M A N U A L

Analogue control electronics
for Thyristor Motor Controller Classic Series

R E G - 5

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Edition / Version

2021 / V 1

Table of contents

1 Basic information

1.1 Applications

A C H T U N G: MANUAL REGxx
Use only in conjunction with the unit description

MANUAL Classic	**Q1 x/x-x, P1-x/x-x**
	Q2 x/xx
	Q3 x/x-x, P3 x/x-x
	Q6 x/x-x

Application

Control electronics for
- Thyristor - Motor controller
- 1Q - and 4Q - operation
- Speedometer control
- Armature voltage control with lxR - compensation
- Speed control
- Torque control
- Speed - Torque control

Properties

Inputs
- Setpoint input with differential amplifier
- 2 additional inputs (setpoint or logic)
- Handwheel input (analogue)
- Tacho actual value input
- Armature voltage with high impedance instrumentation amplifier
- External current limit settings

Outputs analogue
- Ribbon cable connection to the power section
- Current setpoint output (slave controller)
- Speed and current monitors

Outputs digital
- BTB - Relay
- Standstill message
- Speedometer interruption message
- Blocked message
- Setpoint=actual value Message
- 2 monitoring messages for speed or current (selectable)
- Brake logic output

Functions
- Speed controller (RVU) with PID circuitry
- Static and dynamic current limit
- Speed-dependent current limit, commutation limit
- Slope limiter (integrator adjustable)
- Setpoint - zero switching
- Release logic
- Monitoring for speed, current
- Solderless adjustment
- Control bus (connector X4)

Option (can be plugged into connector X4)
- Multi 1, Multi 2, Multi 4, Multi 5

1.2 Specification

Protection class:		IP 00
Unit design:		VDE 0100 Group C, VDE 0160
Moisture stress:		Class F according to DIN 40040
		No condensation
Operating range:		0 to +60°C
Storage area:		-30°C to +80°C
Speed controller:		
Control accuracy:	o. Actual value error	±0,1 %
Control range		> 1:1000
Inputs, outputs		
Logic voltage output:		+24 V=, 10 mA
Setpoint source output:		±10 V=, 10 mA
Setpoint inputs:		±10 V= (50 kΩ)
Actual value input tacho:		±200 V= (min. 20 kΩ)
Actual value input armature voltage:		±200 V= (600 kΩ)
Logic inputs:		+10 … +30V=
Logic outputs:	with internal 24 V	> +22 V=, 5 mA
	with external 24 V	> +22 V=, 30 mA
Power consumption:	+24 V	8.5 mA (without outputs)
	+15 V	35 mA
	-15 V	35 mA

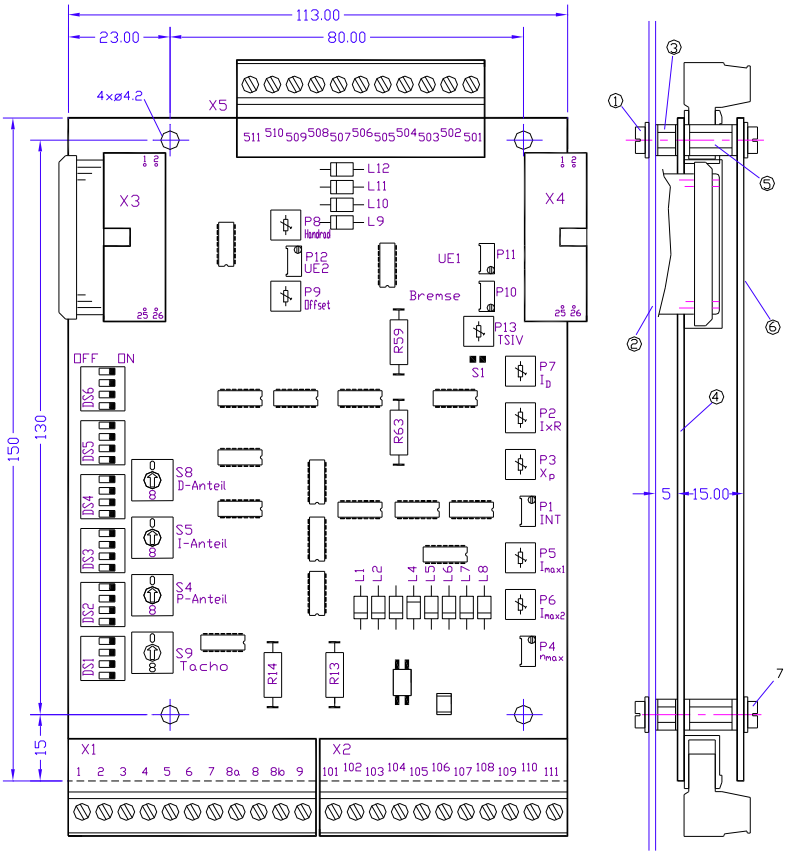
1.3 Connecting cable

Flat ribbon connecting cable to the power unit Connector X3

Function	Area	Plug number
+ 24 V	+24 ±10 %	X3: 1 u. 2
+ 15 V	+15 ±2 %	X3: 3 u. 4
- 24 V	-24 ±10 %	X3: 5 u. 6
- 15 V	-15 ±2 %	X3: 7 u. 8
Device zero GND	0	X3: 9,10,11,12,13 u. 14
I - set point (GND)	0	X3: 15
I - Set point (signal)	± 10 V=	X3: 16
Enable current controller	+ 15 V=	X3: 17
Lock 1	+ 10 V=	X3: 18
Lock 2	+ 10 V=	X3: 19
n - Actual	+ 5 V=	X3: 20
I - Actual	± 5 V=	X3: 21
Overcurrent power unit n. B.		X3: 22
Firing angle 1	+ 10 V=	X3: 23
Ignition angle 2	+ 10 V=	X3: 24
Ready for operation BTB	+ 10 V=	X3: 25
free	n.b.	X3: 26

2 Mechanical installation

2.1 Dimension drawing



Pos.	Material		Piece
1	Screw Cyl.	M3 x 12	4
2	Cover plate	white	1
3	Thread - distance bolt	M3 x 5	4
4	Control electronics	REG 5	1
5	Thread - distance bolt	M3 x 12	4
6	Cover plate	transparent	1
7	Screw Cyl.	M3 x 6	4

Assembly:

- Screw 1 with bolt 3 into cover plate 2
- Connect ribbon cable to REG5 connector X3
- Screw REG5 with bolt 5
- Screw cover plate 6 with screw 7
- Low tightening torques
- Plastic fittings

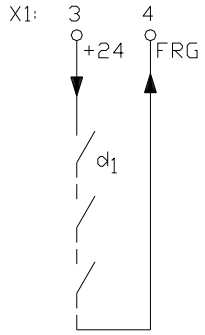
<u>Disassembly in reverse order</u>

3 Electrical installation

3.1 Connection instructions

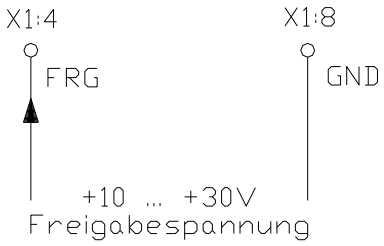
The connection instructions are for general information and are non-binding.

Note:
Connection and operating instructions local regulations
EC Machinery Directive 89/392/EEC
VDE, TÜV and the Employer's Liability Insurance Association.
Terminal numbers terminal-plug
X1:1 to X1:9 and X2:101 to X2:111
Signal lines
Shielded and separated from power lines.
Setpoints twisted in pairs and screened.
Logic connections
Relay with gold contacts or reed relay. Contact current 6 mA.



Release
Enable - internal logic voltage
- Internal logic voltage X1:3 +24 V/10 mA
- Chain of contact between X1:3 and X1:4

Enable - external logic voltage
- Enable voltage +10 … +30 V X1:4
- external GND X1:8



Switch on release
- Setpoint and controller are released immediately
- LED L1, LED 2 bright

Switch off release
Switch DS1:K4 ON (quick stop) (basic setting)
- Setpoint immediately internally to 0 (decelerate) LED L1 dark
- after 2 seconds >>> controller locked LED L2 dark

Switch DS1:K4 OFF (free outlet)
- Setpoint and controller are locked immediately LED L1, LED 2 dark

Note:
Switch DS1: K4 ON Quick stop (basic setting)
Switch DS1:K4 OFF free outflow

3.2 Control ports

Speed setpoint

Voltage source for setpoints ± 10 V, 10 mA

+10 V	X1:5
-10 V	X1:7
GND	X1:8a

With internal voltage source >>> switch DS1:K1 ON

Setpoint inputs
- Setpoint voltage maximum ±10 V=
- Input resistance 50 kΩ
-relay contacts: Gold or reed contacts

Setpoint lines Twisted in pairs and shielded
Shield connection one-sided

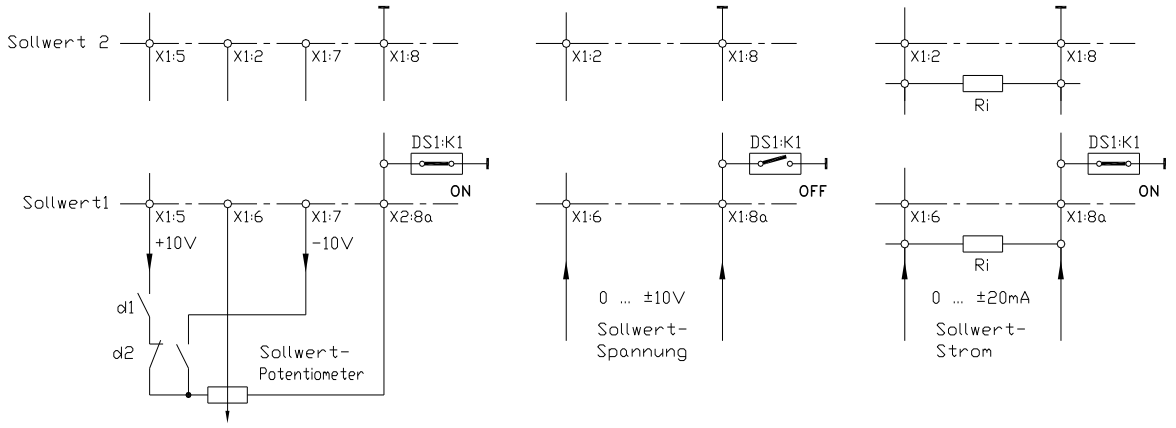
Connection				
Set point	**Connection**	**Switch**	**Function**	**Measuring point**
Set point 1	X1:6 (signal)	DS3:K1 ON	direct	X4:13
	X1:8a (GND)	DS3:K2 ON	Ramp	X4:14
Set point 2	X1:2 (signal)		direct	
	X1:8 (GND)			X4:10
Umbrella	X1:8			

