Technical Support
Bulletin Nr. 14 – Special Functions CR

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Introduction

This bulletin concerns special regulators present in several Commercial Refrigeration controllers, that complete the conventional regulators.
The following is described for each algorithm: capacity, on which instruments it is available and how it must be enabled and activated.

LINK regulator

Definition of Link network, Master, Slave and Echo. Characteristics

The link network (synchronisation network) enables the synchronisation of several commands, that will be subsequently listed, between a Master device and a series of Slave devices. All this leaves aside the correct programming of the devices (7 Slave and Echo devices if using the ID983/985LX and 10 Slave and Echo devices if using the IWP).

MASTER

The only device able to manage the network and in particular to send the commands in network. It is also equipped with independent regulators. The Master can send all the slaves the following functions, controlled by digital input or key:

1. Manual defrost
2. Switching lights on/off
3. Silencing alarms
4. Auxiliary setpoint (also called reduced or Economy)
5. Switching aux relay (Auxiliary) on/off
6. Standby (ON/OFF)

The Master can also:

1. Synchronise the display of all the Slave and Echo devices according to own display
2. Synchronise defrosts (simultaneous or sequential, referred only to the start, whereas the end is always independent)
3. Send commands referred to the “Night and day” regulator

SLAVE
A device equipped with independent regulators that can accept or refuse network commands.
A set of parameters enables its characterisation in different ways in order to make it dependent or independent with respect to:

1. Network functions (points 1,2,3,4,5,6 explained on the Master)
2. The display
3. Commands from the Master referred to the “Night and day” regulator.

ECHO
A device not equipped with input/output resources. It repeats the entire display of the associated instrument (Master or Slave).
The setting of network addresses characterises the Echo device regarding correspondence with the Master or associated Slave. Also, different Echo devices can be associated with the same instrument.

A Link synchronisation network can be created only with Eliwell instruments having this function, i.e. on the date of issue of this document, ID983/985LX, IWP740/750/760LX, IWP985LX and between instruments of the same family. This means, for example, that Link networks can be created between:

- ID983/985LX and ID983/985LX
- IWP740/750/760LX with IWP740/750/760LX
- IWP985LX with IWP985LX

However, Link networks cannot be created between instruments of different families (e.g. ID with IWP).
Normal two-core electric cable can be used for the connection between the various devices making up the Link network, even if a screened 2-wire cable is highly advisable in order to reduce sensitivity to interference. Also the Belden cable suggested for RS485 networks can be used, with 2 of the three wires available in it. Several characteristics of the Link networks are given, according to the controllers:

ID983/985LX

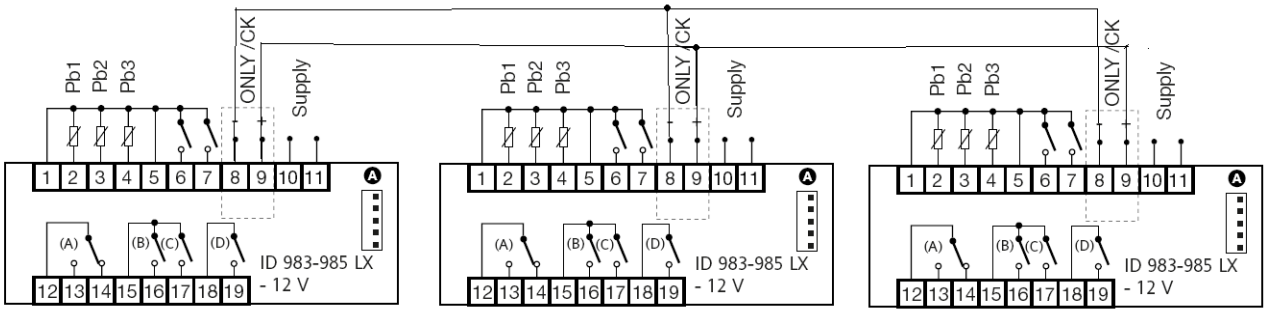
- Total instruments connectable: max. 8, 1 Master + 7 Slaves.
- Distance between instruments: max. 7m
- Total length of network: max. 50m

IWP740/750/760 and IWP985

- Total instruments connectable: max. 10, 1 Master, 4 Slaves + 1 Master Keypad, 4 Slave Keypads*
- Distance between instruments: max. 10m in Short Distance mode, 100m in Long Distance**
- Total length of network: max. 50m in Short Distance, 400m in Long Distance**

