ENGINEERING
TOMORROW

User Guide

Chiller and reversable chiller

Reciprocating, scroll and screw compressors

Software Version 4.40.00

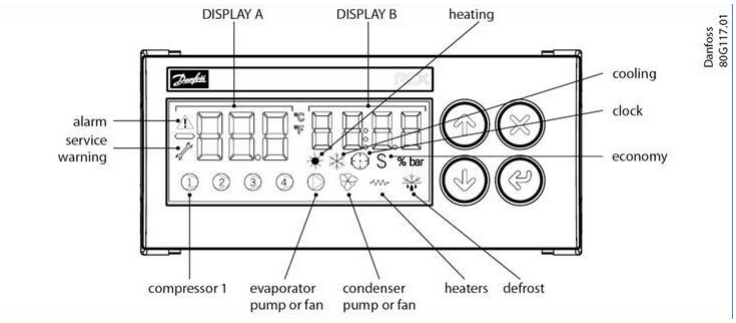
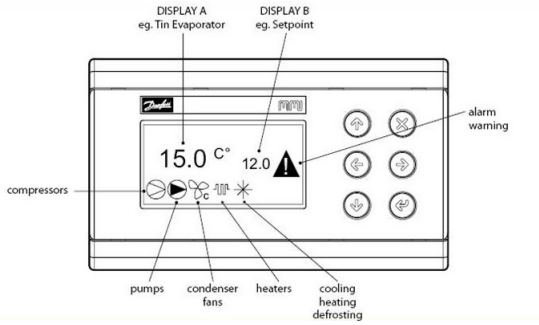
Contents

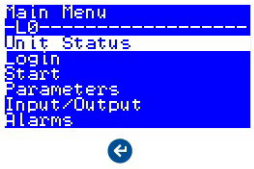
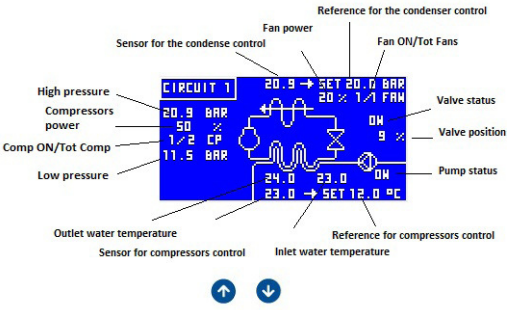
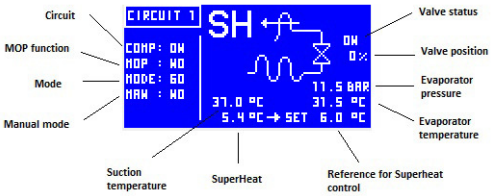
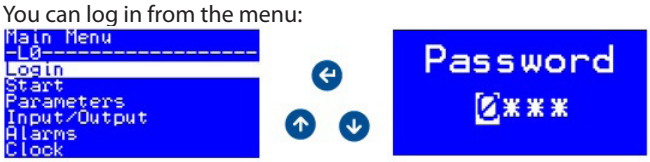
preparatory: link to MCXShape manual

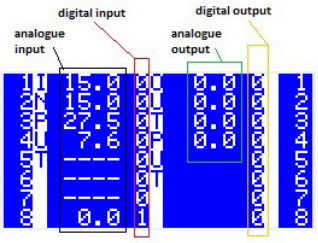
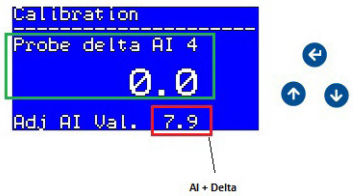
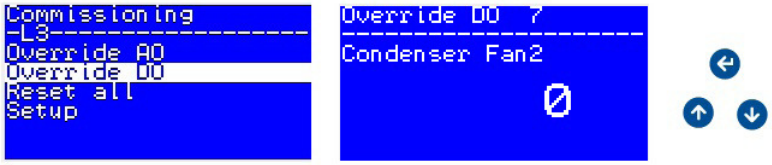
User Interface

LED Display, LCD Display, Keyboard, Unit status, Login, Start, Parameter, Input/Output, I/O Display, I/O Config, I/O Prb Calibration, I/O Commissioning, Alarm, EEV, VSH Monitor, VSH Control, Clock, Language, Service, Hours Counters, Variable speed pump

Note: playing with MCXShape, it is very easy to customize the structure and the visibility of the menu: so the following indication cannot match with all the compiled software

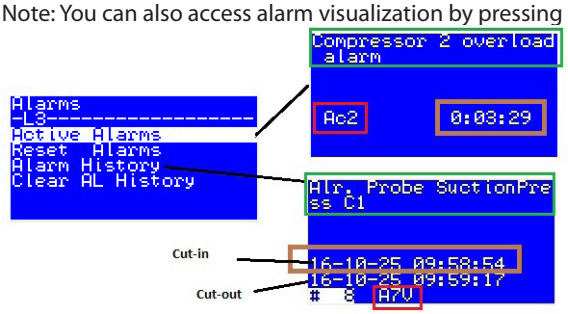
Main screen - LED Display	 Note: check parameters **dsA, dSb** and **dSC**.
Main screen - LCD Display	 Note: check parameters **dsA**, **dSb** and **dSC**.
Keyboard	: Scroll UP, increment a value : 3s when in main screen: toggle ON/OFF : Scroll down, decrement a value : 3s when in main screen: toggle Heat/Cool mode : exit and save, : when in main screen: access the active alarm list : 3s when in Alarm screen: manual reset The LEFT and RIGHT keys, if present, allow you to move the cursor to the desired option

Menu: Unit Status	   Note: to see the menu enable the functionalities "**Enable schema view**"
Menu: Login	Parameters and Menu are organized into 4 access levels. Levels from 1 to 3 are linked to a password. Elements cannot be accessed when they are on a higher level than the entering level. The level of each parameter and menu is defined with MCXShape • Level 0 is accessible without password • Levels 1-3 are linked to a password (Check parameters L01, L02 and L03) • Level 4 is not linked to a password, it can be used to make menu or parameters never reachable. You can log in from the menu:  if the password provided is not correct you remain on the login screen. Otherwise you get back to the main menu.
Menu: Start	 **Network** menu: used to switch all the machines on or off in the Master and Slave network **Default param**. menu: used to load the default value of the parameters which have been defined in the .mcxs file
Menu: Parameter	This menu contains all the parameters. The meanings of the parameters are explained in the last part of this manual

Menu: I/O Display	Display input and output values LED display Shows you (using the UP and DOWN keys) all the input and output values in sequence, showing the I/O code on display A ("AI" for analogue input; "AO" for analogue output; "dI" for digital input and "dO" for digital output) and its value on display B (analogue inputs that are not present or in alarm are shown with "----"). LCD display You have access to three screens showing all the input and output values; each screen shows a group of 8 I/O. Use UP and DOWN keys to scroll. The second and third screens are used with MCX15 and MCX20 only. The example below shows the first screen. 
Menu: I/O Config	This menu is prepared for future use Note: it is under the 4th level of password
Menu: I/O Prb Calibration	**Functionalities: Enable I/O probe calibration**  inside the "Reset All" menu, you can to reset all the offsets to zero  Note: the screens calibration are not translated
Menu: I/O Commissioning	**Functionalities: Enable override of input and output** **Functionalities: Enable commissioning form**  Note: the logic will not affect the override. The override is stopped for power off, "Reset all" command and timeout that is defined into the menu "Setup"

Menu: Alarm

Each alarm is described through an alarm description (for LCD display only), an alarm code and the time since its activated in the format hours:minutes:seconds (seconds for LCD display only).
Note: You can also access alarm visualization by pressing the ESC key from the main screen.

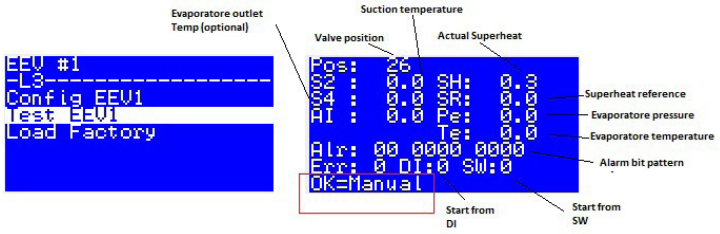


The alarm is only reset if the alarm has ended and it will send you back to the main screen.
Note: Alarms can also be reset by pressing ESC for 3 seconds on the alarm screens

Menu: EEV

Functionalities: Enable expansion valve EXD316

The parameters inside the external driver EXD can be checked and changed in the **Config EEVx** menu.
The available parameters are: **r05, r09, r10, r12, A34, n04, n05, n06, n09, n10, n11, n15, n17, n18, n19, n20, n21, n22, n32, n37, n38, n39, n40, n42, n43, n44, n45, n50, o10, o18, o20, o21, o30, o45, o56, o61, n03**



The alarm bit pattern is:

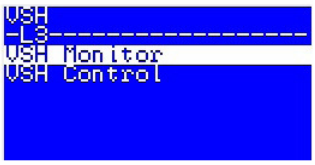
bit 0	(1)	CAN alarm
bit 1	(2)	EKC error
bit 2	(4)	S2 Error
bit 3	(5)	S3 Error
bit 4	(16)	Pe input error
bit 5	(32)	A input error
bit 6	(64)	No refrig. selected
bit 7	(128)	Reserved
bit 8	(256)	Battery low error
bit 9	(512)	CAN diagnostic error

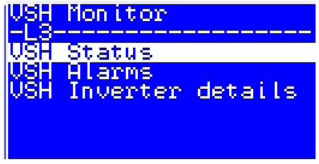
Note: pressing OK key you manually tune the position of the valve

The **Load Factory** menu overwrite the EXD parameters with the default ones

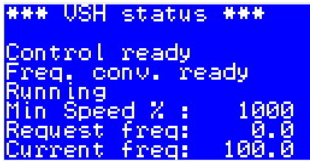
Menu: VSH Monitor

Functionalities: Enable VSH Modbus control





VSH Status:

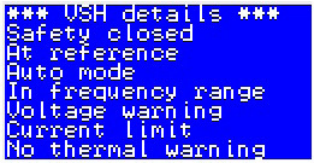


VSH Alarms:

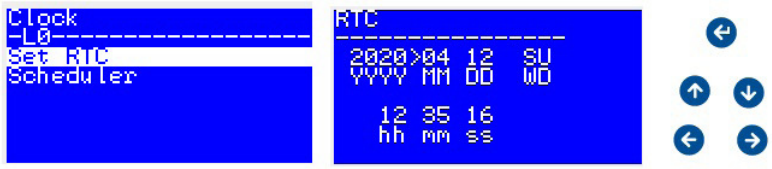
The STW bit-map is:

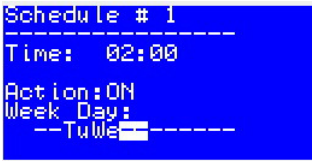
Bit	Bit = 0	Bit = 1
00	Control not ready	Control ready
01	Drive not ready	Drive ready
02	Coasting	Enable
03	No error	Trip
04	No error	Error (no trip)
05	Reserved	-
06	No error	Triplock
07	No warning	Warning
08	Speed ≠ reference	Speed = reference
09	Local operation	Bus control
10	Out of frequency limit	Frequency limit OK
11	No operation	In operation
12	Drive OK	Stopped, auto start
13	Voltage OK	Voltage exceeded
14	Torque OK	Torque exceeded
15	Timer OK	Timer exceeded

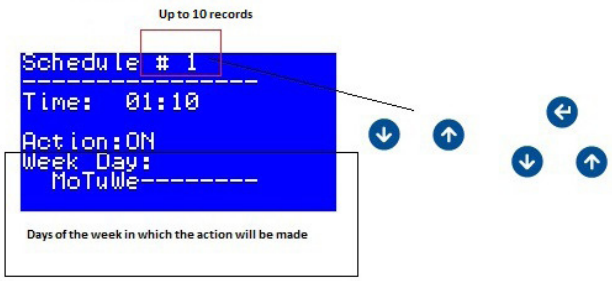
VSH inverter details:



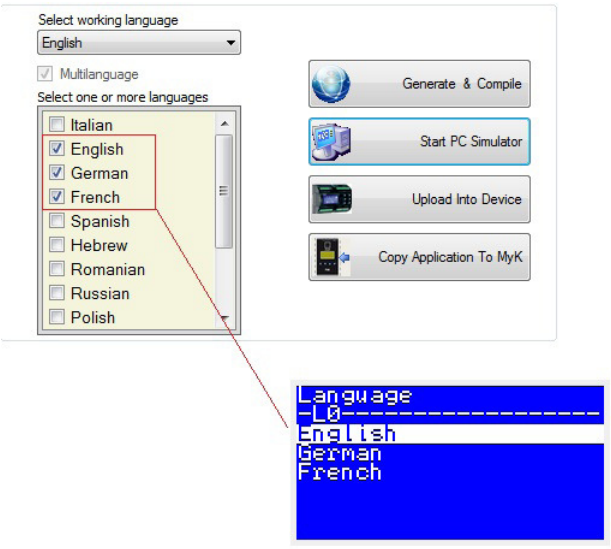
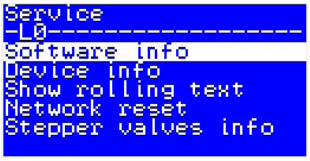
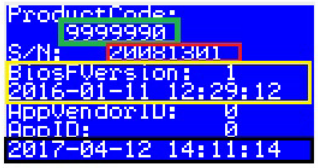
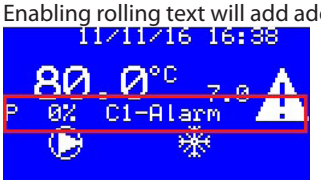
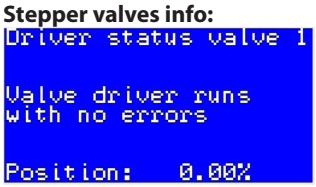
<table>
<tr>
<td>Menu: VSH Control</td>
<td>
Functionalities: Enable VSH Modbus control

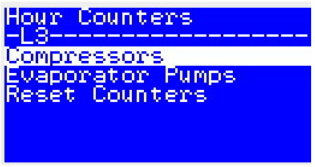
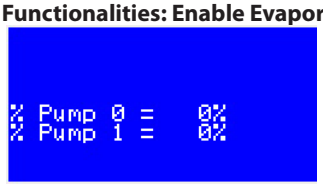

These commands are linked with the control word of the inverter
<table>
<tr><th colspan="3">Control Word (FC profile)</th></tr>
<tr><td>Coil</td><td>0</td><td>1</td></tr>
<tr><td>00</td><td>Reference value</td><td>External selection lsb</td></tr>
<tr><td>01</td><td>Reference value</td><td>External selection msb</td></tr>
<tr><td>02</td><td>DC brake</td><td>Ramp</td></tr>
<tr><td>03</td><td>Coasting</td><td>No coasting</td></tr>
<tr><td>04</td><td>Quick stop</td><td>Ramp</td></tr>
<tr><td>05</td><td>Hold output frequency</td><td>Use ramp</td></tr>
<tr><td>06</td><td>Ramp stop</td><td>Start</td></tr>
<tr><td>07</td><td>No function</td><td>Reset</td></tr>
<tr><td>08</td><td>No function</td><td>Jog</td></tr>
<tr><td>09</td><td>Ramp 1</td><td>Ramp 2</td></tr>
<tr><td>10</td><td>Data invalid</td><td>Data invalid</td></tr>
<tr><td>11</td><td>Relay 01 open</td><td>Relay 01 active</td></tr>
<tr><td>12</td><td>Relay 02 open</td><td>Relay 02 active</td></tr>
<tr><td>13</td><td>Parameter set-up</td><td>Selection lsb</td></tr>
<tr><td>15</td><td>No function</td><td>Reverse</td></tr>
</table>
</td>
</tr>
<tr>
<td>Menu: Clock</td>
<td>


Functionalities: Enable Scheduler




</td>
</tr>
</table>

Menu: Language	
Menu: Service	 **Software info:** Check variables status F01-F07 **Device info:**  Date of compiling  **Show rolling text:** Enabling rolling text will add additional information in the main screen  - P: Power demand - Cx- Alarm: Compressor X is in alarm - Cx- CTy: Compressor X is waiting for the parameter with the label CTy - P-Down: Compressor is waiting for pump down to be switched off - Cx- Prev: Circuit X is being reducing by prevention **Network reset:** it restarts from zero the managing of the master slave network **Stepper valves info:** 

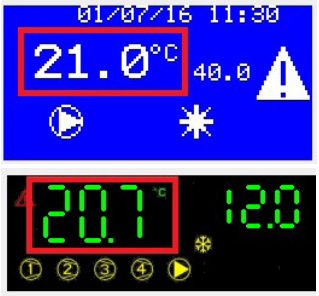
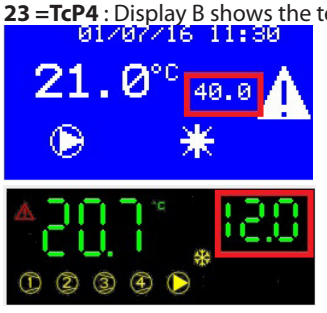
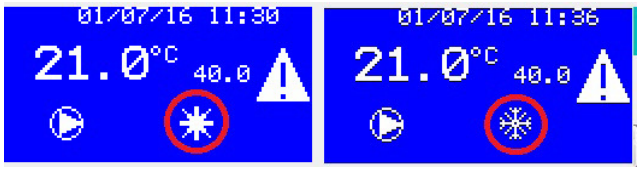
Menu: Hours Counters	Note: The **Reset Counters** menu resets to zero all the counters, compressors and both pumps  
Menu: Variable speed pump	**Functionalities: Enable Evaporator variable capacity pump**  Note: This is a status screen that reports the working percentage of the variable pump

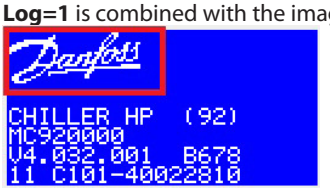
Parameters

Display

Parameter: **dSA, dSb, dsc, Log, Par**

How to customize the main screen.

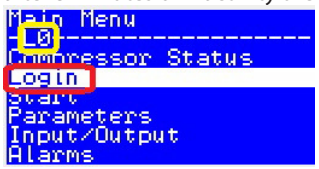
dSA-Display A value	**0= OFF** : Display A is not used **1= IdOF** : Display A shows the state of the digital input ON/OFF **2 =SEt** : Display A shows the set point of the compressors regulation **3 =rEg** : Display A shows the probe used for regulation **4=AI1** : Display A shows the value of the analogue input 1 …… **19 =AI16** : Display A shows the value of the analogue input 16 
dSb-Display B value	**0 =OFF :** Display B is not used **1=IdOF** : Display B shows the state of the digital input ON/OFF **2=SEt** : Display B shows the set point of the compressors regulation **3 =rEg** : Display B shows the probe used for regulation **4 =AI1** : Display B shows the value of the analogue input 1 … **19 =AI16** : Display B shows the value of the analogue input 16 **20 =TcP1** : Display B shows the temperature calculated from the dP1 sensor … **23 =TcP4** : Display B shows the temperature calculated from the dP4 sensor 
dsc-Icone for cooling mode	

Log- Logo	**Log=0** is combined with the image **StartLogoDX** in **Chiller/BIN/Graph** folder **Log=1** is combined with the image **StartLogoDX_1** in **Chiller/BIN/Graph** folder  Note: the logo is shown just after the power on, pay attention to the size of the image because it is fit in this screen
Par- Parameters version	It is not used in the software, can be used to recognize different set of parameters Note: this number is reported into the software information

Password

Parameter: **L01, L02, L03**

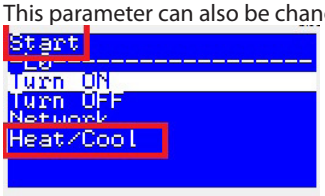
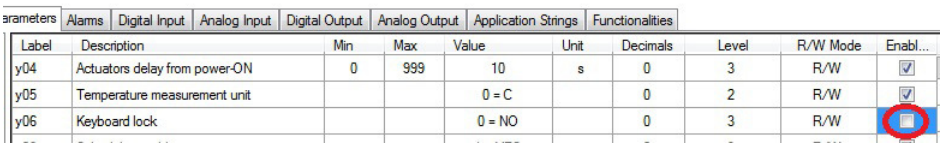
How to change the passwords.

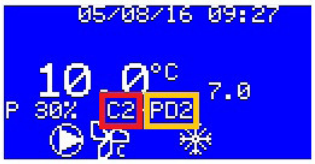
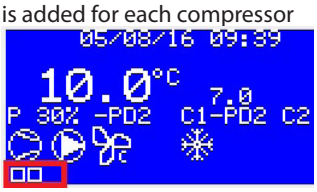
L01, L02, L03- Level x password	Typing the parameter **L0x**, in the login screen, you will be able to see all the parameters and menu with level <= of **X**; The level of access is highlighted in the yellow square; after 5 minutes of inactivity the display is set to an access level of zero 

SetUp

Parameter: **y01, y02, y03, y04, y05, y06, y08, y09**

How to switch ON-OFF and change the application mode from parameters.

y01- System ON/OFF	Defines whether the chiller is in the ON or OFF state, it can be changed from the menu, remotely by Modbus or CANBUS and from start screen by holding the up arrow key
y02- Restart mode after power OFF	**0=OFF** means that after power on, the chiller gets up in OFF state **1=ON** means that after power on, the chiller gets up in ON state **2=EQUA** means that after power on, the chiller keeps the same state as before power off
y03- System heat/cool	It works only with **H40> 0 and rE2=UI;** This defines whether the machine should be in chiller mode or heat pump mode. This parameter can also be changed from the "Start" menu 
y04- Actuators delay from power ON	It sets the delay when powered ON (not when the unit status changes to ON) before activating any output. Its purpose is to distribute the drawn current and protect the elements and particularly the compressor against repeated starts in the event of frequent power failures. When the timer has elapsed, the controller starts to manage the output based on the other times and the other normal functions.
y05- Temperature measurement unit	**0=C** means that the user interface will show values in **Celsius** and **bar** **1=F** means that the user interface will show values in **Fahrenheit** and **PSI**
y06- Keyboard lock	**0=No** **1=Yes** means that the user interface is locked Note: This parameter can be adjusted in order to be set remotely because it is not enabled for the menu 
y08- Scheduler enable	**0=No** means that the scheduler is disabled **1=Yes** means that the scheduler is enabled Note: the "**SCHEDULER_ENABLE**" functionality is required

y09- Show rolling test	**0=No** **1=Yes** Provides information about what is going on in relation to the cutting in/out of the compressors  Compressor 2 is waiting parameter PD2 Note: If the functionalities **"SHOW_EACH_COMPRESSOR_ENABLE"** is enabled in the UI, a small icon is added for each compressor 

Serial setting

Parameter: **Cid, Ser, bAU, COM**

How to configure the communication port.

Functionalities: Distinct Modbus address

Cid – Serial address (CAN)	Defines the ID in the CANBUS communication Note: the baud rate and the settings of the CANBUS communication is tuned through the bios menu or though the MYK
SEr – Serial address (MODBUS)	Defines the ID in the Modbus communication Note: the functionalities **"DISTINCT_MODBUS_ADDRESS"** is required
bAU – Serial baud rate (Modbus)	Defines the baud rate in the Modbus communication **0** means **Reserved: do not use** **1** means **1200 bits/sec** **2** means **4200 bits/sec** **3** means **4800 bits/sec** **4** means **9600 bits/sec** **5** means **14400 bits/sec** **6** means **19200 bits/sec** **5** means **28800 bits/sec** **8** means **38400 bits/sec** **9** means **57600 bits/sec** **8** means **115200 bits/sec**
COM – Serial settings (Modbus)	Defines the serial settings of the Modbus communication **0** means **8N1** **1** means **8E2** **2** means **8N2**

Evaporator

Parameter: **H1, H2, H3, H4, H5, H12**

How to configure the internal coils.

