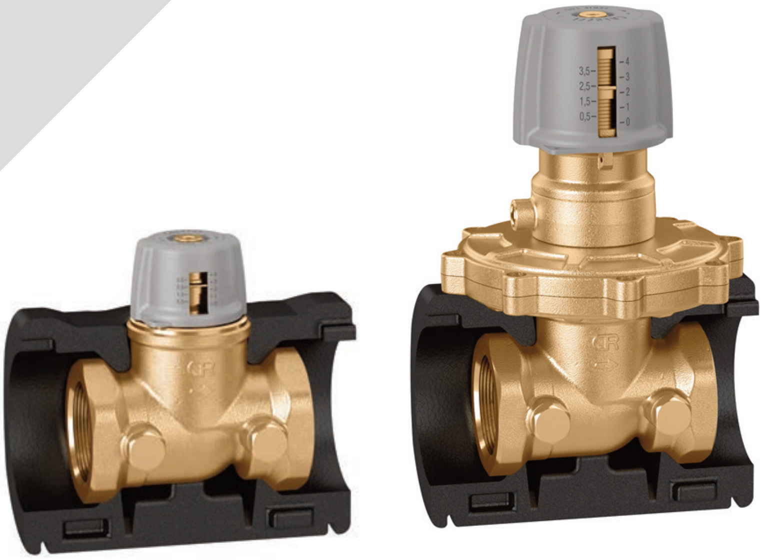
140-142

differential pressure regulating valve - threaded



altecnic
Caleffi group

140-142 differential pressure regulating valve - threaded

Introduction

Differential pressure regulating valves (DPRV) maintain the differential pressure across a circuit or sub-branch at a set differential pressure.

The valve is supplied with a partner valve which enables a capillary pipe to connect the two valves to be connected.

The partner valve is a double regulating valve which is an isolating valve, with a characterised disc for flow regulation and memory stop feature.

Function

The partner valve regulates the thermal medium flow rate supplied to the part of the circuit controlled by the differential pressure regulating valve.

The differential pressure values are selected to suit design flow rates which helps prevent the phenomena of noise and high flow velocities in variable flow rate systems.

The Altecnic differential pressure regulating valve and partner valve are suitable for most types of system including:

- variable volume systems, with two-way thermostatic or modulating valves
- with zones or risers
- systems with condensing boilers
- district heating systems

The differential pressure regulating and partner valve are also supplied complete with shell insulation, to ensure excellent thermal insulation of the system.

Product Range

140340	DPR valve	½"	- setting range Δp 5 - 30 kPa
140440	DPR valve	½"	- setting range Δp 25 - 60 kPa
140350	DPR valve	¾"	- setting range Δp 5 - 30 kPa
140450	DPR valve	¾"	- setting range Δp 25 - 60 kPa
140360	DPR valve	1"	- setting range Δp 5 - 30 kPa
140460	DPR valve	1"	- setting range Δp 25 - 60 kPa
140370	DPR valve	1¼"	- setting range Δp 5 - 30 kPa
140470	DPR valve	1¼"	- setting range Δp 25 - 60 kPa
140380	DPR valve	1½"	- setting range Δp 5 - 30 kPa
140480	DPR valve	1½"	- setting range Δp 25 - 60 kPa
140392	DPR valve	2"*	- setting range Δp 5 - 30 kPa
140492	DPR valve	2"*	- setting range Δp 25 - 60 kPa
142140	partner valve	½"	
142150	partner valve	¾"	
142160	partner valve	1"	
142170	partner valve	1¼"	
142180	partner valve	1½"	
142290	partner valve	2"*	

* without insulation

Materials

Component	Material	Grade
Body - DPRV		
½", ¾" & 1":	DZR	BS EN 12165 CW602N
1¼", 1½" & 2";	DZR	BS EN 1982 CB752S
Body - Partner		
½", ¾" & 1":	DZR	BS EN 12165 CW602N
1¼" & 1½":	DZR	BS EN 1982 CB752S
2":	DZR	BS EN 1982
CuZn21Si3Pb		
		BS EN 1982 CW724R
Control stem:	DZR	BS EN 12164 CW602N
DPRV - diaphragm:	EPDM	
DPRV - spring:	Stainless steel	AISI 302
Seals:	EPDM	
Cap:	Polymer	PA6G30
Capillary pipe:	Copper	

