

MANUAL

3-phase Servo-Drive
TVD3-230-xx-RS
for ac synchro servo motors
with a resolver

TVD3-230-RS



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G m b H

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Ausgabe
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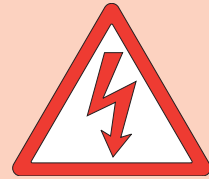
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1 Basic Information

Electronic equipment is not fault proof. This fact should be borne in mind for all possible operating conditions.

ATTENTION - High voltage

AC 255V~, DC 400V=



Before installation or commissioning begins, this manual must be thoroughly read and understood by the technical staff involved.

If any uncertainty arises, the manufacturer or dealer should be contacted.

TVD3-230 devices are power electric parts used for regulating energy flow for power plants. Protection rating IP23.

It must also be ensured that the machine or equipment are fitted with device independent monitoring and safety features.

Standards and guidelines

The device and its associated components can only be installed and switched on where the local regulations and technical standards have been strictly adhered to:

EU Guidelines	89/392/EWG, 84/528/EWG, 86/663/EWG, 72/23/EWG EN60204, EN50178, EN60439-1, EN60146, EN61800-3
IEC/UL	IEC364, IEC 664, UL508C, UL840
VDE Regulations	VDE100, VDE110, VDE160
TÜV Regulations	
Trade body guidelines	VGB4

The operation of the devices is only permissible when the protective earth conductor (PE) is correctly connected!

If the protective earth conductor is not properly connected, bare housing parts may carry high voltages which are a danger to life!

The operation of the devices is only permissible when the switch cabinet is closed or secured. The control and power connections may be voltage-carrying without the axis operating!

The discharge time of the bus circuit is superior to 4 min!

Measure the voltage before any disassembly!

Setting adjustments

- should only be carried out by suitably trained personnel
- should only be carried out in accordance with health and safety guidelines
- should only be carried out when all voltages have been removed.

QS

Test results are archived with the device serial number by the manufacturer.

CE

The device adheres to the following: Guideline EU 89/336/EWG. EMV standards EN61000-2 and EN61000-4.

General Information

The transistor 3-phase current servo-amplifier **SERVO-TVD3-230** in combination with the brushless dc motor (EC synchro servo motor) provide a drive solution free of maintenance and with a wide dynamic control range. The drive displays the well-known good control characteristics of dc drives without the disadvantages of the carbon brushes' wear and the commutation limits.

The rotor moment of inertia is notably lower and the limit power is greater than with equally constructed dc motors. This results in up to 5 times higher acceleration values. The generated heat in the motor only occurs in the stator (cold shaft).

The motors always have the protection rating IP 65.

From the electrical view, the EC synchro motor is a synchro motor with a permanent magnet rotor and a three-phase current stator.

The physical characteristics correspond to those of dc motors, that is, the current is proportional to the torque and the voltage is proportional to the speed.

Current and voltage are precisely measured. The analog circuits are simply constructed.

It is possible to control the speed via the motor voltage, however, in order to achieve the best control precision, always a speed control with speed actual value is used.

The speed actual value is generated in the resolver.

The difference of the command value and the actual value is amplified in the speed control loop circuit (P-I-controller) of the servo drive. The current command value and the current actual value are compared in the current control loop. This results in the PWM voltage. The PWM signals are transferred by means of the resolver signal to the output stage. In the course of this the stator magnetic field leads the rotor magnetic field by 90° electrically.

This field frequency is not controllable, it is automatically adjusted.

The motor currents are trapezoidal.

For dc and ac synchro servo amplifiers which are supplied by a dc bus, it must be checked that the energy is fed back into the bus during brake operation (winding machines, lifts, great centrifugal masses).

The ballast circuitry is rated for 3% duty cycle. An extended operating time can be achieved by additional external resistors. (Option)

Information:

For motors	with incremental encoder	UNITEK TVD3-230-xx-IN
	with resolver	UNITEK TVD3-230-xx-RS
	with bl-tacho	UNITEK TVD3-230-xx-bl
For low-voltage applications		UNITEK TVD3-2-xx
For high power		UNITEK TVD6-2 -bl,IN,RS 200V/400V up to 25/40A
For digital servo controllers		UNITEK DS 400 200V/400V up to 50/100A

1 Basic Information

Applications

Machines and installations for all types with a drive power of up to 1.6kW.

Especially as 4Q-servo-drive for feed axes where the following is required:

- high dynamic acceleration and braking cycles
- a wide control range
- high efficiency
- small motor dimensions
- highly repeatable, accurate and quiet moves
- 'cold shaft'

For speed or torque control or combined speed/torque control incorporated within or independent of position control loops.

Drives with constant speed as in conveyors, spindle drives, pumps, transversal or longitudinal pitch drives.

AC synchro-servo-drives are more compact than other electric drives.

Particularly suitable for:

component equipment inserting machines, sheet-metal working machines, machine tools, plastic working machines, assembly machines, knitting and sewing machines, textile working machines, grinding machines, wood and stone working machines, metal working machines, food processing machines, robots and handling systems, conveyors, extruders, calenders, and many other machines and installations.

Note

Drives where braking operations are predominant, e.g. when deceleration is mainly required:

- winding machines, lifts, great centrifugal masses

The braking energy is annihilated in the ballast circuitry.

Energy compensation is possible for drives with several axes.



Motor features

- protection rating IP 65
- compact
- suitable for rough surroundings
- suitable for high dynamic overload
- free of maintenance

Build

- Switch cabinet mounting or 3HE plug-in device according to the VDE, DIN and EU regulations
- Standard analog control electronics
- Power electronics for 5A and 10A
- Galvanic isolation between the power connection and device ground (GND)

Components

- IGBT power semiconductors, comfortably over-dimensioned
- Only components customary in trade and industrially standardised are used
- SMD basic equipment
- LED displays
- 4 position binary switches for system set-up
- Precision potentiometers for fine adjustment

Characteristics

- * Connection directly to the mains up to 230V~
- * Potential-free control electronics
- * Differential command value input
- * Speed and torque control
- * Static and dynamic current limiting
- * Current command value output
- * Measurement points for current and speed
- * Enable logic
- * Emergency stop
- * Braking in case of a mains failure
- * Temperature watchdog for the motor and the device

1 Basic Information

Technical Data

Power connection

Compact device, multiple axes mounting

Auxiliary voltage

24V~ to 230V~ + 10%

20V~ + 10%/- 5%

24V= + 10%/- 5%

300mA/device

3 x 200V~

Output voltage max.

Specification				
Servo amplifier TVD3.230			5	10
Stationary current output	- continuous	A=	5	10
	- peak	A=	10	20
Max. el. power		W	900	1800
Integrated quick ZW fuses		AF	12.5 - 16	12.5 - 16
Max. dissipation power		W	45	75
Min. ballast resistance		Ohm	80	42
Cooling at		60% d.cyc.	self	self
		100% d.cyc.	self	fan
Dimensions	- plug-in device	wxh	12TE/3HE	
	- compact device	wxhxd	see 'Dimensions'	

Mains module TVD3-230N		10	30
Power supply	V= max.	1x 230V~	1x oder 3x 230V~
Output voltage	V= max.	360	
Output current	A= max.	10	30
Regen switching threshold	V=	380	
Ballast power contin.	W	50	
Ballast power 1s	Ws	6000	

Common specification

Protection rating

Format

Humidity rating

Site of installation

Operating temperature range

Extended operating temp. range

Storage temperature range

IP 23

VDE 0100 group C, VDE 0160

class F acc. to DIN 40040

< 1000m above sea level

0 ... 45°C

up to 60°C reduced by 2%/°C

-30°C to + 80°C

Speed control loop circuit

- control precision without actual value error

- control range

± 0.5%

1: 1000

Caution:

The maximum connection voltages 255V~, 360V= **must not be exceeded** even for short times.

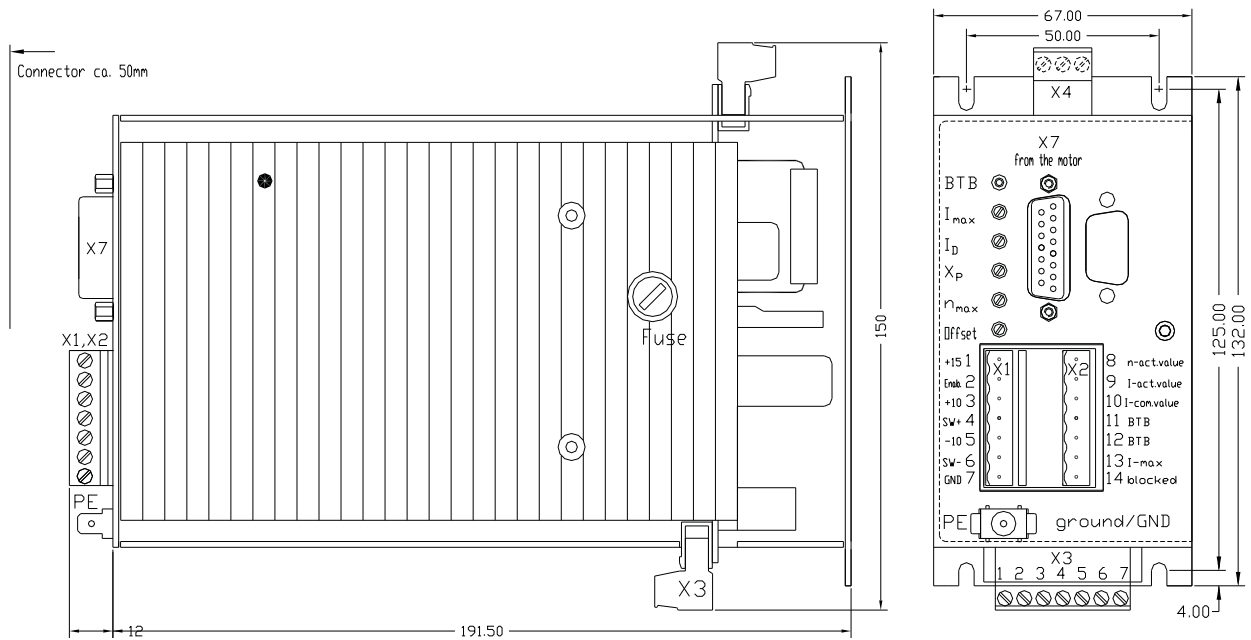
The regen circuit may be destroyed.



