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# VERNIT - HORNIT N2(i) Expansion system

## Maintenance manual

| | | |
|---|---|---|
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# Table of content

# Introduction

This manual is intended to support you while performing maintenance on the PRESSCON nitrogen expansion system. The manual applies to the nitrogen expansion systems delivered from 2012 onwards. Each expansion system includes a compressed air supply. The expansion system is connected to a separate compressor or to the existing compressed air supply. The general instructions for maintaining the separate compressor or compressed air supply are not described in this manual. Please refer to the related manuals of the compressors themselves. However, this manual does cover some exceptions for compressors supplied in combination with an expansion system.

The expansion system monitors and controls the nitrogen pressure prevailing in the expansion chamber of a central heating system. It is applicable to central heating systems in the horticultural industry. The system consists of a nitrogen generator with a compressed air compressor, a set of pressure sensors that measure the water level and pressure at the top of a buffer tank, and a control module that controls the nitrogen generator.

Central heating systems in the horticultural industry store their heat in a vertical or horizontal buffer tank. The buffer tanks are not completely filled with water but there is an expansion space above the water. In a vertical buffer tank, this space is directly above the water in the tank. In a horizontal heat storage tank, the expansion space is also located directly above the water in the heat storage tank, but it can also be located in a separate expansion tank. The expansion tank is designed to give the water in the central heating system room to expand and contract as the water heats up or cools down. When this happens, the pressure in the expansion chamber also changes.

The expansion system monitors the pressure in the expansion chamber. When the pressure gets too high a pressure relief valve lets the extra air escape. If the pressure gets too low, then the expansion system supplies nitrogen to bring the expansion chamber back to pressure. The nitrogen generator of the expansion system supplies an air mixture with a nitrogen concentration of 99.0 vol. % N2. The system uses nitrogen because it is an inert gas. Inert gas has the property of preventing rust at high concentration. The expansion system always ensures that a blanket of nitrogen is present in the expansion chamber within the buffer tank and that it is kept at a constant overpressure.

In addition to pressure management of the nitrogen blanket, the expansion system is also a monitoring device for the water level in the buffer tank. By using pressure sensors, the system determines the height of the water level. Once the water level becomes too high or too low, the expansion system will generate the appropriate error or alarm message and can also send a stop signal to other relevant devices. Water level monitoring is important for maintaining the buffer tank. It prevents the water level from getting too high and causing damage to the roof of the buffer tank. It also prevents the water level from getting too low leading to air in the heat supply nozzle and in the central heating network.

These are important features for maintaining the buffer tank and maintaining the central heating system.

# Important to know

The expansion systems are made in 2 different types. Namely the VERNIT and HORNIT systems. These 2 types have the following differences.

- VERNIT, the expansion system regulates the pressure of the nitrogen blanket in the vertical heat storage tank.
- HORNIT, the expansion system regulates the total system pressure in a horizontal heat storage tank. This is done directly or through an external expansion tank.

In addition to VERNIT and HORNIT, there are some additional designations that define the function of the expansion system. These are:

| | |
|---|---|
| **2.0 – 30.0** | The number in the type designation indicates the capacity of the nitrogen generator. This number represents the flow rate in m³/h that the generator can produce with a purity of 99.0 Vol%N2. The smallest capacity per generator is 2.0 m³/h and the largest possible capacity is 30.0 m³/h. Larger capacities are also possible but then several nitrogen generators should be combined with each other. |
| **H.P.** | "High Performance" stands for the design of the PSA tube. Indicates that the PSA applied to the system is manufactured by PRESSCON. Nitrogen generators manufactured before 2009 do not have this addition. |
| **N2i** | N2i stands for direct injection of nitrogen. So, the expansion system in this case will directly inject nitrogen into the heat storage tank. |
| **N2** | N2 without the "i" stands for an expansion system without direct injection. In this case, the expansion system uses a separate pressure vessel in which the nitrogen is first stored before being blown into the heat storage tank. |
| **Basic** | The Basic generators are equipped with a basic version of the control panels and include a Press display. |
| **Premium and premium plus** | The Premium and Premium Plus generators are equipped with an extended version of the control panels and include a touchscreen display. |
| **Premium plus DUO** | DUO means that the expansion system is suitable for monitoring 2 separate heat storage tanks. |
| **ELC** | The expansion system is prepared to operate in an Equal Level Control setup. This function provides control of the level difference in two tanks by means of controlling a pump. For this purpose, the expansion system will work together with a 1 or more expansion systems via CAN bus. |
| **SLC** | The expansion system is prepared to apply the Switching Level Control function. This function generates a switching signal based on the level difference in two tanks. For this purpose, the expansion system will work together with one or more expansion systems via CAN-bus. |
| **SLDM** | Leakage detection measurement working on the basis of a 3rd pressure sensor at the bottom of the vertical buffer tank. |
| **CLDM** | Leak detection measurement that works on the basis of information that the system receives from the horticultural computer. The horticultural computer then indicates the filling of the vertical buffer tank. |

The type designations described above are compatible with each other according to the matrix below.

| | VERNIT | HORNIT | N2i | N2 | Premium | Premium plus | Basic | ELC / SLC | SLDM / CLDM |
|---|---|---|---|---|---|---|---|---|---|
| **VERNIT** | NA | NA | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** |
| **HORNIT** | NA | NA | **Yes** | **Yes** | **Yes** | **Yes** | **No** | **No** | **No** |
| **N2i** | **Yes** | **Yes** | NA | NA | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** |
| **N2** | **Yes** | **Yes** | NA | NA | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** |
| **Premium** | **Yes** | **Yes** | **Yes** | **Yes** | NA | NA | NA | **No** | **Yes** |
| **Premium plus** | **Yes** | **Yes** | **Yes** | **Yes** | NA | NA | NA | **Yes** | **Yes** |
| **Basic** | **Yes** | **No** | **Yes** | **Yes** | NA | NA | NA | **No** | **No** |
| **ELC / SLC** | **Yes** | **No** | **Yes** | **Yes** | **No** | **Yes** | **No** | NA | **Yes** |
| **SLDM / CLDM** | **Yes** | **No** | **Yes** | **Yes** | **Yes** | **Yes** | **No** | **Yes** | NA |

**Touchscreen and PRESS-Display**

The touchscreen and the PRESS display are both control units that can be used for the PRESSCON nitrogen generators. Originally the PRESS-Display was conceived as a multi-purpose digital screen on which the water level, the pressure of the nitrogen blanket and possible alarms could be displayed. The Touchscreen also fulfils these functions but offers more visual overview of the system and more intuitive controls. Also, the Touchscreen is universally usable for several types of nitrogen generators.

- The Touchscreen is used as standard for the VERNIT - HORNIT Premium (plus) and Premium plus DUO types. Optionally this display could also be applied on a VERNIT Basic.
- The PRESS display is used as standard for the VERNIT Basic.

If 2 or more expansion systems are connected to each other via CAN-bus, it is important that the displays within that network are all of the same type. Touchscreen and PRESS display do not work together within a CAN-bus network. This could occur for example in an ELC setup.

# 1 Precautions and safety instructions

## 1.1 General safety standards

When working with the PRESSCON expansion system, there are some safety risks that must be considered. The risks involve subjects such as dangerous voltage, high pressure and dangerous gas to inhale. These are further explained in this chapter. It is highly recommended that the safety risks are observed before work on the devices is commenced. The safety risks in this chapter are divided amongst the different components of the system. For more information on the composition of the components, is referred to chapter 2 System components.

### 1.1.1 Working with the nitrogen generator

The nitrogen generator is commonly located in the technical room of the facility. When operating or when working on the nitrogen generator, the following hazards should be considered.

| Symbol | Description | Applies to |
|---|---|---|
|  | HIGH PRESSURE, Relief pressure from components before work is conducted. | The external components of the nitrogen generator which are:<br>• Valves;<br>• Hoses;<br>• PSA vessels. |
|  | DANGEROUS VOLTAGE,<br><br>Forbidden to work on the system if the power is on. | All components that are connected to the control cabinet. Applied voltages are:<br>• 24V AC;<br>• 24V DC;<br>• 230V AC;<br>• 380V AC. |
|  | DANGEROUS TO INHALE GAS,<br><br>Avoid the specified area to prevent risk of health. | The nitrogen output connection. The mixture that is produced by the nitrogen generator consists for 99% out of nitrogen. Breathing this in directly from the output tube could cause suffocation. However, the nitrogen evaporates quickly thus poses no significant health risk at a distance of >0.5m from the nitrogen output connection. |

### 1.1.2 Working with the compressor

To work safely and responsibly with the compressor, it is recommended to carefully read the maintenance manual of the concerning device. Please also take note of the hazard symbols and safety features. In addition to the ones that are described in this manual, the manufacturer of the compressor can use different symbols. When operating or working with the compressor, the following hazards should at least be considered.

| Symbol | Description | Applies to |
|---|---|---|
|  | HIGH PRESSURE, Relief pressure from components before work is conducted. | The external and internal components of the compressor which are:<br>• Compressed air HP vessel;<br>• Tubing, filters, oil barrel;<br>• Compressor block. |
|  | OVERPRESSURE VALVE,<br>Be aware of the sudden relief of overpressure. | The compressed air HP vessel which has an overpressure valve of 10 Bar. The overpressure valve can relief its pressure suddenly. |
|  | DANGEROUS VOLTAGE,<br>Forbidden to work on the system if the power is on. | All internal components of the compressor. Applied voltages are:<br>• 230V AC;<br>• 380V AC. |
|  | MOVING PARTS AND ROTAGING FAN,<br>Risk of getting stuck or injuries to limbs. Turn the machine off completely before working on it. | All internal components of the compressor which consist out of some rotating and moving parts. |

**For the precautions and safety instructions of the compressor, PRESSCON also refers to the enclosed instructions of the compressor manufacturer. These can be found with the compressor or in the control panel of the nitrogen generator.**

### 1.1.3 Working with the safety valve

The safety valve is commonly located on the roof of the buffer tank. When working on the safety valve, the following hazards should be considered.

| Symbol | Description | Applies to |
|---|---|---|
|  | HOT PARTS,<br><br>Do not touch parts with bare hands. Use heat-resistant clothing. | The housing of the safety valve and relieved nitrogen from the buffer tank. The upper layer of water can heat up the nitrogen in the safety valve. The housing can then be too hot to touch. The relieved nitrogen from the vacuum-overpressure safety valve on top of a vertical buffer tank can also contain steam with a temperature of 90°C which could cause burn injury. Vacuum safety valves on the horizontal buffer tanks do not release nitrogen. |
|  | ATTENTION! WORKING AT HIGHTS, | Working on the roof of a vertical or horizontal buffer tank is considered working at heights. Fall protection is mandatory when working on the safety valve. |
|  | HIGH PRESSURE, Relief pressure from components before work is conducted. | The safety valves on both the vertical and horizontal buffer tanks. The safety valve on a vertical buffer tank can be depressurized by hand. The pressure is not higher than 28 mBar. The safety valve on a horizontal buffer tank can only be depressurized by relieving water pressure for the buffer tank. The pressure is not higher than 1200 mBar. |

## 1.2 Description of hazard symbols

In addition to the identified risks for the nitrogen generator, compressor and safety valve, the following symbols can also be applied. When a hazard symbol is encountered, please observe its meaning carefully before further commencing the work.

| Symbol | Description | Symbol | Description |
|---|---|---|---|
|  | 1. OVERPRESSURE VALVE,<br>Be aware of the sudden relief of overpressure. |  | 7. HIGH PRESSURE,<br>Relief pressure from components before work is conducted. |
|  | 2. DANGEROUS VOLTAGE,<br>Forbidden to work on the system if the power is on. |  | 8. HOT PARTS,<br>Do not touch parts with bare hands. Use heat-resistant clothing. |
|  | 3. DANGEROUS TO INHALE GAS,<br>Avoid the specified area or wear appropriate breathing equipment. |  | 9. MOVING PARTS,<br>Risk of getting stuck or injuries to limbs. Turn the machine off completely before working on it. |
|  | 4. NOISE,<br>Wear ear protection to prevent hearing damage. |  | 10. ROTATING FAN,<br>Risk of getting stuck or injuries to limbs. Turn the machine off completely before working on it. |
|  | 5.MACHINE WITH AUTOMATIC START,<br>Machine stops and starts automatically when it is operating normally. Turn off the machine completely before working on it. |  | 11. ATTENTION,<br>Special situation occurs, follow additional instructions. |
|  | 6. READ THE OPERATING AND MAINTENANCE INSTRUCTIONS,<br>It is advised that the maintenance instructions are read before continuing work. | | |

# 2 System components

The PRESSCON expansion systems consist out of the following components: a nitrogen generator, compressor, safety valve and 2 or more pressure sensors. This chapter describes these components by giving an image of each device and by numbering the most important parts. The compressor is not described because different brands and types can be applied, and it is delivered with its own manual.

## 2.1 Nitrogen generator PREMIUM (PLUS)

**N2 system**


*Figure 1. N2 PREMIUM (PLUS) SYSTEM*

**N2i system**

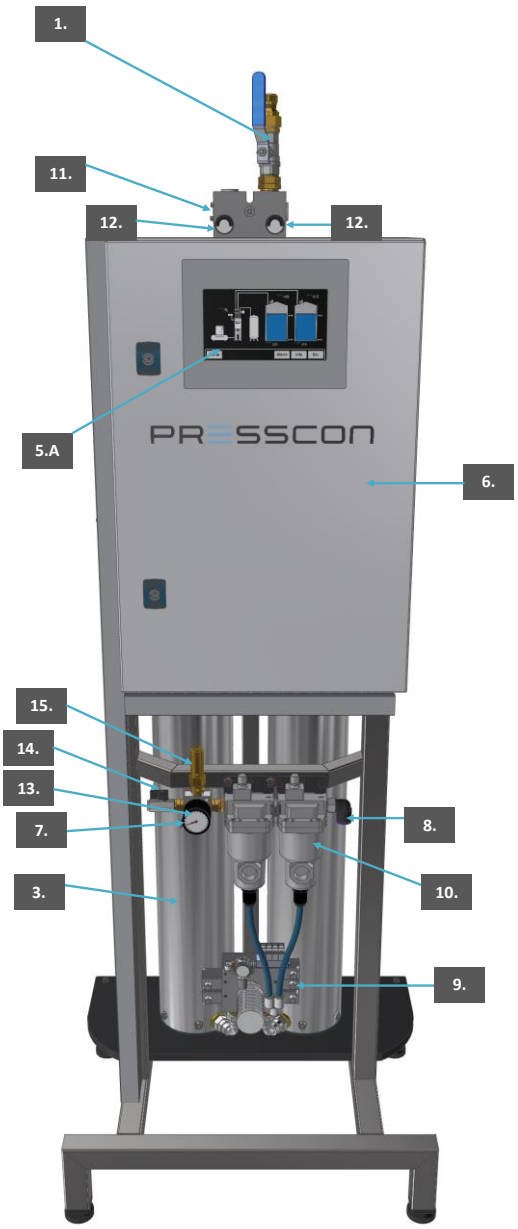



*Figure 2. N2i PREMIUM (PLUS) System*

## 2.2 Nitrogen generator BASIC

**N2 system**

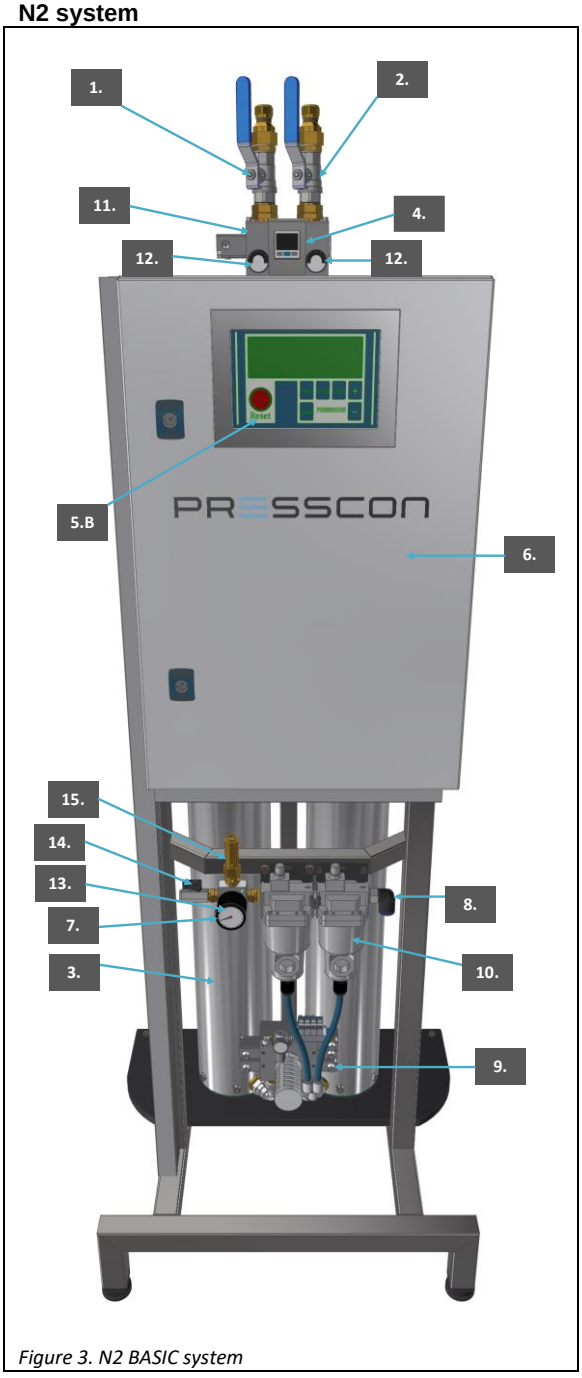



*Figure 3. N2 BASIC system*

**N2i system**

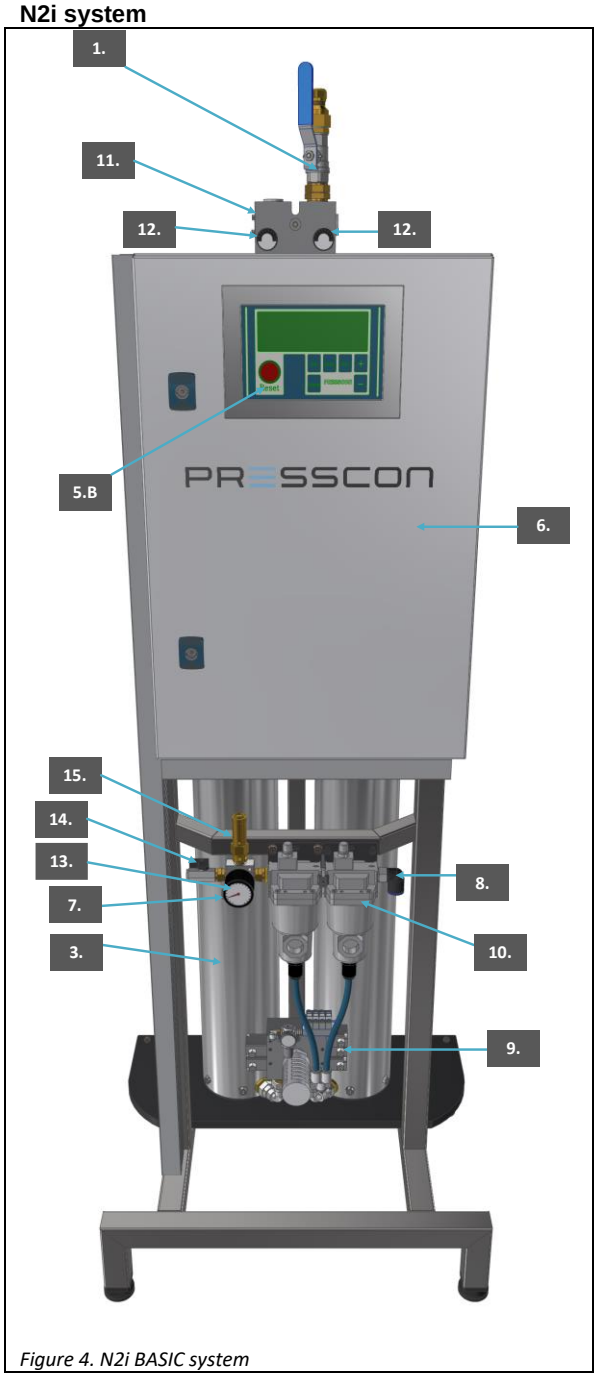



*Figure 4. N2i BASIC system*

## 2.3 Nitrogen generator Premium Plus DUO

**N2 system**

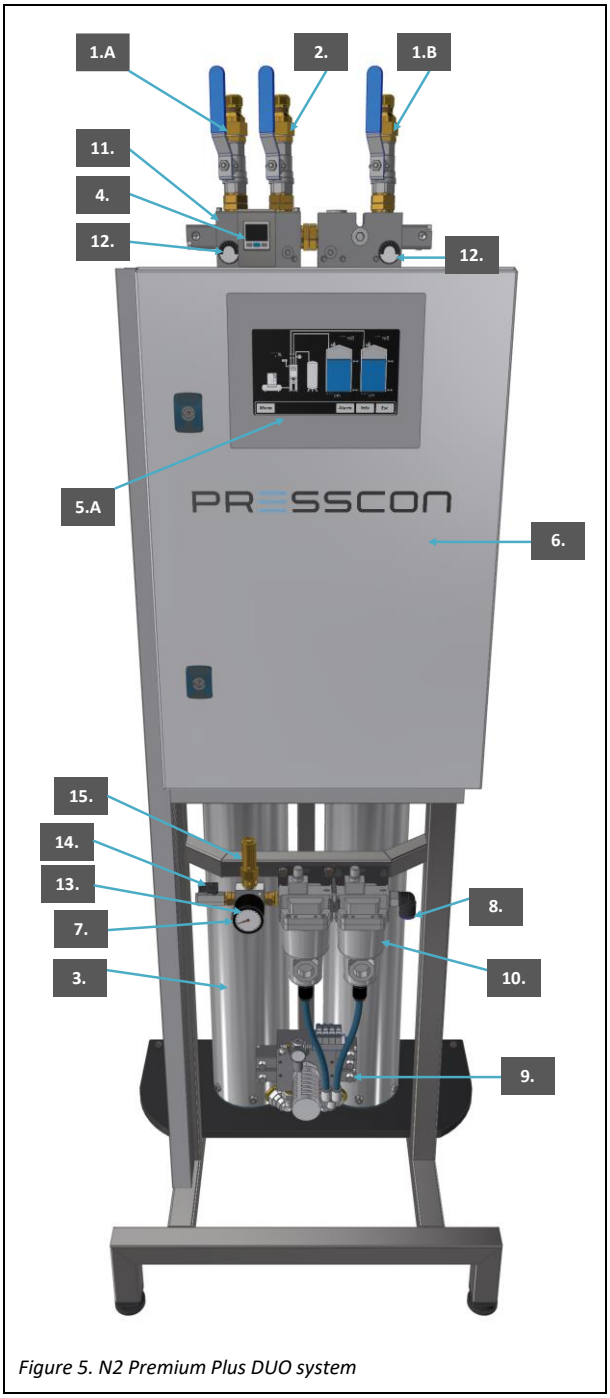



*Figure 5. N2 Premium Plus DUO system*

**N2i system**

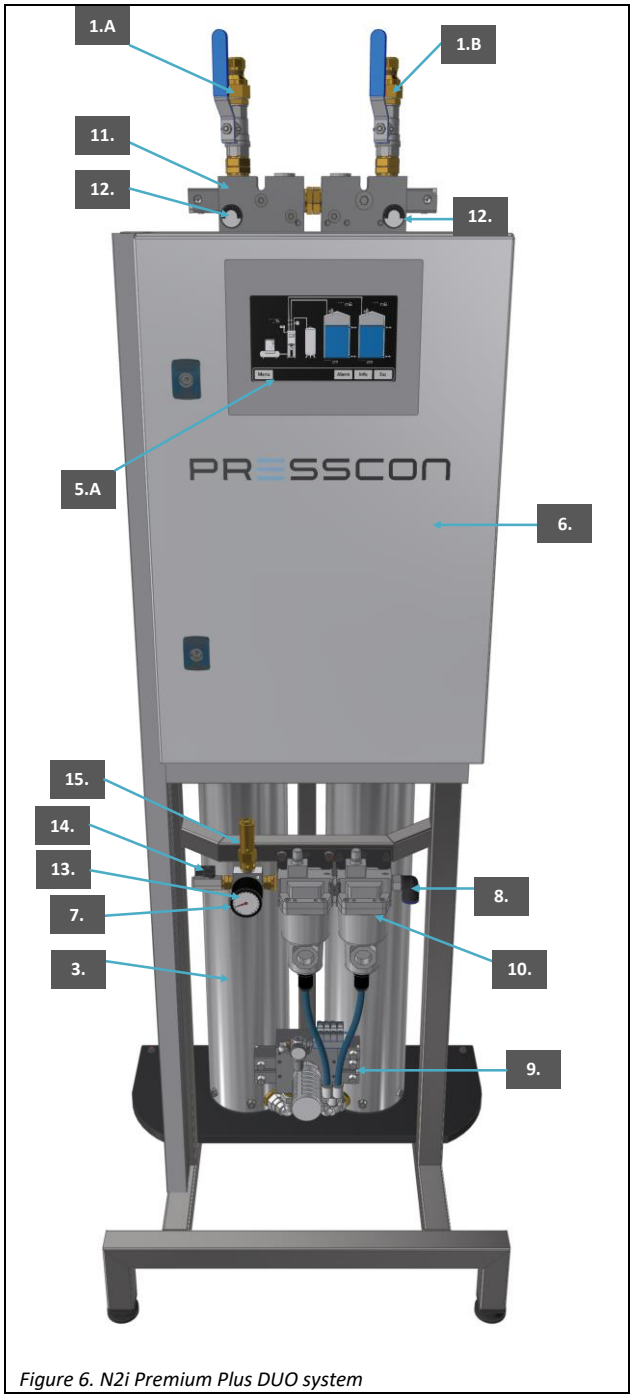



*Figure 6. N2i Premium Plus DUO system*

## Legend

Legend for nitrogen generators of types: Premium (plus), Basic, Premium Plus DUO.

