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EN

KIT BOXSMART

Manual del Usuario

User Manual

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CONTENTS

1. Mechanical installation and installation environment 2

1.1 General 2

1.2 Technical characteristics and dimensions 2

1.3 Operating conditions 4

1.4 Degrees of protection 5

1.5 Entry of the connection cable 5

2. Electrical installation and connection 6

3. Preset Factory Values 10

3.1 Adjustments to the differential pressure transmitter 10

3.2 Frequency converter adjustment 11

4. Zero Point Calibration 16

5. Start-up 17

6. Maintenance 29

7. Troubleshooting and corrective actions 29

EN

Electromagnetic Compatibility

All KIT BOXSMART equipment incorporates a frequency converter as a main element of regulation. The frequency converter has been designed according to the most demanding EMC standards. All the KIT BOXSMART versions with single-phase 230Vac and three-phase 400Vac power, suitable for use within the European Union, include an internal EMC filter. This filter is designed to reduce the emissions brought back to the electrical line through the power cables in fulfilment of the harmonised European standards. It is the responsibility of the installer of KIT BOXSMART equipment to ensure that the equipment, systems or spaces into which our equipment is fitted fulfil the EMC legislation of the country of use. Within the European Union, the equipment which may be installed in the near future must fulfil Directive 2004/108/EC.

When a KIT BOXSMART which incorporates a VSD*/A frequency converter with integrated or external filter is used, the following EMC categories may be achieved as defined by EN61800-3:2004:

<table>
<tr><th rowspan="2">KIT BOXSMART</th><th colspan="3">EMC Category</th></tr>
<tr><th>Cat C1</th><th>Cat C2</th><th>Cat C3</th></tr>
<tr><td>Single phase 230Vac input</td><td colspan="3">No additional filter is required
Use screened cable for the motor</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="2">Three-phase 400Vac input</td><td>Use external OD-Fx34x filter</td><td colspan="2">No additional filter is required</td></tr>
<tr><td colspan="3">Use screened cable for the motor</td></tr>
<tr><td>Note</td><td colspan="3">For motor cables of more than 25 metres, it is necessary to install outlet filters of dv/dt type.</td></tr>
</table>

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All KIT BOXSMART equipment is delivered with a two-year period of guarantee for manufacturing defects from the date of manufacture. The manufacturer does not accept any kind of liability for any damage or consequences which are the result of incorrect installation, negligence, improper use, incorrect adjustment of the parameters of KIT BOXSMART, damp environment, corrosive substances, vibration or high temperatures in the environment outside the specified range of the design.

SODECA S.L.U. does not accept liability for any consequence resulting from inappropiate, negligent or incorrect installation or adjustment of the parameters of the equipment or an improper connection. The contents of this user's guide are treated as true at the moment of printing, with the interest and commitment of a policy of continuous improvement. However, the manufacturer reserves the right to change the specifications of the product or its provisions without prior warning, including the contents of the user's guide.

1. Mechanical installation and installation environment

1.1 General

The staircase or escape route pressurisation system enables automatic control of airflow rate as well as maintaining a differential pressure of 50 Pa in a single unit, based on standard EN 12101-6.

KIT BOXSMART EC: Staircase pressurisation kit comprising of a control panel (BOXSMART EC) and a high efficiency impulsion unit with EC TECHNOLOGY motors (CJK/EC).

KIT BOXSMART: Staircase pressurisation kit comprising of a control panel (BOXSMART) and an impulsion unit (CJHCH or CJBD), for staircase and escape route pressurisation.

KIT BOXSMART II: Pressurisation kit with run and standby fans comprising of a control panel (BOXSMART II) with a built-in auto-changeover system that maintains pressurisation in the event of failure of the main fan.

KIT BOXSMART FLAP: Pressurisation kit with hatch fan comprising of a control panel (BOXSMART FLAP) with a built-in control system for fans with hatch (WALL or HATCH).

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The BOXSMART control panel includes:

- Frequency shifter programmed at 50 Pa and highly accurate differential pressure probe.
- External connection for the control panel to be used exclusively by fire-fighters.
- 24Vdc power supply for integrated control.
- Individual thermal circuit breakers for power and manoeuvres.
- Status indicator light: Operation, Alarm, Activation by fire and Run.
- Built-in control panel with TEST selector for maintenance and exclusive selector for use by fire-fighters 0-AUTO-MANUAL.
- Operating procedures in safe mode in the case of failure of the differential pressure probe and automatic rearming of the system in case of failure.
- Connection of status signals via potential free contacts (FAULT, RUN and FIRE ACTIVATION) and connection to the BMS system via the RTU Modbus to monitor the equipment.
- Memory of the last activation status for increased safety, which can be reset from the RESET selector that is located on the control panel.
- External connection for use in daily ventilation via an SI-TIMER.
- Metal casing with IP66 protection and lock with service key

1.2 Technical characteristics and dimensions

Model	Power (kW)	Power supply (V/Hz)	Output (V)	Maximum flow rate (m^3/h)	Impulsion unit
KIT BOXSMART- 1900 – 230- EC	0.2	200 a 240V 50/60Hz	230V 50/60Hz	1920	CJK/EC-310
KIT BOXSMART- 3600 – 230 -EC	0.5	200 a 240V 50/60Hz	230V 50/60Hz	3642	CJK/EC-400
KIT BOXSMART- 6500 – 400-EC	1.1	380 a 480V 50/60Hz	400V 50/60Hz	6577	CJK/EC-500
KIT BOXSMART- 2880 - 230	0.37	200 a 240V 50/60Hz	230V 50/60Hz	2880	CJBD-2828-4M 1/2
KIT BOXSMART- 7100 - 230	0.37	200 a 240V 50/60Hz	230V 50/60Hz	7100	CJHCH-45-4T-0.5 IE3
KIT BOXSMART- 7800 - 230	1.1	200 a 240V 50/60Hz	230V 50/60Hz	7800	CJBD-3333-6T 1 1/2
KIT BOXSMART- 12900 - 230	0.75	200 a 240V 50/60Hz	230V 50/60Hz	12900	CJHCH-56-4T-1 IE3
KIT BOXSMART- 17000 - 230	1.1	200 a 240V 50/60Hz	230V 50/60Hz	17000	CJHCH-63-4T-1.5 IE3
KIT BOXSMART- 7800 - 400	1.1	380 a 480V 50/60Hz	400V 50/60Hz	7800	CJBD-3333-6T-1.5 IE3
KIT BOXSMART- 12900 - 400	0.75	380 a 480V 50/60Hz	400V 50/60Hz	12900	CJHCH-56-4T-1 IE3
KIT BOXSMART- 17000 - 400	1.1	380 a 480V 50/60Hz	400V 50/60Hz	17000	CJHCH-63-4T-1.5 IE3
KIT BOXSMART-21100 -400	1.5	380 a 480V 50/60Hz	400V 50/60Hz	22100	CJHCH-71-4T-2 IE3
KIT BOXSMART FLAP-21100-400	1.5	380 a 480V 50/60Hz	400V 50/60Hz	21100	WALL/DUCT-71-4T IE3
KIT BOXSMART FLAP-25400-400	3	380 a 480V 50/60Hz	400V 50/60Hz	25400	HCT/HATCH-63-4T-4 IE3
KIT BOXSMART FLAP-41850 -400	4	380 a 480V 50/60Hz	400V 50/60Hz	41850	WALL/DUCT-90-4T-5.5 IE3
KIT BOXSMART FLAP-52500 -400	5.5	380 a 480V 50/60Hz	400V 50/60Hz	52500	HCT/HATCH-100-4T-7.5 IE3

The output power is reduced by 20% when the equipment is operating in the lower power range. The same models, except the FLAP models, may be supplied with the KIT BOXSMART II for standby fan (a second impulsion unit is added to the KIT BOXSMART).

The KIT BOXSMART and KIT BOXSMART EC are manufactured in three different sizes as shown in the table below:

Model	Power (kW)	Power supply (V/Hz)	Output voltage (V)	Max. Output current (A)	Size	Dimensions (length x width x depth)	Weight (Kg)
BOXSMART EC-0.5-230V 50/60 Hz-M-M	0.50	200 to 240V 50/60 Hz	230V 50/60 Hz	1.5	1	300x400x200	10
BOXSMART-0.37-230 V 50/60 Hz-M-T	0.37	200 to 240V 50/60 Hz	230V 50/60Hz	2.3	1	300x400x200	11
BOXSMART-0.75-230 V 50/60 Hz-M-T	0.75	200 to 240V 50/60 Hz	230V 50/60Hz	4.3	1	300x400x200	11
BOXSMART-1.5-230V 50/60Hz-M	1.50	200 a 240V 50/60Hz	230V 50/60Hz	7.0	1	300x400x200	11
BOXSMART-0.75-400 V 50/60 Hz-T-T	0.75	380 a 480V 50/60 Hz	400V 50/60 Hz	2.2	1	300x400x200	11
BOXSMART EC-1.1-400 V 50/60 Hz-T-T	1.10	380 a 480V 50/60 Hz	400V 50/60 Hz	2.0	1	300x400x200	10
BOXSMART-1.5-400V 50/60Hz-T	1.50	380 a 480V 50/60Hz	400V 50/60Hz	4.1	1	300x400x200	11
BOXSMART-2.2-400V 50/60Hz-T	2.20	380 a 480V 50/60Hz	400V 50/60Hz	5.8	2	400x500x250	18
BOXSMART-4-400V 50/60Hz-T	4.00	380 a 480V 50/60Hz	400V 50/60Hz	9.5	2	400x500x250	18
BOXSMART-5.5-400V 50/60Hz-T	5.50	380 a 480V 50/60Hz	400V 50/60Hz	14	3	400x600x250	21
BOXSMART-7.5-400V 50/60Hz-T	7.50	380 a 480V 50/60Hz	400V 50/60Hz	18	3	400x600x250	21
BOXSMART-11-400V 50/60Hz-T	11.00	380 a 480V 50/60Hz	400V 50/60Hz	24	3	400x600x250	21

The KIT BOXSMART II and KIT BOXSMART FLAP are manufactured in three different sizes as shown in the table below:

Model	Power (kW)	Power supply (V/Hz)	Output voltage (V)	Max. Output current (A)	Size	Dimensions (length x width x depth)	Weight (Kg)
BOXSMART II-0.37-230 V 50/60 Hz-M-T	0.37	200 a 240V 50/60H	230V 50/60Hz	2.3	2	400x500x250	18
BOXSMART II-0.75-230 V 50/60 Hz-M-T	0.75	200 a 240V 50/60Hz	230V 50/60Hz	4.3	2	400x500x250	18
BOXSMART II-1.5-230 V 50/60 Hz-M-T	1.50	200 a 240V 50/60Hz	230V 50/60Hz	7.0	2	400x500x250	18
BOXSMART II-0.75-400 V 50/60 Hz-T-T	0.75	380 a 480V 50/60Hz	400V 50/60Hz	2.2	2	400x500x250	18
BOXSMART II-1.5-400 V 50/60 Hz-T-T	1.50	380 a 480V 50/60Hz	400V 50/60Hz	4.1	2	400x500x250	18
BOXSMART II-2.2-400 V 50/60 Hz-T-T	2.20	380 a 480V 50/60Hz	400V 50/60Hz	5.8	3	400x600x250	20
BOXSMART II-4-400 V 50/60 Hz-T-T	4.00	380 a 480V 50/60Hz	400V 50/60Hz	9.5	3	400x600x250	20
BOXSMART II-5.5-400V 50/60Hz-T	5.50	380 a 480V 50/60Hz	400V 50/60Hz	14.0	4	500x700x250	28
BOXSMART II-7.5-400 V 50/60 Hz-T-T	7.50	380 a 480V 50/60Hz	400V 50/60Hz	18.0	4	500x700x250	28
BOXSMART II-11-400 V 50/60 Hz-T-T	11.00	380 a 480V 50/60Hz	400V 50/60Hz	24.0	4	500x700x250	28
BOXSMART FLAP-1.5-400 V 50/60 Hz-T-T	1.50	380 a 480V 50/60Hz	400V 50/60Hz	4.1	2	400x500x250	18
BOXSMART FLAP-4-400 V 50/60 Hz-T-T	4.00	380 a 480V 50/60Hz	400V 50/60Hz	9.5	3	400x600x250	20
BOXSMART FLAP-5.5-400 V 50/60 Hz-T-T	5.50	380 a 480V 50/60Hz	400V 50/60Hz	14.0	4	500x700x250	28

