UNI-PRO

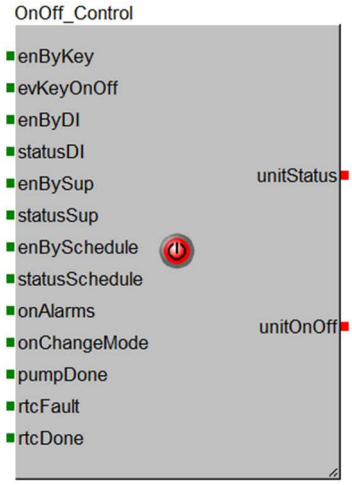
DEVELOPMENT ENVIRONMENT FOR PROGRAMMABLE CONTROLLERS

APPLICATION BLOCKS LIBRARIES MANUAL FOR CHILLERS

CODE 114UPROCBE13

SUMMARY

1. ABL n°1 – Unit ON/OFF management



Manages the on/off procedure of the unit with different methods. On the basis of the modality configured, unit ON only takes place if all of the switch-on conditions are respected; while the unit goes into the OFF status as soon as one of these conditions is missing. In this case, the unit goes into the corresponding OFF status that determined switch-off.

The On/Off status from key has priority with respect to the others. This status is that which determines unit switch-on. Until the condition from key (if *enByKey=1* enabled) has been verified, the unit cannot switch-on and consequently none of the remaining states can be reached.

On/off methods:

1) From **key** (function enabled from the *enByKey* input)
   Switch-on: activate the *evKeyOnOff* event from value 0 to value 1
   Switch-off: activate the *evKeyOnOff* event from value 1 to value 0

2) From **digital input** (function enabled from the *enByDI* input)
   Switch-on: if the value of the On/Off digital contact is "1" switch-on is allowed.
   Switch-off: if the value of the On/Off digital contact is "0" the unit switches off.

3) From **supervisor** (function enabled from the *enBySup* input)
   Switch-on: if the supervisor status is set at "1", switch-on is allowed. Switch-off: if the supervisor status is set at "0", the unit switches off.

4) From **schedule timer** (function enabled from the *enBySchedule* input)
   Switch-on: if the enabling status is set at "1", switch-on is allowed. Switch-off: if the enabling status is set at "0", the unit switches off.

5) From **alarm** (*onAlarms*) input; the unit goes to OFF status, caused buy alarms.
   In order to use this function, all alarms must be connected (eventually in OR) for which the unit must be switched-off. If the *onAlarms* input always remains at zero, the OFF status from alarm can never be reached.

6) From **automatic change-over** (*onChangeMode* input)
   Can only be reaches with machines in ON mode. This state makes the unit switch-off and on automatically for summer/winter functioning mode changeover.

7) From **discharged RTC** (*rtcFault* input)
When the unit switches-on it tests the availability of the system clock. If this is enabled and is in alarm conditions (condition linked to *rtcFault=1* input) it offers the possibility of intercepting the output status (*unitStatus*) and condition it to a particular user management. This status is identical to an *OFF status caused by clock in error conditions*. To release the unit and switch it on, an event must be supplied at the *rtcDone* input. If the RTC alarm returns, the unit goes into switch-on mode, if the necessary conditions are not present.

INPUTS

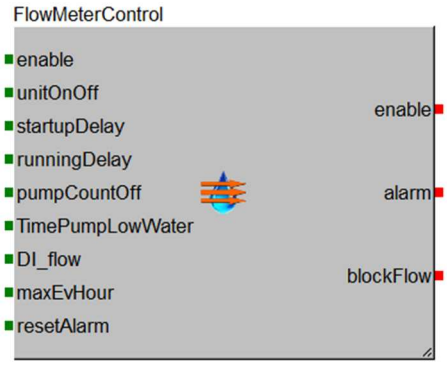
Name	Type	Min.	Max.	Def.	Description
enByKey	CJ_BIT	0	1	0	Enabling ON/OFF status from key 0: disabled, 1: enabled
evKeyOnOff	CJ_BIT	0	1	0	Switch-on/off event from key - If passing from 0 to 1 switch-on request - If passing from 1 to 0 switch-off request
enByDI	CJ_BIT	0	1	0	Enabling ON/OFF status from digital input 0: disabled, 1: enabled
statusDI	CJ_BIT	0	1	0	Status of the digital input for ON/OFF from digital contact - 0: contact open, switch-off request from DI - 1: contact closed, switch-on request from DI The status interferes in ON/OFF management only if the respective enabling parameter is configured.
enBySup	CJ_BIT	0	1	0	Enabling ON/OFF status from supervisor 0: disabled, 1: enabled
statusSup	CJ_BIT	0	1	0	Supervisor status for ON/OFF from supervisor - 0: status not confirmed, switch-off request from supervisor - 1: status confirmed, switch-on request from supervisor The status interferes in ON/OFF management only if the respective enabling parameter is configured
enBySchedule	CJ_BIT	0	1	0	Enabling ON/OFF status from schedule timer 0: disabled, 1: enabled
statusSchedule	CJ_BIT	0	1	0	Status for ON/OFF from schedule timer - 0: status not confirmed, switch-off request - 1: status confirmed, switch-on request The status interferes in ON/OFF management only if the respective enabling parameter is configured
onAlarms	CJ_BIT	0	1	0	Status for ON/OFF from alarm: - 0: no action - 1: activates on/off caused by block alarms Keep the input at "0" if this function is not to be used
onChangeMode	CJ_BIT	0	1	0	Status for automatic ON/OFF from Change-Over: - 0: no action - 1: activates automatic on/off caused by the summer/winter functioning mode changeover Keep the input at "0" if this function is not to be used
pumpDone	CJ_BIT	0	1	0	Functioning consent of the circulation pump (used for switchover of the functioning mode)
rtcFault	CJ_BIT	0	1	0	Indicates a clock malfunctioning status or that the clock is discharged and must be set. Keep the input at =0 if this function is not to be used
rtcDone	CJ_BIT	0	1	0	Event for releasing the unit status caused by discharged RTC, when the unit is if OFF status from discharged RTC and this input passes from "0" to "1" the unit passes to the switch-on status (if allowed)

** Input to be connected*

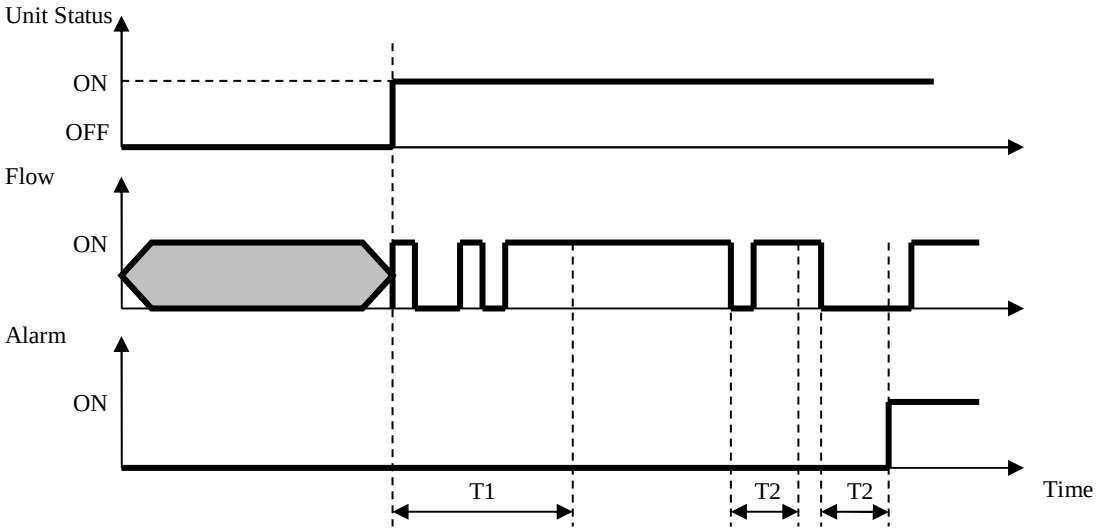
OUTPUTS

Name	Type	Min.	Max.	Description
unitStatus	CJ_BYTE	0	8	Describes the status of the unit - 0: OFF status from key - 1: OFF status from digital input - 2: OFF status from supervisor - 3: OFF status from schedule timer - 4: OFF status from alarm - 5: OFF status from RTC - 6: OFF status for functioning mode change-over - 7: OFF status for switch-on stand-by after functioning mode change-over - 8: ON status
unitOnOff	CJ_BIT	0	1	Unit on/off status - 0: unit off - 1: unit on

2. ABL n°2 – Flow switch control



The flow switch is managed after the initial switch-on phase of the unit and after the time defined by the parameter: *startupDelay*. On expiry of this time band, if the contact signals a lack of flow, the alarm is indicated immediately.
The control is performed also during normal functioning; the flow sensor is monitored continuously: of the contact signals a lack of flow for a band of time exceeding the time set by the *runningDelay* parameter, the alarm is signalled.



If the alarm persists for a time equal to the *pumpStopDelay* parameter, the output is activated in a way to guarantee the activation of the block of any circulation pump.
The flow switch alarm has automatic reset, unless it exceeds a certain number of interventions during the hour (*maxEvHour*). In this case, it becomes manual reset.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on When the input becomes “1”, flow switch management starts
startupDelay	CJ_WORD	1	999	*	Delay (in seconds) of flow switch alarm signal from unit switch-on. (See T1 graphics)

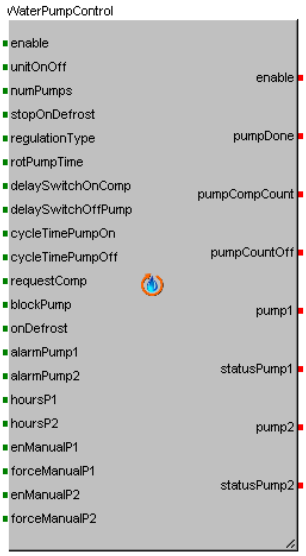
runningDelay	CJ_WORD	1	999	*	Delay (in seconds) of flow switch alarm signal during normal functioning. (See T2 graphics)
pumpCountOff	CJ_WORD	1	999	*	Circulation pump block activation delay (in seconds) due to lack of flow
TimePumpLowWork	CJ_WORD	0	999	*	Pumps functioning time with low quantity of water (flow alarm)
DI_Flow	CJ_BIT	0	1	*	Digital input for indicating flow 0: no flow, 1: flow present
maxEvHour	CJ_BYTE	0	10	*	Number of hourly events after which the alarm requires manual reset
resetAlarm	CJ_BIT	0	1	*	Alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset.

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
flowAlarm	CJ_BIT	0	1	Status of the flow switch alarm - 0: correct flow, no alarm - 1: no flow, alarm active
blockPump	CJ_BIT	0	1	Circulation pump block request - 0: correct flow, no block - 1: no flow for a long time, circulation pump block activation

3. ABL n°3 – Circulation pump control



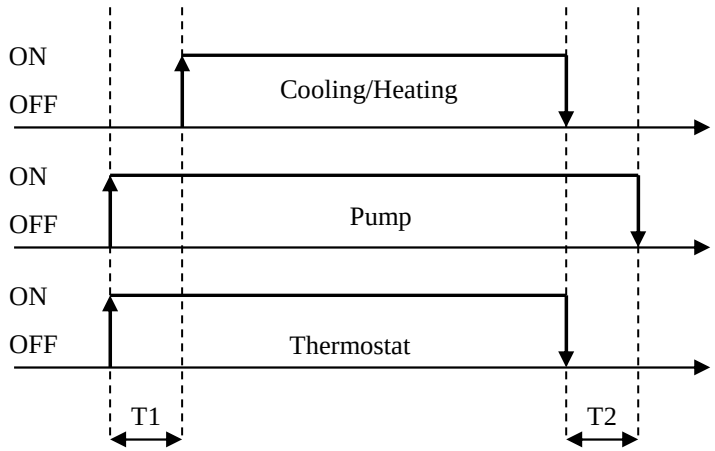
Manages up to two circulation pumps, one alternately to the other. If two pumps are configured (*numPumps* = 2), the functioning hours of both must be equal. Therefore, every *rotPumpTime* time, switch-off of the active pump and switch-on of the other is commanded. In the event of an alarm of the active pump, if possible, the switch-on of the other pump is requested.

The *regulationType* parameter defines the type of regulation with which the pump is controlled:

- *0 : Continuous functioning*
- *1 : Functioning on thermostat call*
- *2 : Cyclical functioning*

In the **continuous functioning mode**, the pump control outputs must activate when the unit switches-off and a time period must pass (*delaySwitchOnComp* parameter) before switch-on of the compressors. Vice versa, on the unit switch-off control, any active compressors must switch-off and a (*delaySwitchOffPump* parameter) time must pass before pump switch-off.

In the **functioning on thermostat control** the pump is activated as a consequence of a cooling or heating request. On this request, first the pump output is activated and then after the *delaySwitchOnComp* time the compressor switches on in heating/cooling mode.

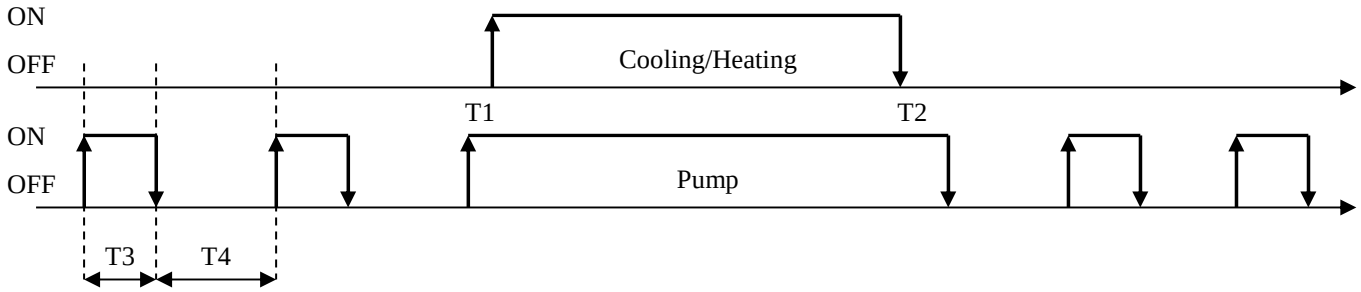


T1 = *delaySwitchOnComp*
compressors activation delay time from pump activation.

T2 = *delaySwitchOffPump*
pump switch-off delay time.

The compressor switches off in the same way as the thermostat switch-off request, while the pump remains on for the *delaySwitchOffPump* time.

In the **cyclical functioning mode** the pump is controlled with definition of the switch-on and switch-off times: if during the pump activation time the thermostat function activates a cooling or heating call, the pump remains active for the entire call period plus any delay time between compressor switch-off and pump switch-off.



T3 = cycleTimePumpON pump switch-on time in cyclical functioning mode
T4 = cycleTimePumpOFF pump switch-off time in cyclical functioning mode

Pump status

Every pump has an associated functioning status (*statusPump1* outputs and *statusPump2*)

- *Disabled*: the pump is not configured.
- *Off*: the pump is off.
- *On*: the pump is functioning.
- *Alarm*: pump thermal switch alarm.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
numPumps	CJ_BYTE	1	2	*	Pumps number
stopOnDefrost	CJ_BIT	0	1	0	Blocks the pump during defrosting
regulationType	CJ_BYTE	0	2	*	Type of pump regulation 0: continuous 1: from thermostat 2: cyclical
rotPumpTime	CJ_BYTE	1	240	4	Difference (in hours) that a rotation between the two pumps requests
delaySwitchOnComp	CJ_WORD	1	999	*	Compressors activation delay (in seconds) from pump start-up
delaySwitchOffPump	CJ_WORD	1	999	*	Pump switch-off delay from compressors switch-off
cycleTimePumpON	CJ_WORD	1	999	120	Pump switch-on time in cyclical regulation
cycleTimePumpOFF	CJ_WORD	1	999	120	Pump switch-off time in cyclical regulation

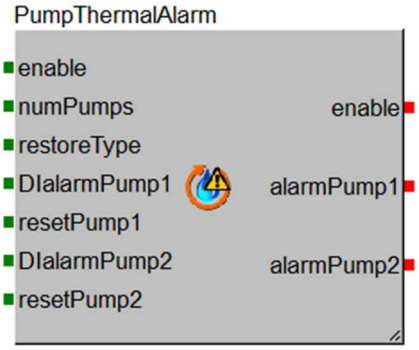
requestComp	CJ_BIT	0	1	0	Request for thermostatic regulation at the compressors
blockPump	CJ_BIT	0	1	*	Generic alarm input for pumps block
onDefrost_C1	CJ_BIT	0	1	0	Circuit 1 defrosting state - 0: not active - 1: circuit in defrosting
onDefrost_C2	CJ_BIT	0	1	0	Circuit 2 defrosting state - 0: not active - 1: circuit in defrosting
alarmPump1	CJ_BIT	0	1	0	Pump 1 thermal switch alarm
alarmPump2	CJ_BIT	0	1	0	Pump 2 thermal switch alarm
hoursP1	CJ_DWORD	0	99999	0	Pump 1 functioning hours
hoursP2	CJ_DWORD	0	99999	0	Pump 2 functioning hours
enManualP1	CJ_BIT	0	1	0	Enable the manual operation of pump 1
forceManualP1	CJ_BIT	0	1	0	Turn on/off pump 1 in manual operation
enManualP2	CJ_BIT	0	1	0	Enable the manual operation of pump 2
forceManualP2	CJ_BIT	0	1	0	Turn on/off pump 2 in manual operation
orCmp	CJ_BIT	0	1	0	Compressors OR

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
pumpDone	CJ_BIT	0	1	Pump consent thermostatic regulation
pumpCompCount	CJ_WORD	0	999	Switch-on delay timer (in seconds) of the compressors from pump switch-on. The pumps may start when it becomes equal to 1
pumpCountOff	CJ_WORD	0	999	Time (in seconds) between switch-off of the pump due to a switch-off request. The pump switches off when it becomes equal to zero.
pump1	CJ_BIT	0	1	Pump 1 control
statusPump1	CJ_BYTE	0	4	Functioning status of pump 1: 0: disabled 1: off 2: on 3: in thermal switch alarm 4: in manual mode
pump2	CJ_BIT	0	1	Pump 2 control
statusPump2	CJ_BYTE	0	4	Functioning status of pump 1: 0: disabled 1: off 2: on 3: in thermal switch alarm 4: in manual moÞ

4. ABL n°4 – Circulation pump thermal switch alarm (2 circuits)



The macroblock manages up to two pump thermal switch alarms. The alarm is immediate intervention, while it can be set whether to have automatic reset or manual reset on return of the alarm condition.

