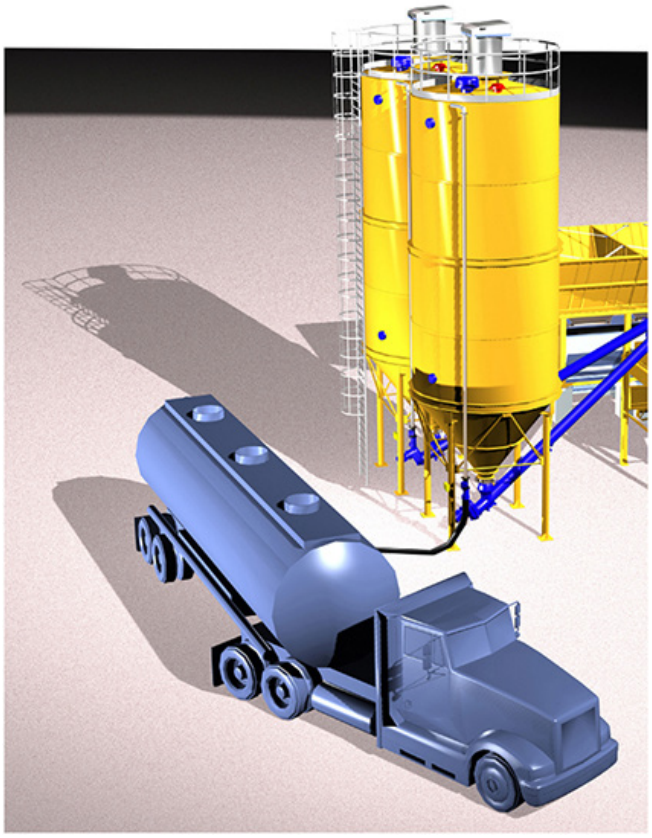
EN

KCS

SILO SAFETY SYSTEM

USER'S INTERFACE MANUAL



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ORIGINAL INSTRUCTIONS IN ENGLISH

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WAMGROUP

TOREX®

All the products described in this catalogue are manufactured according to **TOREX S.p.A. Quality System procedures**. The Company's Quality System, certified according to **ISO 9001-2008** guarantees that the entire production process, from the customer's order to the after sales service, can fulfil the product quality standard.

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1.1 Scope of the Manual

This Manual has been prepared by the Manufacturer to provide the operating technical information for installation, operation and maintenance of the equipment concerned.

The Manual, which is an integral part of the equipment concerned, must be preserved throughout the life of the equipment in a known easily accessible place, available for consultation whenever required.

If the Manual is lost, damaged or becomes illegible, contact the Manufacturer for a copy specifying the serial number of the equipment.

If the equipment concerned changes ownership, the Manual has to be handed over to the new owner as part of the equipment supply.

The Manual is meant for specialist technical personnel appointed and authorized by the Manufacturer, owner and installer to act on the equipment concerned for which specific technical skills in the sector concerned are necessary (electrical, mechanical, etc.).

The illustrations may differ from the actual structure of the equipment concerned but do not interfere with the explanation of the operations.
In case of doubt, contact the Manufacturer for explanations.

The Manufacturer reserves the right to make changes to the Manual without the obligation to provide prior notification, except in case of modifications concerning the safety level.

The technical information included in this Instruction Manual is the property of the Manufacturer and therefore has to be considered as confidential.

It is forbidden to use the Manual for purposes other than those strictly linked to the operation and maintenance of the equipment concerned.

This information is provided by the Manufacturer in the original language (English) and can be translated into other languages to satisfy legislative and/or commercial requirements.

Important

This document contains specific indications for the KCS control card.
It does not contain all the information for the correct use of the KCS system.
It is necessary to read the “Installation and Maintenance Manual” manual for the KCS system, delivered with the system itself and available on our website “WAMGROUP”. If you did not receive it and you cannot access the website, please contact the TOREX Sales Department or your reference WAM® branch.

1.2 Symbols

To highlight certain parts of the text, for purposes of safety, or to indicate important information, certain symbols are used, the meaning of which is described below.

It is important to comply with and scrupulously follow the information highlighted by the symbols.

Danger - Warning

Indicates situations of serious danger which, if ignored, can be risky for the health and safety of persons.

Caution

Indicates that appropriate behaviour must be adopted to avoid posing risk for the health and safety of persons and avoid causing economic damage.

Important

Indicates particularly important technical information which must not be ignored.

1.3 Glossary and terminology

Operator: person appropriately trained and authorized by the Production Manager for setting up the equipment concerned and carrying out routine maintenance.

Installer: organization with specialized technicians and appropriate equipment for carrying out risk-free installation and extraordinary maintenance.

Specialist technician: person responsible for and authorized by the Manufacturer, owner or installer to act on the equipment; must have specific technical skills depending on the sector concerned (electrical, mechanical etc.). The specialist technician, in addition to being familiar with the working of the equipment concerned, must be familiar with the working of the plant or equipment on which the equipment concerned is installed.

Routine maintenance: includes all the actions necessary to keep the equipment in good working conditions, to ensure greater operating durability and to keep the safety requisites constant.

Extraordinary maintenance: all the actions meant to keep the equipment in perfect working order.

Setting in safety conditions: all the precautions the authorized personnel must adopt before acting on the equipment concerned.

The precautions are listed below.

- **Ensure that the equipment concerned is disconnected from all the mains and appropriate devices are used to prevent these from being reconnected accidentally.**
- **Ensure that all the moving parts of the equipment have come to a complete stop.**
- **Ensure the temperature of the equipment concerned is such that it does not burn.**
- **Provide appropriate lighting in the area around the operations.**
- **Wait for the material to be handled inside the equipment or machine concerned to settle down completely.**

1.4 Manufacturer's data and identification of equipment

See KCS Installation and maintenance manual.

1.5 Request for assistance

For all technical assistance, contact the Manufacturer's service network.
For all requests, provide the equipment identification data, the type of problem encountered and all other information which could be useful for identifying the problem.

1.6 Warranty

The conditions for validity and applicability of the warranty are specified in the sales contract.

1.7 Exclusion of responsibility

The equipment is delivered according to the specifications indicated by the Buyer in the order and the conditions valid at the time of purchase.

The Manufacturer shall not accept responsibility for safety of persons or objects and operation failure of the equipment if the loading/unloading operations from trucks, transport, positioning at the site, use, repairs, maintenance etc. have not been carried out in compliance with the warnings described in this Manual, and in accordance with the national legislation in force.

Likewise, the Manufacturer shall not accept any responsibility if the equipment concerned is used:
- improperly;
- by unauthorized persons and/or persons not sufficiently trained for installation, operation and maintenance;
- with modifications made to the original configuration without the Manufacturer's permission;
- with spare parts that are not original or are not specific for the model;
- without maintenance;
- non-pursuant to the regulatory standards and national or local legislation on the matter of occupational safety;
- non-pursuant to the recommendations in this Manual or on the warning and danger plates applied on the equipment.

2.1 General safety prescriptions

Read the Instruction Manual carefully and strictly follow the instructions it includes, especially those regarding safety.

Most accidents at the workplace are caused by negligence, failure to follow the most elementary safety regulations and incorrect or improper use of tools and equipment.

Accidents can be prevented and avoided by taking due care, using suitable equipment and adopting adequate preventive measures.

Apply and comply with the standards in force regarding workplace hygiene and safety.

The personnel trained for and authorized for the operations has to have the psychological/physical requisites, experience in the sector concerned and the necessary technical skills for carrying out the operations assigned to them.

All workers involved in any kind of operation must be prepared, trained and informed as regards the risks and the behaviour to be adopted.

Pay attention to the meaning of the notices applied on the equipment, keep these legible and respect the information indicated.

Use instruments, equipment and tools that have been approved and are intrinsically safe, and cannot alter the safety level of the operations or damage the equipment during installation, use and maintenance.

Modifications to the equipment components should not be made for any reason whatsoever, without the Manufacturer's permission.

In order to operate the whole system, the user must check also the product use and maintenance documents of every single device involved and controlled by KCS system.

2.2.1 SYSTEM SAFETY LEVEL AND SYSTEM CONFIGURATION

KCS system software is designed to safely manage the loading session of the silo: the safety level KCS can offer is however strongly linked to system user's configuration, type and quality of peripheral devices set and silo installation.

Recommended configuration features for a better safety level are:

- **installation of "extra level indicator"**
- **use of the rotation and failure sensor on maximum end extra level indicator**
- **choice of 4-20 mA electronic pressure gauge**
- **use of the pressure switch for pinch valve control unit**
- **system protection password enabled**
- **delay time between max.level indicator signal and pinch valve closure properly dimensioned according to silo installation and process applications.**

2.2 Safety prescriptions for transport and handling

See KCS Installation and maintenance manual.

2.3 Safety prescriptions for installation

See KCS Installation and maintenance manual.

2.4 Safety prescriptions for use and operation

Do not tamper with the equipment concerned by using any kind of device to obtain performances different from those designed.
All unauthorized changes can affect the health of people and the integrity of the equipment.

The operators have to exclusively wear protective clothing and have to be equipped with appropriate individual protection devices for carrying out the operations and as required by the safety and work accident prevention standards.

Before use, ensure that all the safety devices are installed and that they are working properly.

During operations, prevent access to the work area by unauthorized persons.

Remove all obstacles or sources of danger from the work area.

It is strictly forbidden to walk or placing any improper load on the equipment.

2.5 Safety prescriptions for maintenance and replacement of components

See KCS Installation and maintenance manual.

3.1 General description of the equipment

See KCS Installation and maintenance manual.

3.2 Main components

See KCS Installation and maintenance manual.

3.3 Operating principle

KCS works in master-slave mode, where the control board can drive up to 32 silo power cards: they are configured by means of 2 jumpers set in order to be identified with silo number and peripheral device set such as:

- Filter type: mechanical (Vibrating) or pneumatic
- Pressure indicator: mechanical pressure switch / electronic pressure gauge
- Electronic pressure switch signal range: 0-20 mA / 4-20 mA
- Pinch valve type: mechanic / pneumatic
- Pinch valve closing type: single / pulsed

All remaining silo configuration parameters must be set by means of the user's interface software.

3.3.1 STARTUP AND STANDBY

Once the system is turned on, a test is run to check all peripheral devices: during this test the pinch valve closure is checked and the silo power units are identified by means of the serial connection.

If no alarm is present and no truck is connected, KCS keeps the pinch valve open, continuously checks and displays the status of each silo and its devices, displays system alarms and warnings.

3.3.2 TRUCK CONNECTION AND LOAD SESSION

Once the truck is connected (truck connection contact switch OPEN), the sleeve is closed until the operator allows the loading to start[1].

If no alarm condition is present, once the load is enabled the pinch valve opens and the loading control session is started.

During this phase, any alarm condition (except for the maximum level) will cause the immediate pinch valve closure (single or pulsed), the audible alarm activation and the RED light signal for the silo concerned.

When the maximum material level is reached, the pinch valve is closed after a delay time: this delay can be configured for each silo. An "extra filling" procedure is possible after the valve has closed, by means of a specific button that opens the pinch valve as long as it is pressed.

If the alarm condition is cancelled the pinch valve gets open again, the siren stops and the GREEN light is set back for the silo concerned.

The system is able to control more than one loading session at the same time.

[1] If night load mode is set for that silo, loading enable is not needed and truck can start loading immediately after connection.

3.4 Permitted use

KCS is intended to be used as a control system for silo loading operations: it is furthermore intended to be used preferably in connection with WAMGROUP's peripheral devices.

3.5 Improper use not permitted

Any other use or operation not included at Chapter 3.4 and any configuration not including the devices listed in 3.3.

3.6 Noise level

See KCS Installation and maintenance manual.

3.7 Environmental operating limits

See KCS Installation and maintenance manual.

3.8 Overall dimensions and technical features

See KCS Installation and maintenance manual.

3.9 Safety and information signs

Danger - Warning

Follow the warnings on the plates.
Ensure that the plates are readable; otherwise clean them and replace the damaged ones, placing them in their original position.

3.10 Safety devices

See KCS Installation and maintenance manual.

4.1 Type of packaging

See KCS Installation and maintenance manual.

4.2 Reception of goods

On receiving the goods, ensure that the type and quantity correspond to the data present on the acknowledgement of order.

Possible damage has to be immediately communicated in writing in the space provided to this purpose in the waybill.

The carrier is obliged to accept the complaint and leave the Customer a copy of the waybill.

If the supply is “free destination” a copy of the waybill and of the complaint shall be sent to the Manufacturer or to the forwarder.

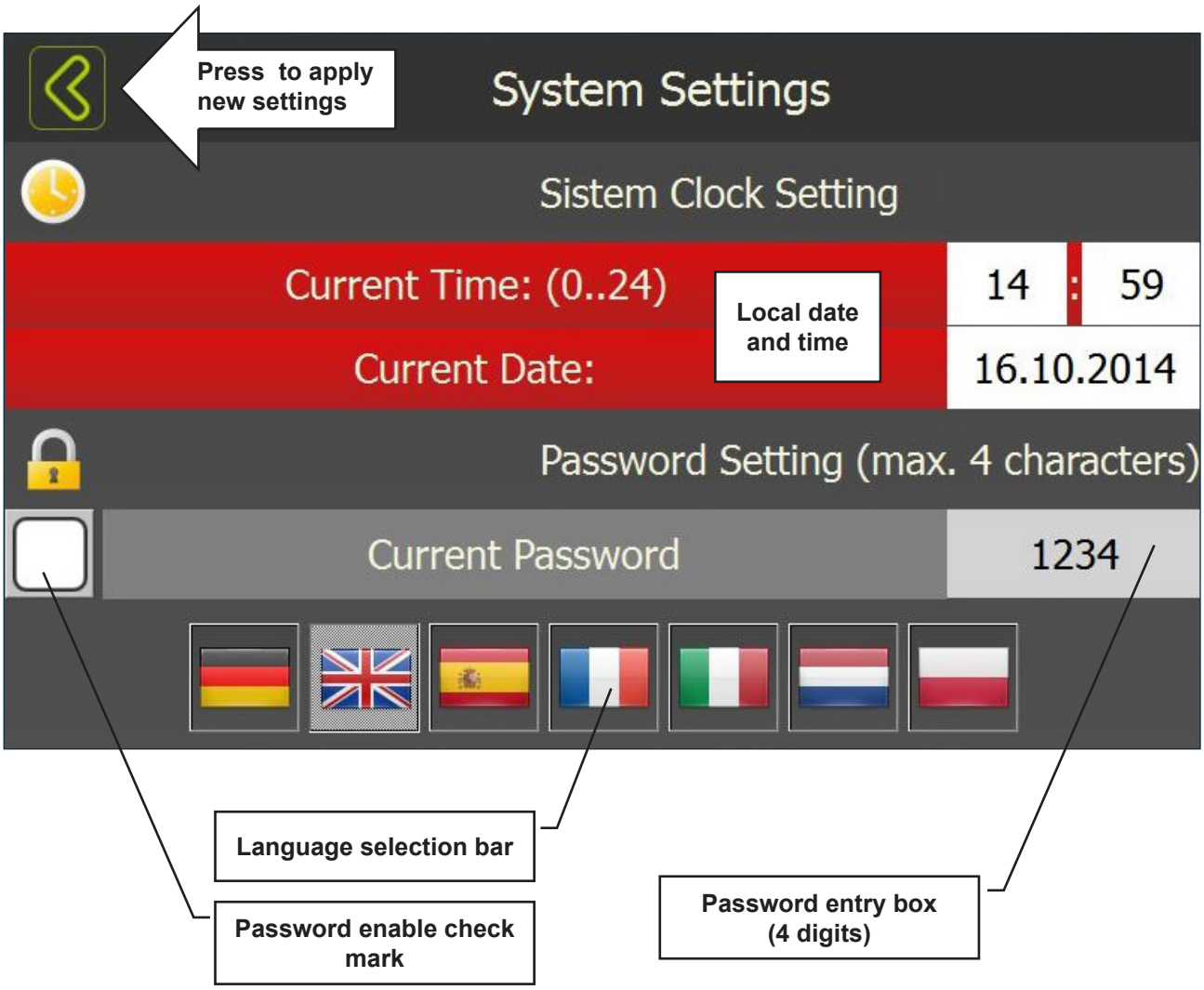
If the damages are not claimed immediately on receipt of the goods, your request for compensation may not be accepted.

4.3 Lifting and unloading methods

See KCS Installation and maintenance manual.

5.1 System settings

At the very first system startup, the system setting page will appear.



5.1.1 LANGUAGE

When the language is changed, the system will demand to reboot to set the selected language.

Once the system settings have been changed, the system will display the "Home page".

5.1.2 SYSTEM PASSWORD

When enabled, the system password will be asked for:

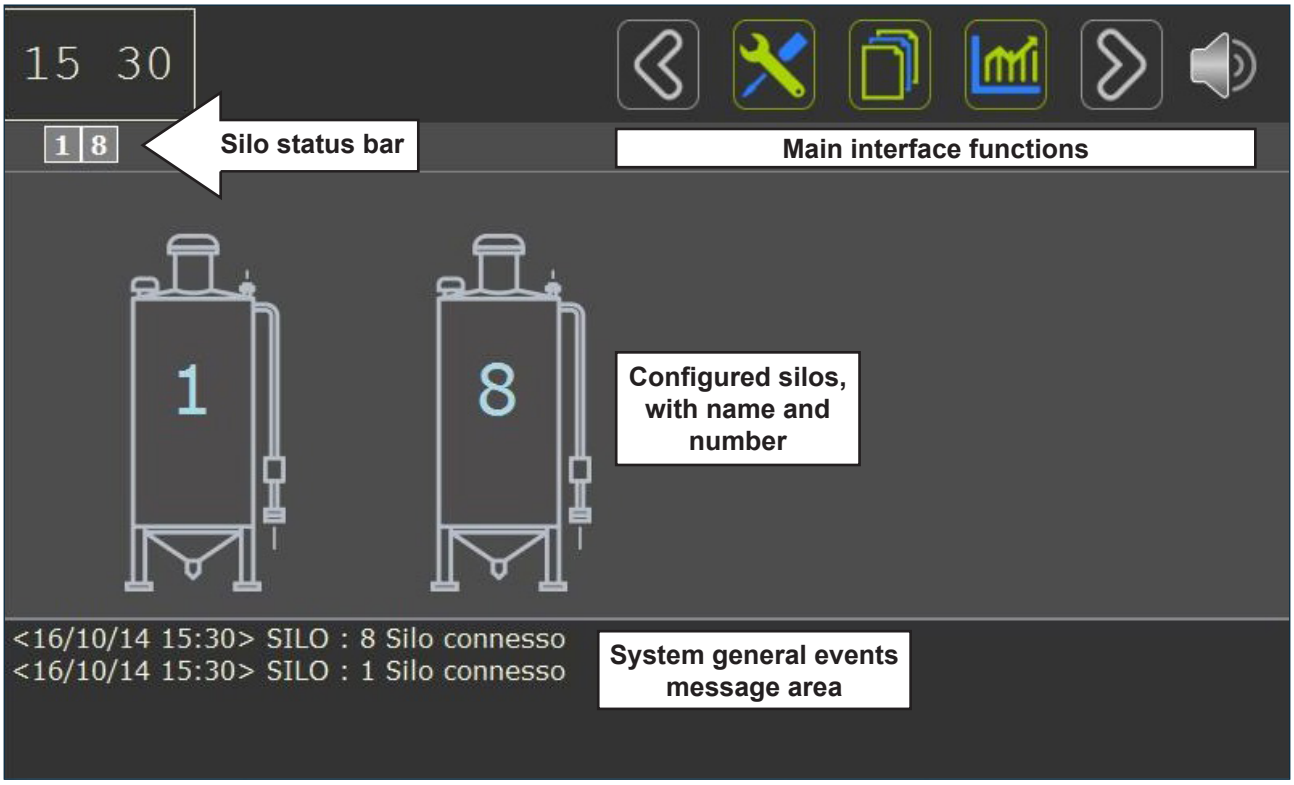
- Any access to the Setup Menu
- Silo overfilling

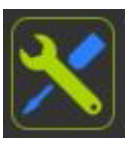
The above operations have to be carried out by authorized and qualified personnel only: any improper use can seriously compromise the silo safety.

The use of the system protection password is strongly recommended.

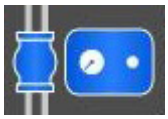
5.2 Home page and main functions

This page displays the general status of the silo system.



