Instructions for using Human Machine Interface on a CAL-PM-4 device

(HMI)

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1 Content

2 Introduction

As the name suggests, human machine interface connects person with machine, device or a system.
In your case, the HMI will connect you with your CAS (compressed air system).
This document represents short instructions for using the operator panel.

3 Status pages

3.1 Home screen

When powering up the unit, the operator panel (later OP) will display the home screen.

Figure 1 Home screen

There are four icons: *STATUS*, *SETUP*, *EVENT LOG* AND *ALARMS*.

3.2 STATUS

When you press the button, you will be moved to STATUS menu.
First what you see is overview of your system.
On the right side are indication lights. These lights represent ALARMS and compressor states.

On the left side are squares. They are filled by values of system flow, system power, system pressure and system specific.

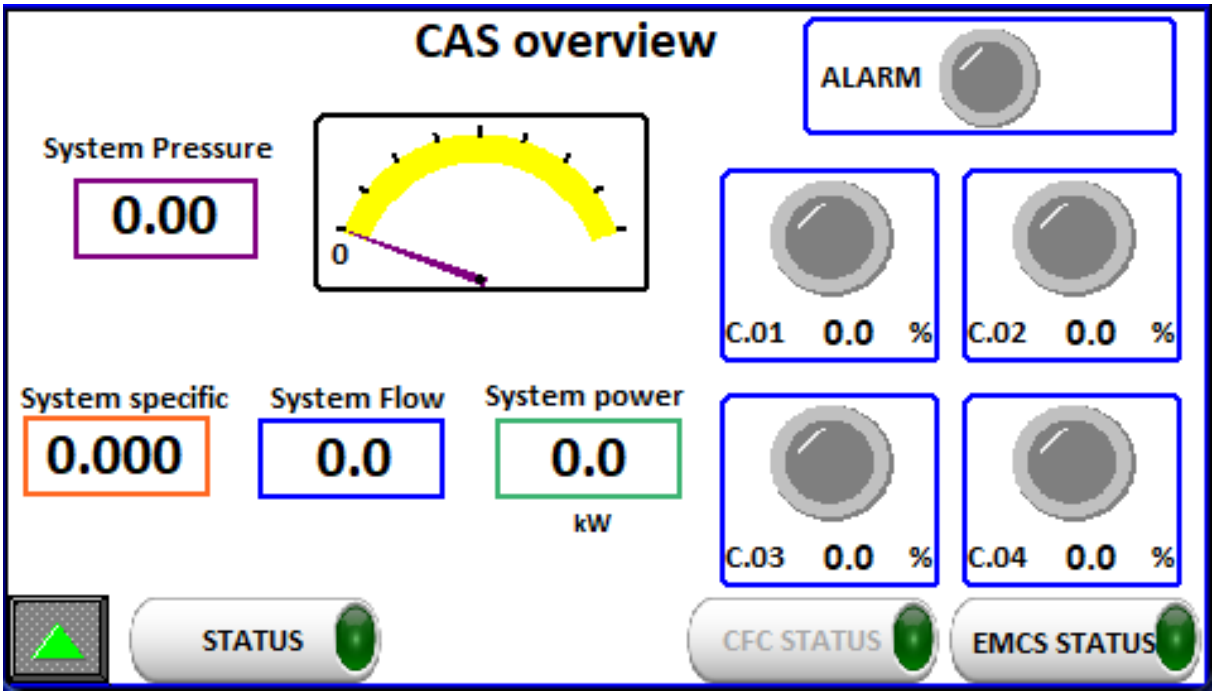


Figure 2 CAS Overview

- If any alarm in your system is active, alarm LED will be ON. Which alarm is active, you can check in alarm status page.
- Lights C.01, C.02, C.03 and C.04 indicate single state of compressor.
  Compressor states are:

Figure 3 Compressor states

For example;

- If C.01 light is yellow it means compressor C.01 is running unloaded,
- If C.02 light is blue it means compressor C.02 is running loaded,
- If C.03 light is red it means compressor C.03 is in alarm – you need to check where and what is a fault.
- If C.04 light is gray it means compressor C.04 is stopped.

Below compressor state light you can see % load of the compressor.

- If *compressor is VSD* and it is *running loaded* this % *changes from 0-100%*.
- If *compressor is ON/OFF* and it is *running loaded* this % indicates full load *(100%)*.
- If *compressor is running unloaded* or is turned off this % indicates no load *(0%)*.

If you want to return to home page click the  button.

If you press 

button, you will be send to the part of OP, which shows you states of digital and analog inputs, compressor hours, alarms, modules...

On the *first status page* you can see compressors digital states.

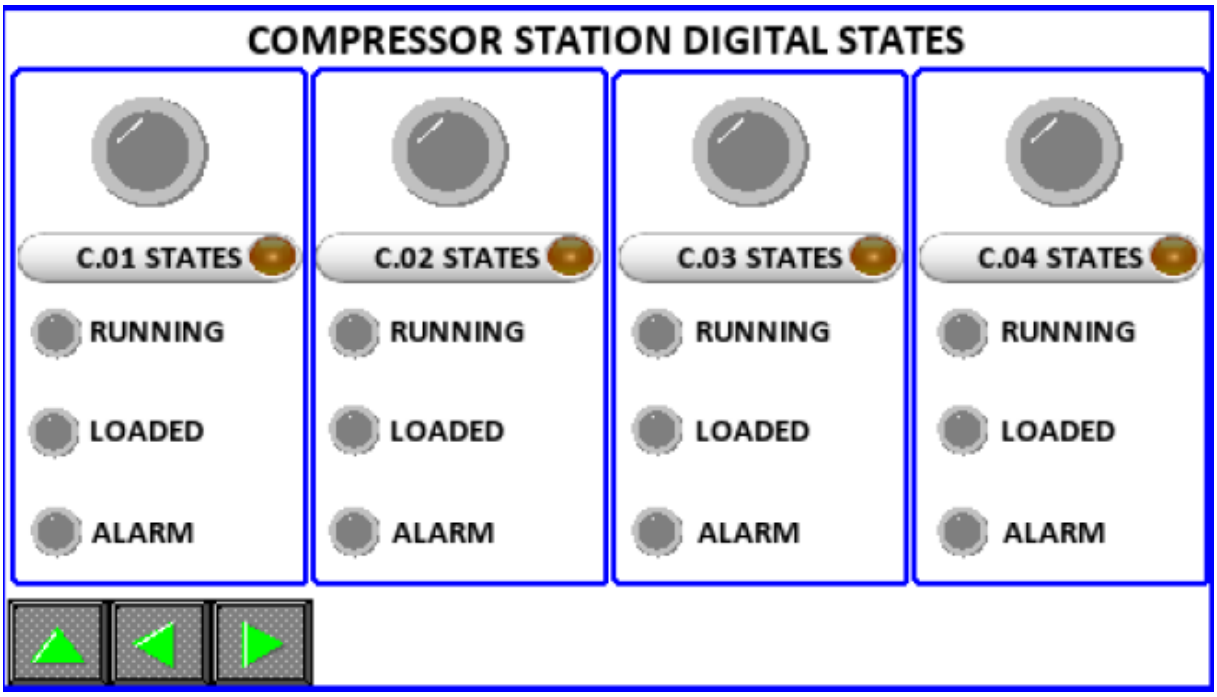


Figure 4 Compressor station digital states

If any state is active, the lights will turn on in color, otherwise the displayed color is gray. The color of lights can be yellow, blue or red, depending on the current state of the compressor. Upper lights represent the same states as in OVERVIEW page.

Second page represents digital input status. If a digital input is active, the light will be ON.

