

# MANUAL

## Classic Q3 240-840A 4 Quadrant Thyristor Drive

<b>Part 1</b>	<b>Thyristor Drive</b>	<b>Q3x/x-240-840A</b>
<b>Part 2</b>	<b>Analogue Control Electronics</b>	<b>REGx</b>



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**Ausgabe / Version**

01/2014      V 01

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**2 Basic - Information**

**2.1 Safety advice**

Electronic equipment is not fault proof.

**Attention – High voltage  
360-550V~, 450-550V=  
Shock hazard / Danger of life!!**



Before installation or commissioning begins, this manual must be thoroughly read and understood by the technical staff involved.

The devices are electrical equipment (EB) to the power electronics for the control of power flow in electrical power systems.

**Protection rating IP00.**

**Control and power connections can  
voltage lead, works without the drive!**



**Measured before disassembly voltage!**

**2.2 Standards and guidelines:**

The device and its associated components can only be installed and switched on where the local regulations and technical standards have been strictly adhered to:

- |                        |   |
|------------------------|---|
| EU Guidelines:         | 2004/108/EG, 2006/95/EG, 2006/42/EG<br>EN 60204-1, EN292, EN50178, EN60439-1,<br>EN61800-3, ECE-R100<br>ISO 6469, ISO 26262, ISO 16750, ISO 20653, ISO12100 |
| IEC/UL:                | IEC 61508, IEC364, IEC664, UL508C, UL840  |
| VDE Regulations:       | VDE100, VDE110, VDE160  |
| Trade body guidelines: | VGB4  |

## The user must ensure that in the event of:

- device failure
- incorrect operation
- loss of regulation or control

the axis will be safely de-activated.

It must be ensured that the machines, equipment or vehicles are fitted with device independent monitoring and safety feature.

Non-earthed systems (e.g. vehicles) need to be secured isolation monitors.

There must be no danger to persons and property arising!



### Assembly

- should only be carried out when all voltages have been removed and the units are secured
- should only be carried out by suitably trained personnel

### Installation

- should only be carried out when all voltages have been removed and the units are secured
- should only be carried out by suitably trained personnel for electricians
- should only be carried in accordance with health and safety guidelines

### Adjustments and programming

- should only be carried out by suitable trained personnel with knowledge in electronic drives and their software
- should only be carried out in accordance with the programming advice
- should only be carried in accordance with health and safety guidelines

### CE

When mounting the units into machines and installations the proper operating of the units may not be started until it is ensured that the machine, the installation, or the vehicle comply with the regulations of the EC machinery directive 2006/42/EG and the EMC guideline 2004/108/EG.

On the installation and test conditions described in the chapter CE-advice it is adhered to the EC guideline 2004/108/EG including the EMC standards EN61000-2 and EN61000-4.

A manufacturer's declaration can be requested.

The manufacturer of the machine or installation is responsible for observing the threshold values demanded by the EMC laws.

### QS

The devices are archived with serial number and the test data from the manufacturer for 5 years. The inspection reports may be requested.

## 2.3 General and features

This manual describes the basic unit and is only in connection with the manual of the control electronics (e.g. REGxx) valid.



### Manual use in connection with:

- an analogue control                   REGxx
- field regulation internal            QS-F
- field regulation external           F2xx
- options

### **Build**

- switch cabinet mounting a
- according to the VDE, DIN and EU regulations
- standard control electronics REG
- intrinsically safe power section with current control loop
- controlled or uncontrolled field supply unit
- optional units

### **Galvanic isolation between**

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

The distance of air gaps and leakage paths adhere to the VDE standards (>8mm).

### **Components**

- fully insulated thyristor modules, comfortably over-dimensioned
- only components customary in trade and industrially standardized are used
- high-quality bases for the IC with external connections
- LED displays
- precision potentiometers for fine adjustments
- plug-in jumpers for the system set-up

#### Characteristics

- \* Series Classic Q3
- \* Thyristor drive for dc motors
- \* Power range 6.75kW to 1.1MW
- \* Drive and brake in all 4 quadrants
- \* Energy recovery
- \* Intrinsically safe power section
- \* Fast analogue current control
- \* Temperature watchdog - power section
- \* Circular current-free dual bridge circuit
- \* Controlled or uncontrolled field rectifier
- \* 26-pin interface
- \* Features of the control electronics:  
see Manual REGxx or third-party product documentation
- \* Optional units

## 2.4 Technical Data

### Q3 400/450-x

Power connection	360 ... 440V~
Auxiliary voltage connection	360 ... 440V~, 200 ... 250V~ or option
Output voltage	max. $\pm$ 450V=
Cooling	ventilation fan

Q3 400/450-			240	360
Input current		A~	192	288
Output current	- peak 5s	A=	480	720
	- continuous	A=	240	360
El. power		kW	108	162
Fuses	- Input 6 pcs. - field	ff	installed	installed
		AFF	250	315
		AF	10	10
Power chokes		Type	1x KD5-250	3x K170-400
		mH	0.12	0.08
Armature chokes		Type	UI180B250	UI210C400
		mH	2.2	1.8
		Armature chokes are necessary only for special applications		
Dimensions		mm	305x510x240	305x510x240
Weight		kg	23	23

### Q3 500/550-x

Power connection	450 ... 550V~
Auxiliary voltage connection	360 ... 440V~, 200 ... 250V~ or option
Output voltage	max. $\pm$ 550V=
Cooling	ventilation fan

Q3 500/550-			240	360
Input current		A~	192	288
Output current	- peak 5s	A=	480	720
	- continuous	A=	240	360
El. power		kW	132	198
Fuses	- Input 6 pcs. - field	ff	installed	installed
		AFF	250	315
		AF	10	10
Power chokes		Type	1x KD5-250	3x K170-400
		mH	0.12	0.08
Armature chokes		Type	UI180B250	UI210C400
		mH	2.2	1.8
		Armature chokes are necessary only for special applications		
Dimensions		mm	305x510x240	305x510x240
Weight		kg	23	23

### Q3 400/450-x

Power connection 360 ... 440V~  
 Auxiliary voltage connection 360 ... 440V~, 200 ... 250V~ or option  
 Output voltage max.  $\pm 450V=$   
 Cooling ventilation fan

Q3 400/450-			480	840
Input current		A~	384	672
Output current	- peak 5s	A=	960	1680
	- continuous	A=	480	840
El. power		kW	216	378
Fuses	- Input 6 pcs. - field	ff	installed	installed
		AFF	400	500
		AF	10	10
Power chokes		Type	KU150-600	KU150-800
		mH	0.06	0.04
Armature chokes		Type	UI240C500	UI240C840
		mH	1.6	1.2
		Armature chokes are necessary only for special applications		
Dimensions		mm	405x560x240	486.5x673x240
Weight		kg	36	40.8

### Q3 500/550-x

Power connection 450 ... 550V~  
 Auxiliary voltage connection 360 ... 440V~, 200 ... 250V~ or option  
 Output voltage max.  $\pm 550V=$   
 Cooling ventilation fan

Q3 500/550-			480	840
Input current		A~	384	672
Output current	- peak 5s	A=	960	1680
	- continuous	A=	480	840
El. power		kW	264	462
Fuses	- Input 6 pcs. - field	ff	installed	installed
		AFF	400	500
		AF	10	10
Power chokes		Type	KU150-600	KU150-800
		mH	0.06	0.04
Armature chokes		Type	UI240C500	UI240C840
		mH	1.6	1.2
		Armature chokes are necessary only for special applications		
Dimensions		mm	405x560x240	486.5x673x240
Weight		kg	36	40.8



## 2.5 Specification

### Specification

Mains frequency	50 or 60Hz ±5%
Protection rating	IP 00
Format	VDE 0100 group C, VDE 0160
Humidity rating	class F acc. to DIN 40040
Site of installation	< 1000m above sea level
Operating temperature range	0 ... 45°C
Extended operating temp. range	up to 60°C reduced by 2%/°C
Storage temperature range	-30°C to + 80°C

### Current control loop circuit

Amplification	
- input signal	0 to ± 10V=
- output	0 to ± 200% type current
Over-current limiting	10s 200% type current
Control precision	± 2%
Control range	1:50
Enable	> +10V
Speed control loop circuit (see manual REG)	
Control precision (without actual value error)	< ±0.1%
Control range	> 1:1000

