8. Use the controller

8.1 Start-up

8.1.1 Warnings

CAUTION! Check again that the equipment and wiring are correct as required in this manual. Make sure that the fan absorption does not exceed the maximum stated on the identification label. Keep people or things out of the work area.

8.1.2 Start-up procedure

Follow this procedure for correct controller start-up:

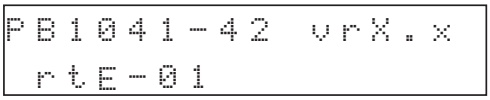
Step	Task	Reference in the manual
1	Complete all electrical power connections at mains voltage.	"Electrical installation" on page 20
2	Complete the input connections (i.e., transducers) and remote controls.	"Connecting analog inputs in Slave mode" on page 23 "Analog input connections in Master mode" on page 25 "Auxiliary On/Off inputs connection" on page 27 "OUT analog output connections" on page 27 "Relay output connection" on page 28
3	Turn on power.	-
4	Set the controller operation using DIP switch SW1.	"DIP switch SW1" on page 13
5	Select the configuration suitable for the transducers used and the application.	"Default configurations" on page 39
6	If needed, modify the base parameters and set the setpoint and night limit.	"Editing parameters" on page 45
7	If needed, in PID mode, modify the parameters.	"Editing parameters" on page 45

8.1.3 Messages displayed when turned on

When the controller is powered on (or after pressing the **RESET** key), before the home page appears, for a few seconds a page appears that shows the following information:

Message	Description
PB1041-42	Hardware type
ver. x.x	Software version
rtE-01	Active configuration at that time.

Example



8.2 Default configurations

8.2.1 Configuration description

***Note**: in the default Master configuration, the setpoint coincides with the maximum fan speed (parameter **hi** = 100%) and the controller automatically selects the probe with the greater signal .*

Configuration	Signal/Transducer	Type of control	Description
rS-010, rS-PWM, rS-420	signal 0–10 Vdc/PWM/4–20 mA	**Slave**	They receive signal in input and replicate it proportionally to the power output. Regulation, alarms, value display will always be in volt (rS-010) or milliampere (rS-420).
rPr420	transducers with 4-20 mA output and mA reading	**Master**	It reads transducer values with current output. Regulation, alarms, and value display will always be in milliampere.
rPr015, rPr025, rPr030, rPr045, rPr050	transducers with 4-20 mA output and bar reading	**Master**	They read transducer values with current output with different scales and convert them into pressure values. Control and value display will always be in pressure (bar). While the minimum and maximum limit alarm on the inputs are in mA, regardless. ***Note**: if the signal is less than 4 mA, 0 bar will always appear on the display.*
rPu030	transducers with V dc output and bar reading	**Master**	It reads transducer values with voltage output and converts them into pressure values. Regulation and value display will always be in pressure (bar).
rUu-05, rUu-010	transducers with V dc output and V dc reading	**Master**	They read transducer values with voltage output. Regulation, alarms, and value display will always be in volt.
rtE-01	probe NTC 10 kΩ @ 25 °C/77 °F	**Master**	They read NTC sensor values and convert them to temperature values. Regulation, alarms, and value display will always be in temperature (° C).

8.2.2 Technical specifications of the configurations

Following are the specifications of each configuration:

***Note**: from version 8.0 of the RDM firmware, the temperature and pressure values can be viewed with Imperial units of measure (°F e psi). Therefore, where the text indicates the unit of measure available in °C, it is also available in °F, and where bar is indicated, psi is also available. For the conversion values, use the following formulas: °F = 32+ (°C x 9/5), psi = bar x 14.5.*

