# Agromatic®

Installation and Operating Manual
(Translation of the German Original)
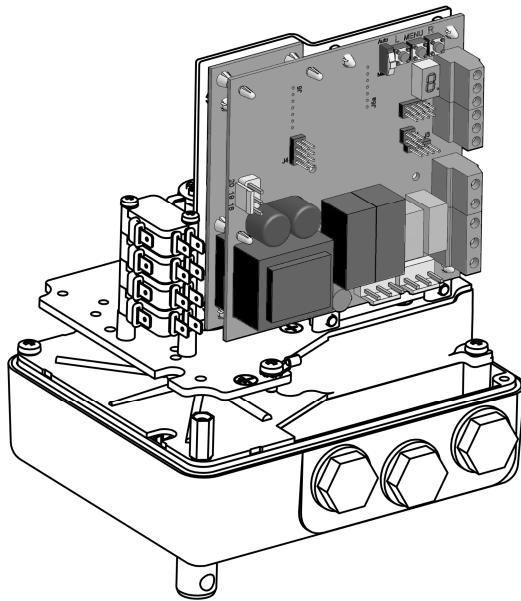
Position Controller PMR3 (Option)

Keep for future reference!

Legal Notice

Contents

1 Safety and EMC instructions

- Only properly trained technical staff may carry out testing, parameterization, calibration and adjustment tasks.

- The ESD (electrostatic discharge) guidelines must be observed when handling electronic components and assemblies.

- All applicable safety regulations must be complied with, including but not only the regulations on personal protection when handling mains voltage.

- The protective measures laid down in the regulations issued by the VDE (German Association for Electrical, Electronic and Information Technologies) and by the local utility company must be implemented. VDE regulation 0105 "Working on Live Components" in particular shall be observed.

- The supply line to the microprocessor controller must have a cross-section in accordance with the VDE regulations.

- Separate shielded wires with a minimum cross-section of 0.5mm² must be used for low voltages (e.g. setpoint and actual value). The shielding must be secured directly at the housing (PE) and routed up to the controller. The shielding must not have a conductive connection to the controller ground.

- The mains power line must be routed separately from the signal line, and both lines must not cross.

- Incorrect installation and operation as well as manipulation by a third party will invalidate the right to make claims under the warranty.

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> **Important information!**
> The installation and operating instructions for the actuators series N, K, KA, and V must be complied with at all times!

2 Controller

- Linear three-step controller with selectable hysteresis.
- Setpoint value input for moving the actuator.
- In addition, a selectable cut-off delay time can be programmed to allow over-travel of the actuator beyond the switching point.
- All controller parameters must be determined and programmed by qualified technical staff to match the complete control system.

3 Electrical connection
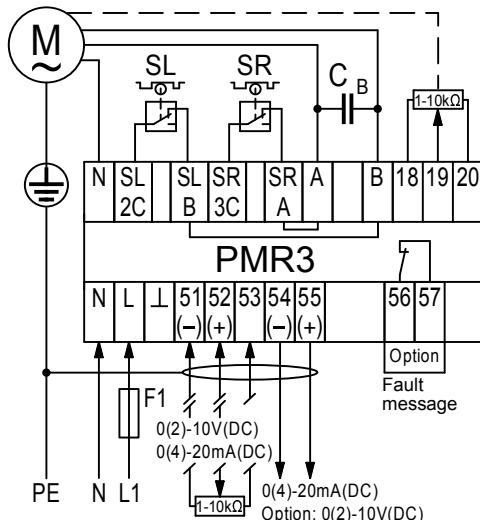
Fig. 1: Schematic diagram PMR3 internal

Standard:

M	motor of the actuator
PMR3	electronic position controller
SL	position limit switch CCW (left-hand) rotation
SR	position limit switch CW (right-hand) rotation
A	output terminal SR, motor & capacitor connection
B	output terminal SL, motor & capacitor connection
N	neutral wire output terminal, motor connection
N	neutral wire input terminal, controller supply
L	phase input terminal, controller supply
GND	controller ground (= same potential as terminal 51)
51	setpoint input controller ground
52	setpoint input (wiring depends on jumper setting J1)
53	setpoint encoder voltage supply (+5V)
54	current output **−** (electrically isolated)
55	current output **+** (electrically isolated)

Option:

56, 57   fault message:
- manual mode: contact is open
- automatic mode: contact is closed
- in automatic mode, contact opens in case of blocking or wrong direction of rotation if monitoring is activated

4   Setpoint input

The configuration of the setpoint input can be changed using jumper J1.

