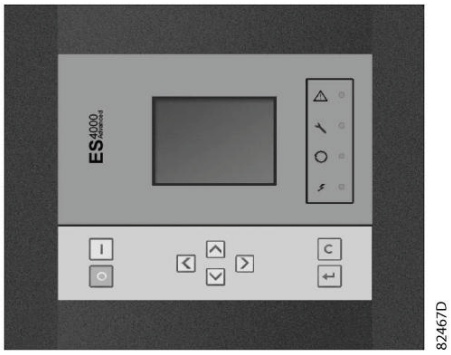
3 Graphic controller

3.1 Controller



View of the ES 4000 Advanced controller

Introduction

The electronic controller has following functions:

- Controlling the compressor
- Protecting the compressor
- Monitoring components subject to service
- Automatic restart after voltage failure

Automatic control of the compressor

The controller maintains the net pressure between programmable limits by adapting the motor speed. A number of programmable settings, e.g. the unloading and loading pressures, the minimum stop time and the maximum number of motor starts are taken into account.

The controller stops the compressor whenever possible to reduce the power consumption and restarts it automatically when the net pressure decreases. If the expected unloading period is to short, the compressor is kept running to prevent too short stand-still periods.

Protecting the compressor

Shut-down

If the compressor element outlet temperature exceeds the programmed shut-down level, the compressor will be stopped. This will be indicated on the display of the controller. The compressor will also be stopped in case of overload of the drive motor.

Air-cooled compressors will also be stopped in the event of overload of the fan motor.

	Before remedying, consult the Safety precautions.

Shut-down warning

A shut-down warning level is a programmable level below the shut-down level.

If one of the measurements exceeds the programmed shut-down warning level, this will also be indicated to warn the operator before the shut-down level is reached.

Service warning

If the service timer exceeds a programmed value, this will be indicated on the display to warn the operator to carry out some service actions.

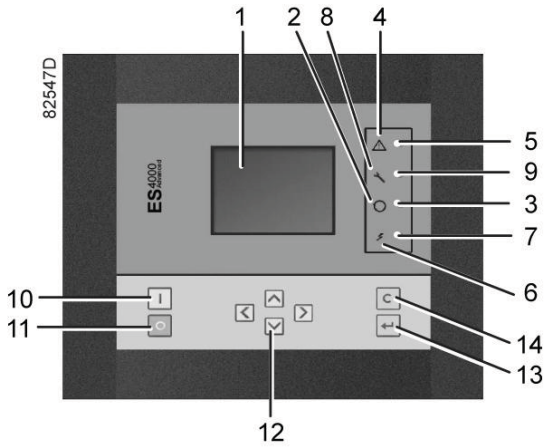
Automatic restart after voltage failure

The controller has a built-in function to automatically restart the compressor when the voltage is restored after voltage failure.

	Provided the controller is in the automatic operation mode, the compressor will automatically restart when the supply voltage to the module is restored.

3.2 Control panel

Detailed description



Function keys of the controller

Reference	Designation	Function
1	Display	Shows icons and operating conditions.
2	Automatic operation symbol	
3	LED, Automatic operation	Indicates that the regulator is automatically controlling the compressor: the compressor is loaded, unloaded, stopped and restarted depending on the air consumption and the limitations programmed in the regulator.
4	Warning symbol	
5	LED, Warning	Is lit if a warning condition exists.

Reference	Designation	Function
6	Voltage symbol	
7	LED, Voltage on	Indicates that the voltage is switched on.
8	Service symbol	
9	LED, Service	Is lit when service is needed.
10	Start button	This button starts the compressor. Automatic operation LED (3) lights up. The Elektronikon is operative.
11	Stop button	This button is used to stop the compressor. Automatic operation LED (3) goes out.
12	Scroll buttons	Use these buttons to scroll through the menu .
13	Enter button	Use this button to confirm the last action.
14	Escape button	Use this button to go to previous screen or to end the current action.

3.3 Icons used

Status icons

Name	Icon	Description
Stopped / Running	 57786F	When the compressor is stopped, the icon stands still. When the compressor is running, the icon is rotating.
Compressor status	 57787F	Motor stopped
	 57788F	Running unloaded
	 57789F	Running loaded

Machine control mode	 57790F or  59161F	Local start / stop
	 57791F	Remote start / stop
	 57792F	Network control
Automatic restart after voltage failure	 57793F	Automatic restart after voltage failure is active
Week timer	 57794F	Week timer is active
Active protection functions	 57795F	Emergency stop
	 57796F	Shutdown
	 57797F	Warning
Service	 57798F	Service required
Main screen display	 59162F	Value lines display icon
	 82196F	Chart display icon
General icons	 81105D	No communication / network problem
	 82418D	Not valid

Input icons

Icon	Description
 57799F	Pressure
 57800F	Temperature
 57801F	Digital input
 57802F	Special protection

System icons

Icon	Description
 57803F	Compressor element (LP, HP, ...)
 57804F	Dryer
 57805F	Fan
 57806F	Frequency converter
 57807F	Drain
 57808F	Filter
 57809F	Motor
 57810F	Failure expansion module
 81105D	Network problem
 57812F	General alarm

Menu icons

Icon	Description

	Inputs
	Outputs
	Protections (Warnings, shutdowns)
	Counters
	Test
	Regulation (Settings)
	Service
	Event history (saved data)
	Access key / User password
	Network
	Setpoint
	Information
	Week Timer
	General

Navigation arrows

Icon	Description
	Up
	Down

3.4 Main screen

Function

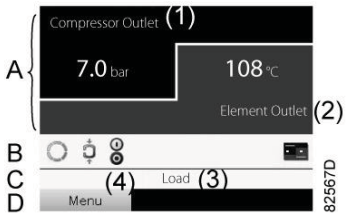
The Main screen is the screen that is shown automatically when the voltage is switched on and one of the keys is pushed. It is switched off automatically after a few minutes when no keys are pushed.

