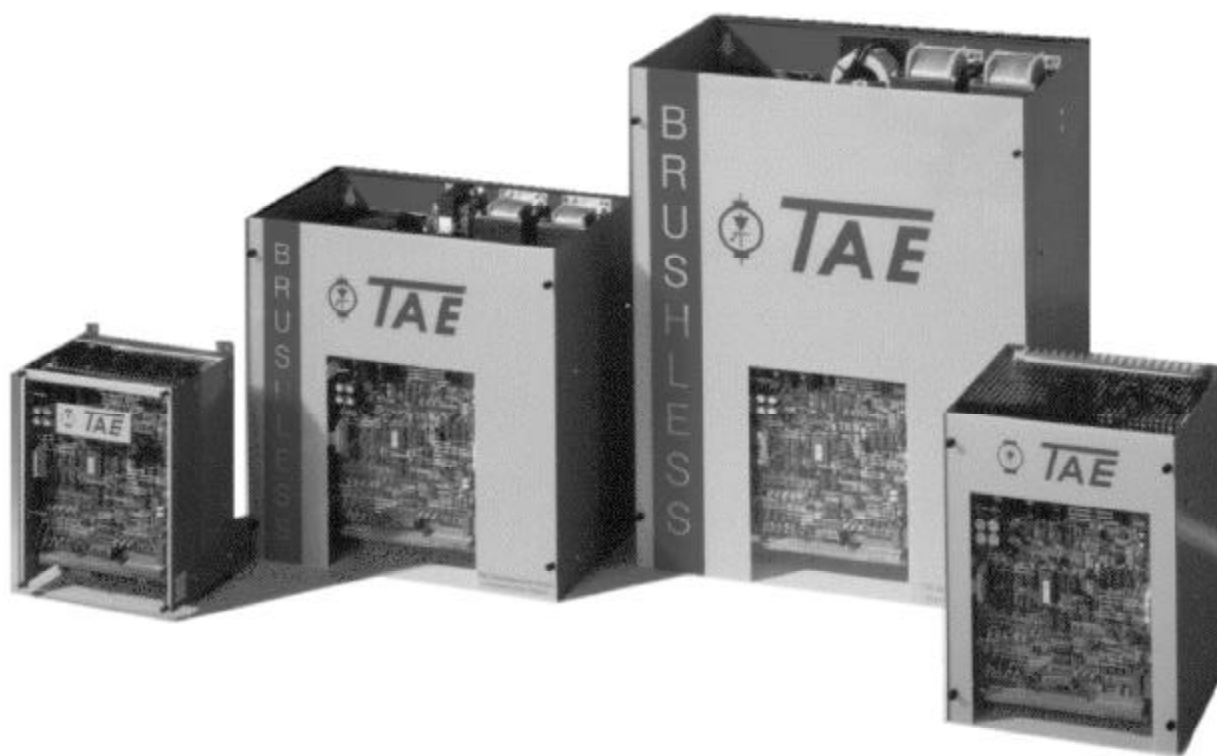
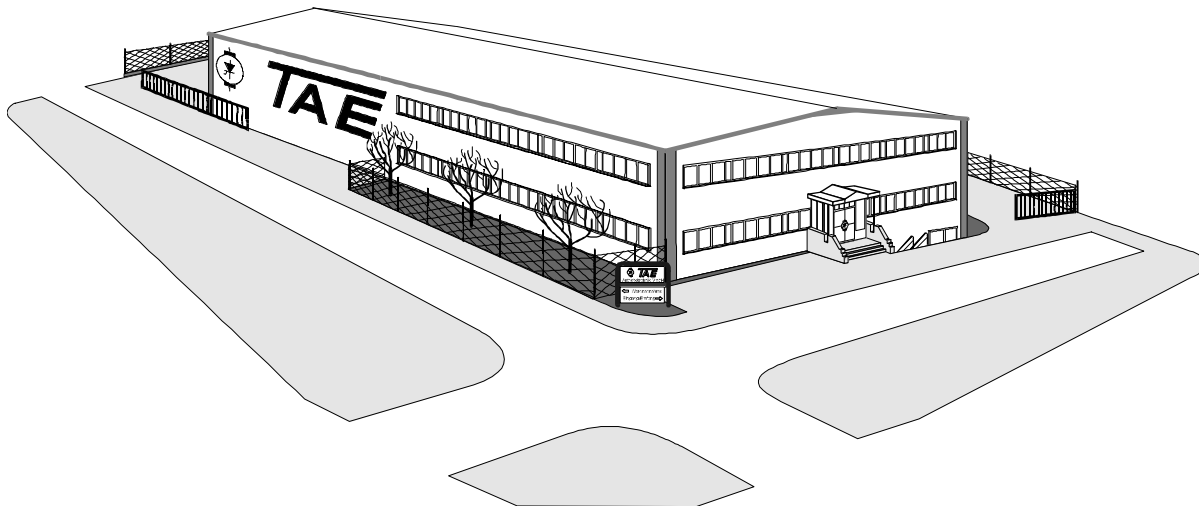


TA-BL 1...3

Instruction & Operating manual





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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.

2.1 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 LD 7 on the Driver board LP2 lights up), 5 minutes after the device has been separated 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 adjustment 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.

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 procedure 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

Type	Typ		Artikelnummer		Part number
Line input	Netz	Ph	Frequenz	50/60 Hz	Line frequency
Device power	Leistung	kW	Nennstrom	A	Rated output current
Series number	SN		Datum		month and year of production

TAE Antriebstechnik GmbH Am Kappengraben 20 61273 Wehrheim

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.

TA-BL 1...3

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.

3.4 Usability

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

3.5 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. Do not make an isolation measurement at the terminals of the control board.

3.6 Safety and Supervising Equipment

Separating protection equipment:

External: Mains fuse (look at Chapter 4.0 Technical Data)

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 8.7 gives detailed information about this.

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

Additional signals which do not lead to a cut off:

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

3.7 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 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.

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 1...3

4.0 Technical Data

Transistor Controller Type	TA-BL 1		TA-BL 2		TA-BL 3	
	1 Phase	3 Phase	1 Phase	3 Phase	1 Phase	3 Phase
Connection	230V 50/60 Hz		230V 50/60 Hz		230V 50/60 Hz	
Mains current (Phase current)	5,8A eff.	2,6A eff.	11,6A eff.	5,2A eff.	14,5A eff.	6,5A eff.
Mains fuse (external)	10A GL		16A GL		20A GL	
Output current (Phase current)	4A eff.		8A eff.		10A eff.	
Peak current (Phase current)	6A eff.		12A eff.		13A eff.	

Mains		200V		230V		240V	
		1 Phase	3 Phase	1 Phase	3 Phase	1 Phase	3 Phase
BUSS voltage		255VDC	280VDC	290VDC	320VDC	300VDC	330VDC
Output voltage max. (rotated motor)		160V		190V		200V	
Output power	TA-BL 1	0,6 kW		0,75 kW		0,8 kW	
	TA-BL 2	1,25 kW		1,5 kW		1,6 kW	
	TA-BL 3	1,9 kW		2,2 kW		2,3 kW	

The voltages, currents and power data in this tabel are nominal data. You will find the exact values on the test records which are supplied with each TA-BL controller.

Weight, Enclosure Environment	TA-BL 1	Weight	5,0kg	Enclosure IP 00	ambient temperature 0-40°C
	TA-BL 2		6,5kg		
	TA-BL 3		7,0kg		
Dimensions		(W x H x D) 203mm x 270mm x 153mm - refer to Dimensions Chapter 8.1.4			

Speed deviation	with analogue reference (0-10V)	less than 1%
	with digital reference (DGM 2000)	0% absolute (+/- 1 Digit)

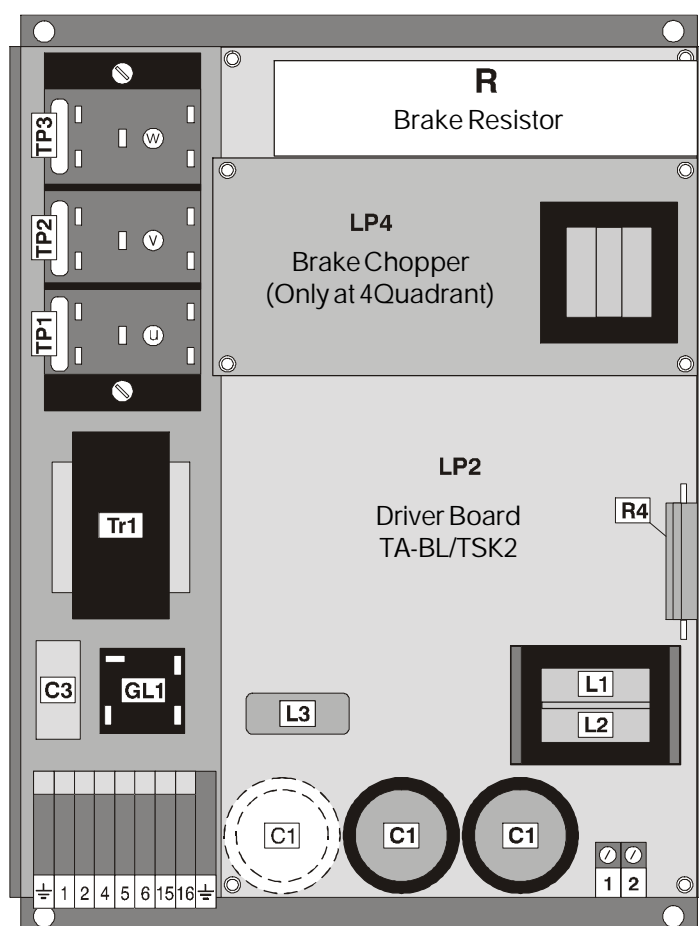
4.1 Equipment

- r** Power Transistor six-pack
- r** Current Limiting
- r** Controlled acceleration and deceleration during Operation with Drive-Control ON/OFF
- r** Drive Control locking at nominal value 0
- r** Separate 2nd speed (Jog-Speed)
- r** Power unit galvanically isolated by Optocoupler
- r** All inputs also galvanically isolated by Opto-couplers
- r** Output short circuit proof against ground (Short circuit can cause damage to motor and Drive Unit
- r** Frequency output for digital speed indicator (Impulse counter DMI-2000)
- r** Reverse rotation by contact or by change of polarity of rated value.
- r** Logical Switch-ON function
- r** Digital electronic with EPROM-memory
- r** Stop-funktion (at zero speed)
- r** Delayed drive lock at analogue rated value 0

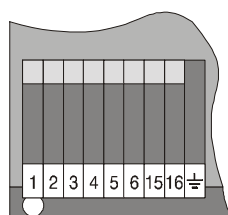
4.2 Indicators (LED´s)

- Power ON
- In operation, ready for operation, zero speed
- Common fault
- Stop
- Jog-speed
- Direction of rotation
- Drive lock
- Loss of Phase
- Overcurrent / short circuit
- Too high or too low voltage
- enable
- 5 LED´s for hallsensors
- Capacitor charging
- BUSS-ready
- Current limit 1Q
- Current limit 4Q
- Drive operates in 4Q
- 6 LED´s for driver board functions (*LP2 Driver Board*)
- BUSS-voltage (*LP2 Driver Board*)

5.0 Construction and Layout



Netz 1 Ph



Netz 3 Ph

Note:

The optional boards

- Torque Controller MDR-2000
 - Measurement converter (U/I) 0...-5V art.-No. 20203 F
 - Measurement converter (U/I) 0...+/-5V art.-No. 20215 F
- are mountable externally.

