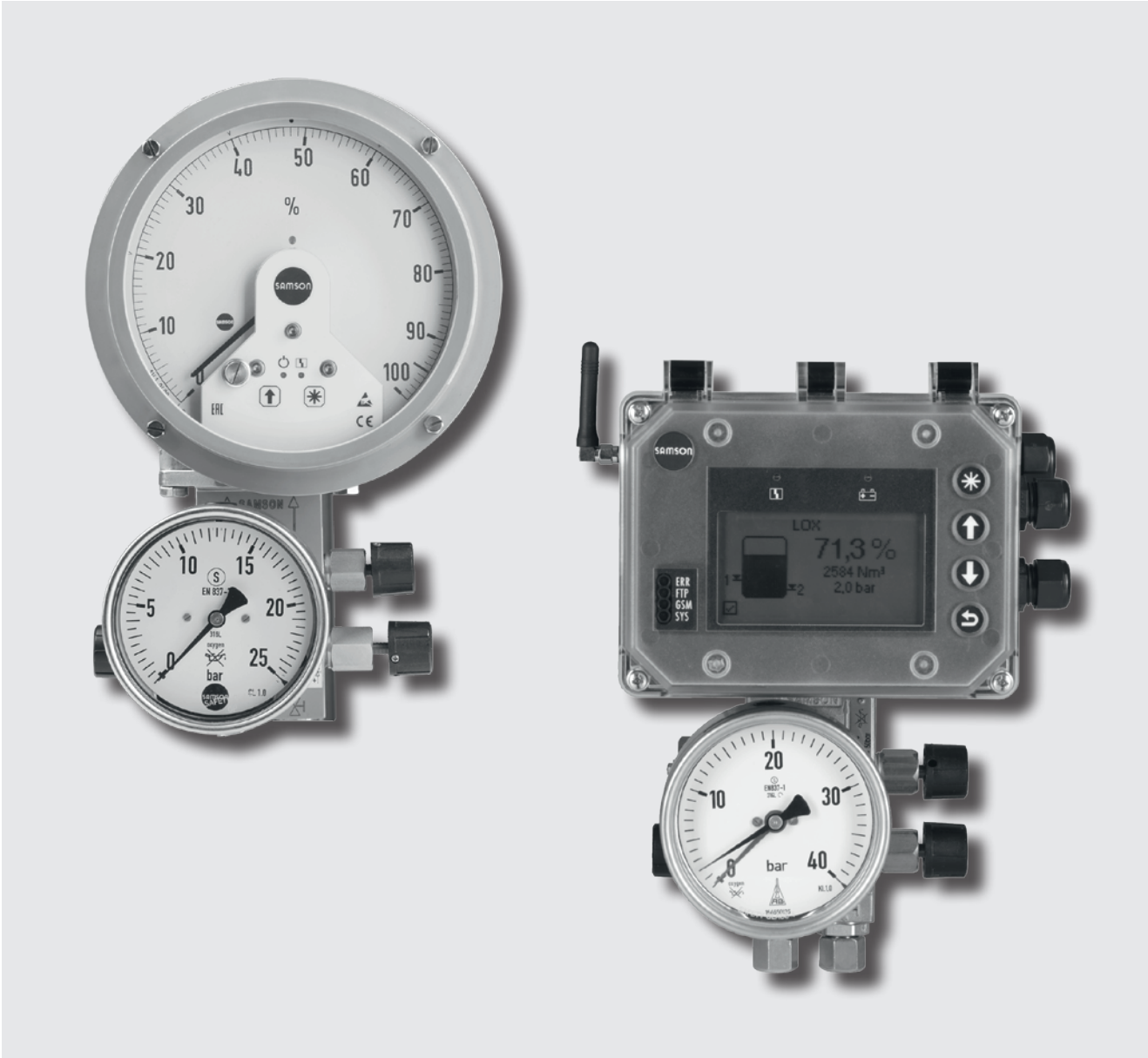
INFORMATION SHEET

T 9500 EN

Media

Liquid Level, Differential Pressure and Flow Meters

Analog and Digital Indicating Units and Transmitters for Liquid Level Measurement
Differential Pressure Measurement · Flow Measurement



SAMSON AKTIENGESELLSCHAFT · Weismüllerstraße 3 · 60314 Frankfurt am Main, Germany
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507 · samson@samson.de · www.samson.de

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1 Media Series · Liquid Level, Differential Pressure and Flow Meters

1.1 General

Media devices are used to measure and indicate differential pressure as well as derived measured variables for gases and liquids.