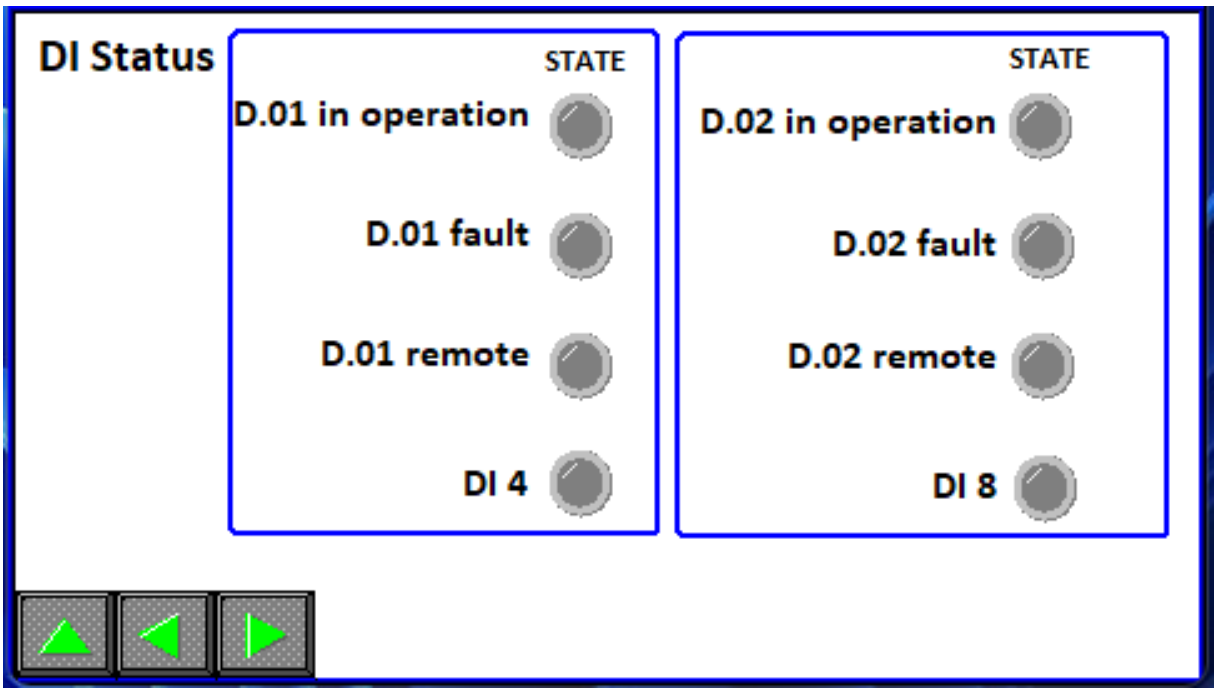


Figure 5 Digital inputs status

These digital inputs are located inside CAL-PM-4 cabinet.

Third page represents analog input status.

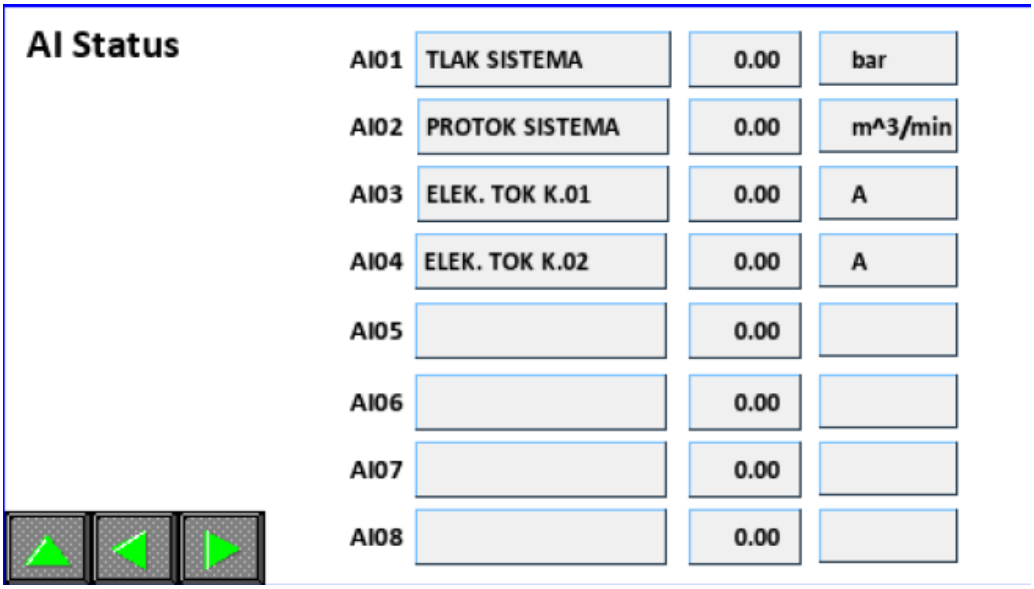


Figure 6 Analog inputs states

You can see input tags, measured values and measuring unit. These three things need to be previously entered. You can do that in setup menu.

Fourth page displays running and loaded hours of each compressor.

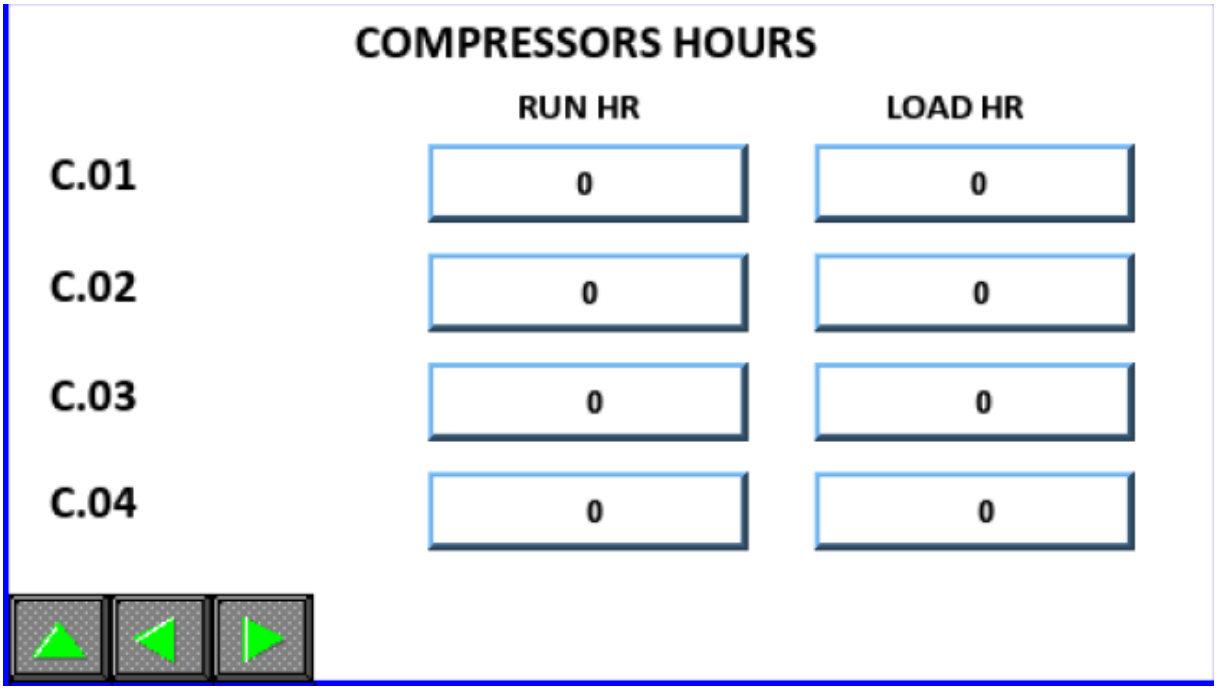


Figure 7 Compressor hours

To return on the home page, click the  button.

Fifth page is about alarms.

On the overview page is a LED, called ALARM. This LED is ON if any alarm in the system is active. On this page you can see which alarm is active. That allows you to find the fault very quickly.

Figure 8 Alarms

Next pages are about the interface modules. They show you measured values of voltage (V), electrical current (A), power (W), cosφ for each phase and total system power (kW).

