

# MANUAL

3-phase Servo-Drive  
TVD3.2-xx-bl  
for ac synchro servo motors  
with  
a rotor position encoder

TVD3.2-bl



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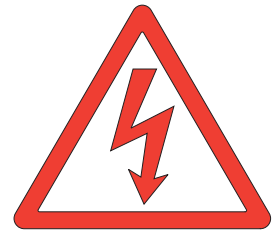
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Electronic equipment is not fault proof. This fact should be borne in mind for all possible operating conditions.

## **ATTENTION - High voltage**

AC 140V~, DC 220V=



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.

TVD3.2 devices are power electric parts used for regulating energy flow for power plants. Protection rating IP00.

### **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 user must ensure that in the event of :**

- device failure
  - incorrect operation
  - loss of regulation or control
- the axis will be safely de-activated.

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

### **Setting Adjustments**

- should only be carried out by suitably trained personnel
- should only be carried out in accordance with health and safety guidelines

### **Installation**

- 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-TVD3.2** in combination with the brushless dc motor (ac synchro servo motor, EC 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 ac 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 analogue 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 the tacho control is used.

The speed actual value is generated in the rotor position encoder plus bl-tacho.

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. This results in the current command value, which is transferred to the three phase current controllers by means of the rotor position signal. 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 TVD3-2-xx-IN
with resolver	UNITEK TVD3-2-xx-RS
with rotor position encoder	UNITEK TVD3-2-xx-bl
For low-voltage applications	UNITEK TVD3-230-xx-bl,IN,RS
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

## Applications

Machines and installations for all types with a drive power of up to 0.8kW.

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

Use bl-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 or fed into the mains through the use of an external dc bus converter.

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
- No galvanic isolation between the power connection and device ground (GND)  
GND = -UB = PE - housing

## Components

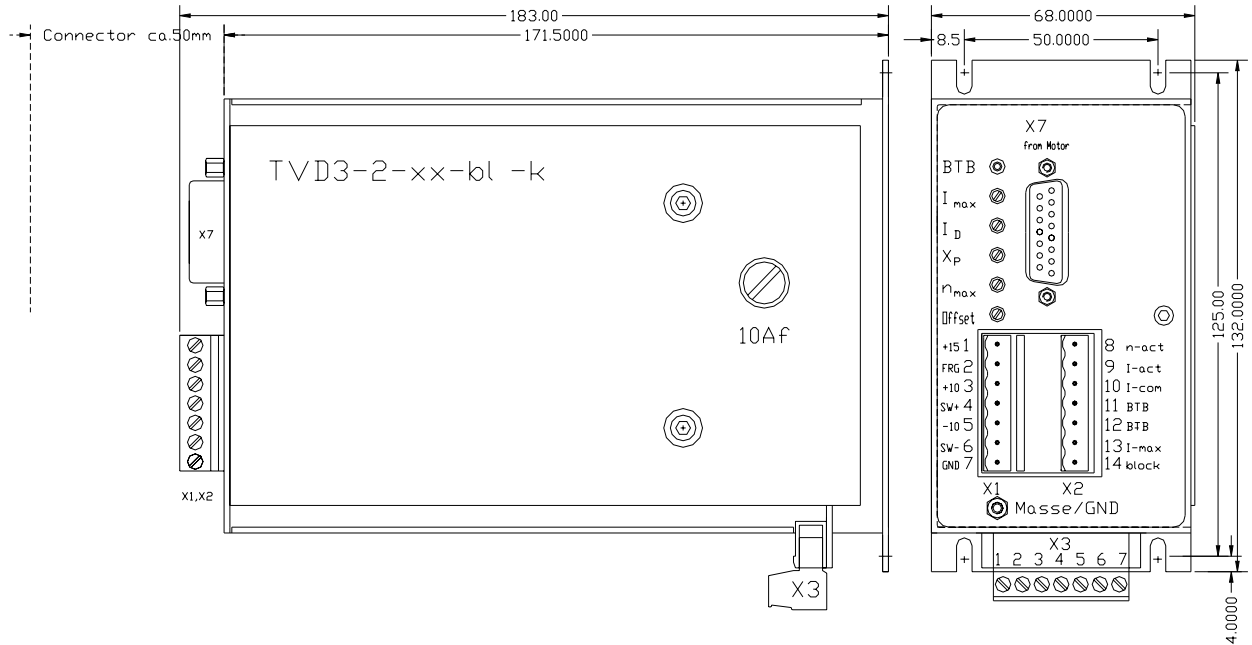
- IGBT power semiconductors, comfortably over-dimensioned
- Only components customary in trade and industrially standardised are used
- SMD basic equipment
- LED displays
- 4 position binary switches for system set-up
- Precision potentiometers for fine adjustment

## Characteristics

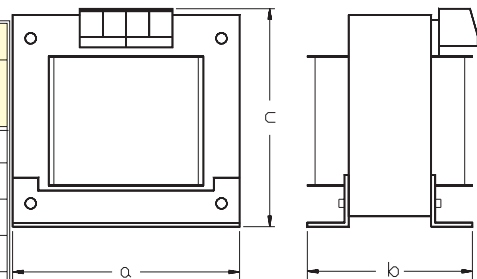
- \* Connection using an isolating transformer nom. 115V~ (max. 140V~)
- \* Differential command value input
- \* Speed and torque control
- \* Static and dynamic current limiting
- \* Current command value output
- \* Measurement points for current and speed
- \* Enable logic
- \* Emergency stop
- \* Braking in case of a mains failure
- \* Temperature watchdog for the motor and the device



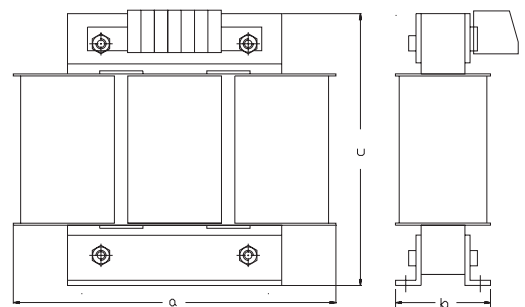
## Compact device dimensions



Transformer dimensions			
Transf. type	Transformer power VA	Dimensions a/b/c mm	Weight kg
TE 8/2	100	85x 89x 82	2.0
TE 12/1	250	120x101x115	4.3
TE 12/3	400	120x133x115	6.8
TE 15/1	500	108x132x122	8.2
TE 15/3	800	150x150x132	13.5
TE 74/2	1300	175x140x160	15.4
TE 74/3	1600	175x150x160	18.5