Only one optional circuit can be used at a time, either MDR-200 or measuring converter. The MDR-2000 torque controller has a separate measuring output. (refer to Chapter 6.3 MDR-2000)

TA-BL 1...3

6.0 PC-board LP2 to LP5

6.1 LP2 - Driver board TA-BL/TSK2

Transistor T1 (top transistor) in TP1

- LD6 - (pale) Transistor driver T1 is active
- TB12 - basis Transistor T1 (TP1)
- TB11 - emitter Transistor T1

Transistor T2 (top transistor) in TP2

- LD4 - (pale) Transistor driver T2 is active
- TB8 - basis Transistor T2 (TP2)
- TB7 - emitter Transistor T2

Transistor T3 (top transistor) in TP3

- LD2 - (pale) Transistor driver T3 is active
- TB4 - basis Transistor T3 (TP3)
- TB3 - emitter Transistor T3

Transistor T4 (bottom transistor) in TP1

- LD5 - (pale) Transistor driver T4 is active
- TB9 - basis Transistor T4 (TP1)
- TB10 - emitter Transistor T4

Transistor T5 (bottom transistor) in TP2

- LD3 - (pale) Transistor driver T5 is active
- TB5 - basis Transistor T5 (TP2)
- TB6 - emitter Transistor T5

Transistor T6 (bottom transistor) in TP3

- LD1 - (pale) Transistortreiberstufe T6 aktiv
- TB1 - basis Transistor T6 (TP3)
- TB2 - emitter Transistor T6

- X1 - Connection to the control board
LP1 TA-BL/E91 by a flat cable
- X2 - Connection to the control board
LP1 TA-BL/E91 by a flat cable
- X3 - Supply voltage for the
Driver board TA-BL/TSK2
- LD7 - (red) BUSS-voltage exist

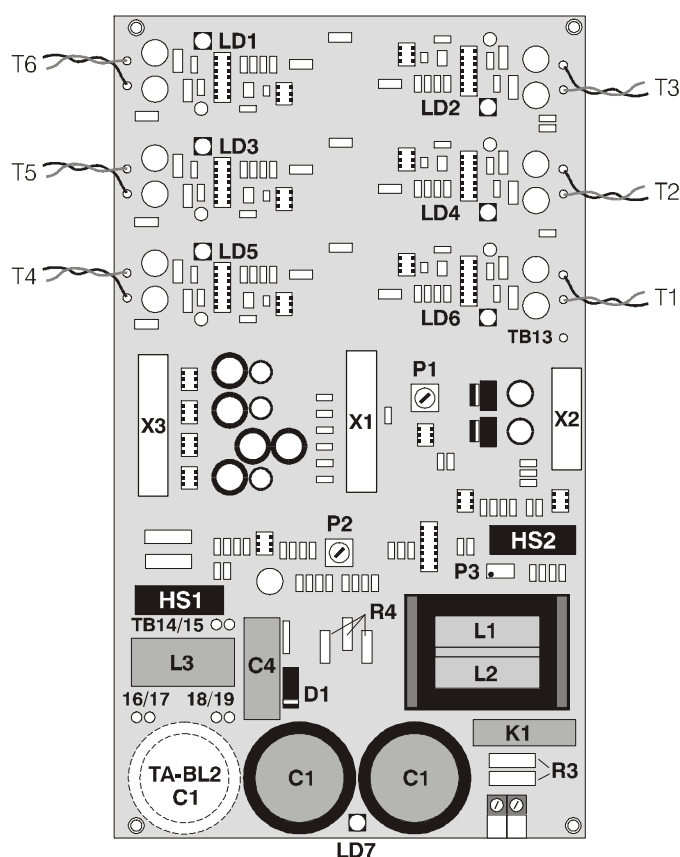
Caution!

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

- P1* - zero point short circuit to earth (HS2)
- P2 - zero point overcurrent (HS1)
- P3 - zero point actual current

* only at TA-BL 2.

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



- HS1 - TA-BL 1 HS1= Overcurrent and short circuit to earth
- TA-BL 2 HS1= Overcurrent

- HS2 - TA-BL 1 HS2= not available
- TA-BL 2 HS2= Short circuit to earth

- TB14/15 - TB14=BUSS positive, TB15=BUSS negative

- TB16/17 - BUSS positive

- TB18/19 - BUSS negative

- TB13 - BUSS positive - (Kollektor T1...T6)

- C1 - TA-BL 1 2 x BUSS-Capacitor C1
- TA-BL 2 3 x BUSS-Capacitor C1

- R4 - TA-BL 1/1Q
The snubber resistor R4 is placed on the Driver board LP2.
TA-BL 1/4Q-TA-BL 2/1Q-TA-BL 2/4Q
The snubber resistor R4 is mounted on side cover of the device

6.2 LP4 - Brake chopper (only at 4 Quadrant drives)

LED1 - (green) Brake chopper ready for operation

P1 - Adjustment of the chopper voltage on 360V

X1 - Supply voltage brake chopper : 200V to 240V

X2 - Supply voltage brake chopper : 200V to 240V

X3 - Klixon - Brake resistor

X4 - Klixon - Brake resistor

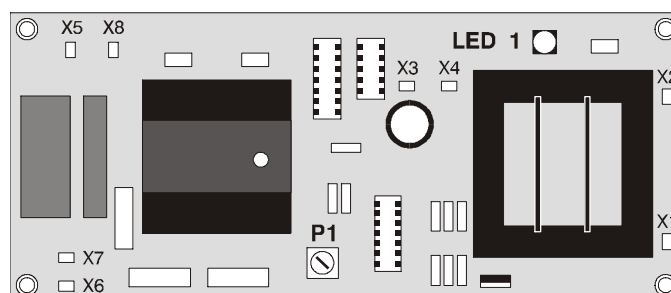
X5 - Brake resistor

X6 - Brake resistor

X7 - BUSS +

X8 - BUSS -

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



6.3 LP5 - MDR-2000 Torque controller (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

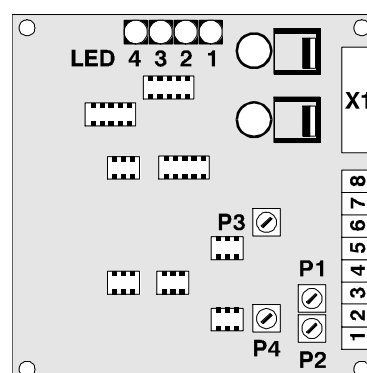
Terminal 5 - not used

Terminal 6 - Output (-10V)

Terminal 7 - Electronic common

Terminal 8 - Measuring output (0-10V)
(10V=twice rated current) -standard adjustment

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

TA-BL 1...3

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

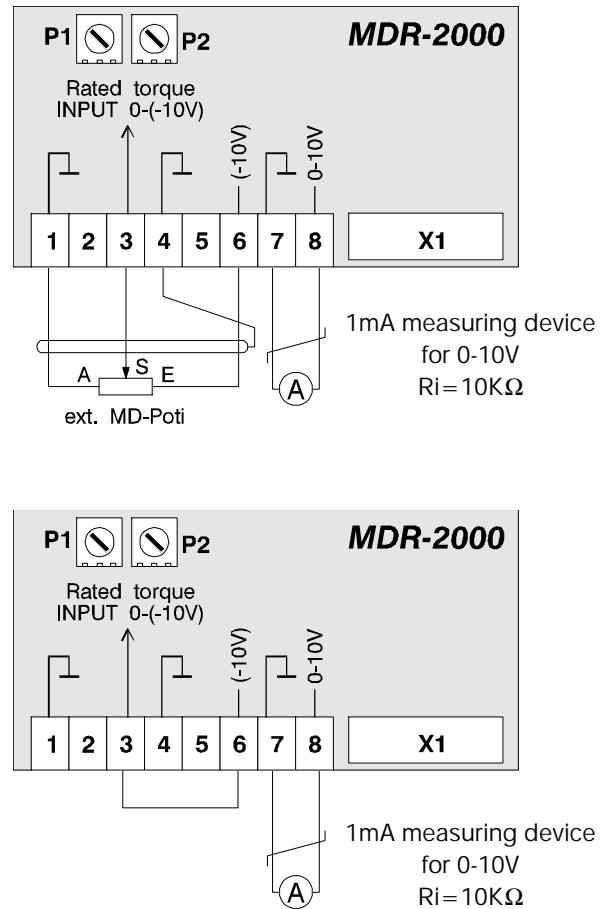
Terminal 3 (Md-rated value input) and terminal 6 (-10V) must be connected with each other in case no external MD-potentiometer is used. P1 is used for the adjustment of the maximum torque at 4Q operation and P2 is used to set the maximum torque at 1Q operation.

