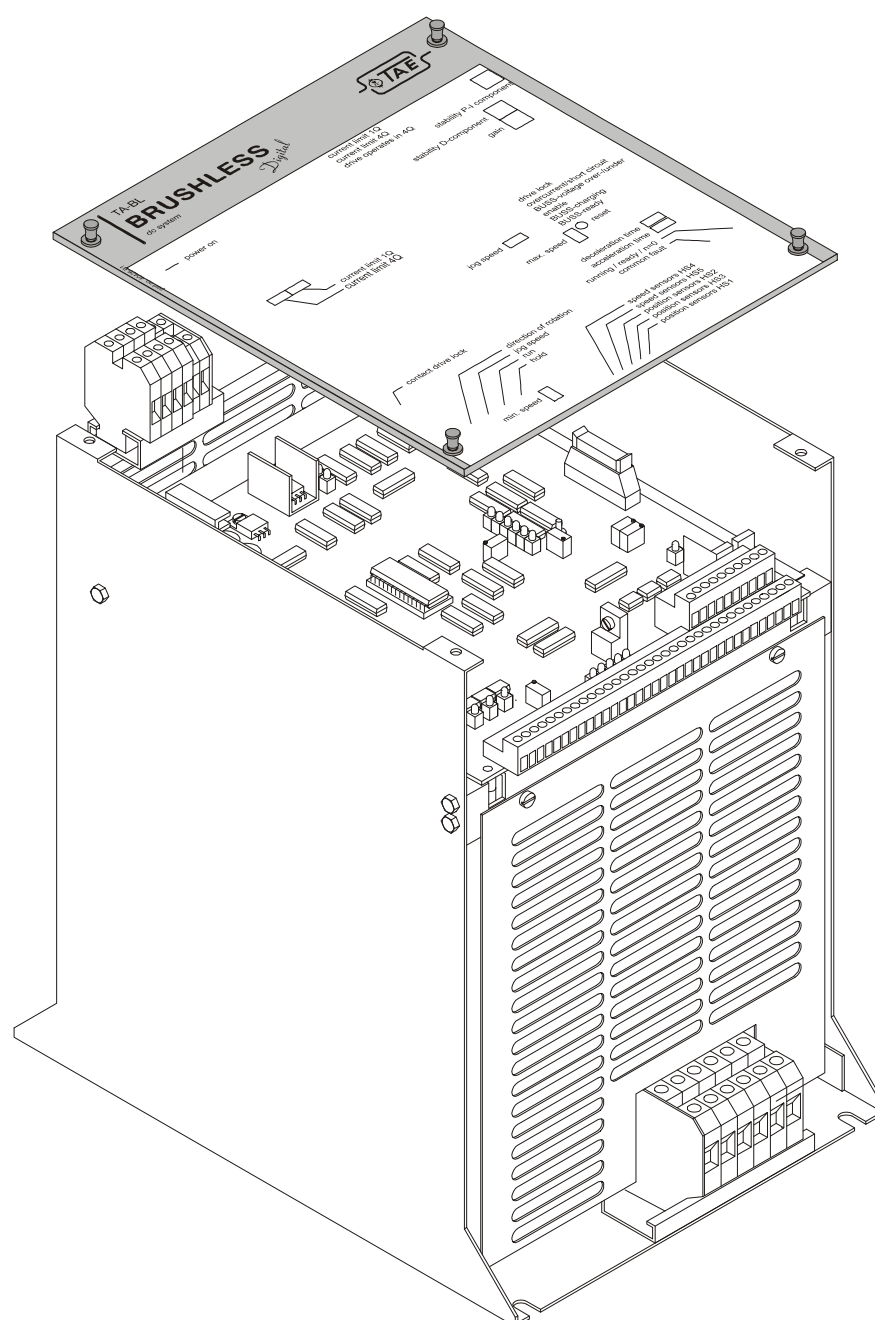
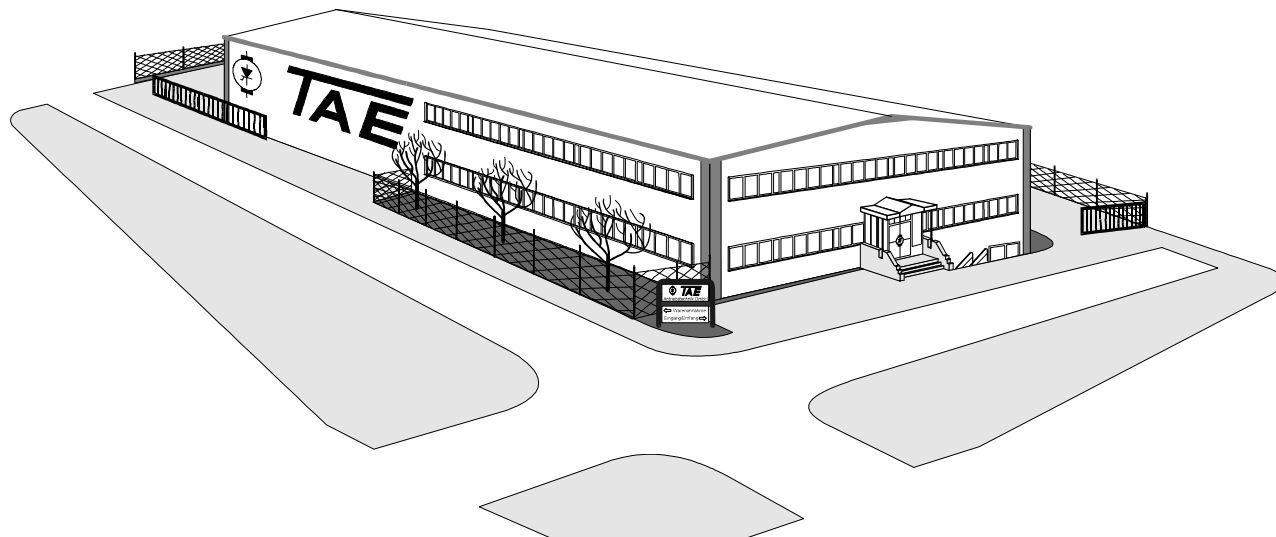


TA-BL 4.1...300.1

Instruction and Operating Manual



TA-BL 4.1...300.1



Head Office and Representatives

Head Office

International Sales Representatives

Germany

Shipping address:

TAE Antriebstechnik GmbH
Am Kappengraben 20
D-61273 Wehrheim

P.O. Box address:

TAE Antriebstechnik GmbH
Postfach 1163
D-61268 Wehrheim

E-mail:

info@tae-antriebstechnik.de

Internet:

<http://www.tae-antriebstechnik.de>

Telephone: +49 60 81 95 13-0
Fax purchase dept.: +49 60 81 5 94 72
Fax sales dept.: +49 60 81 980052

Representatives - Germany

Erhardt Antriebstechnik GmbH
Silcherstraße 8
D-71691 Freiberg a.N.
Telephone: +49 71 41 72 379
Fax: +49 71 41 707457

Belgium

ESCO Transmission
Culliganlaan, 3
B-1831 Machelen Diegem
Telephone: +32 2 720 48 80
Fax: +32 2 715 65 60

Denmark

Thrige Electric A/S
Energivej 25
DK-5260 Odense S
Telephone: +45 63 95 11 11
Fax: +45 63 95 11 12

Finland

Finndrive Oy
Sirrikujä 4 E
FIN-00940 Helsinki
Telephone: +358 9 342 1543
Fax: +358 9 342 1548

France

Radio Energie,
ZAC Fontaine de Jouvence
3, Rue Joly de Bammerville
F-91 462 Marcoussis Cedex
Telephone: +33 1 69 80 67 04
Fax: +33 1 69 80 67 08

Netherlands

GTI-Elektroprojekt
Sluispolder Vej 15
NL-1505 EK Zaandam
Telephone: +31 75 68 11 111
Fax: +31 75 63 54 003

USA

MSI - Motor Systems, Inc
501 TechnCenter Drive
Milford Ohio 45150
Telephone: +1 513 576 1725
Fax: +1 513 576 1915

South America

ENVALCA, C.A.
Apartado 75766
VE-1070 Caracas-Venezuela
Telephone: +58 44 899 28
Fax: +58 44 899 12

1. Inhaltsverzeichnis

2. Instructions of Safety	5
2.1 Instructions and Rules	5
2.2 Safety	6
2.3 Using Fault-Current-circuit-breaker (FI)	6
3. General	7
3.1 Name Plate	7
3.2 Expected Readers of this Manual	7
3.3 Liability	7
4. Description of the Product	8
4.1 Introduction	8
4.1.1 Usability	8
4.1.2 Protection Against Irregular Usage	8
4.1.3 Norms and Directives	9
4.2 Technical Data	10
4.2.1 Drive types	10
4.2.2 Device data and Dimensions	11
4.2.2 Ambient	12
4.2.3 Equipment	12
4.2.4 Indicators (LED's)	12
5. Construction and Function	13
5.1 Construction and Layouts	13
5.1.1 TA-BL 4.1...6.1	13
5.1.2 TA-BL 8.1	13
5.1.3 TA-BL 10.1	14
5.1.4 TA-BL 15.1	14
5.1.5 TA-BL 20.1...30.1	15
5.1.6 TA-BL 50.1	15
5.1.7 TA-BL 60.1	16
5.1.8 TA-BL 80.1	16
5.1.9 TA-BL 150.1	17
5.2 PC Boards LP2 to LP6	18
5.2.1 LP2-IGBT-CONTROL	18
5.2.2 LP3 - Sensor Board	18
5.2.3 LP4 - Switched Mode Power Supply	19
5.2.4 LP6 - MDR-2000 Torque Controller (externally and option)	20
5.3 Principle Diagrams	21
5.3.1 TA-BL 4.1...20.1	21
5.3.2 TA-BL 30.1...300.1	22
5.4 Safety and Supervising Equipment	23
6. Initial Operation	24
6.1 Instructions for Installation	24
6.1.1 Switching Devices	24
6.1.2 Arrangement of Wires	25
6.1.3 Conditions for Grounding	25
6.1.4 Diagram of Dimensions	26
6.1.5 International Protection	27
6.1.6 Instruction for Mounting	27
6.1.7 Arrangement in Switch Cabinet	27
6.1.8 Braking Unit	28

TA-BL 4.1...300.1

6.2	Connections	28
6.2.1	Power Connections	28
6.2.2	Optional Connections	28
6.2.3	Control connections	29
6.2.4	Connection Diagram Control Board LP1	30
6.3	Requirements before Initial Operation	31
6.3.1	Jumper	31
6.3.2	Setting of Motor Parameters	31
6.3.3	DGM 2000 - DGM 2002	31
6.4	Functional Tests and Initial Operation	31
7.	Operation	33
7.1	Instructions of Safety	33
7.2	Sequence for Turn On / Turn Off	33
7.3	Setting of Parameter	34
7.3.1	LED Display Control Board LP1	34
7.3.2	Sensor Test	35
7.3.3	Setting of Potentiometers	36
7.4	Jumper on Control Board LP1	37
7.5	Errors	46
7.6	Trouble Shooting	47
7.7	Spare Part List	48

About This Instruction Manual

If you look for some definite topic you can use the table of contents at the beginning of these instruction and operation manual. In these instructions is a row of symbols which shall provide you with a fast orientation and show the importants.



This symbol stands for notes and useful informations which shall make the operation easier for you.



Note, disregard can damage or destruct the device.



Note, disregard means a danger for the operator.

2. Instructions of Safety



**Before you put the device into operation, please read this instruction and operation manual completely. The operation should only be done by qualified personnel.
The precautions and warnings below must be observed at the operation of the device.**

This product is constructed according to the rules of safety. Nevertheless there may be dangerous situations. Use only functional devices. After safety mechanisms have been triggered, the cause must be found and the failure has to be fixed. Defects on the device can only be repaired by TAE or from TAE authorized qualified personal. Safety equipment must not be bypassed or removed. More information about the provided safety and protection equipment may be found in Chapters 5.4 and 7.5.

2.1 Instructions and Rules

These guidelines for installation have been compiled with regard to the following standards:

EN 60204-1 (VDE 0113: 1992-1)	Electrical equipment for machines
EN 60529:1991 (VDE 0470 Part 1)	Protection by frame
DIN EN 50178 (VDE 0160-1994-11)	Electronic equipment to be used in electrical power installations
DIN VDE 0100	Erection of power installations with nominal voltage up to 1000 V
DIN VDE 0110	Dimensioning of clearances and creepage distances
DIN 40050	(IP-International Protections)
EN 50081/50082	EMC general rules

TA-BL 4.1...300.1

2.2 Safety



Caution - Danger !

Disconnect unit from mains before making any repairs. Only when the BUSS-capacitors have discharged, (The unit is still "Live" as long as the red LED 1 on the Current sensor board LP3 lights up), 5 minutes after the device has been seperated from line, the unit may be opened and worked on.



As with any form of electrical equipment, there is always a risk involved in the handling of electrical machinery. The greatest care must always be exercised during installation and maintenance. It is recommended that service is performed by authorized personnel only.



A careful adjustement of the maximum peak current is necessary!

The peak current must never exceed the maximum current of the motor! For orders of a complete drive unit (unit & motor) then manufacturer will pre-adjust the rated power and the maximum peak current of the unit according to the reference data of the motor.



After the installation make sure that the unit and the motor is properly grounded in order to avoid electrical hazzards! Improper grounding will also cause damage to the electronic circuit and to the Hall-sensors of the motor! The common connection of the electronic circuit is in all units connected to ground.

2.3 Using Fault-Current-circuit-breaker (FI)

Fault-Current-circuit-breaker (FI) can not be used with the TA-BL drives. The high leakage current could trigger or in case of a mistake destruct the FI switch. Please read the instructions for installation in Chapter 6.1.

3. General

After production all devices are checked and are ran a 200 hours continuous test. Before delivering the devices are checked again. By this proceeedure we want to ensure that only flaw less devices are delivered.

In normal case there are no failures expected if the drive has been adjusted correctly and the issues of the operating manual have been followed.

If, in spite of this, a failure occurs, get in contact with one of our agents or contact us directly.

3.1 Name Plate



The name plate is placed on the right side of the device.

Make sure that the device is not damaged by transport before installing it.

Compare the delivered parts (look at name plate) with the bill of delivery.

3.2 Expected Readers of this Manual

This operating manual is for users which are qualified to handle this device.

3.3 Liability

Defects within the device should not be repaired by the user. Nonauthorized repairs leads to loss of warranty.

TAE is not liable if any manipulations have been made, for example, attempts to repair.

If there is any doubt about the cause of failure or possibility of repairing, please contact TAE to avoid further damage to the device or motor.

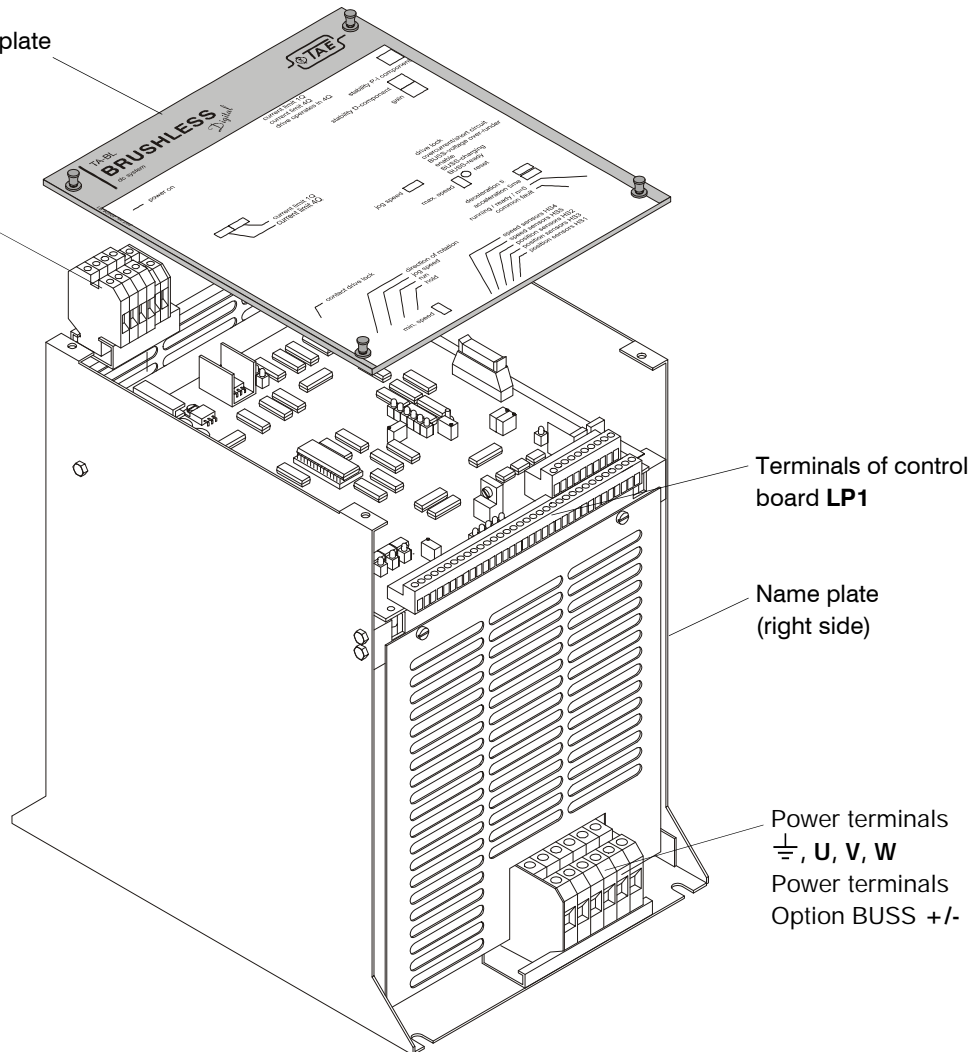
TA-BL 4.1...300.1

4. Description of the Product

4.1 Introduction

Removable plexiglass plate

Power terminals **PE**,
L1, **L2** and **L3**
Current actual value
0 and **I**



4.1.1 Usability

Referring to power only those brushless DC motors can be connected to this device which are specified by TAE.

4.1.2 Protection Against Irregular Usage

This device does not work as a frequency inverter. Interchanging of the terminals U, V, W while connecting the brushless motor results in a malfunction of the motor. Furthermore the control cable from the motor (12 pole plug at terminal box of the motor) has to be a screened cable. TAE is offering premounted cables for this purpose. Without the correct connection of the cable, the drive is not functional.

Caution! Do not apply mains to the output terminals U, V, W.

All devices are tested against high voltage and isolation resistance. Measuring of isolation resistance is only allowed between power terminals and ground, if the connection to the sensor board LP3 is opened and using an EMC filter, the capacitors are disconnected. The connections TB3, TB10 and TB11 are to be disconnected at sensor board LP3. (look at Chapter 5.3 Principle Diagrams). Do not make an isolation measurement at the terminals of the control board. Because of these extensive requirements, the measurement of isolation should be done with greatest care.

4.1.3 Norms and Directives

Declaration of manufacturer

EMC directive

The EMC directive of November 9th 1992 concerning the electromagnetic compatibility with reference to the EMC directive EMCD 89/336/EEG is a national law. This directive distinguishes between two criteria: Product components and product distribution.

According to these criteria, our products are classified as follows:

- Product components: Parts from suppliers which are inoperative on their own.
- Product distribution: Not commonly available, sold to qualified persons.