| No. | Description | Function |
|---|---|---|
| 1. | Nitrogen output connection | Tube which puts out the nitrogen mixture that is produced by the nitrogen generator. This outlet will be connected to the piping that runs to the buffer tank. Please note that this connection is located differently when comparing the N2 and N2i systems. Also note that the N2 and DUO systems have solenoid valves in the tubing while the N2i systems do not. |
| 1.A/B | Nitrogen inlet tank 1 and tank 2 | Same connection as the standard Nitrogen output connection. Connection 1.A is used for supplying nitrogen to tank 1 and connection 1.B is used for supplying nitrogen to tank 2. |
| 2. | Nitrogen HP vessel connection | Tube which puts out the nitrogen mixture that is produced by the nitrogen generator. This outlet is specially fitted for connecting a nitrogen HP vessel. |
| 3. | PSA vessels | High pressure vessels with active carbon inside. The Pressure Swing Adsorption process takes place within these vessels to generate nitrogen. |
| 4. | Digital nitrogen HP vessel pressure regulator. | Digital pressure switch with a start and stop setting. At default, the pressure regulator will generate a start signal below 4.0 Bar. At 6.5 Bar, the signal will turn off and the text on the display will turn green. If the pressure then drops below 4.0 Bar, the text on the display will turn red and a new start signal is generated. |
| 5.A | Touchscreen | The touchscreen. Standard for Premium (plus) and Premium Plus DUO systems. This is the main control device for reading the statuses and values of the system. The touchscreen is used for navigating and adjusting settings. |
| 5.B | PRESS-display | LCD display with buttons. Standard for the Basic systems. This is the main control device for reading the statuses and values of the system. The buttons are used for navigating and adjusting settings. |
| 6. | Control cabinet | Control cabinet containing all the electronic components needed to manage the nitrogen generator, compressor and sensor measurements of 1 buffer tank. This type of control cabinet has enough space for all standard components and additional components required for any further expansion of the control cabinet. |
| 7. | Compressed air regulator and pressure switch | Composition of pressure control valve and pressure switch. The maximum air pressure for the nitrogen generator is manually setup by adjusting the pressure control valve. The pressure switch notifies the system if there is a pressure drop. |
| 8. | Compressed air inlet | Push-in connection that is used for connecting the compressor to the nitrogen generator. This is commonly done with a 16mm air hose. |
| 9. | PSA control manifold | A pneumatically controlled manifold block that regulates the flow of air and nitrogen during the Pressure Swing Adsorption process. |
| 10. | Compressed air filters | 2 Filters that filter out dirt and moisture that comes with the compressed air. |
| 11. | Nitrogen inlet manifold | A pneumatically controlled manifold block that regulates the flow of nitrogen to the nitrogen storage vessel and one or two buffer tanks. |
| 12. | PSA pressure gauges | 0 – 10 bar (0,0 – 1,0 MPa) pressure gauges that indicate the pressure within the PSA vessels. The left pressure gauge is for the left PSA vessel and the right pressure gauge is for the right pressure vessel. |
| 13. | Adjustable pressure switch | Pressure gauge to set minimum compressed air pressure. |
| 14. | Filter air vent | Air vent to depressurize filters. |
| 15. | Pressure relief device | Safety valve to prevent the system from being under too much pressure. |

## 2.4 Control Device

Depending on the type of expansion system, the installation has a "Touchscreen" or a "Press display" as a control device with which the expansion system can be operated.

| Control device | Description |
|---|---|
| Touchscreen | The touchscreen. Standard for Premium (plus) and Premium Plus DUO systems. This is the main control device for reading the statuses and values of the system. The touchscreen is used for navigating and adjusting settings. |
| PRESS-display | LCD display with buttons. Standard for the Basic systems. This is the main control device for reading the statuses and values of the system. The buttons are used for navigating and adjusting the settings. |

### 2.4.1 Touchscreen

The Touchscreen is the main control device for reading the statuses and readings of the system. The Touchscreen has no physical keys but only digital keys on the screen. Touching the keys and the images on the screen can be used to navigate through and adjust settings. The table below shows the touchscreen keys.

**Main screen of the Touchscreen:**
Every button has a different function, some of them have several functions. The following table describes which function each button has.

| Button | Description |
|---|---|
| Menu | This button is only displayed in the main menu and guides you to the following functions:<br>• User : User menu<br>• Service : Service menu<br>• Factory : Factory menu |
| Alarm | • Press the button to view the current fault and alarm messages.<br>• Press the button for more than 3 seconds to view the alarm log. |
| Info | • Pressing this button calls up the information screen. Specific information is displayed in here for each component as well as the current status.<br>• The same menu for a specific component can also be accessed by pressing the relevant icon in the menu screen. |
| Esc | • This button is in every menu and returns you to the previous menu. |

When the “menu” option is pressed, the following menus can be selected.

| Button | Description |
|---|---|
| User | • The user menu is accessible to everyone.<br>• This contains setting which the user can change. |
| Service | • The service menu is only accessible via a code.<br>• Service information can be requested via this menu. |
| Factory | • The service menu is only accessible via a code.<br>• Factory settings can be entered from this menu. |

**Main screen lay-out VERNIT:**
The structure of the menu is based on the type of system the user has. Press the icons to find out the status of this system.

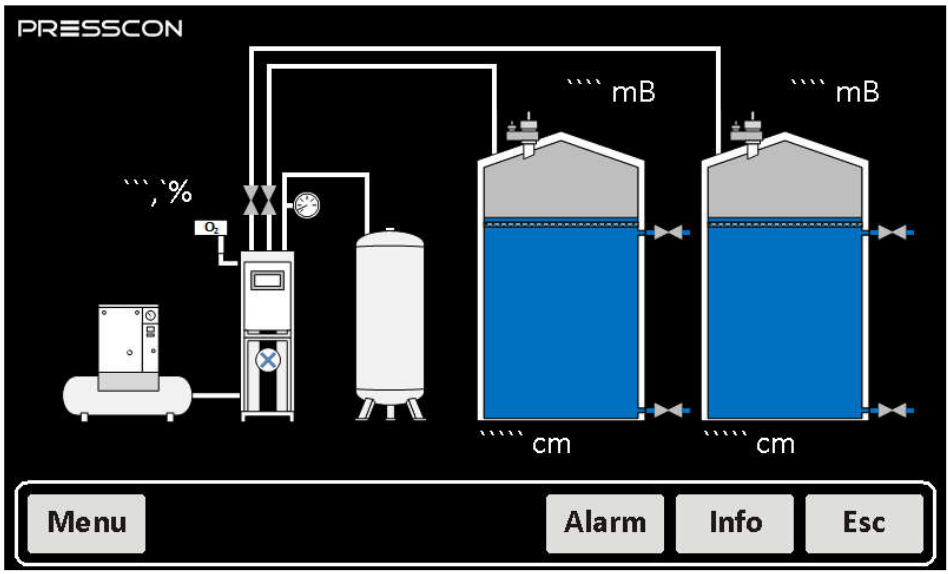



*Figure 7. VERNIT 2.0 – 30.0 N2(i) DUO system overview (Only when the VERNIT is installed)*

**Main screen lay-out HORNIT:**

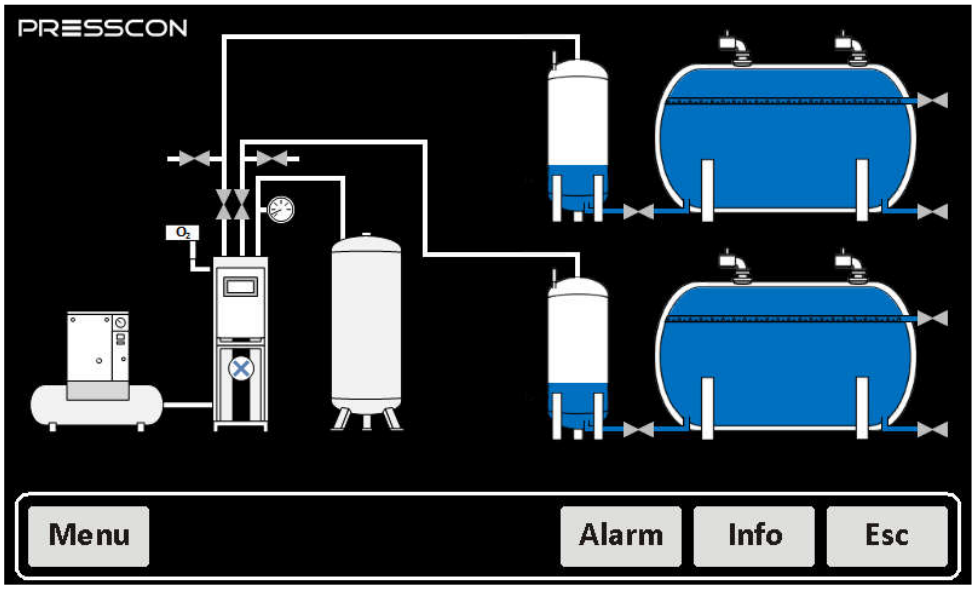



*Figure 8. HORNIT 2.0 – 30.0 N2(i) DUO system overview (Only when the HORNIT is installed)*

### 2.4.2 Press-display

The PRESS-display is the monitoring device for reading the statuses and measured values of the system. The buttons are used to navigate and adjust the settings. Figure 9 below shows a schematic view of the PRESS-display.

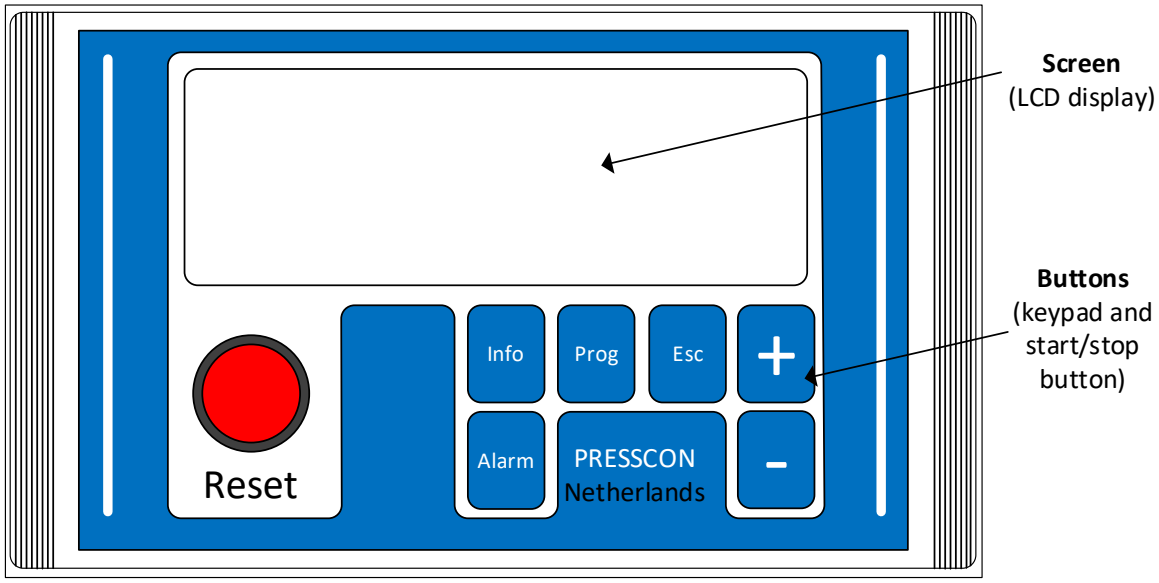



*Figure 9. Schematic view of Press-display*

**Buttons on the PRESS-display**

Each button has a different function, some have more than one. The following table describes which function each button has.

| Button | Description |
|---|---|
| Reset | This button has a light beneath it, when it lights up, this means the following:<br>Light on : An error or alarm has been detected;<br>Light flashes : There is a new error or a new alarm.<br>With this button, you can reset an error or alarm message as soon as the problem that caused the message has been solved. |
| Alarm | • Press the button once to view the current errors and alarm messages.<br>• Press and hold for 3 seconds to view the error and alarm log. |
| Prog | From the main screen:<br>• Press the button once to enter the Service menu. An access code is required.<br>• Press and hold for 3 seconds to view the factory menu. An access code is required.<br><br>Adjusting a setting in one of the menus:<br>• In the user menu: press and hold this button for 3 seconds. The setting will flash and is then adjustable.<br>• In the service menu and factory menu: press this button once briefly. The setting will flash and is then adjustable. |
| Info | • Press this button once briefly to view the service information screen.<br>• Press and hold for 3 seconds to view the factory information screen. |
| Esc | • Press this button once briefly, in one of the menus or information screens, to go back one screen and then return to the main screen.<br>• Press this button once briefly while adjusting a setting. The adjustment will be cancelled. |
| + | • Press this button once briefly in one of the menus to select the next screen.<br>• Press this button when setting a value to increase the value. |
| - | • Press this button once briefly in one of the menus to select the previous screen.<br>• Press this button when setting a value to decrease the value. |

## 2.5 Vacuum- overpressure safety valve and vacuum safety valve

The safety device is attached on top of the buffer tank and ensures that the buffer tank is protected against too high overpressure and too low under pressure.

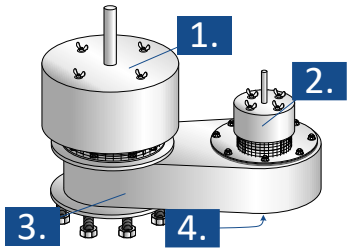



*Figure 10. PV 80/25/20-2, PV 150/25/20-2, PV 200/25/20-2 (VERNIT systems)*

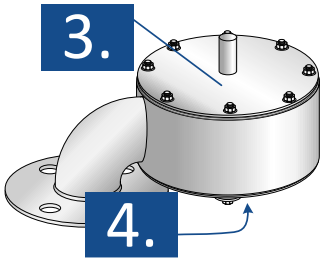



*Figure 11. PV 50-2F, PV 80-2F, PV 100-2F. (HORNIT systems)*

**Legend**

Legend for the safety valves of the types: PV 80/25/20-2, PV 150/25/20-2, PV 200/25/20-2, PV 50-2F, PV 80-2F, PV 100-2F.

| Ref. No. | Description | Function |
|---|---|---|
| 1. | Maximum overpressure valve | A mechanically operating valve plate with calibrated lead or stainless-steel weights that relieves nitrogen at the maximum allowed pressure. It is protected with an additional cover. |
| 2. | Operating overpressure valve | A mechanically operating valve plate with calibrated lead or stainless-steel weights that relieves nitrogen at the maximum operating pressure. It is protected with an additional cover. |
| 3. | Safety valve housing | Assembly housing that holds the vacuum valve and overpressure valves. |
| 4. | Vacuum pressure valve | A mechanically operating valve plate without lead or stainless-steel weights that is lifted when a vacuum occurs. |

## 2.6 Vacuum- overpressure safety valve with tracing band

For cold environments it is possible to install tracing ribbon around the vacuum- overpressure safety valve to prevent it from freezing. Although the safety valve is designed to withstand a certain level of frost, the additional tracing ribbon is an optional feature that is advisable for environments with long periods of frost.

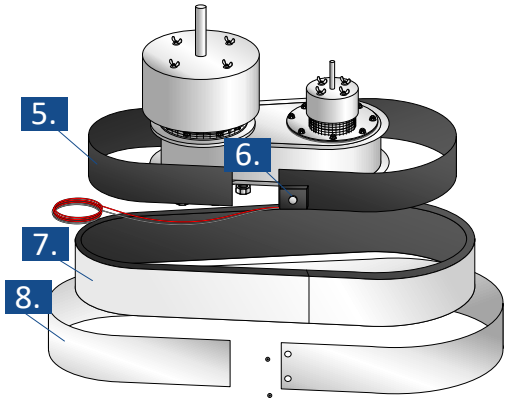



*Figure 12. Vacuum- overpressure safety valve*

| Ref. No. | Description | Function |
|---|---|---|
| 5. | Tracing band | Band that is heated when powered with electricity. |
| 6. | Thermostat | Thermostat that monitors the surrounding temperature at the sensor and activates the tracing ribbon when the temperature becomes too low. |
| 7. | Insulation material | Insulation material that prevents the loss of heat that is generated by the tracing band. By preventing loss of heat to the surrounding, more heat is induced into the safety valve. |
| 8. | Finishing plating | Plating that keeps the tracing band and insulation material in place and protects them against external influence. |

## 2.7 Pressure sensor

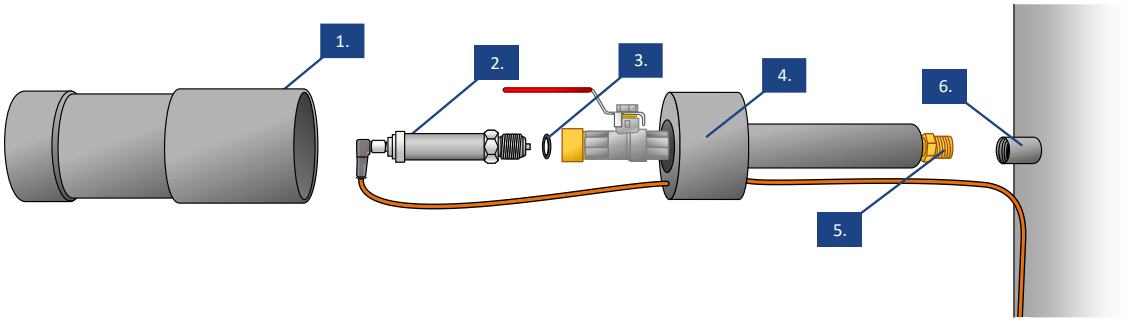



*Figure 13. Sensor 0-600mBar, 0-1000mBar, 0-1500mBar, 0-1600mBar, 0-2500mBar.*

**Legend**

Legend for the pressure sensors of the types: 0-600mBar, 0-1000mBar, 0-1600mBar, 0-2500mBar,

| Ref. No. | Description | Function |
|---|---|---|
| 1. | Protection cap cover | Plastic cover that slides over the pressure sensor. It clamps onto the protection cap sensor holder. |
| 2. | Pressure sensor | Electrical transmitter that translates a pressure measurement into a readable 4…20mA signal over a 2-wire connection. |
| 3. | Rubber ring | Rubber ring that seals leakage from air and water between the pressor sensor and protection cap of the sensor. |
| 4. | Protection cap sensor holder | Plastic isolated holder with tubing that holds the pressure sensor. The sensor holder functions as additional protection against heat and moisture. It also allows the pressure sensor to be easily exchanged. |
| 5. | Threaded end of sensor cap | 1/2” threaded end through which the protection cap is fitted onto the buffer tank. |
| 6. | Welded threaded socket | 1/2” Socket that is welded onto the buffer tank and in which the pressure sensor protection cap is fitted. (Fitted by a third-party company). |

## 2.8 Pressure sensor with tracing ribbon

For cold environments it is possible to install tracing ribbon around the sensor to prevent it from freezing. Although the protection cap of the sensor can protect the sensor against freezing to a certain level, the additional tracing ribbon is an optional feature that is advisable for environments with long periods of frost.