Technical Specification

Medium:	water, glycol solution
Max. percentage of glycol:	50%
Max. working pressure:	
142	16 bar
140 - ½", ¾" & 1"	16 bar
140 - 1¼", 1½" & 2"	10 bar
Max. temperature range:	-10°C to 100°C
Diaphragm max. differential pressure	
½", ¾" & 1":	6 bar
1¼", 1½" & 2":	2.5 bar
Δp setting range - 1403:	5 to 30 kPa
Δp setting range - 1404:	25 to 60 kPa
Accuracy:	±15%

Connections

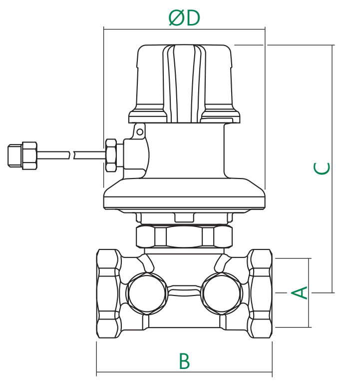
Main thread - female:	BS EN ISO 228
Capillary pipe:	1/8" (complete with ¼" M x 1/8" F adaptor for connection to partner valve) tightening torque 4 to 7 Nm
Pressure test ports - female:	¼" BS EN ISO 228
Capillary length:	Ø 3mm x 1.5m

Insulation

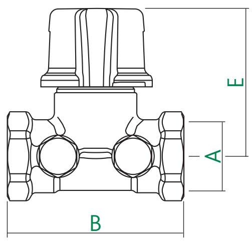
Material:	EPP
Thickness:	15mm
Density:	45 kg/m³
Thermal conductivity:	0.037 W/(m-K)@10°C
Reaction to fire (UL 94):	class HBF

140-142 differential pressure regulating valve - threaded

Dimensions



Code	A	B	C	D	kg
140 40	G½	65	107	69	0.79
140 50	G¾	75	107	69	0.92
140 60	G1	85	113	69	1.18
140 70	G1¼	95	173	139	2.98
140 80	G1½	100	176	139	3.31
140 92	G2	120	176	139	4.21

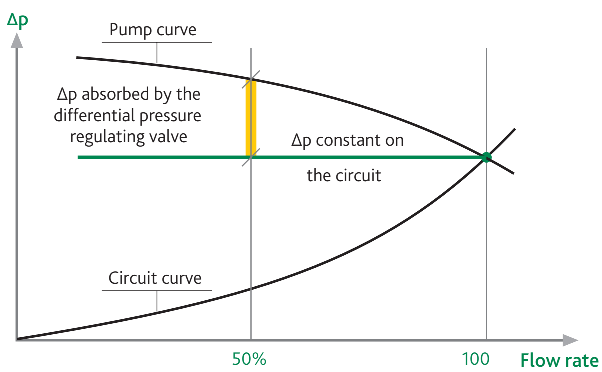


Code	A	B	E	kg
142140	G½	65	64	0.43
142150	G¾	75	64	0.52
142160	G1	85	64	0.67
142170	G1¼	95	83	1.04
142180	G1½	100	86	1.36
142290	G2	120	86	1.75

Operating Principles

The circuit is regulated by the combined action of two devices, the partner valve and the differential pressure regulating valve.

By means of a capillary pipe that connects two valves, the flow rate and differential pressure are maintained in the circuit, as the operating conditions vary in the whole system.

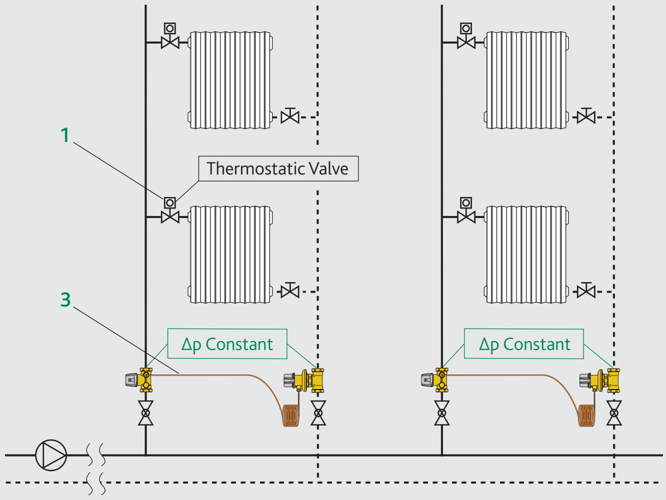


Operating Principles

The partner valve regulates the design flow rate by the action of a characterised disc.