Position I: input 0 … 20mA, 250Ω burden resistor
Position U: input 0 … 10V, approx. 10kΩ input impedance
Position neutral: input 0 … 5V, approx. 20kΩ input impedance

| 0(4) … 20mA | 0(2) … 10V | 0(1) … 5V |
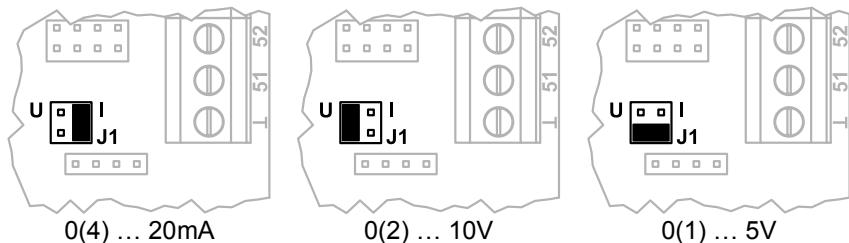
Fig. 2: Setpoint input configuration using jumper J1

The end positions can be assigned either fixed setpoints (0mA, 4mA, 20mA) or optionally defined setpoints within the range of 0 … 20mA (see submenus M3 and M4).

5   Controller parameters

Left end position (0%)

Assignment of the mechanical actuator position to the actual value encoder signal. The left end position is the 0% reference point for the current output.

Right end position (100%)

Assignment of the mechanical actuator position to the actual value encoder signal. The right end position is the 100% reference point for the current output.

Setpoint input for left end position (0%)

Sending this setpoint value to the position controller causes the actuator to move to the parameterized left end position.

Setpoint input for right end position (100%)

Sending this setpoint value to the position controller causes the actuator to move to the parameterized right end position.

Current output for left end position (0%)

The output current at terminals 54-55 is a representation of the actual actuator position. The current output when the left end position is reached is assigned to the controller-internal value 0%.

Current output for right end position (100%)

The output current at terminals 54-55 is a representation of the actual actuator position. The current output when the right end position is reached is assigned to the controller-internal value 100%.

Hysteresis (related to max. input range)

0	10/4096	0.2441%
1	20/4096	0.488%
2	30/4096	0.732%
3	40/4096	0.976%
4	50/4096	1.22%
5	75/4096	1.83%
6	100/4096	2.44%
7	150/4096	3.66%
8	200/4096	4.88%
9	250/4096	6.10%

Cut-off delay time (controller cycle 10ms)

0	1 * 20ms	20ms
1	2 * 20ms	40ms
2	3 * 20ms	60ms
3	4 * 20ms	80ms
4	5 * 20ms	100ms
5	10 * 20ms	200ms
6	20 * 20ms	400ms
7	30 * 20ms	600ms
8	40 * 20ms	800ms
9	50 * 20ms	1000ms

Monitoring of the rotational direction

In the automatic mode, the controller uses the changing actual value to check whether the actuator rotates in the correct direction when the relay is activated. If the controller detects an incorrect rotational direction, the actuator is stopped after 3s, and an error message is issued. The error message and the stopped status of the actuator are reset by switching to the MANU mode.

Blocking protection

Checks the actual value change in the automatic mode when a relay is activated. If the change is very small or if the actual value does not change at all, the actuator is stopped after 3s. After a pause of 1s another attempt is made to move the actuator. After a total of 3 attempts the actuator is stopped, and an error message is issued. The error message and the stopped status of the actuator are reset by switching to the MANU mode or by issuing a positioning command in reverse direction.

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Important information!

Monitoring of the rotational direction and blocking protection only work with actuators with a positioning time of max. 120s for the whole positioning range.

Contrast

Sets the display contrast if a plain-text LCD display is installed.

6   Operation

The PMR3 is operated by means of 3 buttons and one sliding switch.

The controller status is indicated on a one-digit 7-segment LED display.

The actuator is optionally available with a plain-text LCD display (see section *"11 LCD display (option)"*). However, this display cannot be retrofitted.

