ESD112: MASTER MONO-PHASE REGULATOR WITH DIGITAL SCROLL SW

1. SAFETY INSTRUCTIONS

1.1. Important

Read these instructions carefully before installation.

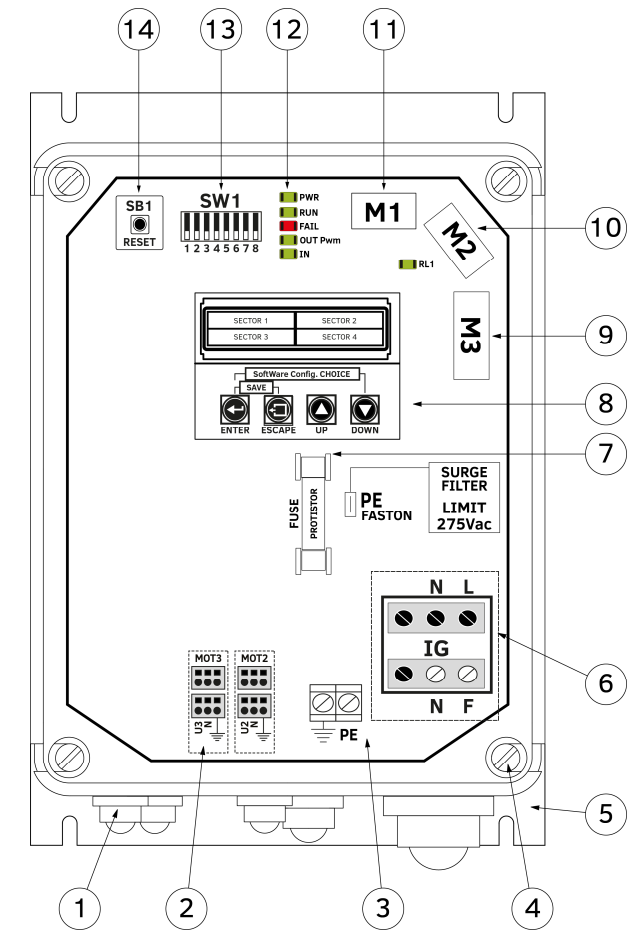
- Before use, follow all the installation and electrical connection instructions.
- Keep these instructions with the regulator for future use.
- Observe current technical and safety regulations.
- The regulator must be professionally installed and commissioned by a qualified technician. INCORRECT installation may cause damages.
- Before turning on regulator power, always check that it is correctly grounded.
- DO NOT tamper with or REMOVE internal regulator components; this NULL AND VOIDS THE WARRANTY and can cause damages.
- The user must be protected against electrical shock and the motor must be equipped with overload protection, as per current pertinent regulations.
- According to safety regulations, protection against any contact with live parts must be ensured by correct device installation; all parts that ensure protection must be secured so as irremovable without the help of a tool.
- DO NOT turn on the regulator without the protection lid.
- NEVER touch electrical circuit parts when the power is on.
- Install the regulator away from direct sunlight so as not to overheat the case.
- Make sure working conditions (working temperature, humidity, etc.) are within the indicated limits (see point 8).
- Do not install the regulator near heat sources (resistances, hot air ducts, etc.) where room temperature can exceed 50 °C, devices that generate strong magnetic fields, sites subject to rain, humidity, dust, excessive mechanical vibrations or shocks.

2. ESD112 DESCRIPTION

2.1. Overview

The ESD series regulators are mono-phase controllers built on a vetronite support in an IP55 grade GW PLAST box.
The control zone is at the top of the board while the power zone is at the bottom.
In addition to the M1, M2 and M3 terminal boards, regulation, connection and signal devices are found in the control zone.
Fan speed control varies to maintain the value measured by the transducer or probe within the P.B. proportional band.
Output increases as input increases.

