

ISO 23296:2022-01 (E)

Metallic materials - Fatigue testing - Force controlled thermo-mechanical fatigue testing method

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Test methods	4
4.1	Apparatus	4
4.1.1	Testing machine	4
4.1.2	Testing machine calibration	4
4.1.3	Cycle counting	4
4.1.4	Waveform generation and control	4
4.1.5	Force measuring system	6
4.1.6	Test fixtures	6
4.1.7	Alignment verification	7
4.1.8	Heating device	7
4.1.9	Cooling device	7
4.2	Specimens	7
4.2.1	Geometry	7
4.2.2	Specimen preparation	9
4.2.3	Specimen measurement	9
4.2.4	Circular or rectangular sections	9
4.2.5	Sampling, storage and handling	9
4.2.6	Specimen insertion	10
4.2.7	Thermocouple attachment	10
4.2.8	Spot welding of thermocouples	10
4.2.9	Heating the specimen	11
4.2.10	Cooling the specimen	11
5	Test preparatory issues	11
5.1	Temperature measurement	11
5.1.1	General	11
5.1.2	Temperature control	11
5.2	Verification of temperature uniformity - Thermal profiling	12
5.2.1	General	12
5.2.2	Maximum permissible temperature variation along the specimen	12
5.2.3	Data recorders	13
5.2.4	Furnace positioning	13
5.3	Force waveform optimisation	13
5.4	Temperature force optimisation	14
5.5	The application of an extensometer to measure maximum and minimum mechanical strain to observe the effects of ratcheting	14
6	Test execution	15
6.1	Test start	15
6.1.1	General	15
6.1.2	Data recording	15

6.1.3	Test termination	15
6.1.4	Test validity	15
6.1.5	During the test	15
6.2	Test monitoring	16
6.3	Termination of test	16
6.3.1	General	16
6.3.2	Accuracy of control parameters	16
7	Analysis and reporting	17
ISO 23296:2022(E) ISO 23296:2022(E) 7.1 Validation of analysis software		17
7.2	Test report	17
7.2.1	General	17
7.2.2	Essential information	17
7.2.3	Additional information	18
7.2.4	Examination of fracture surface	18
Annex A (informative) Guidelines on specimen handling and degreasing		20
Annex B (informative) Thermocouple arrangement for a specimen containing a notch feature		21
Annex C (informative) Thermal imaging for thermal profiling		26
Annex D (informative) Measurement of strain during force controlled TMF testing		27
Annex E (informative) Measurement uncertainty		28
Bibliography		30