pChrono

Solution for the management of lights and non-food devices

CAREL

ENG User manual

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High Efficiency Solutions

Content

IMPORTANT WARNINGS

The CAREL product is a state-of-the-art device, whose operation is specified in the technical documentation supplied with the product or can be downloaded, even prior to purchase, from the website www.carel.com. The customer (manufacturer, developer or installer of the final equipment) accepts all liability and risk relating to the configuration of the product in order to reach the expected results in relation to the specific installation and/or equipment. The failure to complete such phase, which is required/indicated in the user manual, may cause the final product to malfunction; CAREL accepts no liability in such cases. The customer must use the product only in the manner described in the documentation relating to the product. The liability of CAREL in relation to its products is specified in the CAREL general contract conditions, available on the website www.carel.com and/or by specific agreements with customers.

ATTENTION:

Separate as much as possible the probe and digital input signal cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance. Never run power cables (including the electrical panel wiring) and signal cables in the same conduits.

DISPOSAL OF THE PRODUCT

The appliance (or the product) must be disposed of separately in accordance with the local waste disposal legislation in force

Guidelines for disposal

- Do not dispose of the product as municipal waste; it must be disposed of through specialist waste disposal centres.
- The product contains a battery that must be removed and separated from the rest of the product according to the instructions provided, before disposing of the product.
- Improper use or incorrect disposal of the product may negative effects on human health and on the environment.
- The public or private waste collection systems defined by local legislation must be used for disposal.
- In the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

CAREL reserves the right to modify the features of its products without prior notice.

1. INTRODUCTION

The pChrono device can manage several different applications, according to the needs of the system. pChrono has been designed to the most flexible solution possible; a solution that can be used on any installation, thus supporting the work of installers in the field.

Specifically, pChrono includes algorithms for the following applications:

1. Light management
2. Timed device management
3. Pump management
4. Wireless 10A power socket management
5. Universal functions
6. Read wireless temperature/humidity/brightness sensors

All these functions can be used at the same time.

Available versions

The controller is available in two versions, which differ in terms of the number of I/Os available. For details, see the table of inputs / outputs.

Type of hardware	Description	CAREL P/N
Small	PCHRONO SMALL, USB, BUILT-IN DISPLAY, BMS/FBUS OPTO, CONNECTOR KIT, HKSTDmPCHP5+	PCH550S31UB00
Large	PCHRONO LARGE, USB, BUILT-IN DISPLAY, BMS/FBUS OPTO, CONNECTOR KIT, HKSTDmPCHP5+	PCH550L31UB00

Tab. 1.a

2. USER INTERFACE

pChrono utilises the pGD1 "built-in" terminal as the user interface. This device comes with the following buttons:

	Alarm	displays the list of alarms;
	Prg	accesses the main menu tree;
	Esc	returns to the previous screen;
	Up	scrolls a list upwards or increases the value shown on the display;
	Down	scrolls a list downwards or decreases the value shown on the display;
	Enter	enters the selected submenu or confirms the set value.

Tab. 2.a

2.1 Display

Main screen

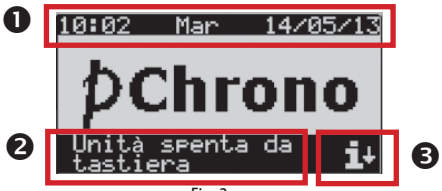

Fig. 2.a

❶	date, weekday and time
❷	unit status
❸	press the DOWN button for information on the loads

Tab. 2.b

This is the screen displayed during normal unit operation: from any other menu press ESC until reaching this screen.

Alarm screen

If an alarm is active, the red LED under the ALARM button flashes.

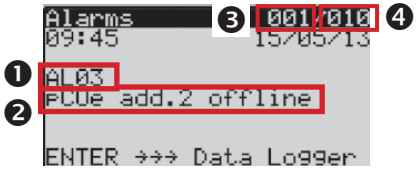

Fig. 2.b

❶	alarm code
❷	alarm description
❸	alarm number
❹	total number of active alarms

Tab. 2.c

Use the arrows (UP and DOWN) to scroll the list of alarms; at the end of the list, pressing ENTER directly accesses the alarm log.
For details on the alarms, see the alarm table, chapter 9.

Parameter display and editing screens

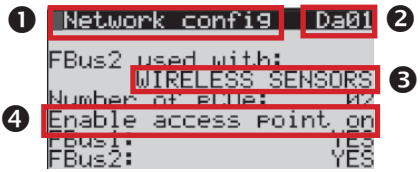

Fig. 2.c

To access these screens, from the main screen press PRG to enter the menu list: scroll the menus using the UP and DOWN buttons and press ENTER to select (see the function tree).

1	name of the function edited on the screen
2	screen index
3	editable value
4	parameter name.

Tab. 2.d

Note: editable fields feature numeric values or upper case letters.

3. SYSTEM ARCHITECTURE

pChrono is a device that can cover several functions. For greater system flexibility, pChrono integrates different wireless devices. The flexibility of the architecture can in fact meet the requirements of even more complex installations, where the electrical loads are often located some distance apart, and consequently it is not always feasible to connect them using a Modbus RS485 serial network. The diagram shown here below refers to a pChrono Large, illustrating a typical installation in which the devices are connected to pChrono via the wireless network. The same diagram also applies to the Small version.

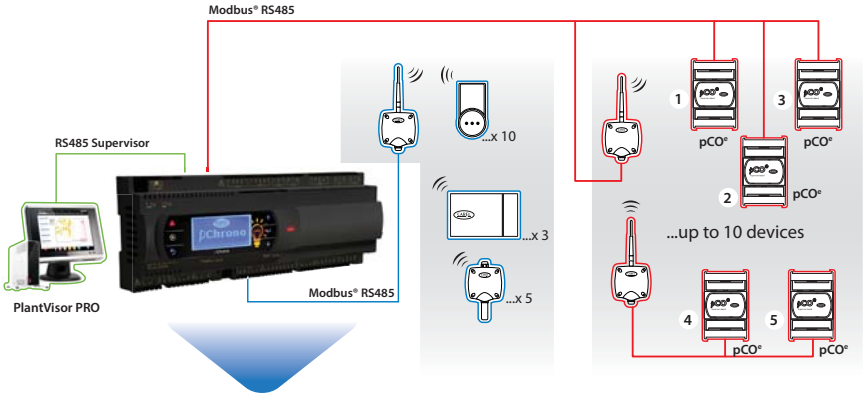

Fig. 3.a

Device	Modbus RS485 network address	Carel P/N	Reference documents
pChrono	-	PCH550*31UB00 (*=S: Small, L:Large)	pCO5 Plus manual, +0300020xx
pCOe RS485	2…11	PCOE004850	inst. sheet +050003265
Access Point (on FBus1)	1	WS01AB2M20	manual +0300030xx installation guide +0400030xx
Access Point (on FBus2)	1	WS01AB2M20	
Router Bridge	--	WS01RB2M20	
SA Sensor, Temperature / Humidity	16, 17, 18	WS01G01M00	
SI Sensor, LUX / Temperature / Humidity	21…25	WS01F01M00	
10A wireless plug / switch	26…35	WS01C010*0 (*=Schuko, I:Italian, F:French, G:British, X:universal switch)	instruction sheet +0500049ML
Battery wireless devices (SI, SA)	--	WS00BAT000	--

Tab. 3.a

Important:

- Both AP Access Points must be set to address 1.
- Addresses from 2 to 11 are available for the pCOe expansion cards.
- The addresses of the pCOe expansion cards must be consecutive, even when using the RB Router Bridge
- The addresses of the SA wireless temperature/humidity sensors must be 16, 17 and 18.
- The addresses of the SI wireless lux/temperature/humidity sensors must be 21, 22, 23, 24 and 25.
- The addresses of the wireless plugs/switches, with energy meter function, must be between 26 and 35.
- The SA, SI devices and the wireless plugs/switches cannot be managed by the same Access Point used for a wireless network with pCOe devices.

3.1 Serial network electrical specifications

- The FieldBus2 and BMS2 serial ports are functionally opto-isolated from the power supply, consequently the serial cable used to connect the devices requires a third wire as a common earth reference for the controllers.

Connection specifications

- Use an AWG 20-22 shielded twisted pair cable, with capacitance between the wires < 90pF/m.

Master device	HW	Lmax(m)	Wire/wire capacitance (pF/m)	Resistor on first and last device	Max no. of slave devices on bus	Data rate (bit/s)
FBUS	RS485	1000	< 90	120 Ω	64	19200
PC		1000	< 90	120 Ω	207	38400

Tab. 3.b

Note: the max length allowed for connection of the pCOe or to the BMS is 1000 m. Remember that the 120 Ω, 1/4W terminating resistor on the first and last device in the network is required if the length exceeds 100m.

3.2 Wireless network electrical specifications

- Maximum distance between Access Point/Router and Sensors in open field (outdoors): 100 m.
- Maximum distance between Access Point/Router and Sensors with field of sight (indoors): around 30 m (inside rooms and built-up areas).

3.3 Features of the wireless devices

Wireless technology

The wireless sensors used by pChrono require no electrical connections, as they use a wireless connection with ZigBee™ technology (mesh) encrypted with Carel private key at a transmission frequency of 2.4 GHz authorised for operation in all countries around the world. This is an advanced system that has achieved an excellent level of security for wireless data exchange. Communication between sensors and the Access Point is two way. The sensors, as well as sending the change in the status of the variables, can also receive data.

pChrono system wireless devices

IThe devices described below are part of the Carel rTM SE wireless system (Remote Temperature Monitoring). This solution ensures considerable savings in terms of installation costs (eliminating the cost of wiring), offering flexibility in the layout of supermarkets and allowing faster retrofit installation. The rTM system guarantees maximum flexibility, functionality, reliability, easy operation, reduction in installation costs and easy commissioning/service.

Access Point: this is the coordinator of a wireless network as well as the gateway for the information between the ZigBee™ protocol and the pChrono controller.

Router Bridge: this has the function of extending the local network of Modbus® RS485 pCOe devices if the FieldBus serial connection is not practicable due to installation restrictions or for other reasons.

pCOe RS485: this is a 4 DIN module expansion card used to increase of the number of inputs/outputs available on the pChrono controller; it features 4 digital inputs, 4 analogue inputs, 4 digital outputs and 1 analogue output.

SA sensor, temperature / humidity: measures room temperature and humidity. Battery-powered, it sends data to the Access Point at regular intervals.

SI sensor, temperature / humidity / lux: measures room temperature and humidity, and light intensity. Battery-powered, it sends data to the Access Point at regular intervals.

Wireless plug / switch: this device is used to read the power consumption of the connected single-phase loads. It incorporates the functions of energy meter, router and remote relay control; it sends the Access Point the instant power (W) and energy (Wh) values. The maximum current draw of the connected appliance is 10 amperes.

Example of a Mesh network

The SA sensor (at the top left), not being able to communicate with the Access Point it is bound to, uses a nearer wireless plug (with router function) to transfer its data to the Access Point, then to the pChrono controller.

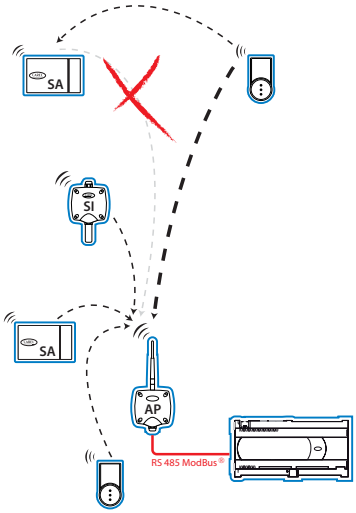

Fig. 3.b

Example installation with pCOe on Router Bridge and wireless plugs that always incorporate the router function

In the figure, one Access Point is dedicated to communication with the Router Bridge, connected to 4 pCOe devices. The other Access Point communicates with all the other wireless devices (wireless plugs/SA/SI). Note how ZigBee™ technology can support communication even when not always possible (directly) between the device and the Access Point, due to problems of distance, fixed or moving obstacles.

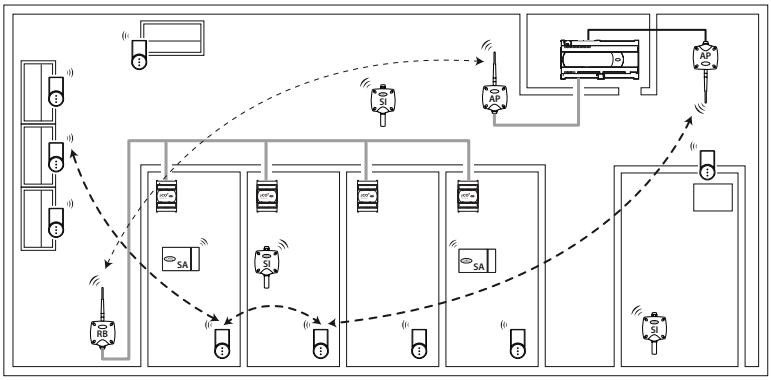

Fig. 3.c

4. MAIN MENU – FUNCTION TREE

		Main menu			Settings menu (with password)
A.		On-Off Unit			
B.		Load status			
C.		Clock/Scheduler			
D.		Hardware config.	a.		Network
			b.		pChrono
			c.		pCOe
			d.		Wireless devices
			e.		Initialisation
E.		Load config.	a.		Lights
			b.		Pumps
			c.		Power sockets
			d.		Generic loads
			e.		Generic functions
F.		Language			

Tab. 4.a

Note: the 'Hardware config.' and 'Load config.' menus are accessed after entering a 4-digit password. There are two types of password, one for each of the menus. These passwords can be set on the corresponding screen.

Note: the menu structure is reflected by the screen index.
See the following example:

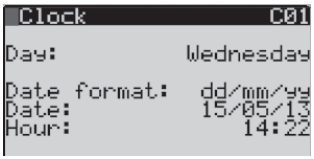

Fig. 4.a

When selecting the following item in the menu:

C. Clock

the letter of the original menu will be shown at the top right of the screen.

Note: after 10 minutes of inactivity on the display, the password will need to be entered again and pChrono will automatically display the main screen.

Password:

Mask index	Description on terminal	Description	Default	UOM	Values
---	Enter hardware configuration: password	Password for configuring pChrono and accessories	1234	---	0…9999
---	Enter load configuration password	Password for configuring the individual loads	1234	---	0…9999

Tab. 4.b

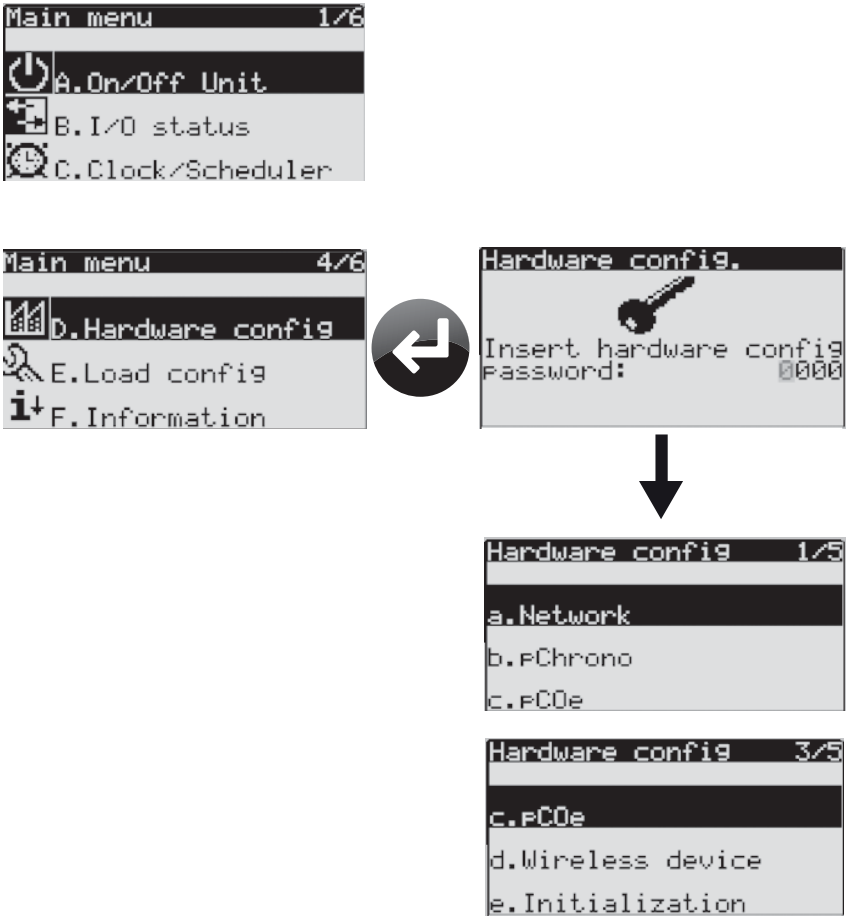
Main menu 1/6
A.On/Off Unit
B.I/O status
C.Clock/Scheduler
Main menu 4/6
D.Hardware config
E.Load config
F.Information
Hardware config.
Insert hardware config
password: 0000
Hardware config 1/5
a.Network
b.pChrono
c.pCOe
Hardware config 3/5
c.pCOe
d.Wireless device
e.Initialization

Fig. 4.b

5. INITIALISING THE SYSTEM

pChrono is structured so that the configuration of each individual device is easy and intuitive. Correct programming of the controlled loads requires an initial configuration of the system, enabling the individual functions one at a time. The main screen only provides information on the date and time; however, pressing the DOWN button displays how many loads have been configured, and how many of these are currently active.

Fig. 5.a

The main screen shows information on unit operating status (On or Off), the current time and date.

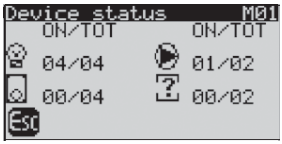

Fig. 5.b

From the main screen, pressing DOWN displays the number of loads configured and how many of these are currently active.

In the example shown here, the following loads have been configured:

Type of load	Active loads	Total loads configured
Lights (top L)	4	4
Wireless plugs (bottom L)	0	4
Pumps (top R)	0	2
Generic loads (bottom R)	0	2

Tab. 5.a

5.1 System set-up

When selecting menu 'D. Hardware config.' (password protected), the following loops can be accessed:

a. Network: to enable the individual devices (Access Points, the number of wireless devices or pCOe units in the network), configure the BM1/BMS2 communication ports, the remote on/off digital input, the alarm output and the configuration of the common auxiliary inputs (see paragraph '7.1 Light management', 'Common auxiliary digital inputs function');
b. pChrono: to configure the individual inputs/outputs for the pChrono board only;
c. pCOe: to configure the inputs/outputs on each individual pCOe;
d. Wireless devices: to set each individual device enabled regarding transmission times, alarm thresholds, etc.;
e. Initialisation: to delete the alarm log, set the unit of measure, install the default values, backup or restore the configuration.

Network settings

'Network' refers to the set of physical devices comprising the pChrono system, as described in chapter 3. System architecture. For details on the maximum number of devices that can be connected to pChrono, see the same chapter; for details on the settings of these devices, see below.

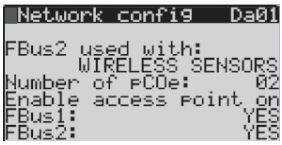

Fig. 5.c

The type of device connected to the integrated FieldBus2 connector can be configured. The options are 'WIRELESS SENSORS' or 'pCOe'. Then, the number of pCOe cards connected can be set, and the 'Access Point' enabled on each FieldBus.

The dipswitches on both Access Points must be configured as shown below.

Access point, address 1	ON	OFF	OFF	ON

Note:

- The slot marked 'FieldBus card' is FieldBus 1, and requires an optional card, part no. PCO100FD10
- Terminal J26, on the other hand, is the integrated and optically-isolated FieldBus 2 connector (FBus2)
- The pChrono settings for communication with the enabled Access Points involve a baud rate of 19200 bit/s. These settings cannot be modified.

Fig. 5.d

If using a 'Router Bridge' to wirelessly connect some of the pCOe devices, the Access Point will need to be configured 'WITH ROUTER BRIDGE', moreover selecting the range of pCOe addresses available and connected via the wireless network. All 10 pCOe devices can be connected via a Router Bridge; in this case, the Min address will be 2, and the Max will be 11.

The dipswitches on the Router Bridges for wireless pCOe connection must be configured as shown below:

Router Bridge, addr. not managed	ON	OFF	ON	OFF

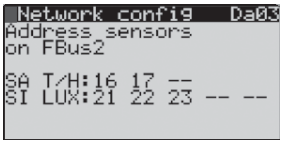

Fig. 5.e

The addresses of the SA (temperature / humidity) and SI sensors (temperature / humidity / brightness) cannot be modified, but rather can be enabled or disabled. This simplifies the configuration procedure and avoids configuration problems in the field. Simply enable the correct address on this screen and set the same serial address on the wireless device using the dipswitches. pChrono will automatically recognise the device and read its parameters as necessary.

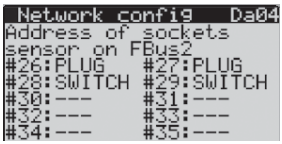

Fig. 5.f

The addresses of the wireless plugs are also predefined. The user can configure address #26 (for example) as a PLUG, and address #28 as a SWITCH. This allows better visibility of the data corresponding to the device when browsing the screens. In addition, the pChrono template on PlantVisorPRO will show, based on the address of the device being accessed, the image of a Plug or Switch. The address of the aforementioned devices can be configured using the button; for details see instruction sheet +0500049ML.

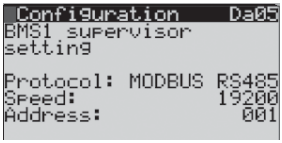

Fig. 5.g

Communication port BMS1 is enabled for the connection of a second supervisory system; this can in fact be used to install the pCOWeb card. The protocol can be selected as pCO MANAGER (to update the application program) or MODBUS RS485.

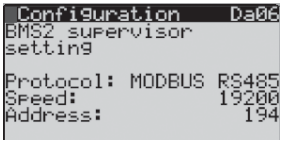

Fig. 5.h

The integrated communication port BMS2 is enabled for the connection of a supervisory system, such as Carel PlantVisorPRO. The protocol can be selected as pCO MANAGER (to update the application program) or MODBUS RS485.

pChrono settings

This loop is used to configure the inputs/outputs on the pChrono device; different screens will be enabled depending on whether the device in question is a pChrono Small or pChrono Large.

