

Manual



Constant Pressure / Constant Flow Regulator ES 10

LSCONTROL

PressureBox Highlights

ES 10 is a constant pressure (Pa) or a constant flow (m/s) regulator designed for use in ventilation systems. All pressure or flow sensors transmitting a 0-10VDC output signal are supported.

ES 10 is equipped with a 0-10VDC regulating output and a start/stop relay, which can control a frequency inverter or a voltage regulator. The ES 10 can be set in 3 different operating modes with corresponding setpoints: Day mode, Night mode or Maximum Operating mode.

If a NTC temperature sensor is connected to the ES 10, it can be set to outdoor temperature compensation.

As the ES 10 is also equipped with a potential free alarm output, the ES 10 can be connected to CTS equipment or other alarm equipment.

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This manual is primarily intended for the use of technical personnel who is to mount and install the ES 10 Constant Pressure / Constant Flow Regulator.

It is a precondition that personnel mounting and installing the product possess the necessary practical experience and education within the area of product use and also possess any necessary authorization for installing electric wiring material.

Safety Instructions

Read the entire manual before installation and use of ES 10 Constant Pressure / Constant Flow Regulator.
If the instructions in this manual are not followed it may cause damage to the product and invalidate the warranty.



Be careful not to damage the product during unpacking.



Make sure to follow common directions for tools used during mounting.



Do not touch product with wet hands.



Do not store or use product outside recommended temperature area.



Do not wash product with water or any other liquids.



Product is only to be used in non-condensing environment.



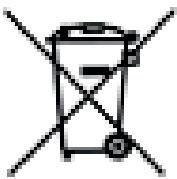
Product must not be exposed to direct sunlight or any other UV-light.



Make sure to be ESD-discharged before installing the product.



Contact hazard.
Take care of live parts (230V AC) in the device during installation and setting.



Product must not be disposed of in refuse collection.

Product must be disposed of according to local regulations regarding disposal of small electronic products.

Manufacturer Information

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Standards and Directives

ES 10 Constant Pressure / Constant Flow Regulator complies to below standards and directives.

- EN 61000-6-1 and EN 61000-6-3 Electromagnetic Compatibility (EMC)
- EN 60669-1 and EN60669-2 Switches for Household and similar fixed- electrical installations.

This product complies to RoHS Directive 2011/65/EU

The manufacturer of this product is registered with the statutory return system under the WEEE directive.