Fields of application include stationary or truck-mounted pressure vessels.

The devices mainly consist of a dp-cell and an indicating unit. The pressure drop measured in liquids, vapors and gases serves as basis for various applications.

The benefits of Media devices include:

- Measuring spans from 0 to 3600 mbar
- Compact, easy-to-service devices with particularly low overall weight
- Indicating unit, with at least a degree of protection IP 54, suitable for field mounting or panel mounting
- Optional additional functions, such as limit switch, current output, analog output/input, GSM module etc., to adapt the devices to specific requirements

An optional valve block is available, which contains three valves. The valve block is bolted onto the bottom of the dp-cell. It offers the following advantages:

- Mounting of an operating pressure gauge
- The connected process lines can be bypassed. This allows a zero calibration to be performed regardless of the current filling level of the tank.

1.2 Accessories

SAMSON offers accessories specially for the Media series:

– Vent screws
– Mounting material for 2" pipe or wall mounting
– Screw fitting/cap kits
– Retrofit limit contacts for Media 5
– Isolating switch amplifier
– Type 5024-1 Power Supply and Indicator Unit
– Pressure sensor
– ...

See Data Sheet ▶ T 9555 for more details.

1.3 Media series · Overview

Device	Media 05	Media 5	Media 7
			
Liquid level measurement	•	•	•
Differential pressure measurement	•	•	•
Flow rate measurement	•	•	– [1]
With inductive limit contact	•	•	
With electric transmitter	–	–	
Remote data transmission	–	–	•
Pressure rating	PN 50	PN 50	PN 60
Measuring spans	40 to 3600 mbar	40 to 3600 mbar	0 to 3600 mbar
Indicator	Analog, Ø100 mm	Analog, Ø160 mm	4" backlit graphical display
dp-cell material	CW617N (brass) or CrNi steel	CW617N (brass) or CrNi steel	Brass CW617N-H070 (according to DIN EN 12420)
Permissible ambient temperature range	–40 to +80 °C	–40 to +80 °C	–40 to +80 °C
Details in Data Sheet	T 9520	T 9519	T 9510

1.4 Flow rate measurement according to the differential pressure method

In combination with a differential pressure meter from the Media series, the differential pressure method is preferably used for continuous flow rate measurement of liquids, gases and vapors. It has the advantage that there are no moving parts in the process medium which could affect the flow rate.

When the process medium flows through a pipe narrowed down by the orifice plate assembly, the flow rate increases at the restriction. The created differential pressure is used to measure the flow rate.

SAMSON orifice plate assembly: **Type 5090 Orifice Flange** with standard orifice plate and annular chamber

Fig. 1: *Type 5090 Orifice Flange*

Technical data · Type 5090

Type 5090 Orifice Flange	
Valve size	DN 32 to 500 (NPS 1¼ to 20)
Pressure rating	PN 6, 10, 16, 25, 40 (Class 150 to 300)
Details in Data Sheet	T 9550

Materials · Type 5090

Standard orifice plate		1.4404
Annular chamber	Max. 300 °C	1.0566/SA 516-70
	Max. 400 °C	1.4404/316L, 1.5415
Pipe		Chromated steel or 1.4404/316L
Differential pressure connections		
Gasket		Fiber gasket (max. 200 °C) Graphite on metal core (max. 450 °C)

Tip

Questionnaire ▶ T 9500-9 is available to specify the data required to size the orifice plate assembly. SAMSON uses the specified data to precisely size the orifice plate assembly.

2 Media 5 and Media 05 Differential Pressure and Flow Meters

The differential pressure cell contains a measuring diaphragm which is designed for measuring spans up to max. 3600 mbar.

The differential pressure $\Delta p = p_1 - p_2$ creates a force at the measuring diaphragm, which is opposed by the range springs. The deflection, which is proportional to the differential pressure, is transferred by the adjustable coupling member and pointer mechanism to the pointer. In the version with limit contacts, the metal tags move in the assigned proximity switches A1 and A2 depending on the pointer's movement. When the metal tag enters the inductive field of the associated proximity switch, it assumes a high resistance (contact open). When the metal tag leaves the inductive field, it assumes a low resistance (contact closed). This function is similar to that of a mechanical-type switching contact. The limit signals are suitable for operating a downstream switching amplifier (transistor relay).

