

Application



AVPB is a self-acting differential pressure control and flow limiter primarily for use in district heating systems. AVPB closes on rising differential pressure or when set max. flow is exceeded.

The control has external threads for heating system connection. Weld-on tailpieces and tailpieces with external threads are available as accessories. The control is supplied complete with compression fittings for connecting Ø6 mm copper impulse tube.

Range 0.05 - 0.5 bar and 0.2 - 1.0 bar are standard. Range 0.8 - 1.6 bar is available on request. AVPB-F with fixed differential pressure 0.2 bar or 0.3 bar is also available on request.

Principle

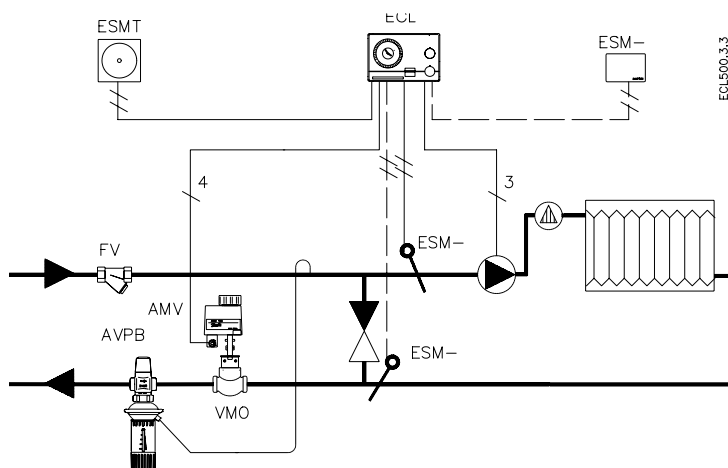


Fig. 1. Direct-connected heating system

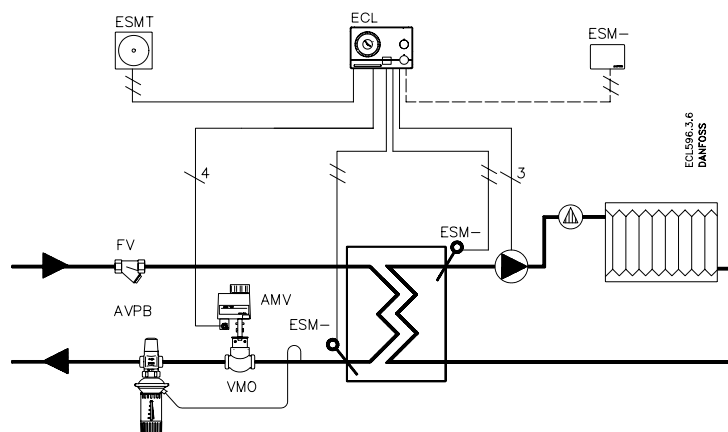


Fig. 2. Indirectly connected heating system

Ordering

Complete control with compression fittings for impulse tube connection

Type	DN	External thread ISO 228/1	Setting range		$k_v^{(1)}$ m ³ /h	Code No.
			Flow	Diff. pressure		
AVPB 15	15	G ¾ A	0.06 - 1.4 m ³ /h	0.05 - 0.5 bar	1.6	003H2071
AVPB 15	15	G ¾ A	0.08 - 1.8 m ³ /h	0.05 - 0.5 bar	2.5	003H2072
AVPB 20	20	G 1 A	0.09 - 3.0 m ³ /h	0.05 - 0.5 bar	4.0	003H2073
AVPB 25	25	G 1¼ A	0.1 - 4.9 m ³ /h	0.05 - 0.5 bar	6.3	003H2074
AVPB 32	32	G 1½ A	0.15 - 7.3 m ³ /h	0.05 - 0.5 bar	10.0	003H2075

