3. Product description

3.1 Description

3.1.1 RDM controllers

Multifunction and multi-input RDM controllers regulate the speed of voltage adjustable high-speed, three-phase, asynchronous motors applied to axial or centrifugal fans. Connected to transducers or to sensors, they can receive signals (pressures, temperatures, etc.) that, together with the set parameters, control motor speeds.

3.1.2 Applications

RDM controllers are suitable for HVAC/R environment applications with voltage adjustable high-speed asynchronous motors, for example, ventilated heat exchangers used in air conditioning and refrigeration systems.

3.1.3 How they work

RDM controllers are three-phase voltage transformers that use the principle of phase partialization or phase cut-off. Partialization is totally controlled on the three phases, regulating the effective voltage applied to the load. During installation, the motor cosϕ can be taken into account and manually compensated. Up to two speed zones can be excluded where greater acoustic disturbances is encountered. Neutral conductor connection is not required. The controller can operate in both Master and Slave mode.

3.1.4 Inputs

The controller has the following inputs:

- two analog inputs that can be configured to read the voltage/current signals or NTC resistance (can be amplified with expansion modules)
- one optoisolated non-polarized input for the PWM signal
- two On/Off for activation of auxiliary functions

3.1.5 Outputs

The controller has the following outputs:

- control outputs:
  - one power for three-phase motors (models 308, 312, and 320)
  - two power for three-phase motors (models 328)
  - one in analogue voltage 0–10 Vdc for power slave units:
    - ff the controller is in slave mode, the 0–10 V voltage follows the controller input (see "Operating mode" on page 29)
    - if the controller is in master mode, the 0–10 V voltage follows the controller output (see "Operating mode" on page 29)
- one relay, for alarm, fault and operating status messages

3.1.6 Controls

The control can be:

- **Slave proportional**: changes the three-phase output proportionally to the prevalent input value.
- **Master proportional**: changes the three-phase output to maintain the value of the prevalent input within the proportional band.

- **Master PID**: changes the three-phase output to keep the prevalent input value near the setpoint.

Voltage regulation at the signal output can be:

- for 0-10 V dc Slave units, proportional variable to the value of the power output
- for 0–10/10–0 V dc outdoor units or 1–10 V dc spray units with independent setpoint and proportional band

3.1.7 Functions that can be activated with On/Off inputs

The following controls are possible via the On/Off inputs:

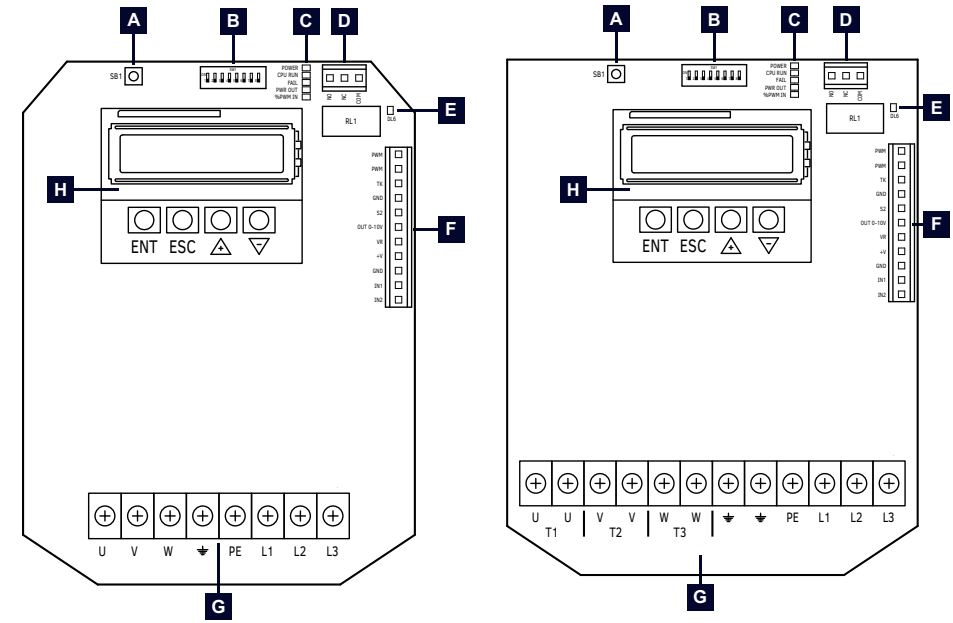
- enabling night limit
- remote enabling of start/stop
- read motor overheat protection status
- defrost and snow-free operation

3.1.8 Default configurations

To facilitate installation, the RDM controller has 13 configurations that can be customized by editing a single parameter. There are configurations for Master or PID proportional control (temperature, pressure, current or voltage) and configurations for Slave proportional control (current, voltage, or based on PWM signal).