HOME PAGE MAIN FUNCTIONS	
	**Home:** always reaches the page of general plant view.
 	**Right/Left:** it allows to scroll plant silos (home page) or more generally to switch from one silo to the previous or next one. When just "LEFT" is present, it skips back to the previous window. When just "RIGHT" is present, it skips forward to the following operation step.
	**Setup:** it displays the system configuration page.

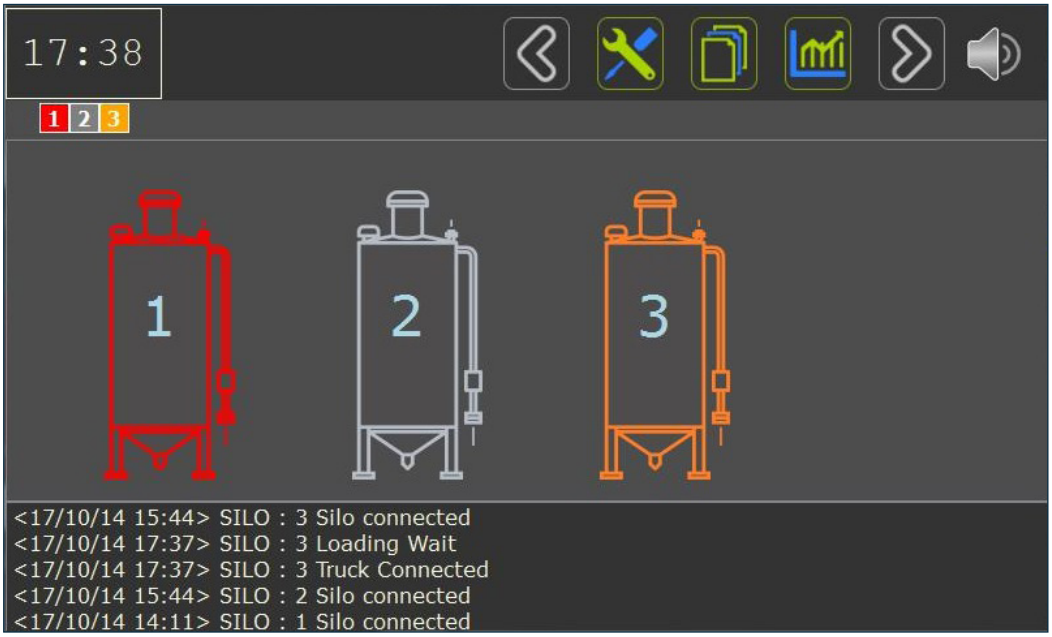
	**Documents:** it enters the "Help on Line" area
	**Statistics:** it enters the system events list.
	**Audible alarm:** this button turns RED when a system alarm occurs. The audible alarm is switched off when pressed.

OTHER ICONS / FUNCTIONS			
	**Silo:** use this icon to select a silo in any area of the SETUP menu		
	**Level indicator**	**Filter unit**	
	**Pressure relief valve**	**Truck connection**	
	**Pinch valve and control unit**	**Pressure gauge**	
	**Emergency push button**	**Overfilling**	
	**Escape:** use this icon to escape from a data entry window.	**Erase:** erase when in data entry.	
	**Start:** give authorization to filling operation once the truck is connected.	**Night:** night load enabled.	
	**Maintenance:** maintenance warning.		

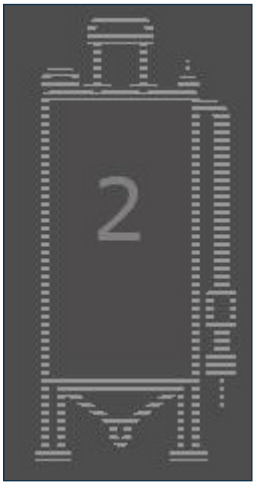
Silo images are colored according to their operation status:

COLOUR	Truck connection	Loading	Alarm
GREY	Free	None	None
ORANGE	Engaged	Waiting for authorization	None
GREEN	Engaged	Authorised, in progress	None
RED	Any	Not authorized	YES
DARK GREY (shaded)	Any	Any	No communication

If one or more silos cannot be displayed together on the same page, the silo status bar on top shows the numbers and status color; press  to scroll through all silos.



When communication is missing, the silo will appear as in the picture below.



5.3 System configuration

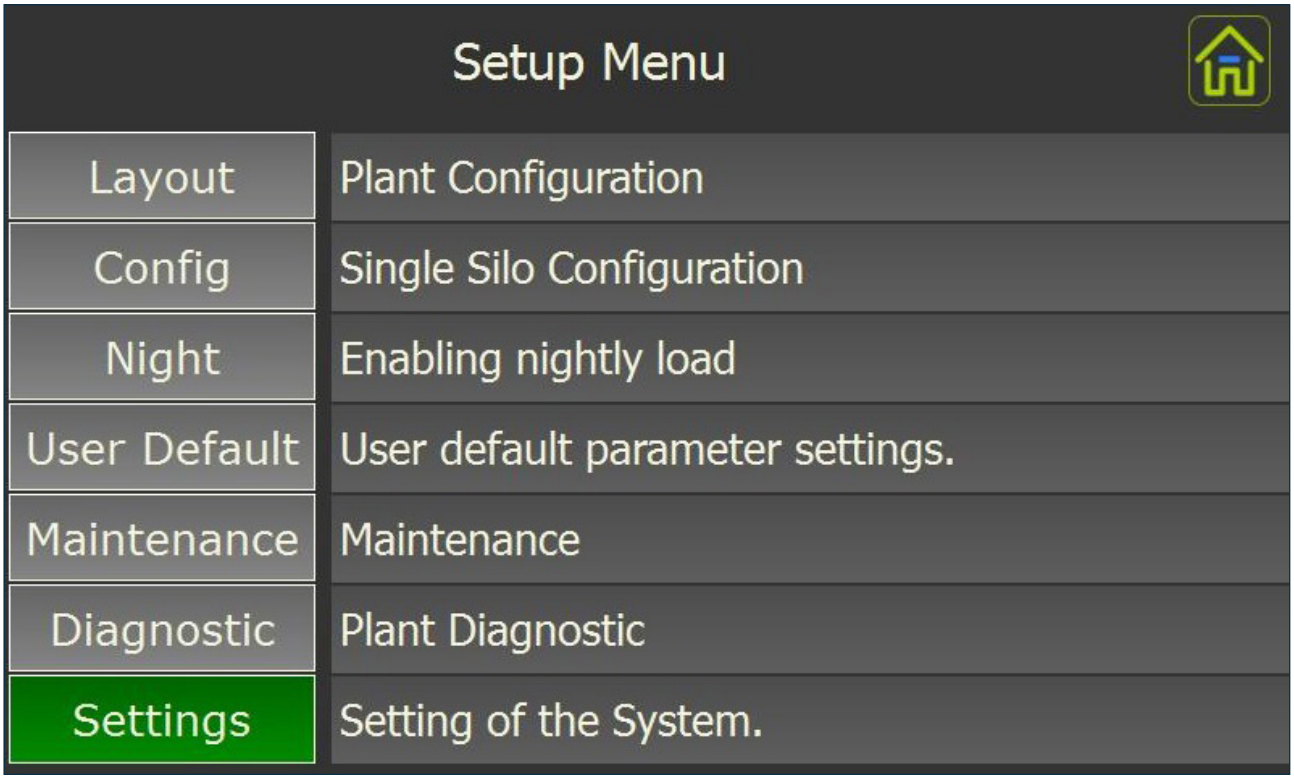
Danger - Warning

Some of the peripheral devices are not configurable in order to ensure a minimum system safety level. We strongly recommend to connect these devices completely and to avoid any manual connection bridging or removal.

Before starting any operation on the touch screen, press  to enter the SETUP.

If a password has been enabled, enter it on the keyboard window;

If  has been pressed wrongly, press  to skip back to HOME.

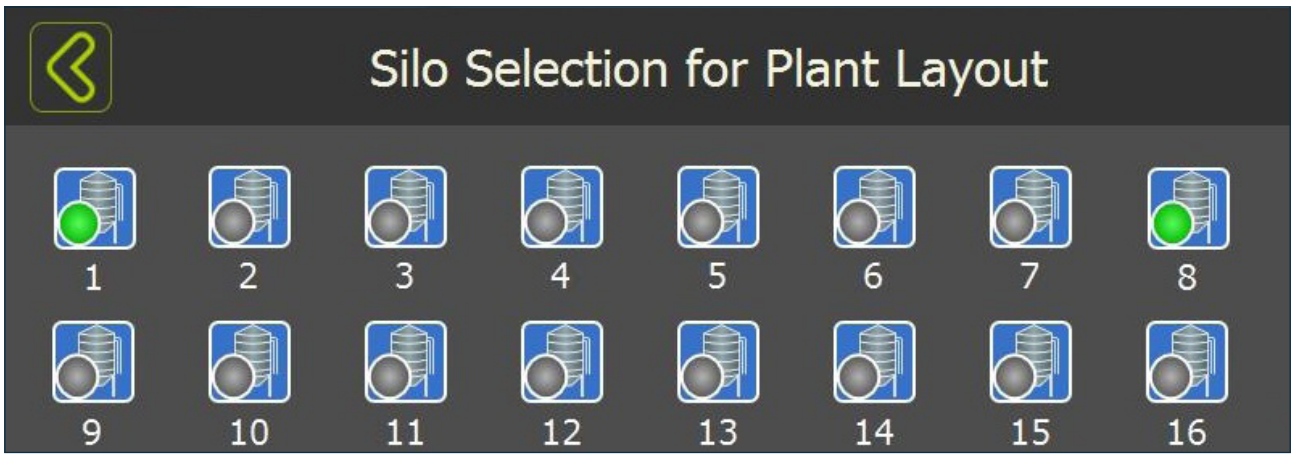


5.3.1 PLANT CONFIGURATION

Press **Layout** to insert the number of silos according to their address number.

Important

The silo number you select on this page must match the serial address number configured on each SP2 by means of the jumpers.

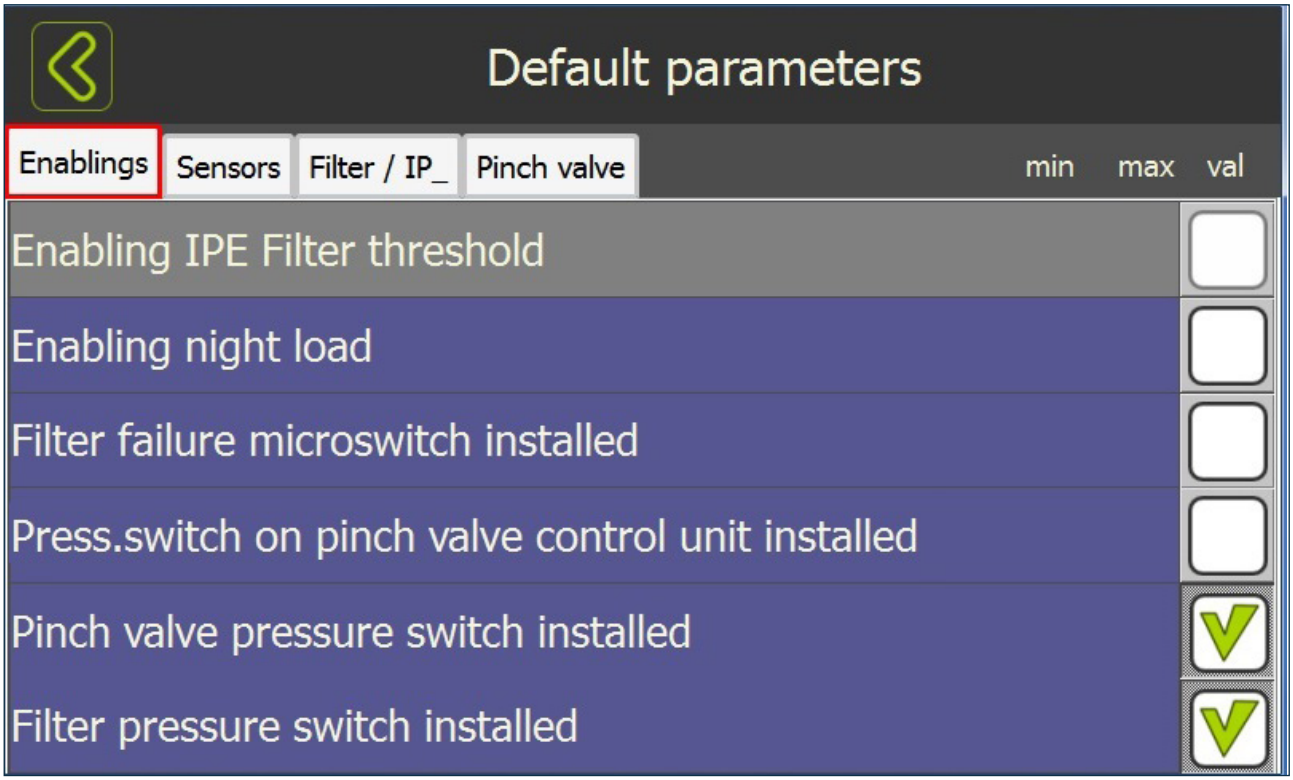


Once the silos have been selected, press  , confirm settings change and get back to SETUP.

5.3.2 SILO CONFIGURATION, USER DEFAULT

If plant silos have the same configuration or very similar to each other, a "User Default" configuration can be entered.

Press **User Default** and enter the configuration page:



5.3.2.1 ENABLINGS

Enabling IPE Filter threshold: this option can be used with electronic pressure gauge only.

When selected, filter cleaning will start once a **Pip** pressure level is reached, and will stop once the pressure inside the silo is lower than a **Pfp** pressure. (See 5.3.2.3).

Enable night load: when night load mode is on, the silo loading can be started without the authorization from the control board, but simply by means of truck connection. Loading will be stopped by the pinch valve when an alarm condition occurs.
A limited time during each day must be defined for this work mode. (See section 5.3.4)

Filter failure microswitch installed: when this option is ON, the system will read a N.C input contact from filter unit:

- Contact OPEN = filter unit out of order or failure alarm
- Contact CLOSED = filter unit working regularly.

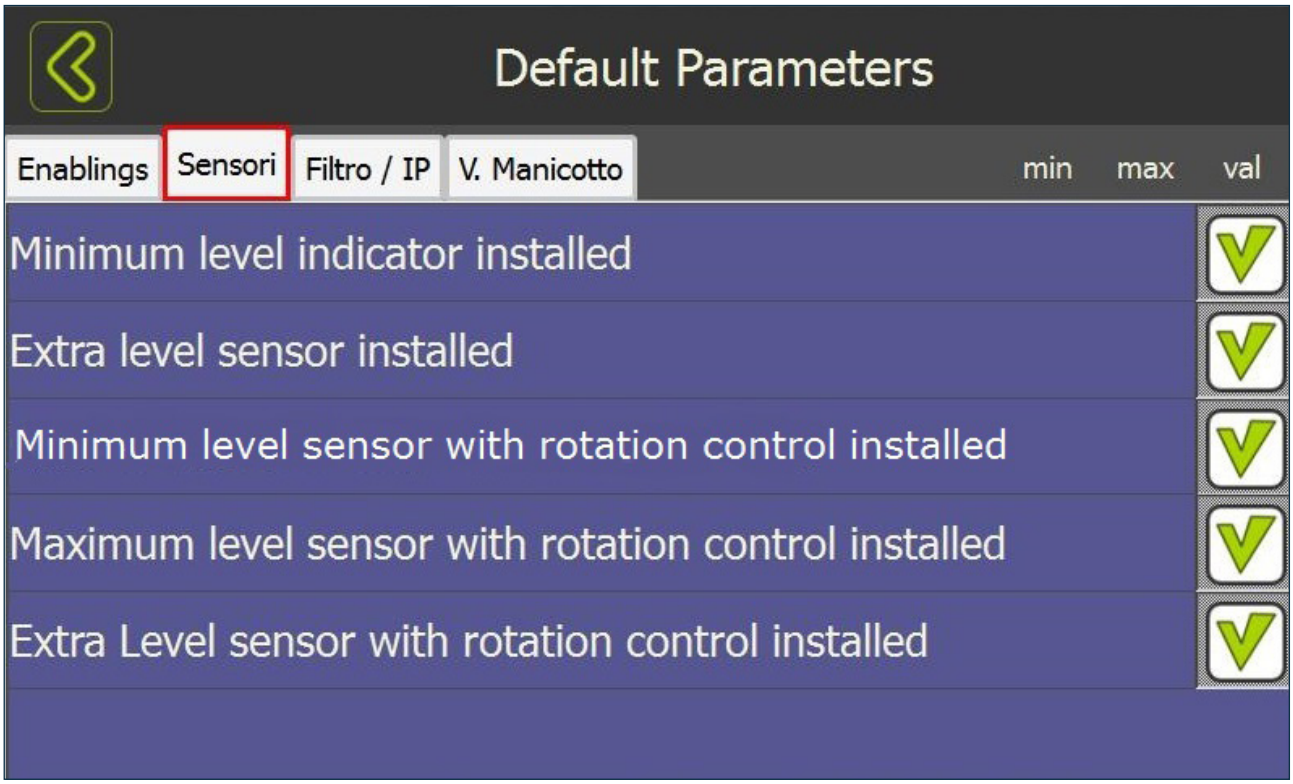
Pressure switch on pinch valve control unit installed: when this option is ON, a pressure switch is installed upstream the VMX pinch valve control unit.

Pinch valve pressure switch installed: when this option is enabled, a pressure switch is installed between the solenoid command VMX and the pinch valve.

It is strongly recommended to use at least 1 of 2 pressure gauges to ensure a suitable level of safety.

Filter pressure switch installed: when this option is ON, a pressure switch is installed at the filter unit air pressure line.

5.3.2.2 SENSORS



This window allows to select:

- If Minimum and/or Extra level indicators are present.
- Which level indicators have the rotation / failure control

Maximum level indicator must always be present on each silo: rotation and faiure detector is recommended for this unit.

5.3.2.3 FILTER UNIT AND PRESSURE GAUGES

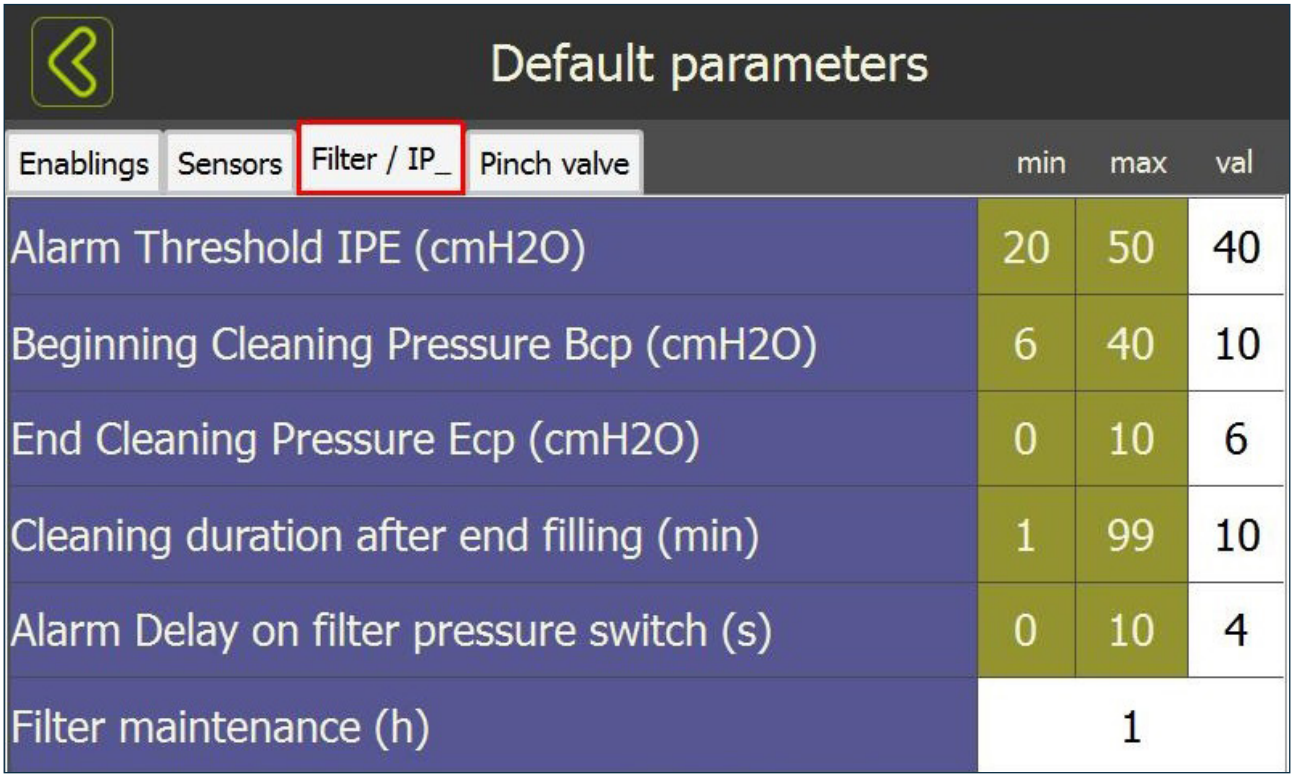
Set in this windows all working parameters for filter unit and electronic pressure gauge.

