

Materials testing machines - Calibration of static torque measuring devices

Contents

	Page
Foreword	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Symbols	5
5 Characteristics of the torque measuring device.....	7
5.1 Description and marking of the torque measuring device.....	7
5.2 Torque application	7
5.3 Measurement of the torque by deformation	7
6 Calibration of the torque measuring device	7
6.1 General	7
6.1.1 Requirements	7
6.1.2 Overload check.....	8
6.2 Resolution of the display unit	8
6.2.1 Scale indication	8
6.2.2 Digital indication	8
6.2.3 Indication fluctuation	8
6.2.4 Resolution and its unit.....	9
6.2.5 Lower limit of measurement range	9
6.3 Preparation for calibration.....	9
6.3.1 Display unit	9
6.3.2 Temperature equalization	9
6.3.3 Transducer zero value I_s.....	9
6.3.4 Mounting direction, transducer connection.....	9
6.4 Calibration procedure	9
6.4.1 Scope of the calibration and procedure	9
6.4.2 Preloading	10
6.4.3 Mounting position	10
6.4.4 Number of measurement series and torque steps	10
6.4.5 Loading conditions	12
6.4.6 Displayed value corrected for the zero value $X_j (M_K)$.....	12
6.4.7 Evaluation of the torque measuring device	12
6.4.8 Short-term creep	15
7 Classification of the torque measuring device.....	15
7.1 General	15
7.2 Classification principle	16
7.3 Lower limit of the measurement range and classification criteria.....	16
7.3.1 Lower limit of measurement range	16
7.3.2 Classification criteria.....	16
7.4 Calibration certificate and recalibration.....	17
7.4.1 Calibration certificate	17
7.4.2 Recalibration	18
8 Designation	18

Annex A (normative) Application of calibrated torque measuring devices	19
Annex B (normative) Recommended dimensions for torque transducers, including couplings for their adaptation to torque calibration machines	20
Annex C (informative) Determination of the relative expanded measurement uncertainty W for the calibration of torque measuring devices.....	21
C.1 General.....	21
C.2 Determination of the measurement uncertainty of the fitted calibration result for the calibration of torque measuring devices.....	21
C.2.1 Model.....	21
C.2.2 Measurement uncertainty budget	22
Annex D (informative) Calibration procedure	26
Bibliography	27

Figures

Figure B.1 — Adaptation dimensions on a torque transducer with cylindrical shaft ends	20
Figure D.1 — Example of preloadings and measurement series for classes 0,05 and 0,1.....	26
Figure D.2 — Example of preloadings and measurement series of square drive transducers for classes 0,2 and 0,5	26
Figure D.3 — Example of preloadings and measurement series of square drive transducers for classes 1 to 5.....	26

Tables

Table 1 — Symbols, units and designation	5
Table 2 — Number of measurement series required.....	11
Table 3 — Classification characteristics of the torque measuring devices	16
Table B.1 — Recommended dimensions for cylindrical shaft ends of a torque transducer.....	20
Table C.1 — Distribution functions for the calculation of the relative standard deviations for the parameters calculated from the spans determined empirically	23
Table C.2 — Example of the tabular calculation of the relative standard measurement uncertainty w for torque measuring devices for static torques	25