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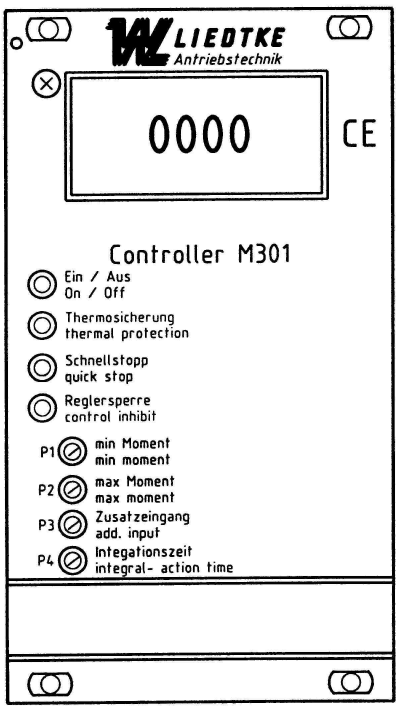
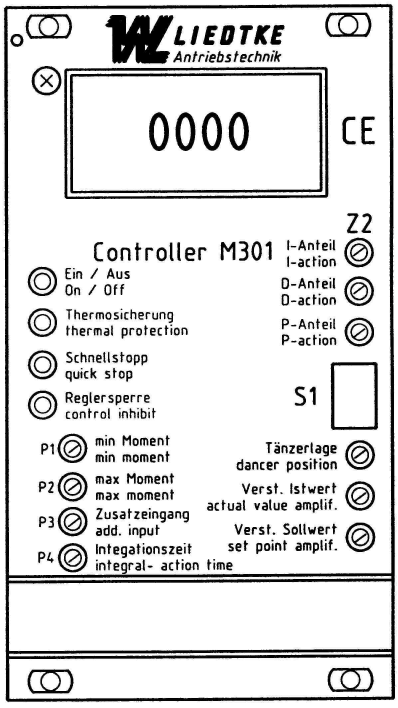
Operating and adjustment instruction

Controller M301



Controller M301
(Display optionally)



Controller M301
with PID-controller Z2
(Display optionally)

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Important Safety Instructions

The device may only be installed and connected by an electrically skilled person with the aid of this manual. National standards and safety regulations must be observed (see DIN V VDE V 0100534... or IEC 60364-5 534:...).
The device must be checked for external damage prior to installation. If any damage or other defects are detected in this check, the device must not be installed.
Its use is only permitted within the limits shown and stated in these manual. The device and the equipment connected to can be destroyed by loads exceeding the values stated. Opening or otherwise tampering with the device invalidates the warranty.

The manufacturer does not take over any responsibility for any consequences resulting from incorrect or negligent installation, change of existing parameters of the devices or the false combination with peripheral components.

A device-independent power shutdown must be guaranteed.
Fuses may only be replaced by fuses of the same type.

For reference and actual signals you have to use shielded cable.
To this please also note the hints for an EMC-proper installation.

In the devices are used components which are sensitive to electrostatic discharges. During the operation, installation and maintenance, measures have to be taken in order to avoid electrostatic discharges.

Attention:
As a basic principle the device has to be made dead before any contact.
In case of non-observance there is the possibility of an electrical shock.

This manual was prepared according to the best of our knowledge and belief. ***LIEDTKE*** is not liable for possible errors and reserves the right to make technical changes without prior notice.

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1. Product description of Controller M301

The Controller M301 is used as constant current controller for magnetic powder brakes / clutches. Magnetic powder brakes / clutches being supplied by the controller M301 do not show any torque change caused by heating. Due to the constant current control, the output current is widely independent from the load resistance.

2. Design Controller M301

Structure of the device:

plug-in card / Euro-card, connection via bracket for plug-in cards type DIN 41612 with front panel for 19inch Rack, Net potential free.

