

MICROFAN

THREE-PHASE FAN SPEED CONTROLLER

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1. GENERAL WARNING

1.1 PLEASE READ BEFORE USING THIS MANUAL

- This manual is part of the product and should be kept near the instrument for easy and quick reference.
 - The instrument shall not be used for purposes different from those described hereunder. It cannot be used as a safety device.
1. Check the application limits before proceeding.

1.2 PRECAUZIONI DI SICUREZZA

- Check the supply voltage is correct before connecting the instrument.
- Use the device only within its application limits
- Never open the device while it's working
- WARNING: before to start any kind of maintenance turn off all the electrical connections of the device and wait 10 minutes before to open the box.
- Consider the maximum load that can be applied (see technical data).
- Consider the maximum current which can be applied to each relay (see technical Data).
- Fit the probe where it is not accessible by the End User.
- Place the device inside the air flow generated by the fan in order to allow the proper heat dissipation.
- Ensure that the wires for probes, loads and the power supply are separated and far enough from each other, without crossing or intertwining.
- In case of failure or faulty operation send the instrument back to the distributor or to "Dixell s.r.l." (see address) with a detailed description of the fault.

2. GENERAL DESCRIPTION

MICROFAN is a family of inverters specifically devoted to fan speed control in air conditioning and refrigeration applications. The series is made by 2 full models, one for power up to 4kW and one for 2.5kW, and 2 power expansions.

- XV340GS** Full unit for powers up 4kW
- XV325GS** Full unit for powers up 2.5kW
- XV340P** Expansion unit of 4kW
- XV325P** Expansion unit of 2.5kW

The combination between one full unit and one expansion allows to reach a maximum power of 8kW in output.

Models XV340GS e XV325GS are equipped with 2 microprocessors, one for the independent control of the power section (which consists in a three-phase output for the managing of fan speed and in a alarm relay) and one for the control section (which includes two probe inputs, configurable as NTC or pressure probe 4-20mA, one configurable digital input, one RS485 serial port with ModBUS protocol and the TTL output for the programming by means of the HOT KEY). Models XV340P and XV325P are equipped with the sole power section since the control and regulation part are managed by the full units (XV340GS or XV325GS) which they are linked to.

3. REGULATION

Fan speed regulation is performed by the variation of the frequency of the output sinusoid. Output frequency calculation is depending on the temperature/pressure values measured by the input probes

Regulation value

Following the set of parameter **Pbr** the regulation is based on the measures of the probes:

Pbr = Pb1: regulation is based on the value measured by probe 1.

Pbr = 1r2: the regulation is based on the difference of the values measured by the two probes (Pb1 – Pb2). This working mode requires that both probes are of the same kind (NTC o 4-20mA).

Pbr = PHi: the regulation is based on the highest value between the measures of the two probes. This working mode requires that both probes are of the same kind (NTC o 4-20mA).

Frequency limits

Two frequency limits are fixed, by means of parameters **Fhi** and **Flo**, which the output is forced to in case of exceeding of the thresholds given by the Set Point (**SET**) and the value Set Point + proportional band (**Pb**).

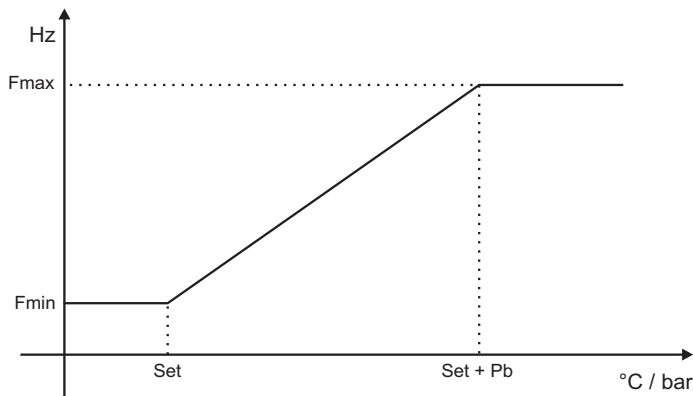
Type of regulation

By means of the parameter **CH** is possible to select direct or reverse action.

