

MANUAL

Analog Control Electronics
for
Thyristor-Motor Controller Serie Classic

R E G - 5

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Basic Information

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Basic Information

2 Basic Information

2.1 Applications

Note: MANUAL REG5

can only be used in connection with

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



Applications

Control electronics for

- Thyristor – Motor controller
- 1Q – und 4Q operation
- Tacho control
- armature voltage control with $I \times R$ – compensation
- speed control
- torque control
- combined speed / torque control

Features

Inputs

- Command value input with differential amplifier
- 2 additional inputs (command value or logic)
- Hand-wheel input (analog)
- Actual value tacho input
- Highly ohmic input of the armature voltage
- External adjustment of the current limit

Analog outputs

- Connection to the power section
- Current command value output
- Speed and current monitors

Digital outputs

- BTB relay
- Signal „stationary“
- Signal „tacho fault“
- Signal „blocked“
- Signal „command value = actual value“
- 2 watchdog signals for speed or current (optional)
- Brake logic output

Functions

- Speed controller (RVU) with PID switching system
- Static and dynamic current limiting
- Speed-dependent current limit, commutation limiting
- Slope limiting device (adjustable integrator)
- Command value zero switching
- Enable logic
- Speed and current watchdog
- Solderless adjustment
- Bus controller (connector X4)

Options

(can be plugged at X4)

- Multi 1, Multi 2, Multi 4, Multi 5

Basic Information

2.2 Specifications

International Protection	IP 00
Device layout	VDE 0100 Group C, VDE 0160
Feuchtebeanspruchung:	Class F / DIN 40040 no condensation
Operating range	0 ... 60°C
Bearing range	-30°C bis +80°C
Speed controller	
Control accuracy	actual value error $\pm 0,1 \%$
Control range	> 1:1000
Input, output	
Logic-voltage supply	+ 24V=, 10mA
Nominal value supply	$\pm 10V$, 10mA
Nominal value inputs	$\pm 10V$ (50kOhm)
Actual value inputs	$\pm 200V$ (min. 20kOhm)
Actual value inputs armature	$\pm 200V$ (600kOhm)
Logical inputs	+ 10 ... +30V=
Logical outputs	internal 24v external 24V
Current reception	+24 V 8,5mA (without output) +15V 35mA -15V 35mA

Basic Information

2.3 Interface power pack X3

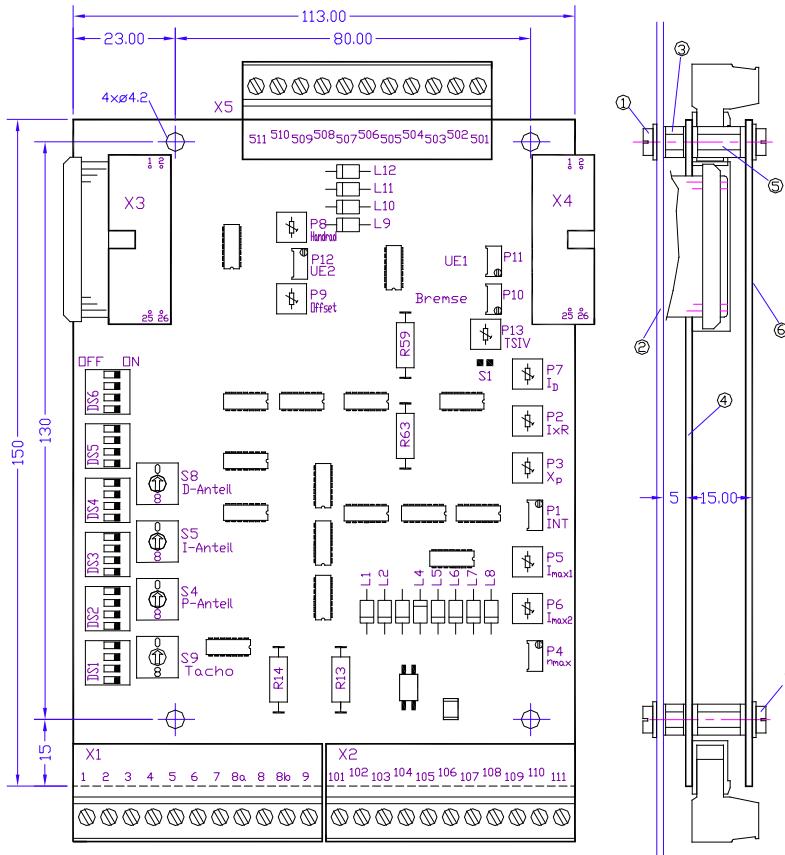
Function		Plug-No.
+ 24 Volt	$+24 \pm 10\%$	X3: 1 u. 2
+ 15 Volt	$+15 \pm 2\%$	X3: 3 u. 4
- 24 Volt	$-24 \pm 10\%$	X3: 5 u. 6
- 15 Volt	$-15 \pm 2\%$	X3: 7 u. 8
Device ground GND	0	X3: 9,10,11,12,13 u. 14
I – nominal value (GND)	0	X3: 15
I – nominal value (signal)	$\pm 10 \text{ V} =$	X3: 16
Enable current controller	$+ 15 \text{ V} =$	X3: 17
Lock 1	$+ 10 \text{ V} =$	X3: 18
Lock 2	$+ 10 \text{ V} =$	X3: 19
n - actual	$+ 5 \text{ V} =$	X3: 20
I - actual	$\pm 5 \text{ V} =$	X3: 21
Over current power unit		X3: 22
firing angel 1	$+ 10 \text{ V} =$	X3: 23
firing angel 2	$+ 10 \text{ V} =$	X3: 24
Ready for operation BTB	$+ 10 \text{ V} =$	X3: 25
free	n .B.	X3: 26
Flat band pin 26 pol.		

Mechanical Installation

Dimension

3 Mechanical Installation

3.1 Dimension



REG5 - B1342-1

Assembly material				
Pos.	Material		pieces	C.No.
1	cyl. Screw	M3 x 12	4	
2	Cover plate	white	1	
3	Threaded distance bolt	M3 x 5	4	
4	Control electronics	REG 5	1	
5	Threaded distance bolt	M3 x 12	4	
6	Cover	transparent	1	
7	cyl. screw	M3 x 6	4	

Assembly:

- Fix screw 1 with bolt 3 in cover plate 2
- Plug ribbon cable into X3 on REG5
- Fix REG5 with bolt 5
- Fix cover 6 with screw 7
- low tightening torques
- plastic screwings

Disassembly in reverse order

Control Connections

4 Control Connections

4.1 Connections

The connection advice is a general information and it is non-obligatory.

Note:

- connection and operating instructions
- local regulations
- EU guideline 89/392/EWG
- VDE and TÜV regulations and Trade body guidelines

Connection no. Terminal connector

X1:1 to X1:9 and X2:101 to X2:111

Signal conductors

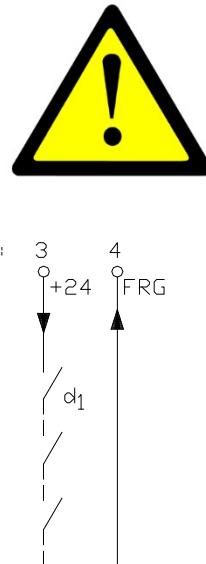
Shielded and separated from power conductors,
command value pairs twisted and shielded.

Logic connections

Relays with gold contacts or reed relays. Contact current 6mA

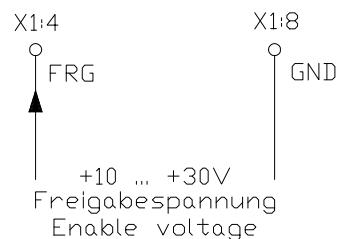
Drive enable- internal logic voltage

- internal logic voltage X1:3 +24V/10mA
- contact circuit between X1:3 und X1:4



Drive enable – extenal logic voltage

- drive enable voltage +10 ... +30V X1:4
- external GND X1:8



Drive disabled

- Switch DS1:K4 ON (emergency stop) (basic set-up)
- command value internally immediately to 0 (braking)
 - after 2 Seconds >>> speed controller de-activated

(E-REG_REG5-FRG-1 / -FRG-2)

>>> LED L1 dark
>>> LED L2 dark

- Switch DS1:K4 OFF (decelerates without braking)
- command value controller are immediately
de-activated

>>> LED L1, LED 2 dark

Note:

- Switch DS1: K4 ON >>> emergency stop (basic set-up)
- Switch DS1:K4 OFF >>> deceleration without braking

Control Connections

4.2 Speed command value

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

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

with internal voltage source >>> switch **DS1:K1 ON**

Command value inputs

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

Command value pairs

should be twisted and shielded

the shield should be connected on one side

Connections				
Command value	Connector	Switch	Function	Measuring point
Command value 1	X1:6 (Signal) X1:8a (GND)	DS3:K1 ON DS3:K2 ON	directly Ramp directly	X4:13 X4:14
Command value 2	X1:2 (Signal) X1:8 (GND)			X4:10
Shield	X1:8			

