D 412
10.06.10 AM
REV. 02

UNIVERSAL CONTROLLER

C ←BUS

DRU 414 - 418 Eng.

- **Universal controller**
- **Communication systems:**
  – C-Bus for remote management
- **Power supply: 24 V a.c. (DRU 414); 230 V a.c. (DRU 418) or 240 V a.c. for UK market .**
- **Installation on DIN rail.**

CE

1. USE

The DRU 414 - 418 is used to control:

- a physical magnitude (pressure, humidity, etc.) measured by means of a 0…10 V– (B1) active sensor
  or
- temperature (0…99 °C) measured by means of a NTC 10 kΩ (B2) passive sensor

By means of the following PI controls:

- 0…10 V– progressive
  or
- 3-way modulating
  or
- 2-wire On-Off for two equal loads
  or
- 3-wire On-Off for two different loads

The controller may be inserted into a remote management system by means of a C-Bus connection.

2. FUNCTIONS

The main functions of the DRU 414 - 418 are:

- setpoint control
- 2 On-Off output load or measure limit controls (only with 0…10 V– progressive control)
- remote control setpoint adjustment

3. SENSORS AND ACCESSORIES

n.	Description	Model	Measurement range	Code	Data sheet
1	Immersion temperature sensor	**SIH 010**	0… 100 °C	B2	N140
	Room temperature sensor	**SAB 010**	0… 40 °C	B2	N 111
	Relative humidity channel sensor (for pools)	**SUT 714**	10… 90 %	B1.1	N 222
	Relative humidity channel sensor	**SUR 704**	10… 90 %	B1.1	N 221
	Relative humidity and room temperature sensor	**SAU 914**	10… 90 %	B1.1	N 227
	Pressure sensor for liquids or air	**SPR 103**	0… 3 bar	B1.4	N 410
	Pressure sensor for liquids or air	**SPR 106**	0… 6 bar	B1.4	N 410
	Differential pressure sensor for liquids or vapour (with SPR 103)	**SPD 103**	0…5 / 0...10 m.c.a	B1.4	N 420
	Differential pressure sensor for liquids or vapour (with SPR 106)	**SPD 106**	0…5 / 0...10 m.c.a	B1.4	N 420
	Differential air pressure sensor	**SDA 701**	0… 1 mbar	B1.3	N 430
	Differential air pressure sensor	**SDA 703**	0… 3 mbar	B1.3	N 430
	Differential air pressure sensor	**SDA 705**	0… 5 mbar	B1.3	N 430
	Differential air pressure sensor	**SDA 730**	0…30 mbar	B1.3	N 430
1	Setpoint adjuster: a) with temperature sensors (B2) b) with active sensors (B1):	**CDB 100**	– ± 5°C ± 5 % of the full range	Rt	N 710

1 mbar = 10 mmWG = 100 Pa

4. TECHNICAL DATA

• Electrical

Power supply:	
DRU 414	24 V a.c. ± 10%
DRU 418	230 V a.c. ± 10%
	or 240 V a.c. for UK market
Frequency	50 … 60 Hz
Consumption	3 VA
Protection	IP40
Active sensor internal power supply	12 V– / 5 mA
Radio disturbances	VDE0875/0871
Vibration test	with 2g (DIN 40 046)
Voltage-free output contacts:	
maximum switched voltage	250 V AC
maximum load	5 (1) Amp
Construction standards	CEI
Software	Class A

• Mechanical

Enclosure	DIN 4E module
Installation	on DIN 35 rail
Materials:	
base	NYLON
cover	ABS
Anbient temperature:	
operation	0 … 45 °C
storage	– 25 … + 60 °C
Ambient humidity	Class F DIN 40040
Weight	0.27 Kg

• Measurement ranges

Temperature	0…99.9 °C
Absolute pressure - liquids or vapours	0 … 16 bar
Differential pressure - liquids	0 … 6 bar
Differential pressure - air	0 … 30 mbar
Relative humidity	0…100 %
Other measurement ranges	Settable

• Setting ranges

Control output caratteristica PI:

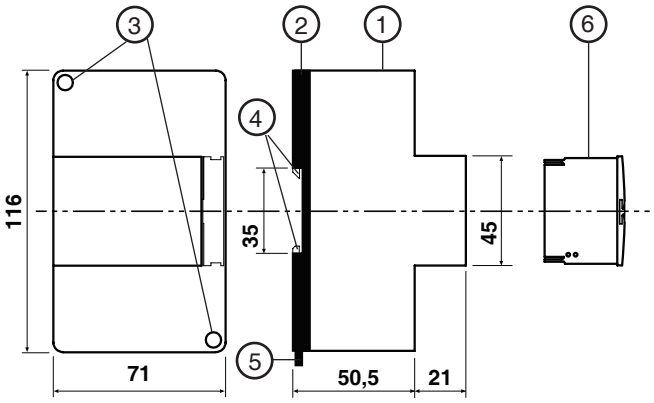
– **0…10 V– progressive**
– 3-wire modulating
– 2-wire On-Off (1; 1+2)
– 3-wire On-Off (1; 2; 1+2)

Output mode: – **Inverted**
– Normal

Modulating output data:	
Actuator run time	60 - **90** - 120 - 180 sec.
Proportional temperature range	± 0.5…**2**…99 °C
Integral time	0…**10**…255 min.
On-Off stage output data:	
On-Off differential	0.5…**2**…99 °C
Input signal pass range	**0**…50.0 °C
Full remote management of data and settings	
Communication speed	**1200**...9600 baud
Electronic alarm send	YES / **NO**

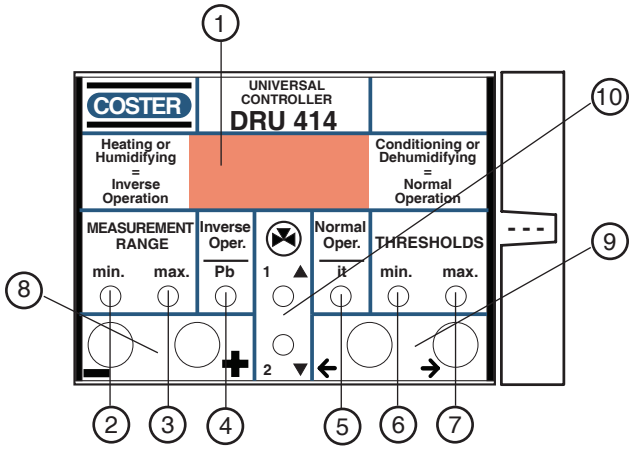
The setting ranges for the adjusment of other measurements depend on the scales of the measurements.

