MANUAL

3-Phase-Transistor-Servo-Drive

for

AC-Synchro-Servomotors

with

Resolver

TVD6.2-RS

Transistor-Servo-Drive TVD6.2-RS

Content

1Basic-Information

Electronic devices always involve the risk of failure.

Caution High Voltage
AC 460V~, DC 750V=

**This manual has to be read carefully and must be understood by experts before installing or starting the device.
If there are any doubts call your trader or the manufacturer.**

The TVD6 series is designed to regulate electrical currents; protection standard IP00.

Instructions and rules:

the devices and accessory components must be set up and connected according to the local technical regulations. In Germany they are:
- EU-machine guide lines 89/392/EWG,84/528/EWG,86/663/EWG
- VDE-regulation VDE 100, VDE 110, VDE 160 und VDE 0113
- TÜV-regulations
- Regulations of the professional guild.

The user has to assure that:
after
- a failure of the device
- an incorrect handling
- a failure of the control unit etc.
he drive is brought to a secure operating condition.
Machines and installations are to be provided with supervisory and safety equipment, that is independent of the device.

Adjustment
- only by qualified personnel
- adher to safety regulations
Installation work
- only when disconnected from all power lines.
QS
The devices are archived by the manufacturer with serial number and their test specifications.
CE
The EU-guide line 89/336/EWG with the EMC-Regulations EN50081-2 and EN50082-2 are observed.

t

Safety Advice

Transistor-Servo-Drive TVD6.2-RS

The transistor 3-phase current servo amplifier SERVO-TVD6.2 forms together with the brushless direct current motor (synchro-servo (EC-) motor) a propulsion unit distinguished by its rear-zero maintenance and by its high dynamic control range.

The drive displays the wellknown good regulation characteristics of the direct current drives without the disadvantages of the carbon brush wear and of the communication limits.

The rotor intertia is notably lower and the power envelope is greater than with equally constructed DC-motors. The result are up to 5 times higher acceleration values. As the generated heat in the motor occurs in the stator, the ec-motors are always designed to the protection standard IP 65.

The brushless direct current motor is electrically a synchro-motor with a permanent magnet rotor and 3-phase stator.

The physical characteristics correspond to those of the direct current motors, that is, the current is proportional to the torque and the voltage is proportional to the speed. As both values can be measured precisely, the servo-control unit can be mounted easily. It is possible to control the speed from the motor voltage, but in order to achieve exact regulation it is preferable touse atways a tachometer regulation.

The tachometer actual value is generated from the sensor unit (resolver). In the speed controller (P-I-controller) of the servo-drive is the differenz of nominal value and actual value amplified. The result is the current nominal value, which is transferred by the resolver signal onto the three phase current controllers such that the stator magnetic field leads ca. 90° electrically the rotor magnetic field.

This field frequency is not a controlled variable, it adjusts istself automatically. The motor currents, following the resolver interpretation, form a sine-waved rotating field.

As occurs in all DC-, AC or ec-servo-amplifiers which are supplied by the dc-bus, the feed-back of the energy must be observed when braking in the dc-bus (especially where stroke or eccentric cycles are concerned). The bleeder switch is set for a 3 % duty cycle. The ballast-resistors have to be mounted externally.

Information:

For lower power	>>>	UNITEK Serie TVD3.2 100V upto 10/20A
For higher power	>>>	UNITEK Serie MODULA 400V upto 100/200A

1 Basic-Information

Application :

for all kinds of machines up to 8KW drive power especially as 4Q-servo-drive in travel axes with

-high dynamic acceleration and deceleration cycles

- great regulation range
- high efficiency
- small motor size
- even and smooth travel

for speed or torque regulation or

combined speed-torque regulation with or without superposed position controller.

Drives with constand speed as in conveyors, lead screw drives, pumps or divider units.

Synchro-Servo-drives are smaller than other drives.

For Use in:

componenet insertation machines, metall-sheet working machines machine tools, plastic working machines, assembly machines, knitting and sewing machines, textile working machines, grinding machines,

wood and stone working machines, food processing machines,

robots and manipulators, storage across machines, Extruder, Kalander, and many other machines and installations

Notice:

In bl-drives which mainly require deceleration

for example:

- winding machines, lifts, great centrifugal masses

the braking energy will be annihilated in the ballast circuit

or re-feded to the mains using an external dc-bus converter.

With multiple-axes an energy compensation is possible.

The motors are

- designed to protection standard IP 65
- compact
- suitable in rough surroundings
- suitable with high dynamic overload
- service-free

Transistor-Servo-Drive TVD6.2-RS

Characteristic

Construction:
- cubicle-mount or 6HE-plug-in unit according to the
  VDE- DIN- and EU- regulations.
- standard analog regulation electronics.
- power electronics for 5A, 10A, 16A and 25A.
- wide-band chopper supply unit for the auxiliary voltages.
- power supply unit on the back circuit board .

Galvanic isolation between
- power section and covering
- power section and regulation electronics
- regulation electronics and contol inputs
The leakage distances are according to the VDE regulations.

There are used:
- fully isolated six-pack IGBT-power semiconductors, generous
  dimensioning.
- only industrial standard components are used
- All ICs with external connections are mouted on high-quality sockets
- LED displays
- 16 digit binary switches for PI-setup of the speed regulator
- precision trimers for fine adjustment
- plug-in jumpers for system setup.

Characteristics:
* Direct power supply 400V~
* Electronic starting current limitation
* 2 differential reference inputs
* Accelleration and decelleration ramp with second nominal value
* Speed and torque regulation
* Static and dynamic current limit
* Current nominal value output
* Test connectors for current and speed
* Galvanic isolated logic in- and outputs
* Enable and end-switch logic
* Integral disabling
* Quick stop
* Mains failure braking
* Temperature control for motor and device
* Parameter adjustments without soldering
* 10 pin control plug
* Incremental encoder output

1Basic-Information

Power connection:

directly on the mains   1x 400V~

3x 400V~

maximum: 460V~

Option :connection voltage < 300V~ >>> notice the advise

Technical data:

type TVD6.2-400-		5	10	16	25
output voltage max.	V~eff.	400	400	400	400
output standstill current					
duration	A=	5	10	16	25
peak	A=	10	20	32	40
electrical power max	kW	2	4	6,4	10
rapid fuses					
built-in	A	20	20	20	20
measurements					
plug-in device	BxH	16TE	16TE	16TE	24TE 6HE
cooling 60% ED		convect	convect	fan	fan
100% ED			convect	fan	fan

fan

switch cabinet mounting BxHxT   see illustrations of the dimensions

Common specifications:

protection standard   IP 00

device layout   VDE 0100 group C

VDE 0160

humidity stress   class F according to DIN 40040

operation altitude   < 1000m above NN

operation range   0 ... 45°C (with external fan 0 ... 35°C)

expanded operation range   up to 60° C red. 2%/ °C

bearing reach   -30°C up to + 80°C

speed controller

control precision (excl. tacho error)   ± 0,1%

control range   > 1: 1000

reference inputs   ± 10V=

logic inputs   +10 ... +30V=

logic outputs   >+14V, 6mA

When order please specify:

notice cyclic duration factor   >>>   external cooling system with 100%

several axes with >=10A

within one rack   >>>   external cooling system recommended

input voltages <300V~   >>>   modify power supply unit

exact torque control   >>>   current controller with PI-wiring

high centrifugal mass   >>>   external ballast resistor

Dimensions

Device	Compact- 10 and 16A	25A
Wanne	Wanne	Wanne or mounting angles

2 Mechanical Installation

Multi-axes combinations

Dimensions 6HE [mm]

	plug-in units				
dimension	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

Unit-grid dimension
10 and 16 A Device	E=	81,28 mm
25 A Device	E=	121,92 mm

Mounting height 255 mm

Structure of Device

TVD6

M3 M2 M1 PE ~ ~ ~ +
9 8 7 6 5 4 3 2 1

X31

a b c

F1

355,0

2

X11

Entfernen
bei externem
Ballastwiederstand

D1

X8 nur bei
Ausführung
IN, RS

32   J2

I1

X8   X7

D9   D15

X1

1   16
17   32

X2

80,0

X3

X31

X11

X7,X8

32

65
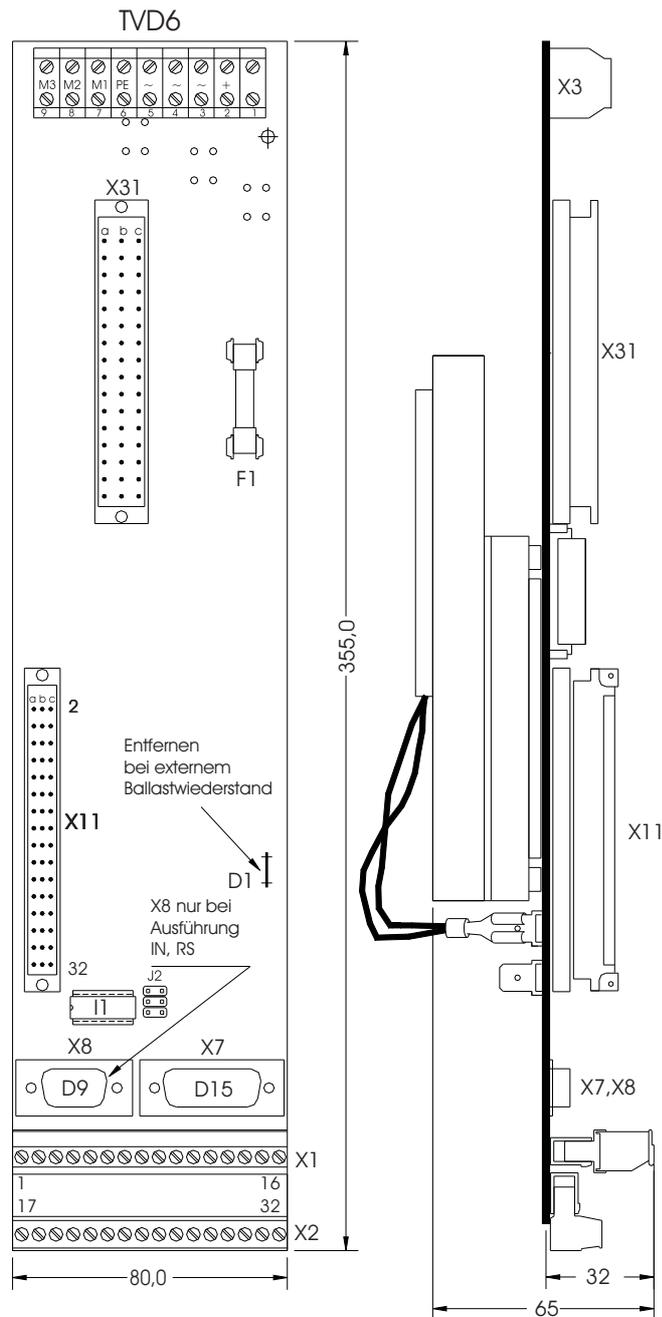
Power supply unit back panel with plug-in-device (without rack)
Power supply unit setup

