DIN 32877-2:2021-07 (E)

Geometrical product specification (GPS) - Dimensional measuring equipment: Optoelectronic measurement of length - Part 2: Design characteristics and metrological characteristics for backward scattering measuring principles

Contents

Page

Foreword 4

Introduction 5

1 Scope 6

2 Normative references 6

3 Terms and definitions 7

4 Symbols and abbreviated terms 16

5 Design characteristics 16

6 Metrological characteristics 17
6.1 Maximum permissible measurement error (MPE) 17
6.2 Limit values of further metrological characteristics (MPL) 17
6.3 Rated operating conditions 18
6.3.1 Reference measuring system 18
6.3.2 Temperature 18
6.3.3 Warm-up time 18
6.3.4 Parameters of the optoelectronic length measuring device 18
6.3.5 Further conditions 19
6.4 Test method 19
6.4.1 General 19
6.4.2 Linearity deviation (limited by Elin,MPE) 19
6.4.3 Temporal repeatability and spatial repeatability (limited by Rtemp,MPE and Rspatial,MPE) 21
6.4.4 Step response time with respect to changes in the measurand (limited by tresponse,MPL) 22
6.4.5 Setting time with respect to changes in the measurand (limited by tvalue,MPL) 23
6.4.6 Limit frequency with respect to changes in the measurand (limited by tvalue,MPL) 23
6.4.7 Limit frequency with respect to changes in the received radiant power (limited by fflux,MPL) 24
6.4.8 Limit tilt (limited by tilt,MPL) 24
6.4.9 Axial optical resolution (limited by zresolution,MPL) 24
6.4.10 Dynamic range of the received radiant power during a single measurement (limited by SNRflux,MPL) 25
6.4.11 Proof of conformity with the metrological specifications 26

Annex A (informative) (Measurement) standards 27

A.1 General 27
A.2 Design characteristics 27
A.2.1 Standard 1 for testing the linearity deviation and repeatability 27
A.2.2 Standard 2 for testing the linearity deviation and repeatability 27
A.2.3 Standard 3 for testing the linearity deviation and repeatability 27
A.2.4 Standard 4 for testing the step response time, the setting time and the limit frequency with respect to changes in the measurand 28

A.2.5 Standard 5 for testing the step response time, the setting time and the limit frequency with respect to changes in the measurand ... 28
A.2.6 Standard 6 for testing the step response time, the setting time and the limit frequency with respect to changes in the measurand ... 28
A.2.7 Standard 7 for testing the limit frequency with respect to changes in the received radiant power ... 29
A.2.8 Standard 8 for testing the limit frequency with respect to changes in the received radiant power ... 29
A.2.9 Standard 9 for testing the limit tilt ... 30
A.2.10 Standard 10 for testing the axial optical resolution ... 30
A.2.11 Standard 11 for testing the dynamic range of the received radiant power during a single measurement ... 31
A.3 Application ... 32
A.4 Test set-up ... 34

Annex B (informative) Data sheet requirements ... 35

Bibliography ... 37

Figures Figure 1 -- Measurement corridor for the triangulation measuring principle ... 9

Figure 2 -- Measurement corridor for the confocal chromatic measuring principle and the absolute interferometric measuring principle ... 10

Figure 3 -- Step response time and setting time for an abrupt change in the measurand ... 11

Figure 4 -- Testing of the axial optical resolution by simultaneous distance measurements to the front and back of a partially transparent test object ... 13

Figure 5 -- Testing the dynamic range of the received radiant power during a single measurement by simultaneous distance measurements to the front and back of a partially transparent test object ... 15

Figure 6 -- Schematic representation of the method of testing linearity deviation, temporal repeatability and spatial repeatability ... 20

Figure 7 -- Diagram of the linearity deviation, the temporal repeatability and the spatial repeatability ... 21

Figure A.1 -- Schematic representation of standard 11 ... 31

Figure A.2 -- Schematic representation of a possible set-up for testing linearity deviation, temporal repeatability and spatial repeatability ... 34

Tables Table 1 -- Abbreviated terms ... 16

Table A.1 -- Application of the standards ... 32

Table B.1 -- Design characteristics of optoelectronic length measuring devices ... 35

Table B.2 -- Metrological characteristics of optoelectronic length measuring devices ... 36