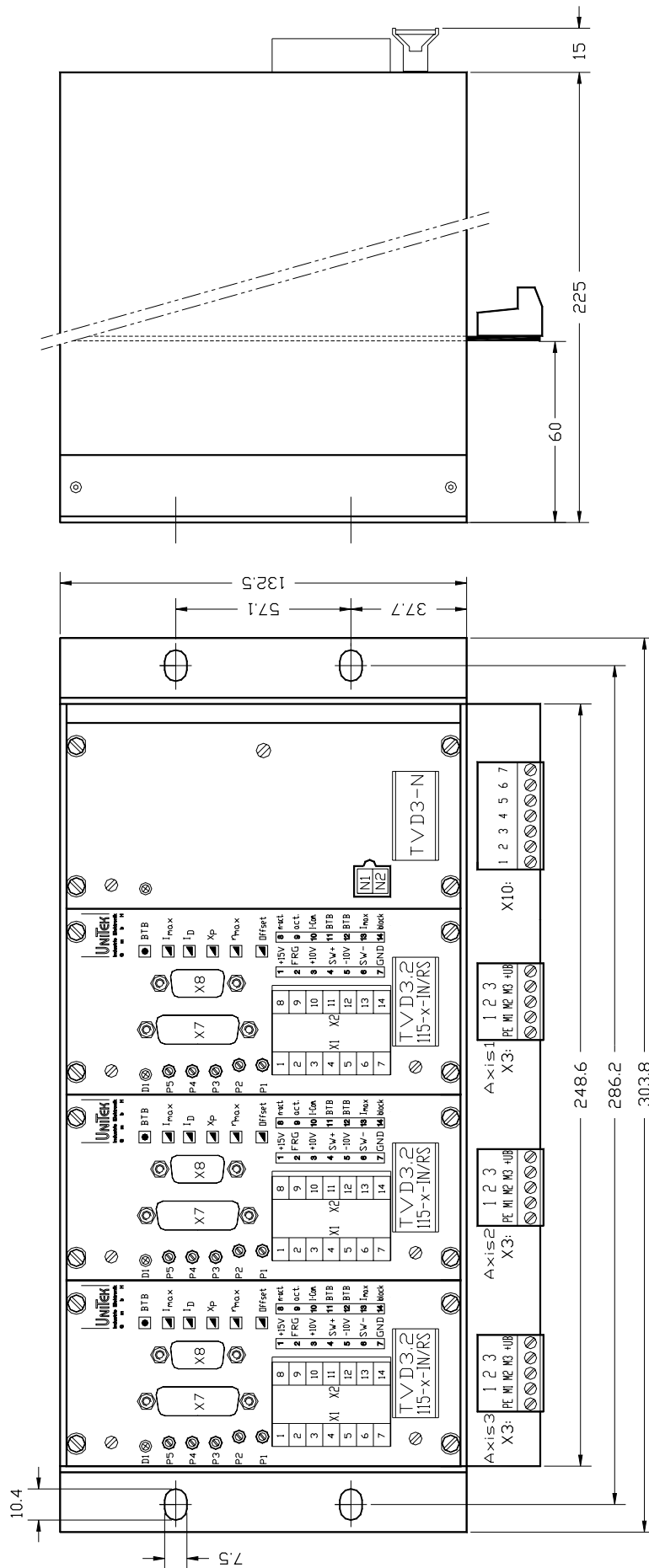
Choke dimensions				
Type	Curr. A	Inductance mH	Dimensions a/b/c mm	Weight kg
MDD 1.3a	-2.5	3.5	80x 48x 90	1.1
MDD 1.6a	-5	1.9	95x 54x108	1.3
MDD 1.6b	-10	1.0	95x 58x108	1.4





# 2 Mechanical Installation

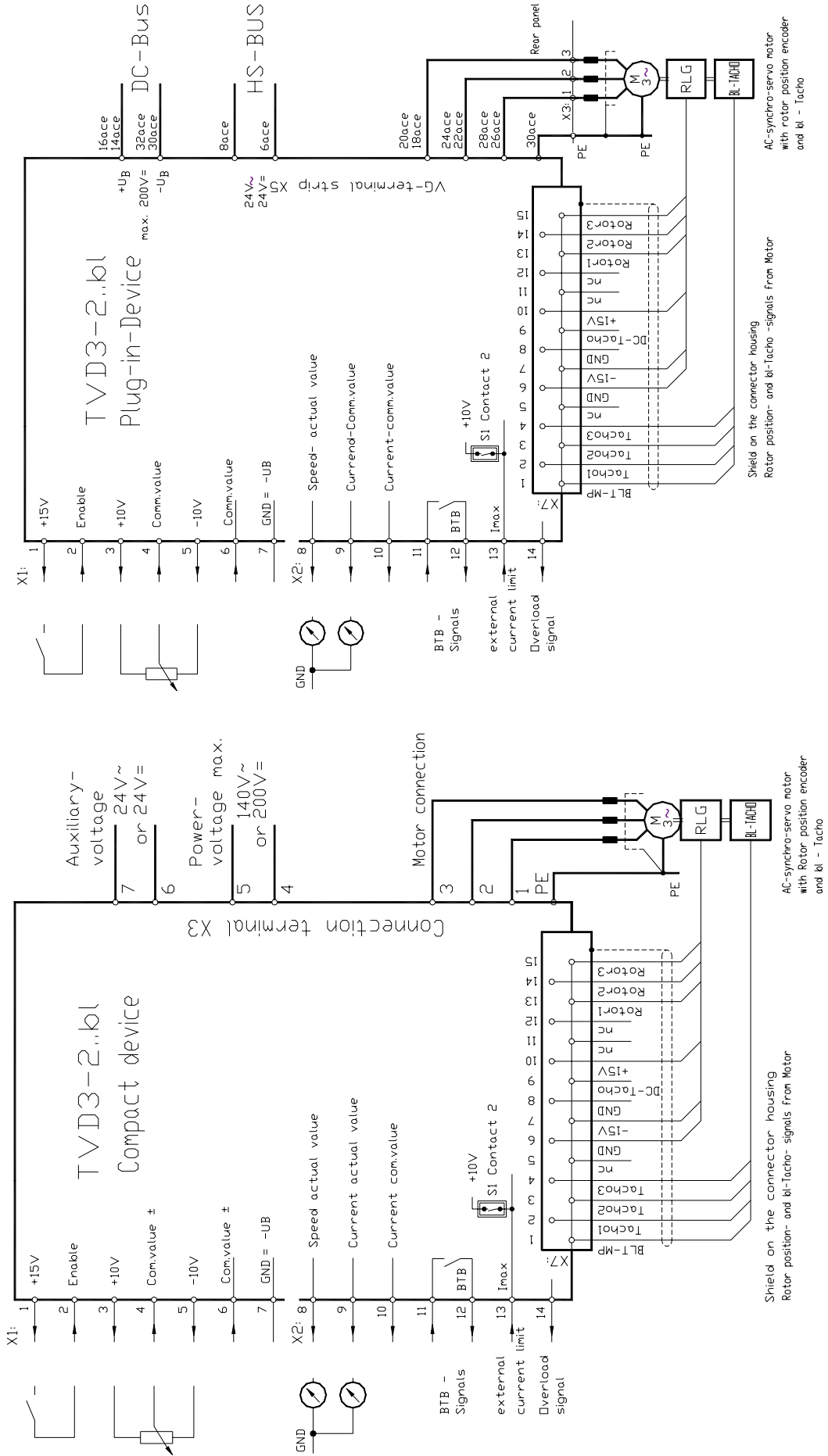
## Dimensions of a multiple axes combination



