

# ***TA-15/I***

## Instruction and Operation Manual

**Caution:**

*There is always a risk involved in the handling of electrical machinery!*

*Therefore mounting and maintenance should only be done by authorized personnel.*

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TA\_BA TA-15\_I\_EN.PDF

The German text applies in cases of doubt

Read these instructions carefully before installation, adjustment and operating of the drive control.

## 1. Technical data

Measurements	:	refer to drawing TA-15 0280
Line voltage	:	400V , three phase, 50/60 Hz
Power	:	15 kW
Armature voltage	:	460V
Field voltage	:	270V
Armature current	:	45 A max.
Field current	:	3 A max.
Ambient temperature:		0°C to +40°C
Speed accuracy	:	3% with armature feedback 1% with tachometer feedback

Semiconrolled three phase bridge, field-current control, phase control, blocking control, current limit and tachometer input control, acceleration and deceleration integrator, voltage and speed control, controlled deceleration at locked drive, logical switch programming, single pole armature disconnection, electronic circuit galvanically separated from line when tachometer feedback is utilized. High resistive connection of electronic circuit to line when armature feedback is used.

## 2. Connection of the drive control (refer to drawing TA-15/I 11505 A1)

Ensure that the voltage indicated on the type marking of the unit corresponds to your a.c. line voltage.

### Terminal strip KL 1

L <sub>1</sub> - L <sub>2</sub> - L <sub>3</sub>	a.c. input, three phase, voltage according to the type marking on the unit, 50/60 Hz
A+ A-	Terminals for connection of armature
F+ F-	Terminals for connection of field
1 - 9	Switch "Drive ON" Unit remains connected to line until contacts are opened.
2 - 5 - 6	Speed potentiometer, connect center to terminal 2, start to terminal 5 and end to terminal 6.
3	Spare terminal
4 - 9	Switch "Jog speed ON" Unit remains connected to line until contacts are opened.
7 - 8	Contacts from relay d 6 (free potential, common fault)
10	Terminal for negative supply voltage for electronic circuit (-15 V).
11 - 20	Terminals for connection of d.c.tachometer; Terminal 11 positive (+), terminal 20 negative (-) Tachometer adaption with R 107.

12		Reference current
13		Current control input; terminals 13 and 18 must be interconnected when speed control is used.
14		Terminal for positive supply voltage of electronic circuit (+15 V).
15		Commutator T 18
16		Terminal for positive supply voltage of electronic circuit (+24 V).
17		Signal input (positive) for sequential drives. Input signal according to value of resistor R 75 , however max. 240 V d.c. Input current approx. 1 mA at max. motor speed.
18		Speed control output
19 - 20		Terminals for connection of a.c. tachometer. Tachometer adaption with R 107.
21 - 22 - 23		Terminals for connection of external acceleration potentiometer. If external potentiometer is used, control P 11 must be removed from circuit.
24 - 25		Spare terminals
26 - 27 - 28		Change-over contact from relay d 6 ( free potential, common fault indication)
29 - 30		Emergency stop
31 - 32		Contacts (free potential) to operate auxiliary relay.
33 - 34 - 35		Change-over contacts (free potential) from voltage / speed control.
36 - 37 - 38		Terminals for connection of external deceleration potentiometer.
39		Spare terminal
40 - 41		Spare terminals

### 3. Drive control adjustment

Switching hysteresis	P 1	This potentiometer enables an infinite variable adjustment of the switching hysteresis from 0,03 V to 3 V in the 0 - 10 V range, and from 0,1 V to 20 V in the 0 - 300 V range.
Phase ballance	P 2/P 3/P 4	These potentiometers are for the adjustment of the blocking period of the individual SCR's, in order to equalize the currents in all three phases. The potentiometers are factory adjusted and sealed.
Stability	P 5	With this potentiometer the drive is dynamical adapted to the load.
Response voltage	P 6	Adjustment of the requested switching point of the voltage control relay for voltage or speed.
Current limit	P 7	Adjustment of the requested maximum armature current. 45 A max. permissable.

