USER'S GUIDE

EE660 - Low Air Velocity Sensor

SCOPE OF SUPPLY

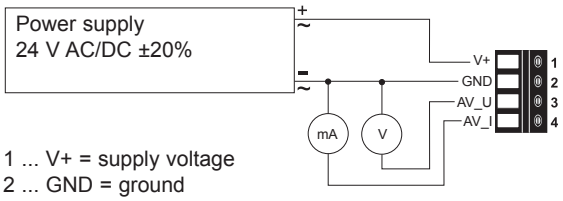
- EE660 Low Air Velocity Sensor
- Cable gland (two pieces at output RS485 for daisy chain wiring)
- Mounting flange
- Mounting materials
- Protection cap
- Quick guide
- Two self-adhesive labels for configuration changes (see user guide at www.epluse.com/relabeling)
- Test report according to DIN EN10204 - 2.2

CAUTION

- Accurate measurement results are conditioned by the correct positioning of the sensing probe in the air stream. Best accuracy is achieved in laminar flow.
- Observe the minimum inlet and outlet path length, see page 5.
- Avoid mechanical stress onto the probe and mainly onto the sensing head.
- Observe the humidity working range 5…95% RH, non-condensing.
- Avoid installation in corrosive environment, as this may lead to sensor destruction.

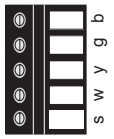
CONNECTING DIAGRAM

Analogue output



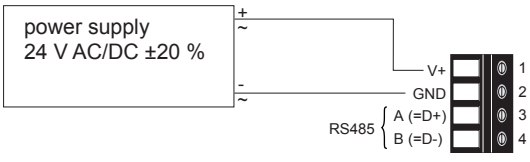
1 ... V+ = supply voltage
2 ... GND = ground
3 ... AV_U = voltage output air velocity
4 ... AV_I = current output air velocity

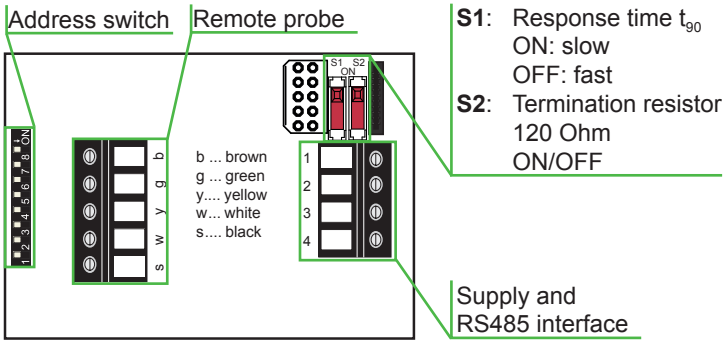
Remote probe



b ... brown
g ... green
y ... yellow
w ... white
s ... black

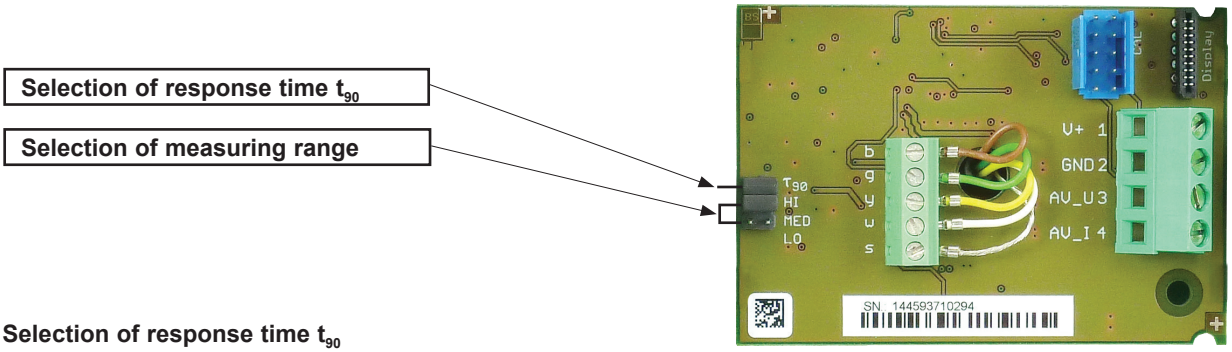
RS485 Interface





ANALOGUE SETTINGS

For performing EE660 settings via EE-PCS Product Configuration Software (download from www.epluse.com/configurator) the working range jumper must be on HI.



