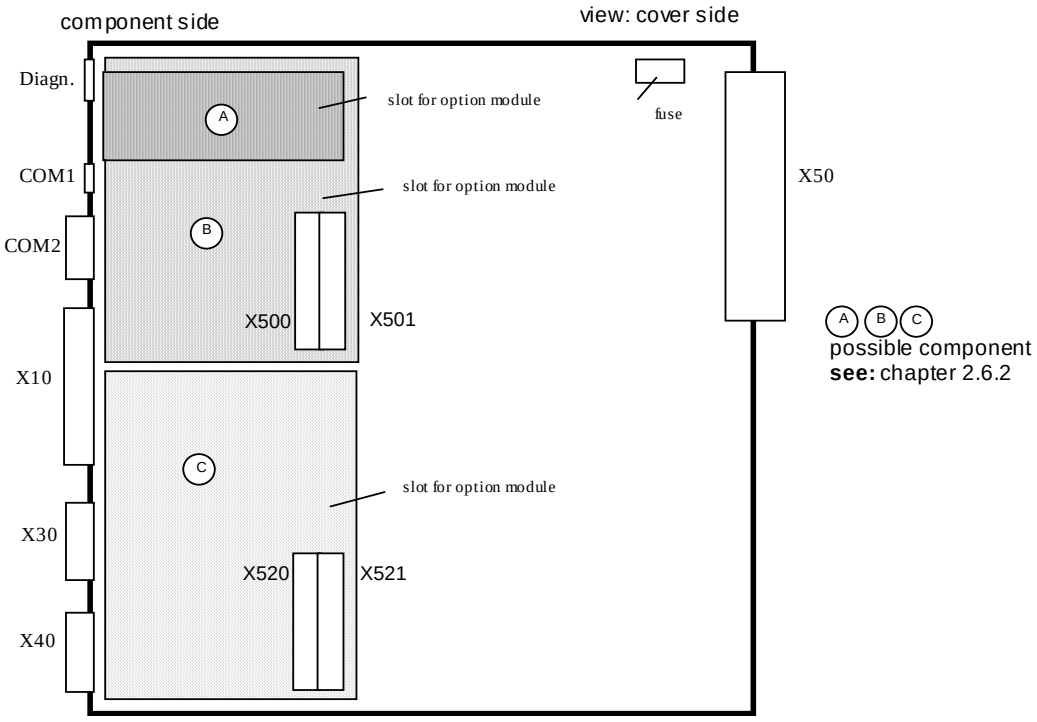
side view front view

EMC-Clip for	
Feedback- cable (e.g. Resolver)	1
net cable	2
Motor cable	3

meaning:
1,2,3 = cage clamp terminal

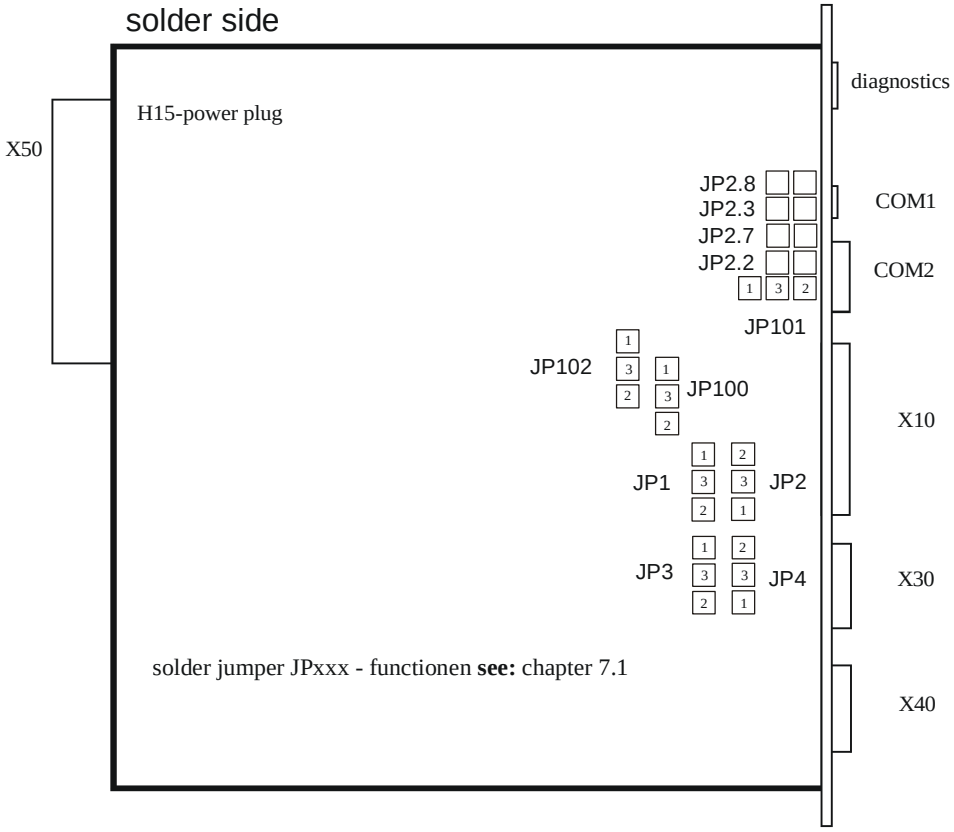
1.4.3 Layout

1.4.3.1 Layout of controller board



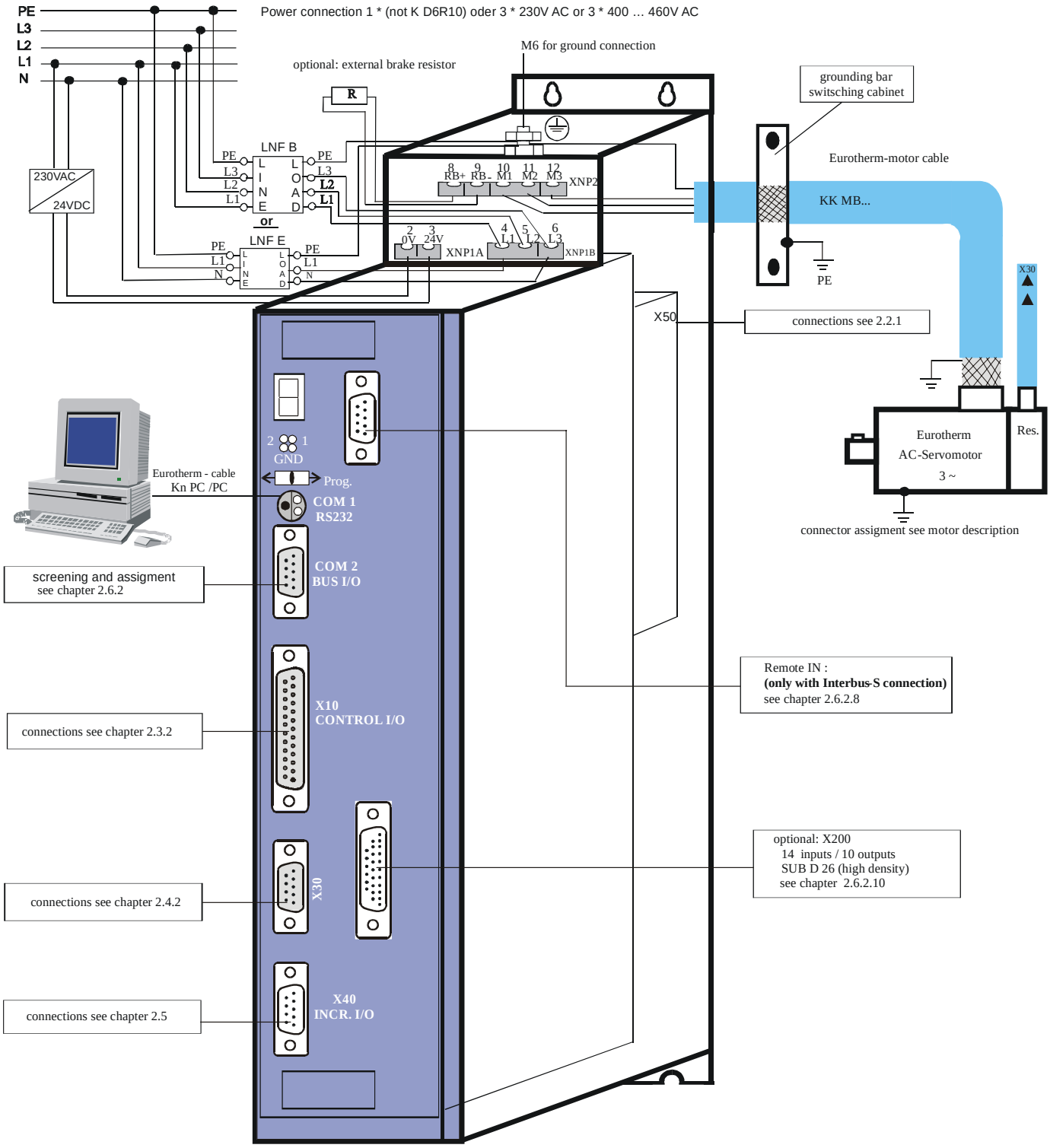
Note: The option modules for the slots A / B / C can only be reached after removing the cooling plate.

1.4.3.2 Layout of power board



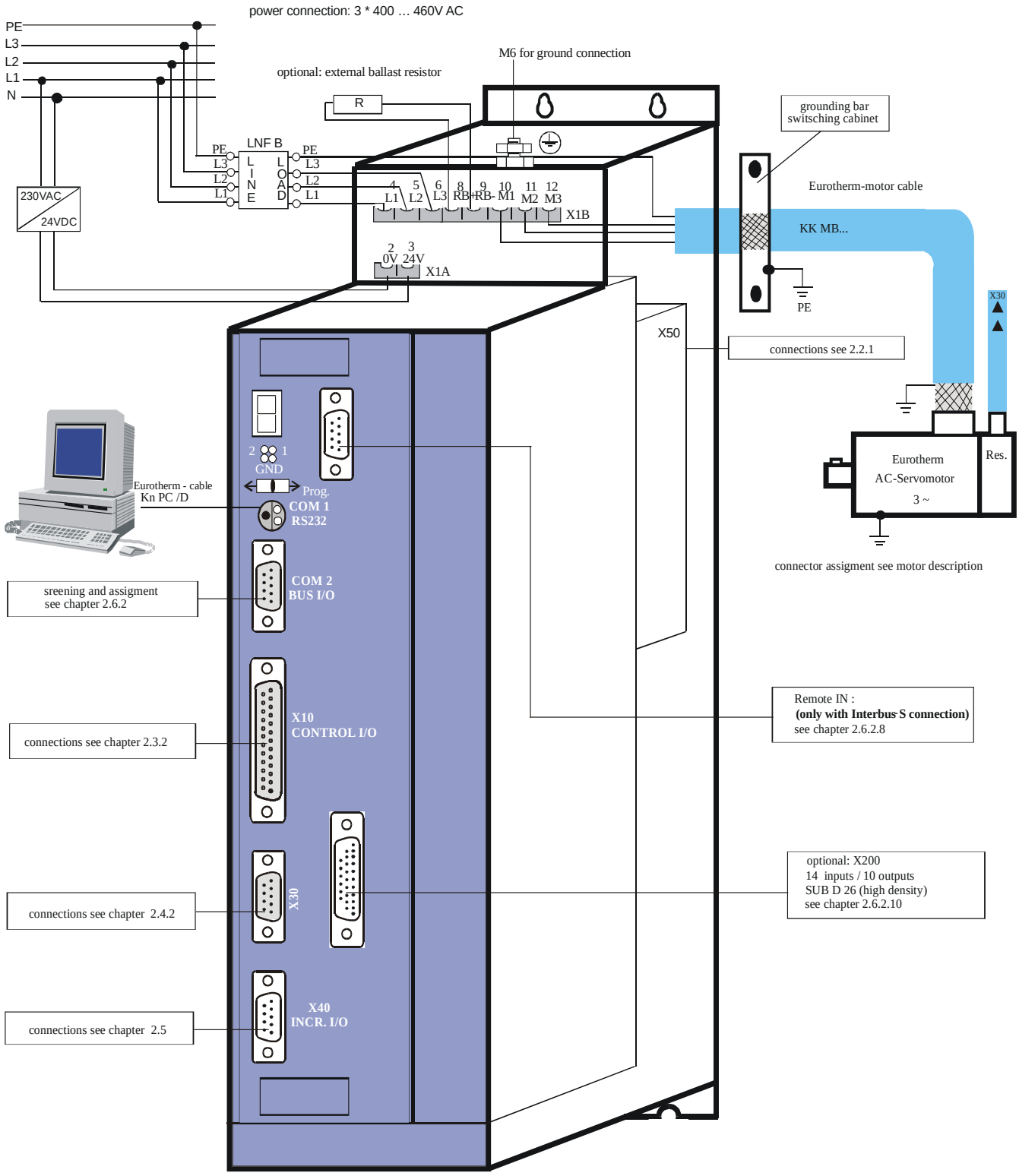
2 Connector assignment and functions

2.1 General view of connections of the compact device 637/K D6R 02...10 Width 14 HP



Connector assignment and functions

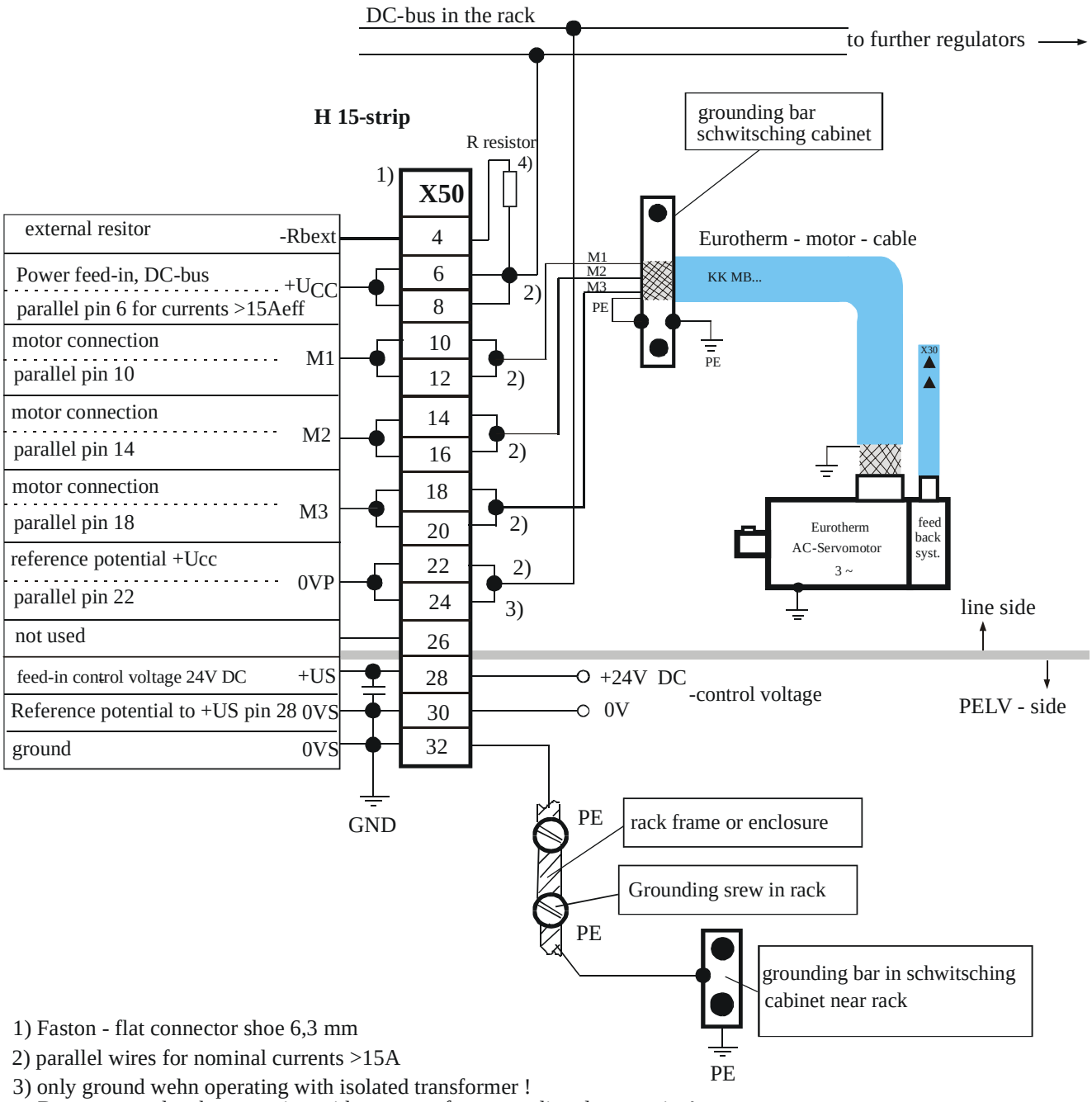
2.1.1 General view of connections of the compact device 637/K D6R 16...30 Width 20 HP