2.2. Key

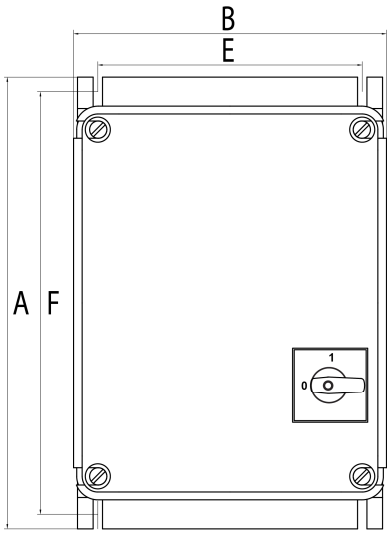


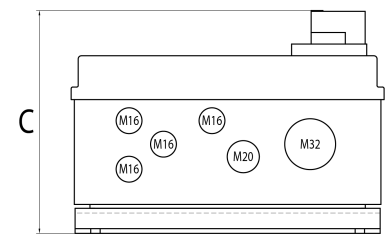
ESD112 Key		
1	-	Wire clamps - connection wires
2	Ux/N	Mono-phase output terminal board (Ux + N + PE) direct fan connection
3	IG	Mono-phase power terminal board (N/F + F/F) + PE
4	-	TPN lock screws with max 1,8 Nm torque
5	-	Wall mount perforated fin
6	-	Main ON-OFF switch
7	-	CH 10x38 protection fuse (Protistor fuse)
8	-	Keyboard: ENT, ESC, ⏃ and ▽ with back lit alphanumeric display
9	M3	Command input terminal board
10	M2	Alarm relay terminal board
11	M1	Auxiliary contact terminal board
12	DLx	Signal and alarm LED
13	SW1	Programming dip switch
14	SB1	Reset button

2.3. Mechanical dimensions

Model	Plate data			Mechanical dimensions (mm)					Weight (*) (kg)
	A	W	IP	A	B	C	E	F	
ESD112	12	2800	55	290	200	143	169	272	2.35

(*) Packaging included





Ø Cable clamp Input		
Input	Min	Max
M16 (1 hole)	5 mm	10 mm
M20 (1 hole)	6 mm	13 mm
M32 (8 holes)	3 mm	6 mm

3. INSTALLATION

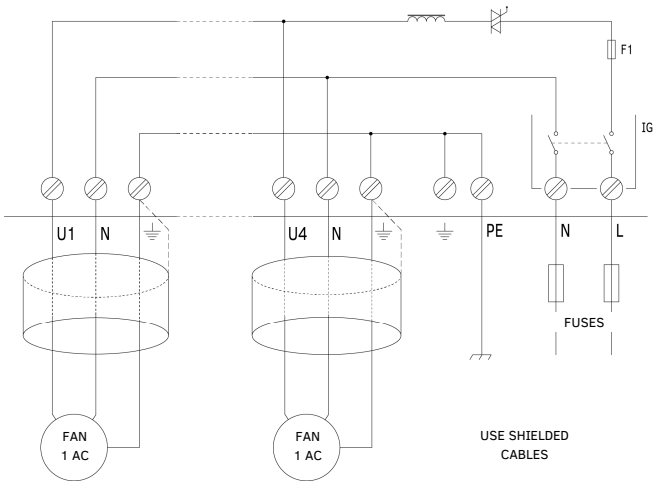
3.1. Installation

Vertically install the device with the wire inlet facing down. To permit correct heat dissipation, guarantee ≥ 50 mm clearance around the regulator.
Reassemble and make sure the external protection lid is fully closed.

3.2. Electrical connections

Flexible wire section.
Signal rated section: ≤1.5 mm² (16 AWG)
Power (output): ESD112 ≤ 2.5 mm² (12 AWG)
Power (supply): ESD112 ≤ 10 mm² (8 AWG)
N.B. Protection devices: see point 9.

