

MANUAL

3-phase Transistor Servo-Drive

TVD6-200-IN, TVD6.2-400-IN

for brushless DC Motors

with Incremental Encoder

TVD6-200IN, TVD6.2-400IN



Industrie Elektronik
G m b H

Hans-Paul-Kaysser-Strasse 1
D-71397 Leutenbach 3 - Nellmersbach

Tel.: 07195/9283-0
Fax 07195/928329
email info@unitek-online.de
[Http:// www.unitek-online.de](http://www.unitek-online.de)

Version
0108

Contents

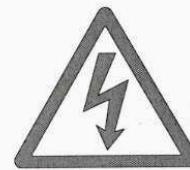
	Page
1. Basic Information	
Safety advice	3
Standards and guidelines	3
General information	4
Applications	5
Features	6
Technical data	7, 8
2. Mechanical installation	
Dimensions	9
Build	10
Mounting advice	12
3. Electrical installation	
Connections	13,14
Earthing diagram,	15
EMC/CE advice	15
Power connections	16,17
TT and IT power supply connections	18
Motor power connections	19
Control connections	20-25
Signal outputs	26,27
Terminal connections and connectors	28-30
4. Device overview	
Components	31
Circuit diagram	32
Front panel	33
Adjustments	34
LED displays	35
5. Adjustments	
Adjustment advice	36
Command value	37
Speed actual value	38
Current limiting	39
Speed control loop circuit	40-42
6. Commissioning	
Basic set-up	43
Commissioning	44
7. Faults	
LED displays - faults	45
Faults	46
Pulse signals - test point connector X4	47
Encoder signals	48
8. Guarantee	49
9. Protocol	50, 51
10. Motor connections	52
11. External ballast resistor	53

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

ATTENTION - High voltage

AC 250V~, DC 420V=

AC 460V~, DC 750V=



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.

TVD6 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

Assembly

- 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.

The transistor 3-phase current servo amplifier **SERVO-TVD6** and **TVD6.2** in combination with the brushless dc motor (synchro servo motor, CE 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, therefore, the bl-motors always have the protection rating IP 65.

From the electrical view, the brushless dc 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, i.e., the current is proportional to the torque and the voltage is proportional to the speed. Current and voltage are precisely measured, thus the analog circuits are simply constructed.

The speed actual value is generated in the encoder unit.

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 resolver signal. In the course of this the stator magnetic field leads the rotor magnetic field by 90° electrically.

This frequency is not controllable, it is automatically adjusted.
The motor currents for the resolver evaluation are sinusoidal.

For dc, ac, or bl-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.

Information:

Further servo-amplifiers for dc servo motors

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

Amplifiers for dc shunt-wound motors

From medium to highest power applications UNITEK series Classic Q1, Q3 up to 550V, 15-2000A

Three-phase servo amplifiers for ac synchro servo motors

For low power applications	UNITEK series SERVO-TVD3-2-xx-bl, IN, RS 24-15V, 5-10A
For medium power applications	UNITEK series SERVO-TVD6-2-bl, IN, RS 200V and 400V, 5-25/40A
For high voltage applications	UNITEK Series AS 250bl, AS 450RS UNITEK series DS 400

Applications

Machines and installations for all types with a drive power of

- 4 kW using TVD6-200-IN,
- 8 kW using TVD6.2-400-IN

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

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.

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:

Brushless drives are used 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 6HE plug-in device according to the VDE, DIN and EU regulations
- standard analog control electronics
- power electronics for 5A, 10A, 16A, and 25A
- wide-band chopper power supply unit for the auxiliary voltages
- power section on the rear panel

Galvanic isolation between

- the power section and the housing
- the power section and the control electronics
- the control electronics and the logic inputs

The distance of air gaps and leakage paths adhere to the VDE standards.

Components

- fully insulated six-pack IGBT power semiconductors, comfortably overdimensioned
- only components customary in trade and industrially standardised are used
- high-quality bases for the IC with external connections
- LED displays
- 16-position binary switches for the P-I adjustment of the speed controller
- precision potentiometers for fine adjustments
- plug-in jumpers for the system set-up

Characteristics

- * TVD6-200IN: connection directly to the mains 230V~
- * TVD6.2-400IN: connection directly to the mains 400V~
- * electronic limitation of the switch-on current
- * 2 differential command value inputs
- * start-up and braking ramp for the 2 command value
- * speed and torque control
- * static and dynamic current limiting
- * current command value output
- * measurement points for current and speed
- * optically de-coupled logic inputs and outputs
- * logic for enable and the output stage switch
- * switch-off of the integral function
- * emergency stop
- * braking in case of a mains failure
- * temperature watchdog for the motor and the device
- * solderless parameter adjustment
- * 10-pin test point connector

Power connection TVD6-200IN:

directly to the mains
using an auto-transformer

Specification

Servo amplifier TVD6-200		10	16	25
Output voltage	V~eff.	200	200	200
Stationary current output - continuous - peak	A=	10 20	16 32	25 40
Max. el. power	kW	2	3.2	5
Integrated quick ZW fuses	A	16	16	20
Dimensions - switch cabinet compact device - plug-in unit	wxhxd wxh	see dimension sheets		
Cooling				
- at 60% duty cycle		self	self	external
- at 100% duty cycle		external	external	external

Power connection TVD6.2-400IN:

directly to the mains 1 x 400V~
 3 x 400V~
 max. 460V~

Specification

Type TVD6.2- 400IN		5A	10A	16A	25A
Output voltage	V~eff	400	400	400	400
Stationary current output - continuous - peak	A=	5 10	10 20	16 32	25 40
Max. el. power	W	2	4	6.4	10
Integrated quick ZW-fuses	A	20	20	20	20
Dimensions plug-in unit	BxH	16TE	16TE	16TE	24TE 6HE
Coolinng	at 60% d.cycle at 100% d.cycle	external external	external external	external external	external external
Switch cabinet plug-in module	wxhxt	see dimensions sheets			

Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Technical Data

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 to 45°C (0 to 35°C when using external fans)
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	± 0.1%
- control range	1: 1000
Command value inputs	± 10V=
Logic inputs	+10 to +30V=
Logic inputs	>+14V, 6mA
Encoder signals	5V (Driver LN75174)

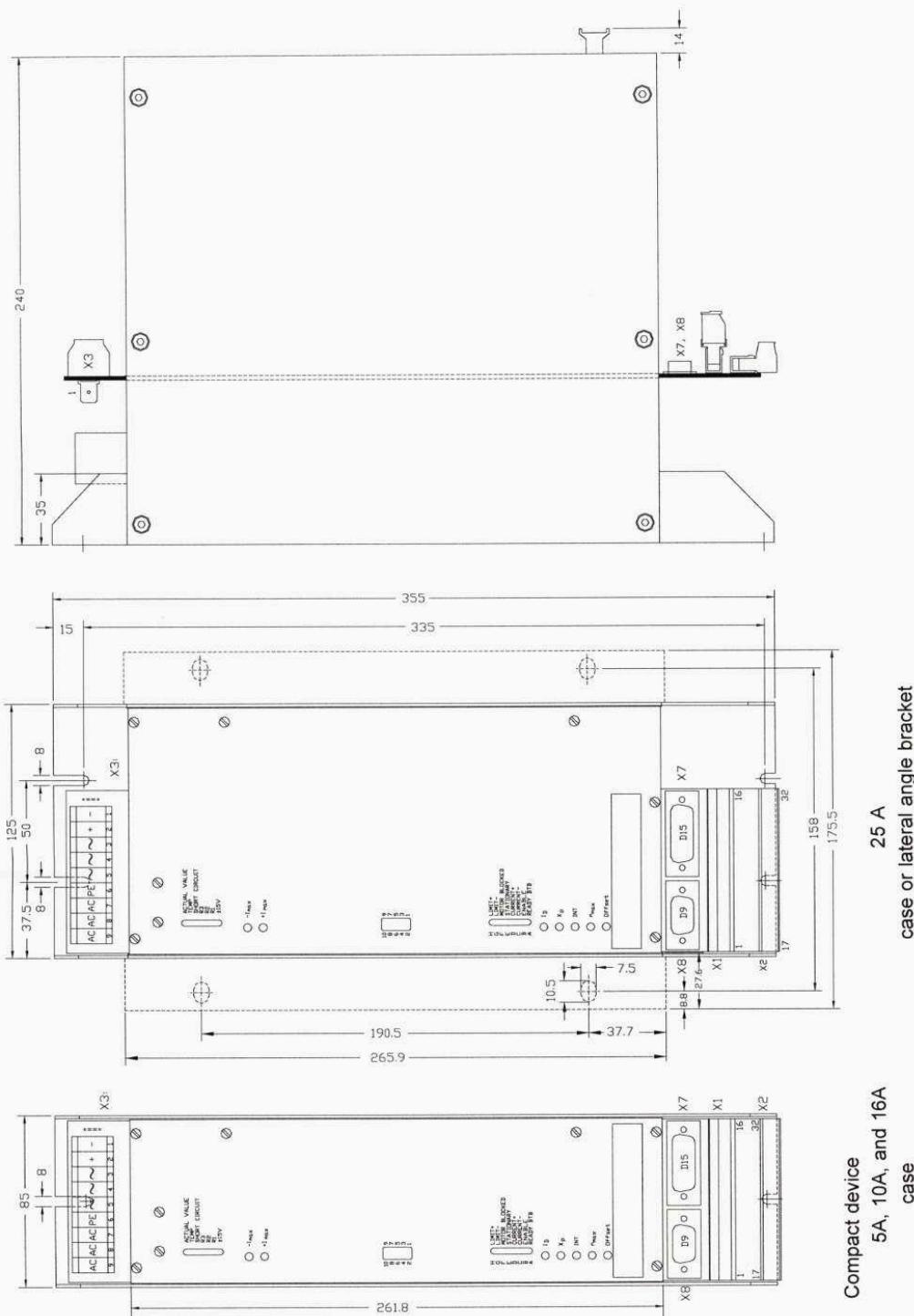


Note:

Necessary information to be indicated when ordering:

Check the switch-on time	>>>	external fan for 100% duty cycle
Multiple 16A axes on one rack	>>>	use an external fan
Precise torque control	>>>	current controller as P-I loop circuit
Large centrifugal mass	>>>	external ballast resistance >27Ω