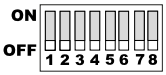
3.2 Presentation

3.2.1 Main components



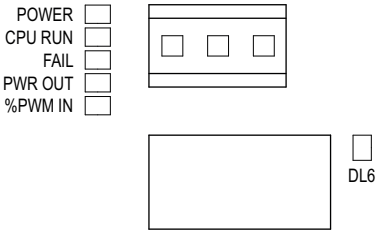
Part	Description	Reference in the manual
A	Reset button.	-
B	DIP switch SW1 to turn functions on/off.	"DIP switch SW1" on page 13
C	Device status LED.	"Status LED" on page 14
D	Terminal board M4 with relay output.	"Relay output" on page 18
E	LED **DL6** relay status.	"Relay status LED" on page 14
F	Terminal board M3 with analog inputs and analog control output.	"Analog inputs and outputs" on page 17
G	Terminal board M1 three phase voltage input and output.	"Three-phase power supply and power output for motor(s)" on page 16
H	Programming display with keypad.	"Programming display keyboard" on page 15

3.2.2 DIP switch SW1



Switch	Function
1	Sets the setpoint position: ■ On: setpoint at the minimum control voltage value ■ Off: setpoint at the maximum control voltage value
2	Sets the control mode: ■ On: inversely proportional to the command signal ■ Off: directly proportional to the command signal
3	Sets the **TK** contact operation (terminal board M3): ■ On: NO contact. Night speed limit **Lh** active when contact closes. ■ Off: NC contact. Serial connection of the motor overload protections (**TK**).
4	Sets the **START/STOP** contact operation (terminal board M3): ■ On: ○ Closed contact: start ○ Open contact and parameter **HP** equal to 0: stop ○ Open contract and parameter **HP** greater than 0: defrost operation active, the motors operate at a constant speed. See "Defrost and snow-free operation" on page 37 ■ Off: ○ Open contact: start ○ Closed contact and parameter **HP** equal to 0: stop ○ Closed contract and parameter **HP** greater than 0: defrost operation active, the motors operate at a constant speed. See "Defrost and snow-free operation" on page 37
5	Set the behavior of the relay in the various operative states and in the event of a fault. See "Behavior of relay and LED DL6 to indicate the operative and fault states" on page 14.
6	
7	Enables/disables editing parameter **cosϕ**: ■ On: enables manual editing of the parameter. See "Modify the cosϕ of the motor" on page 50 ■ Off: disables manual editing of the parameter
8	Saves the parameters set with the programming display.

3.2.3 LED overview



3.2.4 Status LED

Name	Description
PWR	Power on
CPU RUN	■ Blinking fast: micro controller running ■ Blinking slowly (on its own): manual setting of the motor cosϕ active ■ Blinking slowly (with the **PWR OUT** LED blinking): standby
FAIL	***Note**: if multiple alarms are present, the one with highest priority is indicated.* ■ 1 flash: temperature of the board greater than 85 °C ■ 2 flashes: power phase missing ■ 3 flashes: motor overload protection open ■ 4 flashes: input value out of range see "Minimum and maximum limits for inputs IN1 and IN2" on page 53. The alarm details can be consulted on the display, too. See "Alarm messages" on page 52.
PWR OUT	■ On: output voltage distribution ■ Blinking: standby, no voltage distribution but controller ready ■ Off: no output voltage distribution
%PWM IN	The varying intensity indicates the percentage of the PWM command signal

3.2.5 Relay status LED

Name	Description
DL6	Alarm relay status/external unit control. ■ on: relay energized (closed between **COM**-**NO**) ■ off: relay at rest (closed between **COM**-**NC**)

3.2.6 Behavior of relay and LED DL6 to indicate the operative and fault states

The behavior of the relay depends on the settings of switches 5 and 6 of the DIP switch.

***Note**: the relay is energized with contact COM-NA closed; the relay is at rest with contact COM-NC closed.*

Operative status	Status on display	ON OFF 1 2 3 4 5 6 7 8	ON OFF 1 2 3 4 5 6 7 8	ON OFF 1 2 3 4 5 6 7 8	ON OFF 1 2 3 4 5 6 7 8
Stop	**Stop**	Relay energized	Relay de-energized	Relay de-energized	Relay energized
Standby	**STANDBY**	Relay energized	Relay energized	Relay de-energized	Relay energized

Operative status	Status on display	ON OFF 1 2 3 4 5 6 7 8	ON OFF 1 2 3 4 5 6 7 8	ON OFF 1 2 3 4 5 6 7 8	ON OFF 1 2 3 4 5 6 7 8
Alarm	**ALARM**	Relay de-energized 	Relay de-energized 	Relay de-energized 	Relay energized 
Normal operation	**PWR %**	Relay energized 	Relay energized 	Relay energized 	Relay energized 
Defrost operation active	**HP %**	Relay energized 	Relay energized 	Relay energized 	Relay energized 
Manual setting of cosϕ	**SET CosPhi**	Relay energized 	Relay energized 	Relay energized 	Relay energized 
No power supply	**ALARM**	Relay de-energized 	Relay de-energized 	Relay de-energized 	Relay de-energized 
Insufficient power supply	**ALARM**	Relay de-energized 	Relay de-energized 	Relay de-energized 	Relay energized 
Device faulty	**ALARM**	Relay de-energized 	Relay de-energized 	Relay de-energized 	Relay energized 
No power supply phase	**ALARM**	Relay de-energized 	Relay de-energized 	Relay de-energized 	Relay energized 

3.2.7 Programming display keyboard

Key	Function
ENT	Confirms the selection. With the **ENT** key, enters the menu or saves the new settings.
ESC	Cancels the selection. With the **ESC** key, exits the menu or cancels the changes made to the settings.
	Increases the value read or scrolls the parameter list up.
	Decreases the value read or scrolls the parameter list down.