Switch positions			
Function – command value 1	Switch	Position	Basic adjustment
Differential input	DS1:K1	OFF	
with internal voltage source	DS1:K1	ON	*****
with ramp (integrator)	DS3:K2	ON	
without ramp	DS3:K1	ON	*****

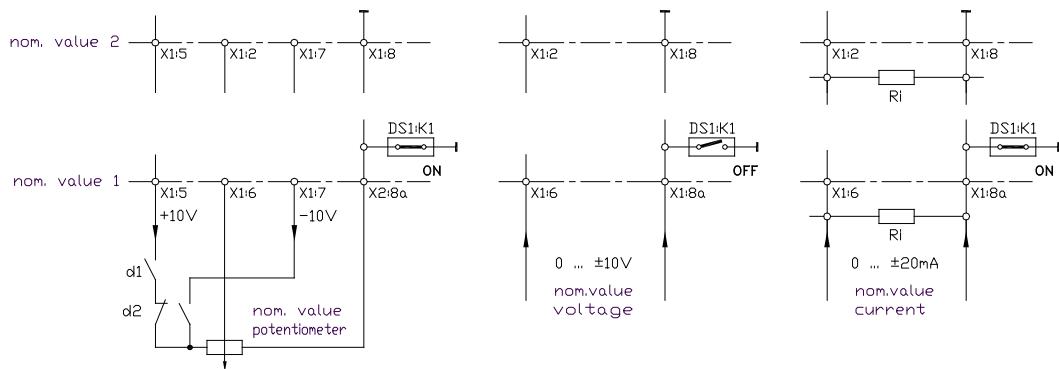
Control Connections

Resistors for a current command value of 0 ±20mA

Command value 1 $R_i = 500\Omega$
 Command value 2 $R_i = 500\Omega$
 Internal supply

CNC / SPC

Current command value



REG5 - Soll1 - 598

External current limiting

Voltage source for external current limits

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

Control range

0 ... + 5V >>> 0 bis 100 % rated current of the device
 0 ... + 10V >>> 0 bis 200 % rated current of the device

Inputs

Maximum input voltage +10V

Input resistance 50 kΩ

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

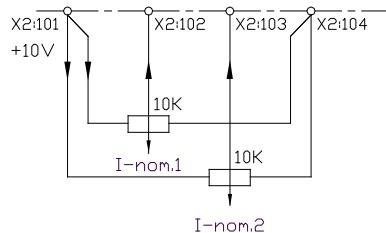
Relay contacts: gold or reed contacts

Connections			
Current limit	Connector	Switch	Measuring point
Speed – Setpoint positive	X2:103 (Signal)	DS2:K3 OFF	X4:19
	X2:104 (GND)		X4:10
Speed – Setpoint negative	X2:102 (Signal)	DS2:K4 OFF	X4:18
	X2:104		X4:10

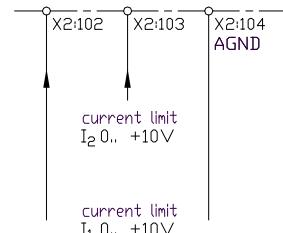
Control Connections

Speed command value

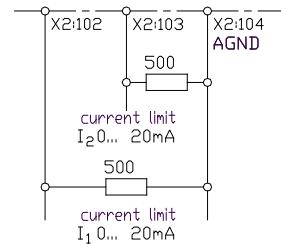
Internal supply



CNC / SPC



Current command value



_Zeichnungen_E-REG_REG5 - Soll2 - 598

Attention:

If the current limit is internally adjusted
>>> Schalter DS2:K3 und DS2:K4 position ON



Control Connections

Actual value connection

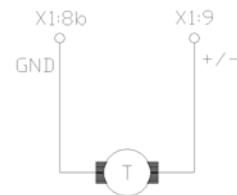
Tacho connection		
Tacho type	1Q – operation	4Q – operation
DC - tacho	x	x
Three-phase tacho + rectifier	x ⁽¹⁾	
AC tacho + rectifier	x ⁽¹⁾	

⁽¹⁾ additional capacitor 0,47 µF at the tacho input

Maximum tacho voltage >>> ±200 Volt.

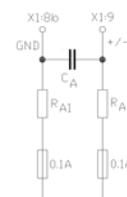
Tacho connection:

Input	X1: 8b	=	Tacho (GND)
Input	X1 : 9	=	Tacho (Signal)
Input	X1 : 8	=	Shield



Command value input X1: 6 positive >>> tacho input X1:9 negative

0Ω-bridges R13 und R14 mounted



REG5 - ISTW – 1 and ISTW 2

Check:

0Ω-bridges	R13 und R14	open !!!
switch	DS4:K2, DS4:K4	ON
switch	DS3:K4	ON
switch	S9	auf 0
fuses	2x 100mA	Amature voltage
no shielding		

Attention:

If the armature voltage is >±180 Volt, connect external series resistors

RA1 and RA2 values:

UA 270 Volt = 200 kΩ

USA 440 Volt = 470 kΩ

UA 550 Volt = 680 kΩ

CA = 0,1 µF/400V

In case of a high voltage ripple

Use package – EXZU-UA 1 !

The leakage current against protective earth is < 1 mA

Potential-free armature voltage connection

through the use of a potential isolating amplifier (z.B. QTV2-3)

connection the same as for tacho control >>> X1:9, X1:8b

Adjustment:

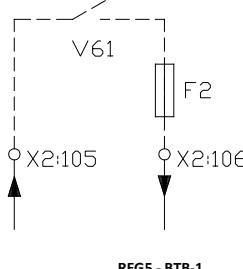
switch	DS4:K2	OFF
switch	DS4:K4	ON
switch	KS3:K4	ON
0Ω-bridges	R13 und R14	mounted
switch	S9	position F

Control Connections

4.3 Signals

Drive ready BTB

Semiconductor relay V61	
Signal contact	X2:105 – X2:106
Contact values	max. 48V, 0,25A
Regenerating fuse F2	340mA



REG5 - BTB-1

The BTB contact signals to the PLC or CNC that the drive is ready for operation.
BTB signals of several devices must be connected in series.

Delay time after switching on the power supply >>> max. 1 Sec.

Display		
Drive ready	LED L3 bright	Contact closed
Fault	LED L3 dark	Contact open

BTB contact opens if

BTB power section	X3:25	fault LED power section
Tacho actual value fault		LED L6 bright

A t t e n t i o n

In any case use a BTB contact with the CNC / PLC

Analog measuring outputs		
Function	Motor current	Speed
Connection	X2:111 – X2:104	X2:109 – X2:104
Measured value	Switch DS2:K1 ON 2,5V = Type current 5,0V = Peak current bipolar	Switch DS2:K2 ON 5,0V = max. speed bipolar
	Schalter DS2:K1 OFF 5,0V = Type current 10,0V = Peak current bipolar	Schalter DS2:K2 OFF 10,0V = max. speed bipolar
Output resistance	1 kΩ	1 kΩ

Control Connections

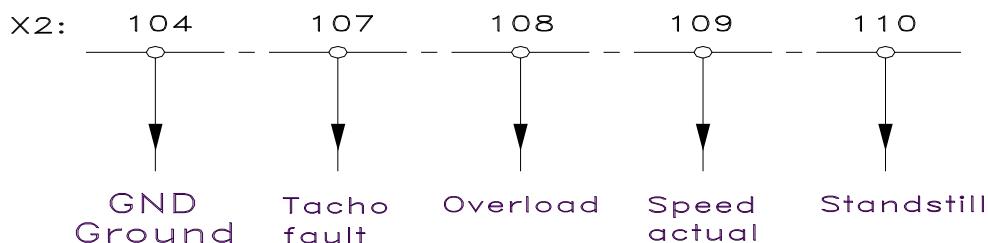
Output signals

Logic output

- wire-break proof	output blocked in case of faults
- Output voltage	>22V=
- Output current (with internal +24V)	5mA
- Output current (with external +24V)	30mA (optional)

Output signals			
Signal	Function	Output	Display
Tacho fault	break	X2:107	L6
Overload	blocks 5s/200ms	X2:108	L8
Stationary	speed <1%	X2:110	L7
Reference mass	GND	X2:104	

Fault signals are not stored



E-REG5 - MELDE 1

Tacho fault signal

- in function	switch DS4:K4	OFF
- only with dc tacho generators		
- no function	switch DS4:K4	ON
- with ac or dc tacho generators		
- with armature voltage control		

Close the jumper S1 in order to switch off the superimposed ac voltage of the tacho watchdog (only necessary in case of an oscilloscope watchdog of the tacho).

Attention

When S1 is closed, the tacho watchdog is out of function

Attention

Tachos with either a high voltage or a high inductance may cause the tacho watchdog to malfunction without the tacho line being broken.

In order to overcome this problem insert a capacitance of 0,1 µF/400V at the tacho terminals + and -.



