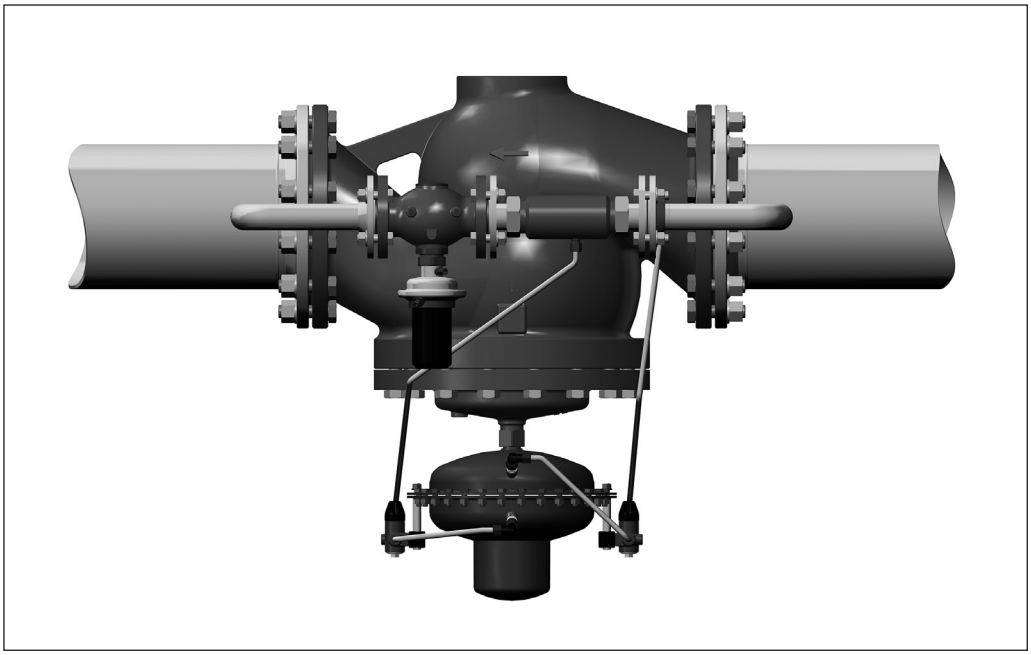
ENGINEERING
TOMORROW

Data sheet

Pilot-controlled differential pressure controller (PN 16, 25, 40)

PCVP - flow and return mounting, adjustable setting

Description



Pilot-controlled 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 controller consist of main controller, installed in main pipe, and pilot controller and with a throttling element, both installed in bypass.

Setting is done on pilot controler.

Throttle valve data can be found on page 10.

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 … 200°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 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 differential pressure controller

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							
Medium	VFG 2(1)		Circulation water/glycolic water up to 30%							
Medium pH			Min. 7, max. 10							
Medium temperature	VFG 21 PN 16, 25, 40		2 … 150 °C							
	VFG 2 PN 16, 25, 40		2 … 200 °C[2]							
Connections	Main controller		Flange							
	Pilot controller		Ext. thread (weld-on tailpieces) or flange					Flange		
Weight	PN 16 /25	kg	18	27.5	30	58	68	115	185	323
	PN 40			30	32.5	60.5	69	141	253	333
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	VFG 2(1)		Stainless steel M. No. 1.4404					Stainless steel M. No. 1.4021		
Sealing	VFG 21		EPDM							
	VFG 2		Metal							
Pressure relieve system			Bellows[3]					Diaphragm[4] (T_{max} 150 °C) Bellows[3] (T_{max} 300 °C)		

[2] On request
[3] Stainless steel M. No. 1.4571
[4] 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	
Nr. of throttle valves (mounted on impulse tubes)		1	2

Trottling element

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

[1] Defined by pilot controller

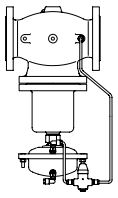
Ordering

Example 1:
Pilot-controlled differential pressure controller; DN 100; k_{VS} 125; PN 16; setting range 0.2-1.0 bar; T_{max} 150 °C; flange;

- *1× PCV-VFG 21 DN 100*
  Code No.: ***003G1573***
- *1× AVP DN 25*
  Code No.: ***003H6319***
- *1× Weld-on tailpieces DN 25*
  Code No.: ***003H6910***
- *1× Mounting set for Impulse tube*
  Code No.: ***003G1599***