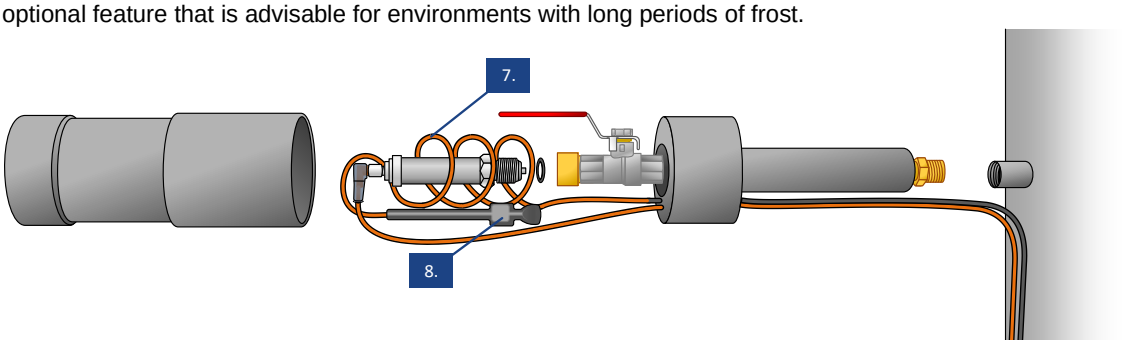



*Figure 14. Sensor with tracing ribbon*

**Legend**

| Ref. No. | Description | Function |
|---|---|---|
| 7. | Tracing ribbon | Ribbon that is heated when powered with electricity. |
| 8. | Thermostat | Thermostat that monitors the surrounding temperature at the sensor and activates the tracing ribbon when the temperature becomes too low. |

# 3 Starting with maintenance

## 3.1 Maintenance schedule

To continue to ensure proper operation, the expansion system should be maintained on a regular basis in accordance with the regulations. Part of the maintenance, the weekly checks, can be carried out by the user or his technical staff. The remaining maintenance must be carried out by a competent installer trained by the manufacturer with a certificate of approval. The expansion system is maintained using the maintenance schedule below. The schedule assumes that a system runs for an average of 2000 operating hours per year.

| Activity | To be done by | Weekly | Each year or every 2.000 hours | Every 2 years or every 4.000 hours |
|---|---|---|---|---|
| **Nitrogen generator** | | | | |
| Visual inspection | Owner/user | X | | |
| Tightening PSA spindles | Service engineer | | X | |
| Clean dirt catcher | Service engineer | | X | |
| Check and replace compressed air filters | Service engineer | | X | |
| Check output flow and purity | Service engineer | | X | |
| Adjusting the generator | Service engineer | | X | |
| Production process and valve operation check | Service engineer | | X | |
| Check high pressure supply vessel | Service engineer | | X | |
| Check for leakage | Service engineer | | X | |
| Cleaning | Service engineer | | X | |
| **Sensors** | | | | |
| Check water level | Service engineer | | X | |
| Check pressure measurement | Service engineer | | X | |
| Check sensor covers | Service engineer | | X | |
| **Vacuum- overpressure safety valve (VERNIT systems)** | | | | |
| Check safety valve(s) | Service engineer | | X | |
| Revision safety valve | Service engineer | | | X |
| **Vacuum safety valve (HORNIT systems) *** | | | | |
| Check safety valve(s) | Service engineer | | X | |
| Revision safety valve | Mechanic/factory | | | X |
| **Compressor**** | | | | |
| Change oil | | | X | |
| Check condensation drain valve | | | X | |
| Replace thermostat | | | | X |
| Replace V-belt | | | | 8.000H |

** The overhaul of the vacuum safety valve for HORNIT systems must be performed at the PRESSCON factory. The used safety valve can be exchanged directly with a reconditioned safety valve. Replacement of the vacuum safety valve on the horizontal buffer tank must be performed by a licensed installer who can safely vent the pressure from the storage tank and the safety valve.*

*** Although the expansion system is generally provided with an assigned compressor, the maintenance instructions are different for each type and brand of machine. The maintenance instructions for the compressor are described in the user manual which is supplied as a separate document together with the compressor.*

## 3.2 Alarms

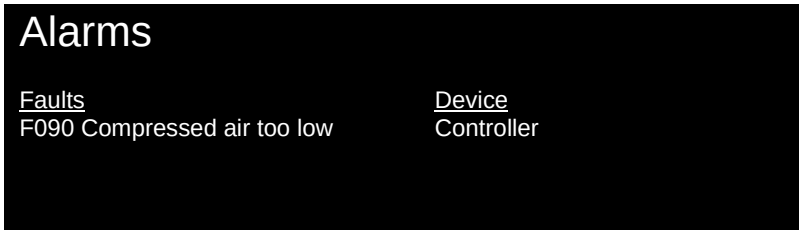
Maintenance begins with the analysis of the alarms. By determine which alarms have occurred and which are active can be decided if extra repairs are necessary besides the standard maintenance.

### 3.2.1 Actual alarms

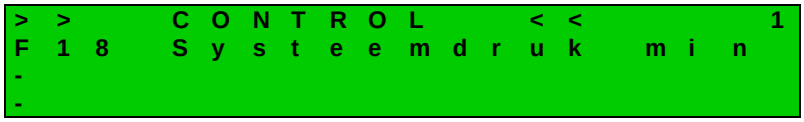
If the system is in alarm, the red button at the display starts flashing. Also, the message ‘Warning’ or ‘alarm notification’ will be displayed at the main screen. To see a description of the actual alarms, the alarm menu can be loaded. (For all possible notifications and their descriptions, see 10.2 Faults and alarm messages).

| |
|---|
| Main screen > 1x short **Alarm** > > Alarm menu |

**Touchscreen**




**Press-display**




When an error is solved, the system can be reset by pressing  Reset .

**If the system is in alarm, the alarm must first be resolved. The system should be fault-free for the start of the maintenance.**

During the maintenance, other notifications can occur. This will primarily be due to the venting of the various components.

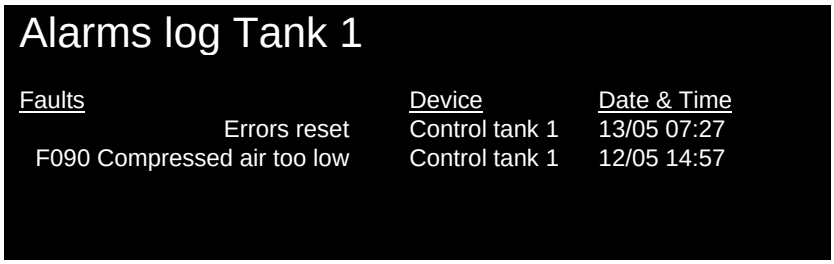
Alarms that can occur include: ‘Minimal pressure’ or ‘Compressor out of compressed air’. Alarms such as these transmit a message to the collective if it is connected. Afterwards, these alarms can be cancelled via the  Reset button. Alarms that can block a boiler or CHP do not occur during the service maintenance.

### 3.2.2 Alarm history

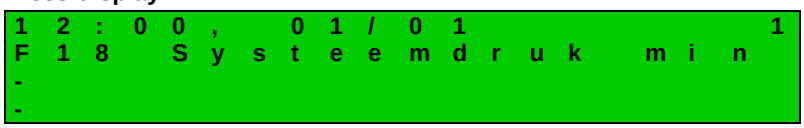
To see all alarms that the system ever had, the alarm log menu can be called up. In this menu the time and date of every notification is shown.

Main screen > 3 sec. **Alarm** > Alarm log menu

**Touchscreen**




**Press-display**




By using the + and − , you can walk through the alarm log. In this way, you can look further into the history of the alarms. See 10.2 Faults and alarm messages for a description of all possible alarm notifications.

**Every notification from the alarm history needs to be evaluated and fixed before the maintenance can be carried out. It is possible that a message from the alarm history is fixed already. In that case, it must be known in the history of the maintenance.**

# 4 Generator

## 4.1 Weekly inspection

This part of the maintenance should preferably be carried out weekly by the user:

- Visual inspection;
- Empty oil- water separator.

### 4.1.1 Visual inspection

To ensure that the expansion system functions as well as possible, it is advisable to check the generator and compressor regularly by means of a brief visual inspection. This will allow any defects to be recognized in time. During this inspection, pay attention to the following points:

1. Is the system free of alarms? When an alarm occurs, a red light on the display will flash. Is there an alarm? Ask PRESSCON for help and instructions if needed.
2. Are there no air leaks? The generator vents the PSA regularly during the nitrogen production but may not have a constant air leakage.
3. Is the water level ok? Check if the water level on the display corresponds with the percentage of heat in the heat storage tank. For this purpose, a sticker is present on the side of the cabinet where instructions are present and the ratio between temperature and water level can be read.

### 4.1.2 Oil- Water separator

The Oil- Water Separators catches the moisture of the nitrogen generator. The nitrogen generator is equipped with an electrically controlled blowdown valve which uses overpressure to blow off excess moisture. The excess moisture will be caught by the oil- water separator. Depending on the type of oil- water separator, maintenance actions may be necessary. Presscon's expansion system generally comes with one of the following three different types of oil- water separator. These types are shown from old to new in Figure 15, Figure 16 and Figure 17. Each type requires a different maintenance action.

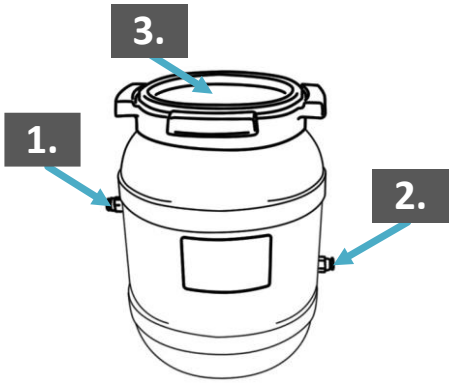



*Figure 15. Oil Water separator*

*Figure 16. Oil Water separator type with filters*

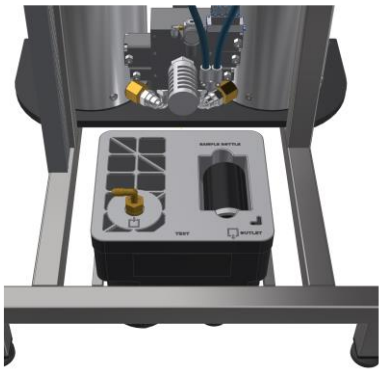


*Figure 17. Oil- water separator with sample bottle*

The type of oil- water separator shown in Figure 15 should be checked regularly to ensure that the oil- water separator is not overfilled, and if necessary it should be emptied. Proceed as follows to drain the oil / water separator:

1. Disconnect the supply hose from the separator (Figure 15 no. 1).
2. Also disconnect the drain hose from the separator (Figure 15 no. 2).
3. Unscrew the red cover (Figure 15 no. 3).
4. If the oil- water separator is as high or higher than the outlet connection, (Figure 15 no. 2) the oil- water separator must be emptied.
5. Drain the dirty oil- water mixture in a responsible manner. Use a jerrycan to take it with you if there is not a suitable drain.
6. Make sure the inlet and outlet ports are not clogged (Figure 15 No. 1 & 2). If necessary, use compressed air to blow it clean. Or use a long thin object to puncture the blockage.
7. Clean the oil- water separator by using a cloth.
8. Tighten the red cover and reconnect the blowdown and drain hoses.

The type of oil- water separator shown in Figure 16 contains 2 filters which must be replaced as soon as they become saturated/contaminated. This must be checked by means of a visual inspection.

1. Loosen the five cover fixing screws (Figure 18).
2. Remove the cover.
3. Check the filters in the oil-water separator.
4. Replace the cover and tighten the five mounting screws.

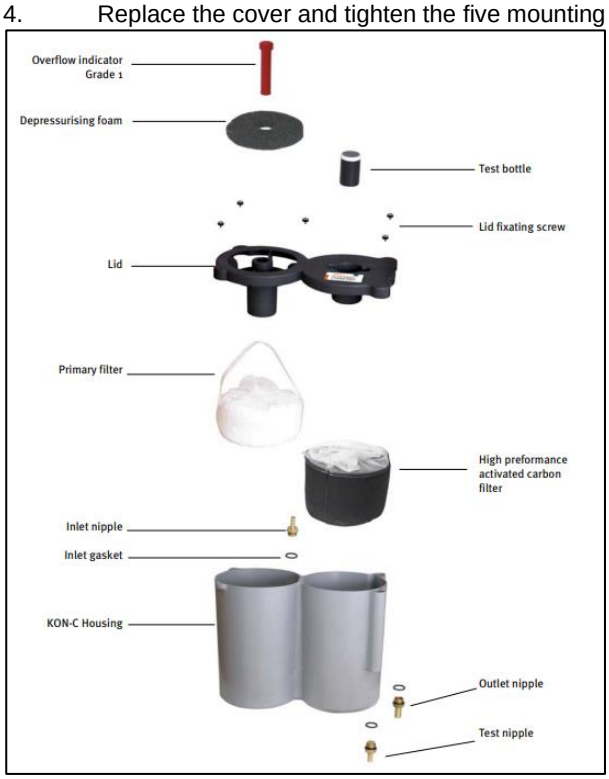



*Figure 18. Oil- water seperator type with filters*

The oil- water separator type shown in Figure 17 should be checked regularly by taking a sample.
Checking the water quality of the oil-water separator:

1. Take out the sample bottle from the top of the oil- water separator.
2. Open the test relief valve at the front of the oil- water separator.
3. Apply the sample bottle to the relief valve and take a water sample:


*Figure 19. Oil- water separator with sample bottle*

- If the water is up to 20 ppm, the quality of the condensate is OK.
- If the water exceeds 20 ppm (milk color), the quality is no longer OK.

4. If the quality is not OK, the oil- water separator should be replaced with a new oil- water separator.

## 4.2 Every year or every 2000 operating hours

This part of the maintenance must be carried out by authorized specialists:

- Depressurize Generator
- Replace compressed air filters
- Tightening spindles
- Cleaning the dirt trap

### 4.2.1 Depressurize Generator

Depressurizing the nitrogen generator is necessary to work safely on the nitrogen generator. The pressure on the components of the generator can be up to 10 bar, which causes an increased safety risk. Before the generator can get depressurized, it first must be put in stand-by mode. This means that the system is not producing nitrogen anymore. By keeping a close eye on the pressure gauges (Figure 20 no. 1 & 2) on the nitrogen generator, it can be checked if the machine is in stand-by mode. When both pressure gauges are showing the same pressure (± 3bar) and not decrease or increase, the nitrogen generator is in stand-by mode.

If the production of nitrogen is still active, the nitrogen generator can be put in stand-by mode manually, for that the next steps must be completed:

1. Set the nominal pressure as low as possible This can be done with the next steps:

**Touchscreen**

Main screen > 1x press [Menu] > 1x open [User] > 1x press [+] key > Tank 1 press [Prog] > 7x press [+] key, nitrogen pressure nominal, press [Prog], adjust value with [+] or [-] keys.

**Press-display**

Main screen **>** 1x [+], User menu at screen **>** 7x [+], line 8; System pressure nominal in screen **>** 3 sec [Prog], nominal value starts flashing, **>** [−] Hold until it no longer continues **>** 1x [Prog] to confirm the setting

*Because the nominal values cannot be set lower than the minimum pressure value, the nominal value will not get any lower than 2 mbar. This is enough.*

2. After adjusting the nominal pressure, it takes around 1 minute before the nitrogen generator finished its cycles and will stop producing nitrogen.
3. In case of a pressure vessel, the valve to this vessel needs to be closed.
4. Both pressure gauges (Figure 20 no. 1 & 2) on the nitrogen generator will drop back to ± 3 bar and will not increase or decrease. The generator is in stand-by mode.

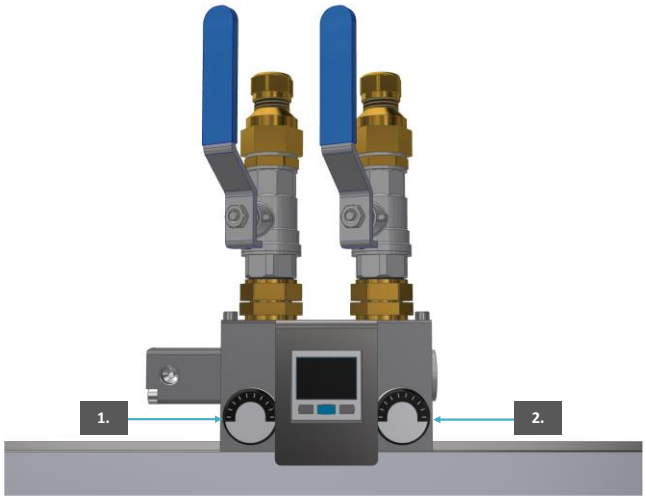



*Figure 20. Pressure gauges on nitrogen generator*

When the nitrogen generator is in stand-by mode, the machine can be vented.

1 Do this by opening 2 of the 3 control valves (valves 1 and 2) manually at the same time, as shown at Figure 21 no. 3. Keep the control valves open until both pressure gauges are dropped to ± 0,5 bar. The pressure can't get any lower.
2 Now close the ball valve on the compressor (Figure 22 no. 1).
3 Make sure that the ball valve at the bottom of the nitrogen generator is closed (Figure 23 no. 5).
4 Remove the cover (Figure 23 no. 4) at the bottom of the generator with a hex key and open the ball valve slowly (Figure 23 no. 5) so that the remaining pressure gets relieved slowly.
5 By loosen the flushing tube (Figure 24 no. 6), the final 0.5 bar can also be vented. The flushing tube is connected with a push-in coupling, this can be loosened by hand. After this, the nitrogen generator is fully vented and repairs or maintenance under pressure-free conditions can be performed.

**Depressurizing the generator could cause a 'compressor compressed air' alarm. This alarm can be corrected by pressing the reset button when the generator is supplied with compressed air.**

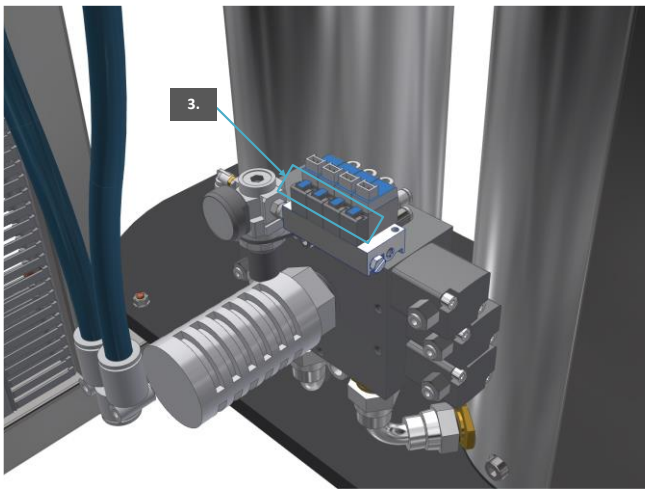



*Figure 21. Valves*

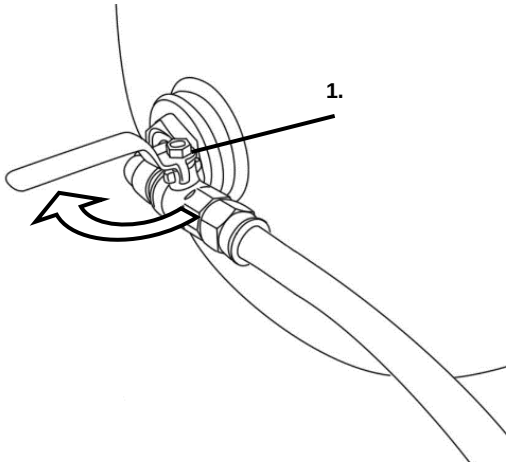



*Figure 22. Compressor ball valve*


*Figure 23. Tap*

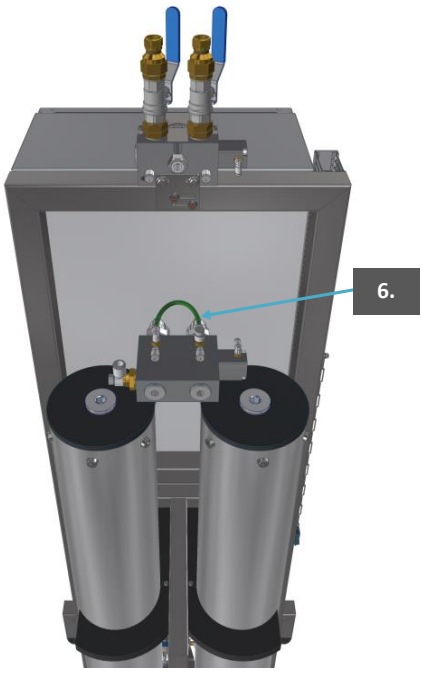



*Figure 24. Flush tubing*

### 4.2.2 Checking compressed air filters

Depending on the year of manufacture and version of the PRESSCON expansion system, compressed air filters of different brands may be installed. The compressed air filter sits between the compressor and the nitrogen generator. They ensure that the compressed air arrives dry and clean at the nitrogen generator.

The service life of a filter element varies from brand to brand, but in most cases, they should be replaced annually to ensure proper operation. The SMC AFF and SMC AMH filters are equipped with a filter element indicator on the filter housing. When these turn red, the filter elements must be replaced.

**If the filter elements have to be replaced, the generator must be depressurized.**
**If this is not the case, follow the instructions in 4.2.1 Depressurize the generator**

Proceed as follows to replace a filter element:

1. Disconnect the drain hose below both filters (Figure 25 no. 1).
2. Unscrew the bottom half of the filters gently (Figure 25 no. 2), if necessary, use a strap wrench.
   If there are filters of the brand SMC mounted, use a hex key to loosen the lower half of the filter housing.
3. Loosen the filter elements by hand.
4. Mount new filter elements and put the filter housing back together (Figure 25 no. 2).
5. Connect the drain hoses again (Figure 25 no. 1).

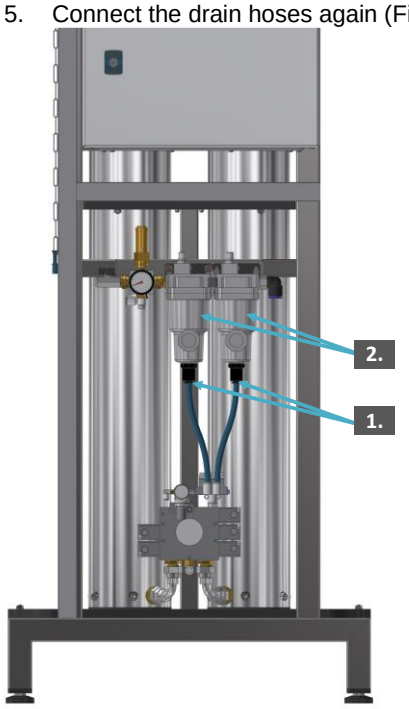



*Figure 25. Filters of the nitrogen generator*

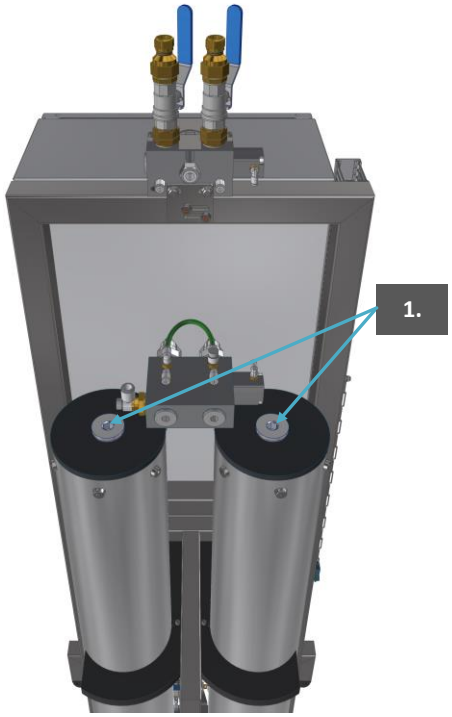



*Figure 26. Spindles*

### 4.2.3 Tightening spindles

**When the spindles are getting tightened, the generator first needs to be depressurized. If this is not the case, follow the instructions in 4.2.1 depressurize generator**

Each HPSA has a spindle. This spindle is a large set screw that makes sure that the coal package in the PSA is firmly held in place. Check the spindle on basis of the follow steps:

1. Remove the blanking plug (Figure 26 no. 1) at the top of the PSA with a 12mm hex key.
2. Use a 17mm hex key to turn the spindle tight. The spindle must be tightened with a torque of 80N/m.

### 4.2.4 Cleaning dirt trap on HORNIT

NOTE: Only in the case of a Hornit type expansion system is there a dirt trap attached to the expansion system. In most cases it is only on the compressor.

Not only the compressor but also the nitrogen generator can be provided with a dirt trap. Whether it is mounted, and where it is mounted varies per system. A dirt trap can, for example after an error on the system be placed, but also during the production. A dirt trap occurs among others on the next places:

- In the blow- off pipe of a HORNIT N2 expansion system.
- In de blow-in pipe of a VERNIT/HORNIT NCT expansion system.

**If the dirt trap must be cleaned, the generator must be depressurized first. If this is not the case yet, follow the instructions in 4.2.1. Depressurize generator**

All dirt traps must be cleaned every year. Do this by following these steps:

1. Open the dirt trap to unscrew it at the bottom side (Figure 27 no. 2).
2. Clean the gauze of the dirt trap well and remove any remaining dirt from the housing of the dirt trap.
3. Mount the gauze and the cap back on when they are completely clean.

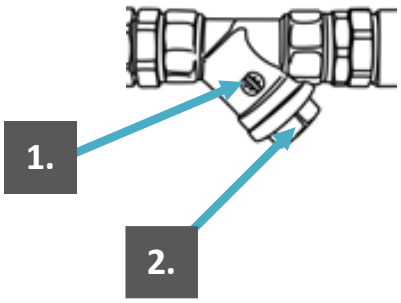



*Figure 27. Dirt trap expansion system*

# 5 Compressor

The compressors that are provided in combination with a PRESSCON expansion system are equipped with some additional components and are used in a special way. Therefore, some extra maintenance instructions arisen that are not listed in the default compressor manuals and therefore they are included in this manual.

