

DIN EN 13129:2016-12 (E)

Railway applications - Air conditioning for main line rolling stock - Comfort parameters and type tests

Contents		Page
European foreword		5
1	Scope	6
2	Normative references	6
3	Terms and definitions	6
4	Compliance with the standard	12
5	Comfort parameters	13
6	Quality limits	13
7	Service conditions	14
7.1	Exterior conditions	14
7.1.1	Design conditions	14
7.1.2	Extreme conditions	15
7.2	Interior conditions	15
8	Performance of the heating and cooling installations	16
8.1	Preheating	16
8.2	Heating	16
8.3	Precooling	16
8.4	Cooling	16
8.5	Stand by operation	17
8.6	Door opening sequence	17
8.7	Degraded mode operation	17
9	Control	17
9.1	General	17
9.2	Interior temperature setting	17
9.3	Quality of regulation	18
9.3.1	General	18
9.3.2	Changing the interior temperature setting	18
9.3.3	Changing test parameter(s)	19
9.3.4	Stabilized conditions	20
10	Comfort conditions to be respected	22
10.1	Parameters in the comfort envelope	22
10.1.1	Temperatures in the comfort zones	22
10.1.2	Temperatures of the surfaces surrounding the comfort envelope	23
10.1.3	Humidity of the air	24
10.1.4	Air speed	25
10.1.5	Air quality	26
10.2	Parameters in the annex areas	28
10.3	Interior parameters in the catering service areas (galley zone)	29
10.4	Limits of temperature values	29
11	Supplementary requirements	30
11.1	Heat transfer coefficient	30

11.2	Solar factor (g) of the windows	30
11.3	Cleaning of air conditioning installation	30
12	Air movement tests	30
12.1	Air flow tests at standstill	30
12.1.1	Test conditions	30
12.1.2	Air flow rates	30
12.1.3	Visualization of the air flow direction	31
12.2	Air flow tests when driving	31
12.3	Air speed tests	31
12.3.1	Critical air speed	31
12.3.2	Measurement of air speed during the climatic tests	31
13	Climatic tests	31
13.1	General remarks	31
13.2	Preheating test	32
13.3	Precooling test	32
13.4	Regulation tests	32
13.4.1	Steady-state tests	32
13.4.2	Intermediate tests	33
13.4.3	Tests for typical daily profiles	33
13.5	Functionality tests	33
14	Supplementary tests	34
14.1	Determination of the heat transfer coefficient	34
14.1.1	Purpose of the test	34
14.1.2	Calculation	34
14.1.3	Procedure	34
14.2	Thermography	35
15	Methods of measurement - Measuring instruments	35
15.1	General remarks	35
15.2	Temperatures	35
15.2.1	Air temperature	35
15.2.2	Surface temperatures	35
15.3	Relative humidity	35
15.4	Air speed	35
15.5	Airflow rate	35
15.6	Simulated speed of the vehicle	35
15.7	Equivalent solar energy	36
15.8	Energy consumption and power rating	36
16	Characteristics of the test equipment	36
16.1	General remarks	36
16.2	Occupation	36
16.3	Temperature and uniformity of the climatic chamber	36
16.4	Relative humidity	36
16.5	Simulation of wind speed	36
16.6	Equivalent solar energy	37
17	Distribution of measuring points	37
17.1	Distribution of sensors in the vehicle	37
17.1.1	Comfort envelope temperature measuring points	37
17.1.2	Surface temperature measuring points	37
17.1.3	Supply air outlet temperature measuring points	38
17.1.4	Comfort envelope air speed measuring points	38
17.1.5	Comfort envelope relative humidity measuring points	38
17.2	Climatic chamber sensors distribution	38
	Annex A (informative) Grouping of countries in climatic zones	39
	Annex B (normative) Calculation method of the overall conformity level CL	40

Annex C (normative) Tests for verification of comfort parameters	43
Annex D (normative) Equivalent solar energy (Simulation of solar exposure)	53
Annex E (normative) Location of the measuring points used for the determination of the mean interior temperature in the comfort envelope (Tim), horizontal range of the extreme interior air temperatures and the measuring point location in the local annexes	54
Annex F (normative) Location of the measuring points used for the determination of the vertical ranges of the extreme interior air temperatures and relative humidity across the comfort envelope	56
Annex G (normative) Location of the measuring points used for the determination of the variation of internal temperatures within the comfort envelope	58
Annex H (informative) Location of the sensors in the climatic chamber	60
Annex I (normative) Typical daily profiles	61
Annex J (normative) Heat emission per person	73
Annex K (informative) Abbreviations	75
K.1 Surface temperatures: TS__Range_Surface concerned	75
K.2 Airflow: V_Type of airflo	75
K.3 Range of temperature: T_Mode_Location	75
K.4 Gradients: T Type of gradient_Range_Location	76
K.5 Others	76
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC	77
Bibliography	79