DN 50-125

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



DN 25


DN (mm)	k_{VS} (m^3/h)	T_{max} (°C)	PN	Connection	Δp_{max} (bar)	Code No.
50	32	150	16	Flange EN 1092-2	15	**003G1626**
65	50					**003G1558**
80	80					**003G1559**
100	125					**003G1573**
125	160					**003G1574**
50	32	150	25	Flange EN 1092-2	15	**003G6707**
65	50					**003G1568**
80	80					**003G1569**
100	125					**003G1523**
125	160					**003G1524**

Impulse tube		
	Copper	Ø 6 × 1 × 3000 mm
		Ø 10 × 1 × 1500 mm
	Stainless steel	Ø 10 × 0.8 × 1500 mm

Pilot controller **AVP**

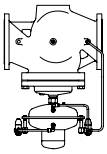
DN (mm)	k_{VS} (m^3/h)	T_{max} (°C)	PN	Connection		Δp setting range (bar)	Δp_{max} (bar)	Code No.
25	8.0	150	25	Cylindr. ext. thread acc. to DIN ISO 228/1	G 1¼ A	0.2-1.0	20	**003H6319**
						0.3-2.0		**003H6329**
						1-5		**on request**
						3-12		

Weld-on tailpieces DN 25	**003H6910**
Mounting set for impulse tube[1)]	**003G1599**

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

DN 150-250

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

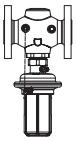


DN 40


DN (mm)	k_{VS} (m^3/h)	T_{max} (°C)	PN	Connection	Δp_{max} (bar)	Code No.
150	320	150	16	Flange EN 1092-2	12	**003G1505**
200	450				10	**003G1506**
250	630					**003G1507**
150	320		25		12	**003G1525**
200	450				10	**003G1526**
250	630					**003G1527**

Impulse tube		
	Copper	Ø 6 × 1 × 3000 mm
		Ø 10 × 1 × 1500 mm
	Stainless steel	Ø 10 × 0.8 × 1500 mm

AVP



DN (mm)	k_{VS} (m^3/h)	T_{max} (°C)	PN	Connection	Δp setting range (bar)	Δp_{max} (bar)	Code No.
40	20	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**

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

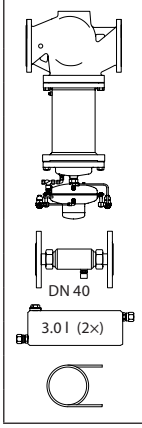
Ordering *(continuous)*

Example 2:
Pilot-controlled differential pressure controller; DN 150; k_{VS} 320; PN 16; setting range 0.2-1.0 bar; T_{max} 150 °C; flange;

- *1× PCV-VFG 21 DN 150*
  Code No.: ***003G1505***
- *1× AVP DN 40*
  Code No.: ***003H6373***
- *1× Mounting set for impulse tube*
  Code No.: ***003G1599***

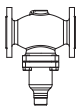
DN 150-250

PCV-VFG 2 - Main controller, throttling element, throtlle valves, seal pots, impulse tubes



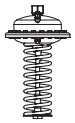
DN (mm)	k_{VS} (m^3/h)	T_{max} (°C)	PN	Connection	Δp_{max} (bar)	Code No.
150	320	200	16	Flange EN 1092-2	12	on request
200	450				10	
250	630					
150	320		25		12	on request
200	450				10	
250	630					
150	320		40		12	on request
200	450				10	
250	630					
Impulse tube		Copper		Ø 10 × 1 × 1500 mm		
		Stainless steel		Ø 10 × 0.8 × 1500 mm		

VFG 2 Valves (metallic sealing cone)



DN (mm)	k_{VS} (m^3/h)	$T_{max.}$ (°C)		Connections	Code No.		
					PN 16	PN 25	PN 40
40	20	150	200[1]	Flanges acc. to EN 1092-1	**065B2392**	**065B2405**	**065B2415**

AFP / AFP-9 Actuators



Type	Δp setting range (bar)	for DN	Code No.
AFP	0.15-1.5	15-250	**003G1016**
	0.1-0.7		**003G1017**
	0.05-0.35		**003G1018**