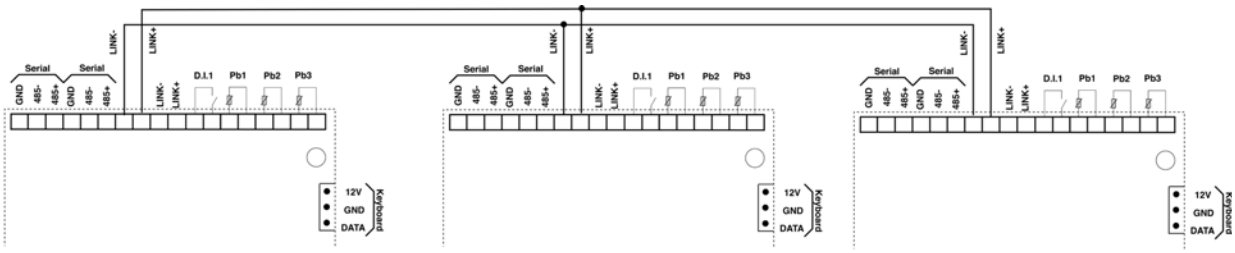
*****IWP comprises a Base+Keypad. The keypads are components of the Link network, in being connected to the same network. In case of no Slave Keypads the network can comprise 1 Master and 4 Slaves max.
**Short Distance: connection with 3 wires, one of which is the Keypad feed wire. The other two (signal and GND) will be used for the Link connection Link; Long Distance: RS485 serial connection obtainable only with some IWP models and keypads with additional module for inserting on the bases and keypads.