Special features

- Gases or liquids
- Measuring and indicating the differential pressure and measured variables derived from it
- Differential pressure cell with brass housing PN 50 and ECO measuring diaphragm
- Measuring spans from 0 to 40 through 0 to 3600 mbar
- Directly attachable valve block with test connection (accessories)
- Limit switch with inductive alarm contacts

Technical data (excerpt)	
Nominal pressure	PN 50 Overloadable on one side up to 50 bar
Measuring spans	40 to 3600 mbar
Characteristic	Reading linear to the differential pressure, selectable scales
Perm. ambient temperature	–40 to +80 °C
Degree of protection	IP 54
Media 5	
Limit switch	Max. 3 alarm contacts with LEDs
Proximity switch	SJ3,5N-LED
Media 05	
Limit switch	Max. 2 alarm contacts
Proximity switch	SJ2-SN
Details for Media 5	Data Sheet T 9519
Details for Media 05	Data Sheet T 9520

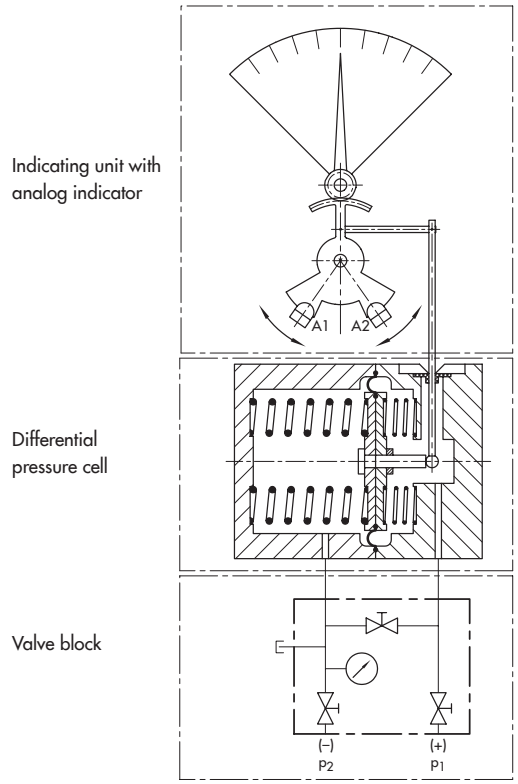


Fig. 2: *Design and principle of operation of Media 05 and Media 5*

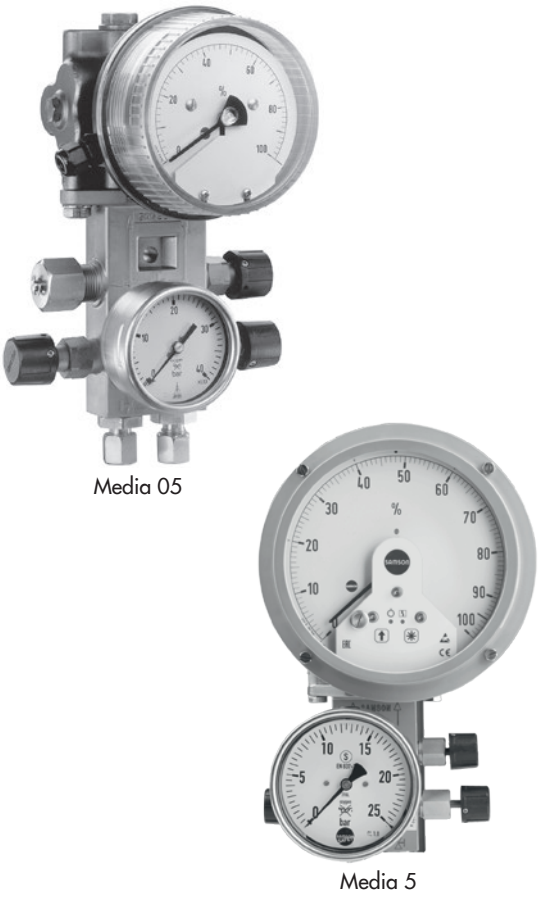


Fig. 3: *Media 05 and Media 5 with valve block, pressure gauge and screw fitting*

3 Media 7 Differential Pressure Meter

The Media 7 device is a microprocessor-controlled transmitter with dp cell for measuring, indicating and transmitting the differential pressure, pressure or measured variables derived from them in stationary pressure vessels and in transportation vehicles. The device is suitable for cryogenic gases, liquids, gases and vapors.

