ISO 9059:2025-08 (E)

Solar energy - Calibration of pyrheliometers by comparison to a reference pyrheliometer

Contents

Page

Foreword v

Introduction vi

1 Scope 1

2 Normative references 1

3 Terms and definitions 1

4 Pyrheliometer calibration 5
4.1 Reference pyrheliometers 5
4.2 Pyrheliometer sensitivity, measurement equation, measurand 5
4.3 Comparison of outdoor and indoor calibration 6
4.4 Method validation 7
4.5 Calibration uncertainty 7
4.5.1 General 7
4.5.2 Calibration uncertainty in indoor calibration 7
4.5.3 Calibration uncertainty in outdoor calibration 7

5 Outdoor calibration 8
5.1 General 8
5.2 Radiation source 8
5.3 Meteorological variables 8
5.3.1 Wind speed and direction 8
5.3.2 Ambient air temperature 9
5.3.3 Sky conditions 9
5.4 Measuring equipment 9
5.4.1 Reference pyrheliometer 9
5.4.2 Solar tracker 9
5.4.3 Data acquisition systems and recording 11
5.5 Outdoor calibration procedure 12
5.5.1 General 12
5.5.2 Preparation 12
5.5.3 Installation and adjustment 12
5.6 Data sampling 12
5.7 Mathematical treatment 13
5.7.1 Initial data rejection and filtering 13
5.7.2 Calculation of individual sensitivity values 13
5.7.3 Computation of the sensitivity of the test pyrheliometer 14
5.7.4 Uncertainty evaluation 15

6 Indoor calibration 15
6.1 General 15
6.2 Radiation source 15
6.3 Meteorological variables 15
6.4 Measuring equipment 15
6.4.1 Reference pyrheliometer 15
6.4.2 Calibration system 15
6.4.3 Data acquisition systems and recording 16
6.5 Indoor calibration procedure 16

6.5.1 General 16
6.5.2 Installation and adjustment 16
6.6 Data sampling 16
6.7 Mathematical treatment 17
6.7.1 Calculation of sensitivity 17
6.7.2 Uncertainty evaluation 18

7 Calibrationcertificate 18

Annex A (informative) Effects of circumsolar radiation 19

Annex B (informative) Introduction of a new Pyrheliometer sensitivity 22

Annex C (informative) Uncertainty evaluation for pyrheliometer calibration 24

Annex D (informative) Example of correction terms for an improved sensitivity value 26

Annex E (informative) Determination of number of days for calibration 28

Bibliography 30