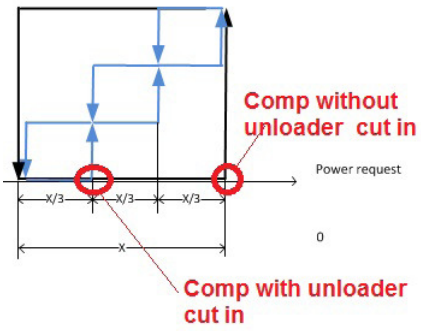
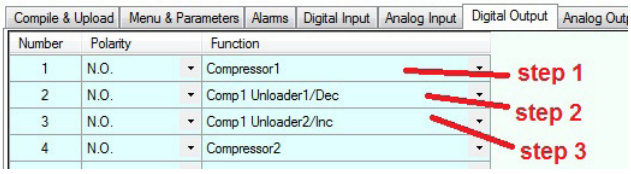
Digital input: OPE, OPE1, OPE2
Digital output: PE1, PE2, ..., PE8
Analogue input: TIN, TOM, TO1,...,TO4
Analogue output: E1,..., E4
Alarms: AE1, AO7, AP0, AP1, ...,AP9

H1 – Number of evaporators	Defines the number of internal coils; The supply temperature (**TIN**) is the same for all the coils. Each coil has a "leaving temperature" **(T01-T04)** ; there is also a common "leaving temperature" sensor for all the coils **(TOM)**
H2 – Number of circuits per evaporator	Defines the number of circuits for each internal coil; Configuration accepted: • **1** circuit per internal coil -> 0<**H1**<4 • **2** circuits per internal coil ->0<**H1**<3 • **3** circuits per internal coil **H1**=1 • **4** circuits per internal coil **H1**=1
H3 – Air or water cooling	Defines whether the evaporation process is managed by a pump **(H3=H2O)** or a fan **(H3=Air)**: • WATER evaporators **(H3=H2O)**. For each evaporator, the **H1,...,H4** digital outputs which are necessary to manage the antifreeze heaters on the basis of the leaving water temperature **TO1,...,TO4** are controlled. The number of heaters per evaporator is defined by **H5**. • AIR evaporators **(H3=Air)**. Only the "**TO1_Tout Evaporator 1**" input is used to measure the supply air temperature even when more than one evaporator is present. The **ice alarm AE1** is replaced with the Low air temperature **warning A07** which is set to the same parameters as the ice alarm.
H4 – Number of pump/fan per evaporator	Defines the pumps (or fan) per evaporator: • WATER evaporators **(H3=H2O)**: The **PE1** and **PE2** digital outputs are managed to control one pump or two twin pumps. **H4<3** • AIR evaporators **(H3=Air)**: "**PE1** and **PE2**" outputs are used to manage fans on the evaporator. **H4<9** Note: check "Fun for internal coil"
H5 – Number of heaters per evaporator	Defines the number of heaters for each internal coil; Configuration accepted: • **1** heater per internal coil -> 0<**H1**<5 • **2** heaters per internal coil ->0<**H1**<3 • **3** heaters per internal coil ->**H1=1** • **4** heaters per internal coil ->**H1=1**
H12 –Fan in common for each evaporator	**0=NO** means that each fan **(AO ECx)** works in relation to the evaporator pressure **1=Yes** means that only the fan **EC1** will work in relation to worst pressure in the evaporators Note: the fan speed is managed with PI logic (check parameters **ECS,….,Hi)**

Compressor

Parameter: **H6, H7**

How to configure the compressors number.

H6 – Number of compressor per circuit	Defines the number of compressor per circuit; It's not possible have circuits with different number of compressors Configuration accepted: • 1 compressor per circuit -> 0<**H1*H2**<5 • 2 compressors per circuit ->0<**H1*H2**<5 • 3 compressors per circuit ->0<**H1*H2**<3 • 4 compressors per circuit ->0<**H1*H2**<3 • >4 compressors per circuit ->0<**H1*H2**<2
H7 – Number of unloader per compressor	Defines the number of compressor partialisation; The number of regulation steps is equal to **H6*H2*H1***(**H7**+1) Activation and deactivation of the compressor's unloader is defined by the parameters "**C04-Unloaders activation mode" and " C05-Unloaders deactivation mode"** **H7= 2**  

Condenser

Parameter: **H9, H10, H11**

How to configure the external coil.

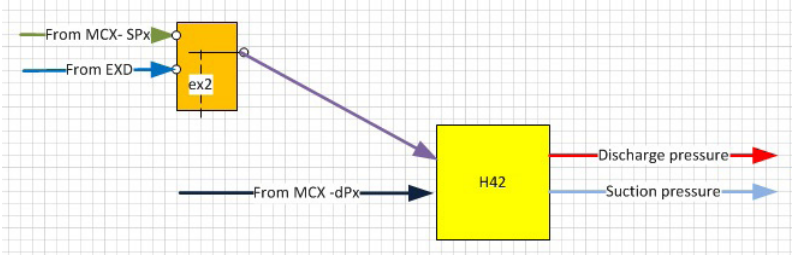
Digital input: OFC, FCL1, ...,FCL4, OFC1, ..., OFC12
Digital output: FC1, ..., FC12
Analogue output: Fc1, ..., Fc4
Alarm: AF1, ..., AF12

H9 – Air or water cooler condenser	Defines whether the fans or the pump regulate condensing. **0=AIR** : Controls defrosting in heating mode. **1=WATER** : The configuration managed is • **H10=1** • **H11=YES** • Only one pump (digital output **FC1_ CondFan1/Pump1)** Note: the pump or fan behaviour is defined by parameters **F01, F02** and **F03**
H10 – Number of pump/fans per condenser	Defines the necessary digital output to control the pumps or fans on the condenser. • Water-cooled units **(H9=H2O)**.The single "**Cond Fan1/Pump1**" digital output is controlled to drive a pump. • Air-cooled units **(H9=AIR)**. Contributes to defining the total number of managed ventilation steps and thus of the corresponding "**Condenser Fan1", ..., "Condenser Fan8**" digital outputs used to drive them.
H11 –Fan in common to all condenser	On multi-circuits units, fans can be in common to all condensers. If fans are not in common to all condensers **(H11=0=NO)**, the following output are controlled: • as many analogue inputs as the condensers **(H1*H2)** • as many digital outputs as the condensers **(H1*H2)**, multiplied by the number of fans per condenser **(H10)**; digital outputs for fans are assigned to condensers in a sequential and balanced way, assuming that all condensers have the same number of fans; e.g. in a system made of 2 condensers and 6 fans, "**Cond Fan1/Pump1", "Condenser Fan2" and "Condenser Fan3**" outputs are assigned to control fans belonging to the first condenser; "**Condenser Fan4", "Condenser Fan5**" and "**Condenser Fan6**" to the second condenser. • as many analogue output s "**InverterFanCond1",...,"InverterFanCond4**" for condensing control as for the condensers **(H1*H2)**. If fans are common to all condensers **(H11=1=YES)** the following outputs are used: • as before, as many analogue inputs for condensing controls as there are circuits per condenser **(H1*H2)**, but the one requiring the higher response from the control is used for regulation. Each analogue input is then used for defrost control in heating mode; • as many digital outputs as fans per condenser (**H10**); • one analogue output "InverterFanCond1" for fan speed regulation.

Heat Pump

Parameter: **H40, H41, H42**

How to configure the heat pump mode

H40 –Heat pump type	**0=No** means that the software does not perform heating mode **1=GAS** means that the software performs the heating mode, the internal coil is the evaporator in cooling mode and the condenser in heating mode **1=H2O** means that the software performs the heating mode, the coils keep the same meaning in both heating and cooling mode both Note: one digital output "**Reverse Valve C1", ..., "Reverse Valve C4**" per each circuit is reserved for controlling the reverse flow valve
H41- Boiler number of heaters	Boiler heaters "**Boiler1", ..., "Boiler4**" are turned ON when the temperature measured by the regulation probe enters in the area defined by the active regulation setpoint in heating (**SH1**) and differential **rH1**. **They are an alternative to the heat pump, not in addition.** Boiler heaters can be activated only if the temperature measured by the "**BoilerSafety"** probe is under a specific safety limit **AbS**. If it is over the limit, alarm **A14** is generated. To reset the alarm there is a constant differential **Abd** to be considered.
H42- Probe change in HP	**0=No** means that the probe is before the 4-way valve (close to the compressor): • the sensor **SPx – Suction pressure Cx** measures low pressure • the sensor **dPx – Discharge pressure Cx** measures high pressure **1=Yes** means that the probe is after the 4-way valve (close to the coils): • the sensor **SPx – Suction pressure Cx** measures low pressure in cooling mode and high pressure in heating mode • the sensor **dPx – Discharge pressure Cx** measures high pressure in cooling mode and low pressure in heating mode Note: if **ex2**=yes the variable used from H42 (pink line below) is always about low pressure, in this case pay attention to set **H42=No** because in heating mode the discharge pressure will not be available 

Maintenance

Parameter: **H43**

How to manually set the compressor power request.

Functionalities: Enable commissioning for power request
Digital output: MPR

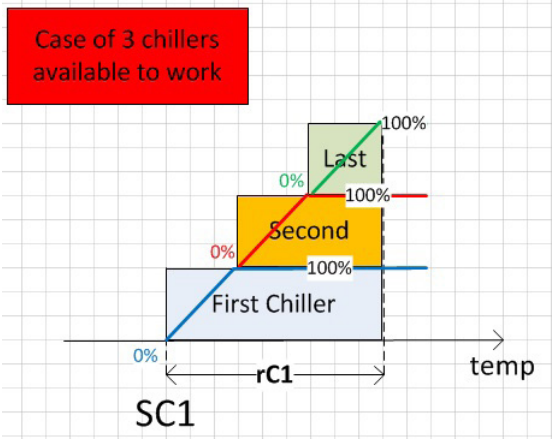
H43- Manual chiller power	The power request provided to the compressors is about **H43 %** **H43< zero** means that the function is disabled Note: if **H43 >=0** the digital output **MPR** is closed

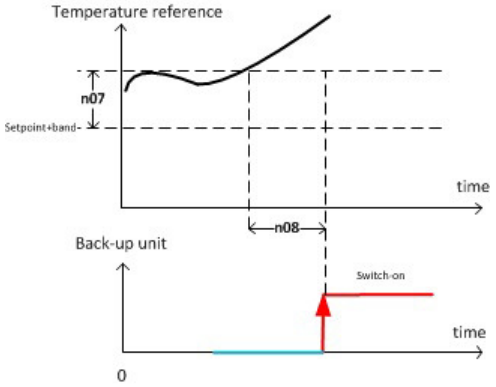
Network settings

Parameter: **n01,...n17**

The Master and Slave is a functionality that allow a group of machines to be managed like one machine (Master) decides which and how many units (Slaves) should run.
The max number of units is 8 (7 slaves + 1 master), the network is CANBUS.
The Master and Slave function optimizes:
- ageing of machines
- distribution of the load in order to improve the performance of the plant
- The backup units

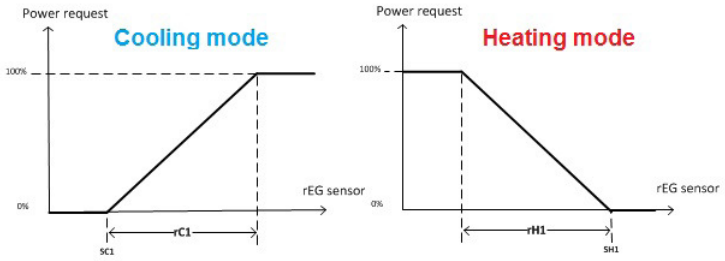
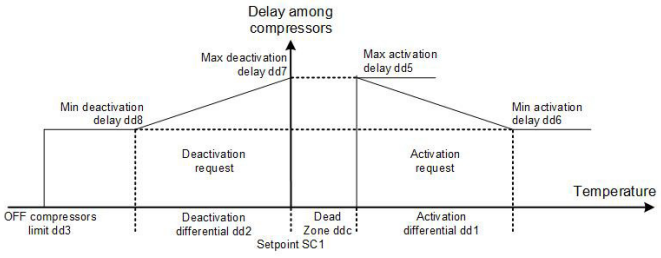
Functionalities: Enable Master/Slave
Alarms: N01, N02, N03, N04, N05,N06, N07, N08

n01 –MCX network disable	**0=NO** means that the Master slave function is enabled **1=Yes** means that the Master slave function is disabled
n02 –Number of slave nodes	It has to be set equal to ("number of chillers in the network" -1)
n03- Auto master select	**0=NO** means that the master in the master slave network can be only the chiller with the CANBUS ID equal to n15: if the master is not more available in the network, the other chillers will start to work in standalone mode **1=Yes** means that the master in the master slave network is the chiller with lowest CANBUS ID
n04- Distribution algo	**0= PWR** The master, using its own sensors, decides how many chillers are working and the chillers' power supply; The rules are : • the maximum number of units that can work is related to the gap between setpoint and temperature: practically the regulation band is divided for the number of machines **(n02+1-n09)**  **1= CAP** the master manages only the start order (following the ageing of the machines), chillers manage their power as standalone machines. If all the units which are running have capacity above **n12** %, the master will switch on another chiller (the youngest one). If all the units which are running have capacity below **n13** %, the master will switch off the oldest chiller running The minimum time between two actions of the master is **n14** seconds
n05- Power distribution enable	**1=Yes** means that the master is allowed to cut-in the first chiller available without considering the start order related to the ageing of the machines
n06- Node rotation enable	**0=No** means that the start sequence of the machines is fixed; the order depends on the addressing, the first to start is the machine with the smallest CANBUS ID, the first to stop is the chiller with the highest CANBUS ID **1=Yes** means that the start/stop sequence of the machines depends on the ageing of the chillers, always starting with the youngest of the set and the oldest one is always the first to stop. In the case that one machine works **n17** hours more than another chiller is switched off, the master will exchange the unit in order to align the ageing.

n07- Backup node offset	When the gap between setpoint and temperature is above **(n07+regulation band)**, the first backup unit is allowed to work as a support, also considering parameter **n08** .  Note: the offset to enable the other backup units is (n07*m+ regulation band): • **m** = 2 for the second backup unit • **m** = 3 for the third backup unit • … Note: the backup units will work running normally after the set point. It will be switched off when the gap between setpoint and temperature is below the regulation band Note: the pump behaviour is defined through the parameter **P01**
n08- Time to enable **n07**	It's the time to stay far away from the setpoint in order to cut in the backup unit Note: check parameter **n07**
n09-Number of back-up unit	**n09** defines the number of backup units inside the master slave network A backup unit is never enabled (so does not provide cooling capacity) unless one of the following situations occurs: • one of the other units becomes unavailable • Support (see parameter **n07** and **n08**) Note: The master chooses the backup unit (among all nodes present in the network) by looking at the working time of every unit: the one which has worked the longest will be the backup unit.
n10 – Evaporator in common	**0=No** each chiller consider its own evaporator flow alarm **1=yes** the master will read its "**FPE**" digital input (**Flow Evaporator**) and will send the information to other slaves
n11 – Pump alarm in common	**0=No** each chiller considers its own pump alarm **1=yes** the master will read its "**AP1**" digital input (**Evap pump/fan overload alarm**) and will send the information to other slaves
n12 – Capacity upper threshold	See parameter **n04**
n13 – Capacity lower threshold	See parameter **n04**
n14 – Capacity step min time	See parameter **n04**
n15 – Master node CAN ID	It has to be set equal to the lowest ID in the CANBUS network
n16 – Slaves node CAN ID offset	The slaves have to take the CAN ID in relation to the **n15** just adding **n16**. E.G. for **n02 =3** • Master ID= **n15** • Slave1 ID= **n15+n16** • Slave2 ID= **n15+n16+n16** • Slave3 ID= **n15+n16+n16+n16**
n17 – Maximum gap time for unit rotation	It is in **hours** If a running unit becomes older than a switched-off unit by more than **n17** hours, the logic will switch off the oldest unit running it will cause the other unit to be switched on.

Configuration

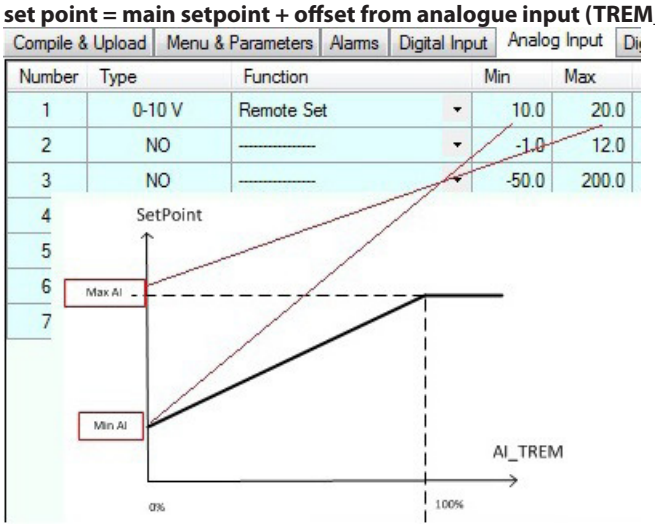
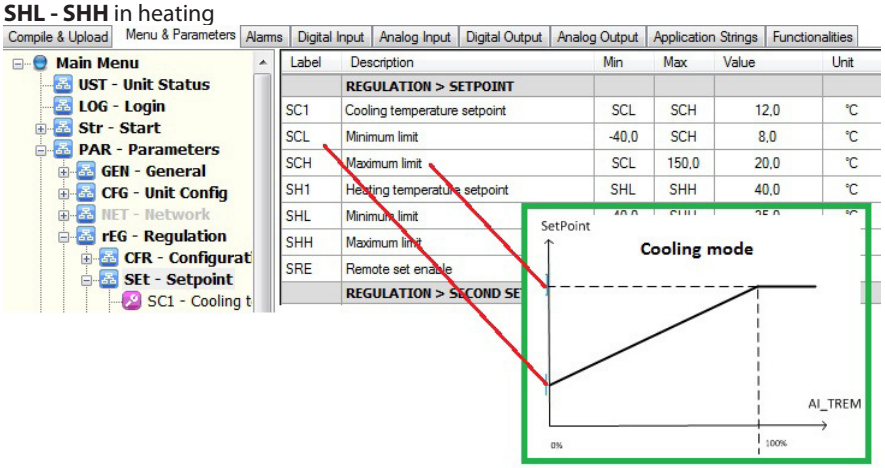
Parameter: **rEG, rET, rT1, rT2, o30, Er1**

rEG – Analogue input for temperature regulation	**0= Tin** : reference sensor is **Tin_Tin Evaporator** **1= ToM**: reference sensor is **TOM_Tout Evap Mix** **2 =AI1**: reference sensor is the **analogue input 1** …… **17 =AI16** : reference sensor is the **analogue input 16** **18 =SPT1**: reference is the temperature calculated from the sensor **SP1_Suction Press C1**, the gas type is set using parameter **031**
rET – Regulation Type	Defines the relation between the temperature gap and the power request to the circuits. **0=P** : Power request to the circuits increases in proportional way with the regulation error, i.e., it is 100% when the regulation error (the gap between setpoint and the reference sensor) is equal to **rC1 (rH1)**  **1=PI**: the power request is the sum of **P** regulation (**rET**=0) plus a component (Integral part) that increases in relation to the regulation error; the speed of the integral part depends on the parameter **rin_Ti**. For PI regulation, the balance is reached only when the regulation sensor gets the setpoint. **2=dZ** : The delay between compressors activations varies between a maximum value **dd5** and minimum value **dd6** proportional to the temperature position inside the regulation band defined by the activation differential **dd1**. Above setpoint + dead zone + activation differential, the delay among activations is equal to the minimum. Similarly the action for the delay among compressors deactivations, which can vary between a maximum value **dd7** and a minimum value **dd8**, is proportional to the temperature position inside the regulation band defined by the deactivation differential **dd2**. Below a setpoint differential, the delay among activations is equal to the minimum value, **dd8**, up to a limit threshold, **dd3**. Below that, all the compressors are immediately switched OFF to avoid the unit ice alarm. 
rT1- Minimum limit for TReg TX	The analogue output **rtr** linearly replays the regulation probe (check parameter **rET**) It gets to 0% when the regulation probe reaches a value of **rT1** Note: if the regulation probe is in error the AO_**rtr gets to 100%**
rT2- Maximum limit for TReg TX	The analogue output **rtr** linearly replays the regulation probe (check parameter rET) It gets to 100% when the regulation probe reachs **rT2** value Note: if regulation probe is in error the the AO_**rtr gets to 100%**

o30 – Gas type	**0=---** **1=R12** **2=R22** **3=R134a** **4=R502** **5=R717** **6=R13** **7=R131b1** **8=R23** **9=R500** **10=R503** **11=R114** **12=R142b** **13=--** **14=R32** **15=R227** **16=R401a** **17=R507** **18=R402a** **19=R404a** **20= R407c** **21= R407a** **22= R407b** **23= R410a** **24= R170** **25= R290** **26=R600** **27= R600a** **28= R744** **29= R1270** **30=R417a** **31=R422a** **32=R413A** **33=R422D** **34=R427A** **35=R438A** **36=R513A** **37=R407F** **38=R1234ze** **39=R1234yf** **40=R448A** **41=R449A** **42=R452A** Note: the gas definition is used when the translation of the pressure in temperature is required; **ReG=SPT1** and for the "internal" super heat control
Er1 – Emergency mode max power	**Er1 < 0** the function is disabled **Er1 >= 0** when the digital input **EEr** is closed the power request is limited to **Er1** instead of 100% Note: the functionality **"Enable emergency mode from DI**" is required

Main Setpoint

Parameter: **SC1, SCL, SCH, SH1, SHL, SHH, SRE**

SC1 – Cooling temperature set point	Defines the setpoint in cooling mode
SCL – Minimum limit	Defines the minimum limit of the setpoint in cooling mode Note: This limit is not respected when adjusted through Modbus
SCH – Maximum limit	Defines the maximum limit of the setpoint in cooling mode Note: This limit is not respected when adjusted through Modbus
SH1 – heating temperature set point	Defines the setpoint in heating mode
SHL – Minimum limit	Defines the minimum limit of the setpoint in heating mode Note: This limit is not respected when adjusted through Modbus
SHH – Maximum limit	Defines the maximum limit of the setpoint in heating mode Note: This limit is not respected when adjusted through Modbus
SRE- Remote set enable	The regulation setpoint is defined through the analogue input **TREM_Remot Set** **0=NO** means that the function is not enabled **1=rEL** means that **set point = main setpoint + offset from analogue input (TREM_Remote set)**  **2=Abs** means that set point is linearly defined through **AI_TREM**, between **SCL - SCH** in cooling and **SHL - SHH** in heating 

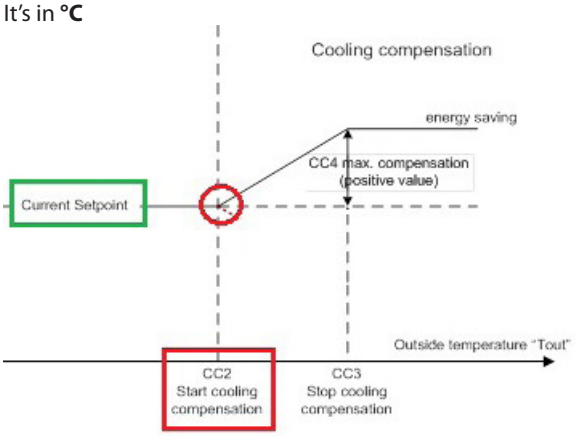
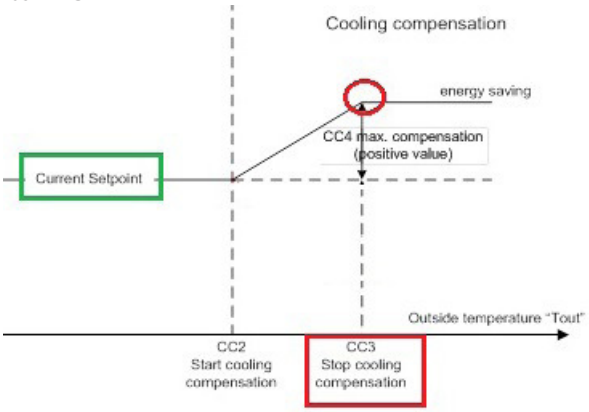
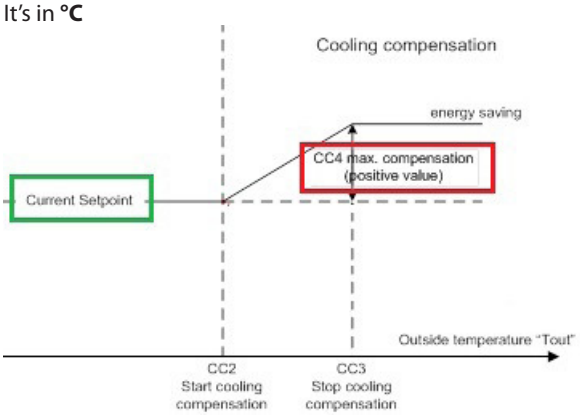
Economic Setpoint

Parameter: **SdS, SdM, SdC, SdH, SdO**

SdS- Setpoint selection	**0=DI** means that the digital input **SET2_Reg offset from DI** defines if use comfort setpoint (**SC1** or **SH1**) or the economic setpoint (**SC1+SdC** or **SH1-SdH**); in economic mode the proportional band in the PI control is increased by **SdO** **1=PAR** meaning that the parameter **SdM_Setpoint mode** defines whether comfort setpoint (**SC1** or **SH1**) or the economic setpoint (**SC1+SdC** or **SH1-SdH**) is to be used; in economic mode the proportional band in the PI control is increased by **SdO**
SdM- Setpoint mode	It works only for **SdS=PAR** **0=COMF** meaning that chiller uses comfort setpoint (**SC1** or **SH1**) **1=ECO** meaning that the chiller uses economic setpoint (**SC1+SdC** or **SH1-SdH**) In economic mode the proportional band in the PI control is increased of **SdO**.
SdC-Offset for setpoint in cooling	In economic status and cooling mode the regulation setpoint is shifted to **SdC**. Note: see parameter **SdS**
SdH-Offset for setpoint in heating	In economic status and heating mode the regulation setpoint is shifted to **SdH**. Note: Take a look to parameter **SdS**
SdO-Offset for differential	In economic mode the proportional band of regulation becomes **rC1+SdO** or **rH1+SdO**. Note: look at parameter **SdS**