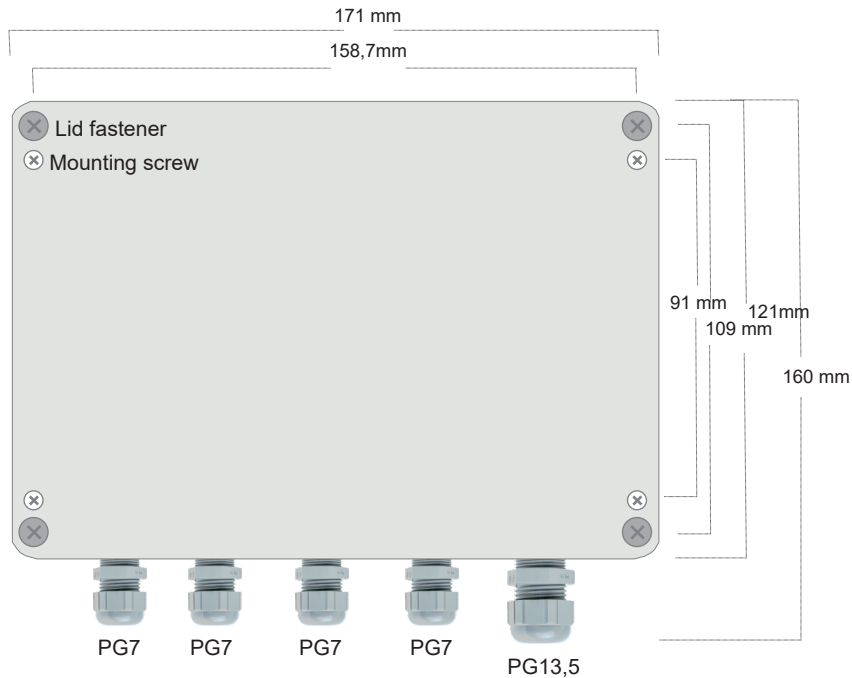


Technical Specifications

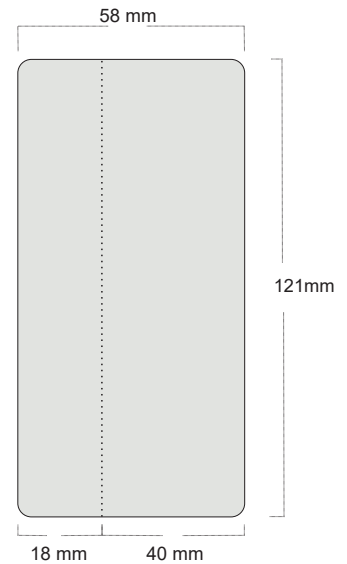
Supply Voltage:	230VAC \pm 10%, 50Hz
Power:	max 15VA
Enclosure:	IP54
Weight:	620 g
Operating Temperature:	-20 - 50°C
Display:	0 - 50°C non-condensing
Alarm relay:	250VAC, 8A Ac1.
Motor relay:	n250VAC, 3A Ac1.
Motor error input:	Open = error.
0-10VDC Out to motor:	0-10VDC max 20mA
Start/Stop Signal:	Open = Stop
Full Speed input:	Closed = Full Speed
Pressure input:	0-10VDC, 4,7Kohm
+24VDC supply:	+24VDC out +50%, -20% Max 80mA
NTC temperature sensor:	22Kohm NTC, \pm 0,5°C, from -40°C to 60°C max 20m unshielded cable
Night-time drop input:	Closed = Setpoint night

Size and Measurement

Front:



Side View

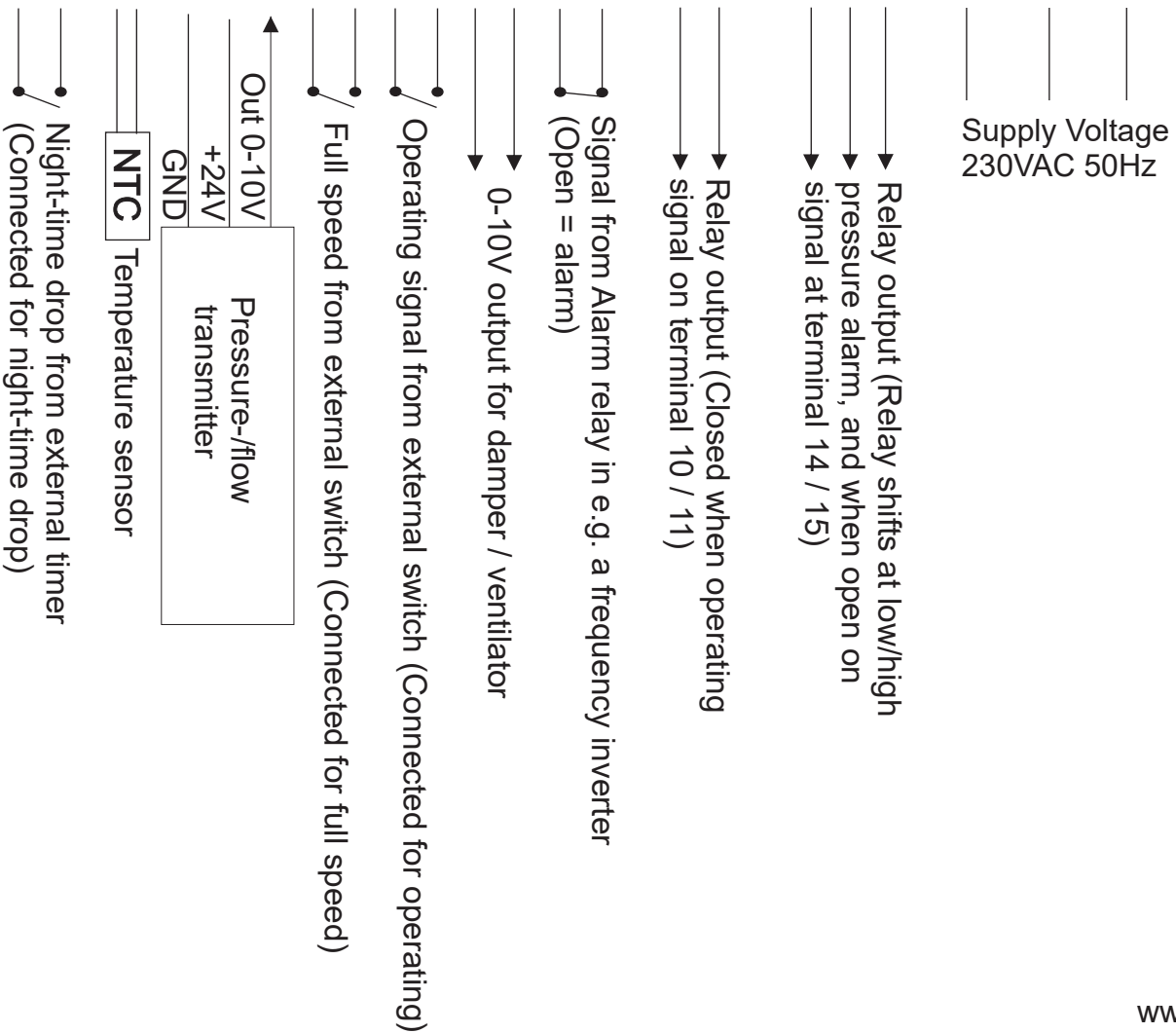
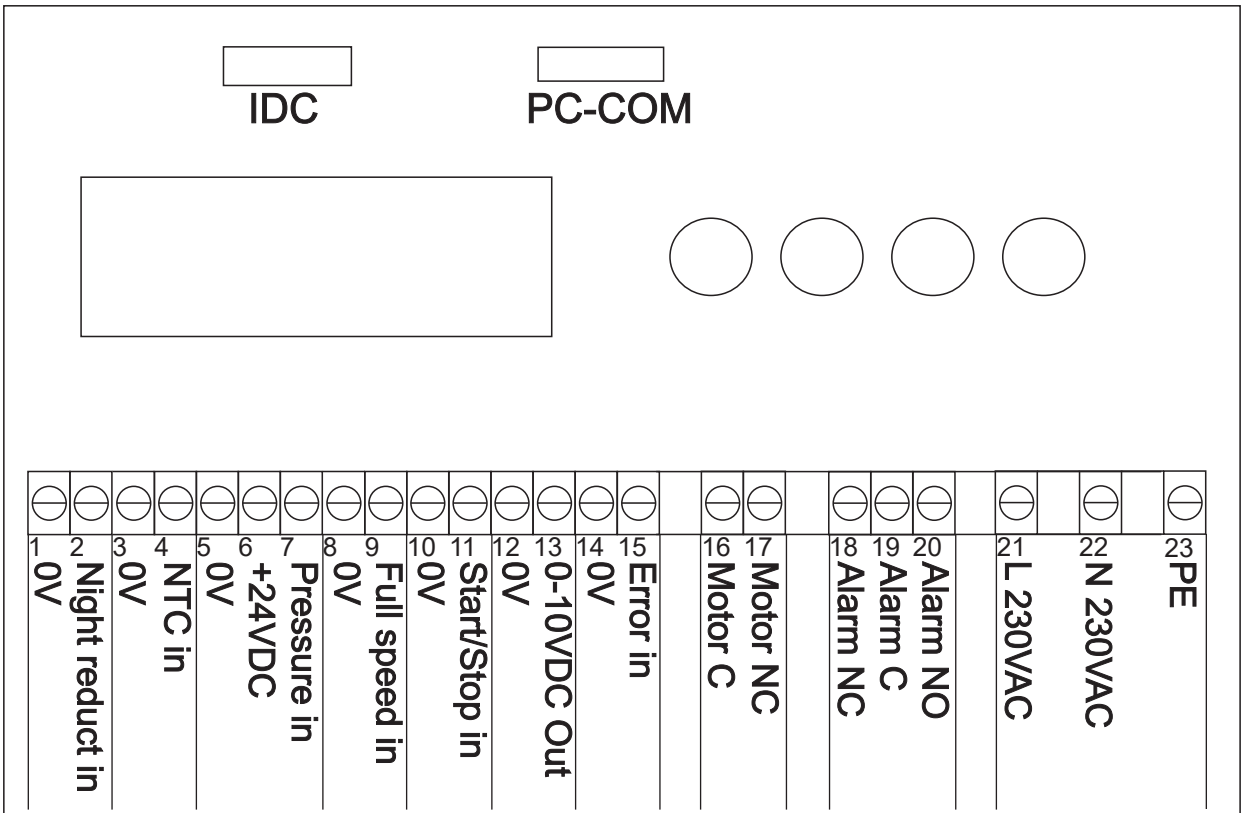


Mounting

The ES10 constant pressure/airflow regulator is to be mounted according to applicable mounting regulations on a flat and stable surface, on which the ES10 is fixed with screws in the 4 corner holes. The ES10 must not be mounted on moving or vibrating surfaces. Cables are run through the cable glands, which must be tightened.

