t035 Winson

Sonic Anemometer

User Manual

Index

1 Precautions and safety measures

This equipment complies with the requirements of the Low Voltage Directive 2014/30/CE and the EMC Directive EMC 2014/35/CE.

The instrument has been designed in accordance with CEI EN 61010; for operator safety, you must follow the procedures described in this manual and carefully read all the notes preceded by the symbol:

(Pay attention, please refer to documentation)

Or by the symbol:

(Pay attention, risk of electric shock)

WINSON is a device designed in order to be used by trained personnel. Manufacturer declines every responsibility in case of malfunction due to failure to follow instructions, tampering, uses not described in this manual, improper use, use by operators not trained. Only authorized personnel should have access to the work area for normal use and maintenance.

-   The instrument must not operate in the presence of flammable gases, fumes or in any environment at risk of explosion.

-   Do not carry out any measure where anomalies are found in the instrument, such as deformation or breakage.

-   Do not work within the apparatus without the presence of a second person in a position to provide a first aid in case of need.

-   Do not remove, replace or modify any electrical or mechanical part without permission.

-   Substitution of components and intervention inside should be performed only by qualified and instructed service personnel, after disconnecting the main power supply.

-   Pay attention to any warning label in order to avoid potentially dangerous procedures.

1.1 Intended use

The purpose of this manual is to supply all the information necessary for proper installation and operation of the product SIAP+MICROS WINSON.
Keep this manual carefully and keep a copy always available for operators.

1.2 Warnings

The manufacturer declines all responsibility in case of failure due to negligence of the instructions, tampering, uses not described in this manual, improper use, use by operators not trained. Only trained, authorized personnel should have access to the work area for normal use and maintenance.
Safety Regulation

- The device must be connected to an electrical ground.

- The instrument must not operate in the presence of flammable gases, fumes or in any environment at risk of explosion.

- Do not remove, replace or modify any electrical or mechanical part without permission.

- Substitution of components and intervention inside should be performed only by qualified and instructed service personnel, after disconnecting the main power supply.

- Pay attention to any warning label in order to avoid potentially dangerous procedures.

1.3 Moving

In order to avoid any damage to the device during transportation, please keep it in upright position without shaking.

1.4 Unpacking

Before unpacking and installing the device, please make sure you have taken the following precautions:

- Use proper gloves in order to be protected against possible abrasions etc.

- If you find any damage caused during transport due to the supplier, return the instrument to the supplier.

Before installing the device, please check that:

- The network voltage in the installation area complies with the operating conditions of the instrument.

- Check that the main switch on the instrument is turned off.

Avoid turning the power on until you have carefully followed the instructions of installation and start-up in this manual.

1.5 During operation

During operation, please avoid to alter the electrical connections; also avoid to alter the connections of the power supplies.

1.6 Storage

If you plan a long period of inactivity (at least one year), disconnect all cables from the device, put it in a plastic bag and seal the bag with tape. Affix appropriate indication on the bag's contents and weight of the device by inserting the words "HANDLE WITH CARE".

Keep the device in an environment with a temperature in the interval 0 – 60°C (32 – 140°F), with a humidity not exceeding 80%. Make sure that the instrument is placed in a stable position and that cannot be possible to damage it or move it through inexperience or distraction. Do not stack other instruments or weights greater than a few pounds. Do not stack the device to other devices and however be sure of the strength and stability of the underlying support.

1.7 Maintenance

Ultrasonic sensors must be clean for proper operation. They must not show fouling by dirt, mud, sand, salt air, ecc... Cleaning must be carried out with a soft cloth moisted with water and mild soap, if needed. It must be carried out very gently, without apply any force to transducers. Avoid every mechanical stress on the transducers.