Setpoint compensation in based on the outside temperature

Parameter: **CC1, CC2, CC3, CC4, CH2, CH3, CH4**

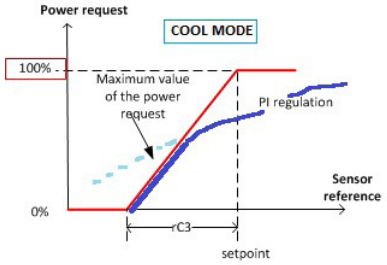
CC1-Compensation enable	**0=NO** means compensation disable **1=YES** means compensation enable Note: this function adapts the setpoint to the outside temperature "Tout"
CC2-Outside temperature to start cool comp**.**	It's in **°C** 
CC3-Outside temperature to stop cool comp.	It's in **°C** 
CC4-Maximum cooling compensation	It's in **°C** 

CH2-Outside temperature to start heat comp**.**	It's in **°C** Like CC2 but used in heating mode
CH3-Outside temperature to stop heat comp.	It's in **°C** Like CC3 but used in heating mode
CH4-Maximum heating compensation.	It's in **°C** Like CC4 but used in heating mode

PI regulation:

Parameter: **CrC1, rH1, Rin, rC2, rC3**

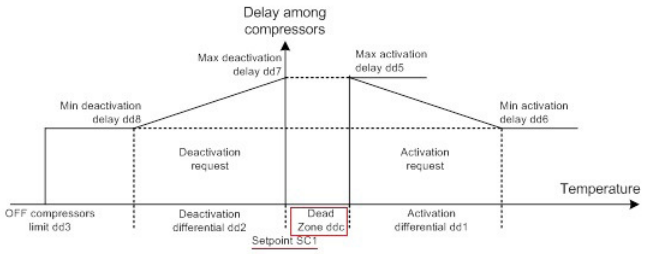
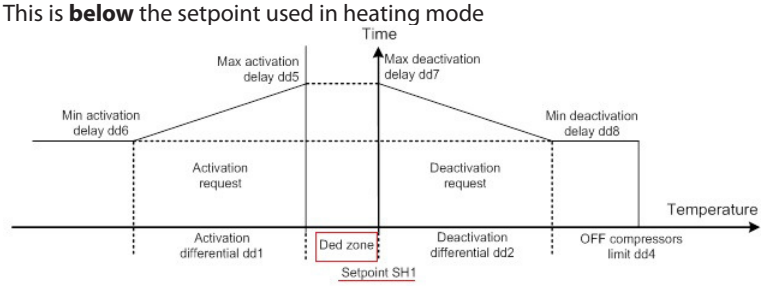
Note: the PI regulation is enabled when the parameter **rET** is equal to **P** or **PI**

rC1-Cooling temperature differential.	See parameter **rET**
rH1-Heating temperature differential.	See parameter **rET**
Rin- Ti	It is the integral time of the PI regulation, the bigger the value of **Rin** the slower the action of the Integral part. See parameter **rET**
rC2-Cut Off enable	It enables the gradual reduction of the integral error once reached and exceeded the setpoint. The error integral in fact tends to keep the compressors turned on even if the proportional part of the error would require a shutdown. The amount of reduction is proportional to the distance from the setpoint considering the **rC3** band. For example, in cooling, the reduction is zero when the control temperature is equal to the setpoint; the reduction is greatest when it is equal to **setpoint-rC3**.
rC3- Cut off offset	

Dead zone regulation:

Parameter: **ddC, ddH, dd1, dd2, dd3, dd4, dd5, dd6, dd7, dd8**

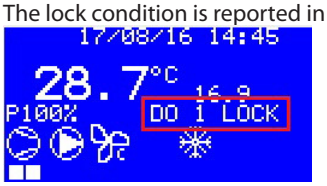
The dead zone regulation is enable when the parameter **rET** is equal to **DZ**
It is a variable time regulation mainly used when the regulated value is the temperature of the fluid leaving the evaporator.
In the dead zone **ddC** no regulating action is taken.
Close to the dead zone the decision to cut the compressor in or out will take a maximum time of (**dd5** or **dd7**), a time that will decrease linearly outside the dead zone. This **variable time logic** is described below.

ddC-Cooling dead zone	In dead zone ddC no regulation action is taken. This is **above** the setpoint and used in cooling mode 
ddH-Heating dead zone	In dead zone ddH no regulation action is taken. This is **below** the setpoint used in heating mode 
dd1-Comp activation differential	Defines the maximum temperature gap to have a minimum delay (**dd6**) in the compressor's activation Note: see picture in the parameter **ddC** and **ddH**
dd2-Comp deactivation differential	Defines the maximum temperature gap to have a minimum delay (**dd6**) in the compressor's deactivation Note: see picture in the parameter **ddC** and **ddH**
dd3-Min temp for OFF comp in cooling	Defines the minimum temperature below which the compressors are switched off Note: see picture in the parameter **ddC**
dd4-Max temp for OFF comp in heating	Defines the maximum temperature above which the compressors are switched off Note: see picture in the parameter **ddH**
dd5-Max delay of comp activation	Defines the maximum delay before a compressor cuts in Note: see picture in the parameter **ddC** and **ddH**
dd6-Min delay of comp activation	Defines the minimum delay before a compressor cuts in Note: see picture in the parameter **ddC** and **ddH**
dd7-Max delay of comp deactivation	Defines the maximum delay before a compressor cuts off Note: see picture in the parameter **ddC** and **ddH**
dd8-Min delay of comp deactivation	Defines the minimum delay before a compressor cuts off Note: see picture in the parameter **ddC** and **ddH**

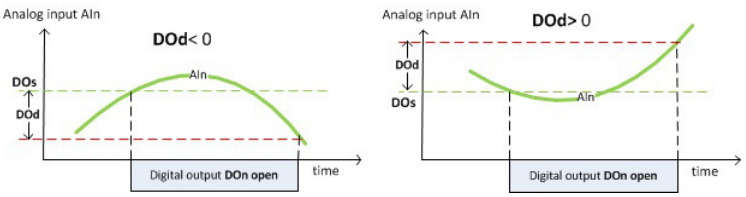
Digital output lock:

Parameter: **DOn, Ain, Dos, DOd**

It is possible to lock a digital output in open position in relation to an analogue input.
The lock condition is reported in the rolling text



Functionalities: Enable DO Locking from AI

DOn-Digital output number	This is the number of the digital output to lock in open position; The conditions to lock it are defined by **Ain**, **DOs** and **DOd**
AIn-Analogue input number	This is the number of the analogue input to refer to lock the digital output **DOn**
DOs-Set point for locking	This is the setpoint to compare with the value of the analogue input **Ain** for locking the digital output **DOn**; Note: set parameter **DOd** to lock the digital output **DOn** above or below the setpoint **DOs**
DOd-Differential to unlock	

Buzzer and relay:

Parameter: **BUZ, Adl, AOF**

BUZ-Buzzer activation time number	It's in **minutes.** Defines the maximum time that the buzzer can work; **BUZ**=15 means that there is no limit in the active time of buzzer
Adl-Alarm relay activation delay	It's in **seconds**. Defines the delay of the alarm relay when there is an alarm
AOF-Alarm relay active if unit in off	Defines whether the alarm relay works in the OFF state of the chiller

Flow alarm:

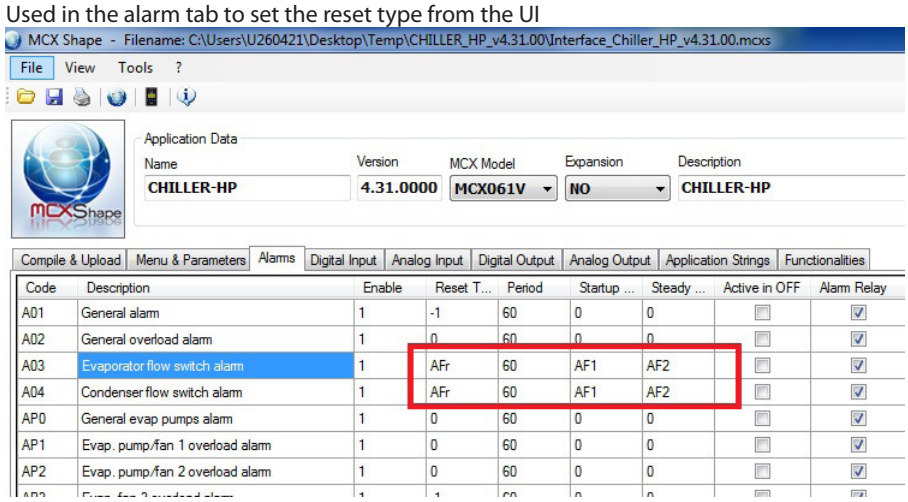
Parameter: **AFr, AF1, AF2, AF3**

It is generated by the "**Flow Evaporator**" digital input.
In the event of an alarm:
- if there is the second pump "**Evap Pump2**", the second pump operating warning **A08** will be activated before the flow switch alarm **A03**;
- otherwise, all the compressors and all the other elements will be immediately switched OFF, ignoring their protection times. The alarm is delayed by **AF1** seconds after the pump starts to wait for the water flow to reach its steady value.

It is also delayed in normal functioning by **AF2** seconds to filter out temporary flow changes or air bubbles in the water circuit.

The reset type is configurable through **AFr** to:
- manual: all the outputs are OFF, including the pump. After reset, if the alarm is still active, the alarm is ignored (but still shown on display) until the delay time from startup is elapsed to give the unit the chance to start normally.
- automatic: all the outputs are OFF, excluding the pump which tries to start every **AF3** seconds; the alarm is ignored until the delay time from startup is elapsed.
- semi-automatic: the pump tries to start every **AF3** seconds for AFr number of times, ignoring the alarm during its delay at startup; exceeded the attempts of starting the pump, the alarm can only be reset manually.

Digital input: FPE
Alarms: A03, A08

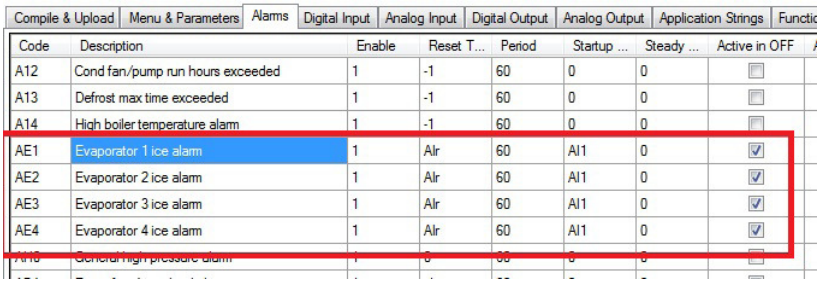
AFr-Reset Type	Used in the alarm tab to set the reset type from the UI 
AF1-Delay from pump starting	Used in the alarm tab to set the Startup delay from the UI Note: Period starts when the pump starts and not from the power being turned on
AF2-Delay in steady operation	Used in the alarm tab to set the Steady delay from the UI
AF3-Time to restart	Defines the time to wait before restart the pump; It works resetting both the automatic and semiautomatic alarms

ICE alarm:

Parameter: **AIS, AID, Air, AI1, AI2, AI3, AIT, AIo**

Analogue input: TO1, TO2, TO3, TO4, TOUt, AIT
Alarms: AE1, AE2, AE3, AE4

Functionalities: Enable enhanced low temperature management

AIS-Ice alarm setpoint	If **TOx** temperature goes below **AIS** °C the alarm **AEx (x=1,2,3,4)** is detected ICE Alarm cuts in the heaters Note: see parameter **AI3** to set up the alarm's behaviour in the OFF state
AID-Differential	Above **AIS +AID** the ICE alarm is resettable
AIr-Reset Type	Used in the alarm tab to set the reset type from the UI 
AI1-Delay from pump starting in cool	It's in **seconds** Used in the alarm tab to set the "Startup delay" from the UI Used for the cooling mode
AI2-Delay from pump starting in heat	It's in **seconds** Defines the delay of the ice alarm from the pump starting in heating mode
AI3-Out status if unit OFF - alarm	Defines the chiller's behaviour in relation to the **ICE alarm** when the chiller is in OFF state **0=HOFF** means that the heaters will not be used **1=HON** means that only the heaters will switch ON **2=HPON** means that pump and heaters both will switch ON Note: in the ON state the ICE Alarm switches on the heaters
AIT-Ice tout alarm	It's in **°C** If external temperature **Tout** goes below **AIT °C,** alarm **AIT** is generated Note: the action of the alarm has to be defined in the alarm tab
AIo-Ice alarm offset	It's in **°C** The setpoint of the ice alarm becomes **AIS+AIo**, the sensor used to check the alarm is the minimum in between **Tin, TOx, TFC1 and Tout** Note: The functionality **"Enable enhanced low temperature management"** is required

Compressor oil delta pressure alarm:

Parameter: **OPR, OdP, GdP**

The alarm is detected when the compressor runs.
The alarm **A4x** is triggered when the difference in between the sensor defined by parameter **OPR** and the sensor **OPx_Oil pressure Compx** is lower than **OdP**.
Alarm behavior has to be set in the Alarm tab

Analogue input: OP1,...,OP8, SP1,…,SP4, dP1,…,dP4
Alarms: A31, …, A35, A41, …., A48,dP1,…, dP4

OPR- Oil delta pressure reference	**0=SUC** means that the alarm depends on suction pressure **1=DIS** means that the alarm depends on discharge pressure Note: check parameter **H42**
OdP- Min oil delta pressure	Measurements are in bar Defines the minimum delta pressure to generate the alarm Alarm hysteresis is fixed and equal to 0.3 bar
GdP- Min gas delta pressure	Measurements are in bar When the gap between discharge and suction pressure is less than **GdP** bar the alarm **dPx** is generated Alarm hysteresis is fixed and equal to 0.3 bar Note: The alarms have to be set in the alarm tab

Circuit high temperature alarm

Parameter: **HTs, HTd**

When the discharge temperature of the circuit is above **HTs** parameter the "**High discharge temp**" alarm is generated.
When the discharge temperature goes below **HTs-HTd** the alarm can be reset

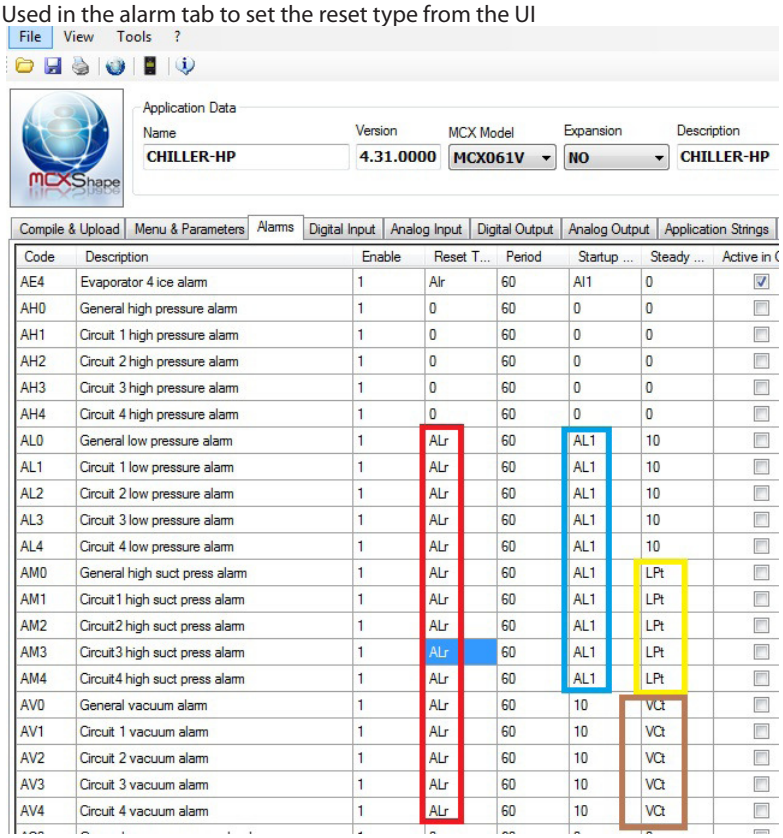
Analogue input: dt1, dt2, dt3, dt4
Alarms: dt0, dt1, dt2, dt3, dt4

HTs- High discharge temperature set	Defines the temperature setpoint above which the **dtx** alarm is generated
HTd- Differential	Below **HTs-HTd** the alarm can be reset

Pressure alarms from analogue input:

Parameter: **AHE, AHS, AHd, Alr, AL1, AL2, ALE, ALS, ALd, LPt, AVO, VCt, SHS, SHb**

Analogue input: dP1, dP2, dP3, dP3, SP1, SP2, SP3, SP4
Alarms: AH0, AH1, AH2, AH3, AH4, AL0, AL1, AL2, AL3, AL4, AV0, AV1, AV2, AV3, AV4, AM0, AM1, AM2. AM3, AM4

AHE- Enable HP alarm from AI	**0=NO** means disable **1=YES** means enable
AHS- High pressure alarm setpoint	When the discharge pressure (sensor **dPx**) goes above **AHS**, alarm **AHx** is triggered
AHd- High pressure alarm hysteresis	Below **AHS-AHd** the alarm **AHx** can be reset
Alr- Reset type	Used in the alarm tab to set the reset type from the UI 
AL1- Delay from compressor starting	Used in the alarm tab to set the startup delay from the UI
AL2- Enable when compressor OFF	**0=NO** means that the low pressure alarm is not triggered when the circuit is switched off **1=YES** means that the low pressure alarm is triggered also when the circuit is switched off
ALE- Enable LP alarm from AI	**0=NO** means disable **1=YES** means enable Note: it enables also the vacuum alarm
ALS- Low pressure alarm setpoint	When the suction pressure (sensor **SPx**) goes below **ALS** alarm **ALx** is triggered
ALd Low pressure alarm hysteresis	Above **ALS+ALd** the alarm **ALx** can be reset

Code	Description	Enable	Reset T...	Period	Startup ...	Steady ...	Active in C
AE4	Evaporator 4 ice alarm	1	Alr	60	Al1	0	☑
AH0	General high pressure alarm	1	0	60	0	0	☐
AH1	Circuit 1 high pressure alarm	1	0	60	0	0	☐
AH2	Circuit 2 high pressure alarm	1	0	60	0	0	☐
AH3	Circuit 3 high pressure alarm	1	0	60	0	0	☐
AH4	Circuit 4 high pressure alarm	1	0	60	0	0	☐
AL0	General low pressure alarm	1	ALr	60	AL1	10	☐
AL1	Circuit 1 low pressure alarm	1	ALr	60	AL1	10	☐
AL2	Circuit 2 low pressure alarm	1	ALr	60	AL1	10	☐
AL3	Circuit 3 low pressure alarm	1	ALr	60	AL1	10	☐
AL4	Circuit 4 low pressure alarm	1	ALr	60	AL1	10	☐
AM0	General high suct press alarm	1	ALr	60	AL1	LPt	☐
AM1	Circuit1 high suct press alarm	1	ALr	60	AL1	LPt	☐
AM2	Circuit2 high suct press alarm	1	ALr	60	AL1	LPt	☐
AM3	Circuit3 high suct press alarm	1	ALr	60	AL1	LPt	☐
AM4	Circuit4 high suct press alarm	1	ALr	60	AL1	LPt	☐
AV0	General vacuum alarm	1	ALr	60	10	VCt	☐
AV1	Circuit 1 vacuum alarm	1	ALr	60	10	VCt	☐
AV2	Circuit 2 vacuum alarm	1	ALr	60	10	VCt	☐
AV3	Circuit 3 vacuum alarm	1	ALr	60	10	VCt	☐
AV4	Circuit 4 vacuum alarm	1	ALr	60	10	VCt	☐

LPt- Low pressure bypass time	Used in the alarm tab to set the Steady delay from the UI
AVO- Vacuum alarm offset	When the suction pressure (sensor **SPx**) goes below **ALS-AVO** alarm **AVx** is triggered Note: The alarm is enabled by **ALE** (the same used for Low pressure alarm)
AVd- Vacuum alarm hysteresis	Above **ALS- AVO + AVd** the alarm **AVx** can be reset
VCt-Vacuum alarm bypass time	Used in the alarm tab to set the Steady delay from the UI
SHS- High suction pressure setpoint	When the suction pressure (sensor **SPx**) goes above **ASH**, alarm **AMx** is triggered
SHb- High suction pressure hysteresis	Below **SHS-SHb** the alarm **AMx** can be reset

High water temperature alarm in cooling mode:

Parameter: **Ats, Atd**

Analogue input: TOx
Alarms: A09

Ats- Setpoint in cooling	In Cooling mode, when the water temperature (**max in between TOx**) goes above **Ats**, the alarm **A09** is triggered Note: The alarm's action has to be set in the alarm tab
Atd- Differential	Below **Ats-Atd** the alarm **A09** can be reset

Boiler water temperature alarm:

Parameter: **AbS, Abd**

It works only for heat pump configuration **H40> 0 (heat pump)**
and H41> 0 (Boiler with heaters)
The alarm **A14** deactivates the heaters

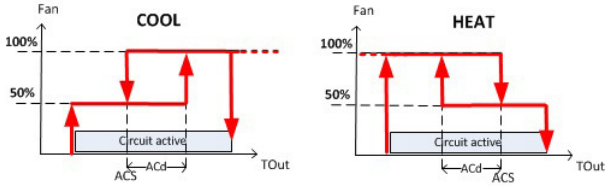
Analogue input: BOI
Digital output: BOx
Alarms: A14

AbS- Setpoint	When the water inside the boiler (**BOI**) goes above **AbS**, the alarm **A14** is triggered Alarm **A14** deactivates the heaters
Abd - Differential	Below **Abs-Abd** the alarm **A14** can be reset

Fault of the regulation probe of the external coil:

Parameter: **ACM, ACS, ACd**

How set it up

ACM- Condenser fan/pump status	**0=OFF** means that if there is a condenser regulation probe fault, the Fan/Pump will be kept switched OFF **1=ON_C** means that if there is a condenser regulation probe fault, the Fan/pump will be switched ON if at least one compressor is active in the circuit **2=FTou** means that if there is a condenser regulation probe fault, the Fan/Pump will cut in in relation to the **TOut_ T out** sensor, see parameter **ACS** and **ACd**
ACS- Outside temp set for fan/ pump	If **ACM**=FTou, in case of fault of condenser regulation probe, the fan will regulate in relation to the outside temperature, following the picture below  Note. In case of outside temperature sensor fault the fan will works as **ACM=ON_C**
ACd- Outside temp diff. for fan/pump	See parameter **ACM**

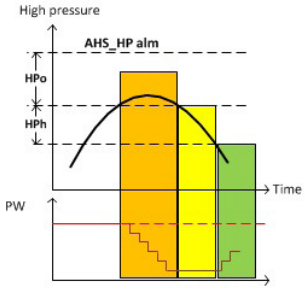
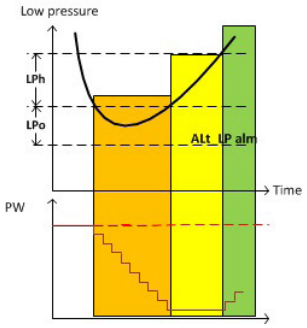
Preventions:

Parameter: **TMx, THo, TLo, HPE, HPo, HPh, LPE, LPo, LPh, PPt, PPp, HFo**

The alarm's action has to be set in the alarm tab.
Info on prevention status through rolling text

Functionalities: Enable compressor high temperature prevention
Analogue input; CTx, dPx, SPx
Alarms: CTx,A8E,A8F

TMx- Max compressor temperature	It's in **°C** When the temperature **CTx** goes above **TMx** the alarm **CTx** is triggered. Note: the action of the alarm has to be defined in the alarm tab
THo- Comp Max Temp Prev Offset	It's in **°C** When the temperature **CTx** goes above **TMx-THo**, the screw compressor is set to minimum power Note: it works only for **screw compressors**
TLo- Comp Max Temp Prev Diff	It's in **°C** When the temperature **CTx** goes below **TMx-THo-TLo**, the screw compressor restart to work with-out limitation Note: it works only for **screw compressors**
HPE- HP prevention enable	**0=NO** means disable **1=YES** means enable

HPo- HP prevention offset	When the high pressure sensor goes above **AHS-HPo**, every **PPt** seconds the prevention **decreases** the circuit power request by **PPp** 
HPh- HP prevention hysteresis	When the high pressure sensor goes below **AHS-HPo -HPh**, every **PPt** seconds the prevention **increases** the circuit power request by **PPp** Note: See **HPo** parameter
LPE- LP prevention enable	**0=NO** means disable **1=YES** means enable
LPo- LP prevention offset	When the low pressure sensor goes below **ALS+LPo**, every **PPt** seconds the prevention **decreases** the circuit power request by **PPp** 
LPh- HP prevention hysteresis	When the low pressure sensor goes below **ALS+LPo +LPh**, every **PPt** seconds the prevention **increases** the circuit power request by **PPp** Note: See **LPo** parameter
PPt-Pressure decreasing power period	It is the period in between 2 corrections of the power request during the prevention
PPp-Pressure decreasing power %	It is the correction (%) of the power request during the prevention
HFo-HP fan offset	Defines the offset to add /subtract to the setpoint **FHS /FCS** during the prevention Note: if **HFo**=0 is like disable this function

Superheat alarms:

Parameter: **SHh, AHl, Ahi, AHd**

It gives the possibility to set a range outside which the superheating triggers an alarm;
The alarm's behaviour has to be set in the alarm's tab

Functionalities: Enable superheating alarm on low and high values
Alarms: LS1, LS2, LS3, LS4, SH1, SH2, SH3, SH3

SHh-Max superheat temp	If the superheat goes above **SHh** alarm is triggered
SHl-Min superheat temp	If the superheat goes below **SHl** alarm is triggered
SHi-Alarm hysteresis	The alarms can be reset only in between **SHl+SHi** and **SHh-SHi**
SHd-Superheat alarm delay	Used in the alarm tab to set the "Steady delay" from the UI

Oil temperature alarms:

Parameter: **OTm, OTi, OTd**

Allows the temperature to be set above the level where an oil's alarm is triggered;
The alarm's behaviour has to be set in the alarm's tab

Functionalities: Enable compressor's oil temperature alarm
Analogue input: OT1, OT2, OT3, OT4, OT5, OT6, OT7, OT8
Alarms: OT1, OT2, OT3, OT4, OT5, OT6, OT7, OT8

OTm-Max oil temperature	If the oil's temperature goes above **OTm** alarm is triggered
OTi-Oil temp hysteresis	The alarms can be reset only below **OTm-OTi**
OTd-Oil temp alarm delay	Used in the alarm tab to set the "Steady delay" from the UI

Screw compressors:

Parameter: **C01, C02, CSO, CSb, T1, T2,T3, T4, C07, C08, T5, T6, T21, T22, T24, T24, T25, T26, T27, T28, T29**

Only 1 screw compressor per circuit can be managed bot in step and stepless mode.

