

MANUAL

3-phase Servo-Drive
TVD3.2-xx-IN
for ac synchro servo motors

TVD3-2-IN

UNITEK

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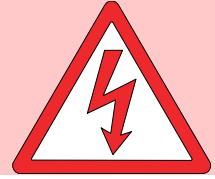
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1 Basic-Information

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

ATTENTION - High voltage **AC 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 analog circuits are simply constructed.

The speed actual value is generated in the incremental encoder with rotor position traces.

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:

Further servo amplifiers for dc servo motors

For low power applications	UNITEK TV6.2 UNITEK TV3.2
For high power applications	UNITEK Classic Q2, Q6, up to 250V, 15-60A UNITEK TVQ6.2

Amplifiers for dc shunt-wound motors

From medium to highest power applications	UNITEK Classic Q1, Q3, up to 550V, 15-2000A
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Three-phase servo amplifiers for ac synchro servo motors

For low power applications	UNITEK SERVO TVD3-2 -xx-bl, IN, RS, 24-150V, 5-10AF
or medium power applications	UNITEK SERVO TVD6-2 -bl, N, RS, 200V/400V, 5-25/40A
For high voltage applications	UNITEK AS 250bl, AS 450RS UNITEK DS 400
For battery operation	UNITEK series BAMO

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
- * Incremental encoder output

1 Basic-Information

Technical Data

Power connection

- Compact device
 - with transformer nominal 115V~ (max. 140V~), 24V~/=
 - with transformer + rectifier nominal 180V= (max. 200V=), 24V~/=
- For a multiple axes mounting with mains module transformer
 - 1x or 3x 115V~ (max.140V)
 - + 1x 24V~/=
- Output voltage max. 3x110~

Specification			
Device TVD3.2-115		5	10
Stationary current output - continuous	A=	5	10
	- peak	A=	10
Max. el. power	W	450	900
Integrated quick ZW fuses	AF	12.5 ... 16	16
Dimensions: - compact device	w x h x d	see 'Dimensions'	
- plug-in device	w x h	12TE/3HE	12TE/3HE
Cooling at	60% d.cyc.	self	self
	100% d.cyc.	self	fan

Mains module TVD3-N 100-30

- Power supply V~ 1x or 3x 115V~ + 1x 24V~
- Output voltage V= max. 200
- Output current A= max. 30
- Regen circuit with V= 220
- Ballast power W 100% 50
- WS 6000

Common specification

- Protection rating IP 00
- Format VDE 0100 group C, VDE 0160
- Humidity rating class F acc. to DIN 40040
- Site of installation < 1000m above sea level
- Operating temperature range 0 ... 45°C
- Extended operating temp. range up to 60°C reduced by 2%/°C
- Storage temperature range -30°C to + 80°C
- Speed control loop circuit
 - control precision without actual value error ± 0.5%
 - control range 1: 1000

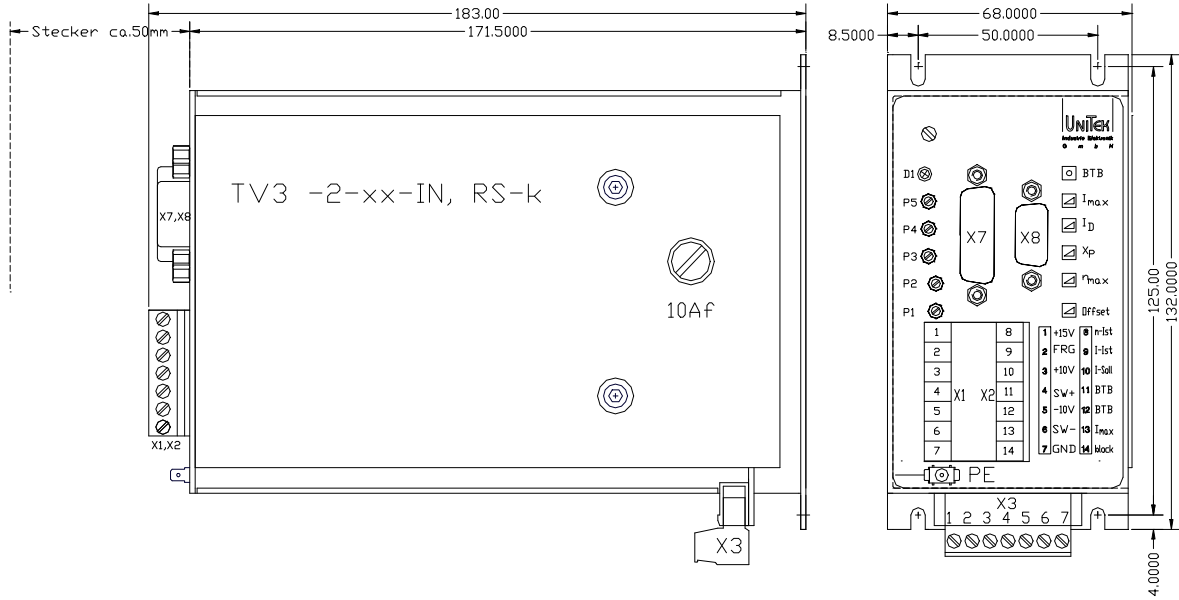
Incremental pulses

A/A, B/B, N/N 5V

Caution: The maximum connection voltages 140V~, 200V= **must not** be exceeded even for short times.
The regen circuit may be destroyed.

