ENGINEERING TOMORROW

# Danfoss HVAC solutions for Commercial Buildings

Greg Langridge – Key Account Manager

# Danfoss who are we?

Worldwide sales in over

100

countries.

Three strong business segments with a leading position in the market.

Power Solutions

Climate Solutions

Power Electronics and Drives

A leading technology partner for our customers who want to decarbonise their business through energy efficiency, productivity, low emissions and electrification.

+42,000

Employees worldwide. People are the foundation of our business.

On track to be carbon neutral by 2030.

97

production units in more than 20 countries.

1933

Long experience in innovation and engineering.

# Decarbonising Commercial Buildings with Danfoss

Hotels, offices, supermarkets and other public spaces, must adapt to market needs and changing regulations. Danfoss helps you save energy, cut emissions and reduce costs on all aspects of the HVAC system.

Only 20% of a building's lifetime costs occur during the design and construction phase, the other 80% is spent on operational expenses, like heating, cooling and maintaining the building. This underscores the vital need to be thoughtful about the systems we design and build.

Building with a low carbon footprint and a short return on investment needs partners with expertise that can support that ambition. Our dedication to driving green solutions ensures you can build integrated, connected, and energy-efficient buildings.

# By addressing sustainability challenges, buildings can become more climate friendly while improving their profitability

## 1 Improve energy efficiency

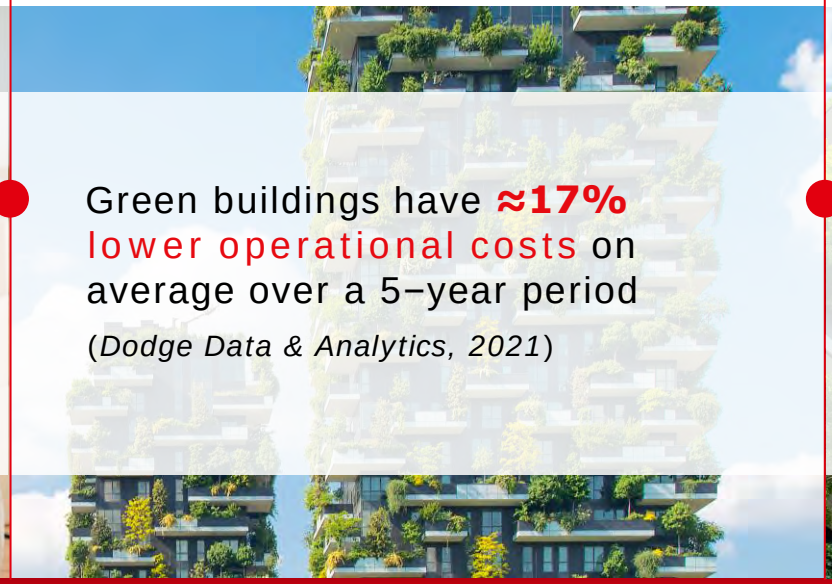
Energy-efficient buildings are more sustainable as less energy is needed. It also saves on the energy bill and can offer a better indoor environment, which tenants are willing to pay a premium for

Energy efficiency improvements lead to 2-5% higher rental rates in commercial buildings on average

(*Publications Office of the European Union, 2018*)

## 2 Reduce carbon emissions

Reducing the carbon emission of a building across its entire lifetime can have a big sustainability impact, while also reducing operating cost



Green buildings have **≈17%** lower operational costs on average over a 5–year period

(*Dodge Data & Analytics, 2021*)

## 3 Comply with green building standards

Complying to green building standards can reduce legal and financial risks and demonstrate commitment to environmental responsibility

Proactive approach to compliance can save legal costs

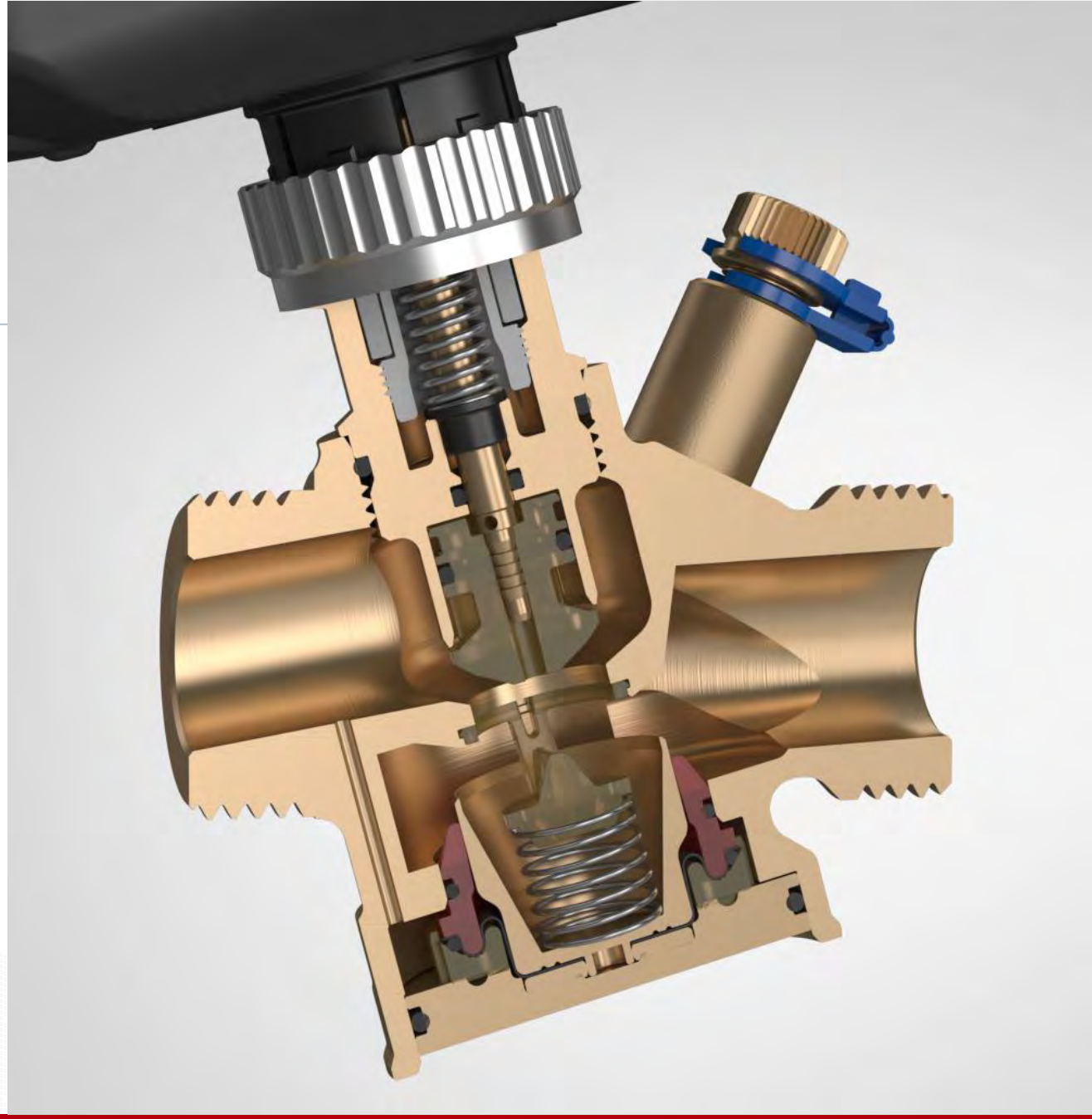
# What is the AB-QM?