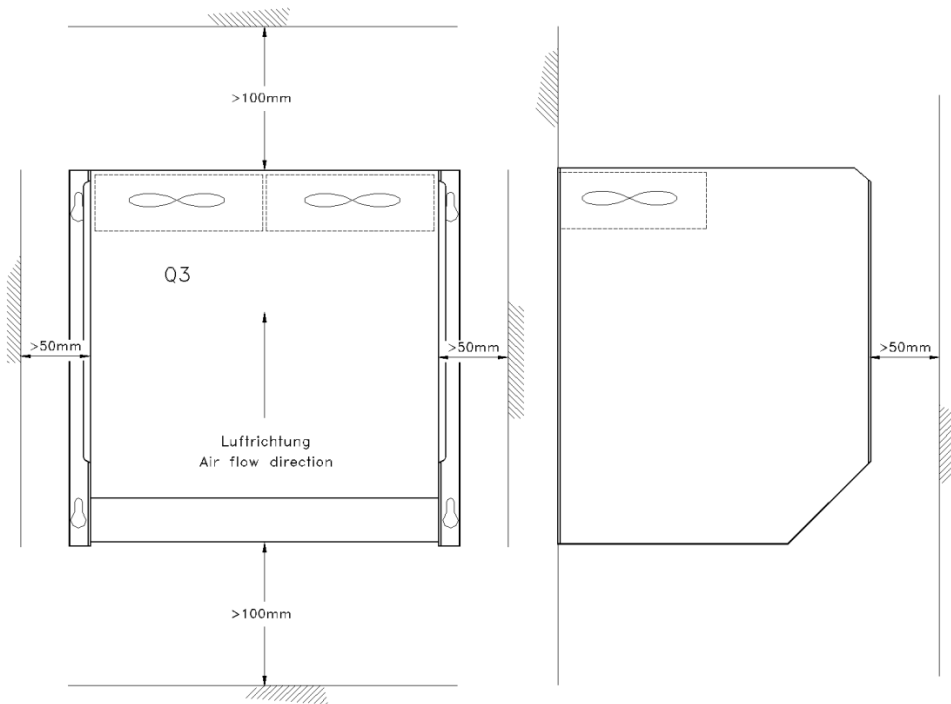
## 2.6 Interface

### Interface control electronics X3

Function		Connector no.
+ 24V	±10%	X3: 1 and 2
+ 15V	±2%	X3: 3 and 4
- 24V	±10%	X3: 5 and 6
- 15V	±2%	X3: 7 and 8
Device GND	0	X3: 9, 10, 11, 12, 13, 14
I-command value (GND)	0	X3: 15
I-command value (signal)	+10V=	X3: 16
Current controller enable	+10V=	X3: 17
Drive disable1	+10V=	X3: 18
Drive disable 2	+10V=	X3: 19
N (speed) actual	+10V=	X3: 20
I (current) actual	±5V=	X3: 21
Over-current power section	+10V=	X3: 22
Option UA	±10V=	X3: 23
Option UA	0 - +10V=	X3: 24
Drive ready BTB	+10V=	X3: 25
	+5V	X3: 26

## 3 Mechanical installation

### 3.1 Mounting



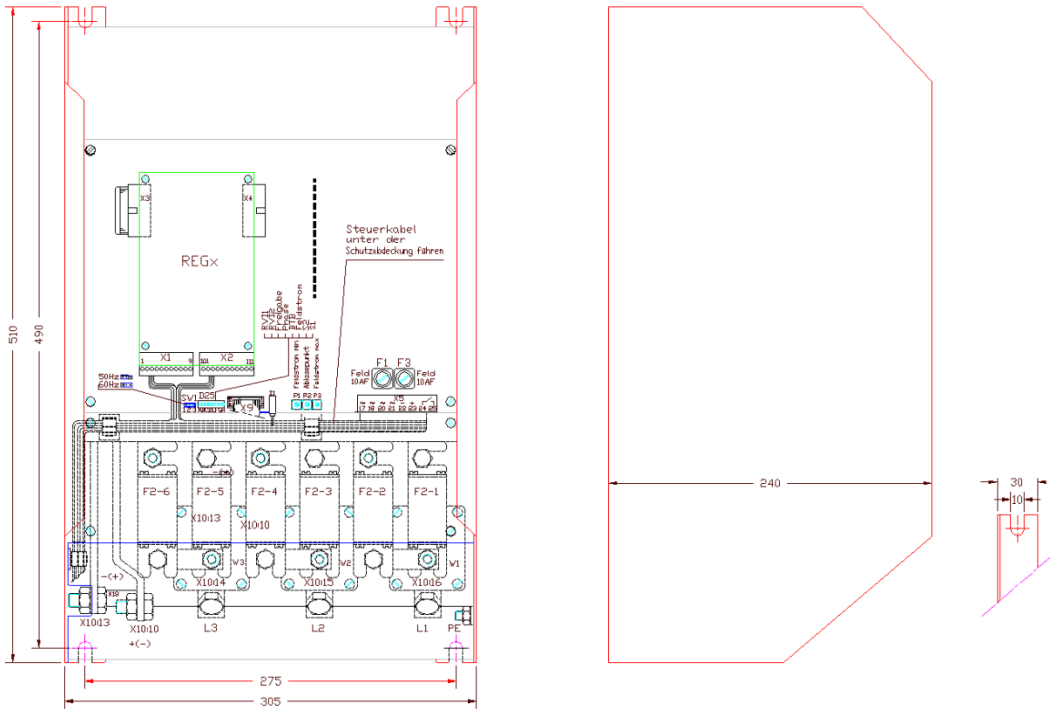
#### Q3-Montage-V616

Ambient temperature                      0 to <45°C      (reduced, up to 60°C)  
 Max. cooling unit-temperature          80°C

Air-mass throughput	240A	600m <sup>3</sup> h
	360A	600m <sup>3</sup> h
	480A	696 <sup>3</sup> h
	840A	800m <sup>3</sup> h

Dissipation loss with max. power		
Unit Q3-x/X	Unit W	Mains choke W
240	1000	260
360	1440	330
480	1890	400
840	3060	780

