TURBO s.r.l.
Electronic Control Systems For Dust Collectors
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SEQUENCER

E1T

57 ÷ 99 OUTPUT CHANNELS

User Manual

05/05/2016
Manual Release 1.00
Hardware Release 1.01

General Description

Sequencer for controlling the pneumatic cleaning function of industrial dust collection systems. The device has three output relays contacts 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.

Technical Specifications

Casing

- Made of insulating, ABS base and polycarbonate lid.
- Degree of protection to water and dust: IP65 (EN60529).
- Shock resistance: IK07, impact energy 2 Joule (EN62262).

Performance of the Device

- Dedicated software program, managed by the microprocessor, easy to set up and consult, facilitates the use of the instrument also by users unfamiliar.
- Led display with 7 segments, 3 digits (0.8” each).
  Power voltage 115-230 Vac 50-60 Hz selectable by means of jumpers, must also set with F05 (Optional 24 Vac/Vdc).
- Output voltage 24Vdc, 24-115-230Vac selectable by means of jumper.
- Three alarm relays.
- Micro SD memory card for data storage, extractable for consultation.
  Sampling is performed every 10 seconds, the time interval is editable.
- Compressed air presence enable input.
- External contact cleaning activation.
- Manual solenoid valve activation.
- Operating times expressed in seconds with selectable ranges for any application.
- Solenoid valve not working alarm.
- Total and partial hour counter for maintenance.
- Setting the current date and time associated with the archiving historical data on the SD card, where are stored the detected values.

Electric Specifications

Warning! Read the section on installation before connecting the device.

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)

Selectable Output Voltage

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

Inputs And Outputs Galvanically Insulated

- Enable contact (remote cleaning enable).
- Fan contact (post-cleaning).

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 Relays

The three alarm relays contain 2 clean contacts on terminals 4 ÷ 9 di J4.
Maximum permitted load: 3A @ 250Vac, 2A @ 24Vac, 2A @ 24Vdc

Fuse

1 x 1 A	@ 115 Vac.	1 x 1 A	@ 230 Vac.
1 x 3 A	@ 24 Vac.	1 x 3 A	@ 24 Vdc.

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

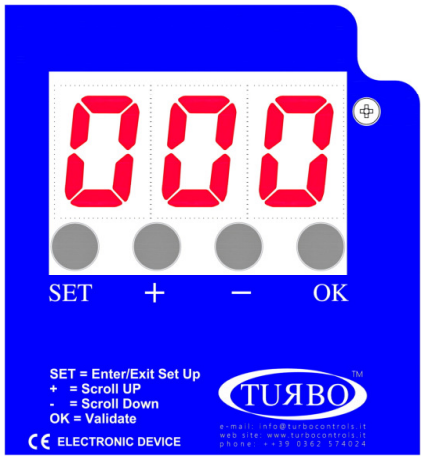
Installation Instructions / Notes and Warnings

- 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.
- 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 0.25 mm2 for all control signals.
- 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 sequencer.
- Cut off power supply immediately if water is found in the casing.

Do not use the sequencer if you have not read or do not understand this manual.

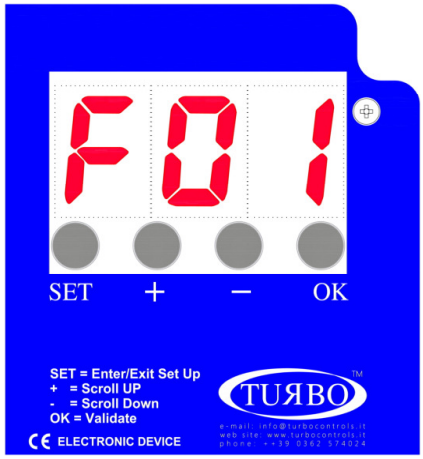
Display Keypad

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



- The SET button enables to enter and exit the programming menu, and activate the manual solenoid test by selecting function F06.
- The + and – buttons enable to scroll functions from F01 to Fxx. After entering one of the Fxx functions use the OK button to select and then + and - increase or decrease the values.
- The OK button is used to confirm data and reset alarms.
- If the + button is pressed during ordinary operation, the activity hour meter is displayed.
- The - Button pressed during the ordinary operation, displays the counts partial hours of activity.
- If the Micro SD Card is inserted, the pressing of the OK button enables safe removal of the card.

Menu Diagram



- Press SET, the letter F flashes.
- Press + and – to select the required function.
- Press OK to confirm.
- Increase or decrease the value of the parameter.
- Holding down the + and - buttons to scroll through all the functions until the end of the left or right.
- Press OK to confirm and exit.
- Press SET again to exit programming mode.

List of Functions

- **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 = 20”.
- **F04:** Number of connected outputs.
  Possible values: 01 - 99
  Depending on the version of the instrument, step 1.
- **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.
- **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 = 10”.
- **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.
- **F24:** Setting the date on the internal clock.
  Settable values: Day 1 – 31 *d*.
  Month 1 – 12 *n*.
  Year 00 – 99 *y*.
- **F25:** Setting of the time for the internal clock.
  Settable values: Hours: 0 – 23 *HH*.
  Minutes: 0 – 59 *nn*.
- **F26:** Exclusion of the valve in short circuit.
  If set to 1 the valve shorted is excluded from the cycle.
  Settable Values 0 (not excluded) - 1 (excluding)
  Default = 0 (not excluded).

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.

A. No.	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 see table next pages. - 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 see table next pages. - 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 see table next pages. - 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 see table next pages. - 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 The signaling of the code E08 alternates with the indication of the interested output is shown as Uxx where xx is the number of the output.	Turn off the device and then turn it back on, after having verified the plant of the solenoid valves.
E11	Maintenance deadline reached	Carry out maintenance.
E14	Indicates that a valve in short circuit has been excluded from the cycle. The signaling of the code E14 alternates with the indication of the interested output, is shown as Uxx where xx is the number of the output. An output is considered a short circuit if not responding for 3 following activations. An activation without error resets the counting.	Turn off the device and then turn it back on, after having verified the plant of the solenoid valves.
E20	Internal clock error.	Replace buffer battery (CR1632 3V 130mAh) and set current time and date

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 sequencer 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:

OFF if the enabling contact is open (14-15).

-0- if the enabling contact (14-15) is closed and the fan is off.

Operative mode

The device works as a programmable cycle sequencer. The connected outputs will be activated at the programmable frequencies. The firing and pausing times can be set on the configuration menu.

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 PCC.

