



HMI instruction guide

CAL-PM-8 device

Note: The CALMS EMCS is a PLC-based master controller designed to manage a range of equipment, including multiple compressors, dryers, and cooling water systems, among others. Its key benefit lies in its customizability, which allows it to adapt based on monitoring data and the specific requirements of the customer. Please note that this guide primarily outlines the standard features of the CALMS EMCS. In many instances, there are additional custom feature pages that are not included in this manual but can be found in the customer's Functional Specification document.

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Date: 20.07.2023

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2 HOME SCREEN


The initial screen on the panel contains 4 icons: **STATUS**, **SETUP**, **EVENTS** and **ALARMS**. By pressing "STATUS" you will enter the section that contains all the information about the status of your compressor station. In the settings, you can set basic parameters, such as: settings for analog inputs, current transformers, indicators, units and EMCS settings... In events, you have a list of all events, with information about when they occurred and what they are. Under alarms, you can see when did alarms occur.

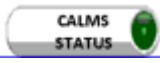



Figure 1: Home screen

3 STATUS

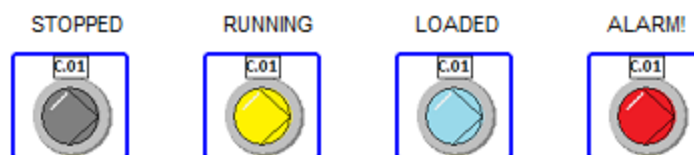
On the first page of the screen, you have information about the status of your compressors, as well as the values of the main system parameters: pressure, power, flow and system specific.

The "ALARM" light informs you if an error occurs anywhere in the system. You will read about the alarm in detail on the alarm-status page. Press the button  It will return you to the home screen.

If you press on  It moves you to the basic states of the compressor station.

Buttons  are navigation buttons (back to first page, step back, step forward).

Compressor states can be: loaded, running, off and error/alarm. The compressor light is colored according to its condition;



