

Classification of solar thermal collectors with respect to PED

Paper of common understanding

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1 Introduction

This paper express the common understanding between Edward Haynes, CEN PED Consultant and Jan Erik Nielsen, ESTIF technical consultant concerning how to categorize solar thermal collectors with respect to the PED. The paper reflects the discussions and conclusions from the meeting 2012-04-23 and subsequent exchange of drafts of this document.

Because of the legal nature of Directives, this document is not a definitive interpretation of the PED and may not be attributed to CEN or ESTIF or to the authors in their roles as CEN and ESTIF consultants.

2 Low pressure classification

Collectors operating at a pressure always lower than 0.5 bar above atmospheric pressure are not to be CE marked under the PED. Such collectors are named Class 0 collectors.

For Class 0 collectors it shall be stated in the product manual that maximum operating pressure, PS is 0.5 bar (above atmospheric pressure).

3 Fluid classification

The vast majority of solar thermal collectors uses water or water/glycol mixtures which are non-hazardous and belongs to group 2 fluids. In exceptional cases thermo-oil or other special fluids are used.

If the collector is **not** intended for use with the hazardous group 1 fluids, manufacturer shall state in the product manual: Not for use with Group 1 fluids as listed in [1].

4 Classification by intended use

Two main classes apply:

- Class A: Collectors **NOT** intended for the generation of steam or super-heated water in the primary circuit at temperature ≤ 110 °C
- Class B: Collectors intended for the generation of steam or super-heated water in the primary circuit at temperature > 110 °C

Class A covers the vast majority of the market for solar thermal collectors including the applications: Domestic hot water, space heating, district heating and low-medium temperature process heating and other low to medium temperature applications.

Class B covers collectors for high temperature applications like high temperature process heat and electricity production.

4.1 Class A: Collectors NOT intended for the generation of steam or super-heated water at temperature > 110 °C

Class A collectors are subdivided into two sub classes:

- Class A1: Collectors considered as piping: Collectors with only one pipe all the way through the absorber are considered as piping, e.g. “serpentine collectors”.
- Class A2: Collectors considered as vessels: All other class A collectors not in class A1 (e.g. collectors with parallel tubing connected by common feeders/headers).

4.1.1 Categorization of Class A1 collectors (one-pipe / serpentine collectors)

One-pipe collectors like serpentine collectors NOT intended for generation of steam or super-heated water in the primary circuit at temperature > 110 °C are categorized according to:

- **PED Annex I, table 7** when used with fluids in group 2 (usual case of non-toxic, non-flammable fluids as water and water/glycol mixtures and other fluids not listed in REF 1) [Class A1f2]
- PED Annex I, table 6 when used with fluids in group 1 (exceptional case: toxic and/or flammable fluids as listed in REF 1) [Class A1f1].

4.1.2 Categorization of Class A2 collectors (multi parallel pipe / harp type collectors)

Non-serpentine collectors NOT intended for generation of steam or super-heated water in the primary circuit at temperature > 110 °C are categorized according to:

- **PED Annex I, table 2** when used with fluids in group 2 (usual case of non-toxic, non-flammable fluids as water and water/glycol mixtures and other fluids not listed in REF 1) [Class A2f2]
- PED Annex I, table 1 when used with fluids in group 1 (exceptional case: toxic and/or flammable fluids as listed in REF 1) [Class A2f1]

For Class A collectors it shall be stated in the product manual that:

- *“The collector is NOT intended for generation of steam or super-heated water at temperature > 110 °C”.*

4.2 Class B: Collectors intended for the generation of steam or super-heated water at temperature > 110 °C

Collectors intended for generation of steam or super-heated water at temperature > 110 °C are always categorized with respect to attestation of conformity according to **PED Annex I, table 5**.

For Class B collectors it shall be stated in the product manual that:

- *“The collector is intended for generation of steam or super-heated water at temperature > 110 °C”.*

5 CE marking of Class A1 collectors

Class A1 is one-pipe /serpentine collectors NOT intended for generation of steam or superheated water in the primary circuit. Class A1 collectors are categorized according to table 1 or 2 for fluid group 1 and 2 respectively. Table 7 for group 2 fluids (non-hazardous fluids) is given below. This table will cover the vast majority of one-pipe / serpentine collectors.