- A maintenance interval can be set, as regards filter cleaning work hours. Once the overall amount of cleaning hours is over the value set, a "Maintenance" warning will be given by the system. This warning does not prevent however any loading operation. Maintenance parameter can be set in this menu for all the silos only.

Important

It is recommended to set proper maintenance intervals and check the filter at every warning.

Parameter	Min.	Max	Factory setting
Alarm limit pressure **Pall** (cm H_2O) *Overpressure alarm occurs when the measured pressure exceeds this value.*	20	50	40
Cleaning START pressure **Pip** (cm H_2O) *Filter starts cleaning when the measured pressure exceeds this value.*	>= **Pfp**	<= **Pall**	10
Cleaning END pressure **Pfp** (cm H_2O) *Filter stops cleaning when the measured pressure is lower than this value.*	0	< **Pip**	6
Cleaning duration after end filling (min) *Once the silo loading has finished, filter cleaning will last as per the set value.*	1	99	10
Alarm delay on filter pressure switch (s) *When the filter pressure switch contact opens, the system waits for a set value before giving the "no air on filter unit alarm".*	0	10	4
Filter maintenance (h) *Filter cleaning maintenance interval.*			100



5.3.2.4 PINCH VALVE

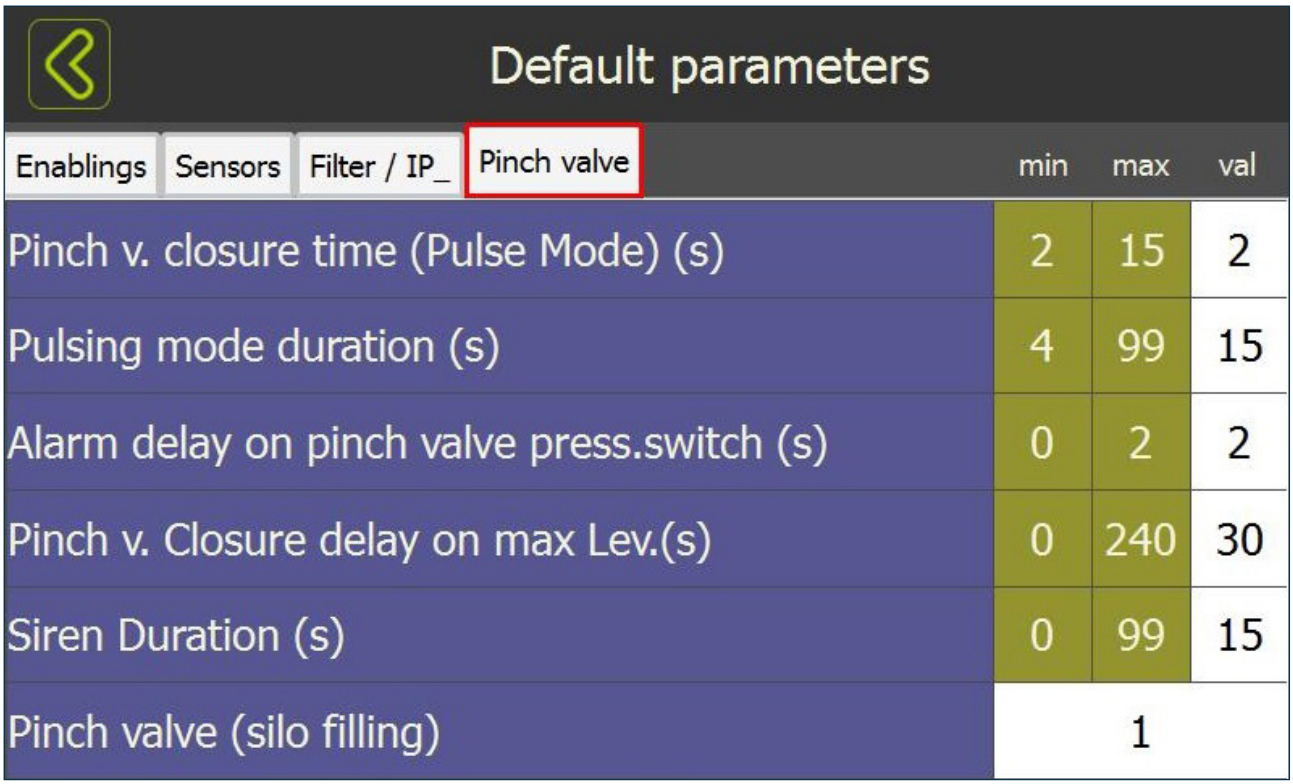
Set in this windows all working parameters for the pinch valve.

- A maintenance interval can be set as regards silo loading operation. Once the overall amount of complete silo operation is over the set value, a "Maintenance" warning will be given by the system. This warning does not prevent any operation on the system. One silo operation is counted every time a truck is disconnected from KAT after an authorized loading session. Maintenance parameter can be set in this menu for all the silos only.

Important

It is recommended to set proper maintenance intervals and check the pinch valve at every warning.

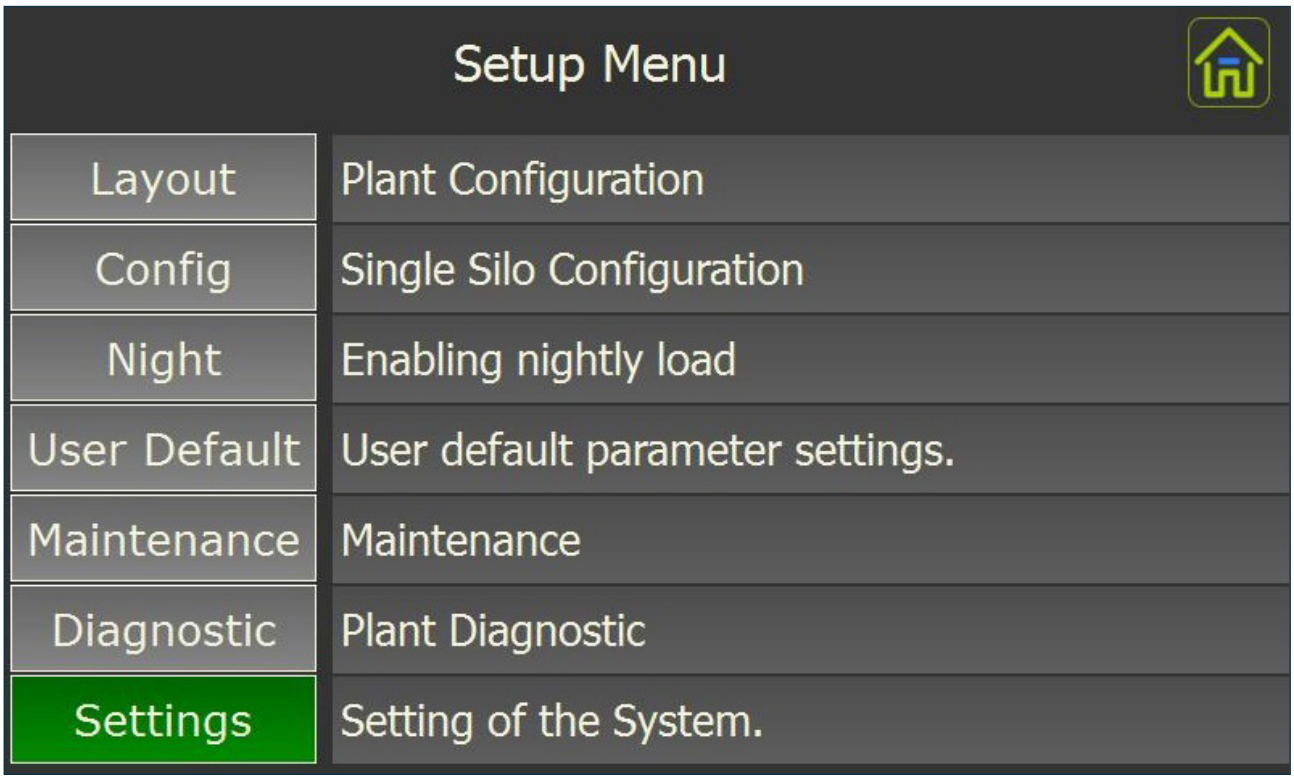
Parameter	Min.	Max	Factory setting
Pinch v.closure time (Pulse Mode) (s) *Cycle time between pinch valve pulsing opening and closing.*	2	15	10
Pulsing mode duration (s) *Pinch valve will pulse for a set time value before closing completely.*	= 2 x p.v.closure time	99	20
Alarm delay on p.valve pressure switch (s) *When the pinch valve pressure switch contact opens, the system waits the reaching of the set value before giving the "no air on pinch valve".*	0	= p.v.closure time	4
Pinch v.closure delay on max.Lev.(s) *When the maximum level indicator reaches the material, the system waits the reaching of the set value before giving the "max.level silo material" alarm.*	0	240	30
Siren duration (s) *Duration of audible alarm sound.*	0	99	15
Pinch valve maintenance (silo filling) *Pinch valve maintenance interval.*			1500



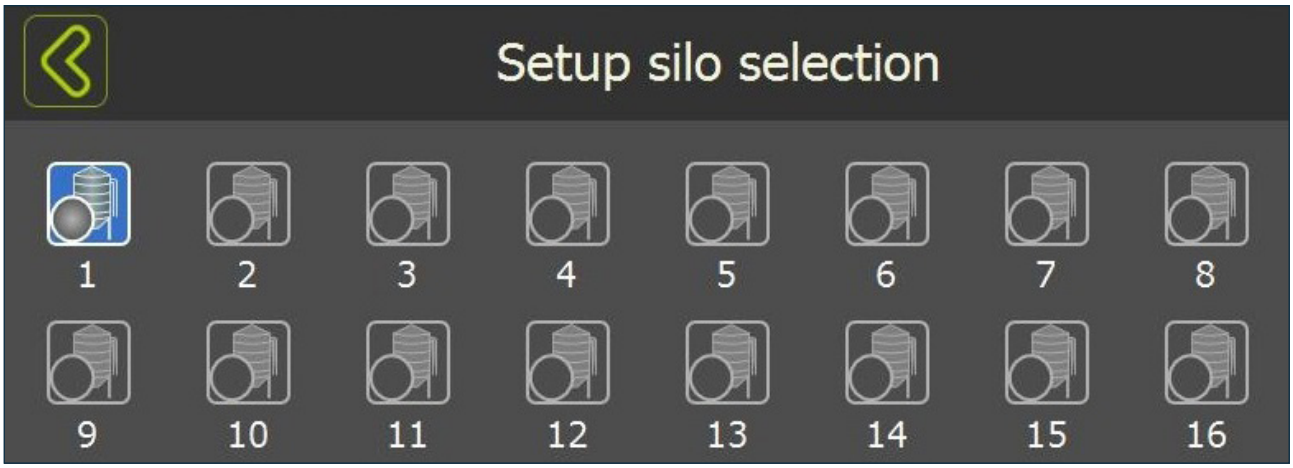
Once the default configuration is completed, press  , and confirm to apply the changes.

5.3.3 SILO CONFIGURATION

Press **Config** to configure every single silo of the plant.



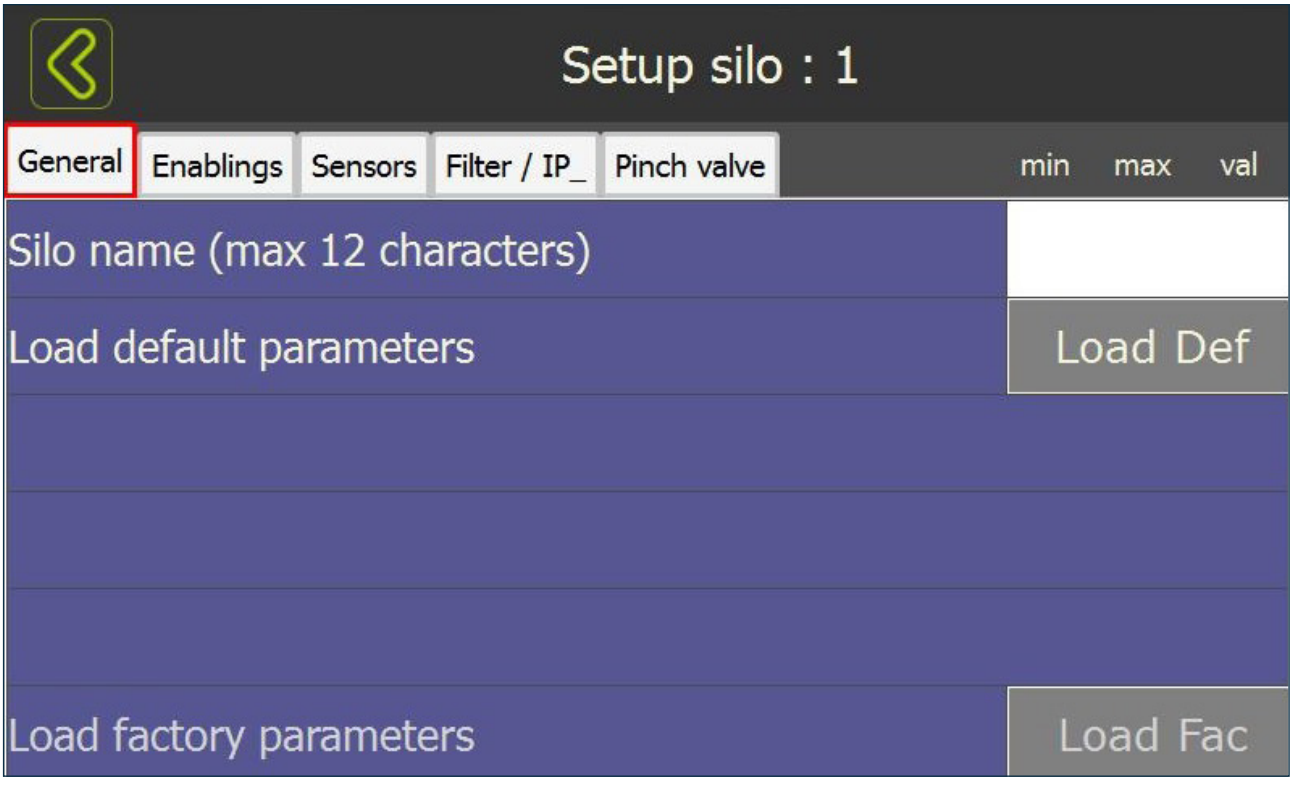
Select the silo to be configured.



5.3.3.1 GENERAL SETTINGS

In this window you can enter the silo name, which will be displayed in the home page on the side of every silo image.

Press **Load Def** to upload Default configuration on this silo; in case you need to reset silo to original factory settings, press **Load Fac**.



Complete silo specific configuration by following the configuration windows as per Ch.5.3.2

Once the silo configuration is complete, press  , and confirm to apply the changes.

For this configuration menu, some options will appear in GREY; they cannot be modified if the specific silo configuration does not involve them.

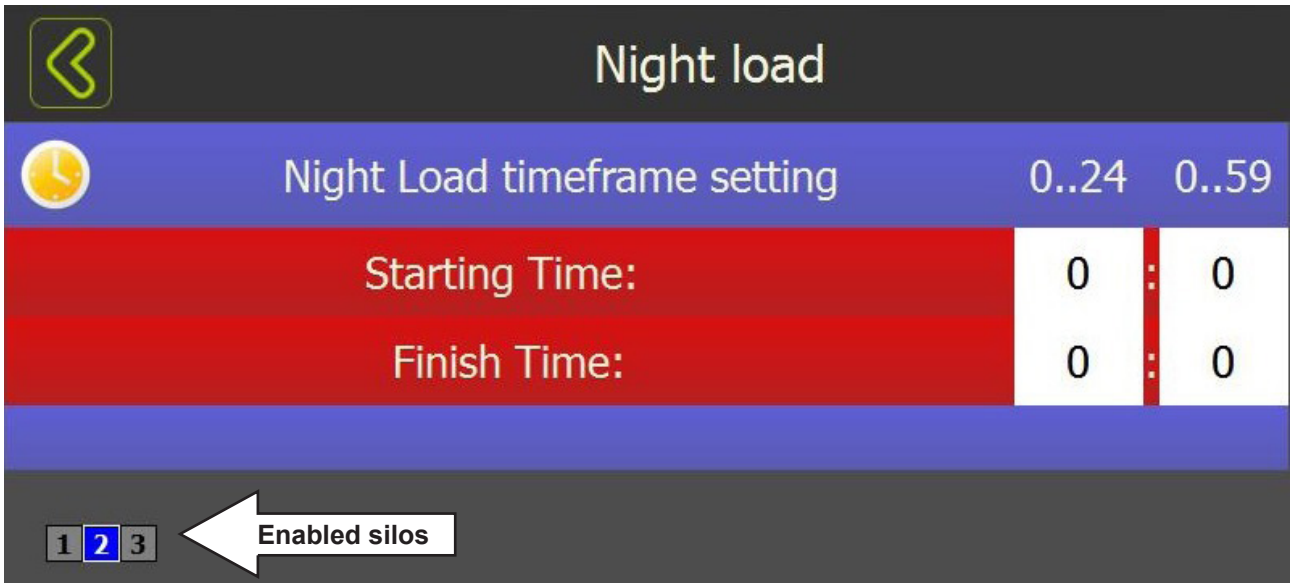
Follow the above steps for every silo.

5.3.4 NIGHT MODE

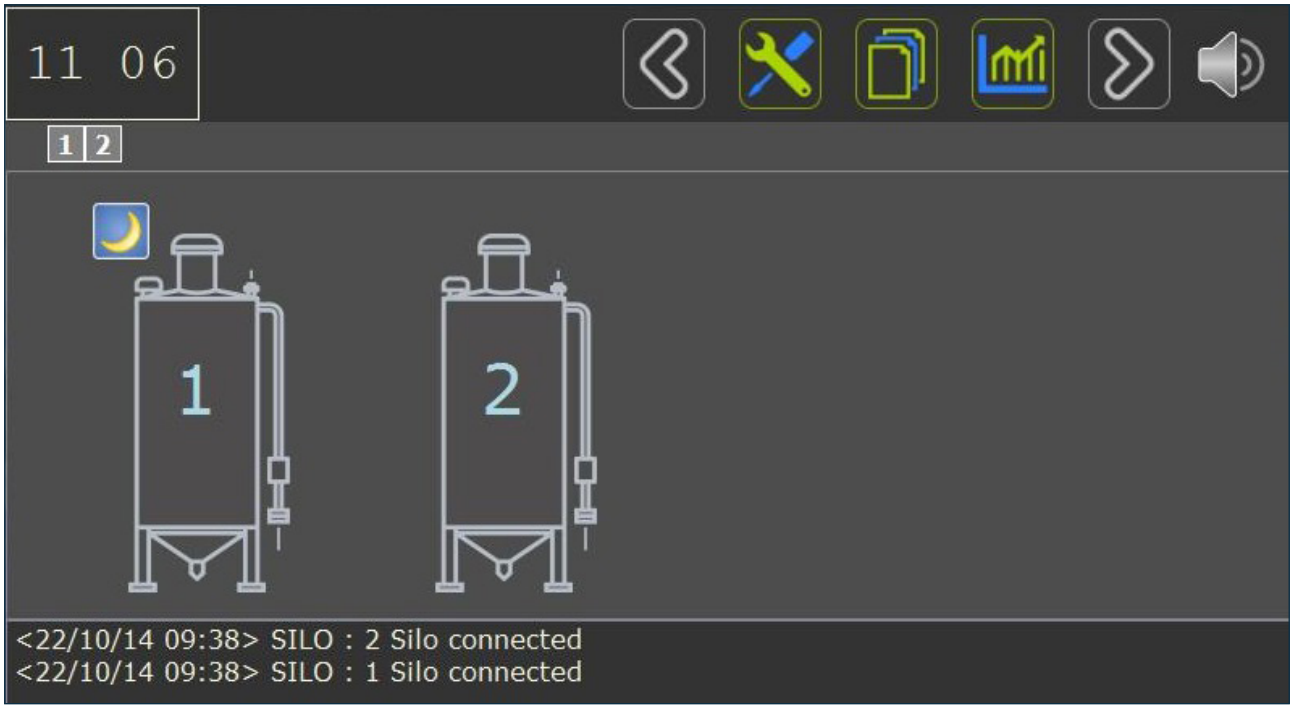
If the night loading mode is used, press **Night** to set the night mode operation time.