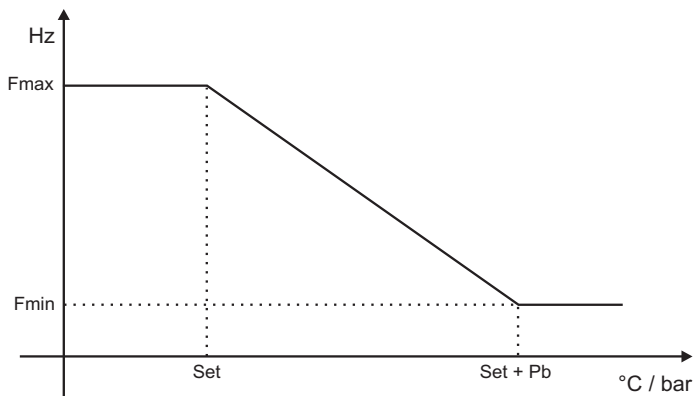
4-20mA direct input

By setting parameter **Pc1** = nrE (no regulation) Microfan is set in a particular working. In this mode a 4-20mA signal is accepted as input (at Probe 1 terminals) but the device doesn't apply any kind of regulation. When the input is 4mA the output will be 0% of the maximum frequency available (**Fhi**); when the input is 20mA the output will be 100% of the maximum frequency available (**Fhi**) while the other values are calculated by mean of a linear interpolation.

Direct action:

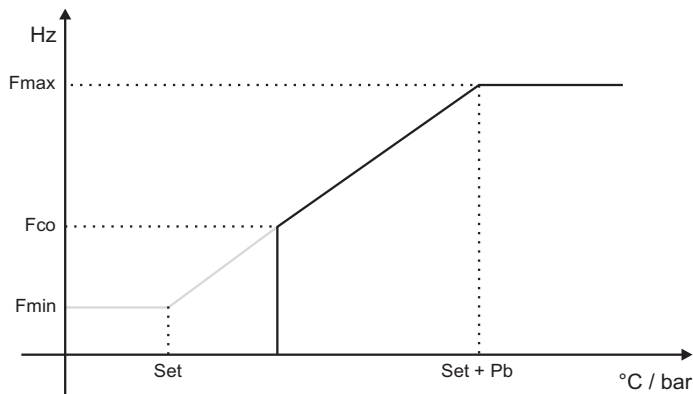


Reverse action:



3.1 CUT OFF FUNCTION

This function allows the regulator to instantaneously turn off the output when its frequency reach the value set in **Fco** parameter (Cut Off frequency).



4. PROGRAMMING KEYBOARD (KXV PRG)



- To display and modify the Set Point. By holding it pressed for 3 seconds allows Set point programming in programming mode it selects a parameter or confirm an operation. in programming mode browses the parameter codes or increases the displayed value.
- In visualisation menù browses the codes of the variable to display. By holding it pressed for 3 seconds allows Hot Key UPLOADING in programming mode browses the parameter codes or decreases the displayed value.
- In visualisation menù browses the codes of the variable to display.
- By holding it pressed for 3 seconds enter to PR1 programming level
- To enter in Visualisation menù
- By holding it pressed for 5 seconds stops or starts the fans

KEYS COMBINATION

- To exit the programming

4.1 USE OF LEDS

Each LED function is described in the following table.

LED	MODE	FUNCTION
	ON	Proportional output ON
	ON	On / Off output ON
LED 1 + LED 2	FLASHING	Programming phase
	ON	- ALARM - In programming phase "Pr2" states that the parameter is present in "Pr1" too.
AUX	ON	AUX output ON

If MICROFAN is not provided with programming keyboard two LED on the side of the unit will signals the working status:

LED	MODE	FUNCTION
GREEN	ON	The unit is powered and working
GREEN	OFF	The unit is not powered
RED	ON	Alarm: an alarm condition occurred
RED	OFF	No alarm in progress

4.2 VISUALISATION MENÙ

The visualisation menu allows the user to choose which variable, among the available one, to display permanently on keyboard display or to temporary all the other ones.

