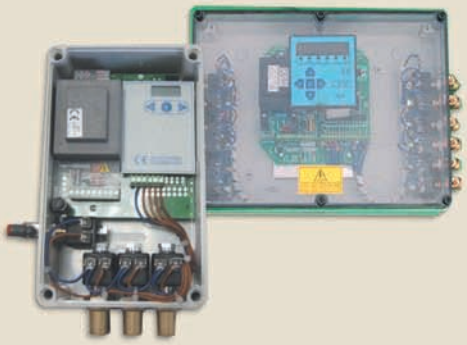
PRODUCT OVERVIEW



Electronic control Systems

DUST FILTER COMPONETS

HOW TO ORDER

ECONOMISER E SERIES

example **E 16** **M** **B**

E 4 - 8 - 12 -16
NUMBER OF OUTPUTS

U=24Vcc B=24V 50-60Hz L=115V 50-60Hz
M=230V 50-60Hz
STANDARD MULTIPLE SUPPLY VOLTAGE

U=24Vcc B=24V 50-60Hz L=115V 50-60Hz
M=230V 50-60Hz
MULTIPLE OUTPUT VOLTAGE

E16 MB is a 16-way E economiser
with **230VAC** supply voltage and **24VAC** output voltage

ECONOMISER BA SERIES

example **BA 16** **M** **B**

BA 4 - 8 - 12 -16
NUMBER OF OUTPUTS

M=230V 50-60Hz L=115V 50-60 Hz
STANDARD SUPPLY VOLTAGE
U=24Vcc B=24V 50-60Hz
OPTIONAL SUPPLY VOLTAGE

U=24Vcc B=24V 50-60HZ L=115V 50-60HZ
M=230V 50-60Hz
MULTIPLE OUTPUT VOLTAGE

BA16 MB is a 16-way BA economiser
with **230VAC** supply voltage and **24VAC** output voltage

SEQUENCER S SERIES

example **S 16** **M** **B**

S 4 - 8 - 12 -16
NUMBER OF OUTPUTS

U=24Vcc B=24V 50-60Hz L=115V 50-60Hz
M=230V 50-60Hz
STANDARD MULTIPLE SUPPLY VOLTAGE

U=24Vcc B=24V 50-60HZ L=115V 50-60HZ
M=230V 50-60Hz
MULTIPLE OUTPUT VOLTAGE

S16 MB is a 16-way S sequencer
with **230VAC** supply voltage and **24VAC** output voltage

SEQUENCER PA SERIES

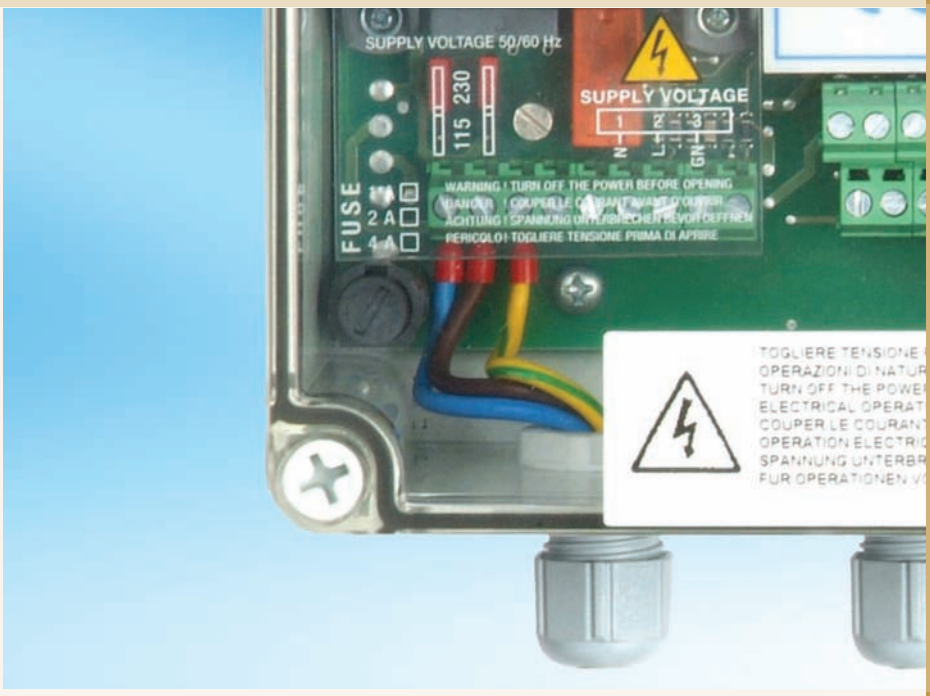
example **PA 16** **M** **B**

PA 4 - 8 - 12 -16
NUMBER OF OUTPUTS

M=230V 50-60Hz L=115V 50-60Hz
STANDARD SUPPLY VOLTAGE
U=24Vcc B=24V 50-60Hz
OPTIONAL SUPPLY VOLTAGE

U=24Vcc B=24V 50-60HZ L=115V 50-60HZ
M=230V 50-60HZ
MULTIPLE OUTPUT VOLTAGE

PA16MB is a16-way sequencer
with **230VAC** supply voltage and **24VAC** output voltage



Description

The control instruments "E" series economizer are among the most modern and complete available today on the market.
They have been built to command membrane solenoids on dust removal filters. A large back lighted liquid crystal display clearly shows the filter and the cleaning system status. It has a fast-flow setting menu with intuitive operation that allows the operator to choose one of five different languages offered, and to select from four different pressure-reading scales (mbar, kpa "H2O and mmH2O). The clogging level can be seen on a numerical and/or graphic scale. The pre-coating deactivation function, the recognition of the valves connected and the post-washing function are all completely automatic.
What makes this "E" Series totally innovative is the software installed in the powerful microprocessor, which directs the full-automatic operation. This mode makes the instrument completely autonomous and independent in the management of the filter washing, modulating the pause and shooting time depending on the clogging level. The "cleaning", then, is increased or reduced automatically depending on the real needs; this optimizes the economy of the entire system.

