MWTECH
matholding group

SKYfilter

User Manual v1.0

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Autor	Revision	Date	Version	Description
Xavier D.	Aaron A. Carlos C.	30/03/2021	1.0	Document creation

1. Introduction

SKYfilter - SKYfilter Tiny (from now SKYfilter) is an efficient filter programmer that allows users to configure in an easy way a variety of possibilities adapted to user necessities and type of filters. SKYfilter allows to manage the range of signals that fit with small filters in order to simplify the solution, all of them managed by digital applications on your Smartphone.

1.1. General features

SKYfilter allows to manage:

Local Buetooth Android-iOS application managing

Remote and local actions

Alarm tool. Managed locally or remote

Datalogger manage by the device with graph representation

Action user control and register.

Flush features:

Flexible configuration of flushes parameters (pre/post flush time, flush duration, sequence, etc.)

Main valve and auxiliary valve manage with pre/post action time configurable.

Link between devices

Differential pressure managing integrate

Flush by water volume

Daily flush preprogrammed.

Blocked by maximum number of flushes

Blocked by number of flushes by time

Minimum time between flushes

SKYfilter is a compacted programmer adaptable to customer requirements that can manage:

- **Standard version**: Till 10 signals; 10 outputs maximum, 1 digital input, 1 relay output, 1 analog input.
- **Tiny version**: 2 outputs LATCH valves, 1 digital ON/OFF input and 2 pressure sensors [0-10]Bar.

1.1.1 Component description and general features

SKYfilter Standard	SKYfilter APP to manage the filter programmer	Bluetooth 5.0 (BLE) communication compatible	
	IP65 protection	Powered by: - 1,5 V AA alkaline batteries – 7,2 AA Lithium batteries – Solar panel + batteries – 12 Volts power supply	
	Configuration and relevant data information managed and saved into non volatil memory	Security password accessibility required	
	Easy User Interface by Button, buzzers and LEDS	Temperature Sensor	
	2 accurate pressure sensors inside [0 – 10] Bar	Till 10 signals: 10 solenoids outputs LATCH 1 digital input 1 analog input 1 relay output	

SKYfilter Tiny	SKYfilter APP to manage the filter programmer		Bluetooth 5.0 (BLE) communication compatible	
	IP65 protection		Powered by: - 9 V alkaline batteries – 7,2 AA Lithium batteries – Solar panel + batteries	
	Configuration and relevant data information managed and saved into non-volatile memory		Security password accessibility required	
	Easy User Interface by Button, buzzers and LEDS		Temperature Sensor	
	2 accurate pressure sensors inside [0 – 10] Bar		2 solenoids outputs LATCH	

1.2. SKYfilter User Interface

There are two ways to operate with SKYfilter:

- **Physical interface**: Button, buzzer and LED's. It allows to Start/Stop flushes, monitoring the state of flushing and the state of SKYfilter in an easy way (no tools required).

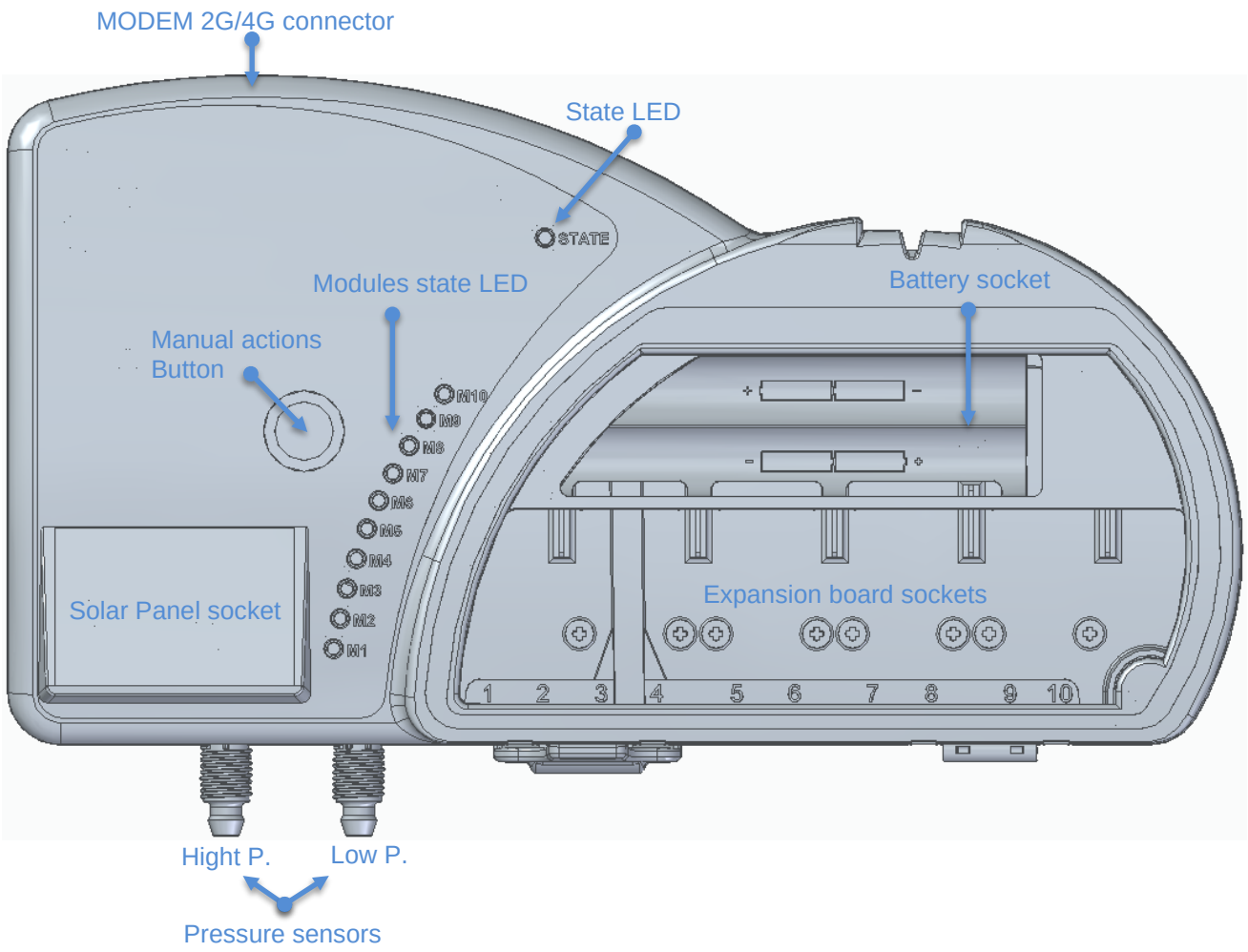
- **Smartphone application**: Connected with SKYfilter App by Bluetooth. It allows get information, configure and act on SKYfilter through friendly smartphone application.

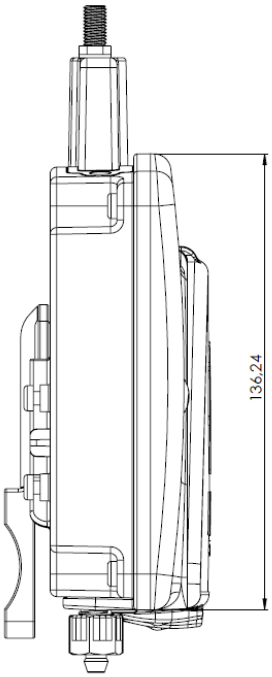
SKYfilter APP	Physical interface
	

Local actions (By Bluetooth LE)
• Flushing sequence configuration
• Flush parameters configuration
• External modules configuration
• Start flush
  ○ Complete
  ○ Modules
• Stop flush
• Factory reset
• Datalogger management
• Events/Alarms management
	Manual actions through button
	• Start flush
	• Stop flush
	• Factory reset
	• Auto calibration