The square icons at the bottom, show which are the enabled silo numbers.

Once a silo is enabled for night load, this operation mode will be enabled every day at the set hours.



Once the silo configuration is complete, press  , and confirm to apply the changes.

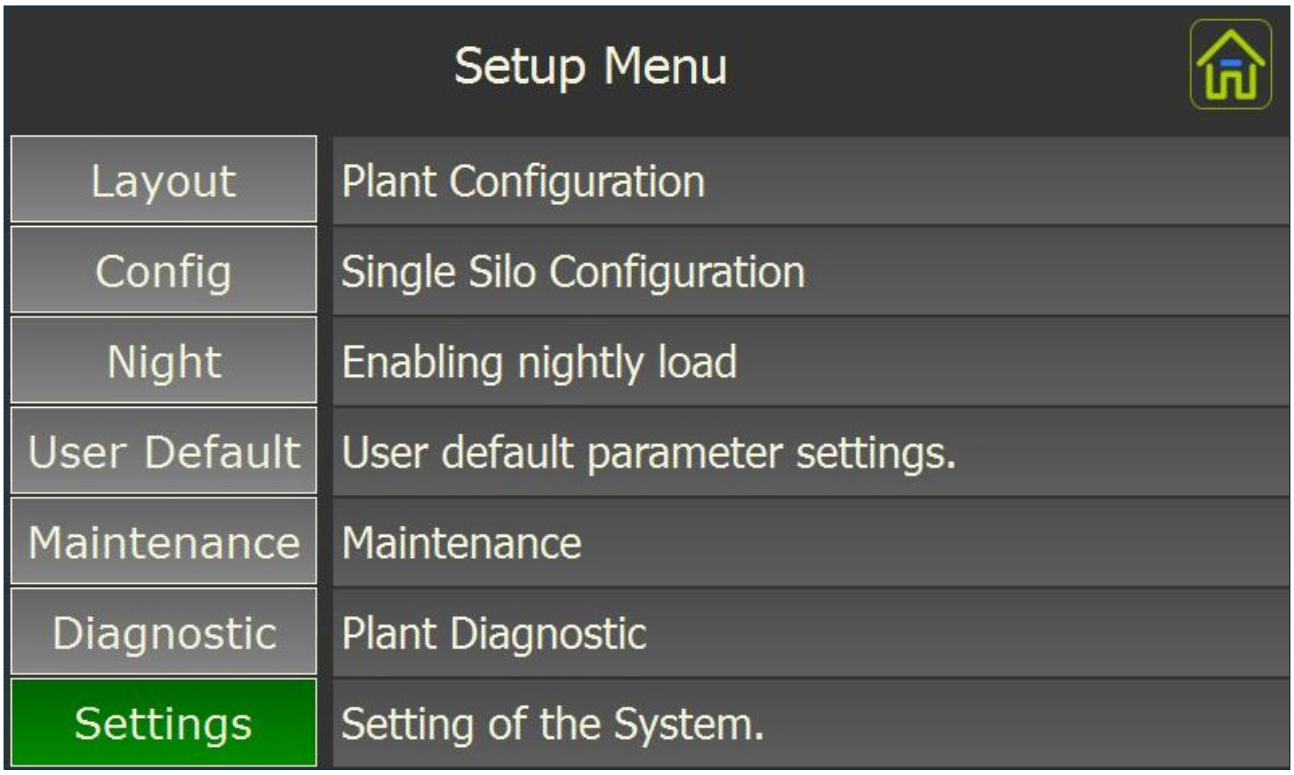


On the home page, a  mark will be present on every silo form whose night load has been enabled.

5.3.5 DIAGNOSTICS

This area allows to check the physical status and working condition of the peripheral devices according to the control and silo card input/output signals.

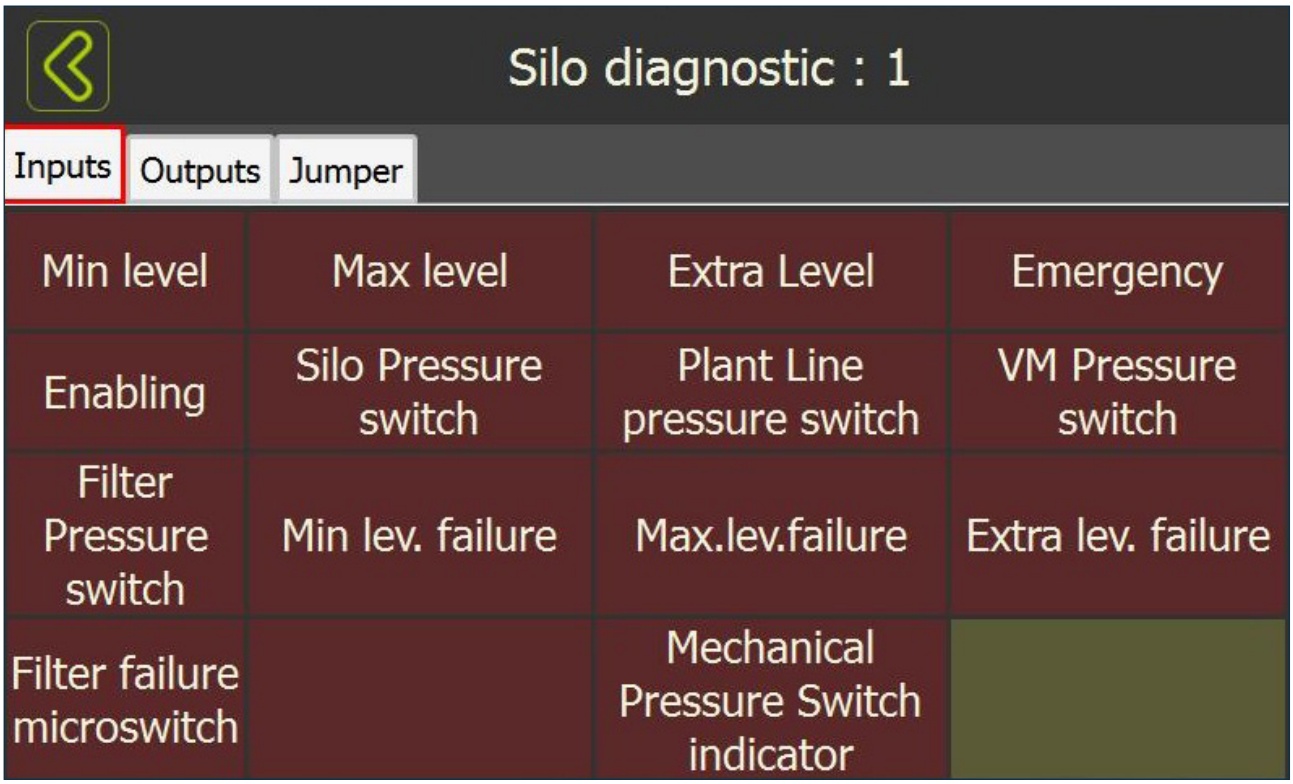
Press **Diagnostic** to enter the diagnostic silo selection window:



Select the silo number you want to check:

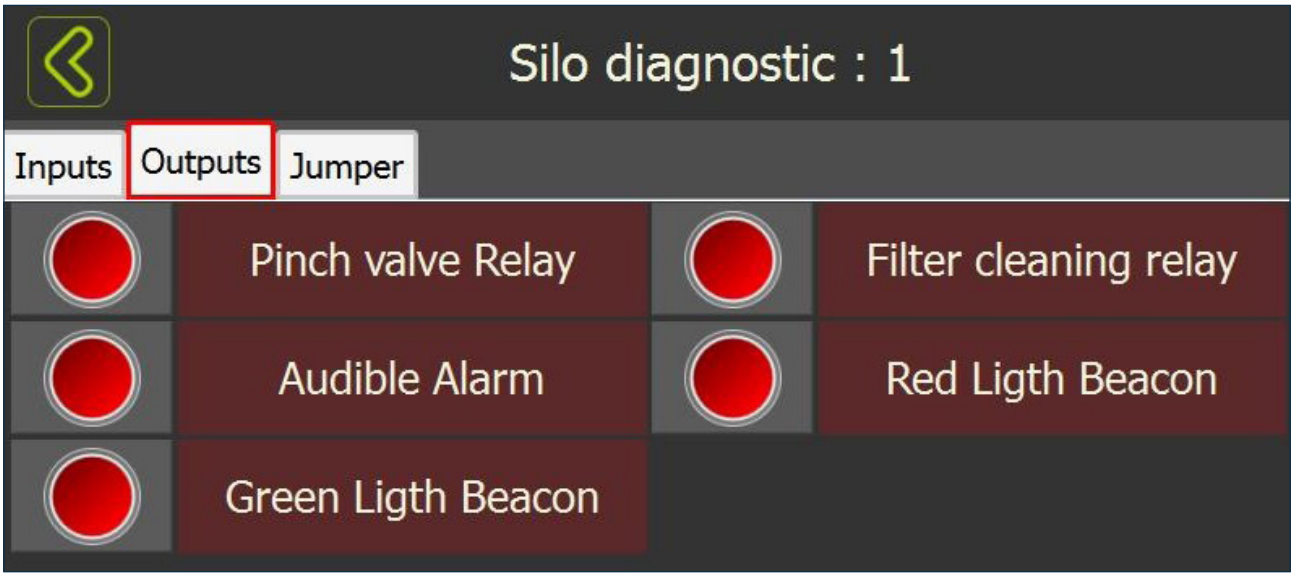
5.3.5.1 INPUTS

Signal	Light	Connection (card-plug-pins)	System status
Min. Level	ON	SP2-J8- 41,45 OPEN	Material at Min. Level. (level sensor engaged)
Max. Level	ON	SP2-J8- 42,47 OPEN	Material at Max. Level. (level sensor engaged)
Extra. Level	ON	SP2-J7(24V), J8(49) OPEN	Material at Max. Level. (level sensor engaged)
Emergency	ON	SP2-J5 OPEN	Emergency pushbutton pressed.
Enabling	ON	SP2-J10- 51,52 OPEN	Truck connected to silo.
Pressure relief valve	ON	SP2-J10- 52,53 OPEN	Pressure relief valve open.
Plant line pressure switch	ON	SP2-J10- 54,55 CLOSED	Air pressure >4.5 bar at press.switch on pinch valve control unit.
VM pressure switch	ON	SP2-J10- 55,56 CLOSED	Air pressure >2.5 bar at pressure switch on pinch valve.
Filter pressure switch	ON	SP2-J10- 57,58 CLOSED	Air pressure >4.5 bar at press.switch on filter unit.
Min. Lev. Failure	ON	SP2-J8- 41,46 OPEN	Level ind. failure
Max. Lev. Failure	ON	SP2-J8- 42,48 OPEN	Level ind. failure
Extra Lev. Failure	ON	SP2-J7(24V),J8(50) OPEN	Level ind. failure
Filter failure microswitch	ON	SP2-J8- 60,61 OPEN	Failure on filter unit.
Mechanical pressure switch	ON	SP2-J8- 58,59 OPEN	Overpressure (Mech. press. switch
Electronic press. gauge signal (mA)	mA	SP2-J3- 26,27,28	Displays the current analog signal from the electronic pressure gauge.

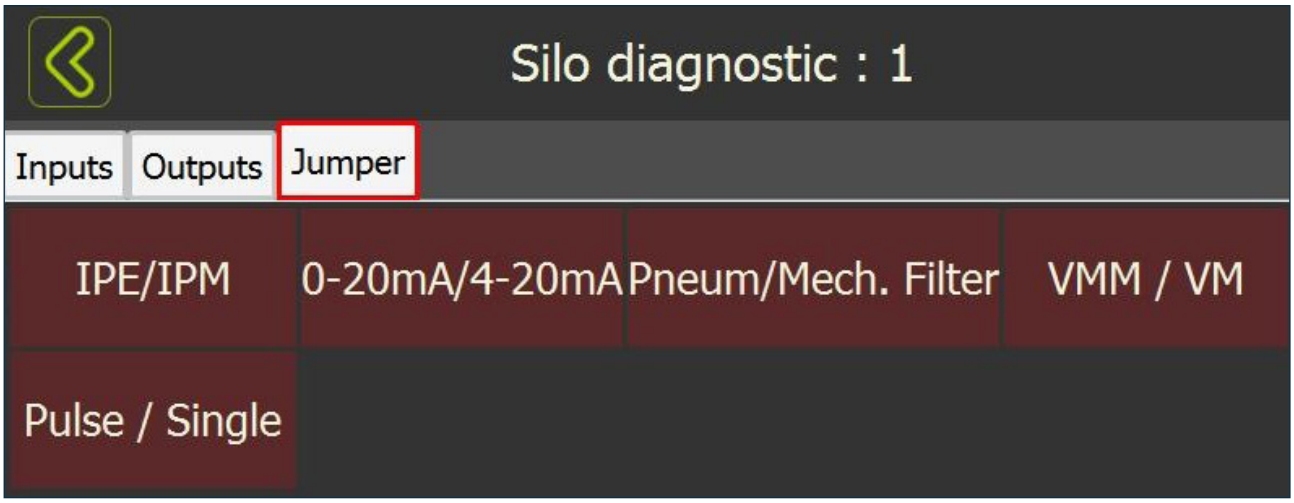


5.3.5.2 OUTPUTS

Signal	Light	Connection (card-plug-pins)	System status
Pinch valve relay	ON	SP2-J4- 6,7 – 24 VAC	Solenoid valve ON
Audible alarm	ON	SC_-J8- 8,9 CLOSED	Audible alarm ON
Filter cleaning relay	ON	SP2-J4- 3,4 OPEN SP2-J4- 4,5 CLOSED	
Red light beacon	ON	SP2-J4- 8,9 CLOSED	Red light ON
Green light beacon	ON	SP2-J4- 10,11 CLOSED	Green light ON



5.3.5.3 SP2 JUMPERS



	Light	Jumper on W2 (SP2)	Meaning
IPE/IPM	ON	J1 (1st left) engaged	Electronic pressure gauge
	OFF	J1 (1st left) free	Mechanical pressure switch
0-20mA / 4-20 mA	ON	J2 (2nd left) engaged	0-20mA electronic press.gauge
	OFF	J2 (2nd left) free	4-20mA electronic press.gauge
Pneumatic / Mech. Filter	ON	J3 (middle) engaged	Pneumatic Filter
	OFF	J3 (middle) free	Mechanical filter
VM/VMM	ON	J4 (2nd right) engaged	Mechanical pinch valve
	OFF	J4 (2nd right) free	Pneumatic pinch valve
Pulse / Single	ON	J5 (1st right) engaged	Pulsed pinch valve closure
	OFF	J5 (1st right) free	Single pinch valve closure

Once the diagnostic control has finished, press  twice then  to go back to home page.

5.4 Basic filling session

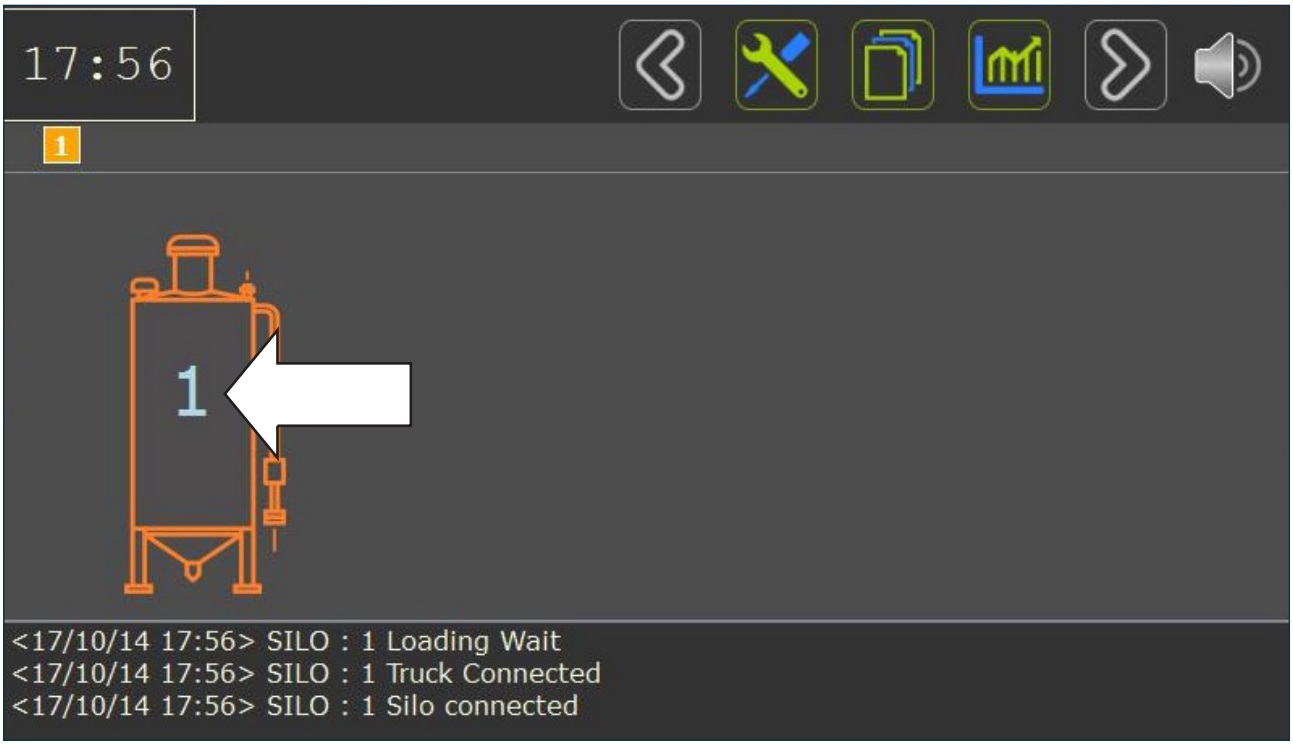
5.4.1 SESSION START – TRUCK CONNECTION

Ensure the Home Page is showing all silos of the plant, and that none has an alarm enabled on or a missing communication warning.

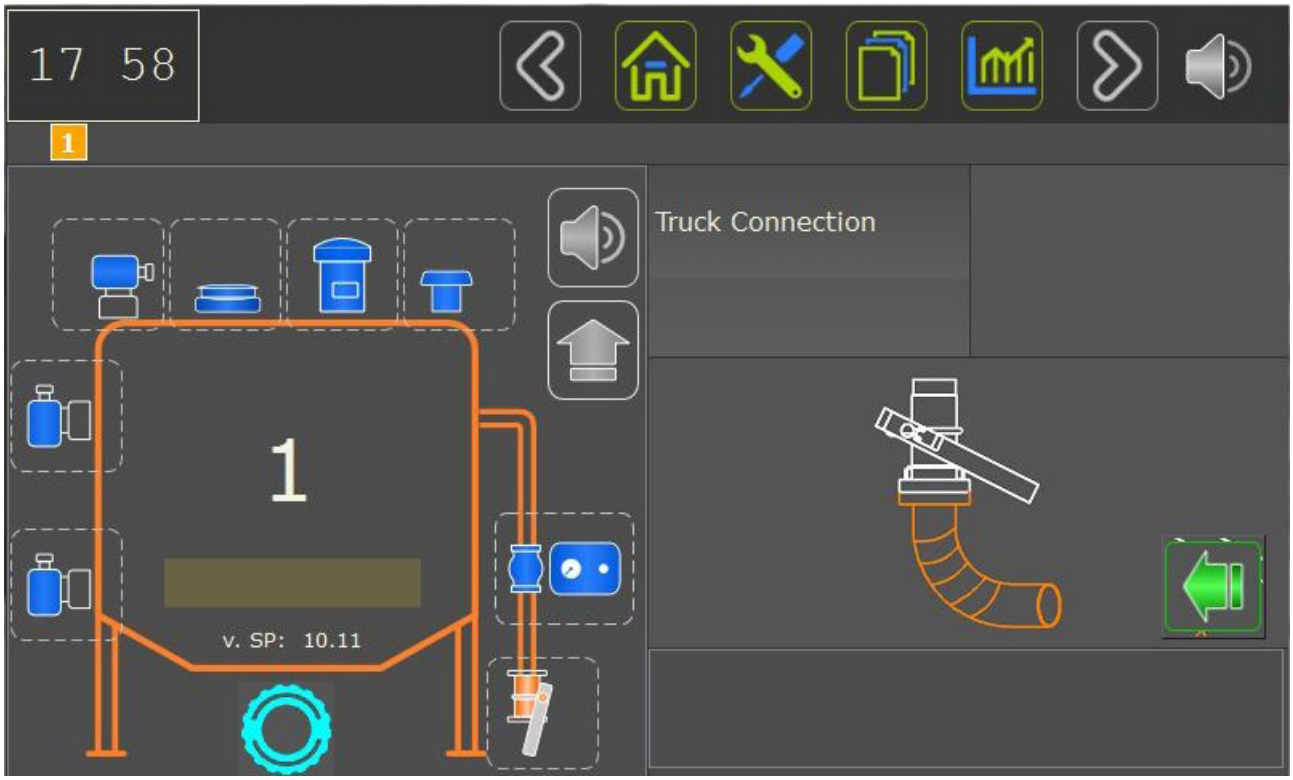
If any warning or alarm is present on the silo to be loaed, check the possible cause by means of the "Help on Line" or "Diagnostic" menu, or on the "Trouble shooting" section of this manual.

