5. FUNCTIONS

5.1 Standard operating modes

The controller can operate in eight standard regulation modes (for the case where B000=0, see paragraph 5.4), selectable via parameter B000:

Code	Description	Default
B000	Operating mode: *0=Special operation (custom)* *1=Direct* *2=Reverse* *3=Neutral zone* *4=Reserved* *5=Reserved* *6=Direct/reverse changeover from DI1* *7=Direct: set point and differential from DI1* *8=Reverse: set point and differential from DI1* *9=Direct/reverse with two separate set points* *10=3 position valve*	Direct

The basic modes are "Direct" and "Reverse":
- In "Direct" mode, the output is activated if the value measured exceeds the set point plus a differential.
- In "Reverse" mode, the output is activated if the temperature is lower than the set point minus a differential.

The other modes are a combination of the two, with the possibility of using two set points (St1 and St2) and two corresponding differentials (B001 and B002), according either "Direct" and "Reverse" operation or the status of digital input 1.
The other options are "Neutral zone" and "3-position valve" operation.

Selecting the correct operating mode is the first action to be completed if the factory configuration, i.e. "Direct" operation, is not suitable for the specific application.

Each mode can use one of the following types of regulation:
- On-Off with hysteresis
- Proportional
- PID (proportional + integral + derivative)

The main parameters are as follows:

Code	Description	Default
St1	Set point 1	20.0
B001	Set point 1 differential	2.0
St2	Set point 2	40.0
B002	Set point 2 differential	2.0
B003	Neutral zone differential	2.0

The following parameters are available specifically for PID regulation:

Code	Description	Default
B004	Control type: *0=Proportional* *1=PID*	0
Bb01	Control Ti 1	180 sec
Bb02	Control Td 1	0 sec
Bb03	Control Ti 2	180 sec
Bb04	Control Td 2	0 sec

The PID regulation features also a special anti-bump filter that serves to smooth the output following changes to the regulation set point and/or differential.
The anti-bump filter can be enabled or disabled via parameter B005.

Notice: initialisation via parameter rStr is recommended before changing operating mode via parameter B000.

5.1.1 Mode 1: Direct (B000=1)

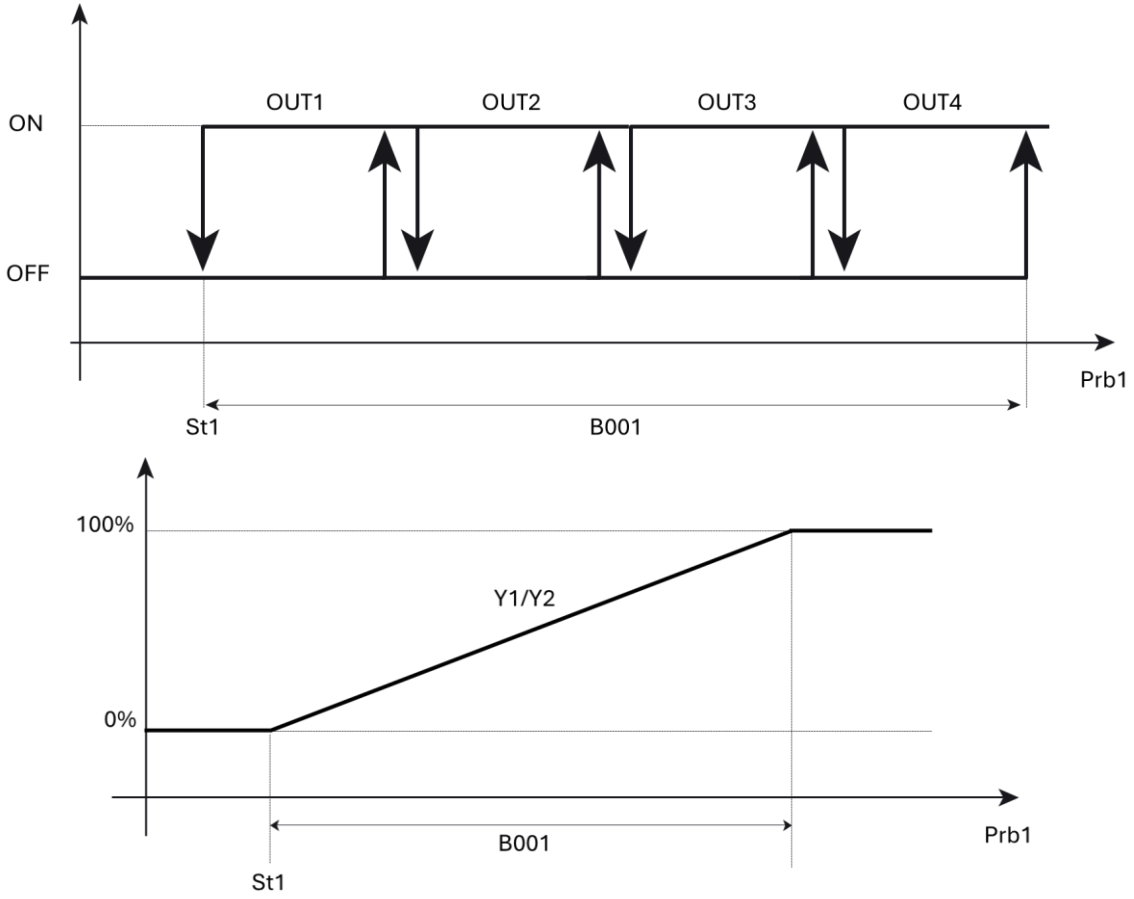
In "Direct" operation, the controller works to contain the measured value when it exceeds the set point (St1). The four digital outputs are activated in sequence, while the two analogue outputs follow the request from the PID or proportional logic.

Digital output activation is evenly distributed across the set differential (B001).

When the measured value is greater than or equal to St1+B001 (in proportional-only operation), all the digital outputs are activated, and the analogue outputs will supply the maximum possible voltage (based on the configured limits). Similarly, if the measured value starts to fall, the outputs are deactivated in sequence and the analogue output voltage will decrease.

On reaching St1, all the outputs are deactivated and the analogue outputs will supply the minimum possible voltage (based on the configured limits).

The controller can be switched to Reverse mode via summer/winter changeover from digital input and/or parameter SEa1.



Key	Description
St1	Set point 1
B001	Set point 1 differential
OUT 1/2/3/4	Digital outputs 1/2/3/4
Y1/Y2	Analogue outputs 1/2
Prb1	Probe 1

5.1.2 Mode 2: Reverse (B000=2)

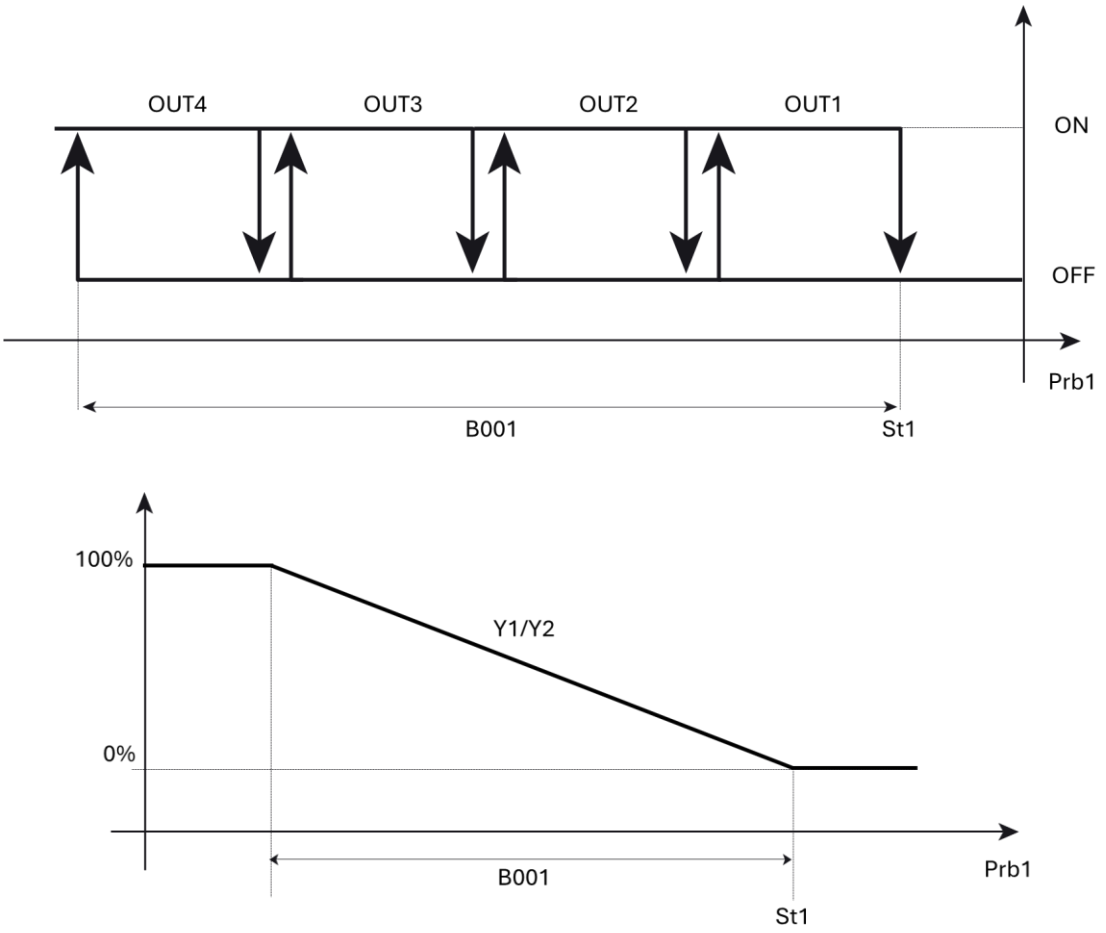
"Reverse" operation is similar to the "Direct" operation, however the outputs are activated when the regulationled value falls below the set point (St1). The four digital outputs are activated in sequence, while the two analogue outputs follow the request from the PID or proportional logic.

Digital output activation is evenly distributed across the set differential (B001).

When the measured value is less than or equal to St1-B001 (in proportional-only operation), all the digital outputs are activated, and the analogue outputs will supply the maximum possible voltage (based on the configured limits). Similarly, if the measured value starts to rise, the outputs are deactivated in sequence and the analogue output voltage will decrease.

On reaching St1, all the outputs are deactivated and the analogue outputs will supply the minimum possible voltage (based on the configured limits).

The controller can be switched to Direct mode via summer/winter changeover from digital input and/or parameter SEa1.



Key	Description
St1	Set point 1
B001	Set point 1 differential
OUT 1/2/3/4	Digital outputs 1/2/3/4
Y1/Y2	Analogue outputs 1/2
Prb1	Probe 1

5.1.3 Mode 3: Neutral zone (B000=3)

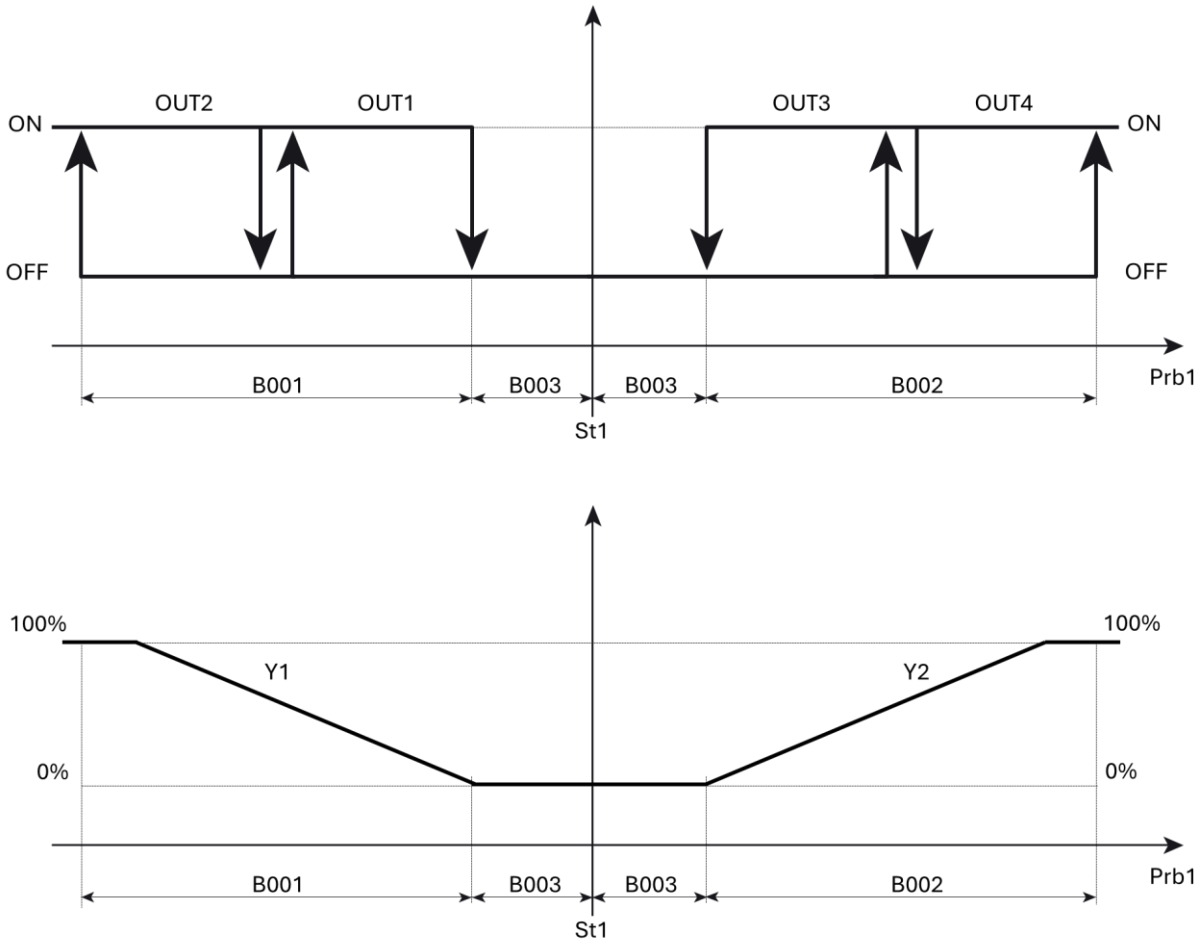
The purpose of "Neutral zone" operation is to bring the measured value within a certain range around the set point (St1), called the neutral zone. This range can be set using parameter B003.

Inside the neutral zone, the controller does not activate any of the outputs, while outside of the zone it works in "Direct" mode when the value is increasing and in "Reverse" mode when it is decreasing.