2 Physical aspect and general dimensions

2.1 SKYfilter

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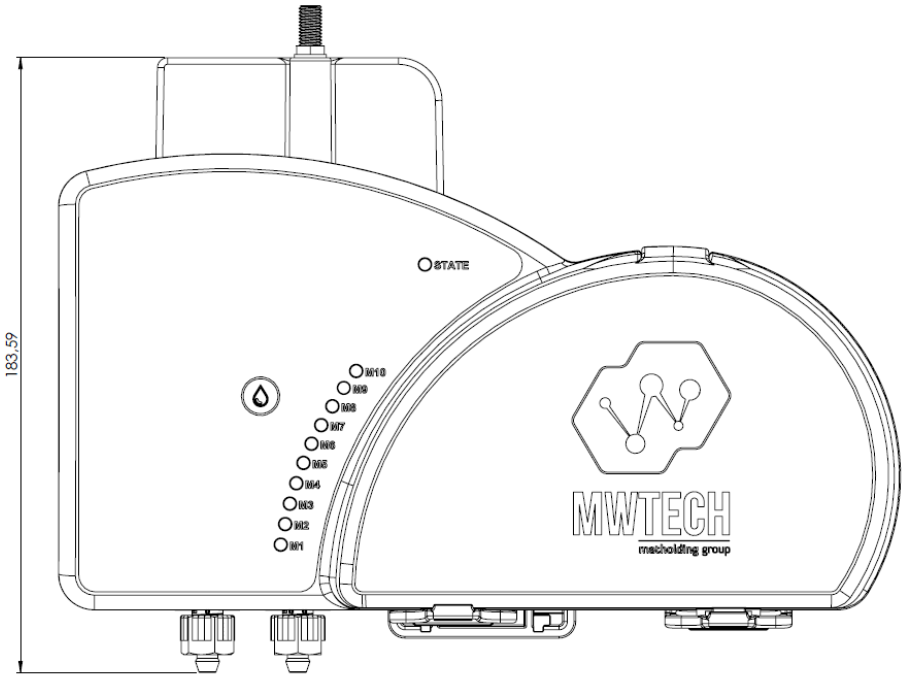
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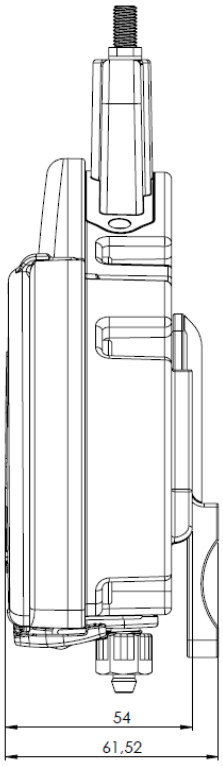
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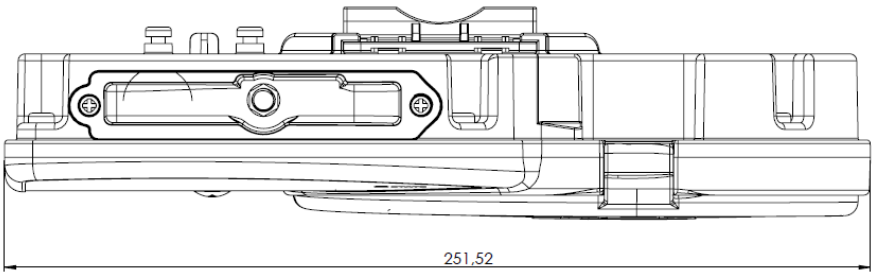
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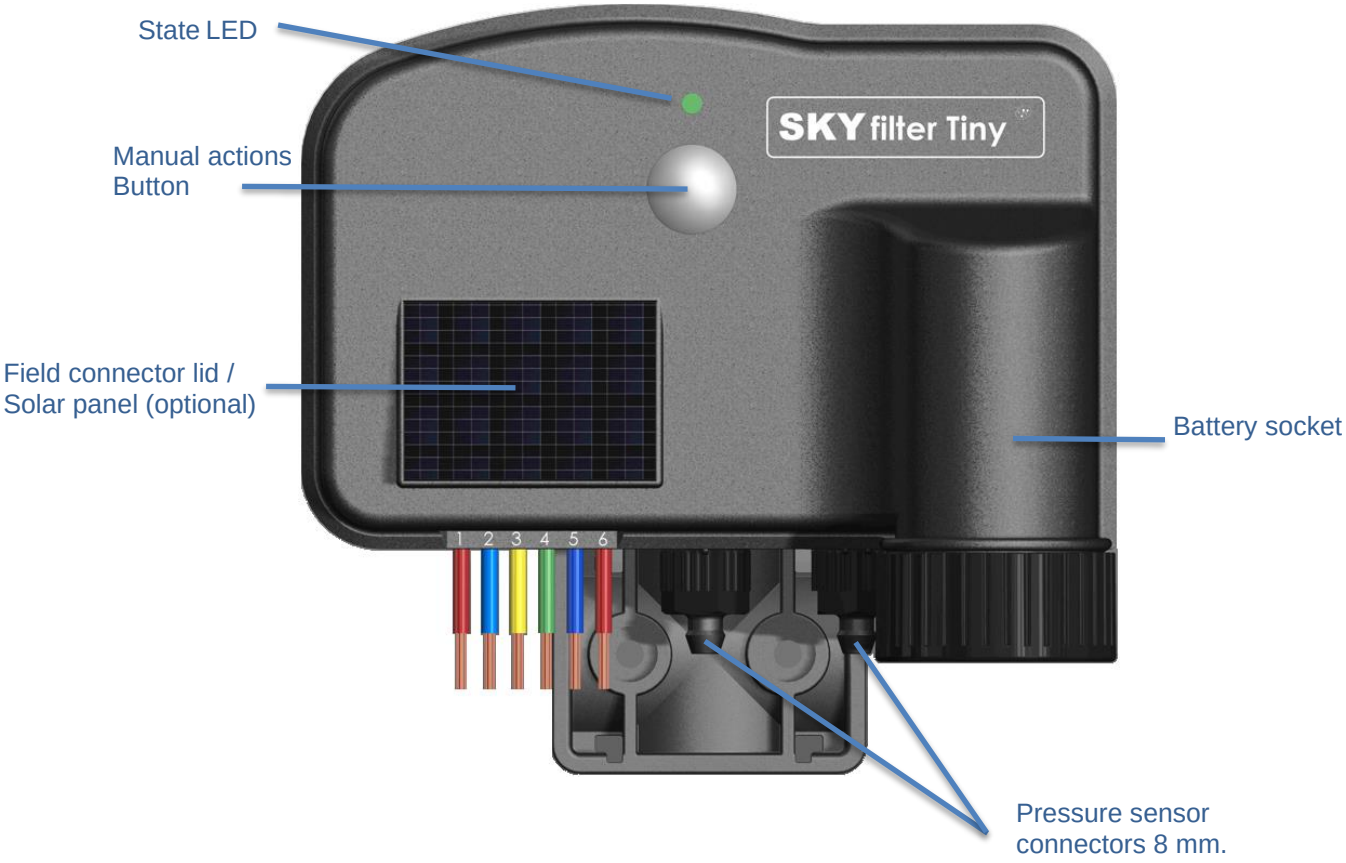
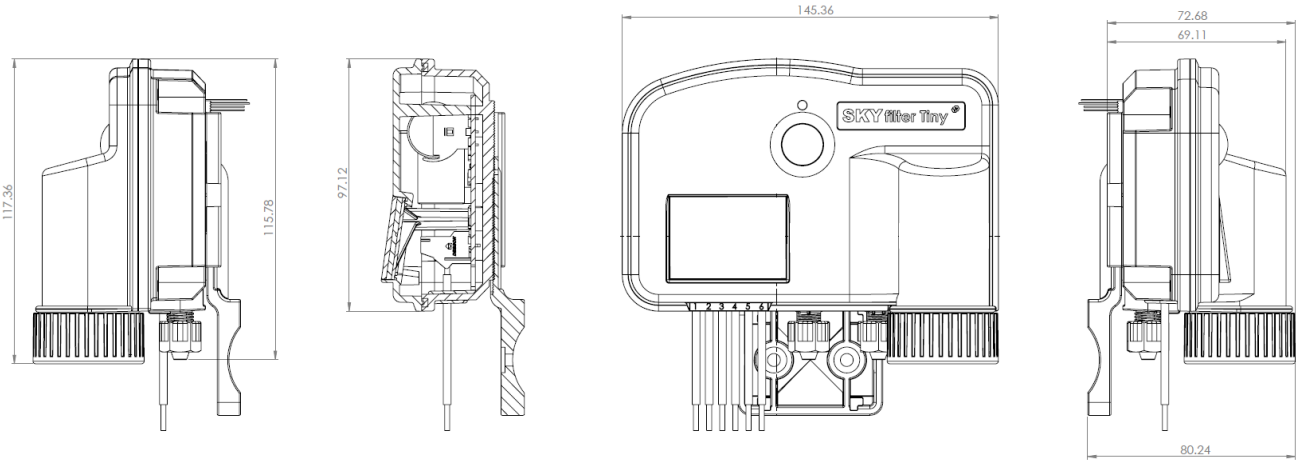
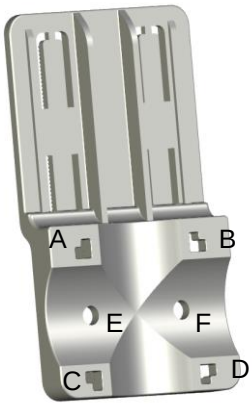
2.2 SKYfilter Tiny





3 Installation

SKYfilter Tiny can be installed in different environments through a removable support.

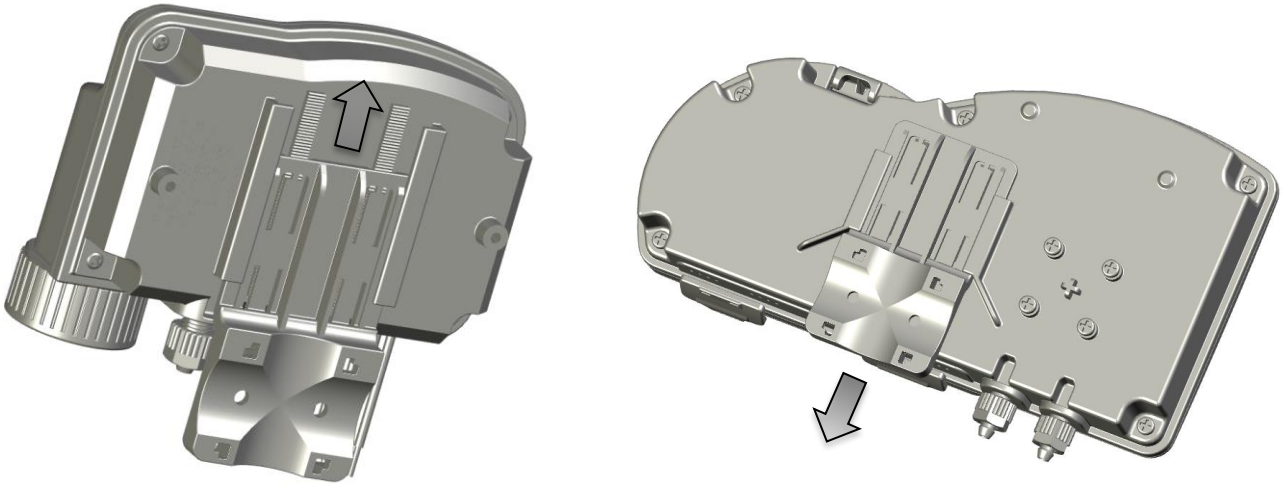


Features:

- 4 holes to fix to wall (A,B,C,D)
- 2 holes to fix mast by plastic brackets (E,F)
- Removable device without tools.

3.1 Wall

The device can be fix to walls, fixing the support through the holes A,B,C,D by screws. After the support is fixed at wall, the device can be coupled to the support by the sliding the device by rear part to support.

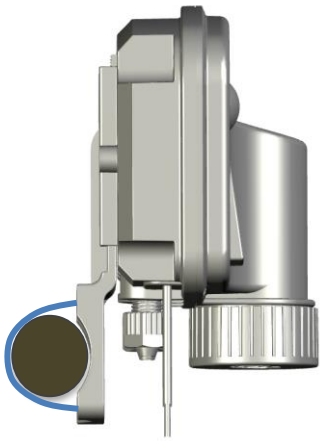


Figures shows the rear part of SKYfilter with the slide support coupled.

The device can be remove (without any tool) from support, sliding it up following the arrow direction.

3.2 Mast

The support fit with mast in vertical or horizontal position.

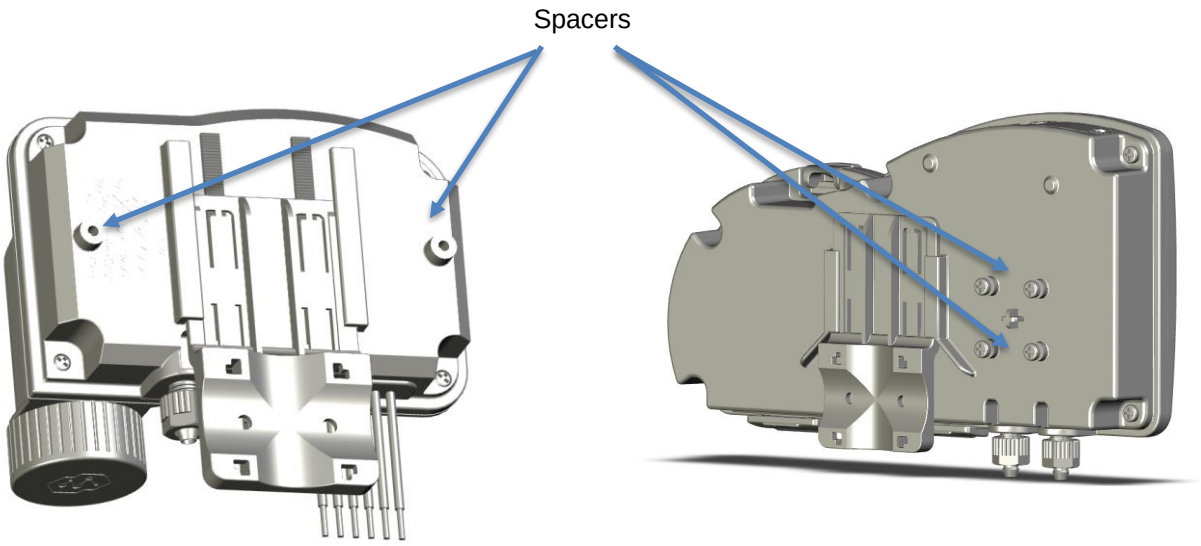


Horitzontal mast mounting

Vertical mast mounting

3.3 Mounting plate

Additionally to the support, the SKYfilter Tiny enclosure has two spacers to fitting through screws the programmer to a plate.