Incremental encoder output X8	**Jumper J2**	**IC I7**
external ballast resistor	**Bridge D open**	**cable 1**

Rack
Hight unit   :   6HE
Wide unit :   10/16A = 16TE, 25A = 24TE
Mixed 6HE, 3HE (TVD3) racks on request

2 Mechanical Installation

mounting height 255mm **Compact device 10/16A** **Compakt device 25A (sw)**
Compact device 25A (w) **Multi-axes combination**

Free space to switch-cabinet wall min. 100mm
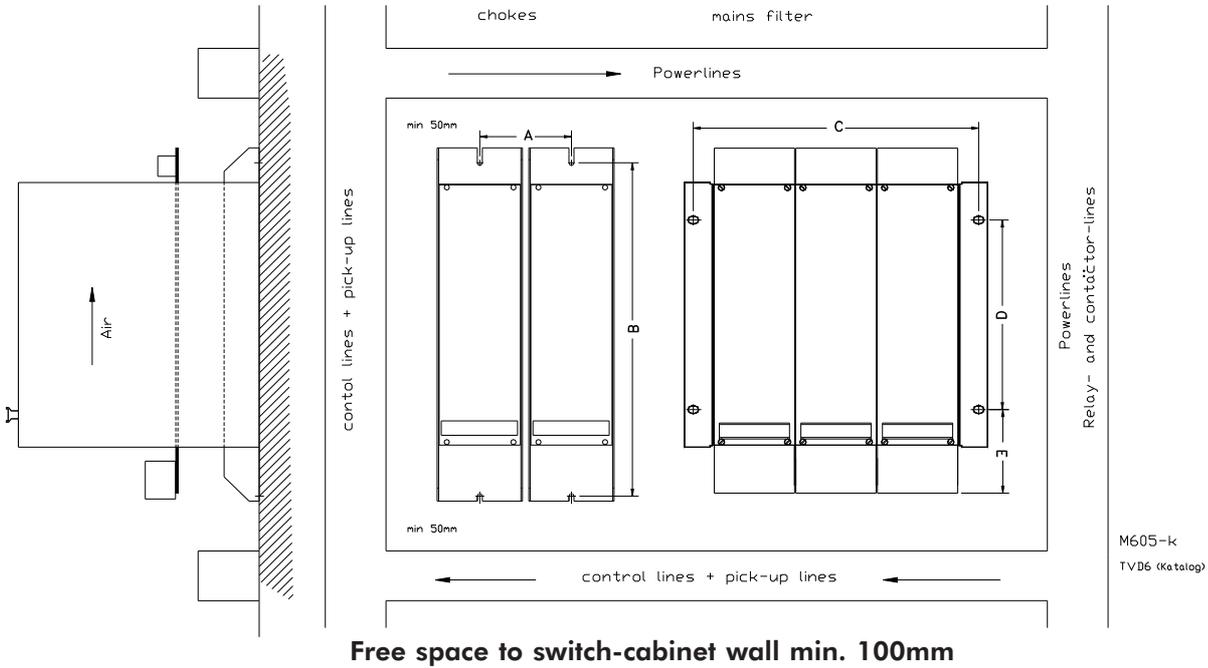
Fixing dimensions [mm]

compact device current	A	B	C	D	E	screw
5,10, 16 Wanne	95	335				M4
5-w Wanne	135	335				M4
25 sw	mounting angles		180		158	
190,555 M5						

multi-axes combinations mounting angles	A	C	D	E	screw
wall mounting	n x E+60	n x E+40	190,5	55	M5

front mounting with19" systems

    E at   <=16A =   81,28 mm   n =number of plug-in units
    E at   25A = 121,92   mm

Dissipation power at maximum power

rated current	dissipation power[W] Device	supply unit	fuse	M-choke	filter
5A	70	20	xx	xx	xx
10A	90	20	xx	xx	xx
16A	125	30	xx	xx	xx
25A	180	43	xx	xx	xx

Connection Overview

Chokes device-rated current	mains filter		motor chokes	ferrite core
	1ph	3ph		
5A	FE1-10	FE3-10	MDD 1,3 α	EMI742 70107
10A	FE1-16	FE3-16	MDD 1,6 α	EMI742 70107
16A	FE1-16	FE3-16	MDD 2 b	EMI742 70107
25A	-	FE3-25	MDD 2,5 b	EMI742 70107

Connection Plans

Connection compact device: only left diagram without internal connections

Connection multi-axes combination :

One or more axes with power supply unit, plus one or more axes without own power supply unit

power supply unit- positions free choosable

Earthing Plan
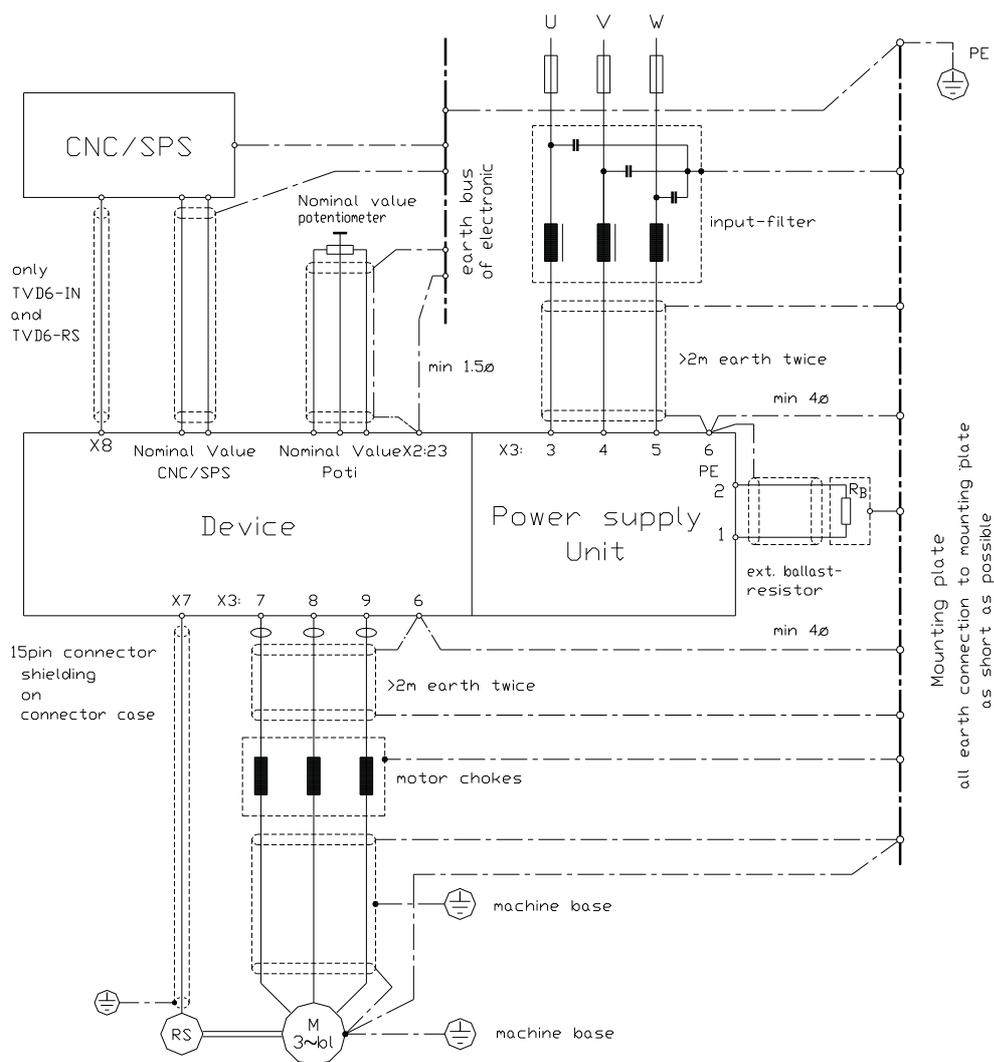
The devices are according to EU-regulation 89/336/EWG, the standards EN 50081-2 and prEN 50082-2 will be observed under the following conditions.

Device,transformer,motor chokes and mains filter fixed on a 500x500x2 mm mounting board.

Mounting board and motor frame connected to gnd with a 10mm² wire.

Devices reference X1:13 connected to mounting board with a 2,5mm² wire.

Device-PE-screw connected to mounting board with a 50mm long 4mm² line.

Single-phase power supply:

> mains filter Type : up to 16A = FE1-16
>
> linelength device - mains filter <100mm

Three-phase power supply:

> mains filter Type : up to 16A = FE3-16
> up to 25A = FE3-25
>
> linelength transformer - mains filter <500mm
> linelength device - mains filter <100mm

Motor connection:

> motor chokes Type : 10A = MDD1,6-10
> 16A = MDDxx-20
> 25A = MDDxx-30
>
> motor line 1,5m long, 4core shielded. Shielding on device side fixed to mounting board and on motor side flächig connected to PE.

EMC-Advice

3 Electrical Installation

Caution:
The connection advice concerning the individual attachments of the connections to the plug numbers or terminals are binding.
All further advices to this are not binding.
The input and output lines can be altered or completed in consideration of the electrical regulations.