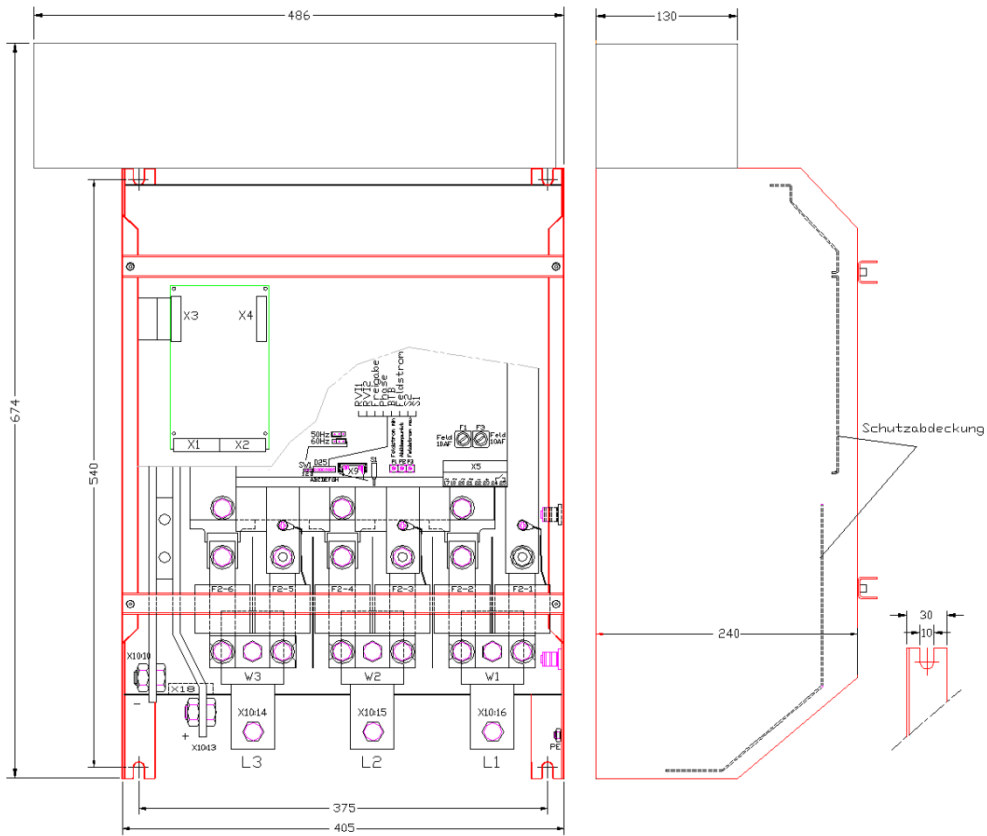
3.2 Dimensions Q3 240-360A



E-Q3-M022-Maßbild240

Dimensions Q3 240-360A

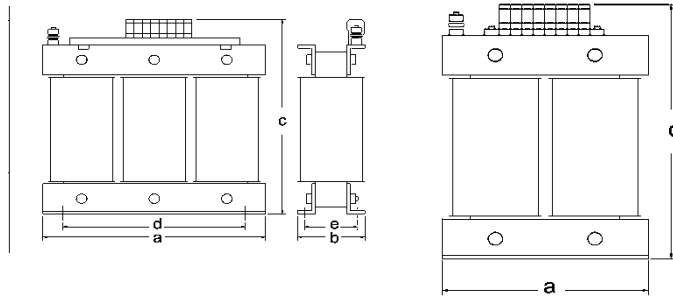
### 3.3 Dimensions Q3 840A



E-Q3-M657-Maßbild840

Dimensions					
Unit Q3-x/x	Width	Height	Depth	Drill hole	Weight
	mm	mm	mm	mm	
240	305	510	240	275 x 490	23
360	305	510	240	275 x 490	23
480	405	560	240	375 x 540	36
660	405	560	240	375 x 540	36
840	486.5	673	240	375 x 540	40.8

## 3.4 Three-phase power-choke



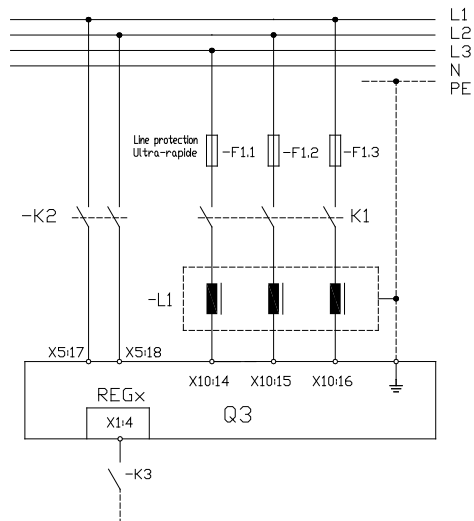
Features	
UN	400V~50/60Hz
UK	4%
Protection rating	IP00
Isolation class	T40/E
Vertical angle bracket	

Q3-V257-UID-Trafo und Q3-V256-UI-Trafo

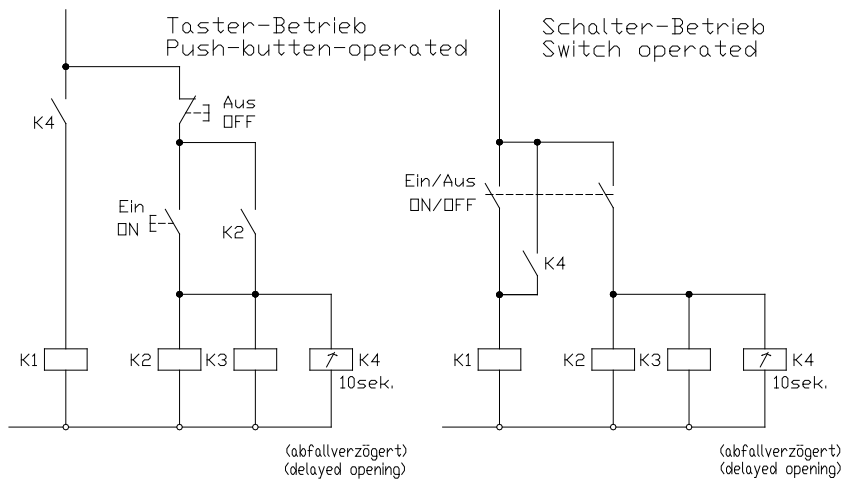
Q3-x/x-	Choke type	LmH	PVW	Dimension					Weight kg	Screw M
				a	b	c	d	e		
240	KD5-250	0.12	260	300	170	270	200	100	31.5	8
360	K170-400	0.08	330	142	170	230	106	88	14	8
480	KU150-600	0.06	400	210	260	275	100	108	29	8
660	KU150-600	0.06	610	210	260	275	100	108	29	8
840	KU150-800	0.04	780	210	270	275	100	108	31	8

## 4 Electrical installation

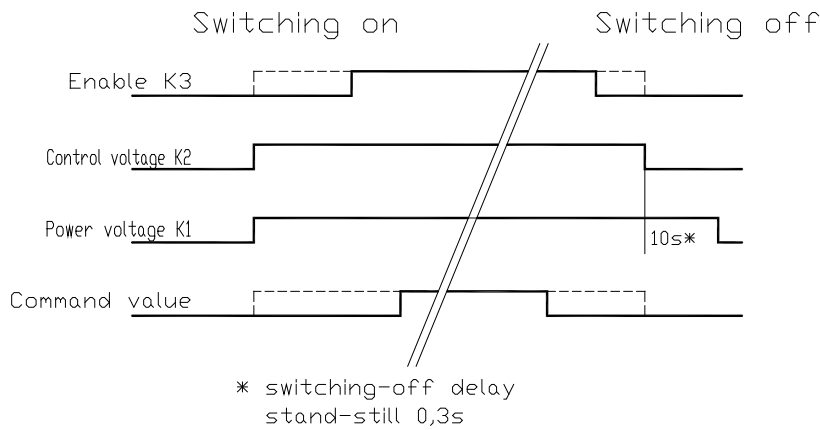
### 4.1 Connections



E-Q3-647

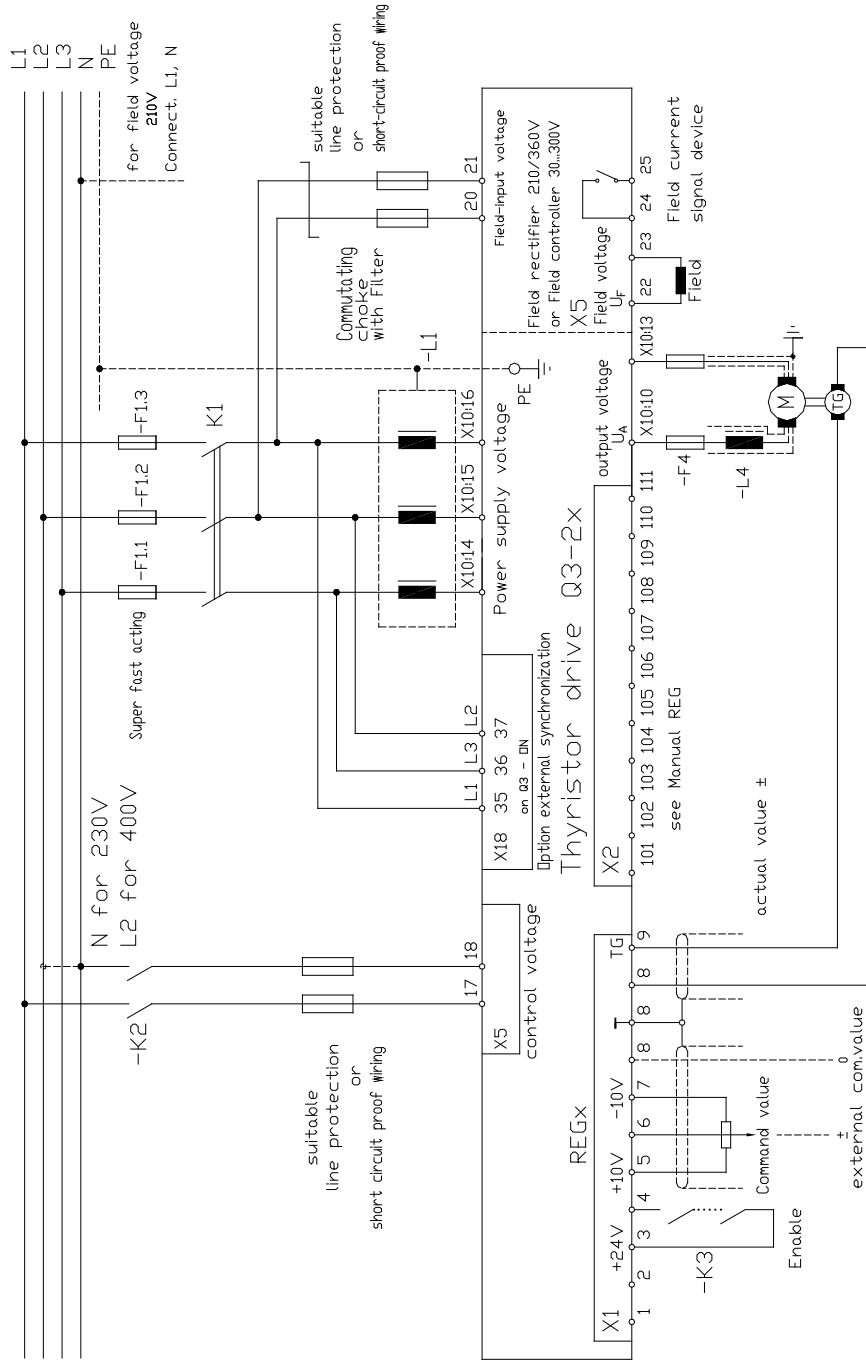


Q3-Relais-1V647



E-Q3-Schaltfolge-1-V647

4.2 Connection diagram



For EMC: All control lines have to be shielded  
 Motor and field lines have to be shielded