Switch positions			
Function - Setpoint 1	**Switch**	**Position**	**Basic setting**
Differential input	DS1:K1	OFF	
with int. voltage source	DS1:K1	ON	*****
with ramp (integrator)	DS3:K2	ON	
Without ramp	DS3:K1	ON	*****

Resistors for setpoint current 0 .... ± 20 mA

Set point 1	Ri	500 Ω
Set point 2	Ri	500 Ω

Int. supply CNC / SPC Setpoint current



External current limitation
Voltage source for external current limit

+ 10 V / 10 mA	X2:101
GND	X2.104

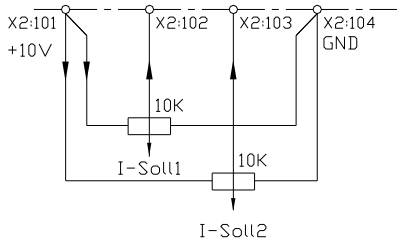
Adjustment range:

0 ... + 5 V	>>	0 to 100 % nominal unit current
0 ... + 10 V	>>	0 to 200 % nominal unit current

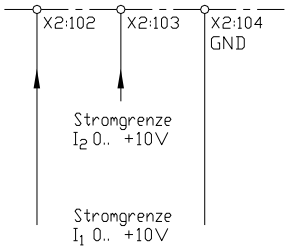
Inputs
Input voltage maximum + 10 V
Input resistance 50 kΩ
Internal attenuation with potentiometer Imax1, Imax2
Relay contacts: Gold or reed contacts

Connection			
Current limit	**Connection**	**Switch**	**Measuring point**
Speed setpoint positive	X2:103 (signal)	DS2:K4 OFF	X4:19
	X2:104 (GND)		X4:10
Speed setpoint negative	X2:102 (signal)	DS2:K3 OFF	X4:18
	X2:104		X4:10

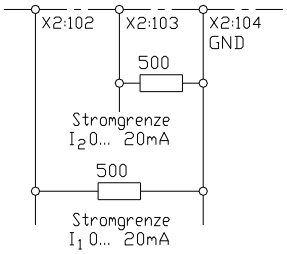
Int. supply



CNC / SPC



Setpoint current



Attention:
With internal current limit setting
Switch DS2:K3 and DS2:K4 **ON**

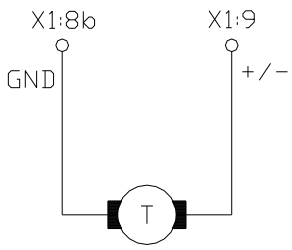
Actual value - connection

Speedometer connection		
Tachotype	**1Q - Operation**	**4Q - Operation**
DC tachometer	x	x
Three-phase tachometer +rectifier	x ([1]	
AC tachometer +rectifier	x ([1]	

([1] additional capacitor 0.47 µF at the tacho input
Maximum tachometer voltage >>> ±200 volts.

Speedometer connection:

Entrance	X1:8b	=	Speedometer (GND)
Entrance	X1:9	=	Speedometer (signal)
Entrance	X1 8	=	Shield



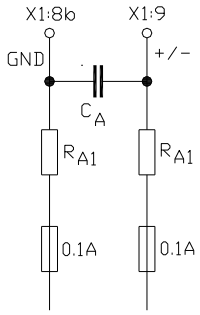
Setpoint input X1: 6 positive corresponds to tacho input X1:9 negative

0 Ω-bridges	**R13 and R14**	**Built-in**

Armature voltage connection with potential (600 kΩ)

Note:

0 Ω-bridges	**R13 and R14**	**open !!!**
Switch	DS4:K2, DS4:K4	ON
Switch	DS3:K4	ON
Switch	S9	to 0
Fuse	2x 100 mA	



Armature voltage

Attention:
For armature voltage > ±180 V, connect external series resistors.

The values for RA1 and RA2 are:	270 V = 200 kΩ
	440 V = 470 kΩ
	550 V = 680 kΩ
With high voltage ripple	CA = 0.1 µF / 400 V

Use the EXZU-UA 1 module!
The leakage current to protective earth is < 1 mA

Armature voltage connection potential-free
With potential isolation amplifier (e.g. QTV2-3)

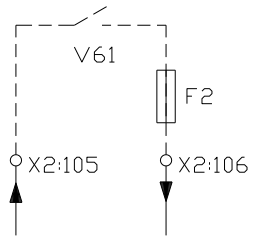
Connection like speedometer control	>>>	X1:9, X1:8b

Setting:

Switch	DS4:K2	OFF
Switch	DS4:K4	ON
Switch	DS3:K4	ON
0Ω-bridges	R13 and R14	Built-in
Switch	S9	Position F

3.3 Messages

Ready for operation - BTB message

Solid state relay V61		
Message contact	X2:105 - X2:106	
Contact values	max. 48 V / 0.25 A	
Self-healing fuse F2	340 mA	

The ready-to-operate message (BTB) signals to the control unit (CNC/SPC) that the drive is functional.
BTB - Connect messages of several units in series.

Delay after mains switch-on max. 1 sec.

Display		
Ready for operation	LED L3 bright	Contact closed
Error	LED L3 dark	Contact open

BTB falls off at

BTB performance part	X3:25	Error LED power unit
Speedometer actual value error		LED L6 bright

A c c o u n t :
It is essential to use the BTB contact in the CNC / PLC control system!

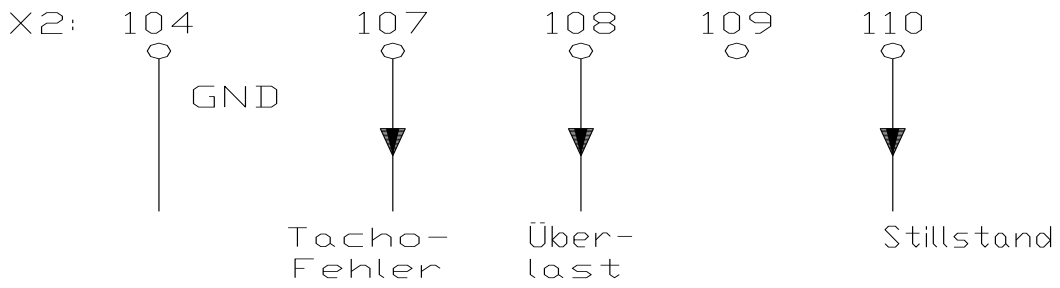
Analogue measurement outputs		
Function	**Motor current**	**Speed**
Connection	X2:111 - X2:104	X2:109 - X2:104
Measured value	Switch DS2:K1 ON 2.5 V = type current 5.0 V = peak current bipolar	Switch DS2:K2 ON 5.0 V = max. speed bipolar
	Switch DS2:K1 OFF 5.0 V = type current 10.0 V = peak current bipolar	Switch DS2:K2 OFF 10.0 V = max. speed bipolar
Output resistance	1 kΩ	1 kΩ

Message outputs
Logic outputs

Wire-break-proof	Output blocked in case of error
Output voltage	> 22 V=
Output current at internal +24V	5 mA
Output current at external +24V	30 mA (optional)

Overview of message outputs			
Message	**Function**	**Output**	**Display**
Speedometer error	Interruption	X2:107	L6
Overload	blocked 5 s / 200 ms	X2:108	L8
Standstill	Speed <1 %	X2:110	L7
Reference mass	GND	X2:104	

Error messages are not saved.



Speedometer interruption error:

Function	Switch DS4:K4	OFF
Only for DC tachogenerators		
No function	Switch DS4:K4	ON
For AC or three-phase tachogenerators		
For armature voltage control		

To switch off the superimposed AC voltage of the tacho monitoring, close solder jumper S1.
(only necessary for oscillographic control of the tachometer).

Attention: With S1 closed, tacho monitoring without function!	
Attention: On tacho generators with high voltage or high winding inductance, the tacho monitor may respond without the tacho cable being interrupted.	
Remedy: Install capacitor 0.1 µF/400 V via + and - in the tacho terminal box.	

Signal outputs Optional
Logic outputs

Wire-break-proof	Output blocked in case of error
Output voltage	> 22 V=
Output current with internal +24 V supply	5 mA
Output current with external +24 V supply	30 mA

Overview of message outputs				
Message	**Function**	**Function Inversion**	**Output**	**Display**
Brake	Start-up armature current > P10		X5:503	L11
Monitoring UE1-A Speed	Speed < P11 DS5:K1 ON	Speed > P11 DS6:K2 ON	X5:504	L10
Monitoring UE1-A Current	Current < P11 DS5:K2 ON	Current > P11 DS6:K2 ON	X5:504	L10
Monitoring UE2-A Speed	Speed < P12 DS5:K3 ON	Speed > P12 DS6:K1 ON	X5:505	L9
Monitoring UE2-A Current	Current < P12 DS5:K4 ON	Current > P12 DS6:K1 ON	X5:505	L9
Speed actual value equals speed setpoint	Target-actual difference < 5 %		X5:506	L12
Reference mass	GND		X5:502	
Supply ext.	+24 V max. 30 V		X5:501	

Error messages are not saved.