Servo-Drive TVD3-230 -xx-RS

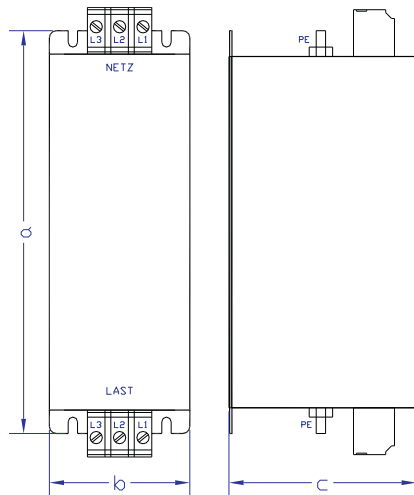
Compact device

Compact device dimensions



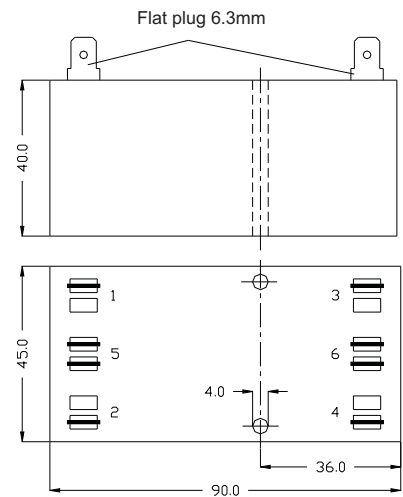
Dimensions of the power line filters and the chokes

Type	Voltage V~	Current A~	Dimensions h x w x d mm	Weight kg
F250V-B90-16	1x250	1x16	45x90x40	0,32
FN3270H-35-33	3x480	3x35	66x180x70	0,50



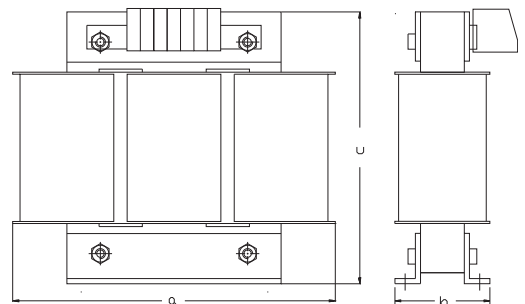
FN3270H-35-33

F250V-B90-16



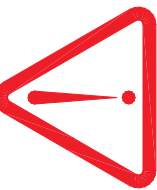
Motor power chokes

Choke-Type	Rated curr. A	Inductance mH	Dimensions a / b / c mm	Weight kg
MDD1.3a	-2.5	3.5	80x 48x 90	1.1
MDD 1.6a	-5	1.9	95x 54x108	1.3
MDD 1.6b	-10	1.0	95x 58x108	1.4

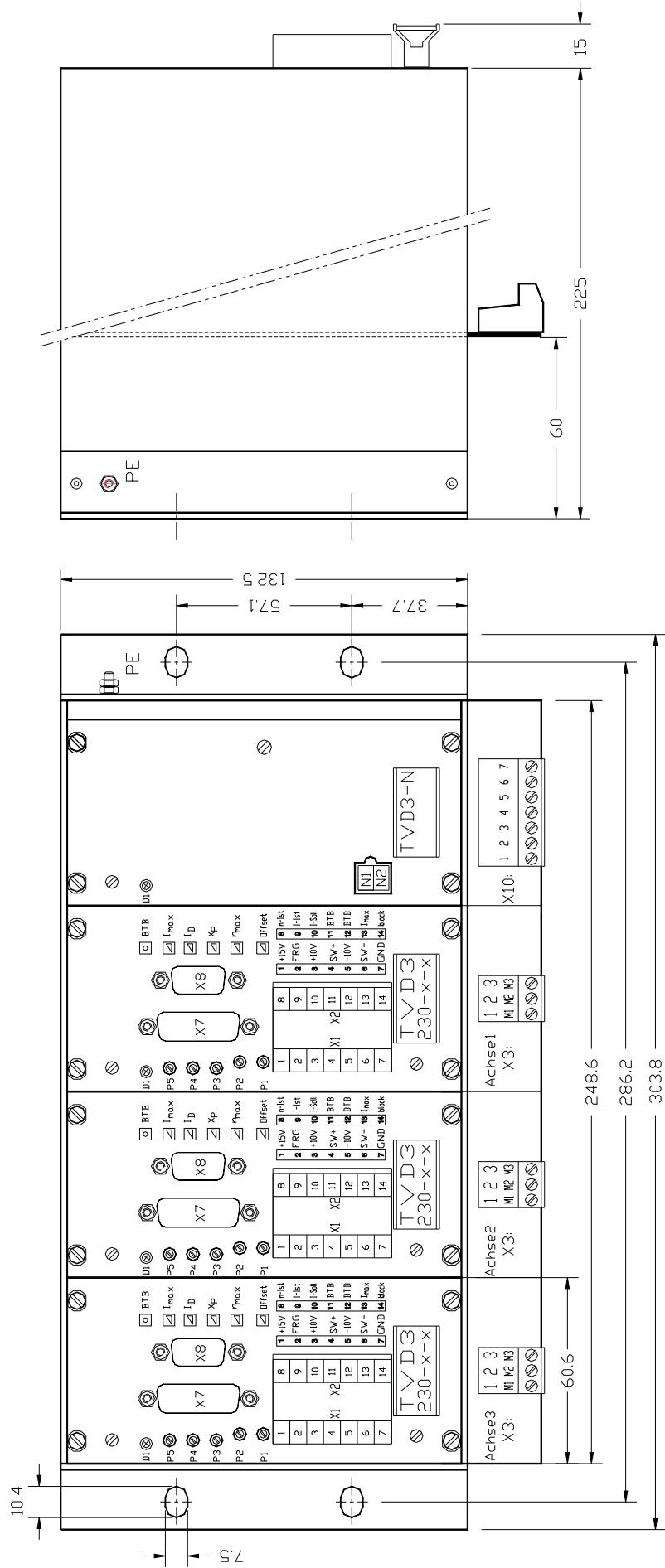


2 Mechanical Installation

Attention:

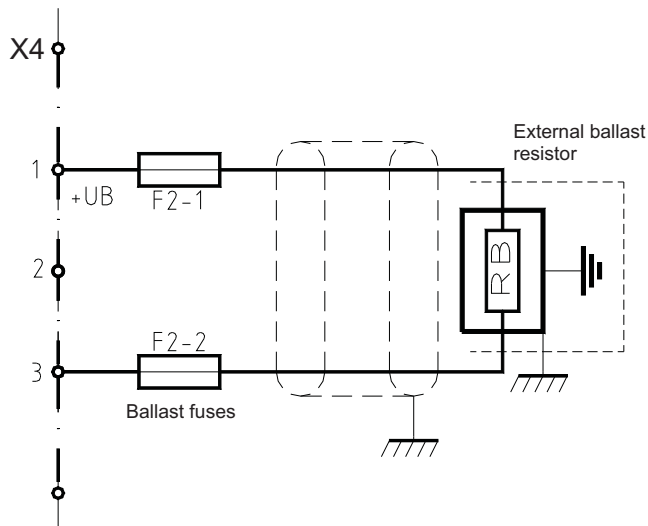


Do not switch on the amplifier before having fastened it with screws!
Check the PE connection!



Dimensions of a multiple axes combination

Servo-Drive TVD3-230 -xx-RS



Connections

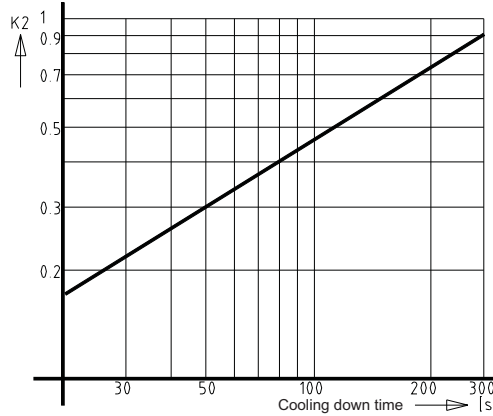
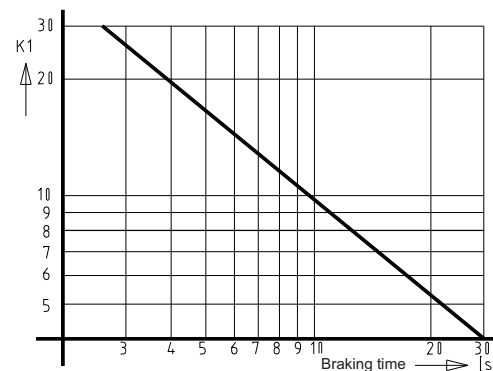
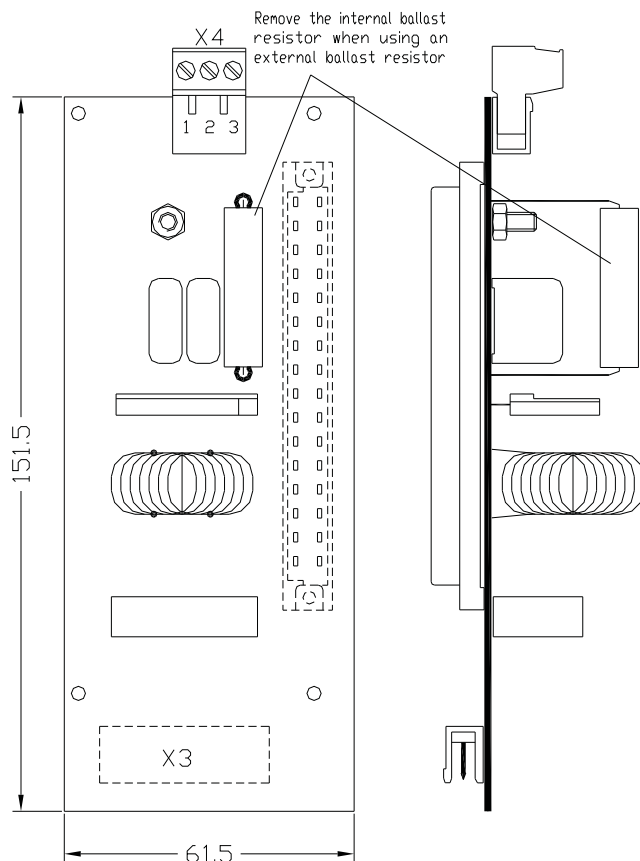
Regen circuit

The energy arising during the braking operation is fed back into the bus circuit.

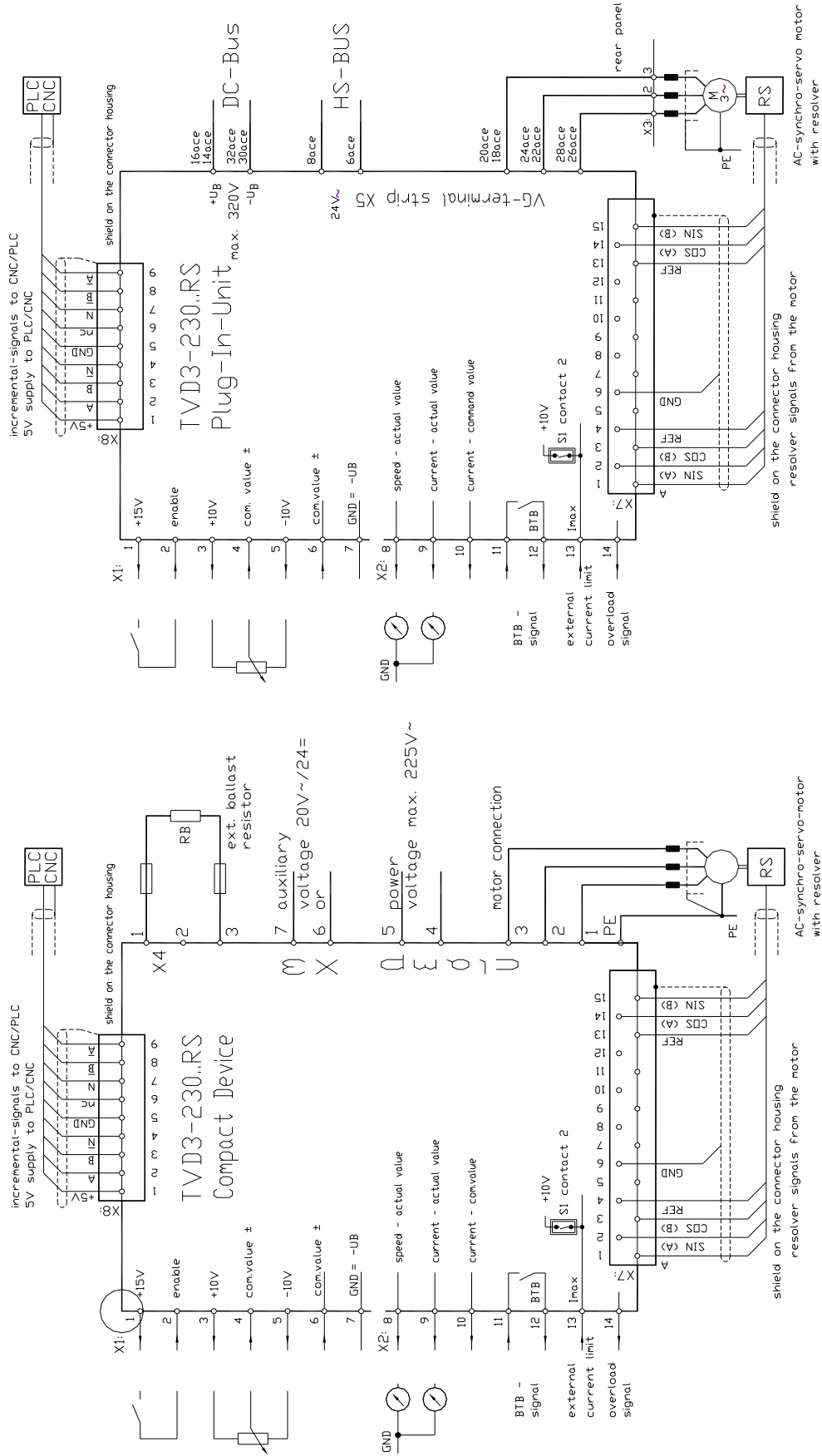
The bus circuit capacitors can store only little energy. Any surplus of energy is transformed into heat in the ballast resistor in order to avoid an excessive voltage in the bus circuit.