### 4.3 CE-Advice

The devices adhere to the EU guidelines 89/336/EWG and the technical standards EN 61000-2 and 61000-4 provided that the following conditions are observed:

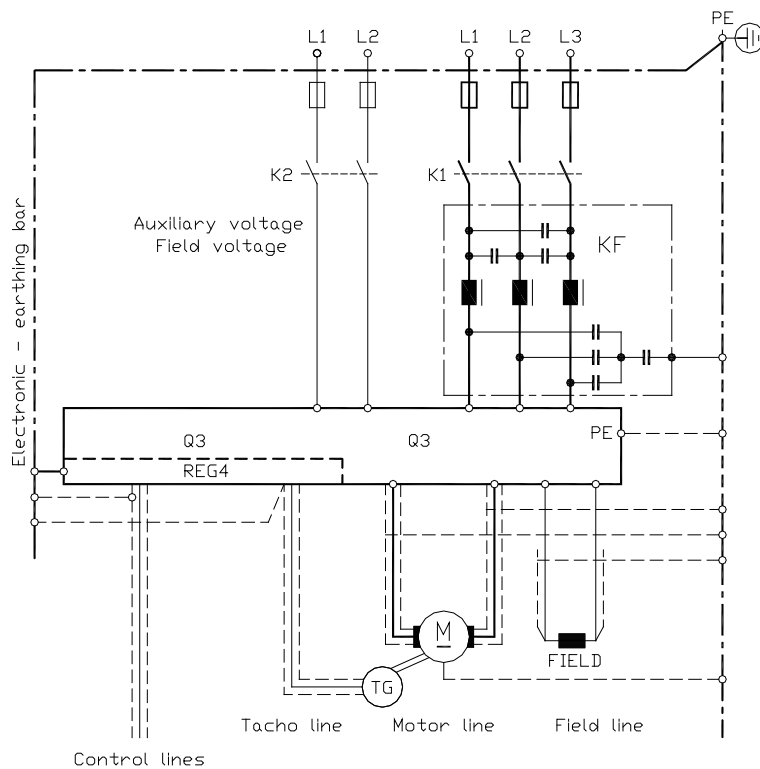
- The device, transformer and filter capacitors are mounted on a 800x800x2mm mounting plate
- The mounting plate must be connected to ground using a 10mm<sup>2</sup> wire.
- The motor housing must be connected to ground using a 10mm<sup>2</sup> wire.
- The device ground X1:8 must be connected to the mounting plate using a 2.5mm<sup>2</sup> wire.
- Device PE screw must be connected to the mounting plate using a 4mm<sup>2</sup> wire, l = 50mm.

#### Three-phase connection:

Power choke type: see technical details  
 Filter capacitors: 0.5mF/600V~ 3 x 1μF (x) + 1 x 1μF (y)  
 Conductor length between the device and the power choke <250mm

#### Motor connection:

Motor conductors l = 1.5m, shielded  
 Tacho and all control lines l = 1.5m, shielded  
 Shielding connected to PE



KF = Commutation choke with filter capacitor

E-Q3-A639



## 4.4 Connection advice

### Attention:

The order of the connections to the connector numbers or screw terminals is obligatory. All further advice is non-obligatory.

The input and output conductors may be altered or supplemented in accordance with the electrical standards.

### **Note:**

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

Switch on the auxiliary voltage and the supply voltage simultaneously.  
Switch off the supply voltage after the auxiliary voltage

Input filter

see CE advice, page 14

Short conductor length to be used between the input filter and the device

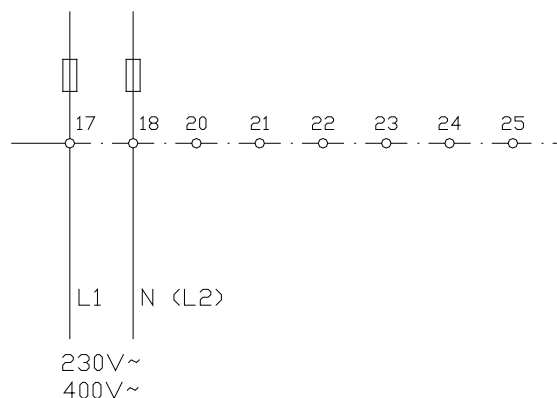
### Auxiliary voltage connection

Connection	terminal X5:17, X5:18
Power supply	400V~ ±15%
Special voltages	24V~, 110V~, 230V~, 500V~
Input current	max. 300mA
Phase position	regardless
Internal fuses	FE1, FE2      0.8AT

Min. line cross-section 0.5mm<sup>2</sup>

External fuse

Min. line protection 6A



Q3-Hilfsspannung1-V647

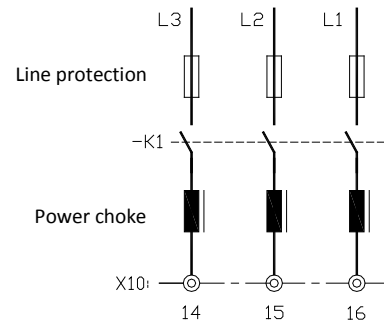
**Note:** Observe the respective type plate. Control voltage XXX



## 4.5 Power connection

Direct power connection

Phase	L1	Bolt X10:16
Phase	L2	Bolt X10:15
Phase	L3	Bolt X10:14



**Note:**

L1, L2, L3 – clockwise rotating field  
Protecting earth – PE connection

Unit Q3 x/x- Type current	Power choke KD-three-phase current K-Phase choke	Fuses A Superfast acting installed
240	KD5-250	6 x 250 A FF
360	K170-400	6 x 315 A FF
480	KU150-600	6 x 400 A FF
840	KU150-800	6 x 500 A FF

Power connection with an auto-transformer

1.1 x continuous motor power

Secondary voltage

0.9 x Motor voltage

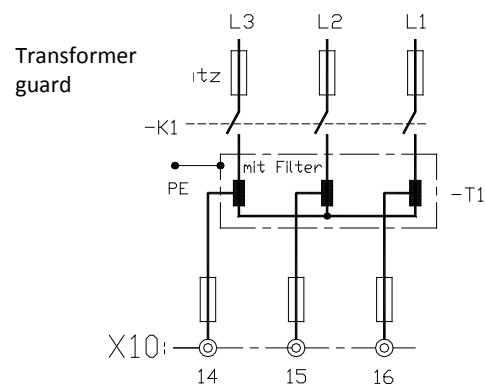
Transformer fuses

Slow acting

Observe the switch –on current!

Nput fuses F1, F2, F3

Rf. to the table above



Q3-V747-with filter

**Attention:**

If the secondary voltages produced by the transformer are inferior to 60% the voltage watchdog has to be adapted. These modifications may only be effected in the factory and thus, the voltages have to be indicated on order.