The variable are:

- Pb1 Probe 1 value
- Pb2 Probe 2 value (if present)

- Frq Frequency of the proportional output
- th1 Heat sink temperature
- Ib1 Current of the proportional output
- IV1 Voltage of the proportional output
- th2 Slave unit Heat sink temperature (if present)
- Ib2 Current of slave unit proportional output (if present)
- IV2 Voltage of slave unit proportional output (if present)
- out Exit visualisation menu

How to check a value:

- Enter the visualisation menu by pressing **Menù** key. the first variable of the menu (Pb1) appears.
- Using **▲** and **▼** choose the desired variable.
- To display the value press **Menu** key.
- By pushing **Menu** key again the following label is displayed.
- To exit the visualisation menu press **Menu** key while label "out" is displayed.

How to chan permanently displayed variable:

- Enter the visualisation menu by pressing **Menù** key. the first variable of the menu (Pb1) appears.
- Using **▲** and **▼** choose the desired variable.
- Press **Menu** key for at least 3 sec.. Variable's label will flash 3 times then the keyboard automatically exits the menu and the new variable is starting to be visualised on the display.

4.3 HOW TO SEE THE SET POINT

- 1 Push and immediately release the **SET** key: the display will show the Set point value.
- 2 Push and immediately release the **SET** key or wait for 5 seconds to display the probe value again.

4.4 HOW TO MODIFY THE SETPOINT

- 1 Push **SET** key for 3 seconds to modify the Set point value.
- 2 The value of the set point will be displayed and LED 1 start blinking.
- 3 To change the Set value push the **▲** or **▼** arrows within 10s
- 4 To confirm the new set point value push the **SET** key again or wait 10s.

4.5 TO ACCESS PARAMETER LIST "PR1"

- 1 At any time push for at least 3 seconds **prg** button. Label of the first parameter available will appear.

4.6 TO ACCESS PARAMETER LIST "PR2"

- 1 Stop the fan by pushing for 3 sec. **Stop** button.
- 2 Access parameter list PR1
- 3 Press again **prg** Button for other 3 seconds. Label of the first parameter available will appear.

4.7 CHANGE PARAMETER'S VALUE

To change value to a parameter:

- 1 Enter the Programming mode.
- 2 Select the required parameter with **▲** or **▼**.
- 3 Press the **"SET"** key to display its value.
- 4 Use **▲** or **▼** to change its value.
- 5 Press **"SET"** to store the new value and move to the following parameter.

To exit: Press **SET + UP** or wait 15s without pressing a key.

NOTE: the new programming is stored even when the procedure is exited by waiting the time-out.

5. PARAMETER LIST

- Pb** **Proportional band:** (0.0 ÷ 50.0°C, 90°F, 30.0 bar, 435 PSI) proportional band value. Proportional band is added to Set Point value and represent the action area within which inverter's proportional output operates.
- LS** **Minimum set point limit:** (- 40.0°C ÷ 110°C, 230°F / 0.0 ÷ 30.0 bar, 435 PSI) Sets the minimum acceptable value for the set point.
- US** **Maximum set point limit:** (- 40.0°C ÷ 110°C, 230°F / 0.0 ÷ 30.0 bar, 435 PSI) Set the maximum acceptable value for set point.
- CH** **Kind of action:** Selects the kind of action of the Inverter
dir = direct
in = reverse
- dEu** **Measuring unit:** C = Celsius, F = Fahrenheit, bar = bar, PSI = PSI.
ATTENTION: . When the measurement unit is changed the SET point and the values of the regulation parameters have to be modified.
- rES** **Resolution (per °C/bar):** (in = 1°C/bar; de = 0,1°C/bar) allows decimal point display.