The internal resistor has been rated for feed axes with small centrifugal masses.

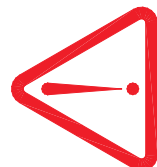
Type TVD3-230-K	5A	10A
Internal resistance	100 Ohm	100 Ohm
Continuous power	50W	
Pulse power	6kW	
External resistance, min. Ohm	80	42
Fuse F2	6.3 AF	



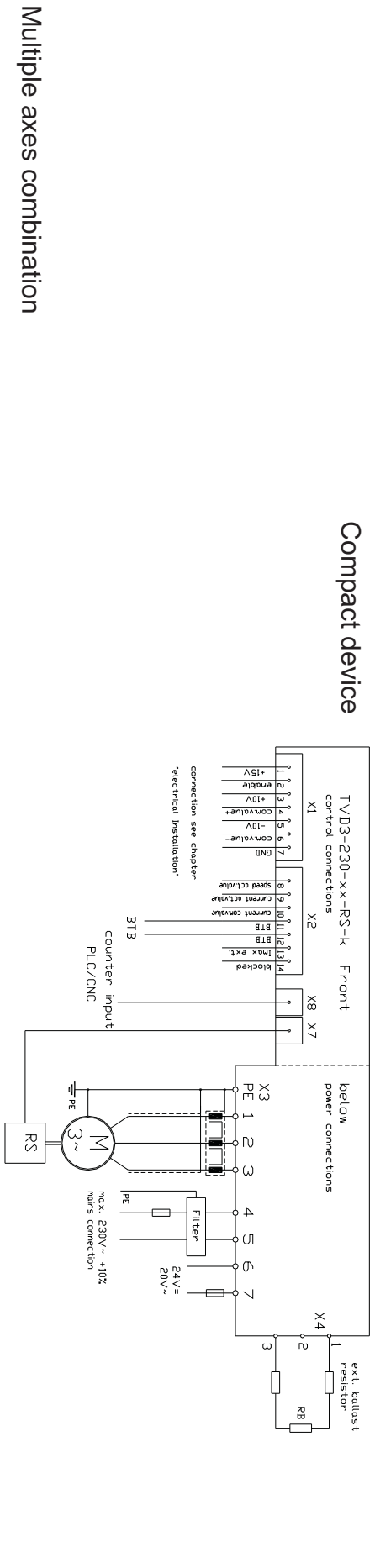
3 Electrical Installation



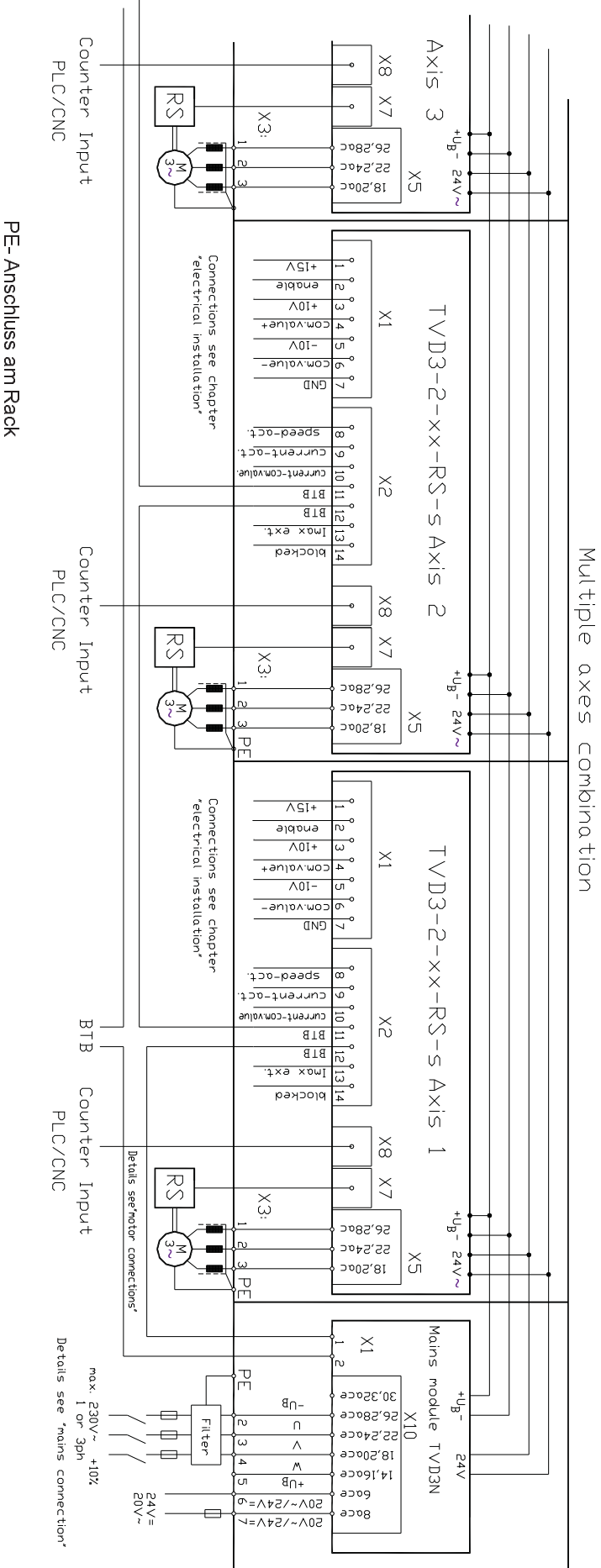
The operation of the devices is only permissible when the protective earth conductor (PE) is correctly connected!



Servo-Drive TVD3-230 -xx-RS

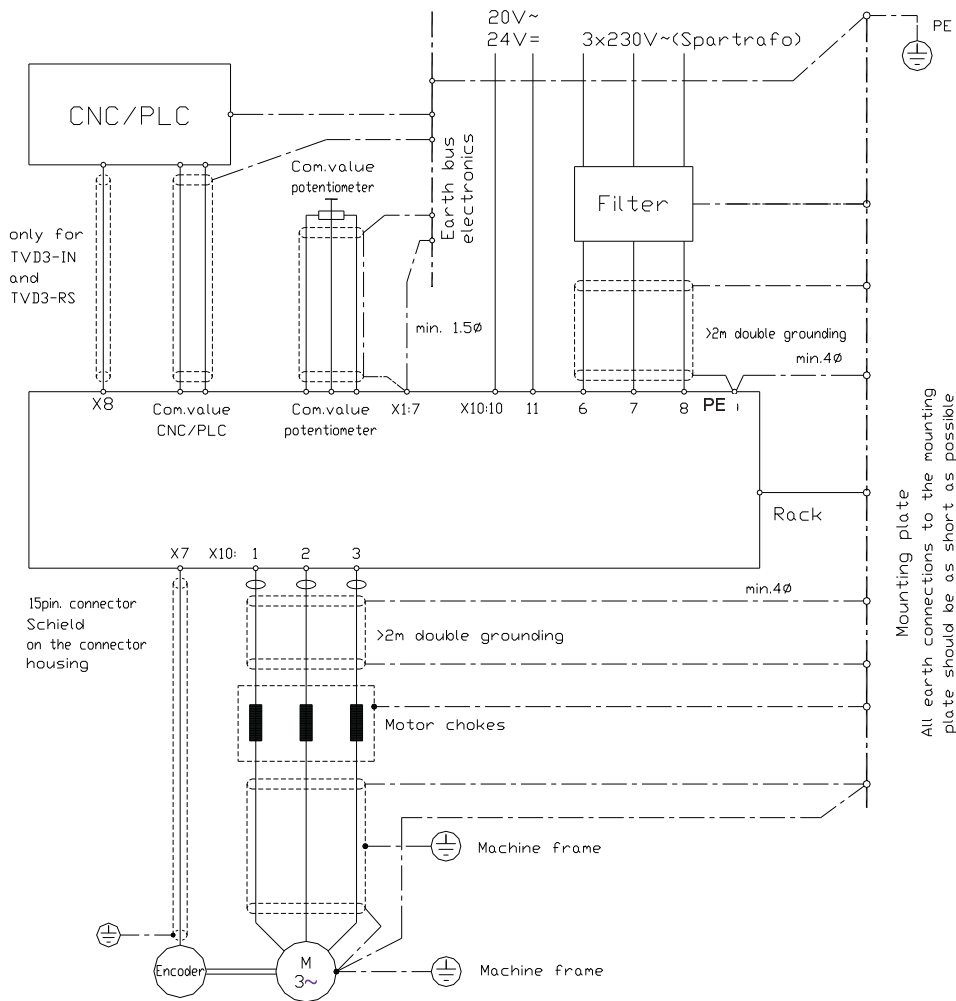


Multiple axes combination



Connection diagram

3 Electrical Installation



EMC Advice

The devices adhere to the EU guidelines 89/336/EWG and the technical standards EN 61000-2 and 61000-4 provided that the following conditions are observed:

- The device, the transformer, motor chokes and power line filter are conductively mounted on a 500x500x2 mm mounting plate.
- The mounting plate must be connected to ground using a 10mm² wire.
- The motor housing must be connected to ground using a 10mm² wire.
- The device ground X1:7 must be connected to the mounting plate using a 2.5mm² wire.
- PE bolt must be connected to the mounting plate using a 4mm² wire, l = 50mm.
- The rack ground screw must be connected to the mounting plate using a 4mm² wire, l = 50mm.

Single-phase connection:

Filter type : F250V-B90-16
 Conductor length between the device and the power line filter <100mm

Three-phase connection:

Filter type : FN3270H-35-33

Motor connection:

Motor conductor choke type: 5A= MD66-5 10A= MD78-10
 Motor conductor l = 1.5m, 4-core, shielded.

Shield must be connected to the mounting plate on the device side as well as to the ground on the motor side.

Connection of the control conductors:

All control conductors must be shielded, 1.5m. Shield must be connected to the ground.

