ECH 985

Electronic controller for heat pumps used in residential hot water application

General Description

ECH 985 is a heat pump for the following kinds of applications:
- water-water
- water-air

with accumulation tank for residential water heating applications.

Main features

- Control of 1 compressor
- 2 configurable digital inputs
- 3 analogue inputs for NTC probes
- 4 configurable digital outputs on relays
- 1 TTL serial port for connection to Copy Card accessory.
- Anti-legionella function
- Timer function to run two daily events
- Party function to manually enable temperature control.
- Parameter setting from keypad
- Copy Card for uploading or downloading parameter maps
- Menu type user interface with 2 different levels of password controlled access

Using the menus

Menu Description

Access to both menus is controlled by the "set" key, which when pressed and instantly released displays the "machine state menu". The "parameter programming menu" is accessed by holding this same key pressed for 5 seconds.

Once you have accessed one of the two menus, you can browse level 1 folders using the "UP" and "DOWN" keys. To open a folder, press the "set" key once; at this point it will be possible to scroll through the contents of the folder and edit or use the functions it contains. There are three ways to exit each level of both menus: by pressing the "Fnc" key, by pressing the "set" key to confirm a new value or after the time-out has elapsed (15 seconds on inactivity).

Machine State Menu

The "machine state menu" contains the folders and main information of the instrument:
- AL: Alarm folder
- SEt: Setpoint programming folder
- rtc: Real Time Clock folder
- Pb1: "Probe 1 value" folder
- Pb2: "Probe 2 value" folder
- Pb3: "Probe 3 value" folder
- OHr: display folder for compressor, heaters and pump running time

If there are no active alarms, the label "SEt" is displayed; at this stage, you can scroll all the other menu items using the "UP" and "DOWN" keys.

Press "set" once to open each folder. To edit values, use the "UP" and "DOWN" and "set" keys to confirm the new value and return to the higher menu level.

The user interface consists of a display with 3 and a half digits plus a sign to display temperatures, parameter labels, alarm codes and parameter values.
Either the Boiler temperature or the Boiler Setpoint (par ddd) can be selected as the main display information.
The instrument's display and programming functions are accessed through a menu system; use the 4 keys on the instrument's front panel to browse menus.

Display

Use to view inputs, the setpoint, parameters and their relative values, alarms, functions and states.
On changing the display from 3 digits with decimal point to 3 digits with no decimal point:
- the least significant digit will not be shown; it will be hidden when the setpoint and parameters are displayed.
- conversion continues to operate with decimal values.
- the setpoint and parameters will retain the least significant digit in memory until the first time they are displayed or changed.

Keys

UP	DOWN	fnc	Esc
•Increases the value of the parameter. •Scrolls menu items. •Enables the associated function (par H10). •**SETS DEFAULT VALUES:** Enables Party function (with H10=2).	•Decreases the value of the parameter. •Scrolls menu items. •Enables the associated function (par H11). •**SETS DEFAULT VALUES:** Enables On/Off function (with H11=1).	•Returns you to the previous menu level. •Confirms the value assigned to the parameter. •Enables the associated function (par H12).	•Opens the selected submenus. •Press once to display alarms, setpoint, probes and output states. •Press and hold to open parameter programming. •Confirms selected value.

Key functions vary according to the current menu position. Direct functions can be associated with the keys only in normal display mode.
The keys operate in single-press mode; auto-repeat mode is enabled only for the UP and DOWN keys and only when scrolling parameter labels and values.
Alarms can be acknowledged by pressing any key (if enabled in par. H13).

LEDs

°C Setpoint	On when boiler setpoint is displayed.	Alarm	ON during an alarm, blinking when an alarm has been acknowledged. Otherwise it is OFF.
Heaters	ON (fixed) when heaters are running.	**D.P.**	When the device is switched off, the LED stays permanently ON. When the device is switched on, it serves as a decimal point.
Compressor	ON (fixed) when the compressor is running. Blinks when the compressor is off during scheduled timings.		

Programming the setpoint

Open the "machine state menu", if no alarms are active, the label "SEt" is displayed". Press the "set" key lightly to enter the setpoint value using the "UP" and "DOWN" keys. Press and release "set" again or "Fnc" to go back to the main level of the menu. The controller will also exit the setpoint programming folder after the time-out has elapsed.

Active alarm
When an alarm is active if you open the "Machine State" menu the "AL" folder label will appear".

Real Time Clock (/C models)
When the "rtc" label is displayed, pressing "set" displays the label d00 (days). Use the "UP" and "DOWN" keys to set the days. Either press "set" or press no key for 2 seconds to move to the hours (h00) and minutes folders ('00): use the "UP" and "DOWN" keys to set the hours and minutes values. Either press no key for 15 seconds (time-out) or press the "fnc" key once to confirm the last value displayed and go back to the previous screen.

NOTE: Always press "set" to save the hours/min/days setting.

NOTE 2: it is advisable to consider the first day d00 as SUNDAY.

Programming Menu Parameters

To open this menu, press and hold the "set" key for at least 5 seconds. The menu structure divides all the parameter folders over two levels; it is possible to access all the level 1 folders by entering the password "PA1".

Use the "UP" and "DOWN" keys to scroll level 1 folders. To access the parameters, press and release the "set" key on the label required.

Use the "UP" and "DOWN" keys to scroll the labels present in the folders and press "set" to display the current value of the parameter selected. Use the "UP" and "DOWN" keys followed by "set" to enter the required value.

To access level 2 folders inside the "Cnf" folder, select the label "PA2" then enter the password "PA2" and press "set" to confirm. This level contains all parameters which cannot be accessed in level 1.

NOTE: Level 1 parameters can only be displayed by exiting the "parameter programming menu" and repeating the steps required to manage level 1 folders.

The operations required to manage level 2 parameters are the same as those described above for level 1 parameters.

NOTE: it is advisable to switch the instrument off then back on again each time parameters are modified to prevent malfunction of the configuration and/or timer operations underway.

Passwords
Passwords "PA1" and "PA2" give access to level 1 and level 2 parameters respectively. To change passwords by assigning different values, open the "parameter programming menu" then the folder with the label "diS" (level 2 only).

