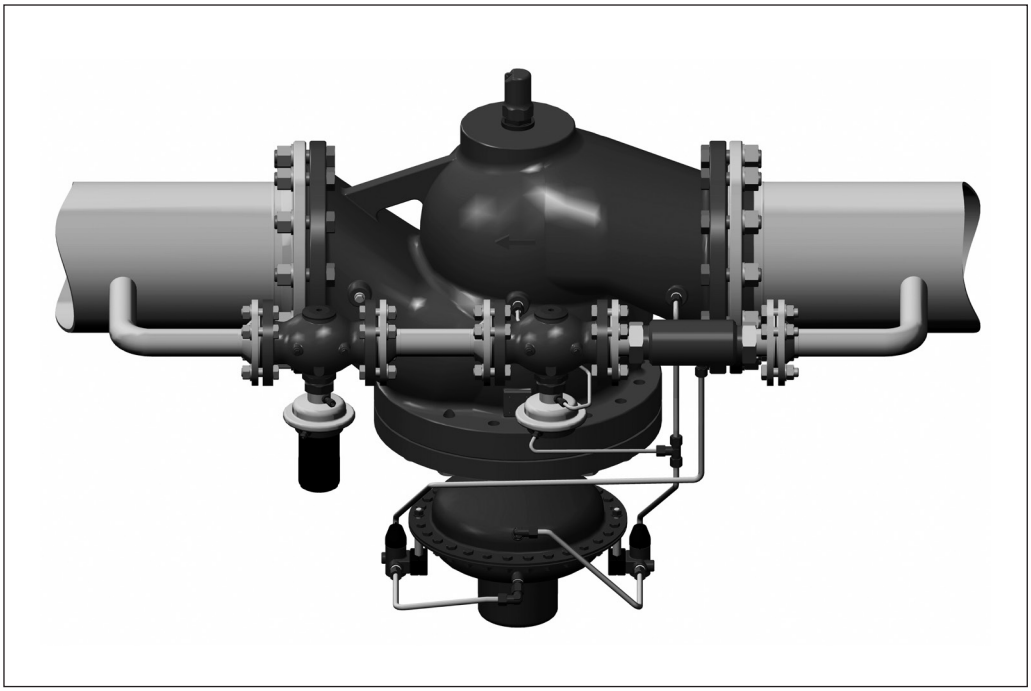
ENGINEERING
TOMORROW

Data sheet

Pilot-controlled differential pressure and flow controller (PN 16, 25, 40)
PCVPQ - flow and return mounting, adjustable setting

Description



Pilot-controlled flow and differential pressure controller is a self-acting differential pressure controller primarily for use in district heating, district cooling or in industrial systems as well. It can be flow and return mounted in applications with and without heat exchanger like large substations and distribution stations.

The control function of the PCVPQ controller is defined by the control function of the pilot controller. Setting of flow is done on main controler , setting of differential pressure is done on the pilot controller.

Throttle valve data can be found on page 8.

Main data[1] :
- DN 50-250[2]
- k_{VS} 32-630 m^3/h
- PN 16, 25, 40[3]
- Temperature:
  - Circulation water/glycolic water up to 30%: 2 … 150°C
- Connections:
  - Pilot controller: ext. thread (weld-on tailpieces) or flange
  - Main valve: flange

[1] for details see Technical data and Ordering sections
[2] smaller DN on request
[3] PN 40 on special request

Features:
- Differential pressure and flow controller
- Extremely high control ratio (see Tab.1) as a result of low pilot controller min. flow rate (k_{VS} value) and high flow rate (k_{VS}) of the main valve
- Small overall dimensions comparing to standard design (especially height)
- Higher valve capacities for DN 150-250 comparing to standard design
- High control stability
- Smooth operation flow controller
- Water/glycolic water applications

Tab. 1

DN	Min. control ratio
50	100 : 1
65	140 : 1
80	220 : 1
100	300 : 1
125	400 : 1
150	400 : 1
200	550 : 1
250	750 : 1

