

ENGINEERING  
TOMORROW

*Danfoss*

eBook | Danfoss Digital Hydronics™

# Modular hydronic HVAC 4.0 design solutions for highest energy efficiency in smart buildings

Discover the Digital Hydronics solutions that optimize your buildings' energy performance.

Digitalization of HVAC systems opens a world of possibilities. But no building is the same. Danfoss Digital Hydronics offer you a modular solution to cover all your digital HVAC 4.0 design needs.

> **START HERE**



Danfoss Digital Hydronics™

# Danfoss Digital Hydronics™

## Modular Hydronic HVAC 4.0 design solution

### Future-proof HVAC design

Designing HVAC systems changes fast. To prepare our buildings for a green and sustainable future there is a much bigger focus on energy efficiency, maintenance, and the data to monitor the system's performance and condition.

Danfoss is launching a new range of solutions to be prepared for the high demands put on HVAC systems, now and in the future.



Navigate through this e-book by **clicking the different**  **buttons**

### Danfoss Digital Hydronics offers:

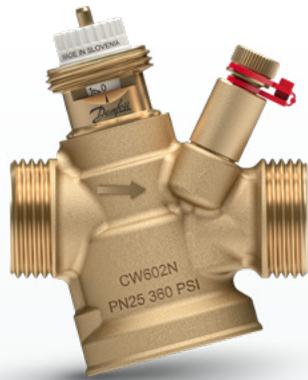
- A modular and upgradeable solution
- Based on PICV technology for best-in-class control accuracy
- Digital to the core with direct BMS connection
- Access to data to ensure optimum energy efficiency and predictive maintenance



# Flawless HVAC design **flexibility**



## PICV



### AB-QM

Pressure independent technology for precise temperature control

[Read more](#) >>



## Actuator



### NovoCon®

Digital IoT actuator for direct BMS connectivity

[Read more](#) >>



## Sensors



### SonoSensor

Flow and temperature sensor integration on one bus connection through NovoCon

[Read more](#) >>

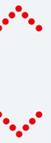
## Support tools



### Digital toolbox

Configuration tool for commissioning multiple devices in the system at once

[Read more](#) >>



# Advantages of **PICV technology**

Danfoss AB-QM has been at the forefront of changing the market to more efficient solutions for balancing and controlling HVAC systems. The concept of combining a control valve and a built-in pressure controller has now been accepted as a standard in most markets worldwide.

The AB-QM PICV combines precise control with great convenience. It is simple to select, effortless to install and straightforward to set.

By combining multiple functions into one valve the AB-QM is also an extremely cost-efficient choice. Through shortening the design process, time saving during the commissioning stage and by efficiency gains during operation it is a financial no-brainer with either negative or extremely short pay-back times.

**In this section of Danfoss Digital Hydronics eBook we will explain:**

- What are the benefits of PICV technology in HVAC applications
- Which challenges are solved by using PICV technology
- The importance of balancing and control in buildings

**Watch the video now**  
Learn about AB-QM 4.0.



**Watch the video now**  
Learn about real PICV.



AB-QM



NovoCon



Sensors



Digital Tool  
Box





## AB-QM - **Pressure independent** control valve



**Challenges** in buildings using traditional control valves in HVAC systems

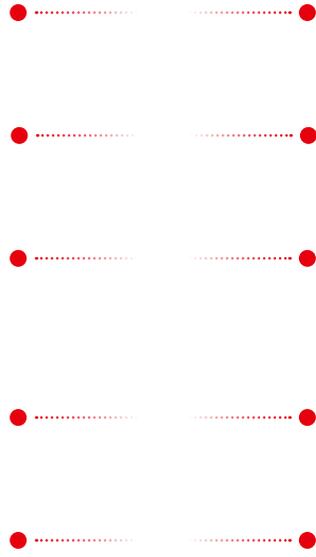
Complex valve sizing and system calculation