The differential pressure regulating valve acts proportionally to re-establish the pre-selected Δp conditions on the valve itself while the flow rate is varied by devices such as, for example, two-way thermostatic valves

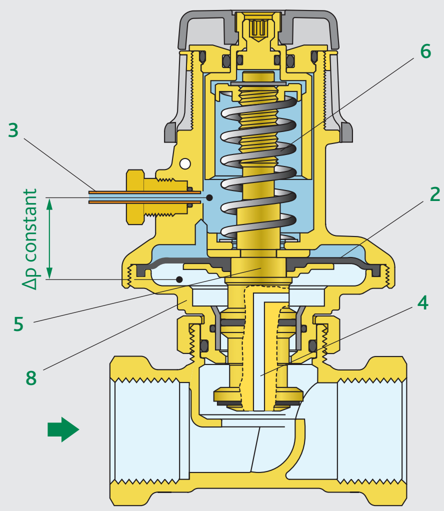
The gradual closing of the ambient temperature control devices (1) causes an increase of the pressure differential between flow and return of the circuit zone.



The flow pressure value is brought to the top surface of the membrane (2) by means of the connecting capillary pipe (3); the return pressure value is brought to the bottom surface of the membrane through the connecting pipe inside the control stem (4).

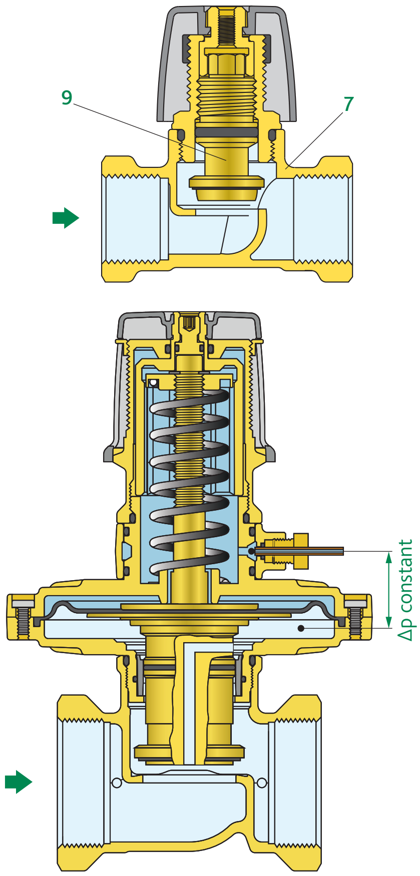
The force generated by the pressure differential on the membrane exerts a thrust on the obturator stem (5), closing the passage of medium on the return of the circuit zone until the thrust force of the membrane and the counter-thrust force of the counter-spring (6) reach equilibrium on the set Δp value.

This is the pressure differential value which is kept constant between flow and return of the circuit zone, even when, according to the inverse physical process, the thermostatic valves open to increase the flow rate to the heating terminals.



140-142 differential pressure regulating valve - threaded

Operating Principles



Construction Details

Materials in DZR alloy and Stainless Steel

The valve bodies (7 and 8) and the control stems (9 and 5) are in dezincification resistant alloy while the spring of the Δp differential regulating valve (6) is in stainless steel.

These materials prevent dezincification, are reliable over time and are compatible with glycols and additives, which are often used in the circuits of heating systems.

Easy installation procedure

Both the Δp regulating valve and the partner valve have been designed with specific structural characteristics, described below in points a), b), c), in order to simplify installation operations.

