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Micatrone®

Operating and installation manual

Programmable differential pressure controller for measurement and control of pressure and flow

MF-PFC

Mi-208gb / 2007-12-13

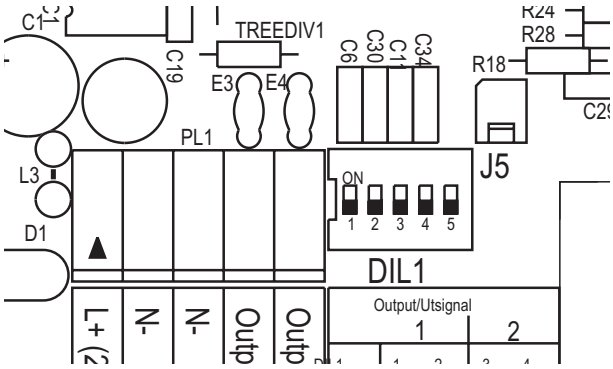
NOTE !
Read the entire instruction before start.

Application
MicaFlex MF-PFC is a pressure and flow controller with built in pressure sensor. With the four keypads ▼,▲, **PGM** and **ESC** the desired function is selected as well as setting and scaling. The two-line display clearly indicates the selected function.

Installation
MF-PFC is designed to be placed on a wall or recessed mounting through a wall or cabin-door. When recessed mounting, a mounting kit, “MFM-PANEL” is used. The unit is fixed to the wall by four screws, max 4 mm. The location of the holes is shown at the back of the enclosure.
Unscrew the four screws of the front cover and use the lower screws to attach the front cover on the upper end of the casing acc. to figure 1 . This simplifies the installation and electrical connection.
Connect power supply according to the electrical connection.
NOTE ! Do not connect the output terminals before the programming is done.

On the front cover both the LCD-display and the CPU is mounted. Because the calibration of the main circuit board´s I/O is stored in a flash-memory on the CPU module it is not possible to move the front cover between two different apparatus.

Output signal
MF-PFC has two analogue outputs to be used for actual value of pressure and flow or PI-control output for pressure or flow. VDC or mA output signal must be set by the DIL-switch marked ‘DIL1’.
The programming is then done under “Outputs”.



DIL 1	1 on,	2 off	volt 1
	3 on,	4 off	volt 2
	1 off,	2 on	mA 1
	3 off,	4 on	mA 2

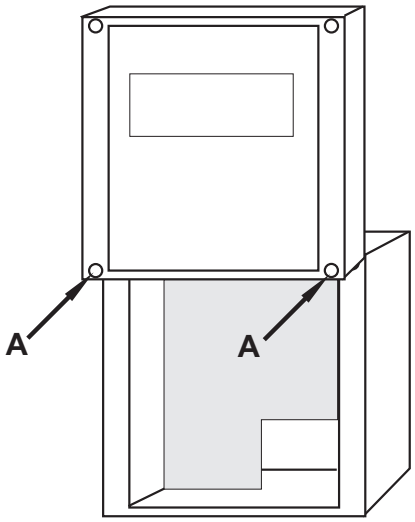


Figure 1, Use the two bottom screws to fix the front cover at the upper edge (**A**) during installation.

Basic programming instruction
When the power supply is connected a start menu will be displayed. With the ▼▲ - keys it is possible to scroll through the different start menus. To always have the same start menu, the selection is programmed under “Systems settings”. If pressing the **ESC**-key when a different menu is displayed means that the programmed menu is displayed.

Programming
Press **PGM** until displayed text disappears. Display shows parameter group, see list page 2.
With ▼▲ it is possible to go through the parameter groups.

1. Current values
2. System settings
3. Outputs
4. Pressure
5. Flow
6. Alarms
7. PI2 controller
8. Communication
9. Internals

When the parameter group to be programmed is shown, press **PGM**. The parameters in that group are then shown, with ▼▲ select the parameter to be programmed and press **PGM** again.