The device mainly consists of a dp cell (1), housing with transmitter and a display (6).

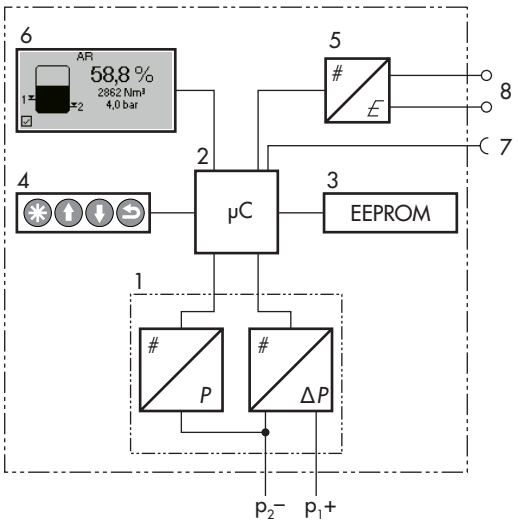
The differential pressure $\Delta p = p_1 - p_2$ is converted into an electric signal in the dp cell by a sensor and processed in the microcontroller (2) which controls the display and D/A converter of the two-wire version.

Four capacitive keys (4) are used to operate the differential pressure meter and allow the user to navigate within the menu on the display.

Fig. 4: *Media 7 with valve block, pressure gauge and screw fitting*

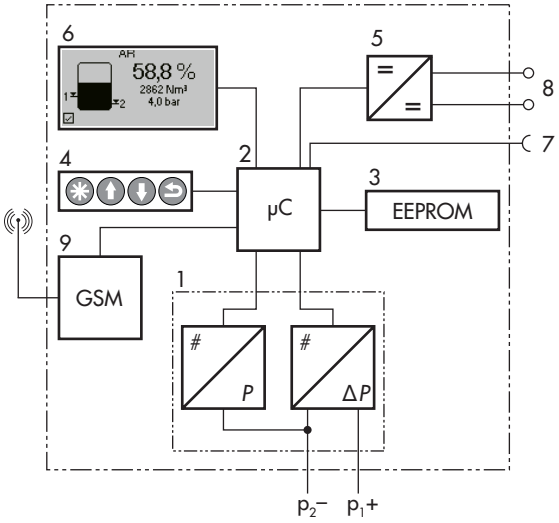
Technical data (excerpt)	
Nominal pressure	PN 60
Measuring spans	0 to 3600 mbar
Characteristic	Differential pressure proportional to the tank geometry
Perm. ambient temperature	–40 to +80 °C
Degree of protection	IP 67
Display	LCD 128 x 64 (90 x 40 mm)
Two-wire version	
Output	4 to 20 mA
24 V version	
Input voltage	24 to 36 V DC
Output voltage	12 V DC
Type of protection	ATEX/IECEx: Ex ia IIB T4 Gb
Details	Data Sheet T 9510

Two-wire version



1 dp cell
2 Microcontroller
3 Data memory
4 Operating keys
5 D/A converter
6 Display
7 Serial interface
8 I_A = 4 to 20 mA

24 V version



1 dp cell
2 Microcontroller
3 Data memory
4 Operating keys
5 24 V power supply unit
6 Display
7 Serial interface
8 U_B = 12 to 36 V
9 GSM module

Fig. 5: *Design and principle of operation of Media 7*

A remote data transmission using the optional GSM module (9) is possible in the 24 V version. Connection to the SAM TANK MANAGEMENT web interface is established over a mobile network.

Measurement tasks

The differential pressure of liquids, vapors and gases are measured by the integrated dp cell in the Media 7 device. The measured differential pressure is used for various possible applications.

Differential pressure measurement

Two absolute pressures p_1 and p_2 are compared for the differential pressure measurement. This way, for example the filters can be monitored by measuring the upstream and downstream pressures at the filter.

Liquid level measurement

The tank content (function of hydrostatic pressure, tank geometry and liquid density of the stored gas) is displayed proportionally and the operating pressure is indicated in the selected unit on the display.

Power supply unit with standby power supply (SPS)

The power supply units include a battery compartment for a 1.5 V battery [1] which provides standby power supply upon power failure. The interchangeable power supply boards allow the supply of 4 to 20 mA, 24 to 36 V (DC), or 85 to 230 V [2] (AC) to be simply adapted to the local conditions.