Connector assignment and functions

2.2 Signal connections

2.2.1 Power connections for plug-in module 637/D6R (at the rear of the rack) (H15-multiple pin strip according to DIN 41612)



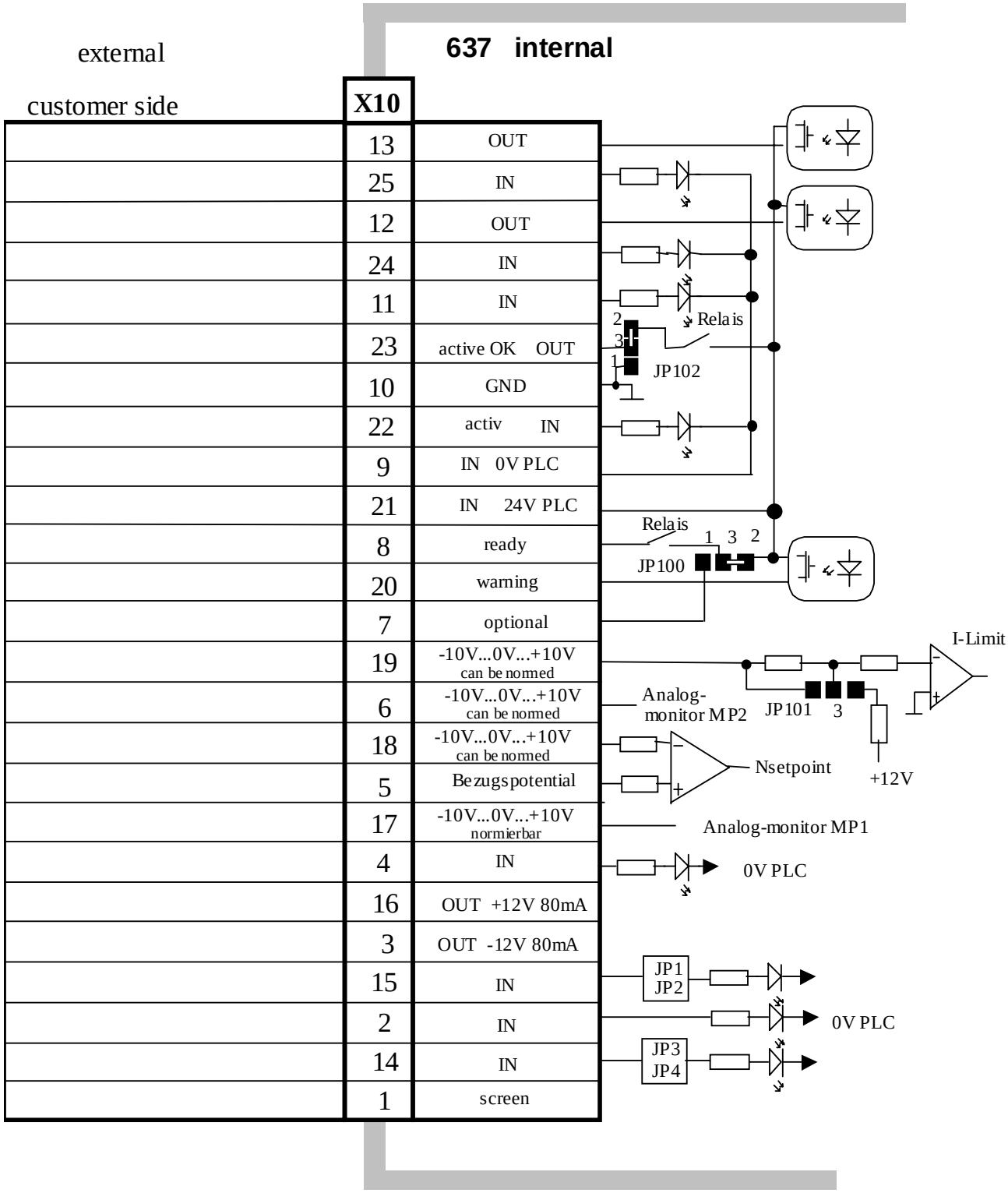
1) Faston - flat connector shoe 6,3 mm
2) parallel wires for nominal currents >15A
3) only ground wehn operating with isolated transformer !
   Do not ground wehn operating with autotransformer or directly on mains!
4) resistor, provided that not from power unit NEB ... accessed

Connector assignment and functions

2.3 Signal connections

2.3.1 Control signal plug X10
SUB D25 socket

Complete representation X10

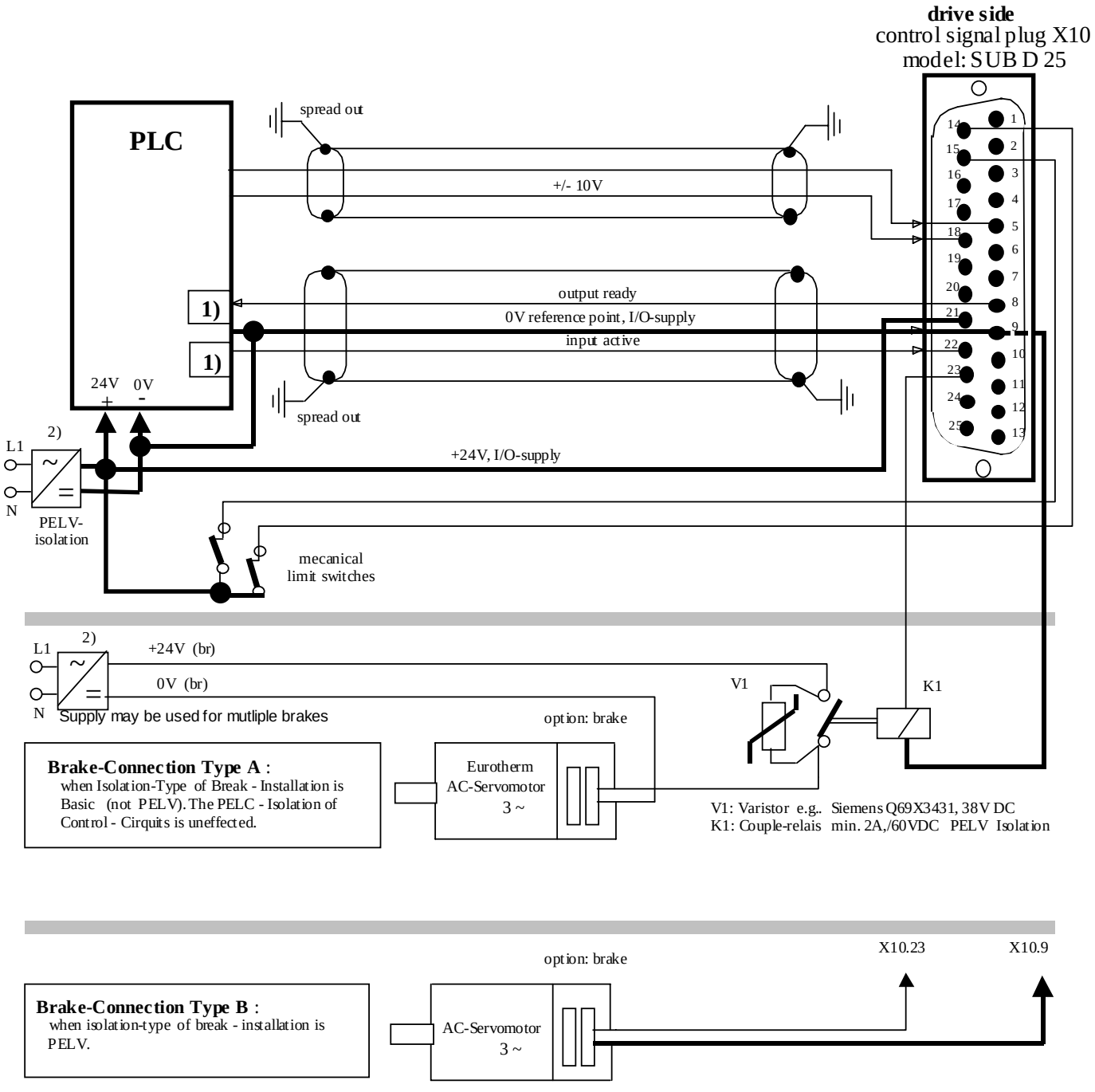


Connector assignment and functions

Signal connections

Control signal plug X10
SUB D25 socket

Connection example



1) Security- and supervising logic, to be programmed by user !

2) **IMPORTANT:**
The Power-Supply for the Motor-Brake has to be adapted to the type of Brake. Voltage-Drops caused by long cables also may effect malfunctions of the Brake

Connector assignment and functions

Signal connections

Control signal plug X10

SUB D25 socket

Inputs / outputs

PIN	Function	Type	In- / output
1	shield connector		Shield
2	configurable (chapter 3)	OPTO	Input
3	stabilized auxiliary voltage -12VDC; max. 80 mA		output auxiliary voltage
4	configurable (chapter 3)	OPTO	Input
5	Reference point to X10.18		analog input -10V...0V..+10V Ri = 10 kOhm
6	Current monitor can be scaled in the speed controller menu		MP2 analog output, -10V...0V..+10V
7	via JP100 (solder jumper) can be assigned as free and loopable potential of the READY contact		Optional
8	ON: regulator without fault OUT: regulator fault or supply voltage off	Relay	Output fixed: ready
9	Reference point for digital inputs		Reference point for digital inputs
10	Reference potential for analog signals		Ground
11	configurable (chapter 3)	OPTO	Input
12	configurable (chapter 3)	OPTO	Output
13	configurable (chapter 3)	OPTO	Output
14	configurable (chapter 3)	OPTO	Input
15	configurable (chapter 3)	OPTO	Input
16	stabilized auxiliary voltage +12V DC; max 80 mA		output auxiliary voltage
17	actual speed value monitor, scalable		MP1 analog output, -10V...0V..+10V
18	nominal speed value; scalable differential referenced to X10.5		Analog input -10V...0V..+10V Ri = 10 kOhm
19	Setting of the current limit can be activated and scaled (-10V...0V..+10V für 0.. I_{max})		analog input 0..+10V Ri = 10 kOhm
20	Configurable (chapter 3)	OPTO	Output
21	Nominal: 24V DC		Supply for outputs
22	H = output stage is active L = output stage inactive	OPTO	input fixed: active
23	configurable (chapter 3)	Relay	output
24	configurable (chapter 3)	OPTO	input
25	configurable (chapter 3)	OPTO	input

Data of the digital inputs and outputs **see** chapter 11 General technical data

2.4 Resolver

Functions of the resolver evaluation

Formation of a digital value for the rotor position within one revolution, evaluation: 12 or 14 bit; adjustable in the config. menu EASYRIDER.

derivated from this:

- commutation according to pole pair number
- actual speed value
- incremental position output
- position value for position regulation

It is only allowed to use SSD Drives approved resolver

2.4.1 Resolver connection X30 SUB D 09 socket

Resolver connector

motor side

SSD Drives - motor size 0...4

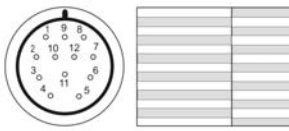
Type: AC G, AC R, AC Mn,
AC M2n, AC M2K; ACM2G
AC MRW, AC MRL

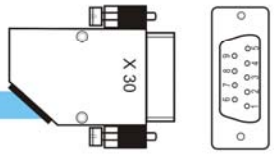
regulator side

SSD Drives - servo drives

Model: 631/635 and 637/637+/637f

view solderside





view solderside

SIR ST.0200.0001	KIR -B KA.0003.6301		SUB - D 09 S/M ST.1002.2001
PIN - Nr.	colour	function	PIN - Nr.
1	white	sin +	4
2	brown	sin -	8
3	green	cos +	3
4	yellow	cos -	7
5	red	PTC optional	2
6	blue	PTC optional	6
7	pink	carrier -	9
8	gray	carrier +	5
case		screen	case

Zust	Änderung	Datum	Name	Ursprung
05	ACM2K	10.08.04	DL	Bear. 09.05.01 DL
04	ACMRL	27.11.03	DL	Gep. 10.05.01 EH
03	ACMRW	02.10.03	DL	Norm
02	ACM2G	15.08.03	DL	
01	637f	16.04.03	DL	

Maßstab / scale:

Typ / model:
KK RT GMR-xx.x/B

Bezeichnung / designation:
Blue resolver cable
for SSD Drives standard motors and servo drives

Zeichnungsnummer / drawing No:
Z-RK.6300.xxxx

Blatt sheet 1

Dateiname / File name: Z-R-.6300-E.cdr

2.5 Multi-function X40

Description X40
Via a programmable I/O processor, the X40 – Connection can be configured different. (EASYRIDER® Windows - Software)
Standard functions:
- Incremental output
- Incremental input
- Stepper motor - pulse input

The different configuration creates e.g. ideal conditions for synchronous applications.

General data	X40
Plug model:	SUB D 09 male plug
maximum input or output frequency:	200 kHz
maximum cable length connected to galvanical insulated terminals (Encoder, controls) maximum cable length connected to ground-related terminals (other drives, controls) maximum number of signal inputs to one as incremental-output configured device	25 m; for extended distances please contact our engineer 2 m, take care for good common grounding ! 8
output signals:	driver model MC34C87 or compatible, RS422
differential logic level:	L ≤ 0,5V H ≥ 2,5V
nominal range:	0,0 ... 5,0V
input signals:	receiver model MC34C86 or compatible, RS422
differential input level:	Diff min = 0,2V
nominal range:	0,0 ... 5,0V
nominal signal difference:	1,0V
current consumption:	1...4 mA (depending on frequency)

Notice:
Master / Slave operation
1 Master maximum 8 Slaves
Condition: Devices directly side by side !

