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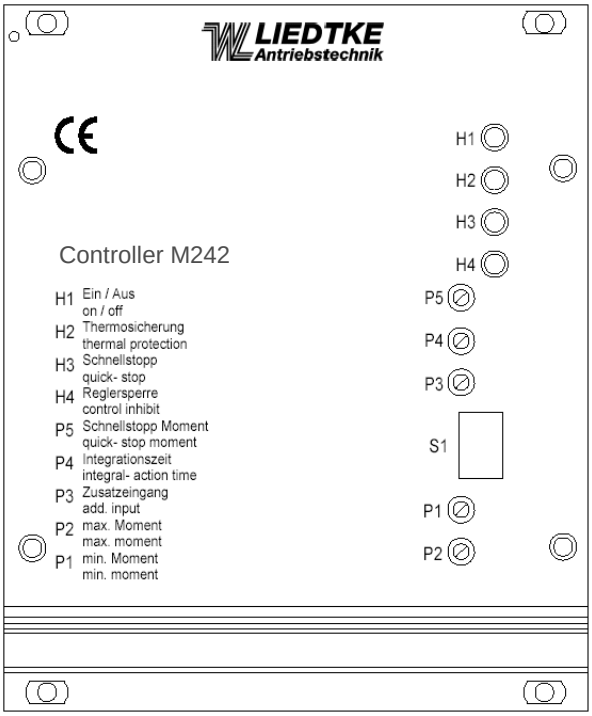
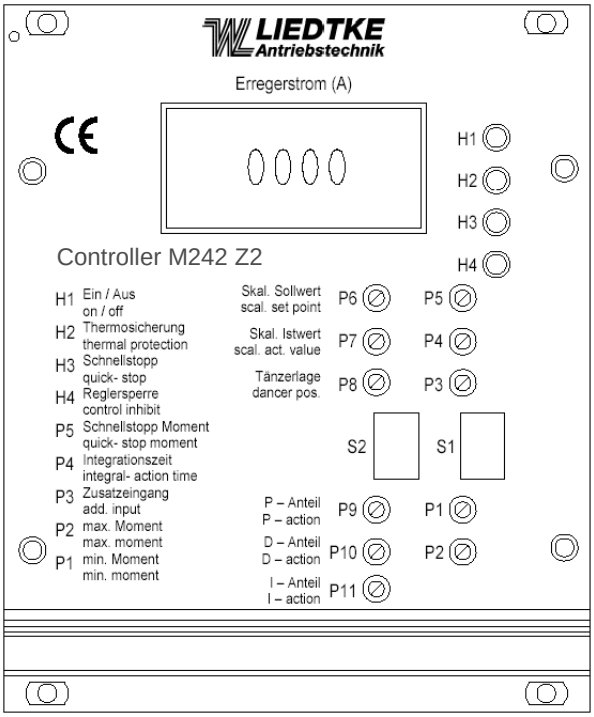
Operating and adjustment instruction

Controller M242

Push- pull Converter





Design

Controller M242

Controller M242 Z2
with PID-controller Z2

Options

Digital Display

Wall mounting IP 20 / wall housing IP 54

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Annexe:
I.) Block diagram
II.) Wiring diagram

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.
The operation of the device is only permitted with connected protective conductor.

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.

1. Product description Controller M242

The Controller M242 is used as a constant current controller to control the magnetic powder brakes and clutches.
Magnetic powder brakes and clutches fed by the Controller M242 are working independent from thermal effects and guarantee thus a linear torque band.
Due to the constant-current control, the output current can be adjusted in wide limits, independent of the load resistance of the connected type.

2. Design Controller M242

Structure of the device:

Complete device in one 19" cassette IP20 with snap-on plug for mounting on hat rail. The terminals are at the bottom on the right sight of the housing.

Technical data:

- output current max. 2 A
- output voltage max. 40 VDC
- voltage supply 24VDC+/-10%
- control inhibit
- reference voltage 0 … 10 VDC
- reference integrator +/- adjustable
- additional reference input 0 … 10 VDC
- min. moment adjustable (min. output current)
- max. moment adjustable (max. output current)
- quick stop function
- remanence compensation
- thermal protection via external sensor
- potential-free thermal relay contact (opener / closer)
- 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.

3. Function specification Controller M242

3.1 Reference input

The reference input at terminal 20 serves to drive the current source of the Controller M242. 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 JP1 (control board) 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 JP1 must be in position 1-2.

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…200mA.
If the remanence compensation is activated the minimum moment must be = 0. (potentiometer **P1** on left limit).

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**.
The maximum current is 2A.

3.4 Additional input

The device has an additional input at terminal 6. The influence of the additional reference value in addition to the main reference value can be adjusted with the help of the potentiometer **P3**.