In addition to the standard maintenance instructions, PRESSCON advises to observe the following points. The condensate drain valve is covered in this manual because it is a component that is provided by PRESSCON. For replacing the thermostat and the fan belt PRESSCON advises to handle the maintenance intervals below.

| Part | Interval | Instructions |
|---|---|---|
| Check Condensate drain valve | Every year or every 2000 operating hours | Perform according to instructions in this manual. |
| Replacing thermostat | Every 4000 operating hours | Perform according to instructions from the relevant compressor instructions. |
| Replacing V-belt | Every 8000 operating hours | Perform according to instructions from the relevant compressor instructions. |

## 5.1 Checking condensate drain valve

The compressors that are provided in combination with an expansion system, will be equipped with an extra condensate water discharge valve (condensate drain valve). The valve makes sure that the condensate is drained regularly while the nitrogen production is still active. For the electric relief valve, a dirt trap is mounted. The valve and the dirt trap must be in good condition.

The condensate drain valve on the compressor can be connected in two ways:

- To the expansion system;
- On the compressor.

Go through the following points to inspect the condensate drain:

If the condensate drain valve is connected to the compressor on the **<u>expansion system</u>**:

1. Remove the drain hose from the angled push-in connection (Figure 28 no. 1) so that it can be checked if the electric relief valve lets air through (Figure 28 no. 3), the exhaust frequency is 2 seconds open and 120 seconds closed. When the valve is closed, there must be no air leakage through the valve. If there are air leaks, the relief valve is dirty or defective.
2. Connect the red ball valve (Figure 28 no. 2).
3. Vent the dirt trap and electrical valve manually by controlling the electric relief valve. This can be done via the display of the nitrogen generator in the following way:

**Press-display**

From the main screen > Prog press for 3 seconds, factory menu is displayed, and a PIN code must be entered. > 9x + > 1x Prog >2x + > 5x Prog > Factory menu monitored with line ‘1. Sensor menu‘ > 5x +, line ‘6. Output test’ at screen> 1x Prog, ‘test output 1’ at screen> 3x + ‘test output 4’ at screen > Prog press for 2 seconds. The electric valve now vents the dirt trap and the valve. 2x Esc to return to the main screen.

4. Open the electric valve (Figure 28 no. 3) and clean the inside. Inspect the interior and replace if necessary. Then put the exhaust valve back together.
5. Open the dirt trap (Figure 28 no. 3) by unscrewing it at the bottom of the trap. Clean the gause of the dirt trap and remove any remaining dirt from the house of the dirt trap. Then mount the gauze and the cap back together.
6. Check the hose (Figure 28 no. 5) between the ball valve and the compressed air tank. Make sure it is in good condition. If not, the tubing must be replaced. Pay attention! The pressure vessel of the compressor must be emptied for this. This can be done by turning the valve carefully open if the dirt trap is open. For this, the compressor must be shut down. For this see: ‘The compressor manual’.
7. Open the ball valve. Check if the relief valve is not leaking and mount the drain hose back on the push-in fitting (Figure 28 no.1).

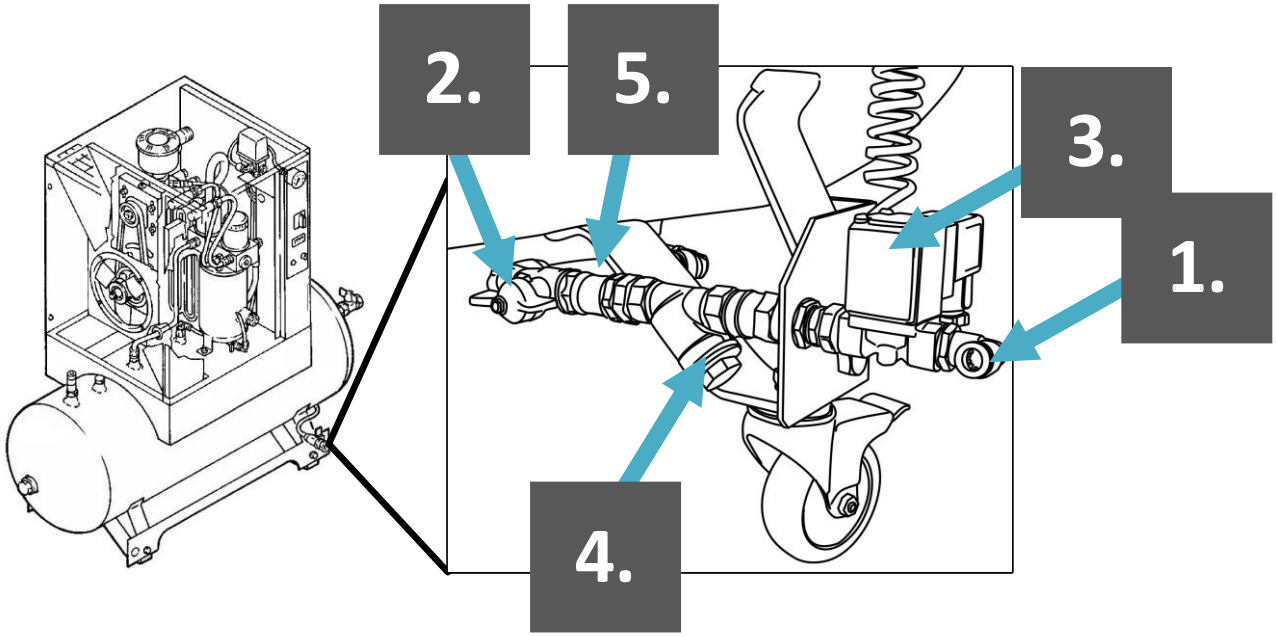



*Figure 28. condensate drain on compressor connected to expansion system.*

**Watch out! For the preservation of the compressor is the combination of the ball valve, strainer, and electrical valve of high importance. It may be that one of these three components has not been mounted yet. In this case, these components should still be mounted**

If the condensate drain on the compressor is connected to the compressor itself:

1. Compressor must be in operation.
2. A light will be on at the timer, press test (Figure 29 No. 1).
3. Check that the condensate drain is blowing off properly.


*Figure 29. condensate drain on compressor connected to compressor*

# 6 Safety valve

## 6.1 Every year or after 2000 operating hours

This part of the maintenance should only be performed by professionals:

- Checking safety valve

### 6.1.1 Checking safety valve

**This manual only describes vacuum overpressure safety valves, used for vertical heat storage tanks. Safety valves on a horizontal heat storage tank must be replaced under the responsibility of the installer and may be revised in the workshop at PRESSCON.**

The vacuum overpressure safety valve is almost always placed at the top of the heat storage tank. Because these tanks have a height of 10 meter or even more, working on a safety valve falls under working at heights. A safety harness or fall protection is therefore mandatory at all times!

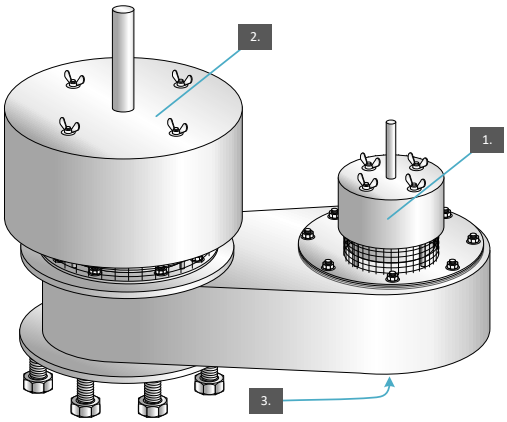




*Figure 30. Vacuum- pressure safety valve*

1. Start with checking the pressure of the N2 blanket. This is shown on the display of the nitrogen generator.
2. Then climb on the buffer tank and check if the safety valve blows off or not. On the nameplate of the safety valve, the working pressure and maximum pressure are indicated. Decide on the basis of this information if the safety valve should blow off or should be closed.

**Example:**

Example: This safety valve has the pressure “25-20-2”. That means:


| | | |
|---|---|---|
| The small valve opens | 20 mbar (Working pressure) | (Figure 30 No. 1) |
| The big valve opens at | 25 mbar (Maximal pressure) | (Figure 30 No. 2) |
| The vacuum valve opens at | -2 mbar (Vacuum) | (Figure 30 No. 3) |

If the pressure is below 20mbar, the safety valve must close
If the pressure is above 20mbar, the small valve must vent
If the pressure is above 25mbar, the big valve also needs to vent.

3. Check if the valve plates of the safety valve do not jam. When the valve plates are lifted manually very short, the plate must close immediately and not get jammed. The safety valve and valve plates can be hot; therefore, you could use a tool to lift the valve plate.
4. Are the silicone rings of the valve plates OK? Disassemble the safety valve as in 6.2.1 Replacing valve plates and inspect if the silicone rings have no imperfections and if they still are flexible.

## 6.2 Every 2 years

This part of the maintenance should only be performed by professionals.

- Replacing valve plates

### 6.2.1 Replacing valve plates

The valve plates of a safety valve need to be replaced if:

1. One of the plates no longer seals properly. The plates are always replaced per set. This should be done in consultation with the owner.
2. If the Safety valve is part of the maintenance contract, the plates must be replaced every 2 years as a preventive measure.
3. Reduce lead or stainless steel.

Follow these steps to replace the valve plates:

1. Disassemble both covers (Figure 31 no. 1) of the safety valve by loosening the wing nuts on top
2. Depressurize the buffer tank by tilting one of the overpressure plates (Figure 31 no. 2). Then the nitrogen can escape out of the buffer tank. **Beware of the steam development that forms! The pressure of the N2 blanket becomes 0mbar now. This creates a 'minimum pressure' alarm.**
3. Remove both valve plates (Figure 31 no. 2) when all the steam is vented.
4. Disassemble the cover plate which is mounted on the housing of the safety valve (Figure 31 no. 3). This can jam a little because of the old gasket. The cover plate needs to be loosened manually! Otherwise, there is a big change that the cover plate gets damaged and can't be used anymore.
5. Remove the old silicone gasket (Figure 31 no. 4) and renew the vacuum plate (Figure 31 no. 5)
6. Place a new silicone gasket (Figure 31 no. 4) on the housing of the safety valve and mount the cover plate back on (Figure 31 no. 3). Tighten the nuts evenly.
7. Place new overpressure plates (Figure 31 no. 2) and place the lead or stainless steel of the old pallets on the new pallets.
8. Mount the cover of the safety valve (Figure 31 no. 1) back on and secure it with the wing nuts.

**Pay attention to steam development. Some safety guards have a cover of insulating material. Please note that the hot steam comes up more during venting.**

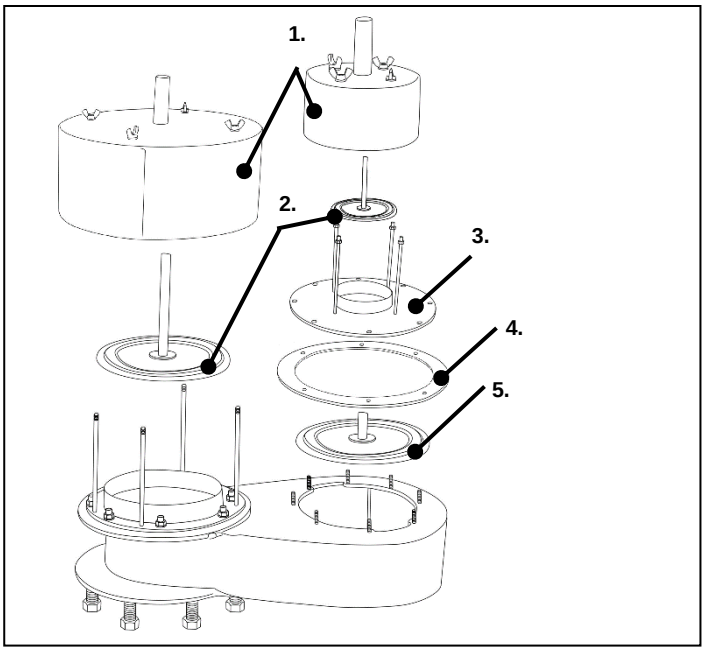



*Figure 31. Vacuum- pressure safety valve*

# 7 Sensors

## 7.1 Every year of after every 2000 operating hours

This part of the maintenance should only be performed by professionals:

- Checking water level
- Checking pressure measurement.
- Checking sensor housing.

### 7.1.1 Checking pressure measurement

The pressure measurement is done by the sensor on top of the buffer tank. This sensor measures the pressure of the nitrogen blanket and displays the measurement on the display of nitrogen generator.

Checking if this works well can be done by venting the buffer tank, and check if the pressure of the nitrogen blanket drops to 0 mbar.

1. Follow the instructions of step 1 and 2 from chapter 6.2.1 Replacing valve plates to open the safety valve on the buffer tank. The pressure inside the tank will drop to 0 mbar.
2. Check the values of the N2 blanket on the display. The main screen can always be called by pressing one, or multiple times, the Esc button on the display. The pressure of the nitrogen blanket must drop to 0 mbar on the display. The display value may deviate maximal 5 mbar.
3. If the values deviate too much, the measurement is defect and need to be repaired

### 7.1.2 Checking water level


In order to check the water level, the water level in the buffer tank needs to be the same as the water level shown by the display. The difference between both may be 5 cm maximal. In order to measure the water level manually, the safety valve needs to be open. The pressure of the nitrogen blanket will drop to 0mbar, which causes a temporary alarm. Follow the instruction of step 1 and 2 from chapter 6.2.1 Replacing valve plates to open the safety valve.

Measure the water level in the buffer tank by following these steps:

1. Measure the distance from the edge of the flange until the water. Use a tape-measure or a floating device to measure the distance (C).
2. Measure the height between the edge of the flange and the edge of the roof (B).
   Keep in mind that there is 20 cm of isolation is placed over the edge of the room, that means that: **The distance between the edge of the tank and the ground = height of the tank (A) + 0,20 m isolation.**
3. Calculate the water level the aid of the next formula. If necessary, use the fill in-exercise below:

| **Height of the tank(A) + 0,20 + Distance flange to roof edge (B) – Distance flange to water(C) = Water level.** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| If desired, fill in the following blank exercise. Based on this, the measured results can be found easily. | | | | | | | | |
| _____meter | + | 0,20 meter | + | _____meter | – | _____meter | = | _____meter |
| *Height of tank (A)* | | *insulation* | | *flange to roof (B)* | | *Flange to water (C)* | | *Water level* |

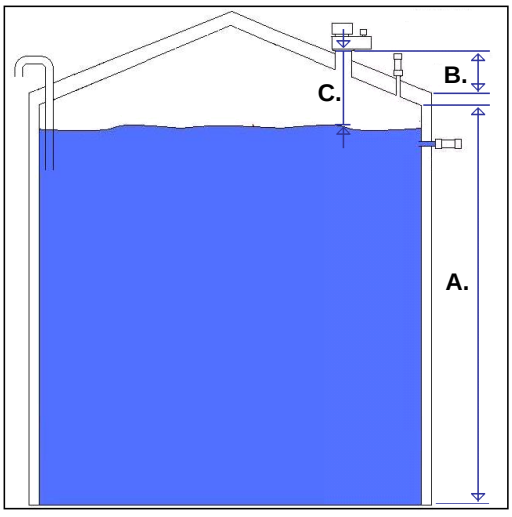



*Figure 32. Measuring the water level*

### 7.1.3 Checking sensor housing

The sensor housings on the heat storage tank should be visually inspected. The points to be met by the sensor housings are:

1. Is the sensor placed in a suitable sensor housing? A correct sensor housing consists of a base, insulation foam and a cover, just as shown as in Figure 33.
2. Is the sensor hosing cover (Figure 33 no. 1) correctly mounted? In the cap of the sensor housing are two little holes, these holes provide the drainage of moisture. The holes in the cap of sensor at the side of tank, need to be pointed downwards (Figure 34).
3. Remove the cover of the sensor housing. Check if the sensor housing is dry on the inside. There should be at most a few drops of moisture on the inside of the cap.
4. Is the sensor cable still good? Look at the colour and flexibility of the cable.
5. Slide the cover back onto the base of the sensor housing (Figure 33 no. 4) and make sure that the insulation foam won't block the condensation holes in the cap. Make these holes accessible if necessary and place new insolation foam in the cap if the foam is lost or damaged.

When a sensor housing does not meet the criteria, it must be repaired. Sensor housing repairs are not covered by the maintenance contract but will be seen as error/repair work. Contact PRESSCON if assistance or instructions are needed.

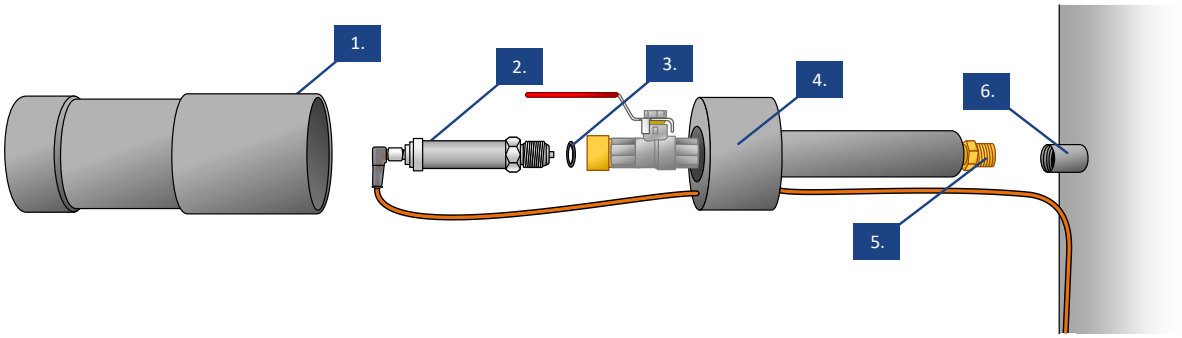



*Figure 33. Sensor housing*

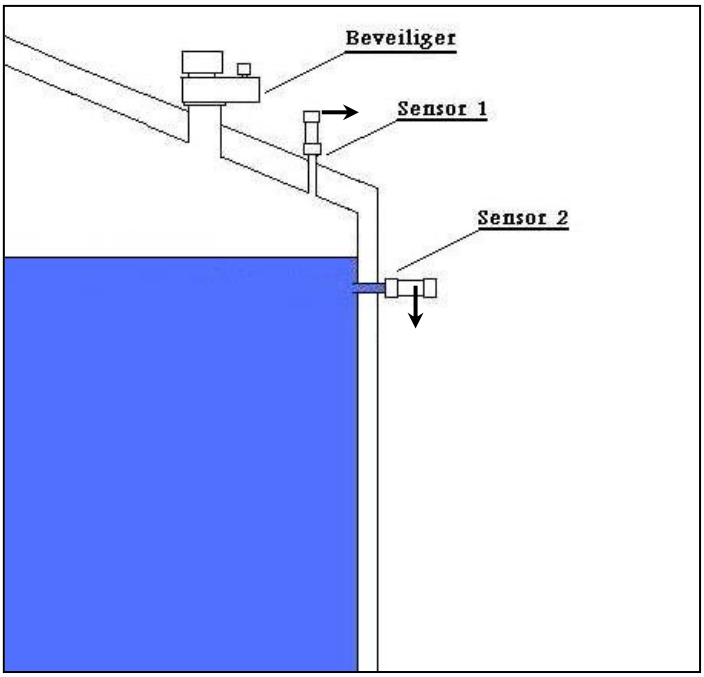



*Figure 34. Mounting of the sensors*

# 8 Testing

## 8.1 Every year or after 2000 operating hours

This part of the maintenance must be carried out by authorized specialists.

- Starting nitrogen production;
- Checking production process and operation of the valves;
- Measuring flow and purity;
- Adjusting generator;
- Checking high pressure storage tank;
- Checking for leaks;
- Cleaning.

### 8.1.1 Starting nitrogen production

For performing maintenance, sometimes it is necessary that the generator is active. If the generator is active, it produces nitrogen. This is needed to, for example, measuring the output of the nitrogen generator, or to adjust them if necessary.

The points where applicable:

- Check production process and operation of the valves;
- Measuring flow and purity;
- Checking high pressure storage tank;
- Checking for leaks.

There are multiple ways to activate the nitrogen production, depending on the type of system or situation where the system is located, one of the follow ways can be chosen:

- Increasing nominal pressure (temporarily),
- Loose HP-vessel pipe

**Always undo the adjustments made on the generator when the maintenance on the nitrogen generator is finished.**

**Increase nominal pressure:**
The generator can be activated manually by temporarily increasing the value of the nominal pressure.

**The value of the nominal pressure is de number of mBar that the generator wants to have in the buffer tank, and where the generator will work to if the pressure is too low.**

By increasing the nominal value, the generator will try to increase the pressure of the nitrogen blanket to the new set nominal values. Nitrogen demand is then created. If there is a pressure vessel present, the tap to the storage vessel must first be closed.

**Adjusting the nominal value:**
**Touchscreen**

Main screen **>** press 1x Menu > press 1x User > press 1x + key > Tank 1 press Prog > press 7x + key, Press Nitrogen pressure nominal Prog, change values with + or - keys.

**Press-display**

Main screen > 1x +, User menu > 7x +, line 8; System pressure nominal > 3 sec Prog, nominal value is flashing, > + or − the change values, > 1x Prog to confirm settings.

Make sure that the nominal pressure is set more than 5 mBar higher than the pressure of the N2 blanket in the buffer tank. The pressure of the N2 blanket can be read on the display. Keep in mind that the generator has a delay of 1 minute before the production starts.

Example:

```
Presscon Vernit 3.6a

N2 deken        17 mbar
Waterniv.      970 cm
```

(The main screen can be displayed by pressing the Esc button several times.)
Given:
Actual pressure N2 blanket = 17 mbar nominal pressure = 15 mbar Start differential = 5 mbar

Nominal values to set from 15 mbar to 23 mbar or higher (17mbar + 5mbar = 22mbar)

**The generator only may be started manually for testing the generator.**
**Always undo the adjustments when the test is completed.**

**Loosen HP-vessel pipe:**
It is also possible to start the generator by disconnecting the pressure line between the nitrogen generator and the HP-vessel. But first, close the taps (Figure 35, Figure 36 no. 1) on the HP-vessel and the tap of the generator to the buffer tank. By doing this, the HP-vessel and buffer tank cannot run empty. Take off the compression fitting as shown in Figure 35, Figure 36 no. 2.