Functionalities: Enable screw compressor
Analogue output: CxV, PVx
Digital output: C1, C1U1, C1U2, C1U3, C1U4, C2, C2U1, C2U2, C2U3, C2U4, C3, C3U1, C3U2, C3U3, C3U4, C4, C4U1, C4U2, C4U3, C4U4

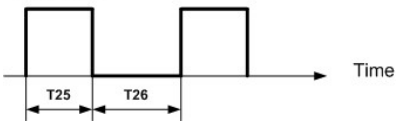
<table>
<tr><td>C01- Rotation type</td><td>Defines the start order of the compressors
0=LIFO means that there is no rotation and the last compressor to be cut in is the first compressor to be cut out, the cut-in order is C1,C2…Cn, and the cut-out order is Cn…C2, C1
1=FIFO means that there is no rotation and the first compressor to be cut in is the first compressor to be cut out, the cut-in order is C1,C2…Cn, and the cut-out order is C1,C2…Cn
2=tIME means running hours control; the compressor to be started is the one with the lowest number of run hours; the compressor to be stopped is the one with the highest number of run hours.
3=BIN means binary logic, it works only for 2 compressors:
• Below 33% of power request, works only C1
• Between 33% and 66% of power request, works C2
• Above 66% both compressors are allowed to work
2=SRM: Reserved</td></tr>
<tr><td>C02- Compressor type</td><td>Defines the type of compressors
0=SCW means that the compressors are screw type, check parameters CS0 and CSb
1=StD means that the compressors are standard type (not screw type)</td></tr>
<tr><td>CS0- Capacity control mode</td><td>Defines whether the screw compressor works in step or stepless mode
0=STeP means that the screw compressor provides predefined steps of power, parameter H7 must be equal 3.
Note: the digital outputs CxU4 (the ones which pulse) are replicated on analogue outputs PVx
<table>
<tr><th>Csb=0 (Other)</th><th>C1</th><th>C1U1</th><th>C1U2</th><th>C1U3</th><th>C1U4</th></tr>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td></tr>
<tr><td>1° step (start): 25%</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>2° step: 50%</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>3° step: 75%</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>Pulsing</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>Pulsing</td></tr>
</table>
The period of pulsing is 2*C07, the contact stays closed per CO7 seconds
<table>
<tr><th>Csb=3 (Grasso)</th><th>C1</th><th>C1U1</th><th>C1U2</th><th>C1U3</th><th>C1U4</th></tr>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>1° step (start): 20%</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>2° step : 40%</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>3° step: 60%</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>4° step: 80%</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td></tr>
</table>
<table>
<tr><th>(Csb=2) Bitzer</th><th>C1</th><th>C1U1</th><th>C1U2</th><th>C1U3</th><th>C1U4</th></tr>
<tr><td>Off</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>1° step (start): 25%</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>2° step: 50%</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>3° step: 75%</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>Pulsing</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>Pulsing</td></tr>
</table>
Note: H7 must be equal 3
The period of pulsing is 2*C07, the contact stays closed per CO7 seconds
<table>
<tr><th>Csb=1 (Frascold)</th><th>C1</th><th>C1U1</th><th>C1U2</th><th>C1U3</th><th></th></tr>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td></td></tr>
<tr><td>1° step (start): 25%</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td></td></tr>
<tr><td>2° step: 50%</td><td>ON</td><td>ON</td><td>ON</td><td>OFF</td><td></td></tr>
<tr><td>3° step: 75%</td><td>ON</td><td>ON</td><td>OFF</td><td>ON</td><td></td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td></td></tr>
</table>
Note: H7 must be equal 3

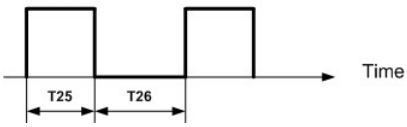
1=LESS means that the screw compressors provides modulating power, parameters H7 and IV0 must be equal 0

Note: the analogue output CxV is the compressor x power request</td></tr>
</table>

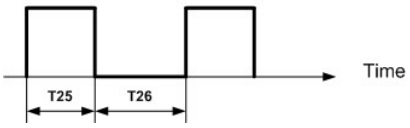
	<table><tr><th>Csb= Other , Grasso, Bitzer</th><th>C1</th><th>C1U1</th><th>C1U2</th></tr><tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td></tr><tr><td>Start</td><td>ON</td><td>ON</td><td>OFF</td></tr><tr><td>Increasing</td><td>ON</td><td>OFF</td><td>Pulsing</td></tr><tr><td>Decreasing</td><td>ON</td><td>Pulsing</td><td>OFF</td></tr><tr><td>Constant</td><td>ON</td><td>OFF</td><td>OFF</td></tr><tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>ON</td></tr></table> Note: Increasing pulsing (T25 and T26) Decreasing pulsing (T27 and T28) Start stage is kept per T1 seconds <table><tr><th>Csb=Frascold</th><th>C1</th><th>C1U1</th><th>C1U2</th></tr><tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td></tr><tr><td>Start</td><td>ON</td><td>OFF</td><td>OFF</td></tr><tr><td>Increasing</td><td>ON</td><td>ON</td><td>Pulsing</td></tr><tr><td>Decreasing</td><td>ON</td><td>Pulsing</td><td>OFF</td></tr><tr><td>Constant</td><td>ON</td><td>ON</td><td>OFF</td></tr><tr><td>maximum power: 100%</td><td>ON</td><td>ON</td><td>ON</td></tr></table> Note: Increasing pulsing (T25 and T26) Decreasing pulsing (T27 and T28) Start stage is kept per T1 seconds Note: this parameter works only for C02=0
CSb- Compressor brand	Defines if the compressor's brand and so the behavior of digital outputs. See also parameter **CS0** **0=Other** **1=Fras** **2=Bitz** **3=Gras**
T1-Min time step1/ stepless startup	It's in **seconds**: • For step compressor **(CS0=0)**: the minimum time that the 1st step has to be kept before increase/cut off the compressor's power • For stepless compressor **(CS0=1)**: The minimum time that the start stage has to be kept before increase/decrease the compressor's power Note: check parameter **CS0, T5, T6**
T2-Min time step2	It's in **seconds** • For step compressor **(CS0=0)**: the minimum time that the 2nd step has to be kept before increase/ decrease the compressor's power Note: check parameter **CS0**
T3-Min time step3	It's in **seconds** • For step compressor **(CS0=0)**: the minimum time that the 3rd step has to be kept before increase/ decrease the compressor's power Note: check parameter **CS0**
T4-Min time step4	It's in **seconds** • For step compressor **(CS0=0)**: the minimum time that the 4th step has to be kept before increase/ decrease the compressor's power Note: check parameter **CS0**
C07- Unloaders for pulsing time	It's in **seconds** The **CxU4** output pulses **C07** seconds opened and **C07** seconds closed Note: it only works for screw step compressors **(CS0=0)**
C08- Unloaders Stop delay	It's in **seconds** Defines the minimum time that the power step of the compressor has to be kept before increase/ decrease power
T5-Special management step1	It enables the functionalities of the parameter **T6** **0=No** **1=Yes**
T6-Max time step1	It's in **seconds**, For step compressor **(CS0=0**), defines the maximum time that the compressor can keep step1, after that the compressor's power will be increased Note: check parameter **CS0** and **T5**
T21-Balance power distribution	Used for stepless screw compressor. **0=No** means that before cutting in a new compressor, the compressors which are working have to be at maximum power; before decreasing the compressor power, a compressor has to be switched off **1=Yes** means that before increasing a compressor's power, all the compressors have to be switched on

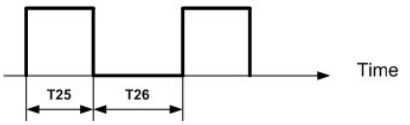
<table>
<tr>
<td>T22-Minimum power</td>
<td>Used for stepless screw compressor.
It's in %
Defines the minimum power request (in the circuit) above which the compressor is switched on.
After this Start stage of the compressor the compressor will be allowed to work
Note: check parameter T1
<table>
<tr><th>Csb= Other , Grasso, Bitzer</th><th>C1</th><th>C1U1</th><th>C1U2</th></tr>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Start</td><td>ON</td><td>ON</td><td>OFF</td></tr>
<tr><td>Increasing</td><td>ON</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>Decreasing</td><td>ON</td><td>Pulsing</td><td>OFF</td></tr>
<tr><td>Constant</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>ON</td></tr>
</table>
Note: Increasing pulsing (T25 and T26)
Decreasing pulsing (T27 and T28)
Start stage is kept per T1 seconds

<table>
<tr><th>Csb=Frascold</th><th>C1</th><th>C1U1</th><th>C1U2</th></tr>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Start</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Increasing</td><td>ON</td><td>ON</td><td>Pulsing</td></tr>
<tr><td>Decreasing</td><td>ON</td><td>Pulsing</td><td>OFF</td></tr>
<tr><td>Constant</td><td>ON</td><td>ON</td><td>OFF</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>ON</td><td>ON</td></tr>
</table>
Note: Increasing pulsing (T25 and T26)
Decreasing pulsing (T27 and T28)
Start stage is kept per T1 seconds</td>
</tr>
<tr>
<td>T23-Valve opening time</td>
<td>Used for stepless screw compressor.
It's in seconds
Defines the minimum time that the compressor spends to reach maximum power starting from the start position
Note: depends on the Pulsing period - check parameters T25 and T26</td>
</tr>
<tr>
<td>T24-Valve closing time</td>
<td>Used for stepless screw compressor.
It's in seconds
Defines the minimum time that the compressor spends to reach the minimum power starting from maximum power
Note: depends on the Pulsing period - check parameters T27 and T28</td>
</tr>
<tr>
<td>T25-Minimum time UP impulse</td>
<td>Used for stepless screw compressor.
It's in milliseconds
Up impulse
 

<table>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Start</td><td>ON</td><td>ON</td><td>OFF</td></tr>
<tr><td>Increasing</td><td>ON</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>Decreasing</td><td>ON</td><td>Pulsing</td><td>OFF</td></tr>
<tr><td>Constant</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>ON</td></tr>
</table></td>
</tr>
<tr>
<td>T26-OFF time in between UP impulses</td>
<td>Used for stepless screw compressor.
It's in seconds
Up impulse
 

<table>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Start</td><td>ON</td><td>ON</td><td>OFF</td></tr>
<tr><td>Increasing</td><td>ON</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>Decreasing</td><td>ON</td><td>Pulsing</td><td>OFF</td></tr>
<tr><td>Constant</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>ON</td></tr>
</table></td>
</tr>
</table>

<table>
<tr>
<td>T27-Minimum time DOWN impulse</td>
<td>Used for stepless screw compressor.
It's in milliseconds
Up impulse
 

<table>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Start</td><td>ON</td><td>ON</td><td>OFF</td></tr>
<tr><td>Increasing</td><td>ON</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>Decreasing</td><td>ON</td><td>Pulsing</td><td>OFF</td></tr>
<tr><td>Constant</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>ON</td></tr>
</table></td>
</tr>
<tr>
<td>T28-OFF time in between DOWN impulses</td>
<td>Used for stepless screw compressor.
It's in seconds
Up impulse
 

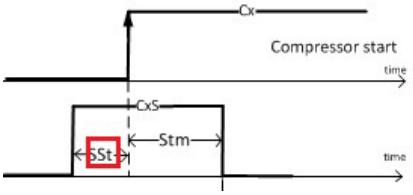
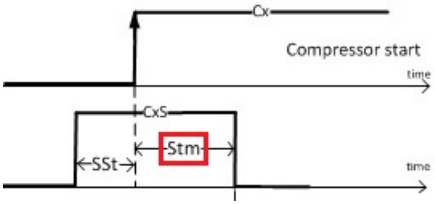
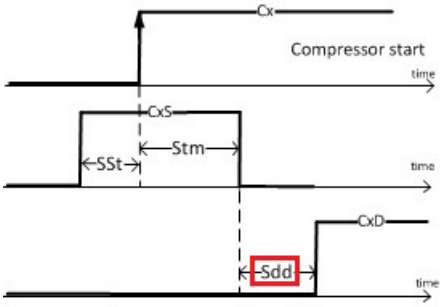
<table>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Start</td><td>ON</td><td>ON</td><td>OFF</td></tr>
<tr><td>Increasing</td><td>ON</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>Decreasing</td><td>ON</td><td>Pulsing</td><td>OFF</td></tr>
<tr><td>Constant</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>ON</td></tr>
</table></td>
</tr>
<tr>
<td>T29-% limit for max Open/ Close</td>
<td>Used for stepless screw compressors.
It's in %
When the circuit's power request goes above (100-T29)% the compressor reaches the "Maximum power 100%" stage
<table>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Start</td><td>ON</td><td>ON</td><td>OFF</td></tr>
<tr><td>Increasing</td><td>ON</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>Decreasing</td><td>ON</td><td>Pulsing</td><td>OFF</td></tr>
<tr><td>Constant</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>ON</td></tr>
</table>
When the circuit's power request goes below T29% the compressor is switched off
<table>
<tr><td>Off</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Start</td><td>ON</td><td>ON</td><td>OFF</td></tr>
<tr><td>Increasing</td><td>ON</td><td>OFF</td><td>Pulsing</td></tr>
<tr><td>Decreasing</td><td>ON</td><td>Pulsing</td><td>OFF</td></tr>
<tr><td>Constant</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>maximum power: 100%</td><td>ON</td><td>OFF</td><td>ON</td></tr>
</table></td>
</tr>
</table>

Starting type of the compressor:

Parameter: **Sty, Sti, SSt, Stm, Sdd**

For the start of big compressors is possible to select a
PARTWINDING logic or **STAR-DELTA** logic

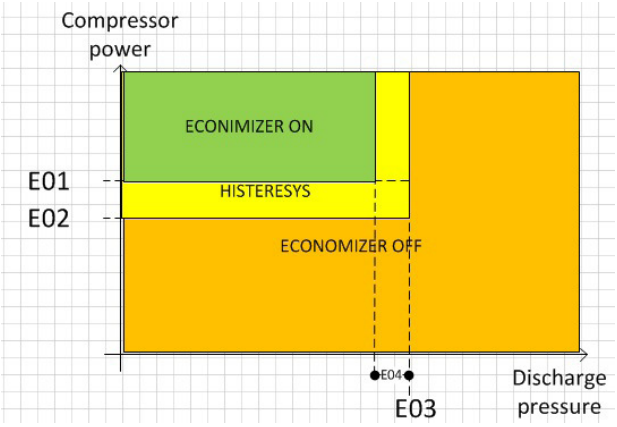
Functionalities: Enable motor starting type selection
Digital output: C1, C1P,C1S, C1D, C2, C2P, C2S, C2D, C3, C3P, C3S, C3D, C4, C4P, C4S, C4D, C5, C5P, C5S, C5D, C6, C6P, C6S, C6D, C7, C7P, C7S, C7D, C8, C8P C8S, C8D,

Sty-Starting type	Defines how to start a compressor in order to limit the start current **0=Dir** : Direct start of the compressor **(only Cx digital output)** **1=PWin** : Part winding start of the compressor **(Cx and CxP digital outputs)** **2=StDe** : Star-Delta start of the compressor **(Cx , CxS and CxD digital outputs)**
Sti-Part winding delay	It's used for part winding starting type **(Sty=1).** It's in **milliseconds** Just **Sti** milliseconds after the start of the xth compressor (Cx= Closed) the digital output CxP is closed
SSt-Compressor start delay	It's used for "star-delta" starting type **(Sty=2)**. It's in **milliseconds** Just **SSt** milliseconds before the start of the xth compressor (Cx= Closed) the digital output CxS is closed 
Stm-Star time	It's used for "star-delta" starting type (**Sty=2**). It's in **milliseconds** It's defines how long the star stage will be kept, the digital output Cxs will be opened after **Stm** milliseconds from the compressor start (Cx=Closed) 
Sdd-Star-Delta delay	It's used for "star-delta" starting type **(Sty=2**). It's in **milliseconds** It's defines the delay between the closing of the "Delta" connection (CxD=Closed) from the opening of the "Star" connection (CxS=Closed) 

Economizer

Parameter: **E01, EO2, EO3, EO4**

The logic to manage the economizer considers one compressor per circuit, like in the case of screw compressors



Digital output: EC1,EC2, EC3, EC4
Analogue input: dp1. dp2, dp3,dp4

E01-ON Setpoint	It's in **%** When the compressor's power is >= **E01%** and the discharge pressure is below **E03-E04**, the economizer (digital output **ECx**) is opened
E02-OFF Setpoint	It's in **%** When the compressor's power is <= **E02**% the economizer (digital output **ECx**) is closed
E03-Pressure limit	It's in **bar G** When the compressor's power is >= **E03** bar, the economizer (digital output **ECx**) is closed
E04-Pressure differential	It's in **bar G** When the compressor's power is >= **E01**% and the discharge pressure is below **E03-E04** the economizer (digital output **ECx**) is opened

Liquid injection

Parameter: **T41, T42, T43, T44, T45**

Liquid injection is managed in relation to the discharge temperature and/or the value of the super heat
It's designed for only one compressor per circuit.

Functionalities: Enable compressor's liquid injection
Functionalities: Enable expansion valve EXD
Digital output: LI1, LI2, LI3, LI4
Analogue input: dT1, dT2, dT3, dT4, and the value of the superheat

T41-Discharge temperature set	It's in **°C** When the discharge temperature " **dTx**" goes above **T41** and compressor x is switched ON, liquid injection valve "**LIx**" is opened
T42-Differential	It's in **°C** When the discharge temperature "**dTx**" goes below **T41 – T42**, liquid injection valve "**LIx**" is closed. Note: if the compressor is switched off, the valve is closed
T43-EEV SH Offset	It's in **°C** When liquid injection x is working, the maximum SH of circuit x becomes **T44-T43** and the minimum SH becomes **T45-T43** Note: Overread is on EXD drivers or in the internal SH drivers
T44- EEV SH Max	It's in **°C** It has to be equal to the maximum SH used in the SH control logic (parameter **N9**)
T45- EEV SH Min	It's in **°C** It has to be equal to the minimum SH used in the SH control logic (parameter **N10**)

Compressor with unloaders:

Parameter: **C04, C05, C06, C08**

A compressor with unloaders means a compressor able to share the power load in several stage.
The number of stage is defined by parameter **H7**
In the single compressor the activation of the unloader follows a fixed sequence **(Cx->CxU1->CxU2>CxU3->CxU4)**

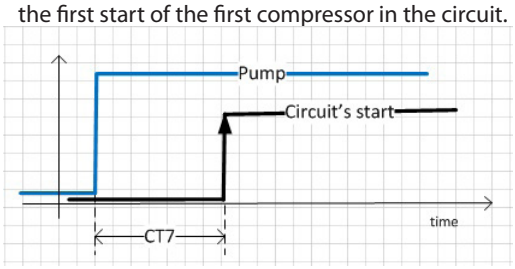
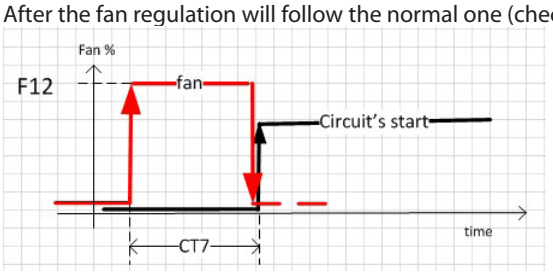
Digital output: C1, C1U1, C1U2, C1U3, C1U4, C2, C2U1, C2U2, C2U3, C2U4, ….. C8, C8U1, C8U2, C8U3, C8U4,
Note: Parameter H7 has to be > zero

C04- Unloaders activation mode	Defines how the increasing of the power between the compressors is managed **0=Cp**: activation sequence is C**1**->C**1**U1->C**1**U2->… C**2**->C**2**U1 (saturation) **1=CCp**: activation sequence is C**1**->C**2**->C**1**U1-> …-> C**1**U4 -> C**2**U1->…-> C**1**U4 (Cut in all the compressors and saturate them one by one) **2=CCp1**: activation sequence is C**1**->C**2**->C**1**U**1**->C**2**U**1** … (Distribution)
C05- Unloaders deactivation mode	Defines how the decreasing of the power in between the compressors is managed **0=pCpC** : **de**activation sequence is C**1U4**->…C**1**U1->C**1**->C**2**U4-→C2U1->C2 (saturation) **1=ppCC** : **de**activation sequence is C**1U4**-> C**2U4**-> C**1U3**-> C**2U3**->…C**1**->C2 (distribution)
C06- Unloaders start delay	It's in **seconds** Start delay C06 among unloaders or between the compressor's activation and its load step. Note: It avoids the activation of the compressor at full load.
C08- Unloaders Stop delay	It's in **seconds** Defines the minimum time that the power step of the compressor has to be kept before increase/ decrease power Note: it is also used in screw management

Maximum number of compressor starts per hour:

Parameter: **CT0, CT1, CT2, CT3, CT4, CT5, CT6, CT7**

How to

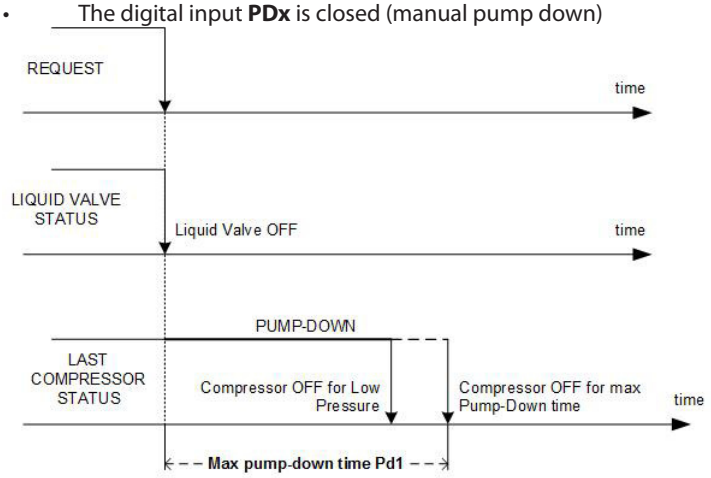
CT0- Minimum ON interval different comp	It's in **seconds** Defines the minimum time between the switching on of different compressors
CT1- Minimum OFF interval different comp	It's in **seconds** Defines the minimum time between the switching off of different compressors
CT2- Minimum OFF time	It's in **seconds** It does not work for inverter compressor **(IV0=1)** Defines the minimum time that the compressor has to stay switched OFF
CT3- Minimum ON time	It's in **seconds** It does not work for inverter compressor **(IV0=1)** Defines the minimum time that the compressor has to stay switched ON
CT4- Minimum time between 2 ON same compressor	It's in **seconds** Defines the minimum time in between two starts of the same compressor: It means that if the compressor started at the 8:00:00, it will be allowed to start again after 8:00:00 after CT2 seconds Note: used to define the maximum number of starts/hour for the compressor
CT5- Max difference in running hours	Works only for rotation "time" **(C01=tIME)**. It's in minutes If a running compressor becomes older than a compressor switched off more than CT5 minutes, the logic will switch off the oldest compressor running; It will cause the other compressor to be switched on. The compressors timing (CT0,…CT4) is respected
CT6- Delay from evaporator pump/fan	It's in **seconds** Defines the minimum delay from the evaporator's pump before allow the switch on of the compressors.
CT7- Delay from cond pump/ fan	It's in **seconds** • For the water-water chiller, this defines the time in between the external coil pump cutting in and the first start of the first compressor in the circuit.  • For the water-air chiller, if **CT7** > zero the fan is switched on(**F12** %) **CT7** seconds before of the first compressor of the circuit.
	After the fan regulation will follow the normal one (check parameter **F01**) 