Digital outputs OUT 1 and 2 and analogue output Y1 will work in "Reverse" mode, while digital outputs OUT 3 and 4 and analogue output Y2 will work in "Direct" mode.

These are activated and deactivated individually or will supply a higher or lower voltage as previously described for modes 1 and 2, depending on the measured value and the settings of St1, B001 for "Reverse" regulation and B002 for "Direct" regulation.

Season changeover is not available in this mode.



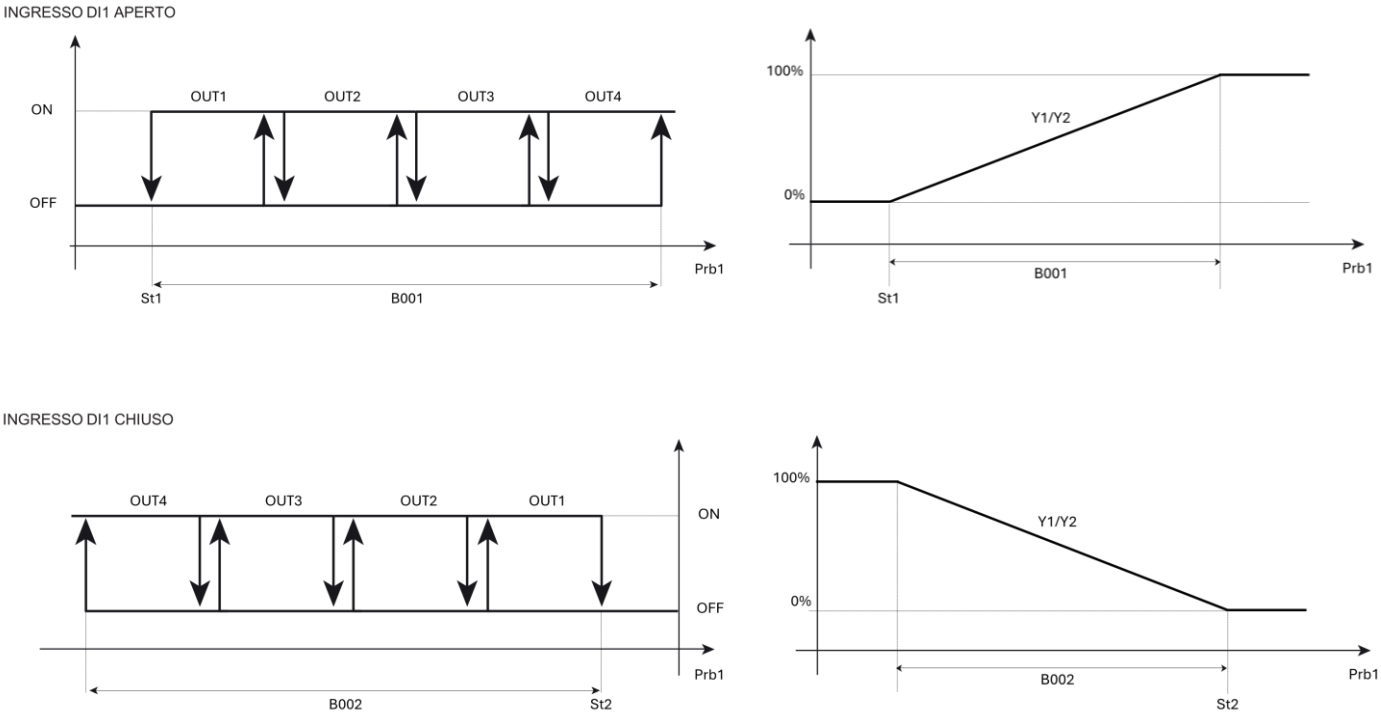
Key	Description
St1	Set point 1
B001 / B002	"Reverse" / "direct" differential
B003	Neutral zone differential
OUT 1/2/3/4	Digital outputs 1/2/3/4
Y1/Y2	Analogue outputs 1/2
Prb1	Probe 1

5.1.4 Mode 6: Direct/reverse changeover from DI1 (B000=6)

The controller works in "Direct" mode with reference to St1 when digital input 1 is open, and in "Reverse" mode with reference to St2 when it is closed.

Analogue outputs Y1 and Y2 will follow the value of probe 1 with respect to St1 or St2 (with proportional-only or PID regulation), depending on the status of digital input 1.

The controller can switch from Reverse to Direct and from Direct to Reverse via summer/winter changeover from digital input and/or parameter SEa1.



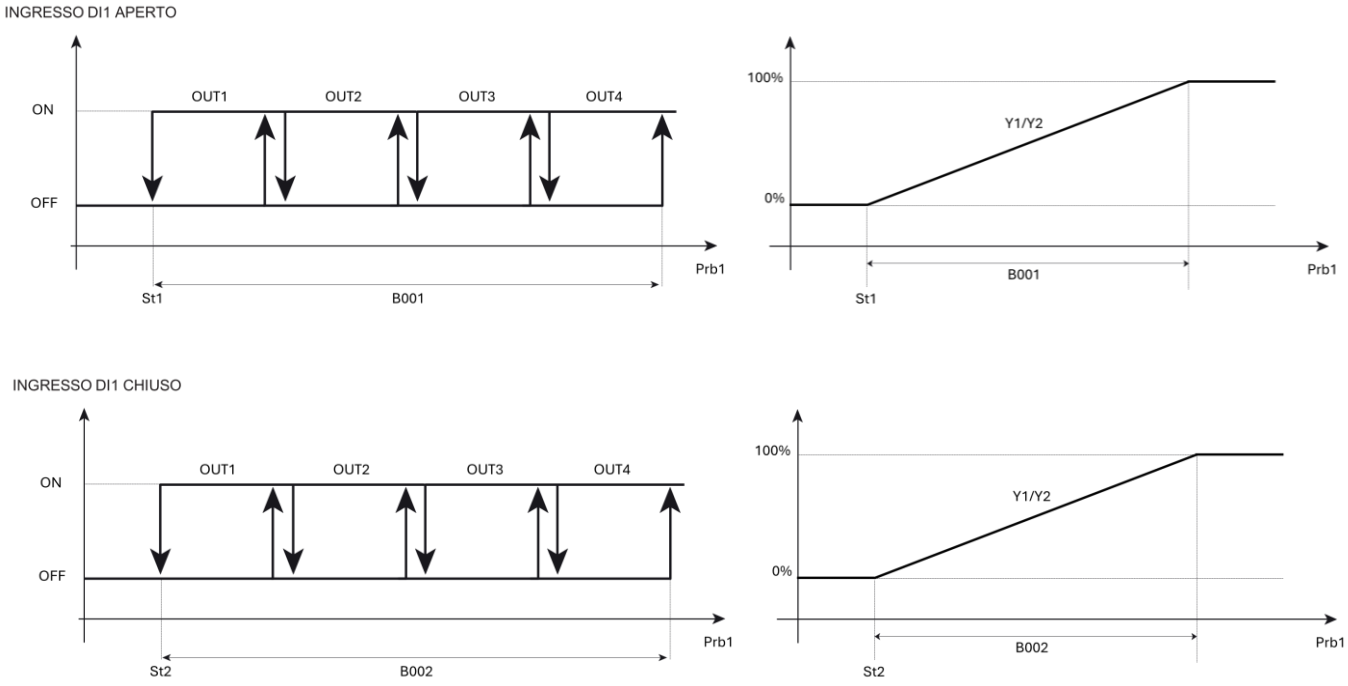
Key	Description
St1/St2	Set point 1/2
B001	"Direct" differential
B002	"Reverse" differential
OUT 1/2/3/4	Digital outputs 1/2/3/4
Y1/Y2	Analogue outputs 1/2
Prb1	Probe 1

5.1.5 Mode 7: Set point and differential from DI1 (Direct) (B000=7)

The controller always works in "Direct" mode, with reference to St1 when digital input 1 is open, and with reference to St2 when it is closed.

Analogue outputs Y1 and Y2 will follow the value of probe 1 with respect to St1 or St2 (with proportional-only or PID regulation), depending on the status of digital input 1.

The controller can be switched from Direct to Reverse mode via summer/winter changeover from digital input and/or parameter SEa1.



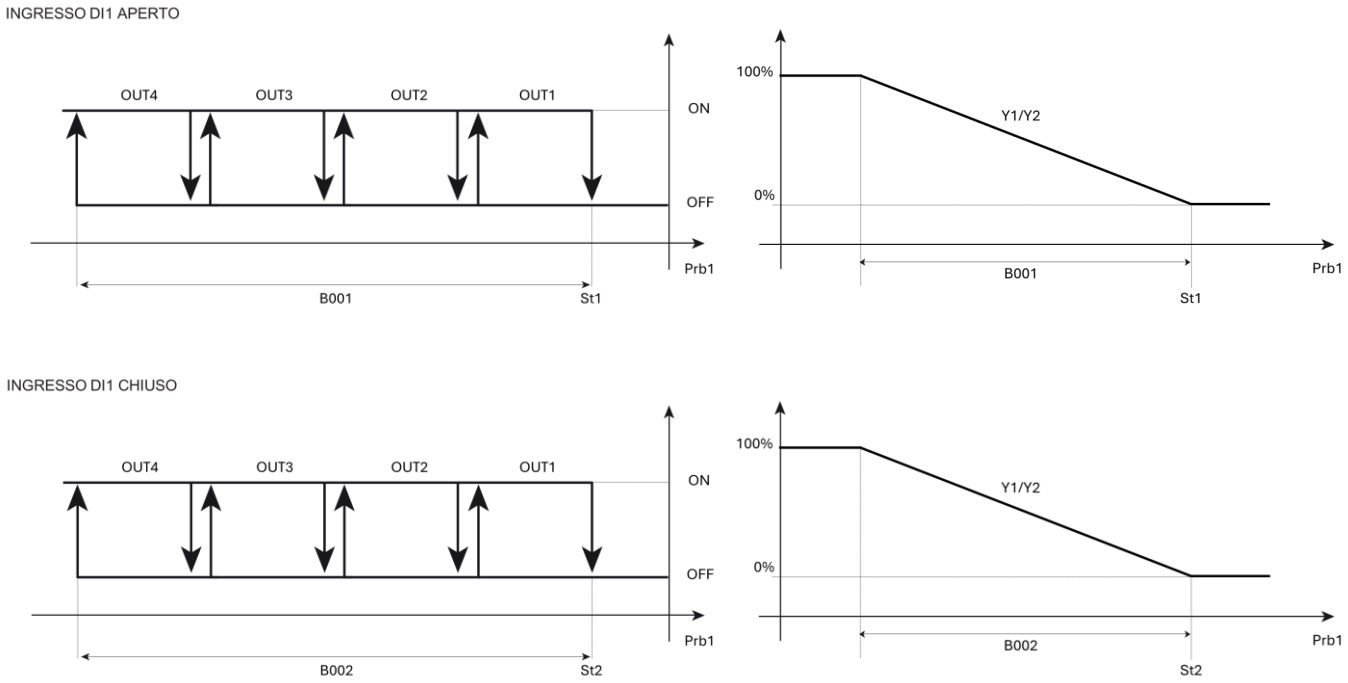
Key	Description
St1/St2	Set point 1/2
B001	St1 "direct" differential
B002	St2 "direct" differential
OUT 1/2/3/4	Digital outputs 1/2/3/4
Y1/Y2	Analogue outputs 1/2
Prb1	Probe 1

5.1.6 Mode 8: Set point and differential from DI1 (Reverse) (B000=8)

The controller always works in "Reverse" mode, with reference to St1 when digital input 1 is open, and with reference to St2 when it is closed.

Analogue outputs Y1 and Y2 will follow the value of probe 1 with respect to St1 or St2 (with proportional-only or PID regulation), depending on the status of digital input 1.

The controller can be switched from Reverse to Direct mode via summer/winter changeover from digital input and/or parameter SEa1.



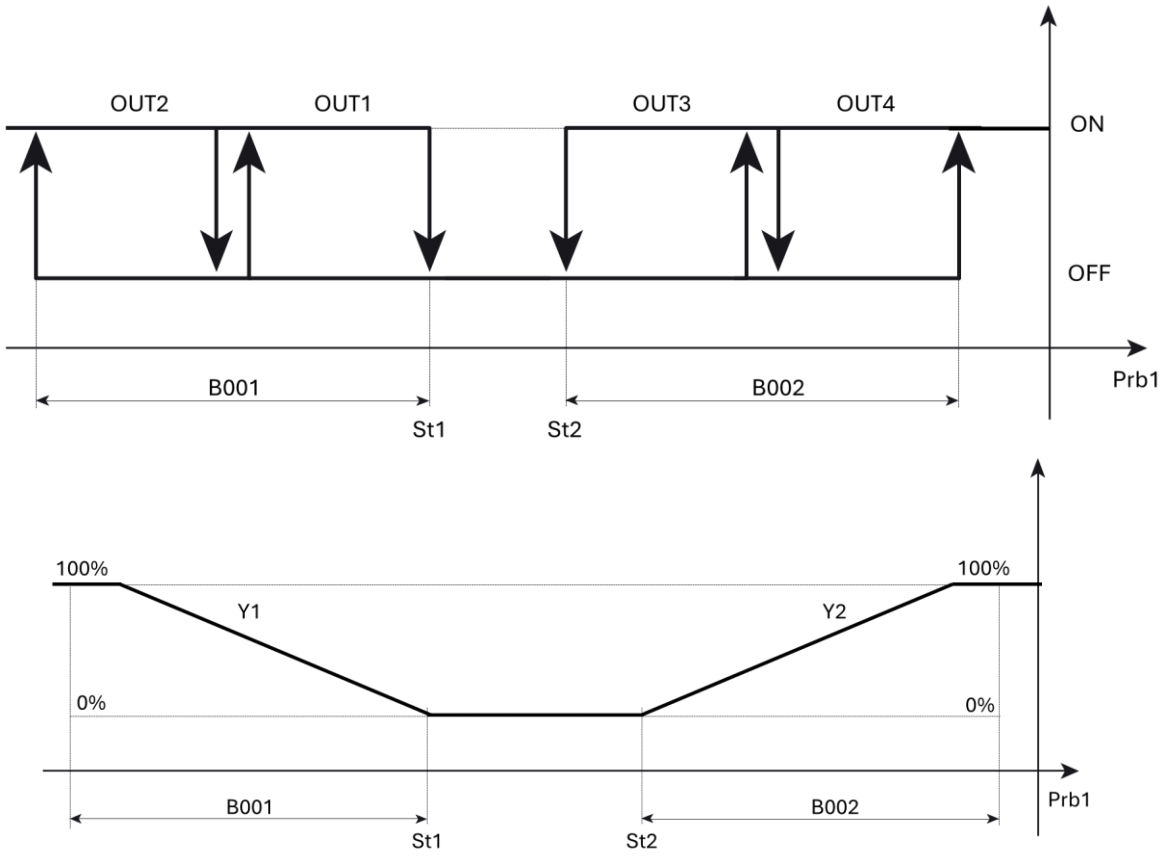
Key	Description
St1/St2	Set point 1/2
B001	St1 "reverse" differential
B002	St2 "reverse" differential
OUT 1/2/3/4	Digital outputs 1/2/3/4
Y1/Y2	Analogue outputs 1/2
Prb1	Probe 1

5.1.7 Mode 9: Direct/reverse with two set points (B000=9)

In this operating mode, half of the outputs are active in "Direct" mode and half in "Reverse" more.
The main feature of this mode is that there are no constraints in setting the set points for the two actions, and consequently the controller can operate as if there were two independent regulation functions based on the reading of probe 1.