Number Of Output Selection

The number of outputs (solenoid valves) on which the sequencer 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.

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 next pages.

SD Memory Card

The Micro SD memory card slot is located on the bottom right of the control unit under the polycarbonate lid.

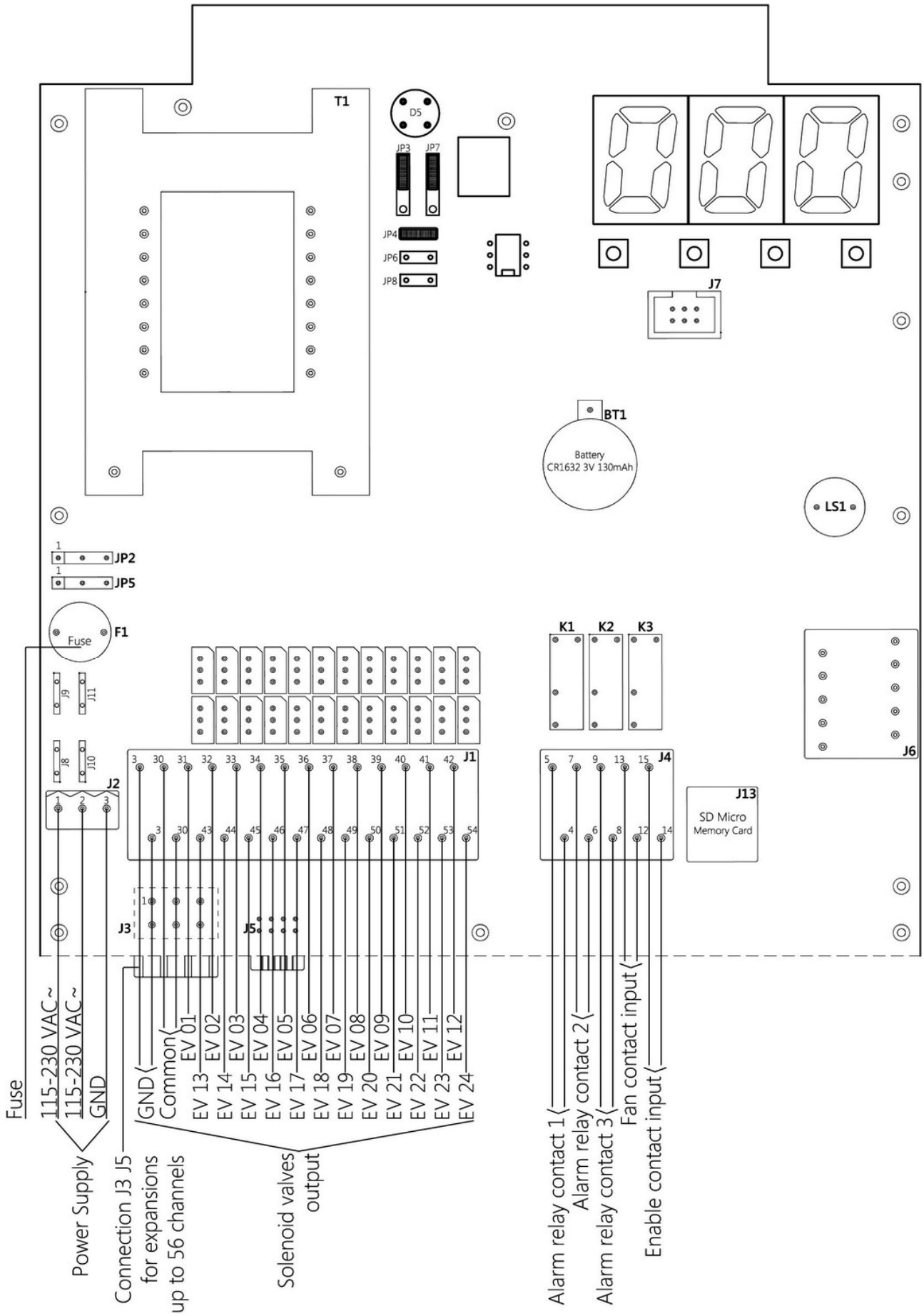
The card is not supplied with the control unit. A card with a maximum of 32GB can be used.

The card must be formatted FAT32, which is the format recognized by all devices and operating systems.

Before removing the memory card, press the OK button with the control unit on, wait for the cd (card) indication and the alternating flashing of the horizontal lines of the third figure ≡. The card can now be safely removed. The Micro SD Card connector is push-pull.

Press upwards and extract the card to remove it.

Connection Diagram Main Board



Contacts And Relay Terminal Block J4

Enable contact input consensus 14.15 terminals.

Is used to activate the control unit remotely, it can be turned on and off remotely.

The unit is supplied with a jumper on the two terminals 14:15, without it will not turn on.

Fan contact 12.13 input terminals.

Indicated by the control unit that the plant has been started and is in operation.

The unit is supplied with a jumper on two 12:13 terminals to simulate the state of the plant, as if the fan was turned on.

Alarm Relay K1 4.5 terminals.

The relay is normally closed, opens in case of alarms, and opens to the control unit off in the absence of power.

The alarms that open the relays are:

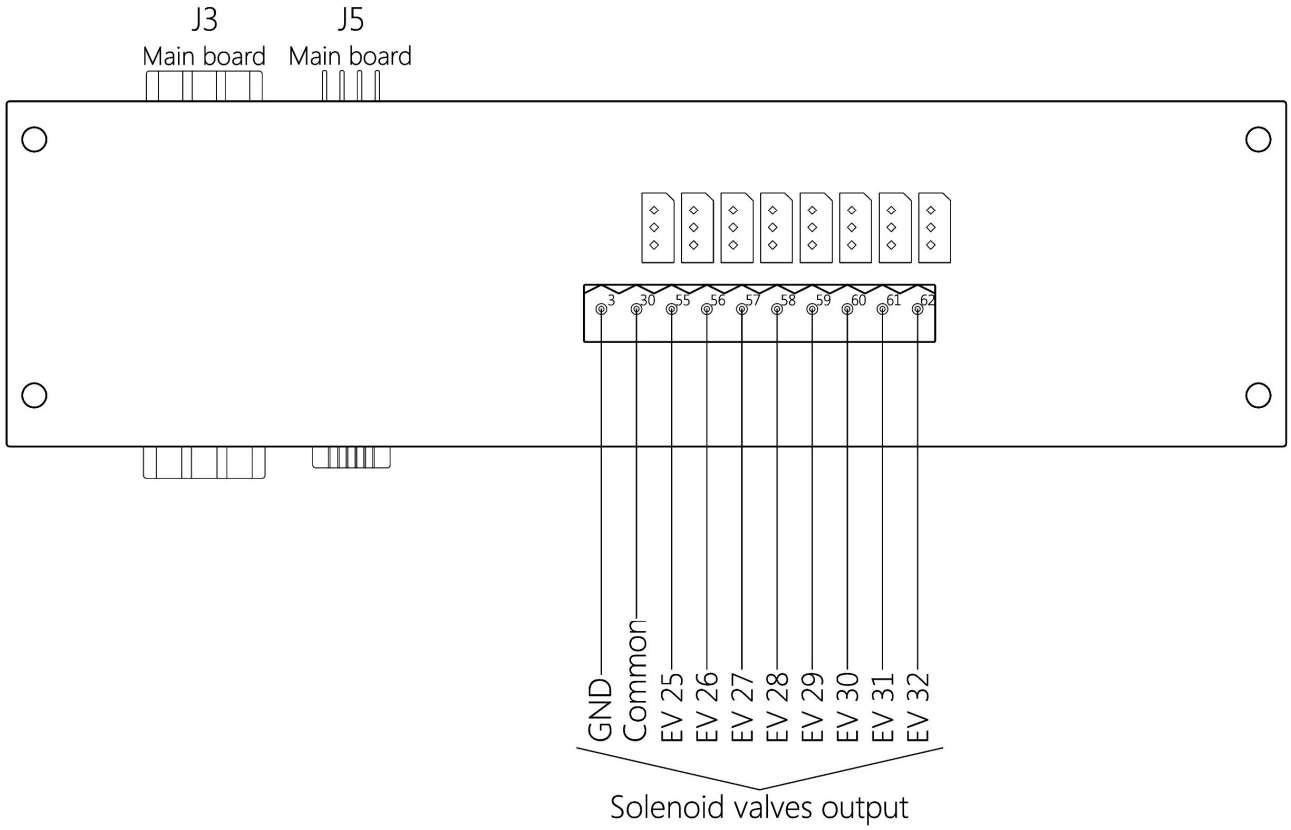
Problem with solenoid valves E06-E08.

Maintenance interval has been reached.

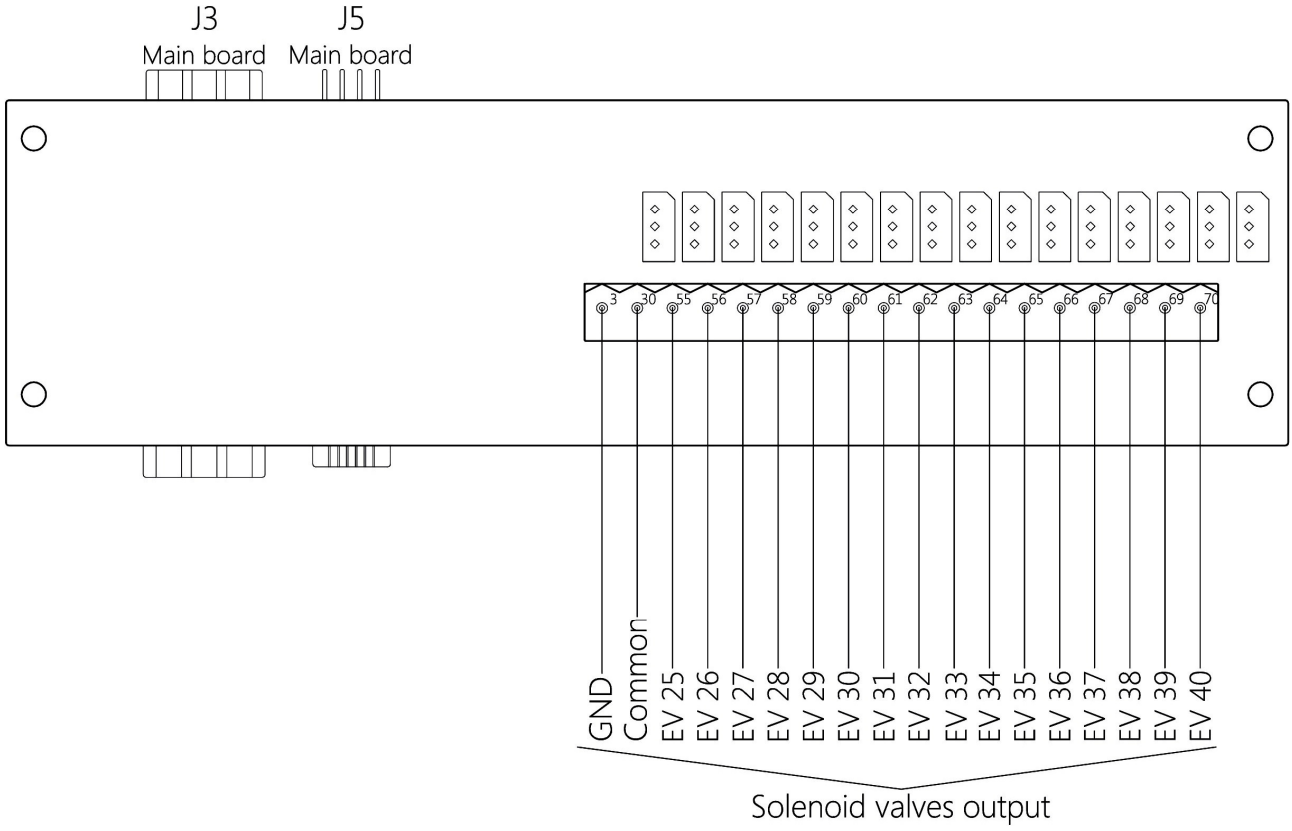
If one of these occurs, the relay is activated.