Notice:
- connection advice and operation advice
- local technical regulations
- EU-machine regulation 89/392/EWG

Input filter:
see CE-advice (page 14)
short line length between input filter and device
or shielded line

FI-switch
- design to DIN VDE 0664
- tripping current > 200mA
- only combined with other protective measure

Connection to 400 V~ mains
Alternating voltage connection 1x400V~ 50/60Hz
     compact device up to 10A.
     multi axis combination up to 20A

Three-phase current-connection 3x400V~ 50/60Hz
     with >10A (multi axes rack >20A) necessary

dimensioning		5/10A	16A	25A	max. 30A
wire cross section	mm²	0.75	1.5	2.5	2.5
fusing					
blow-out fuse	AF	10	16	25	30
automatic circuit					
breaker	A	10	16	25	25

electronical starting current limitation >>> max. current 7A~

Transistor-Servo-Drive TVD6.2-RS

Mains Connection

Connection at 400 V mains
AC or three-phase voltage supply
autotransformer or isolation transformer
one transformer for several devices

Notice:
-set safety contacts on transformer inrush current.
-slow fuses in front of the transformer
-fuse value corresponding to the transformer rated current
-quick fuses after the transformer
-fuse value for each power supply unit max. 30AF

Transformer capacity:
primary voltage   500V~
secondary voltage   400V~

Autotransformer
transformer rated power [VA]= $0{,}2 \times 400 \times IM \times GLF \times nF$
Isolation transformer
transformer rated power [VA]= $1{,}25 \times 430 \times IM \times GLF \times nF$

IM **= total power of the motors**
GLF **= coincidence factor**
nF **= speed ratio factor**

$GLF =$		$nF = \dfrac{\text{effective speed}}{\text{maximum speed}}$
1	with one motor	
0,5 ... 0,7	with 2 motors	
0,4 ... 0,6	with >2 motors	
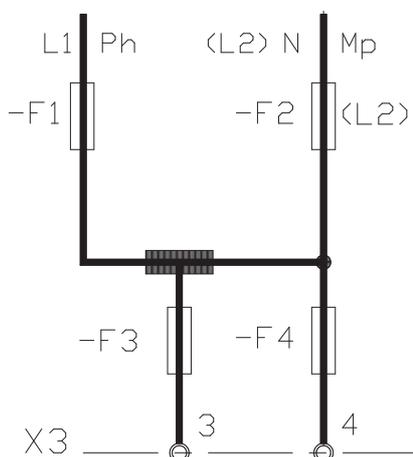
AC   **three phase current**
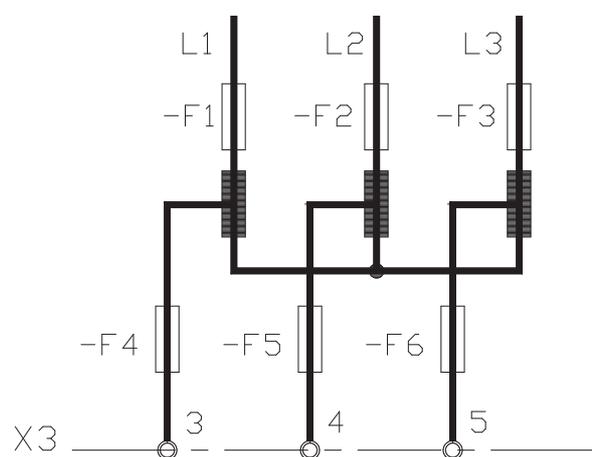
3 Electrical Installation

Motor connections

wire number	PE	M1	M2	M3
connection	X3:6	X3:7	X3:8	X3:9

X3:6 is internally connected with the devices PE-bolt.

motor line at	5A	10A	16A	25A	thermo	brake
cross section	0,75	1,5	1,5	2,5	0,75	0,75
kind of cable	3x motor line shielded + PE					

+ (if required: 2x thermo + 2x brake)

**Shielding with earth clamp
connected directly with the entry
of the switch cabinet and the
motor earth manifold if there
are long lines .**
Ferrit core
- against HF-failure
Motor chokes
- against HF-failure
- against high discharge current
- for high efficiency of the motor
- for the duration of the motors life
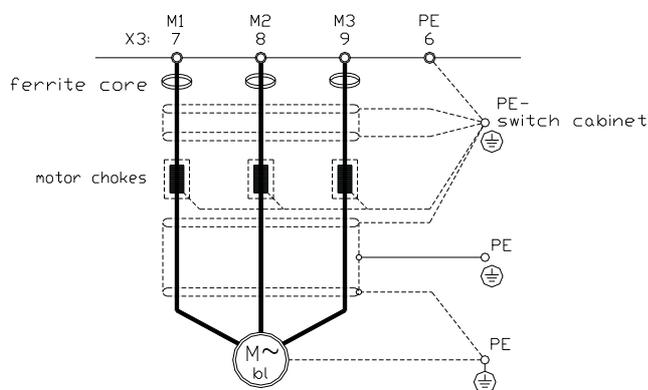
**External ballast resistor
dimensioning :
average of the brake power per axis**

$$P_{ballast} \; [W] \; = \; \frac{1 \times Jg \times n^2}{2} - \frac{Jg^2 \times a \times n}{M} \times f$$

Jg	=	motor- and effective load torque	[kgm²]
n_{max}	=	maximum speed	[s⁻¹]
M_M	=	maximum motor torque	[Nm]
a	=	deceleration	[s⁻²]
f	=	repeating frequency of the braking	[s ¹]

To change on back panel power supply unit:
- remove jump wire connection D
- mount cable 1(external ballast resistor)

external ballast resistor >>>	smallest resistance value 40Ω
internal ballast resistor	42Ω/ 50W, at 3%ED = 1,5 kW

Transistor-Servo-Drive TVD6.2-RS

Control Connections

The connecting advices are for general information and without obligation.

Notice:
- Connecting- and operating instructions
- Local regulations
- EU-machine regulation 89/392/EWG

Clamp terminal pin numbers
X1: 1 to X1:16 and X2 : 17 to X2 : 32

Signal lines
shielded and seperated from power lines
nominal value lines paired twisted and shielded

Logical connections
Relay with golden pins or reed relay. Maximum currency on contact 6mA.

Internal logical voltage15V=
- Potential connection
- With relay control
- Jumper J1 and J3 plugged
External logical voltage
- Galvanic isolation
- With SPS or CNC
- UEXT   +15 up to 30V=   on clamp X2:27
- GNDE   on clamp X1:11
- jumper J1 and J3 unplugged
- residual ripple of the logical voltage <20%

Default setup: jumper J1 and J3 plugged.
Inputs and outputs with optocoupler.
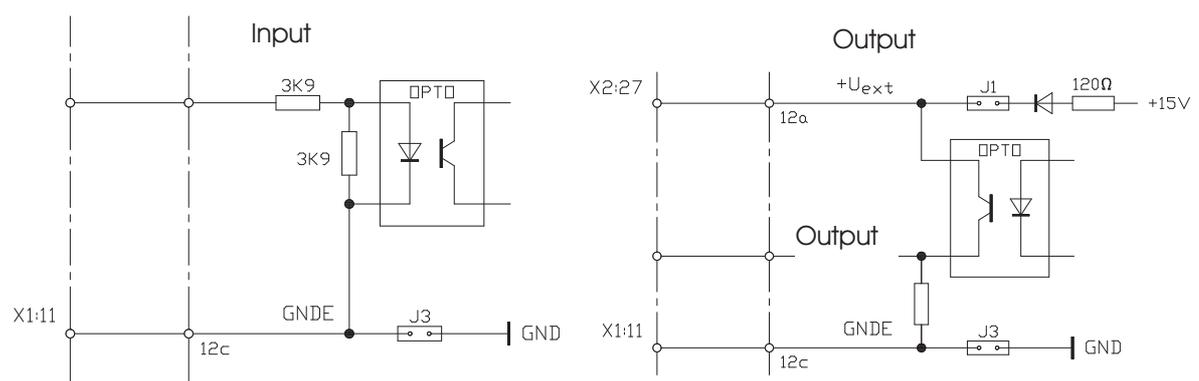
3 Electrical Installation

Enable >>>active with forward voltage

jumper SW1 position 2-3   (default setup)

enable -internal logical voltage

- internal logical voltage   X1:1   +15V/10mA
- chain of contacts between   X1:1 and X1:2
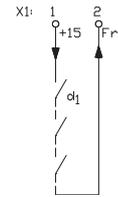
Enable -external logical voltage

- enable voltage +10 ... +30V   X1:2

Enable >>> active at zero point

Jumper position 1-2   (US-version)

Enable -internal logical voltage

- logical zero point   X1:11
- chain of contacts between   X1:2 and
     X1:11
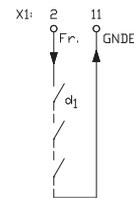
Enable -external logical voltage

- enable voltage 0V   X1:2
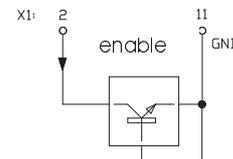
Enable switching on

- nominal value and torque control are cleared immediately
- LED D1B bright

Enable switching off

jumper J2 plugged (quick stop)   (default setup)

- nominal value immediately set to zero internally (deceleration)
- LED D1B dark.
- after five seconds >>> speed controller locked

jumper J2 unplugged (no braking)

- speed controller immediately locked.
- LED D1B dark

Notice:

Jumper SW1   Pos: 2-3 >> enable active with > +10V   (default setup)
             Pos: 1-2 >> enable active at zero point

Jumper J2   plugged   >> quick stop   (default setup)
               unplugged   >> free run out

Control Connections

Limit switch

Limit switch inputs
enable for
- positive nominal value   LED 1D >>>contact between X2:27 and X1:16
- negative nominal value   LED 1H >>>con-
tact between X2:27 and X2:32

Limit switch direction

contact	function
locked	enable>LED bright

direction lock
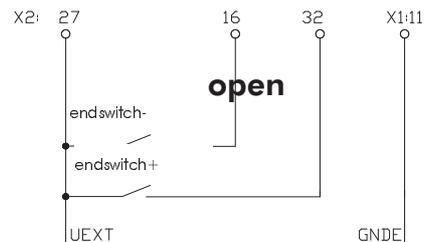
> limit switch is occupied   >>> contact open
- drive decelerates
> change of the nominal value
- drive moves from limit switch
- limit switch cleared   >>> contact closed

Caution:
Without limit switch >>> connection between X2:27, X2:32 and X1:16

Integral switching off

Function - relay contact

contact	speed controller
open	P-I regulation
locked	P- regulation

Function - external logical voltage

voltage X2:31	speed controller
< 2V	P-I regulation
> 10V	P- regulation
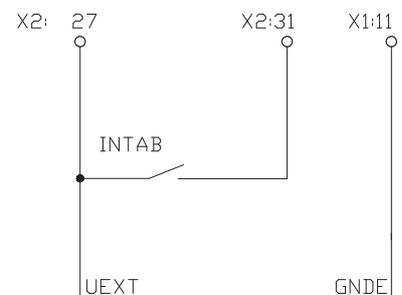
Caution:
Notice optimization advices.

Mains failure-braking
braking function
- nominal value is set immediately to zero

Generatoric rear feed into the intermediate circuit.

3 Electrical Installation

Speed-nominal value

voltage source for nominal values ±10V, 10mA

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

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

Nominal value inputs

- maximum nominal value voltage ±10V=

- input resistance 50 kΩ

- relay contacts: gold or reed contacts

Nominal value lines paired twisted and shielded. Shield connection one sided

Connection

	connection	jumper	function	measuring point
nominal	X1:4 (signal)		directly	X4:1
value 1	X1:8 (GND)			X4:10
nominal	X2:17(signal)	SW2 1-2	directly	X4:2
value 2		SW2 2-3	ramp	X4:2
	X2:28 (GND)			X4:10

Jumper positions

function	jumper	position	default setup
nominal value1			
differential input	S12	unplugged	***
with internal voltage source	S12	plugged	
nominal value 2			
differential input	S11	unplugged	***
with internal voltage source	S11	plugged	
with ramp (integrator)	SW2	Pos. 2-3	***
without ramp	SW3	Pos. 1-2	
without nominal value 2	SW2	unplugged	

Resistors for nominal value current 0 ... ±20mA

| nominal value 1 | R121 | 500Ω |
| nominal value 2 | R4 | 500Ω |

Transistor-Servo-Drive TVD6.2-RS

External current limitation

voltage source for external current limit
>   +10V/10mA   X1:3

Control range:
0 ... + 5V	>>>	0 up to 100% rated current
0 ... +10V	>>>	0 up to 200% rated current

internal overcurrent control   >>>   max. 5 sec.