Technical Data

Main valve

Nominal diameter		DN	50	65	80	100	125	150	200	250
k_{VS} value		m^3/h	32	50	80	125	160	320	450	630
Cavitation factor z			0.5	0.5	0.45	0.4	0.35	0.3	0.2	0.2
Leakage acc. to standard IEC 534			≤ 0.05% of k_{VS}							
Nominal pressure		PN	16, 25, 40							
Max. differential pressure	PN 16	bar	16			15		12	10	
	PN 25/40		20							
Min. differential pressure			0.5							
Min. static pressure			1.5							
Media			Circulation water/glycolic water up to 30%							
Media pH			Min. 7, max. 10							
Media temperature		°C	2 … 150							
Connections	Main controller		Flange							
	Pilot controller		Ext. thread (weld-on tailpieces) and flange					Flange		
Weight	PN 16	kg	18.5	28.5	31	61	71	120	193	337
	PN 25/40			31	34	63	72	147	264	347
Materials										
Valve body	PN 16		Grey cast iron EN-GJL-250 (GG-25)							
	PN 25		Ductile cast iron EN-GJS-400-18-LT (GGG-40.3)					Cast steel EN-GP-240-GH (GS-C 25)		
	PN 40		Cast steel EN-GP-240-GH (GS-C 25) 2)							
Valve seat			Stainless steel M. No. 1.4021					Stainless steel M. No. 1.4313		
Valve cone	VFQ 21		Stainless steel M. No. 1.4404					Stainless steel M. No. 1.4021		
Sealing	VFQ 21		EPDM							
Pressure relieve system			Bellows[1)]					Diaphragm[2)] (T_{max} 150 °C) Bellows[1)] (T_{max} 300 °C)		

1) Stainless steel M. No. 1.4571
2) EPDM

Main actuator

For main valve	DN	50 - 125	150 - 250
Actuator size	cm^2	250	630
Max. operational pressure	bar	25	16, 25
Flow restrictor differential pressure Δp_b[1)]		0.2/0.5	
Diff. pressure setting ranges[1)]		0.2-1.0 / 0.3-2.0 / 1-5 / 3-12	
Weight	kg	11	24
Materials			
Housing		Stainless steel M. No. 1.0338	
Control diaphragm		EPDM	
Impulse tube		Stainless steel tube Ø10 × 0.8 mm	
Number of throttle valves (mounted on impulse tubes)		1	2

1) Defined by pilot controller

Trottling element

For main valve	DN	50 - 125	150 -250
Size of throttling element	DN	25	40
Connections		Welded end	Flange
Max. operational pressure	bar	25, 40	
Weight	kg	3.2	6.6
Materials			
Body material		Red bronze, M. No. 2.1090	
Impulse tube		Stainless steel tube Ø10 × 0.8 mm	

Ordering

Example 1:
Pilot-controlled flow and differential pressure controller; flow 80 m³/h;
Δp 0.8 bar; PN 16; flow restrictor $Δp_b$ 0.5 bar; T_{max} 150 °C

- *1× PCV-VFQ 21 DN 100*
  Code No.: ***003G1533***
- *1× Pilot controller AVP DN 25 PN16 0.2 - 1.0 bar*
  Code No.: ***003H6319***
- *1× Pilot controller AVP-F 0.5*
  Code No.: ***003H6341***
- *1× Mounting set for Impulse tube Code No.:* ***003G1599***

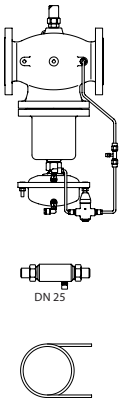
Example 2:
Pilot-controlled flow and differential pressure controller; flow 58 m³/h;
Δp 1 bar; PN 40; flow restrictor $Δp_b$ 0.2 bar; T_{max} 150 °C

- *1× PCV-VFQ 21 DN 100*
  Code No.: ***On request***
- *2× Pilot controller VFG 2 DN 25 PN40*
  Code No.: ***065B2413***
- *1× Pilot actuator AFP 0.15-1.5*
  Code No.: ***003G1016***
- *1× Pilot actuator AFPB-F 0.2*
  Code No.: ***003G1026***
- *2× Mounting set for Impulse tube Code No.:* ***003G1391***

[2] Contains accessories for remounting the impulse tube on the pilot controller from internal connection (factory delivered) to external connection.
[3] Actuator does not have excess pressure safety valve

