

*Danfoss*



## **Balancing Hydronic Systems**

Heating & Cooling - Terminals & Zones

## Complete application knowledge

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### Ever optimum solution



We have combined your needs with our experience and technical knowledge to extend number of solutions that can be offered to the modern buildings and constructions where demand for a better indoor climate has been increasing. It is partly because more and more people work indoors, and partly because indoor climate influences people's well being and also their efficiency at work. You are always able to find the best and optimum solution that will give your customer a sense of satisfaction using Danfoss wide product range.



### Constant or variable flow?

Constant flow application - appears in hydronic systems based on 3-way valves that control both chilled and hot water flows dedicated to particular terminal units. In the case there is no need for cooling or heating the valves open flow bypass. However, the overall flow in the whole system remains constant.



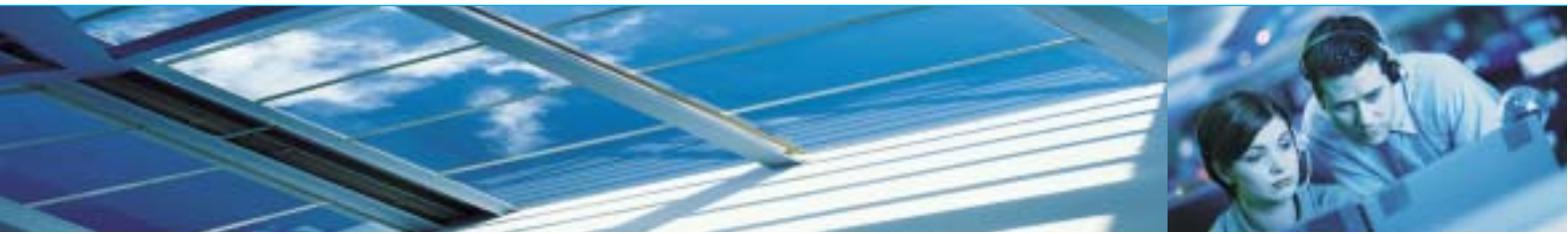
**Constant flow**

**Variable flow**










Variable flow application - appears in systems comprised of fan coil units or chilled beams that are supplied via a 2-pipe distribution system supplying hot water or chilled water. The water flow varies according to the actual demand either for cooling or heating.

## Danfoss - Total solution supplier



### Constant flow

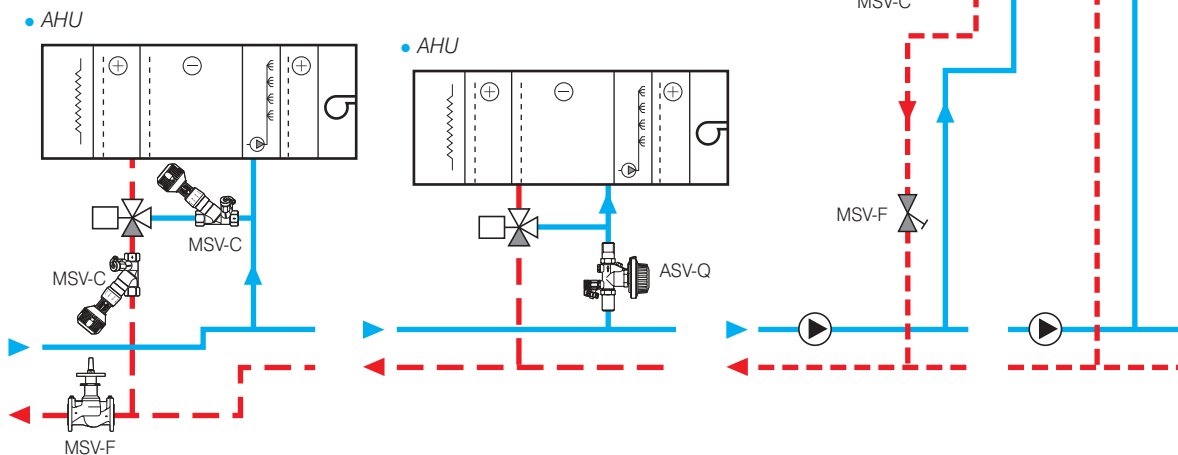
- Reality slightly differs from a theory and calculations conducted at design stage. Therefore in order to achieve design flow rates both for cooling and heating coils it is necessary to verify the system operation. MSV-C valves allow flow through the coil to be easily measured and adjusted with high accuracy due to the measurement across fixed orifice. If there is a need for higher flows in branches, risers and mains MSV-F flanged valves can be used.
- However, to provide a better system performance Danfoss recommends ASV-Q valve that adjusts to differential pressure itself to get the design flow at each terminal. ASV-Q dynamically absorbs pump's overheating and prevents from overflows.
- Automatic balancing with ASV-Q offers additional possibilities and benefits e.g.
  - the overall number of valves is limited - they are not longer required for branches and risers;
  - automatic flow limiting function;
  - eliminates need for balancing labor and makes the maintenance easier;
  - assures reliable and energy efficient operation over the time.