Measuring output

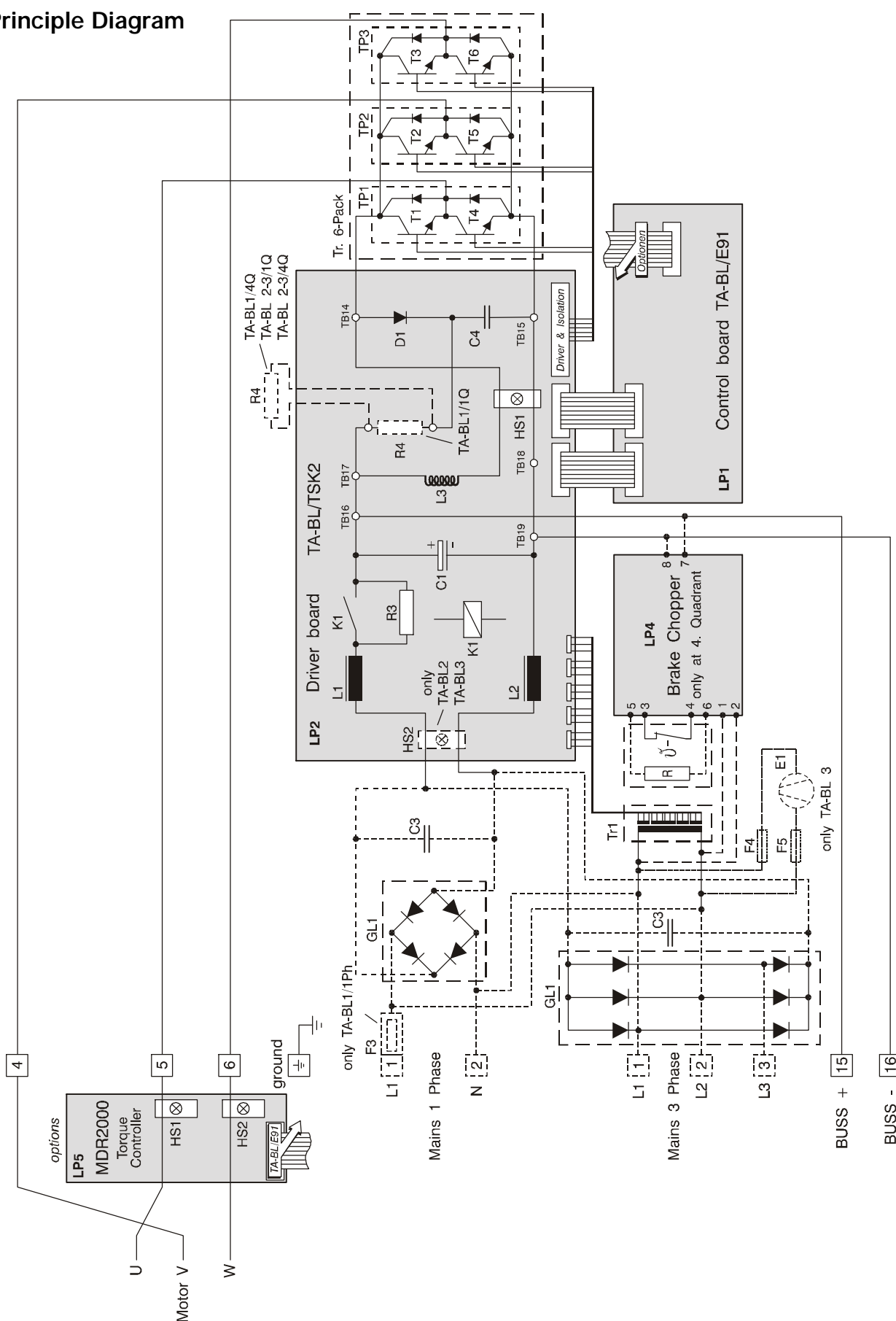
An output for measurements is provided between terminal 7 (electronic common) and terminal 8 (0-10V). The output voltage of 0-10V refers to 0 - twice rated current of the TA-BL controller (*standard adjustment*).

Factory adjustment:

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



7.0 Principle Diagram



8.0 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.

8.1 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.

8.1.1 Switching Devices

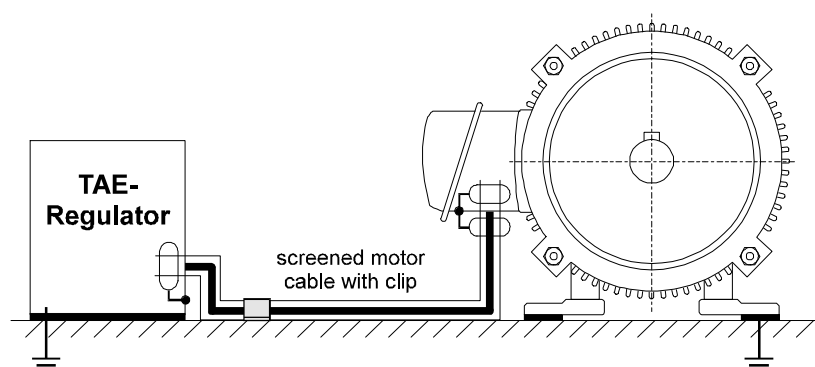
According to the VDE regulations, the transistor controller must be connected to mains supply line in such a manner that it can be separated from the mains supply with suitable circuit breakers (for example main switch, circuit).

8.1.2 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.



8.1.3 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.

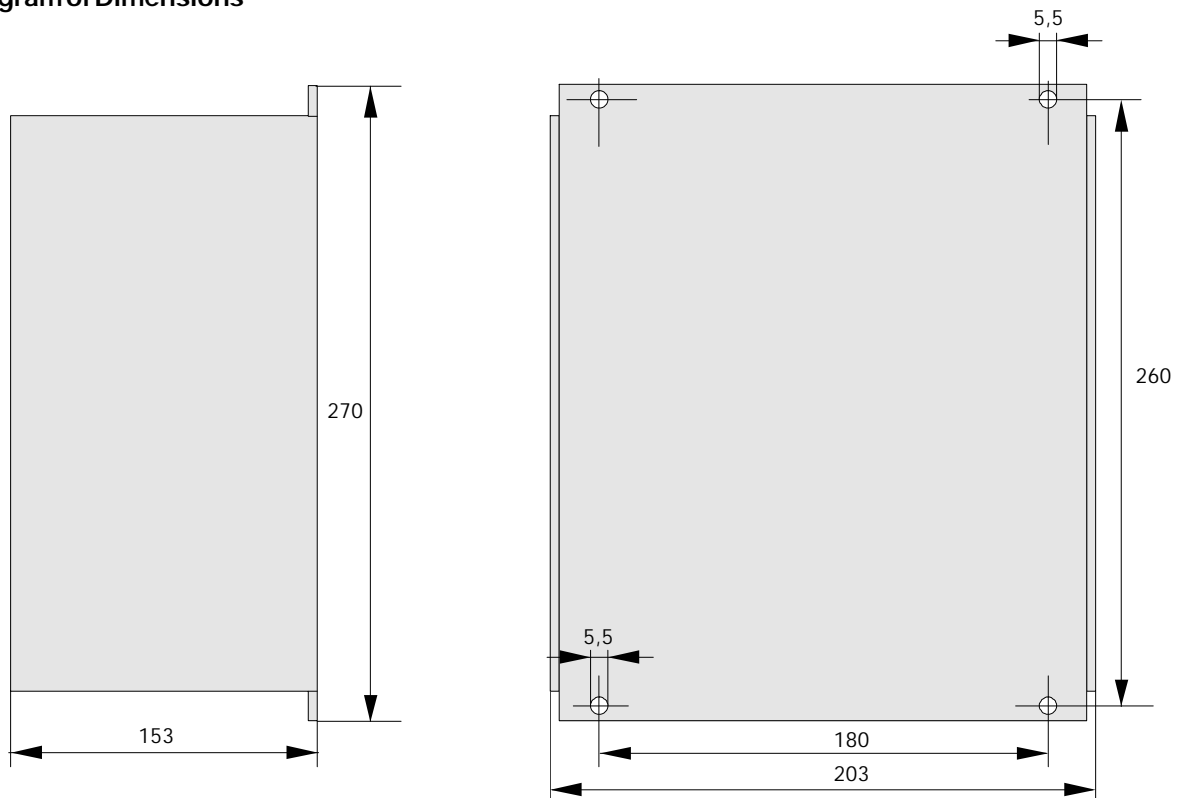
If one or two phases become disconnected the EMC filter can produce leakage currents up to 100mA. Filters and devices with build in filters have to be connected to ground before mains.

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 8.1.7)

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 1...3

8.1.4 Diagram of Dimensions



8.1.5 International Protection

All TA-BL transistors controllers are designed to suit protection class IP00 for switch cabinet mounting.

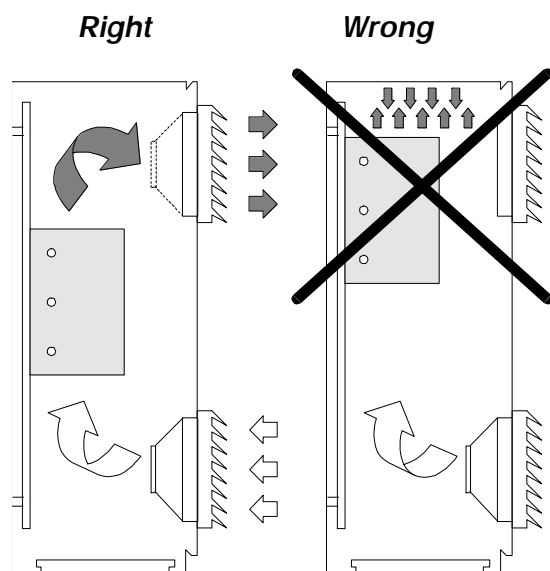
8.1.6 Instruction for Mounting

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)



Drawing

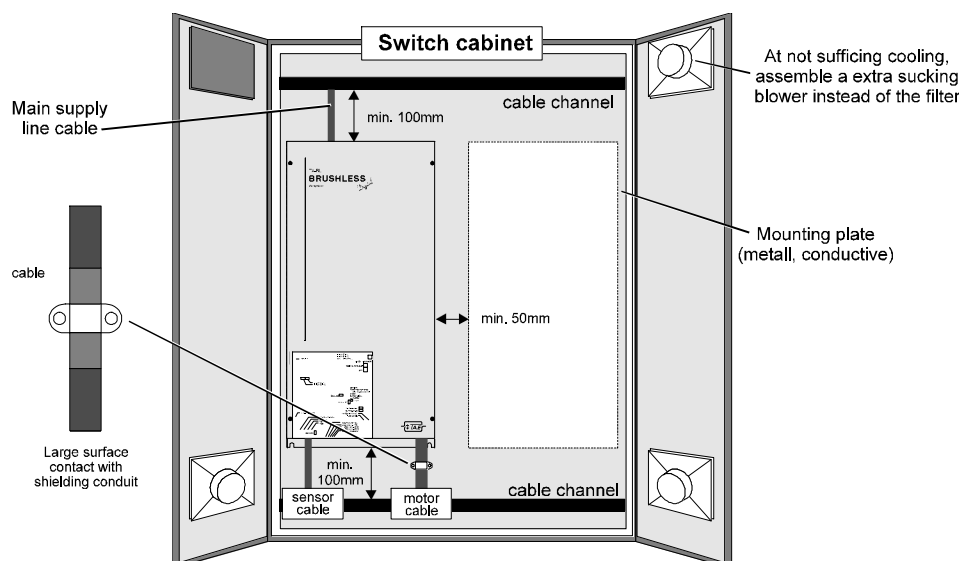
The left picture shows the unit mounted in a optimal position. In the right hand picture the unit is mounted too high. The developed heat cannot escape from the upper part of the cabinet.