Type	DN	External thread ISO 228/1	Setting range		$k_v^{(1)}$ m ³ /h	Code No.
			Flow	Diff. pressure		
AVPB 15	15	G ¾ A	0.06 - 1.4 m ³ /h	0.2 - 1.0 bar	1.6	003H2076
AVPB 15	15	G ¾ A	0.08 - 1.8 m ³ /h	0.2 - 1.0 bar	2.5	003H2077
AVPB 20	20	G 1 A	0.09 - 3.0 m ³ /h	0.2 - 1.0 bar	4.0	003H2078
AVPB 25	25	G 1¼ A	0.1 - 4.9 m ³ /h	0.2 - 1.0 bar	6.3	003H2079
AVPB 32	32	G 1½ A	0.15 - 7.3 m ³ /h	0.2 - 1.0 bar	10.0	003H2080

¹⁾ At $X_p = 0.15$ bar

1 set of accessories including 2 tailpieces, 2 union nuts and 2 seals

DN	Weld-on tailpieces	Tailpieces with external threads
	Code No.	Code No.
15	003N5090	003N5070
20	003N5091	003N5071
25	003N5092	003N5072
32	003N5093	003N5073

Spare parts

Spare part	Code No.
10 compression fittings for impulse tube	003H2300
Adjustment part 0.05 - 0.5 bar and diaphragm	003H2301
Adjustment part 0.2 - 1.0 bar and 0.8 - 1.6 bar and diaphragm	003H2302
Valve insert, $k_{vs} = 1.6$ m ³ /h	003H2310
Valve insert, $k_{vs} = 2.5$ m ³ /h	003H2311
Valve insert, $k_{vs} = 4.0$ m ³ /h	003H2312
Valve insert, $k_{vs} = 6.3$ m ³ /h	003H2313
Valve insert, $k_{vs} = 10.0$ m ³ /h	003H2314

Materials, parts in contact with water

Valve body:	RG 5, DIN 1705, W.no. 2.1096.01	Pressure relief cylinder:	CrNi steel, DIN 17440, W. no. 1.4404
Valve insert:	Dezincing-free brass, BS 2874	O-rings:	EPDM
Valve cone:	Dezincing-free brass, BS 2874	Springs:	CrNi steel, DIN 17224, W.no. N 1.4568
Valve plate:	EPDM	Diaphragm body:	Zinc chromatic steel, DIN 1624, W. no. 1.0338
Valve seat:	CrNi steel, DIN 17440, W. no. 1.4404	Diaphragm:	EPDM