Selection of response time t_{90}

Jumper t90
SLOW 4 sec.
(factory setting)

No jumper
FAST 1 sec.

Selection of measuring range

Jumper HI
0...2 m/s (0...400 ft/min)
(factory setting)

Jumper MED
0...1.5 m/s (0...300 ft/min)

No jumper
0...1 m/s (0...200 ft/min)

DIGITAL SETTINGS

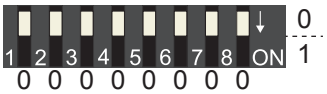
Hardware

The bus termination shall be realized with the 120 Ohm resistor on board, slide switch S2.

Very important:
For proper function the power supply must be strong enough to ensure supply voltage within the specified range (see technical data) at any time and at all devices in the bus. This is particularly relevant when using long and thin cables which can cause high voltage drop; please note that a single EE660 requires peak current of 150 mA.

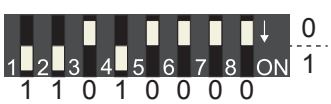
Address Setting

Address Switch



Address setting via EE-PCS Product Configuration Software:
All DIP switches at position 0 → address has to be set via PCS
Modbus (Slave device): factory setting EE660: 65 (permitted values: 1…247).
BACnet (Master device): factory setting EE660: 65 (permitted values: 0…127).
Example: Slave address is set via configuration software.

Address Switch



Address setting via DIP switch:
Modbus (Slave device): Setting the DIP switches to any other address than 0, overrules the slave address set via configuration software (permitted values: 1…247).
BACnet (Master device): Setting the DIP switches to any other address than 0, overrules the slave address set via configuration software.
BACnet Note: permitted values are 0…127.
The 8th bit of the DIP switches is ignored (ID 127 = 0111 111).
To set address 0 via DIP switches, the 8th bit shall be set to 1 (ID 0 = 1000 0000).
Example: Slave address set to 11 (= 0000 1011 binary).

BACnet Setup

Please see PICS (Product Implementation Conformance Statement) - available on www.epluse.com/EE660

Modbus Setup

FLOAT (read register):

Function code / Register number[1] [Dec]	*Register address[2] [HEX]*	*Parameter name*	
31003	0x03EA	Temperature	[°C]
31005	0x03EC	Temperature	[°F]
31041	0x0410	Airflow	[m/s]
31043	0x0412	Airflow	[ft/min]

SHORT (read register)[3]:

Function code / Register number[1] [Dec]	*Register address[2] [HEX]*	*Parameter name*	
34002	0x0FA1	Temperature*	[°C]
34003	0x0FA2	Temperature**	[°F]
34021	0x0FB4	Airflow*	[m/s]
34022	0x0FB5	Airflow***	[ft/min]

* Values are stored with the scale 1:100 (e.g.: 2550 is equivalent to 25.5 °C)
** Values are stored with the scale 1:50 (e.g.: 2550 is equivalent to 51 °F)
*** Values are stored with the scale 1:1

INFO (read register):

Function code / Register number[1] [Dec]	*Register address[2] [HEX]*	*Parameter name*
30001	0x00	Serial number (as ASCII)
30009	0x08	Firmware version

INTEGER (write register):

Function code / Register number[1] [Dec]	*Register address[2] [HEX]*	*Parameter name*
60001	0x00	Slave-ID* (modbus address)
60002	0x01	Modbus protocol settings[3]

* If the ID is set via DIP-Switch the response will be NAK.