Connections examples
ID983/985LX



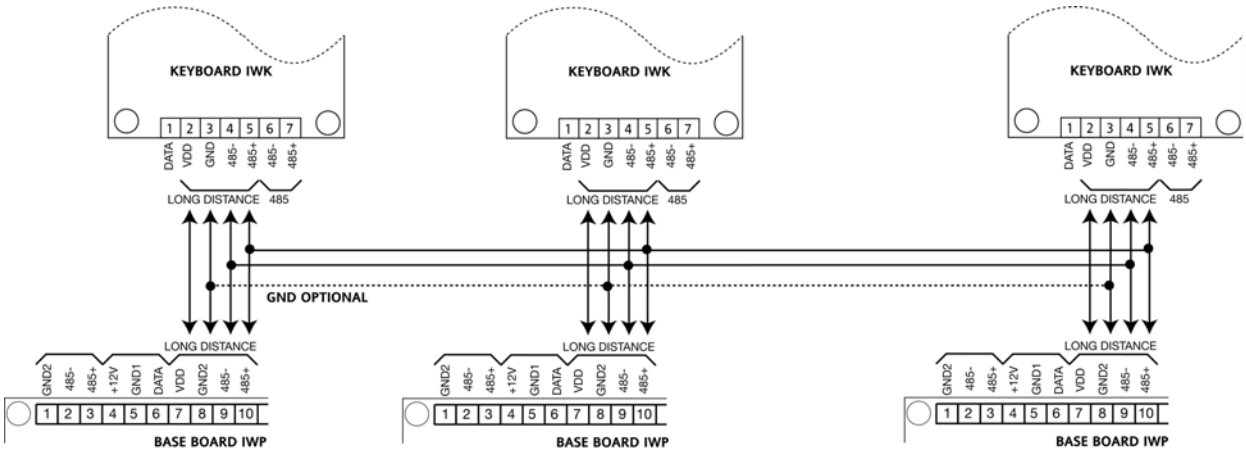
Master Slave1 Slave2

IWP740LX



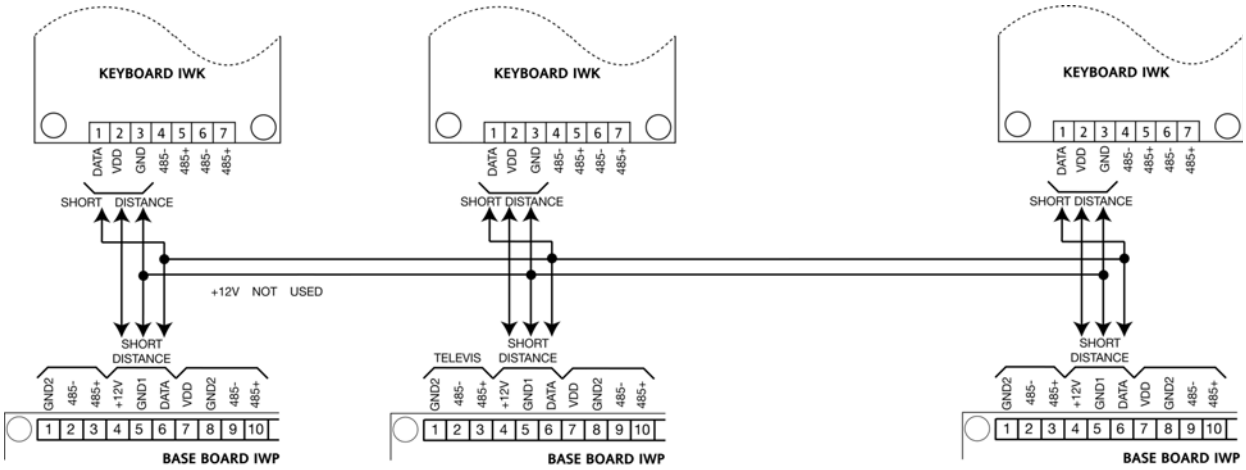
Master Slave1 Slave2

IWP750/760LX
Link connection in case of IWK keypad Long distance connection



Master Slave1 Slave2

Link connection in case of IWK keypad Short distance connection



Master Slave1 Slave2

List of parameters
ID983/985LX

Parameter	Description	Range	UM	Notes
L00	Master, Slave selection	0...7	num	The value 0 defines the Master, 1…7 the Slaves. Use consecutive numbers for the Slaves
L01	Number of Slaves connected in network	0...7	num	Applies only for the Master, the Slaves have 0 set
L02	Presence/absence of local ECHO devices referred to individual Slaves	0/1/2	num	Referred only to slaves 0=local ECO not present 1= Parameter defining that the device is Active, the active slave shares its local display in network at a fixed frequency 2= Parameter identifying local ECO, the instrument gathers and shows the display of the associated instrument (see address L00) **PARAMETER NORMALLY NOT VISIBLE AND ALWAYS NON-USABLE**
L03	Simultaneous/sequential defrost	n/y	flag	Master n=cont./y=seq. Slave n=ignore/y=accept

L04	Distributed display	n/y		Referred to slaves and ECHO devices: n= displays local values y= shows display of master
L05	Activation of network functions	n/y	num	n=if Master: does not request slaves for activation of remote functions if slave : ignores remote function activation commands coming from the master y=if Master: requests slaves present in the network for activation of remote functions as referred by the specific functions if slave: accepts remote function activation requests coming from the master
L06	Block of resources at end of defrost	n/y	num	0=does not block resources (compressor, fans, etc.) at end of defrost 1= blocks resources (compressor, fans, etc.) at end of defrost IMPORTANT: correlated to the Ldd parameter which has priority.

Given below is the list of parameters relative to the IWP Link operation

Parameter	**Description**	**Range**	**UM**	Notes
L00	Master, Slave, Keypad selection	0...4	num	0=master base 1...4=slave base
L01	Number of Slaves connected in network	0...4	num	Applies only for the master, the Slaves have 0 set
L02	Echo devices connected in network (function of connected keypad)	0...1	num	**PARAMETER NORMALLY NOT VISIBLE AND ALWAYS NON-USABLE**
L03	Simultaneous/sequential defrost	n/y	flag	X master 0= seq./1=cont X slave 0=ignore/1=accept
L04	Distributed display	n/y		Referred only to slaves: n=the slave displays local values y= the slave shows the display of master

L05	Activation of network functions	n/y	num	n=if Master: does not request slaves for activation of remote functions if slave : ignores remote function activation commands coming from the master y=if Master: requests slaves present in the network for activation of remote functions as referred by the specific functions if slave: accepts remote function activation commands coming from the master
L06	Block of resources at end of defrost	n/y	num	0=does not block resources (compressor, fans, etc.) at end of defrost 1= blocks resources (compressor, fans, etc.) at end of defrost IMPORTANT: correlated to the Ldd parameter which has priority.
L07	Activation of alarm relay in case of slave alarm	n/y	num	If referred to the master activates/does not activate relay in case of alarm, but in any case displays alarm folders if referred to the slave, transmits or does not transmit slave alarm status to the master
L08	Enabling of network functions from slave base	n/y	Num	Referred to slaves and enables the network functions AUX, LIGHT and ON/OFF by key, function and D.I.
L09	Master compartment probe sharing	n/y	num	Referred only to slave: regulates according to temperature of ambient probe connected to the Master and not according to own.

Displays

By means of parameter L04 it is possible to decide which temperature value the slave instruments connected in a link network must display.

Therefore two types of display, **distributed display** and non-distributed display, are available; in the first case (L04=y) the slave instrument will show the display of the Master, and in the second case (L04=n) the slave will display the local values, i.e. the temperature values obtained by its compartment probe (or by a different probe in accordance with the ddd parameter).

Also, in case of **distributed display** from Master to Slave the following must be taken into account:

1. **parameter programming:** when programming parameters on the Master unit the slave always shows the display of the Master (therefore parameter programming)
2. **simultaneous defrost:** (see chap. Definition of Simultaneous Defrost) when the Master unit gives consent to start defrost, if adequately programmed all the slaves will show the

display of the Master in accordance with the parameter ddL. The display will be blocked only when all the elements of the network have ended defrost or dripping and the Master has reached the adjustment setpoint. The display can be unblocked also for expiry of the timeout set in parameter Ldd. Basically, the defrost cycle is to be considered singular among all the elements of the network.

3. **sequential defrost:** (see chap. Definition of Sequential Defrost): in case of distributed display at start of defrost of the Master unit the Slaves continue to display that provided for by the parameter ddL of the Master: in case of distributed display and defrost on the slave unit it will be possible to know which slave is defrosting from the icon present on the front panel.