Watchdog connection

LED BTB inactive

>>> missing phase

>>> wrong rotating field



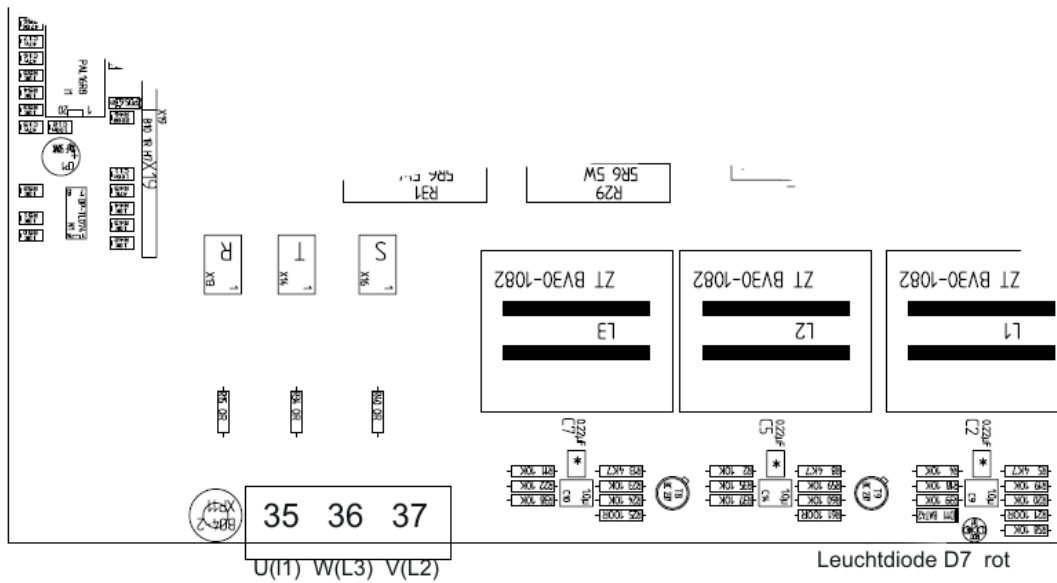
## 4.6 Option

Option - External synchronization

For special applications it might be necessary to tap the synchronization before the power commutating choke, e.g.

- when operating via field triggering circuit
- in case of an instable power supply

**When changing to external synchronization, the 3 resistors 0W (R15, R34, and R40) on the board 'Q3 - on3' have to be removed.**



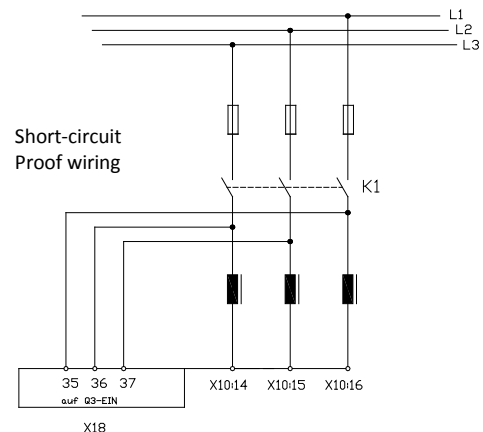
### Q3-Ein-1

Connection across the terminals X18:35, 36, 37

Observe the phase position!

- L3 across X10:14 (via power choke) and directly across terminal X18:36
- L2 across X10:15 (via power choke) and directly across terminal X18:37
- L1 across X10:16 (via power choke) and directly across terminal X18:35

The wiring has to be short-circuit proof or protected by means of a line protection  
 The phase position function has a watchdog and in case of wrong connections the LED D7 on the board Q3-on3 will light and the BTB signal on the controller extinguishes when the controller is enabled.  
 LED D7 also lights if there is a breakage of the installed fuses.



E-Q3-A019-option

## 4.7 Motor-connection

Positive command value			<p style="text-align: center; font-size: small;">Q3-Motor-V647-1</p>
Motor –	bolt	X10:13	
Motor +	bolt	X10:10	
<p><b>Attention:</b></p> <p>Amature choke only for a few applications: Inductance: <math>L [mH] = U_A / I_A \times 0,8</math> Standard version without a choke</p>			

Motor lines have to be shielded

Unit Q3 x/x- Type current	Power choke* Direct current	Min. conductor cross-section (mm <sup>2</sup> )
240	UI180B250	70
360	UI210C400	150
480	UI240C500	240
840	UI240C840	500

\*choke are necessary only for special applications

Switching in the armature circuit

- dc circuit current-free
- disable inactive

**Warning:**

Faulty switching will create arcing across the switch contacts.

Power supply failure - brake resistor

Break contact of the mains contactor K1

Rating:

Resistor RNB = max. armature voltage/2 x type current

**Braking effect only with an excited field!**



**Attention:**

Power lines have to be shielded and routed separately from control lines!

For electro-magnetic interferences please refer to the CE advice.

## 4.8 Field-connection

Constant field Connection		Plug-in terminal connectors
Input		X5:20, X5:21
Field	negative	X5:22
Field	positive	X5:23
Signal contact		X5:24, X5:25
Field voltage		
Power supply		Field supply
230V~		210V=
400V~		360V=
variable		0.9 x transformer secondary voltage
with auto-transformer		

Field current	max. 10A=
Internal fuses	2 x 10AF
Cross-section-connect line	min. 0.5mm <sup>2</sup>
Ext. protection	line protection, min. 10A

### Field current watchdog

Operating current	700mA
Signal contact	48V/0.5A
Connection	X5:24, X5:25
Error	open contact

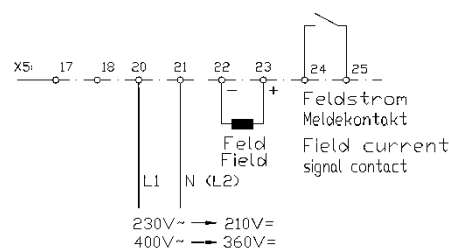
### Controlled field

Optional field current controller Q3-F

Observe Manual Q3-F

### Field current control

Field voltage	max. 320V=
Control range	200mA to 10A



Q3-Feld-1-V647-220Volt

### Combination of field/armature control

### Field triggering circuit

Internal potential-free armature voltage measuring

Field voltage	max. 320V=
Control range	200mA to 10A
Triggering point UA	max. 450V=
Adjustments	min./max. field current control parameter

**EMC:** for a controlled field >>> use shielded field lines

**No switch contact, fuses etc. in DC field circle**



## 4.9 Actual value

Actual value connection

Tacho

Suitable actual value encoders: tacho generator

Brushless tacho generator with evaluation electronics

Incremental encoders with evaluation electronics

**Note:** AC or three-phase tachos with rectification are not suitable

Connection

Control electronics (see Manual REG)