The AB-QM is a Pressure Independent Control Valve (PICV):

- Control valve
- Differential pressure controler

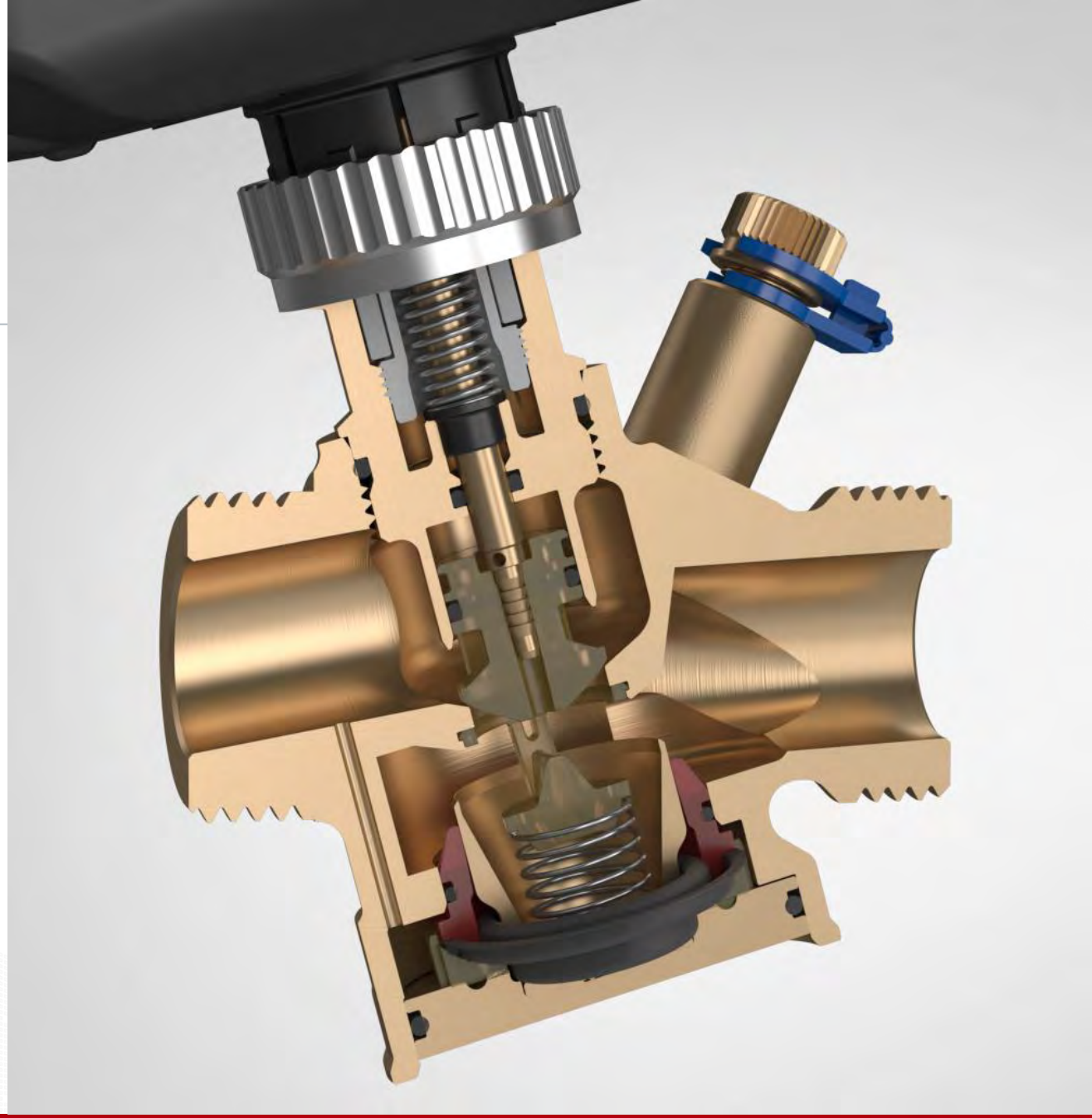
# Control valve

- Allows more or less flow through the valve depending on the position of the actuator



# Differential pressure controller

- Absorbs pressure fluctuations caused by opening and closing of other valves
- Keeps dp across CV stable



