E+E

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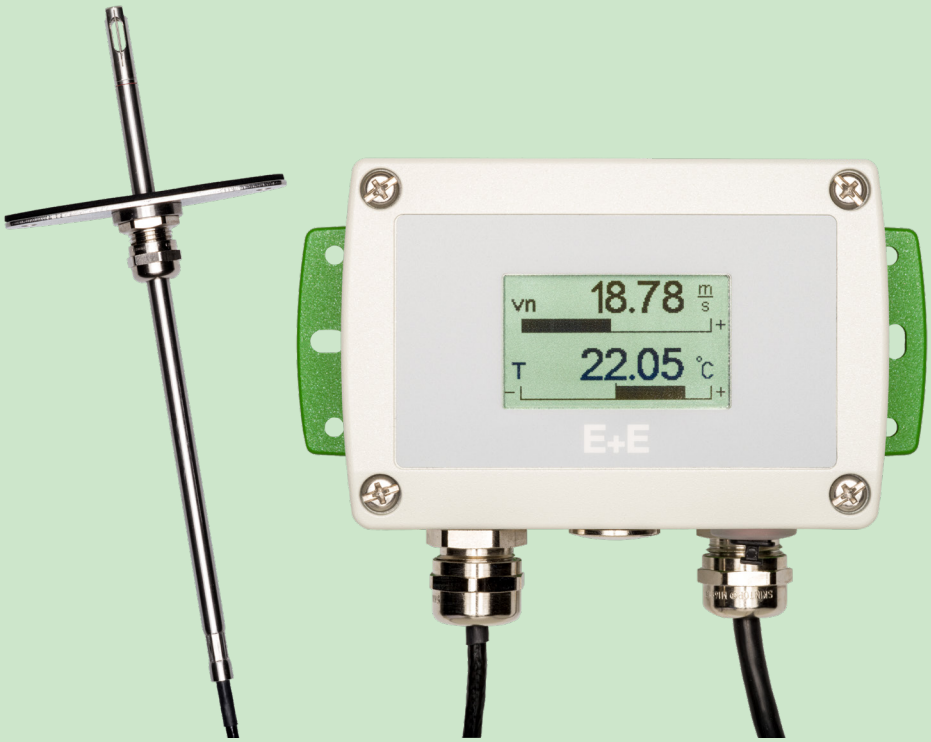
technology.

Datasheet AVS701

Highly Accurate Air / Gas Velocity Sensor for Industrial Applications



Modbus

www.epluse.com

AVS701

Highly Accurate Air / Gas Velocity Sensor for Industrial Applications

The AVS701 air / gas velocity (v) and temperature (T) sensor is optimised for best measurement results and reliability in challenging industrial applications from 0 up to 40 m/s (0 to 8 000 ft/min) and -40...+140 °C (-40...+284 °F).

Measurement Performance

The AVS701 features best-in-class accuracy and durability by employing a high-end ceramic sensing element. The constant temperature anemometry working principle rests on the state-of-the-art thin film technology. The probe alignment key included in the scope of supply is essential to achieve excellent measurement results. This Poka-Yoke-inspired mounting tool simplifies the quick and correct installation of the remote probe.

Long-Term Stability

The robust probe design and the E+E sensing element construction significantly extend the service liefetime of the AVS701. Probe and sensor head are made of stainless steel, suitable for challenging mechanical and chemical environment. A proprietary coating protects the sensing element against corrosion and aggressive substances.

Versatility

The AVS701 is available for wall or duct mount as well as with remote probe. The remote probe features various cable lengths and pressure rating up to 10 bar (145 psi). The modular IP65 polycarbonate or die-cast aluminium enclosure facilitates installation and maintenance. The wiring can be done either via M12 connectors or directly to internal terminals.

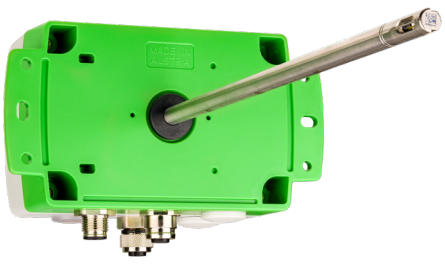
Display and Outputs

The measured data is available on two analogue outputs and on the RS485 interface with Modbus RTU protocol. The display shows up to three measurands simultaneously. Measurand visualization via linear gauges with configurable upper and lower limits gives a quick view onto the actual process status. Optical indication of sensor and measurement status facilitates diagnosis for AVS701 without display.