DEVICE PERFORMANCES

- LCD Display with backlight and friendly menus in six languages
- Three modes of operation: manual, auto and full-auto mode to smart filter management
- Operating time in seconds and minutes with selectable range for any applications
- Four units selectable for differential pressure measures
- No selection jumpers required for the output voltages of the valves that is done automatically according to the positioning of the common of pulse valves in the terminal
- Multi-selectable power supply thought just one jumper located in the terminals compartment
- Post-cleaning function with selectable number of cycles up to 255 cycles
- Hours counter and pulses counter
- Up two programmable alarm relays
- Minimum differential pressure
- Maximum differential pressure
- Maximum current pulse valves dissipation
- Pulse Valves not working alarm
- Power down
- External input to start/stop cleaning from remote
- External input to start/stop cleaning from air tank sensor
- Automatic precoating functions
- 4-20mA output to remote dP pressure
- Zero crossing switching pulse valve
- Pulse valves manual activation
- Selection of pulse-jet cleaning systems or rotating nozzle with self-selection of optimal parameters
- Protection from current overload for device and pulse valves

CONNECTION LAYOUT

VALVES

Terminal	signal	Terminal	signal
1 EV1	Solenoid valve 1	9 EV9	Solenoid valve 9
2 EV2	Solenoid valve 2	10 EV10	Solenoid valve 10
3 EV3	Solenoid valve 3	11 EV11	Solenoid valve 11
4 EV4	Solenoid valve 4	12 EV12	Solenoid valve 12
5 EV5	Solenoid valve 5	13 EV13	Solenoid valve 13
6 EV6	Solenoid valve 6	14 EV14	Solenoid valve 14
7 EV7	Solenoid valve 7	15 EV15	Solenoid valve 15
8 EV8	Solenoid valve 8	16 EV16	Solenoid valve 16

The common of solenoid valves must be connected to the type of pilot according to the following table:

Terminal	LEGEND	Voltages
17	230V	230VAC 50Hz
18	115V	115VAC 50Hz
19	24DC	24VDC
20	24AC	24VAC 50Hz

NOTE: THE TERMINAL 31 IS THE GROUND OF DEVICE AND PULSE VALVES

ELECTRICAL CHARACTERISTICS

Power

230VAC ±10% 50 Hz
115VAC ±10% 50 Hz
24VAC ±10% 50 Hz
24VDC ±10%

Output

24VAC (MAX 20VA @ Ton Max 5s)
24VDC (MAX 20W@ Ton Max 5s)
230VAC (MAX 20VA@ Ton=10s)
115VAC (MAX 20VA@ Ton=10s)

Fuses

1 x 2 Ampere

Working temperature

-15°C÷50°C

Storage temperature

-20°C÷60°C

Timing

Pause time

5 s ÷ 50 min

Working time (air pulse)

50 ms ÷ 10 s (step 10 ms)

Differential pressure Meter

Range: 0 ÷ 10 KPa
Maximum differential pressure:
50 kPa – 0.5 bar

POWER

Power Supply 230-115-24/50hz
Terminal 30 L phase
Terminal 33 N Neutral
Terminal 31 PE Ground

Power Supply 24 VDC
Terminal 32 DC +
Terminal 25 GND Negative
Terminal 31 PE ground
(internally connect to 25)

CE DIRECTIVES

This product is compliant with the following directives:

Machine Directive 2006/42/EC 'Electromagnetic compatibility' related to the European Standard EN61000-6-2:2005 class B of the rule EN61000-6-4:2001. Low Voltage Directive 2006/95/CE related to the European Standard EN60947-1:2004

BA

BA4 / BA8 / BA12 / BA16 Series - Multiple output voltage
Up to 144 outputs available upon request with different enclosures

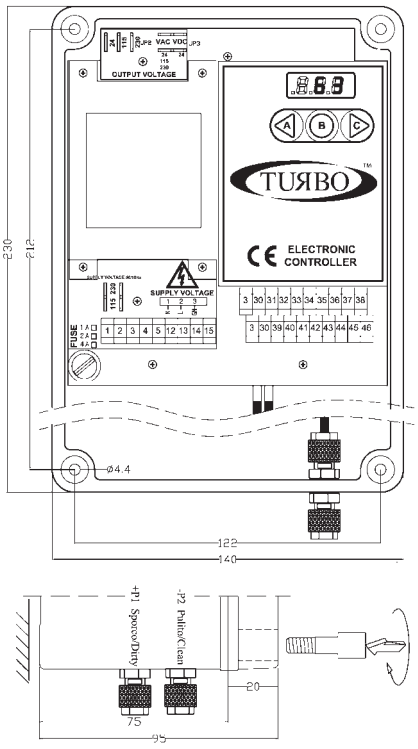
DESCRIPTION

Economiser for dedusting plant cleaning cycle with digital ΔP control.

Microprocessor-operated device with electrical zero connected to ground which ensures high immunity to external interference and low field emissions.

Max 1 output relay. Max 2 volt free digital inputs.