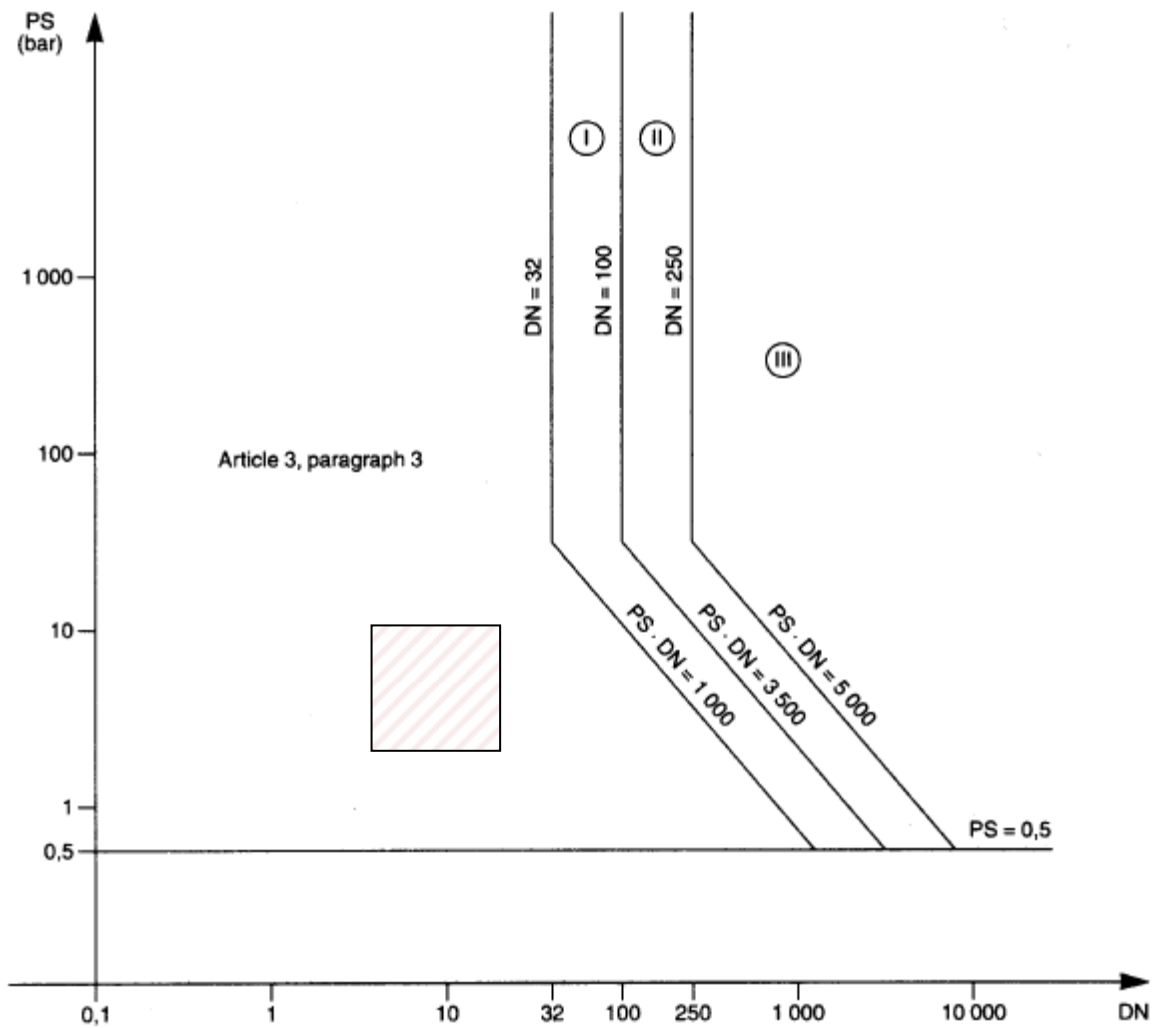


Table 7

Piping referred to in Article 3, Section 1.3 (a), second indent

The shaded area indicates area of typical class A1 collectors.

It is seen from table 7 that [Class A1f2] collectors $DN < 32$ mm or $PS \cdot DN < 1\,000$ bar*mm are not to be CE marked.