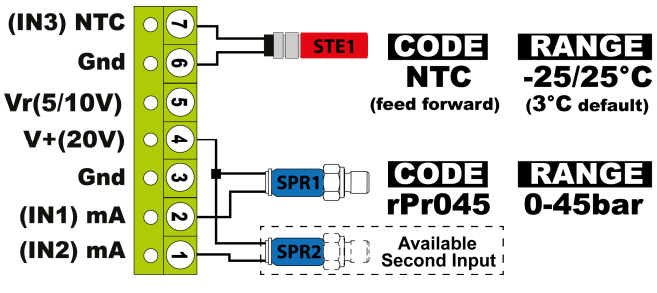
3.2.1. Power connection (IG/PE) and load (Ux/N/GND)



IG	N-L (or L1-L2): power connection 230 Vac (±10%)
PE	Grounding connection **PE**
MOTx	Ux, N, GND: auxiliary terminals to connect 4 mono-phase fans + grounding

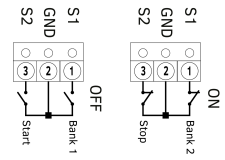
3.2.2. Command signal connections (M3)

M3	Terminal	Label	Description
	7	IN3	NTC probe input
	6	GND	Reference grounding
	5	Vr	Power +5/10 Vdc (±10%) 10 mA
	4	V+	Power +20 Vdc (±20%) 40 mA
	3	GND	Reference grounding
	2	IN1	Transducer input no.1
	1	IN2	Transducer input no.2



3.2.3. ON-OFF contact connection (M1)

Contact	Function
S1	Bank remote selection (Bk1 & Bk2)
S2	Start/Stop function (see SW1-3 condition, point 3.3)



3.2.4. Alarm relay connection (M2)



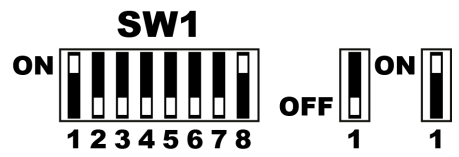
Terminal	Label	Description
1	NO	Normally open contact
2	NC	Normally closed contact
3	COM	Shared terminal

3.3. SW1 (1 – 8) function settings

SW1	Description	
1	**OFF**: SP= MAX (100%)	**ON**: SP= MIN (0%)
2	**OFF**: Direct regulation	**ON**: Reverse regulation
3	Reverses **S2** contact operations	
4 - 5	Alarm relay operations (point 3.3.2)	
6 - 7	Programmable for special functions	
8	Operations with filter for Digital Scroll on	
	OFF: Proportional	**ON**: Filter on

Warning: Press button SB1 after changing SW1 settings to apply changes.

3.3.1. SW1 default settings

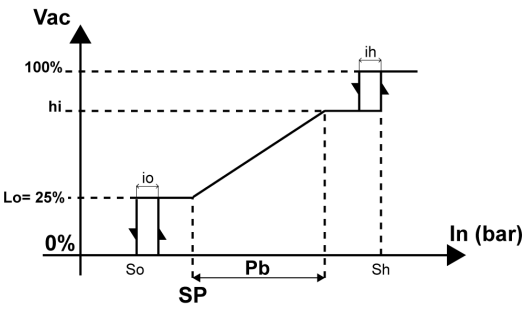


3.3.2. Alarm relay functional programming

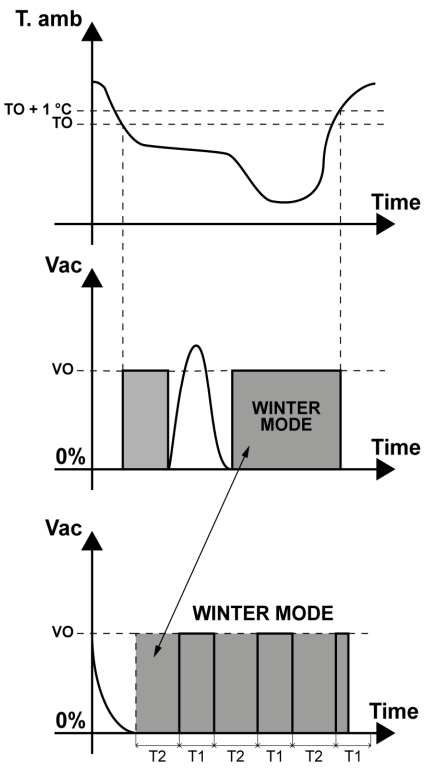
SW1-4	SW1-5	Description
OFF	OFF	Relay idle when the regulator is in alarm conditions
ON	OFF	Relay idle when the regulator is: - In alarm conditions - Stopped
ON	ON	Relay always excited
OFF	ON	Relay idle when the regulator is: - In alarm conditions - In Stand-by - Stopped

4. FUNCTIONAL CHARACTERISTIC

4.1. Command output



4.2. Winter Mode operations



If the ESD is in the regulation zone, the WINTER MODE function automatically turns off

T.amb = Room temperature
TO = Winter Mode ON temperature
VO = Winter Mode fan speed
T1 = Winter Mode fan operating time
T2 = Winter Mode fan downtime

The Winter Mode function turns on when the external °C is lower than **TO**.
Once the function turns on, the regulator waits time **T2** before forcing fans to speed **VO** for time **T1**.