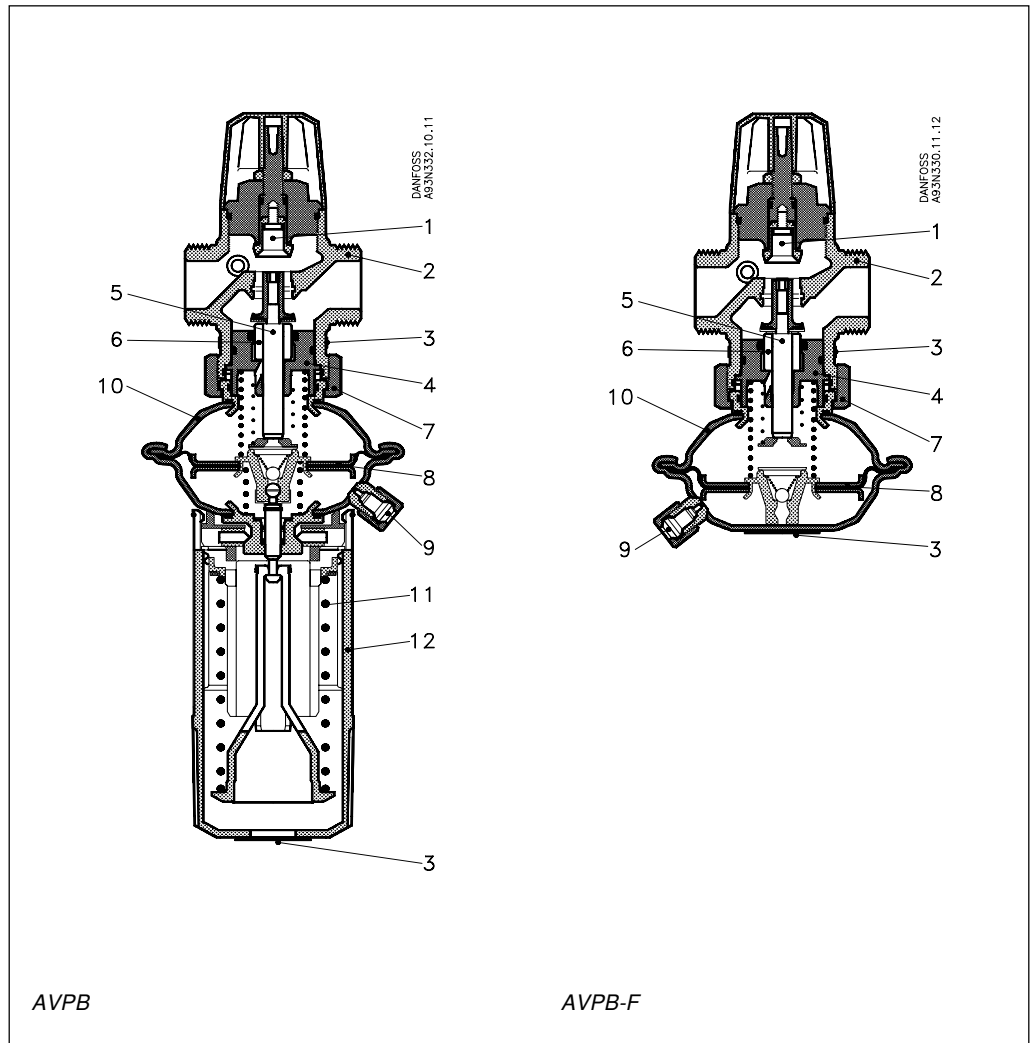
Data

Pressure stage	PN 16
Max. differential pressure	12 bar
Max. water temperature	140 °C
Cavitation factor	$z \geq 0.6$ ¹⁾
Medium	Water for district heating and central heating systems. Glycolic water resistant down to -30 °C
Medium pH	Min. 7, max. 10

¹⁾ $\frac{k_v}{k_{vs}} \leq 0.5$ in DN 25 and DN 32 versions

Design

1. Adjustable flow restrictor
2. Valve body
3. Type label
4. Valve insert
5. Spindle
6. Pressure relief cylinder
7. Union nut
8. Control diaphragm
9. Compression fittings for impulse tube
10. Diaphragm section
11. Setting spring
12. Handle for differential pressure adjustment



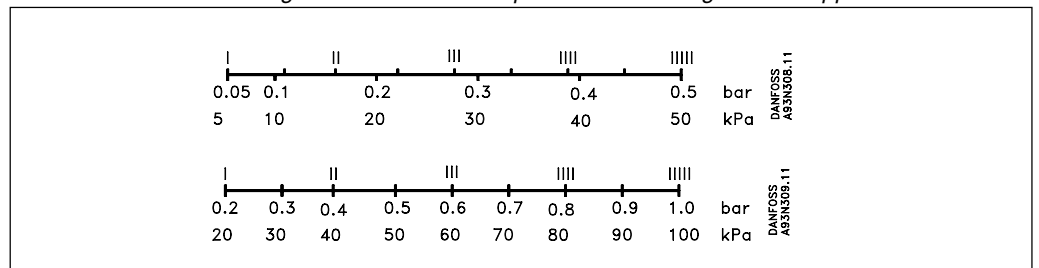
Fitting

The control must be mounted in the heating system return. The impulse tube must be mounted in direct-connected heating system flow (fig. 1) and in indirectly connected systems (fig. 2) ahead of the control valve in the direction of flow.

The control can be fitted in any position. Further fitting details are described in the instruction accompanying the product.