4 Field connection

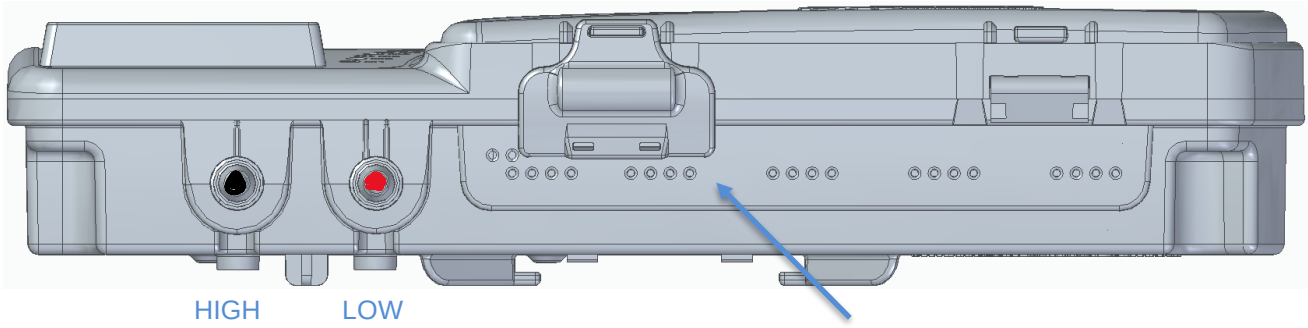
4.1 SKYfilter

- Till 10 LATCH solenoids
- 1 digital input
- 1 relay output
- 1 analog input

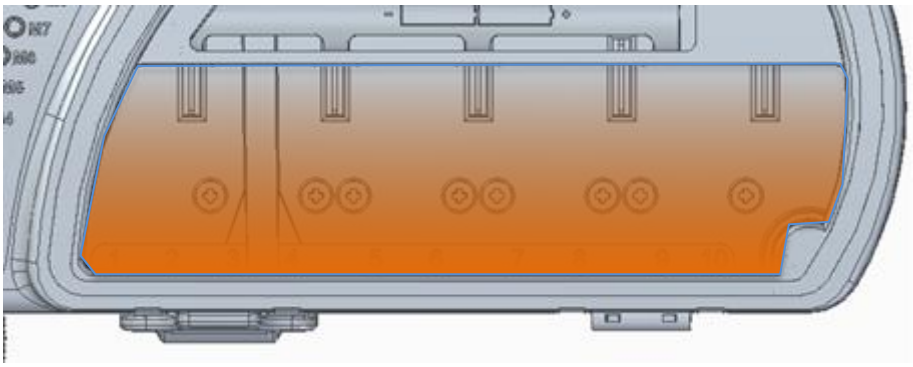
2 Latch solenoids are built-in, all the rest can be incorporate as expansion modules.

SKYfilter programmer has been designed with the aim to:

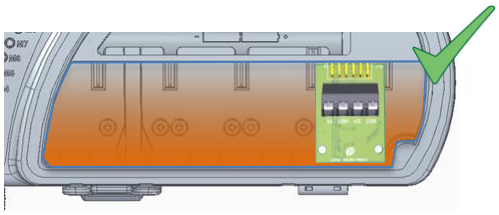
- Connect field sensors/actuators/water meters/etc. in an easy way, with no tools (only screwdriver)
- Adapt the programmer to the requirements.
- Easy test commissioning of elements, before leave the programmer ready to run in unattended mode

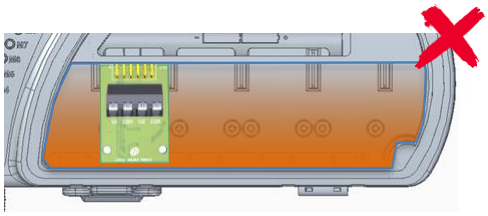


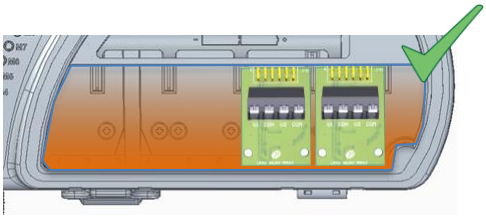
Field connector area

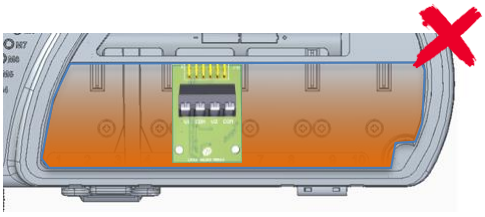


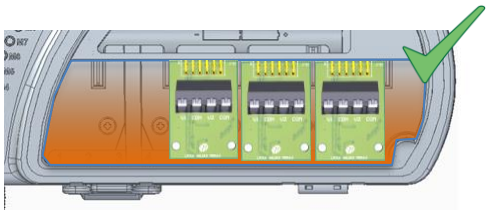
The field connector area allows increase the capabilities of sensors/actuators. Consider connect the modules always from left part to right part, without leaving empty positions.

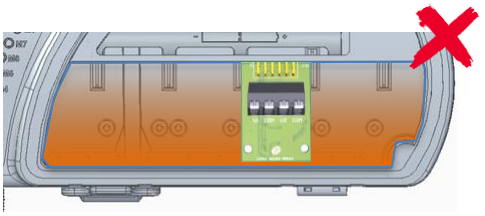


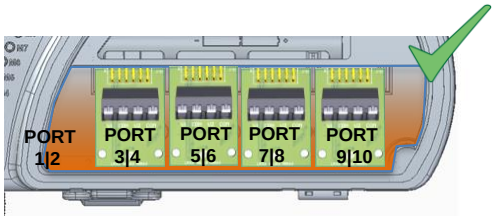


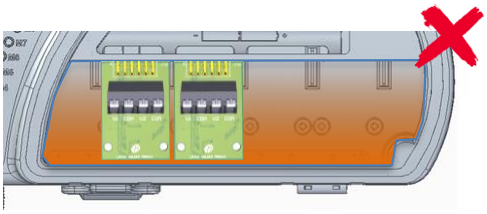


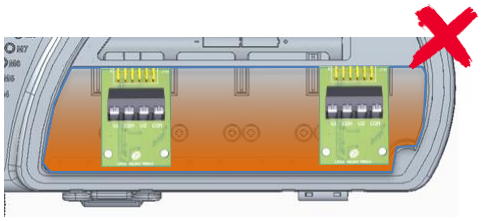


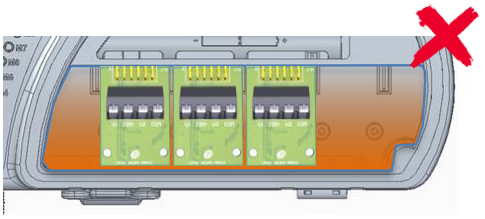


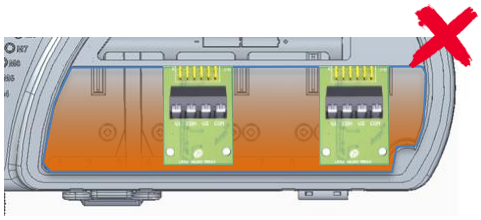


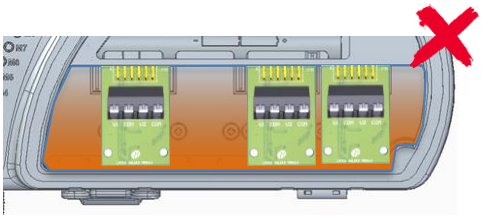

PORT 1|2
PORT 3|4
PORT 5|6
PORT 7|8
PORT 9|10

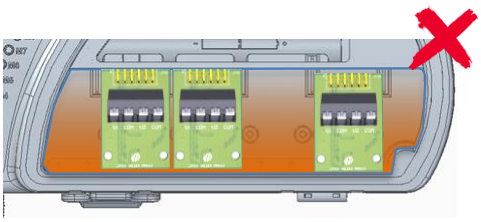










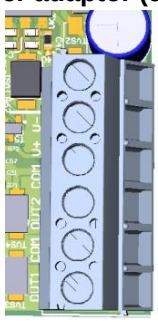


4.1.1 Power Supply

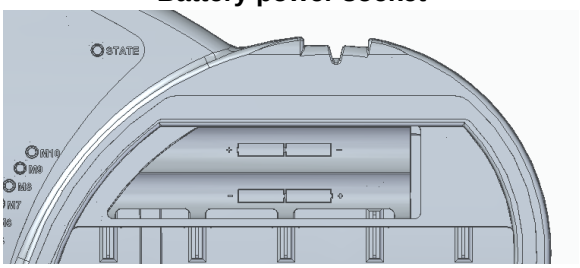
SKYfilter programmer can be powered by:

- Batteries options power:
  - 4 alcalines batteries (1,5Volts) put on the batteries socket of the programmer, following the position indicate in the plastic.
  - 2 Lithium batteries (3,6 Volts) put on the bottom part of the batteries socket of the programmer.
- Grid power supply through power adaptor (9 to 12 Volts **DC – AC/DC**), connected directly in the field connector aera. No polarity sensitive.
- Additionally, to batteries, SKYfilter programmer can be powered by solar module consist on a photovoltaic panel and extra module (battery accumulator) that minimize the battery consumption.

Grid power adaptor (9-12Volts)



Battery power socket



4.1.2 Inputs/Outputs Capabilities

SKYfilter programmer has a minimum capability that can be increased in function of the requirements.

4.1.2.1 Minimum capabilities

- **Pressure sensors**: Absolute pressure sensors from 0 to 10 Bar (Dry sensors, no contact with water).
  - HIGH: Assigned to the measure of high pressure (INLET) of a filtration system.
  - LOW: Assigned to the measure of high pressure (OUTLET) of a filtration system.

The connection between water pressure and sensors, must be done by polyethylene pipe of 8 mm, insert directly to the plastic connector and fit with the plastic NUT that comes with the device.

- **Temperature sensor:** Temperature sensor integrate in pressure sensor, from - 45 ºC to +85 ºC
- **2 Solenoid actuators:** Interface to connect 2 solenoids (LATCH or CONTINUOUS, in function of model)

4.1.2.2 Maximum capabilities

SKYfilter can increase the field capabilities till 4 additional expansion modules. In case of Analog input module and digital input/relay module, only one module can be used per device.

Maximum capabilities options:

- 2 pressure sensors + temperature sensor + 10 solenoids actuators (LATCH or CONTINUOUS, in function of model).
- 2 pressures sensors + temperature sensor + 8 solenoids actuators (LATCH or CONTINUOUS, in function of model) + external analog input [4-20]mA.

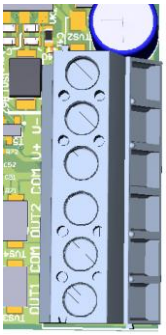
- 2 pressure sensors + temperature sensor + 8 solenoids actuators (LATCH or CONTINUOUS, in function of model) + external digital input/relay output.
- 2 pressure sensors + temperature sensor + 6 solenoids actuators (LATCH or CONTINUOUS, in function of model) + external analog input [4-20]mA + external digital input/relay output.

CONSIDERATION:

- Maximum capabilities can be reach adding external modules by own user.
- Minimum capabilities come by default SKYfilter programmer.