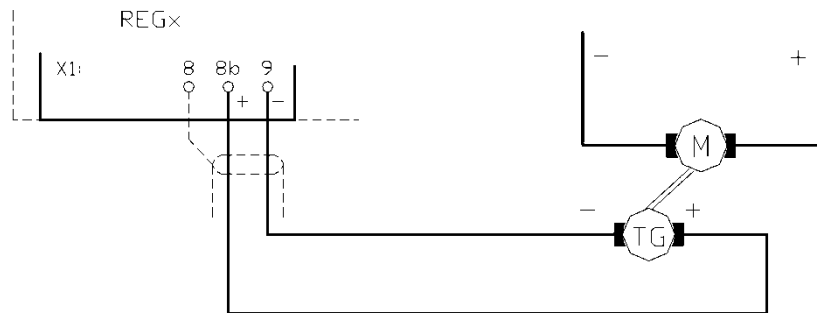
In case of a positive command value

Tacho positive X 1:8b

Tacho negative X 1:9

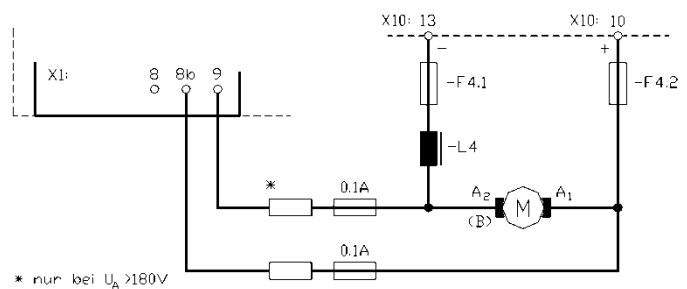
Shield X 1:8

Classic-Tacho-A054-1



## Armature voltage

Classic-Ankerspannung-A054-1



Ground referenced actual value

Fuses 2x 0.1A

For armature voltage >180V=

Use unit UNITEK EXZU-UA1

directly in the armature circuit  
additional resistors are required

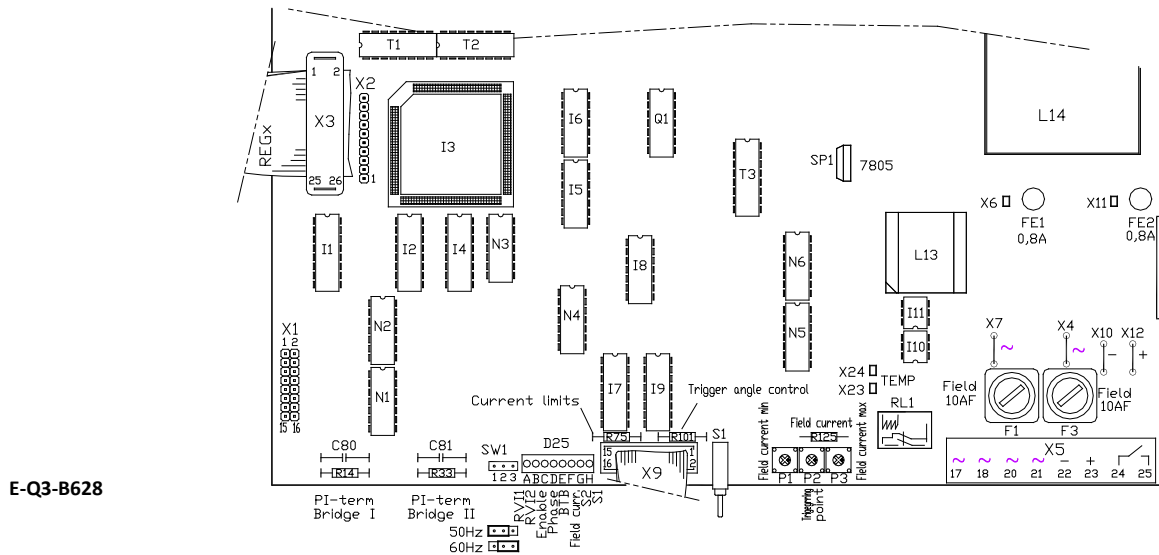
**Note:** Observe Manual REG

Option: In case of internal potential-free armature voltage control please indicate on order.



## 5 Adjustments

### 5.1 Components



**Variable elements**

Component	Function	Range
R14	P-amplification current controller 1	18kΩ to 470kΩ
R33	P-amplification current controller 2	18kΩ to 470kΩ
R75	Exact adjustment current limit	100kΩ to 470kΩ
R101	Trigger angle control	240kΩ to 560kΩ
R125	Field current	
C80	Integral term - current controller 1	0.1μF to 2.2μF
C81	Integral term - current controller 2	0.1μF to 2.2μF

**Potentiometer**

P1	min. field current	0 to 15%
P2	Triggering point for armature/field control	200 to 450V
P3	max. field current	0 to 100%

**Jumper**

SW1 Pos.1-2	50Hz adjustment
SW1 Pos.2-3	60Hz adjustment

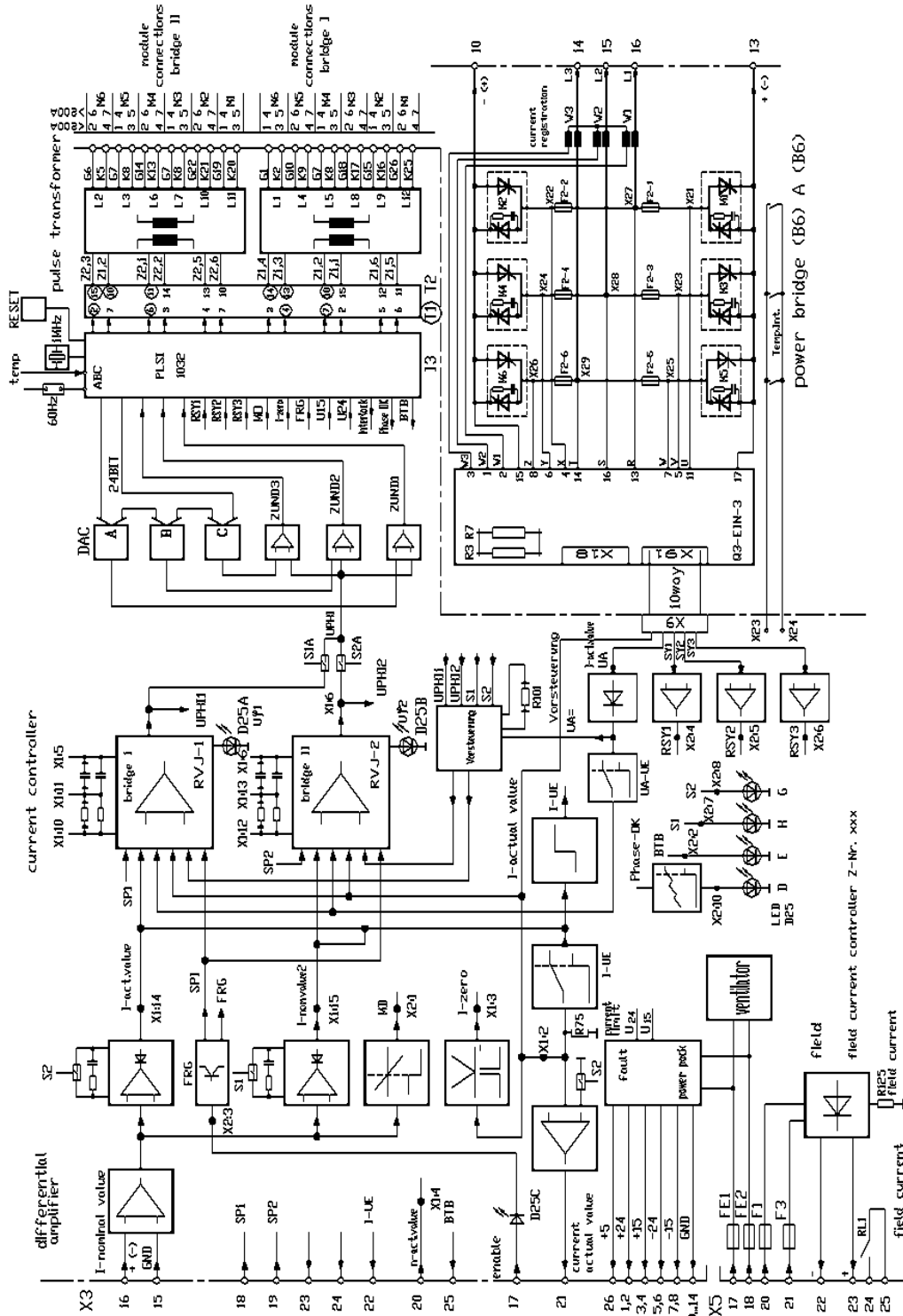
**Switch**

S1	Reset
----	-------

**LED displays**

D25A	Current control loop RVI-1	control active
D25B	Current control loop RVI-2	control active
D25C	Enable current controller/triggering	enabled
D25D	Phase error	error
D25E	BTB ready	operational
D25F	Field current	luminous intensity = field current (only for a controlled field)
D25G	Current flow direction S2	active
D25H	Current flow direction S1	active

## 5.2 Circuit diagram



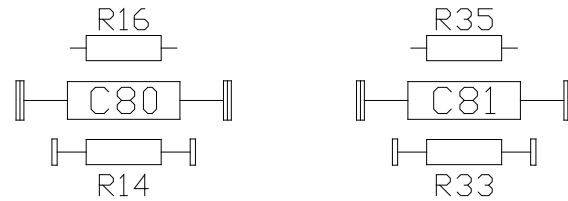
E-Q3-5654



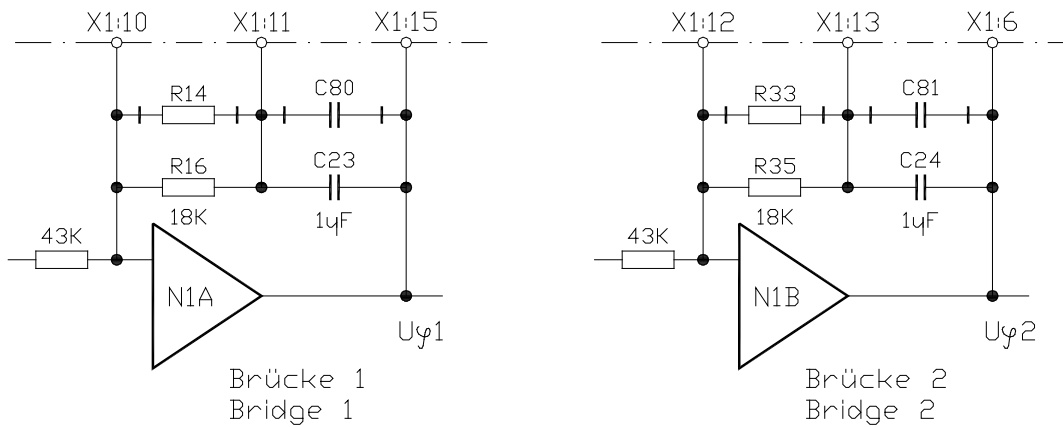
## 5.3 Current controller

Current controller – PI loop circuit

Bridge 1      negative      R14, C80  
 Bridge 2      positive      R33, C81



Q3-Strom-PI-pos-V647-1



Q3-Strom-P1-1-V647

Basic set-up

Amplification ~0.4

Integration time ~18ms

Changing the amplification

Bridge 1	Bridge 2
$X_p = \frac{18k\Omega \times R14}{18k\Omega + R14}$	$X_p = \frac{18k\Omega \times R33}{18k\Omega + R33}$