8.1.7 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.



8.2 Connections

8.2.1 Powerconnections

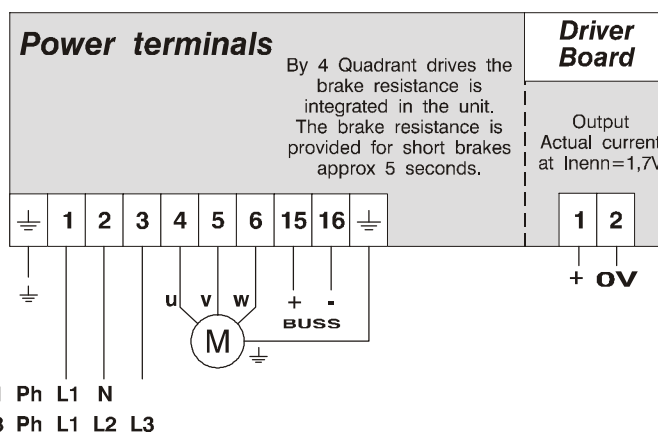
- 1 - 2 - 3** AC Line 1 phase **1**=L1, **2**=MP(N)
 AC Line 3 phase **1**=L1, **2**=L2, **3**=L3
Voltage according to type-marking, 50/60 Hz
TA-BL 1/1 phase: Mains fuse internal (10A FF)
TA-BL 1/3 phase: Mains fuse external (10A FF)
TA-BL 2: Mains fuse must be connected external (16A FF)

- 4 - 5 - 6** Terminals for connection of BL-motor

4=u, **5**=v, **6**=w

By 4 Quadrant drives the brake resistance is integrated in the unit. The brake resistance is provided for short brakes ca. 5 seconds.

- 15 - 16** BUSS-Voltage, **15**=positive, **16**=negative
 The BUSS-Voltage depends on the supplied AC-Line-Voltage.

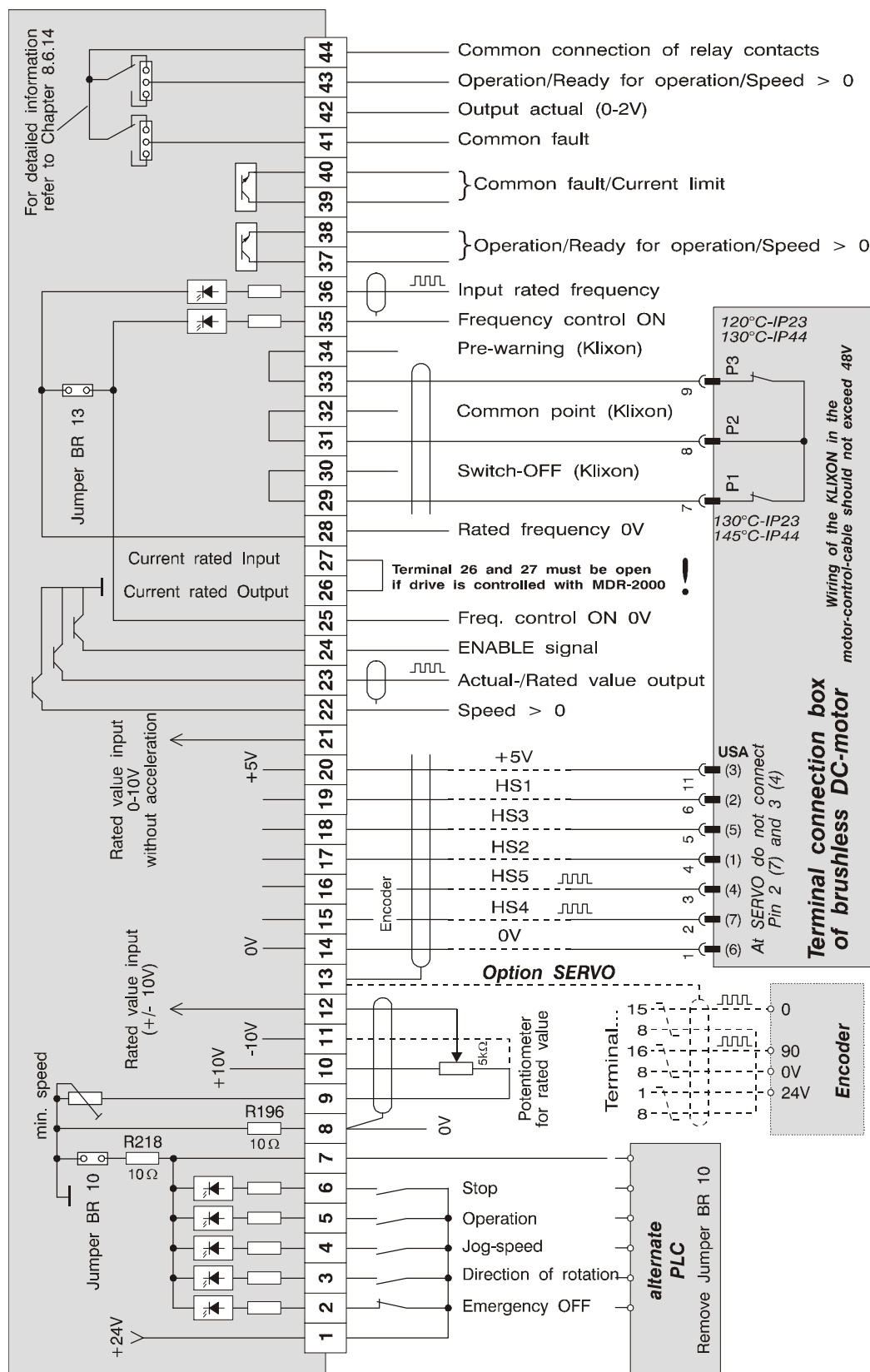


The unit and the motor must be properly grounded! Improper grounding will cause damage to the electronic circuit and to the Hall-sensors of the motor. The common connection of the electronic circuit is in all units connected to ground.

8.2.2 Control and power-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 8.6.11 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 8.6.14)</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> |
|---|--|

8.2.3 Connection diagram of control board LP1

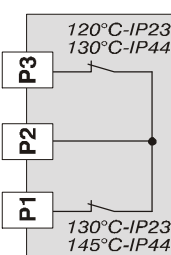


Caution ! Klixon are not evaluated by the device

External KLIXON connection

Separate wiring with a suitable cable is necessary if the KLIXON connection requires a supply voltage of 230VAC. In case terminals 29-34 of the TA-BL control must not

P1 = Switch-OFF
P2 = Common
P3 = Pre-warning



max. contact load 250V/1A

IMPORTANT NOTE!

The wiring for the frequency reference and actual values must be shielded and separated from each other. If the length of the wiring is 1m or less the wiring can be (separately) twisted instead of being shielded, however shielding is necessary in case malfunctions occur.

TA-BL 1...3

8.3 Requirements before Initial Operation

8.3.1 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 8.6

8.3.2 Setting of Motor Parameters

The motor parameters (Chapter 8.6) are adjusted by the factory. The adjustment refers to the nominal data of the selected motor and are documented in the applied test protocol.

8.3.3 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.

8.4 Functional Tests and Initial Operation

Every statement in this chapter is referring to the control board LP1. Chapters 8.2.3 and 8.6 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 8.1 and 8.2

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 8.5.2

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 8.5.2.