[1] *At temperatures above 150 °C only with seal pots (see Accessories)*

Accessories

	Type designation	Description	Connections	Code No.
	Impulse tube set AF[3]	- 1× Copper tube Ø10 × 1 × 1500 mm - 1 × compression fitting for imp. tube connection to pipe (G ¼) - 2 × socket	-	**003G1391**
	Seal pot V1[1]	Capacity 1 liter; with compression fittings for imp. tube Ø10	-	**003G1392**
	Compression fitting[2]	For impulse tube Ø10 connections to controller	G ¼	**003G1468**
	Throttle valve-PCV	Regulating and shut-off device	-	**065Z1502**

[1] *Seal pot has to be used on impulse tubes always when $T_{max} \geq 150$ °C*
[2] *Consist of a nipple, compression ring and nut*
[3] *Impulse tubes on T>150 °C or PN> PN 16 should be of stainless steel*

Service kits AVP

	Type designation	DN (mm)	k_{VS} (m^3/h)	Code No.	
				AVP return	AVP flow
	Valve insert	15	1.6	**003H6863**	**003H6871**
			2.5	**003H6864**	**003H6872**
			4.0	**003H6865**	**003H6873**
		20	6.3	**003H6866**	**003H6874**
		25	8	**003H6867**	**003H6875**
		32 / 40 / 50	12.5 / 20 / 25	**003H6868**	**003H6876**

	Type designation	Δp setting range (bar)	AVP return	AVP flow
	Actuator with adjustable handle (AVP)	0.2-1.0	**003H6829**	**003H6834**
		0.3-2.0	**003H6830**	**003H6835**

Ordering *(continuous)*

Service kits AFP

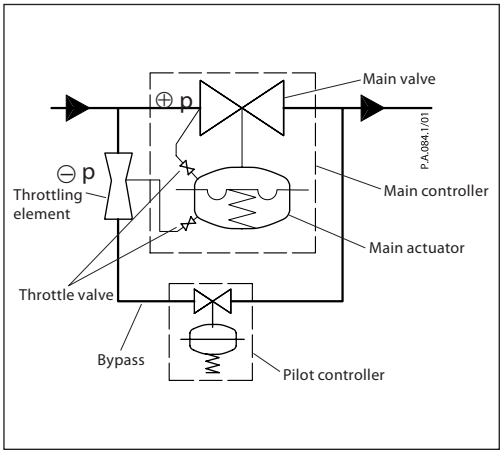
	Type designation	DN (mm)	k_{vs} (m^3/h)	Code No. for VFG 2	Code No. for VFG 21
	Valve insert	15	4.0	**065B2796**	**065B2790**
		20	6.3	**065B2797**	**065B2791**
		25	8	**065B2798**	**065B2792**
		32	16		
		40	20	**065B2799**	**065B2793**
		50	32		
		65	50	**065B2800**	**065B2794**
		80	80		
		100	125	**065B2801**	**065B2795**
		125	160		
		150	280	**065B2964**	**065B2966**
		250	400	**065B2965**	-
	Stuffing cone (with EPDM O-rings)			**003G1464**	

Function

The pilot valve maintains the differential pressure over selected part of system/application. By this action also flow through a bypass changes and therefore (-p) at the throttling element.

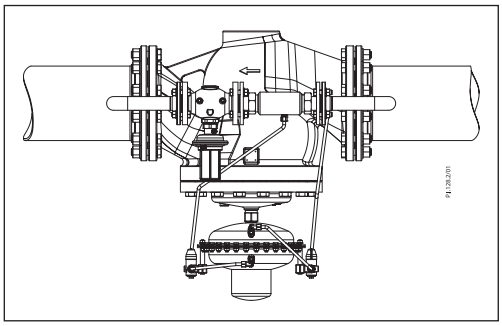
Pressure changes from inlet pipe (+p) and from throttling element (-p) are being transferred through the impulse tubes to the main actuator chambers and act on control diaphragm

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.