Warning:

The order of the connections to the connector numbers or screw terminals is obligatory. All further advice is non-obligatory.

The input and output conductors may be altered or supplemented in accordance with the electrical standards.

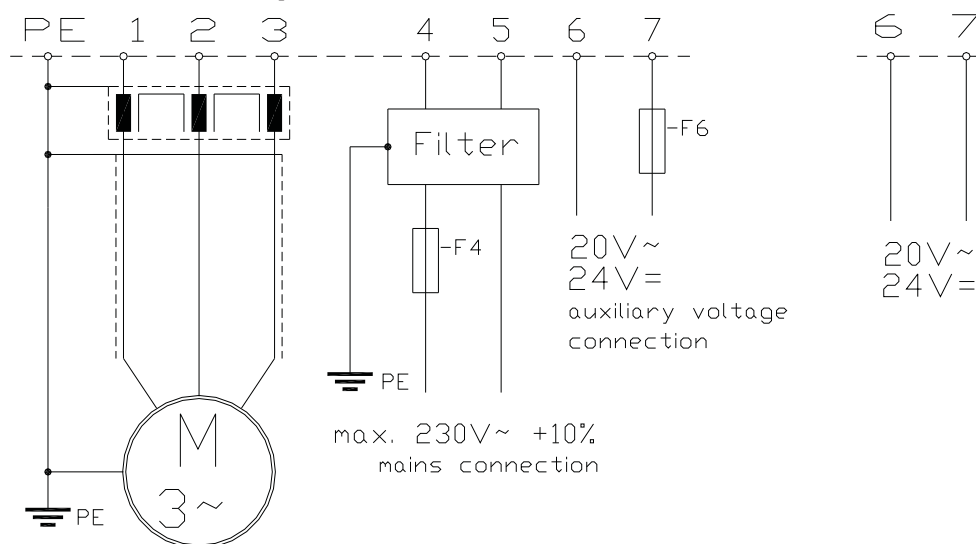
Note:

- connection and operating instructions
- local regulations
- EU guideline 89/392/EWG
- VDE and TÜV regulations and Trade body guidelines
- CE and EMC advice



Connection directly to the mains

Connection of the compact device X3



Auxiliary voltage connection
terminal X3:6, X3:7

- from the mains module 24V=
- from the isolating transformer 20V~

Warning:

Do not earth 20V~

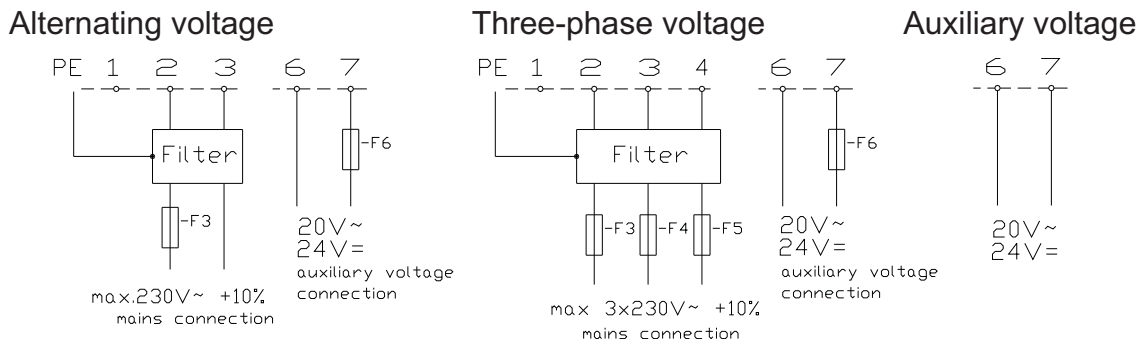
Connection of the external ballast resistor (see page 10)

Warning: The maximum voltage 255V~ must not be exceeded!
Check that the PE connection is correct!



3 Electrical Installation

Connection to the mains module X10



Terminal X3:6, X3:7

- from the mains module 24V=
- from the isolating transformer 20V~



Warning:

PE connection on the rack
Do not earth 20V~

Connecting cable

Dimensioning	5A-k	10A-k	Mains module 10A	Mains module 30A	Auxiliary voltage
Conductor cross-section mm ²	0.5	0.75	0.75	2.5	0.5
Fuses					
- safety fuse AF	6	10	10	25	0.5
- automatic cut-out B	A	6	10	25	

Motor power connection

Cable no.	PE	M1	M2	M3
Connection	PE bolt	X3:1	X3:2	X3:3
Motor cable for	5A	10A	thermo	brake
Cross-section	0.75	1.5	0.5	0.5

Cable type 3x motor conductor + PE **shielded**
+ (if required: 2x thermo+2x brake)

Shielding

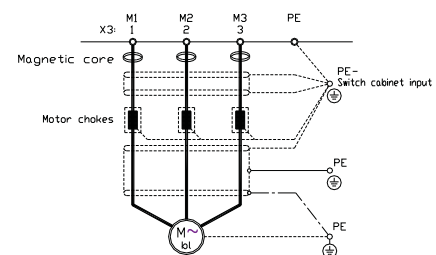
- with earth clamp
- directly to be connected to the switch cabinet input and to the motor
- multiple earthing in case of long conductor cables

Magnetic cores

- against HF failures

Motor chokes

- against LF failures
- against high leakage currents
- for motor efficiency



The connection advice is a general information and it is non-obligatory.

Adhere to:

- connection and operating instructions
- local regulations
- EU guideline 89/392/EWG
- VDE and TÜV regulations and Trade body guidelines



Connection no. terminal connector

X1:1 to X1:7 and X2:8 to X2:14

Signal conductors

Shielded and separated from power conductors, command value pairs twisted and shielded.

Logic connections

Relays with gold contacts or reed relays. Contact current 6mA

Drive enable - internal logic voltage

- internal logic voltage X1:1 +15V/10mA
- contact circuit between X1:1 and X1:2

Drive enable - external logic voltage

- drive enable voltage +10 to +30V X1:2
- GND X1:7

Drive enabled

- command value and speed control loop circuit are immediately active

Drive disabled

- emergency stop
- command value switched internally immediately to 0
- after 2 seconds speed control loop circuit is de-activated

Braking in case of a mains failure

Braking function

- command value switched to 0V in case of a mains failure
- max. braking time 150ms

Feed-back to the bus circuit

3 Electrical Installation

Speed command value

Voltage source for command values $\pm 10V$, 10mA

+10V	X1:3
-10V	X1:5
GND	X1:7

Command value inputs

- command value voltage max. $\pm 10V$
- differential input
- input resistance 50 k Ω
- relay contacts: use gold or reed contacts



Attention:

Command value pairs should be twisted and shielded. The shield should be connected on one side only.

Connections

Command value with an internal voltage source

Command value	X1:4 (signal)
	X1:7 (GND)
Bridge	X1:6 — X1:7

Command value from an external PLC/CNC voltage

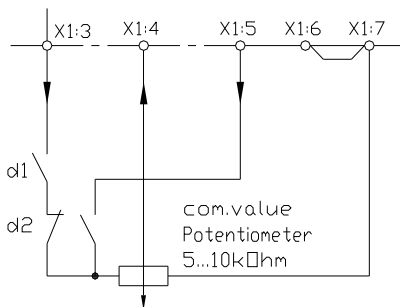
Command value	X1:4 (signal)
	X1:6 (GND)

Command value current from an external PLC/CNC

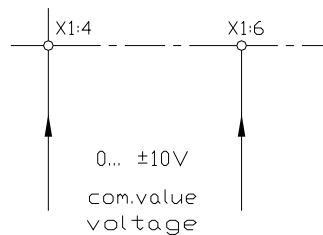
Resistor for a current command value of 0 to $\pm 20mA$ $R_{com.} = 500\Omega$

Current command value	X1:4 (signal)
	X1:6 (GND)

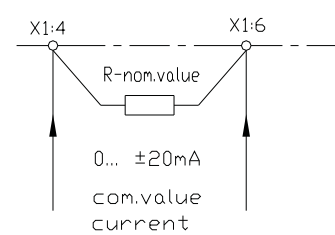
Internal supply



CNC/PLC



Current command value



Attention:

Do not use a command value current of 4 to 20mA !



External current limiting

Voltage source for an external current limit

+10V/10mA	X1:13
GND	X1:7

Range

0 ... + 5V	>>>	0 to 100% rated device current
0 ... +10V	>>>	0 to 200% rated device current
internal over-current watchdog	>>>	max. 1sec.

Current limit input

Max. input voltage +10V

Input resistance 10 kΩ

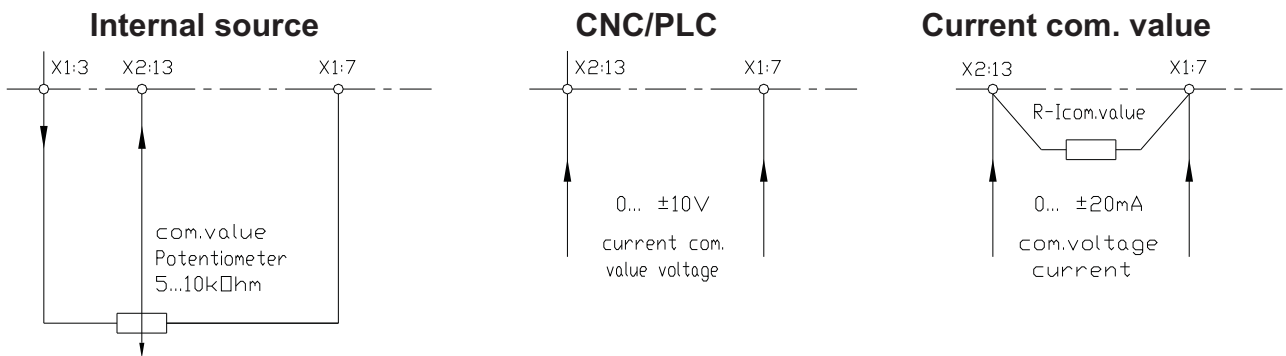
Internal attenuation with potentiometer I_{max1}

Relay contacts: use gold or reed contacts

Switch S1, contact 2 = OFF

Connections

Current limit	X2:13	(signal)
	X1:7	(GND)



Attention:

When internally adjusting the current limit
Switch S1 >>> contact 2 = ON



3 Electrical Installation

Actual value connection - resolver

Connector X7

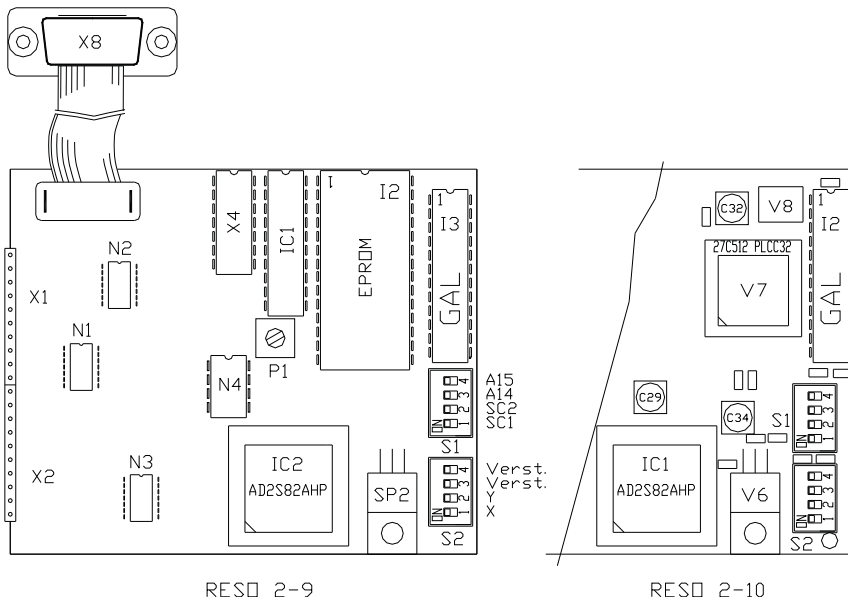
- 15-pin D-connector
- metallized plastic housing
- shield connected to the housing

Cable: resolver cable
3x (2x0.25 drilled and shielded) plus 2x0.25 plus external shield

Connections

Function		Colour	Pin no.
Reference	A(R1)	white	13
Reference	B(R2)	brown	4
Sine	A(S2)	yellow	2
Sine	B(S4)	green	15
Cosine	A(S1)	pink	14
Cosine	B(S3)	grey	3
Thermal sensor			6
Thermal sensor			12

Pin no. 6 is double-coated.



