Media

Liquid Level, Differential Pressure and Flow Meters

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

Associated Data Sheets
T 9519 EN, T 9520 EN, T 9527 EN,
T 9550 EN, T 9555 EN

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Information Sheet T 9500 EN

Media · Liquid Level, Differential Pressure and Flow Meters · Overview

Media ...	**05**	**5**	**6/6 Z**
			
Details in **Data Sheet ...**	**T 9520 EN**	**T 9519 EN**	**T 9527 EN**
Liquid level	•	•	•
Differential pressure	•	•	•
Flow rate	•	•	• [1]
… with inductive limit switches	•	•	•
… with electric transmitter			Digital
Remote data transmission			• [2]
Nominal pressure	PN 50		
Measuring spans	40 to 3600 mbar		
Diameter of indicating unit	100 mm	160 mm	LCD 90 mm
dp-cell material	CW617N (brass, CuZn40Pb) · CrNi steel		
Perm. ambient temperature range	–40 to +80 °C		–40 to +70 °C

[1] With Media 6 Z only: Continuous flow rate measurement and flow rate counting

[2] Remote data transmission possible with special hardware and software

Flow measurement using 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 offers orifice plate assemblies in various versions as accessories.

Refer to Data Sheet T 9550 EN for further details.

Type 90 Orifice Flange
Orifice flange with standard orifice plate and annular chamber
DN 32 to 400 · PN 6 to 40

Type 91 Orifice Tube
Orifice tube with standard orifice plate and annular chamber with welded-on calibrated pipes
DN 15 to 50 · PN 25

Type 92 Orifice Flange
Measuring flange with flange connections and standard orifice plate
DN 20 to 50 · PN 16

Questionnaire FB 9500 EN is available to specify the data required to size the orifice plate assembly.
SAMSON uses the specifications to size the orifice plate assembly correctly when processing the orders.

Fig. 1 · Orifice plate assemblies

Intelligent Tank Management

The **Media 6** Digital Transmitter used in combination with a compatible hardware and software package forms the **MTM 32 Media Tank Management System**.

– MTM 32 Media Tank Management System
  with MTM 32 hardware and MTM 98 software

The tank monitoring system is especially suitable for use in a centralized liquid gas supply system where gases are stored in various separate locations. The consumer benefits from quick and convenient information about the current level of each tank, which facilitates a sufficient and cost-efficient supply. Additionally, digital limit values can be logged and issued as control signals (e.g. for alarms, initiate tank changeover, etc.).

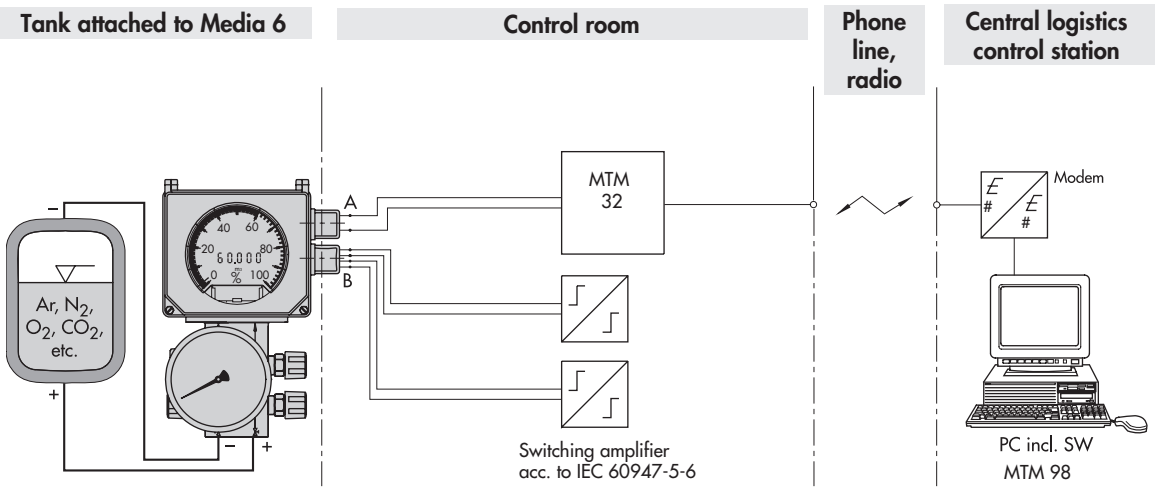
For the gas supplier, it means that logistics can be scheduled more accurately.