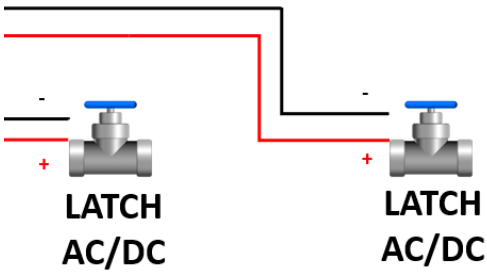
4.1.2.3 Internal connection

SKYfilter programmer device comes with an interface to manage 2 LATCH solenoid actuators (or AC/DC CONTINUOUS solenoid actuators, in function of model). This interface is accessible by the field connector area, where the user can connect directly the solenoid cables passing through the cable gland.



PORT 1|2

GND Solenoid 2
Solenoid 2
GND Solenoid 1
Solenoid 1



CONSIDERATION:

- Only 2 wires LATCH solenoids can be connected (NO 3 WIRES)

4.1.2.4 Expansion modules field connection

Additionally, SKYfilter programmer can increase their capabilities adding extra LATCH or CONTINUOUS solenoids modules. A maximum of 4 modules can be added to SKYfilter programmer.

The modules can be insert by the own user taking into account some considerations:

- The connection/dis connection must be done with the device OFF (without power)
- The first module must be on the right free socket of the field connection area, and next consecutive
- Be sure the connection is done correctly; the module must fit into the electric pins correctly, the module holes inserted into the plastic towers

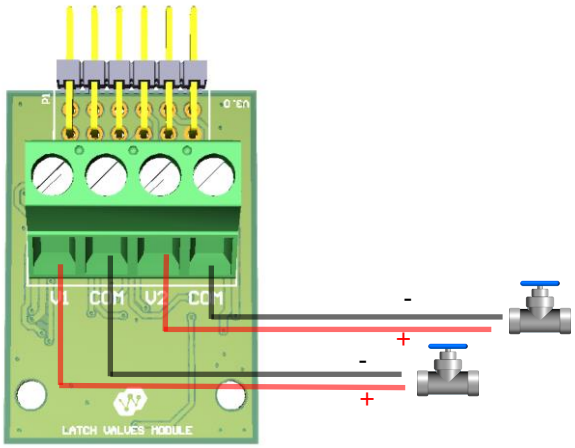
4.1.2.4.1 2 LATCH solenoids expansion module

This module manages 2 outputs compatible with LATCH solenoids.

COM PORT is associated to negative signal of the solenoid.

V1 is associated to PORT 9,7,5 or 3 in function of the position of the expansion module in the SKYfilter device.

V2 is associated to PORT 10,8,6 or 4 in function of the position of the expansion module in the SKYfilter device.



SKYfilter admits until 4 LATCH expansion modules, this is till 8 additional LATCH outputs to the 2 internal LATCH outputs of the SKYfilter device.

CONSIDERATION:

Latch expansion modules can't be used in SKYfilter AC/DC version nor mix with AC/DC modules.

4.1.2.4.2 2 AC/DC solenoids expansion module

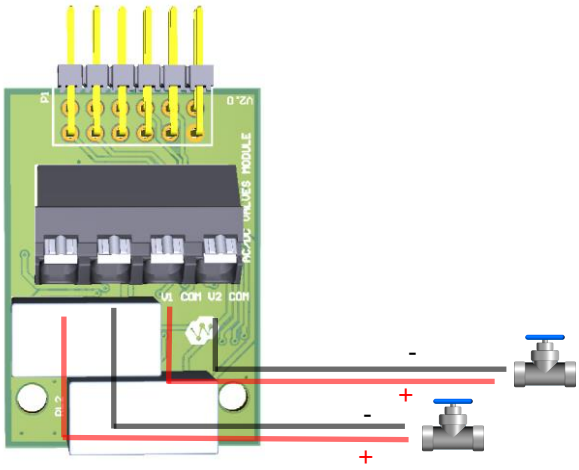
AC/DC modules can manage AC/DC continuous solenoids.

COM PORT is associated to negative signal of the solenoid.

V1 is associated to PORT 9,7,5 or 3 in function of the position of the expansion module in the SKYfilter device.

V2 is associated to PORT 10,8,6 or 4 in function of the position of the expansion module in the SKYfilter device.

SKYfilter admits until 4 AC/DC expansion modules, this is till 8 additional AC/DC outputs to the 2 internal AC/DC outputs of the SKYfilter device.

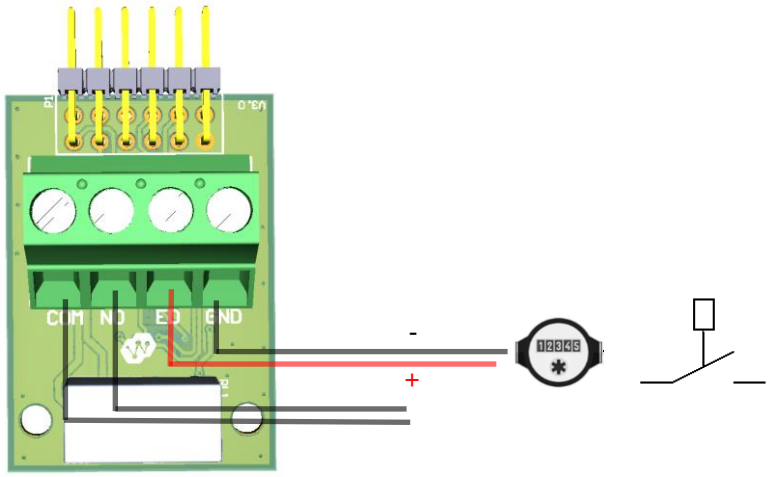


CONSIDERATION:

AC/DC expansion modules can't be used in SKYfilter LATCH version nor mix with LATCH modules.

4.1.2.4.3 1 DIGITAL input – 1 RELAY output expansion module

This module can manage one digital input (dry contact or open collector), and a relay contact.



RELAY contact can be configured as normally open or normally close by the SKYfilter App. The PORT associated to RELAY is 9,7,5,3 in function of the position of the expansion module in the SKYfilter device.

DIGITAL INPUT can manage dry contact inputs or open collector signals compatible. The PORT associated to RELAY is 10,8,4,2 in function of the position of the expansion module in the SKYfilter device.

MAIN CHARACTERISTICS

- Digital input minimum pulse detection: > 1 second
- Digital input dry contact interface < 50 mA
- Relay output minimum pulse output: > 1 second
- Relay power characteristics:
    - Max. switching voltage: 220VDC, 250 VAC
    - Rated current: 2A
    - Switching Power: 60 W, 62,5VA

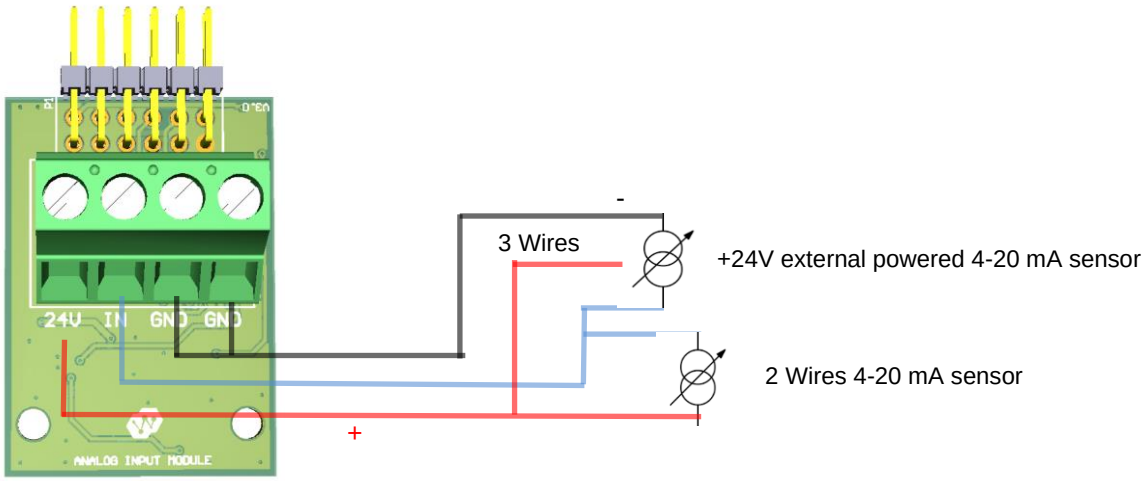
Digital input sensor can be connected to a water meter (dry contact output) to measure the flow and water volume consumption.

CONSIDERATIONS:
Only one digital input / relay output module can be installed in each SKYfilter programmer

4.1.2.4.4 1 4-20 mA ANALOG input expansion module

Analog expansion module can manage one 4-20 mA sensor (2-wires, External powered sensor or 3 wired sensor).

Analog expansion module needs two ports of the SKYfilter and the signal is mapped on PORTS 9,7,5 or 3 in function of the position of the expansion module in the SKYfilter device.



CONSIDERATIONS:
- Only one analog input sensor module can be installed in each SKYfilter programmer.
- The port number only takes 1 position to analog signal, but 2 position to other modules.

4.1.2.4.5 Temperature sensor

Temperature sensor is installed by default in the device, and measure the temperature of the air between the pressure sensor and the water in the high-pressure pipe. The range of measure is – 45ºC to + 85ºC.

4.2 SKYfilter Tiny

- 2 LATCH Solenoids
- 1 digital input
- 2 pressure sensor

Latch solenoids and digital input is accessible through the Field connector lid or solar panel socket that can be extract by a screw from the rear part of the device and pressure sensor through 8 milimeters plastic PORTS sockets.

4.2.1 Power supply

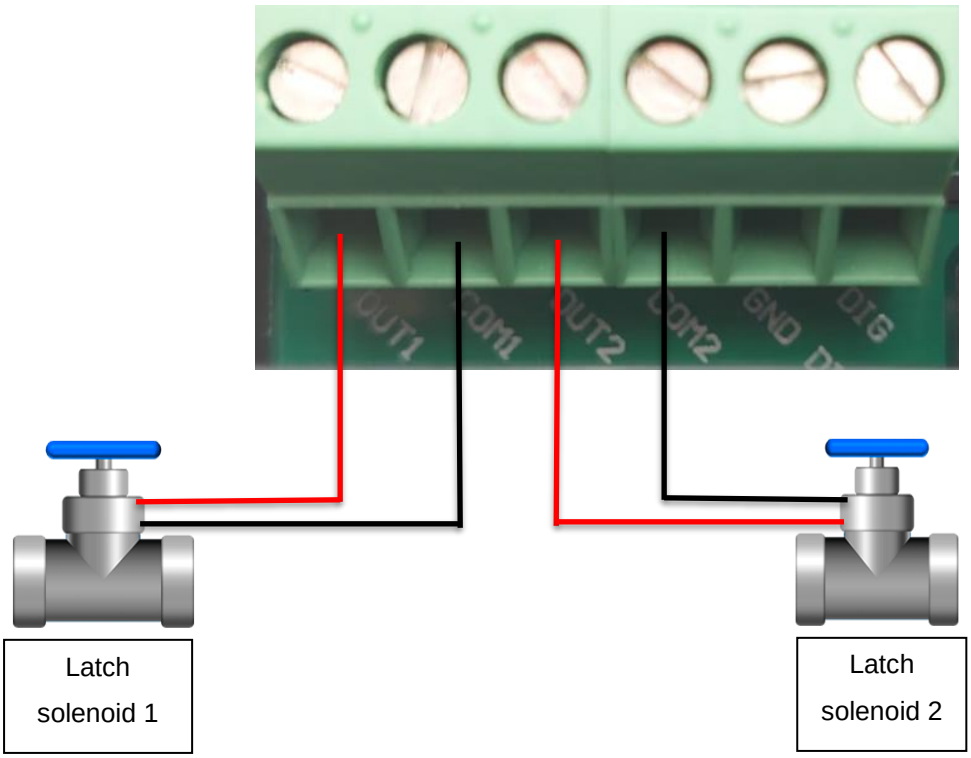
SKYfilter Tiny can be feed with different power sources:

- 9 Volts Alkaline battery
- 9 Volts primary lithium battery
- Solar panel + Lithium rechargable battery (7,2 – 11,2 Volts)
- 12 Volts DC power supply

4.2.2 LATCH solenoid Field connector

SKYfilter Tiny can manage by SKYfilter App, till 2 latch solenoids identifies by PORT1 and PORT2.
PORT 1 is signalled as OUT1 and COM1, where OUT1 is the positive pulse when OPEN action is executed, and OUT1 is the GND,

PORT 2 is signalled as OUT2 and COM2, Where OUT2 is the positive pulse when OPEN action is executed, and OUT2 is the GND.

