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Danfoss District Heating Application Handbook

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Introduction

- With the today's focus on energy efficiency it is important that we in the district heating industry take active stand on promoting and use the best DH application available
- To do that we must have a good base for discussion and choosing the correct applications
- For more than 35 years, Danfoss has been taking an active role working in close cooperation with customers to offer the right solutions for district heating systems
- It is this expertise that we want to share with the district heating community to put our weight to future energy efficient district heating networks



The target group

- Targeted users
 - Designers/planners
 - District heating utilities
 - Universities/educational institutes
 - Standardisation organisations
- Potential usage
 - Training material for
 - Employees
 - Consultants
 - DH companies
 - Base for discussion with customers
- Although the target group is wide we believe it can serve them all at different levels.



Purpose of the handbook

- The aims of the handbook are
 - Give a clear and comprehensive introduction to different applications that are currently being used in district heating schemes, with a special focus on applications recommended by Danfoss
 - List up and give support to the benefits and limitations of the applications
 - Benchmark the applications using quantitative and qualitative measures
- The intention of the handbook is not to give product-specific information or detailed theory behind the components or applications



The handbook structure

- The main categories of the handbook are:
 - Presentation of general principles of regulation in DH applications
 - DHW applications
 - HE applications
 - Supply to flat stations applications
- After introducing these main applications different combinations of the main applications are presented



Distinguishing between applications

- All applications are prioritized using the following symbols:

Danfoss recommendations



Danfoss recommended application



Primary alternative to Danfoss recommended application



Secondary alternative to Danfoss recommended application



How can the handbook be used?

- Serve as a common platform for communication of solutions for district heating across markets and target groups
- For training and strengthening the knowledge of different applications
- It can be used to draw out the main benefits and limitations of the different applications in a systematical way
- Be a tool that others can use as ground work for further work that suits their specific markets/region

Application matrix



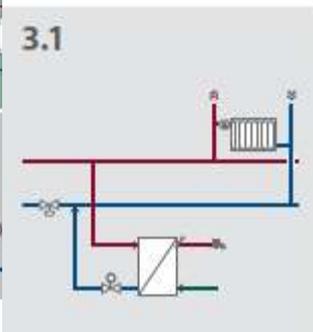
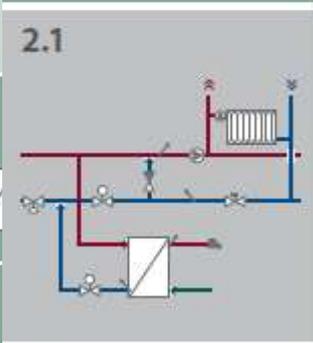
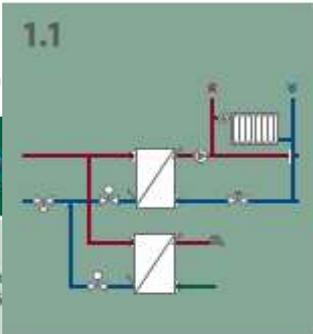
4
 Directly and indirectly
 connected room
 heating and instantane-
 ous domestic hot
 water heat exchanger
 applications

■ The application

provides an overview of all applications

Application type overview

1 Domestic hot water applications	2 Directly and indirectly connected room heating applications	3 Supply system to flat station
0.1	1.0	1.F
0.2	2.0	2.F
0.3	3.0	3.F



5 Directly and indirectly connected room heating and domestic hot water charging applications	6 Directly and indirectly connected room heating and domestic hot water cylinder applications	7 Two-step applications	8 Indirectly connected room heating and secondary side connected domestic hot water charging tank application	9 Indirectly connected room heating and secondary side connected domestic hot water cylinder application
	1.3	1.1.1	S.1.2	S.1.3
	2.3	1.1.2		
	3.3			

- Danfoss-recommended application
- Primary alternative to Danfoss-recommended application
- Secondary alternative to Danfoss-recommended application
- Not recommended by Danfoss



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Application selection

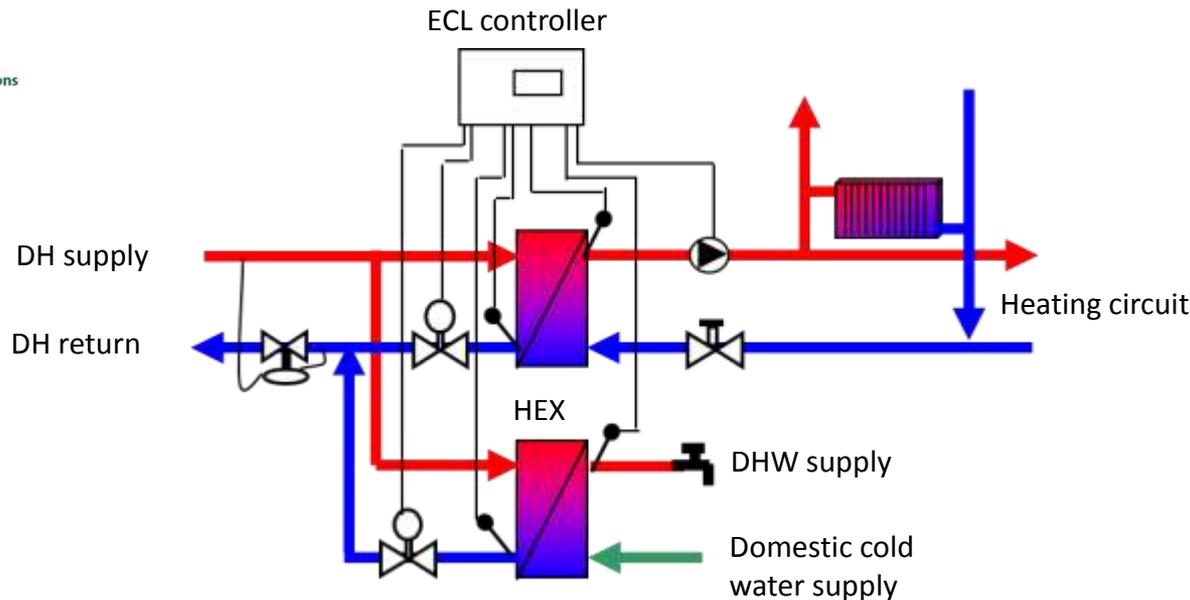
How to choose the correct application?