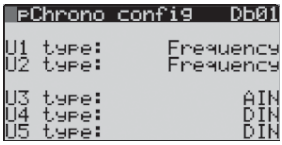

Fig. 5.i

The type of universal inputs on the pChrono can be selected, so as to configure the software to manage these inputs. The options are analogue inputs (AIN) or digital inputs (DIN), according to the requirements of the system.

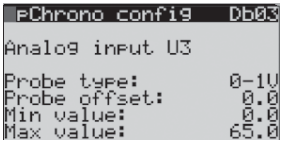

Fig. 5.j

For inputs configured as probe or sensor connections, a screen is provided for setting the Type, an Offset and the end scale Limitsa.

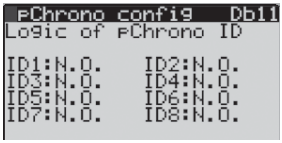

Fig. 5.k

The digital inputs, as well as the digital outputs, can be N.O. (normally open) or N.C. (normally closed) contacts.

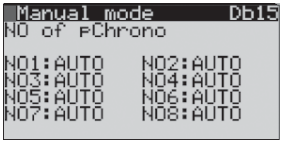

Fig. 5.l

The digital outputs can be tested. Set AUTO for the software to manage the output as per the settings, ON to activate the output, or OFF to deactivate the digital output (always off).

pCOe settings

This loop is used to configure each of the pCOe devices.

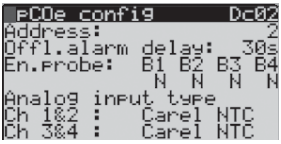

Fig. 5.m

The address of the pCOe being configured is shown on the second line (Address:). The settings available are delay for offline alarm, enable probes/sensors and, for each pair of probes/sensors (B1-B2 and B3-B4), set the type. Other configurations, such as probe offset, manual overrides or output logic are available on the subsequent screens.

The pCOe expansion card must be configured with the dipswitches as shown below:

pCOe, address 2	OFF	ON	OFF	OFF
pCOe, address 3	ON	ON	OFF	OFF
pCOe, address 4	OFF	OFF	ON	OFF
pCOe, address 5	ON	OFF	ON	OFF
pCOe, address 6	OFF	ON	ON	OFF

pCOe, address 7	ON	ON	ON	OFF
pCOe, address 8	OFF	OFF	OFF	ON
pCOe, address 9	ON	OFF	OFF	ON
pCOe, address 10	OFF	ON	OFF	ON
pCOe, address 11	ON	ON	OFF	ON

Note:

- The pCOe expansion cards are connected to the RS485 serial line using the recommended connections and connector J3 on the pCOe.
- The pChrono settings for communication with the enabled pCOe cards involve a baud rate of 19200 bit/s. These settings cannot be modified.

Wireless device settings

This loop is reserved for the settings of the wireless devices, such as the SA sensors (T/H), the SI sensors (T/H/LUX), and the wireless plugs/switches. For the features of the individual devices see paragraph '3. System architecture'. Only the devices enabled in the 'Network configuration' loop will be visible for the following configurations.

SA sensor, Temperature / Humidity

Fig. 5.n

The heading on line zero identifies the type of sensor and the serial address; line 1 on the other hand shows an editable 8-digit text to identify the location of the sensor. This screen is used to set the transmission time for refreshing the values measured by the sensor on pChrono. The lower the time, the shorter the battery life. Typically, for a transmission time of 5 minutes, the battery will last 5 years. Further details are available in the rTM manual, +0300030xx.

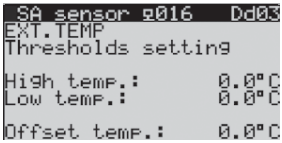

Fig. 5.o

This screen, on the other hand, is used to set the limits for the high and low temperature alarms. An offset can also be entered for the sensor reading.

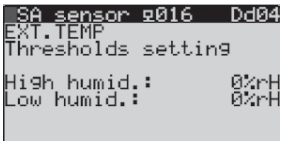

Fig. 5.p

The high and low humidity alarm threshold is set on this screen. No offset is available for the room humidity reading.

The dipswitches on the SA sensors must be configured as shown below.

SA, address 16	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
SA, address 17	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
SA, address 18	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF

SI sensor, LUX / Temperature / Humidity

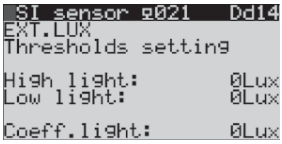

Fig. 5.q

For the SI sensor too, an 8-digit text is available for identifying the sensor; compared to the SA sensor, this also measures brightness in the room, with the high and low brightness alarm thresholds set on this screen; a coefficient is also available for adjusting the reading, set by default to 1000; unless in special cases, this parameter should not be changed.

The dipswitches on the SI sensors must be configured as shown below:

SI, address 21	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
SI, address 22	OFF	ON	ON	OFF	ON	OFF	OFF	OFF
SI, address 23	ON	ON	ON	OFF	ON	OFF	OFF	OFF
SI, address 24	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF
SI, address 25	ON	OFF	OFF	ON	ON	OFF	OFF	OFF

Wireless plug with built-in energy meter function

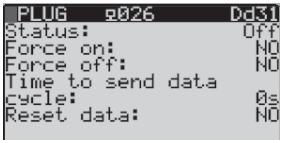

Fig. 5.r

This screen is used to override the relay on the device (On or Off). As this device is mains powered, the transmission time does not affect system flexibility. The energy meter can be reset using the parameter on screen. The energy reading is supplied by the wireless device, which saves the data and transmits these to pChrono every 'data transmission time', together with instant power. These readings are shown in loop 'B. Load status'.

The wireless plugs do not have dipswitches for setting the serial address; for the correct procedure, see instruction sheet +0500049ML included in the packaging with the devices, and online at carel.com. In paragraph 5.2, however, shows an extract of the procedure to be followed.

Initialisation

This loop is reserved for initialising pChrono: delete the alarm log, backup the current configuration.

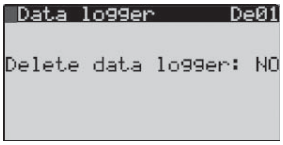

Fig. 5.s

This parameter is used to delete the alarms saved since the previous reset. The log is also reset when restoring the default values.

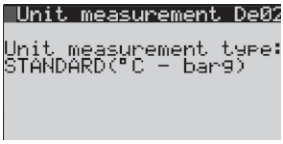

Fig. 5.t

The values can also be displayed using Imperial units of measure. Temperature will be expressed in degrees Fahrenheit (°F) and pressure in PSI (psig).

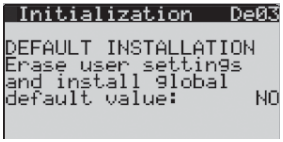

Fig. 5.u

Select YES to confirm, the default values shown in the parameter table will be installed.

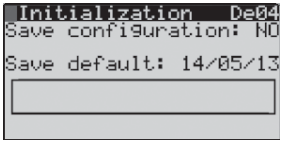

Fig. 5.v

This screen is used to save the current pChrono configuration; the date displayed will be updated with the current date. This function allows the configuration to be modified, saved and then subsequently restored if and when needed. The progress bar advances as the data is saved; the procedure typically takes less than two minutes. When loading a previously saved configuration, a message prompts the user to switch the unit off and on again. The mask is available only with Unit OFF.

Fig. 5.w

Both passwords are 1234 by default; these values can be changed here.

5.2 Wireless network configuration

The procedure described here refers to a system being initialised in which none of the listed devices has already been configured. The devices should be configured near one another for better control over the binding procedure.

To configure the Access Point follow the instructions shown below:

1. set the dipswitches as described above
2. Connect the AP to the desired FBus serial port (previously enabled)
3. Power up the AP at 12/24 Vac
4. Press button T1 on the AP to automatically select the wireless channel. Wait around 10 seconds until L1 starts flashing slowly (1s). L1 flashing means that the wireless network has been automatically selected by the Access Point.

Binding the SA or SI sensors to the Access Point

5a. Press button T1 on the AP again. LED L1 flashes quickly (0.25s); this means that the wireless network has been opened and is ready to bind the sensors.
6a. On the SA or SI device, set the address to be used for communication with the AP
7a. Remove the insulating protection on the battery and make sure that the LEDs come on for a few seconds.
8a. To bind the device to the AP, press button T1. LED L1 on the SA or SI sensor will come on for around 10s, then L1, L2, L3 will flash together several times, and finally go off. The procedure for checking the quality of the wireless signal is then activated (around 1 minute).
9a. Press button T1 on the AP to close the wireless channel.

Binding the wireless plugs / switches to the Access Point

Starting from point 4, proceed as follows:

5b. press button T1 on the AP again. LED L1 flashes quickly (0.25s); this means that the wireless network has been opened and is ready to bind the devices.
6b. Power up the wireless plug / switch and wait a few seconds: the procedure for binding to the Access Point starts automatically. The procedure ends when the yellow LED on the plug/switch flashes every 1s.
7b. Now assign the serial address to the devices using the button, following the procedure described below.

Assigning the serial address to the wireless plugs / switches

As mentioned above, these devices do not have dipswitches for setting the serial address; consequently, proceed as follows:

8b. Press the local button four separate times for no more than a second, and no more than a second apart. Accessing this mode is confirmed by a sequence of green-red-yellow flashes of the LED for 1.5 seconds.
9b. After accessing this mode, the LED goes off and the device waits for the button to be pressed; data entry is divided into two stages, entering the tens and entering the units. Set the tens of the Modbus address.
10b. The number of times the button is pressed during this stage represents the tens of the new Modbus address.
11b. During this stage, pressing the button causes the LED to flash red. The button must be pressed 2 or 3 times, as the possible addresses are between 26 and 35.
12b. The first stage ends 3 seconds after the button was last pressed.
13b. At the end of the first stage, the LED flashes green-red-yellow to indicate the changeover from tens to units. Set the units of the Modbus address
14b. The number of times the button is pressed during this stage represents the units of the new Modbus address.
15b. During this stage, pressing the button causes the LED to flash green; the button must be pressed between 0 and 9 times, as the possible addresses are between 26 and 35.
16b. The second stage ends 3 seconds after the button was last pressed.
17b. At the end of the second stage, the LED flashes green-red-yellow to confirm the end of the setting procedure.

The assigned Modbus address should now be checked; press the local button twice for no more than a second, and no more than a second apart. Then count the flashes: red for the tens, green for the units.

Binding the Router to the Access Point

If the wireless network requires a Router Bridge device (example Fig.3.c.), use the following procedure to bind the RB to the dedicated AP. Starting from point 4, proceed as follows:

5c. press button T1 on the AP again. LED L1 flashes quickly (0.25s); this means that the wireless network has been opened and is ready to bind the devices.
6c. Power up the Router and wait a few seconds: the procedure for binding to the Access Point starts automatically. The binding operation generally lasts less than 30s.
7c. Press button T1 on the AP to close the wireless channel.

For further details, see the corresponding manual or instruction sheets listed in paragraph '3. System architecture'.

5.3 Setting the clock and time bands

Select loop 'C. Clock/Scheduler' on the main menu to set the current time and date, and configure, enable or disable daylight saving time.

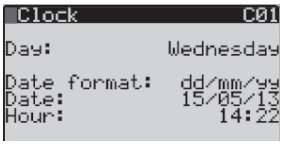

Fig. 5.x

This screen is used to set the date format ("dd/mm/yy", "mm/dd/yy" or "yy.mm.dd"), set the date and time.

Fig. 5.y

If daylight saving time is managed, the changeover period can be set here.

The same loop can be used to set the Time bands and the Periods in which such time bands are active. The scheduler function on the pChrono includes:

- 20 Time bands
- 10 Periods.

Every load that uses the scheduler can be controlled using the periods proposed here, selecting the most suitable one. This ensures flexibility and fast configuration of the entire system during system set-up. Moreover, all the loads affected can be realigned together without needing additional reconfiguration by simply adjust the settings for a time band or period.

The following settings are required for each time band:

- Time band start hours/minutes
- Time band end hours/minutes

The following settings are required for each period:

- Period start day/month
- Period end day/month

The days of the week on which the time band and period settings are active will be selected in the scheduler relating to the individual device.

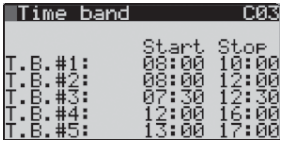

Fig. 5.z

Each time band can be set with the time band start/end hours/minutes. Minimum resolution is 1 minute.

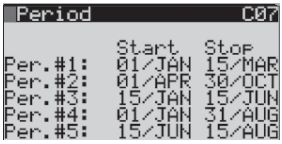

Fig. 5.aa

Each period can be set with the period start/end day/month. Minimum resolution is 1 day.

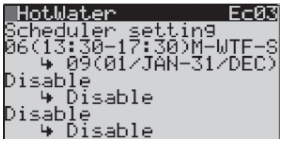

Fig. 5.ab

The example illustrated here, shows how the first time band (of three) selected for managing the load is number "6", with settings "13:30 - 17:30", and is displayed in brackets "(...)". The active reference period is number "9", pre-configured as "1/JANUARY – 31/DECEMBER". The only days the load will be enabled on are MONDAY, WEDNESDAY, THURSDAY, FRIDAY and SUNDAY. The day is enabled if the corresponding first letter is visible.

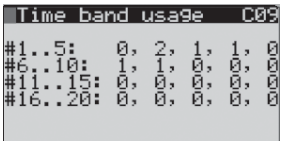

Fig. 5.ac

This screen (and C10 for the periods) summarises how many times the reference time band has been selected. The example shows how time bands "1" and "2" have been used twice, while "4" and "7" once only. The others, on the other hand, have not been used. This provides quick feedback on if and how many times that specific time band has been used, but not by which load. Information on how many times the time band has been used by the loads helps understand how many of these will be affected by the new settings, without needing to search through each individual load. (*)

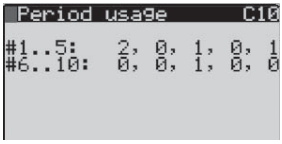

Fig. 5.ad

The same also applies to the periods. In this case, period "2" has been used twice, while periods "2", "3" and "4" once only. See the notes relating to screen "C09". (*)

Note:

(*) The pChrono template for the PlantVisorPRO supervisory system (from version SP 2.1.0) provides the same information. Select the 'Parameters' tab, then 'Scheduler'. The number shown in brackets alongside each 'time band' or 'period' indicates the value described here and displayed on screens C09 and C10.

5.4 Setting the exceptions

Up to 15 special periods can be set, representing exceptions to the time bands selected for the individual load. That means that for each load, scheduling can be enabled or disabled in the period specified by the exceptions. This is useful, for example, for configuring loads that need to be enabled when an exception disables the majority of the loads; for example, managing car park lights or illuminated signs on a Sunday or public holiday.

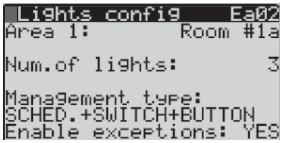

Fig. 5.ae

Area 1, called "Room #1a", has three light fixtures, managed by the scheduler, one switch and a button. Enabling the exceptions will disable the action of the scheduler and the switch (which always depends on the scheduler); the action of the button, on the other hand, will be always enabled, being timed. Further details are available under loop '7.1 Light management'. To set the exceptions in menu 'C. Clock/Scheduler', proceed as follows.

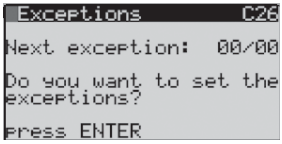

Fig. 5.af

This highlights the 'next exception' (dd/mm); in the example, no exceptions have been configured. Press ENTER to set an exception

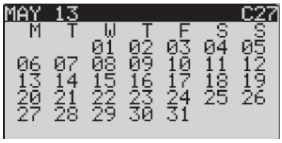

Fig. 5.ag

The screen displays the current month; with the cursor on "0:0", use UP or DOWN to select the month the exception applies to.

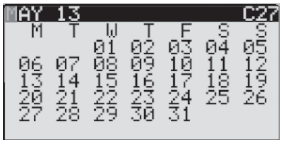

Fig. 5.ah

From position "0:0", pressing ENTER moves the cursor to day 1 of the month. Use the UP arrow to scroll to the desired day. In the example, 16 MAY. Press ENTER to configure the exception.

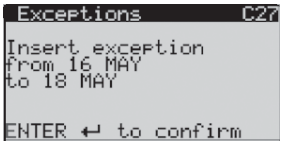

Fig. 5.ai

This screen is used to change the exception period. In the example, the exception will be active from 16 May to 18 May.
Press ENTER to confirm the exception 16-18 May.

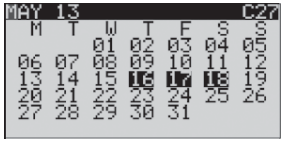

Fig. 5.aj

The exception is then displayed on this screen. The selected days refer to the exception period.

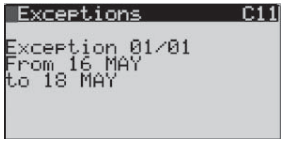

Fig. 5.ak

The active exceptions will be listed here, and on other dedicated screens. "01/01" indicates that the exception displayed is number '1' out of a total of '1'

Note:

- The action of a digital input configured as a 'Button' will always activate the load that the action is associated with, but always and only for the set time. For further details see paragraph '7.1 Light management'.

6. INPUT/OUTPUT TABLE

The flexibility of pChrono in managing inputs and outputs means that an I/O table cannot be provided in the same way as for other controllers. Configuration of the load inputs/outputs is nonetheless managed using a guided procedure during installation. Simplified configuration of the inputs/outputs allows the same input to be shared between different devices; for example, a light button used to switch on several light fixtures at the

		pChrono board				
		SMALL		LARGE		Label
Universal inputs/outputs	NTC input	5		10		U
	PTC input	5		10		U
	PT500 input	5		10		U
	PT1000 input	5		10		U
	PT100 input	max 2		max 4		U
	0 to 1 Vdc / 0 to 10 Vdc input (**) (powered by controller)	max tot 5	5	max tot 10	max 6	U
	0 to 1 Vdc / 0 to 10 Vdc input (**) (powered externally)		5		10	U
	0 to 5 Vdc input	-		-		-
	0 to 20 / 4 to 20 mA input (powered by controller)	max tot 4	max 4	max tot 9	max 6	U
	0 to 20 / 4 to 20 mA input (powered externally)		max 4		max 9	U
	0 to 5 V input for ratiometric probe (+5Vref)	max 5		max 6		U
	Digital input with voltage-free contact	5		10		U
	Fast digital inputs	max 2		max 6		U
	0 to 10 Vdc output, not optically-isolated	5		10		U
	PWM output, not optically-isolated	5		10		U
		max tot 5		max tot 10		
Digital inputs	24 Vac/Vdc input, optically-isolated	8		14		ID
	24 Vac/Vdc or 230 Vac (50/60 Hz) input	-		4		ID
		max tot 8		max tot 18		
Analogue outputs	0 to 10 Vdc output, optically-isolated	4		6		Y
	PWM output, optically-isolated	2		2		Y3, Y4
	Output for two-pole stepper motor	-		-		1-3-2-4
		max tot 4		max tot 6		
Digital outputs	NO/NC relay output	1		6		NO/NC
	NO relay output	7		12		NO
	24 V SSR output	1		3/4		NO/NC
	230 V SSR output	1		3/4		NO/NC
		max tot 8		max tot 18		
Total I/Os		**25**		**48**		
Terminal power		1		1		J10
		1		1		+Vterm
Probe power		1		1		+VDC
		1		1		+5 VREF
Analogue output power		1		1		VG, VG0
pLAN ports		1		1		J10
		1		1		J11
Integrated Fieldbus ports		1		2		J23/ J26
Additional Fieldbus ports		1		1		Fbus card
Integrated BMS ports		1		1		J25
Additional BMS ports		1		1		BMS card
Host USB port (if featured)		1		1		
Slave USB port (if featured)		1		1		

(*) On the pCOe expansion card, the inputs are selectable via software in pairs (B1, B2 and B3, B4)
(**) pCOe card: 0 to 1 V inputs only

same time. For further details, see the examples shown in chapter '7. Functions'.

For further details on the features of the inputs/outputs, and the electrical and serial connections on the controllers used in the pChrono system, see the manual listed in chapter "3. System architecture".

