TVQ6.2

Manual

Transistor-Servo-Drive

for

DC-Servo-Motors

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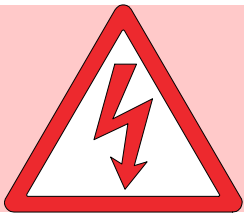
Safety Advice

Electronic devices allways involve the risk of failure.

Caution High Voltage

AC 230V~, DC 400V=



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

The TVQ6 series is designed to regulate electrical currents;
protection standard IP00.

Standards and Guidelines:

The device and it's associated components can only be installed and switched on where the local laws 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
- Regulations of Professional and Occupational bodies: VGB4

The user has to assure that:
- after a failure of the device
- an incorrect handling,
- after a breakdown of the control unit etc.

the drive has to be brought to a secure operating condition.
Machines and installations are to be provided with supervisory and safety equipment, that is indepentent 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 their serial number.

CE
The EU-guide line 89/336/EWG with the Regulations EN61000-2 and EN61000-4 are observed.

General Information

The transistor servo amplifier TVQ6 forms together with the brushless direct current motor a propulsion unit distinguished by its high control performance.
Using a DC-motor the current is propotional to the torque and the voltage is propotional to the speed.
Current and speed are measured precisely.
The analoque regulation circuits of the servoamplifier are designed simply.
The speed actual value is generated from the tachogenerator or the armature voltage.
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.

As occurs in all DC-, AC or ec-servo-amplifiers which are supplied by the dc-bus, when braking the feed-back of the energy in the dc-bus must be observed . (winding machines, lifts, great centrifugal masses)
The ballast circuit is set for 3% on-period, higher duty circles can reached by mounting external resistors (Option).

Information:

Further servo amplifiers for DC-servo motores

for low power	UNITEK series SERVO-TV3&TV6, 24-120V, 6-12A UNITEk series TVQ6.2
for higher power	UNITEK series Classic Q2, Q6 up to 250V, 15-60A

Motor controller for DC-shuntwoound motors
from midrange to highest

Power	UNITEK series Classic Q1, Q3 up to 550V, 15-2000A

3-phase servo amplifiers for AC-synchro servo motors

for low power	UNITEK series SERVO-TVD3-2 -xx-bl, IN, RS 24-15V, 5-10A
for midrange power	UNITEK series SERVO-TVD6-2 -bl, IN, RS 200V and 400V, 5-25/40A
for high power	UNITEK series AS 250bl, AS 450RS UNITEK series DS 400
for Battery-operation	UNITEK series BAMO

Application

for all kinds of machines up to 4KW 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.

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, calander and many other machines and installations .

Notice:
In drives which mainly require deceleration
For example:
-> ing machines, lifts, great centrifugal masses.

The braking energy will be annihilated in the ballast circuit or re-feeded to the mains using an external d.c.-to -a.c. inverter.

With several axes an energy compensation is possible.

Construction

Cubicle-mount compact device or 6HE-plug-in unit According to the VDE- DIN- and EU- regulations.
Standard analog regulation electronics.
Power section for 10A, 16A and 25A.
Wide-band chopper supply unit for the auxiliary voltages.
Power supply unit on the back panel circuit board .

Galvanic isolation between:
- Power section and Case
- Power section and regulation electronics
- Regulation electronics and logical inputs

The leakage distances are according to the CE 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 trimmers for fine adjustment
- Plug-in jumpers for system setup.

Characteristics:

* Direct power supply 230V~
* 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
* Logical in- and outputs with optocouplers
* 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 connector

Power Connection

Direct to the mains max. 1x 230V~ ±10%
With autotransformer max. 3x 230V~ ±10%

Option : mains voltage 60 up to 180V~ adjustment by manufacturer required
Specify mains voltage when ordering!

Data: TVQ6-250-			***10***	***16***	***25***
Output voltage		V=	250	250	250
Output-standstill current	Steady	A=	10	16	25
	Peek	A=	20	32	40
Maximum electric power.		W	2000	3200	5000
Fast fuses built in		A	20	20	20
Dimensions Plug-in-uni		WxH	16TE	16TE	24TE 6HE
Cooling		60% ED 100%ED	convect fan	convect fan	fan fan
Switch cabinet mounting		WxHxD	see dimensions page 9 to 11		

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)
Extented operation range	up to60°C red. 2%/°C
Bearing range	-30°C up to + 80°C
Speed controller	
control precision (excl. act.value error)	±0.1%
Control range	>1:1000
Nominal value inputs	±10V=
Logical inputs	> +10 … +30V=
Logical outputs	> +14V, 6mA

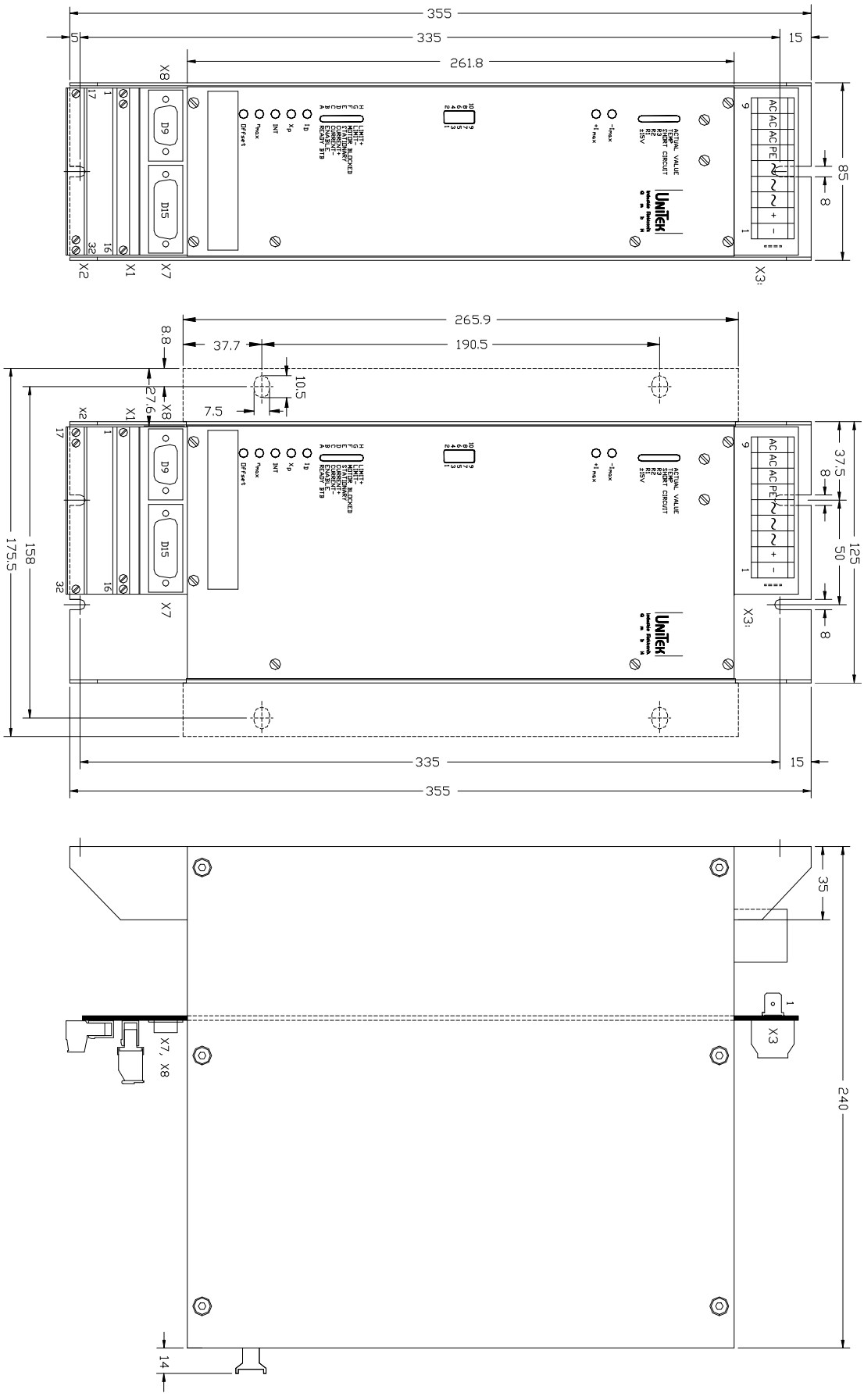
Caution:

When order please specify:	
Notice duty cycle	Fan with 100% on period
Several axes with 16A rated current in one rack.	use external fan
Mains voltage <180V~	charing circuit must be bridged
Exact torque regulation	Current controller with PI-switching
Great centrifugal mass	external ballast resistor >300Ω, 600Ω