Technical data:

- output current max. 1 A
- output tension max. 24 VDC
- voltage supply 24 VDC
- alternatively 24 VAC, 50 Hz (60 Hz)
- via external isolation transformer 230 V/ 24 VAC 50/60 Hz, 63 VA (Option)
- control inhibit
- set point tension 0 … 10 VDC
- set point integrator + / - adjustable
- additional reference input 0 … 10 VDC
- min. moment adjustable (min. output current)
- max. moment adjustable (max. output current)
- connection for an external ampere meter
- quick stop function
- remanence compensation
- thermal protection via external sensor
- potential-free thermal relay contact (opening / closing contact)
- LED-display for control inhibit, thermal protection, ON/OFF and quick stop
- optionally: LC-Display in the front panel (ampere meter)

Option:

PID-controller Z2 slip-on, to realise a closed loop control system for tension / pressure / dancer regulation.

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3. Function specification of Controller M301

3.1 Reference input

The reference input at terminal 12c serves to drive the current source of the Controller M301. This supplies a max. output current of 2 A at a max. reference value of 10 VDC.
When using the PID-controller Z2, the jumper JP2 has to be plugged on position 2-3, whereby the set-point channel is directed on the PID-controller. (considered in the delivery state).
If no PID-controller is installed, jumper JP2 must be in position 1-2.

3.3 Setting the maximum moment

The maximum moment of the brake/clutch at a set point value of 10 V can be adjusted via the potentiometer **P2**.

3.2 Setting the minimum moment

The minimum moment of the brake/clutch at a set point value of 0 V can be adjusted via the potentiometer **P1**.
The adjusting range is 0…20% of max. value.
If the remanence compensation is activated the minimum moment must be = 0. (potentiometer **P1** on left limit).

3.4 Additional input

The device has an additional input at terminal 12a. The influence of the additional reference value can be adjusted with the help of the potentiometer **P3** and acts on the current value via a transfer circuit.

3.5 Reference integrator

The Controller M301 has as standard a reference integrator. This will be activated by feeding the reference value on terminal 16c and by connecting the terminals 18a and 12c. By using the potentiometer **P4**, the integration time can be adjusted in the time range of app. 0…20 sec.

3.6 Quick Stop

The Controller M301 has a Quick Stop function (Connection on terminal 10c). If this function is activated, the maximum moment - adjusted via potentiometer **P2** - will be reached immediately.
The status of the Quick Stop function will be shown via the red LED “quick stop” in the front panel.

Quick Stop active – LED lights
Quick Stop inactive – LED off

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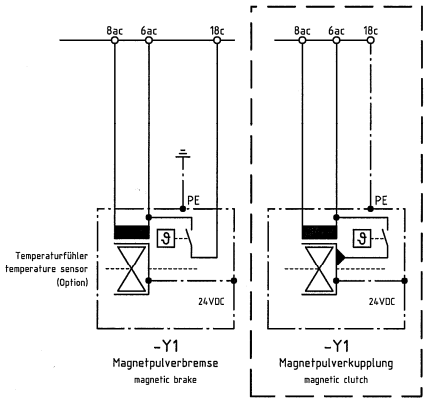
3.7 Thermal protection

The Controller M301 is equipped with an integrated temperature breaker for the connected brake / clutch. The temperature is captured by a sensor located at the brake / clutch (The sensor is available separately). If the sensor recognises an express temperature then the Controller M301 will be locked at once. The activation of the thermal protection will be shown via the red LED “thermal protection” in the front panel. After cooling down the brake / clutch and a short disconnection from the power supply, the device is ready for operation again.

IMPORTANT ! By connecting of the magnetic particle *clutch* the supply and setpoint voltage must be ground isolated ! With magnetic particle *clutch* one connection of the temperature sensor is connected to the coil, the other directly to the chassis of the clutch. The electric circuit runs via the chassis and the machine components when the thermal protection is tripped. Therefore the chassis must be connected electrical conductive in a suitable way with terminal 18c via the mechanic machine components to get the function.
With magnetic particle *brake* one connection of the temperature sensor is connected to the coil, the other directly to terminal 18c. Recommendation: use 4-wire cable.