5. OVERALL DIMENSIONS



1 – Protective cover for electronic components
2 – Base with transformer, relay and terminal blocks
3 – Screws for securing base and cover
4 – DIN rail securing elements
5 – DIN rail release lever
6 – Local readout socket cover

6. FRONT PANEL



1 – 3-digit numeric display
2 – Measurement range minimum physical value, with 0...10 Volt – sensor (B1)
3 – Measurement range maximum physical value, with 0...10 Volt – sensor (B1)
4 – Controller use = adjustment in inverted mode (e.g.: heating)
During setting = Proportional Range
5 – Controller use = adjustment in normal mode (e.g.: conditioning)
During setting = Integral Time
6 – Minimum threshold (set magnitude or output mode)
7 – Maximum threshold (set magnitude or output mode)
8 – + and – buttons
9 – ← and → buttons
10 – Relay output readings:
- Open/Close (valve control)
- 1st/2nd stage (stage On-Off control)
- Usati come limiti min/max (Measurement range or azione output)

7. SITING

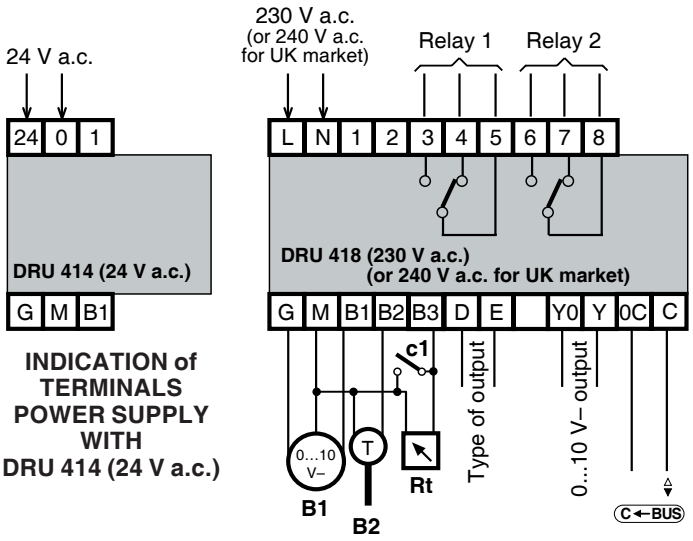
The controller must be installed in a dry location that meets the conditions specified in Section 4.TECHNICAL DATA. It must be housed in an electrical installation constructed according to standard IEC 79-14 (CEI EN 60079-14) and sited in a non-hazardous area in line with standard IEC 79-10 (CEI EN 60079-14), free from potential explosive atmospheres due to the presence of gas in sufficient quantities to require special measures for the installation and use of the electrical devisces.
The controller can be mounted on a DIN rail and housed in a standard DIN enclosure.

8. ELECTRICAL CONNECTIONS

Proceed as follows :
- Separate base and cover
- Mount the base on the DIN rail and check that it is anchored by the securing elements (5.4)
- Make electrical connections in strict accordance with the diagram and in respect of applicable safety regulations, using the following cables :
  – 1.5 mm² for power supply and relay control outputs.
  – 1 mm² for sensor and the setting controller.
  – 1 mm² for C-Bus. For length limits see Technical Data Sheet T 021.
- Switch on power and check that terminals L and N are live.
- Switch off power, replace the cover on the base/terminal block and secure it with the two screws supplied (5.3).

WARNING! : If on 24 V a.c, the controller must be powered using a 230/24 V a.c. dedicated transformer; do not use any power from the auxiliary circuits on the electric switchboard.
Do not connect more than two wires to each terminal; if necessary, use external terminals.

9. WIRING DIAGRAMS



G – 12 V– power supply output for active sensor
M – 0 V– analogue for sensors
B1 – Active sensor 0...10 V– (alternative to B2)
B2 – NTC 1 kΩ temperature sensor (alternative to B1) 0...99.9°C
Rt – Setpoint adjuster
c1 – Remote Control "device operational / not operational":
Switch open = Controller OPERATIONAL
Switch closed = Controller NOT OPERATIONAL
D – digital 0 Volt
E – Output action setting
D – E not short-circuited = Inverse operation
Increase of adjusted quantity = reduction of required output power for the load (e.g.: heating)
D – E short-circuited = Normal Operation
Increase of adjusted quantity = increase of of required output power for the load (e.g.: conditioning)

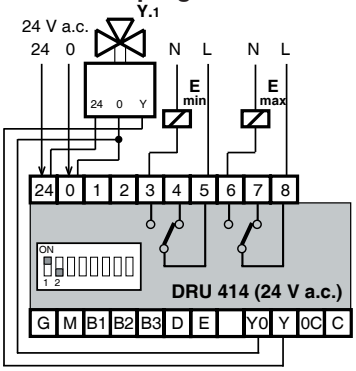
Y0 – **Cold pole for optoinsulated 0...10 Volt output**
Y – **Hot pole for 0...10 Volt optoinsulated output**
Maximum applicable load: 10 mA

C-Bus – Data transmission for remote management.
This function does not require activation plug-ins
L - N – Line and Neutral 230 V a.c. power supply:
DRU 418 = 230 V a.c. (or 240 V a.c. for UK market)
24 - 0 – 24 V a.c power supply: **DRU 414 = 24 V a.c.**
Relay 1– Valve Open, first stage or minimum threshold
Relay 2– Valve Close, second stage or maximum threshold

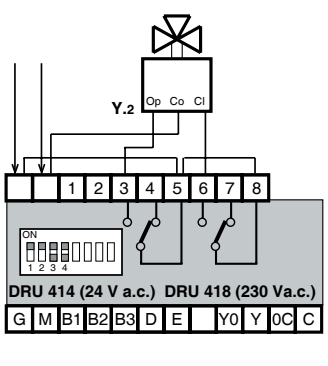
WARNING: the 0...10 Volt c.c. analogue output (Y0. Y) is optoinsulated, and therefore Y0 is insulated from the device's 0 Volt. The devices requiring this input are almost always of two types :
– DEVICES WITH 0 Volt INPUT INSULATED FROM POWER SUPPLY (e.g.: 230 Volt a.c. INVERTER): in this case, Y0 must only be connected to this input.
– DEVICES WITH 0 Volt INPUT CONNECTED TO THE NEUTRAL OF THE A 24 Volt a.c. POWER SUPPLY (e.g.: AIR LOCKS, SDA 7.. or SPW 1.. DIFFERENTIAL PRESSURE SENSORS): in this case the controller can only be 24 Volt a.c. (DRU 414). Y0 is connected to both the input and the power supply neutral.
See examples provided in Sections 9.1, 10.1, and 11.1.
– 24 Volt a.c. SENSORS OR OPERATION, AND 230 Volt a.c. CONTROLLER: in this case, use a 230 Volt a.c. /24 Volt a.c. transformer.