Connection Diagram Expansions

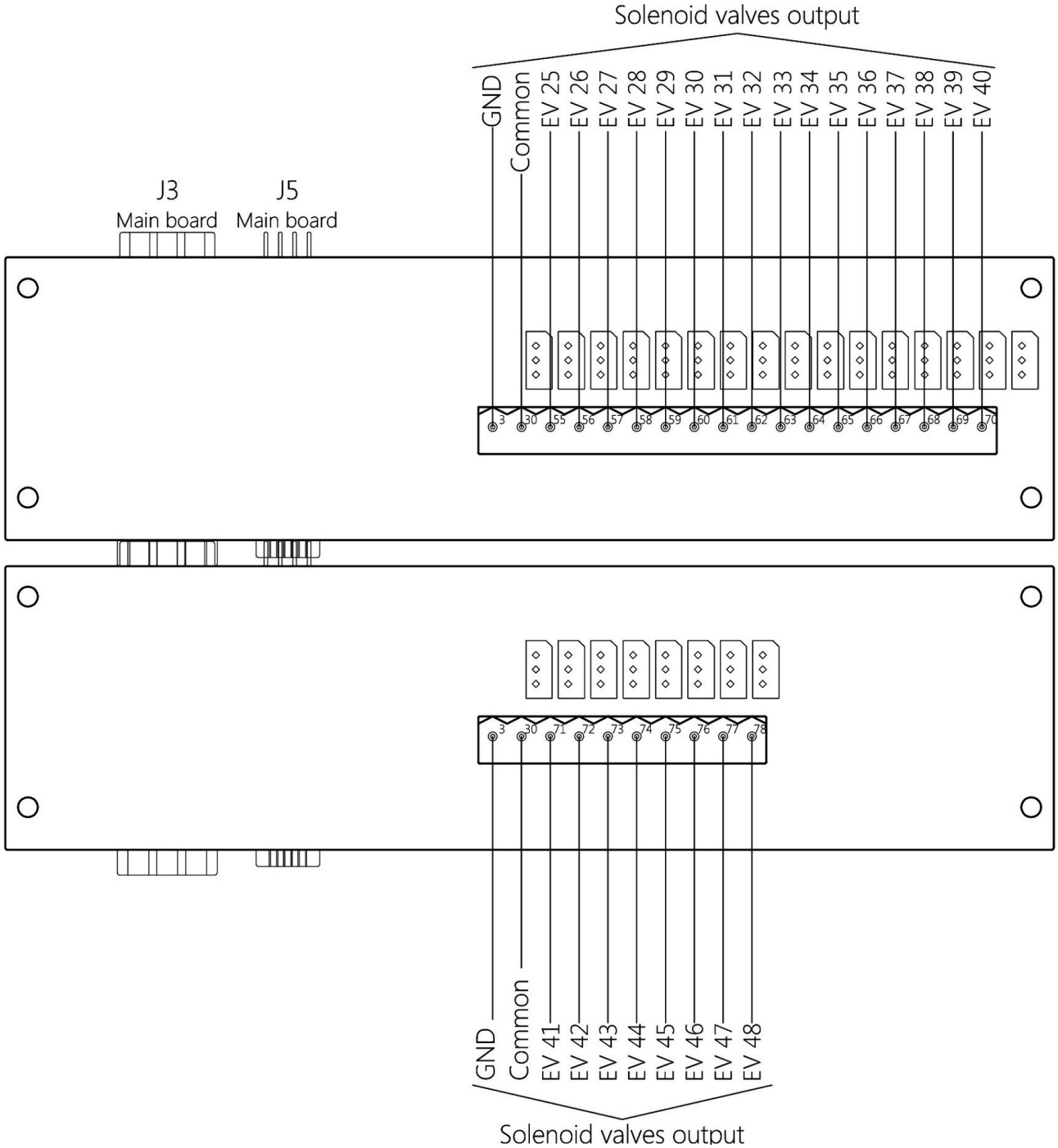
Expansion Up To 32 Channels



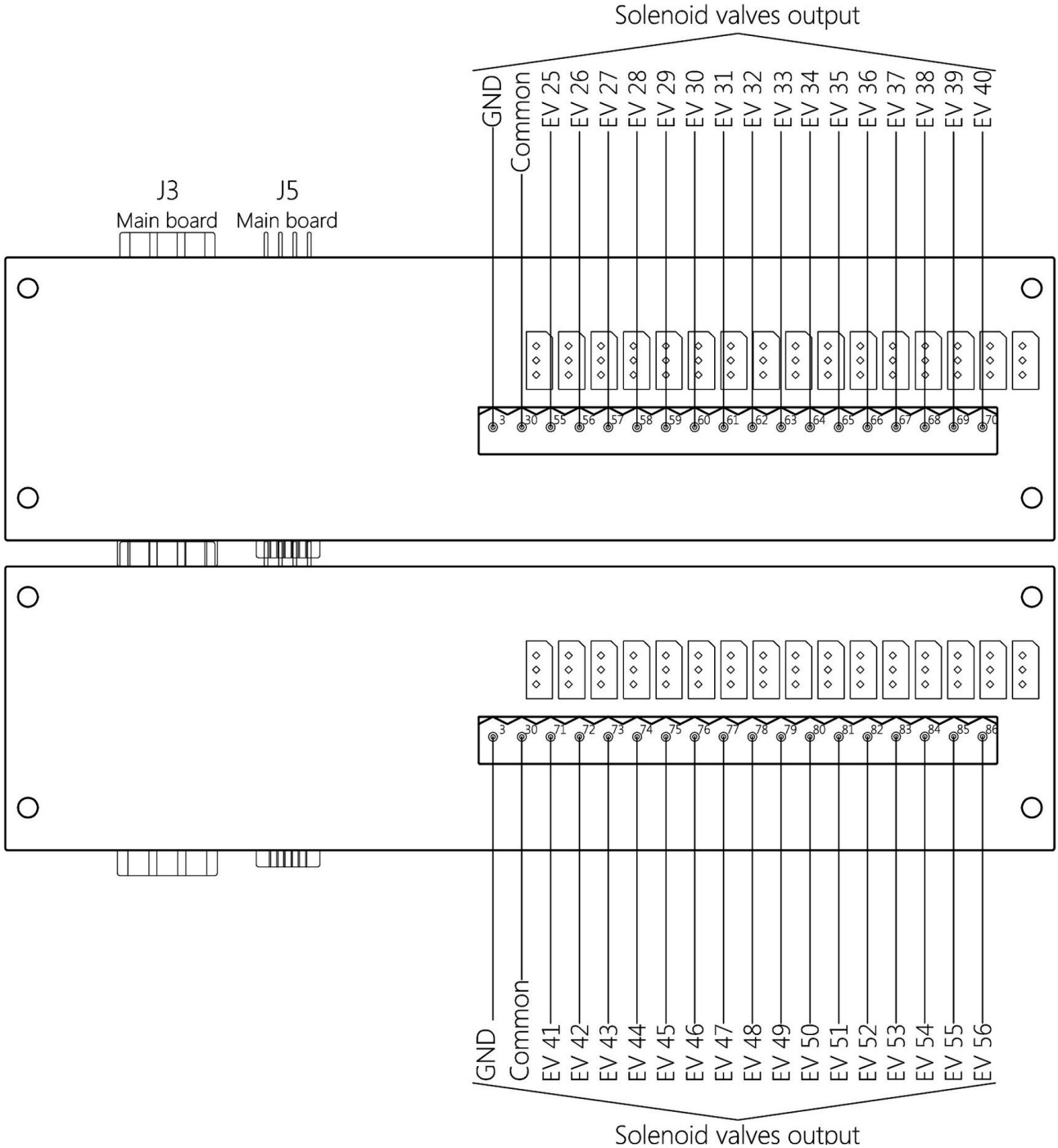
Expansion Up To 40 Channels



