Introducing AB-QM 4.0
Redefining PICV-value

Stanley de Vries
Business Development Director
Trendsetting control valve for HVAC
The evolution of PICV & AB-QM

Before PICV
- Complicated design
- Complicated Commissioning and balancing procedures
- Pressures fluctuations due to opening and closing of valves
- Uncertain results

Advantages of AB-QM
- Integrated balancing and control in one solution
- Easy sizing
- Full hydronic balance under all load conditions
- 100% valve authority and linear control (constant Delta P levels in partial- and full load conditions)
- Precise controls
Greater value – less hassle

A hydronic design is never better than the quality of its components.

• Less calculations
• Less components
• Less mounting
• Less energy consumption

Superior performance, lifetime value, and total cost of ownership
Introducing AB-QM 4.0

The overall combination of price, quality, and reliability plays an increasingly larger role in modern tenders.

With its unsurpassed reliability, AB-QM 4.0 greatly improves performance, lifetime value, and reduces your total cost of ownership.
How the AB-QM 4.0 creates value

Feedback-based product development
- Enhanced reliability and performance
- Improved specifications
- Smarter features
- Ready for smart building-technology
- Longer lifetime and excellent lifecycle value

Setting a new industry standard for quality, ROI, and lifetime value
New AB-QM 4.0 features

- Flow indicated in l/h and GPM
- Setting visible with actuator mounted
- PN 25
- Redesigned membrane without O-rings
- Q measurement
- Higher flows
- Standard internal or external thread
- Flow + Counter-flow direction flushing
A perfect fit – no matter the design

AB-QM 4.0 can be used in a wide range of applications for both heating and cooling

Non-residential buildings:
• For use in commercial buildings such as offices, hotels, and airports

Both heating and cooling:
• Fits designs for both heating and cooling solutions incl. fan coils, chilled beams, and radiant panels

Wide controls-options:
• Compatible with a broad range of actuators
  • On/Off
  • Analogue
  • Digital
Setting a **new standard** in PICV
Interplays with current megatrends

**DIGITALIZATION**
Predictive data and maintenance using NovoCon® digital actuator

Benchmark flow performance and efficiency across several buildings

**URBANIZATION**
21st century tech for modern-day buildings

New legislation requires smarter HVAC solutions

Migration to cities creates greater need for high comfort at low energy

**ENERGY EFFICIENCY**
Monitor energy efficiency in building management systems

Remote, digital commissioning and customization

NovoCon® S offers real time energy consumption data reports
Introducing 4.0 – introducing forward-thinking

• 4.0 introduces next level value to your PICV designs – from performance to connectivity.

• From smart buildings to IoT implementation, AB-QM 4.0 is the enabler for the future of connected HVAC by introducing superior hydronic balancing.

• Without sufficient hydronic balance, smart buildings fail to offer comfort and energy efficiency.
Meeting tomorrow’s standards
Improvements across four categories

- SPECIFICATION AND INSTALLATION
- RELIABILITY AND ROBUSTNESS
- CONNECTIVITY AND DATA
- TCO AND ROI
Smarter specifications

- Bigger flow range per DN-size
- DN-sizes available for Low Flow, Normal Flow, and High Flow (10LF-32HF)
- Uniform stroke length (4 mm) for all sizes
- No o-rings reduces hysteresis
- Standard in- and external threads
- All valves rated PN25

Improved product specifications offer greater performance and reduces associated cost
Easier installation and commissioning

• Easier commissioning
  • Setting scale
  • Precise measuring
  • Easy troubleshooting
• Setting always visible so easy post installation check
• Flushing can be performed in both directions

Easier commissioning with easy-to-use features
Additional value-adding resources

- Danfoss Design Center service
- Energy consumption forecast and system comparison
- Support for BIM models, 3D designs, and data information sharing

Helps build stronger cases and tenders by leveraging cutting-edge technologies
Meeting tomorrow’s standards

New regulations in certain markets make consulting engineers accountable for projects on a much longer timeframe than currently – especially for large and government buildings.