INPUTS

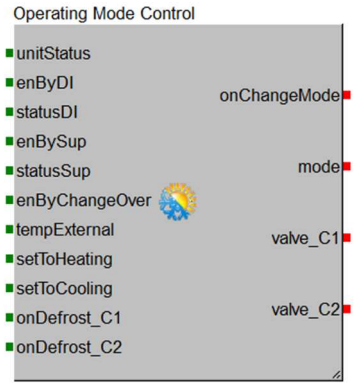
Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
numPumps	CJ_BYTE	1	2	*	Pumps number The alarm of the second pump is enabled when *numPumps=2*
restoreType	CJ_BIT	0	1	*	Type of alarm reset - 0: automatic reset - 1: manual reset
DI_AlarmPump1	CJ_BIT	0	1	*	Digital input for indicating the alarm of pump 1: 0: no alarm, 1: alarm present
resetAlarmPump1	CJ_BIT	0	1	*	Pump 2 thermal switch alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)
DI_AlarmPump2	CJ_BIT	0	1	0	Digital input for indicating the alarm of pump 2: 0: no alarm, 1: alarm present
resetAlarmPump2	CJ_BIT	0	1	0	Pump 2 thermal switch alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
alarmPump1	CJ_BIT	0	1	Circulation pump 1 thermal switch alarm status: - 0: alarm not active - 1: alarm active
alarmPump2	CJ_BIT	0	1	Circulation pump 2 thermal switch alarm status: - 0: alarm not active - 1: alarm active

5. ABL n°5 – Functioning mode (Template)



The operational mode can assume the following values:

"MOdE" parameter	Operational mode	Description
0	Chiller – Cooling	Summer functioning mode
1	Heat Pump – Heating	Winter functioning mode

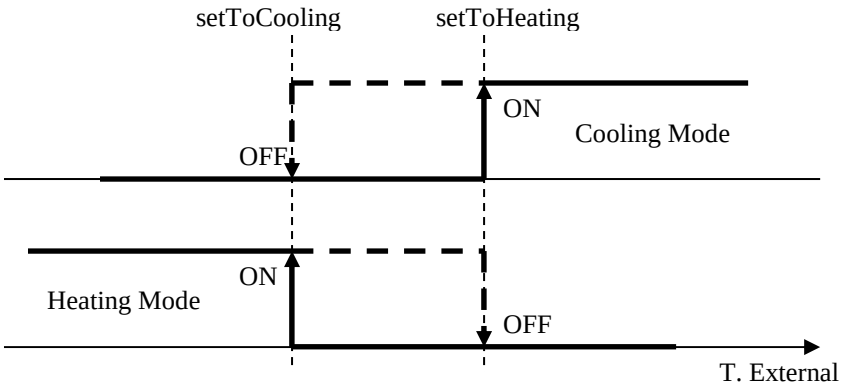
There are procedures that allow to set the unit functioning mode:

1) Via the *MOdE* **parameter** present inside the macroblock.

2) Via **digital input** (function enabled from the *enByDI* input)
Setting - With contact open the unit is in "winter" functioning mode, with contact closed in "summer" functioning mode.

3) Via **supervision protocol** (function enabled by *enBySup* input)
Setting - Connect the *statusSup* input with the command for mode change sent by the supervision protocol

4) Via the **Change-over** from **outside temperature** (function enabled from *enByChangeOver* input)
Setting - When the outside temperature value exceeds the *setToHeating*, the unit switches to "summer" functioning mode. However, when the external temperature drops below the *setToCooling*, the unit switches to "winter" functioning mode.



Note. Switchover is disabled during defrosting

INPUTS

Name	Type	Min.	Max.	Def.	Description
unitStatus	CJ_BYTE	0	8	*	Describes the status of the unit - 0: OFF status from key - 1: OFF status from digital input - 2: OFF status from supervisor - 3: OFF status from schedule timer - 4: OFF status from alarm - 5: OFF status from RTC - 6: OFF status for functioning mode change-over - 7: OFF status for switch-on stand-by after functioning mode change-over - 8: ON status
enByDI	CJ_BIT	0	1	0	Enabling of mode change from digital input: 0: disabled, 1: enabled
statusDI	CJ_BIT	0	1	0	State of the digital input for mode change from digital input - 0: winter functioning mode - 1: summer functioning mode The status interferes with management only if the respective enabling parameter is configured.
enBySup	CJ_BIT	0	1	0	Enabling of supervisor mode change 0: disabled, 1: enabled
statusSup	CJ_BIT	0	1	0	Supervisor status for mode changeover from supervisor - 0: winter functioning mode - 1: summer functioning mode The status interferes with management only if the respective enabling parameter is configured.
enByChangeOver	CJ_BIT	0	1	0	Enabling mode changeover from change over on outside temperature 0: disabled, 1: enabled
tempExternal	CJ_ANALOG	-	-	-	Outside air temperature probe [°C].
setToHeating	CJ_SHORT	-58.0	302.0	20.0	Set Point on the external temperature for changeover to summer functioning mode [°C].
setToCooling	CJ_SHORT	-58.0	302.0	10.0	Set Point on the outside temperature for changeover to winter functioning mode [°C].
onDefrost_C1	CJ_BIT	0	1	0	Circuit 1 defrosting state - 0: not active - 1: circuit in defrosting
onDefrost_C2	CJ_BIT	0	1	0	Circuit 2 defrosting state - 0: not active - 1: circuit in defrosting

** Input to be connected*

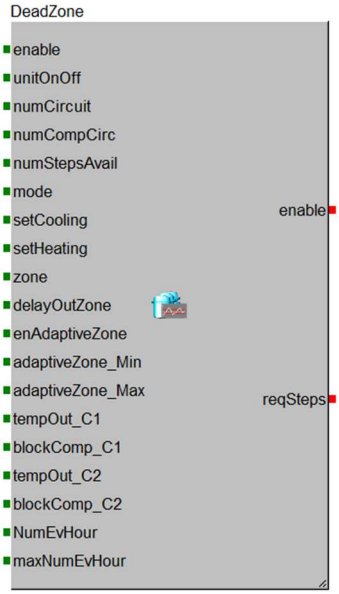
INTERNAL PARAMETERS/STATUS

Name	Type	Def.	Min.	Max.	Description
MOdE	CJ_BIT	0	0	1	Unit functioning mode, can be modified from keyboard The parameter is always updated automatically when the functioning mode changes due to mode changeover from the other procedures.

OUTPUTS

Name	Type	Min.	Max.	Description
onChangeMode	CJ_BIT	0	1	When equal to "1" it indicates that a functioning mode changeover is in progress.
mode	CJ_BIT	0	1	Unit current functioning mode 0: summer mode (chiller) 1: winter mode (heat pump)
valve_C1	CJ_BIT	0	1	Command for the reverse valve of circuit 1
valve_C2	CJ_BIT	0	1	Command for the reverse valve of circuit 2

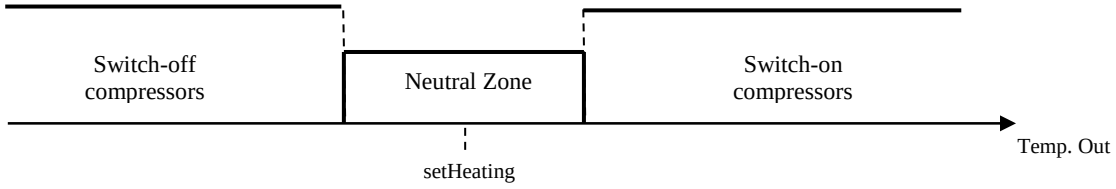
6. ABL n°6 – Neutral zone regulation



Regulation envisions the definition of a neutral zone centres on set-point in which no activation or deactivation decision of the utilities will be taken. Only when the output temperature moves out of the "neutral zone" is a decision taken whether to activate or deactivate the steps available.
If two circuits are set (*numCircuit=2* input), regulation takes place *on the average of the two output temperature probes (tempOutlet_C1, tempOutlet_C2).* If one of the two probes is in error conditions, regulation is made on the other functioning probe. If both probes are in error conditions, regulation is prevented.

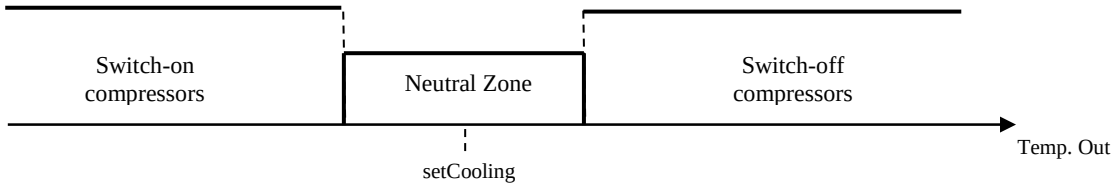
The switch-on and switch-off requests for the various power steps supplied by the compressors in the case of summer functioning mode (chiller, *mode=0*) will follow this logic:

- Switch-on: when the output temperature exceeds the neutral zone
- Switch-off: when the output temperature is below the neutral zone



The switch-on and switch-off requests for the various power steps supplied by the compressors in the case of winter functioning mode (heat pump, *mode=1*) will follow this logic:

- Switch-on: when the output temperature is below the neutral zone
- Switch-off: when the output temperature exceeds the neutral zone



If the output temperature remains outside the neutral area also after a time interval given by the *delayOutZone* input, the switch-on or switch-off of another power step will be requested.
By setting the *enAdaptiveZone=1* parameter, a self-adapting regulation function is activated on the output temperature, in which the neutral zone is calculated in a way to consider the dynamic features of the system and the load variations. In particular, the neutral zone can vary, considering the times of the compressors and the number of start-ups/hour. In this case, the value of the zone only has sense at unit start-up, while it will be recalculated within the minimum *adaptiveZone_Min* and maximum adaptiveZone_Min limits, in order to "adapt" to an intermediate functioning situation with respect to the maximum number of start-ups/hour (*maxNumEvHour*, *numEvHour* inputs).

INPUTS

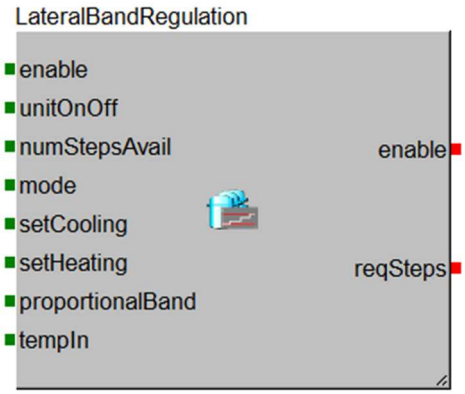
Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured
numCompCirc	CJ_BYTE	0	2	*	Number of compressors set per circuit (the number of compressors must be the same on each of the two circuits)
numStepsAvail	CJ_BYTE	0	4	*	Number of steps that can be used (the compressors functioning in manual mode could be removed)
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
setCooling	CJ_SHORT	-58.0	302.0	*	Summer set point for functioning in summer mode [°C]
setHeating	CJ_SHORT	-58.0	302.0	*	Winter set point for functioning in winter mode [°C]
zone	CJ_SHORT	0.0	50.0	*	Neutral zone value [°C]
delayOutZone	CJ_WORD	0	999	999	Stand-by time (in seconds) out of the neutral zone before intervention on switch-on or switch-off of a further step
enAdaptiveZone	CJ_BIT	0	1	1	Enabling of the self-adapting function of the neutral zone 0: disabled, 1: enabled
adaptiveZone_Min	CJ_SHORT	0.0	50.0	1.0	Minimum value that the neutral zone can assume when the self-adapting function is used (*enAdaptiveZone=1*) [°C]
adaptiveZone_Max	CJ_SHORT	0.0	50.0	5.0	Maximum value that the neutral zone can assume when the self-adapting function is used (*enAdaptiveZone=1*) [°C]
tempOut_C1	CJ_ANALOG	-	-	*	Temperature probe of the water at output of circuit 1 [°C]
blockComp_C1	CJ_BIT	0	1	*	Block alarms of the compressors in circuit 1
tempOut_C2	CJ_ANALOG	-	-	-	Temperature probe of the water at output of circuit 2 [°C]
blockComp_C2	CJ_BIT	0	1	0	Block alarms of the compressors in circuit 2
numEvHour	CJ_BYTE	1	15	*	Number of switch-ons per hour of every compressor over which the compressor is stopped
maxNumEvHour	CJ_BYTE	1	15	*	Maximum number of compressor switch-ons in the hour

** Input to be connected*

OUTPUTS

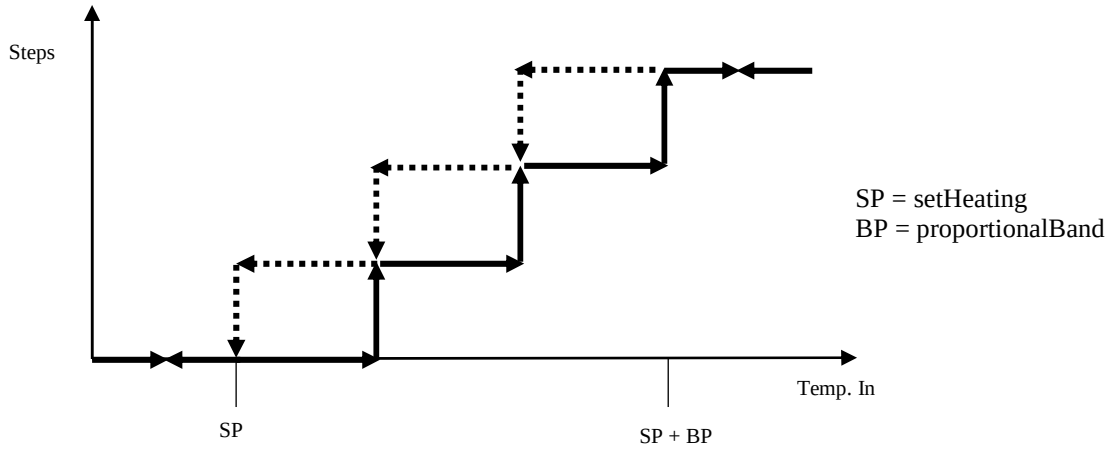
Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
reqSteps	CJ_BYTE	0	4	Number of steps requested by the regulation in neutral zone

7. ABL n°7 – Lateral band regulation

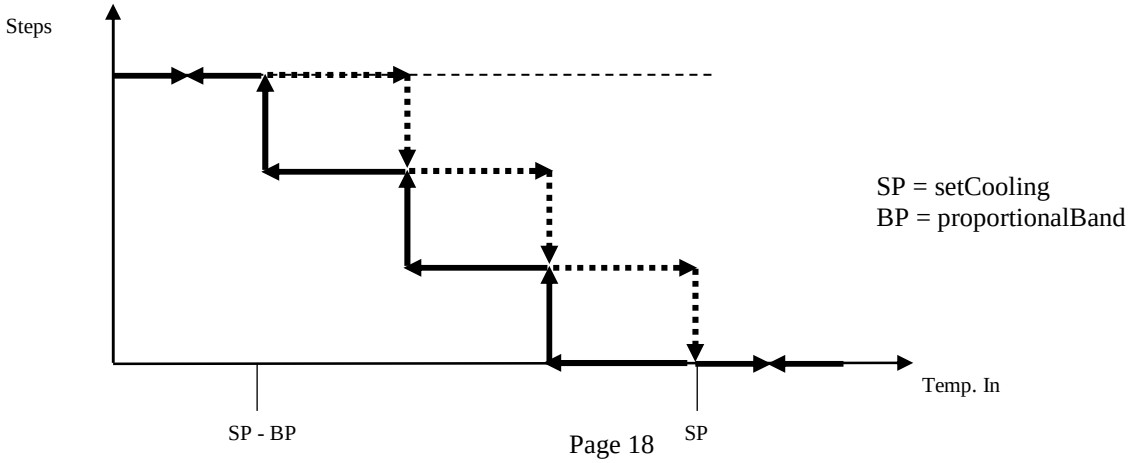


Lateral band regulation makes use of a proportional control to establish when to insert or remove the steps configured, in a way to regulate switch-on or switch-off of the various devices within the proportional band.

The figure shows the behaviour of the regulation in band mode (SP, SP + BP) the case of summer functioning (chiller, *mode=0*). On the basis of the input temperature, the regulation adds or removes the number of steps to request the compressors. In this regulation, the band is shifted completely over the set-point.



However, in winter functioning mode (heat pump *mode=1*), the band is shifted completely below the set-point:



INPUTS

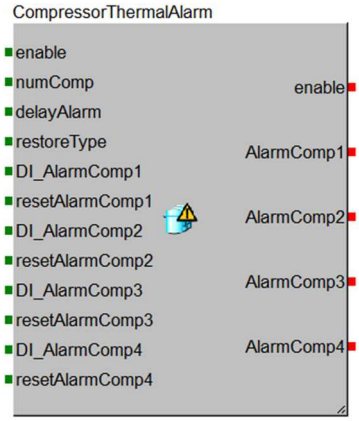
Name	Type	Min.	Max.	Def.	Description
Enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
numStepsAvail	CJ_BYTE	0	4	*	Number of steps that can be used (the compressors functioning in manual mode could be removed)
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
setCooling	CJ_SHORT	-58.0	302.0	*	Summer set point for functioning in summer mode [°C]
setHeating	CJ_SHORT	-58.0	302.0	*	Winter set point for functioning in winter mode [°C]
proportionalBand	CJ_SHORT	2.0	70.0	*	Proportional band value [°C]
tempIn	CJ_ANALOG	-	-	*	Input water temperature probe [°C]

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
reqSteps	CJ_BYTE	0	4	Number of steps requested by the lateral band regulation

8. ABL n°8 – Compressors thermal switch alarm (4/6 compressors)



The macroblock manages the thermal switch alarm of four compressors. The alarm is delayed by any (*delayAlarm* input) by-pass time. The type of reset can also be set: automatic on return of the alarm condition or manual.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
numComp	CJ_BYTE	0	4	*	Total number of compressors. The alarms on the compressors are enabled if the compressors are present
delayAlarm	CJ_WORD	0	999	*	Time (in seconds) of alarm by-pass
restoreType	CJ_BIT	0	1	1	Type of alarm reset - 0: automatic reset - 1: manual reset
DI_AlarmComp N	CJ_BIT	0	1	1	Digital input for indicating the thermal switch alarm of compressor N: 0: no alarm, 1: alarm present
resetAlarmComp N	CJ_BIT	0	1	1	Compressor N thermal switch alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
alarmComp N	CJ_BIT	0	1	State of compressor N thermal switch alarm - 0: alarm not active - 1: alarm active

9. ABL n°9 – Compressors control (Template, 4/6 compressors, 2 circuits)

The macroblock manages up to a maximum of 2 compressors with the same power, for a total of four compressors. The requests to the compressors are satisfied only if the unit is on *unitOnOff=1*.

Compressors status
Every compressor has an associated functioning status (*statusComp1, statusComp2, statusComp3, statusComp4*):

- *Disabled*: the compressor is not configured.
- *On*: the compressor is functioning.
- *Switch-on stand-by*: the compressor is in stand-by due to the switch-on protection times.
- *Off*: the compressor is off.
- *Switch-off stand-by*: the compressor is in stand-by due to the switch-off protection times.
- *Alarm*: compressor thermal switch alarm.
- *Manual*: the compressor is in manual functioning mode.

Rotation of the compressors
The rotation of the compressors is a procedure that allows to balance the number of functioning hours and peaks of each compressor as much as possible.
In the twin circuit case, the rotation must manage, where possible, the distribution of the calls on the circuit compressors, in order to privilege balanced functioning of the two circuits.
The rotation does not involve any compressors in alarm conditions or in manual functioning mode and can dynamically switch other compressors on if one or more of the same go into alarm conditions.
Using the *rotationType* input, the program can manage 4 types of rotation: FIFO, LIFO, FIFO + hours, LIFO + hours.

1) **FIFO**

It follows the *"First In First Out"* logic, i.e. the first compressor that switches on will be the first to switch off. Initially this compressor could lead to a large difference of functioning hours between the various compressors, but after an initial phase these should become equal to each other.
This type of rotation has a particularity in the case where all compressors configured in the system do not switch-on. In fact, for example, if the first compressor switches on and then switches off, the next compressor to switch on will be the second. The last compressor switched off will be memorised to then switch the next on in sequence in a way not to use the same one all of the time and thus make use of all parts configured in the best possible way.

2) **LIFO**

Follows the *"Last In First Out"* logic, i.e. the last compressor to switch-on will be the first to switch-off.

3) **FIFO + functioning hours**

This rotation privileges the comparison of the functioning hours of the various compressors. On switch-on the one with least functioning hours will be privileged, while on switch-off the one with most hours will be privileged.