DN 50-125

PCV-VFQ 21 - Main controller, throttling element, throttle valve, impulse tubes

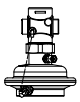


DN (mm)	k_{VS} (m³/h)	T_{max} (°C)	PN	Connection	$Δp_{max}$ (bar)	Flow range (m³/h) $Δp_b$ 0.2 bar	Flow range (m³/h) $Δp_b$ 0.5 bar	Code No.
50	32	150	16	Flange EN 1092-2	15	0.8-16	1.2-24	**003G1627**
65	50					3-28	4-40	**003G6895**
80	80					4-40	6-58	**003G6898**
100	125					6-63	9-90	**003G1533**
125	160					8-80	12-120	**003G1534**
50	32		25			0.8-16	1.2-24	**003G6710**
65	50					3-28	4-40	**003G6878**
80	80					4-40	6-58	**003G1578**
100	125					6-63	9-90	**003G1543**
125	160					8-80	12-120	**003G1544**
100	125		40			6-63	9-90	**on request**[1]
125	160					8-80	12-120	
Impulse tube		Copper		Ø 6 × 1 × 3000 mm				
				Ø 10 × 1 × 1500 mm				
		Stainless steel		Ø 10 × 0.8 × 1500 mm				

AVP Pilot controller for differential pressure control - PN 25

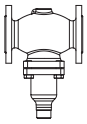
DN (mm)	k_{VS} (m³/h)	T_{max} (°C)	PN	Connection		Δp setting range (bar)	$Δp_{max}$ (bar)	Code No.
25	8.0	150	25	Cylindr. ext. thread acc. to ISO 228/1	G 1¼ A	0.2-1.0	20	**003H6319**
						0.3-2.0		**003H6329**
						1-5		**on request**
						3-12		
Weld-on tailpieces DN 25								**003H6910**
Mounting set for impulse tube [2]								**003G1599**

AVP-F Pilot controller for flow control - PN25



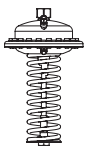
DN (mm)	k_{VS} (m³/h)	T_{max} (°C)	PN	Connection		$Δp_b$ (bar)	$Δp_{max}$ (bar)	Code No.
25	8.0	150	25	Cylindr. ext. thread acc. to ISO 228/1	G 1¼ A	0.2	20	**003H6335**
						0.5		**003H6341**
Weld-on tailpieces DN 25								**003H6910**
Mounting set for impulse tube[2]								**003G1599**

VFG 2 Pilot controlers - PN40 (need to order 2 pcs)



DN (mm)	k_{VS} (m³/h)	$T_{max.}$ (°C)	PN	Connections	Code No.
25	8.0	150 (200)	40	Flanges acc. to EN 1092-1	**065B2413**

AFP / AFP-9 Actuators for differential pressure control



Type	Δp setting range (bar)	for DN	Code No.
AFP-9[3]	1-6	15-125	**003G1014**
	0.5-3		**003G1015**
AFP	0.15-1.5	15-250	**003G1016**
	0.1-0.7		**003G1017**
	0.05-0.35		**003G1018**

AFPB(-F) Actuators for flow control

Δp setting range (bar)	Max. operat. pressure	Code No.
0.2	25	**003G1026**
0.5		**003G1027**

Ordering *(Continuous)*

Example 3:
Pilot-controlled flow and differential pressure controller; flow 260 m3/h; Δp 1.8 bar; PN 16; flow restrictor $Δp_b$ 0.5 bar; T_{max} 150 °C

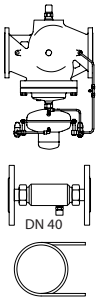
- *1× PCV-VFQ 21 DN 100*
  Code No.: ***003G1535***
- *1× Pilot controller AVP DN 25 PN16 0.3 - 2.0 bar*
  Code No.: ***003H6379***
- *1× Pilot controller AVP-F 0.5*
  Code No.: ***003H6391***
- *1× Mounting set for Impulse tube Code No.:* ***003G1599***

[1] Contains accessories for remounting the impulse tube on the pilot controller from intternal connection (factory delivered) to external connection.
[2] Contains accessories for remounting the impulse tube on the pilot controller from internal connection (factory delivered) to external connection.