BA4	to control	4 solenoid valves
BA8	to control	8 solenoid valves
BA12	to control	12 solenoid valves
BA16	to control	16 solenoid valves



Connect by rylsan tube 4/6

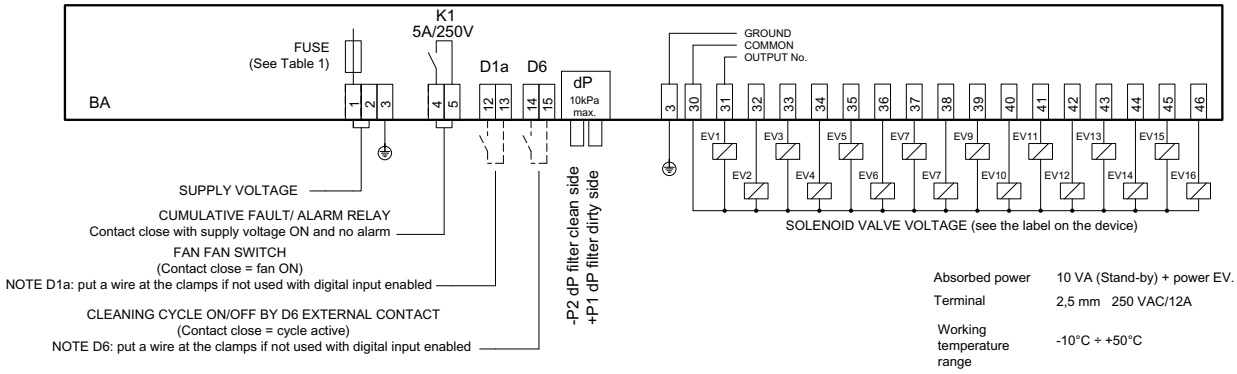
TECHNICAL CHARACTERISTICS

Standard supply voltage	230 VAC / 115 VAC
Supply voltage available upon request	24 VAC / 24 VDC
Output voltage	230/115 / 24VAC - 24VDC
Working temperature range	-10°C ÷ +50°C
Absorbed power	10 VA (Stand by)
Protection level	IP65
Max no. of outputs	16
Dimensions	140x230x95 (BA4 - BA16)
Material	ABS / RAL 7035

STANDARD FEATURES

- Manual selection of output number / solenoid valve
- Adjustable activation time per each output from 0.05 to 5 sec.
- Adjustable interval time between two activations from 1 to 999 sec.
- Short circuit output protection
- Manual activation of each single output
- Digital differential pressure control
- Differential pressure reading by internal transducer (max 10kPa)
- Maximum dP alarm with alarmed contact open and automatic reset
- Zero dP reading adjustment
- 10kPa dP reading full range
- Additional post-cleaning cycle after fan stop
- Cleaning cycle ON/OFF by volt free external contact
- Max 25W load power per each output
- Input and output selection by JP1, JP2 and JP3 jumpers on the board

WIRING DIAGRAM



Absorbed power	10 VA (Stand-by) + power EV.
Terminal	2,5 mm 250 VAC/12A
Working temperature range	-10°C ÷ +50°C

NOTE DC: With 24VDC supply voltage, the available output voltage decreases by 2V for internal timer voltage drop. Check the compatibility with the solenoid valves used. Do no connect any supply voltage pole to ground with 24VDC supply voltage.

PARAMETER SETTING IN SET MODE

In Run Mode press key C to enter the function menu

F01	Digital input use	0 = included 1 = excluded
F02	Pulse time	0,05 ÷ 5,00 sec
F03	Time interval between events	1 ÷ 999 sec (see B3x)
F04	Number of outputs	0 ÷ 16
F05	Cycles after fan stop	0 ÷ 99
F06	Manual activation	C = Selection A = Output activation
F07	ΔP control	0 = excluded 1 = includedo
F08	Output voltage	24V, 115V, 230V (see HV)
F09	Zero ΔP adjustment	0,00 (see C8)
F10	ΔP threshold for cycle STOP	0,01 ÷ 9,99 kPa
F11	ΔP threshold for cycle START	0,01 ÷ 9,99 kPa
F12	Max ΔP alarm threshold	0,01 ÷ 9,99 kPa
F13	Fan mode selection	0 = by contact 1= by ΔP reading

Key A = Access to the selected function	Key A = Parameter decrement in
Key B = Exit from Set Up	Key B = Return to function menu
Key C = Function selection	Key C = Parameter increase in Set

OPERATION

When power is supplied, the cleaning cycle starts if all the conditions required for operation are present

OFF	Cycle stopped due to cleaning consent missing (D6 open)
- 0 -	Cycle stopped due to fan OFF
'P'	Cycle stopped due to low dP (Blinking display)
A01	No. of activated EV
...	Cycles active after fan stop (Blinking points)
–	Bar indicating pause time flow between events
E	ΔP reading over 9.99kPa

Key B	Alarm Reset
Key C	Access to Set Up

NOTE

The device will automatically switch from Set Mode to Run Mode if no key is pressed for 5 minutes

ALARM DESCRIPTION

3,00/ H = Maximum ΔP alarm *(Blinking display)*

example: E1/05 = 05 output overload *(Blinking display)*

CE DIRECTIVES

This product is compliant with the following directives:

Machine Directive 2006/42/EC 'Electromagnetic compatibility' related to the European Standard EN61000-6-2:2005 class B of the rule EN61000-6-4:2001. Low Voltage Directive 2006/95/CE related to the European Standard EN60947-1:2004.