- ALC Alarm configuration:** States if the temperature alarms are related to the set point or are considered absolute values.
rE = relative to the set point
Ab = absolute
- ALU High temperature alarm setting:** (- 40.0°C ÷ 110°C, 230°F / 0.0 ÷ 30.0 bar, 435 PSI) when this temperature is reached and after the ALd delay time the HA alarm is enabled.
- ALd Temperature alarm delay:** (0÷255 min) time interval between the detection of an alarm condition and the corresponding alarm signalling.
- dAO Temperature alarm delay at start-up:** (0 ÷255min) time interval between the detection of the temperature alarm condition after the instrument power on and the alarm signalling.
- Fco CUT OFF frequency:** (1.0 ÷ 30 Hz) Frequency value below which the proportional output is deactivated.
- Hco CUT OFF differential:** (0.5 ÷ 10 Hz) differential for the recovering of CUT OFF condition.
- rEG Type of regulation V-F:** Select the kind of regulation V-F (Voltage – frequency):
co = constant (linear)
qu = quadratic.
- FHI Maximum frequency:** (5.0 ÷ 60.0 Hz) maximum frequency applicable to the motor.
- FLo Minimum frequency:** (5.0 ÷ FHI Hz) Minimum frequency applicable to the motor. This value represent the minimum frequency (so the speed) applied to the fan when the measured variable is below SET POINT value.
- Fno Rated frequency:** (FLo ÷ 60.0 Hz) Rated frequency of the motor.
- tLo Minimum voltage applied to the motor:** (0 ÷ 100%) Value of the minimum voltage applied to the motor (in percentage of the rated voltage applied to Microfan input)
- tno Rated voltage of the motor:** (0 ÷ 100%) Rated voltage of the motor (in percentage of the rated voltage applied to Microfan input)
- tAc Acceleration time:** (5 ÷ 100 sec.) minimum acceleration time of the motor
- tdc Deceleration time:** (5 ÷ 100 sec.) minimum deceleration time of the motor
- ASu Maximum current overload limit:** (1 ÷ 10A) limit for current overload alarm
- ASd Maximum current overload alarm delay:** (0 ÷ 60 sec.) time delay for current overload alarm
- t1A On/Off regulator activation delay:** (0 ÷ 120 min.) when the proportional output reaches the maximum value (FHI) states the On/Off output activation delay.
- FSA On/Off differential:** (0 ÷ 30Hz) Differential for the On/Off output. On/Off output is deactivated when the value of the frequency of the proportional output reaches the value FHI – FSA.
- oF1 Probe 1 calibration:** (± 20.0 °C / ±36 °F / ±10.0 bar / ±145 PSI sec.)
- oF2 Probe 2 calibration:** (± 20.0 °C / ±36 °F / ±10.0 bar / ±145 PSI sec.)
- P2P Probe 2 presence:**
no = probe not present
Yes = probe present
ATTENTION: if probe 2 isn't present it won't be possible to select the linear control based on the 2 probes (see Pbr parameter).
- Pc1 Probe 1 configuration:**
NTC = NTC input
cor = Current (4-20mA) input
nrE = no regulation (4-20mA) input.
- Pc2 Probe 2 configuration:**
NTC = NTC input
cor = Current (4-20mA) input
- Pbr Kind of regulation of linear control:** Allows to select the regulation desired.
Pb1 = regulation is based on Probe 1 value.
1r2 = regulation is based on the difference between probe 1 and probe 2 values (both probe have to be of the same kind).
PHI = regulation is based on the highest value between probe one and probe 2 (both probe have to be of the same kind).
- CSG Frequency in output with faulty probe:** (0 ÷ 100%) is the frequency maintained as output in case of faulty probe. The value is in percentage of FHI
- Lc1 Pressure probe scale start:** (-999 ÷ 999 bar/PSI) First value of pressure probe scale
- Uc1 Pressure probe full scale:** (-999 ÷ 999 bar/PSI) full scale value of pressure probe
- tG Type of Gas:** Kind of gas used in the system:
22 = R22
404 = R404
407 = R407
- dic Digital input configuration:**
OFF = activate / deactivate proportional output
ALL = External alarm
AUX = Auxiliary probe activation
- Dip Digital input polarity:**
CI = active when the contact is close
oP = active when the contact is open
- dld Digital input activation delay:** (0 ÷ 255 min.) If the digital input is set as alarm state the its activation delay
- PP2 Power expansion (XV340P or XV325P) presence:**
no = Power expansion not present
Yes = Power expansion present
- Adr RS485 serial output address:** (1÷247) Identifies the instrument address when connected to a ModBUS compatible monitoring system.
- Ptb Parameter table:** (Read only) shows the original code of the **dixell** parameter map.
- REL Firmware release:** (read only) Software version of the microprocessor

6. DIGITAL INPUT

Microfan is supplied with 1 configurable digital input (free of voltage).