You will be asked to enter the passwords:
- PA1 on entering the "parameter programming menu";

- PA2 inside the relative level 1 parameters folder with the label "PA2".
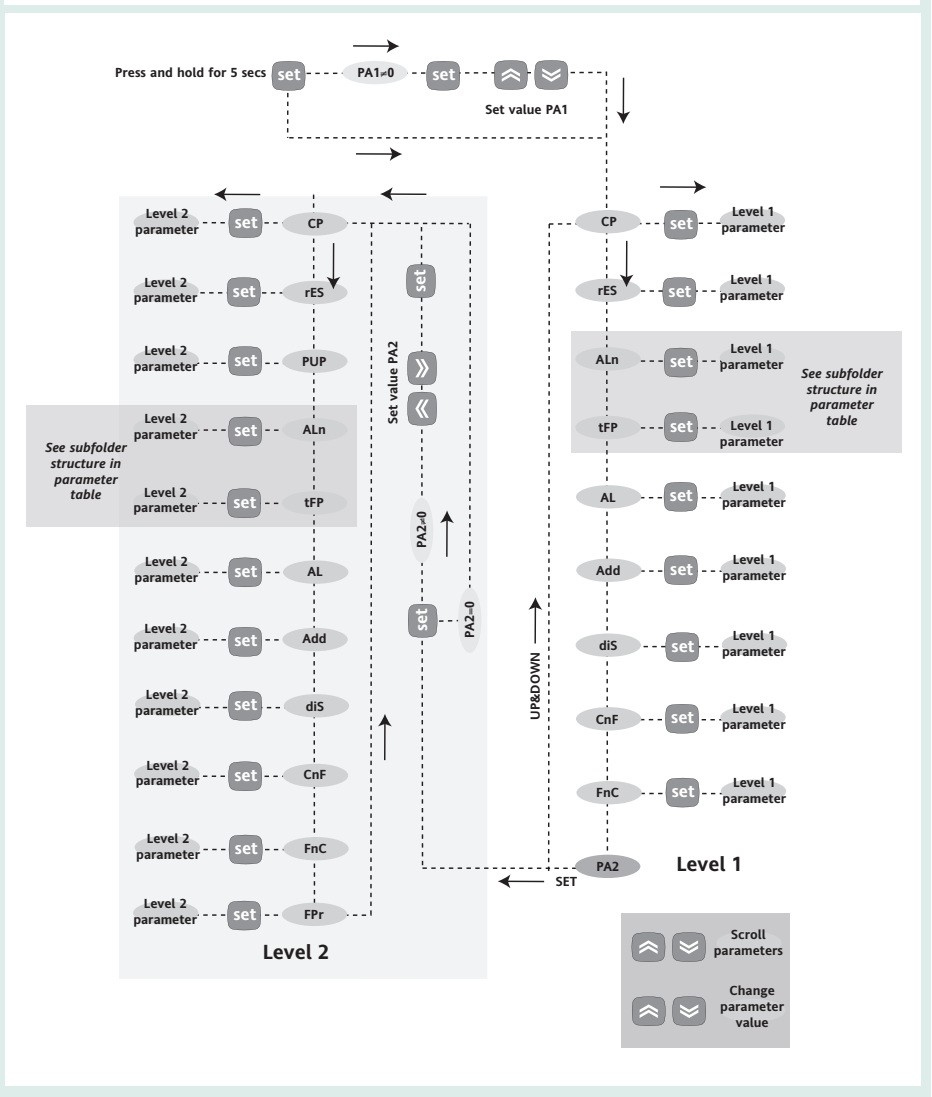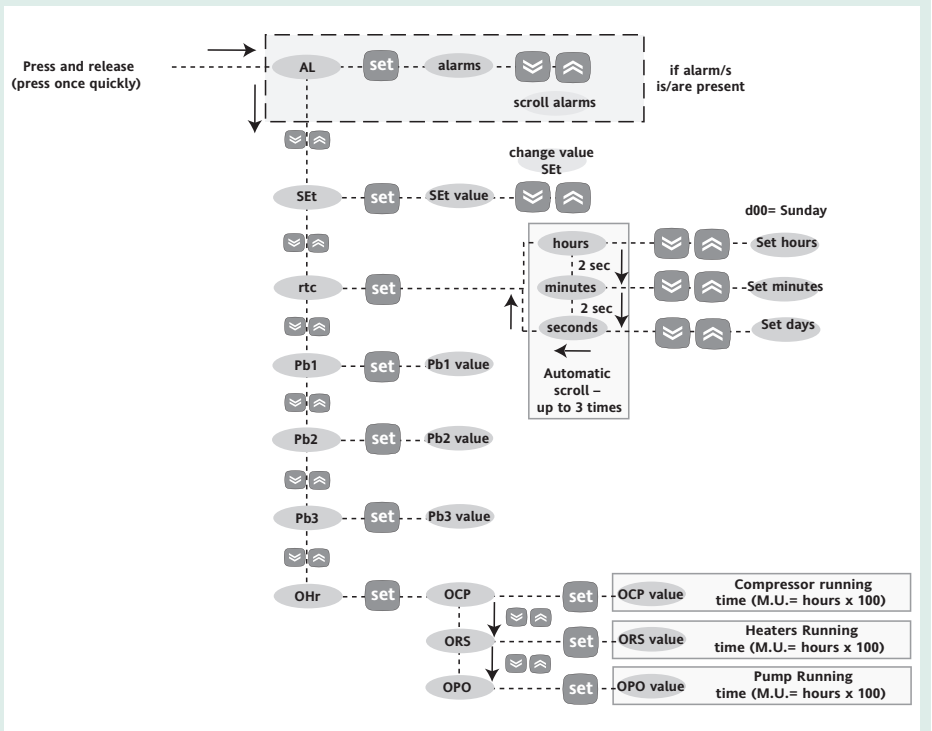
Functions Folder

Folder FnC in the parameter programming menu contains all functions listed in the table on the right.
Press the **"set"** key to activate the associated function.