I x R compensation	P 8	This potentiometer enables to compensate for the voltage drop in the armature and in the supply line when armature feedback is utilized. <u>When tachometer feedback is used, set this potentiometer fully counterclockwise!</u>
Sensitivity	P 9	Adjustment for the blocking protection. This potentiometer is factory adjusted and sealed. Do not attempt to change setting !
Deceleration rate	P 10	Adjustment for linear deceleration of the motor from maximum to minimum speed (adjustable from 2 to 20 sec at positive torque). The deceleration is only effective with the change of the reference signal. At locked drive the motor will decelerate at coast rate.
Acceleration rate	P 11	Adjustment for linear acceleration of the motor from minimum to maximum speed (adjustable from 2 to 20 sec.).
Maximum speed	P 12	Adjustment for maximum speed during operation (set speed potentiometer fully clockwise).
Current zero point	P 13	This potentiometer is factory adjusted and sealed. Do not change setting.
Jog speed	P 14	Jog speed adjustment
Delay time	P 15	Adjustment of the delay time of the control-relay d 6 , from 1 to 10 sec, in case of fault.
Minimum Speed	P 16	Adjustment of the minimum speed during operation (set this potentiometer fully counterclockwise).

#### 4. Indicator lamps

The following functions are indicated with light emitting diodes (LED's):

a) SCR triggering	clear	LED 1, LED 2, LED 3
b) Speed/voltage on, Relay d 1 energized	yellow	LED 4
c) Power supply + 15 V	green	LED 5
d) Current limit, overspeed	red	LED 6
e) Extension for relay	yellow	LED 7
f) Power supply - 15 V	green	LED 8

g) Current supply, -10 V	green	LED 9
h) Jog speed	yellow	LED 10
j) Drive ON	yellow	LED 11
k) Drive release	yellow	LED 12
l) Motor ON (Armature relay ON)	clear	LED 13

5. Functional tests and preliminary tests before operating

a) Armature feedback control (UA-control)

1. If a controlled deceleration at drive stop is desired, the jumper VIII must be installed. For an emergency stop the connection between terminals 29 and 30 must be interrupted. The drive lock will then be immediately effective. Install jumper III and jumper IX. Check if R 109 and R 110 are installed. Remove R 107 from circuit.
2. Check all connections with an Ohm-meter for grounds.
3. Check if line voltage corresponds with voltage indicated on type marking.
4.

Potentiometer	P 10	deceleration time	set in center position
Potentiometer	P 11	acceleration time	set in center position
Potentiometer	P 8	I x R compensation	set fully counterclockwise
Potentiometer	P 5	stability	set fully clockwise and then turn back approx. 90°
Potentiometer	P 16	Min. speed	set fully counterclockwise
Potentiometer	P 14	jog speed	set fully counterclockwise
5. Switch on line voltage. Diodes LED 5 - green , +15 V and LED 8 - green , - 15 V and LED 9 - green , -10 V must light up.
6. Switch on drive (Drive ON , interconnect terminals 9 and 1). LED 11 (Drive ON) and LED 13 ( Motor ON) will now light up; shortly after also LED 12 (Drive release) will light up.  
When the speed potentiometer is turned clockwise, the armature voltage / speed will rise. During this adjustment the clear diodes LED 1, LED 2 and LED 3 (SCR triggering) will light up. Turn the speed potentiometer fully clockwise and adjust the armature voltage/ speed, for the requested value. The output voltage must not exceed 460 V since otherwise no control at low line voltage will be possible. Turn the speed potentiometer fully counterclockwise. The output voltage must drop back to 0 V, now adjust potentiometer P 16 (min. speed) for the requested minimum speed.
7. Switch off drive and switch on jog speed (terminal 9 must be connected with terminal 4). Adjust potentiometer P 14 for the requested jog speed.
8. Adjust the I x R compensation with potentiometer P 8. Check for an approximate equal speed with and without motor load in the lower speed range. When the potentiometer is turned clockwise, the speed under load will increase. If the compensation potentiometer is set too high, the drive will become unstable.

9. Current limit: For checking the current limit disconnect the motor field and block the motor. The field control must be jumpered between points g and f . Switch the drive on (Drive ON), preset a reference signal and adjust potentiometer P 7 for the requested current. The red diode LED 6 (Current limit) must now light up. Relay d 6 will become deenergized and will switch the drive off with a delay. The delay time can be adjusted with potentiometer P 15. Caution: The blocked motor must not be under current for more than 10 sec, otherwise the commutator may become damaged.
10. Adjust the requested acceleration rate with potentiometer P 11
11. Adjust the requested deceleration rate with potentiometer P 10.  
The deceleration rate cannot be shorter than the coast rate of the drive under load, since the SCR drive control operates in the 1st quadrant only. The deceleration is only effective at locked drive (contact of terminal 9/1 must be open). The Emergency OFF must not be engaged and the voltage control must be switched on with jumper VIII.  
The locking of the drive will now take place only when the motor stops or when the preset switching point of the voltage control has been reached. The switching point of the voltage control is infinitely variable with potentiometer P 6 , without jumper II, from 0 V to 10 V.  
If jumper II is connected, the actuating voltage is adjustable in the range from 0 V to 300 V. The switching hysteresis is to be adjusted with potentiometer P 1
12. If a controlled deceleration is not requested, the potential free change-over contacts of the voltage control relay can be used for other functions. In this case jumper IIIa must be installed. If this jumper is installed the drive lock is activated immediately after the unit is switched off.
13. Stability potentiometer P 5. This potentiometer must be adjusted so that the drive operates without overshoot in the preset speeds .