9.1 Examples of output control actions

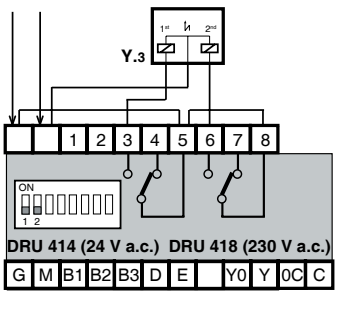
0…10 V– progressive



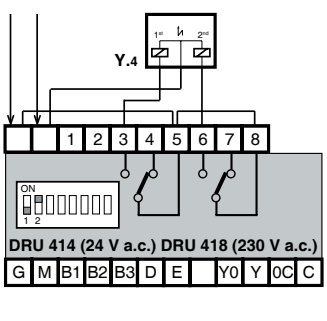
3-wire modulating



2-stage On-Off (1 ; 1+2)



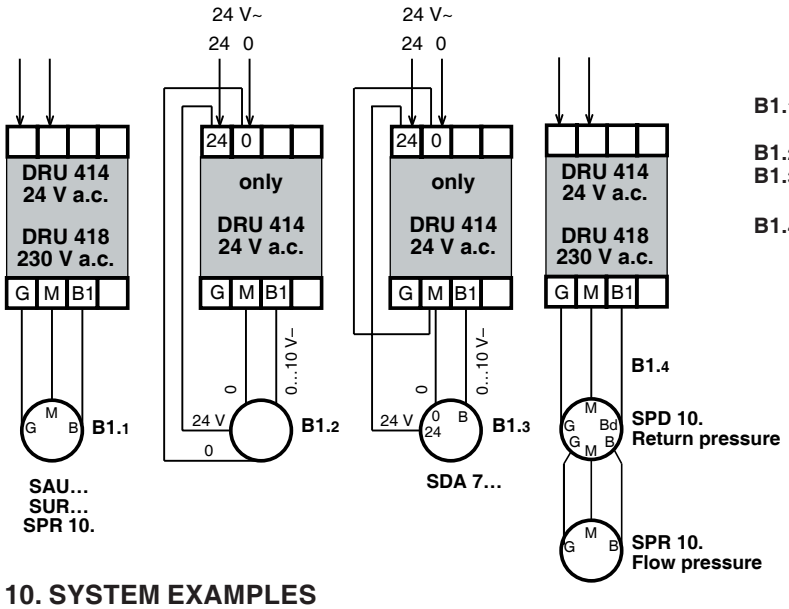
3-stage On-Off (1 ; 2 ; 1+2)



Y.1 – Valve or air lock with 0…10 V– control and 24 Volt AC power supply
Y.2 – 3-wire modulating actuator
Y.3 – 2-stage electrical load (2 equal loads)
Y.4 – 3-stage electrical load (2 different loads)

Emin – On-Off control for adjusted quantity or output load minimum threshold
Emax – On-Off control for adjusted quantity or output load maximum threshold

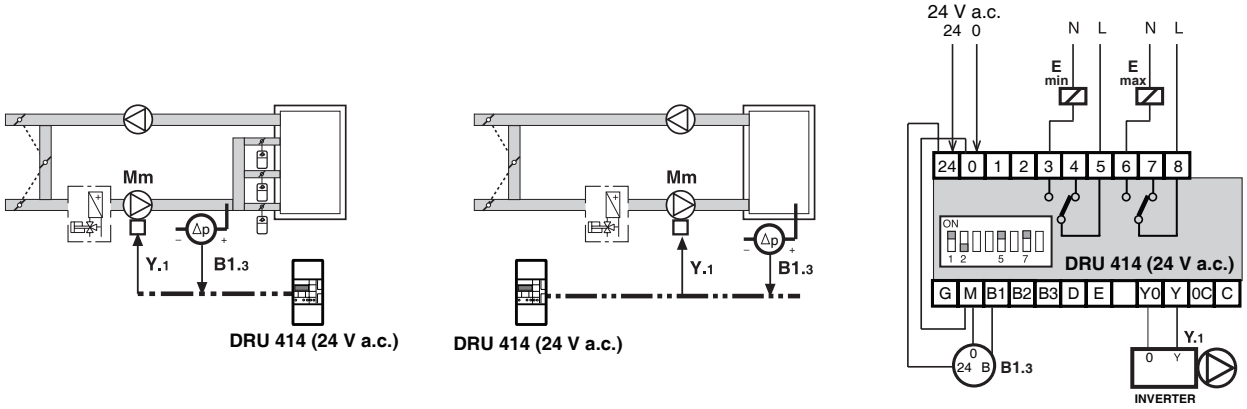
9.2 Active sensor connection examples



B1.1 – Active sensor 0...10 V– with 12 V– / 5mA internal power supply (SAU… ; SUR…)
B1.2 – 0...10 V– active sensor with separate 24 V a.c. power supply
B1.3 – 0...10 V– active sensor with shared 24 V a.c. power supply (SDA 7…)
B1.4 – 0...10 V– active sensor for differential pressure measurement (SPD 10. with SPR 10.)

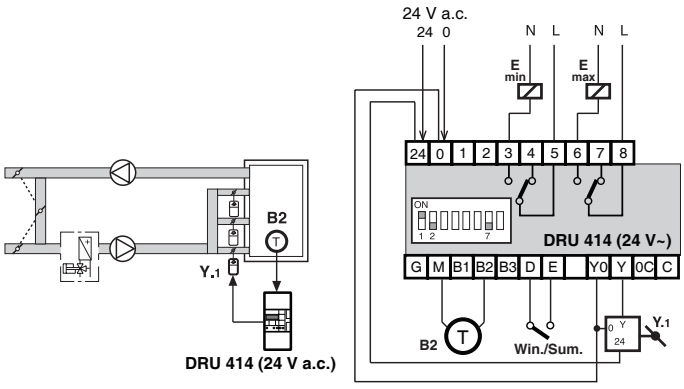
10. SYSTEM EXAMPLES

10.1 Adjustment of discharge pressure or ambient overpressure with progressive fan speed control



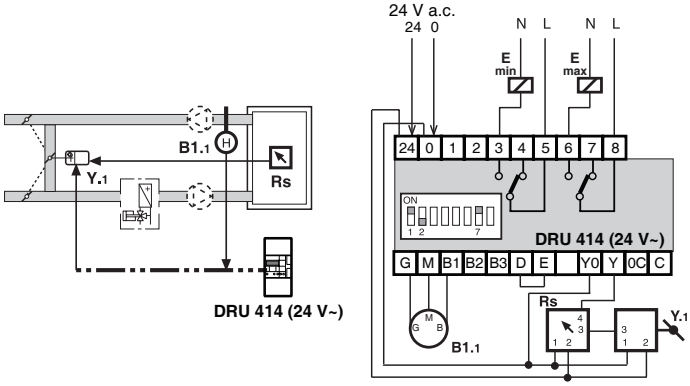
B1.3 – SDA 7… differential air pressure sensor
Y.1 – Inverter
Emin – On-Off control for adjusted quantity or output load minimum threshold
Emax – On-Off control for adjusted quantity or output load maximum threshold