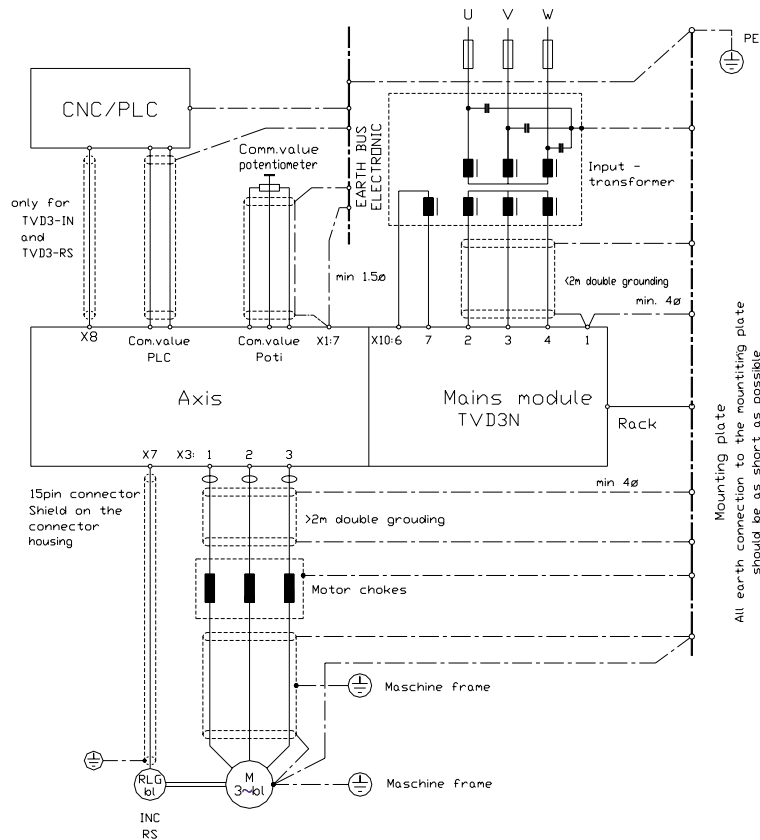
Free



# 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 10mm<sup>2</sup> wire.
- The motor housing must be connected to ground using a 10mm<sup>2</sup> wire.
- The device ground X1:7 must be connected to the mounting plate using a 2.5mm<sup>2</sup> wire.
- X10:1(-U) must be connected to the mounting plate using a 4mm<sup>2</sup> wire, l = 50mm.
- The rack ground screw must be connected to the mounting plate using a 4mm<sup>2</sup> wire, l = 50mm.

### Single-phase connection:

Transformer with filter type : TE8/2 F to TE17/3 F  
 Conductor length between the device and the power line filter <100mm

### Three-phase connection:

Transformer with filter type : DT3/50 F to DT4/75 F

### 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.

## Attention:

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 with an isolating transformer

### Note:

- The relay contacts must be rated according to the transformer switch-on current.
- Slow fuses must be installed at the input of the transformer
- The fuses must be rated according to the transformer current
- Quick fuses must be used at the output of the transformer
- The fuse value for each mains module is max. 30AF

## Isolating transformer

Rated transformer power [VA]= 1.42 x 115 x IM x GLF x nF

IM = Sum of the motor currents (effective)

GLF = simultaneity factor

nF = speed ratio factor

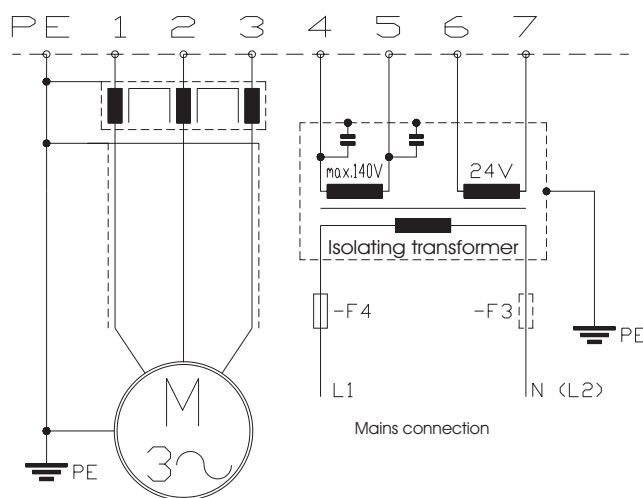
### GLF =

- 1 with 1 motor
- 0.5 - 0.7 with 2 motors
- 0.4 - 0.6 with > 2 motors

### nF =

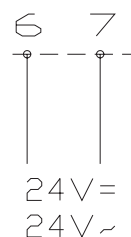
- effective speed
- maximum speed

## Connection compact device X3



### Attention:

Do not earth 24V~  
Short-circuit to -UB



Auxiliary voltage connection terminal X3:6, X3:7  
- from an external 24V source  
- from an isolating transformer

**Attention:** The maximum voltage 140V~ must not be exceeded!

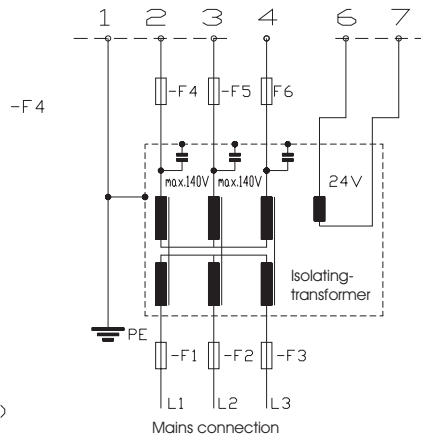
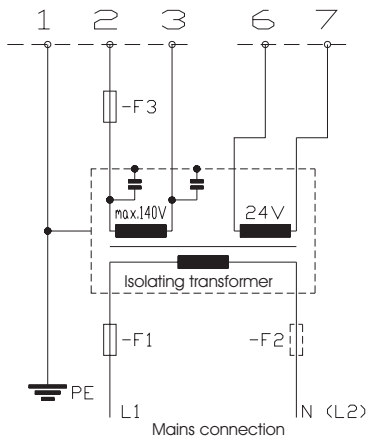


# 3 Electrical Installation

## Connection to the mains module X10

Alternating voltage  
1x 115V + 24V

Three-phase voltage  
3x115V + 24V



Auxiliary voltage connection  
terminal X3:6, X3:7  
- from the isolating transformer  
- from an external 24V source

**Attention:**  
Do not earth 24V~

Connecting cable				
Dimensioning		5A	10A	Mains module max. 30A
Conductor cross-section	mm <sup>2</sup>	0,5	0,75	2,5
Fuses				
- safety fuse	AF	10	16	30
- automatic cut-out	A	10	16	30

## Motor power connection

Cable no.	PE	M1	M2	M3
Connection	PE bolt	X3:1	X3:2	X3:3
Motor cable for	5A	10A	thermal	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

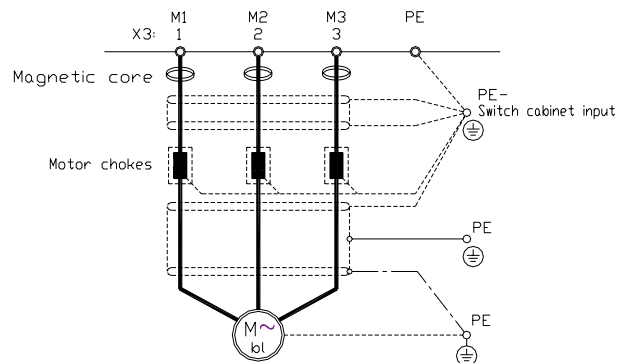
- with earth clamp
- directly to be connected to the switch cabinet input and to the motor
- multiple earthing in case of long conductor cables

## Magnetic cores

- against HF failures

## Motor chokes

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



**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
- 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

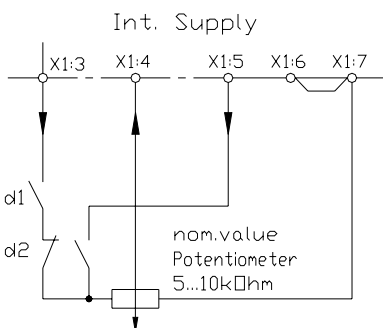
Command value	X1:4 (signal) X1:6 (GND)
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### Command value current from an external PLC/CNC