b) Tachometer feedback control

1. Remove jumpers IX , III and VIII and also R 110 from circuit. Install R 107. The value of R 107 is calculated as follows:  
$$R\ 107\ \text{in}\ k\Omega \hat{=} \text{Tachometer voltage at rated motor speed minus } (-) 50.$$
2. If a d.c. tachometer is used, jumpers VI and X must be removed and jumper XI must be installed.  
If an a.c. tachometer is utilized or if two directions of rotation are requested, jumper XI must be removed and jumpers VI and X must be installed.
3. If the function of a speed control is requested, jumper VII must be installed.
4. The I x R compensation potentiometer must in all cases be set fully counterclockwise.

For all further adjustments refer to the adjustments as previously described for the armature feedback control.

6.) List for Jumper

- a) Drive control: Jog speed on without acceleration and deceleration integrator.
- b) Drive control: Jog speed on with acceleration and deceleration intergrator.

Jumper	V	VA	VB	VC	VD	IXA
a)		×		×		×
b)	×		×		×	

## 7. Troubleshooting

For fast and effective troubleshooting proceed as follows:

Check drive for:

- a) Intermittents and loose connections
- b) Defective insulation of the connecting leads
- c) Defective motor (brushes etc.)

### CAUTION !

Do not use any Megohmmeter, buzzer, or similar test instruments.

Test instruments must be galvanically separated from the a.c. line.

The electronic circuit carries a voltage potential against ground when drive is armature feedback controlled (UA-controlled).

### Fault location

<u>Sympton</u>	<u>possible causes</u>
LED +15 V , -15 V does not light up	<ul style="list-style-type: none"><li>a) Fuse Si 1 or Si 2 defect (upper circuit board).</li><li>b) One phase is missing.</li><li>c) Line transformer defect.</li><li>d) Check power supply and stabilizers.</li></ul>
Output voltage does not increase when speed-potentiometer is turned up	<ul style="list-style-type: none"><li>a) Motor load is too high, drive operates at current limit. LED 6 lights up; possible switch off of electronic circuit.</li><li>b) Speed potentiometer defect.</li><li>c) Current limit is set too low.</li></ul>
Drive is unstable	<ul style="list-style-type: none"><li>a) I x R compensation is set too high.</li><li>b) Defective tachometer or tachometer leads.</li><li>c) Improper adjustment of stability potentiometer P 5.</li><li>d) Auxiliary series winding of the d.c. motor is wrong connected</li><li>e) Defective SCR or SCR-triggering</li></ul>
Drive does not run when switched on (Drive ON)	<ul style="list-style-type: none"><li>a) Check contact (Terminal 1 - 9) (external contact)</li><li>b) Emergency Off - contact open.</li><li>c) Defective relay d 4. .</li><li>d) Jumper between terminals 13 - 18 missing.</li><li>e) no field-supply, check field voltage and field control.</li></ul>



Speed varies without change of setting of speed potentiometer

- f) Check speed potentiometer
- g) Missing or wrong supply voltage -10 V, LED 9, -10 V does not light up.

Main fuse blows

- a) Motor is overloaded
- b) Current limit is adjusted too low
- c) Defective speed potentiometer
- d) Defective SCR or defective SCR-triggering.
- e) Defective tachometer or tachometer leads.
- f) Check -10 V supply voltage.