Inputs

maximum input voltage +10V

input resistance 10 kΩ

internal attenuatiuon with trimer I_{max1}, I_{max2}

relay contacts: gold or reed contacts

Connection

current limit	conection jumper		measuring point
positve	X1:9 (signal) X1:7 (GND)	S19 unplugged	X4:3 X4:10
negative	X1:10 (signal) X1:7 (GND)	S20 unplugged	X4:3 X4:10

internal supply	CNC/SPS	nominal value current
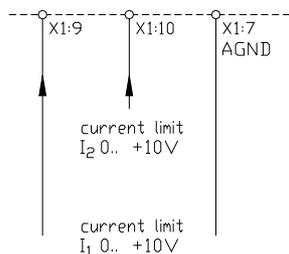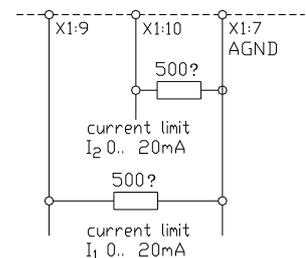
Caution:

with internal current limit adjustment >>> jumper S19, S20 plugged.

3 Electrical Installation

Actual Value-Connection

Connector X7

- D-connector 15 pins
- Case metallized plastic
- Shielding on case

Line: resolver line

3x (2x 0,25 drilled and shielded) + 2x 0,5 shielded

Pin assignment X7

Function		colour	Pin-No
reference	A (R1)	white	X7: 13
reference B (R2)		brown	X7: 4
sine	A (S1)	yellow	X7: 2
sine	B (S2)	green	X7: 15
cosine	A (S3)	pink	X7: 14
cosine	B (S4)	grey	X7: 3
temperature sensor			X7: 6
temperature sensor			X7: 12

with motors without
temperature sensor >>>>>> bridge between pin 6 and 12

Incremental encoder- output

Connector X8

- D-connector 9 pins
- Case metallized plastic
- Shielding on case

Line: until10m   6x 0,14 + 2x 0,5   shielded

>   10m   6x 0,25 + 2x 0,5   shielded

Pin assignment X8

Function		Colour	Pin-No	
channel	A	red	2	
channel	/A	black	9	
channel	B	brown	3	
channel	/B	green	8	
null pulse	N	grey		7
null pulse	/N	pink		4
supply	+5V, 150mA	violet 0,5	1	
supply	GND	blue 0,5		5

connect allways supply!

Caution: Notice motorspecific connection sheets. Appendix A.

Control Connections

Ready for operation- BTB signal

Relay RL2

signal contact   X2:21 - X2:22

contact values   max. 48V, 0.5A
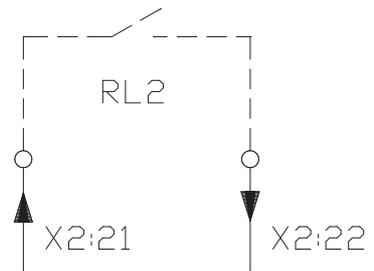
The ready for operation signal (BTB) shows the control (CNC/SPS) that the drive is in working order.
Connect BTB-signals of several axes in series.

delay after switching on the mains >>> max. 1sec.

Indication

     ready for operation   **LED D1A bright**   contact closed

     error   **LED D1A dark**   contact open

BTB turns off with

individual error	BTB-LED D1A	single signal- LED
actual value error	dark	LED D2H bright
overtemperature	dark	LED D2G bright
short, line-to-earth fault	dark	LED D2F bright
voltage error	dark	LED D2B bright
buffer circuit error	dark	LED D2A bright

Caution:

In any case use BTB-contact with CNC/SPS -Control !

Analogue measuring outputs

function	motor currency	speed
connection	X2:20 - X2:24	X1:6 - X1:7
measuring tage	2,5V= current limit	tachometer vol-
value	5,0V= peak current	before divider
	unipolar positiv	bipolar
Output-Resistance	1 kΩ	4,7 kΩ

Signals

Signal output

logical outputs with opto-coupler
- wire break secure   in case of error output is locked
- output voltage   10 ... 30V=
- output voltage   5mA
- output resistance   1kΩ

Overview of signal outputs

signal	function	output	indication	stored
intermediate	power supply			
circuit	unit error	X1:14	LED 2A	yes
overload	blocked	X2:18	LED 1F	no
standstill	speed < 1%	X2:25	LED 1E	no
overtemperature	motor >150°C	X2:26	—	no
	heat sink	> 75°C X2:26		—
no				
	heat sink	> 80°C X2:26		LED 2G
yes				
warning	motor, heat sink			
	too hot	X2:19	—	no
reference earth	GND	X2:23		

memory reset:

enable   off/on   jumper   S6   plugged (default setup)

main s off/on

| | X2:18 | X2:19 | X2:25 | X2:26 | X2:27 | X1:11 | un-plug-ged |

jumper

S6

Overload   Warning or Tachoerror   Standstill   Overheat   +UEXT 10.30V   GNDE

Transistor-Servo-Drive TVD6.2-RS

Connector Plan
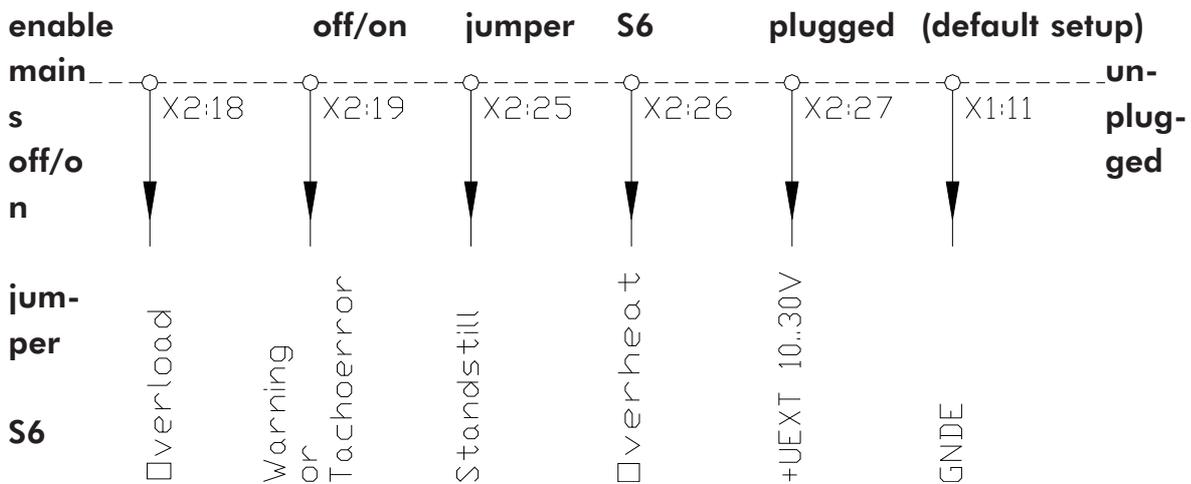
Control Connection X1,X2

Function	Terminal No.	Intern. Connector No.
+ 15 Volt (for enable)	X1: 1	X11: 32c
enable input (+10 ... +30 Volt)	X1: 2	X11: 30c
+ 10 Volt (for nominal value)	X1: 3	X11: 28c
nominal value 1-input (signal)	X1: 4	X11: 26c
- 10 V (for nominal value)	X1: 5	X11: 24c
DC-tachometer -input (signal)	X1: 6	X11: 22c
DC-tachometer-input (AGND)	X1: 7	X11: 20c
nominal value 1-input (AGND)	X1: 8	X11: 18c
external current limit I	X1: 9	X11: 16c
external current limit I	X1: 10	X11: 14c
external GNDE	X1: 11	X11: 12c
-15V (external electronics)	X1: 12	X11: 10c
device ground GND	X1: 13	X11: 8c
intermediate circuit error	X1: 14	X11: 6c
amplification 1:1	X1: 15	X11: 4c
limit switch (-)	X1: 16	X11: 2c
nominal value 2-input (signal)	X2: 17	X11: 32a
overload signal	X2: 18	X11: 30a
overload tacho error or temperature error	X2: 19	X11: 28a
current (I-actual)	X2: 20	X11: 26a
ready/operational BTB	X2: 21	X11: 24a
ready/operational BTB	X2: 22	X11: 22a
device ground GND (mass)	X2: 23	X11: 20a
analogue device ground (AGND)	X2: 24	X11: 18a
standstill signal	X2: 25	X11: 16a
over-temperature	X2: 26	X11: 14a
external voltage UEXT	X2: 27	X11: 12a
nominal value 2 (AGND) input	X2: 28	X11: 10a
nominal current value	X2: 29	X11: 8a
+15V (external electronics)	X2: 30	X11: 6a
integral component interlock	X2: 31	X11: 4a
limit switch (+)	X2: 32	X11: 2a

3 Electrical Installation

Power connection X3

Function	Terminal No.	Intern.Connector No.
intermediate circuit ex. load resistor	X3:1	X31: 18,2 0 abc
intermediate circuit +	X3:2	X31: 14, 16 abc
power L1 400V~	X3:3	X31: 10, 12 abc
power L2 400V~	X3:4	X31: 6, 8 abc
power L3 400V~	X3:5	X31: 2, 4 abc
earth 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

Control Connector X4   (front panel)

Function	Pin-No.
1st nominal value according to the differential amplifier	X4: 1
2nd nominal value according to the diff. amplifier or integrator	X4: 2
I-nominal value	X4: 3
+10 V	X4: 4
-10 V	X4: 5
I-actual value	X4: 6
n-actual value (normalised)	X4: 7
enable	X4: 8
device ground GND	X4: 9, 10

Connector Plan

Transistor-Servo-Drive TVD6.2-RS

Encoder Connector to Motor X7

Function		Colour	D-Connector-No.
reference	A (R1)	white	X7: 13
reference	B (R2)	brown	X7: 4
sine	A (S1)	yellow	X7: 2
sine	B (S2)	green	X7: 15
cosine	A (S3)	pink	X7: 14
cosine	B (S4)	grey	X7: 3
temperature sensor			X7: 6
temperature sensor			X7: 12

Kabel: 3x (2x 0,25 twisted and shielded) + 2x 0,25 (Temp)
Schield on connector case.