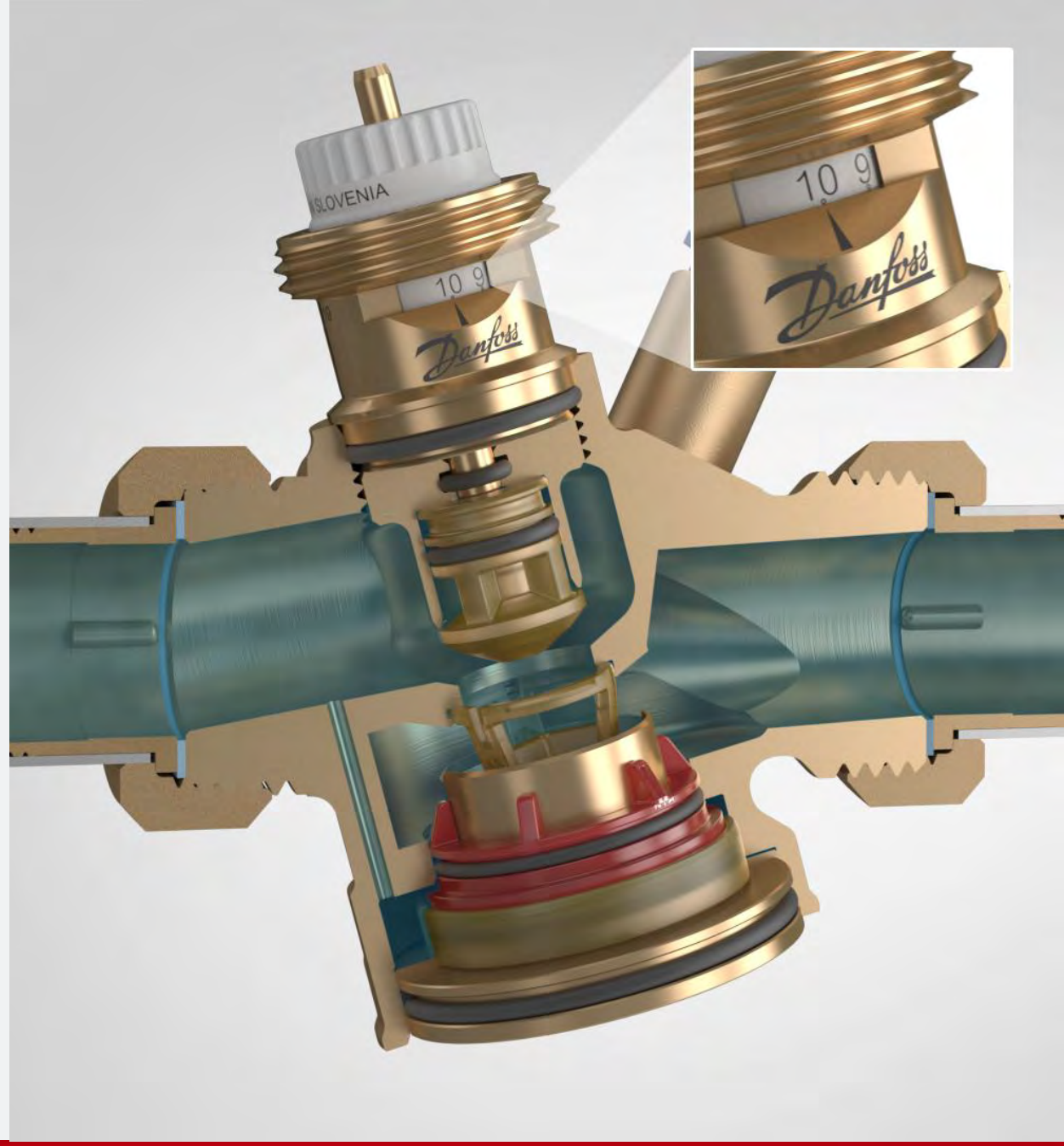
# AB-QM Setting

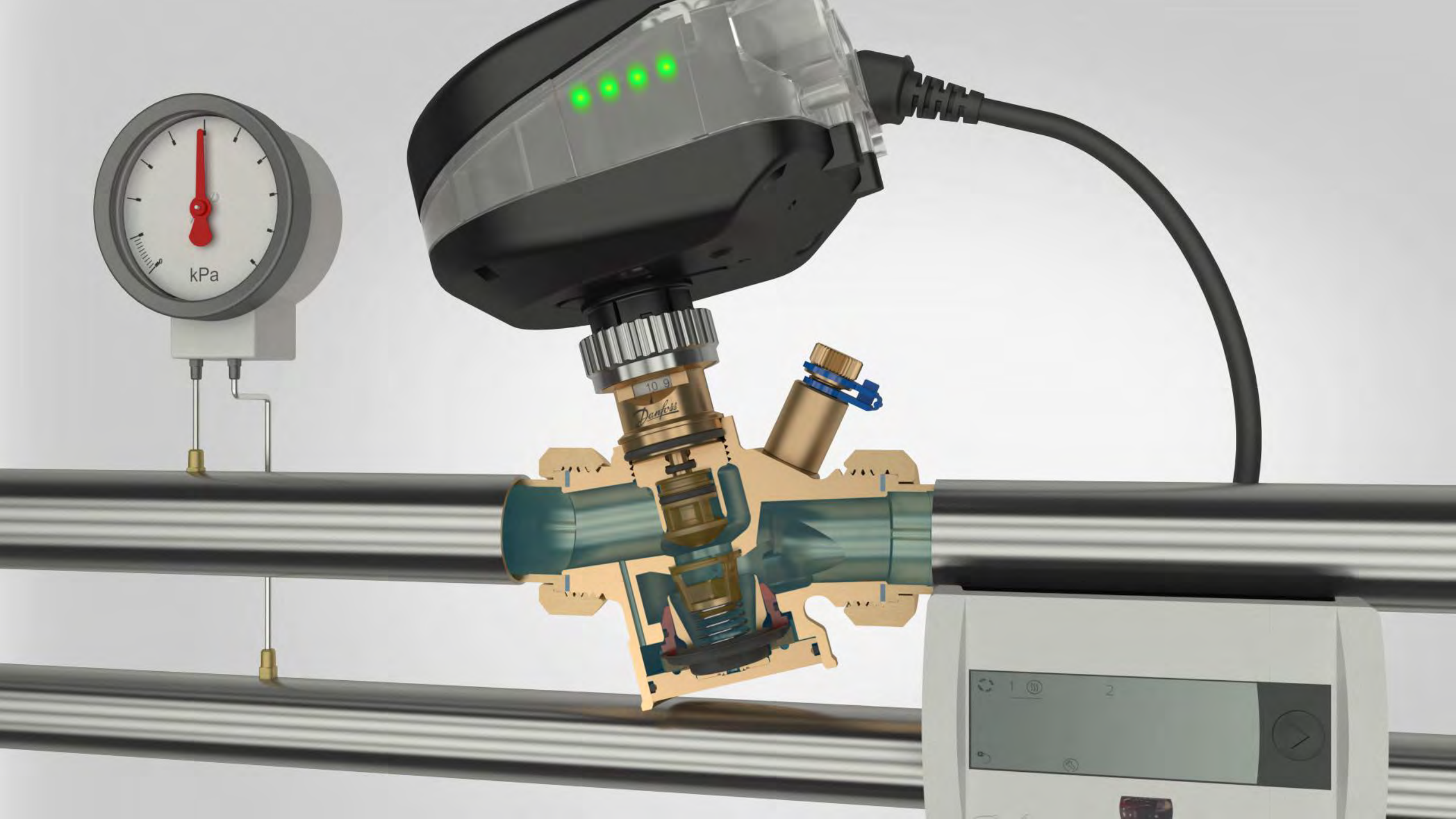
- The design flow is set as a % of the valve's nominal flow
- The minimum flow is 10% of the maximum flow
- The pre-setting remains

  visible when an actuator is mounted

# AB-QM Setting

- Stroke limitation principle




kPa
10 9
Danfoss
1
2

# AB-QM benefits

- Simplicity
- Less components / installation time
- Less energy consumption
  - pumping
  - ΔT to chiller / heat pump
  - Temperature setting
- Less complaints
- **Digital values**
  - Value proposition with digital actuators
  - Include DDH
  - Include DSC

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# Advantages of Digital hydronic HVAC systems - introducing HVAC for smart buildings

# Important HVAC aspects in Commercial Buildings

- **Energy Efficiency**

  **Reducing carbon footprint** and complying to building regulations (EU, local, etc.)

- **Comfort and health**

  Demand for **safety** and **remote access** at all times

- **Fast installation and start up**

  **Helping** the **Installers/SI/Contractors** to reduce installation time and hand over

- **Cost optimisation and Return on investment**

  Running the Building at its **most efficient**

# DDH Portfolio

## AB-QM

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

Read more


## NovoCon

Digital IoT actuators for direct BMS connectivity, energy management features and remote access to all AB-QM's at all times

Read more

**Danfoss Digital Hydronics**

## Sensors

Full transparency of energy consumption in the building for heating / cooling with integrated flow and temperature sensors