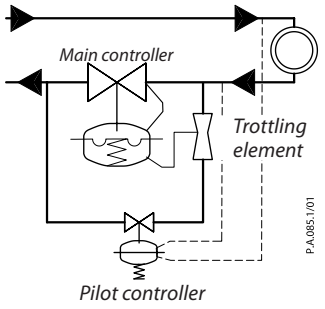
Installation positions

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

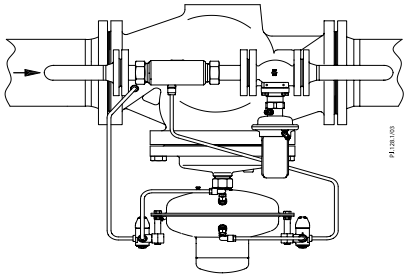


Installation positions
(continuous)

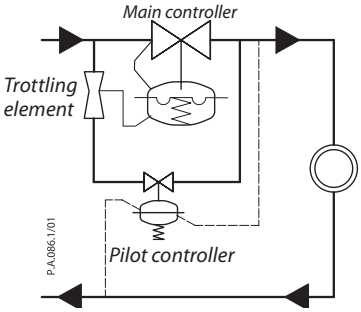
Installation in the return pipe



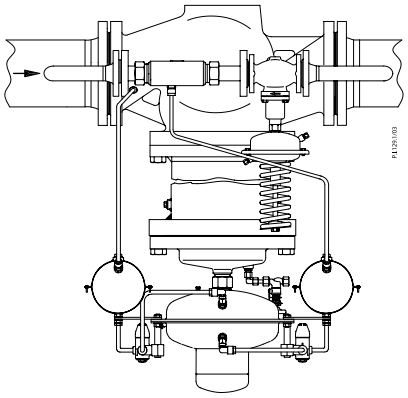
T_{max} = 150 °C



Installation in the supply pipe

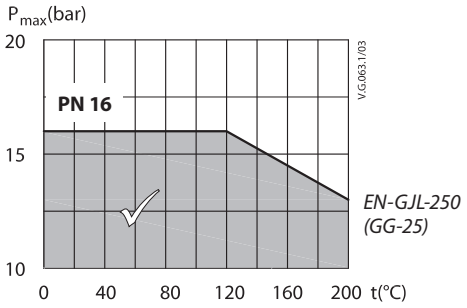


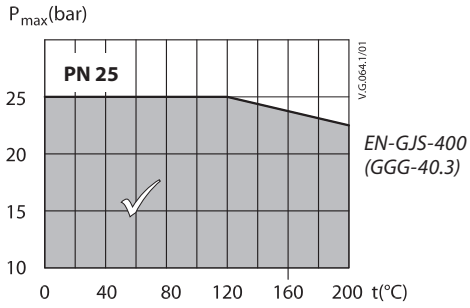
T_{max} = 200 °C



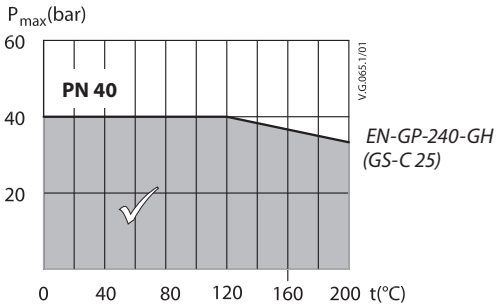
Pressure temperature diagram

Working area is below P-T line and it ends at T_{max} for each valve





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



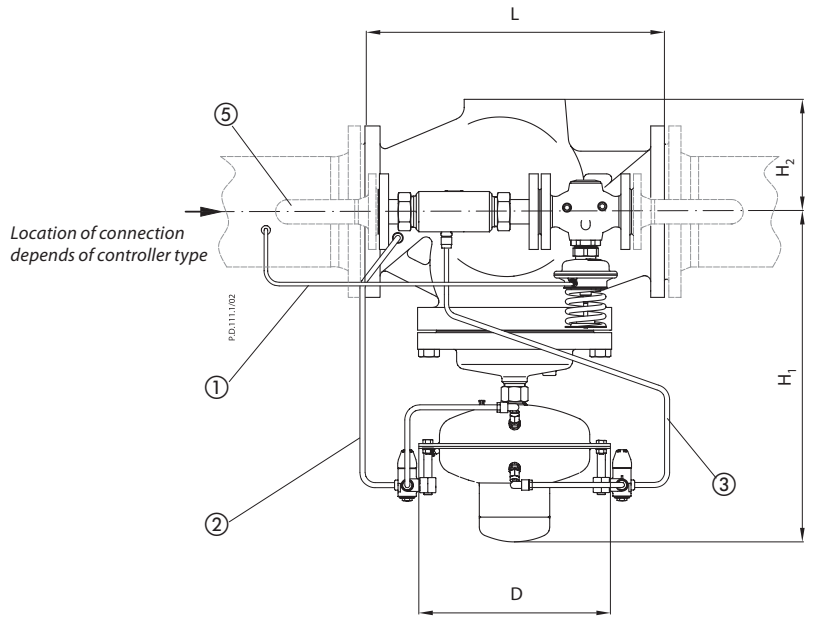
Maximum allowed operating pressure as a function of medium temperature (according to EN 1092-1)

