

ENGINEERING  
TOMORROW

*Danfoss*

# Add a **plus** to your **one-pipe system**

Our Renovation+ Solution makes one-pipe systems as efficient as two-pipe systems

**3** years

payback time when you  
upgrade your one-pipe  
heating system with our  
flexible Renovation+ Solution.

[www.danfoss.com/onepipesolutions](http://www.danfoss.com/onepipesolutions)

## Your challenge

Being responsible for buildings with one-pipe heating systems you will probably know all about the issues present in these type of buildings nowadays. Residents complain about under heated rooms caused by poor hydronic balance. Or they complain about over heated rooms caused by heat transmission from the radiator's by-pass in the rooms. This consumption of heat is not detected by heat allocators located on the radiators. That leaves you with a building that uses huge amounts of precious energy and gives you a hard time collecting money from the residents. Your challenge is now to solve these issues with a low-cost but efficient solution.

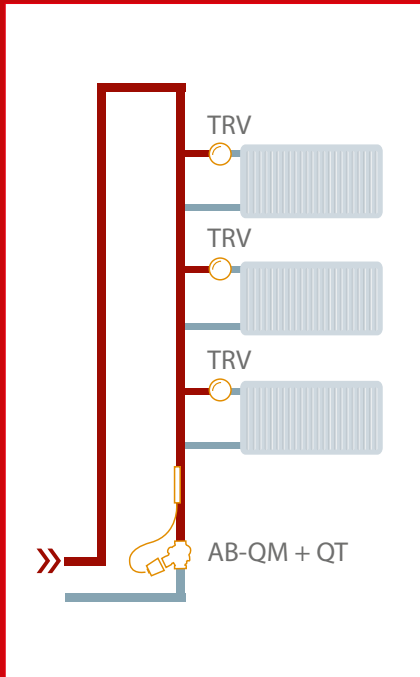
## Our innovation

One possibility is to substitute the one-pipe for a two-pipe heating system. But investment costs are relatively high and organising this is a huge challenge since all residents need to be involved. Instead, Danfoss now developed a new and innovative solution. Our Renovation<sup>+</sup> Solution of-

fers you the benefits of a two-pipe heating system without a complex system renovation. We upgrade the existing one-pipe installation and make it as efficient as a two-pipe system with only a small investment. This provides you and the residents with a perfectly controlled and energy saving heating installation, resulting in improved indoor comfort and reliable heat allocation for precise invoicing.

### The benefits:

- ⊕ improve indoor comfort for residents
- ⊕ reduce overheating of the system and the building
- ⊕ reduce riser flow to match actual heat demand
- ⊕ reduce energy costs
- ⊕ increase the accuracy of heat allocation costs



Renovation<sup>+</sup> Solution preventing over heating

## The Renovation<sup>+</sup> Solution

The first step of the Renovation<sup>+</sup> Solution is to install Danfoss radiator valves and self acting thermostats (TRV). The innovation is to add AB-QM self-acting balancing valves in the return pipe of all risers and mount a new QT thermostatic temperature controller on it. This combination, 'the AB-QT thermostatic one-pipe solution' controls the water flow depending on the return temperature in the risers. This converts a constant flow system (typical for one-pipe) into a variable flow system (typical for two-pipe) with all its advantages. For achieving the highest possible energy saving and efficiency you can, also afterwards, choose for 'the AB-QTE electronic one-pipe solution'. Then, the QT controller is replaced by a TWA actuator which is controlled by an electronic CCR3 controller. Providing you with a flexible set point for the optimum return flow temperature based on the outside temperature.

# 1+1+1 = 3 self acting geniuses



## Step by step renovation

If you have to make the decision on renovation of your one-pipe heating system you are looking for a solution with reasonable investment costs and maximum return on investment. Our Renovation<sup>+</sup> Solution is flexible so it always offers the perfect fit for your situation. Depending on your start situation and your renovation budget you can upgrade your one-pipe system step by step. Each step will bring more comfort and/or energy saving.