Optional additional functions

The modular design of the Media 7 device allows it to be adapted to specific requirements. Additional functions are available through the use of option modules. A GSM module is also available for the 24 V version of the Media 7 device.

- **AO: Analog output**
  The ***Analog output*** option module issues an internal measuring signal (4 to 20 mA) representing the tank pressure or, depending on the operating mode, the filling level or differential pressure. The analog output parameters can be configured.
- **AI: Analog input**
  The ***AI: Analog input*** option module accepts signals from filling level or pressure sensors of external equipment with their own power supply. This module works passively and has galvanically isolated inputs.
- **AIA: Analog input active**
  The ***AIA: Analog input active*** option module accepts signals from filling level or pressure sensors of external equipment. This module works actively and has a 12 V output to power external equipment that do not have their own power supply.
- **GSM module**
  A GSM module is available for the 24 V version of the Media 7 device. The GSM module establishes connection to the SAM TANK MANAGEMENT web interface over a mobile network. It ensures a secure data exchange, polling of states as well as monitoring and operation of the Media 7 (see Fig. 6).

[1] The battery is not included in the standard scope of delivery.
[2] In preparation

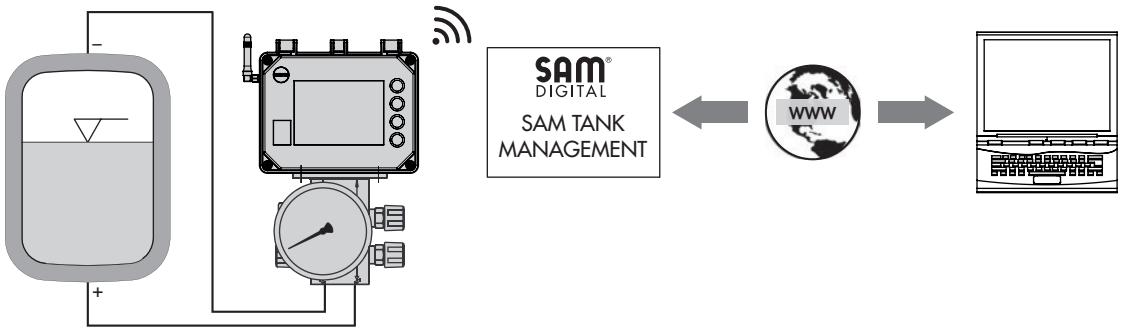
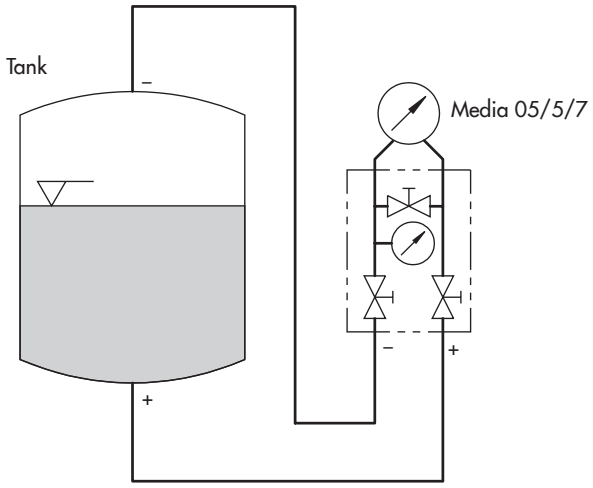
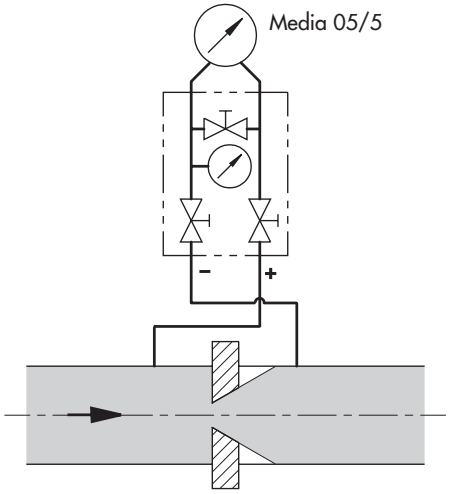


Fig. 6: *Media 7 · Remote data transmission for connection to SAM TANK MANAGEMENT web portal*