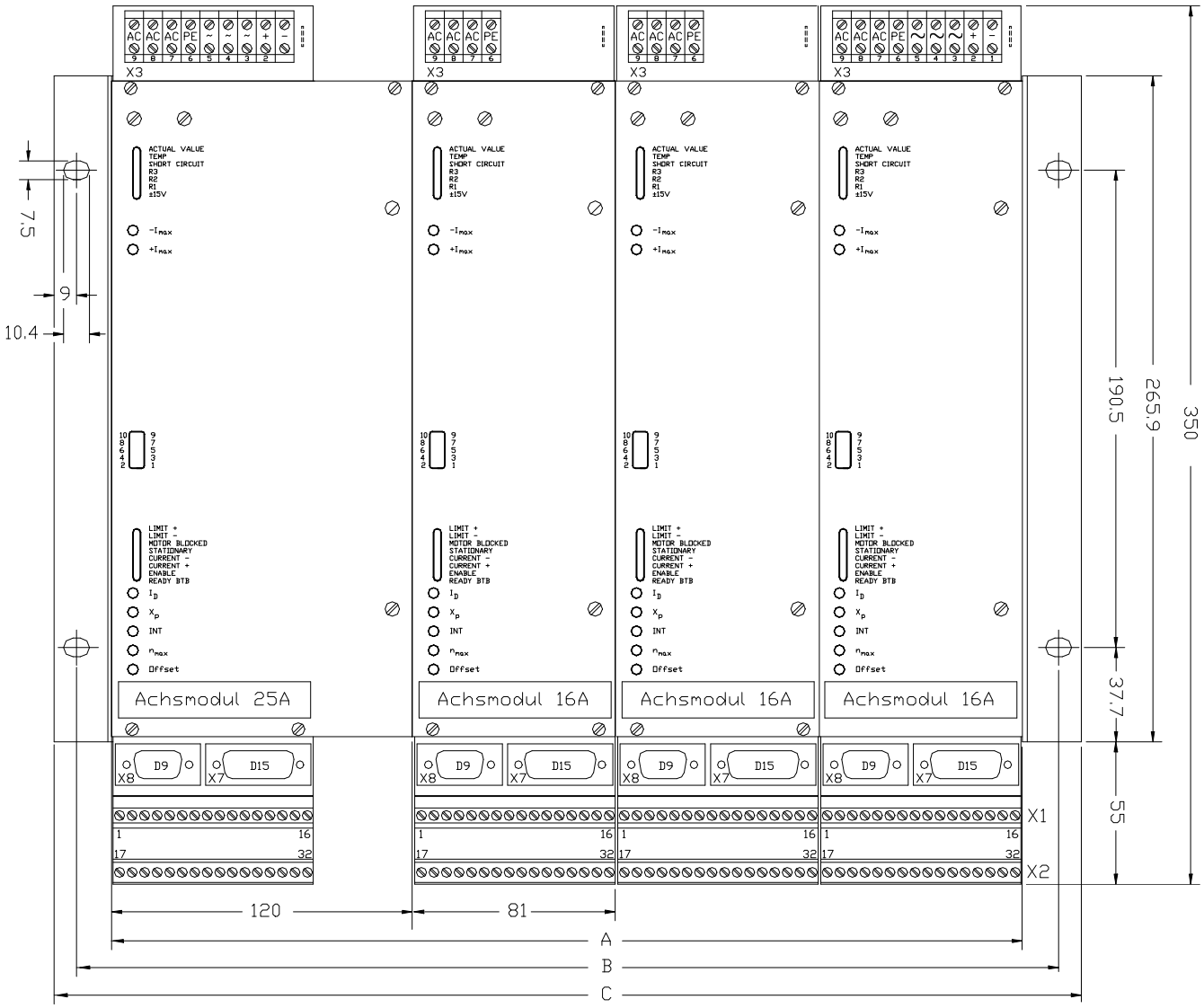
Dimensions

Compact device 10,16A

25A



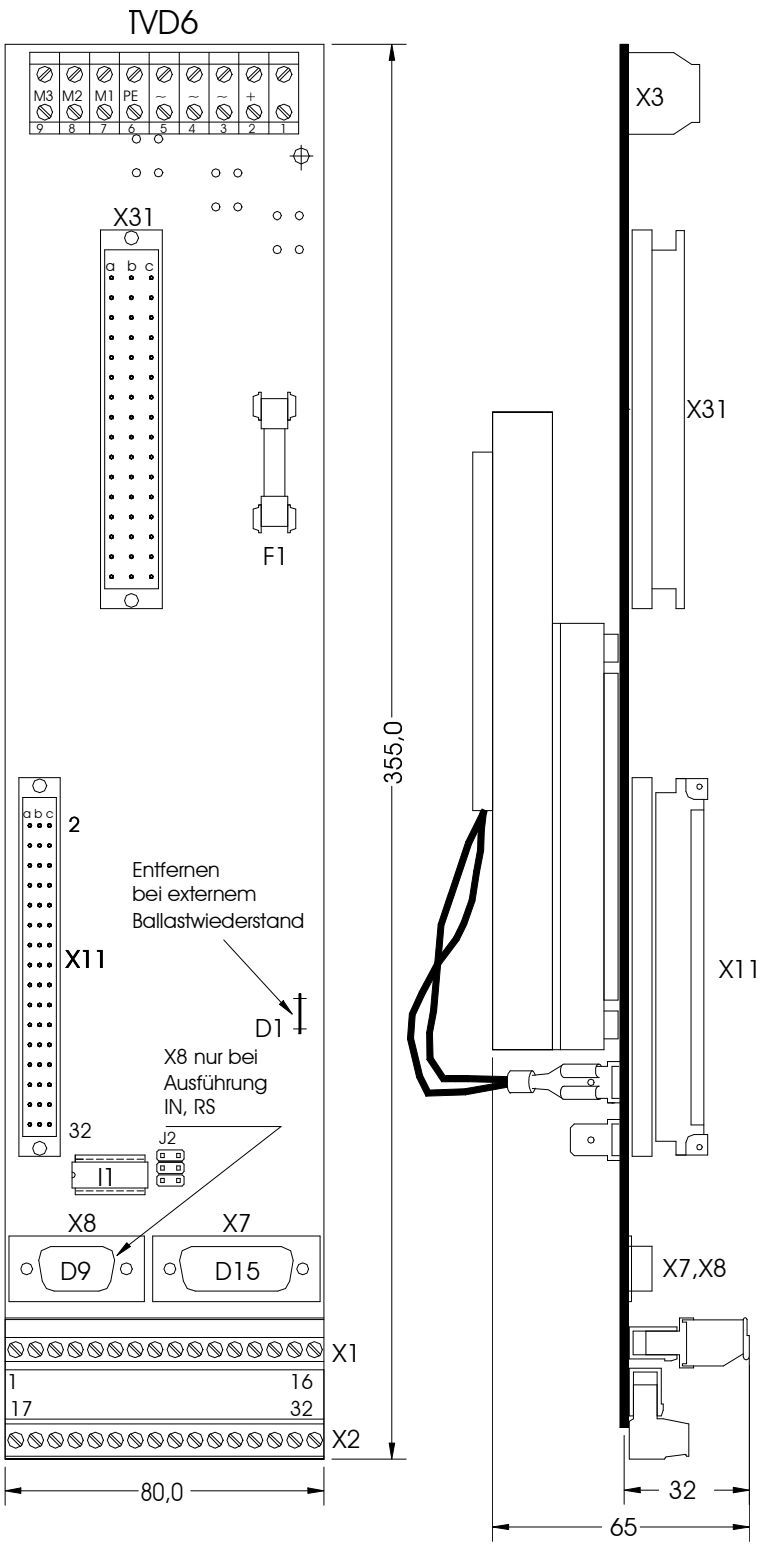
Multi axes combination



Dimensions 6HE (mm)					
Dimensions	*plug-in units*				
	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
Rated current <= 16A E= 81.28mm
Rated current 25A E=121.92mm

Mounting height 255mm

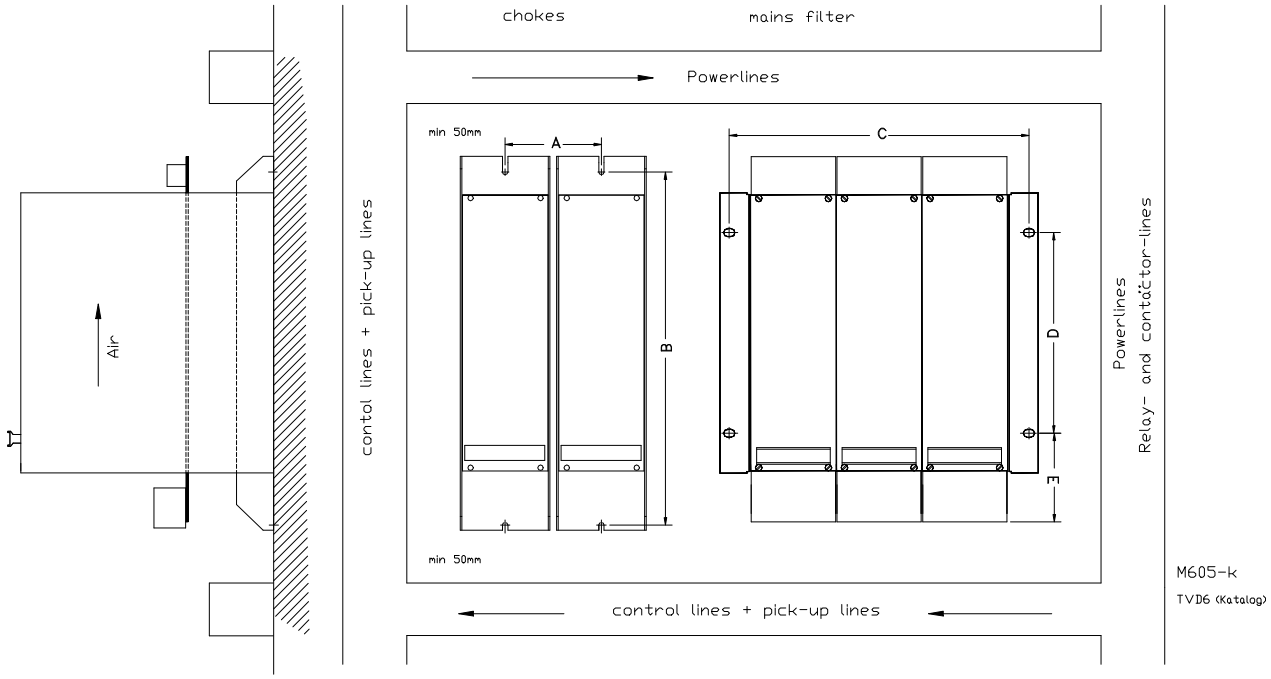


Power supply unit back panel with plug-in-device (without rack)

Rack

Hight units	: 6HE
Wide units 10,16A device	: 16TE
Wide units 25Adevice	: 24TE

Mixed 6HE, 3HE racks on request



Mounting dimensions (mm)