Accessory: ES 1088 PressureBox is to be mounted according to applicable regulations on a flat and stable surface on which ES 1088 is fixed with screws in the 4 corner holes. The ES 1088 must not be mounted on moving or vibrating surfaces. The cable is run through the cable gland, which must be tightened. Please also refer to the manual for ES 1088 PressureBox for further instructions.

Terminal Overview and Connection Diagram



Main Menu

The main menu in the display consist of two lines.

In the first line the following information is shown:
Current operation mode (Stop, Day, Night, Max) and whether outdoor temperature compensation is active (Temp Komp).



In the second line the following information is shown:

1. Current pressure (Pa) or current air velocity (m/s).
2. Press «arrow down» ↓ and the outdoor temperature is shown, if sensor is mounted. If no sensor is mounted -40°C is displayed.
3. By pressing «arrow down» ↓ once more the current motor speed in % is displayed. (0%=0VDC, 100%=10VDC).
4. By once more pressing «arrow down» ↓ display show ›MENU press enter‹. Press «enter» ↵ continuously till display shifts to ›setpoint menu‹, see below description.

Setpoint Menu

Setting of the individual setpoints for required operations is explained in the below sections and on the last 2 pages of this manual you will find a complete overview of all setpoints with their corresponding min/max values and factory setting.

Access the setpoint menu

To access the setpoint menu from main menu press ›arrow down‹ until ›MENU press enter‹ is displayed. Then hold «enter» ↵ until ›MENU enter passw‹ is displayed. **Password is 1234.**

Password is entered using «arrow up» ↑ and «arrow down» ↓, press until required number is displayed then press «enter» ↵. When all 4 numbers are entered complete by pressing «enter» ↵. The first line in the display will show ›Edit setp no: 1‹.

Choose setpoint for editing

To select the required setpoint number for editing press «arrow up» ↑ and «arrow down» ↓.

When required setpoint number is displayed press «enter» ↵. The setpoint is now ready for editing. When finished editing press «enter» ↵ to save the selected value. You may now choose another setpoint number by pressing «arrow up» ↑ and «arrow down» ↓.

Edit setpoint

When the required setpoints for editing has been chosen, a value must be selected. Display show ›Setpoint no.: x‹, where x is the chosen setpoint number, and ›Value: y‹, where y is the factory setting of the setpoint. The value can be changed by pressing «arrow up» ↑ and «arrow down» ↓. When the required value is displayed, press «enter» ↵ to save and return to setpoint menu. If the new value should **not** be saved, press ›ESC‹ to return to setpoint menu without saving.

Exit setpoint menu

When all required setpoint have been changed / set the setpoint menu is exited by pressing «arrow up» ↑ until ›Edit setp no: 0‹ / ›Enter for exit‹ is displayed. Press «enter» ↵ to exit the setpoint menu.

Time out

If nothing is pressed for 30 seconds the setpoint menu will automatically be exited.

Note: Pressure/Flow regulation is not active when setpoint menu is open.

Air Pressure / Airflow Regulation

ES 10 can be set to maintain a constant air pressure or a constant airflow. This is chosen in setpoint number 15 in the setpoint menu. If setpoint number 15 is set to «0», then ES 10 will maintain a constant air pressure measured in (Pa). If setpoint number 15 is set to «1», then ES will maintain a constant airflow measured in meter per second (m/s).

The ES 10 has 3 operating modes which are described below with their corresponding setpoints. ES 10 will automatically change between Pa and m/s according to the chosen value in setpoint number 15.

Besides the 3 operating modes the ES 10 can also be in ›Stop mode‹.

Stop mode. ES 10 is stopped and motor output measures 0VDC (terminal 12 and 13) and the motor relay is not closed (terminal 16 and 17). When in «stop mode» the alarm monitoring is also stopped, so no alarms will be shown.

Day mode. ES 10 regulates according to the «Day mode» setpoint. Which is set in setpoint number 1 in the setpoint menu. The value can be chosen between 0Pa and 5000Pa (if air pressure is chosen as value in setpoint number 15) or between 0.0m/s and 50.00m/s (if airflow is the chosen value). Motor relay (terminal 16 and 17) is closed and a voltage signal is transmitted to motor output (terminal 12 and 13). In «Day mode» the alarm monitoring is activated. Refer to description of alarms on page 9.

Night mode. ES 10 regulates according to the «Night mode» setpoint. Which is set in setpoint number 2 in the setpoint menu. The value can be chosen between 0Pa and 5000Pa (if air pressure is chosen as value in setpoint number 15) or between 0.0m/s and 50.00m/s (if airflow is the chosen value). Motor relay (terminal 16 and 17) is closed and a voltage signal is transmitted to motor output (terminal 12 and 13). In «Night mode» the alarm monitoring is activated. Refer to description of alarms on page 9.

