Guideline to European Standards and Technical Specifications for District Heating and Cooling pipe systems

1. General

The aim of this information is to explain to users which EN standards are available for district heating and district cooling pipes and in which applications the standards and thus the products can be used.

In European standardization, CEN/TC107 "District heating and cooling systems" is responsible for the development and review or adaptation of the standards.

EN 253 was the first standard to be published in 1994. Currently, more than 20 standards are available. Others are currently being developed. District heating pipelines made of rigid pipe systems with steel medium pipes that meet the requirements of the standards have achieved service lives of more than 50 years in practical use at operating temperatures below the permissible continuous temperatures. To date, no systematic damage has occurred to these pipe systems that would indicate a foreseeable end to their useful lives.

In 2022, ISO/TC 341 "Heat supply network" (HSN) was established at ISO level. The scope of activity is standardization in the field of HSN including design, construction, integration, control and regulation based on heating and cooling supply pipeline system. The declared aim of the European NSBs represented in the ISO/TC as P-members is to incorporate the technical status of the EN standards, which has been achieved and proven over many years, into future ISO standards.

It is intended to adapt this information to the current status.

2. Structure of EN-standards

Figure 1 shows which standards have been developed in CEN/TC 107 and which are currently being developed.

The figure also shows

- which standards have a superordinate and thus generally valid character;
- which standards and which technical specifications are to be applied for district heating pipelines and which for district cooling pipelines;
- which standards apply to rigid and which to flexible piping systems.