Control Connections

Signals

Optional output signals

Logic outputs

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

Output signals				
Signals	Function	Function inversion	Output	LED
Brake	Starting current >P10		X5:503	L11
Watchdog UE1-A speed	Speed < P11 DS5:K1 ON	Speed > P11 DS6:K2 ON	X5:504	L10
Watchdog UE1-A current	Current < P11 DS5:K2 ON	Current > P11 DS6:K2 ON	X5:504	L10
Watchdog UE2-A speed	Speed < P12 DS5:K3 ON	Speed > P12 DS6:K1 ON	X5:505	L9
Watchdog UE2-A current	Current < P12 DS5:K4 ON	Current > P12 DS6:K1 ON	X5:505	L9
Speed actual value equal to speed command value	Difference <5%		X5:506	L12
Reference mass	GND		X5:502	
External supply	+24 V max. 30V		X5:501	

Fault signals are not stored.

Analog outputs		
Function	Measured value	Output
Speed command value at the output of the differential amplifier	± 10V	X5 : 507
current actual value	± 5V	X5 : 508
Current command value (output speed controller)	± 10V	X5 : 509
Output resistance 1kΩ		

Connection hand-wheel (optional)

A dc tacho can be connected at X5:510 and X5:511 as hand-wheel.

Max. input-voltage 15V =

Max. input-resistance 100kΩ

There is an automatic enable with this function.

Control Connections

4.4 Control connections

Function		Terminal no.
		X1
current command value input/output or INTAB		X1:1
command value 2 speed controller	Signal ± 10V	X1:2
+24 Volt	-output for enable	X1:3
enable	-input +10 ... +30V	X1:4
+10 Volt	-output for com. Value	X1:5
command value 1	-input signal ± 10V	X1:6
-10 Volt	-output for com. Value	X1:7
command value 1	-input AGND	X1:8a
device ground	GND	X1:8
tacho	-input GND	X1:8b
tacho	-input signal ±200V	X1:9
		X2
+10 Volt output	for current limit	X2:101
external current limit I1	0 ... 10V	X2:102
external current limit 12	0 ... 10V	X2:103
device groun	GND	X2:104
drive ready BTB	Halbleiter-Relais	X2:105
drive ready BTB	Kontakt	X2:106
signal tacho fault	ISTF	X2:107
signal overload	UELA	X2:108
speed (n-lst)	± 5V od. ±10V	X2:109
signal stationary	N=0	X2:110
current (I-lst)	±5V od. ±10V	X2:111
Optional signals		X5
External supply +24V	+24V= max. +30V	X5:501
Supply voltage	GND	X5:502
Output signal brake	>22V	X5:503
Output signal UE1-A	>22V	X5:504
Output signal UE2-A	>22V	X5:505
Output signal SIV-A	>22V	X5:506
Analog output n-com. 1	± 10V	X5:507
Analog output I-act.2	± 5V	X5:508
Analog output I-com.-A	± 10V	X5:509
Input hand-wheel	0 ... ± 15V	X5:510
GND	GND	X5:511

Control Connections

Connection to the power section X3

Function		Connector no.
+24 Volt	$\pm 10\%$	X3: 1 u. 2
+ 15 Volt	$\pm 2\%$	X3: 3 u. 4
- 24 Volt	$\pm 10\%$	X3 :5 u. 6
- 15 Volt	$\pm 2\%$	X3: 7 u. 8
device ground GND	0	X3: 9,10,11,12,13 u. 14
I – command value (GND)	0	X3: 15
I – command value (Signal)	$\pm 10\text{ V} =$	X3: 16
Enable current controller	$+ 15\text{ V} =$	X3: 17
Block 1	$+ 10\text{ V} =$	X3: 18
Block 2	$+ 10\text{ V} =$	X3: 19
n – actual	$+ 5\text{ V} =$	X3: 20
I – actual	$\pm 5\text{ V} =$	X3: 21
Over-current power section	not connected	X3: 22
Trigger angle 1	$+ 10\text{ V} =$	X3: 23
Trigger angle 2	$+ 10\text{ V} =$	X3: 24
Drive ready BTB	$+5\text{V}...+15\text{V}$	X3: 25
free	not connected	X3: 26

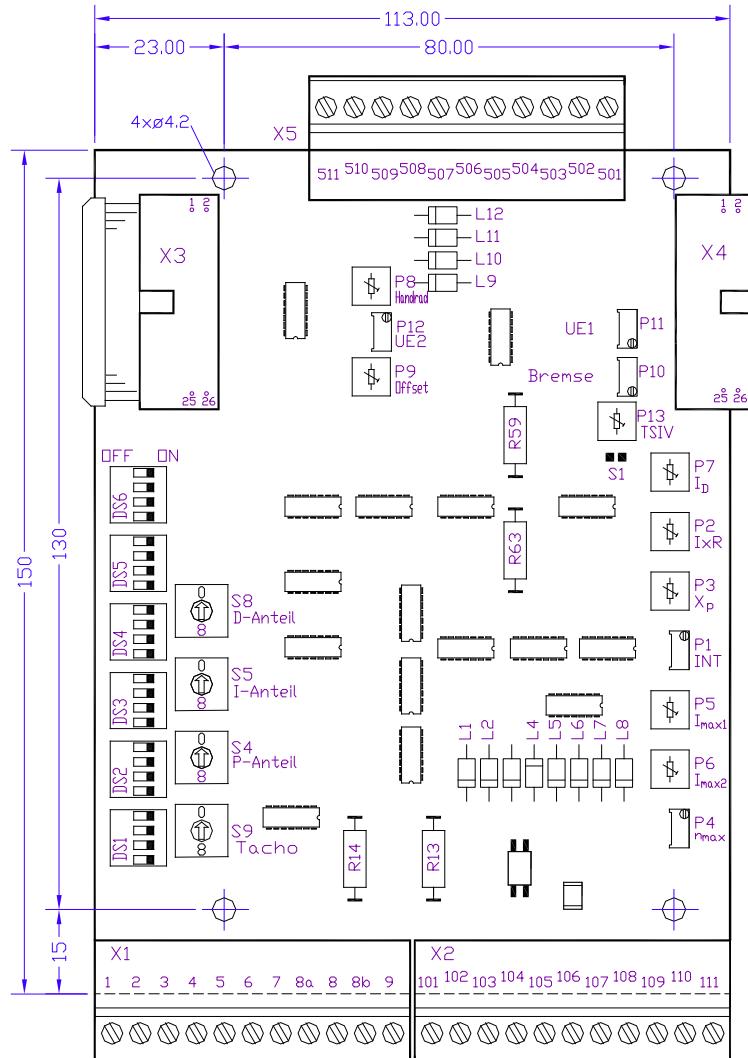
Test point connector, connection be the optional units X4

Function	Connector no.
+ 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 ground GND	X4: 9 u. 10
enable	X4: 11
n-com. Value at the input of the diff. amplifier	X4: 12
n-com. Value at the output of the diff. amplifier	X4: 13
n-com. Value at the output of the integrator	X4: 14
I-command value	X4: 15
n-actual value (at the output of the divider)	X4: 16
EZ 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 (at the output of the rectifier)	X4: 22
tacho fault	X4: 23
overload	X4: 24
BTB1	X4: 25
over-current power section	X4: 26