5) Adjustment of current limit

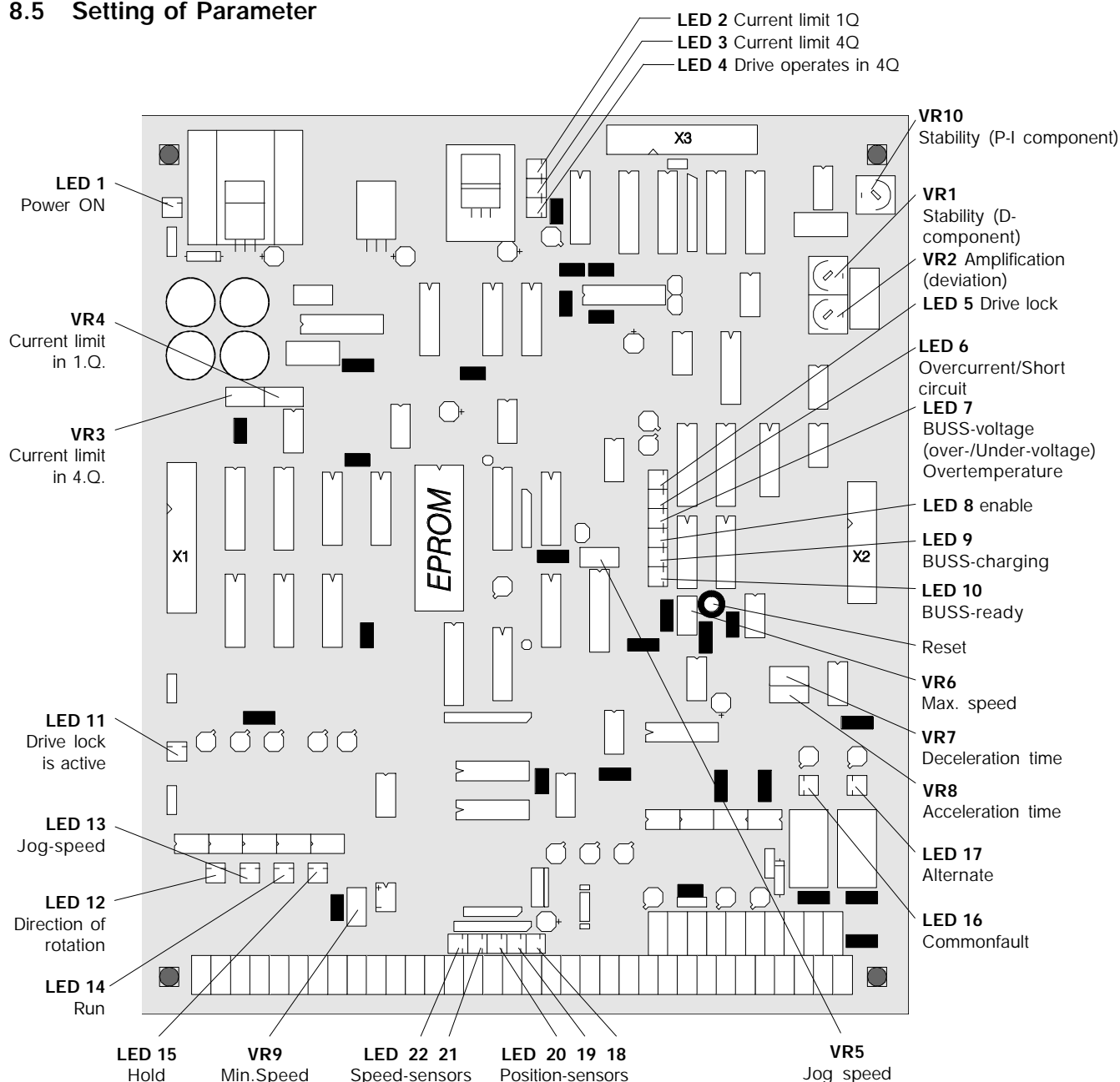
Attention!

For this regulator with transistor 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.

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 signaled. Only if the BUSS voltage sinks below 420V "undervoltage" is indicated.

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

8.5 Setting of Parameter



8.5.1 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

TA-BL 1...3

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. 8.6.14)

8.5.2 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:

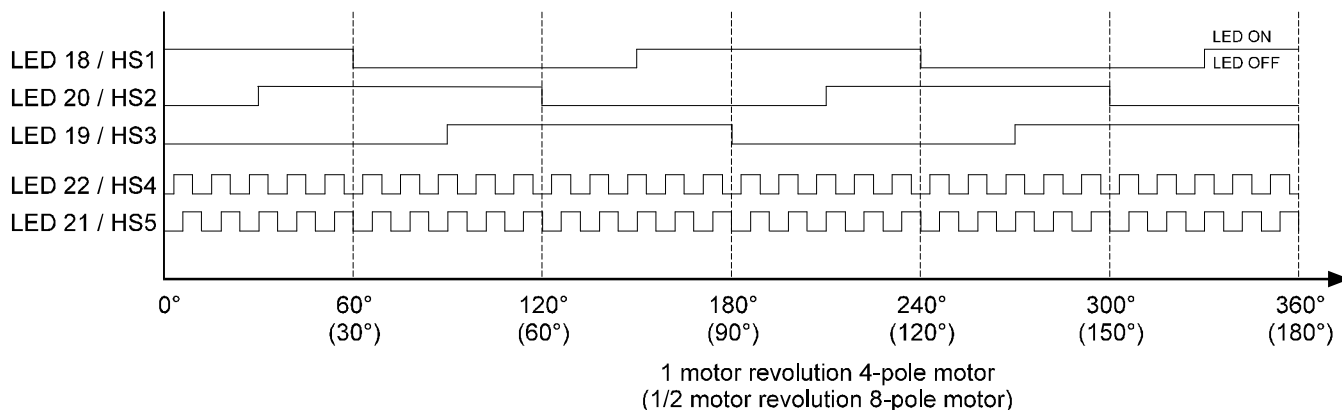
- Disconnect device from mains.
- Connect control cables to motor.
- Remove power cables of motor on terminals U, V, W on the regulator.**
- Turn on mains and control voltage and carry out after the operationally following test.
- Turn the motor shaft slowly counterclockwise with your hand (look at output 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°



8.5.3 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)

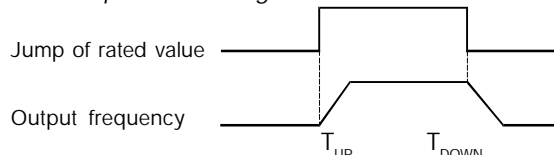
The maximum speed for operation is adjusted with potentiometer VR6 at rated value (10V). If LED 2 lights up it indicates that the drive operates at the current limit or at overspeed. In this case turn potentiometer VR6 back until LED 2 extinguishes. It is possible that the rated speed under rated load 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 8.6.6 and Chapter 8.6.7). 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

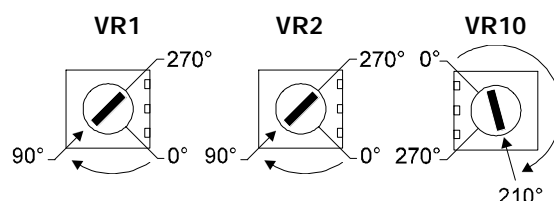
Adjustment of the minimum speed during operation. (this adjustment is only possible if the potentiometer for the reference value is connected to terminal 9 on the control board LP1)

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

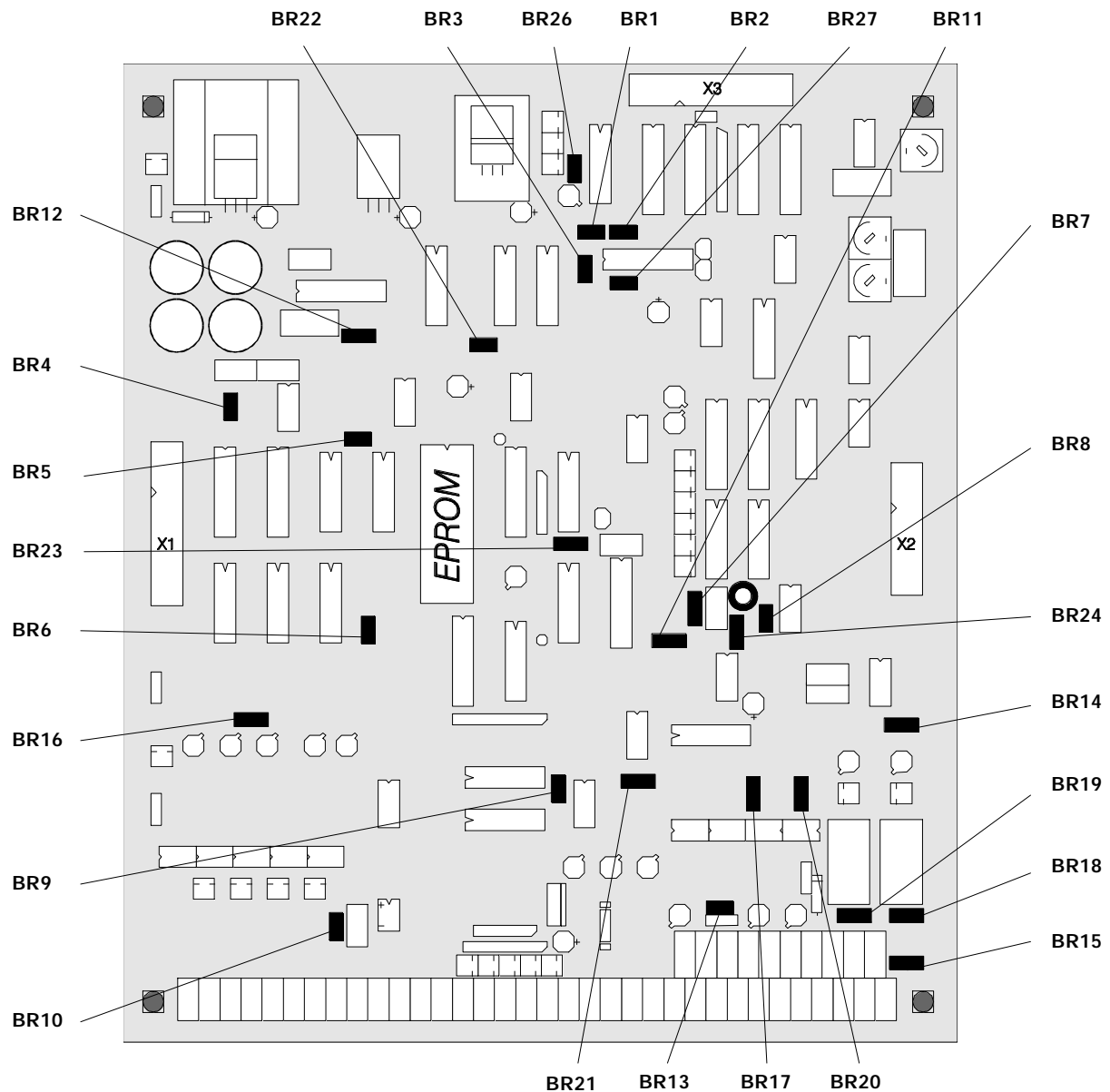


VR3 adjusted for rated motor current (VR3-fully clockwise)
VR4 adjusted for rated motor current (VR4-fully clockwise)
VR6 adjusted for rated motor speed
VR5 These controls are pre-set by the manufacturer. For reference refer to the corresponding test data sheet of the TA-BL drive.
VR7
VR8

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)