Type	Product	Parameters							Functions
ASV-Q		DN	15	20	25	32	40	50	<ul style="list-style-type: none"> <li>•Automatic flow limitation and control</li> <li>•Drain cock</li> <li>•Shut off function</li> <li>•Internal thread</li> </ul>
		adjustment range Q [m³/h]	0.1-0.8	0.2-1.4	0.4-1.6	0.5-3.0	-	-	
		Code No.	003L2002	003L2004	003L2006	003L2008	-	-	
MSV-C		DN	15	20	25	32	40	50	<ul style="list-style-type: none"> <li>•Flow limitation</li> <li>•Flow measuring</li> <li>•Set point lock</li> <li>•Measuring nipples</li> <li>•Internal thread</li> </ul>
		Kvs [m³/h]	1.8	3.8	6.6	13.9	19.9	41	
		Code No.	003Z3001	003Z3002	003Z3003	003Z3004	003Z3005	003Z3006	
MSV-F		DN	65	80	100	125	150	200	<ul style="list-style-type: none"> <li>•Flow limitation</li> <li>•Flow measuring</li> <li>•Set point lock</li> <li>•Measuring nipples</li> <li>•Flange connection</li> </ul>
		Kvs [m³/h]	74.4	111	165	242	372	704	
		Code No.	003Z0030	003Z0031	003Z0032	003Z0033	003Z0034	003Z0035	
MSV-I		DN	15	20	25	32	40	50	<ul style="list-style-type: none"> <li>•Flow limitation</li> <li>•Flow measuring</li> <li>•Set point lock</li> <li>•Internal thread</li> <li>•Needle measuring nipples</li> </ul>
		Kvs [m³/h]	1.6	2.5	4.0	6.3	10.0	16.0	
		Code No.	003Z2081	003Z2082	003Z2083	003Z2084	003Z2085	003Z2086	
MSV-M		DN	15	20	25	32	40	50	<ul style="list-style-type: none"> <li>•Shut off function</li> <li>•Drain cock</li> <li>•Internal thread</li> </ul>
		Kvs [m³/h]	1.6	2.5	4.0	6.3	10.0	16.0	
		Code No.	003Z2061	003Z2062	003Z2063	003Z2064	003Z2065	003Z2066	
USV-M		DN	15	20	25	32	40	50	<ul style="list-style-type: none"> <li>•Shut off function</li> <li>•Drain cock</li> <li>•Upgradeable to automatic valve</li> <li>•Internal thread</li> </ul>
		Kvs [m³/h]	1.6	2.5	4.0	6.3	10.0	16	
		Code No.	003Z2121	003Z2122	003Z2123	003Z2124	003Z2125	003Z2153	
USV-I		DN	15	20	25	32	40	50	<ul style="list-style-type: none"> <li>•Flow limitation</li> <li>•Flow measuring</li> <li>•Drain cock</li> <li>•Internal thread</li> </ul>
		Kvs [m³/h]	1.6	2.5	4.0	6.3	10.0	16.0	
		Code No.	003Z2131	003Z2132	003Z2133	003Z2134	003Z2135	003Z2151	

## Complete application knowledge - constant flow



- Automatic flow controls ASV-Q are self-acting devices that limit flow to a preset value in constant flow systems. ASV-Q is designed to achieve a constant flow rate when the differential pressure across the valve is within a certain range. They are also very well suited for those systems where the necessary data for manual valves adjustment are lacking.
- MSV-C and MSV-F are manual balancing valves suitable for terminals, branches, risers and mains. In MSV-C valve the flow is measured on a fix orifice built in the valve. The measurement on a fix orifice is very fast and accurate. After the flow was measured both MSV-C and MSV-F can be adjusted to achieve design flow rates.
- Balancing valves have to absorb a part of pressure drop and allow control valves to be wide open at design flow. In the Danfoss offer one is able to find a complete and comprehensive selection of balancing and motorized valves that provide a precise control for different terminal units.