3.5 Reference integrator

The Controller M242 has as standard a reference integrator. This will be activated by feeding the reference value on terminal 24 and by connecting the terminals 25 and 20. By using the potentiometer **P4**, the integration time can be adjusted in the time range of app. 0…20 sec.

3.6 Quick Stop

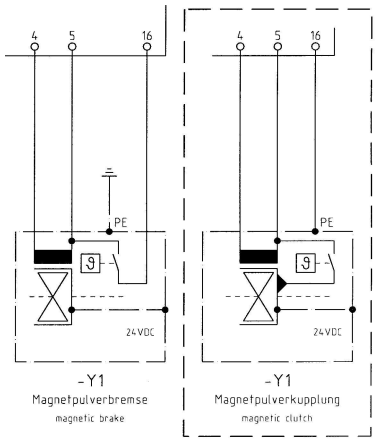
The controller M242 has a Quick Stop function. (Connection on terminal 23)
If this function is activated, the maximum moment will be reached immediately. The maximum moment can be adjusted via potentiometer **P5**.
The status of the Quick Stop function will be shown via the LED **H3** in the front panel.

Quick Stop active – LED H3 lights
Quick Stop inactive – LED H3 off

3.7 Thermal protection

The Controller M242 is equipped with an integrated thermal protection for the connected brake / clutch. When delivered the function is inactive (jumper JP3 in position 1-2). If jumper JP3 (control board) is plugged in position 2-3, the protection is activated. 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 M242 will be locked at once. The activation of the thermal protection will be shown via the LED **H2** 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 ! When connecting magnetic particle *clutch* the supply and setpoint voltage must be grund 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. There for the chassis must be connected electrical conductive in a suitable way with terminal 16 via the mechanic machine components to have the function.
With magnetic particle *brake* one connection of the temperature sensor is connected to the coil, the other directly to terminal 16. Recommendation: use 4-wire cable.



3.8 Control inhibit

The control inhibit will be activated on terminal 22 (10VDC = active) and locks the current flow by the connected consumer.
The status of the control inhibit will be shown via the LED **H4** in the front panel.

control inhibit active – LED H4 lights (device locked)
control inhibit inactive – LED H4 off (device released)

3.9 Actual input

The actual input will be connected directly on terminal 21.
The actual input is only in function with the PID-controller Z2.

3.10 Remanence compensation

The Controller M242 is fit with a remanence compensation. (Activation see Pt. 5.6)
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).

4. Connection Controller M242

The Controller M242 is designed for an operating voltage of 24VDC +/- 10%.

Mains connection:	PE	terminal 1
	L1	terminal 2
	N	terminal 3
brake/ clutch:		terminal 4 and 5

The cable between Controller and brake / clutch should have a minimum cross-section of 1,5 mm^2 and should be twisted.

The reference potentiometer will be connected between terminal 15 (+10 VDC) and terminal 31 (0 V GND). The slider leads to terminal 20.

The control inhibit will be connected to the terminals 7 and 22.

The thermal protection can be activated via the jumper JP3 (control board) in position 2-3. For connection to external controls, a potential-free relay contact (changeover contact) is available at terminal 8, 9 and 10.

The Controller M242 has additionally a reference integrator. This will be integrated in the reference channel, by feeding the reference value to the terminal 24 and connecting terminal 25 and 20.

The connection of the Quick Stop function is made via the terminal 7 and 23. These terminals have to be connected, if the function is activated.

Parallel to the main reference value an additional reference value may be fed via the terminal 6 (Terminal 31 reference point 0V).

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 **H1** 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.

When applying no PID-controller Z2 the jumper JP1 (control board) 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 JP1 has to plugged on position 2-3. (factory setting)

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.

Switch S1 has no function.

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 200mA.

Switch S1 has no function.

5.4 Adjustment additional input

The additional input of the Controller M242 is interconnected with the main reference value. The influence of the additional reference value in addition to the main reference value can be adjusted with the help of the potentiometer **P3** (attenuation 0-100%). It has to be considered that the sum of the reference voltages cannot exceed +10 VDC.

5.5 Adjustment Quick Stop function

When aligning the Quick Stop function it has to be paid attention, that it is activated. This is displayed when the red LED **H3** lights. After that the maximum brake current will be adjusted by potentiometer **P5**.

5.6 Deactivating remanence compensation

The remanence compensation is activated when delivered.
To deactivate the remanence compensation please proceed as follows:

- Open the front panel
- Pull out the power board (board on leftt slot)
- jumper in position 2-3

The device has to be mounted in reverse mode.