8.6 Jumper on Control Board LP1



- 8.6.1 Speed >0
- 8.6.2 Control in 1Q or 4Q
- 8.6.3 Increase of the Rated Value Frequency
- 8.6.4 Common Connection of Optocouplers Connection of t. 25 & 28
- 8.6.5 Motor Rotation Direction
- 8.6.6 Acceleration / Deceleration ON/OFF
- 8.6.7 Leded acceleration without Deceleration by Operation "OFF"
- 8.6.8 Drive Lock at Analogue Rated value 0
- 8.6.9 Stopping Torque
- 8.6.10 120/240 Pulses (Motor)
- 8.6.11 Rated-/Actual Value Output (terminal 23)
- 8.6.12 Option Boards
- 8.6.13 Reset
- 8.6.14 Definition of the Reporting Outputs

BR12	Page	25
BR1 + BR2 + BR4 + BR26		25
BR8		26
BR10, BR13		26
BR9 + BR16		27
BR7 + BR11 + BR27		28
BR5		28
BR3		29
BR6		29
BR22		30
BR21		30
BR23		31
BR24		31
BR14 + BR15 + BR17 +		32
BR18 + BR19 + BR20		

8.6.1 Speed >0

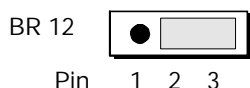
Jumper BR 12

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 8.6.7) 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



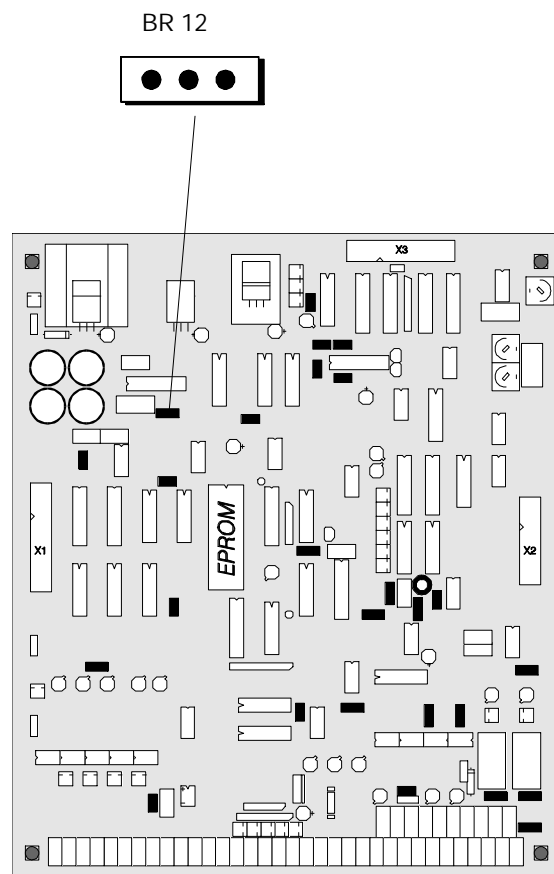
b) Without signal speed >0 at operation off



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

Factory adjustment:

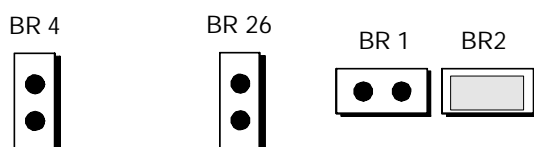
BR12: Pin 1-2 closed



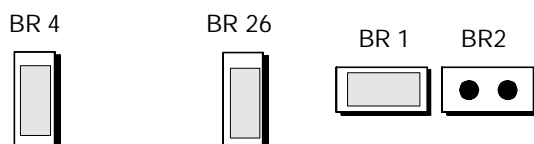
8.6.2 Control in 1Q or 4Q

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

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



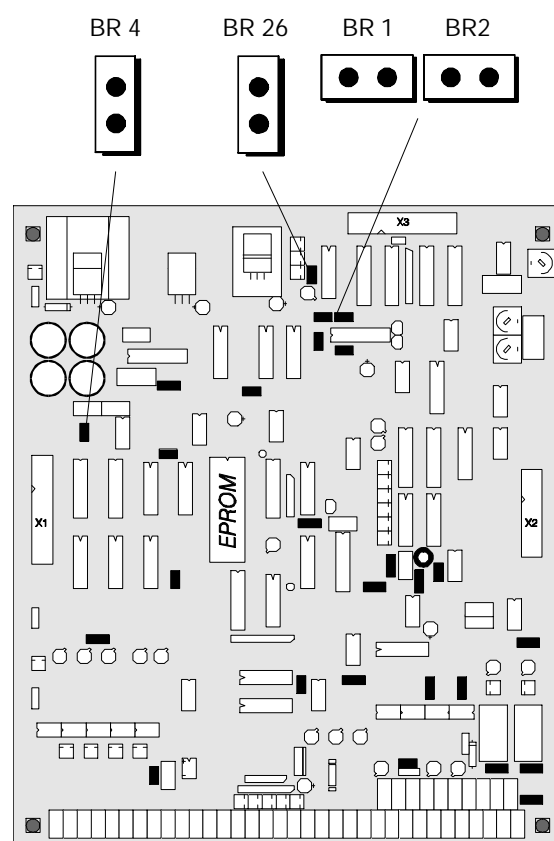
Operation in 4Q - BR 1, BR 4 and BR 26 closed
- BR 2 open



Factory adjustment:

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

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



TA-BL 1...3

8.6.3 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:

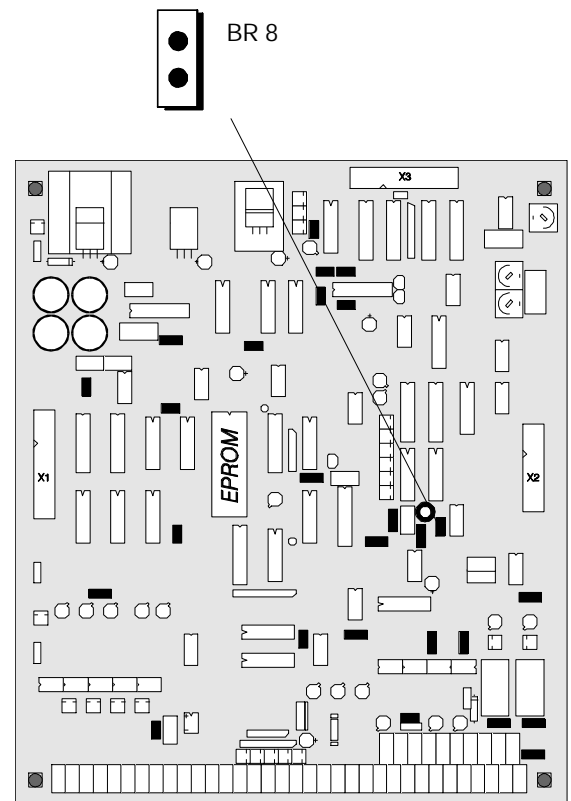
Incremental encoder with 120 pulses (electronic analyzed) per revolution.

Motor size 180 and up:

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

Factory adjustment:

-



8.6.4 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.

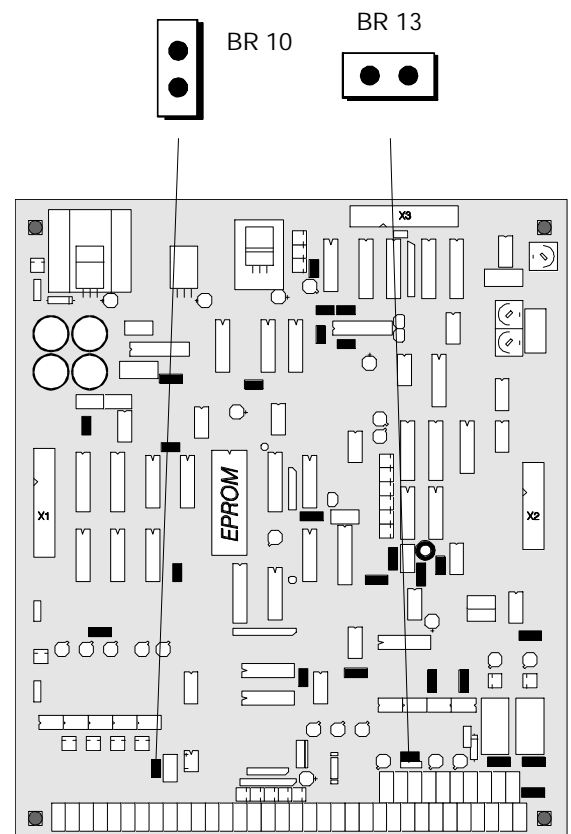
Connection of terminal 25 & 28

Jumper BR 13

This jumper interconnects terminals 25 & 28. Refer to Chapter 8.2 Connection Diagram Control Board LP1.

Factory adjustment:

BR10: closed
BR13: closed



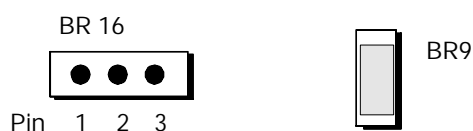
8.6.5 Motor Rotation Direction

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 8.2 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

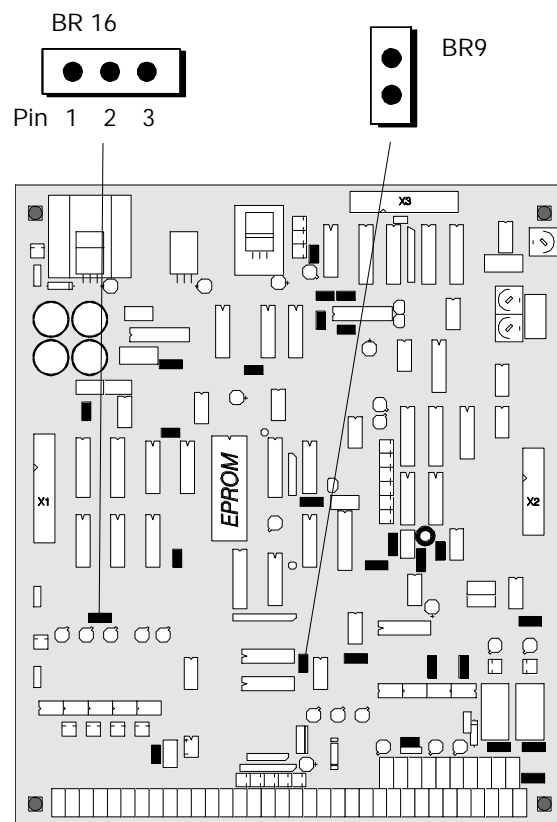
A change of the direction is possible:

- 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

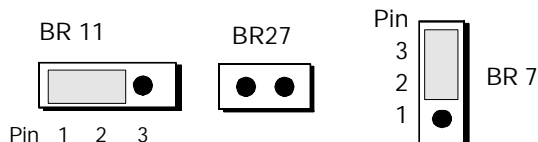
TA-BL 1...3

8.6.6 Acceleration / Deceleration ON/OFF

Jumper BR 7, BR 11 and BR27

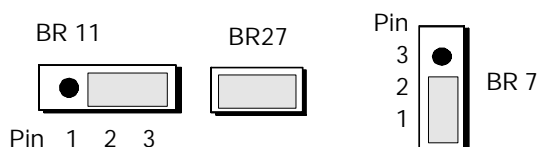
These jumpers are used for the ON- or OFF-switching of the controlled acceleration or deceleration of the drive.

a) With controlled acceleration and deceleration



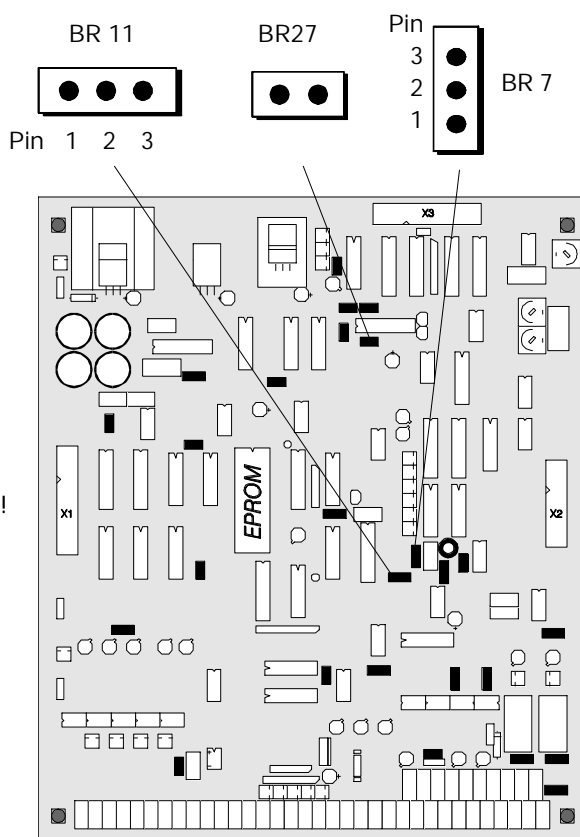
b) Without controlled acceleration and deceleration (max torque)

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



Factory adjustment:

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



8.6.7 Led acceleration without Deceleration by Operation "OFF

Jumper BR 5

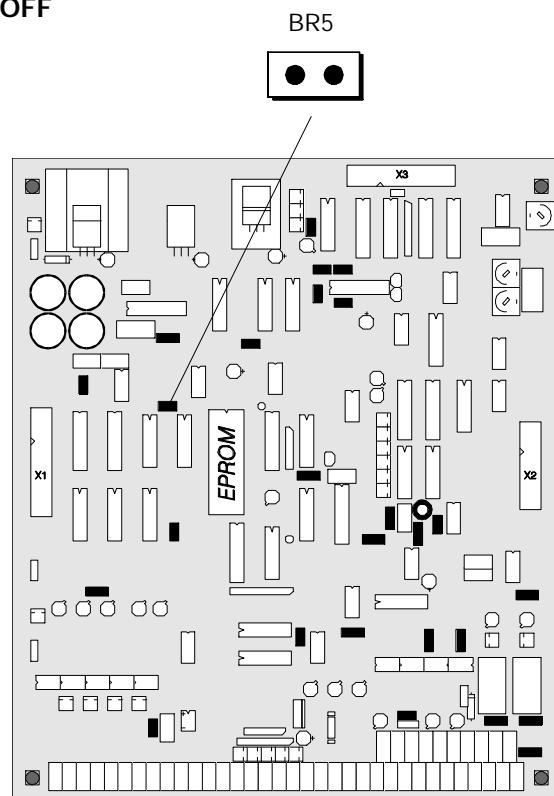
With opened jumper BR 5 the power stage will be turned off after operation off. The drive slows down (centrifugal of mass). The signal speed > 0 can be activated with BR 12 (Chapter 8.6.1).

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



8.6.8 Drive Lock at Analogue Rated Value 0

Jumper BR 3

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

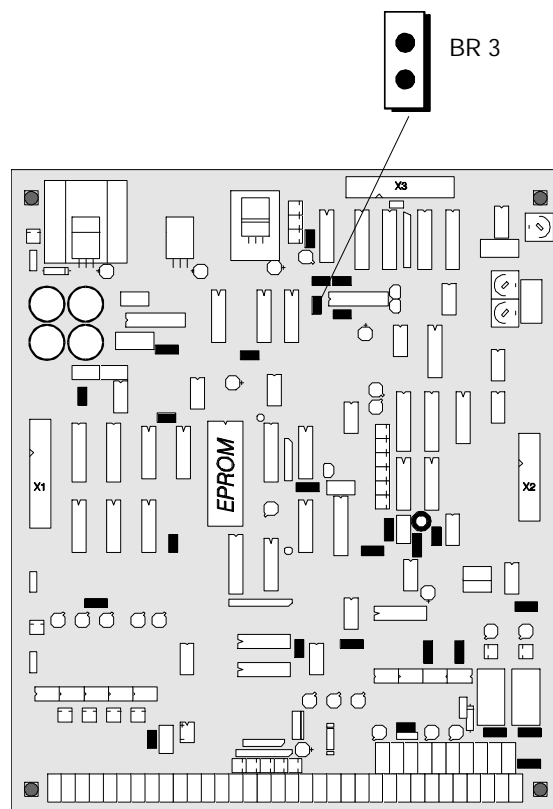
If this jumper is closed all power outputs will be switched off analogue rated value 0. This is also effective if the drive release (terminal 5) is set for ON.

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



8.6.9 Stopping torque

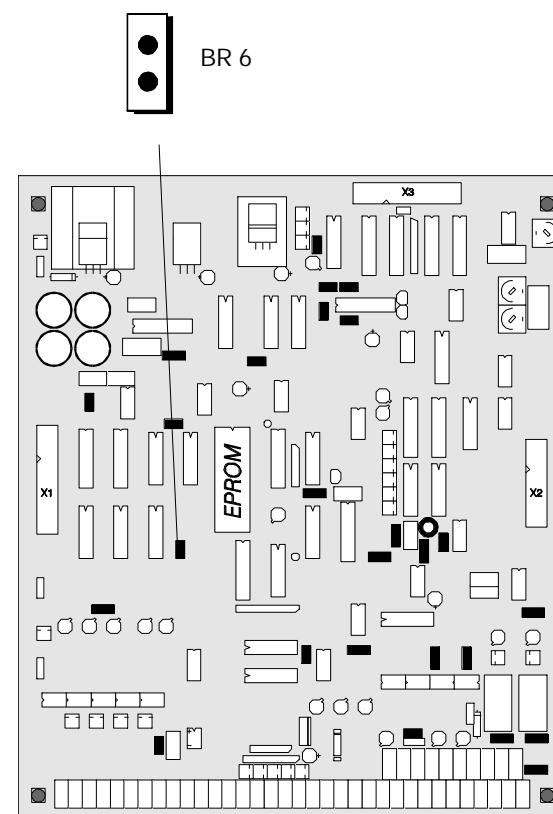
Jumper BR 6

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



TA-BL 1...3

8.6.10 120/240 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).

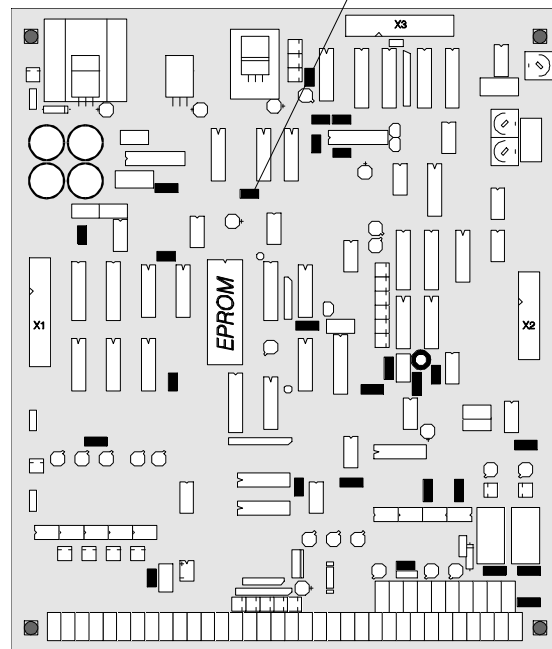
Motor size 180 and up:

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

Factory adjustment:

Motor specific

BR 22



8.6.11 Rated-/Actual Value Output (Terminal 23)

Jumper BR21

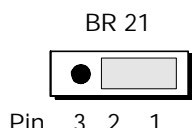
This jumper determines the use of output on terminal 23.

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



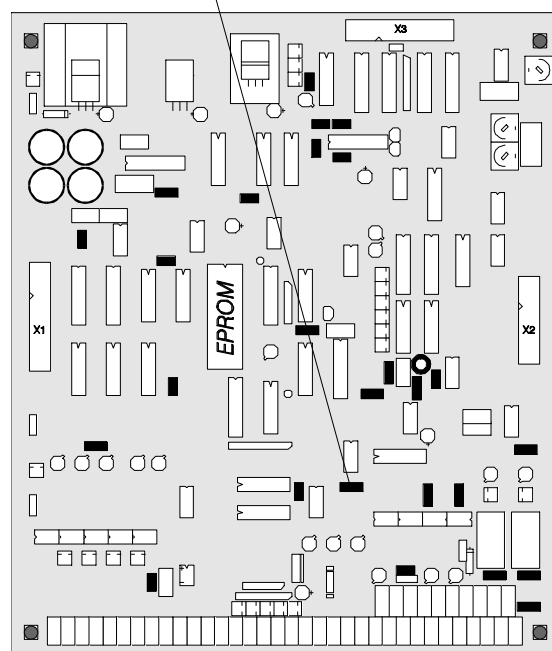
Factory adjustment:

BR21: Pin 2-3 closed

BR 21



Pin 3 2 1



8.6.12 Option Boards

Plug X3

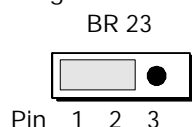
This connector is used for optional cards as phase advance, torque regulator (MDR 2000) or measuring converter.