Function	Function label	Function enabled message
Alarm acknowledgment	tAL	tAL
Manual alarm reset	rAL	rAL
Reset compressor hours counter	rCO	Y
Reset heaters hours counter	rRE	Y
Reset pump hours counter	rPO	Y
Instrument switch-off	OFF	ON

Copy Card

USING THE COPY CARD
When connected to the TTL serial port, the Copy Card allows you to rapidly program device parameters (up/download parameter map to or from one or more devices of the same type). The operations are performed as follows:

Fr-Format
This command is used to format the key, which **MUST** be done the first time the key is used or when using with models that are not compatible.

Important: after programming the key, parameter "Fr" will delete all data entered. This operation cannot be reversed.

UL-Upload
This function uploads programming parameters from the instrument.

dL-Download
This function downloads programming parameters to the instrument.

NOTE:
• UPLOAD: Instrument —> Copy Card
• DOWNLOAD: Copy Card —> instrument.

To perform the above operations, open the folder marked with label "FPr" and select the commands "UL", "dL" or "Fr" as required"; press the "set" key" to confirm. If the operation was completes successfully, the letter "y" will be displayed. If not the letter "n" will appear".
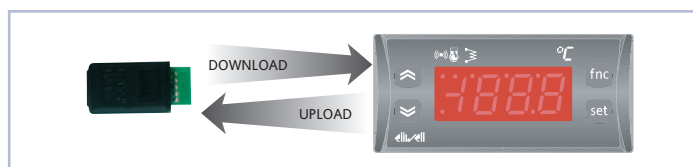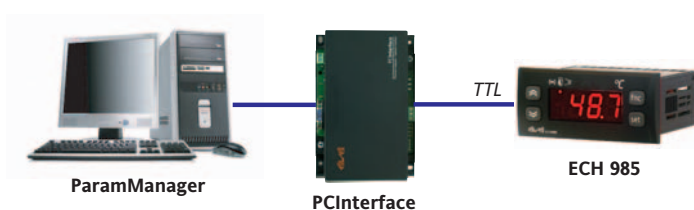

ParamManager

The TTL serial port can be used to configure parameters with ParamManager software.
See the following parameters:

Parameter		Description of values
PtS	Select protocol	0=Eliwell, 1=Modbus
dEA	Device address	from 0 to 14 for Eliwell protocol
		from 1 to 14 for Modbus protocol.

Connect ECH985 to the ParamManager system as illustrated below:

ParamManager   **PCInterface**   **ECH 985**

If Eliwell has been entered as the protocol from parameter **PtS** (**PtS**=0), run ParamManager.

If Modbus has been entered as the protocol from parameter **PtS** (**PtS**=1) follow this procedure:
• Connect the device to the PCInterface (as shown)
• Run ParamManager
• Check the state of the icons shown in the top right of the ParamManager window: these indicate the state of the device-system connection. If no connection is found, the following would appear:


To establish communication between ECH985 and ParamManager, double-click the icon **Dev** and switch ECH985 on at the same time.
Even when configured for the Modbus protocol, the device will recognize when it is connected with ParamManager software and will communicate with the Eliwell protocol.
**N.B.:** After altering parameters using ParamManager, switch the device off then back on again to restore communication with the Modbus protocol: in this case, do not modify the value set in parameter **dEA** with Param Manager.

In this section we will look at how to configure parameters for various utilities depending on the type of installation to be controlled.
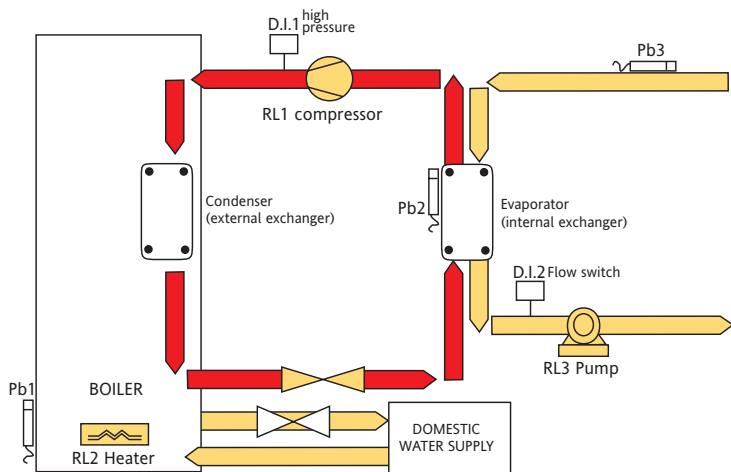
Example of water-water installation
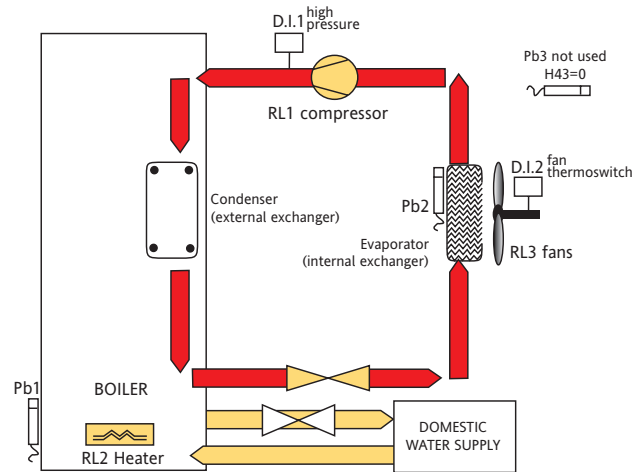
Example of water-air installation

Compressors

The ECH 985 is capable of controlling single-compressor circuits. The compressor is controlled by an onboard relay.
The compressor will switch on or off in accordance with the internal temperature readings and the temperature control settings.
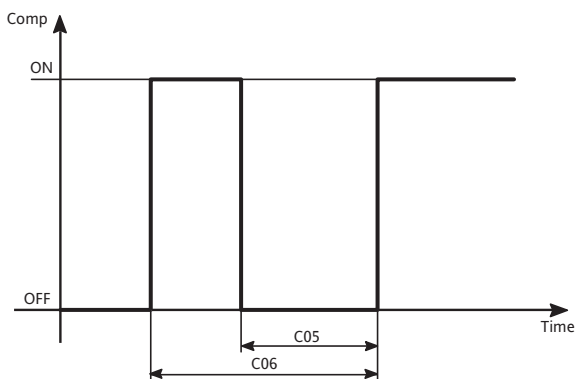
Compressor timings

To protect the compressor from possible damage caused by too frequent start-ups, two protective devices are required:

OFF-ON timing

The minimum time that must elapse between one shut-down and the next start-up (compressor on/off safety time), controlled by parameter C05.