Par.no:	Par name	Range/Unit	Value
Internals			
0	Prog ver	0,00...9,99	
Current values			
100	dP	-32768...32767	
101	Flow	-32768...32767	
102	PI2	0,00...100,00	
103	PI2 CSP	-32768...32767	
105	SPC Input	0,00...100,00	
106	SPD Input	CLOSED OPEN	
System settings			
4	Display	dP FLOW dP+FLW dP+PI2 FLW+PI2	
5	Damping[s]	0...9	
(99)	Access code	0...9999	
Outputs			
19	Output 1	dP FLOW PI2	
20	Signal 1	0..10V 2..10V 0..20mA 4..20mA	
21	Output 2	dP FLOW PI2	
22	Signal 2	0..10V 2..10V 0..20mA 4..20mA	
Pressure			
23	MinCal[Pa]	-32768...32767	
24	MaxCal[Pa]	-32768...32767	
25	Unit dP	Pa PaDec mbar iwc	
26	Min range	-32768...32767	
27	Max range	-32768...32767	
28	Min out	-32768...32767	
29	Max out	-32768...32767	
30	Sign dP	POS NEG	
Flow			
31	Unit flow	l/s m3/s m3/h m/s cfm	
32	Max flow	0...32767	
33	Scale flw	0...32767	
34	Set flow	0...32767	

Par.no:	Par name	Range/Unit	Value
Alarms			
6	Alarm 1	OFF HIGH LOW	
7	Source 1	dP FLOW	
8	Level 1	-32768...32767	
9	Delay 1[s]	0...3600	
11	Alarm 2	OFF HIGH LOW	
12	Source 2	dP FLOW	
13	Level 2	-32768...32767	
14	Delay 2[s]	0...3600	
PI2 controller			
35	Source	OFF dP FLOW	
36	Mode	AUTO HAND	
37	Output	DIRECT REVERSE	
53	SP1	-32768...32767	
55	SP2	-32768...32767	
56	SPC Type	OFF 0..10V 2..10V 0..20mA 4..20mA	
57	SPD Mode	OFF SP2 FORCED FROZEN	
58	Forced	0,00...100,00	
39	NZ [%]	1...50	
40	P-band	0...9999	
41	I-time[s]	0...999	
42	BZ	0...100	
43	I-time BZ	0...999	
96	Min out	0,00...100,00	
97	Max out	0,00...100,00	
Communication			
47	Address	1...247	
48	Location	0...32767	
49	Protocol	COMLI	
50	Baud	600 b 1200 b 2400 b 4800 b 9600 b	
51	Protect	NO YES	

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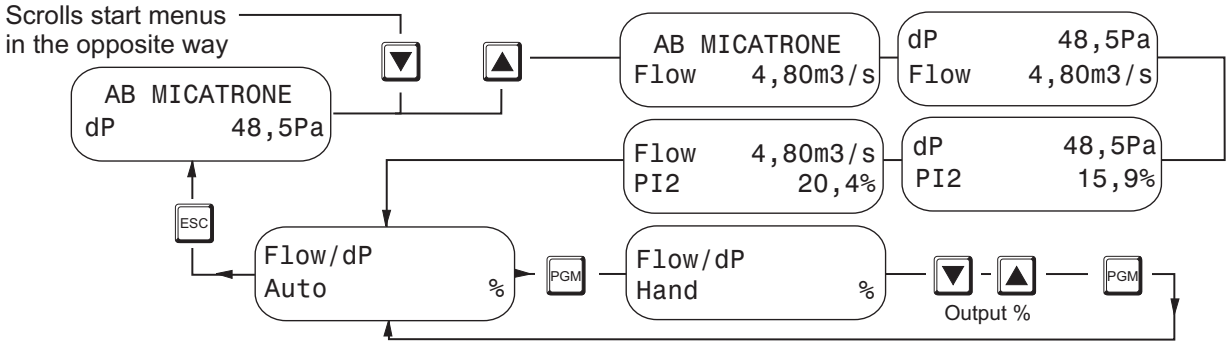