Typically, 5 different main screen views can be chosen:

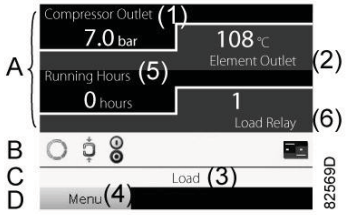
1. Two value lines
2. Four value lines
3. Chart (High resolution)
4. Chart (Medium resolution)
5. Chart (Low resolution)

Two and four value lines screens

This type of Main screen shows the value of 2 or 4 parameters (see section Inputs menu).



Typical Main screen (2 value lines), fixed speed compressors



Typical Main screen (4 value lines), fixed speed compressors

Text on figures

(1)	Compressor Outlet
(2)	Element outlet
(3)	Load, ... (text varies upon the compressors actual condition)
(4)	Menu
(5)	Running hours
(6)	Load relay (one of the input signals of fixed speed compressors) Flow (compressors with frequency converter)

- **Section A** shows information regarding the compressor operation (e.g. the outlet pressure or the temperature at the compressor outlet). On compressors with a frequency converter, the load degree (flow) is given in % of the maximum flow.
- **Section B** shows Status icons. Following icon types are shown in this field:
  - Fixed icons
    These icons are always shown in the main screen and cannot be selected by the cursor (e.g. Compressor stopped or running, Compressor status (running, running unloaded or motor stopped).
  - Optional icons
    These icons are only shown if their corresponding function is activated (e.g. week timer, automatic restart after voltage failure , etc.)
  - Pop up icons
    These icons pop up if an abnormal condition occurs (warnings, shutdowns, service,...)

  To call up more information about the icons shown, select the icon concerned using the scroll keys and press the enter key.
- **Section C** is called the Status bar
  This bar shows the text that corresponds to the selected icon.
- **Section D** shows the Action buttons. These buttons are used:
  - To call up or program settings
  - To reset a motor overload, service message or emergency stop
  - To have access to all data collected by the regulator

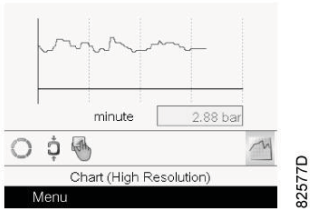
  The function of the buttons depends on the displayed menu. The most common functions are:

Designation	Function
Menu	To go to the menu
Modify	To modify programmable settings
Reset	To reset a timer or message

To activate an action button, highlight the button by using the Scroll keys and press the Enter key.
To go back to the previous menu, press the Escape key.

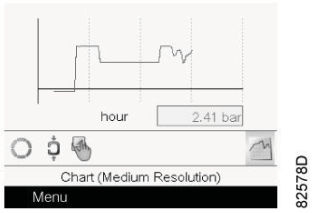
Chart views

Instead of viewing values, it is also possible to view a graph of one of the input signals (see section Inputs menu) in function of the time.

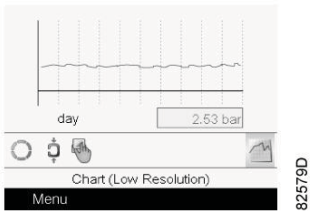


When Chart (High Resolution) is selected, the chart shows the variation of the selected input (in this case the pressure) per minute. Also the instantaneous value is displayed. The screen shows the last 4 minutes.

The switch button (icon) for selecting other screens is changed into a small Chart and is highlighted (active).



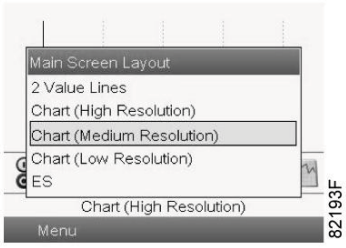
When the Chart (Medium Resolution) is selected, the chart shows the variation of the selected input per hour. The screen shows the last 4 hours.



When the Chart (Low Resolution) is selected, the chart shows the variation of the selected input per day. The screen shows the evolution over the last 10 days.

Selection of a main screen view

To change between the different screen layouts, select the far right icon in the control icons line (see value lines display icon or chart display icon in section Used icons) and press the Enter key. A screen similar to the one below opens:

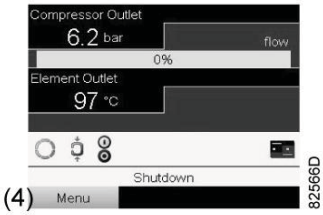


Select the layout required and press the Enter key. See also section Inputs menu.

3.5 Calling up menus

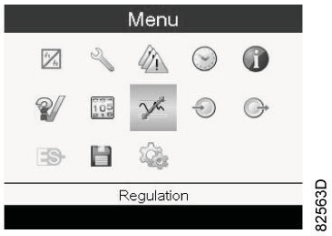
Description

When the voltage is switched on, the main screen is shown automatically (see section Main screen):



- To go to the Menu screen, highlight the Menu button (4), using the Scroll keys.