If a choice must be made between compressors with the same amount of functioning hours, a FIFO rotation comes into practice in a way to guarantee rotation also in the case of the same amount of functioning hours (see previous FIFO case).

4) LIFO + functioning hours

This rotation privileges the comparison of the functioning hours of the various compressors. On switch-on the one with least functioning hours will be privileged, while on switch-off the one with most hours will be privileged.
If a choice must be made between compressors with the same number of functioning hours, a classical LIFO rotation will come into practice.

Method of distributing the steps per circuit

For twin circuit machines (*numCircuit=2*) it is possible to decide (*requestType* input) how to distribute the steps between the two circuits that are requested by the heat regulation:

- 0: **Balancing the circuits:** the system alternately requests a step per circuit in a way to balance the loads between the two circuits, except alarms.
- 1: **Circuits saturation:** the system requests all steps available for the first circuit and then all of those for the second circuit, in a way to have a circuit always at full load, except for alarms.

Using the *priorityCircuit* input it is possible to set which circuit has the priority in a way to satisfy first that circuit rather than the other.

If a defrosting phase is active in the circuit (*onDefrost_C1=1, onDefrost_C2=1*) it requests the maximum steps available, while if a dripping phase is in progress (*onDrippingt_C1=1, onDrippingt _C2=1*) it requests switch-off of all compressors in the circuit.

If the *limit_BlockComp input=1* the compressors switch-off caused by the functioning limit function due to low external temperatures.

If there are compressor alarms, generic block alarms of the *forceShutDown input=1* immediate switch-off of the compressors is requested.

Protection times

These times are used to protect the mechanical means from the various peaks to which they are subjected.

- *minOnDelay*: once activated, the compressor will remain on for this period of time before it can be switched off.
- *minOffDelay*: minimum time that must pass from last switch-off before the compressor can be switched back on again.
- *minOnOnDelay*: establishes the minimum time that must pass between two switch-ons of the same compressor.
- *minOnOtherDelay*: establishes the minimum time that must pass between switch-on of one compressor and the next.
- *minOffOtherDelay* establishes the minimum time that must pass between switch-off of one compressor and the next.
- *maxStartForHour*: establishes the maximum number of switch-ons during one hour: if this limit should be reached, the regulator will wait for the conditions before switching that compressor back on.

Manual Functioning Mode

In this state the devices do not take part in rotations and in heat regulation calculations, however they are sensitive to any alarms.
To go into compressors manual functioning mode, the relevant macroblock inputs *enManualComp1, enManualComp2, enManualComp3, enManualComp4* must be enabled:

- 0: normal device behaviour
- 1: disables the compressor and takes it to manual functioning mode.

A compressor in manual functioning mode will not take part in the regulations and can be forced into switch-on/switch-off by setting the desired value via the relative internal states of the macroblock *forceManualComp1*, *forceManualComp2*, *forceManualComp3* and *forceManualComp4*.
A compressor in manual functioning mode is sensitive to alarms.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured
numCompCirc	CJ_BYTE	0	2/3	*	Number of compressors set per circuit (the number of compressors must be the same on each of the two circuits)
forceShutDown	CJ_BIT	0	1	0	When =1 it indicates that the "Forced switch-off" of the compressors is active. It switches the compressors off immediately
regulationSteps	CJ_BYTE	0	4	*	Number of steps enabled for regulation
requestType	CJ_BIT	0	1	0	Type of step distribution on the circuits: 0: circuits balancing 1: circuit saturation
priorityCircuit	CJ_BIT	0	1	0	Selects which of the two circuits has priority (only if *numCircuit=2*): 0: circuit 1 priority 1: circuit 2 priority
limit_BlockComp	CJ_BIT	0	1	0	When =1 it indicates that the heat pump (the compressors) must switch-off, due to the "Functioning limit" function
errorPobe_C1	CJ_BIT	0	1	*	When =1 it indicates that the regulation probe of circuit 1 is in error condition
errorProbe_C2	CJ_BIT	0	1	0	When =1 it indicates that the regulation probe of circuit 2 is in error condition
compOnErrorProbe	CJ_BYTE	0	2	0	Indicates how many compressors to switch-on for circuit in probe error conditions
blockComp_C1	CJ_BIT	0	1	0	Block alarms of the compressors in circuit 1
onDefrost_C1	CJ_BIT	0	1	0	Indicates that the defrosting phase in circuit 1 is active
onDrippingt_C1	CJ_BIT	0	1	0	Indicates that the dripping phase in circuit 1 is active
blockComp_C2	CJ_BIT	0	1	0	Block alarms of the compressors in circuit 2
onDefrost_C2	CJ_BIT	0	1	0	Indicates that the defrosting phase in circuit 2 is active
onDripping_C2	CJ_BIT	0	1	0	Indicates that the dripping phase in circuit 2 is active
rotationType	CJ_BYTE	0	3	*	Type of rotation of the compressors 0: FIFO 1: LIFO 2: timed FIFO 3: timed LIFO
pumpDone	CJ_BIT	0	1	*	Pump consent thermostatic regulation
pumpCompCount	CJ_WORD	0	999	*	Switch-on delay timer (in seconds) of the compressors from pump switch-on. The pumps may start when it becomes equal to 1
minOnDelay	CJ_WORD	0	999	0	Minimum switch-on time (in seconds)
minOffDelay	CJ_WORD	0	999	0	Minimum switch-off time (in seconds)

minOnOnDelay	CJ_WORD	0	999	0	Time (in seconds) between two consecutive switch-ons of the same compressor
minOnOtherDelay	CJ_WORD	0	999	0	Time (in seconds) between switch-ons of different compressors
minOffOtherDelay	CJ_WORD	0	999	0	Time (in seconds) between switch-offs of different compressors
numEvHour	CJ_BYTE	1	14	*	Number of switch-ons per hour of every compressor over which the compressor is stopped
enManualCompN	CJ_BIT	0	1	0	Enabling of manual functioning mode of the compressor N 0: automatic functioning mode 1: manual functioning mode
hourCompN	CJ_DWORD	0	99999	*	Number of functioning hours of compressor N
alarmCompN	CJ_BIT	0	1	*	Compressor N thermal switch alarm
enReg_By_EVCM_C1	CJ_BIT	0	1	1	Enabling of the EVCM valve circuit 1 to activate the compressors of circuit 1 If *enReg_By_EVCM_C1* is 0 the request of steps for circuit 1 is keeped to 0
enReg_By_EVCM_C2	CJ_BIT	0	1	1	Enabling of the EVCM valve circuit 2 to activate the compressors of circuit 2 If *enReg_By_EVCM_C2* is 0 the request of steps for circuit 2 is keeped to 0
enPrestart	CJ_BIT	0	1	0	Activate function pre ventilation
endCntPrestart_C1	CJ_BIT	0	1	1	It indicates the end of the phase of pre ventilation of circuit 1. If *endCntPrestart_C1* is 0, the compressors will be keeped off; when *endCntPrestart_C1* is 1, the compressors are enabled for regulation
endCntPrestart_C2	CJ_BIT	0	1	1	It indicates the end of the phase of pre ventilation of circuit 2. If *endCntPrestart_C2* is 0, the compressors will be keeped off; when *endCntPrestart_C2* is 1, the compressors are enabled for regulation

** Input to be connected*

INTERNAL PARAMETERS/STATUS

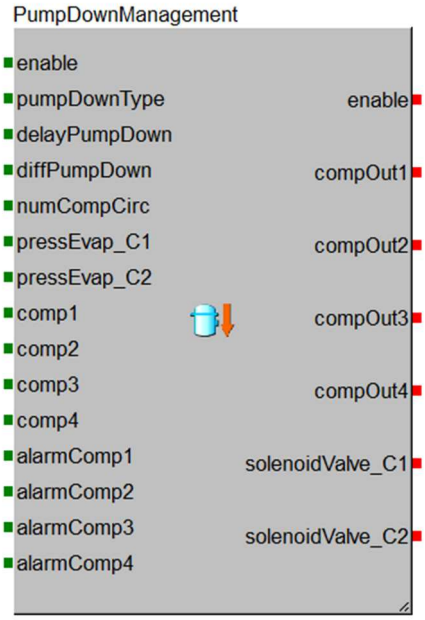
Name	Type	Def.	Min.	Max.	Description
forceManualCompN	CJ_BIT	0	0	1	Forcing of compressors N in manual functioning mode

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
maxNumEvHour	CJ_BYTE	0	15	Maximum number of compressor switch-ons in the hour
reqSteps_C1	CJ_BYTE	0	2/3	Number of steps requested of circuit 1 by the regulation
reqSteps_C2	CJ_BYTE	0	2/3	Number of steps requested of circuit 2 by the regulation
comp1	CJ_BIT	0	1	Compressor 1 command
statusCompN	CJ_BYTE	0	6	Compressor N status 0: disabled 1: off 2: switch-on stand-by 3: on 4: switch-off stand-by 5: thermal switch alarm 6: in manual mode
powerRequested	CJ_BYTE	0	100	Power requested of the compressors [%]

powerSupplied	CJ_BYTE	0	100	Power supplied from the compressors [%]
numStepsAvail	CJ_BYTE	0	4	Number of steps that can be used (the compressors functioning in manual mode are removed)
numStepsAvail_C1	CJ_BYTE	0	2/3	Number of circuit 1 steps that can be used (the compressors functioning in manual mode are removed)
numStepsAvail_C2	CJ_BYTE	0	2/3	Number of circuit 1 steps that can be used (the compressors functioning in manual mode are removed)
reqStepsPrestart_C1	CJ_BYTE	0	2/3	Number of steps requested by circuit 1 to get the fan prestart to run (connect to resStepsPrestart_C1 of the AFB for ventilation)
reqStepsPrestart_C2	CJ_BYTE	0	2/3	Number of steps requested by circuit 2 to get the fan prestart to run (connect to resStepsPrestart_C1 of the AFB for ventilation)
req_En_EVCM_C1	CJ_BIT	0	1	Request for enabling the EVCM circuit 1
req_En_EVCM_C2	CJ_BIT	0	1	Request for enabling the EVCM circuit 2

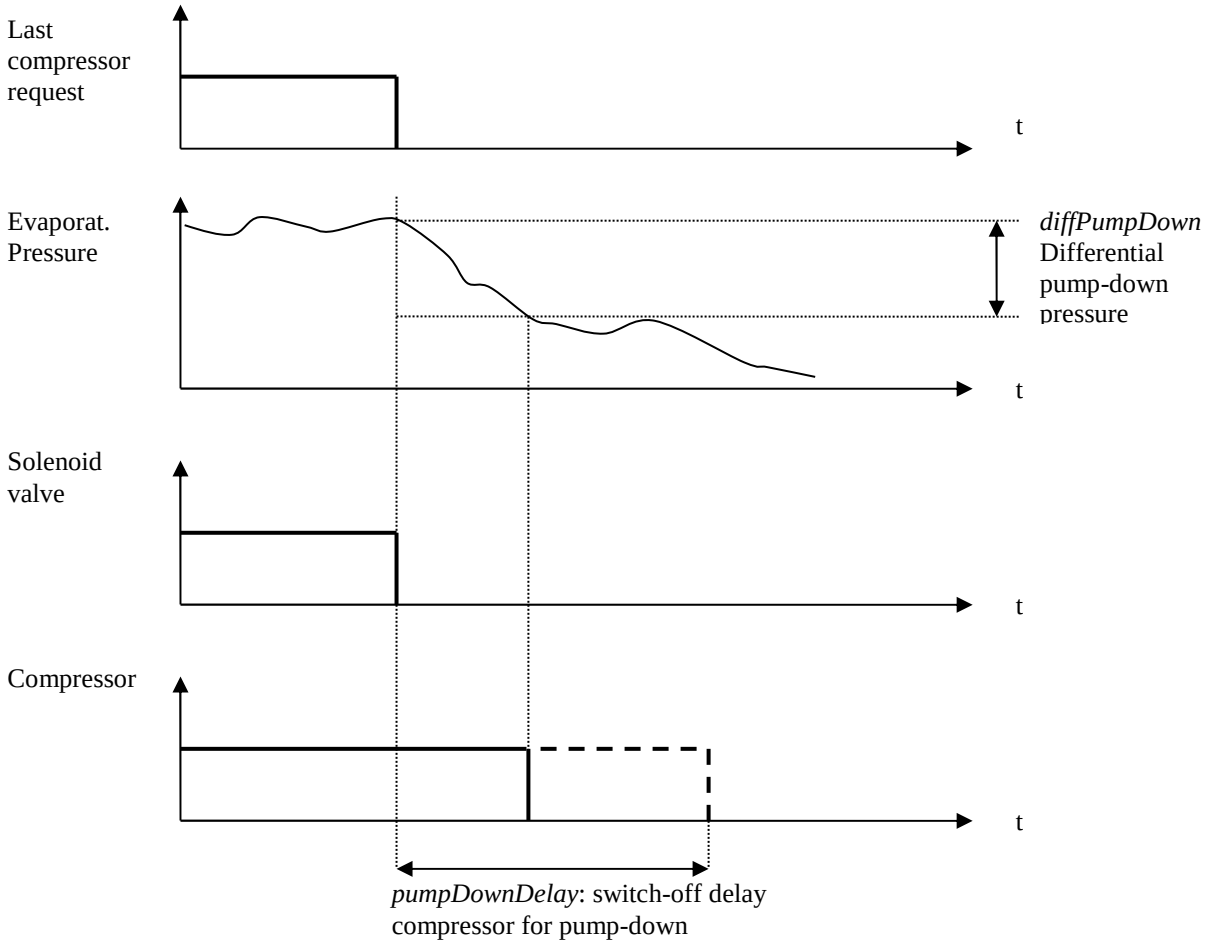
10. ABL n°10 – Pump down management (4/6 compressors, 2 circuits)



The macroblock manages the pump-down procedure up to two circuits.
The pump-down procedure is used to partially empty the excess refrigerant from the evaporator. The type of pump-down regulation can be set using the *pumpDownType* input. Timed only or at relative threshold on the basis of the evaporation pressure.

Only timed pump-down
On switch-on of the first circuit in the compressor, the solenoid valve is opened at the same time. When there is the last switch-off request of the compressors, the solenoid valve, positioned upstream from the relative evaporator, remains open in a way that the last compressor stays on for a time fixed by the *delayPumpDown* input. The valve closes successively.
In the event of an alarm, the procedure ignores the compressors switch-off delay in pump-down mode.

Pump-down to relative threshold
If low pressure transducers are available, it is possible to perform the pump-down procedure by leaving the last compressor in the circuit on only for the time necessary to empty a correct part of refrigerant When the call ceases for the last compressor switched-on on the evaporator of interest, the evaporation pressure is memorised, the liquid electrovalve is disabled and, when the value of the evaporation pressure has dropped below the input value at *diffPumpDown*, the compressor switches off.



In all cases, the compressor switch-off delay in pump-down mode is always valid, whenever the switch-off pressure threshold should not be reached or the evaporation probes are broken.

Note. In the event of an alarm, the procedure ignores the compressors switch-off delay in pump-down mode.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
pumpDownType	CJ_BIT	0	2	*	Enables the pump-Down procedure: - 0: disabled - 1: only timed pump-down - 2: pump-down to relative threshold
delayPumpDown	CJ_WORD	0	999	*	Delay (in seconds) before switch-off of the last compressor of the circuit due to pump-down
diffPumpDown	CJ_SHORT	0	300.0	1.5	Evaporation pressure differential due to switch-off in pump-down mode [bar]
numCompCirc	CJ_BYTE	0	2	*	Number of compressors set per circuit (the number of compressors must be the same on each of the two circuits)
pressEvap_C1	CJ_ANALOG			-	Circuit 1 evaporation pressure probe [bar]
pressEvap_C2	CJ_ANALOG			-	Circuit 2 evaporation pressure probe [bar]
comp1	CJ_BIT	0	1	*	Compressor 1 switch-off/on request

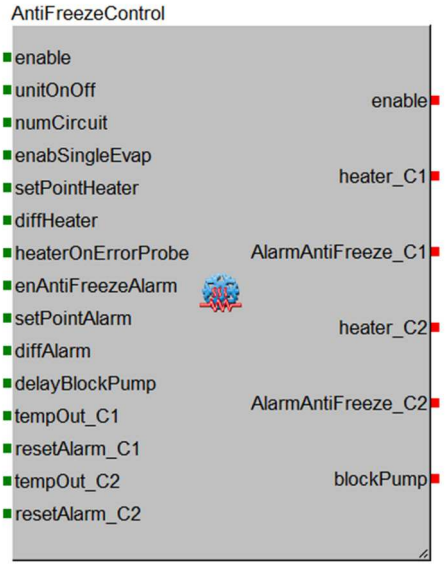
comp2	CJ_BIT	0	1	0	Compressor 2 switch-off/on request
comp3	CJ_BIT	0	1	0	Compressor 3 switch-off/on request
comp4	CJ_BIT	0	1	0	Compressor 4 switch-off/on request
comp5	CJ_BIT	0	1	0	Compressor 5 switch-off/on request
comp6	CJ_BIT	0	1	0	Compressor 6 switch-off/on request
alarmComp1	CJ_BIT	0	1	*	Compressor 1 block alarms
alarmComp2	CJ_BIT	0	1	0	Compressor 2 block alarms
alarmComp3	CJ_BIT	0	1	0	Compressor 3 block alarms
alarmComp4	CJ_BIT	0	1	0	Compressor 4 block alarms
alarmComp5	CJ_BIT	0	1	0	Compressor 5 block alarms
alarmComp6	CJ_BIT	0	1	0	Compressor 6 block alarms

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
compOut1	CJ_BIT	0	1	Compressor 1 switch-off/on command
compOut2	CJ_BIT	0	1	Compressor 2 switch-off/on command
compOut3	CJ_BIT	0	1	Compressor 3 switch-off/on command
compOut4	CJ_BIT	0	1	Compressor 4 switch-off/on command
compOut5	CJ_BIT	0	1	Compressor 5 switch-off/on command
compOut6	CJ_BIT	0	1	Compressor 6 switch-off/on command
solenoidValve_C1	CJ_BIT	0	1	Circuit 1 solenoid valve command
solenoidValve_C2	CJ_BIT	0	1	Circuit 2 solenoid valve command

11. ABL n°11 – Anti-freeze control (2 circuits)



The macroblock manages the anti-freeze heaters and the relative alarm up to two circuits.
Two thresholds are envisioned, with relative differential: one to activate the heaters and the other to signal the alarm.
If the anti-freeze alarm should persist for a time longer than *delayBlockPump* seconds, the *blockPump* output is set at value "1", in a way to switch the pumps off if necessary.
In the case of anti-freeze, when the unit is off (*unitOnOff=0* input) only the heaters are activated while the alarm is not signalled.
The alarms all have manual reset.

Unique evaporation
In the twin circuit machines (*numCircuit=2*) it is possible to select whether to use a unique circuit to manage evaporation. To enable this function, set *enSingleEvap=1*. Evaporation is performed by the anti-freeze and the heaters normally used for circuit 1, using the most unfavourable value between the two outlet water temperature values acquired by the two respective transducers. If one of the two probes is in error conditions, the other is used.
The heaters output and the anti-freeze alarm controlled are always those relative to circuit 1 (*heater_C1* e *alarmAntiFreeze_C1*).