Encoder Connector to CNC\SPS X8

Function		colour	D-Connector-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
+5V/50mA	external	violet 0,5	X8: 1
GND	internal/external	blue 0,5	X8: 5

Notice motorspecific connection sheets. Appendix A.

4 Device Overview
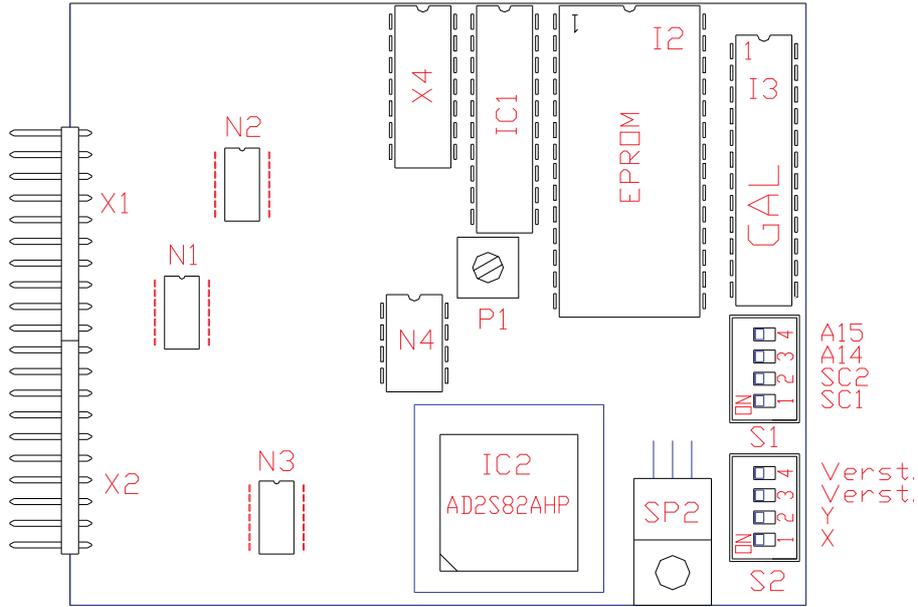
Default setup:

S1

A15	4
A14	3
SC2	2
SC1	1

ON   OFF

S2

Amplification	4
Amplification	3
Y	2
X	1

ON   OFF

RESO 2-7

Poles-adaption $P = \dfrac{\text{Motor-poles}}{\text{Encoder-poles}}$

P=4   P=3   P=2   P=1

Resolution

16bit   14bit   12bit   10bit

ON OFF   ON OFF   ON OFF   ON OFF

Adjustment range n_{max} **-Potentiometer**

	2400-4900	4900-9200	7300-12000
with 12bit			
with 14bit	620-1200	1200-2400	1900-3700

Pulses Output

2048   1024   512

ON OFF   ON OFF   ON OFF

Example 1   S2

6000 Upm
Motor 6pol.
Resolver 2pol.
Resolution 12bit
Pulses 512

ON OFF

S2

Example 2   S2

3000 Upm
Motor 8pol.
Resolver 2pol.
Resolution 14bit
Pulses 2048

ON OFF

S2

Transistor-Servo-Drive TVD6.2-RS

Temperature-Controller
Enable Reset

I5 4071
I1 4081
N5 224
N6 224

I15 4002
I17 40174

H
D2
A

Quickstop
J2
S6
S18

I9 14584

T13 BD140
T12 BD139

2 1
X5
26 25

P5 Imax1
P6 Imax2

I8 14584

I2 4081
N1 224
N11 224
N13 072
N12 072

S19
S20

internal current limits

MP6
+15V

Burden 1.nom.value
R121

I3 211

MP4
AGND

SW2
1 2 3
2.nom.value without/with INT

Amplification 1:1

D-comp. S14

S11 S12
2.nom.value   1.nom.value
GND   GND

S2

N2 074
1.nom.value+RVU

N3 074
2.nom.value+INT

N9 224
act.value

Burden 2.nom.value
R4

S4
P-comp.

S5
I-comp.

act.value-smoothing S3

S1
DC-tacho

10 9
X4
2 1

32 abc

BTB-Relay
Rl2

X4
IC1
I
I2
EPROM
I3
GAL
1

I13
outputs
815

X1

N2

N1

P1

N4

A15
A14
SC2
SC1
1 2 3 4
S1

P7 I D
P3 Xp

Enable pos.-neg.
SW1
1 2 3

I6 817
I12
inputs
815

X2

N3

IC2
AD2S82AHP

SP2

Verst. Y
Verst. X
1 2 3 4
S2

P2 INT
P4 n-max
P8 Offset
MP1

X11

2

GNDE
internal
J3

+Uext
internal
J1

GND MP2

D1
H
A

TVE6RS

Block Diagram

Transistor-Servo-Drive TVD6.2-RS

Frontpanel

ACTUAL VALUE
TEMP
SHORT CIRCUIT
R3
R2
R1
±15V
DC-Link

$-I_{max}$

$+I_{max}$

UNITEK

Industrie Elektronik
G   m   b   H

10 9
8   7
6   5
4   3
2   1

LIMIT +
LIMIT −
MOTOR BLOCKED
STATIONARY
CURRENT −
CURRENT +
ENABLE
READY BTB

I_D

X_p

INT

n_{max}

Offset

TVD6.2

Indicator LEDs 2x

actual value error
temperature error
short detection
rotor position 3
rotor position 2
rotor position 1
voltage error
intermediate circuit error

Adjustment potentiometer

- I current limit
+I current limit

Control Connector X4

1   1.nominal value after the
        diff. amplifier
2   2.nominal value after the
        integrator
3   nominal current value
4   + 10V
5   - 10V
6   current - actual value
7   speed - actual value
8   enable
9   n.c.
10   device ground GND

Indicator LEDs 1x

end limit switch +
end limit switch -
overload - blocked
standstill
current direction -
current direction +
enable
enable ready/operational BTB

Adjustment Potentiometer

I continous current limit

Xp   amplification

INT   Integrator-time

n speed

Offset zero point

4 Device Overview

Adjustment functions

Function	Component
Adjustment functions bl tachometer	poti P4 (n_{max})
actual value adjustment Option DC-tacho	binary switch S9 + poti P4
internal current limit	jumper S19, S20
	poti P5 ($I_{max}1$), S19
	poti P6 ($I_{max}2$), S20
external current limit	poti P5 ($I_{max}1$)
	poti P6 ($I_{max}2$)
steady current	poti P7 (I_D)
integrator	jumper SW2 (2-3)
	poti P2 (INT)
amplification P-component	binary switch S4
	poti P3 (X_p)
amplification I-component	binary switch S5
Nullabgleich	Poti P8 (Offset)

Jumpers

Function	Jumper
1st nominal value input (zero referenced)	S 12
2nd nominal value input (zero referenced)	S 11
ramps 2nd nominal value on/off	SW2 2-3/1-2
actual value differentiation	S 14
actual value smoothing	S 3
internal current limit 2	S 19
internal current limit 1	S 20
amplification 1=1	S 2
ext. +UL = int. +15V	J 1
ext GND = int. GND	J 3
quick stop (delayed controller interlock)	J 2
actual value-bl-tacho	
enable - reset	S 6
enable positive/negative logic	SW1 2-3/1-2
temperature controller	S 18

Transistor-Servo-Drive TVD6.2-RS

Signals

LED- indicators

Function		LED-No.
Control electronics		**LED D1x**
limit switch +		**LED H**
limit switch -		**LED G**
blocked		**LED F**
standstill		**LED E**
speed controller output -		**LED D**
speed controller output +		**LED C**
enable nominal value		**LED B**
ready/operational (BTB)		**LED A**
Power section		**LED D2x**
actual value error	(stored)	**LED H**
temperature	(optional)	**LED G**
short detection	(stored)	**LED F**
rotor position R3		**LED E**
rotor position R2		**LED D**
rotor position R1		**LED C**
voltage error	(stored)	**LED B**
intermediate circuit error	(not stored).	**LED A**

5 Adjustment

Adjustment Advice

adjustments
- only by qualified personnel
- adhered to safety regulations
- notice adjusting sequence

Presettings

actual value	>>>	jumper,	networks
nominal value inputs,	>>>	jumper,	differential input
logical inputs/outputs	>>>	jumper,	int/ext. supply
P-I parameter switch	>>>	jumper,	switch

Optimization

actual value-adjustment	n_{max} adjustment
current regulator	adjustment by the factory (P- or PI-Controller)
current limits	I_{max}, I-adjustment
torque controller	P-I-switch, Xp-adjustment
slope limitation	INT-adjustment (only nominal value 2)
zero point	offset-adjustment
position controller	in CNC\SPS

Caution:

control systems have to be optimized from inside to outside.
sequence: current controller>> torque controller>>position controller
(CNC\SPS)

Measuring values
control connector X4

measuring value	max.value	measuring point
1st nominal value after input amplifier	±10V	X4:1
2nd nominal value after input amplifier	±10V	X4:2
nominal value current (speed controller)	±10V	X4:3
actual value current unipolar	+ 5V	X4:6
torque actual value after divider	± 5V	X4:7

Nominal Value

Function		1st nominal value	2nd nominal value
input amplifier	constant	1	1
input voltage	max.	±10V=	±10V=
differential input	jumper	S12 unplugged	S11 unplugged
input according to GND	jumper	S12 plugged	S11 plugged
input signal		X1:4	X2:17
input GND		X1:8	X2:28
measuring point control pin		X4:1	X4:2
measuring value	max.	±10V=	±10V=
integrator function		does not exist	jumper SW2

Input in relation to GND	Differential input
with nominal value potentiometer	with nominal value of SPS/CNC
with internal supply voltage	foreign external voltage
jumper S11, S12 plugged	jumper S11, S12 open
notice GND connection	signal- and GND-connection
	exchangeable
	default setup

Both nomimal values connected:
- 1st and 2nd nominal value are added internally
- notice signs
- sum of nominal values not over ±10V

Only with 2nd nominal value
-acceleration and deceleration-ramp linear integrator

2nd nominal value	jumper	Poti	range
without integrator	SW2 pos. 1-2	—-	——
with integrator		SW2 pos. 2-3	INT(P2)

0,1 up to 4,5sec.

without 2nd nom.value	SW2 unplugged		—-

Nominal value current
nominal value from external supply 0 to ±20mA
internal compliance resistors 0 to max. ±10V

1st nominal value	resistor R121
2nd nominal value	resistor R4

Resistance value [Ω]
        = nominal value voltage / nominal value current
(max. 500Ω)

5 Adjustment

Actual Value-Speed

Caution:

Please pay attention to the motor specific connection sheets.

see Appendix A

coarse adjustment
see page 29

Fine adjustment
with potentiometer n_{max} (P4)
with nom. value from potentiometer:

      with 1V Sollwert   **adjust to 10% maximum speed**
      with 10V Sollwert   **fine adjust to 100% .**

with nom. value from CNC\SPS:

      with 0,8V Sollwert   **adjust to 10% maximum speed**

Direction of rotation (looking at motor backside-DIN)
change nominal value polarity at the differtial input

.