10.2 Adjustment of ambient temperature with progressive terminal unit air lock control



B2 – SAB 010 ambient temperature sensor
Y.1 – Local air lock actuator
Win./Sum. – Control action inversion switch
Winter = heating = switch open
Summer = conditioning = switch closed
Emin – On-Off control for minimum threshold
Emax – On-Off control for maximum threshold

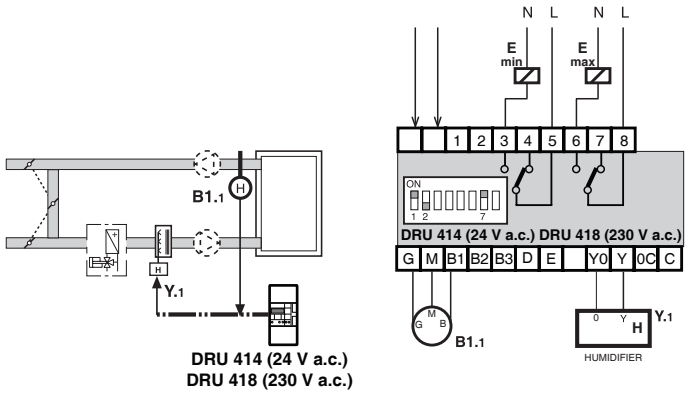
10.3 Adjustment of dehumidification with progressive external air lock control



B1.1 – SAU … ; SUR … humidity sensor
Y.1 – Air lock actuator
Rs – Minimum external air damper actuator
Emin – On-Off control for minimum threshold
Emax – On-Off control for maximum threshold

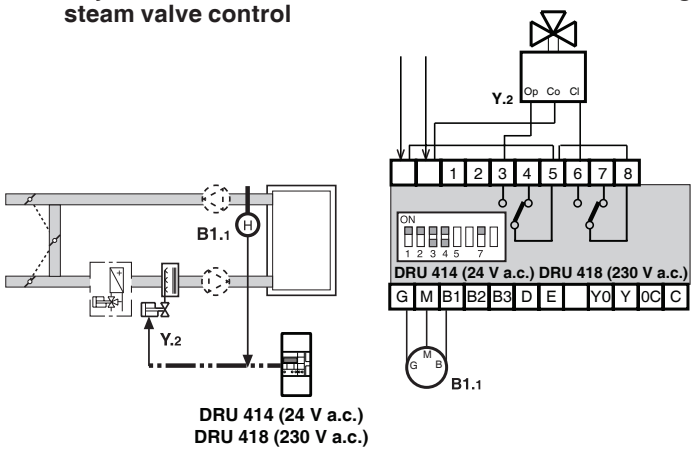
D - E = Short-circuited with a jumper, as the controller is in Normal operation mode: the higher the humidity, the wider the air locks need to be.
THIS APPLICATION IS VIRTUALLY FOR SWIMMING POOLS ONLY IN WINTER (HEATING) MODE.

10.4 Adjustment of humidification with progressive vaporiser control



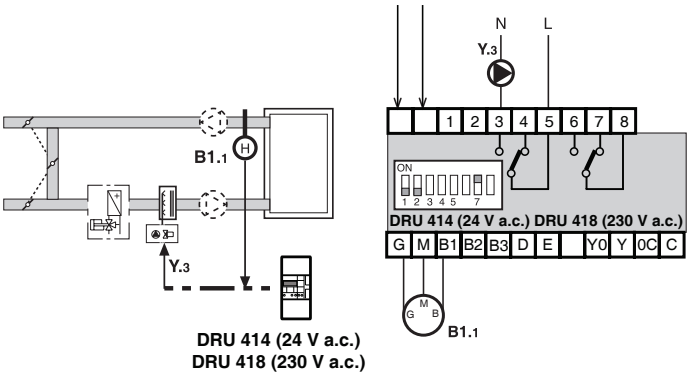
B1.1 – SAU ... ; SUR ... humidity sensor
Y.1 – Vaporiser

10.5 Adjustment of humidification with 3-wire modulating steam valve control



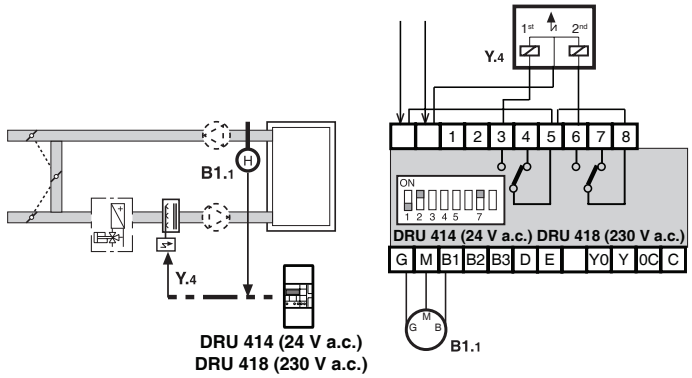
B1.1 – SAU ... ; SUR ... humidity sensor
Y.2 – 3-wire modulating steam valve

10.6 Adjustment of humidification with On-Off adiabatic humidifier control (pump or electrovalve)



B1.1 – SAU ... ; SUR ... humidity sensor
Y.3 – Humidifier pump or electrovalve

10.7 Adjustment of humidification with 3-stage On-Off vaporiser control (2 different loads)



B1.1 – SAU ... ; SUR ... humidity sensor
Y.4 – Vaporiser resistors

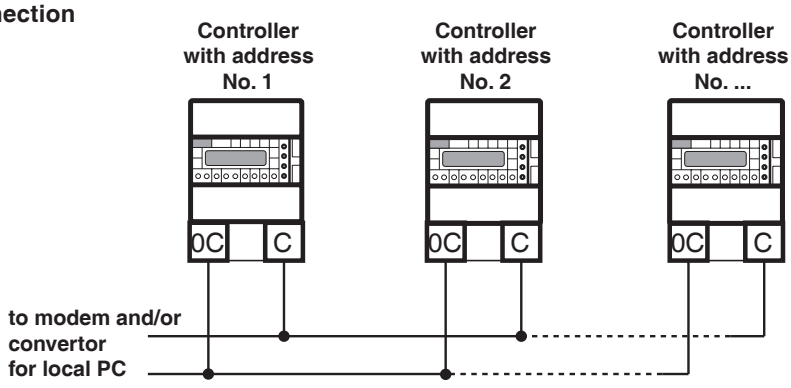
11. COMMUNICATION

11.1 C-Bus communication for remote management (for detailed information see data sheet T 021)

Via the C-Bus output, the DRU 414-418 may be controlled remotely, with two-way data transmission, using one or more local PCs and/or a central PC over the wireline telephone network.
Via the PCs, the following may be viewed and/or modified:

– the controller's setpoint data and the value measured by the sensor
– the status of the control outputs

11.2 C-Bus electrical connection



11.3 Remote management address

Controllers must be assigned progressive address numbers in order to be identified by the central PC and/or the local PCs for remote management.