In/Out	Type	pCOe I/O expansion card			
		PCOE*	Label	In/Out	Type
In	Universal I/O	4	B	In	Analogue in. (*)
In	Universal I/O	-	-	-	-
In	Universal I/O	-	-	-	-
In	Universal I/O	-	-	-	-
In	Universal I/O	-	-	-	-
In	Universal I/O	4	B	In	Analogue in. (*)
In	Universal I/O	4	B	In	Analogue in. (*)
-	-	4	B	In	Analogue in. (*)
In	Universal I/O	4	B	In	Analogue in. (*)
In	Universal I/O	-	-	-	-
In	Universal I/O	4	B	In	Analogue in. (*)
In	Universal I/O	-	-	-	Digital input
In	Universal I/O	-	-	-	Digital input
Out	Universal I/O	-	-	-	Analogue output
Out	Universal I/O	-	-	-	Analogue output
In	Digital input	4	ID	In	Digital input
In	Digital input	-	-	-	
Out	Analogue output	1	Y	Out	
Out	Analogue output	-	-	-	
Out	Analogue output	-	-	-	
Out	Digital output	4	NO/NC	Out	Digital output
Out	Digital output	-	-	-	
Out	Digital output	-	-	-	
Out	Digital output	-	-	-	

Total I/Os	
	Telephone conn. (pLAN) J10
	Additional terminal power
	Active probe power
	Ratiometric probe power
1 VG,VG0	
	Signal and power supply
	Signal only

Tab. 6.a

6.1 pChrono Small and Large: connection terminals

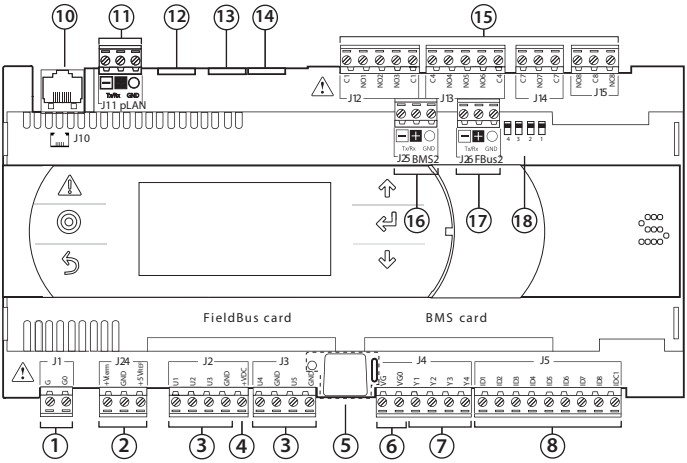

Fig. 6.a

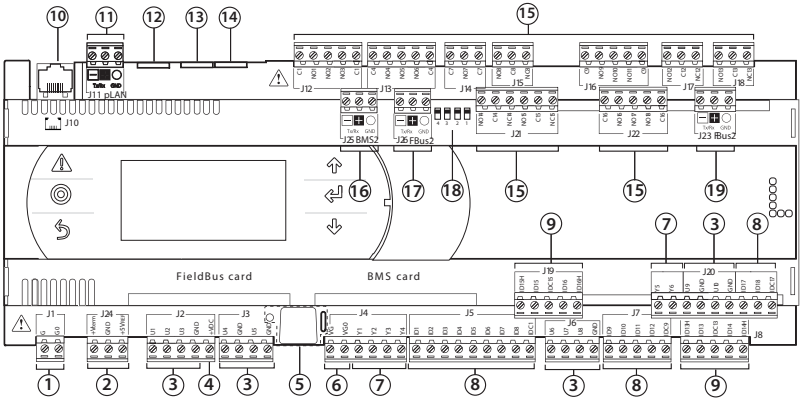

Fig. 6.b

Ref.	Description
1	Power supply connector [G(+), G0(-)]
2	+Vterm: power supply for additional terminal +5 VREF power supply for ratiometric probes
3	Universal inputs/outputs
4	+VDC: power supply for active probes
5	Button for setting pLAN address, secondary display, LEDs
6	VG: power supply at voltage A(*) for opto-isolated analogue output VG0: power for optically-isolated analogue output, 0 Vac/Vdc
7	Analogue outputs
8	ID: digital inputs at voltage A (*)
9	ID..: digital inputs at voltage A (*) IDH..: digital inputs at voltage B (**)
10	pLAN telephone connector for terminal/downloading application

Ref.	Description
11	pLAN plug-in connector
12	Reserved
13	Reserved
14	Reserved
15	Relay digital outputs
16	BMS2 port
17	FieldBus2 port
18	Jumpers for selecting FieldBus/ BMS

(*) Voltage A: 24 Vac or 28 to 36 Vdc; (**) Voltage B: 230 Vac - 50/60 Hz.

Tab. 6.b

6.2 pCOe expansion card: connection terminals

The pCOe card is used to increase the number of inputs and outputs on a pChrono controller, according to system requirements.

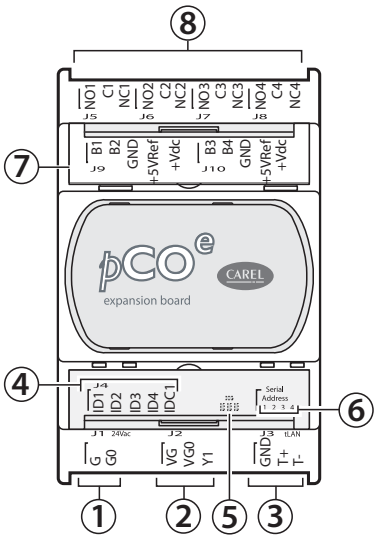

Fig. 6.c

Ref.	Description
1	Power supply connector [G(+), G0(-)]
2	Optically-isolated 0 to 10 V analogue output
3	RS485 connector network (GND, T+, T-)
4	Optically-isolated digital inputs, 24 Vac/Vdc
5	Yellow power LED e 3 signal LEDs
6	Serial Indirizzo
7	Analogue inputs e probe power supply
8	Relay digital outputs

6.3 Description of the pChrono terminals

See the figures on the previous pages relating to pChrono.

Ref.	Term.	Label	Description
1	J1-1	G	Power supply at voltage A(*)
	J1-2	G0	Power supply reference
2	J24-1	+Vterm	Additional power supply terminal
	J24-2	GND	Power supply common
	J24-3	+5 Vref	Power supply to 0 to 5 V ratiometric probes
3	J2-1	U1	Universal input/output 1
	J2-2	U2	Universal input/output 2
	J2-3	U3	Universal input/output 3
	J2-4	GND	Common for universal inputs/outputs 1, 2, 3
3	J3-1	U4	Universal input/output 4
	J3-2	GND	Common for universal input/output 4
	J3-3	U5	Universal input/output 5
	J3-4	GND	Common for universal input/output 5
3	J6-1	U6	Universal input/output 6
	J6-2	U7	Universal input/output 7
	J6-3	U8	Universal input/output 8
	J6-4	GND	Common for universal inputs/outputs 6, 7, 8
3	J20-3♦	U9	Universal input/output 9
	J20-4♦	GND	Common for universal input/output 9
	J20-5♦	U10	Universal input/output 10
	J20-6♦	GND	Common for universal input/output 10
4	J2-5	+VDC	Power to active probes
5	Button for setting pLAN address, secondary display, signal LEDs		
6	J4-1	VG	Power to optically-isolated analogue output, voltage A(*)
	J4-2	VG0	Power to optically-isolated analogue output, 0 Vac/Vdc
7	J4-3	Y1	Analogue output 1, 0 to 10 V
	J4-4	Y2	Analogue output 2, 0 to 10 V
	J4-5	Y3	Analogue output 3, 0 to 10 V
	J4-6	Y4	Analogue output 4, 0 to 10 V

7	J20-1♦	Y5	Analogue output 5, 0 to 10 V
	J20-2♦	Y6	Analogue output 6, 0 to 10 V
8	J5-1	ID1	Digital input 1 at voltage A(*)
	J5-2	ID2	Digital input 2 at voltage A(*)
	J5-3	ID3	Digital input 3 at voltage A(*)
	J5-4	ID4	Digital input 4 at voltage A(*)
	J5-5	ID5	Digital input 5 at voltage A(*)
	J5-6	ID6	Digital input 6 at voltage A(*)
	J5-7	ID7	Digital input 7 at voltage A(*)
	J5-8	ID8	Digital input 8 at voltage A(*)
	J5-9	IDC1	Common for digital inputs from 1 to 8 (negative pole if group with DC power supply)
8	J7-1	ID9	Digital input 9 at voltage A(*)
	J7-2	ID10	Digital input 10 at voltage A(*)
	J7-3	ID11	Digital input 11 at voltage A(*)
	J7-4	ID12	Digital input 12 at voltage A(*)
	J7-5	IDC9	Common for digital inputs from 9 to 12 (negative pole if group with DC power supply)
8	J20-7♦	ID17	Digital input 17 at voltage A(*)
	J20-8 ♦	ID18	Digital input 18 at voltage A(*)
	J20-9♦	IDC17	Common for digital inputs 17 and 18 (negative pole if group with DC power supply)
9	J8-1	ID13H	Digital input 13 at voltage B(**)
	J8-2	ID13	Digital input 13 at voltage A(*)
	J8-3	IDC13	Common for digital inputs 13 and 14 (negative pole if group with DC power supply)
	J8-4	ID14	Digital input 14 at voltage A(*)
	J8-5	ID14H	Digital input 14 at voltage B(**)
9	J19-1♦	ID15H	Digital input 15 at voltage B(**)
	J19-2♦	ID15	Digital input 15 at voltage A(*)
	J19-3♦	IDC15	Common for digital inputs 15 and 16 (negative pole if group with DC power supply)
	J19-4♦	ID16	Digital input 16 at voltage A(*)
	J19-5♦	ID16H	Digital input 16 at voltage B(**)
10	J10	-	Connector for pLAN telephone cable
11	J11-1	Tx-/Rx-	Tx-/Rx- pLAN RS485 port
	J11-2	Tx+/Rx+	Tx+/Rx+ pLAN RS485 port
	J11-3	GND	GND pLAN RS485 port
12	-	-	Reserved
13	-	-	Reserved
14	-	-	Reserved
15	J12-1	C1	Common for relays 1, 2, 3
	J12-2	NO1	Normally open contact, relay 1
	J12-3	NO2	Normally open contact, relay 2
	J12-4	NO3	Normally open contact, relay 3
	J12-5	C1	Common for relays 1, 2, 3
15	J13-1	C4	Common for relays 4, 5, 6
	J13-2	NO4	Normally open contact, relay 4
	J13-3	NO5	Normally open contact, relay 5
	J13-4	NO6	Normally open contact, relay 6
	J13-5	C4	Common for relays 4, 5, 6
15	J14-1	C7	Common for relay 7
	J14-2	NO7	Normally open contact, relay 7
	J14-3	C7	Common for relay 7
15	J15-1	NO8	Normally open contact, relay 8
	J15-2	C8	Common for relay 8
	J15-3	NC8	Normally closed contact relay 8
15	J16-1	C9	Common for relay 9, 10, 11
	J16-2	NO9	Normally open contact, relay 9
	J16-3	NO10	Normally open contact, relay 10
	J16-4	NO11	Normally open contact, relay 11
	J16-5	C9	Common for relay 9, 10, 11
15	J17-1	NO12	Normally open contact, relay 12
	J17-2	C12	Common for relay 12
	J17-3	NC12	Normally closed contact relay 12
15	J18-1	NO13	Normally open contact, relay 13
	J18-2	C13	Common for relay 13
	J18-3	NC13	Normally closed contact relay 13
15	J21-1♦	NO14	Normally open contact, relay 14
	J21-2♦	C14	Common for relay 14
	J21-3♦	NC14	Normally closed contact relay 14
	J21-4♦	NO15	Normally open contact, relay 15
	J21-5♦	C15	Common for relay 15
	J21-6♦	NC15	Normally closed contact relay 15

15	J22-1♦	C16	Common for relay 16, 17, 18
	J22-2♦	NO16	Normally open contact, relay 16
	J22-3♦	NO17	Normally open contact, relay 17
	J22-4♦	NO18	Normally closed contact relay 18
	J22-5♦	C16	Common for relay 16, 17, 18
16	J25-1	Tx-/Rx-	Tx-/Rx- BMS2 RS485 port
	J25-2	Tx+/Rx+	Tx+/Rx+ BMS2 RS485 port
	J25-3	GND	GND BMS2 RS485 port
17	J26-1	Tx-/Rx-	Tx-/Rx- Fieldbus 2 RS485 port
	J26-2	Tx+/Rx+	Tx+/Rx+ Fieldbus 2 RS485 port
	J26-3	GND	GND Fieldbus 2 RS485 port
18	Microswitches for configuring port J26		
19	J23-1	Tx-/Rx-	Tx-/Rx- Fieldbus 2 RS485 port
	J23-2	Tx+/Rx+	Tx+/Rx+ Fieldbus 2 RS485 port
	J23-3	GND	GND Fieldbus 2 RS485 network port

Tab. 6.c

(*): voltage A: 24 Vac or 28 to 36 Vdc;
(**): voltage B: 230 Vac - 50/60 Hz.
♦: Large model

7. FUNCTIONS

As described above, pChrono can manage many types on units and different system requirements. Before configuring pChrono, the unit needs to be OFF; otherwise, when attempting to set a parameter, a message will be shown to 'turn off the unit'. Below is a list of the functions available, with the details for each:

- Lights: up to 20 areas, each with up to 4 light fixtures
- Pumps: up to 2 groups of pumps, each with 2 ON/OFF pumps
- Wireless plugs: up to 10 devices (switches or plugs)
- Generic loads: up to 20 generic loads
- Generic functions: up to 5 functions (thermostat/modulating device/alarm)
- Read wireless sensors: 5 SI sensors (T/H/LUX), 3 SA sensors (T/H)

7.1 Light management

pChrono manages up to 20 light areas. Each area can be named using up to 8 digits. The name associated with the area will then be shown on the screens used to configure such areas; the same name will also be available on PlantVisorPRO. To better understand how to use pChrono for managing lights, the following terms will be used, as described below.

- Area: this refers to a physical, or logical environment that shares the same scheduler. The inputs and outputs will be defined in the configuration stage. Up to 20 areas are available.
- Lights: this refers to how many digital outputs are reserved for the area being configured. Each area can have between 1 and 4 light fixtures.
- Switch: this is the On/Off switch that manages the individual light fixture. The action on the input (Open→Closed, Closed→Open) opens or closes the digital output connected to the light fixture. The action of the Switch always reflects the enabling of the scheduler.
- Button: this is a switch that turns on the lights for a set time. It is physically an On/Off switch, whose action (Open→Closed, Closed→Open) closes the digital output connected to the light fixture. Repeating the action on the digital input configured as a button (e.g. a motion detector), will reset the time; when the set time has elapsed, only for the buttons in the specific area, the lights will be switched off, unless otherwise activated. The action of the button is independent of the scheduler or the exceptions.

Wiring diagram for the switch and button used with pChrono:

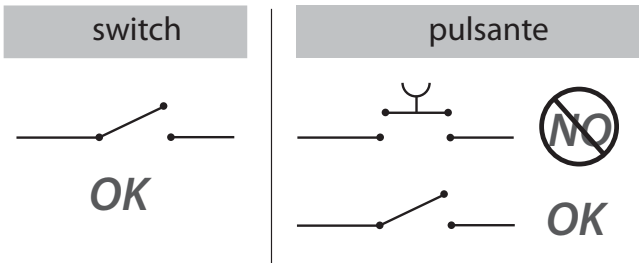

Fig. 7.a

Diagram illustrating the behaviour of the switch and button.

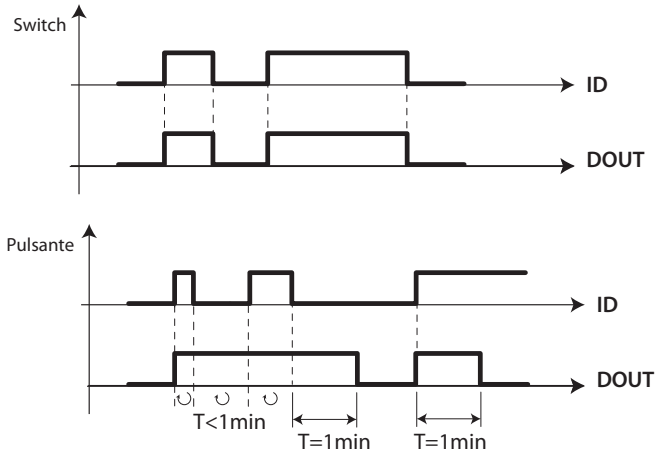

Fig. 7.b

Note how the digital output controlled by the 'switch' follows the status of the digital input.
On the other hand, the digital output managed by a logical 'button' is managed by time, which is reset whenever the digital input switches status before the set time of 1 min. If, on the other hand, the digital output does not switch over before the set time, when the time elapses the digital output is de-energised.
The areas can be managed in different ways, according to system requirements. pChrono provides eight types of management:

- SCHEDULER ONLY: the lights are on when enabled by the scheduler.
- SWITCH ONLY: the lights are on when enabled by the switch input.
- SCHEDULER + SWITCH: the lights are enabled to be switched on based on the scheduler settings, but are only actually switched on using the corresponding switch input. Outside of the time bands, the lights will be off.
- SCHEDULER + SWITCH + BUTTON: the lights are enabled to be switched on based on the scheduler settings, but are only actually switched on using the corresponding switch input. The button will switch on the lights for the set time, independently of whether they are enabled by the scheduler or the switch.
- SCHEDULER + SPV: the lights are enabled to be switched on based on the scheduler settings, but are only actually switched on using the special function on the supervisor. A list of 30 variables is provided for this function. This configuration is useful when using a remote enabling system that identifies daytime (or night-time), for example, for the management of outside lights (see example 3 below, with 'Geo-Lighting' in 'ECO-HVAC' package for PlantVisorPRO).

- SCHEDULER + SPV + BUTTON: the lights are enabled to be switched on based on the scheduler settings, but are only actually switched on using the special function on the supervisor. A list of 30 variables is provided for this function. The button will switch on the lights for the set time, independently of whether they are enabled by the scheduler or the supervisor.
- SCHEDULER + LUX: the lights are enabled to be switched on based on the scheduler settings, but are only actually switched on using the brightness reading from a LUX sensor. This setting requires the configuration of a LUX set point and band. Stepped or modulating management via analogue output is available.
- SCHEDULER + LUX + BUTTON: the lights are enabled to be switched on based on the scheduler settings, but are only actually switched on using the brightness reading from a LUX sensor. This setting requires the configuration of a LUX set point and band. Stepped or modulating management via analogue output is available. The button will switch on the lights for the set time, independently of whether they are enabled by the scheduler.

Security function

pChrono can manage the simultaneous activation of all the light fixtures configured using just one digital input with switch function. This function is often requested by security companies when the burglar alarm is activated; simultaneous activation of all the lights helps identify the culprits.

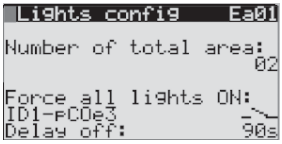

Fig. 7.c

The closing of input ID1 on the expansion card with serial address 3, "ID1-pCOe3", will switch on all the lights in the 2 areas configured. The current status of input ID1-pCOe3 is 'Contact Open'. This function does not require the selection of a restricted number of specific light fixtures. The time parameter will keep the lights ON after the alarm condition back to the normal operation; the DOUT status blink during this time on.

Common auxiliary digital inputs function

Common 'button' management (inputs BUT.AUX1, BUT.AUX2, BUT.AUX3, BUT.AUX4, BUT.AUX5)

Management of the button can be associated with the use of motion detectors. Often however, more than one detector is needed in a certain area, especially larger areas. For this function, pChrono provides 5 'virtual' inputs that group together the action of multiple digital inputs used as buttons (BUT.AUX*). These inputs can be configured under loop "D:Hardware config.\a. Network". Each "BUT.AUXx" input can be associated with up to 8 different digital inputs. The specific BUT.AUX* is then selected in the load configuration screens; the user can select the input by scrolling the list of I/Os available in the field on the 'Button' screen.

Remember that the logical state of these inputs is the logical OR of all the inputs configured as BUT.AUX*: each of the inputs will in fact restart the 'button' time count, cancelling the switching (Open→Closed, Closed→Open) of the previous input. The light will switch off when the set time has elapsed.

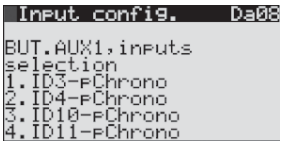

Fig. 7.d

Input BUT.AUX1 will depend on the status of inputs ID3-pChrono, ID4-pChrono, ID10-pChrono, Id11-pChrono; for further details, see screen Da09.

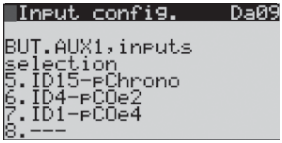

Fig. 7.e

Input BUT.AUX1 will have a logical value of 1 and will also depend on ID15-pChrono, ID4-pCOe2, ID1-pCOe4, plus those inputs previously configured on screen Da08.

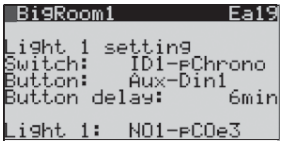

Fig. 7.f

The input selected for the button function is a 'virtual' input; in fact "BUT. AUX1" will be the logical OR of inputs ID3, ID4, ID10, ID11, ID15 on pChrono, ID4 on the pCOe with serial address 2, and ID1 on the pCOe serial 4 (see screens Da08, Da09 above).

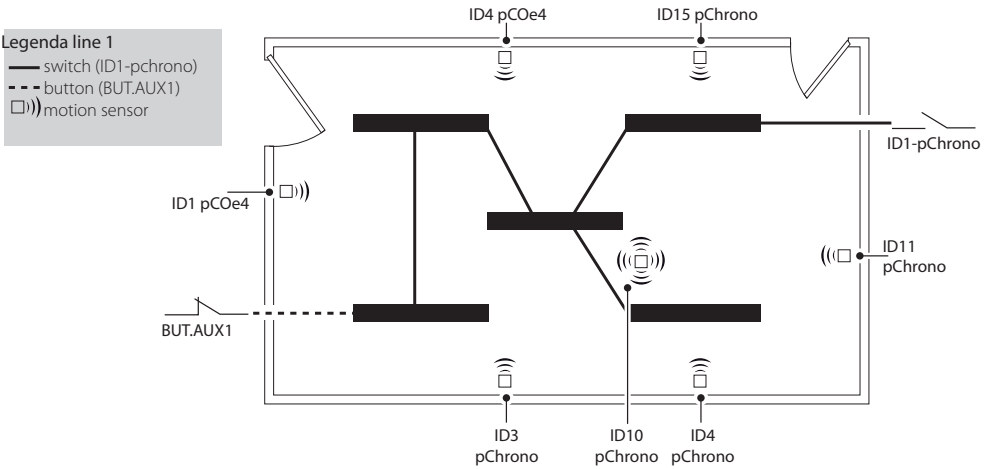

Fig. 7.g

Common 'switch' management (inputs SWI.AUX1, SWI.AUX2, SWI.AUX3, SWI.AUX4, SWI.AUX5)

An individual light fixture can be controlled by several different switches. For this function, pChrono provides 5 'virtual' inputs that group together the action of multiple digital inputs (SWI.AUX*). The action of each reverses the current status of the digital input.

These inputs can be configured under loop "D:Hardware config.\a. Network". Each "SWI.AUX*" input can be associated with up to 4 different digital inputs. The specific SWI.AUX* is then selected in the load configuration screens; the user can select the input by scrolling the list of I/Os available in the field on the 'Switch' screen.

Common 'AND' input management (inputs AND.AUX1, AND.AUX2, AND.AUX3, AND.AUX4, AND.AUX5)

pChrono provides 5 'virtual' inputs that group together the action of multiple digital inputs (AND.AUX*). When all the digital inputs configured for AND.AUX* are closed, the logical value of the AND.AUX* virtual input will be '1'. When the logical state of even just one of the inputs is '0', the value of the virtual input will be '0'. Each "AND.AUX*" can be associated with up to 4 different digital inputs. The AND.AUX* input is then selected in the load configuration screens; the user can select the input by scrolling the list of I/Os available in the field on a 'Switch' or 'Button' screen. Two are the delay times set by mask: one of delay for the ON action, another for the OFF action.