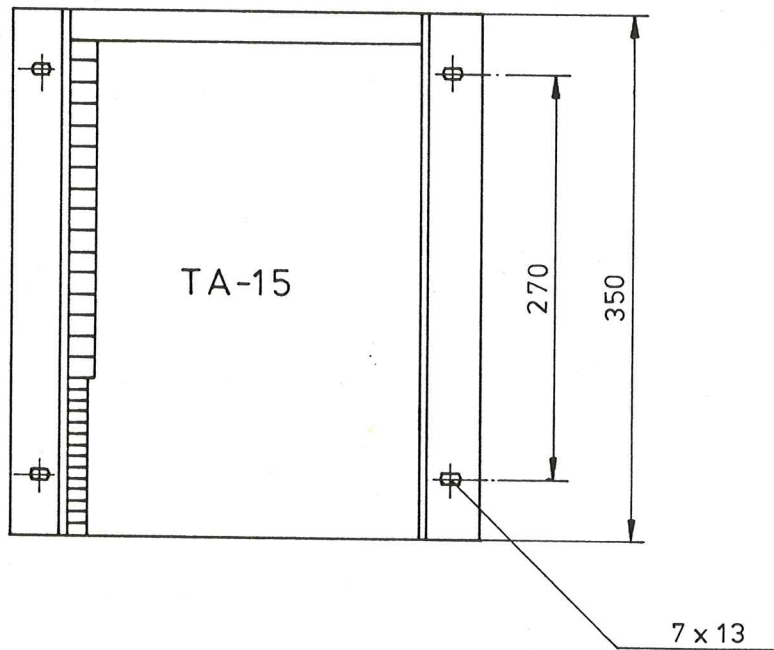
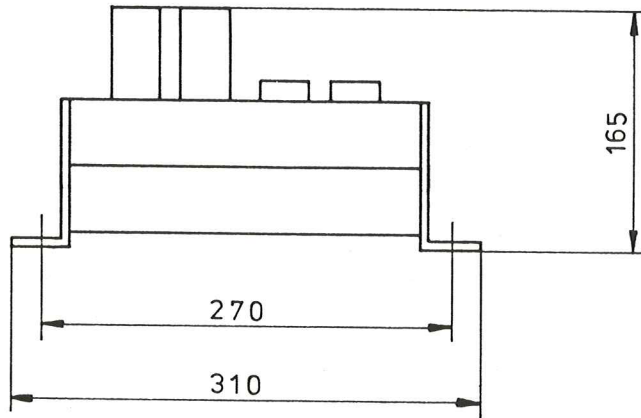
Drive runs after control release at max. speed, however speed control in zero position

- a) Shorted or grounded armature connections.
- b) Defective power-semiconductor.
- c) Defective SCR triggering or defective synchronization.
- d) Motor or armature defect. Check brushes.

Drive accelerates to max. speed after control is released, however adjustment is set for low speed

- a) Intermittent potentiometer P 16 - minimum speed -
- b) Intermittent speed potentiometer or intermittent connection from terminal 5 to potentiometer.
- a) Intermittent tachometer feedback or defective tachometer, wrong polarity.
- b) Defective armature feedback (also refer to point 5., a), 1.)
- c) Defective max. speed potentiometer P 12.

This concludes the preliminary preparation and adjustment of the Thyristor-Drive-Control Type TA-15/I.

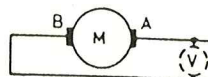


			Datum	Name	TAE Antriebstechnik
			Bearb. 28.8.80	<i>Re</i>	
			Gepr. "	<i>Re</i>	
			Norm		
			Maßstab	Benennung	Zeichnungs- Nr.
			1:5	TA-15 Maßblatt DIMENSIONS	TA 15 0280 11500 M1
1	1.4.80	<i>Re</i>			
Ausgabe	Datum	Name			