The law states that an EC-declaration of conformity, as well as a CE-marking, is not required for such components. In order to meet the requirements of the EMC-directive we supply the following:

- Product-related documents which describe the interference radiation of our products. This information will enable the user to provide all necessary steps to meet the EMC-requirements during planning and installation.
- EMC-specific components such as filters, chokes, shielded wiring, metal enclosures and others are available from TAE. TAE will furthermore provide specific technical information concerning the proper use of such components for their products in order to meet the requirements of the harmonized standards.

It is the users responsibility to carry out our instructions and to use adequate provisions. The user is also responsible that his machine and installation meets the requirements of the EMC-standards.

Based on the EMC directive and its corresponding standards, we have carried out extensive measurements at our premises. These tests have included our complete product line. With the use of filters and proper wiring all our products meet the requirements of standard EN 50081-2 (sweep radiation) and standard EN 55011 class A for industrial use. These directives and recommendation for the use of electronic equipment are based on the following standards:

Low Voltage Directive

Referring to article 2 only those devices may be introduced which meet "the state of safety technique in the community".

Using a QM system, TAE is watching all steps from development to production of the device. So all norms and directives can be fulfilled referring to this aspect of safety.

CE-marking

The CE-marking indicates the conformity of the TA-BL drive to the European norms and directives.

The fulfillment of the norms and directives is only guaranteed if:

- The regulator is fitted out with a internal or external EMC filter which is tested by the manufacturer.
- You exactly follow the Instructions for installation (refer to Chapter 6.0).

Improper installation can lead to exceeding the maximum limits of EMC and to a malfunction of devices of other manufacturers.

DIN EN-50178 (VDE 0160:1994-11)	Electronic equipment for use in Electrical Power installations
DIN VDE 0100	Erection of Power Installations
DIN VDE 0110	Dimensioning of Clearance and Creepage distances
DIN 40050	IP-International Protections
DIN 50081/50082	EMC Basic Standards

TA-BL 4.1...300.1

4.2 Technical Data

4.2.1 Drive types

The power and the rated current at servo and 4Q drives is about 20% less. The voltages, currents and power data in this table are nominal data at switch frequency 2,8 kHz. You will find the exact value on the name plate

Drive type Part Number	Mains		Power 1Q		Efficiency		Current (I)		
	Voltage	Current	Output	Loss	Drive	System	Rated	Peak	Switch-off
TA-BL 4.1 17045-....	230 V	8,2 A	2,7 kW	160 W	96,8 %	85,5 %	13,0 A	22,0 A	29,0 A
	400 V		4,6 kW						
	480 V		5,7 kW						
TA-BL 6.1 17065-....	230 V	12,2 A	3,6 kW	200 W	97,0 %	86,2 %	17,0 A	28,0 A	34,0 A
	400 V		6,2 kW						
	480 V		7,4 kW						
TA-BL 8.1 17085-....	230 V	16,5 A	5,4 kW	280 W	97,1 %	86,5 %	27,0 A	42,0 A	54,0 A
	400 V		9,4 kW						
	480 V		11,3 kW						
TA-BL 10.1 17105-....	230 V	23,5 A	8,1 kW	420 W	97,2 %	87,5 %	40,0 A	68,0 A	82,0 A
	400 V		14,0 kW						
	480 V		16,8 kW						
TA-BL 15.1 17155-....	230 V	34,0 A	11,5 kW	570 W	97,2 %	88,5 %	58,0 A	91,0 A	120,0 A
	400 V		20,0 kW						
	480 V		24,0 kW						
TA-BL 20.1 17215-....	230 V	43,3 A	15,0 kW	720 W	97,3 %	89,6 %	75,0 A	135,0 A	170,0 A
	400 V		26,0 kW						
	480 V		31,0 kW						
TA-BL 30.1 ¹⁾ 17315-....	230 V	60,5 A	20,2 kW	890 W	97,5 %	90,2 %	100,0 A	175,0 A	210,0 A
	400 V		35,0 kW						
	480 V		42,0 kW						
TA-BL 50.1 ¹⁾ 17515-....	230 V	95,0 A	34,1 kW	1360 W	97,7 %	91,3 %	170,0 A	260,0 A	320,0 A
	400 V		59,0 kW						
	480 V		70,0 kW						
TA-BL 60.1 ¹⁾ 17615-....	230 V	115,0 A	38,7 kW	1480 W	97,8 %	92,2 %	190,0 A	340,0 A	410,0 A
	400 V		67,0 kW						
	480 V		80,0 kW						
TA-BL 80.1 ¹⁾ 17815-....	230 V	155,0 A	55,4 kW	2200 W	97,8 %	94,8 %	280,0 A	510,0 A	560,0 A
	400 V		96,0 kW						
	480 V		115,0 kW						
TA-BL 100.1 ¹⁾ 17905-....	230 V	176,0 A	63,5 kW	2500 W	97,8 %	94,9 %	330,0 A	510,0 A	560,0 A
	400 V		110,0 kW						
	480 V		132,0 kW						
TA-BL 150.1 ¹⁾ 17925-....	230 V	240,0 A	86,6 kW	3100 W	98,0 %	95,0 %	440,0 A	700,0 A	840,0 A
	400 V		150,0 kW						
	480 V		180,0 kW						
TA-BL 180.1 ²⁾ 17935-....	230 V	2x 145,0 A	103,9 kW	4000 W	97,8 %	94,8 %	2x 270,0 A	2x 510,0 A	2x 560,0 A
	400 V		180,0 kW						
	480 V		216,0 kW						
TA-BL 200.1 ²⁾ 17945-....	230 V	2x 176,0 A	121,2 kW	4700 W	97,8 %	94,9 %	2x 320,0 A	2x 510,0 A	2x 560,0 A
	400 V		210,0 kW						
	480 V		240,0 kW						
TA-BL 300.1 ²⁾ 17965-....	230 V	2x 240,0 A	173,2 kW	6300 W	98,0 %	95,0 %	2x 440,0 A	2x 700,0 A	2x 840,0 A
	400 V		300,0 kW						
	480 V		360,0 kW						

¹⁾ The drives TA-BL 30.1 to TA-BL 150.1 350-480V need an external control voltage.

²⁾ Drive TA-BL 180.1 and up are delivered as 2 parallel connected drives in a switch cabinet (Enclosure IP54).

Important !

The tables are related to the motors BL-90A to BL-315D. When the drives are used with neodymium magnet motors (BL-N-112 to BL-N-180), the rated motor power must not exceed the rated drive power. This is even valid if the rated motor current is much lower than the rated drive current. Otherwise the drive's rectifier and DC-choke will be overloaded.

4.2.2 Device data and Dimensions

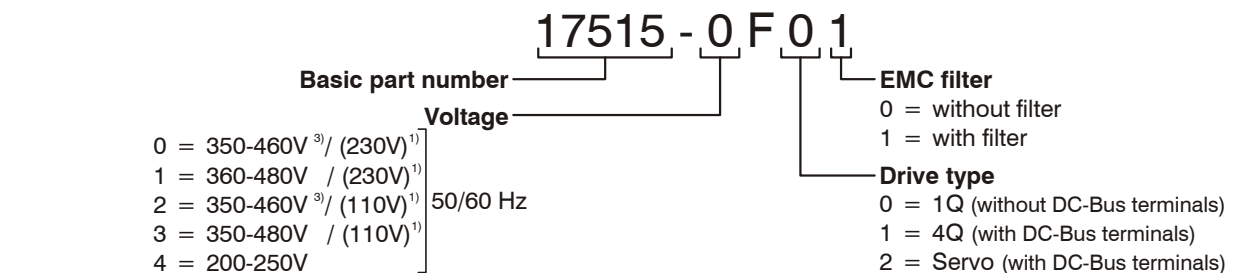
(Voltage according to name plate)	Line voltage		Deviation
	without EMC filter	with EMC filter	±10%
	200-250V	200-250V	
	350-460V	350-420V	
	360-480V	360-480V	
	3 Phase 50/60 Hz		
Enclosure	IP 20		
Environment ³⁾	ambient temperature 0-40°C		
Speed deviation	with analogue reference value (0-10V)	less than 1%	
	with digital reference value (DGM 2000)	0% absolute (+/- 1 Digit)	

³⁾ The technical data are rated at atmospheric humidity of 90% and at 1000 m above sea level.
Above 1000 m and higher ambient temperatures the power must be derated.

Drive type	Dimensions W x H x D	Mains fuse medium blow	Min. air flow for external fan		Weight net
			1Q	4Q / Servo	
TA-BL 4.1	208 x 290 x 288 mm	3x 10,0 A	20 m³/h	36 m³/h	11,0 kg
TA-BL 6.1	208 x 290 x 288 mm	3x 16,0 A	36 m³/h		11,5 kg
TA-BL 8.1	225 x 305 x 342 mm	3x 25,0 A	72 m³/h		13,5 kg
TA-BL 10.1	225 x 305 x 342 mm	3x 25,0 A	72 m³/h		14,0 kg
TA-BL 15.1	275 x 385 x 309 mm	3x 35,0 A	80 m³/h		18,0 kg
TA-BL 20.1	304 x 500 x 309 mm	3x 50,0 A	100 m³/h		31,0 kg
TA-BL 30.1 ¹⁾	304 x 500 x 309 mm	3x 63,0 A	210 m³/h		33,0 kg
TA-BL 50.1 ¹⁾	364 x 645 x 340 mm	3x 125,0 A	220 m³/h		55,0 kg
TA-BL 60.1 ¹⁾	364 x 750 x 340 mm	3x 125,0 A	240 m³/h		65,0 kg
TA-BL 80.1 ¹⁾	412 x 1000 x 360 mm	3x 200,0 A	650 m³/h		107,0 kg
TA-BL 100.1 ¹⁾	437 x 1100 x 360 mm	3x 200,0 A	690 m³/h		125,0 kg
TA-BL 150.1 ¹⁾	695 x 980 x 391 mm	3x 250,0 A	1150 m³/h		158,0 kg
TA-BL 180.1 ²⁾	(1200 x 2000 x 600 mm)	6x 200,0 A	1400 m³/h		470,0 kg
TA-BL 200.1 ²⁾	(1200 x 2000 x 600 mm)	6x 200,0 A	1500 m³/h		720,0 kg
TA-BL 300.1 ²⁾	(1600 x 2000 x 600 mm)	6x 250,0 A	2300 m³/h		630,0 kg

²⁾ Drive TA-BL 180.1 and up are delivered as 2 parallel connected drives in a switch cabinet (Enclosure IP54).

³⁾ By drives with a line voltage range from 350-460V and a internal EMC filter, the line voltage range reduces by technical reasons to 350-420V.



Example:

TA-BL 50.1 350-420V 1Q with EMC filter

TA-BL 4.1...300.1

4.2.2 Ambient

Ensure that the mains voltage conforms with the data in Chapter 4.2.1.

Environmental influences like high temperature and high air moisture are to be avoided. The same applies to dust, dirt and aggressive gas.

The location of mounting should be well ventilated and not be under direct radiation of the sun. The devices are only specified for mounting in switch cabinet. Install the device on a vertical, not flammable plate which does not transmit vibrations. More information to installation and initial operation may be found in Chapter 6.

4.2.3 Equipment

- ☐ Power transistor IGBT
- ☐ Current limiting
- ☐ Controlled acceleration and deceleration during operation with drive-control ON/OFF
- ☐ Separate 2nd speed (jog speed)
- ☐ Driverboard galvanically isolated by optocouplers
- ☐ All inputs also galvanically isolated by optocouplers
- ☐ Output short circuit proof
- ☐ Frequency output for digital speed indicator (Impuls counter FM-2000)
- ☐ Reverse rotation by contact or by change of polarity of rated value
- ☐ Drive lock with memory
- ☐ Logical switch-on function
- ☐ Digital electronic with EPROM
- ☐ Stop-function (at zero speed-stopping torque only at 4Q)
- ☐ Delayed drive lock at analogue rated value 0
- ☐ Wide input voltage range due to switch mode power supply.
- ☐ Automatic or manual reset
- ☐ Option EMC filter
- ☐ Option SERVO

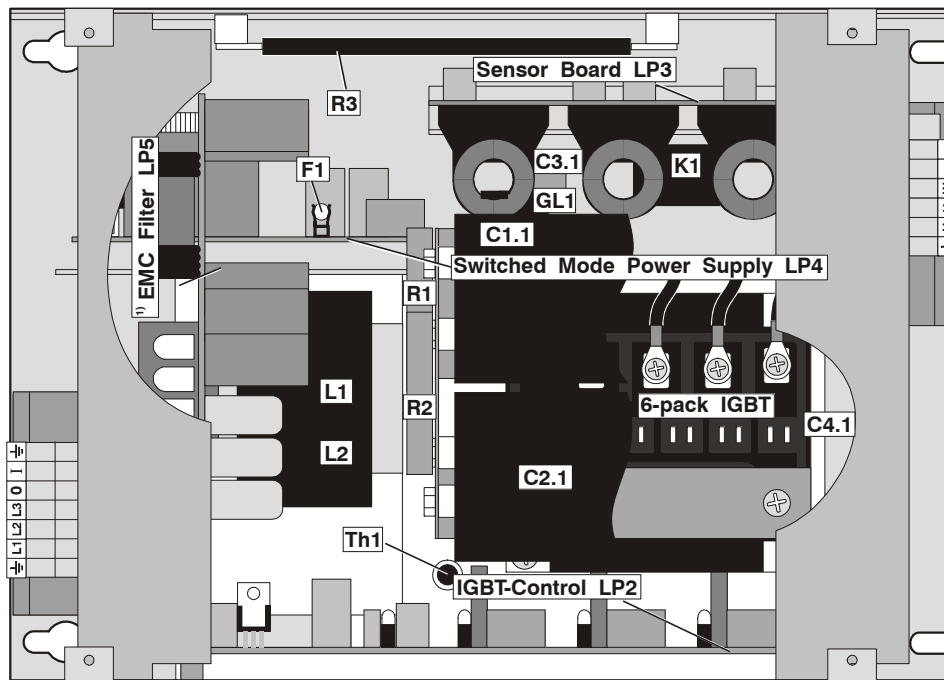
4.2.4 Indicators (LED's)

- ☐ Power ON
- ☐ In operation, ready for operation, zero speed
- ☐ Common fault, current limit
- ☐ Stop
- ☐ Jog-speed
- ☐ Direction of rotation
- ☐ Drive lock
- ☐ Overcurrent / short circuit
- ☐ Too high or too low voltage
- ☐ enable
- ☐ 5 LED's for hallsensors
- ☐ Capacitor charging
- ☐ Ready for operation
- ☐ BUSS-ready
- ☐ Current limit 1Q
- ☐ Current limit 4Q
- ☐ Drive operates in 4Q
- ☐ 6 LED's for driver board functions (*LP2-IGBT-Control*)
- ☐ Relay on (*LP3 Sensor Board*)
- ☐ Overtemperature (Klixon) (*LP3 Sensor Board*)
- ☐ BUSS-voltage (*LP3 Sensor Board*)