3.8 Control inhibit

The control inhibit will be activated on terminal 10a (10VDC = active) and locks the current flow by the connected consumer. The status of the control inhibit will be shown via the red LED “control inhibit” in the front panel.

control inhibit active – LED lights
control inhibit inactive – LED off

3.9 Actual input

The actual input will be connected directly on terminal 14a.
The actual input is only in function with the PID-controller Z2.

3.10 Remanence compensation

The Controller M301 is fit with a remanence compensation. (Activation see Pt. 5.4)
Because of magnetizing the iron core a little magnetism is remaining, also if the coil is not energized (=remanence magnetism). This permanent magnetism has the same effect as mechanical friction.
If the remanence compensation is activated the minimum moment must be = 0. (potentiometer **P1** on left limit).

3.11 Special function

The Controller M301 could be used as current source 4…20mA. For that put jumper J3 in position 2-3, eject measuring resistor R-MESS and put in a jumper for R20.

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4. Connection Controller M301

The Controller M301 can optionally be connected to DC-voltage of 24 VDC or AC-voltage of 24 VAC 50/60Hz.

Supply 24V**DC**:	24V=	Terminal 26a or 26c
	0V=	Terminal 28a or 28c
Supply 24V**AC**:	24V~	Terminal 30a or 30c
	0V~	Terminal 32a or 32c

The device can operate with an external isolation transformer,
witch has the following data:
input tension 230 VAC 50/60 Hz or other, output tension 24 VAC, performance 63 VA.

The brake / clutch is connected via the terminals 6a/c and 8a/c.
The cable between Controller M301 and brake / clutch should have a minimum cross-section of 1,5 mm^2.

When using a device *without* LC-display, the following wiring has to be performed at the terminals 2a or c and 4a or c.

with external ampere meter	Connection of an analogue ampere meter with built-in shunt via terminals 2a/c and 4a/c
without external ampere meter	Inserting a bridge between the terminals 2a/c and 4a/c

When using a device *with* LC-display, this wiring is not required.

The reference potentiometer will be connected between terminal 14c (+10 VDC) and terminal 28c (0 V GND). The slider is connected to terminal 12c.

The control inhibit is connected via the terminals 10a and 16a.

The temperature sensor, if necessary, is connected via terminal 18c and one of the terminals of the brake/ clutch. For connection to external controls, a potential-free relay contact (changeover contact) is available. (terminals 20c, 20a, 22a)

The Controller M301 has a set point integrator.
This will be integrated in the reference channel, by feeding the reference value to the terminal 16c and connecting terminal 18a and 12c.

The connection of the quick stop function is made via the terminals 10c and 14c. If these terminals are connected, the quick stop function is activated.

Parallel to the main reference value an additional reference value may be fed via the terminal 12a. It works in a transfer circuit (highest value is true). Reference point 0V is terminal 28a.

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5. Putting into operation

5.1 Preparatory works

Before switching on the supply voltage, all connections have to be checked for a correct terminal assignment according to the terminal diagram.
The supply voltage is switched on. The green LED "On/Off" on the front panel must light. If not, then you have to check the supply voltage as well as the connected periphery as to short circuits or interruptions. Check also the mains fuse F1 or F2.

When applying no PID-controller Z2 the jumper JP2 have to be plugged on position 1-2. If this is not the case and no PID-controller is plugged on, this change has to be made.
When applying a PID-controller Z2 the jumper JP2 has to plugged on position 2-3 (factory setting).
The Jumper J3 must always be plugged on position 1 – 2.

5.2 Adjustment maximum moment

The maximal admissible current of the respective brake / clutch can be seen from the data sheet and has to be adjusted at the max. reference value with the potentiometer **P2**. For that there can be used the measuring device integrated in the front panel or an ampere meter put in series to the brake / clutch.

5.3 Adjustment minimal moment

This setting is made at a reference value = 0 V.
In some cases it may be of disadvantage, if the moment of the brake / clutch reaches the value 0 (example: control applications).
In this case the minimal current can be adjusted by means of the potentiometer **P1**.
The maximal value is 20% of max. current.