S Series

Description

These control instruments series "S" are among the most modern and complete available today on the market. They have been built to command membrane solenoids on dust removal filters. A large back lighted liquid crystal display clearly shows cleaning system status. It has a fast-flow setting menu with intuitive operation that allows the operator to choose one of six different languages offered. The recognition of the valves connected and the post-washing function are all automatic.
What makes this "S" Series totally innovative is the software installed in the powerful microprocessor, which directs the full-automatic operation.

DEVICE PERFORMANCES

- LCD Display with backlight and friendly menu in six languages
- Operating time in seconds and minutes with selectable range for any application
- No selection jumpers required for the voltages of the valve
- Multi-selectable power supply without removing the panel or the card from enclosures
- Post-cleaning function with selectable number of cycles up to 255 cycles
- Hours counter and pulses counter
- Up two programmable alarm relays
- Pilot not working alarm
- Power down
- External input to start/stop cleaning from remote
- External input to start/stop cleaning from air tank sensor
- Zero crossing switching pilot valves
- Pilot manual activation
- Selection of pulse-jet cleaning systems or rotating nozzle with self-selection of optimal parameters
- Protection from current overload for device and pilot valves

CONNECTION LAYOUT

VALVES

Terminal	signal	Terminal	signal
1 EV1	Solenoid valve 1	9 EV9	Solenoid valve 9
2 EV2	Solenoid valve 2	10 EV10	Solenoid valve 10
3 EV3	Solenoid valve 3	11 EV11	Solenoid valve 11
4 EV4	Solenoid valve 4	12 EV12	Solenoid valve 12
5 EV5	Solenoid valve 5	13 EV13	Solenoid valve 13
6 EV6	Solenoid valve 6	14 EV14	Solenoid valve 14
7 EV7	Solenoid valve 7	15 EV15	Solenoid valve 15
8 EV8	Solenoid valve 8	16 EV16	Solenoid valve 16

The common of solenoid valves must be connected to the type of pilot according to the following table:

Terminal	LEGEND	Voltages
17	230V	230VAC 50Hz
18	115V	115VAC 50Hz
19	24DC	24VDC
20	24AC	24VAC 50Hz

NOTE: THE TERMINAL 31 IS THE GROUND OF DEVICE AND PULSE VALVES

ELECTRICAL CHARACTERISTICS

Power

230VAC ±10% 50 Hz
115VAC ±10% 50 Hz
24VAC ±10% 50 Hz
24VDC ±10%

Output

24VAC (MAX 20VA @ Ton Max 5s)
24VDC (MAX 20W@ Ton Max 5s)
230VAC (MAX 20VA@ Ton=10s)
115VAC (MAX 20VA@ Ton=10s)

Fuses

1 x 2 Ampere

Working temperature

-15°C÷50°C

Storage temperature

-20°C÷60°C

Timing

Pause time

5 s ÷ 50 min

Working time (air pulse)

50 ms ÷ 10 s (step 10 ms)

POWER

Power Supply 230-115-24/50hz
Terminal 30 L phase
Terminal 33 N Neutral
Terminal 31 PE Ground

Power Supply 24 VDC
Terminal 32 DC +
Terminal 25 GND Negative
Terminal 31 PE ground
(internally connect to 25)

CE DIRECTIVES

CE

This product is compliant with the following directives:

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PA

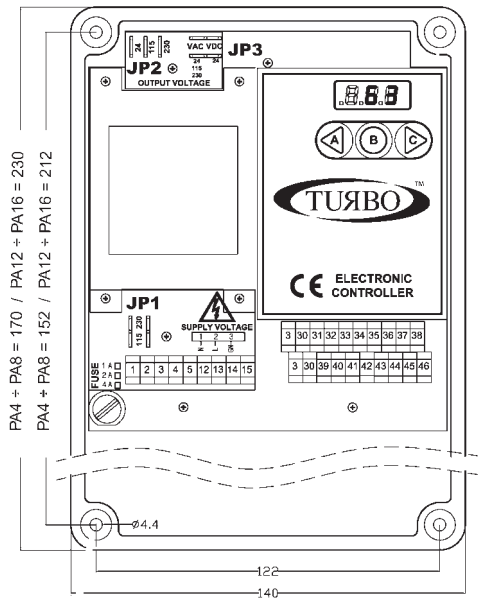
PA4 / PA8 / PA12 / PA16 Series - Multiple output voltage
Up to 144 outputs available upon request with different enclosures

DESCRIPTION

Sequencer for dedusting plant cleaning cycle. Microprocessor-operated device with electrical zero connected to ground which ensures high immunity to external interference and low field emissions.

Max 1 output relay. Max 2 volt free digital inputs.

PA4	to control	4 solenoid valves
PA8	to control	8 solenoid valves
PA12	to control	12 solenoid valves
PA16	to control	16 solenoid valves