Configuration	Mode	IN1/IN2 input	Signal/ Transducer/	Display	Setpoint	Proportional band
rS-010	Slave	0–10 V dc Ri= 10 kΩ	0–10 V dc	0–11 V dc	-	-
rS-420	Slave	4–20 mA Ri= 100 Ω	4–20 mA	0–24 mA	-	-
rS-PWM	Slave	3–30 Vdc/10 mA	PWM Modulator	0–100%	-	-
rPr420	Master	4–20 mA Ri= 100 Ω	4–20 mA	4–20 mA	14 mA	2.6 mA
rPr015	Master	4–20 mA Ri= 100 Ω	0–15 bar > 4–20 mA	0–15 bar	10.6 bar	2.4 bar
rPr025	Master	4–20 mA Ri= 100 Ω	0–25 bar > 4–20 mA	0–25 bar	17.0 bar	3.5 bar
rPr030	Master	4–20 mA Ri= 100 Ω	0–30 bar > 4–20 mA	0–30 bar	17.0 bar	3.5 bar
rPr045	Master	4–20 mA Ri= 100 Ω	0–45 bar > 4–20 mA	0–45 bar	25.0 bar	5.2 bar

Configuration	Mode	IN1/IN2 input	Signal/ Transducer/	Display	Setpoint	Proportional band
rPr050	Master	4–20 mA Ri= 100 Ω	0–50 bar > 4–20 mA	0–50 bar	25.0 bar	5.2 bar
rUu05	Master	0–5 V dc Ri= 10 kΩ	0–5 V dc	0–5 V dc	2.9 V dc	0.8 V dc
rPu030	Master	0–5 V dc Ri= 10 kΩ	0–30 bar > 0–5 V dc	0–30 bar	18.9 bar	3.5 bar
rUu010	Master	0–10 V dc Ri= 10 kΩ	0–10 V dc	0–10 V dc	6 V dc	1.6 V dc
rtE-01 (default)	Master	NTC 10 kΩ @ 25°C	NTC 10 kΩ @ 25°C	from -10 to + 90 °C	45 °C	7.5 °C

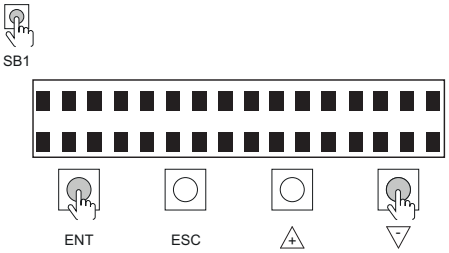
8.2.3 Select a configuration

***NOTICE**: this deletes any previous change and restores all selected configuration default values.*

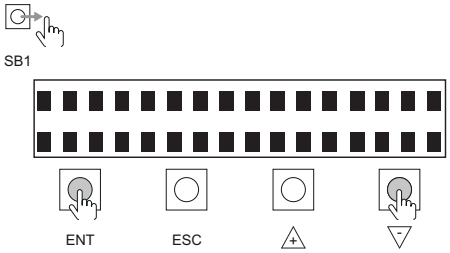
***Note**: if the microprocessor is executing complex algorithms, it may not be able to instantly recognize when keys are pressed. Wait a few seconds and retry.*

***Note**: follow this procedure also if there is a fault in displaying the parameters on the display: all selected configuration default values will be restored.*

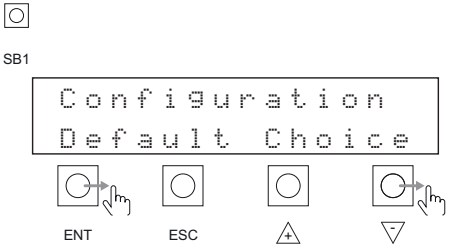
To change/restore a configuration:



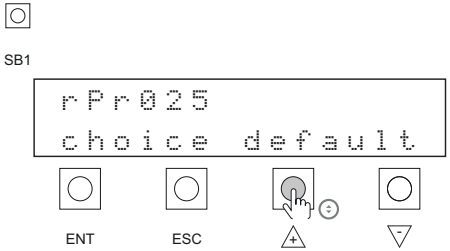
1. Simultaneously press and hold down the **Reset**, **ENT** and ▽ keys.



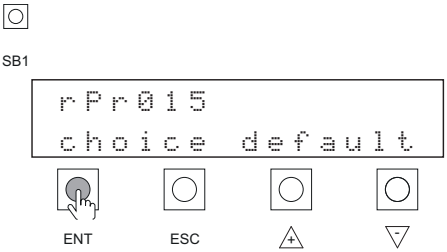
2. Release the reset key and wait for the “Configuration Choice Default” message to appear.