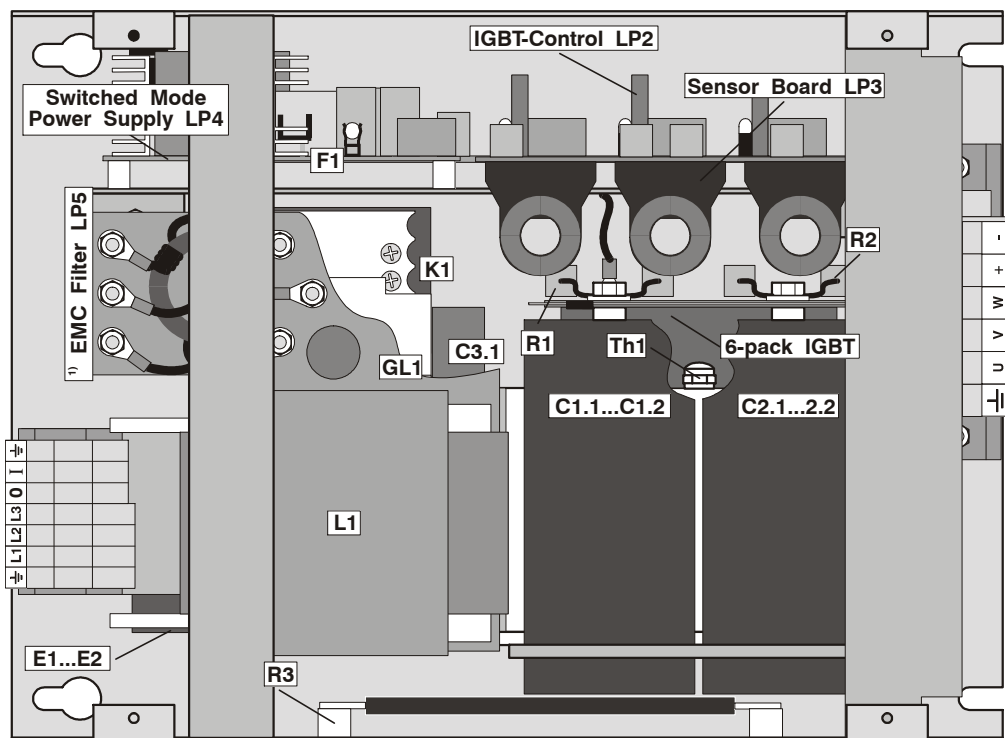
5. Construction and Function

5.1 Construction and Layouts

5.1.1 TA-BL 4.1...6.1



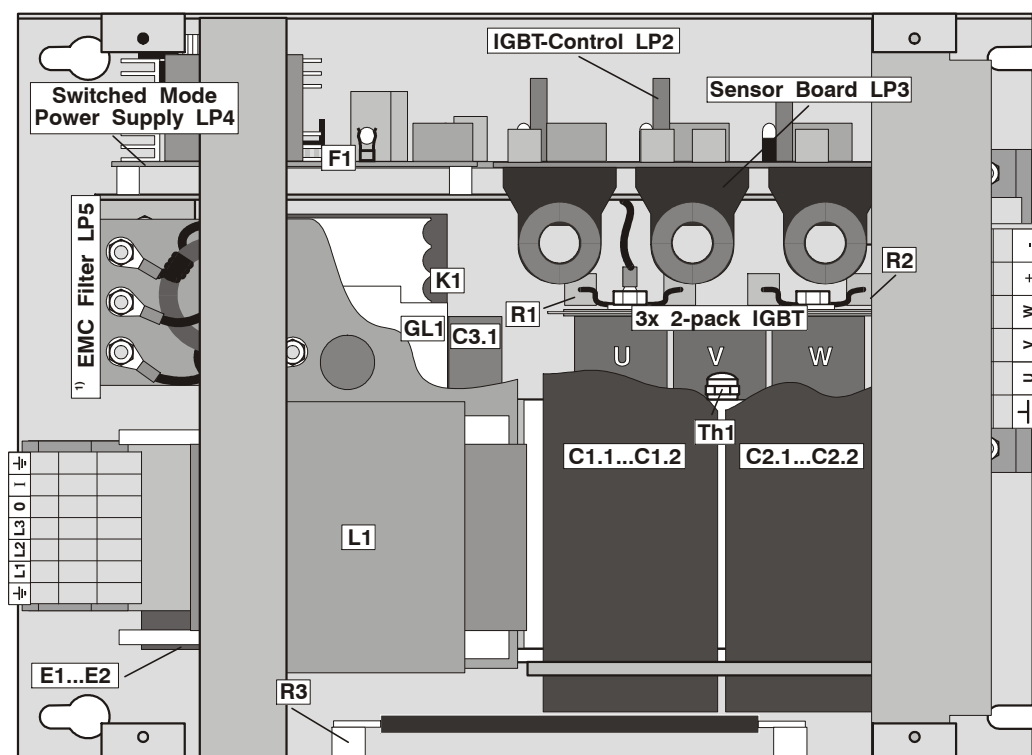
5.1.2 TA-BL 8.1



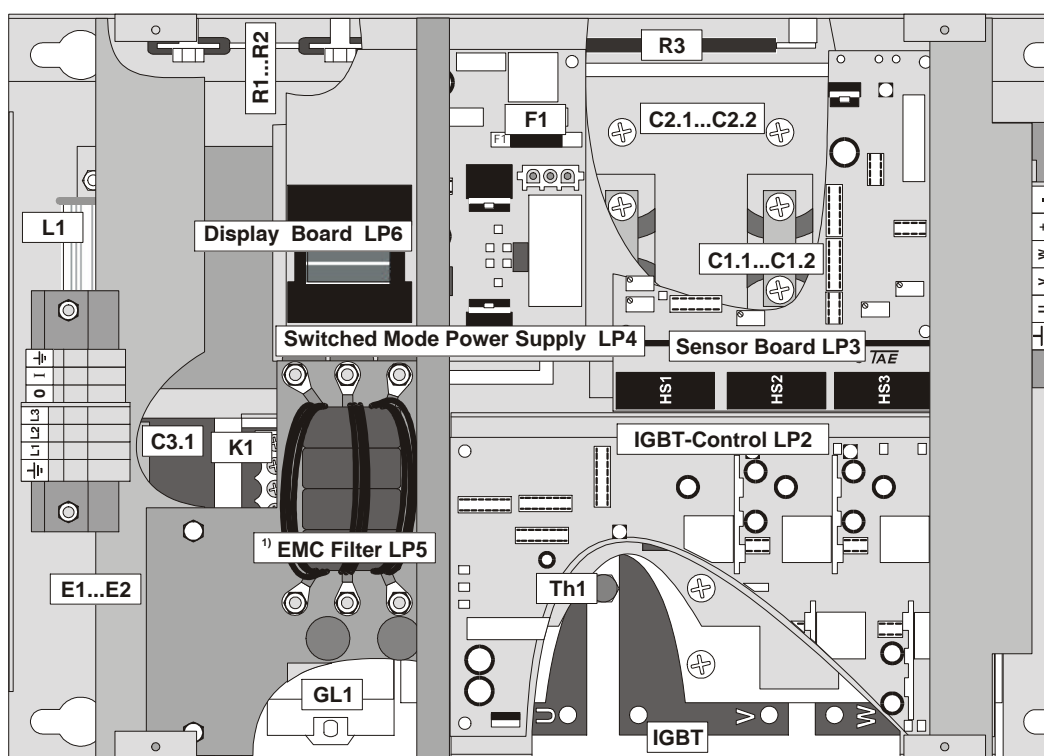
¹⁾ Option EMC Filter

TA-BL 4.1...300.1

5.1.3 TA-BL 10.1

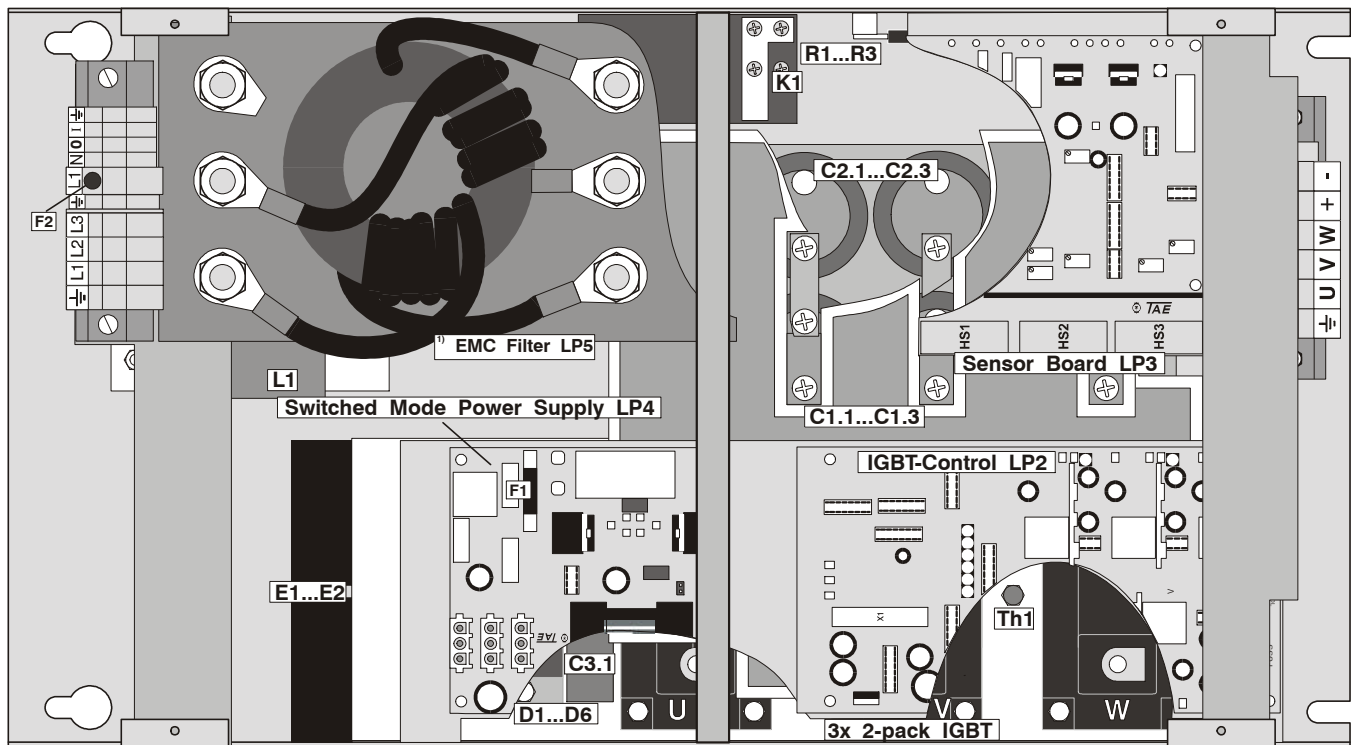


5.1.4 TA-BL 15.1

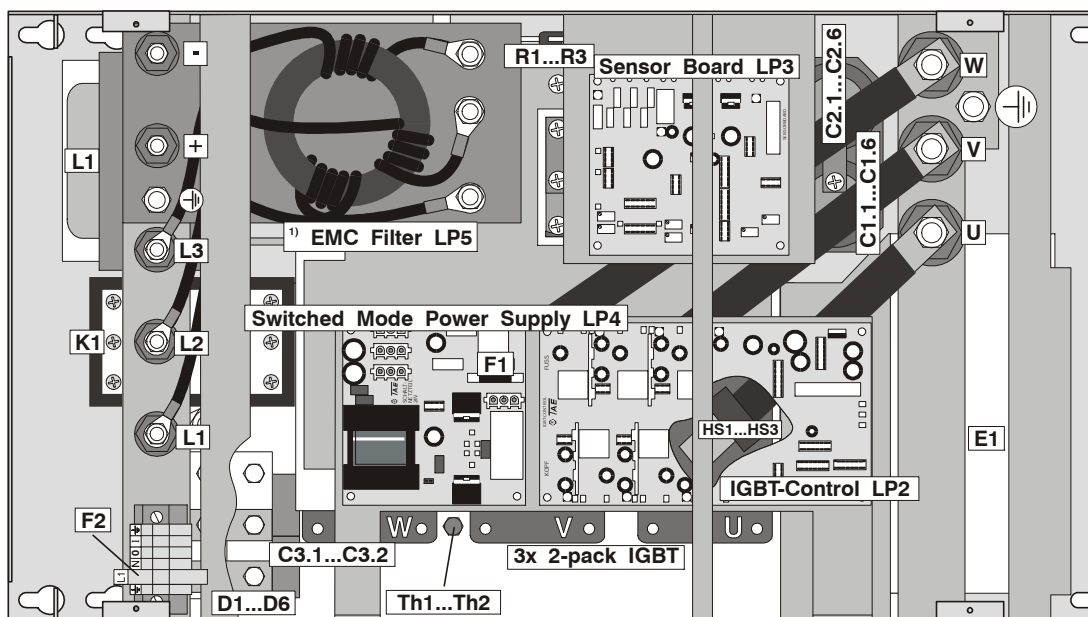


¹⁾ Option EMC Filter

5.1.5 TA-BL 20.1...30.1



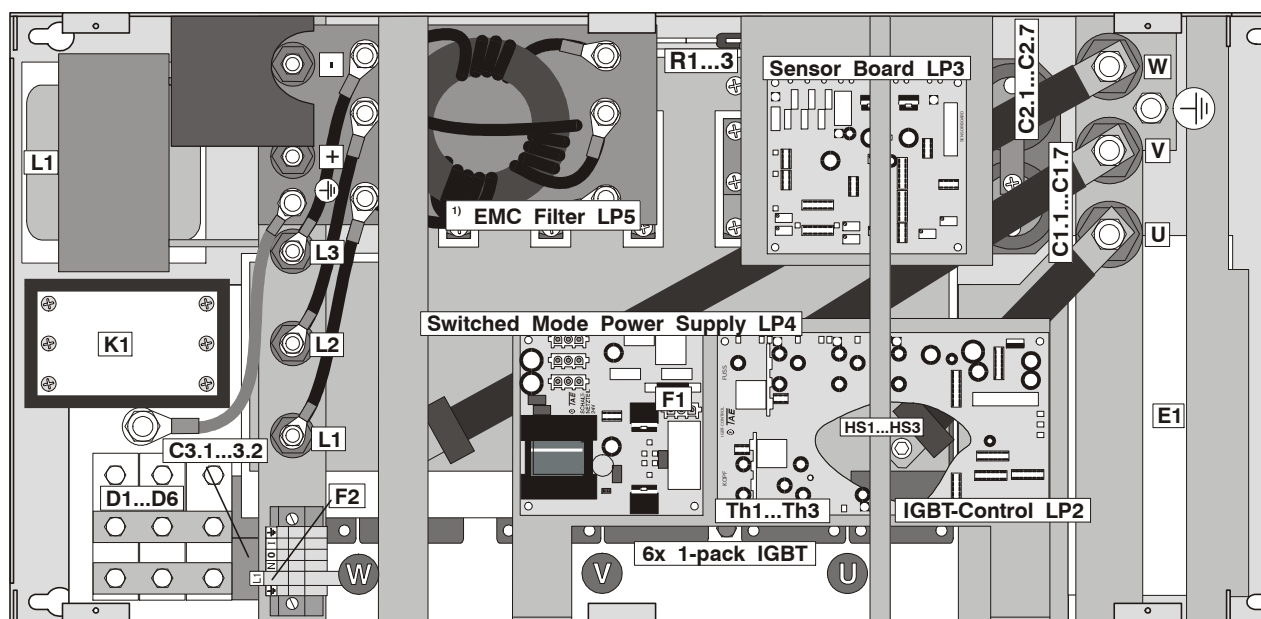
5.1.6 TA-BL 50.1



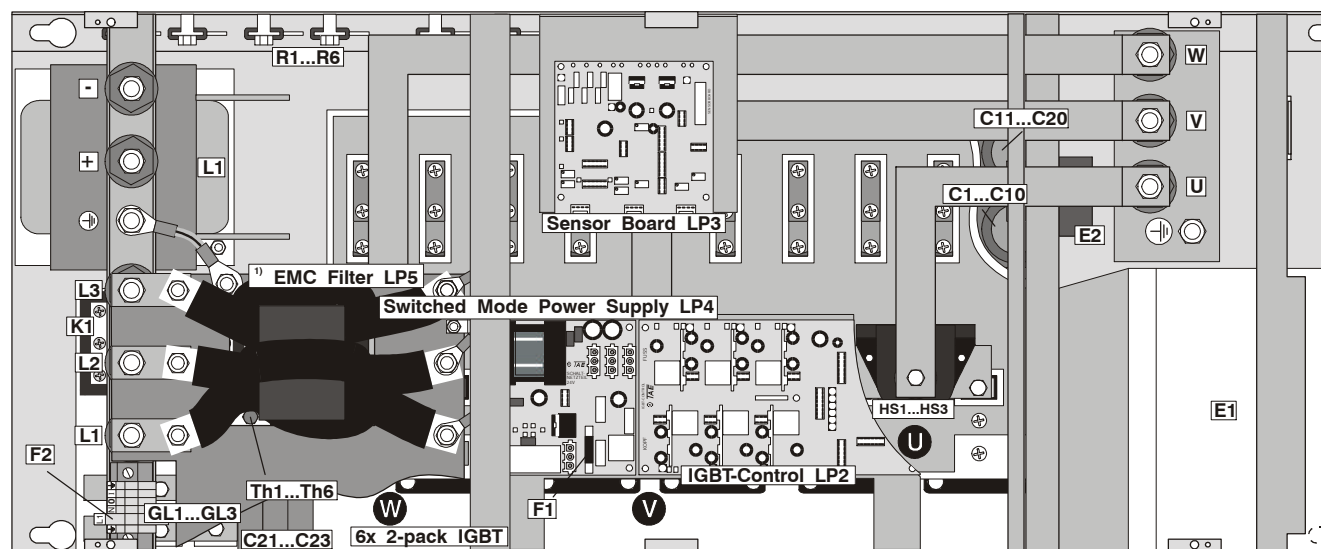
¹⁾ Option EMC Filter

TA-BL 4.1...300.1

5.1.7 TA-BL 60.1



5.1.8 TA-BL 80.1



¹⁾ Option EMC Filter

5.1.9 TA-BL 150.1

¹⁾ Option EMC Filter

TA-BL 4.1...300.1

5.2 PC Boards LP2 to LP6

5.2.1 LP2-IGBT-CONTROL

Transistor T3 (top transistor)

- LED1 - (pale) transistor driver T3 active
- LP1 - Gate Output to transistor T3
- LP2 - Emitter Output to transistor T3
- LP3 - BUSS +

Transistor T2 (top transistor)

- LED2 - (pale) transistor driver T2 active
- LP4 - Gate Output to transistor T2
- LP5 - Emitter Output to transistor T2
- LP6 - BUSS +

Transistor T1 (top transistor)

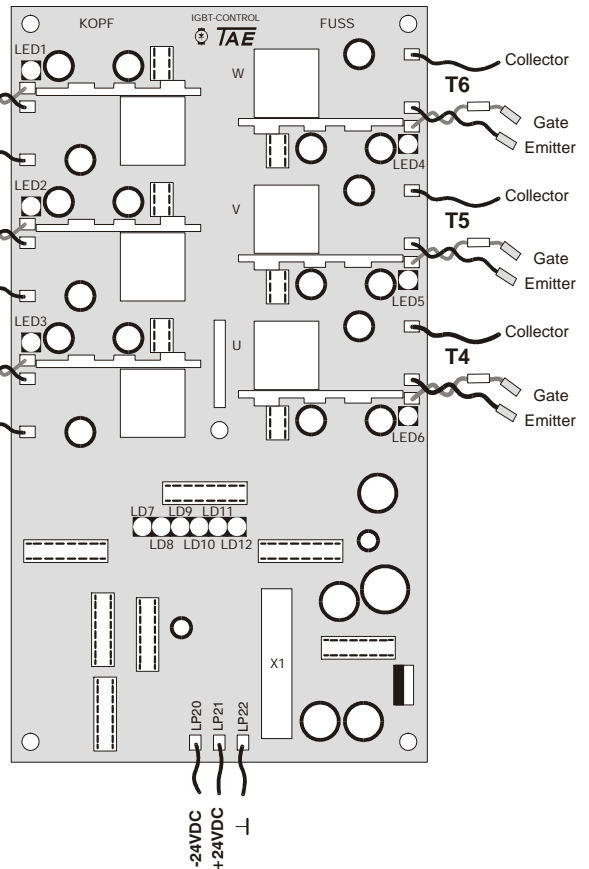
- LED3 - (pale) transistor driver T1 active
- LP7 - Gate Output to transistor T1
- LP8 - Emitter transistor T1
- LP9 - BUSS +

Transistor T6 (bottom transistor)

- LED4 - (pale) transistor driver T6 active
- LP10 - Collector transistor T6
- LP11 - Emitter Output to transistor T6
- LP12 - Gate Output transistor T6

Transistor T5 (bottom transistor)

- LED5 - (pale) transistor driver T5 active
- LP13 - Collector transistor T5
- LP14 - Emitter Output to transistor T5
- LP15 - Gate Output to transistor T5



Transistor T4 (bottom transistor)

- LED6 - (pale) transistor driver T4 active
- LP16 - Collector transistor T4
- LP17 - Emitter Output to transistor T4
- LP18 - Gate Output transistor T4



The IGBT-CONTROL board has been checked and adjusted by the manufacturer.
If the seal is opened all warranty will become void!

Overcurrent/Short-circuit signal

- LED7 - (pale) for transistor 3 top
- LED8 - (pale) for transistor 2 top
- LED9 - (pale) for transistor 1 top
- LED10 - (pale) for transistor 6 bottom
- LED11 - (pale) for transistor 5 bottom
- LED12 - (pale) for transistor 4 bottom

- LP22 - supply voltage DC/DC converter 0V
- LP21 - supply voltage DC/DC converter +24V
- LP20 - supply voltage DC/DC converter -24V

5.2.2 LP3 - Sensor Board



Caution!

The unit is still "Live" as long as the red LED lights up! (BUSS voltage!)

- LED1** - (red) BUSS-voltage exist
LED2 - (yellow) contactor **K1** is energized (ON)
LED3 - (red) Klixon over temperature

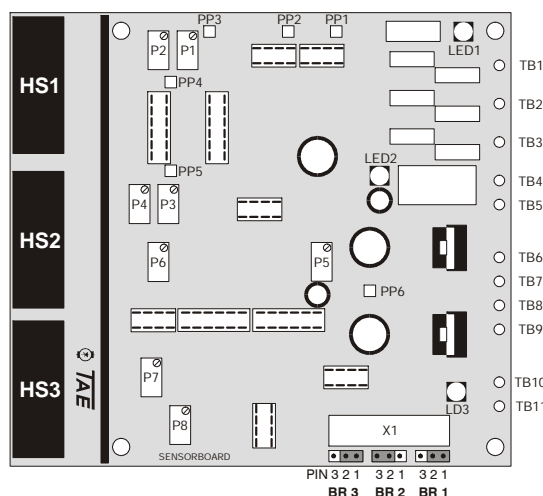
The drive is switched OFF if the unit has reached a temperature above 80°C. LED 7 red, BUSS-voltage/ overtemperature on control board **LP1** will also light up.

- P1** - amplification phase U (HS1)
P2 - zero point phase U (HS1)
P3 - amplification phase V (HS2)
P4 - zero point phase V (HS2)
P6 - zero point phase W (HS3)
P7 - amplification phase W (HS3)
P5 - amplification actual current
P8 - zero point actual current

- HS1** - motor line (**U**)
HS2 - motor line (**V**)
HS3 - motor line (**W**)
- Hall-sensors external or on Sensor Board

- X1** - Connection to the control board LP1
 LP1 TA-BL/E91 by a flat cable

- BR 1** - **Actual current**
 PIN 1-2 closed: Factory adjustment
 PIN 2-3 closed: Option actual current positiv against common
- BR 2** - PIN 2-3 closed: Factory adjustment
- BR 3** - PIN 1-2 closed: Factory adjustment



- TB1** - BUSS negative
TB2 - BUSS positive
TB3 - precharge
TB4 - Connection of the coil from contactor **K1**
TB5 - +24V TA-BL 4.1...20.1
 230VAC TA-BL 30.1...300.1
TB6/7 - Klixon Th1 refer to chapter 5.3
TB8/9 - Klixon refer to chapter 5.3
TB10 - common actual current output
TB11 - negative actual current output



The Current sensor board has been checked and adjusted by the manufacturer.
 If the seal is opened all warranty will become void!

