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**Air quality — Environmental  
meteorology —**

**Part 3:  
Ground-based remote sensing of wind  
by continuous-wave Doppler lidar**

*Qualité de l'air — Météorologie de l'environnement —*

*Partie 3: Télédétection du vent par lidar Doppler à ondes continues  
basé au sol*



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# Contents

Page

<b>Foreword</b>	<b>iv</b>
<b>Introduction</b>	<b>v</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>1</b>
<b>4 Fundamentals of heterodyne Doppler lidar</b>	<b>4</b>
4.1 Overview	4
4.2 Heterodyne detection	5
4.3 Spectral analysis	7
4.3.1 Signal processing for CW lidar	7
4.3.2 An example of a wind speed estimation process	9
4.4 Target variables	9
4.5 Sources of noise and uncertainties	9
4.5.1 Local oscillator shot noise	9
4.5.2 Detector noise	10
4.5.3 Relative intensity noise	10
4.5.4 Speckles	10
4.5.5 Laser frequency	10
4.6 Range assignment	10
4.7 Known limitations	11
<b>5 System specifications and tests</b>	<b>12</b>
5.1 System specifications	12
5.1.1 Laser wavelength	12
5.1.2 Transmitter/receiver characteristics	12
5.1.3 Pointing system characteristics	12
5.2 Figures of merit	13
5.3 Precision and availability of measurements	13
5.3.1 Radial velocity measurement accuracy	13
5.3.2 Data availability	14
5.3.3 Maximum operational range	14
5.4 Testing procedures	14
5.4.1 General	14
5.4.2 Hard target return	14
5.4.3 Assessment of accuracy by intercomparison with other instrumentation	14
5.4.4 Maximum operational range validation	16
<b>6 Measurement planning and installation instructions</b>	<b>16</b>
6.1 Site requirements	16
6.2 Limiting conditions for general operation	17
6.3 Maintenance and operational test	17
6.3.1 General	17
6.3.2 Maintenance	17
6.3.3 Operational test	17
6.3.4 Uncertainty	18
<b>Bibliography</b>	<b>19</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 5, *Meteorology*.

A list of all parts in the ISO 28902 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

Lidars (“light detection and ranging”), used in this document to designate atmospheric lidars, have proven to be valuable systems for the remote sensing of atmospheric pollutants in various meteorological parameters, such as wind, clouds, aerosols and gases. Extensive optical and physical properties of the probed targets, such as size distribution, chemical composition, shape of the particles and gas concentration, and optical properties of the atmosphere, such as visibility, extinction and backscatter, can be retrieved using lidars. Atmospheric targets such as these can be spatially resolved along their line of sight by, for example, focusing the continuous-wave beam at the chosen specific range. The measurements can be carried out without direct contact and in any direction as electromagnetic radiation is used for sensing the targets. Lidar systems, therefore, supplement the conventional *in situ* measurement technology. They are suited for a large number of applications that cannot be adequately performed by using *in situ* or point measurement methods.

There are several methods by which lidar can be used to measure atmospheric wind. The four most commonly used methods are heterodyne pulsed Doppler wind lidar (see ISO 28902-2:2017[1]), heterodyne continuous-wave Doppler wind lidar, direct-detection Doppler wind lidar and resonance Doppler wind lidar (commonly used for mesospheric sodium layer measurements). For further reading, refer to References [2] and [3].

This document describes the use of (monostatic) heterodyne continuous-wave Doppler lidar.



# Air quality — Environmental meteorology —

## Part 3:

# Ground-based remote sensing of wind by continuous-wave Doppler lidar

## 1 Scope

This document specifies the requirements and performance test procedures for monostatic heterodyne continuous-wave (CW) Doppler lidar techniques and presents their advantages and limitations. The term “Doppler lidar” used in this document applies solely to monostatic heterodyne CW lidar systems retrieving wind measurements from the scattering of laser light by aerosols in the atmosphere. Performances and limits are described based on standard atmospheric conditions. This document describes the determination of the line-of-sight wind velocity (radial wind velocity).

NOTE Derivation of wind vector from individual line-of-sight measurements is not described in this document since it is highly specific to a particular wind lidar configuration. One example of the retrieval of the wind vector can be found in ISO 28902-2:2017, Annex B.

This document does not address the retrieval of the wind vector.

This document can be used for the following application areas:

- meteorological briefing for e.g. aviation, airport safety, marine applications, oil platforms;
- wind power production, e.g. site assessment, power curve determination;
- routine measurements of wind profiles at meteorological stations;
- air pollution dispersion monitoring;
- industrial risk management (direct data monitoring or by assimilation into micro-scale flow models);
- exchange processes (greenhouse gas emissions).

This document can be used by manufacturers of monostatic CW Doppler wind lidars as well as bodies testing and certifying their conformity. This document also provides recommendations for users to make adequate use of these instruments.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61400-12-1:2017, *Wind energy generation systems — Part 12-1: Power performance measurements of electricity producing wind turbines*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.