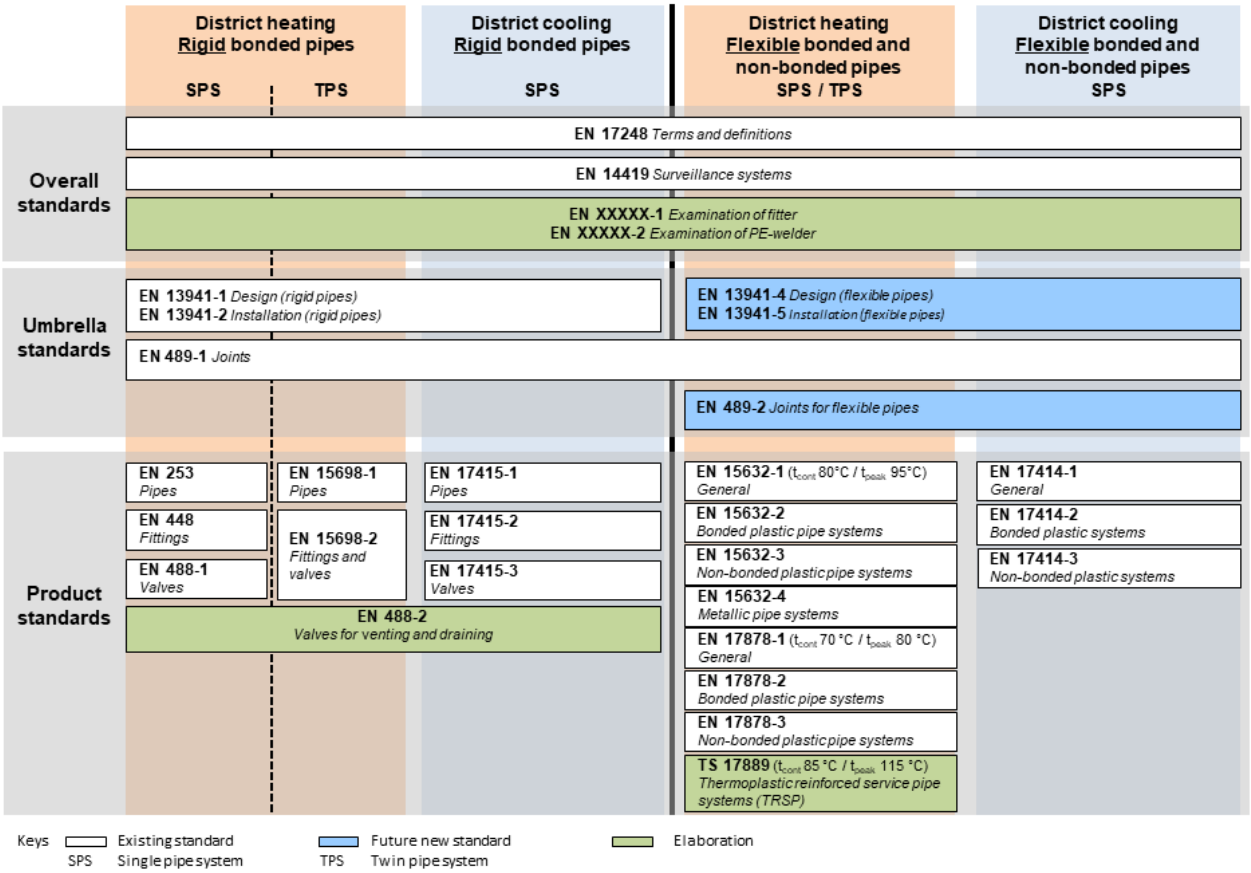

Figure 1 - Structure of standards under the scope of CEN/TC107

3. Temperature ranges

The first standards of CEN/TC 107 dealt with factory made pipe assemblies of steel service pipe, polyurethane thermal insulation and a casing of polyethylene with a continuous temperature of 120 °C and a short-term peak temperature of 140 °C.

In recent years, a number of product standards have also been developed for:

- Flexible pipe systems with different medium pipe materials and different permissible temperature limits
- District cooling piping

The general aim of lowering the operating temperatures also reduces the stresses on the piping systems and the materials used. In order to be able to take appropriate account of the temperature-dependent material parameters for piping systems with lower operating parameters, the EN 13941 series of standards is to make it possible in future to use temperature-dependent material parameters and safety factors. To this end, the first step was to define temperature ranges based on the temperature limits specified in the product standards.

In concrete terms, this means that in the future, for example, general requirements for the temperature range TR5 will be specified in the EN 13941 standard, and permissibl simplifications will be shown in individual cases for the temperature ranges TR1 to TR4.

As can be seen from Figure 2, the temperature range TR1 applies to district cooling pipes and the temperature range TR5 to district heating pipes with the highest permissible design temperatures. The application of pipe systems in the temperature ranges TR2 to TR5 also include application in lower temperature ranges (TR1 to TR4).

The "lower" temperature limit of -5 °C takes into account possible installation temperatures in the winter. This could result in a maximum calculated temperature difference of 145 K = +140 °C - (-5 °C) for

the design in temperature range TR5. The temperature difference leads to high axial compressive stresses and an increased risk with regard to global stability (buckling).

On the other hand, for e.g. district cooling pipelines (TR1) in countries with high installation temperatures in the summer, axial tensile stresses could also occur in the straight pipe sections (e.g. installation temperature 40 °C, maximum design temperature 20 °C).

Figure 2 also provides information on the minimum design service lives (DSL) to be expected according the continuous and peak temperatures.

