DIN EN 16440-1:2015-05 (E)

Testing methodologies of refrigerating devices for insulated means of transport - Part 1: Mechanical coolin g device with forced air circulation evaporator with or without heating device

Contents

Page

Foreword 4

1 Scope 5

2 Normative references 5

3 Terms and definitions, symbols and uncertainties 5
3.1 Terms and definitions 5
3.2 Symbols and uncertainties 9

4 Requirements 11
4.1 Tested appliance description 11
4.2 Test equipment 11
4.2.1 General requirements 11
4.2.2 Requirements for the calorimeter box 12
4.2.3 Requirements for the conditioned test room 12
4.3 Installation and connection of the cooling device 12
4.3.1 General 12
4.3.2 Installation of cooling device with locally separated components (split system) 12

5 Test conditions and methodology 13
5.1 General 13
5.2 Test conditions 13
5.2.1 Test conditions for measuring the cooling capacity PC 13
5.2.2 Test conditions for measuring the heating capacity PH 13
5.2.3 Test condition for measuring the total energy consumption ET 14
5.3 Temperature measurements 14
5.3.1 Temperature of the conditioned test room Te 14
5.3.2 Inside temperature of the calorimeter box Ti 15
5.3.3 Air temperatures of the cooling device 15
5.4 Cooling capacity PC 15
5.5 Heating capacity PH 15
5.5.1 Electric heating device 15
5.5.2 All heating devices 16
5.6 Performance testing under rated conditions 17
5.6.1 General 17
5.6.2 Provisions for cooling devices driven by vehicle engines 17
5.6.3 Heat transmission PTR through the calorimeter box 19
5.6.4 Steady-state conditions under rated conditions 19
5.6.5 Energy consumption measurements 19
5.6.6 Measurement of the maximum cooling capacities and energy consumption at full load 20
5.6.7 Measurement of energy consumption under rated conditions at part load 20
5.6.8 Measurement of heating capacity and energy consumption 21
5.7 Air flow measurement 21
5.8 Rotation speed measurements 21
5.9 Time measurement 22
5.10 Functional tests 22
5.10.1 Cooling-down test 22
5.10.2 Defrosting test 22

6 Test results 22
6.1 General 22
6.2 Energy efficiency ratio determination 24
6.2.1 General 24
6.2.2 Determination of the cooling energy efficiency ratio EERC 24
6.2.3 Determination of the heating energy efficiency ratio EERH 24

7 Test report 24

Annex A (informative) Examples 26

Annex B (informative) Explanation with regard to reference speeds for different vehicle engines 27

Annex C (informative) Total efficiency of the power chain of electric and hybrid vehicles 33

Annex D (normative) Determination of energy and fuel consumption for cooling devices 34

D.1 Determination of energy and fuel consumption for dependent cooling devices 34
D.2 Determination of fuel consumption for independent cooling devices 35

Annex E (informative) Heating device test methodologies 36

E.1 General 36
E.2 Direct refrigeration systems 36
E.3 Indirect refrigeration system 39

Bibliography 40