Device - Overview

5 Device - Overview

5.1 Components

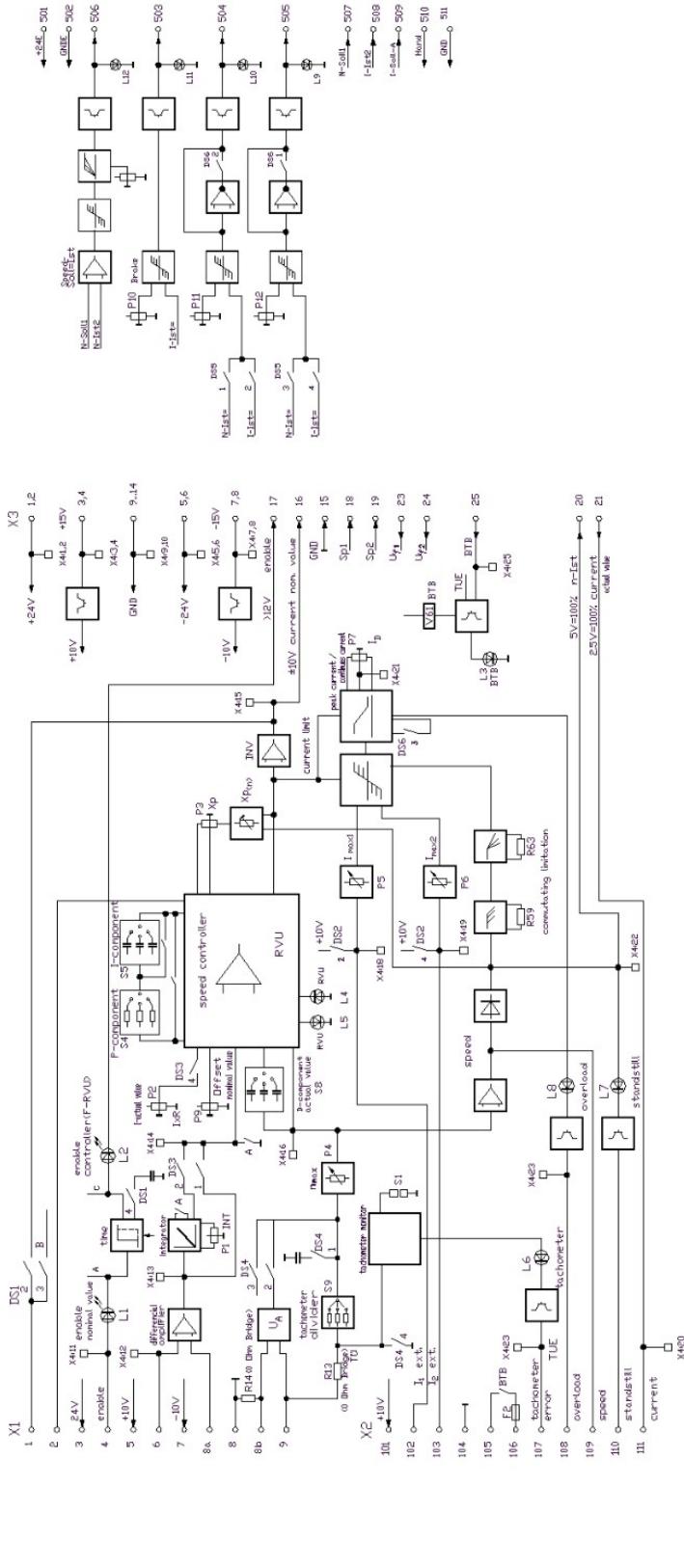


REG5 – B1342 - 2

connector X1	control connections
connector X2	control connections
connector X3	connection to the power section
connector X4	Test point connector, connection to options
connector X5	control connections optional
Minimum connection of the control electronics	
Enable	X1:3, X1:4
Command value	X1:6, X1:8a
Actual value	X1:8b, X1:9

Device - Overview

5.2 Circuit Diagramm



E-Reg_REG5 - BL1174

Device - Overview

5.3 Adjustments

Function Component

Command value	switch		Potentiometer	
Speed command value – differential input	DS1 : K1		OFF	
Speed command value – referred to point zero	DS1 : K1		ON	
Additional input EZ1 I-SOLL-A IN/OUT	DS1 : K2		ON	
Additional output EZ1 INTAB	DS1 : K3		ON	
Additional input EZ2	not adjusted			
Integrator / ramp	DS3 : K2	ON	Poti P1	INT

Actual	Switch		Potentiometer	
Tacho	S9 (bridge R13, R14)		Poti P4	nmax
Armature voltage with IxR compensation	DS4 : K2	ON	Poti P4	nmax
	DS3 : K4	ON	Poti P2	IxR

Current limit	Switch		Potentiometer	
I _{max1} (nur bei 4Q)	intern/external	DS2 : K3	ON/OFF	Poti P5 I _{max1}
I _{max2}	intern/external	DS2 : K4	ON/OFF	Poti P6 I _{max2}
Continuous current	DS6 : K3 ON short time		Poti P7	I _D
Commutation limiting	resistors R59, R63			

Amplification	Switch		Potentiometer	
P-component	S4		Poti P3	X _P
I-component	S5			
D-component	S8			
Zero adjustment (min. speed at 1Q)			Poti P9	Offset

Device - Overview

5.4 LED signals

Function	LED	Colour	Position
Enable command value	L1	green	
Enable speed and current controller	L2	green	
Drive ready BTB	L3	green	
Speed controller output +	L4	green	
Speed controller output -	L5	green	
Signal – tacho fault	L6	red	
Signal – stationary	L7	green	
Signal – blocked / overload	L8	red	
Output UE2-A	L9	green	
Output UE1-A	L10	green	
Output brake	L11	green	
Output command value = acual value	L12	green	

L12○ Command = Actual
 L11○ Brake
 L10○ UE1-A
 L9 ○ UE2-A

E-Reg5 - LED

The LEDs lighten up according to the function

Signal outputs

Function	Type	Terminal no.	State
Drive ready BTB	Semiconductor relay contact	X2:105 – X2:106	open in case of a BTB fault
Tacho fault	Open-emitter	X2:107	Tacho line brake <2V
Stationary	Open-emitter	X2:110	stationary >22V
Blocked / overload	Open-emitter	X2:108	blocked <2V
Output UE1-A	Open-emitter	X5:504	selectable
Output UE2-A	Open-emitter	X5:505	selectable
Output brake	Open-emitter	X5:503	Brake aktive >22V
Output com. Value = actual value	Open-emitter	X5:506	com.value = act. Value >22V
Speed actual value	Analog 1kOhm	X2: 109	± 5V oder ± 10V
Current actual value	Analog 1kOhm	X2: 111	± 5V oder ± 10V
Speed command value	Analog 1kOhm	X2: 507	± 10V
Current actual value I-1st 2	Analog 1kOhm	X5: 508	± 5V
Current command value	Analog 1kOhm	X5. 509	± 10V

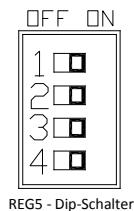
Device - Overview

5.5 Adjustment DS switch

Position OFF

Output UE2-A
Output UE1-A
Peak current time max. 5 sec.

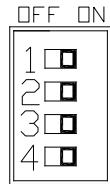
Switch DS6



Position ON

Output UE2-A-inverse
Output UE1-A-inverse
Peak current time max. 1Sek.
Option Deckel

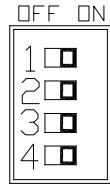
Switch DS5



Either contact 1 or 2 in position ON or both contacts in position OFF
Either contact 3 or 4 in position ON or both contacts in position OFF

UE1-A for speed watchdog
UE1-A for current watchdog
UE2-A for speed watchdog
UE2-A for current watchdog

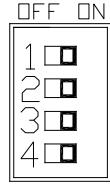
Switch DS4



No tacho smoothing
Tacho actual value
Tacho watchdog ON

Tacho smoothing
Actual armature voltage
Actual armature voltage-power sect.
Tacho watchdog OFF

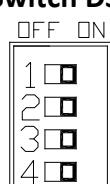
Switch DS3



Only contact 1 or 2 in position ON
Speed controller PI-amplification
IxR compensation OFF (tacho)

Command value without ramp
command value with ramp (integrator)
Speed controller – amplification-1
IxR compensation ON (armature)

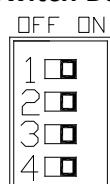
Switch DS2



Current act. Value monitor max. 10V
Speed act. Value monitor max. 10V
Current limit 1 external
Current limit 2 external

Current act. Value monitor max. 5V
Speed act. Value monitor max. 5V
Current limit 1 internal
current limit 2 internal

Switch DS1

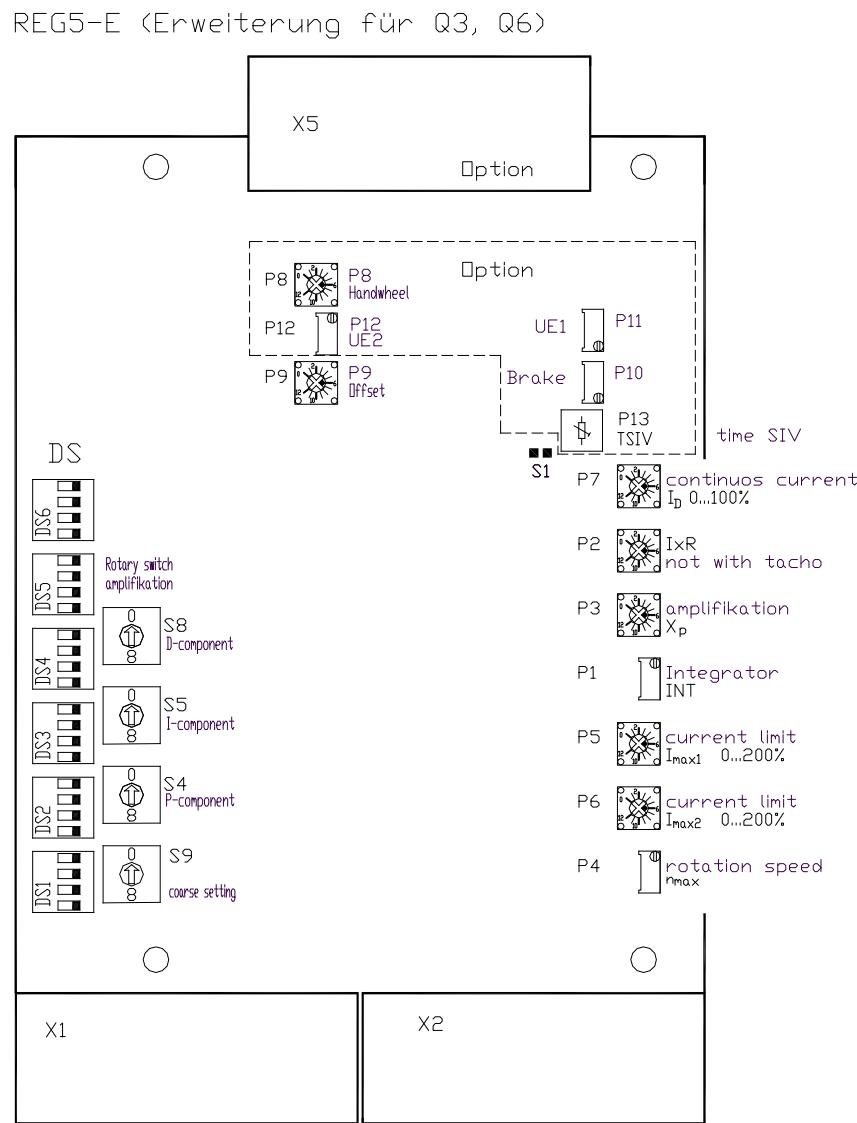


Command value – differential input
Either contact 2 or 3 in position ON or both contacts in position OFF
Immediately blocked control loop

Command value referred to GND
Additional input EZ1 as I-command
Additional input EZ1 as INTAB
Delayed control loop blocking

Device - Overview

5.6 Potentiometer Switches



E-REG_REGS - B1342-3

Adjustment

6 Adjustment

6.1 Adjustment advice

To be carried out only by qualified personal

Observe all safety regulations

Follow the correct adjustment sequence

Use the below manulas

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



Presetting

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

Optimisation

Current controller	on the power section	Classic Q...., P.... (s. MANUAL)
Actual value adjustment	n_{max} adjustment	
Current limiting	I_{max} , ID adjustment	
Speed controller	P-I-switch, Xp-adjustment	
Slope limiting device (integrator)	INT-adjustment (only command value)	
Zero point	Offset adjustment	
Path / position controller	in der CNC/SPC-control	

Attention:

Always optimise beginning with the innermost control loop and work out.