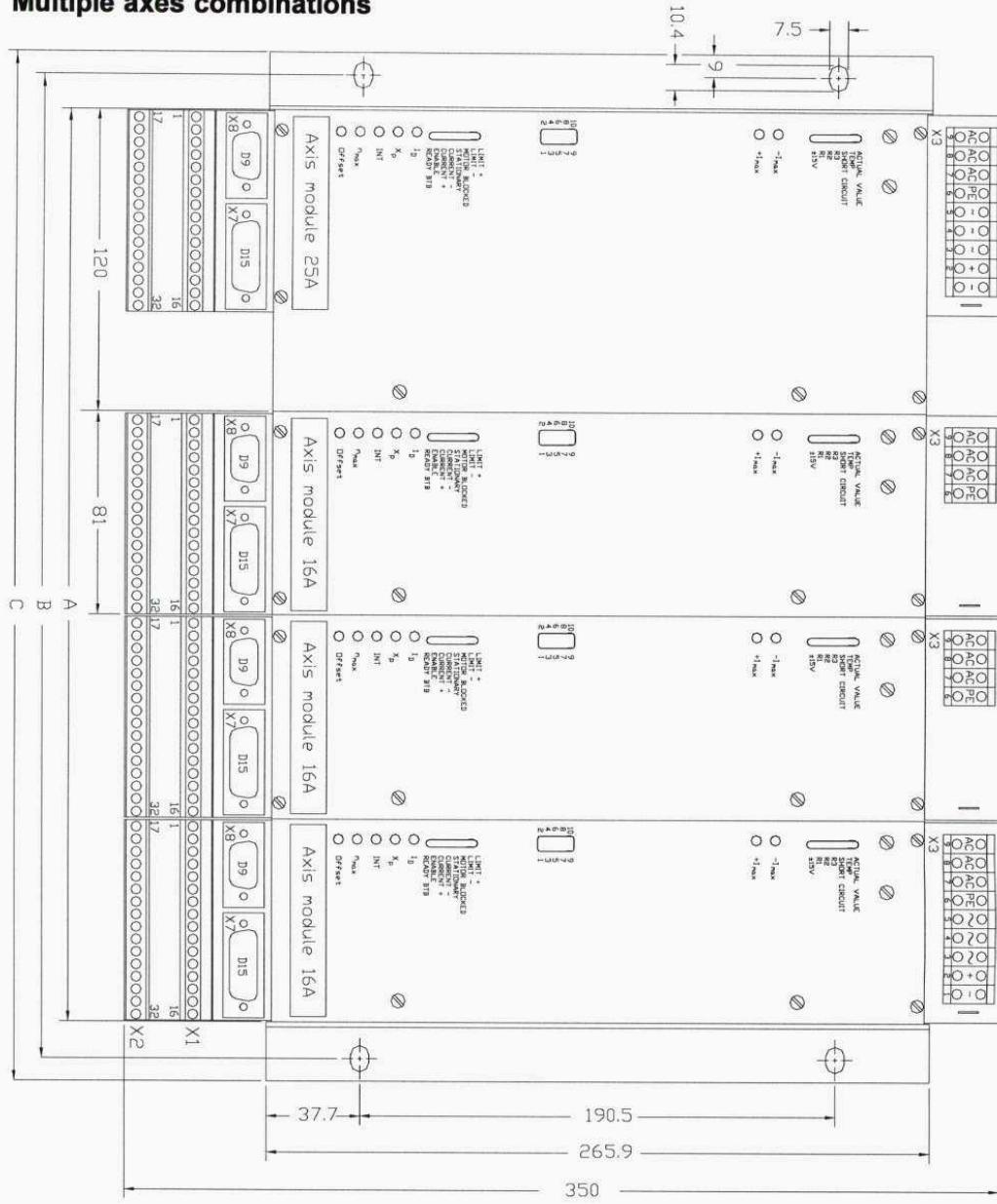
Dimensions



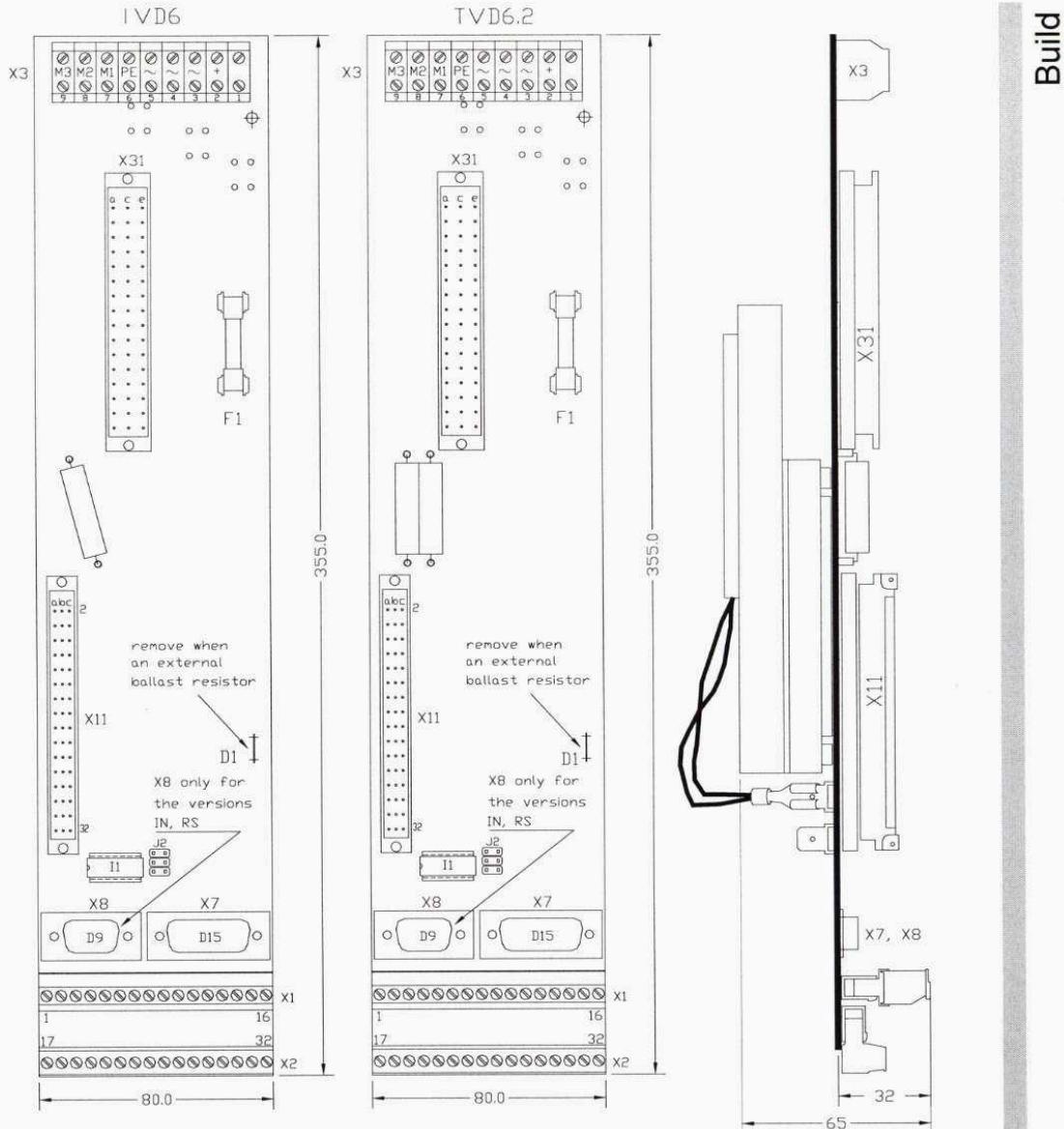
Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Dimensions

Multiple axes combinations



Dimensions 6HE [mm]					
Dimensions of the modules	1	2	3	4	5
A	1xE+3	2xE+3	3xE+3	4xE+3	5xE+3
B	1xE+40	2xE+40	3xE+40	4xE+40	5xE+40
C	1xE+55	2xE+55	3xE+55	4xE+55	5xE+55



Rear panel of the mains module

with the module insertion (without supporting frame)

Mains module adjustments:

external ballast resistance bridge D1 open

Supporting frame

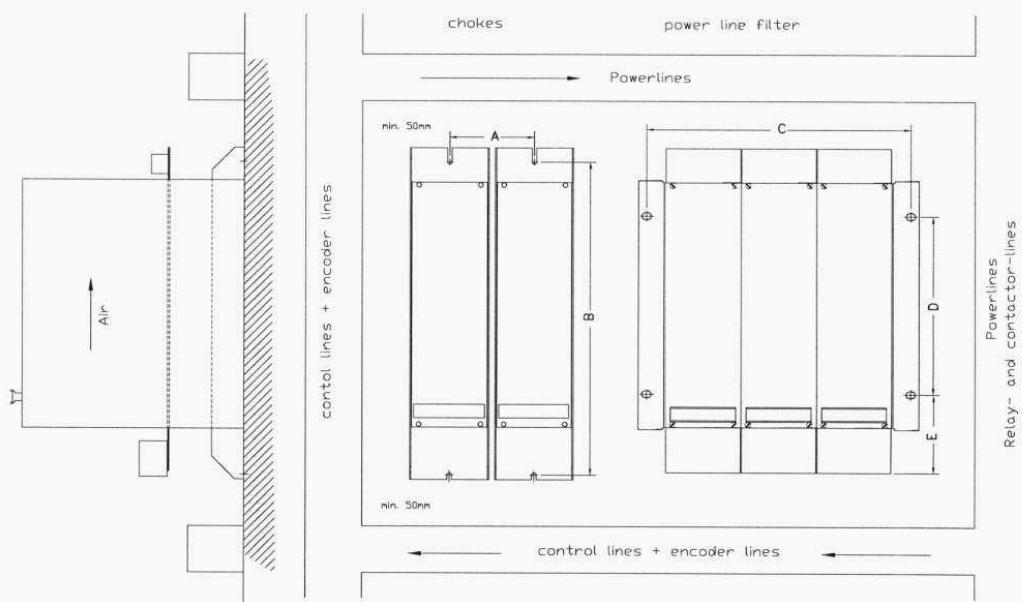
Height units: 6HE

Splitting units: 10/16A = 16TE, 25A = 24TE

Mixed 6HE, 3HE (TVD3): supporting frame on request

Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Mounting advice



Free space to the switch cabinet wall at least 100mm

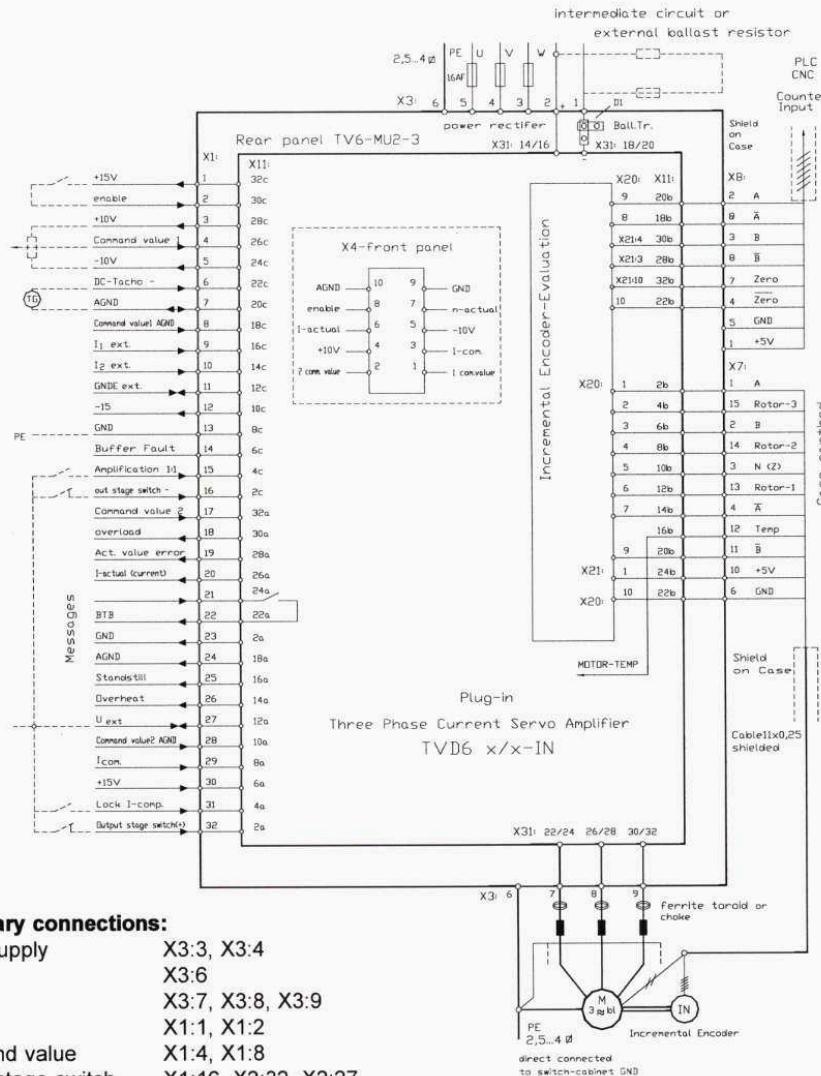
Bore hole dimensions [mm]					
Compact device	A	B	C	D	E
10A, 16A - case	95	335			M4
25A-w case	135	335			M4
25A-sw lat. angle bracket	180		158	190.5	55
					M5

Multiple axes combinations

Wall mountig	n x E+60		n x E+40	190.5	55	M5
Front mounting for 19" Systems						
E for <=16A = 81.28 mm						
E for 25A = 121.92 mm						
n = No. of axis modules						

Power loss at max. power

Device current	Power loss [W]		Fuse	M-choke	Filter
	Amplifier	Mains module			
5A	70	20	xx	xx	xx
10A	90	20	xx	xx	xx
16A	125	30	xx	xx	xx
25A	180	43	xx	xx	xx



Necessary connections:

Power supply	X3:3, X3:4
PE	X3:6
Motor	X3:7, X3:8, X3:9
Enable	X1:1, X1:2
Command value	X1:4, X1:8
Output stage switch	X1:16, X2:32, X2:27
PE-electronics	X1:13
Encoder plug	X7, X8

Note: These connections have to be connected in any case X8:1 = 5V ±0.2V

X8:5 = GND

Earthing: Terminal X1:13 directly or capacitively connected across PE.