[1] Impulse tubes on T>150 °C or PN> PN 16 should be of stainless steel
[2] Consist of a nipple, compression ring and nut

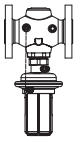
DN 150-250

PCV-VFQ 21 - Main controller, throttling element, throttle valves, impulse tubes



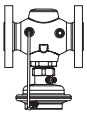
DN (mm)	k_{VS} (m^3/h)	T_{max} (°C)	PN	Connection	Flow range (m^3/h) $Δp_b$ 0.2 bar	Flow range (m^3/h) $Δp_b$ 0.5 bar	$Δp_{max}$ (bar)	Code No.
150	320	150	16	Flange EN 1092-2	15-145	25-220	12	**003G1535**
200	450				20-180	30-280	10	**003G1536**
250	630				25-250	40-380		**003G1537**
150	320		25		15-145	25-220	12	**003G1545**
200	450				20-180	30-280	10	**003G1546**
250	630				25-250	40-380		**003G1547**
Impulse tube		Copper		Ø 6 × 1 × 3000 mm				
				Ø 10 × 1 × 1500 mm				
		Stainless steel		Ø 10 × 0.8 × 1500 mm				

AVP Pilot controller for differential pressure control



DN (mm)	k_{VS} (m^3/h)	T_{max} (°C)	PN	Connection	Δp setting range (bar)	$Δp_{max}$ (bar)	Code No.
40	16	150	25	Flange EN 1092-2	0.2-1.0	16	**003H6373**
					0.3-2.0		**003H6379**
					1-5		**on request**
					3-12		
	Mounting set for Impulse tube[1]						**003G1599**

AVP-F Pilot controller for flow control



DN (mm)	k_{VS} (m^3/h)	T_{max} (°C)	PN	Connection	$Δp_b$ (bar)	$Δp_{max}$ (bar)	Code No.
40	16	150	25	Flange EN 1092-2	0.2	16	**003H6385**
					0.5		**003H6391**
	Mounting set for impulse tube[2]						**003G1599**

Accessories

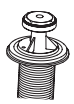
	Type designation	Description	Connections	Code No.
	Impulse tube set AF[1]	- 1× Copper tube Ø10 × 1 × 1500 mm - 1 × compression fitting for imp. tube connection to pipe (G ¼) - 2 × socket	-	**003G1391**
	Compression fitting[2]	For impulse tube Ø10 connections to controller	G ¼	**003G1468**
	Throttle valve-PCV	Regulating and shut-off device	-	**065Z1502**

Service kits AVP(-F) flow

	Type designation	DN	k_{VS} (m^3/h)	Code No.
	Valve insert	25	8.0	**003H6875**

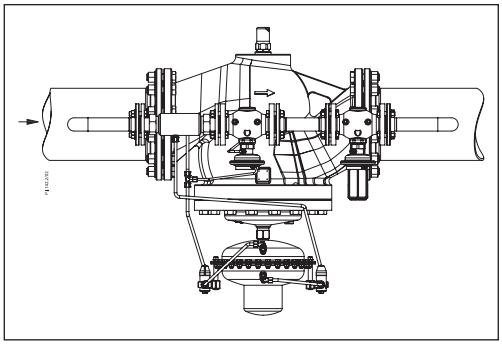
	Type designation	Δp setting range (bar)	Code No.
	Actuator without adjustable handle (AVP-F)	0.2	**003H6839**
		0.5	**003H6840**
	Actuator with adjustable handle (AVP)	0.2-1.0	**003H6834**
		0.3-2.0	**003H6835**