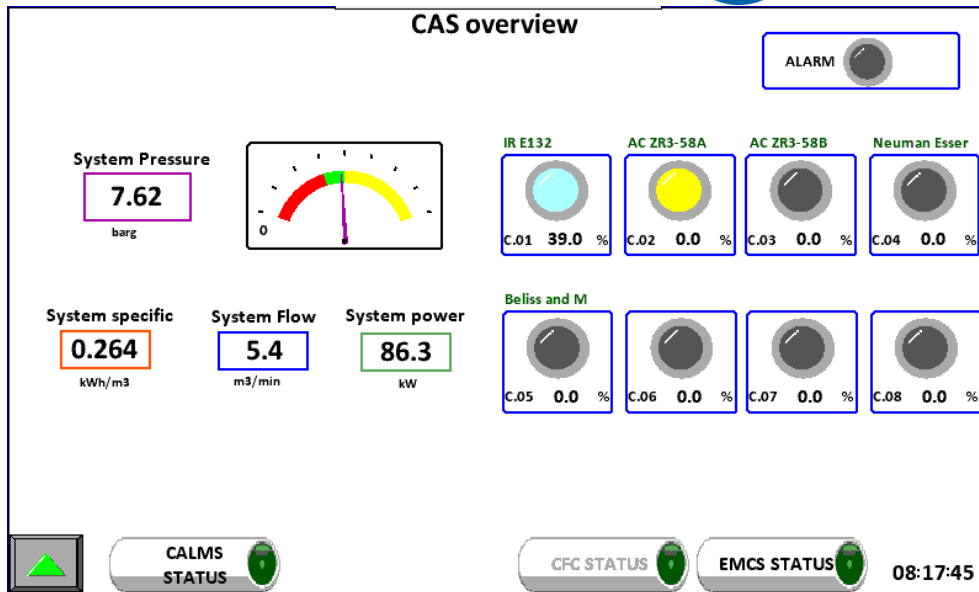


Figure 2: Compressed air station overview page

3.1 Compressor status page

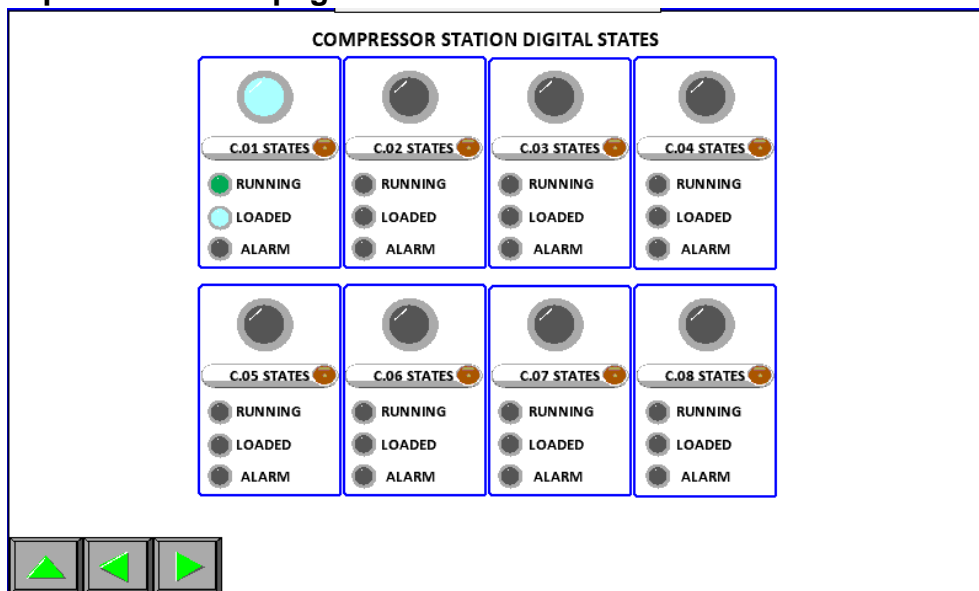


Figure 3: Status of compressors

C.01– operate under load;

C.02 – C.08 – switched off.

3.2 Analog inputs, Digital inputs and alarms

In the list of analog inputs, you can see which analog input the sensor is connected to, or what each AI in your system represents. You have insight into the current value and in which units the value is.

8 digital inputs are shown. A green light means DI is activated. In the picture below, all DI's are inactive.

You can see current active alarms (CS-C02 Alarm means that interface module for C.02 is not connected to the main CAL-PM-box).

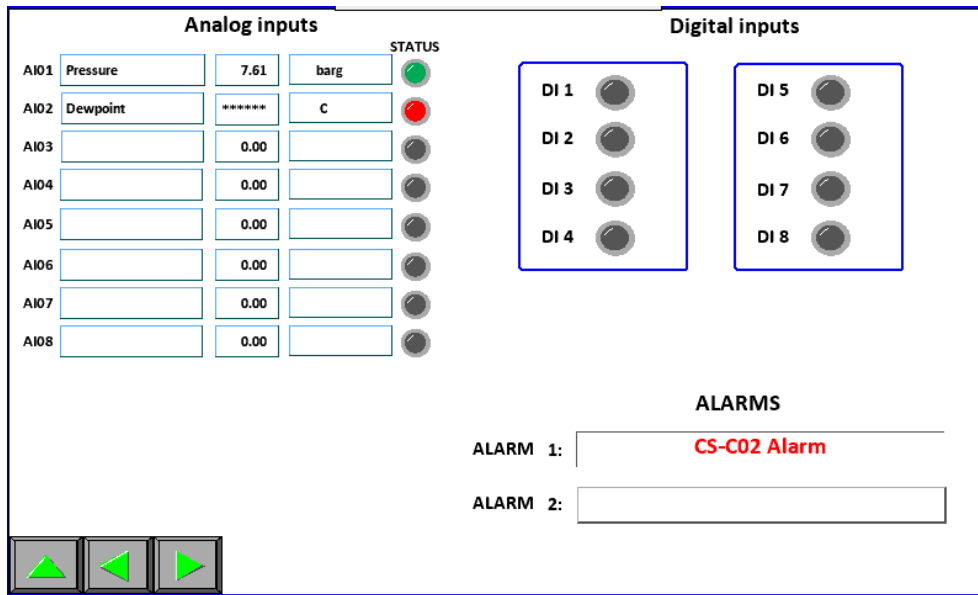


Figure 4: Analog inputs, Digital inputs and alarms

3.3 Compressor hours

The running, loaded hours and number of starts of each compressor are shown. When commissioning the system, manager must enter current compressor values (hours and starts) into the CALMS system.

NOTE: Values are calculated and there can be slight difference between actual values on the compressor and in the CALMS.

COMPRESSORS HOURS				
		RUN HR	LOAD HR	Number of starts
C.01	IR E132	20	17	10
C.02	AC ZR3-58A	14	0	4
C.03	AC ZR3-58B	0	0	0
C.04	Neuman Ess	0	0	0
C.05	Beliss and	0	0	0
C.06		0	0	0
C.07		0	0	0
C.08		0	0	0

Figure 5: Compressor hours and starts

3.4 Overview of electrical parameters of the compressor


Figure 6 shows a screen showing the power, current, voltage and power factor values for the C.01 and C.02 compressor. The same display is for C.03 to C.08.

COMMUNICATION ESTABLISHED – module recognized and connected,

COMMUNICATION INTERRUPTED – the module is neither recognized nor connected.