**Starting the generator manually should only be done when testing the generator.**
**Always undo the adjustments when the test is complete.**

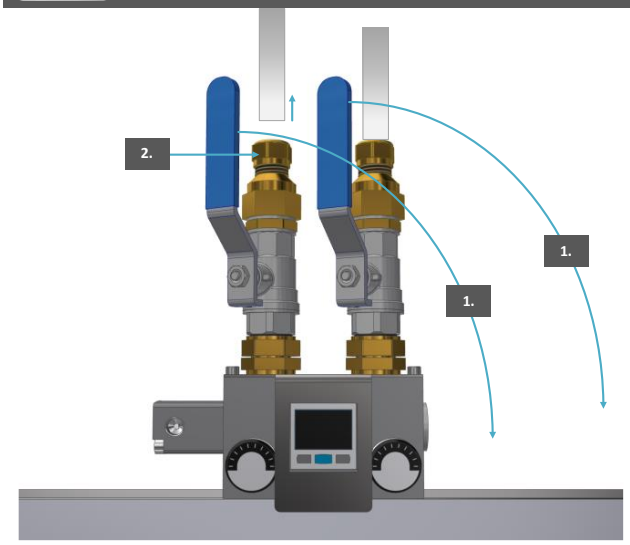


*Figure 35. Loosen HP-vessel pipe*

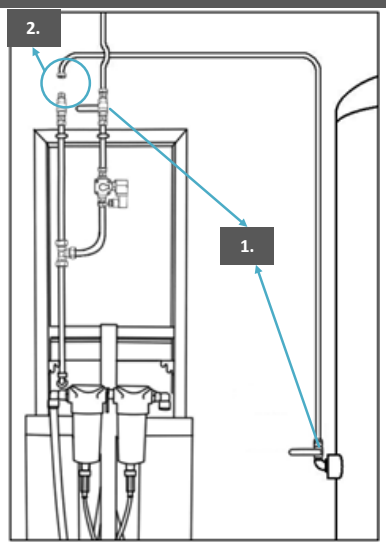


*Figure 36. Loosen HP-vessel pipe, old type of system*

### 8.1.2 Check production process and operation of the valves

In order to make sure that the generator can produce nitrogen, it is provided with several valves and pressure gauges. With these valves, the production of nitrogen is controlled and on the pressure gauges can be seen how this process is going and whether it is in order.

If the production process is going well, it can be concluded that the controlling and operation of the valve is in good condition. The most important thing is that the valves must have no pressure leakage.

**The nitrogen production must be active to check the valves and the process. If this is not the case, it can be start manually. For this, follow the instruction from chapter 8.1.1 Starting nitrogen production.**

Check the production process based on the following steps:

1. Check the pressure to the valve set (Figure 38 no. 5), this may not be lower than 5 bar. 6 till 8 bar is required for an optimal operation. When the pressure is lower than 5 bar, the pneumatic valves will not function probably.
2. The production process starts with building pressure in one of the two PSA's. Which of the two begins is not important. One of the pressure gauges will rise, by this you can see which of the two PSA's comes at pressure first (Figure 37 no. 1 and 2).
3. The pressure increases up to 6 bar, this pressure must be kept until the production time is elapsed, the production time is just over half a minute, during this time the other PSA needs to be depressurized.
4. If the production time has elapsed, the pressure will be levelled. The pressure in both PSA's will be levelled for 2 seconds, and now the pressure needs to be held.
5. The production switches. The PSA that came on pressure in step 1 is being vented, and pressure is built in the second PSA. The second PSA was depressurized during step 1.
6. When the production time has elapsed again, the pressure must be equalized again. Then again, a production switch takes place. This is the end of the cycle, and it now starts again from the beginning and begins again with step 1.

Pay attention to the next points when inspecting the production.

1. When the pressure is building up in the PSA, then only one PSA is pressurized at the same time. When both PSA's pressurize at the same time, something in the valves is defect.
2. If a PSA gets depressurized, it needs to be exactly 0 bar, and not, for example stick on 0,5 bar. When this happens, there is a clog in the blow-off circuit.
3. During the levelling process, the pressure in both cylinders must be precisely the same.
4. During production, the pressure in the cylinders must not increase too rapidly. The maximum pressure of 6 bar generally will be reached in the last 10 seconds of the production time.

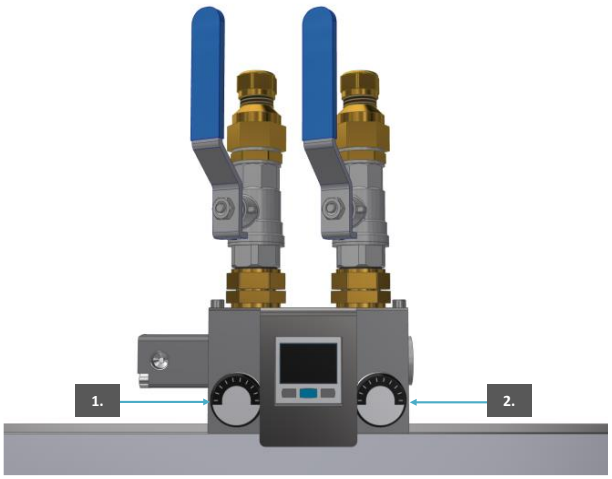



*Figure 37. Pressure gauges*

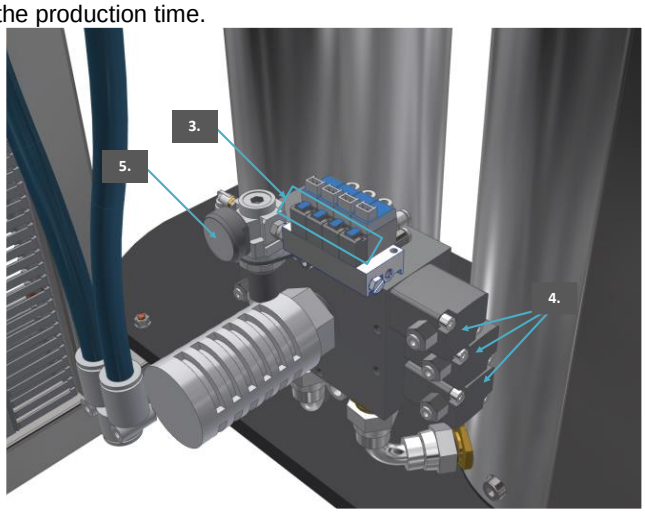



*Figure 38. Valves*

### 8.1.3 Measuring flow and purity

**The nitrogen production must be active to measure the flow and purity. If this is not the case, it can be started manually. For this, follow the instructions from chapter 8.1.1 Starting nitrogen production.**

Of the nitrogen produced by the generator, it is important to know how pure the mixture is and its flow (L/min). Proceed as follows to measure the nitrogen:

New type of unit:

1. Shut off the buffer tank from the generator by closing the ball valve (Figure 39 No. 1) in the nitrogen line. If a high-pressure storage vessel is present, also close the ball valves on the HP vessel and the generator.
2. Depressurize and inactivate the generator according to the instructions in 4.2.1 Depressurize Generator.
3. Disassemble the blind plug on the side of the upper manifold (Figure 39 No. 2)
4. Now install the flow meter according to Figure 40 no. 3.
5. After the flowmeter, mount an oxygen meter (Figure 40 no. 4). Make sure that the air can escape freely so that a good flow measurement is maintained.
   - Depending on the type of oxygen meter, it should be calibrated first.
6. Run the system to produce nitrogen according to 8.1.1 Starting nitrogen production and measure the flow and purity.
7. Depressurize and inactivate the generator according to the instructions in 4.2.1 Depressurize Generator.
8. Disassemble the flow meter and oxygen meter and reassemble the blind plug.

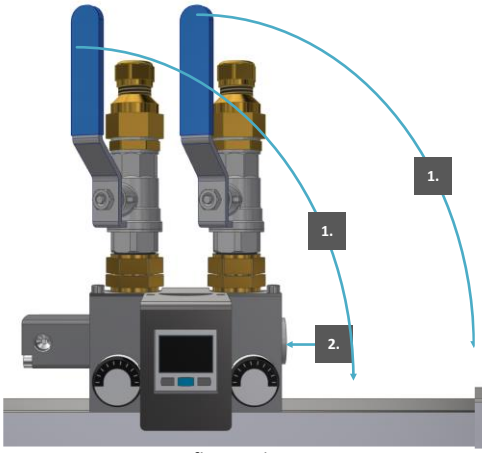



*Figure 39. Measuring flow and purity*

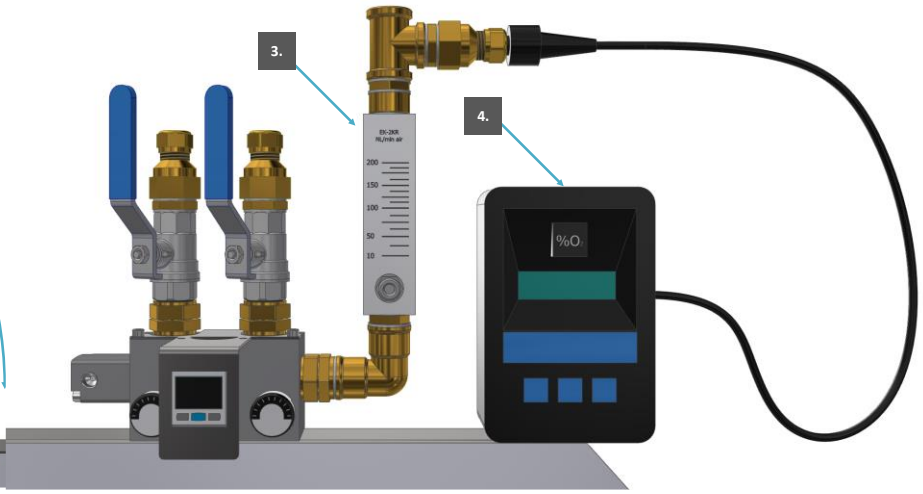



*Figure 40. Measuring flow and purity*

Older type of unit:

1. Close the buffer tank from the generator by closing the ball valve (Figure 41 no. 1) in the nitrogen line. If there is a pressure vessel, also close the ball valve on the HP-vessel and the generator (Figure 42 no. 1).
2. Remove the nitrogen tube (Figure 41 no. 2) before the ball valve so that the nitrogen cannot leak from the buffer tank. When a high-pressure vessel is present, de tube to the HP vessel (Figure 42 no. 2) needs to be disconnected instead of the nitrogen tube.
3. Mount a flow meter (Figure 41 no. 3) (Figure 42 no. 3)
4. After mounting the flow meter, mount an oxygen meter, make sure that the air can be blowed off so you will maintain a good flow measuring. (Figure 41 no. 4) (Figure 42 no. 4)
5. Let the system produce nitrogen according to 8.1.1 Starting nitrogen production and measure the flow and purity.
6. Depressurize and inactivate the generator according to the instructions in 4.2.1 Depressurize Generator.
7. Mount the nitrogen line back and open the ball valve again when the output is good.

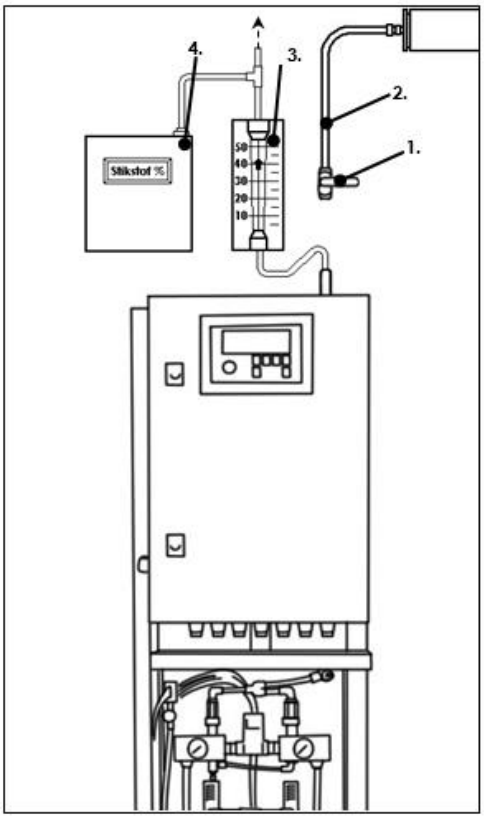



*Figure 41. Output measurement setup with HP vessel*

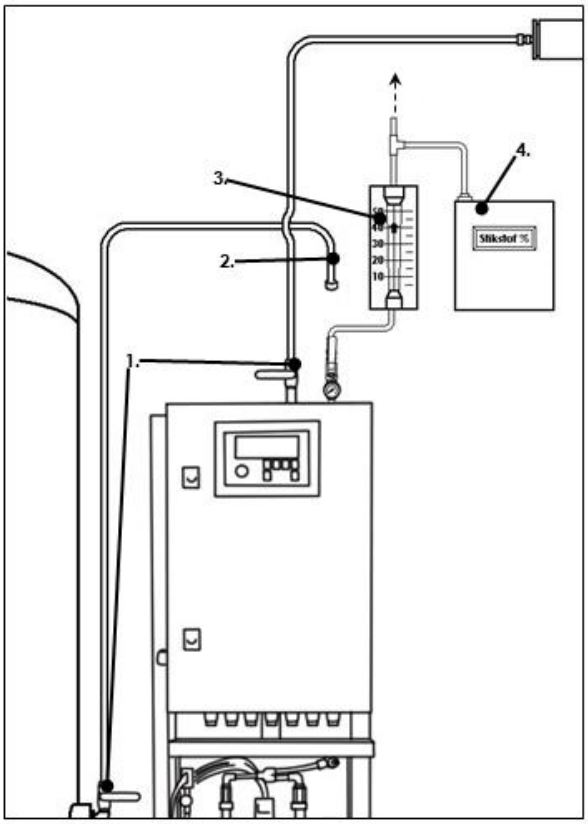



*Figure 42. Output measurement setup with HP vessel*

The nitrogen is good when:

1. The flow is high enough.
   (If necessary, use the rule of thumb: PSA format x 18 = needed flow L/min)
   (for example: PSA 2.0 x 18 = 36 L/min)
2. The percentage of nitrogen is higher than 97%.

The nitrogen percentage must be above 97% to approve the PSA. At a percentage below 97%, rust begins to form and thus the output is not good. An attempt can be made to recalibrate the generator to get the purity back above 97%. To do this, follow the instructions in chapter 8.1.2.

If this does not help, the PSA should be disapproved. If so, please contact Presscon.

### 8.1.4 Checking high pressure storage tank

**The high-pressure storage tank must be pressurized. If this is not the case, the nitrogen production can be started manually to replenish the stock in the storage vessel. For this, follow the instructions from chapter 8.1.1 Starting nitrogen production.**

The high-pressure storage vessel (Figure 43 no. 1) is used to create a nitrogen buffer that can be blown directly when needed. The vessel must meet the following criteria:

1. Is the vessel leak free? Check the vessel for leaks by spraying all joints and glue connections with soap water. The soap will start foaming if there is a leakage.
2. There should be no condense water in the vessel. Drain the condense water by opening the ball valve at the bottom. (Figure 43 no. 2) If wanted, connect a hose to the ball valve to drain the water.

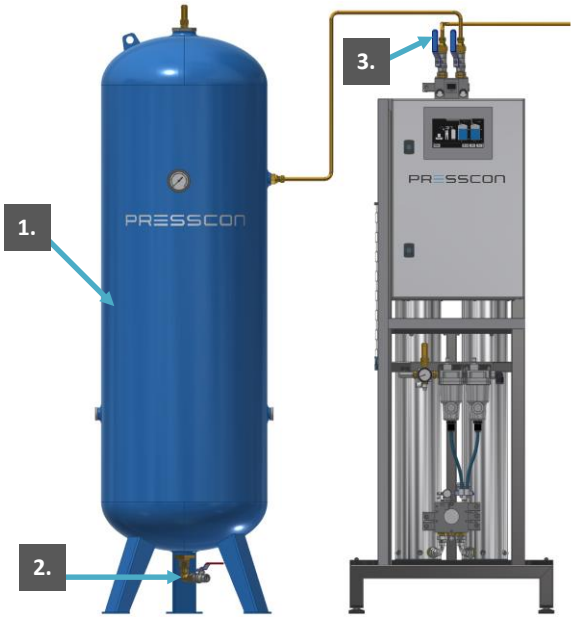



*Figure 43. Setup with high pressure storage vessel*

**If the pressure for the system is reduced to 6 Bar, the end pressure on the nitrogen storage tank may not be set higher than 5. Bar.**

### 8.1.5 Checking for leaks

**The nitrogen production needs to be active in order to check the generator for leaks. If this is not the case, the nitrogen production can be started manually. For this, follow the instructions from Chapter 8.1.1 Starting nitrogen production.**

To let the PRESSCON nitrogen generator function optimally, there should be no pressure leaks. Do the following to check the generator for this.

1. Spray each coupling and hose connections with soapy water. Make sure that the electrical parts are not getting wet.
2. Check if the soapy water starts to foam. This indicates a leak of a connection.
3. Repair the leaking connection with the right material and seals.

### 8.1.6 Cleaning

Clean the generator and compressor so that the system is left presentable.

1. Use a compressed air spray to blow away loose dust.
2. Blow the radiator of the compressor and the air dryer clean.
3. Clean the whole system with water/soap.
4. If necessary for suborn dirt, use LOCTITE 7063 cleaner or LOCTITE 7840 cleaning. **Watch out! LOCTITE 7063 and LOCTITE 7840 cleaner have an irritating trait and may be harmful.**
5. Clean the floor around the unit, and sprinkle absorption sand / gravel on the spilled oil.

# 9 Final Check

In order to ensure that the system gets left behind working and correct, the next proceedings must be carried out:

1. Is all data correct?
   Check the alarm values in the display and on the sticker on the back of the display in the switch panel. These should match.
2. Reset the alarms. Press the reset button on the display to reset the alarms. The light of the reset button needs to go out and the notification ‘WARNING’ or ‘ALARM NOTIFICATION’ need to disappear from the main screen. If it does not, examine where the alarm is coming from and correct this. PRESSCON is always available if assistance or instructions are needed.
3. Is everything clean? If necessary, clean the system additionally.
4. Are all valves in the correct position like they were before the maintenance?
5. Fill out the maintenance log for the compressor. This can often be found on the compressor itself.
6. Place service stickers on the control panel and fill these in. Also note name or initials. Place an additional sticker on the filters or compressor if necessary if it will enhance service friendliness.

# 10 Alarms and error processing

## 10.1 Faults and alarms

The Touchscreen software, PRESS display and PRESS control can generate error and alarm messages when something is wrong with the system. The difference between an error and an alarm is the severity of the problem. An error message is considered less serious than an alarm message. An alarm message is mainly about critical problems in the expansion system. For example, a sensor failure or if the water level has exceeded the maximum or minimum height. An error message is mainly about less critical errors in the system, or a premature warning of an alarm.

If an error message or an alarm message appears, PRESS-control always activates its collective alarm relay. This relay is potential-free. The collect alarm relay is used to send a warning signal to any kind of device that alerts the user. For example, the collect alarm signal can be sent to a computer or SCADA system to indicate that the expansion system has a problem. The collect alarm relay responds to all faults and alarms.

When an alarm message appears, PRESS control will also activate the boiler alarm relay. This relay is potential free. The boiler alarm relay can be used to connect blocking signals to devices that must stop in case of a critical problem in the expansion system. For example, if the water level in the heat storage tank is higher than the "reduce water level" and "water level maximum" settings, the water presses against the roof of the tank and thus should not expand further. With the boiler alarm relay a signal can then be sent to the boiler to stop the heating of the water. This prevents further expansion.

The errors and alarms can also be considered as two alarm levels. The following illustration clarifies this.

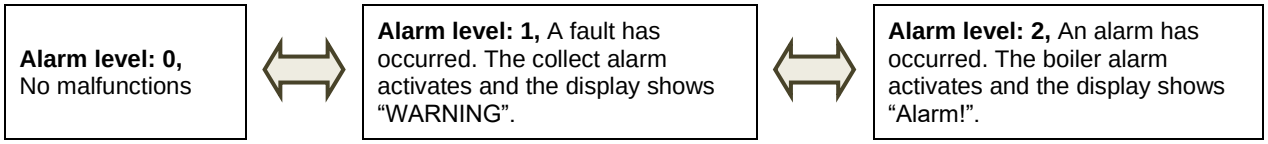



*Figure 44. Alarm levels*

The description of the alarm levels as shown above is based on the operation of the PRESS-display. The Touchscreen handles the alarms in the same way as the PRESS-display but shows it to the user in a different way. Should an error or alarm message occur, the component to which the message refers will turn red. By pressing the red component, the Touchscreen displays the error and alarm information with an error code.

## 10.2 Faults and alarm messages

The following tables show the most important error and alarm messages that may appear on the Touchscreen and PRESS-display. A description is given for each message. The table also indicates for each message whether it is an error and/or an alarm.

### 10.2.1 Fault and alarm messages for the PressControl (JGA2027) (Premium (plus) and Premium plus DUO)

| Error | Display | Fault | Description | Action |
|---|---|---|---|---|
| 1 | EEPROM R/W | Warning | EEPROM fault | Contact the supplier |
| 2 | EEPROM protect | Warning | | |
| 3 | First time booted | Warning | Print was started up for the first time. Shouldn't happen in practice | |
| 4 | Config base | Warning | Control value of configuration not correct | |
| 5 | Config settings | Warning | Settings regarding the configuration are not correct | |
| 6 | Config checksum | Warning | Control value on content of configuration is not correct | |
| 7 | Transmission path error input 1 | Warning | Error detected at input. Measured voltage is not correct | Check input |
| 8 | Transmission path error input 2 | Warning | | |
| 9 | Transmission path error input 3 | Warning | | |
| 10 | Transmission path error input 4 | Warning | | |
| 11 | Transmission path error input 5 | Warning | | |
| 12 | Transmission path error input 6 | Warning | | |
| 13 | Transmission path error input 7 | Warning | | |
| 14 | Transmission path error input 8 | Warning | | |
| 15 | Transmit path error output 1 | Alarm | Error detected at output. Measured current is not correct. | Check output |
| 16 | Transmit path error output 2 | Alarm | | |
| 17 | Transmit path error output 3 | Alarm | | |
| 18 | Transmit path error output 4 | Alarm | | |
| 19 | Transmit path error output 5 | Alarm | | |
| 20 | Transmit path error output 6 | Alarm | | |
| 21 | Transmit path error output 7 | Alarm | | |
| 22 | Transmit path error output 8 | Alarm | | |
| 23 | Transmit path error output 9 | Alarm | | |
| 24 | Transmit path error output 10 | Alarm | | |
| 25 | Transmit path error output 11 | Alarm | | |
| 26 | Transmit path error output 12 | Alarm | | |
| 27 | Sensor 1 | Alarm | Error detected at analogue input. Measured current is not correct. Must be greater than 3 mA and less than 21 mA | Check analogue input |
| 28 | Sensor 2 | Alarm | | |
| 29 | Sensor 3 | Alarm | | |
| 30 | Sensor 4 | Alarm | | |
| 31 | Sensor 5 | Alarm | | |
| 32 | Sensor 6 | Alarm | | |
| 33 | Sensor 7 | Alarm | | |
| 34 | Sensor 8 | Alarm | | |
| 35 | Sensor 9 | Alarm | Error detected at digital sensor | Check connection to digital sensor |
| 36 | Sensor 10 | Alarm | | |
| 37 | Sensor 11 | Alarm | | |
| 38 | Sensor 12 | Alarm | | |
| 39 | Sensor 13 | Alarm | | |

