



TURBO S.R.L.

Electronic Control Systems for Dust Collectors

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ECONOMISER SERIES E2T USER MANUAL



24/06/2014

Manual Release 1.22

Software Release 2.2

General Description

Economiser for controlling the pneumatic cleaning function of industrial dust collection systems. The pressure differential is digitally controlled by an internal transducer allowing to determine filter obstruction with accuracy. The device has one output relay contact and two digital input contacts. A large, bright display is provided for reading the filter obstruction level, the active solenoid valves and any alarms in any moment.

The innovative software managed by a powerful microprocessor makes the device easy to use by everyone. No special skills needed.

Technical Specifications

Casing

- Made of insulating, ABS.
- Degree of protection to water and dust: IP65 (EN60529).
- Shock resistance: IK08/07 (8 joule) (EN62262).

Performance of the Device

- LED display with 7 segments, 3 digits (0.8" each).
- Two operating modes: manual, automatic.
- Operating times expressed in seconds with selectable ranges for any application.
- Pressure measurements expressed in kPa.
- Power voltage 115-230 Vac 50-60 Hz selectable by means of jumpers (optional 24 Vac/Vdc).
- Output voltage 24Vdc, 24-115-230Vac selectable by means of jumper.
- Fan off (post-cleaning) washing function using the "fan Δp " threshold in automatic mode and by means of contact in manual mode with selectable number of cycles up to 99 cycles.
- Total and partial hour counter for maintenance.
- One alarm relay.
- Maximum Δp (filter obstructed) alarm.
- Solenoid valve not working alarm.
- Filtering element maintenance deadline alarm (with on/off selection).
- External contact cleaning activation.
- Compressed air presence enable input.
- Precoating function
- 4-20mA output proportional to dP reading for remote pressure reading.
- Manual solenoid valve activation.

Electric Specifications

Electric power:

- 115 VAC 50-60 Hz – 25W
- 230 VAC 50-60 Hz – 25W
- 24 VAC 50-60 Hz – 25W (optional)
- 24 VDC– 25W (optional)



Important: Read the installation instruction section before connecting the device.

Selectable output voltage:

- 24Vdc
- 24Vac
- 115Vac
- 230Vac

Inputs and outputs (not galvanically insulated):

- Enable contact (remote cleaning enable).
- Fan contact (post-cleaning).
- 4 – 20mA (Δp remote reading).

The solenoid valves connected to the unit are normally closed.

The activation of a solenoid valves causes them to open and consequently let out a jet of air.

Alarm relay:

The alarm relay has one voltage-free contact on terminals 4 and 5.

Maximum permitted load: 3A @ 250Vac - 2A @ 24Vdc

Fuses:

1 x 1 A @ 230Vac.

1 x 2 A @ 115Vac.

1 x 3 A @ 24Vac (optional).

1 x 3 A @ 24Vdc (optional).

Working temperature:

from -10°C to 55°C

Storage temperature:

-20°C to 60°C

Timer specifications:

Pulse time (valve opening)

from 50 ms to 5 sec

Pause time (interval between valve openings)

1 sec - 999 sec



Differential pressure gauge:

Measurable pressure range: from 0 to 4 kPa

Maximum applicable pressure: 16 kPa - 0.16 bar

Important: Higher pressures may damage the device. Do not connect the obstruction measuring pipes to the compressed air circuit.

***Installation Instructions /Notes and Warnings***

- Protect the device from direct exposure to sunlight.
- Do not position the device near or directly in contact with sources of heat or electromagnetic fields.
- Connect the device to power lines other than those for operating motors or other large power devices which could generate network interference.
- Fix the device of a height of at least 60 cm from the ground.
- Use flame-retardant cables with a minimum cross-section area of 0.25 mm² for all control signals.
- Check that atmospheric conditions are safe before starting any operation on the device.
- For electric operations, always remove voltage, wait 30 seconds for the inside capacitors to discharge before opening. At the end of the operations, close the device to restore the correct degree of protection before powering up.
- Use flame-retardant cables with a minimum cross-section area of 0.75mm² to connect to the power supply.
- Use flame-retardant cables with a minimum cross-section area of 1.5 mm² to connect to the indicating relays.
- Any use not described in this user instruction manual or incorrect use of the device may cause damage to the device or to the devices connected to it.
- Furthermore, incorrect use or tampering with the device may cause injury.
- Waterproofness of the casing is guaranteed when the flap is closed.
- Make sure that rigid or flexible ducts used for wiring, if any, do not fill up with water or other liquids.
- Any holes made in the casing must be protected by accessories with degree of protection equal to at least that of the economiser.
- Cut off power supply immediately if water is found in the casing.
- Do not use the economiser if you have not read or do not understand this manual.