Analogue outputs		
Function	**Measured value**	**Connection**
Speed setpoint after differential amplifier	± 10 V	X5:507
Actual current value	± 5 V	X5:508
Current setpoint (output speed controller)	± 10 V	X5:509
Output resistance 1kΩ		

Handwheel connection (optional)

A DC tachogenerator is connected to X5:510 and X5:511 as a handwheel encoder.
Maximum input voltage 15 V=
Input resistance 100 kΩ
Automatic release by handwheel tension

3.4 Plug plans

Control connections - Function			Terminal number
			X1
Current setpoint input-output or INTAB			X1:1
Setpoint 2 Speed controller		Signal ±10 V	X1:2
+24 Volt	-Output	for release	X1:3
Release	-Input	+10 … +30 V	X1:4
+10 Volt	-Output	for set point	X1:5
Set point 1	-Input	Signal ± 10 V	X1:6
-10 Volt	-Output	for set point	X1:7
Set point 1	-Input	AGND	X1:8a
Device zero		GND	X1:8
Speedometer	-Input	GND	X1:8b
Speedometer	-Input	Signal ±200 V	X1:9
			X2
+10 Volt output		for current limit	X2:101
Current limit I1 external		0 … 10 V	X2:102
Current limit I2 external		0 … 10 V	X2:103
Device zero		GND	X2:104
Ready for operation BTB		Semiconductor relay	X2:105
Ready for operation BTB		Contact	X2:106
Speedometer error message		ISTF	X2:107
Overload message		UELA	X2:108
Speed (n-actual)		±5 V or ±10 V	X2:109
Message standstill		N=0	X2:110
Current (I-actual)		±5 V or ±10 V	X2:111

Message Optional

			X5
External supply +24 V		+24 V= max. +30 V	X5:501
External supply GNDE		GND	X5:502
Brake control		> 22 V	X5:503
Message output UE1-A		> 22 V	X5:504
Message output UE2-A		> 22 V	X5:505
Message output SIV-A		> 22 V	X5:506
Analogue output n setpoint 1		±10 V	X5:507
Analogue output I-actual2		±5 V	X5:508
Analogue output I-Setpoint-A		±10 V	X5:509
Handwheel input		0 … ±15 V	X5:510
GND		GND	X5:511

Connection to power unit X3

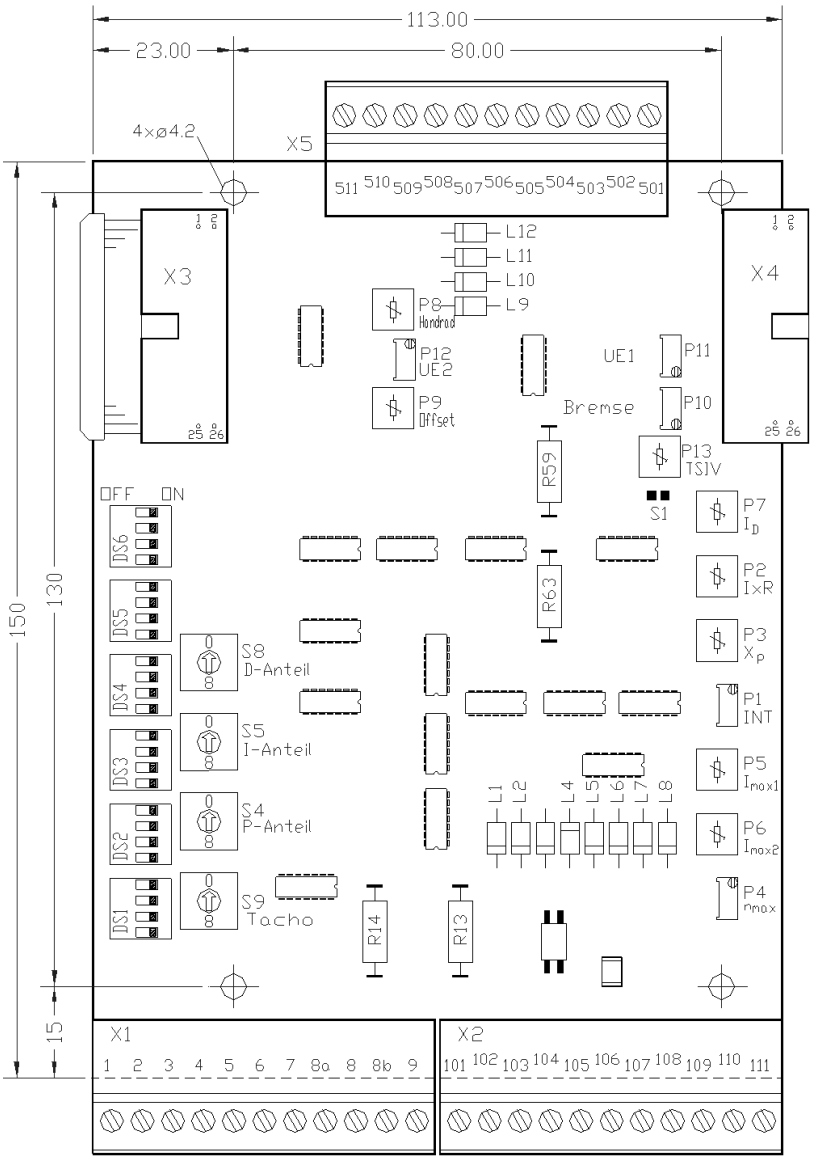
Function		Plug number
+ 24 Volt	±10 %	X3: 1 u. 2
+ 15 Volt	±2 %	X3: 3 u. 4
- 24 volt	±10 %	X3 :5 u. 6
- 15 Volt	±2 %	X3: 7 u. 8
Units Zero GND	0	X3: 9,10,11,12,13 u. 14
I - Set point (GND)	0	X3: 15
I - Set point (signal)	±10 V =	X3: 16
Enable current controller	+15 V =	X3: 17
Lock 1	+10 V =	X3: 18
Lock 2	+10 V =	X3: 19
n - Actual	+5 V =	X3: 20
I - Actual	±5 V =	X3: 21
Overcurrent - power unit	n. B.	X3: 22
Firing angle 1	+10 V=	X3: 23
Ignition angle 2	+10 V=	X3: 24
Ready for operation BTB	+5 V ... +15 V=	X3: 25
free	n. B.	X3: 26

Control plug, connection to option and assembly groups X4

Function	Plug number
+ 24 Volt	X4: 1 u. 2
+ 15 Volt	X4: 3 u. 4
- 24 volt	X4: 5 u. 6
- 15 Volt	X4: 7 u. 8
Device zero GND	X4: 9 u. 10
Release	X4: 11
n - Setpoint before diff.	X4: 12
n - Setpoint after diff.	X4: 13
n - setpoint after integrator	X4: 14
I - set point	X4: 15
n - actual value (after divider)	X4: 16
SR 1-2	X4: 17
Current limit I1	X4: 18
Current limit I2	X4: 19
I - actual value	X4: 20
Continuous current limit ID	X4: 21
n - actual value (after rectifier)	X4: 22
Speedometer error	X4: 23
Overload	X4: 24
BTB1	X4: 25
Overcurrent power unit	X4: 26

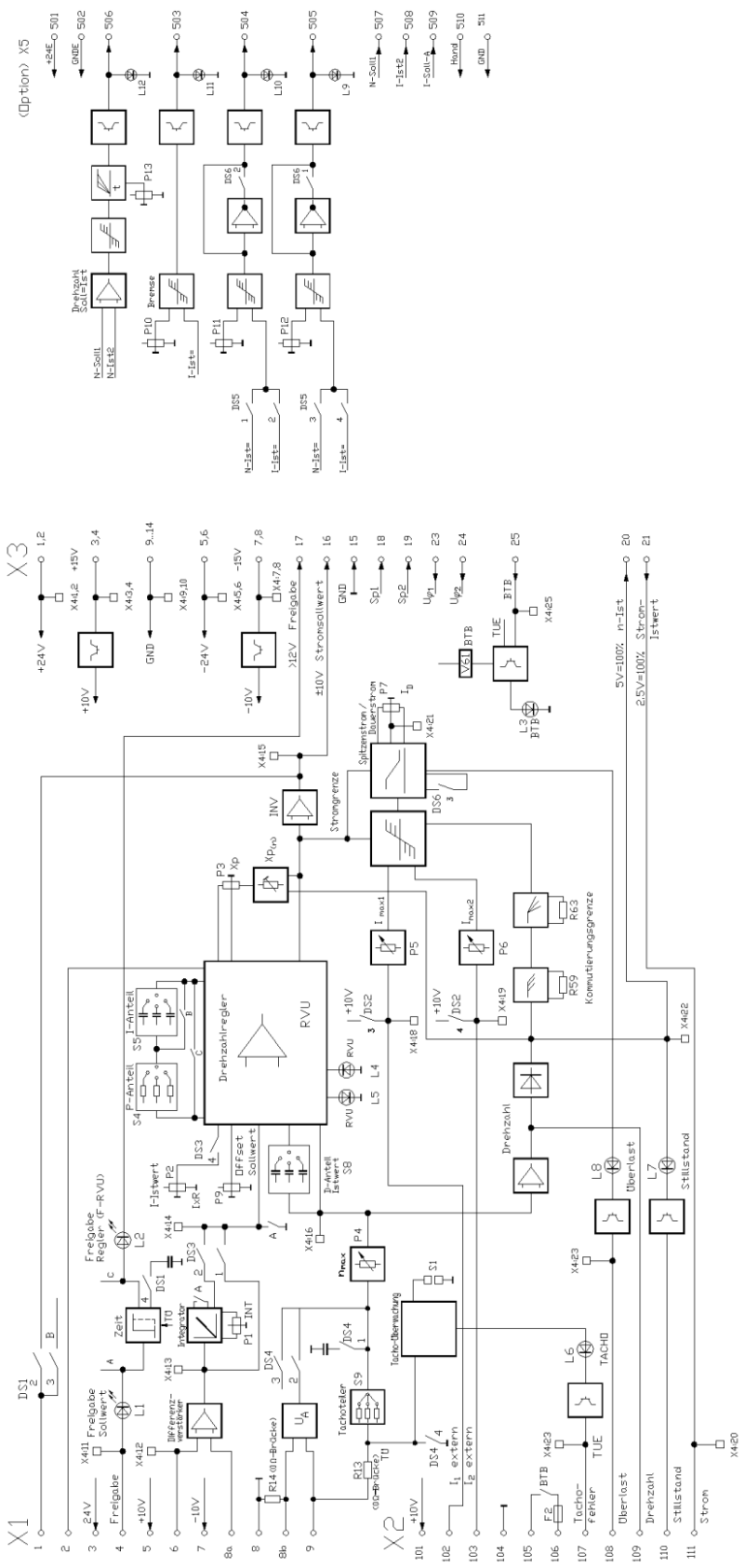
4 Device overview

4.1 Component position



Connector X1	Control ports
Connector X2	Control ports
Connector X3	Connection to the power unit
Connector X4	Control plug, connection to options
Connector X5	Control connections Optional
Minimum connection control electronics	
Release	X1:3, X1:4
Set point	X1:6, X1:8a
Actual value	X1:8b, X1:9