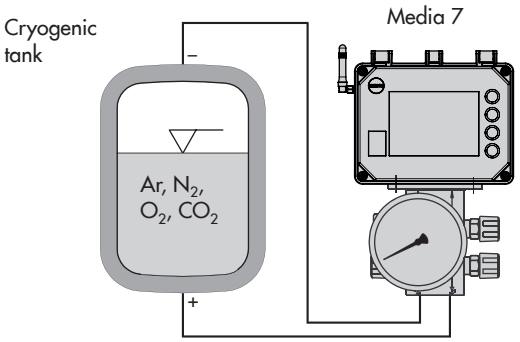
Liquid level measurement with non-condensing liquids



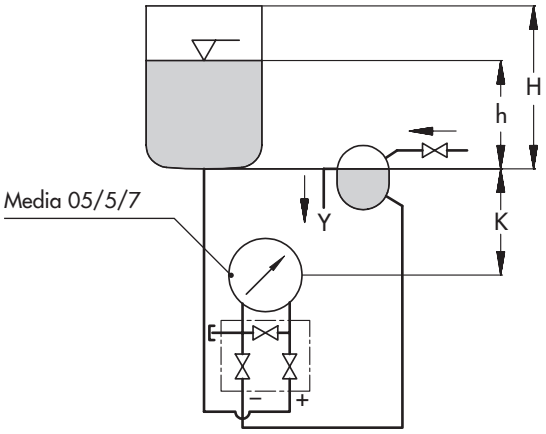
Flow rate measurement with an orifice plate



Level measurement with cryogenic gases



Measurements on open vessels with the meter located in a low position



H Measuring range
h Measured height
K Compensation height

Fig. 7: *Media series · Sample applications*

4 SAM Connect Gateway

Gateway for connection to SAM TANK MANAGEMENT

The modular SAM Connect Gateway allows the input of signals (4 to 20 mA), for example issued by external transmitters. For this purpose, four slots exist in the device for option modules that can optionally be used for analog input and/or analog input active option modules.

Furthermore, the integrated GSM module allows remote data transmission and connection to the SAM TANK MANAGEMENT web portal.

Special features

- Modular design: easy to install or exchange optional additional functions by inserting option modules (four slots in the device)
- Integrated GSM module for remote data transmission
- Modular power supply unit with standby power supply (SPS)
- 4″ backlit graphical display
- Configuration and programming using the TROVIS-VIEW software
- Capacitive keys facilitate operation
- Start-up wizard

Design and principle of operation

The modular SAM Connect Gateway allows the input of signals (4 to 20 mA), for example issued by external transmitters. For this purpose, four slots exist in the device to hold option modules that can optionally be used for the AI (analog input) and/or AIA (analog input active) option modules.

Furthermore, the integrated GSM module allows remote data transmission and connection to the SAM TANK MANAGEMENT web portal.

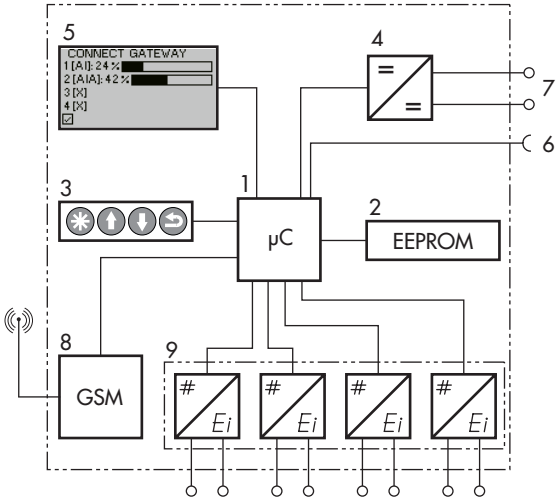
Power supply unit with standby power supply (SPS)

The power supply unit includes a battery compartment for a 1.5 V battery which provides standby power supply upon power failure.

Application

The SAM Connect Gateway can accept up to four 4 to 20 mA signals and transfer the data over the integrated GSM module. As a result, transmitters installed in a plant (e.g. Media 5, Media 6 and/or other transmitters by other manufacturers) can be connected to the SAM TANK MANAGEMENT web interface. This allows the filling levels of up to four tanks (Fig. 10, top) or the filling level and pressure of two tanks (Fig. 10, bottom) to be logged and managed on the SAM TANK MANAGEMENT interface.