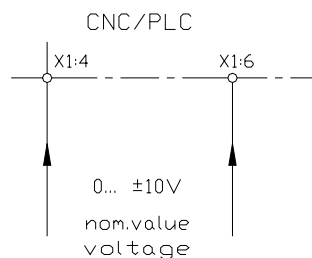
Resistor for a current command value of 0 to  $\pm 20mA$   $R_{com.} = 500$

Current command value	X1:4 (signal) X1:6 (GND)
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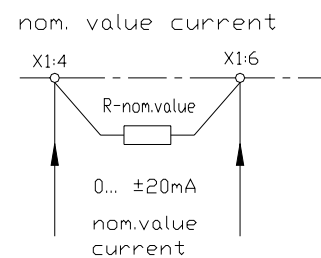
### Internal supply



### 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. 5sec.

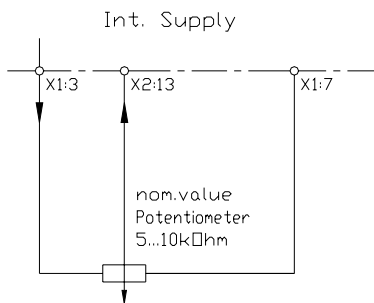
## Current limit input

Max. input voltage +10V  
 Input resistance 10 kW  
 Internal attenuation with potentiometer I  
 Relay contacts: use gold or reed contacts  
 Switch S1, contact 2 = OFF

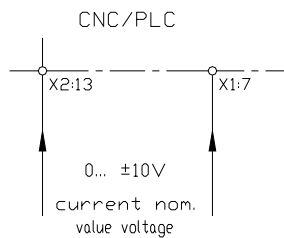
### Connections

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

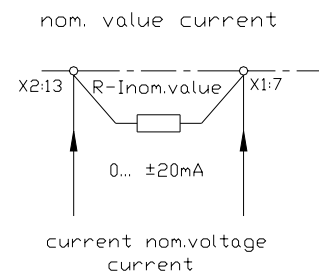
#### Internal source



#### CNC/PLC



#### Current command value



### Attention:

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



## Actual value connection

### Connector X7

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

**Cable:** up to 10m                    12 x 0.14 shielded  
> 10m                                12 x 0.25 shielded

### Connections

Function	Colour (recommended)	Pin no.
Bl-tacho mp	grey	1
Bl-tacho phase 1	yellow	2
Bl-tacho phase 2	black	3
Bl-tacho phase 3	white	4
+15V	violet	10
GND	blue	6
Thermal sensor	pink	6
Thermal sensor	orange	12
Rotor position 1	brown	13
Rotor position 2	green	14
Rotor position 3	red	15

Additional connection when using a dc tacho:

-15V	grey	7
dc tacho signal	yellow	9
dc tacho GND	black	8

(The BL-tacho connections at pin no. 1 and 4 are removed)

Pin no. 6 is double-coated.

For motors without thermal sensor >>> bridge between pin no. 6 and 12

### Attention:

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



## 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 dim green    contact open  
 Fault                 LED bright red    contact open

### BTB contact drops in case of

over-temperature controller, motor            not 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	>+10V	<+2V

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

# 3 Electrical Installation

## 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

## Power connections - plug-in unit

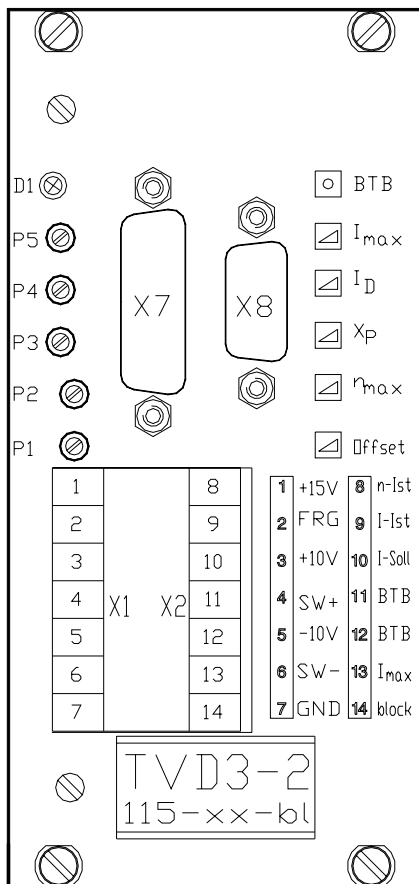
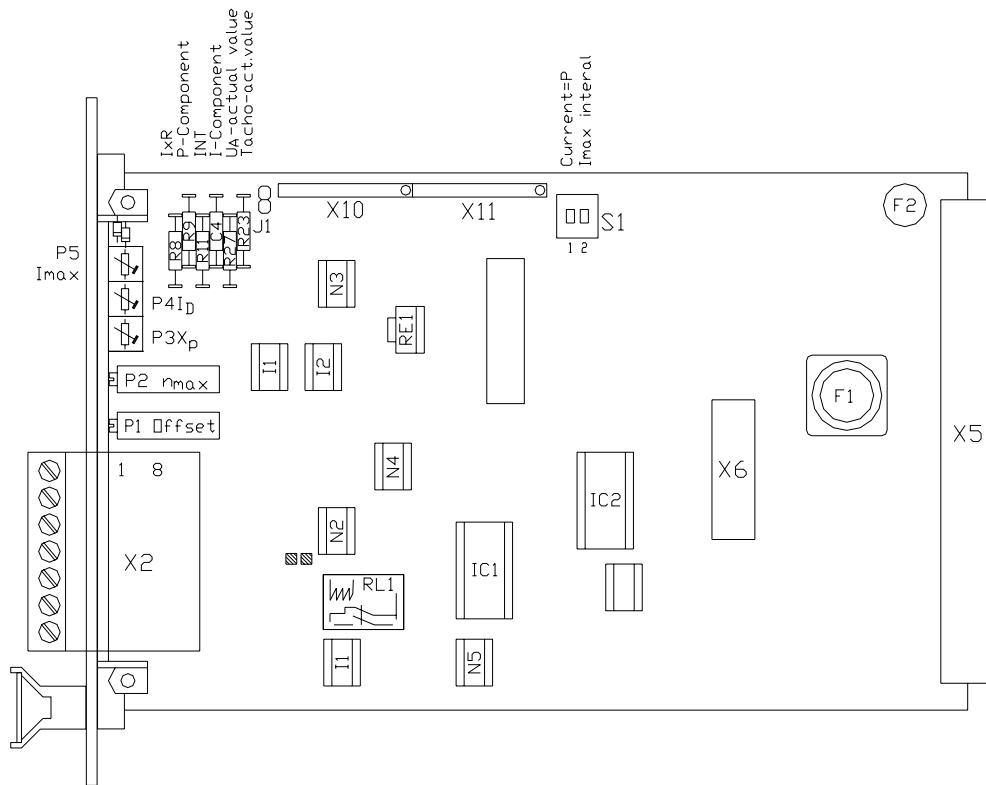
Function	Plug-in connector	Terminal no.
Bus circuit - (UB-)	X5: 30, 32 ace	
Motor 1	X5: 26, 28 acc	X3: 1
Motor 2	X5: 22, 24 ace	X3: 2
Motor 3	X5: 18, 20 ace	X3: 3
Bus circuit + (UB+)	X5: 14, 16 ace	
24V~	X5: 8 ace	
24V~	X5: 6 ace	