Connector assignment and functions

Multi-function X40

2.5.1 Incremental output

Connector pin assignment X40
EASYRIDER® Windows - Software X40 Modus = 0

- Incremental encoder simulation for processing in positioning modules
- Standard: 1024 increments
  further selectable pulse numbers: 2048, 512, 256, 128, 64
  4096 only with max. speed 2500 min^{-1} possible (200 KHz)

Pin	Function	Designation
1	Channel B	B
2	Channel B inverted	/B
3	Shield connector	Shield
4	Channel A	A
5	Channel A inverted	/A
6	Reference *	GND
7	Channel Z inverted zero impulse	/Z
8	Channel Z, zero impulse	Z
9	Supply voltage output max. 150 mA	+ 5 VDC

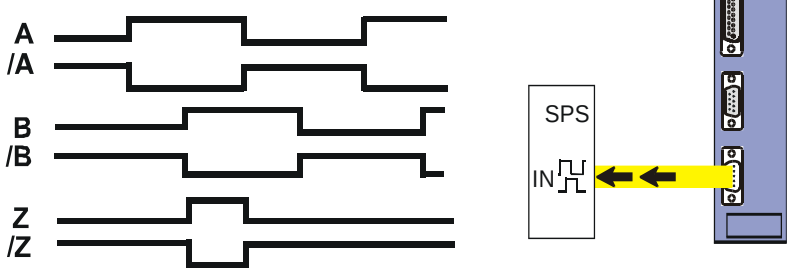
Design rule:
The capability of input-frequency of any connected device must meet at least the value of pulse outputs on X40..

n = max. speed (rpm)
x = increments e.g. 1024
f = output frequency at X40.1,2,4,5

Formula: $f = \frac{1,2 * (n * x)}{60} = [Hz]$

Example: n = 4000 1/min

$$f = \frac{1,2 * (4000 * 1024)}{60} = 81920\ Hz$$



Incremental outputs

Connector assignment and functions

Multi-function X40

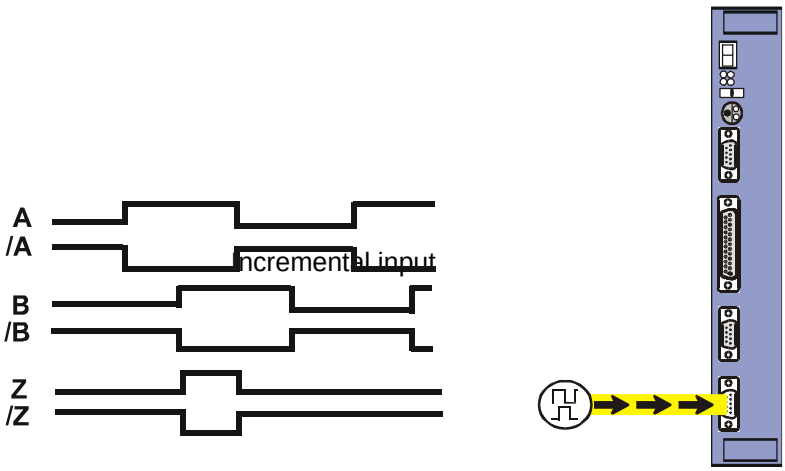
2.5.2 Incremental input

EASYRIDER® Windows - Software X40 Modus = 1

Parameter area of the input signals:
10...1000000 increments

Pin	Function	Designation
1	Channel B	B
2	Channel B inverted	/B
3	Shield connector	Shield
4	Channel A	A
5	Channel A inverted	/A
6	Reference potential *	GND
7	Channel Z inverted zero impulse	/Z
8	Channel Z, zero impulse	Z
9	Supply voltage output max. 150 mA	+5 VDC

Note:
The operation of incremental encoders via long cables may cause a voltage drop of the encoder power supply. We suggest the use of external supply if necessary.



Connector assignment and functions

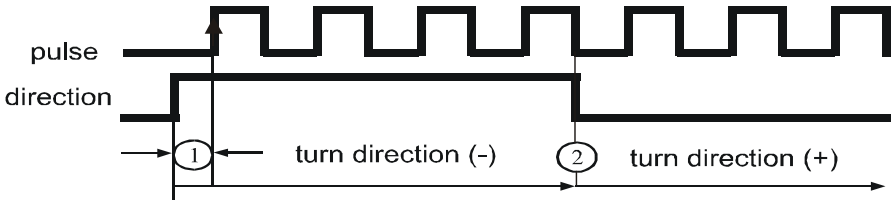
Multi-function X40

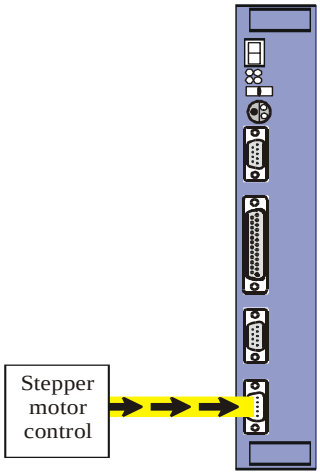
2.5.3 Stepper motor input

pulse / direction

EASYRIDER® Windows - Software X40 Modus = 2

Pin	Function	Designation
1	output: drive active inverted	/READY
2	output: drive active	READY
3	Shield connector	Shield
4	Pulse inverted	/P
5	Pulse	P
6	Reference potential	GND
7	Direction inverted	/R
8	Direction	R
9	Supply voltage output max. 150 mA	+5 VDC





1 set-up time ≥ 2,5 µs

2 hold time = 0

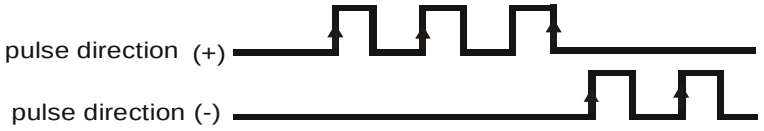
Connector assignment and functions

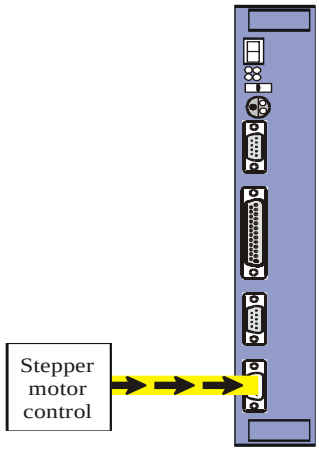
Multi-function X40

2.5.4 Stepper motor input

pulse positive / negative
EASYRIDER® Windows - Software X40 Modus = 3

Pin	Function	Designation
1	output: drive active inverted	/READY
2	output: drive active	READY
3	Shield connector	Shield
4	Pulse direction (-) inverted	/P-
5	Pulse direction (-)	P-
6	Reference potential	GND
7	Pulse direction (+) inverted	/P+
8	Pulse direction (+)	P+
9	Supply voltage output max. 150 mA	+5 VDC





Connector assignment and functions

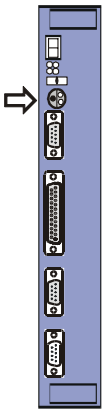
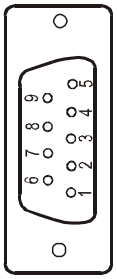
2.6 Digital interfaces

2.6.1 **Service interface** COM1 **(RS232)**

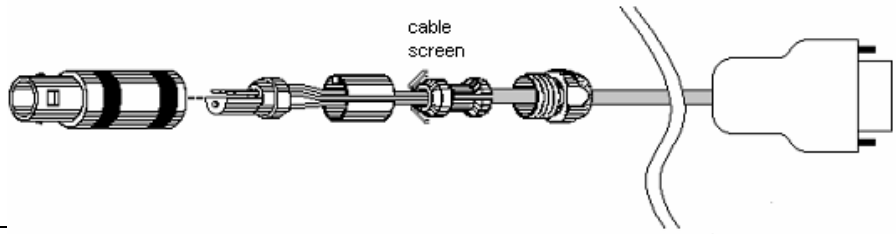
standard

Functions:

- Supporting all diagnosis and setup tasks
- Connection to your PC is made with the SSD Drives communication cable KnPC/D
- Communication is made via the SSD Drives operating program (EASYRIDER® Windows - Software)

Com RS232	**PIN**	**Function drive side**	**PIN**	**RS232 PC-Side**
SnXA0 (View to solder-side)  				SUB D 09- socket (View to solder-side) 
GND	**1**	Reference potential	**5**	GND
TXD	**2**	Transmit serial data	**3**	RXD
RXD	**3**	Receive serial data	**2**	TXD
Screen	**-**	Enclosure	**-**	Screen

Cable Ready for Use: **RS232 Service- Connector**	**Type**	**Order Number.**
Drive → PC	Kn PC/D	KK.5004.0001



Notice:

The service interface RS232 is not galvanically separated and should not be planned for this reason as a operating interface ("firm wiring")!

The Line-Connection of the PC must be close to the Drive to achieve operation related to a common ground.

Connector assignment and functions

Digital interfaces

2.6.2 Fieldbus interface COM2

Option module (SUB D09 socket)

Many different functions can be implemented using optional option module**.**

Layout, **see** chapter 1.4.3

Overview:

modul- designation		interface	galvanic seperation	design
RP 232		RS 232	-	A
RP 422		RS 422/485	-	A
RP 485		RS 422/485	X	A
RP CAN		CAN	X	A
RP PDP		Profibus DP	X	B
RP SUC		SUCOnet K	X	B
RP IBS	1)	Interbus S	X	B
RP DEV		DeviceNet	X	B

1) additional plug Interbus Rem. IN (SUB D)

2.6.2.1 additional In-/Outputs

modul- designation		Inputs	Outputs	connection via	design
RP EA5	2)	5	2	COM2	B
RP EAE		14	10	X200	C

2) no Fieldbus possibility (Interface)

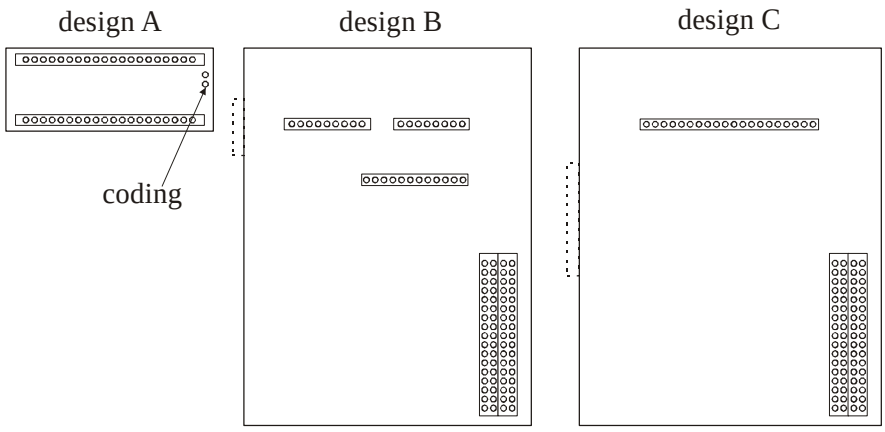
Caution:

The connections COM2 and X30 are implemented via SUB D09 socket.
The customer have to be guaranteed that an interchanging is not possible!

Connector assignment and functions

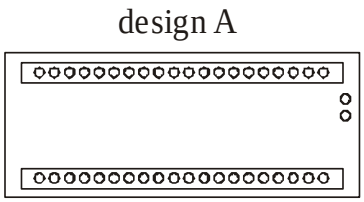
Digital interfaces

2.6.2.2 Modul – design



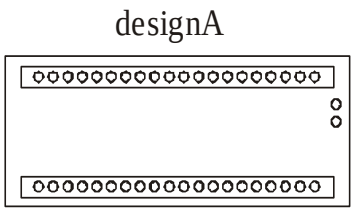
2.6.2.3 Pin assignment for RS232
with option modul RP 232

pin	assignment as RS232
1	-
2	RXD
3	TXD
4	-
5	GND
6	-
7	-
8	-
9	-



2.6.2.4 Pin assignment for RS422/485
with option modul RP 422, **<u>without</u> galvanic seperation**
with option modul RP 485, **<u>with</u> galvanic seperation**

pin	assignment as RS422/485
1	-
2	-
3	-
4	Data In
5	GND
6	Data In inverted
7	Data Out inverted
8	Data Out
9	-



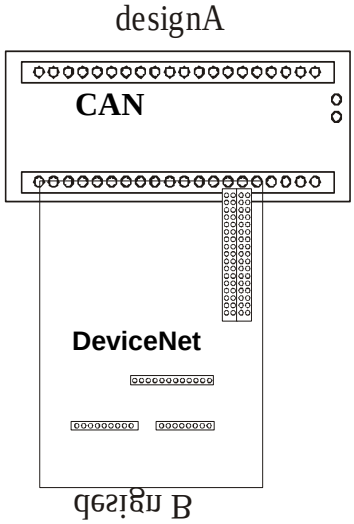
Daisy-chain wiring up to 16 devices

Connector assignment and functions

Digital interfaces

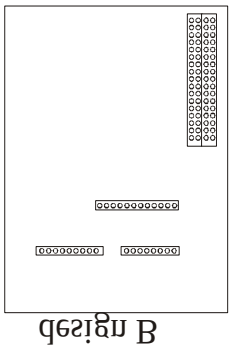
2.6.2.5 Pin assignment for CAN/DeviceNet
with option modul RP CAN**, with galvanic seperation**

pin	description	designation
1	-	-
2	CAN_L bus line (dominant low)	CAN_L
3	Ground	GND
4	-	-
5	-	-
6	optional ground	GND
7	CAN_H bus line (dominant high)	CAN_H
8	-	-
9	-	-



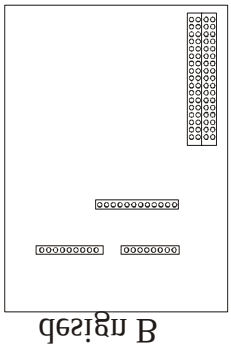
2.6.2.6 Pin assignment for Profibus DP
with option modul RP PDP, **with galvanic seperation**

pin	description	designation
1	-	-
2	-	-
3	Line B	B
4	Request to send	RTS
5	Ground	GND
6	Potential +5V	+5V
7	-	-
8	Line A	A
9	-	-



2.6.2.7 Pin assignment for SUCOnet K
with optionsmodul RP SUC**, with galvanic seperation**

pin	description	designation
1	-	-
2	-	-
3	Data line +	TA/RA
4	-	-
5	Signal ground	SGND
6	-	-
7	Data line -	TB/RB
8	-	-
9	-	-



Connector assignment and functions

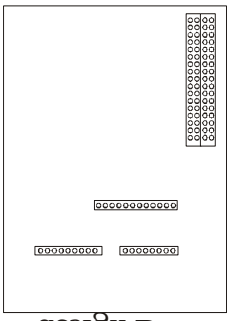
Digital interfaces

2.6.2.8 Pin assignment for Interbus S

with option modul RP IBS, with galvanic seperation

Remote OUT (COM2)
Remote OUT (SUB D09 socket)

com 2	description	designation
1	Data line OUT forward (error voltage A)	DO2
2	Data line IN backward (error voltage A)	DI2
3	Reference potential	GND I
4	-	-
5	VCCI	+5V
6	Data line OUT forward (error voltage B)	/DO2
7	Data line IN backward (error voltage B)	/DI2
8	-	-
9	Reporting input *	RBST

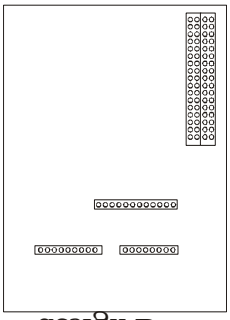


Pin 1 Pin 9

* to forward Interbus-S interface

Remote IN
Remote IN (SUB D09 plug)
≅ additional plug

remote IN	description	designation
1	Data line IN forward (error voltage A)	DO1
2	Data line OUT backward (error voltage A)	DI1
3	Reference potential	GND I
4	-	-
5	-	-
6	Data line IN forward (error voltage B)	/DO1
7	Data line OUT backward (error voltage B)	/DI1
8	-	-
9	-	-



Pin 1 Pin 9

Attention: specific front panel is required !