Analogue output Y1 will follow the value of probe 1 during operation in "Reverse" mode, while analogue output Y2 will follow the value of probe 1 during operation in "Direct" mode (with proportional-only or PID regulation).

Season changeover is not available in this mode.



Key	Description
St1/St2	Set point 1/2
B001	St1 "reverse" differential
B002	St2 "direct" differential
OUT 1/2/3/4	Digital outputs 1/2/3/4
Y1/Y2	Analogue outputs 1/2
Prb1	Probe 1

5.1.8 Mode 10: 3-position valve (B000=10)

This configuration is used to regulation a tri-state floating actuator.
Unlike modulating regulation which uses 0-10 V outputs, tri-state floating regulation uses two separate digital outputs, one to regulation opening and one to regulation closing, according to the regulation request, either proportional-only or PID, as set by parameter B004.

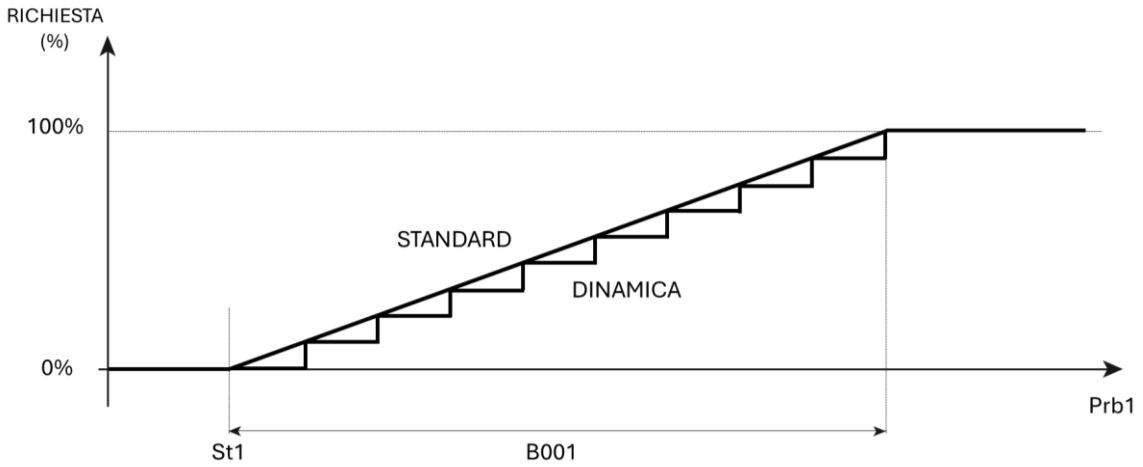
On the Universal Controller, the tri-state actuator will be regulationled using digital output OUT1 for opening and digital output OUT2 for closing.
Outputs Y1 and Y2 will return the total request as a 0-10 V value.

The main parameters for configuring this function are as follows:

Code	Description	Default
B100	3-position valve opening time 0-100%	60 sec
B101	Type of 3-position valve regulation request *0=Standard* *1=Dynamic*	Dynamic
B102	Dynamic 3-position valve regulation request reaction time	10 sec
B103	Dynamic 3-position valve regulation request threshold percentage	10 %

The valve travel time, defined by parameter B100, is used to calculate an estimate of its position as a percentage 0-100%, while parameter B101 is used to set "Dynamic" regulation type, which slows down any variations in the request by increasing or decreasing it in steps.
The steps as a percentage and the delay in the variation of the request in "Dynamic" regulation mode can be set using parameters B102 and B103.

The valve opening and closing requests is calculated as per Direct regulation.
The controller can be switched to Reverse mode via summer/winter changeover from digital input and/or parameter SEa1.



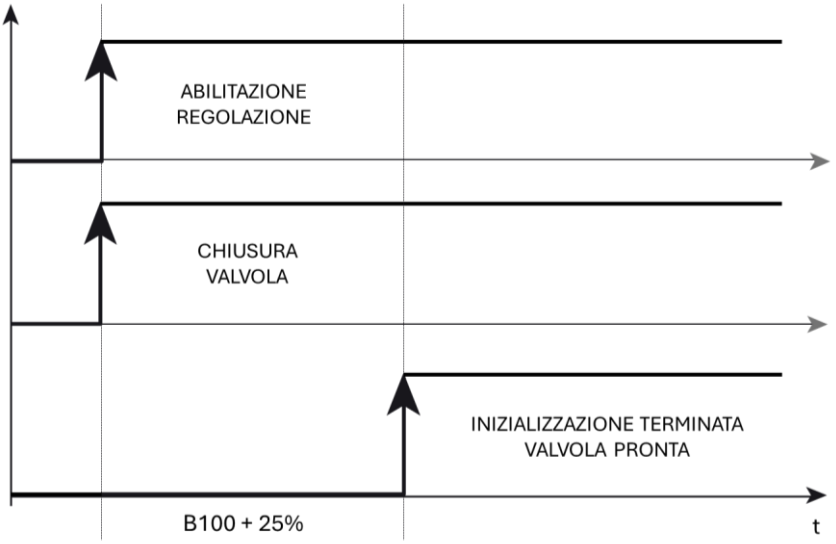
Key	Description
St1	Set point 1
B001	Differential
Prb1	Probe 1
STANDARD	Proportional or PID regulation, defined by parameter B101
DYNAMIC	Stepped regulation, defined by parameters B101, B102 and B103

The following sections define the different phases for regulationling the tri-state floating actuator.

INITIALISATION

Following activation of the controller, the first phase is initialisation, during which a closing command is sent for a time equal to the setting of parameter B100 + 25%.
This phase ensures that the next regulation phase starts with the valve in the fully-closed position (0%).
During initialisation, output OUT1 will be Off, while OUT2 will be On.

At the end of the set time, the initialisation phase will end and the valve will be ready to modulate its position based on the reading of probe 1.



CONTROL: OPENING

The valve opening or closing request as a percentage is defined by proportional or PID regulation (as set by parameter B004).

When the value measured by probe 1 is greater than St1, the opening request will increase until reaching maximum value defined by the threshold St1+B001. During opening, output OUT1 will be On, while OUT2 will be Off.

When the valve position reaches 100%, an alignment phase will be activated, during which an opening command is sent for a time equal to 20% of B100.

CONTROL: CLOSING

Similarly, if the measured value starts to fall, the 3-position valve will be sent a closing request, until reaching a total closing request at St1.
During closing, output OUT1 will be Off, while OUT2 will be On.

When the valve position reaches 0%, an alignment phase will be activated, during which a closing command is sent for a time equal to 20% of B100.

CONTROL: STANDBY

In order to reduce the number of output activations, the opening and closing commands will only be sent if the request (calculated as a percentage) varies by a value greater than or equal to 1000/B100, otherwise the controller remains in standby.
In standby, no actions will be applied and the OUT1 and OUT2 will remain Off.

5.2 Operating modes with probe 2 (Prb2)

The installation of probe 2 (input S4, terminal J3 on the controller) allows various types of auxiliary operation to be enabled based on the value read by this probe, and which are in addition to the main regulation modes "Direct", "Reverse", "Neutral zone" and "3-position valve", described in the previous paragraph.

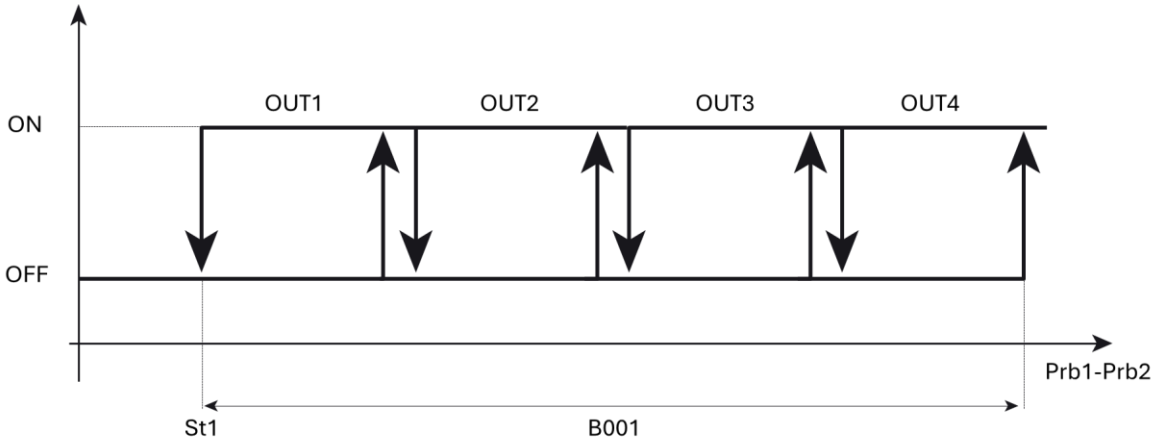
These options can be selected via parameter B012:

Code	Description	Default
B012	Probe 2 operating mode (if B000=1, 2, 3, 10): *0=Not used* *1=Differential operation (Prb1-Prb2)* *2=Reserved* *3=Reserved* *4=Reserved* *5=Enable regulation based on absolute set point* *6=Enable regulation based on set point differential* *7=Independent operation (circ.1 + circ.2)* *8=Control on higher probe value* *9=Control on lower probe value* *10=Control set point from probe 2* *11=Automatic summer/winter changeover from probe 2*	Not used

5.2.1 Differential operation (Prb1-Prb2) (B012=1)

Control is carried out by comparing the set point St1 against the difference between the values read by the two probes (Prb1-Prb2) instead of just the value of probe Prb1.
In practice, the regulation aims to bring the difference Prb1-Prb2 to the value St1.

"Direct" operation (B000=1) shown in the example aims to reduce the difference Prb1-Prb2, that is tending to increase.
"Reverse" operation (B000=2), on the other hand, aims to reduce the difference Prb1-Prb2 that is tending to decrease.



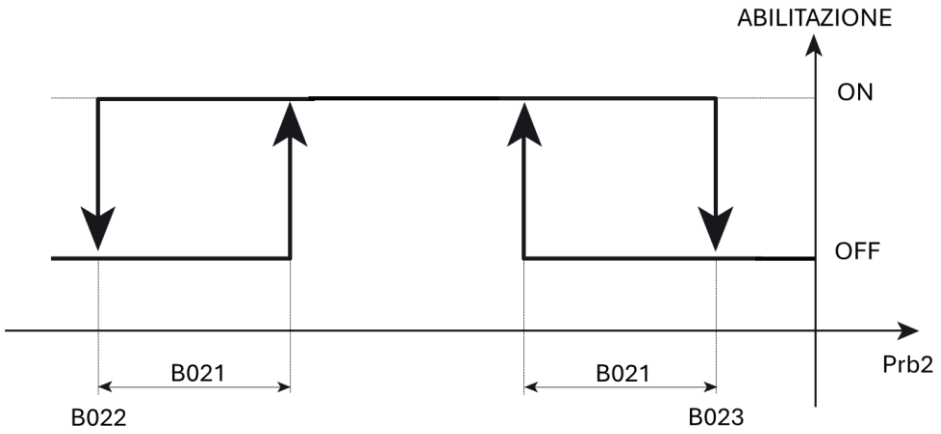
Key	Description
St1	Set point 1
B001	Differential
OUT 1/2/3/4	Digital outputs 1/2/3/4
Prb1	Probe 1
Prb2	Probe 2

5.2.2 Enable regulation based on absolute set point (B012=5)

If B012=5, the value of probe 2 is used as the logic to enable the main regulation mode, Direct or Reverse.

If the value read by probe 2 is between the threshold value B022+B021 and the threshold value B023+B021, the main regulation mode, Direct or Reverse, will be activated.
Otherwise, if the value read by probe 2 is lower than the value of parameter B022 or higher than the value of parameter B023, the main regulation mode, Direct or Reverse, will be deactivated.

This operation is not available in "Neutral zone" mode (B000 = 3).



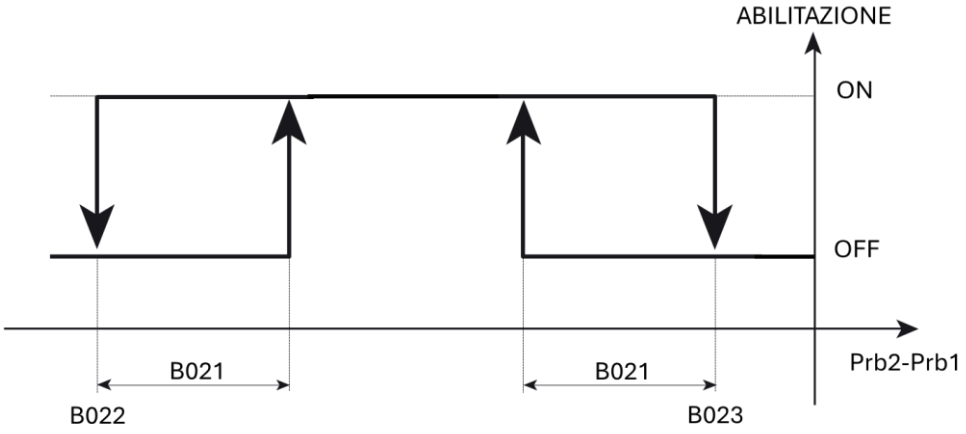
Key	Description
B021	Logical differential on absolute set point from probe 2
B022	Start threshold on absolute set point from probe 2
B023	End threshold on absolute set point from probe 2
Prb2	Probe 2

5.2.3 Enable regulation based on set point differential (B012=6)

Unlike enable regulation on absolute set point, when B012=6 the difference between probe 2 and probe 1 is used to enable the main regulation, Direct or Reverse.

If the difference between the readings of the two probes is between the threshold value B022+B021 and the threshold value B023+B021, the main regulation mode, Direct or Reverse, will be activated.
Otherwise, if the difference is less than the value of parameter B022 or greater than the value of parameter B023, the main regulation mode, Direct or Reverse, will be deactivated.

This operation is not available in "Neutral zone" mode (B000 = 3).