MODULE C.01 Power measurements COMMUNICATION ESTABLISHED IR E132	Voltage L1 [V]	228.09	Power L1 [kW]	21.9	Total Power [kW] 62.3
	Voltage L2 [V]	226.43	Power L2 [kW]	20.1	
	Voltage L3 [V]	228.21	Power L3 [kW]	19.8	
	Current L1 [A]	111.80	CosFi L1	0.983	
	Current L2 [A]	106.61	CosFi L2	0.965	
	Current L3 [A]	103.03	CosFi L3	0.988	
MODULE C.02 Power measurements COMMUNICATION INTERRUPTED AC ZR3-58A	Voltage L1 [V]	0.00	Power L1 [kW]	0.0	Total Power [kW] 0.0
	Voltage L2 [V]	0.00	Power L2 [kW]	0.0	
	Voltage L3 [V]	0.00	Power L3 [kW]	0.0	
	Current L1 [A]	0.00	CosFi L1	0.000	
	Current L2 [A]	0.00	CosFi L2	0.000	
	Current L3 [A]	0.00	CosFi L3	0.000	

Figure 6: Electrical parameters of compressor 1 and compressor 2

By pressing button  return to the first page of STATUS. To go back to the home screen - STATUS OVERVIEW, click twice on the same button.

3.5 Flowmeters

Flowmeters are connected in a MODBUS daisy chain. On the picture below you can see current values of all three parameters (Pressure, Flow, Temperature). You can see also

communication parameters settings and current communication status (if LED light is RED there is a communication error).

On the picture below you can see that flowmeters HP1 and HP2 have communication error.

Flowmeters					Communication error
	MODBUS address	Pressure value	Flow value	Temp. value	
1. Flowmeter LP1	1	7.46 barg	6.56 Nm3/min	26.40 °C	
2. Flowmeter LP2	2	0.00 barg	0.00 Nm3/min	27.11 °C	
3. Flowmeter LP3	3	7.65 barg	3.02 Nm3/min	14.65 °C	
4. Flowmeter HP1	4	0.00 barg	0.00 Nm3/min	0.00 °C	
5. Flowmeter HP2	5	0.00 barg	0.00 Nm3/min	0.00 °C	

Communication parameters: Baudrate: 9600
 Parity: None
 Data bits: 8
 Stop bits: 1

Figure 7: Status of the flowmeters

By pressing a button  return to the first page of STATUS

3.6 SCADA

By clicking on SCADA button you enter a page where all relevant real-time values are seen. This page is also set as a “screen saver page” → after 10 minutes of inactivity system goes to this page.

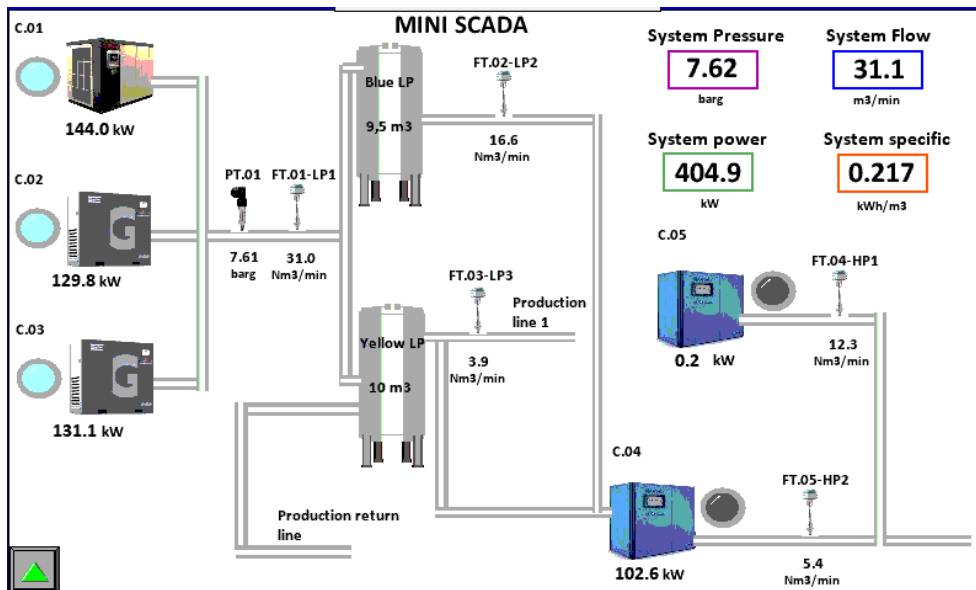



Figure 8: SCADA

3.7 EMCS status

Press the button  means entering the EMCS Status page.