## 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)

## Components



## Components

### Display

D1 green BTB  
D2 red fault

### Potentiometer

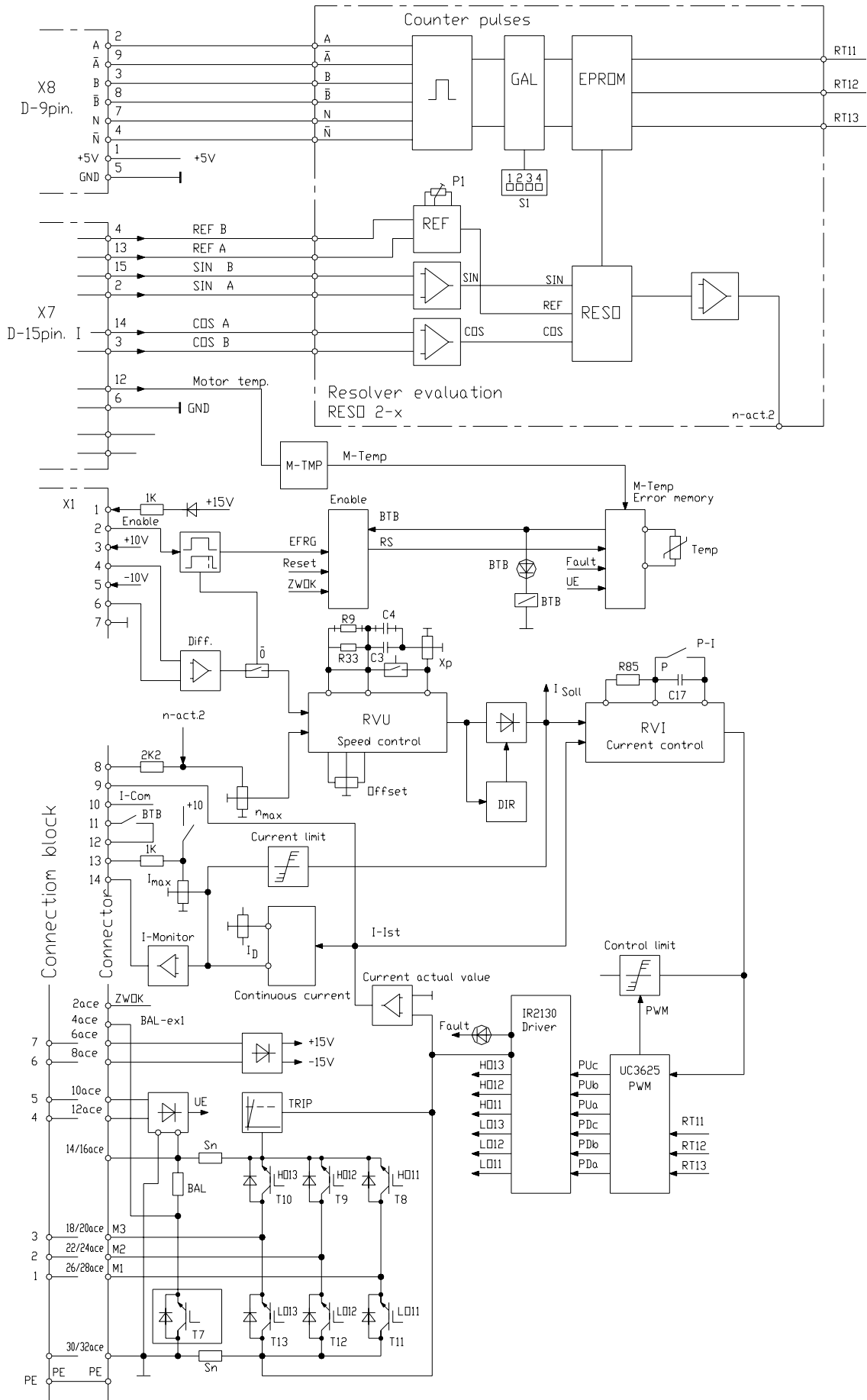
P5 Imax  
P4 ID  
P3 XP  
P2 nmax  
P1 offset

### 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 external current limit  
X2:14 blocked

# 4 Device Overview







## Adjustments

### Function

### Component

Actual value adjustment bl-tacho	Poti P2 (nmax)
Actual value adjustment, option dc tacho	Resistor R + poti P2 (nmax)
Internal current limit	Switch S1 > contact 2=ON Poti P5 (Imax)
External current limit	Switch S1 > contact 2=OFF Poti P5 (Imax)
Continuous current	Poti P4 (ID)
Amplification P-component	Resistor R9 Poti P3 (XP)
Amplification I-component	Capacitor C4
Integrator	Resistor R11
Zero adjustment	Poti P1 (offset)

## Switch S1

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

## LED display

BTB	green	LED 1
fault	red	LED 2

## Signal outputs

Function	Designation	Terminal no.
DrehzahlSpeed	n-actual value	X2:8
Current	I-actual value	X2:9
Current command value	I-command value	X2:10
blocked	>10V/6mA	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	>>>	network RN1, RN2 (on TVD-RLG-bl)
Current limit internal/external	>>>	switch S1, contact 2
Current control P- PI	>>>	switch S1, contact 1

### Optimisation

Actual value adjustment	nmax adjustment
Current control	switch S1, contact 1 (stand. set-up > ON)
Current limits	I <sub>max</sub> , I <sub>D</sub> -adjustment
Speed control	XP-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)

Measurement	max.	Test points
Command value	± 10V	X1:4
Speed act. value at the output of the divider	± 5V	X2:8
Current actual value unipolar	+ 5V	X2:9
Current com. value (control func. speed controller)	- 10V	X2:10

Command value		
Function	max.	Connector
Input signal	± 10V=	X1:4
Input 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[ ] = com. value voltage/com. value current (max. 500 )