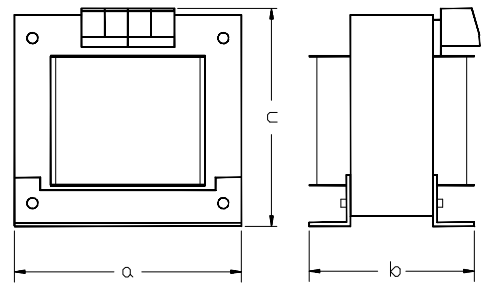


Compact device dimensions

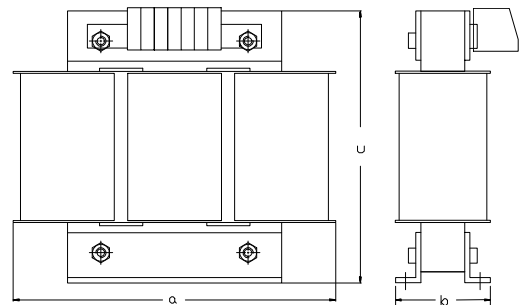


Transformer and choke dimensions

Transformer			
Transformer 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

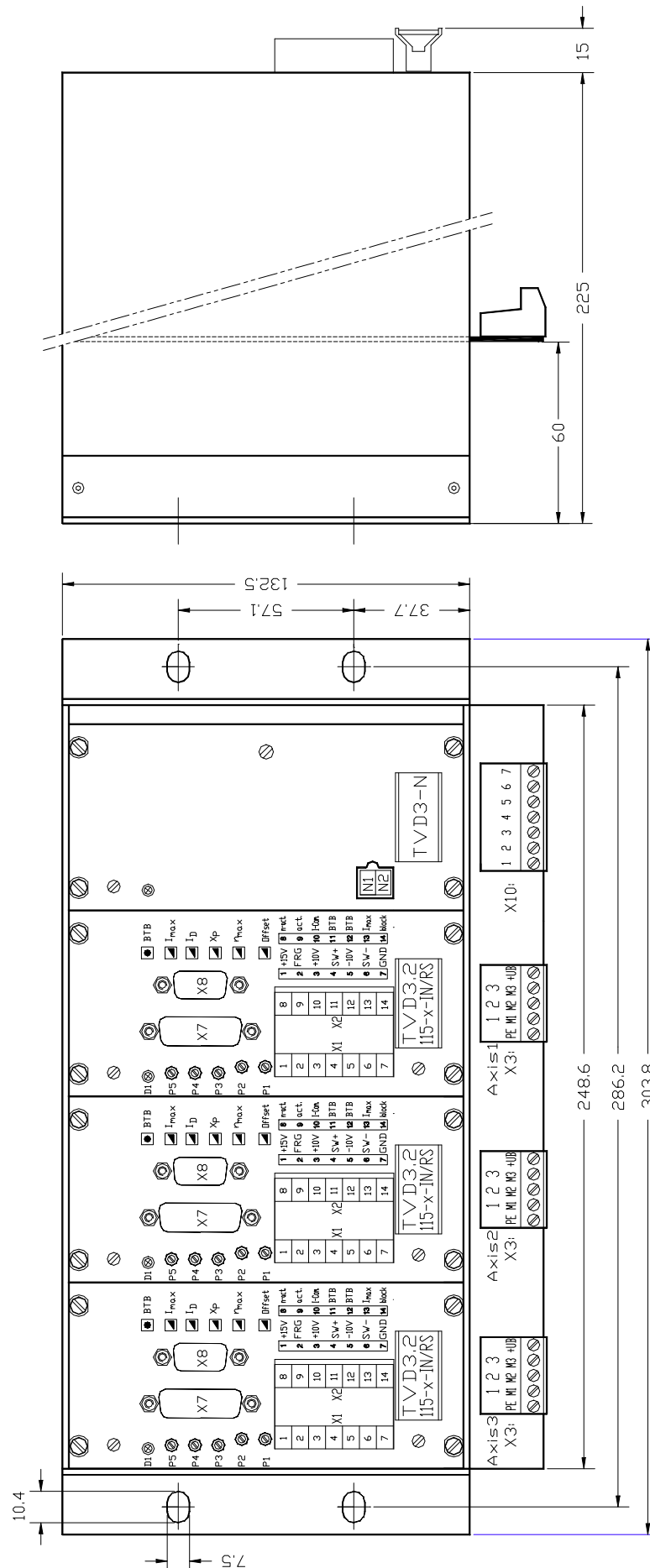


Choke				
Type	Current A	Inductance mH	Dimensions a/b/c mm	Weight kg
MDD 1,3a	-2.5	3.5	80x 48x90	1.1
MDD 1,6a	-5	1.9	95x54x108	1.3
MDD 1,6b	-10	1.0	95x 58x108	1.4



2 Mechanical Installation

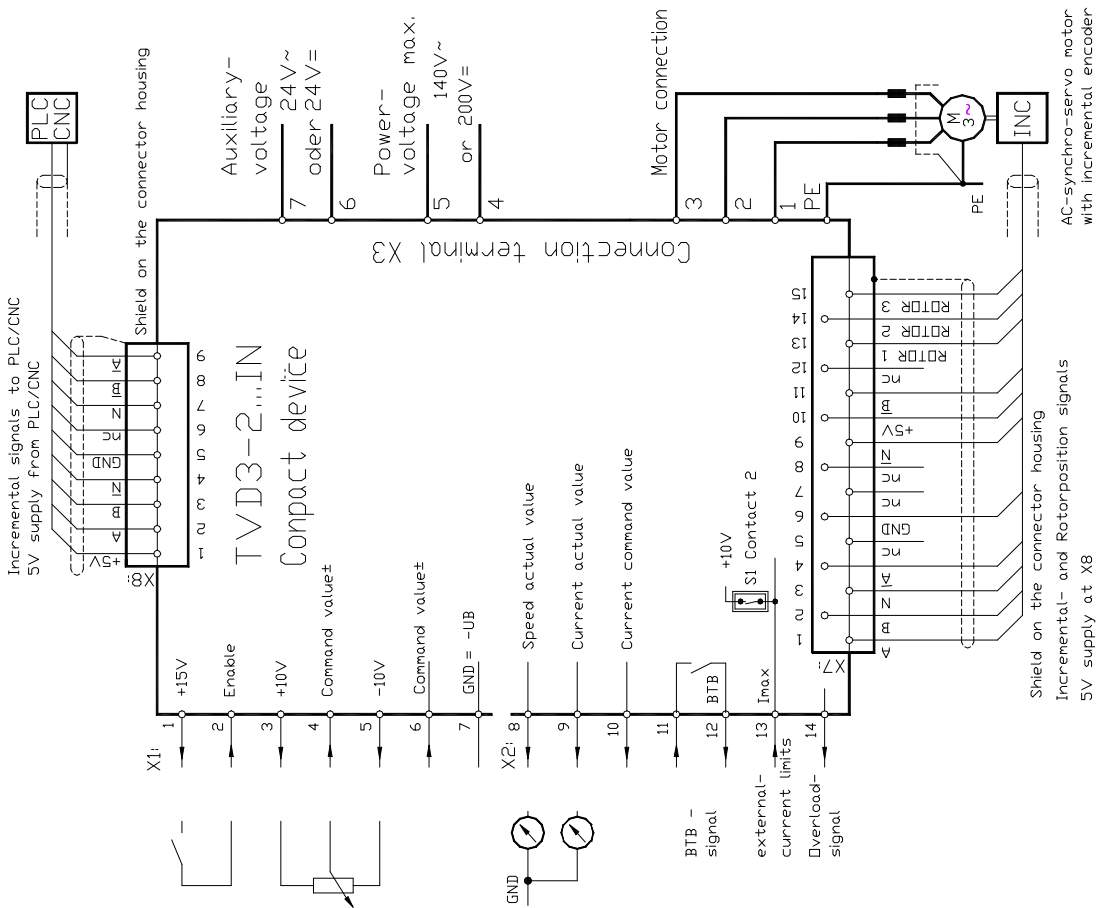
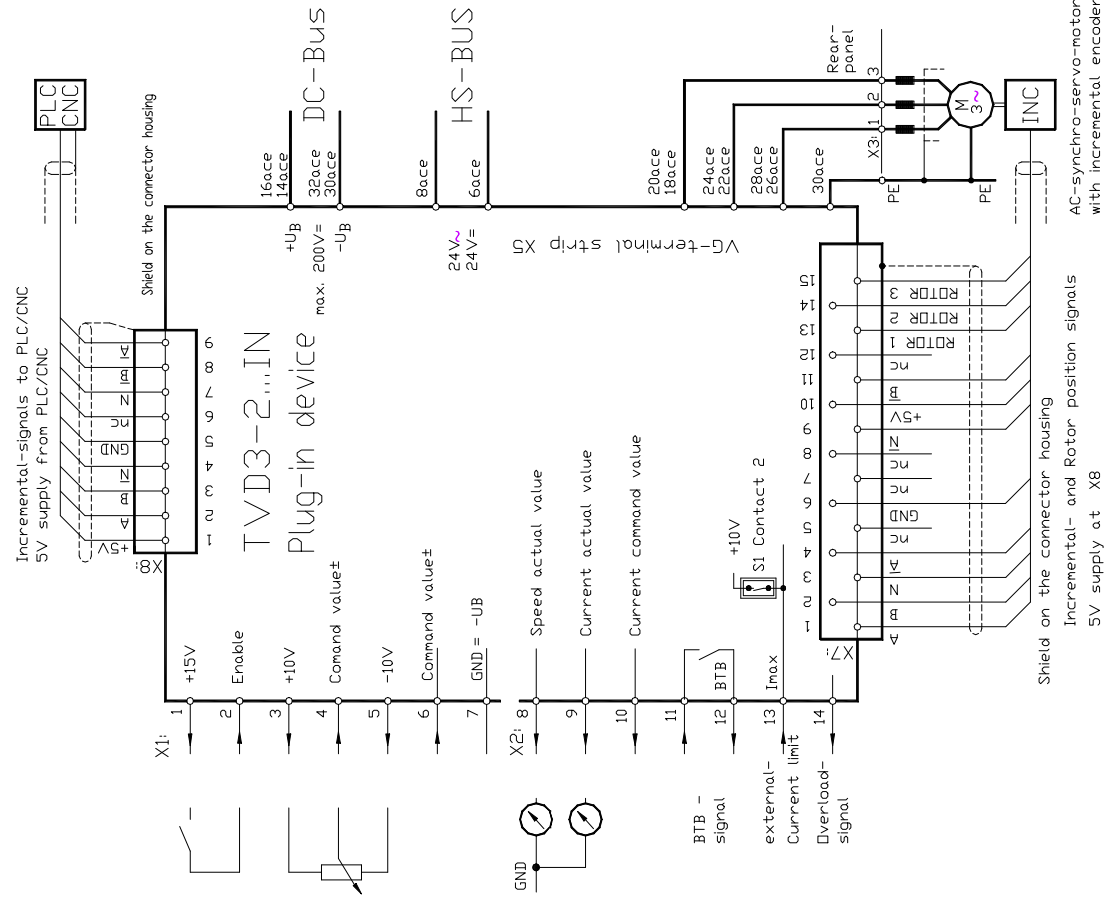
Dimensions of a multiple axes combination