ON-ON timing

The minimum time that must elapse between one start-up and the next (compressor on/on safety time), controlled by parameter C06.
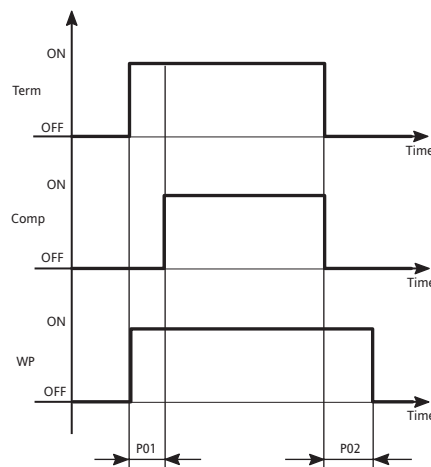

COMP: compressor	Time: seconds x 10
C05: OFF-ON safety time	C06: ON-ON safety time

Water pump

The water pump connects to the C relay output (see wiring diagram).

In the event of a temperature control request, the pump will always switch on before the compressor (par. P01); once the temperature control requirement has been met, the pump will switch off after the compressor with time delay P02.

Term: temperature controller	Comp: compressor
WP: water pump	Time: time in seconds
P02: Pump ON compressor ON delay	P02:Compressor OFF pump OFF delay

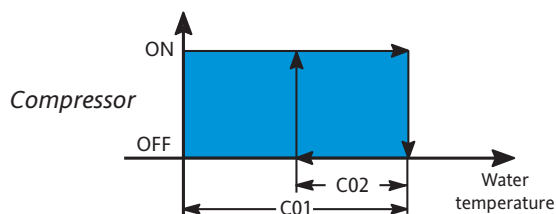| PAR.	DESCRIPTION	RANGE	DEFAULT	LEVEL	UM
C05	OFF/ON safety time. Time period that must elapse between the compressor switching off then switching back on again.	0..250	0	2	sec x10
C06	ON/ON safety time. The minimum time that must elapse between one start-up and the next.	0..250	0	2	sec x10

Regulation

During normal operation, ECH 985 regulates the water temperature in accordance with the value set in parameter C01 (Boiler water setpoint). The compressor, where applicable, generally manages this kind of temperature control. Otherwise it is done by the electric heaters.

If a compressor is present (see Alarms paragraph):

- the compressor remains in operation until the temperature set in parameter C01 is reached;

- if the temperature falls after reaching C01, the compressor will restart at temperature C01-C02.

**N.B.:** compressor operation is illustrated in the following graph:

PAR.	DESCRIPTION	RANGE	DEFAULT LEVEL	UM
C01	Boiler water setpoint. Control range between minimum setpoint (C04) and maximum setpoint (C03).	C04...C03	2	°C/°F
C02	Boiler water differential. Temperature value between compressor start-up and shut-down. Cannot be equal to 0.	0.1...30.0	2	°C/°F
C03	Maximum temperature value that can be set for the Boiler water setpoint.	C04...255.0	2	°C/°F
C04	Minimum Boiler setpoint value. Minimum temperature value that can be set for the Boiler water setpoint.	0...C03	2	°C/°F

If there is no compressor in the system (see Alarms paragraph):
electric heaters are used to raise the temperature to C01:

- the heaters stay on until the temperature set in parameter C01 is reached;

- if the temperature falls after reaching C01, the heaters will switch back on at temperature C01-C02.

N.B.: heater operation is illustrated in the graph on the right:
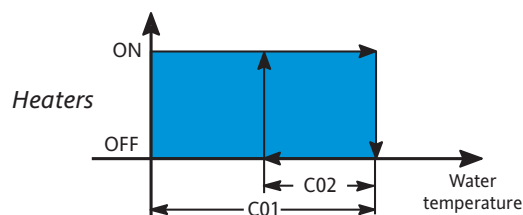
Heat pump behaviour during normal device operation:

The heat pump does not run when:
• Machine set to OFF
• Probe 1, 2 or 3 alarm active
• High pressure alarm active
• Manual flow control alarm reset active
• Boiler water temperature > C01

PAR.	DESCRIPTION	RANGE	DEFAULT LEVEL	UM
P01	Pump ON compressor ON delay. Delay between pump start-up and compressor start-up.	0..250	2	sec
P02	Compressor OFF pump OFF delay. Delay between compressor shut-down and pump shut-down.	0..250	2	sec

Anti-legionella function

The purpose of this function is to eliminate legionella bacteria responsible for Legionnaires disease and which typically reside in the water tanks of heating systems or, for example, in the cooling towers of air conditioning systems. These bacteria are typically killed at temperatures of around 60°C.
The anti-legionella function is only enabled if parameter LEn has been configured accordingly (LE1, LE2, etc...). The function is enabled by a daily/weekly event which remains active for a preset time period (the start time and duration of the event are determined by parameters that can be set by the user).

Daily activation of the anti-legionella function can be programmed by setting the parameters contained in subfolders **d0**, **d1**, ..., **d6**, **Ed**, to be found in folder **ALn** in the parameter programming menu.
In each folder there are 3 parameters:
• **LE**n: if set to "1" the function is enabled and will be activated on that day.
• **LS**n: hours/minutes for the start of the event: when parameter **LE**n is set to 1, the function enables at the time set in this parameter.
• **Ld**n: duration of the event: defines the time period for which the function is to remain activated.