Max mode. ES 10 regulates according to the «Max mode» setpoint. Which can be set in setpoint number 3 in the setpoint menu. The value can be chosen between 0Pa and 5000Pa (if air pressure is chosen as value in setpoint number 15) or between 0.0m/s and 50.00m/s (if airflow is the chosen value). Motor relay (terminal 16 and 17) is closed and a voltage signal is transmitted to motor output (terminal 12 and 13). In «Max mode» the alarm monitoring is partly activated. Low pressure/flow is not monitored and no alarm is given. Only high pressure/flow is monitored for alarming. Also see the description of alarms on page 9.

The «Max mode» function is activated in setpoint number 23 in the setpoint menu. If this setpoint is set to ›0‹ Max mode will be activated when terminal 8 and 9 are closed. If the setpoint is set to ›1‹ max mode is activated when terminal 8 and 9 are open.

Alarm Control

ES 10 has 3 different types of alarms.

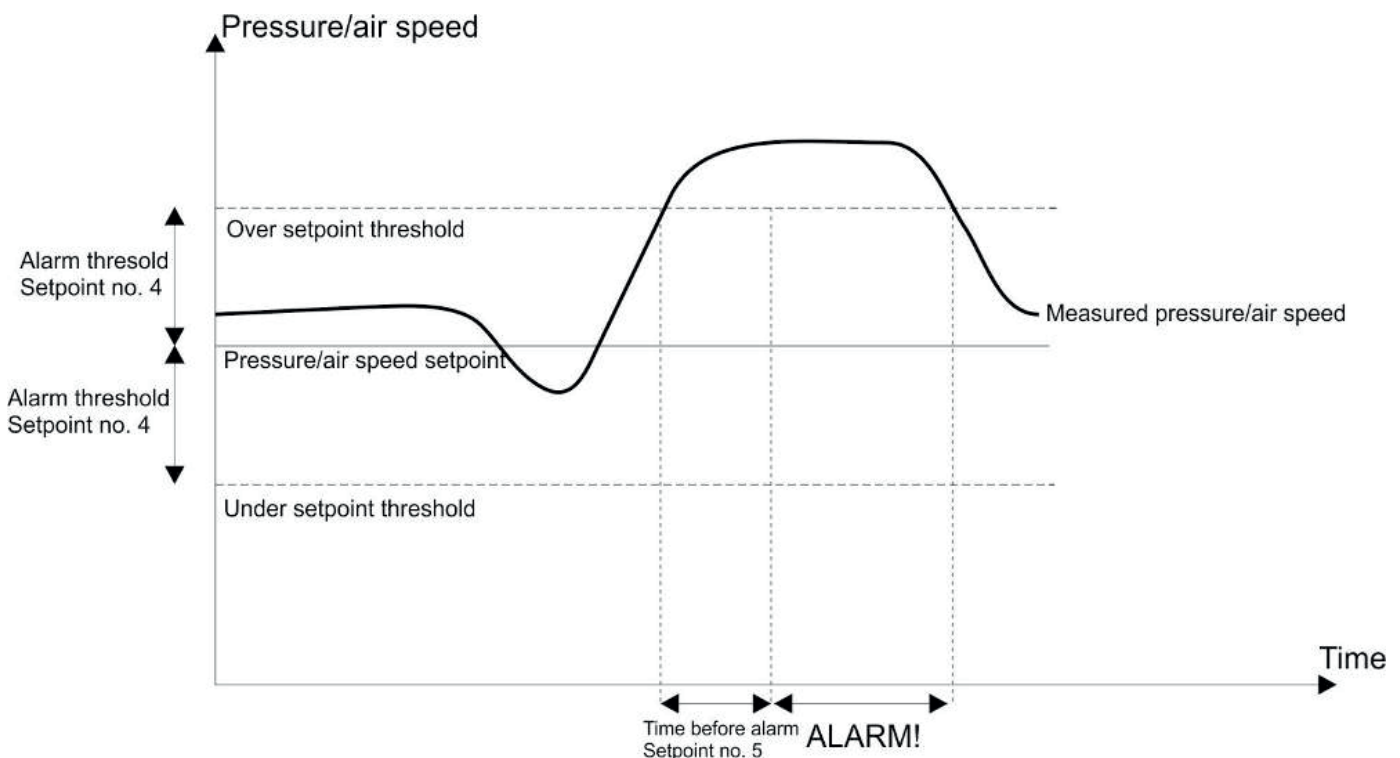
1. Motor error alarm. If the connection between terminal 14 and 15 is disrupted, the display will show the alarm «ERROR! Motor» and the alarm relay (terminal 18, 19 and 20) draws. Pressure / Flow regulation will continue as usual. If the motor error alarm disappears (terminal 14 and 15 connects) the alarm in the display will also automatically disappear.

