SEVEN
SENSOR SOLUTIONS

3S-WD

Wind Direction Sensor

USER MANUAL

USER MANUAL TABLE OF CONTENTS

Pinarcay OSB Mahallesi Organize Sanayi Tesisleri Teknokent Idare Binasi No: 7, D:1, 19100 Merkez / Corum / Türkiye
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1. Introduction

The Wind Direction Sensor is part of the SEVEN meteorological sensor range, which includes professional and intelligent measuring sensors with a digital or analog interface for environmental and industrial applications such PV plants.

Figure 1-Wind Direction Sensor

It is a measuring transmitter used for the measurement of the horizontal wind direction.

The measured horizontal wind direction data are transmitted as analog or digital output signals to the data loggers and receiver units according to the input requirements.

SEVEN products use reliable and high-quality components to provide accurate meteorological information in environmental and industrial applications. They are specially designed according to the requirements of PV plant monitoring systems.

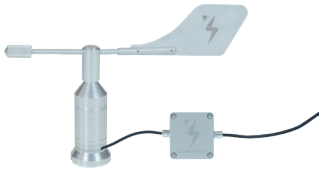
Note: *SEVEN reserves the right to make changes in this entire document without prior notice.*

Models

3S-WD

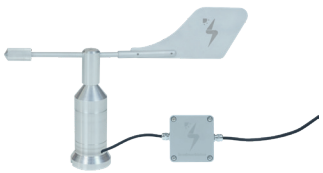
Small and economical wind direction sensors with magnetic field output. They are ideal measurement transmitters with the best price/performance ratio for the standard requirements of industrial and environmental applications such as PV plants.

3S-WD-I



Wind direction sensors with analog output specially designed for advanced industrial applications and environmental conditions. The housings are made of seawater resistant alloy aluminium, making them extremely durable and resistant.

3S-WD-MB



Professional and intelligent measuring sensors with a digital interface for environmental and industrial applications such as PV plants. The measured value can be transmitted to monitoring instruments, data loggers and other receiving units via the serial RS485 interface with MODBUS RTU protocol.

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2. Wind Direction Sensor Installation

It is suggested that the system be operated at ground level to make sure that all components are working properly prior to installation. A general diagram of the progress of the installation steps is given below.

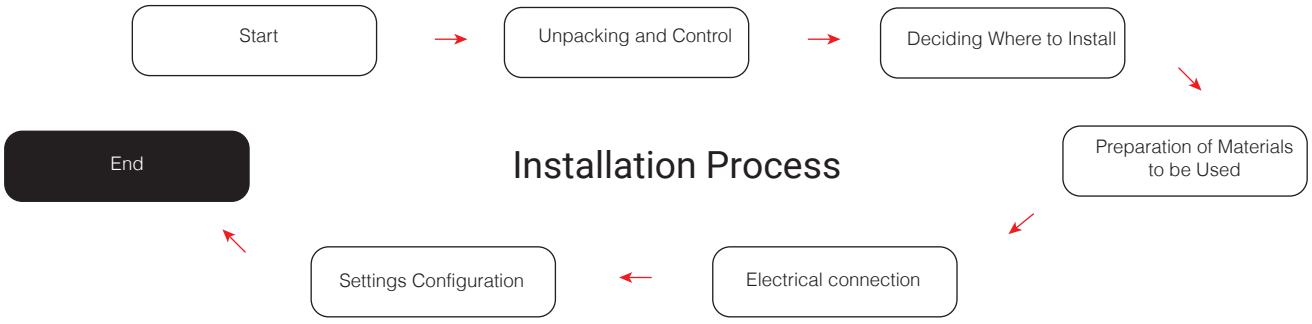

Figure 2 – Installation Process

2.1. Unpacking and Control

Upon receipt of the product, it must be carefully checked whether the package content is complete. Seven Sensor Solutions must be contacted if any of the components are missing, damaged or defective.