| Error | Display | Fault | Description | Action |
|---|---|---|---|---|
| 40 | Sensor 14 | Alarm | | |
| 41 | Sensor 15 | Alarm | | |
| 42 | Sensor 16 | Alarm | | |
| 43 | System pressure sensor | Alarm | Sensor for system pressure regulation is incorrect | Check sensor for connection |
| 44 | System pressure minimum | Alarm | System pressure is too low for too long | Check pressure and nitrogen supply |
| 45 | System pressure maximum | Alarm | System pressure is too high for too long | Check pressure and nitrogen supply |
| 46 | System pressure N2 not present | Warning | No nitrogen present within the set time | Check nitrogen supply and production |
| 47 | System pressure N2 in timeout | Warning | Blowing in of nitrogen has taken too taken too long | Check nitrogen supply and for leaks |
| 48 | System pressure N2 out of timeout | Warning | Blowing off nitrogen has taken too long | Check nitrogen discharge |
| 49 | Water level sensor | Alarm | Sensor for water level control is incorrect | Check water level sensor(s) |
| 50 | Increase water level | Warning | The water level is too low, the water should be refilled | Check water supply. Add water in tank |
| 51 | Lower water level | Warning | The water level is too high, the water must be drained | Check water discharge. Drain water from tank. |
| 52 | Water level minimum | Alarm | The water level is too low for too long | Check water level |
| 53 | Water level maximum | Alarm | The water level is too high for too long | Check water level |
| 54 | Water level in time-out | Warning | Adding water took too long | Check water level. Check water supply. |
| 55 | Water Level out of Timeout | Warning | Discharging water has taken too long | Check water level. Check discharge of water |
| 56 | Heat content sensor | Alarm | Sensor for heat content is not correct | Check sensor or connection |
| 57 | Heat content warning | Warning | The difference between desired heat content and water level is too large. | Check water level and heat content |
| 58 | Heat content alarm | Alarm | | |
| 59 | Buffer pressure sensor A | Alarm | Sensor A for the buffer pressure is incorrect | Check sensor or connection |
| 60 | Buffer pressure minimum | Alarm | Buffer pressure has been too low for too long | Check buffer pressure |
| 61 | Buffer pressure maximum | Alarm | Buffer pressure is too high for too long | Check buffer pressure |
| 62 | Level adjustment internal | Alarm | Error in water level of this tank | Check water level |
| 63 | Level adjustment external | Alarm | Error in water level of external tank | Check water level external. Check connection to external tank. |
| 64 | Boiler protection active | Warning | The boiler protection is activated | Check reason for protection |
| 65 | Boiler protection deactivated | Warning | The boiler protection is switched off | |
| 66 | N2 client server connection | Warning | The connection with the N2 server has been lost | Check connection |
| 67 | Compressor fault | Alarm | Compressor fault input activated | Check fault input(s) |
| 68 | Compressor inactive | Alarm | Compressor on signal not seen within the set time | Check compressor. Check compressor on signal |
| 69 | Compressor time-out | Warning | Compressor has been running for too long in a row | Check reason for compressor to be activated for a long time |

| Error | Display | Fault | Description | Action |
|---|---|---|---|---|
| 70 | Compressor service warning | Warning | Compressor running time is longer than the set value. | Perform service |
| 71 | Compressor service alarm | Alarm | | |
| 72 | PSA service warning | Warning | PSA running hours is longer than the set value | Perform service |
| 73 | PSA Service Alarm | Alarm | | |
| 74 | PSA I/O | Alarm | PSA inputs/outputs have an error | Check PSA inputs and outputs |
| 75 | PSA Settings | Alarm | PSA settings are not correct | Check PSA settings |
| 76 | PSA trip Meter | Warning | PSA has run longer (in 1 day) than the set than the set maximum | Check reason PSA has run for too long has |
| 77 | Oxygen sensor | Alarm | Oxygen sensor is incorrect | Check sensor. Check connection to sensor |
| 78 | Oxygen minimum | Alarm | Measured oxygen level is too low for too long | Check oxygen value |
| 79 | Oxygen maximum | Alarm | Measured oxygen level is too high for too long | |
| 80 | Sensor purity | Alarm | Sensor for purity measurement is incorrect | Check sensor. Check connection to sensor |
| 81 | Purity minimum | Alarm | Measured purity is too low for too long | Check purity. Check PSA |
| 82 | Purity maximum | Alarm | Measured purity is too high too long | |
| 83 | ELC sensor A TX | Alarm | Sensor for tank X of the ELC is not correct | Check sensor. Check connection to sensor |
| 84 | ELC sensor A TY | Alarm | Sensor for tank Y of the ELC is not correct | |
| 85 | SLC sensor A TX | Alarm | Sensor for tank X of the ELC is not correct | |
| 86 | SLC sensor A TY | Alarm | Sensor for tank Y of the ELC is not correct | |
| 87 | License about to expire | Warning | License almost expired | Check status of license and contact supplier |
| 88 | License expired | Alarm | Licence has expired, function no longer available | |
| 89 | Alarms suppressed | Notification | Alarms are being suppressed | |
| 90 | Compressed air too low time-out | Warning | Compressed air demand is too long | |
| 91 | N2 pressure sensor | Warning | N2 pressure sensor fault | Check the set sensor |
| 92 | N2 pressure sensor settings | Warning | The start pressure is set higher or equal to the stop pressure | Set the settings correctly |
| 100 | CAN TX | Warning | Transmission via CAN bus does not work (properly) | Check CAN bus |
| 101 | CAN TX fifo | Warning | Too many messages to send via CAN-bus | |
| 102 | CAN RX fifo | Warning | Too many messages via CAN bus received | |
| 103 | CAN duplicate device number | Warning | Double unit number detected on CAN bus | Check CAN bus for loops. Check that no devices with the same number are present on the CAN bus. |
| 104 | IP-conflict | Warning | Device with same IP address detected on network | Check units for IP address |
| 105 | Ethernet TX fifo | Warning | Too many messages for Ethernet | Contact the supplier |
| 106 | address | Warning | No MAC address found in print | |
| 107 | NTP connection | Warning | Could not receive time via network | Check that print has access to the time server. |
| 108 | TCP TX | Warning | Too many messages via TCP to send | Contact the supplier |

| Error | Display | Fault | Description | Action |
|---|---|---|---|---|
| 109 | TCP RX | Warning | Too many messages received via TCP | |
| 110 | Buffer pressure sensor B | Warning | Sensor B for buffer pressure is incorrect | Check sensor or connection |
| 111 | Buffer pressure measurement | Warning | Sensor B measures a higher value than Sensor A | Check sensors |
| 112 | ELC sensor B Tank X | Alarm | Error in Sensor B | Check sensor or connection |
| 113 | ELC sensor B Tank Y | Alarm | Error in Sensor B | Check sensor or connection |
| 114 | ELC sensor measurement Tank X | Alarm | Sensor B measures a higher value than Sensor A | Check sensors |
| 115 | ELC sensor measurement Tank Y | Alarm | Sensor B measures a higher value than Sensor A | Check sensors |
| 116 | SLC sensor B Tank X | Alarm | Error in Sensor B | Check sensor or connection |
| 117 | SLC sensor B Tank Y | Alarm | Error in Sensor B | Check sensor or connection |
| 118 | SLC sensor measurement Tank X | Alarm | Sensor B measures a higher value than Sensor A | Check sensors |
| 119 | SLC sensor measurement Tank Y | Alarm | Sensor B measures a higher value than Sensor A | Check sensors |
| 140 | Started up | Notification | Device has been restarted | |
| 142 | Internal fault | Warning | Internal fault | Contact the supplier |
| 143 | Test fault | Alarm | Test error for testing purposes, may not occur in practice | |

### 10.2.2 Fault and alarm messages for the Touchscreen (JGA1085)

The error messages below apply to the display if it is installed in conjunction with a PressControl type JGA2027.

| Error | Display | Fault | Description | Action |
|---|---|---|---|---|
| 1 | EEPROM R/W | Warning | EEPROM error | Contact the supplier |
| 2 | EEPROM protect | Warning | | |
| 3 | EEPROM base | Warning | Program error | |
| 4 | Config checksum | Warning | Check value on content of configuration is not correct. | |
| 5 | CAN-bus TxBuffer | Warning | Display sends too many messages | Check CAN bus |
| 6 | CAN-bus RxBuffer | Warning | Display receives too many messages | Check CAN bus |
| 7 | Config base | Warning | Monitoring value of configuration not correct | Contact the supplier |
| 8 | Config settings | Warning | Settings for the configuration do not are not correct | |
| 9 | First time booted | Warning | Print has been started for the first time. Should not happen in practice | |
| 11 | CAN-bus halt | Warning | Error detected on CAN bus | Check CAN bus |
| 20 | RTC comm. | Warning | Internal clock fault | Offer PCB for repair |
| 22 | Main voltage | Notification | Display has been rebooted | |
| 23 | Software version | Warning | Software version not compatible with baseboard | Check that the correct software has been used between display and ground board |
| 24 | PressControl N/A | Warning | Cannot connect to ground print | Check settings and connections |
| 28 | Uart rxFifo | Warning | Excessive communication via service dongle | Check communication via service dongle |
| 29 | Uart txFifo | Warning | | |
| 43 | Uart rxData | Warning | Communication error via service dongle | |
| 44 | Uart rxFifo | Warning | | |
| 45 | Uart frame length | Warning | | |
| 46 | Uart frame bcc | Warning | | |
| 50 | IP-conflict | Warning | There is a device with the same IP address on the network | Check network settings. Contact the network administrator |
| 51 | MAC-address | Warning | MAC address not set. Should not occur in practice | Contact the supplier |
| 52 | W5500 cmd | Warning | Internal error. Should not occur in practice | |
| 53 | NTP connection | Warning | Cannot retrieve the time from the NTP server | Check whether NTP server can be reached via network. Contact the network administrator |
| 55 | Timer handler | Warning | Internal error. Should not occur in practice | Contact the supplier |
| 60 | TCP Tx buffer | Warning | Too much communication via TCP | |
| 64 | TCP Rx buffer | Warning | | |
| 67 | CAN double | Warning | Duplicate device number detected | Check device numbers |
| 74 | 4D Display | Warning | Cannot connect to display | Send printout for repair |
| 75 | Test error | Warning | Test error, for testing purposes. May not occur in practice | Contact the supplier |

### 10.2.3 Fault and alarm messages for the PressControl (JGA0953) (Premium (plus) and Premium plus DUO)

| Error | Display | Fault | Description | Action |
|---|---|---|---|---|
| F01 | Eeprom address | 1 | Read/write error in the permanent setting memory (EEPROM) | Something went wrong while reading or writing a setting; check settings |
| F02 | Eeprom R/W | 1 | | |
| F03 | Eeprom 0x0000 | 1 | | |
| F04 | Configuration | 1 | Checksum error | |
| F05 | CAN TxBuffer | 1 | CAN bus transmit buffer full | Check CAN bus. Adjust macro interval if necessary. |
| F06 | CAN RxBuffer | 1 | CAN bus receive buffer full | |
| F07 | Config base | 1 | Base values do not match. | The software is new, first time started. Otherwise, the Eeprom memory is not properly written. |
| F08 | x | 1 | x | |
| F09 | First boot | 1 | First boot up, new cfg. | |
| F10 | x | 1 | x | |
| F11 | CAN-bus halt | 1 | CAN bus halt detected | One of the devices on the bus had a fatal CAN error or rebooted. |
| F12 | Water in timeout | 2 | Feed pump sent too long | Problem with the automatic fill/flush system. |
| F13 | Water out timeout | 2 | Water outlet sent too long | |
| F14 | Water level min | 3 | Water below minimum level | Add water |
| F15 | Water level max | 3 | Water above maximum level | Drain water |
| F16 | Lower water | 2 | Water above, lower level | Drain water |
| F17 | Increase water | 2 | Water below, lower level | Add water |
| F18 | System pressure min | 3 | System pressure below minimum | System pressure not good; call service technician |
| F19 | System pressure max | 3 | System pressure above maximum level | |
| F20 | N2 in timeout | 2 | Intake valve controlled too long | |
| F21 | N2 out timeout | 2 | Exhaust valve operated too long | |
| F22 | Main power | 0 | System restarted | x |
| F23 | Comp thermal | 2 | Compressor thermal fault | Compressor fault: Check compressor. Call service technician |
| F24 | Comp temperature | 1 | Compressor temperature fault | |
| F25 | Comp compressed air | 2 | Compressor compressed air low | |
| F26 | Comp control time | 2 | Compressor controlled too long | |
| F27 | N2srv connection | 2 | N2 server connection fault | Check CAN bus ext. app. |
| F28 | Uart rxFifo | 1 | UART receive buffer full | Too much debug information sent, or noise on line. |
| F29 | Uart txFifo | 1 | UART send buffer full | |
| F30 | RTC comm. | 1 | Internal clock is faulty | Send board for repair |
| F31 | Clock new | 2 | Internal clock not set | Set the clock via service menu |
| F32 | PressControl N/A | 2 | PressController not available | Check SW version and CAN bus |
| F33 | Software ver. | 2 | Software version difference between the PressDisplay and PressControll | Check SW version and CAN bus Perform software update. |
| F34 | Boiler protection off | 2 | Boiler protection is switched off | Press button B if you want to turn it on again. |
| F35 | Span setting | 2 | Span high is lower than Span low | Check settings. |
| F36 | External ADC | 3 | A/D converter defective | Send print for repair |
| F37 | ELC Sensor TankX | 3 | ELC sensor Tank X faulty | Check (ext) pressure sensor (wiring, sensor, connection) |
| F38 | ELC Sensor TankY | 3 | ELC sensor Tank Y faulty | |
| F39 | Lcd button | 2 | Button pressed at start-up | Release button and restart |
| F40 | x | 0 | x | |
| F41 | Sensor 1 | 3 | Pressure sensor 1 defective | Check pressure sensor (wiring, sensor, connection) |
| F42 | Sensor 2 | 3 | Pressure sensor 2 defective | |
| F43 | Sensor 3 | 3 | Pressure sensor 3 defective | |
| F44 | Sensor 4 | 3 | Pressure sensor 4 defective | |
| F45 | Sensor 5 | 3 | Pressure sensor 5 defective | |
| F46 | Sensor 6 | 3 | Pressure sensor 6 defective | |
| F47 | Sensor 7 | 3 | Pressure sensor 7 defective | |
| F48 | Sensor 8 | 3 | Pressure sensor 8 defective | |
| F49 | ElcTX connection | 3 | ELC tank X connection error | PressController cannot find external device; check CAN-bus and external PressController |
| F50 | ElcTY connection | 3 | ELC tank Y connection failure | |
| F51 | SlcTX connection | 3 | SLC tank X connection fault | |
| F52 | SlcTY connection | 3 | SLC tank Y connection faulty | |

| Error | Display | Fault | Description | Action |
|---|---|---|---|---|
| F53 | SLC Sensor TankX | 3 | SLC sensor Tank X defect | Check (ext) pressure sensor (cabling, sensor, connection) |
| F54 | SLC Sensor TankY | 3 | SLC sensor Tank Y defect | |
| F55 | Taskfifo | 1 | Internal fault | |
| F56 | ElcTX fatalError | 1 | External tank1 has fatal alarm | The (external) PresControl has a fatal Tank1/Tank2 error. Clear the alarm at the other Controller and press reset key. |
| F57 | ElcTY fatalError | 1 | External tank2 has fatal alarm | |
| F58 | SlcTX fatalError | 1 | External tank1 has fatal alarm | |
| F59 | SlcTY fatalError | 1 | External tank2 has fatal alarm | |
| F60 | Tank 1 level consumption | 3 | External level control connection of tank 1 could not retrieve value for more than 15 seconds | PressController cannot find external device; check CAN bus, and external PressControl. |
| F61 | Tank 2 level consumption | 3 | External level control connection of tank 2 could not retrieve value for more than 15 seconds | |
| F62 | Tank 1 level sensor | 3 | Sensor Tank 1 control defective | Check (ext) pressure sensor (wiring, sensor, connection) |
| F63 | Tank 2 level sensor | 3 | Sensor Tank 2 control defective | |
| F64 | Oxygen min1 | 1 | Oxygen level PSA generator below minimum level | Check PSA generator |
| F65 | Oxygen max1 | 1 | Oxygen level PSA generator above maximum level | |
| F66 | Dual appNo (d) | 1 | There are two devices in the network with the same number. | Change device numbers so that each device is unique |
| F67 | Service < 14 days | | This system will work for another 14 days. Make sure that within two weeks service maintenance is performed within two weeks. | Call Service Engineer |
| F68 | Service expired | | No service done; system is switched off | Call Service Engineer |
| F69 | Dual appNo (c) | 1 | There are two devices in the network with the same number. | Change device numbers, so that each device is unique |
| F70 | Tank 1 pressure related. | 1 | The pressure measurement connection of tank 1 could not retrieve a value for more than 15 seconds | PressController cannot find external device; check CAN bus, and external PressControl. |
| F71 | Tank 2 pressure related. | 1 | The pressure measuring connection of tank 2 could not get a value for more than 15 seconds. | |
| F72 | Tank 1 pressure sensor | 1 | An (ext) pressure sensor of tank 1 1 control gives an error message | |
| F73 | Tank 2 pressure sensor | 1 | An (ext) pressure sensor of tank 2 control gives an error message | |
| F74 | Buffer pressure verb. | 1 | The connection of the buffer pressure measurement has a timeout error. | |
| F75 | Buffer pressure min | 1 | Buffer pressure below minimum niv. | Call Service Engineer |
| F76 | Buffer pressure max | 1 | Buffer pressure above maximum niv. | |
| F77 | Buffer pressure sensor | 1 | An (ext) pressure sensor of the buffer pressure measurement gives an error | |
| F78 | Oxygen sensor1 | 1 | Oxygen sensor error | Check that set sensor is an oxygen sensor. Check oxygen sensor is not giving false readings. |
| F79 | PSA day counter | 1 | The PSA has been active longer than the set time in 24 hours. set time in 24 hours. | Check system for leaks |

### 10.2.4 Fault and alarm messages for the Touchscreen (JGA1085)

The error messages below apply to the display if it is installed in conjunction with a PressControl type JGA0953.

| Error | Display | Fault | Description | Problem |
|---|---|---|---|---|
| F01 | Eeprom address | 1 | Read/write error in permanent setup memory (EEPROM) | Something went wrong while reading or writing a setting; check settings |
| F02 | Eeprom R/W | 1 | | |
| F03 | Eeprom 0x0000 | 1 | | |
| F04 | Configuration | 1 | Checksum error | |
| F05 | CAN TxBuffer | 1 | CAN bus transmit buffer full | Check CAN bus. Adjust if necessary. macro interval. |
| F06 | CAN RxBuffer | 1 | CAN bus receive buffer full | |
| F07 | Config base | 1 | Base values do not match | The software is new, first time started. Otherwise, the Eeprom memory is not properly written. |
| F08 | Configuration | 1 | Controller value configuration not correct | |
| F09 | First boot | 1 | First boot up, new cfg. | |
| F10 | x | 1 | x | |
| F11 | CAN-bus halt | 1 | CAN bus halt detected | One of the devices on the bus had a fatal CAN error or rebooted. |
| F20 | RTC comm. | 1 | Communication with RTC not correct | Contact service technician |
| F22 | Main voltage | 1 | Display has been rebooted | Check power supply |
| F23 | Software vers. | 1 | Software version does not match | Check software versions of PressControl [JGA953] and ColorPressDisplay [JGA1085]. |
| F24 | PressControl N/A | 1 | No connection to PressControl | Check CAN bus connection to PressControl [JGA953]. |
| F28 | Uart rxFifo | 1 | UART receive buffer full | Too much debug information sent, or noise on the line. |
| F29 | Uart txFifo | 1 | UART send buffer full | |
| F42<br>F43 | Uart rx data | 1 | Communication error | Contact service technician |
| F44 | Uart rxFifo | 1 | | |
| F45 | Uart frame length | 1 | | |
| F46 | Uart frame BCC | 1 | | |
| F50 | IP-conflict | 1 | There is a device on the computer network with the same IP address | Check network settings |
| F51 | MAC-address | 1 | MAC address error | Contact the service technician |
| F52 | W5500 cmd | 1 | Factory error | |
| F53 | NTP connection | 1 | Connection to the time server could not be made | Check access to Internet / time server. |
| F55 | Timer handler | 1 | Factory error message | Contact the service technician |
| F57 | MAC-address | 1 | MAC address error | Contact the service technician |
| F60 | TCP Tx buffer | 1 | | |
| F63 | TCP Rx buffer | 1 | | |
| F67 | Dual appNr(d) | 1 | Dual device number detected | Check device numbers on CAN bus |
| F74 | Display error | 1 | Display has error | Contact service technician |
| F75 | Test fault | 1 | Test error message | |

### 10.2.5 Fault and alarm messages for the PRESS-Basic control (Basic)

| Alarm no. | Display message | Fault | Alarm | Description | Cause of problem |
|---|---|---|---|---|---|
| F01 | Eeprom address | X | | Read write error in the permanent eeprom settings memory | An error has occurred during reading or writing of a setting; check configuration |
| F02 | Eeprom R/W | X | | | |
| F03 | Eeprom address0 | X | | | |
| F04 | Configuration | X | | Checksum error. | |
| F05 | CAN TxBuffer | X | | CAN-bus send buffer is full | Check CAN-bus. Adjust macro interval when necessary |
| F06 | CAN RxBuffer | X | | CAN-bus receive buffer is full | |
| F07 | Config base | X | | Base values do not match | New software or first boot. Else Eeprom memory program could be faulty |
| F09 | First boot | X | | First boot, new cfg. | |
| F11 | CAN-bus halt | | | CAN-bus halt detected | One of the devices on the bus had a fatal CAN error, or has been restarted |
| F14 | Water level min | X | X | Water below minimum level | Insufficient water in the heat storage tank |
| F15 | Water level max | X | X | Water above maximum level | Drain off water |
| F16 | Water lower | X | | Water above reduce level | Drain off water |
| F17 | Water raise | X | | Water below reduce level | Add water |
| F18 | System press min | X | X | System pressure below minimum level | System pressure not correct, there is a leakage on the system or heat storage tank; call service technician |
| F19 | System press max | X | X | System pressure above maximum level | |
| F22 | Main power | | | The system has restarted | |
| F23 | Comp thermic | X | X | Compressor thermal error | Compressor error: Check compressor; Call service mechanic |
| F25 | Comp air low | X | X | Compressor pressure too low | |
| F28 | Uart1 rxFifo | X | | UART1 receive buffer is full | Debug information overflow. Or distortion on info bus |
| F29 | Uart1 txFifo | X | | UART1 send buffer is full | |
| F32 | BasicPControl N/A | X | | BasicPController not available | Check software version and CAN-bus connection |
| F33 | Software ver. | X | | Software version between PressDisplay and BasicPControll is different | Update the software of the display and controller |
| F34 | Boiler prot off | X | | Boiler alarm is switched off | Press button 'B' to switch on the boiler alarm again |
| F35 | Span config | X | X | Span high is lower than Span low | Check configuration |
| F36 | External ADC | X | X | A/D converter defect | Send the controller to the dealer for repair |
| F39 | Lcd button | X | | Button was pressed during start-up | Release the button and restart the system |
| F41 | Sensor 1 | X | X | pressure sensor 1 defect | Check pressure sensor (cable, sensor, connection) |
| F42 | Sensor 2 | X | X | pressure sensor 2 defect | |
| F55 | Taskfifo | X | | Internal error | |
| F62 | Regel niv sensor | X | X | level sensor error | Check (ext) pressure sensor (cable, sensor, connection) |
| F67 | Double dev Nr(d) | X | X | Two devices have the same network number | Change device number to a unique number. |
| F68 | Service <14 days | | | Make sure that a maintenance service has been carried out within two weeks | Call service technician |
| F69 | Service expir. | | | No maintenance service carried out; system will shut down | Call service technician |
| F70 | Double dev Nr(c) | X | X | Two devices have the same network number | Change the device number to a unique number |
| F73 | Press contr sens | X | X | Pressure sensor error | |
| F75 | Reserved | X | | Reserved error message | |
| F76 | Reserved | X | | Reserved error message | |
| F77 | Reserved | X | | Reserved error message | |
| F78 | Reserved | X | | Reserved error message | |

## 10.3 Overriding the boiler alarm relay

If the boiler alarm relay is active and blocks one or more devices, such as the boiler, there are scenarios in which this is not desirable. For example: if the boiler still must heat the central heating system of the greenhouse while the water level sensor on the buffer tank causes an alarm message. In such scenarios it is possible to bypass the boiler alarm relay. While bypassing the boiler alarm, the alarm messages on the Touchscreen and the PRESS-display remain unchanged, but the boiler alarm relay on the PCB will be switched off. So, the blocking signal to another device will also be disabled.

