Pressure controller
Air data test set
Model CPA8001

Applications

- Calibration of altitude and vertical airspeed
- Airspeed calibration
- Calibration of air data computers
- Military, commercial and aircraft
- Research and development laboratories

Special features

- Ps/Qc or Ps/Pt removable transducer that can be changed via the front
- Control stability 0.001 % of span
- Accuracy up to 0.009 % IS-50 (IntelliScale)
- Uncertainty: ±2.5 ft, ±0.06 knots
- RVSM-compliant and automated zero point adjustment

Pressure controllers air data test set, model CPA8001

Description

Application

The model CPA8001 air data test set (ADTS) is an air data controller designed for automated calibration and testing of altimeters, rate of climb indicators, airspeed indicators and air data computers.

Functionality

The high-definition colour touchscreen and intuitive interface provides for simultaneous or asynchronous control of altitude / altitude rate, and/or airspeed / airspeed rate. Entry of set points and system setting becomes second nature through the easy to understand buttons and menus. In addition, the user-programmable sequence function provides storage and automated control of standard test procedures.

Sensors and control

A dual (Ps/Pt or Ps/Qc) removable/interchangeable transducer is available, with an accuracy of 0.009 % IS-50. The requirements of RVSM specification are achieved with either sensor. User-specified ranges are available for military, commercial or aircraft applications. The automated zero point adjustment adds another high accuracy absolute sensor within the zero point adjustment. This insures a high level of accuracy by automatically zero point adjustment for both channels. The percent of reading specification plus a proprietary control valve regulator, provides accurate, and stable control.

Remote operation
Remote operation, via IEEE-488.2 (GPIB), Ethernet, RS-232 or USB and command set emulation of non-Mensor ADTS instruments makes the CPA8001 a valuable “drop-in” asset that can be used in production or calibration of air data instruments.

Service and calibration
The CPA8001 can be supplied with an external calibration sled for remote calibration outside of the installed unit. Combined with Mensor’s world-class service and support, the CPA8001 is the best solution to air data calibration applications.

Specifications for reference pressure sensor model CPR8001

Reference pressure sensor		
Pressure range		
Ps sensor	Range	0 ... 950 mbar abs. up to 0 ... 1,253 mbar abs. 0 ... 29.5 inHg abs. at 0 °C up to 0 ... 37 inHg abs. at 0 °C
	Accuracy [1]	0.009 % IS-50 [2]
Pt sensor	Range	0 ... 1,355 mbar abs. up to 0 ... 3,725 mbar abs. 0 ... 40 inHg abs. at 0 °C up to 0 ... 110 inHg abs. at 0 °C
	Accuracy [1]	0.01 % IS-50 [3]
Qc sensor	Range	-34 ... +100 mbar up to -34 ... +3,386 mbar -1 ... +3 inHg D [4] at 0 °C up to -1 ... +100 inHg D [4] at 0 °C
	Accuracy [1]	0.01 % Full span [5]
Precision	±2.5 ft, ±0.06 knots	
Calibration interval	365 days	

1) It is defined by the total measurement uncertainty, which is expressed with the coverage factor (k = 2) and includes the following factors: the intrinsic performance of the instrument, the measurement uncertainty of the reference instrument, long-term stability, influence of ambient conditions, drift and temperature effects over the compensated range during a periodic zero point adjustment.
2) 0.009 % IS-50 accuracy: between 0 ... 50 % of the scale range, the accuracy is 0.009 % of the half scale range and between 50 ... 100 % of the scale range, the accuracy is 0.009 % of reading.
3) 0.01 % IS-50 accuracy: between 0 ... 50 % of the full scale, the accuracy is 0.01 % of half of the full scale value and between 50 ... 100 % of the full scale, the accuracy is 0.01 % of reading.
4) D is a value in differential mode
Qc is a differential pressure and can be referenced to atmospheric pressure or to the current Ps pressure.
5) Full span = end of measuring range - start of measuring range

As barometric reference	
Measuring range	■ 552 ... 1.172 mbar abs. ■ 8 ... 17 psi abs. ■ 552 ... 1.172 hPa abs.
Accuracy [1]	0.01 % of reading
Function	The barometric reference can be used to switch pressure types [2], absolute <=> gauge. With gauge pressure sensors, the measuring range of the sensors must begin with -1 bar [-15 psi] in order to carry out an absolute pressure emulation.