Display/Keypad

There are four round buttons on the front panel for controlling the device and turning on the display as shown in the following figure.



Figure 1

- Press SET to open and close the programming menu and activate the manual solenoid test by selecting function F06.
- Press + and – to select a function, increase/decrease values, view the total hour counter (+) and the maintenance counter (-).
- Press OK to confirm data and reset the alarms.

Menu Diagram

How to access programming:

- Press SET (see figure 2).



Figure 2

- Press + and – to select the required function.
- Press OK to confirm.
- Increase or decrease the value of the parameter.
- Press OK to confirm and exit.
- Press SET again to exit programming mode.

List of Functions

- **F01:**
Automatic setting using dP or manual.
Possible values: 0 - Manual
 1 – Automatic (Default)
- **F02:**
Solenoid activation time.
Possible values: 0.05" – 5.00" step 0.01".
 Default = 0.20".
- **F03:**
Washing pause time between solenoid valves.
Possible values: 001" – 999" step 1".
 Default = 020".
- **F04:**
Number of connected outputs.
Possible values: 01 – 16 step 1.
 Default = 001.
- **F05:**
Output voltage setting.
Possible values: d24, a24, 115, 230.
 Default = a24.
- **F06:**
Manual output activation.
Possible values: 1 – number of outputs set in F04.
 Press SET to activate the set output.
- **F07:**
Zero dP threshold.
Possible values: 0.00 kPa – 3.99 kPa step 0.01.
 Default = 0.00 kPa.
- **F08:**
Cleaning cycle start threshold.
Possible values: 0.00 kPa – 3.99 kPa step 0.01.
 Default = 0.80 kPa.
- **F09:**
Cleaning cycle stop threshold.
Possible values: 0.00 kPa – 3.99 kPa step 0.01.
 Default = 0.40 kPa.
- **F10:**
Max. dP level.
Possible values: 0.00 kPa – 3.99 kPa step 0.01.
 Default = 3.00 kPa.
- **F11:**
Fan on recognition mode.
Possible values: 0 from contact – 1 from dP.
 Default = 1 from dP.

- **F12:**
dP threshold for fan on recognition if F11=1.
Possible values: 0.00 kPa – 3.99 kPa step 0.01.
Default = 0.10 kPa.
- **F13:**
Number of post cleaning cycles after stopping the fan.
Possible values: 01 – 99 step 1.
Default = 01.
- **F14:**
Post cleaning mode pause time between solenoid valves (fan off).
Possible values: 001" – 999" step 1".
Default = 010".
- **F15:**
Maintenance frequency expressed in tens of hours (e.g.: 1=10h, 10=100h).
Possible values: 001 – 999 step 1.
Default = 100 (=1000h).
- **F16:**
Maintenance deadline alarm enable.
Possible values: 0 (disabled) – 1 (enabled).
Default = 0 (disabled).
- **F17:**
Maintenance hour counter reset.
Possible values: 0 (disabled) – 1 (reset).
Default = 0 (disabled).
Note: The maintenance hour counter will be reset and the F17 parameter will be set back to 0 by setting F17 to 1.
- **F18:**
Precoating function enabling.
Possible values: 0 (disabled) – 1 (enabled).
Default = 0 (disabled).
- **F19:**
dP threshold for precoating function.
Possible values: 0.00 kPa – 3.99 kPa step 0.01.
Default = 2.00 kPa.

Alarms

The unit runs a number of checks during the start-up cycle and during normal operation. The possible alarms and respective solutions are shown in the following table.