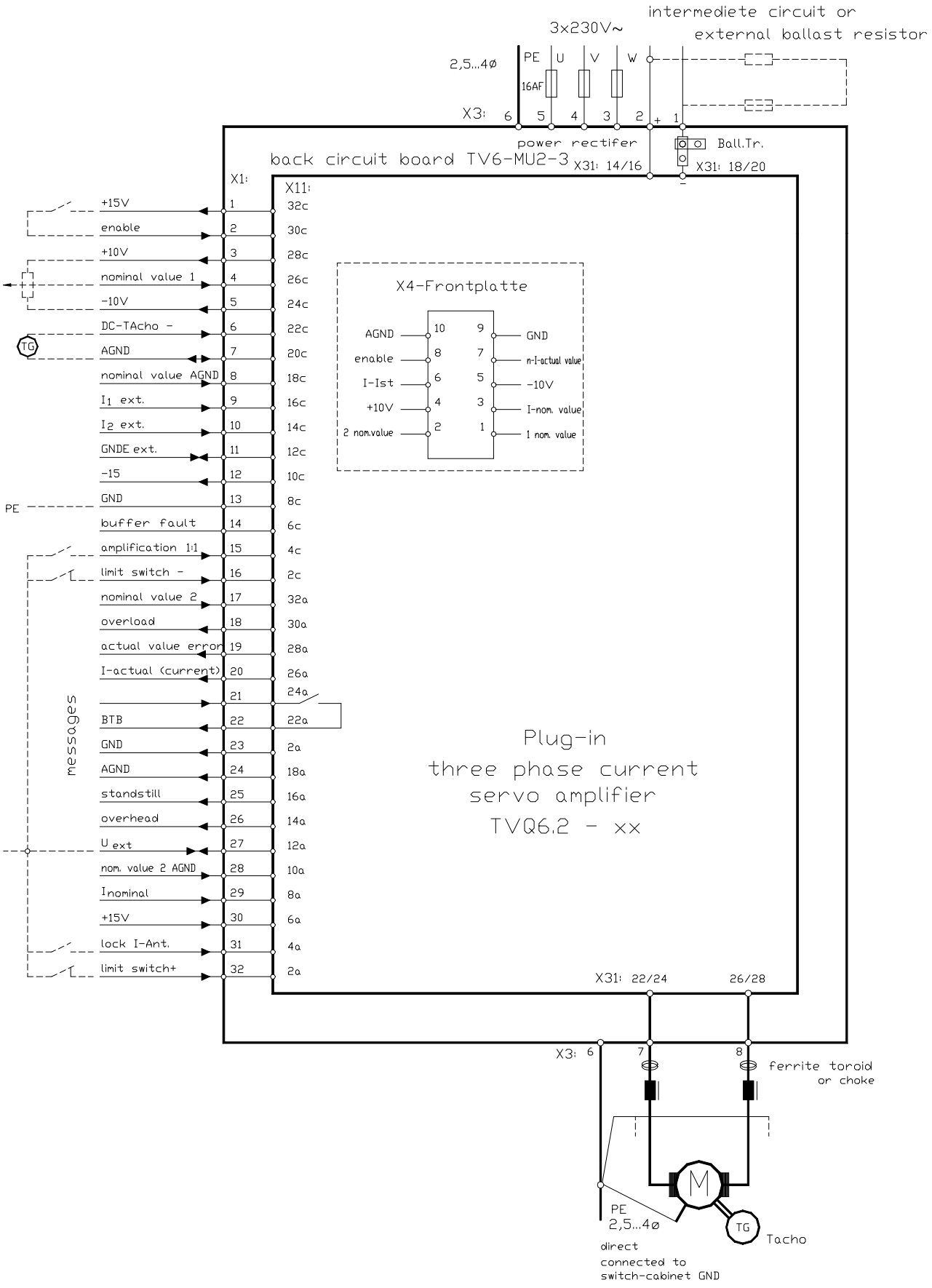
Compact device

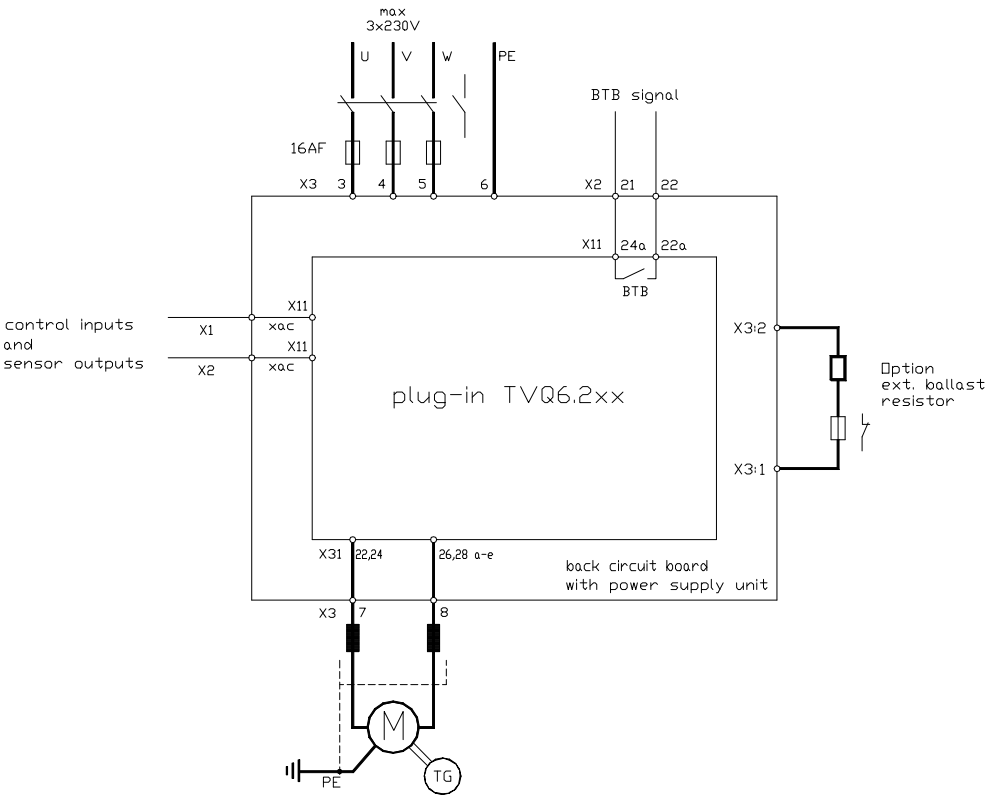
Current	A	B	C	D	E	thread
10,16A	95	335				M4
25-w	135	335				M4
25-sw	180		158	190.5	55	M5

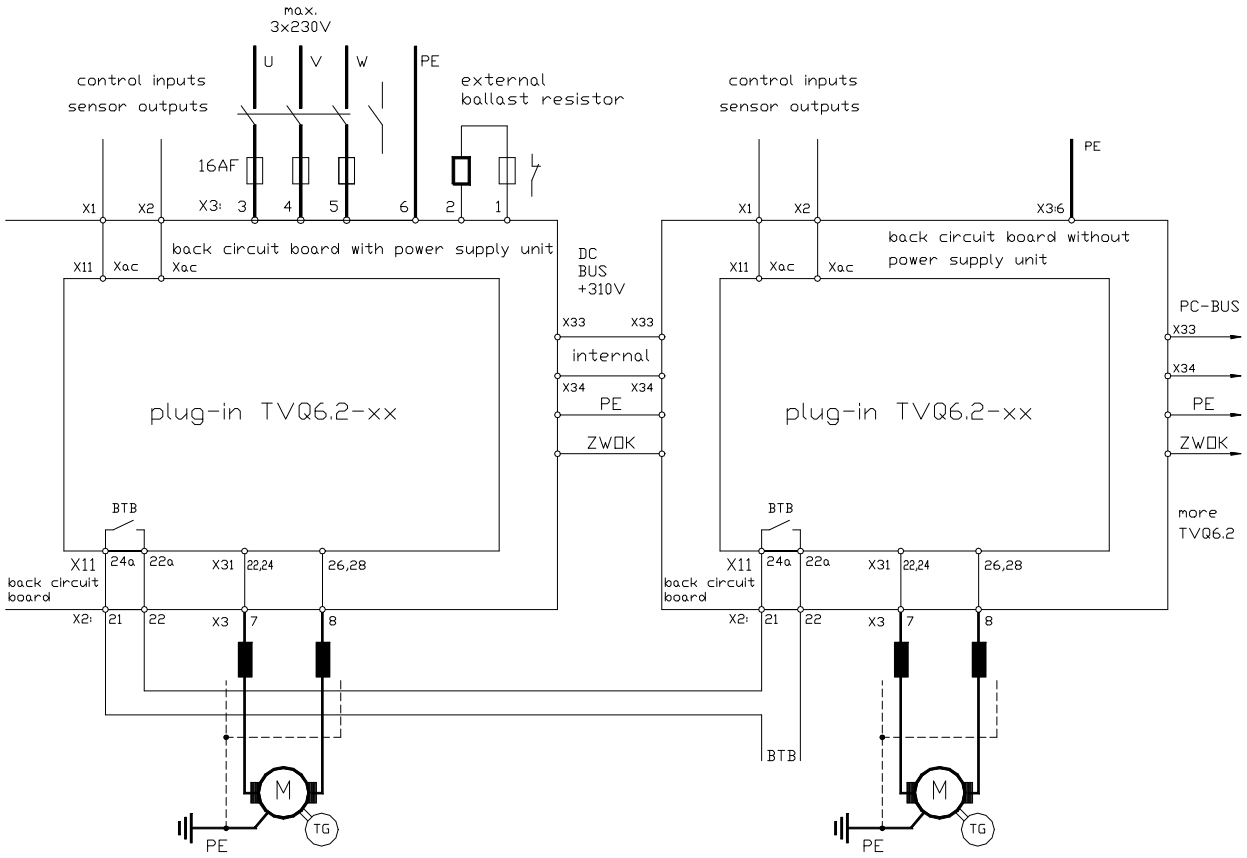
Multi-axes combination

	A	C	D	E	thread
Wall mounting	nxE+60	nxE+40	190.5	55	M5

Rated current = 10,16A E = 81.28mm n = number of plug-in units
Rated current = 25A E = 121.92mm