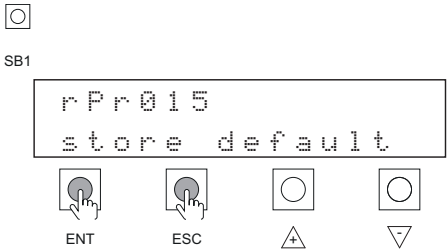
3. Simultaneously release the **ENT** and ▽ keys: the last set configuration appears.



4. Press the △ and ▽ keys to scroll through the settings.



5. Press the **ENT** key corresponding to the chosen configuration: the “Store default” message appears, flashing.



6. Continue as follows:
   - To confirm, simultaneously press the **ENT** and **ESC** keys: the "Update" message appears and then the main page is displayed.
   - To cancel and modify the selected configuration press the **ESC** key once.
   - To return to the home page, press the **ESC** key twice.

8.3 Set the DIP switch

8.3.1 Getting started

Based on the switch settings, the functions enabled change. For details on setting the switches, see "DIP switch SW1" on page 13. For detailed information on the settings of switch 7, see "Modify the cosϕ of the motor" on page 50.

8.3.2 Set the switches

1. With the controller powered on, set the switch to the desired position.
2. Press the reset button: the display turns black and the **FAIL** status LED turns on.
3. Wait for the controller to restart: the **FAIL** status LED turns off, the start screen appears on the display, and then the home page is displayed.

8.4 Parameter table

8.4.1 List of parameters/measurements

Following are all of the parameters for the controller in order of their display.

Parameter/ page	Description	Unit of measure
SP (1)	Setpoint	°C/ mA/ bar/ V dc
Mode (1)	Control mode: **P** (proportional) or **PID**	-
Pb (1,2)	Fan proportional band	°C/ mA/ bar/ V dc
Lh (1,3)	Maximum night limit speed (% RPM)	%
hi	Maximum speed limit (% RPM)	%
Lo	Minimum speed limit (% RPM)	%
dE	Execution time for changing from the minimum speed to the maximum speed, and vice versa	s
Jh	Upper speed limit for jump (% RPM)	%
JL	Lower speed limit for jump (% RPM)	%
Sh (1)	Input value that forces the fan control command to the maximum. (Bypass maximum speed limit)	°C/ mA/ bar/ V dc
ih (1)	**Sh** hysteresis	°C/ mA/ bar/ V dc
So	Input value that forces the fan control command to zero. (Bypass minimum speed limit)	°C/ mA/ bar/ V dc
io	**So** hysteresis	°C/ mA/ bar/ V dc
HP (1, 3)	Set speed (%RMP) for defrost operation	%
PID control parameters. Only with PID control mode (Mode = PID)		
Kp (4)	Proportional band	°C/ mA/ bar/ V dc
Ki (4)	Integral component weight	-
Kd (4)	Derivative component weight	-
Ti (4)	Integration time	s
Td (4)	Derivation time	s
Read-only parameters		
ti	Real-time board temperature	°C
in1/in2	Prevalent input and therefore used by the controller	°C/ mA/ bar/ V dc
i2	Current value of input IN1	°C/ mA/ bar/ V dc
i2	Current value of input IN2	°C/ mA/ bar/ V dc

(1): the parameter is visible and can only be set if the controller is operating in Master mode.

*(2): the parameter is visible if the parameter **Mode**=**P**.*

(3): set the relative switch of the DIP switch SW1. See "DIP switch SW1" on page 13.

*(4): the parameter is visible if the parameter **Mode**=**PID***

8.4.2 Display the values of all the parameters/measurements

***Note**: visible parameters depend on the set configuration.*

1. Press + or − to scroll through all the parameters/measurements: they are shown in the sequence indicated in "List of parameters/measurements" on page 42.
2. Press the **ESC** key to return to the home page.