Sequence: current controller>speed controller>position controller (CNC/PLC)

Test points

Test point connector X4

Measurement	max. value	Connector
Command value at the output of the input amplifier	$\pm 10V$	X4:13
command value at the output of the integrator (control function speed controller)	$\pm 10V$	X4:14
Current command value	$\pm 10V$	X4:15
Current actual value	$\pm 5V$	X4:20
Speed actual value at the output of the divider	$\pm 5V$	X4:16

Adjustment

6.2 Command value

Command value

Function		command value 1	command value 2
Input amplification	fixed	1	1
Input voltage	max.	$\pm 10V =$	$\pm 10V =$
Differential input	switch	DS1:K1 OFF	non existent
Input referred to GND	switch	DS1:K1 ON	
Input signal		X1:6	X1:2
Input GND		X1:8a	X1:8
Test point connector		X4:13	
Measured value	max.		$\pm 10V =$
Integrator function	switch	DS3:K1 OFF DS3:K2 ON	non existent

Command value 1	
Input referred to GND	Differential input
for a potentiometer command value	for a command value from the SPS/CNC
with internal voltage supply	external command value
switch DS1:K1 ON	switch DS1:K1 OFF
Check the GND connection	The signal and GND connections can swapped.
Basic set-up	

Both command values connected:

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

Only with the command value 1 – acceleration and braking ramp – linear integrator			
Command value 1	Switch	Poti	Range
without integrator	DS3:K1 ON, DS3:K2 OFF	---	---
with integrator	DS3:K2 ON, DS3:K1 OFF	INT (P1)	0,3 bis 15 Sec.

Command value current

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

Resistance values [Ω] = com value voltage/com. Value current
 (max. 500Ω)

Attention:

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



Adjustment

6.3 Actual Value

Tacho-Control

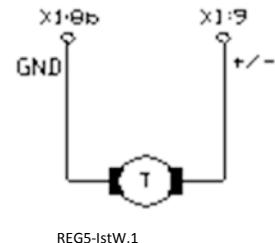
- for Q ... >>> only DC tacho
- for P ... >>> DC tachos or three-phase tachos with a rectifier
- 0Ω-bridges R13 und R14 >>> soldered-in
- switch DS4:K2 >>> OFF
- command value X1:6 positive >>> tacho signal X1: 9 negative (for P and Q)
- command value X1:6 negative >>> tacho signal X1: 9 positive (only for Q)
- tacho smoothing >>> switch DS4: K1 ON [only for S9 < pos.6]

Tacho voltage with maximum speed

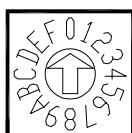
minimum 12V, maximum 205V

Speed adjustment

- rough adjustment >>> binary switch S9
- fine adjustment >>> potentiometer η_{max} (P4)



Switch S9										
Rough tacho adjustment										
Position	0	1	2	3	4	5	6	7	8	Poti
Tacho-voltage	∞	86	59	37	33	26	23	20	7	7V min.
		122	85	54	48	38	34	30	11	mitdd.
		200	156	101	89	71	65	56	23	max.



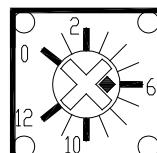
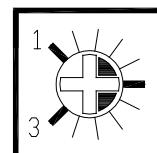
REG5 - Schotax 1

Attention:

switch DS4:K1 OFF when S9 > or = Pos. 7

Pre-setting

- η_{max} potentiometer >>> mid-position
- switch position S9 >>> choose acc. to tacho voltage
- tacho voltage unknown >>> start with position 8



REG5 - Poti 1

Fine adjustment – command value from a potentiometer

- with a command value of 1V adjust the speed to 10% of max. required
- with a command value of 10V make a fine adjustment to achieve 100%

Command value from a CNC/PLC

- with a command value of 0.8V adjust the speed to 10% of the max. required

η_{max} potentiometer (P4) >>> turning clockwise = faster

Speed measurement

- tacho voltage X1:9 >>> precision approx. ca. 5%
- optical tachometer >>> precision 0,1 ... 1%

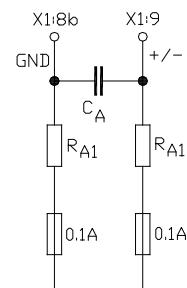


Adjustment

Armature voltage as actual value

Armature voltage control is not galvanically isolated.

- Input $\pm 180\text{V}$
- Input resistance $600\text{k}\Omega$
- Leakage current $< 1\text{mA}$
- Fuse $2 \times 100\text{mA}$



Attention

- Armature voltage $> 180\text{ Volt}$

Ankerspannung / REG5-1STW21

- Connect external series resistors

The values are as follows: $U_A = 270\text{ V} = 200\text{ k}\Omega$
 $440\text{ V} = 470\text{ k}\Omega$
 $550\text{ V} = 680\text{ k}\Omega$



Use package: EX ZU-UA1

Adjustments

- Switch	DS4:K2 , DS4:K4 and DS3:K4	ON
- 0Ω -bridges	R13 und R14	open !!!
- switch	S9	position 0

Potential-free armature voltage control with

- potential isolating amplifier	(e.g. QTV)
- switch	OFF
- switch	ON
- 0Ω -bridges	soldered-in
- switch	position F

Speed adjustment

Pre-setting

- n_{max} Potentiometer $>>>$ mid-position
- switch position S9 $>>>$ see above (0 oder F)
- > with a command value of 1V adjust the armature voltage to 10%
- > with a command value of 10V make a fine adjustment to achieve 100%

IxR compensation

The speed drop IxR is compensated for by the potentiometer P2 (IxR) so that in case of a low speed and a 50% load jump the speed does not drop into idle running.



Adjustment

6.4 Current

Current limiting

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

Internally resetting current limits		
Current limit	Function	Limit
Overload (DS6:K3 OFF)	time (5 Sec.)	Continuous current
Commutation limit	Speed	Limit cycle
The lowest current limit is effective!		

Peak current	Set-up	Input	Switch	Poti
Internal current limit	I _{max1}	-	DS2:K3 ON	I _{max1} (P5)
	I _{max2}	-	DS2:K4 ON	I _{max2} (P6)
External current limit	I _{max1}	X2:102 0 ... +10V	DS2:K3 OFF	I _{max1} (P5)
	I _{max2}	X2:103 0 ... +10V	DS2:K4 OFF	I _{max2} (P6)

The external current limiting voltage can be reduced internally by means of the potentiometer I_{max}.

Continuous current

The motor protection for both torque directions is adjusted to motor rated current by means of the potentiometer ID (P7).

Measuring adjusted values:

- do not connect the motor
- preset the command value and enable >> switch off/on
- value to be measured applies across the test point connector X4:15 (5V = rated current)

command value	Measured value I _{max} (2 Sec.)	Measured value I _D
+ 5V	0 to max. 10V	0,25 to max. 5V
- 5V	0 to max. 10V	0,25 to max. 5V

Current actual values

Measured value at the test point connector X4:20 >>> I_{max} = 0 bis +5V

 I_D = 0,12 bis +2,5V

Attention:

Current controller adjustment

See MANUAL "power section"

MANUAL Q...., P...



Adjustment

6.5 Speed - control

Speed control loop circuit

- three 16-position binary switches S4, S5, S8

- amplification potentiometer P3 (Xp)

Take over the adjusted values when the device is exchanged.