Attention:

The position of the switches S1 and S2 on some of the resolver panels RESO 2-10 are incorrect (turned by 180° rf. to the figure shown).

The series of numbers printed on the switches is not correct and the ON/OFF switch positions have been swapped (position ON is at the panel rim side).

Please observe the attached advice!



Servo-Drive TVD3-230 -xx-RS

Attention:

It is absolutely necessary to observe the motor-specific connection data sheets. Appendix A.

Incremental encoder output

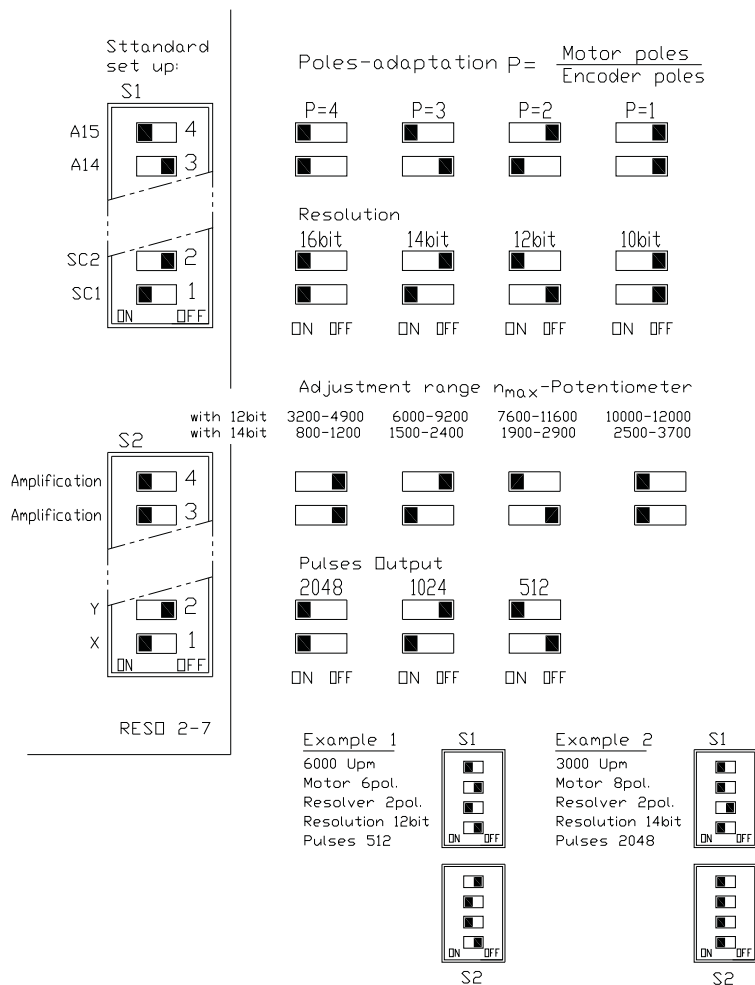
Connector X8

- 9-pin D-connector
- metallized plastic housing
- shield connected to the housing

Cable: shielded shorter than 10m: 8 x 0.14, longer than 10m: 8 x 0.25

Connections

Function		Colour (recommended)	Pin no.
Channel	A	grey	2
Channel	B	yellow	3
Channel	N(Z)	black	7
Channel	/A	white	9
Channel	/B	green/white	8
Channel	/N(/Z)	pink	4
+5/50mA		violet 0.5	1
GND		blue 0.5	5



3 Electrical Installation

Drive ready - BTB signal

Relay RL1

Signal contact	X2:11 - X2:12
Switch rating	max. 48V, 0.5A

The BTB contact signals to the PLC/CNC that the drive is functional.
The BTB signals of several axes can be connected in series.

Delay time after switching on the power supply >>> max. 1sec.

Display

Drive ready	LED bright green	contact closed
Drive not ready	LED bright red	contact open
Fault	LED bright red	contact open

BTB contact drops in case of

over-temperature controller, motor	saved
over-voltage	saved
short-circuit, short-circuit to earth	saved
voltage error	not saved
bus circuit error	not saved

To clear the error re-enable the drive (switch off/on)

Attention:

In any case the BTB contact (drive ready) must always be used with the CNC/PLC or wired into the emergency stop circuit.



It is possible that the drive initiates motion without being instructed to do so.

Fault memory

Fault saving is not effective for all errors!

Signal blocked		
Current demand	normal	overload
Output X2:14	>+12V	<+2V

Analog parameter measurement outputs		
Function	Motor current	Speed
Connector	X2:9 - X1:7	X2:8 - X1:7
Measured value	2.5V = Type current 5.0V = peak current unipolar positiv	tacho voltage at the input of the divider bipolar
Output resistance	1 kΩ	4.7 kΩ

Control connections

Function	Terminal no.
+ 15 Volt (for enable)	X1: 1
Enable input(+10 to +30 Volt)	X1: 2
+ 10 Volt (for command value)	X1: 3
Command value + input	X1: 4
- 10 Volt (for command value)	X1: 5
Command value - input	X1: 6
GND	X1: 7
Speed actual value output	X2: 8
Current actual value output	X2: 9
Current command value output	X2: 10
BTB contact	X2: 11
BTB contact	X2: 12
External current limit input	X2: 13
blocked output	X1: 14

Power connections - compact device

Function	Terminal no.
Motor 1	X3: 1
Motor 2	X3: 2
Motor 3	X3: 3
Power	X3: 4
Voltage	X3: 5
Auxiliary voltage	X3: 6, X3: 7
external ballast resistor	X4:1-X4:3

Power connections - plug-in unit

Function	Plug-in connector	Terminal no.
Bus circuit - (UB-)	X5: 30, 32 ace	
Motor 1	X5: 26, 28 acc	X3: 1
Motor 2	X5: 22, 24 ace	X3: 2
Motor 3	X5: 18, 20 ace	X3: 3
Bus circuit + (UB+)	X5: 14, 16 ace	
20V~/24V=	X5: 8 ace	
20V~/24V=	X5: 6 ace	

Mains module - plug-in unit

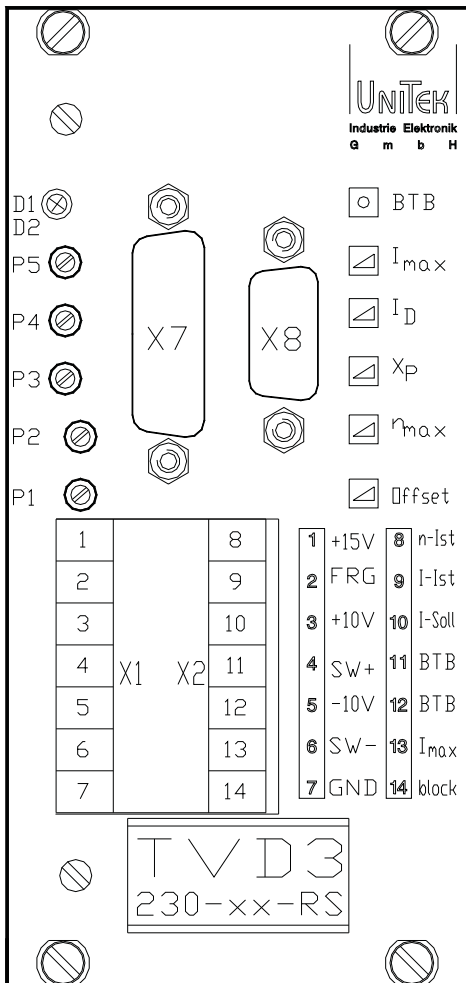
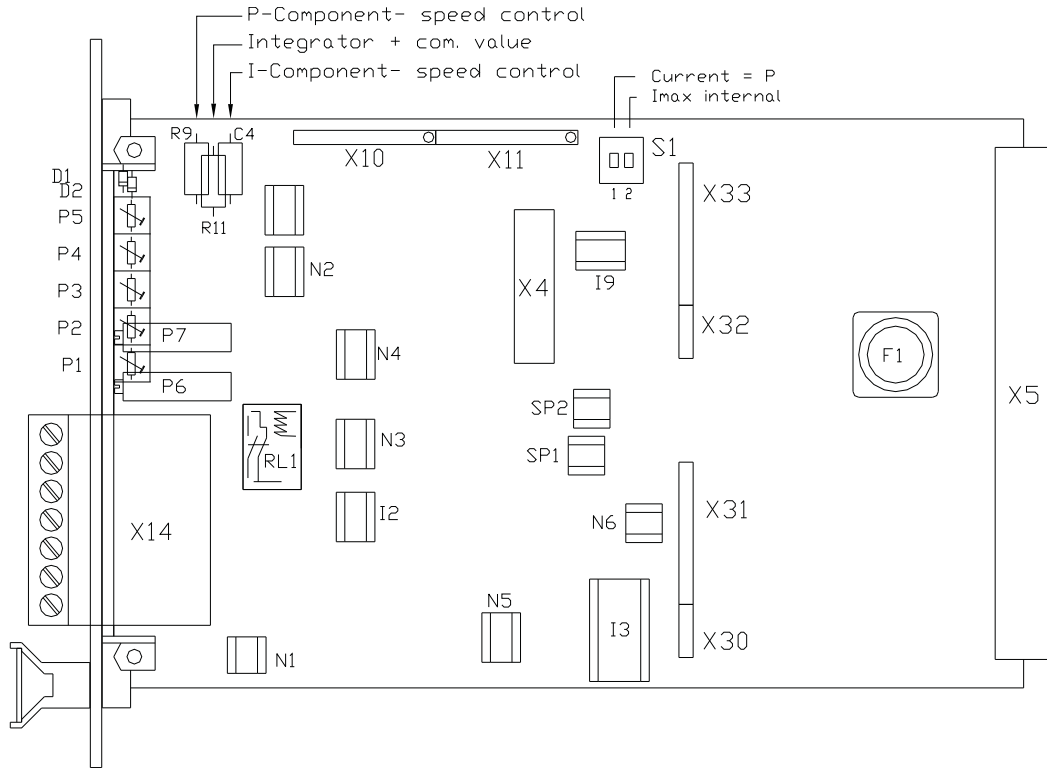
Function	Plug-in connector	Terminal no.
Bus circuit - (UB-)	X5: 30, 32 ace	X10: 1
Power U	X5: 26, 28 acc	X10: 2
Power V	X5: 22, 24 ace	X10: 3
Power W	X5: 18, 20 ace	X10: 4
Bus circuit + (UB+)	X5: 14, 16 ace	X10: 5
Auxiliary voltage	X5: 8 ace	X10: 6
	X5: 6 ace	X10: 7

Encoder connections (see page 19)