5.2.3 LP4 - Switched Mode Power Supply

Input voltage: (DC BUSS Voltage)

200-400VDC

BR1: closed

Terminal pins for trafo TR1:

- | | |
|-----------|-------|
| PIN-No.: | color |
| P3 | green |
| P4 | blue |
| P5 | white |
| P6 | red |

450-800VDC

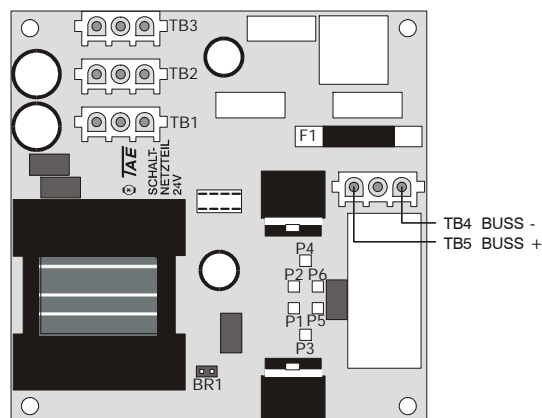
BR1: open

Terminal pins for trafo TR1:

- | | |
|-----------|-------|
| PIN-No.: | color |
| P1 | blue |
| P2 | green |
| P5 | white |
| P6 | red |

Switched Mode Power Supply switches on, after approx. 6-8 seconds at voltage.

Connection TB4- / TB5+



TA-BL 4.1...300.1

5.2.4 LP6 - MDR-2000 Torque Controller (externally and option)

- LED 1** - (green) Supply voltage ON
- LED 2** - (red) Test (inactive)
- LED 3** - (yellow) 4Q operation
- LED 4** - (rot) 1Q operation

- P1** - Maxium torque at 4Q operation
- P2** - Maxium torque at 1Q operation
- P3** - Voltage level (-10V)
- P4** - Output calibration

- Terminal 1** - Electronic common
- Terminal 2** - not used
- Terminal 3** - Md-rated value input 0-(-10V)
(-10V=twice rated current) -*standard adjustment*
- Terminal 4** - Electronic common
- Terminal 5** - not used
- Terminal 6** - Output (-10V)
- Terminal 7** - Electronic common
- Terminal 8** - Measuring output (0-10V)
(10V=twice rated current) -*standard adjustment*

Connection and Adjustments

The adjustment of the maximum torque on the MDR-2000 can be set by either using an external potentiometer and/or by adjusting the two intergrated potentiometers P1 and P2 which are located on the PC-board of the MDR-2000.

External Md-potentiometer

If an external potentiometer is used the torque can be adjusted from 0 up to the maximum torque which is set with the potentiometers P1 and P2.

Internal Md-potentiometer P1 and P2

Terminal 3 (Md-rated value input) and terminal 6 (-10V) must be connected with each other in case no external MD-potentiometer is used. P1 is used for the adjustment of the maximum torque at 4Q operation and P2 is used to set the maximum torque at 1Q operation.

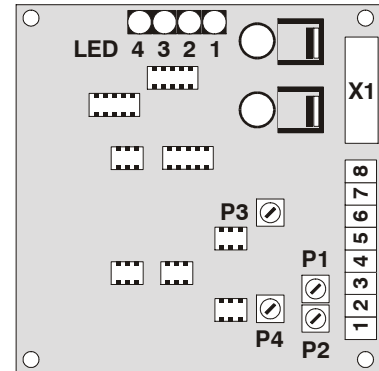
Measuring output

An output for measurements is provided between terminal 7 (electronic common) and terminal 8 (0-10V). The output voltage of 0-10V refers to 0 - twice rated current of the TA-BL controller (*standard adjustment*).

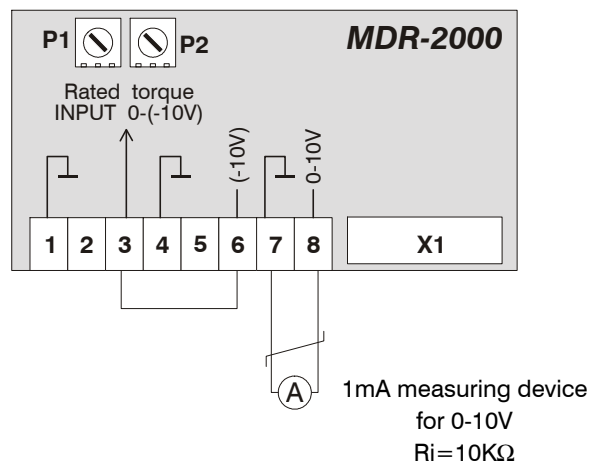
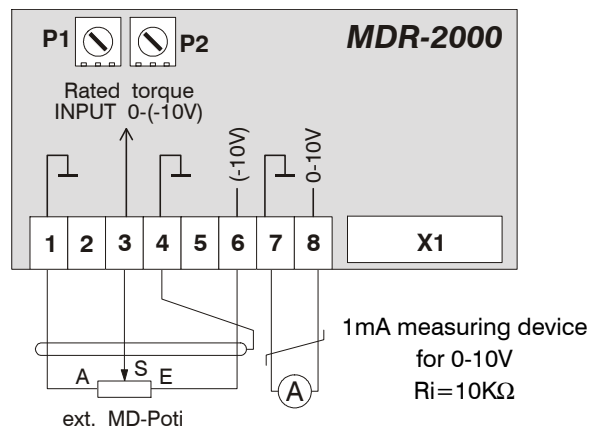
Factory adjustment:

For factory adjustment of the MDR-2000 refer to the test-data-sheet of the corresponding TA-BL drive

The MDR-2000 has been checked and adjusted by the manufacturer. If the seal is opened all warranty will become void!

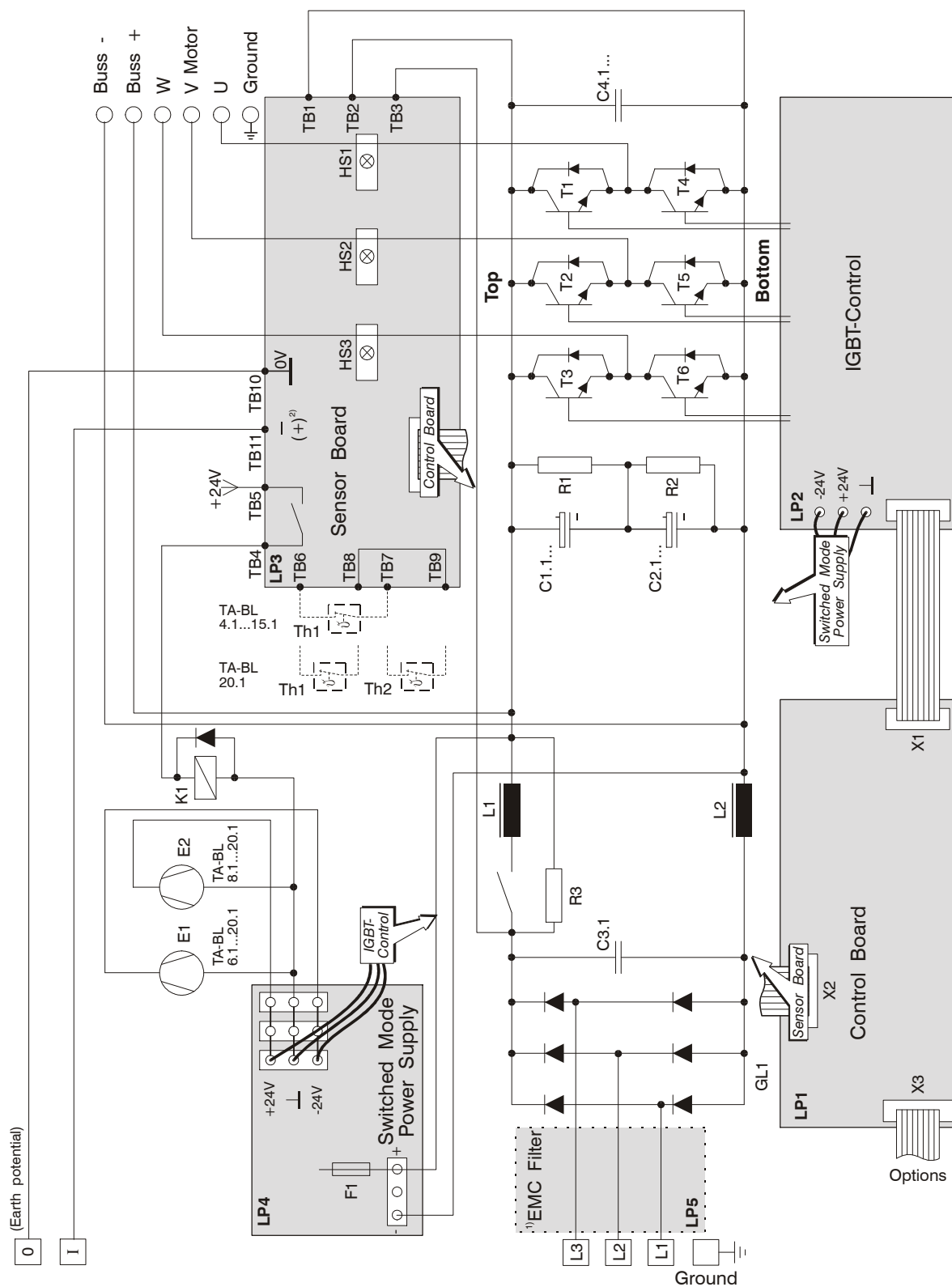


X1 - Connection to the control board LP1 TA-BL/E91 by a flat cable



5.3 Principle Diagrams

5.3.1 TA-BL 4.1...20.1

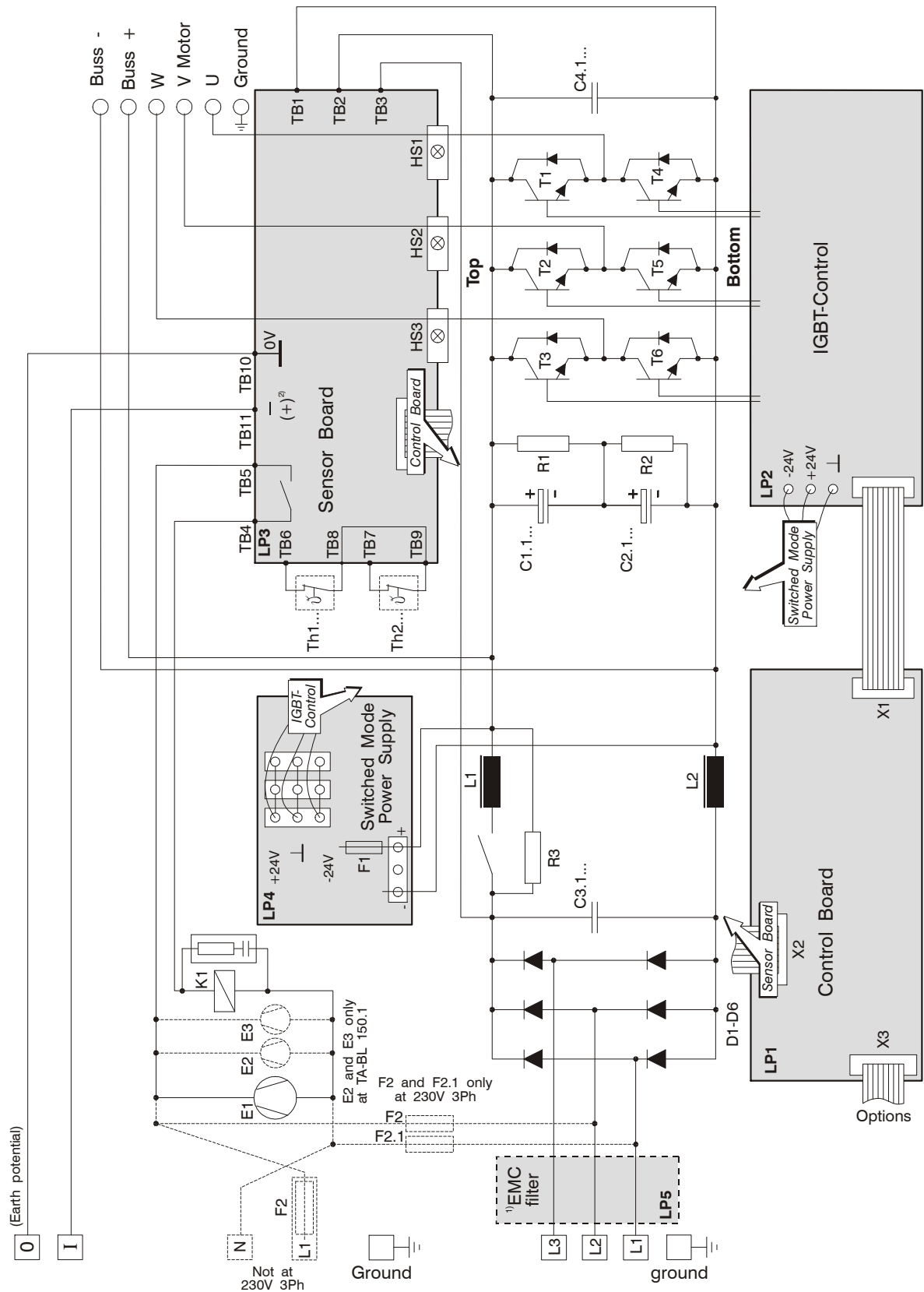


¹⁾ Option EMC Filter

²⁾ Option actual current positiv against common

TA-BL 4.1...300.1

5.3.2 TA-BL 30.1...300.1



¹⁾ Option EMC Filter

²⁾ Option actual current positiv against common

5.4 Safety and Supervising Equipment

Separating protection equipment:

Internal: Prefuse F1 switched mode power supply (look at Chapter 5.1 Construction and Layouts)

Internal: Prefuse F2 blower and contactor TA-BL 30.1 (look at Chapter 5.3 Principle Diagrams)

External: Mains fuse (look at Chapter 4.2.2 Drive data and Dimensions)

Non separating protection equipment:

To keep the device working correctly the following errors will be evaluated by the control board LP1. They will be displayed and stored.

These errors cut off the current to the motor. Chapter 7.5 gives detailed information about this.

- ⇒ Disable at terminal 2
- ⇒ Overcurrent motor
- ⇒ Shortcurrent power stage / motor
- ⇒ Overtemperature power stage
- ⇒ Over-/Undervoltage BUSS
- ⇒ Ripple current

Additional signals which do not lead to a cut off:

- Current Limit 1Q or 4Q
- Speed > 0 min⁻¹
- Ready for Work
- Run

TA-BL 4.1...300.1

6. Initial Operation

Only devices with integrated or external EMC filter are within the limit of the radiated emission norm.

The greatest care has been taken in constructing our devices to minimize radiated and conducted interference. The guidelines of installation should be carefully executed. Improper installation can lead to exceeding the maximum limits of EMC and to a malfunction of devices of other manufacturers.

6.1 Instructions for Installation

Follow the safety advises in Chapter 2. Furthermore the following advice for installation have to be applied. The installation should only be done by qualified personnel.

This device does not work as a frequency inverter. Interchanging of the terminals U, V, W while connecting the brushless motor results in a malfunction of the motor. Furthermore, the control cable from the motor (12 pole plug at terminal box of the motor) has to be a screened cable. TAE is offering premounted cables for this purpose. Without the correct connection of the cable, the drive is not functional.

During installation, general installation regulations such as the following should be observed:

VDE 0100 General requirements for the installation of power with mains voltage up to 1000V.

VDE 0113 General requirements for the installation of electrical equipment for production and tooling machines.

VDE 0160 Requirements for electronic equipment for use in electrical power installations.

Further regulations may have to be observed if a special use for the unit is planned.

As protection equipment the following concepts could be used if allowed by your energy supplier:

Fault-Voltage-circuit-breaker (FU), protection earth or grounding (if allowed), Fault-Current-circuit-breaker (FI) can not be used with the TA-BL. In some countries this is prohibited. The reasons are:

- a) All rectifiers (not only transistor regulators) could cause direct current which reduces the sensibility of the protection device.
- b) An asymmetrical load caused by radio noise suppression filters can trigger the FI to switch prematurely which would cause the undesired loss of the drive.
- c) High leakage currents of EMC filters could trigger the protection device.

Use only functional devices. After safety equipment has been triggered, the cause must be found and the failure has to be corrected. Defects on the device can only be repaired by TAE or from TAE authorized qualified personal. Safety equipment must not be bypassed or removed. More information about the provided safety and protection equipment may be found in Chapter 5.4 and 7.5.

6.1.1 Switching Devices

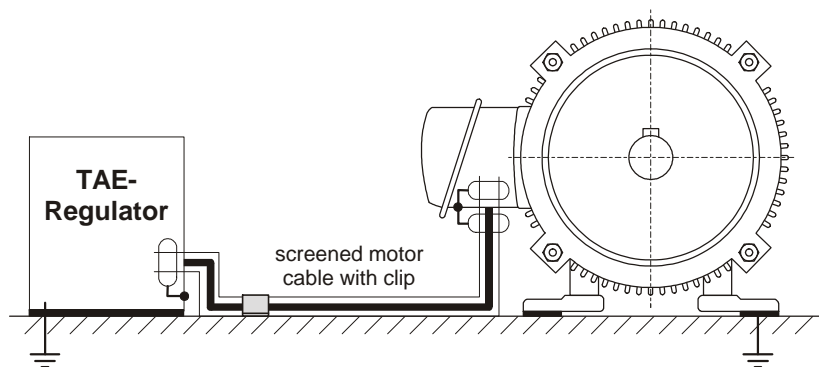
According to the VDE regulations, the transistor controller must be connected to mains supply line in such a manner that it can be separated from the mains supply with suitable circuit breakers (for example main switch, circuit).

6.1.2 Arrangement of Wires

The supply cable should be a stranded conductor and not a solid conductor type to achieve proper connection inside the terminal block. Rails for high current with their screw connection are also suited. Cable lengths inside the wiring cabinet should be kept to a minimum.

The supply cables, motor cables and control cables should never run together in the same trunking or conduit. If the cables are put together in cable trees then the wires of the control cables have to be twisted. Keep the electronic control cables separated from the power control cables to avoid feedback. The distance should be at least 20 cm. For the digital and analog reference and feedback cables screened cable has to be used in general.

Since the cable between regulator and motor is the major source of radiated and conducted interference, it should be a screened type and as short as possible.



6.1.3 Conditions for Grounding

All metal frames have to be connected to ground by their own. Make a well defined path for high ground currents. For short-circuits to frame and leakage currents of filter components exists minimum cross-sections.

If one or two phases become disconnected the EMC filter can produce leakage currents up to 100mA. Filters and devices with build in filters have to be connected to ground before mains.