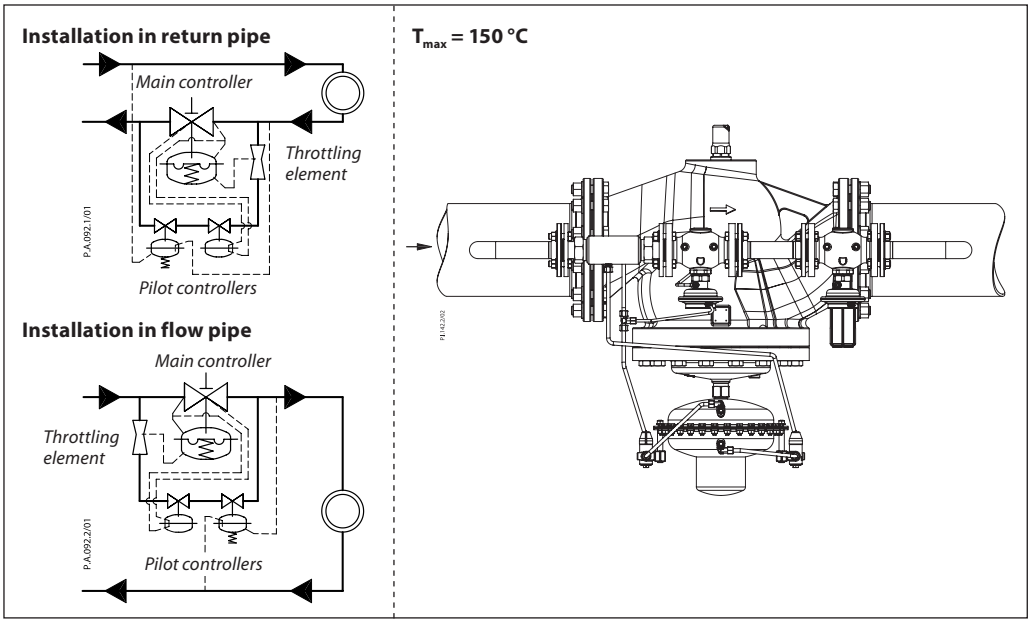
Service kits VFQ 21

	Type designation	For valve	DN (mm)	k_{VS} (m^3/h)	Code No.
	Valve insert	VFQ 2	40	20	**065B2799**
	Stuffing cone (with EPDM O-rings)				**003G1464**

Installation positions

Both main and pilot controllers have to be installed in horizontal pipes only, with a pressure actuator oriented downwards.

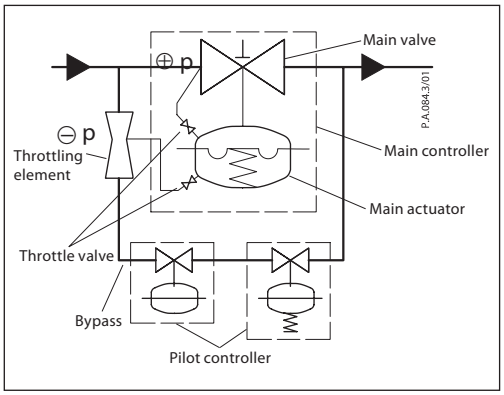




Function

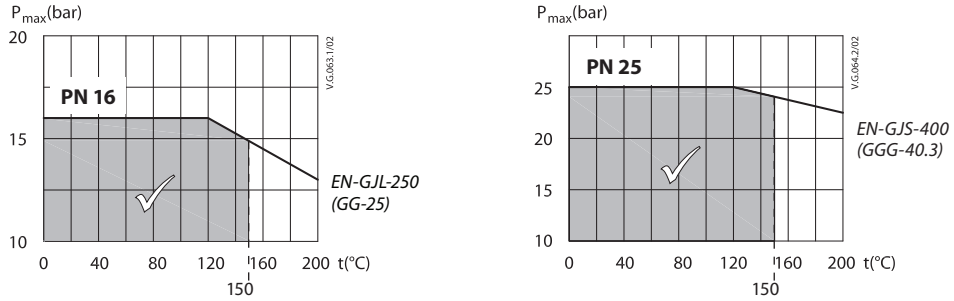
Pressure changes from inlet pipe (+p) and from throttling element (-p) are being transferred through the impulse tubes to the main actuator chambers and act on control diaphragm

In case of small flow rates the main controller is closed and control is taken by the pilot controller only. With increasing the flow rate, a negative pressure is built in the throttling element.
This partial vacuum acts on the main actuator diaphragm and causes the main controller to open.