Their use is often necessary during construction or when refurbishing an existing system.

a) Reduced overall dimensions

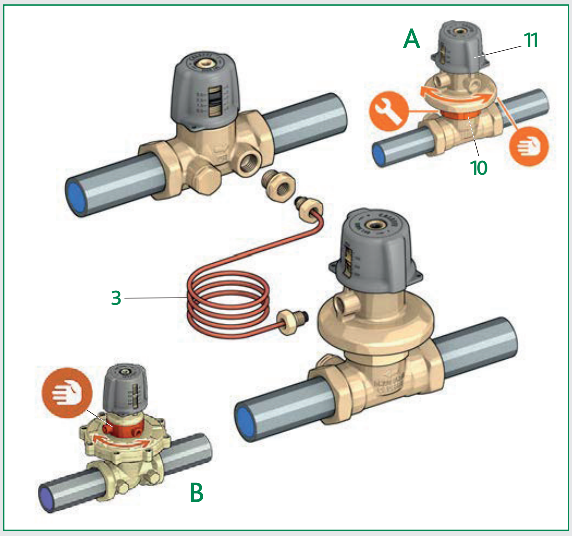
The two valves have compact dimensions, maintaining high accuracy and performance over a wide range of flow rates and adjustable Δp.

The design of the internal components of the Δp regulating valves have allowed an appreciable reduction in size of the largest components housing the membrane (2).

b) Adjustable capillary pipe connection

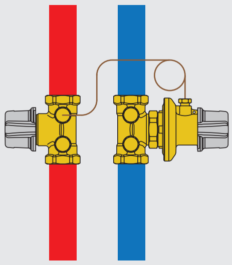
On ½" ¾" and 1" valves, for optimum positioning of the capillary pipe connection, using a suitably sized spanner loosen the lock nut (10) on the Δp regulator by rotating through 45°, the membrane housing can be manually rotated (fig. A).

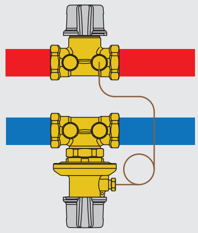
On 1¼", 1½" and 2" valves it is only necessary to rotate manually the capillary connection (fig. B).



c) Installation

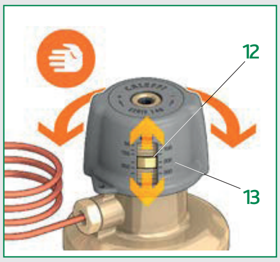
The valves can be installed in any orientation but the direction of flow must follow the direction arrow on the valve body.





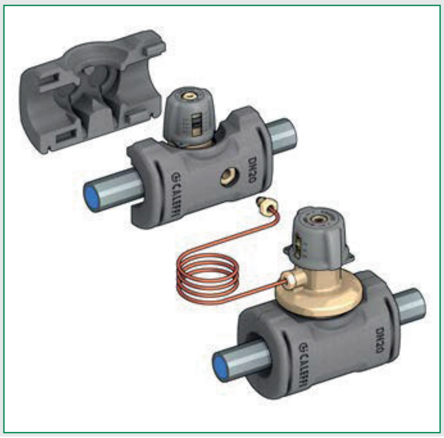
Δp indicator

Setting the Δp differential regulating valve is simplified by the presence of the mobile indicator (12) and of the graduated scale (13) in mbar on the valve knob.



Insulation

The valves (2" excluded) are both supplied complete with pre-formed shell insulation. This method guarantees an optimum insulation for decreasing heat losses, to the advantage of the thermal efficiency of the whole system.



140-142 differential pressure regulating valve - threaded

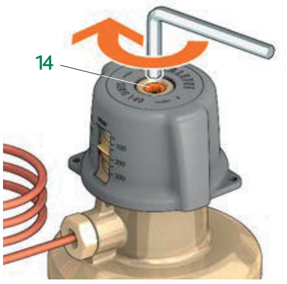
Circuit Isolation

Where for reasons of space it is not possible to install suitable shut-off devices upstream and downstream from the two valves, it is still possible to isolate the circuit zone controlled by the Δp differential regulating valve.