Connector assignment and functions

Digital interfaces

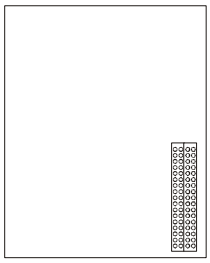
2.6.2.9 Pin assignment for I/O interface

with option modul RP EA5, with galvanic seperation

Digitale I/O Option
COM2 SUB D09 socket
(I = input; O = output)

com 2	designation	comment	status
1	BIAS input 101	standard	E
2	BIAS input 102	standard	E
3	BIAS input 107	standard	E
4	BIAS input 108	standard	E
5	0VSPS	ground reference 0VSPS	B
6	BIAS input 106	standard	E
7	BIAS output 109	standard	A
8	BIAS output 110	standard	A
9	+24VSPS	ext. +24V feed-in	UB

design B



Notice !!
The input´s with the internal number 107 and 108 must be connected to the pin´s with number 3 and 4.
The output´s with the internal number 109 and 110 must be connected to the pin´s with number 7 and 8.

Connector assignment and functions

Digital interfaces

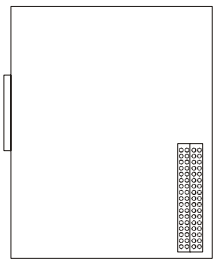
2.6.2.10 Pin assignment for I/O interface

with option modul RP EAE, with galvanic seperation

Digital I/O option
X200 SUB D26 high density socket
(I = input; O = output)

X200	Designation	comment	status
1	Bias input 201	standard	E
2	Bias input 202	standard	E
3	Bias input 203	standard	E
4	Bias input 204	standard	E
5	Bias input 205	standard	E
6	Bias input 206	standard	E
7	Bias input 207	standard	E
8	Bias input 208	standard	E
9	Bias output 209	standard	A
10	Bias output 210	standard	A
11	Bias input 211	standard	E
12	Bias input 212	standard	E
13	Bias input 213	standard	E
14	Bias input 214	standard	E
15	Bias input 215	standard	E
16	Bias input 216	standard	E
17	Bias output 217	standard	A
18	Bias output 218	standard	A
19	Bias output 219	standard	A
20	Bias output 220	standard	A
21	Bias output 221	standard	A
22	Bias output 222	standard	A
23	Bias output 223	standard	A
24	Bias output 224	standard	A
25	+24 V SPS	Ext. +24 V feed-in	Ub
26	0 V SPS	Ground reference 0 V SPS	B

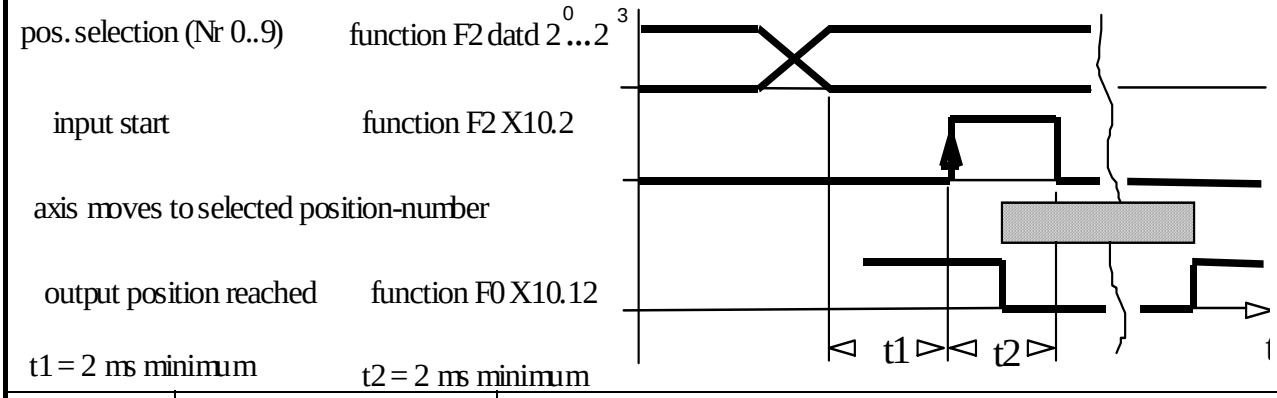
design C



3 Operating modes

The preselection of the device functions is carried out by choosing the operating modes 0...5 according to the following table, **see chapter** 3.1, (EASYRIDER® Windows - Software).

Each operating mode allows the assignment of different in- and output functions (F0..F5).

Operating mode	Reference-soure	Hints for selecting the operating mode
0 **1** **2**	analog (X10.5/18)	switchable the operating modes 1 and 2 by input X10.24 speed control analog torque controller analog
3	analog (X10.5/18) / digital	simple applications with requirement of switching between position and speed control position controller (input X10.24) handling like operating mode 4
4	digital or analog in acc. to parameter set	general position-controlled systems. Up to 10 positions can be stored under identifier-numbers and activated like shown.
		
5	**digital or analog in acc. to programming or via digital communication (e.g. fieldbus)**	**simple to complex systems using instructions BIAS (up to 1500 command blocks)** **PLC - functions** **for further informations:** **see chapter 13.1 and 13.2**

Operating modes

3.1 Operating modes and pin functions

	operating modes					
Available pins number	**0** torque / speed-control	**1** speed control	**2** torque control	**3** position / speed-control	**4** position control	**5** **position control + BIAS functions**
input X10.14	F0, F1	F0, F1	F0, F1	F0, F1, F2, F3	F0, F1, F2, F3	**F0, F1, F2**
input X10.15	F0, F1	F0, F1	F0, F1	F0, F1, F2, F3	F0, F1, F2, F3	**F0, F1, F2**
input X10.4	---	---	---	---	F2	**F0, F2, F3**
input X10.25	---	---	---	---	F2	**F0, F2, F3**
input X10.11	F1	F1	F1	F1	F1,F2	**F0, F1, F2, F3**
input X10.24	F0 L = torque- H = speed control	---	---	F0 L = torque- H = speed control	F1, F2	**F1, F2, F3**
input X10.2	---	---	---	---	F0	**F2, F3**

output X10.12	F0, F2, F5	F0, F2, F5	F0, F2, F5	F0, F1,F3, F5	F0, F1,F3, F5	**F0, F1, F2, F3, F4, F5**
output X10.13	F0, F2, F5	F0, F2, F5	F0, F2, F5	F0, F1,F3, F5	F0, F1,F3, F5	**F0, F1, F2, F3, F4, F5**
output X10.20	F0, F2, F5	F0, F2, F5	F0, F2, F5	F0, F1,F3, F5	F0, F1,F3, F5	**F0, F1, F2, F3, F4, F5**
output X10.23	F0, F2, F5	F0, F2, F5	F0, F2, F5	F0, F1,F3, F5	F0, F1,F3, F5	**F0, F1, F2, F3, F4, F5**

The assignment of the functions F0..F5 is listed in the following table

3.2 Configurable pin-functions (depending on the operating mode)

	Input functions (depending on the operating modes)					
input Nr.	**function F0**	**function F1**	**function F2**	**function F3**	**function F4**	**function F5**
input X10.14	☒	limit switch +	*) set selection data 2^0	move manually +	☒	☒
input X10.15	☒	limit switch -	*) set selection data 2^a	move manually -	☒	☒
input X10.4	latch input 1 ⌒	extended latch	*) set selection data 2^b	☒	☒	☒
input X10.25	latch input 2 ⌒	☒	*) set selection data 2^c	☒	☒	☒
input X10.11	start (slope 0-->1) for BIAS -move commands	regulator trouble reset	*) set selection data 2^d	☒	☒	☒
input X10.24	operating mode selection (0) – 1or 2 (3) – 1or 4	reference sensor	*) set selection data 2^{max}	☒	☒	☒
input X10.2	start (slope 0-->1) with position set selection in position control (4)	☒	strobe (slope 0-->1) for BIAS-set selection	☒	☒	☒

output X10.12	position reached	reference output	☒	tracking window exceded	synchron-format trigger	non regulator trouble
output X10.13	temperature monitoring	reference output	☒	tracking window exceded	start offset trigger	non regulator trouble
output X10.20	warning	reference output	☒	tracking window exceded	☒	non regulator trouble
output X10.23	active ok (motor brake)	reference output	☒	tracking window exceded	☒	non regulator trouble

☒ BIAS-function, free programmable.(in operating mode 5) resp. no function in operating mode 0 at 4.

*) With every row (from the top to the bottom) in which the function F2 is assigned to an input, the binary value (2^n) increases by 1. (see example)

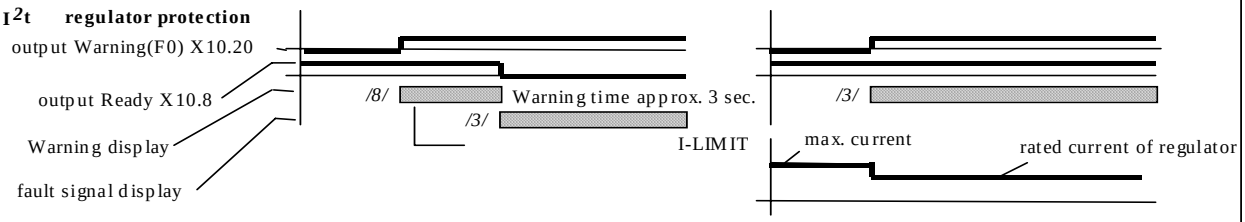
Operating mode 4: only permissible set number 0 - 9 !

⌒ fast input for optimal timing

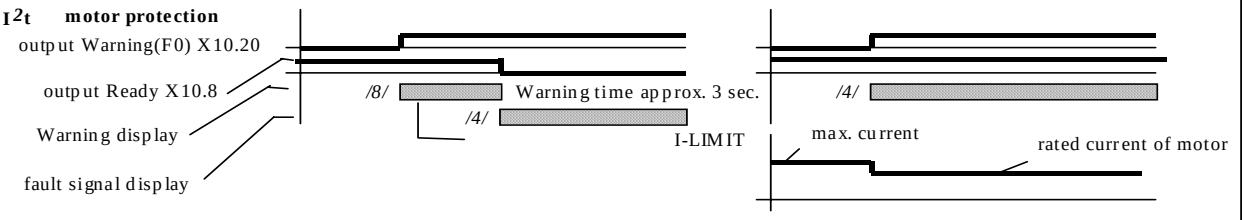
3.3 Function diagrams from inputs and outputs

Fault signal / protection function	Protection mode switching off in acc. with EASYRIDER config.- menue	Protection mode limiting acc. with EASYRIDER config. menue

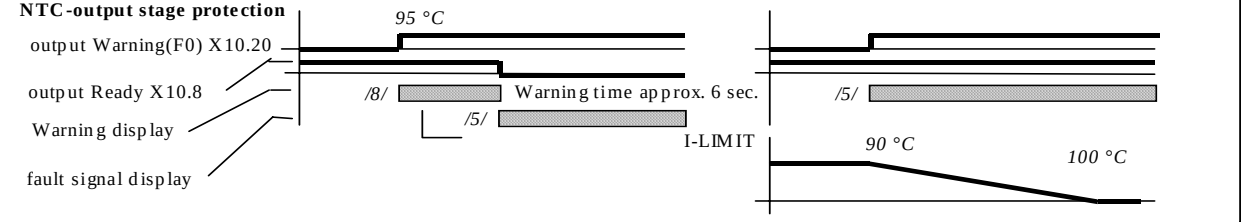
I^2t regulator protection

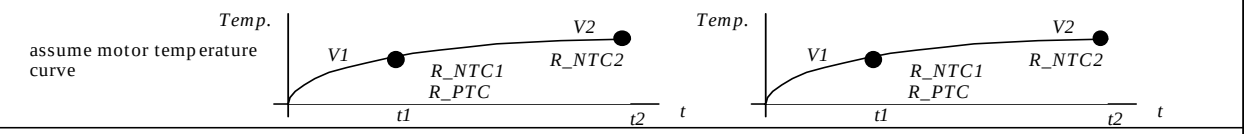


I^2t motor protection

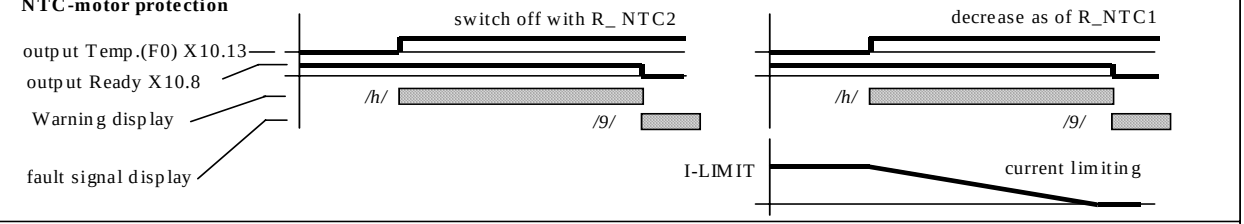


NTC-output stage protection

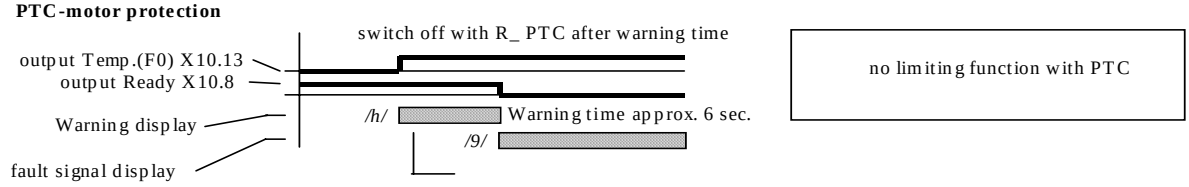




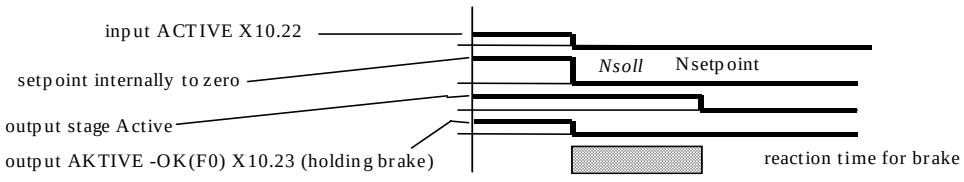
NTC-motor protection



PTC-motor protection



Function Passive -Delay (recommanded by use of motor brake)



4 Mechanical installation

4.1 Mounting

SSD Drives digital servo drives may be installed only in a vertical position to guarantee the best air circulation for the cooling ribs of the heat sink. Vertical installation above other drive racks or above other heat producing devices can lead to overheating. In addition the drives are to be operated exclusively in SSD Drives racks or the compact enclosure respectively.