Sliding switch AUTO/MANU
AUTO   selection of the AUTOMATIC operating mode
MANU selection of the MANUAL operating mode

Button MENU
< 2s   show the next value (see section *"11 LCD display (option)"*)
> 2s   open the programming menu

Button MENU (within the programming menu)
− Open submenu
− Confirm input and exit submenu

Button L
− Switch on relay for left-hand rotation
− Select the menu option
− Select the parameter

Button R
− Switch on relay for right-hand rotation
− Select the menu option
− Select the parameter

Depiction of the buttons and the 7-segment LED display

$8.$	7-segment LED display
$P. \_ \_ \_$	Representation of the dot flash sequence
(L) (M) (R)	Buttons L, MENU, R

7 Parameterization

The actual value must change for the parameterization because the detection of the rotational direction is performed.

If the actuator runs in the opposite direction to the required direction of rotation, the end positions must be parameterized again. Detection of the rotational direction is then repeated.

Detection of the rotational direction may not work correctly with extremely slow actuators. In this case the motor polarity may have to be reversed.

The limits for the setpoint and the actual value must each cover the maximum range by more than 20%, otherwise a parameter error will be issued.

The predefined values 0mA/4mA/20mA refer to the calibrated values of the current output and the setpoint input respectively.

8 Automatic mode

| STOP | The position limit switches must be set before the controller is switched to automatic operation! |

Representation and operation

	8.	Automatic mode is active, but the motor is off because the setpoint position has been reached
	8. - - -	Faulty parameterization, automatic mode not possible
	L.	Left-hand rotation is active because the controller is moving the actuator to the setpoint position
	r.	Right-hand rotation is active because the controller is moving the actuator to the setpoint position
	d.	Monitoring of rotational direction triggered
	b.	Blocking protection triggered
Ⓛ	8.	Automatic mode: Button L has no function
Ⓡ	8.	Automatic mode: Button R has no function
Ⓜ	8.	Press the button < 2s: LCD display shows the next value

9   Manual mode

Representation and operation

	H.	Manual mode
	H. - - -	Dot flashes continuously: Faulty parameterization, automatic mode not possible
Ⓛ	**B.**	Actuator rotates in left-hand direction
Ⓡ	**C.**	Actuator rotates in right-hand direction
Ⓜ	**P.**	Press the button < 2s: LCD display shows the next value
Ⓜ	**P. - - -**	Press button > 2s: Activation of programming mode

10   Programming mode

Operation

Ⓜ	Press button > 2s: Activation of programming mode
Ⓛ	In main menu: scroll upwards In submenu: change value
Ⓡ	In main menu: scroll downwards In submenu: change value
Ⓜ	In main menu: jump to submenu In submenu: confirm input and exit the submenu

When a submenu is exited, the relevant value is saved immediately!

The programming mode can be exited at any time by switching to the automatic mode. In this case the values in the currently active submenu are not saved!

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Important information!

The saving of values can be suppressed **only for the currently active submenu** by switching to the AUTO operating mode.

Flash sequences in the programming mode (7-segment LED display)

8. . .	Dot flashes once: main menu
8...	Dot flashes twice: submenu / parameter
8...	Dot flashes three times : parameter setting where required (free values)

Main menu

Once a menu item is completed, the main menu is displayed again, allowing the next item to be edited.

▲ Ⓛ	**8.** . .	M1: left end position (0%)
	8. . .	M2: right end position (100%)
	L. . .	M3: setpoint input for left end position (0%)
	J. . .	M4: setpoint input for right end position (100%)
	H. . .	M5: current output for left end position (0%)
	H. . .	M6: current output for right end position (100%)
Ⓡ ▼	**h.** . .	M7: hysteresis
	E. . .	M8: cut-off delay time
	d. . .	M9: monitoring of the rotational direction
	b. . .	M10: blocking protection
	C. . .	M11: contrast setting for the LCD display
	E. . .	M12: EXIT – exits the programming menu

Submenu M1: left end position (0%)

	M	Jump to submenu M1
	L	Actuator moves to the left
	R	Actuator moves to the right
	M	Save position, return to main menu item M2

Submenu M2: right end position (100%)

	M	Jump to submenu M2
	L	Actuator moves to the left
	R	Actuator moves to the right
	M	Save position, return to main menu item M3

Submenu M3: setpoint input left end position (0%)

		M	Jump to submenu M3
▲		**M**	Save 0mA, return to main menu item M4
L		**M**	Save 4mA, return to main menu item M4
R		**M**	Save 20mA, return to main menu item M4
▼		**M**	Jump to sub-submenu "free values"

	L **R**	No function
	M	Save the setpoint input value, return to main menu item M4

Submenu M4: setpoint input for right end position (100%)

![display]	**(M)**	Jump to submenu M4

Possible selection limited by the setting in submenu M3.