Features to isolate the flow are contained in the two valves 140 and 142 series and described below in points d) and e).

e) Isolation and maintaining the set Δp - 140 series

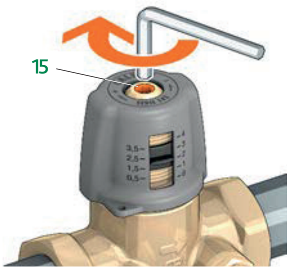
The circuit can be isolated by inserting an Allen key into the hole (14) and turning it fully clockwise. The Δp setting procedure allows isolation for system maintenance and restoring operation without having to reset the valves.



e) Isolation and maintaining the set Δp - 142 series

Once the flow rate has been balanced, it is possible to make use of the memory stop by inserting an Allen key into the hole (15) of the balancing valve (partner valve) and tightening it fully without forcing it.

This operation sets the valve's maximum opening: if necessary, it is possible to isolate the circuit by turning the knob (15) fully clockwise.

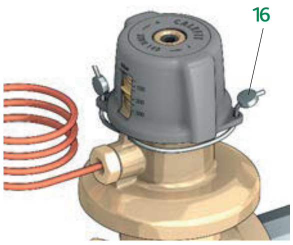


To return the valve to its preset balancing position, turn the knob fully counter-clockwise.

Locking/sealing the regulated position

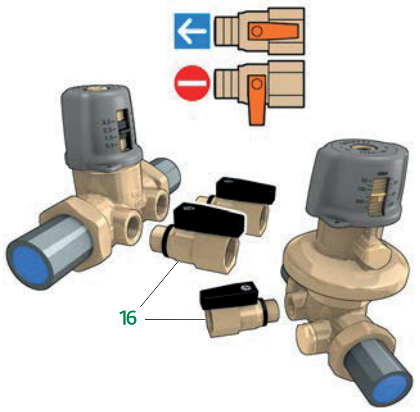
On the knob and on the valve body there are special holes that can be used to seal the set position, once the regulating has been completed (16).

The application of sealing means that, during any inspections, it can be rapidly ensured that the system has not been tampered with.



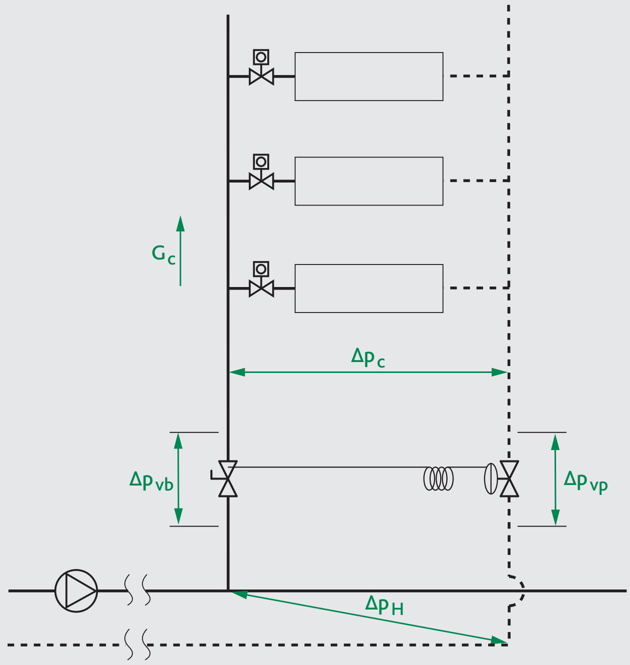
Connection accessories ½", ¾" and 1" valves

The capillary tubes may be isolated from the valves using manual cocks, accessory code 538203 (17).



Sizing Method

Reference circuit



G_C = design flow rate to circuit
Δp_C = headloss of through circuit Gc
Δp_{VP} = headloss of the differential pressure regulating valve
Δp_{Vb} = headloss of the partner double regulating valve
Δp_H = total headloss of the circuit = $\Delta p_{Vb} + \Delta p_C + \Delta p_{Vp}$

Example

For sizing and setting the differential pressure control devices in a heating system, it is necessary to know the design flow rates and head losses of the circuit being considered (G_C and G_C).

Choice and setting of the differential pressure regulating valve, when the design flow rates and head losses of the circuit are known:

G_C = 0.8 m^3/h
Δp_C = 20 kPa

Using the table Δp_{SET}, we choose a valve which, when set at a pressure differential = Δp_C = 20 kPa, should be of such a size that the value G_C is between Gmin and Gmax , shown in the table.