Configurable and Adjustable

AVS701 configuration and adjustment can be performed with the free PCS10 Product Configuration Software and the USB interface.

Wall mounting version with remote probe, die-cast enclosure



Duct mount version, polycarbonate enclosure

Features

Measurement performance

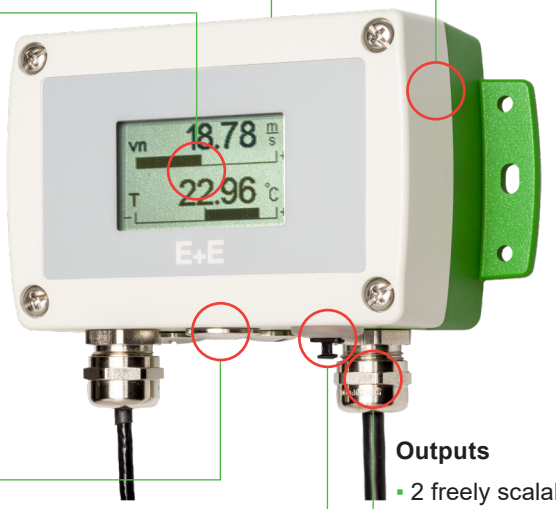
- Best-in-class accuracy
- Measuring range -40...+140 °C (-40...+284 °F) and up to 10 bar (145 psi)

Display

- Shows up to 3 measurands simultaneously
- Freely selectable layout and measurands
- Linear gauges for quick perception

Enclosure

- IP65 protection rating
- Polycarbonate or die-cast aluminium
- Easy mounting and service
- Versatile connection options



Sensor control port

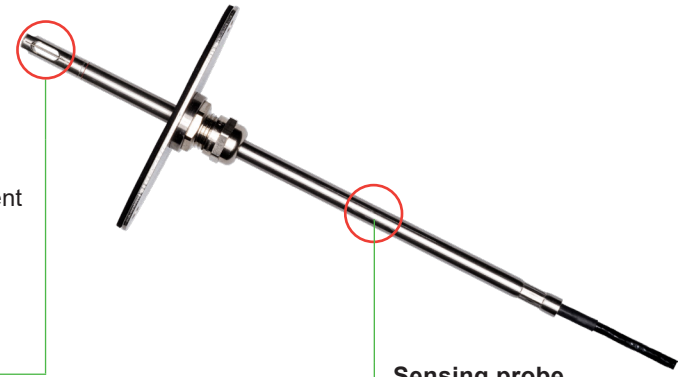
- Connector for external pressure probe (optional)
- Realtime pressure compensation

USB-C service interface

- Configuration, adjustment and firmware update
- Short-term power supply via USB
- Device status indication via illuminatet port

Outputs

- 2 freely scalable analogue outputs, current / voltage
- Error indication according to NAMUR
- Modbus RTU
- 2 alarm outputs
- Configurable via software



Sensing element

- Accurate air velocity measurement from 0.06 m/s to 40 m/s (12 to 8 000 ft/min)
- Low angular dependency
- Long-term stability

Sensing probe

- Poka-Yoke inspired probe alignment key
- Probe choice depending on
  - T range
  - p range
  - Environmental condition
- Various probe and cable lengths

Inspection certificate

According to DIN EN 10204-3.1

Features

Sensing Element Protection

Proprietary hermetic polymer coating (varnish) protects the sensing element from corrosion in demanding environment and substantially extends sensor lifetime in applications with H_2O_2 sterilisation.

Sensor Control Port

The sensor control port is an RS485 interface with Modbus RTU protocol for the optional external pressure probe. The pressure data allow for the realtime calculation of the actual flow, can be shown on the display and is available on the outputs. A suitable pressure probe is available as an accessory.

Accredited Traceable Calibration Certificate

Internationally recognised certificates for the calibration of measuring instruments from accredited laboratories document the traceability of the measurements to the International System of Units (SI). The E+E Elektronik calibration laboratory offers two levels of traceable calibrations.