Read more


## Support tools

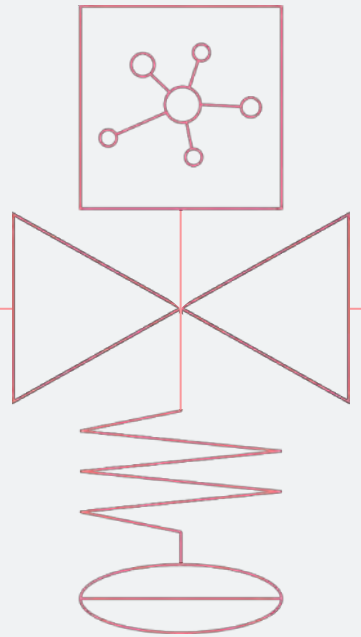
NovoCon Configuration tool for fast commissioning of multiple devices on the network and selection/conversion tool

Read more

# NovoCon® S, M, L digital actuators for all hydronic HVAC applications

# Solution for Energy efficient building – Danfoss Digital Hydronics

Technical specification



## Accurate flow control

- Linear characteristic at different differential pressures for accurate flow setting
- Equal percentage characteristic for linear system response
- Best in class flow measurement accuracy with MID flow sensor as option
- Possibility to measure energy / power (MID)

## Bus Actuator

- BACnet MS/TP and Modbus RTU communication protocols
- Auto baud rate detection
- Auto MAC addressing
- Bi-directional communication to BMS system
- Operation status reporting

## I/O device

- Analog output
- 1x AO (0-10V)
- Analog inputs
- 2 or 3x ΩI (°C/°F/ Ω), Pt1000, NTC 10k t2, NTC 10k t3
- 1x AI (V/mA)

## Energy manager

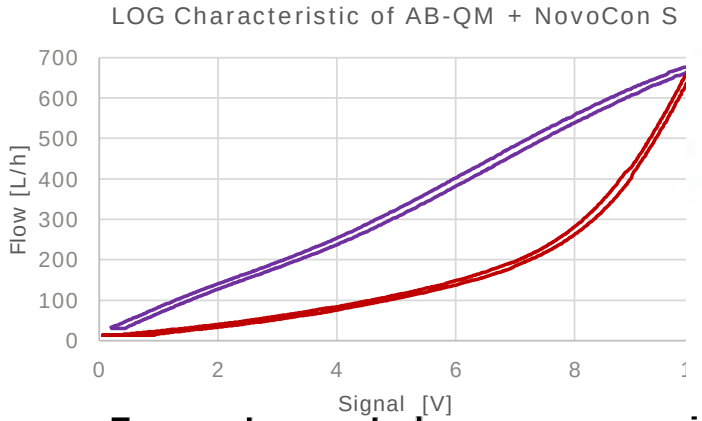
- Advanced algorithms for energy management
- Possibility for continuous commissioning
- Integrated PID controller

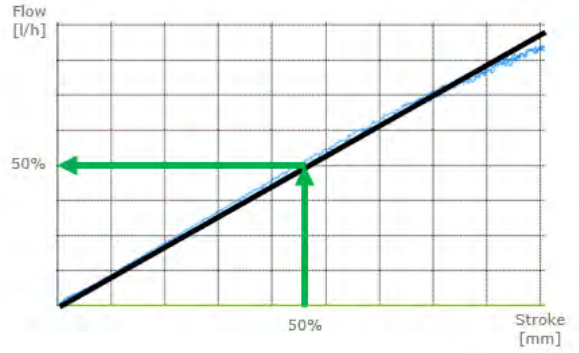
# Solution for Energy efficient building – Danfoss Digital hydronics

Technical specification

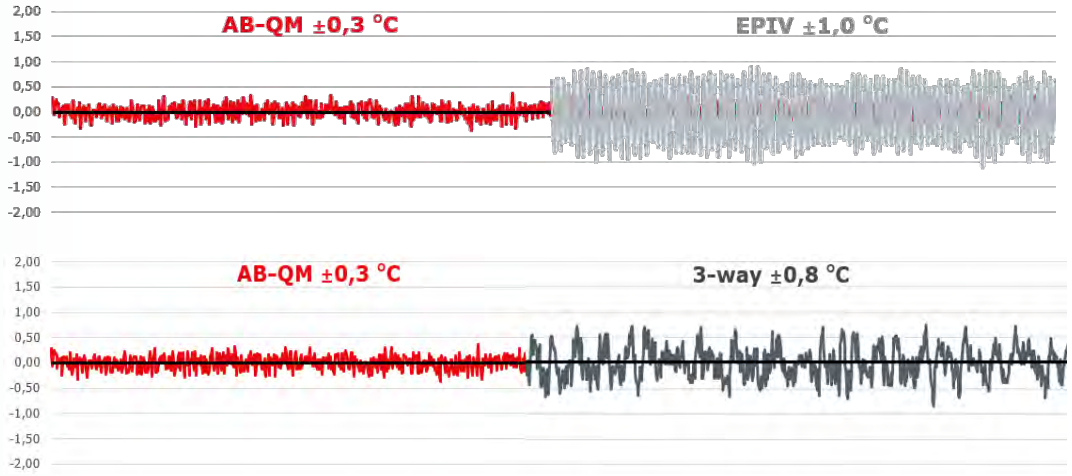
## Accurate flow control

- Linear characteristic at different differential pressures and loads for accurate flow setting
- Equal percentage characteristic for best room temperature control
- Accurate flow measurement with MID flow sensor as option
- The first integrated MID certified flow sensor
- Best in class temperature control accuracy despite pressure fluctuations in the system