Basic set-up

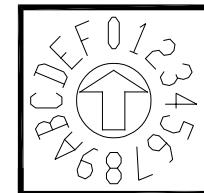
binary switch S5 auf Position 4

binary switch S8 auf Position 0

binary switch S4 auf Position 1

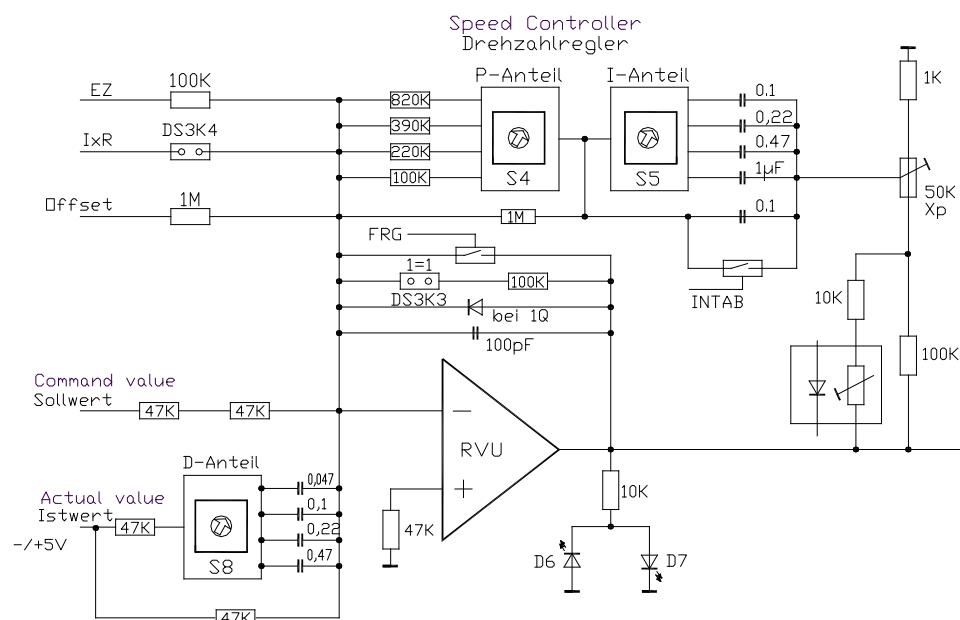
amplification poti Xp to 50 %

suits the majority of drives



The integral component can be switched off (INTAB)

switch DS1:K3 ON. Contact from X1:1 to X1:8

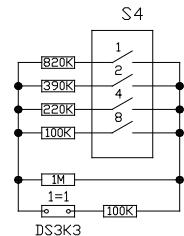


E-REG_REG5 - DREG-1 1

Adjustment

switch S4

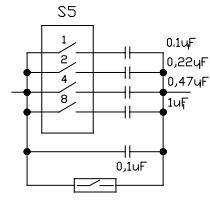
position	0	1	2	3	4	5	6	7	kΩ
R-value	100	450	280	209	180	148	123	107	
0									
position	8	9	A	B	C	D	E	F	kΩ
R-value	90	82	73	67	64	59	55	52	



RG5 S4-1

switch S5

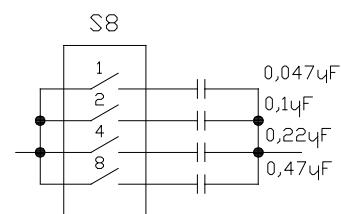
position	0	1	2	3	4	5	6	7	μF
C-value	0,1	0,2	0,3	0,4	0,8	0,9	1,0	1,1	
position	8	9	A	B	C	D	E	F	
C-value	1,1	1,2	1,3	1,4	1,8	1,9	2,0	2,1	μF



RG5 - S5-1

switch S8

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

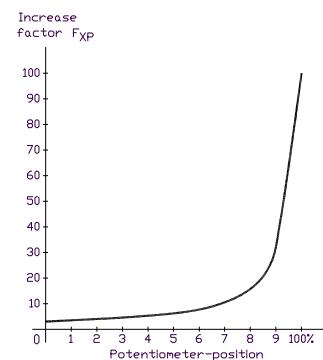
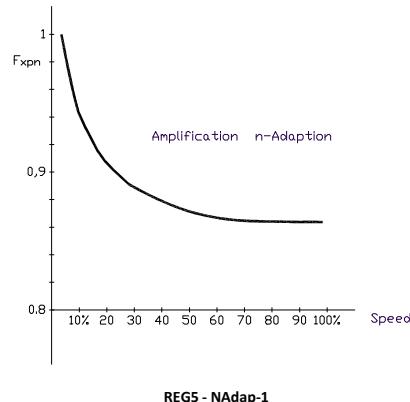


RG5 - S8-1

Adjustment

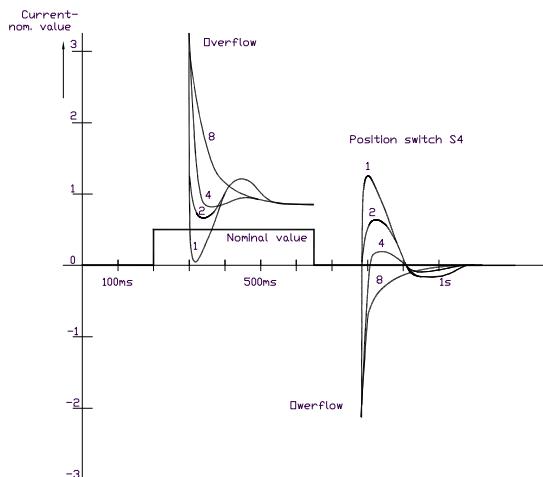
Speed - control

Proportional amplification



Function binary switch S4

Function potentiometer XP



Adjustment by means of an oscilloscope

Adjustment

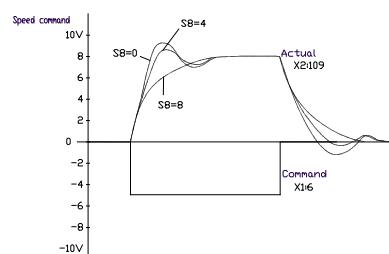
Command value jump $\pm 0.5V$
Input INTAB X1:1 activated
Switch DS1:K3 ON, DS1:K2 OFF

Measured value

Command value X4:13
Controller response
Current command value X4:15

Effect D-component

-actual value differentiation
-adjustment by means of the switch S8



Adjustment

Adjustment without measurement equipment

Connect the motor,

Command value	=	0
X _P	=	50%
Switch S4	=	position 4
Switch S5	=	position 4
Switch S8	=	position 0

Enable the drive.

Turn the potentiometer X_P clockwise until the axis begins to oscillate.

If the axis does not oscillate

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

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

Drive behaviour:

Amplification too low	Amplification too high
Long-wave oscillations 0,1...1Hz	short oscillations 5 ... 20Hz
Large overshoots	vibrates > during acceleration
Overshoots destination position	vibrates > during braking and in position

Attention:

Drives connected to CNC / PLC controllers.

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



Adjustment

6.6 Commutation limiting

Commutation limiting

- with permanently excited DC motors with iron core

- adhere to the motor data sheets

maximum motor torque

>>> 3 to 6 time M_{drates}

maximum amplifier current

>>> twice I_{rated}

Example

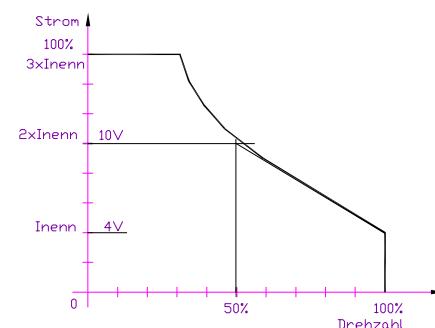
a = motor limited curve

b = limit characteristic of the amplifier

I_{rated} Motor >>> 4V

I_{rated} amplifier >>> 5V

Reduction line within motor curve



RG5 - KomGrenze-1

Slope of the limit characteristic

Value S = V change of current /%

change of speed >>> (S = V/%n)

Example:

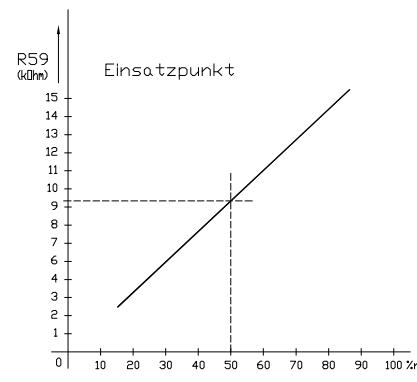
Starting point = 50 % speed

Slope = 6/50 = 0,12 V/%n

Adjustment

resistor R59 >>> starting point

resistor R63 >>> slew rate



RG5-R59-Einsatz-1

Example:

diagram 2 R59 = 8,2 kΩ

diagram 3 R63 = 220 kΩ

RG5-R63-STeil-1

Testing

without Motor

command value zero, enable active

- tacho voltage >>> X4:16

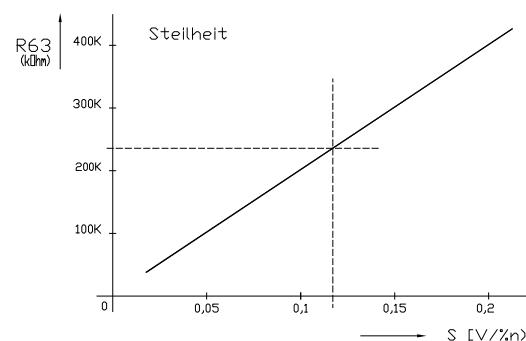
- speed range >>> 0 ... ±5V

- current com. value

- reduction >>> X4:15

- current range >>> 0... ± 10V

- limit characteristic according to diagram 1



Attention: The values are valid for a command value of 10 V



Adjustment

6.7 Adjustments Options

Brake - Control

As soon as the current exceeds the value adjusted by means of the poti P10 (brake), the output X5:503 switches to >22V. Even if the motor current falls again below the adjusted value, this output X5:503 remains active until the enables is switched off.