### Command value integrator

Integration time = 0.1msx yy/R11

### Attention:

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

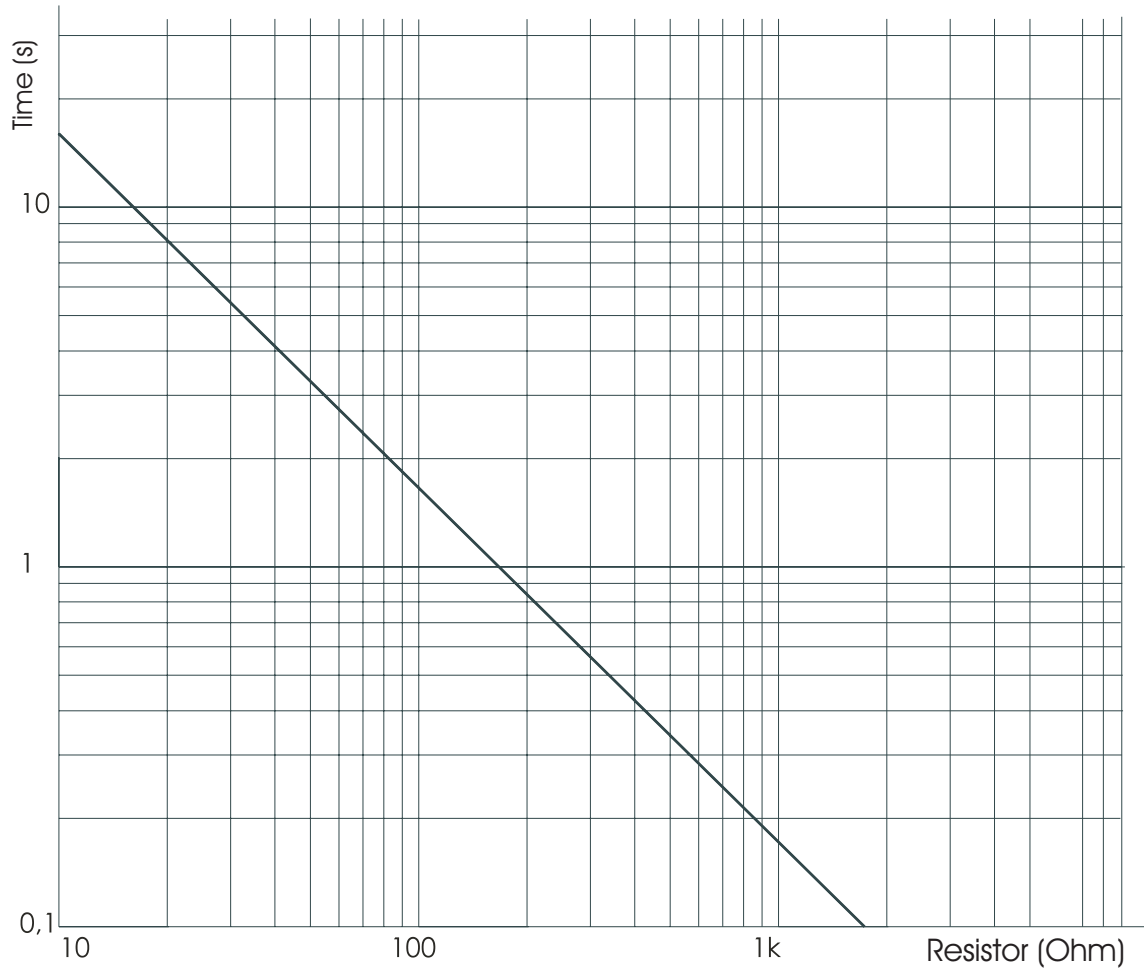


# 5 Adjustment

## Command value integrator

Linear integrator

Time adjustment with resistor R11 (INT)





# 5 Adjustment

## Speed actual value

### Evaluation electronics subprint TVD-RLG-bl

#### Attention:

Observe in any case the motor-specific connection data sheets.  
(see appendix A).

#### Connection test

Motor turning anti-clockwise (looking onto the rear side of the motor acc. to DIN)

There is only one correct connector configuration.

#### Rotor position encoder

Signal sequence X7:15//X7:15+X7:14//X7:14//X7:14+X7:13//X7:13//X7:13+X7:14//

#### Attention:

When all of the 3 rotor signals are inferior to 8V, the encoder conductor is interrupted.

#### Tacho signal X2:8

uniform speed-proportional voltage, no saw-tooth voltage

#### Pre-settings

- with the resistance network RN1, RN2
- Resistance value (Ohm) = tacho voltage x max. speed
- Standard adjustment for 3000 min<sup>1</sup>

#### Fine adjustment

with potentiometer n<sub>max</sub> (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

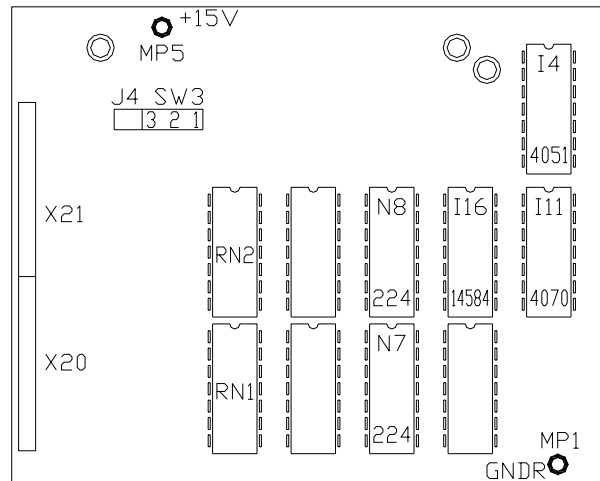
#### Direction change

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

#### Option dc tacho

or motors with dc tacho or rotor position encoder,  
resistance R23 = 22kOhm,  
fine adjustment see 'bl-tacho'

#### Bl-tacho with rotor position encoder





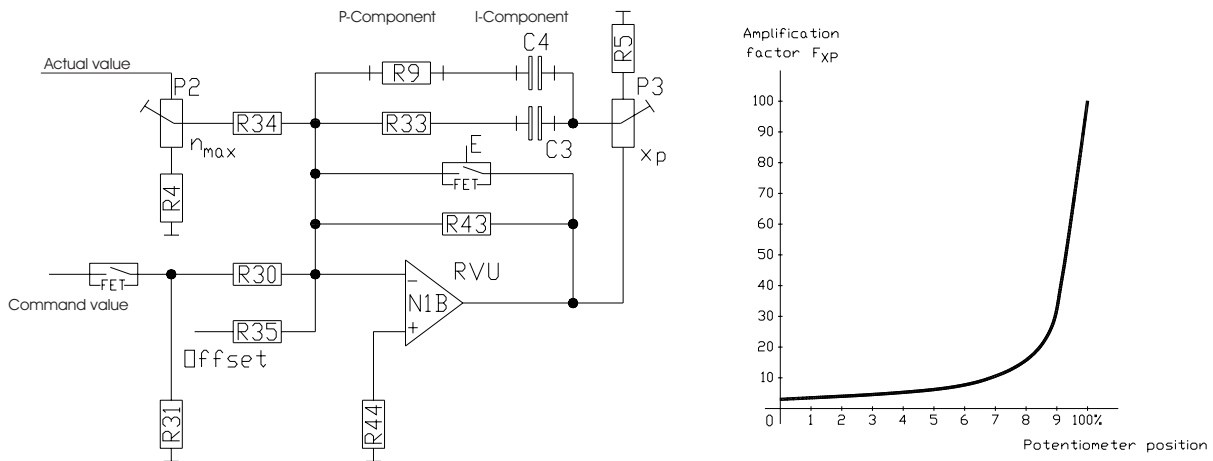
# 5 Adjustment

## Speed control loop circuit

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

## Standard set-up

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



## Adjustment without measurement equipment

Connect the motor

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

Enable the drive

- Turn the potentiometer Xp clockwise until the axis begins to oscillate
- Turn the potentiometer Xp anti-clockwise until the oscillations disappear
- Turn the potentiometer Xp 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 nmax.