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on When the input becomes "1", flow switch management starts
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured. The anti-freeze of the second circuit is enabled if *numCircuit=2*
enSingleEvap	CJ_BIT	0	1	0	Enabling unique evaporation 0: disabled, 1: enabled If enabled, the circuit 2 evaporator is not controlled

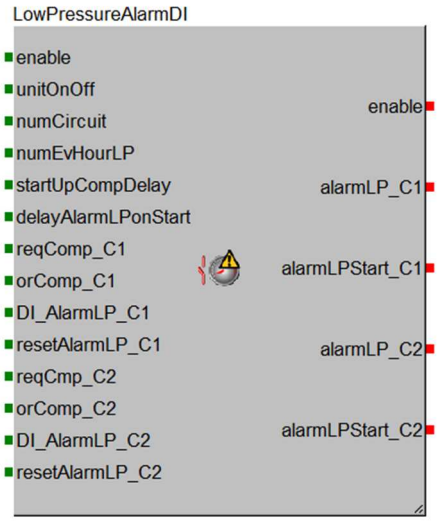
setPointHeater	CJ_SHORT	-58.0	302.0	*	Set point for the activation of anti-freeze heaters [°C]
diffHeater	CJ_SHORT	0.0	50.0	*	Differential for the regulation of the anti-freeze heaters [°C]
heaterOnErrorProbe	CJ_BIT	0	1	0	Activates the anti-freeze heaters when the relative probe is in error conditions 0: not active, 1:active
enAntiFreezeAlarm	CJ_BIT	0	1	1	Enables the management of the anti-freeze alarm 0: disabled, 1: enabled
setPointAlarm	CJ_SHORT	-58.0	302.0	3.0	Set point for the detection of the anti-freeze alarm [°C]
diffAlarm	CJ_SHORT	0.0	50.0	2.0	Differential for the regulation of the anti-freeze alarm [°C]
delayBlockPump	CJ_WORD	0	999	*	Time (in seconds) for which the *blockPump* output mains off before passing to value“1” (that indicates the necessity to block the circulation pump)
tempOut_C1	CJ_ANALOG			*	Temperature probe of the water at output of circuit 1 [°C]
resetAlarm_C1	CJ_BIT	0	1	0	Circuit 1 alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset.
tempOut_C2	CJ_ANALOG			-	Temperature probe of the water at output of circuit 2 [°C]
resetAlarm_C2	CJ_BIT	0	1	0	Circuit 2 alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset.

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
heater_C1	CJ_BIT	0	1	Circuit 1 anti-freeze heaters command
alarmAntiFreeze_C1	CJ_BIT	0	1	Circuit 1 anti-freeze alarm
heater _C2	CJ_BIT	0	1	Circuit 2 anti-freeze heaters command
alarmAntiFreeze_C2	CJ_BIT	0	1	Circuit 2 anti-freeze alarm
blockPump	CJ_BIT	0	1	Pump block - 0: block not active - 1: block active

12. ABL n°12 – Low pressure alarm from digital input (2 circuits)



The macroblock manages the alarm up to two circuits. It is possible to monitor when a minimum condensation pressure occurs using a digital input connected to an external pressure switch. The alarm is detected only if the machine is on (*unitOnOff=1*).
On start-up of the first compressor, the alarm is delayed by a certain time (*startUpCompDelay*), so as not to allow the compressors to pressurise the circuit.
The alarm initially has automatic reset, unless it exceeds a certain number of interventions during the hour (*numEvHourBP*). In this case, it becomes manual reset.

Low pressure alarm on start-up
If in a low pressure situation and with the incapacity to activate any compressor on request for switch-on of the same, it is called *low pressure start-up alarm*. The alarm *has* automatic reset and should disappear unless there is a Freon leak in the system.
On compressors switch-off due to a low pressure alarm, the latter is delayed by a certain period of time (*delayAlarmBPonStart* input), in order to permit the refrigerant circuit to allow compressor start-up.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured. The alarm of the second circuit is enabled if *numCircuit=2*
numEvHourLP	CJ_BYTE	1	15	*	Number of low pressure alarms over which the reset becomes manual
starUpCompDelay	CJ_WORD	0	999	*	By-pass time (in seconds) from the start-up of the first compressor for the detection of the low pressure alarm
delayAlarmLPonStart	CJ_WORD	0	999	*	Delay time (in seconds) due to the detection of the low pressure alarm on start-up when a low pressure alarm sub enters.

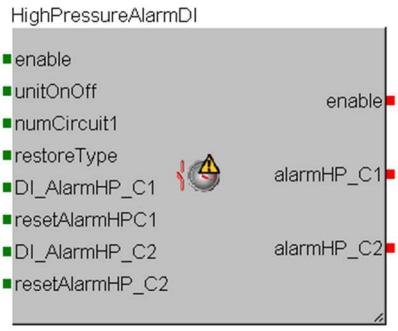
reqComp_C1	CJ_BYTE	0	2	*	Number of steps requested by the compressors regulation of circuit 1
orComp_C1	CJ_BIT	0	1	*	Circuit 1 compressors OR
DI_AlarmLP_C1	CJ_BIT	0	1	*	Digital input for signalling the low pressure alarm of circuit 1: 0: no alarm, 1: alarm present
resetAlarmLP_C1	CJ_BIT	0	1	*	Circuit 1 low pressure alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)
reqComp_C2	CJ_BYTE	0	2	0	Number of steps requested by the compressors regulation of circuit 2
orComp_C2	CJ_BIT	0	1	0	Circuit 2 compressors OR
DI_AlarmLP_C2	CJ_BIT	0	1	0	Digital input for signalling the low pressure alarm of circuit 2: 0: no alarm, 1: alarm present
resetAlarmLP_C2	CJ_BIT	0	1	0	Circuit 2 low pressure alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
alarmLP_C1	CJ_BIT	0	1	Circuit 1 low pressure alarm state: - 0: alarm not active - 1: alarm active
alarmLPStart_C1	CJ_BIT	0	1	Circuit 1 start-up low pressure alarm state: - 0: alarm not active - 1: alarm active
alarmLP_C2	CJ_BIT	0	1	Circuit 2 low pressure alarm state: - 0: alarm not active - 1: alarm active
alarmLPStart_C2	CJ_BIT	0	1	Circuit 2 start-up low pressure alarm state: - 0: alarm not active - 1: alarm active

13. ABL n°13 – High pressure alarm from digital input (2 circuits)



The macroblock manages the alarm up to two circuits. It is possible to monitor when a maximum condensation pressure is exceeded using a digital input connected to an external pressure switch. The alarm is detected only if the machine is on (*unitOnOff=1*). The type of reset can be set: automatic on return of the alarm condition or manual.

INPUTS

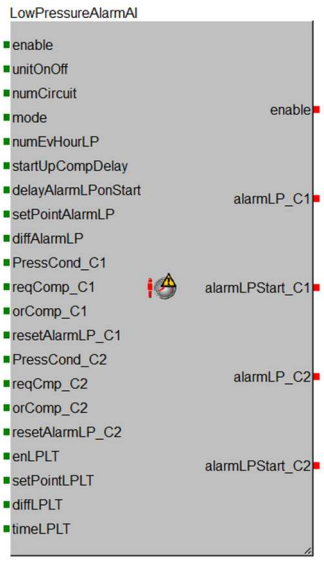
Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured. The alarm of the second circuit is enabled if *numCircuit=2*
restoreType	CJ_BIT	0	1	*	Type of alarm reset - 0: automatic reset - 1: manual reset
DI_AlarmHP_C1	CJ_BIT	0	1	*	Digital input for signalling the high pressure alarm of circuit 1: 0: no alarm, 1: alarm present
resetAlarmHP_C1	CJ_BIT	0	1	*	Circuit 1 high pressure alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)
DI_AlarmHP_C2	CJ_BIT	0	1	0	Digital input for signalling the high pressure alarm of circuit 2: 0: no alarm, 1: alarm present
resetAlarmHP_C2	CJ_BIT	0	1	0	Circuit 2 high pressure alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)

** Input to be connected*

OUTPUTS

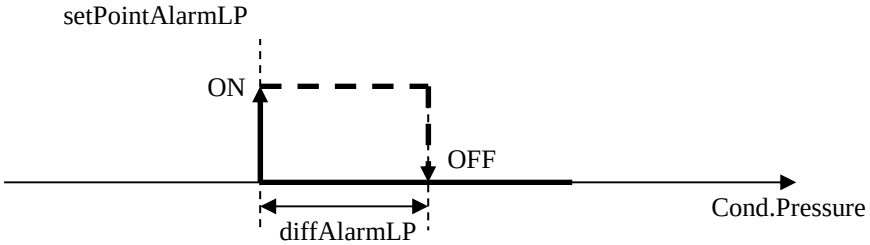
Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
alarmHP_C1	CJ_BIT	0	1	Circuit 1 high pressure alarm state: - 0: alarm not active - 1: alarm active
alarmHP_C2	CJ_BIT	0	1	Circuit 2 high pressure alarm state: - 0: alarm not active - 1: alarm active

14. ABL n°14 – Low pressure alarm from transducer (2 circuits)



The macroblock manages the alarm up to two circuits. If the intake pressure drops below a certain threshold, a low condensation pressure alarm is generated. The alarm is detected only if the machine is on (*unitOnOff=1*).
On start-up of the first compressor, the alarm is delayed by a certain time (*startUpCompDelay*), so as not to allow the compressors to pressurise the circuit.

The alarm initially has automatic reset, unless it exceeds a certain number of interventions during the hour (*numEvHourBP*). In this case, it becomes manual reset and can be zeroed if, in the meantime, the pressure has risen above the minimum threshold (*setPointAlarmLP*) by a certain differential value (*diffAlarmLP*).



If the pressure probe is in error conditions, the relative alarm cannot be used.

In the presence of *low external air temperatures*, the intake pressure could be lower than the minimum pressure threshold and therefore prevent compressor start-up. In this situation it is possible to activate (*enLPLT=1* input) a control that moves the alarm control threshold to a higher temperature (*setLPLT*) for a certain period of time (*timeLPLT*) from the start-up of the first compressor, however maintaining the safety conditions and pre-start control. This control is only enabled in winter functioning mode (heat pump, *mode=1*).

Low pressure alarm on start-up
If in a low pressure situation and with the incapacity to activate any compressor on request for switch-on of the same, it is called *low pressure start-up alarm*. The alarm *has* automatic reset and should disappear unless there is a Freon leak in the system.

On compressors switch-off due to a low pressure alarm, the latter is delayed by a certain period of time (*delayAlarmBPonStart* input), in order to permit the refrigerant circuit to allow compressor start-up.

INPUTS

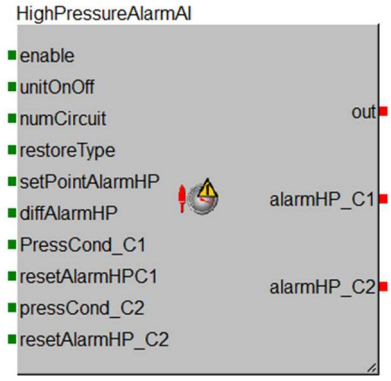
Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured. The alarm of the second circuit is enabled if *numCircuit=2*
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
numEvHourLP	CJ_BYTE	1	15	*	Number of low pressure alarms over which the reset becomes manual
starUpCompDelay	CJ_WORD	0	999	*	By-pass time (in seconds) from the start-up of the first compressor for the detection of the low pressure alarm
delayAlarmLPonStart	CJ_WORD	0	999	*	Delay time (in seconds) due to the detection of the low pressure alarm on start-up when a low pressure alarm sub enters.
setPointAlarmLP	CJ_SHORT	0.0	750.0	*	Set point over which the low pressure alarm from transducer is tripped [bar]
diffAlarmLP	CJ_SHORT	0.0	300.0	*	Differential for the regulation of the low pressure alarm from transducer [bar]
pressCond_C1	CJ_ANALOG			*	Circuit 1 condensation pressure probe [bar]
reqComp_C1	CJ_BYTE	0	2	*	Number of steps requested by the compressors regulation of circuit 1
orComp_C1	CJ_BIT	0	1	*	Circuit 1 compressors OR
resetAlarmLP_C1	CJ_BIT	0	1	*	Circuit 1 low pressure alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)
pressCond_C2	CJ_ANALOG			-	Circuit 2 condensation pressure probe [bar]
reqComp_C2	CJ_BYTE	0	2	0	Number of steps requested by the compressors regulation of circuit 2
orComp_C2	CJ_BIT	0	1	0	Circuit 2 compressors OR
resetAlarmLP_C2	CJ_BIT	0	1	0	Circuit 2 low pressure alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)
enLPLT	CJ_BIT	0	1	0	Enabling of low pressure alarm management at low temperatures (*mode=1*)
setPointLPLT	CJ_SHORT	0.0	750.0	1.0	Low pressure alarm set-point management time at low temperatures (only if *enLPLT=1* and *mode=1*)
diffLPLT	CJ_SHORT	0.0	300.0	0.5	Low pressure alarm regulation differential at low temperatures (only if *enLPLT=1* and *mode=1*)
timeLPLT	CJ_WORD	0	999	120	Low pressure alarm management time at low temperatures (only if *enLPLT=1* and *mode=1*)

** Input to be connected*

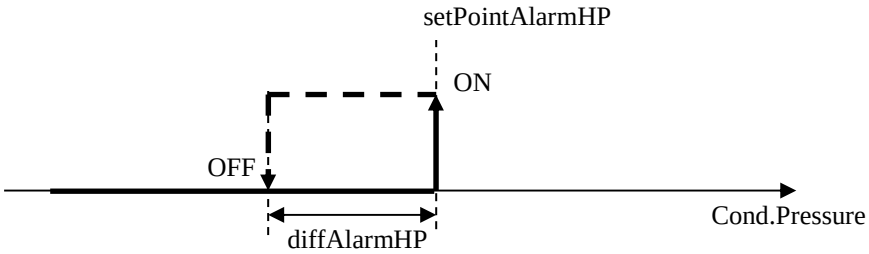
OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
alarmLP_C1	CJ_BIT	0	1	Circuit 1 low pressure alarm state: - 0: alarm not active - 1: alarm active
alarmLPStart_C1	CJ_BIT	0	1	Circuit 1 start-up low pressure alarm state: - 0: alarm not active - 1: alarm active
alarmLP_C2	CJ_BIT	0	1	Circuit 2 low pressure alarm state: - 0: alarm not active - 1: alarm active
alarmLPStart_C2	CJ_BIT	0	1	Circuit 2 start-up low pressure alarm state: - 0: alarm not active - 1: alarm active

15. ABL n°15 – High pressure alarm from transducer (2 circuits)



The macroblock manages the alarm up to two circuits. If the condensation pressure exceeds a certain threshold, a *high pressure* alarm is generated. The alarm is detected only if the machine is on (*unitOnOff=1*). The type of reset can be set: automatic on return of the alarm condition or manual.



If the pressure probe is in error conditions, the relative alarm cannot be used.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured The alarm of the second circuit is enabled if *numCircuit=2*
restoreType	CJ_BIT	0	1	*	Type of alarm reset - 0: automatic reset - 1: manual reset
setPointAlarmHP	CJ_SHORT	0.0	750.0	*	Set point over which the high pressure alarm from transducer is tripped [bar]
diffAlarmHP	CJ_SHORT	0.0	300.0	*	Differential for the regulation of the high pressure alarm from transducer [bar]
pressCond_C1	CJ_ANALOG			*	Circuit 1 condensation pressure probe [bar]
resetAlarmHP_C1	CJ_BIT	0	1	*	Circuit 1 high pressure alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)
pressCond_C2	CJ_ANALOG			-	Circuit 2 condensation pressure probe [bar]

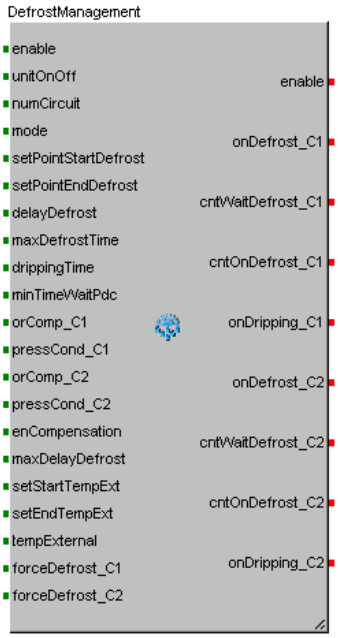
resetAlarmHP_C2	CJ_BIT	0	1	0	Circuit 2 high pressure alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
alarmHP_C1	CJ_BIT	0	1	Circuit 1 high pressure alarm state: - 0: alarm not active - 1: alarm active
alarmHP_C2	CJ_BIT	0	1	Circuit 2 high pressure alarm state: - 0: alarm not active - 1: alarm active

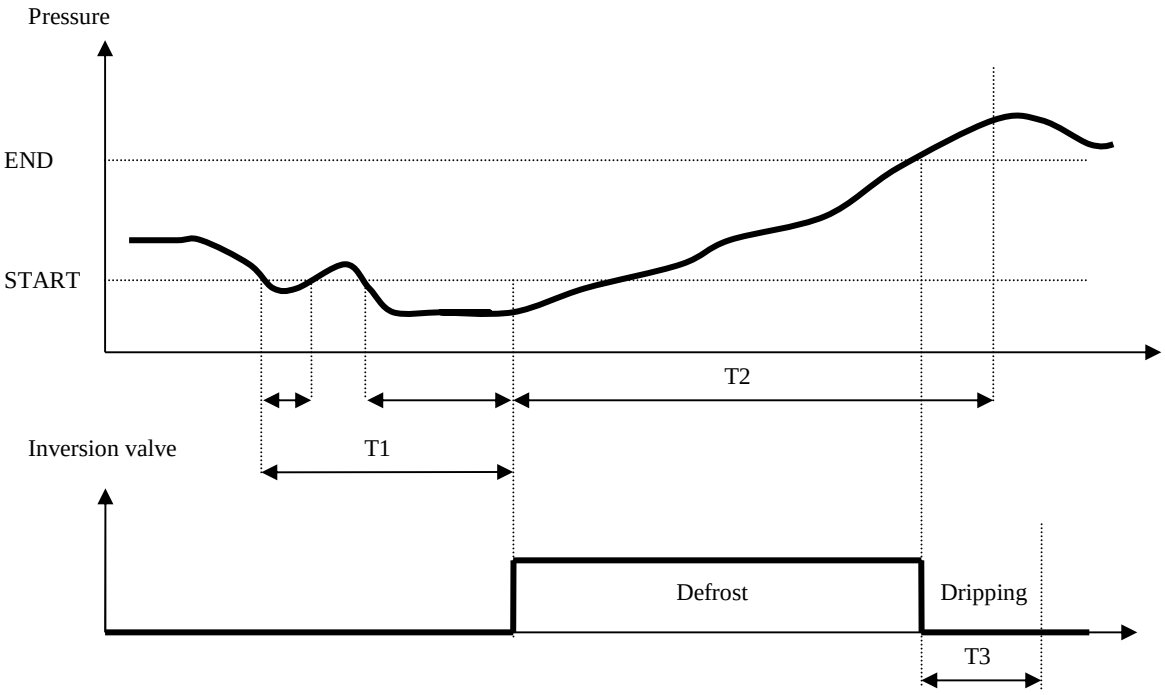
16. ABL n°16 – Defrosting management (2 circuits)



This procedure is only active in winter functioning mode (heat pump, *mode=1*) and when at least one compressor in the circuit is on (*orCmpC1=1*).
If the pressure persists (even not continuously) for a determined period of time (*delayDefrost* input) below the defrost start set-point (*setPointStartDefrost*) and at least one compressor is functioning, the defrosting phase starts and the relative (*onDefrost_C1, onDefrost_C2*) output is activated in a way to manage the switch-over of the inversion valve.
Through the input *forceDefrost_C1 (forceDefrost_C2)* it is possible to get the defrost to run in manual mode, on condition that it is not running yet.
The defrosting phase ends due to one of these conditions:

- when the pressure reaches the defrosting end set point (*setPointEndDefrost*)
- on expiry of the maximum duration time of defrosting (*maxDefrostTime*)
- in the case of machine or circuit alarms that block the compressors
- due to unit switch-off (OFF)

After the end of the defrosting the dripping phase starts for the entire time set from *drippingTime* input.