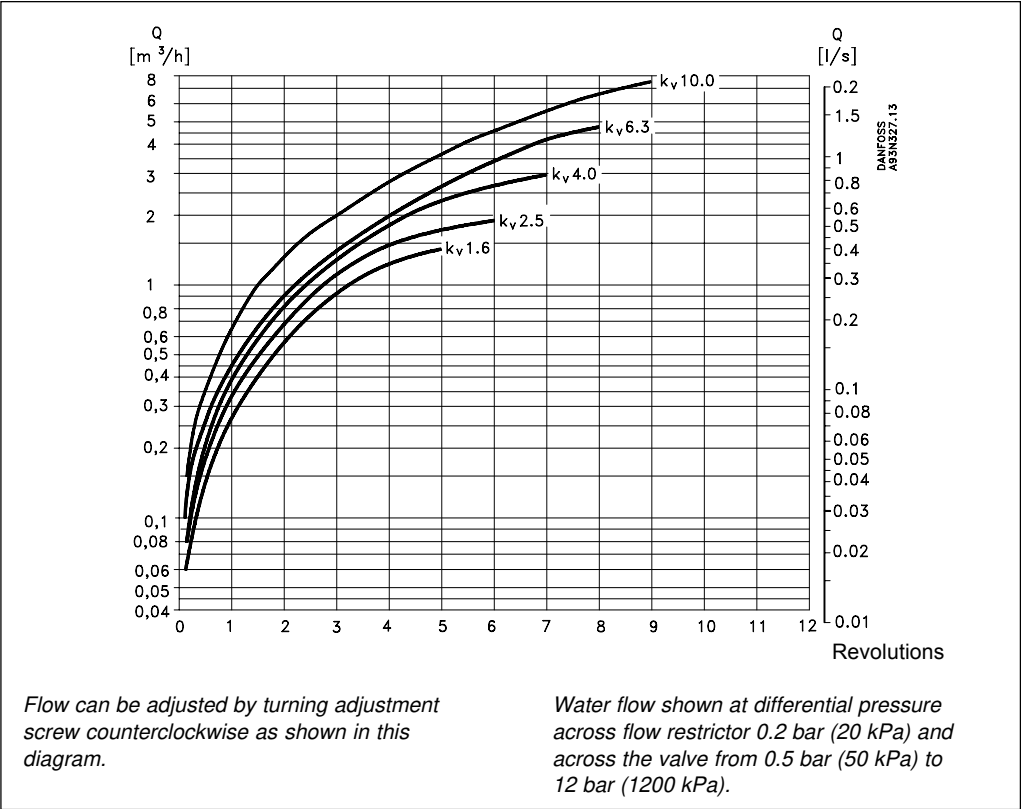
Differential pressure adjustment

Relation between scale figures and differential pressure. Values given are approximate.



Flow adjustment

Relation between adjusted flow and actual flow. Values given are approximate



Sizing

Example 1

Motor valve for mixing circuit in direct-connected heating systems requires differential pressure of 0.2 bar (20 kPa) and flow less than 350 litres (fig. 1)

Given:

$$\begin{aligned} Q_{\max} &= 0.35 \text{ m}^3/\text{h} \text{ (350 l/h)} \\ \Delta p_{\min} &= 0.5 \text{ bar (50 kPa)} \\ \Delta p_{\text{circuit}} &= 0.1 \text{ bar (10 kPa)} \\ \Delta p_{\text{motor valve}} &= 0.2 \text{ bar (20 kPa)} \\ \Delta p_{\text{restrictor}} &= 0.1 \text{ bar (selected)} \\ \Delta p_{\text{AVPB}} &= \Delta p_{\min} - \Delta p_{\text{motor valve}} \\ \Delta p_{\text{AVPB}} &= 0.5 - 0.2 = 0.3 \text{ bar (30 kPa)} \end{aligned}$$

Possible pipe pressure losses are not included.

k_v value is calculated according to formula:

$$k_v = \frac{Q_{\max}}{\sqrt{\Delta p_{\text{AVPB}} - \Delta p_{\text{restrictor}}}} = \frac{0.35}{\sqrt{0.3 - 0.1}} = 0.8 \text{ m}^3/\text{h}$$

or read from sizing diagram by taking a line through Q -scale (0.35 m³/h) and Δp_v scale (0.3 - 0.1 = 0.2 bar) to intersect k_v axis at 0.8 m³/h.