Current

Current Limitation

peek current	range 0 up to 200% rated current	Poti P5/P6
	reset time max. 5 sec.	
steady current	range 5 up to 100% rated current	Poti P7

Internal reducing current limits

current limit	function	limit
overload	time	steady current
heat sink	temperature	50% rated current
motor	temperature	50% rated current

The lowest current limit is active!

Peek current
internal current limit (default setup)

adjustment	Jumper	Poti
I_{max1}	S19 plugged	I_{max1} (P5)
I_{max2}	S20 plugged	I_{max2} (P6)

external current limit

adjustment	input		Jumper	Poti
I_{max1}	X1:9	0 .. +10V	S19 unplugged	I_{max1} (P5)
I_{max2}	X1:10	0 .. +10V	S20 unplugged	I_{max2} (P6)

The external current limit can be internally reduced
with the I-potentiometer.

Steady current
motor protection adjustment for both torque directions to
motor rated current potentiometer I_D (P6)

Measure adjusted values:
- motor not connected
- predetermine nominal value and enable >> turn on/off
- measuring value at connector X4:3 (5V=rated current)

nom.value	measuring value I_{max} (2 sec.)	measuring value I_D
+5V	0 bis max.10V	0,25 bis max. 5V
- 5V	0 bis max.10V	0,25 bis max. 5V

Current-actual value
measuring value at connector X4:6 >>> Imax = 0 up to +5V,
I_D = 0,12 up to +2,5V

Caution:
for exact torque regulation:
-changing of adjustment from P-toPI-regulation in the current
   regulator by the manufacturer

5 Adjustment

Speed control switching
- **two 16 pole binary switches S4, S5**
- **amplification trimmer P3 (Xp)**
- **D-component with jumper S14**
- **in case of exchanging the devices>>> take over adjustment values.**

Default setup
- **binary switch S4 und S5 on position 4**
- **amplification trimmer Xp on 50%**
- **no D-component, jumper S14 open**
- **optimal for most drives.**
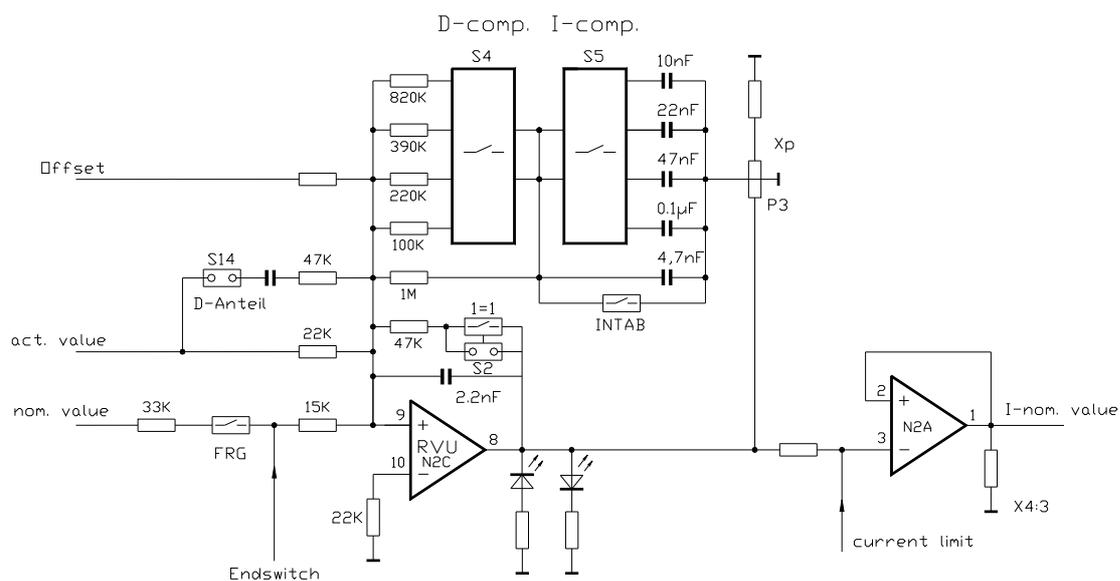
Adjustment P-component with the binary switch S4

switch S4

position	0	1	2	3	4	5	6	7	
R-value	1000	450	280	209	180	148	123	107	kΩ

position	8	9	A	B	C	D	E	F	
R-value	90	82	73	67	64	59	55	52	kΩ
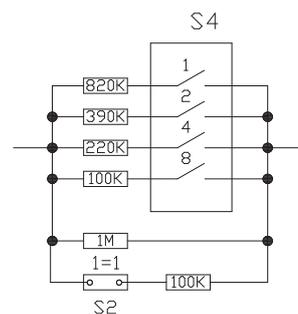
adjustment I-component with the binary switch S5

switch S5

position	0	1	2	3	4	5	6	7	
C-value	0,01	0,02	0,03	0,04	0,08	0,09	0,1	0,11	μF

position	8	9	A	B	C	D	E	F	
C-value	0,11	0,12	0,13	0,14	0,18	0,19	0,2	0,21	μF
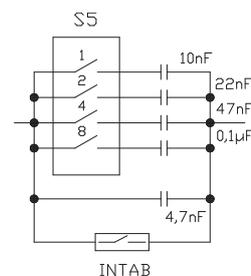
Caution:
with the input INTAB (X2:31) the I-component can be switched off.

Speed controller

Proportional amplification

function binary switch S4

P-amplification

Xp

10

5

0

1 2 3 4 5 6 7 8 9 A B C D E F
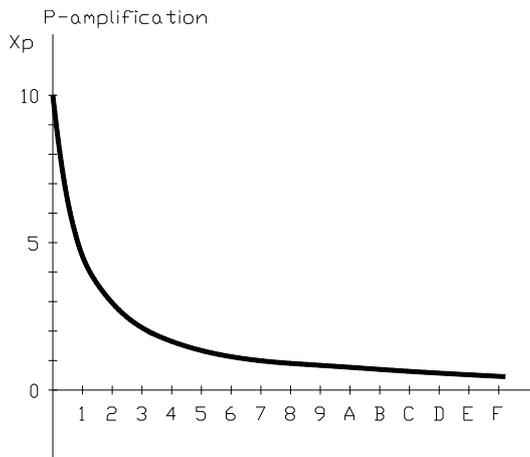
function potentiometer X

Amplification
factor F_{XP}

100
90
80
70
60
50
40
30
20
10

0 1 2 3 4 5 6 7 8 9 100%   trimer position
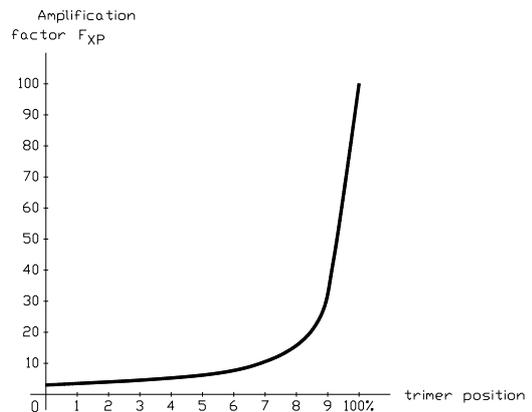
proportional amplification = Xp x Fxp

Adjustment with osciloscope

Strom-
Sollwert

3

Überlauf

2

8

1

4
2

Sollwert

0

100ms   500ms

−1

−2

Überlauf

−3

Stellung Schalter S4

1

2

4

8   1s
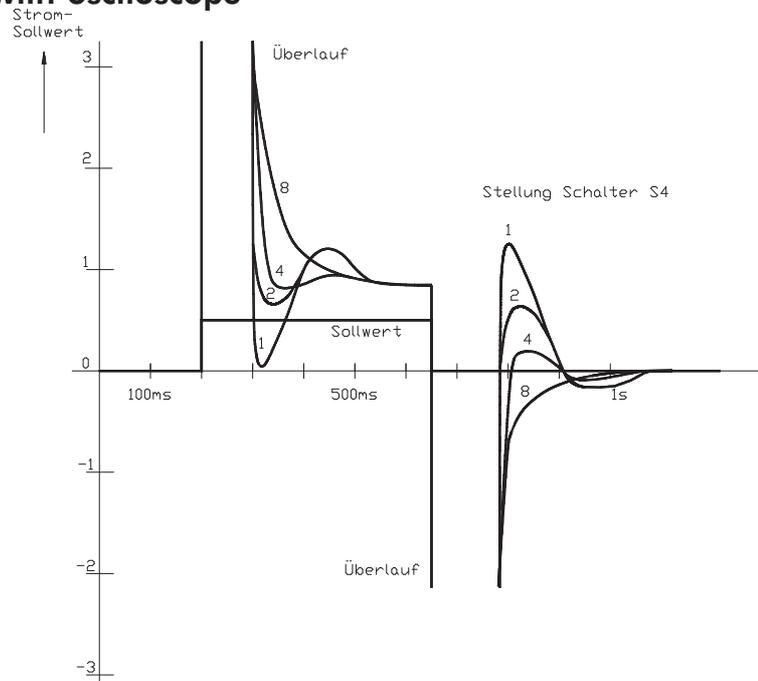
Adjust

- nominal value jump ± 0,5V

- input INTAB X2:31 activated

Effect D-component

- nominal value -differentiation

- jumper S14 plugged

Caution:

In case of position control (CNC/SPS)

do not use D-component

Measuring value

nominal value   X4:1

reply of the controller

nominal value current X4:3

current nom. value
10V
8
6
4
2
0
−2
−4
−6
−8
−10V

without S14

with S14

act. value
X2:109

nom. value
X1:6

s
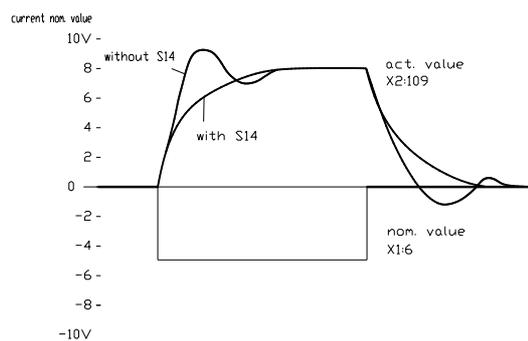
5 Adjustment

Adjustment without measuring instruments

connect the motor,

     nominal value = 0

     Xp   = 50%

     switch S4   = position 4

     switch S5   = position 4

enable the device,

turn potentiometer Xp clockwise until the drive swings.

if there is no oscillation

-turn switch S4 back to a lower value

-set to swinging with potentiometer Xp

-turn the potentiometer Xp anti-clockwise until the swinging fades out

-turn potentiometer Xp another two positions anti-clockwise.