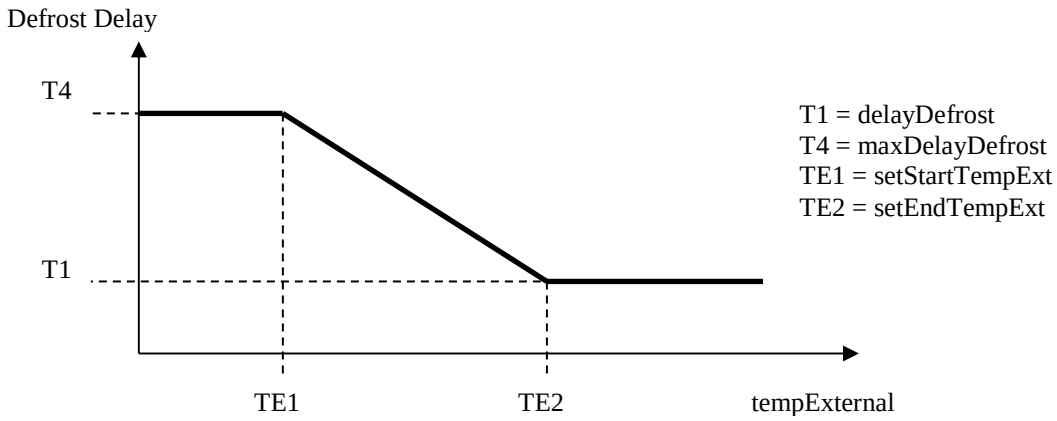


START = setPointStartDefrost
END = setPointEndDefrost
T1 = delayDefrost
T2 = maxDefrostTime
T3 = dripping time

To prevent defrosting starting immediately after shutdown of all compressors, a minimum time is waited for re-start of the circuit (*minTimeWaitPdc*) in a way to guarantee at least one functioning period in heat pump mode before entering defrost mode.
Defrosting is disabled with probes in error conditions.

Note. In the case of twin circuit (*numCircuit=2*), defrosting cannot be simultaneous. If one circuit is defrosting the other circuit cannot start a defrosting procedure until the circuit in defrosting mode has ended the complete cycle.

Defrosting cycle compensation
With the decrease in external temperature, the content of water vapour in the air (responsible for the formation of frost on the evaporating coil and therefore cause of the necessity to perform defrosting), decreases and it can therefore be convenient to increase the defrost activation delay depending on the decrease of the external temperature 8to increase the average efficiency of the system). If the function is enabled (*enCompensation=1* input), it activates starting from an initial external temperature set-point (*setStartTempExt*) below which compensation starts with increase of the defrosting activation delay, up to a maximum value (*maxDelayDefrost*) on reaching an external temperature final set-point (*setEndTempExt).*



The function is disabled if the probe is in error conditions.

INPUTS

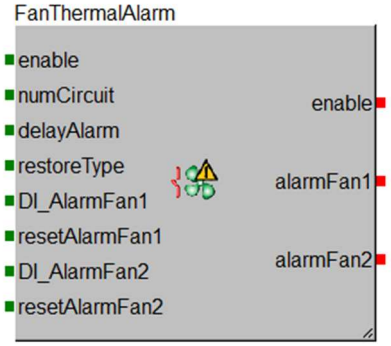
Name	Type	Min.	Max.	Max.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
setPointStartDefrost	CJ_SHORT	0.0	750.0	*	Defrost start set point [bar]
setPointEndDefrost	CJ_SHORT	0.0	750.0	*	Defrost end set point [bar]
delayDefrost	CJ_WORD	60	3600	*	Defrosting start-up delay (in seconds)
maxDefrostTime	CJ_WORD	10	999	*	Maximum duration time (in seconds) of defrosting
drippingTime	CJ_WORD	5	999	*	Time (in seconds) of the dripping phase
minTimeWaitPdc	CJ_WORD	0	999	*	Re-start time (in seconds) before next defrosting
orComp_C1	CJ_BIT	0	1	*	Circuit 1 compressors OR
pressCond_C1	CJ_ANALOG			*	Circuit 1 condensation pressure probe [bar]
orComp_C2	CJ_BIT	0	1	0	Circuit 2 compressors OR
pressCond_C2	CJ_ANALOG			-	Circuit 2 condensation pressure probe [bar]
enCompesation	CJ_BIT	0	1	0	Enabling the compensation function of the defrosting cycle
maxDelayDefrost	CJ_WORD	60	9600	3600	Maximum start-up delay time (in seconds) of defrosting Used only if (*enCompesation=1*)
setStartTempExt	CJ_SHORT	-58.0	302.0	5.0	Initial set point on the external temperature for the compensation of the defrosting cycle. Used only if (*enCompesation=1*)
setEndTempExt	CJ_SHORT	-58.0	302.0	0.0	Final set point on the external temperature for the compensation of the defrosting cycle. Used only if (*enCompesation=1*)
tempExternal	CJ_ANALOG			-	Outside air temperature probe [°C]. Used only if (*enCompesation=1*)
forceDefrost_C1	CJ_BIT	0	1	0	Request for forced defrost circuit 1
forceDefrost_C2	CJ_BIT	0	1	0	Request for forced defrost circuit 2

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
onDefrost_C1	CJ_BIT	0	1	Indicates that the defrosting phase in circuit 1 is active
cntWaitDefrost_C1	CJ_WORD	0	999	Residual time (in seconds) before defrosting of circuit 1
cntOnDefrost_C1	CJ_WORD	0	999	Residual time (in seconds) for defrosting circuit 1
onDripping_C1	CJ_BIT	0	1	Indicates that the dripping phase in circuit 1 is active
onDefrost_C2	CJ_BIT	0	1	Indicates that the defrosting phase in circuit 2 is active
cntWaitDefrost_C2	CJ_WORD	0	999	Residual time (in seconds) before defrosting of circuit 2
cntOnDefrost_C2	CJ_WORD	0	999	Residual time (in seconds) for defrosting circuit 2
onDripping_C2	CJ_BIT	0	1	Indicates that the dripping phase in circuit 2 is active

17. ABL n°17 – Fans thermal switch alarm (2 circuits)



The macroblock manages the thermal switch alarm of two fans. The alarm is delayed by any (*delayAlarm* input) by-pass time. The type of reset can also be set: automatic on return of the alarm condition or manual. Each of the alarms can be enabled individually

INPUTS

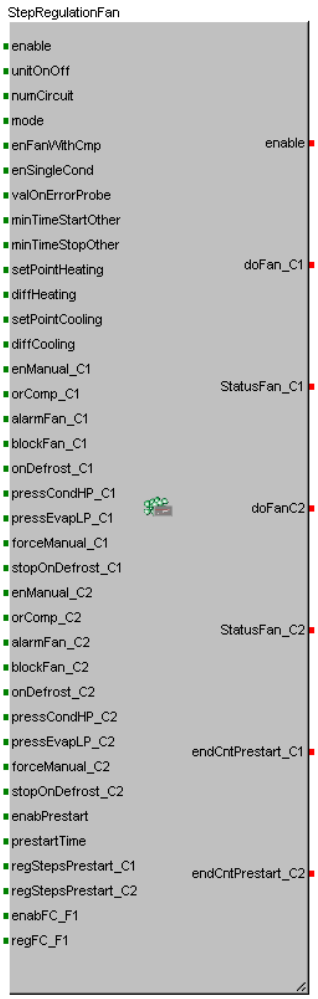
Name	Type	Min.	Max.	Max.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured The circuit 2 fan alarm is enabled if *numCircuit=2*
delayAlarm	CJ_WORD	0	999	*	Time (in seconds) of alarm by-pass
restoreType	CJ_BIT	0	1	0	Type of alarm reset - 0: automatic reset - 1: manual reset
DI_AlarmFan1	CJ_BIT	0	1	*	Digital input for indicating the thermal switch alarm of fan 1: 0: no alarm, 1: alarm present
resetAlarmFan1	CJ_BIT	0	1	0	Fan 1 thermal switch alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)
DI_AlarmFan2	CJ_BIT	0	1	0	Digital input for indicating the thermal switch alarm of fan 2: 0: no alarm, 1: alarm present
resetAlarmFan2	CJ_BIT	0	1	0	Fan 2 thermal switch alarm input manual reset; when passing from the 0 value to 1, if the alarm conditions have returned, the alarm will be reset. (Only if *restoreType=1*)

** Input to be connected*

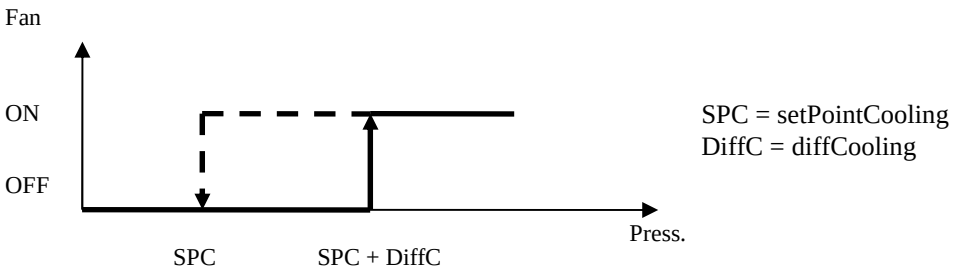
OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
alarmFan1	CJ_BIT	0	1	State of fan 1 thermal switch alarm - 0: alarm not active - 1: alarm active
alarmFan2	CJ_BIT	0	1	State of fan 2 thermal switch alarm - 0: alarm not active - 1: alarm active

18. ABL n°18 – Fans control in step regulation mode (2 circuits)

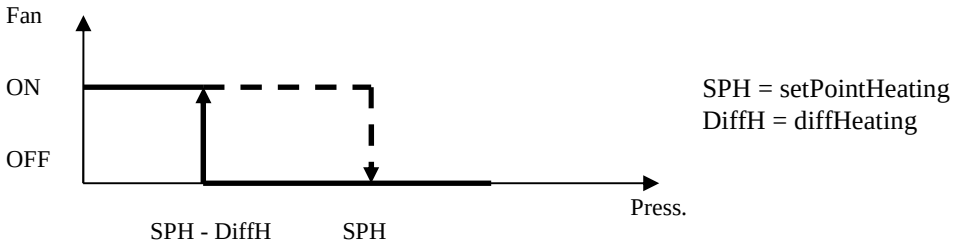


Manages a step regulation of the condensation fans regulating a digital output. The regulations are active if the unit is on (*unitOnOff=1*).
The following figure shows the behaviour of the proportional regulation in the case of summer functioning (chiller, *mode=0*). In this regulation, the proportional band is shifted completely over the set-point.



The regulation probe is the high pressure one (input *PressCondHP_C1* and *PressCondHP_C2*).

The following figure shows the behaviour of the proportional regulation in the case of winter functioning (heat pump, *mode=1*). In this regulation, the proportional band is shifted completely under the set-point.



The regulation probe is the lowpressure one (input *PressEvapLP_C1* and *PressEvapLP_C2*).

With the pressure probe in error conditions, it is possible to force (valOnErrorProbe input) the regulation value of the two fans.

The possibility exists to make the regulation of the fans independent or dependent with that of the compressors; by setting the *enFanWithComp=0* input. The regulation is independent from the heat regulation, otherwise (*enFanWithComp=1)* the fans will only be activated if the heat regulator has requested to switch at least one compressor on (if *orCmp_C1=1*, *orCmp_C2=1*).

The *stopOnDefrost* input establishes the behaviour of the fans during defrosting

Preventilation
Enabling the function (*enabPrestart*=1), to the request of steps activating the first compressor of the condensation circuit, the prestart of the fans is started and after a time you can set (*prestartTime*) the compressor is activated; the prestart of the fans lasts as long as there is the request of steps for ventilation and later the regulation follows the behaviour of the condensing pressure, as standard.

Note 1 The prestart keeps into consideration the protection times of the fans; the fan asking the prestart will runonce ts protection time is elapsed. As consequence also the compressor requests will be delayed (for the proper circuit).

Use of fan 1 for free-cooling
When the input *enabFC_F1* is active, it is possible to drive the fan of circuit 1 with an external regulation for free cooling (input *regFC_F1*). The regulation follows the input *regFC_F1* as long as at least a compressor request and a condensation request will arise; when this condition is true, the fan of circuit 1 follows the normal control of regulation.

Unique condensation
In the twin circuit machines (*numCircuit=2*) it is possible to select whether to use a unique circuit to manage condensation. To enable this function, *enSingleCond=1* must be set. Condensation is performed by fan number 1 using the most unfavourable value from the two condensation pressure values acquired from the two respective transducers. If one of the two probes is in error conditions, the other is used. The output activated is always that relative to circuit 1 (*doFan_C1*).

Fans state
Every fan has an associated functioning status (*statusFan_C1* and *statusFan_C2* outputs)

- *Disabled*: the fan is not configured.
- *On*: the fan is functioning.
- *Switch-on stand-by*: the fan is in stand-by due to the switch-on protection times.
- *Off*: the fan is off.
- *Switch-off stand-by*: the fan is in stand-by due to the switch-off protection times.

- *Alarm*: fan thermal switch alarm.
- *Manual*: the fan is in manual functioning mode.

Fan times

Fan protection times to prevent simultaneous peaks:
- *minTimeStartOther*: minimum time that must pass between switch-on of one fan and the next.
- *minTimeStopOther*: minimum time that must pass between switch-off of one fan and the next.

Manual Functioning Mode

The program allows to set manual functioning for compressors and fans. In this state the devices do not take part in rotations and in heat regulation calculations, however they are sensitive to any alarms.
Manual functioning of the devices is useful when functional tests must be performed on the machine in order test the integrity and correct functioning.
For condensing fans to go into manual functioning mode, the two enM*anual_C1* e enM*anual_C2* inputs must be set:

- 0: normal device behaviour
- 1: disables the fan and takes it to manual functioning mode.

A fan in manual functioning mode does not participate in regulations and can be forced into switch-on/off by setting the relative states inside the*forceManual_C1* and *forceManual_C2* macroblock.
A fan in manual functioning mode is sensitive to alarms.

INPUTS

Name	Type	Min.	Max.	Max.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
enFanWithComp	CJ_BIT	0	1	0	Enabling of regulation of the fans with the compressors 0: disabled, 1: enabled
enSingleCond	CJ_BIT	0	1	0	Enabling unique condensation 0: disabled, 1: enabled If enabled, the circuit 2 fan is not controlled
stopOnDefrost_C1	CJ_BIT	0	1	*	When =1 it stops the fans of the circuit in defrosting mode
valOnErrorProbe	CJ_BIT	0	1	*	Fans value with relative probe in error conditions
minTimeStartOther	CJ_WORD	0	999	*	Protection time (in seconds) between fan start-up
minTimeStopOther	CJ_WORD	0	999	*	Protection time (in seconds) between fan switch-off
setPointHeating	CJ_SHORT	0.0	750.0	*	Condensation set point in winter mode [bar]
diffHeating	CJ_SHORT	0	300.0	*	PI proportional band in winter mode [bar]
setPointCooling	CJ_SHORT	0.0	750.0	*	Condensation set point in summer mode [bar]
diffCooling	CJ_SHORT	0	300.0	*	PI proportional band in summer mode [bar]
enManual_C1	CJ_BIT	0	1	0	Enabling of manual functioning mode of the

					circuit 1 fan: 0: automatic functioning mode 1: manual functioning mode
orComp_C1	CJ_BIT	0	1	0	Circuit 1 compressors OR
alarmFan_C1	CJ_BIT	0	1	*	Circuit 1 fan thermal switch alarm, blocks the fan
block Fan_C1	CJ_BIT	0	1	*	Block alarms of the fan in circuit 1
onDefrost_C1	CJ_BIT	0	1	*	Indicates that the defrosting phase in circuit 1 is active
pressCondHP_C1	CJ_ANALOG			*	Circuit 1 condensation pressure probe [bar]
pressEvapLP_C1	CJ_ANALOG			-	Circuit 1 evaporation pressure probe [bar]
forceManual_C1	CJ_BIT	0	1	0	Circuit 1 fan forcing in manual functioning mode
enManual_C2	CJ_BIT	0	1	0	Enabling of manual functioning mode of the circuit 1 fan: 0: automatic functioning mode 1: manual functioning mode
orComp_C2	CJ_BIT	0	1	0	Circuit 2 compressors OR
alarmFan_C2	CJ_BIT	0	1	0	Circuit 2 fan thermal switch alarm, blocks the fan
block Fan_C2	CJ_BIT	0	1	0	Block alarms of the fan in circuit 2
onDefrost_C2	CJ_BIT	0	1	0	Indicates that the defrosting phase in circuit 2 is active
pressCondHP_C2	CJ_ANALOG			*	Circuit 2 condensation pressure probe [bar]
pressEvapLP_C2	CJ_ANALOG			-	Circuit 2 evaporation pressure probe [bar]
forceManual_C2	CJ_BIT	0	1	0	Circuit 2 fan forcing in manual functioning mode
stopOnDefrost_C2	CJ_BIT	0	1	0	When =1 it stops the fans of the circuit in defrosting mode
enabPrestart	CJ_BIT	0	1	0	enable function prealert
prestartTime	CJ_WORD	0	999	0	prealert time
regStepsPresart_C1	CJ_BYTE	0	3	0	request for circuit 1 compressor regulation (to get the prealert to start)
regStepsPresart_C2	CJ_BYTE	0	3	0	request for circuit 2 compressor regulation (to get the prealert to start)
enabFC_F1	CJ_BIT	0	1	0	enable fan circuit 1 for free cooling
regFC_F1	CJ_WORD	0.00	100.00	0.00	regulation of free cooling on fan belonging to circuit 1

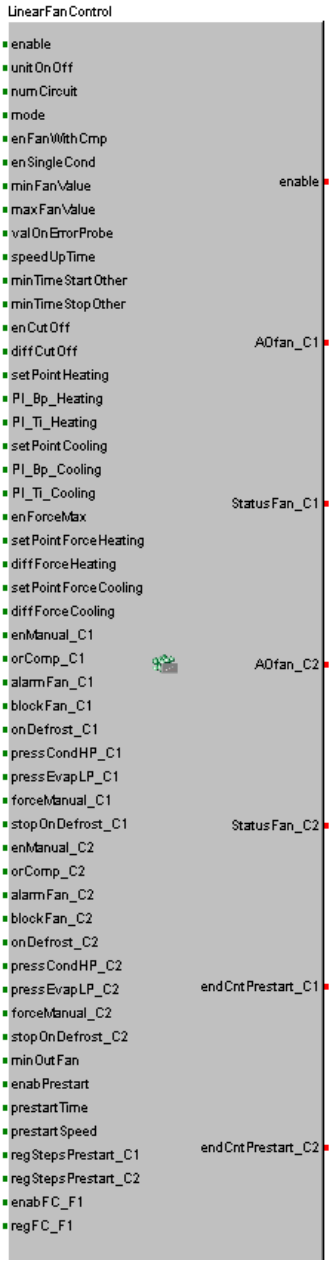
** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
doFan_C1	CJ_BIT	0	1	Circuit 1 condensation fan command [%]
statusFan_C1	CJ_BYTE	0	6	circuit 1 condensation fan status 0: disabled 1: off 2: switch-on stand-by 3: on 4: switch-off stand-by 5: thermal switch alarm 6: in manual mode
doFan_C2	CJ_BIT	0	1	Circuit 2 condensation fan command [%]
statusFan_C2	CJ_BYTE	0	6	circuit 2 condensation fan status 0: disabled 1: off

