ECD25: Master EC fans controller with Proportional & Digital Scroll SW

1. SAFETY INSTRUCTIONS

1.1. Important

Read these instructions carefully before installation.

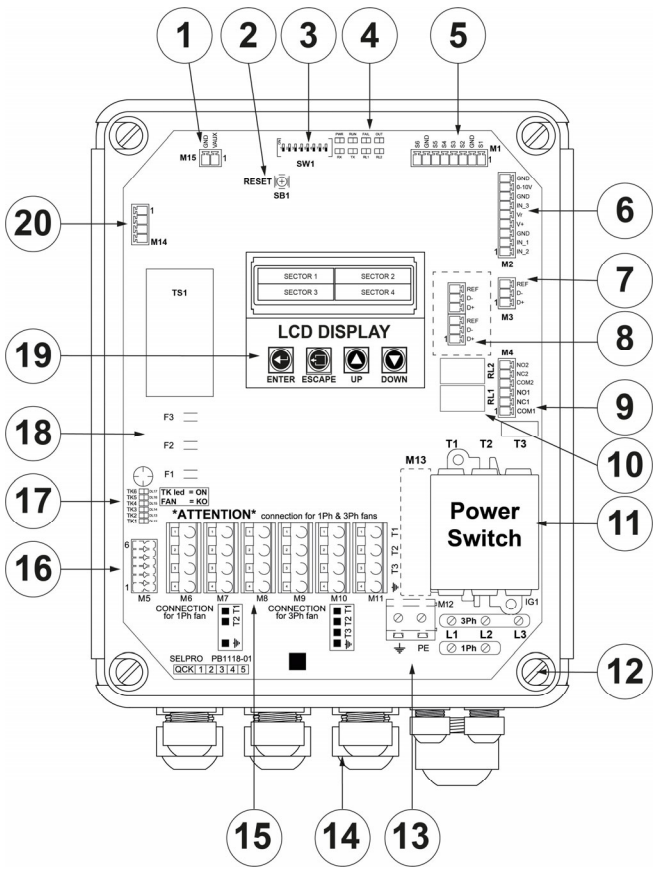
- Before use, follow all the installation and electrical connection instructions.
- Keep these instructions with the regulator for future use.
- Observe current technical and safety regulations.
- The device must be professionally installed and commissioned by a qualified technician. INCORRECT installations may cause damages.
- Before turning on device 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 device 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. ECD 25 REGULATOR: UNIT DESCRIPTION

2.1. Overview

The all in one ECD solution, is an electric multifunction digital compact panel, designed for the total management of EC fans with 1 & 3 phases motors, as standard through the control signal 0(1)-10Vdc, generated by the short-circuit protected output.
The ECD is specialized in the dynamic regulation of EC motors of ventilated heat exchangers, for refrigeration & air conditioning systems with ON-OFF, modulating or Digital Scroll compressors. The regulator is designed for direct connection and power supply up to n. 6 EC fans (1-phase or 3-phase), with the support terminal board for reading the contact of the alarm relays of the individual motors connected.
It use the signals coming from the two analog inputs, with automatic selection of the higher value, programmed for Condenser mode (4-20 mA transducer) with input for reading the ambient temperature (° C), for activation of winter operation. It is available with extended range power supply from 125 VAC to 420 VAC (+/-20%), always with automatic selection of the 50/60Hz frequency.
The system can operate within the minimum and maximum RPM% limits, both in Proportional and Digital Scroll mode, to maintain the system pressure (Set-Point) to the value designed.
The device has 2 working parameter banks (BK1 and BK2), which can be automatically selected with the auxiliary contact S1, and it is also possible to activate the Winter mode via the ° C field NTC probe (feed forward).
By default the set point (SP) is set at the input value where the control output is at the minimum speed value. The integrated software is specialized for the dynamic management of ventilated heat exchangers, in two Master modes:
□ P (Proportional with IES algorithm: Intelligent Energy Saving)
□ DS (Digital Scroll)
There are also two alarm relays (RL1-RL2) with changeover contact.
The setting of the work area of the Set Point takes place via the display.
The FRIENDLY setting of the Set-Point (SP), allows a quick start-up of the system.