Valve in the liquid line:

Parameter: **Pd1, Pd2, Pd3, Pd4**

Pump down before the circuit's stop and equalization of the pressure before circuit's startup

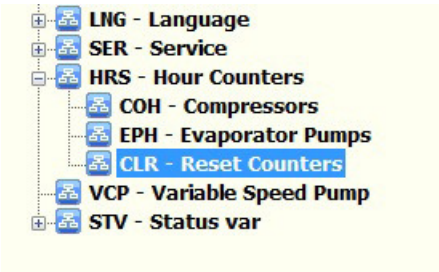
Digital output: LV1, LV2, Lv3, LV4
Digital input: PD1, PD2, PD3, PD4, LPL1, LPL2, LPL3,LPL4
Analogue input: SP1, SP2, SP3, SP4

Pd1-Pump down enable and max time	It's in **seconds** **0=Disable** **>0=**It defines the maximum pump down time. The liquid valve **LVx** is closed before switch off the last compressor in the circuit. The compressor will switch off for the following reasons: • Low pressure switch (**LPLx**) • Suction pressure below **Pd4 (SPx< Pd4)** • **Pd1** seconds are elapsed from **LVx** closing • The digital input **PDx** is closed (manual pump down)  Note: Pump down is not executed in case of alarm Note: if the sensor SPx is not present it is not considered
Pd4- Pump down pressure set	It's in **bar G** If the pressure of the circuit (**SPx**) goes below Pd4 during the pump down process the compressor is switched off
Pd2- Compressor ON delay from liquid valve	It's in **seconds** Before starting the first compressor in the circuit, the liquid valve is opened in order to decrease the pressure ratio of the circuit. The compressor will start if: • The suction pressure goes above **Pd3** • At the maximum after **Pd2** seconds from liquid line valve opening
Pd3- Start up suction pressure set	It's in b**ar G** See parameter **Pd2**

Maximum compressor running hours

Parameter: **C50**

The hours counters can be reset in the menu, the menu has password level3



Alarms: A61, A62, A63, A64, A65, A66, A67, A68

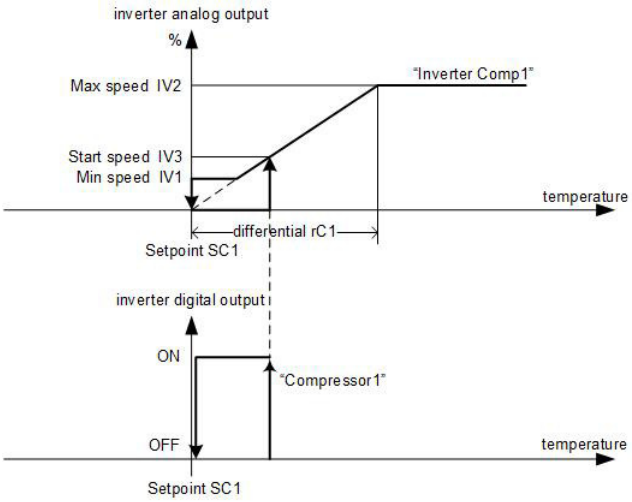
C50-Maximum limit	It's in **k Hours (1,000 hours)** When the running hours of the compressor **Cx** goes above **C50** the alarm **A6x** is triggered

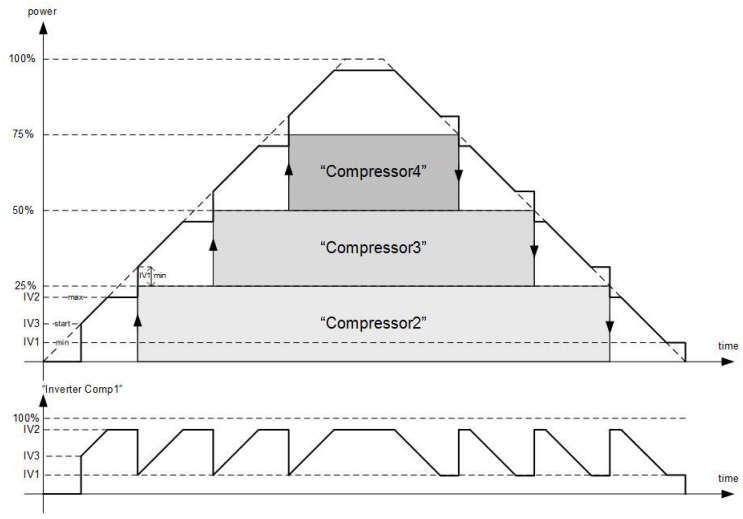
Inverter compressor:

Parameter: **IV0, IV1, IV2, IV3, IV4, IV5**

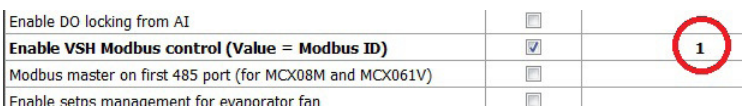
The inverter compressor will be switched on at first and switched off last.
The inverter compressor will provide a large range of power.
Below are the inverter behaviours alone or combined with other ON-OFF compressors

Digital input: OC1
Digital output: C1
Analogue output: C1

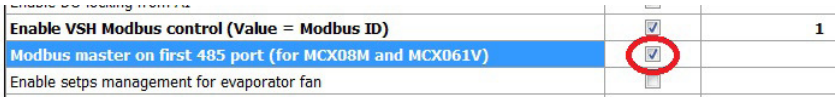


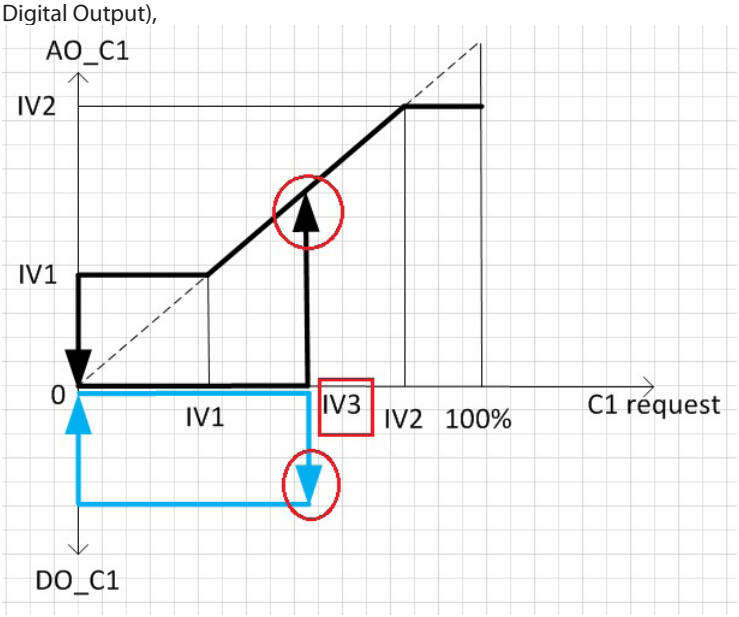


Note: the Danfoss Inverters can be driven through Modbus; Modbus communication reports the status of the inverter in the MCX user interface. Modbus communication with the inverter is enabled through the functionalities **"Enable VSH Modbus control(Value=Modbus ID)"** , MCX will be master in the Modbus communication.
It will call the inverter with the ID reported in the functionalities tab (it can be changed)



MCX will use the Modbus port 2,
With MCX having only one Modbus port is required to enable also the functionalities **"Modbus master on the first 485 port (for MCX08 and MCX061V)"**



IV0-Inverter enable	It enables the managing of the inverter compressor in the compressor C1 **0=No** **1=Yes**
IV1- Minimum speed	It's in **%** Defines the minimum speed of the inverter compressor, check also **IV3**
IV2- Maximum speed	It's in **%** Defines the maximum speed of the inverter compressor, check also **IV3**
IV3- Start speed	It's in **%** Defines the request that will switched on the inverter compressor (both Analogue Output and Digital Output), 
IV4- Minimum ON time	It's in **seconds** It works only for inverter compressor **(IV0=1)** Defines the minimum time that the compressor has to stay switched ON
IV5- Minimum OFF time	It's in **seconds** It works only for inverter compressor **(IV0=1)** Defines the minimum time that the compressor has to stay switched OFF

Compressor enabling:

Parameter: **CT1, CT2, CT3, CT4, CT5, CT6, CT7, CT8**

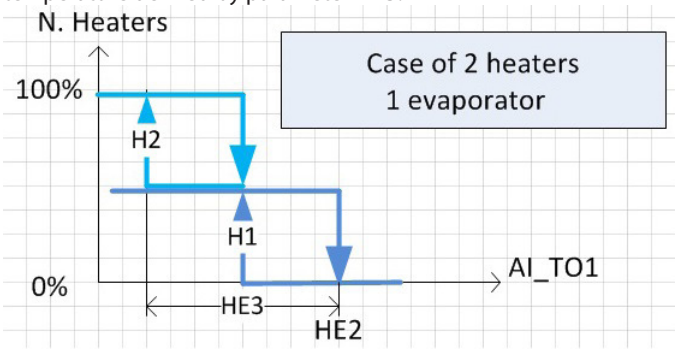
CT1-CTx-CT8 Compressor x enable	**0=No** : compressor x can work **1=Yes** : compressor x cannot work

Heaters

Parameter: **HE1, HE2, HE3, HE4, HE5, HE6, HE7**

The heaters work:
- for regulation **(HE1,HE2 and HE3)**
- Ice alarm **(AIS, AID AI3)**

Digital output: H1, H2, H3, H4
Digital input: OH1, OH2, OH3, OH4, OHL1, OHL2, OHL3, OHL4, OH
Analogue input: TO1, TO2, TO3, TO4
Alarms: A90, A91, A92, A93, A94, Ar1, Ar2, Ar3, Ar4

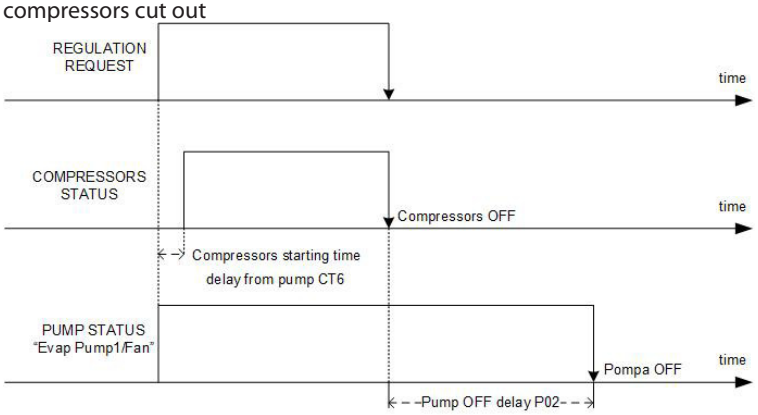
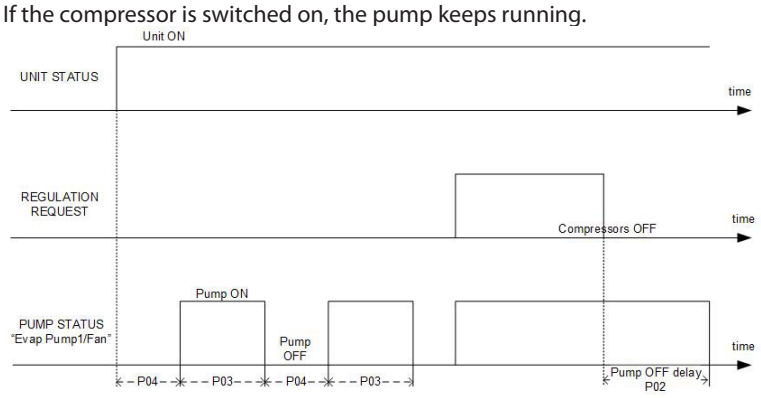
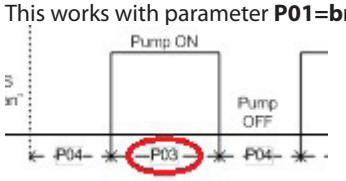
HE1-Compressor ON/OFF with heaters	**0= ON**: compressor can work with the heaters switched on **1= OFF**: compressor will be switched off if the heaters are switched on Note: The times of the compressors **(CT0-CT7)** are respected
HE2-Heaters setpoint in cooling	It's in **°C.** It works in cooling mode. Defines the minimum tout evaporator temperature (**TOx**) below which the heaters are allowed to work, the cut-in of the heaters depends on the number of heaters (**H5**) and the differential temperature defined by parameter **HE3**. 
HE3-Heaters differential in cooling	It's in **°C.** Works in cooling mode. The heaters switched on between **HE2** and **HE2-HE3 °C** Note: Check parameter HE2
HE4-Heaters setpoint in Heating	It's in **°C.** It works in heating mode. Defines the minimum tout evaporator temperature (**TOx**) below which the heaters are enabled to works, the cut-in of the heaters depends on the number of heaters (**H5**) and the differential temperature is defined by parameter **HE5**. Note: check parameter **HE2**
HE5-Heaters differential in heating	It's in **°C**. It works in heating mode. The heaters are switched on between **HE4** and **HE4-HE5 °C** Note: Check parameter **HE2**
HE6-Heaters offset in cooling	It's in **°C**. In cooling mode, the setpoint of the heaters becomes **HE2+HE6**, the sensor used to control the heaters are the maximum in between **Tin, TOx, TFC1 and Tout** Note: the "**Enable enhaced low temparature managment"** is required
HE7-Heaters offset in heating	It's in **°C.** In heating mode, the setpoint of the heaters becomes **HE2+HE6**, the sensor used to control the heaters are the maximum in between **Tin, TOx, TFC1 and Tout** Note: the "**Enable enhaced low temparature managment**" is required

Pump of the internal coil:

Parameter: **P01, P02, P03, P04**

In the case of a gas/water coil (H3=H2O) it is possible to manage up to 2 pumps in the water line: **H4 <3**
In the case of a gas/air coil (**H3=Air**) it is possible to manage up to 8 fans in the air line: **H4 <3**

Digital output: PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8
Digital input: FPE, OPE, OPE1, OPE2
Analogue input: TOM, WPR
Analogue output: E1, E2, E3, E4
Alarms: A03, AP0, AP1, AP2, AP3, AP4, AP5, AP6, AP7, AP8

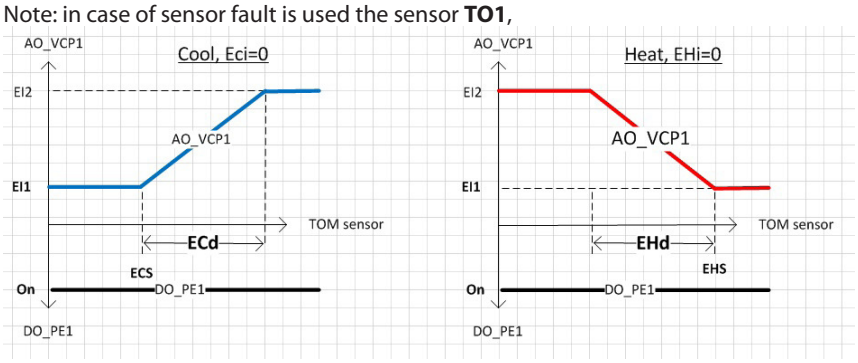
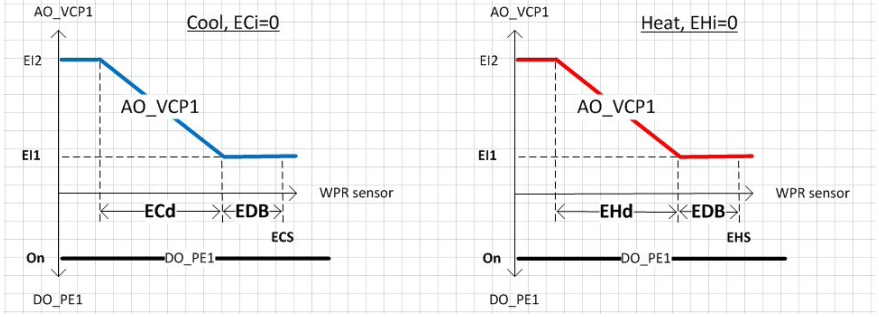
PO1-Evaporator pump/fan working mode	**0= OFF:** Pump is always switched off; the flow switch is detected **1= ON:** Pump is switched on at the same time as the unit **2= ON_C**: Pump is switched on only if there is a request to switch on a compressor, in which case there will be a power request to cut in the pump; the pump is switched off **P02** seconds after the compressors cut out  **3= brSt:** Pump is switched on **P03** seconds than switched off for **P04** minutes. The compressors can start only if the pump is running. If the compressor is switched on, the pump keeps running. 
PO2-Pump/fan OFF delay from comp OFF	It's in **second**. Defines the minimum time that the pump has to work after compressor is cut off. Note: It works after the machine is switched OFF only if the compressor was running
PO3-Pump ON pulse time	It's in **second**. This works with parameter **P01=brSt**, defining the ON time in the pump's cycle 
PO4-Pump OFF pulse time	It's in **minutes** This works with parameter **P01=brSt**, defining the OFF time in the pump's cycle

Modulating Pump:

Parameter: **ERT, ECS, ECd, ECi, EHS, EHd, EHi, EDB, EI1, EI2, EI3**

Functionalities: Enable evaporator variable capacity pump
Analogue input: TOM, WPR
Analogue output: VCP1, VCP2
Digital output: PE1, PE2

Note: works for P01=ON

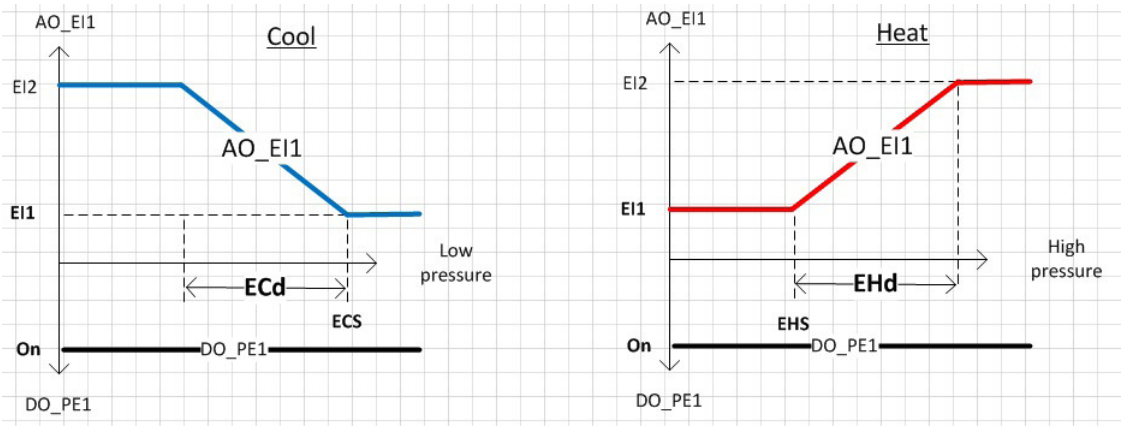
ERT-Regulation type	**0= TOM**: The speed of the pump is defined through the sensor **TOM (Tout evap mix)** Note: in case of sensor fault is used the sensor **TO1**,  **1= WPR**: The speed of the pump is defined through the sensor **WPR (Water pressure)** 
ECS-Cooling setpoint	It's in **°C** (or **barG** for **ERT=WPR**) Note: Check **ERT**
ECd-Cooling differential	It's in **°C** (or **barG** for **ERT=WPR**) Note: Check **ERT**
ECi-Cooling integral time	It's in **°C** (or **barG** for **ERT=WPR)** Note: Check **ERT**
EHS-Heating setpoint	It's in **°C** (or **barG** for **ERT=WPR**) Note: Check **ERT**
EHd-Heating differential	It's in **°C** (or **barG** for **ERT=WPR**) Note: Check **ERT**
EHi-Heating integral time	It's in **°C** (or **barG** for **ERT=WPR**) Note: Check **ERT**
EDB-Dead band	It's in **°C** (or **barG** for **ERT=WPR**) Note: Check **ERT**

EI0-Inverter enable	**0=NO** means that the pump's variable speed control is disabled **1=YES** means that the pump's variable speed control is enabled
EI1-Minimum speed	It's in **%** Defines the minimum speed of the pump
EI2-Maximum speed	It's in **%** Defines the maximum speed of the pump
EI3-Max pump speed up time at startup	It's in **seconds** Defines how long the pump holds the maximum speed during startup

Fan for the internal coil

Parameter: **P21, P22, P50**

For **(H3=Air), (H1<3), (H4<3):**
The evaporator fan is driven on the basis of the pressure that is inside the internal coil. If the fans are shared between the evaporators **(H12=yes)** the pressure used is the worst one of the 2 circuits.



Note: if there are 2 evaporators which are separated, the outputs PE2 and EI2 will work for evaporator 2

Functionalities: Enable evaporator variable capacity pump
Functionalities: Enable step management for evaporator fans
Digital output: PE1, PE2
Digital input: OPE1, OPE1
Analogue input: low pressure or high pressure
Analogue output: E1, E2
Alarms: AP1, AP2

Second pump (internal coil):
Managing another pump is only possible for circuit 1, as defined by parameter P21

Digital input: OPE2
Digital output: PE2

P21-Pumps rotation type	**0= bUP**: Emergency mode: If the pump overload alarm **A05** or flow switch **alarm A03** is active, the second pump will replace the pump running; the **A08 warning** is generated. If the alarm goes back the **A08 warning** is reset. **1= Strt**: Emergency mode more rotation to each restart (It also works for **P01>1**). **2= HOUr**: Emergency mode more rotation when the gap of the working hours is bigger that **P22**

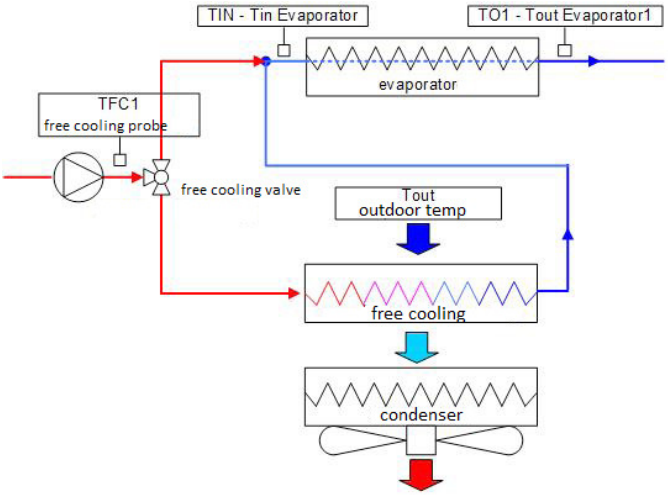
P22-Max run hours to force rotation	It's in **Hours** Used with **P21=HOUr**, defines the hours gap above which the pumps are rotated
P50-Maximum limit	It's in Hours*1000 If the pump works more than **P50** hours * 1000 , the **warning A10** (or **A11**) is generated

Free cooling:

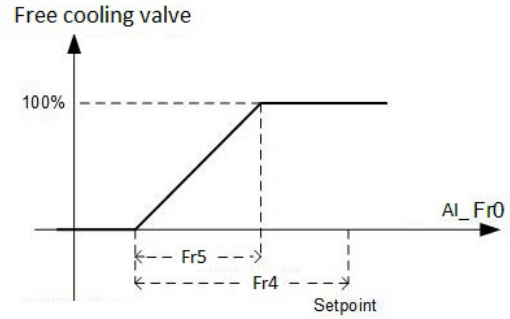
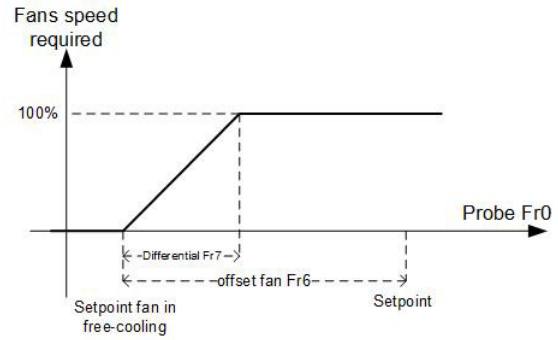
Parameter: **FrA, Fr1, Fr2, Fr3, Fr4, Fr5, Fr6, Fr7, Fr8, Fr9, FI1, FI2, FI3**

The free cooling regulation uses the favourable conditions of outside air temperature to contribute to cooling the water. It uses an additional coil (free cooling coil) enabled through the free cooling valve which deflecting the return water from the plant if the outside air temperature conditions are favourable.
Note: Free cooling management is active only in air/water units in cooling mode.
Note**:** In case of multiple evaporators and condensers, the free cooling is handled only on the first evaporator and condenser.