1) It is defined by the total measurement uncertainty, which is expressed with the coverage factor (k = 2) and includes the following factors: the intrinsic performance of the instrument, the measurement uncertainty of the reference instrument, long-term stability, influence of ambient conditions, drift and temperature effects over the compensated range during a periodic zero point adjustment every 30 days.
2) For a pressure-type emulation, we recommend a native absolute pressure sensor, since the zero point drift can be eliminated through a zero point adjustment.

As vacuum reference	
Measuring range	100 ... 1,000 mtorr abs.
Accuracy [1]	0.4 % of reading

1) It is defined by the total measurement uncertainty, which is expressed with the coverage factor (k = 2) and includes the following factors: the intrinsic performance of the instrument, the measurement uncertainty of the reference instrument, long-term stability, influence of ambient conditions, drift and temperature effects over the compensated range during a periodic zero point adjustment every 30 days.

Uncertainty specifications / repeatability		
Ps pressure range	**0.009 % IS-50** **0 … 32 inHg abs.**	**0.009 % IS-50** **0 … 34 inHg abs.**
Altitude	Sea level ±2.5 ft 29,000 ft ±3.4 ft 41,000 ft ±5.7 ft	Sea level ±2.5 ft 29,000 ft ±3.6 ft 41,000 ft ±6 ft
Pressure	32 inHg ±0.0027 inHg 15 inHg ±0.0014 inHg 5 inHg ±0.0014 inHg	34 inHg ±0.003 inHg 15 inHg ±0.0015 inHg 5 inHg ±0.0015 inHg
Qc pressure range	**0.01 % FS** **-1 … 32 inHg**	**0.01 % FS** **-1 … 80 inHg**
Airspeed	250 kn ±0.12 kn 500 kn ±0.05 kn 661 kn ±0.03 kn	250 kn ±0.31 kn 500 kn ±0.13 kn 661 kn ±0.08 kn 1,000 kn ±0.03 kn

Specifications for pressure controller (ADTS) model CPA8001

Base instrument		
Instrument		
Instrument version	■ Desktop case ■ 19" rack-mounting kit with side panels incl. rack-mounting kit	
Weight	Approx. 23.6 kg [52 lb]	
Warm-up time	Approx. 15 minutes	
Digital display		
Type of display	10.1" colour TFT with capacitive touchscreen	
Display resolution	4 ... 6 digits depending on range and units	
Integrated sensor	■ Depending on version, minimum 1 ■ Additional barometric reference ■ Additional vacuum reference sensor	
Functions		
Calibration / Adjustment	Zero adder and span multiplier, up to 11-point linearisation for each sensor	
Calibration data storage	Calibration data is stored on each removable sensor	
Resolution	■ 0.1 ft ■ 0.1 knots	
Orientation effects	For standard sensors and optional sensors negligible	
Measuring range	Depending on the reference pressure sensor and accuracy of model CPR8001	
Pressure type	■ Gauge ■ Absolute pressure ■ Differential mode (Qc is a differential pressure and can be referenced to atmospheric pressure or to the current Ps pressure.)	
Unit		
Aviation units	Altitude	■ Feet ■ Metre
	Airspeed	■ Knots ■ Km/h ■ Metre/s ■ Mach
Pressure units	38 and two freely programmable pressure units	

Control parameter	
Control stability of pressure units	0.002 % of span
Control stability of aviation units	→ See table “Control stability of aviation units“
Control speed	10 s to stable flag for a 10 % pressure change into 150 ml [cc] volume. Larger volumes can lengthen this time. Controlling to pressures less than 30 mbar abs. [0.5 psi abs.] will lengthen this time.
Control range	0 ... 100 % FS
Rate control	0 ... 6,000 ft/min
Stability of the rate control	±0.8 % of the set rate ±10 ft/min
Minimum control pressure	0.0017 bar [0.025 psi] over exhaust pressure or 0.05 % FS → Whichever is greater
Test volume	50 ... 1,000 ccm [3 ... 60 in^3]

1) Regarding a 10 % FS pressure increase in a 150 ml [cc] test volume

Further details on: control stability of aviation units				
	Altitude		**Airspeed**	
	in ft	**Stability (± ft)**	**Knots**	**Stability (± Knots)**
Stability	-1,870	0.56	0	4.684
	0	0.59	10	1.042
	5,000	0.69	20	0.540
	10,000	0.80	30	0.363
	20,000	1.11	40	0.273
	30,000	1.58	50	0.218
	40,000	2.39	60	0.182
	50,000	3.88	70	0.156
	60,000	6.28	80	0.136
	65,000	7.99	90	0.121
	-	-	100	0.108
	-	-	200	0.052
	-	-	300	0.033
	-	-	400	0.023
	-	-	500	0.017
	-	-	600	0.013
	-	-	710	0.009