ALARMS TABLE

Alarm number	Description	Action
E01	F05 set to 24Vdc – AC jumper detected	- For 24Vdc, switch the device off and move the AC/DC jumpers to DC. Jumper table p. 12. - For 24Vac, press OK, then press SET, set the function F05 using “+” and “-”, select A24 and press OK to confirm.
E02	F05 set to 24Vac – DC jumper detected	- For 24Vac, switch the device off and move the AC/DC jumpers to AC. Jumper table p. 12. - For 24Vdc, press OK, then press SET, set the function F05 using “+” and “-”, select d24 and press OK to confirm.
E03	F05 set to 24Vac or dc. Voltage out of range detected	- To use 24V valves, switch the device off and move the output voltage selection jumper to 24V. Jumper table p. 12. - If the jumper is in the correct position, press OK, then SET, select the F05 function with “+” and “-”, set 115 or 230 (as jumper) and press OK.
E04	F05 set to 115V. Voltage out of range detected	- To use 115V valves, switch the device off and move the output voltage selection jumper to 115V. Jumper table p. 12. - If the jumper is in the correct position, press OK, then SET, select the F05 function with “+” and “-”, set 115 or 230 (as jumper) and press OK.
E05	F05 set to 230V. Voltage out of range detected	- To use 230V valves, switch the device off and move the output voltage selection jumper to 230V. - If the jumper is in the correct position, press OK, then SET, select the F05 function with “+” and “-”, set a24, d24 or 115 (as jumper) and press OK.
E06	Solenoid valve current lower than minimum threshold or disconnected solenoid valve	Check correct connection of the solenoid valve and respective data. The alarm is self-reset.
E07	Solenoid valve current higher than maximum threshold	Check correct connection of the solenoid valve and respective data. The alarm is self-reset.
E08	Output short circuit. Alarm cannot be reset	Switch the device on and back on after having checked the solenoid valve system.
E09	dP maximum pressure exceeded (F10)	Check state of filtering elements.
E10	dP sensor hardware offset out of range.	The self-calibration of the dP sensor has determined that a value is out of range. Disconnect the air tubes and repeat the function. Take the device to be serviced if the alarm occurs again.
E11	Maintenance deadline reached	Carry out maintenance.
E12	dP sensor full-scale value reached	Check state of filtering elements. IMPORTANT: Running in this condition may damage the device.

Description of Operation

The installed SW version and the symbol ---, meaning that coherence between settings stored in E2Prom and the set jumpers is being checked, will appear on the display when the economiser is

powered up. A corresponding error code will appear in case of discrepancies between settings (see Alarms Table). Only editing functions will be allowed on the unit. The operator may switch off the unit and configure the jumpers correctly.

Symbol **0_0** will appear on the display if the test is entirely successful. The following pages will then appear:

- In automatic mode (F01=1):
 - dP value alternating with OFF if the enabling contact (14-15) is open
 - dP value alternating with -0- if the enabling contact (14-15) is closed and the fan is off
 - dP value only if the fan is enabled and active.
- In manual mode (F01=0):
 - OFF if the enabling contact is open (14-15)
 - -0- if the enabling contact (14-15) is closed and the fan is off

Manual operating mode

The economiser will work as a programmable cycle sequencer in manual mode. The connected outputs will be activated at the programmable frequencies. Manual mode can be activated by accessing the configuration menu and setting F01 to 0. F02 and F03 will set the activation time and the pause time, respectively.

Automatic operating mode

By selecting automatic mode (F01=1), the economiser will work autonomously can carry out the pneumatic washing cycle only when needed. The device will start the washing cycle if the obstruction is higher than Threshold_DP_Start (F08). Washing is suspended when obstruction drops under Threshold_DP_Stop (F09) level until it reaches a value higher than the Threshold_DP_Start threshold once again. When washing is active, the economiser respects the times set in F02 (operating time) and F03 (pause time).

Cleaning function with fan off (PCC)

This function allows to carry out one or more cleaning cycles (the number of cycles is defined by F13) when the fan is off. The on or off state of the fan may be determined by the state of the contacts 12-13 (contacts open = fan off) if F11=0, or may be determined automatically (with F11=1) when the dP pressure drops under the threshold defined in F12. The pulse time of the valves will always be that defined in F02, while the pause time in this case is defined in F14.

The display alternately shows the number of the valve activated and the word CCP.

Number of output selection

The number of outputs (solenoid valves) on which the economiser will run the cleaning cycle can be selected. Cleaning will be carried out in order from the first to the last solenoid valve. The valves can be adjusted by the F04 function.