**ATTENTION! Overriding the boiler alarm is not without any risks. It is strongly recommended to consult the technical support of PRESSCON on forehand. If used in an inappropriate situation, damage to the buffer tank and central heating systems cannot be prevented.**

The PRESS-control of the type of PRESS-control minimal and PRESS-control maximal have two buttons on the PCB. The button with the designation “SWITCH B” is programmed to override the boiler alarm relay. The button should be pressed and held for 3 seconds to activate the override. The PRESS-display will then give 2 bleeps and the message ‘BOILER PROTECTION OFF” will be shown on the main screen. To deactivate the override, the ‘SWITCH B’ button should be pressed and held again for 3 seconds.

For switch panels with a Touchscreen the activation and deactivation of the boiler alarm bypass works the same as for panels with a PRESS-display. However, the Touchscreen does not show the message "BOILER SAFETY OFF" on the screen but instead the icon of the nitrogen generator will turn red. Selecting the nitrogen generator on the Touchscreen will display the alarm menu showing the alarm "F34 Boiler Safety off".

The button is located at the centre of the PCB. The following image shows what the switch looks like.


*Figure 45. Switch A and B on the PCB of the PRESS-control*

The "SWITCH B" button is not available on the PRESS-Basic control PCB used in the VERNIT 2.0 - 30.0 N2(i) Basic systems. These systems do not have the possibility to bypass the boiler alarm relay. The override of the boiler alarm relay is automatically deactivated after 48 hours.

# 11 Warranty

PRESSCON provides a warranty of 1 year on the components of the expansion system, assuming that the following conditions are met:

- The equipment has been installed by PRESSCON or under direct or indirect supervision of PRESSCON.
- The equipment is undamaged and unprocessed and not defective due to improper use.
- The equipment is not defective by inadequate maintenance or other proceedings.
- The equipment is not defective or non-speech hit by negligence, accident or whatsoever.

The warranty includes checking, repair or replacement if defective from proven equipment. Faulty equipment, which has been replaced shall become property of PRESSCON.

Regarding the products supplied by PRESSCON in the Netherlands, PRESSCON refers to the general terms of conditions. All offers and agreements relating to goods to be delivered and / or services within the Netherlands are applicable the general terms and conditions for the technology industry, as last filed by the FME-CWM with the court in The Hague. A Dutch copy of these terms is included with all Dutch offers and agreements. Other terms and conditions are expressly rejected.

# 12 Appendix

In addition to this document, the description of the content extends to the following appendixes:

| Appendix ID | Description | Version |
|---|---|---|
| - | - | - |
| | | |
| | | |
| | | |
| | | |

# 13 Document history

Version **1.0** to **2.0** indicates **Modification**, in lay-out, structure or other major modifications.

Version **1.0** to **1.1** indicates **Supplement**, a chapter of paragraph has been added to the document.

Revision _**R01** to _**R02** indicates **Correction**, an image, language error or text error has been corrected.

| Version | Date | Modification |
|---|---|---|
| 1.6_R02 | 06-02-2017 | Chapter 4.2.3. Tightening spindles, adjusted torque value from 95 N/m to 80 N/m. |
| 2.0_R00 | 04-08-2022 | Names of systems (Economy A, B and Duo changed to Basic, Premium and Premium plus. Drawings and text completely renewed. |
| | | |

# 14 To conclude

This manual has been written in order to support the mechanic, installer or customer in adjusting, modifying or working with a product of PRESSCON. Its aim is to maintain and possibly improve the quality of its products. If additional information or support is requested, then PRESSCON can be consulted through the following information.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# Appendix A: Touchscreen

The touchscreen is the most important control device for reading the statuses and values of the system. The touchscreen has no physical buttons, but only digital buttons on the screen. Touching the buttons and the images on the screen can be used to navigate and adjust the settings. The table below shows the buttons of the touchscreen.

## 1. Main screen of the Touchscreen

Every button has a different function, some of them have several functions. The following table describes which function each button has.

| Button | Description |
|---|---|
| Menu | This button is only displayed in the main menu and guides you to the following functions:<br>• User : User menu<br>• Service : Service menu<br>• Factory : Factory menu |
| Alarm | • Press the button to view the current fault and alarm messages.<br>• Press the button for more than 3 seconds to view the alarm log. |
| Info | • Pressing this button calls up the information screen. Specific information is displayed in here for each component as well as the current status.<br>• The same menu for a specific component can also be accessed by pressing the relevant icon in the menu screen. |
| Esc | • This button is in every menu and returns you to the previous menu. |

When the “menu” option is pressed, the following menus can be selected.

| Button | Description |
|---|---|
| User | • The user menu is accessible to everyone.<br>• This contains setting which the user can change. |
| Service | • The service menu is only accessible via a code.<br>• Service information can be requested via this menu. |
| Factory | • The service menu is only accessible via a code.<br>• Factory settings can be entered from this menu. |

## 1.1 Main screen lay-out VERNIT

The structure of the menu is based on the type of system the user has. Press the icons to find out the status of this system.

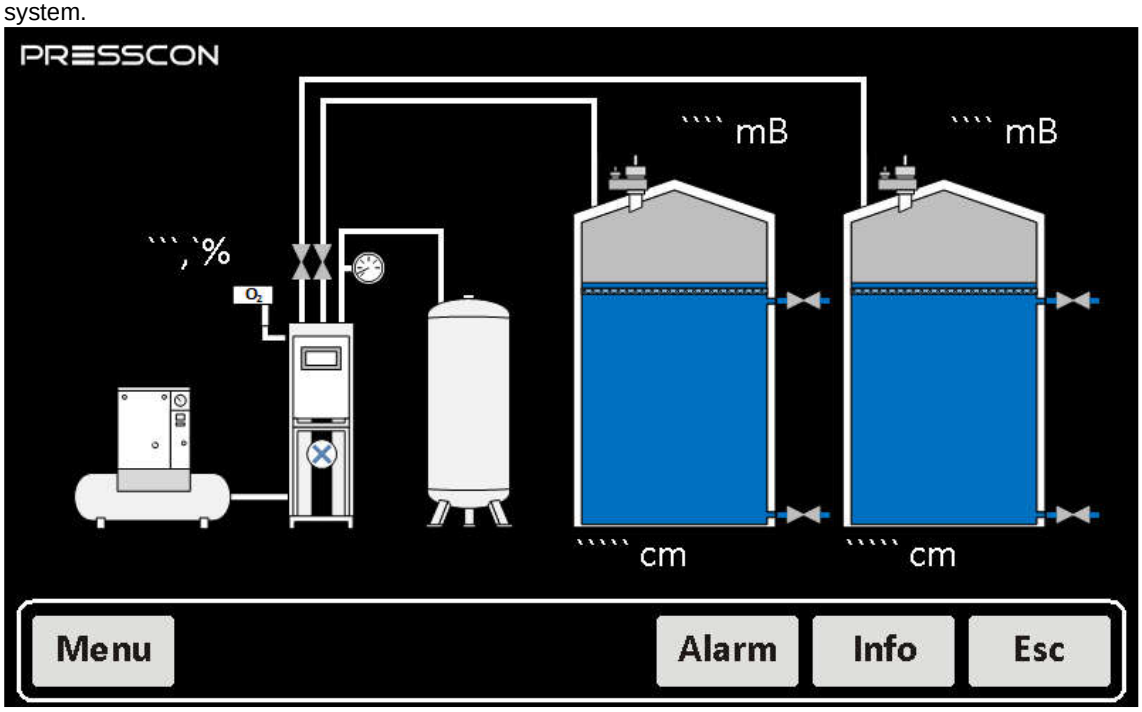



*Figure 46. VERNIT 2.0 – 30.0 N2(i) DUO system overview (Only when the VERNIT is installed)*

## 1.2 Main screen lay-out HORNIT

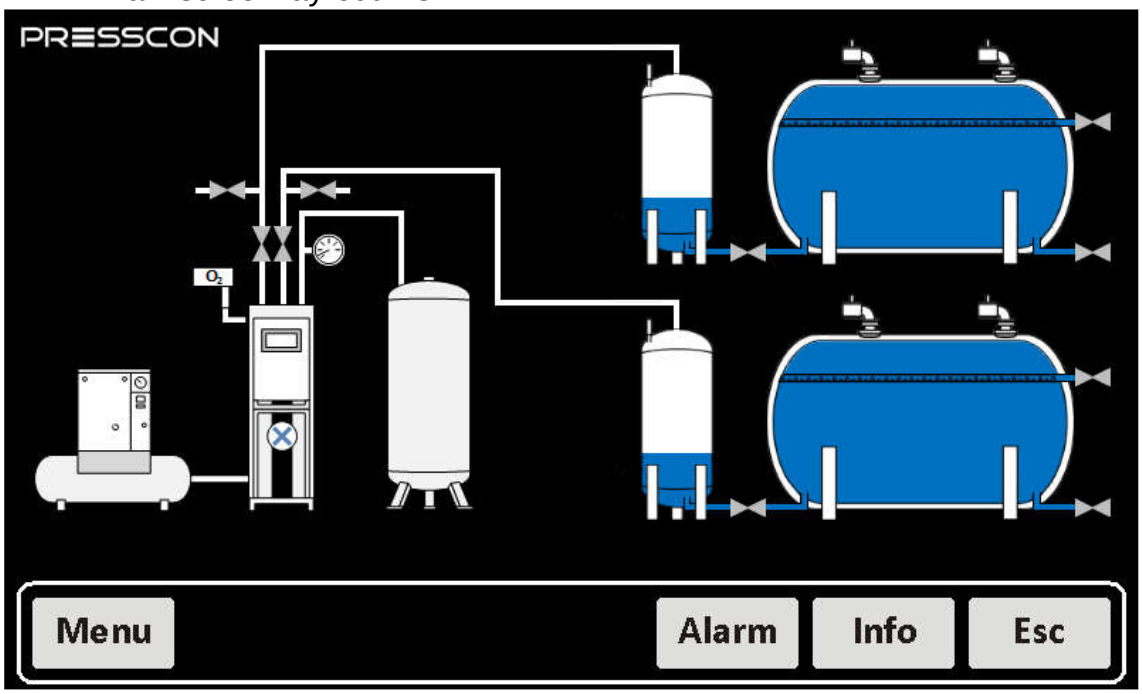
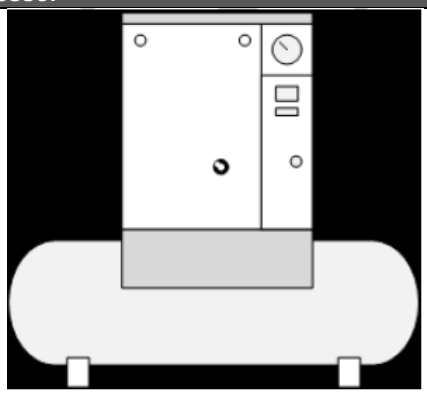
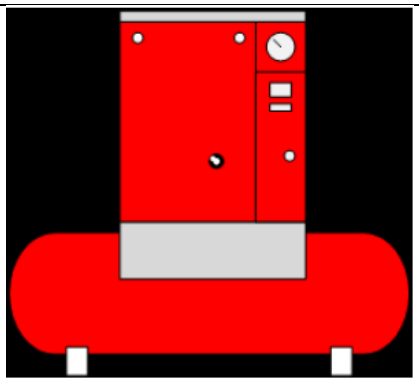



*Figure 47. HORNIT 2.0 – 30.0 N2(i) DUO system overview (Only when the HORNIT is installed)*

# 2. Icons on the main screen

## 2.1 Compressor

The compressor supplies compressed air to the system. The status of the compressor is forwarded to the PressControl.

| Compressor | Description/status |
|---|---|
|  | • The compressor supplies the compressed air to the system.<br>• When it is coloured white, de compressor is working properly. |
|  | • If the compressor turns red, there is a malfunction.<br>• Press the compressor to go to the fault menu. |

## 2.2 PSA generator

The PSA generator produces nitrogen for the system. The status of the PSA generator is forwarded to the PressControl.

| PSA generator | Description/status | PSA generator | Description/status |
|---|---|---|---|
|  | • The circle with the cross, will start running when the PSA generator is activated.<br>• When it is coloured white, de compressor is working properly. |  | • If the system turns red, there is a malfunction.<br>• Press the system to go to the fault menu. |

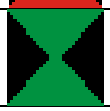
## 2.3 Oxygen sensor

The oxygen sensor measures the value of the oxygen which remains after generation the nitrogen from the PSA generator. The status of the oxygen sensor is forwarded to the PressControl.

| Oxygen sensor | Description/status |
|---|---|
|  | • The current value of the oxygen is displayed above the sensor.<br>• When it is coloured white, the oxygen sensor is functioning properly. |
|  | • When the oxygen sensor is coloured red, there is a malfunction.<br>• Press the oxygen sensor to go to the fault menu. |

## 2.4 Valves

The vertical valves above the PSA generator represent the nitrogen blow-in valves for both tanks.

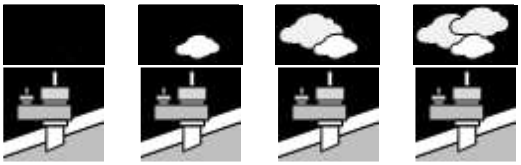
| Vertical valves | Description/status |
|---|---|
|  | • When the valve turns white, it means the status of the valve is yet unknown. |
|  | • When the valve turns red, it means the valve is closed. |
|  | • When the valve turns green, it means the valve is open. |

The horizontal valves next to the tank, regulate the water discharge and supply. The top valve shows the water supply. The lower valve shows the water return. The status of the valves is forwarded to the PressControl.

| Horizontal kleppen | Description/status |
|---|---|
|  | • When the valve turns white, it means the status of the valve is yet unknown. |
|  | • When the valve turns red, it means the valve is closed. |
|  | • When the valve turns green, it means the valve is open. |

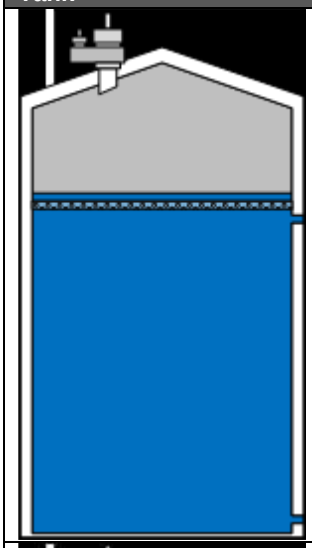
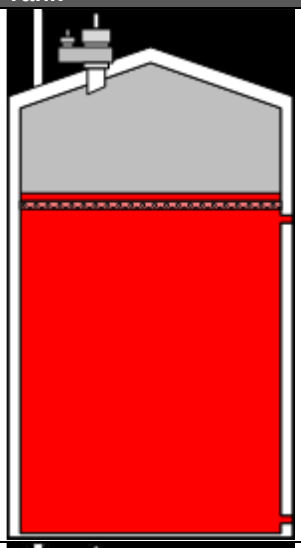
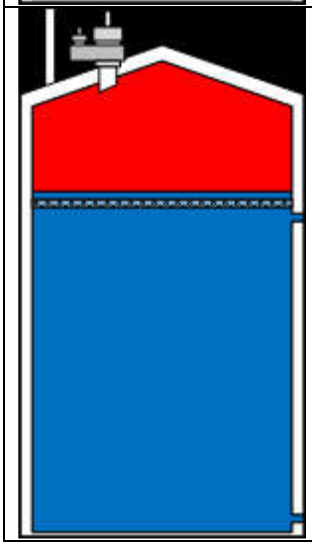
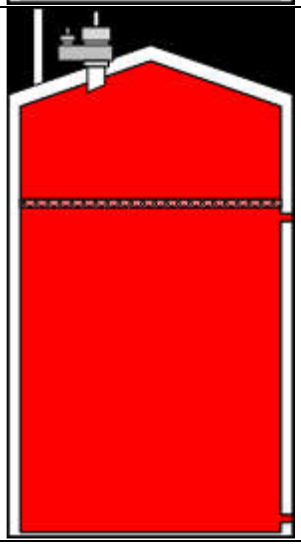
## 2.5 Overpressure safety relief

The overpressure safety reliefs are on top of the tank. (These protection devices are only visible with VERNIT systems with a vertical tank. The status of the overpressure safety relief is forwarded to the PressControl.

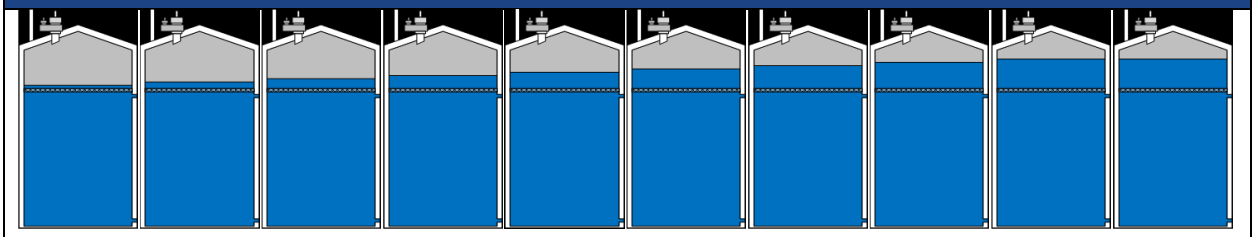
| Overpressure safety relief | Description/status |
|---|---|
|  | • When the tank is blowing off nitrogen, this is indicated by clouds above the tank's overpressure relief.<br>• Alternately, 4 different symbols can be displayed as shown in the left figure. The number of depicted clouds, represents the amount of nitrogen. |

## 2.6 VERNIT tank malfunction status

The status of the tank is represented by the colour of the tank.

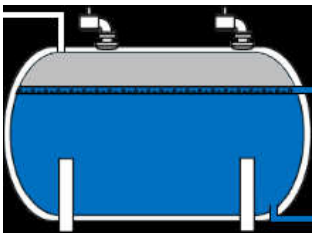
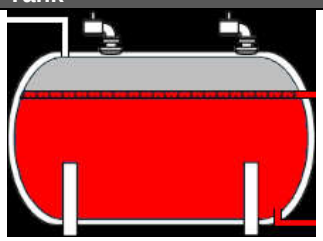
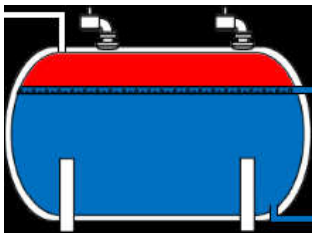
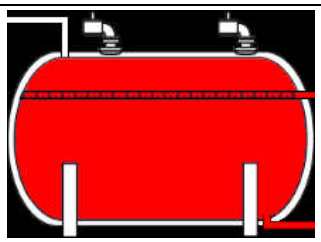
| Tank | Description/status | Tank | Description/Status |
|---|---|---|---|
|  | • When the tank is represented like this, the tank is functioning properly. |  | • When the tank is represented like this, the tank has a water level failure. |
|  | • When the tank is represented like this, the tank has a system pressure failure.<br>• Press the tank to go to the fault menu. |  | • When the tank is represented like this, the tank has system pressure failure and water level failure.<br>• Press the tank to go to the fault menu. |

## 2.7 VERNIT tank water level status

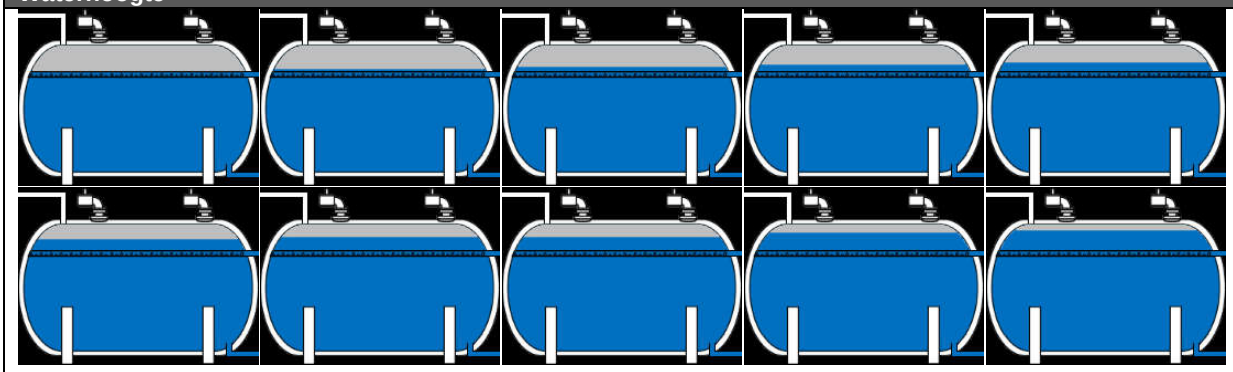
| Water level |
|---|
|  |
| • The water level is globally represented by the height of the blue part in the tank.<br>The range is calculated between the 'water level maximum' and 'water level 'minimum' settings.<br>This range is divided in 10 parts. Next, the current water level is checked at which part it is. The water level under the tank is also shown. |

## 2.8 HORNIT tank malfunction status

The status of the tank is represented by the colour of the tank.

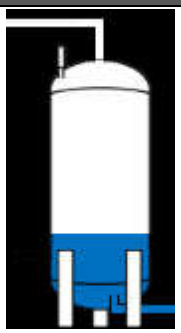
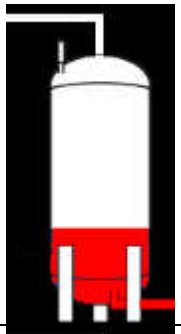
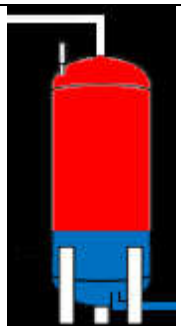
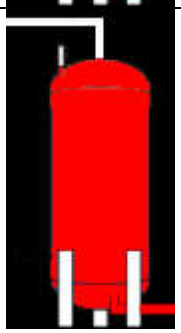
| Tank | Description/status | Tank | Description/Status |
|---|---|---|---|
|  | • The water level is represented by the blue part in the tank. The water level is also displayed next to the tank.<br>• When the tank is represented like this, the tank is functioning properly. |  | • When the tank is represented like this, the tank has a water level failure.<br>• Press the tank to go to the fault menu. |
|  | • When the tank is represented like this, the tank has a system pressure failure.<br>• Press the tank to go to the fault menu. |  | • When the tank is represented like this, the tank has system pressure failure and water level failure.<br>• Press the tank to go to the fault menu. |

## 2.9 HORNIT tank water level status

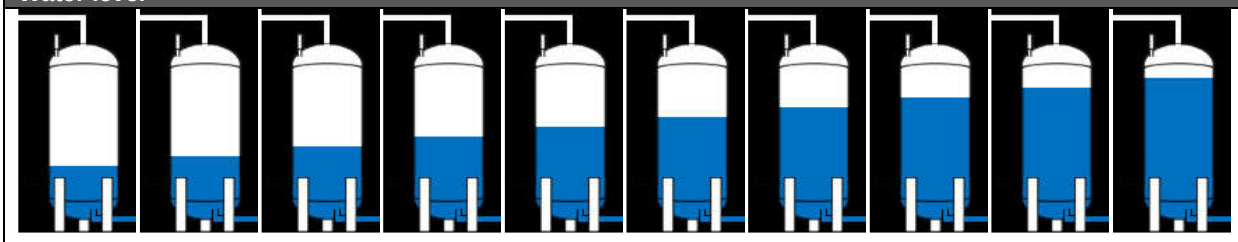
| Waterhoogte |
|---|
|  |
| • The water level is globally represented by the height of the blue part in the tank.<br>The range is calculated between the ‘water level maximum’ and ‘water level ‘minimum’ settings.<br>This range is divided in 10 parts. Next, the current water level is checked at which part it is. The water level under the tank is also shown. |

## 2.10 HORNIT pressure tank failure status

The status of the tank is represented by the colour of the tank.

| Tank | Description/status | Tank | Description/Status |
|---|---|---|---|
|  | • When it is coloured white, it is functioning properly. |  | • When the tank is represented like this, the tank has a water level failure.<br>• Press the tank to go to the fault menu. |
|  | • When the tank is represented like this, the tank has a system pressure failure.<br>• Press the tank to go to the fault menu. |  | • When the tank is represented like this, the tank has system pressure failure and water level failure.<br>• Press the tank to go to the fault menu. |

## 2.11 HORNIT pressure tank water level status

| Water level |
|---|
|  |
| • The water level is globally represented by the height of the blue part in the tank.<br>The range is calculated between the ‘water level maximum’ and ‘water level ‘minimum’ settings.<br>This range is divided in 10 parts. Next, the current water level is checked at which part it is. The water level under the tank is also shown. |

# 3. User menu

The User menu contains the basic settings for the expansion system. In this menu, the user can setup the values such as: Start value, stop value, alarm thresholds for the pressure of the nitrogen blanket, total system pressure and the height of the water level. The user menu also has settings for the language and back-up.