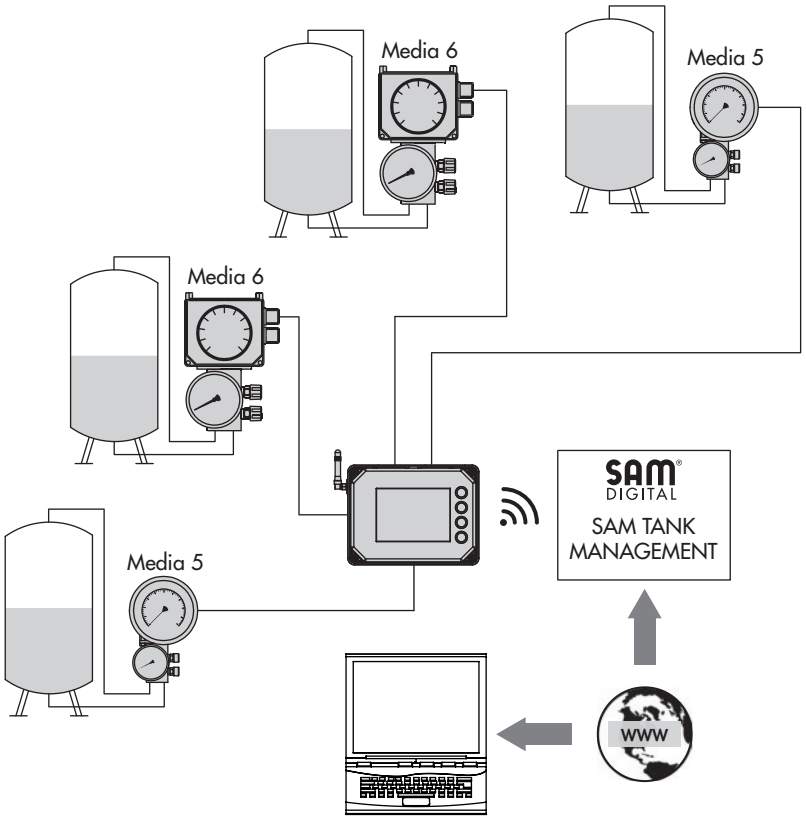
Fig. 8: *SAM Connect Gateway*



1 Microcontroller
2 Data memory
3 Operating keys
4 24 V power supply unit
5 Display
6 Serial interface
7 U_B = 24 to 36 V
8 GSM module
9 Option module (up to 4)

Fig. 9: *Block diagram of SAM Connect Gateway*

Example 1: filling levels of four tanks are transferred to the gateway.



Example 2: filling levels and absolute pressures of two tanks are transferred to the gateway.

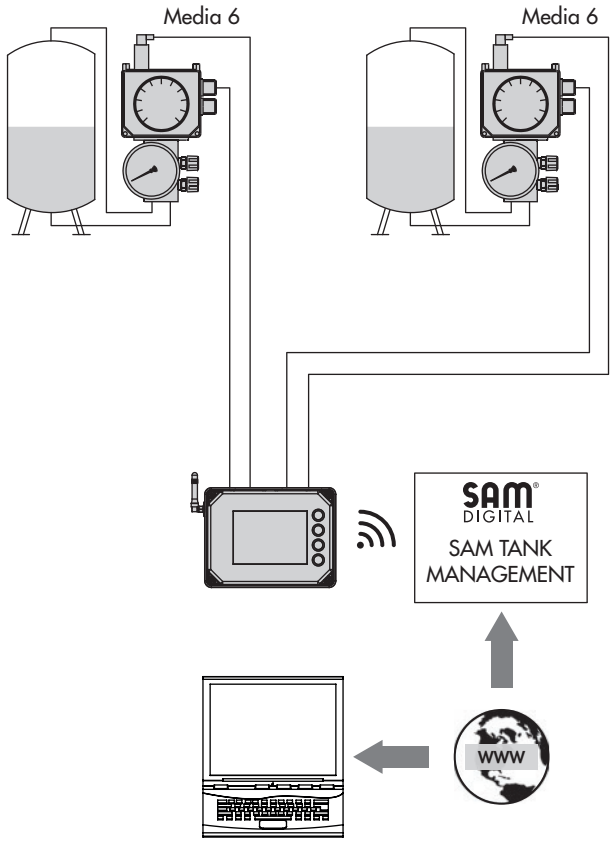


Fig. 10: *Sample applications of the SAM Connect Gateway*

6 SAM TANK MANAGEMENT

SAM TANK MANAGEMENT is a web-based application specifically developed for monitoring the filling levels of liquids, gases and vapors stored in stationary or truck-mounted pressure vessels.

