Hach Sigma 940 Intrinsically Safe Area Velocity Flow Meter

FLOW

The Hach Sigma 940 Intrinsically Safe Area Velocity Flow Meter supports dual sensors, interfaces with samplers, has a long battery life and offers increased data storage.

Features and Benefits

WW

IW

C

CSA-NRTL/C Certified

The Hach Sigma 940 Intrinsically Safe Area Velocity Flow Meter is CSA-NRTL/C DEMKO listed and certified for operation in Class I, Division I, Groups C & D hazardous locations.

Versatile Set-up

Use a single Sigma 940 flow meter for multi-point and/or redundant monitoring. The flow meter can accommodate two Submerged depth area velocity sensors or a combination of one Submerged area velocity or one velocity only sensor and one ultrasonic depth sensor (in-pipe or down looking).

Long Battery Life

The meter will typically operate for about 365 days with a 15-minute recording interval, using one submerged area velocity sensor and downloading data once per week.

Rugged Construction

The enclosure of the Sigma 940 flow meter is NEMA 6P-sealed to withstand submergence and prolonged surcharge conditions.

Sampler Pacing Capabilities

The sampler pacing capabilities of the flow meter are ideal for Combined Sewer Overflow and stormwater monitoring.

Superior Submersible Area Velocity Sensor for Open Channel Applications

The Sigma 940 flowmeter uses a Submerged Area Velocity sensor that uses an advanced ultrasonic sensor with one-MHz Doppler technology for velocity measurements. This technology greatly reduces signal dropouts and ensures high levels of accuracy in low-flow, full-pipe, or reversed-flow conditions. Installation is fast and single point atmospheric calibration is easy. The hydrodynamic body and side-mounted cable maintains accuracy by reducing turbulence.

Accurate Level Measurement

The pressure depth transducer and optional ultrasonic depth sensors are temperature compensated to ensure accurate depth readings in changing conditions. A patented* drawdown correction feature corrects the effects of velocity on accurate level measurement. The Zero dead band In-pipe ultrasonic sensor will measure level closer to full pipe conditions.

*Patent number 5691914

Applications

The Hach Sigma 940 Intrinsically Safe Area Velocity Flow Meter is ideal for long-term flow studies in hazardous or potentially hazardous areas, sanitary sewer evaluation studies, Combined Sewer Overflow studies and industrial discharge monitoring.

DW = drinking water   WW = wastewater municipal   PW = pure water / power
IW = industrial water   E = environmental   C = collections   FB = food and beverage

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Specifications*

940 Flow Meter

Units of Measurement
Level: m, cm, ft., in.

Flow: gps, gpm, gph, lps, lpm, lph, mgd, afd, cfs, cfm, cfh, cfd, m^3s, m^3m, m^3h, m^3d

Totalized Flow: L, m^3, $ft.^3$, gal., acre-ft.,

Monitoring Intervals
1, 2, 3, 5, 6, 10, 12, 15, 20, 30, and 60 minutes

Operating Temperature
-18 to 60°C (0 to 140°F)

Storage Temperature
-40 to 60°C (-40 to 140°F)

Time-Based Accuracy
±1 second per day

User Interface
Windows based Hach data management and analysis software via RS-232

Program Memory
Non-volatile programmable flash, can be updated via RS-232 port

Data Storage (optional)
Capacity: 175 days of 3 level readings, 3 velocity readings, and rain at a 15-minute recording interval

Data Types: Level and velocity

Storage Mode: Wrap or slate

RAM Memory: 128 K

Communications
RS-232 serial connection to Hach data management and analysis software

Local Terminal: RS-232 at 19.2 k baud

Sampler Output Conditions (optional)
Set point on level, velocity, flow, or flow rate of change

Sampler Output (optional)
6 to 12 Vdc pulse, 100 mA maximum at 500 ms duration

Enclosure Material
PVC

Enclosure Rating
NEMA 6P (IP67)

Power Source
One lithium battery pack or external AC or DC power source using instrinsically safe barrier

Battery Life
365 days typical with a 15-minute recording interval, 1 level and 1 velocity, data download once per week, at 50°F (10°F), (also affected by site conditions)

Dimensions
21.9 cm diameter x 60 cm (8.6 in. diameter x 23.6 in.)

Weight
16.2 kg (35.7 lbs.) with battery

Submerged Depth/Velocity (AV) Sensor

VELOCITY MEASUREMENT

Range
-1.52 to 6.10 m/s (-5 to 20 ft./s)

Zero Stability
0.015 m/s (<0.05 ft./s)

Accuracy
±2% of reading

Operating Temperature
-18 to 60°C (0 to 140°F)

Typical Minimum Depth for Velocity
2 cm (0.8 in.)