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) 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. 5) must be welded during mounting.

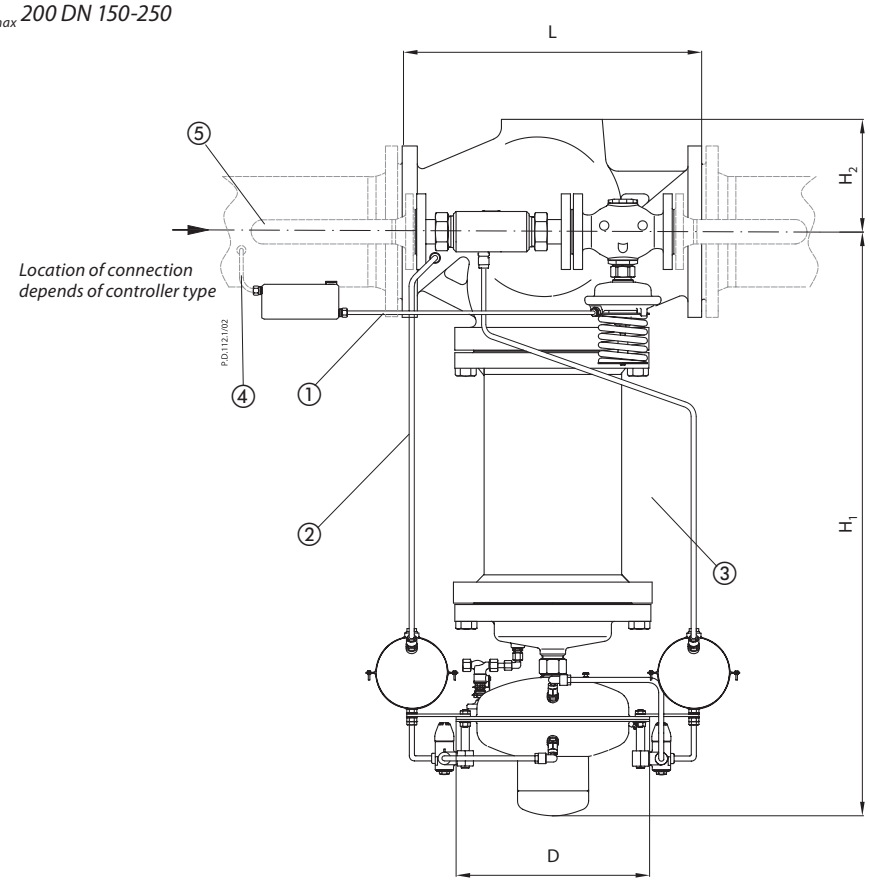
T_{max} 150 DN 50-250



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		82	95	95	125	125	179	237	257
D		263	263	263	263	263	380	380	380

Dimensions *(continuous)*

T_{max} 200 DN 150-250

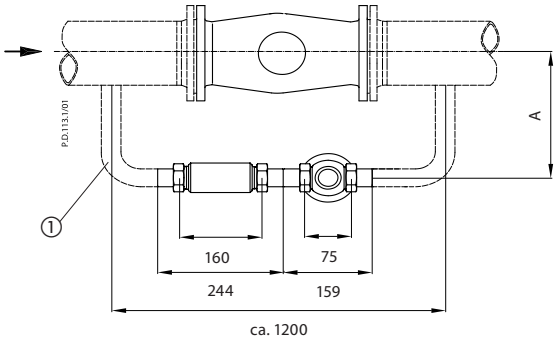


DN		150	200	250
L	mm	480	600	730
H_2		169	234	254
H_4		916	1162	1494
D		380	380	380