PS is maximum pressure stated by manufacturer. Given in bar (over atmospheric pressure).
 DN is maximum nominal diameter of the piping stated by manufacturer. Given in mm.

For Group 1 fluids the similar table 6 is used - here the limit is more strict: $DN = 25$ is here the limit for CE marking.

6 CE marking of Class A2 collectors

Class A2 is for multi-pipe /harp-type collectors NOT intended for generation of steam or superheated water in the primary circuit. Class A2 collectors are categorized according to table 1 or 2 for fluid group 1 and 2 respectively. Table 2 for group 2 fluids (non-hazardous fluids) is given below. This table will cover the vast majority of multi-pipe / harp-type collectors.

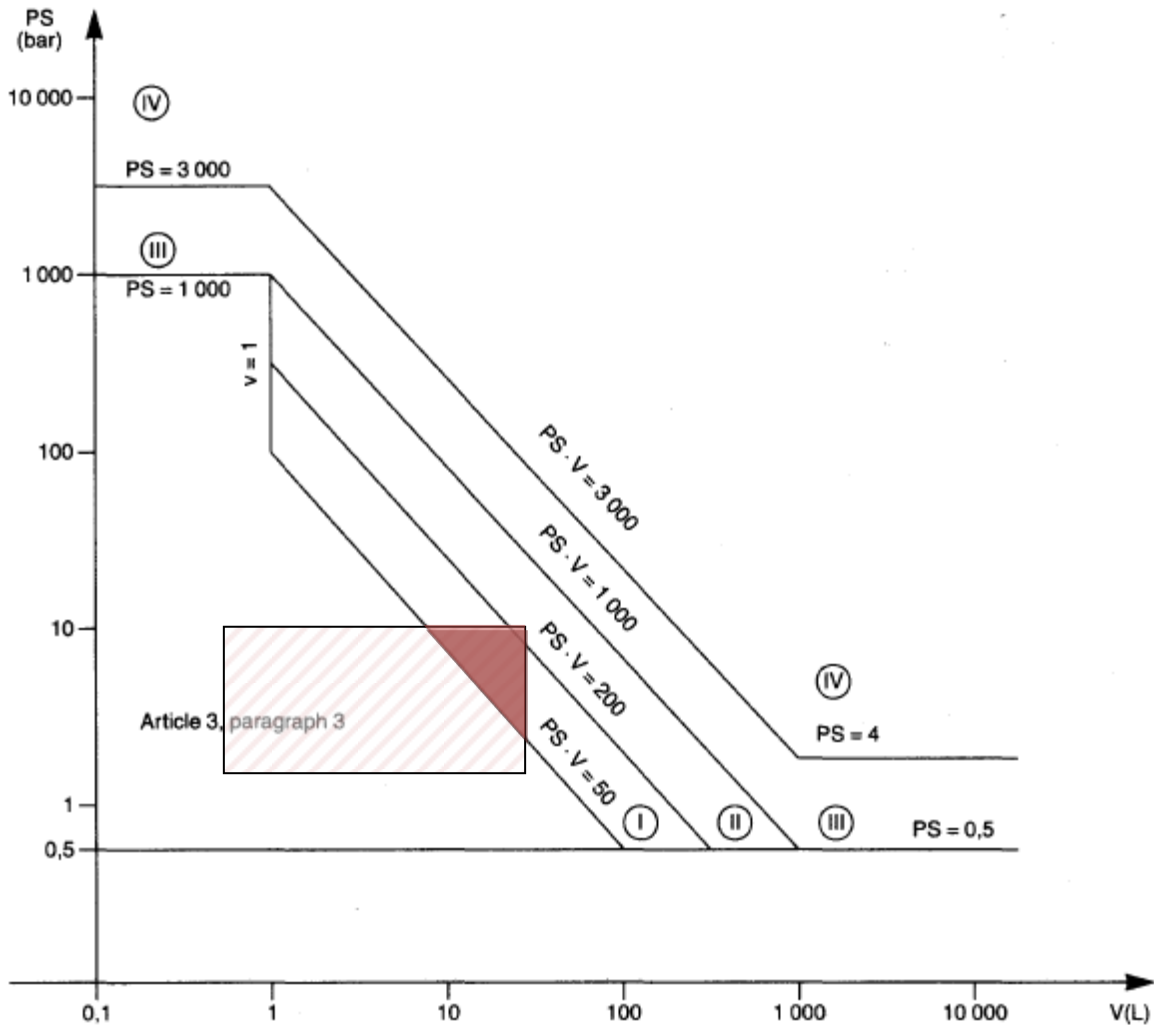


Table 2

Vessels referred to in Article 3, Section 1.1 (a), second indent

The shaded area indicates area for typical class A2 collectors.