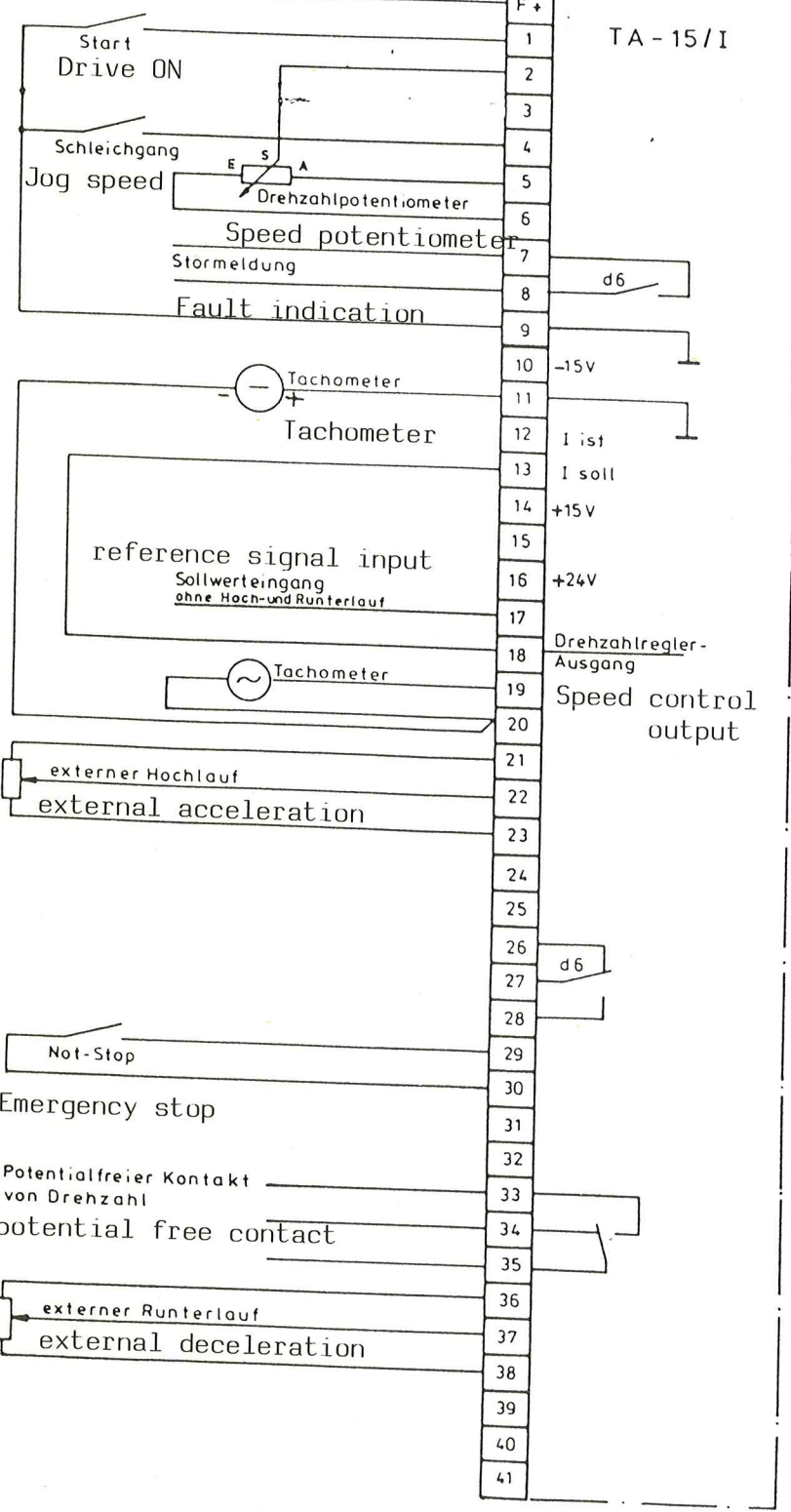
Line chokes

Netzdrosseln

L1  
L2  
L3



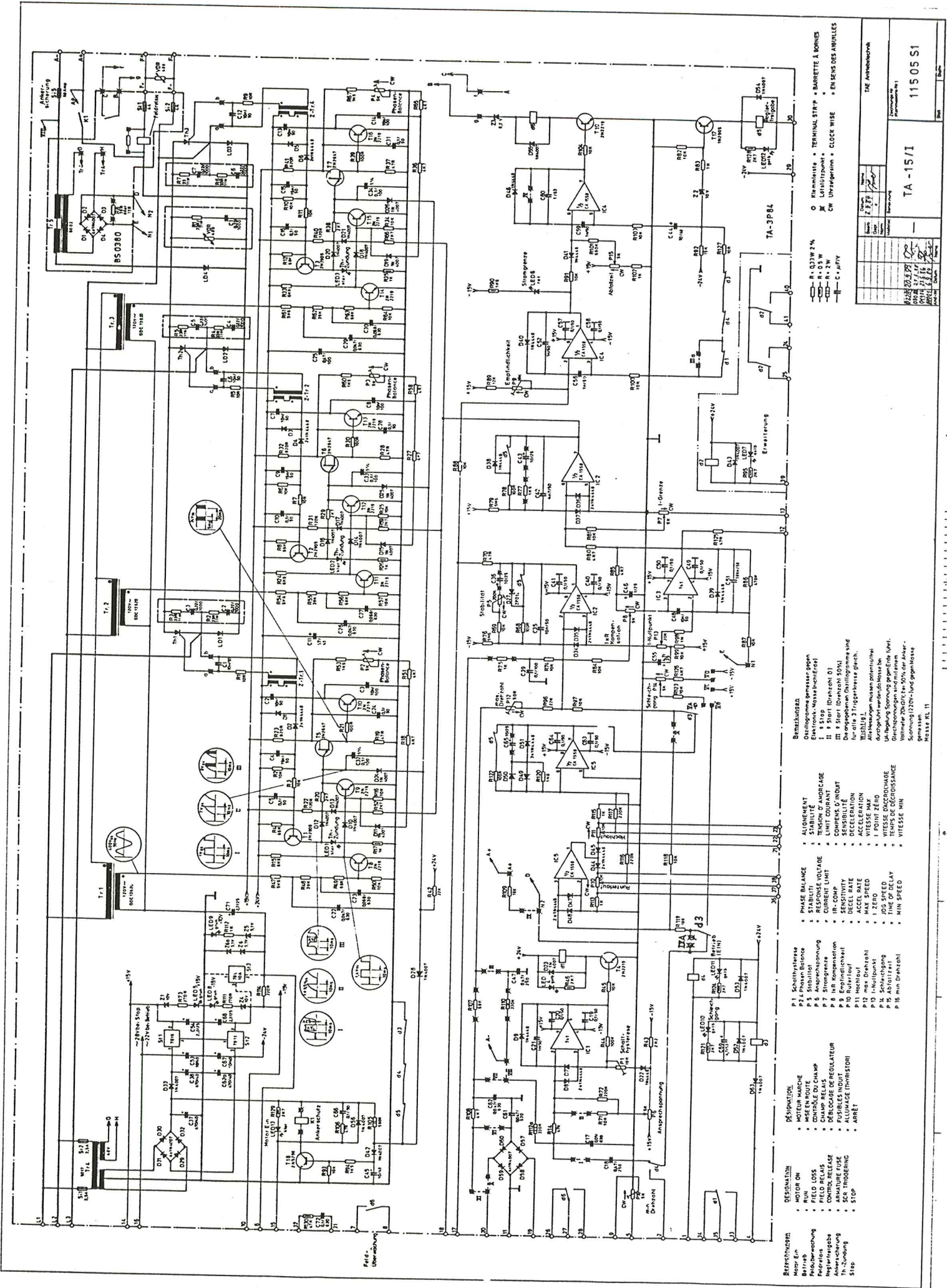
L4  
Glättungsdrossel.



TA-15/I

Ausgabe		Datum		Name		Bearb.		Datum		Name		Bezeichnung		Blatt		Blätter	
1		12.5.74				11344							TA-15/I Anschlussbild				115 05 A1

Zeichnungs-Nr.  
(Kommissions-Nr.)



- R 0,33W 2%  
 W 1/4W  
 Cw Unreguliert • CLOCK WISE • EN SENS DES ANHILLES  
 C 0,1µFV

- O Klemmleiste • TERMINAL STRIP • BARRETTTE A BORNES  
 X Leuchtpunkt  
 CW Uhrzeigersinn • CLOCK WISE • EN SENS DES ANHILLES

- BREMSELENDEN**  
 O Schrittmotorgeschwindigkeit  
 O Elektrik-Messwertbereich  
 II 4 Stop (Drehzahl 0)  
 III 8 Start (Drehzahl 50%)  
 Die eingetragenen Drehmomente sind für alle 3 Triggereinstellungen gleich.

- ALIMENT**  
 \* STABILITE  
 \* REPERSE VOLTAGE  
 \* CURRENT LIMIT  
 \* IR-ODP  
 \* SENSIBILITE  
 \* DECELERATION  
 \* ACCELERATION  
 \* MAX SPEED  
 \* I ZERO  
 \* TEMPS DE ACCROISSANCE  
 \* THE OF DELAY  
 \* MIN SPEED

- BEZUGSPUNKTE**  
 MOTOR ON  
 RUN  
 FIELD LOSS  
 FIELD RELAYS  
 ARMATURE FUSE  
 ICH FROERING  
 STOP

P 1 Schrittmotoren  
 P 2 Motorbrücke  
 P 3 Antriebsstrom  
 P 4 Strombegrenzung  
 P 5 IR-Kompensation  
 P 6 IR-Relais  
 P 7 Regulator  
 P 8 Regulator  
 P 9 Maximaler Drehmoment  
 P 10 Nullpunkt  
 P 11 Maximaler Drehmoment  
 P 12 Maximaler Drehmoment  
 P 13 Motorbrücke  
 P 14 Motorbrücke  
 P 15 Min Drehzahl

TA-15/I

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# Connection diagram to use with a external Armature contactor