Chokes

Device current	Power line filter 1ph 3ph		Motor choke TVD6-200IN	Motor choke TVD6.2-400IN	Magnetic core 25-100MHz
5A	FE1-10	FE3-10	--	MDD1.3a	EMI 742 70107
10A	FE1-16	FE3-16	MDD1.6-10	MDD1.6a	EMI 742 70107
16A	FE1-16	FE3-16	MDDxx-20	MDD2b	EMI 742 70107
25A	--	FE3-25	MDDxx-30	MDD2.5b	EMI 742 70107

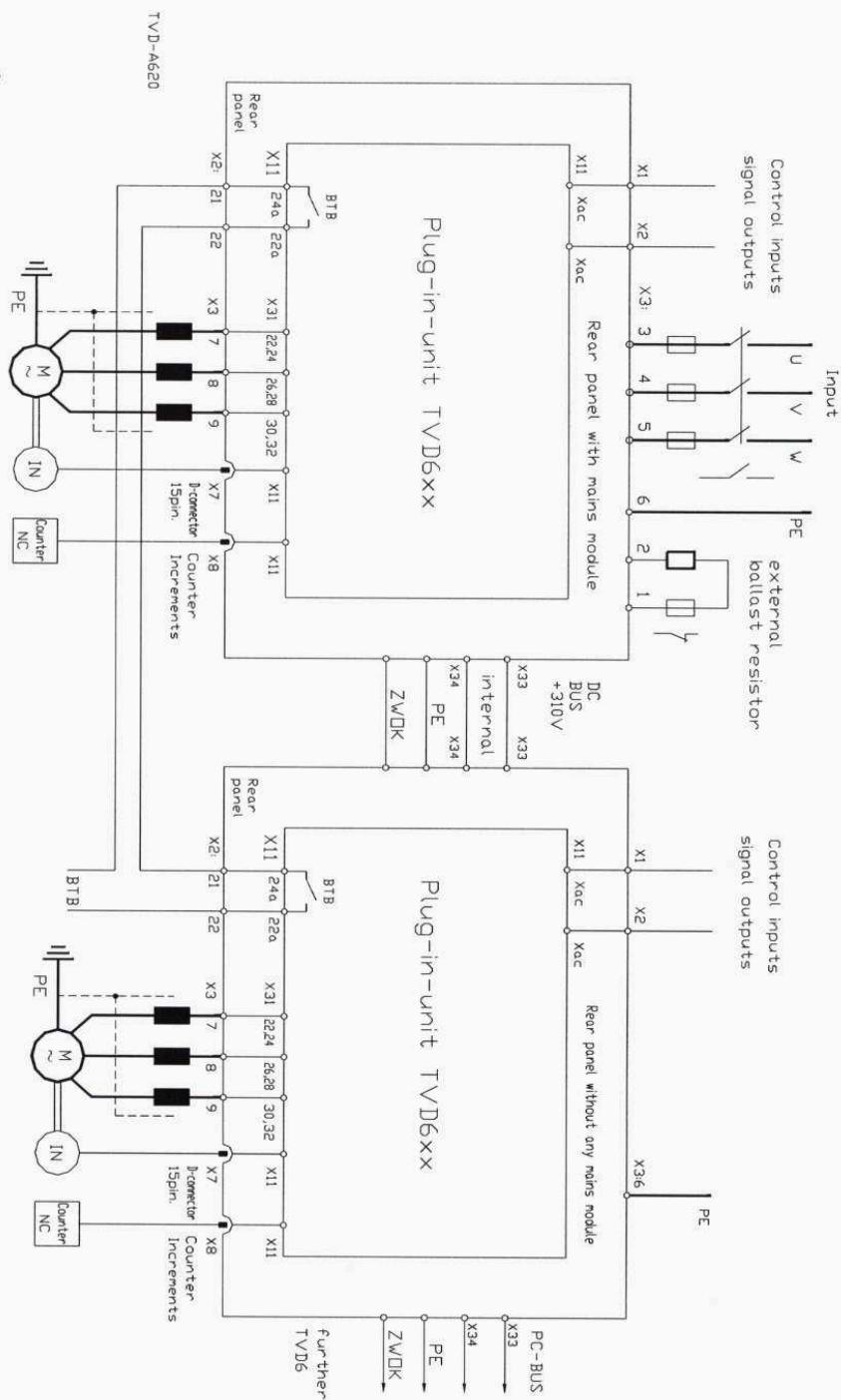
Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

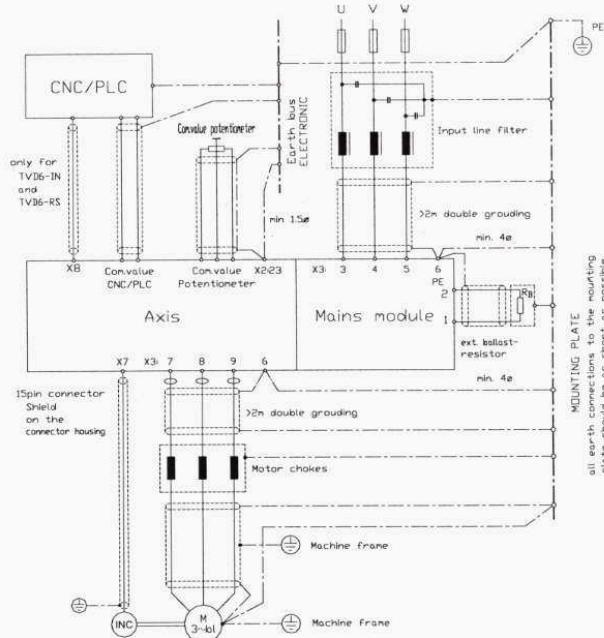
Connections

Connections

Compact device connection: only left figure without internal connections

Multiple-axis combination: one or multiple axis with a mains module plus one or multiple axis without any mains module; optional position of the mains module





EMC Advice

The devices adhere to the EU guidelines 89/336/EWG and the technical standards EN 50081-2 and prEN 50082-2 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 X1:13 must be connected to the mounting plate using a 2.5mm² wire.
- Device PE screw must be connected to the mounting plate using a 4mm² wire, l=50mm.

Single-phase connection:

Power line filter type:	5A	= FE1-10
	10-16A	= FE1-16

Conductor length between the device and the power line filter <100mm

Three-phase connection:

Power line filter type:	5A	= FE3-10
	10-16A	= FE3-16
	up to 25A	= FE3-25

Conductor between the transformer and the power line filter <500mm.

Conductor between the device and the power line filter <100mm.

Motor connection:

Types of motor line chokes		
	TVD6-200IN	TVD6.2-400IN
5A	--	MDD 1.6-10
10A	MD78-10	MDD 1.6-10
16A	MD84-20	MDD xx-20
25A	MD84-30	MDD xx-30

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.

Earthing diagram

EMC Advice

Power connections

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



Input filter:

ref. to the CE advice, page 15

Short conductor length to be used between the input filter and the device or a shielded conductor to be used.

FI switch:

- layout acc. to the DIN standard VDE 0664
- release current >200mA
- only in combination with further protection measures

	TVD-200IN	TVD.2-400IN
Connection to the mains	230V~	400V~ (T-NC power supply system) For asymmetrical or unearthed power supply systems the connection must only be effected via an isolating transformer.
AC voltage connection	1 x 230V~, 50/60Hz	1 x 400V~, 50/60Hz
Compact device up to 10A		
Multiple axes combination up to 20A		
Three-phase voltage connection necessary for >10A (multiple axes rack 20A)	3 x 230V~, 50/60Hz	3 x 400V~, 50/60Hz

Dimensioning	5A/10A	16A	25A	max. 30A
Conductor cross-section mm ²	0.75	1.5	2.5	2.5
Fuses - safety fuse Af - automatic cut-out A (release feature A, acc. to EN60898)	10 10	16 16	25 25	30 25

Electronic switch-on current limiting >>> max. current 7A~

Input fuses >>> semi-conductor fuses or
semi-conductor automatic



Connection to the 400V~ power supply (TVD6-200-IN)

Connection via transformer (TVD6.2-400-IN)

- AC or three-phase voltage connection
- Auto-transformer or isolating transformer (additional over-voltage protection provided)
- One transformer for multiple devices

Power connections

	TVD6-200-IN	TVD6.2-400-IN
Autotransformer		
Transformer rated power [VA] =	$0.6 \times 230 \times IM \times GLF \times nF$	$0.2 \times 400 \times IM \times GLF \times nF$
Isolating transformer		
Transformer rated power [VA] =	$1.42 \times 230 \times IM \times GLF \times nF$	$1.25 \times 400 \times IM \times GLF \times nF$
IM = Sum of the motor currents (effective)		
GLF = simultaneity factor		
nF = speed ratio factor		

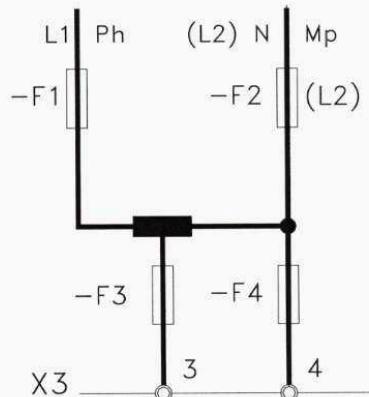
GLF =

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

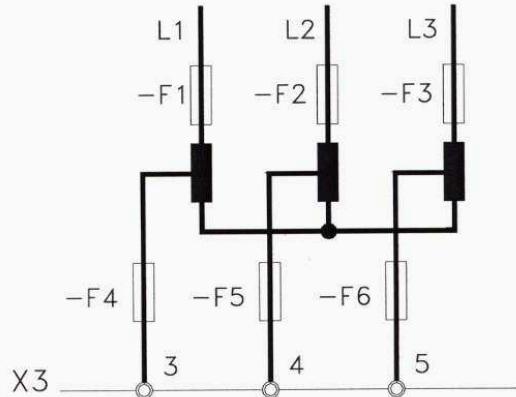
nF =

- effective speed
- maximum speed

ac voltage



three-phase voltage



Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

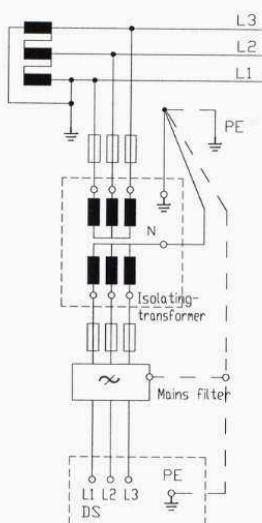
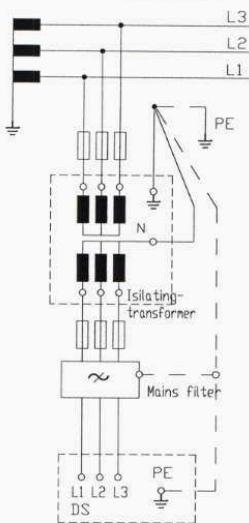
Power connections

Note:

For power supply systems without protective conductors the connection must only be effected via an isolating transformer!!!

Connection to the TT mains

Connection to the TT mains



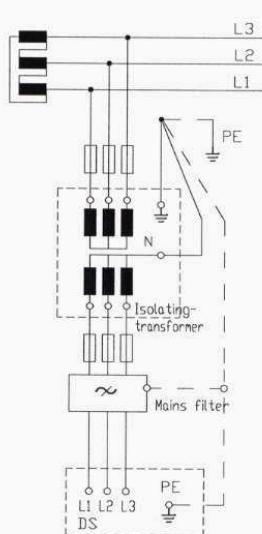
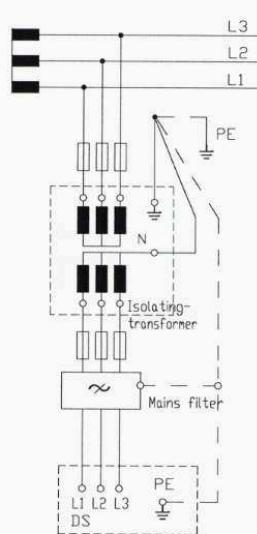
TT mains:

Symmetrical three or four conductor three-phase mains with direct earthing.

Device PE via the earthing connection.

Connection to the IT mains

Connection to the IT mains



IT mains:

Symmetrical three or four conductor three-phase mains without direct earthing.

Device PE via the earthing connection.

Attention:

If the TVD6-Servo is directly connected and the transformer primarily switched, it is necessary to connect an additional over-voltage protection device (e.g. TRAB-TECH).