It is seen from table two that only collectors with $PS * V > 50$ bar*litre shall have CE mark. No CE-marking in other cases when $PS < 1000$ bar.

PS is maximum pressure stated by manufacturer. Given in bar (over atmospheric pressure).
V is fluid volume content stated by manufacturer. Given in litres.

PED guideline 2/23 [2] refers to such class A2 multi-pipe collectors.

For Group 1 fluids the similar table 1 is used - here the limit is more strict: $PS \cdot V = 25 \text{ bar} \cdot \text{litre}$ is here the limit for CE marking.

7 Class B collectors

Collectors intended for generation of steam or superheated water in the primary circuit are categorized according to table 5 shown below (used together with group 2 non-hazard fluids). This is collectors for high temperature applications like high temperature process heat and electricity production.

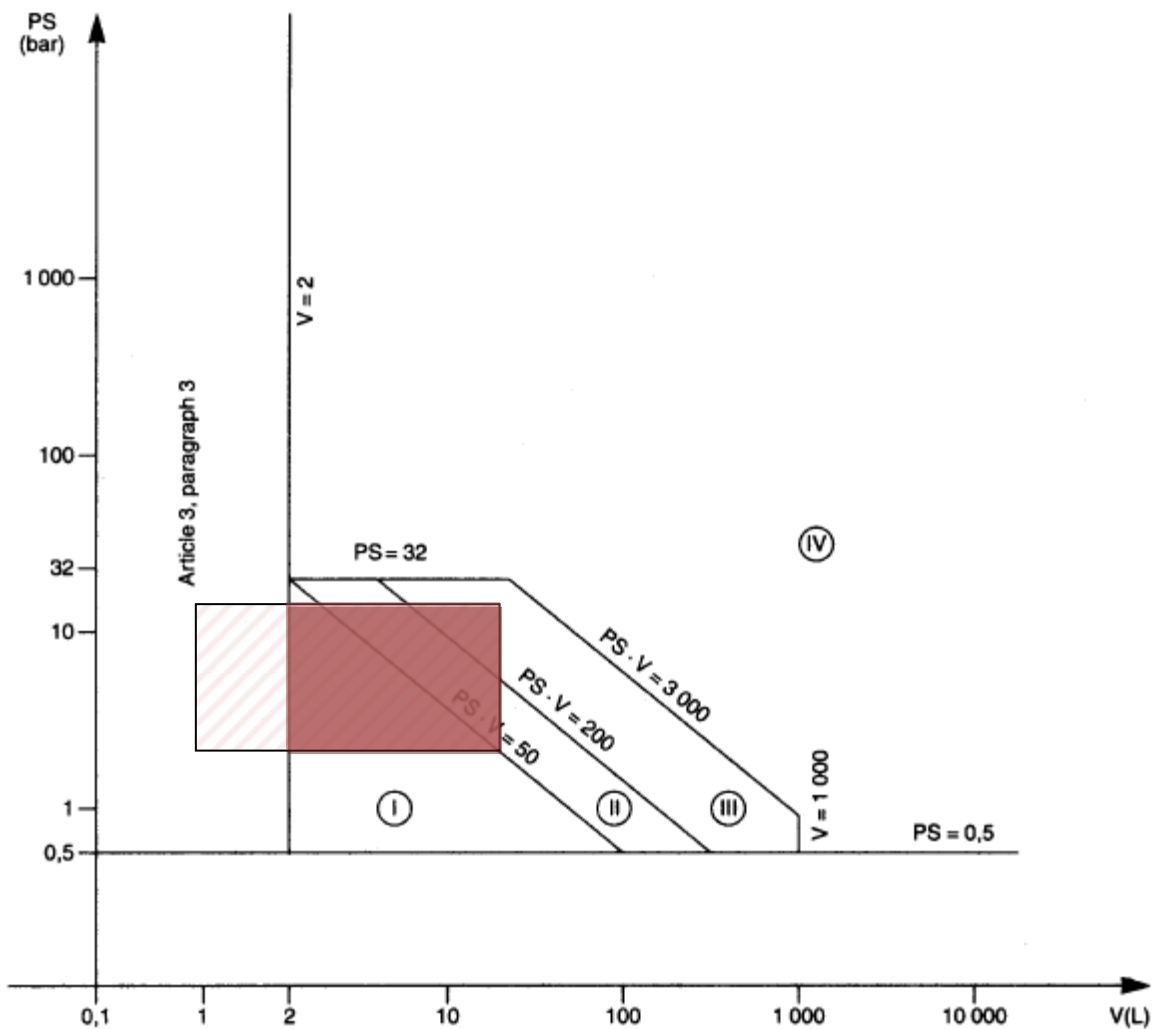


Table 5

Pressure equipment referred to in Article 3, Section 1.2

The shaded area indicates area of typical class B collectors.

All Class B collectors with $V > 2$ litres shall have CE mark.

PS is maximum pressure stated by manufacturer. Given in bar (over atmospheric pressure).
V is fluid volume content stated by manufacturer. Given in litres.

8 Product manual specifications:

The following shall be specified in collector manual:

- Max. operating pressure, PS =
- Volume content, V =
- DN for largest diameter, DN =
- Max. operating temperature, TS =
- Stagnation temperature at incident solar radiation of 1000 W/m² and ambient air temperature of 30°C, Tmax =
- A safety valve shall be installed in the collector loop to secure that the pressure in the collector is always lower than PS
- Not for use with Group 1 fluids as listed in [1] (if this is the case)

9 Specifications in standard

It shall be clearly stated in a future collector standard harmonised to PED, that it only deals with the collector module and not with assemblies.

10 Others

It will most probably not be possible to include an Annex Z related to PED in the ongoing revision of the standard (being now in public enquiry).

A way to proceed could be to ask TC 312 to start work on a CEN TR or CEN TS dealing with PED requirements for solar thermal and systems and components (including collectors).