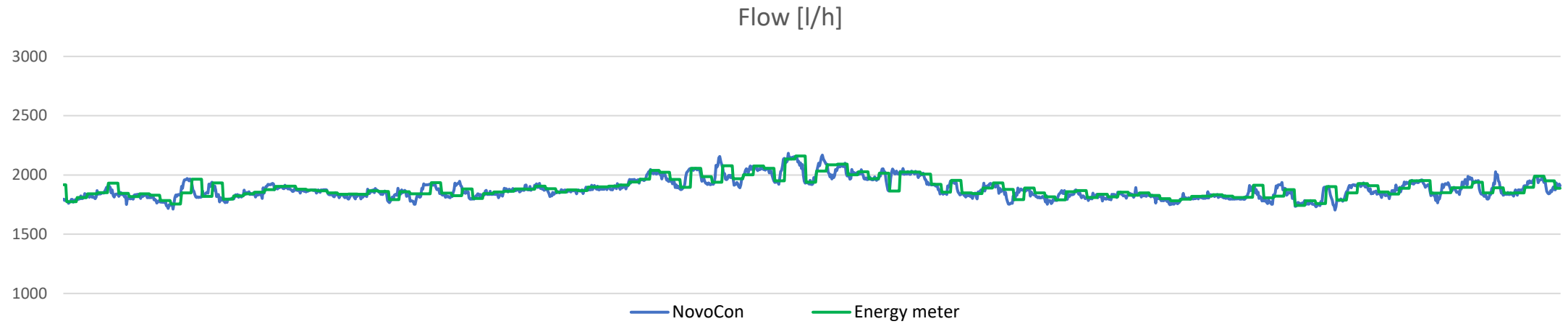



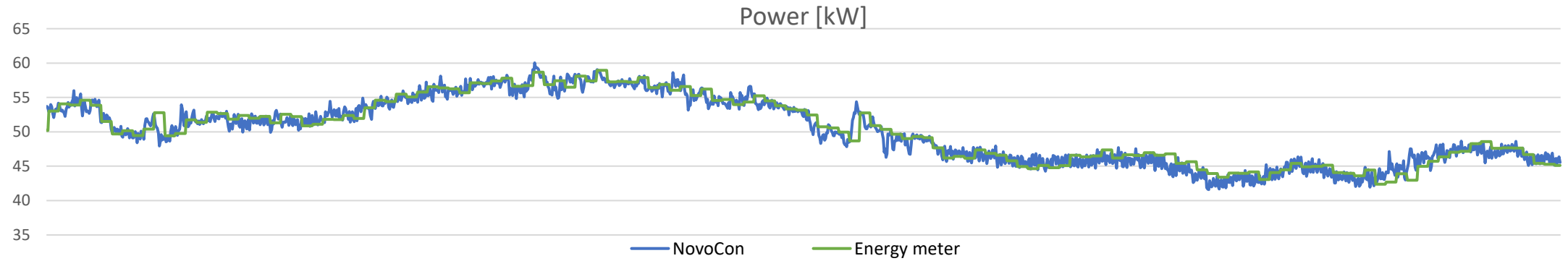

**Temperature control accuracy comparison**




Danfoss Digital Hydronics

# Flow, power and energy comparison



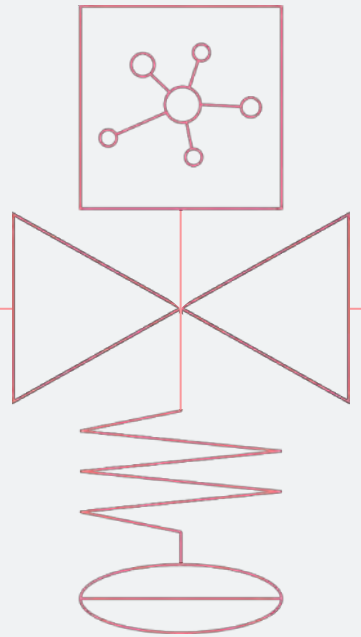




## Energy [kWh]

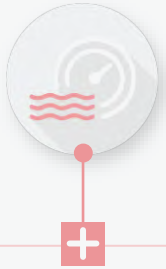
| | | |
|---|---|---|
| **24.12.2021** | | |
| NovoCon | 1204,4 kWh | |
| Energy Meter | 1205,0 kWh | |
| **Difference:** | **0,05%** | |
| **25.12.2021** | | |
| NovoCon | 1125,6 kWh | |
| Energy Meter | 1122,0 kWh | |
| **Difference:** | **-0,32%** | |
| **26.12.2021** | | |
| NovoCon | 1217,8 kWh | |
| Energy Meter | 1220,0 kWh | |
| **Difference:** | **0,18%** | |
| **27.12.2021** | | |
| NovoCon | 1300,3 kWh | |
| Energy Meter | 1298,0 kWh | |
| **Difference:** | **-0,17%** | |
| **28.12.2021** | | |
| NovoCon | 1155,5 kWh | |
| Energy Meter | 1148,0 kWh | |
| **Difference:** | **-0,65%** | |
| **29.12.2021** | | |
| NovoCon | 1292,2 kWh | |
| Energy Meter | 1289,0 kWh | |
| **Difference:** | **-0,25%** | |
| **30.12.2021** | | |
| NovoCon | 1345,2 kWh | |
| Energy Meter | 1338,0 kWh | |
| **Difference:** | **-0,54%** | |
| **31.12.2021** | | |
| NovoCon | 1391,1 kWh | |
| Energy Meter | 1390,0 kWh | |
| **Difference:** | **-0,08%** | |

# Solution for Energy efficient building – Danfoss Digital Hydronics

Technical specification



## Accurate flow control

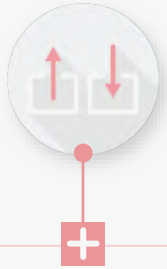


- Linear characteristic at different differential pressures for accurate flow setting
- Equal percentage characteristic for linear system response
- Best in class flow measurement accuracy with MID flow sensor as option
- Possibility to measure energy / power (MID)

## Bus Actuator

- BACnet MS/TP and Modbus RTU communication protocols
- Auto baud rate detection
- Auto MAC addressing
- Bi-directional communication to BMS system
- Operation status reporting

## I/O device



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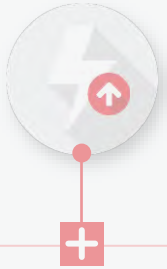
## Energy manager



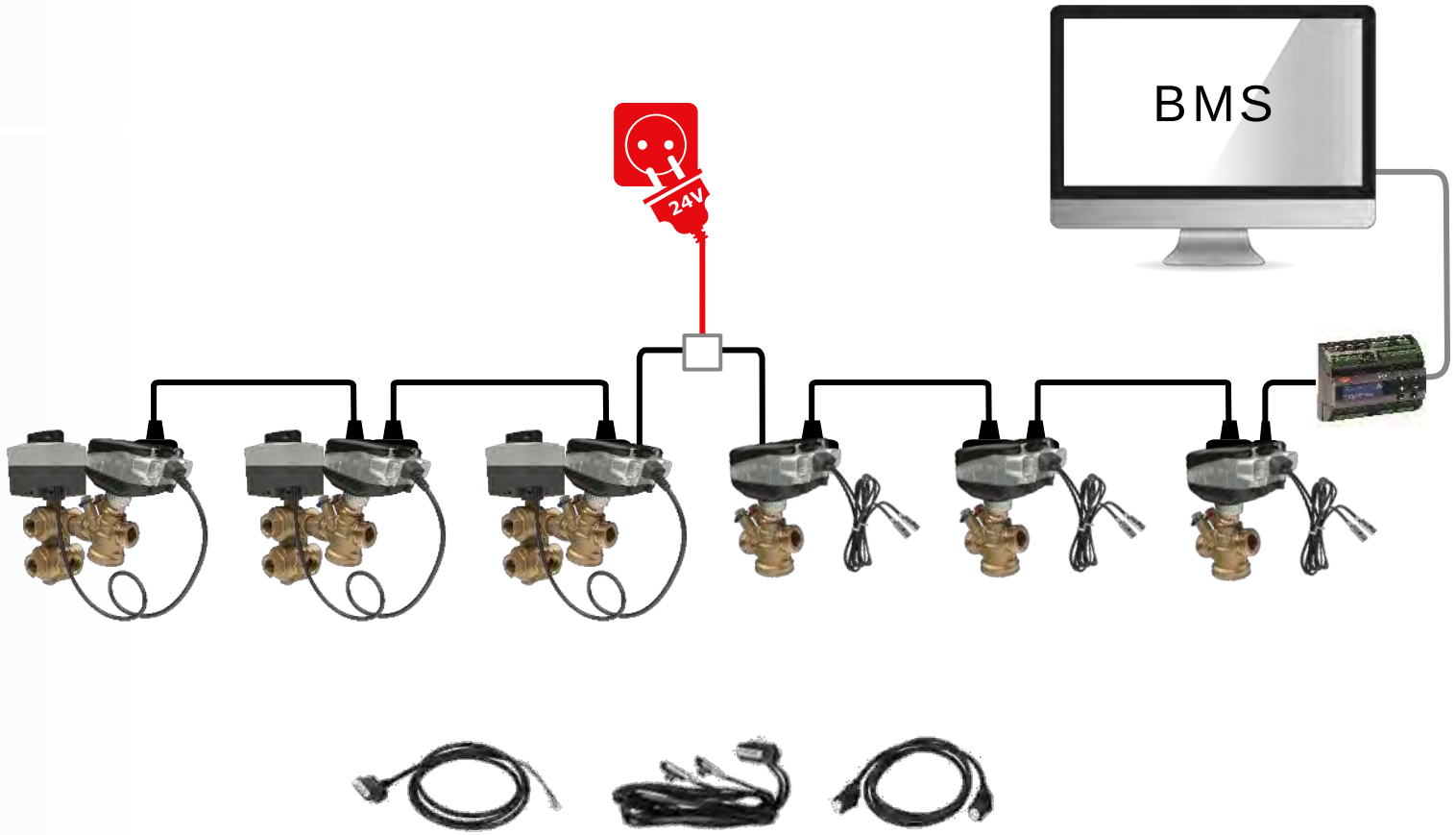
- Advanced algorithms for energy management
- Possibility for continuous commissioning
- Integrated PID controller

