

ISO 13506-1:2024-06 (E)

Protective clothing against heat and flame - Part 1: Test method for complete garments - Measurement of transferred energy using an instrumented manikin

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Overview	4
4.1 General	4
4.2 Heat flux - energy balance on the sensor	4
4.3 Assumptions to achieve the required heat flux	5
5 Apparatus	6
5.1 Instrumented manikin	6
5.2 Posture of the manikin	9
5.3 Manikin sensors	10
5.3.1 Principle	10
5.3.2 Number of manikin sensors	11
5.3.3 Manikin sensor-measuring capability	12
5.3.4 Manikin sensor specification	12
5.3.5 Manikin sensor positioning	14
5.3.6 Manikin heat flux validation	14
5.4 Data acquisition system	16
5.5 Computer software program	16
5.5.1 General	16
5.5.2 Incident heat flux	17
5.5.3 Exposure heat flux	17
5.5.4 Thermal manikin protection factor (TMPF)	17
5.5.5 Transferred energy	18
5.6 Flame exposure chamber	19
5.6.1 General	19
5.6.2 Chamber size	19
5.6.3 Chamber air flow	19
5.6.4 Chamber isolation	19
5.6.5 Chamber air exhaust system	19
5.6.6 Chamber safety devices	19
5.7 Fuel and delivery system	20
5.7.1 General	20
5.7.2 Fuel	20
5.7.3 Fuel delivery and shut-off system	20
5.7.4 Burner system	20
5.8 Image recording equipment	21
5.9 Safety checklist	21
5.10 Laboratory capability demonstration	22
6 Sampling and test specimens	22
6.1 General	22
6.2 Number of test specimens	22
6.3 Size of test specimen	22
6.4 Specimen preparation	23

6.4.1	Conditioning.....	23
6.4.2	Optional laundering.....	23
6.5	Standard reference garment design.....	23
7	Pre-requisites for products implementing this test method	24
8	Procedure.....	25
8.1	Preparation of test apparatus.....	25
8.1.1	General.....	25
8.1.2	Manikin sensor check.....	25
8.1.3	Flame exposure chamber purging.....	26
8.1.4	Confirming safe operation conditions and lighting of pilot flames	26
8.1.5	Gas line charging.....	26
8.1.6	Confirmation of nude and garment exposure conditions.....	26
8.2	Specimen testing procedure.....	27
8.2.1	General.....	27
8.2.2	Dressing the manikin.....	27
8.2.3	Recording the specimen identification, test conditions and test observations	28
8.2.4	Starting the image recording system.....	28
8.2.5	Setting time for heat transfer data acquisition.....	29
8.2.6	Exposure of the test specimen.....	29
8.2.7	Recording of specimen response remarks.....	29
8.2.8	Calculation of surface incident heat flux and transferred energy	29
8.2.9	Still images.....	29
8.3	Preparing for the next test exposure	29
9	Test report.....	30
9.1	General.....	30
9.2	Specimen identification.....	30
9.3	Exposure conditions.....	30
9.4	Results for each specimen.....	31
9.4.1	General.....	31
9.4.2	Heat flux data of each manikin sensor.....	31
9.4.3	Thermal manikin protection factor	31
9.4.4	Transferred energy	31
9.4.5	Other information that may be reported.....	32
9.5	Observations	32
	Annex A (informative) Considerations for conducting tests and using test results.....	33
	Annex B (informative) Interlaboratory test data analysis	34
	Annex C (normative) Calibration and validation procedure.....	36
	Annex D (informative) Burner stand alignment for flame engulfment.....	39
	Annex E (informative) Elements of a computer software program	42
	Bibliography.....	44