Special features

- Media 6 device functions as a liquid level measuring and indicating unit on site; continuous tank monitoring by measuring the liquid level and pressure
- MTM 32 hardware modules at the point of measurement to register and exchange data over a telephone line or radio data transmission; type of transmission configurable (analog, ISDN or GSM)
- MTM 32 hardware modules linked to a PC at the central logistics control station using MTM 98 software
- Administration and monitoring of communications modules at the point of measurement; data polling by operator or automatically at regular intervals; automatic remote data transmission in the event of limit alarm
- Data processing, protocols and analysis

Fig. 2 shows how remote data transmission works using MTM 32 Media Tank Management System.

For further details, refer to Data Sheet T-MTM 32 from SAMSOMATIC Automationssysteme GmbH.



Storage tank with Media 6 functioning as level sensor to continuously measure the liquid level and as indicating unit on site.

MTM 32 for connection of max. 8 sensors as well as with modem for data transmission.

Data transmission over a telephone line or radio to the central control station.

Monitoring of points of measurements, customer and tank data transmission administration over PC using MTM 98 software.

Fig. 2 · MTM 32 Media Tank Management System (principle)

Design and principle of operation

Media Series

The instruments consist of a **differential pressure cell** functioning according to the deflection principle and an **indicating unit**. A **valve block** - a combination of three valves and a test connection - is available as an option. Additionally, the process lines for +/– pressure must be connected.

Media 05, 5 Analog Measuring and Indicating Devices

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 balanced by the range spring. The deflection, which is proportional to the differential pressure, is transmitted to the pointer mechanism via the adjustable coupling.

In the version with limit switches, the metal tags to the assigned proximity switches A1 and A2 depending on the pointer's movement . If the metal tag is in the pick-up field of the assigned proximity switch, it is highly resistive (contact open). If it leaves the pick-up field, it becomes lowly resistive (contact open). The function corresponds to that of a mechanical switch contact. The limit signals are suitable for operating a downstream switching amplifier (transistor relay).

Digital Transmitter Media 6 with LCD

The differential pressure cell with a measuring diaphragm and range springs designed to correspond to the span measures the pressure.

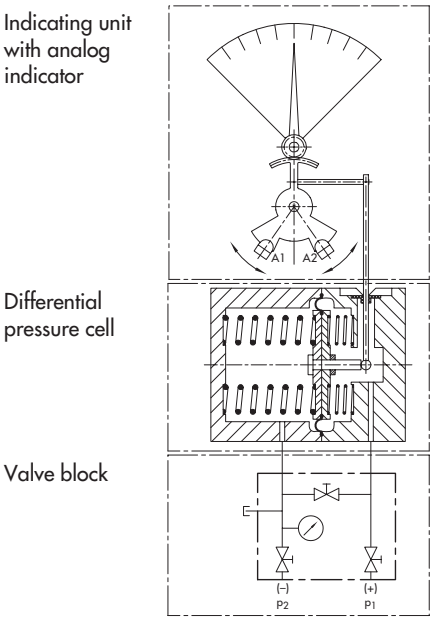
The differential pressure $\Delta p = p_1 - p_2$ causes a shift in the axis of the measuring diaphragm which is supported by the range springs. The change in travel which is proportional to the differential pressure is led to the displacement sensor which converts the travel into an electric signal. The signal is compared with data stored in the FRAM and processed in the microprocessor which controls the LCD display and the D/A converter for the output signal. This output signal, which is proportional to the measured value, is issued as a load-independent 4 to 20 mA DC signal at connector A.