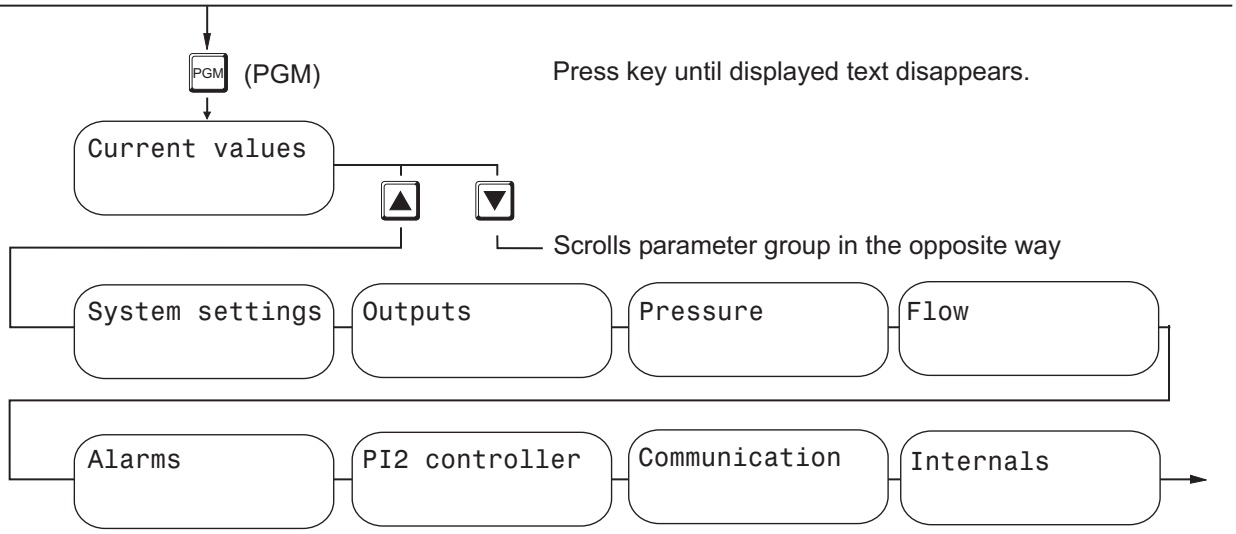

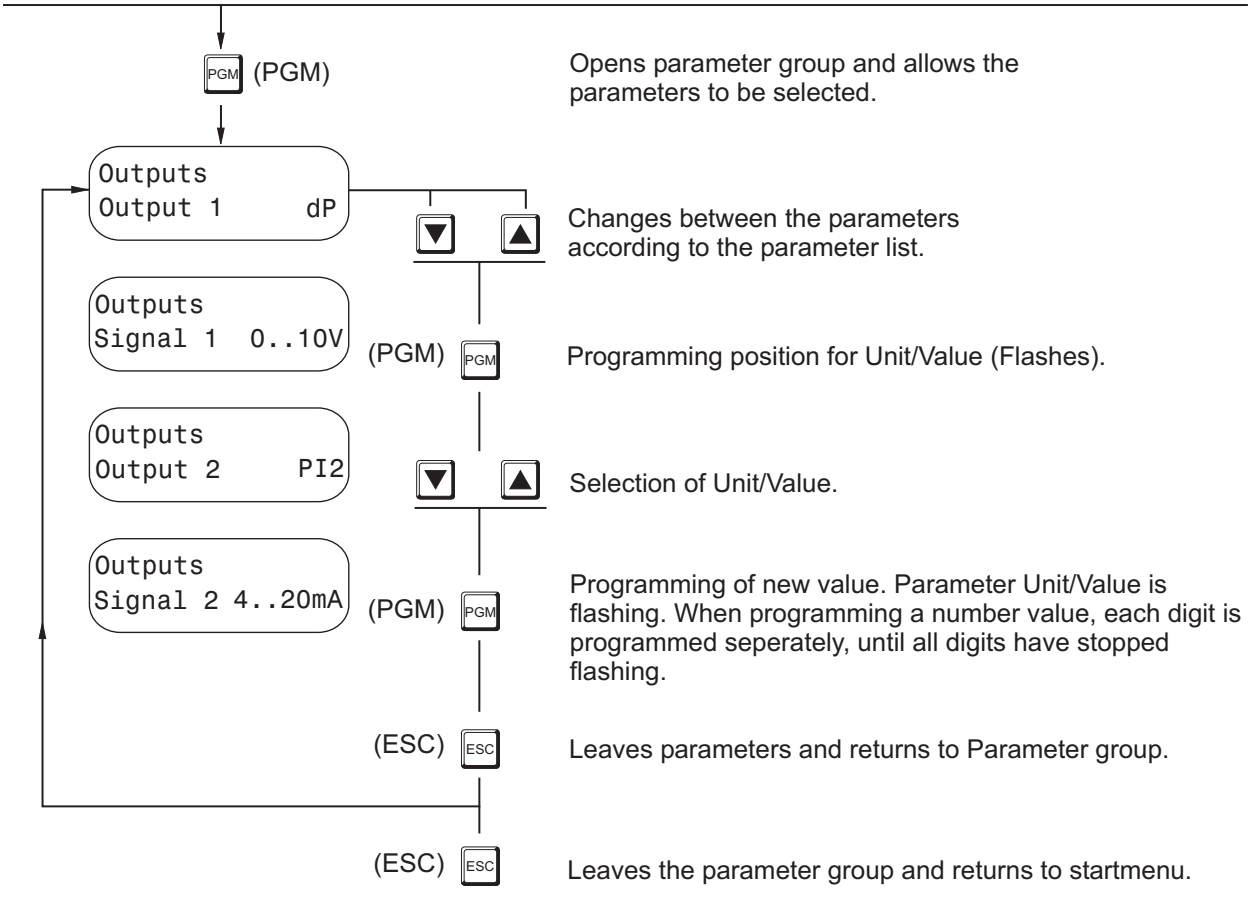

PFC
Programming guide

Always note the programmed data beside the parameter in the programming protocol for future documentation

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Digit programming
Every digit is separately programmed. Press ▲ for 1...9 after 9 if negative values are accepted -9...0. Digit to be changed is flashing . When all digits are programmed press **PGM** and the whole row will flash. To stop incorrect programming press **ESC** and then **PGM** to execute new programming.

Unit or value programming
Press ▼▲ to change unit/value. When selected press **PGM** then the whole row will flash.
Press **ESC** to return to parameter group.
Press **ESC** to leave the parameter group and return to the start menu.
NOTE ! It is always possible to stop an incorrect programming with **ESC** if you have not pressed **PGM** after the last digit or unit/value selection.

Programming instruction
We recommend you to follow this instruction.
When any of the start menus are displayed press **PGM** until displayed text disappears.

1. Current values

100	dP	-32768...32767	
101	Flow	-32768...32767	
102	PI2	0,00...100,00	
103	PI2 CSP	-32768...32767	
105	SPC Input	-327,68...327,67	
106	SPD Input	CLOSED OPEN	

Shows the actual values.

2. System settings

4	Display	dP FLOW dP+FLW dP+PI2 FLW+PI2	
5	Damping[s]	0...9	
(99)	Access code	0...9999	

Select the start menu to be shown. Select the time constant (damping) for the flow and pressure measurement 0...9,9 seconds, normally 1...3 seconds.

Key lock is a hidden parameter (99) if the function is activated and no code has been entered.
This function is available from program version 2.20 or higher.

The key lock is to be used when then transmitters settings must be protected from unwanted alteration. The 4-digit code must be entered before accessing the program and function menu. For Micaflex with built-in control function the code must also be entered to switch between AUTO and HAND operation.

Indication of the measured values and operating state is accessible without entering the code.

At delivery the code is programmed to "0000" unless nothing else is agreed to. With factory default code "0000" the key lock is in-active. I.e no protection against altering the settings.

Activating the key lock
To activate the key lock settings must be programmed into the parameter 'Access code' which is found below the parameter group 'System settings'. The code must be different from "0000" unless the lock will be in-active. After programming a 4-digit code into the parameter this code must be used to access the program and function menus.

In-activating the key lock
The key lock can be in-activated by setting the value of parameter 'Access code' to "0000". Since the setting is done from the program menu the already programmed code must be known to inactivate the key lock.

Contact Micatrone if the code has been lost!

Entering code
To access the program or function menu or to switch between AUTO-HAND function the code must be entered.

Example to access the program menu:

Press the **PGM**-key to open the program menu. Keep the key pressed until following screen appears.

