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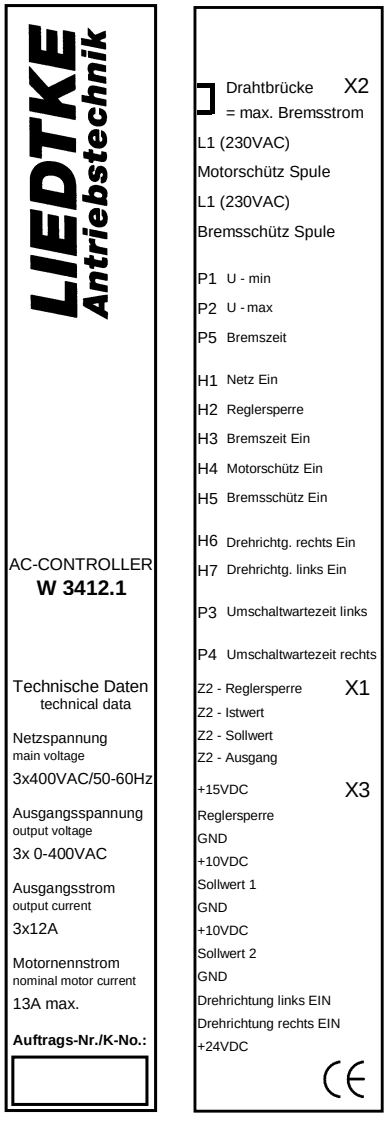
Technical device manual

AC power controller W3412.1

Option: DC braking
Option: Tension controller Z2



Before the installation and before putting into operation please read this technical device manual.
It contains important safety information regarding the protection of the user as well as information for the proper use of this device !

Important safety information

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 auto power ON/OFF 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.

In case of an error it might occur that for safety reasons the device shuts down by itself and causes the motor to stop. The removal of the defect can lead to an automatic restart of the drive.
If, for safety reasons, this is not permissible, then the operator of the system has to prevent an auto-restart by using appropriate measures.

For reference and actual lines you have to use shielded lines.
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.

Lacquer-sealed potentiometers are basic settings of the device and may not be changed.
Lacquer-sealed screws serve for important safety functions and may not be opened.

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.

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Index AC-Controller W3412.1

1. Product description

1.1 General description of the AC power controller (standard function)

The AC power controller of the Type W3412.1 is a compact devices to adjust the torque and the tensile force on the AC winder.

The device is designed for the installation in a switch-cabinet.
The device complies with the protection class IP20.

The output voltage can be adjusted steplessly variable through a three phase-angle control from an adjustable minimum voltage (main feature) up to the approximate mains voltage via a potential-free reference input (0...10VDC).
Via a further floating reference input it is possible to connect a correction voltage.

Potential free inputs for:
- control inhibit
- set point 1
- set point 2
- reversal of rotation
- tension controller Z2

The AC-Controller W3412.1 can be delivered with the following options:

- Type W3412.1 with integrated DC braking
(Function specification and adjustment see chapter 6)

- Type W3412.1 with integrated tension controller Z2
(Function specification and adjustment see chapter 7)

1.2 Ambient conditions

Housing:	Switch-board installation, Protection class IP20
Operating environmental temperature:	**0 ... +40°C**
Performance-reduction:	Performance-reduction 2% per °C at environmental temperatures over +40°C.
Storage temperature range:	-25°C … +85°C
Transport temperature range:	-25°C … +85°C
Relative humidity:	min. 15% relative humidity max. 80% rel. humidity; not condensing A bedewing is not permitted [1)]

Installation height:

Height	operating temperatures
1000m	+40°C
1500m	+36°C
1500m	+32°C
1500m	+28°C
1500m	+24°C

Installation position:	vertical; distance to other components always at least 30mm.
Air pollution degree:	1 acc. to IEC 664

1) In case of need use the heating of a switch-cabinet to avoid a condensation or use an aeration to avoid that the admissible operating environmental temperature range from 0° to +40°C will be exceeded. For this we recommend the installation of a frost / temperature controller.

1.3 Connecting data

Mains supply voltage:	3 x 400VAC* / +/-10% *Special voltages are possible on request
Mains frequency:	50-60Hz (automatic adaptation)

Electrical device data:

Motor voltage:	approx. 0V up to approx. 3 x 400VAC adjustable via a three phase-angle control

The motor voltage can be adjusted with the aid of two potentiometers to the minimum and maximum value; (The potentiometers are operable from the front).

