ENGINEERING
TOMORROW

Hydronic Balancing & Control

The **solutions** are here
The **choice is yours ...**

1114

products to support your business's water-based heating or cooling applications

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Well balanced
and controlled solutions

Hydronic Balancing & Control
If you are dedicated to establish indoor climate solutions that provide optimal air quality, comfortable living and/or work conditions and maximum energy efficiency, then Danfoss is your ideal partner.

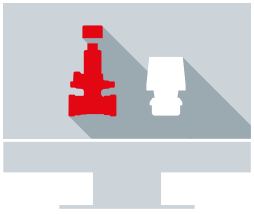
You already know that the most efficient heating or cooling installations can only be realised by ensuring optimal hydronic balance and perfect temperature control. We have many years of experience and a complete range of products in this area. We supply high quality products for innovative, energy saving and easy to use solutions. Our expertise is to create more comfort for less money.

And our expertise is everywhere. Everybody involved from R&D to after sales service are highly skilled professionals offering you knowledge, experience and deep customer and application understanding.

In this brochure we present a basic overview of our many products for different applications. Each has its own special features and benefits to make your daily work easier, faster or better. Find the products you need for your projects and let us help you to become your customer's preferred partner in realizing hydronic balancing solutions.

3 reasons for choosing
Danfoss as your Hydronic Balancing & Control partner:

- **Benefit from a complete product range**
- **Gain knowledge from our highly skilled professionals**
- **Feel confident about our products, support and service**



Learn more about our products at our website:

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Manual
balancing valves

Manual balancing valves provide a static, basic balancing solution for many applications. The valves limit the flow through different parts in heating, cooling and domestic hot water systems. Since manual balancing valves can not react to changing conditions the valves are recommended to be used in constant flow systems.

LENO™ MSV-BD / MSV-B / MSV-O

Danfoss LENO™ range offers the latest technology in manual balancing. To save costs for often used shut-off valves the MSV-BD, MSV-B and MSV-O valves combine both a balancing and shut-off function. For that purpose the principle design is based on a ball valve, making sure the shut-off offers 100% watertight closure of the system. Using the shut-off ball valve, which has a red/white colored closed/open indication, will not influence the settings.

Furthermore the hand wheel can temporarily be removed for easier installation in narrow spaces. The numeric presetting indications can be viewed from different angles making the commissioning easier as well. All three types of LENO™ valves offer built-in measuring nipples for 3 mm needles. In case of the MSV-BD these can even be rotated over 360° to any preferred position. The MSV-O has a fixed venturi orifice.

LENO™ MSV-S

MSV-S is a manual shut-off partner valve in the LENO™ range which can be used to close the system's return pipe in case the balancing valve is mounted in the supply pipe. It uses the same high quality ball valve and offers a high capacity drain.

MSV-F2

The MSV-F2 has a range from size DN15 up to DN 400. The flanges are according to international standards. The valves have a position indicator, a stroke limiter and the settings can be locked.

Type	MSV-BD	MSV-B	MSV-O	MSV-S	MSV-F2
Function	Balancing Shut-off	Balancing Shut-off	Balancing Shut-off	Shut-off	Balancing
Version	Thread	Thread	Thread	Thread	Flange
DN range	15 – 50	15 –50	15-50	15 –50	15 - 400
PN	20	20	20	20	16/25
Integrated ball valve	Yes	Yes	Yes	Yes	No
Measuring nipples	Rotating	Fixed	Fixed	No	Fixed
Drain tap	Yes	No	No	Yes	No

Automatic
balancing valves

Automatic balancing valves provide a dynamic solution for balancing of two-pipe heating systems in multi-family buildings. They are the best solution for both new build or renovation of existing systems with radiators or floor heating.

The hydronic balance is optimized under all possible loads by controlling the differential pressure. Commissioning efforts are minimum and the result is a reliable heating system with improved indoor temperature control, significant energy savings and low noise emission.

ASV & partner valves

Return pipe mounted differential pressure controllers are available with fixed setting of 10 kPa (ASV-P) or adjustable setting (ASV-PV). In case of ASV-PV the setting is simply adjusted by turning the setting scale. ASV-PV differential pressure controllers are available with different setting ranges to match any application. For high volume systems also flanged versions ASV-PV are available.

Supply pipe mounted shut-off partner valves are used to measure the differential pressure by an impulse tube connected to both valves. ASV-P and ASV-PV can be connected to ASV-M, ASV-I or ASV-BD partner valves. Flanged ASV-PV can be connected to MSV-F2 partner valves. Some partner valves can also be used for manual limitation of the maximum system flow.