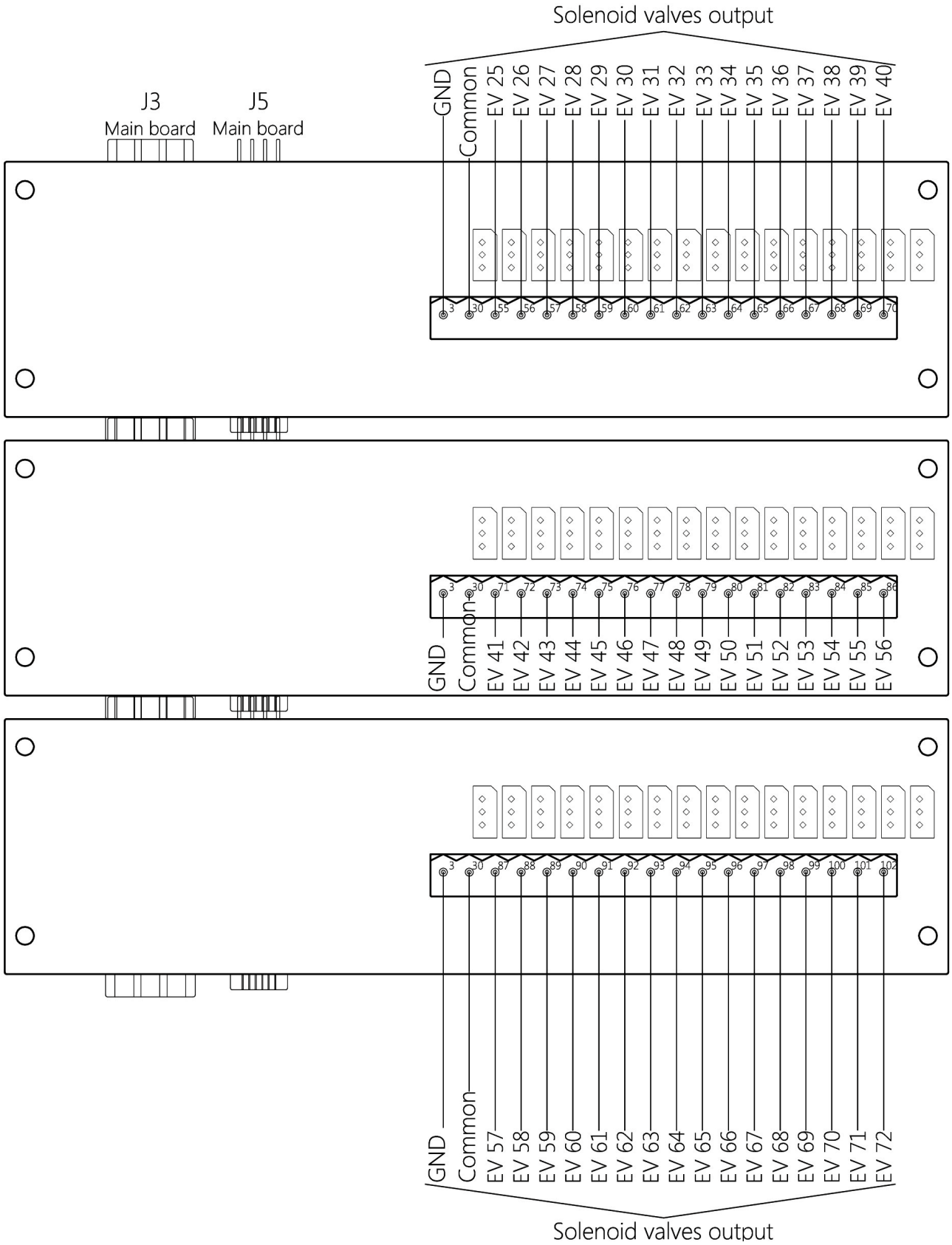
Expansion Up To 48 Channels



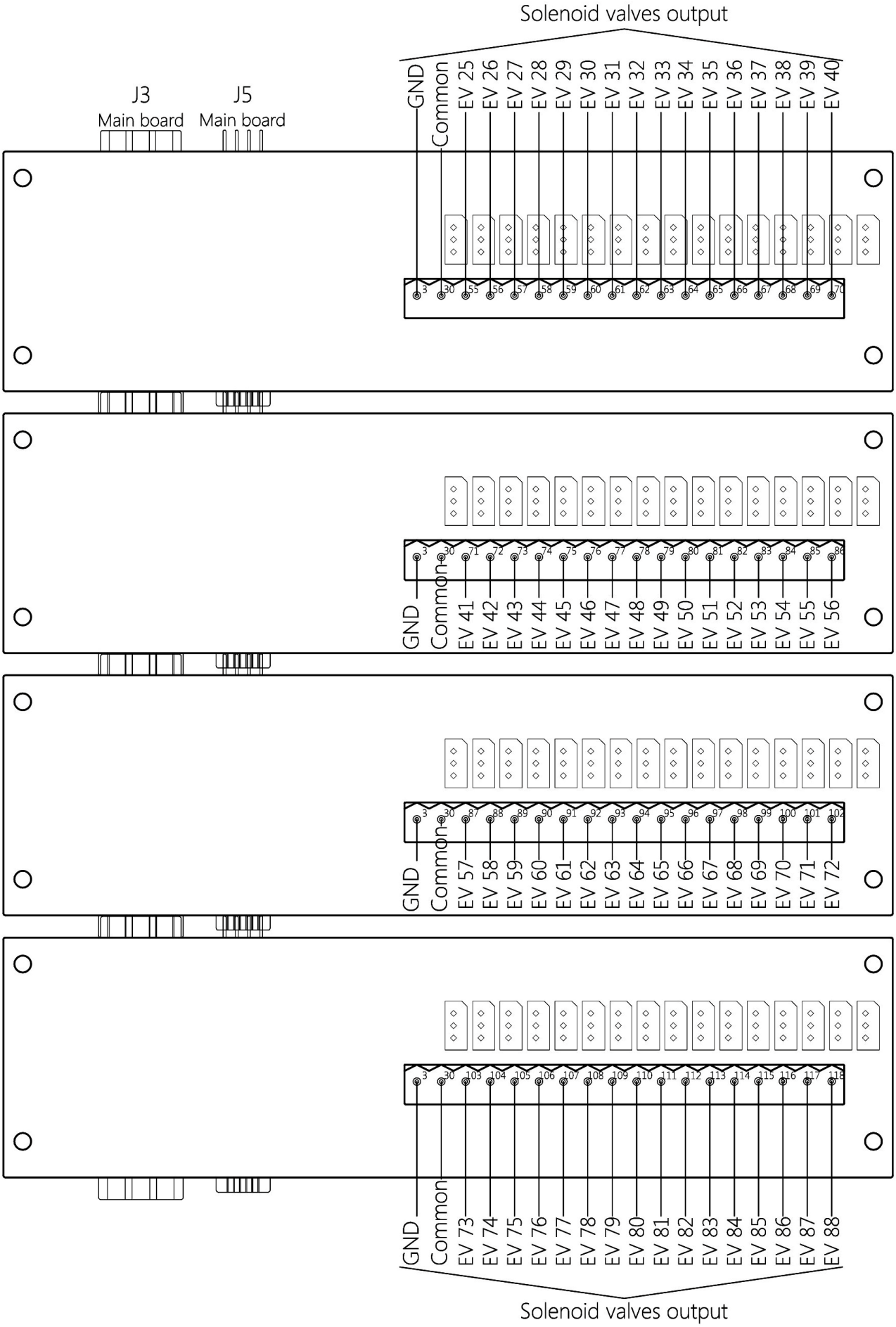
Expansion Up To 56 Channels



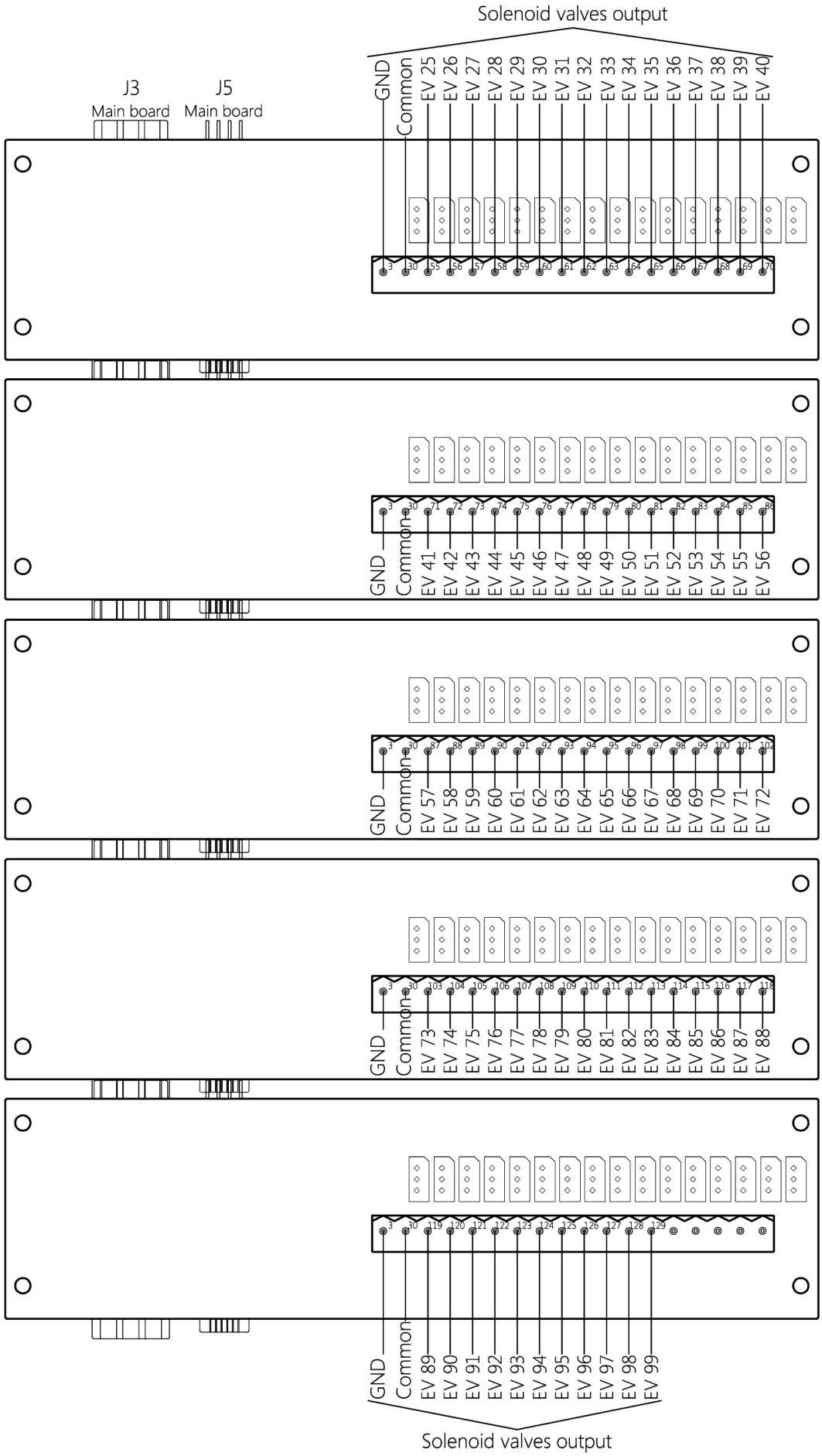
Expansion Up To 72 Channels



Expansion Up To 88 Channels



Expansion Up To 99 Channels



Terminal Table

To access at the terminal blocks of the control board, unscrewing countersunk screws of the cover panel blue.