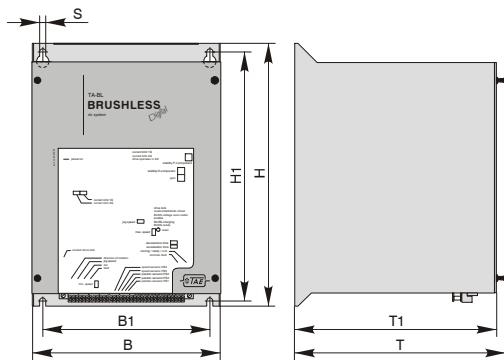
To clamp high frequency currents it is required to take some care along to the advice made above about grounding: All grounding leads should be as short as possible. Poor connections and loops of cable will act as aerials and pick up stray radiated emissions. The screen should be connected to ground by removing the coat pressing the screen with a clip to the backplate bonded ground. Do not use a "pig tail" to connect the screen of the cable. The screen should lead into the device. On the motor it is possible to connect the screen with a EMC screwing. On the regulator the screen will be surrounded by a metal clip pressing it on the blank chassis. (Look at figure in Chapter 6.1.7)

Make ground connection of the regulator by a wide plain on the backplate of the wiring cabinet. It is preferable to use a galvanized backplate not sealed with varnish. This concept does not replace the national safety codes for grounding.

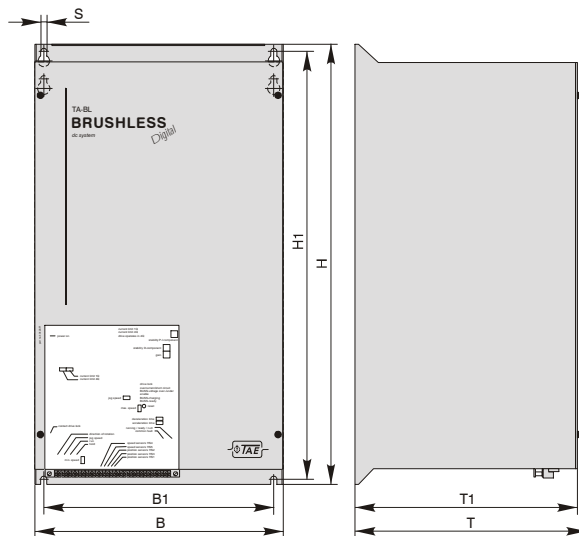
TA-BL 4.1...300.1

6.1.4 Diagram of Dimensions

TA-BL 4.1...30.1

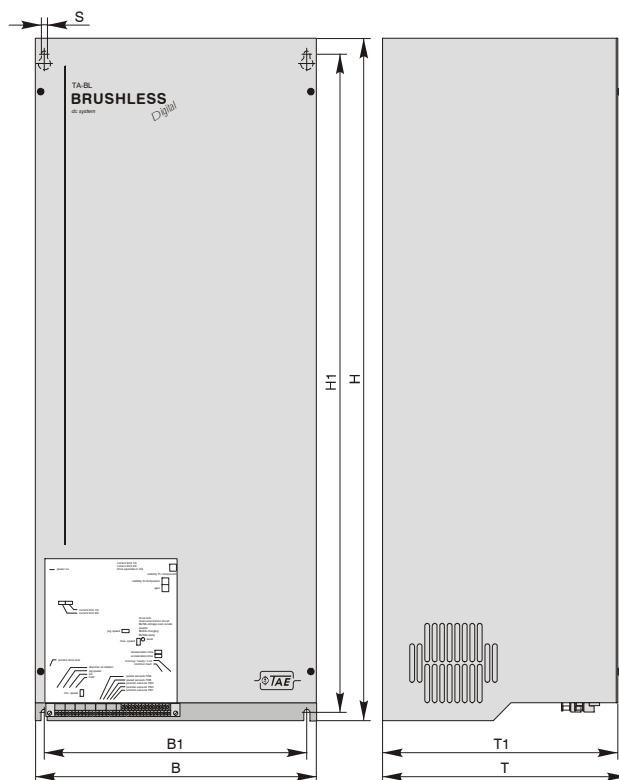
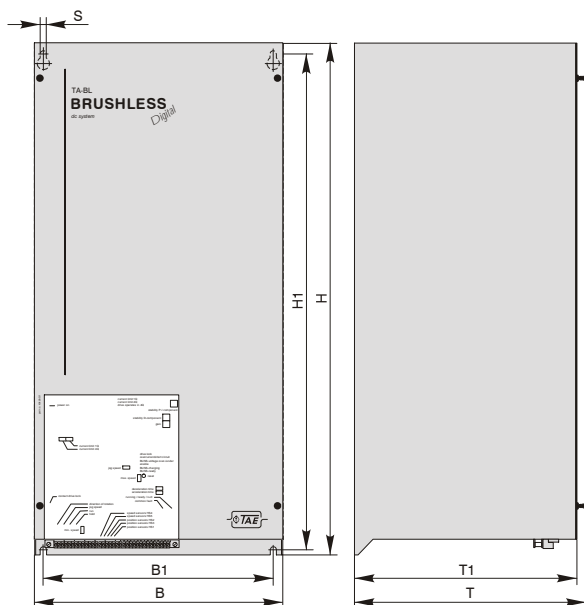


TA-BL 50.1



TA-BL 80.1...150.1

TA-BL 60.1



All Measures in Millimeters

Device	4.1...6.1	8.1...10.1	15.1	20.1...30.1	50.1	60.1	80.1	150.1
B	208	225	275	304	364	364	412	695
B1	182	198	245	275	337	337	381	660
H	290	305	385	500	645	750	1000	980
H1	271	285	365	470	627	727	967	955
T	288	342	309	309	340	340	360	391
T1	278	332	298	298	329	329	348	379
S	7	7	9	9	9	9	12	9

6.1.5 International Protection

All TA-BL transistors controllers are designed to suit protection class IP20 for switch cabinet mounting.

6.1.6 Instruction for Mounting

It is recommended to use a galvanized or chrome-plated backplate.

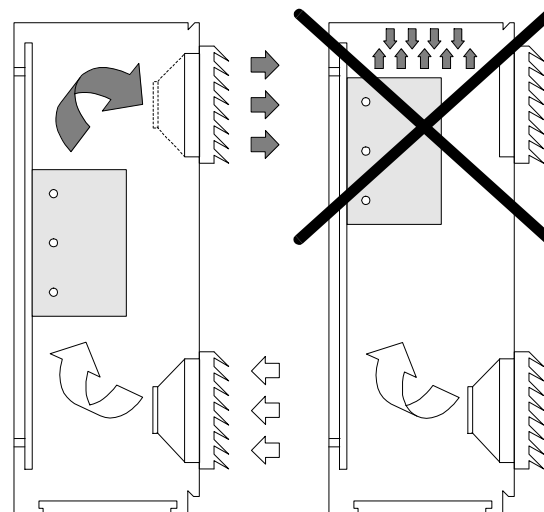
All TA-BL controllers are to be mounted in a vertical position with 4 screws. The location where the unit is mounted should be free of dust, moisture and aggressive gas. In cases where the unit or the switch cabinet is subjected to excessive vibrations, it is recommended to protect the electronic components by either mounting the plate or the complete switch cabinet in a shock and vibration absorbing manner.

The sum of the air flows of the devices in the switch cabinet should be equal to the air flow of the switch cabinet.

The power data sheet shown in the technical data for the TA-BL refer to a internal switch-cabinet-temperature of 0 - 40°C. (see drawing)

RIGHT

WRONG



Drawing

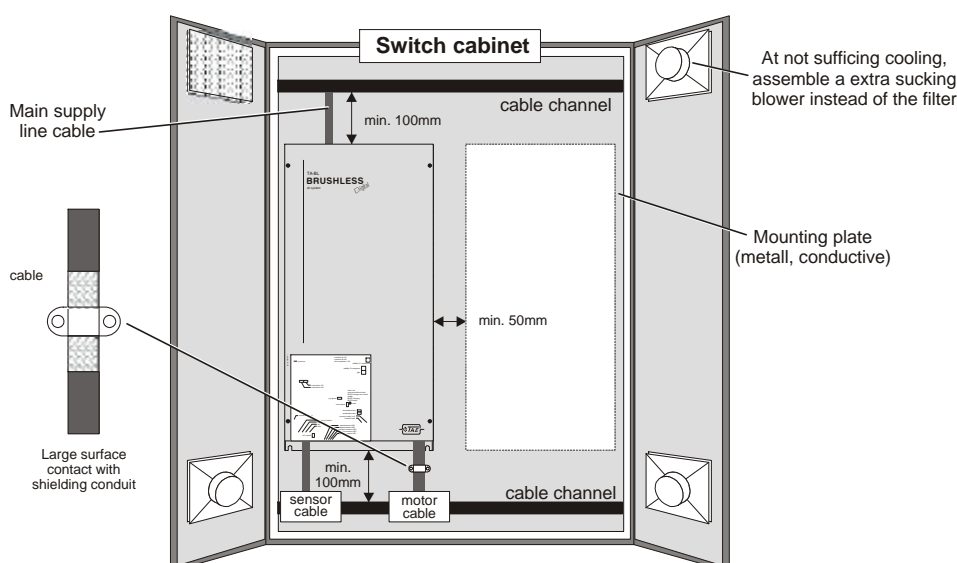
The left picture shows the unit mounted in a optimal position. In the right hand picture the unit is mounted too high. The developed heat cannot escape from the upper part of the cabinet.

6.1.7 Arrangement in Switch Cabinet

If several units are installed next to each other, then a minimum clearance of 50mm should be maintained. When installing several TA-BL controllers one above the other, a minimum clearance of 100mm should be maintained. For units without heat source, -for example cable channels - then a minimum clearance should be observed. This spacing is 150mm above and 100mm below the units and 50mm to each side.

Power Supply and Motor Cable

Keep the separation of input and output cables as great as possible to prevent feedback. Input and output cables should never be run together in the same trunk or cable channel. Motor cable must be screened.



TA-BL 4.1...300.1

6.1.8 Braking Unit

Connection between braking chopper, braking resistor and regulator are a source of radiated and conducted interference. The cable should be screened and as short as possible. Ensure proper grounding (Chapter 6.1.3).

6.2 Connections

6.2.1 Power Connections

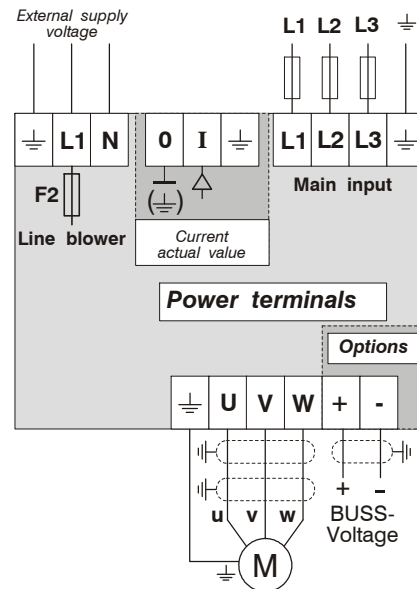
- L1 - L2 - L3** Input from mains
Voltage according to type-marking
- U - V - W** Terminals for connection of the brushless DC motor
- L1 - N** Upward TA-BL 30.1
 External supply voltage for Line blower and contactor. Connection voltage refer to Basic part number chapter 4.2.2. The correct part number is on the nameplate or on the order confirmation. F2 fuse for contactor K1 and blower 20,0 x 5,0 medium blow 2,5A/250V~

Control terminals

- 0 - I** Output actual current:
 $0 - I_{rated} \triangleq 0 - (-5V) \pm 3\%$
 Terminal **I** \triangleq output signal
 Terminal **0** \triangleq common (earth potential)

Option actual current positiv against common (Please indicate by order)

On request the output signal can be positiv configured. $I \triangleq 0-5V$



6.2.2 Optional Connections

- + -** **Option BUSS-voltage (DC BUSS)** The BUSS-voltage depends on the supplied AC-line-voltage. (refer to Chapter 4.2 Technical Data)



The unit and the motor must be properly grounded! Improper grounding will cause damage to the electronic circuit and to the Hall-sensors of the motor. The common connection of the electronic circuit is in all units connected to ground.

6.2.3 Control connections

- | | |
|---|--|
| <p>1 Output + 24 V</p> <p>2 disable
(no function of drive with contact open, will be stored as error and must be reset manually. The control logic can be delivered on request without the need of reset.)</p> <p>3 Change of direction of rotation (also for jog speed) if contact is closed, the motor turns clockwise (view of motor shaft)</p> <p>4 Jog-speed (priority before operation)</p> <p>5 Operation</p> <p>6 Stop (priority before jog speed)
 - <i>Stop-function by 1Q drives</i>
 Motor coasts toward zero-speed and is stopped by a reverse torque
 - <i>Stop-function by 4Q drives</i>
 fast-stop (without deceleration), with stopping torque at zero speed</p> <p>7 Base of optocoupler-inputs</p> <p>8 Electronic common</p> <p>9 Minimum speed potentiometer</p> <p>10 Rated value output+ 10 V (reference voltage)</p> <p>11 Rated value output - 10 V (reference voltage)</p> <p>12 Rated value input (+/- 10 V)</p> <p>13-20 Connection of position sensor and incremental encoder of BL motor for option SERVO the hallsensors HS4 and HS5 must not be connected. Connect the external encoder on terminal 15 and 16. For option SERVO the 0° and 90° signal of the incremental encoder has to be connected according to drawing. (refer to Connection Diagram Control Board LP1)</p> | <p>21 Rated value correction without acceleration, (-0,7 to +10V) Caution, The reference values on terminals 12 and 21 are added). (This input is only effective if resistor R224 is installed)</p> <p>22 Speed > 0 (collector output open) (refer to Connection Diagram Control Board LP1)</p> <p>23 Frequency output, actual or rated value (signal) (collector output open) (Choice of output signal refer to Chapter 7.4.11 BR21)</p> <p>24 Power stage enabled</p> <p>25, 35 External frequency control ON 15-30V
(0V = terminal 25, +24 V = terminal 35)</p> <p>28, 36 Input rated frequency 15-30V high / 0-3V low
(0V = terminal 28, +24 V =terminal 36)</p> <p>26, 27 Current rated value (terminal 27 Input, terminal 26 Output)</p> <p>29-34 Terminals for connection of KLIXON`s from brushless DC motor or alternatively thermistor-connections (refer to drawing). The max. current load for terminals and plugs is:
 48VDC/500mA or 48VAC/100mA</p> <p>Pre-warning
 (Klixon) at 130°C IP44 or 120°C IP23</p> <p>Switch-OFF
 (Klixon) at 145°C IP44 or 130°C IP23</p> <p>Caution !
 Klixon are not evaluated by the device</p> <p>37-44 These terminals can be used for different signals (common fault, operation etc). (for detailed information refer to Chapter 7.4.14)</p> <p>42 Actual current value output I_{eff} 0-2V refers to 0 to nominal current of unit. Tolerance »4% (This output is only effective if resistor R49 is installed).</p> |
|---|--|

6.2.4 Connection Diagram Control Board LP1



6.3 Requirements before Initial Operation

6.3.1 Jumper

Before operating the drive it is necessary to install several jumpers on the control board LP1 in order to adjust or select some parameters. In general these jumpers are already properly installed by the manufacturer. Nevertheless make sure that the configuration corresponds to your requirements. Detailed information concerning the installation of these jumpers is provided in Chapter 7.4

6.3.2 Setting of Motor Parameters

The motor parameters (Chapter 7.4) are adjusted by the factory. The adjustment refers to the nominal data of the selected motor and are documented in the applied test protocol.

6.3.3 DGM 2000 - DGM 2002

Instructions for the connection of the DGM-2000 and DGM-2001 are found in the operating manuals of these units.

Note: If the analogue input circuit of the TA-BL drive is disengaged then the potentiometers for acceleration, deceleration, minimum speed, maximum speed and jog-speed will not function.

6.4 Functional Tests and Initial Operation

Every statement in this chapter is referring to the control board LP1. Chapters 6.2.3 and 7.4 give a description of the control connections, signals and adjustments. Before the first operation of the TA-BL drive proceed according to the following check-list:

- 1) Install and interconnect the TA-BL unit with reference to Chapters 6.1 and 6.2
- 2) Check,...
 - **if your line voltage corresponds to the voltage indicated on the type-marking of the TA-BL drive.**
 - **if the unit and the motor is properly grounded.**
 - if all terminals and bolts are properly tightened.
 - if all basic adjustments correspond to the instructions.
 - if all jumpers on the control board LP1 are properly installed and will suit your requirements.
 - if all connections correspond to the wiring-schematic
 - the motor output phases U, V and W with an ohm-meter for possible shorts to ground. The measuring should read a resistance of 500K Ω -1M Ω to ground.
 - the hall-sensors according to Chapter 7.3.2
- 3) Switch on the line voltage
 - After the TA-BL drive has been connected to the line voltage within 5-10 seconds the LED 1-*green*- (Power ON) must light up. The LED 9-*red*- (BUSS-charging) indicates that the electrolytic capacitors for the BUSS-voltage are being charged. LED 9 will then extinguish and the LED 10-*green*- (BUSS-Ready) will light up. This indicates that the TA-BL drive is now ready for operation. You hear the net contactor when it switches on. This indicates that the TA-BL controller is ready-to-operate now.
 - Within the unit on the Sensorboard BUSS- voltage (LED 1-*red*-) and contactor on (LED 2-*yellow*-) will light up.
- 4) Start the drive
 - The drive is switched on by closing the contact "operation" (terminal 5) LED 14-*pale*- (operation) and LED 8-*yellow*- (enable) will light up. If you now provide a rated value, the motor starts to rotate and the LEDs from the position encoder and speed encoder turns on or off according to the diagram Chapter 7.3.2.

TA-BL 4.1...300.1

5) Adjustment of current limit

Attention

For this regulator with IGBT power stage the torque is almost linear from 0 to maximum speed. The torque increase from maximum to zero speed is lower than 5% driving at current limit. Please note that in blocked state measured motor phase currents (with true RMS measurement) are 1,5 times higher than the actual currents in the rotating motor.

- The current limit is adjusted to the values in the test protocol when it will be delivered. If the current limit should be reached earlier then continue in this way:
 - Disconnect hall sensors on control board LP1 terminal 17, 18, 19 and connect 18 to ground.
 - Turn the device on and adjust the current (1Q) with VR4 referring to the voltage (0 to -5V means 0 to rated current) on terminals I+ and I- (chapter 6.2.1):

$$I = \frac{\text{rated current} \times \text{measured current } I+/- \text{ (0 bis -5V)}}{-5V}$$

- 6) After initial operation set the parameters minimum and maximum speed, jog-speed, acceleration, deceleration and so on to meet your requirements. Short phase losses are not signalized. Only if the BUSS voltage sinks below 420V "undervoltage" is indicated.

This concludes the preliminary steps for the operation of the TA-BL drive.

7. Operation

7.1 Instructions of Safety

The operation should only be done by qualified personnel. Follow the advice in Chapter 3 about usability and protection against irregular usage.



Caution - Danger !

Disconnect unit from mains before making any repairs. Only when the BUSS-capacitors have discharged, (The unit is still "Live" as long as the red LED 1 on the Current sensor board LP3 lights up), 5 minutes after the device has been seperated from line, the unit may be opened and worked on.



As with any form of electrical equipment, there is always a risk involved in the handling of electrical machinery. The greatest care must always be exercised during installation and maintenance. It is recommended that service is performed by authorized personnel only.



A careful adjustement of the maximum peak current is necessary!

The peak current must never exceed the maximum current of the motor! For orders of a complete drive unit (unit & motor) then manufacturer will pre-adjust the rated power and the maximum peak current of the unit according to the reference data of the motor.



After the installation make sure that the unit and the motor is properly grounded in order to avoid electrical hazards! Improper grounding will also cause damage to the electronic circuit and to the Hall-sensors of the motor! The common connection of the electronic circuit is in all units connected to ground.

7.2 Sequence for Turn On / Turn Off

There is no sequence for turn on/turn off in general. Nevertheless we recommend the following to take care of relais' and fuses.