▲	![display]	**(M)**	Save 0mA, return to main menu item M5
(L)	![display]	**(M)**	Save 4mA, return to main menu item M5
(R)	![display]	**(M)**	Save 20mA, return to main menu item M5
▼	![display]	**(M)**	Jump to sub-submenu "free values"

![display]	**(L) (R)**	No function
![display]	**(M)**	Save the setpoint input value, return to main menu item M5

Submenu M5: current output for left end position (0%)

![display]	**(M)**	Jump to submenu M5

▲	![display]	**(M)**	Save 0mA, return to main menu item M6
(L)	![display]	**(M)**	Save 4mA, return to main menu item M6
(R)	![display]	**(M)**	Save 20mA, return to main menu item M6
▼	![display]	**(M)**	Jump to sub-submenu "free values"

![display]	**(L)**	Reduce output current [1]
![display]	**(R)**	Increase output current [1]
![display]	**(M)**	Save, return to main menu item M6

[1] Holding the keys down will reduce/increase the value faster.

Submenu M6: current output for right end position (100%)

⁅ . . .	**(M)**	Jump to submenu M6

Possible selection restricted by the setting in M5.
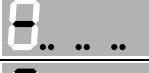
▲	日..	**(M)**	Save 0mA, return to main menu item M7
Ⓛ	⁅..	**(M)**	Save 4mA, return to main menu item M7
Ⓡ	日..	**(M)**	Save 20mA, return to main menu item M7
▼	日..	**(M)**	Jump to sub-submenu "free values"

⁅...	Ⓛ	Reduce output current **2)**
⁅...	Ⓡ	Increase output current **2)**

⁅...	**(M)**	Save, return to main menu item M7

2) Holding the keys down will reduce/increase the value faster.

Submenu M7: hysteresis, three-step controller

片 . . .	**(M)**	Jump to submenu M7

	日..	**(M)**	Save 0.244%, return to main menu item M8
	日..	**(M)**	Save 0.488%, return to main menu item M8
▲	⁅..	**(M)**	Save 0.732%, return to main menu item M8
Ⓛ	∃..	**(M)**	Save 0.976%, return to main menu item M8
	⁅..	**(M)**	Save 1.22%, return to main menu item M8
	⁅..	**(M)**	Save 1.83%, return to main menu item M8
	日..	**(M)**	Save 2.44%, return to main menu item M8

Ⓡ	**7**..	Ⓜ	Save 3.66%, return to main menu item M8
▼	**8**..	Ⓜ	Save 4.88%, return to main menu item M8
	9..	Ⓜ	Save 6.10%, return to main menu item M8

Submenu M8: cut-off delay time, three-step controller

E. . .	Ⓜ	Jump to submenu M8

	0..	Ⓜ	Save 20ms, return to main menu item M9
	1..	Ⓜ	Save 40ms, return to main menu item M9
▲	**2**..	Ⓜ	Save 60ms, return to main menu item M9
Ⓛ	**3**..	Ⓜ	Save 80ms, return to main menu item M9
	4..	Ⓜ	Save 100ms, return to main menu item M9
	5..	Ⓜ	Save 200ms, return to main menu item M9
Ⓡ	**6**..	Ⓜ	Save 400ms, return to main menu item M9
▼	**7**..	Ⓜ	Save 600ms, return to main menu item M9
	8..	Ⓜ	Save 800ms, return to main menu item M9
	9..	Ⓜ	Save 1000ms, return to main menu item M9
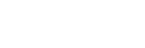
Submenu M9: monitoring of the rotational direction

$d...$	(M)	Jump to submenu M9

(L)	$0....$	(M)	Save OFF, return to main menu item M10
(R)	$1....$	(M)	Save ON, return to main menu item M10

Submenu M10: blocking protection

$b...$	(M)	Jump to submenu M10

(L)	$0....$	(M)	Save OFF, return to main menu item M11
(R)	$1....$	(M)	Save ON, return to main menu item M11

Submenu M11: contrast setting for the LCD display

$c...$	(M)	Jump to submenu M11

An LCD display is available as a special option.