TECHNICAL CHARACTERISTICS

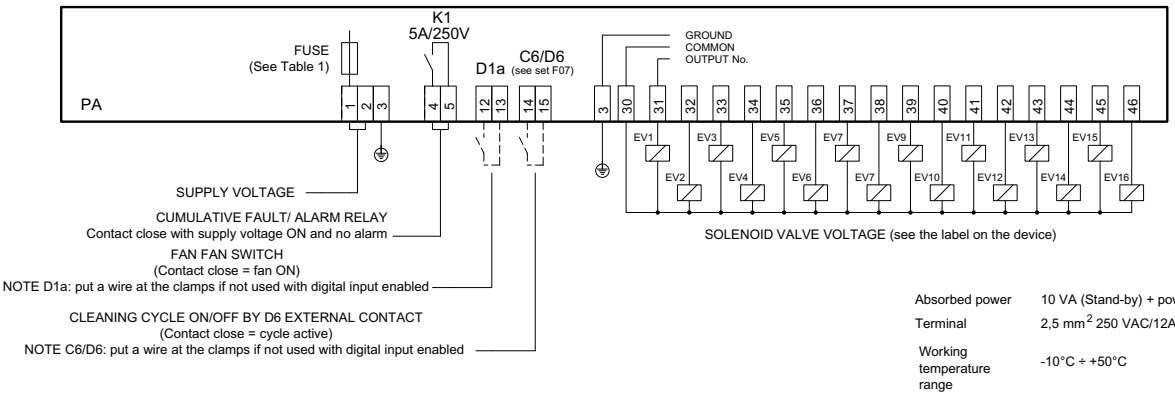
Standard supply voltage	230 VAC / 115 VAC
Supply voltage available upon request	24 VAC / 24 VDC
Output voltage	230/115 / 24VAC - 24VDC
Working temperature range	-10°C ÷ +50°C
Absorbed power	10 VA (Stand by)
Protection level	IP65
Max no. of outputs	16
Dimensions	140x170x95 (PA4 - PA8)
Dimensions	140x230x95 (PA12 - PA16)
Material	ABS / RAL 7035

STANDARD FEATURES

- Manual selection of output number / Autoselection
- Adjustable activation time per each output from 0.05 to 5 sec.
- Adjustable interval time between two activations from 1 to 999 sec.
- Short circuit output protection
- Manual activation of each single output
- Cleaning cycle ON/OFF with external pressure controller by volt free contact
- Additional post-cleaning cycle after fan stop
- Cleaning cycle ON/OFF by volt free external contact
- Max 25W load power per each output
- Input and output selection by JP1, JP2 and JP3 jumpers on the board

PA4 / PA8 / PA12 / PA16 Series - Multiple output voltage
Up to 144 outputs available upon request with different enclosures

WIRING DIAGRAM



Absorbed power	10 VA (Stand-by) + power EV.
Terminal	2,5 mm^2 250 VAC/12A
Working temperature range	-10°C ÷ +50°C

NOTE DC: With 24VDC supply voltage, the available output voltage decreases by 2V for internal timer voltage drop. Check the compatibility with the solenoid valves used.
Do no connect any supply voltage pole to ground with 24VDC supply voltage.

PARAMETER SETTING IN SET MODE

In Run Mode press key C to enter the function menu

F01	Digital input use	0 = included 1 = excluded
F02	Pulse time	0,05 ÷ 5,00 sec
F03	Interval time between events	1 ÷ 999 sec (see B3x)
F04	Number of outputs	0 ÷ 16 (seeB1b)
F05	Cycles after fan stop	0 ÷ 99
F06	Manual activation	C = Selection/ A = output activation
F07	Digital input	0 = C6, 1=D6 (see C6, D6)
F08	Output voltage	24V, 115V, 230V (see HV)

Key A = Access to the selected function	Key A = Parameter decrement in Set
Key B = Exit from Set Up	Key B = Return to function menu
Key C = Function selection	Key C = Parameter increase in Set

OPERATION

When power is supplied, the cleaning cycle starts if all the conditions required for operation are present

OFF	Cycle stopped due to cleaning consent missing (D6 open)
- 0 -	Cycle stopped due to fan OFF
1,00/ P	Cycle stopped due to low dP (Blinking display)
A01	No. of activated EV
...	Cycles active after fan stop (Blinking points)
1,23	ΔP reading (kPa)
E	ΔP reading over 9.99kPa
Key B	Alarm Rest
Key C	Access to Set Up

NOTE

The device will automatically switch from Set Mode to Run Mode if no key is pressed for 5 minutes

ALARM DESCRIPTION

3,00/H= Maximum ΔP alarm
(Blinking display)

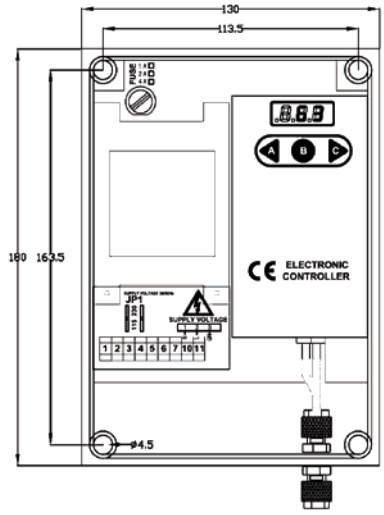
example: E1/05 = : E1/05=05 output overload
(Blinking display)

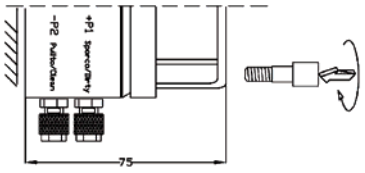
CE DIRECTIVES

This product is compliant with the following directives:

Machine Directive 2006/42/EC 'Electromagnetic compatibility' related to the European Standard EN61000-6-2:2005 class B of the rule EN61000-6-4:2001. Low Voltage Directive 2006/95/CE related to the European Standard EN60947-1:2004.

BPB Series





DESCRIPTION

Digital differential pressure controller between two points with microprocessor.

Maximum 2 output relays.