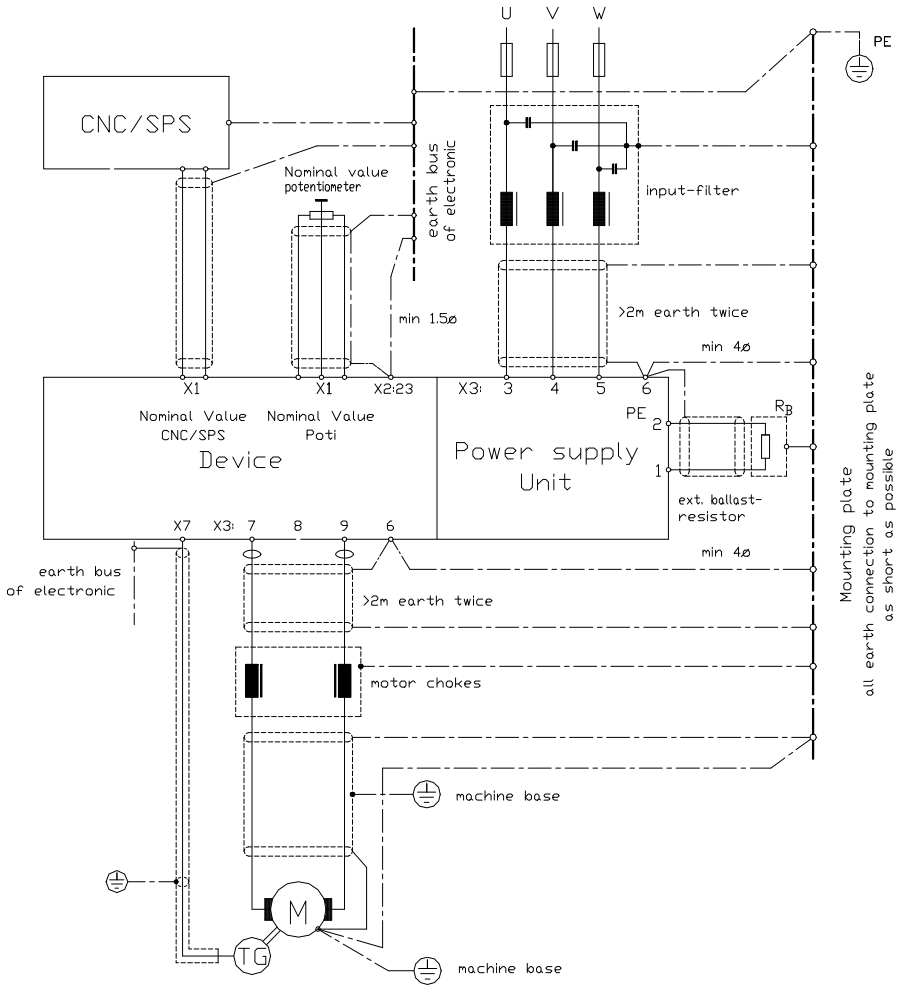

intermediete circuit or
external ballast resistor
3x230V~
2,5...4ø
PE U V W
16AF
X3: 6 5 4 3 2 + 1
power rectifer
Ball.Tr.
back circuit board TV6-MU2-3
X31: 14/16
X31: 18/20
X1:
X11:
+15V 1 32c
enable 2 30c
+10V 3 28c
nominal value 1 4 26c
-10V 5 24c
DC-TAcho - 6 22c
TG
AGND 7 20c
nominal value AGND 8 18c
I1 ext. 9 16c
I2 ext. 10 14c
GNDE ext. 11 12c
-15 12 10c
PE
GND 13 8c
buffer fault 14 6c
amplification 1:1 15 4c
limit switch - 16 2c
nominal value 2 17 32a
overload 18 30a
actual value error 19 28a
I-actual (current) 20 26a
21 24a
messages
BTB 22 22a
GND 23 2a
AGND 24 18a
standstill 25 16a
overhead 26 14a
U ext 27 12a
nom. value 2 AGND 28 10a
Inominal 29 8a
+15V 30 6a
lock I-Ant. 31 4a
limit switch+ 32 2a
X4-Frontplatte
AGND 10 9 GND
enable 8 7 n-I-actual value
I-Ist 6 5 -10V
+10V 4 3 I-nom. value
2 nom.value 2 1 1 nom. value
Plug-in
three phase current
servo amplifier
TVQ6.2 - xx
X31: 22/24
26/28
X3: 6 7 8
ferrite toroid
or choke
M
TG
Tacho
PE
2,5...4ø
direct
connected to
switch-cabinet GND


max
3x230V
U
V
W
PE
16AF
X3
3
4
5
6
BTB signal
X2
21
22
X11
24a
22a
BTB
control inputs
and
sensor outputs
X1
X2
X11
xac
X11
xac
plug-in TVQ6.2xx
X3:2
X3:1
Option
ext. ballast
resistor
X31
22,24
26,28 a-e
back circuit board
with power supply unit
X3
7
8
M
TG
PE


max.
3x230V
U
V
W
PE
control inputs
sensor outputs
external
ballast resistor
16AF
X3:
3
4
5
6
2
1
X1
X2
back circuit board with power supply unit
X11
Xac
Xac
plug-in TVQ6.2-xx
DC
BUS
+310V
X33
X33
internal
X34
X34
PE
ZWOK
BTB
X11
24a
22a
X31
22,24
26,28
back circuit
board
X2:
21
22
X3
7
8
control inputs
sensor outputs
PE
X3:6
back circuit board without
power supply unit
PC-BUS
X33
X34
PE
ZWOK
more
TVQ6.2
BTB
M
TG
PE

Earthing Plan

EMC-Advice



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 10mm^2 wire.
Devices reference X1:13 connected to mounting board with a 2.5mm^2 wire.
Device-PE-screw connected to mounting board with a 50mm long 4mm^2 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 = MD78-10 16A = MD84-20 5A = MD84-30

motor line 1,5m long, 4core shielded. Shielding on device side fixed to mounting board and on motor side flächig connected to PE.

Contol lines supply:
All lines shielded <1.5m. Shielding fixed to PE

Connetion Advice

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 filters:

(See EMC advices on page 14)
short line length between input filter and device or shielded line.

Parasitic current switch

- Bauart nach DIN VDE 0664
- tripping current > 200mA
- only combined with other safety precaution

Connection to 230 V~ Mains

2-phase connection 1x 230V~

compact device up to 10A.
multi axis combination up to 20A

3-phase connection 3x 230V~

with >10A (multi axis combination > 20A) necessary

Connection lines, Fuses

Dimensioning		**10A**	**16A**	**25A**	**max. 30A**
Cross section	mm²	0.75	1.5	2.5	2.5
Fusing					
blow-out fuse	AF	10	16	25	30
automatic circuit braker	A	10	16	25	25

electronical starting current limitation to 7A~

Connection to 400V~ Netz

2-phase or 3-phase connection
Auto- or isolationtransformer
One transformer for serveral devices

Notice:
- rate contactor according to transformer inrush current.
- time-lag fuses before transformer
- fuse value according to transformer current
- fast fuses after transformer
- fuse value per powersupply unit max. 30AF

Transformer power (Example):

Primay voltage	400V~
Secondary voltage	230V~

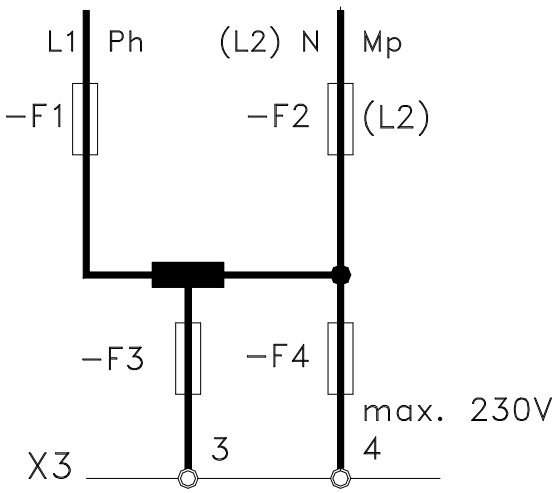
Autotransformer
Transformer rated current [VA] = 0.6 x 230 x IM x GLF x nF

Isolationtransformer
Transformer rated current [VA] = 1.42 x 230 x IM x GLF x nF

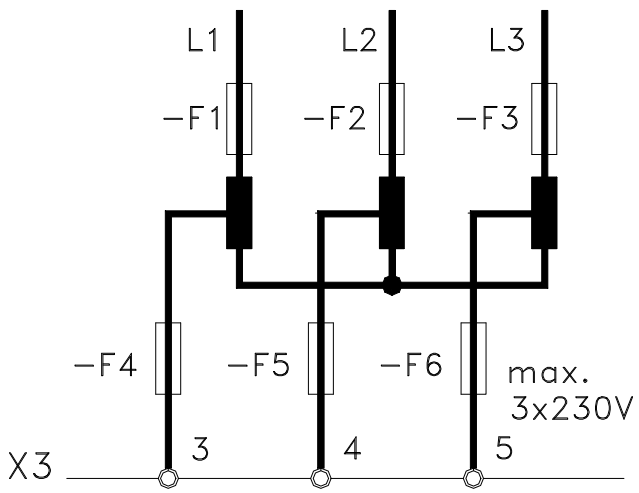
IM = sum of motor currents
GLF = coincidence factor
nF = speed ratio- factor

GLF =		**nF =**
1	with 1 motor	effective speed
0.5 ... 0.7	with 2 motors	maximum speed
0.4 ... 0.6	more than 2 motoren	

2-phase-voltage



3-phase-voltage



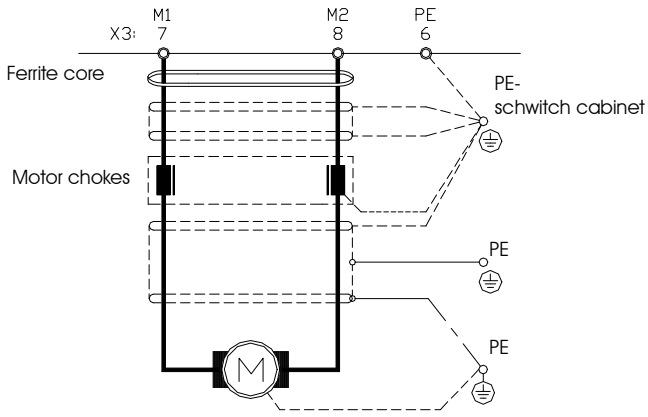
Motor Power connection

Line number	PE	M1	M2	M3
Connection X3	X3:6	X3:7	X3:8	X3:9

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

motor line at	10A	16A	25A	thermo	brake
Cross section	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 long lines earth several times



Ferrit cores
- against HF-disturbance

Motor Chockes
- against LF-disturbance
- 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

$$P_{brake}\ [W] = \frac{1 \times Jg \times n^2}{2} - \frac{Jg^2 \times a \times n}{M_M} \times f$$

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

To change on back panel power supply unit:
- remove solding bridge D

Notice:

External ballast resistor	>>>	minimum resistance 20Ω
Internal ballast resistor		27W/50Ω, at 3% on-period = 1.5 kW

Control Connections

The connecting advices are for general information and without obligation

Notice:
- **Connecting- and operating instructions**
- **Local regulations**
- **EU-machine regulation**

Connector numbers
Clamp connectors X1: 1 up to X1:16 and X2 : 17 up to X2 : 32

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

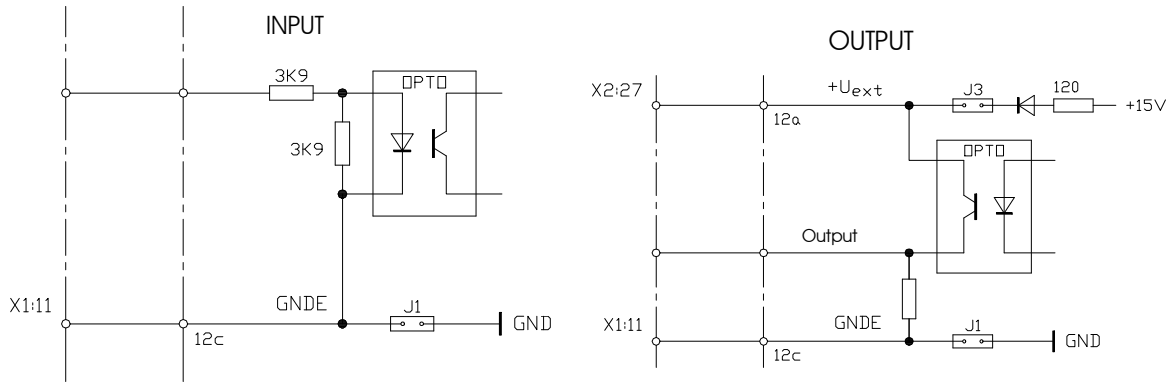
Logical connections
Relay with golden pins or reed relay. Maximum currency on contact 6mA.