AB-QM 4.0’s product performance and lifetime value helps meet the European Energy Performance of Buildings Directive (EPBD) requirements and live up to the growing accountability requirements.

✔ Helps build stronger cases and tenders by leveraging cutting-edge technologies
Bar-raising reliability and performance
AB-QM Reliability – Preliminary results

PICV performance through product life time

Valves out of the factory are all performing well and in majority of case according to the data sheet. However valve exposure in application water has big influence on valve performance thru product life time. Below is description of what is happening today.

Control performance of PICV from factory

Control performance of PICV after 50,000 cycles in application

Control performance of PICV after 100,000 cycles in application
AB-QM Reliability – Test rig

Using the 13 years experience in PICV applications and Danfoss deep hydronic knowledge we have design a PICV Reliability test in „application water“ with the aim to test new generation of valves and competition in real application environment.

Test rig specification

• Temperature control up to 95°C
• Insulated test rig
• Calibrated dp sensors,
• Calibrated flow meter,
• National instruments controller

• Test is enabling automatic dp characteristic and CV characteristic measurements at different cycles (100, 1.000, 10.000...), different temperatures, different pressures, different modulation options,...)

2 identifiers of reliability / robustness

• Pressure (in)dependence / flow deviation
• Time it takes for the valve (dp, cv) to get stuck
AB-QM Reliability – Test rig

Chemical test specification
CaCO3 (calcium carbonate) and FeO3 (Iron oxide) are the most common elements (+dezinification) that have influence on PICV

In cooperation with a Chemical institute we have developed 2 tests:
• CaCO3 deposition
• FeO2 deposition

Mechanical valve operation
• Continuous precipitation of CaCO3 during the test
• Q nom flow setting of valves
• Modulation 0-50% during the test
• 90°C water temperature

<table>
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<th>Change of Ca concentration per change of water (mg/l as CaCO3)</th>
<th>Inner surface area of bench (m2)</th>
<th>Volume of water tank (l)</th>
<th>Number of water replacements in water tank</th>
<th>Density of CaCO3 (g/cm³)</th>
<th>Total amount of precipitated CaCO3 mass (g)</th>
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AB-QM Reliability – Preliminary results
• Continues precipitation of CaCO3 during the test
• Q nom flow setting of valves
• Modulation 0-50% during the test
• 90°C water temperature
• 3 samples
AB-QM Reliability – AB-QM current version 50,000 cycles

Scaling test: Estimated values

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Reliability – Competitor 1 new

- Continues precipitation of CaCO3 during the test
- Q nom flow setting of valves
- Modulation 0-50% during the test
- 90°C water temperature
- 3 samples
Reliability – Competitor 1 50,000 cycles

Cannot reach flow capacity!!!

Scaling test: Estimated values

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Reliability – Competitor 2 new

- Continues precipitation of CaCO3 during the test
- Q nom flow setting of valves
- Modulation 0-50% during the test
- 90°C water temperature
- 3 samples
Reliability - Competitor 2, 50,000 cycles

![Graph showing flow deviations](image)

**Scaling test: Estimated values**

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• 90°C water temperature
• 3 samples
Superior reliability

- Best-in-class reliability and lifetime performance tests
  - Maintains high overall system energy efficiency
  - Correct Delta T levels for greater system efficiency
- Continued high performance ensuring high energy efficiency and protection of expensive equipment

Unrivaled reliability and product lifetime reduces costs and improves project economy
The future of connected HVAC
Future-ready HVAC

Danfoss NovoCon® digital actuators are tailored to fit AB-QM 4.0 and bring out its full value. It establishes the perfect connection between superior hydronic HVAC system performance and Building Automation Solutions.

NovoCon® allows for remote commissioning of AB-QM 4.0 design flows – saving time, resources, and money.

✔️ NovoCon® actuators unlock the full AB-QM 4.0 potential.
Smarter data, predictive maintenance

NovoCon® can use data from more than 80 BACnet defined parameters and allows users to select the specific data they need.

The data can be used to produce predictive maintenance reports which allows for controlled downtime during maintenance and pro-active repairs.