## Standard set-up

### Before commissioning check the following connections

Nominal power supply 115V~/180V=, maximum 140V~/200V=



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

### 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

### Multiple axes combination

- Power supply	mains module	terminals X10:2, X10:3, X10:4
- 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)
--------------------	----	--------------------------------------------------------------------

### Power connections

- Protection earth	PE bolt
- Mains	1x or 3x 115V~
- Motor	3x motor conductors + protect. conductor + shield
- Encoder connection	observe the motor-specific connection data sheets

### Control connections

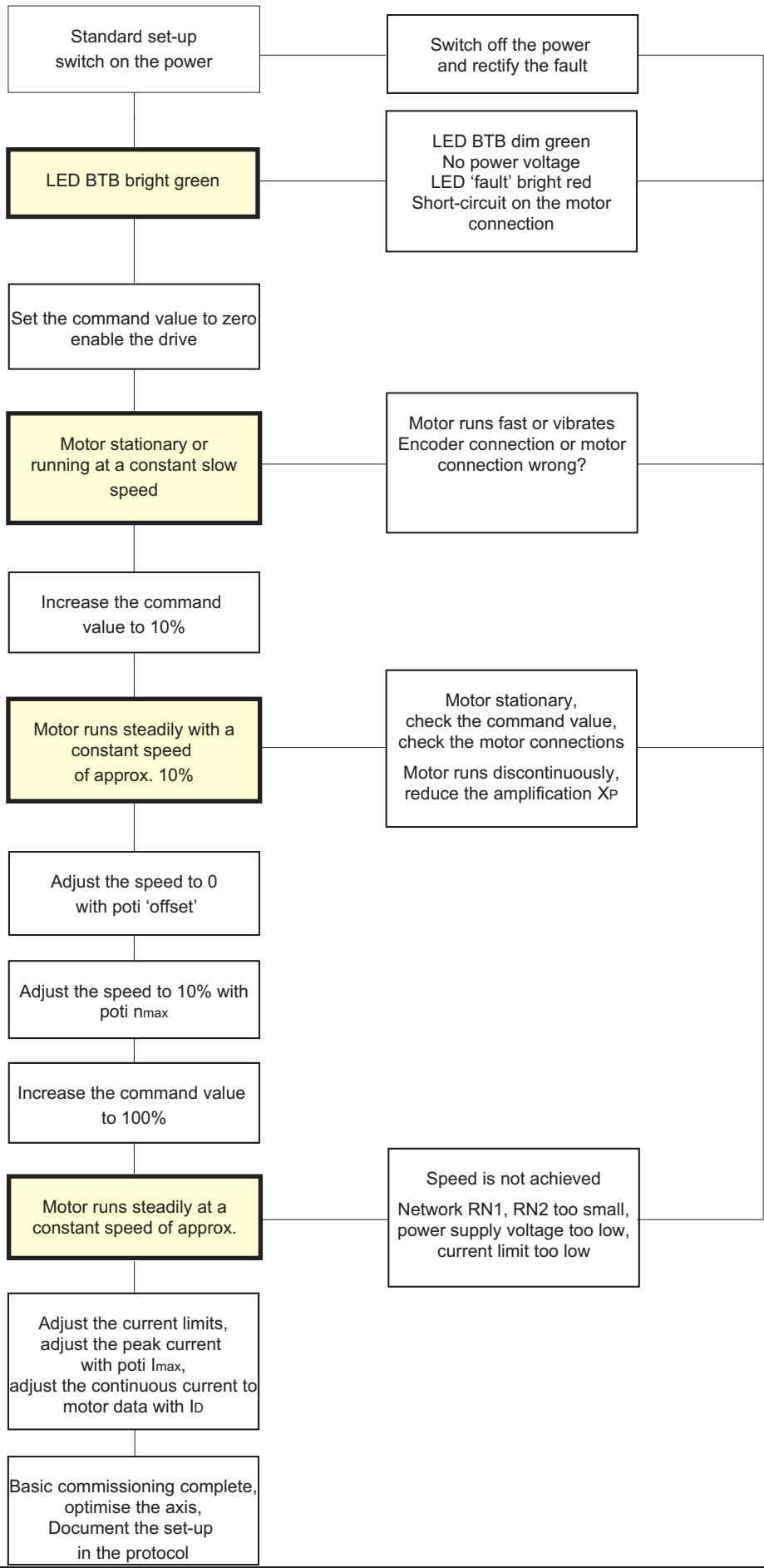
- Enable	contact between X1:1 and X1:2
- Command value	signal X1:4, GND X1:6 in case of an internal poti supply, bridge between X1:6-X1:7

### Standard set-up for the first commissioning

Potentiometer	I <sub>max1</sub>	peak current	20%
Potentiometer	ID	continuous current	100%
Potentiometer	XP	amplification	50%
Potentiometer	n <sub>max</sub>	speed	left full scale
Switch	S1	contact 1	= ON
		contact 2	= ON