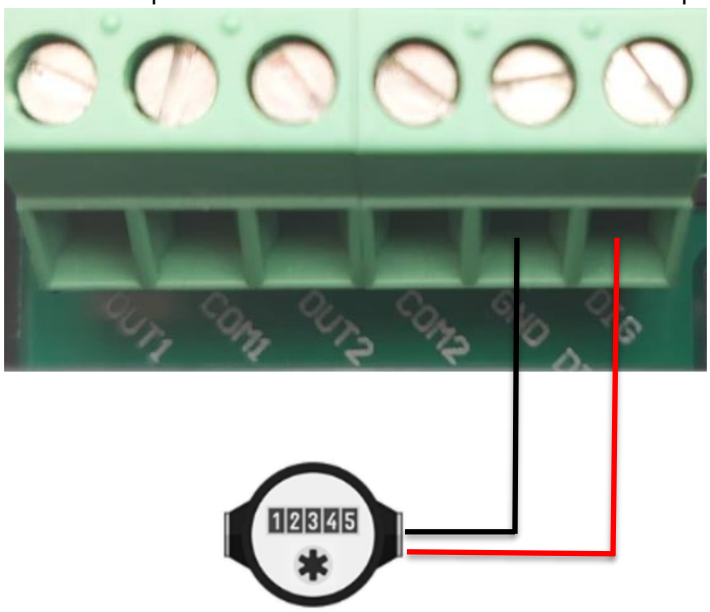


User can define whatever of the two solenoid outputs (both or only one).

CONSIDERATION: By default, SKYfilter tiny is configured with 1 Latch solenoid attached at PORT 1.

4.2.3 Digital input field connector

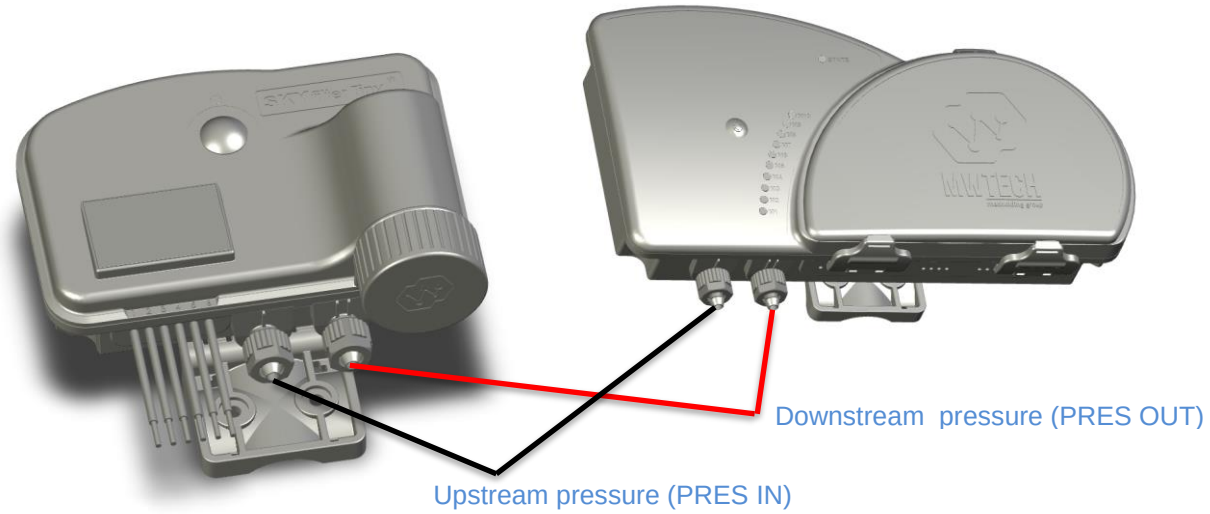
SKYfilter Tiny can manage one digital input (dry contact or open collector interface). The digital input is managed by SKYfilter App as PORT 4 and must be connected at GND DIG and DIG hole connector.
In dry contact sensors it doesn't matter the polarity. However, if you are using open collector interface, user must be sure to connect GND of the open collector interface to GND DIG and the open collector signal to DIG.



CONSIDERATION: By default, SKYfilter tiny is configured with 1 digital input as a ON/OFF sensor attached as PORT 4. This sensor is configured as stopper of flushed when ON.

4.2.4 Sensor pressure 8 mm pipe connectors

SKYfilter can manage two absolute pressure sensors [0-10] Bar range.



SKYfilter App consider the Upstream or PRES IN pressure the sensor attached at PORT | and Downstream or PRES OUT pressure the sensor attached at PORT ||.
The connection to these ports must be done attaching 8 mm polyethylene pipe to the ports and fit to device by the nut supplied with the device.
Pressure sensor Accuracy is ±0,25% Full Scale Span.

CONSIDERATIONS: These two sensors are defined by default in the SKYfilter Tiny, it's not necessary be created by user.

4.2.5 Temperature sensor

SKYfilter tiny has a built-in temperature sensor that can be used to start flushes in function of the temperature.
The temperature sensor is created by default in SKYfilter tiny and SKYfilter App.
The temperature sensor range is -40ºC to +85ºC, with ± 1,5ºC error in the range of 0 to +50ºC and and ± 2,5ºC in the rest of the range.

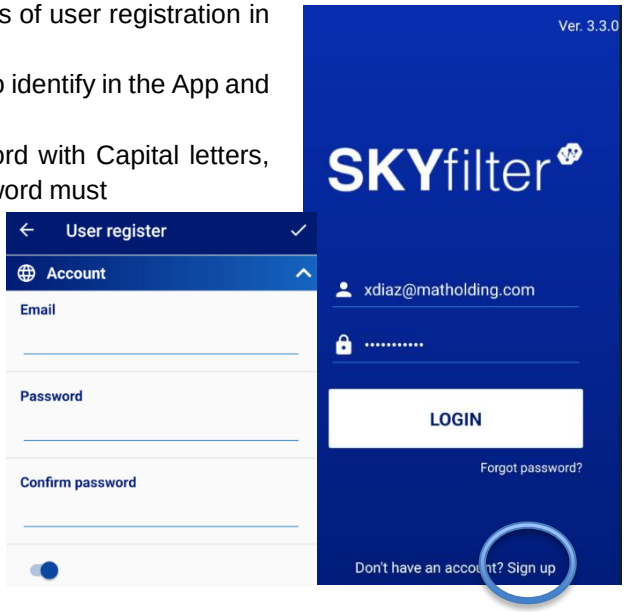
5 SKYfilter App

SKYfilter App can manage a set of SKYfilter programmers (SKYfilter and SKYfilter Tiny) in the same framework, sharing information, projects, users, etc.

5.1 Identification / user creation

Before start the commissioning a SKYfilter Tiny device, it's mandatory to download the SKYfilter App and install it in your portable device. After that, follow the next steps:

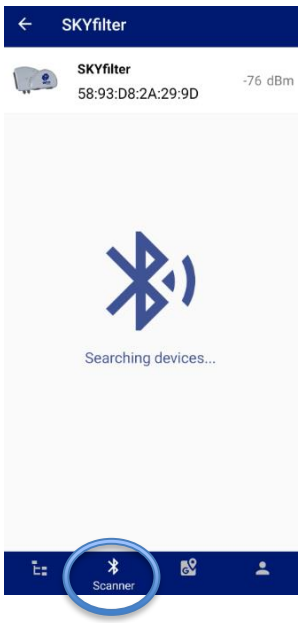
1- Run SKYfilter App.
2- User identification:
   a. If you don't have a SKYfilter account, select ***Sign up*** in the bottom part of the main screen of SKYfilter App. This allows to start the process of user registration in the ***User register screen***:
      i. Enter a valid e-mail. It will allow you to identify in the App and recover the password if you lost it.
      ii. Password must be a secure password with Capital letters, number and special signs. The password must be confirmed for security reasons.
   b. If you have a SKYfilter account, identify with your e-mail and password to enter in the SKYfilter App
   c. If you don't remember the password, select ***Forgot password*** to re start the credentials through your valid e-mail.



5.2 App Operation

SKYfilter App allows user to operate with programmers directly from the main screen of *searching devices,* or through a structured organization configured by user in function of their requirements.

5.2.1 Searching screen



The *searching devices* screen is the default screen showed when user access to SKYfilter App. It is constantly searching for SKYfilter devices in order to be able to connect with them. A list of the found devices is showed meanwhile the App is searching new devices.

The App shows the name of the device, if was created in the App, or the type of programmer (SKYfilter / SKYfilter Tiny) if the device wasn't created in the App. Additionally is showed the associated MAC address with the coverage level (as higher as better).

The user can access to the monitor screen tapping on device row.

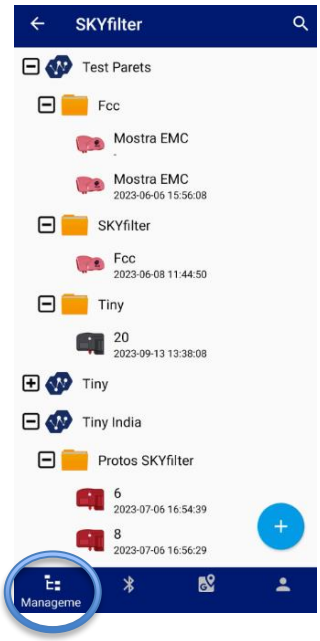
There are some functionalities that are not available accessing by searching mode:

- Access with device PIN code active
- Historical information (Datalogger, events, alarms, etc.)
- Name of the device (customizable)
- Maintenance information
- Firmware upgrade

- Notes
- Geolocation

5.2.2 Project managing screen

SKYfilter App can organize the devices in folders in function of different parameters that user can need to have them well organized, etc.



There are three levels of organization:

- **Project**: It's the first level of organization, only needs a name to identify the structure. User can create as projects as needed. Project can't content programmers, only folders (control zone).
- **Folder (control zones)**: It's the second level of organization, and can content other sub folders or devices, even duplicated devices.
- **Device:** It's located in folders.

SKYfilter App can manage the information of the SKYfilter programmers organized by projects. Each project can content several devices that can be organized by Control zones (folders that allow user to organize the different devices contained in a project). This feature allows users to manage from 1 SKYfilter programmer till hundreds of them, organized in projects/folders/sub folders/…

It's important before to create the device(s) to think the structure of the projects/folders and devices they will contain.