- Press the Enter key to select the menu. Following screen appears:



- The screen shows a number of icons. Each icon indicates a menu item. By default, the Pressure Settings (Regulation) icon is selected. The status bar shows the name of the menu that corresponds with the selected icon.
- Use the Scroll keys to select an icon.
- Press the Escape key to return to the Main screen.

3.6 Inputs menu

Menu icon, Inputs

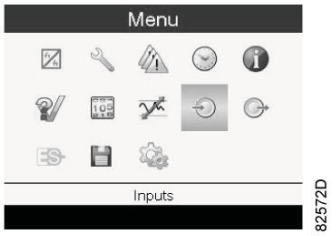
Function

- To display the actual value of the measured data (analog inputs) and the status of the digital inputs (e.g. emergency stop contact, motor overload relay, etc.).
- To select the digital input to be shown on the chart in the main screen.

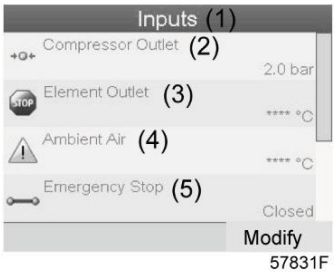
Procedure

Starting from the main screen (see Main screen),

- Move the cursor to the action button Menu and press the Enter key.
- Using the Scroll keys, move the cursor to the Inputs icon, as shown in the following screen:



- Press the Enter key. A screen similar to the one below appears:



Text on image

(1)	Inputs
(2)	Compressor outlet
(3)	Element outlet
(4)	Ambient air
(5)	Emergency stop

- The screen shows a list of all inputs with their corresponding icons and readings.
- If an input is in warning or shutdown, the original icon is replaced by the warning or shutdown icon respectively (i.e. the Stop icon and the Warning icon in the screen shown above).

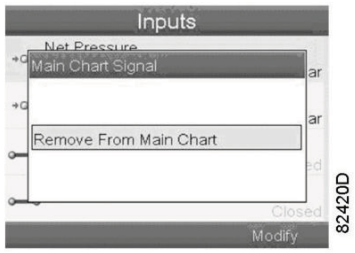
A small chart icon, shown below an item in the list means this input signal is shown on the chart at the main screen. Any analog input can be selected.

Selecting another input signal as main chart signal

With the Modify button active (light grey background in above screen), press the Enter button on the controller. A screen similar to the one below appears:

The first item in the list is highlighted. In this example, the Net Pressure is selected (chart icon).

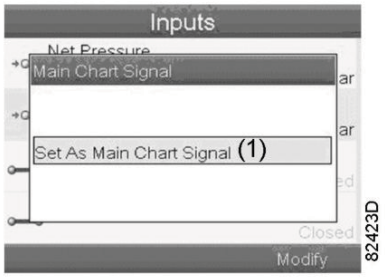
To change, press the Enter button again: a pop-up window opens:



Press Enter again to remove this input from the chart. Another confirmation pop-up opens:

Select Yes to remove or No to quit the current action.

In a similar way, another input signal can be highlighted and selected as Main Chart signal:



(1): Set as main chart signal

3.7 Outputs menu

Menu icon, Outputs

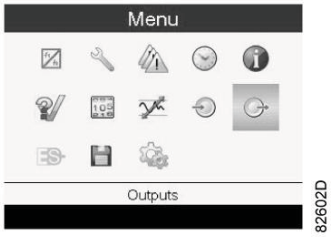
Function

To call up information regarding the actual status of some outputs such as the condition of the Fan overload contact (on air cooled compressors), the Emergency stop contact, etc.

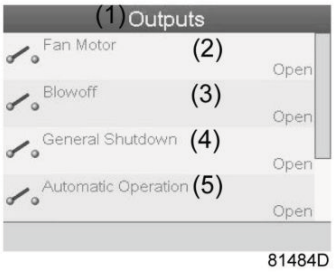
Procedure

Starting from the Main screen (see Main screen),

- Move the cursor to the action button Menu and press the Enter key.
- Move the cursor to the Outputs icon (see below).



- Press the Enter key. A screen similar to the one below appears:



Outputs screen (typical)

Text on figure

(1)	Outputs
(2)	Fan motor contact
(3)	Blow-off contact
(4)	General shutdown
(5)	Automatic operation

- The screen shows a list of all outputs with their corresponding icons and readings.
  If an output is in warning or shutdown, the original icon is replaced by the warning or shutdown icon respectively.

3.8 Counters

Menu icon, Counters

Function

To call up:

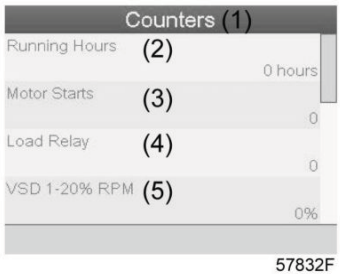
- The running hours
- The loaded hours
- The number of motor starts
- The number of hours that the regulator has been powered
- The number of load cycles

Procedure

Starting from the Main screen (see Main screen),

- Move the cursor to the action button Menu and press the Enter key.
- Using the Scroll keys, move the cursor to the Counters icon (see below)

- Press the Enter key. A screen similar to the one below appears:



Text on figure

(1)	Counters
(2)	Running hours
(3)	Motor starts
(4)	Load relay
(5)	VSD 1-20 % rpm in % (the percentage of the time during which the motor speed was between 1 and 20 %) (compressors with frequency converter)

The screen shows a list of all counters with their actual readings.

Note: the example above is for a frequency converter driven compressor. For a fixed speed compressor, the actual screen will be somewhat different.