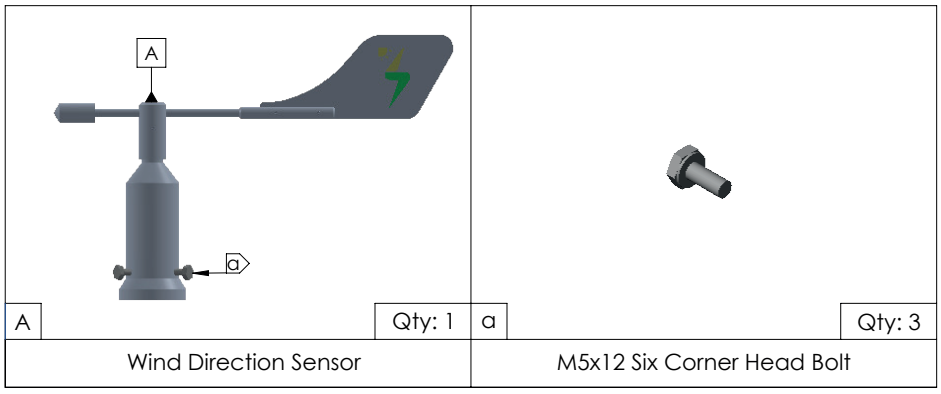

Figure 3 – Mounting Structure Packing List

Note: *Quantity and content of the received material may be different based on customer confirmed order.*

2.2. Site Requirements and Considerations

Each site is different and has its own unique challenges. For this reason, the installation of the product may differ in each site. First of all, it should be decided where the product will be installed. The Wind Direction Sensor can be affected by obstructions and local topography.

The Wind Direction Sensor should be placed no closer than 10 times the height of any obstruction.

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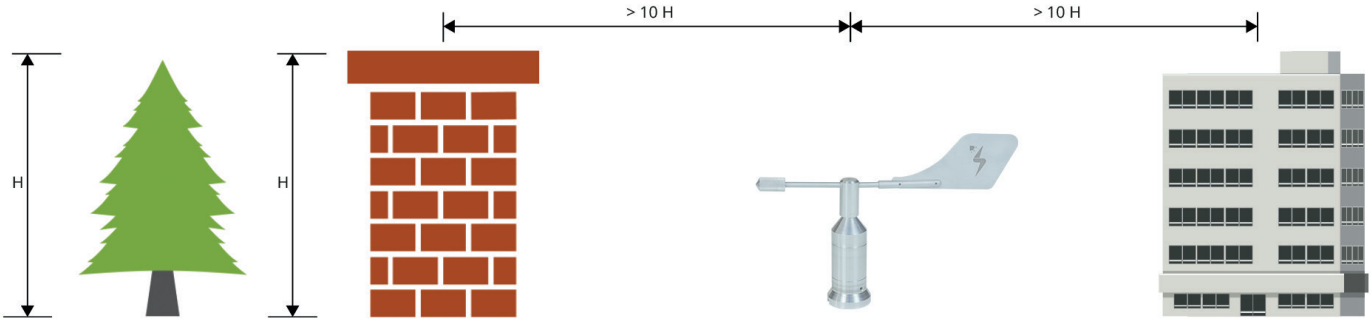

Figure 4 – Installation Site Selection

When the Wind Direction Sensor is to be mounted on a rooftop, it should preferably be mounted on the prevailing wind side of the building.

When placing the Wind Direction Sensor on the mounting structure, attention should be paid to the north direction mark and it should be aligned to the north with the help of a compass.

2.3. Preparation of Materials to be Used in Installation

The materials needed during installation are provided by SEVEN. The user should only prepare the following hand tools and personal protective equipment.