Type	ASV-PV	ASV-P	ASV-M/I/BD	MSV-F2
Function	ΔP control	ΔP control	Shut-off	Shut-off
Version	Thread / Flange	Thread	Thread	Flange
DN range	15 – 100	15 – 40	15 – 50	15 – 400
ΔP Setting	• 5 – 25 kPa • 20 – 60 kPa • 20 – 80 kPa • 60 – 100 kPa	10 kPa	--	--

AB-PM

This compact differential pressure controller automatically balances the system and also offers other functionalities such as flow limitation and zone control. The valve is the best option for heating systems with manifolds for either radiator or floor heating in each apartment. The AB-PM is installed in the flow pipe and is connected to the return pipe with either an impulse tube adapter or a partner valve.

Type	AB-PM	AB-PM HP	MSV-S	TWA-Z / ABN A5
Function	• ΔP control • Flow limitation • Zone control	• ΔP control • Flow limitation • Zone control	• Shut-off • Impulse tube connection	• Thermal on/off control
Version	Thread	Thread	Thread	24 V / 230 V
DN range	15 – 25	15 – 25	15 – 25	--
Settings	300 – 1200 l/h at ΔP = 10 kPa	300 – 1200 l/h at ΔP = 20 kPa	Open – closed	--

Pressure independent balancing and control valves & changeover valves

Pressure Independent Balancing and Control Valves (PIBCV) represent the latest development in balancing and control solutions. Successfully introduced to the market by Danfoss, this has become a standard in most heating and cooling systems by offering the lowest possible 'Total Cost of Ownership'. Combining the control function, pressure independency and flow limitation in one valve saves in purchasing individual valves and reduces valuable time. PIBCV are designed to control and balance bigger sized systems in public and commercial buildings.

AB-QM – Threaded versions

Danfoss AB-QM is a control valve with automatic flow limitation and built-in differential pressure control functioning over the control valve. The result of this concept is a small sized high performing control valve with a unique valve authority of 100%. The design flow can easily be set to the needed amount by using a 20-100% scale. Simply setting the design flow replaces traditional commissioning processes, gives a much more accurate control and avoids Kv calculations for system designers. PIBCV's increase the energy efficiency and indoor climate. The AB-QM with thread connections can be used for climate ceilings, fan-coil units and other HVAC systems.

AB-QM – Flanged versions

The AB-QM with flange connections extend the range of automatic balancing and control for volumes up to 442,000 liters per hour by one single valve. The biggest sized AB-QM valves can be used for large air-handling units to ensure maximum energy efficiency and lowest possible operational costs.

ChangeOver[6]

In many HVAC systems a Danfoss AB-QM valve is used for heating as well as for cooling control. In addition such 4-pipe system requires on/off valves to prevent mixing of heated and cooled water circuits. All in all there's 4 valves and actuators used. With Danfoss Changeover[6] there's only a need for one control valve as the Changeover valve is used to separate the circuits as well as control the heating <> cooling changeover. The valve is equipped with a on/off gear actuator and allows either heated or cooled water into e.g. the fan-coil unit.

Type	AB-QM thread	AB-QM flange	ChangeOver6
Function	• Control valve • Flow limitation • Balancing	• Control valve • Flow limitation • Balancing	• Separate heating and cooling circuits • Control of heating <> cooling operation
DN range	10 – 50	50 – 250	15 - 20
Flow range	30 – 12,500 l/h	5,000 – 442,000 l/h	DN 15 – Kvs 2.4 DN 20 – Kvs 3.8

Actuators for pressure independent balancing and control valves

In systems without actuators, AB-QM functions as an automatic flow limiter. To take advantage of its unique combined balancing and control features, the AB-QM has to be equipped with an actuator controlled by a room thermostat or Building Management System (BMS). The best results in indoor climate control are achieved by using the best possible actuators. The faster and more accurate the actuator responds to the control signal, the better the result.

NovoCon®

AB-QM changed the way HVAC systems are hydronic balanced and controlled within a decade. The new and highly innovative NovoCon® digital actuator is expected to change the way how hydronic balancing is connected to Building Management Systems and become another new standard even faster.

Where traditional analog controlled actuators, at best, offer an analog control signal and an analog feedback signal, this information is tiny in comparison to the amount of information NovoCon gives to the Building Management System via BACnet or Modbus e.g. alarms, settings, temperatures etc.

A series of NovoCon® actuators can be wired for both power supply and communication purpose in a daisy chain, simply combined in the same plug-in cable, saving significant lengths of cable as well as installation time.