1) Regarding a 10 % FS pressure increase in a 150 ml [cc] test volume

Pressure connections	
Connections	■ 6 ports with 7/16"-20 F SAE female ■ 2 ports with barb fitting
Filter elements	All pressure ports have a 20-micron filters except the barometer and Qc reference.
Pressure adapters	■ 7/16"-20 SAE male to 6 mm tube fitting ■ 7/16"-20 SAE male to ¼" tube fitting ■ 7/16"-20 SAE male to ¼ NPT, female thread ■ 7/16"-20 SAE male to ⅛ NPT, female thread ■ 7/16"-20 SAE male to ⅛ BSP, female thread ■ AN4 fitting ■ AN6 fitting
Barometer adapters	Barb fitting
Qc reference	Barb fitting
Overpressure protection	Safety relief valve scaled to 120 % of full scale of each sensor.

Pressure connections	
Permissible pressure	
Supply port (Ps, Pt/Qc)	Approx. 110 % FS
Measure/Control port (Ps, Pt/Qc)	Max. 105 % FS

Communication	
Interface	■ Ethernet ■ IEEE-488 ■ USB ■ RS-232 (null modem cable not required)
Baud rate	■ 9600 ■ 19200 ■ 38400 ■ 57600 ■ 115200
Command sets	■ Mensor ■ WIKA SCPI ■ Others on request
Response time	< 100 ms

Voltage supply and performance data	
Operating voltage	■ AC 100 ... 120 V, 50/60 Hz ■ AC 200 ... 240 V, 50/60 Hz
Power consumption	Max. 140 VA
Supply voltage fluctuation	±10 % (AC 90 ... 132 V / 180 ... 264 V)
Overvoltage resistance	Category II
Fuse	2.5 A, 250 V; SLO-BLO 5 x 20 mm
Power cord	■ For Europa ■ For USA/Canada ■ For UK ■ For India ■ For China

Operating conditions	
Place of use	Indoor Not for wet locations
Altitude per ISA (International Standard Atmosphere)	■ Up to 19,800 m [65,000 ft] for software ■ Up to 2,000 m [6,562 ft] for instruments
Operating temperature	15 ... 35 °C [59 ... 95 °F]
Compensated temperature range	15 ... 45 °C [59 ... 113 °F]
Storage temperature range	0 ... 70 °C [32 ... 158 °F]
Relative humidity, condensation	35 ... 85 % relative humidity (non-condensing)
Permissible pressure media	10 % over the range of the channel's transducer ■ Clean dry air (class 3 instrument air per ISO 8753) ■ Nitrogen (ISO 8573-1:2010 class 5.5.4 or better)
Mounting position of transducer	Horizontal or slightly tilted
Permissible pollution degree	Degree 2
EMC (HF field)	EN 61326-1 emission (group 1, class A) and immunity (industrial application)

Approvals

Logo	Description	Region
CE	**EU declaration of conformity**	European Union
	EMC directive [1)] EN 61326-1 emission (group 1, class A) and immunity (industrial application)	
	Low Voltage Directive	
	RoHS directive	

1) This is class A equipment for emissions and is intended for use in industrial environments. In other environments, e.g. residential or commercial installations, it can interfere with other equipment under certain conditions. In such circumstances the operator is expected to take the appropriate measures.

Certificates

Certificates	
Calibration [1)]	
Barometric reference	■ Without ■ A2LA calibration certificate (traceable and accredited in accordance with ISO/IEC 17025) ■ DAkkS calibration certificate for barometric reference (traceable and accredited in accordance with ISO/IEC 17025)
Reference pressure sensor model CPR8001	■ A2LA calibration certificate (traceable and accredited in accordance with ISO/IEC 17025) ■ DAkkS calibration certificate - for two measuring ranges (traceable and accredited in accordance with ISO/IEC 17025)
Recommended calibration interval	1 year (dependent on conditions of use)

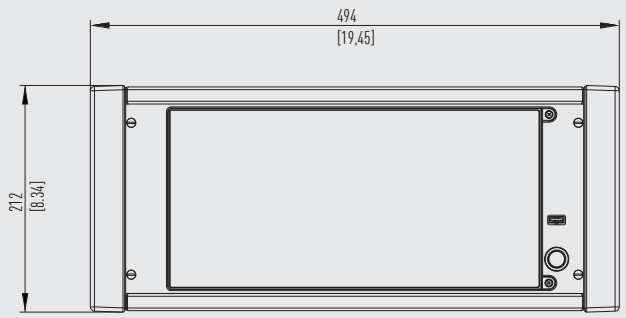
1) Calibration in a horizontal position / operating position.