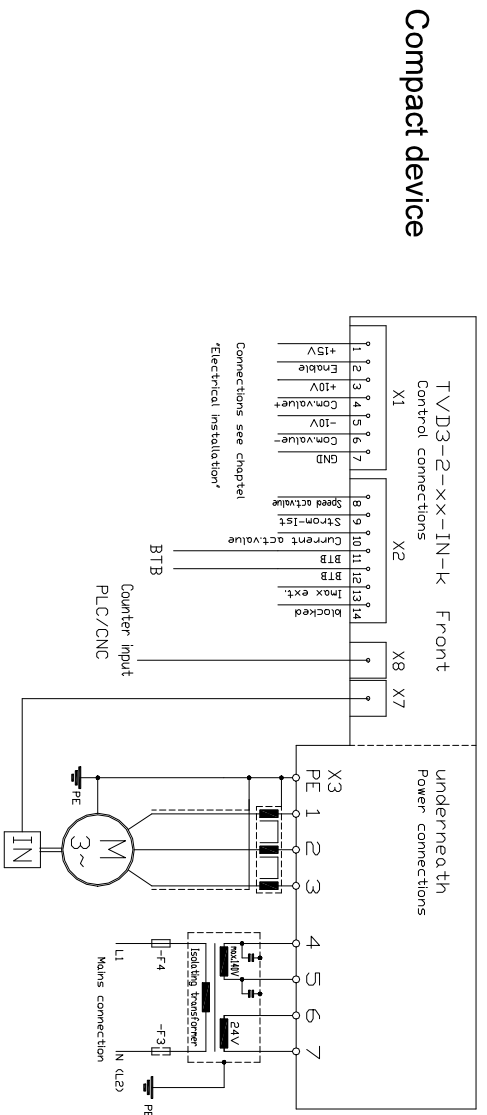


Free



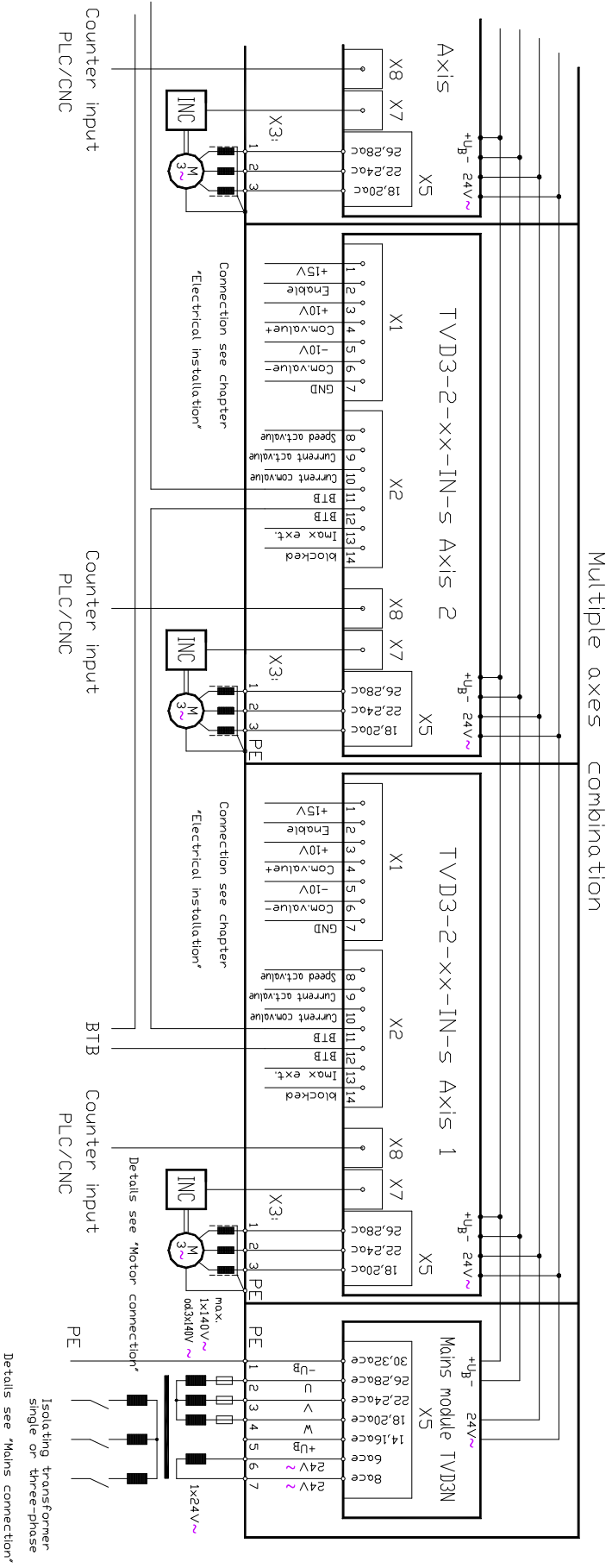
3 Electrical Installation





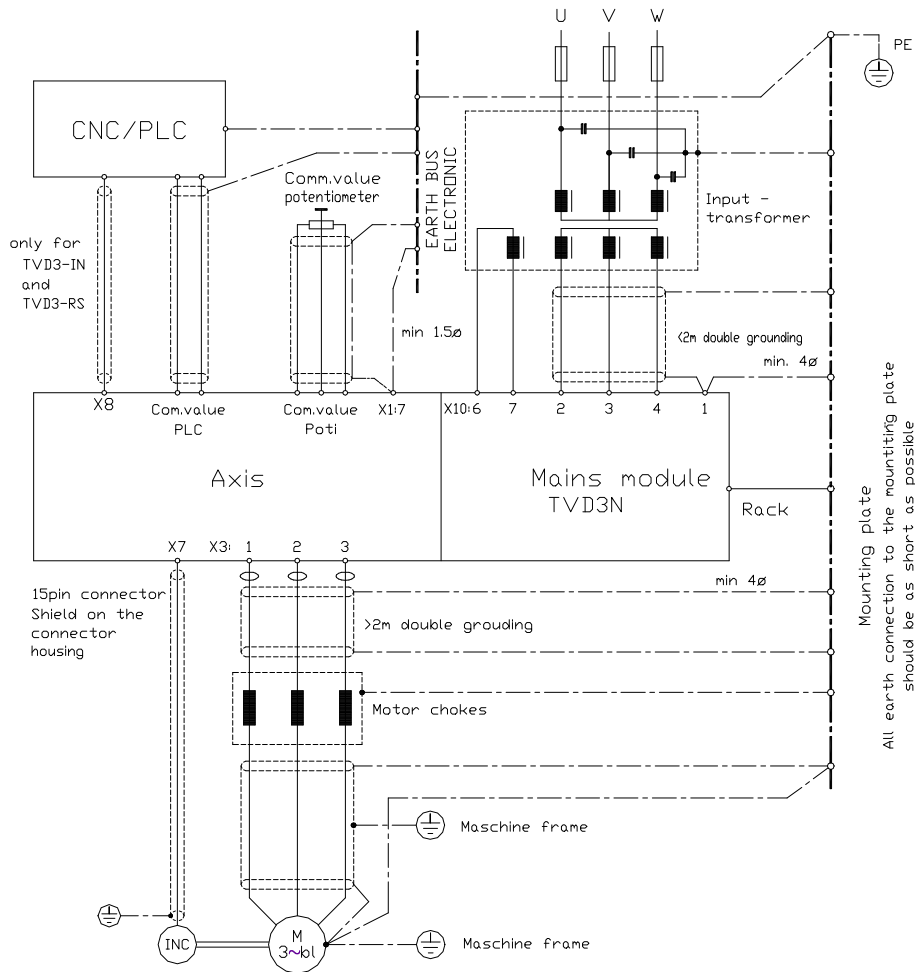
Compact device

Multiple axes combination



Multiple axes combination

Connections Diagram



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.
- X10:1(-U) 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:

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.