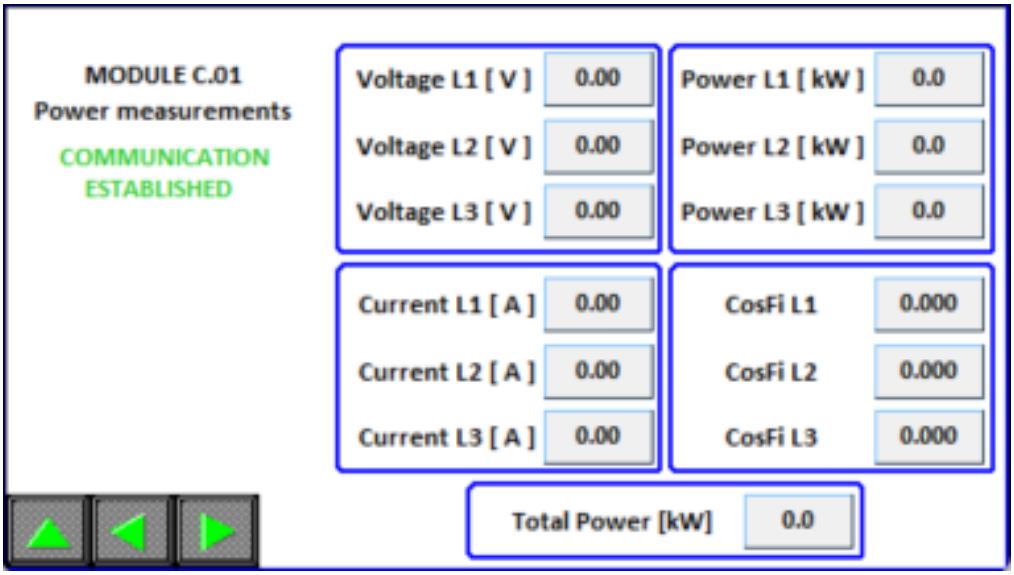


Figure 9 C.01 power measurements

If "*Communication established*" text is showing a compressor module is connected and recognized, otherwise the text color is red.

The *last page* is for the Modbus data from the compressor C.01.

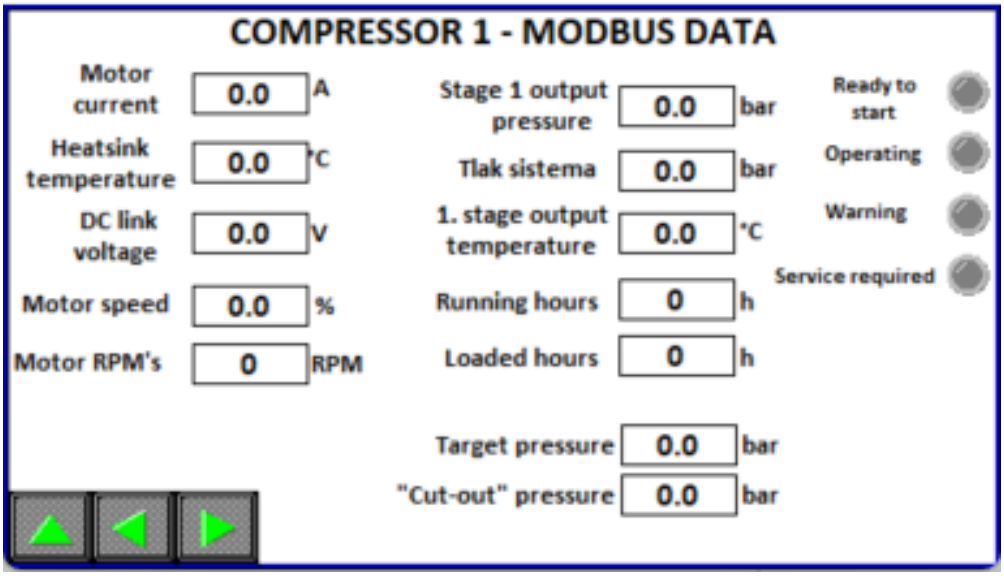


Figure 10 Modbus data for the compressor

3.3 EMCS Status

If the EMCS option is enabled (purchased) the field than can be accessed otherwise it is in grey and cannot be accessed.

The first page is the *EMCS Status* page and there you can see the compressor states (written in the gray squares), if a compressor is in remote mode (the light is ON) and the control sequence if it has been previously set in the setup page. The sequence starts with 1 and ends with 4, with 1 having the highest priority and 4 the lowest priority.

Also shown on this page is the system pressure.

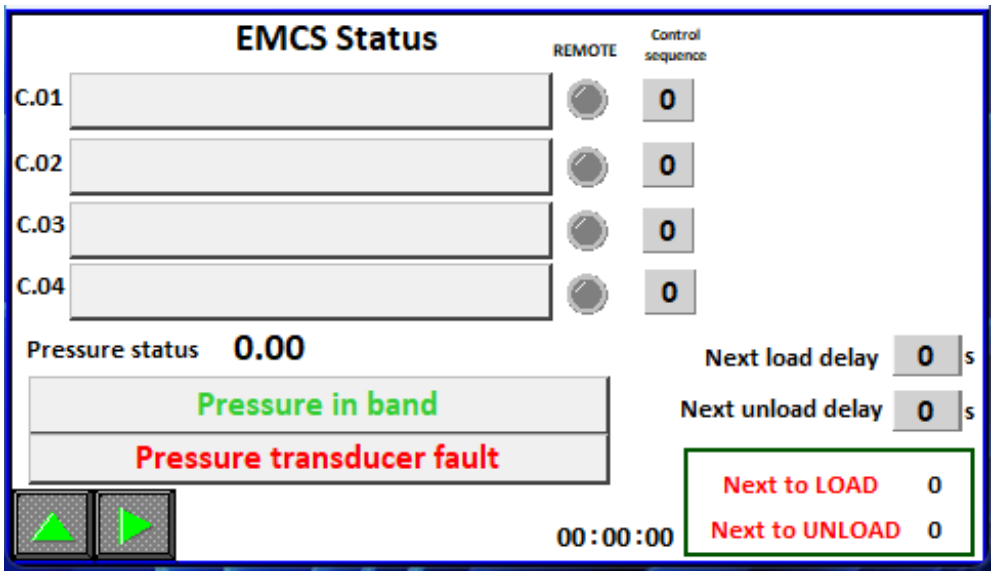
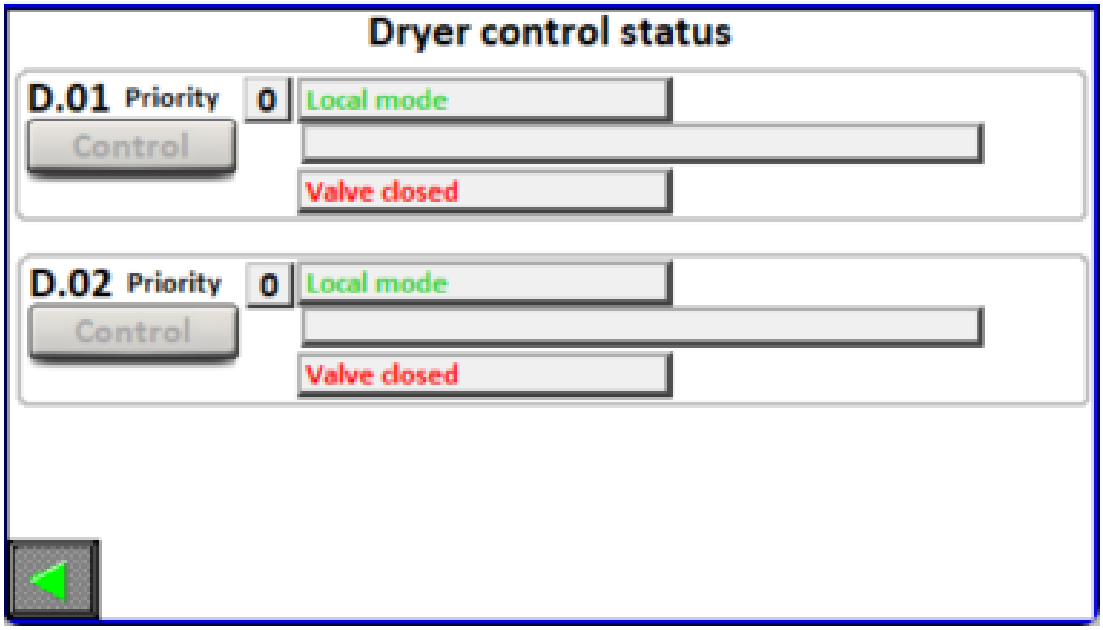


Figure 11 EMCS Status page

The next page is the *Dryer control status* and it shows if the dryer is in remote or local mode and the priorities of the dryers if they had been previously assigned.