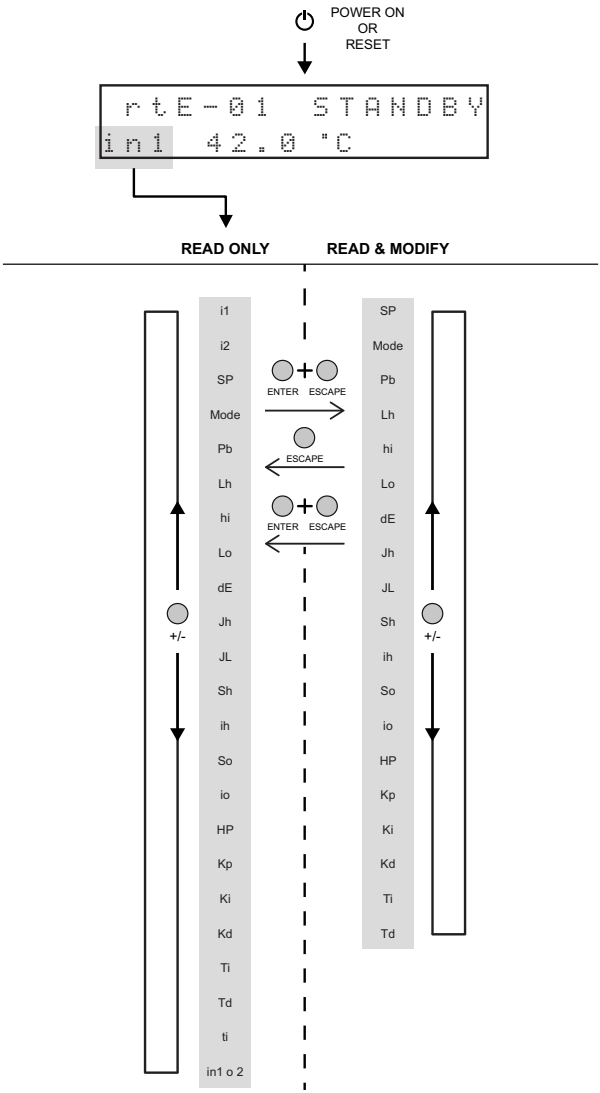
8.5 Navigation structure

8.5.1 Getting started

When turned on, after the start-up screen, the home page is displayed (see "Home page" on page 45). From the home page, press the + and − keys to display the current values of all the parameters/measurements (see "List of parameters/measurements" on page 42).

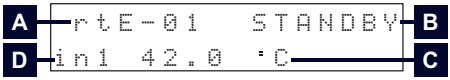
To edit the parameters, simultaneously press the **ENT** and **ESC** keys (see "Editing parameters" on page 45).

8.5.2 Menu layout



8.6 Home page

8.6.1 Page structure

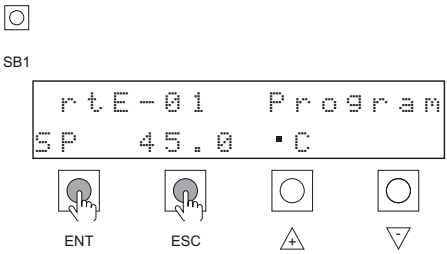


Part	Description
A	Current configuration
B	System status or alarm/warning message. **System status** ■ **STANDBY**: controller ready for operation, no power distributed. ■ **PWR XXX%**: control command value. ■ **LhPW XXX%**: control command value with night limit active. ■ **HP%**: control command value with defrost function active. ■ **SET CosPhi**: manual control of the **cosϕ** parameter enabled (switch 7 of DIP switch: ON). ■ **STOP**: control disabled (start/stop contact at rest). **Alarm messages** See "Alarm messages" on page 52.
C	Prevalent input value. The unit of measure depends on the set configuration.
D	Prevalent input (**IN1** or **IN2**)