Motor power connection

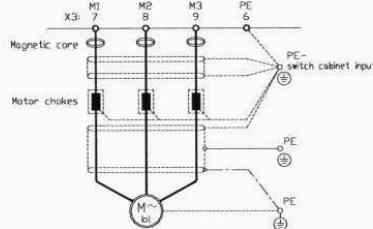
Cable no.	PE	M1	M2	M3
Connection X3	X3:6	X3:7	X3:8	X3:9

Terminal X3:6 is internally connected to the PE connection bolt of the device

Motor cable for	5A	10A	16A	25A	Thermo	Brake
Cross-section	0.75	1.5	1.5	2.5	0.75	0.75
Cable type	3 x shielded motor conductor + PE (+ if required: 2 x thermo + 2 x 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

External ballast resistance

Dimensioning

Mean value of the braking power per axis

$$P_{\text{Ballast}} [\text{W}] = \frac{1 \times J_g \times n^2}{2} - \frac{J_g^2 \times a \times n}{M_{\max}} \times f$$

J_g	= reduced motor and load moment	$[\text{kgm}^2]$
n	= max. speed	$[\text{s}^{-1}]$
M_{\max}	= max. motor torque	$[\text{Nm}]$
a	= delay time	$[\text{s}^{-2}]$
f	= repetition frequency of the braking	$[\text{s}^{-1}]$

Modify on the rear panel of the mains module:

- Remove soldered bridge D1

	TVD6-200IN	TVD6.2-400IN
External ballast resistor	smallest resistance value 20Ω	smallest resistance value 20Ω
Installed ballast resistor	20Ω/50W, for 3% d.cyc.=1.5kW	42Ω/50W, for 3% d.cyc.=1.5kW

Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Control connections

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. of the terminal connectors

X1:1 to X1:16 and X2:17 to X2:32

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

Internal logic voltage 15V=

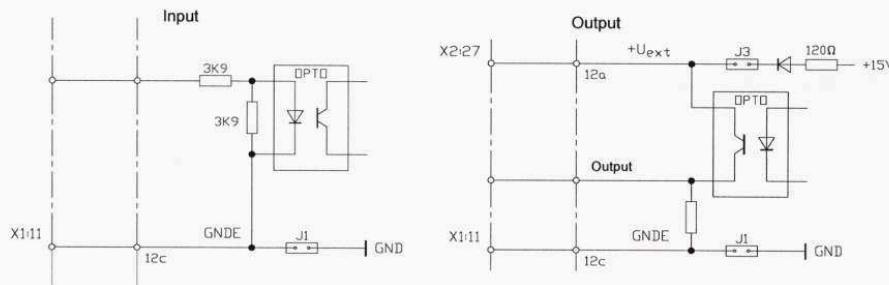
- Potential connection
- for relay control
- Jumpers J1 and J3 plugged-in

External logic voltage

- Potential isolation
- for PLC or CNC
- UEXT +15V to 30V= across terminal X2:27
- GNDE across terminal X1:11
- Jumpers J1 and J3 **not** plugged-in
- residual ripple of the logic voltage <20%

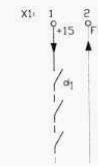
Basic set-up: Jumpers J1 and J3 are plugged-in

Inputs and outputs via an optocoupler



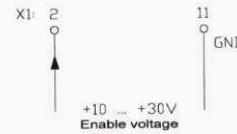
Drive enable >> active with a positive voltage

- Jumper SW1 in position 2-3 (basic set-up)



Drive enable - internal logic voltage

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

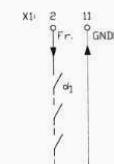


Drive enable - external logic voltage

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

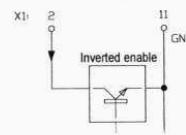
Drive enable >> active at zero

- Jumper SW1 in position 1-2 (US version)



Drive enable - internal logic voltage

- logic zero X1:11
- contact circuit between X1:2 and X1:11



Drive enabled

- command value and speed control loop circuit are immediately active
- LED D1B bright



Drive disabled

Jumper J2 plugged-in (emergency stop)(basic set-up)

- command value internally immediately to 0 (braking)
- LED D1B dark
- after 5 seconds >> speed controller de-activated

Jumper J2 open (decelerates without braking)

- speed controller is immediately de-activated
- LED D1B dark

Note:

Jumper SW1

Pos. 2-3 >> Drive enable active at >/+10V (basic set-up)

Pos. 1-2 >> Drive enable active at zero

Jumper J2 plugged >>> emergency stop (basic set-up)

open >>> deceleration without braking

Output stage switch

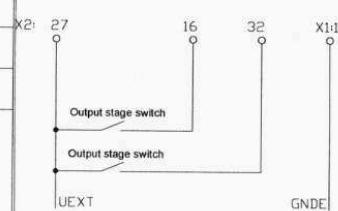
Switch inputs

Drive enable for

- positive command value direction LED 1D >> contact between X2:27 and X1:16
- negative command value direction LED 1H >> contact between X2:27 and X2:32

Output stage switch - function

Contact	Function
closed	Enable >LED bright
open	Protection disabled
> output stage switch is connected >>> contact open	
- drive brakes	
> reversal of the command value direction	
- the drive is disconnected from the output stage switch	
- output stage switch disconnected >>> contact closed	



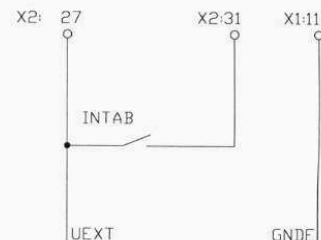
Attention:

without output stage switch >>> connection between X2:27, X2:32, and X1:16

Integral-switch - off function

Function - Relay contact

Contact	Speed control loop
open	P-I Control
closed	P- control



Note:

Please observe the optimisation advice

Braking in case of a mains failure

Braking function

- command value immediately switched to zero in case of a mains failure

Feed-back to the bus circuit

Speed command value

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

+10V	X1:3
-10V	X1:5
GND	X1:8

with internal voltage source >> Jumper S11, S12 plugged-in

Command value inputs

- Command value voltage max. $\pm 10V$ =
- Input resistance $50 k\Omega$
- Relay contacts: use gold or reed contacts

Command value pairs should be twisted and shielded.
They should be connected on one side.

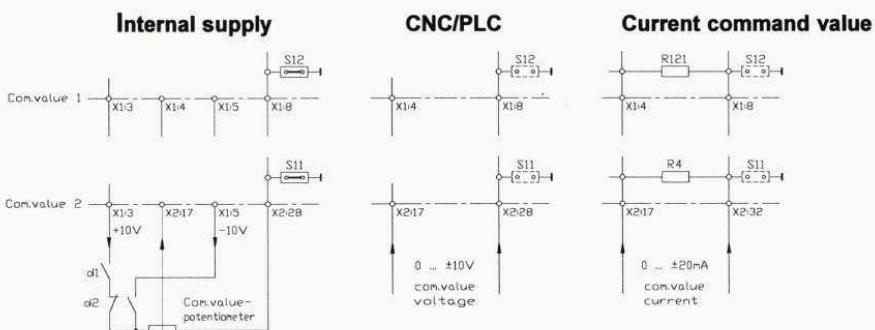
Connections				
Command value	Connector	Jumper	Function	Measuring point
Command value 1	X1:4 (Signal) X1:8 (GND)		directly	X4:1 X4:10
Command value 2	X2:17(Signal) X2:28 (GND)	SW2 1-2 SW2 2-3	directly Ramp	X4:2 X4:2 X4:10

Jumperpositions

Function	Jumper	Position	Basic set-up
Command value 1			
Differential input	S12	open	
with internal voltage source	S12	plugged	***
Command value 2			
Differential input	S11	open	
with internal voltage source	S11	plugged	***
with ramp (integrator)	SW2	Pos. 2-3	***
without ramp	SW3	Pos. 1-2	
without command value 2	SW2	open	

Resistors for a current command value of 0 to 20mA

command value 1	R121	500Ω
command value 2	R4	500Ω



Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Control Connections

External current limiting

Voltage source for external current limits
+10V/10mA X1:3

Control range

0 ... +5V >>> 0 to 100% rated current of the device
0 ... +10V >>> 0 to 200% rated current of the device
internal over-current watchdog >>> max. 5s

Inputs

Maximum input voltage +10V

Input resistance 10 kΩ

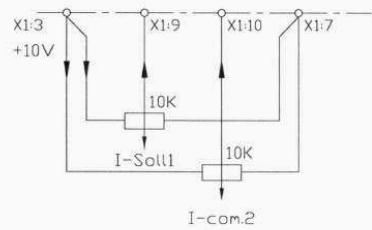
Internal reduction using the potentiometers I_{max1}, I_{max2}

Relay contacts: gold or reed contacts

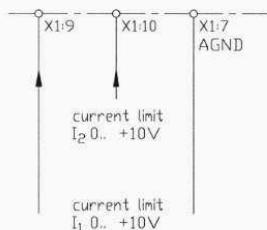
Connections

Current limit	Connector	Jumper	Measuring point
positive	X1:9 (signal)	S19 open	X4:3
	X1:7 (GND)		X4:10
negative	X1:10 (signal)	S20 open	X4:3
	X1:7 (GND)		X4:10

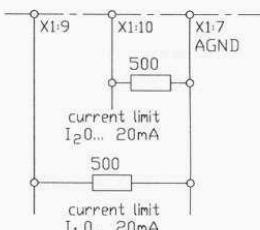
Internal supply



CNC/PLC



Current command value



Attention:

If the current limit is internally adjusted >>> Jumper S19, S20 plugged-in.



Actual value connection

Connector X7

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

Cable up to 10m 10 x 0.14 + 2 x 0.5 shielded
 > 10m 10 x 0.25 + 2 x 0.5 shielded

Connections X7

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

Pin 6 double-coated.

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

Incremental encoder output

Connector X8

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

Cable up to 10m 6 x 0.14 + 2x 0.5 shielded
 > 10m 6 x 0.25 + 2x 0.5 shielded

Connections X8

Function	Colour (recommended)	Pin no.
Channel A	red	2
Channel /A	black	9
Channel B	brown	3
Channel /B	green	8
zero pulse N	grey	7
zero pulse /N	pink	4
Supply +5V, 150mA	violet 0.5	1
Supply GND	blue 0.5	5

Always connect the power supply! 5V from a CNC/PLC or from an external 5V mains module

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

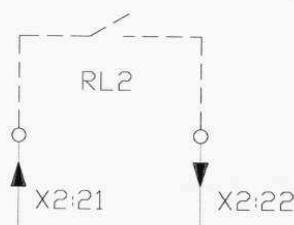


Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Signal outputs

Drive ready - BTB signal

Relay RL2
Signal contact X2:21 - X2:22
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 D1A bright	contact closed
Error	LED D1A dark	contact open

BTB contact drops in case of:

Error	BTB LED D1A	LED display
Actual value error	dark	LED D2H bright
Over-temperature	dark	LED D2G bright
Short-circuit, short-circuit to earth	dark	LED D2F bright
Voltage error	dark	LED D2B bright
Bus error	dark	LED D2A bright



Attention:

In any case the BTB contact (drive ready) must always be used with the CNC/PLC!

Analog parameter measurement outputs		
Function	Motor current	Speed
Connector	X2:20 - X2:24	X1:6 - X1:7
Measured value	2.5V = type current	tacho voltage
	5.0V = peak current	at the input of the divider
	unipolar positive	bipolar
Output resistance	1kOhm	4.7 kOhm

Output signals

Logic outputs with optocoupler

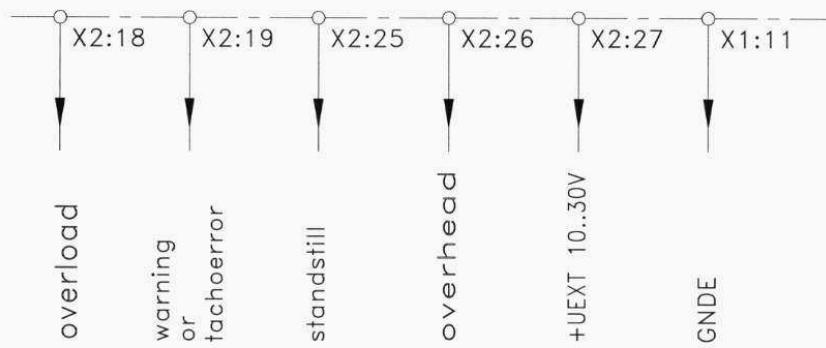
- wire-break proof
- output voltage
- output current
- output resistance

output blocked in case of errors
 10 to 30V=
 5mA
 1kOhm

Output signals				
Signal	Function	Output	Display	saved
Bus	mains module error	X1:14	LED2A	yes
Overload	disable	X2:18	LED 1F	no
Stationary	speed < 1%	X2:25	LED 1E	no
Over-temperature	motor >150°C	X2:26	-	no
	heat sink >75°C	X2:26	-	no
	heat sink >80°C	X2:26	LED 2G	yes
Pre-warning	motor, heat sink too hot	X2:19	-	no
Reference ground	GND	X2:23	-	-

Memory deletion

Drive enable	off/on	Jumper S6 plugged-in (basic set-up)
Mains	off/on	Jumper S6 off