Automatic flow control and limitation using ASV-Q

High measurement accuracy using MSV-C/F

Tools for selection and dimensioning

New and modern measuring set PFM 3000

Less time consuming start up period

Danfoss product and service quality

## Complete application knowledge - variable flow



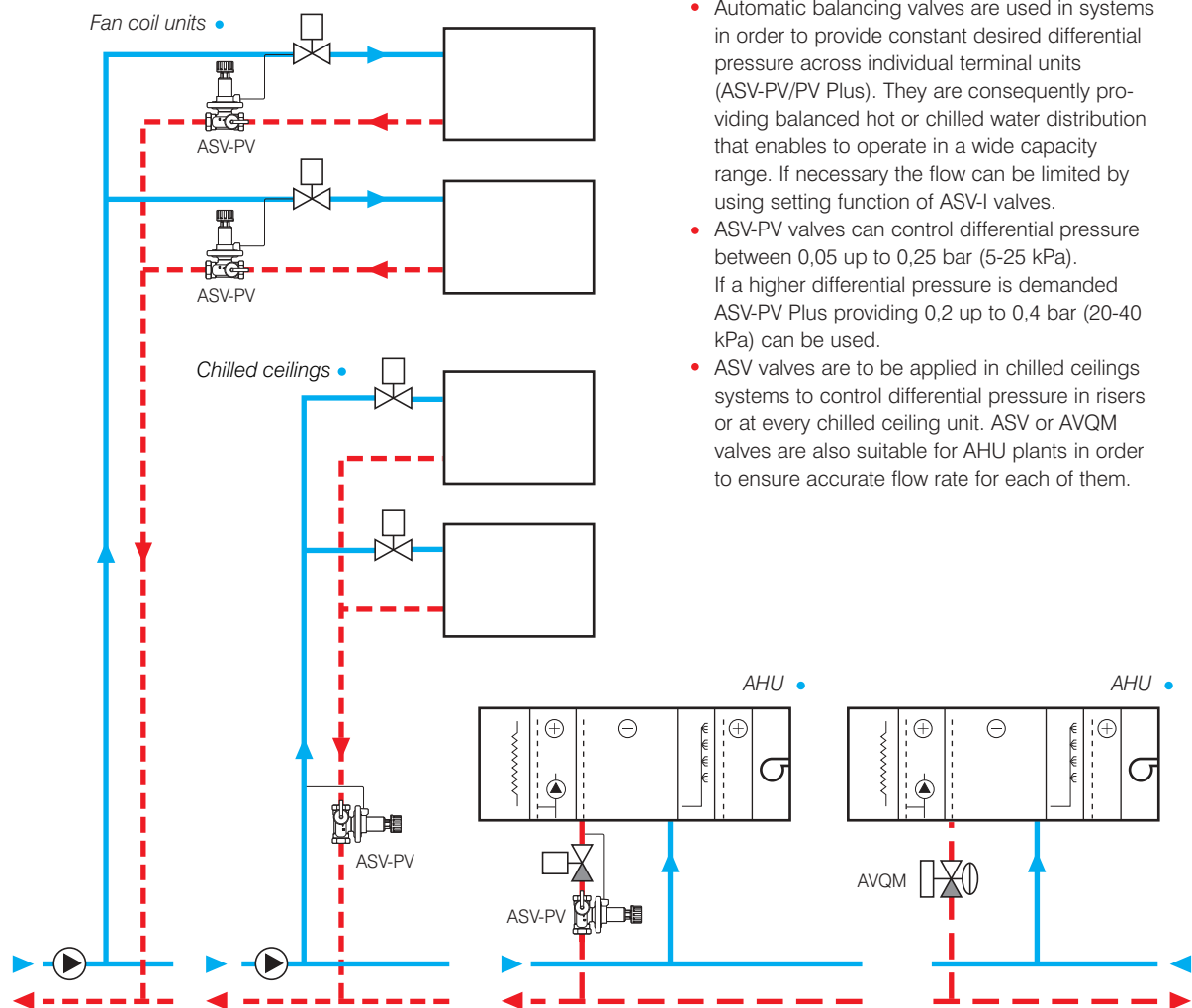
**Self-acting Thermostats**  
Ensure reliable temperature control inside a building equipped in either 2-pipe or 4-pipe systems; they use RA-C 2-way valves with presetting function

**Electric Thermostats**  
They control thermo-actuators built in particular terminal units; available in many versions such as: 24/230V power supply, fan speed etc.