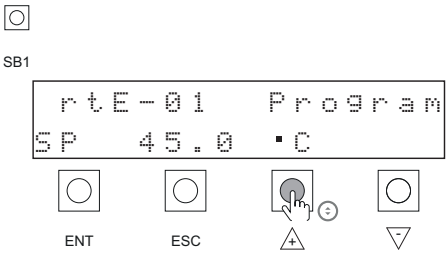
8.7 Editing parameters

8.7.1 Modify a parameter

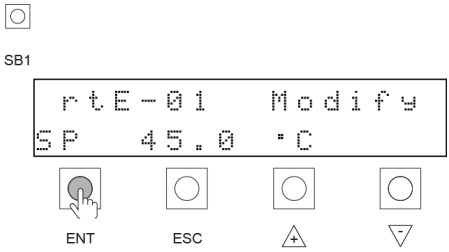
***Note**: To modify the PID parameters, set the parameter **Mode**=**PID** and then modify the individual* parameters.



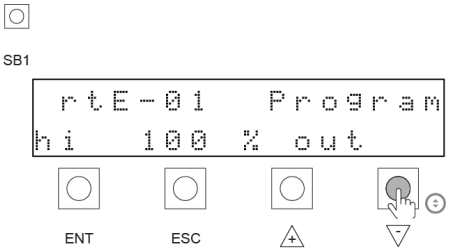
1. Press the **ENT** and **ESC** keys at the same time: when they are released, the "Program" message appears.



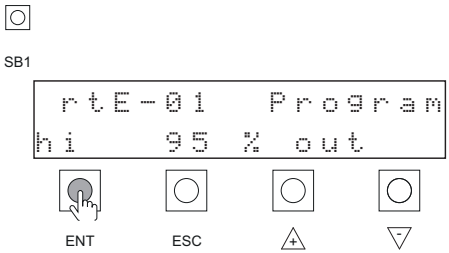
2. Press ▲ or ▼ to scroll through the parameters.



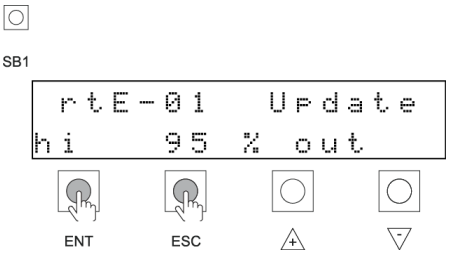
3. Press the **ENT** key for the parameter selected: when it is released, the "Modify" message appears.



4. Press ▲ or ▼ to edit the selected parameter value.



5. Press the **ENT** key to confirm the modification of the parameter: when it is released, the "Program" message appears.



6. Continue as follows:
   - To confirm, press the **ENT** and **ESC** keys at the same time to save the change: the "Update" message appears and then the home page is displayed.
   - To cancel the change, press only the **ESC** key: the "Escape" message appears and then the home pave is displayed.

8.7.2 Note for modifying parameters Lh and HP

To change the parameters **Lh** and **HP**, the relative switches must be set on DIP switch SW1, see "DIP switch SW1" on page 13 and "Set the DIP switch" on page 41.

8.7.3 Note for modifying parameters Jh and JL

When modifying the parameter, the output voltage of the controller is changed to the current value of the parameter. This allows the scale of output voltage control to be scrolled through and for the identification and definition of the noise zone emitted by the fans.