Example of parameter configuration in a network of 6 elements with display:

non-distributed

MASTER	**SLAVE 1**	**SLAVE 2**
L00=0	L00=1	L00=2
L01=2	L01=0	L01=0
	L02=1	L02=1
	L04=N	L04=N

Distributed (1) and non-distributed (2)

MASTER	**SLAVE 1**	**SLAVE 2**
L00=0	L00=1	L00=2
L01=2	L01=0	L01=0
	L02=1	L02=1
	L04=Y	L04=N

Definition of synchronised, parallel and sequential defrost

SYNCHRONISED DEFROST

Synchronisation of defrosts is carried out with respect to the actual defrost phase. The Master also limits itself to merely supplying the start of defrost enabling commands or thermostatting at the end of defrost, without interfering in the normal protections or delays of each device, such as: defrost delay, dripping, etc.

The defrost LED flashes when the slave devices are awaiting enabling for thermostatting by the Master (in case of end of synchronised defrost).

IMPORTANT: If the slaves connected in network are programmed in order to accept the commands of the master regarding defrosts and network functions possible defrosts or functions associated with events requested by the slave will not be activated.

The slaves will activate defrosts or functions associated with events requested by the slave itself only in case of “no link” (error E7 see chap. Alarms).

Also, defrost can occur in two separate ways selectable by means of parameter L03 (see table of parameters); both are described below.

PARALLEL DEFROST

After the command of the Master, all the devices start the defrost phase at the same time (except specific protections of each device) - like manually pressing the defrost button on all the devices at the same time.

At the end of the defrost and dripping phase of all the devices, the Master enables thermostatting for all the devices.

Regarding the Master unit, it must manage and synchronise operation of the slave fans during the final defrost phase or, the Master must give consent for restarting the fans only when the temperature control is re-enabled.

SEQUENTIAL DEFROST

The Master activates one defrost after another for the various devices in network. At the end of its own defrost (and not dripping) each device freely starts to thermostat.

Regarding the description of the dt and Fdt parameters, refer to the technical sheet of the instrument.

Alarms and solutions

Each single device independently manages its own alarm conditions including that relevant to no master/slave communication (no-link error E7).

The system also manages any address conflicts, i.e. the setting of devices as multiple masters and slaves with the same address (no-link error E7).

No-link and address conflict alarms are displayed in the “AL” alarms folder on the Master and Slaves by means of error code E7.

In case of E1 or E2 on the Master, if the display is distributed the slaves will always show the display of the Master: to know which unit is in alarm status reference will be made to the alarm LED of each instrument.

In case of simultaneous defrost the temperature alarm signalling delay, set with parameter dAO, will start when the last instrument has terminated the defrost cycle.

In case of alarm E7 in the AL folder in the machine status menu, it is advisable to check the connection cable between the master instrument and slave; the cable must be correctly connected and with the right polarity.

Also, by means of the parameters L00 (applicable for the master and slaves) it is advisable check the correct Master and Slave selection, and by parameter L01 (applicable only for the master) the number of slaves connected in network.

In the IWP and ID983/985 instruments alarm E7 also appears in case of no communication between base and keypad (even if the keypad is configured as Echo), however in this case the message E7 appears on the display and not in the AL folder.

DCC (Deep cooling cycle) REGULATOR

Description

This regulator is suitable for refrigeration units that provide for a blast chilling cycle and subsequent preservation of food. At the end of the blast chilling phase the controller automatically switches to preservation mode.

Once the cycle is activated the DCC regulator ensures that controller regulates according to the **dcS setpoint,** with a differential equal to the value set by parameter **diF,** and for the time set in parameter **tdc,** it therefore being a blast chilling cycle. On reaching the setpoint indicated and elapsing of the time, the controller switches to preservation mode, controlling the temperature according to the setpoint value set from keypad.

Instruments where the function is available

ID974 DCC

DCC regulator enabling and activation

The DCC function is enabled by means of the parameter **H01** (yes=enabled)
The blast chilling cycle can be activated by key (H31…H33=4) or by digital (H11=6).
In case of probe error (E1,E2) the DCC terminates and the controller returns to the standard operation provided for probe error.
In case of no power, when the controller switches on again it always starts in standard mode even if at the time of the power failure it was carrying out a DCC, therefore the function must be reactivated from key or digital.

If the parameters **dcS, tdc** and **ddc**, which intervene on the DCC when active, are modified, DCC operation is recalculated with the new set values.

When the DCC regulator is activated, the time between defrosts is zero-set and defrosts are disabled. From the end of the DCC, after a time settable by means of parameter **dcc** a defrost is forced and the counts for the time between defrosts (**dit**) restart.

During the DCC the temperature alarms are disabled, except for the low temperature alarm (set by means of parameter LAL . Normal temperature alarm management is restored when, a the end of the DCC, the compartment temperature reaches the adjustment setpoint value again.