Periodically check if the sealings around the transducers are intact and clean.
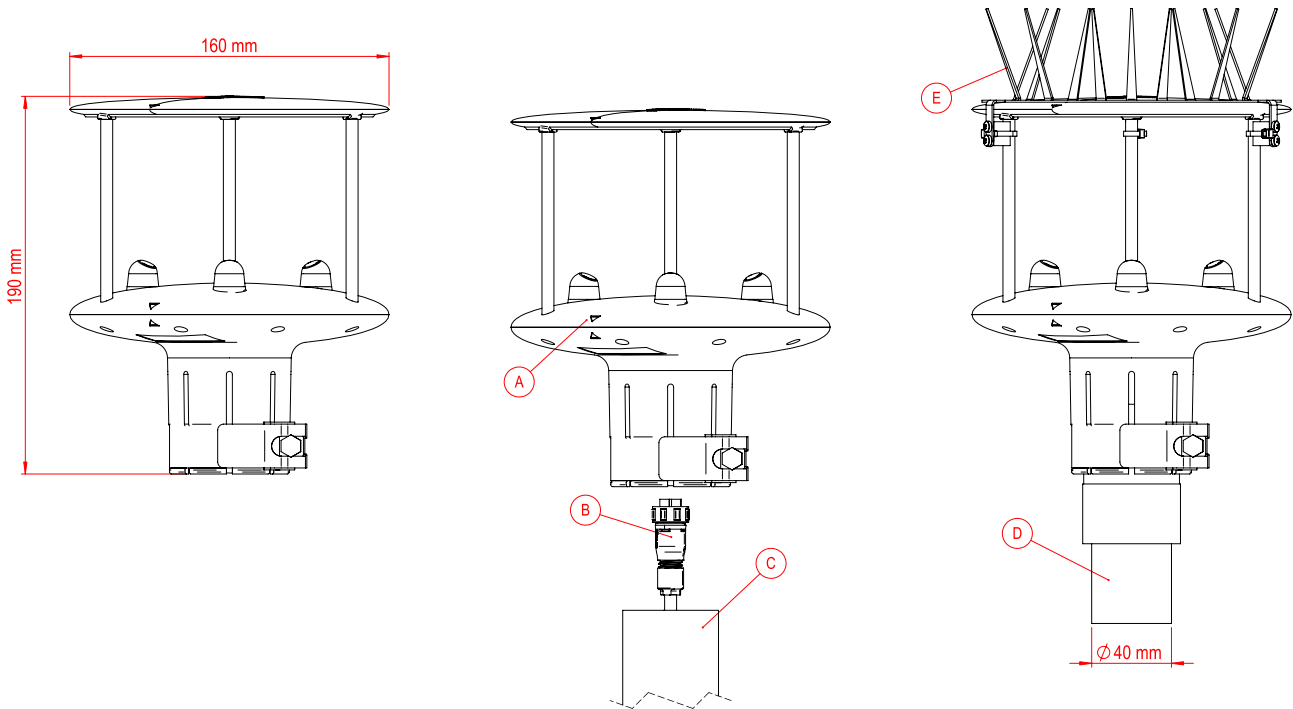
1.8 Periodic calibration

Calibration must be carried out every time the ultrasonic sensors shows a value grater than 0.5 m/s in absence of wind. Calibration must be carried out only by the manufacturer

2   Description of Winson

2.1   Dimensions, Installation and Accessories

A –   North indicator: orient the sensor with the indicator pointing north.

B –   Connector: insert and lock the connector before insertion on the support pole
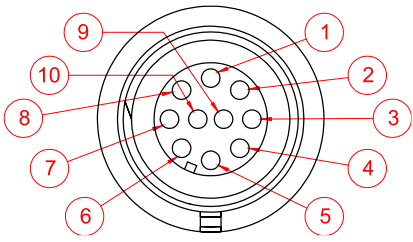
C –   Support: Tube $\varnothing_{ExtMax}$ = 52mm, $\varnothing_{IntMin}$ = 40mm; Recommended $\varnothing_{Ext}$ = 48mm, th = 3mm (1 "1/2 pipe)

D –   Reduction: accessory for installation with U-bolts for Ø40mm pipes (code: t035-01)

E -   Bird Deterrent: accessory to keep birds away (code: t035-02)

2.1   Electrical connections

The next figure shows the sensor connector pinout.

Figure 1: Winson connector pinout

Contact Number	Name	Description
1	A	Positive of the RS485 bus
2	B	Negative of the RS485 bus
3	VV_OUT	Wind speed measurement analogue output [0÷2V].
4	DV_OUT	Wind direction measurement analogue output [0÷359 °]
5	GND_AN	Voltage reference for wind speed and direction analog measurements
6	TX	RS232 serial transmission
7	RX	RS232 serial reception
8	SDI12	SDI12 serial data line
9	VCC	Positive power supply
10	GND	Ground

3   Use of Winson

3.1   Turning on

The anemometer can be powered applying a 9 – 24Vdc voltage between the VCC and GND terminals. The sensor will be active about 20 seconds later after the power up. If the heater is activated, the sensor will do the wind speed and direction measurements only when the temperature set point of the sensor will be achieved.