8.7.4 Parameter list

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/signal	Configuration
SP (1)	Setpoint	°C	-10.0	+90.0	45.0	NTC 10k@ 25 °C	rtE-01
		mA	4.0	20.1	14.0	4–20 mA	rPr420
		bar	0	15.0	10.6	0–15 bar > 4–20 mA	rPr015
		bar	0	25.0	17.0	0–25 bar > 4–20 mA	rPr025
		bar	0	30.0	17.0	0–30 bar > 4–20 mA	rPr030
		bar	0	45.0	25.0	0–45 bar > 4–20 mA	rPr045
		bar	0	50.0	25.0	0–50 bar > 4–20 mA	rPr050
		V dc	0	10.0	6.0	0–10 V dc	rUu010
		V dc	0	5.0	2.9	0–5 V dc	rUu-05
		bar	0	30.0	18.9	0–30 bar > 0–5 V dc	rPu030
Mode (1)	Control mode: **P** (proportional) or **PID**	-	-	-	P	-	-
Pb (1,2)	Fan proportional band	°C	2.0	55.0	7.5	NTC 10k@ 25 °C	rtE-01
		mA	0.2	16.0	2.6	4–20 mA	rPr420
		bar	0.5	15.0	2.4	0–15 bar > 4–20 mA	rPr015
		bar	1.0	25.0	3.5	0–25 bar > 4–20 mA	rPr025
		bar	1.0	30.0	3.5	0–30 bar > 4–20 mA	rPr030
		bar	1.0	45.0	5.2	0–45 bar > 4–20 mA	rPr045
		bar	1.0	50.0	5.2	0–50 bar > 4–20 mA	rPr050
		V dc	0.2	10.0	1.6	0–10 V dc	rUu010
		V dc	0.1	5.0	0.8	0–5 V dc	rUu-05
		bar	1.0	30.0	3.5	0–30 bar > 0–5 V dc	rPu030
Lh (1,3)	Maximum night limit speed (% RPM)	%	0	100	100	All	All in Master mode
hi	Maximum speed limit (% RPM)	%	0	100	100	All	All
Lo	Minimum speed limit (% RPM)	%	0	100	0	All	All
dE	Execution time for changing from the minimum speed to the maximum speed, and vice versa	s	2	60	2	All	All
Jh	Upper speed limit for jump (% RPM)	%	0	100	100	All	All

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/signal	Configuration
JL	Lower speed limit for jump (% RPM)	%	0	100	100	All	All
Sh (1)	Input value that forces the fan control command to the maximum. (Bypass maximum speed limit)	°C	-20.0	+90.0	90.0	NTC 10k@ 25 °C	rtE-01
		mA	4.0	20.0	20.0	4–20 mA	rPr420
		bar	0	15.0	15.0	0–15 bar > 4–20 mA	rPr015
		bar	0	25.0	25.0	0–25 bar > 4–20 mA	rPr025
		bar	0	30.0	30.0	0–30 bar > 4–20 mA	rPr030
		bar	0	45.0	45.0	0–45 bar > 4–20 mA	rPr045
		bar	0	50.0	45.0	0–50 bar > 4–20 mA	rPr050
		V dc	0	10.1	10.0	0–10 V dc	rUu010
		V dc	0	5.0	5.0	0–5 V dc	rUu-05
		bar	0	30.0	30.0	0–30 bar > 0–5 V dc	rPu030
ih (1)	**Sh** hysteresis	°C	1.0	30.0	1.0	NTC 10k@ 25 °C	rtE-01
		mA	0.1	5.0	0.1	4–20 mA	rPr420
		bar	0.1	5.0	0.1	0–15 bar > 4–20 mA	rPr015
		bar	0.1	8.0	0.1	0–25 bar > 4–20 mA	rPr025
		bar	0.1	8.0	0.1	0–30 bar > 4–20 mA	rPr030
		bar	0.1	15.0	0.1	0–45 bar > 4–20 mA	rPr045
		bar	0.1	15.0	0.1	0–50 bar > 4–20 mA	rPr050
		V dc	0.1	5.0	0.1	0–10 V dc	rUu010
		V dc	0.1	2.5	0.1	0–5 V dc	rUu-05
		bar	0.1	15.0	0.1	0–30 bar > 0–5 V dc	rPu030