At connector B, two software limit switches for min. alarm (e.g. minimum liquid level) and max. alarm (e.g. maximum liquid level) are led to the connection to the switching amplifier according to IEC 60947-5-6. In the case of Media 6 Z, a software limit switch (alarm 1) and a pulse output proportional to the quantity (in place of alarm 2) for an external meter are used.

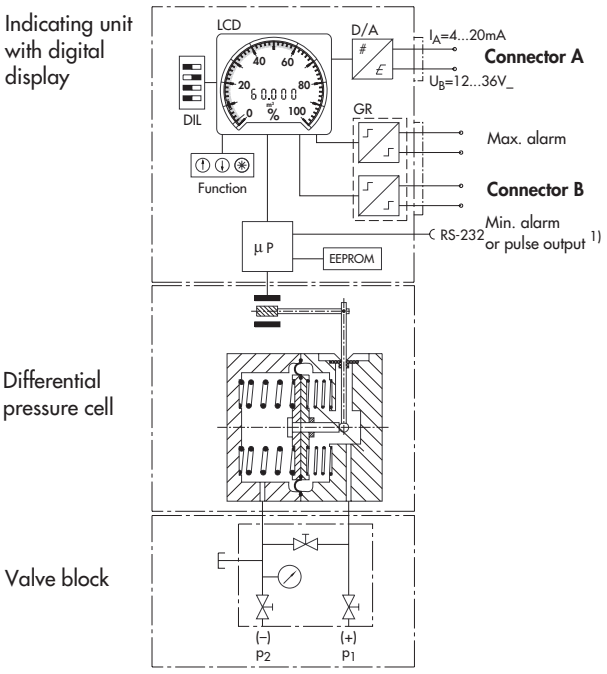
The RS-232 interface allows the device to be configured with a special memory pen or directly via PC with SAMSON's TROVIS-VIEW Configuration and Operator Interface. The user-specific data are saved in the FRAM. Operating data - type of gas, gas density, geometrical shape of the tank and location of the min./max. alarms - can also be programmed.

These specifications enable the conversion of the differential pressure into values proportional to the tank contents, in order to display and issue them as a 4 to 20 mA DC signal.

On remote transmission of all the relevant data of the Media 6, the data to be analyzed are sent via modem and phone line to a remote PC. The hardware and software required for remote data transmission is included in the SAMSON product range.



Media 05, Media 5
Analog Differential Pressure and Flow Meters



Media 6 Digital Indicating Transmitter for Differential Pressure with LCD

1) Only with Media 6 Z

Fig. 3 · Design and principle of operation

Liquid Level, Differential Pressure and Flow Meters

The liquid level, differential pressure and flow meters of the SAMSON **Media Series** are described below.

Ranges of application

- Liquid level measurement in storage tanks, pressure vessels, steam boilers and liquid gas tanks
- Differential pressure measurement in industrial plants and buildings, e.g. measuring the differential pressure between flow and return pipes; measuring the pressure drop in filters, valves and restrictions located in the bypass circuit of pumps or air compressors
- Flow measurement according to the differential pressure method

Special features

- Measuring spans from 40 to 3600 mbar at static pressures up to 40 bar
- dp-cell with spring-loaded diaphragm and easy-to-exchange range spring, overloadable on one side up to the permissible static pressure of 50 bar
- Compact, service-friendly version with an especially low overall weight
- Indicating unit suitable for field mounting (degree of protection IP 54) and for panel mounting
- Zero point adjustment from the front
- Version with inductive limit switches to operate connected control and alarm equipment
- Two-wire connection for standard 4 to 20 mA signal

Media 5 · Media 05

- Measuring and indication of differential pressure and measured variables derived from it
- dp-cell with brass housing PN 50 and ECO measuring diaphragm
- Measuring spans in the range 0 to 40 to 0 to 3600 mbar
- Directly attachable valve block with test connection (accessories)

Media 5 (05) · Differential pressure and flow meter · Indicating unit Ø 160 (85) mm

- Suitable for gases or liquids
- Limit switch with inductive alarm contacts

Technical data

Media 5	**Data Sheet T 9519 EN**
Media 05	**Data Sheet T 9520 EN**
Nominal pressure	PN 50, overloadable on one side up to 50 bar
Measuring span in the range	40 to 3600 mbar
Characteristic	Reading linear to differential pressure, scales selectable
Max. perm. ambient temperature	–40 to +80 °C
Degree of protection (DIN 40050)	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