- Connect device with mains and close disable avoiding error while electronic is powering up. After signal "ready for operation" you can start the device (for example terminal 5, Operation).
- For turning off stop the regulator (terminal 4, 5 and 6 open) and separate it from mains with the signal "zero speed".
- Immediate turn on is possible while the signal "ready for operation" is active. Otherwise turn on again after 10 seconds or after the signal on terminal 40 is low.

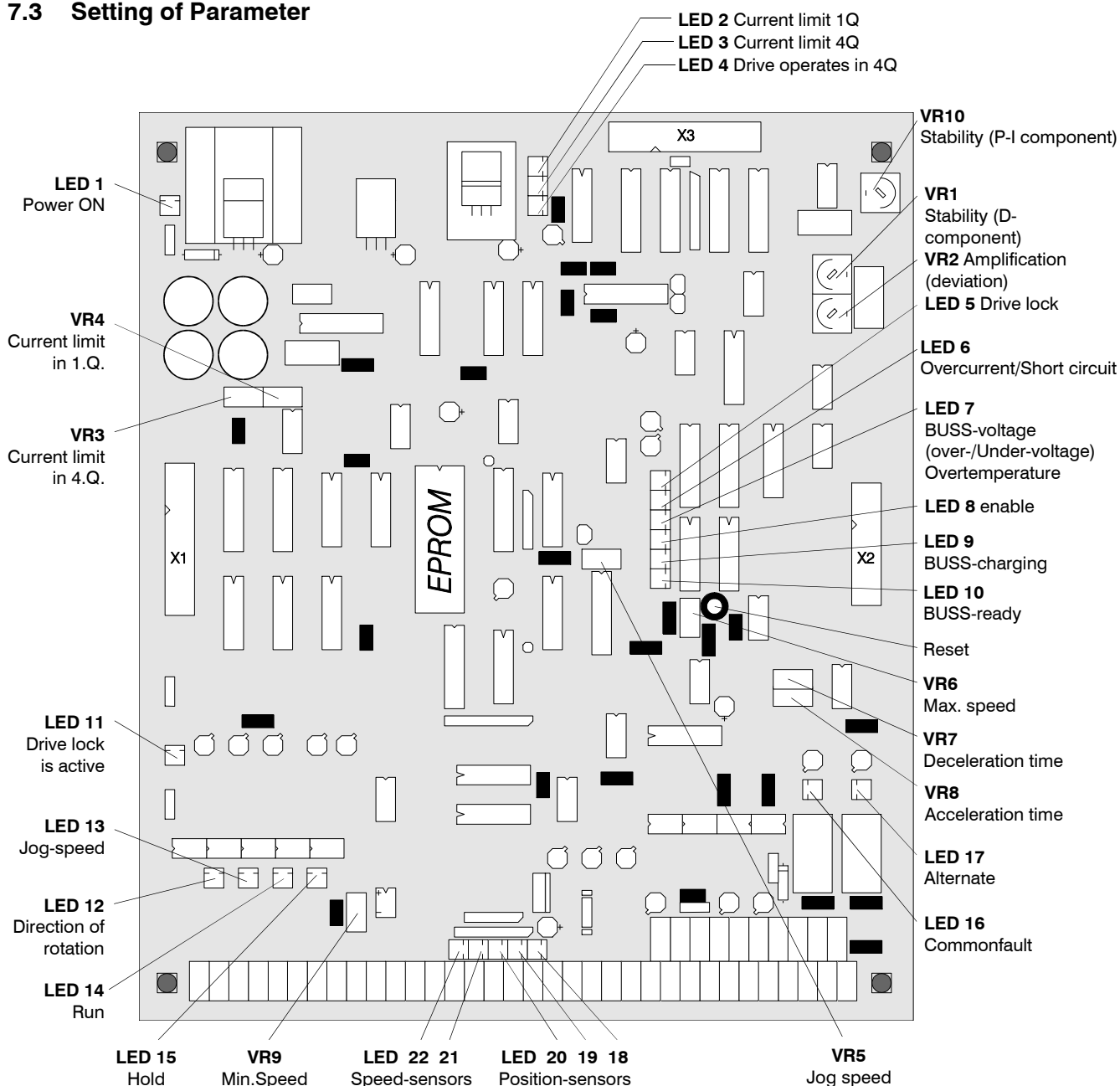


Attention!

Do not turn on again before 10 sec. after the signal "ready for operation" is not active. The turn on in this moment results in a high inrush current which causes stress to relais' and fuses. That can lead to a premature failure.

TA-BL 4.1...300.1

7.3 Setting of Parameter



7.3.1 LED Display Control Board LP1

LED 1	green	Power on
LED 2	red	Current limit 1Q
LED 3	red	Current limit 4Q
LED 4	pale	Drive operates in 4Q
LED 5	red (Memory)	Drive lock
LED 6	red	Overcurrent / short circuit
LED 7	red	BUSS-voltage over-/under
LED 8	yellow	Enable
LED 9	red	BUSS-charging
LED 10	greed	BUSS-ready

LED 11 red	Contact drive lock
LED 12 pale	Direction of rotation
LED 13 yellow	Jog speed
LED 14 pale	Run
LED 15 yellow	Stop
LED 16 red	Common fault
LED 17 green	Running / ready / n=0
LED 18 pale	Position sensors HS1
LED 19 pale	Position sensors HS3
LED 20 pale	Position sensors HS2
LED 21 pale	Speed sensors HS5
LED 22 pale	Speed sensors HS4

(Definition - look at Chapter. 7.4.14)

7.3.2 Sensor Test

The five LED indicators LED 18 to LED 22 (pale) on the control board LP1 indicates, if the hall-sensors on the brushless DC motor are working proper or not.

LED 18 / LED 19 / LED 20 - Position sensors

LED 21 / LED 22 - Speed sensors

To check the hall-sensors, you have to proceed as follows:

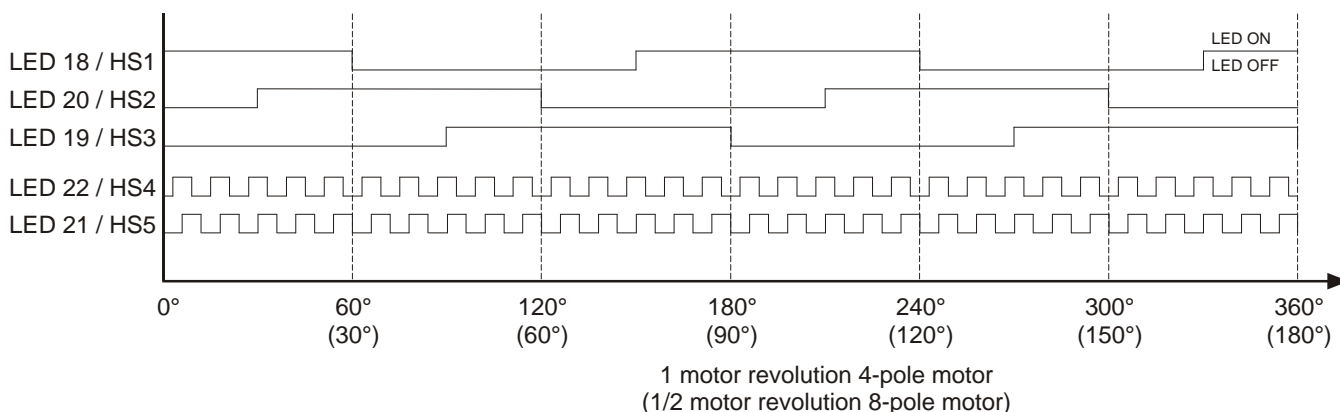
- Disconnect device from mains.
- Connect control cables to motor.
- Remove power cables of motor on terminals U, V, W on the regulator.**
- Turn on mains and control voltage and carry out after the operationally following test.
- Turn the motor shaft slowly counterclockwise with your hand (look at output shaft). The LED indicators LED 18 to LED 22 start to light on and off in a definite order. (refer to diagram below).

Diagramm:

light-intervals (ideal diagram)


4-pole motor: BL-71, BL-90, BL-112, BL-132, BL-160 with incremental encoder with 30 pulses/360° scale 0-360°

8-pole motor: BL-180, BL-200, BL-315 with incremental encoder with 60 pulses/360° scale 0-180°



TA-BL 4.1...300.1

7.3.3 Setting of Potentiometers

 All values will increase by turning the potentiometer in clockwise direction.

VR1 Stability

Adjustment for dynamical amplification of the control deviation. (D-component)

VR2 Amplification Only at 1Q and 4Q

Adjustment for statical amplification. (Angle-deviation of the motor between idling condition and running with load)

VR3 Current limit for 4Q

(Inactive with 1Q drives)

This potentiometer adjusts the maximum output current of the drive in 4Q.

For the adjustment of the current limit the drive should be operated at rated speed with the rated load. The current is measured with an rms-meter in one of the output phases (U,V, or W).

Close contact (terminal 6), LED 3 (current limit) will light up, now adjust potentiometer VR3 for the requested output current (effective current).

VR4 Current limit for 1Q

This potentiometer limits the maximum output current of the drive. If the preset value has been reached, the LED 2 (current limit) will light up. The current limit is normally adjusted for the rated motor current at rated speed and rated load. Measure the current with an rms-meter at rated speed and rated load in one of the output phases (U,V or W) and set the potentiometer VR4 for the requested value.

*VR5 Jog-speed

Adjustment of the requested jog speed.

*VR6 Maximum speed (speed limit)

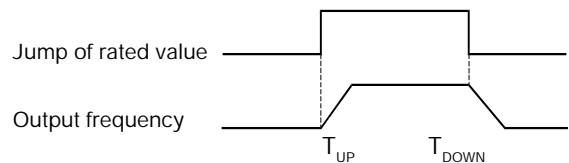
The maximum speed for operation is adjusted with potentiometer VR6 at rated value (10V). If LED 2 lights up it indicates that the drive operates at the current limit or at overspeed. In this case turn potentiometer VR6 back until LED 2 extinguishes. It is possible that the rated speed under rated load cannot be obtained if the motor is cold (below 25°C) or if the line voltages is 10% lower than normal. This will also cause LED 2 to light up.

*VR7 Deceleration

*VR8 Acceleration

The acceleration and deceleration function can only be activated if jumpers **BR 5**, **BR 7**, **BR 11** and **BR 27** are properly installed (refer to Chapter 7.4.6 and Chapter 7.4.7). The adjustable time advance for the linear acceleration is the time which is needed for the drive to accelerate from 0-speed up to the maximum speed which is preset with the potentiometer VR6. The adjustable time for the linear deceleration is the time which is needed for the drive to decelerate from the maximum speed to 0-speed. (For drives which operates in the 1Q the adjusted deceleration time cannot be less than the coasting time of the motor and the machine).

Time response at change of rated value:



*VR9 Minimum speed

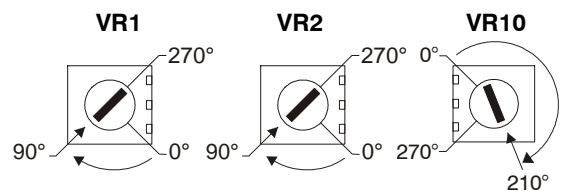
Adjustment of the minimum speed during operation. (this adjustment is only possible if the potentiometer for the reference value is connected to terminal 9 on the control board LP1)

VR10 Stabilität

Adjustment of the stability. (P-I-component) The stability will become more sluggish if this potentiometer is turned clockwise.

Potentiometer-Factory adjustments

Only at 1Q and 4Q

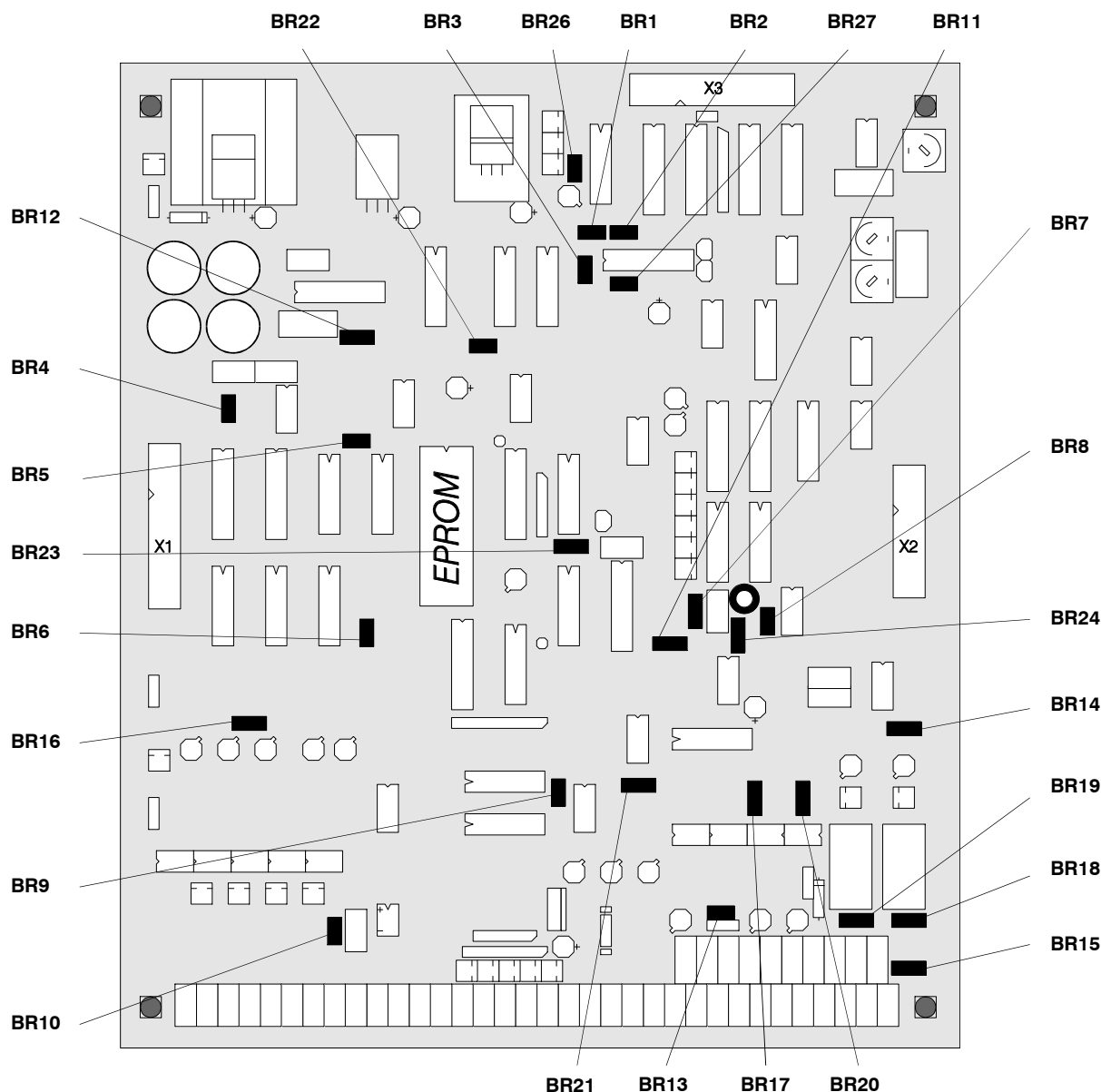


VR3	adjusted for rated motor current	(VR3-fully clockwise)
VR4	adjusted for rated motor current	(VR4-fully clockwise)
VR6	adjusted for rated motor speed	
VR5	These controls are pre-set by the manufacturer. For reference refer to the the corresponding test data sheet of the TA-BL drive.	
VR7		
VR8		

VR9 *

All potentiometers which are marked with an asterisk are active with analogue reference values only, since the internal analogue circuit will be switched off when using a DGM-2000 (frequency control)

7.4 Jumper on Control Board LP1



7.4.1	Speed >0
7.4.2	Control in 1Q or 4Q
7.4.3	Increase of the Rated Value Frequency
7.4.4	Common Connection of Optocouplers Connection of t. 25 & 28
7.4.5	Motor Rotation Direction
7.4.6	Acceleration / Deceleration ON/OFF
7.4.7	Loaded acceleration without Deceleration by Operation "OFF"
7.4.8	Drive Lock at Analogue Rated value 0
7.4.9	Stopping Torque
7.4.10	120/240 Pulses (Motor)
7.4.11	Rated-/Actual Value Output (terminal 23)
7.4.12	Option Boards
7.4.13	Reset
7.4.14	Definition of the Reporting Outputs

BR12	Page 38
BR1 + BR2 + BR4 + BR26	38
BR8	39
BR10, BR13	39
BR9 + BR16	40
BR7 + BR11 + BR27	41
BR5	41
BR3	42
BR6	42
BR22	43
BR21	43
BR23	44
BR24	44
BR14 + BR15 + BR17 +	45
BR18 + BR19 + BR20	

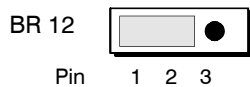
TA-BL 4.1...300.1

7.4.1 Speed >0

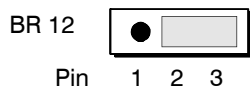
Jumper BR 12

With the jumper BR 12 the signal speed>0 can be activated even if operation is off or power stage is off respectively. Using controlled deceleration (Chapter 7.4.7) the signal speed>0 will remain active until the power stage is off or the motor stands still respectively.

a) With signal speed>0 at operation off



b) Without signal speed>0 at operation off

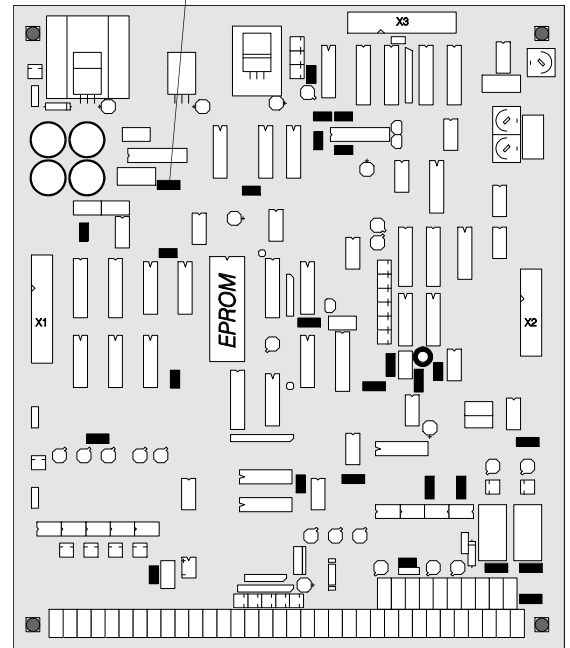


The signal speed>0 depends on the turning direction. It is only active for the last direction of the motor.