5.4 Activating remanence compensation

The remanence compensation is deactivated when delivered.
It is activated by changing the position of jumper JP1.

	jumper JP1
without remanence compensation	position 1 – 2
with remanence compensation	position 2 – 3

Note: If this function is activated the minimum moment must be = 0.
(potentiometer **P1** on left limit).

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6. Product description PID-controller Z2

The PID-controller Z2 enables with low effort the building up of a closed-loop control system. Out of it result a multitude of application possibilities in the industrial production engineering.

The PID-controller Z2 compares the reference value with an actual value (i.e. tensile force, pressure force or temperature) creates a correction signal out of the deviation. The PID-control terms can be separately switched in and be regulated. The input signals can be fed to the PID-controller Z2 independent of their polarity. Internal precision rectifier provide for a conditioning of the signals. The reference and actual value signals can be adjusted via the input potentiometers.
The output signal of the PID-controller Z2 can be adjusted for further processing.
If the control inhibit is activated, the I-action will be deleted automatically.

6.1 Reference and actual value

The reference input of the PID-Controller is designed for an input voltage of 0…+10V or 0…-10V. In the controller this potential will be rectified negatively and amplified. Therefore the reference value can be fed directly to the controller without consideration the polarity. The amplification factor can be adjusted in the range from 0.5 to 2 by using the potentiometer "Verst. Sollwert / set point amplif.", in order to adjust the maximum reference value in the range of 5...14 V.
The factory setting of the amplification is =1.
Measuring point P9 = reference value

The actual value is led directly to the PID-controller. The range is assigned for an input voltage of optionally 0…+10V or 0…-10V. In the controller this potential will be rectified positively and amplified. Therefore the actual value can be fed to the controller without consideration the polarity. The amplification factor can be adjusted in the range from 0.5 to 2 by using the potentiometer "Verst. Istwert / actual value amplif.", in order to adjust the maximum actual value in the range of 5...14 V.
The factory setting of the amplification is =1.
Measuring point P8 = actual value

In case of a dancer position control the reference input can be placed on ground potential and an internal reference value can be used for the adjustment of the dancer position. The internal, negative reference value can be switched in with the switch S1.4. If the switch S1.4 is in position ON, the internal dancer position adjustment is active.

The internal reference value can be adjusted with the potentiometer “Tänzerlage = dancer position” in the range from 0…-15 V.
Measuring point P10 = dancer position

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All measuring outputs are equipped with 3.3 kOhm series-connected protecting resistors. To avoid measuring errors we recommend therefore only to use measuring instruments with a high internal resistance.
With certain control tasks it might be recommendable, to switch off the automatic precision rectification and to work with defined reference levels.

	with precision rectifier	without precision rectifier
Reference value jumper J2	position 1 - 2	position 2 - 3
Actual value jumper J1	position 1 - 2	position 2 - 3

6.2 Control functions

In the PID-Controller all components can be separately switched in and adjusted.
Thereby the respective control terms are activated in switch position ON and deactivated in switch position OFF.
The **P-term** can be switched on with the switch **S1.3** and the amplification in the range from 0.15…3 can be adjusted with the potentiometer "P-Anteil / P-action".
The **D-term** can be switched in with the switch **S1.2** and be adjusted with the potentiometer "D-Anteil / D-action". The control range is 0…0.2 s.
The **I-term** is switched on with switch **S1.1** and adjusted with the potentiometer "I-Anteil / I-action". The control range is 0.6…40s.

Switch	Function
S1.1	I- action
S1.2	D- action
S1.3	P- action
S1.4	dancer position

The control inhibit will be activated by a control voltage of +10 VDC at terminal 10a on the Controller M301. The PID-controller will also be locked.
The remaining I-term of the PID-controller will be deleted.

6.3 Special adjustments

The output signal of the PID-Controller can be adapted via potentiometer (**P7**) on the controller board. Slider on right end position gives the full output signal (factory preset).