	$0....$	(M)	Save contrast 0 (= min.), return to main menu item M12
▲	$1....$	(M)	Save contrast 1, return to main menu item M12
(L)	$2....$	(M)	Save contrast 2, return to main menu item M12
...	$3\ 4\ 5\ 6\ 7\ 8\ 9\ A\ b\ C$		...
(R)	$d....$	(M)	Save contrast 13, return to main menu item M12
▼	$E....$	(M)	Save contrast 14, return to main menu item M12
	$F....$	(M)	Save contrast 15 (= max.), return to main menu item M12

Submenu M12: EXIT

$E...$	(M)	Exit the programming menu

11 LCD display (option)

The LCD display facilitates menu navigation by showing the individual parameters as plain text. The input and output values can also be displayed.

Layout of the LCD display

Line 1 `AUTO █`
Line 2 `IS  100%`

Manual or automatic mode

Line 1:

− Mode status: `AUTO` = Automatic mode

                       `MANU` = Manual mode

− Actuator status: `█` = Motor off

                       `←L` = Left-hand rotation is active

                       `R→` = Right-hand rotation is active

Line 2: variable measured values
− **IS**: actual value 0 … 100%
− **IS**: absolute actual value   0 … 5V
− **S**: setpoint value 0 … 100%
− **S**: setpoint value 0 … 20mA
− **S**: absolute setpoint value 0 … 5V
− **I**: actual output current 0 … 20mA

Programming mode

Main menu:
− Line 1:   `KONFIG:`
− Line 2:   menu item

Submenu:
− Line 1:   main menu item
− Line 2:   submenu item selection

Parameter/calibration:
− Line 1:   main menu item
− Line 2:   actual output/input value

12   Technical data

Operating voltage

230V AC ±10%,   50/60Hz ±5%
115V AC ±10%,   50/60Hz ±5%
24V AC ±10%,   50/60Hz ±5%

Fuse protection

− Primary (transformer): fuse TR5, 50mA slow-blow
− Secondary (transformer): Polyswitches 140mA & 200mA, self-resetting when the controller is disconnected from the line voltage
− Motor: No fuse protection of the motor current path; a suitable fuse protection must be provided externally

Motor control

− OMRON relay 250V/16A, for 2-winding synchronous motor, 230V, 50/60Hz

Position limit switches

− External with connector JST NVR-03, mechanical, on-board RC interference suppression

Environmental data

− Ambient temperatures for actual value output current 20mA
  − 0 ... +50°C @ burden resistor below 100Ω
  − 0 ... +70°C @ burden resistor above 100Ω
− Dust, humidity and vibration must be avoided
− Installation in actuators series N

System resolution of the microprocessor controller

− 12-bit, flash controller, DSP function
− Undervoltage reset, watchdog timer

Setpoint input

− Current input max. 0 … 20mA, burden resistor 250 Ω
− Voltage input 0 … 5V, 0 … 10V
− Can be selected via jumpers
− Limited protection against overvoltage and reverse polarity

Actual value encoder

− External potentiometer 1 … 10kΩ, attached with connector JST VH-B3P, line length max. 25cm

Actual value output

− Electrically isolated, 4 … 20mA/0 … 20mA
− Burden resistor max. 500 Ω, output voltage max. 10V
− Burden resistor max. 500 Ω, output voltage max. 5V
− Minimum burden resistor 100Ω @ T_u > 50°C, 0Ω @ T_u < 50°C

Configurable

- Left and right end positions
- Setpoint input:
  - 0mA/4mA/20mA/free values
  - 0V/5V/10V/free values
- Actual value output: 0mA/4mA/20mA/free values
- Selectable hysteresis
- Selectable cut-off delay time
- Monitoring of rotational direction can be activated
- Blocking protection can be activated
- LCD display: adjustable contrast

Operation

- Buttons LEFT/MENU/RIGHT
- Switch AUTO/MANU
- Status indication:
  - 7-segment LED display
  - LCD display (option)

Extension slots J2, J3

- Bus module for CANopen fieldbus communication (option)
- Fault message output, pluggable (option)

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