Functionalities: Enable free cooling capacity
Digital output: FV1, FRC
Digital input: OH1, OH2, OH3, OH4, OHL1, OHL2, OHL3, OH4, OH
Analogue input: TFC1, TOUt
Analogue output: FV1, FRC, FC1
Alarms: A7Z, AFC, FRC,



Fr0- Free cooling enable and probe	**0=No** means that the free cooling is disabled **1=Tin** means that the free cooling regulation probe is **TIN_Tin Evaporator** **2=Tout** means that the free cooling regulation probe is **TO1_Tout Evaporator1**
Fr1- Delta Free-cooling	It's in **Kelvin** Defines the minimum temperature gap between **TFC1_Free Cooling Temp** and the **TOUt_Tout** to enable the free cooling logic. Note: free cooling is disabled when: • The water circulation pump is not operating • There is not a minimum temperature gap between **TFC1_Free Cooling Temp** and the **TOUt_Tout (<(Fr1- 1.5°C))** • One of the following alarms has occurred: antifreeze alarm, serious alarm from digital input, pump overload alarm, evaporator flow alarm, fault of regulation probe, anti-freeze probe, free-cooling probe, outside temperature probe
Fr2- Only Free-cooling setpoint	It's in **°C** If the outside temperature **(TOUt_Tout)** stays below **Fr2** for more than **Fr3 seconds** the compressors are switched off. Note: check parameter **FrA**

FrA- Only free cooling delta	It's in Kelvin If the outside temperature **(TOUt_Tout)** is above **(Fr2+FrA)** the compressors are allowed to work. Note: check parameter **Fr2**
Fr3- Only free cooling delay	It's in **seconds** Note: check parameter **Fr2**
Fr4- Offset free cooling valve	It's in **°C** Defines the opening point of the free cooling valve **(FV1 Free Cooling Valve)** 
Fr5- Differential free cooling valve	It's in **°C** Note: see the image in parameter **Fr4**
Fr6- Offset free cooling fan	It's in **°C** Defines the fan starting point related to the free-cooling request.  Note: The analogue output **FRC_Free Cooling Fan** is managed as in the image above; Note: For the analogue output **FC1_Inverter Fan Cond 1** check parameter **Fr9_ Free cooling/Cond priority**
Fr7- Offset free cooling fan	It's in **°C** Note: check picture in the parameter **Fr6** • when the unit is OFF, it is open at 100% of its capacity • when the unit is ON, it is open at 10% of its capacity • The ON/OFF type valve is always open at 100%.
Fr8- AntiFreeze temp	It's in **°C** If the outside air temperature **TOUt_Tout** is below **Fr8 °C** • the alarm **AFC_Free cooling ice alarm** is generated, • the main circulation pump is turned on and the free cooling valve is operated as follows: Note: The procedure stops with a fixed hysteresis of **1K**.
Fr9- Free cooling/Cond priority	**0=Cond** means that in case of free-cooling and condensation that are working together the analogue output **FC1_Inverter Fan Cond 1** follows the control of gas condensation **1= FrEE** means that in case of free-cooling and condensation that working together the analogue output **FC1_Inverter Fan Cond 1** follows the free cooling request **2=GrEA** means that where free cooling and condensation are working together, the analogue output **FC1_Inverter Fan Cond 1** uses the greatest value **3=Ind** means that the analogue output **FC1_Inverter Fan Cond 1** follows only the gas condensation and the analogue output **FRC_Free Cooling Fan** follows the free-cooling request
FI1- Minimum speed	It's in **%** Defines the minimum speed of the free cooling fan **FRC_Free Cooling Fan**
FI2- Maximum speed	It's in **%** Defines the maximum speed of the free cooling fan **FRC_Free Cooling Fan**
FI3- Max fan speed up time at start up	It's in **seconds** Defines the time that the **FRC_Free Cooling Fan** stays at the maximum speed during the cut in, after that, it will follow the free-cooling request

Valve in the water line:

Parameter: **EF1, EF2**

This valve will close the water line when the chiller is switched off

Functionalities: Enable water valve
Digital output: EFV, PE1

EF1- Delay pump on from valve	It's in **seconds** The valve **EFV_Evaporator Pump Flow Valve** is open when the chiller is switched on, **EF1 seconds** after the pump is allowed to work
EF2- Delay valve close from pump off	It's in **seconds** The valve **EFV_Evaporator Pump Flow Valve** will switched off **EF1 seconds** after a pump is cut off

External coil:

Parameter: **F01**

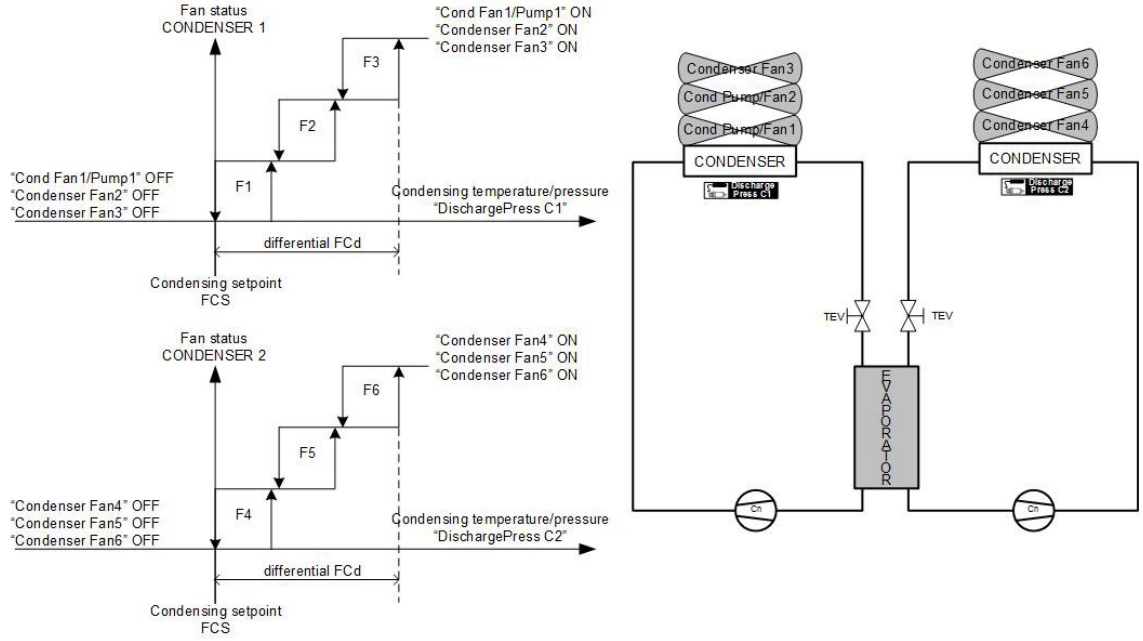
Digital output: FC1,…,FC12, FI1, FI2, FI3, FI14,
Digital input: OFC, FCL1. FCL2, FCL3, FCL4, OFC1, …, OFC12
Analogue input: dP1, dP2, dP3, dP4, SP1, SP2, SP3, SP4
Analogue output: FC1, FC2, FC3, FC4, DF1, …, DF12
Alarms: AF1, …, AF12, A50, A51, A52, A53, A54

F01-Condensation regulation type	**0=OFF** means that the fans will not be managed **1= ON** means that the fans are always ON. They are switched OFF only when the unit is OFF; this setting does not work for the analogue output **2=ON_C** means that if the circuit is operating, the relative fans are switched on. The fans will be switched off **F03 seconds** after the cut off of the last compressor in the circuit. **3=Prb** means that the fans are managed in relation to the pressure inside the external coil: Note: check parameters **H42 ,ex2 and F10** **4=Ft0** means that the fans are regulated at 2 fixed speeds based on the external temperature. If **Tout<F22**, speed is set to **F20**. If **Tout>F22+F23**, speed is set to **F21** Note: it works only with **F10=yes** **5=TcP** means that the fans are managed like **F01=Prb** but the adjustment (parameters **FCs**, **FCd**, …) of the parameters has to be in temperature; the software will translate pressure into temperature (check parameter **o30**)

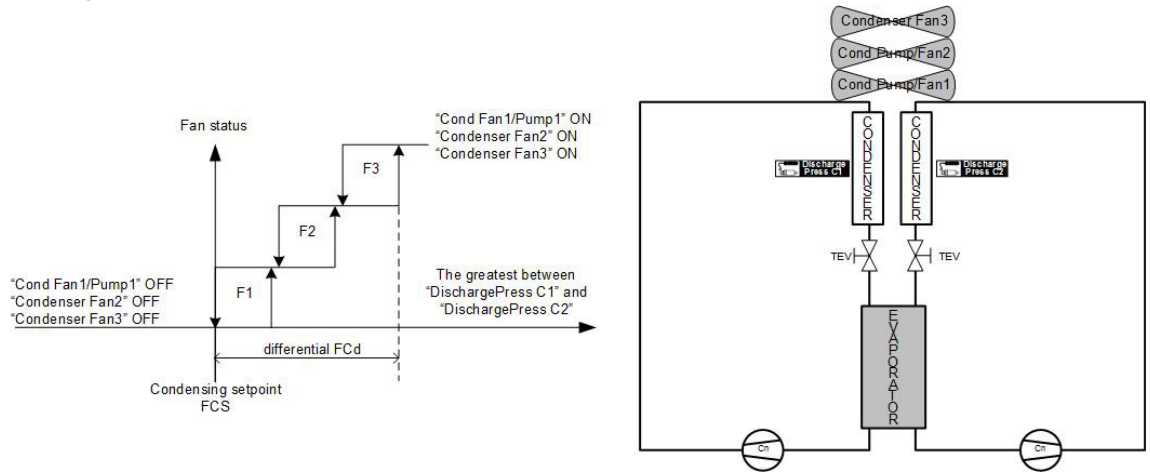
Fan requests:

Parameter: **F02, F03, FC, FCD, FCI, FCd, FHS, FHD, FHI, FHd**

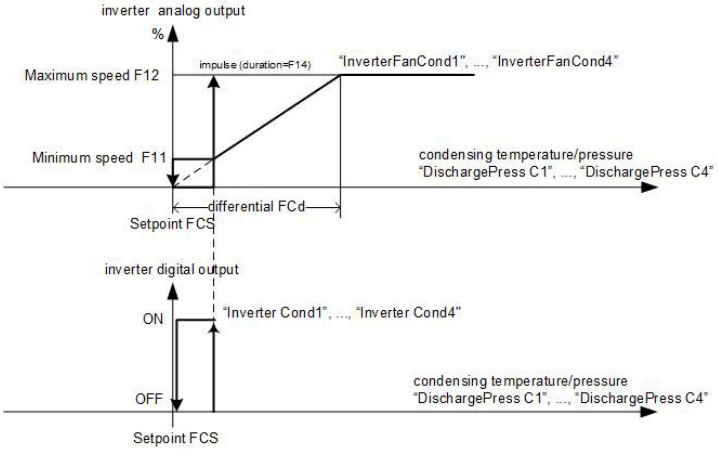
The request by the fan is calculated with PID logic. This request can be used with a stepless fan or spread to ON-OFF fans.
Below is one example of how the fan request is managed in both the cases
Note: it works for **F01=Prb or TcP**



F11=YES



F10=YES

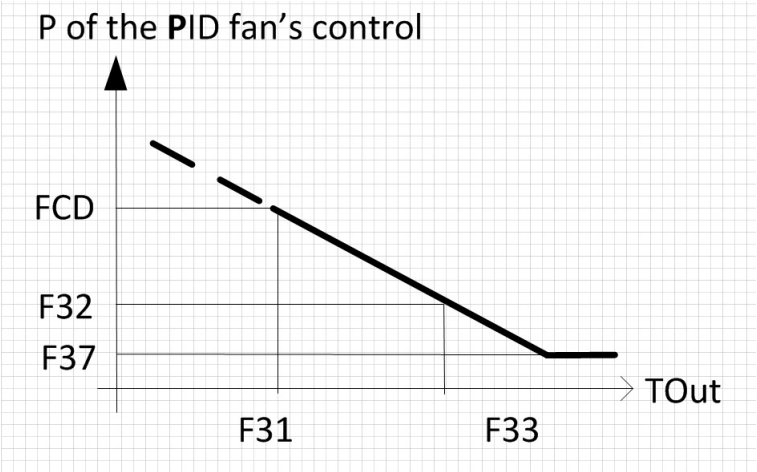


F02- Fan off with compressor OFF	**0=NO** **1=YES** means that the fan is allowed to work only if the relative circuit is switched on Note: it works only for F01=3
F03- Pump/Fan OFF delay from compressor OFF	It's in **seconds** After the circuit cut off, the fan/pump is kept active for **F03** additional **seconds**
FCS-Cooling setpoint	It's in **barG or °C (F01=TcP)** This is the setpoint used for the PID control of the fan in chiller mode. Note: works for **F01=Prb**
FCD-Cooling differential	It's in **barG or °C (F01=TcP)** This is the proportional band of the fan's PID control in chiller mode. Note: works for **F01=Prb**
FCI-Cooling integral time	It's in **seconds** This is the integral part of the fan's PID control in chiller mode. Note: works for **F01=Prb**
FCd-Cooling derivate time	It's in **seconds** This is the derivate part of the fan's PID control in chiller mode. Note: works for **F01=Prb**
FHS-Heating setpoint	It's in **barG or °C (F01=TcP)** This is the setpoint used for the PID control of the fan in heat pump mode. Note: works for **F01=Prb**
FHD-Heating differential	It's in **barG or °C (F01=TcP)** This the proportional band of the fan's PID control in heat pump mode. Note: works for **F01=Prb**
FHI-Heating integral time	It's in **seconds** This is the integral part of the fan's PID control in heat pump mode. Note: works for **F01=Prb**
FHd-Heating derivate time	It's in **seconds** This is the derivate part of the fan's PID control in heat pump mode. Note: works for **F01=Prb**

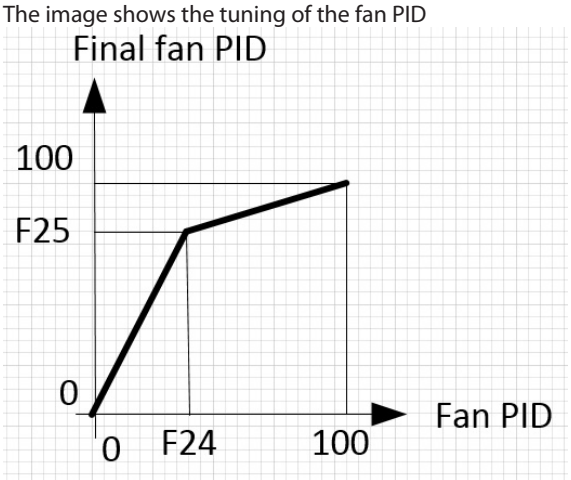
Fan regulation with a variable proportional part:

Parameter: **F31, F32, F33, F34, F35, F36, F37, F24, F25**

The proportional part (FCD or FHD) of the PID regulation for the fan control can be changed linearly:



Functionalities: Enable advanced condenser regulation
Analogue input: Tout

F31- Cooling base out temperature	Check picture above Note: works in cooling mode
F32- Cooling second diff ref	Check picture above Note: works in cooling mode
F33- Cooling second out temp ref	Check picture above Note: works in cooling mode
F34- Heating base out temperature	Check picture above Note: works in heating mode
F35- Heating second diff ref	Check picture above Note: works in heating mode
F36- Heating second out temp ref	Check picture above Note: works in heating mode
F37- Differential minimum value	It's in **barG or °C (F01=TcP)** Defines the minimum value allowed for the proportional band. Note: Check picture above
F24-Shaping X component	It's in % The parameters **F24** and **F25** define the shape of the PID output of the fan. The image shows the tuning of the fan PID 
F25-Shaping Y component	It's in **%** Check Parameter **F24**

Economic setpoint for fan regulation:

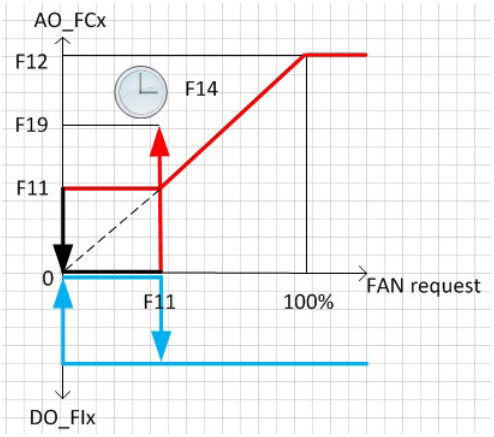
Parameter: **SS1, SS2, SS3, SS4**

Digital input: CSE1, CSE2, CSE3, CSE4

SS1-Second set point enable	**0=NO** **1=YES** means that when the digital input **CSEx** is closed, the "x" external coil gets a new setpoint (**SS2** for cool mode and **SS3** for heat mode)
SS2-Cooling Second set point	It's in **barG or °C (F01=TcP)** Note: Check SS1
SS3-Heating Second set point	It's in **barG or °C (F01=TcP)** Note: Check SS1
SS4- Second set auto dec	It's in **barG or °C (F01=TcP)** When a compressor is at minimum power, the second setpoint becomes **(SS2-SS4)** or (**SS3-SS4**) Note: works only for screw compressor

Stepless regulation of the fan:

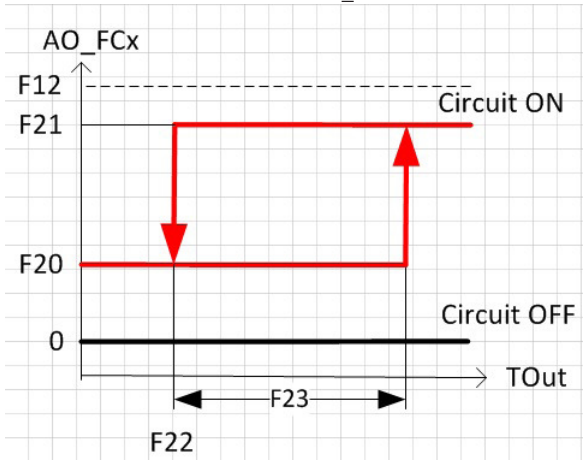
Parameter: **F10, F11, F12, F13, F14, F19, F20, F21, F22, F23**



Note: the pictures above are related to proportional regulation
Note: it works for **F01=Prb**

Digital output: FI1, FI2, FI3, FI14
Digital input: OFC, FCL1. FCL2, FCL3, FCL4
Analogue input: dP1, dP2, dP3, dP4, SP1, SP2, SP3, SP4
Analogue output: FC1, FC2, FC3, FC4,
Alarms: AF1, …, AF12, A50, A51, A52, A53, A54

F10- Inverter enable	**0=NO** **1=YES** means that the analogue outputs **Fcx** are managed
F11- Minimum speed	It's in **%** Defines the minimum speed of the fan **InverterFanCondx** (external coil) Note: see image above
F12- Maximum speed	It's in **%** Defines the maximum speed of the fan **InverterFanCondx** (external coil) Note: see image above
F14- Max fan speed up time at start up	It's in **seconds** Defines the time that the **InverterFanCondx** stays at the maximum speed during the cut in. After that, it will follow the fan's request Note: see image above

F19- Triac impulse on time	It's in **%** Defines the **InverterFanCondx** speed at start up Note: see image above
F20-Fixed speed low	It's in **%** If the external temperature (**AO_Tout**) goes below **F22**, the **InverterFanCondx** is set to **F20**% If the circuit is switched off the **AO_ InverterFanCondx is set to 0%**  Note: It works only for **F01= Fto** Note: there are no differences between either machine mode (heating or cooling)
F21-Fixed speed high	It's in **%** If the external temperature (**AO_Tout**) goes above **F22+F23** , the **InverterFanCondx** is set to **F21 %** Note: It works only for **F01= Fto** Note: there are no differences between either machine mode (heating or cooling)
F22-Tout limit	It's in **°C** Check parameter **F20**
F23-Tout hysteresis	It's in **°C** Check parameter **F21**

Hot gas bypass valve:

Parameter: **Bp0, Bp1**

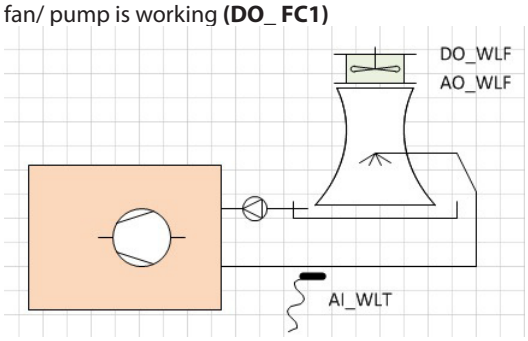
Digital output: FC1, FC2, FC3, FC4
Analogue input: dP1, dP2, dP3, dP4, SP1, SP2, SP3, SP4

Bp0-Pressure set point	It's in **barG** It is related to the external coil's pressure Defines the pressure threshold above which the **DO_FCx** is closed Note: Check parameter **Bp1**
Bp1-pressure differential	It's in **barG** It is related to the external coil's pressure If the pressure goes below **(Bp0-Bp1)** the output **DO_FCx** is opened

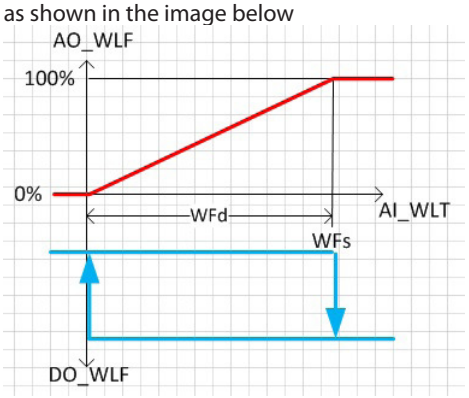
Cooling towers:

Parameter: **WFs, WFd**

The cooling tower works in order to keep the temperature **WLT** below a **WFs** threshold ;
Note: The cooling tower works only if the chiller's condenser fan/ pump is working **(DO_ FC1)**



Functionalities: Enable water loop pump management
Digital output: WLF, FC1
Analogue input: WLF
Analogue output: WLF

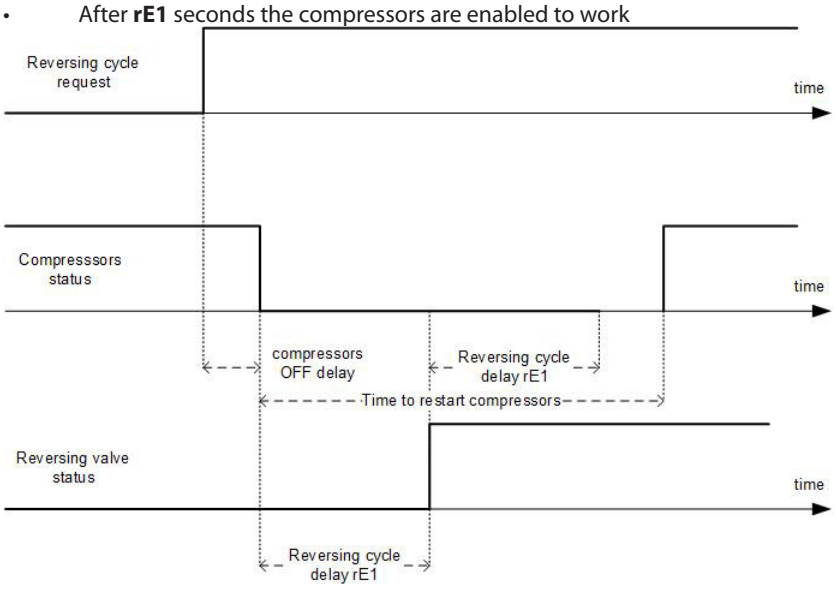
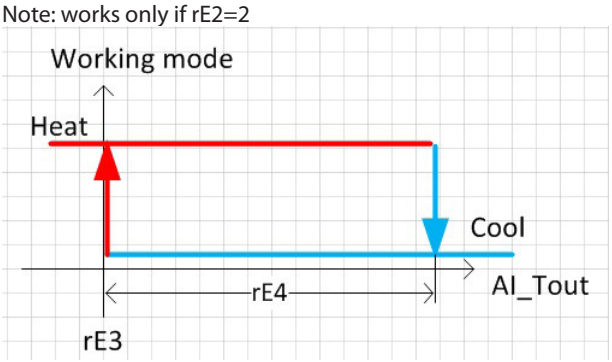
WFs-Water fan setpoint	It's in **°C** The cooling tower is managed based on the water temperature **WLT**. The cooling tower linearly increases the analogue output **AO_WLF** between **WFs-WFd** and **WFs** °C , as shown in the image below 
WFd-Water fan differential	It's in **°C** Note: check parameter **WFs**

Reversing cycle valve (4 ways valve):

Parameter: **rE2, rE1, rE3, rE4**

The working mode of the chiller is defined by parameter **rE2**.
The reversing cycle valve will switch with **rE1** seconds of delay from the cut off of the last compressor running