PE connection on the housing or the rack

4 Device overview

Components overview



Display

D1 green BTB
D2 red fault

Potentiometer

P5 I_max
P4 I_D
P3 X_p
P2 n_max
P1 offset

Connector

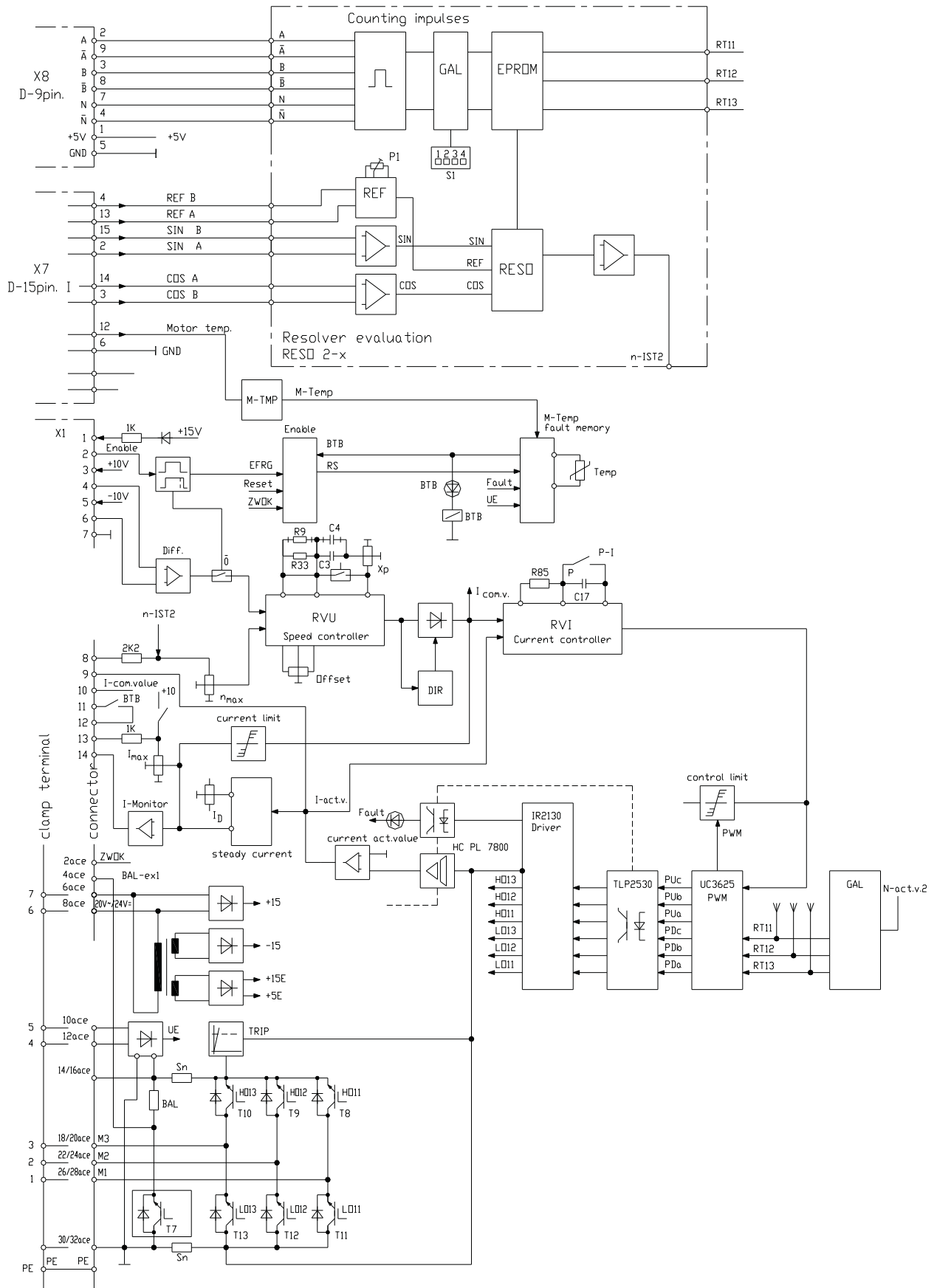
X7 encoder input
X8 inc. output

X1:1 +15V
X1:2 enable
X1:3 +10V
X1:4 com. value + (-)
X1:5 -10V
X1:6 com. value - (+)
X1:7 GND

X2:8 n-act. value
X2:9 I-act. value
X2:10 I-com. value
X2:11-12 BTB contact
X2:13 ext. current limit
X2:14 blocked

Servo-Drive TVD3-230 -xx- RS

Circuit diagram



4 Device overview

Adjustments

Function	Component
Actual value adjustment	Poti P2 (n_{max})
Internal current limit	Switch S1 > contact 2=ON Poti P5 (I_{max})
External current limit	Switch S1 > contact 2=OFF Poti P5 (I_{max})
Continuous current	Poti P4 (I_D)
Amplification P-component	Resistor R9 Poti P3 (X_P)
Amplification I-component	Capacitor C4
Integrator	Resistor R11

Switch S1			
Function	Contact	ON	OFF
Current limit	2	internal	external
Current amplification	1	P	PI

LED display		
BTB	green	LED D1
fault	red	LED D2

Signal outputs		
Function	Designation	Terminal no.
Speed	n- actual value	X2:8
Current	I- actual value	X2:9
Current command value	I- command value	X2:10
Blocked	+12V/10mA	X2:14
BTB - contact	BTB / fault	X2:11, X2:12

Adjustment advice

Adjustments

- to be carried out only by qualified personnel
- observe all safety regulations
- follow the correct adjustment sequence

Pre-settings

Actual value	>>> switch RS-S1, contact 1, 2 on
RESO2-xCurrent limit internal/external	>>> switch S1, contact 2
Current control P- PI	>>> switch S1, contact 1

Optimisation

Actual value adjustment	n_{max} adjustment
Current control	switch S1, contact 2 (basic setup > ON)
Current limits	I_{max} , I_D -adjustment
Speed control	X _P -adjustment, variable components
Zero point	offset adjustment
Path-/position control	in the CNC/PLC

Attention:

Always optimise beginning with the innermost control loop and work out. Sequence: current loop>speed loop>position loop (CNC/PLC)

Messwerte		
Messwert	max. Wert	Messpunkt
Sollwert	±10V	X1:4
Drehzahl - Istwert nach Teiler	± 5V	X2:8
Stromistwert unipolar	+ 5V	X2:9
Stromsollwert Regelfunkt. Drehzahlregler	- 10V	X2:10

Sollwert		
Funktion	max. Wert	Anschluss
Eingang Signal	± 10V	X1:4
Eingang GND		X1:6

The signal and the GND connection can be swapped.

Command value as current signal

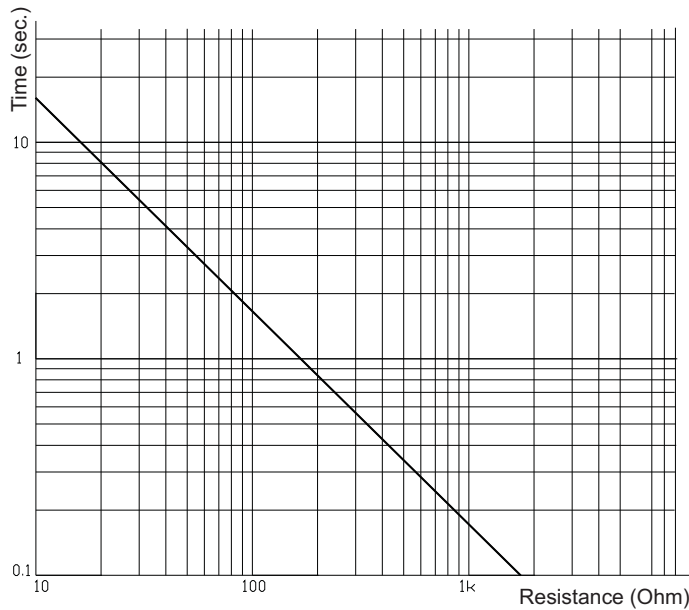
Command value from an external current source	0 to ± 20mA
External load resistance for the command value	0 to max. ±10V

Command value resistance $R_{com}[\Omega]$ = com. value voltage/com. value current
(max. 500 Ω)

5 Adjustment

Command value integrator

Integration time
R11 = see table below



Attention:
Do not use a command value current of 4 to 20mA



Speed actual value
Resolver
Pre-settings (see page 19)

Fine adjustment
with potentiometer n_{max} (P2)

Command value from the potentiometer:

- with a 1V command value: adjust the speed to 10% of the maximum required
- with a 10V command value: make fine adjustment to achieve 100% (max. speed).

Command value from a CNC/PLC:

- with a 0.8V command value: adjust the speed to 10% of the maximum required

Direction change
Swap the command value connections X1:4, X1:6

Current limiting

Peak current	range 0 to 200% rated current max. reset time 1sec.	Poti I _{max} (P5)
Continuous current	range 5 to 100% rated current	Poti I _D (P4)

Internally resetting current limits

Current limit	Function	Limit
Overload	time	continuous current
Signal to X2:14	blocked	
The lowest current limit is effective!		

Peak current

Internal current limit (standard set-up)		
Adjustment	Switch	Potentiometer
I _{max}	S1, contact 2=ON	I _{max1} (P5)

External current limit			
Adjustment	Input	Switch	Potentiometer
I _{max}	X1:9 0 ... +10V	S1, contact 2=OFF	I _{max1} (P5)
The external current limiting voltage can internally be reduced by means of the potentiometer I _{max} .			

Continuous current

The motor protection for both torque directions is adjusted to motor rated current by means of the potentiometer I_D (P4).

Measuring adjusted values:

- Do not connect motor
 - Set the command value and enable >>> switch off/on (5V = rated current)
- Measured current command value X2:10

Command value	Measured value I _{max} (ca. 1sec.)	Measured value I _D
+5V	0 to max.10V	0.25 to max. 5V
- 5V	0 to max.10V	0.25 to max. 5V

Current actual values

Measured current actual value X2:9 I_{max} = 0 to +5V
I_D = 0.12 to +2.5V

Attention

for an exact torque control:

- a PI-current control switching is necessary
- the device is adjusted to P-control in the factory
- change from P to PI control in the current control loop
- switch S1, contact 1 = OFF



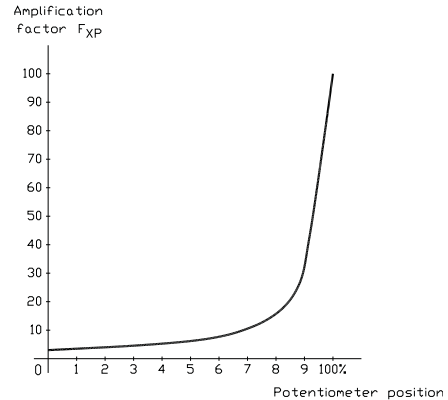
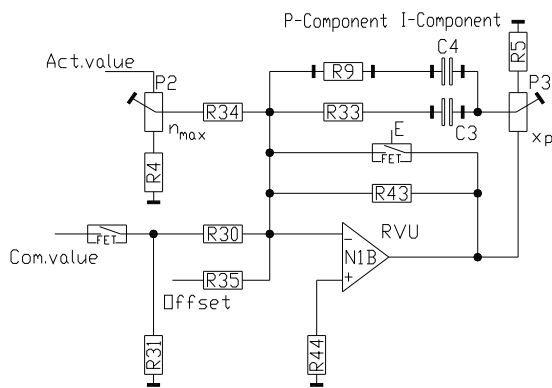
5 Adjustment

Speed control loop circuit

- variable components R9, C4
- amplification potentiometer P3 (X_P)
- Take over the adjusted values when the device is exchanged

Standard set-up

- fixed R, C values: 220kΩ, 22nF
- amplification potentiometer X_P to 50%
- suits the majority of drives



Adjustment without measurement equipment

Connect the motor

- command value = 0
- X_P = 50%
- R, C = basic values

Enable the drive

- Turn the potentiometer X_P clockwise until the axis begins to oscillate
- Turn the potentiometer X_P anti-clockwise until the oscillations disappear
- Turn the potentiometer X_P another 2 clicks anti-clockwise

Drive behaviour:	
Amplification too low	amplification too high
Long-wave oscillations 1 to 0.1Hz	short oscillations 30 to 200Hz
Large overshoots	vibrates during acceleration
Overruns destination position	vibrates during braking and in position

Attention:

Drive connected to CNC/PLC controllers
 For the maximum speed output from the controller,
 adjust the speed command value to between 8V and 9V by means of the
 potentiometer n_{max}.