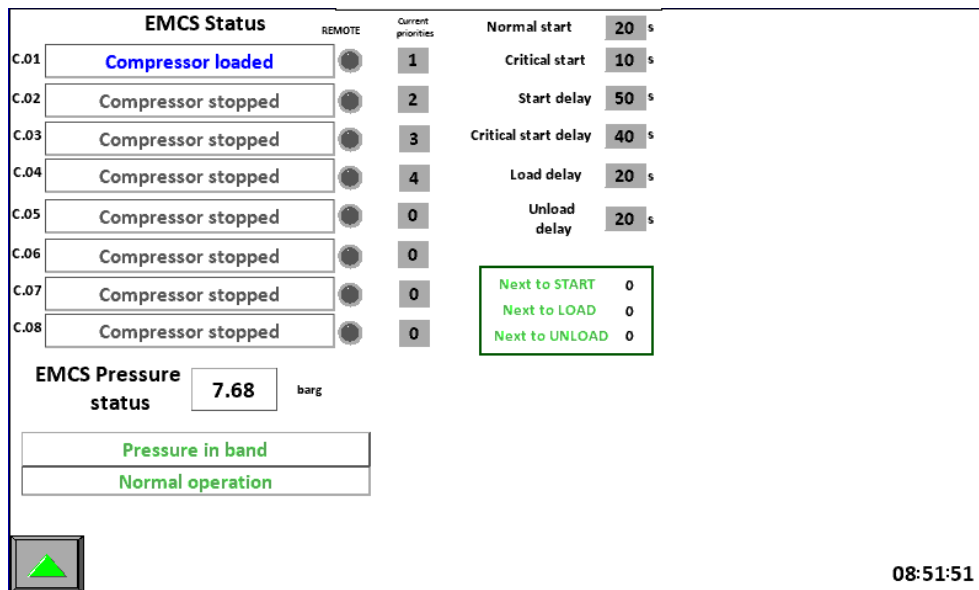


Figure 9: EMCS status

Compressor states can be:

- Compressor stopped: the compressor is switched off,
- Compressor unloaded: the compressor is running unloaded,
- Compressor loaded: the compressor is running and loaded,
- Compressor in alarm: intervention required
- Compressor starting: Compressor is in starting sequence
- Compressor start error: the compressor received a command to start, but did not "respond" within 20s,
- Compressor stop error: the compressor received the command to stop, but did not "respond" within 70s,
- Compressor is stopping: the compressor has received a stop command,
- The compressor is loading: the compressor has received a load command,
- The compressor is unloading: the compressor has received a command to unload,
- Compressor load error: the compressor received a load command, but did not "respond" within 20s,
- Compressor unload error: the compressor received a unload command but did not "respond" within 20s.

If the REMOTE LED light is on, it means that the compressor is in REMOTE operating mode. The current priority of the compressors is also shown. In the picture, we can see that C.01 is the leading compressor, while the rest are trailing compressors.

The pressure state can be:

- Pressure within limits: the pressure is below the upper limit and above the lower limit,

- Pressure below the lower limit: the pressure is below the lower limit (it is necessary to load or start the next compressor),
- Pressure below the critical value: the pressure is below the critical pressure (it is necessary to load or start the next compressor),
- Pressure above the upper limit: the pressure is above the upper limit (it is necessary to unload the next compressor),

EMCS status

The EMCS status field shows the status of the EMCS system. The EMCS system can be in the following statuses:

- Normal operation: the compressor station is operating normally,
- Compressor start: EMCS starts the next compressor,
- Critical compressor start: EMCS starts the next compressor as critical conditions have occurred,
- Compressor stop: EMCS stops the next compressor,
- Compressor loading: EMCS loads the next compressor,
- Compressor unloading: EMCS unloads the next compressor,
- Compressors rotation: EMCS changes the priority of compressors and starts with a rotation,
- Compressor station OFF: The condition for stopping the compressor station is met,
- No available compressors: EMCS has no available compressor to control,
- Compressor station startup: The condition for compressor station startup is met.

"Next for" indication

"Next for" tells you which compressor it is:

- Next to start: if the number is e.g. 3 means that compressor 3 is the next to start,
- Next to load: if the number is e.g. 0 means there is no next compressor to load,
- Next to relieve: if the number is 5, it means that compressor 5 is next to relieve.

4 SETTINGS

The first step is registration. Click on the button "LOGIN" and log in as "Operator" with the password "111". If you want to change anything, you must be logged in.