Key	Description
B021	Logical differential on set point differential from probe 2
B022	Start threshold on set point differential from probe 2
B023	End threshold on set point differential from probe 2
Prb2	Probe 2

5.2.4 Independent operation (circuit 1 + circuit 2) (B012=7)

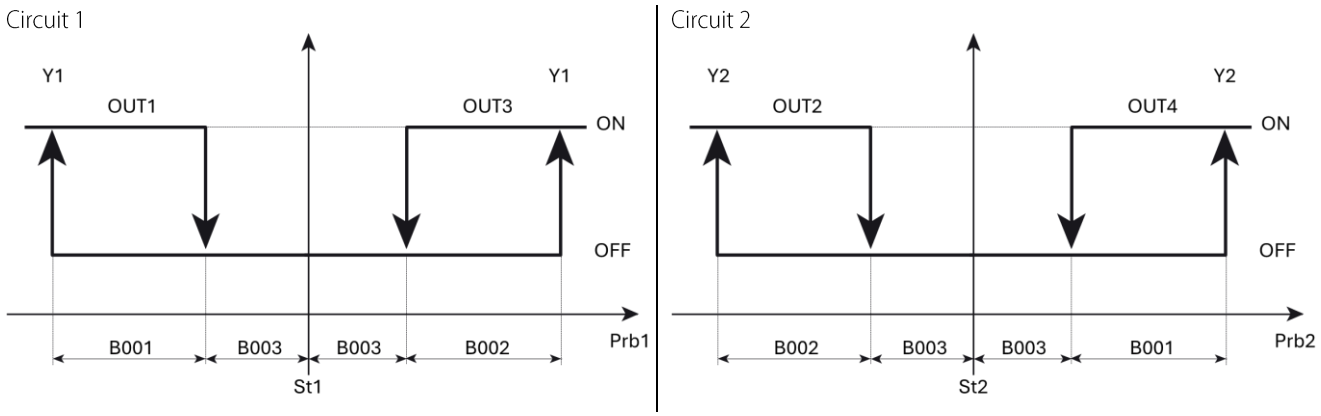
By setting B012=7, the controller manages two independent circuits, called circuit 1 and circuit 2, each with its own set point (St1, St2), differential (B001, B002), digital outputs, analogue outputs and regulation probes.

For the main regulation modes (defined by parameter B000), Direct, Reverse or 3-position valve, the type of regulation can be switched via summer/winter changeover from digital input or managed independently for circuit 1 and circuit 2, using parameters SEa1 and Sea2 respectively.

The association of the outputs during independent operation is shown below:

Description output	Direct (B000=1)	Reverse (B000=2)	Neutral zone (B000=3)	3-poisition valve (B000=10)
OUT1	Output 1 Circuit 1	Output 1 Circuit 1	Output 1 Circuit 1	Circuit 1 valve opening
OUT2	Output 2 Circuit 1	Output 2 Circuit 1	Output 1 Circuit 2	Circuit 1 valve closing
OUT3	Output 1 Circuit 2	Output 1 Circuit 2	Output 2 Circuit 1	Circuit 2 valve opening
OUT4	Output 2 Circuit 2	Output 2 Circuit 2	Output 2 Circuit 2	Circuit 2 valve closing
Y1	Request Circuit 1	Request Circuit 1	Request Circuit 1	Request Circuit 1
Y2	Request Circuit 2	Request Circuit 2	Request Circuit 2	Request Circuit 2

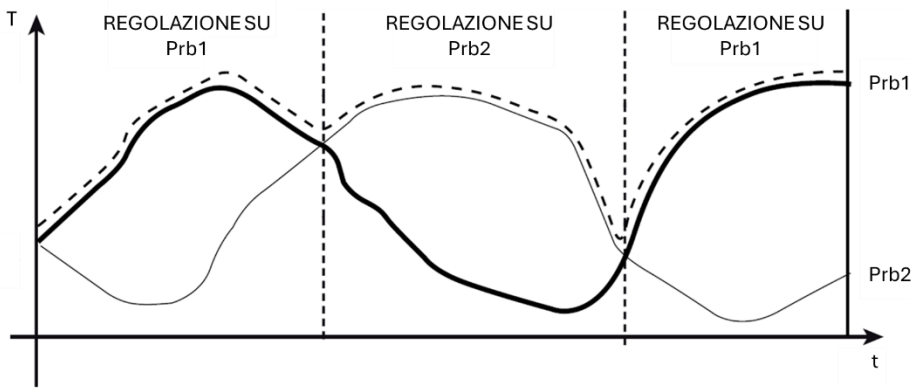
The example shows “Neutral zone” mode (B000=3):



Key	Description
St1	Set point 1
B001	Set point 1 differential
St2	Set point 2
B002	Set point 2 differential
B003	Neutral zone differential
OUT 1/2/3/4	Digital outputs 1/2/3/4
Y1/Y2	Analogue outputs 1/2
Prb1	Probe 1
Prb2	Probe 2

5.2.5 Control on the higher probe value (B012=8)

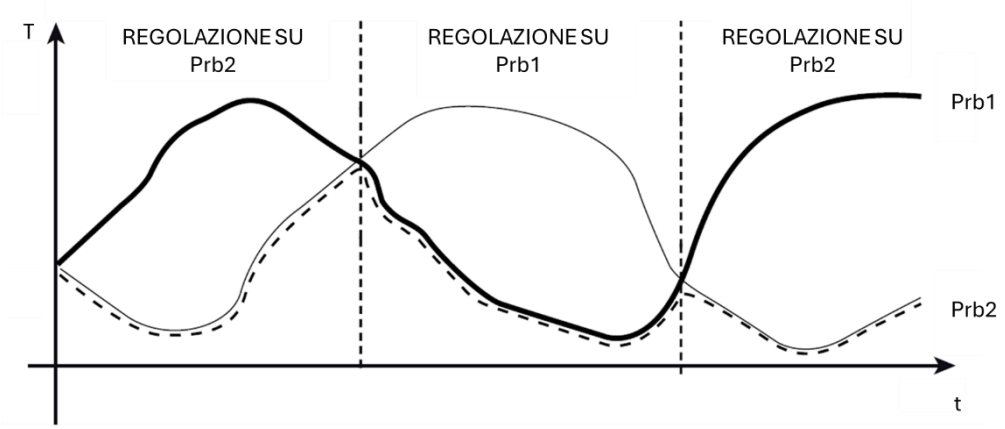
By setting B012=8, the probe used for regulation and therefore activation of the outputs is, at any given moment, the one that measures the higher value, between probe 1 and probe 2.



Key	Description
Prb1	Probe 1
Prb2	Probe 2

5.2.6 Control on the lower probe value (B012=9)

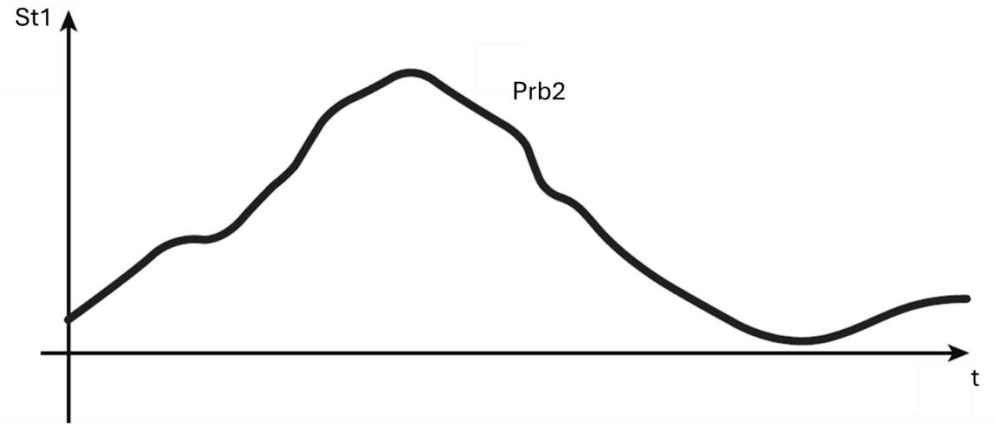
By setting B012=9, the probe used for regulation and therefore activation of the outputs is, at any given moment, the one that measures the lower value, between probe 1 and probe 2.



Key	Description
Prb1	Probe 1
Prb2	Probe 2

5.2.7 Set point on probe 2 (B012=10)

If B012=10, the regulation set point is no longer fixed, but will refer to the value read by probe 2.



Key	Description
St1	Set point 1
Prb2	Probe 2

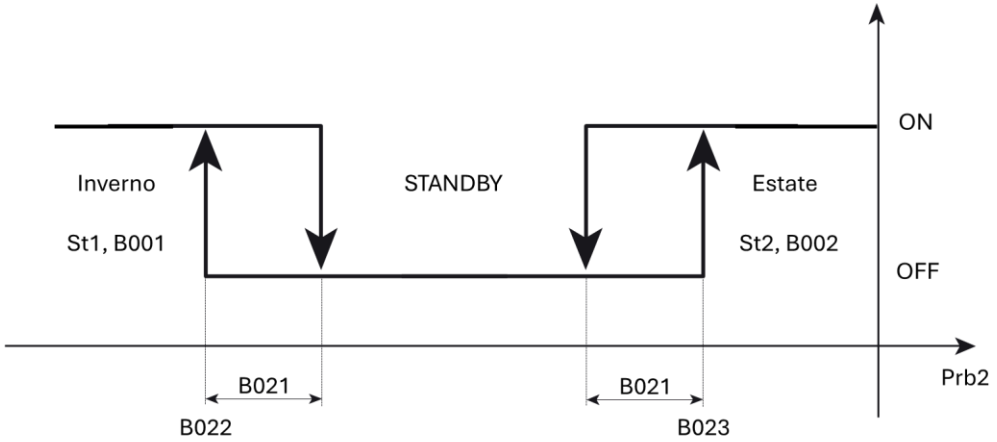
5.2.8 Automatic summer/winter changeover from probe 2 (B012=11)

If B012=11, when the value of probe 2 is lower than B022, regulation will be based on parameters St1 and B001 and the Direct or Reverse mode setting defined by B000 (if B000 = 10, Direct regulation mode will be active).

If the value of probe 2 is within the range between B022 and B023, the controller will enter standby mode, and any active or modulating outputs due to the main regulation mode will be deactivated.

When the value of probe 2 is higher than B023, the set point and differential will automatically switch to St2 and B002 respectively, while the regulation logic will be the opposite of what has been set for B000 (if of B000 = 10, Reverse regulation mode will be active).

This operation is not available in "Neutral zone" mode (B000 = 3).



Key	Description
St1	Set point 1
B001	Set point 1 differential
St2	Set point 2
B002	Set point 2 differential
B021	Season changeover logical differential from probe 2
B022	Season changeover start threshold from probe 2
B023	Season changeover end threshold from probe 2
ON, OFF	Main regulation status
STANDBY	Standby zone
Prb2	Probe 2

5.3 Probe 3 functions (B036)

The installation of probe 3 (input S5, terminal J2 on the controller) allows various auxiliary functions to be enabled as compensation of the main regulation modes "Direct", "Reverse", "Neutral zone" and "3-position valve" (described in paragraph 5.1).

These options can be selected via parameter B036:

Code	Description	Default
B036	Probe 3 function (if B000=1, 2, 3, 10): *0=Disabled* *1=Summer compensation* *2=Winter compensation* *3=Summer/winter compensation* *4=Read only (valid for any value of B000)*	Disabled

5.3.1 Summer compensation (B036=1)

If B036=1, the value read by probe 3 is used to calculate and apply an offset to the current set point, in order to compensate for the action of the main regulation in summer.

The offset is calculated proportionally between an initial threshold (parameter B024) and an end threshold (parameter B025):

- At and below the initial threshold, the offset will be zero.
- At and above the end threshold, the offset will be equal to the value set for parameter B026.
- For probe 3 values between the initial threshold and the end threshold, the offset is calculated proportionally between the null value and the value defined by parameter B026.

Therefore, if parameter B026 is set to a value greater than 0, the offset will be positive.
Similarly, if parameter B026 is set to a value less than 0, the offset will be negative.

This mode can be used with the standard Direct, Reverse, Neutral Zone and 3-Point Valve modes.

Summer compensation can also be activated with special operating modes (B000=0), provided that the special mode selected is "regulation on St1 and B001" or "regulation on St2 and B002".

Key	Description
B024	Summer compensation start value
B025	Summer compensation end value
B026	Maximum summer compensation value
NEW SET POINT	Control set point with offset equal to B026
STANDARD SET POINT	Control set point with null offset
Prb3	Probe 3

5.3.2 Winter compensation (B036=2)

Similarly to summer compensation, if B036=2 the value read by probe 3 is used to calculate and apply an offset to the set point in use to compensate for the action of the main regulation in winter.

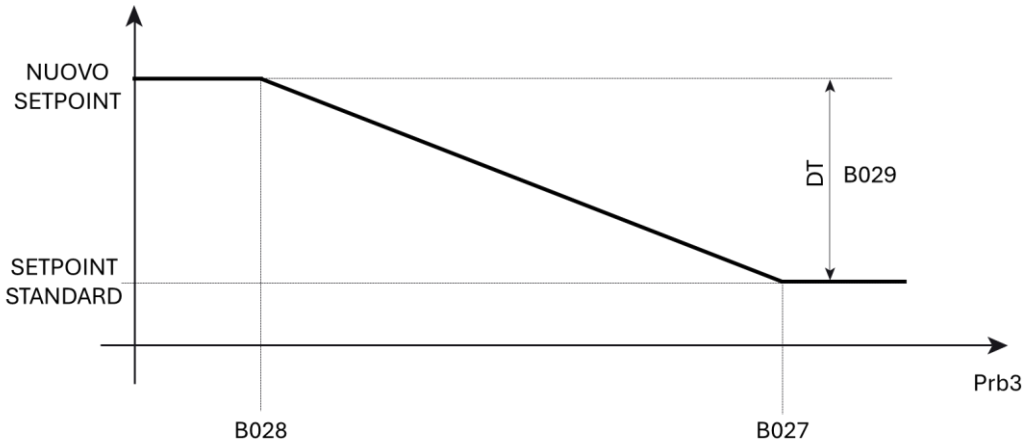
The offset is calculated proportionally between an initial threshold (parameter B027) and an end threshold (parameter B028):

- At and below the initial threshold, the offset will be zero.
- At and above the end threshold, the offset will be equal to the value set for parameter B028.
- For probe 3 values between the initial threshold and the end threshold, the offset is calculated proportionally between the null value and the value defined by parameter B028.

Therefore, if parameter B028 is set to a value greater than 0, the offset will be positive.
Similarly, if parameter B028 is set to a value less than 0, the offset will be negative.