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

6. Product description PID-controller Z2

The PID-controller Z2 enables with low effort the building up of a closed-loop control system (PID). 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) 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 "Skal. Sollwert / scal. ref. value", 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, to be measured on terminal 29.

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 "Skal. Istwert / scal. act. value", 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, to be measured on terminal 26.

In case of a dancer position control an internal reference value is used for the adjustment of the dancer position. The internal, negative reference value can be switched in with the switch S2.4. If the switch S2.4 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, to be measured on terminal 28.

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 **S2.3** 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 **S2.2** 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 **S2.1** and adjusted with the potentiometer "I-Anteil / I-action". The control range is 0.6…40s.

Switch	Function
S2.1	I- action
S2.2	D- action
S2.3	P- action
S2.4	dancer position

The control inhibit will be activated by a control voltage of +10 VDC at terminal 22 on the Controller M242. 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, measurable on terminal 27.

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

7. Summaries

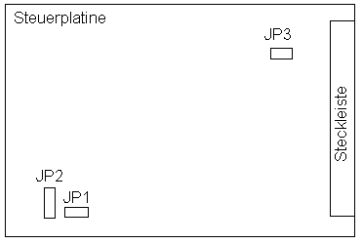
7.1 Terminals

Terminal	Function	
1	PE	
2	24VDC	
3	GND1	
4	output for magnetic powder brake / clutch	
5	output for magnetic powder brake / clutch	
6	additional input	
7	10 VDC	
8	relay thermal protection NO	
9	relay thermal protection NC	
10	relay thermal protection C	
11	scanning potentiometer	
12	scanning potentiometer	
13	reference value potentiometer	
14	reference value potentiometer	
15	10 VDC	
16	input thermal protection	
17	GND	
18	GND	
19	GND	
20	reference value input	
21	actual value input	
22	control inhibit	
23	Quick Stop	
24	integrator input	
25	integrator output	
26	Z2 Pin 8	actual value
27	Z2 Pin 13	output PID-controller
28	Z2 Pin 10	dancer position
29	Z2 Pin 9	reference value
30	-15 VDC	
31	GND	
32	GND	
33	+15 VDC	

7.2 Jumper

Control board

JP1 Reference value switchover
when using the PID-controller Z2
Position 1-2, if no Z2 available
Position 3-2, if Z2 available
JP2 connections for internal ampere meter
JP3 thermal protection
Position 1-2 temperature control active
Position 3-2 temperature control inactive



Position of the jumper

Power board

JP3 Deactivation of Remanence compensation
Position 1-2 active
Position 2-3 inactive

7.3 Potentiometer, LED, Internal fuse

Potentiometer

P1	min. moment
P2	max. moment
P3	additional input
P4	integration time
P5	moment Quick Stop

LED

H1 (green)	On/Off
H2 (red)	thermal protection
H3 (red)	Quick Stop
H4 (red)	control inhibit

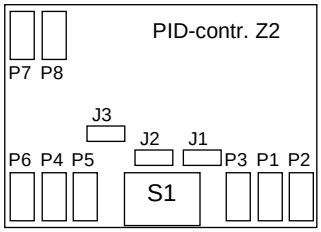
Internal fuse

power part:	F1	4A slow-acting
control part:	F1	0,1A slow-acting

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

P6	scal. reference value	(P2)
P7	scal. actual value	(P1)
P8	dancer position	(P3)
P9	P-action	(P5)
P10	D-action	(P4)
P11	I-action	(P6)
	output signal	(P7)
	amount I-action	(P8)

Note: The front marking of the potentiometer is different from the identifier on the print card (in brackets).

7.5 Occupation of the terminal bus board M242

Terminal		Control part	power part
1			PE terminal ac32
2		ac32	L1 terminal ac28
3		ac28	N terminal ac24
4			brake ac8 and ac10
5		a14	brake ac2 and ac4
6		additional input a2	
7		+10V c2	
8	NO	thermal protection a8	
9	NC	thermal protection a10	
10	C	thermal protection a12	
11		scanning potentiometer	
12		scanning potentiometer	
13		reference value potentiometer	
14		reference value potentiometer	
15		10V+ c2	
16		input thermal protection a16	
17		GND ac22	
18		GND ac22	
19		GND ac22	
20		reference value a4	
21		actual value c4	
22		control inhibit a6	
23		Quick stop c6	
24		integrator input c16	
25		integrator output a18	
26		Z2 Pin 8 c8	
27		Z2 Pin 13 c14	
28		Z2 Pin 10 c12	
29		Z2 Pin 9 c10	
30		15V- ac20	
31		GND ac22	
32		GND ac22	
33		15V+ac26	

8. External Fuse

External input fuse: Fuse automat type characteristic A; I= 3A
Cable connection: A=2,5mm²