Precoating function (F18=1)

This function is used to carry out precoating. Precoating is a filtering element treatment carried out with precoating powder. Washing and manual output activation is suspended during precoating until the precoating thresholds defined in F19 is reached.

The Δp value and the message PC (precoating) will appear alternatively on the display.

dP zero calibration (F07)

This function is used to reset dP reading with the fan off.

Increase or decrease the value shown by pressing “+” and “-” as required. This value will be subtracted from the value read by the dP sensor.

dP sensor self-calibration

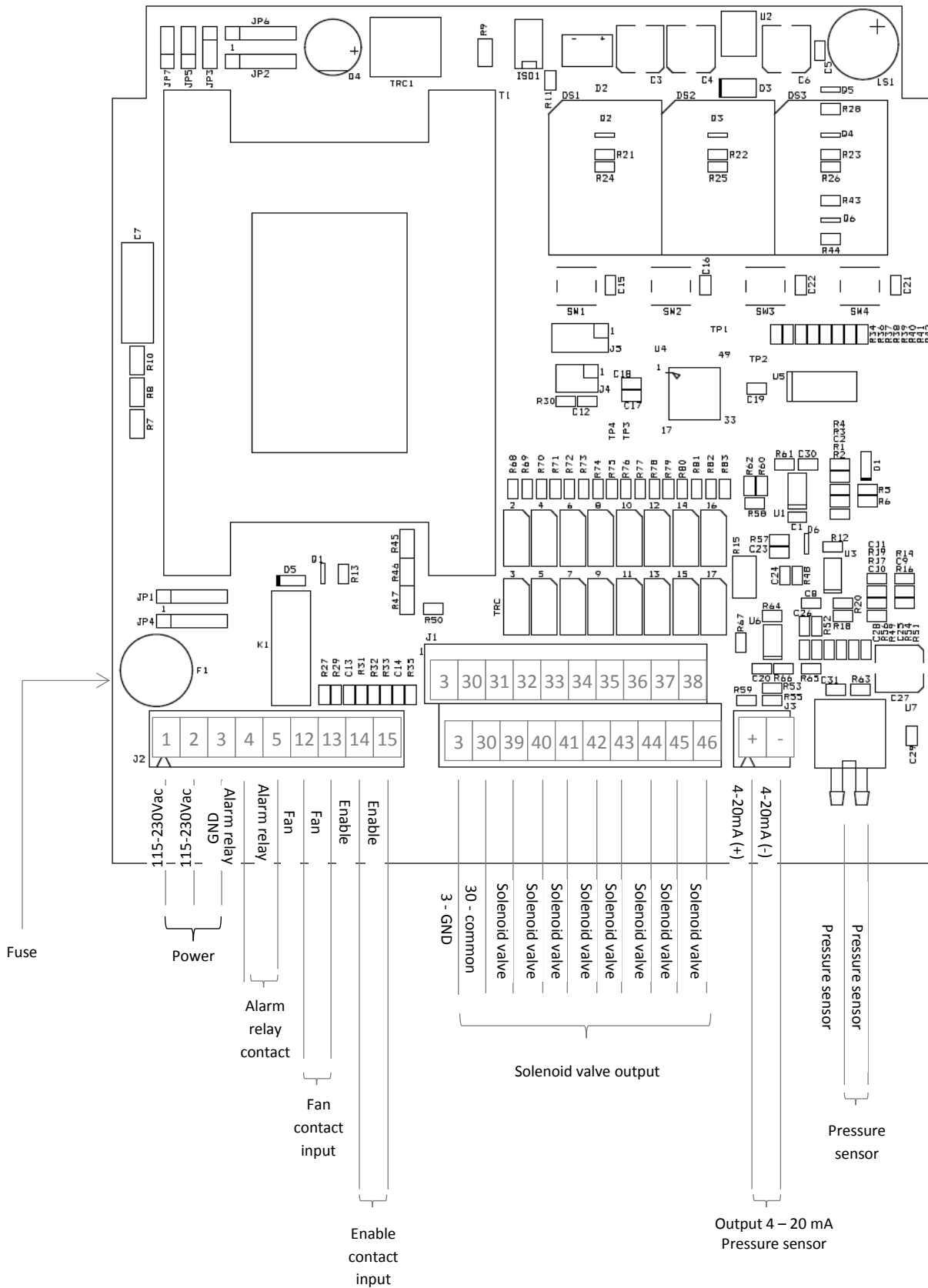
This function allows to reset dP reading with the fan off automatically.