**Programmable Thermostats**  
Provide cost effective control of heating, cooling and heat/cool systems

**ECL Comfort Controllers**  
Responsible for system supply temperature in various applications dependent on a program card that one selects

**Motorized Control Valves**  
Based on long term experience they secure excellent control performance for systems as well as easy handling and maintenance



- Automatic balancing valves are used in systems in order to provide constant desired differential pressure across individual terminal units (ASV-PV/PV Plus). They are consequently providing balanced hot or chilled water distribution that enables to operate in a wide capacity range. If necessary the flow can be limited by using setting function of ASV-I valves.
- ASV-PV valves can control differential pressure between 0,05 up to 0,25 bar (5-25 kPa). If a higher differential pressure is demanded ASV-PV Plus providing 0,2 up to 0,4 bar (20-40 kPa) can be used.
- ASV valves are to be applied in chilled ceilings systems to control differential pressure in risers or at every chilled ceiling unit. ASV or AVQM valves are also suitable for AHU plants in order to ensure accurate flow rate for each of them.

Automatic balancing using ASV-P/PV/PV Plus

Software for selection and dimensioning

Easy handling and compact design

Reduced noise emissions

Lower balancing labor

Expanding system without rebalance









Excellent control performance

## Danfoss - Total solution supplier



### Variable flow

- There are systems comprised of fan coil units or chilled beams that are situated in various locations within the building and are supplied via a 2-pipe distribution system that is used to supply hot water during the time of year when heating is required and chilled water during times of year when cooling is required. In such cases we recommend ASV-P or ASV-PV valves in order to provide constant required pressure across terminal units. If there is a need the flow can be also limited by using setting function of ASV-I valves.
- Automatic balancing based on ASV-P, ASV-PV or ASV-PV Plus valves ensures system flexibility in situations where demands change from heat to cool on daily or hourly basis or where parts of the system may require heating whilst other parts require cooling. Independent on season of the year and individual demands of human being, the automatic balancing combines people's comfort and energy efficient system operation.