Factory adjustment:

BR12: Pin 1-2 closed

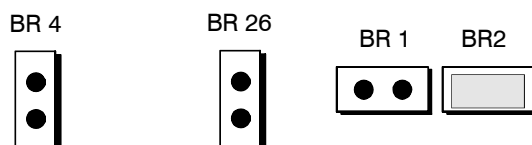
BR 12



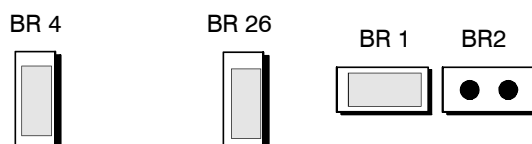
7.4.2 Control in 1Q or 4Q

Jumper BR 1, BR 2, BR 4 and BR 26

Operation in 1Q - BR 1, BR 4 and BR 26 open
- BR 2 closed



Operation in 4Q - BR 1, BR 4 and BR 26 closed
- BR 2 open

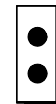


Factory adjustment:

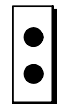
1Q-drives: BR1, BR4 & BR26 open
BR2 closed

4Q-drives: BR1, BR4 & BR 26 closed
BR2 open

BR 4



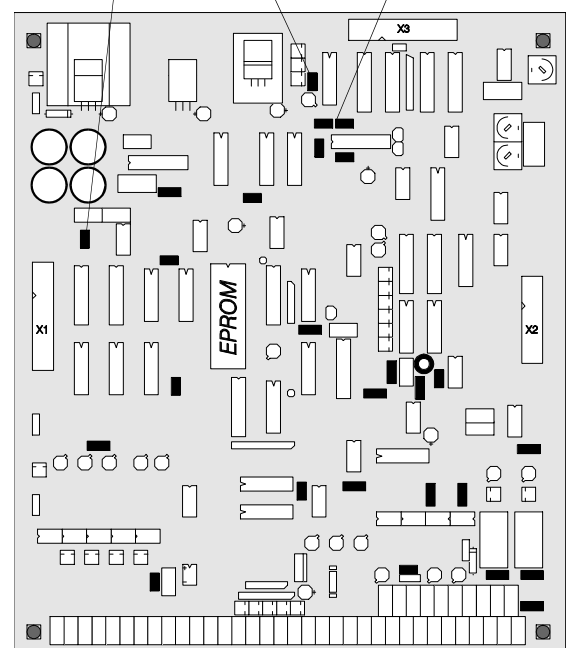
BR 26



BR 1



BR 2



7.4.3 Increase of the Rated Value Frequency

Jumper BR 8

If this jumper is open the internal frequency will be increased.

This Jumper must be open if:

- the rated motor speed is more than 2500 RPM. (effective only at analogue rated value).
- the used incremental encoder transmits more than 240 pulses. Standard for TA-BL motors is :

Motor up to size 160:

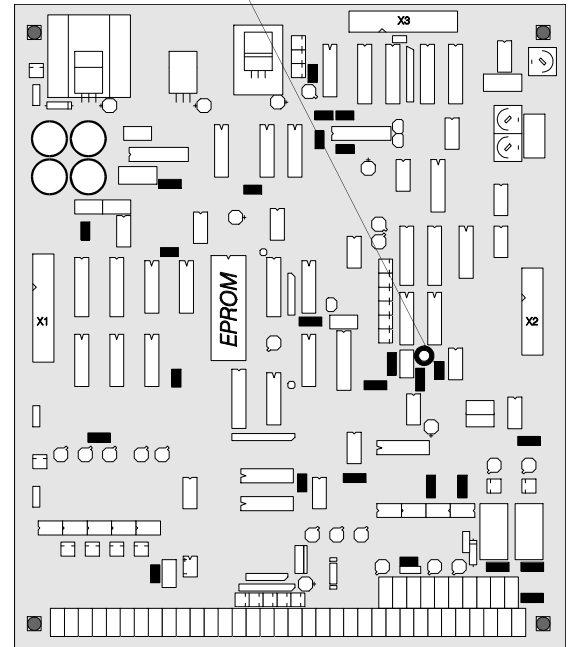
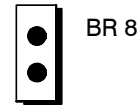
Incremental encoder with 120 pulses (electronic analyzed) per revolution.

Motor size 180 and up:

Incremental encoder with 240 pulses (electronic analyzed) per revolution.

Factory adjustment:

-



7.4.4 Common Connection of Optocouplers Connection of Terminal 25 & 28

Jumper BR 10

If this jumper is open the control inputs (operation, stop, jog speed etc.) are galvanically separated from the drive. The common connecting point is in this case terminal 7. This setting is recommended for use of PLC.

If the jumper is closed the connection of the electronic circuit.

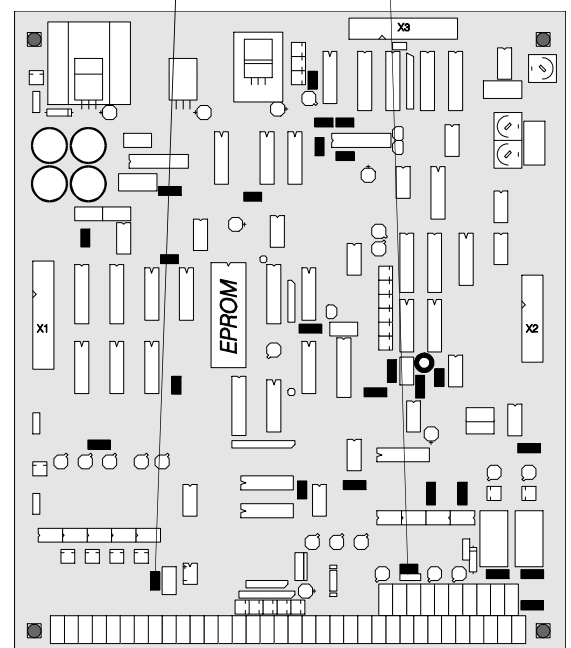
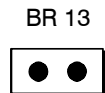
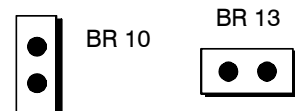
Connection of terminal 25 & 28

Jumper BR 13

This jumper interconnects terminals 25 & 28. Refer to Chapter 6.2 Connection Diagram Control Board LP1.

Factory adjustment:

BR10: closed
BR13: closed



TA-BL 4.1...300.1

7.4.5 Motor Rotation Direction

Jumper BR 9 & BR 16

The position of jumper BR9 determines the method of selecting the direction of the motor rotation. You can select a change of the direction either with a switch or by changing the polarity of the rated value. The change of the direction of the motor rotation at jog speed is only possible by switching.

- Reversal of motor rotation with rated value polarity

If the jumper BR9 is closed a change of the motor rotation is only possible by changing the polarity of the rated value.



- Reversal of motor rotation with a switch (contact)

If the jumper BR9 is open a change of the motor rotation is only possible with a switch. (refer to Chapter 6.2 Connection Diagramm Control Board LP1, terminal 3).

Jumper BR16 is only effective if jumper BR9 is open. With jumper BR16 the following two alternate operations are possible:

Pin 1 - 2 closed

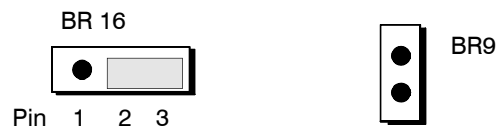
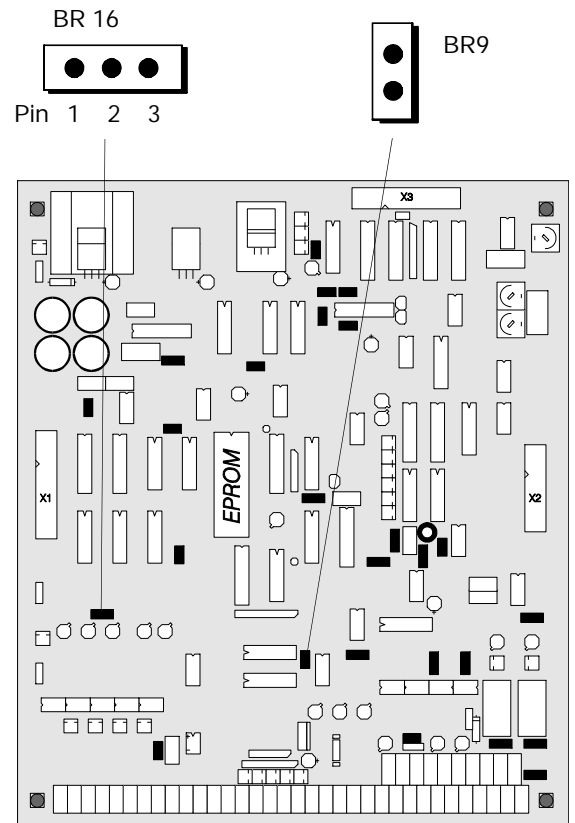
A change of the direction is possible:

- during normal operation (terminal 5) at any speed or after drive has stopped.
- during jog speed (terminal 4) up to max. 30 RPM. If the speed is greater than 30RPM **must** the jog speed, first be switched off. The direction of the rotation can be changed after the drive has stopped.

Pin 2 - 3 closed

A change of the direction is possible:

- during normal operation (terminal 5) at any speed or after drive has stopped.
- during jog speed the change of the rotation is only possible after drive has stopped! (jog speed OFF).



Factory adjustment:

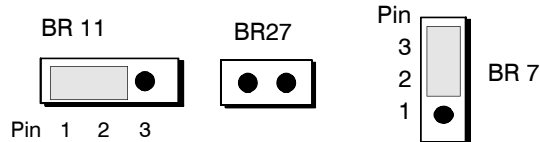
BR9: open
BR16: Pin 2-3 closed

7.4.6 Acceleration / Deceleration ON/OFF

Jumper BR 7, BR 11 and BR27

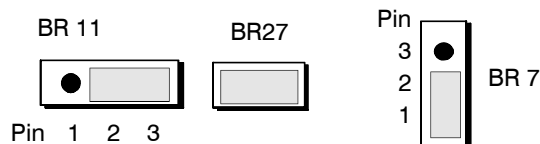
These jumpers are used for the ON- or OFF-switching of the controlled acceleration or deceleration of the drive.

a) With controlled acceleration and deceleration



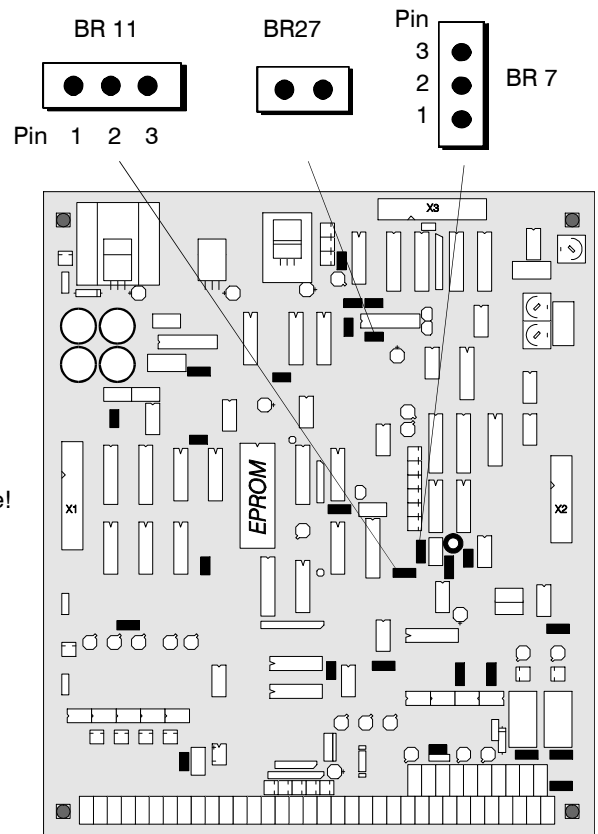
b) Without controlled acceleration and deceleration (max torque)

Potentiometers VR7 & VR8 must be set fully counter-clockwise!



Factory adjustment:

BR11: Pin 1-2 closed
BR7: Pin 2-3 closed
BR27: open



7.4.7 Leded acceleration without Deceleration by Operation "OFF

Jumper BR 5

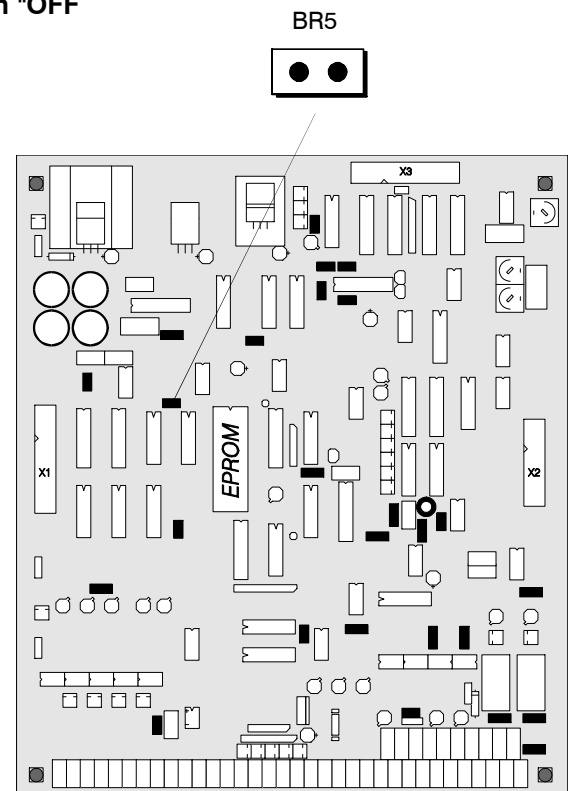
With opened jumper BR 5 the power stage will be turned off after operation off. The drive slows down (centrifugal of mass). The signal speed > 0 can be activated with BR 12 (Chapter 7.4.1).

If jumper BR 5 is closed, the regulator will slow down after operation "OFF" according to the preadjusted slope. Precondition is that jumper BR 7 and BR 11 are set accordingly.

The signal speed > 0 remains until the drive stands still. The jumper BR 12 does not influence the controlled deceleration.

Factory adjustment:

BR5: closed



TA-BL 4.1...300.1

7.4.8 Drive Lock at Analogue Rated Value 0

Jumper BR 3

The possible use of this function is only useful for 1Q drives!

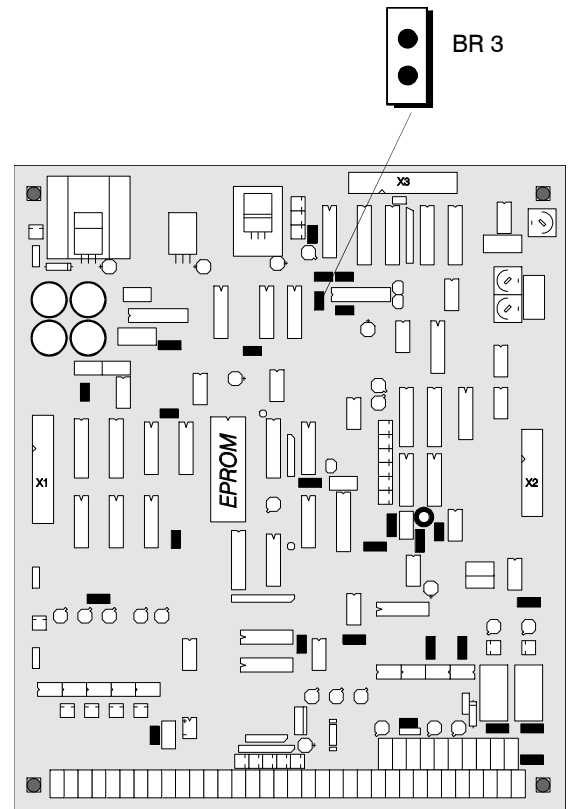
If this jumper is closed all power outputs will be switched off analogue rated value 0. This is also effective if the drive release (terminal 5) is set for ON.

If jumper BR3 is open, the power outputs will be in function.

This means the motor will not be currentless if the analogue rated value is 0.

Factory adjustment:

BR3: open



7.4.9 Stopping torque

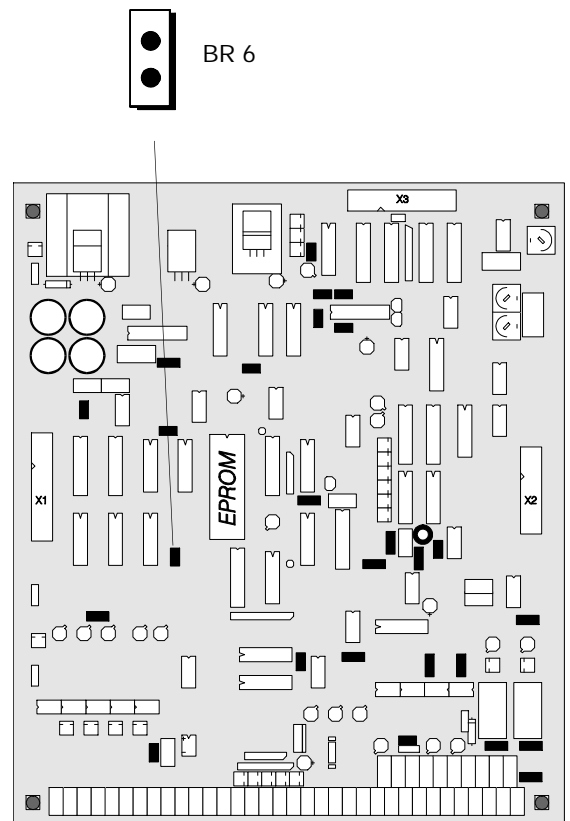
Jumper BR 6

Only valid for 4Q drives!

If this jumper is closed, the motor will be held with a stopping torque for about 0,5 seconds after the drive has been switched off. This stopping force is necessary in order to activate a brake (or similar).

Factory adjustment:

BR6: open



7.4.10 120/240 Pulses (Motor)

Jumper BR 22

This jumper must be open if the incremental encoder at the BL-motor has 120 pulses (electronic analyzed).

This jumper must be closed if the incremental encoder at the BL-motor has 240 pulses (electronic analyzed).

Standard for TAE BL-motors is :

Motor up to size 160:

Incremental encoder with 120 pulses (electronic analyzed per revolution).

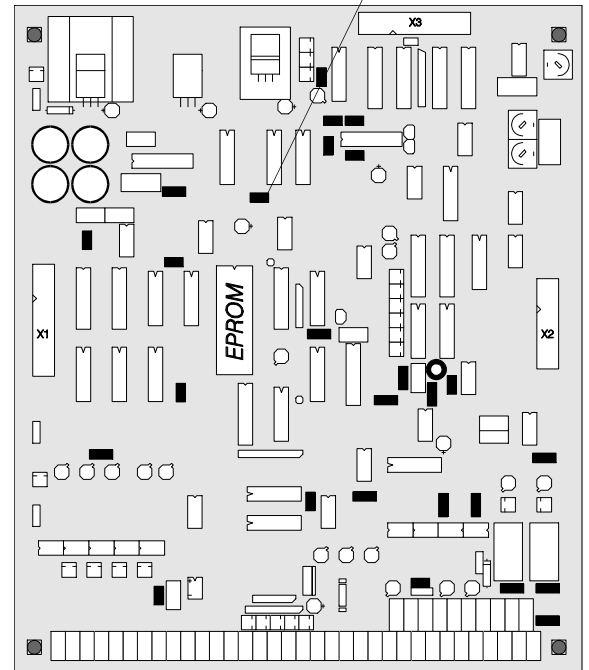
Motor size 180 and up:

Incremental encoder with 240 pulses (electronic analyzed per revolution).

Factory adjustment:

Motor specific

BR 22



7.4.11 Rated-/Actual Value Output (Terminal 23)

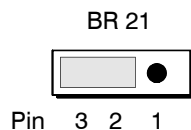
Jumper BR21

This jumper determines the use of output on terminal 23.

Either you can reserve the terminal as a rated value output or as a actual value output.