For example:
if in folder d2:
• **LE2** = 1
• **LS2** = 12:00
• **Ld2** = 3
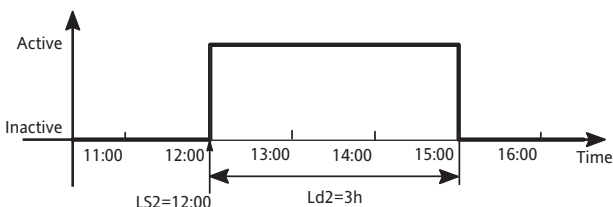
On the second day of the week, the function will activate at 12:00 and stop after 3 hours.

Operation

This function raises the boiler water temperature above the level set in parameter **r01** (electric heaters setpoint, usually above 60°C).
To achieve this rise in temperature, the compressor and electric heaters switch on until an intermediate value set in parameter **C01** (compressor setpoint) is reached. At this temperature, the function switches the compressor off and continues with the electric heaters alone until setpoint **r01** is reached.

The behaviour of the compressor and/or electrical heaters during activation of the anti-legionella' function is described below. However, bear in mind that this depends on the presence (or not) of the compressor:

PAR.	DESCRIPTION	RANGE	DEFAULT LEVEL	UM
r01	Anti-legionella setpoint. Control value in range between Boiler water setpoint (C01) and maximum anti-Legionella setpoint.	C01...r03	2	°C/°F
r02	Anti-legionella hysteresis. Temperature value between heater start-up and shut-down. Cannot be equal to 0.	0.1...30.0	2	°C/°F
r03	Max Boiler setpoint value. Maximum temperature that can be set for the anti-legionella setpoint.	0...255	2	°C/°F

If a compressor is present (see Alarms paragraph):
    A- The compressor runs until the temperature set in parameter C01 is reached, after which it switches off.
    B- The electric heaters stay on until the temperature set in r01 is reached.
    C- If the temperature drops after reaching r01, the electric heaters are switched on again at a temperature equal to r01-r02.
    D- On reaching the temperature C01-C02 (point D) the compressor is switched on again.
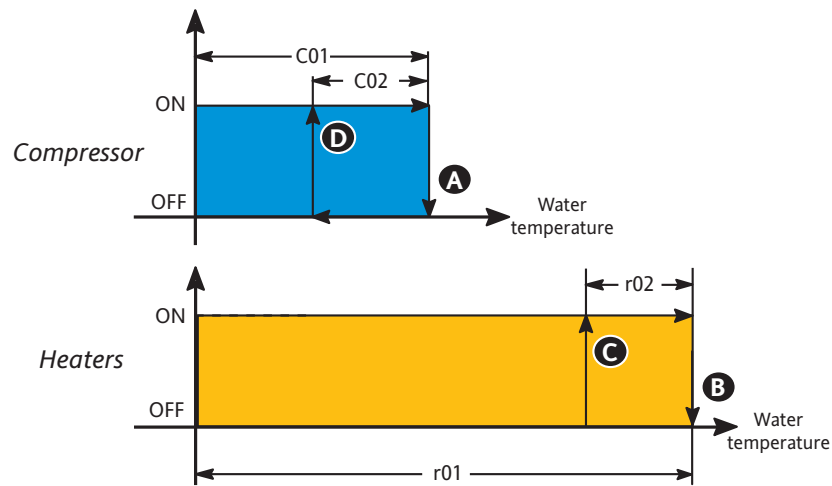
If there is no compressor (see Alarms paragraph):
    A- The electric heaters stay on until the temperature set in parameter r01 is reached.
    B- If the temperature drops after reaching r01, the electric heaters are switched back on again at a temperature equal to r01-r02.
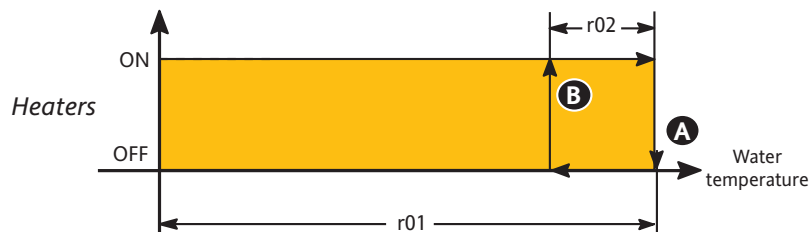
Operation of the anti-legionella function in the event of black-out
• If power fails and then is restored while this function is in operation, the device will return to the state current at the time of the black-out (and the anti-legionella function will continue to operate).
• If power fails while this function is in operation and is only restored after the operating phase has been concluded (but before the next phase), the device will consider it to have been completed.
• If power fails while this function is in operation and is restored during the next operating phase, the device will consider the phase underway at the time of the blackout to have been completed and will start the phase scheduled to be underway at the time power is restored.

N.B.: The functions folder contains subfolders to reset the running hours of the various utilities. See par. **Functions Folder**, page 4.

Timer function

The temperature controller can be programmed to activate when certain events occur by setting the parameters in subfolders **d0**, **d1**, ..., **d6**, **Ed**, which are located in folder tFP in the parameter programming menu.

There are 6 parameters in each folder (3 parameters per event):

- **En0, En1**: when set to "1", temperature control is enabled at the time set for the event (see par Sn0, Sn1).
- **Sn0, Sn1**: hours/minutes for the start of the event: when parameter **En0, En1** is set to 1, temperature control activates at the time set in this parameter.
- **dn0, dn1**: duration of the event: defines the time temperature control remains active for.

With the Timer function, temperature control can be programmed for specific time intervals only to save energy.
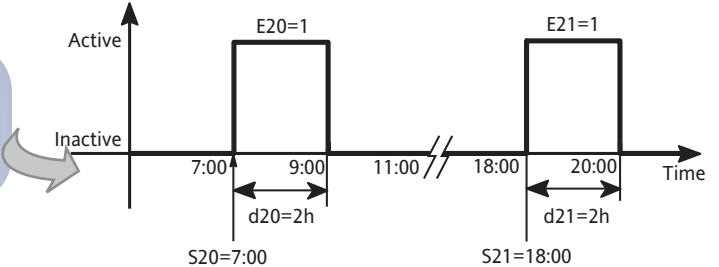
Subfolders d0...d6 indicate the events scheduled on a daily basis.
Subfolder Ed indicates the weekly event scheduled.

