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Proposals of amendments to ATP pending proposals

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English

Tests requirements for fixed dividing walls to measure their K coefficient

Transmitted by the Government of France

Introduction

1. Paragraph 7.3.7 of ATP annex 1 Appendix 2 gives K values for fixed dividing walls. Those values are dependent of:

   (a) the implantation inside the vehicle,

   (b) their mobility and,

   (c) the surface material of the floor on which these dividing walls stand.

2. To check the value of these coefficients, ATP imposes a criterion of foam minimum thickness.

3. K values given by ATP are fixed one. This strategy pushes down and limit the insulation level actually offered by the walls with, as a result, an incentive to:

   (a) prefer dividing walls with reduced insulation and,

   (b) limit manufacturers willingness to improve their internal partitioning solutions for a vehicle used in the ATP.

4. Paragraph 7 of ATP annex 1 Appendix 2 defines the "PROCEDURE FOR MEASURING THE CAPACITY OF MECHANICAL MULTI-TEMPERATURE REFRIGERATION UNITS AND DIMENSIONING MULTI-COMPARTMENT EQUIPMENT". Given that no methods exist within the ATP to measure the K value of the internal dividing walls, paragraph 7.2.1 defines the test general procedure test with the obligation to test each evaporator in a separate calorimeter. If this measure is applicable to refrigerating units with independent evaporators, the others with built-in multiple evaporators cannot be tested in accordance with this paragraph. Such refrigeration units are excluded from ATP which creates an unjustifiable filter for those kinds of refrigeration units.

5. Taking into account that the application of paragraph 7.3.7 of ATP annex 1 Appendix 2:

   - is detrimental to the improvement of K value for dividing walls and,

   - makes impossible the test of a some multi-temperature refrigeration units according to point 7 of ATP annex 1 Appendix 2, it would be beneficial to add to the proposed K values a methodology to measure the real K value of dividing walls.

State of art

6. Test methodology is based on the one given by ATP at section 2, annex 1 Appendix 2 "Insulating capacity of equipment" in its 6 January 2018 release version.

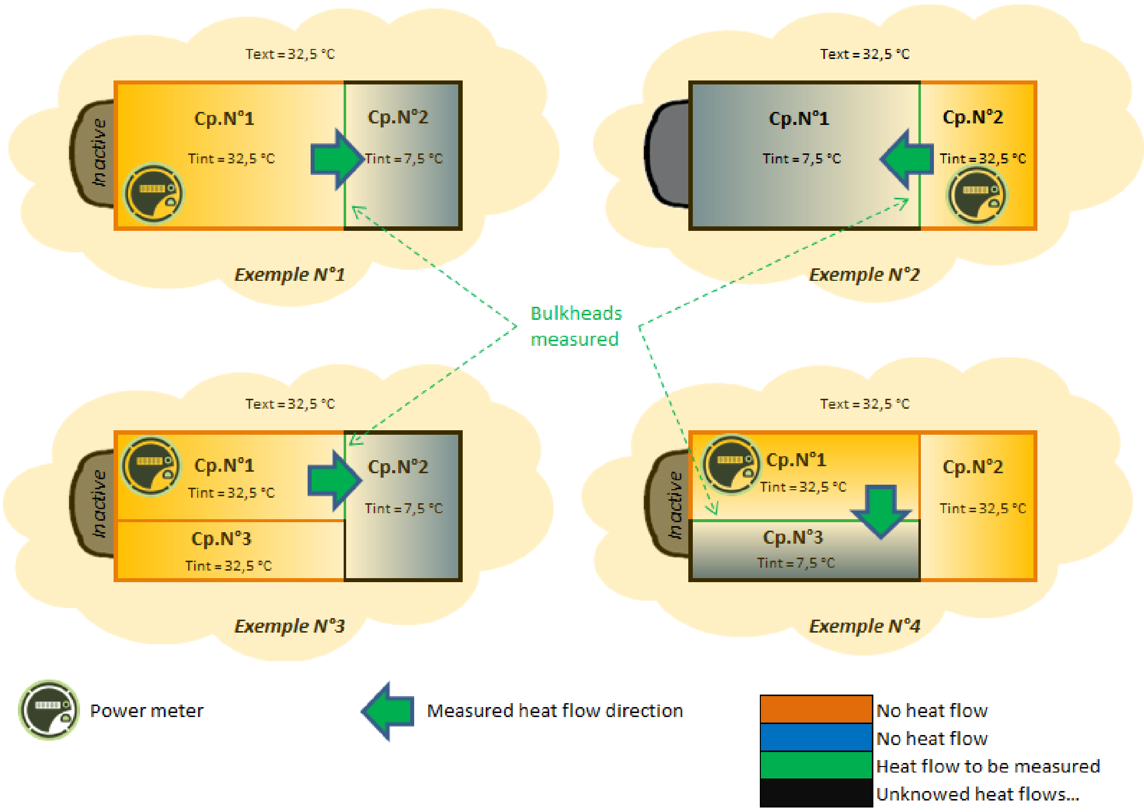
7. This methodology introduces an addition to paragraph 7.3.7 in order to meet the need to:

- adapt the multi-temperature refrigeration units testing methodology proposed in paragraph 7.2 to inbuilt multiple evaporators refrigeration unit;
- to promote manufacturers who offers better solutions in the case of fixed dividing walls use.

8. The methodology principle is based on:

- Creating a thermal flow controlled through the fixed dividing wall where the K coefficient value is sought;
- Cancelling heat fluxes of all of the other walls of the compartment where the power measurement is done.