To insert the address, see Section 15: Parameter settings

If the remote management key has been activated (from the PC), it can be disactivated by switching on the device by keeping the ⊖ and ⊕ buttons pressed down together, until "dic" appears on the display.
This way, it is possible to directly connect a PC and manage the controller without knowing the key.

12. OPERATION

DRU 414-418 is a digital controller with a microprocessor, capable of adjusting to a fixed point a physical quantity given by the type of sensor used:

- **Active sensor (0…10 V–) =** any quantity (humidity, pressure or other) expressed in 0..10 Volt –
- **Passive sensor (NTC 10kΩ) =** standard temperature sensor.

PI controller with selectable output:

- **0…10 V– progressive** (any actuator with 0...10 Volt analogue input)
- **3-wire modulating** (valve open/close)
- **1 or 2 stage On-Off** (e.g.: 2 equal electrical or thermal loads: 1; 1+2)
- **3 stage On-Off** (2 different electrical or thermal loads: 1; 2; 1+2)

Control action:

- **Inverted** = increase of the adjusted quantity = reduction of required output power for the load (e.g.: heating or humidifying) = **D - E terminals not short-circuited**

- **Normal =** increase of the adjusted quantity = increase of required output power for the load (e.g.: conditioning or dehumidifying) = **D - E terminals short-circuited**

Use of the relays as limit thresholds.

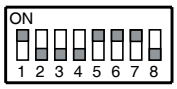
The two relays may be used as limit thresholds, when not in use as adjustment outputs, as the 0..10 Volt – progressive output is in use.

Limits may be set for the:

- **Value of the adjusted quantity:** minimum and maximum thresholds may be set for the real value of the "physical quantity" measured by the sensor.

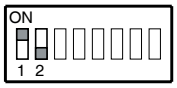
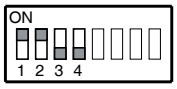
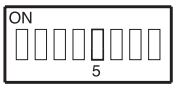
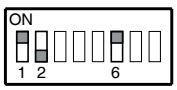
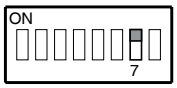
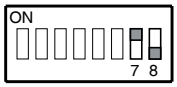
- **Value of the output action load:** minimum and maximum thresholds may be set for the value of the controller's output action, when the 0...10 Volt – progressive output is in use. In practice, two alarms are set for the minimum and maximum power required of the actuator.

12.1 Configuration



It is essential to configure the controller in function of its use, by means of the microswitch panel on its base. The position of the microswitch cursors is indicated in black (although they are white, on the actual device).

Factory (DEFAULT) settings are in bold.

Microswitch	Function	Description	Microswitch positions
	Output control action	3-wire modulating **0 … 10 V – progressive** 1 or 2-stage On-Off (1 ; 1+2) 3-stage On-Off (1 ; 2 ; 1+2)	1 On and 2 On **1 On and 2 Off** 1 Off and 2 Off 1 Off and 2 On
	Valve actuator run time (only with 3-wire modulating output: 1 and 2 On)	60 seconds **90 seconds** 120 seconds 180 seconds	3 On and 4 On **3 Off and 4 Off** 3 On and 4 Off 3 Off and 4 On
	Microswitch number 5 is not used, therefore its position is irrelevant		
	Relays used as limits (Only with 0...10 Volt progressive output: 1 On and 2 Off)	**Referred to adjusted quantity value** Referred to output action load	**6 On** 6 Off
	Sensor model connected	**Active sensor 0 … 10 V – (B1)** Sensor NTC 10 KΩ (B2)	**7 On** 7 Off
	Position of the point on the display (decimals) (Only with active sensor B1 - 7 On)	Two digits after the point (e.g.: 0.00) **One digit after the point (e.g.: 00.0)**	8 On **8 Off**

12.2 Output control actions

The controller compares desired value **X** with value **x** of the quantity measured by sensor B, and calculates the load value of output **Y** in function of the deviation and of the set parameters.

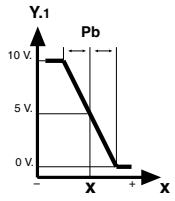
• PI Progressive output

Output Y: signal 0…10 V–

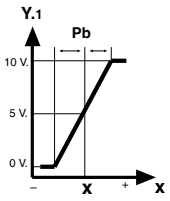
Microswitch settings:
– Progressive output: 1 On and 2 Off

– Control action :
Inverted = D-E terminals not short-circuited
Normal = D-E terminals short-circuited

Inverse operation



Normal Operation



• 3-wire PI modulating output
Terminals 3-5 = valve open
Terminals 6-8 = valve close

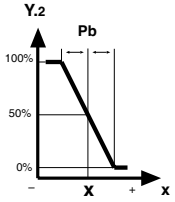
Microswitche setting:
– Modulating output: 1 and 2 On

– Valve actuator run time:

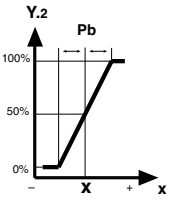
3 On and 4 On	=	60 sec.
3 Off and 4 Off	=	90 sec.
3 On and 4 Off	=	120 sec.
3 Off and 4 On	=	180 sec.