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]= $1.42 \times 115 \times IM \times GLF \times nF$

IM = Sum of the motor currents (effective)

GLF = simultaneity factor

nF = speed ratio factor

GLF =

1 with 1 motor

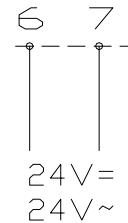
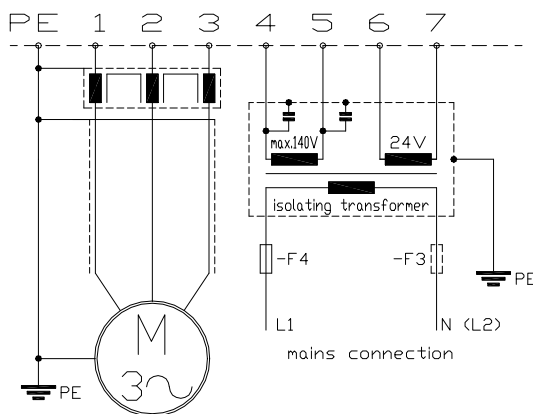
0.5 ... 0.7 with 2 motors

0.4 ... 0.6 with > 2 motors

nF =

effective speed
maximum speed

Connection compact device X3



Warning:

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

Auxiliary voltage connection terminal X3:6, X3:7

- from an external 24V source
- from the isolating transformer

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

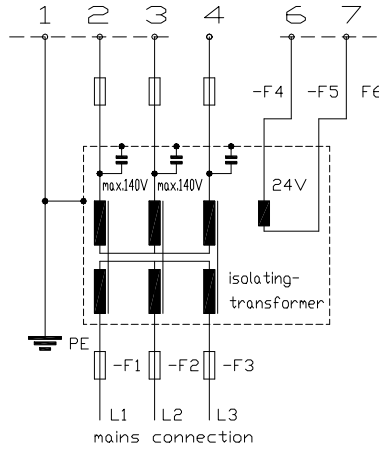
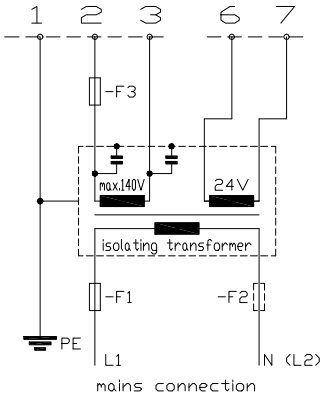


3 Electrical Installation

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 an external 24V source
- from the isolating transformer

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

Connecting cable			
Dimensioning	5A	10A	Mains module max. 30A
Conductor cross-section mm ²	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

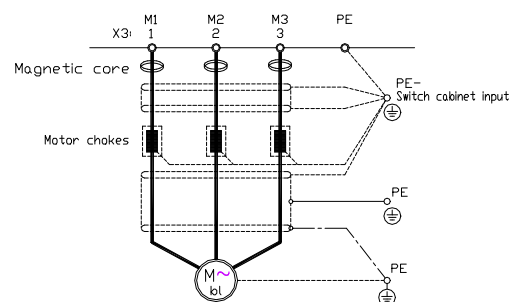
- with earth clamp
- directly to be connected to the switch cabinet input and to the motor
- multiple earthing in case of long conductor cables

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 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

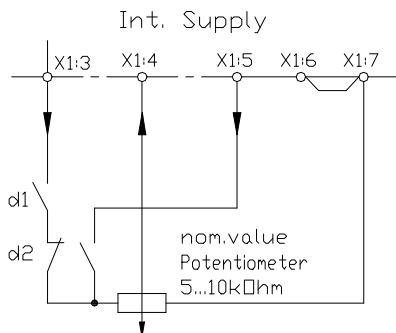
Command value	X1:4 (signal)
	X1:6 (GND)

Command value current from an external PLC/CNC

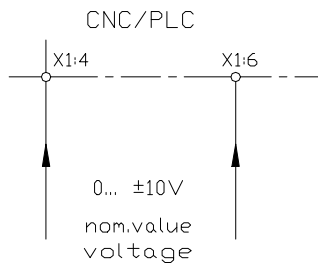
Resistor for a current command value of 0 to $\pm 20mA$ >>>>> $R_{com.} = 500\Omega$

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

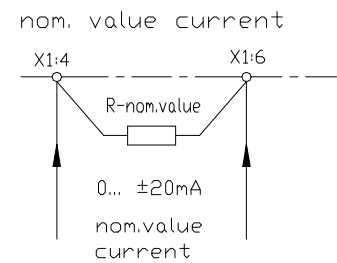
Internal supply



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. 5sec.

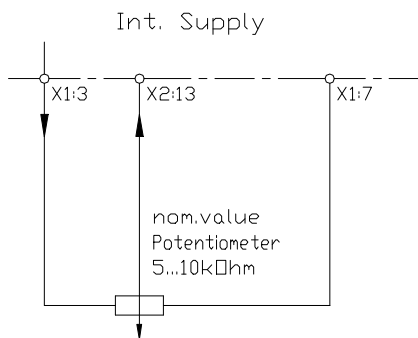
Current limit input

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

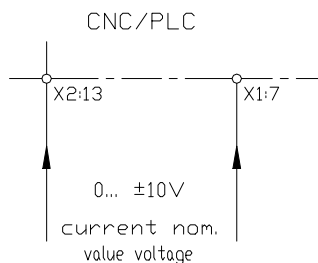
Connections

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

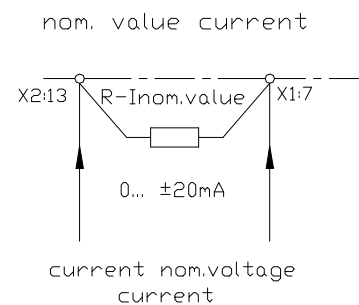
Internal source



CNC/PLC



Current command value



Attention:

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



3 Electrical Installation

Actual value connection

Connector X7

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

Cable: supply 2 x 0.5 + signal 12 x 0.14 shielded

Connections

Function	Colour (recommended)	Pin no.
Channel A	grey	1
Channel B	yellow	2
Channel N(Z)	black	3
Channel /A	white	4
Channel /B	green/white	11
Channel /N(/Z)	pink	9
+5 \pm 0.2V 150mA	violet 0.5	10
GND	blue 0.5	6
Thermal sensor	red/white	6
Thermal sensor	orange	12
Rotor position 1	brown	13
Rotor position 2	green	14
Rotor position 3	red	15

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

Connector X8

- 9-pin D-connector
- metallized plastic housing
- shield connected to the housing
- Cable: supply 2 x 0.5 + signal 6 x 0.14 shielded



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



Incremental encoder supply

+5/150mA	violet 0.5	1	Always connect +5V and GND!!!
GND	blue 0.5	5	

Cable: supply 2 x 0.5 + signal 6 x 0.14 shielded

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	2.5V = Type current 5.0V = peak current unipolar positive	tacho voltage input of the divider bipolar
Output resistance	1 kΩ	4.7 kΩ