- ⊕ Control room temperatures
- ⊕ Balance all riser flows
- ⊕ Control return flow temperature
- ⊕ Optimise return flow temperature

## Conclusion:

**The flexible Danfoss Renovation<sup>+</sup> Solution offers you a tailor made improvement of your one-pipe system.**




# You decide your upgrade level



## Control room temperatures

With RA-G + RA 2000/RA 5060




Give residents the ability to control the temperature in each individual room to optimise indoor comfort and achieve basic energy savings. This is possible by using Danfoss' self acting thermostatic radiator valves. They continuously control an individual room temperature and create a comfortable living room, a bit warmer bathroom and nice, cool bedrooms. By upgrading your heating system with the first step of the Danfoss Renovation<sup>+</sup> Solution you can already start saving on your annual heating costs.

-  increase indoor comfort
-  individual room temperature control
-  rooms are not over heated

## Balance all riser flows

With AB-QM

By installing automatic balancing and control valves in the return pipe of the individual risers it will be easy to balance all riser flows. Balancing the installation will ensure an even heat distribution throughout the building. No rooms will be under or over heated and there will be no overflows and unnecessary circulation, which cause energy waste. The balance is very reliable because pressure independent balancing valves with easy adjustable flow setting are used. Only by balancing the flow of the one-pipe heating system a big improvement in comfort and energy consumption will be realised.

-  no more uneven heat distribution
-  exact needed flows throughout the system
-  easy selection and commissioning

# We provide the flexibility



## Control return flow temperature

With AB-QM + QT

For additional energy savings in your one-pipe heating system you can implement 'the AB-QT thermostatic one-pipe solution'. A self-acting thermostat controls the return temperature of the riser. As soon as the heat load in the room is reduced and thus return temperature becomes higher than the set temperature, the thermostatic controller will close the balancing and control valve. The flow reductions lower the return flow temperature and make the installation even more energy efficient.



bring dynamic control in the system



prevent over heated risers



improve precision of heat allocators

## Optimise return flow temperature

With AB-QM + CCR3 + TWA-Z + ESMC

The very best option for full control of your one-pipe heating system is 'the AB-QTE electronic one-pipe solution'. This electronic solution allows automatic control of the return temperatures independent of the supply temperature, based on the outside temperature. A thermal actuator is used to control the return flow via an electronic controller equipped with temperature sensors on each riser and an outdoor temperature sensor. This provides an optimised return flow temperature and results in additional energy savings in all seasons.



full control based on the outside temperature



easy monitoring of each riser (settings, temperature, etc)



## A win win optimisation

### Renovation<sup>+</sup> Solution case

The building in our case study is a medium high residential building located in Szczecin, Poland and was built in 1976. The heating system is a traditional one-pipe system, originally used with a three way valve with a shut-off function only. The radiators are cast-iron types. The heat is supplied by a big sub-station which is located about 100 meters from the building.

In 1994-1995 the Building Society started with their first renovation by installing thermostatic radiator valves (Danfoss type RTD-D) and by installing a weather compensator, control valves and differential pressure controller in the sub-station. Due to a lack of money the hydraulic balance was done based on the traditional manual method with measuring orifices.

In 1996-1997 heat cost allocators were installed that allow measuring of individual energy consumption. The third renovation was done in 2002-2003: wall isolation (10 cm of polystyrene) and new windows. Due to the still relatively high energy consumption (compared to a two-pipe system) the Building Society considered changing the heating system to a two-pipe system. In 2009 they decided to choose the Danfoss Renovation<sup>+</sup> Solution instead and use automatic, flow adjustable balancing valves type AB-QM on the risers with self acting thermostats type QT for return temperature control. The investment for this alternative was only 1/5 of the costs for replacement by a two-pipe system.



Investment costs: **€ 32,201**



Energy saving: **1.283 GJ (3 heating season average)**



Energy price: **€ 9.70 per GJ**



Pay back time: **2,6 years**

# The Renovation<sup>+</sup> range comes with full support

The Danfoss Group is a leader in development and production of mechanical and electronic products and controls. Our products help to heat and cool homes and offices, refrigerate food and control production lines.

In short, Danfoss contributes to the conveniences of modern life as well as to a safer and cleaner environment. If you are interested in hearing more about the success of our Renovation<sup>+</sup> Solutions please contact Danfoss.