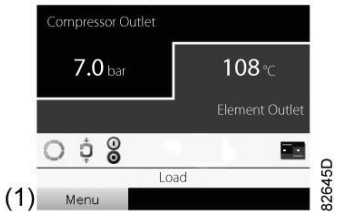
3.9 Control mode selection

Function

To select the control mode, i.e. whether the compressor is in local control, remote control or controlled via a local area network (LAN).

Procedure

Starting from the main screen, make sure the action button Menu (1) is selected:

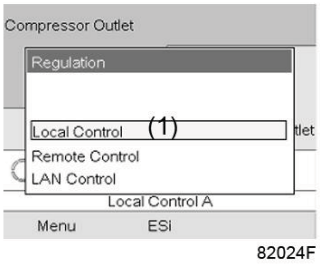


Next, use the scroll buttons to go to the Status icons (see Main screen) and select the Regulation icon (2). When the icon is active, this icon is highlighted with a grey background colour.

Press the enter button:

There are 3 possibilities:

- Local control
- Remote control
- LAN (network) control



After selecting the required regulation mode, press the enter button on the controller to confirm your selection. The new setting is now visible on the main screen. See section Used icons for the meaning of the icons.

3.10 Service menu

Menu icon, Service

Function

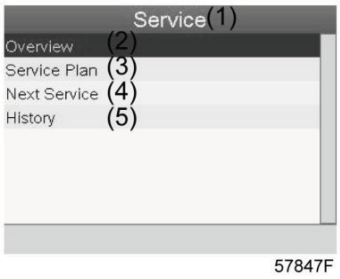
- To reset the service plans which are carried out.
- To check when the next service plans are to be carried out.
- To find out which service plans were carried out in the past.
- To modify the programmed service intervals.

Procedure

Starting from the Main screen (see Main screen),

- Move the cursor to the action button Menu and press the Enter key.
- Using the Scroll keys, move the cursor to the Service icon (see below).

- Press the Enter key. Following screen appears:

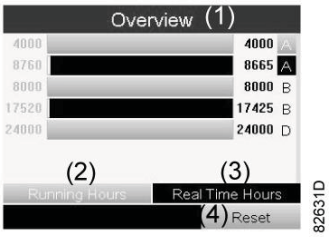


Text on figure

(1)	Service
(2)	Overview
(3)	Service plan
(4)	Next service
(5)	History

- Scroll through the items to select the desired item and press the Enter key to see the details as explained below.

Overview



Text on figure

(1)	Overview
(2)	Running Hours
(3)	Real Time hours
(4)	Reset

Example for service level (A):

The figures at the left are the programmed service intervals. For Service interval A, the programmed number of running hours is 4000 hours (upper row, green) and the programmed number of real time hours is 8760 hours, which corresponds to one year (second row, blue). This means that the controller will launch a service warning when either 4000 running hours or 8760 real hours are reached, whichever comes first. Note that the real time hours counter keeps counting, also when the controller is not powered.

The figures at the end of the bars are the number of hours to go till the next service intervention. In the example above, the compressor was just started up, which means it still has 4000 running hours or 8299 hours to go before the next Service intervention.

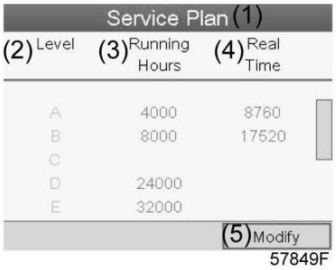
Service plans

A number of service operations are grouped (called Level A, Level B, etc...). Each level stands for a number of service actions to be carried out at the time intervals programmed in the Elektronikon controller.

When a service plan interval is reached, a message will appear on the screen.

After carrying out the service actions related to the indicated levels, the timers must be reset.

From the Service menu above, select Service plan (3) and press Enter. Following screen appears:

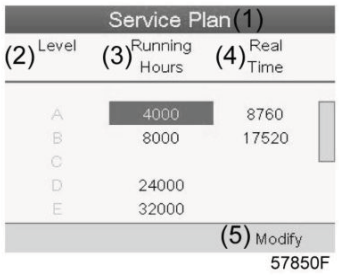


Text on figure

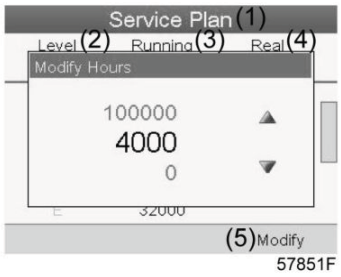
(1)	Service plan
(2)	Level
(3)	Running hours
(4)	Real time hours
(5)	Modify

Modifying a service plan

Dependant on the operating conditions, it can be necessary to modify the service intervals. To do so, use the Scroll keys to select the value to be modified. A screen similar to the one below appears:



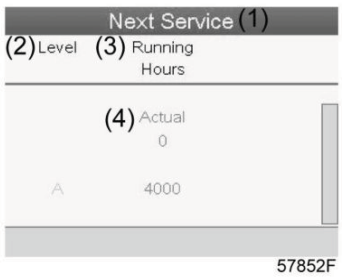
Press the Enter key. Following screen appears:



Modify the value as required using the ↑ or ↓ scroll key and press the Enter key to confirm.

Note: Running hours can be modified in steps of 100 hours, real time hours can be modified in steps of 1 hour.

Next Service



Text on figure

(1)	Next service
(2)	Level
(3)	Running hours
(4)	Actual

In the example above, the A Service level is programmed at 4000 running hours, of which 0 hours have passed.

