PRESSURE SENSOR[1]
0..700 KPA
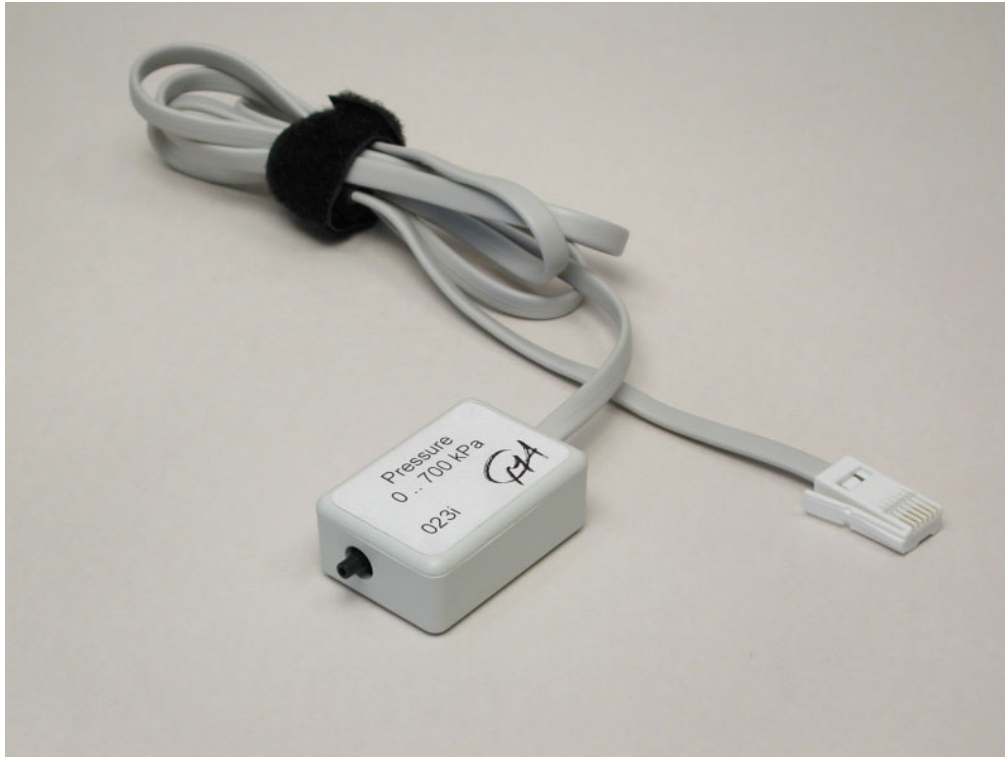## Description D023i

Figure 1. The Pressure Sensor 0..700 kPa

Short description

The Pressure Sensor (023i) is designed to measure absolute gas pressure in the range from 0 to 700 kPa (0 to 7 atm). The pressure is measured via a pressure port, which is located on the side of the box.
The pressure sensor uses the Motorola MPX5700AP pressure chip. This element has a membrane that flexes as pressure changes. It is arranged to measure absolute pressure, so one side of the membrane is a vacuum. The sensor produces an output voltage that varies in a linear way with absolute pressure.
Special circuitry minimizes the errors that might be caused by changes in temperature.

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[1] To use the new CMA intelligent sensors in Coach 5 you need to update the program. This update can be found at http://www.cma.science.uva.nl/english section Support > Coach 5.

The pressure sensor is fairly durable but it is designed only for use with non-corrosive, non-ionic working gasses such as air, dry gases and the like. Do not get it wet.
The pressure sensor is delivered with the following accessories:

- one plastic 20-ml syringe with Luer-lock, for use in simple Boyle experiments;
- two plastic tubes with an inside diameter of 3.2 mm (5 cm and 45 cm long) which can be attached to the port of the pressure sensor;
- one three-way valve with Luer-lock connectors, when the blue "Off" handle is aligned with one of the valve stems, it closes off this stem;
- two Luer-lock connectors.

The pressure sensor is equipped with a BT-plug and can be connected to the following CMA interfaces:

- **U**LAB
- CoachLab
- CoachLab II
- UIA/UIB through Measuring console (via 0520 adapter[2]).

Furthermore the sensor can be used in combination with other interfaces, like Texas Instruments CBL™, CBL2™ and Vernier LabPro without the need of an adapter.