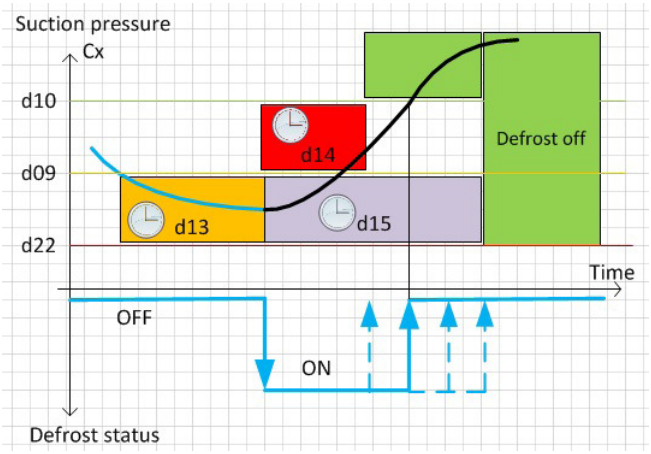
Digital input: HC
Digital output: HC1, HC2, HC3, HC4
Analogue input: Tout

rE2-Changeover from	**0=DI** means that the working mode is defined by Digital Input **HC** **1=UI** means that the working mode is defined by parameter **y03** and the digital input HC. The mismatch between the 2 ways to set the working mode is solved considering that the last request (from DI or from UI) will win. If the DI does not match the working mode, the DI will start to work only after being passed through the actual status **2=Tout** means that the working mode is defined by the probe **Tout** (check parameters **rE3** and **rE4**)
rE1-Change over delay	It's in **seconds** **rE1=0** means that the compressors are not switched off for switching the 4 way valve **rE1<>0** means that the working mode is changed following 3 steps: • Switch off all the running compressors • After **rE1** seconds, the 4-way valve is switched • After **rE1** seconds the compressors are enabled to work 
rE3-Changeover setpoint	It's in **°C** If the outside temperature (**AI_Tout**) goes below **rE3 °C** the working mode becomes heating Note: works only if rE2=2 
rE4-Changeover differential	It's in **°C** If the outside temperature (**AI_Tout**) goes above **rE3+ rE4 °C** the working mode becomes cooling Note: works only if rE2=2

Defrost:

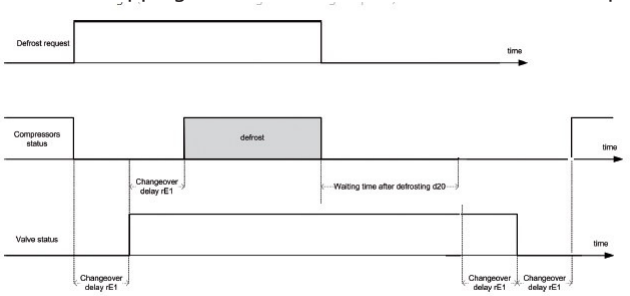
Parameter: d01, d02, d03, d04, d05, d06, d07, d09, d10, d11, d12, d13, d14, d15, d16, d20, d22, d23, d24, d25, d26

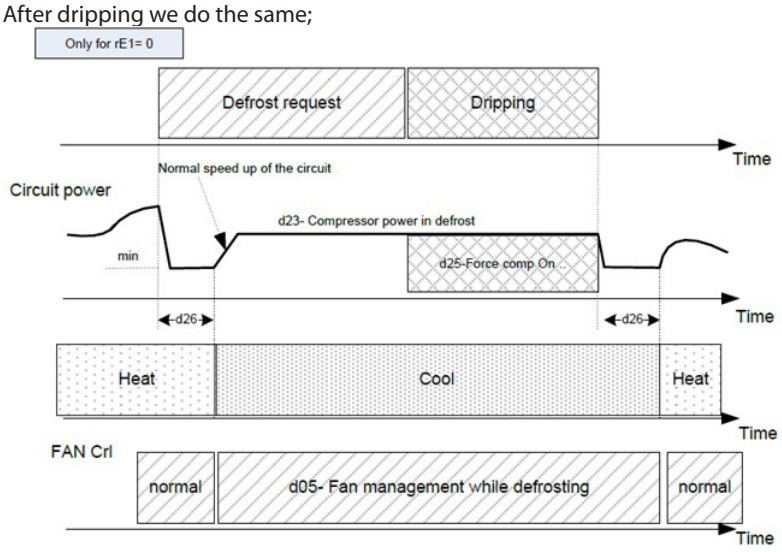
The circuit suction pressure detects the condition to defrost the circuit;



Digital input: DEF
Digital output: H1, H2, H3,H4
Analogue input: dP1, dP2, dP3, dP4, SP1, SP2, SP3, SP4, Tout
Warning: A13

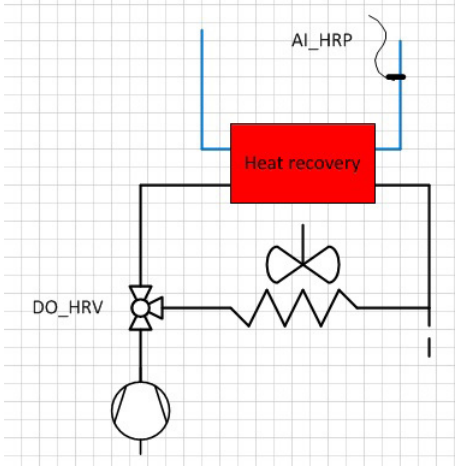
d01-Defrost enable	**0=NO: Disable** **1=All:** means that the defrost is performed across circuits at once when at least one circuit requires defrosting **2=Ind** means that the defrost is performed only in the circuits which have to be defrosted and the other circuits are switched off
d02-Defrost type	**0=SpEp:** means that the defrost is detected and stopped in relation to the probe defined by parameter **d24** **1=SpEt:** means that the defrost is detected in relation to the probe defined by parameter d24 and the defrost is stopped only after **d15** seconds (Defrost maximum time)
d03-Defrost digital input config	**0=NO:** Digital input **DEF** does not work **1=Strt:** If the **DI_DEF** is closed, the defrost is performed **(d16** can delay the start) **2=End:** If the **DI_DEF** is opened, the defrost is stopped; If the **DI_DEF** is closed, the defrost starts or stops according to the manner selected with **d02** **3= Strt :** The digital input is used to start defrosting (when toggled from closed to open) and to stop defrosting (when toggled from open to closed)
d04-Heaters ON while defrosting	**0=NO:** **1=Strt:** This means that the heaters are switched on during defrosting (in order to reduce the cold effect of the defrosting action)
d05-Fan management while defrosting	**0=OFF:** It means that during defrosting and the dripping phase the fan is switched off **1=EqUA:** It means that during defrosting the fan works in cooling mode **1=ONdr:** It means that during defrosting the fans are switched off and during the dripping phase the fan is switched on 100%
d06-Fan only defrosting	It's in **°C** **0:** It means that this function is disabled **>0**: It means that the defrost is only performed with the fan when the external temperature is **Tout>d06**; in this case, when defrosting is detected the compressors are switched OFF and the fan is set to 100%. Note: the start and stop conditions and the support heaters management stay unchanged
d07-Enable LowP alarm in defrost	**0=NO:** **1=Yes**

d09-Defrost start setpoint	It's in **bar G** If the pressure **dPx** stays below **d09** for more than **d13** seconds, defrosting is detected Note: works for **d02<>1**
d10-Defrost stop setpoint	It's in **bar G** If the pressure **dPx** goes above **d10** defrosting is completed Note: it works for **d02<>1**and **d24<>1**
d11-Combined defrost temp start setpoint	It's in **°C** If the temperature **TCDx** stays below **d11** for more than **d13** seconds, defrosting is detected Note: it works for **d02<>0**
d12-Combined defrost temp stop setpoint	It's in **°C** If the temperature **TCDx** goes above **d12** defrosting is completed Note: it works for **d02<>0** and **d24<>1**
d13-Defrost temp start verifying time	It's in **seconds** Check parameters **d09** and **d11** Counting is stopped but not reset when the temperature/pressure goes beyond that limit **d11/d09**. Counter is reset at power ON or when the defrost cycle starts.
d14-Defrost minimum time	It's in **sec** Defrosting can be switched off only after **d14** seconds.
d15-Defrost maximum time	It's in **minutes** This represents the maximum duration for defrosting beyond which defrosting is stopped and the **A13** warning occurs. This warning is reset after a correct defrost cycle. Note: If **d02=1**, parameter **d15** defines the duration of defrosting.
d16-Minimum time to defrost same circuit	It's in **minutes** Defines the minimum wait time to defrost the same circuit Note: Ignored if the request to defrost comes from a digital input
d20-Waiting time after defrosting	It's in **seconds** Defines the dripping time after the coil is defrosted: also check parameter **d25**  Fig 38_[Defrost - Waiting time after defrosting]
d21-Start verifying time	It's in **seconds** Used to force defrosting to start If the pressure is maintained for **d21** seconds below **d22** the defrost will start
d22-Start setpoint	It's in **bar** Used to force defrosting to start If the pressure is maintained for **d21** seconds below **d22** the defrost will start
d23-Compressor power in defrost	It's in **°C** Defines the circuit power to be used during defrosting
d24-Defrost probe	**0=DPX**: The defrosting status depends on the **dPx** sensor (check parameters **d02, d09, d10)** **1=TCDX:** The defrosting status depends on the **TCDx** sensor (check parameters **d02, d11, d12)** **2=both**: The defrosting status depends on the **TCDx and dPx** sensors (check parameters **d02, d09, d10, d11, d11)**
d25-Force compressor ON during dripping	**0=NO:** **1=Yes:** This means that the compressor is kept running during the dripping phase

d26-Waiting time for reducing	It's in **seconds** It works only with rE1=0 and for stepless screw compressors. When defrosting is detected, the compressor is set to the minimum (the decrement valve is held open) starting from the detection of defrosting we wait d26 seconds before going into cooling mode; After dripping we do the same; 

Heat recovery:

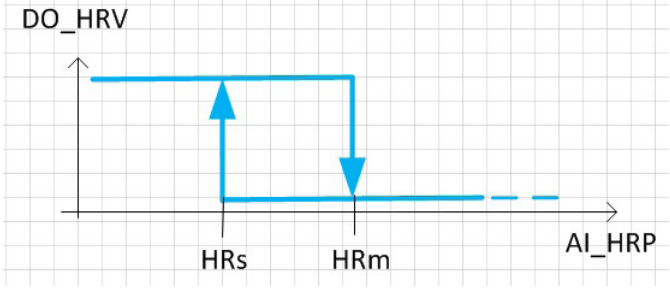
Parameter: **HRs, HRm, HRc, HRn, HRt, HRo**



Functionalities: Enable heat recovery management
Digital input: HRE, HRD
Digital output: HRV
Analogue input: HRP
Alarm: A9A

Note: sensor **A9A**'s alarm will switch off the heat recovery after **HRc** seconds

HRs-Heat Recovery Set	It's in **°C** If the temperature **HRP** goes below **HRs** °C, the digital output **HRV** is closed Note: if the digital input **HRE**= close the digital output **HRV** is closed too Note: if the parameter **HRn=0** or **DI_HRD=Close** the heat recovery is disabled

HRm-Heat Recovery Max temperature	It's in **°C** If the temperature **HRP** goes above **HRm** °C, the digital output **HRV** opens after **HRc** seconds  Note: If the temperature **HRP** goes above **HRm** °C, the fan can work immediately
HRc-Heat Recovery Cut Out Delay	It's in **seconds** Check parameter **HRm**
HRn-Heat Recovery Max Cycles per Hours	**HRn=0**: this means that this function is disabled **HRn>0:** Defines the maximum number of times that recovery can start per hour
HRt-Heat Recovery fan off	**0=NO:** this means that there are not changes in the fan management **1=Yes:** This means that the fan is switched off if the heat recovery is working
HRo-Heat Recovery Cond set Offset	It's in **bar** When the heat recovery is working, the fan's setpoint is increased by **HRo** bar ; Note: it works only in cooling mode

Superheat:

Parameter: **V10, V20, ex1, ex2, ex3, N19, N04, N05, N20, N22, N10, N09, N11, N32, N33, N37, N38, N18, N17, N15, N21, o56, o61, o10**

The software manages a number of valves equal to the number of circuits (H1 * H2).
Are available internal valves driver (for MCX152V or MCX061V) or the connection trough CANBUS with the Danfoss EXD driver.
Note: the superheat algorithm is the same in both cases

Functionalities:
- **Enable EEV with EXD device:**
- **Enable EEV with: Internal Superheat Control Circuit 1**
- **Enable EEV with: Internal Superheat Control Circuit 2**
- **Enable Internal Valve(s) Driver**

Analogue input: SP1, sT1, SP2, St2
Analogue output: SH1, SH2
Alarms: E10,…,E49

Note: inputs and outputs are related to the internal valves

v10-Valve 1 type	**0=ETS 25** **1= ETS 50** **2= ETS 100** **3= ETS 250** **4= ETS 400** **5=Custom** **6=UKV** This only works for MCX152V or MCX061V Defines the type of valve that will be used. With **v10 =5**, the valve's drive setting is configured by editing the file CustomValveParameters.c "inside the BIN folder.

v20-Valve 2 type	Check parameter **v10**
bAt-Enable battery check	**0=No** **1= Yes:** if the voltage of the battery goes below **12** V, alarm **E18 EEV1 battery low** is generated Note: this only works for MCXxxV,
ex1-First EEV add. Offset	**ex1= 0:** the EXD drivers **are not managed** **ex1<> 0**: Defines the CANBUS address of the first EXD driver; the CAN address of the other EXD drivers, if any, must be consecutive to the first and without gaps. Note: Refer to the specific document on how to set the CAN address on the EXD drivers; we suggest setting ex1 to 20 as it is the default address of the EXD drivers.
ex2-Define suction pressure source	**0=MCX** means that evaporator pressure is read from an MCX analogue input **1= EXD** means that evaporator pressure is read through CANBUS, from the analogue input of the EXD Note: check parameter **H42**
ex3-Number of EEV per circuit	**ex3=1** means that there is 1 valve per circuit **ex3=2** means that there are 2 valves per circuit Note: in case of **ex3**=2 and **ex2**=1 the suction pressure is read from the first driver Note: **ex3**=2 works only with EXD drivers, in case of 2 circuits the first 2 drivers are in the circuit 1
N19-Damping of amplification factor N04	This setting damps the normal amplification Kp, but only just around the reference value. A setting of 0.5 will reduce the KP value by half. The value should only be changed by specially trained staff.
N04-P Amplification factor Kp	If the Kp value is reduced the regulation becomes slower.
N05-Integration time Tn	If the Tn value is increased the regulation becomes slower.
N20-Amplification factor for the SH	This setting determines the valve's opening degree as a function of the change in evaporating pressure. An increase of the evaporating pressure will result in a reduced degree of opening. When there is a drop in the low-pressure thermostat during startup, the value must be raised a bit. If there is pendling during startup, the value must be reduced a little. The value should only be changed by specially trained staff.
N22-Min superheat ref per load under 10%	The value must be smaller than "N10"
N10-Min superheat ref	Warning! Due to the risk of liquid flow the setting should not be lower than approx. 2-4 K.
N09-Max superheat ref	
N11-MOP point in press (bar G)	Measured in **bar G**
N32-Max valve opening degree	The valve's opening degree can be limited. The value is set in %
N33-Min valve opening degree	The valve's opening degree can be limited. The value is set in %
N37-Number of steps	Number of steps from 0% to 100% open (User-defined valve, n03 =5) (Automatic setting when valve is selected in n03). Note: Max. steps (100 to 9990 steps)
N38-Number of steps per second	Spindle stroke speed (number of steps per second) (Automatic setting when valve is selected in n03). Note: Steps/sec (5 to 300 step/sec)
N18-Stability factor for superheat control	A higher value will allow the control function a greater fluctuation of superheat before the reference is changed. The value should only be changed by specially trained staff.
N17-Signal safety during start-up	The control function uses the value as start value for the valve's opening degree at each thermostat cut-in. The controller continuously calculates new values by adaptive control. The value should only be changed by specially trained staff.
N15-Start-up time for safety signal	If the controller does not obtain a reliable signal within this period of time, the controller will try to establish a stable signal in other ways. (Too high a value may result in a flooded evaporator). The value should only be changed by specially trained staff.
N21-Definition of superheat control mode	0: The superheat reserence is N10 1: Lowest permissible superheat (MSS). Adaptive regulation. 2: Load-defined superheat. The reference is established based on the line formed by the three points: N09, N10 and N22.
O56-Control type	**1=Nor** :normal control (single loop) **2=Inr**: inner loop regulation and S4 temperature less T0 (double loop) Note: After o56 is changed, the controller must be switched off and powered up again.

O61-Control mode	**1=AnIn**: The controller receives signals from another controller and must control the valve's degree of opening. **2=SH:** Superheat regulation.
O10-External signal type	1 Only used if **o61** is set to 1. Definition of the signal's range. **0= No signal** **1= 0-20 mA** **2= 4-20 mA** **3= 0-10 V** **4= 1-5 V** Note**:** (At the lower value the valve will be closed. At the upper value the value will be fully open. There is a linear relationship between the signal and the opening degree. The height of the valve is not taken into account.).

Input output expansion module:

Parameter: **XCn**

It is possible to use only one additional MCX as IO expansion module, the connection is through CANBUS.
The MCX when not programmed (as it out of the box) is ready to be used as an expansion module.
By adjusting parameter **XCn** the software is ready to get connection

Alarms: Cn

XCn-Expansion can address	**The software looks for input output expansion module on the CANBUS address XCn**

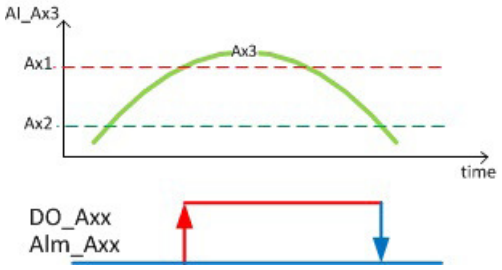
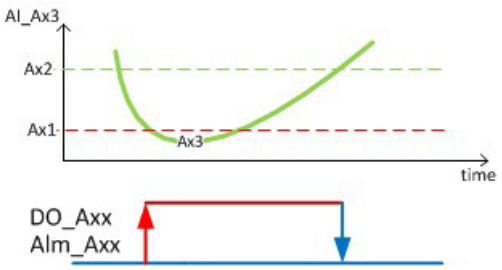
Auxiliary alarms:

Parameter: **a11, a21, a31, a41, a12, a22, a32, a42, a13, a23, a33, a43, a 14, a24, a34, a44**

Functionalities:
- **Enable auxiliary alarms from analogue input**
- **Disable the alarm of the auxiliary alarms**

Analogue input: Ax1, Ax2, Ax3, Ax4
Digital input: All
Digital output: Ax1, Ax2, Ax3, Ax4
Alarms : Ax1, Ax2, Ax3, Ax4

Note**:** the action of the alarm has to be defined in the alarm tab
Note: with the **"Disable the alarm of the auxiliary alarms" functionality** it is possible to disable the alarms but keep the action of the alarms

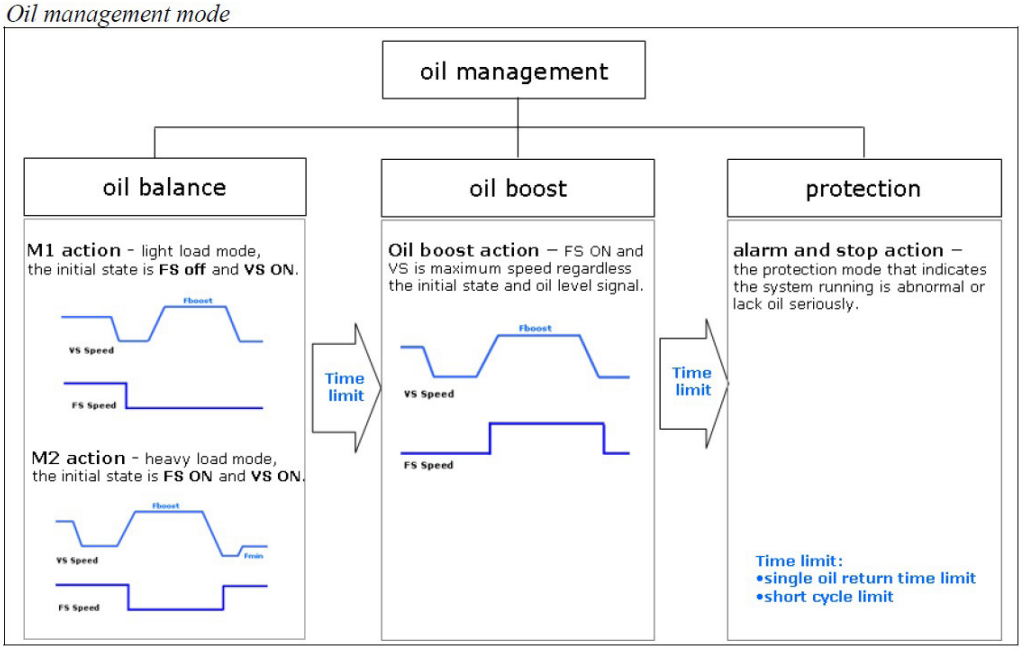
a11,a21, a31, a41- Aux alarm x cut-in	
a12, a22, a32, a42- Aux alarm x cut-out	
a13, a23, a33, a43- Aux alarm x AI selection	Defines the analogue input to detect the auxiliary alarm. **a13=SPP** means analogue input **ax1** **a13=AI1** means analogue input 1
a14, a24, a34, a44- Aux alarm x DI selection	Defines the digital input to detect the auxiliary alarm. **a14=SPP** means digital input **AX1** **a13=AI1** means analogue input 1

Oil Alarm Tandem:

Parameter: **BME, BST, TD1, TD2, TD3, TD4, ADO, BOF, BFR**

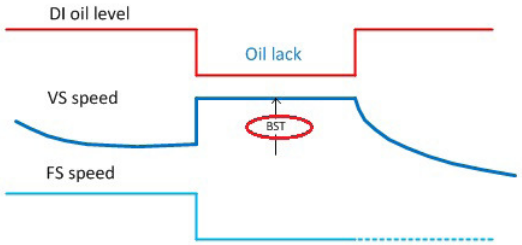
- Scenarios: On-OFF and variable speed (VS) Danfoss tandem compressors
- Purpose: recover oil from ON-OFF compressor (Balancing mode) or from the pipes line (Boost mode)

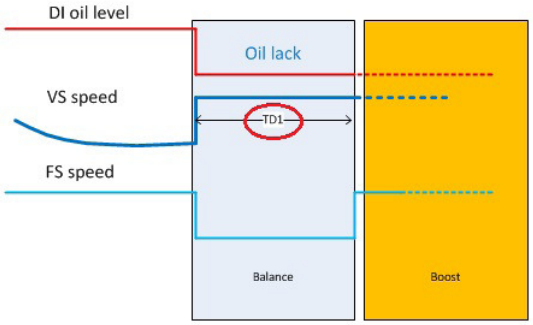
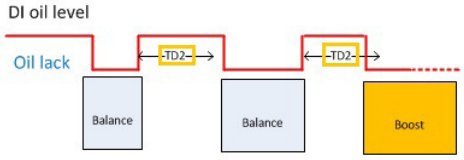
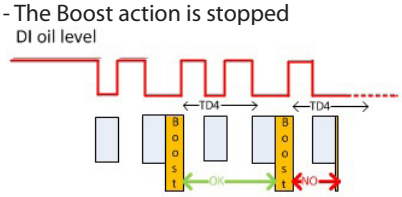
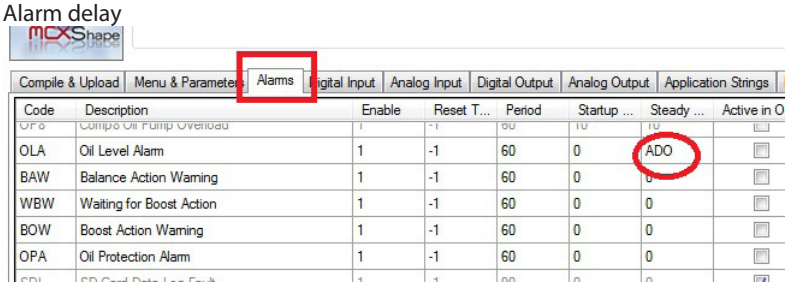
Oil management mode



- **During the Balance action the 'BAW_Balance Action Warning' warning is turned on**
- **During the Boost action the 'BOW_Boost Action Warning' warning is turned on**

Functionalities: Oil Alarm Tandem Control
Digital input: LEV
Digital output: C1, C2
Analogue output: C1
Alarms: OLA, BAW, WBW, BOW, OPA

OME-Oil Manager Enable	- OME=yes means that the logic is enabled
BST-Boost action speed	Defines the speed of the inverter compressor during the logic in balance and boost action, in both the cases 

TD1-Maximum single oil Balance action time	Balance Action can take at the maximum **TD1** minutes, if it will take more time, the Boost action will be turned on 
TD2-Interval after stop Balance action	**TD2** defines a minimum time in between two Balance action, if the oil lack comes sooner of **TD2** the software will perform a Boost action 
TD3-Maximum single oil Boost action time	Boost Action can take at the maximum **TD3** minutes, if it will take more time: - "OPA-Oil protection" alarm is generated The Boost action is stopped
TD4-Interval after stop Boost action	**TD4** defines a minimum time in between two Boost actions, if it will take less time: - "OPA-Oil protection" alarm is generated - The Boost action is stopped 
ADO-Start Delay Oil level alarm	Alarm delay 
BOF-Boost action offset	Defines the minimum temperature gap between the reference and water temperature which allows to start the Boost action, if the gap is smaller than the BOF: - "WBW - waiting for boost action" warning is generated - The boost action is frozen (not started) The boost action will start as soon the temperature gap will be bigger than "BOF - Boost action offset".
BFR- Stop free cooling on boost action	Defines if free cooling is performed during the Boost action

Oil pump of the compressor:

Parameter: **OPE, OPO, OT1, OT2**

Oil pump is used to push oil inside the compressors.
The **DI_ OPx** switches off the oil pump **OPx**

Functionalities: Enable oil pump
Analogue input: OP1, …, OP8, Sp1, …, Sp4, dP1, …, dP4
Digital output: OP1, …, OP8
Digital input: OP1, …, OP8
Alarm: OP1, …, OP8, A8G, A8H, A8I, A8J, A8K, A8L, A8M, A8N

OPE- Oil Pump Enable	**0=NO: Disable** **1=ON_C:** means that the oil pump **OPx** is switched ON **OT1** seconds before the activation of compressor x Note: An information is shown in the "rolling text" when compressor is delayed **2=Prb** means that oil pumps work as **ON-C** but if the delta pressure **OPx** – **suction pressure** is greater than **OdP+OPO** the **DO_OPx** is switched off. Oil pump starts up again when delta pressure goes below **OdP+OPO** Note: **CX-OILP** information is shown in the "rolling text" when a compressor is delayed 
OPO- Oil Pump Offset	It's in **bar** Check parameters **OPE =Prb**
OT1- Delay compressor from oil pump	It's in **seconds** Check parameters **OPE =ON_C**
OT2- Oil pump min time ON	It's in **minutes** The oil pump has to work at least **OT2** minutes before switching off

Temperature delta of the oil:

Parameter: **OTD, OD1, OD2**

The start of the compressor is delayed up to the temperature of the oil is ok

Functionalities: Enable oil temperature delta control
Analogue input: OT1, …, OT8, Sp1, …, Sp4, dP1, …, dP4
Alarm: A8O, A8P, A8Q, A8R, A8S, A8T, A8U, A8V

OTD- Enable oil temperature delta control	**0=NO: Disable** **1=Yes:** means that the start of the compressor is delayed up to the delta temperature **OTx – T (suction pressure)** goes above **OD1 °C.** The maximum delay is **OD2** seconds Note: **CX-OTD** information is shown in the "rolling text" when a compressor is delayed
OD1- Oil Temperature Delta	It's in **°C** Check parameters **OTD =Yes**
OD2- Delta Control Max Time	It's in **minutes** Check parameters **OTD =Yes**

How to set the power request remotely:

Parameter: **RPE**

- Set parameter RPE <> **NO**
- Write 1 to the Modbus address17501 (ADU), at least 1 time per minute (it is used to check the connection)
- Write power request (0-1000) to the address 17502

Functionalities: Enable remote power demand

RPE - Remote power enable	**0=NO** means that the function is disabled **1= YESA** means that without remote connection, the machine works as **RPE=NO** **2= YESB** means that without a remote connection, the power request of the chiller goes to zero

How to log data on an SD card:

Parameter: **ENL**

Only available for SD-card-compatible MCXs (MCX152V and MCX061V).