Any smart mobile device can be used to access SAM TANK MANAGEMENT.

The Media 7 Differential Pressure Meter and the SAM Connect gateway are suitable for wireless connection to SAM TANK MANAGEMENT. This ensures safe data exchange all across the world, polling of states, as well as monitoring and operation of the Media devices.

Additionally, the Media 7 Differential Pressure Meter and the SAM Connect gateway function as a hub, which can connect up to four Media devices to SAM TANK MANAGEMENT and as a result, monitor several tank farms at the same time.

Special features

- Real-time monitoring of all connected devices
- Immediate notification in the event of device malfunctions by plain-text message with device status information
- Configuration of Media differential pressure meters over the Internet
- Unrestricted access to the medium database saved in the Media 7 meter
- Around-the-clock availability
- Universal interfaces and data exchange using MQTT
- Monitoring of the tank (e.g. maximum filling, pressures, vacuum insulation etc.)

Further information and a demo account available at
▶ www.samson.de

5 TROVIS-VIEW software

The Media 7 device and the SAM Connect Gateway can be configured with SAMSON's TROVIS-VIEW Software (version 4). For this purpose, the device has a serial interface (SSP) to allow the USB port of a computer to be connected to it using an adapter cable (order. no. 1400-9740).

The TROVIS-VIEW software enables the user to easily configure the connected device as well as view process parameters online.

i Note

TROVIS-VIEW can be downloaded free of charge from our website at www.samson.de > Service & Support > Downloads > TROVIS-VIEW.

7 Commonly used units and terms

7.1 Conversion table for units of pressure

The SI unit of pressure is the **Pascal** (abbreviation Pa):

1 Pa = 1 N/m^2 = 1 $kg/(m \cdot s^2)$

The table below shows the factors used to convert units still commonly used:

Unit	bar	Pa	psi	Torr (= 1 mmHg)	mH_2O
bar	–	$1 \cdot 10^5$	14.5	750	10.2
Pa	$1 \cdot 10^{-5}$	–	$0.15 \cdot 10^{-3}$	$7.5 \cdot 10^{-3}$	$0.1 \cdot 10^{-3}$
psi	0.07	$6.9 \cdot 10^3$	–	51.7	0.7
Torr (= 1 mmHg)	$1.33 \cdot 10^{-3}$	133.3	$19.3 \cdot 10^{-3}$	–	$14 \cdot 10^{-3}$
mH_2O	0.1	$9.8 \cdot 10^3$	1.4	73.6	–

7.2 Terms explained

The following terms (often used in connection with the Media series) are briefly explained.

Absolute pressure

The absolute pressure p_{abs} is the pressure referenced against a perfect vacuum.

Calibration

Adjust a measuring instrument in such a way that the error between the output variable and the set point remains within the error tolerance.

Differential pressure

Difference between two pressure p_1 and p_2:
($\Delta p = p_1 - p_2$)

Differential pressure across the restriction Δp

The difference between the high pressure (+) and low pressure (–) for flow rate or differential pressure measurement.

Error tolerance

Limits within which the measured error of the output variable lies.

Flow rate

The medium flowing through a cross-section is measured in time (e.g. flow rate in m^3/h; mass flow in kg/h).

Gauge pressure

Difference p_e between absolute pressure p_{abs} and the prevailing atmospheric pressure p_{amb}:
$p_e = p_{abs} - p_{amb}$

Internal state variable

Those physical variables (pressure, temperature, humidity, composition), which determine the state of the process medium.

Lower range value

The lowest value of the input variable at which the output variable has its initial value.

Measuring range

The range between lower range and upper range values.

Measuring span

The difference between the lower range and the upper range values

Nominal pressure

Greatest operating pressure (static pressure), which may be applied to both sides of the measuring chamber of the transmitter at the same time.

Operating state

The state of the process medium at the point of measurement (tag) during operation.

Orifice flange (orifice plate assembly)

A restriction which creates a differential pressure of the process medium in the pipeline to measure the flow rate.

Point of measurement

The point in a control loop at which a variable is measured.

Process medium

The medium whose flow rate, pressure or differential pressure is to be measured.

Upper range value

The highest value of the input variable at which the output variable has its final value.