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

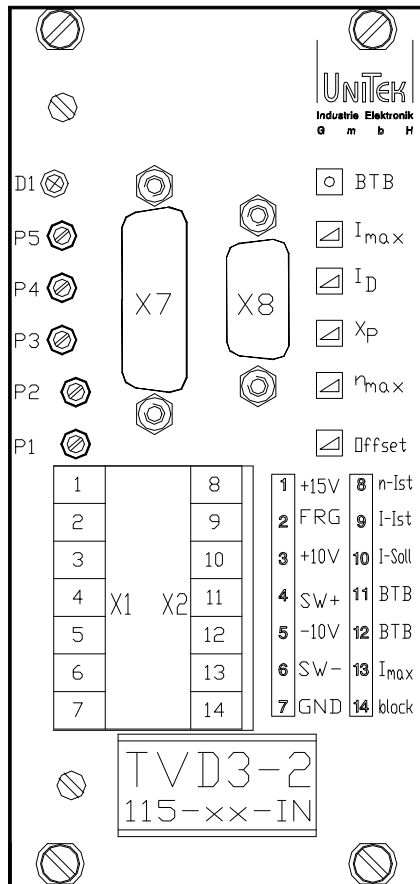
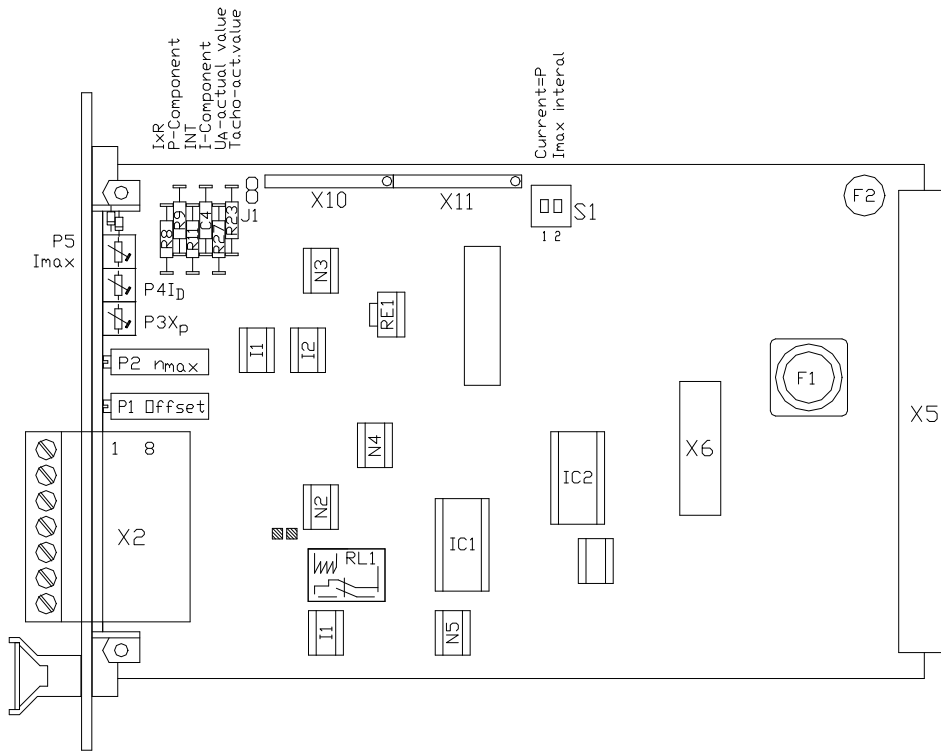
Function	Plug-in connector	Terminal no.
Bus circuit - (UB-)	X5: 30, 32 ace	
Motor 1	X5: 26, 28 acc	X3: 1
Motor 2	X5: 22, 24 ace	X3: 2
Motor 3	X5: 18, 20 ace	X3: 3
Bus circuit + (UB+)	X5: 14, 16 ace	
24V~	X5: 8 ace	
24V~	X5: 6 ace	

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 overview



Display D1 green BTB
D2 red fault

Potentiometer

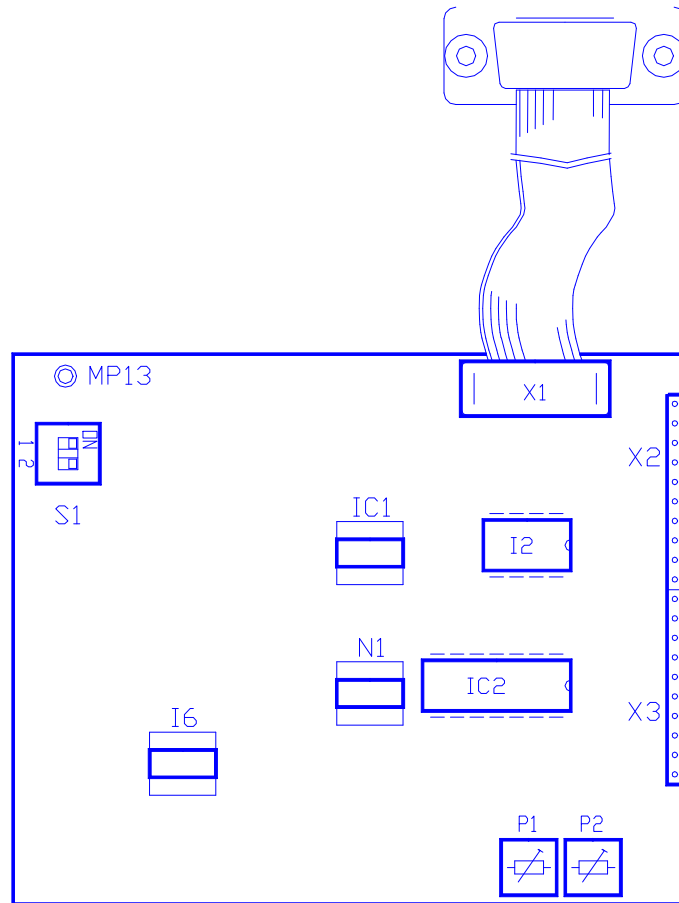
P5 I_{max}
P4 I_D
P3 X_P
P2 n_{max}
P1 offset

Connector

X7 encoderinput
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

4 Device Overview

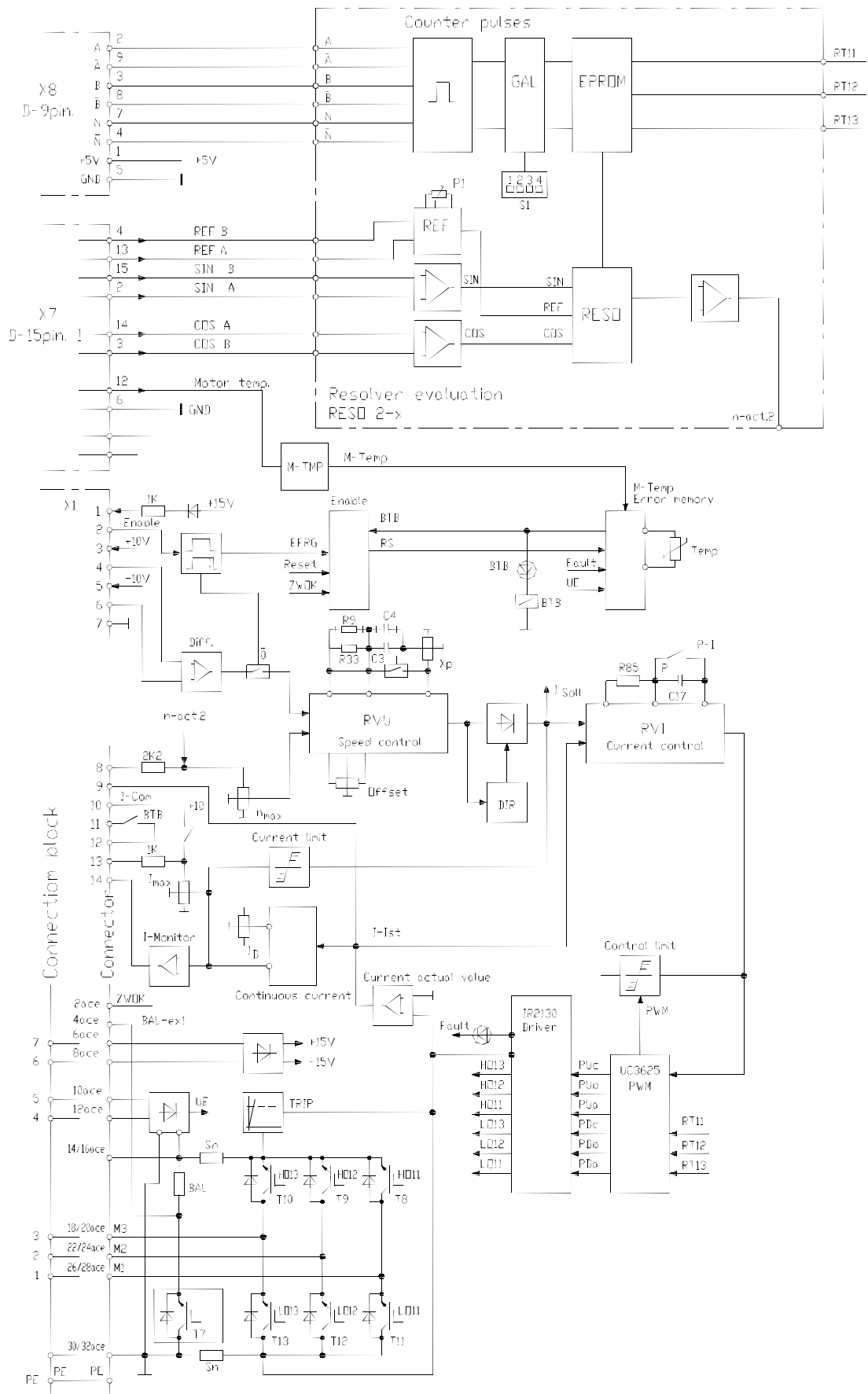


Adjustment range with potentiometer n_{max} at a command value of 10V						
Pulse encoder on the motor Pulses	Switch position		Multiplication factor x	Adjustment range n_{max} poti- position kHz		Frequency
	S1-1	S1-2		left	right	
1024	<input type="checkbox"/>	<input checked="" type="checkbox"/>	4	950	1700	64 ... 116
1024	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	1900	3400	64 ... 116
1024	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	3800	7000	64 ... 116
2048	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	950	1700	64 ... 116
2048	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	1900	3500	64 ... 116