MF-xxx
PROGRAM-MENU

Instead of the text 'xxx' the actual model for the present type is indicated.

Release the **PGM**-key. If the key lock is activated the following screen appears.

ENTER CODE: 0*
PROGRAM-MENU

The first digit (0) is flashing to indicate that the first digit of the code must be entered by using the arrow-keys. Press the **PGM**-key to jump to the second digit, etc.

When all four digits are entered press a final time the **PGM**-key. The entered code is now compared with the settings in the parameter 'Access code'. If they match the program menu is accessed.

Current values

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The menu is accessible until the **ESC**-key is pressed one or several times and the preset start menu is displayed. Example:

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dP 4 Pa

If the code does not match the programmed settings following screen appears

INVALID CODE
PROGRAM-MENU

for a period of 2 second before shifting to the "Enter code" screen again.

ENTER CODE: 0***
PROGRAM-MENU

By pressing the **ESC**-key during the operations the programming of the code is aborted and the preset start menu is displayed.

AB MICATRONE
dP 4 Pa

3. Outputs

19	Output 1	dP FLOW PI2	
20	Signal 1	0..10V 2..10V 0..20mA 4..20mA	
21	Output 2	dP FLOW PI2	
22	Signal 2	0..10V 2..10V 0..20mA 4..20mA	

Select the sources for the two analogue outputs.
The selection is possible between actual value of pressure or flow, PI-control output for pressure or flow.
NOTE ! There is only one controller in the unit. The source for the PI-controller is programmed under “PI2 controller”.
NOTE ! Always have the same source: pressure or flow for the analogue and PI-control outputs. To measure and control flow or velocity it is necessary to connect the unit to a flow measurement device mounted in the duct or fan inlet etc.
Select the output signal for the two outputs 0/2...10 VDC or 0/4...20 mA.
NOTE ! The DIL-switch on the circuit board for VDC or mA output must be set the same as the programmed output signal.
It is possible to have VDC on one of the output and mA on the other.

Pressure

23	MinCal[Pa]	-32768...32767	
24	MaxCal[Pa]	-32768...32767	
25	Unit dP	Pa PaDec mbar iwc	
26	Min range	-32768...32767	
27	Max range	-32768...32767	
28	Min out	-32768...32767	
29	Max out	-32768...32767	
30	Sign dP	POS NEG	

NOTE ! If the unit is used for flow measurement, you do not need to do any programming under “Pressure”.
All units are factory calibrated to a special range. The range is marked on the label on the right side of the casing. The calibration is always in Pa. Under “Pressure” you also find the calibrated range, “Min cal” and “Max cal”. These values are only notes and are not possible to change. If you want to change to another unit, program the “Unit dP”. Selections: Pa, Pa Dec (Pa with decimal), mbar or iwc (inch water). When programming a new unit the actual range is shown under “Min range” and “Max range”. These values are only notes and not possible to change. To change the range in selected unit or factory programmed unit, program “Min output” and “Max output”. The programmed values shall always be in the selected unit (Pa, Pa,dec, mbar, iwc). When scaling, note that the accuracy always is in % of the factory scaled range.

When measuring a negative pressure normally the MF-PFC will show the same as measuring a positive pressure (no sign). When programming “Sign dP” to ‘NEG’ (negative) you have a negative (**-**) sign before the actual value.

5. Flow

31	Unit flow	l/s m3/s m3/h m/s cfm	
32	Max flow	0...32767	
33	Scale flw	0...32767	
34	Set flow	0...32767	

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If you have programmed the MF-PFC for flow follow this instruction.
Program the unit for flow to: l/s, m^3/s, m^3/h or m/s.
The basic flow calculation used is made with √dP. To have the display and the output corresponding to the actual flow or velocity in the selected unit it is necessary to make some calculations.
Different manufactors of flow measurement devices have different calculation, but common for all is √dP.
Use the actual formula to calculate the max flow for the factory calibrated measure range. The calculated flow or velocity is then programmed under “Max flow” in the selected unit. It is possible to scale the flow range under “Scale flow”. When scaling the flow note that the accuracy depends on the “Max flow” range.
If adjustment of the displayed actual flow or velocity must be done, it is possible to do under “Set flow”. Programme the actual flow from a reference flow sensor or equal.
NOTE ! The programming must be done at the same time as the reference values are presented. Automatically the “Max flow” programming will be changed for the new values. If the unit is connected to a BMS system or equal, the “Max flow” or if scaled, the “Scaled flow” and the output signal must be programmed in the connecting system.
Eg 3,5 m^3/s = 10 VDC. The output signal is linear to the flow or velocity.