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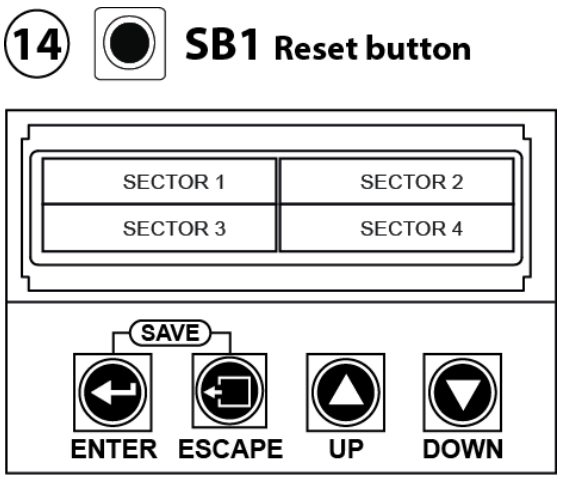
5. DISPLAY

5.1. Data display: Main display screen



With the regulator on, the following information appears on the display:

Sector	Description
1	Current configuration/Alarms
2	Regulator status
3	Inputs used
4	Value read at input/Bank used

5.2. Brightness regulation

To regulate display brightness, hold down the ENT key and press "-" to decrease or "+" to increase the dimmer.
The dimmer can vary between 20 (darker) and 90 (lighter), by units of 2.

5.3. Sector 1

5.3.1. Configuration

The regulator has a single setting for transducer 4-20 mA with range 0-45 bar.
Bk1 or Bk2 can be selected via S1 logic input.
The operating mode is set via dip switch 8 (see 3.3)

Configuration	Bank	Function	Inputs
rPr045	Bank 1 (*) if S1= OFF	FIX if SW1-8= OFF	In1 = pressure transducer In2 = pressure transducer
	Bank 2 if S1= ON	DGT(*) if SW1-8= ON	IN3 = NTC probe

(*) Default configuration

5.3.2. Alarms

In the event of regulator alarm, the word alarm covers the current function name until the cause of the alarm is removed.
Viewable alarms are:

Message	If
T. board	Internal regulator temperature is > 85°C - Check whether the regulator is well-ventilated; - Check whether the regulator is under direct sunlight.
Thermal	The T.K. contact is open: - Make sure the T.K. contact in the terminal board is grounded.
IN Under	The transducer input signal is too low: - Check whether the transducer(s) is correctly connected; - Check whether the transducer(s) operates correctly.
IN Over	The transducer input signal is too high: - Check whether the transducer(s) is correctly connected; - Check whether the transducer(s) operates correctly.

5.4. Sector 2

Regulator status indicates the operation run by the regulator at that time.
Viewable regulator status includes:

Message	If
STAND-BY	The input command is out of operating dynamics but over the Under Range alarm threshold
PWR XX%	The input command is within Pb (Pb1 or Pb2)
STOP	The S2 contact is on (see point 3.2.3)
ALARM	Regulator alarm ('Fail' LED on)