# Solution for Energy efficient building – Danfoss Digital Hydronics

Technical specification

## Bus actuator

- BACnet MSTP and Modbus RTU communication protocols
- Field bus and power over prefabricated daisy chain cables
- Auto baud rate detection and Auto MAC addressing
- Accurate flow/energy measurement with MID certified flow sensor
- Firmware upgrade via Bootloader / configuration tool
- Operation status reporting (no flow, no control signal, poor cable connection)



# Solution for Energy efficient building – Danfoss Digital Hydronics

Technical specification

## Bus actuator

- BACnet MSTP and Modbus RTU communication protocols
- Connection of field bus and power is available with standard connectors
- Auto baud rate detection and Auto MAC addressing
- Accurate flow/energy measurement with MID certified flow sensor
- Firmware upgrade via Bootloader / configuration tool
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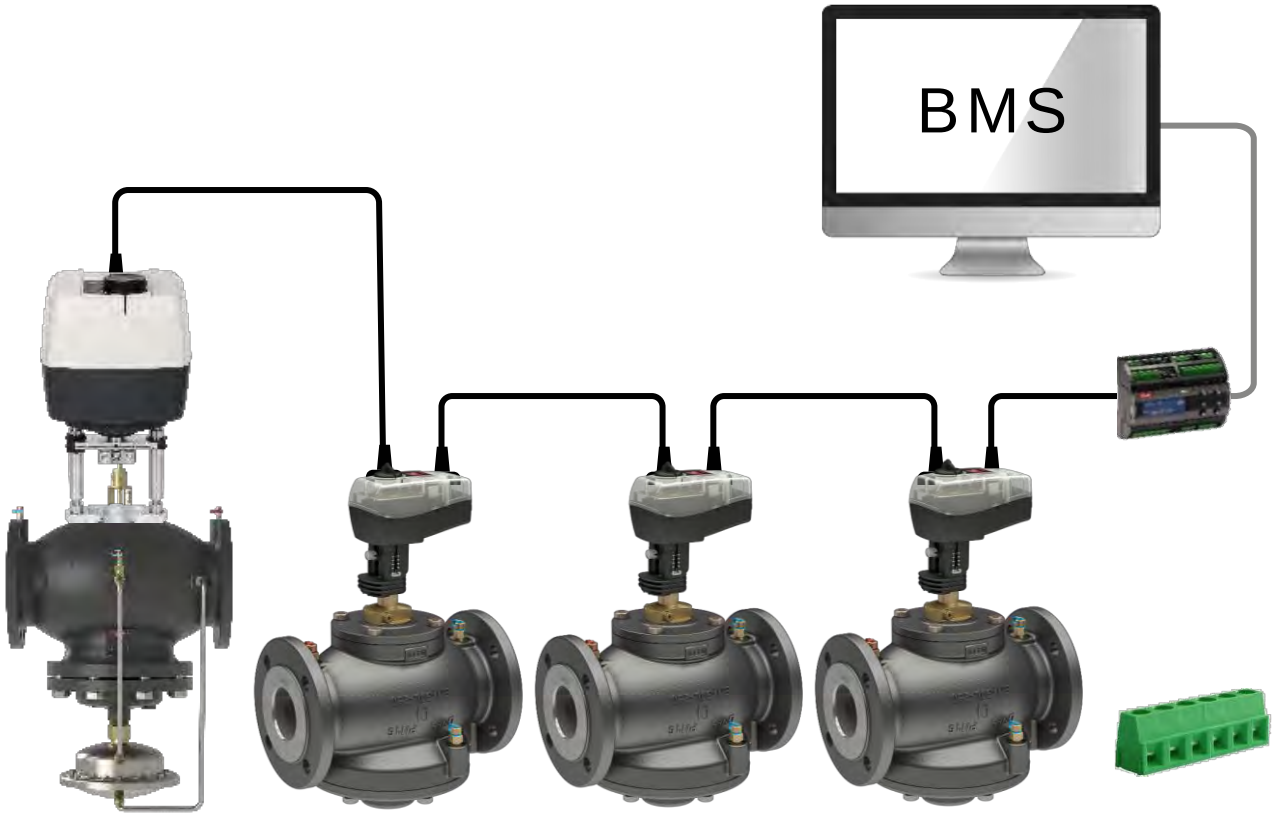

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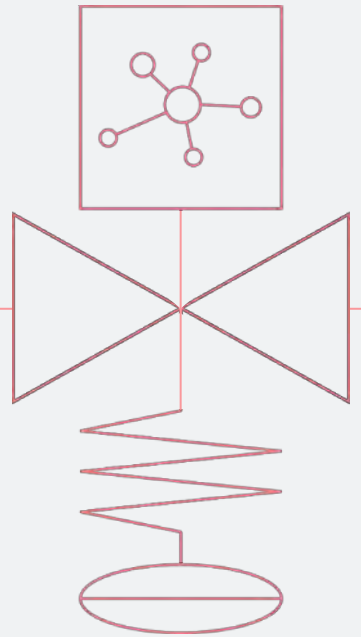

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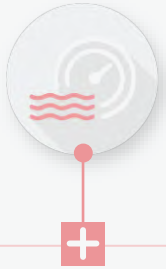

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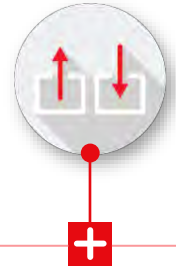

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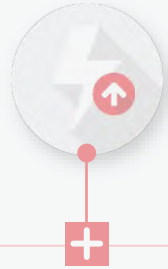