				One-family houses				Flat station systems				
Low temperature system, T <= 60°C (X) PN10 bar only	X	X		Low temperature system, T <= 60°C (X) PN10 bar only	X	X	X	(X)	X	X	(X)	
PN10 bar / T ≤ 90°C	X	X		PN10 bar / T ≤ 90°C	X	X	X	X	X	X	X	
PN10 & PN16 bar / T < 110°C	X	X		PN10 & PN16 bar / T < 110°C	X	X	X		X	X		
PN16 bar / T ≥ 110°C	X	X		PN16 bar / T ≥ 110°C	X	X	X		X	X		
PN25 bar / T ≥ 110°C				PN16 bar / T ≥ 110°C	X	X	X		X	X		
Type	DHW application	HE application	Combined HE and DHW application	PN25 bar / T ≥ 110°C					Central supply to flat station (for HE and DHW via flat stations)			
Danfoss recommended systems				Type	DHW application	HE application	Combined HE and DHW applications					
Application	Instantaneous DHW application	Indirectly connected HE application	Indirectly connected HE and instantaneous DHW application	Danfoss recommended systems					two-dimensional application	Indirectly connected application	Indirectly connected with heat accumulator	Directly connected mixing-loop application
System index	0.1	1.0		Application	Instantaneous DHW application	Indirectly connected HE application	Indirectly connected HE and instantaneous DHW application	Directly connected HE with mixing loop and DHW instantaneous application	1	1.F	2.F	3.F
				Application	Instantaneous DHW application	Indirectly connected HE application	Indirectly connected HE and instantaneous DHW application	Directly connected HE with mixing loop and DHW instantaneous application	Danfoss recommended application			
				System index	0.1	1.0	1.1	2.1	Alternative to Danfoss recommended application			
									Alternative Danfoss recommended application			



Indirect HE and instantaneous DHW

Danfoss recommendations



Areas of use:

One-family houses
 Multi-family houses
 Commercial buildings

DH system types:

PN10 & PN16 bar	$T \leq 60^{\circ}\text{C}$
PN10 bar	$T \leq 90^{\circ}\text{C}$
PN10 & PN16 bar	$T < 110^{\circ}\text{C}$
PN16 bar	$T \geq 110^{\circ}\text{C}$
PN25 bar	$T \geq 110^{\circ}\text{C}$

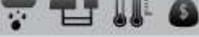
Typical markets:

Almost all markets

- The heat exchanger physically separates the DH network and the HE circuit. The application minimizes the risk of contamination of DH water plus the risks and consequences of leakage in apartments. The secondary flow temperature is adapted to the heat demand of the building.
- DHW is instantaneously prepared with a heat exchanger. The heat exchanger physically separates the DHW and DH water.
- The application can supply unlimited amount of hot water at constant temperature, which is prepared close to the tapping point when demanded, and hence reduces the risk of legionella and other bacterial growth.
- Depending on the desired DHW comfort level and the applied DHW controller, the heat exchanger and the supply line can be kept either hot or cold during idle time.
- The heating system is typically controlled by an electronic weather compensator. The DHW system can be either electronically or self-acting controlled, for small systems it is typically self-acting controlled.



Application comparisons

Heating		Indirectly connected room heating application	Directly connected room heating application with mixing loop	Directly connected room heating application
Investment cost saving		●	●●	●●●
Installation time saving		●●	●●	●●●
Space requirement saving		●●	●●●	●●●
Service/maintenance saving		●●	●●	●●●
Energy efficiency performance		●●●	●●●	●
System operation safety		●●●	●	●
User comfort		●●●	●●●	●
Domestic hot water		Instantaneous domestic hot water application	Domestic hot water charging application	Domestic hot water cylinder application
Investment cost saving		●●●	●	●●
Installation time saving		●●●	●	●●
Space requirement saving		●●●	●	●
Service/maintenance saving		●●●	●	●
Energy efficiency performance		●●●	●●	●
System operation safety		●●●	●	●
User comfort		●●●	●●	●●



Where can you access the handbook?

- The handbook can be accessed through Danfoss webpage at the site:

www.heating.danfoss.com/dhapplication

- We also have few copies at the Danfoss stand where you are welcome to come by and have a talk with us



Thank you for the Attention

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