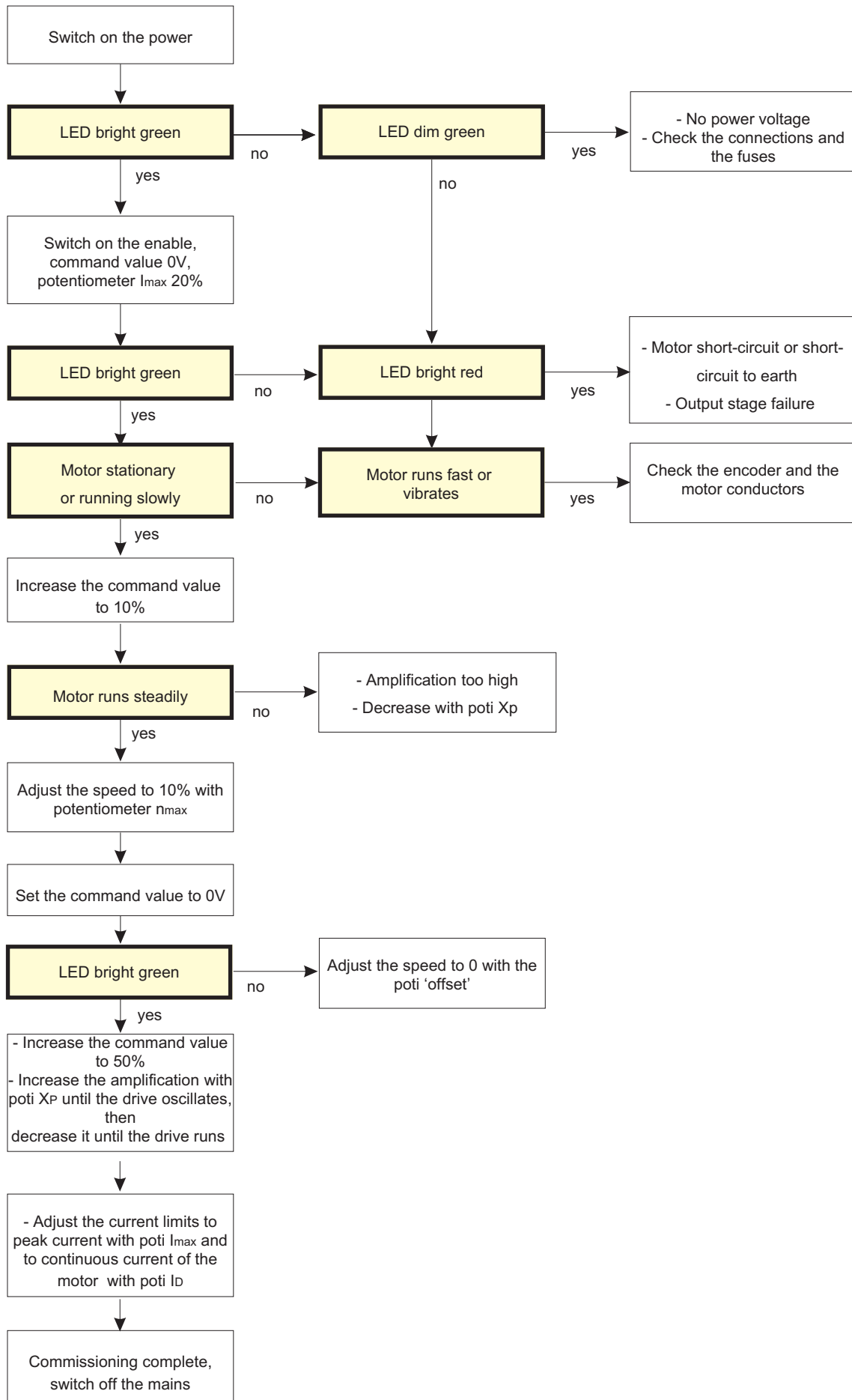
# 6 Commissioning



**Faults**

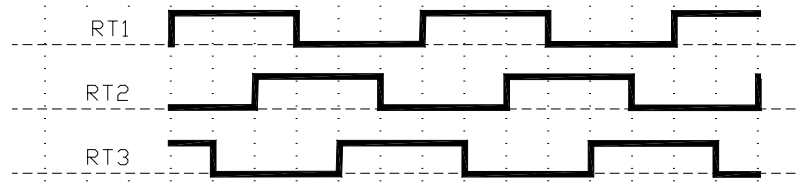
Fault	Causes
LED dim green	<ul style="list-style-type: none"> <li>- No power connection</li> <li>- Power voltage too low</li> <li>- no temperature connection of the encoder cable</li> </ul>
LED 'fault' bright red	<ul style="list-style-type: none"> <li>- Short-circuit on the motor connection</li> <li>- Final stage fault</li> <li>- Over-voltage</li> </ul>
Motor stationary, no torque	<ul style="list-style-type: none"> <li>- no enable, current limit I<sub>max</sub> at left full scale</li> <li>- Motor connection interrupted</li> </ul>
Motor stands in one position, runs jerky or oscillates in one position	<ul style="list-style-type: none"> <li>- Encoder or motor cable mixed up or interrupted</li> <li>- Switch position RESO S1-pos. 3 and 4 wrong</li> <li>- (pole number adaptation)</li> </ul>
Motor speeds up	<ul style="list-style-type: none"> <li>- Motor or rotor position cores leading or lagging by 120° in the rotating field</li> </ul>
Motor runs unsteadily	<ul style="list-style-type: none"> <li>- Tacho cores mixed up or interrupted</li> <li>- Amplification XP too high</li> <li>- Command value failures</li> </ul>
Amplifier switches to failure, LED bright red	<ul style="list-style-type: none"> <li>- Over-temperature, phase short-circuit or short-circuit to earth, BTB fault,</li> <li>- Output stage failure</li> </ul>
Speed cannot be adjusted with poti n <sub>max</sub>	<ul style="list-style-type: none"> <li>- Resistance network RN1, RN2 on the evaluation electronics TVD-bl wrong</li> </ul>
Mains module switches to failure during braking	<ul style="list-style-type: none"> <li>- Braking energy too high</li> </ul>
Mains module switches immediately to failure when being switched on	<ul style="list-style-type: none"> <li>- Under-voltage</li> <li>- Over-voltage</li> </ul>

# 7 Faults

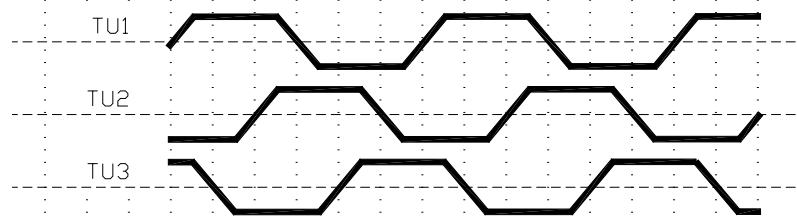


## Functional diagram bl/ec motor amplifier

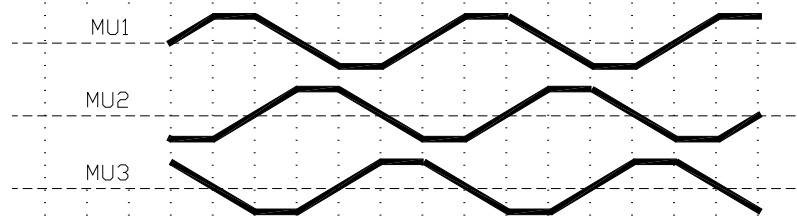
Rotor position encoder



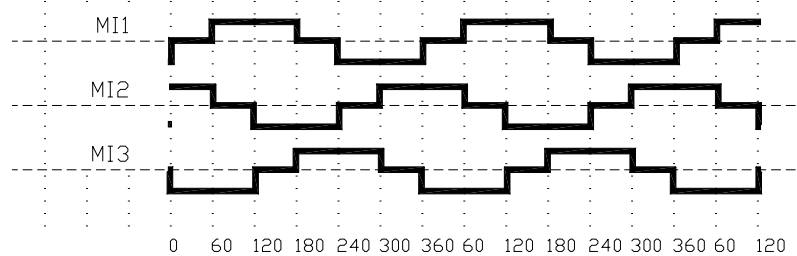
Tachometer voltage



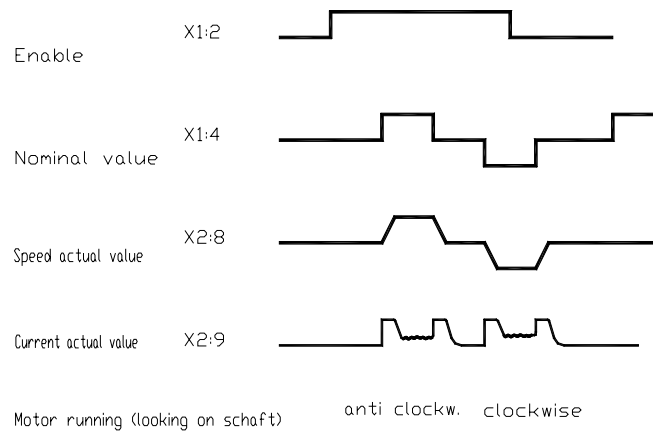
Motor voltage



Phase current



## TVD3 - Signal scheme



# 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<sub>max</sub>1 external ..... Voltage [V=] .....

**Actual value settings - evaluation**

DC tachometer R23 Value [k ] .....

bl-Tachometer Network RN1, RN2 Value [k ] .....

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

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

**Speed control loop settings**

Variable components

P-Component R9 Value .....

I-Component C4 Value .....

**Potentiometer settings**

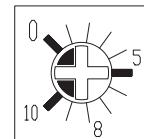
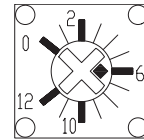
Speed n<sub>max</sub> P2 Position .....

Pea Current I<sub>max</sub> P5 Position .....

Continuous current I<sub>D</sub> P4 Position .....

Amplification X<sub>P</sub> P3 Position .....

Offset Offset P1 Position .....



**Current controller settings** P/PI Switch S1, contact 1 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.

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## Encoder connections for AC-Synchro-Servo-Motors with Rotor position encoder and bl-Tachometer.

MOTOR	ABB GC/LC	AEG-MT -Motors	BAUMÜLLER DS-Motors	EMOD EC-Motors	SCHABMÜLLER SDS	SIEMENS IFT-Motors	STÜBER EC-Motors
<b>Terminal-Box</b> TVD3 X3 MODULA X10 3 — 7 — M1 — 2 — 8 — M2 — 1 — 9 — M3 —							
<b>MOTOR-connector</b> UNITEK— Electronics connection Rotor position encoder + bl-Tacho X7							
<b>Encoder cable shielded</b> 12x 0,25 oder 10x 0,25+2x 0,5							
<b>Encoder connector soldered side of ... Lötseite</b>							
<b>Network RN1 / RN2</b> by 3000min <sup>-1</sup>	remove	10kΩhm	22kΩhm	33kΩhm	33kΩhm	47kΩhm	10kΩhm