1- It is possible to start/stop data logging through the parameter **ENL_Enable SD Card Log.** If you want to restart the data logger from zero, it is enough to delete the file from the SD card memory.

2- By editing the file **SDCardLogDefines.c** (in the BIN folder), it is possible to define the variables which will be stored in the SD card

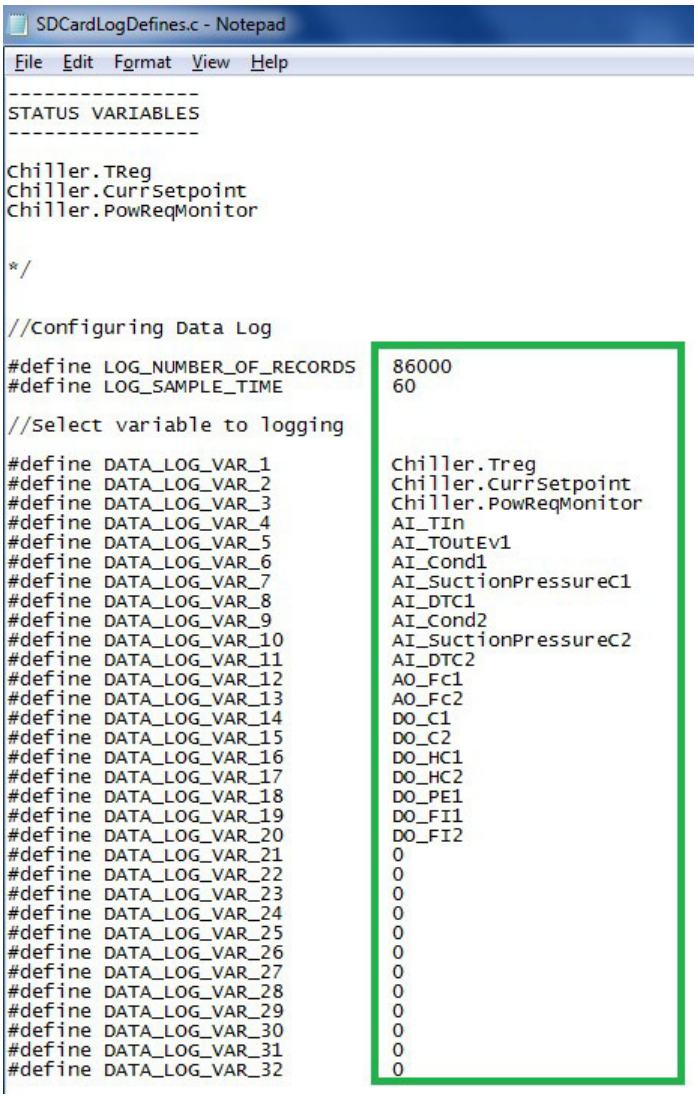
3- The variables available are reported in the first part of the SDCardLogDefines.c file, consisting mainly of all the input/output functions and a few status variables. If you are going to use variables not traced in the file, contact MCX Support

4- In the second part of the .c file, the following can be edited:

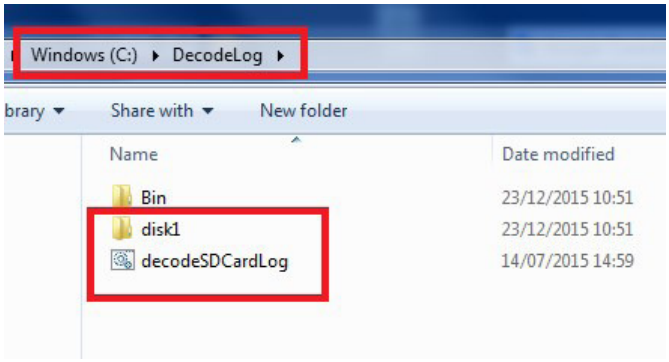
a. **The number of records:** when the records reach this number, the oldest record will be overwritten by the most recent (circular file)

b. **Sample time**: the time between two records

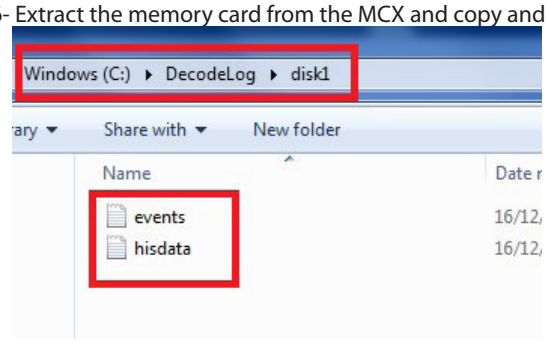
c. **The variables to log**: the maximum number of variables is 32, and the variable's name must be the same as the first part of the .c file



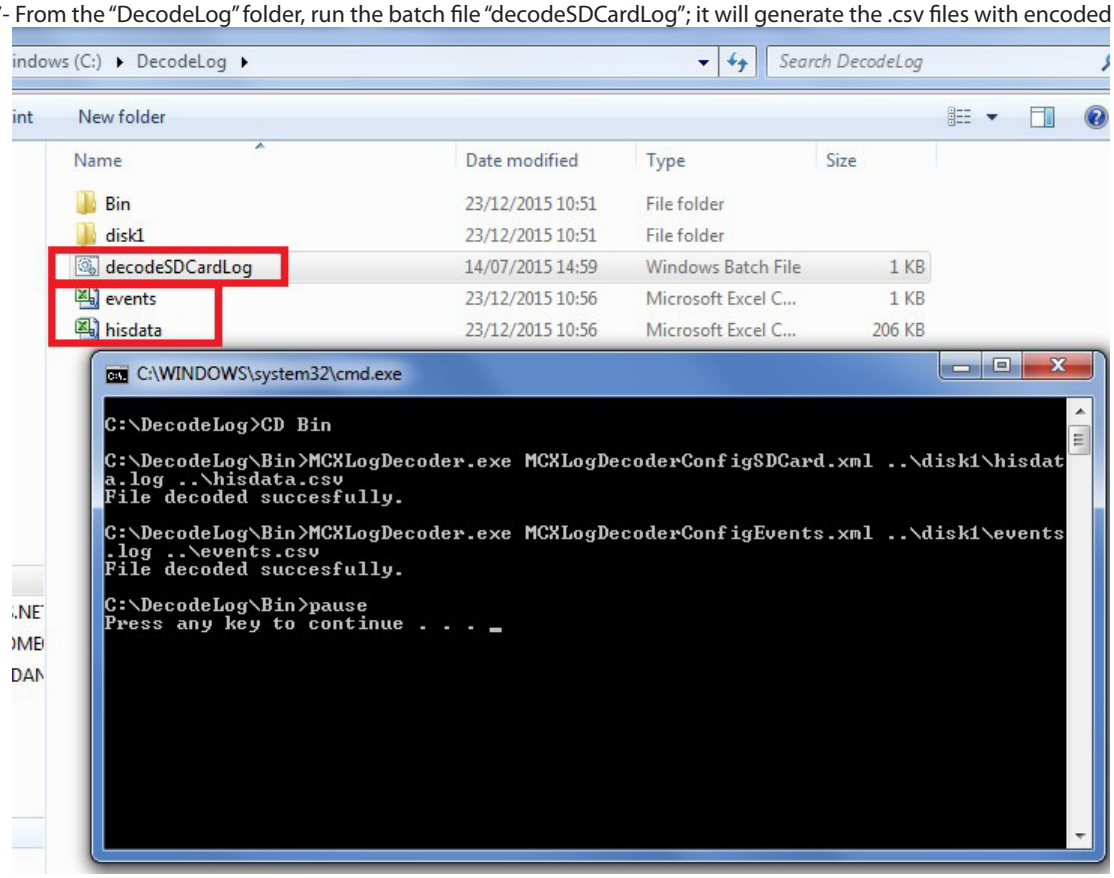
5- To read the files on the SD card using a decode program, download the "DecodeLog" folder available on the MCX site and save it to the C disk



6- Extract the memory card from the MCX and copy and paste the files to the SD card in the "DecodeLog/Disk1" folder



7- From the "DecodeLog" folder, run the batch file "decodeSDCardLog"; it will generate the .csv files with encoded data.



8- Events are recorded in the events.csv file. There are six columns:

a. Event time: the time of the event (start event, stop event, parameters change and RTC change)

b. EventNodeID: the ID of the MCX

c. EventType: a numerical description of the event type

i. -2: Reset of MCX history alarm

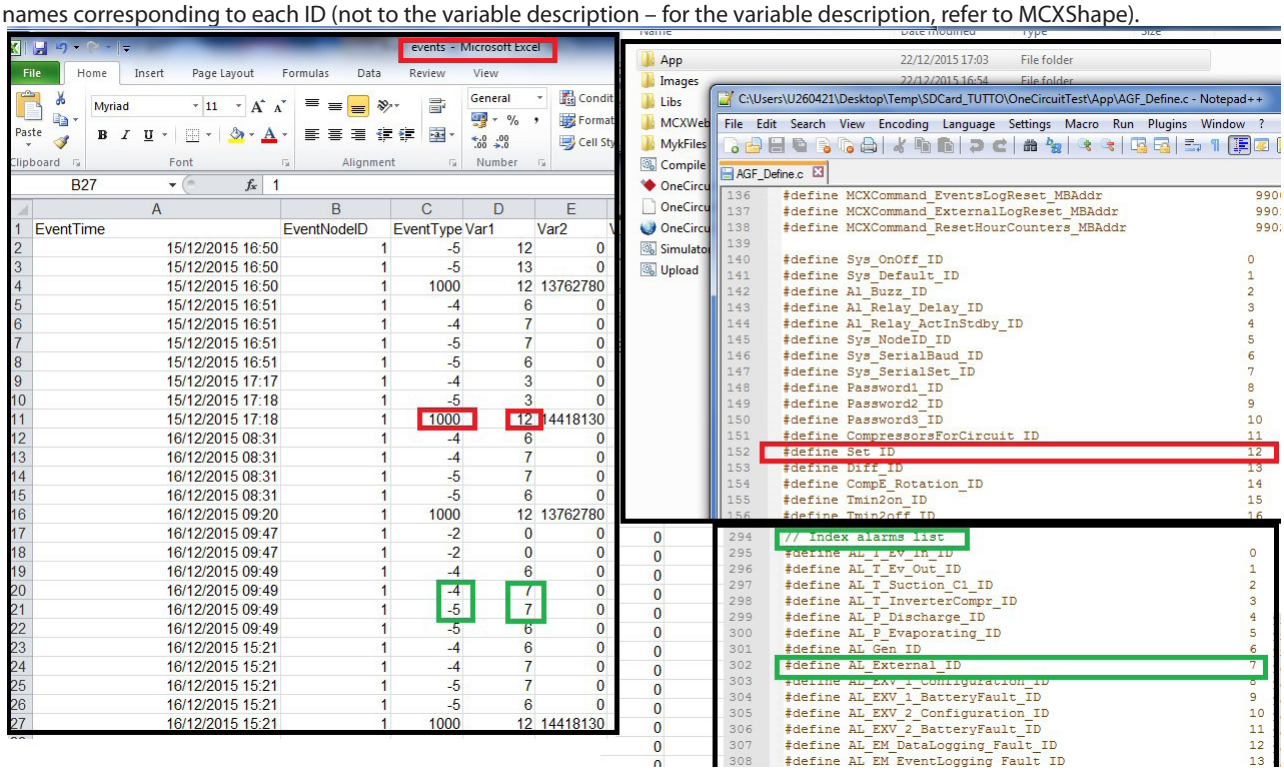
ii. -3: RTC set

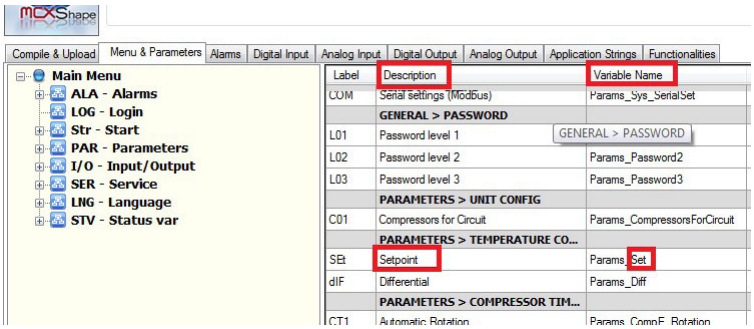
iii. -4: Start alarm

iv. -5: Stop alarm

v. 1000: Parameters change (note: the change can be detected only when it is made through a user interface and not via serial communication)

d. Var1: a numerical description of the variable. To decrypt it, open the "AGFDefine.c" file in the "App" folder of the MCXDesign software. In this file there are two sections with an ID indication: one is for the parameters and the other is for the alarm. If the event type is 1000, refer to the index parameters list; if the event type is -4 or -5, refer to the index alarms list. These lists contain the variable names corresponding to each ID (not to the variable description – for the variable description, refer to MCXShape).





e. Var2: used to record the parameter value before and after the change. This number is a double integer; in the high part there is the new parameter value and in the low part there is the old value.

f. Var3: not used.

Functionalities: Enable SD Card Log

ENL- Enable SD card log	**0=NO** means that the log is stopped **1=YES** means that the log is started Note**:** If you want to restart the data logger from zero, it is enough delating the file into the SD card memory

Commissioning

Parameter: Ort

Overwriting an Analogue input: using the Modbus, write value 1 into the "Enable Override" register first, then it is possible to write the "Override input value" register.

MCX analogue input	**Enable MB register(ADU) 0=Disable, 1= enable**	**Input MB register(ADU)** (0-1000)
1	21537	1005
2	21538	1006
….		
26	21562	1030

Overwriting an Analogue output: Using Modbus, write the value 1 into the "Enable Override" register first, then it will be possible to write the "Override input value" into the register.

MCX analogue output	**Enable MB register(ADU) 0=Disable, 1= enable**	**Input MB register(ADU)** (0-1000)
1	21505	1037
2	21506	1038
….		
12	21516	1048

Overwriting of Digital input: write through Modbus the value 1 to the "Enable Override" register first, then it becomes possible to write the relative bit of "Override input value" into the register.

MCX digital input	**Enable MB register(ADU) 0=Disable, 1= enable**	**Input MB register(ADU)**
1	21601	21637. Bit08
2	21602	21637. Bit09
….	…	…
8	21608	21637. Bit15
9	21609	21637. Bit00
….	…	…
16	21616	21637. Bit07
17	21617	21638. Bit08
24	21624	21638. Bit15
25	21625	21638. Bit00
…	…	…
32	21632	21628.Bit 07

Overwriting of Digital output: write through Modbus the value 1 to the "Enable Override" register first, then it becomes possible to write the relative bit of the "Override input value" into the register.

MCX digital output	**Enable MB register(ADU) 0=Disable, 1= enable**	**Input MB register(ADU)**
1	21569	21635. Bit08
2	21570	21635. Bit09
….	…	…
8	21576	21635. Bit15
9	21577	21635. Bit00
….	…	…
16	21584	21635. Bit07
17	21585	21636. Bit08
24	21592	21636. Bit15
25	21593	21636. Bit00
…	…	…
32	21600	21636.Bit 07

Overwriting of functions used in the analogue input: write through Modbus the value 1 to the "Enable Override" register first, then it becomes possible to write the relative "Override input value" register.

Functions for analogue inputs Note: the order follows the list of functions into MCXS	**Enable MB register(ADU) 0=Disable, 1= enable**	**Input MB register(ADU)** (0-1000)
TIN-Tin evaporator	20002	18502
T01-Tout evaporator 1	20003	18503
….	…	…
WPR-Water pressure	21093	18593

Overwriting of functions used in the digital input: use Modbus to write the value 1 into the "Enable Override" register first, then it becomes possible to write the relative "Override input value" into the register.

Functions for digital inputs Note: the order follows the list of functions into MCXS	**Enable MB register(ADU) 0=Disable, 1= enable**	**Input MB register(ADU)** (0-1000)
OC- Comp overload	21002	17502
OCL1- Comp overload C1	21003	17503
….	…	…

Functionalities: Enable override of inputs and outputs

Functionalities: Enable commissioning form

Ort- Override IO Timeout	It's in **seconds** Defines how long the override of inputs and outputs will work Note: zero means disable

Status variables:

The following variable are available through Modbus, they are the states of the software.
The variables which can work as command are set as R/W variable

Software status

Parameter: **A01, …, A19, C01, …, C04, E01, …, E08**

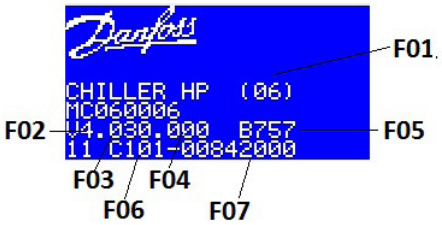
A01- Main command (R/W)	**0:** no meaning, the software reads and sets to zero this variable each loop **1:** writing 1, the buzzer stops **2:** writing 2, the alarms are reset **3:** writing 3, the default parameters are restored **4:** writing 4, the parameter **y01-System On Off** is changed **7:** writing 7, the alarm history are reset **8:** writing 8, heat/cool mode is changed
A02-Alarm notification (R)	**0:** means that there are not alarms **1:** means that there are alarm or warning active **2:** means that buzzer is working
A03-Compressor status (R)	**0:** means that all the compressors are switched off **1:** means that the first compressor is waiting to start **2:** means that a compressor is waiting to start **3:** means that there is at least one compressor switched on
A04-Control setpoint (R)	Is the reference used for regulation
A05-System time (R)	It's in **Seconds** Is the period since the last power ON
A06-Comp inverter (R)	It's in % Is the demand set to the inverter compressor
A07-Pump (R)	0= Off 1= ON
A08-Fun (R)	0= Off 1= ON: at least one fan is switched on
A09-Heaters (R)	0= Off 1= ON: at least one heater is switched on
A10-Remote ON-OFF (R)	0= OFF: the digital input **ONO_ON/OFF** is in OFF 1= ON: the digital input **ONO_ON/OFF** is in ON
A11-Defrost status (R)	0= OFF 1= ON: the defrost is performed
A12-Control probe (R)	This is the value of the sensor used for the regulation; it is compared with the status A04
A13-Request power (R)	It's in % It's the power request for the compressors
A14-Actual power (R)	It's in % It's the power available in the moment; it depends on alarms, temporization, etc.
A15-Hours Counter Saving (R/W)	Writing 1 all the counters are stored in persistent memory Note: the hour counters are usually stored every 20 minutes
A16-Integer error (R)	It's in ‰ It's the integral part of the PID regulation of compressors
A17-Actual control probe (R)	This is the probe used for the regulation of the compressors
A18-Actual setpoint (R)	This is the real setpoint used for the regulation of the compressors Note: the setpoint also considers compensations

A19-Status System(R)	0= Off chiller 1= On chiller
B01-Cooling-Heating(R)	0= Cool 1= Heat
C01-C04 Compressor x Pow(R)	It's in % The screw compressor power is
E01-E08 Compressor x (R)	0= Compressor is switched OFF 1= Compressor is waiting to switch ON 3= Compressor is waiting to switch OFF 4= Compressor is switched ON

Software info

Parameter: **F01, ..., F07**

The information about the software is available in the Service/ Software info menus or through Modbus.



F01-Application ID (R)	This is the software identification
F02-Major (R)	Defines a major change in the software
F03-Minor (R)	Defines a change in the .mcxs file (new parameters etc.)
F04-Patch (R)	Defines a minor change into the logic
F05-Build (R)	Changed whenever compiling takes place
F06-Control File Version (R)	This is equal to the parameter **Par-Parameters version**
F07-Build option (R)	This depends on the compilation of the software; different configurations (functionalities, inputs and outputs) will change a value

Superheat info:

Parameter: **H01, ..., H13**

<table>
<tr><td>H01-Alarm status v1 (R)</td><td>It is a bit map:
Alarm bit pattern:
<table>
<tr><td>bit 0</td><td>(1)</td><td>CAN alarm</td></tr>
<tr><td>bit 1</td><td>(2)</td><td>EKC error</td></tr>
<tr><td>bit 2</td><td>(4)</td><td>S2 error</td></tr>
<tr><td>bit 3</td><td>(8)</td><td>S3 error</td></tr>
<tr><td>bit 4</td><td>(16)</td><td>Pe input error</td></tr>
<tr><td>bit 5</td><td>(32)</td><td>AI input error</td></tr>
<tr><td>bit 6</td><td>(64)</td><td>No refrig selected</td></tr>
<tr><td>bit 7</td><td>(128)</td><td>Reserved</td></tr>
<tr><td>bit 8</td><td>(256)</td><td>Battery low error</td></tr>
<tr><td>bit 9</td><td>(512)</td><td>Can diagnostic error</td></tr>
</table>
Example
. If for example S2 is shorted the S2 alarm will become active and the alarm register will read 4. If the battery voltage monitoring is enabled and the voltage is too low the alarm register will read 256 and so on. If several alarms are active they will be added to each other. So for instance if the EKC error, S2 error, and no refrigerant selected alarms are all active, the alarm register will read 2+4+64=70."</td></tr>
<tr><td>H02-Valve position v1 (R)</td><td>It's in %</td></tr>
<tr><td>H03-Digital input v1 (R)</td><td>This is the switch function to start/stop the regulation
0= Stop
1= Start</td></tr>
<tr><td>H04-Analogue input v1 (R)</td><td>It's in mA
This is the pressure transmitter</td></tr>
<tr><td>H05-S2 Temperature v1 (R)</td><td>It's in °C
It's the evaporator outlet temperature</td></tr>
<tr><td>H06-Superheat v1 (R)</td><td>It's in °C</td></tr>
<tr><td>H07-Superheat reference v1 (R)</td><td>It's in °C</td></tr>
<tr><td>H08-Pe pressure v1 (R)</td><td>It's in bar
This is the evaporator pressure</td></tr>
<tr><td>H09-Te temperature v1 (R)</td><td>It's in °C
This is the evaporator's temperature calculated from the evaporator's pressure</td></tr>
<tr><td>H10-S4 temperature v1 (R)</td><td>It's in °C
This is a sensor for measuring air temperature</td></tr>
<tr><td>H11-Manual mode v1 (R)</td><td>0= valve is in normal operation
1= valve is in manual mode</td></tr>
<tr><td>H12-Manual valve position v1 (R)</td><td>It's in %</td></tr>
<tr><td>H13-Main switch v1 (R)</td><td>0= Stop
1= Start</td></tr>
</table>