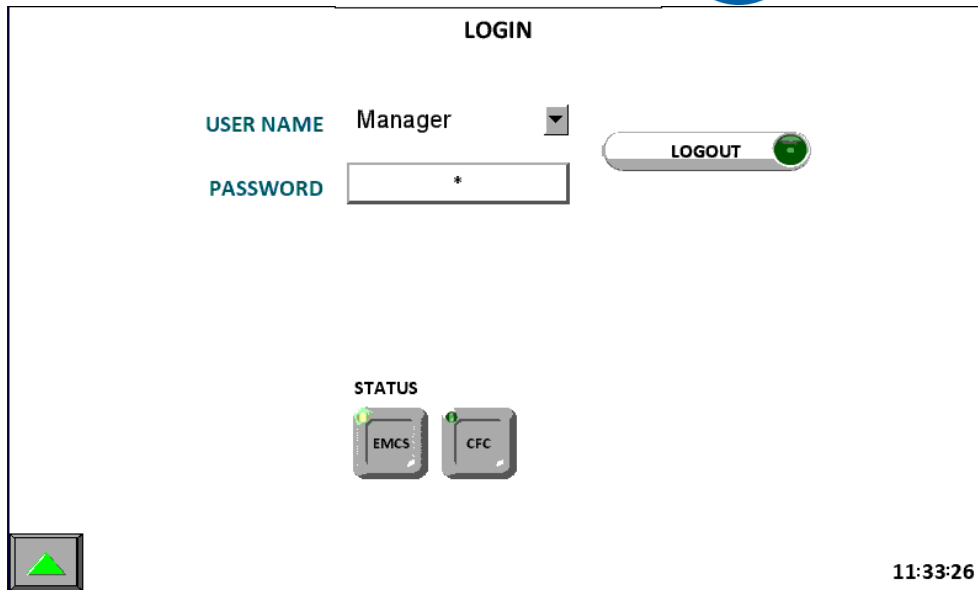


Figure 10: Login

4.1 CALMS SETTINGS

4.1.1 Analog input settings

The analog input settings are understood as setting the sensor's operating range, selecting the appropriate unit, and specifying the name/designation for each analog input.

Set the range of the current transformers used for the each compressor. It is important that you enter **maximum** current value, usually labeled on the current transformer!

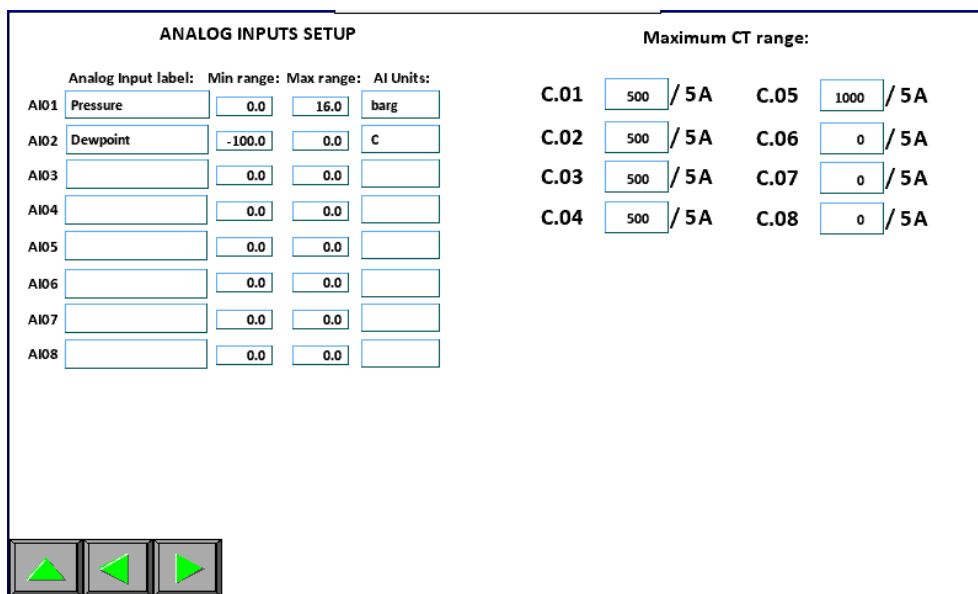


Figure 11: Analog input settings and CT settings

4.1.2 General settings

Here you set on which analog input you get the value of system pressure and system flow (system flow is the sum of two or more values).