Setup switch S5 so, that the drive runs smoothly after about two oscillations when there was a nominal value jump off 50%.

Responce of the drive:

amplification too low	amplification too high
long wave oscillation 1 ... 0,1Hz	short wave oszillation 30 ... 200Hz
long ballistic factors	vibrates >in case of acceleration,
overshoots target position	vibrates >in case of deceleration and in position

Caution:

operation with CNC\SPS - control

-ad maximum speed >>> speed nominal value from 8 up to 9V

Transistor-Servo-Drive TVD6.2-RS

Default setup

check connections before putting into operation

- mains connection   clamps X3:3, X3:4, X3:5 max. 460V~
- protective conductor   earth screw at case
- motor connection clamps X3:7, X3:8, X3:9
- motor earth connection   clamps X3:6
- option
- external ballast resistor   clamps X3:1 and X3:2
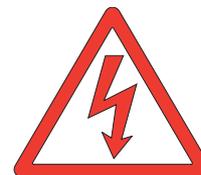
mind connection advices on page 12.

Encoder connection X7   pay attention to the motor specific
                                connection sheets. See appendix A

Basic connections-supply lines

- protective conductor
- mains   1x oder 3x 400V~
- motor   3x motorline + earth conductor + screen
- encoder   pay attention to the motor specific
                                connection sheets.

Basic connections - control lines

enable   contact betweem X1:1 and X1:2
nominal value   signal X1:4, GND X1:8
limit switch   limit switch at X1:16 and X2:32
                                or bridge X2:27 to X1:16, X2:32

Default adjustment for first putting into operation

switch	S4	P-amplification	position 4
switch	S5	I-component	position 4
potentiometer	I_{max1}	peak current	10%
potentiometer	I_{max2}	peak current	10%
potentiometer	I_D	steady current	100%
potentiometer	X_p	amplification	50%
potentiometer	INT	integrator	anti-clockwise stroke
potentiometer	n_{max}	speed	anti-clockwise stroke

Jumper	unplugged	plugged
	S2, S14, S18	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

6 Getting Started

```
┌─────────────────────────┐
│     turn on mains        │◄──────────────────────────────────────────┐
└─────────────────────────┘                                            │
            │ yes                                                       │
            ▼                                                           │
┌─────────────────────────┐  no   ┌──────────────────────────────────┐ │
│     LED D1A bright       │──────►│      check mains connection      │─┤
│     LED D1E bright       │       │         turn off mains           │ │
└─────────────────────────┘       │   check power supply unit fuse   │ │
            │ yes                  └──────────────────────────────────┘ │
            ▼                                                           │
┌─────────────────────────┐  no   ┌──────────────────────────────────┐ │
│     LED D1H bright       │──────►│        turn off mains            │─┤
│     LED D1G bright       │       │      check limit switches        │ │
└─────────────────────────┘       │     connect limit switches       │ │
            │ yes                  │       or thread bridges          │ │
            ▼                      └──────────────────────────────────┘ │
┌─────────────────────────┐                                            │
│      enable drive        │                                            │
└─────────────────────────┘                                            │
            │ yes                                                       │
            ▼                                                           │
┌─────────────────────────┐  no   ┌──────────────────────────────────┐ │
│      LED D1B bright      │──────►│        turn off mains            │─┤
└─────────────────────────┘       │    check enable voltage and      │ │
            │ yes                  │     chain of enable contacts     │ │
            ▼                      └──────────────────────────────────┘ │
┌─────────────────────────┐                                            │
│ increase nom.value to 10%│                                            │
└─────────────────────────┘                                            │
            │ yes                                                       │
            ▼                                                           │
┌─────────────────────────┐  no   ┌──────────────────────────────────┐ │
│      motor turns         │──────►│       motor speeds up >>         │─┤
│    with about 10% of     │       │      motor stands still >>       │ │
│    maximum speed         │       │        turn off mains            │ │
└─────────────────────────┘       │   check motor and encoder lines  │ │
            │ yes                  └──────────────────────────────────┘ │
            ▼                                                           │
┌─────────────────────────┐  no   ┌──────────────────────────────────┐ │
│    motor run smooth      │──────►│    amplification too high Xp >>  │─┘
│       not jerky          │       │       turn anticlockwise         │
└─────────────────────────┘       │        turn off mains            │
            │ yes                  │   check motor and encoder lines  │
            ▼                      └──────────────────────────────────┘
┌─────────────────────────┐
│    adjust speed with     │
│     poti n.. to 10%      │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ adjust nom. dcvalue      │
│     value to 0V          │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐  no   ┌──────────────────────────────────┐
│   drive stands still     │──────►│   adjust speed with poti "Offset"│
└─────────────────────────┘       │         to standstill            │
            │ yes                  └──────────────────────────────────┘
            ▼                                   │
┌─────────────────────────┐                     │
│ increase nom.value to 50%│◄────────────────────┘
│ turn poti X clockwise until the drive
│ oszillates, then turn anti-clockwise until
│ the drive runs smooth    │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ adjust current limits with poti Imax1 and
│ Imax2 to the peek current
│ and with poti ID to the steady current
│ acording to the motor data │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Getting started finished │
│      turn off mains      │
│ optimize drive and record the adjustment
│    dates in the protocol │
└─────────────────────────┘
```

Transistor-Servo-Drive TVD6.2-RS

```
┌─────────────────────┐
│   Switch on mais    │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐   yes   ┌──────────────────────────┐
│    All LED dark     │────────▶│    No mains V0ltage      │
└─────────────────────┘         │ fuse on power supply unit│
          │ no                  │       blown out          │
          ▼                     └──────────────────────────┘
┌─────────────────────┐   yes   ┌──────────────────────────┐
│   LED D1A dark      │────────▶│  Check power supply unit │
│   LED D2A bright    │         └──────────────────────────┘
└─────────────────────┘
          │
          ▼
┌─────────────────────┐   yes
│   LED D1A dark      │──────────────┐
│   LED D2A dark      │              │
└─────────────────────┘              ▼
          │ no        ┌─────────────────────┐   yes   ┌──────────────────────┐
          │           │   LED D2B bright    │────────▶│  internal or external│
          │           └─────────────────────┘         │     power supply     │
          │                     │                      │      overloaded      │
          │                     ▼                      └──────────────────────┘
          │           ┌─────────────────────┐   yes   ┌──────────────────────────┐
          │           │   LED D2F bright    │────────▶│ short or line-to-earth   │
          │           └─────────────────────┘         │   fault in motor line    │
          │                     │                      │   or outputstage error   │
          │                     ▼                      └──────────────────────────┘
          │           ┌─────────────────────┐   yes   ┌──────────────────────────┐
          │           │   LED D2G bright    │────────▶│ heatsink-temperature >80°C│
          │           └─────────────────────┘         └──────────────────────────┘
          │                     │
          │ yes                 ▼
          │           ┌──────────────────────┐
          ▼           │  let device be checked│
┌─────────────────────┐ │  by the manufactorer │
│ connect limit switches│ └──────────────────────┘
└─────────────────────┘
          │
          ▼
┌─────────────────────┐   yes   ┌──────────────────────┐
│   LED D1G dark      │────────▶│ check limit switches │
│   LED D1H dark      │         │   or bridge limit    │
└─────────────────────┘         │      switches        │
          │ yes                 └──────────────────────┘
          ▼
┌─────────────────────┐
│   connect enable    │
└─────────────────────┘
          │ yes
          ▼
┌─────────────────────┐   yes   ┌──────────────────────┐
│   LED D1B dark      │────────▶│  check enable voltage│
└─────────────────────┘         │     and jumpers      │
          │ no                  └──────────────────────┘
          ▼
┌─────────────────────┐
│  preset nom.v alue ±│
└─────────────────────┘
          │ no
          ▼
┌─────────────────────┐   yes   ┌──────────────────────┐
│   LED D1C dark      │────────▶│   check nom.value    │
│   LED D1D dark      │         │     and jumper       │
└─────────────────────┘         └──────────────────────┘
          │ no
          ▼
┌─────────────────────┐   yes   ┌──────────────────────────┐
│   LED D1F bright    │────────▶│   motor mech. blocked    │
└─────────────────────┘         │ motor- or encoder line wrong│
          │ no                  └──────────────────────────┘
          ▼
┌─────────────────────┐
│ let device be checked│
│ by the manufactorer  │
└─────────────────────┘
```
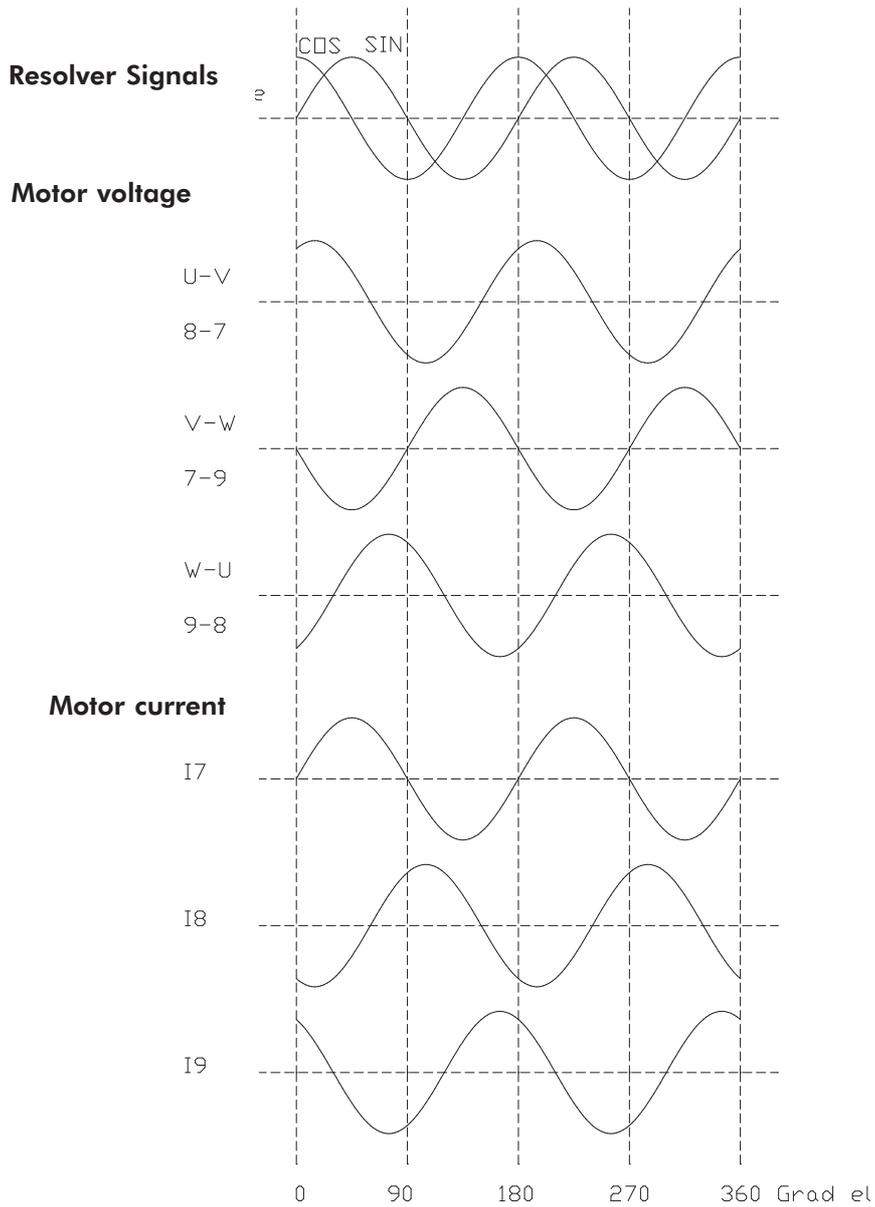
7 Fault Finding