This mode can be used with the standard Direct, Reverse, Neutral Zone and 3-Point Valve modes.

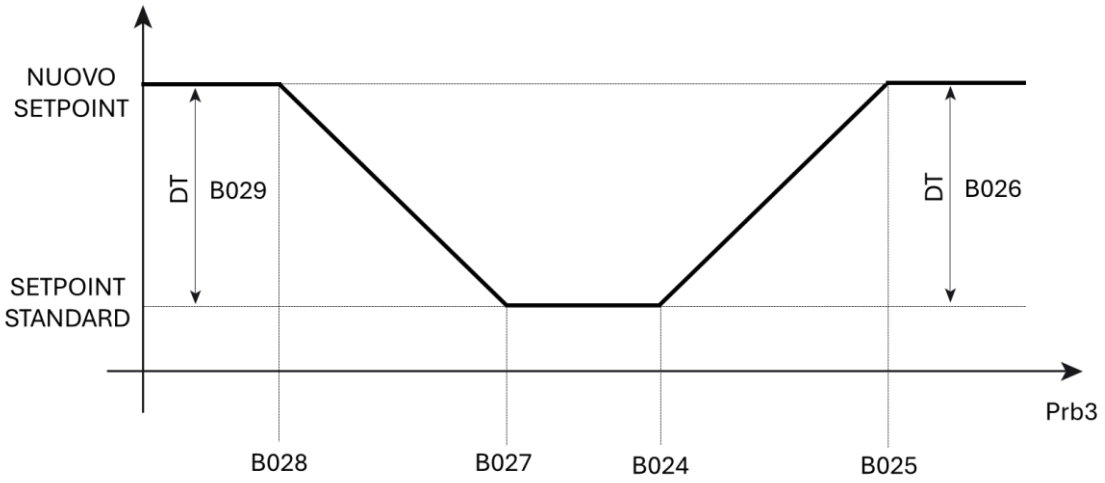
Winter compensation can also be activated with special operating modes (B000=0), provided that the special mode selected is "regulation on St1 and B001" or "regulation on St2 and B002".



Key	Description
B027	Winter compensation start value
B028	Winter compensation end value
B029	Maximum winter compensation value
NEW SET POINT	Control set point with offset equal to B029
STANDARD SET POINT	Control set point with null offset
Prb3	Probe 3

5.3.3 Summer/winter compensation (B036=3)

The compensation calculated when B036=3 is the combined action of the summer and winter compensation, in order to adapt the main regulation to different probe 3 readings during the two seasons.



Key	Description
B024	Summer compensation start value
B025	Summer compensation end value
B026	Maximum summer compensation value
B027	Winter compensation start value
B028	Winter compensation end value
B029	Maximum winter compensation value
NEW SET POINT	Control set point with offset equal to B026 or B029
STANDARD SET POINT	Control set point with null offset
Prb3	Probe 3

5.3.4 Read-only (B036=4)

The value read by probe 3 will be shown on the display, in Applica and via the supervisor, however no additional actions are performed. This function can be enabled for any type of main and auxiliary regulation.

5.4 Special operation (B000=0)

If parameter B000 is set to value 0=Special operation, a custom operating logic can be created that allows the regulation logic of each individual regulation output to be configured using additional parameters, known as special parameters, which will be available in the "Control configuration" menu.

These parameters are:

- Control type
  - Control on thresholds
  - Control on St1 and B001
  - Control on St2 and B002
  - Alarm status
  - Unit status ON/OFF
  - Control status ON/OFF
- Control probe
  - Probe 1
  - Probe 2
  - Probe 1/probe 2 from DI1
  - Probe 1 - probe 2
  - Probe 2 - probe 1
- Activation value/request at 100%
- Deactivation value/request at 0%
- Output mode
  - Direct
  - Reverse
  - Direct/reverse from summer/winter
- Alarm dependency (On-Off outputs only)
  - Global alarm
  - Alarm on probe 1/circuit 1
  - Alarm on probe 2/circuit 2
  - Alarm on probe 3
  - High alarm on probe 1
  - Low alarm on probe 1
  - High alarm on probe 2
  - Low alarm on probe 2
  - High alarm on probe 3
  - Low alarm on probe 3
- Control type (for On-Off output only)
  - On/Off
  - 3-position valve opening
  - 3-position valve closing

Special parameters and correspondence with the different outputs

	NO1	NO2	NO3	NO4	Y1	Y2
Control type	Ba01	Ba08	Ba15	Ba22	Ba30	Ba40
Control probe	Ba02	Ba09	Ba16	Ba23	Ba31	Ba41
Activation value	Ba03	Ba10	Ba17	Ba24		
Request at 100%					Ba32	Ba42
Deactivation value	Ba04	Ba11	Ba18	Ba25		
Request at 0%					Ba33	Ba33
Output mode	Ba05	Ba12	Ba19	Ba26	Ba34	Ba44
Alarm dependency	Ba06	Ba13	Ba20	Ba27		
On-Off output regulation	Ba07	Ba14	Ba21	Ba28		

Please see paragraph 6.4.2 for further details.

Notice:

- The override settings via C001, C002, C020 and C021 only apply to outputs NO* and Y* that have the "Control type on NO* output and "Control type on Y* output" set to a value ≠ 0.
- The "Alarm dependency for NO* activation" can only be set if the "Control type on NO* output" is set as "Alarm status".
- The regulation parameters that are valid for "3-position valve" mode are set for output NO1, for the regulation of valve 1, and those set for output NO3 for the regulation of valve 2. However, Ba08 and Ba22 need to be set to a value ≠ 0.
- "3-position valve" mode will use outputs NO1-NO2 for the regulation of valve 1 and outputs NO3-NO4 for the regulation of valve 2. It will be possible to set which output to use for the opening command and which for the closing command.
- If the output rotation function is active, the regulation type, activation value and deactivation value parameters referring to NO1, NO2, NO3 and NO4 will be decoupled from the respective digital output and will be reassigned according to the activation/deactivation order calculated based on the operating hours of each digital output.

5.5 Scheduler

The Universal Controller offers the possibility to enable a scheduler. Three different profiles can be programmed:

- COMFORT
- ECONOMY
- OFF

The economy and comfort profiles have different regulation set points.

Code	Description	Default
St1	Set point 1	20.0
St2	Set point 2	40.0
St1e	Set point 1 in economy mode	15.0
St2e	Set point 2 in economy mode	35.0

There are also different summer and winter compensation thresholds:

Code	Description	Default
B024	Summer compensation start value	35.0
B025	Summer compensation end value	45.0
B026	Maximum summer compensation value	5.0
B027	Winter compensation start value	15.0
B028	Winter compensation end value	0.0
B029	Maximum winter compensation value	5.0
B030	Summer compensation start value (economy)	35.0
B031	Summer compensation end value (economy)	45.0
B032	Maximum summer compensation value (economy)	5.0
B033	Winter compensation start value (economy)	15.0
B034	Winter compensation end value (economy)	0.0
B035	Maximum winter compensation value (economy)	5.0

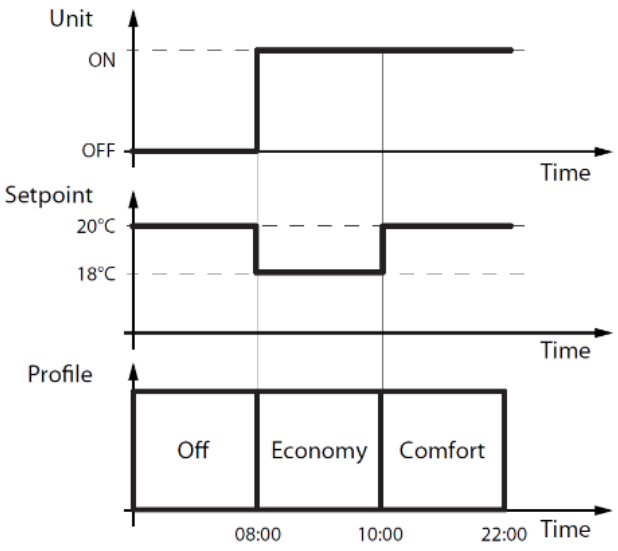
The off profile, on the other hand, switches the unit to "Off from scheduler" status.

Up to three programs can be set (P1, P2 and P3), each with four daily time bands.
Each time band can be enabled and the desired start time and profile can be selected. The set profile will then remain active until the start of the next time band.

For each day of the week, the operating mode can be selected between:

- COMFORT
- ECONOMY
- OFF
- Program 1 (P1)
- Program 2 (P2)
- Program 3 (P3)

Below is an example of switching from the off profile to economy and then comfort:



If selecting off, economy or comfort, the selected profile will remain active for the entire day, from 00:00 to 23:59.

If selecting P1, P2 or P3, the set daily program will be active.
The default is:
- P1 used as the Monday to Thursday program
- P2 used as the Friday program
- P3 used as the weekend program (Saturday and Sunday).

P1 (weekday program) has two time bands:
- At 08:00 the comfort profile starts
- At 22:00 the economy profile starts

P2 (Friday weekday program) has two time bands:
- At 08:00 the comfort profile starts
- At 22:00 the off profile starts.

P3 (weekend program) has two time bands:
- At 08:00 the economy profile starts
- At 22:00 the off profile starts.

The scheduler also allows a vacation period to be set, specifying the day and month the vacation period starts/ends and the operating mode that will be applied during this period.

Please see paragraph 6.7 for further details.

5.6 Soft start

The soft start function allows the set point to be increased or decreased when regulation starts based on the value set for parameter B072.

The function is useful if the controller is used in applications where switching on at full load could be incompatible with the regulationled process.

The soft start function is applied at the start of regulation for a set time (in seconds) via parameter B071. Setting the value of parameter B071 to zero disables the function.

Parameter B073 applies to circuit 2 if independent operation is active.

Code	Description	Default
B071	Soft start time on starting regulation. Set 0 to disable.	0 sec
B072	St1 during soft start	20.0
B073	St2 during soft start	40.0

Example:
assuming that the set point (St1) is 30.0 with a differential (B001) of 2.0 and that the regulation probe measures 20.0.

By setting B071 to 120 seconds and B072 to 20.0, when Reverse regulation is activated (B000=2), the regulation set point will be 20.0 for 2 minutes.
After 2 minutes, the regulation set point changes to the value set for parameter St1, therefore 30.0, and will remain at that value until the regulation request is null, deactivating regulation. The next time regulation is reactivated, the soft start function starts again.

5.7 Output rotation

The rotation function changes the on and off priority of the on/off regulation outputs.

Code	Description	Default
B011	Output rotation (if B000=0,1, 2, 7, or 8) *0=Rotation not active* *1=Standard rotation*	0

With standard rotation, in relation to the regulation request, the output that has been active for the longest time is deactivated, or the output that has been inactive for the longest time is activated.

For outputs with the same number of operating hours, the same activation and deactivation sequence used when B011=0 will be applied, rotation not active, i.e. LIFO (last in first out).

6. PARAMETER TABLE

Notice:
Parameter setting access levels: U=User; S=Service; M=Manufacturer;
R/W=read/write parameters; R=read-only parameters;
Modbus: HR=Holding register; IR=Analogue input; CS=Coil status; DI=Digital input; (2R)=32 bit register;

IMPORTANT:
Not all the parameters listed below will be displayed when scrolling through the display interface; enabling a specific configuration may mean parameters are displayed that were previously hidden.

Example:
- The operating status and parameters relating to circuit 2 will be displayed only if independent operation is selected,
- Economy mode status and parameters will only be displayed if there are active time bands.

The display therefore depends on what has been configured.

6.1 Main page (press DOWN briefly)

User	Code	Description	Def.	Min.	Max.	UOM	R/W	Modbus
U	On - - - - Unit on OFF ALrM OFF bMS OFF Schd OFF dI OFF diSP	Unit operating status *0=Waiting* *1=Unit ON* *2=OFF from alarm* *3=Reserved* *4=OFF from BMS* *5=OFF from scheduler* *6=OFF from DI* *7=OFF from display*		0	7		R	IR 3000
U	SEaS	Season *0=Summer* *1=Winter*		0	1		R	CS 2005
U	rEGt	Control probe reading					R	IR 3002
U	rSt1	Control set point 1					R	IR 3003
U	rSt2	Control set point 2					R	IR 3004
U	Prb1	Probe 1 reading					R	IR 0001
U	Prb2	Probe 2 reading					R	IR 0002
U	Prb3	Probe 3 reading					R	IR 0003
U	din1	Digital input 1 reading					R	DI 0005
U	din2	Digital input 2 reading					R	DI 0006
U	do	Relay status *Relay 1* *Relay 2* *Relay 3* *Relay 4*		-	4		R	DI 0000 DI 0001 DI 0002 DI 0003
U	dou5	Relay 5 status		0	1		R	DI 0004
U	Y1	Analogue output 1 %		0	100	%	R	IR 0226
U	Y2	Analogue output 2 %		0	100	%	R	IR 0227
U	000 000h	Unit operating hours				h	R	IR 3018 (2R)
U	000 000h1	Output 1 operating hours				h	R	IR 3020 (2R)
U	000 000h2	Output 2 operating hours				h	R	IR 3022 (2R)
U	000 000h3	Output 3 operating hours				h	R	IR 3024 (2R)
U	000 000h4	Output 4 operating hours				h	R	IR 3026 (2R)
U	rEL	Firmware version					R	IR 3028
U	dAY	Day		1	31		R	IR 8000
U	Mont	Month		1	12		R	IR 8001
U	YEAr	Year		0	99		R	IR 8002
U	UdAY	Day of the week *0=Sunday* *1=Monday* *2=Tuesday* *3=Wednesday* *4=Thursday* *5=Friday* *6=Saturday*		0	6		R	IR 8005
U	Hour	Hours		0	59		R	IR 8003
U	Min	Minutes		0	59		R	IR 8004

6.2 Main page (press PRG briefly)

User	Code	Description	Def.	Min.	Max.	UOM	R/W	Modbus
U	UnSt	Set unit on/off from keypad *0=Off* *1=On*	0	0	1		R	CS 0035
U	St1	Set point 1	20	B013	B014		R	HR 0003
U	St2	Set point 2	40	B015	B016		R	HR 0004
U	St1E	Set point 1 in economy mode	15	B013	B014		R	HR 2003
U	St2E	Set point 2 in economy mode	35	B015	B016		R	HR 2004
U	SEa1	Circuit 1 season *0=Summer* *1=Winter*	0	0	1		R	CS 2005
U	SEa2	Circuit 2 season *0=Summer* *1=Winter*	0	0	1		R	CS 2006