In the table it is highlighted in yellow that, on the setting 20 kPa, (1) the value of G_C (0.8 m^3/h) is between Gmin (2) and Gmax (3) for the valve size ¾" (4).

¾" is chosen, as a compromise between regulation requirements, head loss and economic installation.

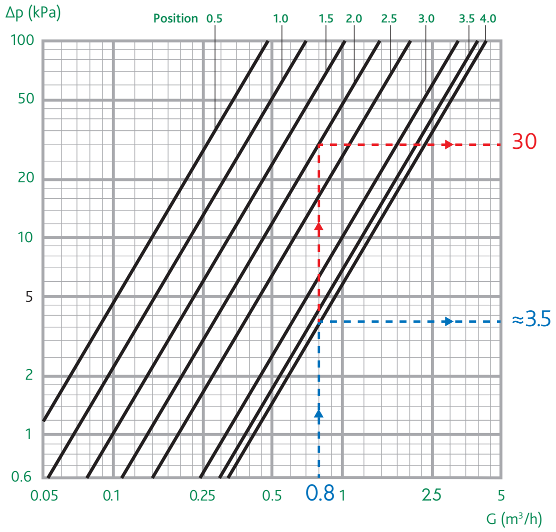
Δp_{SET} 5 - 30 kPa (50 - 300 mbar)													
Code	in	5 kPa		10 kPa		15 kPa		20 kPa (1)		25 kPa		30 kPa	
		Gmin m^3/h	Gmax m^3/h	Gmin m^3/h	Gmax m^3/h	Gmin m^3/h	Gmax m^3/h	Gmin m^3/h	Gmax m^3/h	Gmin m^3/h	Gmax m^3/h	Gmin m^3/h	Gmax m^3/h
140340	½	0.05	0.45	0.05	0.60	0.05	0.7	0.05	0.75	0.05	0.8	0.05	0.9
140350 (4)	¾	0.10	0.65	0.10	0.85	0.10	1.0	0.10 (2)	1.05 (3)	0.10	1.1	0.10	1.2
140360	1	0.25	0.90	0.25	1.20	0.25	1.5	0.25	1.55	0.25	1.6	0.25	1.7
140370	1¼	0.4	3.5	0.4	4.5	0.4	5.0	0.4	5.5	0.4	6.0	0.4	6.0
140380	1½	0.5	4.5	0.5	5.5	0.5	6.0	0.5	7.0	0.5	7.5	0.5	7.5
140392	2	0.8	10.	0.8	10	0.8	10	0.8	12	0.8	12	0.8	12

Calculation of Δp_H for sizing the circulator:

$\Delta p_H = \Delta p_{vb} + \Delta p_c + \Delta p_{vb}$

Δp_{vb}: presuming that a ¾” Δp regulating valve has been chosen, the head loss of the balancing valve starts from a minimum value (“fully open” position for the most favoured circuit) up to an increasing value in relation to the flow rate setting for the least favoured circuits.

Graphically this gives for 142150 - ¾”



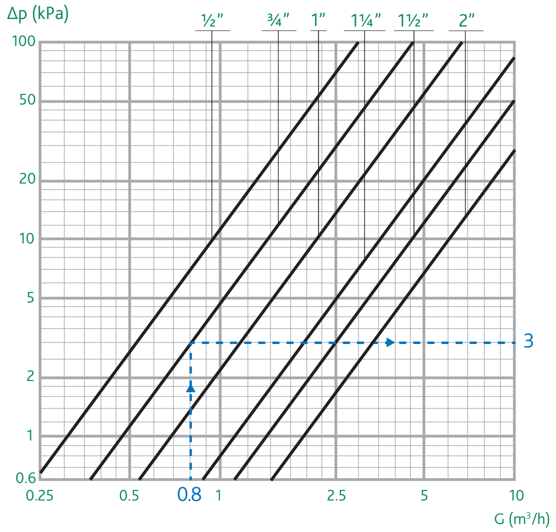
Δp_{vb} = 3.5 kPa, valve fully open-blue line

Δp_{vb} = 30 kPa, valve in flow rate regulation-red line

Δp_c = head loss of the circuit referred to Gc =20 kPa

Δp_{vp}: the head loss of the Δp regulating valve is obtained using the Kvs diagram with the device in ‘fully open’ position, the ideal operating condition.