Materials		
		
Gloves	Meter	Drill
		
10-11 Wrench	Spirit Level	Digital Compass

Figure 5 – Materials to be Used in Installation

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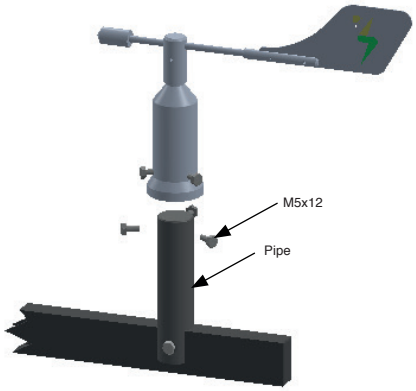
2.4. Installation

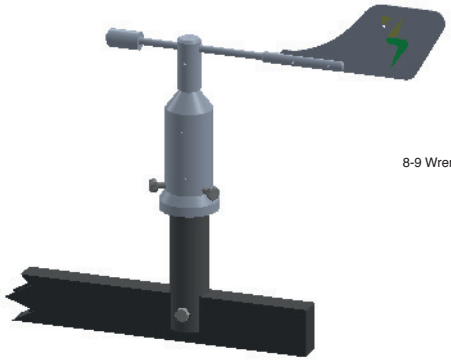
3S-WD Wind Direction Sensor is designed with the Plug & Run principle. The installation can be easily completed by a qualified electrician by following SEVEN instructions.

Pipe Mounting



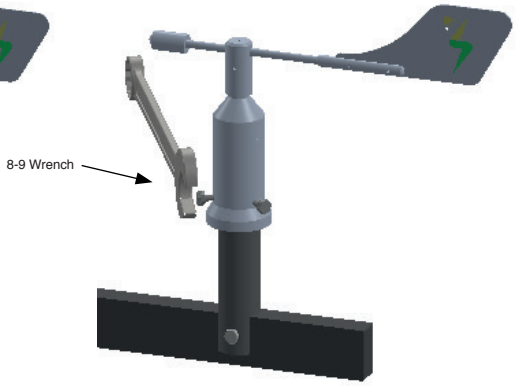
First Step

The Wind Direction Sensor must be placed on the pipe parallel to the ground.



Second Step

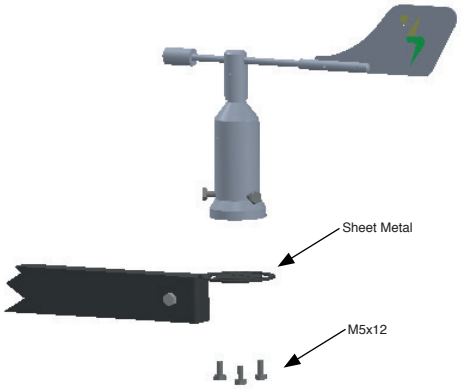
The M5 bolt should be screwed into the holes on the sides of the sensor.



Third Step

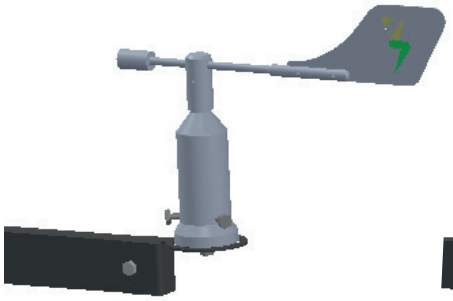
The bolt should be tightened with an 8-9 mm wrench. The pipe must be fixed on a flat surface.

Pipe Mounting



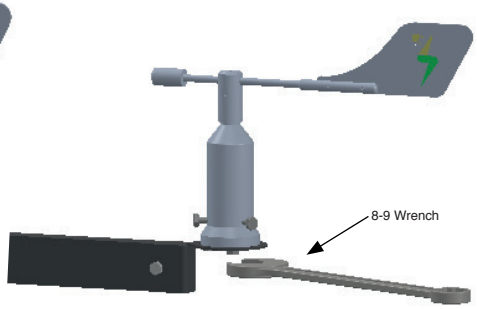
First Step

The mounting area must be level and parallel to the ground.