Complex hydronic balancing and building start up

Overflows in the system due to opening and closing of valves

Fluctuations in room temperature

Low delta T syndrome



**Benefits** of using pressure independent control valves in HVAC systems



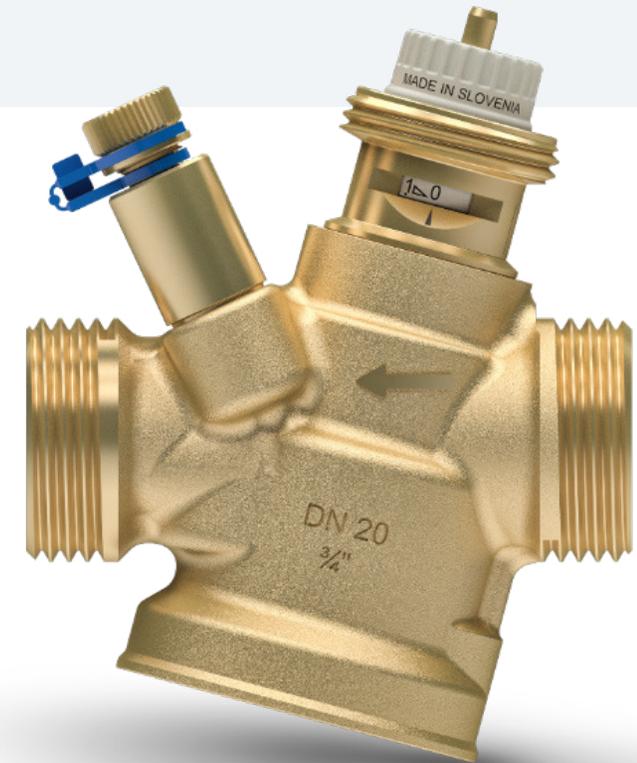
**Easy valve selection according to design flow calculation**

**Integrated balancing and control in one product**

**Dynamic balancing ensures design flows at full- and partial load conditions**

**Precise room temperature control and high delta T**

**Energy efficient building**





# AB-QM – Importance of **balancing and control in buildings**

[Read the white paper now](#) >>>



**Benefits** of using AB-QM in buildings during operation

- Heating and cooling our buildings accounts for about 30% of the final energy consumption in the EU, over 70% of which comes from fossil fuels.
- The optimization of heating, ventilation and air conditioning (HVAC) systems in buildings requires more than simply improving the efficiency of the heating or cooling generation equipment (e.g. heat pumps, boilers, chillers).
- **It is also vital to look at how heating and cooling is distributed from the central generator to points of end use.**
- EU legislation, including the Energy Performance of Buildings Directive (EPBD) and Ecodesign, has put forward important provisions to optimize technical building systems. But these **have not yet fully addressed market failures** and therefore **the potential of hydronic balancing remains largely unrealized.**



# Advantages of digital actuators

The NovoCon® digital IoT actuators are tailor made to fit Danfoss AB-QM Pressure Independent balancing and Control Valves from DN 15 to DN 250. They establish the perfect connection between superior hydronic HVAC system performance and smart building automation solutions.

Due to its accuracy, remote functionality and flow indication features, this product facilitates accelerates the commissioning process, allows easy and predictive maintenance, improves indoor comfort and increases energy savings.

## In this section of Danfoss Digital Hydraulics eBook we will explain:

- What are the benefits of digital actuators
- What are the challenges in commercial buildings today
- What are the key benefits of digital hydraulics compared to other control technologies as used in HVAC applications
- The importance of control accuracy in AHU applications

**Watch the video now**  
about NovoCon® and AB-QM  
used in the I-tower at WTC  
Amsterdam, the Netherlands.



AB-QM



NovoCon



Sensors



Digital Tool  
Box





# NovoCon® – Digital actuator



**Challenges** in buildings using traditional actuators in HVAC systems

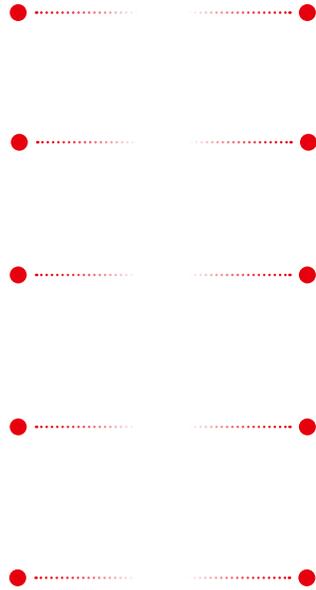
Manual commissioning of the valves according to the design flow