Graphically this gives



$\Delta p_{vp} = 3$ kPa

The total head loss of the circuit to be used to calculate the size of the circulator is as follows:

$\Delta p_H = 3.5 + 20 + 3 = 26.5$ kPa

Note: in cases where G_c and Δp_c must be “estimated” and not calculated or in the case of practical setting on site, it is preferable to calculate Δp_{vp} using the Kv_{nom} diagram of the 140 series valve, which represents the mean regulation conditions.

For fast sizing, in average conditions, we can evaluate: $\Delta p_H \geq 1.5 \times \Delta p_c$

Correction of the flow rate on the circuit, using only the Δp regulating valve

Once the valves have been set, it may be necessary to correct the flow rate to the controlled circuit.

This operation may be performed by adjusting the Δp setting of the double regulating partner valve according to the equation:

$G_2 = G_1 \times \sqrt{(\Delta p_2 / \Delta p_1)}$, which means:

$\Delta p_2 = G_2^2 / G_1^2 \times \Delta p_1$ (1)

For example, if we have to increase G_c by 15% (which corresponds to an increase of the flow rate from $G_1 = 0.8$ m³/h to $G_2 = G_1 \pm 15\% = 0.92$ m³/h), using the formula (1), we find the new setting value Δp_2 of the double regulating valve:

$\Delta p_2 = 0.92^2 / 0.80^2 \times 20 = 26.45$ kPa

The setting of the regulating valve will be modified from 20 kPa to ≈ 26.5 kPa.

Correction for liquids of different density

If using liquids with a density different from water at 20°C (ℓ ≈ 1 kg/dm³), correct the value of the measured head loss Δp using the following formula:

$\Delta p' = \Delta p / \ell$

where: $\Delta p'$ = water equivalent head loss

Δp = measured head loss

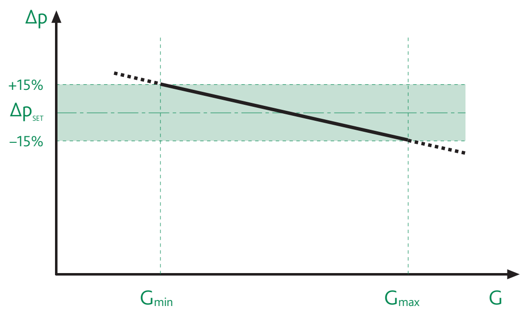
ℓ = medium density in kg/dm³

Use the value $\Delta p'$ to measure the flow rate

See the flow data manual for flow charts for the 140 and 142 series valves.

140-142 differential pressure regulating valve - threaded

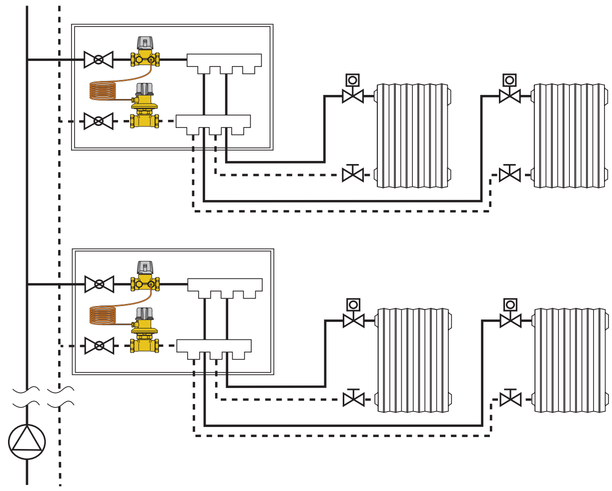
Hydraulic Characteristic of the DPRV - 140 Series