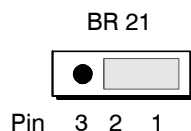
Actual value

output on terminal 23



Rated value

output on terminal 23



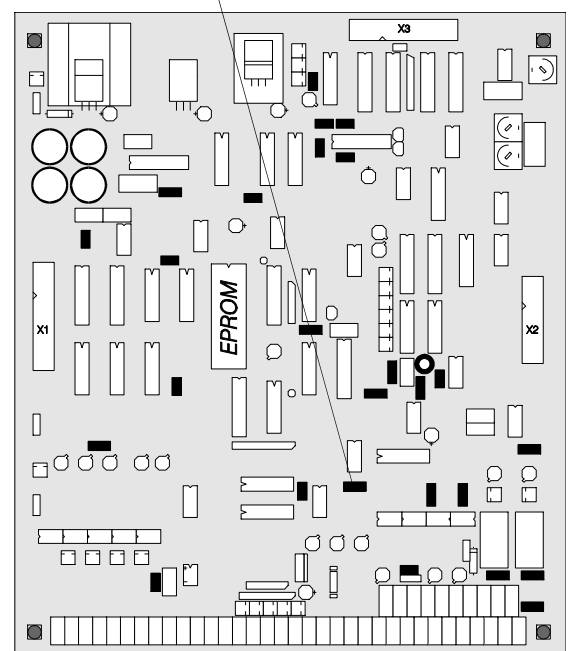
Factory adjustment:

BR21: Pin 2-3 closed

BR 21



Pin 3 2 1



TA-BL 4.1...300.1

7.4.12 Option Boards

Plug X3

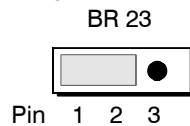
This connector is used for optional cards as phase advance, torque regulator (MDR 2000) or measuring converter.

Jumper BR23

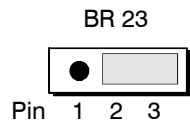
This jumper must be set depending on the installed optional card.

If no option is used the standard configuration is set: BR23, pin 1-2 closed.

Phase advance option active.

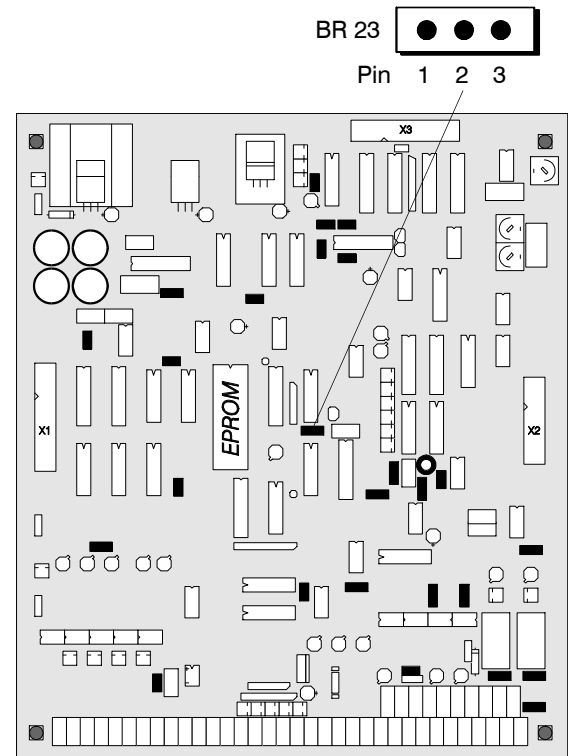


MDR-2000 torque regulator option active.



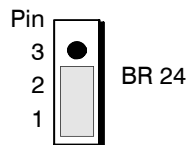
Factory adjustment:

BR23: depending on used option

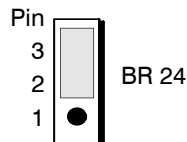


7.4.13 Reset

Automatic reset



Reset by key S1



Jumper BR24

This jumper specifies if reset is done automatically or by pressing key S1.

Jumped as - automatic reset - reset occurs:

- If the functions operation, jog speed and hold are turned off and the motor stands still.
- If mains was minimum 20s off.

Jumped as - reset by key - reset occurs:

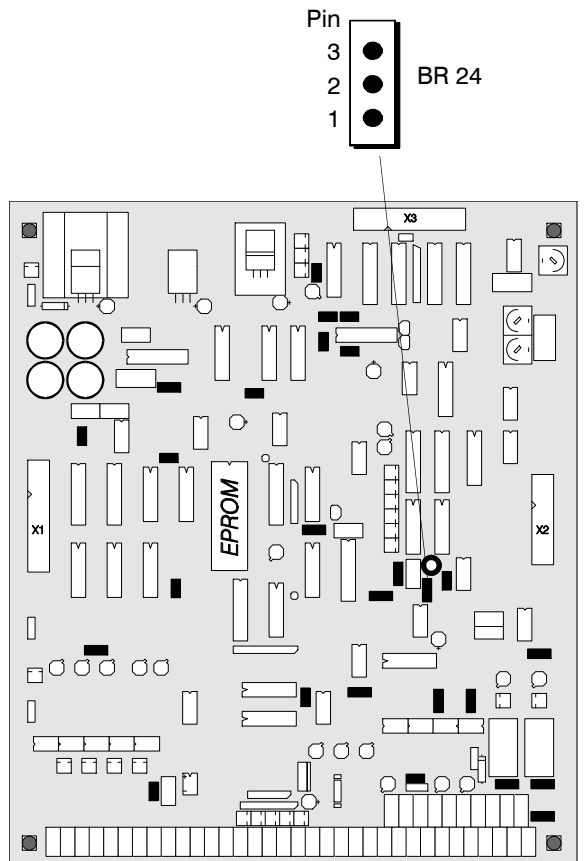
- By pressing key S1.
- If mains was minimum 20s off.

Attention!

Reset may only be pressed if the motor is standing still.

Factory adjustment:

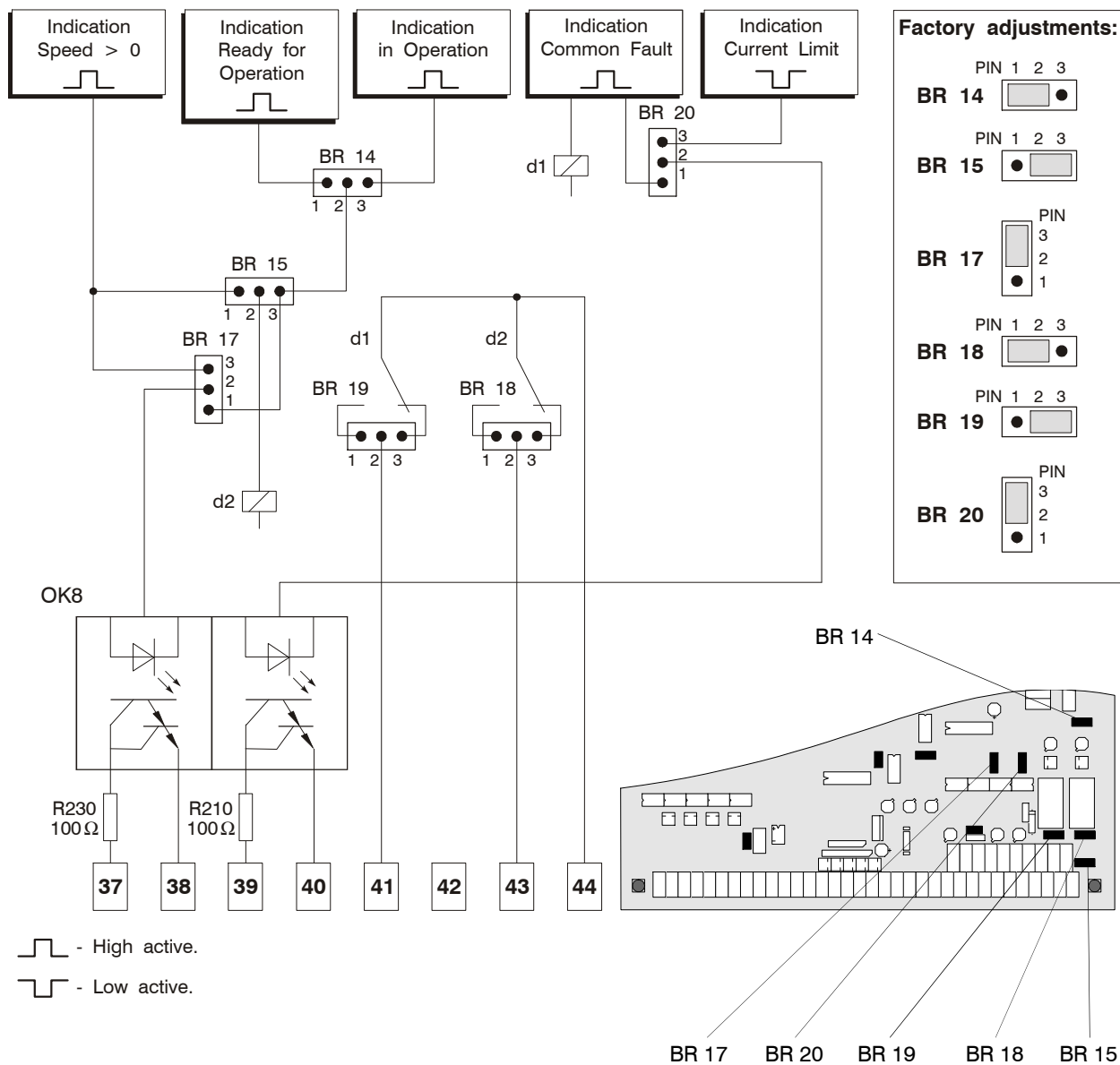
BR24: PIN 1-2 closed



7.4.14 Definition of the Reporting Outputs

Jumper BR 14, BR 15, BR 17, BR 18, BR 19, BR 20

These jumpers determine the different relay- and optocoupler outputs. The different functions are explained below:



Maximum load on output terminals:

Terminal 37, 38, 39, 40: max. 30V/20 mA

Terminal 41, 43, 44: max. 250V/1A

TA-BL 4.1...300.1

7.5 Errors

The device has internal error recognition for the following errors.

All errors trigger the common fault on terminal 41/44 (LED 16) and must be reset.

Error	Display LP1 Control Board	Display LP3 Sensor Board	Effect
Regulator disable terminal 2	LED 5 and LED 11		Power stage disabled motor gets no current
Overcurrent motor	LED 6		
Short circuit power stage, motor	LED 6		
Short circuit to earth, motor	LED 6		
Overttemperature power stage	LED 7	LED 3	
Over-/undervoltage BUSS	LED 7		
Ripple current	LED 7		

The following possibilities exist for reset:

By "automatic reset" (Chapter 7.4.13) the errors can be reset if the drive stands still and the inputs jog speed, operation or hold are turned on. Furthermore, the errors are reset if mains are off at least for twenty seconds.

By "reset with key" (Chapter 7.4.13) the errors can be reset by key.

A reset by external terminals is not possible. Furthermore, the errors are reset if mains are off at least for twenty seconds.

An error reset is only possible if the error does not remain.

7.6 Trouble Shooting

In order to speed up the search for defective components, the drive, motor etc. should first be checked for possible intermittent, open or wrong connections and faulty insulation of the wiring.

Note!

Do not use any Mega-Ohm-Meters, buzzers or similar test-instruments. All measuring instruments must be galvanically separated from the line voltage!

Symptom: **LED 1 (Power ON) does not light up.**

- Possible causes:
- a) Line voltage missing
 - b) Defective fuse F1 on switched mode power supply.
 - c) Short circuit of terminal 1 of control unit with terminals 7,8 or to ground.
 - d) BUSS shorted.
 - c) Charging resistor defect.

Symptom: **Drive runs at maximum speed immediately after switch-on.
(speed cannot be adjusted with potentiometer for rated value)**

- Possible causes:
- a) Motor connections U,V, W are connected wrong.
 - b) Hall-sensors HS 4 and HS 5 are interchanged.
 - c) Hall-sensors HS 1, HS 2 or HS 3 are interchanged.

Symptom: **LED 6 (red, short circuit) & LED 16 (red, common fault) lights up immediately after switch-on.**

- Possible causes:
- a) Motor or motor wiring is shorted or has short circuit to ground.
 - b) Defective power-transistor (IGBT).
 - c) Wrong motor size (motor have too low inductivity).

Symptom: **Drive starts briefly, LED 6 (red, short circuit) and LED 16 (red, common fault) lights up.**

- Possible causes:
- a) Current limit is set too high.
 - b) Motor is connected wrong.
 - c) Inductivity of motor is insufficient (Power rating of motor does not match power rating of unit).
 - d) Motor has short circuit to ground
 - e) Motor winding shorted.

Symptom: **Motor runs instable**

- Possible causes:
- a) Hall-sensors are interchanged or connected wrong.
 - b) One Hall-sensor does not receive position signal (check connections).
 - c) Hall sensors are defect. Use LED 18-22 for sensor test, turn motor slowly by hand and check hallsensors according to Chapter 7.3.2.

Symptom: **Motor does not run / LED 2 (red, current limit 1Q) lights up / current supply to motor is OK.**

- Possible causes:
- a) Motor-load is too high.
 - b) Current limit is set too low.
 - c) Motor connections U, V, W are connected wrong.
 - d) Hall-sensors HS 1, HS 2 or HS 3 are interchanged.

Symptom: **Motor does not run / LED 2 (red, current limit 1Q) lights up / no motor current.**

- Possible causes:
- a) Hall-sensors HS 1, HS 2 or HS 3 are not connected (terminals 17,18 and 19) or are defective.
 - b) At least one Hall-sensor was activated after drive has been switched on (approx. 0,5V). An inactivated Hall-sensor has approximately 8,0V. (pay attention to LED 18-22)
 - c) Motor terminals U, V, W interrupted.
 - d) Jumper from terminal 26 to terminal 27 is missing.

TA-BL 4.1...300.1

7.7 Spare Part List

	Article-No	Description	4.1	6.1	8.1	10.1	15.1	20.1	30.1	50.1	60.1	80.1	150.1
LP1	78243-1F	Control Board TA-BL/E91.1 (1Q/4Q)	*	*	*	*	*	*	*	*	*	*	*
	78243-2F	Control Board TA-BL/E91.1 (Option Servo)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
LP2	78285-0F	IGBT-CONTROL EXB841	*	*	*	*	*	*	*	*	*	*	*
LP3	78304-0F	Sensor Board	*	*	*	*	*	*	*	*	*	*	*
	78313-0F	Sensor Board	*	*	*	*	*	*	*	*	*	*	*
LP4	78287-0F	Switched Mode Power Supply 24V	*	*	*	*	*	*	*	*	*	*	*
LP5	78297-0F	EMC Filter TA-BL 4.1	2)										
	78298-0F	EMC Filter TA-BL 6.1		2)									
	78299-1F	EMC Filter TA-BL 8.1			2)								
	78299-2F	EMC Filter TA-BL 10.1				2)							
	78300-1F	EMC Filter TA-BL 15.1					2)						
	78300-2F	EMC Filter TA-BL 20.1						2)					
	78300-3F	EMC Filter TA-BL 30.1							2)				
	78300-5F	EMC Filter TA-BL 50.1								2)			
	78300-6F	EMC Filter TA-BL 60.1									2)		
	78300-8F	EMC Filter TA-BL 80.1										2)	
T1...T6	78300-9FC	EMC Filter TA-BL 150.1											2)
	34292-11	IGBT-6MBI 25F-120	*	*									
	34292-21	IGBT-6MBI 50F-120		1)	*								
	34292-47	IGBT-2MBI 75N-120				*							
	34292-52	IGBT-2MBI 100N-120					*						
	34292-57	IGBT-2MBI 150N-120						*					
	34292-62	IGBT-2MBI 200N-120							*				
	34292-67	IGBT-2MBI 300N-120								*		*	*
GL1	34292-87	IGBT-1MBI 400N-120									*		
	34364-00	Rectifier 36 MT 120A DS-GL. 35A 1200V	*	*									
	34366-00	Rectifier SKD 60/12			*	*	*						
	34370-A0	Rectifier IRKD 61/12						*	*				
	34370-C0	Rectifier SKKD 100/14								*	*		
	34370-E0	Rectifier SKKD 162/12										*	
L1	34374-07	Rectifier SKKE 201/14											*
	36315-00	Line Choke NGD78/40-9,8/2x4,4	*										
	36317-01	Line Choke ZKD96/36,5-2x16A/2,5mH		*									
	36322-01	Line Choke ZKD9/59,7-2x 28A/1,4mH			*	*							
	36329-01	Line Choke ZKD105/86-2x40A/1,0mH					*						
	36331-01	Line Choke ZKD135/72-2x50A/1,1mH						*					
	36334-01	Line Choke ZKD135/72-2x66A/0,8mH							*				
	36343-01	Line Choke ZKD150/66-2x120A/0,17mH								*			
	36348-01	Line Choke ZKD150/92-2x140A/0,17mH									*		
	36350-02	Line Choke ZKD192/110-2x190A/2x0,3mH										*	
R1,R2	36353-L0	Line Choke ZKD174/102-300/0,24mH (L)											*
	36353-R0	Line Choke ZKD174/102-300/0,24mH (R)											*
	30470-22	BUSS Balance Resistors 33k Ohm 11W	*	*	*	*	*	*	*	*	*	*	*
R3	30522-U0	BUSS Balance Resistors 10k 65W	*	*	*	*	*	*	*	*	*	*	*
C1.1.../C2.1.-..	30522-K0	BUSS Charging Resistors 470 Ohm 65W	*	*	*	*	*	*	*	*	*	*	*
	32126-A0	BUSS Capacitors 2200µF 400VDC (to 460V)	*	*	*	*	*	*	*	*	*	*	*
C3.1	32126-00	BUSS Capacitors 2200µF 450VDC (to 480V)	*	*	*	*	*	*	*	*	*	*	*
	31791-00	Rectifier Capacitor 0,22µF 1000V MKP1	*	*		*	*	*	*	*	*	*	*
C4.1	31791-A0	Rectifier Capacitor 0,22µF 1250V FKP1	*	*	*	*	*	*	*	*	*	*	*
	31665-A0	Snubber Capacitor 1µF F250V ACX2	*	*	*	*	*	*	*	*	*	*	*
K1	31665-B0	Snubber Capacitor 2,2µF F250V ACX	*	*	*	*	*	*	*	*	*	*	*
	35020-A0	Relay SDS JA1a-TM DC24V	*	*									
	36738-AD	Contactactor 20A 24VDC			*	*	*	*					
	36745-IO	Contactactor 35A 230V							*				
	36751-IO	Contactactor 90A 230V								*	*	*	*
F1	36754-IO	Contactactor 160A 230V											*
F2	34472-00	Fuse 30x5 Medium blow 3,15A	*	*	*	*	*	*	*	*	*	*	*
Th1.../Th2...	34442-00	Fuse 20x5 Medium blow 2,5A	*	*	*	*	*	*	*	*	*	*	*
E1-E2-E3	31330-00	Klixon 80°C	*	*	*	*	*	*	*	*	*	*	*
	68053-00	Fan 24V Type 614	*	*	*	*	*	*	*	*	*	*	*
	68058-00	Fan 230V Type 5656			*	*	*	*	*	*	*	*	*
	68062-00	Radial Fan 230V type 621 AL-F38								*	*		
	68065-00	Radial Fan 230V type D2E 133-AM47										*	
	68066-00	Radial Fan 230V type D2E 133-DM47											*
	40426-B1	Plexiglass Cover TA-BL 4.1...6.1	*	*									
	40426-C1	Plexiglass Cover TA-BL 8.1...10.1			*	*							
	40426-D1	Plexiglass Cover TA-BL 15.1					*						
	40426-E1	Plexiglass Cover TA-BL 20.1...30.1						*	*				
	40426-F1	Plexiglass Cover TA-BL 50.1								*			
	40426-G1	Plexiglass Cover TA-BL 60.1									*		
	40426-H1	Plexiglass Cover TA-BL 80.1										*	
	40426-I1	Plexiglass Cover TA-BL 150.1											*

1) Option Servo

2) Option EMC Filter

Orders must always indicate type of unit, serial number and supply voltage.