History

The History screen shows a list of all service actions done in the past, sorted by date. The date at the top is the most recent service action. To see the details of a completed service action (e.g. Service level, Running hours or Real time hours), use the Scroll keys to select the desired action and press the Enter key.

3.11 Regulation menu

Menu icon, Setpoint

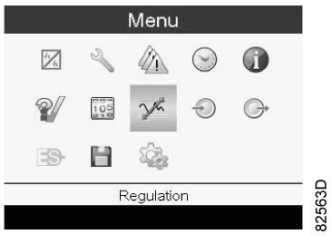
Function

On fixed speed compressors , the operator can program two different pressure bands. This menu is also used to select the active pressure band.

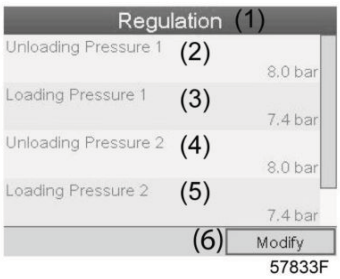
Procedure

Starting from the Main screen (see Main screen),

- Move the cursor to the action button Menu and press the Enter key.
- Using the Scroll keys, move the cursor to the Setpoint icon (see below).



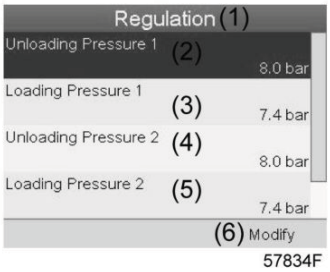
- Press the Enter key. Following screen appears:



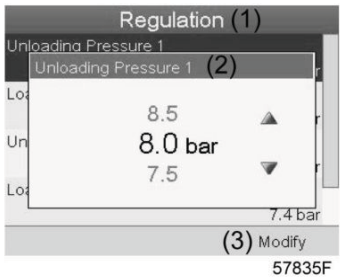
Text on figure

(1)	Regulation
(2)	Unloading pressure 1
(3)	Loading pressure 1
(4)	Unloading pressure 2
(5)	Loading pressure 2
(6)	Modify

- The screen shows the actual unloading and loading pressure settings for both pressure bands.
  To modify the settings, move the cursor to the action button Modify and press the Enter key. Following screen appears:



- The first line of the screen is highlighted. Use the Scroll keys to highlight the setting to be modified and press the Enter key. Following screen appears:



- The upper and lower limit of the setting is shown in grey, the actual setting is shown in black. Use the ↑ or ↓ key of the Scroll keys to modify the settings as required and press the Enter key to accept.

If necessary, change the other settings as required in the same way as described above.

3.12 Event history menu

Menu icon, Event History

Function

To call up the last shut-down and last emergency stop data.

Procedure

Starting from the Main screen (see Main screen),

- Move the cursor to the action button Menu and press the Enter key.
- Using the Scroll keys, move the cursor to the Event History icon (see below).

- Press the Enter key.
  The list of last shut-down and emergency stop cases is shown.

Example of Event History screen

- Scroll through the items to select the desired shut-down or emergency stop event.
- Press the Enter key to find the date, time and other data reflecting the status of the compressor when that shut-down or emergency stop occurred.

3.13 Week timer menu

Menu icon, Week timer

Function

- To program time-based start/stop commands for the compressor
- To program time-based change-over commands for the net pressure band
- Four different week schemes can be programmed.
- A week cycle can be programmed, a week cycle is a sequence of 10 weeks. For each week in the cycle, one of the four programmed week schemes can be chosen.

Procedure

Starting from the Main screen (see Main screen),

- Move the cursor to the action button Menu and press the Enter key.

- Use the Scroll buttons to select the Timer icon. (see below)

- Press the Enter key. Following screen appears:

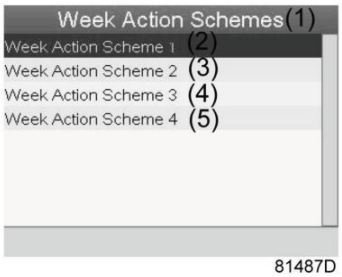
Text on figure

(1)	Week Timer
(2)	Week Action Schemes
(3)	Week Cycle
(4)	Status
(5)	Week Timer Inactive
(6)	Remaining Running Time

The first item in this list is highlighted. Select the item requested and press the Enter key on the controller to modify.

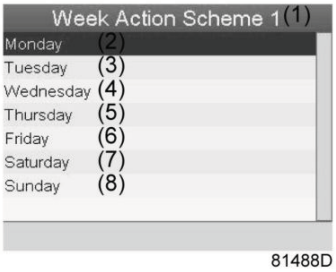
Programming week schemes

- Select Week action schemes and press Enter. A new window opens. The first item in the list is highlighted in red. Press the Enter key on the controller to modify Week Action Scheme 1.



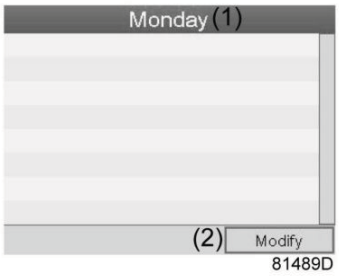
(1)	Week Action Schemes
(2)	Week Action Scheme 1
(3)	Week Action Scheme 2
(4)	Week Action Scheme 3
(5)	Week Action Scheme 4

- A weekly list is shown. Monday is automatically selected and highlighted in red. Press the Enter key on the controller to set an action for this day.