Terminal connections and connectors**Control connections X1, X2**

Function	Terminal no.	Connector no.
+ 15 Volt (for enable)	X1: 1	(internal) X11: 32c
Enable input(+10 to +30 Volt)	X1: 2	X11: 30c
+ 10 Volt (for command value)	X1: 3	X11: 28c
Command value 1 - input (signal)	X1: 4	X11: 26c
- 10 Volt (for command value)	X1: 5	X11: 24c
DC tacho input (signal)	X1: 6	X11: 22c
DC tacho input (AGND)	X1: 7	X11: 20c
Command value 1 - input (AGND)	X1: 8	X11: 18c
Current limit I1 external	X1: 9	X11: 16c
Current limit I2 external	X1: 10	X11: 14c
external GNDE	X1: 11	X11: 12c
-15V (external electronics)	X1: 12	X11: 10c
Device zero GND	X1: 13	X11: 8c
Bus error	X1: 14	X11: 6c
Amplification 1:1	X1: 15	X11: 4c
Output stage switch -	X1: 16	X11: 2c
Command value 2 - input (signal)	X2: 17	X11: 32a
Overload signal	X2: 18	X11: 30a
Temperature signal - without tacho fault	X2: 19	X11: 28a
Current (lact)	X2: 20	X11: 26a
Drive ready BTB	X2: 21	X11: 24a
Drive ready BTB	X2: 22	X11: 22a
Device zero GND (ground)	X2: 23	X11: 20a
analog device zero (AGND)	X2: 24	X11: 18a
Stationary signal	X2: 25	X11: 16a
Over-temperature	X2: 26	X11: 14a
external voltage UEXT	X2: 27	X11: 12a
Command value 2 input (AGND)	X2: 28	X11: 10a
Current command value	X2: 29	X11: 8a
+15V (external electronics)	X2: 30	X11: 6a
Integral term disable	X2: 31	X11: 4a
Output stage switch +	X2: 32	X11: 2a

Power connections X3

Function	Terminal no.	Connector no.
Bus external ballast resistor	X3: 1	X31: 18, 20 abc
Bus +	X3: 2	X31: 14, 16 abc
Mains L1	X3: 3	X31: 10, 12 abc
Mains L2	X3: 4	X31: 6, 8 abc
Mains L3	X3: 5	X31: 2, 4 abc
PE	X3: 6	
Motor 1	X3: 7	X31: 22, 24 abe
Motor 2	X3: 8	X31: 26, 28 abe
Motor 3	X3: 9	X31: 30, 32 abe

Test point connector X4 (front panel)

Function

Function	Connector no.
1 n-com.value at the output of the diff. amplifier	X4: 1
2 n-com.value at the output of the diff. amplifier or integrator	X4: 2
I-command value	X4: 3
+ 10 V	X4: 4
- 10 V	X4: 5
I-actual value	X4: 6
n-actual value (at the output of the divider)	X4: 7
Enable	X4: 8
Device ground GND	X4: 9, 10

Terminal connections and connectors

Encoder connector X7 to the motor

Function	Colour (recommended)	Pin no.
Channel A	grey	X7:1
Channel /A	white	X7:4
Channel B	yellow	X7:2
Channel /B	green/white	X7:11
Channel N (Z)	black	X7:3
Supply GND	blue 0.5	X7:6
Supply +5V, 150mA	violet 0.5	X7:10
Thermo sensor	pink	X7:6
Thermo sensor	orange	X7:12
Rotor position 1 (V)	brown	X7:13
Rotor position 2 (U)	green	X7:14
Rotor position 3 (W)	red	X7:15

Pin X7:6 double-coated!

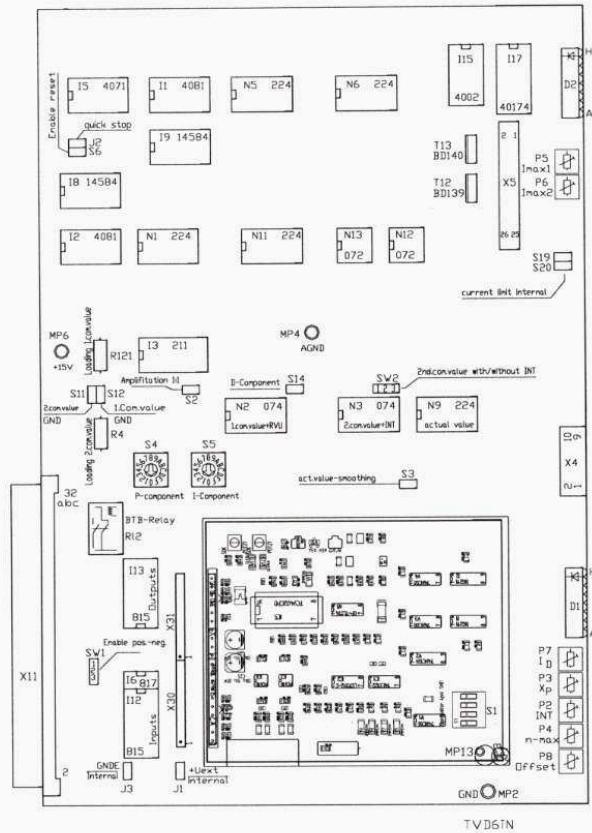
Encoder connector X8 to the CNC/PLC

Function	Colour (recommended)	D Pin no.
Channel A	red	X8:2
Channel /A	black	X8:9
Channel B	brown	X8:3
Channel /B	green	X8:8
zero pulse N	grey	X8:7
zero pulse /N	pink	X8:4
Supply +5V/150mA	violet 0.5	X8:1
Supply GND	blue 0.5	X8:5

Note: Always connect the power supply! X8:1 = +5V
 X8:5 = GND

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





Adjustment range of the potentiometer at a com.value of 10V

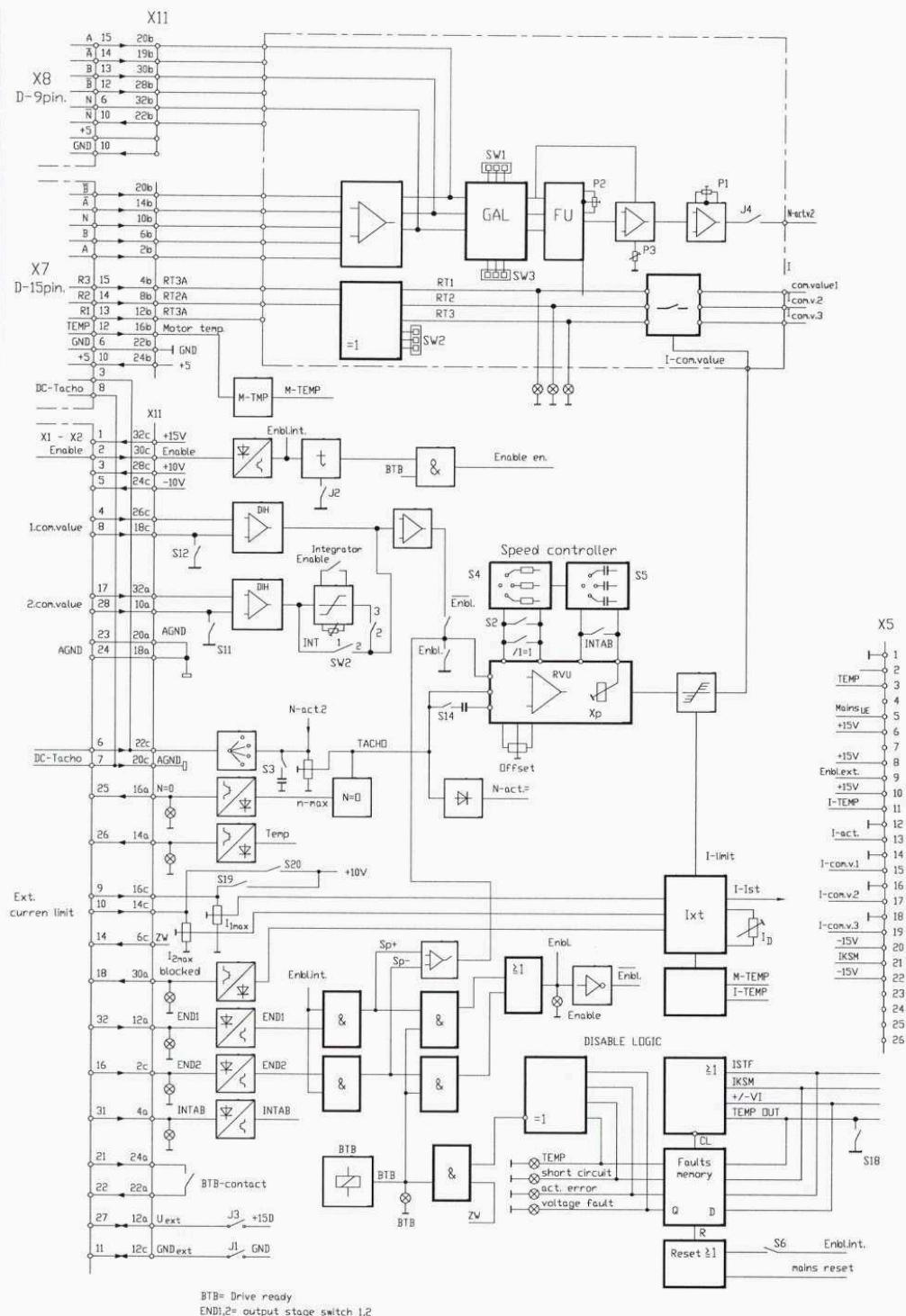
Pulse encoder on the Motor Pulses	Switch position		Multiplication factor x	Adjustment range		Frequency kHz
	S1-1 ON / OFF	S1-2 ON / OFF		nmax poti positon kHz	left	
1024			4	950	1700	64 ... 116
1024			2	1900	3400	64 ... 116
1024			1	3800	7000	64 ... 116
2048			2	950	1700	64 ... 116
2048			1	1900	3500	64 ... 116

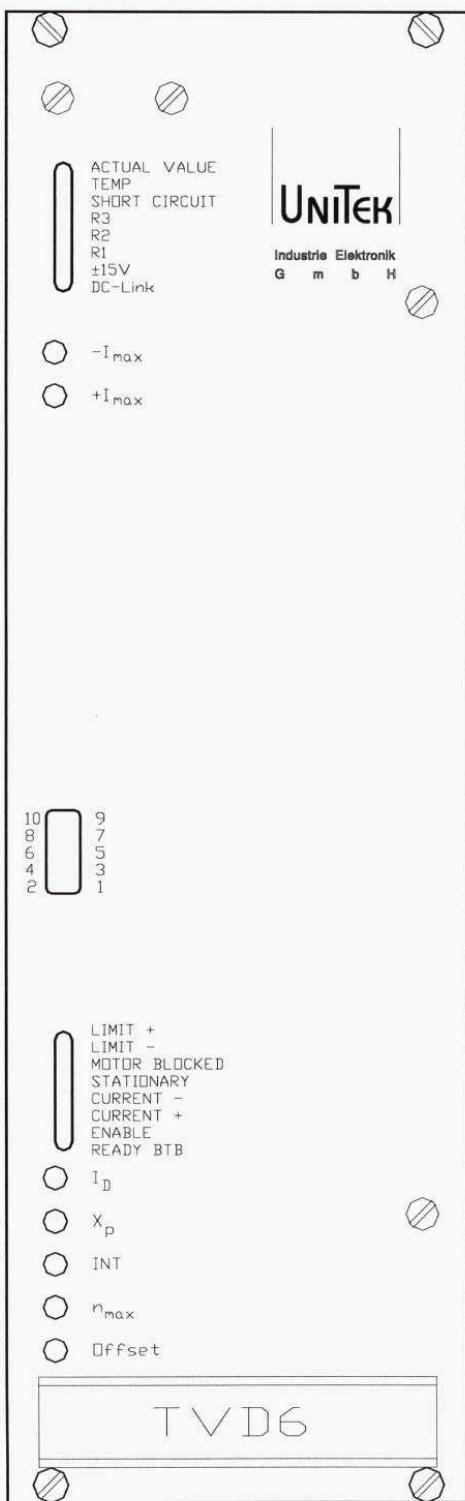
Examples

Example no.	Encoder pulses	Speed rpm.	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	102.40
4	2048	3000	on	off	1	102.40

Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Circuit diagram





Front panel

LED displays 2x

Actual value error
Temperature error
Short-circuit
Rotor position 3
Rotor position 2
Rotor position 1
Voltage error
Bus error

Adjustment potentiometers

Current limit I_{max} -
Current limit I_{max} +

Test point connector X4

- | | |
|----|---|
| 1 | 1st command value at the output of the differential amplifier |
| 2 | 2nd command value at the output of the integrator |
| 3 | Current command value |
| 4 | +10V |
| 5 | -10V |
| 6 | Current actual value |
| 7 | Speed actual value |
| 8 | Enable |
| 9 | free |
| 10 | Device zero GND |

LED displays 1x

Output stage switch +
Output stage switch -
Overload - disabled
Stationary
Current direction -
Current direction +
Enable
Drive ready BTB

Adjustment potentiometers

- | | |
|------------------|--------------------------|
| I _D | Continuous current limit |
| X _p | Amplification |
| INT | Integrator time |
| n _{max} | Speed |
| Offset | zero point |