6.1 ON/OFF (OFF)

When the digital input is activated the proportional output of the inverter is turned off.
When the digital input is kept deactivated again the proportional output turns back on.

6.2 EXTERNAL ALARM (EAL)

When the digital input is activated and, after the delay set in "did" parameter, an alarm is signalled.

6.3 AUXILIARY OUTPUT ACTIVATION (AUX)

When the digital input is activate the auxiliary output is turned on.
When the digital input is deactivated Microfan's auxiliary output is turned off.

7. INSTALLING

Install the MICROFAN within the air flow generated by the fan, taking care that the heat sink is directly invested by the air, so the best heat dissipation.

8. ELECTRICAL WIRING

The instrument is provided with screw terminal block to connect cables with cross section up to 2,5 mm² for the digital and analogue inputs (low voltage signals).
For High voltage connections (400Vac), MICROFAN is supplied with screw terminal blocks to connect cables with cross section up to 4 mm².

Before to connect the cable check carefully that the voltage is according to the unit requirements . Separate the probe cables from the power supply cables, from the outputs and the power connections. Do not exceed the maximum current allowed on each relay, in case of heavier loads use a suitable external relay.

Do not open the unit while powered and wait 10 minutes after power cutting before to open the box.

9. RS485 SERIAL OUTPUT

The RS485 serial communication port allows to connect the unit, by means of a simple 2 wires shielded cable, to a network line ModBUS-RTU compatible as the **dixell** monitoring system XJ500.

10. USE OF THE PROGRAMMING "HOT KEY"

10.1 DOWNLOAD (FROM THE "HOT KEY" TO THE INSTRUMENT).

At power on if the programming Hot Key is inserted the data DOWNLOAD is automatically started.

During this phase the red LED is flashing and all the regulations are blocked .

At the end of the download the red LED will state the result of the operation:

Red Led OFF = the download has been successfully operated

Red Led ON = the downloading wasn't successfully terminated and the unit has to be turned off and on again in order to repeat the operation or to start with the normal regulation (in this last case the hot key has to be removed).

10.2 UPLOAD (FROM THE INSTRUMENT TO THE "HOT KEY").

The unit can perform an UPLOAD of its programming to the Hot Key.

The programming keyboard have to be connected and the unit have to be powered.

While displaying the standard visualisation push the ▲ till the label "uPL" appears (5 seconds).
Now if the keyboard is connected to the TTL output remove it and insert the HOT KEY within 20 seconds; "UPLOAD" procedure will start.

During this phase the red LED is flashing and all the regulations are blocked .

At the end of the upload the red LED will state the result of the operation:

Red Led OFF = the upload has been successfully operated

Red Led ON = the uploading wasn't successfully terminated; now it's possible to re-insert the keyboard and repeat the operation or to remove the HOT KEY and let the unit start with the standard regulation.

11. ALARM SIGNALS

Mess.	Cause	Output
HtA	High temperature alarm	Alarm led on
PF1	Probe 1 failure	Proportional output following CSG parameter
PF2	Probe 2 failure	Proportional output following CSG parameter
EE	Memory failure	Proportional output OFF sequence
tA	Power section voltage alarm	Proportional output OFF sequence
SA	Power section overload alarm	Proportional output OFF sequence
HA	Heat sink high temperature alarm	Proportional output OFF
GA	Power section general alarm	Proportional output OFF
FA	Phase loss alarm	Proportional output OFF sequence
cA	Power expansion No link alarm	Proportional output OFF sequence
AA	Power section analogue input alarm	Proportional output OFF sequence

The alarm message is displayed until the alarm condition is recovered.