→ Approvals and certificates, see website

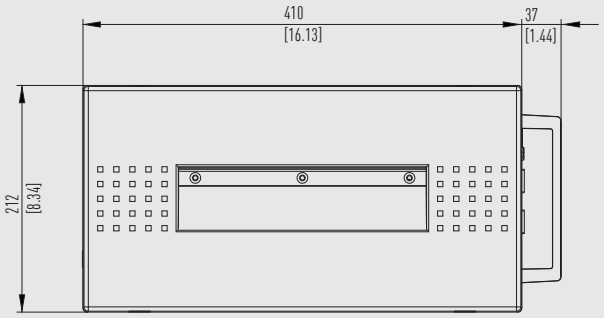
Dimensions in mm [in]

Desktop case

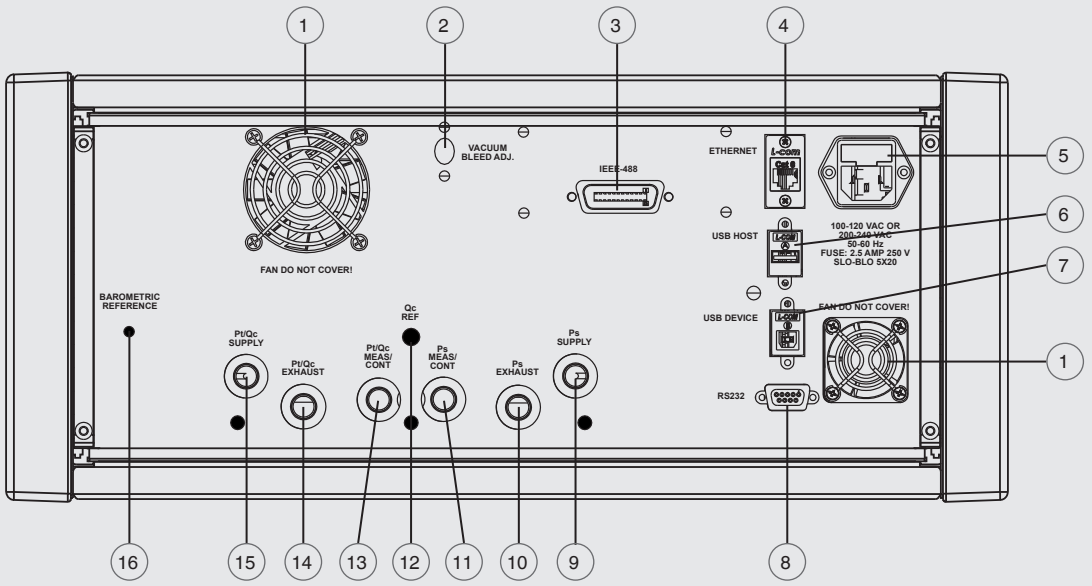
Front view



Side view (left)



Electrical and pressure connections - rear view



1. Fan
2. Vacuum bleed adjustment (for zero point adjustment)
3. IEEE-488 interface
4. Ethernet interface
5. Power supply and micro fuse
6. USB interface (host) for service
7. USB interface (instrument) for remote communication
8. RS-232 interface
9. Supply port Ps (7/16"-20 F SAE)
10. Exhaust port Ps (7/16"-20 F SAE)
11. Measure/Control port Ps (7/16"-20 F SAE)
12. Qc reference (barb fitting)
13. Measure/Control port Pt/Qc (7/16"-20 F SAE)
14. Exhaust port Pt/Qc (7/16"-20 F SAE)
15. Supply port Pt/Qc (7/16"-20 F SAE)
16. Barometric reference (barb fitting)

Modular design of the CPA8001

Modular design

Modular design simplifies servicing and saves time. The electronics, controller and transducer package are self-contained modules that require minimal service but on the occasion that service is required each component can be removed and easily replaced with a new or repaired module.