Second Step

The installation should be done using three M5x12 bolts.



Third Step

The bolts should be tightened using an 8-9 mm wrench.

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2.5. Inspection and Maintenance

Fastener tightness and cable conditions, looking for damage, deterioration, or disconnection of sensors and electrical enclosures, evidence of moisture or vermin in enclosures, loose wiring connections, embrittlement of attachments and other potential problems, should be checked periodically.

Note: *We recommend to use thread-locking fluid for fasteners.*

According to IEC 61724-1:2021, the monitoring system should be inspected at least annually and preferably at more frequent intervals.

3. Connections

The supply voltage for the Wind Direction Sensors are 12 - 30 V DC. Operation with a supply voltage of 24 V is recommended.

The communication and power cable of Wind Direction Sensor should be always laid separated from AC/DC cables.

Note: *The installation and electrical connections of SEVEN sensors should be carried out by a qualified electrician.*

3.1. Wind Direction Sensor (3S-WD-MB)

The Wind Direction Sensor has an electrically isolated, half-duplex, 2 wire RS485 interface for configuration, communication and the firmware update.

Wire Assignment for Power & Communication	
RS485 A / Data (+)	Green
RS485 B / Data (-)	Yellow
Positive Supply Voltage	Brown
Supply Voltage Ground	White

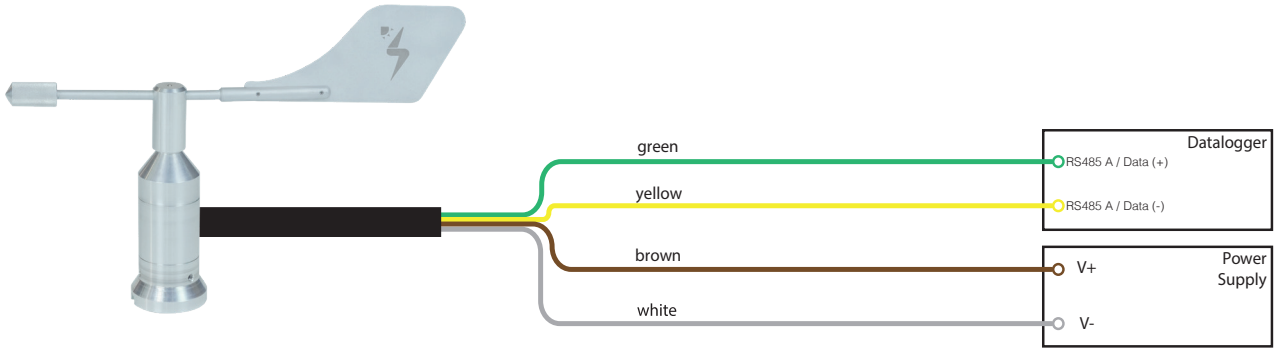

Figure 6 – Wire Assignment for Power & Communication

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3.2. 4-20 mA Wind Direction Sensor (3S-WD-I)

Wire Assignment for Power & Communication	
4-20 mA (+)	Green
4-20 mA (-)	Yellow
Positive Supply Voltage	Brown
Supply Voltage Ground	White