- As a Designated Institute (DI) of the Republic of Austria, the E+E calibration laboratory maintains Austria's national measurement standards for humidity, dew point temperature, air velocity and CO_2. This authorises the E+E calibration laboratory to issue calibration certificates at the level of a National Metrological Institute (NMI).
- The E+E calibration laboratory is accredited by Akkreditierung Austria in accordance with DIN EN ISO/IEC 17025 with the identification number 0608. This allows the laboratory to issue ISO 17025 certificates for the measurands humidity, temperature, dew point temperature, air velocity, flow, pressure and CO_2.

Visit www.eplusecal.com for detailed information on calibration and to enquire a certificate of accredited traceable calibration for the AVS701 from the Designated Institute.

ISO 9001 Calibration Certificate

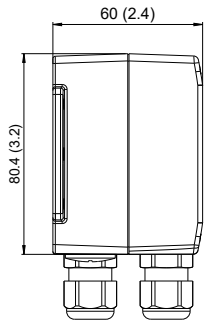
An ISO 9001 calibration certificate documents the comparative measurement of a device against high quality reference equipment (factory level standard). The comparison is performed in accordance with internal procedures that comply with ISO 9001 and provides information on the specimen's measuring accuracy. The reference equipment is traceable to national standards, however, the calibration process is not accredited. Therefore, an ISO 9001 calibration is neither traceable nor internationally comparable.

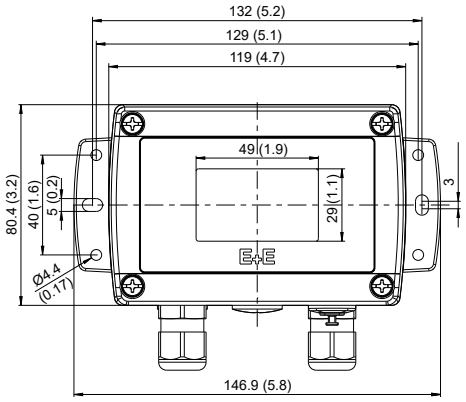
Visit www.epluse.com/iso9001cal for detailed information on calibration and to enquire an ISO 9001 calibration certificate.

Dimensions

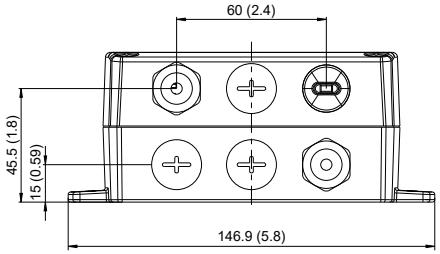
Values in mm (inch)

Enclosure



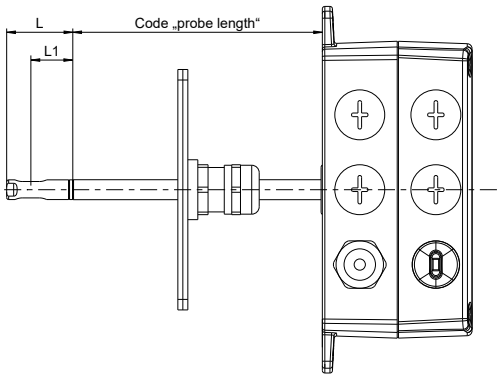


Connector side view



Type T2

Duct mount



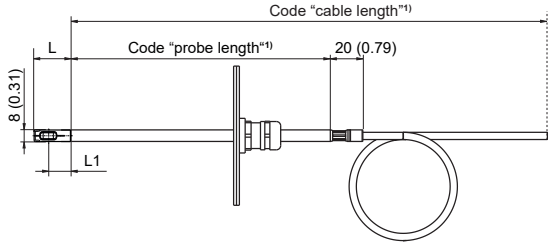
Sensing head	L	L1
Stainless steel	26.5 (1.04)	16.8 (0.66)

Dimensions

Values in mm (inch)