- Advanced algorithms for energy management
- Possibility for continuous commissioning
- Integrated PID controller

# Solution for Energy efficient building – Danfoss Digital Hydronics

Technical specification

## I/O device

**Analog output**
1x AO (0-10V)

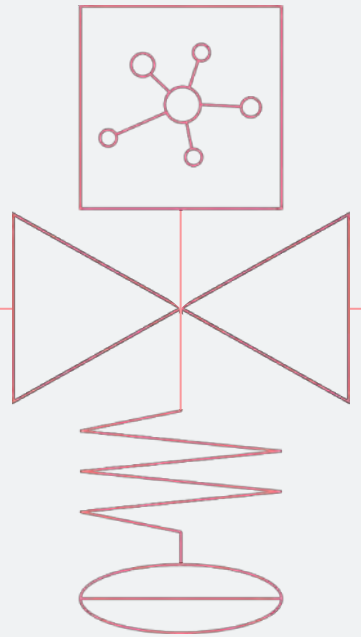
**Analog inputs**
3x ΩI (°C/°F/ Ω), Pt1000, NTC 10k t2, NTC 10k t3

1x AI (V/mA)

**Multiple data points on one bus**

# Solution for Energy efficient building – Danfoss Digital Hydronics

Technical specification



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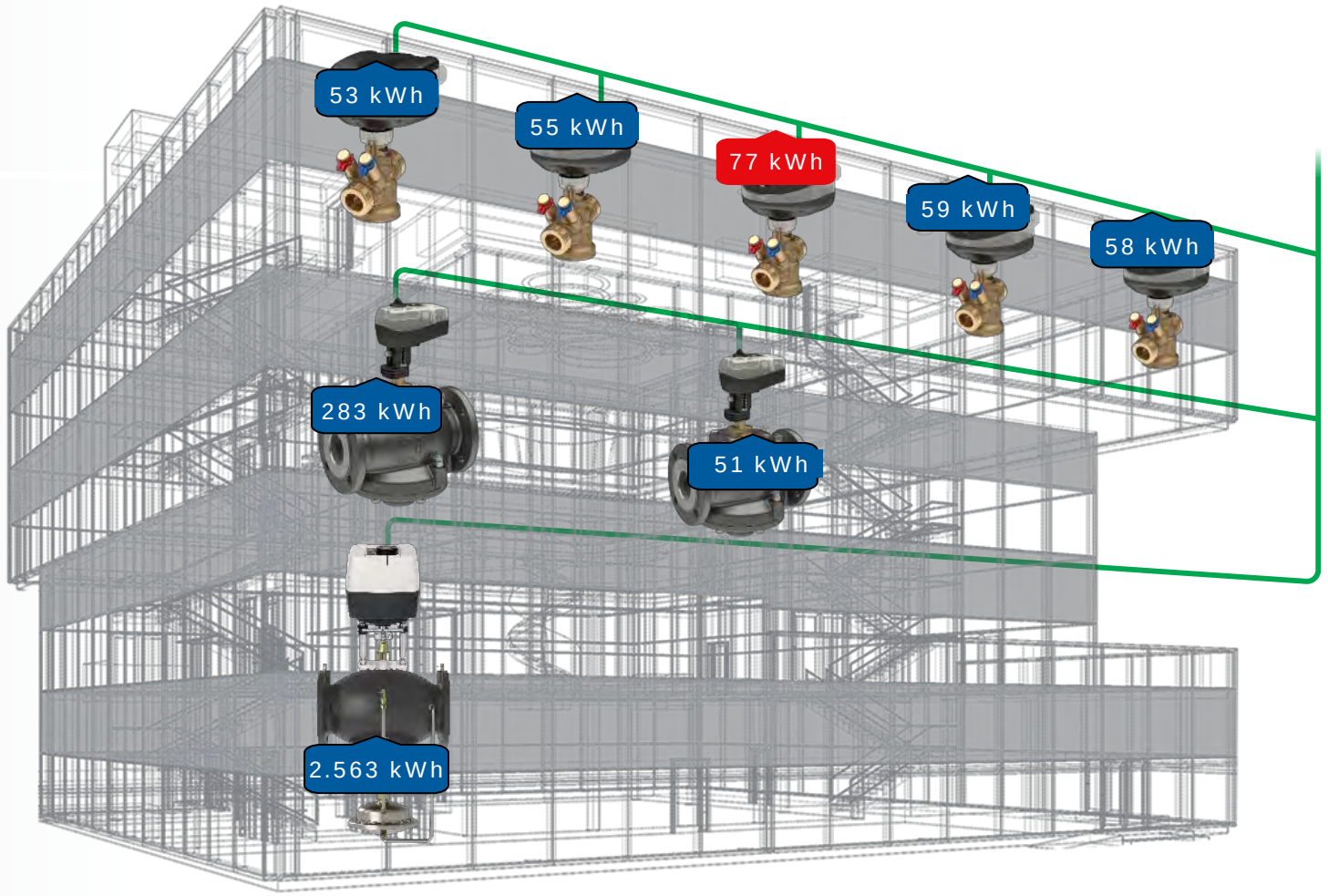
# Solution for Energy efficient building – Danfoss Digital Hydronics

Technical specification

## Energy manager

- **Energy monitoring**
- Energy analysing
- Energy benchmark
- **Energy management**
- Energy management limitation (working with controller)
- Energy management control (working as stand-alone controller)