4.2 Block diagram



4.3 Setting functions

Function **Component**

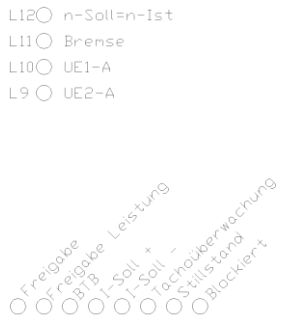
Set point	Switch		Potentiometer	
Speed setpoint differential input	DS1 : K1	OFF		
Speed reference zero-related	DS1 : K1	ON		
Additional input EZ1 I-SOLL-A IN/OUT	DS1 : K2	ON		
Additional input EZ1 INTAB	DS1 : K3	ON		
Additional input EZ2	No setting			
Integrator / Ramp	DS3 : K2	ON	Poti P1	INT

Actual value	Switch		Potentiometer	
Speedometer	S9 Bridge R13, R14		Poti P4	n_{max}
Armature voltage	DS4 : K2	ON	Poti P4	n_{max}
with IxR compensation	DS3 : K4	ON	Poti P2	IxR

Current limit		Switch		Potentiometer	
$I_{max}1$ (only for 4Q)	internal/external	DS2 : K3	ON/OFF	Poti P5	$I_{max}1$
$I_{max}2$	internal/external	DS2 : K4	ON/OFF	Poti P6	$I_{max}2$
Continuous current		DS6 : K3	ON short time	Poti P7	ID
Commutation limit		Resistor R59, R63			

Reinforcement	Switch	Potentiometer	
P-share	S4	Poti P3	X_P
I-share	S5		
D-share	S8		
Zero adjustment (n_{min} at 1Q)		Poti P9	Offset

4.4 View

Function	Ref.	Colour	Position
Enable set point	L1	green	
Enable speed and current controller	L2	green	
Ready for operation BTB	L3	green	
Speed controller output +	L4	green	
Speed controller output -	L5	green	
Speedometer error message	L6	red	
Message standstill	L7	green	
Message blocked / overload	L8	red	
Output UE2-A	L9	green	
Output UE1-A	L10	green	
Brake control	L11	green	
Output setpoint equal to actual value	L12	green	

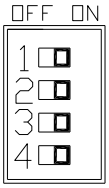
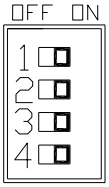
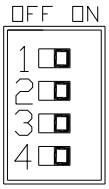
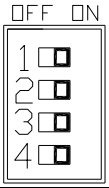
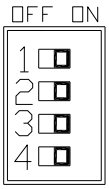
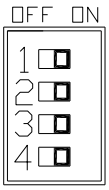
LEDs light up for the specified function

Message - Outputs

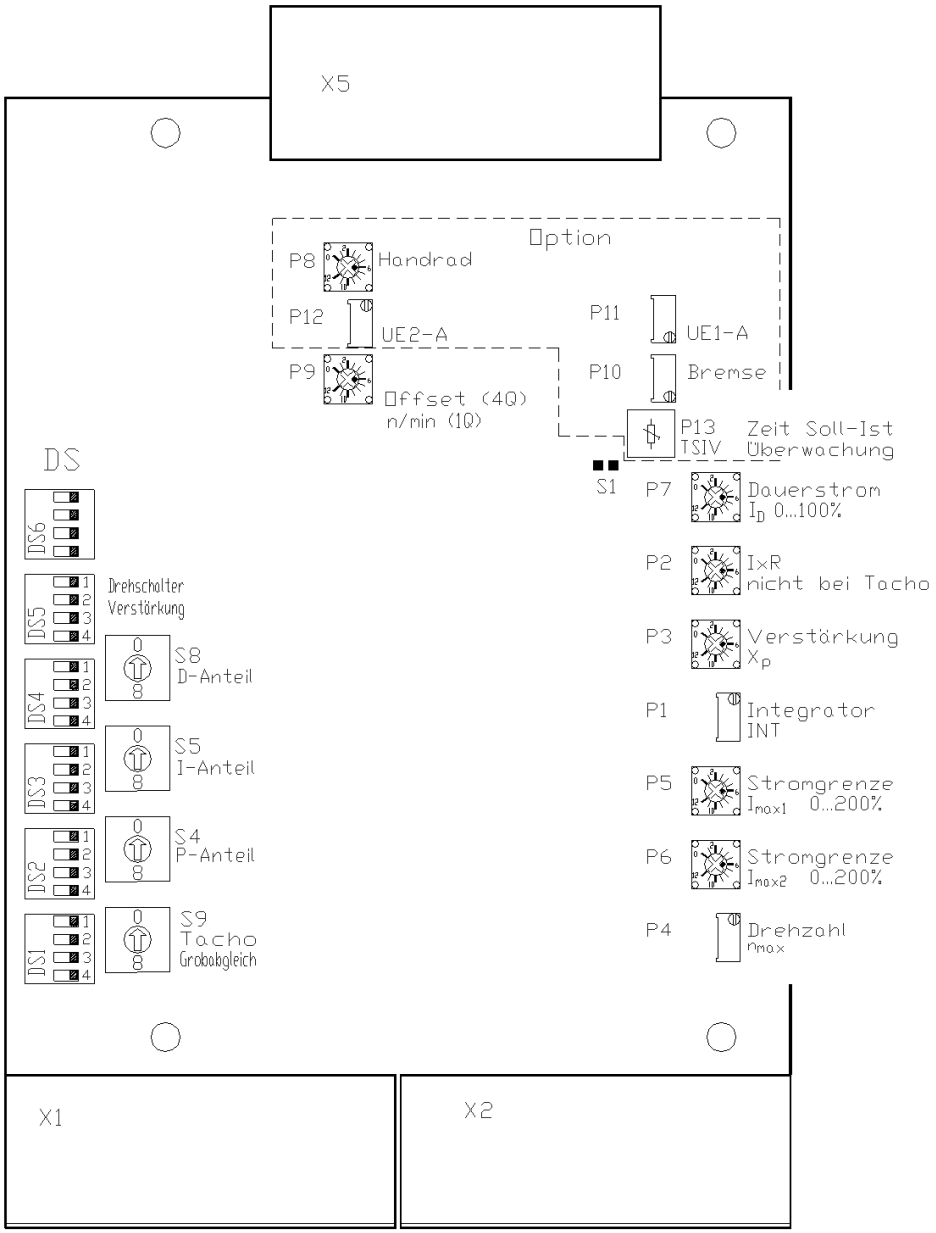
Function	Art	Terminal no.	State	
Ready for operation BTB	Semiconductor relay contact	X2:105 - X2:106	For BTB error	open
Speedometer error	Open-emitter	X2:107	for tacho breakage	< 2 V
Standstill	Open-emitter	X2:110	at standstill	> 22 V
Blocked / Overload	Open-emitter	X2:108	when blocked	< 2 V
Output UE1-A	Open-emitter	X5:504	selectable	
Output UE2-A	Open-emitter	X5:505	selectable	
Brake control	Open-emitter	X5:503	Brake applied.	> 22 V
Output Target = Actual value	Open-emitter	X5:506	with target=actual	> 22 V
Actual speed value	Analogue 1 kΩ	X2:109	± 5 V or ± 10 V	
Actual current value	Analogue 1 kΩ	X2:111	± 5 V or ± 10 V	
Speed setpoint	Analogue 1 kΩ	X2:507	± 10 V	
Current actual value I-actual2	Analogue 1 kΩ	X5:508	± 5 V	
Current setpoint	Analogue 1 kΩ	X5:509	± 10 V	

4.5 Switch DS

Settings overview switch DS

OFF position		ON position
	Switch DS6	
Output UE2-A		Output UE2-A inverted
Output UE1-A		Output UE1-A inverted
Peak current time max. 5 s		Peak current time max. 1 sec.
		Lid option
	Switch DS5	
Only contact 1 **or** 2 ON or both contacts OFF		UE1-A for speed monitoring UE1-A for current monitoring
Only contact 3 **or** 4 ON or both contacts OFF		UE2-A for speed monitoring UE2-A for current monitoring
	Switch DS4	
No tacho smoothing		Tacho smoothing
Actual speedometer value		Armature voltage -actual value
		Armature voltage - actual value of power unit
Speedometer monitoring on		Speedometer monitoring off
	Switch DS3	
Only contact 1 **or** 2 ON		Setpoint without ramp
		Setpoint with ramp (integrator)
Speed controller PI amplification		Speed controller gain -1
IxR compensation off (speedometer)		IxR compensation on
	Switch DS2	
Actual current monitor max.10V		Actual current monitor max. 5 V
Actual speed monitor max. 10V		Actual speed monitor max. 5 V
Current limit 1 external		Current limit 1 internal
Current limit 2 external		Current limit 2 internal
	Switch DS1	
Setpoint difference input		Setpoint referred to GND
Only contact 2 or 3 ON or both contacts OFF		Additional input EZ1 as I-Set Additional input EZ1 as INTAB
Controller lock immediately		Controller lock delayed

4.6 Potentiometer rotary switch



5 Settings

5.1 Setting instructions

Only by trained staff.
Observe safety regulations.
Observe the setting sequence.

Use device description.

