

PID conf ( I configure an analog pressure sensor from 0.0bar to 100.0 bar ) :

▼ PID Feedback			
TOCT	Type of control	PRESSURE	↕ NA
PIF	PID controller feedback	AI1 Analog input	↕ Not configure
AI1T	Configuration of AI1	Voltage	Voltage
UIL1	AI1 voltage scaling parameter of 0%	0 V	0 V
UIH1	AI1 voltage scaling parameter of 100%	10 V	10 V
CRL1	AI1 current scaling parameter of 0%	0 mA	0 mA
CRH1	AI1 current scaling parameter of 100%	20 mA	20 mA
AI2T	Configuration of AI2	Voltage	Voltage
UIL2	AI2 voltage scaling parameter of 0%	0 V	0 V
UIH2	AI2 voltage scaling parameter of 100%	10 V	10 V
CRL2	AI2 current scaling parameter of 0%	0 mA	0 mA
CRH2	AI2 current scaling parameter of 100%	20 mA	20 mA
AI3T	Configuration of AI3	Current	Current
UIL3	AI3 voltage scaling parameter of 0%	0 V	0 V
UIH3	AI3 voltage scaling parameter of 100%	10 V	10 V
CRL3	AI3 current scaling parameter of 0%	0 mA	0 mA
CRH3	AI3 current scaling parameter of 100%	20 mA	20 mA
AI4T	Configuration of AI4	Current	Current
UIL4	AI4 voltage scaling parameter of 0%	0 V	0 V
UIH4	AI4 voltage scaling parameter of 100%	10 V	10 V
CRL4	AI4 current scaling parameter of 0%	0 mA	0 mA
CRH4	AI4 current scaling parameter of 100%	20 mA	20 mA
AI5T	AI5 type	Current	Current
UIL5	AI5 voltage scaling parameter of 0%	0 V	0 V
UIH5	AI5 voltage scaling parameter of 100%	10 V	10 V
CRL5	AI5 current scaling parameter of 0%	0 mA	0 mA
CRH5	AI5 current scaling parameter of 100%	20 mA	20 mA
PIF1	Minimum PID feedback	0 bar	↕ 10 bar
PIF2	Maximum PID feedback	100 bar	100 bar
RPF	PID feedback	35.6 bar	0 bar
PAL	Minimum feedback level Warning	0 bar	↕ 10 bar
PAH	Maximum feedback level Warning	100 bar	100 bar

The PID reference is 50.0bar

▼ PID Reference			
PII	Internal PID reference	Yes	↕ No
FR1	Configuration reference frequency 1	AI1 Analog input	AI1 Analog input
PIP1	Minimum PID process	0 bar	↕ 15 bar
PIP2	Maximum PID process	100 bar	↕ 90 bar
RPI	Internal PID reference	50 bar	↕ 15 bar
PAU	Auto/Manual select input	Not assigned	Not assigned
PIM	Manual PID reference	Not configured	Not configured
FPI	Predictive speed reference	Not configured	Not configured
PSR	PID speed input % ref	100 %	100 %

On friction loss, I use an analog input sensor (range from 0.0 to 40.0m3)

I enter a static compensation FLH0=5.0 Bar and one working point (mandatory, if FLQ1 or FLH1 are equal to zero, the friction will not work).

FLQ1 is 20m3 and compensation point in pressure FLH1 is 7.5Bar.

▼ Friction loss comp			
FLCM	Mode Selection	Compensation	↕ Inactive
FS1A	Installation Flow Sensor Assignment	AI2 Analog input	↕ Not configured
FLH0	Static compensation	5 bar	↕ 0 bar
FLQ1	Flow Rate Working Point	20 m³/h	↕ 0 m³/h
FLH1	Compensation at Point 1	7.5 bar	↕ 0 bar
FLDA	Alpha	2	2