Hold “SET” and “OK” pressed at the same time with the device off. The message “CAL” will appear after the start-up test. Release the buttons. The unit will go back to normal state after a few instants. Automatic calibration is complete.

Fuse

A fuse which can be reset in case of need is located near the power terminal board. Use a delayed fuse 5x20mm as shown in the table on page 12.

Connection diagram



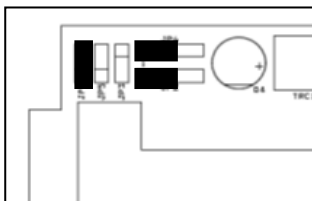
Terminal table

Terminal n.	Description	Terminal n.	Description
1	Power 115 – 230 Vac	35	Solenoid 5 output
2	Power 115 – 230 Vac	36	Solenoid 6 output
3	Earth (GND)	37	Solenoid 7 output
4	Relay contact	38	Solenoid 8 output
5	Relay contact	39	Solenoid 9 output
12	Fan input	40	Solenoid 10 output
13	Fan input	41	Solenoid 11 output
14	Enable input	42	Solenoid 12 output
15	Enable input	43	Solenoid 13 output
30	Solenoid valve common	44	Solenoid 14 output
31	Solenoid 1 output	45	Solenoid 15 output
32	Solenoid 2 output	46	Solenoid 16 output
33	Solenoid 3 output	11	"+" 4-20mA dP output
34	Solenoid 4 output	10	"-" 4-20mA dP output