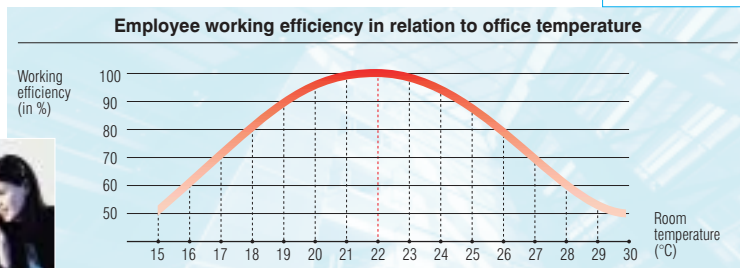
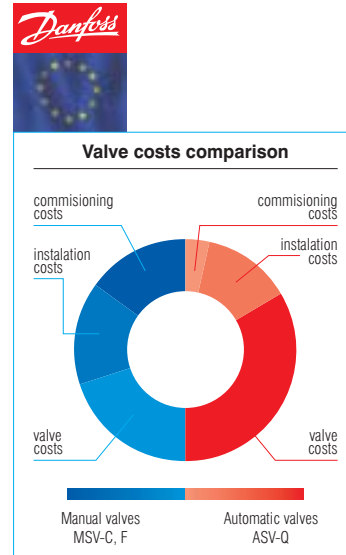
Type	Product	Parameters							$\Delta p$ [kPa]	Functions
ASV-P		DN	15	20	25	32	40	50	10 kPa	<ul style="list-style-type: none"> <li>• Differential pressure control</li> <li>• Fixed <math>\Delta p</math> value • Drain cock</li> <li>• Shut off function • Internal thread</li> </ul>
		Kvs [m <sup>3</sup> /h]	1.6	2.5	4.0	6.3	10.0	-		
		Code No.	003L7621	003L7622	003L7623	003L7624	003L7625	-		
		DN	15	20	25	32	40	50		
ASV-PV		DN	15	20	25	32	40	50	5-25 kPa	<ul style="list-style-type: none"> <li>• Automatic balancing</li> <li>• Adjustable <math>\Delta p</math> value • Drain cock</li> <li>• Shut off function • Internal thread</li> </ul>
		Kvs [m <sup>3</sup> /h]	1.6	2.5	4.0	6.3	10.0	-		
		Code No.	003L7601	003L7602	003L7603	003L7604	003L7605	-		
		DN	15	20	25	32	32	50		
ASV-PV Plus		DN	15	20	25	32	32	50	20-40 kPa	<ul style="list-style-type: none"> <li>• Automatic balancing</li> <li>• Adjustable <math>\Delta p</math> value • Drain cock</li> <li>• Shut off function • Internal thread</li> </ul>
		Kvs [m <sup>3</sup> /h]	1.6	2.5	4.0	6.3	10.0	-		
		Code No.	003L7611	003L7612	003L7613	003L7614	003L7615	-		
		DN	-	-	-	-	50	50		
ASV-PF		DN	-	-	-	-	50	50	20*/ 50** kPa	<ul style="list-style-type: none"> <li>• Automatic balancing</li> <li>• Fixed <math>\Delta p</math> value • Drain cock</li> <li>• Shut off function • Flanged connection</li> </ul>
		Kvs [m <sup>3</sup> /h]	-	-	-	-	20.0	20.0		
		Code No.	-	-	-	-	003L7900*	003L7901**		
		DN	15	20	25	32	40	50		
ASV-I		DN	15	20	25	32	40	50	-	<ul style="list-style-type: none"> <li>• Flow limitation • Flow measuring</li> <li>• Impulse tube connection • Set point lock</li> <li>• Measuring nipples • Internal thread</li> </ul>
		Kvs [m <sup>3</sup> /h]	1.6	2.5	4.0	6.3	10.0	-		
		Code No.	003L7641	003L7642	003L7643	003L7644	003L7645	-		
		DN	15	20	25	32	40	50		
ASV-M		DN	15	20	25	32	40	50	-	<ul style="list-style-type: none"> <li>• Shut off function</li> <li>• Drain cock as accessories</li> <li>• Impulse tube connection • Internal thread</li> </ul>
		Kvs [m <sup>3</sup> /h]	1.6	2.5	4.0	6.3	10.0	-		
		Code No.	003L7691	003L7692	003L7693	003L7694	003L7695	-		
		DN	15	20	25	32	40	50		
USV-M		DN	15	20	25	32	40	50	-	<ul style="list-style-type: none"> <li>• Shut off function</li> <li>• Drain cock • Upgradeable to automatic valve</li> <li>• Internal thread</li> </ul>
		Kvs [m <sup>3</sup> /h]	1.6	2.5	4.0	6.3	10.0	16.0		
		Code No.	003Z2121	003Z2122	003Z2123	003Z2124	003Z2125	003Z2153		
		DN	15	15	20	25	32	50		
AVQM		DN	15	15	20	25	32	50	20 kPa	<ul style="list-style-type: none"> <li>• Motorized control valve • Differential pressure control</li> <li>• Fixed <math>\Delta p</math> value • Actuator controlled via ECL Comfort controller • External thread</li> </ul>
		Kvs [m <sup>3</sup> /h]	1.6	2.5	4.0	6.3	10.0	-		
		Code No.	003H2256	003H2257	003H2258	003H2259	003H2260	-		
		DN	15	15	20	25	32	50		

# Danfoss - experience and technical knowledge

## Action behind the words

Over the past years, changing expectations about the role of business in society has pushed the concept of good working environment into mainstream of business thinking.

There is growing evidence that links the environment people are working in, with positive business performance. The indoor climate is a significant part of it.



Studies by David Wyon  
Statens Institut för Byggnadsforskning, Sweden

## Long term benefits

- Balancing valves are quick and easy in calculation as well as operation.
- Limited need for balancing labor and possibilities to add or subtract coils from the system without rebalancing.
- Reduced overall number of valves within a system requires less maintenance.
- Danfoss automatic balancing valves assure stable and accurate control of water flow thereby improved comfort and value for money that occurs in long term cost analyses

The Danfoss logo, featuring the word "Danfoss" in a stylized red script font.

## Experience and technical knowledge

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Hotel Santa Claus - Rovaniemi (Finland)  
*Heating & cooling installation with ASV valves*



Intertrans - Ljubljana (Slovenia)  
*Cooling system installation with ASV-Q valves*



KBC-Bank - Leuven (Belgium)  
*Chilled air system installation*

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