## Thermostatic radiator valves

### Valves

| Type | Description                         | Size  | Code No. |
|------|-------------------------------------|-------|----------|
| RA-G | Thermostatic valve, straight design | DN 15 | 013G1675 |
| RA-G | Thermostatic valve, angle design    | DN 15 | 013G1676 |
| RA-G | Thermostatic valve, straight design | DN 20 | 013G1677 |
| RA-G | Thermostatic valve, angle design    | DN 20 | 013G1678 |
| RA-G | Thermostatic valve, straight design | DN 25 | 013G1679 |
| RA-G | Thermostatic valve, angle design    | DN 25 | 013G1680 |

### Sensors

| Type    | Description                                   | Cap. tube | Temp. range | Code No. |
|---------|---|-----------|-------------|----------|
| RA 2990 | Thermostat with built in sensor               |           | 5 - 26 °C   | 013G2990 |
| RA 2992 | Thermostat with remote sensor                 | 0 - 2 m.  | 5 - 26 °C   | 013G2992 |
| RA 2920 | Thermostat with built in sensor, tamper proof |           | 5 - 26 °C   | 013G2920 |
| RA 2922 | Thermostat with remote sensor, tamper proof   | 0 - 2 m.  | 5 - 26 °C   | 013G2922 |
| RA 5062 | Thermostat with remote temperature adjuster   | 0 - 2 m.  | 8 - 28 °C   | 013G5062 |
| RA 5065 | Thermostat with remote temperature adjuster   | 0 - 5 m.  | 8 - 28 °C   | 013G5065 |
| RA 5068 | Thermostat with remote temperature adjuster   | 0 - 8 m.  | 8 - 28 °C   | 013G5068 |

## Automatic balancing and control valves

| Type  | Description                             | Size    | Code No. excl. measuring nipples | Code No. incl. measuring nipples |
|-------|---|---------|----------------------------------|----------------------------------|
| AB-QM | Balancing valve with max. flow 150 l/h  | DN 10LF | 003Z1251                         | 003Z1261                         |
| AB-QM | Balancing valve with max. flow 275 l/h  | DN 10   | 003Z1201                         | 003Z1211                         |
| AB-QM | Balancing valve with max. flow 275 l/h  | DN 15LF | 003Z1252                         | 003Z1262                         |
| AB-QM | Balancing valve with max. flow 450 l/h  | DN 15   | 003Z1202                         | 003Z1212                         |
| AB-QM | Balancing valve with max. flow 900 l/h  | DN 20   | 003Z1203                         | 003Z1213                         |
| AB-QM | Balancing valve with max. flow 1700 l/h | DN 25   | 003Z1204                         | 003Z1214                         |
| AB-QM | Balancing valve with max. flow 3200 l/h | DN 32   | 003Z1205                         | 003Z1215                         |

## Thermostatic return temperature controller

| Type | Description                                 | Temp. range | Code No. |
|------|---|-------------|----------|
| QT   | Controller for combination AB-QM DN 10 - 20 | 45 - 60 °C  | 003Z0382 |
| QT   | Controller for combination AB-QM DN 25 - 32 | 45 - 60 °C  | 003Z0383 |
| QT   | Controller for combination AB-QM DN 10 - 20 | 35 - 50 °C  | 003Z0384 |
| QT   | Controller for combination AB-QM DN 25 - 32 | 35 - 50 °C  | 003Z0385 |

## Electronic return temperature controller

| Type         | Description  | Cable  | Code No. |
|--------------|--|--------|----------|
| CCR 3        | Electronic temperature controller, 16 sensors, 24V a.c.  |        | 003Z0389 |
| TWA-Z        | Thermal actuator, 24V a.c., Normally Open                | 1,2 m. | 082F1220 |
| ESMC         | Surface temperature sensor, Pt 1000                      | 2 m.   | 087N0011 |
| TWA-Z + ESMC | Set with Thermal actuator and surface temperature sensor |        | 003Z0388 |

Product details can be found in dedicated Danfoss data sheets



## Quality is the real plus

State-of-the-art heating systems are more than the sum of the solutions and components. If you need assistance or inspiration to optimise your solutions, Danfoss has substantial application knowhow ready for you to employ. Our industry leading position and years of experience mean that Danfoss is the preferred advisor and partner to consultants and system integrators when specifying heating system solutions for new buildings and renovation projects.

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