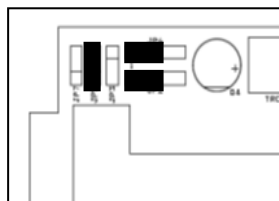
Fuse table

Voltage	Value
230 V	1 A
115 V	2 A
24 Vdc / ac	3 A

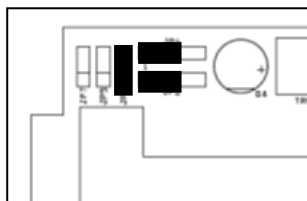
Jumper configuration - Output



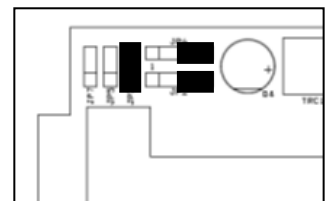
230Vac



115Vac

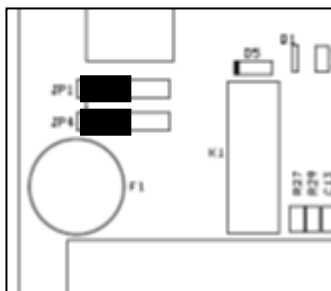


24Vac

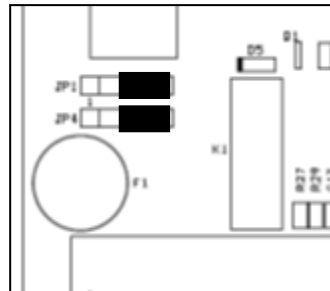


24Vdc

Jumper configuration - Power

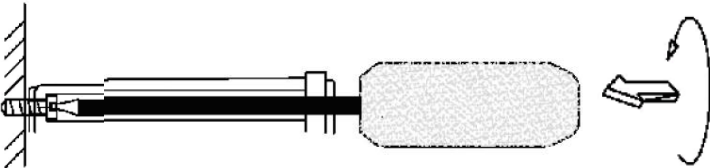
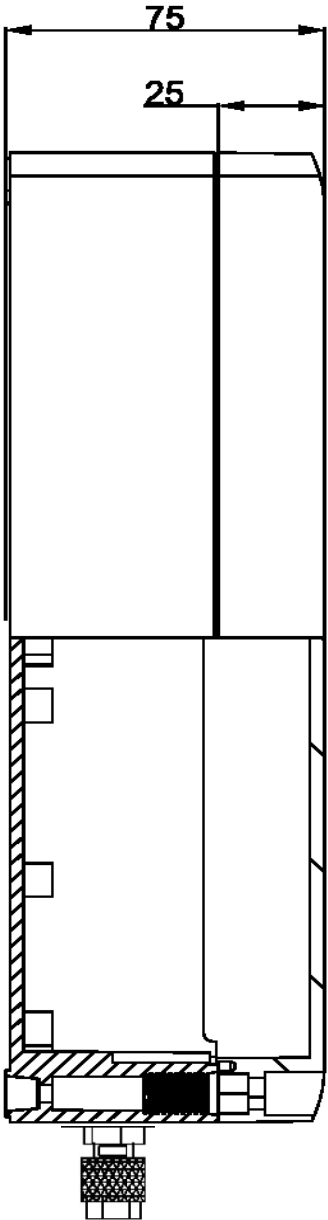
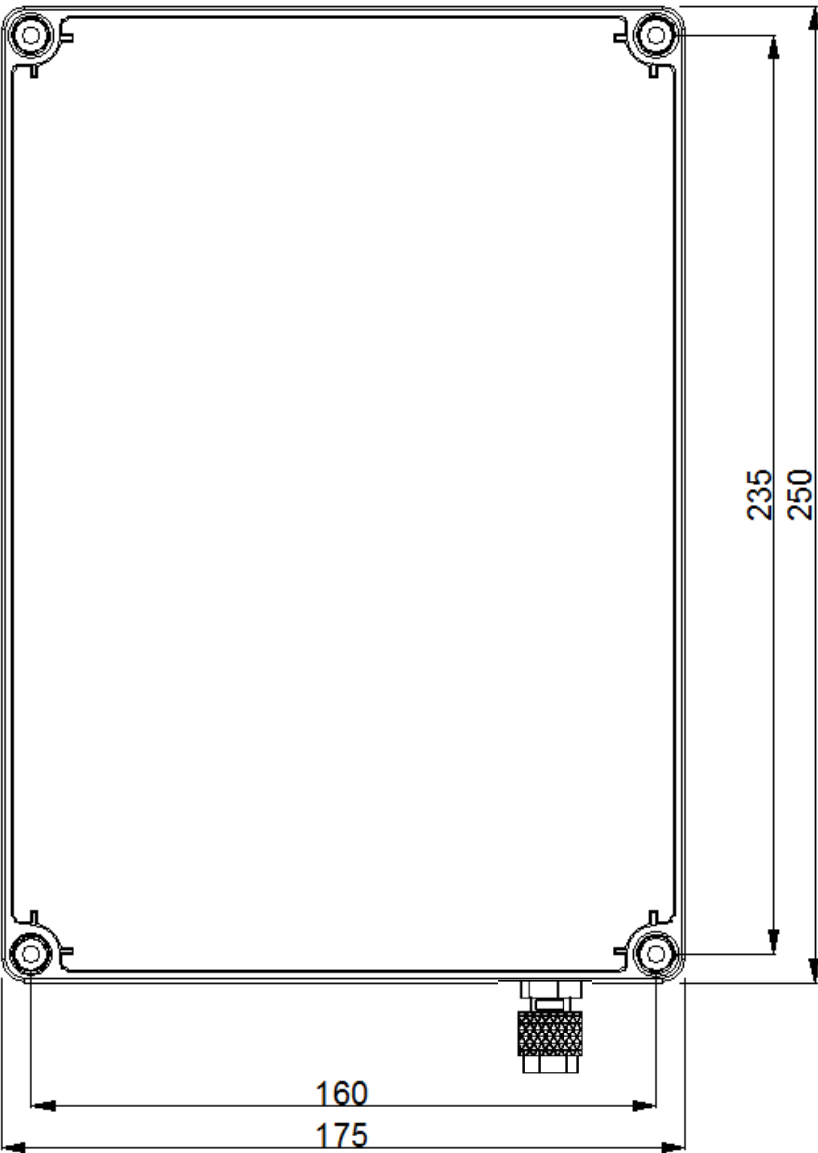


