

ISO 28902-4:2026-08 (E)

Air quality - Environmental meteorology - Part 4: Ground-based remote sensing of meteorological parameters by particle backscatter lidar

Contents	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	2
3 Terms and definitions	2
4 Symbols and abbreviated terms	4
4.1 Symbols	4
4.2 Abbreviated terms	6
5 Fundamental principles of the backscatter lidar	7
5.1 General	7
5.2 Choice of suitable wavelengths	9
5.2.1 General	9
5.2.2 Overlap function	10
5.3 Attenuated backscatter coefficient	10
5.4 Backscatter coefficient	11
5.4.1 General	11
5.4.2 Determining the boundary condition for the derivation of the particle backscatter coefficient	11
5.5 Particle extinction coefficient	12
5.6 Optical depth	13
5.7 Shape classification / linear depolarisation ratio	13
5.8 Obtaining information on particle size distribution	14
6 Measured and target variables of the backscatter lidar	14
6.1 General	14
6.2 Measured variables	15
6.3 Target variables	15
6.3.1 Backscatter profiles	15
6.3.2 Identification of layers and their boundaries	15
6.3.3 Cloud base, cloud penetration depth and vertical extension	16
6.3.4 Shape classification by analysing the linear depolarisation ratio	17
6.4 Lidar Ratio	17
6.5 Auxiliary variable	19
6.6 Definition of performance characteristics	19
6.6.1 General	19
6.6.2 Temporal resolution	19
6.6.3 Range resolution	19
6.6.4 Spatial averaging	20
6.6.5 Signal-to-noise ratio	20
6.6.6 Operating range	22
6.6.7 Completeness, POD and FAR	23
6.7 Conventional ranges	23
7 Systems and system components	24
7.1 General	24

7.2	Radiation source(s)	24
7.3	Transmitting and receiving optics	25
7.4	Filters	25
7.5	Detectors	26
7.5.1	General	26
7.5.2	Photon counting	26
7.5.3	Analogue data acquisition	27
7.6	Data acquisition, control system	27
7.7	Mechanical structure, infrastructure	28
7.8	Additional system components	28
7.9	Typical lidar design	28
7.9.1	General	28
7.9.2	Bistatic and monostatic lidars	29
7.9.3	Ceilometers	32
7.9.4	Single wavelength lidar systems	32
7.9.5	Multi-wavelength systems	32
7.9.6	Polarisation lidar	33
8	Measurement planning and site requirements	34
8.1	General considerations	34
8.2	Safety	35
8.3	Adjusting the measurement system to atmospheric conditions	35
8.4	Limiting conditions for general operation	36
8.5	Maintenance and operational test	36
8.5.1	General	36
8.5.2	Maintenance	36
9	Factors and uncertainty considerations	36
9.1	General	36
9.2	"Frozen" atmosphere	39
9.3	Uncertainty considerations related to att and cloud base	40
9.4	Uncertainty considerations relating to the particle backscatter coefficient	41
9.5	Depolarisation lidar uncertainty considerations	42
9.6	Effect of atmospheric pressure and temperature	43
10	Quality assurance and system monitoring	43
10.1	Adjustments	43
10.2	Functional tests	43
10.3	Maintenance	44
10.4	Calibration	44
10.5	Quality assurance of the attenuated backscatter lidar	45
10.6	Performance tests in the laboratory or at test sites	46
10.6.1	General	46
10.6.2	Depolarisation	49
10.7	Individual or specific parameter tests	49
	Annex A (informative) Examples and theory	51
	Annex B (informative) Mathematical considerations	62
	Bibliography	65