Adjustments		
Function	Component	Basic adjustment
Actual value adjustment bl-tacho	Poti P4 (n)	50%
Internal current limit	Jumper S19, S20 Poti P5 (Imax1), S19 Poti P6 (Imax2), S20	plugged 100% 100%
External current limit	Poti P5 (Imax1) Poti P6 (Imax2)	100% 100%
Continuous current	Poti P7 (ID)	100%
Integrator	Jumper SW2 (2-3) Poti P2 (INT)	plugged 2-3 50%
Amplification P-term	Binary switch S4 Poti P3 (XP)	Position 8 50%
Amplification I-term	Binary switch S5	Position 4
Zero adjustment	Poti P8 (offset)	

Plug-in jumpers		
Function	Jumper no.	Basic adjustment
1st command value input, ref. zero	S12	open
2nd command value input, ref. zero	S11	open
Ramps 2nd command value on/off	SW2 2-3/1-2	plugged 2-3
Actual value differentiation	S14	open
Actual value smoothing	S3	plugged
Current limit 2, internal	S19	plugged
Current limit 1, internal	S20	plugged
Amplification 1=1	S2	open
ext. +UL = int. +15V	J3	plugged
ext. GND = int. GND	J1	plugged
Emergency stop (delay - blocked control loop)	J2	plugged
Enable - reset	S6	plugged
Enable - pos./neg. logic	SW1 2-3/1-2	plugged 2-3
Direction of rotation	FU board S1 - 3	
Zero impulse	FU board S1 - 4	

LED signals

	Function	LED no.
Control electronics		LED D1x
Output stage switch +		LED H
Output stage switch -		LED G
Disabled		LED F
Stationary		LED E
Speed loop output -		LED D
Speed loop output +		LED C
Command value enable		LED B
Drive ready BTB		LED A
Power section		LED D2x
Actual value error	saved	LED H
Temperature	optional	LED G
Short-circuit	saved	LED F
Rotor position 3		LED E
Rotor position 2		LED D
Rotor position 1		LED C
Voltage error	saved	LED B
Bus error	not saved	LED A

Signals

Adjustments

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



Pre-setting

Actual value	>>> jumper
Command value inputs	>>> jumper, differential input
logic inputs/outputs	>>> jumper, internal/external supply
P-I parameter switch	>>> jumper, switch

Optimisation

Current controller	adjusted in the factory (P or PI control loop)
Actual value adjustment	I _{max} adjustment
Current limits	I _{max} , I _D adjustment
Speed controller	P-I switch, X _P adjustment
Slope limiting device (integrator)	INT adjustment (only command value 2)
Zero point	Offset adjustment
Path/position controller	in the CNC\PLC control

Attention:

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

Test points

Test point connector X4

Measurement

	max.value	Connector
Com.value 1 at the output of the input amplifier	±10V	X4:1
Command value 2 at the output of the input amplifier	±10V	X4:2
Current command value (control function speed controller)	±10V	X4:3
Current actual value, unipolar	±5V	X4:6
Speed actual value at the output of the divider	±5V	X4:7

Function		Command value 1	Command value 2
Input amplification	fixed	1	1
Input voltage	max.	$\pm 10V=$	$\pm 10V=$
Differential input	Jumper	S12 open	S11 open
Input referred to GND	Jumper	S12 plugged-in	S11 plugged-in
Input signal		X1:4	X2:17
Input GND		X1:8	X2:28
Test point connector		X4:1	X4:2
Measured value	max.	$\pm 10V=$	$\pm 10V=$
Integrator function		not existing	Jumper SW2

Command Value

Input referred to GND	Differential input
for a potentiometer command value	for a command value from the PLC/CNC
with internal voltage supply	external command value
Jumper S11, S12 plugged-in	Jumper S11, S12 open
Check the GND connection	The signal and GND connections can be swapped. (Basic set-up)

Both command values connected:

- The command values 1 and 2 are added internally.
- Check the signs.
- The sum of the command values must not be superior to $\pm 10V$.

Only with the command value 2			
Command value 2	Jumper	Poti	Range
without integrator	SW2 Pos. 1-2	—	—
with integrator	SW2 Pos. 2-3	INT(P2)	0.1 to 4.5 sec.
without command value 2	SW2 open	—	—

Command value current

Command value from an external current source 0 to $\pm 20mA$.
Internal load resistors for 0 to max. $\pm 10V$.

Command value 1	Resistor R121
Command value 2	Resistor R4

Resistance values $[\Omega] = \text{command value voltage}/\text{command value current}$ (max. 500Ω)

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

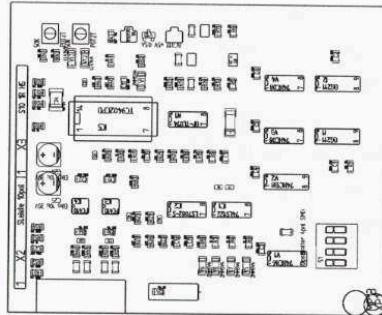


Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Actual value

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//



Adjustment range of the poti 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 rpm		Frequency kHz
	S1-1 ON / OFF	S1-2 ON / OFF		left	right	
1024	[] []	[] []	4	950	1700	64 ... 116
1024	[] []	[] []	2	1900	3400	64 ... 116
1024	[] []	[] []	1	3800	7000	64 ... 116
2048	[] []	[] []	2	950	1700	64 ... 116
2048	[] []	[] []	1	1900	3500	64 ... 116

Tacho signal X2:8

uniform speed-proportional voltage, no saw-tooth voltage

Attention:

Speeds <950 or 1700...1900 are only possible by adapting the command value.
Frequency limit 120 kHz

Fine adjustment

- with potentiometer n_{max} (P4)

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 of rotation (with view onto the rear side of the motor DIN)		
Command value	Direction of rotation	Switch S1-3
positive	turning clockwise	ON
positive	turning anti-clockwise	OFF

Current limiting

Peak current range	0 to 200% rated current maximum reset time 5sec.	Poti P5/P6
Continuous current range	5 to 100% rated current	Poti P7

Internally resetting current limits

Current limit	Function	Limit
Overload	Time	Continuous current
Heat sink	Temperature	50% rated current
Motor	Temperature	50% rated current

The lowest current limit is effective!

Peak current

Internal current limit (Basic set-up)

Adjustment	Jumper	Potentiometer
I _{max1}	S19 plugged-in	I _{max1} (P5)
I _{max2}	S20 plugged-in	I _{max2} (P6)

External current limit

Adjustment	Input	Jumper	Potentiometer
I _{max1}	X1:9 0 to +10V	S19 open	I _{max1} (P5)
I _{max2}	X1:10 0 to +10V	S20 open	I _{max1} (P6)

The external current limiting voltage can be reduced internally 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 ID (P6)

Measuring adjusted values:

- Do not connect the motor
- Preset the command value and enable > switch on/off
- The value to be measured applies across the test point connector X4:3 (5V=rated current)

Command value	Measured value I _{max} (2 Sec.)	Measured value ID
+5V	0 bis max.10V	0,25 bis max. 5V
-5V	0 bis max.10V	0,25 bis max. 5V

Current actual values

Measured value at the test point connector X4:6 >> I_{max} = 0 to +5V
ID = 0.12 to +2.5V

Note:

for an exact torque control:
- the device is adjusted to from P- to PI-control in the factory



Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Speed controller

Speed control loop circuit

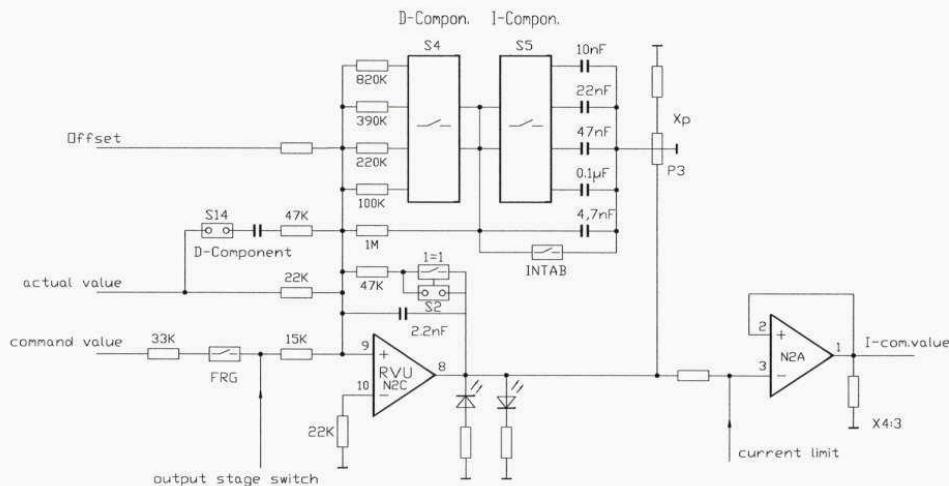
- two 16-position binary switches S4, S5
- amplification potentiometer P3 (XP)

- D-term with jumper S14

Take over the adjusted values when the device is exchanged.

Basic set-up

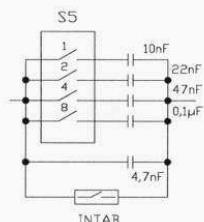
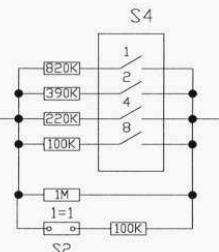
- binary switches S4 and S5 in position 4
- amplification poti XP to 50%
- no D-term, jumper S14 open
- suits the majority of drives



Adjustment of the proportional term by means of the binary switch S4

Switch S4

Position	0	1	2	3	4	5	6	7
R-value kΩ	1000	450	280	209	180	148	123	107
Position	8	9	A	B	C	D	E	F
R-value kΩ	90	82	73	67	64	59	55	52



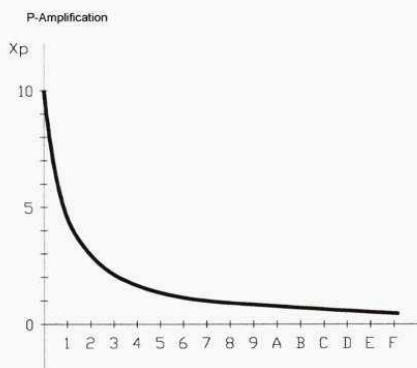
Note:

The integral term can be switched off through the use of the input INTAB (X2:31)

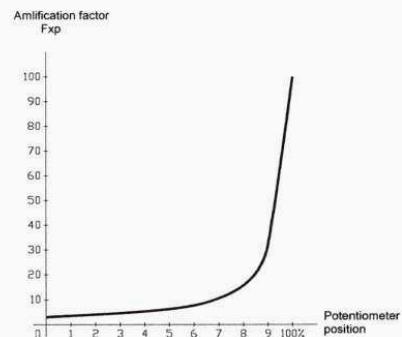


Proportional amplification

Function binary switch S4

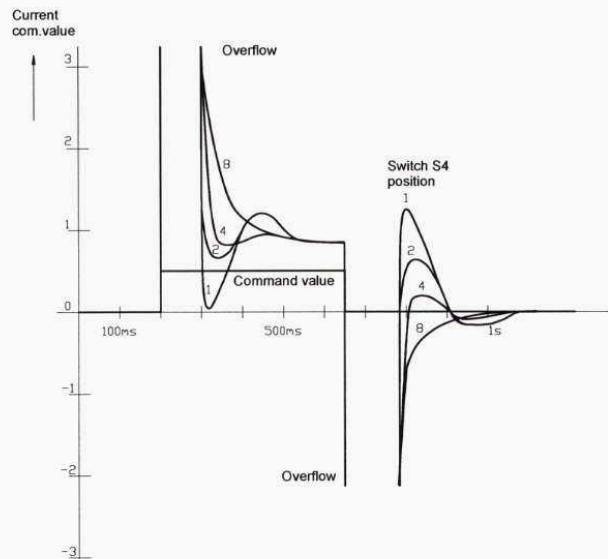


Function potentiometer X_P



$$\text{Proportional amplification} = X_p \times X_{\text{P}}$$

Adjustment by means of an oscilloscope



Adjustment

- Command value jump $\pm 0.5V$
- Input INTAB X2:31 activated

Measured value

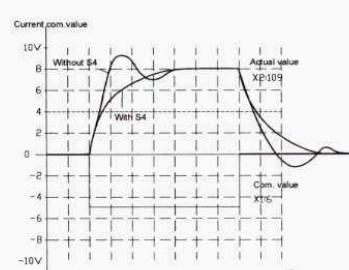
- | | |
|-----------------------|------|
| Command value | X4:1 |
| Controller response | |
| Current command value | X4:3 |

Effect D-term

- Actual value differentiation
- Jumper S14 plugged-in

Attention:

Do **not** use the D-term for the position control (CNC/PLC)!