All the alarm messages are showed alternating with the variable selected for the displaying All the alarms related to the power section are displayed together with a number that state is the power section is local (1) or remote (2).

EXAMPLE:

HA2 = Heat sink high temperature alarm on the expansion power section

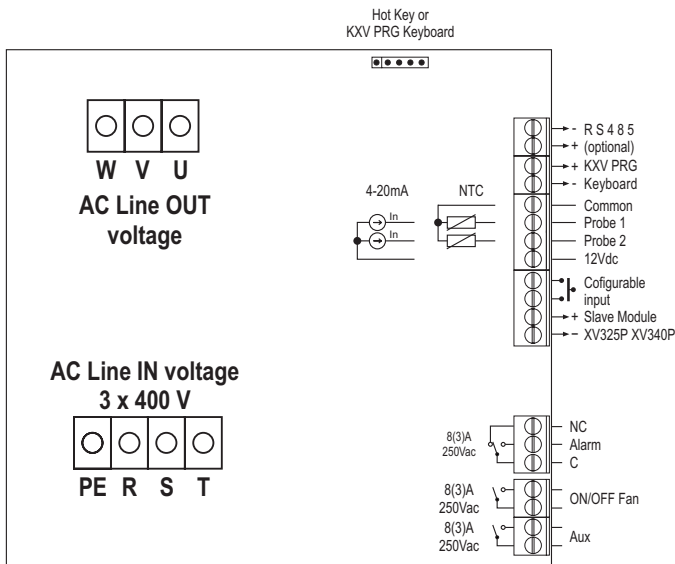
SA1 = Local power section overload alarm

12. TECHNICAL DATA

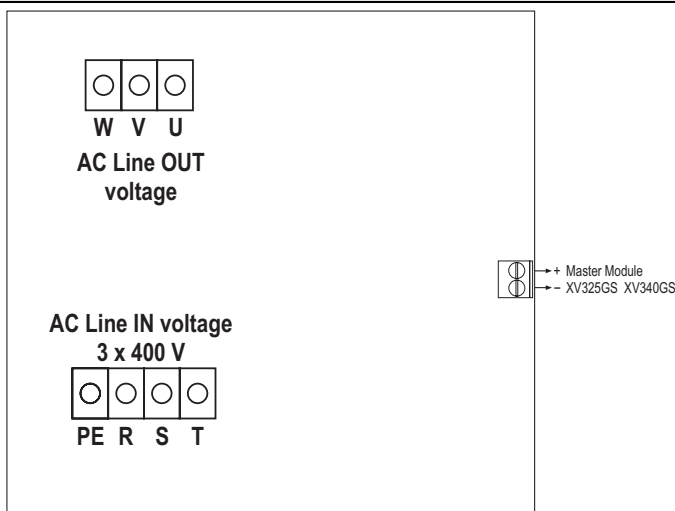
Format: frontal 22x27 cm; depth 15cm
 Protection degree: IP66
 Power supply: 400Vac three-phase (self powered)
 Power absorption: 10VA max.
 Probe inputs: up to 2 NTC probe or 4..20mA (configurable)
 Digital inputs: 1, configurable
 Control method: sin-wave PWM
 Frequency range: 5 - 60Hz
 Voltage output: 400Vac max.
 F/V characteristic: configurable (constant torque/quadratic)
 Protection functions: current overload, short-circuit, phase loss, thermal protection
 Voltage drop protection: stops the system when the voltage drops below 320Vac
 Acc. / dec. times: 5 - 100 sec. (set separately)
 Relay output:
 On/Off fan output: SPST 8(3) A, 250Vac
 Auxiliary: SPST 8(3) A, 250Vac
 Alarm: SPDT 8(3) A, 250Vac
 Operating temperature: -0÷45 °C
 Storage temperature: -25÷60 °C
 Relative Humidity: 20÷85% (non-condensing)
 Measuring and regulation range: -40÷110 °C(- 40 ÷ 230 °F) o 0÷30 bar
 Resolution: 0.1 o 1 °C/Bar or 1°F/PSI (selectable)
 Accuracy (25 °C ambient temperature): better than 1% Full scale