Once the truck is connected to the silo loading pipe by means of KAT, the silo icon will turn ORANGE.

If a light beacon is used, it will now turn RED.



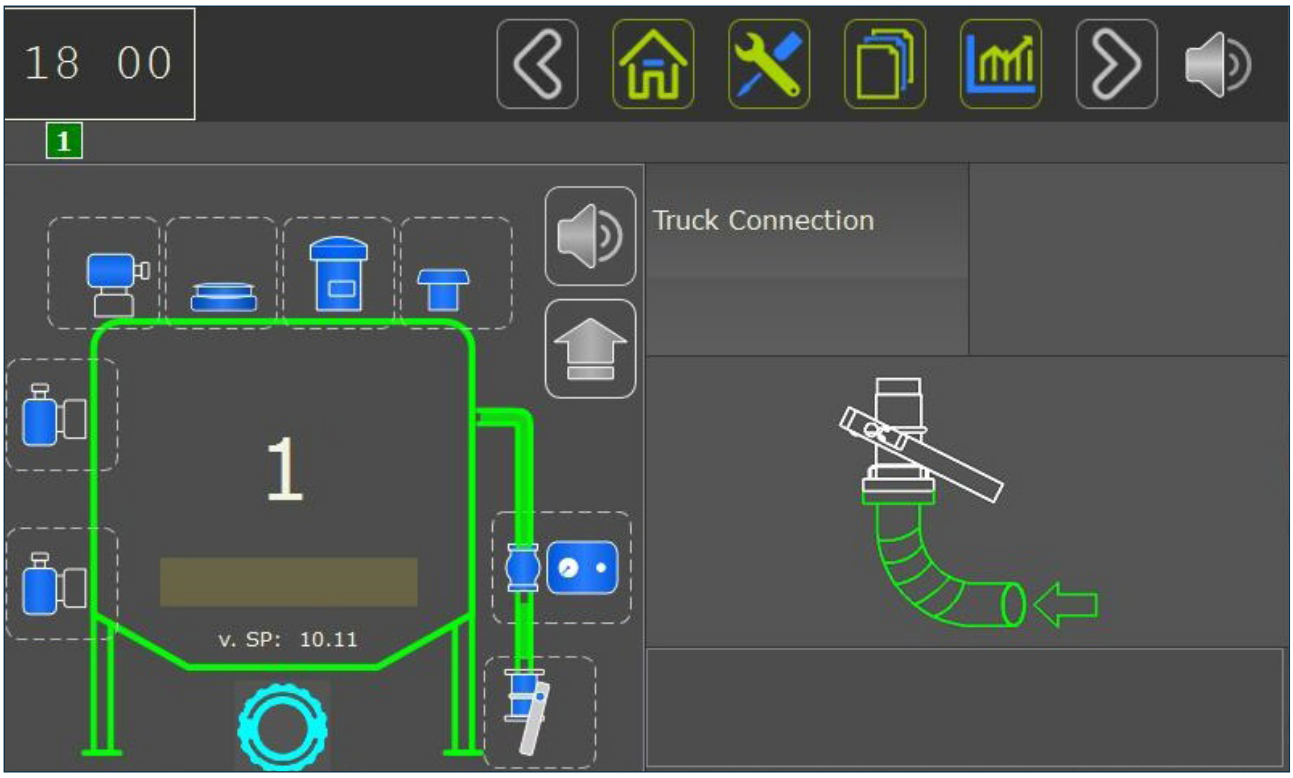
Press on the **silo number** to access the detailed silo view page.



To authorize the loading to start, press  ; the silo icon will turn GREEN and the loading sessions will be kept under control from now on.

If a light beacon is used, it will now turn GREEN.

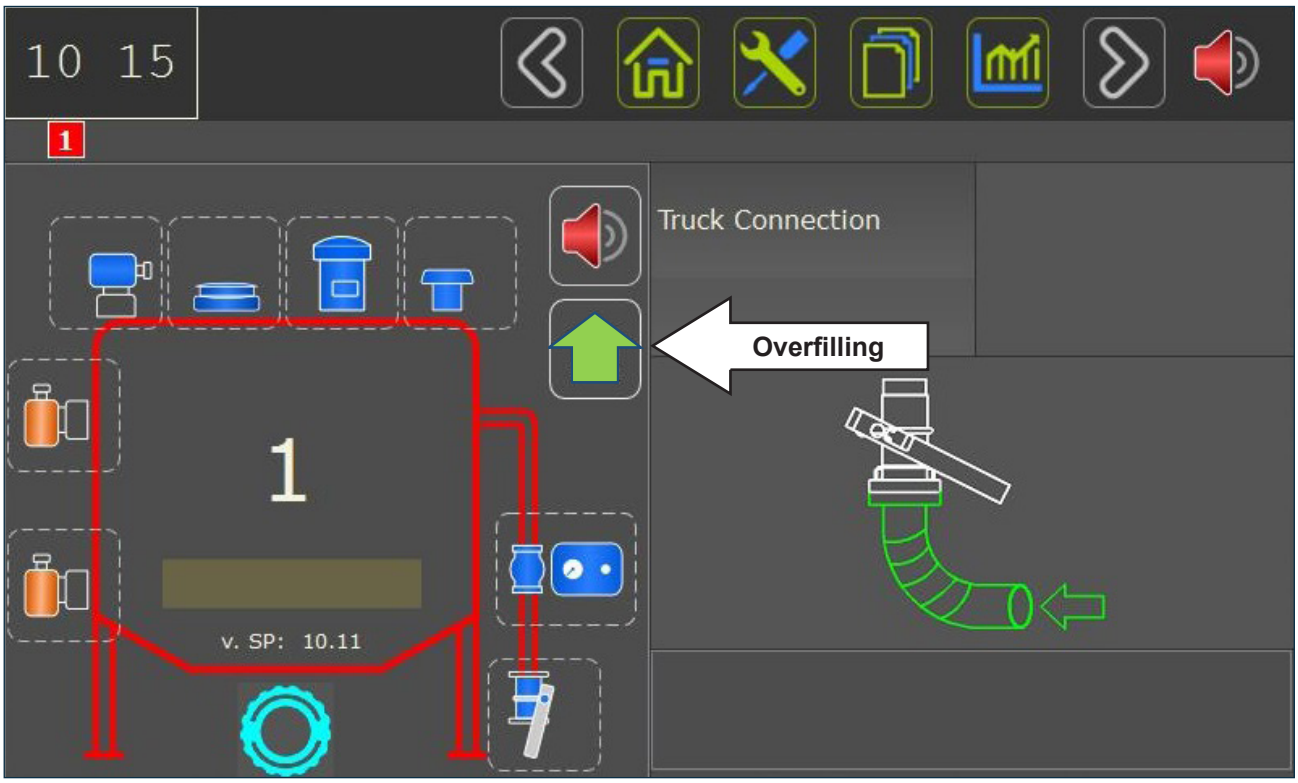
Loading will be allowed until any alarm condition will occur.


18 00
1
Truck Connection
1
v. SP: 10.11

5.4.2 SILO MATERIAL LEVEL MONITORING

The system can detect up to three different bulk levels inside the silo:

Maximum level: when the material reaches this level indicator, on the silo page the device icon will be ORANGE and the silo will be RED. After a delay time (see 5.3.2.4) the pinch valve will close, and the overfilling option will turn on.



Silo Overfilling:
Press the **green arrow** to open the pinch valve again and continue the silo filling as long as **green arrow** is pressed. **Release the green arrow** to close pinch valve.

If PASSWORD is enabled in the system setting, the system it will be necessary to enter the password before the overfilling is enabled.

Danger - Warning

This operation must be allowed and kept under control by authorised personnel only as it overrides the maximum level alarm. For this reason the use of extra level indicator is also strongly recommended.

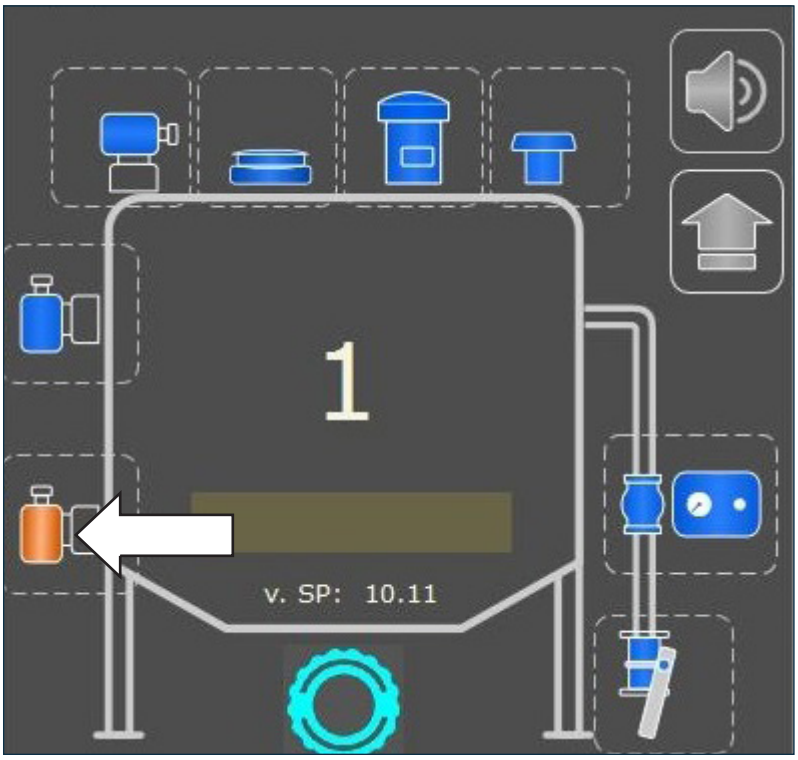
Extra level indicator: when the material touches the extra level indicator, the pinch valve is closed immediately and the system alarm is enabled. **No overfilling is possible.**

This device is used as a further safety measure in addition to the maximum level indicator.

Minimum / standard filling level: when the material reaches this level indicator, the silo page will show the device icon in ORANGE. No alarm is related to this event as it stands for information only. This monitoring level is used as an indication for reorder or standard filling level.

5.4.2.1 DETAILED DEVICE WINDOW

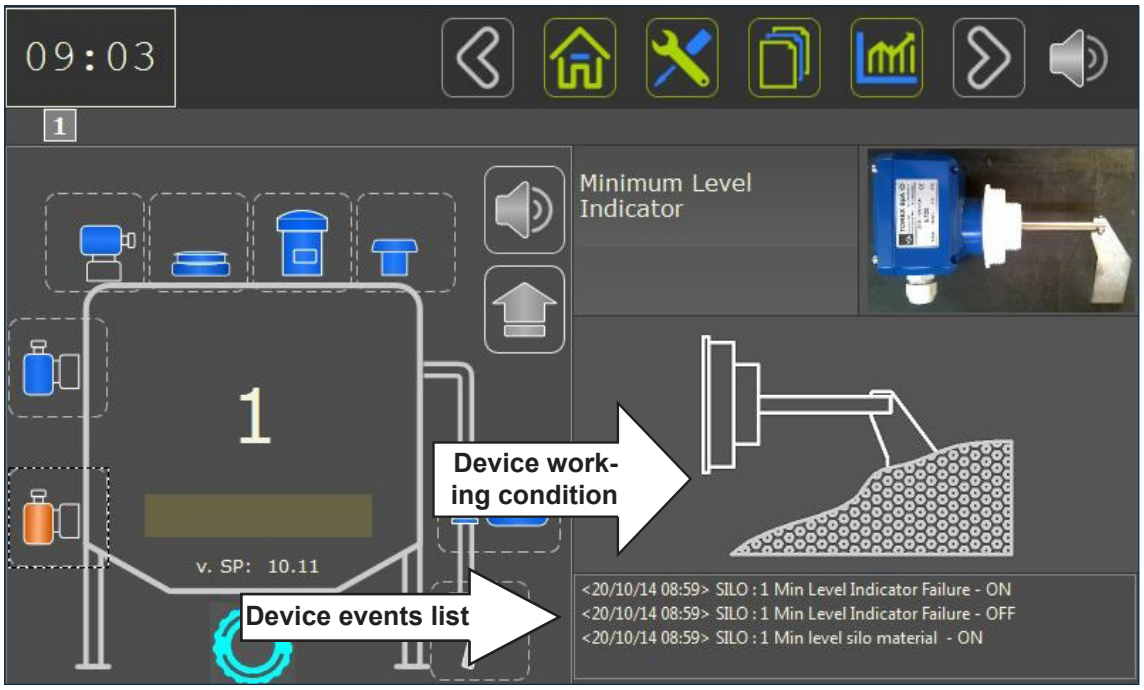
Press on any **level indicator icon** to display the detailed device window on the right area of the screen.



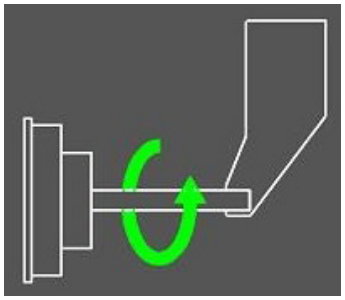
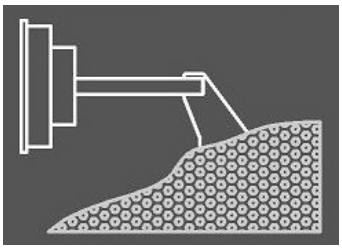
Use this window to check the operating condition of every device: any mismatch with the real working condition of the system must lead the user to check:

- electrical / pneumatic connections
- silo hardware configuration (by means of SP2 jumpers set)
- silo software configuration (by means of Setup menu)

This area is available for all peripheral devices.



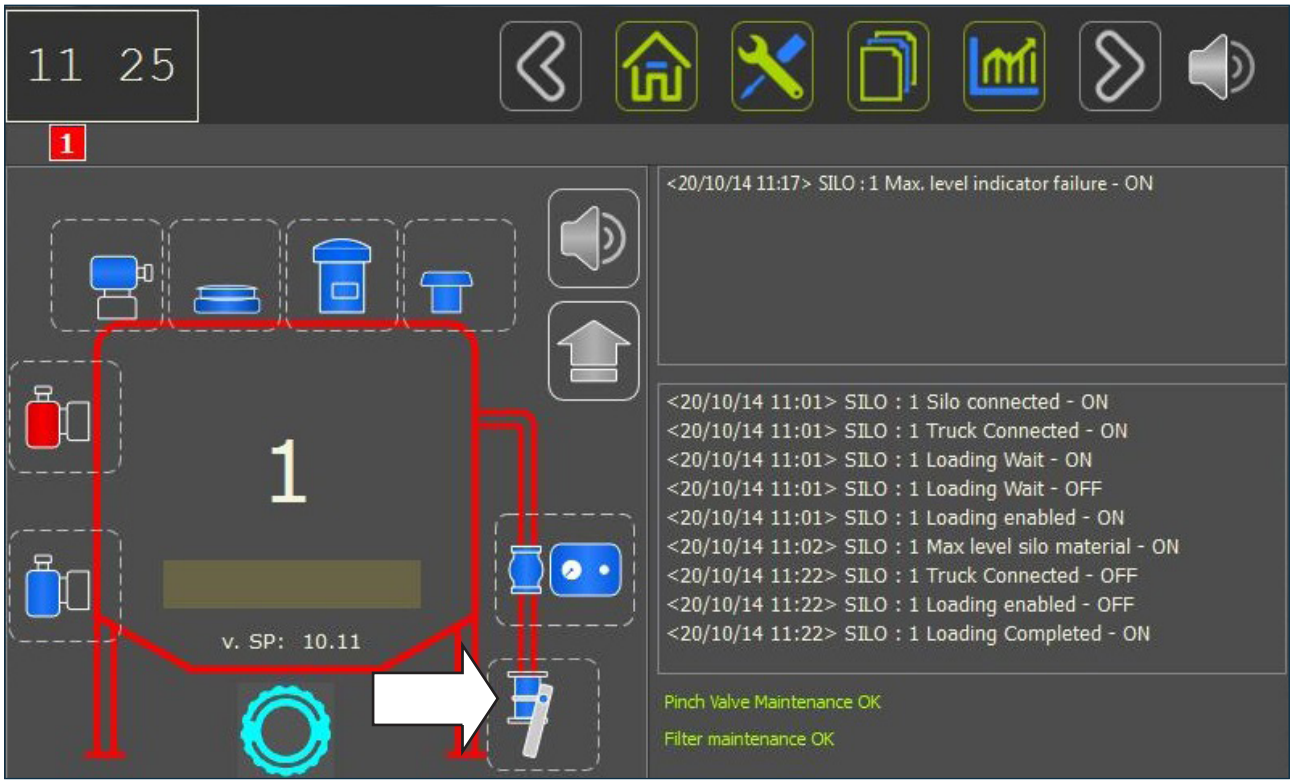
Depending on device work condition the following images can be displayed:

Free	Engaged	Failure (if failure/rotation detector is used)
		

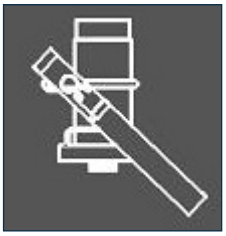
5.4.3 SESSION STOP

When truck is disconnected from KAT, the filling session gets closed.

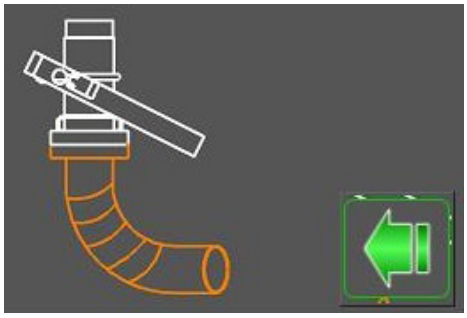
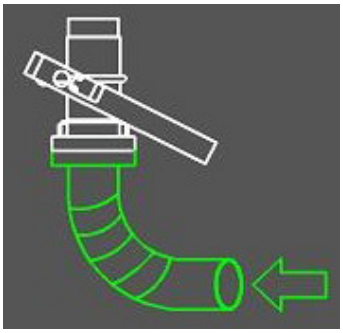
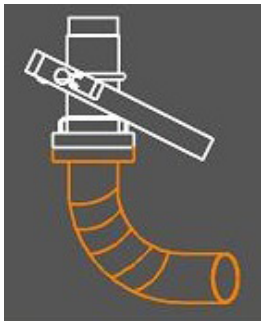
If a alarm condition has been reached, it will remain active until it is removed.



By pressing the truck connection icon, the following image will be displayed when truck is disconnected.