2.2. Keys

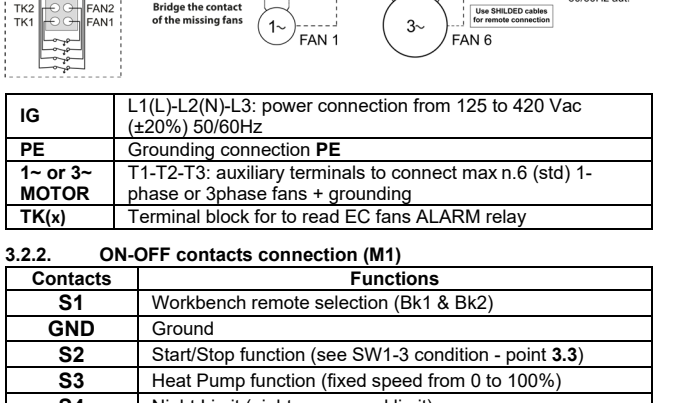


ECD Keys		
1	M15	Auxiliary power supply 15V
2	SB1	Reset button
3	SW1	Programming dip switch (8 poles)
4	LEDs	Functional signaling LEDs
5	M1	Auxiliary functional contacts terminal board
6	M2	Terminal board for transducers and command output
7	M3	NOT Isolated Modbus RS-485 (RTU)
8	PLUG	Isolated Optional plug for direct Modbus management
9	M4	Terminal block RL1 & RL2 relays (NO-NC-COM)
10	RL1 & 2	RL1 Alarm relay & RL2 programmable relay
11	IG	ECD 1 & 3 phase Power supply terminals (L1/L - L2/N - L3)
12	-	TPN lock screws with max 2.5 Nm torque
13	M12	GROUND terminals for 1 & 3 phase ECD Power supply
14	-	Cable glands for the passage of single cables
15	M6-11	1 & 3 phase output terminal board (T1/L T2/N T3 + PE) direct connection for EC fans power supply
16	M15	Direct connection for single EC fan alarm relay
17	TK	Leds for EC alarm relays
18	Fx	ECD Power supply protection fuses (NOT replaceable)
19	-	LCD display Keyboard: ENT, ESC △ and ▽ with back lit alphanumeric (two rows with n.16 characters) display
20	M14	Connection for lamps (panel only)

2.3. Mechanical dimensions

Model	Plate data			Mechanical dimensions (mm)							Weight (*) (kg)
	Ph	A	IP	A	B	C	E1	E2	F1	F2	
ECD 25	3~	25	55	247	296	173	163	266	55	217	2.50
	1~										

(*) Packaging included



Ø Cable clamp Input		
Input	Min	Max
M12 (4 holes)	3.5 mm	7 mm
M16 (3 holes)	5 mm	10 mm
M20 (6 holes)	7 mm	13 mm
M25 (1 hole)	10 mm	17 mm

3. SAFETY INSTRUCTIONS

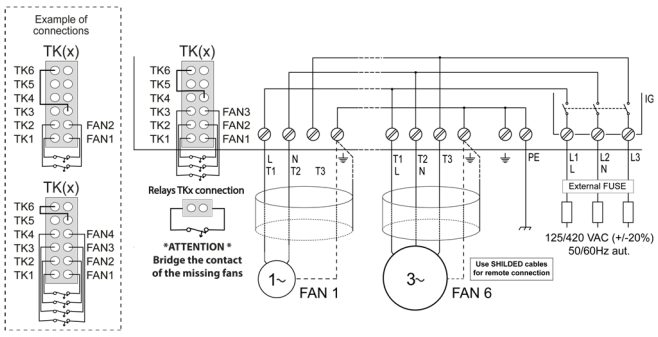
3.1. INSTALLATION

The regulator can be installed: vertically or horizontally.
To permit correct heat dissipation, guarantee 50 mm clearance around the regulator case.
WARNING! Check correct cable dimensions (as per table: Ø cable clamp Input
WARNING! Check the position (0-1) of the IG switch handle and do NOT force switch rotation if NOT correctly positioned.
WARNING! Check cable clamp closure on the input, the gasket position with screws fully tightened and external protective cover to guarantee IP55 for the device.

3.2. Electrical connections

Flexible wire section.
WARNING! Use cables suitably dimensioned for the cable clamp holes on the cable input side (as per table: Ø cable clamp Input)
Signals: rated section 1.0 mm² (17 AWG)
Power output (for each fan): ECD 25 ≤ 2.5 mm² (14 AWG)
Power supply: ECD 25 ≤ 10 mm² (8 AWG)
N.B.: Protection devices: see point 9.