4 SETUP PAGES

Another icon on the HOME page is  . When you press that icon, you will be send to the SETUP page.

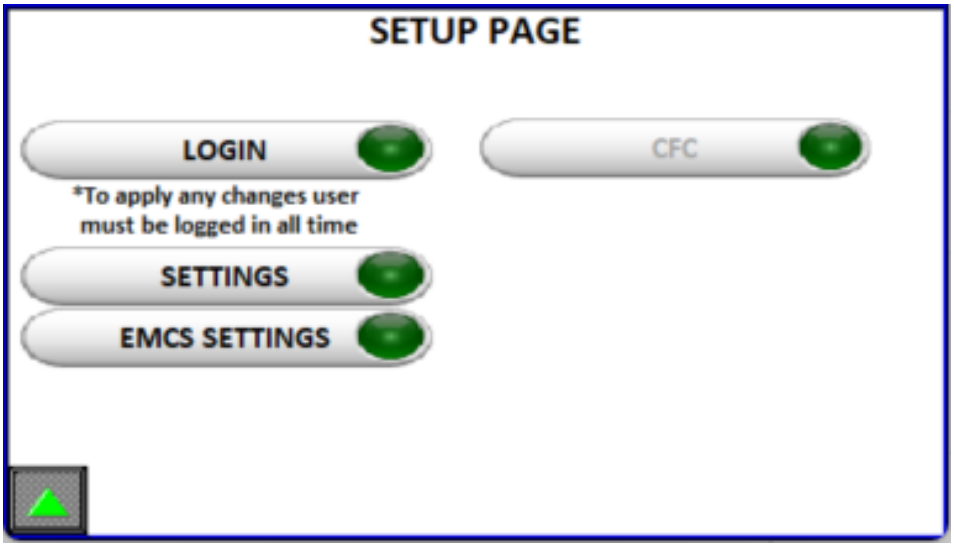
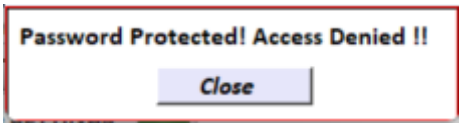


Figure 12 Setup page

If you want to change or set anything, you must be logged in.

User: Operator, Password: 111.

If login was successful, you can access the settings otherwise the following message appears.



The *first page* is ANALOG INPUT SETUP menu where you can change parameters of analog inputs. Here is where you configure the analog inputs. The user **must configure the analog input**:

- Next to the correct input write the label of the input, for example **SYSTEM PRESSURE**
- Set the correct range for the analog sensor, for example **0-16**
- Set the correct units for the input, for example **bar**

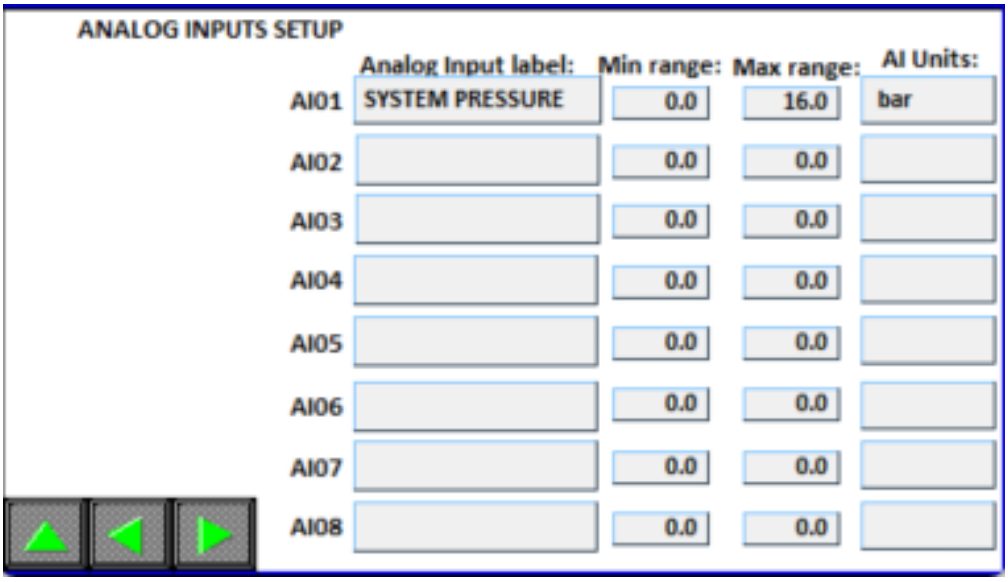


Figure 13 Analog input setup

Second page allows you to set the current transformer range.

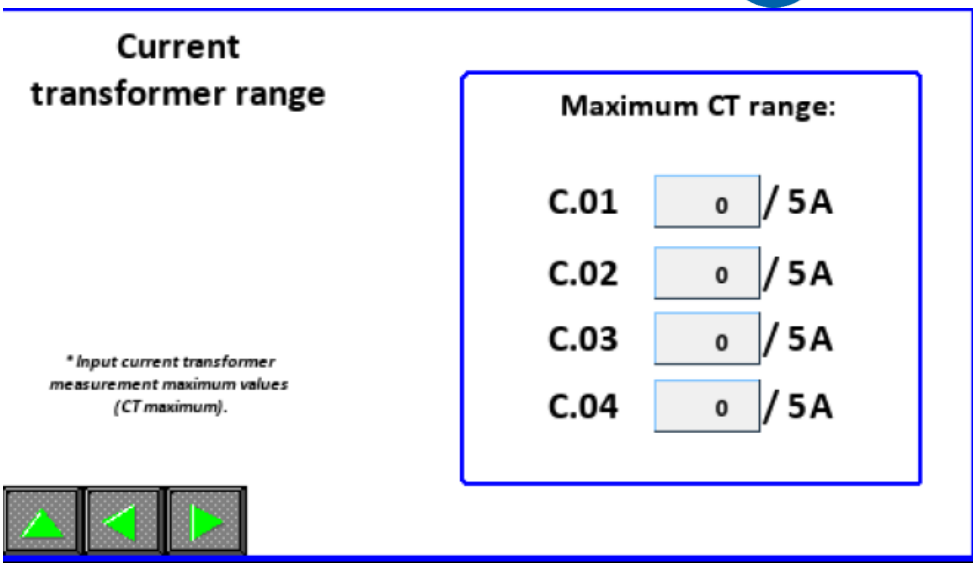


Figure 14 Current transformer range

Third page is unit selection.

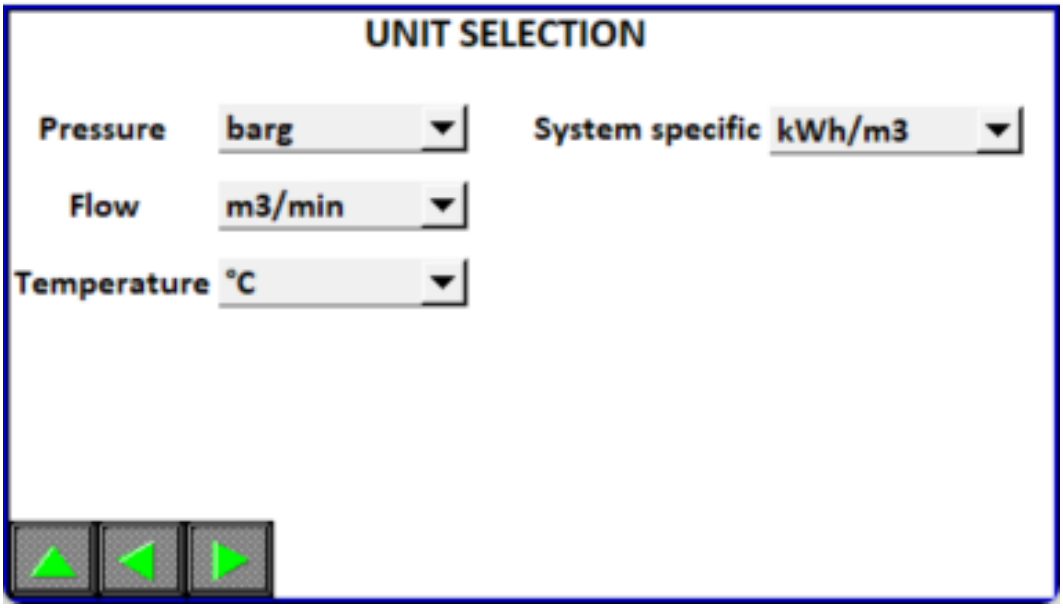


Figure 15 Unit selection page

There you can adjust units for pressure, flow, temperature and system specific.
These units must be same as units on analog input settings page, because system is doing some calculations with those values.