MANUAL Classic	**Q1 x/x-x, P1 x/x-x**
	Q2 x/x-x
	Q3 x/x-x, P3 x/x-x
	Q6 x/x-x

Default settings

Actual value	>>>	Switch
Setpoint inputs	>>>	Switch, differential input
Logic inputs/outputs	>>>	Switch, int/ext. Supply
P-I parameter switch	>>>	Switch

Optimisation

Current regulator	on power unit Classic Q...., P.... (see MANUAL)
Actual value adjustment	nmax setting
Current limits	Imax, ID setting
Speed controller	P-I switch, Xp setting
Slope limiter	INT setting (setpoint1 only)
Zero point	Offset setting
Position controller	in the CNC/SPC control

Attention:
Always optimise control loops from the inside out.
Sequence: current controller>>speed controller<<position controller (CNC/SPS)

Measured values

Control plug X4

Measured value	max. value	Measuring point
Setpoint 1 after input amplifier	±10 V	X4:13
Setpoint 1 after integrator	±10 V	X4:14
Current setpoint (control funct. speed controller)	±10 V	X4:15
Actual current value	±5 V	X4:20
Actual speed value after divider	±5 V	X4:16

5.2 Set point

Set point

Function		Set point 1	Set point 2
Input gain	fixed	1	1
Input voltage max.		±10 V=	±10 V=
Differential input	Switch	DS1:K1 OFF	Not available
Input referred to GND	Switch	DS1:K1 ON	
Input signal		X1:6	X1:2
Input GND		X1:8a	X1:8
Measuring point control plug		X4:13	
Measured value	max.		±10 V=
Integrator function	Switch	DS3:K1 OFF DS3:K2 ON	Not available

Set point	
Input referred to GND	**Differential input**
For potentiometer setpoint	for setpoint from PLC/CNC
With internal supply voltage	External setpoint
Switch DS1:K1 ON	Switch DS1:K1 OFF
Note GND connection Basic setting	Signal and GND connection interchangeable

Both setpoints connected:
- Setpoint 1 and setpoint 2 are added internally.
- Note the sign.
- Setpoint buzzer not above ±10 volts.

Only with setpoint 1 - acceleration and braking ramp - linear - integrator			
Set point 1	**Switch**	**Potentiometer**	**Area**
Without integrator	DS3:K1 ON, DS3:K2 OFF	---	---
With integrator	DS3:K2 ON, DS3:K1 OFF	INT (P1)	0.3 to 15 sec.

Setpoint current
Setpoint from external current source 0 to ±20 mA
External load resistors for 0 to max. ±10 V.

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

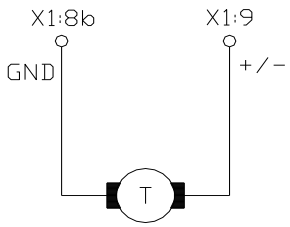
Attention:
Do not use setpoint current 4 to 20 mA.

5.3 Actual value

Tacho control
- with Q ... only DC tacho
- with P ... DC tacho or three-phase tacho with rectifier

- 0 Ω-bridges R13 and R14	soldered in
- switch DS4:K2	OFF
- Setpoint X1:6 positiv	Tacho signal X1:9 negative (for P and Q)
- Setpoint X1:6 negativ	Tacho signal X1:9 positive (only for Q)
- Tacho smoothing	Switch DS4:K1 ON [only with S9 < pos.6]

Tacho voltage at maximum speedminimum
minimum 12 V, maximum 205 V



Speed adjustment

Rough adjustment	Binary switch S9
Fine adjustment	Potentiometer n_{max} (P4)

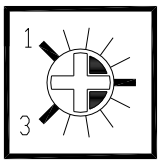
Switch S9											
Setting speedometer - coarse adjustment											**Potentiometer**
Position	0	1	2	3	4	5	6	7	8	9 to F	nmax
Tacho Voltage	∞	86	59	37	33	26	23	20	7	7V	min.
		122	85	54	48	38	34	30	11	11	middle
		200	156	101	89	71	65	56	23		max.

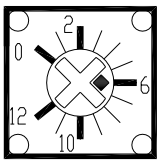
Attention:
Switch DS4:K1 OFF at S9 > or = pos. 7

Preset

- nmax potentiometer	Middle position
- switch position S9	select according to tachometer voltage
- tachometer voltage unknown	start with position 8

Fine adjustment at setpoint from potentiometer
- at 1 V adjust setpoint to 10 % maximum speed
- at 10 V fine adjust setpoint to 100 %
- at setpoint from CNC/PLC
- at 0.8 V adjust setpoint to 10 % maximum speed
- nmax potentiometer (P4) clockwise faster

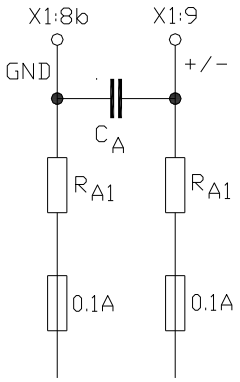




Speed measurement

- tachometer voltage X1:9	Accuracy approx. 5 %
- Optical tachometer	Accuracy 0.1 ... 1 %

Armature voltage as actual value
Potential-controlled armature voltage control
Input ±180 V
Input resistance 600 kΩ
Leakage current < 1 mA
Fuse 2 x 100 mA



Attention:

Connect external resistors to armature voltage > 180 volts.

The values are for UA	270 V= 200 kΩ
	440 V= 470 kΩ
	550 V= 680 kΩ

Use the EXZU-UA1 module.
Settings:

- Switches	DS4:K2 , DS4:K4 and DS3:K4	ON
- 0Ω-bridges	R13 and R14	open!!!
- Switch	S9	Position 0

Potential-free armature voltage control with

- potential isolation amplifier		e.g. QTV
- switch	DS4:K2	OFF
- switch	DS4:4 and DS3:K4	ON
- 0 Ω-bridges	R13 and R14	soldered in
- switch	S9	Position F

Speed settingPresetting
- n_{max} potentiometer >>> centre position
- switch position S9 >>> see above (0 or F)
> at 1 V setpoint adjust to 10 % armature voltage
> at 10 V setpoint fine adjust to 100

IxR compensation
The IxR speed drop is compensated for with potentiometer P2 (IxR), that at low speed and 50 % load step, the speed towards idling does not fall off.

5.4 Power

Current limitation

peak current	Range 0 to 200 % nominal current Reset time maximum 5 sec.	Potentiometer P5/P6
continuous current	Range 5 to 100 % nominal current	Potentiometer P7

Internally resetting current limits		
Current limit	**Function**	**Border**
Overload (DS6:K3 OFF)	Time (5 sec.)	Continuous current
Commutation limit	Speed	Boundary curve
The smallest current limit is effective!		

Peak current	Setting	Entrance	Switch	Potentiometer
Current limit internal	Imax1	-	DS2:K3 ON	Imax1 (P5)
	Imax2	-	DS2:K4 ON	Imax2 (P6)
External current limit	Imax1	X2:102 0 ... +10 V	DS2:K3 OFF	Imax1 (P5)
	Imax2	X2:103 0... +10 V	DS2:K4 OFF	Imax2 (P6)

The external current limit voltage can be attenuated internally with the Imax potentiometers.

Continuous current
Motor protection setting for both torque directions on
Motor measure rated current with potentiometer ID (P7)

Setting values:
- Do not connect motor
- Preset setpoint and enable Switch off- Measure
- Value at control plug X4:15 (5 V = nominal current)

Set point	Measured value Imax (2 sec.)	Measured value ID
+ 5 V	0 to max. 10 V	0.25 to max. 5 V
- 5 V	0 to max. 10 V	0.25 to max. 5 V

Current actual values
Measured value at control plug X4:20 Imax =0 to +5 V

ID =0 0,12 to +2.5 V

Attention:
Current controller - setting
See device description power section MANUAL Q...., P...

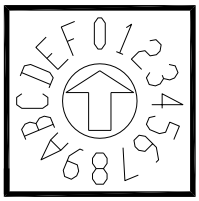
5.5 Speed controller

Speed controller - wiring
Three 16-digit binary switches S4, S5, S8.
Gain potentiometer P3 (Xp).
When replacing the unit = accept the settings.

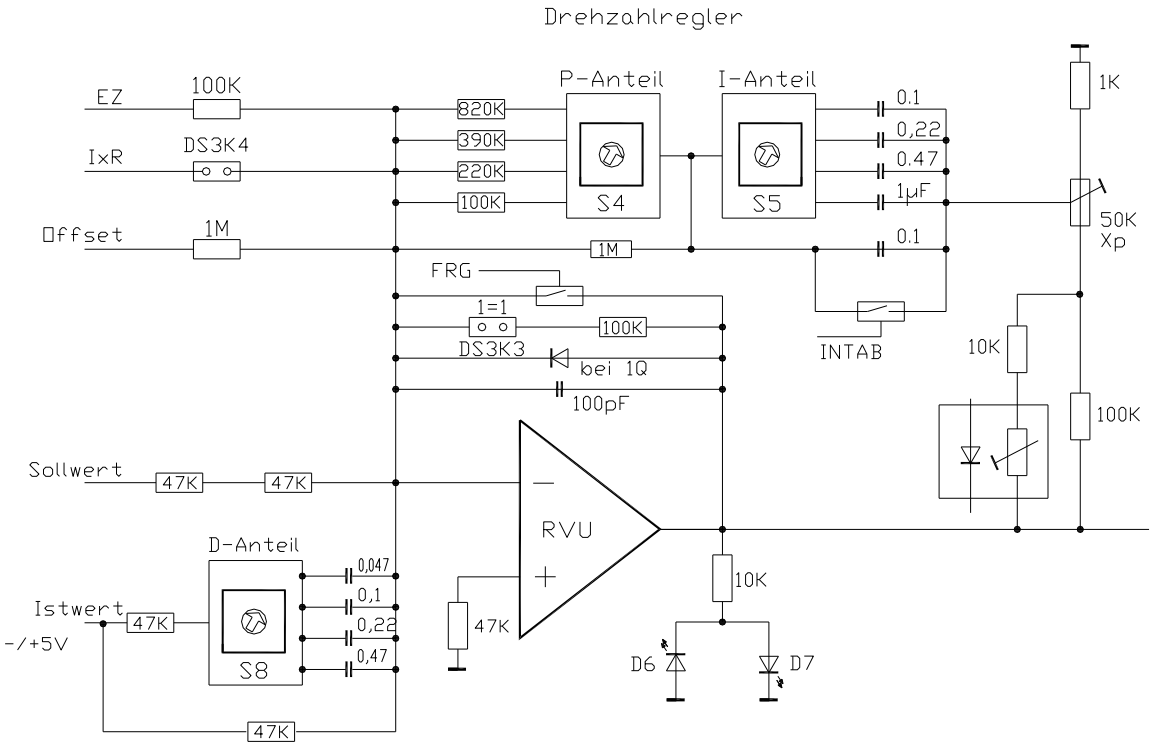
Basic setting

Binary switch S5	in position 4
Binary switch S8	at position 0
Binary switch S4	in position 1