1) Register number starts from 1
2) Register number starts from 0
3) For Modbus protocol setting please see Application Note Modbus (www.epluse.com)

MODBUS RTU EXAMPLE

Example of MODBUS RTU command for reading the temperature (float value) T = 26,652524 °C from the register 0x03EA

Device EE660; slave ID 65
Reference document, chapter 6.3: http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b.pdf

Request [Hex]: 41 03 03 EA 00 02 EB 7B

	Modbus ID address	Function code	Starting address Hi	Starting address Lo	No. of register Hi	No. of register Lo	CRC	
Request [Hex]:	41	03	03	EA	00	02	EB	7B

Response [Hex]: 41 03 04 38 5F 41 D5 0A E3

	Modbus ID address	Function code	Byte count	Register 1 value Hi	Register 1 value Lo	Register 2 value Hi	Register 2 value Lo	CRC	
Response [Hex]:	41	03	04	38	5F	41	D5	0A	E3

For decoding of float values (according IEEE754 format), please refer to AN0103, chapter 7 (page 6).

7.2 Modbus floating point format

E+E devices use the Modbus floating point format. The byte pairs 1, 2 and 3, 4 are inverted as follows:

MMMMMMMM	MMMMMMMM	SEEEEEEE	EMMMMMMM
Byte 3	Byte 4	Byte 1	Byte 2

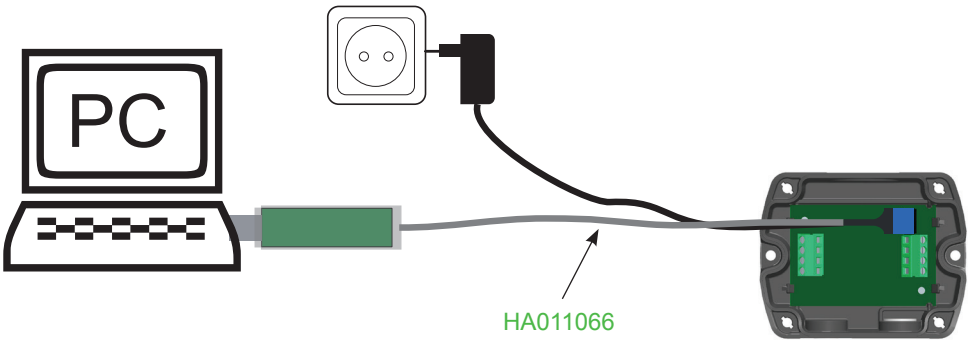
Example:

Response [Hex]	Value in decimal
41 D5 38 5F	26.652524

Protocol setting:
Address, baudrate, parity and stop bits can be set via:
1. Product Configurator Software (available on www.epluse.com/EE660)
2. Modbus protocol (please see Application Note Modbus (available on www.epluse.com/EE660)

CONFIGURATION AND ADJUSTMENT

The EE660 as ordered is ready for use immediately and requires no configuration by the user. If required, the optional USB configuration adapter and the E+E Product Configuration Software (EE-PCS) can be used for changing the factory setup as well as for adjusting of the air velocity measurement.
Note: The EE660 must not have any additional power supply when using the USB configuration adapter HA011066.



For product data sheets EE-PCS please see www.epluse.com.
The E+E Product Configuration Software (EE-PCS) is free and can be downloaded from www.epluse.com/configurator.

TECHNICAL DATA

(Modification rights reserved)

Measurand

Working range [1]	0...1 m/s	(0...200 ft/min)		
	0...1.5 m/s	(0...300 ft/min)		
	0...2 m/s	(0...400 ft/min)		
Accuracy at 20 °C [2] (68 °F), 45 % RH, 1013 hPa	0.15...1 m/s	(30...200 ft/min)	± (0.04 m/s (7.9 ft/min)	+ 2 % of mv)
	0.15...1.5 m/s	(30...300 ft/min)	± (0.05 m/s (9.8 ft/min)	+ 2 % of mv)
	0.15...2 m/s	(30...400 ft/min)	± (0.06 m/s (11.8 ft/min)	+ 2 % of mv)
Response time τ_{90} [3]	typ. 4 sec or typ. 1 sec (at constant temperature)			

Output

Analogue	0 - 10 V	and	4 - 20 mA
0...1 m/s / 0...1.5 m/s / 0...2 m/s [1]	-1 mA < I_L < 1 mA		R_L < 450 Ω (linear, 3-wires)
Digital interface	RS485 with max. 32 devices on one bus		
Protocol	Modbus RTU or BACnet MS/TP		

General

Power supply (Class III)	24 V AC/DC ± 20 %

Current consumption (max.)