Main Board			
Terminal	Description	Terminal	Description
01	Power Supply 115 230 Vac	45	Solenoid output 15
02	Power Supply 115 230 Vac	46	Solenoid output 16
03	Earth (GND)	47	Solenoid output 17
		48	Solenoid output 18
03	Earth (GND)	49	Solenoid output 19
03	Earth (GND)	50	Solenoid output 20
30	Solenoid valve common	51	Solenoid output 21
30	Solenoid valve common	52	Solenoid output 22
31	Solenoid output 01	53	Solenoid output 23
32	Solenoid output 02	54	Solenoid output 24
33	Solenoid output 03		
34	Solenoid output 04	04	Alarm relay contact 01
35	Solenoid output 05	05	Alarm relay contact 01
36	Solenoid output 06	06	Alarm relay contact 02
37	Solenoid output 07	07	Alarm relay contact 02
38	Solenoid output 08	08	Alarm relay contact 03
39	Solenoid output 09	09	Alarm relay contact 03
40	Solenoid output 10	12	Fan input
41	Solenoid output 11	13	Fan input
42	Solenoid output 12	14	Enable input
43	Solenoid output 13	15	Enable input
44	Solenoid output 14		

Expansion Boards			
Expansion up to 32 channels		Expansion up to 40 channels	
Terminal	Description	Terminal	Description
03	Earth (GND)	03	Earth (GND)
30	Solenoid valve common	30	Solenoid valve common
55	Solenoid output 25	63	Solenoid output 33
⇩	⇩	⇩	⇩
62	Solenoid output 32	70	Solenoid output 40

Expansion up to 48 channels		Expansion up to 56 channels	
Terminal	Description	Terminal	Description
03	Earth (GND)	03	Earth (GND)
30	Solenoid valve common	30	Solenoid valve common
71	Solenoid output 41	79	Solenoid output 49
⇩	⇩	⇩	⇩
78	Solenoid output 48	86	Solenoid output 56

Expansion up to 64 channels		Expansion up to 72 channels	
Terminal	Description	Terminal	Description
03	Earth (GND)	03	Earth (GND)
30	Solenoid valve common	30	Solenoid valve common
87	Solenoid output 57	95	Solenoid output 65
⇩	⇩	⇩	⇩
94	Solenoid output 64	102	Solenoid output 72

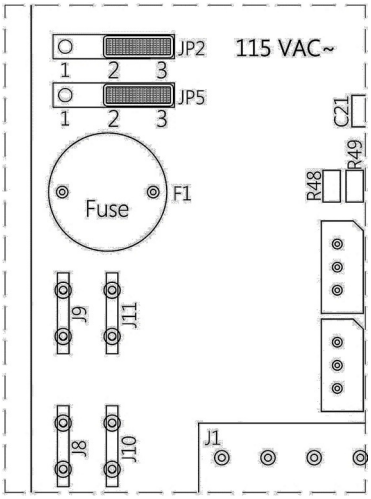
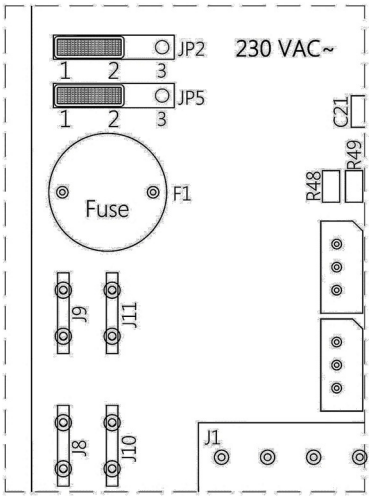
Expansion up to 80 channels		Expansion up to 88 channels	
Terminal	Description	Terminal	Description
03	Earth (GND)	03	Earth (GND)
30	Solenoid valve common	30	Solenoid valve common
103	Solenoid output 73	111	Solenoid output 81
⇩	⇩	⇩	⇩
110	Solenoid output 80	118	Solenoid output 88

Expansion up to 96 channels		Expansion up to 99 channels	
Terminal	Description	Terminal	Description
03	Earth (GND)	03	Earth (GND)
30	Solenoid valve common	30	Solenoid valve common
119	Solenoid output 89	127	Solenoid output 97
⇩	⇩	⇩	⇩
126	Solenoid output 96	129	Solenoid output 99

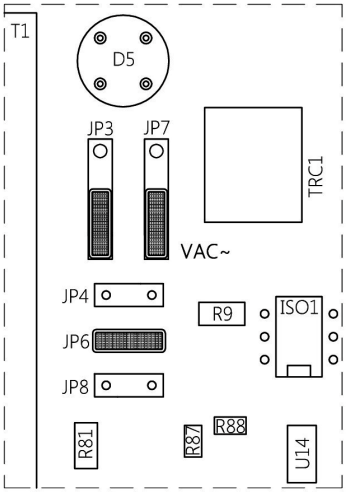
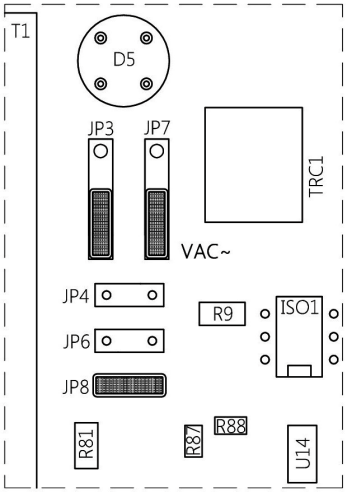
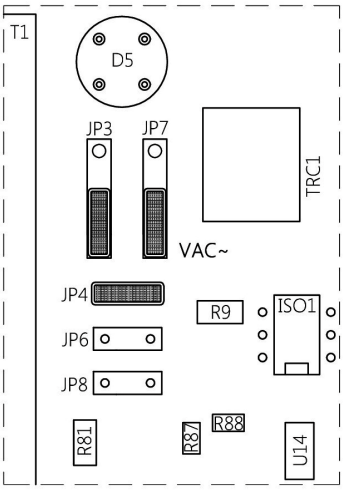
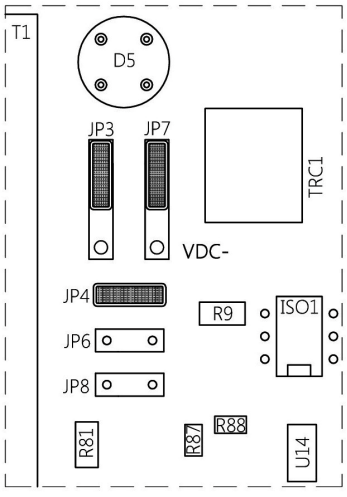
Fuse Table