Examples:						
Example No.:	Encoder pulse	Speed 1/min	Switch position		Factor x	Frequency kHz
			S1-1	S1-2		
1	1024	1200	OFF	OFF	4	81,92
2	1024	2000	OFF	ON	2	68,26
3	1024	3000	OFF	ON	2	102,4
4	2048	3000	ON	OFF	1	102,4

Servo-Drive TVD3.2 - IN

Circuit Diagram



4 Device Overview

Adjustments

Function

Components

Actual value adjustment bl-tacho	Poti P2 (n_{max})
Actual value adjustment, option dc tacho	Resistor R + 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
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.
Speed	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	>>>>	switch S1, on FU1-x
Current 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 1 (stand. set-up > ON)
Current limits	I_{max} , I_D -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)

Test points		
Measurement	max.	connector
SollwertCommand value	$\pm 10V$	X1:4
Speed act. value at the output of the divider	$\pm 5V$	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	$\pm 10V=$	X1:4
Input GND		X1:6

The signal and the GND connection can be swapped.

5 Adjustment

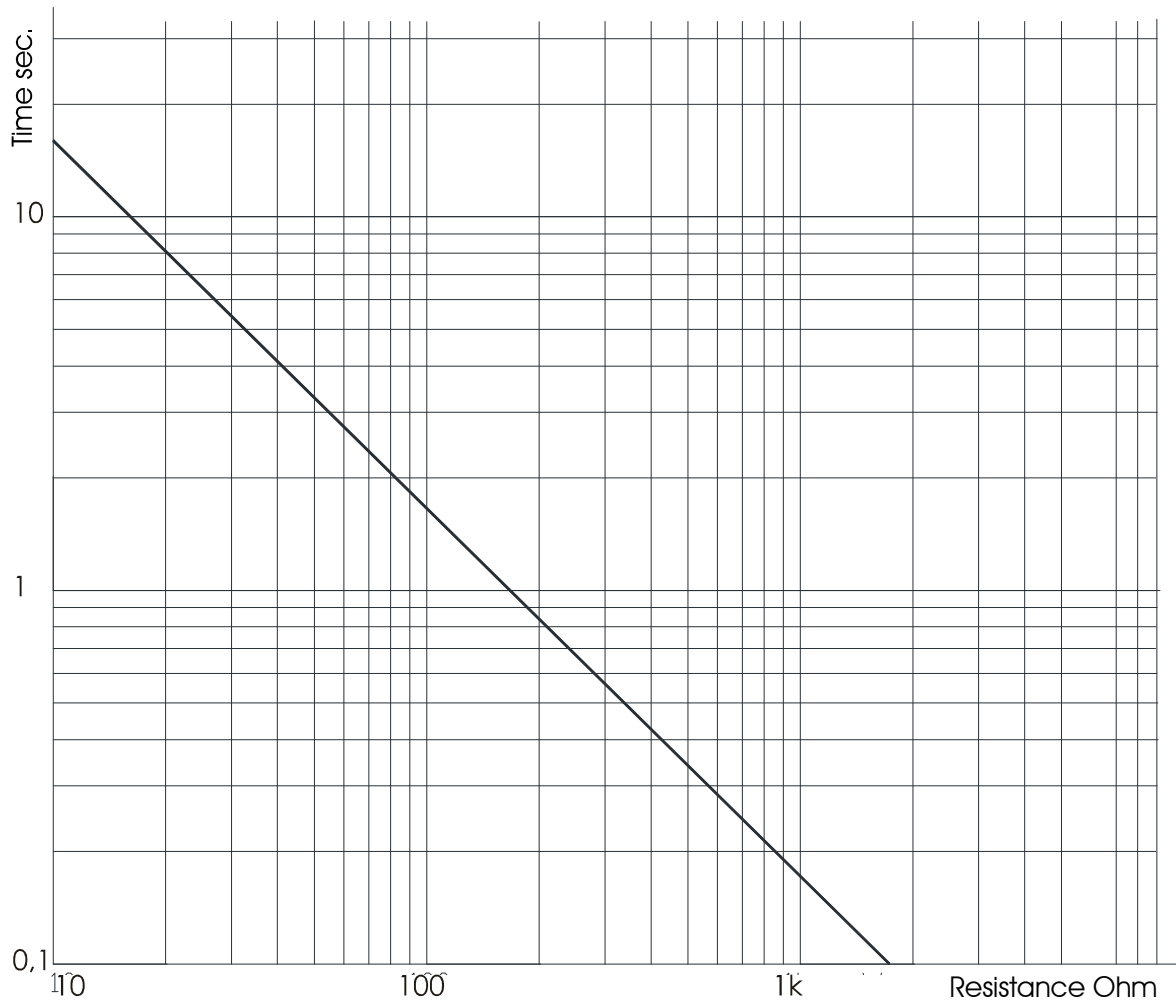
Command value as current signal

Command value from an external current source 0 to $\pm 20\text{mA}$
External load resistance for the command value 0 to max. $\pm 10\text{V}$
Command value resistance $R\text{-com}[\Omega] = \text{com. value voltage}/\text{com. value current}$ (max. 500Ω)

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

Command value integrator

Linear integrator
Time adjustment with resistor R11 (INT)



Free



5 Adjustment

Speed actual value from the incremental encoder

Evaluation electronics subprint FU 1-x

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, DIN)
- There is only one correct connector configuration.

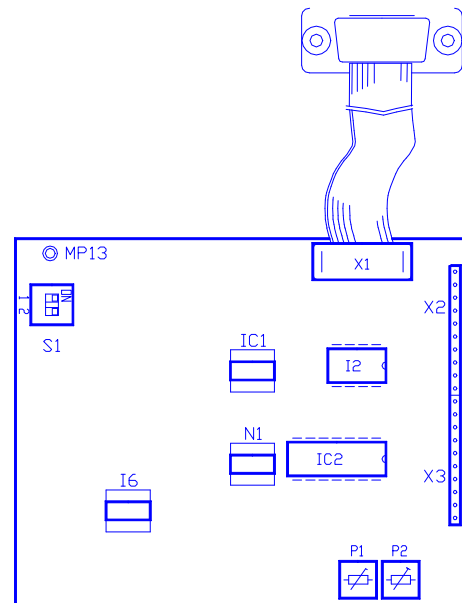
Rotor position encoder

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

Tacho signal X2:8

uniform speed-proportional voltage,
no saw-tooth voltage

Pre-settings - with switch S1



Adjustment range of poti n. at a command value of 10V						
Pulse encoder on the motor	Switch position S1-1		Multiplication factor x	Adjustment range n _{max} poti position kHz		Frequency
	ON	OFF		left	right	
Pulses						
1024	<input type="checkbox"/>	<input checked="" type="checkbox"/>	4	950	1700	64 ... 116
1024	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	1900	3400	64 ... 116
1024	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	3800	7000	64 ... 116
2048	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	950	1700	64 ... 116
2048	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	1900	3500	64 ... 116

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 chang

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

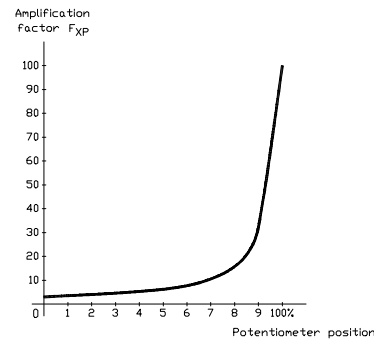
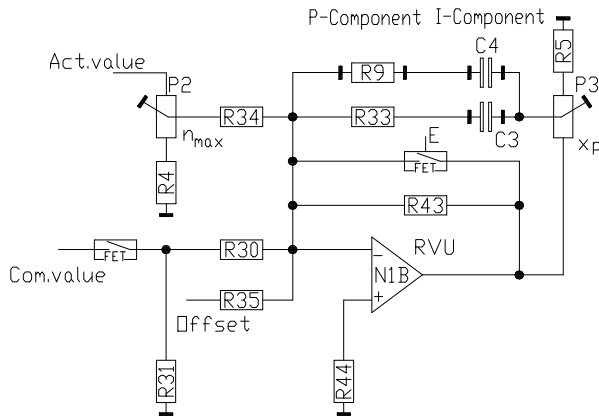
5 Adjustment