CONSIDERATIONS
The structure of projects/folders can be deleted/modified easily by user. Don't worry if the first time something is different for the final operative structure, you can modify it.

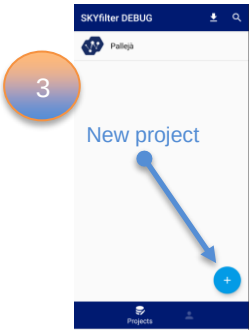
5.2.2.1 Project creation

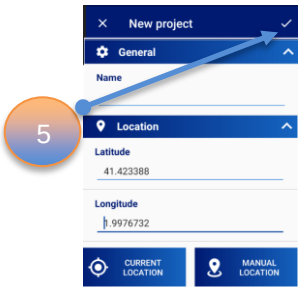
A project is a logical way to identify the project/parcel/organization/etc. which belong the SKYfilter programmer device, in order to clarify to user, the use of the hole system.
A project can contain folders, that can contain one or more SKYfilter devices or other folders, so a project can identify in general words the set of SKYfilter contained in it.

Steps to create a project:

1. Run SKYfilter App and access by credentials.
2. In the *Searching devices* screen go to Manage option (left icon in the bottom part of the App).
3. Tap + in the main screen to create a new project.
4. Enter the project name (Alphanumeric text) to identify the project (only informative for user) and enter the geolocation of the Project device.

5. Confirm the information tapping the check symbol in the top right corner of the application.
6. Check in the main screen a new project has been created.





5.2.2.2 Control zones

A control zone is a folder in a project that can contains SKYfilter devices or other folders (control zones). This structure allows users to organize the devices in a clear mode to access the different places where devices are located. For a selected project, the user can see in a geo referenced map all the devices contained in the project taping in the Map icon (place in the bottom of the application).

To create a control zone, from the *Manage* screen follow the next steps:

1- Tap on the project name and select “Add Control zone” icon.
2- Enter a name (Alphanumeric text), description and geolocation and confirm the information tapping in the confirmation icon.

CONSIDERATIONS

- One Control zone can content more control zones
- Each Control zone can content SKYfilter programmer devices, even repeated devices in other projects/control zones
- Each Smart device can be organized in a different way (following the user structure). This is, the same devices could be in different smart phones with different structures (each one belongs to the user). The structures are locally for each smart phone. This allow organize the Projects/Control zones/SKYfilter devices in a different way for each user. E.g., two users can have different organization (project/control zone) of the same SKYfilter programmers.

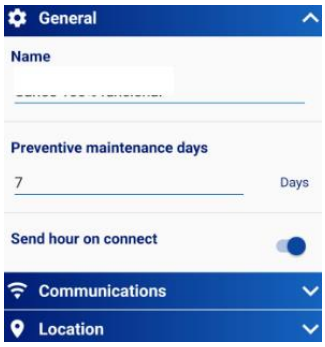
5.2.2.3 SKYfilter creation

Once the project and control zone have been created, the user can add SKYfilter programmer in the selected control zone.

1- Select the desired Control zone and tap on type of SKYfilter device icon
2- Fill de different fields of the SKYfilter device
   a. General
      i. **Name**: Alphanumeric text that identify the SKYfilter device

ii. **Preventive maintenance days**: Number of days that the system considers before indicating error in the SKYfilter application for non-periodic maintenance. The application considers a *non-periodic maintenance error,* painting the device in red colour, if after *preventive maintenance time* the user haven't connected with the device by the SKYfilter application.

iii. **Send hour on connect:** This option allow application to synchronize the SKYfilter programmer every time when connecting.



b. Communications

i. **Bluetooth MAC:** Indicate the Bluetooth address of the device, needed to connect with the SKYfilter programmer. This information can be got texting it manually or by scanning the QR code with the smartphone camera.

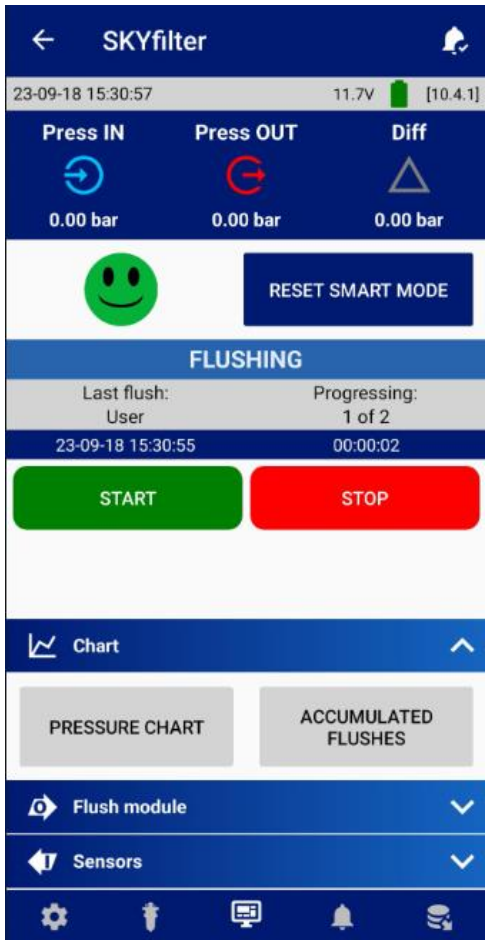
ii. **Security PIN access:** This is a 4 digits code that user can modify in order to enter to SKYfilter device. This code is necessary to connect with the SKYfilter programmer (by default 0000). Once it has been modified, SKYfilter programmer could be reached (connected) only by applications that know the PIN number. If you forget the PIN number, a factory reset must be done to recover the functionality/connectivity.

c. **Location:** Coordinates of the site installed the SKYfilter programmer.

5.2.3 Bluetooth connection.

Link the App and the programmer by Bluetooth, allows a set of functionalities in order to configure, program, monitoring, upgrading, managing information, etc., the programmer.

5.2.4 Control mode



Control mode screen allows user to control all the features of SKYfilter devices. User can access to Control mode by the *searching devices* screen or *project managing* screen.

Once the user is connected to SKYfilter device a set of functionalities/information are available. This information is being upgrading continuously.

5.2.4.1 General information

The first line of the control mode screen indicates the Date of the programmer, the battery level in Volts and the version (Firmware, bootloader and hardware version, e.g.: Firmware 10, Bootloader 4 and Hardware 1).

5.2.4.2 Pressure information

On the top of the screen there are three icons with the values of the input pressure (Press IN), output pressure (Press OUT) and de differential pressure (Diff).

5.2.4.3 Flushing information

The application is monitoring all the time is connected with the programmer, the timing of the flushing. This information is:

- **Last flush:** Indicates the origin of the last flush done by programmer, and the date when it was done.
- **Next flush:** Indicates if there is a periodic flush programmer when it will come by a countdown time.
- **Processing:** Indicates the timing in the current flushing, this is, the number of sequences involve in the flushing process, the countdown time for each sequence, master valve or auxiliary valve sequences.
- **START / STOP buttons:** These buttons allow start or stop a flushing sequence.
- **Chart**:
    - **Pressure CHART:** Represents a live graph of the three pressures involve in the filter (Press IN, Press OUT, Diff). The user can modify the upgrading period of the graph.
    - **Accumulated flushes:** A chart with the accumulated flushes by
        - Time (day, week, month, year)
        - Origin (Differential pressure, Time, Manual, external).
- **Flush module:** functionality that allow user to operate only one module of the filter. This is, open/close independently one module of the complete filter. This functionality is useful in filter commissioning or maintenance test.

5.2.4.4 Sensor information

Information about the extra sensor defined in the programmer, this is:

- **Temperature**: Built-in sensor associates to the temperature near the water.
- **External 4-20 mA**: If user has defined an external 4-20 mA sensor, the value can be consult in this screen. This sensor must be defined if an extra input sensor module is installed in the programmer. Only for SKYfilter programmer's type.

- **Flow** – **Water meter consumption volume**: Through the digital input sensor, the user can define a flow sensor or Water meter volume sensor. This values, can be showed in the Sensor information tab.

5.2.4.5 Sm@rt mode information

SKYfilter has a functionality that increase the performance of the filter; sm@rt mode. This feature allows to improve the filter performance by a set of algorithm and automatism.
The sm@rt mode can be activate by user and a face image can show, in a glance, the state of the filter.
Indicates by a face image the state of the smart mode (if active). A smiled face image (green) indicates that the filter is working without any issue, a neutral face image (yellow) indicates some activity associate to sm@rt mode utility (it's needed to see the events to know which functionality was acting), and a sad face image (red) indicates clogging risk of the filter.

5.2.4.5.1 Advance Sm@rt mode

For factory users, it's possible to access to advanced settings on the sm@rt mode.

5.2.5 Configuration

Configuration option allows configure the multiple parameters of the programmer.

5.2.5.1 General parameter

5.2.5.1.1 Differential pressure

Differential pressure required between the input and the output pressure of the filter in order to begin the backwashing cycle, if enabled.

- Minimum value: 0,01 Bar
- Maximum value: 9,99 Bar
- Recommended (consult filter manufacturer): 0,5 Bar

5.2.5.1.2 Flushing time

Backwash cycle duration for each filter module. The value can be configured in minutes and seconds. These parameters are always enabled.

5.2.5.1.3 Time between flushes

The amount of time between one backwashing and the next one. This parameter start to countdown when the last backwashing is finished. This parameter can be configured in hours and minutes.

5.2.5.2 Advanced setting

Additional to the general parameters, there are a set of settings allowed only for factory users (contact your distributor to access these parameters, if needed). To access this configuration menu, user must select the + button in the *configuration* screen and introduce the 4 digits code gave by your distributor.

5.2.5.2.1 Parameters

5.2.5.2.1.1 Differential pressure time

The amount of time that the pressure differential must remain (whether it is the same or higher) in order to start backwashing.

Default value: 3 seconds. Enabled

5.2.5.2.1.2 Delay time between filters

Time between the end of a filter backwash and the start of the next. Threshold in minutes and seconds.

Default value: 0 minutes. 3 seconds. Enabled

5.2.5.2.1.3 Delay time between consecutive flushes

Time between the end of the wash and the start of the next one, if the wash conditions are maintained (continuous washing). Threshold in minutes and seconds.

Default value: 0 minutes, 0 seconds. Disabled.

5.2.5.2.1.4 Diary programs

Indicate the time (during 24:00 hours of the day) when the programmer will start a flush. There is a maximum number of 8 diary programs.

Default value: No programs. Disabled.

5.2.5.2.1.5 Maximum consecutive flushes

The number of consecutive backwashing that are allowed. If this number is exceeded, the filter will be disabled. An alarm will appear if defined (see 5.2.5.4.2).

Default value: 20 flushes. Disabled.

5.2.5.2.1.6 Maximum volume to flush

The volume of water that is consumed in order to start the backwashing of the filter. Threshold in pulses of water meter.

Default value: 1000. Disabled.

5.2.5.2.1.7 Stabilization time

Time to stabilize the measure before to take it. Threshold in seconds.

Default value: 1 sec. Enabled.

5.2.5.2.1.8 Maximum flushes by time

The maximum number of backwashes allowed per time. Threshold *number* of flushes by *hour.*

Default value: 100 flushes per 24 hours. Disabled.

5.2.5.2.1.9 Latch output voltage

The voltage applied by the device to the LATCH solenoid. Threshold in volts.