(see parameter values and ranges in folder tFP in the Parameters table on page 9)

For example:
if in folder **d2**:
- **E20** = 1   **E21** = 1
- **S20** = 7:00   **S21** = 18:00
- **d20** = 2   **d21** = 2

On the second day (folder **d2**) of the week, temperature control will activate for both events (**E20**=**E21**=1):

- **EVENT 1**: at 07:00 (**S20**=7/0) and will stop 2 hours later **d20**=2
- **EVENT 2**: at 18:00 (**S21**=18/0) and will stop 2 hours later **d21**=2

Party Function

The Party function enables temperature control when the Timer function is disabled (see "Timer Function" paragraph). The Party function is associated to the UP key (parameter H10=2): pressing the key will switch on temperature control. The temperature controller stays on until the setpoint has been reached.
On reaching the temperature set as the temperature control setpoint, temperature control is switched off if it is outside the interval set in the Timer function for temperature control on (see User Interface - Keys on page 2 and Parameters Table - CnF Folder on page 11).

Alarms

If the machine is ON, Alarm control is activated; alarms can be classified as follows:
- Analogue, i.e. probe errors or alarms caused by temperature values rising above the set limits.
- Digital, i.e. generated by the activation of digital inputs (with configurable polarity).

Message	Alarm	Description	Block Utilities			Bypass	Reset
			Compressor	Pump	Heaters		
E01	Boiler temperature probe.	An alarm message is generated if a boiler probe shortcircuits, or probe is open, out of range or unstable.	OFF	OFF	OFF		
E02	Evaporator temperature probe.	An alarm message is generated if an evaporator probe shortcircuits or is unstable.	OFF	OFF			
E03	Inlet water temperature probe.	An alarm message is generated if the inlet water temperature probe shortcircuits, is open, out of range or unstable.	OFF	OFF			
E04	Antifreeze.	An alarm message is generated when the evaporator temperature reaches the value in < parameter A06 (see table).	OFF				It is reset automatically if the evaporator temperature is >A06+A07.
—	Low inlet water temperature.	An alarm message is generated if the inlet water temperature < A08.	OFF			A bypass time lasting A10 is programmed, after which an alarm message is generated. The bypass is suspended if the inlet water temperature > A08; if during the interval, the inlet water temperature > A08+A09, the count is reset.	It is reset automatically if the inlet water water temperature > A08+A09.

Message	Alarm	Description	Block Utilities			Bypass	Reset
			Compressor	Pump	Heaters		
E10	High pressure[1] (digital)		Activated by digital input ID1	OFF	OFF	OFF	Reset automatically if the alarm occurs < A01 times in one hour. Reset manually if the alarm is repeated A01 times in one hour.
E11	Flow switch [1] (digital)	Disabled if digital input ID2 is active for A03 seconds.	OFF	OFF[2]		A bypass of A02 seconds is programmed after the start-up of the pump.	Automatically reset if ID2 is active for a time equal to > A03 but < A05. Reset manually if ID2 is active for more than A05 seconds.
E20	Clock (digital)	The clock is enabled in the following cases: •When the controller is switched on for the first time and it has not been programmed yet; •in the event of a black-out lasting 24/36 hours.					Manual

N.B.:

1) The heaters are activated if the Boiler water temperature > Boiler water setpoint (par. C01).

2) Only in the case of manual reset.

Parameters Table

	PAR.	DESCRIPTION	RANGE	DEFAULT	VALUE*	LEVEL**	UM
Compressor Regulator – label CP	C01	Boiler water setpoint. Control value, to the range going from the minimum setpoint (C04) and the maximum setpoint (C03).	C04...C03	50.0		1	°C/°F
	C02	Boiler water differential. Temperature value between compressor start-up and shut-down. Cannot be equal to 0.	0.1...30.0	2.0		1	°C/°F
	C03	Maximum temperature value that can be set for the Boiler water setpoint.	C04...255.0	55.0		1	°C/°F
	C04	Minimum Boiler setpoint value. Minimum temperature value that can be set for the Boiler water setpoint.	0.0...C03	0.0		2	°C/°F
	C05	OFF/ON safety time. Time period that must elapse between the compressor switching off then switching back on again.	0...250	30		2	sec*10
	C06	ON/ON safety time. The minimum time that must elapse between one start-up and the next.	0...250	90		2	sec*10
Heater Regulator label reS	r01	Anti-legionella setpoint. Control value in range from Boiler water setpoint (C01) to maximum anti-Legionella setpoint.	C01...r03	62.0		1	°C/°F
	r02	Anti-legionella hysteresis. Temperature value between heater start-up and shut-down. Cannot be equal to 0.	0.1...30.0	4.0		2	°C/°F
	r03	Max Boiler setpoint value. Maximum temperature that can be set for the anti-legionella setpoint.	0...255	65.0		2	°C/°F
Pump Control label PUP	P01	Pump ON compressor ON delay. Delay between pump start-up and compressor start-up.	0...255	20		2	sec
	P02	Compressor OFF pump OFF delay. Delay between compressor shut-down and pump shut-down.	0...255	20		2	sec

NOTE: At level 1, the folders display all level 1 parameters. At level 2, the folders display all and only level 2 parameters. The 1-2 symbol indicates parameters visible at each menu level.