1.3 Operating conditions

- The purpose of the BOXSMART pressurisation kit is to regulate the speed of the fan in order to maintain a pressure of 50 Pa with closed doors and a set flow with the door open. This allows personnel to evacuate by allowing these doors to open while the entrance is protected from smoke in spaces used for evacuation.
- The equipment can be used in DUAL operating mode; in other words, in the case of fire as well as in the case of daily ventilation, in a manner where alternatively, an inlet for daily ventilation is included and via the SI-CALENDAR exterior clock option, it will be possible to increase the performance of the installation by starting it up at certain hours for the purpose of ventilating an area, while always prioritising the operation in the case of fire.
- The equipment has been designed to prevent inadvertent activations caused by electrical noise, interferences or by a quick pulse from the switchboard. For this reason, the start-up contact must be kept active for 3 seconds to initiate the activation of the fire mode.
- Once the fire signal is present, BOXSMART will switch to fire mode and will selectively disable the protections for the electronic actuation of the fan speed regulator and will regulate the fan speed to maintain an overpressure of 50 Pa.
- If the fire signal is accidentally cancelled, the BOXSMART design allows for continuous operation until BOXSMART activates the Reset signal. In other words, BOXSMART saves its last status in the memory in a manner that, even if the activation signal fails after this activation has occurred or if the electrical power supply fails and once power is restored, BOXSMART will remain on and operational in order to guarantee personnel can safely evacuate.
- If the start signal fails, the system may be started manually from the kit BOXSMART itself or from the CM-SMART fire-fighter control panel. The functionality of the system will be the same as if it had been activated by a signal received from the fire switchboard.
- The controls built-in to BOXSMART and BOXSMART II (on the kit itself as well as on the fire-fighter panel) are equipped with 4 LED pilot lights (Ready, Fault, On, Fire) as well as a key selector used for selecting the automatic mode, manual mode or to turn off the equipment. Another selector with key allows resetting the fire condition and finally, a test selector allows starting up the system with the door closed to confirm that the system regulates properly while also verifying the speed of operation in order to maintain 50 Pa.
- To safeguard against a possible break of the differential pressure sensor, BOXSMART allows configuring the safe operating speed that would be implemented if the sensor were to break. To accomplish this, a test shall be conducted to determine the speed at which the fan must turn to ensure the overpressure can be maintained at 50 Pa. This configurable safe speed, which must be determined through the test procedure, guarantees the system will continue operating in case of fire activation and break of the differential pressure sensor.
- Although the KIT BOXSMART has a built-in control panel on the kit itself for its control, it also has a connection for a remote fire-fighter control panel via a 12 x 0.5 mm multi-wire harness to be used exclusively by fire-fighters. The system may be operated from both control panels; the built-in or remote panel. Having this panel available will avoid having situations where BOXSMART is not accessible to fire-fighters and not being able to start it; in this case the remote fire-fighter control panel allows for a quick activation as well as determining the status of the equipment.
- In the case of fire, the KIT BOXSMART II will save the fan that was started-up last in its memory and will make a second attempt to start using the standby motor. The motors will be alternatively started during each new restart attempt. Any anomaly that occurs during start-up or once started, either by thermal failure, contactor failure in the case of a dual motor or by low consumption of the motor, even because it is not switched on, will require changing the motor.
- The KIT BOXSMART FLAP will first initiate the hatch open sequence and start the fan once the hatch is open. The same sequence is used for a stop resulting from fire reset or because the manual control is deactivated. First the fan is stopped and then the hatch is closed.
- In cases where BOXSMART FLAP does not receive the open hatch signal as a result of a fault or absence of the limit switch signal, 30 seconds after a fire is detected, the fan will be forced to start. Once 60 seconds have elapsed without receiving an open hatch signal, the open hatch action will be stopped.

The KIT BOXSMART is delivered inside a rolled steel box with 4 brackets for quick wall mounting **(Figure 1)**. The equipment must be mounted flush, vertical, free of vibrations and protected against direct sunlight. Also, ensure the KIT BOXSMART air inlets and outlets are not blocked and allow air to circulate.

Figure 1

KIT BOXSMART units must be installed indoors (never outdoors), in areas where they are not exposed to direct sunlight which could increase the operating temperature of the units, considering that the maximum operating ambient temperature of these units is 25°C. For other operating environments, please consult the manufacturer.

Keep the equipment stored in its box until use. Store in a clean, dry place and at a temperature between -20°C and +60°C.

Figure 2: BOXSMART with CM-SMART and SI-CALENDAR accessories

1.4 Degrees of protection

The KIT BOXSMART units have a protection rating of IP66 IK10, with cold rolled steel sheets and are coated with a layer of UV protection polyester paint.

1.5 Entry of the connection cable

The conduits for the power supply, motor and fire signal cables are routed through the top section of the KIT BOXSMART unit as well as the pressure inlets.
The cables that are routed to the unit are suitable for the power supply and meet the characteristics stipulated in current regulations at the time the installation was carried out.

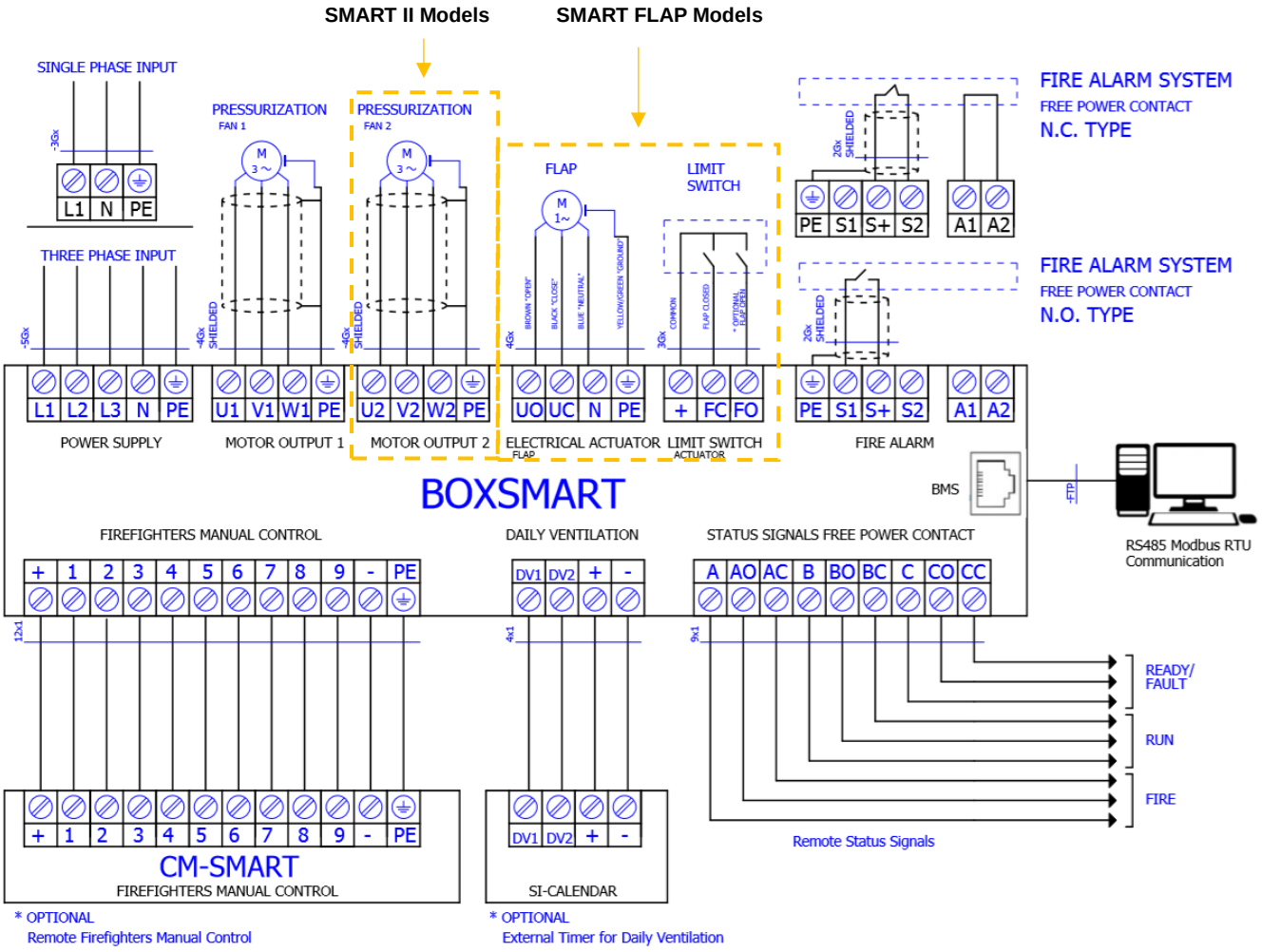
The unit inputs are also equipped with an interconnection with the fire-fighter control panel and with the remote status indicating station.

2. Electrical installation and connection

To connect the unit, simply connecting the required power supply, the fan motor and the activation signal for the fire switchboard (potential free) will suffice. The diagram below shows the connections for the KIT BOXSMART, KIT BOXSMART II and KIT BOXSMART FLAP. It is essential to ensure the motor is connected in accordance with the voltage it requires for operation.

The cable gauge used for the power supply and motor must be suitable for the installed power. The motor harness should be shielded and connected to ground at both ends in order to minimise any interferences that could affect the equipment through the motor cable.

The maximum length of the BOXSMART cable to the motor must be 25 metres. If the maximum length is exceeded, contact SODECA to assess the need to install an output filter.



For single-phase power supplies the connection should be made between L1 and L2. For three-phase power supplies the connection should be made between L1, L2 and L3. The phase sequence is not important.

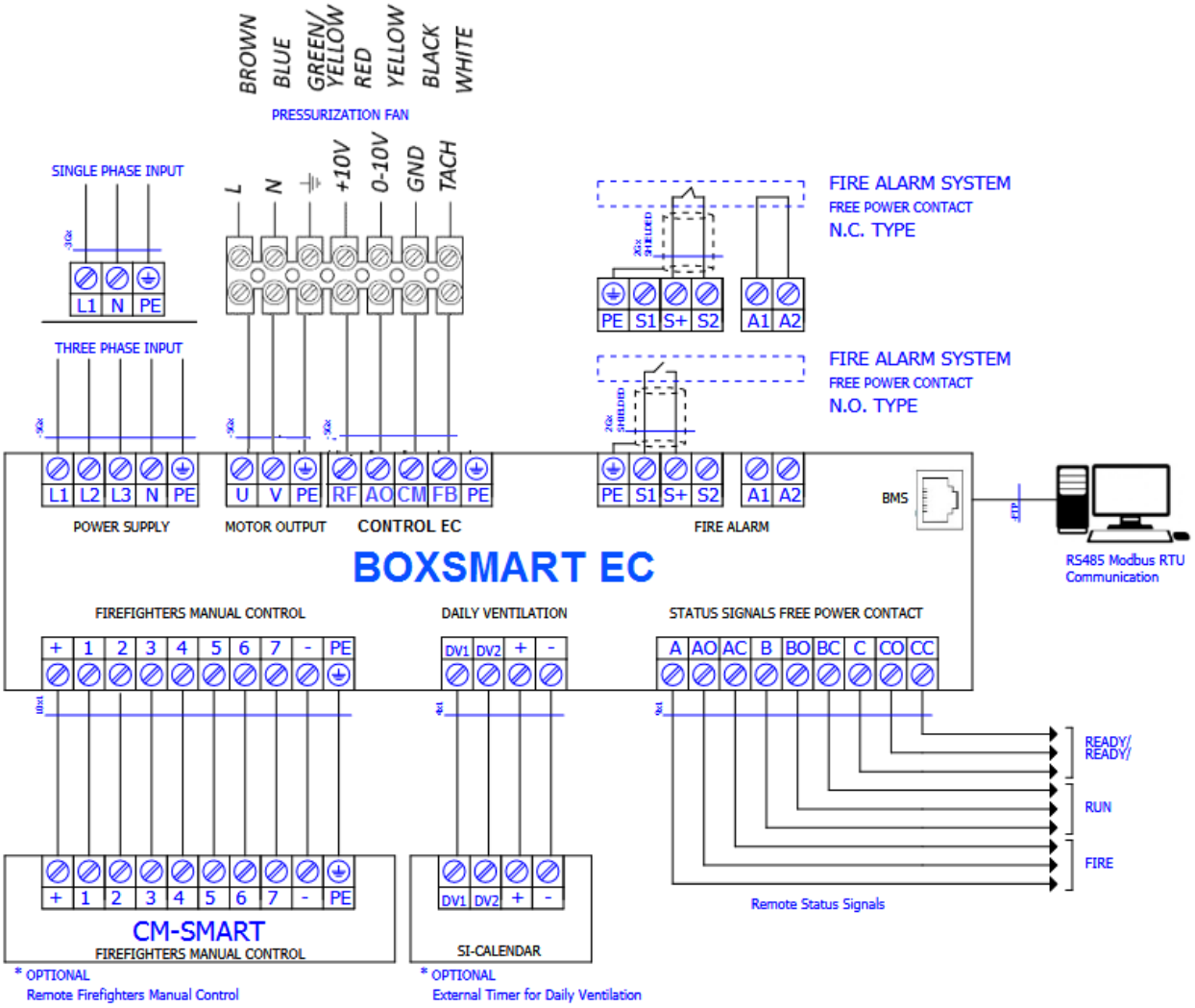
The motor must be connected between U, V, W. For single-phase motors, the connection should be made between U and V.

