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