	AC supply - no display	DC supply - no display	AC supply - with display	DC supply - with display
Analogue ouput	74 mA rms	41 mA	180 mA rms	85 mA
Digital output	120 mA rms	50 mA	-	-

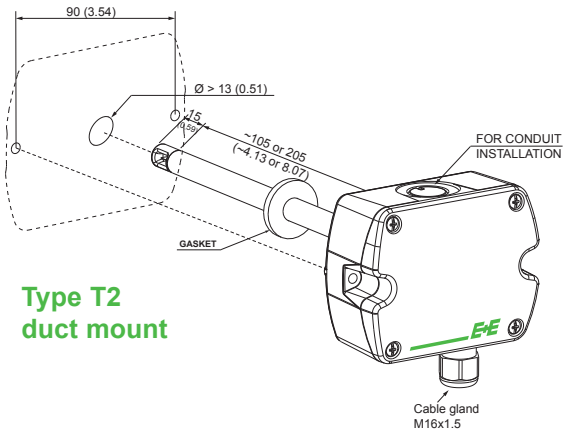
Angular dependence	< 3% of the measured value at | Δα | < 10°
Electrical connection	screw terminals max. 1.5 mm² (AWG 16)
Cable gland	M16x1.5
Electromagnetic compatibility	EN61326-1 EN61326-2-3 Industrial Environment
Housing material	Polycarbonate, UL94V-0 (with Display UL94HB) approved
Protection class	Enclosure IP65 / NEMA4, remote probe IP20
Temperature range	working temperature probe -25 ... +50 °C (-13...122 °F) working temperature electronic -10 ... +50 °C (14...122 °F) storage temperature -30 ... +60 °C (-22...140 °F)
Working range humidity	5...95 % RH (non-condensing)

1) Selectable by jumper, only for analogue output
2) The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation).
The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).
3) Selectable by jumper (analogue) and slide switch (digital)

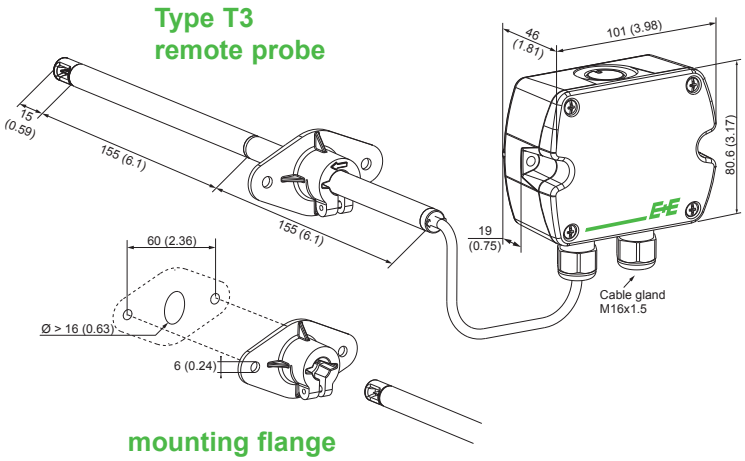
ACCESSORIES

• USB configuration adapter	HA011066
• Product configuration software	EE-PCS (free download: www.epluse.com/EE660)
• Power supply adapter	V03 (see data sheet Accessories)

DIMENSIONS MM (INCH)