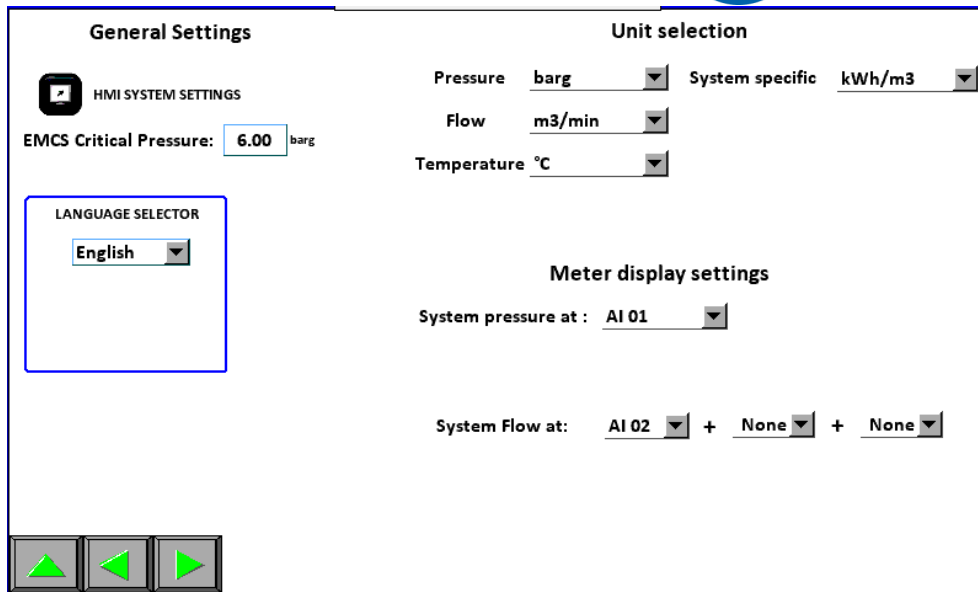


Figure 12: General settings

4.1.3 Setting the digital input type

Here you can determine whether the contact of the digital input is normally open or normally closed.

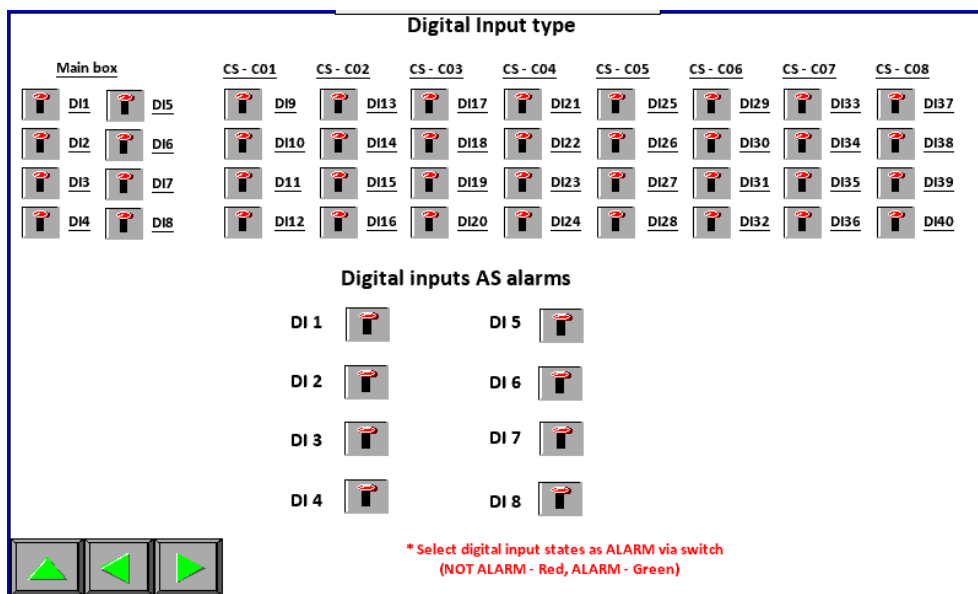


Figure 13: Digital input type selection

4.2 EMCS SETTINGS

You can set the settings under EMCS **pressure values, timers, control mode and start/stop function.**

4.2.1 Pressure settings

If you click on the pressure you can change **pressure setpoint** (desired system pressure value), setpoint offset and **min critical pressure** (if the pressure value falls below that value, an alarm is triggered and additional compressors are switched on).

Under EMCS pressure, you select the pressure to which EMCS refers.

4.2.2 Timers settings

Timers are used to adjust the delay time before the EMCS starts to react, or before the implementation of a certain state (e.g. start-up) begins.