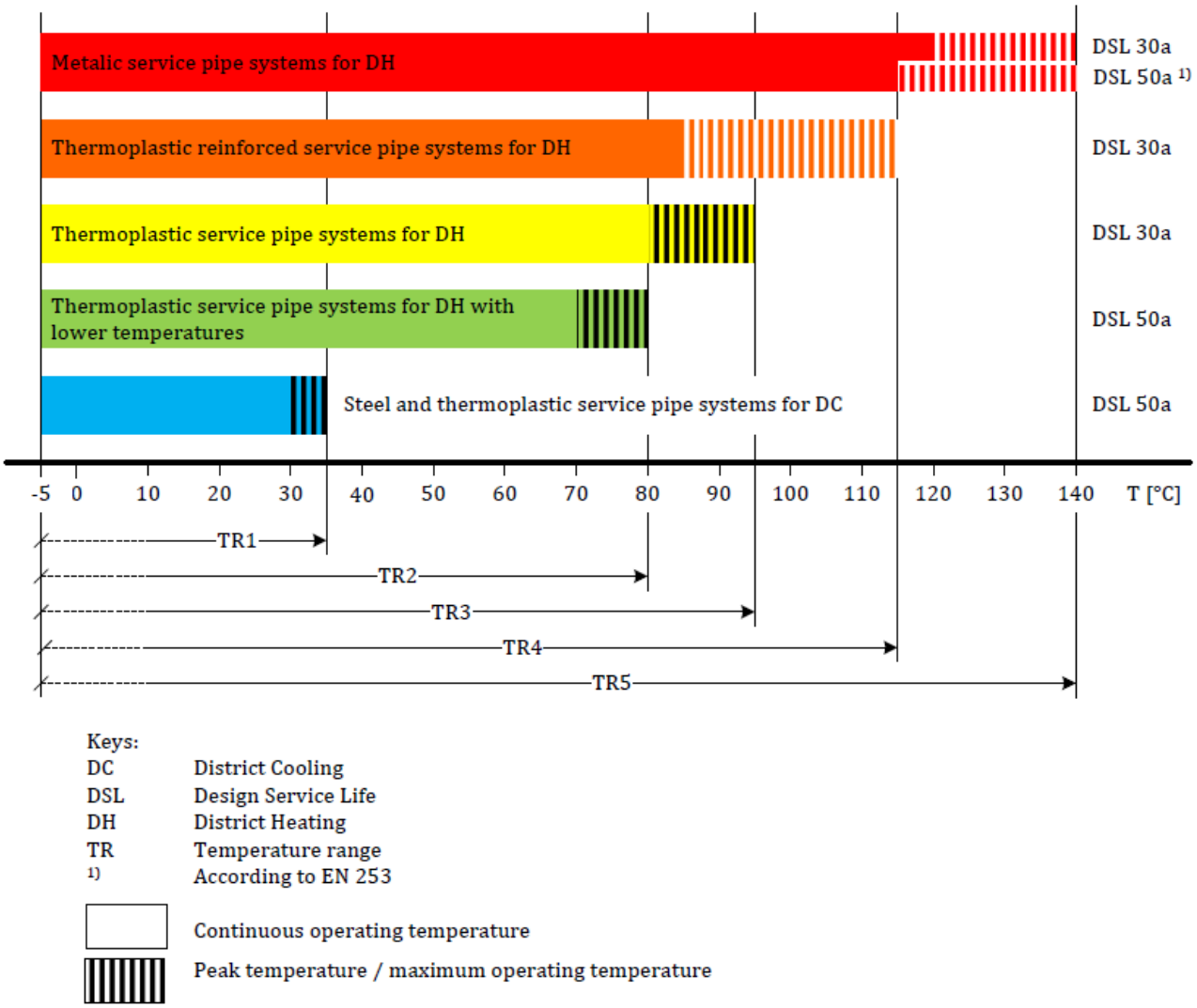

Figure 2 – Temperature ranges of pipe systems for the application of district heating and district cooling

4. Applicability of the standards

The various standards and technical specifications for the rigid and flexible pipe systems with different service pipe materials are valid for different temperature ranges. The user can use Table 1 to select the standards suitable for his application and thus the suitable products.

Table 1 – Applicability of the standards according to medium pipe materials and temperature ranges

Standard or Technical specification	Description	Service pipe				Temperature ranges acc. to Figure 2				
						DC	DH			
		Steel	Corrugated stainless steel	Copper	Plastic	TR1	TR2	TR3	TR4	TR5
Overall standards										
EN 14419	Surveillance systems	X				X				
EN 17248	Terms and definitions	X				X				
EN WWWW-1	Qualification of fitter	X				X				
EN WWWW-2	Qualification of PE-welder	X				X				
Rigid pipe systems										
EN 253	Pipes	X					X			
EN 448	Fittings	X					X			
EN 488-1	Shutoff valves	X					X			
EN 488-2	Valves for venting and draining	X				X				
EN 489-1	Joint casing assemblies	X				X				
EN 13941-1	Design	X	Should be in-vestigated			X				
EN 13941-2	Installation	X	Should be in-vestigated			X				
EN 15698-1	Twin pipes	X					X			
EN 15698-2	Fittings and valves for twin pipes	X					X			
EN 17415-1	Pipes	X			X	X				
EN 17415-2	Fittings	X			X	X				
EN 17415-3	Shutoff valves	X			X	X				
Flexible pipe systems										
EN 489-2	Joint casing assemblies				X		X	X	X	
EN 15632-1	Classification, General	X					X			
EN 15632-2	Bonded pipes				X		X			
EN 15632-3	Non-bonded pipes				X		X			
EN 15632-4	Bonded pipes	X					X			
EN 13941-4	Design	Admission to EN 13941?			X			X		
EN 13941-5	Installation	Admission zo EN 13941?			X			X		
CEN/TS 17889	Reinforced plastic pipes				X			X		
EN 17878-1	Classification, General				X		X			
EN 17878-2	Bonded pipes				X		X			
EN 17878-3	Non-bonded pipes				X		X			
EN 17414-1	Pipes				X	X				
EN 17414-2	Bonded pipes				X	X				
EN 17414-3	Non-bonded pipes				X	X				

Key

DC	District cooling	X	Intended use
DH	District heating	(X)	Possible use
ABCDE	In elaboration		Not applicable
ABCDE	Intended for future development		