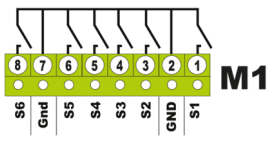
3.2.1. Power connection (IG) and load (T1/T2/T3) & TK (relay)



IG	L1(L)-L2(N)-L3: power connection from 125 to 420 Vac (±20%) 50/60Hz
PE	Grounding connection **PE**
1~ or 3~ MOTOR	T1-T2-T3: auxiliary terminals to connect max n.6 (std) 1-phase or 3phase fans + grounding
TK(x)	Terminal block for to read EC fans ALARM relay

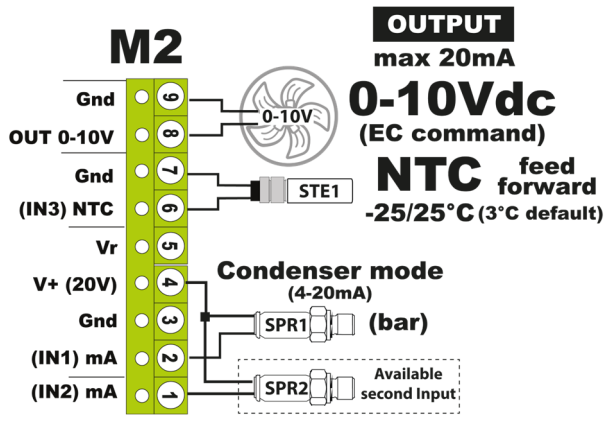
3.2.2. ON-OFF contacts connection (M1)

Contacts	Functions
S1	Workbench remote selection (Bk1 & Bk2)
GND	Ground
S2	Start/Stop function (see SW1-3 condition - point **3.3**)
S3	Heat Pump function (fixed speed from 0 to 100%)
S4	Night Limit (night max speed limit)
S5	Not used
GND	Ground
S6	Not used

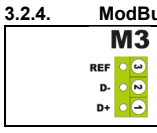


3.2.3. Command signal connections (M2)

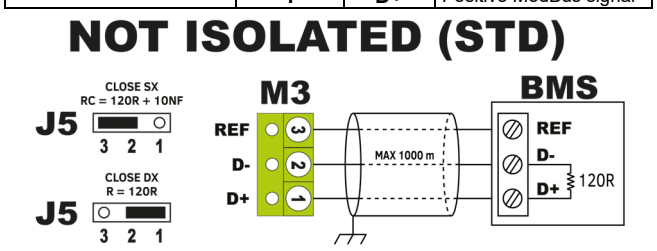
M2	Terminal	Label	Descriptions
	9	GND	Ground output 0-10V
	8	OUT 0-10V	Output 0-10V, (max 20 mA)
	7	GND	Ground
	6	IN3	Input NTC probe
	5	Vr	Power Supply +10 Vdc (±10%) 10 mA
	4	V+	Power Supply +15 Vdc (±20%) 40 mA
	3	GND	Ground
	2	IN1	Input for Transducer/Probe no.1
	1	IN2	Input for Transducer/Probe no.2

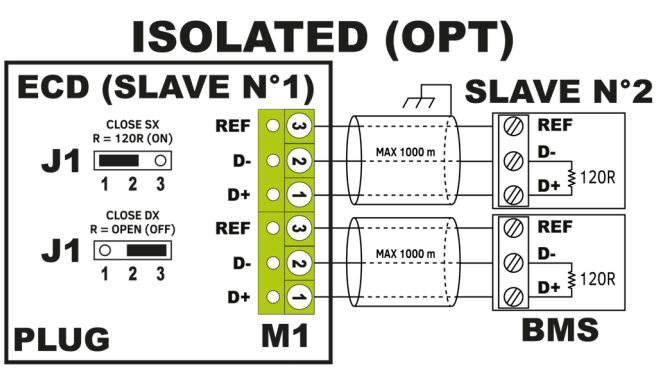


3.2.4. ModBus connection (M3)

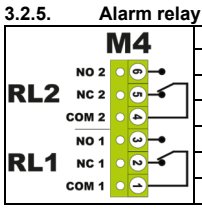


Terminal	Label	Description
3	REF	Reference signal
2	D-	Negative ModBus signal
1	D+	Positive ModBus signal