3.2   Set-up

1. Connect the TX, RX and GND terminals to a PC RS232 serial port.

2. Start a serial terminal software on the PC, like hyperterminal, and set the connection with the following parameters:

    BAUDRATE: 115200, DATA BITS: 8, PARITY: None, STOP BITS: 1, FLOW CONTROL: None

3. Power up the sensor.

4. After few seconds it will appear on the terminal a message similar to the following:

    ```
    WINSON sonic anemometer
    SW:1.6 HW:1.0
    Parameters CRC          : 0CBB 0CBB--> OK
    Pulses CRC              : 8127 8127--> OK
    Reference 2.5V          : 3105 --> OK
    Internal temperature    : 24.2'C --> OK
    Transducers temperature : 24.5'C --> OK
    Magnetometer ID         : C4 --> OK
    wait: init ok
    ```

    If any self-diagnosis step will fails, it will appear the message "WARNING" instead of "OK".

5. Enter the user password: *PASSW12345*

    ```
    PASSW12345
    OK
    ```

6. To show the actual setting parameters of the sensor, enter the *LIST* command. The terminal will show all the actual parameters set:

    ```
    LIST
    SW         :1.6
    HW         :1.0
    Param. rev. :1
    L1         :0.182378 (0.182496)
    L2         :0.182280 (0.182398)
    L3         :0.183139 (0.183257)
    T taratura :21.70
    KV         :1.99000
    KT         :0.000023
    Filtro vel. :OFF
    Soglia Dir  :0.05
    Offset T sen:-1.59
    Offset T int:-0.49
    Rotaz.assi  :0'
    ID          :1
    ```

```
Out         :OFF
Out freq.   :4
Debug       :OFF
Heater      :OFF
T heater    :3.0
T target    :40.0
T. ramp     :1.000
Analog Out. :1
Analog FS   :2000mV @ 60m/s
PWM Max     :4534
PWM Max     :4532
PWM Min     :14
PWM Min     :15
PWM Ref     :130
Output      :BCDEPTWm
Unit vel.   :m/s
NMEA mode   :$IIMWV+$WIXDR
Baud rates  :1)115200  2)115200
Protocol    :SDI12
Interface   :SDI12
Mag correct :0
Mag. off.   :-1024,1236
Mag. scl.   :434,431
Mag. TCO    :-942,3406
```

The user can set some of these parameters; this manual will describe how to set them.

3.3 Communication protocol settings

1. Enter the user's password *PASSW12345*.

2. The *PROTOCOL<n>* command set the type of the communication protocol to be used. It is possible to choose one of the following setting:

COMMAND	COMMUNICATION PROTOCOL
PROTOCOL0	Serial RS232, proprietary protocol (BAUDRATE: 115200, DATA BITS: 8, PARITY: None, STOP BITS: 1, FLOW CONTROL: None).
PROTOCOL1	SDI12 protocol.
PROTOCOL2	Serial RS485, MODBUS protocol (BAUDRATE: 115200, DATA BITS: 8, PARITY: None, STOP BITS: 1).
PROTOCOL3	Serial RS232, protocol NMEA0183 (BAUDRATE: 4800, DATA BITS: 8, PARITY: None, STOP BITS: 1, FLOW CONTROL: None).
PROTOCOL4	Serial RS485, NMEA0183 protocol (BAUDRATE: 4800, DATA BITS: 8, PARITY: None, STOP BITS: 1).

3. The *BAUD<n>,<xxx>* command set the RS232 and RS485 baud rate. In particular:

n =   *1* - RS232

            2 - RS485

xxx = admitted values: *1200, 4800, 9600, 19200, 38400, 57600, 115200*. Using RS485, it is preferable to set a baud rate lower than *38400* baud.

For example:

BAUD1,9600 set the RS232 baudrate to 9600 baud;

BAUD2,19200 set the RS485 baudrate to 19200 baud.