Method
Doppler ultrasonic

Transducer Type
Twin 1 MHz piezoelectric crystals

LEVEL MEASUREMENT

Range
Standard: 0 to 3 m (0 to 10 ft.)
Extended: 0 to 9 m (0 to 30 ft.)

Accuracy
±0.16% full scale ±1.5% of reading at constant temp (±2.5°C)

±0.20% full scale ±1.75% of reading from 0 to 30°C (32 to 86°F)

±0.25% full scale ±2.1% of reading from 0 to 70 °C (32 to 160°F)

Maximum Allowable Level
Standard: 10.5 m (34.5 ft.)
Extended: 31.5 m (103.5 ft.)

Air Intake
Atmospheric pressure reference is desiccant protected

Method
Pressure transducer with stainless steel diaphragm

GENERAL

Material
Noryl® plastic outer shell with epoxy potting

Cable
Standard: 9, 15, 23, and 30.5 m (30, 50, 75 and 100 ft.)
Custom: greater than 30.5 m (100 ft.)
Maximum: 76 m (250 ft.)

Cable Diameter
0.91 cm (0.36 in.)

Sensor Dimensions
2.3 x 3.8 x 13.5 cm (0.9 x 1.5 x 5.3 in.)

Specifications continued

In-Pipe Ulrasonic Level and Low Profile Velocity Only Sensor Specifications

LEVEL MEASUREMENT

Range
0 cm (0 in.) minimum distance from sensor to liquid

4.57 m (15 ft.) maximum distance from sensor to liquid

Accuracy
0.038 to 4.57 m ±0.003 m
(0.125 to 15 ft. ±0.01 ft.) at 22°C (72°F) still air and 40 to 70% relative humidity

Span
0.038 to 4.57 m (0.125 to 15 ft.)

Resolution
0.019 cm (0.0075 ft.)

Operating Temperature
-18 to 60°C (0 to 140°F)

Temperature Error
±0.00005 m/°C (±0.0001 ft./°F) maximum error within compensated temperature range per degree of change

Crystal Specification
75 KHz, 7° beam angle

Material
Stainless steel housing with PVC acoustic window

Cable
4-conductor

Cable Length
Standard: 7.6 m (25 ft.)
Other lengths available up to 45 m (150 ft)

Dimensions
3.8 cm diameter x 30 cm (1.5 in. diameter x 12 in.)

VELOCITY MEASUREMENT

Nose Angle
20 degrees from horizontal

Cable *Standard:* 7.6 m (25 ft.)
Custom Lengths: up to 76 m (250 ft.)

Diameter: 0.57 cm (0.225 in.)

Materials
Sensor: polymer

Cable: urethane

Mounting Hardware
Stainless steel

Dimensions
1.1 x 3.8 x 6.9 cm (0.44 x 1.5 x 2.7 in.)

Engineering Specifications

1. The flow meter shall utilize an ultrasonic 1 MHz Doppler sensor for measurement of average stream velocity, an integral or separate level transducer for depth measurement, and shall be able to use an ultrasonic level sensor for redundancy.

2. The flow meter shall be able to utilize an In-pipe Zero Dead ultrasonic sensor for measuring level.

3. The meter and probes shall be CSA-NRTL/C certified for Class I, Division I, Groups C & D hazardous locations.

4. The flow meter shall utilize removable probes to measure depth and velocity. The probes, regardless of type, shall be CSA-NRTL/C certified for Class I, Division I, Groups C & D hazardous locations

5. All electrical components shall be housed in an UV resistant PVC enclosure rated NEMA 6P for prolonged submergence.

6. Overall flow meter dimensions including batteries shall not exceed 21.9 cm (8 5/8 in) diameter x 60 cm (23 5/8 in) length.The meter shall not exceed 16.2 kg (35.7 lbs) with batteries.

7. The meter shall be programmed through an optically isolated RS-232 interface.

8. For "area x velocity" applications, the flow meter shall be capable of computing flows in channels of circular, U channel, rectangular, and trapezoidal cross sections. For irregular channels, the flow meter shall be capable of storing in memory, two tables of up to 99 user entered (depth, area) points per table.

9. For "level only" applications, the flow meter shall be field programmable for primary devices including weirs, flumes, nozzle, manning equation, power curve equation, head vs. flow table.

