7. Operating mode

7.1 Slave proportional mode

7.1.1 Applications

Control from external controller or manually controlled potentiometer.

7.1.2 Operation

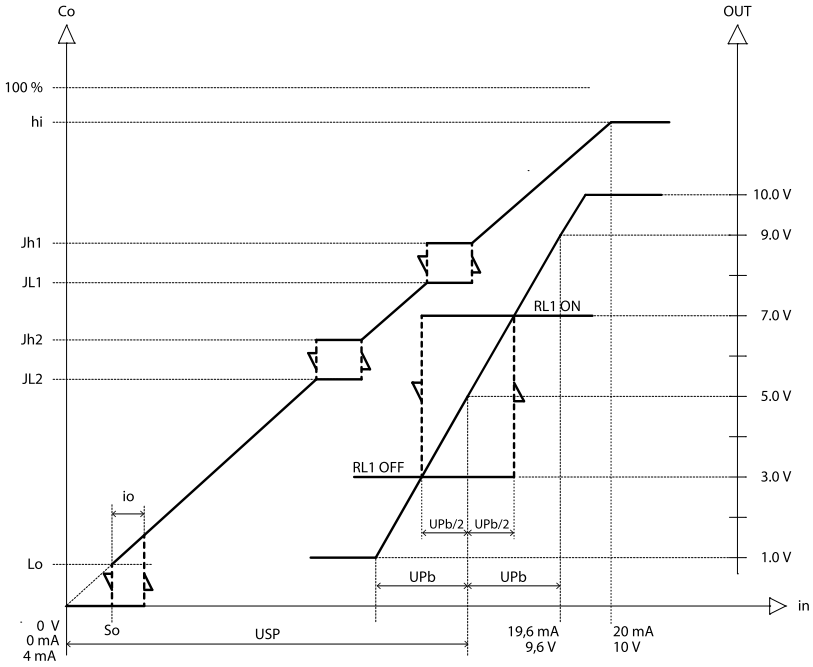
OUT output voltage varies in proportion to the prevalent input. It increases or decreases in direct proportion to the **Co** parameter (regulation control value). The minimum speed limits, **Lo/L.o.** are active. and maximum, **hi/h.i.**, with forcing at 0% and relative hysteresis (**So/S.o.** + **io/i.o.**). Regulation jumps (**Jh1** + **JL1** and **Jh2** + **JL2**) are enabled, used to avoid particularly noisy zones.

7.1.3 Slave regulation on relay control for spray

*menu **conF** > parameter **C6**=3, parameter **C7**= 0 (default)*

The controller enables a second work zone with independent setpoint **USP** and **UPb** proportional band. The work zone uses the same IN input signal and overlaps the fan work zone.

The RL1 relay is configured for the On/Off control of a water spray unit (**C6**=3): it is On when input **IN** is greater than **USP** + **UPb**/2, it is Off when input IN is lower than **USP** - **UPb**/2.



Operating example

Following is an example of spray unit control via relay.

Configuration	Setpoint	Proportional band	Effect on relay
rS-020	**USP** = 15 mA	**UPb** = 4.2 mA	Relay On with **IN1** or **IN2** = 15+4.2/2 = 17.1 mA Relay Off with **IN1** or **IN2** = 15-4.2/2 = 12.9 mA
rS-420	**USP** = 15 mA	**UPb** = 4.2 mA	Relay On with **IN1** or **IN2** = 15+4.2/2 = 17.1 mA Relay Off with **IN1** or **IN2** = 15-4.2/2 = 12.9 mA
rS-010	**USP** = 7.5 V	**UPb** = 2.1 V	Relay On with **IN1** or **IN2** = 7.5+2.1/2 = 8.55 mA Relay Off with **IN1** or **IN2** = 7.5-2.1/2 = 6.45 V

7.2 Master proportional mode

7.2.1 Applications

Signals from temperature sensors or transducers.

7.2.2 Operation

The **OUT** output voltage varies to keep the magnitude measured by the prevalent input transducer within the proportional band (higher or lower in value). The voltage increases or decreases in direct proportion to the **Co** parameter (regulation control value).