230Vac

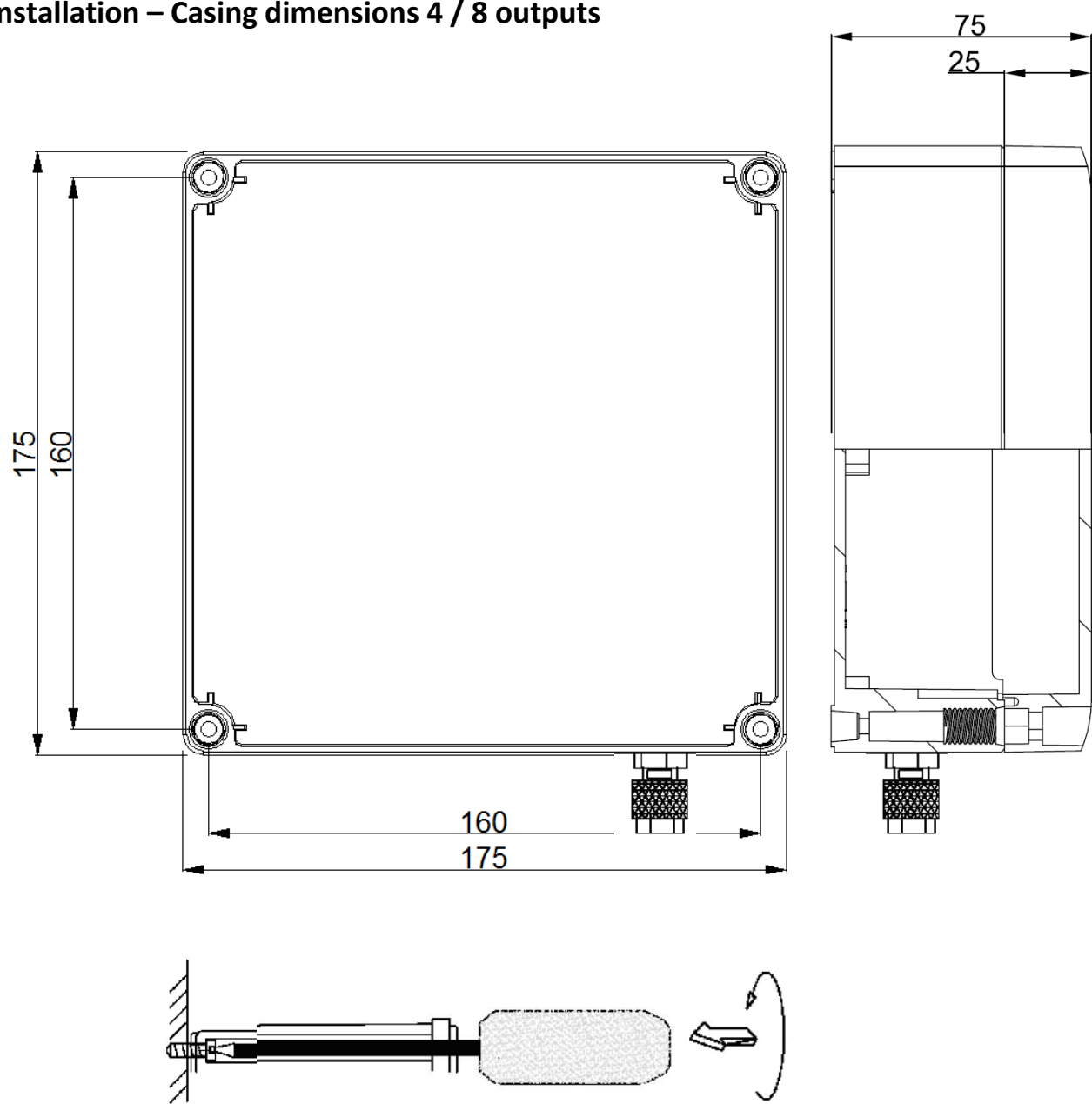


115Vac

Installation – Casing dimensions 12 / 16 outputs



Installation – Casing dimensions 4 / 8 outputs



Maintenance

The only parts which may be replaced are fuses.
All other operations must be carried out by the manufacturer.

Scrapping

Dispose of properly after use. Dispose of the product according to laws in force for electronic equipment.



This device is for use in a dust collection system and is therefore part of a fixed installation.