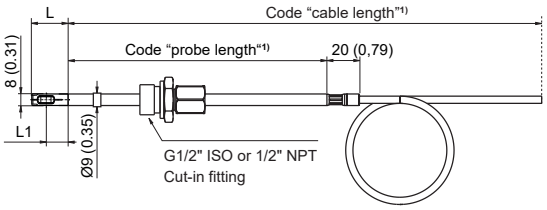
Type T3 Probe

Remote probe



Type T26 Probe

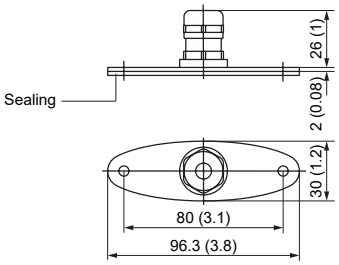
Remote probe, pressure-tight up to
10 bar (150 psi) with cut-in fitting



1) Refer to ordering guide

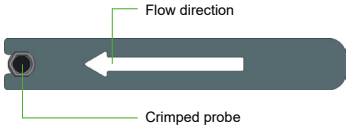
Mounting flange

Within scope of supply for T2 and T3



Probe alignment key

Poka-yoke inspired tool, only one direction possible
Within scope of supply for types T3 and T26



Technical Data

Measurands

Air Velocity Standardised (vn)

Measuring range	0...2 m/s (0...400 ft/min) 0...15 m/s (0...3 000 ft/min) 0...40 m/s (0...8 000 ft/min)	
Accuracy in air at 23 °C (73 °F) and 1 013 mbar (14.7 psi), including non-linearity, hysteresis and repeatability **0.06...2 m/s (12...400 ft/min)** **0.15…15 m/s (30…3 000 ft/min)** **0.20…40 m/s (40…8 000 ft/min)**	 ±0.03 m/s (6 ft/min) ±(0.10 m/s (20 ft/min) + 1 % of mv) ±(0.20 m/s (40 ft/min) + 1 % of mv)	 mv = measured value
Uncertainty of factory calibration	±1 % of mv, min. 0.015 m/s (3 ft/min)	mv = measured value
Dependency of inflow angle (α)	<3 % for α < ±10°	
Influence of the reverse flow, typ.	<2 % of mv	mv = measured value
Response time t_{90}, typ.	0.1...35 s (Factory setting: 1.7 s; configurable via PCS10 in 9 steps)	
Temperature dependency of electronics, typ.	±0.01 % of mv/K deviating from 25 °C (77 °F)	mv = measured value
Temperature dependency of probe, typ.	±0.1 % of mv/K deviating from 25 °C (77 °F)	mv = measured value
Warm-up time	<5 s	

Temperature (T)

Measuring range **Remote probe** **Duct version**	 -40...+140 °C (-40...+284 °F) -40...+80 °C (-40…+176 °F)	
Accuracy in air at 23 °C (73 °F) at vn ≥1 m/s (200 ft/min)	±0.5 °C (±0.9 °F)	
Temperature dependency of electronics, typ.	±0.005 % of mv/K, deviating from 25 °C (77 °F)	mv = measured value
Temperature dependency of probe, typ.	±0.1 % of mv/K , deviating from 25 °C (77 °F)	mv = measured value
Response time t_{90}, typ.	≤10 s	

Outputs

Analogue

Two freely selectable and scalable outputs for vn, T, V'n	0 – 10 V 0 – 20 mA / 4 – 20 mA (3-wire)	-1 mA < I_L < 1 mA R_L ≤ 350 Ω	I_L = load current R_L = load resistance
Accuracy @23 °C (68 °F)	±0.05 % FS		FS = full scale (20 mA, 10 V)
Temperature dependency[1)]	±0.005 % FS / °C		FS = full scale (20 mA, 10 V)
NAMUR Factory settings	11 V or 21 mA		

1) Deviating from 23 °C (68 °F), defined at 12 mA or 5 V, respectively

Digital

Digital interface	RS485 (AVS701 = 1 unit load)
Protocol	Modbus RTU
Factory settings	9 600 Baud, 8 data bits, parity none, 1 stop bit, Modbus address 47
Supported Baud rates	9 600, 19 200, 38 400, 57 600, 76 800 and 115 200

Switching Outputs (Optional)

2 switching outputs	Potential-free (Opto-MOS)
Switching capacity	Max. 24 V DC, 1 A