Alarms

6	Alarm 1	OFF HIGH LOW	
7	Source 1	dP FLOW	
8	Level 1	-32768...32767	
9	Delay 1[s]	0...3600	
11	Alarm 2	OFF HIGH LOW	
12	Source 2	dP FLOW	
13	Level 2	-32768...32767	
14	Delay 2[s]	0...3600	

The visible alarms are indicated by green LED (normal) and red LED (alarm). There are two separate alarms for high or low limit with separate time delays. For each alarm you have to program high or low limit, source: dP or Flow, and time delay. If both of the alarms are used the red LED will indicate the first alarm that is activated.
At the alarm limit the red LED is activated and after time delay the red LED starts flashing.

8. PI2 controller

35	Source	OFF dP FLOW	
36	Mode	AUTO HAND	
37	Output	DIRECT REVERSE	
53	SP1	-32768...32767	
55	SP2	-32768...32767	
56	SPC Type	OFF 0..10V 2..10V 0..20mA 4..20mA	
57	SPD Mode	OFF SP2 FORCED FROZEN	
58	Forced	0,00...100,00	
39	NZ [%]	1...50	
40	P-band	0...9999	
41	I-time[s]	0...999	
42	BZ	0...100	
43	I-time BZ	0...999	
96	Min out	0,00...100,00	
97	Max out	0,00...100,00	

MF-PFC has a PI-controller specially developed for pressure or flow control. The controller has an analogue input ‘SPC’ for Volt/mA and a digital input ‘SPD’ which is activated by a potential free contact closing. SPC and SPD function may be used together. At closed contact the SPD function gets priority.

SPC
SPC function is used when an external Volt/mA signal shall change the set point. The set point continuously changes between two selected limits/set points SP1 and SP2. Selection between volt/mA is made with DIL-switch no 2, and is programmed with “SPC Type” to 0/2...10 VDC / 0/4...20 mA or ‘Off’.

SPD
SPD function is activated by a potential free closing contact. SPD function may change between two set points SP1 and SP2 or force the output to a set value before e.g. start of a fan. Under “SPD Mode” the selection SP2 is made if a change between two set points is desired, FORCED if forced operation is desired or OFF if SPD function is not wanted. If the function FORCED is selected, the wanted control output 0...100 % when the contact is closed is programmed under FORCED.
The controller may be programmed as a standard PI-controller, but in most pressure or flow applications we recommend that it is programmed as an I-controller without P-band. When it is programmed as an I-controller there are two programmable I-times. E.g. Outside a desired level on both sides of the set value it is possible to have a shorter I-time and inside a longer I-time.

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The parameters "Min out" and Max out" are used to prevent the control output signal to decrease or increase outside a programmed limit. For example, when the output is connected to an actuator that should only receive a control signal of 2..8 volt, the "Min out" should be programmed to 20,0 (= 2V) and the "Max out" should be programmed to 80,0 (= 8V).

Programming
Select source: dP, Flow off.
Select mode: AUTO, HAND
Normally Auto
The output signal is programmed to be indirect or direct. Normally indirect (if the pressure or flow is higher than the set point the output signal will decrease). Programme the set point in the earlier programmed unit for dP or Flow. Programme the neutral zone 'NZ' to 0...9,9% of the selected pressure or flow range, normally 1...5%. If the range is not scaled the 'NZ' is in % of the factory calibrated pressure range or max flow range. If scaled in % of the scaled range, half of the neutral zone is on each side of the set point.

P-band
Normally not used for pressure and flow control.

I-time
When programming as an I-controller there are two possibilities.