Tensione	Valore
230 V	1 A
115 V	1 A
24 Vdc / Vac	3 A

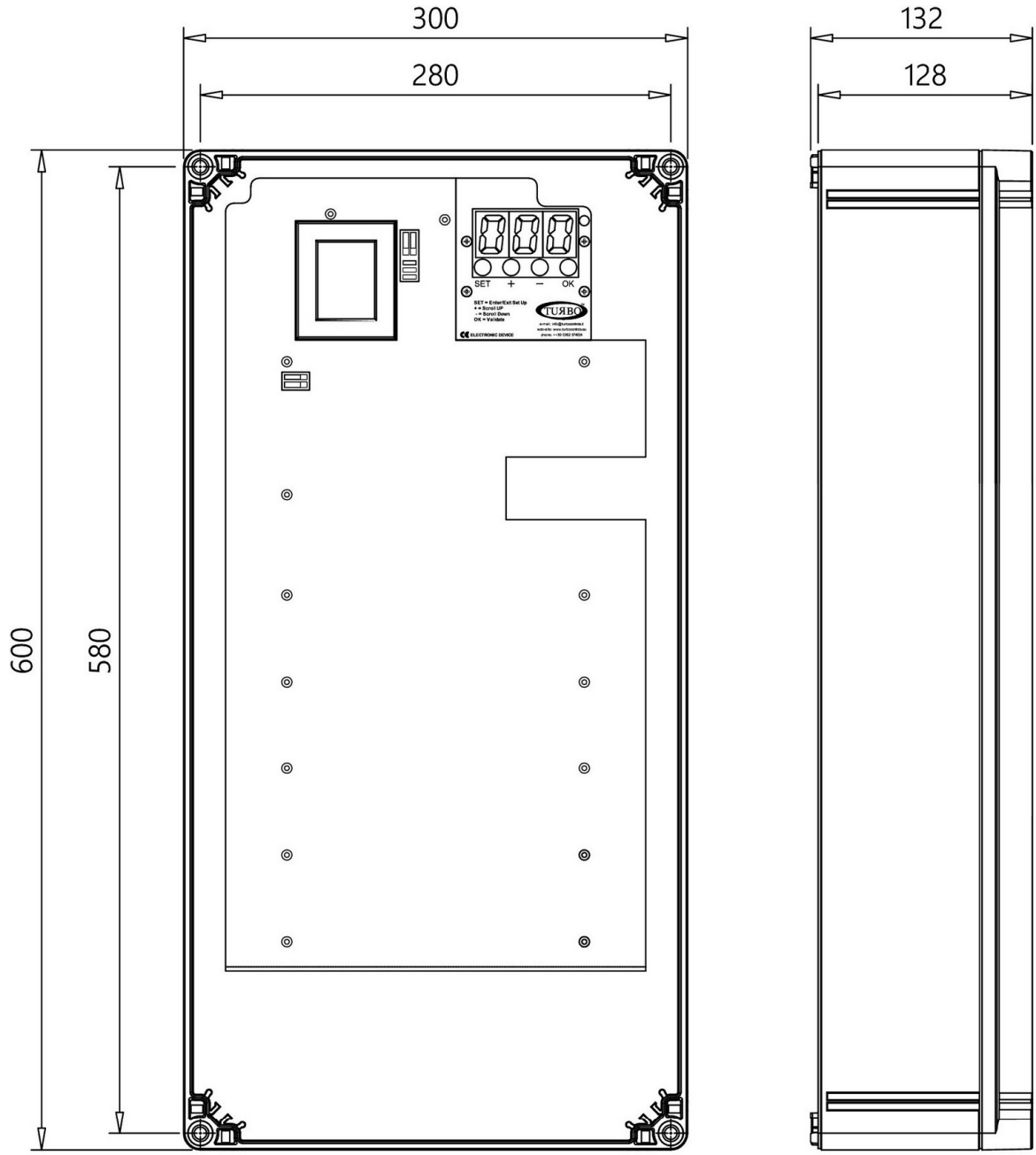
Jumper Configuration Power Supply

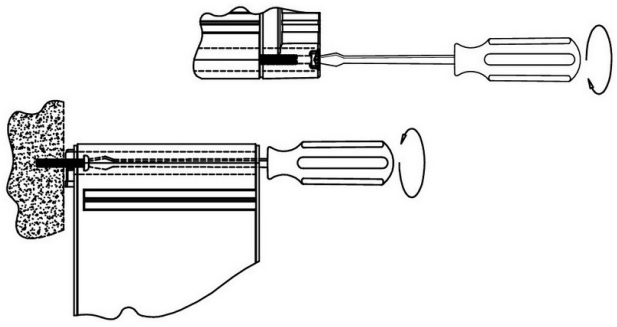
115VAC	230VAC
	

Jumper Configuration Output

115VAC	230VAC
	
24VAC	24VDC
	

Installation And Casing Dimensions





Weight 4.8 Kg

Maintenance

Only the fuses, batteries and SD card can be replaced.
All other repairs must be done by the manufacturer.

Default Settings

Function Number	Description	Set Value
F02	Solenoid valve activation time	0.20”
F03	Washing pause time between solenoid valves in normal cycle	020”
F04	Number of outputs	1
F05	Tensione uscita: 24 Vdc, 24 Vac, 115 Vac, 230 Vac.	24 Vac
F06	Manual solenoid valve activation	1
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
F26	Exclusion of valve in short circuit.	0

Disposal

Do not disperse in the environment after use. Dispose of the product according to current regulations for the disposal of electronic equipment.

This device is used in a dust collector system and, therefore, it is part of a fixed installation.

Warranty

The warranty has a duration of 2 years. The company will replace any electronic component deemed defective exclusively at our workshop, except in the presence of contrary agreements to be authorized by the company.

Exclusions From Warranty

The warranty is void in the case of:

- Signs of tampering and unauthorised repairs.
- Incorrect use of the equipment that does not comply with the technical data.
- Incorrect electrical connections.
- Failure to comply with the installation standards.
- Use beyond EC standards.
- Atmospheric events (lightning, electrostatic discharge), over voltages.
- Clogged air connections. Damaged tubes.

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 01 and 03).
The outputs are not activated.	Incorrect output voltage. Wiring to solenoid valves.	Check that the unit and solenoid vale output voltage agree. Check wiring between sequencer and solenoid valves.
Do alarm messages appear?		Check the alarm code with the table.
Do the alarms fail to activate signalling devices?	System wiring errors. No power to alarm devices.	The alarm devices must be powered by voltage external to the sequencer. Activating to open the respective relay.
Does the sequencer occasionally reset?	Check the 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 sequencer, if needed.

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:
Sequencer E1T

Product Options:
All

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

A typical configuration of the product was tested.

Cesano Maderno, 05/05/2016

F. MESSINA (C.E.O.)

TURBO s.r.l.

Code And Serial Number