– Control action :
Inverted = D-E terminals not short-circuited
Normal = D-E terminals short-circuited

Inverse operation



Normal Operation

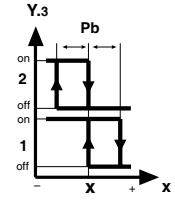


• 1 or 2-stage PI On-Off output
1st stage = Relay 1 On and Relay 2 Off;
2nd stage = Relay 1 On and Relay 2 On;

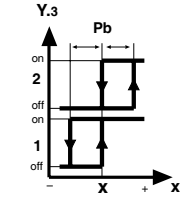
Microswitch settings:
– 1 or 2-stage On-Off output: 1 and 2 Off

– Control action :
Inverted = D-E terminals not short-circuited
Normal = D-E terminals short-circuited

Inverse operation



Normal Operation

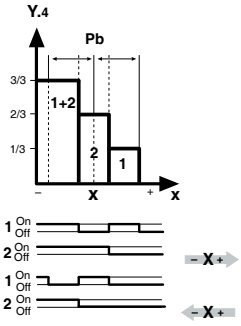


• 3-stage PI On-Off output
1st stage = Relay 1 On and Relay 2 Off;
2nd stage = Relay 1 Off and Relay 2 On;
3d stage = Relay 1 On and Relay 2 On;

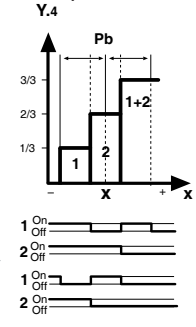
Microswitch settings:
– 3-stage On-Off output: 1 Off and 2 On

– Control action :
Inverted = D-E terminals not short-circuited
Normal = D-E terminals short-circuited

Inverse operation



Normal Operation



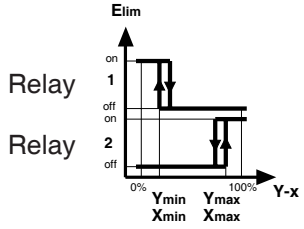
• To change the On-Off output from PROPORTIONAL/INTEGRAL to PURE DIFFERENTIAL, set integral time value it = 0

Y.1 – 0…10 V– progressive output
Y.2 – Modulating output
Y.3 – 2-stage On-Off output
Y.4 – 3-stage On-Off output
Pb – Proportional band
x – Adjusted quantity
X – Desired value

12.3 Threshold controls

When the output is set to Progressive (0...10 V –), the controller can manage the two relay outputs as an On-Off minimum threshold control (relay 1) and an On-Off maximum threshold control (relay 2), as follows:

– Threshold action on:
6 On = Min/Max threshold values on adjusted quantity
6 Off = Min/Max threshold values on output action load



13. NORMAL OPERATION

Normal operation is possible after having completed and tested all the electrical connections, configurated the microswitches (section 12.1, Configuration), and defined all the settings.

• **Power on:** each time the device is switched on, the number of the software version used by the unit (XXX) is displayed.
All LEDs are activated in sequence to test their functioning.
After a few seconds, the home page appears on the display.

• **Home page: Display** shows the value of the measured quantity, temperature or other.

• **Home page: LEDs** = indicate the status of the controller's functions.
Min MEASUREMENT RANGE LED: always off on the home page.
Max MEASUREMENT RANGE LED: always off on the home page.
Inverse operation LED ON = controller in Inverse operation mode (e.g.: heating or humidifying).
NORMAL OPERATION LED ON = controller in Normal Operation mode (e.g.: conditioning or dehumidifying).
MIN THRESHOLD LED = adjusted quantity or output action power below min. threshold.
MAX THRESHOLD LED = adjusted quantity or output action power above max. threshold.
VALVE and Stage 1 and 2 LEDs = indicate the status of the two output relays

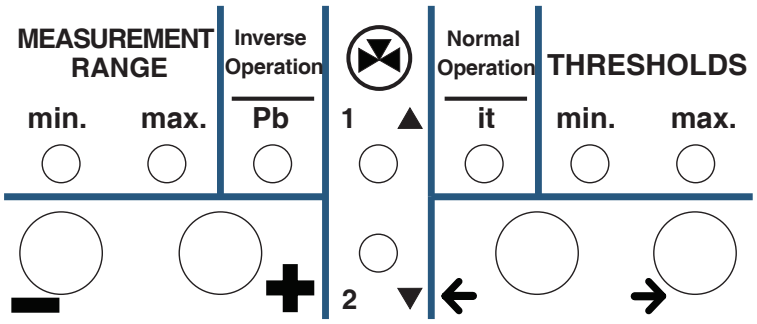
• **Inverse operation and Normal Operation**

The controller is in actual fact formed by two separate controllers: one for Inverse operation, and one for Normal Operation.
Selection of one or the other controller is made via the external control, on terminals D and E.

Example: the unit controls a hot/cold battery.
WINTER (Inverse operation) = if the adjusted temperature **decreases**, the opening of the valve **increases** to provide more heat to the battery. The controller operates in winter mode, with all the relevant parameters and the desired temperature for heating.
SUMMER (Normal Operation) = if the adjusted temperature **increases**, the opening of the valve **increases** to provide more cold to the battery. The controller operates in summer mode, with all the relevant parameters and the desired temperature for conditioning.
The summer/winter switchover is carried out via the external control (D, E terminals), and indicated by the Inverse operation LED (winter) and the Normal Operation LED (summer).

• **Reading of internal microswitch (dipswitches) configuration conditions:**

Press ⊕ and ⊖: The 7 upper LEDs light up, indicating the position of the 7 microswitches of the internal dipswitch.



LED 1, 2, 3, 4, 6, 7, 8 on = relevant MICROSWITCH in the ON position (Section 12.1, Configuration)

• **Restore to factory settings**

Switch on the device by keeping buttons ⊖ and ⊕ pressed down together until the message "ini" appears.

• **General use of the buttons**

The ⊖ and ⊕ buttons call up the pages dedicated to the operation or setting parameters

The ⊕ and ⊖ buttons allow the user to change the value of the displayed operation or setting parameters

• **Use of the Rt external remote control and of the c1 Switch**
An external setpoint variator may be connected, allowing the following changes to be made:
– With 0...10 Volt (B1) active sensor, ± 5 % variation on the full scale.
– With the temperature sensor (B2), ± 5 °C variation.
Switch c1 closed = controller not operational (reduces the actuator power to zero = off)
Switch c1 open = controller operativo.

14. CHOICE OF THE DESIRED VALUE OF THE PHYSICAL QUANTITY TO ADJUST (SETTING)

In normal conditions, the display shows the value of the physical quantity to adjust (temperature or other).

If external control "c1" is closed (controller not operational), the value of the quantity to adjust alternates with the readout "OFF".

Whatever the controller's configuration, to select or change the desired value of the physical quantity to adjust (e.g. the desired temperature), proceed as follows :

– Press ⊖ : desired value (temperature or other) flashes on display

Change with ⊕ or ⊖ to select the desired value.
If connected to the **Rt** remote control, and a deviation other than zero is set, the desired value includes the remote control's correction value, and alternates with the symbol " DDD ".

If the controller is not operational (Switch c1 closed) the value of the quantity to may in any case be read and the desired value set, as if the controller were operational.
These parameters will be used when the controller becomes operational.