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: 220kΩ, 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

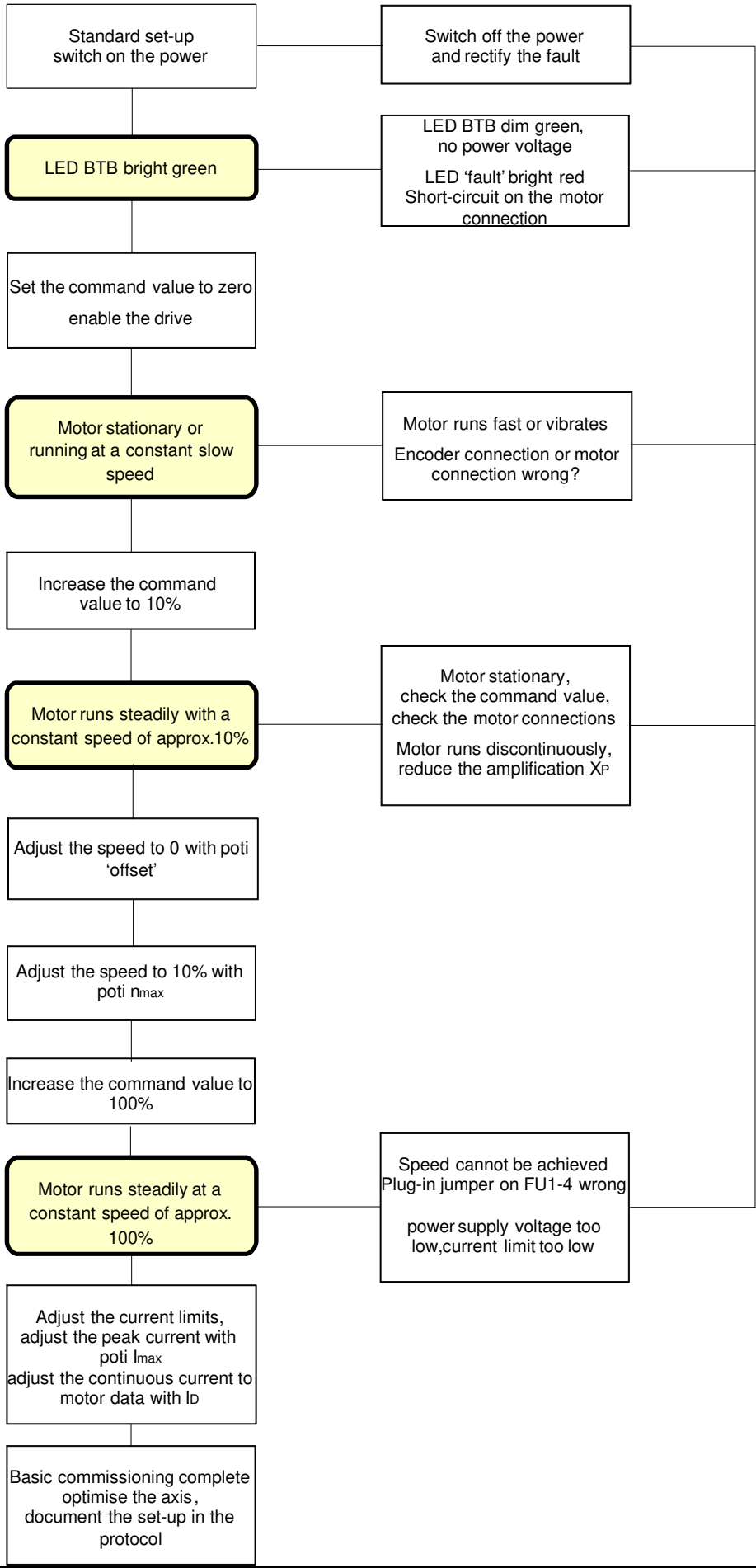
Control connections

- 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 _{max1}	peak current	20%
Potentiometer	ID	continuous current	100%
Potentiometer	XP	amplification	50%
Potentiometer	n _{max}	speed	left full scale
Switch	S1	contact 1	= ON
		contact 2	= ON