Late design changes or calculation mistakes can result in complaints

No access after the ceiling is closed in case of trouble shooting

Complicated integration into the BMS (wiring)

Limited transparency of energy usage in a building



**Benefits** of using NovoCon® digital IoT actuators in HVAC systems



**Remote mass upload of designed flows via configuration tool / BMS (up to 64 actuators / valves at once)**

**Setting and correction of the flow can be done centrally from the BMS / Computer**

**Flushing and purging of the system centrally from BMS / Computer (all at once, one floor at a time, one valve at a time)**

**Use of standard BACnet or ModBus bus-communication and pre-fabricated cables for easy BMS integration**

**Full transparency of energy consumption in the building for heating / cooling using AB-QM and NovoCon**





# NovoCon® – Digital actuators in **AHU application**

[Read the white paper now](#) 



**Benefits** of using Danfoss Digital Hydronics in an AHU application compared to other control technologies

● We tend to stick with what we know that works. But, sometimes, new technology comes on the market that forces us to rethink our set ways of doing things.

● In this paper we're discussing how 3 different technologies perform in AHU temperature control. We have compared 3-way valve performance with a more modern solution as PICV and the electronically controlled valve, which is a new solution that is offered by several companies.

● The air handling unit has a standard set up, with a cooling coil, a heating coil and a crossflow heat recovery unit to recover energy from the exhaust air before it is expelled outside. The control is trying to maintain a stable supply air temperature.

● From the measurements performed, it is clear the different solutions generate different results, especially when we're looking at control accuracy and stability. It is interesting to determine what causes those differences. Read more about it.



# Advantages of **sensors** in **HVAC 4.0 systems**

Data can be transformed into useful information. Information about how much energy you're using, where you are maybe wasting energy and what is the status of maintenance in your system.

To collect data you need to add sensors that link into your Building Management System. Temperature- and flow sensors can give valuable insights in energy consumption and can be used to spot problems with inefficiencies in the energy transfer process. In some buildings it can also be used for a fair allocation of energy costs.

Temperature and flow sensors can directly be connected to the NovoCon actuator giving you highly precise and valuable insights in the functioning of your HVAC system.

## In this section of Danfoss Digital Hydraulics eBook we will explain:

- How to easy integrate flow and temperature sensors in the Building Management System using Danfoss digital actuators
- What are the benefits of using flow and temperature sensors in hydronic HVAC systems

[Read the fact sheet now](#)



AB-QM



NovoCon



Sensors



Digital Tool  
Box





## Sensors – **flow and temperature sensors**



**Challenges** in buildings using traditional technology in HVAC systems

Limited transparency regarding the energy efficiency of a building

Limited visibility of maintenance cost during the building's lifetime

Limited information on poor system performance of room temperature control

Complex integration of different sensors in the Building Management System

**Benefits** of using flow and temperature sensors in HVAC systems

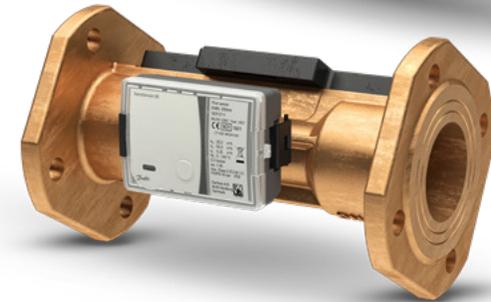


**Advanced transparency of energy flows in a building per terminal unit and air handling unit.**

**Predictive maintenance data and transparency (lifetime, total operating hours, etc.)**

**Easy identification of energy waste in building, enabling benchmark per user.**

**MID certified volume and temperature sensors directly connected to the Building Management System**



# Digital toolbox

Modern HVAC systems contain a bewildering number of components that all need to be sized, selected, installed and commissioned.