1. **The same I-time over the whole range. Normally used.**

Programme 'BZ' to 000 and 'I-time BZ' to 000. The I-time should normally be longer than the time for the damper motor etc to go from min to max.

2. **Shifting between two I-times**

If working with two I-times the reason is often that outside a set pressure or flow limit you want to have a fast response and inside a shorter response (see figure 2).
Bz is the limit for switching I-time. Bz is in % of the scaled pressure or flow range, if not scaled % of the factory calibrated pressure range or max flow range. Half the Bz is on each side of the set point.

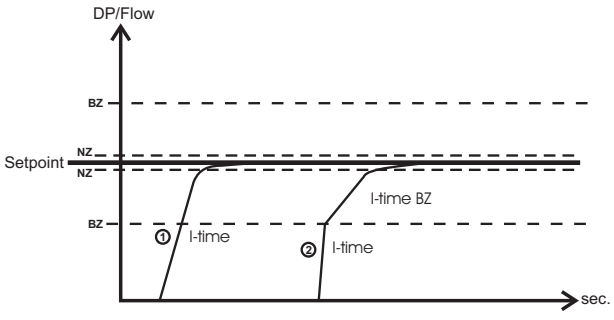

Fig 2, I-times

If the control output is not going to a stable position increase the I-time. If the effect is not efficient enough, increase the neutral zone.

Hand position
Return to start menu and select this menu.

Flow / dP
Auto %

Press **PGM**. "Auto" will shift to "Hand" and make it possible to set the output in % with the ▼▲ -keys .
To return to "Auto" press **PGM**.
To return to start menu press **ESC**.

Zero set of the pressure sensor
Disconnect the pressure tubes or set the manifold valve in a calibration position.
Press simultaneously on ▼▲ - keys when any startmenu is displayed. The display first show:

ZERO OFFSET

Release the keys when the display shows:

ZERO OFFSET
ADJUSTING

When zero set is done the display will show:

ZERO OFFSET
DONE

and the display will automatically return to the start menu.

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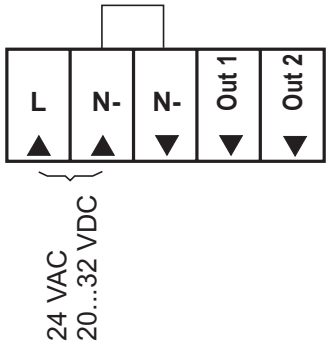
Technical Data

Indicator,	Alphanumeric LCD, 2 rows, 2x16 characters
Measurement range of;	
-Pressure:	see label
-Flow:	0...30.000
Accuracy:	± 0,5 %
Temperature dependence:	± 0,5 % /10 °C
Time delay:	0...9,9 sec.
Outputs:	Two analogue outputs 0/2...10 VDC, 0/4...20 mA selectable and scalable
Inputs:	SPD potential free closing SPC 0/2...10 VDC, 0/4...20 mA
Ambient temperature:	0...50 °C
Alarm (visible):	Two separate alarms, high&low Red LED alarm indication
Power supply:	24 VAC ±15 % 20...32 VDC
Power consumption:	3 VA
Housing class.:	IP 65
Cable entry:	2 threaded holes M16x1,5 (cable connectors not attached)
Dimensions:	WxHxD 122 x 120 x 90mm

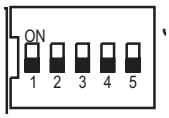
Service

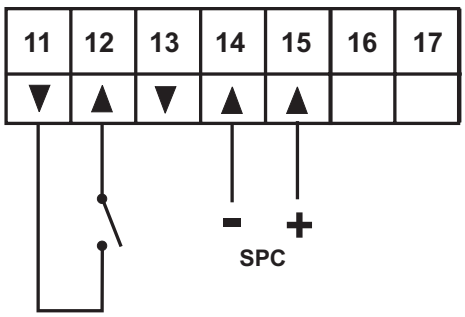
Check the zero point every 6 months.

Electrical connection:



DIL 2
SPC
VDC 1-5 Off
mA 1-2 On, 3-5 Off





11	+ 15V
12	SPD
13	Digital ground
14	Analogue signal ground
15	Analogue signal input Volt/mA
[16]	Not in use
[17]	Not in use

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