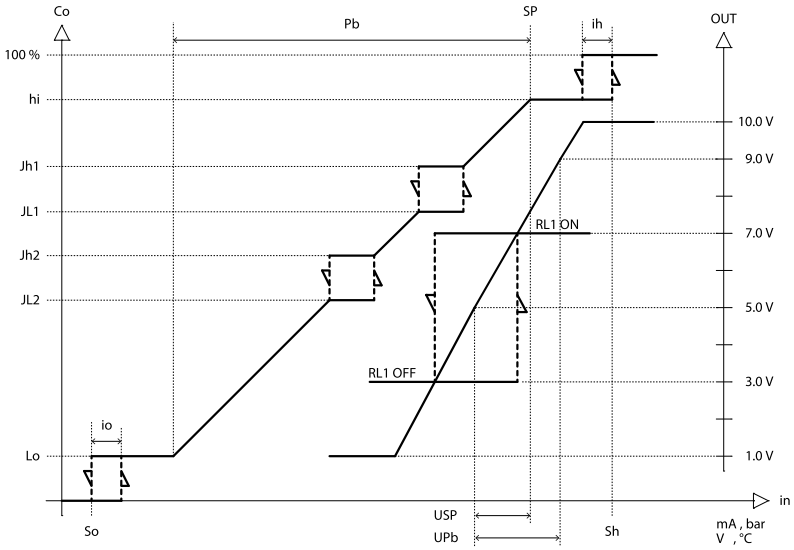
The controller manages fans with its setpoint (**S1** or **S2**) and reference proportional band (**Pb1** or **Pb2**). The minimum (**Lo/L.o.**) and maximum (**hi/h.i.**) speed limits are enabled, with forcing and relevant hysteresis at 0% (**So/S.o.** + **io/i.o.**) and 100% (**Sh/S.h.** + **ih/i.h.**). Regulation jumps (**Jh1** + **JL1** and **Jh2** + **JL2**) are enabled, used to avoid particularly noisy zones.

7.2.3 Master regulation on relay control for spray

*menu **conF** > parameter **C6**=3, **C7**= 0 (default)*

The controller enables a second work zone with independent setpoint **S1-USP** or **S2-USP** and **UPb** proportional band. The work zone uses the same **IN** input signal and overlaps the fan work zone.

Relay RL1 is set to On/Off control a water spray unit (**C6**=3): it is On when input **IN** is higher than **S1**+**USP**+**UPb**/2 (or **S2**+**USP**+**UPb**/2), it is Off when input **IN** is lower than **S1**+**USP**-**UPb**/2 (or **S2**+**USP**-**UPb**/2)



Operating example

Following is an example of spray unit control via relay.

Selected setpoint	Setpoint	Proportional band	Effect on relay
S1 = 45.0 °C	**USP** = - 1,0 °C	**UPb** = 4,0 °C	Relay On with **IN1** or **IN2** = 46.0 °C Relay Off with **IN1** or **IN2** = 42.0 °C
S2 = 50.0 °C	**U.S.P.** = 3,0 °C	**U.P.b.** = 3,0 °C	Relay On with **IN1** or **IN2** = 54.5 °C Relay Off with **IN1** or **IN2** = 51.5 °C

7.3 Master PID mode

7.3.1 Applications

Signals from temperature sensors or transducers.

7.3.2 Operation

The **OUT** output voltage varies to keep the prevalent input at the setpoint value. The voltage increases or decreases in direct proportion to the **Co** parameter (regulation control value).

***Note**: for correct PID regulation operations, accurately set the specific parameters*

At full potential, meaning once the settlement transitions are depleted and far from the minimum and maximum limits (**Lo/L.o.**) and maximum limits (**hi/h.i.**), the PID controller maintains the set setpoint value of the magnitude measured by the prevalent transducer (**IN1** or **IN2**) at the setpoint