Depending on the device condition, the following images can also be displayed:

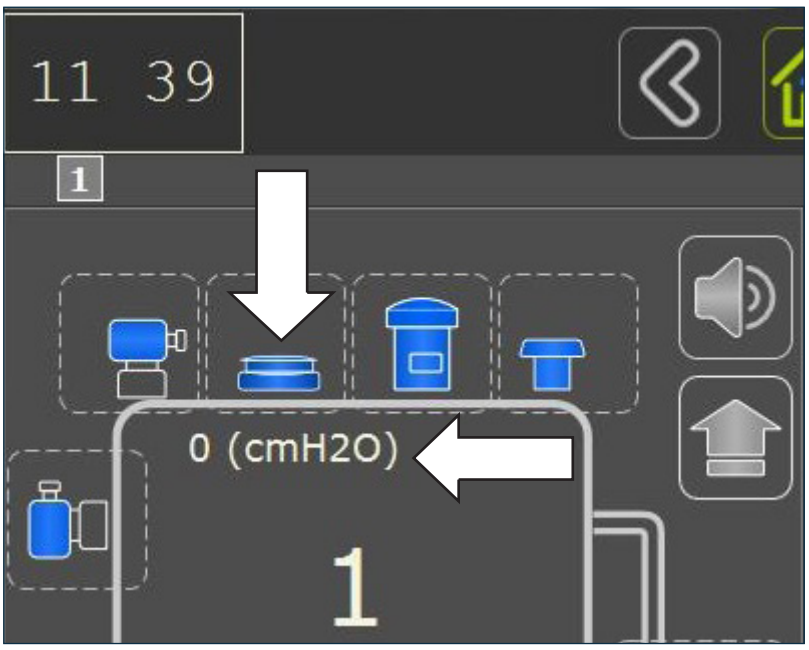
Truck connected Waiting for load authorisation	Truck connected Authorized loading in process	Truck connected Loading not authorized
		

5.5 Silo overpressure monitoring

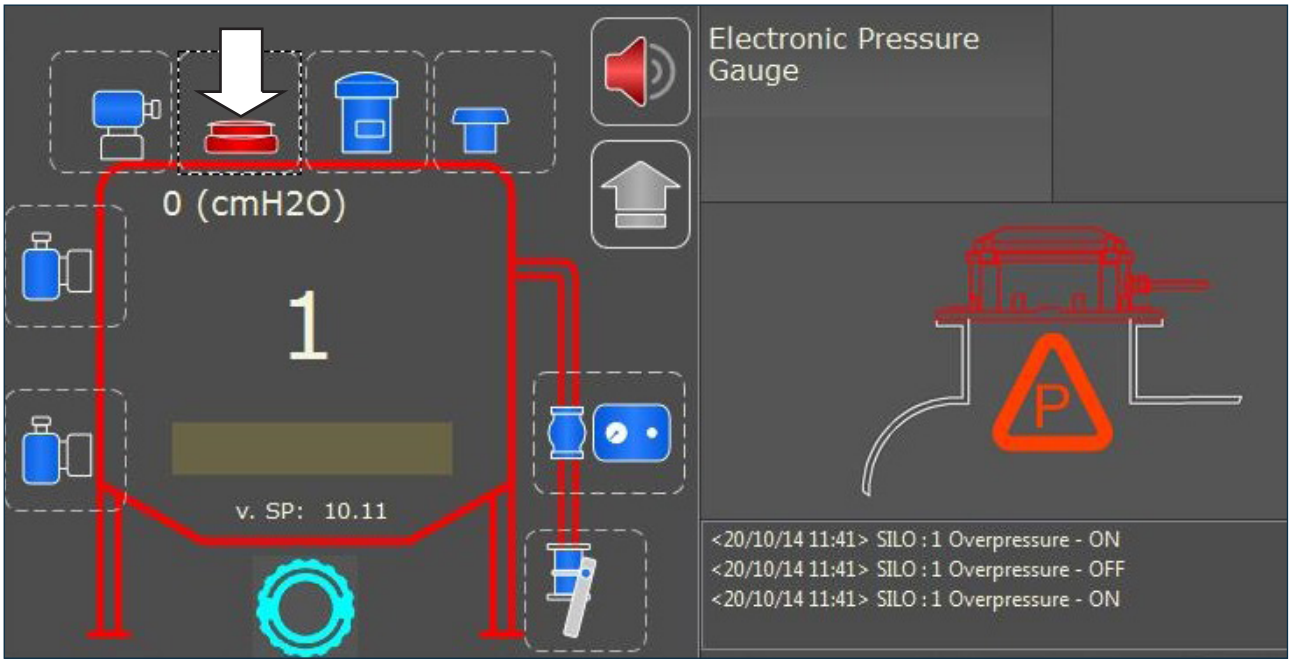
The silo overpressure can be controlled by the following devices:
- Pressure relief valve
- Mechanical pressure switch or Electronic pressure gauge

5.5.1 ELECTRONIC PRESSURE GAUGE

The silo overpressure is measured continuously on the silo page within a 0-99 cm H_2O range.



When the measured pressure exceeds the **Pall** (see 5.3.2.3) limit, an overpressure alarm is displayed: press the pressure gauge icon to display the detailed device view on the right.

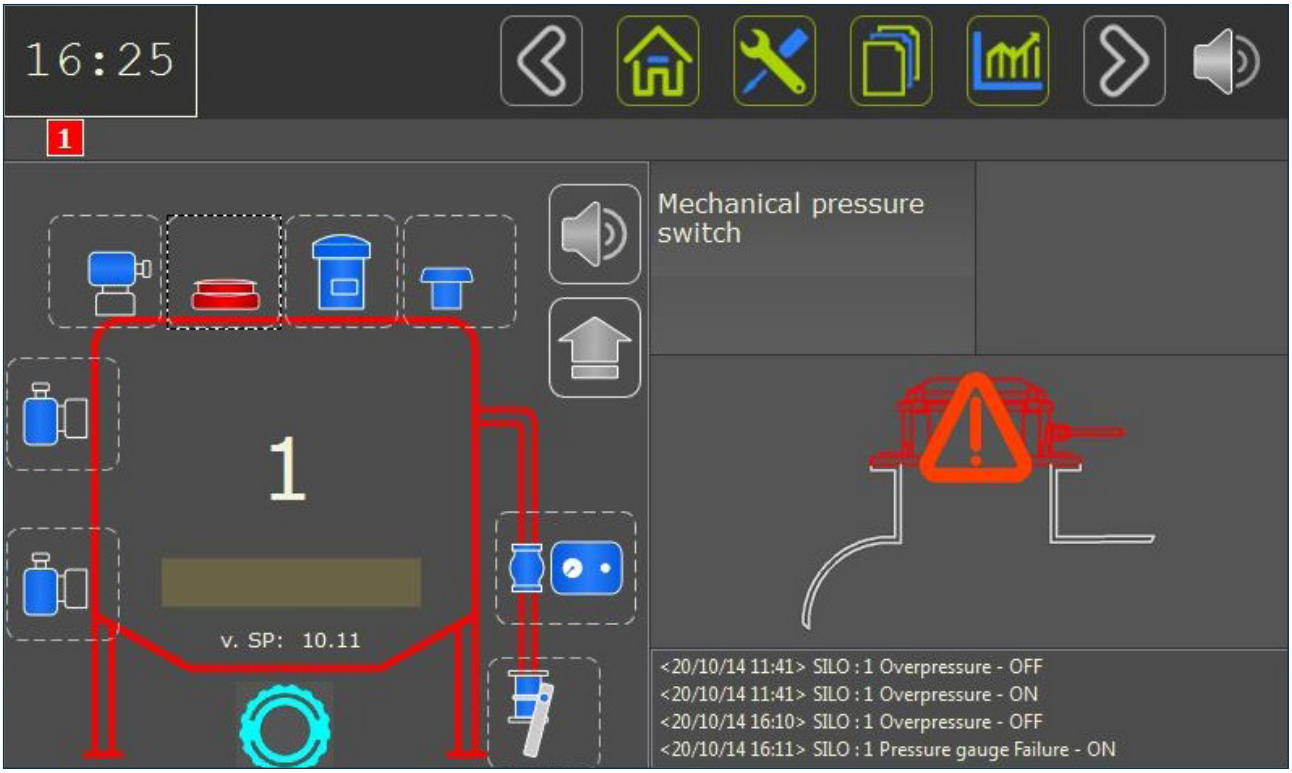


Pressure gauge signals: pressure gauge with either analog signal 0-20mA or 4-20mA can be used. It is recommended the 4-20 mA as it allows the system to detect a failure or a missing connection.

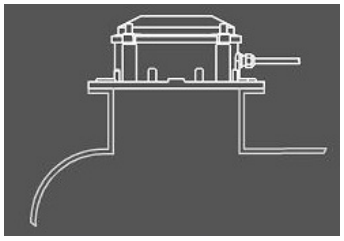
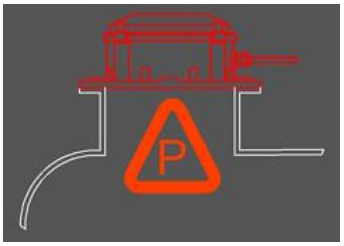
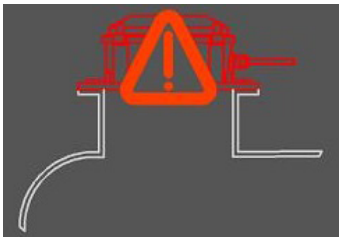
Make sure the choice on SP2 jumper set matches the installed device.

5.5.2 MECHANICAL PRESSURE SWITCH

This device will OPEN a N.C contact on SP2 input when the pressure exceeds 40cm H_2O.



Depending on device condition, the following images can be displayed:

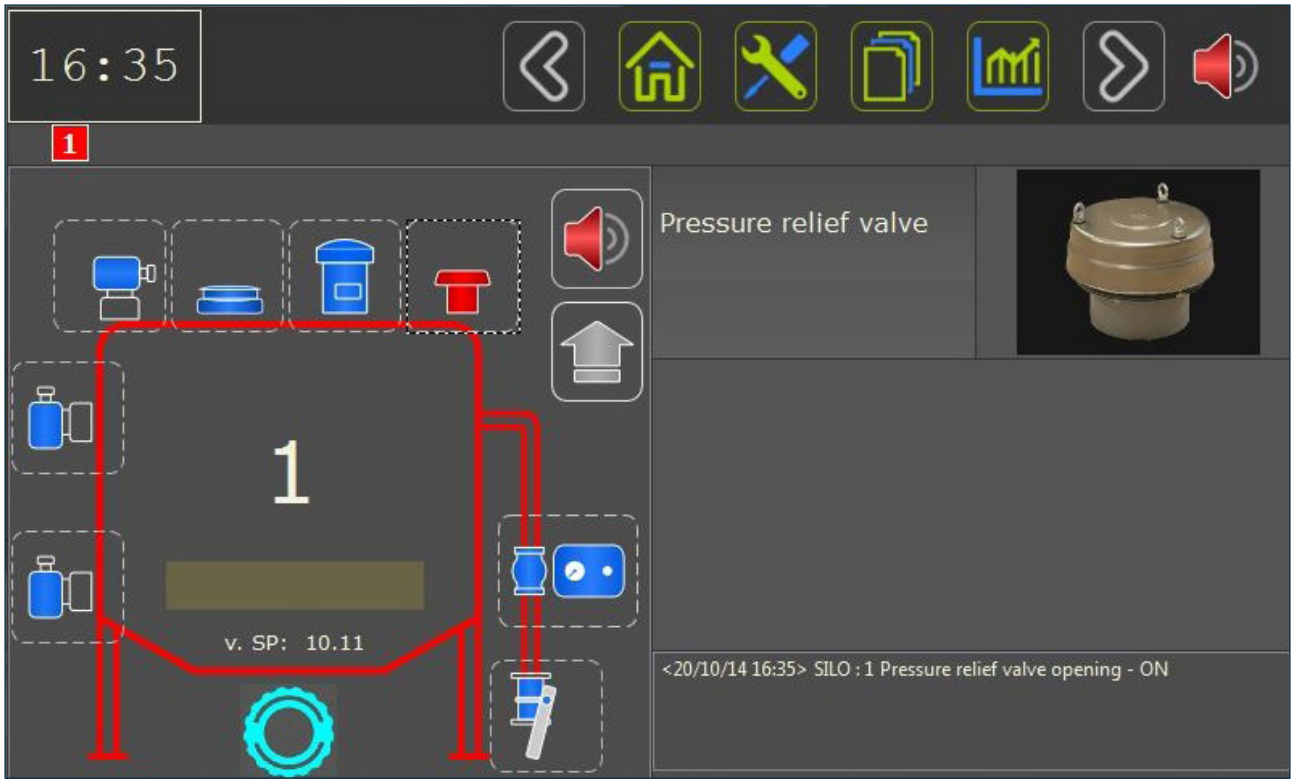
Regular	Overpressure (p>*Pall*) or p>*40cm H_2O*)	Failure (for 4-20 mA electronic press.gauge only)
		

Filling in progress: overpressure alarm will automatically and immediately close the pinch valve.

No filling: the overpressure alarm won't allow enabling the filling.

5.5.3 PRESSURE RELIEF VALVE

This device will OPEN a N.C contact on SP2 input when the pressure exceeds 50cm H_2O.



Depending on device condition, the status of the valve will be displayed in the message in with RED (= ALARM) / BLUE (=NORMAL) color.

Filling in progress: overpressure alarm will automatically and immediately close the pinch valve.

No filling: the overpressure alarm won't allow enabling the filling.

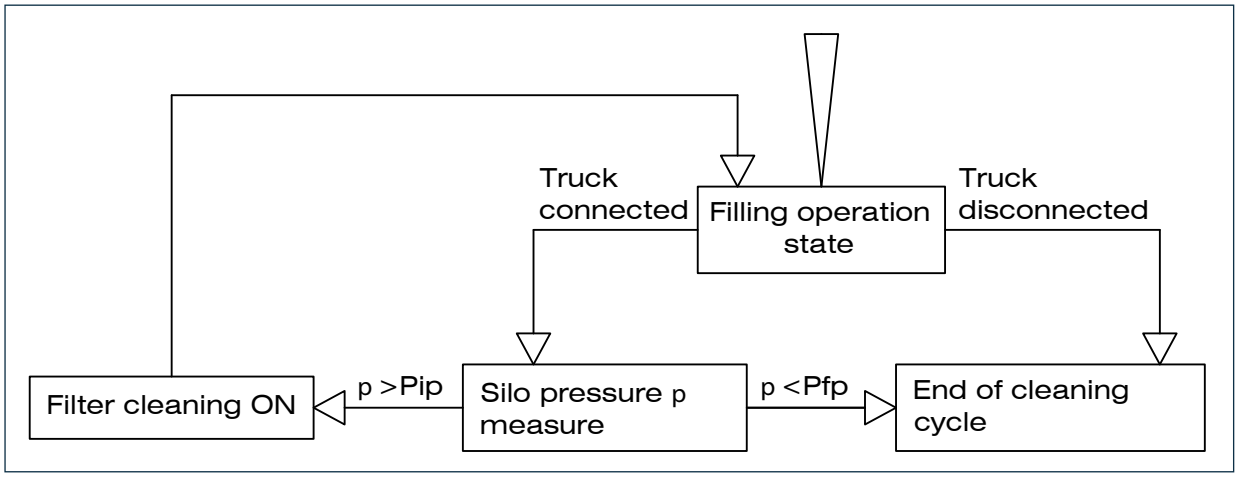
5.6 Filter unit cleaning and monitoring

The KCS system can drive the filter elements cleaning, it receives an input signal for failure detection (if available from the filter unit) and a signal from filter unit pressure switch.

5.6.1 PRESSURE THRESHOLD MODE (5.3.2.3)

This working mode is available with electronic press.gauge only

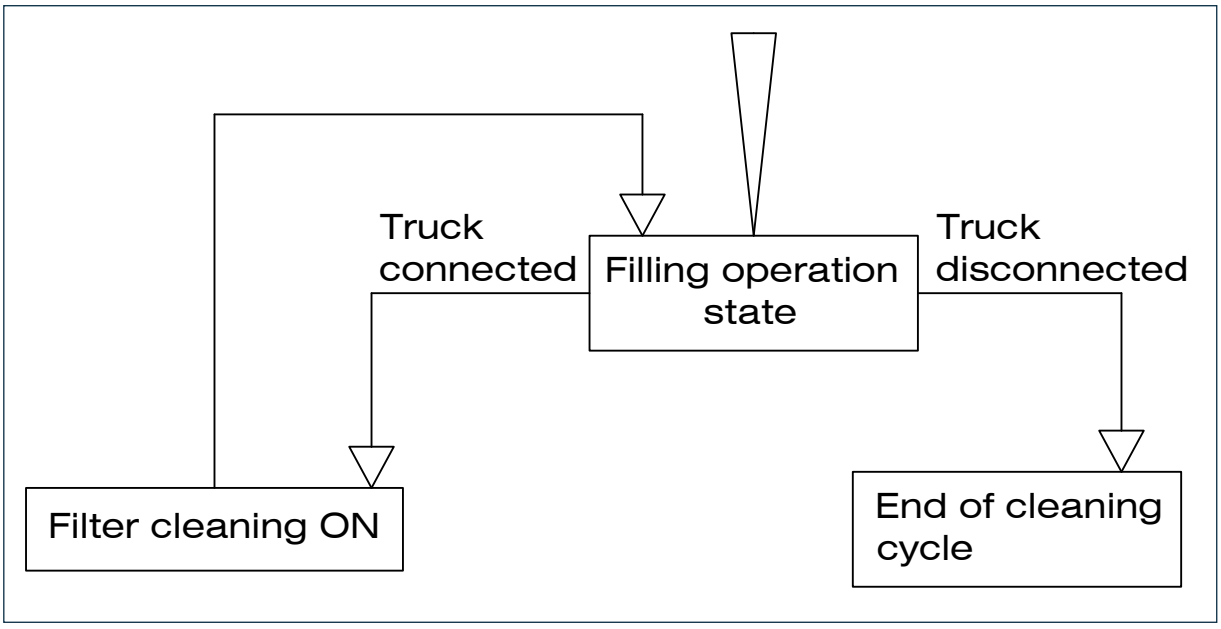
Filter cleaning works between Pip and Pfp: once the filling is over, the cleaning will last for an end-of cycle set time.



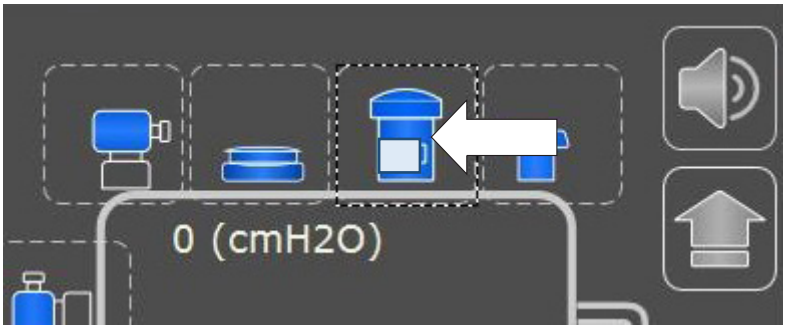
End of cleaning cycle: *Once the silo loading has finished, the filter cleaning will last for a set value.(5.3.2.3).*

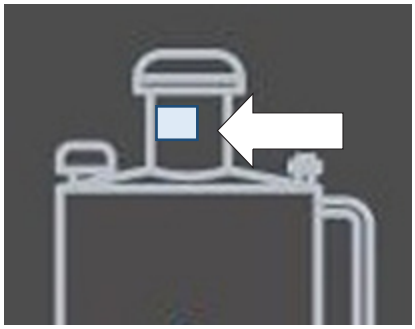
5.6.2 PRESSURE THRESHOLD DISABLED (5.3.2.3

When pressure threshold are not used, the filter cleaning will stay ON during the whole filling operation: once the filling is over, the cleaning will last for a end-of cycle set time.

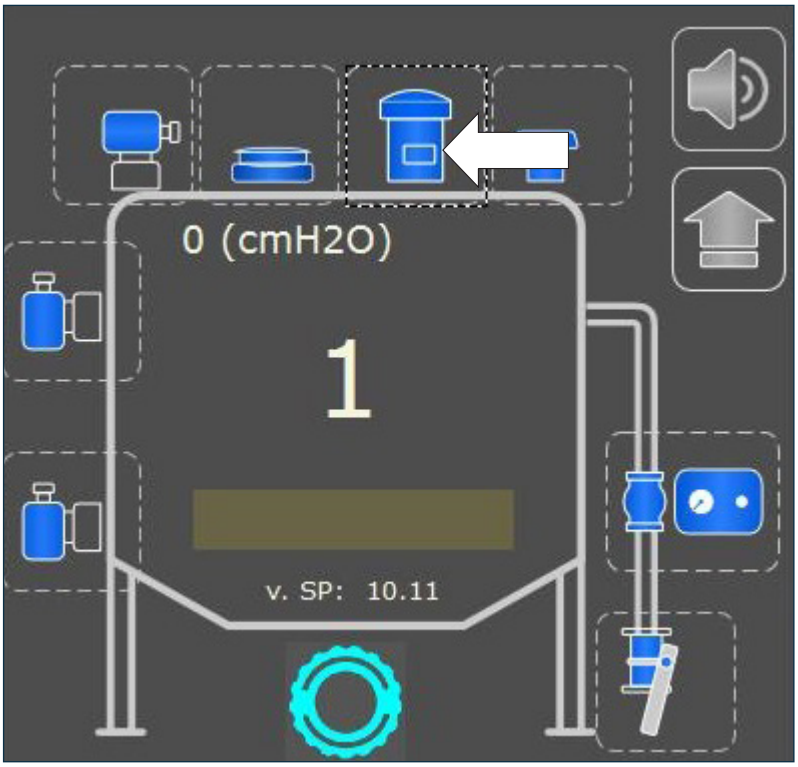


When filter cleaning is ON, the filter icon on silo and home page will blink.