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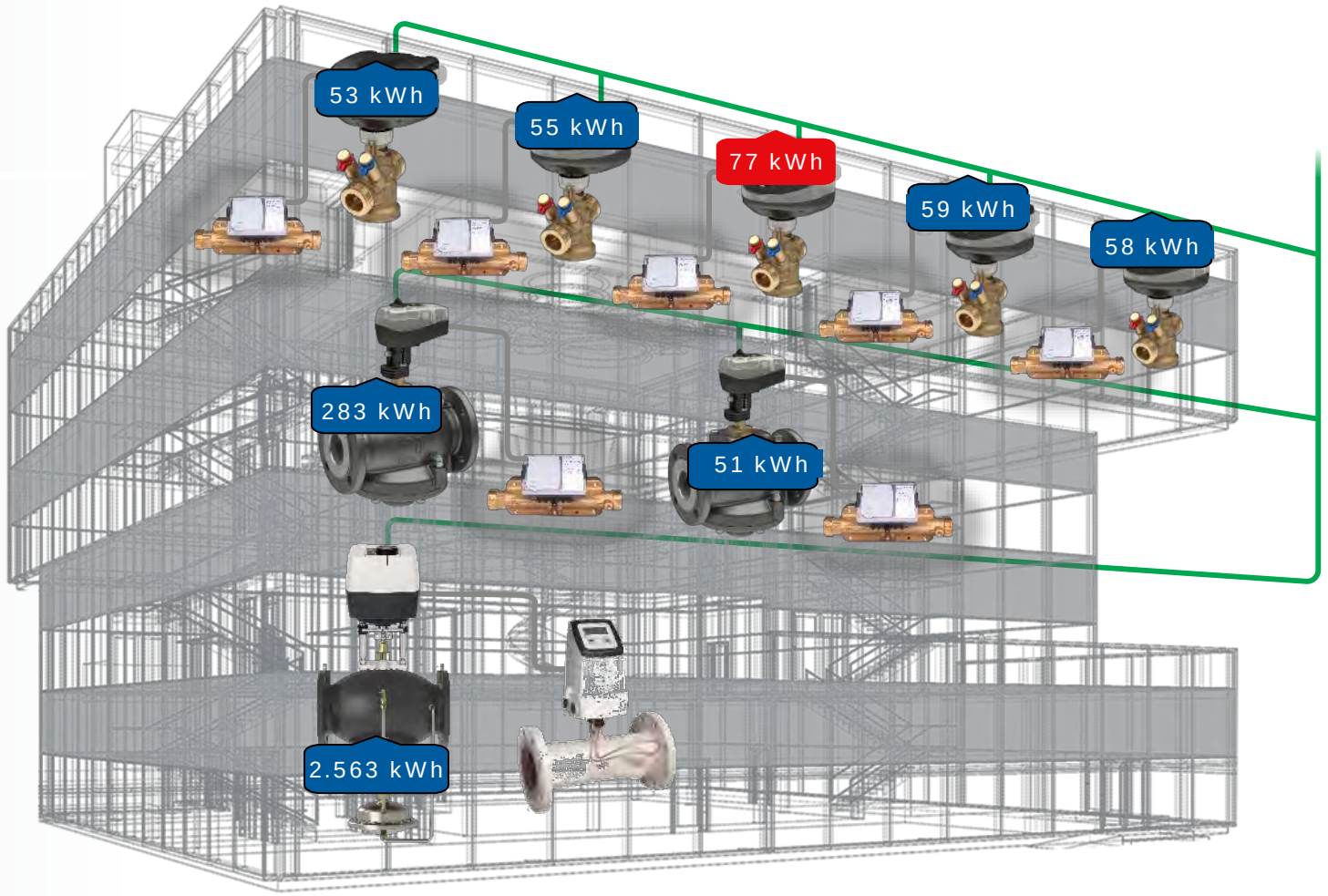

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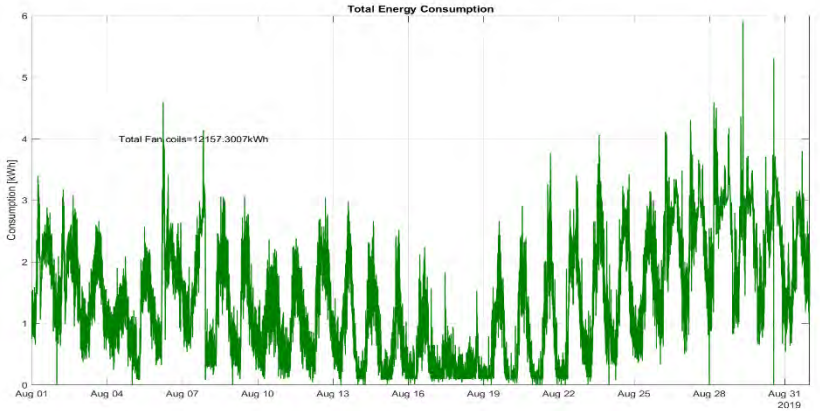
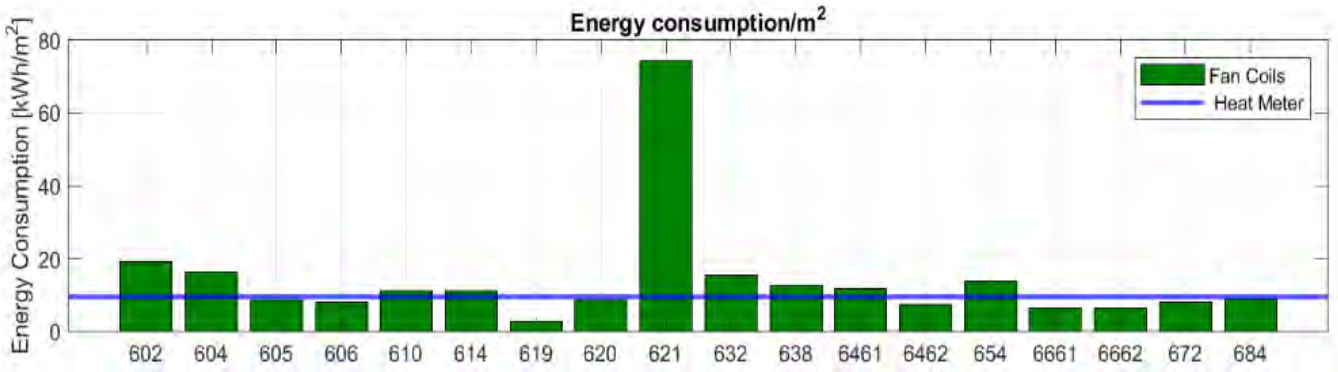
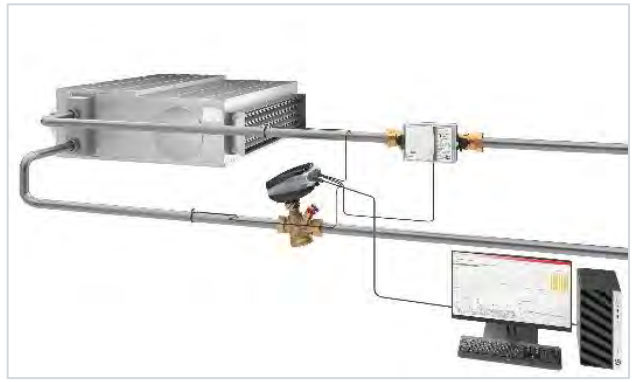


# Scalable for all hydronic HVAC applications



**S-combination** in **DN 15-32**
as for example used for:

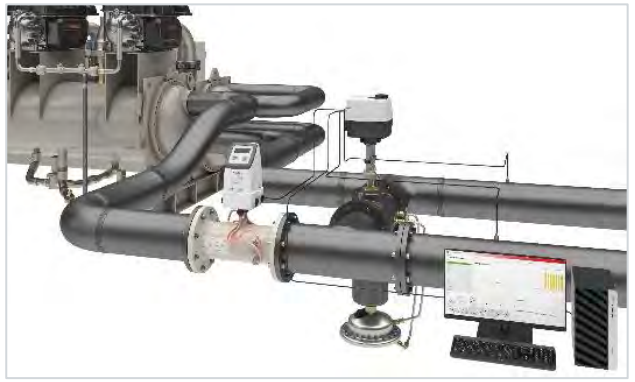
- Fan Coil Units (FCU)
- Radiant panels
- Chilled beams

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 DN**
as for example used for:

- Chillers
- District cooling connection
- Commercial heat pumps

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

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

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

**Full transparency** of energy usage in a building for heating / cooling with integrated flow/temperature sensors

# Advantages
## of Danfoss Digital hydronics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