Application Note DK9222-0909-0013

Bus Terminal/measurement technology

**Keywords**
Differential pressure
Absolute pressure
Dynamic pressure
Pressure measurement
KM3701
KM3702
KM3712

# Measuring pressures directly in the Bus Terminal

**This Application Example introduces the Bus Terminals from Beckhoff that can be used for measuring the pressure of non-aggressive gases directly in the I/O field. In addition to the design and function of the terminals, their application is explained based on three examples.**

## Differential and absolute pressure measuring terminal KM37xx

The pressure measuring terminals record direct differential and absolute pressures in non aggressive gases. In a similar way to electrical signal acquisition, pressure measurement is carried out using a "standard" 24 mm Bus Terminal. They change the measured pressure into an electrical signal and make it available to the higher level controller as a 16-bit value. The measuring principle is based on the most up-to-date, on-chip sensor technology. In addition to measuring, this semiconductor also executes other functions such as temperature compensation and avoidance of long-term drift. Status LEDs indicate the function or error, such as "out of range."

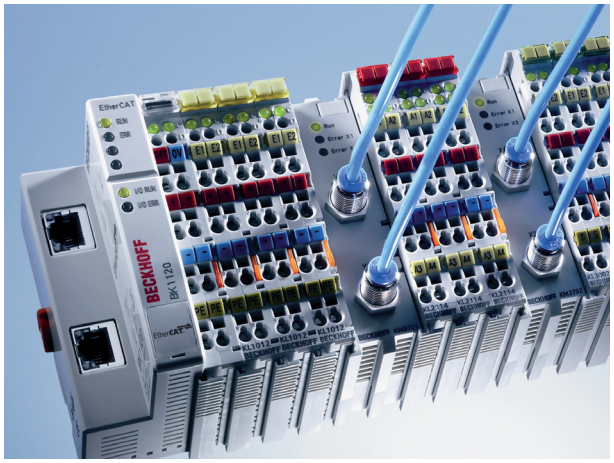


**Fig. 1 Pressure measurement in the I/O strand**

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### Differential pressure measurement

The 1-channel differential pressure measuring terminal, KM3701 measures pressure differences between two hose connectors. The differential pressure can be measured up to an ambient pressure of 7,000 hPa (7 bar) between points. The range of the differential pressure measuring terminal lies between 0 and 100 hPa (100 mbar).

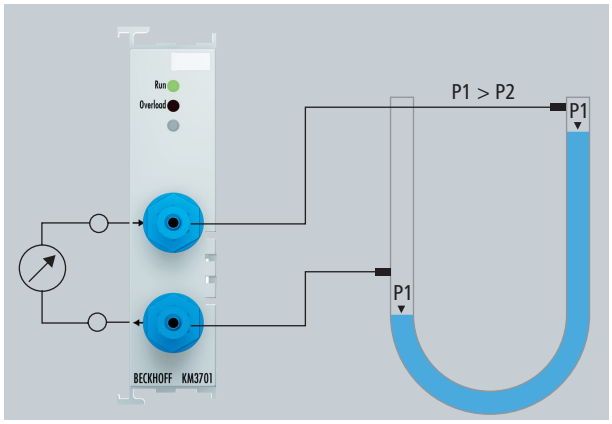


**Fig. 2 1-channel differential pressure measurement**

### Absolute pressure measurement

The 2-channel absolute pressure measuring terminal, KM3702 records pressure values between 0 and 7,000 hPa (7 bar) at each hose connector. Pressure measurement takes place relative to the actual current ambient pressure.