In1	In2	In3	In4	OUT
0	0	0	0	0
X	X	X	X	0
1	1	1	1	1

Common 'OR' input management (inputs OR.AUX1, OR.AUX2, OR.AUX3, OR.AUX4, OR.AUX5)

pChrono provides 5 'virtual' inputs that group together the action of multiple digital inputs (OR.AUX*). When at least one of the digital inputs configured for OR.AUX* is closed, the logical value of the OR.AUX* virtual input will be '1'. When the logical state of all of the inputs is '0', the value of the virtual input will be '0'. Each "OR.AUX*" can

be associated with up to 4 different digital inputs. The OR.AUX* input is then selected in the load configuration screens; the user can select the input by scrolling the list of I/Os available in the field on a 'Switch' or 'Button' screen. Two are the delay times set by mask: one of delay for the ON action, another for the OFF action.

In1	In2	In3	In4	OUT
0	0	0	0	0
X	X	X	X	1
1	1	1	1	1

As described, the inputs/outputs can be selected by the installer according to system requirements. The complete selection of the inputs used as a Switch or Button is shown below, to simplify configuration in the field.

List of inputs used for setting the Switch or Button:
---;ID1-pChrono;ID2-pChrono;ID3-pChrono;ID4-pChrono;ID5-pChrono;ID6-pChrono;ID7-pChrono;ID8-pChrono;ID9-pChrono;ID10-pChrono;ID11-pChrono;ID12-pChrono;ID13-pChrono;ID14-pChrono;ID15-pChrono;ID16-pChrono;ID17-pChrono;ID18-pChrono;ID1-pCOe2;ID2-pCOe2;ID3-pCOe2;ID4-pCOe2;ID1-pCOe3;ID2-pCOe3;ID3-pCOe3;ID4-pCOe3;ID1-pCOe4;ID2-pCOe4;ID3-pCOe4;ID4-pCOe4;ID1-pCOe5;ID2-pCOe5;ID3-pCOe5;ID4-pCOe5;ID1-pCOe6;ID2-pCOe6;ID3-pCOe6;ID4-pCOe6;ID1-pCOe7;ID2-pCOe7;ID3-pCOe7;ID4-pCOe7;ID1-pCOe8;ID2-pCOe8;ID3-pCOe8;ID4-pCOe8;ID1-pCOe9;ID2-pCOe9;ID3-pCOe9;ID4-pCOe9;ID1-pCOe10;ID2-pCOe10;ID3-pCOe10;ID4-pCOe10;ID1-pCOe11;ID2-pCOe11;ID3-pCOe11;ID4-pCOe11;U3-pChrono;U4-pChrono;U5-pChrono;U6-pChrono;U7-pChrono;U8-pChrono;U9-pChrono;U10-pChrono;BUT.AUX1;BUT.AUX2;BUT.AUX3;BUT.AUX4;BUT.AUX5;SWI.AUX1;SWI.AUX2;SWI.AUX3;SWI.AUX4;SWI.AUX5;U1-pChrono;U2-pChrono;AND.AUX1;AND.AUX2;AND.AUX3;AND.AUX4;AND.AUX5;OR.AUX1;OR.AUX2;OR.AUX3;OR.AUX4;OR.AUX5.

Below on the other hand is the list of analogue inputs that can be used to connect a brightness sensor (LUX):
---;U3-pChrono;U4-pChrono;U5-pChrono;U6-pChrono;U7-pChrono;U8-pChrono;U9-pChrono;U10-pChrono;B1-pCOe2;B2-pCOe2;B3-pCOe2;B4-pCOe2;B1-pCOe3;B2-pCOe3;B3-pCOe3;B4-pCOe3;B1-pCOe4;B2-pCOe4;B3-pCOe4;B4-pCOe4;B1-pCOe5;B2-pCOe5;B3-pCOe5;B4-pCOe5;B1-pCOe6;B2-pCOe6;B3-pCOe6;B4-pCOe6;B1-pCOe7;B2-pCOe7;B3-pCOe7;B4-pCOe7;B1-pCOe8;B2-pCOe8;B3-pCOe8;B4-pCOe8;B1-pCOe9;B2-pCOe9;B3-pCOe9;B4-pCOe9;B1-pCOe10;B2-pCOe10;B3-pCOe10;B4-pCOe10;B1-pCOe11;B2-pCOe11;B3-pCOe11;B4-pCOe11;SI add.21;SI add.22;SI add.23;SI add.24;SI add.25;U1-pChrono;U2-pChrono.

Note: at the end of this manual there is a table for noting the actual configuration of the various inputs/outputs.

Below are some examples of how the user can configure the light areas.

Example 1

- Name Area1 "Room #1a"
- Light fixtures installed: 3
- Light management: Scheduler + Switch + Button
- Lights off based on scheduled exceptions: Yes
- Switch DI for light fixture 1, Area 1: ID1 on pChrono
- Button DI for light fixture 1, 2 and 3, Area 1: ID4 on pChrono (common to all three light fixtures)
- Switch DI for light fixture 2, Area 1: ID2 on pChrono
- Switch DI for light fixture 3, Area 1: ID3 on pChrono
- Scheduling:
  - From 1 January to 15 March → from 7:30 to 12:30, from Monday to Friday
  - From 15 June to 15 August → from 8:00 to 12:00, from Monday to Friday
  - From 1 January to 31 December → from 13:30 to 17:30, Saturday & Sunday only

```
Lights config     Ea02
Area 1:          Room #1a

Num.of lights:          3

Management type:
SCHED.+SWITCH+BUTTON
Enable exceptions: YES
```

Fig. 7.h

Area 1 has been named "Room #1a". There are '3' light fixtures; management is "Scheduler + Switch + Button" and the lights in the area will be disabled during the periods specified in the exceptions. Remember that the button always switches on the lights, even outside of the scheduled periods.

```
Room #1a          Ea03

Light 1 setting
Switch:    ID1-pChrono
Button:    ID4-pChrono
Button delay:      5min

Light 1:  NO1-pChrono
```

Fig. 7.i

Light fixture 1, in area 1, is switched on/off by ID1-pChrono. The button that switches light 1 on for 5 minutes is associated with ID4-pChorno. The dedicated digital output is NO1 on pChrono

```
Room #1a          Ea06

Light 2 setting
Switch:    ID2-pChrono
Button:    ID4-pChrono


Light 2:  NO2-pChrono
```

Fig. 7.j

Light fixture 2, in area 1, is switched on/off by ID2-pChrono. The button that switches light 2 on (for 5 minutes) is associated with ID4-pChorno. The dedicated digital output is NO2 on pChrono

```
Room #1a          Ea07

Light 3 setting
Switch:    ID3-pChrono
Button:    ID4-pChrono


Light 3:  NO3-pChrono
```

Fig. 7.k

Light fixture 3, in area 1, is switched on/off by ID3-pChrono. The button that switches light 3 on (for 5 minutes) is associated with ID4-pChrono. The dedicated digital output is NO3 on pChrono

```
Room #1a          Ea09
Scheduler setting
03(07:30-12:30)MTWTF--
   ↳ 01(01/JAN-15/MAR)
02(08:00-12:00)MTWTF--
   ↳ 05(15/JUN-15/AUG)
06(13:30-17:30)-----SS
   ↳ 08(01/JAN-31/DEC)
```

Fig. 7.l

The scheduler is set here as per specifications. For the days of the week, note how when the first letter of the day is visible, the scheduler is active on that day.

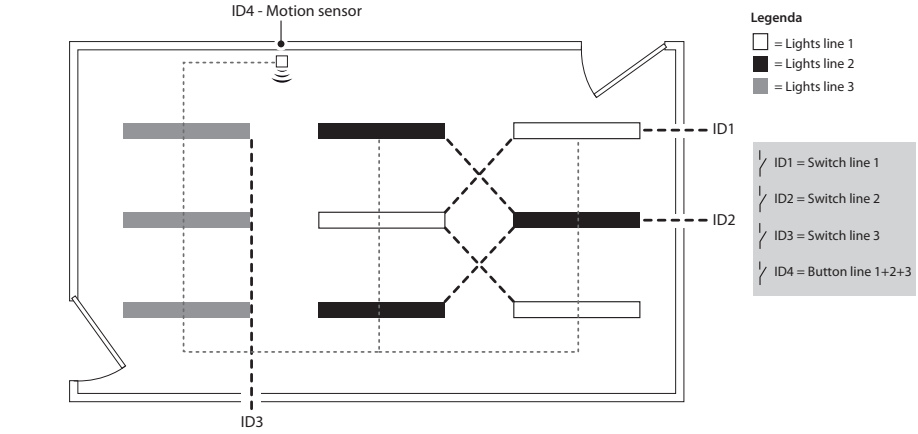

Fig. 7.m

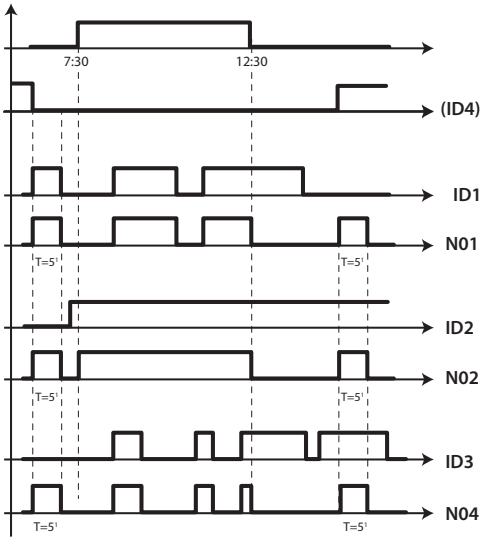

Fig. 7.n

Example 2

- Name Area 2 "Room #2b"
- Light fixtures installed: 1, analogue (1-10V)
- Light management: Scheduler + LUX + Button
- Lights off based on scheduled exceptions: Yes
- LUX sensor input for light fixture 1, Area 2: SI sensor with serial address 21
- Button DI for light fixture 1, Area 2: ID1 on pCOe with serial address 2
- Scheduling:
  - From 1 January to 31 December → from 7:30 to 12:30, from Monday to Friday
  - From 1 January to 31 December → from 08:00 to 12:00, Saturday only

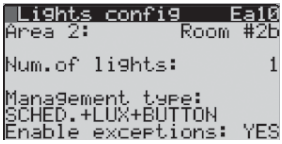

Fig. 7.o

Area 2 has been named "Room #2b". There is just one light fixture available, with analogue control; management is "Scheduler + LUX + Button" and the light will be disabled during the periods specified in the exceptions. Remember that the button always switches on the lights, even outside of the scheduled periods

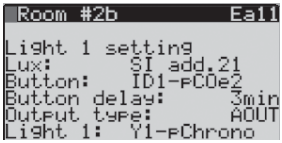

Fig. 7.p

Light fixture 1, in area 2, is managed with modulating control by the wireless SI sensor with address 21. The button that switches the light on for 3 minutes is associated with ID1 on the pCOe with serial address 2. The dedicated analogue output is Y1 on pChrono.

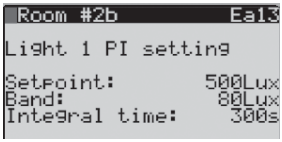

Fig. 7.q

The set point in the room is 500 LUX, the band is set to 80 LUX and the integral time (PI control) is 300 seconds (modifiable). This time means control via the analogue output is filtered against random variations in room brightness.

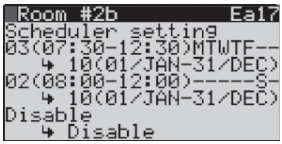

Fig. 7.r

The scheduler is set here as per specifications. For the days of the week, note how when the first letter of the day is visible, the scheduler is active on that day.

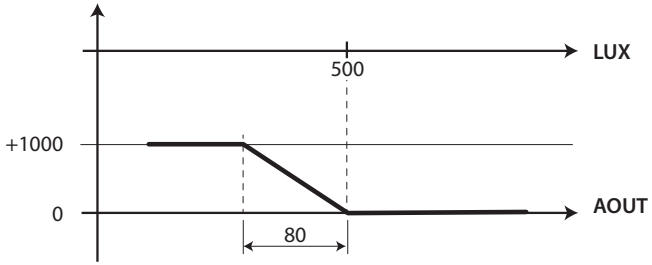

Fig. 7.s

Note: behaviour would be different if needing to manage 4 on/off lights always brightness sensor. The graph below in fact shows the behaviour of the 4 digital outputs.

- Set point: 500 LUX
- Band: 200

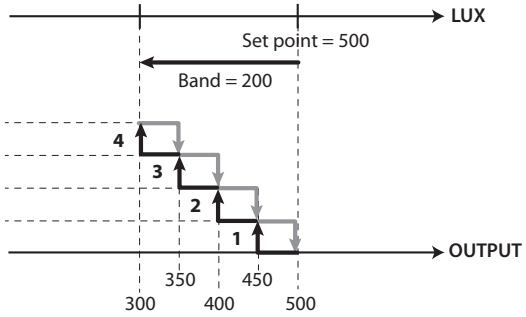

Fig. 7.t

Example 3

The following scheduling is made possible by the BMS (PlantVisorPRO for example) providing a variable that indicates the number of hours of daylight or night (darkness). This function is available using the Geo-Lighting plugin in the ECO-HVAC package. Specifically, the Geo-Lighting plugin provides, based on latitude and longitude data, the sunrise and sunset time for the current day. For further details see the online help in PlantVisorPRO.

- Name Area4 "Adv.sign", ('Advertising sign')
- Light fixtures installed: 1
- Light management: Scheduler + SPV + Button
- Lights off based on scheduled exceptions: No
- Supervisor variable for light fixture 1, Area 3: SPV addr.1
- Button DI for light fixture 1, Area 3: ID11 on pChrono
- Scheduling:
  - From 1 January to 31 December → from sunset to 3:00 a.m.

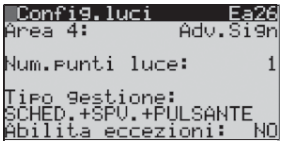

Fig. 7.u

The name "Adv.Sign" is assigned to area 4, the number of light fixtures is set to '1', management is configured as requested and the light is not enabled for exceptions.

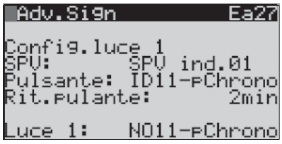

Fig. 7.v

Selecting the variable "SPV.add.01", pChrono awaits the signal from the BMS to enable light fixture 'NO11-pChrono'; this output will switch on the outdoor advertising sign, from sunset until the time set in the scheduler. The action on button 'ID11-pChrono' switches on the lights for 2 minutes to check for any blown bulbs.

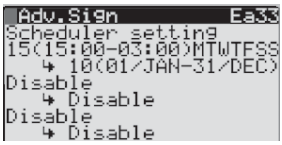

Fig. 7.w

The time band is enabled from 03pm to 3:00am. The sign will not however be switched on before sunset, as defined by the 'Geo-Lighting' plugin (or in any case by the BMS). The changeover at midnight is properly managed.

Fig. 7.x

The configuration shown here refers to the city of Brugine (Padova, Italy), latitude "45.3 North" and longitude "12.0 East". The variable that identifies night-time status is associated with variable "SPV_Add01" on pChrono.

Note: The passage of the midnight is handled properly as long as the next day needs the same scheduling, otherwise the band will disable the load at midnight.

Fig. 7.y

On the Geo-Lighting plugin dashboard, sunset for the current day has been calculated at 20:55 (current day: 5 June 2013). That means that the lights in the advertising signs managed by 'NO11-pChrono' will be switched on note at 20:55, and off at 3:00, as set in the scheduler.

Example 4

Management of 3 lines of lights in steps of 33%, 66%, 100% according to the time bands defined by the following scheduler:

- 33%, from 1 January to 31 December → from 7:00 to 22:00, from Monday to Friday
- 66%, from 1 January to 31 December → from 9:00 to 21:00, from Monday to Friday
- 100%, from 1 January to 31 December → from 15:00 to 21:00, from Monday to Friday

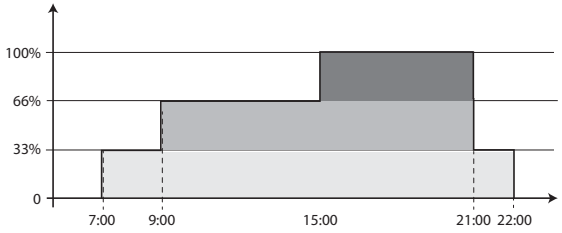

Fig. 7.z

7.2 Pump management

pChrono provides functions for managing up to two groups of pumps. Each group can manage two on/off pumps. If there are no active alarms, when the corresponding digital input sends the signal to start the pump, this will be switched on. The no-flow alarm (flow switch) has a fixed delay of 30 seconds (non-modifiable) from when the pump starts, so as to ignore any variations in water flow-rate. The following functions are available for pump management:

- If there are two pumps, manual or automatic rotation between pumps so as to equally share the workload and operating hours between pumps. Automatic rotation occurs:
  - after a certain period of time;
  - if there is an overload (thermal protector activated) or no flow on one of the two pumps.
- Pump overload management (thermal protector activated). The fault is signalled and the pump stops immediately. Automatic rotation if a second pump is available.
- Management of the flow switch that controls circulation of fluid in the system. The fault is signalled until the pump is eventually shutdown. Automatic rotation if a second pump with fluid flow is available.
- Function to prevent blocking, with the pump started occasionally during extended periods in which the system is not operating.
- Antifreeze function, with the pump started to force circulation of the fluid.

Flow control

Flow control is always enabled, and pChrono attempts to guarantee system operation even when there is no flow. Each pump signals the malfunction repeatedly (until reaching the 'Max number of water flow warnings') before activating the no-flow alarm.

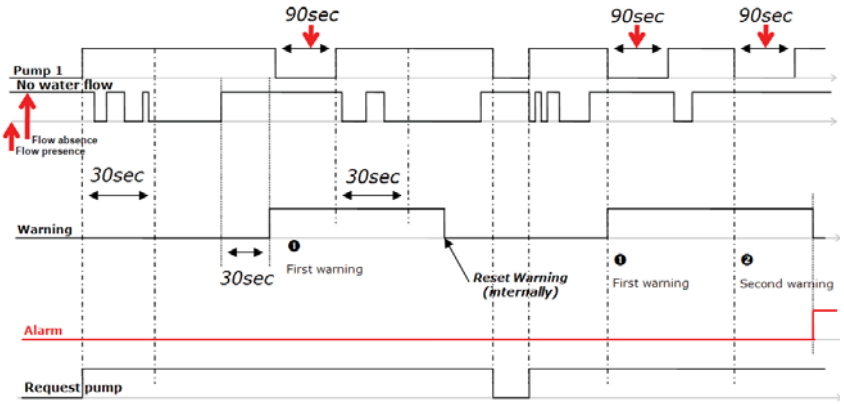

Fig. 7.aa

While remembering that the warnings described below are managed internally by pChrono and therefore nothing is shown on the display, it is important to observe that:

- The number of warnings is reset as soon as water flow is measured.
- When the alarm is activated, the warning is automatically reset.
- If there is an active warning, the pump is switched off for 90 seconds (non-modifiable). Only after this time interval is the pump started again using the start-up procedure: the warning is only reset when flow is measured and the pump is on.
- If 'Max number of water flow warnings' = 0, the alarm is activated immediately and no attempts are performed to restore fluid flow.

When there are two pumps, and the first warning is signalled on one of the pumps, operation alternates between the pumps (rotation).

The two possible cases are described in detail as follows:

- One pump (Number of pumps = 1): If the flow switch input = 1 for > 30 seconds (non-modifiable), the pump continues operating until the internal warning counter > 'Max number of water flow warnings', then the Pump alarm is signalled and the pump is switched off, until the alarm is reset manually by pressing the Alarm button. If when restarting flow is measured for > 30 seconds (non-modifiable), the internal warning counter is set to zero.
- Two pumps (Number of pumps = 2): If the flow switch input = 1 for > 30 seconds (non-modifiable), the pump stops and the other pump starts, unless this too has an active alarm. If there is still no flow, the pumps continue alternating until the 'Max number of water flow warnings' is reached on both. If on each pump the internal warning counter reaches the maximum number of warnings, then the Pump alarm is signalled and the pumps are switched off, until the alarm is reset manually by pressing the Alarm button. If when restarting flow is measured on each pump for > 30 seconds (non-modifiable), the respective internal warning counter is set to zero. Some examples are shown below.

Example 1:

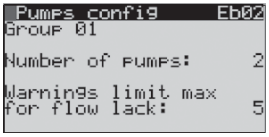

Fig. 7.ab

Pump group 1 manages 2 pumps, with 5 warnings before the water flow alarm.

Rotation between pumps with no flow:
Number of pumps = 2
Max number of water flow warnings = 5
Initial situation: first pump on, and flow constantly absent (flow switch input = 1) then:

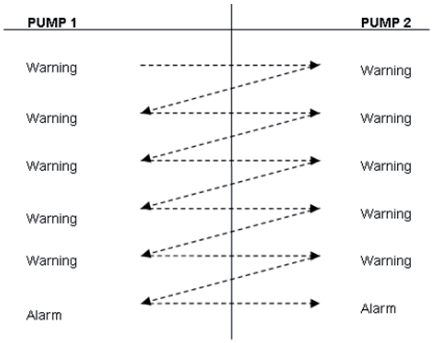

Fig. 7.ac

Example 2:

Rotation between pumps with no flow:
Number of pumps = 2
Max number of water flow warnings = 5
Initial situation: pump 1 on and flow absent. At a certain moment flow is measured, and lasts for a limited time.

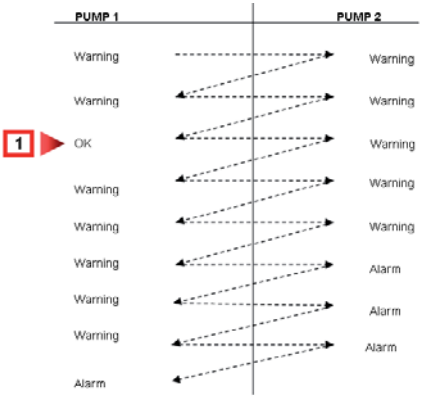

Fig. 7.ad

Legenda
[1]: Rilevazione flusso per un tempo > 30sec (tempo non modificabile) per poi tornare a mancare.