Motor current:	approx. 0 to 12A (at short-time load max. 13A)
Control inhibit:	switched with internal or external +24VDC signal
Reference input 1:	0 up to +10VDC
Reference input 2:	0 up to +10VDC

Note: If you use both reference inputs then please make sure that the sum of the reference values does not exceed +10VDC.

1.4 Device protection

Note: In order to avoid damages to the device or to external components it is absolutely necessary only to use the type of fuse mentioned in the following.

The internal fuses are located in fuse retainers on the board and are thought for the protection of the internal electronics.

Fuse type: 1A MT - size 6.3 x 32 mm

Principally, the power supply has to be protected externally.

For the protection of the semiconductors the following fuse types have to be built in mains-sided:

The device may be protected at a maximum with semiconductor fuses of the type **16A FF** (3x) .

Below this value the mains-sided protection may be adjusted to the used motor.

2. Notes on connecting and wiring

2.1 Control terminals

Terminal strip: **X3** (potential free range)

Type of terminal: pluggable screw terminal – 12 poles
cable cross-section max. 1 mm²

Terminal-No.:	**Function:**	
Term. 1	Control inhibit (internal supply voltage +15VDC)	
Term. 2	(Variant 1) Input for internal control inhibit (+15VDC via contact of term.1 – term. 3 has to be bridged to term. 9).	
	(Variant 2) Input for the external control signal of the control inhibit (+24VDC external with external GND at terminal 3)	
	Attention: 1-Signal corresponds to the controller release	
Term. 3	GND in case of external control inhibit	
Term. 4	+10VDC	- potential free
Term. 5	Input for set point 1	
Term. 6	Device GND	- potential free
Term. 7	+10VDC	- potential free
Term. 8	Input for set point 2	
Term. 9	Device mass (GND)	- potential free
Note:	If you use both set point inputs then the sum of the set points may not exceed +10VDC.	
Term. 10	Direction of rotation left	
Term. 11	Direction of rotation right	
Term. 12	+24VDC	- potential free

2.2 Power terminals

Type of terminal: Series terminals
Cable cross-section max. 2.5 mm²

Terminal designation:	**Functions:**		
PE :	Protective conductor	-	**IMPORTANT** !!
L1 :	Connection Phase L1		
L2 :	Connection Phase L2		
L3 :	Connection Phase L3		
U :	Motor connection U		
V	Motor connection V		
W :	Motor connection W		
PE :	Protective conductor	-	**IMPORTANT** !!

2.3 Hints for an EMC-suitable installation

In order to observe the electromagnetic compatibility please note the appropriate guidelines and instructions.
This applies especially to:
- installation
- earthing
- filtration
- shielding

The next user is responsible for the observance of the EMC- guideline in case of industrial use. If all components / plant components meet the CE- immunity requirement, then no electromagnetic impairments have to be expected.

Additionally we are offering the corresponding interference filters.
Please only use those interference filters assigned to the devices.
Ask our Sales Team to help you to select the right filter.

3. Function setting

3.1 Trim potentiometer

Note: The potentiometers which are accessible from the outside, are – as their names applies – provided for the optimisation of the controller.
They can be freely adjusted within their permitted adjustment ranges.
Please take note that the critical values for the device regarding output voltage and output current will not be exceeded. This can lead to damages at the device. The internal potentiometers are factory settings and may not be changed.
All potentiometers have their lowest value at the left end-stop or set the function to zero.

Potentiometer:	Function:
P1:	minimum voltage at the motor (=basic tension force)
P2:	rated voltage at the motor (=maximum tension force)

3.2 Adjusting the basic tension force

With the front-sided operable potentiometer **P1** a basic tension can be adjusted at set point zero (both set point potentiometers at left end-stop). For this the potentiometer **P1** will be turned until after the desired basic tension has been reached.

3.3 Adjusting the maximum tension force

With the front-sided operable potentiometer **P2** there can be adjusted the maximum tension force at set point +10V. For this the potentiometer **P2** will be turned until after the desired tension force has been reached. Hereby it has to be observed, that the max. output voltage may lie approx. 10…20V below the mains supply voltage.