DIFFERENTIAL-IC regulator

Description

In controllers provided with this function the analogue adjustment value is given by the difference between the two probes, Pb1 and Pb2

If the difference is positive (Pb1>Pb2) or negative (Pb2>Pb1) but less than or equal to the setpoint value the relay output set for heating (HC=H) will be active.

If the difference is positive (Pb1>Pb2) but greater than the setpoint value the output set for cooling (HC=C) will be active

Instruments where the function is available

IC915LX DIFFERENTIAL

Differential regulator enabling
Differential regulation is enabled by means of the parameter **H03** (1= enabled),
and the probe Pb2 must be enabled (H42=y).

DIFFERENTIAL-IWP regulator

Description
In controllers equipped with this function the analogue regulation value is given by the difference between two probes, Pb1 and Pb3

If enabled, the temperature control, as well as the regulation and on probe PB1 also the regulation on the temperature variance measured between probe Pb3 and Pb1. In this way, for the compressor regulator to be activated, either condition must be met (on Pb1 or on the variance Pb3-Pb1), or both. The temperature variance value is established by parameter H44. For deactivation of the compressor regulator, both conditions must be met: if either one is not, the regulator is not deactivated. In case of error on probe Pb3, regulation only occurs on Pb1, like for H43 different from 3-1. Therefore:

Instruments where the function is available
IWP750-760LX, SM versions. TO BE REQUESTED WHEN ORDERING

Differential regulator enabling
Differential regulation is enabled by means of parameter **H43** (3-1= enabled)

DEFROST ON SECOND EVAPORATOR regulator

Description
This regulator enables the control of defrosting of a second evaporator.

Instruments where the function is available
ID985LX DOUBLE EVAPORATOR, ID985LX/E IWP740/750/760LX, IWP985LX, EWDR985 LX (OTHER EWDR 98X BY REQUEST)

Enabling and activation of regulator for defrost on the second evaporator
To implement this function proceed as follows:

a) configure the 3rd probe in 2nd evaporator defrost control mode (par. H43=2EP).
b) configuring a relay output as a 2nd evaporator defrost relay (configuration parameters H21…H26).
c) Define the defrost mode by setting H45.

Start defrost mode
In case of double evaporator, start defrost mode can occur in three different modes according to the parameter H45 as described below:

- H45=0: Defrost is enabled by only controlling that the temperature of the 1st evaporator is less than the parameter dSt.
- H45=1: Defrost is enabled by controlling that at least one of the two probes is below its end of defrost temperature (dSt for the 1st evaporator and dS2 for the 2nd evaporator)
- H45=2: Defrost is enabled by controlling that both probes are below their respective end of defrost setpoints (dSt for the 1st evaporator and dS2 for the 2nd evaporator)

Defrost exit mode

In case of double evaporator, exiting defrost occurs when both probes have reached or exceeded their respective end of defrost setpoints (dSt for the 1st evaporator and dS2 for the 2nd evaporator)
In case of error in one or both probes the end of defrost will occur for timeout (parameter dEt).

DOUBLE DEFROST regulator

Description

This regulator enables the control of defrosting of a second evaporator.
This function also enables management of defrosts in a simultaneous and non-simultaneous way.

Instruments where the function is available

IWP760 DOUBLE DEFROST

Regulator enabling and activation for defrost on 2nd evaporator

The defrost on the 2nd evaporator works in the same way as defrost on the first evaporator (managed by controllers for refrigeration). The parameters dst, dit, det, dOH are duplicated, becoming

ds1, di1, de1, dO1 relative to the lst evaporator
ds2, di2, de2, dO2 relative to the 2nd evaporator

Defrosting of the second evaporator can be controlled by means of the third probe, configuring a relay output as a 2nd evaporator defrost relay (configuration parameters H21…H28).
To implement this defrost function on the 2nd evaporator, proceed as follows:

d) configure the third probe in 2nd evaporator defrost control mode (par. H43=2EP).
e) configuring a relay output as a 2nd evaporator defrost relay (configuration parameters H21…H28).