6.3 Input/output configuration

User	Code	Description	Def.	Min.	Max.	UOM	R/W	Modbus
S	Io01	Probe 1 type *0=NTC* *1=NTC HT* *2= PT1000* *3=Reserved* *4=0-10 Vdc* *5=0 to 5 Vdc ratiometric* *6=0-20 mA* *7=4-20 mA*	0	0	7		R/W	HR 4000
S	Io02	Minimum value of probe 1 (current or voltage)	0	-199	Io03		R/W	HR 4001
S	Io03	Maximum value of probe 1 (current or voltage)	100	Io02	999		R/W	HR 4002
S	Io04	Probe 1 calibration	0	-179	179	Delta	R/W	HR 4003
S	Io05	Probe 1 noise filter *0=Value without any sample (faster measurement)* *1=Value after 3 samples* *2=Value after 6 samples* *3=Value after 9 samples* *4=Value after 14 samples* *5=Value after 26 samples* *6=Value after 46 samples* *7=Value after 85 samples* *8=Value after 155 samples* *9=Value after 255 samples (slower measurement)*	5	0	9		R/W	HR 4004
S	Io06	Probe 2 type *0=NTC* *1=NTC HT* *2=0 to 5 Vdc ratiometric* *3=0-20 mA* *4=4-20 mA*	0	0	4		R/W	HR 4005
S	Io07	Minimum value of probe 2 (current or voltage)	0	-199	Io08		R/W	HR 4006
S	Io08	Maximum value of probe 2 (current or voltage)	100	Io07	999		R/W	HR 4007
S	Io09	Probe 2 calibration	0	-179	179	Delta	R/W	HR 4008
S	Io10	Probe 2 noise filter (see Io05)	5	0	9		R/W	HR 4009

S	Io11	Input DI1 configuration *(If B000≠6, 7, 8 and if B000=0 with regulation probe≠2: Probe 1/probe 2 from DI1)* *0=Input not active* *1=Serious alarm Automatic reset (circ.1)* *2=Serious alarm Manual reset (circ.1)* *3=Delayed serious alarm Manual reset (circ.1)* *4=Unit ON/OFF input* *5=Reserved* *6=Reserved* *7=Delayed signal-only alarm* *8=Signal-only alarm* *9=Serious alarm Automatic reset (circ.2)* *10=Serious alarm Manual reset (circ.2)* *11=Delayed serious alarm Manual reset (circ.2)* *12=Reserved* *13=Summer/winter (not valid for B000=3, 9)*	0	0	13		R/W	HR 4010
S	Io12	Input DI1 logic *0=NC* *1=NO*	1	0	1		R/W	CS 4011
S	Io13	Input DI2 configuration (see Io11)	0	0	13		R/W	HR 4012
S	Io14	Input DI2 logic (see Io12)	1	0	1		R/W	CS 4013
S	Io15	Probe 3 type *0=NTC* *1=NTC HT* *2=0 to 5 Vdc ratiometric* *3=0-20 mA* *4=4-20 mA*	0	0	4		R/W	HR 4014
S	Io16	Minimum value of probe 3 (current or voltage)	0	-199	Io17		R/W	HR 4015
S	Io17	Maximum value of probe 3 (current or voltage)	100	Io16	999		R/W	HR 4016
S	Io18	Probe 3 calibration	0	-179	179	Delta	R/W	HR 4017
S	Io19	Probe 3 noise filter (see Io05)	5	0	9		R/W	HR 4018
S	Io20	Output NO1 relay logic *0=NO* *1=NC*	0	0	1		R/W	CS 4019
S	Io21	Output NO2 relay logic (see Io20)	0	0	1		R/W	CS 4020
S	Io22	Output NO3 relay logic (see Io20)	0	0	1		R/W	CS 4021
S	Io23	Output NO4 relay logic (see Io20)	0	0	1		R/W	CS 4022
S	Io24	Output NO5 alarm relay logic (see Io20)	0	0	1		R/W	CS 4023
S	Io25	Output Y1 cut-off *0=Operation with cut-off* *1=Operation at minimum speed*	1	0	1		R/W	CS 4024
S	Io26	Minimum value of analogue output Y1	0	0	100	%	R/W	HR 4025
S	Io27	Maximum value of analogue output Y1	100	0	100	%	R/W	HR 4026
S	Io28	Output Y2 cut-off (see Io25)	1	0	1		R/W	CS 4027
S	Io29	Minimum value of analogue output Y2	0	0	100	%	R/W	HR 4028
S	Io30	Maximum value of analogue output Y2	100	0	100	%	R/W	HR 4029
S	doF0	Enable override digital outputs 0=DISABLE 1=ENABLE	0	0	1		R/W	CS 4030
S	doF1	Override digital output 1	0	0	1		R/W	CS 4031
S	doF2	Override digital output 2	0	0	1		R/W	CS 4032
S	doF3	Override digital output 3	0	0	1		R/W	CS 4033
S	doF4	Override digital output 4	0	0	1		R/W	CS 4034
S	doF5	Override digital output 5	0	0	1		R/W	CS 4035
S	AoF0	Enable override analogue outputs (see doF0)	0	0	1		R/W	CS 4036
S	AoF1	Override analogue output 1	0	0	1		R/W	HR 4037
S	AoF2	Override analogue output 2	0	0	1		R/W	HR 4038

6.4 Control configuration

User	Code	Description	Def.	Min.	Max.	UOM	R/W	Modbus
M	B000	Operating mode *0=Special operation (custom)* *1=Direct* *2=Reverse* *3=Neutral zone* *4=Reserved* *5=Reserved* *6=Direct/reverse changeover from DI1* *7=Direct: set point and differential from DI1* *8=Reverse: set point and differential from DI1* *9=Direct/reverse with two separate set points* *10=3 position valve*	1	0	10		R/W	HR 5000
S	B001	Set point 1 differential	2	0.1	99.9		R/W	HR 0005
S	B002	Set point 2 differential	2	0.1	99.9		R/W	HR 0006
S	B003	Neutral zone differential	2	0	99.9		R/W	HR 0007
S	B004	Control type *0=Proportional* *1=PID*	0	0	1		R/W	CS 5004
S	B005	Enable anti-bump for PID *0=Disable* *1=Enable*	0	0	1		R/W	CS 5005
M	B006	Delay between activation of two different outputs	5	0	255	Sec	R/W	HR 5006
M	B007	Minimum time between two on cycles of the same output	0	0	900	Sec	R/W	HR 5007
M	B008	Delay between activation of two different outputs	5	0	255	Sec	R/W	HR 5008
M	B009	Minimum output off time	0	0	900	Sec	R/W	HR 5009
M	B010	Minimum output on time	0	0	900	Sec	R/W	HR 5010
M	B011	Output rotation (if B000=0, 1, 2, 7 or 8) *0=Rotation not active* *1=Standard rotation*	0	1	0		R/W	HR 5011
M	B012	Probe 2 operating mode (if B000=1, 2, 3, 10) *0=Not used* *1=Differential operation (Prb1-Prb2)* *2=Reserved* *3=Reserved* *4=Reserved* *5=Enable regulation based on absolute set point* *6=Enable regulation based on set point differential* *7=Independent operation (circ.1 + circ.2)* *8=Control on higher probe value* *9=Control on lower probe value* *10=Control set point from probe 2* *11=Automatic summer/winter changeover from probe 2*	0	0	11		R/W	HR 5012
S	B013	Minimum value of set point St1	-50.0	-199	B014		R/W	HR 5013
S	B014	Maximum vaue of set point St1	60	B013	800		R/W	HR 5014
S	B015	Minimum value of set point St2	-50	-199	B016		R/W	HR 5015
S	B016	Maximum vaue of set point St2	60.0	B015	800		R/W	HR 5016

S	B020	Display *0=Probe 1* *1=Probe 2* *2=Digital input 1* *3=Digital input 2* *4=Set point 1* *5=Set point 2* *6=Probe 1/Probe 2 alternating* *7=Output NO1 status* *8=Output NO2 status* *9=Output NO3 status* *10=Output NO4 status* *11=Output Y1 percentage* *12=Output Y2 percentage* *13=Probe 3* *14=Control probe*	14	0	14		R/W	HR 5017
S	B021	Logical differential on absolute set point/differential or season changeover from probe 2	1.5	0	99.9		R/W	HR 5018
S	B022	Start threshold on absolute set point/differential or season changeover from probe 2	-50	-199	999.9		R/W	HR 5019
S	B023	End threshold on absolute set point/differential or season changeover from probe 2	150	-199	999.9		R/W	HR 5020
S	B024	Summer compensation start value	35	-99.9	999.9		R/W	HR 5021
S	B025	Summer compensation end value	45	-99.9	999.9		R/W	HR 5022
S	B026	Maximum summer compensation value	5	-99.9	999.9		R/W	HR 5023
S	B027	Winter compensation start value	15	-99.9	999.9		R/W	HR 5024
S	B028	Winter compensation end value	0	-99.9	999.9		R/W	HR 5025
S	B029	Maximum winter compensation value	5	-99.9	999.9		R/W	HR 5026
S	B030	Summer compensation start value (economy)	35	-99.9	999.9		R/W	HR 5027
S	B031	Summer compensation end value (economy)	45	-99.9	999.9		R/W	HR 5028
S	B032	Maximum summer compensation value (economy)	5	-99.9	999.9		R/W	HR 5029
S	B033	Winter compensation start value (economy)	15	-99.9	999.9		R/W	HR 5030
S	B034	Winter compensation end value (economy)	0	-99.9	999.9		R/W	HR 5031
S	B035	Maximum winter compensation value (economy)	5	-99.9	999.9		R/W	HR 5032
M	B036	Probe 3 function *0=Disabled* *1=Summer compensation* *2=Winter compensation* *3=Summer/winter compensation* *4=Read only*	0	0	4		R/W	HR 5033
S	B070	Start regulation delay. Set 0 to disable.	0	0	255	Sec	R/W	HR 5034
S	B071	Soft start time when starting regulation. Set 0 to disable.	0	0	255	Sec	R/W	HR 5035
S	B072	St1 during soft start	20	B013	B014		R/W	HR 5036
S	B073	St2 during soft start	40	B013	B014		R/W	HR 5037
S	B100	3-position valve opening time 0-100%	60	0	999	Sec	R/W	HR 5038
S	B101	Type of 3-position valve regulation request *0=Standard* *1=Dynamic*	1	0	1		R/W	CS 5039
S	B102	Dynamic 3-position valve regulation request reaction time	10	0	999	Sec	R/W	HR 5040
S	B103	Dynamic 3-position valve regulation request threshold percentage	10	0	100	%	R/W	HR 5041

6.4.1 PID parameter table (B004=1)

User	Code	Description	Def.	Min.	Max.	UOM	R/W	Modbus
S	Bb01	Control Ti 1	600	0	999	Sec	R/W	HR 5300
S	Bb02	Control Td 1	0	0	999	Sec	R/W	HR 5301

S	Bb03	Control Ti 2	600	0	999	Sec	R/W	HR 5302
S	Bb04	Control Td 2	0	0	999	Sec	R/W	HR 5303

6.4.2 Special parameter table (B000=0)

User	Code	Description	Def.	Min.	Max.	UOM	R/W	Modbus
M	Ba01	Control type on output NO1 *0=Not enabled;* *1=Control on thresholds* *2=Control on St1 and B001* *3=Control on St2 and B002* *4=Alarm status* *5=Unit status ON/OFF* *6=Control status ON/OFF*	0	0	6		R/W	HR 5500
M	Ba02	NO1 regulation probe *0=Probe 1* *1=Probe 2* *2=Probe 1/probe 2 from DI1* *3=Probe 1 - probe 2* *4=Probe 2 - probe 1*	0	0	4		R/W	HR 5501
S	Ba03	NO1 activation	22	-199	999		R/W	HR 5502
S	Ba04	NO1 deactivation	20	-199	999		R/W	HR 5503
M	Ba05	NO1 output mode *0=Direct* *1=Reverse* *2=Direct/reverse from summer/winter*	0	0	2		R/W	HR 5504
M	Ba06	Alarm dependency for NO1 activation *0=Global alarm* *1=Probe 1 / circuit 1 alarm* *2=Probe 2 / circuit 2 alarm* *3=Probe 3 alarm* *4=Probe 1 high alarm* *5=Probe 1 low alarm* *6=Probe 2 high alarm* *7=Probe 2 low alarm* *8=Probe 3 high alarm* *9=Probe 3 low alarm*	0	0	9		R/W	HR 5505
M	Ba07	NO1 regulation type *0=ON-OFF* *1=3-position valve opening* *2=3-position valve closing*	1	0	1		R/W	HR 5506
M	Ba08	Control type on output NO2 *0=Not enabled;* *1=Control on thresholds* *2=Control on St1 and B001* *3=Control on St2 and B002* *4=Alarm status* *5=Unit status ON/OFF* *6=Control status ON/OFF*	0	0	6		R/W	HR 5507
M	Ba09	NO2 regulation probe *0=Probe 1* *1=Probe 2* *2=Probe 1/probe 2 from DI1* *3=Probe 1 - probe 2* *4=Probe 2 - probe 1*	0	0	4		R/W	HR 5508
S	Ba10	NO2 activation	22	-199	999		R/W	HR 5509
S	Ba11	NO2 deactivation	20	-199	999		R/W	HR 5510
M	Ba12	NO2 output mode *0=Direct* *1=Reverse* *2=Direct/reverse from summer/winter*	0	0	2		R/W	HR 5511
M	Ba13	Alarm dependency for NO2 activation *0=Global alarm* *1=Probe 1 / circuit 1 alarm* *2=Probe 2 / circuit 2 alarm* *3=Probe 3 alarm* *4=Probe 1 high alarm* *5=Probe 1 low alarm* *6=Probe 2 high alarm* *7=Probe 2 low alarm* *8=Probe 3 high alarm* *9=Probe 3 low alarm*	0	0	9		R/W	HR 5512