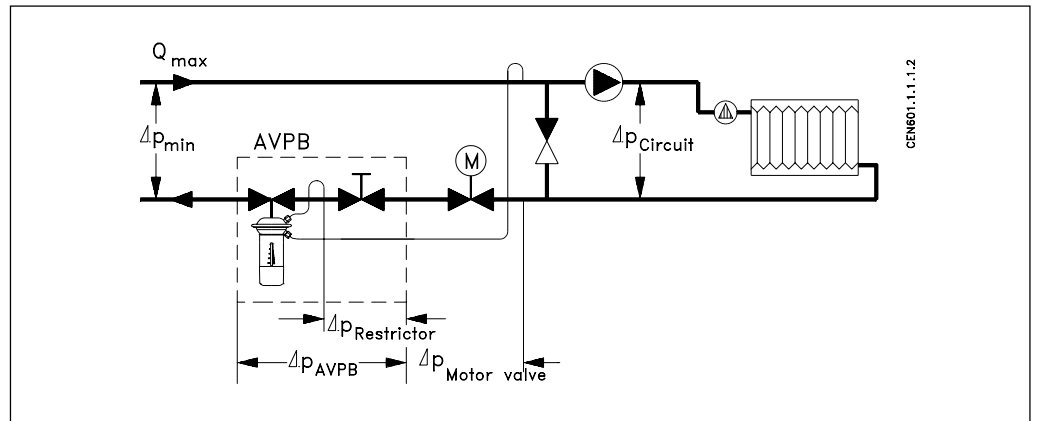
From k_v value 0.8 m³/h take a line horizontally to the right to intersect vertical X_p lines.

Solution:

The example selects AVPB 15 with differential pressure setting range 0.05 - 0.5 bar, $X_p = 0.03$ bar, $k_v = 1.6$. At 0.3 bar (0.1 + 0.2 bar) control setting AVPB varies between 0.3 bar at open valve and 0.3 + 0.03 = 0.33 bar at closed valve.

As $\Delta p_{\text{restrictor}}$ is chosen for 0.1 bar, an adjusted Q is calculated according to formula:

$$Q_{\text{adjustment}} = \frac{\sqrt{0.2}}{\sqrt{0.1}} Q_{\max} = 0.5 \text{ m}^3/\text{h}$$



Example 2

Motor valve for indirectly connected heating system control requires differential pressure of 0.5 bar and flow less than 1.25 m³/h (fig. 2)

Given:

$Q_{\max}$	=	1.25 m ³ /h
$\Delta p_{\min}$	=	1.0 bar (100 kPa)
$\Delta p_{\text{exchanger}}$	=	0.05 bar (5 kPa)
$\Delta p_{\text{motor valve}}$	=	0.5 bar (50 kPa)
$\Delta p_{\text{restrictor}}$	=	0.2 bar (selected)
Δp_{AVPB}	=	$\Delta p_{\min} - \Delta p_{\text{exchanger}} - \Delta p_{\text{motor valve}}$
Δp_{AVPB}	=	$1.0 - 0.05 - 0.5 = 0.45 \text{ bar}$ (45 kPa)

Possible pipe pressure losses are not included.

k_v value is calculated according to formula:

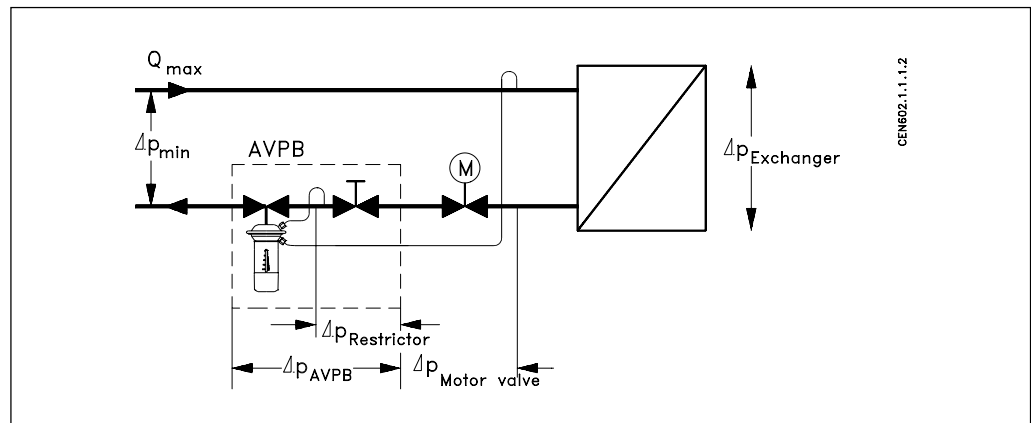
$$k_v = \frac{Q_{\max}}{\sqrt{\Delta p_{\text{AVPB}} - \Delta p_{\text{restrictor}}}} = \frac{1.25}{\sqrt{0.45 - 0.2}} = 2.5 \text{ m}^3/\text{h}$$