	PAR.	DESCRIPTION		RANGE	DEFAULT	VALUE*	LEVEL**	UM
Anti-Legionella Function-ALn	**subfolders dn (d0, d1, d2, d3, d4, d6, Ed)**	LEn*	Anti-legionella function enabled during events 0=disabled 1=enabled	0...1	0 (LEd=1)		1-2	flag
		LSn	Hours/Minutes for start of event. Used to set the start time (hours and minutes) for the event.	0...23/0...59	0/0 (LSd=0/30)		1-2	hours/mins
		Ldn *	Duration of event To set the duration of the event.	0...24	0 (Ldd=4)		1-2	hours
Timer Function - tFP	**subfolders dn (d0, d1, d2, d3, d4, d6, Ed)**	En0 *	Temperature control enabled during the event. 0=disabled 1=enabled	0...1	1 (Ed0=0)		1-2	flag
		Sn0 *	Hours/minutes for start of event.	0...23/0...59	7/00		1-2	hours/mins
		dn0 *	Duration of event.	0...24	2		1-2	hours
		En1 *	Temperature control enabled during the event 0=disabled 1=enabled	0...1	1 (Ed1=0)		1-2	flag
		Sn1 *	Hours/minutes for start of event.	0...23/0...59	18/00		1-2	hours/mins
		dn1 *	Duration of event.	0...24	2		1-2	hours

* The meaning of "n" is:
- **varies from 0 to 6 to indicate the days of the week for daily folders from d0 to d6.**
- **equals "d" for folder "Ed" in relation to weekly events.**

	PAR.	DESCRIPTION	RANGE	DEFAULT	VALUE*	LEVEL**	UM
Alarm Regulator - label AL	A01	Number events per hour/high pressure required to generate the manual reset high-pressure alarm.	0...30	2		2	num
	A02	Flow control bypass from pump start-up. Time for which the flow switch alarm is not signalled.	0...255	30		2	sec
	A03	Duration flow switch input activation. Minimum time for which the flow switch digital input must be activated for an alarm (automatic reset) to be generated.	0...255	10		2	sec
	A04	Duration of flow switch input activation. Minimum time the flow switch must be off in order for the alarm to reset (automatically).	0...255	10		2	sec
	A05	Flow switch manual reset alarm delay. Minimum time the flow switch digital input must be active for before the manual reset alarm is signalled.	0...255	60		2	sec*10
	A06	Antifreeze alarm setpoint Temperature threshold below which the antifreeze alarm is signalled.	0.0...255	0.5		1	°C/°F
	A07	Antifreeze alarm hysteresis. Temperature value between the activation and deactivation of the antifreeze alarm. This value cannot be O.	0.1...30.0	0,5		2	°C/°F
	A08	Low temperature alarm setpoint. Temperature threshold below which the low temperature alarm will be signalled.	-30.0...50.0	2.0		1	°C/°F
	A09	Low temperature alarm hysteresis. Temperature value between the activation and deactivation of the low temperature alarm.	0.1...30.0	0.3		2	°C/°F
	A10	Low temperature alarm bypass. Bypass time before low temperature alarm is signalled.	0...255	250		2	sec
Communication - label Add	PtS	Protocol selection 0= Eliwell; 1=Modbus	0/1	0		1-2	flag
	dEA	Device index in family (values from 0 to 14)	0...14	0		1-2	num
	FAA	Device family (values from 0 to 14)	0...14	0		1-2	num
	PtY	Modbus parity bit 0=none; 1=even 2=odd	0/2	0		1-2	num
	StP	Modbus stop bit 0= 1 bit; 1=2bit	0/1	0		1-2	flag

NOTE: At level 1, the folders display all level 1 parameters. At level 2, the folders display all and only level 2 parameters. The 1-2 symbol indicates parameters visible at each menu level.

	PAR.	DESCRIPTION	RANGE	DEFAULT	VALUE*	LEVEL**	UM
Display - label dIS	PA1	Password 1. To set the entry password to parameters visible at level 1.	0...255	1		1-2	num
	PA2	Password 2. To set the entry password to parameters visible at level 2.	0...255	20		2	num
	ndt	Display with decimal point. The format in which temperature values appear. Temperature values can be displayed as whole numbers or with decimal point: n=whole numbers only y=decimal point	n/y	y		2	flag
	CA1	Boiler probe calibration. Positive or negative temperature offset added to the value read by the Boiler probe before it is displayed and used for regulation. The offset value can be programmed in the same unit of measure as the display.	-15.0...15.0	0.0		2	num
	CA2	Evaporator probe calibration. Positive or negative temperature offset added to the value read by the evaporator probe before it is displayed and used for regulation. The offset value can be programmed in the same unit of measure as the display.	-15.0...15.0	0.0		2	num
	CA3	Inlet water probe calibration. Positive or negative temperature offset added to the value read by the inlet water probe before it is displayed and used for regulation. The offset value can be programmed in the same unit of measure as the display.	-15.0...15.0	0.0		2	num
	LdL	Lowest value that can be displayed.	-55.0...HdL	-50.0		2	°C/°F
	HdL	Highest value that can be displayed.	LdL...302	99.0		2	°C/°F
	drO	Selects °C or °F for temperature display. 0=°C 1=°F	0...1	0		2	flag
	ddd	Value to be shown on the display. 0=displays Boiler temperature 1=displays Boiler setpoint	0...1	1		2	flag
Configuration - label CnF	H01	Digital input 1 configuration. 0=Disabled 1=High pressure 2=Flow switch (if water-water) Fan thermoswitch (if water-air)	0...2	1		2	num
	H02	Digital input 2 configuration. Same as H01	0...2	2		2	num
	H03	Polarity of digital input 1 0=active when contact closed 1=active when contact open	0...1	1		2	flag
	H04	Polarity of digital input 2 0=active when contact closed 1=active when contact open	0...1	0		2	flag
	H05	Configuration of relay RL2: 0=Disabled 1=Compressor 2=Pump 3=Electric heaters 4=Alarms	0...4	1		2	num
	H06	Configuration of relay RL1: Same as H05	0...4	3		2	num
	H07	Configuration of relay RL3: Same as H05	0...4	2		2	num
	H08	Configuration of relay RL4: Same as H05	0...4	4		2	num
	H09	Buzzer configuration 0=Buzzer disabled 1=Buzzer enabled	0...1	1		2	flag
	H10	UP key configuration 0=Disabled 1=ON/OFF; 2=Party Function	0...2	2		1	flag
	H11	DOWN key configuration 0=Disabled 1=ON/OFF; 2=Party Function	0...2	1		1	flag
	H12	Configuration of fnc key 0=Disabled 1=ON/OFF; 2=Party Function	0...2	0		2	flag
	H13	Acknowledge alarm with any key. 0= Alarm acknowledgment disabled1= Alarm acknowledgment enabled	0...1	1		2	flag
	H43	Probe Pb3 present 0=not present; 1=present	0...1	0		2	flag
Copy Card Fpr label	UL	Transfer parameter map from device to Copy Card	/	/		2	/
	dL	Transfer parameter map from Copy Card to device	/	/		2	/
	Fr	Formatting Delete data on Copy Card	/	/		2	/

FUNCTIONS (folder with label "FnC")
A number of functions in the FnC folder (last folder visible from level 2 of Programming Menu) can be enabled by pressing the "set" key.
SEE Folder Functions paragraph.