Gain potentiometer Xp to 50 %.
Optimal for most drives

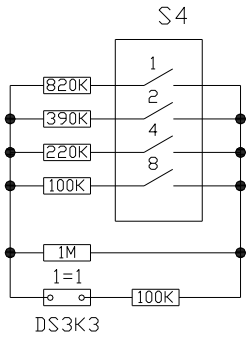


Integral component can be switched off (INTAB)
Switch DS1:K3 to ON. Switch contact from X1:1 to X1:8



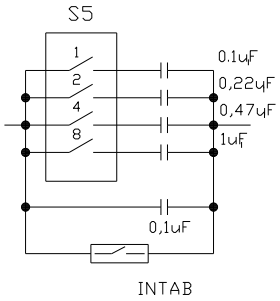
Switch S4

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



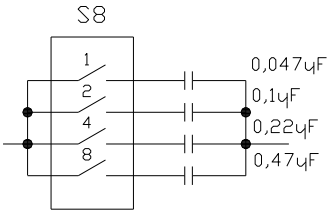
Switch S5

Position	0	1	2	3	4	5	6	7	
C-value	0,1	0,2	0,3	0,4	0,8	0,9	1,0	1,1	µF
Position	8	9	A	B	C	D	E	F	
C-value	1,1	1,2	1,3	1,4	1,8	1,9	2,0	2,1	µF

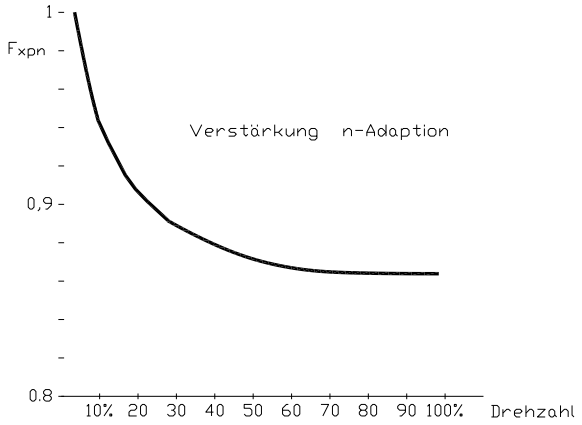


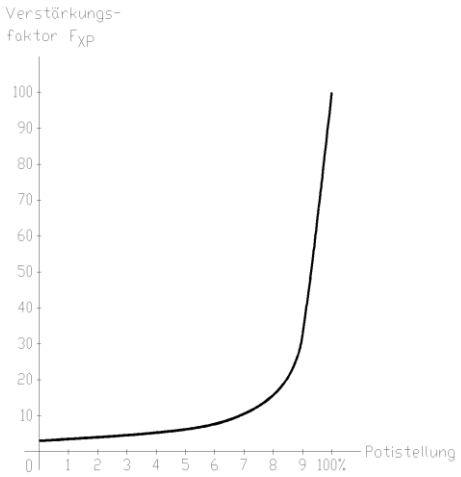
Switch S8

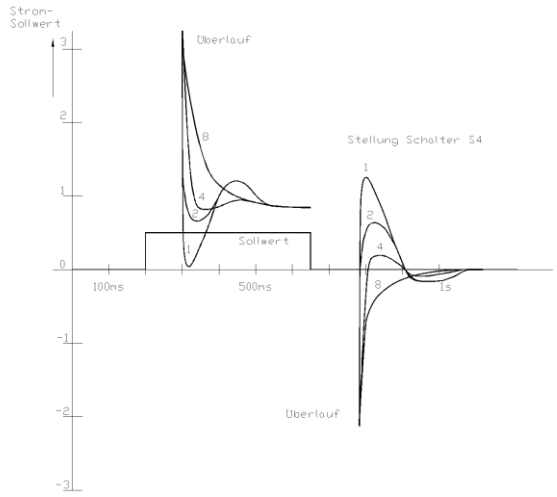
Position	0	1	2	3	4	5	6	7	
C-value	0	0,047	0,1	0,15	0,22	0,27	0,32	0,37	µF
Position	8	9	A	B	C	D	E	F	
C-value	0,47	0,52	0,57	0,62	0,69	0,74	0,79	0,84	µF



Proportional gain



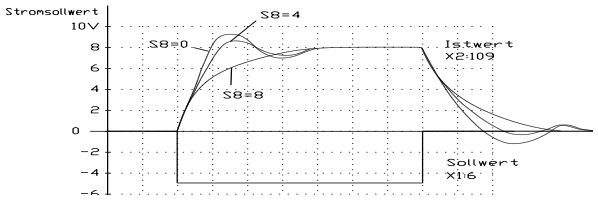




Adjustment with oscilloscope

Setting	**Measured value**	
Setpoint step ± 0.5V	Set point	X4:13
Input INTAB X1:1 activated	Control response	
Switch DS1:K3 ON, DS1:K2 OFF	Current setpoint	X4:15

Effect D proportion
- Actual value differentiation
- Setting with switch S8



Adjustment without measuring equipment

Connect the motor,

Setpoint	=	0
Xp	=	50 %
Switch S4	=	position 4
Switch S5	=	position 4
Switch S8	=	position 0

Release the controller.
Turn potentiometer Xp clockwise until the drive oscillates.

If no oscillation is achieved,
- reset switch S4 to lower values,
- set Xp potentiometer to oscillation
- turn potentiometer Xp counterclockwise until the oscillation subsides,
- turn Xp potentiometer 2 more positions to the left.

Set switch S5 so that the drive runs smoothly after approx. two oscillations
at a setpoint jump of 50 %.

Drive behaviour:

Gain too small	Reinforcement too large
Long-wave vibrations 0.1...1 Hz	Short oscillations 5 ... 20 Hz
Long overshoot	Jolts - during acceleration
Overruns target position	Jolts - when braking and in position

Attention:
When operating with CNC PLC controls:
at maximum speed / speed setpoint at 8 to 9 V

5.6 Commutation limit

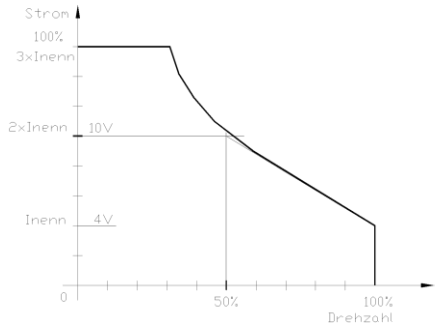
Commutation limit:
- For permanently excited DC motors with iron armature
- Observe motor data sheets

Maximum motor torque	3 to 6 fold Mdnenn
Maximum amplifier current	2 fold inside

Example:

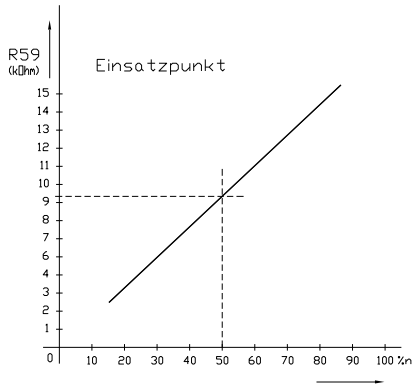
a = Motor limit curve
b = limit characteristic of the servo amplifier

Inenn Motor 4 V
Inenn Amplifier 5 V



Reduction line within motor curve

Slope of the limit characteristic
Value S = V current change/%
Speed change (S = V/%n)
Example:
Application point = 50 % speed
Slope = 6/50 = 0.12 V/%n

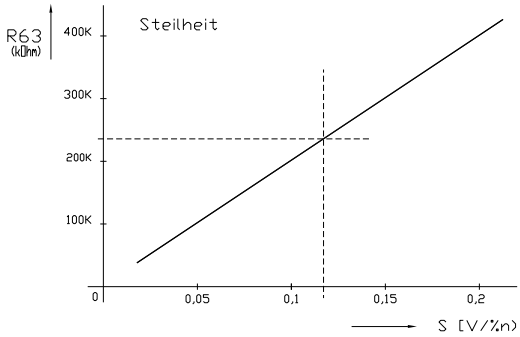


Setting
Resistor R59 Application point
Resistance R63 Slope
Example:

Diagram 2	R59 = 8.2 kΩ
Diagram 3	R63 = 220 kΩ

Control
Without motor
Setpoint zero, enable active

- Tachometer voltage	X4:16
- Speed range	0 … ±5 V
- current setpoint	
- Reduction	X4:15
- Current range	0 … ± 10 V
- Limit characteristic	According to
- Diagram 1	



Attention - The values are valid for 10 V setpoint value

5.7 Monitoring option

Brake control
As soon as the current value set with potentiometer P10 (brake) is exceeded during start-up, output X5:503 switches to > 22 V.
The output remains switched even if the motor current < P10 until the enable is switched off.

Adjustment range Potentiometer P10 0 to 20 % Rated current
Setting value of potentiometer clockwise greater.

Speed or current monitoring
The function of the threshold switches UE1-A and UE2-A can be programmed via dip switches as speed or current monitoring.
The output function (high or low) is selected with the dip switch.

Monitoring UE1-A
Adjustment range
Potentiometer P11 0 to 100 % Speed or rated current setting value of potentiometer clockwise greater.

Monitoring function Output switched at	Potentiometer	Switch DS5:K1	Switch DS5:K2	Output DS6:K2
Speed greater than set value	P11	ON	OFF	OFF
Speed less than set value	P11	ON	OFF	ON
Current greater than set value	P11	OFF	ON	OFF
Current less than set value	P11	OFF	ON	ON

Monitoring UE2-A
Adjustment range Poti P12 0 to 100 % speed or rated current setting value of Potentiometer clockwise greater.