				2: switch-on stand-by 3: on 4: switch-off stand-by 5: thermal switch alarm 6: in manual mode
endCntPrestart_C1	CJ_BIT	0	1	If set to 1 it indicates the pre ventilation phase has finished (if active) of circuit 1
endCntPrestart_C2	CJ_BIT	0	1	If set to 1 it indicates the pre ventilation phase has finished (if active) of circuit 2

19. ABL n°19 – Fans control in PI regulation mode (2 circuits)



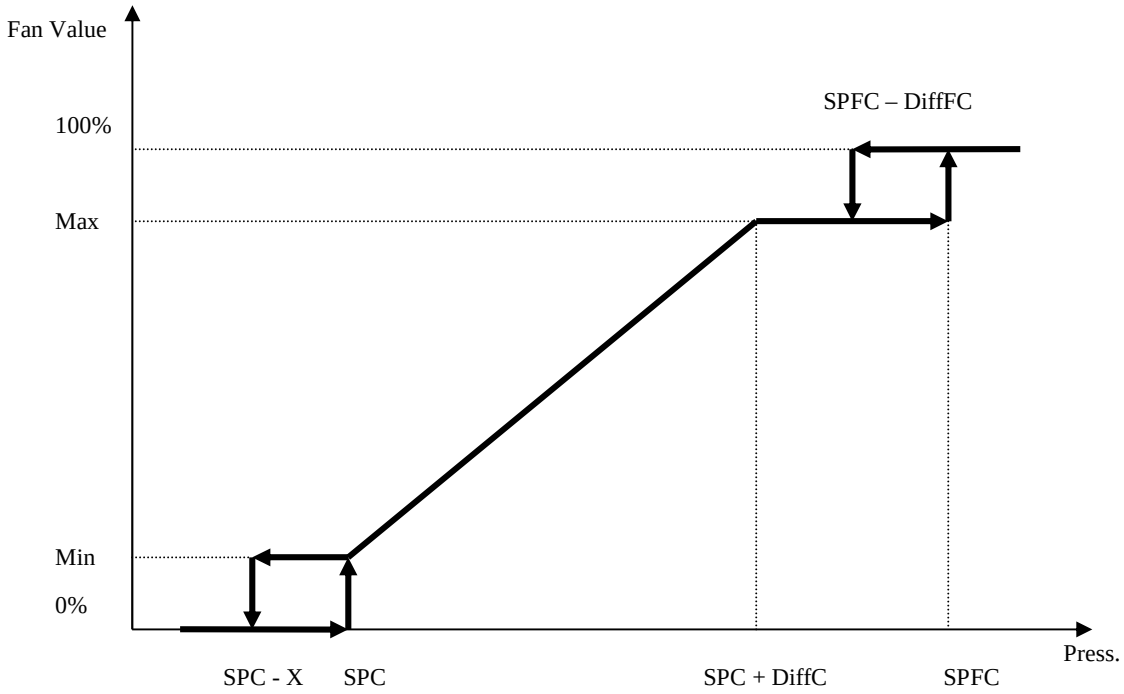
Manages a proportional-integral regulation of the condensation fans, regulating an analogue output. The regulation becomes only proportional by setting a zero value at the input of the integral time (*PI_Ti_Heating=0*, *PI_Ti_Cooling=0*), the regulations are only active if the unit is on (*unitOnOff=1*).

The fan speed regulation envisions a minimum value (*minValFan* and a maximum value (*maxValFan*). It is also possible to set the speed-up time (*speedUpTime* input) on start-up, during which the speed of the fan will go to maximum.

The possibility of keeping the fans at minimum, even under the set-point, is also envisioned by enabling the cut-off function (*enCutOff=1*). If the pressure should decrease further below the set-point of a certain threshold, fans switch-off is forced.

A high speed value is also present, over which the speed remains constant. Whenever forcing is enabled at maximum (*enForceMax=1*), if the pressure should increase further and exceed a certain threshold, the speed of the fans is forced at 100%.

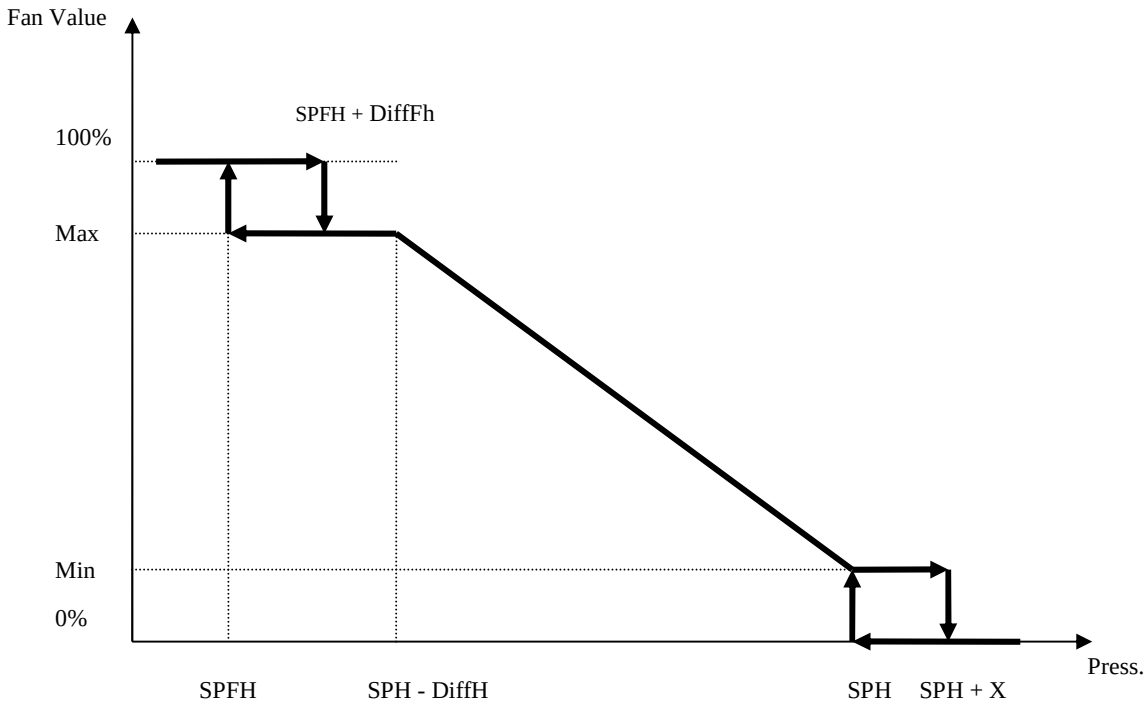
The following figure shows the behaviour of the proportional regulation in the case of summer functioning (chiller, *mode=0*). In this regulation, the proportional band is shifted completely over the set-point.



SPC = setPointCooling
DiffC = PI_Bp_Cooling
X = diffCutOff
SPFC = setPointForceMaxCooling
DiffFC = diffForceMaxCooling
Max = maxFanValue
Min = minFanValue

The regulation probe is the high pressure in input to *PressCondHp_C1* and *PressCondHp_C2*.

The following figure shows the behaviour of the proportional regulation in the case of winter functioning (heat pump, *mode=1*). In this regulation, the proportional band is shifted completely under the set-point.



SPH = setPointHeating
DiffH = PI_Bp_ Heating
X = diffCutOff
SPFH = setPointForceMaxHeating
DiffFH = diffForceMaxHeating
Max = maxFanValue
Min = minFanValue

The regulation probe is the low pressure in input to *PressEvapLP_C1* and *PressEvapLP_C2*.

With the pressure probe in error conditions, it is possible to force (valOnErrorProbe input) the regulation value of the two fans.

The possibility exists to make the regulation of the fans independent or dependent with that of the compressors; by setting the *enFanWithComp=0* input. The regulation is independent from the heat regulation, otherwise (*enFanWithComp=1)* the fans will only be activated if the heat regulator has requested to switch at least one compressor on (if *orCmp_C1=1*, *orCmp_C2=1*).

The *stopOnDefrost* input establishes the behaviour of the fans during defrosting

Preventilation
Enabling the function (*enabPrestart*=1), to the request of steps activating the first compressor of the condensation circuit, the prestart of the fans is started and after a time you can set (*prestartTime*) the compressor is activated; the prestart of the fans lasts as long as the regulation ramp of the condensation pressure overtakes the set speed (*prestartSpeed*) and then leaves the prestart and the regulation follows the behaviour of the condensing pressure, as standard.

Note 1 The prestart keeps into consideration the protection times of the fans; the fan asking the prestart will runonce ts protection time is elapsed. As consequence also the compressor requests will be delayed (for the proper circuit).

Use of fan 1 for free-cooling
When the input *enabFC_F1* is active, it is possible to drive the fan of circuit 1 with an external regulation for free cooling (input *regFC_F1*). The regulation follows the input *regFC_F1* as long as at least a compressor request and a condensation request will arise; when this condition is true, the fan of circuit 1 follows the normal control of regulation.

Unique condensation
In the twin circuit machines (*numCircuit=2*) it is possible to select whether to use a unique circuit to manage condensation. To enable this function, *enSingleCond=1* must be set. Condensation is performed by fan number 1 using the most unfavourable value from the two condensation pressure values acquired from the two respective transducers. If one of the two probes is in error conditions, the other is used. The output activated is always that relative to circuit 1 (*aoFan_C1*).

Fans state
Every fan has an associated functioning status (*statusFan_C1* and *statusFan_C2* outputs)
- *Disabled*: the fan is not configured.
- *On*: the fan is functioning.
- *Switch-on stand-by*: the fan is in stand-by due to the switch-on protection times.
- *Off*: the fan is off.
- *Switch-off stand-by*: the fan is in stand-by due to the switch-off protection times.
- *Alarm*: fan thermal switch alarm.
- *Manual*: the fan is in manual functioning mode.

Fan times
Fan protection times to prevent simultaneous peaks:
- *minTimeStartOther*: minimum time that must pass between switch-on of one fan and the next.
- *minTimeStopOther*: minimum time that must pass between switch-off of one fan and the next.

Manual Functioning Mode
For condensing fans to go into manual functioning mode, the two enM*anual_C1* e enM*anual_C2* inputs must be set:
- 0: normal device behaviour
- 1: disables the fan and takes it to manual functioning mode.

A fan in manual functioning mode does not participate in regulations and can be forced into switch-on/off by setting the desired value through the internal *forceManual_C1* and *forceManual_C2* inputs.
A fan in manual functioning mode is sensitive to alarms.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off

					- 1: unit on
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
enFanWithComp	CJ_BIT	0	1	0	Enabling of regulation of the fans with the compressors 0: disabled, 1: enabled
enSingleCond	CJ_BIT	0	1	0	Enabling unique condensation 0: disabled, 1: enabled
minFanValue	CJ_WORD	0.00	100.00	*	Minimum functioning speed
maxFanValue	CJ_WORD	0.00	100.00	*	Maximum functioning speed
valOnErrorProbe	CJ_WORD	0.00	100.00	*	Fans value with relative probe in error conditions
speedUpTime	CJ_WORD	0	999	0	Speed-up tome (in seconds)
minTimeStartOther	CJ_WORD	0	999	*	Protection time (in seconds) between fan start-up
minTimeStopOther	CJ_WORD	0	999	*	Protection time (in seconds) between fan switch-off
enCutOff	CJ_BIT	0	1	0	Enabling of cut-off function 0: disabled, 1: enabled
diffCutOff	CJ_SHORT	0.0	300.0	2.0	Cut-off differential [bar]
setPointHeating	CJ_SHORT	0.0	750.0	*	Condensation set point in winter mode [bar]
PI_Bp_ Heating	CJ_SHORT	0	300.0	*	PI proportional band in winter mode [bar]
PI_Ti_Heating	CJ_WORD	0	999	*	Integral PI time (in seconds) in winter functioning mode
setPoinCooling	CJ_SHORT	0.0	750.0	*	Condensation set point in summer mode [bar]
PI_Bp_ Cooling	CJ_SHORT	0	300.0	*	PI proportional band in summer mode [bar]
PI_Ti_ Cooling	CJ_WORD	0	999	*	Integral PI time (in seconds) in summer functioning mode
enForceMax	CJ_BIT	0	1	0	Enabling forced regulation at maximum speed
setPointForceHeating	CJ_SHORT	0.0	750.0	*	Forcing set-point at maximum in winter mode [bar]
diffForceHeating	CJ_SHORT	0.0	300.0	*	Forcing differential at maximum in winter mode [bar]
setPointForceCooling	CJ_SHORT	0.0	750.0	*	Forcing set-point at maximum in summer mode [bar]
diffForceCooling	CJ_SHORT	0.0	300.0	*	Forcing differential at maximum in summer mode [bar]
enManual_C1	CJ_BIT	0	1	0	Enabling of manual functioning mode of the circuit 1 fan: 0: automatic functioning mode 1: manual functioning mode
orComp_C1	CJ_BIT	0	1	0	Circuit 1 compressors OR
alarmFan_C1	CJ_BIT	0	1	*	Circuit 1 fan thermal switch alarm, blocks the fan
block Fan_C1	CJ_BIT	0	1	*	Block alarms of the fan in circuit 1
onDefrost_C1	CJ_BIT	0	1	*	Indicates that the defrosting phase in circuit 1 is active
pressCondHP_C1	CJ_ANALOG			*	Circuit 1 condensation pressure probe [bar]
pressEvapLP_C1	CJ_ANALOG			*	Circuit 1 evaporation pressure probe [bar]
forceManual_C1	CJ_WORD	0.00	100.00	0.00	Circuit 1 fan forcing in manual functioning mode
stopOnDefrostC1	CJ_BIT	0	1	*	When =1 it stops the fans of the circuit in defrosting mode
enManual_C2	CJ_BIT	0	1	0	Enabling of manual functioning mode of the

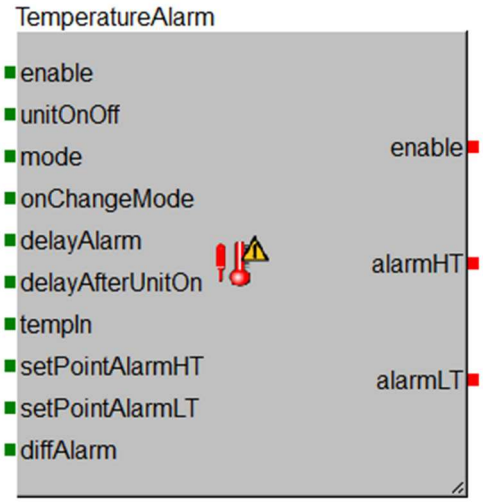
					circuit 1 fan: 0: automatic functioning mode 1: manual functioning mode
orComp_C2	CJ_BIT	0	1	0	Circuit 2 compressors OR
alarmFan_C2	CJ_BIT	0	1	0	Circuit 2 fan thermal switch alarm, blocks the fan
block Fan_C2	CJ_BIT	0	1	0	Block alarms of the fan in circuit 2
onDefrost_C2	CJ_BIT	0	1	0	Indicates that the defrosting phase in circuit 2 is active
pressCondHP_C2	CJ_ANALOG			*	Circuit 2 condensation pressure probe [bar]
pressEvapLP_C2	CJ_ANALOG			*	Circuit 2 evaporation pressure probe [bar]
forceManual_C2	CJ_WORD	0.00	100.00	0.00	Circuit 2 fan forcing in manual functioning mode
stopOnDefrostC2	CJ_BIT	0	1	1	When =1 it stops the fans of the circuit in defrosting mode
minOutFan	CJ_WORD	0.00	100.00	*	Fan speed minimum limit
enabPrestart	CJ_BIT	0	1	0	enable function prealert
prestartTime	CJ_WORD	0	999	0	prealert time
prestartSpeed	CJ_WORD	0.00	100.00	0.00	prealert speed
regStepsPresart_C1	CJ_BYTE	0	3	0	request for circuit 1 compressor regulation (to get the prealert to start)
regStepsPresart_C2	CJ_BYTE	0	3	0	request for circuit 2 compressor regulation (to get the prealert to start)
enabFC_F1	CJ_BIT	0	1	0	enable fan circuit 1 for free cooling
regFC_F1	CJ_WORD	0.00	100.00	0.00	regulation of free cooling on fan belonging to circuit 1

** Input to be connected*

OUTPUTS

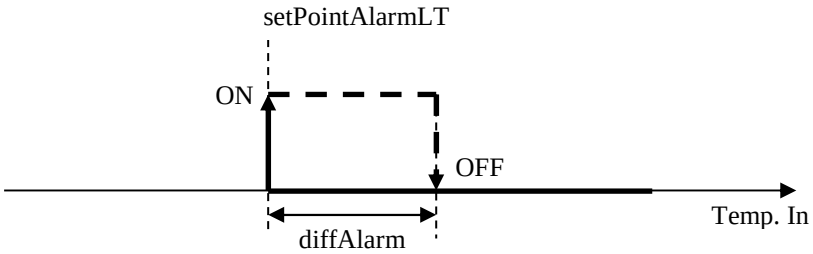
Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
aoFan_C1	CJ_WORD	0.00	100.00	Circuit 1 condensation fan command [%]
statusFan_C1	CJ_BYTE	0	6	circuit 1 condensation fan status 0: disabled 1: off 2: switch-on stand-by 3: on 4: switch-off stand-by 5: thermal switch alarm 6: in manual mode
aoFan_C2	CJ_WORD	0.00	100.00	Circuit 2 condensation fan command [%]
statusFan_C2	CJ_BYTE	0	6	circuit 2 condensation fan status 0: disabled 1: off 2: switch-on stand-by 3: on 4: switch-off stand-by 5: thermal switch alarm 6: in manual mode
endCntPrestart_C1	CJ_BIT	0	1	If set to 1 it indicates the pre ventilation phase has finished (if active) of circuit 1
endCntPrestart_C2	CJ_BIT	0	1	If set to 1 it indicates the pre ventilation phase has finished (if active) of circuit 2

20. ABL n°20 – Temperature alarms control

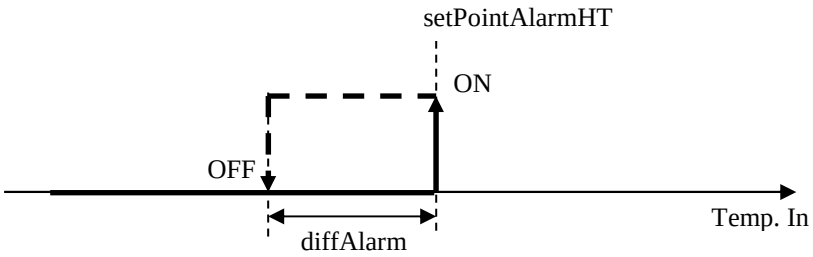


Depending on the functioning mode, a control is made on the input temperature to the exchangers, eventually activating an alarm.

- In winter functioning mode (heat pump, *mode=1*), if the temperature falls below a certain threshold for a time that can be set (*delayAlarm*), a “low temperature” alarm is generated.



- In summer functioning mode (chiller, *mode=0*), if the input temperature is over a certain threshold for a time that can be set (*delayAlarm*), a “high temperature” alarm is generated.



It is also possible to set a prevention time of the temperature alarms on switch-on of the system. By setting the *delayAfterUnitOn* input higher than zero, when *unitOnOff* passes from 0 to1 the alarms signal is delayed for the entire time selected.

These alarms are only detected if the machine is on (*unitOnOff=1*) and have automatic reset.
The alarms control is disabled during a functioning mode changeover (*onChangeMode=1*).