2. Pressure / Air velocity Alarm, above setpoint If the measured pressure / air velocity gets above the set regulation setpoint plus an alarm limit (pressure / flow setpoint + alarm limit) for a certain time the display will display «ERROR! To High», and the alarm relay (terminal 18,19 and 20) draws. The alarm limit is set in setpoint number 4 in the setpoint menu. The alarm limit can be set between 0Pa and 1000Pa (when pressure is the chosen value) or between 0.00m/s and 10.00m/s (when flow is the chosen value).

The alarm delay time is set in setpoint number 5 in the setpoint menu and can be chosen between 0 to 1000 seconds. If the pressure / flow fall under the alarm limit the alarm disappears automatically. Refer to below figure as example.

3 Pressure / Air velocity Alarm, under setpoint If the measured pressure / air velocity gets below the set regulation setpoint plus an alarm limit (pressure / flow setpoint + alarm limit) for a certain time the display will display «ERROR! To Low», and the alarm relay (terminal 18,19 and 20) draws. The alarm limit is set in setpoint number 4 in the setpoint menu. The alarm limit can be set between 0Pa and 1000Pa (when pressure is the chosen value) or between 0.00m/s and 10.00m/s (when flow is the chosen value).

The alarm delay time is set in setpoint number 5 in the setpoint menu and can be chosen between 0 to 1000 seconds. If the pressure / flow fall under the alarm limit the alarm disappears automatically. Refer to below figure as example.



Outdoor Temperature Compensation

ES 10 is equipped with an outdoor temperature compensation function. The outdoor temperature is measured with a NTC temperature sensor mounted in terminal 3 and 4. The measurement range of the sensor must be between -40.0°C - 60.0°C .

The outdoor temperature compensation function is activated by setting the value in setpoint number 6 in the setpoint menu to $\rangle 1 \langle$.

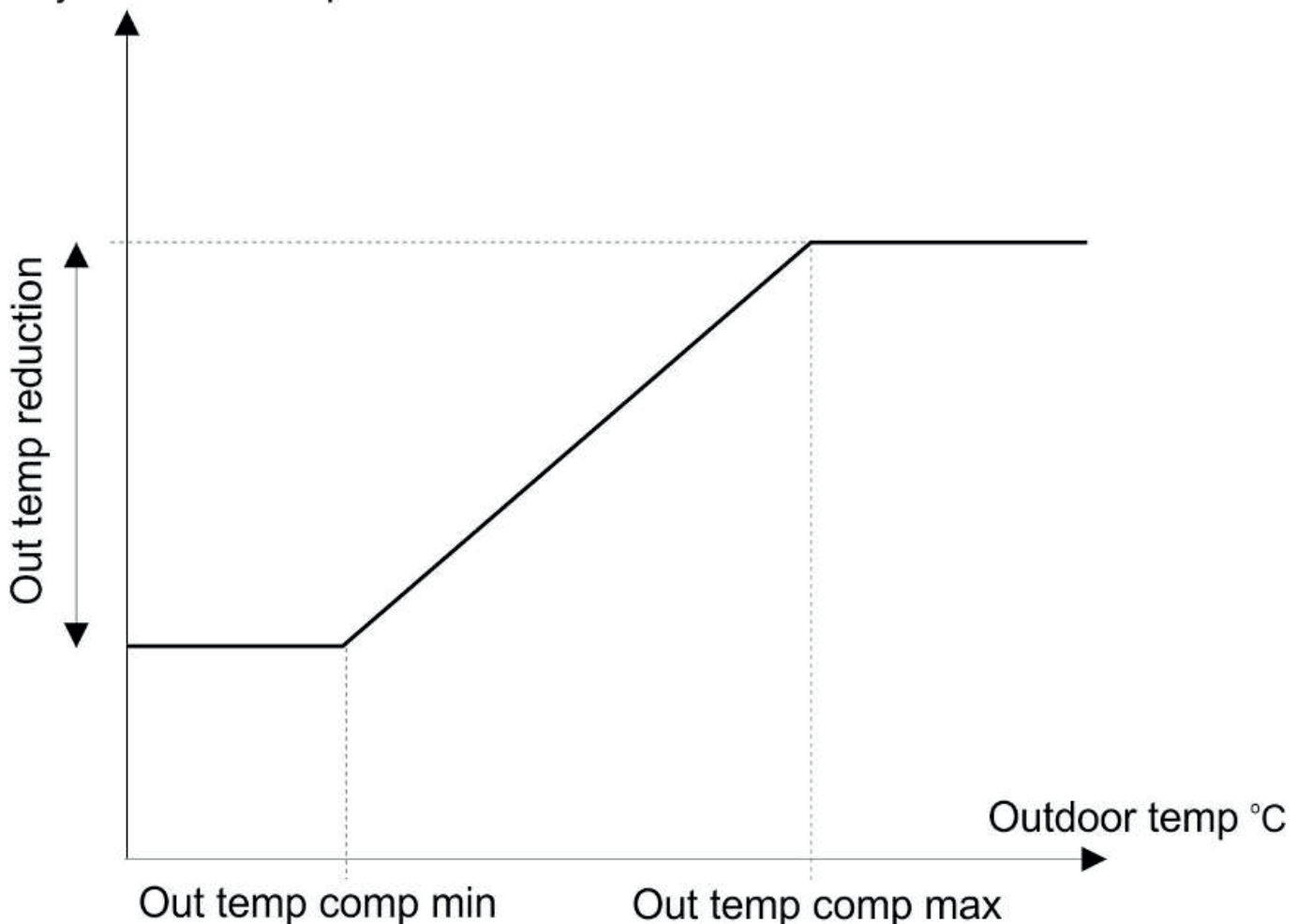
If the outdoor temperature falls below the outdoor temperature compensation max. value the pressure/flow setpoint values will gradually be reduced. The outdoor compensation max. value is set in setpoint number 7 in the setpoint menu and can be chosen between -10°C and 15°C . The reduction of the pressure/flow setpoint will continue until the value of Outdoor temperature compensation min. is obtained. The outdoor compensation min. value is set in setpoint number 8 in the setpoint menu and can be chosen between -25°C and 0°C .