The fire activation signal is potential free and selectable between a Normally Open or Normally Closed contact.

BOXSMART EC

To connect the BOXSMART EC it must be taken into account that the motor already integrates the motor regulation electronics and therefore BOXSMART, once the activation signal is received, delivers the current supply depending on the model, at a fixed voltage and frequency, always in alternating current. The regulation is carried out using a 0-10Vdc signal that is modulated to maintain the set pressure of 50Pa. In the installation, the power supply cable to the EC motor must be distinguished from its control cable, which operates with low voltages in direct current.

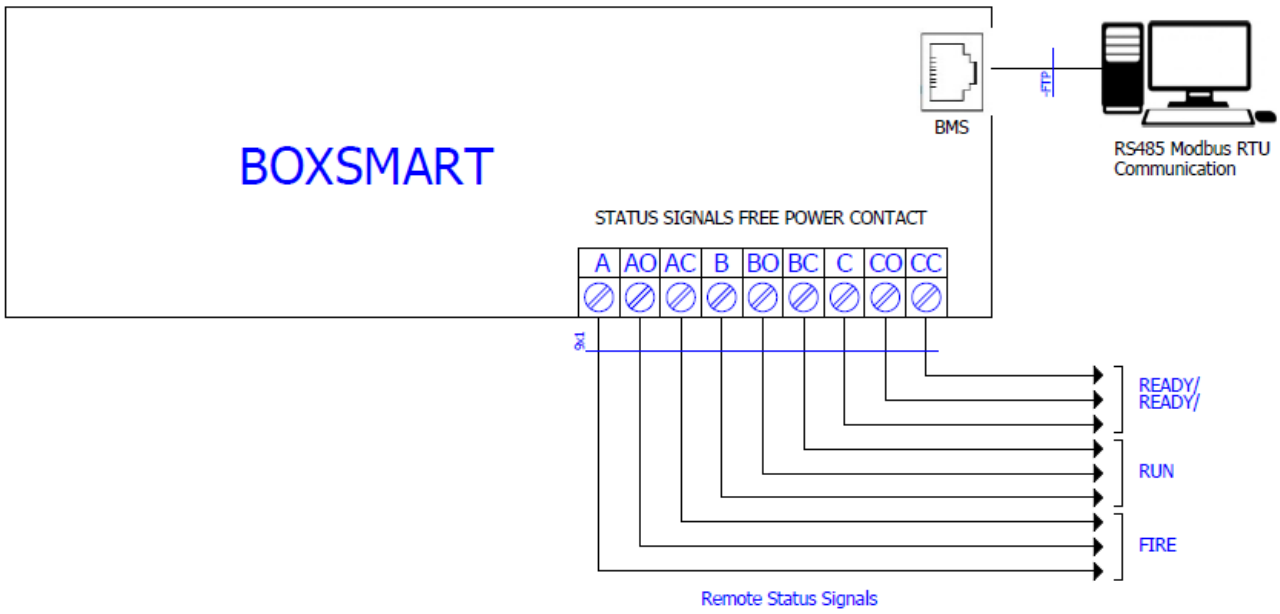
The section of the power supply and motor cables must be adapted to the installed power.



A detailed reading of the CPC card that integrates BOXSMART EC must be made in the event that settings other than those made by SODECA are required. BOXSMART EC has been configured to maintain a pressure of 50Pa.

It is highly recommended to read the attached manual of the CPC control card for EC motors in order to familiarise yourself with the additional possibilities it offers and which may be necessary in your installation.

KIT BOXSMART incorporates a connection terminal that is used as an optional interconnection with the supervisory panel for remote monitoring of the system status using auxiliary contacts or via communications. These potential free contacts indicate the status of the equipment: Ready, Fault, Run and Fire is active.



CAUTION

This manual is considered a guide to be used to carry out a proper installation. Sodeca shall not be held liable in the case of compliance or failure to comply with any national, local or any other regulation concerning the proper installation of the unit or associated equipment. In the event of ignoring the regulations during the installation process, there is a risk of personal and/or material injury occurring. Please make sure you read and understand this manual in full before proceeding.

The equipment comprising the KIT BOXSMART incorporate high voltage capacitors that have a delayed discharge after the electrical power has been disconnected. Always wait 30 minutes prior to conducting maintenance on the BOXSMART after it has been disconnected from the power supply to allow enough time for the capacitors to discharge down to a safe voltage level. Failure to comply with this precaution may result in severe injury or loss of life. It is important that BOXSMART is installed or adjusted by qualified electricians who are familiar with the construction and operation of the equipment and the hazards involved.

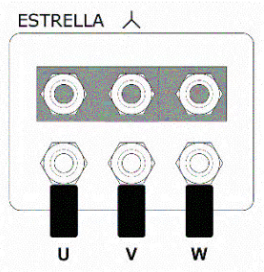
IMPORTANT: Make sure the BOXSMART ground terminal is connected directly to the general grounding system.

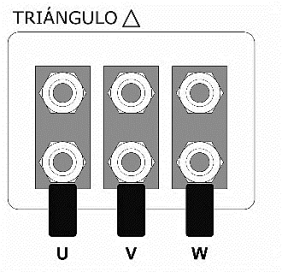
AC MOTOR CONNECTIONS

Most motors for general use have windings in order to operate with dual voltage sources. This is indicated on the motor nameplate. This operating voltage is normally selected when the motor is installed or with a STAR or TRIANGLE connection. The STAR always provides the higher of the two voltage ranges.

The typical characteristics are: 人/△

400 V / 230 V
690 V / 400 V





AIR TUBE CONNECTIONS

The air connection must be executed with a 4 mm diameter tube, and it must be located at the end of each tube in the following position or zone:
(-) Leave the tube in the benchmark pressure zone.
(+) Leave the tube in the zone to be pressurised in the event of a fire.

BOXSMART has all the air hose or tube inlets located on the top section, are properly labelled and have pressure cable glands to maintain airtightness.

3. Preset Factory Values

By default the units are supplied with a series of adjustments that allows start-up without modifying the parametrisation of the frequency converter and the differential pressure transducer.

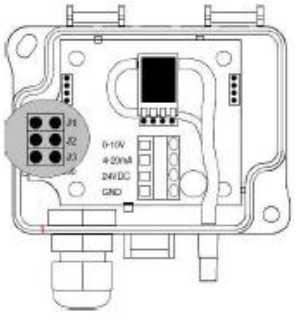
3.1 Adjustments to the differential pressure transmitter

BOXSMART incorporates a multi-range differential pressure transmitter. This transforms and amplifies the signal to 4...20mA and the range is determined by bridges inside it that allow making adjustments.

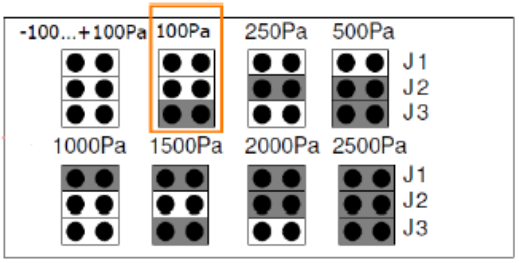
BOXSMART is preset at the factory to operate at a pressure of 50 Pa. If you have any questions about the factory settings, check the adjustments to the differential pressure transmitter.

To carry out this check, lift the front cover of the transmitter to access the bridges inside it.

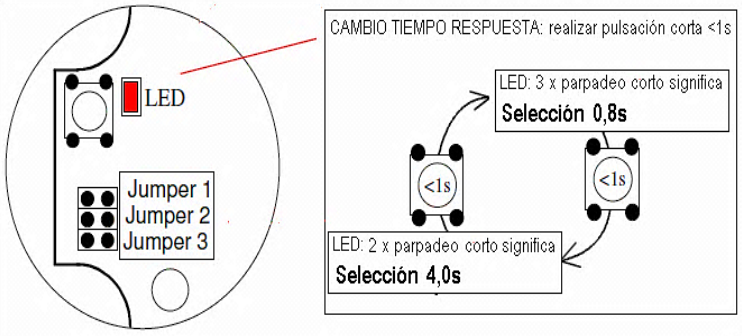
The location of these bridges is shown below.



Of the 8 adjustment scales you must select the option of **0..100 Pa.**



By conducting a short press of the calibration button we can adjust the response time to the optimum value. In BOXSMART this value is 0.8S.



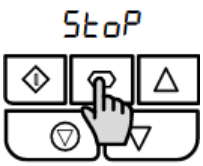
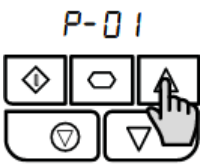
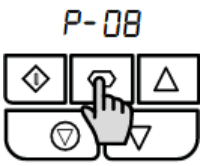
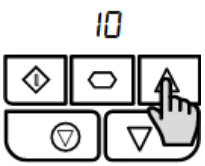
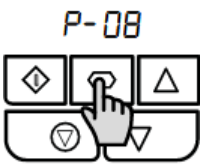
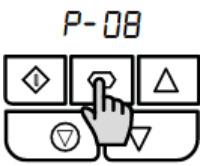
3.2 Frequency converter adjustment

All BOXSMART units incorporate a frequency converter as the primary regulation component preset from the factory to operate at 50 Pa to pressurise spaces. The default parameters of these frequency converters are provided below as well as the procedure used to modify them.

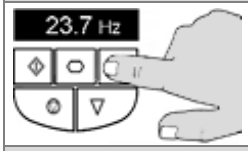
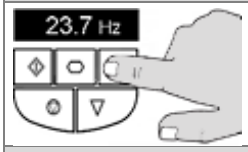
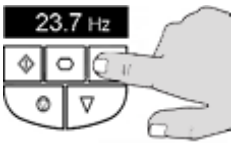
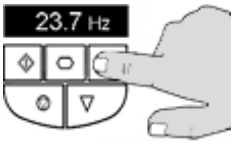
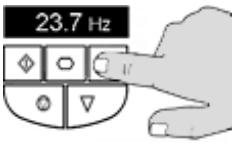
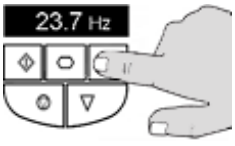
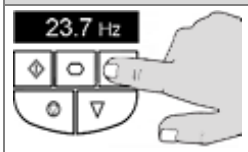
Frequency converter keyboard and action of each button.

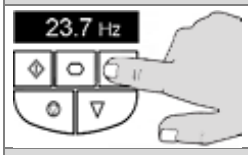
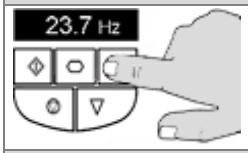
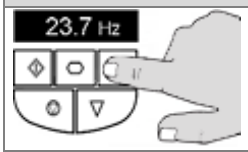
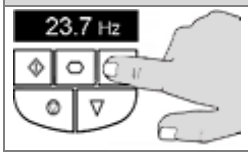
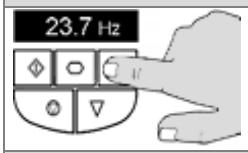
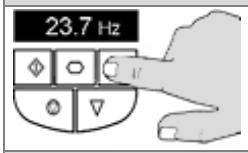
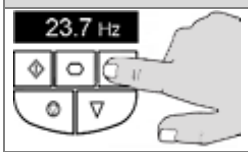
	NAVIGATOR	Used to view the information in real time, access and exit the parameter editing mode and save changes to parameters.
	UP	Used for increasing the speed in real time or increase the values of parameters in the editing mode.
	DOWN	Used for decreasing the speed in real time or decrease the values of parameters in the editing mode.
	RESET / STOP	Used for resetting a unit with an alarm activated. When in the keyboard mode, it is used to stop a unit that is running.
	START	When in the keyboard mode, it is used to start a unit that is stopped or to reverse the direction of rotation if the bidirectional keyboard mode is enabled.