INPUTS

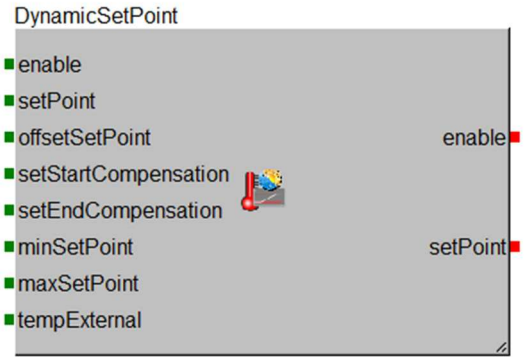
Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off - 1: unit on
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
onChangeMode	CJ_BIT	0	1	*	When equal to "1" it indicates that a functioning mode changeover is in progress (control disabled)
delayAlarm	CJ_WORD	0	999	*	Time (in seconds) of alarm by-pass
delayAfterUnitOn	CJ_WORD	0	999	*	Time (in seconds) of unit start-up alarm by-pass
tempIn	CJ_ANALOG			*	Input water temperature probe [°C]
setPointAlarmHT	CJ_SHORT	-58.0	302.0	*	High temperature alarm regulation set point [°C]
setPointAlarmLT	CJ_SHORT	-58.0	302.0	*	Low temperature alarm regulation set point [°C]
diffAlarm	CJ_SHORT	0.0	50.0	*	Regulation differential for the temperature alarms [°C]

** Input to be connected*

OUTPUTS

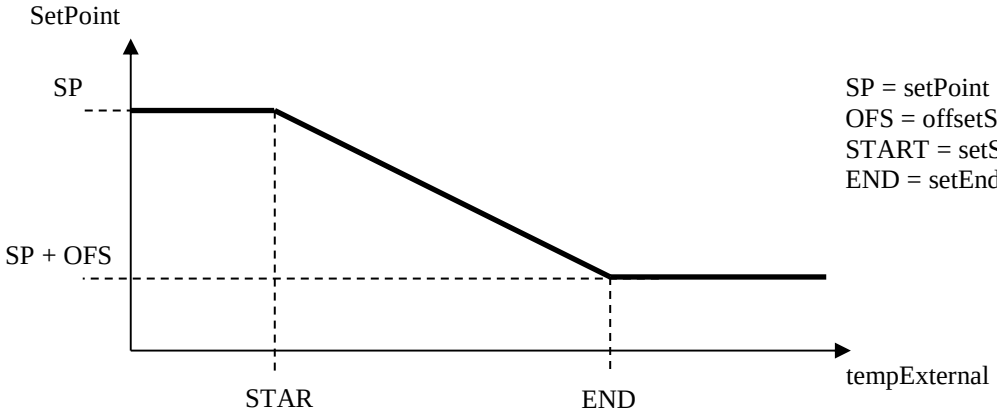
Name	Type	Min.	Max.	Description
Enable	CJ_BIT	0	1	Status of the “enable” input
alarmHT	CJ_BIT	0	1	High temperature alarm status: - 0: alarm not active - 1: alarm active
alarmLT	CJ_BIT	0	1	Low temperature alarm status: - 0: alarm not active - 1: alarm active

21. ABL n°21 – Dynamic Set Point

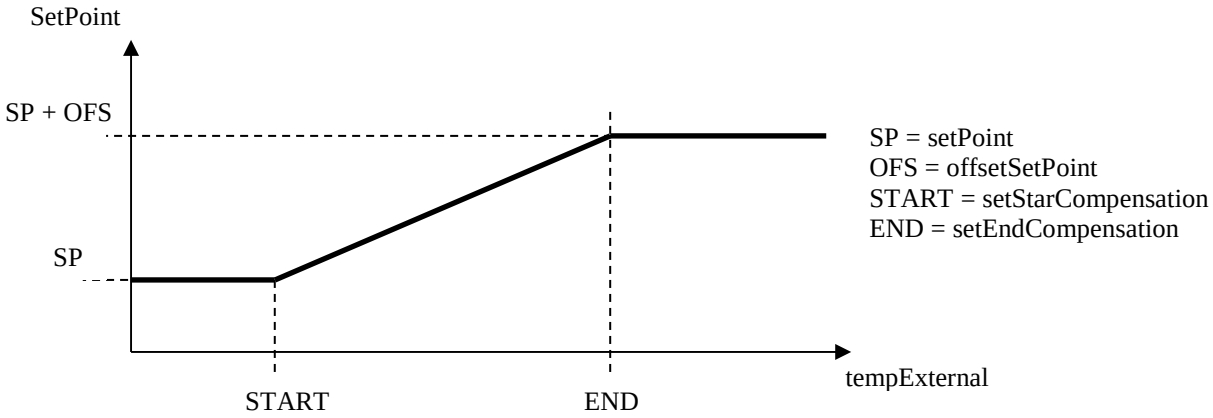


Allows to perform set point compensation on the basis of the external temperature detected.
The regulation set-point assumes a value between the standard set-point *SP* (corresponding to the initial threshold of the external temperature, *START*) and the set-point plus an offset *OFS* (corresponding to the final threshold of the external temperature, *END*), both for chiller and heat pump functioning modes. The trend is linear between the two compensation points and the curve assumes a different meaning on the basis of the offset sign.

With offsets below zero there is the following behaviour (chiller, summer functioning mode):



With offsets above zero there is the following behaviour (heat pump, winter functioning mode):



If the external temperature probe is in alarm conditions, the function is disabled.

INPUTS

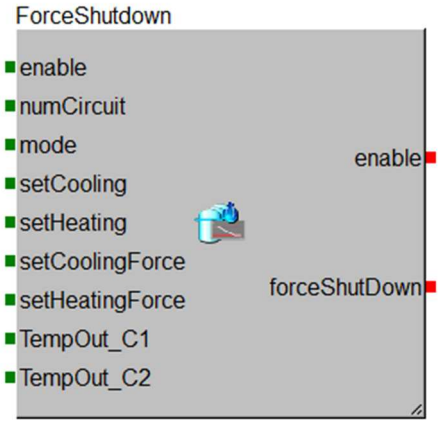
Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
setPoint	CJ_SHORT	-58.0	302.0	*	Value of the regulation set point [°C]
offsetSetPoint	CJ_SHORT	-58.0	302.0	*	Offset for the variation of the regulation set point [°C]
setStartCompensation	CJ_SHORT	-58.0	302.0	*	Initial value for the external temperature for the compensation of the set-point [°C]
setEndCompensation	CJ_SHORT	-58.0	302.0	*	Final value for the external temperature for the compensation of the set-point [°C]
minSetPoint	CJ_SHORT	-58.0	302.0	*	Minimum value of the regulation set point [°C]
maxSetPoint	CJ_SHORT	-58.0	302.0	*	Maximum value of the regulation set point [°C]
tempExternal	CJ_ANALOG			*	Outside air temperature probe [°C]

** Input to be connected*

OUTPUTS

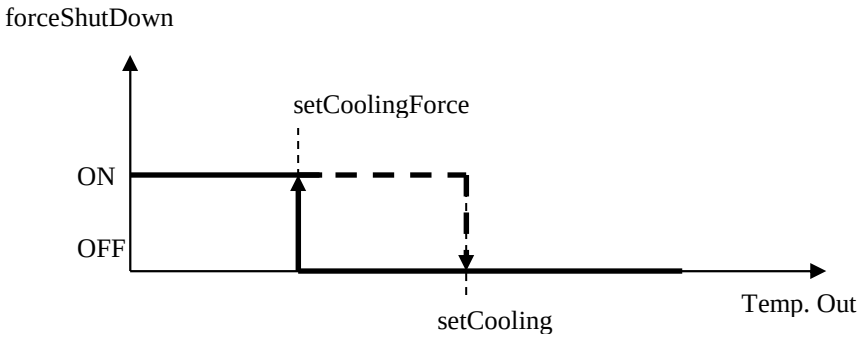
Name	Type	Min.	Max.	Description
Enable	CJ_BIT	0	1	Status of the “enable” input
setPoint	CJ_SHORT	-58.0	302.0	Value of the calculated regulation set point If (enable=0) the output corresponds to the *setPoint* input

22. ABL n°22 – Compressors forced switch-off (2 circuits)

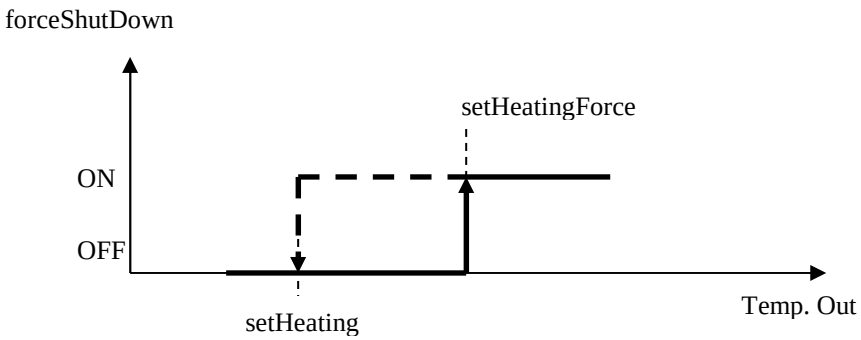


Manages the forced switch-off of the utilities when the output temperature passes a determined set-point. The block is released only when the temperature re-passes via the main regulation set-point
If two circuits are set (*numCircuit=2* input), regulation takes place *on the average of the two output temperature probes (empOut_C1, tempOut_C2).* If one of the two probes is in error conditions, regulation is made on the other functioning probe. If both probes are in error conditions, regulation is prevented.

In summer functioning mode (chiller, *mode=0*):



In winter functioning mode (heat pump, *mode=1*):



INPUTS

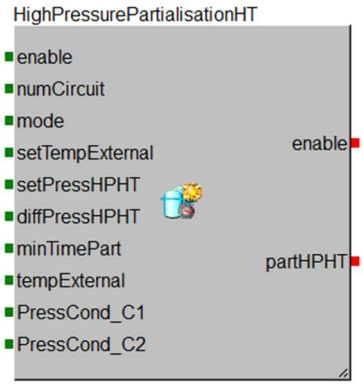
Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
setCooling	CJ_SHORT	-58.0	302.0	*	Summer set point for functioning in summer mode [°C]
setHeating	CJ_SHORT	-58.0	302.0	*	Winter set point for functioning in winter mode [°C]
setCoolingForce	CJ_SHORT	-58.0	302.0	*	Summer set-point over which the forced switch-off of the compressors is activated [°C]
setHeatingForce	CJ_SHORT	-58.0	302.0	*	Winter set-point over which the forced switch-off of the compressors is activated [°C]
tempOut_C1	CJ_ANALOG			*	Temperature probe of the water at output of circuit 1 [°C]
tempOut_C2	CJ_ANALOG			-	Temperature probe of the water at output of circuit 2 [°C]

** Input to be connected*

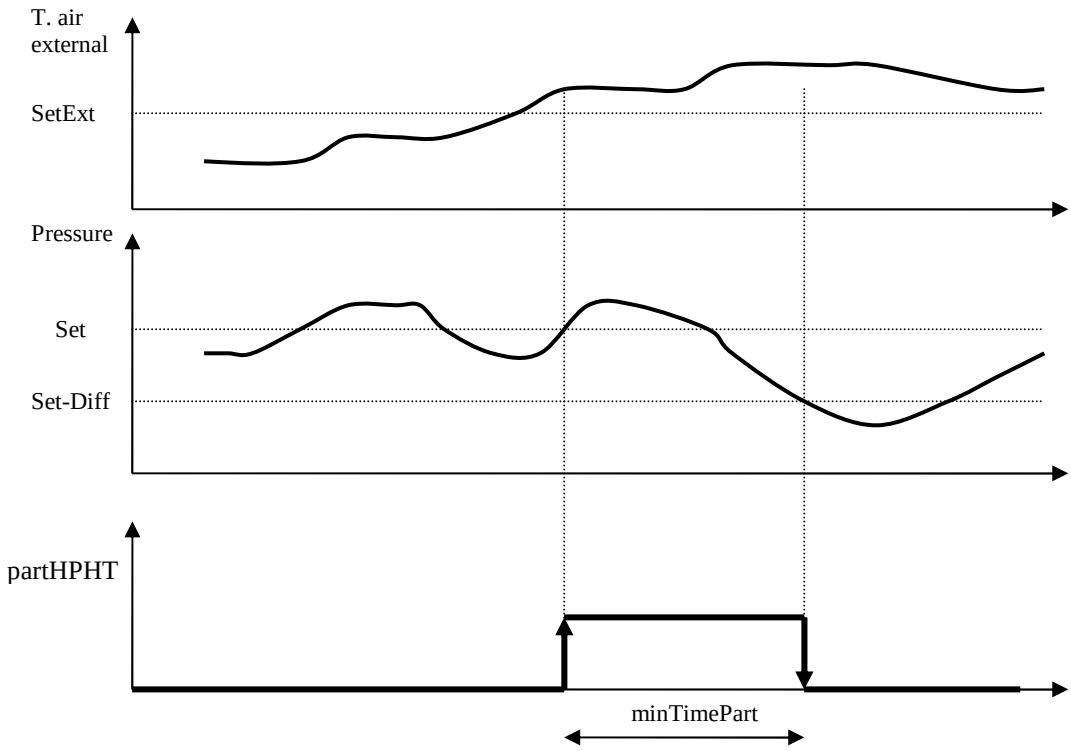
OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
forceShutDown	CJ_BIT	0	1	Commands for forced switch-off of the compressors

23. ABL n°23 – High pressure chocking with high temperatures (chiller)



This control allows the functioning of the refrigerant circuit also with high external air temperatures, contrasting the high pressure alarm intervention via the chocking of the power active in the circuit. The chocking with high temperatures is only active in summer functioning mode (chiller mode, *mode=0*).
When the external air temperature exceeds a determined threshold (*setTempExternal* input), the value of the pressure probe is tested in a way to activate chocking (*partHPHT=1* output) when the pressure passes the set-point set (*setPressHPHT* input). To prevent oscillations once the chocking is activated it is maintained for the entire time set in *minPartTime*.
If two circuits are set (*numCircuit=2* input), regulation takes place *on the average of the two output temperature probes (pressCond_C1, pressCond_C2).* If one of the two probes is in error conditions, regulation is made on the other functioning probe.
If the probes used are in error mode, the function is disabled.



SetExt = setTempExternal
Set = setPressHPHT
Diff= diffPressHPHT

INPUTS

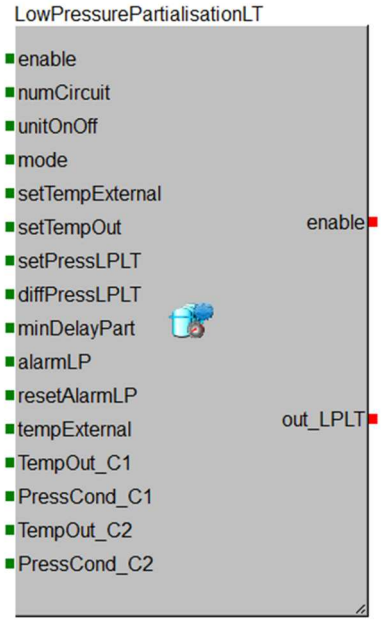
Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
setTempExternal	CJ_SHORT	-58.0	302.0	*	External temperature threshold over which it is allowed to chocke [°C]
setPressHPHT	CJ_SHORT	0.0	750.0	*	Set-point in pressure for regulation of chocking [bar]
diffPressHPHT	CJ_SHORT	0.0	300.0	*	Differential in pressure for regulation of chocking [bar]
minTimePart	CJ_WORD	0	99	*	Minimum time (in minutes) for maintaining chocking
tempExternal	CJ_ANALOG			*	Outside air temperature probe [°C]
pressCond_C1	CJ_ANALOG			*	Circuit 1 condensation pressure probe [bar]
pressCond_C2	CJ_ANALOG			-	Circuit 2 condensation pressure probe [bar]

** Input to be connected*

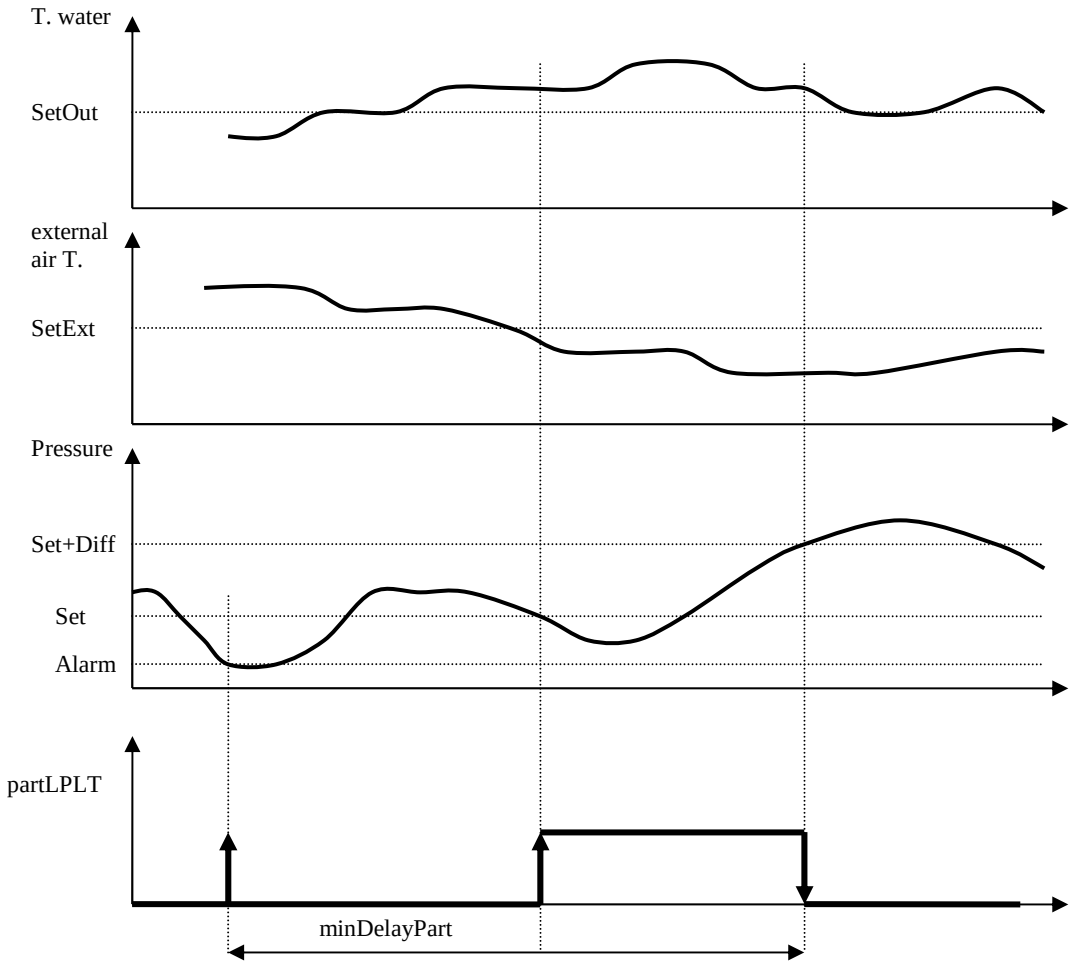
OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
partHPHT	CJ_BIT	0	1	Activation of chocking

24. ABL n°24 – Low pressure chocking with low temperatures (heat pump)



This control allows to chocke the power of the refrigerant circuit if the external temperature conditions and of the cooled water lead to minimum pressure alarms. If less than *minDelayPart* seconds have passed from the intervention of a minimum pressure alarm and the external air temperature drops below a determined threshold (*setTempExternal* input) and the output water temperature exceeds a determined threshold (*setTempOut* threshold) the value of the pressure probe is tested in a way to activate chocking (*partLPLT=1* output) when the pressure goes below a determined threshold (*setPressLPLT* input).
The chocking with high temperatures is only active in winter functioning mode (heat pump mode, *mode=1*).
If two circuits are set (*numCircuit=2* input), pressure regulation takes place *on the average of the condensation pressure probes (pressCond_C1, pressCond_C2),* while output temperature regulation takes place on *the average of the two water output temperature probes (tempOut_C1, tempOut_C2).*
If one of the two probes is in error conditions the regulation is made on the other functioning probe.
If the probes used are in error mode, the function is disabled.