Standard set-up

Before commissioning check the following connections

Nominal power supply	24V~ ... 230V~	±10%
Auxiliary voltage	20V~/24V=	+10%/-5%

Caution: The maximum voltage must not be exceeded even for short times



Power connections

- Protection earth	PE contact
- Mains + auxiliary voltage	1x or 3x 230V~ + auxiliary voltage 20V~/24V=
- Motor	3x motor conductors + protect. conductor + shield
- Encoder connection	observe the motor-specific connection data sheets

Compact device

- Power supply	compact	terminals X3:4, X3:5,
- Auxiliary voltage	compact	terminals X3:6, X3:7
- Motor connection	compact	terminals X3:1, X3:2, X3:3
- Protective conductor		earth connection on the housing
- Motor earth connection		earth connection on the housing

Multiple axes combination

- Power supply	mains module	terminals X10:2, X10:3, X10:4
- Auxiliary voltage	mains module	terminals X10:6, X10:7
- Motor connection axis		terminals X3:1, X3:2, X3:3
- Protection earth		earth screw on the housing
- Motor-earth connection		earth screw on the housing

Always observe the connection advice

Encoder connection	X7	observe the motor-specific connection data sheets (see appendix A)
--------------------	----	--

Control connections

- Enable	contact between X1:1 and X1:2
- Command value	signal X1:4, GND X1:6 in case of an internal poti supply, bridge between X1:6-X1:7

Standard set-up for the first commissioning

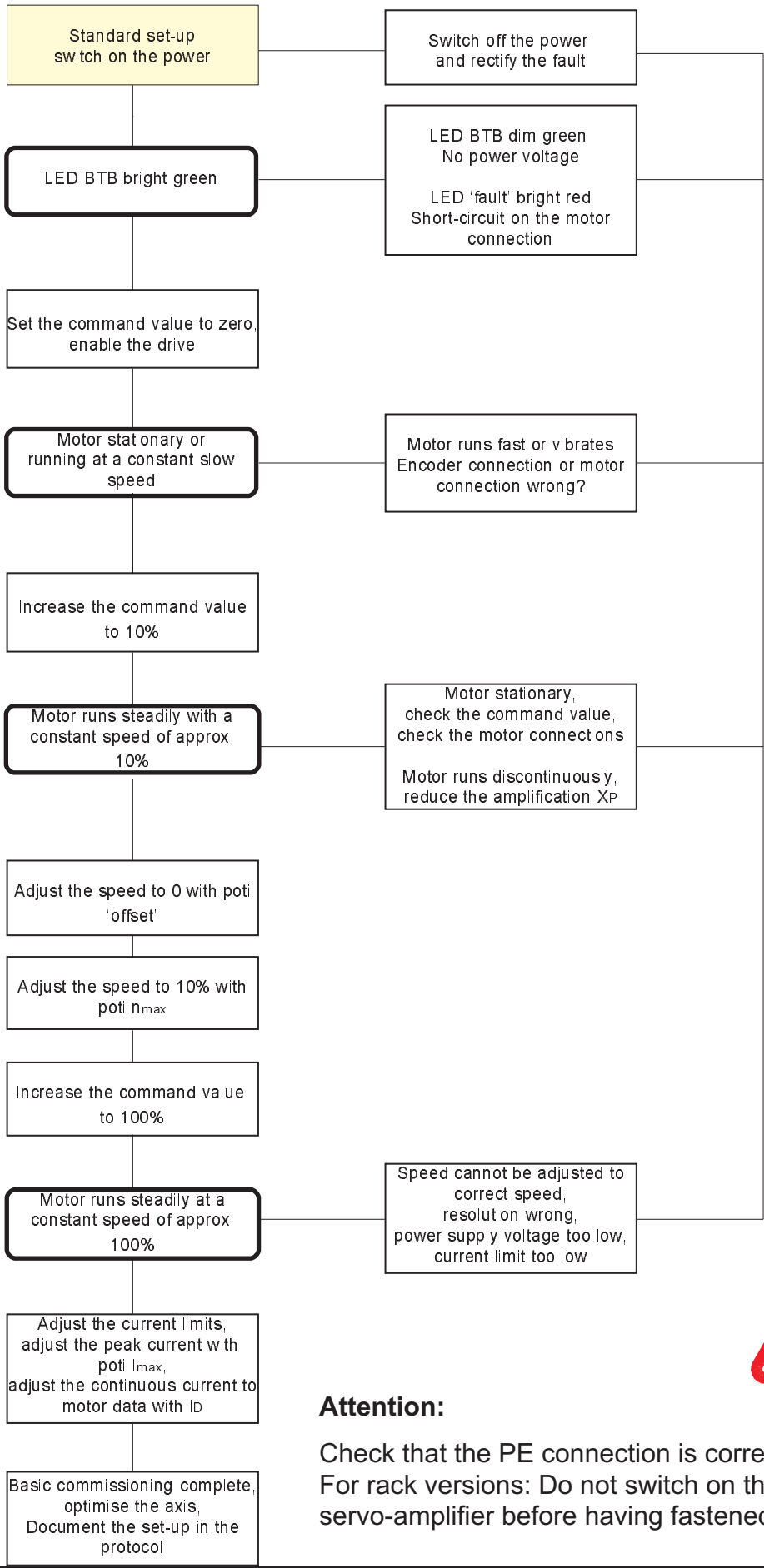
Potentiometer	I_{max1}	peak current	20%
Potentiometer	I_D	continuous current	100%
Potentiometer	X_P	amplification	50%
Potentiometer	n_{max}	speed	left full scale
Switch	S1	contact 1	= ON
		contact 2	= ON

Attention:

The operation of the devices is only permissible when the protective earth conductor (PE) is orrectlyconnected!



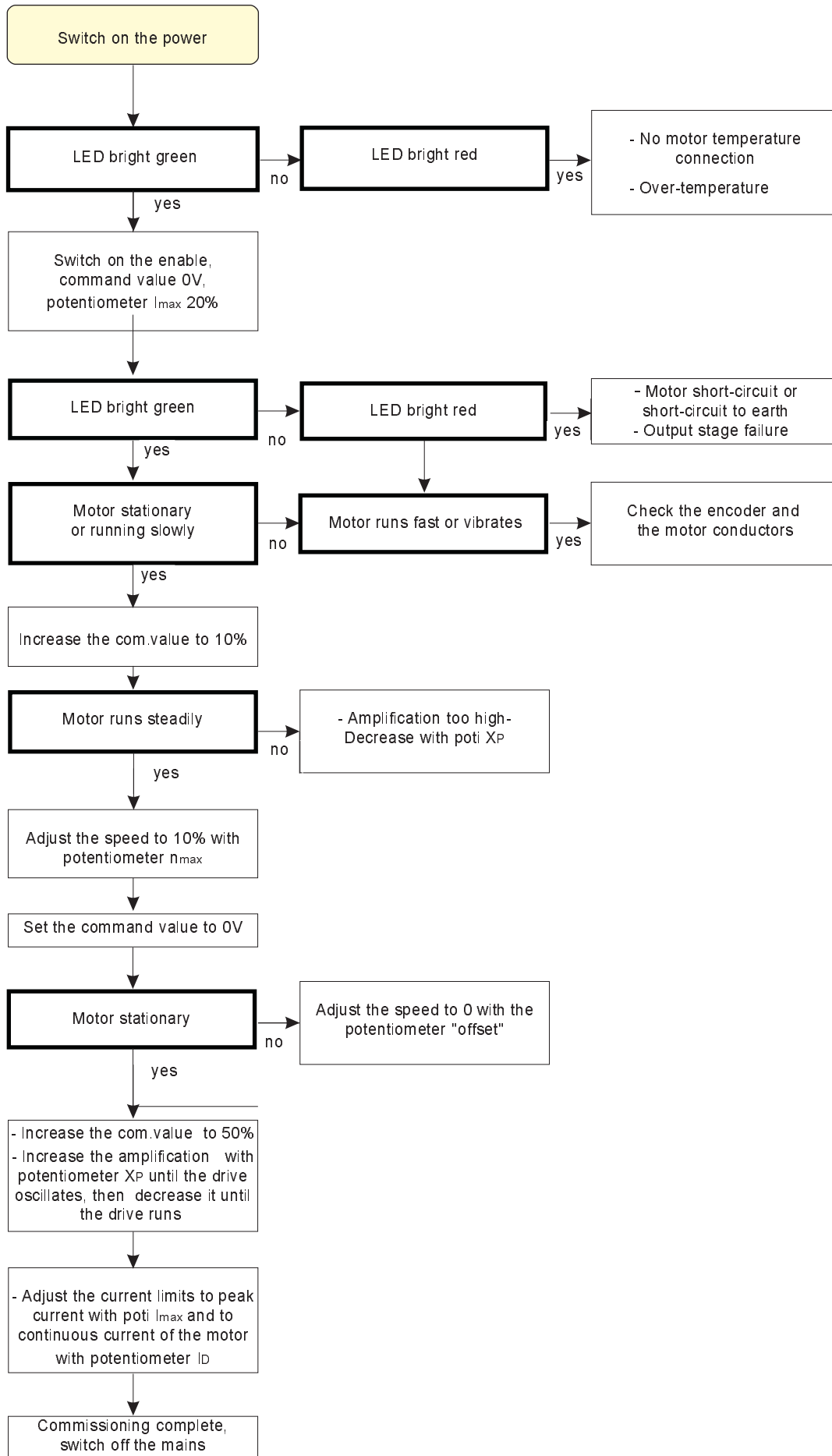
6 Commissioning



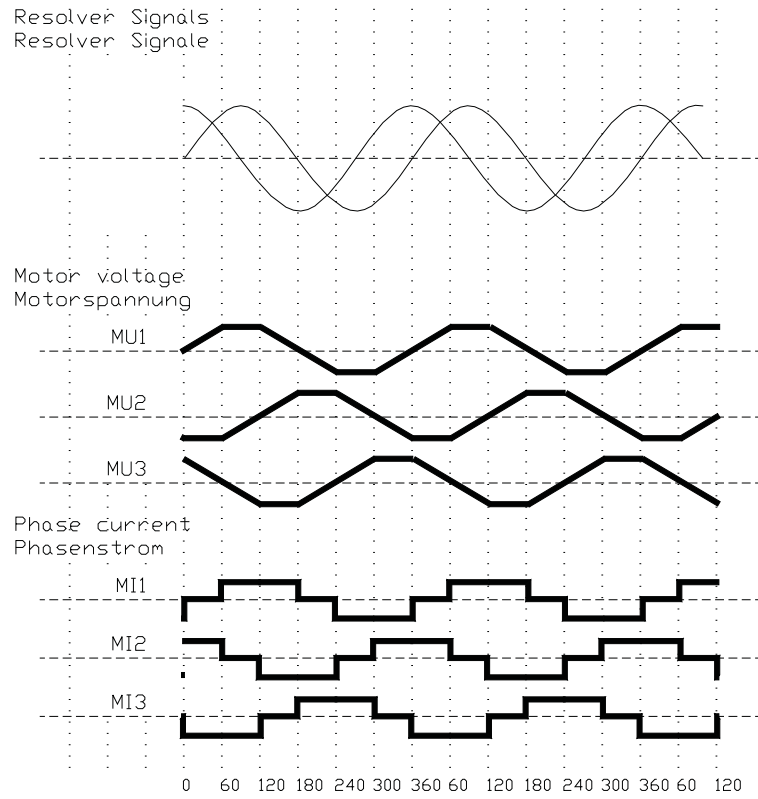
Attention:
 Check that the PE connection is correct!
 For rack versions: Do not switch on the servo-amplifier before having fastened it with screws!