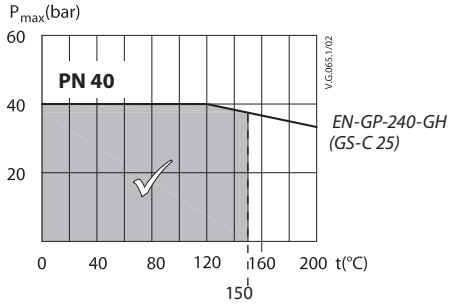


Pressure temperature diagram

Working area is below P-T line and it ends at Tmax for each valve



Maximum allowed operating pressure as a function of media temperature (according to EN 1092-2)



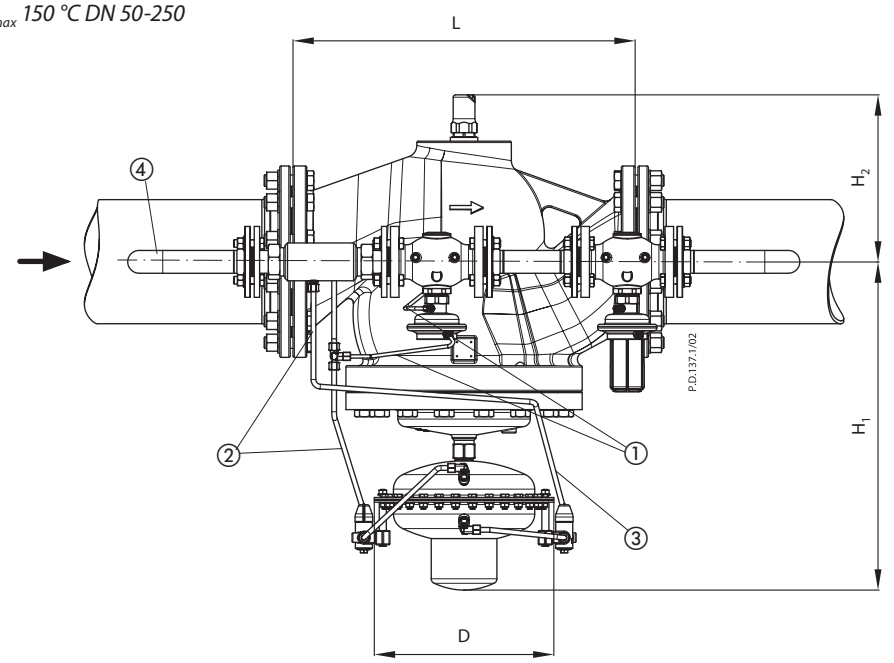
Maximum allowed operating pressure as a function of media temperature (according to EN 1092-1)

Dimensions

Impulse tubes (pos. ①, ②, ③) are part of the delivery. Their shape depends on the controller type. In case of high temperatures (T_{max} > 150 °C) seal pots have to be installed. For details see relevant Instructions.

The components shown with dashed lines are NOT part of the delivery. The pipes (pos. ④) must be welded during mounting.

T_{max} 150 °C DN 50-250



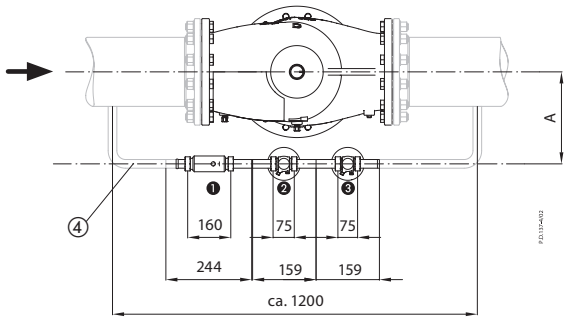
DN		50	65	80	100	125	150	200	250
L	mm	230	290	310	350	400	480	600	730
H_1		390	425	425	530	530	619	647	697
H_2		152	164	164	194	194	269	332	355
D		263	263	263	263	263	380	380	380

Impulse tubes	T_{max}	
	200 °C	300 °C
①	Cu Ø 6 × 1	SS Ø 10 × 0.8
②	SS Ø 10 × 0.8	
③	Cu Ø 10 × 1	

Dimensions *(continuous)*

T_{max} 150 °C DN 50-125

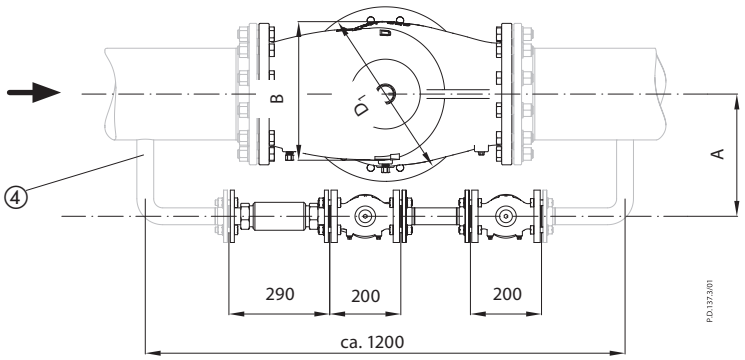
❶ throttling element
❷ pilot controller AVP-F
❸ pilot controller AVP