4. The *ID<n>* command set the identifier of the device used in the RS485 and SDI12 protocols.

For example, *ID10* set the ID of the device to the value 10.

5. To make the above modifications effective, restart the sensor using the *REBOOT* command.

Enter *F1* to enable the automatic repetitive transmission of the measures through RS232. Instead, if you want to disable this function, enter *F0*.

After each *REBOOT* command, if you want to continue with the sensor set-up, you have to login again typing the password *PASSW12345*.

3.3.1 MODBUS command format

In order to read the measurement values, you need to use the standard MODBUS function code 0x03 (Read Holding Register). In particular the following table reports the lists of the registers that can be polled:

Register number	Address	Data format	Number of bytes to be read	Description of the measurement
1	0	Swapped Float	4	Wind speed [m/s]
3	2	Swapped Float	4	Wind direction [°N]
5	4	Swapped Float	4	Sonic temperature [°C]
7	6	Swapped Float	4	Magnetometer's direction [°N]
9	8	Swapped Float	4	Status of the sensor
11	10	Swapped Float	4	Temperatur of the sensor's heads [°C]
13	12	Swapped Float	4	Internal temperature [°C]
15	14	Swapped Float	4	Mean value of the wind speed between the actual and the previous reading [m/s]
17	16	Swapped Float	4	Gust (Maximum value between the actual and the previous reading) [m/s]

Follow the table of the managed exception codes:

Exception type	Code
Not available function	0x01
Not available address	0x02

3.3.2 SDI12 command format

The following table reports the list of the SDI12 commands implemented in the sonic anemometer:

Command description	Command	Sensor's answr
Address query	?!	a<CR><LF>
Acknowledge Active	a!	a<CR><LF>
Send Identification	aI!	a13siapmicrwinson1.0<CR><LF>
Change Address	aAb!	b<CR><LF>
Start Measurement	aM!	a0018<CR><LF>
Start Measurement and Request CRC	aMC!	a0018<CR><LF>
Additional Measurements	aM1!	a0018<CR><LF>
Additional Measurements and Request CRC	aMC1!	a0018<CR><LF>
Start Concurrent Measurement (*)	aC!	a0018<CR><LF>
Start Concurrent Measurement and Request CRC (*)	aCC!	a0018<CR><LF>
Additional Concurrent Measurements (*)	aC1!	a0018<CR><LF>
Additional Concurrent Measurements and Request CRC (*)	aCC1!	a0018<CR><LF>
Send Data	aDn!	a<values><CR><LF> or a<values><CRC><CR><LF>

The sensor reply to the SD12 commands as described below:

ID, wind speed, wind direction, sonic temperature, sensor status, gust, mean value

ID, internal temperature, sensor heads' temperature, magnetometer direction, sensor status

3.3.3 RS485/RS232 NMEA0183 data packets format

Login using the user password *PASSW12345* and enter F1 to enable the automatic repetitive transmission of the measures through RS232. In this case, it is possible to set the type of the output data packet using the *NMEA<n>* command:

- *NMEA0*: the output is composed by the ASCII data packets *$IIMWV* and *$WIXDR*;

- *NMEA1*: the output is the ASCII data packet *$IIMWV*;

- *NMEA2*: the output is the ASCII data packet *$WIXDR*.

Where the ASCII data packets are composed as below described:

*$IIMWV,*wind direction*,R,*wind speed,unit,flag*checksum*<CR><LF>*

*$WIXDR,C,*temperature*,C,,*checksum*<CR><LF>*

For example:

*$IIMWV,2263.0,R,001.12,N,A*0B*

*$WIXDR,C,036.5,C,,*52*

If it is not desired to use the automatic repetitive transmission but a "polled mode" is preferred, enter the *F0* command. The commands to be used to request the measurement values are:

$CCWIQ,MWV<CR><LF> - wind speed and direction;

$CCWIQ,XDR,<CR><LF> - temperature*.*

Using the RS485 output (*PROTOCOL4 command*); it is possible to set only the "automatic repetitive transmission mode".

3.3.4 RS232 data packet format, proprietary protocol

Before to set the data packet format it is necessary to login using the user password *PASSW12345*.