Intelligent sensor[3]

The pressure sensor is an intelligent sensor. The sensor has a memory chip with information about the sensor. Through a simple protocol (I^2C) the sensor communicates with **U**LAB and transfers its data (name, quantity, unit and calibration) to the datalogger. **U**LAB automatically displays the calibrated values on its screen. Also **U**LAB communicates the information to the Coach software. The sensor is delivered with a standard calibration.

Suggested experiments

The pressure sensor can be used in various experiments such as:

- measurements of pressure changes in gas-law experiments (Boyle's law and Gay-

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[2] The CMA adapter art. nr 0520 allows connecting sensors with BT-plugs to 4-mm inputs.
[3] At this moment only for CMA **U**LAB datalogger, in the future also for LabPro and the CBL2.

Lussac's law
- measurements of reaction rates as a gas is produced in a chemical reaction
- measurements of vapor pressure of various liquids and solutions.

Calibration

The output of the pressure sensor is linear with respect to absolute pressure.
To collect data you can:
1. Use the calibration supplied in the standard sensor library of the Coach program.
2. Use the calibration supplied by the sensor EEPROM memory (only for the **ULAB** datalogger).
3. Calibrate the pressure sensor. The calibration can be performed in the Coach software (for details see 'Guide to Coach 5').
   You can prepare a two-point calibration using two different pressures measured with another pressure gauge. For the first calibration point you can use atmospheric pressure as measured by barometer. For the second point you can apply pressure with a pump, measuring it at the same time with a pressure gauge.

Changing of the default calibration in EEPROM of the sensor
In the near future a special program will be available to enable replacing of the default calibration in EEPROM of the sensor by a calibration done by the user. This will be done while the sensor is connected to the **ULAB** datalogger. In this way the sensor can have its own, precise calibration.
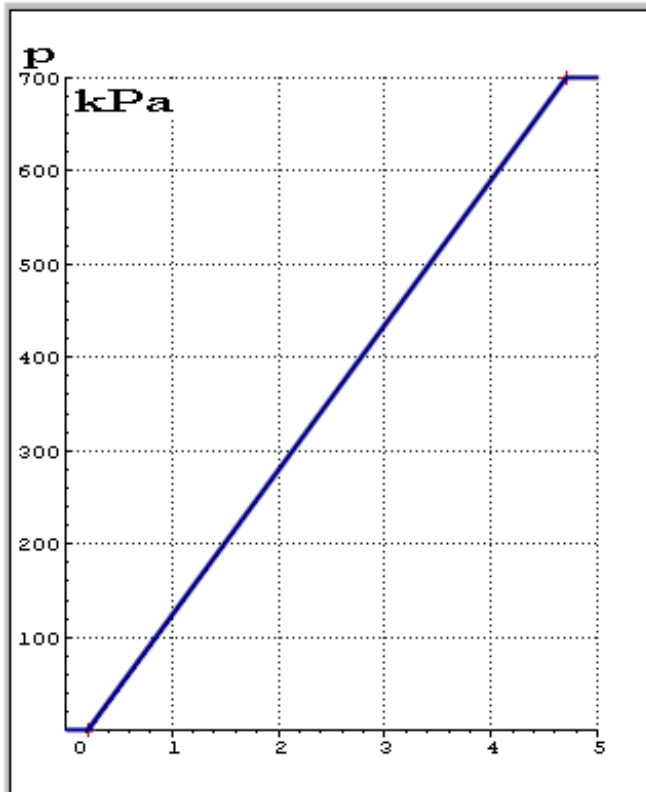
The name of the pressure sensor in the sensor library of the Coach 5 program is **Pressure sensor (023i) (CMA) (0..700kPa).**

Figure 2.
Default calibration graph of the light sensor (used in the standard Coach library and sensor memory)
p (kPa) = 156.25 * V_{out} (V) - 34.375

Coefficients of the calibration function:
a= 156.25; b= -34.375.

Technical data

Pressure range	0 – 700 kPa (0 - 7 atm)
Voltage output range	0.2 - 4.7 V
Calibration function	p (kPa) = 156.25 * V_{out}(V) - 34.375
Resolution using 12 bit AD converter	0.19 kPa (0.0019 atm)
Max. pressure	1000 kPa without permanent damage
Connection	Pressure port for use with standard plastic tubing
Usage	Only for non-corrosive gasses, non-ionic working gasses such as air, dry gases and the like. Keep the sensor dry!
Long term stability	± 0.1 % full scale reading
Response time	1 ms
Sensor information for Auto-ID and calibration	256 byte serial EEPROM
Connection	BT (British Telecom) plug

This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

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