**Friction loss definition:**

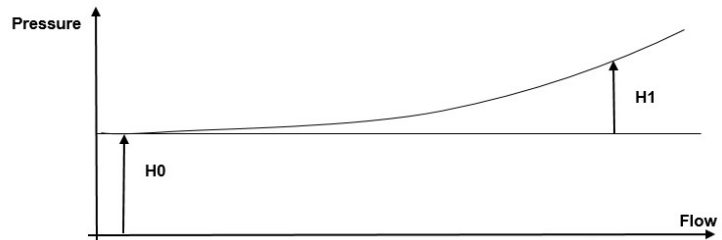
**Friction Loss Compensation**

Description

- The aim of this function is to estimate pressure drop over pipeline system
  - Pressure drop due to friction and to geometrical height between the usage points and pump outlet
- 2 modes available
  - Monitoring: The function is enabled and estimated pressure drop is only used for monitoring
  - Compensation: The function is enabled and estimated pressure drop is used correct the pressure set-point

- H1: Compensation at working point1  
[FLQ1] and [FLH1]

(In expert mode constant static compensation is also possible  
H0: Static compensation [FLH0])



**Flow sensor:**

AI2 Installation Flow			
AI2T	Configuration of AI2	Voltage	Voltage
UII2	AI2 voltage scaling parameter of 0%	0 V	0 V
UIH2	AI2 voltage scaling parameter of 100%	10 V	10 V
CRL2	AI2 current scaling parameter of 0%	0 mA	0 mA
CRH2	AI2 current scaling parameter of 100%	20 mA	20 mA
AI2J	AI2 Lowest Process	0	0
AI2K	AI2 Highest Process	400	0

You can use Estimated pump flow instead of Flow sensor, but you have to enter the pump characteristic and use gain/offset if needed to have better estimation of flow:

Flow estimation			
FEM	Flow Estimation Mode	Disable pump characteristics	Disable pump characteristics
HEG	Head Dynamic Gain	0 %	0 %
HEO	Head Static Offset	0 %	0 %
PEG	Power Dynamic Gain	0 %	0 %
PEO	Power Static Offset	0 %	0 %
FS2V	Pump Flow Value	0 m³/h	0 m³/h
SLFV	Estimated Pump flow value	0 m³/h	0 m³/h
WPXF	Pump operating point filter	1 s	1 s

Friction loss comp			
FLCM	Mode Selection	Compensation	↕
FS1A	Installation Flow Sensor Assignment	AI2 Analog input	↕
FLH0	Static compensation	AI Virtual 1	↕
FLQ1	Flow Rate Working Point	AI Virtual 2	↕
FLH1	Compensation at Point 1	DI5 PulseInput Assignment	↕
FLDA	Alpha	DI6 PulseInput Assignment	↕
▶ AI1 Installation Flow		AI Virtual 2	↕
▼ AI2 Installation Flow		Estimated pump flow	↕

Here, you can see that my **PID feedback** is more than my PID ref (RPI=50.0Bar), but as the friction loss is activated, you can see that the regulation point is not 50.0bar, but 50,0bar +**11,1 bar** = 61,1 bar (flow is not null).

RUN	53.2bar	+50.0Hz	Term
Friction loss comp			
AI2 Installation Flow			
Static Compensation	+5.0 bar		
Flow at Point 1	+20.0 m³/h		
Comp. at Point 1	+7.5 bar		
Delta Pressure	+11.1 bar		

Always check **Delta pressure** to know the delta needed to compensate the friction loss (here it's 11,1 bar).

When flow is null, the new target is: 50.0bar (RPI value) +5.0 bar (static Compensation) = 55.0bar

RUN	53.2bar	+50.0Hz	Term
Friction loss comp			
AI2 Installation Flow			
Static Compensation	+5.0 bar		
Flow at Point 1	+20.0 m³/h		
Comp. at Point 1	+7.5 bar		
Delta Pressure	+5.0 bar		

My feedback is 54,6bar, and drive still running at 50.0hz :

RUN	54.6bar	+50.0Hz	Term
Friction loss comp			
AI2 Installation Flow			
Static Compensation	+5.0 bar		
Flow at Point 1	+20.0 m³/h		
Comp. at Point 1	+7.5 bar		
Delta Pressure	+5.0 bar		

When the feedback is greater than 55.0bar, the drive begins to decrease the speed:

RUN	55.5bar	+47.4Hz	Term
Friction loss comp			
AI2 Installation Flow			
Static Compensation	+5.0 bar		
Flow at Point 1	+20.0 m³/h		
Comp. at Point 1	+7.5 bar		
Delta Pressure	+5.0 bar		