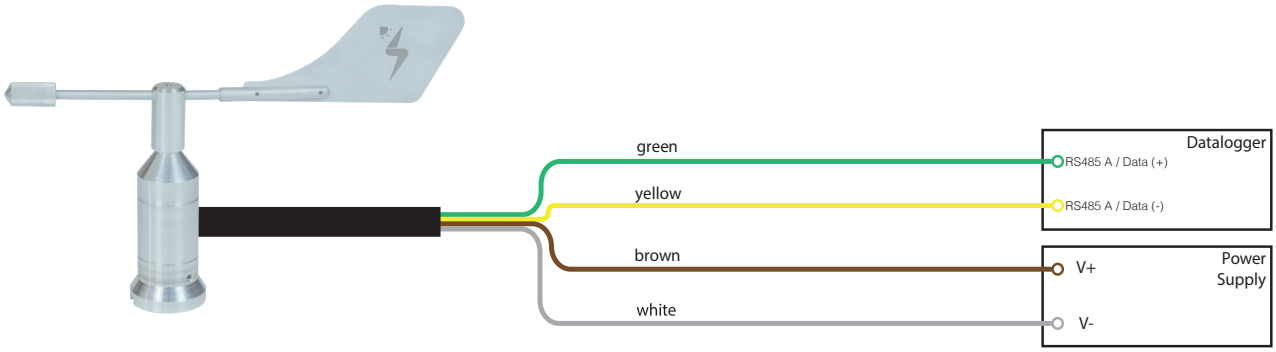

Figure 7 – Wire Assignment for Power & Communication

Enter the information for the 4-20 mA Sensor configuration in your datalogger as follows.

Running Parameter	
Lower Threshold	**0°**
Upper Threshold	**359°**
Start mA	**4 mA**
End mA	**20 mA**

4. Configuration and Communication

Once the Wind Direction Sensor has been installed and connected correctly, the sensor begins autonomously to take measurements.

Attention must be paid to the following points:

- A measurement request should be made to the Wind Direction Sensor with the 3S-WD Configuration Tool and it should be checked whether it correctly operation in the site.
- The Wind Direction Sensor must be aligned to the North in order to ensure correct wind measurement data.
- If several Modbus Device are operated on a network, a unique device ID must be assigned to each device.

Note: *The 3S-WD Configuration Tool is used for the 3S-WD-MB Wind Direction Sensor model. 3S-WD-I Wind Direction Sensor model do not need any configuration.*

Follow SEVEN instructions to configure the Wind Direction Sensor on dataloggers.

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4.1. 3S-WD Configuration Tool

3S-WD Configuration Tool is a software tool for testing communication and adjusting Modbus parameters on the Wind Direction Sensor. The 3S-WD Configuration Tool can also be used to update the firmware of the Wind Direction Sensor.

A Windows® PC with a serial bus interface set as a serial COM port, 3S-WD Configuration Tool software, and USB to RS485 Converter are required for configuration and testing purposes.

Download the software 3S-WD Configuration Tool and install it on your computer. Download link is below.
https://www.sevensensor.com/files/d/s/3S-WD-Configuration_Tool.zip

4.2. Modbus RTU Specifications

4.2.1. Supported Bus Protocol

The Wind Direction Sensor is equipped with an RS-485 communication port that supports Modbus RTU commands. The Wind Direction Sensor can be configured to operate in different communication parameters. The table that follows describes each supported bus protocol.

Baud Rate	**1200, 2400, 9600, 19200, 38400**
Parity	**None, Even, Odd**
Stop Bit	**1, 2 (only at None parity)**
Factory Default	**9600 Baud, 8N1, address: 1**

4.2.2. Supported Function Codes

The Wind Direction Sensor supports a specific subset of Modbus RTU commands. The table that follows lists each supported function code.

0x03	**Read Holding Registers**
0x04	**Read Input Registers**
0x46	**Read & Change Parameters**
0x08	**Diagnostics**

Note: *All checksums of the Modbus protocol are omitted in this document. These checksums must always be calculated and sent during communication.*

4.2.2.1. Read Holding Registers (0x03)

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x03
Start Register	2 Byte (Big Endian)	see register table below
End Register	2 Byte (Big Endian)	see register table below

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Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x03
Number of Bytes	1 Byte	0 to 255 (2xN) N = Number of Registers
Data	2 Byte x N (Big Endian)	see register table below

Holding Register Map

The Wind Direction Sensor holding register map is based on the **"SunSpec Alliance"** communication standards.