Interchangeable transducers

The interchangeable transducers are a special feature of the Mensor calibration instruments. Interchangeable transducers guarantee long-term operation with practically no downtime. Transducers removed for calibration can be replaced by freshly calibrated transducers in less than five minutes. The ability to remove a transducer for calibration and replace it with a freshly calibrated transducer while the instruments remains in service saves time and money. In addition, changing transducer ranges in the CPA8001 provides an expanded capability within a single calibrator.

Removable transducer (e.g. for calibration purposes)

The front panel of the CPA8001 air data test set contains a hinged door that can be opened using a Phillips head screwdriver. The dual (Ps/Pt or Ps/Qc) transducer CPR8001 can be removed by loosening a thumb screw and lifting it out of its captive cradle. The CPR8001 can then be calibrated using the remote calibration sled (optional). After the transducer is calibrated it can be inserted back into the CPA8001 to resume operation.

An additional dual transducer can also be purchased in order to have a reserve transducer with a fresh calibration on hand to immediately replace the transducer requiring calibration. This feature virtually eliminates downtime for the operation of the CPA8001 air data test set.

Modular parts of the hardware (transducer model CPR8001)

CPR8001 mounted on calibration sled

Special features of the CPA8001

Accuracy and stability
The total uncertainty specification for a standard CPA8001 falls well within the uncertainty required for RVSM.
In addition, the patented needle valve regulator provides a steady and precise pressure control output that simulates altitude / altitude rate and airspeed / airspeed rate into large volumes.

Knots: IAS or TAS
Indication of airspeed can be “indicated airspeed” (Knots IAS) or “true airspeed” (Knots TAS).

Simple operation
The lean and unambiguous menu structure ensures a particularly high user-friendliness.

Touchscreen and intuitive user interface
The CPA8001 has an updated high definition colour touchscreen with an intuitive menu structure and job-specific screens that includes password-protection. Set points for altitude, altitude rate, airspeed and airspeed rate are initially in a pending state and can be activated simultaneously. The “Favourites” button saves instrument sequences for easy recall. The display can be configured to show aviation and pressure units simultaneously.

Zero point adjustment
The automated zero point adjustment utilises a high-accuracy low-pressure absolute sensor. The zero point adjustment function ensures a high level of accuracy by automatically adjusting the zero for both channels.

Emulation and drop-in compatibility
The CPA8001 remote communication software can receive and understand commands intended for other ADTS units, including the Mensor ADTS 8201 and 8205. This provides drop-in emulation of ageing or obsolete ADTS calibrators and requires no programming changes. Drop-in emulation saves time and money plus established processes or procedures can remain in place.

Outstanding control performance
The CPA8001 (ADTS) air data test set convinces particularly with outstanding control performance. The control unit guarantees fast, harmonic and overshoot-free control of pressure values with the highest precision and a very high control stability.

Particularly adaptable to any application
The controller has an short warm-up time of approx. 15 minutes. In addition, it can be automatically adapted to the test volume.

Long-term stability and low maintenance
As a result of the high-quality precision transducer technology, the instrument offers an excellent measurement accuracy and long-term stability. Furthermore, special patented needle valve technology ensures a low-noise and low-wear control of pressure.

Touchscreen and intuitive user interface

Shortly after power-up, the standard home screen (see figure) is displayed. In this menu screen, one can switch between the operating modes using the buttons **Measure**, **Control** and **Vent** at the bottom of the screen. The display can be configured to show aviation and pressure units simultaneously.

Standard desktop / main screen

1 **General settings**
Set-up button: provides access to all setup and configuration parameters.

2 **Input via numeric keypad**
Data entry button: provides a numerical data entry keypad for entering set points.

3 **Favourites settings**
Favourites button: provides quick choice of preprogrammed sequences and standard operation routines (leak test).

4 **Frame for airspeed (Pt/Qc channel)**
- Qc airspeed button: provides quick access to the setup parameters of the Qc airspeed channel including units of measurement, limit values, and stable window.
- Set-point button: used to enter a set point for airspeed or airspeed rate or the pressure set point and rate in the pressure mode.
- Set point
- Current measuring value
- Current unit
- Current airspeed

5 **Frame for airspeed rate**
- Qc rate button: provides quick access to the setup parameters of the Qc rate channel including unit of measurement, limit values, and stable window.
- Set-point button: used to enter a set point for airspeed or airspeed rate or the pressure set point and rate in the pressure mode.
- Set point
- Current measuring value
- Current unit
- Current airspeed

6 **Vent (Go to ground)**
The instrument controls by a user-adjustable altitude rate the system, including the test set-ups to the atmosphere that are connected to the test port.