Jumper BR23

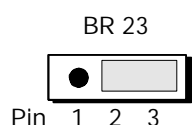
This jumper must be set depending on the installed optional card.

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

Phase advance option active.

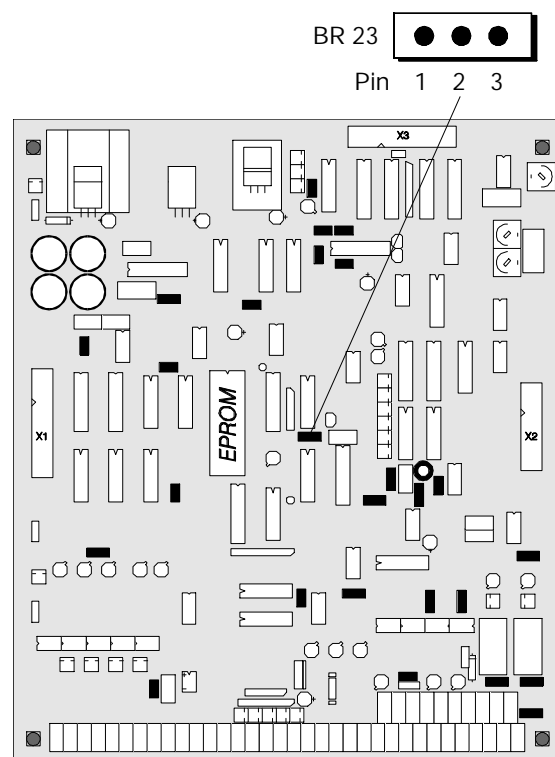


MDR-2000 torque regulator option active.



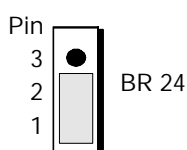
Factory adjustment:

BR23: depending on used option

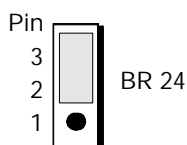


8.6.13 Reset

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:

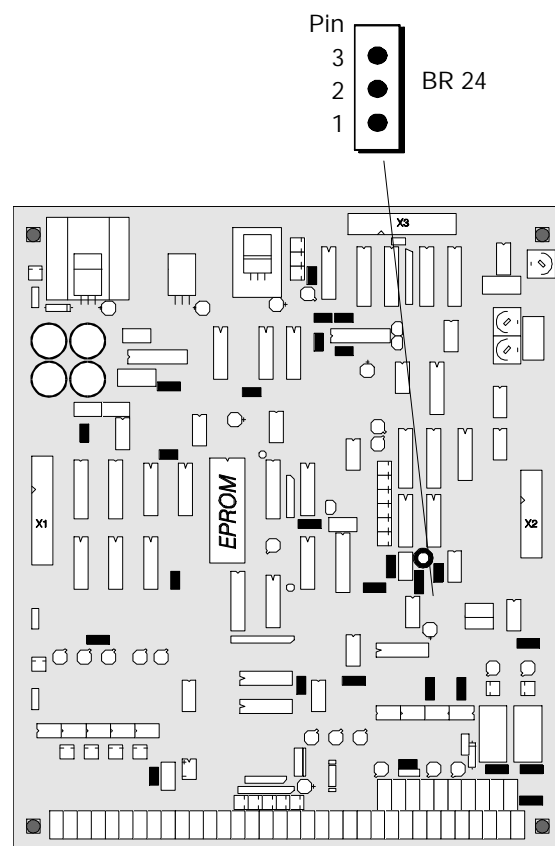
- By pressing key S1.
- If mains was minimum 20s off.

Attention!

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

Factory adjustment:

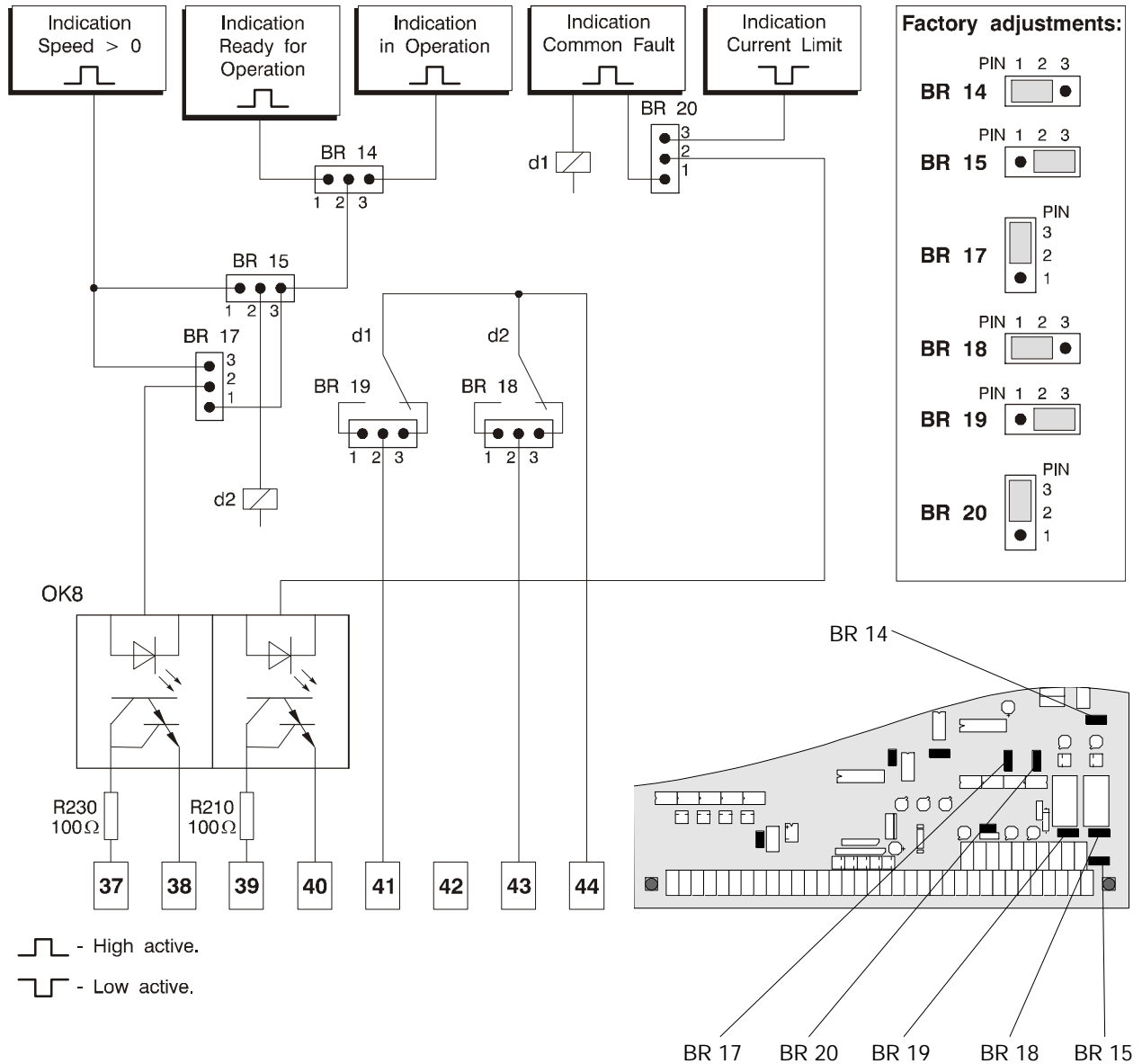
BR24: PIN 1-2 closed



8.6.14 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

8.7 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	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	
Over-/undervoltage BUSS	LED 7	

The following possibilities exist for reset:

By "automatic reset" (Chapter 8.6.13) 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 8.6.13) 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.

8.8 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) Short circuit of terminal 1 of control unit with terminals 7,8 or to ground.
c) BUSS shorted.

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.
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 8.5.2.

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.

8.9 Spare Part List

Article-No.	Description	TA-BL 1		TA-BL 2		TA-BL 3	
		1Q	4Q	1Q	4Q	1Q	4Q
78243-0F	LP1	Control Board TA-BL/E91		1	1	1	1
78218-AF	LP2	Driver Board TA-BL/TSK2 TA-BL 1		1	1		
78218-0F		Driver Board TA-BL/TSK2 TA-BL 2				1	1
78225-0F	LP4	Brake Chopper			1		1
29524-0F	LP5	Torque Controller MDR-2000 < 75A (option)		1	1	1	1
34280-D0	TP1-TP3	Power Transistor 6-pack Darlington 15A		1	1		
34280-E0		Power Transistor 6-pack Darlington 20A				1	1
34324-00	GL1	Rectifier 34A/1000V (1 Phase)		1	1	1	1
34364-00		Rectifier 35A/1200V (3 Phase)		1	1	1	1
36310-00	L1, L2	Line Choke 2x8A		1	1		
36313-00		Line Choke 2x12A				1	1
36497-B0	L3	Snubber Choke		1	1		
36497-F0		Snubber Choke				1	1
30348-00	R3	Charging Resistor 1,5K Ohm 2W		1	1	1	1
30322-B0	R4	Snubber Resistor 10 Ohm 1W		1			
30500-00		Snubber Resistor 2 Ohm 50W			1	1	1
32114-00	C1	BUSS-Capacitor		1	1	1	1
31765-00	C3	Rectifier-Capacitor		1	1	1	1
31791-00	C4	Snubber-Capacitor		1	1	1	1
58078-Q0	Tr1	Transformer		1	1	1	1
35013-00	K1	Relay		1	1	1	1
	E1	Fan S095-2-HWB 230 VAC				1	1
34437-00	F4 - F5	Fuse 20x5 Medium blow 0,5A					
40426-A1	-	Plexiglass-Cover TA-BL 1...3		1	1	1	1

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