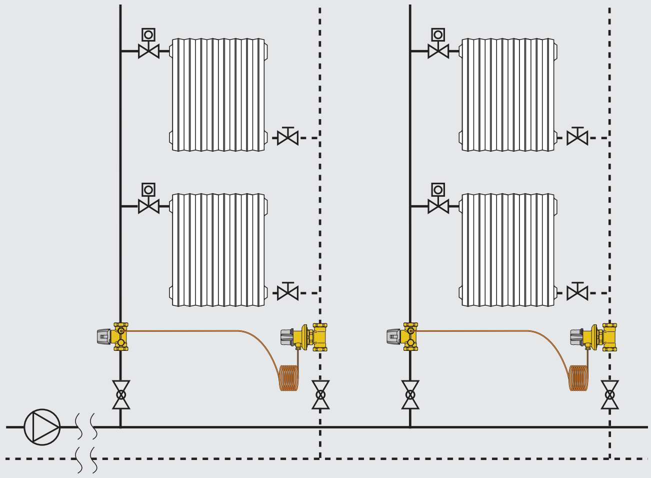
Δp_{SET} 5 - 30 kPa (50 - 300 mbar)													
Code	in	5 kPa		10 kPa		15 kPa		20 kPa		25 kPa		30 kPa	
		G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h
140340	½	0.05	0.45	0.05	0.60	0.05	0.7	0.05	0.75	0.05	0.8	0.05	0.9
140350	¾	0.10	0.65	0.10	0.85	0.10	1.0	0.10	1.05	0.10	1.1	0.10	1.2
140360	1	0.25	0.90	0.25	1.20	0.25	1.5	0.25	1.55	0.25	1.6	0.25	1.7
140370	1¼	0.4	3.5	0.4	4.5	0.4	5.0	0.4	5.5	0.4	6.0	0.4	6.0
140380	1½	0.5	4.5	0.5	5.5	0.5	6.0	0.5	7.0	0.5	7.5	0.5	7.5
140392	2	0.8	10	0.8	10	0.8	10	0.8	12	0.8	12	0.8	12

Δp_{SET} 25 - 60 kPa (250 - 600 mbar)																	
Code	in	25 kPa		30 kPa		35 kPa		40 kPa		45 kPa		50 kPa		55 kPa		60 kPa	
		G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h	G_{min} m^3/h	G_{max} m^3/h
140440	½	0.05	0.8	0.05	0.9	0.05	0.95	0.05	1.0	0.05	1.05	0.05	1.1	0.05	1.1	0.05	1.2
140450	¾	0.10	1.1	0.10	1.2	0.10	1.3	0.10	1.4	0.10	1.45	0.10	1.5	0.10	1.55	0.10	1.6
140460	1	0.25	1.6	0.25	1.7	0.25	1.75	0.25	1.75	0.25	1.8	0.25	1.85	0.25	1.9	0.25	2
140470	1¼	0.4	6	0.4	6	0.4	6.5	0.4	6.5	0.4	6.5	0.4	6.5	0.4	6.5	0.4	6.5
140480	1½	0.5	7.5	0.5	7.5	0.5	7.5	0.5	7.5	0.5	8	0.5	8	0.5	8	0.5	8
140492	2	0.8	12	0.8	12	0.8	12	0.8	13	0.8	14	0.8	14	0.8	14	0.8	14

Application Diagrams



Application Diagrams



Accessories

100000

Pair of pressure/temperature points.
Brass body.
EPDM seals.
Max. working pressure: 30 bar.
Working temperature range: -5 to 130°C
Connections: 1/4" M.

100010

Pair of angled pressure/temperature points.
Female 1/4" threaded connection.
Max. working pressure: 10 bar.
Max. working temperature: 110°C.

538203

Manual shut-off cock.

Brass body.
Seals in non-asbestos fibre.
Max. working pressure: 16 bar.
Working temperature range: -10 to 120°C.
Connections: ¼" M x ¼" F.

130

Electronic flow rate and differential pressure measuring station.

Supplied complete with shut-off valves and connection fittings.

May be used for Δp measurements and setting of balancing valves.

Bluetooth® transmission between Δp measuring station and remote control unit.

Versions complete with remote control unit with Windows Mobile® or with Android® application for Smartphone and Tablet.

Code

130006 - complete with remote control unit, with Android® application.

130005 - without remote unit, with Android® application.

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