Internal Logical voltage 15V=
- not galvanic isolated
- with relay control
- Jumper J1 and J3 plugged

External logical voltage
- galvanic isolated
- used with SPS or CNC
- UEXT +15 bis 30V= at clamp X2:27
- GNDE at clamp X1:11
- Jumper J1 and J3 unplugged
- residual ripple of the logical voltage<20%

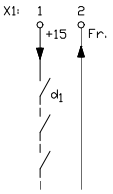
Default setup: Jumper J1 and J3 plugged.

Inputs and outputs with optocoupler



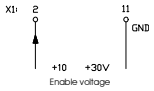
Enable

Enable >> aktive with positive voltage
Jumper SW1 position 2-3 *(default setup)*



Enable - relay contact
- internal logical voltage X1:1 +15V/10mA
- contact chain between X1:1 and X1:2

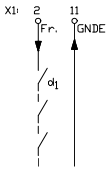
Enable -external Logical voltage
- Enable voltage X1:2 +10 ... +30V



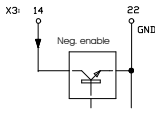
Enable >> aktive at zero point
Jumper SW1 Position 1-2 (US-version)

Enable - relay contact
- Logic-zero point X1:11
- Contact chain between X1:2 and X1:11

Enable -external logical voltage
- Enable voltage X1:2 0V



Switching on enable
- Nominal value and speed controoler are relaised at once
- LED D1B bright



Switching off enable

Jumper **J2** plugged (quick stop) *(default setup)*
- nominal value is internally and immediately set to zero (deceleration)
- LED D1B dark.
- after 5 seconds >> speed controller locked.

Jumper **J2** unplugged (free running down)
- Speed controller locked at once.
- LED D1B dark.

Notice:

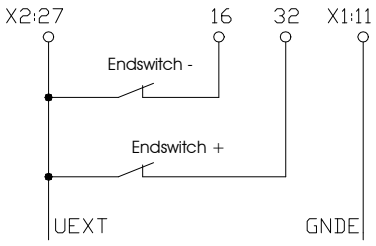
Jumper SW1	Pos: 2-3 >	enable aktive at	> +10V	(default setup)
	Pos: 1-2 >	enable aktive at	zero point	
Jumper J2	plugged >	quick stop		(default setup)
	Unplugged >	free running down		

Limit Switches

Limit switch inputs
Enable for
- positive nom. value direction
  LED 1D >> contact between X2:27 and X1:16
- negative nom. value direction
  LED 1H >> contact between X2:27 and X2:32

Limit switch functions

Contact	Function
Closed	enable>LED bright
open	direction locked



limit switch is occupied >> contact offen >> drive decelerates

Changing nominal value direction
- 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
Closed	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
- at mains failure nominal value is set immediately to zero
- Phases monitoring switched off (Jumper J1 on back panel)
generatoric rear feed into the intermediate circuit.

Speed nominal value

voltage source for nominal values ±10V, 10mA

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

If the internal voltage source is used >> Jumper S11, S12 plugged

Nominal value inputs

- Maximum nomial value voltage ±10V=
- Input resistance 50 kΩ
- Relay contacts: gold or reed contacts

Nominal value lines paired twisted and shielded. Shield connection on one side

Connetion

Nom.value	Connection	Jumper	Function	Measuring point
nom.value 1	X1:4 (Signal)		direct	X4:1
	X1:8 (GND)			X4:10
nom.value 2	X2:17(Signal)	SW2 1-2	direct	X4:2
		SW2 2-3	ramp	X4:2
	X2:28 (GND)			X4:10

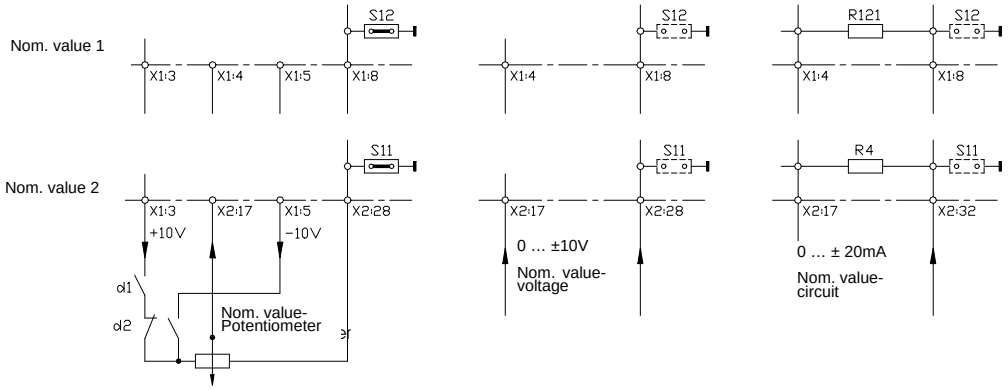
Jumper positions

Function	Jumper	Position	default setup
Nominal value 1			
Differential input	S12	unplugged	
Using internal voltage source	S12	plugged	***
Sollwert 2			
Differential input	S11	unplugged	
Using internal voltage source	S11	plugged	***
With ramp (integrator)	SW2	plugged in pos. 2-3	***
Without ramp	SW3	plugged in pos. 1-2	
Without nom. value 2	SW2	unplugged	

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

Nominal value 1	R121	500Ω
Nominal Value 2	R4	500Ω

internal supply **CNC/SPS** **nom.value current**



External current limittation

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

Control range:

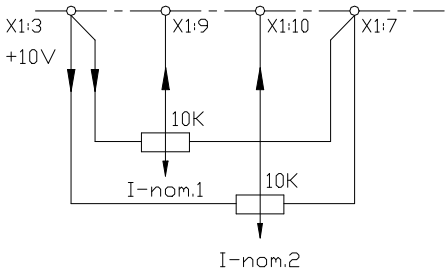
0 ... + 5V	>>>	0 up to 100% rated current
0 ... +10V	>>>	0 up to 200% rated current
Internal overcurrent control	>>>	max. 5sec.

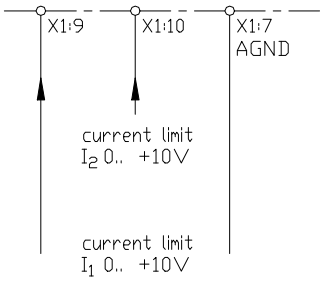
Inputs
Maximum input voltage +10V
Input resistance 10kΩ
Internal attenuatiuon with potentiometer I_{max1}, I_{max2}
Relay contacts: gold or reed contacts

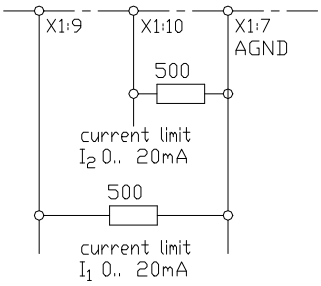
Connection

Current limit	connection	jumper	measuring point
Positive	X1:9 (signal) X1:7 (GND)	S19 unplugged	X4:3 X4:10
Negative	X1:10 (signal) X1:7 (GND)	S20 unplugged	X4:3 X10

Internal supply **CNC/SPS** **nominal value**







Caution:

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

Ready for Operation Signal BTB

Relay

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. 1 sec.

Indication

Ready for Operation	LED D1A bright	contact closed
Error	LED D1A dark	contact open

Ready for operation turns off with

Individual fault	BTB-LED D1A	Individual fault- 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 error	dark	LED D2A bright

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

Analogue measuring outputs

Function	**Motor current**	**Speed**
Connection	X2:20 - X2:24	X1:6 - X1:7
Measuring value before	2.5V = rated current 5V = peek current	tachometer voltage attenuator
	unipolar positive	bipolar
Output resistance	1 kΩ	4.7 kΩ

Signal outputs

logical outputs with opto-coupler

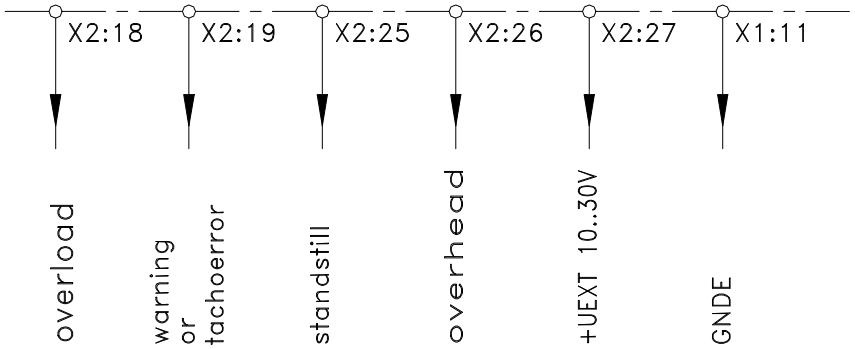
- wire break securebei — in case of error output is locked
- Output voltage — 10 ... 30V=
- Output current — 5mA
- Output resistance — 1kΩ

Overview of signal outputs

Signal	Function	Output	Indication	stored
Buffer	power supply 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)*
Mains	Off-On	Jumper S6 unplugged