SetExt = setTempExternal
SetOut = setTempOut
Set = setPressLPLT
Diff= diffPressLPLT
Alarm = alarmLP

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
numCircuit	CJ_BYTE	1	2	*	Number of circuits configured
unitOnOff	CJ_BIT	0	1	*	Unit on/off status - 0: unit off 1: unit on
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
setTempExternal	CJ_SHORT	-58.0	302.0	*	External temperature threshold over which it is allowed to chocke [°C]
setTempOut	CJ_SHORT	-58.0	302.0	*	Output water temperature threshold over which it is allowed to chocke [°C]
setPressLPLT	CJ_SHORT	0.0	750.0	*	Set-point in pressure for regulation of chocking [bar]
diffPressLPLT	CJ_SHORT	0.0	300.0	*	Differential in pressure for regulation of chocking [bar]

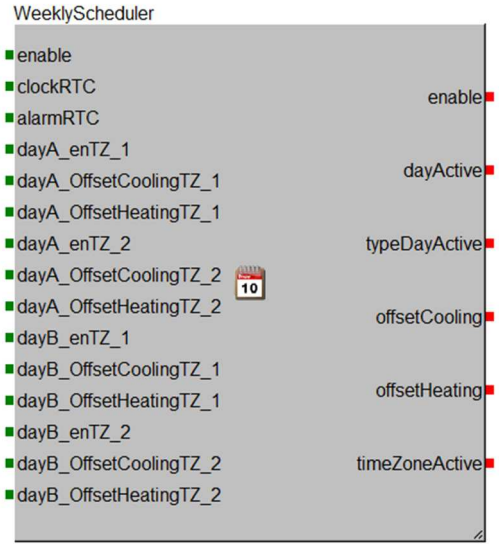
minDelayPart	CJ_WORD	0	999	*	Minimum delay time (in seconds) for activation of chocking from low pressure alarm
alarmLP	CJ_BIT	0	1	*	Circuits low pressure alarm (if 2 circuits connect the OR of the alarms)
resetAlarmLP	CJ_BIT	0	1	*	Circuits low pressure alarm reset (if 2 circuits connect the OR of the resets)
tempExternal	CJ_ANALOG			*	Outside air temperature probe [°C]
tempOut_C1	CJ_ANALOG			*	Temperature probe of the water at output of circuit 1 [°C]
pressCond_C1	CJ_ANALOG			*	Circuit 1 condensation pressure probe [bar]
tempOut_C2	CJ_ANALOG			-	Temperature probe of the water at output of circuit 2 [°C]
pressCond_C2	CJ_ANALOG			-	Circuit 2 condensation pressure probe [bar]

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
partLPLT	CJ_BIT	0	1	Activation of chocking

25. ABL n°25 – Weekly Scheduler (Template)



Manages a weekly scheduler, every day of the week can be one of three types: workingDayA, workingDayB and notWorkingDay. The *typeDay_Sunday*, *typeDay_Monday*, *typeDay_Saturday* internal parameters allow to set the type of day in a way to associate up to three different behaviours to each of the days of the week.
Two time bands are associated to every "*type of working day*". Each of the two bands has an *enable* status associated, for enabling/disabling of the band and two offset values, so as to modify the work set point. For *notWorkingDay* types of day, the scheduler does not manage any time band and relative offsets.
The *offsetCooling* and *offsetHeating* outputs correspond with the value actually calculated on the basis of the parameters and the time bands set, while *timeZoneActive* indicates if one of the time bands configured is active or not. The output remains at "1" for the entire time included in the band configured, while it remains at zero in other cases.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
clockRTC	CJ_DATETIME	-	-	*	System clock for scheduler control
alarmRTC	CJ_BIT	0	1	*	If there is a clock alarm (*alarmRTC=1*) the scheduler does not function, the offset output goes back to value of 0.0.
dayA_enTZ_1	CJ_BIT	0	1	0	Enabling of the first time band for the type of day *workingDayA(1)*
dayA_OffsetCoolingTZ _1	CJ_SHORT	-58.0	302.0	-10.0	Summer offset in the first time band for the type of day *workingDayA(1)*
dayA_OffsetHeatingTZ_1	CJ_SHORT	-58.0	302.0	10.0	Winter offset in the first time band for the type of day *workingDayA(1)*
dayA_enTZ_2	CJ_BIT	0	1	0	Enabling of the second time band for the type of day *workingDayA(1)*
dayA_OffsetCoolingTZ_2	CJ_SHORT	-58.0	302.0	-10.0	Summer offset in the second time band for the type of day *workingDayA(1)*
dayA_OffsetHeatingTZ_2	CJ_SHORT	-58.0	302.0	10.0	Winter offset in the second time band for the type of day *workingDayA(1)*
dayB_enTZ_1	CJ_BIT	0	1	0	Enabling of the first time band for the type of day *workingDayB(2)*

dayB_ OffsetCoolingTZ_1	CJ_SHORT	-58.0	302.0	-10.0	Summer offset in the first time band for the type of day *workingDayB(2)*
dayB_OffsetHeatingTZ_1	CJ_SHORT	-58.0	302.0	10.0	Winter offset in the first time band for the type of day *workingDayB(2)*
dayB_enTZ_2	CJ_BIT	0	1	0	Enabling of the second time band for the type of day *workingDayB(2)*
dayB_OffsetCoolingTZ_2	CJ_SHORT	-58.0	302.0	-10.0	Summer offset in the first time band for the type of day *workingDayB(2)*
dayB_OffsetHeatingTZ_2	CJ_SHORT	-58.0	302.0	10.0	Winter offset in the first time band for the type of day *workingDayB(2)*

** Input to be connected*

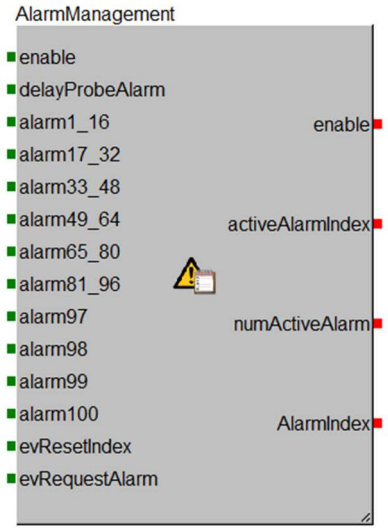
INTERNAL PARAMETERS/STATUS

Name	Type	Min.	Max.	Def.	Description
typeDay_Sunday	CJ_BYTE	0	2	0	Type of day for Sunday: 0: notWorkingDay 1: workingDayA, 2: workingDayB
typeDay_Monday	CJ_BYTE	0	2	0	Type of day for Monday: 0: notWorkingDay 1: workingDayA, 2: workingDayB
typeDay_Tuesday	CJ_BYTE	0	2	0	Type of day for Tuesday: 0: notWorkingDay 1: workingDayA, 2: workingDayB
typeDay_Wednesday	CJ_BYTE	0	2	0	Type of day for Wednesday: 0: notWorkingDay 1: workingDayA, 2: workingDayB
typeDay_Thursday	CJ_BYTE	0	2	0	Type of day for Thursday: 0: notWorkingDay 1: workingDayA, 2: workingDayB
typeDay_Friday	CJ_BYTE	0	2	0	Type of day for Friday: 0: notWorkingDay 1: workingDayA, 2: workingDayB
typeDay_Saturday	CJ_BYTE	0	2	0	Type of day for Saturday: 0: notWorkingDay 1: workingDayA, 2: workingDayB
dayA_StartTZ_1	CJ_TIME	0:00:00	23:59:59	8:00:00	Start of the first time band for the type of day *workingDayA(1)*
dayA_EndTZ_1	CJ_TIME	0:00:00	23:59:59	17:00:00	End of the first time band for the type of day *workingDayA(1)*
dayA_StartTZ_2	CJ_TIME	0:00:00	23:59:59	18:00:00	Start of the second time band for the type of day *workingDayA(1)*
dayA_EndTZ_2	CJ_TIME	0:00:00	23:59:59	21:00:00	End of the second time band for the type of day *workingDayA(1)*
dayB_StartTZ_1	CJ_TIME	0:00:00	23:59:59	8:00:00	Start of the first time band for the type of day *workingDayB(2)*
dayB_EndTZ_1	CJ_TIME	0:00:00	23:59:59	17:00:00	End of the first time band for the type of day *workingDayB(2)*
dayB_StartTZ_2	CJ_TIME	0:00:00	23:59:59	18:00:00	Start of the second time band for the type of day *workingDayB(2)*
dayB_EndTZ_2	CJ_TIME	0:00:00	23:59:59	21:00:00	End of the second time band for the type of day *workingDayB(2)*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
dayActive	CJ_BYTE	0	6	Actual day of the week [0: Sunday... 6: Saturday]
typeDayActive	CJ_BYTE	0	2	Type of day of current day: 0: notWorkingDay 1: workingDayA, 2: workingDayB
offsetCooling	CJ_SHORT	-58.0	302.0	Current offset in summer functioning mode (chiller)
offsetHeating	CJ_SHORT	-58.0	302.0	Current offset in winter functioning mode (heat pump)
timeZoneActive	CJ_BIT	0	1	Indicates if it is a set time band: - 0: no time band configured - 1: in configured time band

26. ABL n°26 – Alarms management



The macroblock manages up to 100 alarm events. Every alarm has an increasing index associated; alarm 1 has index 1 … alarm n has index n. Management is based on a priority of 100 alarms, the priority is decided by the index; the alarm with highest priority must be that at alarm 1 input, while that with least priority will be connected to the input of the last alarm managed.
The six input WORDS allow to memorise the first 96 alarms, while the remaining 4 alarms must be connected to the respective alarm97, alarm98, alarm99, alarm100 inputs. Every time the *evRequestAlarm* input is activated, the next active alarm is requested. If it is the first requested (after a reset, *evResetIndex* input) the first active alarm is requested. The request is interpreted and as a result the index of the index of the relative active alarm (*activeAlarmIndex* output). This value allows to unmistakably identify which alarm is being examined. If the active output AlarmIndex=0 it means that there is no alarm active to be examined.
The *evResetIndex* input is used to zero the structure in a way that the first time that an alarm is requested the output index supplied is effectively that of the priority active alarm.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
delayProbeAlarm	CJ_BYTE	0	240	*	Time (in seconds) for signalling the probe error alarms
alarm1_16	CJ_WORD	0	65535	0	Alarms 1..16 packed in a WORD: bit1 = alarm 1, … bit16 = alarm 16
alarm17_32	CJ_WORD	0	65535	0	Alarms 17.0.32 packed in a WORD: bit1 = alarm 17, … bit16 = alarm 32
alarm33_48	CJ_WORD	0	65535	0	Alarms 33.0.48 packed in a WORD: bit1 = alarm 33, … bit16 = alarm 48
alarm49_64	CJ_WORD	0	65535	0	Alarms 49.0.64 packed in a WORD: bit1 = alarm 49, … bit16 = alarm 64
alarm65_80	CJ_WORD	0	65535	0	Alarms 65.0.80 packed in a WORD: bit1 = alarm 65, … bit16 = alarm 80
alarm81_96	CJ_WORD	0	65535	0	Alarms 81.0.96 packed in a WORD: bit1 = alarm 81, … bit16 = alarm 96
alarm97	CJ_BIT	0	1	0	Alarm n°97
alarm98	CJ_BIT	0	1	0	Alarm n°98
alarm99	CJ_BIT	0	1	0	Alarm n°99

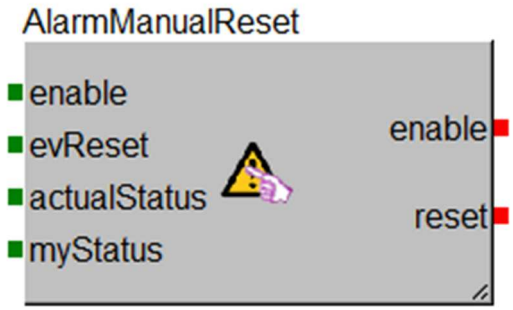
alarm100	CJ_BIT	0	1	0	Alarm n°100
evResetIndex	CJ_BIT	0	1	1	Event for the reset of the structure
evRequestAlarm	CJ_BIT	0	1	1	Event to request the first/successive active alarm

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
activeAlarmIndex	CJ_BYTE	0	100	Index of the alarm currently under examination, if *activeAlarmIndex=0* there are no active alarms
numActiveAlarm	CJ_BYTE	0	100	Number of alarms currently active

27. ABL n°27 – Manual alarms reset management



Block for management of alarms manual reset; the *reset* output must be connected directly to the reset inputs of the alarms that manage a manual reset.
When the *evReset* input passes from "0" to "1" the "*actualStatus=myStatus*" condition is verified. If the condition is verified, the reset output is set at "1".
The input "*forceReset*" forces the reset of the alarm independently on the oher conditions, the reset of the alarm is done when the input "*forceReset*" moves from value "0" to value "1".

INPUTS

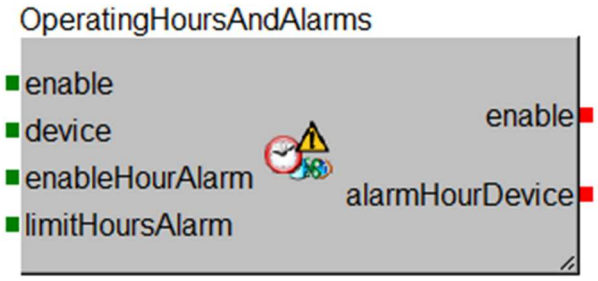
Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
evReset	CJ_BIT	0	1	*	Event for the reset of the alarm
actualStatus	CJ_WORD	0	65535	*	Generic comparison status for the reset of the alarm
myStatus	CJ_WORD	0	65535	*	Status of the relative alarm for the reset
forceReset	CJ_BIT	0	1	0	event for reset forced by the alarm

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the "enable" input
reset	CJ_BIT	0	1	Consent on manual reset of the alarm. When it equals 1" it indicates that reset of the relative alarm has been requested

28. ABL n°28 – Functioning times and alarm (Template)



Manages the functioning times of the connected device. To zero the functioning hours just set the internal status *hoursCntDevice* at zero.
By activating the *enableHourAlarm* input, it is possible to manage the alarm relative to exceeding the functioning hours set (*limitHoursAlarm* input).

INPUTS

Name	Type	Min.	Def.	Description
enable	CJ_BIT	0	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
device	CJ_BIT	0	1	Indicates the status of the associated device - 0: off - 1: functioning
enableHourAlarm	CJ_BIT	0	1	Enables the alarms relative to the functioning hours of the two pumps
limitHoursAlarm	CJ_DWORD	0	99999	Functioning hours maximum limit, exceeding which the alarm is triggered

** Input to be connected*

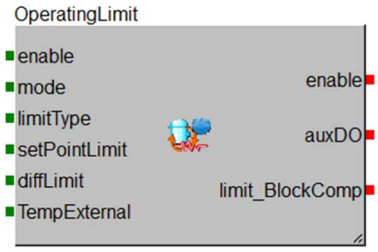
INTERNAL PARAMETERS/STATUS

Name	Type	Def.	Min.	Max.	Description
hoursCntDevice	CJ_DWORD	0	0	99999	Number of functioning hours of the associated device

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
alarmHourDevice	CJ_BIT	0	1	Set functioning hours exceeded alarm

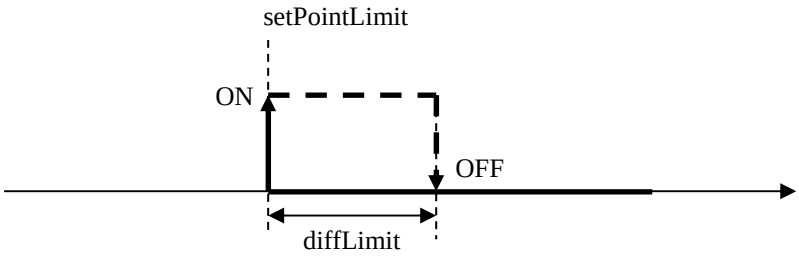
29. ABL n°29 – Functioning limit



When the external temperature drops to particularly low values, it may no longer be convenient or sufficient to heat using the heat pump. A *Limit Set-point* on the external temperature is used to deactivate the heat pump and activate, as a replacement, a relay output for switch-on consent of a boiler or a set of electric heaters. The reactivation occurs when the external temperature exceeds the Limit Set-point plus a *Limit Differential*. Management is enabled via the *limitType* input and can be set if the auxiliary output and compressors are used simultaneously:

- 0: Heat pump only (limit function disabled)
- 1: Activates auxiliary output as an alternative to the heat pump
- 2: Activates auxiliary output and the heat pump

The auxiliary digital output control is given at the *auxDO* output, while if the heat pump must be deactivated (therefore if the compressors must switch-off) the *limit_BlockComp* output is activated.



If the external temperature probe is incorrect, the function is disabled.
This functionality can only be used in the winter functioning mode, *mode=1*)

INPUTS

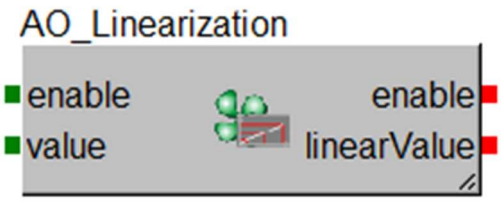
Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
mode	CJ_BIT	0	1	*	Current functioning mode: 0: summer mode (chiller) 1: winter mode (heat pump)
limitType	CJ_BYTE	0	2	*	Enabling of the type of functioning limit 0: modulating only 1: auxiliary relay only 2: auxiliary relay and compressors
setPointLimit	CJ_SHORT	-58.0	302.0	*	Set-point for the regulation of the functioning limit [°C]
diffLimit	CJ_SHORT	0.0	50.0	*	Differential for the regulation of the functioning limit [°C]
tempExternal	CJ_ANALOG			*	Outside air temperature probe [°C]

** Input to be connected*

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
auxDO	CJ_BIT	0	1	Auxiliary relay control
limit_BlockComp	CJ_BIT	0	1	Output for management of the heat pump block. When =1 it indicates that the compressors must be off

30. ABL n°30 – Analogue outputs linearisation (Template)



The value input is linearised by setting the internal parameters *x1, x2, x3. y1, y2, y3*.
If the *enable* input =0 the *linearValue* output corresponds with the *value* input.

INPUTS

Name	Type	Min.	Max.	Def.	Description
enable	CJ_BIT	0	1	1	Enable functioning of the macroblock 0: function disabled, 1: function enabled If nothing is connected to the default input "1" is valid
value	CJ_WORD	0.00	100.00	*	Value of the analogue output to linearise

** Input to be connected*

INTERNAL PARAMETERS/STATUS

Name	Type	Def.	Min.	Max.	Description
x1	CJ_WORD	25.00	0.00	100.00	First point abscissa linearisation
x2	CJ_WORD	50.00	0.00	100.00	Second point abscissa linearisation
x3	CJ_WORD	75.00	0.00	100.00	Third point abscissa linearisation
y1	CJ_WORD	25.00	0.00	100.00	First point ordered linearisation
y2	CJ_WORD	50.00	0.00	100.00	Second point ordered linearisation
y3	CJ_WORD	75.00	0.00	100.00	Third point ordered linearisation

OUTPUTS

Name	Type	Min.	Max.	Description
enable	CJ_BIT	0	1	Status of the “enable” input
linearValue	CJ_WORD	0.00	100.00	Value of the analogue output linearised

UNI-PRO - Application blocks libraries manual for chillers.
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