Monitoring function Output switched at	Potentiometer	Switch DS5:K3	Switch DS5:K4	Output DS6:K1
Speed greater than set value	P12	ON	OFF	OFF
Speed less than set value	P12	ON	OFF	ON
Current greater than set value	P12	OFF	ON	OFF
Current less than set value	P12	OFF	ON	ON

Monitoring actual speed value equal to speed setpoint (SIV-A)
Output X5:506 switches to >22 V if the difference between actual speed value and input setpoint (terminal X1:6) is less than 5 %.
If the integrator (ramp) is selected, a speed error is output during acceleration or braking (output < 2 V).
If a time-delayed display of the error is desired, this can be set with potentiometer P13 in a range from 0.1 sec. to 11.0 sec.

6 Warranty

UNITEK warranties that the device is free from material and production defects. Test results are recorded and archived with the serial number.

The warranty time begins from the time the device is shipped, and lasts two years.

UNITEK undertakes no warranties for devices which have been modified for special applications.

During the warranty period, **UNITEK** will, at its option, either repair or replace products that prove to be defective, this includes guaranteed functional attributes. **UNITEK** specifically disclaims the implied warranties or merchantability and fitness for a particular purpose. For warranty service or repair, this product must be returned to a service facility designated by **UNITEK**.

For products returned to UNITEK for warranty service, the buyer shall prepay shipping charges to **UNITEK** and **UNITEK** shall pay shipping charges to return the product to the buyer.

However, the buyer shall pay all shipping charges, duties and taxes for products returned to **UNITEK** from another country.

The foregoing warranty shall not apply to defects resulting from:
- improper or inadequate repairs effected by the buyer or a third party,
- non-observance of the manual which is included in all consignments,
- non-observance of the electrical standards and regulations,
- improper maintenance
- acts of nature.

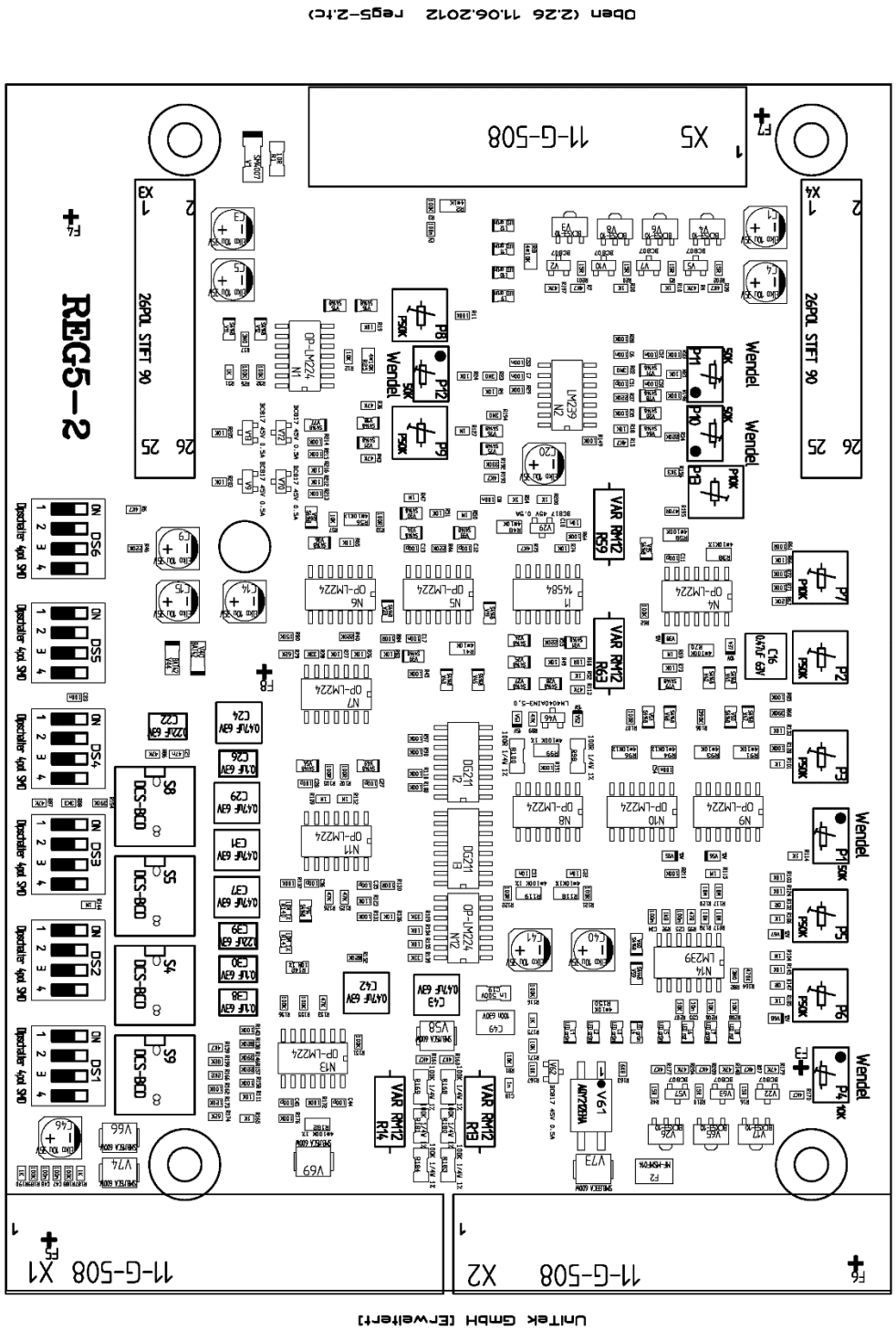
All further claims on transformation, diminution and replacement of any kind of damage, especially damage, which does not affect the UNITEK device, cannot be considered. Follow-on damage within the machine or system, which may arise due to malfunction or defect in the device cannot be claimed. This limitation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

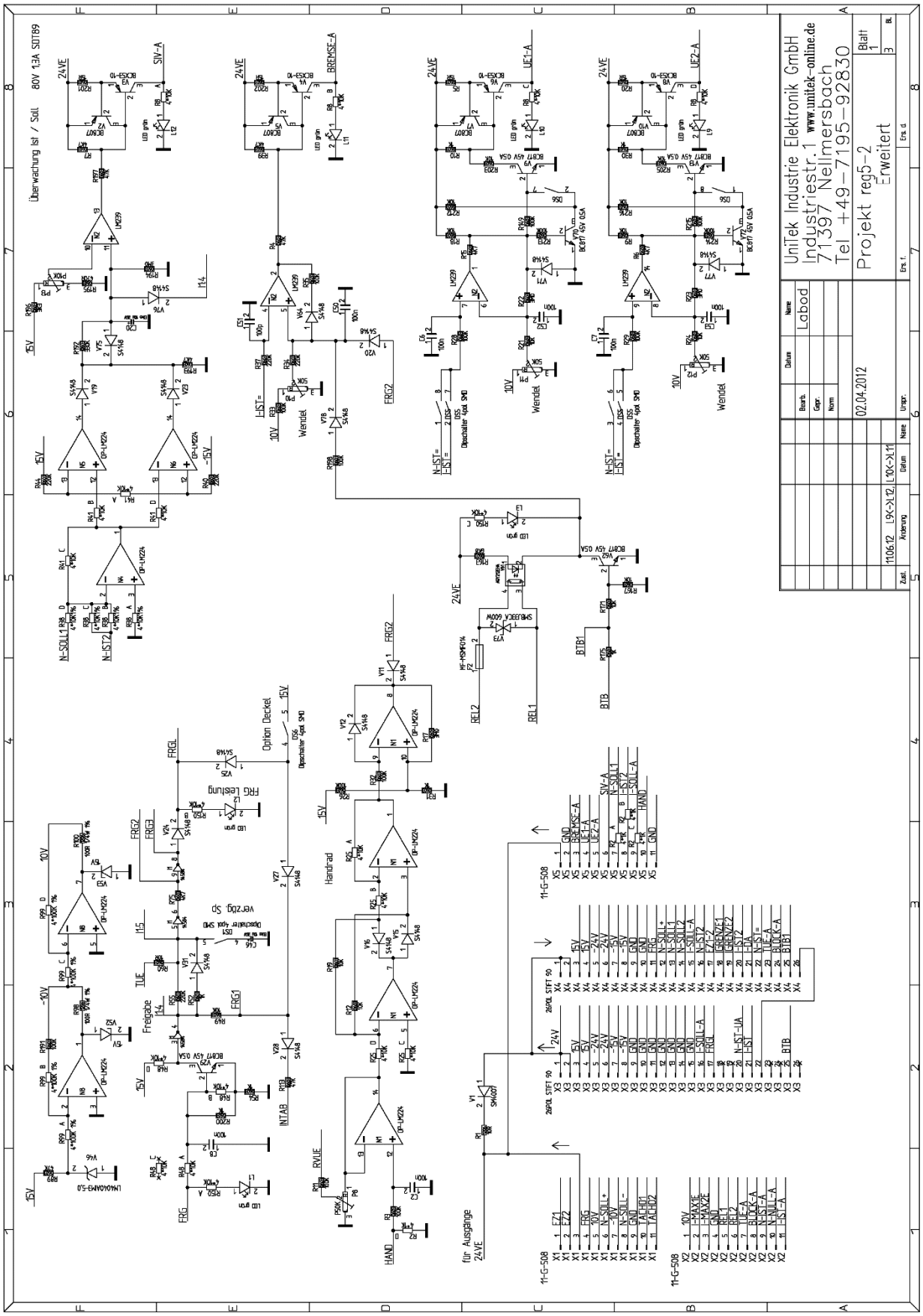
UNITEK reserves the right to change any information included this MANUAL.
All connection circuitry described is meant for general information purposes and is not mandatory.
The local legal regulations, and those of the standards authorities have to be adhered to. **UNITEK** does not assume any liability,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

UNITEK's products are not authorised for use as critical components in the life support devices or systems without express written approval.
The onus is on the reader to verify that the information here is current.