Harmonised standards for solar thermal systems and components can be elaborated under the general Mandate M/071

CE marking related to PED can go together with the existing CEN KEYMARK certification scheme for solar collectors and systems - if the CE mark is at least as visible as the KEYMARK on the product and in accordance with PED ANNEX VI".

11 Overview table for categorizing solar thermal collectors with respect to PED

	Main type	Sub type	Table to be used for categorization		CE mark when	
			Group 1 fluids	Group 2 fluids	Group 1 fluids	Group 2 fluids
Class 0	“Low pressure collectors” ($< \frac{1}{2}$ bar over atmosphere)		Never		Never	
Class A1	“Collectors NOT intended for generation of steam or super heated water in the primary circuit”	One-pipe / serpentine collectors	PED, Annex 1, table 6	PED, Annex 1, table 7	DN > 25 mm	DN > 32 mm
Class A2		Multi-pipe / harp type collectors	PED, Annex 1, table 1	PED, Annex 1, table 2	PS*V > 25 bar*litres	PS*V > 50 bar*litres
Class B	“Collectors intended for generation of steam or super heated water in the primary circuit”		PED, Annex 1, table 5		V > 2 litres	

The most common cases covering the vast majority of the market (domestic hot water, space heating, district heating, low temperature process heating, etc.) are indicated with **bold**.

12 References

[1]: DIRECTIVE 97/23/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, Article 9, § 2.1: Group 1 comprises dangerous fluids. A dangerous fluid is a substance or preparation covered by the definitions in Article 2 (2) of Council Directive 67/548/EEC of 27 June 1967 on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances (OJ No 196, 16. 8. 1967, p. 1. Directive as last amended by Commission Directive 94/69/EC (OJ No L 381, 31. 12. 1994, p. 1).

Group 1 comprises fluids defined as:

- explosive,
- extremely flammable,
- highly flammable,
- flammable (where the maximum allowable temperature is above flashpoint),
- very toxic,
- toxic,
- oxidizing.

[2]: PED Guideline 2/23; (http://ec.europa.eu/enterprise/sectors/pressure-and-gas/documents/ped/guidelines/index_en.htm)

Annex: Flow chart for PED categorization of solar collectors