Impulse tubes	T_{max} (200 °C)
①	Cu Ø 6 × 1
②	SS Ø 10 × 0.8
③	Cu Ø 10 × 1
④	SS Ø 6 × 1

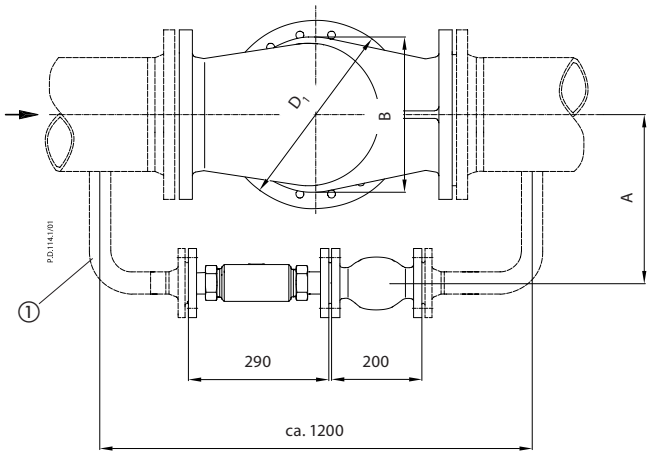
Dimensions *(continuous)*

T_{max} 150 °C DN 50-125



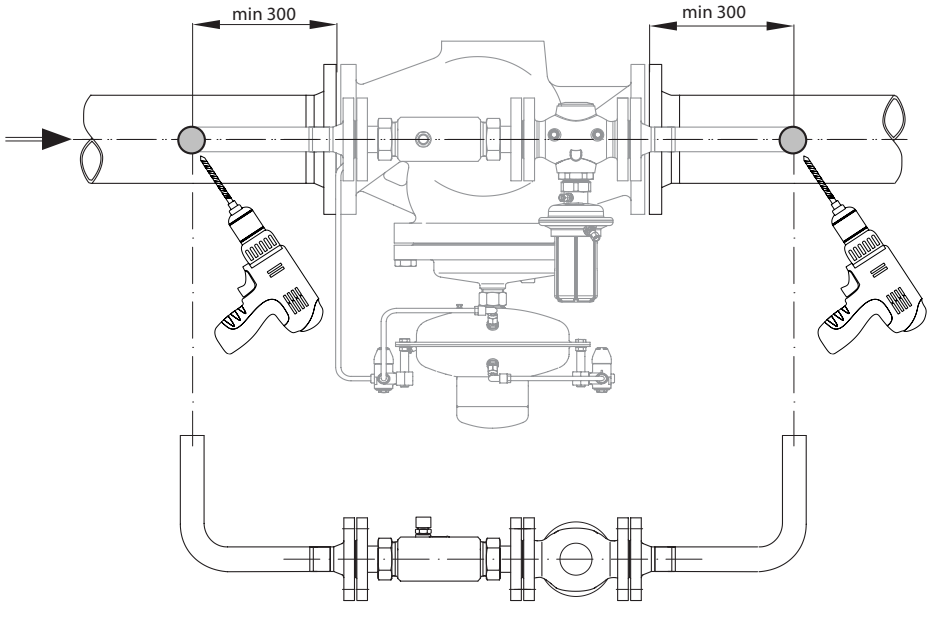
DN		50	65	80	100	125
A	mm	290	290	290	290	290

T_{max} 150°C DN 150-250



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

Pipes Pos. 1:
DN 25: Pipes Ø 33.7 × 2.6
DN 40: Pipes 48.3 × 3.2



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.

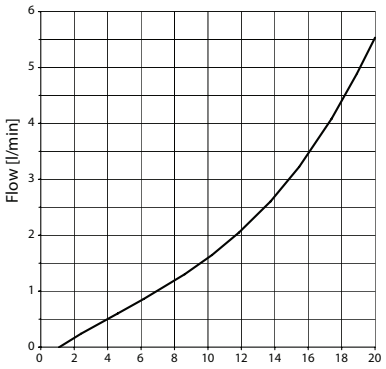
In general:
- by opening of the valve (clockwise) PCV's reaction time increases
- by valve closing (counterclockwise) PCV's reaction time decreases

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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