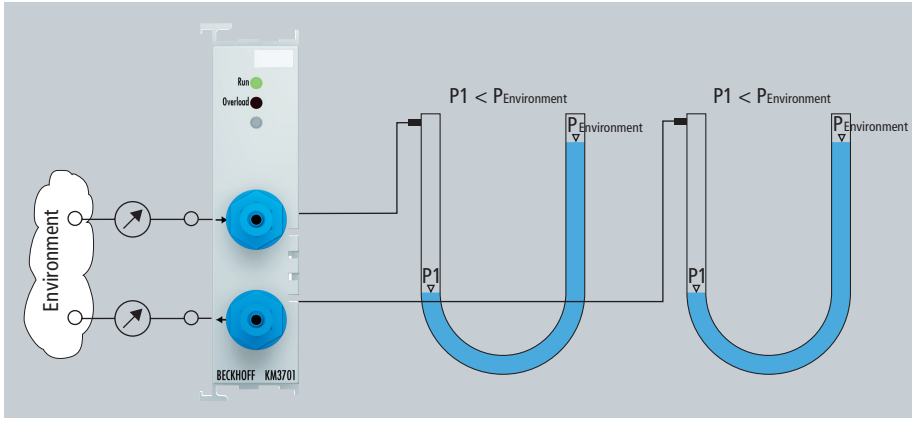


**Fig. 3 2-channel absolute pressure measurement**

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The 2-channel absolute pressure measuring terminal, KM3702 records negative pressure values of -1,000 hPa (-1 bar) to + 1,000 hPa (+1 bar). Pressure measurement takes place relative to the actual current ambient pressure.

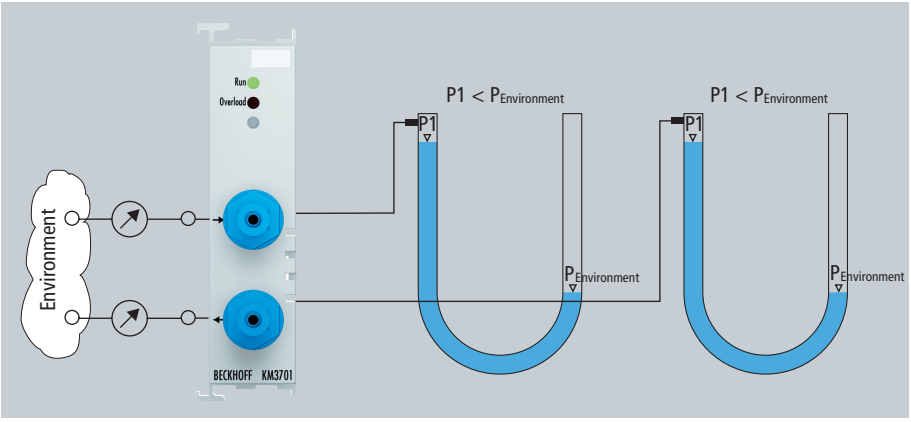


**Fig. 4 Measurement of negative pressures**

## Applications

Beckhoff pressure measuring terminals can be used in any situation that requires the measurement and monitoring of differential and dynamic pressures in non aggressive gases, e.g. in pressure tanks, pressurized cabins, pneumatic and suction systems. They measure operating pressures, monitor filters and sieves, check the seal tightness of tanks and assist in position testing of construction elements or monitoring the level of liquids. If flow rates are calculated from the measured pressures, then the KM37xx can also be used for flow measurement. They can therefore be applied in areas such as process engineering, systems engineering, building services and heating, ventilating and air conditioning.

## Selected examples

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## 1-channel differential pressure measuring terminal KM3701 – Tank systems

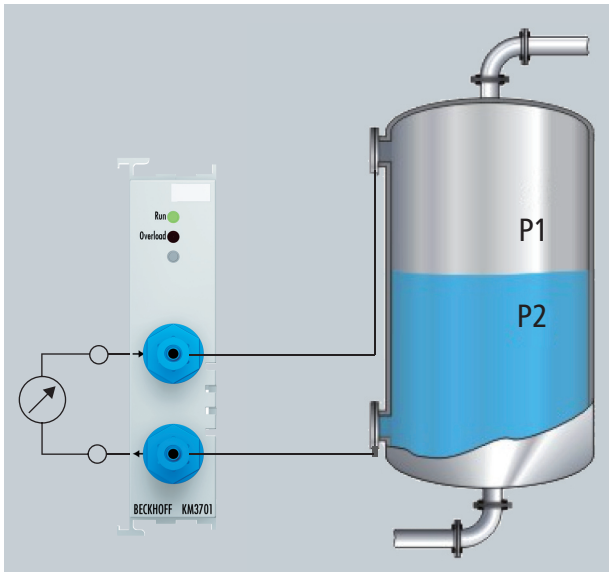


**Fig. 5 Tank systems**

- Monitors tank filling levels and activates topping up when the level falls below a defined filling value
- The pressure difference is an indicator for the filling height
- No additional pressure gauges, switches and associated connection equipment are required