Technical Data

General

Power supply class III USA & Canada: Class 2 supply necessary	24 V DC ±20 %
Current consumption **Typ.** **With Display**	<100 mA <160 mA
Electrical connection	M12x1 plug or via M16 cable gland to internal terminals
Temperature working range **Probe and sensing element** **Probe cable** **Enclosure** **Enclosure with display**	 -45…+160 °C (-40…+320 °F)[1)] -40…+180 °C (-40…+356 °F) --40…+60 °C (-40…+140 °F) -30…+60 °C (-22…+140°F)
Pressure working range **T2, T3** **T26**	 700...1 300 mbar (10.2...18.9 psi) Pressure-tight 0.05...10 bar (0.73...145 psi)
Humidity working range	0…99 %RH, non-condensing
Storage conditions	-20...+70 °C (-4…+158 °F) 0...95 %RH, non-condensing
Protection rating	IP65 / NEMA 4X
Material **Probe incl. head** **Probe cable jacket** **Sensing element** **Enclosure**	 Stainless steel 1.4404 PTFE (Polytetrafluoroethylene) Ceramics with polymer finish Die-cast aluminium AlSi9Cu3 or PC (Polycarbonate)
Electromagnetic compatibility	EN 61326-1 EN 61326-2-3 Industrial Environment FCC Part15 Class B ICES-003 Class B
Configuration und adjustment	PCS10 via USB
Conformity	CE UKCA

1) Without power supply

Ordering Guide

	Feature	Description	Code		
Hardware Configuration			AVS701-		
	Type	Duct mount	T2		
		Remote probe		T3	
		Remote probe, pressure-tight, 10 bar (145 psi)			T26
	Enclosure material	PC (Polycarbonate)	HS1		
		Die-cast aluminium (AlSi9Cu3)	HS3		
	Process connection	G 1/2" ISO - cut-in fitting, Ø8 mm (0.31")			PA29
		1/2" NPT - cut-in fitting, Ø8 mm (0.31")			PA30
	Measuring range	0...2 m/s (0...400 ft/min)		HV23	
		0...15 m/s (0...3 000 ft/min)	HV27	HV27	HV27
		0...40 m/s (0...8 000 ft/min)	HV30	HV30	HV30
	Probe length	100 mm (3.94")	L100	L100	
		200 mm (7.87")	L200	L200	L200
		400 mm (15.75")	L400	L400	L400
		600 mm (23.62")		L600	L600
	Probe cable length (incl. probe length)	2 m (6.6 ft)		K2	K2
		5 m (16.4 ft)		K5	
		10 m (32.8 ft)		K10	K10
	Display	Without display	No code		
		Display with backlight	D2		
	Electrical connection	Cable glands	No code		
		1 plug for power supply and outputs	E4		
		1 plug for power supply + outputs and 1 socket for RS485	E6		
		1 M12 plug, 4 poles, for RS485 (with A0 only)	E9		
	Analogue output	0 – 10 V or 4 – 20 mA[1)]	No code		
		No analogue output (does not require the analogue output configuration)	A0		
	Digital interface	RS485 with Modbus RTU	J3		
	Sensor control port	Without sensor control port	No code		
		Modbus RTU via M12 socket	SCP1		
	Additional module	Without additional module	No code		
		2 potential-free switching outputs with cable gland	AM10		

1) Applies to both analogue outputs.

Ordering Guide (cont'd)