M	Ba14	NO2 regulation type *0=ON-OFF* *1=3-position valve opening* *2=3-position valve closing*	0	0	2		R/W	HR 5513
M	Ba15	Control type on output NO3 *0=Not enabled;* *1=Control on thresholds* *2=Control on St1 and B001* *3=Control on St2 and B002* *4=Alarm status* *5=Unit status ON/OFF* *6=Control status ON/OFF*	0	0	6		R/W	HR 5514
M	Ba16	NO3 regulation probe *0=Probe 1* *1=Probe 2* *2=Probe 1/probe 2 from DI1* *3=Probe 1 - probe 2* *4=Probe 2 - probe 1*	0	0	4		R/W	HR 5515
S	Ba17	NO3 activation	22	-199	999		R/W	HR 5516
S	Ba18	NO3 deactivation	20	-199	999		R/W	HR 5517
M	Ba19	NO3 output mode *0=Direct* *1=Reverse* *2=Direct/reverse from summer/winter*	0	0	2		R/W	HR 5518
M	Ba20	Alarm dependency for NO3 activation *0=Global alarm* *1=Probe 1 / circuit 1 alarm* *2=Probe 2 / circuit 2 alarm* *3=Probe 3 alarm* *4=Probe 1 high alarm* *5=Probe 1 low alarm* *6=Probe 2 high alarm* *7=Probe 2 low alarm* *8=Probe 3 high alarm* *9=Probe 3 low alarm*	0	0	9		R/W	HR 5519
M	Ba21	NO3 regulation type *0=ON-OFF* *1=3-position valve opening* *2=3-position valve closing*	0	0	2		R/W	HR 5520
M	Ba22	Control type on output NO4 *0=Not enabled;* *1=Control on thresholds* *2=Control on St1 and B001* *3=Control on St2 and B002* *4=Alarm status* *5=Unit status ON/OFF* *6=Control status ON/OFF*	0	0	6		R/W	HR 5521
M	Ba23	NO4 regulation probe *0=Probe 1* *1=Probe 2* *2=Probe 1/probe 2 from DI1* *3=Probe 1 - probe 2* *4=Probe 2 - probe 1*	0	0	4		R/W	HR 5522
S	Ba24	NO4 activation	22	-199	999		R/W	HR 5523
S	Ba25	NO4 deactivation	20	-199	999		R/W	HR 5524
M	Ba26	NO4 output mode *0=Direct* *1=Reverse* *2=Direct/reverse from summer/winter*	0	0	2		R/W	HR 5525
M	Ba27	Alarm dependency for NO4 activation 0=Global alarm 1=Probe 1 / circuit 1 alarm 2=Probe 2 / circuit 2 alarm 3=Probe 3 alarm 4=Probe 1 high alarm 5=Probe 1 low alarm 6=Probe 2 high alarm 7=Probe 2 low alarm 8=Probe 3 high alarm 9=Probe 3 low alarm	0	0	9		R/W	HR 5526

M	Ba28	NO4 regulation type 0=ON-OFF 1=3-position valve opening 2=3-position valve closing	0	0	2		R/W	HR 5527
M	Ba30	Control type on output Y1 *0=Not enabled;* *1=Control on thresholds* *2=Control on St1 and B001* *3=Control on St2 and B002*	0	0	6		R/W	HR 5528
M	Ba31	Y1 regulation probe *0=Probe 1* *1=Probe 2* *2=Probe 1/probe 2 from DI1* *3=Probe 1 - probe 2* *4=Probe 2 - probe 1*	0	0	4		R/W	HR 5529
S	Ba32	Output Y1 at 100%	22	-199	999		R/W	HR 5530
S	Ba33	Output Y1 at 0%	20	-199	999		R/W	HR 5531
M	Ba34	Y1 output mode *0=Direct* *1=Reverse* *2=Direct/reverse from summer/winter*	0	0	2		R/W	HR 5532
M	Ba40	Control type on output Y2 *0=Not enabled;* *1=Control on thresholds* *2=Control on St1 and B001* *3=Control on St2 and B002*	0	0	6		R/W	HR 5533
M	Ba41	Y2 regulation probe *0=Probe 1* *1=Probe 2* *2=Probe 1/probe 2 from DI1* *3=Probe 1 - probe 2* *4=Probe 2 - probe 1*	0	0	4		R/W	HR 5534
S	Ba42	Output Y2 at 100%	22	-199	999		R/W	HR 5535
S	Ba43	Output Y2 at 0%	20	-199	999		R/W	HR 5536
M	Ba44	Y2 output mode *0=Direct* *1=Reverse* *2=Direct/reverse from summer/winter*	0	0	2		R/W	HR 5537

6.5 Alarm configuration

User	Code	Description	Def.	Min.	Max.	UOM	R/W	Modbus
S	C001	Status of the regulation outputs on circuit 1 with probe 1 alarm (See the table in paragraph 8.2)	0	0	63		R/W	HR 6000
S	C002	Status of the regulation outputs on circuit 2 with probe 2 alarm (See the table in paragraph 8.2)	0	0	63		R/W	HR 6001
S	C003	Probe 1 low alarm threshold	-50.0	-199	B014		R/W	HR 0018
S	C004	Probe 1 high alarm threshold	150	C003	800		R/W	HR 0019
S	C005	Probe 1 alarm differential	2	0	99	Delta	R/W	HR 0020
S	C006	Probe 1 alarm delay and delayed alarms from DI1	60	0	250	Sec	R/W	HR 6005
S	C007	Probe 1 alarm threshold type 0=relative 1=absolute	1	0	1		R/W	CS 6006
S	C008	Probe 2 low alarm threshold	-50	-199	C009		R/W	HR 0030
S	C009	Probe 2 high alarm threshold	150	C008	800		R/W	HR 0031
S	C010	Probe 2 alarm differential	2	0	99	Delta	R/W	HR 0032
S	C011	Probe 2 alarm delay and delayed alarms from DI2	60	0	999	Sec	R/W	HR 6010
S	C012	Probe 2 alarm threshold type (see C007)	1	0	1		R/W	CS 6011
S	C020	Status of regulation outputs with alarm from DI1 (See the table in paragraph 8.2)	0	0	63		R/W	HR 6012
S	C021	Status of regulation outputs with alarm from DI2 (See the table in paragraph 8.2)	0	0	63		R/W	HR 6013
S	C030	Probe 3 low alarm threshold	-50.0	-199	B014		R/W	HR 6014
S	C031	Probe 3 high alarm threshold	150	C030	800		R/W	HR 6015
S	C032	Probe 3 alarm differential	2	0	99	Delta	R/W	HR 6016
S	C033	Probe 3 alarm delay	60	0	999	Sec	R/W	HR 6017
S	ClrH	Clear the alarm log	0	0	1		R/W	CS 1100

6.6 Settings

User	Code	Description	Def.	Min.	Max.	UOM	R/W	Modbus
S	Hd00	BMS address	1	1	247		R/W	Not available
S	Hd01	BMS baud rate 0=1200 1=2400 2=4800 3=9600 4=19200 5=38400 6=57600 7=115200 8=375000	4	0	8		R/W	Not available
S	Hd02	BMS network settings 0= 8-NONE-1 1= 8-NONE-2 2= 8-EVEN-1 3= 8-EVEN-2 4= 8-ODD-1 5= 8-ODD-2	1	0	5		R/W	Not available
S	Hd03	Apply changes to BMS port	0	0	1		R/W	Not available
S	Hd04	Enable unit ON/OFF command via BMS network	0	0	1		R/W	CS 7000
S	Hd05	Delay at controller power on. Set 0 to disable	0	0	255	Sec	R/W	HR 7001
M	Hd97	Reset unit and output hour counters	0	0	1		R/W	CS 7002
S	Hd98	Enable buzzer	0	0	1		R/W	CS 7003
S	Hd99	Main screen return delay	60	10	9999	Sec	R/W	HR 7004
M	rStr	Restore default parameters	0	0	1		R/W	Not available

6.7 Clock

User	Code	Description	Def.	Min.	Max.	UOM	R/W	Modbus
U	dAY	Day setting		1	31		R/W	HR 8006
U	Mont	Month setting		1	12		R/W	HR 8007
U	YEAr	Year setting		17	99		R/W	HR 8008
U	Hour	Hour setting		0	23		R/W	HR 8009
U	Min	Minutes setting		0	59		R/W	HR 8010
S	SetC	Apply date-time changes		0	1		R/W	CS 8011

6.8 Scheduler

User	Code	Description	Def.	Min.	Max.	UOM	R/W	Modbus
U	Hb00	Enable scheduler	0	0	1		R/W	CS 9000
U	Hb01	P1 Time band 1 – Enable	1	0	1		R/W	CS 9001
U	Hb02	P1 Time band 1 – Start hours	8	0	23		R/W	HR 9002
U	Hb03	P1 Time band 1 – Start minutes	0	0	59		R/W	HR 9003
U	Hb04	P1 Time band 1 – Profile *0=COMFORT* *1=ECONOMY* *2=OFF*	0	0	2		R/W	HR 9004
U	Hb05	P1 Time band 2 - Enable	1	0	1		R/W	CS 9005
U	Hb06	P1 Time band 2 – Start hours	22	0	23		R/W	HR 9006
U	Hb07	P1 Time band 2 – Start minutes	0	0	59		R/W	HR 9007
U	Hb08	P1 Time band 2 – Profile (see Hb04)	1	0	2		R/W	HR 9008
U	Hb09	P1 Time band 3 – Enable	0	0	1		R/W	CS 9009
U	Hb10	P1 Time band 3 – Start hours	0	0	23		R/W	HR 9010
U	Hb11	P1 Time band 3 – Start minutes	0	0	59		R/W	HR 9011
U	Hb12	P1 Time band 3 – Profile (see Hb04)	0	0	2		R/W	HR 9012
U	Hb13	P1 Time band 4 – Enable	0	0	1		R/W	CS 9013
U	Hb14	P1 Time band 4 – Start hours	0	0	23		R/W	HR 9014
U	Hb15	P1 Time band 4 – Start minutes	0	0	59		R/W	HR 9015
U	Hb16	P1 Time band 4 – Profile (see Hb04)	0	0	2		R/W	HR 9016
U	Hb17	P2 Time band 1 – Enable	1	0	1		R/W	CS 9017
U	Hb18	P2 Time band 1 – Start hours	8	0	23		R/W	HR 9018
U	Hb19	P2 Time band 1 – Start minutes	0	0	59		R/W	HR 9019
U	Hb20	P2 Time band 1 – Profile (see Hb04)	0	0	2		R/W	HR 9020
U	Hb21	P2 Time band 2 – Enable	1	0	1		R/W	CS 9021
U	Hb22	P2 Time band 2 – Start hours	22	0	23		R/W	HR 9022
U	Hb23	P2 Time band 2 – Start minutes	0	0	59		R/W	HR 9023
U	Hb24	P2 Time band 2 - Profile (see Hb04)	2	0	2		R/W	HR 9024
U	Hb25	P2 Time band 3 – Enable	0	0	1		R/W	CS 9025
U	Hb26	P2 Time band 3 – Start hours	0	0	23		R/W	HR 9026
U	Hb27	P2 Time band 3 – Start minutes	0	0	59		R/W	HR 9027
U	Hb28	P2 Time band 3 – Profile (see Hb04)	0	0	2		R/W	HR 9028
U	Hb29	P2 Time band 4 – Enable	0	0	1		R/W	CS 9029
U	Hb30	P2 Time band 4 – Start hours	0	0	23		R/W	HR 9030
U	Hb31	P2 Time band 4 – Start minutes	0	0	59		R/W	HR 9031
U	Hb32	P2 Time band 4 – profile (see Hb04)	0	0	2		R/W	HR 9032
U	Hb33	P3 Time band 1 – Enable	1	0	1		R/W	CS 9033
U	Hb34	P3 Time band 1 – Start hours	8	0	23		R/W	HR 9034
U	Hb35	P3 Time band 1 – Start minutes	0	0	59		R/W	HR 9035
U	Hb36	P3 Time band 1 – Profile (see Hb04)	1	0	2		R/W	HR 9036
U	Hb37	P3 Time band 2 – Enable	1	0	1		R/W	CS 9037
U	Hb38	P3 Time band 2 – Start hours	22	0	23		R/W	HR 9038
U	Hb39	P3 Time band 2 – Start minutes	0	0	59		R/W	HR 9039
U	Hb40	P3 Time band 2 – Profile (see Hb04)	2	0	2		R/W	HR 9040
U	Hb41	P3 Time band 3 – Enable	0	0	1		R/W	CS 9041
U	Hb42	P3 Time band 3 – Start hours	0	0	23		R/W	HR 9042
U	Hb43	P3 Time band 3 – Start minutes	0	0	59		R/W	HR 9043
U	Hb44	P3 Time band 3 – Profile (see Hb04)	0	0	2		R/W	HR 9044
U	Hb45	P3 Time band 4 – Enable	0	0	1		R/W	CS 9045
U	Hb46	P3 Time band 4 – Start hours	0	0	23		R/W	HR 9046
U	Hb47	P3 Time band 4 – Start minutes	0	0	59		R/W	HR 9047

U	Hb48	P3 Time band 4 – Profile (see Hb04)	0	0	2		R/W	HR 9048
U	Hb49	Monday profile *0=COMFORT* *1=ECONOMY* *2=OFF* *3=Program 1 (P1)* *4=Program 2 (P2)* *5=Program 3 (P3)*	3	0	5		R/W	HR 9049
U	Hb50	Tuesday profile (see Hb49)	3	0	5		R/W	HR 9050
U	Hb51	Wednesday profile (see Hb49)	3	0	5		R/W	HR 9051
U	Hb52	Thursday profile (see hb49)	3	0	5		R/W	HR 9052
U	Hb53	Friday profile (see Hb49)	4	0	5		R/W	HR 9053
U	Hb54	Saturday profile (see Hb49)	5	0	5		R/W	HR 9054
U	Hb55	Sunday profile (see Hb49)	5	0	5		R/W	HR 9055
U	Hb56	Enable vacation period	0	0	1		R/W	CS 9056
U	Hb57	Vacation start day	1	1	31		R/W	HR 9057
U	Hb58	Vacation start month	1	1	12		R/W	HR 9058
U	Hb59	Vacation end day	1	1	31		R/W	HR 9059
U	Hb60	Vacation end month	1	1	12		R/W	HR 9060
U	Hb61	Vacation period mode (see Hb49)	0	0	5		R/W	HR 9061

7. SUPERVISION

The Universal Controller provides, via the J4-BMS terminal, a database of registers available for supervision via the Modbus RTU protocol over RS485. The BMS port is set by default with the following communication parameters, which can be set on the user interface and in Applica:

Code	Description	Default
Hd00	BMS address	1
Hd01	BMS baud rate *0=1200* *1=2400* *2=4800* *3=9600* *4=19200* *5=38400* *6=57600* *7=115200* *8=375000*	19200 kbps
Hd02	BMS network settings *0= 8-NONE-1* *1= 8-NONE-2* *2= 8-EVEN-1* *3= 8-EVEN-2* *4= 8-ODD-1* *5= 8-ODD-2*	8-NONE-2
Hd03	Apply changes to BMS port	0

Notice:
- fixed 8 bit data bits.
- To make the changes to parameters Hd00, Hd01 and Hd02 active, parameter Hd03 must be set to 1 (Yes).
- The Modbus registers of the regulation variables and parameters are available in an extended list downloadable from ksa.carel.com.

7.1 Unit on/off management from BMS

The unit On/Off status can also be managed from the BMS supervisor.