Default settings

The default settings are:

Function number	Description	Set value
F01	Automatic setting using dP (1) or manual (0)	1
F02	Solenoid valve activation time	0.20"
F03	Washing pause time between solenoid valves in normal cycle	020"
F04	Number of outputs	1
F05	Output voltage: 24Vdc, 24Vac, 115ac, 230ac.	24 ac
F06	Manual solenoid valve activation	1
F07	Zero dP threshold	0 kPa
F08	Cycle start dP threshold	0.80 kPa
F09	Cycle stop dP threshold	0.40 kPa
F10	Max. dP level	3.00 kPa
F11	Fan mode: 0 from contact , 1 from dP	1
F12	Fan dP threshold (if F11 = 1). If < fan off	0.10 kPa
F13	Number of cycles after fan stop	1
F14	Pause time between solenoid valves in cycle with fan off	010"
F15	Maintenance frequency in 10h (1=10h, 100=1000h)	100
F16	Maintenance deadline alarm on (1) or off (0)	0
F17	Maintenance hour counter reset: set 1 and confirm to reset the maintenance hour counter	0
F18	Precoating on (1) or off (0)	0
F19	Precoating dP threshold (if F17 = 1).	2.00 kPa

WARRANTY

The warranty lasts for two years. The manufacturer will replace any faulty electronic component at their own facilities only, unless otherwise authorised by the manufacturer.

WARRANTY EXCLUSIONS

The warranty will be cancelled in case of:

- Signs of unauthorised tampering and repairs.
- Incorrect use of the device not respecting technical data.
- Incorrect electric connections.
- Failure to respect system standards.
- Use not in accordance with EC standards.
- Atmospheric events (lightening, electrostatic discharges, power surges).
- Obstructed pneumatic connections. Damaged pipes.

Problem solution (FAQ)

FAULT

POSSIBLE CAUSE

SOLUTION

The display does not light up.

Burnt fuse.

Check the protection fuse on the power voltage.
Check that the power voltage is present and compliant with that required for the device (terminals 1 and 3).

The outputs are not activated.

Incorrect output voltage.
Wiring to solenoid valves.

Check that the unit and solenoid valve output voltage agree.
Check wiring between economiser and solenoid valves.

The differential pressure reading is not correct.

Obstructed pneumatic connections.
Damaged pipes.

Check that the differential pressure is 0.00 kPa with the pipes disconnected. In this case, check that the connection pipes between device and filter are not obstructed or damaged.

The cleaning cycle is not carried out.

The set cycle start threshold (F08) is too high and therefore the cycle is not activated.

Adjust the start-up pressure threshold or set the economiser to MANUAL mode (F01=0).

Do alarm messages appear?

Do the alarms fail to activate signalling devices?

System wiring errors.
No power to alarm devices.

Check the alarm code with the table.

The alarm devices must be powered by voltage external to the economiser.
Activating to open the respective relay.

Does post-cleaning start during normal cleaning?

Fan threshold (F12) set too high.

Change the post-cleaning start-up threshold (F12) by lowering it.

Does post-cleaning fail to start when the normal cleaning cycle ends?

Fan threshold (F12) set too low.

Check that the measured pressure is lower than the post-cleaning activation pressure when the fan is off.

Does the economiser occasionally reset?

Check that there is no filtered pulse load on the power line (spot welding machines, welding machines, plasma cutters etc.).

Install a filter on the power line of the economiser, if needed.

The value of 0.0 kPa does not appear on the display when the fan is off.

dP zero calibration (F07) is not correct.

Calibrate the dP zero by appropriately setting the parameter F07 or running the self-calibration function explained on page 10.

DECLARATION OF CONFORMITY OF THE MANUFACTURER



The manufacturer:

TURBO SRL

The manufacturer's address:

Via Po 33/35 20811 Cesano Maderno (MB), Italy

declares that:

Product Name:

Economiser / Sequencer E2T

Models:

E2T / E1T 4 - 16

Product Options:

ALL

Code and Serial Number: E2T04MU5022 140000133Y14

complies with the following directives:

Machinery Directive 2006/42/EC 'Electromagnetic compatibility' compliant with Harmonised European standards EN61000-6-2:2005 class B of EN61000-6-4:2001

Low Voltage Directive 2006/95/EC compliant with Harmonised European Standards EN 60947-1:2004

Supplementary Information:

A typical configuration of the product was tested.

Cesano Maderno, 24/06/2013

F. MESSINA (C.E.O.)

TURBO s.r.l.