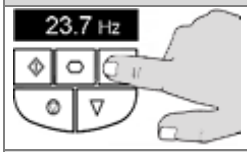
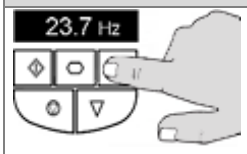
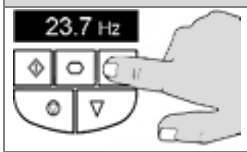
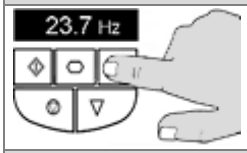
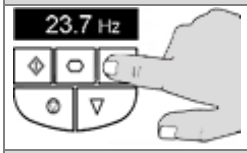
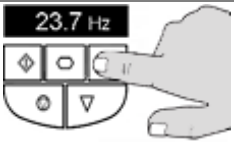
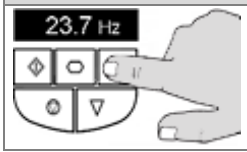
The procedure for changing parameters is described below. As we can see in the diagram below, press the navigator key for 2 seconds while STOP is displayed. Then the converter displays the initial parameter. Use the up and down keys to select the desired parameter and shortly press the navigator key to access its value, which may then be modified.

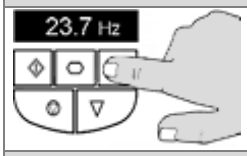
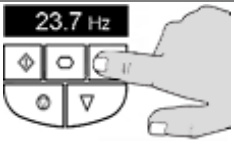
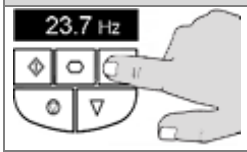
					
Keep the navigator key pressed for 2 seconds.	Use the up and down keys to select the desired parameter.	Press the navigator key for 1 second.	Use the up and down keys to set the parameter.	Press the navigator key for 1 second to return to the parameters menu.	Press the navigator key for 2 seconds to return to the operating menu.

BOXSMART parameters by default

Parameter	Parameter name	BOXSMART	BOXSMART II	BOXSMART Flap
P-01	***Maximum Speed***	***50.0 Hz***	***50.0 Hz***	***50.0 Hz***
	***Parameter description*** Maximum speed limit that can be reached by the fan. Units in Hertz. If this parameter is increased above 50.0 Hz, make sure the motor current does not exceed the maximum current indicated on the motor nameplate at maximum speed. If this current is exceeded, then this parameter must be decreased.			
Parameter	***Parameter name***	***BOXSMART***	***BOXSMART II***	***BOXSMART Flap***
P-02	***Minimum Speed***	***20.0 Hz***	***20.0 Hz***	***20.0 Hz***
	***Parameter description*** Minimum speed limit that can be reached by the fan. Units in Hertz. Once the operating pressure is reached, the motor speed will be regulated to ensure the set pressure is maintained. If the space has a high degree of airtightness, the motor will end up reducing its speed until the minimum speed is reached.			
Parameter	***Parameter name***	***BOXSMART***	***BOXSMART II***	***BOXSMART Flap***
P-03	***Acceleration ramp time***	***5 s***	***5 s***	***5 s***
	***Parameter description*** Acceleration ramp time from speed zero to the rated speed of the motor. Very short ramp times may cause a response to changes in pressure that is too fast and for very long ramp times, a response that is too slow.			
Parameter	***Parameter name***	***BOXSMART***	***BOXSMART II***	***BOXSMART Flap***
P-04	***Deceleration ramp time***	***5 s***	***5 s***	***5 s***
	***Parameter description*** Deceleration ramp speed from the rated speed of the motor to zero speed. Very short ramp times may cause a response to changes in pressure that is too fast and for very long ramp times, a response that is too slow.			
Parameter	***Parameter name***	***BOXSMART***	***BOXSMART II***	***BOXSMART Flap***
P-08	***Rated current of the motor***	***I motor plate***	***I motor plate***	***I motor plate***
	***Parameter description*** Rated current of the motor indicated on its nameplate. It is very important to properly set this parameter in order for the thermal protection of the BOXSMART to operate properly.			
Parameter	***Parameter name***	***BOXSMART***	***BOXSMART II***	***BOXSMART Flap***
P-12	***Main control mode selection***	***5***	***5***	***5***
	***Parameter description*** BOXSMART uses a PI (Proportional - Integral) type regulation. This type of control uses feedback to calculate the error or deviation between the set pressure and the actual pressure in the space to be pressurised and applies a corrective action to the fan to change this deviation to zero.			
Parameter	***Parameter name***	***BOXSMART***	***BOXSMART II***	***BOXSMART Flap***
P-14	***Access to the extended menu***	***201***	***201***	***201***
	***Parameter description*** Parameter to 201 allows accessing the following parameters. Otherwise we will only be able to access the first fourteen.			

Parameter	Parameter name	BOXSMART	BOXSMART II	BOXSMART Flap
P-15	**Digital input Function selection**	**15**	**15**	**15**
	**Parameter description** Setting of the digital inputs to the proper operating mode according to the BOXSMART operation.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-16	**Analogue 1 input signal format**	**r4..20mA**	**r4..20mA**	**r4..20mA**
	**Parameter description** Set the format of the analogue input according to the transmitter that is installed in BOXSMART. If ***r4..20mA*** is selected, in case of failure of the transmitter, BOXSMART will adjust the speed of turn of the motor to the transmitter fault speed; this way a minimum pressure will be maintained in the space even if the transmitter is not operating.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-17	**Switching frequency/Motor noise**	**4 kHz**	**4 kHz**	**4 kHz**
	**Parameter description** Set the switching frequency of the power transistors. This will not affect the effective operating pressure, which will be between P-01 and P-02. Low values such as 4 kHz provides a better motor performance, less heat loss in the motor and reduced electrical noise level even though the audible noise level is increased.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-18	**Relay output function selection**	**1**	**1**	**1**
	**Parameter description** Parameter that allows defining the converter output relay function when the set condition is met. Value 1 defines the relay function as a status without a converter alarm.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-19	**Relay attention level**	**25.0%**	**25.0%**	**25.0%**
	**Parameter description** Parameter that defines the minimum reachable consumption level for BOXSMART to interpret that a motor connection omission fault is not present.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-20	**Programmable speed 1/Safety Speed**	**30.0 Hz**	**30.0 Hz**	**30.0 Hz**
	**Parameter description** Motor turn frequency in case of transmitter failure. This parameter must be checked in Test mode II since this will allow us, in case of a failure of the pressure transmitter, to select a motor turn speed that will ensure the fan turns at a speed that does not provide a pressure higher than 50 Pa under normal conditions.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-23	**Programmable speed 4/Daily Ventilation**	**40.0 Hz**	**40.0 Hz**	**(-)50.0 Hz**
	**Parameter description** Daily ventilation speed for BOXSMART and BOXSMART II. Extraction speed for BOXSMART Flap.			

Parameter	Parameter name	BOXSMART	BOXSMART II	BOXSMART Flap
P-25	**Analogue output function selection**	**5**	**5**	**5**
	**Parameter description** Parameter that allows defining the transistor output function when the set condition is met. Value 5 indicates the reached motor consumption level function in P-19.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-30	**Start-up and automatic restart mode**	**Auto5 ;NO; OFF**	**Auto5 ;NO; OFF**	**Auto5 ;NO; OFF**
	**Parameter description** The unit will make 5 attempts to reset itself after a converter alarm and with a pause time of 25 seconds. Once 5 attempts are reached without being able to start the motor as a result of a converter failure, reset the alarm to reset the unit.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-33	**Fly hook**	**0**	**0**	**1**
	**Parameter description** The fly hook function allows synchronising the output frequency of the converter with the motor turn speed after a loss of electrical power. This is very useful in high inertial loads.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-38	**Parameter access block**	**1**	**1**	**1**
	**Parameter description** This parameter blocks the input of parameters and therefore does not allow modifying these. Set to zero to unlock.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-41	**Proportional gain PI**	**0.9**	**0.9**	**0.9**
	**Parameter description** A reduced proportional gain will cause a slow reaction system, which may serve useful in installations where this response is suitable. By increasing the proportional gain, the system will react quicker and may transform itself into an unstable system.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-42	**Integral Time PI**	**0.2**	**0.2**	**0.2**
	**Parameter description** The proportional mode induces stationary type errors that can be corrected by integrating the error in time and adding it to the proportional action. Very high values may result in a slower correction and response.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-45	**Regulation work PI value**	**50.0 Pa**	**50.0 Pa**	**50.0 Pa**
	**Parameter description** Adjustment of the BOXSMART setpoint value. When the fire signal is activated, the system will start and regulate the fan to maintain the pressure set in this parameter.			

Parameter	Parameter name	BOXSMART	BOXSMART II	BOXSMART Flap
P-46	**Selection of transmitter feedback input**	**1**	**1**	**1**
	**Parameter description** This parameter selects the analogue input where the pressure transmitter is connected.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-51	**Motor control mode**	**1**	**1**	**1**
	**Parameter description** Motor control mode by default in v/f mode.			
Parameter	**Parameter name**	**BOXSMART**	**BOXSMART II**	**BOXSMART Flap**
P-54	**Maximum current limit**	**150%**	**150%**	**150%**
	**Parameter description** Maximum current limit that can be supplied by the converter. When this value is exceeded, the unit enters in limitation mode and reduces its speed.			

EN

All units arrive from the factory configured with these parameters, which are required for a proper operation of BOXSMART. Sodeca shall not be held liable for any malfunction resulting from tampering with these settings or from faulty connections.

WARNING:

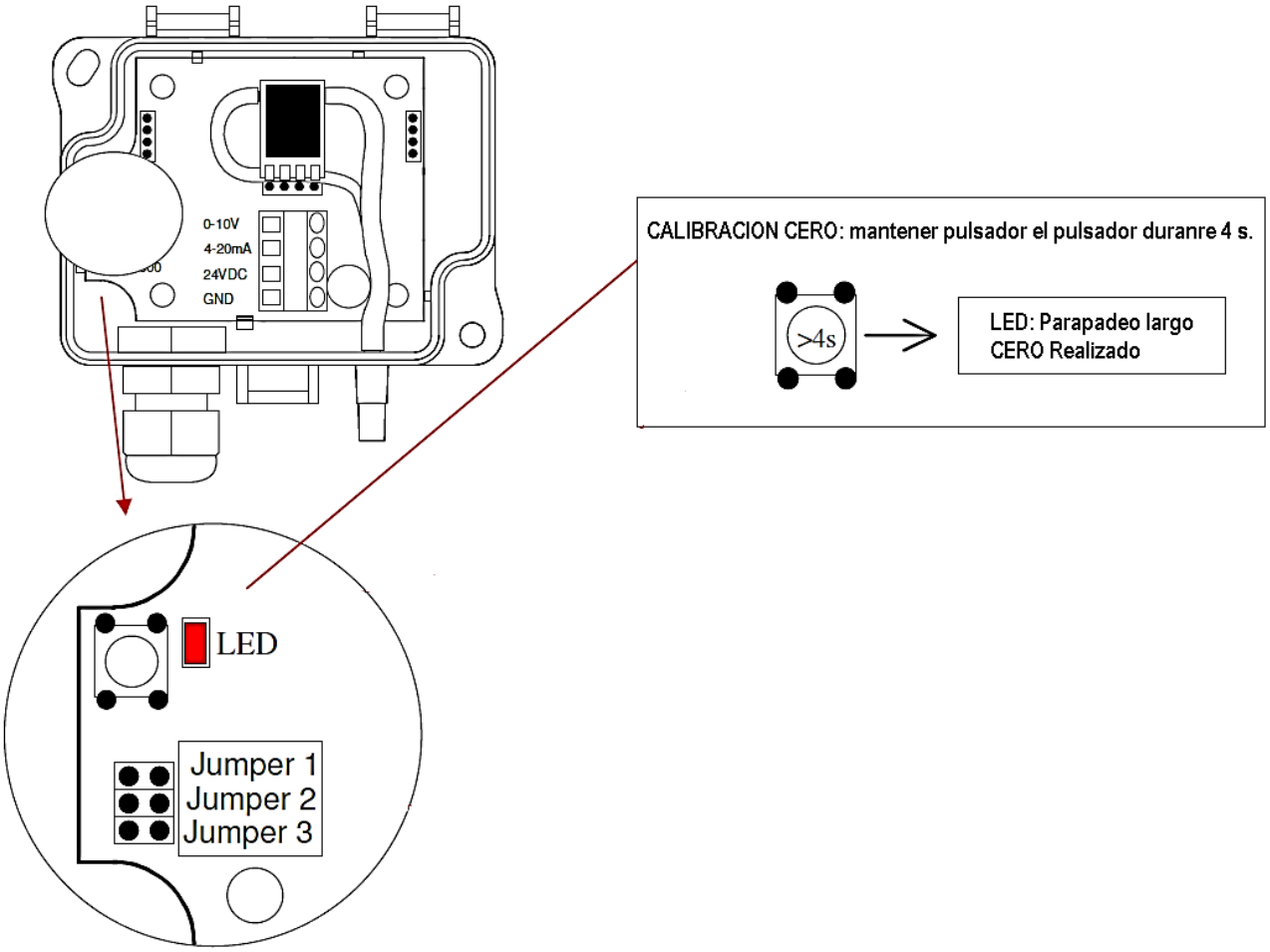
If we are not sure what parameters have been modified, we recommend loading the factory parameters by default on the frequency converter and configuring the previously mentioned parameters.