Media 05

Media 5

Fig. 4 · Transmitters from Media 05 and Media 5 attached to a valve block, pressure gauge and screw joints

Media 6 · Media 6 Z

Media 6 · Indicating digital transmitter for differential pressure · LCD display Ø 90 mm

- Suitable for gases and liquids in cryogenic service
- Microprocessor-controlled two-wire transmitter with a digital display and RS-232 interface
- Two-wire connection for standard 4 to 20 mA DC signal
- Two adjustable software limit switches acc. to NAMUR
- Media 6 Z: Pulse output for an external meter

Technical data	Data Sheet T 9527 EN
Nominal pressure	PN 50, overloadable on one side up to 50 bar
Measuring span in the range	40 to 3600 mbar
Characteristic	Reading linear to tank contents
Interface	RS-232
Output	4 to 20 mA
Max. perm. ambient temperature	–40 to +80 °C
Degree of protection (DIN VDE 0470)	IP 65
Limit switches	2 software limit switches according to NAMUR and EN 60947-5-6

Media 6 with LCD, combined with valve block and pressure gauge

Fig. 5 · Transmitter from Media 6 Series

Tank management with Media 6

MTM 32 Media Tank Management System from SAMSOMATIC Automationssysteme GmbH has been especially designed for use with Media 6 devices as liquid level sensors for logging and remote data transmission of tank data.

– MTM 32 hardware and MTM 98 software

The signals, which are proportional to the tank contents, are transmitted via phone line (analog/digital) or radio signals from the tank farm to the control station where they are analyzed.

Liquids, gases and vapors are suitable process media for use in the energy sector, the food and beverage industries as well as the chemical and pharmaceutical industries.

Media tank management

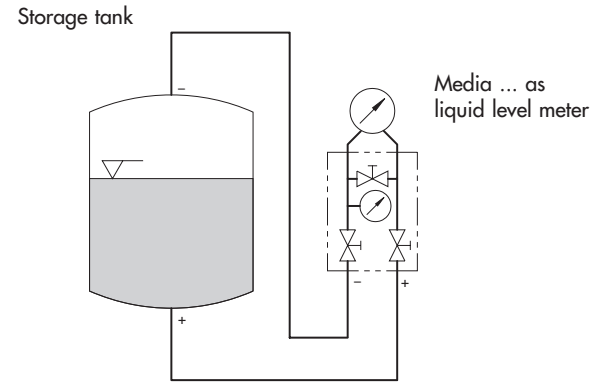
Technical data	Data Sheet T-MTM 32
Hardware	**MTM 32**
Remote data transmission	Analog, ISDN or GSM
8 analog inputs	0 (4) to 20 mA
11 (max. 16) digital inputs	24 V DC
2 digital outputs max. 16 digital outputs	24 V DC, max. 0.5 A 24 V DC, max. 20 m A
Supply voltage	13 to 30 V DC
Device interface	RS-232
Perm. ambient temperature range	–20 to +70 °C
Degree of protection in cabinet	IP 54

The MTM 32 hardware is available prewired in a steel cabinet. The photo shows the opened cabinet with power supply unit and ready-to-connect wiring for four Media 6 devices.

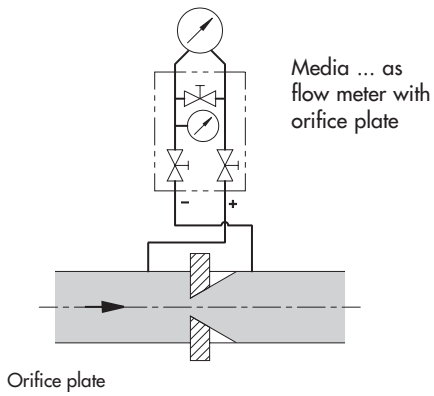
MTM 98 software allows inventory and schedule management of several storage tanks including alarm functions.