The data packet format sent through RS232, proprietary protocol, can be set using the *STROUT<str>* command, where <str> can assume the following values:

A	ID of the device
B	number of valid pulses for every axis (three values) used to compute the measurement
C	diagnostic values for every axis: m=measured values, c=calculated, s=copied from the previous status, x=lost
D	wind speed
E	wind direction (°N), from 0 to 359
K	U e V cartesian components of the wind speed (two values)
L	raw wind speed components on the three axis (three values for X, Y and Z components)
M	Flight times of the sonic transmission from one sensor head to another sensor head. Unit: µs – six values
m	magnetometer direction (0...359°)
N	wind speed [m/s]
O	wind speed [m/s] for every axis (three values)
P	sonic temperature [°C]
R	sonic temperature [°C] for every axis (three values)
S	sensor status
T	internal PCB temperature
U	calibration parameter (two values)
u	balance index of the measurement values of the three axis. (two values)
X	gain values applied for every measurement path (six values)
x	checksum
Y	margins of the amplitude [%] below the correlation peak (six values)
W	sonic temperature [°C]

For example, *STROUTADEP* will set the following data packet format:

`#A1,D0.04,E188,P25.2`

The *STROUT?* command prints a short help that describes the meaning of the various packet fields that can be set.

3.4 Head's heater settings

Before to set the head's heater settings it is necessary to login using the user password *PASSW12345*.

The commands for this feature are listed below.

COMMAND	DESCRIPTION
HT<n>	HT1 enable the heaters of the 3 sensor's heads; HT0, instead, disable these heaters.
HTEMP<n>	HTEMP reads the setting value of the ambient temperature under which the heaters are switched on. The switch-off temperature is 3 °C above HTEMP value (HTEMP+3°C). HTEMP3, for example, sets to 3°C the ambient temperature under which the heaters will switch on. n=[-5..60°C]. Default value: 3°C
HSENS<n>	HSENS reads the sensor's heads temperature set. HSENS40, for example, sets to 40°C the temperature at which the sensor's heads are adjusted when the ambient temperature drops below HTEMP.

3.5 Other settings

Before to set the following parameters it is necessary to login using the user password PASSW12345.

COMMAND	DESCRIPTION
AFS<n>	AFS shows the setting of the full scale value of wind speed at which the analogue voltage output will be 2000 mV. AFS<n> sets the full scale wind speed value of the analogue voltage output [1..70 m/s]
AOUT<n>	AOUT1 enables the wind speed and wind direction analogue outputs. AOUT0 disables the wind speed and wind direction analogue outputs.
FILTER<n>	FILTER0 disables moving average filter on the wind speed and direction measurements. FILTER<n> enables the moving average filter. The value is calculated on the last <n> seconds. [0..10s] To be WMO compliant set FILTER3
UM<n>	This command sets the measure unit of wind speed: UM0 = [m/s] UM1 = knot [knt] UM2 = [Km/h]

4   Safety regulations

This document is collecting all the technical documentation to demonstrate that this product fulfills all the essential safety requirements given by the guidelines applicable to it.

The detailed examination of the project and the means of implementation allowed us to establish what are the risks that the product may present throughout his life, if properly used, and then to define the essential requirements which are applicable to it. These requirements may be contained in one or more guidelines and all must be met. For the application of a directive to a product then two conditions are required:

−   The product falls within its scope;

−   The product presents risks to which the essential requirements of the Guideline refers.

From risk analysis conducted, described in the following pages, it arose that the European directives applicable to the product in question are as follows:

Main Guideline	Additional or Variation Guideline	Title	Reference transposition law in Italy
73/23/CEE	93/68/CEE	Low Voltage Guideline	L. 791/77; D.Lgs 626/96; D.Lgs. 277/97;
89/336/CEE	93/68/CEE 92/31/CEE	Electromagnetic Compatibility Guideline (EMC)	D.Lgs. 615/96

This product falls within the scope of the Low Voltage guideline 73/23 / EEC implemented in Italy by Law 791/77, since some of its components fall within the definition of art. 1:

"The disposition of this law shall apply to electrical equipment intended for use with a nominal voltage rating of <u>between 50 and 1,000 volts AC</u> and between 75 to 1500 Volt DC, with the following exceptions:

a) electrical equipment intended for use in environments exposed to explosion hazards;

b) electrical equipment for radiology and clinical use;

c) electrical parts of lifts and elevators;

d) electric meters;

e) plugs and socket for domestic use;

f) power devices of electric fences;

g) Material in respect of radio interference;

h) specialized electrical equipment, intended for use on ships, aircraft and railways, which comply with the safety provisions drawn up by international bodies, involving the Member States of the European Economic Community;

i) electrical equipment intended for export outside the territory of the European Economic Community."