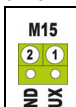


3.2.5. Alarm relay & Programmable relay connection (M4)



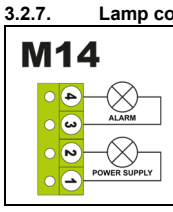
Terminal	Label	Description
6	NO2	Normally open contact
5	NC2	Normally closed contact
4	COM2	Shared terminal
3	NO1	Normally open contact
2	NC1	Normally closed contact
1	COM1	Shared terminal

3.2.6. Connection for auxiliary power supply (M15)



Terminal	Label	Description
2	GND	Ground
1	VAUX	Power Supply +15 Vdc (±20%) 150 mA

3.2.7. Lamp connection (M14)



Terminal	Label	Description
4	- (-)	Connection for alarm signal lamp
3	- (+)	
2	- (+)	Connection for power supply signal lamp
1	- (-)	

3.3 Function settings via dip switch (SW1-1 – SW1-8)

SW1	Description	
1	**OFF**: SP= MAX (100%)	**ON**: SP= MIN (0%)
2	**OFF**: Direct regulation	**ON**: Reverse regulation
3	Reverses **S2** contact operations	
4 and 5	Alarm Relay operations (RL1 point **3.2.4**)	
6 and 7	Programmable for special functions (on request)	
8	Operations with filter for Digital Scroll **ON**	
	OFF: Proportional	**ON**: Filtro attivo

Attention: To make SW1 modifications operative, it is necessary to press the SB1 button.

3.3.1. SW1 default settings



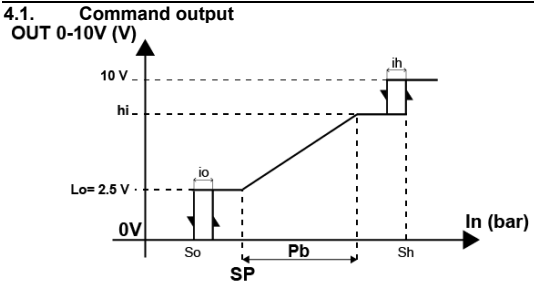
3.3.2. Alarm RL1 functional programming

SW1-4	SW1-5	Description
OFF	OFF	RL1 idle when the regulator is in alarm conditions
ON	OFF	RL1 idle when the regulator is: - In alarm conditions - Stopped
ON	ON	RL1 always excited
OFF	ON	Relay idle when the regulator is: - In alarm conditions - In Stand-by - Stopped

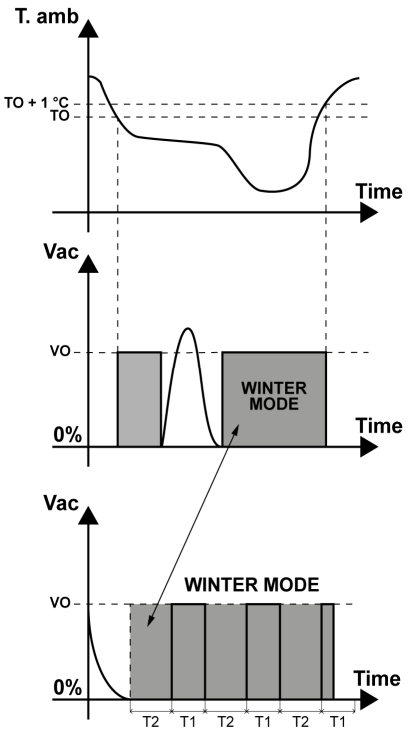
ECD25: Master EC fans controller with Proportional & Digital Scroll SW

4. FUNCTIONAL CHARACTERISTIC

4.1. Command output



4.2. Winter Mode function



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

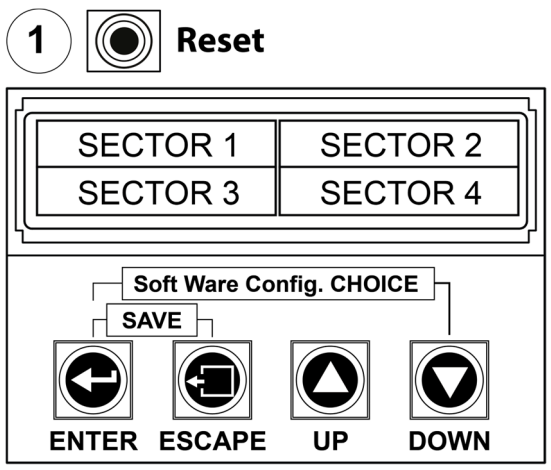
T.amb = External temperature
TO = Winter Mode ON temperature
VO = Winter Mode fan speed
T1 = Winter Mode fan operating time
T2 = Winter Mode fan downtime

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**.