4.2 Control cabinet - mounting

Installation should be carried out only in a control cabinet in which the inside must be free from dust, corrosive fumes, gases, and all liquids.

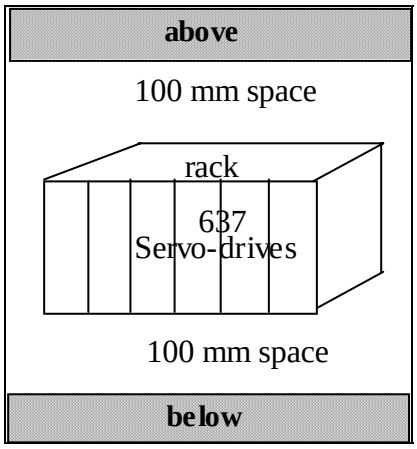
Make absolutely sure that the condensing of evaporating liquids including atmospheric moisture, is avoided. Should the digital servo drive be installed in a place where condensation is likely, a suitable anticondensation heater must be installed. The heater must be SWITCHED OFF during normal operation.

Automatic switch off is recommended

SSD Drives-digital servo drives should not be installed in are as which have been classified as dangerous, if they have not been installed in an approved enclosure an accordance with regulations and checked.

Make sure, there is enough cooling and space ! (see sketch)

- only horizontal !
- on the side
  no distance is required



General rule:
It is better to place heat-producing devices low in an enclosure to support internal convection and to spread the heat. If placing such devices up high is unavoidable, enlarging the upper dimensions at the expense of height or installing fans should be considered.

4.3 Cooling

The digital servo drives are protected against damages caused by overheating.
There is a thermal sensor installed on the heat sink. When the temperature rises to >95°C,
the drive is automatically switched off. This setting cannot be changed.
Make sure a cabinet of proper size is selected for adequate air circulation

If the device becomes operated in a not ventilated device, the case volume of the specified control cabinet must be calculated in accordance with the following table !

Device	Volume/control cabinet
637/D6R02...D6R10	0,12 m³
637/D6R16...D6R30	0,25 m³

For more exact information, please, address to the control-cabinet manufacture

5 Electrical installation

5.1 Safety

The voltages carried by power supply cables, motor cables, connectors, and certain parts of the drive can cause serious electric shocks and even death

5.2 The danger of electric shocks

CAUTION !

Risk of electrical shock, wait 3 minutes after switching off, for discharging the capacitors.

Disconnect SSD Drives plug-in units from mains before working on them. A period of **three** minutes **must** pass after switching off so that the internal capacitors can discharge completely. Until the discharge time is over, there can be dangerous voltages in the
module !
Persons, which monitoring or carrying out electrical installation and maintenance must be adequately qualified and schooled in these activities.

5.3 Danger areas

The use of variable speed drives of all kinds can invalidate the certification for dangerous areas (apparatus group and/or temperature class) of explosion-protected motors. Inspection and certification for the complete installation of servo motors and electronic components **must** be obtained.

5.4 Grounding, safety grounding

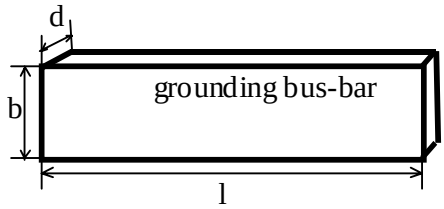
The grounding impedance must meet the requirements of local industrial safety regulations and should be inspected and checked at appropriate and regular intervals

5.4.1 Ground connections

It is recommended to attach a ground bus of high conductivity copper as near as possible to the servo-rack or regulator modules in order to minimize the length of the cable connections.
The recommended dimensions are:

Thickness: d = 5 to 6 mm

Length (m)	Width (mm)
< 0,5	20
0,5 < 1,0	40
1,0 < 1,5	50



Ways of raised discharge currents > DC 10mA resp. > AC 3,5mA the PE-Bolt of the drive has to be connected to PE using copper-cable minimum 10mm² !

5.5 Short-circuit capability and discharge currents

Due to the working-principle of servo drives there may discharge currents to
PE exceeding DC 10mA resp. AC 3,5mA.
Suitable for use on a circuit capable of delivery not more than 5000 RMS symmetrical amperes 505V maximum. (Note according to UL508C)

Electrical installation

5.6 Fuses, contactors, filters

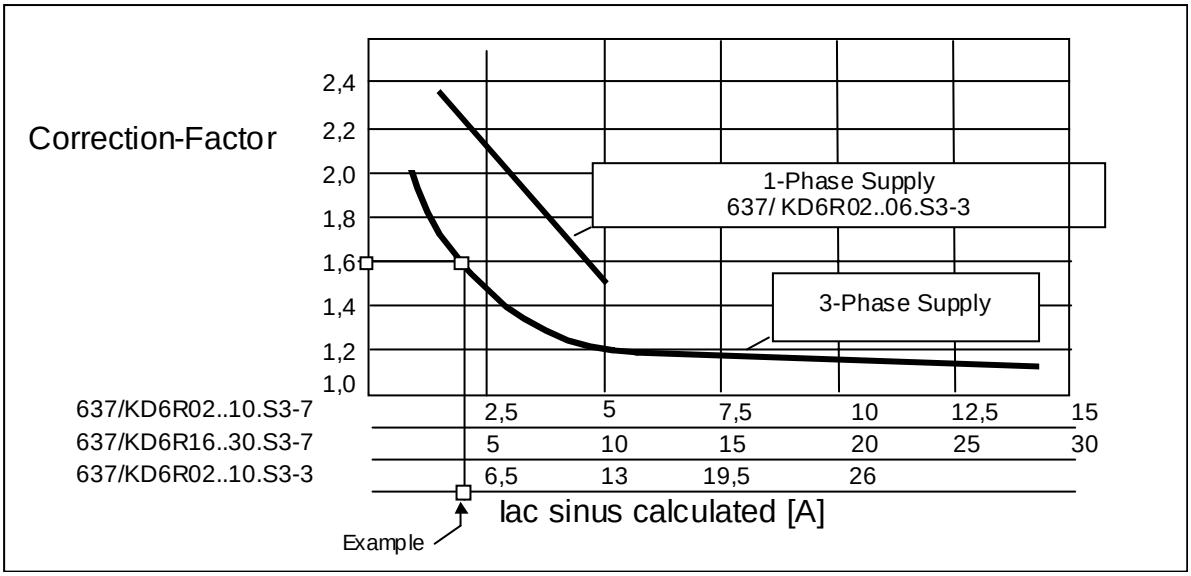
Compact units			637/	KD6R 02 .S3		KD6R 04 .S3		KD6R 06 .S3		KD6R 10 .S3		KD6R 16 .S3	KD6R 22 .S3	KD6R 30 .S3
				-3	-7	-3	-7	-3	-7	-3	-7	-7	-7	-7
Fuses, Contactors		4)												
RCD-switch				not recommended. Required setpoint: 300 mA, no protection against life danger										
mains input currents	1phase			5,2	-	8,8	-	12,5	-	-	-	-	-	-
	3pahse		[A]	3,5	3,5	5	5	7,5	7,5	12	12	19	26	30
mains protection		1)	Typ	T10A		T10A		T10A		T20A		T25A	(T32A) 35A	(T32A) 35A
protector-switch		2)	Typ	PKZM0-16		PKZM0-16		PKZM0-16		PKZM0-16		PKZM0-25	PKZ2/ZM32	PKZ2/ZM32
mains fuse		2)	Typ	DIL 00M		DIL 00M		DIL 00M		DIL 00M		DIL 0M	DIL 0M	DIL 0M
Line filters		4)												
generall				only for use in earth referenced supplies(TN). Current drain to PE !										
				single-phase										
industrial env. max. motor cable 50m (EN55011 A)			model	LNF E 1*230/012 **up to AC 230V !!** + ferrite core FR 3						not possible				
residential env. max. motor cable 20m (EN55011 B)			model	LNF E 1*230/012 **up to AC 230V !!** + ferrite core FR 3						not possible				
				3-phase										
industrial env. max. motor cable 50m (EN55011 A)			model	LNF B 3*480/008 + ferrite core FR 3						LNF B 3*480/018 + ferrite core FR 6			LNF B 3*480/033 + ferrite core FR 6	
residential env. max motor cable 20m (EN55011 B)			model	LNF B 3*480/008 + ferrite core FR 3						LNF B 3*480/018 + ferrite core FR 3			LNF B 3*480/033 + ferrite core FR 3	
				3-phase, max. 3 servo drives supplied by one common filter										
industrial env. max. motor cable 20m (EN55011 A)			model	LNF B 3*480/018; LNF B *480/033 + ferrite core FR other models upon request (according to ref.measurements with 3 units, supplied by common line)										
residential env. max motor cable 20m (EN55011 B)		3)	model	LNF B 3*480/018; LNF B 3*480/033 + ferrite core FR other models upon request (according to ref.measurements with 3 units, supplied by common line)										

Plug-in modules		637/	D6R 02 .S3		D6R 04 .S3		D6R 06 .S3		D6R 10 .S3		D6R 16 .S3		D6R 22 .S3		D6R 30 .S3	
			-3	-7	-3	-7	-3	-7	-3	-7	-3	-7	-3	-7	-3	-7
Fuses, contactors, filters	4) 1)															
generall		Orientation: Table for compact units and the addition of rated currents of used units on the DC-Bus. Depending on the application, energy sharing effects by DC-link may reduce the required supply current considerable.														
fuses		Rule of the thumb: single-phase operation: 2...3 times of added rated currents Rule of the thumb: 3-phase operation: 1,5...2 times of added rated currents														
peak making currents		Depending on power-supply unit, limiting equipment is requiered (delay contactor)														
filters		only for use in earth referenced supplies(TN). Current drain to PE !														
filter models		Orientation: Table of compact units. Further models: see separate manual														

1) recommended for UL-requirements: Bussmann Type FRS-R, 600V, use only UL-approved fuse-holders !
2) recommended, Klöckner Moeller for instance
3) Measurement of conducted emissions only
4) for applications with continuous load: see notes in chapter 5.7

5.7 Correction of supply current

Attention in case of continous load:
Due to the capacitive input impedance of DC-Bus, the input current is deformated.
This guides to RMS -values higher than the sinus-based calculated values. Fuses, contactors and line filters have to be selected in respect to this effect.
In typical servo application with Stop/Go-operation (S3-Operation), the rating to nominal data will be sufficient.
In other cases, the value has to be corrected using the following diagram.



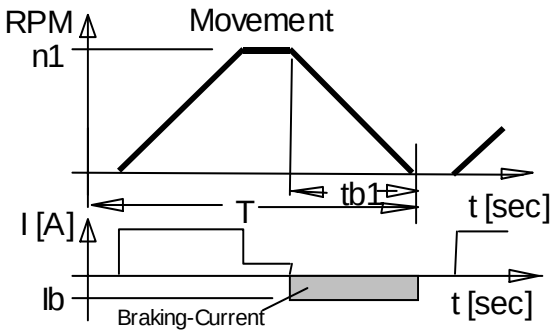
Example:
Drive type 637/KD6R16.S3-3 is supplied by AC 230V 3-ph.
Output data to the motor: AC 200V 16A
Output-power: Pout = 200V x 16A x 1,73 = 5,54 kW
This output-power must be generated by:
calculated supply-current Iac sinus = 5,54kW / (230V x 1,73) = 13,9 A
Correction-Factor from diagram: 1,6
RMS. Supply-Current Ieff = Iac sinus x 1,6 = 22,3 A

Result:
All supply-equipment has to be selected in respect tothe enhanced current.

5.8 Brake resistor

5.8.1 Selection of the brake resistor

The energy of a moving system flows back to the Drive. The DC-Bus capacitors are able to take a small value. The rest has to be converted to heat by a resistor.
Switching of this brake resistor depends on the DC-Bus voltage.
The load of the resistor is simulated and supervised electronically (EASYRIDER® Windows - Software). Peak power (Pmax) and continuous power (Pd) ratings have to be sufficient to meet the requirements of the application.



Definition of Data	*Values for Example*
Speed at Brake-Start	n1 = 3000 RPM
Braking Time	tb1 = 0,1 sec.
Cycle-Time	T = 2,0 sec.
Total Inertia	J = 0,0005 kgm²
Braking-Current	Ib = 3,2 A
Motor-Resistance	Rph = 3,6 Ohm
Cable-Resistance	RL = 0,3 Ohm

Calculation	
Step 1 **Calculation of brake-power** (Approximation. Capacitor-load, friction-and drive-losses neglected)	example
Power of motion: **Pkin** = 0,0055 * J * n1² / tb1 [W]	Pkin = 0,0055 * 0,0005 * 3000²/0,1 Pkin = 247 W
Motor-losses: **Pvmot** = Ib² * (Ri + RL) [W]	Pvmot = 3,2² * (3,6 + 0,3) Pvmot = 40 W
Cont. Power: **Pd = 0,9 * (Pkin-Pvmot) * tb1 / T [W]**	Pd = 0,9 * (247 - 40) * 0,1 / 2 Pd = 9,3 W
Peak-Power: **Pmax = (1,8 * Pkin) - Pvmot [W]**	Pmax = (1,8 * 247) - 40 Pmax = 405 W

used units:
J total inertia [kgm²]
n1 speed at Brake-Start [RPM]
tb1 braking time [Sec]
T cykle time [Sec]
Ib brake-current [A]
Rph resistance of motor (between terminals) [Ω]
RL line resistance of motor cable [Ω]

Elektrische Installation

Brake resistor

Selection of the brake resistor

Step 2 Internal / external Brake-resistor required ? see data in chapter 1.3.3 / 1.3.4	Example-Drive model 637/K D6R04-7
In case of unsufficient capability or not included internal Brake-Resistor, a type may be selected from the following list External and internal Brake-Resistors will be switched in parallel. The internal and external performance-Data may be added in this case.	acc. to data in 1.3.3: internal resistor: Cont. Power Pd = 30W Peak Power Pmax = 1700W Required: Pd = 9,3W Pmax = 405W **Result: The internal capability is sufficient**

Selection guide

external Brakeresistors

Ub-Setpoint	Pmax ext [W]	Pd ext [W]	Rb ext [Ohm]	SSD Drives-Type
DC 375V	4260	100	33	B100/33-3
	17150	300	8,2	B300/8,2-3
	17800	560	7,9	B560/7,9-3
DC 720V	5184	100	100	B100/100-6
	15709	300	33	B300/ 33-6
	19938	560	26	B560/ 26-6

Overload-Capability: approx. 5000% / 0,5sec

5.8.2 Configuration of the brake resistor

Possible ballast circuit configurations at digital devices

a) Compact design
The plug-in modules of servo-control series 635 / 637 /637+ are provided with an on board ballast electronics. It is intended for application as compact unit KDER resp. KD6R.
These compact units contain the necessary ballast resistor incl. fuse for the ballast circuit.
Except KD6R 16..30-7 (external resistor only).

b) Rack design
While the plug-in modules are used in a rack, the NEB power supply module takes dissipation of the braking energy (adjustment of ballast monitoring: please see NEB manual).
In this case the ballast electronics of the plug-in module will be deactivated with the configuration parameter "Ballast aktiviert = N".
All further ballast parameters are no longer relevant then.

r.g. a) Adjustment of ballast circuit for compact units:
In this case the ballast electronics of the plug-in module will be activated."Ballast aktiviert = J".
The operating point has to be adjusted depentent on the voltage variant.
"Ucc Ballast Ein = 375 V" for 230 V AC supply
"Ucc Ballast Ein = 720 V" for 400..460 V AC supply
As resistance value, the parallel resistance from internal and external resistance has to be adjusted.
e.g. "Ballastwiderstand = 300 Ohm" for KD6R-10-7 (internal resistance only)
"Ballastwiderstand = 75 Ohm" for KD6R-10-7 (+ external 100 Ohm / 100 W)
As ballast power (braking energy), the sum total of internal and external resistor power has to be adjusted.
e.g. "Ballastleistung = 30 Watt" for KD6R-10-7 (internal resistance only)
"Ballastleistung = 130 Watt" for KD6R-10-7 (+ external 100 Ohm / 100 W)
Precondition for correct monitoring of shunted ballast resistors is the nearly same ratio of P - cont. power to P - pulse power. This is guarantied with the SSD Drives standard combinations.