Adjustment range Poti P10 0 bis 20% rate current
Turning the poti clockwise will increase the adjusted value.

Speed or current watchdog

The function (speed or current watchdog) of the threshold switches UE1-A and UE2-A can be selected by means of DIP switches.

The output function (high or low) is selected by means of DIP switches.

Watching UE1-A

Adjustment Poti P11 0 to 100% speed or rated current
Turning the poti clockwise will increase the adjusted value.

Watchdog function Output ON if:	Poti	Switch DS5:K1	Switch DS5:K2	Switch DS6:K2
Speed > adjusted value	P11	ON	OFF	OFF
Speed < adjusted value	P11	ON	OFF	ON
current > adjusted value	P11	OFF	ON	OFF
current < adjusted value	P11	OFF	ON	ON

Watchdog UE2-A

Adjustment Poti P12 0 to 100% speed or rated current
Turning the poti clockwise will increase the adjusted value.

Watchdog function Output ON if:	Poti	Switch DS5:K3	Switch DS5:K4	Switch DS6:K1
Speed > adjusted value	P12	ON	OFF	OFF
Speed < adjusted value	P12	ON	OFF	ON
Current > adjusted value	P12	OFF	ON	OFF
Current < adjusted value	P12	OFF	ON	ON

Watchdog (actual speed value = speed command value, SIV-A)

The output X5:506 switches to (>22V) if the difference between the actual speed value and the command value input (terminal X1:6) is less than 5 %. With the integrator function enabled (ramp), there will be a speed fault output (<2V) during the acceleration resp. braking phase. This is not adjustable.

Warranty

7 Warranty

We 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. WE undertakes no guarantee for devices which have been modified for special applications.

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

For products returned to us for warranty service, the Buyer shall prepay shipping charges to us and we 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 us 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 our 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).

We reserve the right to change any information included in this MANUAL.

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

The local legal regulations, and those of the Standards Authorities have to be adhered to. We do not assume any liability, expressively or inherently, for the information contained in this MANUAL, for the functioning of the device or its suitability for any specific application.

All rights are reserved.

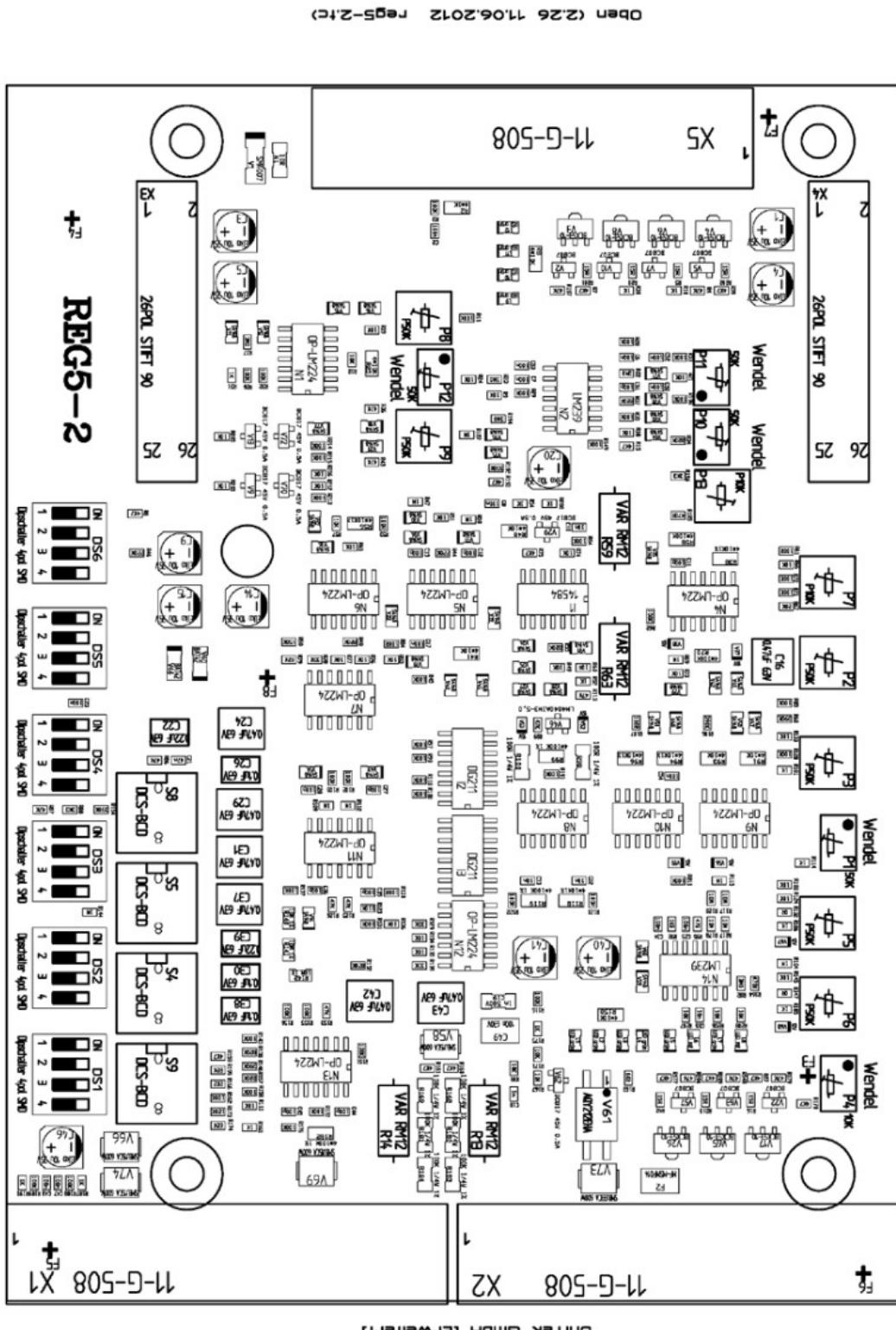
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The onus is on the reader to verify that the information here is current.

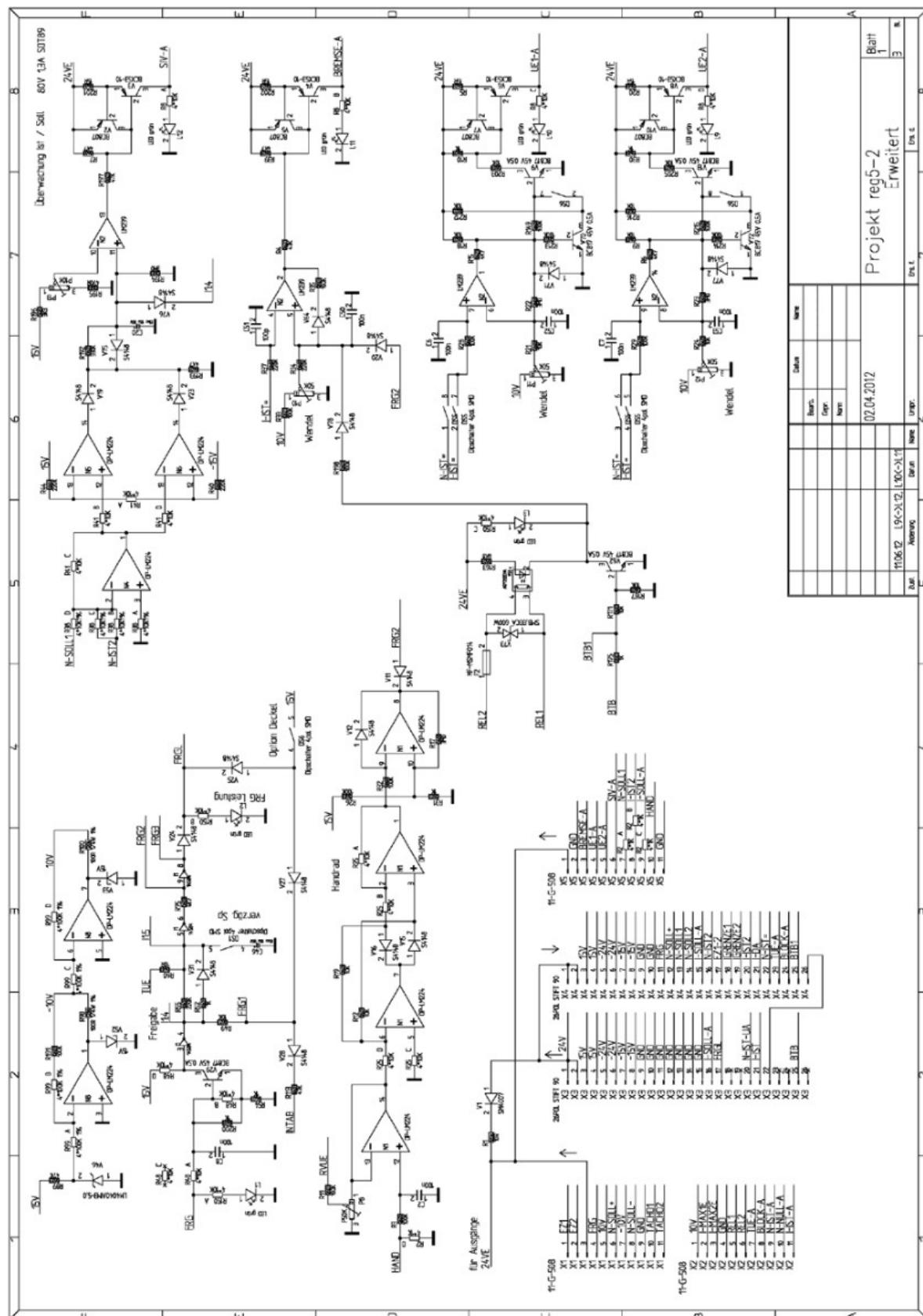
Drawing Set

8 Drawing Set

(Representation such as built-in device)