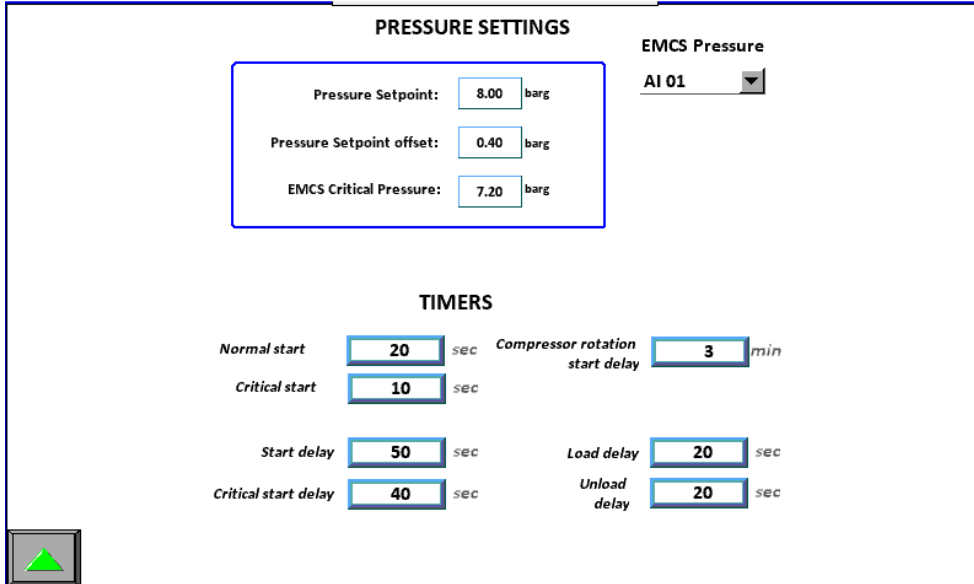


Figure 14: Pressure and timers settings

4.2.3 Control strategy settings

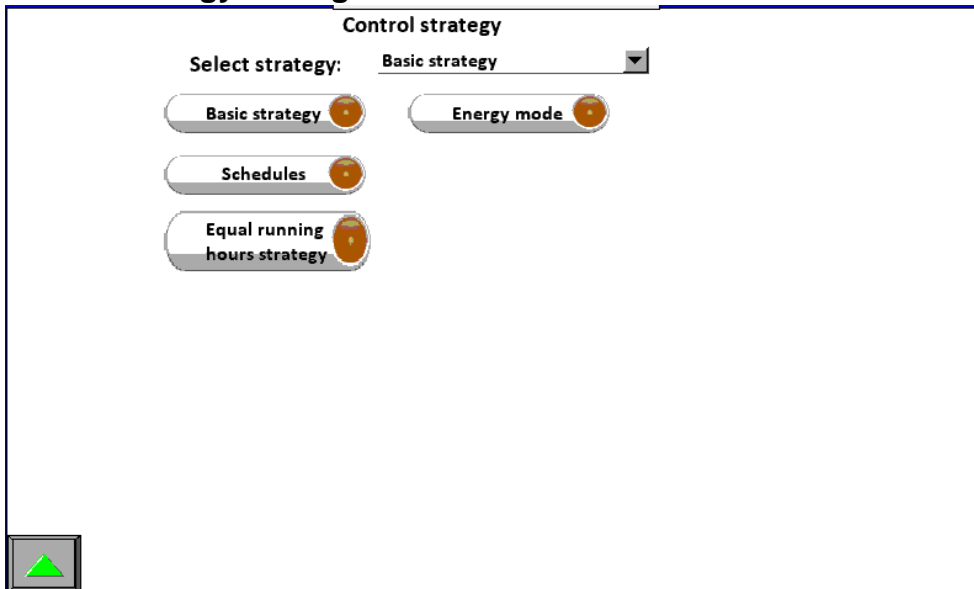


Figure 15: Control strategy

You can choose from the following strategies: basic strategy, even hours strategy, schedules strategy or energy mode.

4.2.3.1 Basic strategy

Basic strategy means that the control mode is set according to the priority of the compressors. The lead and consequently the main compressor are running, and the following compressors are switched on as needed.

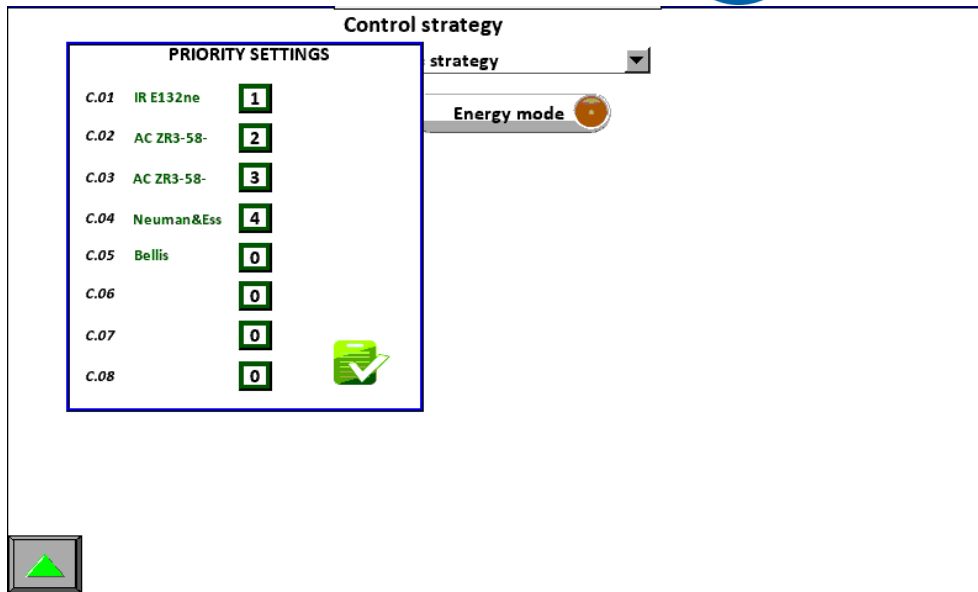


Figure 16: Basic strategy

Schedules – The schedule mode gives you the possibility to change compressor’s priorities based on a day and time. You can set nine different schedules.