Control Connections

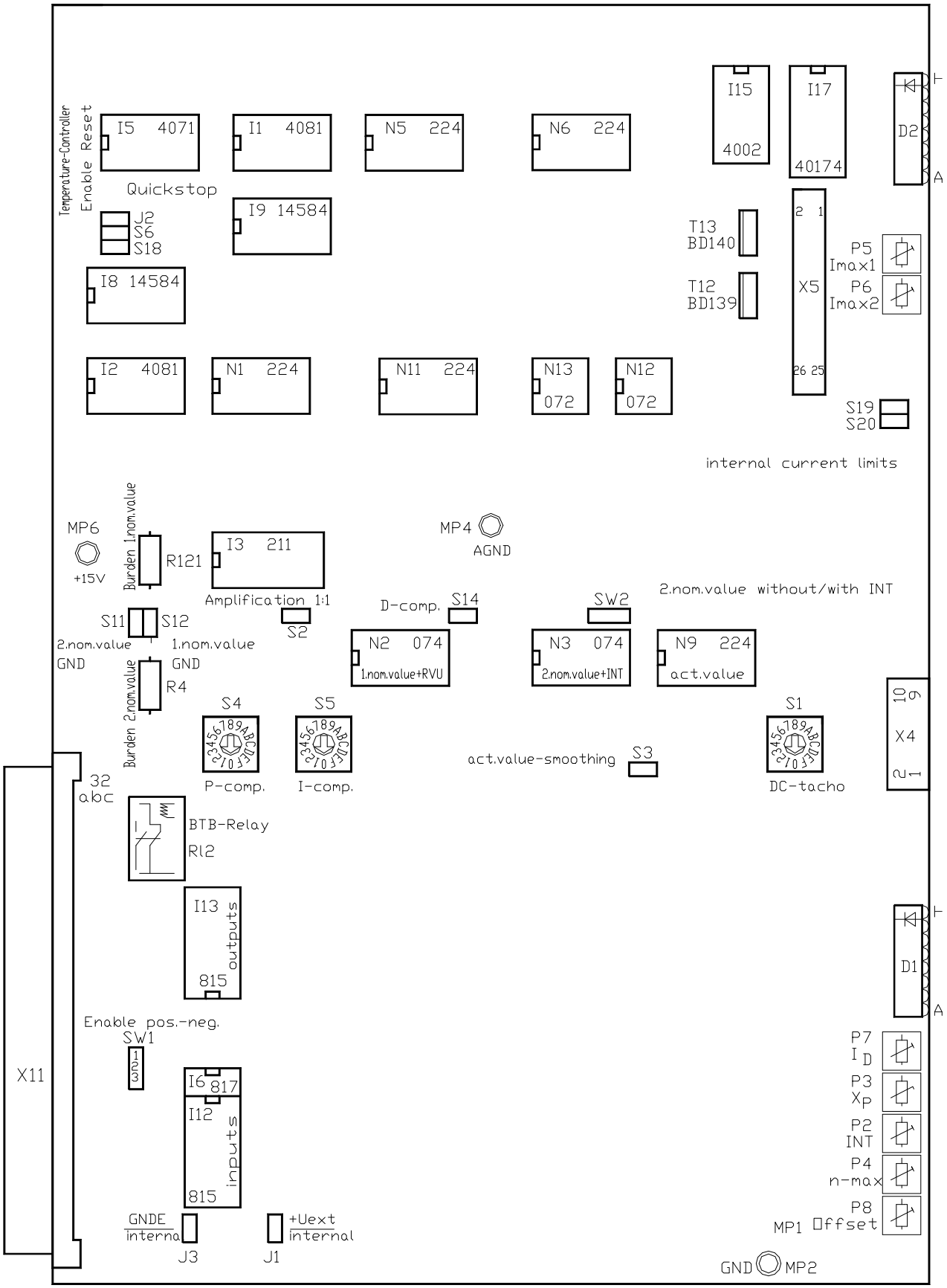
Function	Clamp-Number	Pin-Number (internal)
+ 15 Volt (for enable)	X1: 1	X11: 32c
Enable-Input (+10 ... +30 Volt)	X1: 2	X11: 30c
+ 10 Volt (for nominal value)	X1: 3	X11: 28c
Nominal value 1 - input +(Signal)	X1: 4	X11:26c
- 10 Volt (for nominal value)	X1: 5	X11: 24c
DC-tacho - input (Signal)	X1: 6	X11: 22c
DC-tacho - input (AGND)	X1: 7	X11: 20c
Nominal value 1 - input -(AGND)	X1: 8	X11: 18c
External current limit I_1	X1: 9	X11: 16c
External current limitI_2	X1: 10	X11: 14c
External GNDE	X1: 11	X11: 12c
-15V (ext. electronic)	X1: 12	X11: 10c
Device ground GND	X1: 13	X11: 8c
Buffer 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
Signal Overload	X2: 18	X11: 30a
Signal temperature or tachometer error	X2: 19	X11: 28a
Current (I_{ist})	X2: 20	X11:26a
Ready for operation	X2: 21	X11: 24a
Ready for operation	X2: 22	X11: 22a
Device ground GND (Earth)	X2: 23	X11: 20a
Analogue-device ground(AGND)	X2: 24	X11: 18a
Signal standstill	X2: 25	X11: 16a
Overtemperature	X2: 26	X11: 14a
external voltage UEXT	X2: 27	X11: 12a
Nominal value 2 input -(AGND)	X2: 28	X11: 10a
Current nominal value	X2: 29	X11: 8a
+15V (external electronic)	X2: 30	X11: 6a
Integral component interlock	X2: 31	X11: 4a
Limit switch +	X2: 32	X11: 2a

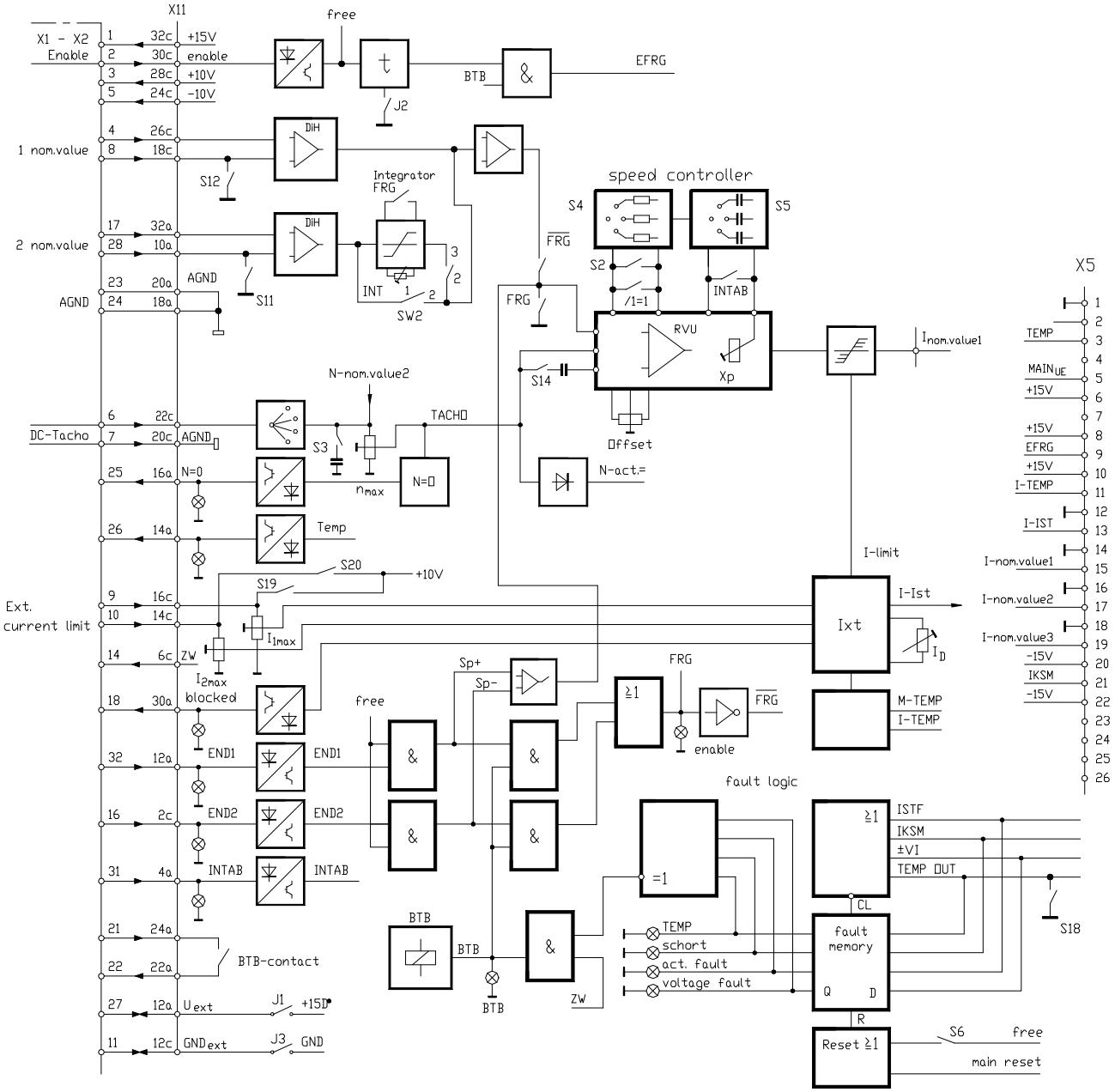
Power connections X3

Function	Clamp-Number	Pin-Number
External ballast resistor	X3:1	X31: 18,20 abc
DC Buffer	X3:2	X31: 14,16 abc
Mains L1 230V~	X3:3	X31: 10,12 abc
Mains L2 230V~	X3:4	X31: 6,8 abc
Mains L3 230V~	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

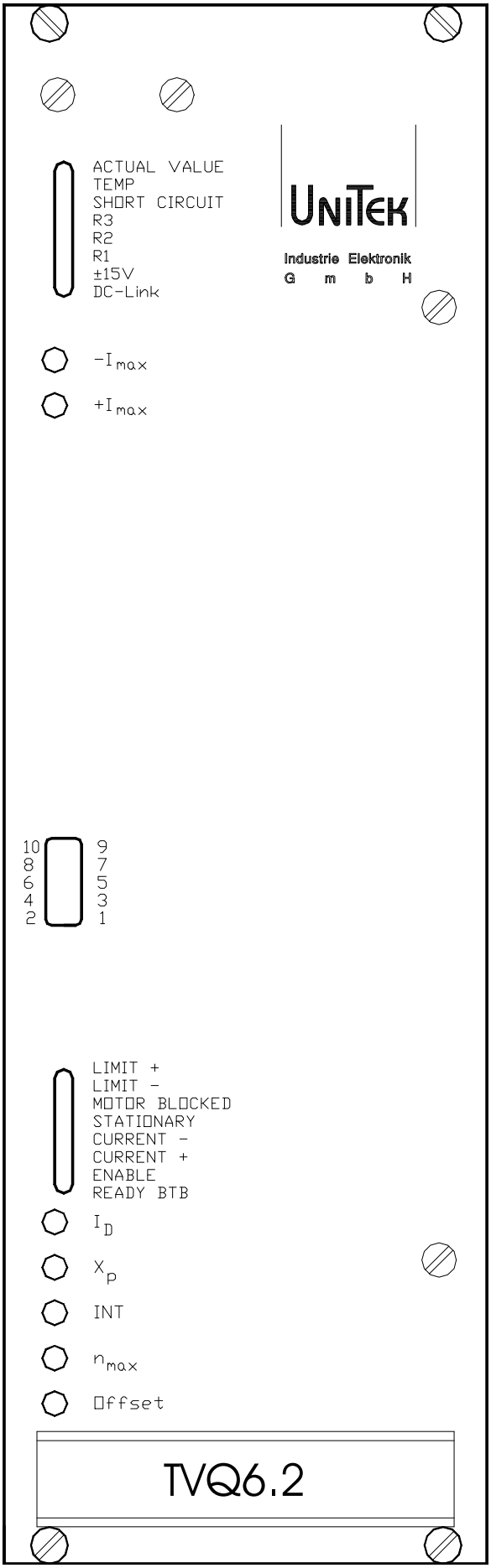
Control Connector X4 (front panel)