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Digital input type

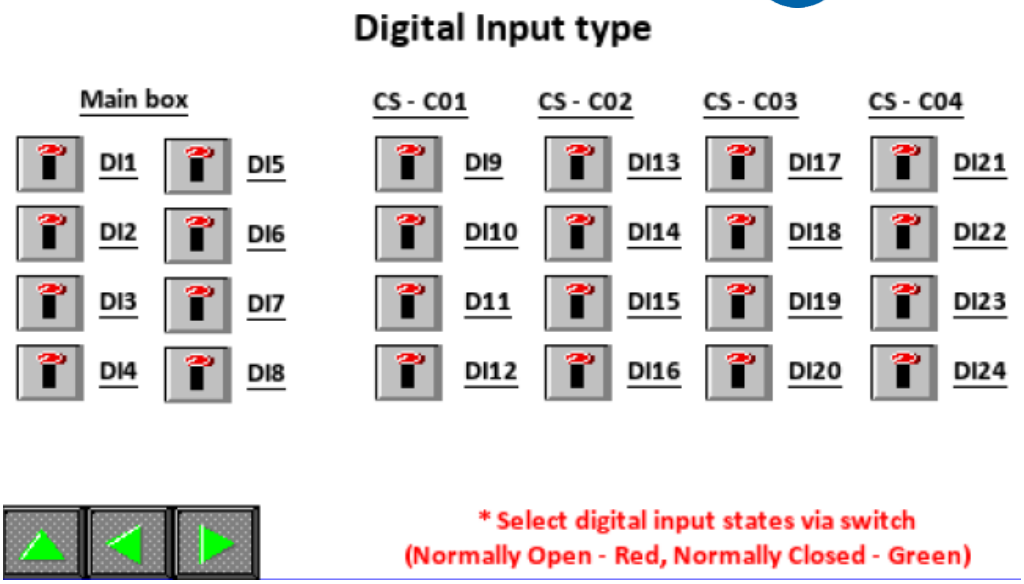


Figure 16 Digital input type

Depending on what type of digital input you need (NO, NC) different inputs states and logic can be selected here. Here you can set for all digital inputs that are available in your device.

Digital input as alarms

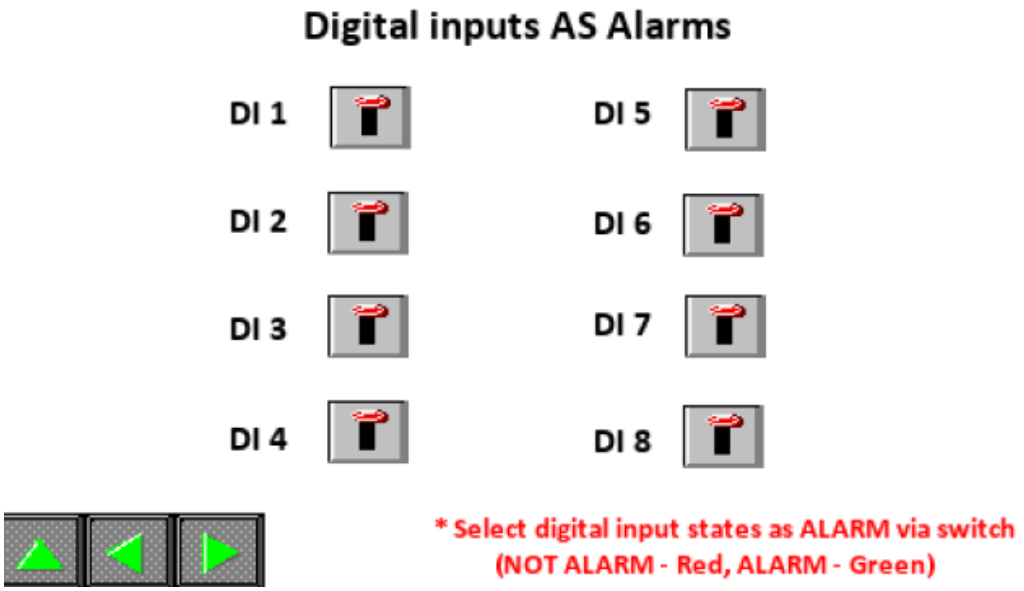


Figure 17 Digital inputs as alarms

Here you can choose which DI`s you will use as ALARM inputs. If specific DI is used as ALARM, it means that after 5s of active state, alarm output will be activated and also CAEMS Alarm will be triggered.

On last page are *general settings.*

There you can choose language (english, slovenian).

If you click on HMI SYSTEM SETTINGS button, you can change HMI system parameters.

If you want to change anything in here, you need to login. ***Password: 111111.***

You can set the date and time by clicking on the icon next to TIME AND DATE ADJUSTMENT.

The system minimal critical pressure can also be set next to the label.

5 EMCS Settings

This page allows the user to adjust the pressure setpoint, set the priorities of the compressors, choose control strategies or set timetables. In the following photos are described the settings and what they mean.

In total there are 3 control strategies and only one can be used. First one is basic setting of priorities of the compressors, the user also has to correctly fill the data for pressure settings and timers. Next, is the Equal running hours strategy and finally the energy mode.

5.1 PRESSURE SETTINGS

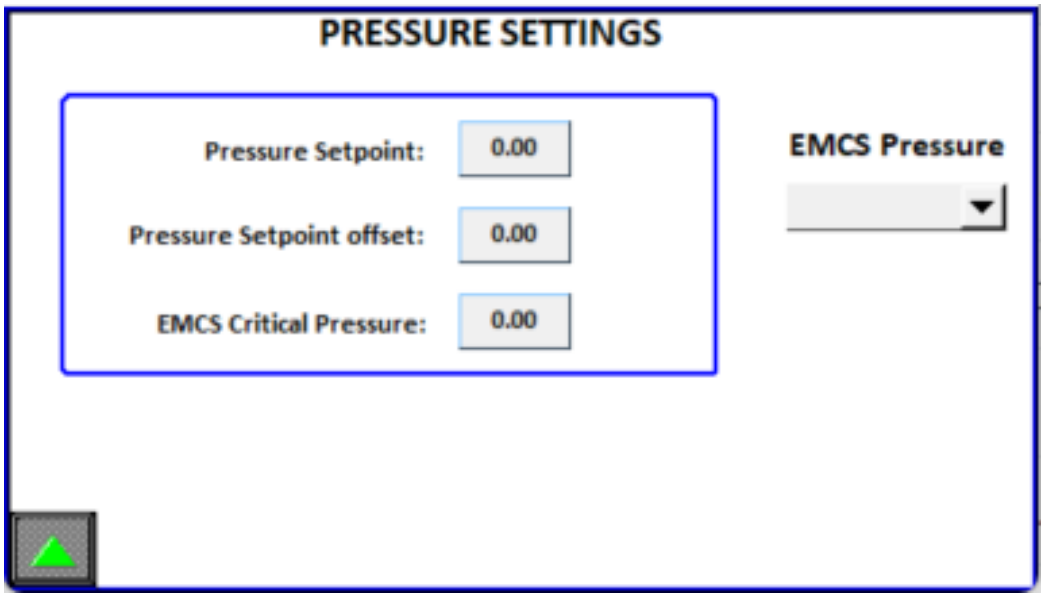


Figure 18 EMCS Settings - Pressure settings

On this page the user can set the pressure setpoint, the setpoint offset and the EMCS critical pressure. And on the right side of the page the EMCS Pressure has to be chosen, meaning on which analog input has that sensor been connected.