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/signal	Configuration
So	Input value that forces the fan control command to zero. (Bypass minimum speed limit)	°C	-20.0	+90.0	-20.0	NTC 10k@ 25 °C	rtE-01
		mA	4.0	20.0	4.0	4–20 mA	rPr420
		bar	0	15.0	0	0–15 bar > 4–20 mA	rPr015
		bar	0	25.0	0	0–25 bar > 4–20 mA	rPr025
		bar	0	30.0	0	0–30 bar > 4–20 mA	rPr030
		bar	0	45.0	0	0–45 bar > 4–20 mA	rPr045
		bar	0	50.0	0	0–50 bar > 4–20 mA	rPr050
		V dc	0	10.0	0	0–10 V dc	rUu010
		V dc	0	5.0	0	0–5 V dc	rUu-05
		bar	0	30.0	0	0–30 bar > 0–5 V dc	rPu030
		mA	4.0	20.0	4.0	-	rS-420
		%	0	100	0	-	rS-PWM
		V dc	0	10.0	0	-	rS-010
io	**So** hysteresis	°C	1.0	30.0	1.0	NTC 10k@ 25 °C	rtE-01
		mA	0.1	5.0	0.1	4–20 mA	rPr420
		bar	0.1	5.0	0.1	0–15 bar > 4–20 mA	rPr015
		bar	0.1	8.0	0.1	0–25 bar > 4–20 mA	rPr025
		bar	0.1	8.0	0.1	0–30 bar > 4–20 mA	rPr030
		bar	0.1	15.0	0.1	0–45 bar > 4–20 mA	rPr045
		bar	0.1	15.0	0.1	0–50 bar > 4–20 mA	rPr050
		V dc	0.1	5.0	0.1	0–10 V dc	rUu010
		V dc	0.1	2.5	0.1	0–5 V dc	rUu-05
		bar	0.1	15.0	0.1	0–30 bar > 0–5 V dc	rPu030
		mA	0.1	5.0	0.1	-	rS-420
		%	0.1	50	0.1	-	rS-PWM
		V dc	0.1	5.0	0.1	-	rS-010
HP (1, 3)	Set speed (%RMP) for defrost operation	%	0	100	0	All	All in Master mode

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/signal	Configuration
Kp (4)	Proportional band	°C	2.0	55.0	7.5	NTC 10k@ 25 °C	rtE-01
		mA	0.2	16.0	2.6	4–20 mA	rPr420
		bar	0.5	15.0	2.4	0–15 bar > 4–20 mA	rPr015
		bar	1.0	25.0	3.5	0–25 bar > 4–20 mA	rPr025
		bar	1.0	30.0	3.5	0–30 bar > 4–20 mA	rPr030
		bar	1.0	45.0	5.2	0–45 bar > 4–20 mA	rPr045
		bar	1.0	50.0	5.2	0–50 bar > 4–20 mA	rPr050
		V dc	0.2	10.0	1.6	0–10 V dc	rUu010
		V dc	0.1	5.0	0.8	0–5 V dc	rUu-05
		bar	1.0	30.0	3.5	0–30 bar > 0–5 V dc	rPu030
Ki (4)	Integral component weight	-	0.0	1000	2	All	All
Kd (4)	Derivative component weight	-	0.0	1000	1	All	All
Ti (4)	Integration time	s	0	100	1	All	All
Td (4)	Derivation time	s	0	100	10	All	All

(1): the parameter is visible and can only be set if the controller is operating in Master mode.

*(2): the parameter is visible if the parameter **Mode**=**P**.*

(3): set the relative switch of the DIP switch SW1. See "DIP switch SW1" on page 13.

*(4): the parameter is visible if the parameter **Mode**=**PID***

8.8 Modify the cosϕ of the motor

8.8.1 Getting started

Setting the **cosϕ** parameter, it is possible to change the motor cosϕ factory value.

8.8.2 Set the cosϕ parameter

1. Set switch 7 of DIP switch SW1 to On. See "Set the DIP switch" on page 41: the display turns on. After the start-up screen is displayed, the **SET cosϕ** screen is displayed.
2. Proceed to modify the parameter. See "Editing parameters" on page 45. When modifying, check the wave shape of the output current of one phase using an oscilloscope and a current transducer.
3. Set switch 7 of DIP switch SW1 to Off.
4. Press the reset button and wait for the controller to restart.

8.9 Adjust the display contrast

8.9.1 Getting started

The brightness value can be varied from 60 to 100 and set in steps of 2.

8.9.2 Procedure

To increase the contrast, simultaneously press and hold down the **ENT** and  keys.
To decrease the contrast, simultaneously press and hold down the **ENT** and  keys.
On the second row of the display “LCD” appears and the current value of the dimmer.