Function	Pin-Number
1st speed nominal value behind differential amplifier	X4: 1
2nd speed nominal value behind differential amplifier or integrator	X4: 2
Current nominal value	X4: 3
+ 10 Volt	X4: 4
- 10 Volt	X4: 5
Current actual value	X4: 6
Speed actual value (behind attenuator)	X4: 7
Enable	X4: 8
Device ground GND	X4: 9, 10


Temperature-Controller
Enable Reset
I5 4071
Quickstop
J2
S6
S18
I1 4081
I9 14584
N5 224
N6 224
I15
4002
I17
40174
D2
T13
BD140
T12
BD139
X5
2 1
26 25
P5
Imax1
P6
Imax2
S19
S20
internal current limits
I8 14584
I2 4081
N1 224
N11 224
N13
072
N12
072
MP6
+15V
Burden 1.nom.value
R121
I3 211
Amplification 1:1
S2
MP4
AGND
2.nom.value without/with INT
D-comp.
S14
SW2
S11
S12
2.nom.value
1.nom.value
GND
GND
Burden 2.nom.value
R4
N2 074
1.nom.value+RVU
N3 074
2.nom.value+INT
N9 224
act.value
S4
S5
S1
P-comp.
I-comp.
DC-tacho
act.value-smoothing
S3
X4
10
9
2
1
32
abc
BTB-Relay
Rl2
I13
outputs
815
D1
Enable pos.-neg.
SW1
X11
I6 817
I12
inputs
815
P7
I D
P3
Xp
P2
INT
P4
n-max
P8
Offset
MP1
GNDE
interna
J3
+Uext
internal
J1
GND
MP2


X11
X1 - X2
Enable
+15V
enable
+10V
-10V
free
J2
BTB
EFRG
1 nom.value
2 nom.value
AGND
S12
S11
DIH
Integrator
FRG
INT
SW2
speed controller
S4
S5
S2
/1=1
INTAB
RVU
Xp
S14
Offset
N-act.=
N-nom.value2
TACHO
DC-Tacho
S3
nmax
N=0
N=0
Temp
S20
+10V
S19
Ext.
current limit
I1max
I2max
ZW
blocked
END1
END2
INTAB
BTB-contact
Uext
J1
+15V
GNDext
J3
GND
Sp+
Sp-
≥1
enable
I-limit
Ixt
I-Ist
ID
M-TEMP
I-TEMP
fault logic
=1
TEMP
schort
act. fault
voltage fault
fault
memory
Q
D
R
CL
ISTF
IKSM
±VI
TEMP OUT
S18
Reset ≥1
S6
free
main reset
X5
TEMP
MAINUE
+15V
EFRG
I-TEMP
I-IST
I-nom.value1
I-nom.value2
I-nom.value3
-15V
IKSM

Front Panel



Indication LED 2x

H Actual value error
G Temperature- error
F Short detection
E Rotor position 3
D Rotor position 2
C Rotor position 1
B Voltage- error
A Buffer error

Trimmer

Current limit Imax -
Current limit Imax +

Control Conector X4

1 nom. value 1 behind diff.-amplifier
2 nom. value 2 behind Integrator
3 Current - nominal value
4 +10V
5 -10V
6 Current - actual value
7 Speed - actual value
8 Enable
9 not coated
10 device ground GND

Indication LED 1x

Limit switch +
Limit switch -
Overload - blocked
Standstill
Current direction -
Current direction+
Enable
Ready for operation

Trimmer

ID	steady current limit
Xp	Amplification
INT	Integration time
nmax	Speed
Offset	Zero point

Adjustment functions

Function	Poti	Switch	Jumper	Component
Actual value balancing - DC-Tacho		S9		switch S9
	nmax			trimmer P4
Internal current limit			S19, S20	
	Imax1		S19	trimmer P5
	Imax2		S20	trimmer P6
External current limit	Imax1			trimmer P5
	Imax2			trimmer P6
Steady current	ID			trimmer P7
Integrator			SW2 (2-3)	trimmer P2
Amplification P-Component		S4		switch S4
	Xp			trimmer P3
Amplification I-Component		S5		switch S5
Zero point adjustment	Offset			trimmer P8

Jumper

Function	plugged	unplugged	Jumper-Number
1st nominal value input (zero referenced)		differential input	S 12
2nd nominal value input (zero referenced)		differential input	S 11
Ramps 2nd nominal value on=2-3,		2-3,off=1-2 plugged	SW2 2-3/1-2
Actual value differentiation		no differentiation	S 14
Actual value smoothing		no smoothing	S 3
Internal current limit 2		external current limit 2	S 19
Internal current limit 1		external current limit 1	S 20
Amplification 1=1		Amplification >1000	S 2
ext. +UL = int. +15V		ext-int separated	J 1
ext GND = int. GND		ext-int separated	J 3
Quick stop (delayed controller interlock)		free running down	J 2
Enable - reset		mains-reset	S 6
Enable positive=2-3		2-3,negative=1-2 plugged	SW1 2-3/1-2
Temperature controller		temperature circuit breaking	S 18

LED- Indications

Function		designation	LED-Number
Control electronics			**LED D1x**
Limit switch +		LIMIT+	LED H
Limit switch -		LIMIT-	LED G
Blocked		MOTOR BLOCKED	LED F
Standstill		STATIONARY	LED E
Speed controller output -		CURRENT-	LED D
Speed controller output +		CURRENT+	LED C
Enable nominal value		ENABLE	LED B
Ready for operation		READY BTB	LED A
Power section			**LED D2x**
Actual value error	stored	ACTUAL VALUE	LED H
Temperature	choosable	TEMP	LED G
Short detection	stored	SHORT CIRCUIT	LED F
Rotorlage R3	no function	R3	LED E
Rotorlage R2	no function	R2	LED D
Rotorlage R1	no function	R1	LED C
Voltage error	stored	±15	LED B
Buffer error	not stored	DC-LINK	LED A

Adjustment Advice

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

Presettings

Actual value	>>	Jumper,	networks
Nominal value inputs	>>	Jumper,	differential inputs
logical inputs/outputs	>>	Jumper,	int/ext. supply
P-I parameter switch	>>	Jumper,	switches

Optimization

Actual value balancing	n_{max} adjustment
Current controller	adjusted by manufacturer (P- or PI-controller)
Current limits	I_{max}, I_D-adjustment
Speed controller	P-I-Switch, X_P-Adjustment
Slope limitation	INT-Adjustment (only nom. value 2)
Zero point	Offset-Adjustment
Path- and position controller	in CNC/SPS - Control

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 values	**max. value**	**measuring point**
Nom.value 1 after input amplifier	±10V	X4:1
Nom.value 2 after input amplifier	±10V	X4:2
Current nom. value (speed controller)	±10V	X4:3
Current actual value unipolar	+5V	X4:6
torque actual value after divider	± 5V	X4:7

Nominal Value

Function		**nom.value 1**	**nom.value 2**
Input amplification	fix	1	1
Input voltage	max.	± 10V=	± 10V=
Differential input	Jumper	S12 unplugged	S11 unplugged
Input in relation to GND	Jumper	S12 plugged	S11 plugged
Input Signal		X1:4	X2:17
Input GND		X1:8	X2:28
Measuring on control connector		X4:1	X4:2
Measuring value	max.	±10V=	±10V=
Integrator function		not available	Jumper SW2

Input in relation to GND
with nominal value trimmer
with internal supply voltage
Jumper S11, S12 plugged
Notice GND-connection

Differential input
with nominal value of SPS/CNC
foreign external voltage
Jumper S11, S12 unplugged
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 ±10Volt.

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

Nom. value 2	Jumper	trimmer	range
without Integrator	SW2 Pos. 1-2	——	——
with Integrator	SW2 Pos. 2-3INT(P2)	0.1 up to 4.5 sec.	
Without nom. value2	SW2 offen	——	——

Nominal Value Current
nominal value from external source 0 up to ±20mA
internal compliance resistors for 0 up to max. ±10V

Nom. value 1	resistor R121
Nom. value 2	resistor R4

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

Caution:
Do not use nominal value current from 4 up to 20mA

Actual Value

Als Drehzahl-Istwert nur Gleichstomtachogeneratoren verwenden
Use only DC-Tachodynamos to acquire the speed actual value
Option: Incremental encoder with IN-evaluation

Coarse Adjustment

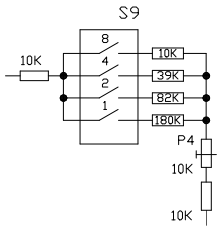
Switch S9

Adjustment Tacho - coarse balancing

Position	0	1	2	3	4	5	6	7	8	9 up to F	trimmer-position
Tachometer Voltage	∞	67	40	32	25	23	20	18	14	12V	min.
		100	70	50	40	35	30	25	18		middle
		205	145	97	85	70	65	55	35		max.

Fine Adjustment

With trimmer n_{max} (P4)



with nominal value from potentiometer:

with 1V nominal value adjust to 10% maximum speed
with 10V nominal value fine adjust to 100% .

with nominal value from CNC/SPS:

with 0,8V nominal value adjust to 10% maximum speed
with 8V nominal value fine adjust to 100%

-

Current limitation

Peek current	Range: 0 up to 200% rated current reset time maximum 5 sec.	Poti P5/P6
Steady current	Range: 5 up to 100% rated current	Poti P7

Internal resetting 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	Trimmer
I_{max1}	S19 plugged	I_{max1} (P5)
I_{max2}	S20 plugged	I_{max2} (P6)

external current limit

Adjustment	Input		Jumper	Trimmer
I_{max1}	X1:9	0...+10V	19 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_{max}-trimmer.