Danfoss reduces the complexity by supplying an extensive toolbox to help you select the right products, make the right combinations and facilitate easy commissioning for up to 64 actuators at the same time.

In this section of Danfoss Digital Hydronics eBook **we will explain:**

- How to use Danfoss configuration tool for fast and reliable commissioning of AB-QM / NovoCon
- How to select the right AB-QM, NovoCon, SonoSensor combination



[Download the Software now](#)



AB-QM



NovoCon



Sensors



Digital Tool Box





# Danfoss Digital Toolbox – **Configuration tool**



**Challenges** in buildings using traditional technology in HVAC systems



**Benefits** of using the configuration tool during commissioning

Diagnostic possible only after BMS is online and fully commissioned

Commissioning of only one valve at a time

Trial and error attempts to identify errors are inconvenient and time consuming

Time consuming valve/actuator selection

Time consuming setup to connect with different software tools

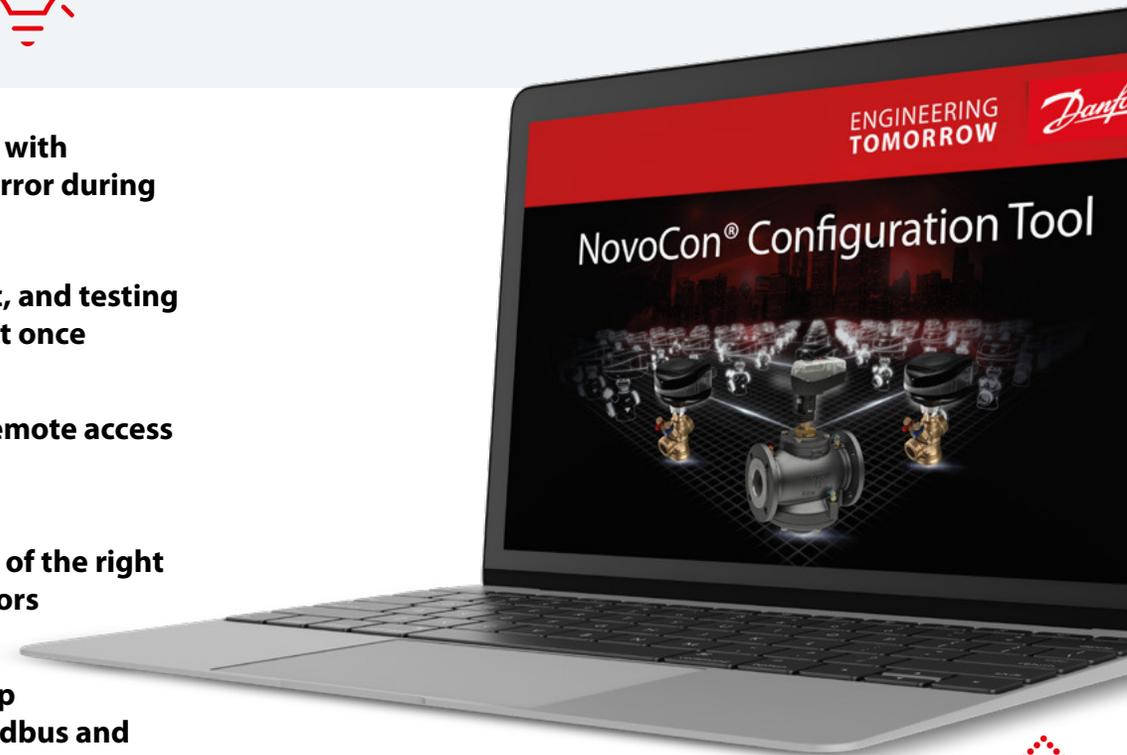
**Fast identification of faults with alarms (no control signal, error during closing, low delta T)**