All the functions described above are to all effects doubled, as a double controller is being used (e.g.: heating/conditioning).
To verify whether one or the other is being used, check the two Normal Operation or Inverse operation LEDs.
Remember: Inverted = heating, humidifying o similar
Normal = conditioning, dehumidifying o similar

15. SETTING OF ADJUSTMENT PARAMETERS

The sequence of adjustment parameters changes in function of the type of sensor used, and of the controller's output control action, which depends on the actuator it must control.

Before setting adjustment parameters, check whether the controller is set to:
– INVERSE OPERATION (e.g.: heating o humidifying) or
– NORMAL OPERATION (es.:conditioning o dehumidifying).

READ AND REMEMBER the two indicator LEDs , as during the setting these LEDs are used to display other parameters (Pb = Proportional Band and it = Integral Time)

WARNING: all the following sections which describe the setting of adjustment parameters for all the different applications, should be considered as double: one for Inverse operation mode, and one for Normal Operation.

AT ALL TIMES THE PARAMETERS REFERRED TO THE TYPE OF CONTROLLER SELECTED BY TERMINALS "D" and "E" ARE DISPLAYED.

REMEMBER:
– Controller in Inverse operation mode (e.g.: heating or humidifying) = D - E Open
– Controller in Normal Operation mode (e.g.: conditioning or dehumidifying) = D - E Closed

15.1 Setting of parameters with B2 temperature sensor  and 1, 2  or 3-stage  On-Off control

Fixed display shows value of the temperature measured by B2.

Press ⊖: Display flashes showing desired value **X** (0…99.9 °C).

Release ⊖: Display flashes showing desired value **X** (0…99.9 °C).

Keep ⊖ pressed until the display shows **– – –** (approx. 3 secs.), then release button:
Display flashes showing Proportional band **Pb**.
"Pb" LED flashes.
Change with ⊕ or ⊖ (0.1 °C resolution).

Press ⊖: Display flashes showing Integral time it.
"it" LED flashes.
Change with ⊕ or ⊖ (1 minute resolution).
By setting "– – –" (integral time non-existent), the controller becomes a PURE DIFFERENTIAL ON-OFF.

Press ⊖: Display with 4 flashing LEDs to select C-Bus communication speed.
b12 = 1200 baud, b24 = 2400 baud, b48 = 4800 baud, b96 = 9600 baud

Press ⊖: Display flashes showing remote management address.
All LEDs flash.
To change, use ⊕ or ⊖ .

Press ⊖: Fixed display shows value of the temperature measured by B2 (home page). The readout appears in any case after 60 seconds if no buttons are pressed.

15.2 Setting of parameters with B2 temperature sensor  and 3-wire modulating control 

Fixed display shows value of the temperature measured by B2.

Press ⊖: Display flashes showing desired value **X** (0…99.9 °C).

Release ⊖: Display flashes showing desired value **X** (0…99.9 °C).

Keep pressed ⊖ until the display shows **– – –** (approx. 3 sec.), then release button:
Display flashes showing proportional band **Pb**.
"Pb" LED flashes.
Change with ⊕ or ⊖ (resolution 0.1 °C).

Press ⊖: Display flashes showing integral time **it**.
"it" LED flashes.
Change with ⊕ or ⊖ (resolution 1 minute).
By setting "– – –" (i.e. integral time non-existent), the controller becomes PURE PROPORTIONAL.

Press ⊖: Threshold LEDs and display flash, showing the insensitivity value of the adjusted variable (0…50.0 °C).
Change with ⊕ or ⊖ (resolution 0.1 °C).
Insensitivity = accepted tolerance in adjustment, to avoid too frequent and unnecessary interventions.

Press ⊖: "Pb" LED,"ti" LED and display flash, showing the type of adjustment:
Pi = proportional integral; **int** = integral
Change with ⊕ or ⊖ (Pi; int).

Press ⊖: Display and 4 LEDs flash to select C-Bus communication speed.
b12 = 1200 baud, b24 = 2400 baud, b48 = 4800 baud, b96 = 9600 baud

Press ⊖: All LEDs and display flash, with remote management address.
Change with ⊕ or ⊖ .

Press ⊖: Fixed display shows value of the temperature measured by B2 (home page). The readout appears in any case after 60 seconds if no buttons are pressed.

15.3 Setting of parameters with B2 temperature sensor  and progressive 0…10 V– control 

Fixed display shows value of the temperature measured by B2.

Press ⊖: Display flashes showing desired value **X** (0…99.9 °C).

Release ⊖: Display flashes showing desired value **X** (0…99.9 °C).

Keep pressed ⊖ until the display shows **– – –** (approx. 3 sec.), then release button:
Display flashes showing Proportional band **Pb**.
"Pb" LED flashes.
Change with ⊕ or ⊖ .

Press ⊖: Display flashes showing Integral time **it**.
"it" LED flashes.
Change with ⊕ or ⊖ (resolution 1 minute).
By setting "– – –" (i.e. integral time non-existent), the controller becomes PURE PROPORTIONAL.

Press ⊖: "Min threshold" LED and display flash showing minimum threshold of the **Xmin** quantity (microswitch 6 On), or of the **Ymin** output load (microswitch 6 Off). Measure expressed in its physical units, and output in %.
Change with ⊕ or ⊖ .

Press ⊖: "Max threshold" LED and display flash showing maximum threshold of the **Xmax** quantity (microswitch 6 On) or of the **Ymin** output load (microswitch 6 Off). Measure expressed in its physical units, and output in %.
Change with ⊕ or ⊖ .

Press ⊖: Threshold LEDs and display flash, showing the insensitivity value of the adjusted variable (0…50.0 °C).
Change with ⊕ or ⊖ .
Insensitivity = accepted tolerance in adjustment, to avoid too frequent and unnecessary interventions.

Press ⊖: "Pb" LED,"ti" LED and display flash, showing the type of adjustment :
Pi = PROPORTIONAL integral ; **int** = integral
Change with ⊕ or ⊖ (Pi ; int).

Press ⊖: Display flashes showing value of the progressive control for the output test (0…100 %).
"Open/Close Valve" LED flashes.
Change with ⊕ or ⊖ to simulate 0...10 Volt– output and test the connection with the actuator.

Press ⊖: Display and 4 LEDs flash to select C-Bus communication speed.
b12 = 1200 baud, b24 = 2400 baud, b48 = 4800 baud, b96 = 9600 baud

Press ⊖: All LEDs and display flash, showing remote management address.
Change with ⊕ or ⊖ .

Press ⊖: Fixed display shows value of the temperature measured by B2 (home page). The readout appears in any case after 60 seconds if no buttons are pressed.