6. ESD112 SETTINGS

6.1. Default parameter list

The ESD112 regulator has a basic set of parameters and 2 memory banks

6.1.1. Basic parameters (shared by both banks)

Basic Parameters				
Abbreviation	**Description**	**Default**	**Range**	**U.M.**
ti	ESD external temperature	-	0/90	°C
i3	Room temperature	-	-25/+25	°C
i2	Input value no. 2	-	0/50	bar
i1	Input value no. 1	-	0/50	bar
inX	Selected input	-	0/50	bar
SP	Current set point	-	0/45	bar
Common Values				
Abbreviation	**Description**	**Default**	**Range**	**U.M.**
Jh	Extra-dB jump zone upper limit	100	0/100	%
JL	Extra-dB jump zone lower limit	100	0/100	%
Cosfi	Fan power factor	59	0/99	%
Db (*)	Scroll filter dead band	50	2/50	%
SN (*)	Number of scroll filter samples	16	6/30	-
Winter Mode				
Abbreviation	**Description**	**Default**	**Range**	**U.M.**
Winter TO	On temperature	3	-5/+5	°C
Winter VO	Winter Mode speed	100	30/100	%
Winter T1	Operating time	0	0/300	sec
Winter T2	Downtime	15	1/120	min

(*) Parameters only available with scroll filter on (SW1-8=ON)

6.1.2. Bank1 parameters (Bk1)

Abbreviation	Description	Default	Range	U.M.
SP1	Set-Point	23.4	0/45	bar
Pb1	Proportional band	5.4	1/45	bar
Hi1	Maximum speed limit	100	0/100	%
Lo1	Minimum speed limit	25	0/100	%
De1	Acceleration time	2	2/60	sec
Sh1	Forced to 100%	32.4	0/45	bar
Ih1	Hysteresis on Sh1	1	0.1/15	bar
S01	Forced to 0%	19.3	0/45	bar
i01	Hysteresis on S01	4.1	0.1/15	bar
HP1	Heat pump speed	100	0/100	%

6.1.3. Bank2 parameters (Bk2)

Abbreviation	Description	Default	Range	U.M.
SP2	Set-Point	20.2	0/45	bar
Pb2	Proportional band	5.4	1/45	bar
Hi2	Maximum speed limit	100	0/100	%
Lo2	Minimum speed limit	25	0/100	%
De2	Acceleration time	2	2/60	sec
Sh2	Forced to 100%	32.4	0/45	bar
Ih2	Hysteresis on Sh2	1	0.1/15	bar
S02	Forced to 0%	16.1	0/45	bar
i02	Hysteresis on S02	4.1	0.1/15	bar
HP2	Heat pump speed	100	0/100	%

6.2. Default parameters edit procedure

Proceed as follows to edit one or more parameters:
1- Simultaneously press the ENT and ESC keys located under the display;
2- Using the "+" or "-" keys, scroll available parameters until the required one is found;
3- When the parameter is found, press ENT. "**Program**" will switch to "**Modify**";
4- Press "+" to increase or "-" decrease the selected parameter value (hold down to change faster);
5- Press ENT to confirm changes;
6- To edit another parameter, restart from point 2 or simultaneously press the ENT and ESC keys to save changes ("**Update**" appears), or press ESC to cancel the operation and return to the main screen.

N.B. If, due to incorrect parameter settings, the regulator has regulation problems, we recommend you restore default parameters (see point 6.3)

6.3. Default parameters restore procedure

Proceed as follows to restore default parameters:
1- Press and hold down the SB1 key;
2- Simultaneously press and hold down the ENT and ESC keys located under the display;
3- Release the SB1 key;
4- Wait until: "**Configuration store Default"**;
5- Simultaneously release the ENT and ESC keys

7. SIGNALS

7.1. Led

Led	Color	Label	Description
	GREEN	PWR	Power on (light on)
	GREEN	RUN	Microprocessor running (blinking light)
	RED	FAIL	Fault alarm (see point 5.3.2)
	GREEN	OUT	Output command (light on)
	GREEN	-	RL1 relay excited (light on) (see point 3.3.2)

8. TECHNICAL SPECIFICATIONS

8.1. Power supply

Voltage: 230 Vac (±10%) mono-phase (Phase/Neutral or Phase/Phase)
Frequency: 50/60 Hz automatic frequency recognition
Surge: For installation category II (4 kV) (> 500 Vac surge filters ON).

8.2. Current:

Rated RMS current @ 50 °C room temperature:
Load: ESD112 12 A < 50 °C > 50 °C -0,6 A/°C
Overload: 200% of rated current (max 10" every 3')

8.3. Power:

Absorbed: 5 V A (command circuits)
Dissipated: 48 W @ 12 A
Functional characteristic: MASTER regulator
Output increases as input increases.