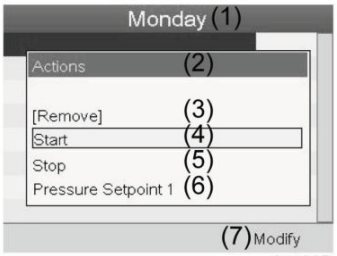
(1)	Week Action Scheme 1
(2)	Monday
(3)	Tuesday
(4)	Wednesday
(5)	Thursday
(6)	Friday
(7)	Saturday
(8)	Sunday

- A new window opens. The Modify action button is selected. Press the enter button on the controller to create an action.



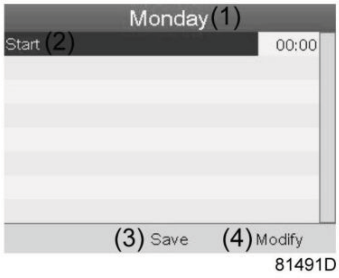
(1)	Monday
(2)	Modify

- A new pop-up window opens. Select an action from this list by using the Scroll keys on the controller. When ready press the Enter key to confirm.



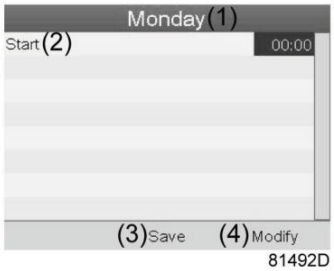
(1)	Monday
(2)	Actions
(3)	Remove
(4)	Start
(5)	Stop
(6)	Pressure Setpoint 1
(7)	Modify

- A new window opens. The action is now visible in the first day of the week.



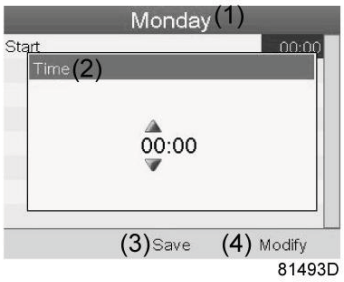
(1)	Monday
(2)	Start
(3)	Save
(4)	Modify

- To adjust the time, use the Scroll keys on the controller and press the Enter key to confirm.



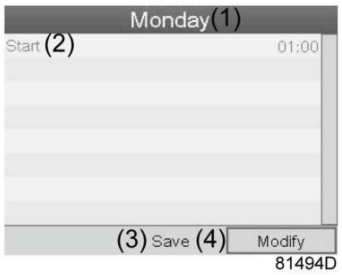
(1)	Monday
(2)	Start
(3)	Save
(4)	Modify

- A pop-up window opens. Use the ↑ or ↓ key of Scroll keys to modify the values of the hours. Use the ← or → Scroll keys to modify the minutes.



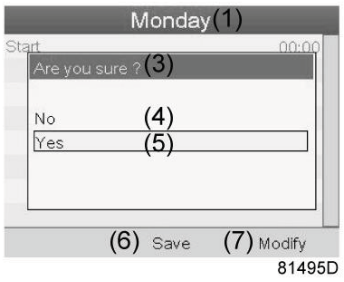
(1)	Monday
(2)	Time
(3)	Save
(4)	Modify

- Press the Escape key on the controller. The action button Modify is selected. Use the Scroll keys to select the action Save.



(1)	Monday
(2)	Start
(3)	Save
(4)	Modify

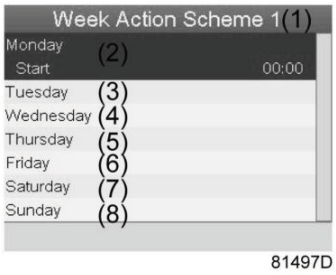
- A new pop-up window opens. Use the Scroll keys on the controller to select the correct actions. Press the Enter key to confirm.



(1)	Monday
(3)	Are you sure?
(4)	No
(5)	Yes
(6)	Save
(7)	Modify

Press the Escape key to leave this window.

- The action is shown below the day the action is planned.



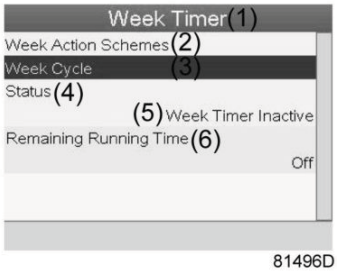
(1)	Week Action Scheme 1
(2)	Monday - Start
(3)	Tuesday
(4)	Wednesday
(5)	Thursday
(6)	Friday
(7)	Saturday
(8)	Sunday

Press the Escape key on the controller to leave this screen.

Programming the week cycle

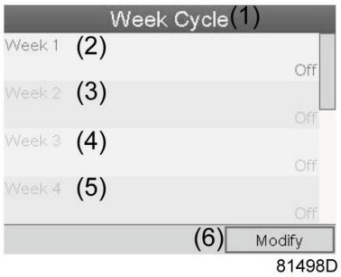
A week cycle is a sequence of 10 weeks. For each week in the cycle, one of the four programmed week schemes can be chosen.

- Select Week Cycle from the main Week Timer menu list.



(1)	Week Timer
(2)	Week Action Schemes
(3)	Week Cycle
(4)	Status
(5)	Week Timer Inactive
(6)	Remaining Running Time

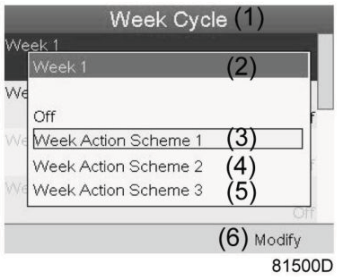
- A list of 10 weeks is shown.