Fig. 6 · MTM 32 Media Tank Management System

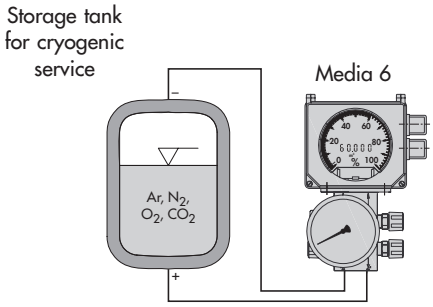
Typical applications



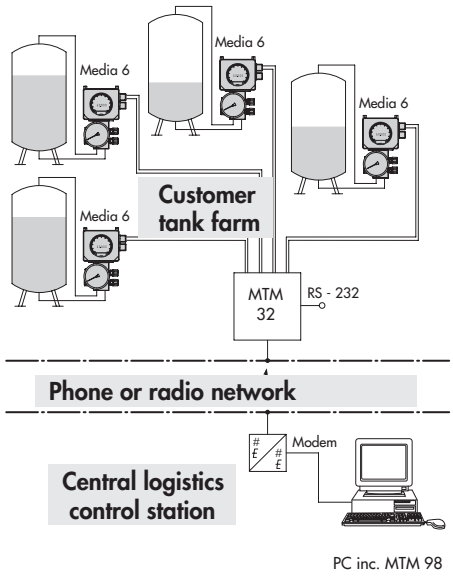
Liquid level measurement with non-condensing liquids



Flow rate measurement



Media 6 with level measurement for liquified gases in cryogenic service



Media Tank Management System

Fig. 7 · Typical applications

Accessories

Accessories especially designed for the Media series are available from SAMSON:

Venting screws · Mounting parts for 2″ pipe or wall mounting Screw connection kits · Retrofit limit switches for Media 5 · Isolating switch amplifier · Type 5024-1 Power Supply and Indicating Unit · Pressure sensor

More information can be found in Data Sheet T 9555 EN.

Commonly used units and terms

Conversion table for units of pressure

Pressure (p) is described as the force (F) exerted per unit area (A):

$$p = \frac{F}{A}$$

Table 1 shows the factors used to convert units still commonly used, e.g. bar, psi, Torr and mm WC (kp/m²) into the SI unit Pa (see DIN 1314).

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

1 Pa = 1 N/m² (1 N = 1 kg x m/s²)

1 bar = 10^5 Pa

Pressure terminology

Table 1 · Conversion factors

Unit	bar	1 Pa = 1 N/m²	psi	1 Torr = 1 mm Hg	1 mm WS = 1 kp/m²
bar	1	$1 \cdot 10^5$	14.5	750	10.2×10^3
1 Pa = 1 N/m²	1×10^{-5}	1	0.145×10^{-3}	7.5×10^{-3}	0.102
psi	0.07	6.9×10^3	1	51.8	703
1 Torr = 1 mm Hg	1.33×10^{-3}	133.33	19.3×10^{-3}	1	13.6
1 mm WC = 1 kp/m²	9.81×10^{-5}	9.81	1.42×10^{-3}	735×10^{-3}	1

The millibar is commonly defined as one thousandth of a bar (**1 mbar = 10^{-3} bar**).

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

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

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

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

Flow The medium flowing through a cross-section is measured in time (e.g. flow rate in m³/h; mass flow in kg/h).

Measuring range The range between lower range and upper range values of the measured variable within which measurements can be made with the specified accuracy.

Measuring span The difference between the lower range and the upper range values.

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

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

Point of measurement The point of a control loop at which a variable is measured.

Limit of error The maximum error over the entire scale or range of use under specific conditions.

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

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

Absolute pressure Measured above total vacuum or zero absolute. Zero absolute represents total lack of pressure.

Differential pressure Δp Difference between two pressures p_1 and p_2 $\Delta p = p_1 - p_2$

Gauge pressure Difference p_e between absolute pressure p_{abs} and existing atmospheric pressure p_{amb} $p_e = p_{abs} - p_{amb}$

Specifications subject to change without notice.

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