To load the factory parameters by default, press △ and ▼ for >2 s. The display will show P-DEF. Press the ▼ button to acknowledge and reset the unit.

4. Zero Point Calibration

All BOXSMART units must be calibrated once they are installed at the operating location. To accomplish this carry out the following steps:

1. Apply electrical power to BOXSMART and verify that the Line LED and the pressure transmitter display illuminate. The electrical power supply must be connected one hour prior to carrying out the zero point adjustment.
2. Release both pressure tubes from BOXSMART's + and - inlet connections.
3. Press the zero button for longer than 4 seconds until the red light illuminates. (Note: This button is accessed by opening the pressure transmitter's front cover).



4. Wait for the red light to illuminate and then reinstall the pressure tubes.

We recommend conducting a zero point calibration once a year or any time the cabinet is relocated or any component of the entire system is replaced.

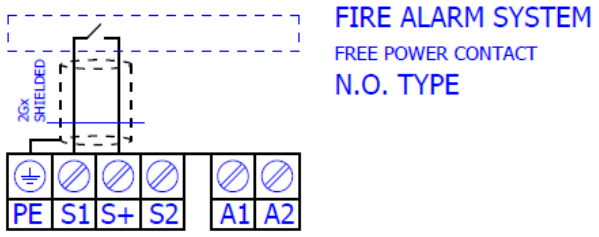
5. Start-up

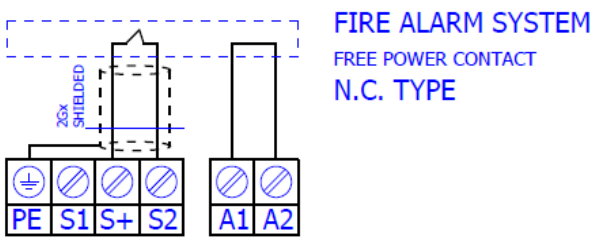
BOXSMART

Start-up

Fire activation signal

We must check the type of activation signal that is selected. It should be either Normally Open (NO), which activates the fire condition when it closes or Normally Closed (NC), which activates the fire condition when it opens. The signal type selection is carried out at connection terminals A1 and A2 as indicated in the diagram below.





It is important to mention that we recommend using activation contact (NC) since in cases where the continuity of the cable is interrupted, this situation is detected and the system will start-up. Otherwise, if the cable continuity is interrupted and a fire alarm is activated from the panel, the system would not start-up.
BOXSMART has status relays that confirm the status of the equipment. Some fire panels allow connecting a fire signal feedback so that once the fire alarm signal is activated, this feedback allows connecting a signal as the alarm becomes activated. If permitted by your panel, connect this status relay if possible.

The fire alarm activation signal must be free of potential. Otherwise, the unit may be damaged.

We can check the manoeuvre without connecting the motor during this first phase.

With the selector mode in Automatic, activate the fire condition, NC or NO as selected. After 3 seconds, the FIRE pilot light illuminates on BOXSMART and the unit must begin its operation. The ON pilot light will not illuminate if the motor is not switched on since BOXSMART conducts a motor consumption analysis to verify if it is connected to BOXSMART. We could disable the fire alarm activation as selected; this can be accomplished by closing or opening the activation contact and BOXSMART must remain operating with the Fire pilot light and ON illuminated.

If the electrical power becomes disconnected at this time, when the power comes back on line, even if the electrical power supply has been disconnected for a long time, the unit must resume operation in the previous mode of operation; in other words, with fire alarm activated and running. The RESET sequence operates as follows: for what needs to be activated for 3 seconds, the RESET selector and the unit will switch to STANDBY mode prior to the fire alarm activation condition. If a RESET is carried out for any reason while the fire alarm condition is active, the unit will switch to STANDBY but after 3 seconds have elapsed after the Reset selector is released, the fire condition will be reactivated.

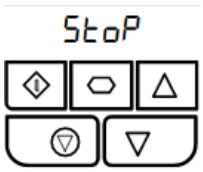
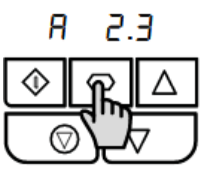
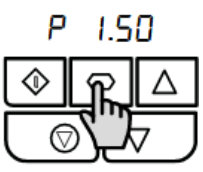
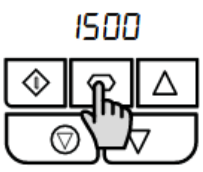
Motor turn and consumption

In this phase we must switch on the motor/fan and make sure ahead of time that the mode selector is set to 0, a fire alarm activation signal is not present and a fire reset has been carried out.

Before carrying out this check, we must configure the motor consumption parameter P08 to guarantee that when the equipment is operating in TEST mode and therefore the converter protections are active, it triggers if the consumption exceeds this parameter for some time following a calculation model through integration.

Check the direction of turn of the motor to verify that the fan pressurises the area when the fire alarm is activated. To accomplish this we must place the selector in AUTO mode and use the TEST selector in BOXSMART. Via a temporary activation, the fan will switch on and we can then verify the direction of turn of the blades, which should be the direction indicated on the fan itself.

We must also check that the motor consumption is within its nominal operating range; to accomplish this, using the same procedure as before, check the Amps on the frequency converter screen.
Use the read mode as indicated to carry out this check:

				
Motor stopped / Deactivated	The motor is switched on / running, the output frequency (Hz) is shown on the display.	Press the navigator key for 1 second. The motor current (A) will be shown on the display.	Press the navigator key for 1 second. The motor power (kW) will be shown on the display.	If P-10>0, press the navigator key for 1 second and the display will show the speed of the motor (RPM).

EN

Use this opportunity to verify that the ON pilot light illuminates once the motor consumption exceeds 25% of the P08 parameter that is set on the frequency converter.

Important:
It is important to verify the direction of turn in order to ensure that the system pressurises the area in case of a fire.

Check the pressurisation of the area and set the Safety Speed

Check that the measuring tubes are properly installed.
Connect the (+) air inlet in the area to be pressurised and the (-) inlet in the reference area. Otherwise, swap the connections.
Verify the maximum distance of the measuring tube with Sodeca.

Switch on the system using the TEST selector to verify that the system is regulating and pressurises the area, maintaining the pressure at 50 Pa.
To accomplish this, we must switch on the system by actuating the TEST key and verify that the fan turns in the proper direction and that the pressure value on the pressure transducer that is installed on BOXSMART reads approximately 50 Pa. This must always be carried out with the lobby doors closed in order to pressurise the space.

The system must be capable of pressurising the space to 50 Pa with the doors closed if no important leaks are present in the installation.

When we are sure that the system is able to maintain a pressure of approximately 50 Pa with the doors closed we must record the speed of turn of the converter, check its display and enter the converter frequency in parameter P20.

BOXSMART has a safety feature, which in the case of failure of the pressure transducer (loss of 4-20mA signal), remains operating at the safety speed to maintain a pressurisation as close as possible to 50 Pa.

Periodically check the operation of the system.

Using the TEST selector (a key selector with feedback) switches on the pressurisation unit without switching on the FIRE mode, allows us to periodically check the system without activating the fire alarm and while maintaining the frequency converter protections. This only works if selector 0-Auto-Man is in the Auto position and the TEST selector has been actuated.

Check the modes of operation

Manual Mode

If the manual mode is selected from BOXSMART, the system will start instantly and in the pressurisation mode; in other words, regulating to maintain the pressure at 50 Pa. The Fire mode is activated in a manner that a prediction of the damage that may be caused by a defect is carried out before the damage is irreversible and the unit is not stopped in situations that do not entail an immediate risk to the frequency converter.
Once the system is activated in manual mode, check that the system is properly regulating the pressure and that the fire mode has been activated. This is visible on the converter Display, where an intermittent point will be displayed indicating that the fire mode is enabled although the BOXSMART fire pilot light will remain out if the fire signal provided by the switchboard has not been activated.

Automatic Mode

In Automatic mode, the system is waiting to receive the activation signal. This activation signal may be the activation input of the fire switchboard, the BOXSMART TEST selector or the activation input of the daily ventilation. Any of the 3 activations is possible however, it is important to emphasise that the activation of the fire mode will supersede any of the other two and if the system is operating in daily ventilation; in other words, at a speed adjustable in P-23 on the frequency converter itself and if a fire activation signal is received or the mode is switched to MANUAL, BOXSMART will disable the fixed daily speed and will switch to pressurise in fire mode.
It is worth mentioning that in daily Ventilation mode, all the converter protections are enabled as well as in TEST mode.

Checking the operation of the Pilot lights

The pilot lights that are located on the front of BOXSMART as well as on the fire-fighting panel provide us with information about the status of the KIT. Although this has been checked at the factory, we must periodically check that the pilot lights continue to operate properly and have not been damaged. Under normal conditions, the service life of an LED light is about 20,000 h; however, SODECA provides a 2-year warranty on all their units in accordance with international regulations.

The pilot light indications are described below:

READY PILOT

Indicates when the unit is capable of operating after a fire has been detected; therefore, a READY status indicates that the following conditions are met:
Frequency Converter without an alarm and with electrical power applied.
FIRE activation electronic board without a fault.
0-Auto-Man selector in Auto position.
Electrical power supplied for control as well as for power to the BOXSMART.

FAULT PILOT

Indicates when the unit is not capable of operating after a fire has been detected; therefore, a FAULT status indicates that the following conditions are not met:
Frequency Converter without an alarm and with electrical power applied.
FIRE activation electronic board without a fault.
0-Auto-Man selector in Auto position.
Electrical power supplied for control as well as for power to the BOXSMART.

ON PILOT

Indicates when the frequency converter is started by the unit and the minimum current of 20% of the value indicated on the motor nameplate is exceeded (P08 to VFD), thus guaranteeing a reliable indication that the fan is operating by current flow being present and for example in order to not forget to switch on the motor. This activation of the fan could be configured for the daily ventilation mode, manual mode with fire activated, manual mode with fire deactivated, Test mode or Fire mode.

FIRE PILOT LIGHT

Indicates when the unit receives the fire activation signal. This signal could be of a NO contact or of a NC contact to be configured in BOXSMART.

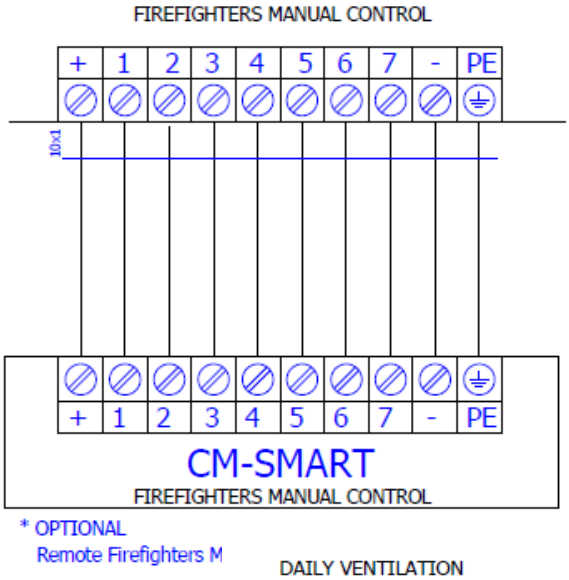
EN

Check the operation of accessories

Fire-fighting Panel

It is possible that at the time you purchase a BOXSMART, you also purchase a FIRE-FIGHTING control panel. In these cases you must follow the diagram provided in this manual to connect both units and continue as shown to check their operation.