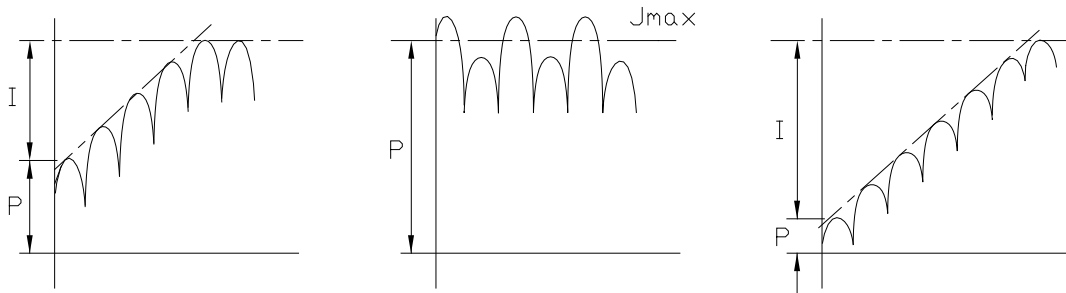
Changing the integration time

Bridge 1	Bridge 2
$\tau[ms] = \frac{18k\Omega \times R14}{18k\Omega + R14} \times 1\mu F + C81$	$\tau[ms] = \frac{18k\Omega \times R33}{18k\Omega + R33} \times 1\mu F + C80$

Optimization of the current controller

- Connect an oscilloscope across the current actual value X3:21
- Current command value step-change  $\pm 1V$  X3:16
- Increase the current command value by 1V steps to  $\pm 10V$
- Alter the P-amplification by means of the resistors R14 and R33
- Optimal adjustment fig. 1
- Not permissible adjustment fig. 2
- Alter the integral part by means of the capacitors C80 and C81

Oscilloscope – current adjustment



Q3-strom-PF-QSzt-1-V161

graphic 1  
setting optimal

graphic 2  
amplifier too high

graphic 3  
P-amplifier small

**Note:**

Any changes in the optimization of the current controller must be checked by means of an oscilloscope.

## 5.4 Displays

BTB signal - Drive ready			
BTB signal	X3:25	>+5V	
Error	X3:25	<+5V	
Error			
Voltage error	24V, 15V, 5V		saved
Phase error, rotating field			saved
Defective input fuse			saved
Over-temperature			saved

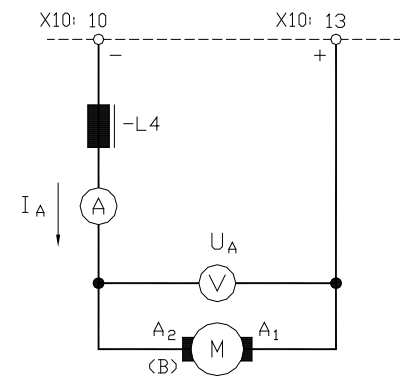
In case of errors or failure the power section is immediately internally disabled without delay.  
To clear the saved error re-enable the drive (switch off/on or reset key)

### Measurements

#### Measurement advice

Measuring instruments: multi-meter for current and voltage  
shunt or clamp-on ammeter

Measuring faults: mean value > actual value  
acc. to the form factor  
approx. 1 to 5%



Q3-Motor-Mess-1V647

#### Measured values

with a positive command value

Voltage: X10:10 positive X10:13 negative  
max 1.15 x power supply  
For 400V~ >> 460V=

Current: ammeter in the motor circuit  
5s 200%, continuously 110% type current



Measured values across REGxx (selectable, see Manual REGxx)

Speed	X2:109	±5V or ±10V	for ±100% speed
Current	X2:111	±5V or ±10V	for ±200% current
GND	X2:104		

## 6 Commissioning

### 6.1 Commissioning Q3 x/x-x with REG4

Check the following connections before commissioning



Observe the type plate!

#### Basic connection - power connections Q3

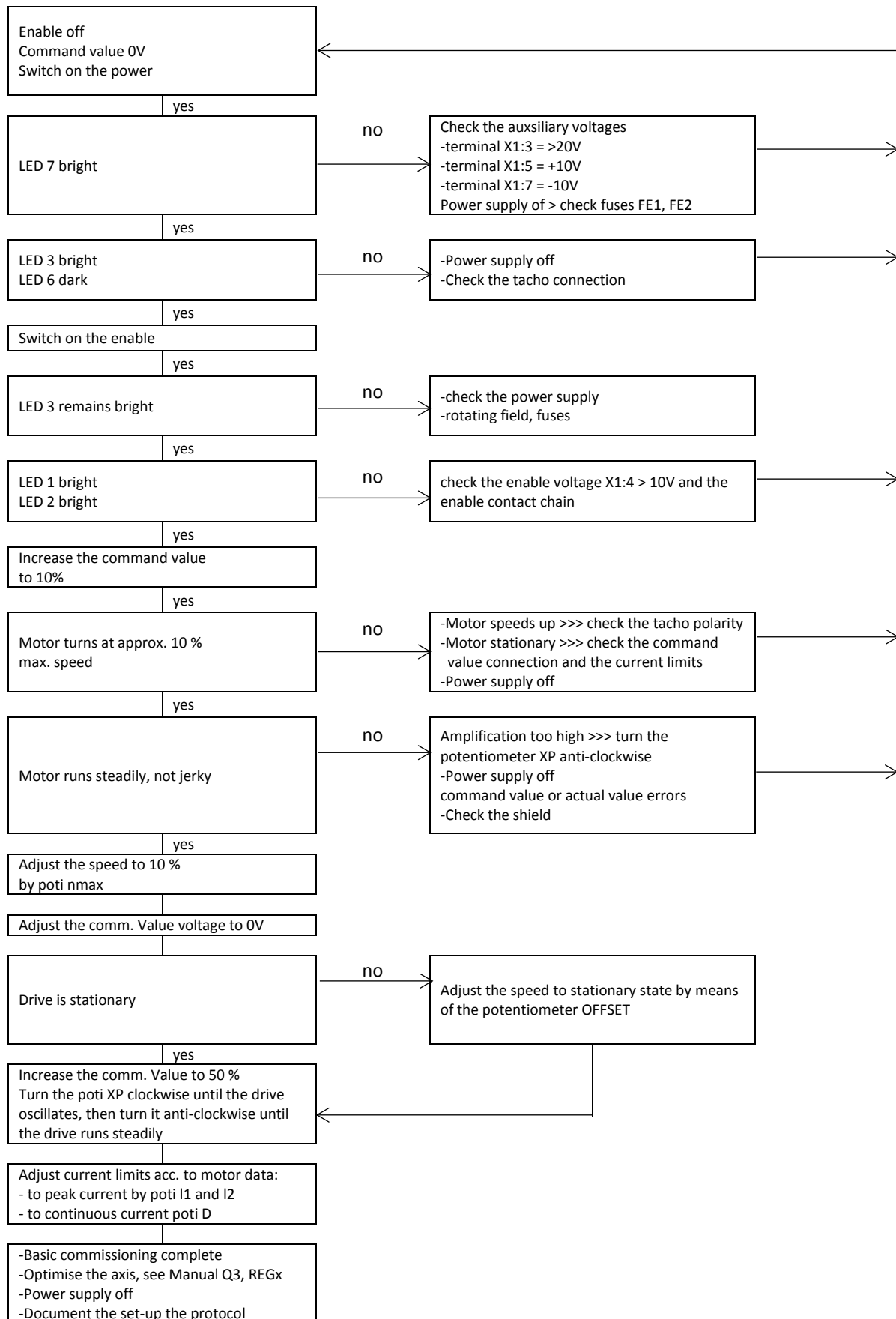
Power supply	power	bolts X10:14, X10:15, X10:16
Power supply	auxiliary voltage	terminals X5:17, X5:18
Power supply	field	terminals X5:20, X5:21
Motor connection	A1/A2	bolts X10:10, X10:13
Field connection	F1/F2	terminals X5:22, X5:23
Field current signal		terminals X5:24, X5:25
Protecting earth	PE	earthing screws PE on the housing