Pipes Pos. ④:
DN 25: Pipes Ø 33.7 × 2.6
DN 40: Pipes 48.3 × 3.2

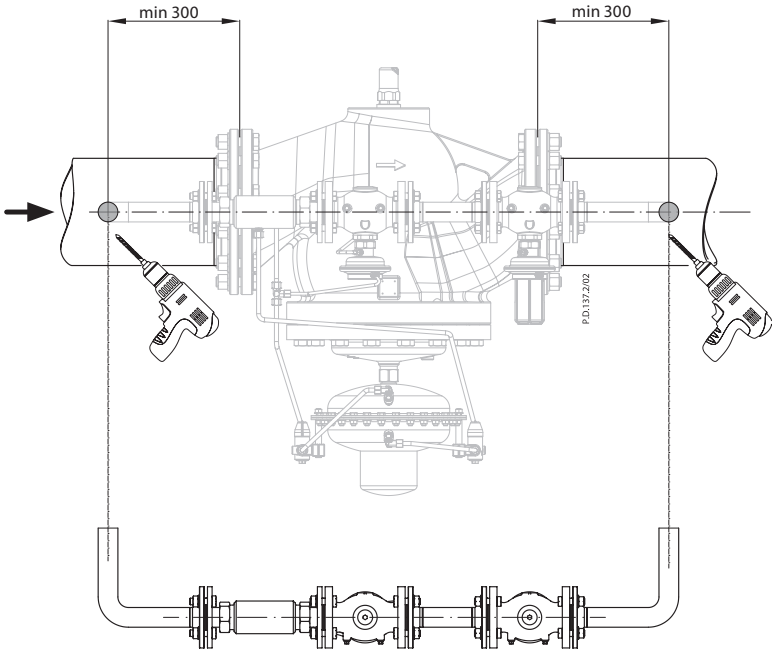
DN		50	65	80	100	125
A	mm	290	290	290	290	290

T_{max} 150 °C DN 150-250



Pipes Pos. ④:
DN 25: Pipes Ø 33.7 × 2.6
DN 40: Pipes 48.3 × 3.2

DN		150	200	250
D_1	mm	320	385	500
A		320	350	410
B		310	336	412



Data sheet **Pilot-controlled differential pressure and flow controller PCVPQ (PN 16, 25, 40)**

Throttle valve

Throttle valve is regulating and shut-off device, which is / are installed on the impulse tubes connected to main PCV actuator. Number of used throttle valves can be seen in table for Main actuator in Technical Data section.

Function of throttle valve is to control flow speed through impulse tube and consequently influence on PCV's reaction time. Influence on reaction time is not completly defined and strongly depends on application conditions and could significantly vary from application to application.

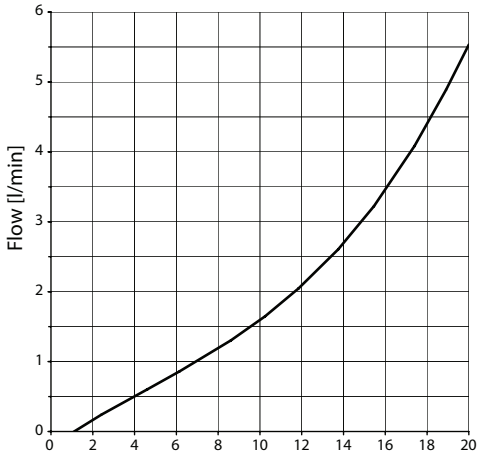
In general:
- by opening of the valve (clockwise) PCV's reaction time increases
- by valve closing (counterclockwise) PCV's reaction time decreases

In case valve is completly closed it has function as shut-off valve.

Throttle valve is delivered from factory in completly open position.

Main data:
- DN 4
- used for Ø10 mm impulse tube

Flow diagram



(1 revolution of spindle equals to 1 mm stroke)

Danfoss A/S
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