The control panel has a 0-AUTO-MAN selector as well as status and operation pilot indicator lights. Check that the pilot lights indicate the system statuses and current conditions of the system on the BOXSMART.
From the selector, you may disconnect the system or select the AUTO or MAN mode, taking into account that the MAN mode is always a priority setting. In other words, if AUTO is selected in BOXSMART and MAN is selected at the fire-fighting panel, the MAN mode will prevail since it is a priority setting.



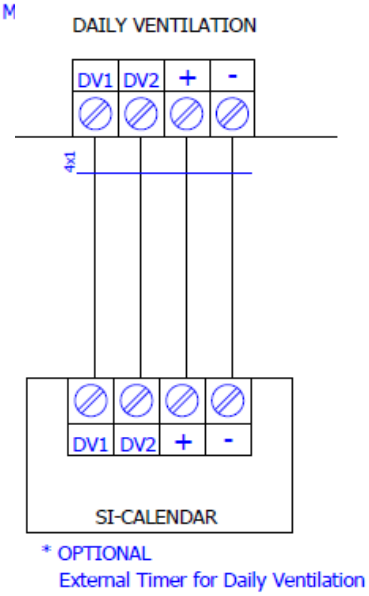
Daily ventilation

If the digital input is activated from BOXSMART considering that the activation contact must be free of potential and with the system in AUTO mode, the system will start-up once the signal is activated at a safe speed as configured in parameter P-23 of BOXSMART's frequency converter.

Sodeca recommends using the SI-CALENDAR option that allows easily and quickly interconnecting an hourly timer with BOXSMART for the ventilation system to operate in time slots.

Check that the connections have been properly made and if SI-CALENDAR is not used and a different timer is used, electrical power for this timer must be supplied by an external power supply and not by BOXSMART to avoid damaging the internal power supply that is located inside BOXSMART:

If SI-CALENDAR is used, check that its system starts-up and stops at the times configured in the timer.



Status signals

In cases where the status signals need to be interconnected with a control centre or the fire switchboard, the following must be taken into account:

- All status outputs are free of potential, and voltage from an auxiliary power supply may be connected to the common contact.
- All the outputs are switched with a NO as well as an NC contact.
- The system has Fire Activated, Run and Ready/Fault status relays.

Communication with a BMS or SCADA system

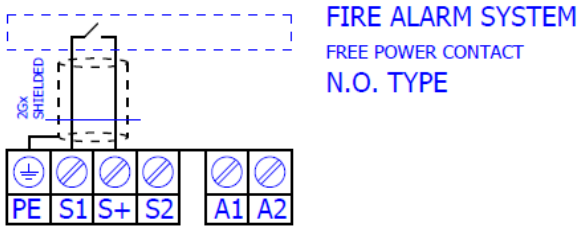
BOXSMART has an RS485 communication serial port with a MODBUS RTU protocol that allows connecting BOXSMART with a BMS or SCADA system for the purpose of monitoring the status (Running/ Stopped, Fault, Operating pressure).

BOXSMART II

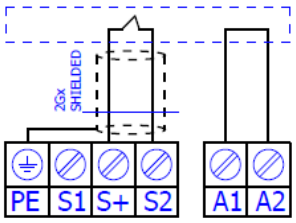
Start-up

Fire activation signal

We must check the type of activation signal that is selected. It should be either Normally Open (NO), which activates the fire condition when it closes or Normally Closed (NC), which activates the fire condition when it opens. The signal type selection is carried out at connection terminals A1 and A2 as indicated in the diagram below.



FIRE ALARM SYSTEM
FREE POWER CONTACT
N.O. TYPE



FIRE ALARM SYSTEM
FREE POWER CONTACT
N.C. TYPE

It is important to mention that we recommend using activation contact (NC) since in cases where the continuity of the cable is interrupted, this situation is detected and the system will start-up. Otherwise, if the cable continuity is interrupted and a fire alarm is activated from the panel, the system would not start-up.
BOXSMART II has status relays that confirm the status of the equipment. Some fire panels allow connecting a fire signal feedback so that once the fire alarm signal is activated, this feedback allows connecting a signal as the alarm becomes activated. If permitted by your panel, connect this status relay if possible.

The fire alarm activation signal must be free of potential. Otherwise, the unit may be damaged.

We can check the manoeuvre without connecting any of the motors during this first phase.

With the selector mode in Automatic, activate the fire condition, NC or NO as selected. After 3 seconds, the FIRE pilot light illuminates on BOXSMART II and the unit must begin its operation. The ON pilot light will not illuminate if none of the motors are switched on since BOXSMART conducts a motor consumption analysis to verify if it is connected to BOXSMART II. We could disable the fire alarm activation as selected; this can be accomplished by closing or opening the activation contact and BOXSMART II must remain operating with the Fire pilot light and ON illuminated.
If the electrical power becomes disconnected at this time, when the power comes back on line, even if the electrical power supply has been disconnected for a long time, the unit must resume operation in the previous mode of operation; in other words, with fire alarm activated and running. The RESET sequence operates as follows: for what needs to be activated for 3 seconds, the RESET selector and the unit will switch to STANDBY mode prior to the fire alarm activation condition. If a RESET is carried out for any reason while the fire alarm condition is active, the unit will switch to STANDBY but after 3 seconds have elapsed after the Reset selector is released, the fire condition will be reactivated.

Motor selection

BOXSMART II selects the motor based on the events described below. It is important to read this section in order to check in this phase that the alternating is carried out based on the conditions described below.

The alternating operation of the system only occurs if we detect that both contactors and thermal relays are correct and occurs each time the system is started and the activation signal remains active for at least 3 seconds. In cases where only one of the motors is running, there is no alternation and this set is selected directly.
There are two types of Events that would cause alternation; events without memory and events with memory. Both types force selecting another set.

EVENT WITHOUT MEMORY:

If this occurs, the fan is alternated but the event is not recorded in the memory.

EVENT WITH MEMORY:

If this occurs, the fan alternates and the event will be recorded in the memory. The event cannot be recovered until a reset is carried out or the event is acknowledged. To reset activate the MAN mode with one pulse (operates by positive edge) or deactivating the system start-up.

EVENTS:

Thermal Relay Fault (Event without Memory)

The system detects what fan has a thermal relay that has not triggered and if both thermal relays have not been triggered, with the system start-up deactivated, BOXSMART II will be ready to operate the fan that was not operated during the last activation once the run command is received.

If a single thermal relay is detected OK with the start-up disabled, the system will select this fan and will be ready to be actuated once the run command is received.

If no thermal relay is detected OK, the system cannot operate even if it receives a run command from the system.
The Ready output will go out with any fault. In other words, the failure of a single fan per event will switch off the Ready.

With a single fan failed per thermal event, the system operates with the set available if it does not generate a fault, even though the Ready pilot light remains off. The fault can be reset by pressing RESET on the thermal relay.

Contactor auxiliary contact fault (Event with Memory)

Once the run command is received, it is verified that the set meets the activation conditions, its thermal relay is not triggered and there is no event in memory for this fan. If this is so, the applicable contactor will be activated.
After 2 seconds have elapsed since the contactor was activated, the contactor auxiliary must confirm that it has been activated. If so, the output and the shifter RUN condition will be activated, enabling the proper operation of the first motor (M1). However, if 2 seconds after all the conditions have been met, the contactor is activated but its auxiliary does not come on line, the system will switch statuses and will check if the second motor (M2) is in optimum condition for operation. This procedure will be the same for the second motor. Likewise, once the system has detected, for the first motor as well as the second motor, that none of the auxiliaries come on line, the system will be disabled; in other words, none of the motors will operate until the events have been reset.

The Ready output will go out with any fault. In other words, the failure of a single set per auxiliary contact will switch off the Ready.

With a single fan failed per auxiliary camera event, the system operates with the set available if it does not generate a fault, even though the Ready pilot light remains off. The fault can be reset by activating the MAN or with a system run pulse (positive edge).

Contactor auxiliary contact locked ON error (Event with Memory)

Another situation that could occur would be that an auxiliary of a motor is stuck (ON) as result of a contactor failure.

If a run command is received from the system when set 2 is activated and we detect that the contact of the auxiliary contact of the contactor of set 1 is ON, the system switches sets as a protection to ensure two contactors are not acting at the same time and also to ensure the system operates with at least one contactor and thereby take advantage of the contactor ON condition of set 1.
If a run command is received from the system when set 1 is activated and we detect that the contact of the auxiliary contact of the contactor of set 2 is ON, the system switches sets as a protection to ensure two contactors are not acting at the same time and also to ensure the system operates with at least one contactor and thereby take advantage of the contactor ON condition of set 2.

If it is detected that the two contacts of the auxiliary cameras of the contactors are ON, the system cannot be started and the problem must be resolved to resume operation.

The Ready output will go out with any fault when the system is disabled.
A Reset of the fault if it occurs is accomplished by activating the MAN selector.

VFD in alarm (Alarm Event without Memory)

If we enable system and the Drive signal OK is not present, the Ready output is disconnected and a 2-second pulse is provided every 30 seconds to reset the VFD.

While the VFD signal in alarm is active, the ready indicator light remains out.

If when the system start-up is activated, the contactors are activated and the corresponding auxiliary camera is received and if when the VFD run output is activated, a fault is detected in the VFD ok input for at least 0.5 second, the system forces a change of set since it is assumed that the set that is currently connected has triggered the fault.

The event Reset is automatic.

Shifter Contact Running (Event with Memory)

Once the run command is received, the contactor is activated, the system waits to receive contact from auxiliary camera and the converter start-up is activated. Then, a confirmation must be received from the frequency converter that is running. If this confirmation is not received within 30 seconds, the system will change sets.

If set 1 is on line, the thermal relay is OK, the output is activated, the contact from the auxiliary camera of the contactor is received, the VFD run is activated and 30 seconds elapse without receiving the VFD run contact from the VFD, it is understood that the VFD is damaged or that no motor is connected and the set is forced to switch. The failure of this set is saved in the memory.

If set 2 is on line, the thermal relay is OK, the output is activated, the contact from the auxiliary camera of the contactor is received, the VFD run is activated and 30 seconds elapse without receiving the VFD run contact from the VFD, it is understood that the VFD is damaged or that no motor is connected and the set is forced to switch. The failure of this set is saved in the memory.

If the system detects that in set 1 as well as set 2 the VFD run contact is not properly received, the counter will reset to zero and will not begin to count until at least one of the memory faults has been reset after 120 seconds.

This alarm will be automatically reset by a Reset input or by disabling the system start-up. The Ready Pilot light will go out with any of the two sets.

Run / Stop Sequence

Once the motor as well as the shifter have been started and are running, to stop the system we must disable the start-up. This will cause the shifter output to drop and after a few seconds (shifter deceleration ramp), the shifter RUN signal will also drop and at that time the contactor and its auxiliary will be deactivated. In other words, to stop the contactor, first we must stop the shifter and then the contactor and its auxiliary in order to prevent damaging any component of the system, especially the shifter.

If we are operating with any of the two motors; in other words, with the given system operation, the thermal relay in question detected, the contactor and its auxiliary on line and the shifter is OK and therefore, the shifter output is active, in this case, if the thermal relay of the active set is triggered with the system in operation, the shifter output will be deactivated.

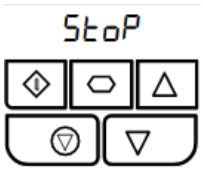
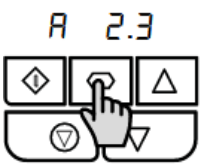
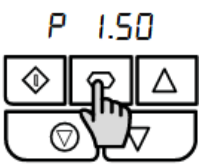
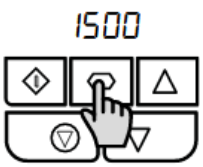
Motor turn and consumption

In this phase we must switch on the motors/fans and make sure ahead of time that the mode selector is set to 0, a fire alarm activation signal is not present and a fire reset has been carried out.

Before carrying out this check, we must configure the motor consumption parameter P08 and the thermal relays of each motor must be individually adjusted to guarantee that when the equipment is operating in TEST mode and therefore the converter protections are active, it triggers if the consumption exceeds this parameter for some time following a calculation model through integration.

Check the direction of turn of the motor to verify that the fan pressurises the area when the fire alarm is activated. To accomplish this we must place the selector in AUTO mode and use the TEST selector in BOXSMART. Via a temporary activation, the fan will switch on and we can then verify the direction of turn of the blades, which should be the direction indicated on the fan itself.
We must also check that the motor consumption is within its nominal operating range; to accomplish this, using the same procedure as before, check the Amps on the frequency converter screen.