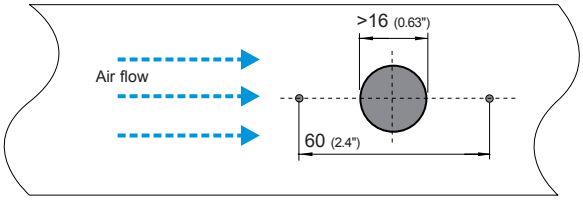


Type T2
duct mount

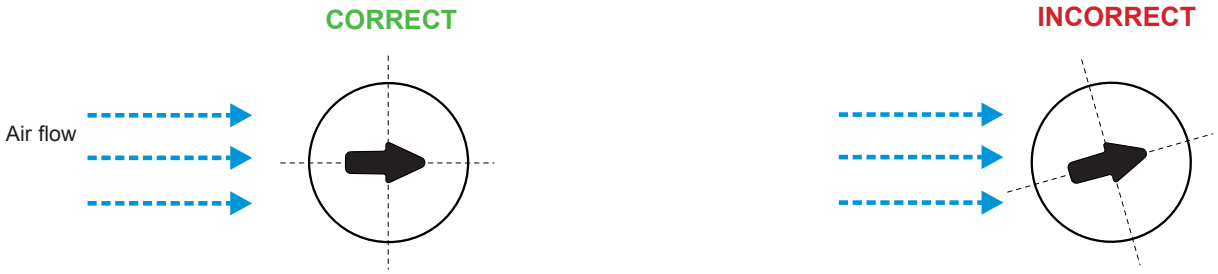


MOUNTING

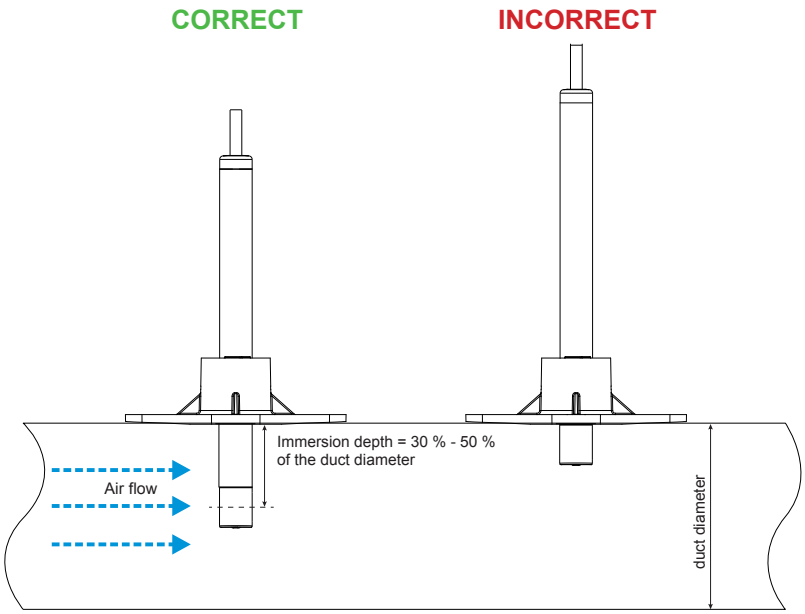
DRILLING IN THE WALL OF THE DUCT FOR INSTALLING THE MOUNTING FLANGE



The arrow engraved on the sensing head of EE660 indicates the direction of the air stream during factory adjustment. When installing the EE660 probe, make sure that the arrow matches exactly the flow direction.



The mounting flange allows for precise setting of the EE660 immersion depth in a duct. The entire sensing head must be in the air flow to be measured.



POSITIONING OF AIR VELOCITY SENSOR IN A VENTILATION DUCT

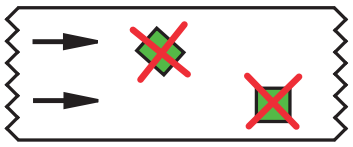
The reliable and accurate measurement of air velocity depends on the correct positioning of the sensor in the ventilation duct. Accurate measurements are only possible if the air velocity probe is positioned at a location with a laminar (not-turbulent) flow.