## 1-channel differential pressure measuring terminal KM3701 – Filter systems, pipe constrictions

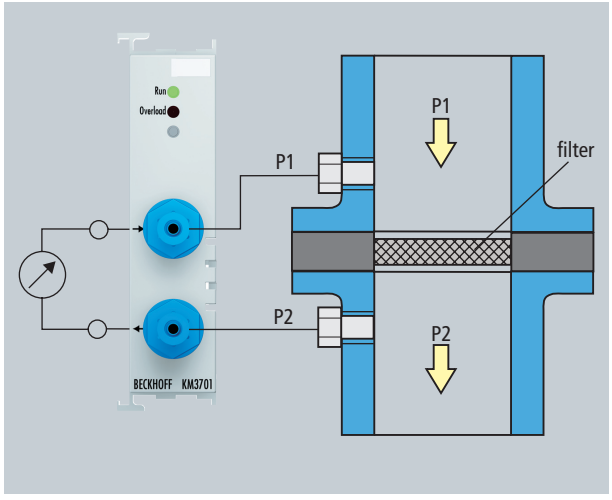


**Fig. 6 Filter systems**

- Monitors the operating state of filters and screens
- The pressure difference indicates the degree of contamination

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## 2-channel absolute pressure measuring terminal KM3702 – Pneumatic systems

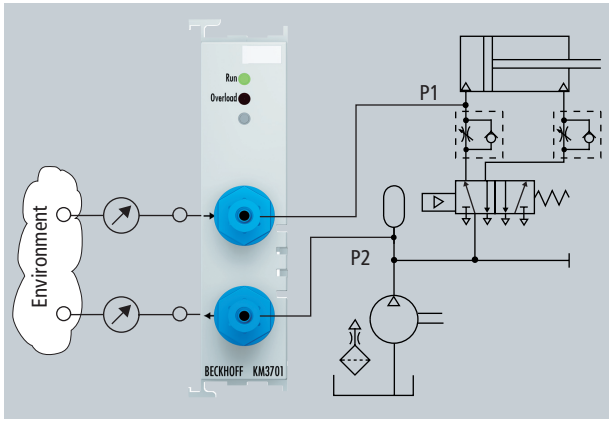


**Fig.7 Pneumatic systems**

– Controls storages filling levels
– Monitors the operating pressure of systems
– Protects systems from overpressure

## 2-channel absolute pressure measuring terminal KM3712 – Packaging system for eggs

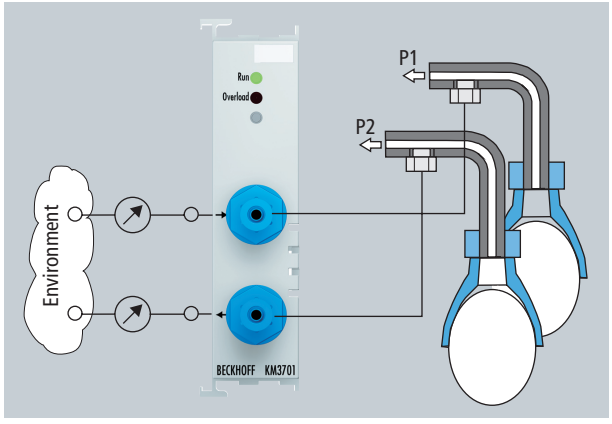


**Fig. 8 Packaging system for eggs**

– Controls suction
– Pressure deviations indicate leakages or positioning inaccuracies

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### Installation and connection technique

Pressures are recorded directly from the KM37xx terminal. Additional measuring instruments are unnecessary. This avoids connection systems and saves space compared with the use of conventional measuring instruments. The installation of the pressure measuring terminals is simple, fast and can be carried out without any additional mounting tools. The measuring hoses are connected directly to the quick couplings of the pressure measuring terminal. Standard commercial plastic hoses can be used as the measuring hoses. In terms of connections and installation space, the pressure measuring terminals are designed like a „normal" 24 mm Bus Terminal and can be installed with minimum space requirement directly in the Bus Terminal system.

– The modular fieldbus system for automation **www.beckhoff.com/Busterminal**
– 1-channel differential pressure measuring terminal -100…+100 hPa (-100…+100 mbar) **www.beckhoff.com/KM3701**
– 1-channel differential pressure measuring terminal -340...+340 hPa (-340...+340 mbar) **www.beckhoff.com/KM3701**
– 2-channel absolute pressure measuring terminal 7,500 hPa (7.5 bar) **www.beckhoff.com/KM3702**
– 2-channel absolute pressure measuring terminal -1,000…+1,000 hPa (-1…+1 bar) **www.beckhoff.com/KM3712**