10. The meter shall allow real-time modification of time (including PC synchronization), level and level calibration without other changes and allow resetting the logger without losing programming set-ups.

11. The software shall have the ability to view real time meter status; download with a single keystroke; store data to individual files or database; merge site files; automatically append new data with old; save and program meters using "templates" for sites; view all settings on a single screen; calculate simulated flow for different primary devices, levels and velocities.

12. The flow meter shall be capable of storing at least 116,000 data points (240 days at 15 minute logging intervals of (2) level, (2) velocity and rainfall).

13. Slate and wrap-around data storage shall be field selectable. Once programmed, the meter with software shall display the total time available for data-logging.

14. Logging intervals should include 1, 2, 3, 5, 6, 10, 12, 15, 20, 30 and 60-minute intervals. The meter should have the intelligence to log data at logical times automatically, i.e. 5 minute intervals at 0:00, 0:05, 0:10, etc. so all data during analysis of multiple sites is from the identical interval and time. The logger shall have the ability to data-log battery voltage as a separate parameter.

15. The meter shall operate 365 days at 15-minute logging intervals of level/flow and velocity, including weekly data downloads utilizing a single 12-volt lithium battery pack.

16. The flow meter shall incorporate Modbus ASCII protocol to allow access to all monitored parameters, including optional integral devices indicated below (if any).

17. The flow meter and sensor shall be the Sigma Model 940 Intrinsically Safe Area Velocity Flow Meter manufactured by Hach Company.

Dimensions

Hach Sigma 940 Intrinsically Safe Area Velocity Flow Meter can be used in hazardous locations where combustible gases may be present. Mount the meter so that the connectors face down. When not in use, cover the connectors with their protective caps to prevent corrosion. Always use the appropriate manhole support bracket/spanner bar.

Side View

60 cm (23.625 in.)

Bottom View

⌀ 21.9 cm (8.625 in.)
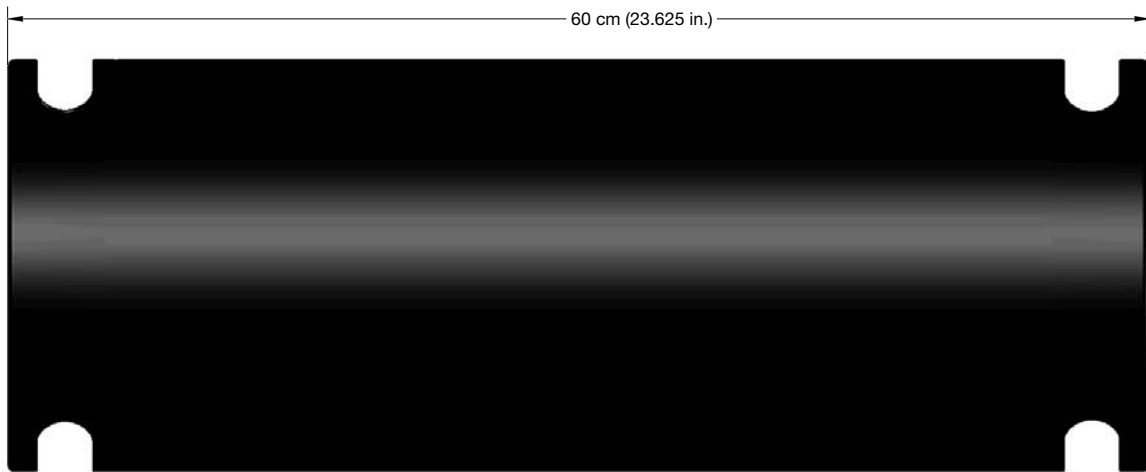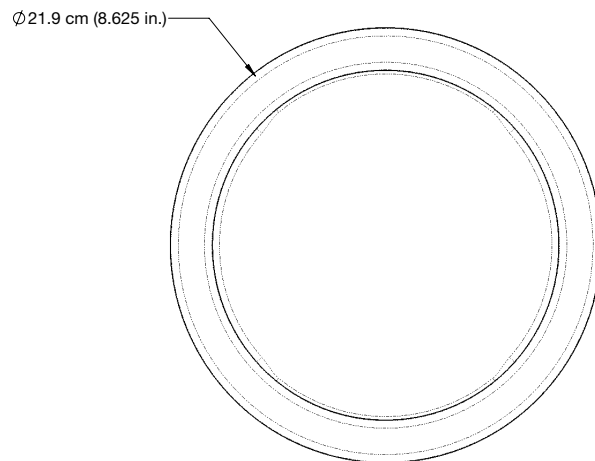
Ordering Information