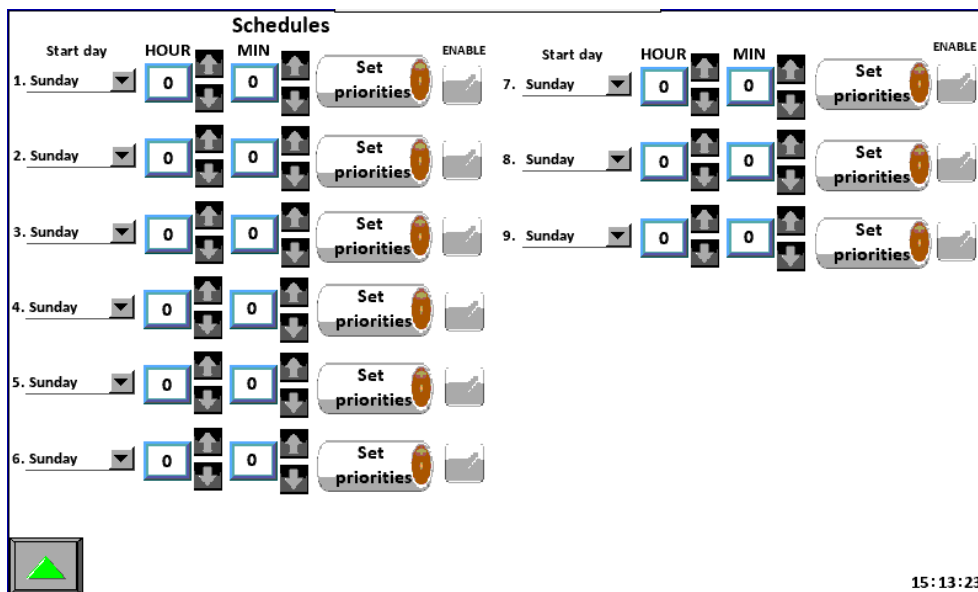


Figure 17: Schedules strategy

Equal running hours strategy - EMCS will determine the priority of the compressors based on the number of running hours. Priority 1 will be given to the compressor with the least running hours, the last in priority is the compressor with the most running hours. You can set when next recalculation will take place.



Figure 18: Equal running hours strategy

Energy mode strategy – Based on the average flow of the system and entered flow bands, EMCS will determine the priority of the compressors.

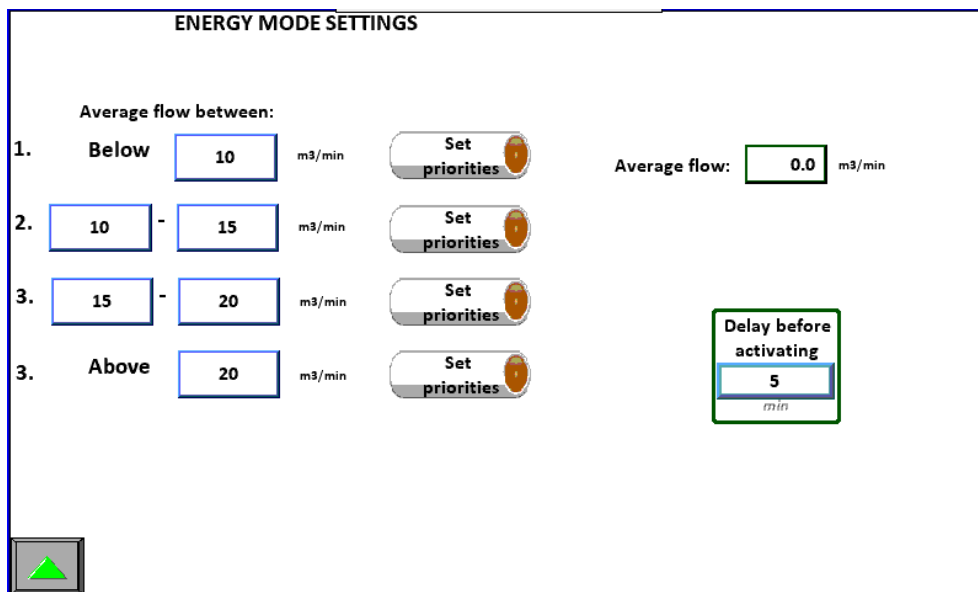


Figure 19: Energy mode strategy