15.4 Setting of parameters with B1 active sensor  and 1, 2  or 3-stage  On-Off control

Fixed display shows value of the quantity to adjust, measured by B1.

Press ⊖: Display flashes showing desired value **X** .

Release ⊖: Display flashes showing desired value **X** .

Keep ⊖ pressed until the display shows **– – –** (approx. 3 secs.), then release button:
Display flashes showing value of the measurement when the input signal is 0 V–.
"Measurement range min" LED flashes.
Change with ⊕ or ⊖ to set this as the starting value in the active sensor's measurement scale.

Press ⊖: Display flashes showing value of the measurement when the input signal is 10 V–.
LED "Measurement range max" flashes.
Change with ⊕ or ⊖ to set this as the end value in the active sensor's measurement scale.

Press ⊖: Display flashes showing proportional band **Pb**.
"Pb" LED flashes.
Change with ⊕ or ⊖ .

Press ⊖: Display flashes showing Integral time **it**.
"it" LED flashes.
Change with ⊕ or ⊖ (resolution 1 minute).
By setting "– – –" (integral time non-existent) the controller becomes PURE ON-OFF DIFFERENTIAL.

Press ⊖: Display and 4 LEDs flash to select C-Bus communication speed.
b12 = 1200 baud, b24 = 2400 baud, b48 = 4800 baud, b96 = 9600 baud

Press ⊖: Display flashes showing remote management address.
All LEDs flash.
Change with ⊕ or ⊖ .

Press ⊖: Fixed display shows value of the temperature measured by B2 (home page). The readout appears in any case after 60 seconds if no buttons are pressed.

15.5 Setting of parameters with B1 active sensor  and 3-wire modulating control 

Fixed display shows value of the quantity to adjust measured by B1.

Press ⊖: Display flashes showing desired value **X** .

Release ⊖: Display flashes showing desired value **X** .

Keep pressed ⊖ until the display shows **– – –** (approx. 3 sec.), then release button:
Display flashes showing value of the measurement when the input signal is 0 V–.
LED "Measurement range min" flashes.
Change with ⊕ or ⊖ to set this as the starting value in the active sensor's measurement scale.

Press ⊖: Display flashes showing value of the measurement when the input signal is 10 V–.
LED "Measurement range max" flashes.
Change with ⊕ or ⊖ to set this as the end value in the active sensor's measurement scale.

Press ⊖: Display flashes showing proportional band **Pb**.
"Pb" LED flashes.
Change with ⊕ or ⊖ .

Press ⊖: Display flashes showing Integral time **it**.
"it" LED flashes.
Change with ⊕ or ⊖ (resolution 1 minute).
By setting "– – –" (integral time non-existent) the controller becomes PURE PROPORTIONAL.

Press ⊖: Threshold LEDs and display flash, showing the insensitivity value of the adjusted variable.
Change with ⊕ or ⊖ .
Insensitivity = accepted tolerance in adjustment, to avoid too frequent and unnecessary interventions.

Press ⊖: "Pb" LED,"ti" LED and display flash, showing the type of adjustment :
Pi = PROPORTIONAL integral ; **int** = integral
Change with ⊕ or ⊖ (Pi ; int).

Press ⊖: Display and 4 LEDs flash to select C-Bus communication speed.
b12 = 1200 baud, b24 = 2400 baud, b48 = 4800 baud, b96 = 9600 baud

Press ⊖: All LEDs and display flash, with remote management address.
Change with ⊕ or ⊖ .

Press ⊖: Fixed display shows value of the temperature measured by B2 (home page). The readout appears in any case after 60 seconds if no buttons are pressed.

15.6 Setting of parameters with active sensor B1  and with 0…10 V– progressive control 

Fixed display shows value of the quantity to adjust measured by B1.

Press ⊖: Display flashes showing desired value **X**.

Release ⊖: Display flashes showing desired value **X** .

Keep pressed ⊖ until the display shows **– – –** (approx. 3 sec.), then release button:
Display flashes showing value of the measurement when the input signal is 0 V–.
LED "Measurement range min" flashes.
Change with ⊕ or ⊖ to set this as the starting value in the active sensor's measurement scale.

Press ⊖: Display flashes showing value of the measurement when the input signal is 10 V–.
LED "Measurement range max" flashes.
Change with ⊕ or ⊖ to set this as the end value in the active sensor's measurement scale.

Press ⊖: Display flashes showing proportional band **Pb**.
"Pb" LED flashes.
Change with ⊕ or ⊖ .

Press ⊖: Display flashes showing Integral time **it**.
"it" LED flashes.
Change with ⊕ or ⊖ (resolution 1 minute).
By setting "– – –" (integral time non-existent) the controller becomes PURE PROPORTIONAL.

Press ⊖: "Min threshold" LED and display flash showing minimum threshold of the **Xmin** measurement (microswitch 6 On) or of the **Ymin** output load (microswitch 6 Off). Measure expressed in its physical units, and output in %.
Change with ⊕ or ⊖.

Press ⊖: "Max threshold" LED and display flash showing maximum threshold of the **Xmax** measurement (microswitch 6 On) or of the **Ymax** output load (microswitch 6 Off). Measure expressed in its physical units, and output in %.
Change with ⊕ or ⊖ .

Press ⊖: Threshold LEDs and display flash, showing the insensitivity value of the adjusted variable .
Change with ⊕ or ⊖ .
Insensitivity = accepted tolerance in adjustment, to avoid too frequent and unnecessary interventions.

Press ⊖: "Pb" LED,"ti" LED and display flash, showing the type of adjustment:
Pi = proportional integral; **int** = integral
Change with ⊕ or ⊖ (Pi; int).

Press ⊖: Display flashes showing value of the progressive control to test output (0…100 %).
"Open/Close Valve" LED flashes.
Change with ⊕ or ⊖ to simulate 0...10 Volt– output and test the connection with the actuator.

Press ⊖: Display and 4 LEDs flash to select C-Bus communication speed.
b12 = 1200 baud, b24 = 2400 baud, b48 = 4800 baud, b96 = 9600 baud

Press ⊖: All LEDs and display flash, showing remote management address.
Change with ⊕ or ⊖ .

Press ⊖: Fixed display shows value of the temperature measured by B2 (home page). The readout appears in any case after 60 seconds if no buttons are pressed.

Data sheet amendments

Date	Revision No.	Page	Section	Description of amendments	Firmware version	Software version
20.07.09 AM	**01**	3	9. WIRING DIAGRAMS.	Clarification in caption, letter Y		
10.06.10 VM	**02**	1 4	3. SENSOR AND ACCESSORIES 9.2 Active sensor connection examples	Add new sensor SPD 10. and SPR 10.		

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