#### Control connections


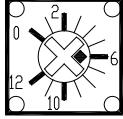
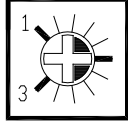
Enable	contact between X1:3 and X1:4	
Command value	signal X1:6, GND X1:8a	
Actual value	signal X1:9, GND X1:8b	
Shields	X1:8	

#### Control electronics REG4

Switch	S4	PI amplification	position 4
Switch	S5	I-term	position 4
Switch	S8	D amplification	position 8
Switch	S9	actual value	position 8
Potentiometer	I1	peak current	10%
Potentiometer	I2	peak current	10%
Potentiometer	ID	continuous current	100%
Potentiometer	XP	amplification	50%
Potentiometer	INT	integrator	left full scale
Potentiometer	nmax	speed	left full scale
Potentiometer	offset	offset	50%



## 6.2 Protocol Q3 x/x-x with REGxx

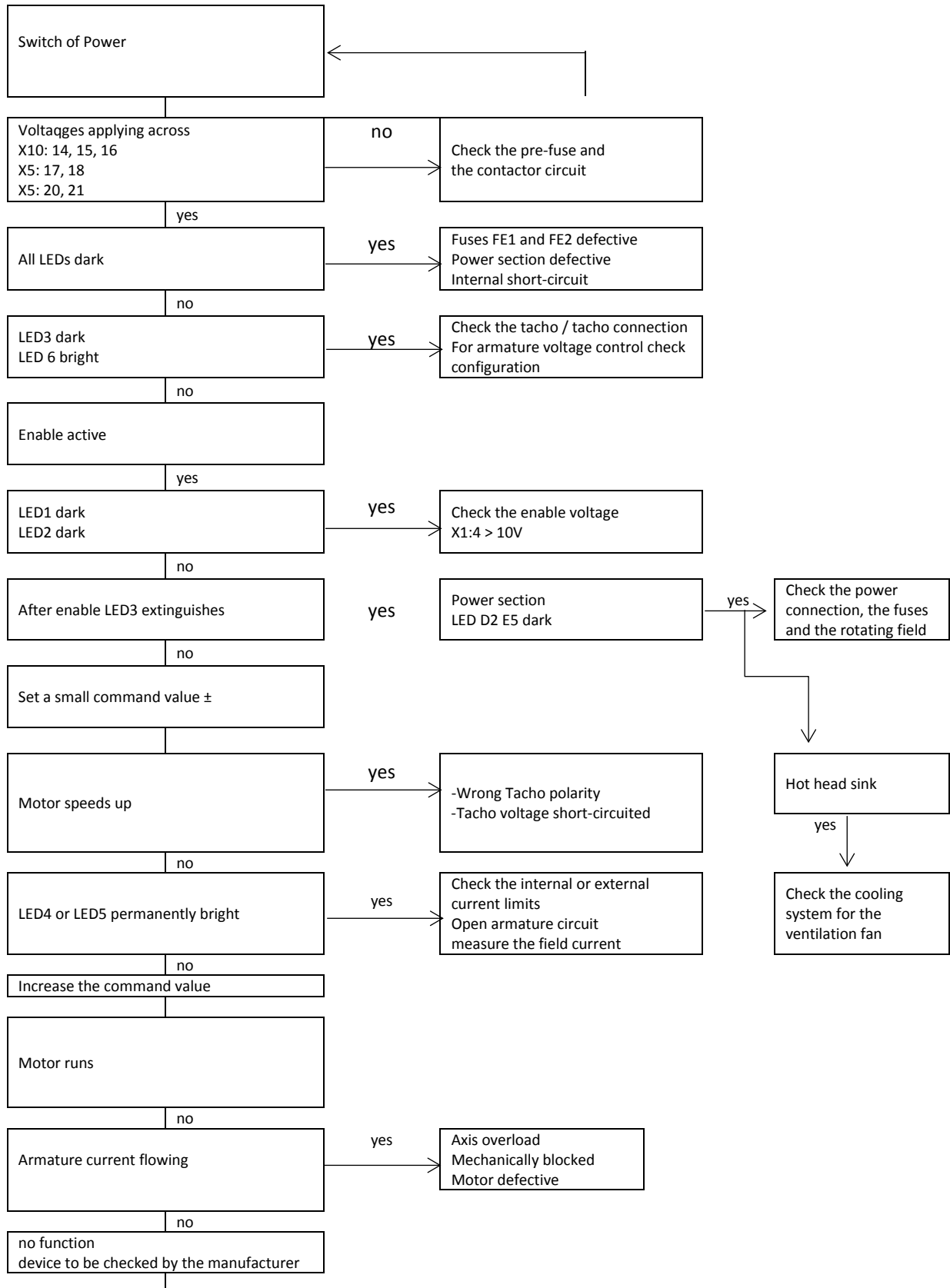
<b>Customer</b>				<b>Machine no.</b>			
<b>Device</b>				<b>Serial no.</b>			
<b>Control voltage</b>		[V~]					
<b>Power supply voltage</b>		[V~]					
<b>Field voltage</b>		[V=]					
<b>Inputs</b>							
Enable	Contact?	Voltage [V=]					
Command value	Type	Voltage [V=]					
Command value, additional	Type	Voltage [V=]					
Current command value	$I_{max1}$ external	Voltage [V=]					
Current command value	$I_{max2}$ external	Voltage [V=]					
<b>Speed controller settings REGxx</b>							
<b>Switches</b>							
Tacho adjustments		S9	Position	 <small>REG5 - Schotax</small> <small>1</small>			
P-term		S4	Position				
I-term		S5	Position				
D-term		S8	Position				
<b>Potentiometers</b>							
Speed	$n_{max}$	P4	Position	 <small>REG5 - Poti 1</small>			
Peak current	$I_{max1}$	P5	Position				
Peak current	$I_{max2}$	P6	Position				
Continuous current	$I_D$	P7	Position				
Integrator	INT	P1	Position	 <small>REG5 - Poti 2</small>			
Amplification	$X_p$	P3	Position				
$I_xR$ compensation		P2	Position				
<b>DIP switch</b>							
ON	No.						
OFF	No.						

## Current controller adjustments

Current controller settings			
P-amplification	R14=....	R13=....	
I-term	C80=....	C81=....	
50/60 Hz			
Jumper SW1	Pos. 1-2 (50Hz)	Pos. 2-3 (60Hz)	
Measured data			
Armature voltage	max.	[V=]	
Armature current	peak	[A=]	
Armature current	continuous	[A=]	
Tacho voltage	max.	[V=]	
Acceleration	X4:16	[V/ms]	
Integrator	X4:14	[V/ms]	
Motor data			
Type plate data			
Manufacturer			
Type		Serial no.	
Motor voltage [V=]		Motor current [A=]	
Field voltage [V=]		Field current [A=]	
Tacho voltage [V/min <sup>-1</sup> ]		Tacho type	
Brake [V]		Fan [V]	
Nominal speed [rpm]			

## 7 Faults

### 7.1 Faults





7.2 Error diagnosis

Error diagnosis	
Malfunction	Causes
Motor does not run	<ul style="list-style-type: none"> <li>-Wrong power supply and motor connections</li> <li>-Activated fuses</li> <li>-Missing enable or command value</li> <li>-Current limit too low</li> <li>-Missing BTB</li> </ul>
Motor speeds up	<ul style="list-style-type: none"> <li>-Wrong polarity of the actual value (Tacho armature voltage)</li> <li>-Values of the tacho switch S9 too low</li> <li>-Command value too high</li> </ul> <p>For armature voltage control</p> <ul style="list-style-type: none"> <li>-Field current too low</li> <li>-Fuses, armature voltage feedback activated</li> </ul>
Motor runs unsteadily	<ul style="list-style-type: none"> <li>-Mechanical defect of the tacho</li> <li>-Tacho malfunction</li> <li>-Amplification on the speed controller too low or too high</li> <li>-Wrong PID parameter</li> <li>-Command value errors</li> <li>-Amplification of the current controller too low or too high</li> </ul>
No motor torque	<ul style="list-style-type: none"> <li>-Current limits too low</li> <li>-Field current too low</li> <li>-Mechanical overload of the axis</li> </ul>

## 8 Warranty

### 8.1 Warranty

**UNITEK** warrants 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).

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