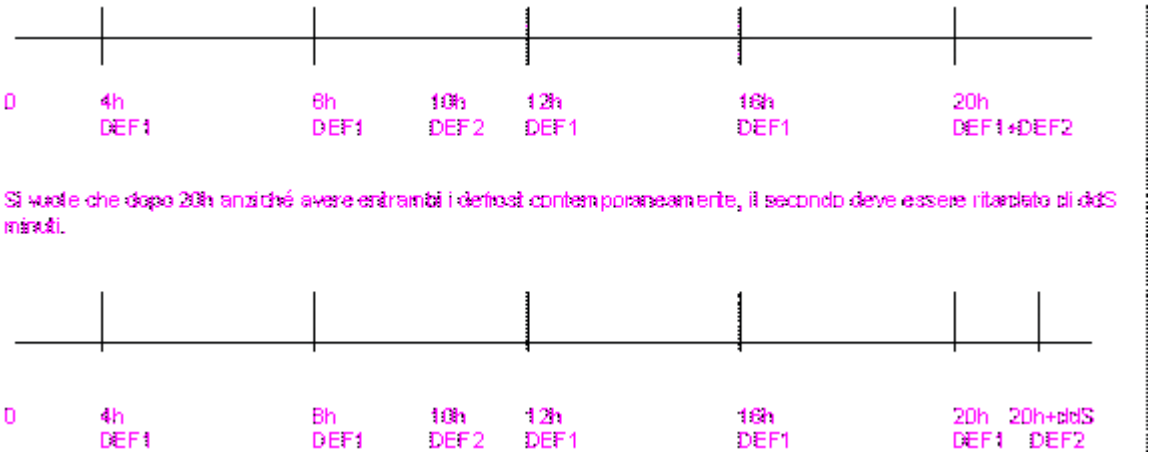
Simultaneous defrost activation option

By means of parameter H46 it is possible to decide, when defrost on the second evaporator is activated, if also defrost on the first evaporator (y) must be activated or if defrost on the first evaporator must follow its times.

Non-simultaneous defrost activation option

If simultaneous defrosts are not required, the parameter H46 must be set to n; also, if the parameter ddS (delay in case of simultaneous defrost) is different from 0, the machine does not carry out defrosts simultaneously and the second starts, after the other, with a delay in minutes defined by the parameter ddS.

Example:
di1=4h
di2=10h



At the twentieth hour the two defrosts occur at the same time, even if the "non-simultaneous" option was set. To avoid this, set ddS to a value other than 0 (Range ddS: 0..60 min).

SECOND COMPRESSOR regulator

Description

In regulators provided with this function a relay can be configured as a second compressor; the work setpoint of the second compressor will always be the setpoint of the first compressor and will be activated (if the relevant temperature conditions, detected by the compartment probe, exist) after a certain time settable by parameter dSC, whereas the second compressor will stop (if the relevant temperature conditions, detected by the compartment probe, exist) at the same time as the first compressor.
The parameter dSC was introduced to avoid close starts of the two compressors.

Instruments where the function is available

IWP750LX 2nd COMPRESSOR, IWP760LX 2nd COMPRESSOR, IWP985LX

Second compressor function enabling and activation

To enable the regulator of the second compressor just set an output as 2nd compressor (H21…H26=10)

CONDENSER FANS regulator

Description

This regulator enables control of the condenser fans using a suitably configured relay output and the third probe of the controller; the probe will detect the condenser temperature when the temperature reaches the setpoint value (SCF), the output configured as condenser fans will switch ON and then OFF when the temperature detected by the probe 3 is equal to the setpoint value minus the differential (SCF-dCF).

If the probe Pb3 is not present the regulator will always be active except during defrosts. The probe can be cut out. In this case its non-connection does not generate any type of alarm. In case of alarm E3 the output will always be ON except during defrosts. During the dripping time the output will be OFF.

Instruments where the function is available
ID985LX/E,IWP760LX Condenser Fan

Condenser fans regulator enabling and activation
To enable the condenser fans regulator a relay output must be set as condenser fans (H21…H24 for the ID985LX/E and H21…H26 for the IWP760LX Condenser Fan and the presence of probe Pb3 of the instrument (H43=y).

FRAME HEATER regulator

Description
This regulator enables activation of the defogging heater of a display unit or refrigerated counter using a suitably configured relay output; the regular acts cyclically according to the values set in Hon and Hof, and the output will be activated according to the following table:

Hon	**Hof**	OUT
0	0	Off
0	>0	Off
>0	0	On
>0	>0	Duty Cycle

Instruments where the function is available
IWP760LX CONDENSER FAN, IWP760 SM

Frame Heater regulator enabling and activation
The frame heater regulator is enabled by setting a relay as frame heater (H21…H26=10) and can be activated and deactivated by key (H31…H33=10) or digital (H11…H14=15).

SEQUENCE regulator

Description
This regulator enables the setting of up to 2 work programmes of 8 steps each, in controllers provided with this function. The following can be programmed for each step:
STEP ACTIVATION DELAY: defines the step activation delay from the moment of start. If it concerns the first step of the programme, activation occurs through the Start process key. During the set delay time, the operation setpoint is that defined by the end of step mode (this does not apply for step number 1)
STEP DURATION: defines step duration: expressed in hours/minutes, if set to --- it indicates the end of the step for reaching of temperature.
DURATION FROM START OR FROM REACHING SETPOINT: defines if step duration must be calculated from its actual start or from reaching the setpoint inside the step.
STEP SETPOINT: defines the step regulation setpoint
ACTIVE REGULATOR: indicates which regulator is active in the step
On1 on/off
On2 on/off
Ne neutral zone
Cyc cyclic
PH PID heating
PC PID cooling