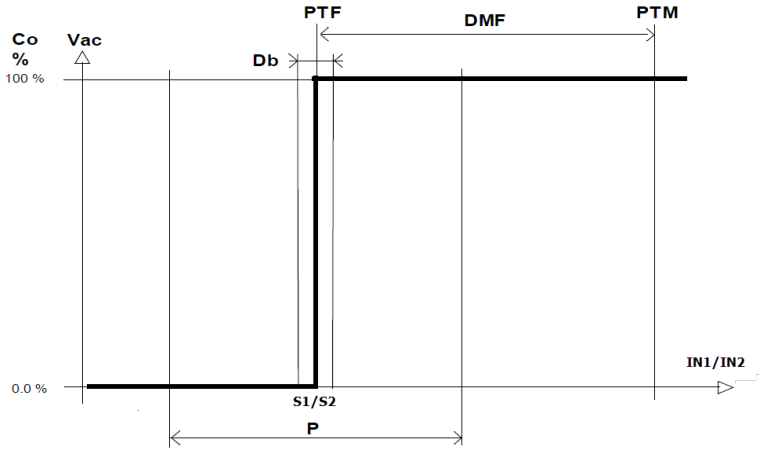
(**S1** or **S2**). The motor control (**Co**) can have a free value that ranges from 0% to 100%, according to that required to keep the set work point.

During transitions, if the prevalent input value (**IN1** or **IN2**) moves around the setpoint (**S1** or **S2**), but remains within the proportional band (**P**), motor control (**Co**) varies from 0% to 100% to return the input value (**IN1** or **IN2**) to the set setpoint (**S1** or **S2**).

If, instead, the prevalent input value (**IN1** or **IN2**) exits the proportional band (**P**), motor control gradually moves to 0%, or 100%, according to what is needed.

A dead band zone (**Db**) can be enabled around the setpoint by setting DIP switch 2 On. This balances the small regulation system variations.

The minimum (**Lo/L.o.**) and maximum (**hi/h.i.**) speed limits are enabled, with forcing and relevant hysteresis at 0% (**So/S.o.** + **io/i.o.**) and 100% (**Sh/S.h.** + **ih/i.h.**). Regulation jumps (**Jh1** + **JL1** and **Jh2** + **JL2**) are enabled, used to avoid particularly noisy zones.



Key

Variable	Description
PTF	Minimum working temperature or pressure restricted by system conditions. Set the setpoint to the same value as PTF to obtain greater compressor energy savings
PTM	Maximum working temperature or pressure restricted by system conditions.
DMF	Temperature or pressure difference (PTM-PTF). Movement of the input from PTF to PTM occurs due to an increase in ambient temperature.
Db	*with DIP switch SW1 switch 2 = On* Dead band around the setpoint **(S1 or S2)**, equals +/- 2.5% of the proportional band (**P**). Freezes the fan control value if the prevalent input value **IN1** o **IN2** is within it.

7.3.3 Master PID regulation on relay control for spray

*menu **conF** > parameter **C6**=**3**, **C7**= **0** (default)*

The controller enables a second work zone with independent setpoint **S1-USP** or **S2-USP** and **UPb** proportional band. The work zone uses the same **IN** input signal and overlaps the fan work zone.

Relay RL1 is set to On/Off control a water spray unit (**C6**=3): it is On when input **IN** is higher than **S1**+**USP**+**UPb**/2 (or **S2**+**USP**+**UPb**), it is Off when input **IN** is lower than **S1**+**USP**-**UPb**/2 (or **S2**+**USP**-**UPb)**. See diagram "Master regulation on relay control for spray" on page 31.

7.4 Defrost and snow-free operation

***Note**: function available only in Master mode.*

7.4.1 Applications

To defrost the unit for heat pump applications or remove snow if the fans are installed outdoors.

7.4.2 Operation

It controls the motors with a constant voltage that heats the motor and keeps the fan blades rotating at low speed to avoid snow buildup. The speed is set using the **icE** parameter.

With **icE** greater than 0, motor heating can be activated via the On/Off input **S1**, for example, by means of an antifreeze thermostat connected to the input **S1** terminals 1 and 2.

Function will automatically activate in the case of a closed contact, provided there is no regulation at device output.

***Note**: if **icE**= 0 (default) input **S1** is used to select the Direct/Reverse mode. The reverse mode (output voltage decreases as the input increases) is used to run the controller in heat pump mode.*