Pump overload (thermal protector activated)

If an overload is measured, the corresponding pump stops immediately and an alarm is activated. If there is a second pump with no alarms, operation switches to the second pump.

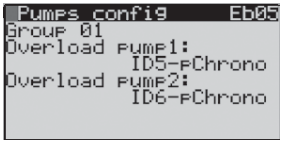

Fig. 7.ae

Pump 1 overload is associated with input ID5 on the pChrono controller; pump 2 with ID6.

Antifreeze

The antifreeze function is always enabled.

The antifreeze request ('Antifreeze active' input = 1) is managed based on the status of the pumps:

1. if one pump is on, this will continue operating until the antifreeze request terminates ('Antifreeze active' input = 0). If there is a second pump, alternating operation is guaranteed, based on the 'Rotation time'.
2. if all the pumps are off, pChrono starts the pump that should start next due to rotation.

The antifreeze function ends when the 'Antifreeze active' input = 0.

The following diagram shows the operation of the antifreeze procedure:

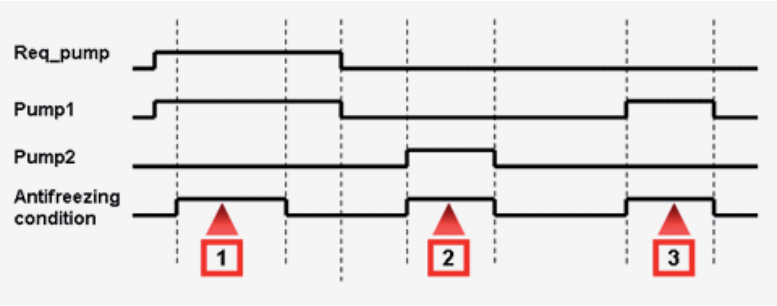

Fig. 7.af

Key

[1]: Pump 1 is already on, therefore antifreeze has no effect.

[2]: No pump was on, therefore the antifreeze function, by rotation, starts pump 2.

[3]: No pump was on, therefore the antifreeze function, by rotation, starts pump 1.

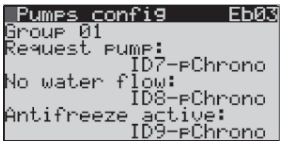

Fig. 7.ag

Input configuration for pump request (common to both pumps), Flow switch and Antifreeze input.

Anti-block

This function is used to prevent physical or mechanical blockages due to rust or fouling in the pumps, following stoppages for an extended period of time.The anti-blocking function is always enabled.

If a pump is not started for more than 7 days (non-modifiable), pChrono automatically switches it on for 30 seconds (non-modifiable), then switches it off again. The anti-blocking function does not affect the operation of any pumps that are already operating.

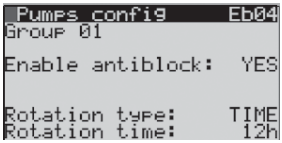

Fig. 7.ah

The anti-blocking function is enabled.
Pump operation is rotated based on operating time, every 12 hours.

7.3 Wireless plug management

Integration of these devices is useful when needing to monitor the power consumption of certain loads and schedule operation based on specific needs. Typical appliances that require monitoring and control as electrical loads are coffee machines, vending machines, water heaters, printers, etc., the power consumption of which is often neglected, even when in standby. Shutting down these appliances completely often brings considerable reductions in total power consumption.

pChrono can manage up to 10 wireless devices that act as energy meters and can control an on/off load according to the dedicated scheduler. The scheduler for these devices can also be bypassed using the exceptions configured in loop 'C. Clock/Scheduler'. Each load/appliance can be named using the 8-digit text available. The name associated with the load will then be shown on the screens used to configure such loads; the same name will also be available on PlantVisorPRO. Management of these devices, which also include the router function, requires an Access Point connected to FBus1 or FBus2, see paragraph '3. System architecture'.

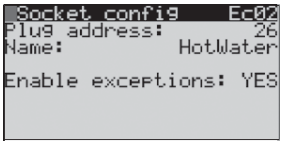

Fig. 7.ai

The load has been identified with the name 'HotWater'. The load will be switched off based on the configured exceptions.

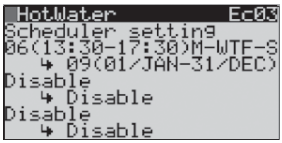

Fig. 7.aj

The scheduler for the 'HotWater' load (shown in the heading, line '0' on the screen) is configured to operate every Monday, Wednesday, Thursday, Friday and Sunday from 13:30 to 17:30.

For further details on using these devices, see the corresponding instruction sheet, +0500049ML.

7.4 Generic load management

pChrono can manage up to 20 generic loads. This is especially useful for loads that require simple timed operation; for example, exhaust fans, air curtains, dampers and irrigation systems. Each device can be named using the 8-digit text available. The name associated with the load will then be shown on the screens used to configure such loads; the same name will also be available on PlantVisorPRO. For details on some of the technical terms used here, see paragraph '7.1 Lights'.

Each load can be managed in different ways, according to system requirements. pChrono provides six types of management:

- SCHEDULER ONLY: the load is on when enabled by the scheduler.
- SWITCH ONLY: the load is on when enabled by the switch input.
- SCHEDULER + SWITCH: the load is enabled to be switched on based on the scheduler settings, but is only actually switched on using the corresponding switch input. Outside of the time bands, the load will be off.
- SCHEDULER + SWITCH + BUTTON: the load is enabled to be switched on based on the scheduler settings, but are only actually switched on using the corresponding switch input. The button will switch on the load for the set time, independently of whether it is enabled by the scheduler or the switch.
- SCHEDULER + SPV: the load is enabled to be switched on based on the scheduler settings, but are only actually switched on using the special function on the supervisor. A list of 30 variables is provided for this function.
- SCHEDULER + SPV + BUTTON: the load is enabled to be switched on based on the scheduler settings, but are only actually switched on using the special function on the supervisor. A list of 30 variables is provided for this function. The button will switch on the load for the set time, independently of whether it is enabled by the scheduler or the supervisor.

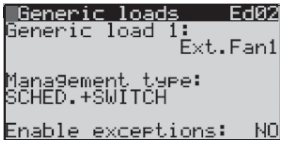

Fig. 7.ak

The exhaust fan "Ext.Fan1" is enabled with SCHEDULER + SWITCH management. Operation will not be affected by the set exceptions.

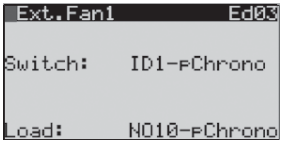

Fig. 7.al

The switch configured to start the fan inside the time band is connected to ID1 on pChrono, while the output is NO10, again on pChrono.

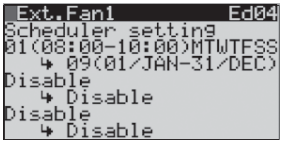

Fig. 7.am

The fan will be enabled every day of the year, from 8.00 to 10:00. Remember that the scheduler simply enables the action of the switch.

7.5 Generic function management

pChrono provides users up to 5 generic functions, which can be configured according to system requirements. These are particularly useful, for example, for managing ON/OFF operation of a valve based on the temperature/pressure/other reading. Each function can be configured as:

- **Thermostat:** to manage a 'Direct' or 'Reverse' step based on the settings of a set point, an ON differential and an OFF differential. The high and low alarm thresholds and the corresponding alarm delay time can also be set
- **Modulating device:** to manage a 'Direct' or 'Reverse' ramp based on the settings of a set point and a band. The action can be 'Proportional' or 'Proportional + Integral'. The integral time, high and low alarm thresholds and the corresponding alarm delay time can also be set
- **Generic alarm:** to manage a generic alarm signal. The alarm input is set, together with the corresponding output that will be activated in the event of alarms, the operating logic and an activation delay.

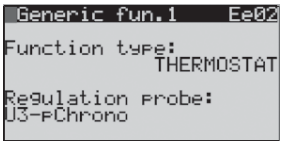

Fig. 7.an

Generic function 1 has been set as 'Thermostat'. The control probe is connected to universal input U3 on pChrono.

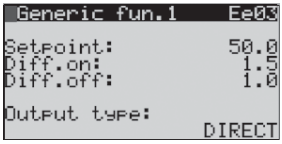

Fig. 7.ao

The set point is 50.0 (the unit of measure refers to the monitored value, not defined here). The step has a positive differential of 1.5 from the set point (50+1.5) and a negative differential of 1.0 from the set point (50-1.0). As the output is set as 'Direct', the output NO3-pCOe3 will be:
NO3-pChrono = ON, if U3-pChrono > 51.5
NO3-pChrono = OFF, if U3-pChorno < 49.0

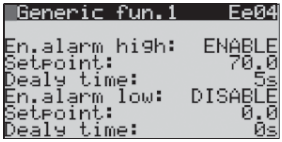

Fig. 7.ap

The high alarm is enabled and has a set point of 70.0 and an activation delay of 5 seconds. The low alarm, on the other hand, is disabled. A fixed offset of 2.0 (20 on the generic analogue input reading) is managed to avoid swings in the two alarms.

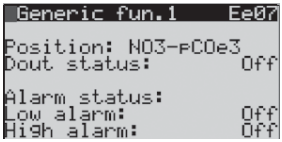

Fig. 7.aq

The digital output for generic function 1 is NO3 on the pCOe with serial address 3. Its current status is off; neither alarm is active.

The settings described previously are illustrated here below.

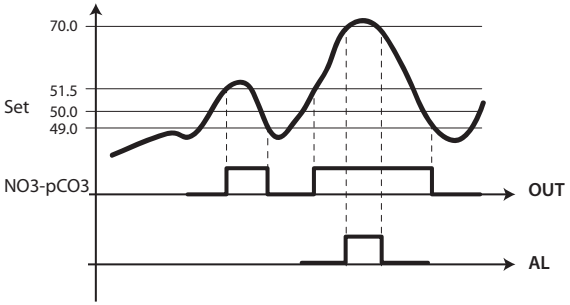

Fig. 7.ar

7.6 Read wireless temperature / humidity / brightness sensors

The installation of a dedicated Access Point, on one of the two FieldBus ports, makes the reading of a number of wireless sensors available. This further increases the flexibility of pChrono. Each wireless sensor can be named using the 8-digit text available. The name associated with the sensor will then be shown on the screens used to configure such sensors. As mentioned in paragraph '3. System architecture', pChrono manages:

pChrono model	Type of wireless sensor	Number of devices
Small / Large	SA, Temperature/ Humidity	3
	SI, Temperature/ Humidity/ Brightness	5

Integration of these sensors makes the pChrono system even more flexible and adaptable; the system is therefore suitable for all installations, offering installers adequate support in the field. As pChrono can read these sensors, it is also suitable for managing lights (SI sensors) or a temperature or humidity value that can then be shared with other devices or simply monitored. An integrated system in fact helps the user identify the information needed to optimise the installation. The outside temperature, for example, read using pChrono, can then be shared with the air handling unit to enable free cooling where possible. Likewise, the room temperature and humidity reading improves management of anti-sweat heaters on refrigerated cabinets, through calculation of the dew point.

8. PARAMETER TABLE

"Mask index": indicates the unique address of each screen and consequently the path needed to reach the parameters available on this screen; for example, to reach the parameters corresponding to the suction pressure probe with mask index Bab01, proceed as follows:

Main menu B.In./Out. → a.Status → b.Analog.in.

Below is the table of the parameters that can be displayed on the terminal. The values indicated with '---' are not significant or are not set, while the values indicated with '…' may vary according to the configuration, with the possible options visible on the user terminal. A row of '…' means that there are a series of parameters similar to the previous ones.

Note: not all the screens and parameters shown in the table are always visible or can be set, the screens and parameters that are visible or can be set depend on the configuration and the access level.

Mask index	Display description	Description	Def.	UOM	Values
Main screen					
Main screen for pChrono	pChrono	The name of the product	...	...	...
	Time and date	Hours and minutes	...	...	0...23, 0...59
		Weekday (Monday to Sunday)	...	...	1...7
		Date (20/6/13)	...	...	...
	Unit status	Unit status (with unit OFF)	...	...	1: Unit ON 0: Unit OFF by keyboard
	i	Press down to see the device status	...	...	...
M01 (read only)	ON/TOT	Number of lights on	...	...	0...80
		Number of lights configured	...	...	0...80
	ON/TOT	Number of pumps on	...	...	0...4
		Number of pumps configured	...	...	0...4
	ON/TOT	Number of sockets on	...	...	0...10
		Number of sockets configured	...	...	0...10
	ON/TOT	Number of generic loads on	...	...	0...20
		Number of generic loads configured	...	...	0...20
	Esc	Press Esc key to go back to main mask	...	...	...

Tab. 8.a

Mask index	Display description	Description	Def.	UOM	Values
A.On/Off unit					
A01	---	Unit status	---	---	7: OFF by KEY 1: Unit on

Tab. 8.b

Mask index	Display descr.	Description	Def.	UOM	Values
B.Load status (the I/Os available depend on the selected configuration, the following are just some examples.)					
B01	ID1:	Status of digital input 1	...	...	Open / Close
(Read only)	ID2:	Status of digital input 2	...	...	Open / Close
	ID3:	Status of digital input 3	...	...	Open / Close
	ID4:	Status of digital input 4	...	...	Open / Close
	...				
B05	U1:	Frequency of U1 input	...	Hz	0...162.5
(Read only)	U2:	Frequency of U2 input	...	Hz	0...162.5
	U3:	Value of U3 input (can be digital input or analogue input)	...	...	-32767...32768
	U4:	Value of U4 input (can be digital input or analogue input)	...	...	-32767...32768
	U5:	Value of U5 input (can be digital input or analogue input)	...	...	-32767...32768
...	...	...	...		...
B07	NO1:	Status of digital output 1	...	...	Off / On
(Read only)	NO2:	Status of digital output 2	...	...	Off / On
	NO3:	Status of digital output 3	...	...	Off / On
	NO4:	Status of digital output 4	...	...	Off / On
...	...		...	...	...
B011	Y1:	Output value of Y1	...	V	0...10.0
(Read only)	Y2:	Output value of Y2	...	V	0...10.0
	Y3:	Output value of Y3	...	V	0...10.0
	Y4:	Output value of Y4	...	V	0...10.0
...	...		...		...

Mask index	Display descr.	Description	Def.	UOM	Values
B013 (Read only if enable)	pCOe address:	Address of pCOe read	...	...	2...11
	Digital input Channel 1:	Status of digital input 1	...	...	Open / Close
	Channel 2:	Status of digital input 2	...	...	Open / Close
	Channel 3:	Status of digital input 3	...	...	Open / Close
	Channel 4:	Status of digital input 4	...	...	Open / Close
B014 (Read only if enable)	pCOe address:	Address of pCOe read	...	...	2...11
	Analog input Channel 1:	Value of analog input 1	...	...	-32767...32768
	Channel 2:	Value of analog input 2	...	...	-32767...32768
	Channel 3:	Value of analog input 3	...	...	-32767...32768
	Channel 4:	Value of analog input 4	...	...	-32767...32768
B015 (Read only if enable)	pCOe address:	Address of pCOe read	...	...	2...11
	Digital output	Off / On of output channel 1	...	...	Off / On
		Off / On of output channel 2	...	...	Off / On
		Off / On of output channel 3	...	...	Off / On
		Off / On of output channel 4	...	...	Off / On
	Analog output	Output value of Y1	...	...	0.0...10.0
...	...	...	...		...
B43 (Read only, if enable)	AP address	Access point address connected FB1	...	...	1
	Connected on FBus1 Firmware version:	Access point version	...	...	2051
	AP trasmi. power:	Access point trasmission power	...	...	0...100
	Radio signal lev.:	Radio signal level	...	...	0...100
B44 (Read only, if enable)	AP address	Access point address connected FB1	...	...	1
	Connected on FBus1 Num.of connected units (online units):	Number of units connected on AP (end device)	...	...	0...18
	Num.of connected units (access point):	Number of units connected on AP	...	...	0...18
	Num.of units connected through RB-device:	Number of routers in the network	...	...	0
B45 (Read only, if enable)	AP address	Access point address connected FB2	...	...	1
	Connected on FBus2 Firmware version:	Access point version	...	...	2051
	AP trasmi. power:	Access point trasmission power	...	...	0...100
	Radio signal lev.:	Radio signal level	...	...	0...100
B46 (Read only, if enable)	AP address	Access point address connected FB2	...	...	1
	Connected on FBus2 Num.of connected units (online units):	Number of units connected on AP (end device)	...	...	0...1
	Num.of connected units (access point):	Number of units connected on AP	...	...	0...1
	Num.of units connected through RB-device:	Number of routers in the network	...	...	0...1
B47 (Read only, if enable)	AP address	Access point address connected FB2	...	...	1
	Number of router in the network:	Number of routers in the network	...	...	0...65535
	Number of router nearby:	Number of router nearby	...	...	0...10
	Num.of router nearby with good connect.:	Number of router nearby with good connection	...	...	0...10
B48 (Read only, if enable)	SA sensor	Address of SA sensor	...	...	16
	...	Name of SA letter 1	...	...	0...72
		Name of SA letter 2	...	...	0...72
		Name of SA letter 3	...	...	0...72
		Name of SA letter 4	...	...	0...72
		Name of SA letter 5	...	...	0...72
		Name of SA letter 6	...	...	0...72
		Name of SA letter 7	...	...	0...72
		Name of SA letter 8	...	...	0...72
	Firmware version:	Firmware version of SA	...	...	2051
	Temperature:	Temperature of SA	...	°C / °F	-500...1000
	Humidity:	Humidity of SA	...	%rH	0...100
	---	Battery level	...	...	0...4
	---	Signal level	...	...	0...4
...	...	...	...	...	...

Mask index	Display descr.	Description	Def.	UOM	Values
B51 (Read only, if enable)	SI sensor	Address of SI sensor	...	...	21
	---	Name of SI letter 1	...	...	0...72
		Name of SI letter 2	...	...	0...72
		Name of SI letter 3	...	...	0...72
		Name of SI letter 4	...	...	0...72
		Name of SI letter 5	...	...	0...72
		Name of SI letter 6	...	...	0...72
		Name of SI letter 7	...	...	0...72
		Name of SI letter 8	...	...	0...72
	Firmware version:	Firmware version of SI	...	...	2051
	Temperature:	Temperature of SI	---	ºC / ºF	-500...1000
	Humidity:	Humidity of SI	---	%rH	0...100
	Light:	Light of SI	---	LUX	0...65535
	---	Battery level	---	---	0...4
	---	Signal level	---	---	0...4
...	...	...	...		...
B56 (Read only, if enable)	PLUG/SWITCH	Address of socket	...	...	26
	---	Name of the socket letter 1	...	...	0...72
		Name of the socket letter 2	...	...	0...72
		Name of the socket letter 3	...	...	0...72
		Name of the socket letter 4	...	...	0...72
		Name of the socket letter 5	...	...	0...72
		Name of the socket letter 6	...	...	0...72
		Name of the socket letter 7	...	...	0...72
		Name of the socket letter 8	...	...	0...72
	Firmware version:	Firmware version of socket	...	...	2053
	Energy:	Energy of the socket	...	Wh	0...4294967296
	Power:	Power of socket	...	W	0...2300
	Status:	Status of socket	...	...	Off / On
	---	Signal level	...	...	0...4
...	...	...	...	...	...
B66 (Read only, if enable)	Generic loads ---	Name of generic load 1	...	...	Off / On
	---	Name of generic load 2	...	...	Off / On
	---	Name of generic load 3	...	...	Off / On
	---	Name of generic load 4	...	...	Off / On
	---	Name of generic load 5	...	...	Off / On
...	...		...	...	...
B70 (Read only, if enable)	Pump 1 of group 1:	Working hours of pump 1 group 1	...	H	0...999999
	Pump 2 of group 1:	Working hours of pump 2 group 1	...	H	0...999999
B71 (Read only, if enable)	Pump 1 of group 2:	Working hours of pump 1 group 2	...	H	0...999999
	Pump 2 of group 2:	Working hours of pump 2 group 2	...	H	0...999999

Tab. 8.c

Mask index	Display descr.	Description	Def.	UOM	Values
c.clock/scheduler					
C01	Day:	Weekday (Monday to Sunday)	...	...	0: *** 1: Monday 2: Tuesday 3: Wednesday 4: Thursday 5: Friday 6: Saturday 7: Sunday
	Date format:	Date format showing on the main mask	1	...	1: DD/MM/YY 2: MM/DD/YY 3: YY.MM.DD
	Date:	Set the new date – day	...	...	0...31
		Set the new date – month	...	...	0...12
		Set the new date – year	...	...	0...99
	Hour:	Set the new time – hour	...	...	0...23
		Set the new time - minute	...	...	0...59

Mask index	Display descr.	Description	Def.	UOM	Values
C02	DST:	Activates the module algorithm	1	...	0: Disable 1: Enable
	Start:	Start weekly in one month	0	...	0: Last 1: First 2: Second 3: Third 4: Fourth
		Start day in one week	0	...	0: *** 1: Monday 2: Tuesday 3: Wednesday 4: Thursday 5: Friday 6: Saturday 7: Sunday
	in	Start month	0	...	1: January 2: February 3: March 4: April 5: May 6: June 7: July 8: August 9: September 10: October 11: Novermber 12: December
		Start hour	0	...	0...23
	End:	End weekly in one month	0	...	0: Last 1: First 2: Second 3: Third 4: Fourth
		End day in one week	0	...	0: *** 1: Monday 2: Tuesday 3: Wednesday 4: Thursday 5: Friday 6: Saturday 7: Sunday
	In	End month	0	...	1: January 2: February 3: March 4: April 5: May 6: June 7: July 8: August 9: September 10: October 11: Novermber 12: December
		End hour	0	...	0...23
C03	T.B.#1:	Starting of Time Band 1	8	H	0...23
		Starting of Time Band 1	30	M	0...59
		Ending of Time Band 1	20	H	0...23
		Ending of Time Band 1	30	M	0...59
	T.B.#2:	Starting of Time Band 2	8	H	0...23
		Starting of Time Band 2	30	M	0...59
		Ending of Time Band 2	12	H	0...23
		Ending of Time Band 2	30	M	0...59
	T.B.#3:	Starting of Time Band 3	13	H	0...23
		Starting of Time Band 3	30	M	0...59
		Ending of Time Band 3	17	H	0...23
		Ending of Time Band 3	30	M	0...59
	T.B.#4:	Starting of Time Band 4	13	H	0...23
		Starting of Time Band 4	30	M	0...59
		Ending of Time Band 4	20	H	0...23
		Ending of Time Band 4	30	M	0...59
	T.B.#5:	Starting of Time Band 5	0	H	0...23
		Starting of Time Band 5	0	M	0...59
		Ending of Time Band 5	0	H	0...23
		Ending of Time Band 5	0	M	0...59
...	...	...	...	...	...