Additionally it has to be secured that the maximum device current of **13A** never will be exceeded. If necessary the output voltage will have to be reduced in order to adjust the current limit to the maximum permissible value.

4. Displays

4.1 Light-emitting diodes

Description:	Function:
H1 (green) mains ON	Lights if the mains voltage is switched in and the internal supply voltage is in order.
H2 (red) Control inhibit	Goes off if the controller has been released. Lights if the controller is blocked.
H3 (yellow) Braking time ON	lights if the DC-braking is active. (only with option DC-braking).
H4 (green) Motor contactor ON	Lights if the motor contactor is switched in Goes off if the controller is blocked or the DC-braking is active. (only with option DC-braking).
H5 (green) Brake contactor ON	Lights if the brake contactor is switched in (only with option DC-braking).
H6 (green)	Lights in case of rotation direction right
H7 (green)	Lights in case of rotation direction left

5. Reversal of rotation

For the function reversal of rotation the terminals X3:10 up to X3:12 are used.
switch-over time with relay: ***3 sec.*** *(from Oct.2004)*

5.1 Control terminals

Terminal strip: **X3** (potential free range)

Type of terminal: plug-in screw terminal – 12 poles
Cable cross-section max. 1 mm²

Terminal-No.:	**Function:**	
Term. 1	Control inhibit (internal supply voltage +15VDC)	
Term. 2	(Variant 1)	Input for internal control inhibit (+15VDC via contact of term.1 – term. 3 has to be bridged to term. 9).
	(Variant 2)	Input for the external control signal of the control inhibit (+24VDC external with external GND at terminal 3)
	Attention:	1-Signal corresponds to controller release
Term. 3	GND in case of external control inhibit	
Term. 4	+10VDC - potential free	
Term. 5	Input for set point 1	
Term. 6	device mass (GND) – potential free	
Term. 7	+10VDC - potential free	
Term. 8	Input for set point 2	
Term. 9	device mass (GND) – potential free	
Note:	If you use both set point inputs, the sum of the set points may not exceed +10VDC.	
Term. 10	**Input for direction of rotation left**	
Term. 11	**Input for direction of rotation right**	
Term. 12	**+24VDC for controlling the reversal of rotation**	

5.2 Function and adjustment

Note: The function „reversal of rotation“ is internally interconnected with the control inhibit, that means **only if the control inhibit is opened** the reversal of rotation can be activated.

If the AC controller disposes of the additional function „reversal of rotation“, then the direction of rotation of the AC winder can be switched over via an external connected change-over contact.

For this a DC-voltage (24V) provided at the terminal X3-12 will be switched to the terminals X3-10 or X3-11 (change-over contact).

Please take care that always only one input will be activated.

Sequence of functions

After switching on the mains voltage the Controller always disposes of an internal pre-defined direction of rotation. If the direction of rotation is internally defined with „d.o.r. left", then the LED **H7** will light after a short switch-over time delay.

The desired direction of rotation can be selected by using the toggle switch at the term. X3-10 up to X3-12. After a short switch-over time delay this direction of rotation is now active and the corresponding LED lights.

After closing the control inhibit, the Controller can be adjusted to the desired output voltage by using the set point potentiometer.

Sequences of functions and adjustment with reversal of rotation

On the first adjustment the potentiometers **P3** and **P4** (time delay until the switching over) should be set on right end-stop. (Max. time delay).

The actually active direction of rotation will be displayed
by the light-emitting diodes **H6** and **H7**.

Starting status - direction of rotation left / toggle switch in position X3-11

Control inhibit OPEN
Switch on the mains voltage
LED **H1** (mains ON) and LED **H7** (direction of rotation left) are lighting

Control inhibit CLOSE
The direction of rotation left is active (toggle switch in position X3-11)
Motor turns with d.o.r. left.

Control inhibit OPEN
Close toggle switch to X3-10
At the end of the internal time delay two internal load relays will change the direction of rotation.
LED **H7** goes off and LED **H6** lights

CLOSE control inhibit
Motor turns to the other direction

OPEN control inhibit
Close toggle switch to X3-11
At the end of the internal time delay two internal load relays will change the direction of rotation.
LED **H6** goes off and LED **H7** lights

Adjustment of the Potentiometer P3 and P4 (switch-over time delay)

Should the drive after a performed internal reversing switch-over not come to a standstill, then, after closing the control inhibit, the drive will first be slowed down in the actually active direction before it can be accelerated in the new direction of rotation.