TECHNICAL CHARACTERISTICS

Standard supply voltage	230 VAC / 115 VAC
Supply voltage available upon request	24 VAC / 24 VDC
Operating temperature range	-10°C ÷ +50°C
Absorbed power	5 VA
Protection level	IP65
Dimensions (mm)	180x130x75

STANDARD FEATURES

Minimum (K2) and maximum (K1) ΔP alarms on separate relays
Differential pressure reading by internal transducer (max 10kPa)
Minimum ΔP alarm with alarmed contact open and automatic reset
Maximum ΔP alarm with alarmed contact open and automatic reset
Zero ΔP reading adjustment

PARAMETER SETTING IN SET MODE

In Run Mode press key C to enter the function menu

F01	Zero ΔP adjustment	0,00 (see C8)
F02	Min. ΔP alarm threshold	0,01 ÷ 9,99 kPa (E=disabled)
F03	Max ΔP alarm threshold	0,01 ÷ 9,99 kPa

Key A = Access to the selected function	Key A = Parameter decrement in Set
Key B = Exit from Set Up	Key B = Return to function menu
Key C = Function selection	Key C = Parameter increase in Set

NOTE: The device will automatically switch from Set Mode to Run Mode if no key is pressed for 5 minutes

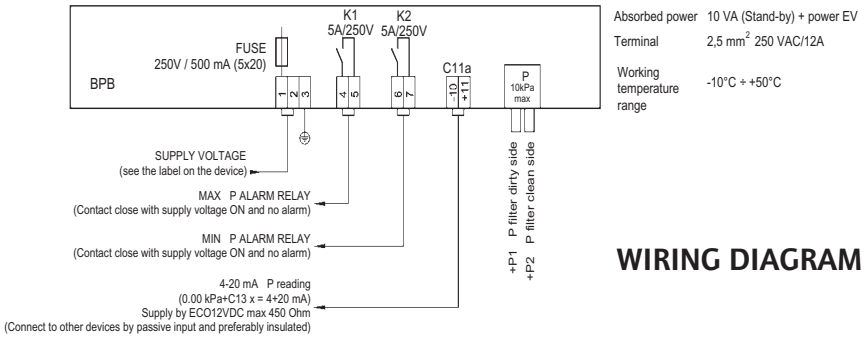
OPERATION

When power is supplied, dP control starts immediately

1,23	ΔP reading (kPa)
E	ΔP reading over 9.99kPa
Key B	Alarm reset
Key C	Access to Set Up

ALARM DESCRIPTION

3,00/H	Max dP alarm *(Blinking display)*
0,50/L	Min ΔP alarm *(Blinking display)*



Absorbed power	10 VA (Stand-by) + power EV
Terminal	2,5 mm² 250 VAC/12A
Working temperature range	-10°C ÷ +50°C