8.4. Input signals and contacts:

Analog: 4-20 mA (Ri= 100 Ω)
NTC 10kΩ @ 25 °C
S1 contact: Bank1 or Bank2 selection (see point 3.2.3)
S2 contact: Start/Stop function (see point 3.2.3)

8.5. Output signals and contacts:

Auxiliary power: 20 Vdc (±20%), ≤ 20 mA not stabilized and protected against short circuit
RL1 relay: COM, NC, NO contacts for alarm
3 A @ 250 Vac – 3 A @ 30 Vdc

8.6. Alarms

Command input: 4-20 mA: 2 mA ≤ Iin ≤ 24 mA
Regulator: Working temperature control with internal probe (T > 85 °C).

8.7. Protections

Surge: As per EN 61000-4-5: surge category II (4 kV)
Command inputs: With PTC sensor for short circuit protection
Internal temperature: Internal thermal protection
Power module: FR10GR69V25 model series fuse

8.8. Case

Materials: GW-PLAST 75 (temperature < 85 °C) and aluminum
Pollution: High pollution
Fire resistance: category D

8.9. Insulation

Case: Class I (use of grounded protection)
Command: 4000 V between command input and mains voltage parts

8.10. Working conditions

Working temperature: From -20 °C to 50 °C; use S2 contact if T ≤ -10 °C:
Storage temperature: From -25 °C to 65 °C
Humidity: from 0% to 85% non-condensing relative humidity
Vibrations: ≤ 1 g (9.8 m/s^2)

8.11. Assembly

Assembly: Wall mount in vertical position only

9. CIRCUIT BREAKER AND SHORT CIRCUIT PROTECTION

To protect the regulator power module from severe short-circuits or overloads, it is imperative to use semiconductor protection fuses with a suitable I2t value fitted upstream of the regulator.

Model	Circuit breaker	Protection fuses - SRC			
		Type	Vac	Amp	P/N
ESD112	**20 A**	10x38	690	25	FR10GR69V25

For additional protection, a circuit breaker with a C-curve can be used, mounted upstream of the regulator.
The installer must install these protections.

Surge arrester:
Electrical protection inserted between the regulator power supply and grounding, that protects the device from transitory power surges.

Warning:
Disconnect the faston contact from the PE ground reference, in the electrical rigidity test.

Warning:
For DIFFERENTIAL protection systems, use components with grounded current dispersion ≥ 60 mA.

ESD has a grounded current dispersion of about 1 mA.

10. MANUFACTURER'S DECLARATION

This instrument was designed and constructed for use in Industrial environments and meets the following community directives:
- Low Voltage Directive (LVD) 2014/35/EU.
- Electromagnetic Compatibility Directive (EMC) 2014/30/EU.

11. CONFORMITY AND TECHNICAL STANDARDS

The essential directive requirements are met by compliance with "generic standards" for the industrial environment.

11.1. CE – Declaration of conformity

Directive	CE standard code	Version
EMC 2014/30/UE	EN IEC 61800-3	2018
	EN IEC 61000-6-2	2019
	EN 61000-6-3	2007 +A1:2011
	EN IEC 55014-1	2021
	EN IEC 55014-1	2021
Safety 2014/35/UE	EN 61800-5-1	2007 +A1:2017 +A11:2021
	EN 60335-1	2012 +A13:2017 +A2:2019
	EN 60730-1	2017
RoHS	EN 50581	2012

11.2. UK – Declaration of conformity

Subject	Name	Version
EMC	BS EN IEC 61800-3	2018
	BS EN IEC 61000-6-2	2019
	BS EN 61000-6-3	2007 +A1:2011
	BS EN IEC 55014-1	2021
	BS EN IEC 55014-1	2021
Safety	BS EN 61800-5-1	2007 +A1:2017 +A11:2021
	BS EN 60335-1	2012 +A13:2017 +A2:2019
	BS EN 60730-1	2017
RoHS	BS EN 50581	2012

The instrument must be disposed of according to local electric and electronic device disposal regulations.