Mask index	Display descr.	Description	Def.	UOM	Values
C07	Per.#1:	Starting of Period 1	20	...	1...31
		Starting of Period 1	3	...	1...12
		Ending of Period 1	20	...	1...31
		Ending of Period 1	6	...	1...12
	Per.#2:	Starting of Period 2	21	...	1...31
		Starting of Period 2	3	...	1...12
		Ending of Period 2	20	...	1...31
		Ending of Period 2	9	...	1...12
	Per.#3:	Starting of Period 3	22	...	1...31
		Starting of Period 3	9	...	1...12
		Ending of Period 3	20	...	1...31
		Ending of Period 3	12	...	1...12
	Per.#4:	Starting of Period 4	21	...	1...31
		Starting of Period 4	12	...	1...12
		Ending of Period 4	19	...	1...31
		Ending of Period 4	3	...	1...12
	Per.#5:	Starting of Period 5	20	...	1...31
		Starting of Period 5	6	...	1...12
		Ending of Period 5	21	...	1...31
		Ending of Period 5	9	...	1...12
...	...	...	...	...	...
C09	#1..5:	Time band usage from time band 1 to time band 5	...	...	0...50
	#6..10:	Time band usage from time band 6 to time band 10	...	...	0...50
	#11..15:	Time band usage from time band 11 to time band 15	...	...	0...50
	#16..20:	Time band usage from time band 16 to time band 20	...	...	0...50
C10	#1..5:	Period usage from period 1 to period 5	...	...	0...50
	#6..10:	Period usage from period 6 to period 10	...	...	0...50
C11	Exception 01/01	Indicate the exception	...	...	---
	From	Exception from date	...	...	1...31, 1...12
	to	Exception end date	...	...	1...31, 1...12
...	...	...	...	...	...
C26	Next exception:	Showing next exception date	...	...	1...31, 1...12
	Do you want to set exceptions?	---	...	...	...
	press ENTER	---	...	...	...
C27	Inset exception from	Set start day	...	...	0...31
		Set start month	...	...	0...12
	to	Set end day	...	...	0...31
		Set end month	...	...	0...12
	...	Enter to confirm	...	...	...

Tab. 8.d

Mask index	Display descr.	Description	Def.	UOM	Values
D. Hardware config. (The I/Os available depend on the selected configuration, the following are just some examples)					
Da01	FBus 2 used with:	Select which device connected to FBus2	0	---	0: pCOe 1: Wireless sensors
	Number of pCOe	How many pCOe used	0	---	0...10
	Enable access point on FBus1: FBus2:	Enable access point connected on FBus1 and FBus2	0	---	0: No 1: Yes
Da02 (If enable AP on FBus2, and used pCOe)	Access point on FBus2:	Choose router bridge connected on AP or not	0	---	21: Without router-bridge 17: With router-bridge
	pCOe on router bridge Min address: Max address:	Min and max address set to connected on router bridge	0	---	2...11
Da03	Address sensors on FBus1 SA T/H:	Enable the address for SA sensor	0	---	0: Disabilitato 1: Abilitato
	SI LUX:	Enable the address for SI sensor	0	---	0: Disabilitato 1: Abilitato
Da04	Address of socket sensors on FBus1 #26: #27:	Set the socket type	0	---	0: Plug 1: Switch
	#28: #29:	Set the socket type	0	---	0: Plug 1: Switch
	#30: #31:	Set the socket type	0	---	0: Plug 1: Switch
	#32: #33:	Set the socket type	0	---	0: Plug 1: Switch
	#34: #35:	Set the socket type	0	---	0: Plug 1: Switch

Mask index	Display descr.	Description	Def.	UOM	Values
Da05	BMS1 supervisor setting Protocol:	Set protocol for BMS1	0	---	0: None 1: Modbus RS485 2: pCO Manager
	Speed:	Set speed for protocol	4	---	0: 1200 1: 2400 2: 4800 3: 9600 4: 19200
	Address	Set address for SPV	1	---	1...207
Da06	BMS2 supervisor setting Protocol:	Set protocol for BMS1	0	---	0: None 1: Modbus RS485 2: pCO Manager
	Speed:	Set speed for protocol	4	---	0: 1200 1: 2400 2: 4800 3: 9600 4: 19200
	Address	Set address for SPV	1	---	1...207
Da07	Enable buzzer	Enable buzzer beep	1	---	0: No 1: Yes
	Alarms output Output position:	Set the position for alarm output	0	---	0...58
	Relay status:	Logic of alarm output relay output status	---	---	0: NO 1: NC
	Waring blackout:	Enable blackout warning	1	---	0: NO
Da08	BUT.AUX1, inputs selsection 1: YES	Button logic input 1 for DIN AUX1	---	---	0...66
	2.	Button logic input 2 for DIN AUX1	---	---	0...66
	3.	Button logic input 3 for DIN AUX1	---	---	0...66
	4.	Button logic input 4 for DIN AUX1	---	---	0...66
Da09	BUT.AUX1,inputs selsection 5.	Button logic input 5 for DIN AUX1	---	---	0...66
	6.	Button logic input 6 for DIN AUX1	---	---	0...66
	7.	Button logic input 7 for DIN AUX1	---	---	0...66
	8.	Button logic input 8 for DIN AUX1	---	---	0...66
...	...	...	...	...	...
Da18	SWI.AUX1,inputs selection 1.	Switch logic input 1 for DIN AUX1	---	---	0...66
	2.	Switch logic input 2 for DIN AUX1	---	---	0...66
	3.	Switch logic input 3 for DIN AUX1	---	---	0...66
	4.	Switch logic input 4 for DIN AUX1	---	---	0...66
...	...	...	...	...	...
Da23	AND.AUX,inputs selection 1.	And logic input 1 for DIN AUX1	---	---	0...66
	2.	And logic input 2 for DIN AUX1	---	---	0...66
	3.	And logic input 3 for DIN AUX1	---	---	0...66
	4.	And logic input 4 for DIN AUX1	---	---	0...66
	ON: sec OFF: sec	Delay on and delay off time for AND AUX1	0	s	0...999
...	...	...	...	...	...
Da28	OR.AUX1,inputs selection 1.	Or logic input 1 for DIN AUX1	---	---	0...66
	2.	Or logic input 2 for DIN AUX1	---	---	0...66
	3.	Or logic input 3 for DIN AUX1	---	---	0...66
	4.	Or logic input 4 for DIN AUX1	---	---	0...66
	ON: sec OFF: sec	Delay on and delay off time for Or AUX1	0	s	0...999
...	...	...	...	...	...
Db01	U1 type:	Type for the U1	---	---	0:--- |1:DIN |2:AIN
	U2 type:	Type for the U2	---	---	0:--- |1:DIN |2:AIN
	U3 type:	Type for the U3	---	---	0:--- |1:DIN |2:AIN
	U4 type:	Type for the U4	---	---	0:--- |1:DIN |2:AIN
	U5 type:	Type for the U5	---	---	0:--- |1:DIN |2:AIN
Db02 (If large board)	U6 type:	Type for the U6	---	---	0:--- |1:DIN |2:AIN
	U7 type:	Type for the U7	---	---	0:--- |1:DIN |2:AIN
	U8 type:	Type for the U8	---	---	0:--- |1:DIN |2:AIN
	U9 type:	Type for the U9	---	---	0:--- |1:DIN |2:AIN
	U10 type:	Type for the U10	---	---	0:--- |1:DIN |2:AIN

Mask index	Display descr.	Description	Def.	UOM	Values
Db03 (If enable)	Analog input U3 Probe type:	Analog type for U3	0	---	0:NTC 1:PT1000 2:0-1V 3:0-10V 4:4-20mA 5:0-5V
	Probe offset:	Probe offset for U3	0	---	-9.9...9.9
	Min value:	Set min value for analog input	0.0	---	-3276.7...3276.8
	Max value	Set max value for analog input	0.0	---	-3276.7...3276.8
...	...	...	...	...	...
Db11	Logic of pChrono ID ID1: ID2:	Logic for ID1 and ID2	---	---	0:NC 1:NO
	ID3: ID4:	Logic for ID3 and ID4	---	---	0:NC 1:NO
	ID5: ID6:	Logic for ID5 and ID6	---	---	0:NC 1:NO
	ID7: ID8:	Logic for ID7 and ID8	---	---	0:NC 1:NO
...	...	...	...	...	...
Db13	Logic of pChrono NO NO1: NO2:	Logic for NO1 and NO2	---	---	0:NO 1:NC
	NO3: NO4:	Logic for NO3 and NO4	---	---	0:NO 1:NC
	NO5: NO6:	Logic for NO5 and NO6	---	---	0:NO 1:NC
	NO7: NO8:	Logic for NO7 and NO8	---	---	0:NO 1:NC
...	...	...	...	...	...
Db15	NO of pChrono NO1: NO2:	Set AUTO/OFF/ON for NO1 and NO2	---	---	0:AUTO 1:OFF 2:ON
	NO3: NO4:	Set AUTO/OFF/ON for NO3 and NO4	---	---	0:AUTO 1:OFF 2:ON
	NO5: NO6:	Set AUTO/OFF/ON for NO5 and NO6	---	---	0:AUTO 1:OFF 2:ON
	NO7: NO8:	Set AUTO/OFF/ON for NO7 and NO7	---	---	0:AUTO 1:OFF 2:ON
…	…	…	…	…	…
Dc01	No pCOe devices	---	---	---	---
Dc02	Address:	Address of pCOe	2	---	2
	Offl.alarm delay:	Offline alarm delay time	30	---	0...300
	En.probe: B1 B2 B3 B4	Enable analog input for B1 to B4	0	---	0:N 1:Y
	Analog input type Ch 1&2:	Analog type of probe	0	--	0:Carel NTC 1:0..1V 2:0..20mA 3:4..20mA 4:0..5V 6:NTC-HT
	Ch 3&4:	Analog type of probe	0	--	0:Carel NTC 1:0..1V 2:0..20mA 3:4..20mA 4:0..5V 6:NTC-HT
Dc03	Address:	Address of pCOe	2	---	2
	Analog input limits Ch 1 Min:	Min value of probe 1	---	---	-999.9...999.9
	Ch 1 Max:	Max value of probe 1	---	---	-999.9...999.9
	Ch 2 Min:	Min value of probe 2	---	---	-999.9...999.9
	Ch 2 Max:	Max value of probe 2	---	---	-999.9...999.9
Dc04	Address:	Address of pCOe	2	---	2
	Analog input limits Ch 3 Min:	Min value of probe 3	---	---	-999.9...999.9
	Ch 3 Max:	Max value of probe 3	---	---	-999.9...999.9
	Ch 4 Min:	Min value of probe 4	---	---	-999.9...999.9
	Ch 4 Max:	Max value of probe 4	---	---	-999.9...999.9
Dc05	Address:	Address of pCOe	2	---	2
	Logic of pCOe ID1: ID2:	Logic of ID1 and ID2	0	---	0:NC 1:NO
	ID3: ID4:	Logic of ID3 and ID4	0	---	0:NC 1:NO
	NO1: NO2:	Logic of NO1 and NO2	0	---	0:NO 1:NC
	NO3: NO4:	Logic of NO3 and NO4	0	---	0:NO 1:NC

Mask index	Display descr.	Description	Def.	UOM	Values
Dc06	Address:	Address of pCOe	2	---	2
	NO1:	Set AUTO/OFF/ON for NO1	0	---	0:AUTO 1:OFF 2:ON
	NO2:	Set AUTO/OFF/ON for NO2	0	---	0:AUTO 1:OFF 2:ON
	NO3:	Set AUTO/OFF/ON for NO3	0	---	0:AUTO 1:OFF 2:ON
	NO4:	Set AUTO/OFF/ON for NO4	0	---	0:AUTO 1:OFF 2:ON
...	...	....	...	...	...
Dd01	No wireless device	---	...	...	...
Dd02	SA sensor	Address of SA sensor	16	---	16
	---	Name of SA letter 1	---	---	0...72
		Name of SA letter 2	---	---	0...72
		Name of SA letter 3	---	---	0...72
		Name of SA letter 4	---	---	0...72
		Name of SA letter 5	---	---	0...72
		Name of SA letter 6	---	---	0...72
		Name of SA letter 7	---	---	0...72
		Name of SA letter 8	---	---	0...72
	Time to send data cycle:	Each cycle to send data to AP	60	s	5...3600
Dd03	SA sensor	Address of SA sensor	16	---	16
	---	Name of SA letter 1	---	---	0...72
		Name of SA letter 2	---	---	0...72
		Name of SA letter 3	---	---	0...72
		Name of SA letter 4	---	---	0...72
		Name of SA letter 5	---	---	0...72
		Name of SA letter 6	---	---	0...72
		Name of SA letter 7	---	---	0...72
		Name of SA letter 8	---	---	0...72
	Threshol. setting High temp.:	High temperature threshold set	---	°C/°F	-999.9...999.9
	Low temp.:	Low temperature threshold set	---	°C/°F	-999.9...999.9
	Offset temp.:	Offset of temperature probe	---	°C/°F	-99.9...99.9
Dd04	SA sensor	Address of SA sensor	16	---	16
	---	Name of SA letter 1	---	---	0...72
		Name of SA letter 2	---	---	0...72
		Name of SA letter 3	---	---	0...72
		Name of SA letter 4	---	---	0...72
		Name of SA letter 5	---	---	0...72
		Name of SA letter 6	---	---	0...72
		Name of SA letter 7	---	---	0...72
		Name of SA letter 8	---	---	0...72
	Threshol. setting High humid.:	High humidity threshold set	---	%rH	0...100
	Low humid.:	Low humidity threshold set	---	%rH	0...100
...	...	...	...	...	...
Dd11	SI sensor	Address of SI sensor	21	---	21
	---	Name of SI letter 1	---	---	0...72
		Name of SI letter 2	---	---	0...72
		Name of SI letter 3	---	---	0...72
		Name of SI letter 4	---	---	0...72
		Name of SI letter 5	---	---	0...72
		Name of SI letter 6	---	---	0...72
		Name of SI letter 7	---	---	0...72
		Name of SI letter 8	---	---	0...72
	Time to send data cycle:	Each cycle to send data to AP	60	s	5...3600
Dd12	SI sensor	Address of SI sensor	21	---	21
	---	Name of SI letter 1	---	---	0...72
		Name of SI letter 2	---	---	0...72
		Name of SI letter 3	---	---	0...72
		Name of SI letter 4	---	---	0...72
		Name of SI letter 5	---	---	0...72
		Name of SI letter 6	---	---	0...72
		Name of SI letter 7	---	---	0...72
		Name of SI letter 8	---	---	0...72
	Threshol. setting High temp.:	High temperature threshold set	---	°C/°F	-999.9...999.9
	Low temp.:	Low temperature threshold set	---	°C/°F	-999.9...999.9
	Offset temp.:	Offset of temperature probe	---	°C/°F	-99.9...99.9

Mask index	Display descr.	Description	Def.	UOM	Values
Dd13	SI sensor	Address of SI sensor	21	---	21
	---	Name of SI letter 1	---	---	0...72
		Name of SI letter 2	---	---	0...72
		Name of SI letter 3	---	---	0...72
		Name of SI letter 4	---	---	0...72
		Name of SI letter 5	---	---	0...72
		Name of SI letter 6	---	---	0...72
		Name of SI letter 7	---	---	0...72
		Name of SI letter 8	---	---	0...72
	Threshol. setting High humid.:	High humidity threshold set	---	%rH	0...100
	Low humid.:	Low humidity threshold set	---	%rH	0...100
Dd14	SI sensor	Address of SI sensor	21	---	21
	---	Name of SI letter 1	---	---	0...72
		Name of SI letter 2	---	---	0...72
		Name of SI letter 3	---	---	0...72
		Name of SI letter 4	---	---	0...72
		Name of SI letter 5	---	---	0...72
		Name of SI letter 6	---	---	0...72
		Name of SI letter 7	---	---	0...72
		Name of SI letter 8	---	---	0...72
	Threshol. setting High light:	High light threshold set	---		0...9999
	Low light:	Low light threshold set	---		0...9999
	Coeff.light:	Light multiplicative coefficient	---		0...9999
...	...	...	...	...	...
Dd31	PLUG/SWITCH	Address of PLUG/SWITCH	26	---	26
	Status:	Status of PLUG/SWITCH	---	---	0:OFF 1:ON
	Force on:	Force on PLUG/SWITCH	---	---	0:No 1:Yes
	Force off:	Force off PLUG/SWITCH	---	---	0:No 1:Yes
	Time to send data cycle:	Each cycle to send data to AP	20	s	5...3600
	Reset data:	Reset value	---	---	0:No 1:Yes
	---	Wait please...			
...	...	...	...	..	...
De01	Delete data logger:	Delete alarm history	---	---	0:No 1:Yes
De02	Unit measurement type:	Set unit measurement for unit	---	---	1:ºC/Barg 2:ºF/Psig
De03	DEFAULT INSTALLATION Erase user settings and install global default value:	Load default	---	---	0:No 1:Yes
De04	---	Save user default	---	---	0:No 1:Yes
	---	Load user default	---	---	0:No 1:Yes
	Save default:	Show the date for the latest default value	---	---	1...31, 1...12, 0...99
De05	Insert new hardware config password:	Set new hardware password	---	---	0...9999
	Insert new load config password:	Set new load config password	---	---	0...9999

Tab. 8.e

Mask index	Display descr.	Description	Def.	UOM	Values
E.Load config. (The I/Os available depend on the selected configuration, the following are just some examples)					
Ea01	Number of total area:	Lights area number set	1	---	0...20
	Force all lights ON:	Set input position for force all lights ON	--	---	0...88
	---	Status of Force on function	---	---	Open / Close
	Delay off time	Delay off time for force all lights on	0	---	0...999
Ea02	Area 1:	Name of area 1 (8 letters)	---	---	0...72
	Num.of lights:	Set numbers in area	---	---	0...4
	Management type:	Set management type for lights	---	---	0:--- 1:only scheduler 2:only switch 3.sched.+switch 4:sched.+switch+ button 5:sched.+spv. 6:sched.+spv.+ button 7:sched.+lux 8:sched.+lux+ button
	Enable exceptions:	Enable/Disable exceptions	---	---	0:No 1:Yes

Mask index	Display descr.	Description	Def.	UOM	Values
Ea03	---	Name of area 1 (8 letters)	---	---	0...72
	Light 1 setting	Switch, set position for switch (if enable)	---	---	0...88
	---	Button, set position for button (if enable)	---	---	0...88
	---	SPV, set position for SPV (if enable)	---	---	0...30
	---	Lux, set position for Lux (if enable)	---	---	0...55
	---	Button on time (if enable)	1	min	0...999
	---	Output type (if enable)	---	---	0: DOUT 1: AOUT
	Light 1:	Light 1 output position	---	---	0...58 (Dout) 0...16 (Aout)
Ea04 (if enable LUX, and set Dout)	---	Name of the area 1 (8 letters)	---	---	0...72
	Lights setting Setpoint:	Setpoint for the lux of dout	750	Lux	0...32767
	Band:	Band for lux of dout	50	Lux	0...32767
Ea05 (if enable LUX, and set Aout)	---	Name of the area 1 (8 letters)	---	---	0...72
	Light 1 PI setting Setpoint:	Setpoint for lux of aout	500	Lux	0...32767
	Band:	Band for lux of aout	50	Lux	0...32767
	Integral time:	Integral time for aout	0	s	0...9999
	Minmum aout:	Set minimum aout for light	---	V	0...10.0
	Maximum aout:	Set maximum aout for light	---	V	0...10.0
Ea06 (if enable)	---	Name of the area 1 (8 letters)	---	---	0...72
	Light 2 setting	Switch, set position for switch (if enable)	---	---	0...88
	---	Button, set position for button (if enable)	---	---	0...88
	---	SPV, set position for SPV (if enable)	---	---	0...30
	Light 2:	Light 2 output position (if enable)	---	---	0...58
Ea07 (if enable)	---	Name of the area 1 (8 letters)	---	---	0...72
	Light 3 setting	Switch, set position for switch (if enable)	---	---	0...88
	---	Button, set position for button (if enable)	---	---	0...88
	---	SPV, set position for SPV (if enable)	---	---	0...30
	Light 3:	Light 3 output position (if enable)	---	---	0...58
Ea08 (if enable)	---	Name of the area 1 (8 letters)	---	---	0...72
	Light 4 setting	Switch, set position for switch (if enable)	---	---	0...88
	---	Button, set position for button (if enable)	---	---	0...88
	---	SPV, set position for SPV (if enable)	---	---	0...30
	Light 4:	Light 4 output position (if enable)	---	---	0...58
Ea09	---	Name of the area 1 (8 letters)	---	---	0...72
	Scheduler setting	Select which time band use	0	---	0...20
	---	Show the current time band	---	---	---
	---	Enable weekday	0	---	0:Disable 1:Enable
	---	Select which period use	0	---	0...10
	---	Show the current period	---	---	---
	---	Select which time band use	0	---	0...20
	---	Show the current time band	---	---	---
	---	Enable weekday	0	---	0:Disable 1:Enable
	---	Select which period use	0	---	0...10
	---	Show the current period	---	---	---
	---	Select which time band use	0	---	0...20
	---	Show the current time band	---	---	---
	---	Enable weekday	0	---	0:Disable 1:Enable
	---	Select which period use	0	---	0...10
	---	Show the current period	---	---	---
...	...	...	...	...	...
Eb01	Number of pumps group:	Set number of pump groups	0	---	0...2
	Alarms of pumps:	Set the pumps alarm output position	0	---	0...58
	Status:	Show the status of pump alarms	---	---	Open / Close
Eb02	Group 01 Number of pumps:	Set number of pumps	0	---	0...2
	Warnings limit max for flow lack:	Set maximum number of flow lack warning	0	---	0...5
Eb03	Group 01 Request pump:	Set input position for request pumps	0	---	0...88
	No water flow:	Set input position for no water flow	0	---	0...88
	Antifreeze active:	Set input position for antifreeze active	0	---	0...88
Eb04	Group 01 Enable anti-block:	Enable antiblock for pumps	0	---	0:No 1:Yes
	Rotation type:	Select rotation type	0	---	0:TIME 1:SWITCH
	---	Rotation time (if enable)	1	h	1...999
Eb05	Group 01 Overload pump1:	Set input position for pump 1 overload	0	---	0...88
	Pump 2 (if enable)	Set input position for pump 2 overload	0	---	0...88
	Rotation by switch (if enable)	Set input position for switch pumps	0	---	0...88
Eb06	Group 01 Pump1:	Set output position for pump 1 output	0	---	0...58
	Pump 2 (if enable)	Set output position for pump 2 output	0	---	0...58