The value of the reduction is set in setpoint number 9 in the setpoint menu and can be chosen between 0Pa and 500Pa or 0m/s and 5.00m/s according to chosen regulation value in setpoint number 15.

Refer to below figure as example.

Note: Outdoor temperature compensation is only active in the operating modes $\rangle \text{Day mode} \langle$ and $\rangle \text{Max mode} \langle$ and *not* in $\rangle \text{Night mode} \langle$.

Adjustment of setpoint Pa / m/s



Motor Control

Frequency Inverter / Voltage Regulator. The choice between frequency inverter or voltage switch must be made in the setpoint number 16 in the setpoint menu. Value >0<=frequency inverter and value >1<=voltage regulator.

If >voltage regulator< is chosen the size of the sudden pressure / air velocity increases that might occur in the ventilation system must be set. This is set in setpoint number 17 in the setpoint menu. And value must be set between 0 and 1000Pa or 0.00m/s and 10.00m/s.

Connection of motor control. Terminal 12 and 13 on the ES 10 provides a 0-10VDC output for control of a frequency inverter or a voltage regulator. On terminal 16 and 17 a motor operation relay is found which is drawn when the ES 10 is in day, night or max operation. Furthermore the ES 10 is equipped with an error input on terminal 14 and 15 for errors from frequency inverter, voltage regulator or motor. At fault free operation terminal 14 and 15 are closed. Refer to the Alarm Control section on page 9.

Setting of control signal. Maximum voltage of the 0-10VDC output during operation can be set in setpoint number 10 in the setpoint menu. Value can be set between 50% and 100% (50%=5,0VDC, 100%=10,0VDC). Also the minimum output voltage of the 0-10VDC output during operation can be set. This is set in setpoint number 11 in the setpoint menu. Value can be set between 0% og 50% (0%=0,0VDC, 50%=5,0VDC).

Inverted operation. The 0-10VDC output from the ES 10 can be inverted. That means that the output reverses so it will give a higher signal in the circumstances that normally would be given a lower signal. Inverted operation is chosen in setpoint 14 in the setpoint menu. Value >0< = normal 0-10VDC output, value >1<= inverted 0-10VDC output.