KD6R 16..30-7 units do not contain an internal ballast resistor.
At these versions the values of the external resistor can be feeded directly.

5.8.3 Additional informations

Adjustment of load-supervision

used brake resistor R intern	R extern	EASYRIDER-data adjustment acc. to...
X		R intern
X	X	R extern
	X	R extern

Paralleling of resistors:
possible in respect of the limits in accordance to chapter 1.3.3 / 1.3.4

Genral rule for resistor data:
Pmax / Pd <= 59

Caution !

Placing of external brake resistors

Brake-resistor are dissipating heat !
Make sure, that there will be no fire-danger in case of operating the resistor in nominal- or fail-conditions

6 Wiring instructions

6.1 General Information

Digital servo drives are designed for **operation in metallic grounded enclosures**.
For perfect operation as well as for observance of all regulations the **front board must be connected with the enclosure electrically and fixed.**

6.2 Control cabling

Recommended cross section 0,25 mm².The control signal lines must be laid seperate from the power signal lines.(see chapter 6.7.1)
The resolver cable should contain three shielded pairs **and** be shielded as a whole. The shielding should be connected to the ground spread out on the regulator side.We recommend using SSD Drives resolver cable **KIR.** Cable for transmitting data are always to be laid shielded !

6.3 Power cabling

Recommended section according to rated current. Use only 75° Cu-cables.

6.4 Installation of the rack

When the rack is secured not in a hinged bay but on a mounting plate, it is recommended to do the wiring of the connections for the power connector X50 on the rear of the rack before installing. With hinged-bay installation, the customer must ensure that the parts sensitive to voltage such as the Ucc bus, mains supply lines, etc., are protected against electric shock.

6.5 Analog setpoint

The setpoint input is a differential input. Therefore the poling can be done depending on the requirements.
Important: the setpoint voltage must be galvanically connected to the reference potential of the control connections (plug X10). It is possible to connect one pole directly to GND.

6.6 Safety rules

CAUTION !

Plug / unplug all modules only when
Ucc (DC-BUS) is off, that is, the green LED on the power supply module is off and the discharge time > 3 minutes has elapsed.
The user must ensure protection against accidental touching.

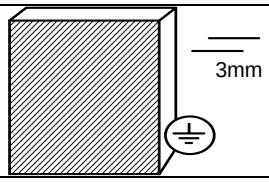
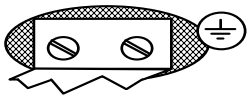
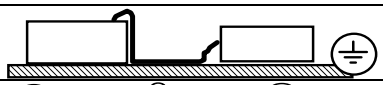
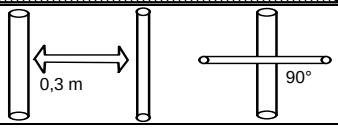
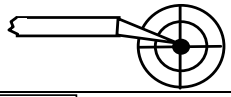
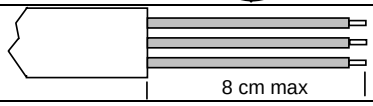
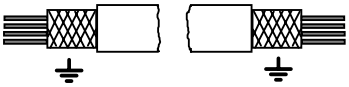
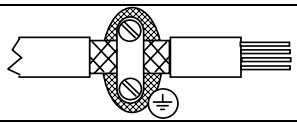
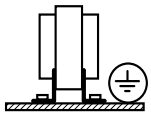
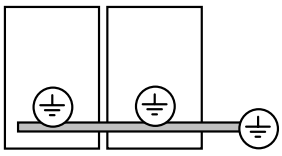
6.7 Electromagnetic compatibility (EMC)

Confirmity in accordance with the EEC Directive 89/336/EEC has been evaluated using a reference-system, consisting of a compact type drive and a line-filter on mounting-plate,
connected to an AC-syncronous motor.
Mainly responsible for EMC-emissions is the motor cable. So this has to be installed exeptional carefully. The layout of grounding is very important. Grounding has to be low-impedant for high frequences. That means, all ground-connecting parts have to use area.
The measurements made are valid under the use of SSD Drives - cables, suppression aids and line filters and by application of the following wiring instructions:

Wiring instructions

Electromagnetic compatibility (EMC)

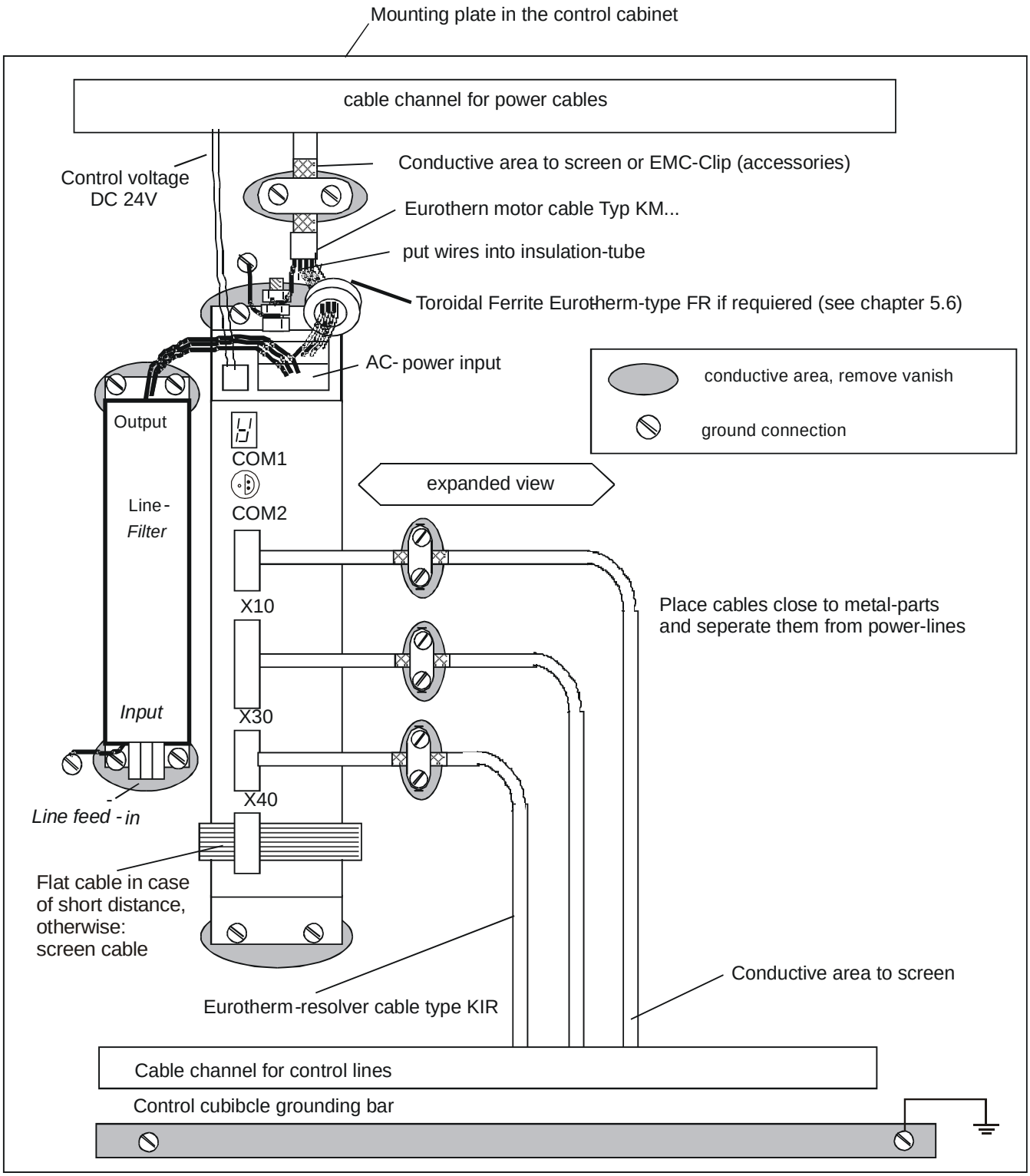
6.7.1 Hints for mounting

A	All components are mounted inside of a steel control cubicle on a mounting plate (thickness min. 3mm). Recommended: Galvanizing	
B	The connection between drive housing filter-housing and mountig-plate must be blank and not reduced by varnish. All screws must be well fixed !	
C	Use only SSD Drives-filters and cables for motor and resolver	
D	Place all wires and cables as close as possible to any grounded metal planes	
E	Separate power- and control cables. Minimum distance: 0,3m Crosspoints: 90°	
F	Avoid cable-loops. Especially the line between line-filter and drive has to be as close and short as possible (drilled)	
G	Maintain screen as close as possible to the cable-end (max distance 8 cm)	
H	Connect screen-connections according to general view of connetions, see chapter 2.1. Ground screens on both sides, shortest way. For long cables: Connect additional screen-area along the way	
I	Connect screens area-contacted to good grounded points	
K	Connect unused wires in cables to ground	
L	Install control cables directly close to grounded metal-parts or screend when leaving the control-cubicle	
M	Take care for good grounding of control-transformer (DC 24V). Use transformer with metal-socket and take care for conductive contact to mounting-plate	
N	Take care for good general grounding of the complete system. Interconnect several mounting-plates with copper-rails or copperband. Take care for ground connection between conrol-cubicle and machine !	

Wiring instructions

Electromagnetic compatibility (EMC)

6.7.2 Example for mounting



6.7.3 Achieveable specifications and conditions

	Area	Class	Standard	conditions		additional conditions	
				Motor-cable length	SSD Drives line filters	mounting in	additional
Emissions: transmitted by cable or by air	Industrial	A	EN50081-2/ EN55011Klasse A	see chapter 5.6	LNF S/E LNF B	closed cabinet with ≥ 15 dB attenuation	toroidal ferrite cores see chapter 5.6
	Residential	B	EN50081-1/ EN55011 Klasse B	see chapter 5.6	LNF S/E LNF B		
Interference immunity: (≅ radiation) transmitted by cable or by air	Industrial	A	EN50082-2	-	-	-	-
	Residential	B		-	-	-	-

7 Setting and programming

7.1 Jumper

All jumpers are set to a standard position in production !

JP100, bridged pad...	
2 and 3 (standard)	READY contact with reference to common output supply voltage on X10.21
1 and 3	READY contact can be wired freely

JP101, bridged pad...	
2 and 3 (standard)	Analog input X10.19 without internal Pull-up.
1 and 3	Analog input X10.19 with internal Pull-up to +12 V (FRR compatible)

JP102, bridged pad...	
2 and 3 (standard)	X10.23 = active ok. output
1 and 3	X10.23 = GND internal (FRR compatible)

JP1, JP2 bridged pad...	**adjust identically !**
2 and 3 (standard)	X10.15 = high-active
1 and 3	X10.15 = low-active

JP3, JP4 bridged pad...	**adjust identically !**
2 and 3 (standard)	X10.14 = high-active
1 and 3	X10.14 = low-active

7.2 Digital communication

see chapter 1.1.1

7.3 PROG-key functions

7.3.1 Description for PROG-key

Simple changes of the parameters can be made without any further aids directly on the device as follows:

Conditions for activating:
a.) PROG-key function is allowed. (EASYRIDER® Windows - Software)
b.) Local mode selected no HOST LOGIN.
c.) Only possible in interference-free state.

Activating the programming operation:
PROG-key approx. 4 seconds to the left

Characteristic of the programming operation:
blinking display alternately:
mode-identifier / value

Change values:
press key left or right according to the following table.
The whole range is divided in 32 steps and will be displayed as follows:

smallest value					**largest value**
01,	02,	03,	04,	.....	1F, 20

If an error occurs, the programming operation is switched off.

Setting and programming

7.3.2 Operating via PROG-key

PROG-key	Remark	Function	Value range	Display	Remark
		normal operation [1]		/-./ or / ./	
←	hold for 4sec				
		reserved		/r/	flashes
←	hold for 4sec				
		maximal current limit	/0/ ... /F./	/n/	alternates blinking
←|→	press briefly	set			
←	hold for 4sec				
		speed-0 adjustment	none	/0/	flashes
→	press briefly	adjustment: a) ok b) not possible		a) /n/ b) /-/	flashes
←	hold for 4sec				
		P-gain-setting of the speed controller	/0/ ... /F./	/P/	alternates blinking
←|→	press briefly	set			
←	hold for 4sec				
		I-gain setting of the speed controller	/0/ ... /F./	/I/	alternates blinking
←|→	press briefly	set			
←	hold for 4sec				
		Setpoint evaluation:	/0/	/H/	alternates blinking
←|→	press briefly	set: -5,+5 rpm/step	/F/ , /1/	/H/	
←	hold for 4sec				
		Axis number designation:	/0/ ... /F./	/U/	alternates blinking
←|→	press briefly	set: /0/ Nr.1 /F./ Nr.32	/0/ ... /F./	/U/	
←	hold for 4sec				
		Store in EPROM?	-	/E/	flashes
→	hold for 4sec	yes	-	/ ./	norm. operation[1]
←	hold for 4sec				
		=> **normal operation** [1]	-	/ ./	

1) Normal operation: Ucc and Us on, no failure

8 Commissioning

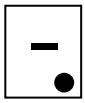
CAUTION !

Wiring errors or incompatible operation may cause unpredictable motions.
Avoid danger for men and machine !