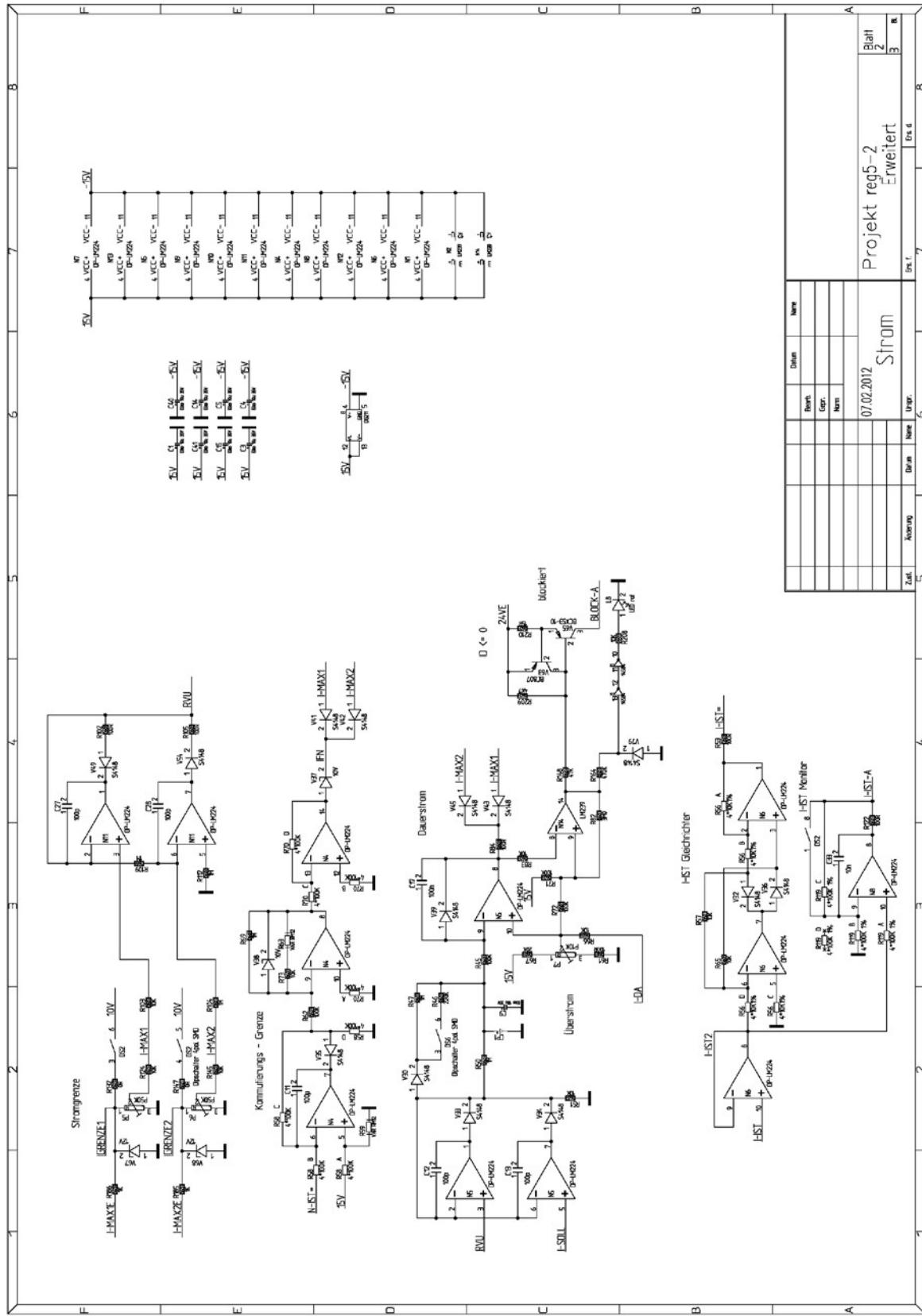


Drawing Set

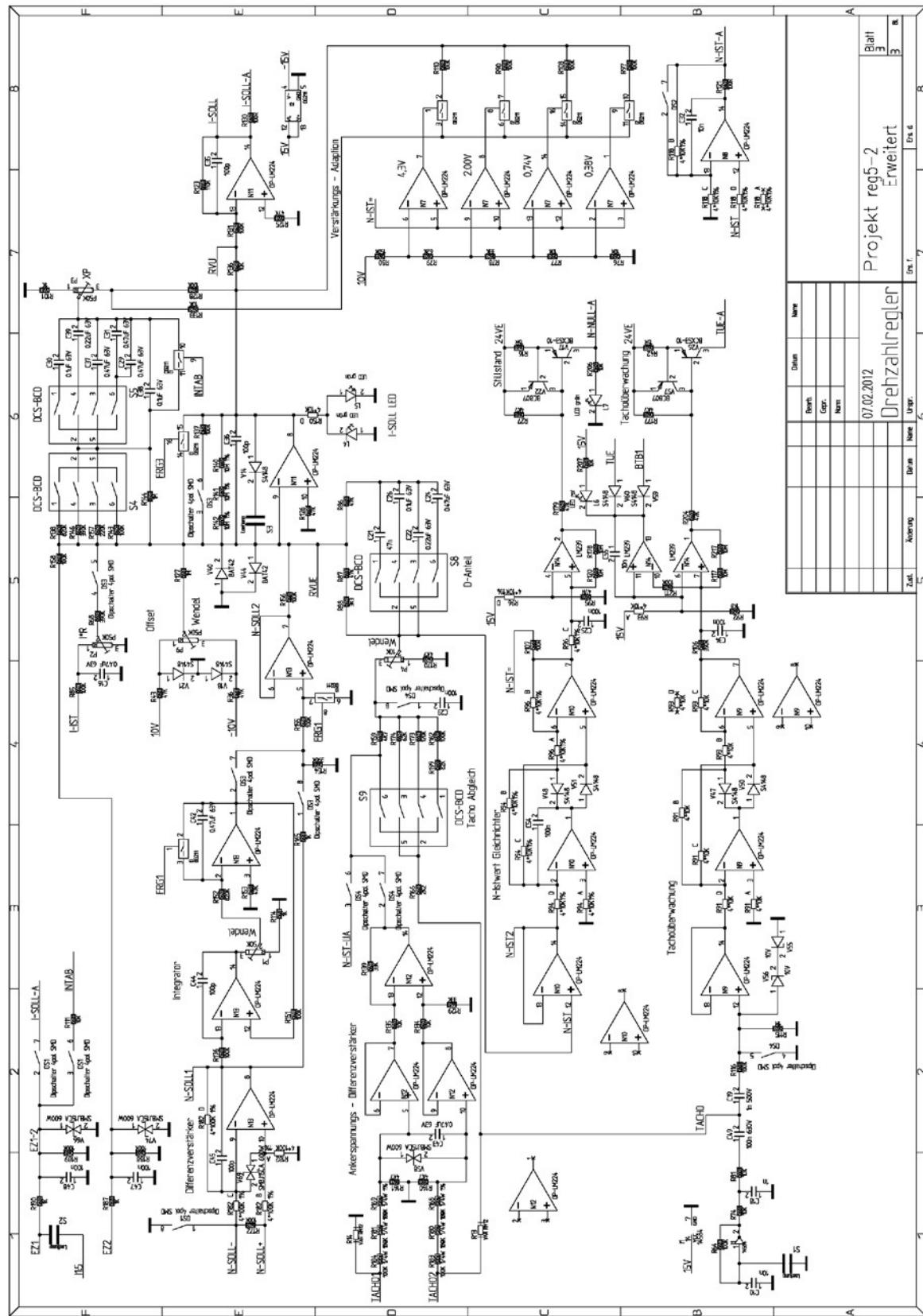


Pläne_REG5-2_erw-schalt.seite 1

Drawing Set



Drawing Set



Compatibility list REG 3 – REG 5

9 Compatibility list REG 3 – REG 5

9.1 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	K:2 ON	K:3 OFF or
	DS1	K:3 ON	K:2 OFF

Basic set-up 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