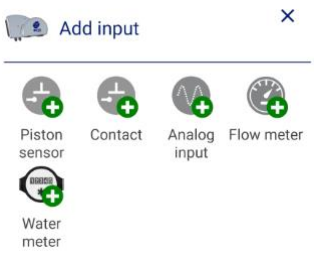
Default value: 12 Volts. Always enabled. In case of AC/DC model programmers, this parameter won't be taken into account.

5.2.5.2.1.10 Latch discharge time

The time that the energy discharge is applied to the latch solenoid. Threshold in milliseconds.

Default value: 50ms. Always enabled. In case of AC/DC model programmers, this parameter won't be taken into account.

5.2.5.2.2 Inputs

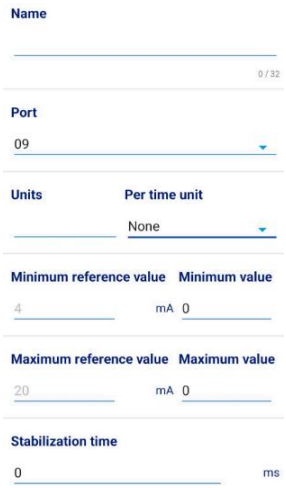


Allow to define and configure extra Inputs in the filter. This configuration depends on the type of filter.

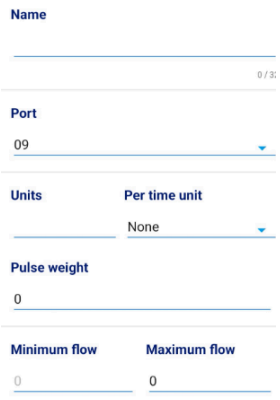
- **SKYfilter:** Possibilities of inputs:
  - 1 Piston sensor / Contact / Flow meter / Water meter
  - 1 analog input
- **SKYfilter Tiny**
  - 1 piston sensor / Contact / Flow meter / Water meter

By default, the configuration for both types of SKYfilter is a Piston sensor.

- *Piston sensor:* It's necessary to indicate the PORT number where the hardware is placed in the SKYfilter device. See **¡Error! No se encuentra el origen de la referencia.** section, and the name of the signal.
- *Contact***:** It's necessary to indicate the PORT number where the hardware is placed in the SKYfilter device. See **¡Error! No se encuentra el origen de la referencia.** section, and the name of the signal.
- *Analog input***:**



  - **Name**: Name of the signal.
  - **PORT** number where the hardware is placed in the SKYfilter device. See **¡Error! No se encuentra el origen de la referencia.** section, and t he name of the signal.
  - **Units**: Engineering units of the sensor associated to analog sensor.
  - **Per time unit**: time variable associated to the analog sensor.
  - **Minimum reference value**: 4 mA (not editable)
  - **Minimum value**: Engineering value corresponding to 4 mA sensor value.
  - **Maximum reference value**: 20 mA (not editable)
  - **Maximum value**: Engineering value corresponding to 20 mA sensor value.
  - **Stabilization time**: time that the programmer waits to get the value of the sensor in order to be stable.
- *Flow meter*:



  - **Name**: Name of the signal.
  - **PORT** number where the hardware is placed in the SKYfilter device. See **¡Error! No se encuentra el origen de la referencia.** section, a nd the name of the signal.
  - **Units**: Engineering units of the sensor associated to analog sensor.
  - **Per time unit**: time variable associated to the analog sensor.
  - **Pulse weight:** Weight of the pulse to transform to the units.

- **Minimum flow:** The minimum flow of the Water meter to be consider 0. (Not editable)
- **Maximum flow:** The maximum flow of the Water meter.

- *Water meter*:
  - **Name:** Name of the signal.
  - **PORT**: number where the hardware is placed in the SKYfilter device. See **¡Error! No se encuentra el origen de la referencia.** section.
  - **Units**: Engineering units of the sensor associated to water meter.
  - **Pulse weight**: Weight of the pulse to transform to the units.

5.2.5.2.3 Relay

Allow the user to define a relay output contact (only available for SKYfilter programmer type).

Data required:

- **Name:** Name of the signal.
- **PORT:** Number where the hardware is placed in the SKYfilter device. See **¡Error! No se encuentra el origen de la referencia.** section.
- **State of the output:** Indicates if the relay output must be Normally close (the contact is active in standby), or normally open (the contact is not active in standby).

5.2.5.2.4 Sensor actions

This section allows to define an action in function of the value of an external analog input sensor.

Data required:

- **Sensor:** Sensor that will modulate the action. User must choose the sensor from a list.
- **Threshold level**: Choose if the sensor value must be above or below the threshold value.
- **Threshold**: Value of reference to active the action when is under/overcome.
- **Action**: action that the programmer will execute.
  - Start flush: The programmer starts a new flush.
  - Stop flush: The programmer stops the current flush.
  - Enable scheduler: The programmer enables the schedule.
  - Disable scheduler: The programmer disables the schedule.
  - Disable pressure conditions: The programmer disable the pressure conditions.

User can define more than one action for sensor.

5.2.5.2.5 Contact actions

In this section user can define actions in function of the state of a contact input.

Data required:

- **Contact input:** Signal that will be considered.
- **Pulse shape:** Indicate the state or state change that will be consider to enable the action:
  - Rise: When the contact signal come from low to high
  - Fall: When the contact signal come from high
  - Change: When a change comes (from low to high or high to low)

- High: When the signal is high
- Low: When the signal is low

- **Action**: action that the programmer will execute.
  - Start flush: The programmer starts a new flush.
  - Stop flush: The programmer stops the current flush.
  - Enable scheduler: The programmer enables the schedule.
  - Disable scheduler: The programmer disables the schedule.
  - Disable pressure conditions: The programmer disable the pressure conditions.

5.2.5.3 Smart mode

Enable/disable the smart mode of the filter.
Smart mode is a set of algorithm and automatism that improve the performance of the filter.

5.2.5.4 Alarm actions

Utility to configure alarms by user.
Each alarm could:

- Enable a relay (if exists an it's configured)
- Configure an action when the alarm appears. The standard actions are:
  - **None**: No action is executed when the alarm appears.
  - **Start flush:** When the alarm appears start a new flush.
  - **Stop flush:** When the alarm appears stop the current flush.
  - **Enable scheduler:** Enable the scheduler when the alarm appears.
  - **Disable scheduler:** Disable the scheduler when the alarm appears.
- For Pressure sensor failure, there is a special action:
  - **Disable pressure conditions:** Disable the acquisition of pressure and the actions associated to pressure. E.g., flush by differential pressure.

5.2.5.4.1 Internal alarms

There are three alarms that are pre-configured in the programmer. User can modify the threshold values to activate the alarm, enable the relay (if exists and it's configured) or the action when the alarm appears (None, start flush, stop flush, enable scheduler or disable scheduler).

- **Low Battery:** The programmer generates an alarm when the battery voltage level goes down the configured. By default, the threshold of the Low Battery alarm is 4 Volts, no actions enabled, and the relay (if exists and it's configured) disabled.

- **Device not synchronized:** This alarm appears if the programmer is not synchronized correctly (bad date time).
- **Pressure sensor failure:** The programmer generates this alarm if the acquisition of the pressure sensor fails. Additionally, to the standard actions, in this alarm user can *Disable pressure conditions* to avoid a bad operation of the programmer. E.g. the programmer won't flush by differential pressure, only by time.

5.2.5.4.2 Customized alarms

Additionally, to internal alarms, user can add more customized alarms:

- **Digital input:** This alarm appears when a contact signal is active.
- **Sensor:** This alarm appears when an external analog input sensor is defined.
- **Flow meter:** This alarm appears when a pulse flow meter sensor is defined.
- **Volume:** This alarm appears when a water meter sensor is defined.
- **In Pressure:** Additionally, to enable the relay (if defined), user can configure an independent action for upper and lower values than some input pressure values.
- **Maximum consecutive flushes:** This alarm will appear when the conditions of maximum consecutive flushes are reached.
- **Maximum flushes by time:** This alarm will appear when the condition of maximum flushes by time is reached.
- **Out pressure:** Similar to In Pressure for Out pressure. Alarm that will appear when de Out pressure is above/bellow the threshold configure by user. Each threshold has an action that can be configured.

5.2.5.5 System

There are some aspects of the programmer that can be configured by user, that improve the user experience and/or improve the performance of the device.

- **LED**: Can be enable/disable by user configuration. LED signalize the state of the programmer, but sometimes we need to save energy and the functionality is not required. Default value: Enabled.
- **Sound**: Enable/Disable the buzzer to indicate the state of the programmer. Default value: Enabled.
- **Low power mode:** Indicate if the programmer must work as saving energy or not. It's recommended to enable low power mode when the programmer is powered by batteries. If the programmer is powered by grid electricity, user can configure it disabled. Default value: Enabled.
- **Programmer enabled:** This parameter enable the programmer to work as programmer. If it's disabled, the programmer can't start flushes. Default value: Enabled.

5.2.5.6 Default configuration

Devices comes from factory with a default configuration that allow user to start to work without additional configurations.

5.2.5.6.1 Main default parameters:

Parameters	FMA1000	FMA4000	FMA4000 SF	RING Filter	SAND Filters
Differential pressure	0,5	0,5	0,5	0,5	0,8
Flushing Time	20	45	45	45	300
Time between flushes	720	720	720	720	1440
Differential pressure time	3	3	3	3	3
Delay time between filters	5	5	12	5	5
Stabilization time	1	1	1	1	1
Latch output voltage	12	12	12	12	12
Latch discharge time	50	50	50	50	50

5.2.5.6.2 SKYfilter

Signals	FMA1000	FMA4000	FMA4000 SF	RING Filter	SAND Filters
Piston detection	X	X	√	X	X
Modules	PORT 1	PORT 1	PORT 1	PORT 1	PORT 1

5.2.6 Filter modules and valve configuration

In order to configure the filter modules and valve configuration, user must access to Filter module icon. This allows to configure the filtration station, with auxiliary valves too.

The options to configure the filter station are:

- Main valve
- Auxiliary valve
- Filter link
- Manual configuration
- Configuration by model

Some of the options of this menu, are only accessible by advanced users (contact your local distributor .

5.2.6.1 Manual configuration

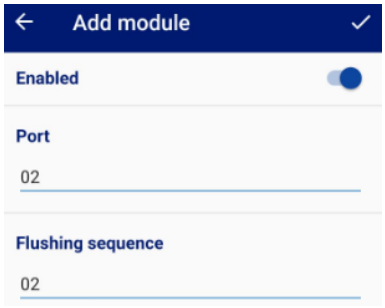
This option allows create filter modules sequentially, this is, each module will be open-close in sequential order.

Add a new filter module

1. Select the port where the solenoid is connected

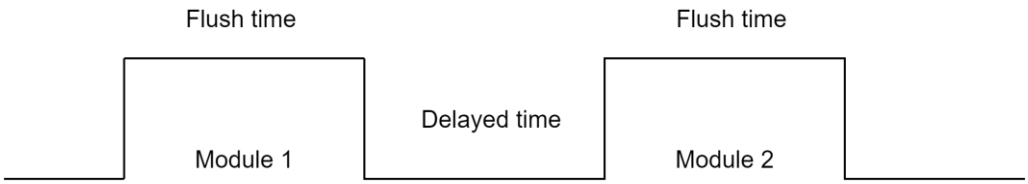
2. Select the sequence of this filter module in the flush sequence

3. Enable or disable this filter



SKYfilter generate automatically the flush sequence with the filter modules configured.