If a slowing down of the drive is not desired then one has to extend the switch-over time delay with the aid of the potentiometers **P3** and **P4**.

Note: Both potentiometers should be adjusted symmetrically in order to obtain the same switch-over times for both directions of rotation.

6. Option 1: DC-braking

6.1 Control terminals

Terminal description: **X2** (potential affected range)

Type of terminal: plug-in screw terminal – 9 poles
Cable cross-section max. 1.5 mm²

Terminal-No.:	**Function:**
Term. 1 + term. 2	One wire strap between term. 1 and term. 2 will cause a maximum braking power. By removing the strap, the braking current will be halved.
Term. 3	Connection to L1 (230VAC)
Term. 4	Connection to coil motor contactor
Term. 5	Connection to L1 (230VAC)
Term. 6	Connection to coil motor contactor

The remaining coil connections of the motor and brake contactor will be connected to the N - conductor.

Note: The internal switching contacts are loadable with 230V/2A.

6.2 Adjustment of the DC-braking

Note: The function „DC-braking“ is internally interconnected with the control inhibit, that means **only if the control inhibit is opened** the braking function can be activated.

If the AC controller already disposes of the additional function „DC-braking“, then by opening the control inhibit the drive can be slowed down until its standstill through a DC-voltage which is connected to two motor leads.
After the opening of the control inhibit, the DC-braking will be activated. The internal control then takes over all necessary external switching measures.

Via an internal load relay the motor will receive a DC voltage, which decelerates the drive electrically.

Braking time —> adjustment with potentiometer P6
Braking current 50% —> no wire strap between plug terminal X2-1 and X2-2.
Braking current 100% —> wire strap between plug terminal X2-1 and X2-2.

As long as the DC-braking is active, there will light the LED H3 (yellow).
Additionally the LED **H5** (green) shows that the brake contactor is activated.
At the end of the braking time the brake contactor will be turned off.
The LED **H3** (yellow) and the LED **H5** (green) are off.

After the control inhibit is closed, the motor contactor will start after a short time delay. This is displayed through the LED **H4** (green).

Basically the internal activation for the motor and the brake contactor are internally locked and are released time-delayed, so if the connection was made in a correct way, a secure switch in and switch off of the function is guaranteed.

Attention:
Please note that the brake unit is designed for a maximum braking current of **12A** at an on-period of 20%.

7. Option 2: Tension controller Z2

7.1 Product description

The tension 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 tension 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 tension 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 tension controller Z2 can be adjusted for further processing.
If the control inhibit is activated, the I-action will be deleted automatically.

7.2 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 "Verstärkung Sollwert / amplif. 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**

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 "Verstärkung Istwert / amplif. actual 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**

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

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

Note: The jumper J3 (internal function) always rests in position 1-2.

7.3 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…50s. Further more the time constant could be adapted by changing the capacitor C8.

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 1 on the PID-controller. The PID-controller will also be locked.
The remaining I-term of the PID-controller will be deleted.

7.4 Special adjustments

The output signal of the PID-Controller can be adapted via potentiometer (**P7**) on the tension 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 tension 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.

7.5 Connection, Jumper, Potentiometer

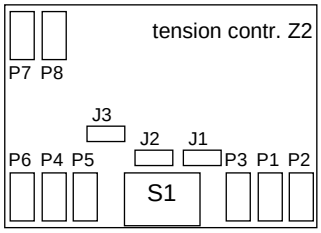
Terminal description: **X1** (potential free range)
(intended only for control print „Z2".)

Type of terminal: plug-in screw terminal – 4 poles
Cable cross-section max. 1 mm²

Terminal-No.:	**Function:**
Term. 1	Control inhibit tension controller Z2
	Attention: 1- Signal represents tension controller is locked
Term. 2	Actual input (0...10VDC)
Term. 3	Reference input (0...10VDC)
Term. 4	Tension controller output (0...14VDC)

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

Function	Identifier	Value
scaling reference value	(P2)	0...10V
scaling actual value	(P1)	0...10V
dancer position	(P3)	0...10V
P-action	(P5)	0,15...3
D-action	(P4)	0...0.2s
I-action	(P6)	0,6...50s
output signal	(P7)	0...100%
amount I-action	(P8)	0...100%