Fault	Causes
LED 'fault' bright red	<ul style="list-style-type: none"> - Over-temperature - no temperature connection of the encoder cable - Short-circuit on the motor connection - Final stage fault - Over-voltage
Motor stationary, no torque	<ul style="list-style-type: none"> - no enable, current limit I_{max} at left full scale - Motor connection interrupted
Motor stands in one position, runs jerky or oscillates in one position	<ul style="list-style-type: none"> - Encoder conductor or motor conductor mixed up or interrupted
Motor speeds up	<ul style="list-style-type: none"> - Motor or resolver cores leading or lagging by 120° in the rotating field
Motor runs unsteadily	<ul style="list-style-type: none"> - Encoder cores mixed up or interrupted - Amplification X_P too high - Command value failures
Amplifier switches to failure, LED bright red	<ul style="list-style-type: none"> - Phase short-circuit or short-circuit to earth, BTB fault, - Output stage failure
Speed cannot be adjusted with poti n_{max}	<ul style="list-style-type: none"> - S1 (resolution) on the evaluation electronics RESO 2-9 wrong
Mains module switches to failure during braking	<ul style="list-style-type: none"> - Braking energy too high - Over-voltage in the bus circuit
Mains module switches immediately to failure when being switched on	<ul style="list-style-type: none"> - Under-voltage - Over-voltage

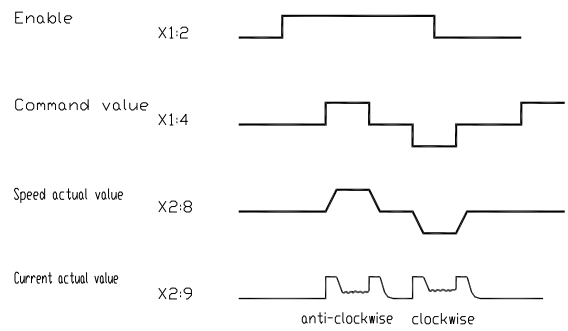
7 Faults



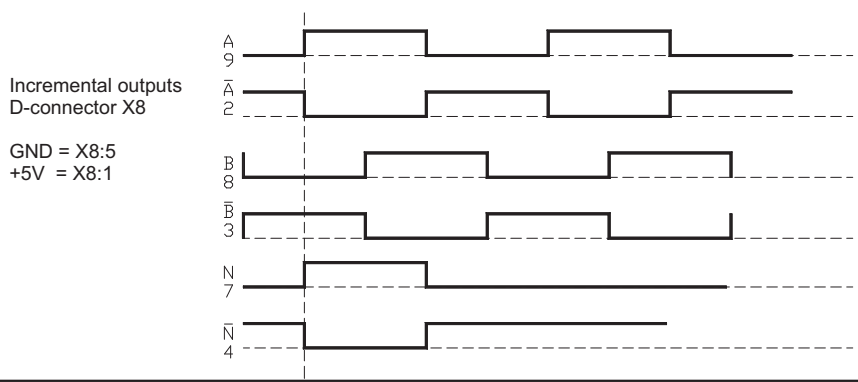
Functional diagram RS motor amplifier
 Funktions-Diagramm RS Motorverstärker



TVD3 - Signal scheme



Motor running (locking on the shaft)



8 Protocol

Customer Machine no.

Device Serial no.

Connection voltage [V=,V~]

Inputs

Enable Contact ? Voltage [V=]

Command value 1 Type Voltage [V=]

Current com. value I_{max1} external Voltage [V=]

Actual value settings - evaluation

bl-Tacho Network RN1, RN2 Value [kΩ]

IN-Evaluation Jumper SW1, 1-2/2-3 Position

RS-Evaluation Switch RS-S1/S2 ON/OFF Position

Speed control loop settings

Variable components

P-Component R9 Value

I-Component C4 Value

Potentiometer settings

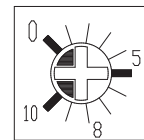
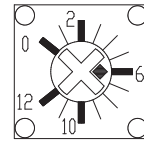
Speed n_{max} P2 Position

Pea Current I_{max} P5 Position

Continuous current I_D P4 Position

Amplification X_P P3 Position

Offset Offset P1 Position



Current control loop settings P/PI Switch S1, contact 2 ON/OFF

Measured data

Motor voltage max.

Motor current peak continuous

Motor Data

Manufacturer Type

Serial number

Encoder type IMP Voltage

Motor voltage Motor current

Brake Fan

Guarantee

UNITEK guarantees that the device is free from material and production defects. Test results are recorded and archived with the serial number.

The guarantee time begins from the time the device is shipped, and lasts one year. Unitek undertakes no guarantee for devices which have been modified for special applications.

During the warranty period, UNITEK will, at its option, either repair or replace products that prove to be defective, this includes guaranteed functional attributes. UNITEK specifically disclaims the implied warranties or merchantability and fitness for a particular purpose. For warranty service or repair, this product must be returned to a service facility designated by UNITEK.

For products returned to UNITEK for warranty service, the Buyer shall prepay shipping charges to UNITEK and UNITEK shall pay shipping charges to return the product to the Buyer.

However, the Buyer shall pay all shipping charges, duties, and taxes for products returned to UNITEK from another country.

The foregoing warranty shall not apply to defects resulting from:

- * improper or inadequate repairs effected by the Buyer or a third party,
- * non-observance of the manual which is included in all consignments,
- * non-observance of the electrical standards and regulations
- * improper maintenance
- * acts of nature

All further claims on transformation, diminution, and replacement of any kind of damage, especially damage, which does not affect the UNITEK device, cannot be considered. Follow-on damage within the machine or system, which may arise due to malfunction or defect in the device cannot be claimed.

This limitation does not affect the product liability laws as applied in the place of manufacture (i. e. Germany).

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All connection circuitry described is meant for general information purposes and is not mandatory.

The local legal regulations, and those of the Standards Authorities have to be adhered to. UNITEK does not assume any liability, expressively or inherently, for the information contained in this MANUAL, for the functioning of the device or its suitability for any specific application.

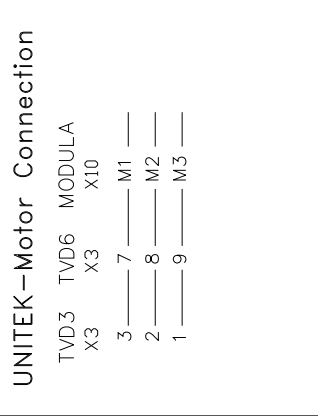
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The onus is on the reader to verify that the information here is current.

Encoder Connection for AC-Synchro-Servo-Motors with Resolver

MOTOR	ABB-Motor 861-865	AEG-MT-Motor M421 with 2pin Resolver	Motor DIERKING AC-Servomotor	EMOD-EC Motor with Resolver	ESTAN Motor 4p. SB65/35 Resolver	Motor HAUSER MOK15 MOK6
Terminal box						
MOTOR-Connector						
Encoder cable shielded	3x2x0.25 + 2x0.25	3x2x0.25 + 2x0.25	3x2x0.25 + 2x0.25	3x2x0.25 + 2x0.25	3x2x0.25 + 2x0.25	3x2x0.25 + 2x0.25
Encoder Connector looking on Solder Side						
EPROM for TVD3, TVD6/Modula	RLTAB 270 SINTAB	RLTAB 270 SINTAB	RLTAB 270 SINTAB	RLTAB 270 SINTAB	RLTAB 270 SINTAB	RLTAB 270 SINTAB



25.6.2002 TV-A739

Page 1

Connection diagram TVD3, TVD6 and Modula with x ... Motors

Encoder Connection for AC-Synchro-Servo-Motors with Resolver

MOTOR	KOBOLD KSY SRL2-SRL4 with 2pin Resolver	SAT-DSM Motor SRL2-SRL4 with 2pin Resolver	SMB Motor SRL2-SRL4 with 2pin Resolver	STÜBER EC-Motor with Resolver	Siemens 1FK 06	Multi Drive 4pin with 2pin Resolver
UNITEK-Motor Connection TVD3 TVD6 MODULA X3 X3 X10 3 — 7 — M1 — 2 — 8 — M2 — 1 — 9 — M3 —						
MOTOR-Connector 						
Encoder Line shielded 3x2x0,25 + 2x0,25	Encoder Line shielded 3x2x0,25 + 2x0,25	Encoder Line shielded 3x2x0,25 + 2x0,25	Encoder Line shielded 3x2x0,25 + 2x0,25	Encoder Line shielded 3x2x0,25 + 2x0,25	Encoder Line shielded 3x2x0,25 + 2x0,25	Encoder Line shielded 3x2x0,25 + 2x0,25
Encoder Connector looking on Solder Side 	Encoder Connector looking on Solder Side 	Encoder Connector looking on Solder Side 	Encoder Connector looking on Solder Side 	Encoder Connector looking on Solder Side 	Encoder Connector looking on Solder Side 	Encoder Connector looking on Solder Side

15:4.99 TV-A739

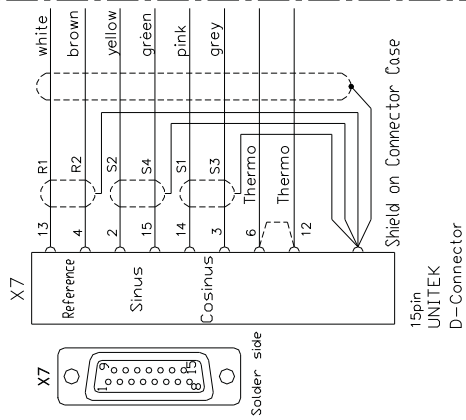
Page 2
 Connection Overview
 TVD3, TVD6 and Modula
 with x ... Motors

without Thermo
 Bridge X7:12
 and X7:6

UNITEK-Motor Connection

TVD3 TVD6 MODULA
X3 X3 X10
3 — 7 — M1 —
2 — 8 — M2 —
1 — 9 — M3 —

UNITEK-
Electronic Connection
Resolver



154.99 TV-A739
Blatt 3
Connection diagram
TVD3, TVD6 and Modula
with x ... Motors

MOTOR	ASB - Motor with Resolver	Baumüller-Motor DSG 56L with Resolver	Motor SEM HIR 142 G6	LENZE SBL2..SBL4 n2pol Resolver
Terminal box				
MOTOR-Connector				
Encoder shielded				
Encoder Connector looking on Solder Side				
EPROM for TVD3 TVD6/Modula	RLTAB 270 SINTAB		3x2x0,25 + 2x0,25	3x2x0,25 + 2x0,25