Each filter module will open and remained opened during the flushing time (configured in the parameters section), and will close after this time expired. Afterwards, the next filter module in the sequence will open, taking into account the delay between flushes parameter.

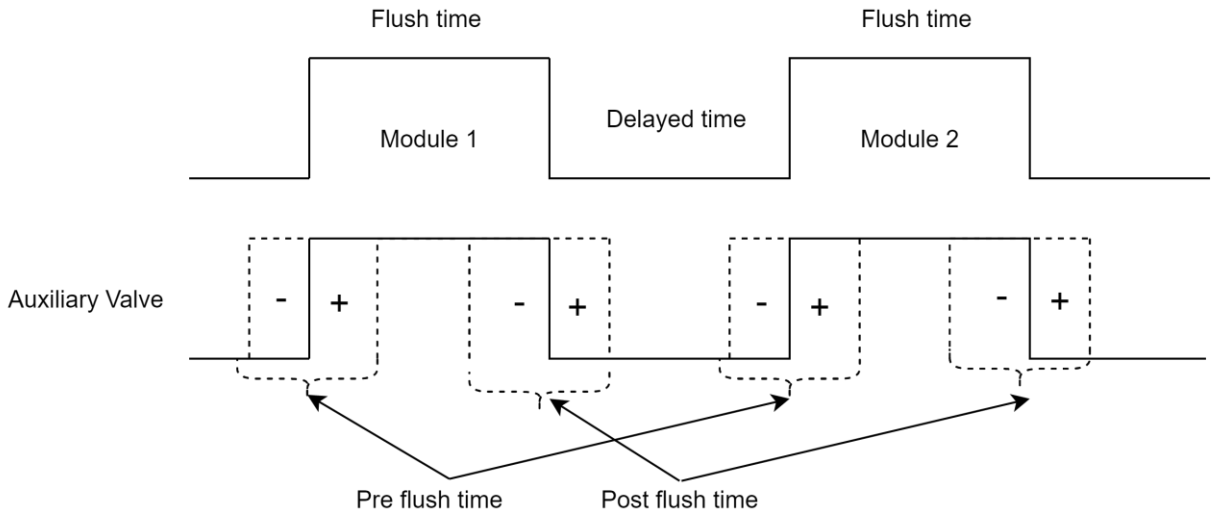


5.2.6.2 Auxiliary valve

The behaviour of an auxiliary valve is open before each module and close a little bit later than the module, in each module operation for each flush cycle.

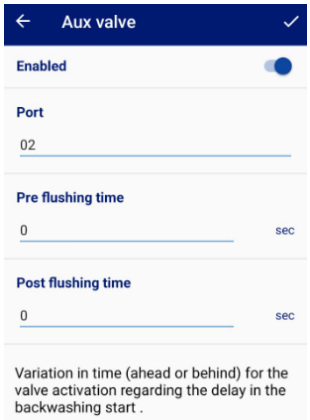
SKYfilter App allow to configure the time before and late that the auxiliary valve must open and close, this parameters Pre and post time could be positive or negative (before the action of the filter module).

Pre flush time: Indicate the time before (-) or after (+) the filter module must open
Post flush time: Indicate the time before (-) or after (+) the filter module must close.



Configuration parameter

1. PORT where the auxiliary valve solenoid is connected
2. Pre flush time (negative or positive)
3. Post flush time (negative or positive
4. Auxiliary valve enabled – disabled.



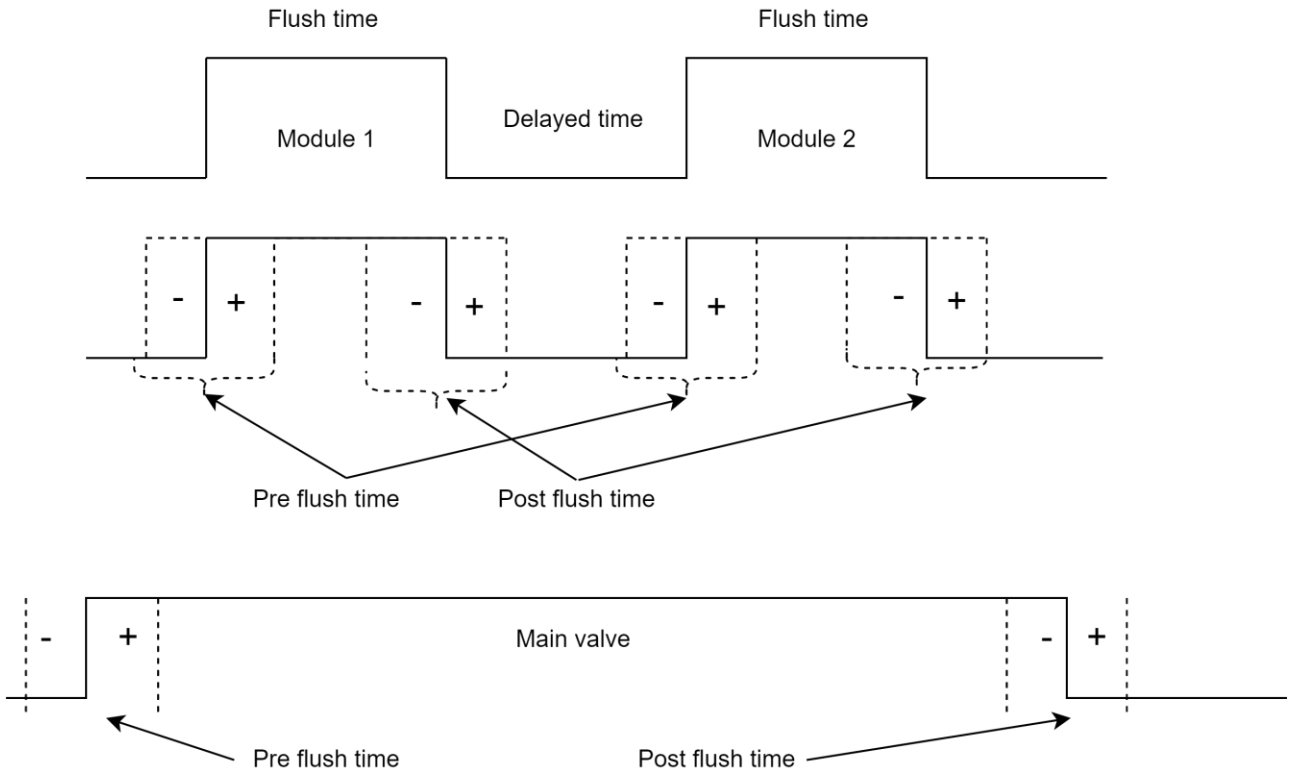
CONSIDERATION

If pre flush and post flush is configured to zero, the auxiliary valve will open a little bit before the modules open and will close a little bit after the modules close.

5.2.6.3 Main valve

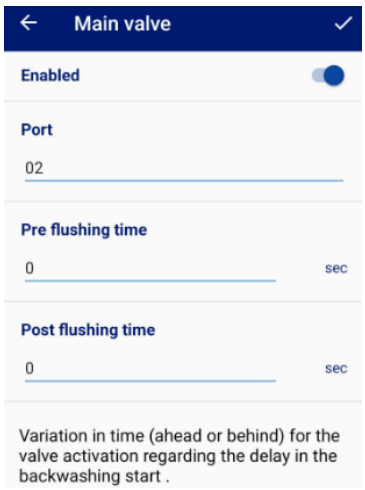
The main valve is associated to a valve that must open before the auxiliary valve or modules, and must close and the end of the flush cycle.

This valve allows to define the pre flush time and the post flush time, this is open a little bit before/after the auxiliary-module valve open and close.



Configuration parameter

1. PORT where the main valve solenoid is connected
2. Pre flush time (negative or positive)
3. Post flush time (negative or positive
4. Auxiliary valve enabled – disabled.



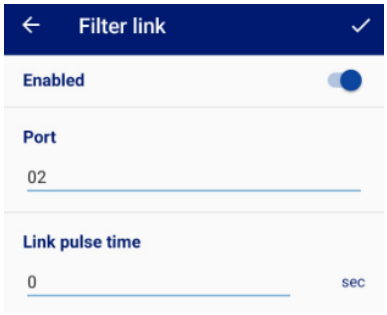
5.2.6.4 Filter modules link

SKYfilter allow to link two or more SKYfilter programmer in order to flush more than 10 modules in a filter station by the activation of a relay when the previous SKYfilter module has finished their flush.
The process to configure the link between programmers is:

- Don't configure any relay signal in the configuration section. If you have a relay configured, it's necessary to delete it.

Select link between filters in the Filter module configuration menu

1. Select the port where the relay module is connected
2. Configure the time the relay must be active
3. Enable or disable de link relay



The second device must be defined a digital input signal, to sense this action to start the sequence.

CONSIDERATION:

The use of a link signal disables the use of relay to alarms.

5.2.6.5 Configuration by model

This option allows to configure the modules and parameters associated to standard filter models. Choose this option if you know the model of the filter in order to adapt the better parameters in the programmer recommended by the filter manufacture.

User only has to select the filter module.

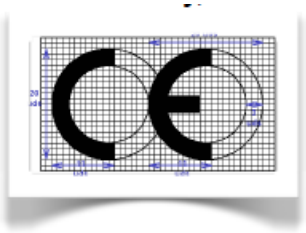
6 Troubleshouting

Can’t connect by Bluetooth:

- **Scan device screen:**
  - Try to get closer to the device to improve the coverage
  - Check the Bluetooth is active in the smart phone
  - Check the device hasn’t a PIN code. If the device has PIN code it’s mandatory to access by the *Manage device screen*. There the user will be able to configure the PIN code access.
- **Manage device screen:**
  - Be sure the MAC address is correct
  - The device is powered
  - Try to get closer to the device to improve the coverage
  - Check the Bluetooth is active in the smart phone
  - Error PIN code: Check the PIN code in the device parameters.

7 Regulatory statements

7.1 CE – Regulatory Notices



Marca: Brand:	REGABER
Modelo: Model:	SKYfilter
Descripción: Description:	Equipo control de riego
Directivas: Directives:	2014/35 /EU (LVD) 2014/30/EU (E. M. C.) 2014/53/EU (RED)
Ensayos y medidas. Norma: Tests and measurements. Standard:	UNE-EN 61000-3-2:2014 UNE-EN 61000-3-3:2013 UNE-EN 61000-6-1:2019 UNE-EN 61000-6-3:2007+A1:2012 UNE-EN 55032:2016 +/AC:2016-07 Class B UNE-EN 55035:2017 UNE-EN 301 489-1 v2.2.3 (2020-01-01) UNE-EN 301 489-3 v2.1.1 (2019-05-01) UNE-EN 301 489-17 v3.1.1 (2017-03-01)
Resultado en el informe de los ensayos Nº.: Show in summary in test report N°.:	2020-09-011
Verificado: Verified:	V
Fecha (DD-MM-AAAA): Date(DD-MM-YYYY):	21-09-2020

7.2 FCC - Regulatory Notices

FCC ID: 2BB2S-SKYFILTER

Modification statement

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Interference statement

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Distance of use of the device

This device complies with the FCC RF exposure limits and has been evaluated in compliance with mobile exposure conditions.

The equipment must be installed and operated with minimum distance of 20cm of the human body.

FCC Class B digital device notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.