5.2 TIMERS

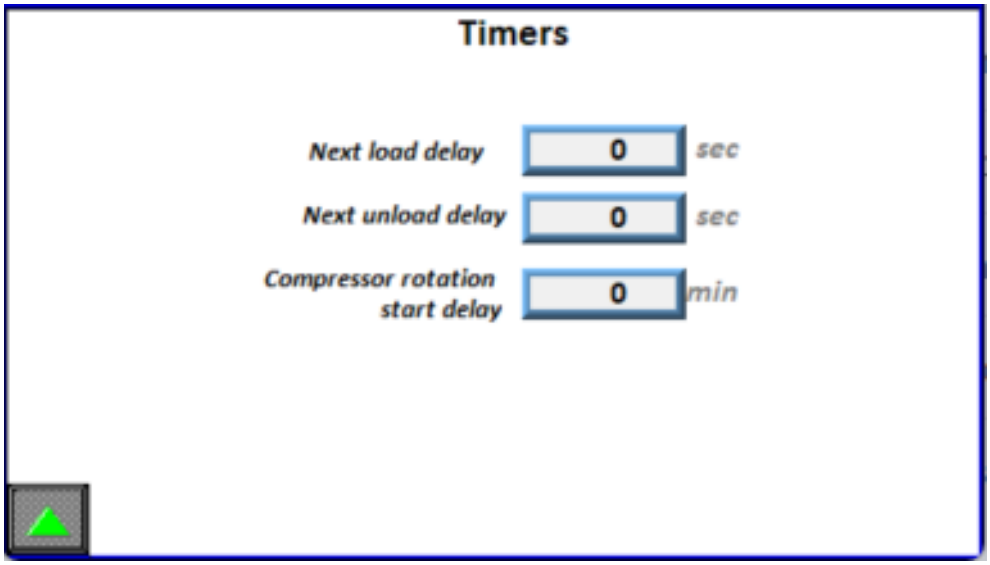


Figure 19 EMCS Settings - Timers

Next is the *Timers page,* where the user can set the time in seconds for the load and unload delay of the next compressor and the compressor rotation start delay in minutes.

The *Next load delay* timer sets how many seconds will have to pass before the next compressor is loaded. Similarly the *Next unload delay* sets how many seconds have to pass before unloading.

5.3 PRIORITIES

On this page the user sets the priorities of the compressors in their system. They are to be assigned:

- Priority 1, the compressor with the highest priority
- Priority 4, the compressor with the lowest priority

If all the compressors have the same priority, the EMCS control mode is going to be used.

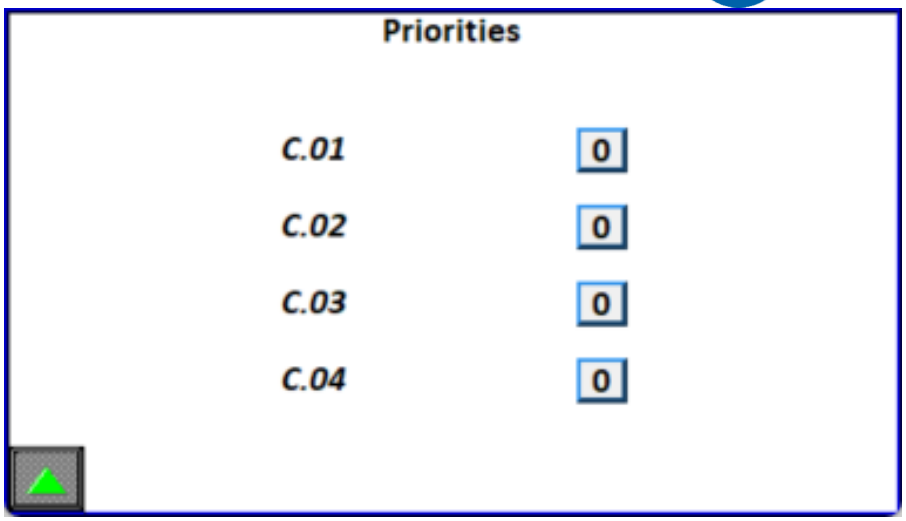


Figure 20 EMCS Settings - priorities

5.4 Control strategy

On this page the user can choose one control strategy. For that the strategy should be selected. Below are described the two control strategies.

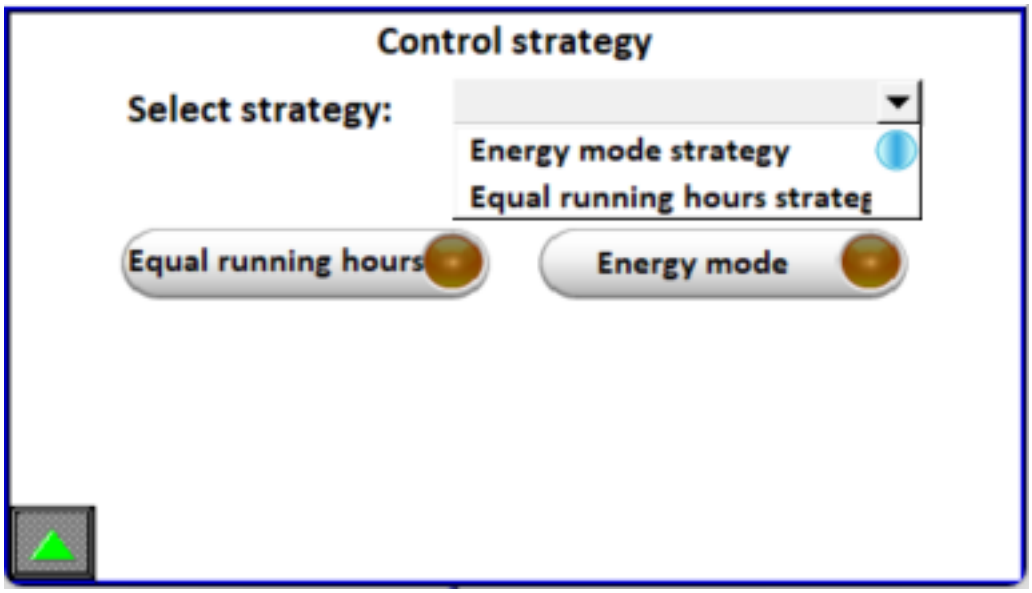


Figure 21 EMCS Settings - Control strategy

1. *Energy mode strategy*

On this page the user can assign different sequences for the compressors based on the average flow of the system. There are 4 options available and for each sequence set the user has to save the changes by clicking on the  icon.

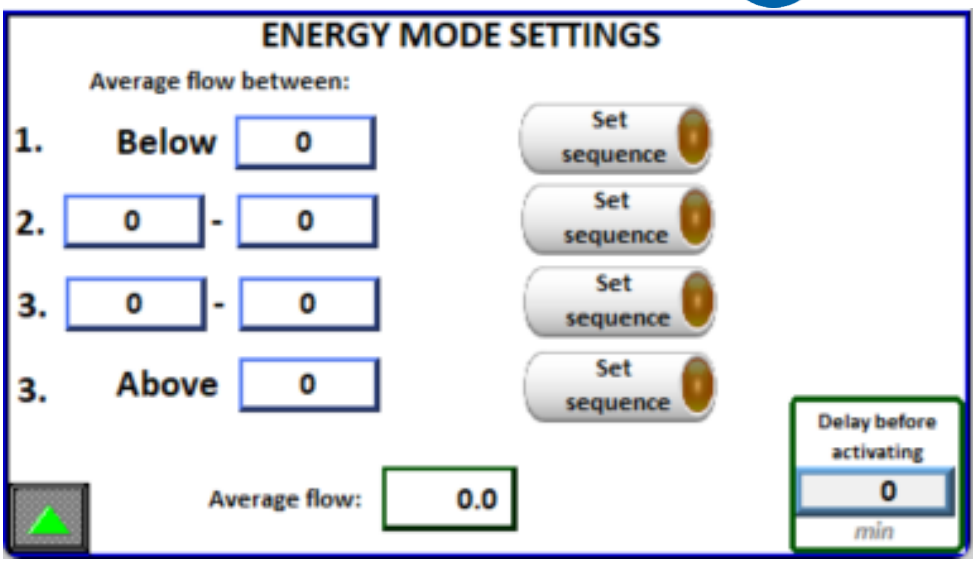


Figure 22 Control strategy - Energy mode settings

2. *Equal running hours strategy*

When the user chooses this strategy, the compressor with the least amount of running hours will have highest priority, then the next one with the least amount of hours will have the second priority and so on. The final compressor, with priority 4 will have the most running hours.