(1)	Week Cycle
(2)	Week 1
(3)	Week 2
(4)	Week 3
(5)	Week 4
(6)	Modify

Press twice the Enter key on the controller to modify the first week.

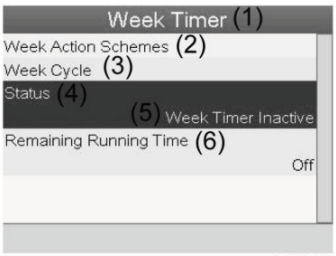
- A new window opens. Select the action, example: Week Action Scheme 1



(1)	Week Cycle

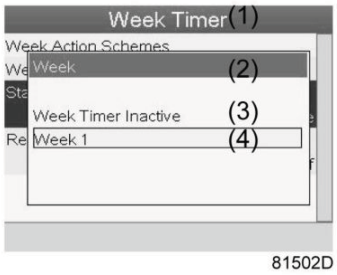
(2)	Week 1
(3)	Week Action Scheme 1
(4)	Week Action Scheme 2
(5)	Week Action Scheme 3
(6)	Modify

- Check the status of the Week Timer
  Use the Escape key on the controller to go back to the main Week Timer menu. Select the status of the Week Timer.



(1)	Week Timer
(2)	Week Action Schemes
(3)	Week Cycle
(4)	Status
(5)	Week Timer Inactive
(6)	Remaining Running Time

- A new window opens. Select Week 1 to set the Week Timer active.

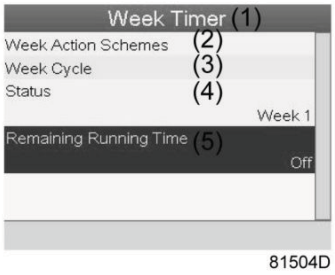


(1)	Week Timer
(2)	Week
(3)	Week Timer Inactive
(4)	Week 1

- Press the Escape key on the controller to leave this window. The status shows that week 1 is active.

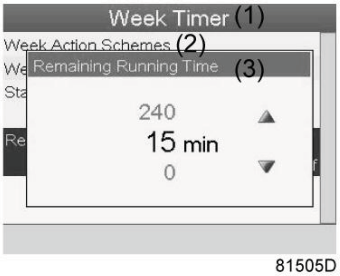
(1)	Week Timer
(2)	Week Action Schemes
(3)	Week Cycle
(4)	Status
(5)	Remaining Running Time

- Press the Escape key on the controller to go to the main Week Timer menu. Select Remaining Running Time from the list and press the Enter key on the controller to Modify.



(1)	Week Timer
(2)	Week Action Schemes
(3)	Week Cycle
(4)	Status
(5)	Remaining Running Time

- This timer is used when the week timer is set and for certain reasons the compressor must continue working, for example, 1 hour, it can be set in this screen. This timer is prior to the Week Timer action.



(1)	Week Timer
(2)	Week action schemes
(3)	Remaining Running Time

3.14 Test menu

Menu icon, Test

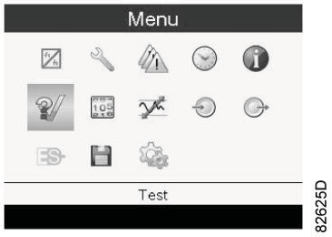
Function

- To carry out a display test, i.e. to check whether the display and LEDs are still intact.

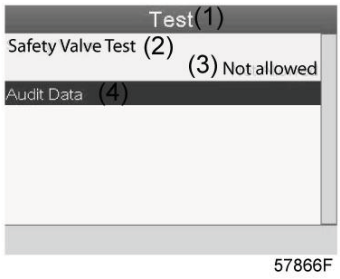
Procedure

Starting from the Main screen (see Main screen):

- Move the cursor to the action button Menu and press the Enter key.
- Using the scroll keys, move the cursor to the Test icon (see below).



- Press the Enter key, following screen appears:



Text on figure

(1)	Test
(2)	Safety Valve Test
(3)	Not allowed
(4)	Audit Date

- The safety valve test can only be performed by authorized personnel and is protected by a security code.

- Select the item display test and press the enter key. A screen is shown to inspect the display, at the same time all LED's are lit.

3.15 Modifying general settings

Menu icon, Settings

Function

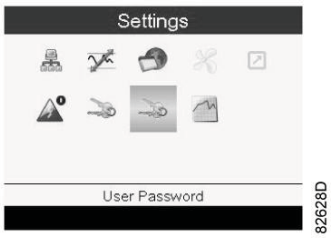
To display and modify a number of general settings.

Procedure

Starting from the Main screen (see Main screen),

- Move the cursor to the action button Menu and press the Enter key.
- Using the Scroll keys, move the cursor to the Settings icon (see below).

- Press the Enter key. A second menu screen appears:



- This submenu screen shows again a number of icons. By default, the User Password icon is selected. Also the status bar shows the name of the menu that corresponds with the selected icon.

3.16 General menu

Menu icon, General

Function

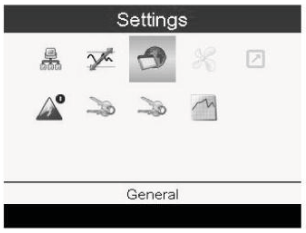
This menu covers a list of general settings:

- Language
- Time
- Date
- Date Format
- Units

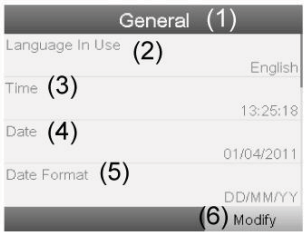
Procedure

Starting from the submenu screen (see Modifying general settings),

- Using the Scroll keys, move the cursor to the General icon (see below).