Pressure or Flow Sensor

Standard LS Control Sensor. The ES 10 can maintain and regulate either air pressure or airflow by connecting the appropriate sensor. The sensor is connected to terminal 5 (0VDC), terminal 6 (+24VDC) and terminal 7 (0VDC pressure / flow input). LS Control PressureBox E 2500 0-10V only /ES 1088 fits the factory settings of ES 10 perfectly. It is therefore unnecessary to set the setpoint regarding the pressure sensor. The mentioned pressure sensor has a measurement range between 0 and 2500Pa, factory setting is 0-500Pa.

Use of Other Sensor If instead another air pressure/ airflow sensor is to be used, the setpoint numbers 12 and 13 in the setpoint menu must be set. In setpoint no. 12 the measurement value of the chosen sensor, when output signal from sensor is 10VDC is set. Setpoint can be set between 0Pa and 5000Pa or 0.00m/s and 50.00m/s. In setpoint no. 13 the output voltage of the chosen sensor when sensor measures 0Pa or 0.0m/s is set. This setpoint can be set between 0.0VDC and 10.0VDC.

Language

The menu language of ES 10 is available in Danish and English. The language is set in setpoint number 18 in the setpoint menu. Value >0<=Danish and value >1<=English.

PID Controller

Air pressure or airflow adjustment is controlled by a PID controller. The PID controller is equipped with 4 setpoints in the setpoint menu.

1. Setpoint no. 19. PID KP. The amplification of the PID controller.
2. Setpoint no. 20. PID TI. The integration time of the PID controller.
3. Setpoint no. 21. PID H. The sampling time of the PID controller.
4. Setpoint no. 22. The adjustment frequency of the PID controller.

Setpoint Menu Table and Factory Settings

Setpoint Number	Display text	Description	Min Value	Max Value	Factory Setting
1	Pressure day Flow day	Setpoint for day mode operation	0Pa 0.00m/s	5000Pa 50.00m/s	200Pa 2.00m/s
2	Pressure night Flow night	Setpoint for night mode operation	0Pa 0.00m/s	5000Pa 50.00m/s	150Pa 1.50m/s
3	Pressure max Flow max	Setpoint for max mode	0Pa 0.00m/s	5000Pa 50.00m/s	400Pa 4.00m/s
4	Pressu error+/- Flow error +/-	Pressure/flow +/- limit until alarm activation	0Pa 0.00 m/s	1000Pa 10.00m/s	100Pa 1.00m/s
5	Time delay alarm	Time delay for pressure/flow before alarm activates.	0sec	1000sec	300sec
6	Temp comp.	Outdoor temperature compensation ON or OFF	0=OFF	1=ON	0=OFF
7	Temp comp. max	Max temperature for activating compensation	-10.0°C	15.0°C	5.0°C
8	Temp comp. min	Min temperature when compensation is at max.	-25.0°C	0.0°C	-10.0°C
9	Temp pres reduce Temp flow reduce	Pressure/flow value to be compensated for	0Pa 0.00m/s	500Pa 5.00m/s	50Pa 0.50m/s
10	Motor out max	Max voltage on 0-10VDC motor output	50%	100%	100%
11	Motor out min	Min voltage on 0-10VDC motor output	0%	50%	0%
12	Sensor max	Pressure/flow value which the sensor measures at 10VDC output	0Pa 0.00m/s	5000Pa 50.00m/s	500Pa 5.00m/s
13	Sensor V 0pa/ms	Voltage of pressure/flow sensor at 0Pa or 0m/s	0.0V	10.0V	0.0V
14	Inverted output	0-10VDC motor output at inverted operation	0=OFF	1=ON	0=OFF
15	Pressure / flow	Should the regulator regulate pressure or flow	0=Pressure	1=Flow	0=Pressure
16	Freq.inverter // Voltage Regulator	Setting of control of pressure or flow triacregulating	0=Freq. inverter	1=Voltage Regulator	0=Freq. inverter
17	Voltage Reulator pressure / flow	Pressure/flow value indicating a sudden pressure/flow change	0Pa 0.00m/s	1000Pa 10.00m/s	50Pa 0.50m/s
18	Language 0:DK 1:UK	Choice of language for menus	0=DK	1=UK	0=DK

Setpoint Menu Table and Factory Settings Continued

Setpoint number	Display text	Description	Min Value	Max Value	Factory Setting
19	PID kp	PID controller amplification	0	250	10
20	PID ti	PID controller integration time	0	4000	100
21	PID h	PID controller sampling frequency	0	2000	100
22	PID period	PID controller is called every time set value is reached.	0.0sec	25.0sec	1.0sec
23	Max. in invert	Max mode input invert function	0=OFF	1=ON	0=OFF
24	Factory setting	Reset to factory setting	0=OFF	1=Reset	0=OFF