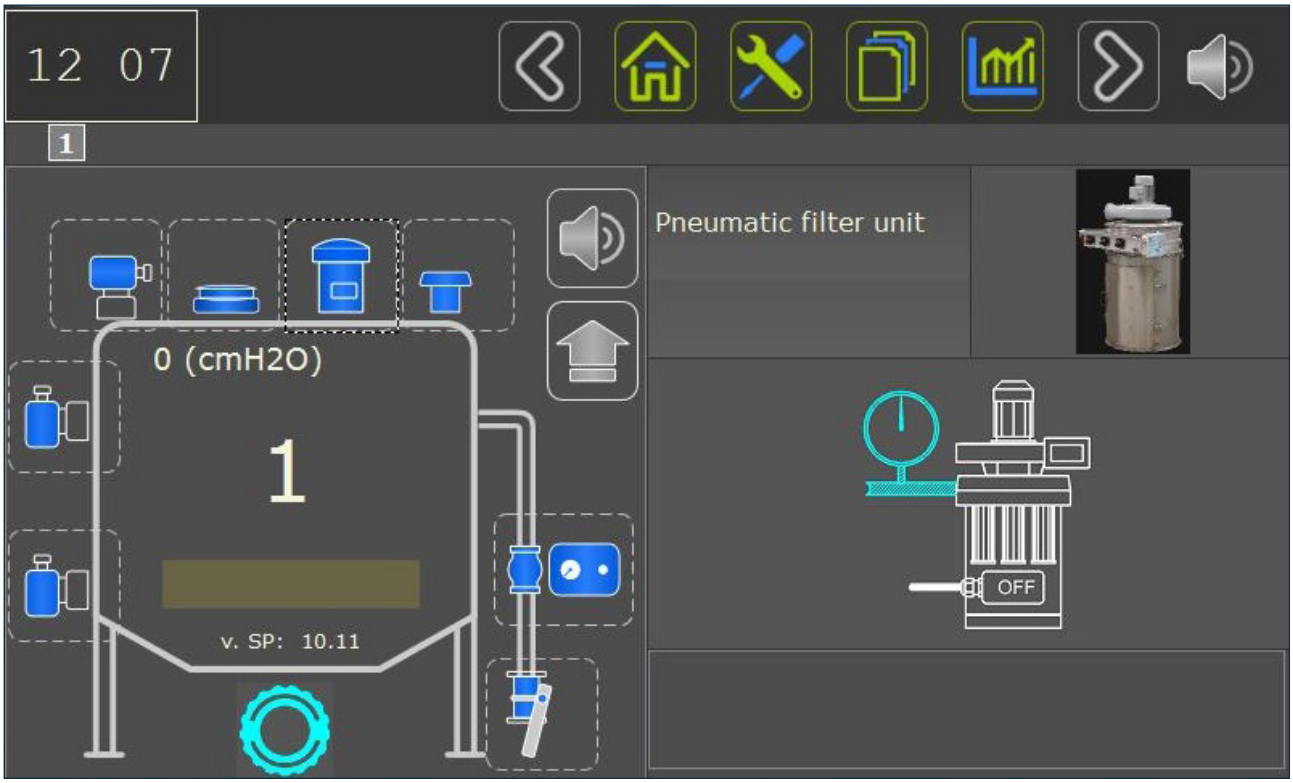




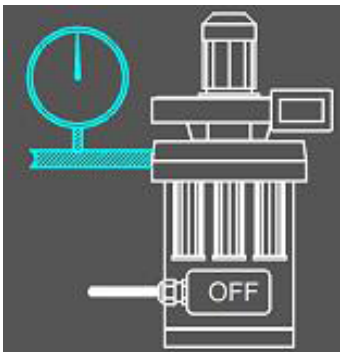
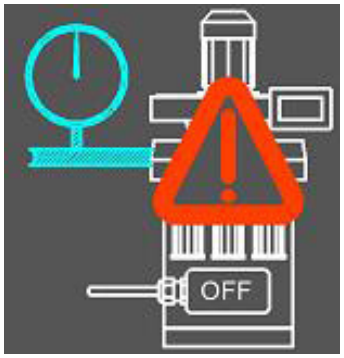
Press on the **filter icon** to display the detailed device view.

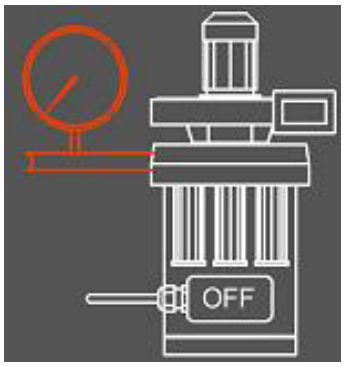
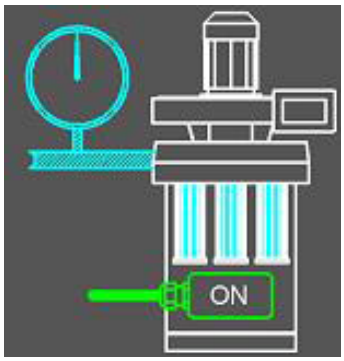


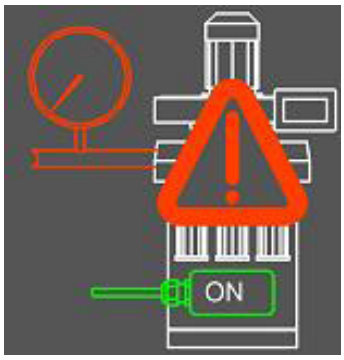
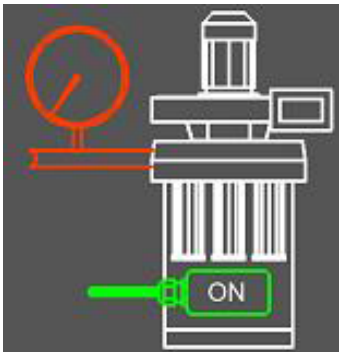
5.6.3 PNEUMATIC FILTER UNIT



Depending on the device condition and on the configuration, the following images can be displayed:

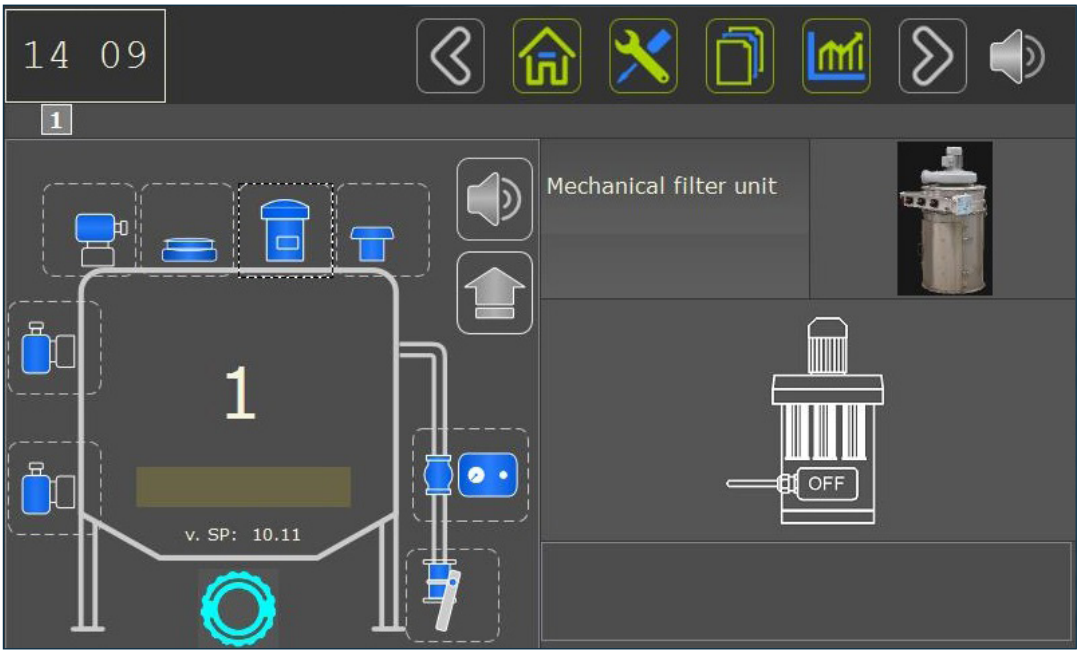
Pressure ON Filter cleaning OFF	Pressure ON Filter cleaning OFF FAILURE alarm	NO AIR on filter line Filter cleaning OFF FAILURE alarm
		

NO AIR on filter line Filter cleaning OFF	Pressure ON Filter cleaning ON	Pressure ON Filter cleaning ON FAILURE alarm
		

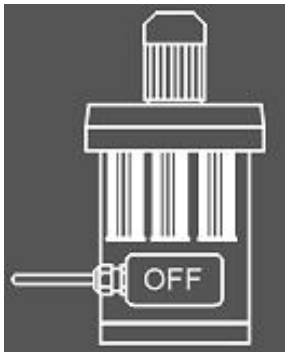
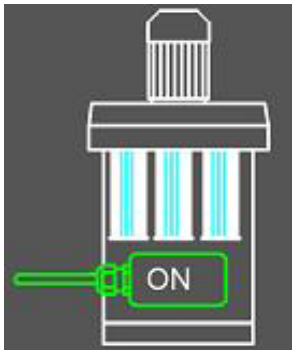
NO AIR on filter line Filter cleaning ON FAILURE alarm	NO AIR on filter line Filter cleaning ON
	

5.6.7 MECHANICAL FILTER UNIT

KCS system can drive the filter elements cleaning and receive an input signal for failure detection (if available from the filter unit).



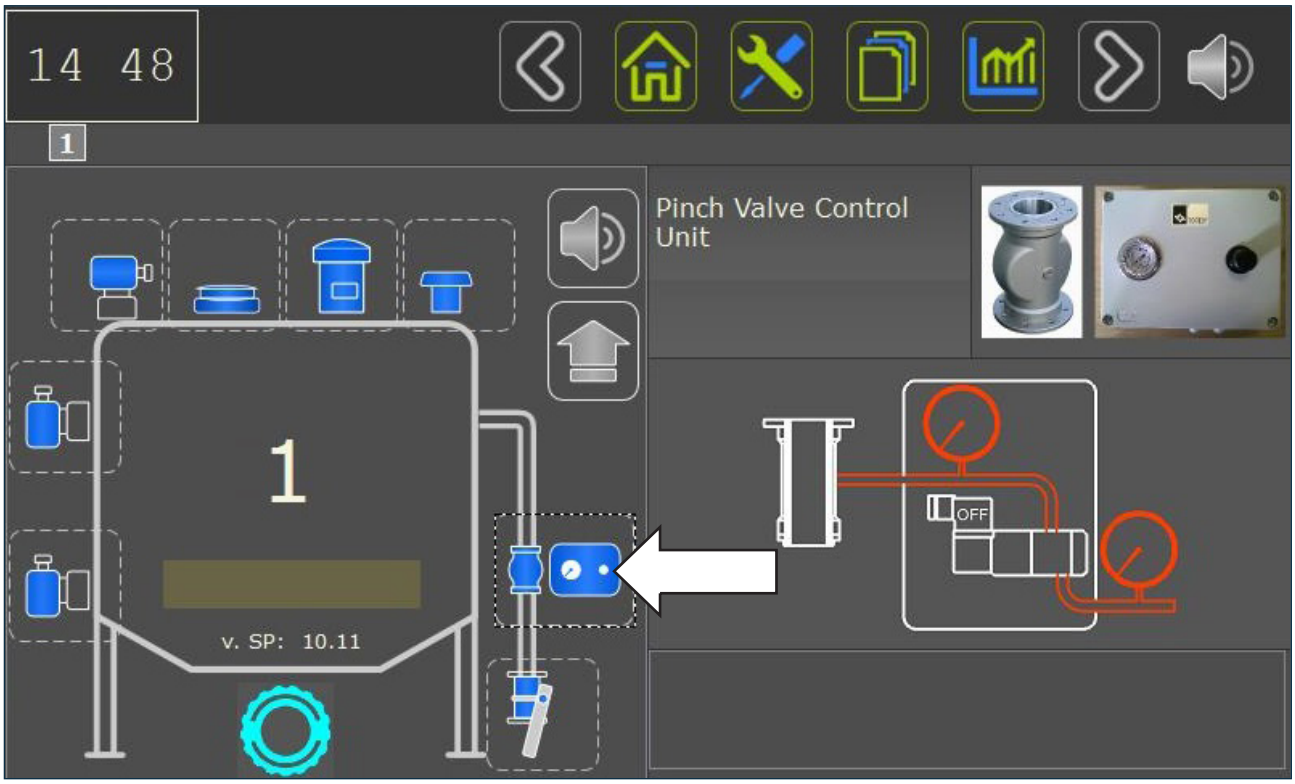
Depending on the device condition and on the configuration, the following images can be displayed:

Filter cleaning OFF	Filter cleaning OFF FAILURE alarm	Filter cleaning ON
		

Filter cleaning ON FAILURE alarm


5.7 Pinch valve control unit

The KCS can drive the solenoid valve to operate the pinch valve, and it receives an input signal from a pressure switch between the pinch valve and the control unit and from a pressure switch on the control unit pressure supply line.



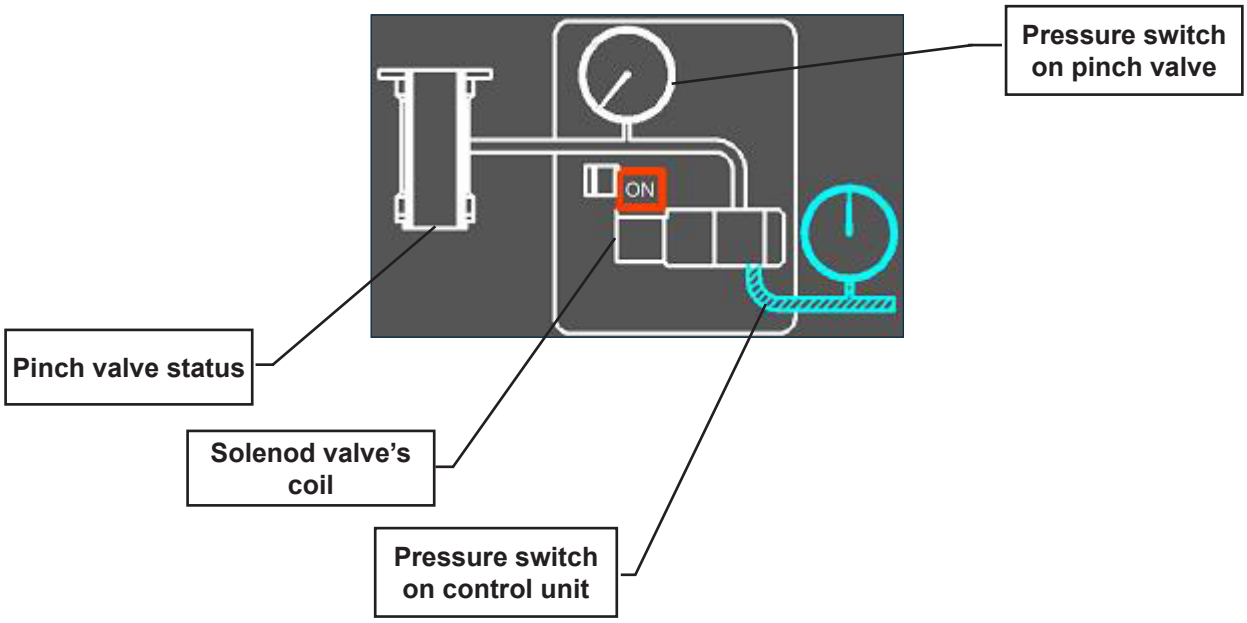
Press the pinch valve control unit icon to display the detailed window; depending on the system configuration and operation condition, this window will show:

Status of solenoid valve's coil: ON/OFF

Status of pressure switch on the pinch valve.

Status of pressure switch on pinch valve control unit.

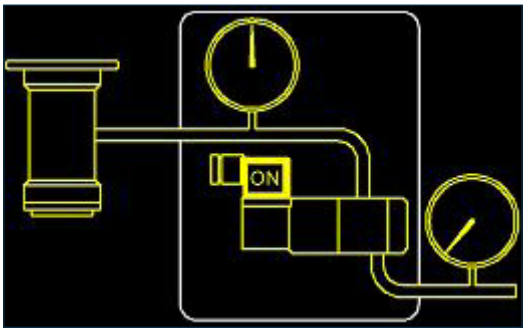
5.7.1 PNEUMATIC PINCH VALVE – PRESSURE SWITCH ON CONTROL UNIT INSTALLED



Displayed devices could have different colours / status depending on the operating condition.

	Status	Meaning
Solenoid valve coil	ON	Coil powered
	OFF	Solenoid valve at normal status
Pressure switches		Pressure ON Normal condition
		NO Pressure Alarm condition
		NO Pressure Normal condition

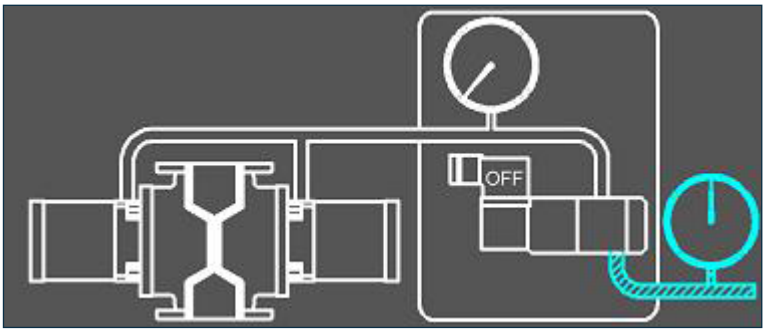
When the status of coil and pressure switches is not consistent, the whole scheme appears in YELLOW. In these condition, the status of the pinch valve cannot be shown: check the pneumatic / electric connections, the solenoid valve and the pressure switches.



Pressure switch on control unit won't be displayed if not present.(5.3.2, 5.3.2.1). The system will consider the air pressure always present on the control unit supply line and it will monitor the pinch valve press. switch only.

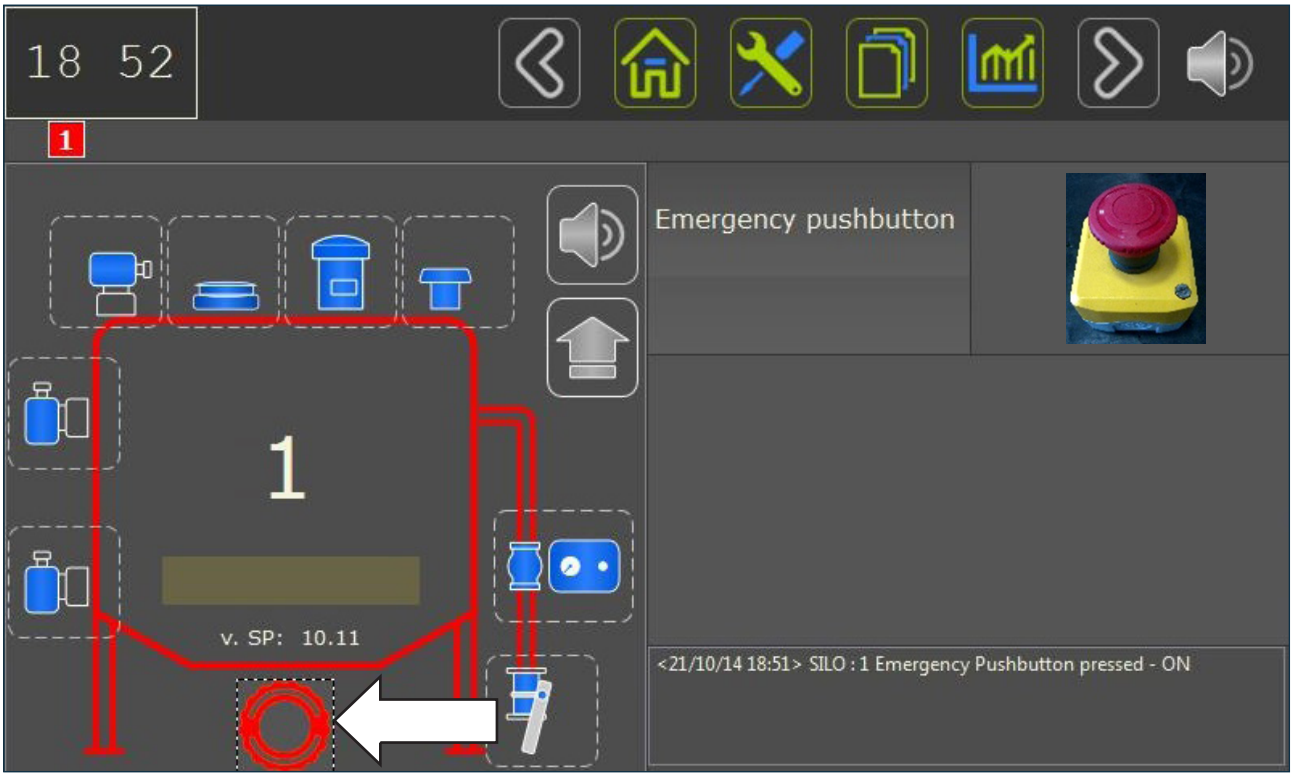
5.7.2 MECHANICAL PINCH VALVE – PRESSURE SWITCH ON CONTROL UNIT INSTALLED

When mechanical pinch valve is used, the scheme below is displayed.