Use the read mode as indicated to carry out this check:

				
Motor stopped / Deactivated	The motor is switched on / running, the output frequency (Hz) is shown on the display.	Press the navigator key for 1 second. The motor current (A) will be shown on the display.	Press the navigator key for 1 second. The motor power (kW) will be shown on the display.	If P-10>0, press the navigator key for 1 second and the display will show the speed of the motor (RPM).

EN

Use this opportunity to verify that the ON pilot light illuminates once the motor consumption exceeds 25% of the P08 parameter that is set on the frequency converter.

Important:

It is important to verify the direction of turn in order to ensure that the system pressurises the area in case of a fire.

Check the pressurisation of the area and set the Safety Speed

Check that the measuring tubes are properly installed.
Connect the (+) air inlet in the area to be pressurised and the (-) inlet in the reference area. Otherwise, swap the connections.
Verify the maximum distance of the measuring tube with Sodeca.

Switch on the system using the TEST selector to verify that the system is regulating and pressurises the area, maintaining the pressure at 50 Pa.
To accomplish this, we must switch on the system by actuating the TEST key and verify that the fan turns in the proper direction and that the pressure value on the pressure transducer that is installed on BOXSMART reads approximately 50 Pa. This must always be carried out with the lobby doors closed in order to pressurise the space.

The system must be capable of pressurising the space to 50 Pa with the doors closed if no important leaks are present in the installation.

When we are sure that the system is able to maintain a pressure of approximately 50 Pa with the doors closed we must record the speed of turn of the converter, check its display and enter the converter frequency in parameter P20.
BOXSMART has a safety feature, which in the case of failure of the pressure transducer (loss of 4-20mA signal), remains operating at the safety speed to maintain a pressurisation as close as possible to 50 Pa.

Periodically check the operation of the system

Using the TEST selector (a key selector with feedback) switches on the pressurisation unit without switching on the FIRE mode, allows us to periodically check the system without activating the fire alarm and while maintaining the frequency converter protections. This only works if selector 0-Auto-Man is in the Auto position and the TEST selector has been actuated.

Check the modes of operation

Manual Mode

If the manual mode is selected from BOXSMART, the system will start instantly and in the pressurisation mode; in other words, regulating to maintain the pressure at 50 Pa. The Fire mode is activated in a manner that a prediction of the damage that may be caused by a defect is carried out before the damage is irreversible and the unit is not stopped in situations that do not entail an immediate risk to the frequency converter.
Once the system is activated in manual mode, check that the system is properly regulating the pressure and that the fire mode has been activated. This is visible on the converter Display, where an intermittent point will be displayed indicating that the fire mode is enabled although the BOXSMART fire pilot light will remain out if the fire signal provided by the switchboard has not been activated.

Automatic Mode

In automatic mode, the system is waiting to receive the activation signal. This activation signal may be the activation input of the fire switchboard, the BOXSMART TEST selector or the activation input of the daily ventilation. Any of the 3 activations is possible however, it is important to emphasise that the activation of the fire mode will supersede any of the other two and if the system is operating in daily ventilation; in other words, at a speed adjustable in P-23 on the frequency converter itself and if a fire activation signal is received or the mode is switched to MANUAL, BOXSMART will disable the fixed daily speed and will switch to pressurise in fire mode.
It is worth mentioning that in daily Ventilation mode, all the converter protections are enabled as well as in TEST mode.

Checking the operation of the Pilot lights

The pilot lights that are located on the front of BOXSMART as well as on the fire-fighting panel provide us with information about the status of the KIT. Although this has been checked at the factory, we must periodically check that the pilot lights continue to operate properly and have not been damaged. Under normal conditions, the service life of an LED light is about 20,000 h; however, SODECA provides a 2-year warranty on all their units in accordance with international regulations.

The pilot light indications are described below:

READY PILOT

Indicates when the unit is capable of operating after a fire has been detected; therefore, a READY status indicates that the following conditions are met:
Frequency Converter without an alarm and with electrical power applied.
FIRE activation electronic board without a fault.
0-Auto-Man selector in Auto position.
Electrical power supplied for control as well as for power to the BOXSMART.

FAULT PILOT

Indicates when the unit is not capable of operating after a fire has been detected; therefore, a FAULT status indicates that the following conditions are not met:
Frequency Converter without an alarm and with electrical power applied.
FIRE activation electronic board without a fault.
0-Auto-Man selector in Auto position.
Electrical power supplied for control as well as for power to the BOXSMART.

ON PILOT

Indicates when the frequency converter is started by the unit and the minimum current of 20% of the value indicated on the motor nameplate is exceeded (P08 to VFD), thus guaranteeing a reliable indication that the fan is operating by current flow being present and for example in order to not forget to switch on the motor. This activation of the fan could be configured for the daily ventilation mode, manual mode with fire activated, manual mode with fire deactivated, Test mode or Fire mode.

FIRE PILOT LIGHT

Indicates when the unit receives the fire activation signal. This signal could be of a NO contact or of a NC contact to be configured in BOXSMART.

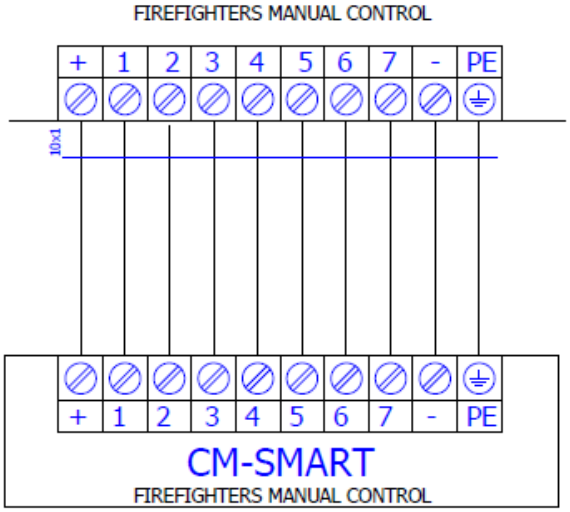
EN

Check the operation of accessories

External control for Fire-fighters C-SMART

It is possible that at the time you purchase a BOXSMART, you also purchase a FIRE-FIGHTING control panel. In these cases you must follow the diagram provided in this manual to connect both units and continue as shown to check their operation.

The control panel has a 0-AUTO-MAN selector as well as status and operation pilot indicator lights. Check that the pilot lights indicate the system statuses and current conditions of the system on the BOXSMART.
From the selector, you may disconnect the system or select the AUTO or MAN mode, taking into account that the MAN mode is always a priority setting. In other words, if AUTO is selected in BOXSMART and MAN is selected at the fire-fighting panel, the MAN mode will prevail since it is a priority setting.



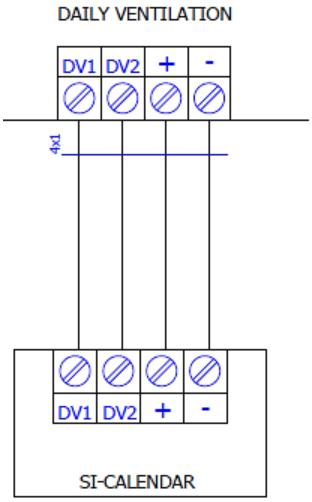
* OPTIONAL
Remote Firefighters Manual Control

Daily ventilation

If the digital input is activated from BOXSMART considering that the activation contact must be free of potential and with the system in AUTO mode, the system will start-up once the signal is activated at a safe speed as configured in parameter P-23 of BOXSMART's frequency converter.
Sodeca recommends using the SI-CALENDAR option that allows easily and quickly interconnecting an hourly timer with BOXSMART for the ventilation system to operate in time slots.

Check that the connections have been properly made and if SI-CALENDAR is not used and a different timer is used, electrical power for this timer must be supplied by an external power supply and not by BOXSMART to avoid damaging the internal power supply that is located inside BOXSMART:

If SI-CALENDAR is used, check that its system starts-up and stops at the times configured in the timer.



* OPTIONAL
External Timer for Daily Ventilation

Status signals

In cases where the status signals need to be interconnected with a control centre or the fire switchboard, the following must be taken into account:

- All status outputs are free of potential, and voltage from an auxiliary power supply may be connected to the common contact.
- All the outputs are switched with a NO as well as an NC contact.
- The system has Fire Activated, Run and Ready/Fault status relays.

Communication with a BMS or SCADA system

BOXSMART has an RS485 communication serial port with a MODBUS RTU protocol that allows connecting BOXSMART with a BMS or SCADA system for the purpose of monitoring the status (Running/ Stopped, Fault, Operating pressure).

BOXSMART FLAP

BOXSMART FLAP controls a motorised actuator that actuates a hatch that opens when the system is activated prior to starting up the fan and closes when there is a deactivation subsequent to the stopping of the fan.

The sequence of operation involves a whole series of safety devices that are listed in the following document to be checked.

OPERATING MODE WITH A SINGLE LIMIT SWITCH (HATCH CLOSED) OR TWO LIMIT SWITCHES (HATCH CLOSED + OPEN)

BOXSMART FLAP may operate with a single hatch closed limit switch or two limit switches for hatch closed and hatch open. The system will not operate unless at least the closed hatch limit switch is installed. The second limit switch for hatch open is therefore optional.

The operating mode is detected automatically in a working cycle; therefore, we must not configure the mode to one or two limit switches since it is automatically detected by BOXSMART FLAP when a working cycle is completed.

Quick view of operation with the activation enabled

The sequence is as follows:

1. When the enabling signal is received from the system, this initiates the sequence.
2. The hatch open contactor is activated
3. If the open hatch LS is detected before 30 seconds elapse and the closed hatch LS is released, disconnect the open contactor. This means that the hatch has moved from closed to open and the frequency converter run is activated. The normal operating cycle is initiated.
4. If the open hatch LS is not detected 30 seconds after the activation and the closed hatch LS has been released, the frequency converter begins to decelerate the fan. After 60 seconds, if the closed LS signal is still not received, the open hatch contactor is deactivated and the normal operation is maintained.
5. Once we have reached this point and the open LS is detected but is lost, the hatch open contactor is activated until open hatch LS is recovered for a maximum time.

Quick view of operation with the activation disabled

When we disable the BOXSMART FLAP activation signal, the system will first try to stop the operation of the motor and will close the door once the motor has stopped.

The sequence is as follows:

When the activation signal is disabled, the stop sequence is initiated.

1. The output that activates the frequency converter run mode is deactivated.
2. When the fan stopped signal is received, after a 1-second delay, the hatch CLOSE contactor is activated.
3. When hatch closed is detected, after a 3-second delay, the hatch CLOSED output is disconnected.
4. When 60 seconds elapse since the hatch close manoeuvre was initiated and the closed hatch LS is not detected, the close contactor is deactivated and an event is entered.
5. If once a closed hatch signal is detected and the CLOSE contactor is deactivated, the closed hatch LS is lost, the close sequence is re-initiated but for a shorter period of 5 seconds.

Description of the events

THERMAL RELAY FAULT EVENT + OPEN HATCH CONTACTOR AUXILIARY CONTACT

When the OPEN hatch output is activated, wait to receive the thermal relay OK and open contactor auxiliary camera signal. If 2 seconds elapse without receiving the signal, activate the event. This event will stop the sequence.

A reset must be carried out by disconnecting the power supply to the BOXSMART FLAP, disabling the activation signal or by activating the MANUAL function of the BOXSMART FLAP.

HATCH BLOCKED WHEN OPENING ALARM

When enabling the card and having activated the hatch OPEN output, the closed hatch limit switch is not released within 6 seconds, it will be understood that the hatch is blocked and we enter an event.

A reset must be carried out by disconnecting the power supply to the BOXSMART FLAP, disabling the activation signal or by activating the MANUAL function.

IMPROPER CONNECTION ALARM

BOXSMART FLAP detects the improper connection of the hatch position limit switches. This way, if the activation of both limit switches is detected at once, the event is not entered but a degraded mode is, in a manner that only the hatch closed limit switch is considered.

A reset must be carried out by disconnecting the power supply to the BOXSMART FLAP, disabling the activation signal or by activating the MANUAL function.

FREQUENCY CONVERTER ALARM

If a frequency converter alarm is detected at any time, the converter activation is disconnected but allows continuing with its open or close sequence and event is activated.

IMPORTANT: If the alarm remains active after 60 seconds, an auto Reset is activated in the converter in an attempt to resume its operation. This is carried out continuously.