Adjustment without measurement equipment

Connect the motor,
command value = 0
 X_P = 50%
switch S4 = position 4
switch S5 = position 4

enable the drive,
turn the potentiometer X_P clockwise until the axis begins to oscillate.

If the axis does not oscillate

- reset the switch S4 to a lower value.
- Adjust by means of the potentiometer X_P until the oscillations begin.
- Turn the potentiometer X_P anticlockwise until the oscillation disappears.
- Turn poti X_P back another 2 clicks.

Adjust the switch S5 in such a way, that when a command value jump of 50 % occurs, the drive runs smoothly after approx. two oscillations.

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



Attention:

Drives connected to CNC\PLC controllers:

for the maximum speed output from the controller, adjust the speed command value to between 8 and 9V.

Basic set-up

Before commissioning check the following connections

- | | |
|---|--|
| - Power supply (TVD6-200IN)
(TVD6.2-400IN) | terminals no. X3:3, X3:4, X3:5 max. 230V~
terminals no. X3:3, X3:4, X3:5 max. 460V~ |
| - Protection earth | earthing screw on the housing |
| - Motor connection | terminals X3:7, X3:8, X3:9 |
| - Motor earth connection | terminal X3:6 |
| - Option | |
| - external ballast resistance | terminals no. X3:1 and X3:2 |
| - Fuse type, fuse value | |
- (Please observe the connection advice, page 13)

Encoder connection X7

observe the motor-specific connection data sheets (page 52)

Power connections

- | | |
|--|---|
| - Protective earth | |
| - Mains (for TVD6-200IN)
(for TVD6.2-400IN) | 1x or 3x 230V~
1x or 3x 400V~ |
| - 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 X1:8 |
| - Output stage switch | output stage switch across X1:16 and X2:32
or bridge between X2:27 and X1:16, X2:32 |

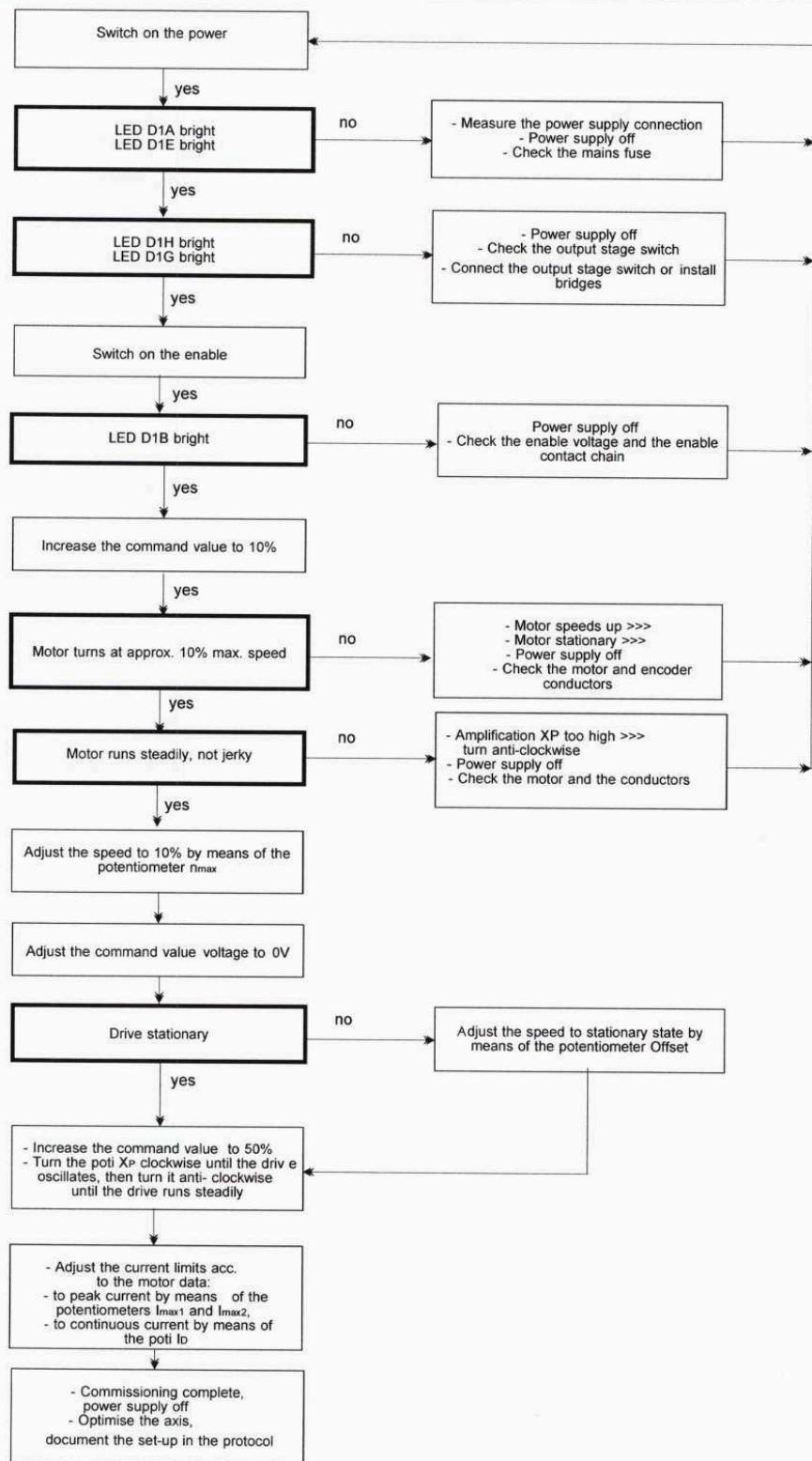
Basic set-up for the first commissioning

Switch	S4	P amplification	position 4
Switch	S5	I-term	position 4
Potentiometer	I _{max1}	peak current	10%
Potentiometer	I _{max2}	peak current	10%
Potentiometer	I _D	continuous current	100%
Potentiometer	X _P	amplification	50%
Potentiometer	INT	integrator	left full scale
Potentiometer	n _{max}	speed	left full scale

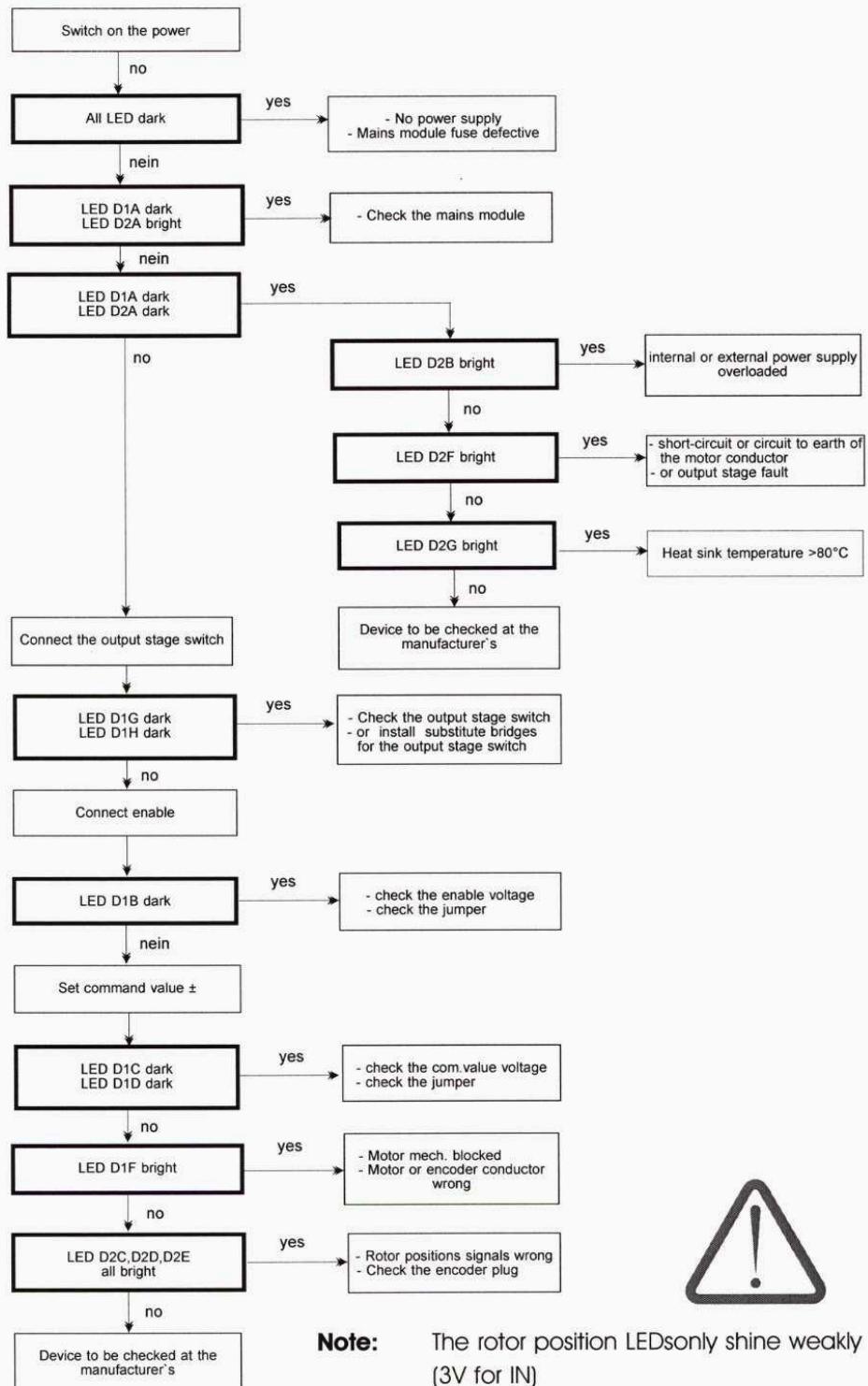
Jumper	open	plugged-in
	S2, S14	J1, J2, J3, J4
		S3, S6, S11, S12, S19, S20
SW1 pos. 1-2		SW1 pos. 2-3
SW2 pos. 1-2		SW2 pos. 2-3

Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Commissioning



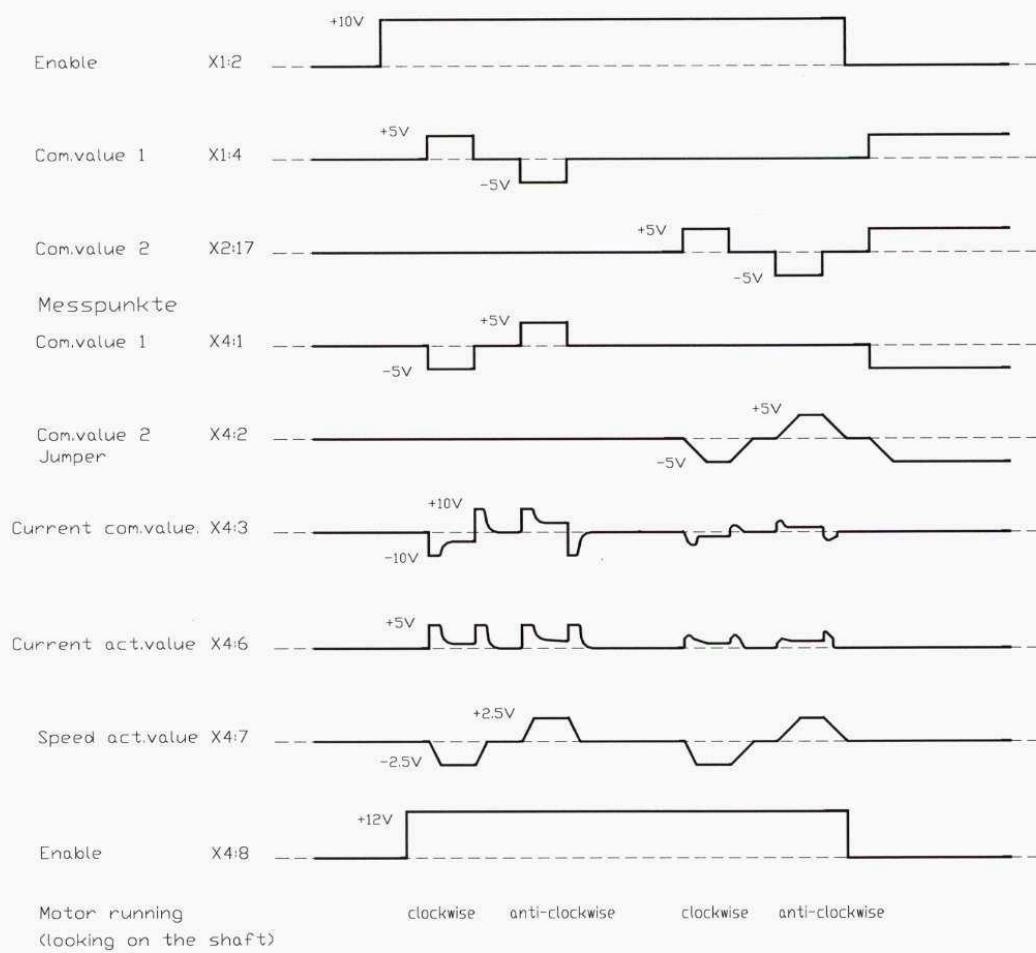
LED-displays



Faults

Fault	Causes
Motor stands in one position, runs jerky or oscillates in one position	- Encoder cable or motor conductor cores mixed up or interrupted
Motor speeds up	- Motor or rotor position conductor cores leading or lagging by 120° in the rotating field
Motor runs unsteadily	- Incremental channels mixed up or interrupted - Amplification too high - Command value faults
Mains module switches to failure during braking, LED D2A bright	- Braking energy too high
Mains module switches to failure when being switched on, LED D2A bright	- No connecting phase - or the power supply voltage is too low
Amplifier switches to failure	- Over-temperature - Phase short-circuit or short-circuit to earth - BTB fault - Output stage failure
Speed cannot be adjusted with poti n _{max}	- Pulse evaluation on FU board wrong