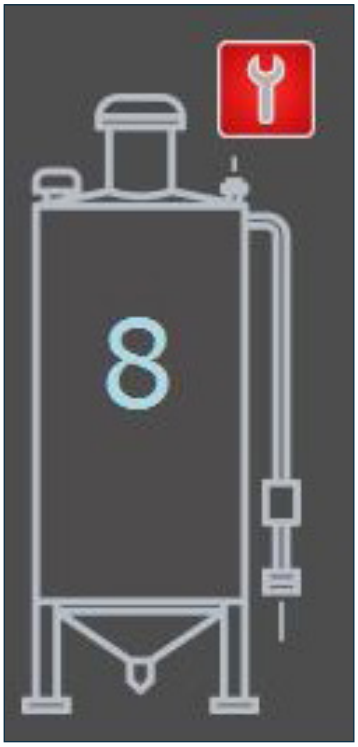
5.8 Emergency push button

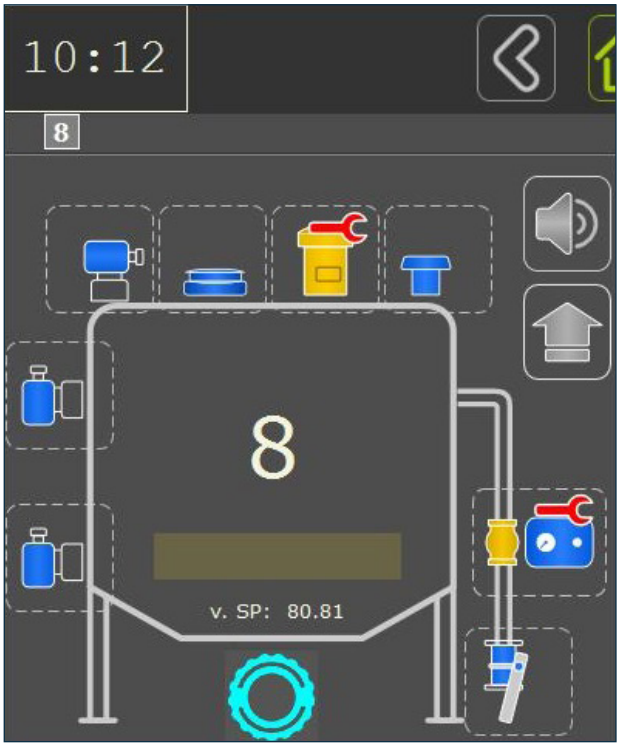
Press  to view the status of emergency push button.



5.9. Maintenance

When the filter or the pinch valve work over the set maintenance interval (5.3.2.3, 5.3.2.4) a maintenance warning appears on the silo page and on the home page.





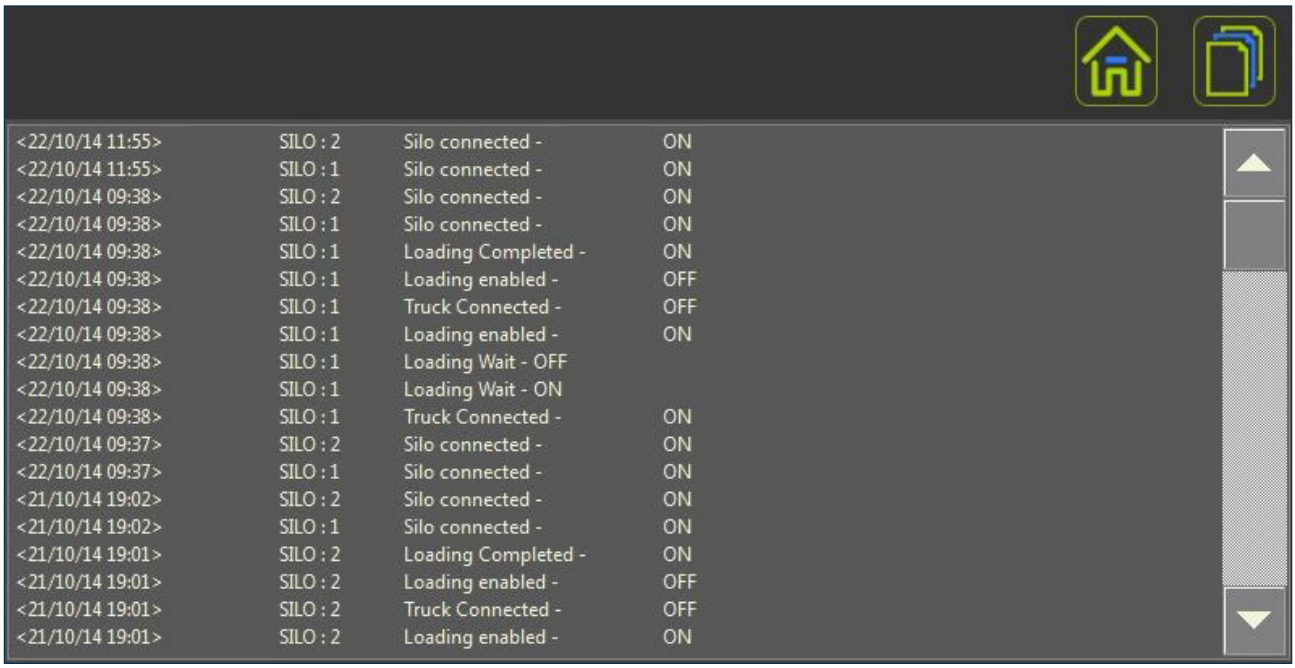
Press  to view the maintenance summary of that silo: when maintenance is made, go to the **SETUP** menu, press **MAINTENANCE** and select the silo.

Press **RESET** to set the work hours/cycle of the selected device to 0.

Once the reset is made, the maintenance warning will disappear.

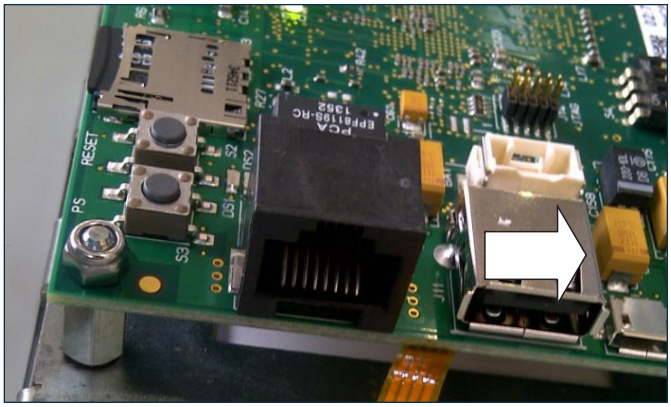
5.10 Statistics and software update

Press  from the HOME PAGE to view the full system events list: this window will keep the last 200 events visible only.



5.10.1 DOWNLOADING THE FULL EVENTS LIST

Open the SCTOUCH card and fit a USB stick on the port available on the card's back.



Close the SCTOUCH and press  to save the a "**storico.txt**" file on the stick.

Every message will be formatted as

Date / Time	Silo number	Event	Status
<24/09/14 13:16>	SILO: 8	No Air VMX	ON

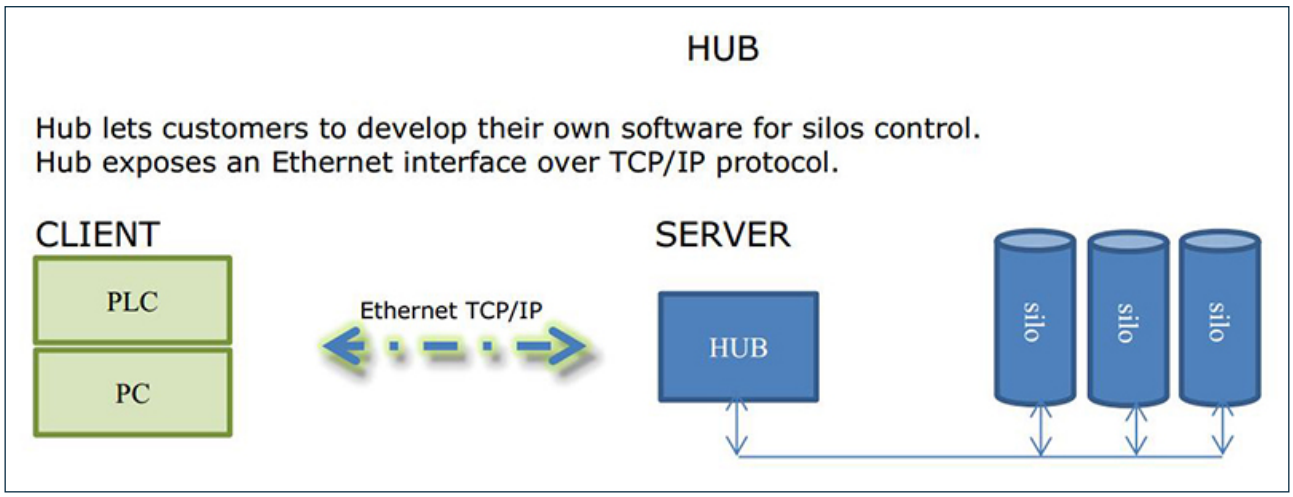
5.10.2 UPDATING SP AND SC SOFTWARE

- The software file pack to be loaded must be contained in a folder named "DINEX".
- Load the DINEX folder in an empty USB stick.
- Switch SP2 and SC card power supply OFF.
- Open the SC card and fit the USB stick in.
- Turn the power on again on both SC and SP2 cards.
- Wait for the system to complete update and to make the first window available.
- Take the USB stick off.

The following are the communication standards and protocol to be used with SCHUB when the system is driven without the touch screen.

Hub allow customers to develop their own software for silos control.

Hub exposes an Ethernet interface over TCP/IP protocol.



Technical Specification Sheet

Data Format	**Big Endian**
Protocol TCP/IP (*)	**IP: 172.22.100.132 - 255.255.0.0**

(*) IP-address is specified in “system startup file” (./scServer 172.22.100.132 255.255.0.0) which can be up-dated via USB by “install.sh” script file.

START

CLIENT send to server the plant layout via s_packetMAP

LOOP

SERVER starts cyclic interrogations on silos {

Each silo sends to CLIENT the s_packetSTATO_SILOS and s_packetSTATO_AUTOMA_SILOS

if (silo is connected for the first time) {
SERVER sends to CLIENT the version via s_packetVERSION_SLAVE
CLIENT sends to SERVER the configuration via s_packetCFG
}
}

OTHERS

CLIENT sends to SERVER s_packetOK_CARICAMENTO (when the load request is true)

CLIENT send to SERVER s_packetOK_EXTRAFILL (when extra fill request is true)

CLIENT send to SERVER s_packetDGN_ENABLE (which Enable/Disable DIAGNOSTIC Mode)
SERVER send to CLIENT s_packetDGN_IN_DIGIT
SERVER send to CLIENT s_packetDGN_IN_ANALOG
SERVER send to CLIENT s_packetDGN_OUT_DIGIT

DATA STRUCTS

R = READ (SERVER -> CLIENT)
W = WRITE (SERVER <- CLIENT)
I = INITIAL WRITE (SERVER <- CLIENT)

PACKET TYPE	(ID)		
PACKET_VERSION_SERVER	0	SERVER VERSION	R
PACKET_VERSION_SLAVE	1	SILO VERSION	R
PACKET_CFG	2	SILO CONFIG	W/I
PACKET_MAP	3	SILO plant Layout	W/I
PACKET_STATO_SILOS	4	SILO status	R
PACKET_OK_CARICAMENTO	5	Enable Load	W
PACKET_OK_EXTRAFILL	6	Enable extra-fill	W
PACKET_DGN_ENABLE	7	Diagnostic mode	W
PACKET_DGN_IN_DIGIT	8	Diagnostic - digital input	R
PACKET_DGN_OUT_DIGIT	9	Diagnostic - digital output	R/W
PACKET_SIRENA	10	Acoustic Alarm	W
PACKET_STATO_AUTOMA_SILOS	11	stato dell'automa SILOS	R
PACKET_SAVE	12	salvataggio	R/W

Type def

__u8: /* 8 bit unsigned */
__u16: /* 16 bit unsigned */

structs

s_packetBase		
__u8	Tipo	PACKET TYPE
__u8	Addr	SILO ADDRESS (1..32) (0 = broadcast)
version		
__u8	ver	version - Major Number
__u8	sottover	version – Minor Number

TCP PACKETS

s_packetVERSION_SERVER	
s_packetBase	base
version	verTcp
version	verScServer

s_packetVERSION_SLAVE	
s_packetBase	base
version	verSpSlave[MAX_SLAVE]

SILO configuration packet: W/I

s_packetCFG	
s_packetBase	base
__u16	ritardoChiusuraVMsuLivMax
__u8	abilSoglieInterventoFiltroIPE
__u16	pressioneInizioPuliziaP
__u16	pressioneFinePuliziaP
__u16	sogliaAllarmeIPE
__u16	durataPuliziaDopoFineCarico
__u16	durataSirena
__u16	tempoChiusuraVM
__u16	durataModoPulsato
__u16	tempoAttesaPrimaDelRitardoPressostatoVM
__u16	tempoAttesaPrimaDelRitardoPressostatoFiltro
__u8	tipoContattoPerComandarePuliziaFiltro
__u8	abilConsensoCaricoNotturno
__u8	indicatoreLivelloMinInst
__u8	indicatoreLivelloExtraInst
__u8	sensRotazLivelloMinInst
__u8	sensRotazLivelloMaxInst
__u8	sensRotazLivelloExtraInst
__u8	sensRotturaManicheInst
__u8	sensPressMonteValvolaInst
__u8	sensPressValvolaInst
__u8	sensPressFiltroInst

SILO plant Layout: W/I

s_packetMAP	
s_packetBase	base
__u32	bitmapPresenza

SILO status: R

BITst1_connesso	0x00000001	Silo (SP board) connected/disconnected
BITst1_aLivelloMin	0x00000002	minimum level
BITst1_aLivelloMax	0x00000004	maximum level
BITst1_allarmeLivelloMax	0x00000008	maximum level is reached during the load (alarm)
BITst1_allarmeLivelloExtra	0x00000010	extra level is reached during the load (alarm)
BITst1_avariaIndPressioneElettr	0x00000020	
BITst1_sovrapressioneVCP	0x00000040	
BITst1_pulsanteEmergenza	0x00000080	Emergency pressed/released
BITst1_avariaVMX_VM	0x00000100	
BITst1_mancanzaComunicazioneSeriale	0x00000200	
BITst1_camionCollegato	0x00000400	truck connected
BITst1_attesaConsensoCarico	0x00000800	Waiting for enabling load
BITst1_caricoAbilitato	0x00001000	Load Enabled
BITst1_caricoTerminato	0x00002000	
BITst1_avariaIndLivelloMax	0x00004000	max level sensor failure
BITst1_avariaIndLivelloMin	0x00008000	min level sensor failure
BITst1_avariaIndLivelloExtra	0x00010000	extra level sensor failure
BITst1_sovrapressioneIPX	0x00020000	
BITst1_mancanzaAriaVMX	0x00040000	
BITst1_mancanzaAriaFiltro	0x00080000	No air filter (on/off) - **normal on** - off = alarm
BITst1_rotturaManicheFiltro	0x00100000	Filter unit failure (on/off) - on = alarm
BITst1_tipoIndPressione	0x00200000	Mechanical pressure switch indicator
BITst1_livelloSegnaleIndPressione	0x00400000	
BITst1_tipoFiltro	0x00800000	**J3** status (Pneum/Mech Filter): close = Pneum
BITst1_aLivelloExtra	0x01000000	
BITst1_releValvManicotto	0x02000000	
BITst1_releAriaFiltro	0x04000000	Filter cleaning relay
BITst1_releDispAllarme	0x08000000	Pinch valve relay
BITst1_releSemaforoRosso	0x10000000	Red light
BITst1_releSemaforoVerde	0x20000000	Green light
BITst1_tipoManicotto	0x40000000	**J4** status (Pneum/Mech Pinch Valve): close=Mech (VMX/VM)
BITst1_consensoRiempiExtra	0x80000000	Extrafill enabled
BITst2_pressostatoAmonte	0x00000001	Plant Line Pressure switch (0 = no Air)
BITst2_pressostatoAvalle	0x00000002	VM Pressure switch (0 = no Air)
BITst2_chiusuraPulsata	0x00000004	**J5** status (closing Pulse/Single)

s_packetSTATO_SILOS	
s_packetBase	base
__u32	BITst1_
__u32	BITst2_
__u16	Analog Value (mA) (IPE pressure)

Enable Load: W

s_packetOK_CARICAMENTO	
struct	s_packetBase base

Enable extra-fill: W

s_packetOK_EXTRAFILL	
s_packetBase	base
__u8	stato

Diagnostic mode (Enable/disable): W

s_packetDGN_ENABLE	
s_packetBase	base
__u8	abilDiagnostica

BITin_pulsanteEmergenza	0x00000001
BITin_contattoAttaccoCamion	0x00000002
BITin_sensoreLivelloMin	0x00000004
BITin_sensoreLivelloMax	0x00000008
BITin_sensoreLivelloExtra	0x00000010
BITin_valvolaPressioneSilo	0x00000020
BITin_pressostatoAriaCompressa	0x00000040
BITin_pressostatoValvolaManicotto	0x00000080
BITin_pressostatoAriaFiltro	0x00000100
BITin_guastoSensoreLivelloMin	0x00000200
BITin_guastoSensoreLivelloMax	0x00000400
BITin_guastoSensoreLivelloExtra	0x00000800
BITin_indicatorePressioneMecc	0x00001000
BITin_aux1	0x00002000
BITin_aux2	0x00004000
BITin_jumper0	0x00008000
BITin_jumper1	0x00010000
BITin_jumper2	0x00020000
BITin_jumper3	0x00040000
BITin_jumper4	0x00080000

diagnostic digital input: R

s_packetDGN_IN_DIGIT	
s_packetBase	base
__u32	bitmapIn

BITout_releValvolaManicotto	0x00000001	// solenoide On / Off
BITout_releAriaFiltro	0x00000002	// Filtro On / Filtro Off
BITout_releAllarme	0x00000010	
BITout_releSemaforoRosso	0x00000004	
BITout_releSemaforoVerde	0x00000008	
BITout_releAux1	0x00000020	
BITout_releAux2	0x00000040	

Diagnostic – digital output: R/W

s_packetDGN_OUT_DIGIT	
s_packetBase	base
__u32	bitmapOut;

Acoustic Alarm: W

struct s_packetSIRENA	
struct s_packetBase	base
__u8	stato

STAUTO_diagnostiga	0x00
STAUTO_inizializzazione	0x01
STAUTO_standBy	0x02
STAUTO_attesaConsensoOperatore	0x03
STAUTO_predisposizioneAlCarico	0x04
STAUTO_caricamentoSilo	0x05
STAUTO_uscitaDaCaricamento	0x06
STAUTO_caricamentoExtra	0x07
STAUTO_allarmeInInizializzazione	0x81
STAUTO_allarmeInStandBy	0x82
STAUTO_allarmeInCaricamento	0x83
STAUTO_allarmeInCaricamentoExtra	0x87

Stato dell'automa SILOS: R

s_packetSTATO_AUTOMA_SILOS	
s_packetBase	base
__u32	stato