By setting "Enable unit ON/OFF command via BMS network" (parameter Hd04, Coil Status register 7000) and "Set unit On/Off from keypad" (parameter UnSt, Coil Status register 35), unit ON/OFF can be controller via BMS using variable BmsOffOn (Coil Status register 1000).

7.2 Supervisor model for Boss and PlantVisorPRO range

The supervisor model in .xml format for the Boss and PlantVisorPRO range supervisors is available on ksa.carel.com, in the reserved area for the Universal Controller.

8. ALARMS AND SIGNALS

8.1 Types of alarms

The controller manages two types of alarms, depending on the reset mode:

- Automatic: the alarm is reset automatically when the alarm condition ceases
- Manual: the needs to reset the alarm manually (by pressing and holding the ALARM button or by sending a specific command from Applica or the supervisor) to resume regulation. For some alarms, the reset mode can be configured by parameter.

Each alarm situation identified is signalled on the display by the flashing red ALARM icon (see paragraph 3.2.2).

8.2 Override regulation outputs

The probe 1, probe 2 alarms and the alarms from DI1 and DI2 (see the complete alarm list in paragraph 8.3) can be used to override the regulation outputs when the alarm is activated. This only happens if the unit is initially On from all available and configured sources (keypad, digital input, time bands and supervisor).

The following parameters are used to set these constraints:

Code	Description	Default
C001	Status of the regulation outputs on circuit 1 with probe 1 alarm	0
C002	Status of the regulation outputs on circuit 2 with probe 2 alarm	0
C020	Status of regulation outputs with alarm from DI1	0
C021	Status of regulation outputs with alarm from DI2	0

Each value from 0 to 63 can set different overrides on the digital and analogue outputs, as shown in the following summary table:

C001 – C002 – C020 – C021															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1
NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2
NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3
NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4
Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1
Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1
NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2
NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3
NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4
Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1
Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1
NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2
NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3
NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4
Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1
Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2
48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1	NO1
NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2	NO2
NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3	NO3
NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4	NO4
Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1
Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2

Key
GREEN = digital output active / analogue output at 100%
GREY = digital output off / analogue output at 0%

Example:
to activate outputs NO1, NO3, Y1 and deactivate NO2, NO4, Y2 following a serious alarm from digital input DI1, to set parameter C020 to 21.

8.3 Alarm list

Notice:
Automatic reset: the alarm is reset automatically when the alarm condition ceases
Manual reset: the user needs to reset the alarm and restart regulation
Modbus: HR=Holding register; IR=Analogue input; CS=Coil status; DI=Digital input; (2R)=32 bit register;

Code	Cause	Reset	Action	Solution	Modbus
A01	Probe 1 (S06) disconnected alarm	Automatic	Stop regulation on circuit 1 and override corresponding outputs according to C001	Check the connection of probe 1 (S06)	DI 0008
A02	Probe 2 (S04) disconnected alarm	Automatic	If B000 > 0 and B012 = 1 or 2 or B000 = 0, circuit 2 regulation is stopped and the corresponding outputs are overridden according to C002. Otherwise, regulation is not stopped	Check the connection of probe 2 (S04)	DI 0020
A03	Probe 3 (S05) disconnected alarm	Automatic	Stop compensation	Check the connection of probe 3 (S05)	DI 0009
A04	The value of probe 1 is higher than the threshold C004 for a time C006	Automatic	Signal only	Check the setting of parameters C004, C005, C006, C007.	DI 0011
A05	The value of probe 1 is lower than the threshold C003 for a time C006	Automatic	Signal only	Check the setting of parameters C003, C005, C006, C007.	DI 0012
A06	The value of probe 2 is higher than the threshold C009 for a time C011	Automatic	Signal only	Check the setting of parameters C009, C010, C011, C012.	DI 0021
A07	The value of probe 2 is lower than the threshold C008 for a time C011	Automatic	Signal only	Check the setting of parameters C008, C010, C011, C012.	DI 0022
A08	The value of probe 3 is higher than the threshold C031 for a time C033	Automatic	Signal only	Check the setting of parameters C031, C032, C033.	DI 0048
A09	The value of probe 3 is lower than the threshold C030 for a time C033	Automatic	Signal only	Check the setting of parameters C030, C032, C033.	DI 0049
A10	Immediate/delayed signal-only alarm from digital input	Automatic	Signal only	Check the cause of the digital input alarm signal.	DI 0051
A11	Immediate/delayed serious alarm from digital input on circuit 1	According to Io11 or Io13	Stop circuit 1 regulation and override corresponding output according to C020 (if assigned to DI1) or C021 (if assigned to DI2)	Check the cause of the digital input alarm signal.	DI 0010
A12	Immediate/delayed serious alarm from digital input on circuit 2	According to Io11 or Io13	Stop circuit 2 regulation and override corresponding output according to C020 (if assigned to DI1) or C021 (if assigned to DI2)	Check the cause of the digital input alarm signal.	DI 0052
A98	Error in number of permanent memory writes	Manual	Signal only	Try manually resetting the alarm. If the alarm persists, contact service.	DI 0016
A99	RTC error	Automatic	Signal only	Update the time via display or Applica.	DI 0015

9. TECHNICAL SPECIFICATIONS

Model	U20R00UC00200 (Panel model)	U20R00UC00250 (DIN rail model)
Physical specifications		
Dimensions	See figures	See figures
Case	Polycarbonate	Polycarbonate
Mounting	Panel	DIN rail
Ball pressure test temperature	125°C	125°C
Ingress protection	IP20 (rear) - IP65 (front)	IP00
Front cleaning	Use soft, non-abrasive cloth and neutral detergent or water	-
Environmental conditions		
Storage conditions	-40T85°C, <90% RH non-condensing	-40T85°C, <90% RH non-condensing
Operating conditions	-20T60°C, <90% RH non-condensing	-20T60°C, <90% RH non-condensing
Electrical specifications		
Rated power supply	24 Vac/dc (SELV or PELV power supply, Class 2)	24 Vac/dc (SELV or PELV power supply, Class 2)
Operating power supply voltage	24 Vac/dc, +10% -15%	24 Vac/dc, +10% -15%
Input frequency (AC)	50/60 Hz	50/60 Hz
Maximum current draw	600 mA rms	600 mA rms
Power for transformer sizing	15VA	15VA
Clock	Precision: ±50 ppm; min. retention time after power off: 72h	Precision: ±50 ppm; min. retention time after power off: 72h
Software class and structure	A	A
Pollution degree	3	3
Class of protection against electric shock	To be incorporated in class I or II appliances	To be incorporated in class I or II appliances
Type of action and disconnection	See table in paragraph 1.3.1	See table in paragraph 1.3.1
Rated impulse voltage	Relay outputs: 4 kV; 24 V input: 0.5 kV	Relay outputs: 4 kV; 24 V input: 0.5 kV
Surge immunity category	Relay outputs: III; 24 V input: II	Relay outputs: III; 24 V input: II
Control device construction	Device to be incorporated	Device to be incorporated
Terminal block	Plug-in male-female. Wire sizes: see the connector table	Plug-in male-female. Wire sizes: see the connector table
Purpose of the controller	Electrical operating regulation	Electrical operating regulation
User interface		
Buzzer	Integrated	Integrated
Display	LED 2 rows, decimal point, and multi-function icons	LED 2 rows, decimal point, and multi-function icons
Connectivity		
Bluetooth Low Energy	Max distance 10m, variable according to the mobile device used	Max distance 10m, variable according to the mobile device used
BMS serial interface	Modbus over RS485, not opto-isolated	Modbus over RS485, not opto-isolated
FieldBUS serial interface	Modbus over RS485, not opto-isolated	Modbus over RS485, not opto-isolated
Analogue inputs (Lmax=10)		
J2 S1, S2, S3: NTC S5: 0 to 5 V ratiometric / 4-20 mA / NTC	NTC: resolution 0.1°C; 10Kohm@25°C, error: ±1°C in range -50T50°C, ±3°C in the range 50T90°C 0-5 V ratiometric: error 2% fs, typical 1%; 4-20 mA: error 2% fs, typical 1%	NTC: resolution 0.1°C; 10Kohm@25°C, error: ±1°C in range -50T50°C, ±3°C in the range 50T90°C 0-5 V ratiometric: error 2% fs, typical 1%; 4-20 mA: error 2% fs, typical 1%
J3 S4: 0 to 5 V ratiometric / 4-20 mA / NTC S6: 0 to 5 V ratiometric / 0-10 V / 4-20 mA / NTC	0-5 V ratiometric: error 2% fs, typical 1%; 4-20 mA: error 2% fs, typical 1% 0-10 V: error 2% fs, typical 1%	0-5 V ratiometric: error 2% fs, typical 1%; 4-20 mA: error 2% fs, typical 1% 0-10 V: error 2% fs, typical 1%
J9 S7: NTC (DIN version only)	-	NTC: resolution 0.1 °C; 10Kohm@25°C, error: ± 1°C in the range - 50T50°C ± 3°C in the range 50T90°C
Digital inputs (Lmax=10)		
J2 ID1, ID2 J3 ID3, ID4, ID5 J9 ID6 – DIN model only	Voltage-free contact, not opto-isolated, typical closing current 6 mA, open contact voltage 13 V, open contact resistance 13 V, max contact resistance 50 Ω. (*) Fast digital input: 0-2 kHz; error 2% fs	Voltage-free contact, not opto-isolated, typical closing current 6 mA, open contact voltage 13 V, open contact resistance 13 V, max contact resistance 50 Ω. (*) Fast digital input: 0-2 kHz; error 2% fs
Analogue outputs (Lmax=10m)		
J14 Y1, Y2	0 to 10 Vdc: 10 mA max	0 to 10 Vdc: 10 mA max

Digital outputs (Lmax=10m)

Note: the sum of current draw on NO1, NO2, NO3 and NO4 must not exceed 8 A		
J6 NO1 (5 A), NO2 (5 A), NO3 (5 A), NO4 (5A)	5 A: EN60730: 5 A resistive, 250 Vac, 50k cycles; 4(1), 230 Vac, 100k cycles; 3 (1), 230 Vac, 100k cycles UL60730: 5 A resist., 250 Vac, 30k cycles; 1FLA, 6LRA, 250 Vac, 30k cycles; Pilot Duty C300, 30k cycles	5 A: EN60730: 5 A resistive, 250 Vac, 50k cycles; 4(1), 230 Vac, 100k cycles; 3 (1), 230 Vac, 100k cycles UL60730: 5 A resist., 250 Vac, 30k cycles; 1FLA, 6LRA, 250 Vac, 30k cycles; Pilot Duty C300, 30k cycles
J7 NO5 (5 A)		
J11 NO6(5A) – DIN model only		

Probe and terminal power supply (Lmax=10m)

5 V	5 Vdc ± 2% to power the 0 to 5 V ratiometric probes. Max current delivered: 35 mA protected against short-circuits	5 Vdc ± 2% for power supply to 0 to 5 V ratiometric probes Max current delivered: 35 mA protected against short-circuits
+V	8-11 V to power the 4-20 mA current probes. Maximum current delivered: 80 mA protected against short-circuits	8-11 V to power the 4-20 mA current probes. Maximum current delivered: 80 mA protected against short-circuits
VL	Not used	Not used
J8	User terminal power supply	User terminal power supply

Serial ports

BMS	Lmax = 500 m, shielded cable (RS485 1½ twisted pair) (1) Integrated Protocol: Modbus HW driver: asynchronous half duplex RS485 Not optically-isolated 3-pin plug-in connector, 3.81mm pitch Max data rate: 115200 bits/s Maximum number of connectable devices: 16	Lmax = 500 m, shielded cable (RS485 1½ twisted pair) (1) Integrated Protocol: Modbus HW driver: asynchronous half duplex RS485 Not optically-isolated 3-pin plug-in connector, 3.81mm pitch Max data rate: 115200 bits/s Maximum number of connectable devices: 16
FieldBus	Lmax = 10 m, shielded cable (RS485 1½ twisted pair) (1) Integrated HW driver: asynchronous half duplex RS485 Typical reception resistance 96 kohms, equal to 1/8 of unit load, i.e. 1/256 of maximum load applicable on the row Not optically-isolated Max data rate: 19200 bits/s Maximum number of connectable devices: 16 Protocol: ModBus RTU	Lmax = 10 m, shielded cable (RS485 1½ twisted pair) (1) Integrated HW driver: asynchronous half duplex RS485 Typical reception resistance 96 kohms, equal to 1/8 of unit load, i.e. 1/256 of maximum load applicable on the row Not optically-isolated Max data rate: 19200 bits/s Maximum number of connectable devices: 16 Protocol: ModBus RTU

Cable lengths

Analogue inputs/outputs, digital inputs/outputs, probe power	< 10m (*) (*) in the panel version, if using the +13 V power supply in domestic environments, the maximum cable length is 2 m.	
BMS and Fieldbus serial	<500 m with shielded cable	<500 m with shielded cable

Conformity

Electrical safety	EN/UL 60730-1, EN/UL 60335-1	EN/UL 60730-1, EN/UL 60335-1
Electromagnetic compatibility	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4
Applications with flammable refrigerant gases	EN/UL 60079-15, EN/UL 60335-2-34, EN/UL 60335-2-40, EN/UL 60335-2-89	EN/UL 60079-15, EN/UL 60335-2-34, EN/UL 60335-2-40, EN/UL 60335-2-89
Wireless compliance	RED, FCC, IC	RED, FCC, IC

Notice: (1) it is recommended to use a BELDEN 8761 cable (AWG 22).

9.1 Connector/cable table

Ref.	Description	Wiring terminals	Wire cross-section (mm^2)	Lmax (m)
J1	Controller power supply	Panel model: removable terminal, screw, 2-pin, pitch 5.08	0.5 to 1.5	10
		DIN rail model: removable terminal, screw, 2-pin, pitch 5.08	0.21 to 3.31	10
J2	Inputs S1, S2, S3, S5, ID1, ID2; Outputs Y1, Y2	10-pin Microfit crimp connector	0.05 to 0.52	10
J3	Inputs S4, S6, ID3, ID4, ID5	8-pin Microfit crimp connector	0.05 to 0.52	10
J4	BMS	Plug-in screw terminal, 3-pin, pitch 3.81	0,081 to 1.31	500
J5	Fbus	Plug-in screw terminal, 3-pin, pitch 3.81	0,081 to 1.31	10
J6	Outputs NO1, NO2, NO3, NO4	6-pin Microfit crimp connector	0.5 to 1.31	10
J7	Output NO5	3-pin Microfit crimp connector	0.5 to 1.31	10
J9	Inputs S7, ID6	4-pin Microfit crimp connector	0.05 to 0.52	10
J11	Output NO6	3-pin Microfit crimp connector	0.5 to 1.31	10

10. RELEASE NOTES

REVISION	DATE	DESCRIPTION
1.0.0	31.01.2025	First draft of the document

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