This product falls within the scope of the Electromagnetic Compatibility Directive (EMC) 89/336 / EEC implemented in Italy with Law Decree. 615/96, since some of its components fall within the definition of art. 2:

"1. This Decree applies to <u>devices which can create electromagnetic emissions</u> or whose operation can be affected by electromagnetic interference in the environment. It sets the protection requirements relating to electromagnetic compatibility and the procedures of control.

2. The devices built for military purposes falls outside the scope of this Decree, unless they are commercially available.

3. Radio equipment used by radio amateurs do not fall within the scope of this Decree, unless they are commercially available.

4. The disposition of this Decree shall not apply or shall cease to apply to those devices whose protection requirements relating to electromagnetic compatibility are established by rules of implementation of specific directives.

5. The equipment referred to in paragraph 1 shall not apply the provisions of the Law of 22 May 1980, no. 209."

Instead, **it is not within** the scope of the Machinery Guideline 89/392 / EEC and its amendments adopted in Italy by Decree 459/96, as it is described in paragraph 2 of art. 1:

"... Omissis

2. For the purposes of this Regulation, the term "machine" means a set of parts or organs<u>, including at least one mobile</u>, interconnected, including through actuators, with control and power circuits, or other connections, joined together for an application well established, in particular for the processing, treatment, moving or packaging materials.

... Omissis"

4.1   EMC

This equipment has been designed in accordance with the requirements of the Directive 89/336/CEE and CEI EN 61326-1. The compliance has been tested in accordance with:

➔   EN 50081-1

➔   EN 50082-2

5 Operating conditions

The equipment has been designed to be used according to the specifications given in the following table:

INTENDED USE AND LIMITATIONS OF THE EQUIPMENT	DATA / AVAILABLE INFORMATION
Intended use	The intended use includes only measures of physical and chemical parameters for meteorology, agricultural meteorology, hydrometry, climate and environmental monitoring, remote control and automation of aqueducts, treatment plants, sewers, etc., control systems and automation in distributed logic control for special applications such as landslides, chemicals or microbiological processes, etc.
Reasonably foreseeable misuses and contraindications of use	It is not correct to use in domestic environments or for unprofessional purposes; use by unqualified persons and / or not properly trained.
Operative environment	It is not intended to be used in the presence of gases or fumes corrosive and flammable.
Any critical environmental factors	The environmental conditions for correct use are: - Reference temperature: 20° C - Temperature of use: -40 ÷ +70 °C - Maximum relative humidity allowed: 100% uncondensed - Storage Temperature: -40 ÷ +80 °C - Storage Humidity: 90%
Professionalism or experience required for operators	The operator must be qualified or properly trained and informed about the risks which can be run.
Determination of the expected life cycle of the equipment and / or some of its components taking into account the intended use	The peripheral stations and components used are of robust construction and durable. All components are replaceable and/or repairable, it is not expected a time limit of use. However, specific maintenance interventions are scheduled, and possibly replacement, according to a predetermined cadence, for all the components, in relation to the alleged deterioration or breakage of some parts which constitute them.
Space limitations	The peripheral stations do not have any moving parts, therefore any fence in the area is not necessary for the safety of people. May be requested by the customer to prevent any alteration. Installation of the peripheral stations is done directly by the manufacturer. Customer shall provide, upon installation, the delivery point of electricity power and an area which can comply with the requirements.

REMARKS

- Periodic updates of this document are released and available on demand.

- The manufacturer may update the product described in this document, or parts of it, at any time without notice.

- It is not allowed reproduce or duplicate, entirely or part of this document without the permission of SIAP+MICROS S.p.A.

6   Revision history

The following table provides a description of the changes made to this document.

Version	Date	Updates
03	06/05/2020	Current version of the document..

All the information content in this document are the current available at the printing phase. Siap+Micros S.p.A. reserve the rights to change the specifications without any advance notice.