Functional diagram - test point connector X4

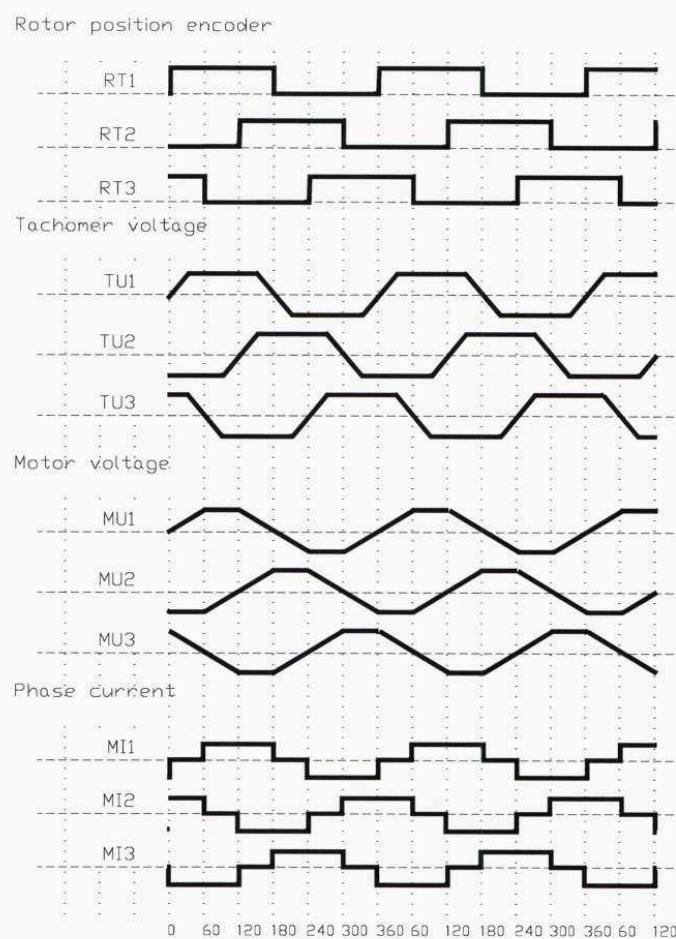


Test point connector X4

Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Encoder signals

Functional diagram bl/ec motor amplifier

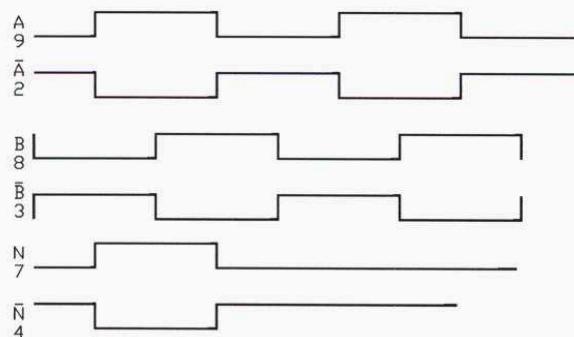


Incremental outputs

D-connector X8

GND = X8:5

+5V = X8:1



Output line driver

Guarantee

UNITEK guarantee 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.

Defects, defective goods.

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 drive 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.

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.

All rights are reserved.

Copying, modifying and translations lie outside UNITEK's liability and thus are not prohibited. UNITEK's products are not authorized for use as critical components in life support devices or systems without express written approval.

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

Guarantee

Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

Protocol

Protocol

Customer

Machine No.

Device

Serial No.

Supply voltage [V=V~].

Inputs

Enable contact ? voltage [V=]

Command value 1 type voltage [V=]

Com.value 2 additional type voltage [V=]

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

Current com.value I_{max2} external voltage [V=]

Speed controller settings

Actual value - rough adjustment

DC tacho S9 Position



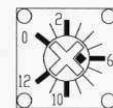
Switches

P-term S4 Position

I-term S5 Position

Potentiometers

Speed Ω_{max} P4 Position



Peak current I_{max1} P5 Position



Peak current I_{max2} P6 Position

Continuous current I_D P7 Position

Integrator INT P1 Position

Amplification XP P3 Position

Offset Offset P8 Position

Jumper (Plug-in bridges) soldered jumpers

plugged-in no.

open no.

Adjustments - power section**Current control loop amplification**

Resistances - current control loop (kOhm)

Measured data

Motor voltage	max.	[V~] 3x
Motor current	peak	[A~] 3x
Motor current	continuous	[A~] 3x
DC tacho voltage	max.	[V=]
Acceleration		[V/ms]
Braking		[V/ms]

Motor Data

Manufacturer

Type Serial number

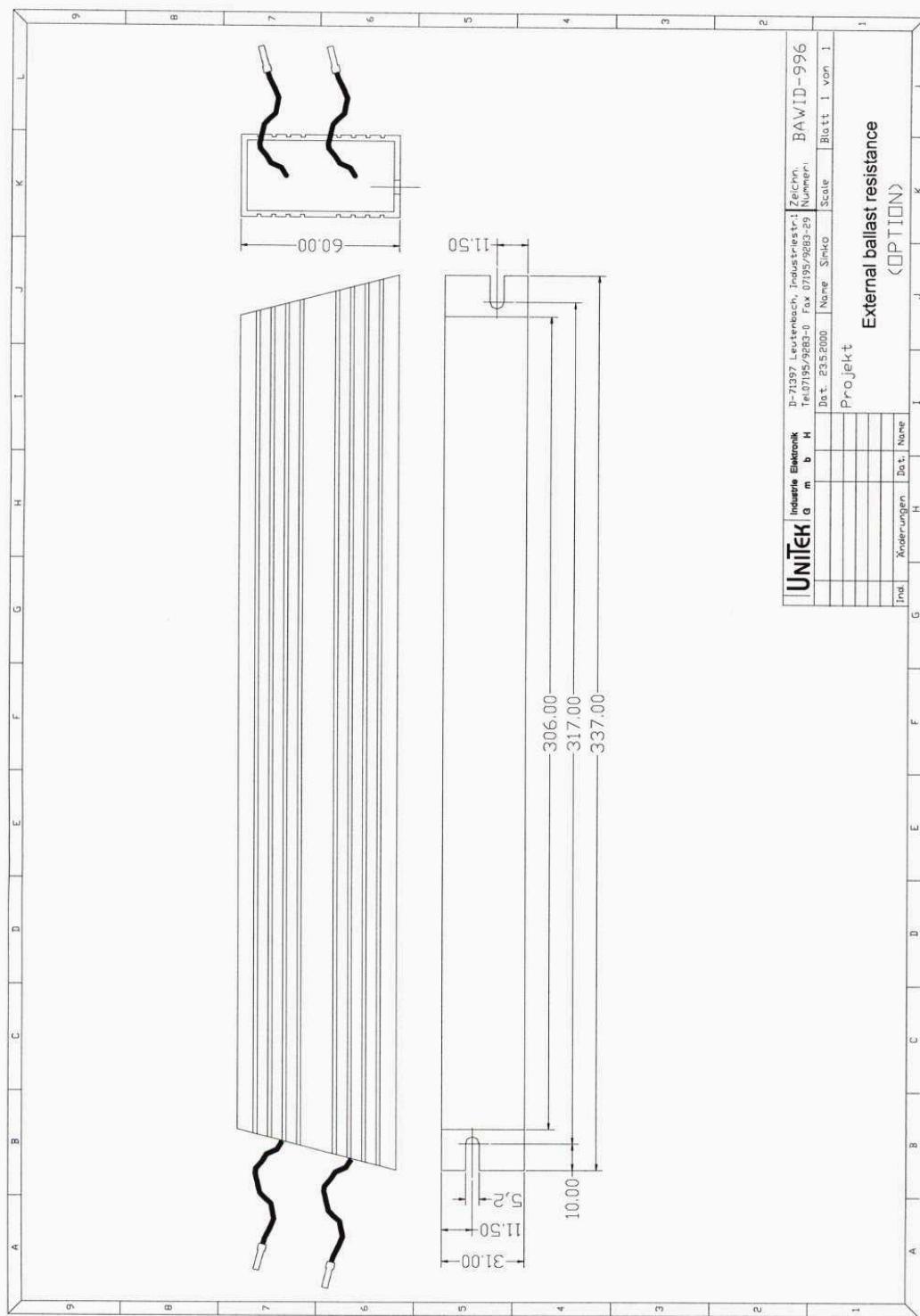
Motor voltage [V~] Motor current [[A~]]

Brake [V] Fan [V]

Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

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

UNITEK-Motor Connection		MOTOR EC-Motors		BAUMÜLLER-Motors DSM 115		STÖBER EC-Motors		PAPST-Motors	
TVD3 X3	TVD6 X3	X10	DS400 X10	Terminal Box	W 1 V 3 U 2	W 3 blue V 1 black U 2 red	W red V black U green	Power Connection	
3 7	7 M1	9	9						
2 8	8 M2	8	7						
1 9	9 M3								
UNITEK- Electronic Connection		MOTOR- Connector		EMD-EC-Motor with Encoder DIH48-TS..NSD-5V		with Encoder DIH48-TS..NSD-5V		with Encoder 500 Inc.	
Solder Side		Solder Side		Sensor-Line DIH48-TS..NSD-5V		Encoder Connection			
X7:		X7:		X7:		X7:		X7:	
15 Rotor 3 (w)	red	1 M	1 M	1 M	1 M	1 M	1 M	1 M	1 M
14 Rotor 2 (w)	green	2 C	2 C	2 C	2 C	2 C	2 C	2 C	2 C
13 Rotor 1 (w)	brown	3 CK	3 CK	3 CK	3 CK	3 CK	3 CK	3 CK	3 CK
10 + 5V	violet	4 US	4 US	4 US	4 US	4 US	4 US	4 US	4 US
6 GND	blue	5 GND	5 GND	5 GND	5 GND	5 GND	5 GND	5 GND	5 GND
1 Channel A, grey		6 B	6 B	6 B	6 B	6 B	6 B	6 B	6 B
2 Channel B, yellow		7 CA	7 CA	7 CA	7 CA	7 CA	7 CA	7 CA	7 CA
11 Chromel Al green/white		8 CT	8 CT	8 CT	8 CT	8 CT	8 CT	8 CT	8 CT
with TVD5 do not connect with TVD5		Chromel Al Z (pin 9) do not connect with TVD5		Motor- Position- Signals		1 1 2 3 4 5 6 7 8 9 10 11 12		1 1 2 3 4 5 6 7 8 9 10 11 12	
15-pins D-Connector UNITEK		15-pins D-Connector UNITEK		Pulses		1 1 2 3 4 5 6 7 8 9 10 11 12		1 1 2 3 4 5 6 7 8 9 10 11 12	
Encoder Line shielded		Encoder Line shielded		Supply- Volatges		1 1 2 3 4 5 6 7 8 9 10 11 12		1 1 2 3 4 5 6 7 8 9 10 11 12	
Encoder Connector Looking on Solder Side		Encoder Connector Looking on Solder Side		Motor- Temperature- Sensor		1 1 2 3 4 5 6 7 8 9 10 11 12		1 1 2 3 4 5 6 7 8 9 10 11 12	
without Termi- nals 47/48 and X75		without Termi- nals 47/48 and X75		10 x 0.14 +2 x 0.5		10 x 0.14 +2 x 0.5		10 x 0.14 +2 x 0.5	
with TVD5 do not connect X75									



Ballast resistance

Transistor Servo-Drive TVD6-200IN, TVD6.2-400IN