The amount of the I-action can be changed via potentiometer (**P8**) on the controller board. Slider on right end position gives the maximum value (factory preset).
Measuring point P13 = output signal PID-Controller/ amount I-action

Note: The potentiometer (P7) and (P8) are not accessible from front side.

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7. Summaries

7.1 Terminals

Terminal	Function
2a	Connection (+) ampere meter 0…1 A
2c	Connection (+) ampere meter 0…1 A
4a	Connection (-) ampere meter 0…1 A
4c	Connection (-) ampere meter 0…1 A
6a	Connection (+) for magnetic powder brake / clutch
6c	Connection (+) for magnetic powder brake / clutch
8a	Connection (-) for magnetic powder brake / clutch
8c	Connection (-) for magnetic powder brake / clutch
10a	Input for control inhibit
10c	Input for quick stop
12a	Additional input for 2. reference value
12c	Input reference value for PID-controller Z2
14a	Input actual value for PID-controller Z2
14c	Output power supply unit +10 VDC
16a	Output power supply unit +10 VDC
16c	Input integrator +10 VDC
18a	Output integrator
18c	Input for thermal protection
20a	Relay output of thermal protection NC
20c	Relay output of thermal protection C
22a	Relay output of thermal protection NO
22c	GND for electronic
24a	GND for electronic
24c	GND for electronic
26a	Voltage supply (+) 24 VDC
26c	Voltage supply (+) 24 VDC
28a	Voltage supply (-) 24 VDC (GND)
28c	Voltage supply (-) 24 VDC (GND)
30a	Voltage supply (L) 24 VAC 50/60 Hz
30c	Voltage supply (L) 24 VAC 50/60 Hz
32a	Voltage supply (N) 24 VAC 50/60 Hz
32c	Voltage supply (N) 24 VAC 50/60 Hz

Note: Terminals of strip a and c for supply (26~32), ampere meter (2,4) and brake/ clutch (6,8) are linked internal. Connection at both sides is possible.

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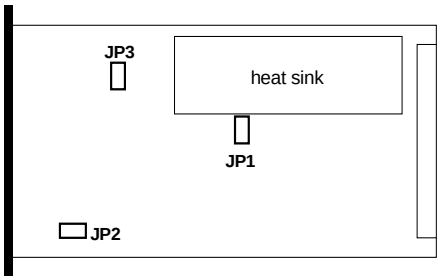
7.2 Jumper

Main board

JP1 Switch-on the remanence compensation
Position 1-2 inactive
Position 2-3 active
JP2 Reference value switchover when using the PID-controller Z2
Position 1-2, if no Z2 available
Position 2-3, if Z2 available
JP3 Position 1-2, normal use 0…1A
Position 2-3, current source 4-20mA



Position of the jumper

7.3 Potentiometer, LED, Internal fuse

Potentiometer		LED		
P1	min. moment	On/Off	green	(D12)
P2	max. moment	Thermal protection	red	(D10)
P3	additional input	Quick Stop	red	(D5)
P4	integration time	Control inhibit	red	(D9)

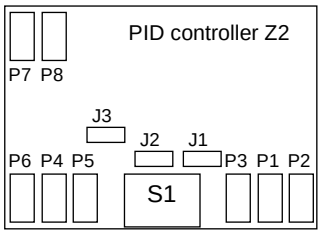
Internal fuse

Supply 24V**DC**: F1 1,6A (Terminal 26a/c – 28a/c)
Supply 24V**AC**: F2 2,5A (Terminal 30a/c – 32a/c)

7.4 Jumper, Potentiometer PID-controller Z2 (Option)

Jumper

J1 Precision rectifier actual value
Position 1-2 active
Position 2-3 inactive
J2 Precision rectifier reference value
Position 1-2 active
Position 2-3 inactive
J3 Testing point
Position 1-2



Position Jumper/ Potentiom.

Potentiometer

set point amplif.	(P2)
actual value amplif.	(P1)
dancer position	(P3)
P-action	(P5)
D-action	(P4)
I-action	(P6)
output signal	(P7)
amount I-action	(P8)