WARNING! If the NTC temperature probe is not installed on IN3, the function is always on.
The function is OFF, with T1 = 0 sec. (std)

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 / Bench 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 40 (darker) and 80 (lighter), by units of 1.

5.3. Sector 1

5.3.1. Configuration

The regulator has a single setting for transducer 4-20 mA with range 0-45 bar.
Workbench Bk1 or 2 can be selected via S1 logic input.
The operating mode is set via dip switch 8 (see 3.3)

Configuration	Bench	Function	Inputs
rPr045 (to restore see at 6.3)	**Bench 1** (*) if S1= OFF **Bench 2** if S1= ON	**FIX** if SW1-8= OFF **DGT**(*) if SW1-8= ON	**In1** = pressure transducer **In2** = pressure transducer ((opt) **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 or disconnected: - Check whether the transducer(s) is correctly connected; - Check whether the transducer(s) operates correctly.
IN Over	The transducer input signal is too high or in short-circuit: - 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' with LED on)

6. ECD REGULATOR SETTINGS

6.1. Default parameter list

The ECD regulator has a basic set of parameters and 2 memory benches.

6.1.1. Basic parameters (shared by both workbenches)

Abbreviation	Description	Default	Range	M.Reg.
ti	ECD external temperature	-	0/90 °C	109
i3	External temperature	-	-25/+25 °C	115
i2	Input value no. 2	-	0/50 bar	114
i1	Input value no. 1	-	0/50 bar	113
inX	Selected input	-	0/50 bar	111
SP	Current set point	-	0/45 bar	112
Common Values				
Jh	Extra-dB jump zone upper limit	100	0/100 %	202
JL	Extra-dB jump zone lower limit	100	0/100 %	203
Db (*)	Scroll filter dead band	50	2/50 bar	204
SN (*)	Number of scroll filter samples	16	6/30	205
Modbus Parameters (only with Modbus Plug – on request)				
MB Add	Device address	247	1/247	106
MB Speed	Communication speed	19200	4800/38400	107
MB Type	Communication settings	8E1	8E1, 8o1, 8N1	108
Winter Mode				
Winter TO	On temperature	3	-5/+5 °C	211
Winter VO	Winter Mode speed	100	30/100 %	212
Winter T1	Operating time	30	0/300 sec	213
Winter T2	Downtime	15	1/120 min	214

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

6.1.2. Bench1 parameters (Bk1)

Code	Description	Default	Range	M.Reg.
SP1	Set-Point	23.4	0/45 bar	215
Pb1	Proportional band	5.4	1/45 bar	216
Hi1	Maximum speed limit	100	0/100 %	217
Lo1	Minimum speed limit	25	0/100 %	218
De1	Acceleration time	2	2/60 sec	219
Sh1	Forced to 100%	32.4	0/45 bar	220
ih1	Hysteresis on Sh1	1	0.1/15 bar	221
So1	Forced to 0%	19.3	0/45 bar	222
I01	Hysteresis on S01	4.1	0.1/15 bar	223
HP1	Heat pump speed	100	0/100 %	224
LH1	Night limit output	100	0/100 %	225

6.1.3. Bench2 parameters (Bk2)

Code	Description	Default	Range	M.Reg.
SP2	Set-Point	20.2	0/45 bar	226
Pb2	Proportional band	5.4	1/45 bar	227
Hi2	Maximum speed limit	100	0/100 %	228
Lo2	Minimum speed limit	25	0/100 %	229
De2	Acceleration time	2	2/60 sec	230
Sh2	Forced to 100%	32.4	0/45 bar	231
ih2	Hysteresis on Sh2	1	0.1/15 bar	232
So2	Forced to 0%	16.1	0/45 bar	233
I02	Hysteresis on S02	4.1	0.1/15 bar	234
HP2	Heat pump speed	100	0/100 %	235
LH2	Night limit output	100	0/100 %	236

6.2. Default parameter 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 to restore default parameters (see point 6.3)