8.1 Preparation

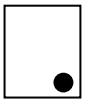
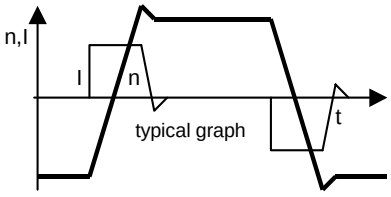
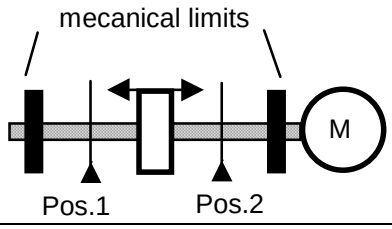
- For PC-link use the SSD Drives communication software EASYRIDER® Windows - Software. For the start, we suggest exercises in simulation mode to get familiar with EASYRIDER.This chapter presumes the knowledge how to handle EASYRIDER.Suggestions: Use testequipment to train yourself. EASYRIDER® Windows - Software contains interactive HELP - functions.
- For security-reasons the access to several functions is blocked by password. Commissioning has to be executed by trained stuff only.
- Users may have their application-adapted commissioning methode when familiar with the product, on their own resposibility.
- The system must be in accordance with all valid safety specifications. The function of all safety equipment (limit-switches for example) have to be checked.
- To activate the power-stage of the drive, the "ACTIVE"-signal (X10.22 against X10.9) has to be exited.

8.2 Commissioning in steps

Step	Action	Remark
1	**Before switching on** Check the wirung, especially: Filterpolarity, supply motor wiring, motor polarity resolver wiring, polarity (or other feedback systems)	
2	with critical mechanical parts: remove motor shaft from application	avoid danger
3	Connect PC by RS232 link to the drive service port COM1 and start EASYRIDER®	
4	Switch on control voltage Us (DC 24V) EASYRIDER® communicates (see diagnosis F9)	7-Segment-display 
5	**Set up state** **NOT ACTIVE (X10.22 against X10.9)** **Power ON**	7-Segment-display 
6	Are parameters already evaluated ? **yes:** load parameter file *.WDD. Store parameters in the drive. If existent: load BIAS-file *.WBD and store it in the drive. proceed with **10 or 15** (experts) **no:** continue with **7**	
7	Menue Comissioning: Select the used motor from the EASYRIDER®- Library Adjust max. current to nominal motor current or smaller	reduced torque
8	When leaving that menue: Tuning-parameters for current loop will be calcualated and offered to the user. Normally, these values give dynamic servo motion.	confirm acceptance of offered parameters
9	store data power-fail-save in the drive (F7)	
10	**Menue: Tuning speed loop**	

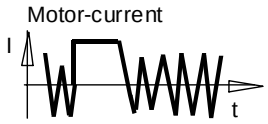
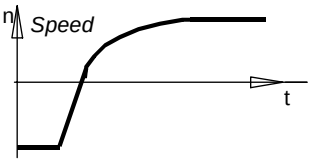
Commissioning

Commissioning in steps

Step	Action	Remark
11	"ACTIVE" switched	7-Segment-display 
12	Adjust test generator as required. Activate test generator with "START Motor". Activate graph to display motor current or speed. can be optimized manually (P- and I-gain)	
13	Is the result ok? **yes:** continue with **14** | **no:** continue with **U1**	
14	Preparation to the position controller The commissioning of the position controller is first recommended without linked up mechanics. In the case of secure functions, the mechanics can then be linked up.	
15	**Power OFF.** connect motor-shaft to the application Move application to a free area between mecanical limits. **Power ON** **Menue: Tuning position loop**	
16	Adjust testgenerator. Select Pos.1 and Pos .2 to uncritical values. Select slow speed and slow acceleration first, rise up later.	mind: reaction-time to **Emergency Stop**
17	"ACTIVE" - switched. Every activation of "START Motor" exites a motion from Pos. 1 to Pos.2 and, with the next activation, from Pos 2 to Pos. 1	
18	Observe the behavior of application and graph. Optimize tuning-parameters (P-, I- andV gain)	
19	Is the result ok? **yes:** continue with **20** | **no:** continue with **9**	
20	**Basic power-up is done now.** Further functions (Interfaces, fieldbus functions, syncronizing and so on may be done adapted to the selected equipment.	
21	Select the menu **File** "store parameters" and store the data in the regulator, protected against loss, with the F7-key.	data save

Commissioning

Commissioning in steps

Step	Action	Remark
U1.1	**Menue: Tuning Speed Loop** Stable parameters are calculated bases on the system data; and can be called up with F5. Sometimes it is recommanded to make further manual tuning. Rated values can be sourced either digital by the internal generator or analog by using +/-10V at X10.5/18. **ATTENTION !** Too hard tuning will cause current- ripple and high power-dissipation.	 *P-Gain too* high *or I-time constant* too small Motor-noise
U1.2	Too weak adjustment causes slow loop-reactions, that may cause problems for the tuning of position loops.	 P-Gain too smal l or I-time constant too high
U1.3	Is the result ok? **yes:** continue with **9** | **no:** continue with **U2.1**	
U2.1	**Menue: Tuning Current Loop** Stable parameters are calculated bases on the system data and can be called up with F5. Manual tuning may be sensfull. Rated values can be sourced either digital by the internal generator or analog by using +/-10V at X10.5/18. **ATTENTION !** Tuning of current loop should be only done after consultation of SSD Drives experts. **continue with 9**	

9 Diagnosis and trouble shooting

9.1 7-segment display

Many sources of faults can be narrowed down with the diagnosis display.

display	explanation	output ready	output [2] warning	Comment
/ /	no display	off	off	any control voltage? external fuses ok?
/–/	system ready for operate	on	off	regulator ready not activ
/•/	drive ready for operate ! system active	on	off	DC-bus within the boundaries
/-/	internal STOP with serial deactivating	off	off	activate drive via serial interface
/=/	regulator of serial interface COM2 deactivated !	off	off	only if bus interface is integrated or the BIAS-command deactivated !
/¯/	deactivated with delay time for the brake	on	off	deactivated via input.
		off	off	deactivated via serial command.
/=/	Activ input is activated with switching on	off	off	switch enable X10.22 low and then high
/U/	undervoltage of control voltage	off	off	control voltage < 17 V.
/I/	undervoltage in DC-bus <Ua low threshold	off	off	power supply switched on? power supply unit ok? internal fuses ok? Error signal disappears, if DC-bus voltage over the threshold. EASYRIDER® Windows – Software.
/2/	fault in feedback system (e.g. resolver)	off	off	wiring to encoder system ok? encoder system ok? encoder system supply ok?
/3/	I²t-overload of the regulator	1)	1)	does the control loop oscillate? P-amplification too high mechanics stiff? requirements too high? is warning /8/ evaluated?
/4/	overload of the motor I²t	1)	1)	does the control loop oscillate? P-amplification too high mechanics stiff? requirements too high? is warning /8/ evaluated?
/5/	overtemperature of the output stage (> 95°C)	1)	1)	adequate cooling of the regulator? ambient temperature too high?

1) Reaction to these errors see chapter 3.3
2) With configuration corresponding chapter 3.1
* Only warning and/or status indicator

Diagnosis and trouble shooting

7-segment display

display	explanation	output ready	output 2) warning	Comment
/b/	overvoltage on DC bus	1)	1)	ballast module ok? adequate ballast module?
/1/	chassis shorting and short circuit due to hardware	off	off	motor cabling ok? digital-loops setup ok? short circuit to chassis in the motor? braking resistor: ohm- value too low? try to start fresh! send in for repair
* /0/	WARNING! overload of the regulator I²t or motor I²t or temp.-output stage too high. If no reaction within approx. 3sec.it switches off with signals /3/, /4/ or /5/. Signal /8/ clears when there is no more danger or it is switched off	off	1)	mechanics stiff? defective bearings; cold grease? reduce requirements and creep to next possible STOP
/5/	overtemperature motor(NTC/PTC)	off		check overload of the motor / cooling etc.
* /h/	motor temperature too high	on	1)	check overload of the motor / cooling etc.
/-/	ballast active			Brake energy is removed
/u/	warning I²t ballast too high	on	1)	ballast resistance usage >90%
/U/	switch off ballast	on	1)	ballast resistance overloaded
/11/	X 300 – Modul not inserted or wrong inserted or defect	off	off	X 300 testing Chapter1.4.3.1 Layout
* /L/	tracking window exceeded			only in operation mode position control, will be deleted with the next run-command
/E/	tracking error with switch off			only in operation mode "position control"
/y/	memory-checksum-error	off	off	try new start

1) Reaction to these errors see chapter 3.3
2) With configuration corresponding chapter 3.1
* Only warning respect. status indicator

The error signals are shown as long as there is control voltage (Us), also when the power (DC-Bus) is switched off for safety reasons.

9.2 Reset of a regulator trouble

A general precondition for correct execution of the Reset is the elimination of the error cause

The error signals 2 - 7, 9, Ł, U, u, Y
of the drive can be reset via:

1. **Control voltage OFF/ON**,
2. **for RESET with the programming switch**
   a. The active input X10.22 must be deactivated.
   b. No host registration have to be occurred.
   c. The progamming switch function must be activated.
   d. Hold the progamming switch for 1sec. on the right side.
3. **the serial command "reset drive" 0x02**
   The host registration must be occurred.
   The drive must be deactivated via the serial command"deactivate Drive" 0x00.
4. **the Fieldbus command "reset drive" 0x16**
   The host registration must be occurred via the BUS command 0x01.
   The drive must be deactivated via the BUS command"deactivate Drive" 0x14.
   The fieldbus command "Drive Reset" with constant repetition of the fieldbus command 0x16 will be works-off only once. For further processing, it is necessary, meanwhile to send another control word (e.g. 0 status order).
5. **a 0 – 1 flank on input X10.11**
   Precondition:
   - The input X10.11 is with function 1"Reset drive fault" configured (EASYRIDER® Windows – Software)
   - There is no host login.
   - The input Active,(X10.22) is inactive (0V)
   - The signal must be present min. 250 ms
6. **the BIAS command "end of program, mode = 6"**
   only possible in PLC – program with option
   "PLC – program: Continue execution at reactivation".

Notice !!

After remove of the tracking error deactivation "Ł ", the warning message "L"
(tracking error) is active up to the next move command.

The **error signal** "≡"(releasing before ready) can be reset by deactivation the drive.

9.3 Trouble shooting

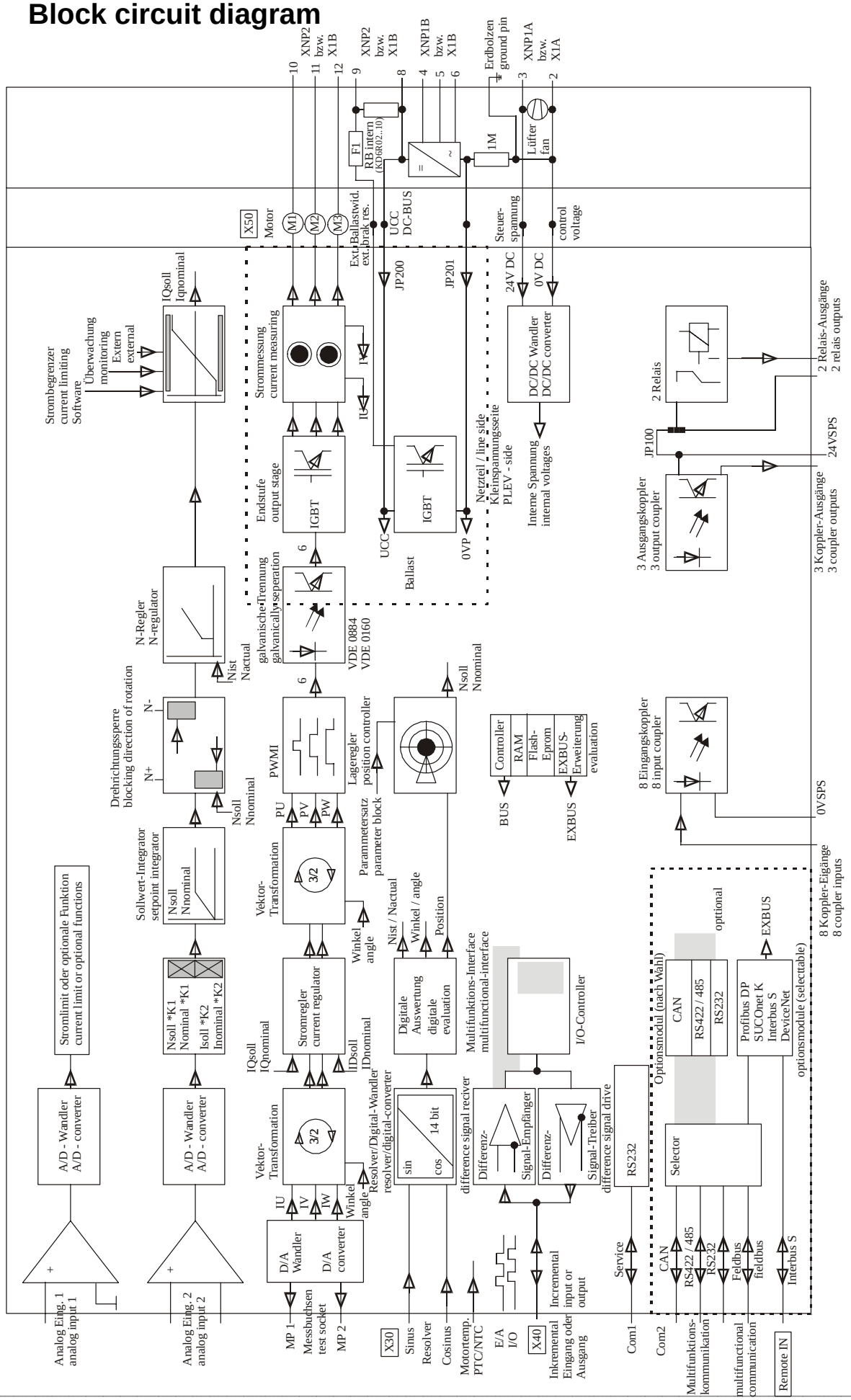
The following list refers to faults which can occur during operation.