7 **Control**
In control mode the instrument provides a very precise pressure at the test port of the respective channel in accordance with the desired value setting.

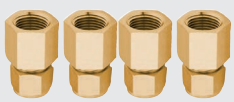
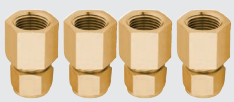
8 **Measure**
In measure mode, the pressure present at the test port is measured with high accuracy (if you switch directly from control to measure mode, the last controlled pressure in the connected test assembly will be maintained/locked).

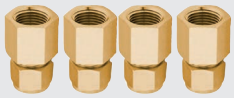
9 **Info/Status screen**
Provides information on remote communication status, channel linkage, automated zero point adjustment status and actuation, screen lock-out, and error status.

10 **Frame for altitude rate**
- Ps rate button: provides quick access to the setup parameters of the Ps rate channel including unit of measurement, limit values, and stable window.
- Set-point button: used to enter a set point for altitude, altitude rate, or the set point in pressure mode.
- Set point
- Current measuring value
- Current unit
- Current altitude rate in pressure unit

11 **Frame for altitude (Ps channel)**
- Ps altitude button: provides quick access to the setup parameters of the Ps altitude channel including unit of measurement, limit values, and stable window.
- Set-point button: used to enter a set point for altitude, altitude rate, or the set point in pressure mode.
- Set point
- Current measuring value
- Current unit
- Current altitude in pressure unit

Accessories and spare parts

Description [1]		Order code
		CPX-A-A8
-	**19" rack-mount case** With side pieces, EU	-R-
	With side pieces, NAM	-U-
	**Barometric reference** Measuring range: 552 ... 1,172 mbar abs. Accuracy to 0.01 % of reading	-1-
	Measuring range: 552 ... 1,172 hPa abs. Accuracy to 0.01 % of reading	-2-
	Measuring range: 8 ... 17 psi abs. Accuracy to 0.01 % of reading	-3-
	**Calibration adapter** For reference pressure sensor, voltage supply and software	-4-
	**Calibration adapter** For barometric reference, voltage supply and software	-5-
	**Calibration adapter** For vacuum sensor, voltage supply and software	-F-
-	**Dual differential pressure relief valve**	-G-
-	**Spare vacuum sensor**	-H-
	**Transport case**	-6-
	**RS-232 interface cable**	-9-
	**Adapter set** 6 mm Swagelok® male thread (4 adapters) Max. 137 bar [2,000 psi] Material: brass	-M-
	**Adapter set** ¼" tube fitting (4 adapters) Max. 137 bar [2,000 psi] Material: brass	-I-
	**Adapter set** ⅛ BSPG, female thread (4 adapters) Max. 137 bar [2,000 psi] Material: brass	-B-
	**Adapter set** ¼ NPT, female thread (4 adapters) Max. 137 bar [2,000 psi] Material: brass	-N-

Description [1]		Order code
		CPX-A-A8
	**Adapter set** ⅛ NPT, female thread (4 adapters) Max. 137 bar [2,000 psi] Material: brass	-S-
-	**Adapter set** Consisting of: 2 x AN4 fittings 4 x AN6 fittings Max. 137 bar [2,000 psi] Material: brass	-C-
-	**Adapter set** Consisting of 4 x AN4 fittings Max. 137 bar [2,000 psi] Material: brass	-D-
-	**Adapter set** Consisting of 4 x AN6 fittings Max. 137 bar [2,000 psi] Material: brass	-E-
Ordering information for your enquiry:		
	1. Order code: CPX-A-A8 **2. Option:**	⇓ [ ]

1) The figures are an example and may change depending on the state-of-the-art in design, material composition and representation.

Scope of delivery

- Air data test set controller model CPA8001
- 2 m [6 ft] power cord
- Operating instructions
- Calibration certificate

Ordering information

CPA8001 / Case type / Reference pressure sensor / Barometric reference / Type of certificate for the barometric reference / Power cord / Single pressure supply Ps/Pt or Ps/Qc / Pressure connection adapter / Further approvals / Additional order information

CPR8001 / Mounted in CPA8001/CPA2501 / Sensor type / Pressure unit / Minimum pressure range Ps / Maximum pressure range Ps / Pressure type of measuring range two (Pt resp. Qc) / Minimum pressure range (Pt resp Qc) / Maximum pressure range (Pt resp Qc) / Accuracy / Type of certificate for the sensor module / Further approvals / Additional ordering information

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