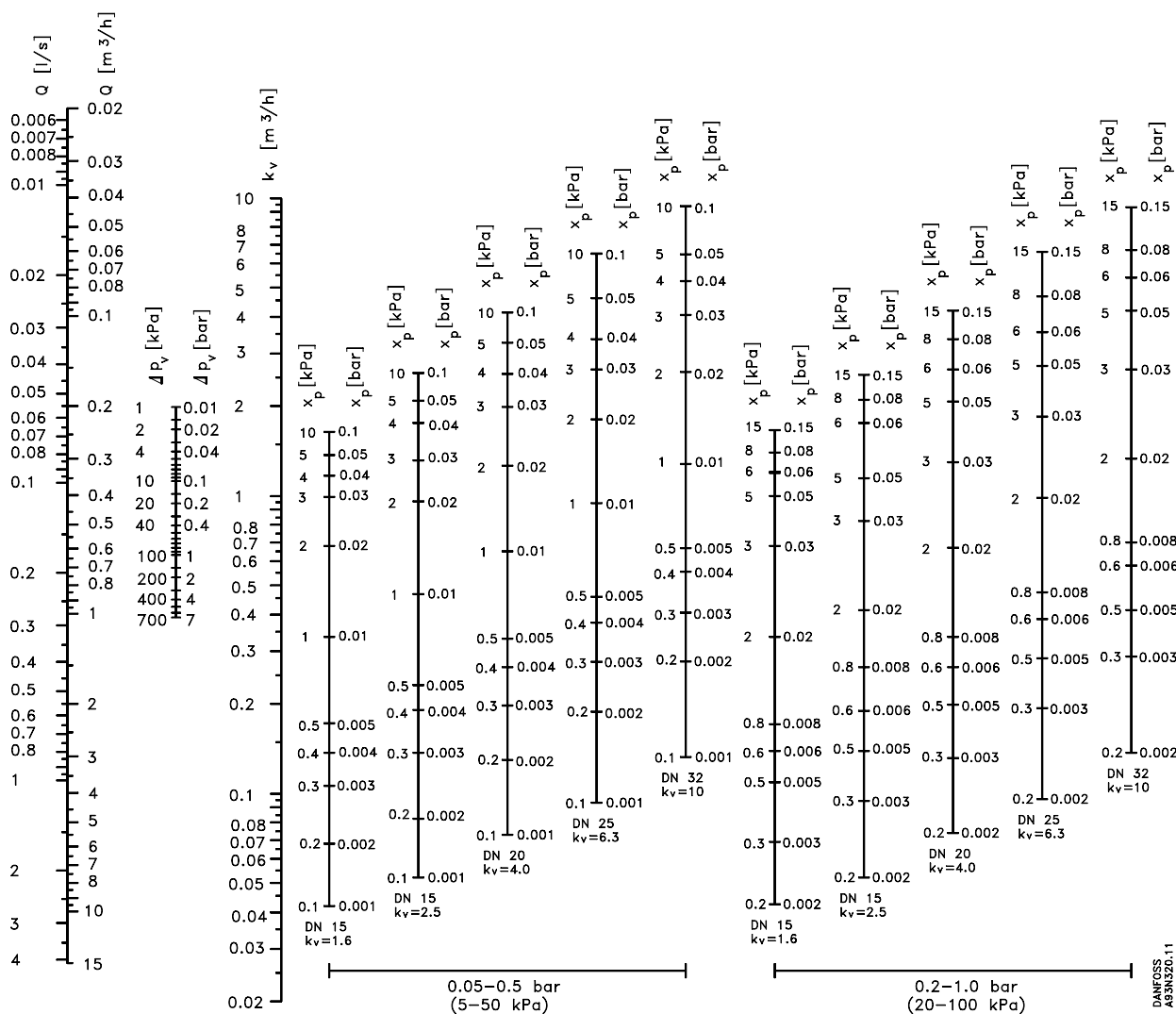
or read from sizing diagram by taking a line through Q -scale (1.25 m³/h) and Δp_v scale (0.05 - 0.2 = 0.25 bar) to intersect k_v axis at 2.5 m³/h.