6.3. Default parameter 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"** on the display
5- Simultaneously release the ENT and ESC keys
6- Wait the controller reset

7. SIGNALS

7.1. 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	RX	Modbus write command (light on)
GREEN	TX	Modbus read command (light on)
GREEN	RL1	RL1 relay excited (light on)
GREEN	RL2	RL2 relay excited (light on)
RED	TK6	Thermal contact 6th fan OK (light off)
RED	TK5	Thermal contact 5th fan OK (light off)
RED	TK4	Thermal contact 4th fan OK (light off)
RED	TK3	Thermal contact 3rd fan OK (light off)
RED	TK2	Thermal contact 2nd fan OK (light off)
RED	TK1	Thermal contact 1st fan OK (light off)

8. TECHNICAL SPECIFICATIONS

8.1. Power supply

Voltage: 125/420 (±20%) Vac 1~(L-N) or 3~(L1-L2-L3) (Phase/Neutral or Phase/Phase/Phase)
Frequency: 50/60 Hz automatically recognized
Surge: for installation category II (4 kV) (> 550 Vac surge filters ON).

8.2. Rated Current (RMS) @ 50 °C (room temperature)

Load current: ECD 25: 25 A ≤ 50 °C
Fan Power Supply: ≤ 8 A for each fan
Command: 5 V A
Functional characteristic: MASTER regulator (Direct function) Output increases as input increases.

8.3. Input signals and contacts

Analog: 4-20 mA (Ri= 100 Ω) for Condenser mode NTC 10kΩ @ 25 °C (feed forward)
S1 contact: Bench1 or Bench2 selection (see point **3.2.3**)
S2 contact: Start/Stop function (see point **3.2.3**)
S3 contact: Heat Pump function (see point **3.2.2**)
S4 contact: Night limit function (see point **3.2.2**)
S5 & S6 contact: Not used

8.4. Output signals and contacts

Auxiliary power: 15 Vdc (±20%), ≤ 20 mA not stabilized and protected against short circuit
M14: 15 Vdc (±20%), ≤ 150 mA not stabilized and protected against short circuit
M15: Alarm and Power Supply lamps connections
RL1 relay: NO, NC, COM contacts for alarm 10 A @ 250 Vac – 5 A @ 30 Vdc
RL2 relay NO, NC, COM contacts for alarm 10 A @ 250 Vac – 5 A @ 30 Vdc

8.5. Alarms

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

8.6. Protections

Surge: As per EN 61000-4-5: surge category II (4 kV)
Command inputs: With PTC sensor for protection against short circuit
Internal temperature: Internal heat protection

8.7. Case

Materials: Gewiss GW-UL94 (V0)
Pollution: in the presence of heavy pollution, using the cable gland kits
Fire resistance: category D
Protection grade: IP55

8.8. Insulation

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

8.9. Working conditions

Working temperature: from -25 °C to 50 °C (-25T50);
N.B.: for T ≤ -10 °C:
1) use the Start/Stop contact (S2) to stop regulation and put the system in Stand-by
2) at first start, leave in Stand-by for 5 minutes
Storage temperature: from -30 °C to 85 °C
Humidity: from 0% to 85% non-condensing relative humidity
Vibrations: ≤ 1 g (9.8 m/s^2) - CEI EN 61800-5-1

8.10. Assembly

Assembly: Vertical or horizontal

9. CIRCUIT BREAKER AND SHORT CIRCUIT PROTECTION

The fuses must be installed on the power supply of the ECD regulator, to protect the device, the cables and the connected fans.
We also recommend a thermal magnetic protection with AC ignition curve, installed upstream of the ECD regulator.

Model	Circuit breaker
ECD 25	**25 A**

The use of both protections safeguards regulation device electrical integrity.

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 ≥ 100 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) 201/35/EC.
- Electromagnetic Compatibility Directive (EMC) 2014/30/EC.

11. DIRECTIVES 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 EN IEC 61000-6-2 EN 61000-6-3 EN IEC 55014-1 EN IEC 55014-2	2018 2019 2007 +A1:2011 2021 2021
Safety 2014/35/UE	EN 61800-5-1 EN 60335-1 EN 60730-1	2007 +A1:2017 +A11:2021 2012 +A13:2017 +A2:2019 2017
RoHS	EN 50581	2012

11.2. UK – Declaration of conformity

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

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