Start	End	Value	Type	Units	Scale Factor	Constant
40000	40001	SunSpec ID	uint32	N/A	N/A	"SunS"
40002	40002	SunSpec Device ID	uint16	N/A	N/A	0x0001
40003	40003	SunSpec Length	uint16	Registers	N/A	65
40004	40019	Manufacturer	String (32)	N/A	N/A	"SevenSensor"
40020	40035	Model	String (32)	N/A	N/A	"3S-WD"
40036	40043	Hardware Version	String (16)	N/A	N/A	"1.1"
40044	40051	Software Version	String (16)	N/A	N/A	"2.0"
40052	40067	Serial Number	String (32)	N/A	N/A	"23.12.345.65.0013"
40068	40068	Device ID	uint16	N/A	N/A	1
Sunspec Device Model Measurement Registers						
40075	40075	Wind Direction	int16	°	0	Measured
End of Block Registers						
40100	40100	End of SunSpec Block	uint16	N/A	N/A	0xFFFF
40101	40101	Length	uint16	Registers	0	0
Device Address Read/Write Register						
40199	40199	Modbus ID – Write Register	uint16	N/A	N/A	1

4.2.2.2. Read Input Registers (0x04)

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x04
Start Register	2 Byte (Big Endian)	see register table below
End Register	2 Byte (Big Endian)	see register table below

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x04
Number of Bytes	1 Byte	0 to 255 (2xN) N = Number of Registers
Data	2 Byte x N (Big Endian)	see register table below

Input Register Map

A common input register map has been created for all SEVEN Modbus devices. All data marked in bold in the common input register map below are defined for Wind Direction Sensor.

Note: *Values marked as "raw data" are for information only and should not be used for serial applications.*

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The following Modbus data marked in bold can be read individually or in blocks.

ID-Dec	ID-Hex	Value	Range	Resolution
30019	**0x13**	**Wind Direction**	**0...359°**	**1**

Additionally, the following internal data marked in bold can be read individually or in blocks.

ID-Dec	ID-Hex	Value	Range
30060	**0x3C**	**Hardware Version**	**Manufacturer Parameters Read Only**
30061	**0x3D**	**Software Version**	
30117	**0x75**	**Wind Direction Enable Selection**	

4.2.2.3. Read & Change Parameters (0x46)

Sub Function (0x04): Write Device Address

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x04
New Address	1 Byte	1 to 247

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x04
New Address	1 Byte	1 to 247

Sub Function (0x06): Write Communication Parameters

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x06
New Baud Rate	1 Byte	0 to 3, see table below
New Parity / Stop Bit	1 Byte	0 to 3, see table below

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x06
New Baud Rate	1 Byte	0 to 3, see table below
New Parity / Stop Bit	1 Byte	0 to 3, see table below

Note: *When the "Write Communication Parameters" command is used, the "Write Device Address" command must also be used before the restart communication command.*

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Communication Parameter Settings

Parameter changes will take effect after restart of the sensor by power on reset or restart communication command.

Baud Rate	Value	Parity / Stop Bit	Value
1200	1	**None/1**	1
2400	2	**None/2**	2
9600	3	**Odd**	3
19200	4	**Even**	4
38400	5	**Even**	5

Sub Function (0x07): Read Hardware & Software Versions

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x07

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x07
Hardware Version	2 Byte (Little Endian)	0 to 65535
Software Version	2 Byte (Little Endian)	0 to 65535

Sub Function (0x08): Read Serial Number - Production Date - Calibration Date

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x08

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x08

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4.2.2.4. Diagnotics (Restart Command) (0x08)

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x08
Restart Code	4 Byte	0x00000000

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x08
Restart Code	4 Byte	0x00000000

5. Additional Documents and Software

The following documents and software can be downloaded from www.sevensensor.com or requested from SEVEN Sensor Solutions.

User Manual	This document
Datasheet	Wind Direction Sensor Brochure
3S-WD Configuration Tool	Windows® software for testing, firmware updates and configuration of the device
Firmware	Current device firmware

6. Contact Details

Please feel free to contact us if you face any difficulties during installation or configuration.

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