Faults

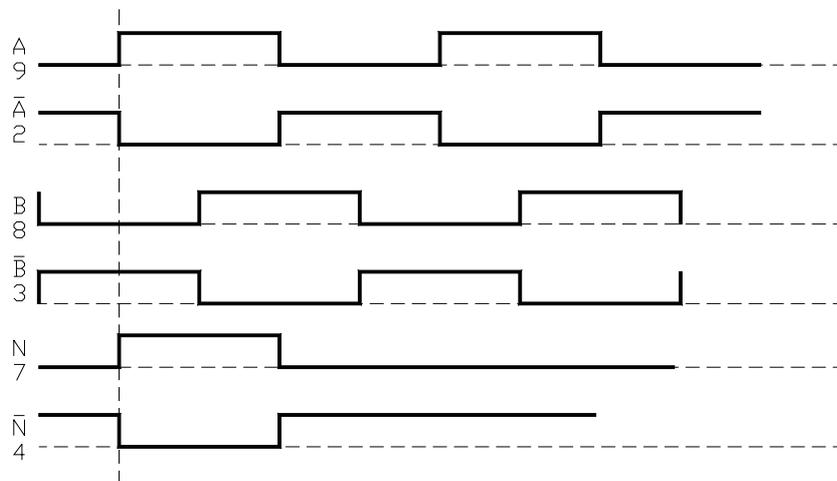| Fault	Causes
motor is fixed in one position, runs jerkey or swings in one position	**transmittercable or motorcable connection wire changed or interrupted. Switchposition S1: pos3 and pos4 wrong(pole-number adaption)**
motor speeds up	**motor- or rotor positon- line wire in rotating field 120° leading or lagging.**
motor runs restless	**tachometer- connection wires exchanged or interrupted amplification too high. nominal value failure**
power supply unit goes while braking to failure LED D2-A glows	**braking energy too high**
power supply unit goes while switching on to failure LED D2-A glows	**power supply phase is missed or the mains voltage is too low.**
amplifier switches to failure	**overtemperature, phase- or line-to-earth fault . BTB-fault power amplifier mistake.**
speed is not adjustable with potentiometer n_{max}	**resistor R19 or switch-position S1-1, S1-2 on RESO2-x wrong**

Transistor-Servo-Drive TVD6.2-RS

Connector X4

Enable   X1:2   +10V

nom. value 1   X1:4   +5V   -5V

nom. value 2   X2:17   +5V   -5V

measuring points

nom. value 1   X4:1   +5V   -5V

nom. value 2   X4:2   +5V   -5V
Jumper

current nom.value   X4:3   +10V   -10V

current act.value   X4:6   +5V

speed act.value   X4:7   +2.5V   -2.5V

enable   X4:8   +12V

motor direction   rechts   links   rechts   links
looking on axle

7 Fault Finding

Resolver Signals

COS SIN

e

Motor voltage

U–V

8–7

V–W

7–9

W–U

9–8

Motor current

I7

I8

I9

0   90   180   270   360 Grad el
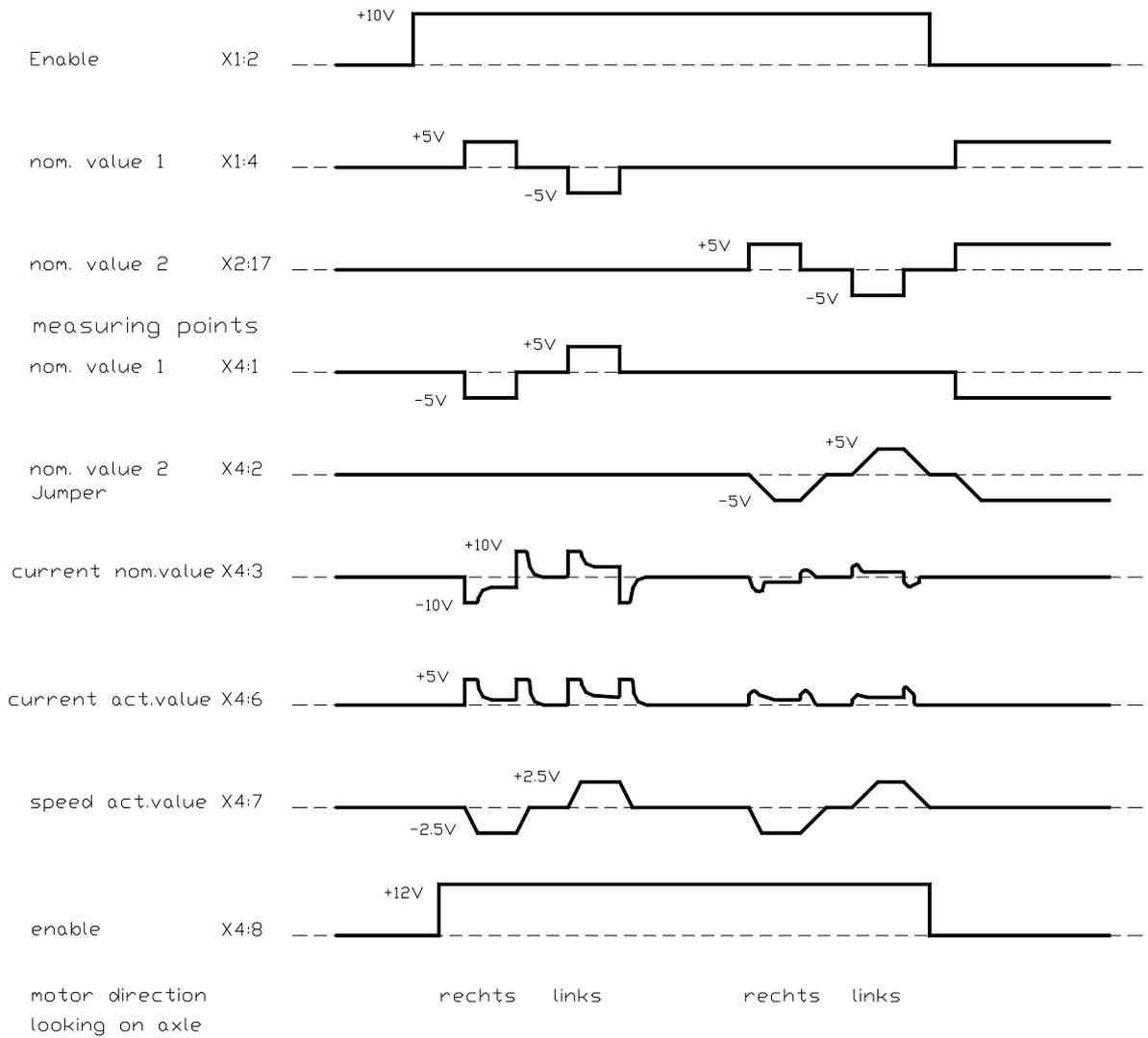
Incremental output
D-plug X8

GND = X8:5
+5V = X8:1

A
9

Ā
2

B
8

B̄
3

N
7

N̄
4

Guarantee

UNITEK products have a warranty against defects in material and workmanship for a period of one year from the date of shipment. All values from the pre- and final quality control checks are archivied with the devices' serial numbers. UNITEK does not guarantee the suitability of the device for any specific application.

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 the all
  consignments,
* non-observance of the electrical standards and regulations
* improper maintenance
* acts of nature

All further claims on transformation, diminution and replacement of any kind of damage, especially damage, which does not affect the UNITEK device, cannot be considered. Follow-on damage within the machine or system, which may arise due to malfunction or defect in the device cannot be claimed. This limitation does not affect the product liability laws as applied in the place of manufacture (i. e. Germany).

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9 Protocol

Customer: . . . .**Maschine-No** . . . .

Device: . . . .   **Series-No** . . . .

Anschlußspannung   **[V=,V~].** . . . .

Eingänge

Enable	**Contact ?**	**voltage [V=]**
Nom. value1	**Type**	**voltage [V=]**
Nom.value 2 additional Type		**voltage [V=]**
current nom.value Imax1 external		**voltage [V=]**
current nom.value Imax2 external		**voltage [V=]**

Adjustments speed controller

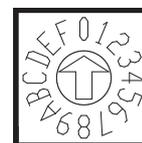**Act.value coarse adjustment**
DC-Tacho   **S9**   **position**

Switch positions
P-component   **S4**   **position**
I-component   **S5**   **position**
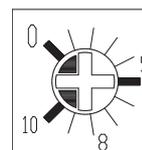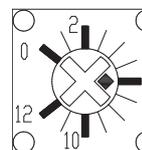

Potistellungen
Speed	**nmax**	**P4**	**position**
Peek current	**Imax1**	**P5**	**position**
Peek current	**Imax2**	**P6**	**position**
Steady current	**ID**	**P7**	**position**
Integrator	**INT**	**P2**	**position**
Amplification	**Xp**	**P3**	**position**
Offset	**Offset**	**P8**	**position**

Jumper (plug-in bridges) soldjumper
plugged   **Nr.** . . . .
Unplug   **Nr.** . . . .

Protocol

Adjustment power section

Amplification current controller

Resistors current controller   [kW]. . . . .

Measuring values

Motor voltage   **max.**   [V~]   3x

Motor current   **peek**   [A~]   3x

Motor current   **steady**   [A~]   3x

DC-Tacho voltage max   [V=]

Acceleration   [V/ms]

Deceleration   [V/ms]

Motor data

Identification plate specifications

Producer . . . .

Type . . . .   **Series No.** . . . .

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

Brake   [V] . . . .   **Fan**[V]