A reset must be carried out by disconnecting the power supply to the BOXSMART FLAP, disabling the activation signal or activating the MANUAL function.

ALARM SIGNAL CONFIRMING THE CONVERTER IS ON OR THE MOTOR IS NOT CONNECTED

If once the frequency converter run output is activated, the converter confirmation signal is not detected within 30 seconds or the signal is lost during operation, the event is activated. The run activation output is disconnected but the established hatch sequence is continued.

A reset must be carried out by disconnecting the power supply to the BOXSMART FLAP, disabling the activation signal or by activating the MANUAL function.

THERMAL RELAY FAULT EVENT + CLOSE HATCH CONTACTOR AUXILIARY CONTACT

When the CLOSE hatch output is activated, wait to receive the thermal relay OK and close contactor auxiliary camera signal. If 2 seconds elapse without receiving the signal, activate the event. This event will stop the sequence.
A reset must be carried out by disconnecting the power supply to the BOXSMART FLAP, disabling the activation signal or activating the MANUAL function of the BOXSMART FLAP.

HATCH BLOCKED WHEN CLOSING ALARM

When the card is disabled and the hatch open LS is detected, the hatch CLOSE output is activated. If the open limit switch is not released within 6 seconds, it will be understood that the hatch is blocked and we enter an event.

The sequence is aborted and the hatch close action is disconnected.
A reset must be carried out by disconnecting the power supply to the BOXSMART FLAP, disabling the activation signal or activating the MANUAL function.

6. Maintenance

It is advisable to conduct regular inspections to ensure the system is in perfect operating condition and that when necessary, the equipment will function correctly. These inspections shall be carried out by qualified technicians at least bi-annually or as stipulated by applicable regulations.

7. Troubleshooting and corrective actions

BOXSMART

Troubleshooting and corrective actions

Alarms and faults that may be generated as well as their corrective actions are detailed below.

The Ready LED light is out

Cause: The unit is not ready for operation when the activation signal is received.

- Check that the power supply is not damaged and is supplying 24Vdc.
- Check that none of the thermal circuit breakers have tripped.
- Check that the frequency converter has not failed.
- Check that the Auto-0-Man selector is in the AUTO position.

If the fault condition persists, contact SODECA.

The thermal LED is illuminated

Cause: Failure of the frequency converter or the safety devices.

If the frequency converter alarm has tripped, disconnect the power supply from the BOXSMART to reset or press the STOP key on the unit to reset it. If this is not the cause of the fault, check the following:

- Check that the Auto-0-Man selector is in the AUTO position.
- Check that none of the thermal circuit breakers have tripped.
- Check that the frequency converter has not failed.

If the fault condition persists, contact SODECA.

Does not start when the activation signal is activated.

Cause: Activation signal improperly connected or is not free of potential

We must ensure that the activation signal by fire or daily ventilation is free of potential since otherwise, the equipment could be damaged. Therefore, the following shall be checked:

- Check that the activation signal is free of potential and is properly connected.
- Check that the activation signal is actually reaching the Kit BOXSMART.

If the fault condition persists, contact SODECA.

When running in Test mode the pressure transmitter provides a negative pressure reading

Cause: Air tube connection or pressure transmitter failure

- It is possible that the (+) air inlet in the reference area and the (-) inlet in the area to be pressurised may not be connected. These connections must be swapped.
- Check that the fan motor turns in the proper direction since otherwise, the fan may be suctioning.
- Locally, blow on the (+) tube and if the differential transmitter does not increase in value but instead its indication remains in negative, it is possible that one of the inlets may be obstructed or the transducer may be faulty.

If the fault condition persists, contact SODECA.

In Standby mode, the pressure transmitter provides a positive pressure reading

(The Standby mode is entered when the system is stopped as a result of no activation signal being present)

Cause: Possible failure of the pressure transmitter

- Locally, gently blow on the (-) tube and if the differential transmitter does not decrease in value but instead its indication remains in positive, it is possible that one of the inlets may be obstructed or the transducer may be faulty.
- Perform an auto calibration as shown in the manual so the transmitter will indicate 0 Pa.

If the fault condition persists, contact SODECA.

When running in Test mode the pressure transmitter indicates pressure but the shifter does not regulate.

Cause: Transmitter analogue output fault.

- Check parameter P0-01 of the converter. It shall read 0% if the transmitter reads 0 Pa and 100% if we have 100 Pa.
- Verify the parametrisation of the frequency converter according to the manual.

If the fault condition persists, contact SODECA.

The transmitter display is off and the frequency converter is on.

Cause: Transmitter or power supply failure

- Verify that 24Vdc is present at the output of the power supply.
- Check that none of the thermal circuit breakers on the BOXSMART have tripped.
- Verify that none of the connections on the pressure transmitter are disconnected.

If the fault condition persists, contact SODECA.

The converter display indicates a fault message:

Cause: Converter protection active

In the frequency converter user manual, verify the table with the alarm codes that may be displayed on the converter and their corrective action.
To reset an error on the converter display, press STOP once the BOXSMART activation signal is disabled.

BOXSMART II

Troubleshooting and corrective actions

Alarms and faults that may be generated as well as their corrective actions are detailed below.

The Ready LED light is out

Cause: The unit is not ready for operation when the activation signal is received.

- Check that the power supply is not damaged and is supplying 24Vdc.
- Check that none of the thermal circuit breakers have tripped.
- Check that the frequency converter has not failed.
- Check that none of the thermal relays protecting BOXSMART II are tripped. If any are found tripped, reset them by pressing the reset button on the thermal relay itself.
- Check that none of the BOXSMART contactors are causing a fault.
- Check that the Auto-0-Man selector is in the AUTO position.

If the fault condition persists, contact SODECA.

The thermal LED is illuminated

Cause: Failure of the frequency converter or the safety devices.

If the frequency converter alarm has tripped, disconnect the power supply from the BOXSMART II to reset or press the STOP key on the unit to reset it. If this is not the cause of the fault, check the following:

- Check that the Auto-0-Man selector is in the AUTO position.
- Check that none of the thermal circuit breakers have tripped.
- Check that none of the thermal relays protecting BOXSMART II are tripped. If any are found tripped, reset them by pressing the reset button on the thermal relay itself.
- Check that none of the BOXSMART II contactors are causing a fault.

If the fault condition persists, contact SODECA.

Does not start when the activation signal is activated.

Cause: Activation signal improperly connected or is not free of potential

We must ensure that the activation signal by fire or daily ventilation is free of potential since otherwise, the equipment could be damaged. Therefore, the following shall be checked:

- Check that the activation signal is free of potential and is properly connected.
- Check that the activation signal is actually reaching the BOXSMART II Kit.
- Verify if any of the two thermal relays protecting each of the motors have tripped.
- Verify that the frequency converter has not failed.
- Verify that once the activation signal is detected, one of the contactors is actuated.

If the fault condition persists, contact SODECA.

When running in Test mode the pressure transmitter provides a negative pressure reading

Cause: Air tube connection or pressure transmitter failure

- It is possible that the (+) air inlet in the reference area and the (-) inlet in the area to be pressurised may not be connected. These connections must be swapped.
- Check that the fan motor turns in the proper direction since otherwise, the fan may be suctioning.
- Locally, blow on the (+) tube and if the differential transmitter does not increase in value but instead its indication remains in negative, it is possible that one of the inlets may be obstructed or the transducer may be faulty.

If the fault condition persists, contact SODECA to resolve the problem.

In Standby mode, the pressure transmitter provides a positive pressure reading

(The Standby mode is entered when the system is stopped as a result of no activation signal being present)

Cause: Possible failure of the pressure transmitter

- Locally, blow on the (-) tube and if the differential transmitter does not decrease in value but instead its indication remains in positive, it is possible that one of the inlets may be obstructed or the transducer may be faulty.
- Perform an auto calibration as shown in the manual so the transmitter will indicate 0 Pa.

If the fault condition persists, contact SODECA to resolve the problem.

When running in Test mode the pressure transmitter indicates pressure but it does not regulate.

Cause: Transmitter analogue output fault.

- Check parameter P0-01 of the converter. It shall read 0% if the transmitter reads 0 Pa and 100% if we have 100 Pa.
- Verify the parametrisation of the frequency converter according to the manual.

If the fault condition persists or any of the previously mentioned anomalies is detected, contact SODECA to resolve the problem.

The transmitter display is off and the frequency converter is on.

Cause: Transmitter or power supply failure

- Verify that 24Vdc is present at the output of the power supply.
- Check that none of the thermal circuit breakers on the BOXSMART II have tripped.
- Verify that none of the connections on the pressure transmitter are disconnected.

If the fault condition persists, contact SODECA.

The converter display indicates a fault message:

Cause: Converter protection activated

In the frequency converter user manual, verify the table with the alarm codes that may be displayed on the converter and their corrective action.
To reset an error on the converter display, press STOP once the BOXSMART activation signal is disabled.

BOXSMART FLAP

Troubleshooting and corrective actions

Alarms and faults that may be generated as well as their corrective actions are detailed below.

The Ready LED light is out

Cause: The unit is not ready for operation when the activation signal is received.

- Check that the power supply is not damaged and is supplying 24Vdc.
- Check that none of the thermal circuit breakers have tripped.
- Check that the frequency converter has not failed.
- Check that the BOXSMART FLAP hatch is closed when in standby.
- Check that the closed / open hatch limit switches are properly connected.
- Check that the Auto-0-Man selector is in the AUTO position.

If the fault condition persists, contact SODECA.

The thermal LED is illuminated

Cause: Failure of the frequency converter or the safety devices.

If the frequency converter alarm has tripped, disconnect the power supply from the BOXSMART FLAP to reset or press the STOP key on the unit to reset it. If this is not the cause of the fault, check the following:

- Check that the power supply is not damaged and is supplying 24Vdc.
- Check that none of the thermal circuit breakers have tripped.
- Check that the frequency converter has not failed.
- Check that the BOXSMART FLAP hatch is closed when in standby.
- Check that the closed / open hatch limit switches are properly connected.
- Check that the Auto-0-Man selector is in the AUTO position.

If the fault condition persists, contact SODECA.

When BOXSMART FLAP is activated, the hatch does not open.

Cause: Hatch blocked or electrical failure.

If the frequency converter alarm has tripped, disconnect the power supply from the BOXSMART FLAP to reset or press the STOP key on the unit to reset it. If this is not the cause of the fault, check the following:

- Check that the power supply is not damaged and is supplying 24Vdc.
- Check that the hatch is not mechanically blocked.
- Check that the BOXSMART FLAP limit switches are properly connected and are free of potential.

If the fault condition persists, contact SODECA.

When running in Test mode the pressure transmitter provides a negative pressure reading

Cause: Pressure transmitter fault

- It is possible that the (+) air inlet in the reference area and the (-) inlet in the area to be pressurised may not be connected. These connections must be swapped.
- Check that the fan motor turns in the proper direction since otherwise, the fan may be suctioning.
- Locally, blow on the (+) tube and if the differential transmitter does not increase in value but instead its indication remains in negative, it is possible that one of the inlets may be obstructed or the transducer may be faulty.

If the fault condition persists, contact SODECA to resolve the problem.

In Standby mode, the pressure transmitter provides a positive pressure reading

(The Standby mode is entered when the system is stopped as a result of no activation signal being present)

Cause: Possible failure of the pressure transmitter

- Locally, blow on the (-) tube and if the differential transmitter does not decrease in value but instead its indication remains in positive, it is possible that one of the inlets may be obstructed or the transducer may be faulty.
- Perform an auto calibration as shown in the manual so the transmitter will indicate 0 Pa.

If the fault condition persists, contact SODECA.

When running in Test mode the pressure transmitter indicates pressure but the shifter does not regulate.

Cause: Transmitter analogue output fault.

- Check parameter P0-01 of the converter. It shall read 0% if the transmitter reads 0 Pa and 100% if we have 100 Pa.
- Verify the parametrisation of the frequency converter according to the manual.

If the fault condition persists, contact SODECA to resolve the problem.

The transmitter display is off and the frequency converter is on.

Cause: Transmitter or power supply failure

- Verify that 24Vdc is present at the output of the power supply.
- Check that none of the thermal circuit breakers on the BOXSMART have tripped.
- Verify that none of the connections on the pressure transmitter are disconnected.

If the fault condition persists, contact SODECA.

The converter display indicates a fault message:

Cause: Converter protection active

In the frequency converter user manual, verify the table with the alarm codes that may be displayed on the converter and their corrective action.
To reset an error on the converter display, press STOP once the BOXSMART FLAP activation signal is disabled.

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