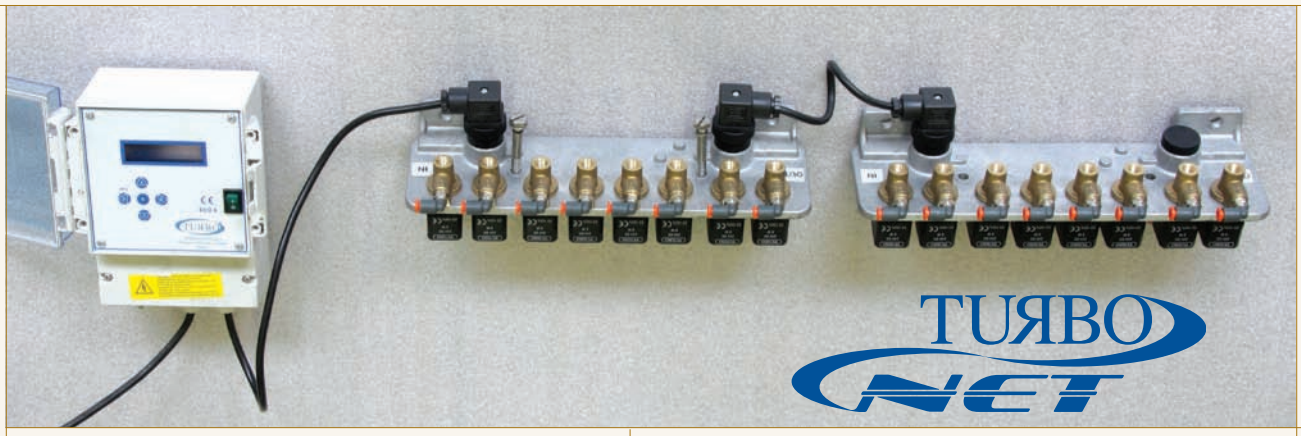
WIRING DIAGRAM

TECHNICAL CHARACTERISTICS

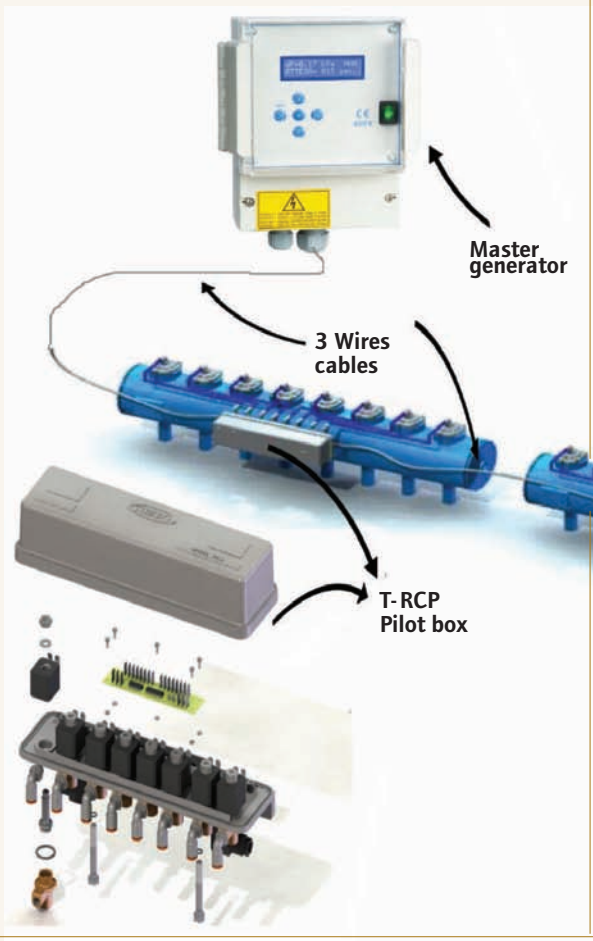
Interval time	0,5 to 45 minutes, adjustable
Activation time	20 to 300 ms, adjustable
Manual adjustment	by micro-switch
Supply voltage range	24 to 240 VAC/DC 50/60Hz
Current consumption	4 mA max
Working temperature	-40°C ÷ +60°C
Protection level	IP65
Enclosure material	ABS plastic FR grade
Connection type	EN175301-803 (ex DIN 43650A)
Indicators	ON/OFF indication by LEDs
Standard design	VDE 01 10C

TURBONET BUS SYSTEM CONTROLS - Up to 144 Valves

Connection to master controller by a single 3-core cable



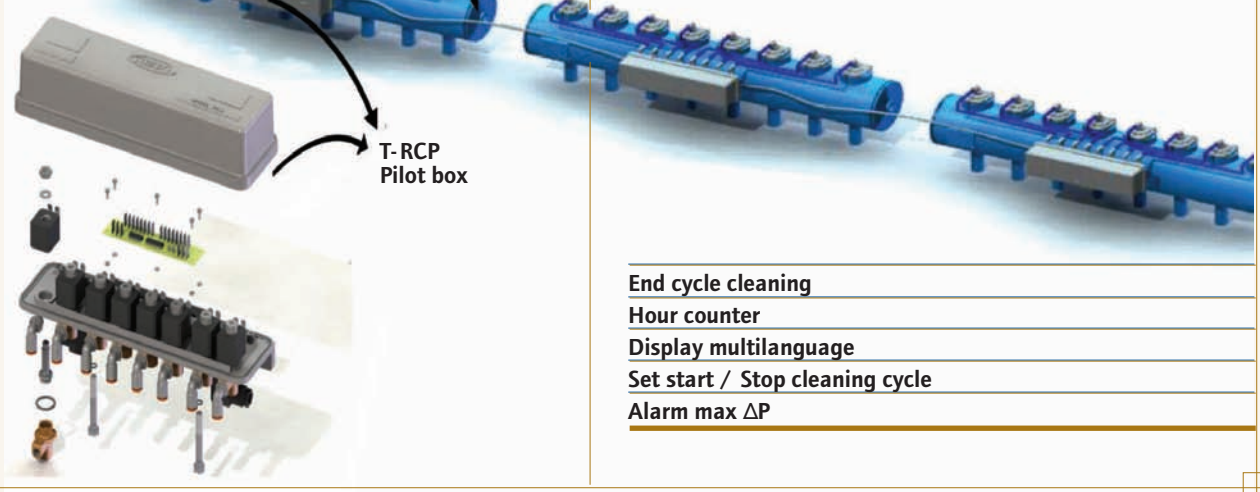
TurboNet master controller has been designed to control cleaning cycle in dust collector filter applications. It features digital differential pressure control by internal transducer and provides effective cost reduction in electrical wiring procedures. It is a microprocessor operated system with electrical zero connected to ground which ensures high immunity to external interference and low field emissions.
Max 2 output relays and 2 volt free digital inputs.



TECHNICAL CHARACTERISTICS

T-RCP Series	
Fluid	Filtered and oilfree compressed air
Operating pressure	Min 0,5 bar - max 7,5 bar
Temperature range	-20°C +80°C
Base and cover	Die cast aluminium
Core tube	Stainless steel
Plunger	Stainless steel
Screws	Stainless steel
Coil insulation	Class H
Protection	IP66
Standar voltage	24V DC

MASTER WITH ΔP CONTROLLER	
Enclosure	IP65
Dimensions (mm)	160x137x103
Temperature	-10°C +70°C
Power inlet	110/220 AC
Power outlet	24DC
One time	0,05 ÷ 5 sec
Off time	1 ÷ 999 sec
ΔP	10kPa



- **End cycle cleaning**
- **Hour counter**
- **Display multilanguage**
- **Set start / Stop cleaning cycle**
- **Alarm max ΔP**

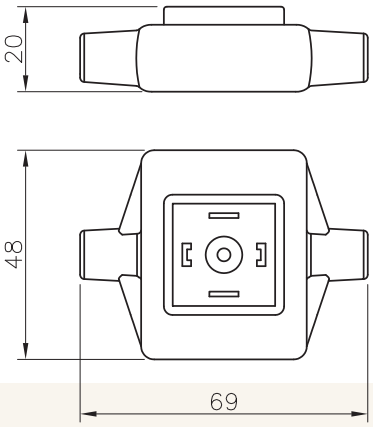
Matrix System is designed to reduce time and cost of wiring installation.
Matrix require a simple connection to the sequencer and to pulse valve.