The design flow through every valve can be remotely changed at any time without the need to open ceilings. The actuator offers I/O's for added functionality, flexibility and cost savings. A few examples of the possibilities using the actuator's I/O's are:

- flow & energy indication by connecting sensors for return and supply temperature measurement
- connectivity for 4-pipe changeover applications with NovoCon® ChangeOver[6]
- to connect different sensors (e.g. room temperature, humidity, or condensation) and control different devices such as fan speed control.)

NovoCon® is an essential device in the transition to smart connected buildings with continuous monitoring, energy management and preventive maintenance at highest comfort level and lowest operating costs.

Type	NovoCon® S
Function	• Digital control • Bus communication • Flow indication • Data logging
Version	Gear
Control signal	• BACnet • Modbus • 0-10V / 4-20 mA
AB-QM range	DN 10 - 32

AME & AMV

To achieve best control performance with analog control signals gear actuators should be used. These actuators control the position of the valve opening in a very accurate way.

AME gear actuators are controlled by 0-10V or 4-20mA signal, while AMV actuators are controlled by 3-point signal (open/neutral/close). To achieve maximum control performance geared actuators for AB-QM are equipped with automatic valve stroke detection.

TWA, ABN & ABNM

Thermal actuators provide a cost efficient solution to control temperature via AB-QM balancing and control valves. The basic principle of these actuators is based on thermal expansion of a wax element. TWA-Z and ABN A5 actuators are controlled by an On/Off signal of a temperature controller, either heating the wax or not. ABNM A5 actuators are controlled by a 0-10 Volt modulating signal of a temperature controller. The 0-10 V signal allows more accurate control possibilities.

QT

For some applications the AB-QM can be controlled by a thermostatic actuator as well. An external surface temperature sensor determines whether the AB-QM needs to be opened or closed based on the set and measured temperature. This is e.g. valid to combine flow limitation and return pipe flow temperature control in one-pipe heating systems which AB-QM + QT convert into variable flow systems, delivering excellent reliability with significant energy savings.

Type	AME/V	TWA-Z / ABN A5	ABNM A5	QT
Function	Modulating control	On/Off control	Modulating control	Temperature control
Version	Gear	Thermal	Thermal	Thermostatic
Control signal	3-point 0-10V / 4-20 mA	On/Off	0-10 V	--
AB-QM range	DN 10 – 250	DN 10 – 32	DN 10 – 32	DN 10 – 32

Measuring orifices and **measuring equipment**

Where there is hydronic balancing, there is a need for measuring. To establish an optimized energy efficient heating or cooling system the flows and pressures in a system need to be designed. For systems balanced with manual balancing valves the commissioning process is fully based on measuring, adapting settings and re-measuring of the balancing valves. For systems with automatic balancing valves measuring is often only required to make a system report or perform random test measuring.

Measuring orifices

For big flow pipe systems Danfoss offers stand alone measuring orifices. These are used to determine the flow by measuring the differential pressure across a fixed orifice with a fixed Kv value. Via a measuring device the measured differential pressure and used Kv value are calculated into a measured flow.

Measuring equipment

PFM 5001 measures the differential pressure between both sides of a valve. Flow and pressure can be displayed in various units. This equipment is for professionals looking for highly accurate and detailed information in any language. The device consists of a pressure sensor and a special Danfoss smartphone app. Projects can be calculated on-site just by using the smartphone and data can easily be transferred to a PC to prepare thorough measuring reports. The universal PFM 5001 contains data of all well-known balancing valve manufacturers.

PFM 100 is a handheld solution for professionals needing accurate measuring results of the flow. Flow and pressure can be displayed in various units and it is possible to select one of the ten available languages, it is easy to operate and can be used for all well-known balancing valves.

MSV LENO™ Balancing App. This App, available for Apple and Android smartphones and tablets, can be used to verify the flow through Danfoss manual balancing valves (MSV- series) and Automatic Balancing partner valves (ASV- series).

Type	Orifices	PFM 5001	PFM 100	LENO™ App
Function	Measuring point	Measuring	Measuring	Verifying
Version	DN 50 – DN 400	Smartphone sensor (wireless)	Handheld sensor (wireless)	Smartphone App

Hot water
and mixing valves

Not only heating and cooling systems should be balanced. Energy savings and safety increases can be achieved by balancing domestic hot water systems.
In these systems the best performance is realized by using temperature operated automatic balancing valves. Thanks to the stable water temperature and constant availability of it, the end user's comfort increases significantly.

MTCV

Danfoss MTCV are Multifunctional Thermostatic Circulation Valves that are used in domestic hot water circulation systems. They provide a thermal balance by maintaining a constant temperature in all parts of the system. At the same time this provides a safe solution to help prevent the dangerous Legionella bacteria to multiply and become a danger to public health. The solution is therefore often used in buildings for health care, such as hospitals and retirement pensions.