N.B.: At level 1, the folders display all level 1 parameters. At level 2, the folders display all and only level 2 parameters. The 1-2 symbol indicates parameters visible at each menu level.

TECHNICAL DATA	ECH 985	WIRING DIAGRAM

Front protection	IP65
Container	PC+ABS UL94 V-0 plastic resin casing, polycarbonate glass, thermoplastic resin keys
Dimensions	Front 32x74 mm
Mounting	Panel mounting with 29x72 mm drilling template (+0.2/-0.1mm)
Operating temperature	-5°C...55°C
Storage temperature	-30°C...85°C
Ambient humidity in use and in storage	10...90% RH (non-condensing)
Display range	NTC: -50...110°C (-58...230°F) on display with 3 and a half digits plus sign
Analogue input	3 NTC analogue inputs
Digital input	2 voltage-free digital inputs
Serial	TTL for Copy Card connection
Digital outputs (configurable) - RL1 output (A) - RL2 output (B) - RL3 output (C) - RL4 output (D)	1 SPDT 5A 230 V~ 1 SPST 5A 230 V~ 1 SPST 5A 230 V~ 1 SPST 5A 230 V~
Buzzer output	Buzzer output present
Accuracy	Better than 0.5% of full-scale +1 digit
Resolution	0.1°C (0.1°F up to +199.9°F; then 1°F)
Power draw	3VA
Power supply	Power supply 12V~ ±10% 50/60Hz

ECH 985 - 12V~

TERMINALS
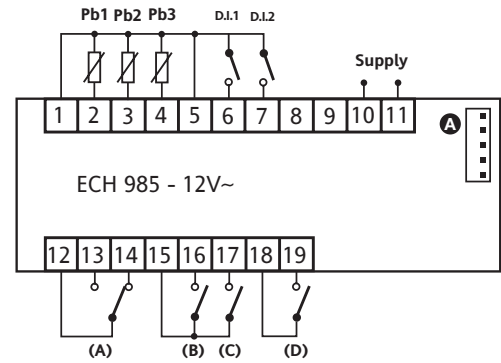
12-14	NC Relay RL1(A) par.H06	1 - 3	Probe input Pb2
12-13	NO Relay RL1(A) par.H06	1 - 4	Probe input Pb3
15-16	NO Relay RL2(B) par.H05	5 - 6	Digital input - DI1
15-17	NO Relay RL3(C) par.H07	5 - 7	Digital input - DI2
18-19	NO Relay RL4(D) par.H08	10-11	Power supply
1 - 2	Probe input Pb1	A	TTL input for Copy Card

ELECTRICAL CONNECTIONS

Important! Switch off the device before working on the electrical connections.

The device is equipped with screw terminal boards for connection of electrical cables with a diameter of 2.5 mm^2 (one conductor only per terminal for power connections): for details of the terminals, see the label on the device.

Do not exceed the maximum permitted current; for higher loads, use a contactor with sufficient power capacity.

Make sure that power supply is the correct voltage for the device.

Probes have no connection polarity and can be extended using a normal bipolar cable (note that the extension of the probes influences the device's electromagnetic compatibility (EMC): take great care with the wiring).

Probe cables, power supply cables and the TTL serial cables should be routed separately from power cables.

INSTALLATION

The device is designed for panel mounting. Make a 29x71 mm hole and insert the device; fix it with the special brackets provided.

Do not mount the device in damp and/or dirt-laden areas; It is designed for use in places with ordinary or normal levels of pollution.

Keep the area around the device's cooling slots adequately ventilated.

DISCLAIMER

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The same applies to any person or company involved in preparing and editing this document. Eliwell Controls S.r.L. reserves the right to alter or improve the device for aesthetic or functional purposes at any time without notice.

RESPONSIBILITY AND RESIDUAL RISKS

Eliwell Controls S.r.L. shall not be liable for damages deriving from:
• installation/uses other than those stated and, in particular, which do not comply with the safety requirements set out in the regulations and/or stated herein;
• use on panels that do not provide adequate protection against electric shock, water or dust when assembled;
• use on panels that allow access to dangerous parts without having to use tools;
• tampering and/or modification of the product;
• installation/use on panels that do not comply with the current standards and regulations.

NOTE: The technical specifications stated in this document regarding the measurement (range, accuracy, resolution, etc.) refer strictly to the instrument and not to any accessories provided, such as the probes.
This means, for example, that any error introduced by the probe must be added to the error of the instrument.

CONDITIONS OF USE

INTENDED USE

For safety reasons, the device must be installed and used according to the instructions provided. In particular, parts carrying dangerous voltages must not be accessible in normal conditions.

The device must be adequately protected from water and dust according to the application, and must also only be accessible using tools (with the exception of the front panel).

The device is suitable for use in household refrigeration appliances and/or similar equipment and has been tested for safety aspects in accordance with harmonised European reference standards.

It is classified as follows:
• In terms of design, as a built-in automatic electronic control controller.
• In terms of automatic operating characteristics, as a type 1B controller.
• In terms of software class and structure, as a Class A controller.

IMPROPER USE

Any use other than that stated is not allowed. Note that the relay contacts provided are of a functional type and therefore subject to malfunction: any safety protection prescribed in product standards, or suggested by common sense, must be installed externally to the instrument for obvious safety reasons.