9. The four examples below explain the method for some given configurations:



With 'Cp.N ° X, the compartment number X.

Technical impact of the proposed measure

10. This proposal provides a methodology to assess the value of the K coefficient of fixed dividing walls. This methodology is based on one already existing in the ATP for the determination of the overall K coefficient of a calorimeter box which has been proven since 1976.

Economical impact of the proposed measure

11. The use multi-temperature refrigeration units with integrated multiple evaporators will not be any more excluded by ATP even though these units are in use in the ATP world,

12. The efforts made by manufacturers to improve fixed dividing walls can be recognized via a real K value measurement,

13. The impact of each fixed dividing wall can be evaluated according to a refrigeration unit reduced running time as indicated according to paragraph 7.3 "Dimensioning and certification of refrigerated multi-temperature equipment".

Environmental impact of the proposed measure

14. This proposal can improve the thermal insulation of fixed dividing walls of a vehicle. This provision help to reduce the energy required to maintain a level of temperature according to ATP.

Conclusion

15. The present proposal introduces a test methodology for measuring real K value of fixed dividing walls. This methodology is to be entered in paragraph 7.3.7 as being a method giving places to results that can be used instead of the default ones.

16. As soon as an amendment to ATP can be registered on the basis of this methodology, the general procedure of paragraph 7.2.1 where refrigeration test conditions are specified for mechanical multi-temperatures refrigeration units could then be changed.

ATP Proposal of amendment

Section of ATP concerns by the proposal: Point 7.3.7, annex 1 appendice 2

List the relevant paragraph for instance:

7.3.7 Internal dividing walls

It is proposed to ❑ add ☑ replace ❑ suppress the following paragraphe of ATP

Original paragraph of ATP :

ii) Original text

7.3.7 Internal dividing walls

Thermal losses through internal dividing walls shall be calculated using the K coefficients in the following table.

	K coefficient – [W/m².K] Fixed	Removable	Minimum foam thickness [mm]
Longitudinal – alu floor	2.0	3.0	25
Longitudinal – GRP floor	1.5	2.0	25
Transversal – alu floor	2.0	3.2	40
Transversal – GRP floor	1.5	2.6	40

K coefficients of movable dividing walls include a safety margin for specific ageing and unavoidable thermal leakages.

For specific designs with additional heat transfer caused by additional thermal bridges compared to a standard design, the partition K coefficient shall be increased.

Proposal of amendment:

ii) Proposed modified text

7.3.7 Internal dividing walls

7.3.7.1 General conditions

Thermal losses through internal dividing walls shall be calculated using the K coefficients in the following table or measure according to the testing methodology that follows it for fixed dividing walls only.

7.3.7.2 Determination of default K coefficients for dividing walls

	K coefficient – [W/m².K] Fixed	Removable	Minimum foam thickness [mm]
Longitudinal – alu floor	2.0	3.0	25
Longitudinal – GRP floor	1.5	2.0	25
Transversal – alu floor	2.0	3.2	40
Transversal – GRP floor	1.5	2.6	40

K coefficients of movable dividing walls include a safety margin for specific ageing and unavoidable thermal leakages.

For specific designs with additional heat transfer caused by additional thermal bridges compared to a standard design, the partition K coefficient shall be increased.

7.3.7.3 K-value test procedure for fixed dividing walls

The measurement of the K coefficient is done in continuous operation by internal heating and cooling method. The vehicle is placed, empty of all loading in a cooler room.

The choices of internal temperatures of each compartment have to be chosen in order to:

- Create a thermal flow controlled through the dividing wall where the K coefficient value is sought,

- Cancel heat fluxes of all of the other walls of the compartment where the power measurement is done.

Temperature measurement points:

- external to the body of the machine comply with point 1.4 of this appendix.
- interior of each compartment closed with the dividing wall respect point 1.3 with an additional sensor positioned in the center of the inner dividing wall.

In the case of compartments:

- to be cool: one or more heat exchangers are placed.
- To be heat: an electric heating device (resistance, etc.) are positioned.

All must respect points 2.1.2 and 2.1.3 of this appendix where the empty volume and the inner surfaces of the body correspond, respectively, to the empty volume and the inner surfaces of each of the considered compartments.

The average temperature of the insulated chamber is maintained for the duration of the test, uniform and constant as indicated in paragraph 1.7 of this appendix, at a level such that the temperature difference between the inside of the box and the insulated chamber is:

- Equal to 25 ° C ± 1 K, the average temperature walls of the body to the relevant compartment, being maintained at + 20 ° C ± 0.25 K for the compartments to 7.5 ° C, or
- Equal to 0 ° C ± 1 K, the average temperature walls of the body to the relevant compartment, being maintained at + 32.5 ° C ± 0.25 K to 32.5 ° C compartments.

in accordance with point 2.1.5 2.1.6 2.1.7 and 2.1.8 of this appendix.

The K coefficient of the dividing wall is defined by the following relation:

$$K = \frac{W}{S.\Delta T}$$

Where:

- W is the absolute power of heating or cooling, as the case may be, required to meet the conditions of stability required by the method.
- ΔT is the difference between the average temperatures Ti of the compartments closed with the dividing wall, when the average outside temperature Te is constant.
- S is the internal exchange surface seen in one of the compartments that the dividing wall closes.

There will be mention, in the test report, about the floor surface type material on which the partition is based.

K-value uncertainty must be within the limits expose in point 2.3.2 of this appendix.