For extra safety the MTCV balancing valve can optionally be equipped with a disinfection module. This self acting or electronically controlled process allows a temporary increase of the water temperature.

TVM-H & TVM-W

In some heating or domestic hot water systems a temperature controlled mixing valve can be a simple solution to maintain a constant temperature in a system. These thermostatic controlled mixing valves provide a constant water temperature at the outlet port. The desired outlet temperature can be set between 30 °C – 70 °C.

TVM-H is designed for heating applications and can be used to establish a constant temperature for floor heating systems. It can be used for single outlets such as a bath or shower, or small numbers of grouped outlets. TVM-W is mainly for domestic water systems and provides some extra safety features. In case the cold water connection fails the outlet is immediately shut-off to prevent hot water from entering the system. It is a great addition to MTCV valves in systems where there is a risk of water temperatures getting too high.

Type	MTCV	TVM-H	TVM-W
Function	Temperature based balancing	Constant temperature	Constant temperature
Application	Hot water	Heating	Hot water
DN range	DN 15 – 20	DN 20 – 25	DN 20
Temperature range	35°C - 60°C	30 °C – 70 °C	30 °C – 70 °C
Disinfection options	• Thermostatic • Electronic	--	--

Always
a solution

Danfoss has realized projects of all sorts over the entire world. With our local sales companies or agents and we can provide a unique level of experience and knowledge in hydronic balancing solutions. Below you can find a few of the many projects we have realized.

International project references

Grand National Theater - Beijing - China

Project: Grand National Theater
Location: Beijing, China
Application: AB-QM including actuators

The Grand National Theatre is an enormous 180,000 square meter glass and titanium tear-drop-like bubble structure surrounded by water. Danfoss supplied China's top art performance centre with a wide range of products, including 1200 AB-QM's that were installed in a combined heating and cooling system.

Triumph Astana - Astana, Kazakhstan

Project: Triumph Astana
Location: Astana, Kazakhstan
Application: Manual balancing valves

The architectural landmark Triumph Astana contains offices, apartments, a sport centre, a theatre as well as restaurants. Danfoss has supplied manual balancing valves to a 4-pipe heating and cooling system.

Obrucheva Street - Moscow, Russia

Project: Three buildings in Obrucheva Street
Location: Moscow, Russia
Application: Modernization of one-pipe heating systems

In this project thermostatic radiator valves without pre-setting are combined with automatic balancing of return temperature which ensures a pleasant indoor climate, resulting in fewer complaints and increased well-being among the residents.

1 provider

for hydronic balancing and control solutions across the globe

UMKC Student Union Building - Kansas City, USA

Location: Kansas City, USA
Project: UMKC Student Union Building
Application: AB-QM including actuators

The hydronic heating and cooling system in this 110,000 square feet building focuses on energy savings. Danfoss AB-QM pressure independent balancing and control valves were used on all the air-handling unit (AHU's) and Variable Air Volume (VAV) boxes throughout the facility.

Prime Tower - Zurich, Switzerland

Project: Prime Tower
Location: Zurich, Switzerland
Application: AB-QM including actuators

The highest skyscraper in Switzerland is equipped with 6200 AB-QM valves with complementary AMZ motorized control valves to create optimal balance in heating and cooling. Danfoss designed an energy efficient solution with a 4-pipe system including radiant cooling and heating ceilings, manifolds for the pipes and 0-10 volt thermal actuators.

Hospital – Bielsko Biala, Poland

Project: Hospital
Location: Bielsko Biala, Poland
Application: MTCV for domestic hot water system

In Bielsko Biala hospital Danfoss installed MTCV with the CCR module as a part of a modernization process of the domestic hot water system. This improved the hot water circulation and thus also significantly reduced the risk of legionella contamination.

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Danfoss Hydronic Balancing & Control's first point of contact can be found on the internet. At **hbc.danfoss.com** or one of the many local websites you can find a complete toolbox of supporting materials. These tools can help you to make the best product selection for each of your projects. Find the best suitable product with the right dimensions and prepare the right setting to make the job on site as easy as possible.

Literature

Both commercial as technical literature help you to explain our products and solutions to your customers and help you find the best products for your projects. You can find brochures, case stories, technical datasheets and instruction manuals.

Tools

Videos and educational animations help you to understand our products better. Calculation tools and software help you commission on site.

Social media

Besides visiting our websites you can also follow us on social media. At **youtube.com/DanfossHeating** you can find our videos. Just click on 'Hydronic Balancing & Control'.

Or stay up to date by following us on Twitter at **twitter.com/DanfossBalance**

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