	Feature	Description		Code
Software Configuration	**Output signal**	0 – 10 V[1)]		GA3
		4 – 20 mA[1)]		GA6
		RS485 digital interface		No code
	Output 1 measurand	Temperature T	[°C]	No code
		Temperature T	[°F]	MA2
		Air velocity v	[m/s]	MA20
		Air velocity v	[ft/min]	MA21
		Air velocity standardised vn[2)]	[m/s]	MA22
		Air velocity standardised vn[2)]	[ft/min]	MA23
		Volume flow standardised V'n	[m^3/min]	MA84
		Volume flow standardised V'n	[ft^3/min]	MA87
		Volume flow V'	[m^3/min]	MA89
		Volume flow V'	[ft^3/min]	MA90
	Output 1 scaling low	0		No code
		Value		SAL*Value*
	Output 1 scaling high	50		No code
		Value		SAH*Value*
	Output 2 measurand[3)]	Air velocity standardised vn[2)]	[m/s]	No code
		Air velocity standardised vn[2)]	[ft/min]	MB23
		Air velocity v	[m/s]	MB20
		Air velocity v	[ft/min]	MB21
		Temperature T	[°C]	MB1
		Temperature T	[°F]	MB2
		Volume flow standardised V'n	[m^3/min]	MB84
		Volume flow standardised V'n	[ft^3/min]	MB87
		Volume flow V'	[m^3/min]	MB89
		Volume flow V'	[ft^3/min]	MB90
	Output 2 scaling low	0		No code
		Value		SBL*Value*
	Output 2 scaling high	40		No code
		Value		SBH*Value*
	Medium 1	Air		No code
		Nitrogen		MUA2
		CO_2		MUA3
		Argon		MUA7
	Medium 2[4)]	No additional medium		No code
		Air		MUB1
		Nitrogen		MUB2
		CO_2		MUB3
		Argon		MUB7
	Duct cross section[3)5)]	Factory pre-setting		No code
		Value in [mm^2]		DC*Value*
	Protocol	Modbus RTU		P1
	Measurand displayed 1	Air velocity standardised vn	[m/s]	DA22
		Other		DA*xx*
	Measurand displayed 2	Temperature T	[°C]	DB1
		Other		DB*xx*
	Accredited traceable calibration certificate in accordance with DIN EN ISO/IEC 17025			see www.eplusecal.com
	ISO 9001 Calibration Certificate			see www.epluse.com/iso9001cal

1) Applies to both analogue outputs.
2) Standardised air velocity vn at standard conditions (factory setup): Tn = 23 °C (73 °F), pn = 1 013.25 mbar (14.7 psi), settable via PCS10.
3) Only in combination with volume flow measurement (Mx84, Mx87, Mx89, Mx90): DC value in mm^2 required.
4) Optional. If not applicable, then "No Code".
5) Required for volume flow measurement in RS485 version, value in mm^2, factory pre-setting 8 000 mm^2 (12.4 $inch^2$).

Code for measurand displayed

Measurand		Unit	Code	Measurand		Unit	Code
			DA*xx* / DB*xx*				DA*xx* / DB*xx*
Temperature	T	°C °F	1 2	**Volume flow standardised**	V'n	m^3/min SCFM	84 87
Air velocity	v	m/s ft/min	20 21	**Volume flow**	V'	m^3/min ft^3/min	89 90
Air velocity standardised	vn	m/s ft/min	22 23	**Pressure**	p	mbar psi	100 101

Order Example

AVS701-T3HS3HV30L400K5D2J3SCP1GA3MUB3DA20DB1

Feature	Code	Description
Type	**T3**	Remote probe
Enclosure material	**HS3**	Die-cast aluminium (AlSi9Cu3)
Measuring range	**HV30**	0...40 m/s (0...8 000 ft/min)
Probe length	**L400**	400 mm (15.75")
Probe cable length (incl. probe length)	**K5**	5 m (16.4 ft)
Display	**D2**	Display with backlight
Electrical connection	**No code**	Cable glands
Analogue output	**No code**	0 – 10 V or 4 – 20 mA
Digital interface	**J3**	RS485 with Modbus RTU
Sensor control port	**SCP1**	Modbus RTU via M12 socket
Additional module	**No code**	Without additional module
Output	**GA3**	0 – 10 V (applies to both outputs)
Output 1 measurand	**No code**	Temperature T [°C]
Output 1 scaling low	**No code**	0
Output 1 scaling high	**No code**	50
Output 2 measurand	**No code**	Air velocity standardised v [m/s]
Output 2 scaling low	**No code**	0
Output 2 scaling high	**No code**	40
Medium 1	**No code**	Air
Medium 2	**MUB3**	CO_2
Duct cross section	**No code**	Factory pre-setting
Measurand displayed 1	**DA20**	Air velocity v [m/s]
Measurand displayed 2	**DB1**	Temperature T [°C]

Accessories

Description	Code
E+E Product Configuration Software (Free download: www.epluse.com/pcs10)	**PCS10**
Modbus pressure probe, 0…10 bar abs.	**HA600001**
Connection cable, unshielded, 5 poles, M12x1 plug ←→ socket **2 m (6.6 ft)** **5 m (16.4 ft)** **10 m (32.8 ft)**	 **HA010813** **HA010814** **HA010815**

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