**Commissioning, diagnostic, and testing on site, of up to 64 valves at once**

**Troubleshooting tool for remote access and analysis**

**Fast and accurate selection of the right AB-QM, NovoCon and sensors**

**Free downloadable desktop application supporting Modbus and BACnet bus-communication protocols**



## AB-QM

Pressure independent system ensures perfect temperature control in both full and partial load conditions

[Read the data sheet now](#)



## NovoCon®

Remote access with digital IoT actuators to all AB-QMs, at all times

[Read the data sheet now](#)



# Danfoss Digital Hydronics

## SonoSensor (optional)

Full range of MID certified from DN 15 to DN 250 ultrasonic flow and temperature sensors

[Read the data sheet now](#)



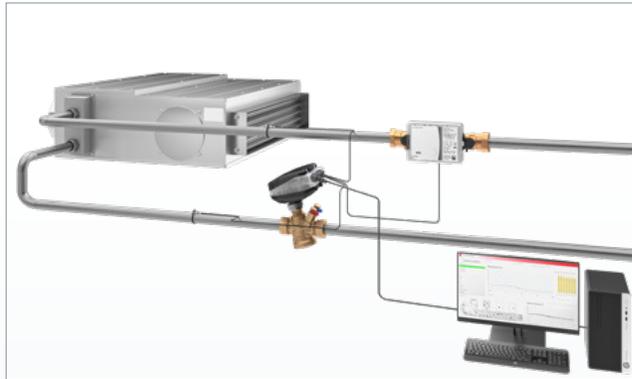
## Digital tool box

Fast and simple configuration and commissioning of hydronic HVAC 4.0 systems

[Download the Software now](#)



# Scalable for all hydronic HVAC applications

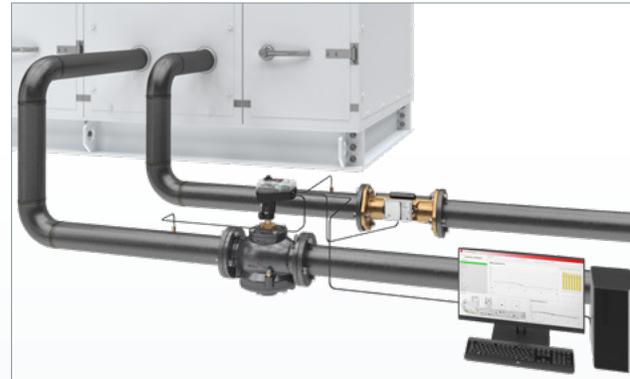


## **S-combination** in DN 15-32

as for example used for:

- Fan Coil Units (FCU)
- Radiant panels
- Chilled beams

with nominal design flows from 20 - 4,400 l/h



## **M-combination** in DN 40-100

as for example used for:

- Air Handling Units (AHU)
- Heat Exchangers
- Computer Room Air Conditioning (CRAC)

with nominal design flows from 3,000 - 59,000 l/h



## **L- and XL-combinations** in DN 125-250

as for example used for:

- Chillers
- District cooling connections
- Commercial heat pumps

with nominal design flows from 36,000 - 407,000 l/h



# Engineering HVAC 4.0 for smart buildings

As studies by the International Energy Agency (IEA) show 30% of the global energy consumption is caused by HVAC and lighting of buildings.