7 Drawing set

(Display as installation in the unit)

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Projekt reg5-2
Erweitert
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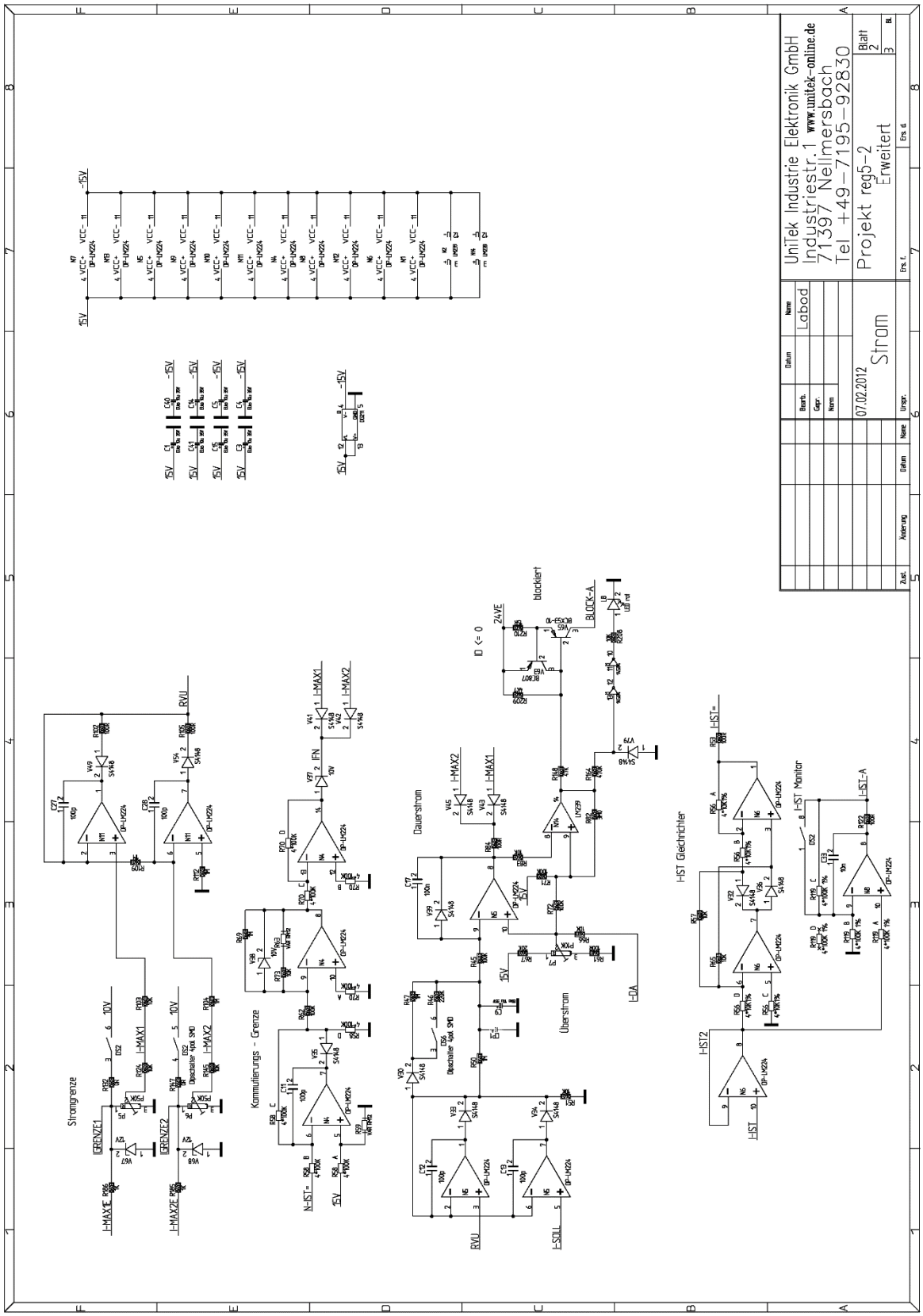
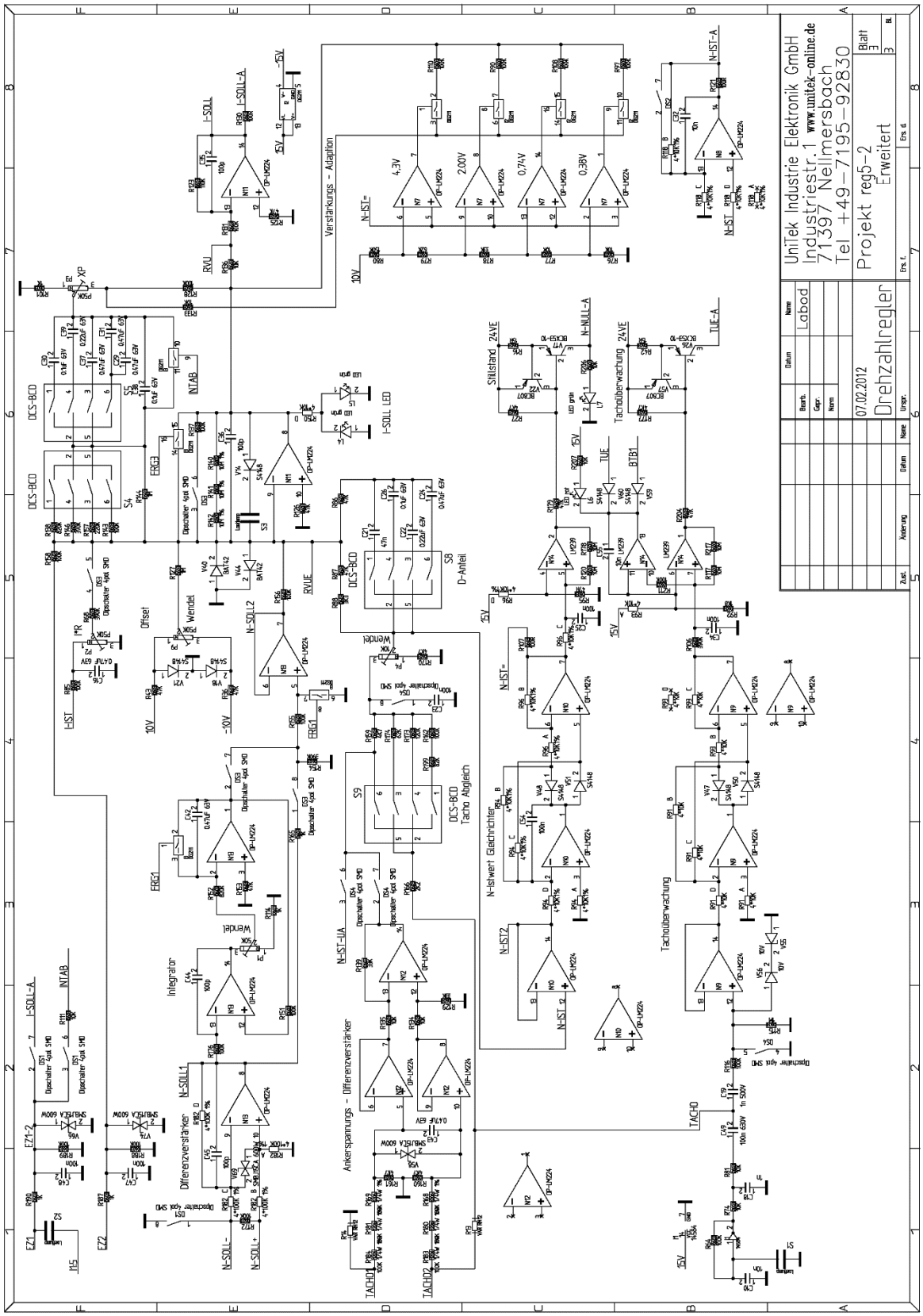
02.04.2012
Labod
Überwachung Ist / Soll 80V 1.3A SOT89
24VE
SIV-A
BREMSE-A
UE1-A
UE2-A
Wendel
Dipschalter 4pol SMD
Option Deckel
FRG Leistung
Freigabe
Verzog. Sp
Handrad
für Ausgänge 24VE
11-G-508
26POL STFT 90


UniTek Industrie Elektronik GmbH
Industriestr. 1 www.unitek-online.de
71397 Nellmersbach
Tel +49-7195-92830
Projekt reg5-2
Erweitert
Blatt 2
07.02.2012
Strom
Stromgrenze
Kommutierungs - Grenze
Dauerstrom
Überstrom
HST Gleichrichter
HST Monitor
blockiert
BLOCK-A
I-MAX1
I-MAX2
I-MAXE
I-HST
I-HST-A
I-HST=
I-SOLL
N-IST=
RVU
IFN
GRENZE1
GRENZE2
ID <> 0
HOA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Projekt reg5-2
Erweitert
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Drehzahlregler
Blatt 3
Verstärkungs - Adaption
Ankerspannungs - Differenzverstärker
N-Istwert Gleichrichter
Tachoüberwachung
Stillstand 24VE
Tachoüberwachung 24VE
Integrator
Differenzverstärker
D-Anteil
DCS-BCD Tacho Abgleich
I-SOLL LED
Offset
Wendel

8 Compatibility list REG 3 - REG 5

8.1 Compatibility

REG3	REG5		
S1	DS3	K:4	
S2	DS3	K:2 ON	K:1 OFF
S3	DS3	K:1 ON	K:2 OFF
S4	S4		
S5	S5		
S6	DS1	K:1	
S7	R14		
S8	S8		
S9	S9		
S10	DS4	K:2	
S11	DS4	K:1	
S12	R13		
S13	DS2	K:4	
S14	DS2	K:3	
S15	DS3	K:3	
SW16	DS4	K:4	
S18	DS6	K:3	
S19	DS1	K:4	
SW1	DS1 DS1	K:2 ON K:3 ON	K:3 OFF or K:2 OFF

Default setting on delivery						
DS1	K:1 K:2 K:3 K:4	ON ON OFF at at	 P... OFF Q... ON	DS4	K:1 K:2 K:3 K:4	ON OFF OFF OFF
DS2	K:1 K:2 K:3 K:4	ON ON at at ON	 P ... OFF Q... ON 	DS5	K:1 K:2 K:3 K:4	ON OFF ON OFF
DS3	K:1 K:2 K:3 K:4	ON OFF OFF OFF		DS6	K:1 K:2 K:3 K:4	OFF OFF OFF OFF