## 3.1 User menu schematic for touchscreen type (Premium (plus) and Premium Plus DUO)

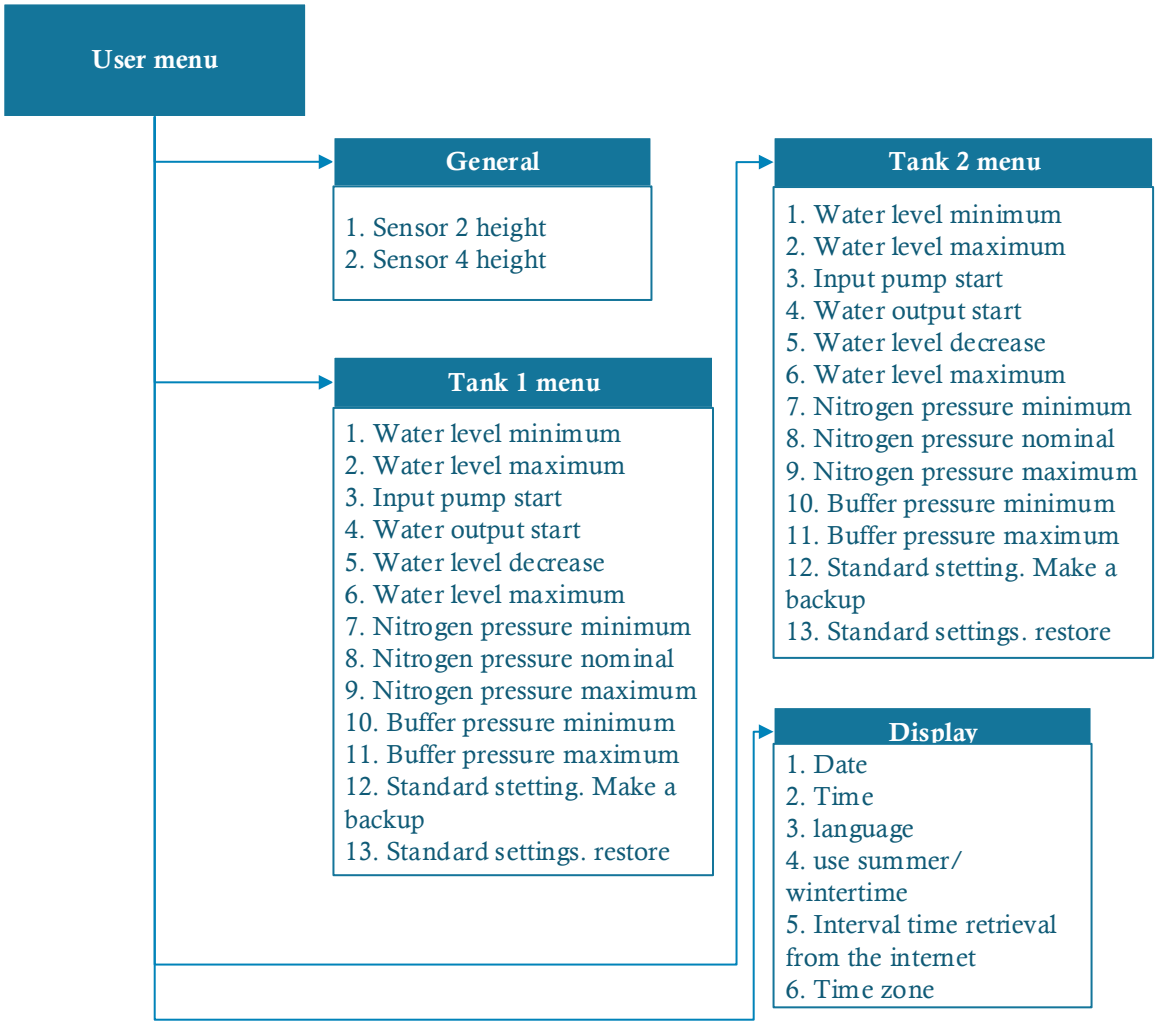



*Figure 48. Structure of the user menu*

## 3.2 User menu description

| | General | Description |
|---|---|---|
| 1 | Sensor 2 height | This sets the height of sensor 2. |
| 2 | Sensor 4 height | This sets the height of sensor 4. |

| | Tank 1/2 menu | Description |
|---|---|---|
| 1 | Water level minimum | If the water level falls below this value, the control unit gives the following alarm: "F14 Water level min". |
| 2 | Increase water level | If the water level falls below this value, the control unit gives the following warning: "F17 Increase water". |
| 3 | Input pump start | If the water level falls below this value, the input pump is started. |
| 4 | Water output start | If the water level exceeds this value, the water output is opened. |
| 5 | Decrease water level | If the water level exceeds this value, the control unit gives the following warning: "F16 Reduce water". |
| 6 | Water level maximum | If the water level exceeds this value, the control unit gives the following alarm: "F15 Max water level." |
| 7 | System pressure minimum | If the nitrogen pressure falls below this value, the control gives the following alarm: "F18 Nitrogen pressure min. " |
| 8 | System pressure nominal | With this setting you set the target pressure of the pressure control. Nitrogen is removed or supplied if the pressure deviates too much. |
| 9 | System pressure maximum | If the nitrogen pressure exceeds this value, the software will generate the following error message "F19 Nitrogen Pressure Max" |
| 10 | Buffer pressure minimum | If the buffer pressure falls below this value, the control will give the following alarm: "F76 Buffer pressure min". |
| 11 | Buffer pressure maximum | If the buffer pressure exceeds this value, the control will give the following alarm: "F77 Buffer pressure max". |
| 12 | Standard settings. Make a backup | The Presscontrol makes a backup of the settings memory. |
| 13 | Standard settings. Reset | The Presscontrol resets the backup of the settings. |

| | Display | Description |
|---|---|---|
| 1 | Date | Current date saved in the display. |
| 2 | Time | Current time saved in the display. |
| 3 | Language | Language of the display |
| 4 | Use summer/wintertime | Indicates whether the daylight-saving time system is being used. |
| 5 | Interval time retrieval from the internet | The interval at which time is synchronized with the Internet. |
| 6 | Time zone | Time zone in which the display is located, this is necessary when retrieving the time from the internet. |

## 4. Service menu

The service menu contains more advanced settings for the expansion system. This menu is intended for the service engineer, when the system is put into service or to make adjustments during maintenance. The service menu can be accessed by pressing the "service" button once when the touchscreen is on the main menu screen. The software will then ask for the access code of the menu. This code is only available for the service engineer.

## 5. Factory menu

The factory menu contains the critical software and hardware settings for the operation of the PRESS-control motherboard and the touchscreen. This menu is meant for setting the nitrogen generator when tested in the factory. The factory menu can be approached by pressing the “factory” button once when the touchscreen is on the main menu screen. The software will then ask for the access code of the factory menu. This code is only available for the service engineer.

## 6. Standby

When the touchscreen is in operation, it can go into standby mode to reduce the energy consumption and the wear of the hardware. The touchscreen enters standby mode when no buttons are pressed on the touchscreen for a period of 14,5 minutes and when there are no alarms or error messages. In standby mode the display turns itself off until the screen is pressed again.

# Appendix B: PRESS-display

The PRESS-display is the monitoring device for reading the statuses and measured values of the system. The buttons are used to navigate and adjust the settings. Figure 49 below shows a schematic view of the PRESS-display.

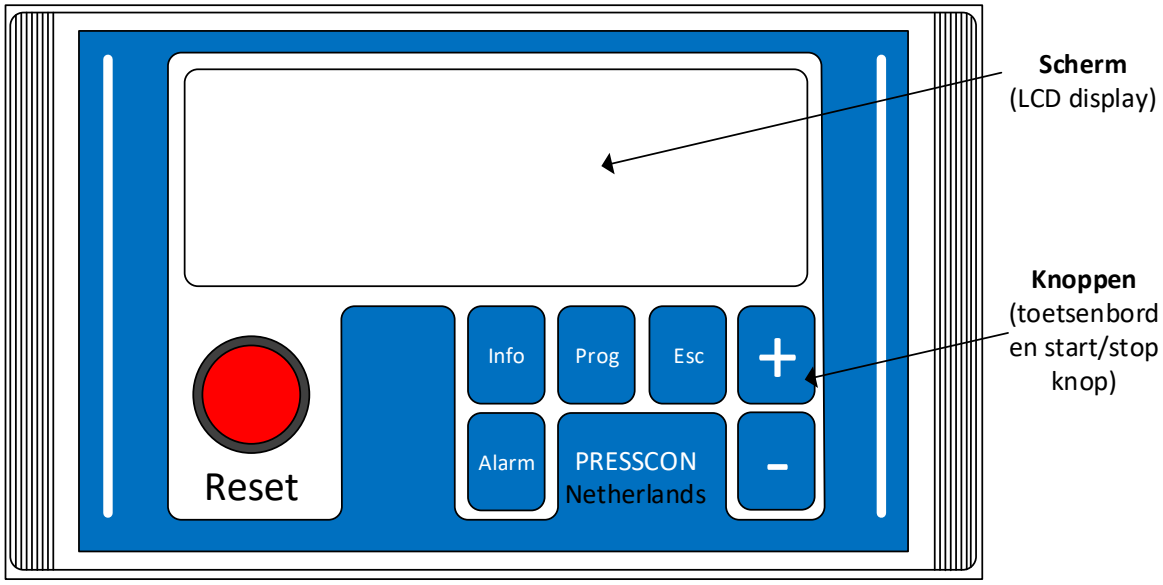
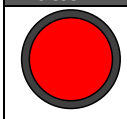



*Figure 49. Schematic view of Press-display*

## 1. Buttons on the PRESS-display

Each button has a different function, some have more than one. The following table describes which function each button has.

| Button | Description |
|---|---|
|  Reset | This button has a light beneath it, when it lights up, this means the following:<br>• Light on : An error or alarm has been detected;<br>• Light flashes: There is a new error or a new alarm.<br>With this button, you can reset an error or alarm message as soon as the problem that caused the message has been solved. |
|  Alarm | • Press the button once to view the current errors and alarm messages.<br>• Press and hold for 3 seconds to view the error and alarm log. |
|  Prog | From the main screen:<br>• Press the button once to enter the Service menu. An access code is required.<br>• Press and hold for 3 seconds to view the factory menu. An access code is required.<br><br>Adjusting a setting in one of the menus:<br>• In the user menu: press and hold this button for 3 seconds. The setting will flash and is then adjustable.<br>• In the service menu and factory menu: press this button once briefly. The setting will flash and is then adjustable. |
|  Info | • Press this button once briefly to view the service information screen.<br>• Press and hold for 3 seconds to view the factory information screen. |
|  Esc | • Press this button once briefly, in one of the menus or information screens, to go back one screen and then return to the main screen.<br>• Press this button once briefly while adjusting a setting. The adjustment will be cancelled. |
|  | • Press this button once briefly in one of the menus to select the next screen.<br>• Press this button when setting a value to increase the value. |
|  | • Press this button once briefly in one of the menus to select the previous screen.<br>• Press this button when setting a value to decrease the value. |

## 2. Menu structure and access

The PRESS-display software has a specific structure that is described in this chapter. The structure consists of 3 levels and a set of menus for each level. The levels in the software are like user levels. The levels are called: user menu, service menu and factory menu. In addition to these menus, there are also information screens, i.e.: main screen, alarm screen and information screen. The structure of the levels, menus and information screens are shown in the image below. This image also shows how to reach each menu or screen. This is applicable for the BASIC systems.

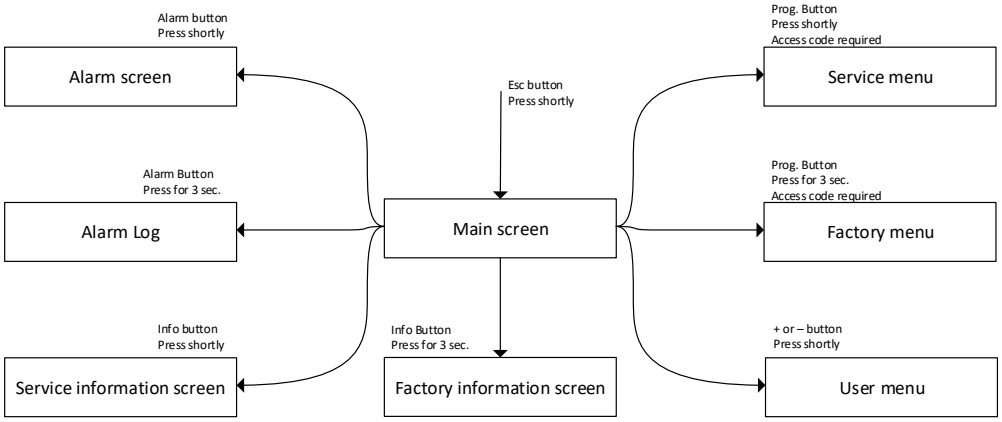



*Figure 1. Menu structure of PRESS-display software*

## 3. User Menu

The user menu contains all the basic settings for the expansion system. In this menu, the user can set values such as; start values, stop values, alarm values for nitrogen blanket pressure, total system pressure and water level. The user menu also contains language and backup settings. There are some differences in the software between the types of PRESS-controls and PRESS-displays, so the user menus will also be different. Only the User Menu of the BASIC systems is described here.

## 3.1 User menu for the VERNIT Basic systems

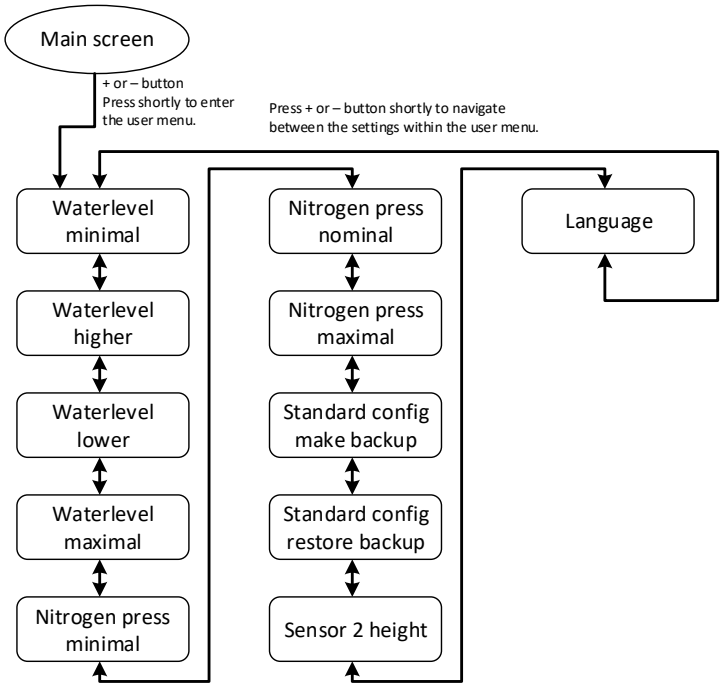



*Figure 50. Structure of user menu of Vernit Basic system*

**Description of user menu settings**

| | Line | Description |
|---|---|---|
| 1 | Minimum water level | If the water level drops below this value, the software will generate the alarm message ''F14 minimum water level''. |
| 2 | Increase water level | If the water level drops below this value, the software will generate the error message ''F17 increase water level''. |
| 3 | Reduce water level | If the water level is higher than this value, the software will generate the error message ''F16 reduce water level''. |
| 4 | Water level maximum | If the water level is higher than this value, the software will generate the error message ''F15 maximum water level''. |
| 5 | Nitrogen pressure minimum | If the nitrogen pressure is higher than this value, the software will generate the error message ''F18 Nitrogen pressure Min.''. |
| 6 | Nitrogen pressure nominal | This setting sets the target value for the pressure of the nitrogen blanket. The pressure is increased or decreased if it deviates too much from the nominal value. |
| 7 | Nitrogen pressure maximum | If the nitrogen pressure is higher than this value, the software will generate the error message ''F19 Nitrogen pressure Max.'' |
| 8 | Backup of default settings | With this setting, the software backs up all of the configured memory. |
| 9 | Restore backup of default settings | With this setting, the software restores the configured memory that was stored as a backup. |
| 10 | Sensor 2 Height | This setting sets the height of sensor 2. This sensor is located on the side of buffer tank 1 and measures the water level. |
| 11 | Language | This setting allows you to set the language of the PRESS-display. |

# 4. Service Information screen

This information screen contains the directly measured values from the sensors of the VERNIT or HORNIT expansion system. These are the values to which the VERNIT or HORNIT expansion system responds. These measurements can be viewed in real-time via the Service Information screen. There are no settings available in the Service Information screen that can be changed. There are differences between the PRESS-control and PRESS-display types, so there is also differences in the Service information screen. Only the Service Information screen of the BASIC systems is described here.

## 4.1 Service information screen for the VERNIT Basic systems

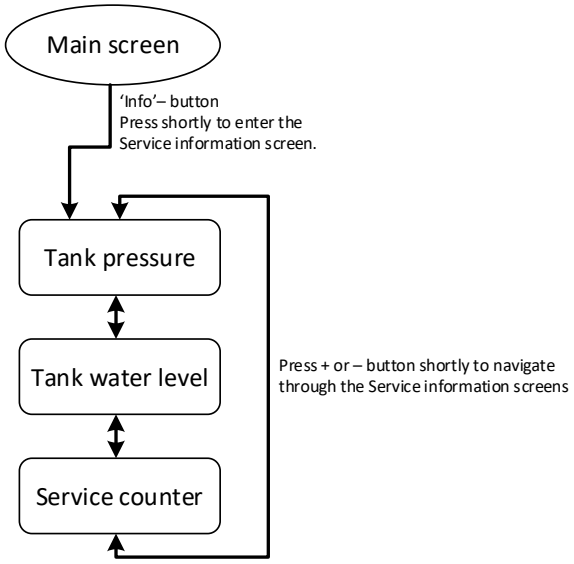



*Figure 51. Structure of the service information screens for the VERNIT Basic*

**Description of the service information screen**

| | Line | Description |
|---|---|---|
| 1. | Tank pressure | This screen shows which measured values are used to determine the pressure of the nitrogen blanket or the total system pressure. This can be a directly measured value from sensor A or B. Or it can be a calculated value based on both sensor A and sensor B depending on the factory settings. |
| 2. | Water level in tank | This screen shows which measured values are used to determine the water level in the buffer tank. This can be a directly measured value from sensor A or B. Or it can be a calculated value based on both sensor A and sensor B depending on the factory settings. |
| 3. | Service counter | This screen shows the current system maintenance interval counter. |

# 5. Factory information screen

The factory information screen displays the status of all input and output signals of the PRESS-control. It indicates, for example, if a sensor measurement has been received, if an output is active, if an input is active and if nitrogen is being produced or not. There are some differences between the different types of PRESS-controls and PRESS-displays in the software, so there are also differences in the factory information screen. Only the Factory information screen of the BASIC systems is described here.

## 5.1 Factory information screen for the VERNIT Basic systems

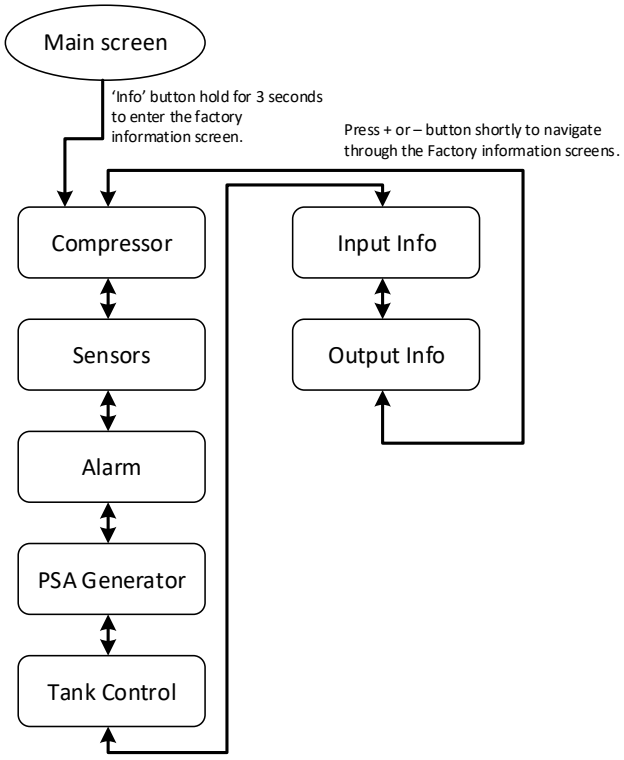



*Figure 52. Structure of factory information screen of VERNIT Basic*

**Description of factory information screen for VERNIT Basic**

| | Line | Descriptions |
|---|---|---|
| 1. | Compressor | This screen displays the current time and date. It shows the amount of time that the compressor has been active. |
| 2. | Sensors | This screen shows what each pressure sensor measures. It contains the measurements from 2 sensors. |
| 3. | Alarm | This screen shows the status of the boiler protection. It indicates whether a signal from the 'Switch B' button on the PCB of the PRESS-control is being received and it indicates how many days the boiler protection has been switched off. It also shows the status of the alarm relay. |
| 4. | PSA Generator | This screen indicates whether the valves for the production of nitrogen are activated. It includes the 3 different solenoid valves for the Pressure Swing Adsorption process, the compressor activation signal and the status of the sluice valve. |
| 5. | Tank controls | This screen shows the status of the nitrogen blanket pressure control and total system pressure control. It indicates which mode is active, such as; N2 in, N2 out, Boiler and Alarm. |
| 6. | Input info. | This screen gives an overview of all the input signals available on the PRESS-control PCB. The status of each signal is indicated by a "0" or "1". |
| 7. | Output info. | This screen gives an overview of all the output signals available on the PRESS-control PCB. The status of each relay is indicated by a "0" or "1". |

## 6. Service menu

The service menu contains more advanced settings for the expansion system. This menu is intended for the service technician, when the system is being commissioned or to make adjustments during maintenance. The service menu can be accessed by pressing the Prog button once when the PRESS-display is on the main screen. The software will then ask for the menu access code. This code is only available to the service technician.

## 7. Factory menu

The factory menu contains the critical software and hardware settings for the operation of the PRESS-control motherboard and the PRESS-display. This menu is for setting up the nitrogen generator when it is tested at the factory.

The factory menu can be accessed by pressing the Prog button for 3 seconds when the PRESS-display is on the main menu. The software will then ask for a factory menu access code. This code is only available to the service technician.

## 8. Standby

When the PRESS-display is in operation, it can go into standby mode to reduce power consumption and wear and tear on the hardware. The PRESS-display goes into standby mode when no buttons are pressed on the PRESS-display for a period of 5 minutes and there are no alarms or error messages. In standby mode, the display will automatically return to the main screen.