Display: / •/

Error	Explanation and remedy	
no motor run despite current flow	motor mechanically blocked? motor brake released?	1)
motor runs unevently	check setpoint wiring check grounding and shielding too high P-amplification in the speed controller reduce value (with EASYRIDER® setting/speed controlle) too small I-time in the speed controller? reduce value (with EASYRIDER® setting/speed controlle)	
no reaction of setpoint progression, despite torque in standstill	Limit switch functions effective (BIAS)	
no current flow; no torque despite activating the regulator correctly	motor cables interrupted? Is input "I extern" (X10.19) activated (config. menu) and not notched up? limit switch - input activated and not notched up?	
Interference symptoms with power frequency	Ground loops in setpoint or actual value wiring? Shieldings laid on both sides? Signal cables near high voltage cables?	
Motor takes up preferred positions after activation	Position encoder or motor cables with reversed poles? Resolver orFeedback- encoder incorrectly adjusted? Number of motor poles wrong matching? (config. menu)	1)
Motor runs up immediately after activation although there is no setpoint	Motor cables or feedback- cables reversed? Encoder incorrectly adjusted? (e.g. Resolver)	1)
Motor reaches in idling cycle very different speed when running to the right or to the left	Feedback-Encoder incorrectly adjusted (e.g. Resolver)	

1) Display /3./ or /4./ mostly short after activating; before warning /8./

10 Block circuit diagram



11 General technical data

11.1 Power circuit

galvanic separation from control circuit	in acc. with EN 50178 / VDE 0160
specification in accordance with	UL 508C and cUL
short circuit and to frame proof for	Min. 2000 releasings
overvoltage monitoring D6R..-3	Max. 400V DC ±5V DC
overvoltage monitoring D6R..-7	Max. 765V DC ±10V DC
undervoltage monitoring	min. 15V DC; configurable
overtemperature switch off at	95 ° C +/- 5%
clock frequency	4,75 kHz
frequency of current ripple	9,5 kHz

11.2 Control circuit

galvanic separation from power circuit	in acc. with EN 50178 / VDE 0160
further informations:	see concept of insulation chapter 1.3.1
	see data compact units chapter. 1.3.3
	see data plug-in modules chapter 1.3.4

11.3 Signal inputs and outputs, connection X10

additional galvanic separation from power and control circuit	
nominal voltage of the in- and outputs	24 V DC
number of outputs signal outputs via OPTO coupler	5 U_{max} = 45V DC; I = 0..60 mA; short circuit proof, resistive load
signal outputs via RELAY contact protection with inductive load	U_{max} = 45V DC; I = 1uA...1,2A internal varistor
number of inputs signal outputs via OPTO coupler	8 L = 0...7 V DC or open H = 15...30 V DC I_{in} 24VDC @ 8 mA
reaction time of the intputs X10.2, X10.4, X10.11, X10.14, X10.15, X10.24	> 1 ms
reaction time of the intputs X10.4, X10.25 (configured as latch input "see chapter 3")	0,2 ms
Effect of cycle-time	≤ 0,02 ms

General technical data

11.4 Digital control

a) current control	
settings	according to factory specifications or motor data
current limits	speed control menu or PROG-key
externally through fixed voltage	0..10V = 0..100%; can be normed
resolution	10 bit
b) speed control	
settings	speed control menu or PROG key
differential setpoint input analog	U_{soll} = 10 V, can be normed; R_i = 10k
resolution (including sign)	12 bit
digital setpoint input	via interfaces
c) position control	

11.5 Digital communication

RS232 - service interface	COM1
optional RS232 / RS 422 / RS 485 on SUB D - socket CAN, Profibus DP, SUCOnet K on SUB D-socket Interbus S on SUB D - socket (OUT) Interbus S (Remote IN)	COM2 additional SUB D plug
standard-protocol	19200 baud, 8 databits,1 startbit, 1 stopbit, parity: even

11.6 Resolver evaluation/transmitter principle

General: The specified data refer to the combination of the standard resolver interface; operated with the SSD Drives resolver R 21-T05, R15-T05	
carrier frequency	f_t = 4,75 kHz
linearity error of the actual value signal	1%
ripple of the actual value signal	2%
max. position resolution for one revolution	16384 Incr. 14 bit
absolute position accuracy	+/- 0,7 °
relative position accuracy	+/- 0.08 °

11.7 Controllersystem

system run-up time after switching on the control voltage	max. 6 sec.
data memory / organization	Flash Eprom 256 KB RAM 64 KB; EEPROM 256 Byte

11.8 Measuring sockets MP1 and MP2

signal range	-10V.....0.....+10V magnifier function can be normed
resolution	7 bit, independend of norming
internal resistance	10 k

11.9 Thermal data

thermal data	see chapter 1.3

11.10 Mechanical data

dimensions	see chapter 1.4
weight	see chapter 1.3

Further data you will find in chapter 1.3

12 Disposal

The digital servo drive consists of different materials.

The following table shows, which materials can be recycled and which have to be disposed of in a special way.

material	recycle	disposal
metal	yes	no
plastics material	yes	no
printed board assembly	no	yes

Dispose of the appropriate materials in accordance with the valid environmental control laws.

13 Software

13.1 EASYRIDER® Windows - Software

EASYRIDER® Windows - Software is an comfortable tool to use all drive functions.
Detailed Online-Help-infomations and instructions are available..

EASYRIDER® Instructions: (extract)

- Autopilote-function as interactive tutorial
- System identification
- BIAS - instruction-set editor
- Oszilloscope-function
- start-up and comissioning-tools
- Setting of parameters
- Setting of configurations
- Servo-diagnostics
- Interface diagnostics
- Fieldbus diagnostics
- Motor library
- save system data in file
- load system data from file
- send system data to servodrive
- save system data in servodrive
- load system data from servodrive

Important:
Edited data in EASYRIDER® are transmitted to the RAM of the servodrive and **active after** use of the instruction **SEND**. **Only the instruction SAVE in EEPROM** writes data into a nonvolatile memory. Data are stored there power-fail save.

13.2 SSD Drives programming language BIAS

In **Operating mode 5** – Position control with BIAS, three user-defined programs can be executed parallel. The BIAS-program and the PLC-program
(sequence cascades, 1 command per position controller sampling = 2ms) as well as the Mathematics program (cyclic execution in remaining time of processor).

The BIAS-program is primary intended for administration of travel commands. If application permits, also simple calculations can be performed and analog/digital I/O‘s can be serviced in this task. The PLC-task is conceived to perform I/O logic, sequence control, monitoring and CAN-Bus communication. The Mathematics program is designed for complex calculations, e.g. computing of a cam, executed by the BIAS-program afterwards. But it is also possible to store the same tasks here, as basically defined for PLC-task, which can increase PLC performance of the 637 controller approx. twenty times.

While the BIAS-program will be executed from the start block directly after activation of
operating mode 5, the PLC-program will be first started by BIAS-command "PLC-program" and the Mathematics program by command "Mathematics program". At reaching the command "End of program" (Mode = 0) the respective execution pointer re-jumps to his start label.
Within the command set the following command groups are provided:

Pogram flow control
- Fixing start/end of main- and sub-programs
- Conditional and unconditional jump commands

Travel relevant commands
-Positioning commands
-Parameter commands
-Technology functions
>Register positioning
>PID-control
>Synchronous applications

Logic commands
- Logic commands for coils and internal relays

Variable commands
-Writing and reading of parameters
-Fundamental operations of arithmetic with long integer
-Type-conversions long integer <=> double float (Math.task only)
-Fundamental operations of arithmetic with double float (Math.task only)
-SIN(x),COS(x),SQRT(x) with double float (Math.task only)
-Writing and reading of synchronous profile tables.

CAN-Bus commands
-Communication with other SSD Drives products

Software

SSD Drives programming language BIAS

The user has the possibility to program his sequence himself from this set of commands.

Available program area
Set number 0000 - ... | ... | can be selected via ... | data inputs X10.xx ... | max. to block no. 63 and ... | and Strobe X10.2 ... | 0063 - ... ... 1499 last block

The BIAS operation set is listed on the next page.
You can read the exact function of the individual commands in the help function of the EASYRIDER® Windows -Software in the BIAS editor or in the BIAS command description (UL:10.06.05).

13.3 BIAS-commands

	0	1	2	3	4	5	6	7	8
0	move position	move position + parameter	position =	position = [variable X]	[variable X] = position	NOP	flag X =	If input X ?	[variable X] =
1	move incremental position	move incremental position + parameter	speed =	speed = [variable X]	[variable X] = speed	end of program	If flag X = ?	If output X ?	If [variable X] ? const.
2	move datum	move datum + parameter	acceleration =	acceleration = [variable X]	[variable X] = acceleration	sub-program	flag X = flag Y	output X =	[variable X] = [variable Y] + const.
3	move infinite positive	move infinite positive + parameter	deceleration =	deceleration = [variable X]	[variable X] = deceleration	end of sub-program	flag X = input Y	output X = flag Y	[variable X] = [variable Y] – const.
4	move infinite negative	move infinite negative + parameter	gear factor =	gear factor = [variable X]	[variable X] = gear factor	PLC-program	flag X = output Y		[variable X] = [variable Y] * const.
5	move synchron	move synchron + parameter	"position reached" window =	"position reached" window = [variable X]	[variable X] = block-number	jump	flag X =flag Y & flag Z		[variable X] = [variable Y] / const.
6	move cam-profile	move analogue value + integrator	remaining position =	remaining position =[variable X]	[variable X] = actual position Y	jump [variable X]	flag X= flag Y| flag Z		[variable X] = flag Y,number Z
7	synchronous settings 1	move speed + integrator	ramp filter =	maximal current = [variable X]	[variable X] = analogue input Y	BIAS execution pointer	flag X =flag Y ^ flag Z		
8	synchronous settings 2		actual position X =	actual position X = [variable Y]	[variable X] = latchposition Y	wait for "position reached"	flag X = !flag Y	IBT-masknumber =	[variable X] = [variable Y]
9	move PID ; speed		If actual position X ? const.	analogue output = [variable X] (*)	[variable X] = actual speed Y	wait time	flag X = status Y	IBT-notification number =	If [variable X] ? [variable Y]
A	move PID ; torque	cycle length =	If actual position X ? [var.Y]	PID scaling	[variable X] = latchstatus Y	wait time [variable X]	If status X ?	CAN-command = [variable X]	[variable X]= [var.Y] + [var. Z]
B		cycle length = [variable X]	sensor window	sensor window = [variable X]	[variable X] = position Y	BIAS execution pointer = [var. X]	mode X =	IBT data-transfer	[variable X]= [var. Y] - [var. Z]
C			sensor position	sensor position = [variable X]	[variable X] = value Y		flag X =[variable Y], number Z		[variable X]= [var. Y] * [var. Z]
D			sensor adjustment 1	sensor adjustment 1 = [variable X]					[variable X]= [var. Y] / [variable Z]
E	start axis		sensor adjustment 2	sensor adjustment 2 = [variable X]					[teachvar. X] = [variable Y]
F	stop axis	stop axis + parameter	update parameter	PID parameter		virtual program			[variable X] = [teachvar. Y]

start axis	only defined in BIAS-program	stop axis	defined in BIAS- and PLC-program	**BIAS-execution pointer**	defined in PLC- and Math.-program	**flag X =**	defined in BIAS- , PLC- and Math.-program

13.4 Extended BIAS-commands

	9	10	11
0	mathematics-program	table [variable X] =	[D_variable X] = [D_variable Y] + [D_variable Z]
1	profil-initialization	table [variable X] = [y variable Z]	[D_variable X] = [D_variable Y] - [D_variable Z]
2	profil-cycle lenght	[x_variable Y] = table [variable Z]	[D_variable X] = [D_variable Y] * [D_variable Z]
3	[variable X] = profil value	[w_variable X] = [y_variable Z]	[D_variable X] = [D_variable Y] / [D_variable Z]
4	profil value = [variable X]	[x_ variable Y] = const.	Wenn [D_variable X] ? [D_Variable Y]
5		**[variable [X]] = const.**	[D_variable X] = SIN [D_variable Y]
6		**[variable [X]] = [variable Y]**	[D_variable X] = COS [D_variable Y]
7	save table	**[variable X] = [variable [Y]]**	[D_variable X] = SQRT [D_variable Y]
8			
9			
A			
B			
C			
D			
E			
F			

mathematics-program	defined in BIAS and PLC-program
table [Variable X] =	only defined in math.-program
Merker X =	defined in BIAS, PLC and mathematics- program

14 Certificates

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MARKS LICENCE

Eurotherm Antriebstechnik GmbH
Im Sand 14
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Geräte, sonstige
Other appliances
Kompakt-Servoregler

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File ref.:
Ausweis-Nr.: 108336 Blatt 1
Licence No.: *page*

Weitere Bedingungen siehe Rückseite und Folgeblätter /
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76669 Bad Schönborn-Langenbrücken

Aktenzeichen / *File ref.*	letzte Änderung / *updated*	Datum / *Date*
19235-3990-0003 / 22WYD F17 / EN	1999-03-22	1998-07-02

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Jahresgebühren-Einheiten / *Annual fee units*

Geräte, sonstige 30,00
Other appliances

Typ(en) / Type(s):

637/K D6R02.S3-3
637/K D6R02.S3-7
637/K D6R04.S3-3
637/K D6R04.S3-7
637/K D6R06.S3-3
637/K D6R06.S3-7
637/K D6R10.S3-3
637/K D6R10.S3-7
637/K D6R16.S3-3
637/K D6R16.S3-7
637/K D6R22.S3-3
637/K D6R22.S3-7
637/K D6R30.S3-3
637/K D6R30.S3-7

Nennspannung *Nominal Voltage*	1/N/PE 230 V oder 3PE AC 230 V; 50/60 Hz (S3-3 Typen) 3/PE AC 460 V; 50/60 Hz (S3-7 Typen)
Nennstrom *Nominal input*	siehe Anlage Nr. 1 *see Appendix No. 1*
zulässige Umgebungstemperatur *Ambiant temperature*	0...40°C
Schutzmaßnahme *Protection against electric shock*	Schutzklasse I *Class I*
Schutzart *Degree of protection*	Einbaugerät, die Servoregler sind ausschließlich zur Speisung von Eurotherm (oder von Eurotherm freigegeben) Servomotoren bestimmt. *Built in devise, the servo controller are used only for Eurotherm servo motors or released from Eurotherm if others.*

Fortsetzung siehe Blatt 3 /
continued on page 3

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Überspannungskategorie *overvoltage category*	III	
Kurzschlußfestigkeit *Short-circuit with stand capability*	bedingt kurzschlußfest *conditionally short-circuit-proof*	
Transformator *Transformer*	Fa. J. Lasslop, Typ TIV2DER Az.: 19235-3990-0002 *conditionally short-circuit-proof* Fa. Pulse FEE Typ MTA 12358	2,00
Weitere Angaben *Further information*	vergleiche Anlagen Nr. 1 und 2. *see Appendix No. 1 and 2.*	

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Geräte, sonstige
Other appliances

Fertigungsstätte(n)
Place(s) of manufacture

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Power conversion equipment, Series K D6RXX.X3-Y where Y can be 02, 04, 06, 10, 16, 22 or 30, Y can be 3 or 7; Model KDER followed by 03, 05, 07 or 10; 635 Series followed by 03, 05, 07, 10.

LOOK FOR LISTING MARK ON PRODUCT

704071001 Page 1 of 1

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Manufacturer's name and address:	Eurotherm Antriebstechnik GmbH Im Sand 14 76669 Bad Schönborn-Langenbrücken
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Type designation:	637/K D6R02.S3-3, 637/K D6R02.S3-7, 637/K D6R04.S3-3, 637/K D6R04.S3-7, 637/K D6R06.S3-3, 637/K D6R06.S3-7, 637/K D6R10.S3-3, 637/K D6R10.S3-7, 637/K D6R16.S3-3, 637/K D6R16.S3-7, 637/K D6R22.S3-3, 637/K D6R22.S3-7, 637/K D6R30.S3-3, 637/K D6R30.S3-7

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16 Modification Record

Version	Änderung	Kapitel	Datum	Name	Bemerkung
V07.37STPL98	text addition text addition text addition new chapter text addition text addition text addition text modification text modification text addition new chapter text addition	1.2 1.3.2 1.3.5 1.4.2 2.2.2 5.4.1 5.5 5.6 8.2 9.1 9.2 9.3	28.10.1998	K. Stadler	Dokumentation im Eurotherm-Format
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