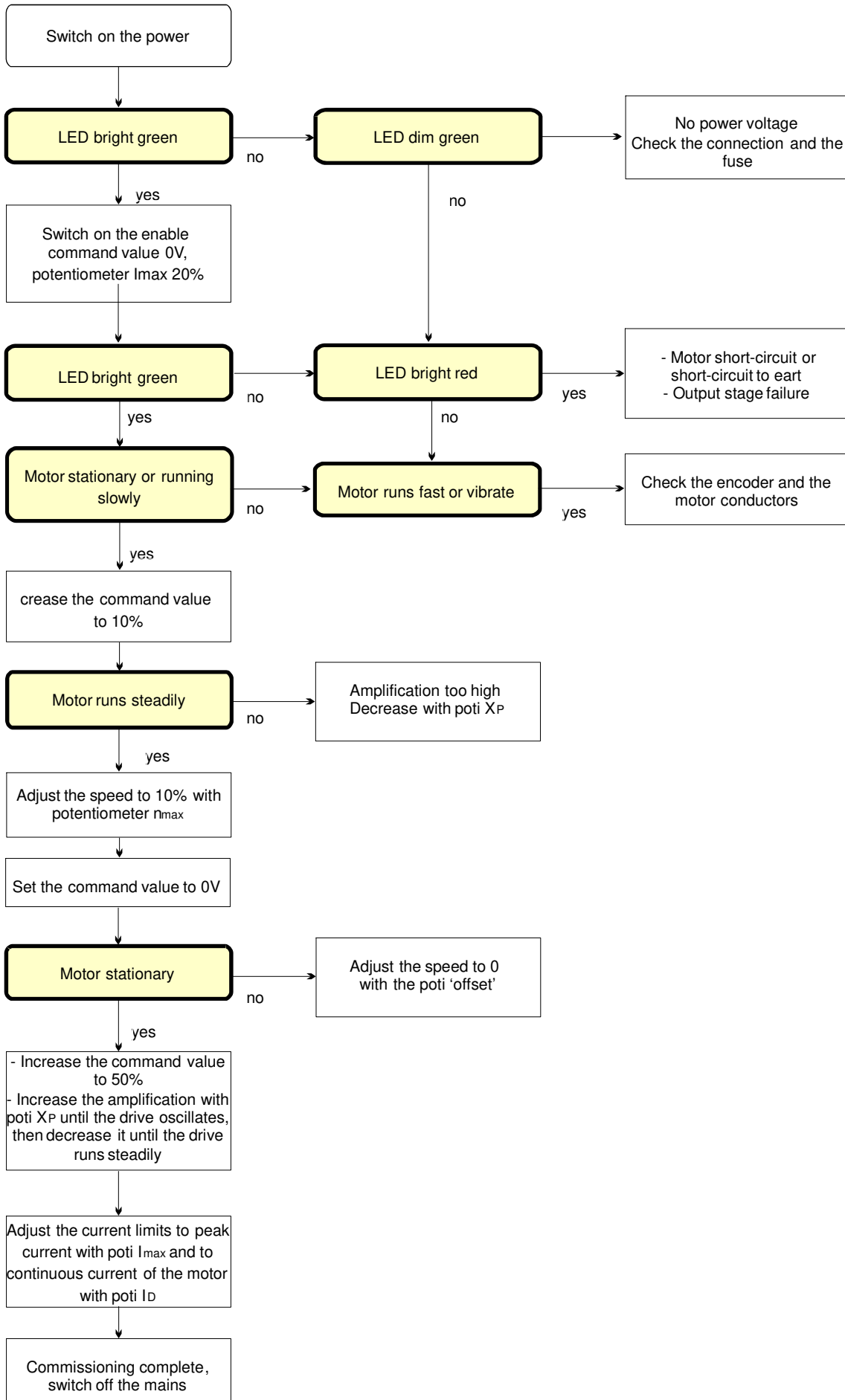
6 Commissioning



Faults

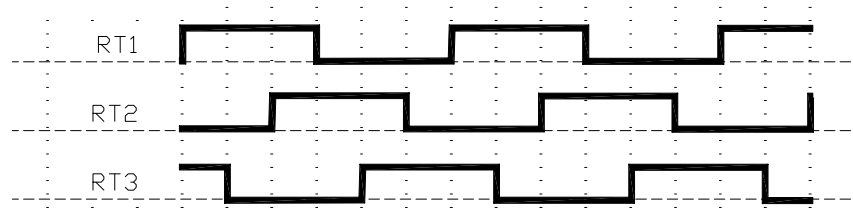
Fault	Causes
LED dim green	<ul style="list-style-type: none"> - no power connection - Power voltage too small - no temperature connection of the encoder cable
LED 'fault' bright red	<ul style="list-style-type: none"> - Short-circuit on the motor connection - Final stage fault - Over-voltage
Motor stationary, 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 or motor connection cable cores mixed up or interrupted
Motor speeds up	<ul style="list-style-type: none"> - Motor or IN-rotor position cores leading or lagging by 120° in the rotating field
Motor runs unsteadily	<ul style="list-style-type: none"> - Incremental encoder connection 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"> - Over-temperature, 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"> - Switch S1 on the evaluation electronics FU1-x wrong
Mains module switches to failure during braking	<ul style="list-style-type: none"> - Braking energy too high
Mains module switches immediately to failure when being switched on	<ul style="list-style-type: none"> - Under-voltage - Over-voltage

7 Faults

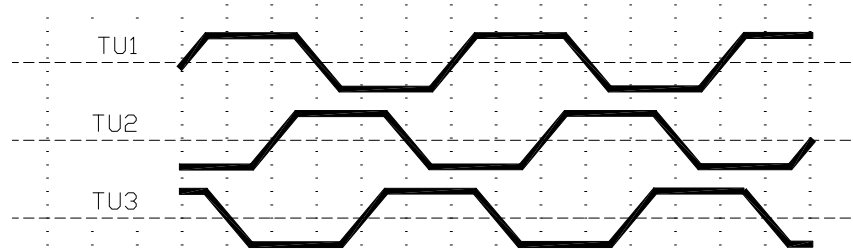


Functional diagram bl/ec motor amplifier

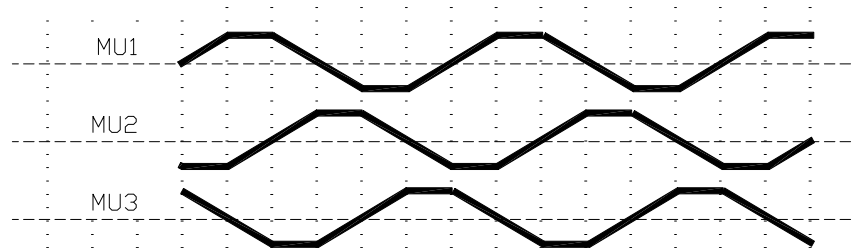
Rotor position encoder



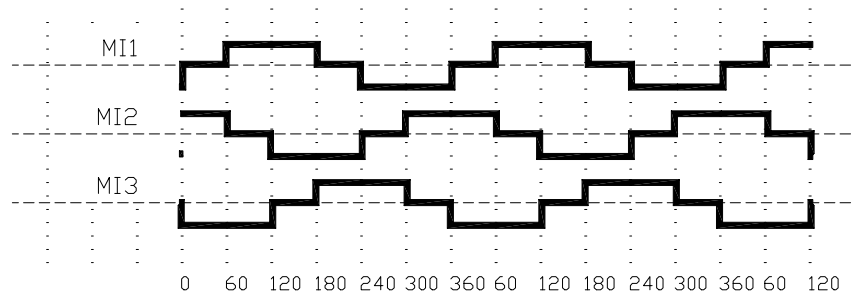
Tachometer voltage



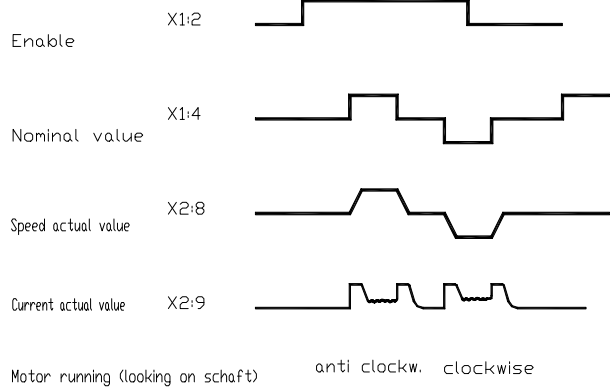
Motor voltage



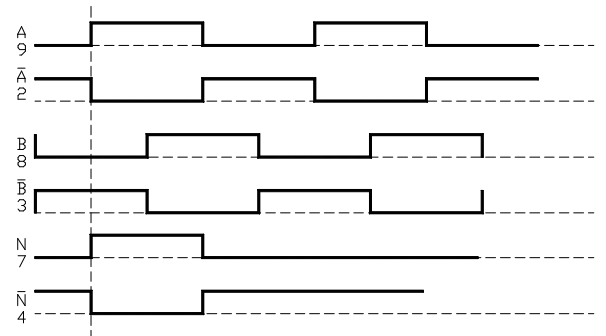
Phase current



TVD3 - Signal scheme



Incremental outputs
D-cvconnector X8
GND = X8:5
+5V = X8:1



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

DC tacho R23 Value [kΩ]

bl-Tacho Network RN1, RN2 Value [kΩ]

IN-Evaluation Switch S1-1, S1-2 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

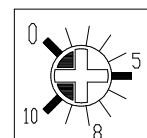
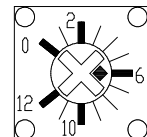
Speed n_{max} P2 Position

Pea Current I_{max} P5 Position

Continuous current I_D P4 Position

Amplification X_P P3 Position

Offset Offset P1 Position



Current 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

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).

UNITEK reserves the right to change any information included in this MANUAL.

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

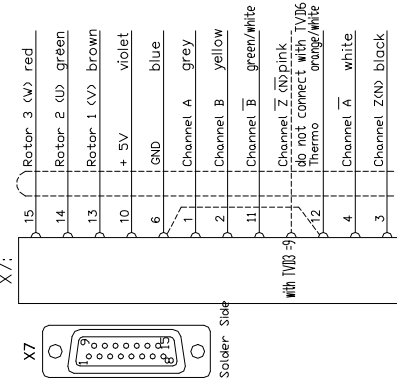


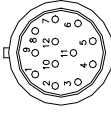
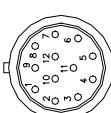
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The onus is on the reader to verify that the information here is current.

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

MOTOR	EMOD EC-Motors	BAUMÜLLER-Motors DSM 115	STÄBER EC-Motors	PAPST-Motors
UNITEK-Motor Connection TVD3 X3 X10 DS400 X10 3 7 M1 9 2 8 M2 8 1 9 M3 7	W 1 V 3 U 2 BR TEMP	W 3 blue V 1 black U 2 red BR TEMP	W red V black U green BR TEMP	Power Connection 5 4 6 3 1 Encoder Connection
MOTOR-Connector UNITEK-Electronic Connection  <p> X7: Rotor 3 (V) red Rotor 2 (U) green Rotor 1 (V) brown + 5V violet GND blue Channel A grey Channel B yellow Channel B green/white Channel Z (X) pink do not connect with TVD6 Thermo orange/white Channel A white Channel ZND black </p> Shield on Connector Case 15pins UNITEK	EMOD-EC-Motor with Encoder DIH48-TS...N510-5V	Sensor-Line Green L yellow K brown M blue GND white D grey B pink A	with Encoder DIH48-TS...N510-5V	with Encoder 500 Inc.
Encoder Line shielded	10 x 0,14	8 x 0,14 +2 x 0,5	10 x 0,14 +2 x 0,5	10 x 0,14 +2 x 0,5
Encoder Connector Looking on Solder Side				

AP744-Ulebersicht-IN
9/2011