13. WIRING DIAGRAMS

13.1 XV340GS / XV325GS



13.2 XV340P / XV325P



14. STANDARD VALUES

Label	Name	Limits	Default	Level
Pb	Proportional band	0 ÷ 50.0°C, 90°F 30.0 bar, 435 PSI	4.0	Pr1
LS	Minimum Set point limit	-40.0 ÷ 110°C, 230°F 0.0 ÷ 30.0 bar, 435 PSI	10.0	Pr1
uS	Maximum Set point limit	-40.0 ÷ 110°C, 230°F 0.0 ÷ 30.0 bar, 435 PSI	25.0	Pr1
CH	Kind of action (direct / reverse)	dir = direct / in = reverse	dir	Pr2
dEu	Measuring unit	°C = Celsius, °F = Fahrenheit bAr = bar, PSI = PSI	bar	Pr2
rES	Resolution	dE = decimal / in = integer	dE	Pr2
ALc	Alarm configuration	rE = relative / Ab = absolute	rE	Pr1
ALu	High temperature alarm setting	-40.0 ÷ 110°C, 230°F 0.0 ÷ 30.0 bar, 435 PSI	10.0	Pr1
ALd	Temperature alarm delay	0 ÷ 255 min.	15	Pr1
dAo	Temperature alarm delay at start-up	0 ÷ 255 min.	30	Pr2
Fco	Cut-Off frequency	1.0 ÷ 30.0 Hz	1.0	Pr2
hco	Cut-Off differential	0.5 ÷ 10.0 Hz	0.5	Pr2
rEG	Kind of regulation V-F	co = constant qu = quadratic	co	Pr2
FHi	Maximum frequency	5.0 ÷ 60.0 Hz	50.0	Pr2
FLo	Minimum frequency	5.0 ÷ FHi Hz	5.0	Pr2
Fno	Rated frequency	FLo ÷ 60.0 Hz	50.0	Pr2
tLo	Minimum voltage applied to the motor	0 ÷ 100 %	0	Pr2
tno	Rated voltage of the motor	0 ÷ 100 %	100	Pr2
tAc	Acceleration time	5 ÷ 100 sec.	10	Pr2
tdc	Deceleration time	5 ÷ 100 sec.	10	Pr2
ASu	Current overload limit	0 ÷ 10A	10	Pr2
ASd	Current overload alarm delay	0 ÷ 60 sec.	10	Pr2
t1A	On/Off regulator activation delay	0 ÷ 120 min.	0	Pr2
FSA	On/Off regulator differential	1 ÷ 30 Hz	5	Pr2
oF1	Probe 1 calibration	±20.0°C / ±36°F ±10.0 bar/ ±145 PSI	0.0	Pr1
oF2	Probe 2 calibration	±20.0°C / ±36°F ±10.0 bar/ ±145 PSI	0.0	Pr1
P2P	Probe 2 presence	no / yes	no	Pr2
Pc1	Probe 1 configuration	ntc = NTC / cor = current nrE = no regulation	cor	Pr2
Pc2	Probe 2 configuration	ntc = NTC / cor = current	cor	Pr2
Pbr	Kind of regulation	Pb1 / 1r2 / Phi	Pb1	Pr2
cSG	Frequency output with faulty probe	0 ÷ 100 %	50	Pr2
Lci	Pressure probe scale start	-999 ÷ 999 bar / PSI	0.0	Pr2
uci	Pressure probe full scale	-999 ÷ 999 bar / PSI	30.0	Pr2
tG	Kind of gas	22=R22 / 404=R404 407=R407	22	Pr2
dic	Digital input configuration	oFF = ON OFF ALL = alarm AUX = auxiliary	oFF	Pr1
diP	Digital input polarity	cL = closed / oP = open	cL	Pr1
did	Digital input delay	0 ÷ 255 min.	10	Pr1
PP2	Power expansion presence	No / Yes	no	Pr2
Adr	RS485 serial address	1 ÷ 247	1	Pr1
Ptb	Parameter table code	Read only	1	Pr1
rEL	Software release	Read only	0.1	Pr1

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