Mask index	Display descr.	Description	Def.	UOM	Values
Eb07	Group 01 Pumps working hour setting	Set pumps working hour	100000	h	0...999999
...	...	...	...	...	...
Ec01	No socket devices	---	---	---	---
Ec02	Plug/Switch	Plug/Switch address	26	---	26
	Name:	Set the name for PLUG/SWITCH (8 letters)	---	---	0...72
	Enable exceptions:	Enable/Disable the exceptions for sockets	0	---	0:No 1:Yes
Ec03	---	Name of the plug/switch (8 letters)	---	---	0...72
	Scheduler setting	Select which time band use	0	---	0...20
	---	Show the current time band	---	---	---
	---	Enable weekday	0	---	0:Disable 1:Enable
	---	Select which period use	0	---	0...10
	---	Show the current period	---	---	---
	---	Select which time band use	0	---	0...20
	---	Show the current time band	---	---	---
	---	Enable weekday	0	---	0:Disable 1:Enable
	---	Select which period use	0	---	0...10
	---	Show the current period	---	---	---
	---	Select which time band use	0	---	0...20
	---	Show the current time band	---	---	---
	---	Enable weekday	0	---	0:Disable 1:Enable
	---	Select which period use	0	---	0...10
	---	Show the current period	---	---	---
...	...	...	...	...	...
Ed01	Number of generic loads:	Set number of generic loads	0	---	0...20
Ed02	Generic load 1:	Set the name for generic load 1 (8 letters)	0	---	0...72
	Management type:	Set management type for generic load 1	0	---	0:--- 1:only scheduler 2:only switch 3.sched.+ switch 4:sched.+switch+ button 5:sched.+spv 6:sched.+spv.+ button
	Enable exceptions:	Enable/Disable exceptions	0	---	0:No 1:Yes
Ed03	---	Name of generic load 1 (8 letters)	---	---	0...72
	---	Switch, set position for switch (if enable)	---	---	0...88
	---	Button, set position for button (if enable)	---	---	0...88
	---	SPV, set position for SPV (if enable)	---	---	0...30
	---	Button on time (if enable)	0	min	0...999
	Load:	Set the output position for output	0	---	0...58
Ed04	---	Name of generic load 1 (8 letters)	---	---	0...72
	Scheduler setting	Select which time band use	0	---	0...20
	---	Show the current time band	---	---	---
	---	Enable weekday	0	---	0:Disable 1:Enable
	---	Select which period use	0	---	0...10
	---	Show the current period	---	---	---
	---	Select which time band use	0	---	0...20
	---	Show the current time band	---	---	---
	---	Enable weekday	0	---	0:Disable 1:Enable
	---	Select which period use	0	---	0...10
	---	Show the current period	---	---	---
	---	Select which time band use	0	---	0...20
	---	Show the current time band	---	---	---
	---	Enable weekday	0	---	0:Disable 1:Enable
	---	Select which period use	0	---	0...10
	---	Show the current period	---	---	---
...	...	...	...	...	...
Ee01	Number of generic functions:	Set number of generic functions	0	---	0...5
Ee02	Function type:	Set function type	0	---	0:Thermostat 1:Modulating 2: Generic alarm
	Regulation probe:	Set input position for regulation probe (if enable)	0	---	0...75
	Input for gen.alarn	Set input position for generic alarm (if enable)	0	---	0...88
Ee03 (if enable)	Setpoint:	Setpoint for thermostat	0.0	---	-3276.7...3276.7
	Diff.on:	Diff on for thermostat	0.0	---	-3276.7...3276.7
	Diff.off:	Diff off for thermostat	0.0	---	-3276.7...3276.7
	Output type:	Set output type for thermostat	0	---	0:Direct 1:Reverse

Mask index	Display descr.	Description	Def.	UOM	Values
Ee04 (if enable)	En.alarm high:	Enable high alarm	0	---	0:Disable 1:Enable
	Setpoint:	High alarm setpoint (diff is fixed to 2.0)	0.0	---	-3276.7...3276.7
	Delay time:	High alarm delay time	0	S	0...999
	En.alarm low:	Enable low alarm	0	---	0:Disable 1:Enable
	Setpoint:	Low alarm setpointc (diff is fixed to 2.0)	0.0	---	-3276.7...3276.7
	Delay time:	Low alarm delay time	0	S	0...999
Ee05 (if enable)	Regulation type:	Set regulation type for modulating output	0	---	0:P 1:PI
	Setpoint:	Setpoint for modulating output	0.0	---	-3276.7...3276.7
	Band:	Band for modulating output	0.0	---	-3276.7...3276.7
	---	Integral time (if enable)	0	s	0...999
	Output type:	Set output type for modulating	0	---	0:Direct 1:Reverse
Ee06 (if enable)	En.alarm high:	Enable high alarm	0	---	0:Disable 1:Enable
	Setpoint:	High alarm setpoint (diff is fixed to 2.0)	0.0	---	-3276.7...3276.7
	Delay time:	High alarm delay time	0	S	0...999
	En.alarm low:	Enable low alarm	0	---	0:Disable 1:Enable
	Setpoint:	Low alarm setpoint (diff is fixed to 2.0)	0.0	---	-3276.7...3276.7
	Delay time:	Low alarm delay time	0	S	0...999
Ee07	Position:	Set position for output	0	---	0...58 (Dout) 0...16 (Aout)
	Dout status:	Output value (if enable)	---	---	0: Off 1: On
	Minimum aout:	Set minimum aout (if enable)	---	V	0...10.0
	Maximum aout:	Set maximum aout (if enable)	---	V	0...10.0
	Aout value:	Output value (if enable)	---	---	0...10.0
	Alarm status: Low: High:	Low alarm status High alarm status	---	---	0:No 1:Yes
Ee08 (if enable)	Position:	Set generic alarm output position	---	---	0...58
	Enable reverse:	Set reverse for input	---	---	0: NO 1: YES
	Alarm delay:	Set delay time for generic alarm	---	S	0...999
...	...	...	...	...	...

Tab. 8.f

Mask index	Display descr.	Description	Def.	UOM	Values
F. Language					
F01	Language	Change language (press Enter to change)	---	---	0: English 1: Italian
	---	Press ESC to confirm	---	---	---
	---	Show mask time	---	S	0...999
F02	Code: pChrono	---	---	---	---
	Ver.:	Software version and date	---	---	---
	Bios:	Bios version and date	---	---	---
	Boot:	Boot version and date	---	---	---
F03	Board type:	Board type	---	---	Small / Large
	Board size:	---	---	---	---
	Total flash:	Total flash	---	---	---
	RAM:	Ram memory	---	---	---
	Built-In type	Built-in type	---	---	---
	Main cycle:	Program cycle	---	---	---

Tab. 8.g

9. ALARM TABLE

Below is the list of alarms managed by pChrono. All of the alarms have automatic reset (except for AL01 and AL02), and therefore, when the causes are no longer present, the signal ceases.

Code	Description	Reset	Action
AL01	Clock board fault or not connected	Manual	---
AL02	Extended memory error	Manual	---
AL03	pCOe address 2 offline	Automatic	---
AL04	pCOe address 3 offline	Automatic	---
AL05	pCOe address 4 offline	Automatic	---
AL06	pCOe address 5 offline	Automatic	---
AL07	pCOe address 6 offline	Automatic	---
AL08	pCOe address 7 offline	Automatic	---
AL09	pCOe address 8 offline	Automatic	---
AL10	pCOe address 9 offline	Automatic	---
AL11	pCOe address 10 offline	Automatic	---
AL12	pCOe address 11 offline	Automatic	---
AL13	Access point connected on FBus1 offline	Automatic	---
AL14	Access point connected on FBus2 offline	Automatic	---
AL15	SA sensor address 16 offline	Automatic	---
AL16	SA sensor address 17 offline	Automatic	---
AL17	SA sensor address 18 offline	Automatic	---

AL18	SI sensor address 21 offline	Automatic	---
AL19	SI sensor address 22 offline	Automatic	---
AL20	SI sensor address 23 offline	Automatic	---
AL21	SI sensor address 24 offline	Automatic	---
AL22	SI sensor address 25 offline	Automatic	---
AL23	Low temperature alarm of SA address 16	Automatic	---
AL24	High temperature alarm of SA address 16	Automatic	---
AL25	Low humidity alarm of SA address 16	Automatic	---
AL26	High humidity alarm of SA address 16	Automatic	---
AL27	Probe error of SA address 16	Automatic	---
AL28	Low battery alarm of SA address 16	Automatic	---
AL29	Low temperature alarm of SA address 17	Automatic	---
AL30	High temperature alarm of SA address 17	Automatic	---
AL31	Low humidity alarm of SA address 17	Automatic	---
AL32	High humidity alarm of SA address 17	Automatic	---
AL33	Probe error of SA address 17	Automatic	---
AL34	Low battery alarm of SA address 17	Automatic	---
AL35	Low temperature alarm of SA address 18	Automatic	---
AL36	High temperature alarm of SA address 18	Automatic	---
AL37	Low humidity alarm of SA address 18	Automatic	---
AL38	High humidity alarm of SA address 18	Automatic	---
AL39	Probe error of SA address 18	Automatic	---
AL40	Low battery alarm of SA address 18	Automatic	---
AL41	Low temperature alarm of SI address 21	Automatic	---
AL42	High temperature alarm of SI address 21	Automatic	---
AL43	Low humidity alarm of SI address 21	Automatic	---
AL44	High humidity alarm of SI address 21	Automatic	---
AL45	Low light alarm of SI address 21	Automatic	---
AL46	High light alarm of SI address 21	Automatic	---
AL47	Probe error of SI address 21	Automatic	---
AL48	Low battery alarm of SI address 21	Automatic	---
AL49	Low temperature alarm of SI address 22	Automatic	---
AL50	High temperature alarm of SI address 22	Automatic	---
AL51	Low humidity alarm of SI address 22	Automatic	---
AL52	High humidity alarm of SI address 22	Automatic	---
AL53	Low light alarm of SI address 22	Automatic	---
AL54	High light alarm of SI address 22	Automatic	---
AL55	Probe error of SI address 22	Automatic	---
AL56	Low battery alarm of SI address 22	Automatic	---
AL57	Low temperature alarm of SI address 23	Automatic	---
AL58	High temperature alarm of SI address 23	Automatic	---
AL59	Low humidity alarm of SI address 23	Automatic	---
AL60	High humidity alarm of SI address 23	Automatic	---
AL61	Low light alarm of SI address 23	Automatic	---
AL62	High light alarm of SI address 23	Automatic	---
AL63	Probe error of SI address 23	Automatic	---
AL64	Low battery alarm of SI address 23	Automatic	---
AL65	Low temperature alarm of SI address 24	Automatic	---
AL66	High temperature alarm of SI address 24	Automatic	---
AL67	Low humidity alarm of SI address 24	Automatic	---
AL68	High humidity alarm of SI address 24	Automatic	---
AL69	Low light alarm of SI address 24	Automatic	---
AL70	High light alarm of SI address 24	Automatic	---
AL71	Probe error of SI address 24	Automatic	---
AL72	Low battery alarm of SI address 24	Automatic	---
AL73	Low temperature alarm of SI address 25	Automatic	---
AL74	High temperature alarm of SI address 25	Automatic	---
AL75	Low humidity alarm of SI address 25	Automatic	---
AL76	High humidity alarm of SI address 25	Automatic	---
AL77	Low light alarm of SI address 25	Automatic	---
AL78	High light alarm of SI address 25	Automatic	---
AL79	Probe error of SI address 25	Automatic	---
AL80	Low battery alarm of SI address 25	Automatic	---
AL81	Pump 1 alarm in group 1	Manuale	---
AL82	Pump 2 alarm in group 1	Manuale	---
AL83	Pump 1 alarm in group 2	Manuale	---
AL84	Pump 2 alarm in group 2	Manuale	---
AL85	Probe B1 alarm of pCOe address 2	Automatic	---
AL86	Probe B2 alarm of pCOe address 2	Automatic	---
AL87	Probe B3 alarm of pCOe address 2	Automatic	---
AL88	Probe B4 alarm of pCOe address 2	Automatic	---
AL89	Probe B1 alarm of pCOe address 3	Automatic	---
AL90	Probe B2 alarm of pCOe address 3	Automatic	---
AL91	Probe B3 alarm of pCOe address 3	Automatic	---
AL92	Probe B4 alarm of pCOe address 3	Automatic	---
AL93	Probe B1 alarm of pCOe address 4	Automatic	---
AL94	Probe B2 alarm of pCOe address 4	Automatic	---

AL95	Probe B3 alarm of pCOe address 4	Automatic	---
AL96	Probe B4 alarm of pCOe address 4	Automatic	---
AL97	Probe B1 alarm of pCOe address 5	Automatic	---
AL98	Probe B2 alarm of pCOe address 5	Automatic	---
AL99	Probe B3 alarm of pCOe address 5	Automatic	---
AL100	Probe B4 alarm of pCOe address 5	Automatic	---
AL101	Probe B1 alarm of pCOe address 6	Automatic	---
AL102	Probe B2 alarm of pCOe address 6	Automatic	---
AL103	Probe B3 alarm of pCOe address 6	Automatic	---
AL104	Probe B4 alarm of pCOe address 6	Automatic	---
AL105	Probe B1 alarm of pCOe address 7	Automatic	---
AL106	Probe B2 alarm of pCOe address 7	Automatic	---
AL107	Probe B3 alarm of pCOe address 7	Automatic	---
AL108	Probe B4 alarm of pCOe address 7	Automatic	---
AL109	Probe B1 alarm of pCOe address 8	Automatic	---
AL110	Probe B2 alarm of pCOe address 8	Automatic	---
AL111	Probe B3 alarm of pCOe address 8	Automatic	---
AL112	Probe B4 alarm of pCOe address 8	Automatic	---
AL113	Probe B1 alarm of pCOe address 9	Automatic	---
AL114	Probe B2 alarm of pCOe address 9	Automatic	---
AL115	Probe B3 alarm of pCOe address 9	Automatic	---
AL116	Probe B4 alarm of pCOe address 9	Automatic	---
AL117	Probe B1 alarm of pCOe address 10	Automatic	---
AL118	Probe B2 alarm of pCOe address 10	Automatic	---
AL119	Probe B3 alarm of pCOe address 10	Automatic	---
AL120	Probe B4 alarm of pCOe address 10	Automatic	---
AL121	Probe B1 alarm of pCOe address 11	Automatic	---
AL122	Probe B2 alarm of pCOe address 11	Automatic	---
AL123	Probe B3 alarm of pCOe address 11	Automatic	---
AL124	Probe B4 alarm of pCOe address 11	Automatic	---
---	---	---	---
AL128	No water flow warning of pump 1 group 1	Automatic	---
AL129	No water flow warning of pump 2 group 1	Automatic	---
AL130	No water flow warning of pump 1 group 2	Automatic	---
AL131	No water flow warning of pump 2 group 2	Automatic	---
AL132	Pump 1 group 1 working hour warning	Automatic	---
AL133	Pump 2 group 1 working hour warning	Automatic	---
AL134	Pump 1 group 2 working hour warning	Automatic	---
AL135	Pump 2 group 2 working hour warning	Automatic	---
AL136	Generic alarm of generic function 1	Automatic	---
AL137	Generic alarm of generic function 2	Automatic	---
AL138	Generic alarm of generic function 3	Automatic	---
AL139	Generic alarm of generic function 4	Automatic	---
AL140	Generic alarm of generic function 5	Automatic	---
AL141	Probe U1 disconnected or fault		
AL142	Probe U2 disconnected or fault		
AL143	Probe U3 disconnected or fault		
AL144	Probe U4 disconnected or fault		
AL145	Probe U5 disconnected or fault		
AL146	Probe U6 disconnected or fault		
AL147	Probe U17disconnected or fault		
AL148	Probe U8 disconnected or fault		
AL149	Probe U9 disconnected or fault		
AL150	Probe U10 disconnected or fault		
AL151	Socket add.26 offline		
AL152	Socket add.27 offline		
AL153	Socket add.28 offline		
AL154	Socket add.29 offline		
AL155	Socket add.30 offline		
AL156	Socket add.31 offline		
AL157	Socket add.32 offline		
AL158	Socket add.33 offline		
AL159	Socket add.34 offline		
AL160	Socket add.35 offline		
AL161	High alarm of generic function 1		
AL162	High alarm of generic function 2		
AL163	High alarm of generic function 3		
AL164	High alarm of generic function 4		
AL165	High alarm of generic function 5		
AL166	Low alarm of generic function 1		
AL167	Low alarm of generic function 2		
AL168	Low alarm of generic function 3		
AL169	Low alarm of generic function 4		
AL170	Low alarm of generic function 5		

Tab. 9.h

10. PCHRONO SPECIFICATIONS

10.1 Power supply

The following figure shows the power supply connection diagram. Use a class II safety transformer with protection against short-circuits and overload. See the table of technical specifications for the size of the transformer according to the model.

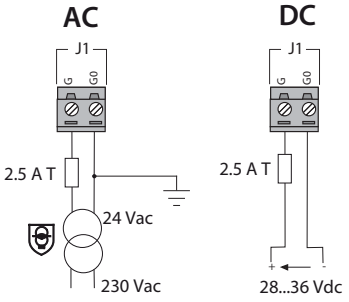

Fig. 10.a

Important:
- a power supply voltage other than the rated value may seriously damage the controller;
- if the power transformer secondary is earthed, check that the earth wire is connected to terminal G0. This applies to all the devices connected to the to the pChrono via serial network;
- the power supply to the controller should be separated from the power supply to the other electrical devices (contactors and other electromechanical components) inside the electrical panel.

Note: power to the controller is indicated by a yellow LED;

10.2 Digital inputs

The controller features digital inputs for connecting safety devices, alarms, device status and remote switches. These inputs are all optically isolated from the other terminals and can work at 24 Vac (+10/-15%) or 28 to 36 Vdc (-20/+10%) (indicated as ID*) and some a 230 Vac (indicated as IDH*).

Note:
- if the control voltage is drawn in parallel with a coil, fit a dedicated RC filter in parallel with the coil (typical ratings are 100 Ω, 0.5 µF, 630 V);
- if connecting the digital inputs to safety systems (alarms), the presence of voltage across the contact must be the normal operating condition, while no voltage must represent an alarm situation. This will ensure that any interruption (or disconnection) of the input will also be signalled;
- do not connect the neutral in place of an open digital input;
- always interrupt the phase.

Important: sseparate as much as possible (at least 3 cm) the probe and digital input cables from the power cables to loads to avoid possible electromagnetic disturbance. Never insert power cables (including the electrical cables) and probe signal cables in the same conduits.

24 Vac digital inputs

Digital inputs ID... can be controlled at 24 Vac.

Note:
- the digital inputs only have functional insulation from the rest of the controller;
- to maintain the optical isolation of the digital inputs, a separate power supply must be used for each of these;
- the digital inputs can be powered at a different voltage from the controller.

Cable cross-section: lethe sizes of the cables for the remote connection of the digital inputs are: cross-section for length < 50 m = 0.25 (mm^2)

Important: if the controller is installed in an industrial environment (EN 61000-6-2), the maximum length of the connections is 30 m. To avoid measurement errors, never exceed this length.

Example connection diagram: (LARGE model):

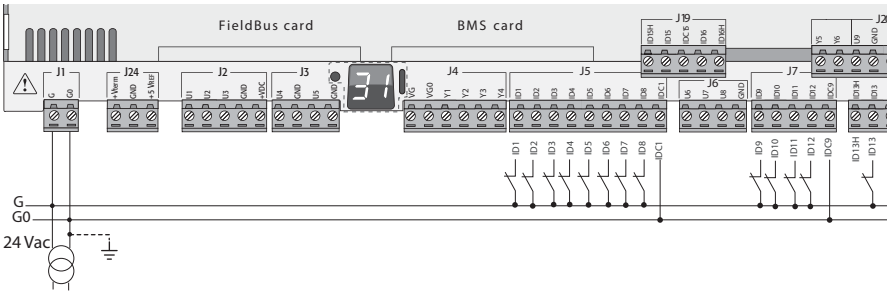

Fig. 10.b

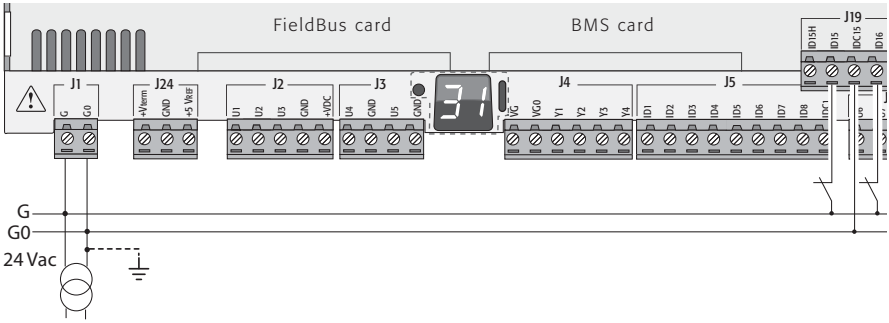

Fig. 10.c

24 Vdc digital inputs

Digital inputs ID... can be controlled at 24 Vdc.