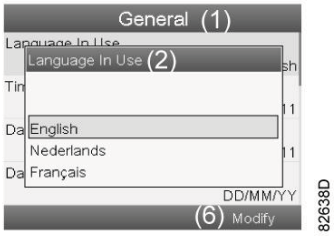
- Press the Enter key. A screen similar to the one below appears:



Text on figure

(1)	General
(2)	Language in use
(3)	Time
(4)	Date
(5)	Date format
(6)	Modify

- A screen similar to the one above is shown, a selection bar is covering the first item (Language). Use the ↓ key of the Scroll keys to select the setting to be modified and press the Enter key.
- To modify, select the Modify button using the Scroll keys and press the Enter key.
- A pop-up screen appears. Use the ↑ or ↓ key to select the required parameter and press the Enter key to confirm.



3.17 User password menu

Menu icon, Password

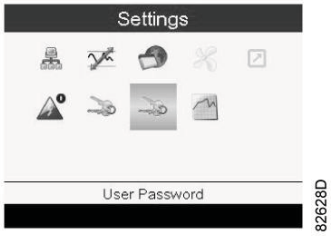
Function

The end customer can activate and choose a personal password. Once the password option activated, it is impossible for not authorized persons to modify any setting.

Procedure

Starting from the submenu screen (see Modifying general settings),

- Using the Scroll keys, move the cursor to the User Password icon (see below)



- Press the Enter key. Next screen appears.

- Select the Activate button and press the Enter key.
- Next, fill in the User Password and press the Enter key, a confirmation window opens.
- Fill in the password again and press the enter key to confirm.

Text on figure

(1)	User Password
(2)	Not activated
(3)	Activate

3.18 Access key menu

Menu icon, Access Key

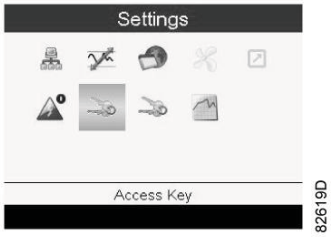
Function

Only a number of basic Icons will be displayed in the Menu screen. Using the Access Key with the proper access code allows the user to see more Icons, or have access to more parameters.

Procedure

Starting from the submenu screen (see Modifying general settings),

- Using the Scroll keys, move the cursor to the Access Key icon (see below)



- Three Access levels are possible.
  - **0** : A basic set of parameters is visualized, no password is required.
  - **1** : A basic set of parameters can be modified.
  - **2** : Extra parameters will be visualized and can be modified.
- Changing the Access level can be done through the Modify button. A new pop-up window will be activated asking to enter an Access Key.

3.19 Programmable settings

Parameters: unloading/loading pressures

	Minimum setting	Factory setting	Maximum setting
Unloading/loading pressures	see Compressor data	see Compressor data	see Compressor data

Parameters variable speed drive

		Minimum setting	Factory setting	Maximum setting
Motor running time in star	sec	NA	NA	NA
Load delay time (star-delta)	sec	NA	NA	NA
Number of motor starts	starts/day	NA	NA	NA
Minimum stop time	sec	10	10	30
Programmed stop time	sec	0	3	20
Power recovery time (ARAVF)	sec	30	30	3600
Restart delay	sec	0	0	1200
Communication time-out	sec	10	30	60

Protections

		Minimum setting	Factory setting	Maximum setting
Compressor element outlet temperature (shut-down warning level)	˚C	50	113	119
	˚F	122	235	246
Compressor element outlet temperature (shut-down level)	˚C	111	120	120
	˚F	232	248	248

Service plan

The built-in service timer will give a Service warning message after a preprogrammed time interval has elapsed.

Also see section Maintenance schedule.

Consult your supplier if a timer setting has to be changed. See section Modifying general settings. The intervals must not exceed the nominal intervals and must coincide logically.

Terminology

Term	Explanation
ARAVF	Automatic restart after voltage failure. See section Controller and .
Power recovery time	Is the period within which the voltage must be restored to have an automatic restart. Is accessible if the automatic restart is activated. To activate the automatic restart function, consult your supplier.
Restart delay	This parameter allows to programme that not all compressors are restarted at the same time after a power failure (ARAVF active).
Compressor element outlet	The regulator does not accept inconsistent settings, e.g. if the warning level is programmed at 95 ˚C (203 ˚F), the minimum limit for the shut-down level changes to 96 ˚C (204 ˚F). The recommended difference between the warning level and shut-down level is 10 ˚C (18 ˚F).
Delay at shut-down signal	Is the time for which the signal must exist before the compressor is shut down. If it is required to program this setting to another value, consult your supplier.
Minimum stop time	Once the compressor has automatically stopped, it will remain stopped for the minimum stop time, whatever happens with the net air pressure. Consult your supplier if a setting lower than 20 seconds is required.
Unloading/ Loading pressure	The regulator does not accept illogical settings, e.g. if the unloading pressure is programmed at 7.0 bar(e) (101 psi(g)), the maximum limit for the loading pressure changes to 6.9 bar(e) (100 psi(g)). The recommended minimum pressure difference between loading and unloading is 0.6 bar (9 psi(g)).