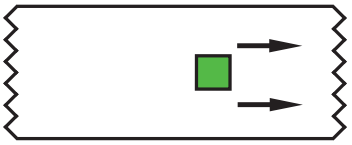
The required length of the calming section after a fault is a function of the tube diameter D. For a rectangular channel a x b applies:

$$D_{gl} = \frac{2 \cdot a \cdot b}{a + b}$$

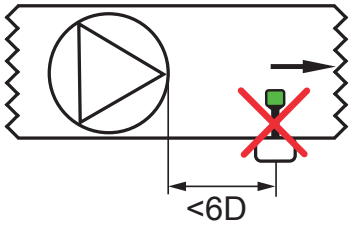
INCORRECT

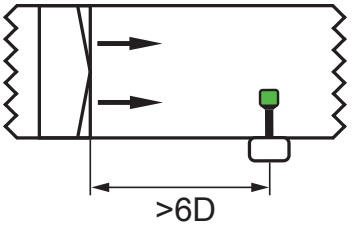
CORRECT



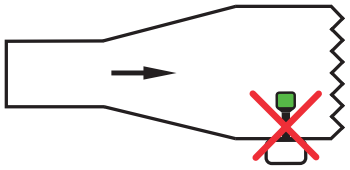


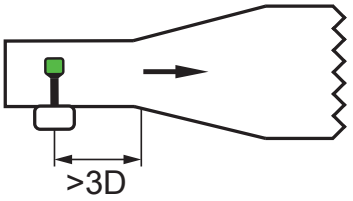
Mounting the sensing probe in the middle of the channel.



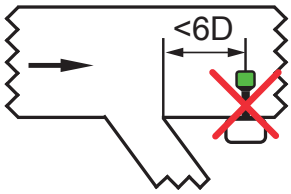


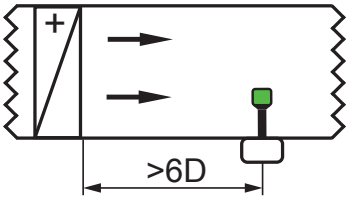
The optimal position is after the filter.
Please note sufficient distance.





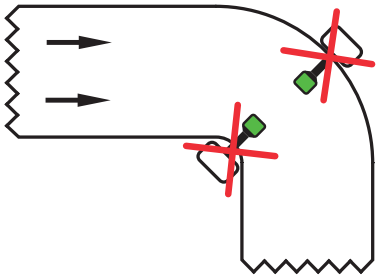
Positioning the probe ahead of diffusor, at a place with high flow rate.

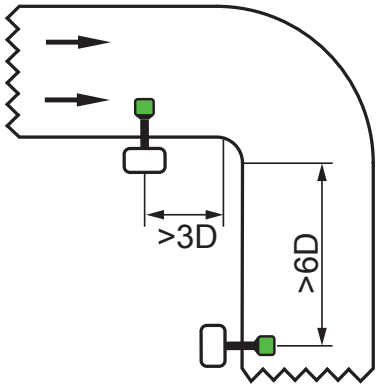




Positioning the probe at a location with a laminar (to-turbulent) flow.

Turbulent flows are caused by pipe bends, branches, behind flaps, flans, air heaters, air coolers or cross-sectional changes.





MAINTENANCE OF THE E+E AIR VELOCITY TRANSMITTERS

Due to the absence of moving parts, the E+E air velocity transmitters are not subject to wear. The construction (shape, dimensions and materials) of the hot film air velocity sensor is per se highly insensitive to dust and dirt. No maintenance is required under normal environmental conditions. For operation in polluted environment it is advisable to periodically clean the sensing head by washing it in isopropyl alcohol, preferably in an ultrasound cleaner. Alternatively shake it gently few minutes in a pot with isopropyl alcohol and let it dry free. Do not touch or rub the sensor and do not use any mechanical tools for cleaning.

E+E Elektronik Ges.m.b.H. doesn‘t accept warranty and liability claims neither upon this publication nor in case of improper treatment of the described products.

The document may contain technical inaccuracies and typographical errors. The content will be revised on aregular basis. These changes will be implemented in later versions. The described products can be improved and changed at any time without prior notice.

EMC note USA (FCC):

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

EMC note Canada (ICES-003):

CAN ICES-3 (A) / NMB-3 (A)

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