☑️ Predictive maintenance cuts costs and improves building comfort
Extreme precision

NovoCon® can be digitally adjusted to 3,000 across a spindle travel of just 4.5 millimetres.

Precise settings result in fewer cycles, ensuring optimum temperatures and conditions in installed buildings.

Precise settings with less cycles improve product longevity
Continuous commissioning

NovoCon® retrieves and analyses system data in order to optimize the HVAC system and maximize energy efficiency.

Adaptations to settings of design flows are easily applied on any number of actuators. Additionally, continuous digital monitoring and commissioning saves time and costs throughout the life cycle of the building.

Custom reports allow for energy efficiency benchmarks and smart monitoring
Quality pays off
With AB-QM 4.0, your building performs better over its whole lifecycle while creating significant savings.
Dubai Address Hotel

FAN COIL 1 application

FAN COIL 2 application

Hydronic analyser 1

Hydronic analyser 2

Room

TCO AND ROI
Dubai Adress Hotel, Field test
1 Day comparisson

PIBCV AB-QM

CLASSIC VALVE

During 1 day, AB-QM delivered supply air with temperature from 17°C up to 22°C, cooling started at approx 9AM and during the day temperature of supply air steadily grew since room was not at full load. Classic valve is obviously hunting/oscilating since temperature of supply air changes from 16°C to 22°C once per 10minutes.
Mean temperature, °C

Mean temperature

σ

σ

μ_T_b = 74 °F
σ_T_b = 3.57 °F (Log A)

σ_T_b = 1 °F
σ_T_b = 2 °F

Ratio of complaint cost to expected cost

68  70  72  74  76  78

Mean temperature, °F

TCO AND ROI
How to save the money?

1. Increasing internal temperature
2. Decreasing standard deviation (more stable control)
3. Max savings - decreasing standard deviation and increasing internal temperature

third option is possible if valve & actuator are able to maintain stable control of flow at any circumstances
DUBAI FIELD TEST ADDRESS HOTEL
Savings calculation

ENERGY Savings based on improved control

1. COMPARE CONTROL AB-QM vs CLASSIC VALVE

   a. Oscillation classic
   b. Oscillation AB-QM
   c. deviation from Troom, set AB-QM
   d. deviation from Troom, set CLASSIC
   e. difference of control of room temp.

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   Potential for energy savings with better control  30.00%

30% of energy savings can’t be expected over whole year. 2 way classic control valve usually has hunting problem at partial loads. When room is operating at 100% load, valve will not oscillate. Over the whole year savings will be 15 – 20%
Lower costs

- Better control supplies stable temperature and optimized ΔT
- Longer lifetimes for actuators
- Longer lifetime for major equipment (chillers)

Quality pays off. Vastly lower costs across product lifetime
AB-QM in action
Abu Dhabi International Airport

Project Name: 
Abu Dhabi International Airport: Midfield Terminal Building (MTB)

Location: 
Abu Dhabi - UAE

Product: 
AB-QM PICV with modulating actuators for chilled water system

Quantity: 
3000+
Paramount Towers

Project Name: Paramount Towers

Location: Dubai - UAE

Product: AB-QM PICV with modulating actuators for chilled water system

Quantity: 3000+
Khalifa Stadium

Project Name: Khalifa Stadium
Location: Doha-Qatar
Product: AB-QM PICV with modulating actuators for chilled water system
Quantity: 1000+
Metro Project Red Line

**Project Name:**
Metro Project-Red Line

**Location:**
Doha-Qatar

**Product:**
AB-QM PICV with modulating actuators for chilled water system

**Quantity:**
3000+
Key takeaways and benefits

Danfoss AB-QM 4.0 offers
• Perfect control
• Automatic balance
• Simple settings and controls
• Stable temperatures without fluctuations
• Greater energy efficiency
• Easy digital and manual commissioning
• Better project economy and lower lifetime costs
• Future-ready digital options
• Improved materials with better longevity
For questions or further elaboration, please reach out to

Oussama Rouis