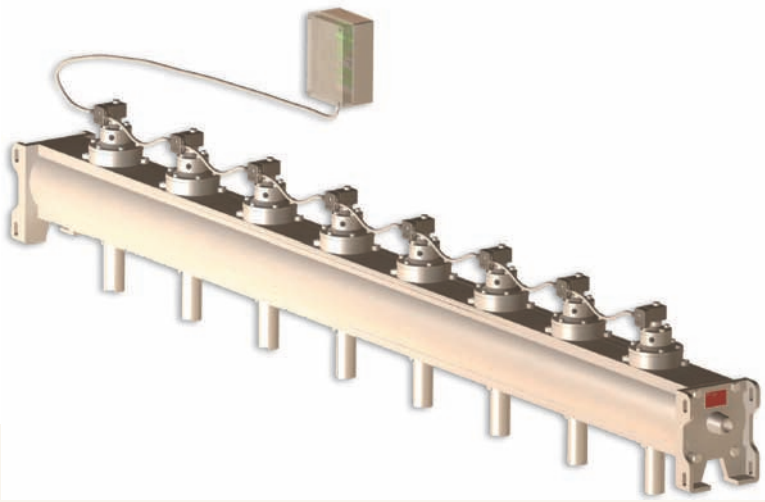
FEATURES

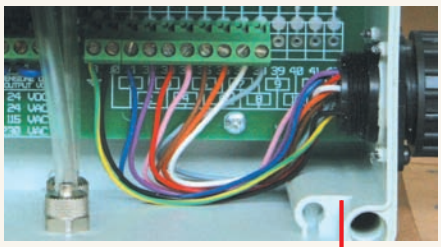
Matrix consist in moulded prewired connectors for pulse valve
Turbo provide Matrix connectors with desired pitch between valves.
Is compatible with any sequence controller available from the market.
Matrix can be supplied factory plugged to pulse valves on the header tank

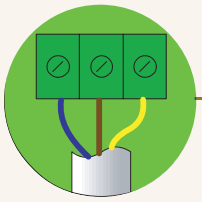
TECHNICAL CHARACTERISTICS

Connectors	Up to 12 per single belt
Cable diameter	8 mm
Protection	IP65
Temperature range	-20°C / +80°C









HOW TO ORDER

MATRIX 4 P200 M3 Plugged

- **No.° of Connectors** → 4
- **Pitch (mm)** → P200
- **Conduit lenght to sequencer** → M3
- **Terminal:**
  - **plugged** → Plugged
  - **free wires**

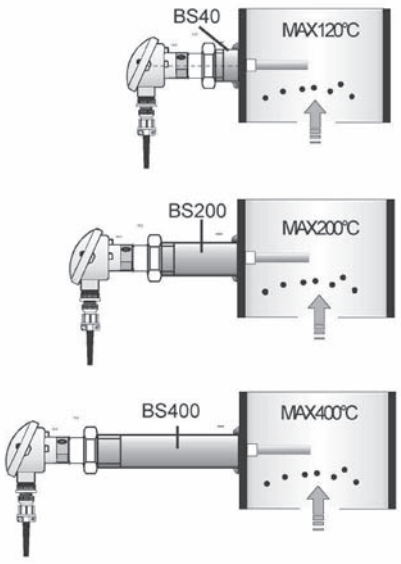
TC Series

DESCRIPTION

The TC probe surveys the passage of particles present in the gas, converting this physical phenomenon in an electric signal proportional to the dustiness degree. By comparing the signal generated by TC with preset thresholds in proper devices, it is possible to activate an alarm at the desired value. If the cause of the alarm is due to a broken bag, this can be identified if it is connected to proper devices belonging to ECO series which are envisaged for this kind of control.

TECHNICAL FEATURES

Power supply supply voltage	16 ÷ 24 VDC 100mA
Output signal	4 ÷ 20mA activ
Maximum load	350 Ohm
Gas temperature	120°C (standard)
Operating temperature	-10° ÷ +50°C
Relative humidity	80%
Housing degree protections	IP65



DESCRIPTION

Device designed to show and check the signal from Tribo-Electric probe to measure the quantity of dust in a duct with gas flow.

TECHNICAL FEATURES

- Emission control by connecting a Tribo-Check Probe
- High emission pre-alarm with relay contact open in alarm and automatic reset
- High emission alarm with relay contact open in alarm and automatic reset
- TC Probe signal zero adjust
- Emission value set in mg/m^3
- TC Probe reading meaning time
- TC Probe signal reading in mA
- Double terminal on the board 2,5 mm^2 250V 12A
- Multi language display

OPTIONS ON REQUEST

- Cable glands type & Q.ty on request
- Other enclosures available on request

ISO 9001:2008 certificated

CERTIFICATE

European Quality Assurance

Certificate of Assessment

Turbo S.r.l.

Via Po, 33 – 20031 Cesano Maderno – MI

EQAICC hereby grants to the above company whose Quality Management System is in conformance with

ISO 9001:2008

Scope

Progettazione, produzione e commercializzazione di componenti per filtri depolveratori.

Design, production and trade of components for dust collector filters.

Registration No. U5379
First issued on 23rd July, 2004
Reissued on 15th May, 2010
This certificate is valid until 18th July, 2013

The Chief Executive

UKAS QUALITY MANAGEMENT 047

CERTIFIED EQA ISO 9001

Further clarifications regarding the scope of this certificate and the applicability of ISO 9001:2000 requirements may be obtained by consulting EQAICC #602, AceTechno 1-cha, #197-17 Guro-Dong, Guro-Gu, Seoul, Korea / URL:www.eqaicc.com