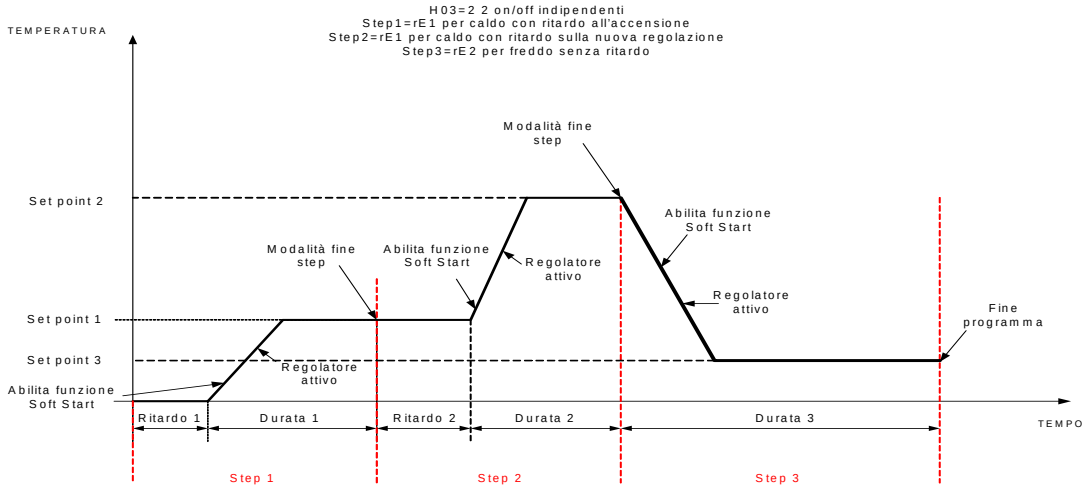
PHC PID heating/cooling

ENABLE/DISABLE SOFT START: indicates if the Soft Start function must be enabled during the step (reference parameters present inside folder SFt).
AUX RELAY MODE: indicates how the AUX relay must be, if configured, during the step between ON, OFF and DUTY CYCLE
END OF STEP MODE: indicates the end of step mode from among the following possibilities:
1-end of program (standby mode)
2-go to next step, maintaining the current setpoint
3-go to next step waiting for new setpoint
4-go back to start of sequence
5-go back to sequence no.xx
6-infinite duration, maintains the setpoint

Instruments where the function is available
EW4800,EW7200

Sequence regulator activation
Activation and disabling of the regulator occurs by key (H31…H32=8), suitably configured digital (H11=8) or from function menu.

Regulation diagrams

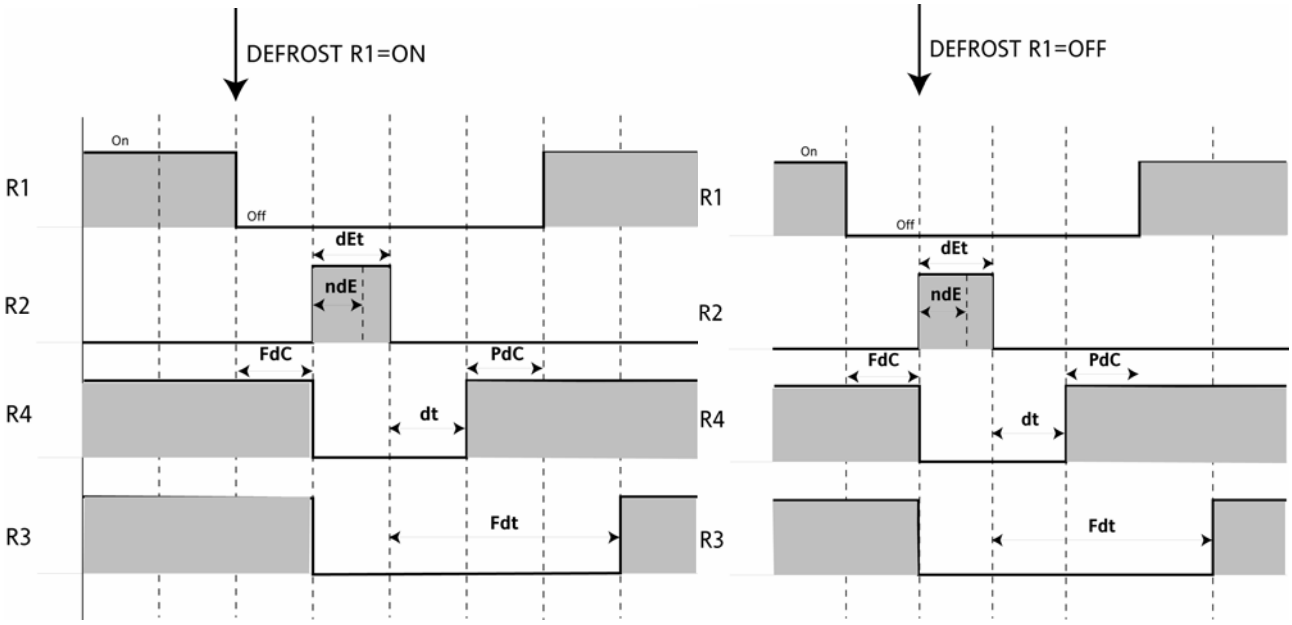


HOT GAS regulator

Description

In regulators having this function there is the possibility of selecting electric defrost with reverse cycle, also HOT GAS defrost, not to be confused with reverse cycle defrost.
Hot Gas defrost regulation occurs using the 4 digital outputs (relay) (relay outputs A,B,C,D on the regulator). The following users are connected to such outputs:

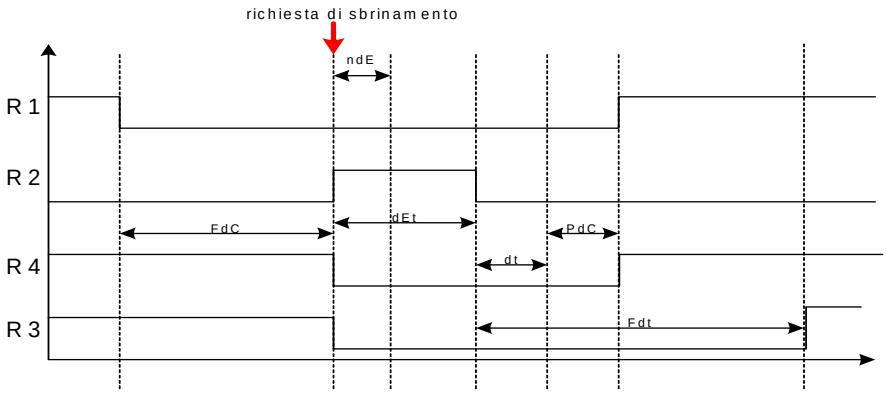
- R1: Liquid solenoid valve
- R2: Hot gas solenoid valve
- 40R3 : Evaporator fan
- R4 : Intake solenoid valve



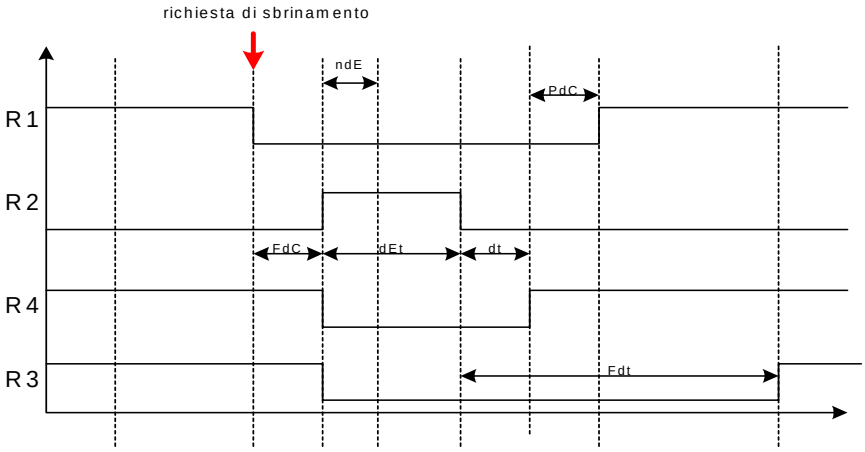
Defrost operation

example 1

the defrost request occurs during a period in which the valve R1 is off. R2 is immediately activated and the start of defrost is immediate As request a manual type is considered.



The end of defrost, for the probe (in respect of parameter ndt) or for timeout (par.dEt), will be followed by dripping (par.dt) after which the device returns to normal operating conditions and therefore the possibility of activating R4 if required by the temperature controller and R1 after par. PdC.



example 2

the defrost request occurs during a period in which the valve R1 is On, R1 is turned off, respecting the turning off times R4 is turned off after the period FdC, then R2 is activated and defrost starts, after which operation is the same as example 1.

Instruments where the function is available
ID985LX HOT GAS

Regulator enabling and activation
To enable the hot gas regulator, set the parameter dty=3 (hot gas defrost) and configure the 4 digital outputs as Liquid solenoid valve/compressor (H21…H24=1), hot gas solenoid valve/defrost (H21…H24=2), evaporator fan (H21…H24=3) and intake solenoid valve (H21…H24=9).
The regulator is enabled at every expiry of the time set in the parameter dit if the relevant temperature conditions exist (Pb2>dst).

DISCLAIMER

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Eliwell Controls s.r.l.
Via dell'Industria, 15 • Zona Industriale Paludi • 32010 Pieve d'Alpago (BL) ITALY
Telephone +39 0437 986 111 • Facsimile +39 0437 989 066
Technical helpline +39 0437 986 300 • E-mail techsuppeliwell@invensyscontrols.com
www.eliwell.it