Example connection diagram: (LARGE model):

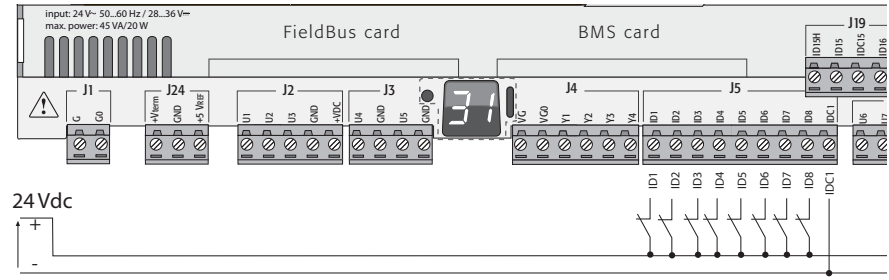

Fig. 10.d

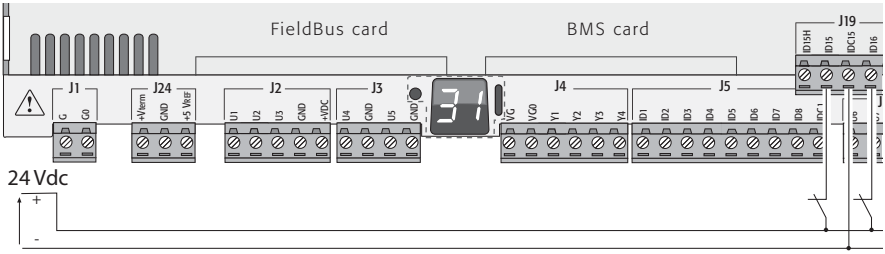

Fig. 10.e

230 Vac digital inputs

On the Large version there are two groups of inputs that can be powered at 230 Vac, terminals J8 and J19. Each group has two 230 Vac digital inputs, indicated as ID*H, and two 24 Vac/Vdc inputs, indicated as ID*.. The groups of 230 Vac inputs feature double insulation between them and the controller: the digital inputs connected can be 24 Vac/dc in one group and 230 Vac in the other.

In each group, the two inputs have the same common pole. The insulation is main. Within each group the digital inputs must be powered at the same voltage (24 Vac, 28 to 36 Vdc or 230 Vac) to avoid dangerous short-circuits and/or the powering of lower-voltage circuits at 230 Vac

Note:

- the range of uncertainty for the activation threshold is from 43 to 90 Vac;
- the voltage must be 230 Vac (+10/-15%), 50/60 Hz.

Example 1: connection diagram with 230 Vac inputs.

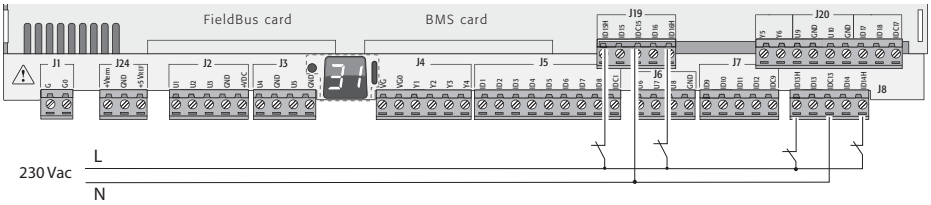

Fig. 10.f

Example 2: connection diagram with digital inputs at different voltages.

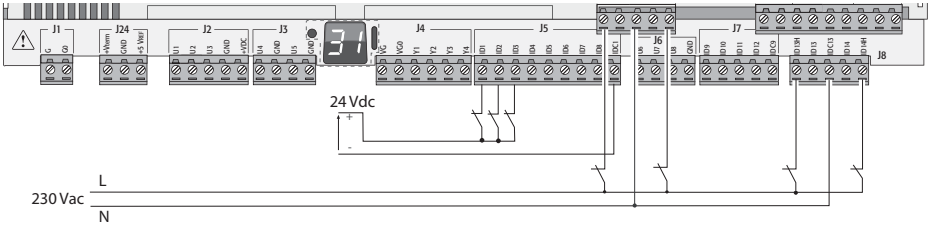

Fig. 10.g

10.3 Digital outputs

Electromechanical relay digital outputs: the controller features digital outputs with electromechanical relays. For ease of installation, the common terminals of some of the relays have been grouped together. See the following table as regards the type of insulation. Also see the table of the technical specifications.

Type of insulation	
Between relays in same group	functional insulation
Between groups of relays	reinforced insulation
Between relays and rest of controller	reinforced insulation

Note:

- inside each group, the relays have basic insulation and must have the same voltage (generally 24 Vac or 110/230 Vac);
- between groups of relays there is reinforced insulation and thus the groups can have different voltages.

Example connection diagram (LARGE model):

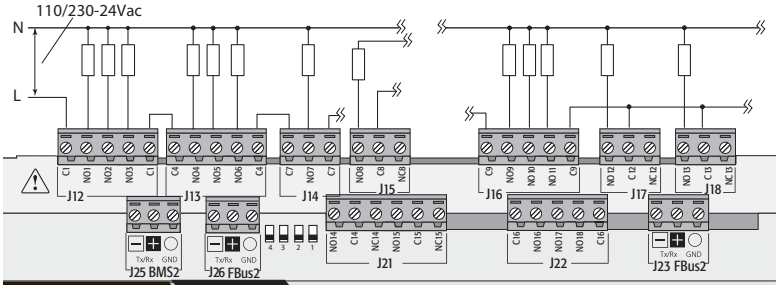

Fig. 10.h

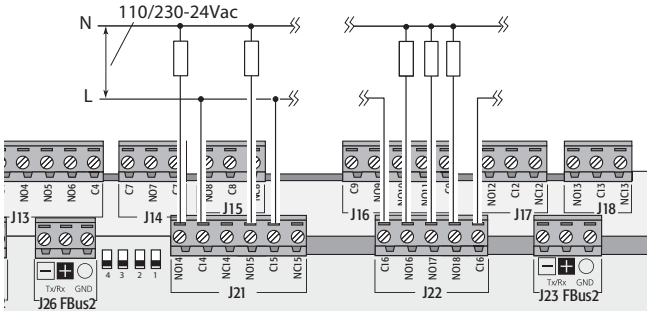

Fig. 10.i

Important: the current running through the common terminals must not exceed the rated current of an individual terminal (8 A). Some relays feature changeover contacts.

Relays with changeover contacts		
	pChrono model	
	Small	Large
No. outputs	8	8, 12, 13

Remote connection of digital outputs

The sizes of the cables based on the current are shown in the table below.

Size (mm²)/AWG	Current (A)
0.5/20	2
1.5/15	6
2.5/14	8

10.4 pChrono technical specifications

Physical specifications

Dimensions	SMALL	13 DIN modules	110 X 227.5 X 60 mm
	LARGE	18 DIN modules	110 X 315 X 60 mm
Plastic case	Assembly	fitted on DIN rail in accordance with DIN 43880 CEI EN 50022	
	Material	technopolymer	
	Flammability	V2 (UL94) and 850 °C (in accordance with IEC 60695)	
	Ball pressure test	125 °C	
	Resistance to creeping current	≥ 250 V	
	Colour	Grey RAL 7016	
Built-in terminal	pGD1 (132x64 pixel) with backlit keypad		

Other specifications

Operating conditions	-20T60 °C, 90% RH non-condensing
Storage conditions	-30T70 °C, 90% RH non-condensing
Ingress protection	IP20 on the front panel only
Pollution rating for disposal	2
Class according to protection against electric shock	to be integrated into Class I and/or II equipment in versions without valve driver
PTI of the insulating materials	PCB: PTI 250 V; insulating material: PTI 175
Period of stress across the insulating parts	long
Type of action Type of disconnection or microswitching	1C microswitching
Heat and fire resistance category	Category D (UL94-V2)
Ageing characteristics (operating hours)	80,000
Number of automatic operating cycles	100,000 (EN 60730-1); 30,000 (UL60730)
Rated impulse voltage	2500V

Electrical specifications

Power supply	SMALL, LARGE: use a dedicated class II safety transformer, 50 VA..				
		Vac	P (Vac)	Vdc	P (Vdc)
	SMALL LARGE	24 Vac (+10/-15%), 50/60 Hz protected by external 250 A T fuse	45 VA	28-36 Vdc (-20/+10%) protected by external 250 A T fuse	30 W
Terminal block	with male/female plug-in connectors				
Cable cross-section	min 0.5 mm2 - max 2.5 mm^2				
CPU	32 bit, 100 MHz				
Non-volatile memory (FLASH)	9 Mbyte (2 Mbyte Bios + 7 Mbyte application program + 4MB logs)				
Data memory (RAM)	3.2 Mbyte (1.76 Mbyte Bios + 1.44 Mbyte application program)				
T buffer memory (EEPROM)	13 KByte				
P parameter memory (EEPROM)	32 kbyte (not available to the pLAN)				
Working cycle duration (medium compl. applications)	0.2 s (typical)				
Clock with battery	standard, precision 100 ppm				
Buzzer	can be enabled via software				
Battery	lithium button battery type CR2430 voltage 3 Vdc (dimensions 24x3 mm)				
Software class and structure	Class A				
Category of immunity to voltage surges (EN 61000-4-5)	Category III				

Device not designed to be hand-held when powered

Universal inputs/outputs (U...): Analogue inputs, Lmax = 30 m, (maximum number)

	SMALL	LARGE
- CAREL NTC probes (-50T90°C; R/T 10 kΩ±1% at 25°C); - HT NTC(0T150°C); - PTC (600Ω ...2200Ω) - PT500 (-100T300°C) - PT1000 (-100T400°C)	5	10

- PT100 probes (-100T400°C)		2		4 (2 on U1...U5, 1 on U6...U8, 1 on U9...U10)
- 0 to 1 Vdc/0 to 10 Vdc signals from probes powered by the controller (*)	max tot 5	5	max tot 10	6
- 0 to 1 Vdc/0 to 10 Vdc signals powered externally (*)		5		10
- 0 to 20 mA inputs /4 to 20 mA from probes powered by the controller (*)	max tot 4	4	max tot 9	6 (max 4 on U1...U5, 3 on U6...U8, 2 on U9...U10)
- 0 to 20 mA inputs /4 to 20 mA powered externally (*)		4		9 (max 4 on U1...U5, 3 on U6...U8, 2 on U9...U10)
- 0 -5 V signals from ratiometric probes powered by controller (*)		5		6
Input precision: ± 0.3 % f.s.				
Time constant for each input: 0.5 s				
Classification of measuring circuits (CEI EN 61010-1): category I				

Digital inputs without optical-isolation, Lmax = 30 m (maximum number)

	SMALL	LARGE
- voltage-free contacts	5	10
- fast digital inputs type: voltage-free contact max current: 10 mA max frequency 2kHz and resolution ±1 Hz	max 2	6 (max 2 on U1...U5, max 2 on U6...U8, 2 on U9...U10)

Important:

- for active probes powered externally (0 to 1 V, 0 to 10 V, 0 to 20 mA, 4 to 20 mA), to avoid irreparably damaging the controller, implement adequate current protection measures that must always ensure < 100 mA;
- the ratiometric probes can only be powered by the controller;
- on power-up, the universal inputs/outputs remain shorted to GND for around 500 ms until the end of the configuration procedure.

Power supply to probes and terminals: Analogue outputs without optical-isolation (maximum number), Lmax = 30 m

		SMALL	LARGE
	0 to 10 Vdc (*) (maximum current 2 mA)	5	10
	PWM (output 0/3.3 Vdc, maximum current 2 mA, frequency: 2kHz asynchronous, 100 Hz asynchronous)	5	10
+Vdc	the 24/21 Vdc ± 10% (*) available at terminal +VDC (J2) can be used to power any active probes. The maximum current available is 150 mA, protected against the short-circuits.		
+5Vref	to power the 0 to 5V ratiometric probes, use the 5 Vdc (± 5%) available at terminal +5VREF(J24). The maximum current available is 60 mA.		
Vterm	24 Vdc ± 10% (*) Used to power an external terminal as an alternative to the one connected to J10, Pmax = 1.5 W		

Important: if the length exceeds 10 m, use shielded cable with the shield connected to earth. In any case, the max length allowed is 30 m.

Digital inputs (ID..., IDH...)

Type	Optically-isolated		
Lmax	30 m		
		no. of opto-isolated inputs, 24 Vac or 24 Vdc	
Maximum number	SMALL	8	
	LARGE	14	
Minimum digital input pulse detection time	Normally open (open-closed-open)	200 ms	
	Normally closed (closed-open-closed)	400 ms	

Power supply to the inputs	External	IDH...: 230 Vac (+10/-15%) 50/60 Hz
		ID...: 24 Vac (+10/-15%) 50/60 Hz o 28...36 Vdc (+10/-20%)
Classification of measuring circuits (CEI EN 61010-1)	Category I: 24 Vac/Vdc (J5, J7, J20) Category III: 230 Vac (J8, J19)	
Digital input current draw at 24 Vac/Vdc		5 mA
Digital input current draw at 230 Vac		5 mA

Analogue outputs (Y...)

Type	0...10 V optically-isolated on Y1...Y6	
Lmax	30 m	
Maximum number	SMALL: 4	LARGE: 6
Power supply	external	24 Vac (+10/-15%) or 28 to 36 Vdc on VG(+), VG0(-) (*)
Precision	Y1...Y6	± 2% full scale
Resolution	8 bit	
Settling time	Y1...Y6	from 1 s (slew rate 10 V/s) a 20 s (slew rate 0.5 V/s) selectable via SW
Maximum load	1 kΩ (10 mA)	

Important:

- for lengths > 10 m, only use shielded cable, with the shield connected to earth;
- a 0 to 10 Vdc analogue output can be connected in parallel to other outputs of the same type, or alternatively to an external source of voltage. The higher voltage will be considered. Correct operation is not guaranteed if actuators with voltage inputs are connected;
- power the VG-VG0 analogue outputs at the same voltage on G-G0: Connect G to VG and G0 to VG0. This is valid for both alternating and direct current power supplies.

Digital outputs (NO..., NC...)

Type	Relay. Minimum contact current: 50 mA.											
Maximum no.	8: SMALL; 18: LARGE											
Insulation distance	The relay outputs have different features depending on the model of controller. The outputs can be divided into groups. The relays belonging to the same group (individual cell in the table) have functional insulation and therefore must have the same voltage. Between groups (cells in the table) there is reinforced insulation and consequently these may have different voltages. There is also reinforced insulation between each terminal of the digital outputs and the rest of the controller.											
	Relays with same insulation											
		Group										
Makeup of the groups	Model	1	2	3	4	5	6	7	8	9	10	11
	SMALL	1...3	4...6	7	8	-	-	-	-	-	-	-
	Type of relay	Type A	Type A	Type A	Type A	-	-	-	-	-	-	-
	LARGE	1...3	4...6	7	8	9...11	12	13	14...15	16...18	-	-
	Type of relay	Type A	Type A	Type A	Type A	Type A	Type A	Type A	Type A	Type A	-	-
Number of changeover contacts	1: SMALL (relay 8) 5: LARGE (relays 8, 12, 13, 14 e 15)											

Note: the output relays have different features, depending on the model of pChrono.

Switchable power	Type A relay	Rated data	SPDT, 2000 VA, 250 Vac, 8A resistive	
		Approval	UL60730	2 A resistive, 250 Vac, 30,000 cycles Pilot duty C300, 240Vac, 30,000 cycles
			EN 60730-1	2(2)A, 250 Vac, 100,000 cycles
	Type B relay	Rated data relay	SPST, 1250 VA, 250 Vac, 5A resistive	
		Approval	UL60730	1 A resistive, 250 Vac, 30,000 cycles Pilot duty C300, 240Vac, 30,000 cycles
			EN 60730-1	1(1), 250 Vac, 100,000 cycles

Important:

- to power external loads, use the same power supply as the controller (connected to terminals G-G0); this must always be dedicated and not in common with the power supply to other devices on the electrical panel (such as contactors, coils, etc...);
- the groups that the digital outputs are divided into have two common pole terminals to simplify wiring;
- make sure that the current running through the common terminals does not exceed the rated current of an individual terminal, i.e. 8 A.

(*) class 2

Serial ports: use AWG 20-22 twisted pair shielded cable for the i +/-

Serial	Type/connectors	Features
Serial 0	pLAN/J10, J11	• Integrated on main board • HW driver: asynchronous half duplex RS485 pLAN • Not optically-isolated • Connectors: 6-pin telephone jack + 3-pin plug-in • Maximum length: 500 m • Max data rate: 115200 bit/s • Maximum number of connectable devices: 32
Serial ONE	BMS 1 Serial Card	• Not integrated on main board • HW driver: not featured • Can be used with all pCO family optional BMS cards
Serial TWO	FieldBus 1 Serial Card	• Not integrated on main board • HW driver: not featured • Can be used with all pCO family optional FieldBus cards
Serial THREE	BMS 2 / J25	• Integrated on main board • HW driver: asynchronous half duplex RS485 Slave • Optically-isolated • 3-pin plug-in connector p. 5.08 • Maximum length: 1000 m • Max data rate: 384000 bit/s • Maximum number of connectable devices: 16
Serial FOUR	FieldBus 2 / J23	• Integrated on main board • HW driver: asynchronous half duplex RS485 Master/Slave • J26: optically-isolated • 3-pin plug-in connector p. 5.08

Note: in industrial/residential environments, for distances > 10 m, shielded cable is required, with the shield connected to earth. In residential environments (EN 55014), irrespective of the cable length, connection cable between the controller and the terminal and the serial cable must be shielded and connected to earth at both ends.

10.5 Standards compliance

Electrical safety	EN 60730-1, EN 60730-2-9, EN 61010-1, UL60730
Electromagnetic compatibility	Versions without valve driver: EN 61000-6-1, EN 61000-6-2, EN 61000-6-2/EC, EN 61000-6-2/IS1, EN 61000-6-3, EN 61000-6-4; EN 55014-1, EN 55014-2, EN 55014-2/EC, EN 55014-2/A1, EN 55014-2/IS1, EN 55014-2/A2 Versions with valve driver with or without Ultracap module: EN 61000-6-1, EN 61000-6-2, EN 61000-6-2/EC, EN 61000-6-2/IS1, EN61000-6-3, EN 61000-6-4

11. SYSTEM CONFIGURATION

11.1 pChrono solution I/O table

pChrono

Type	Label	Description	Scheduler	Switch	Button	SPV	Action on…	Note
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
	ID5							
	ID6							
	ID7							
	ID8							
	ID9							
	ID10							
	ID11							
	ID12							
	ID13							
	ID14							
	ID15							
	ID16							
	ID17							
	ID18							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
	NO5							
	NO6							
	NO7							
	NO8							
	NO9							
	NO10							
	NO11							
	NO12							
	NO13							
	NO14							
	NO15							
	NO16							
	NO17							
	NO18							
Universal inputs	U1							
	U2							
	U3							
	U4							
	U5							
	U6							
	U7							
	U8							
	U9							
	U10							
Analogue outputs	Y1							
	Y2							
	Y3							
	Y4							
	Y5							
	Y6							

Type	Label	Description	Scheduler	Switch	Button	SPV	Action on…	Note
pCOe addr. #2								
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
Analogue inputs	B1							
	B2							
	B3							
	B4							
Analog out.	Y1							
pCOe addr. #3								
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
Analogue inputs	B1							
	B2							
	B3							
	B4							
Analog out.	Y1							
pCOe addr. #4								
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
Analogue inputs	B1							
	B2							
	B3							
	B4							
Analog out.	Y1							

Type	Label	Description	Scheduler	Switch	Button	SPV	Action on…	Note
pCOe addr. #5								
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
Analogue inputs	B1							
	B2							
	B3							
	B4							
Analog out.	Y1							
pCOe addr. #6								
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
Analogue inputs	B1							
	B2							
	B3							
	B4							
Analog out.	Y1							
pCOe addr. #7								
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
Analogue inputs	B1							
	B2							
	B3							
	B4							
Analog out.	Y1							

Type	Label	Description	Scheduler	Switch	Button	SPV	Action on…	Note
pCOe addr. #8								
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
Analogue inputs	B1							
	B2							
	B3							
	B4							
Analog out.	Y1							
pCOe addr. #9								
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
Analogue inputs	B1							
	B2							
	B3							
	B4							
Analog out.	Y1							
pCOe addr. #10								
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
Analogue inputs	B1							
	B2							
	B3							
	B4							
Analog out.	Y1							

pCOe addr. #10

Type	Label	Description	Scheduler	Switch	Button	SPV	Action on…	Note
Digital inputs	ID1							
	ID2							
	ID3							
	ID4							
Digital outputs	NO1							
	NO2							
	NO3							
	NO4							
Analogue inputs	B1							
	B2							
	B3							
	B4							
Analog out.	Y1							

Type	Label	Description	Action on…	Note
SA wireless sensor addr. #16 (T/H)				
Analogue inputs	Temp.			
	Humid.			
SA wireless sensor addr. #17 (T/H)				
Analogue inputs	Temp.			
	Humid.			
SA wireless sensor addr. #18 (T/H)				
Analogue inputs	Temp.			
	Humid.			
SI wireless sensor addr. #21 (T/H/LUX)				
Analogue inputs	Temp.			
	Humid.			
	LUX			
SI wireless sensor addr. #22 (T/H/LUX)				
Analogue inputs	Temp.			
	Humid.			
	LUX			
SI wireless sensor addr. #23 (T/H/LUX)				
Analogue inputs	Temp.			
	Humid.			
	LUX			
SI wireless sensor addr. #24 (T/H/LUX)				
Analogue inputs	Temp.			
	Humid.			
	LUX			

SI wireless sensor addr. #25 (T/H/LUX)

Analogue inputs	Temp.			
	Humid.			
	LUX			

Wireless plug addr. #26

Type	Description	Scheduler	Switch	Plug	Action on…	Note
10A socket						

Wireless plug addr. #27

10A socket						

Wireless plug addr. #28

10A socket						

Wireless plug addr. #29

10A socket						

Wireless plug addr. #30

10A socket						

Wireless plug addr. #31

10A socket						

Wireless plug addr. #32

10A socket						

Wireless plug addr. #33

10A socket						

Wireless plug addr. #34

10A socket						

Wireless plug addr. #35

10A socket						

Time bands

Time band	Start	End
Time band 1		
Time band 2		
Time band 3		
Time band 4		
Time band 5		
Time band 6		
Time band 7		
Time band 8		
Time band 9		
Time band 10		

Time band	Start	End
Time band 11		
Time band 12		
Time band 13		
Time band 14		
Time band 15		
Time band 16		
Time band 17		
Time band 18		
Time band 19		
Time band 20		

Periods

Period	Start	End
Period 1		
Period 2		
Period 3		
Period 4		
Period 5		

Period	Start	End
Period 6		
Period 7		
Period 8		
Period 9		
Period 10		

NOTE:

NOTE:

CAREL

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