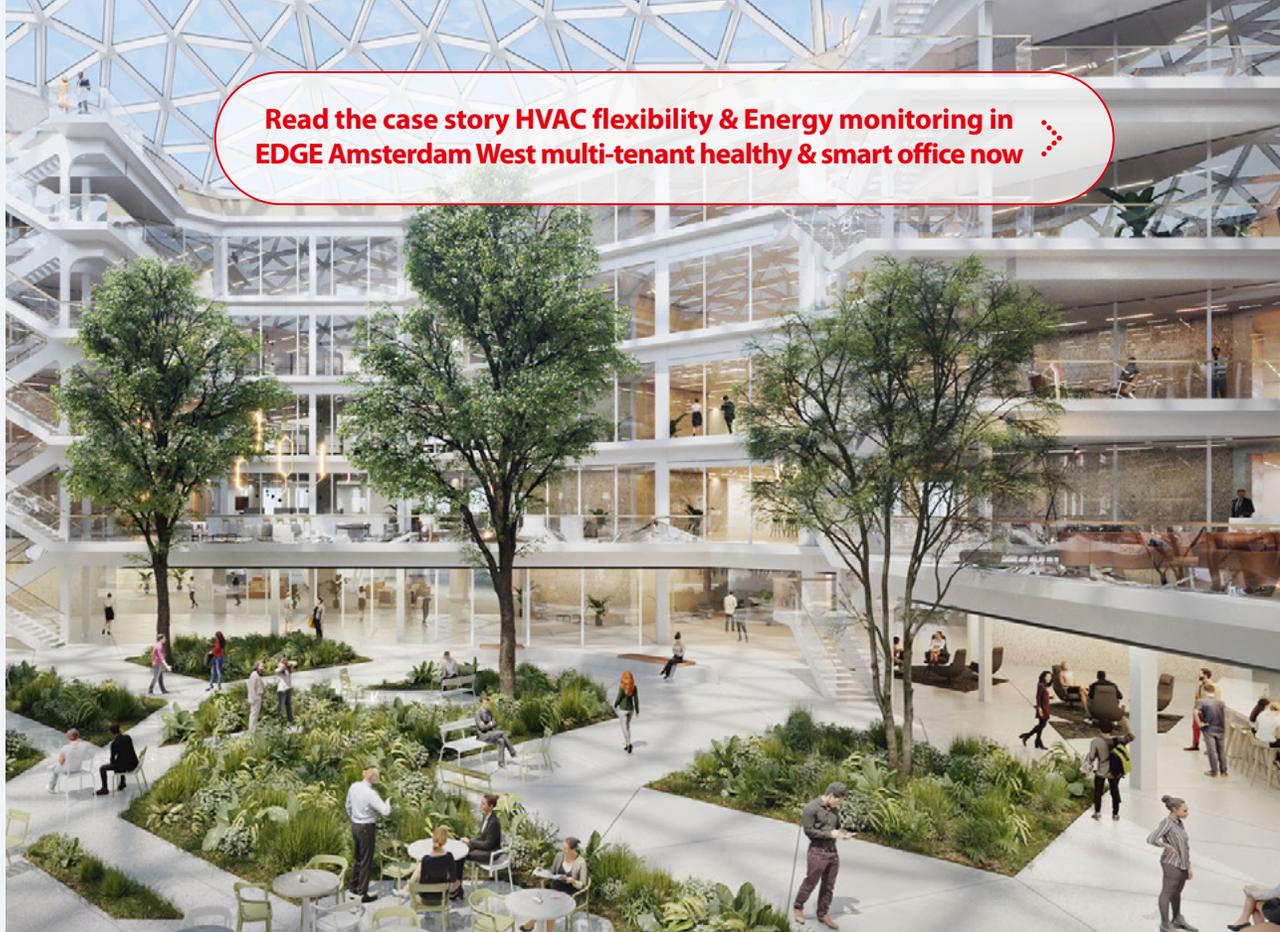
To make buildings more energy efficient and comfortable for its occupants we need to use smart technologies.

Danfoss Digital Hydronics™ is the most innovative solution to digitalize and optimize HVAC systems and is a good example of what we call HVAC 4.0

The digital actuators provide the Building Management System (BMS) with real-time performance data. Optionally expanded with actual flow and temperature measurement. By continuously analyzing the data and remotely adapting the HVAC system to perform better, we help reduce the global energy consumption.

**For a better tomorrow already today.**

Read more on [hvac40.danfoss.com](https://hvac40.danfoss.com)



Read the case story HVAC flexibility & Energy monitoring in  
EDGE Amsterdam West multi-tenant healthy & smart office now