The user can set the *Modified compressor hours* field, which is then added to the *Actual compressor hours.* The user can also choose the time for recalculation for running hours of the compressors.

The button *Manual recalculation* is self-explanatory. The user has to hold that button pressed couple of seconds to activate that option.

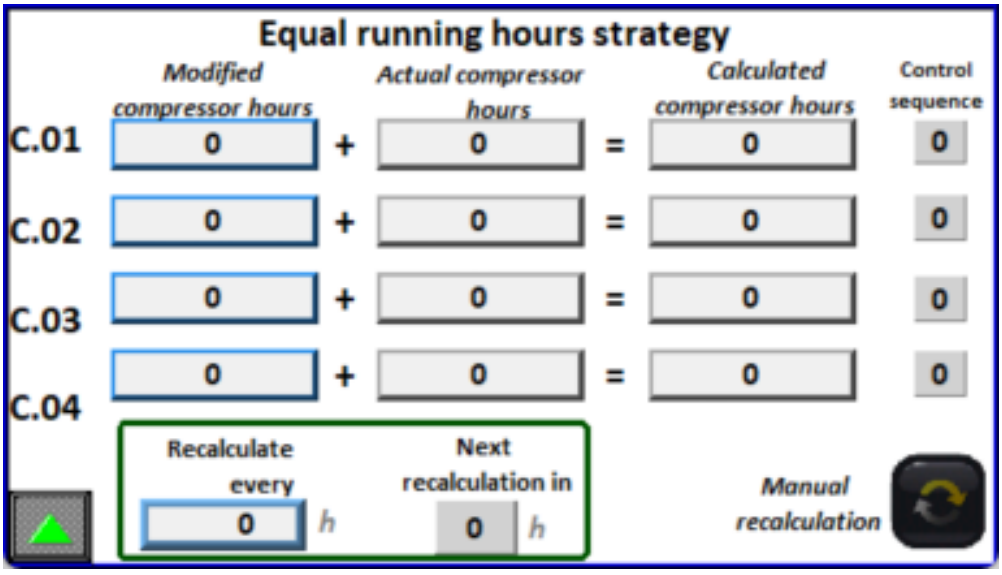


Figure 23 Control strategy - Equal running hours settings

5.5 TIMETABLES

This option enables the user to set for each day different pressure settings, compressors sequence or different options.

Each day from Monday to Sunday have 4 different pages where the user can set the options.

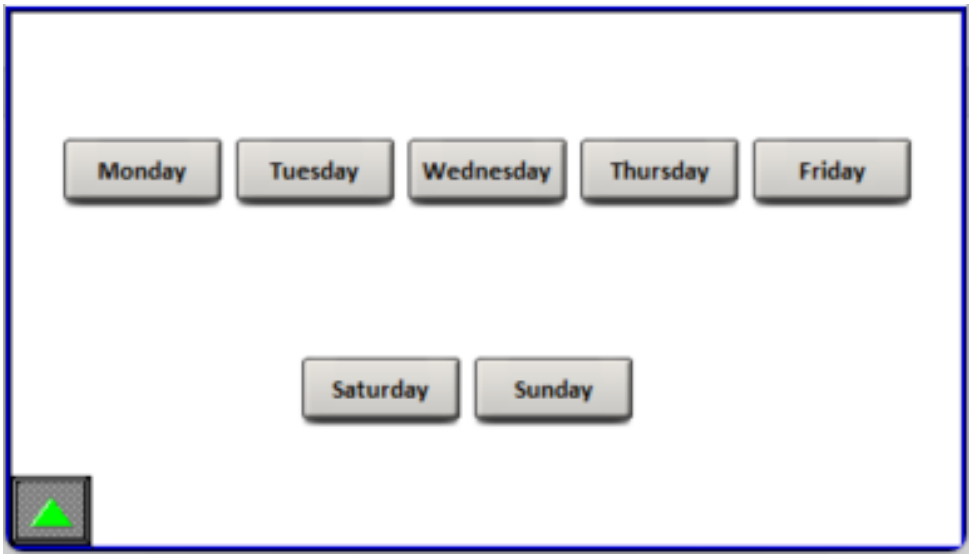


Figure 24 Timetables

When the user clicks on one day the page below opens. To enable the timetable the user clicks on the *Enable timetable* button. Once it is enabled it is green.

Next the user sets the hour and minute for that timetable. The options available are shown below:

- The user can enable *Start the compressor station*
- The user can enable *Stop the compressor station*
- The user can enable *Change the pressure settings*
- The user can enable *Change priority settings*

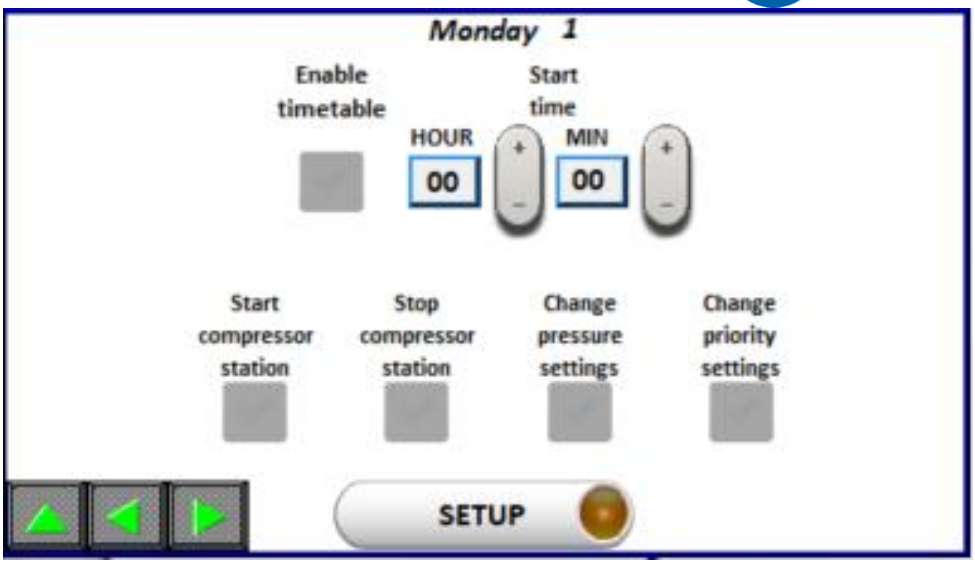


Figure 25 Timetables - Monday 1 settings

Once one option is enabled the user can click on *SETUP* and set the following options:

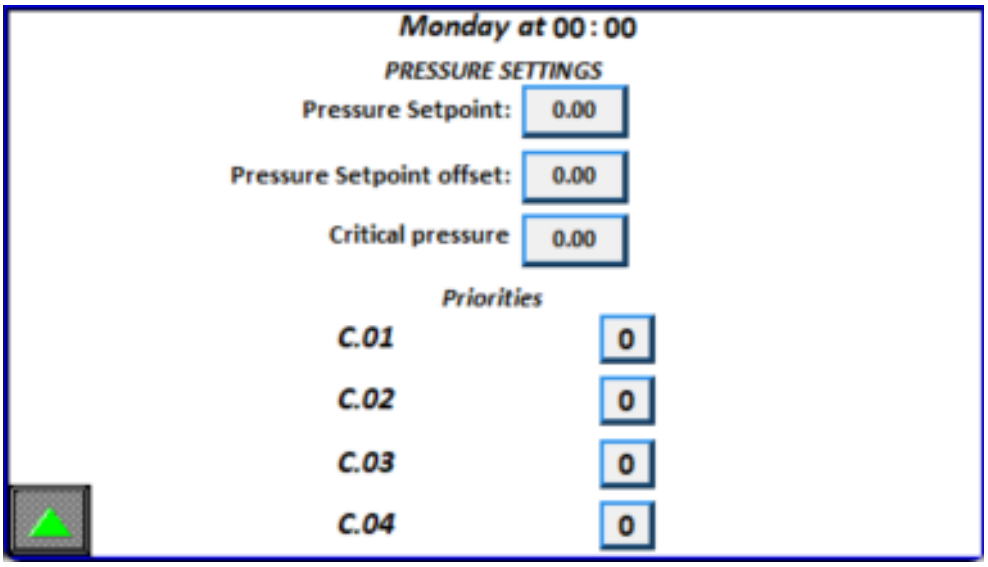


Figure 26 Timetables - Setup

All the fields on the page can be changed by the user.