Steady current
motor protection adjustment for both torque directions to motor rated current with trimmer I_D (P6).

Measuring adjusted values:
- don't connect Motor
- predetermine nominal value and turn on/off enable

measuring value at connector X4:3 (5V=rated current)

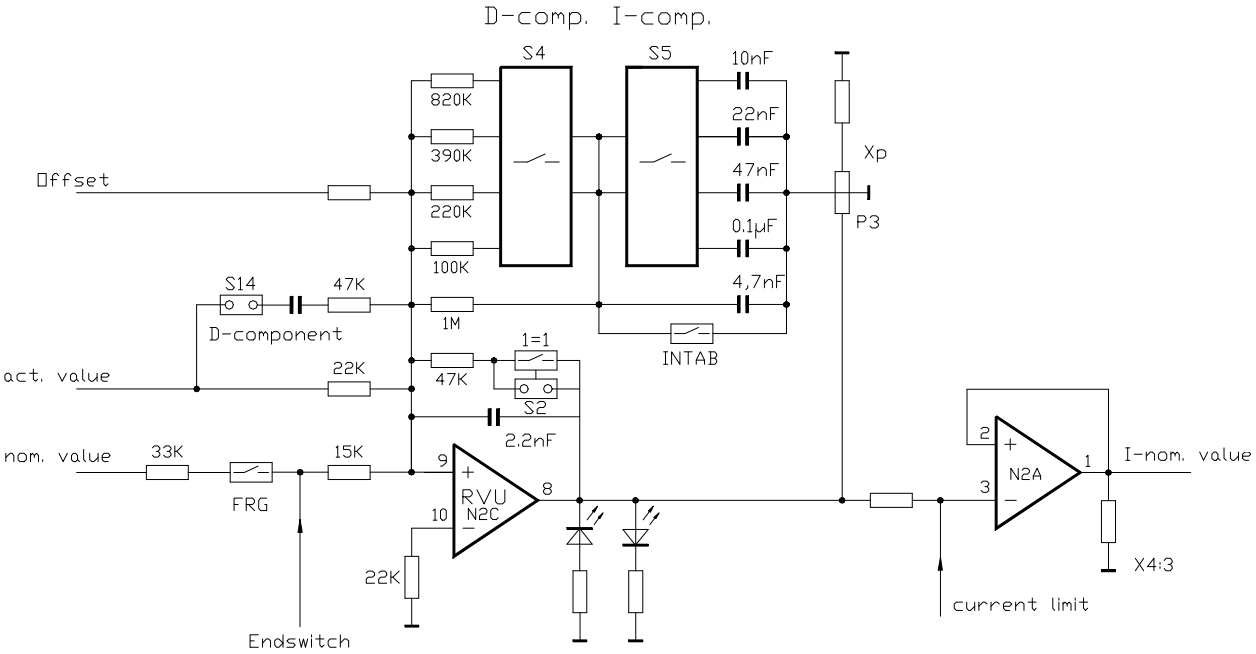
Nominal value	measuring value I_{max} (2 sec.)	measuring value I_D
+5V	0 up to max. 10V	0.25 up to max. 5V
- 5V	0 up to max. 10V	0.25 up to max. 5V

Current-actual values
measuring value at connector X4:6 >> I_{max} = 0 up to +5V, I_D = 0.12 up to +2.5V

Caution:
for exact torque regulation:
- Changing the current controller from P- to PI-regulation by the manufacturer
- specify when ordering

Speed controller switching
Adjustment with
- two 16-position binary switches S4, S5
- Amplification trimmer P3 (Xp)
- D-component with jumper S14
- in case of replacing the device > take over adjustment values

Default Setup
Binary switches S4 and S5 in position 4
- amplification trimmer Xp is set to 50%
- no D-component, Jumper S14 unplugged
- optimal for most drives.



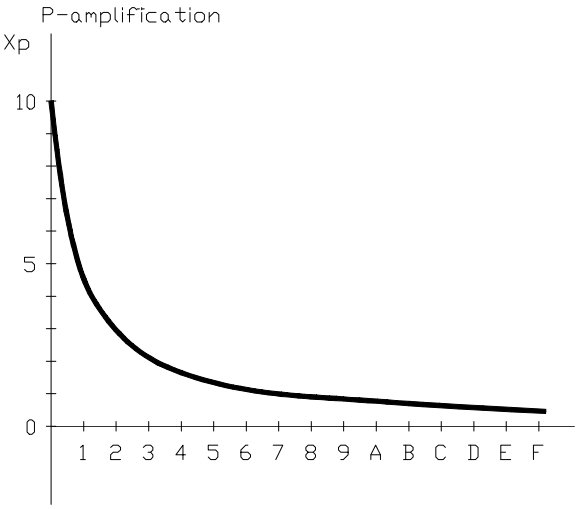
Adjustment Proportional-component with binary switch S4																
Switch S4																
Position	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Resistance kΩ	1000	450	280	209	180	148	123	107	90	82	73	67	64	59	55	52

Adjustment Integral-component with binary switch S5																
Switch S5																
Position	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Capa-city µF	0.01	0.02	0.03	0.04	0.08	0.09	0.1	0.11	0.11	0.12	0.13	0.14	0.18	0.19	0.2	0.21

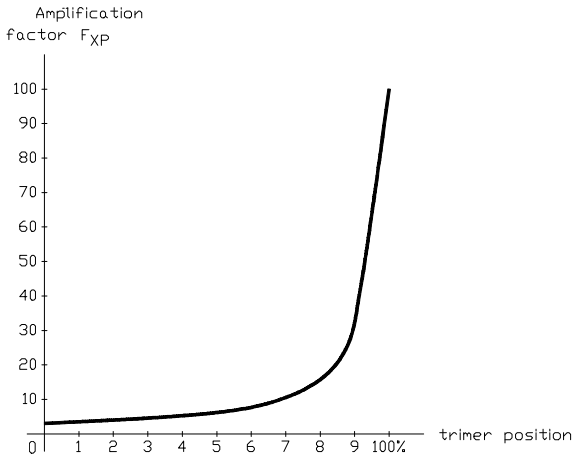
Caution:
With the input INTAB (X2:31) the I-component can be switched off.

Proportional Amplification

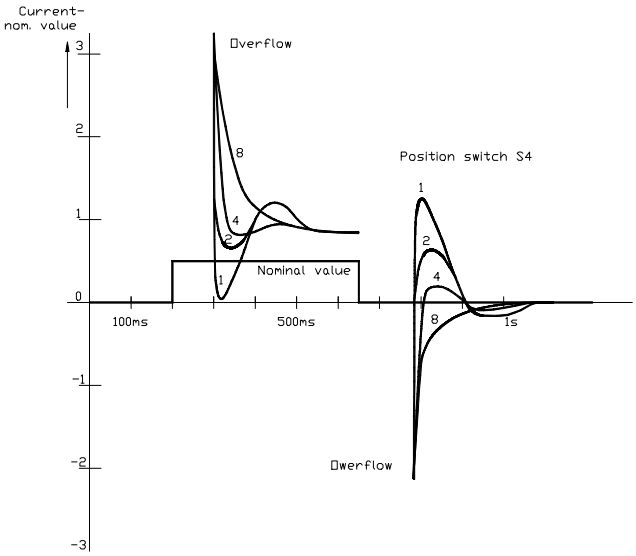
Function binary switch S4



Function Potentiometer Xp



Proportional amplification= Xp x Fxp

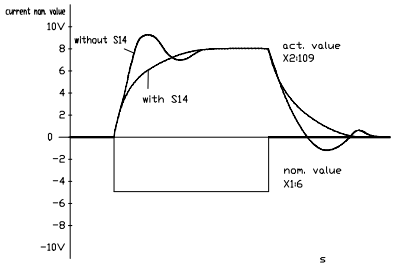


Adjustment with osciloscope

Adjust	Measuring value	Measuring point
- nom.value jump ±0,5V	nominal value	X4:1
- Input INTAB X2:31 activated	reply of the controller	
	current nominal value	X4:3

Effect D-component

- nominal value -differentiation
- jumper S14 plugged



Caution:
In case of position control (CNC/SPS)
Do **not** use D-component

Adjustment without measuring instruments

Connect Motor

Nominal Value	= 0
Xp	= 50%
Switch S4	= position 4
Switch S5	= position 4

Enable drive,
Turn trimmer Xp clockwise until the drive oscillates.

if there is no oscillation
- turn switch S4 back to a lower value
- adjust to oscillation with trimmer Xp

- turn the potentiometer Xp anti-clockwise until the oscillation fades out,
- turn potentiometer Xp two more positions anti-clockwise.

Adjust 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 overshoots	vibrates >during acceleration
overshoots target position	vibrates >during deceleration and in position

Caution:
Operation with CNC/SPS - Contols
- ad maximum speed >>speed nominal value between 8 and 9V.

Default Setup

Check connections before getting started!

- Mains connection	clamps X3:3, X3:4, X3:5	**max. 230V~**
- protective conductor	PE-screw at case	
- Motor connection	clamps X3:7, X3:8	
- Motor-earth-connection	clamps X3:6	
- Option		
- external ballast resistor	clamps X3:9 and X3:2	

Notice Connection Advice on Page 12.

Basic Connection - Power connections

Protective earthing	
Mains	1x or 3x 230V~
Motor	2x Motorline + protective conductor + shielding

Basic Connection - Control connections

Enable	contact between X1:1 and X1:2
Nominal Value	signal X1:4, GND X1:8
Limit Switch	limit switch to X1:16 and X2:32 or bridge between X2:27 and X1:16, X2:32
Tachometer Connection	2x Tacholine + shielding to X1:6,X1:7

Default setup for first getting started

Switch	S4	P-amplification	Position 4
Switch	S5	I-component	Position 4
Switch	S9	tacho-attenuator	Position 4
Potentiometer		I_{max1} peek current	10%
Potentiometer		I_{max2} peek current	10%
Potentiometer		I_D steady current	100%
Potentiometer		Xp Amplification	50%
Potentiometer		INT integrator	anti-clockwise stop
Potentiometer		n_{max} speed	anti-clockwise stop

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

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 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).

UNITEK reserves the right to change any information included in this MANUAL.
All connection circuitry discribed is meant for general information purposes and is not mandatory.
The local legal regulations, and those of the Standards Authorities have to be adhered to. UNITEK does not assume any liability, expressively or inherently, for the information contained in this MANUAL, for the functioning of the device or its suitability for any specific application.

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