From k_v value 2.5 m³/h take a line horizontally to the right to intersect vertical X_p lines.

Solution:

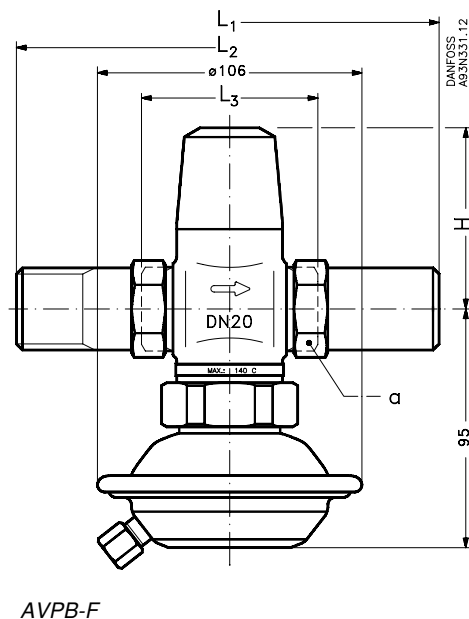
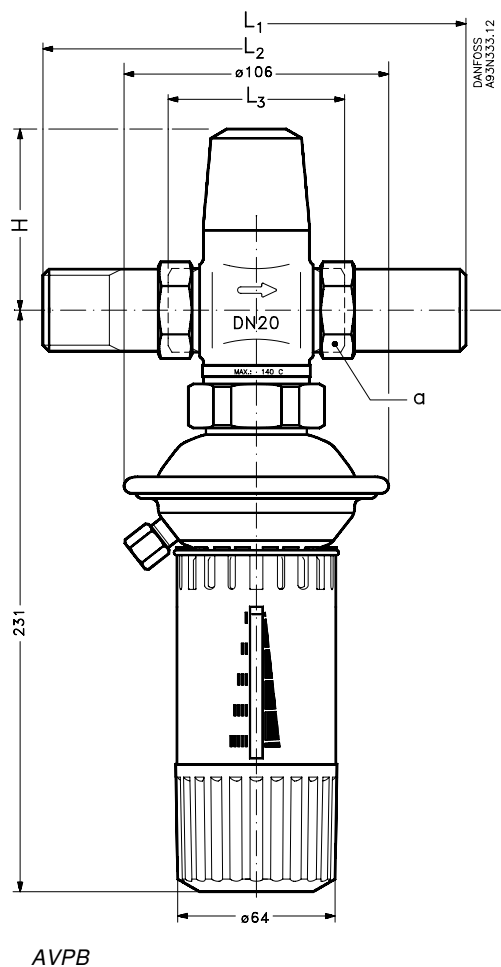
The example selects AVPB 15 with setting range 0.2 - 1.0 bar, $X_p = 0.15$ bar, $k_v = 2.5$. At 0.7 bar (0.5 + 0.2 bar) control setting AVPB varies between 0.50 bar at open valve and 0.7 + 0.15 = 0.85 bar at closed valve.



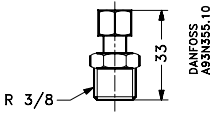


Select suitable control size and P-band (X_p), not exceeding 50% of the set control differential pressure.

Dimensions



	H mm	L ₁ mm	L ₂ mm	L ₃ mm	a ISO 228/1
DN 15	71	139	131	65	G ¾ A
DN 20	71	154	142	70	G 1 A
DN 25	75	159	159	75	G 1 ¼ A
DN 32	75	184	196	100	G 1 ½ A



Fitting for impulse tube

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