5.6 EMCS Manual mode

This is the last option shown on the *EMCS Settings* page. It is in the bottom right corner and if a user clicks on this option the following page opens:

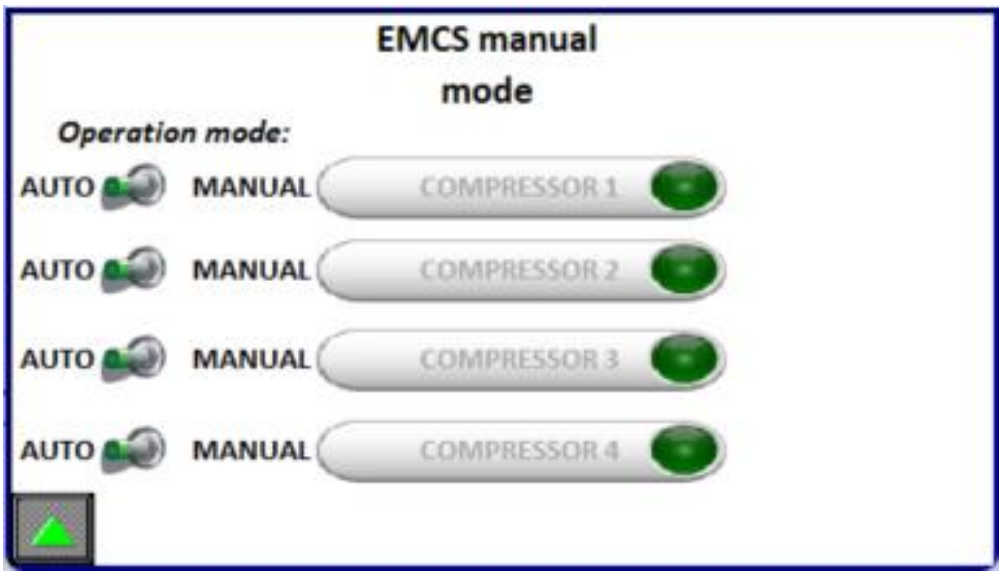


Figure 27 EMCS Manual mode

Here the user can choose the operation mode for all the compressors. By default the mode is on AUTO, which means the compressors will operate by themselves, based on the previous settings.

If the user chooses the MANUAL mode, then he can remotely Start,Stop, Load orUnload the compressor by holding the button for several seconds.In the gray square the state of the compressor will be shown (the one the user selected).

Once the state was activated and the compressor can go back to how it was previously working, the switch can be again turned to AUTO.

Each time the modes are changed the user has to confirm the operation by clicking Ok, after the pop –up message.

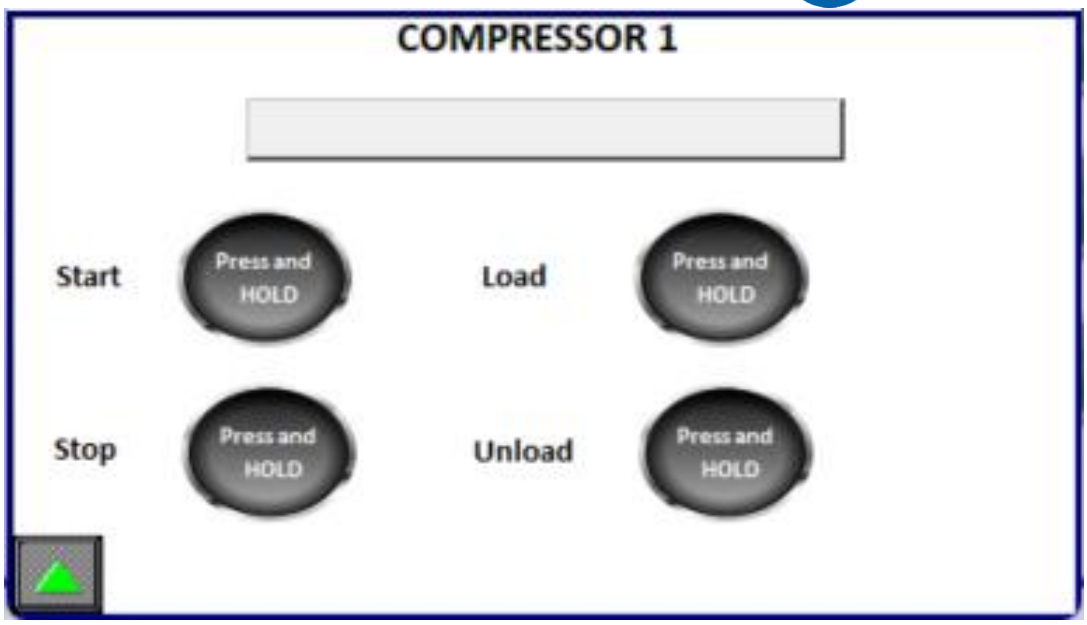


Figure 28 EMCS Manual mode - manual

6 EVENT LOG

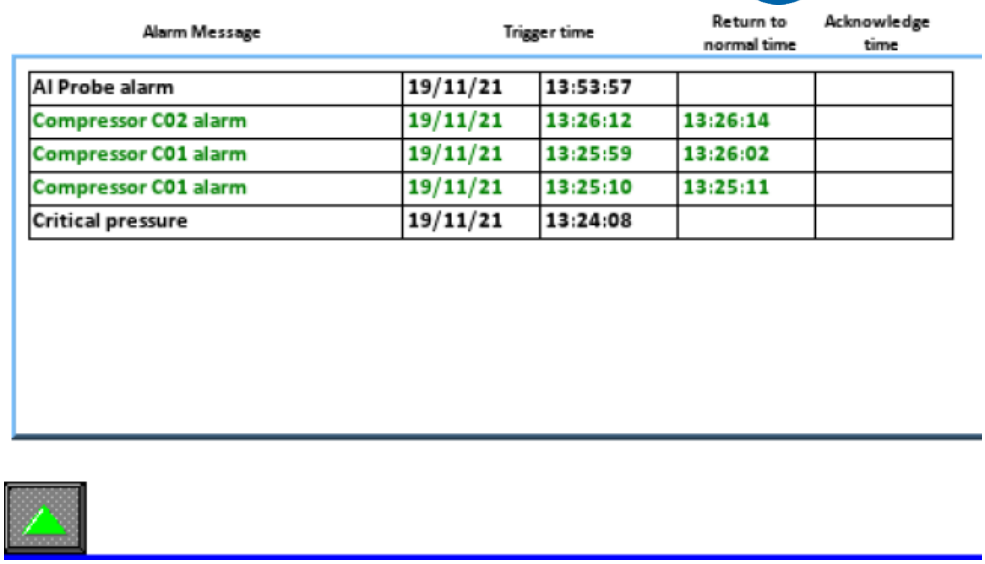
From main menu go to event log page by pressing the icon. Event log is self-explanatory.

DATE	TIME	Comment	Action
11/19/21	15:32:59	Enter password	Set word
11/19/21	13:53:02	Enter password	Set word

Figure 29 Event log

4. ALARMS

From main menu go to alarm log page by pressing the icon. Alarm log is self-explanatory.



Alarm Message	Trigger time		Return to normal time	Acknowledge time
AI Probe alarm	19/11/21	13:53:57		
Compressor C02 alarm	19/11/21	13:26:12	13:26:14	
Compressor C01 alarm	19/11/21	13:25:59	13:26:02	
Compressor C01 alarm	19/11/21	13:25:10	13:25:11	
Critical pressure	19/11/21	13:24:08		

Figure 30 Alarms