Flow Meter Only

4840	Hach Sigma 940 Intrinsically Safe Area Velocity Flow Meter; includes one lithium battery pack
5232	Hach Sigma 940 Intrinsically Safe Area Velocity Flow Meter; externally powered

Optional Flow Meter Sensor Configurations

4842	Input for additional sensor; for submerged area velocity or velocity sensor
4844	Input for 75 kHz Ultrasonic Sensor; requires ultrasonic sensor
4998	Sampler pacing output; includes intrinsically safe barrier with 10 ft (9m) cable on both sides

Flow Meter Accessories

4920	Suspension Harness; for suspending the flow meter
9542	Manhole Support Bracket/Spanner; 18 in., fits 18- to 28-in. manholes (457 mm fits 457- to 711 mm)
9557	Manhole Support Bracket/Spanner; 28 in., fits 28- to 48-in. manholes (711 mm fits 711- to 1219 mm)
5713000	Manhole Support Bracket; 18 to 27 in. (457 to 685 mm)
4087	RS-232 Intrinsic Safety Barrier with 3 m (10 ft) cable (For longer cable length please contact Hach)

AC Power Converter

4733	AC Power Converter; 230 Vac (Includes battery back up and intrinsically safe barrier)
1004	AC Power Converter; 115 Vac (Includes battery back up and intrinsically safe barrier)
4150-26	Replacement lithium battery pack

Sensors

Sigma Non-oil Filled Intrinsically Safe (IS) Submerged Depth/Velocity (AV) Sensors

0 to 10 ft. Range

88065-030	Non-oil Filled IS Submerged AV Sensor; 30 ft. cable with connector
88065-050	Non-oil Filled IS Submerged AV Sensor; 50 ft. cable with connector
88065-075	Non-oil Filled IS Submerged AV Sensor; 75 ft. cable with connector
88065-100	Non-oil Filled IS Submerged AV Sensor; 100 ft. cable with connector

0 to 30 ft. Range

88075-030	Non-oil Filled IS Submerged AV Sensor; 30 ft. cable with connector
88075-050	Non-oil Filled IS Submerged AV Sensor; 50 ft. cable with connector
88075-075	Non-oil Filled IS Submerged AV Sensor; 75 ft. cable with connector
88075-100	Non-oil Filled IS Submerged AV Sensor; 100 ft. cable with connector

Sigma Oil Filled Intrinsically Safe (IS) Submerged Depth/Velocity (AV) Sensors

0 to 10 ft. Range

88064-030	Oil Filled IS Submerged AV Sensor; 30 ft. cable with connector
88064-050	Oil Filled IS Submerged AV Sensor; 50 ft. cable with connector
88064-075	Oil Filled IS Submerged AV Sensor; 75 ft. cable with connector
88064-100	Oil Filled IS Submerged AV Sensor; 100 ft. cable with connector

0 to 30 ft. Range

88074-030	Oil Filled IS Submerged AV Sensor; 30 ft. cable with connector
88074-050	Oil Filled IS Submerged AV Sensor; 50 ft. cable with connector
88074-075	Oil Filled IS Submerged AV Sensor; 75 ft. cable with connector
88074-100	Oil Filled IS Submerged AV Sensor; 100 ft. cable with connector

Ordering Information continued

Sensor Mounting Hardware

4939 Submerged AV Mounting Plate; for pipe wall installation

9574 Insertion Tool, Street Level; for use with spring rings only

Spring Rings

1361 Spring Ring for 6-in. diameter pipe

1362 Spring Ring for 8-in. diameter pipe

1363 Spring Ring for 10-in. diameter pipe

1364 Spring Ring for 12-in. diameter pipe

Accessories

5254 Insight Software (free of charge)

7724700 Silicon Oil; dual 50-ml pack (refills 100 sensors)

7724800 Silicon Oil Refill Kit; includes dispensing tool and oil packs.

7725600 Oil-Filled Sub-AV Sensor Kit

7730000 Retrofit Kit (converts non oil-filled to oil-filled); includes kit Silicon Oil Refill Kit

8713200 Solar Module, 10-Watt panel; includes power regulator assembly

8713300 Solar Module, 20-Watt panel; includes power regulator assembly

For Telemetry options please contact Hach.

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At Hach, it's about learning from our customers and providing the right answers. It's more than ensuring the quality of water—it's about ensuring the quality of life. When it comes to the things that touch our lives...

Keep it pure.

Make it simple.

Be right.

For current price information, technical support, and ordering assistance, contact the Hach office or distributor serving your area.

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