

# 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

### 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 1, 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.

WW

IW

C

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



Be Right™

## 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<sup>3</sup>s, m<sup>3</sup>m, m<sup>3</sup>h, m<sup>3</sup>d

Totalized Flow: L, m<sup>3</sup>, ft.<sup>3</sup>, 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

Optically Isolated Interface to IBM compatible PC

#### Program Memory

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

#### Data Storage

Capacity: 306 days of 2 level readings and 2 velocity readings at a 15 minute recording interval.

Data Types: Level and Velocity

Storage Mode: Wrap or Slate

#### Communications

Serial connection via optically isolated interface to IBM compatible computer with analysis software.

Local Terminal: RS-232 at 19.2 k baud

#### Sampler Output Conditions (optional)

Set point on level, velocity, rainfall, flow, or flow rate of change

#### Sampler Output (optional)

6 to 12 Vdc pulse, 100 mA maximum at 500 ms duration with approved interface.

#### Enclosure Material

PVC

#### Enclosure Rating

NEMA 6P (IP67)

#### Power Source

One (14 V) 16 amp hour lithium rechargeable battery pack

#### Battery Life

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

#### Dimensions

21.9 cm D x 60 cm L (8.6 in. D x 23.6 in. L)

#### Weight

8.16 kg (18 lb) without batteries

### Submerged Depth/Velocity AV Sensor

#### DEPTH 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 158°F)

Velocity-Induced Depth Error: Compensated based on pipe geometry and flow velocity.

##### 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

#### 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 Ultrasound Twin 1 MHz piezoelectric crystals

##### Transducer Type

Twin 1 MHz piezoelectric crystals

##### Material

Noryl® plastic outer shell with epoxy potting within

##### Cable

Standard: 9, 15, 23, and 30.5 m (30, 50, 75 and 100 ft.)

##### Cable Diameter

0.91 cm (0.36 in.)

##### Dimensions

2.3 cm H x 3.8 cm W x 13.5 cm L

(0.9 in. H x 1.5 in. W x 5.31 in. L)

##### Power Consumption

≤1.2 W @ 12 Vdc

##### Cable Material

Urethane sensor cable with air vent

##### Certification

cCSAus Approved for Class I and Division 1

Continued on next page.

## Specifications *continued*

### In-Pipe Ultrasonic Sensor

#### Operating Frequency

75 kHz

#### Accuracy

±0.027 ft for sensor to liquid distance between 2.5 inches and 5 ft at ±1 ft change in head from calibration point, 20°C still air, ideal target, 25 ft cable.

#### Range

Distance from sensor to liquid: 0.2 inches (minimum) to 5 feet (maximum), @ 20°C still air, ideal target, 25 ft cable.

#### Resolution

0.019 cm (0.0075 in.)

#### Operating Temperature

Range: -20 to 60°C (-4 to 140°F)

Storage Temperature: -20 to 60°C (-4 to 140°F)

Temperature Error: 0.00005 meter/°C typical

#### Material

Stat-Kon A-E ABS Plastic

#### Cable Length

7.6 m (25 ft) standard, maximum custom length is 30.5 m (100 ft.)

#### Dimensions

4.44 cm (1.75 in.) maximum diameter,  
31.435 cm (12.375 in.) long

#### Mounting

Dedicated Mounting Rings, Permanent Mounting Bracket (installs directly to pipe wall),

Adjustable Mounting Band Kit.

### Downlook Ultrasonic Sensor

#### Operating Frequency

75 kHz

#### Beam

Angle 5°

#### Accuracy

±15.24 cm or 3.048 m ±0.003 m (±0.01 ft), at 22°C (72°F), still air, 40–70% relative humidity, from 6 in. to 10 ft

#### Range

10 ft

#### Operating Temperature

-18 to 60°C (0 to 140°F)

#### Temperature Error

0.00005 m/°C (0.0001 ft/°F) maximum error with compensated temperature range—per degree of change.

#### Resolution

0.019 cm (0.0075 in.)

#### Material

ABS housing with ABS acoustical window

#### Cable Length

7.62 to 30.48 m (25 to 100 ft)

#### Dimensions

15.24 cm x 5.7 cm (6 in. x 2.25 in.)

<sup>1</sup>When the sensor is out of the water, the system may report velocity readings of up to 0.76 m/s due to radio frequency and interferences at frequencies of 140–170 MHz and 300 MHz with field strengths greater than 3 V/m.

<sup>2</sup>For temperatures above 40°C (104°F) add ±0.3 cm/°C (0.03 in./°F)

\*Specifications subject to change without notice.

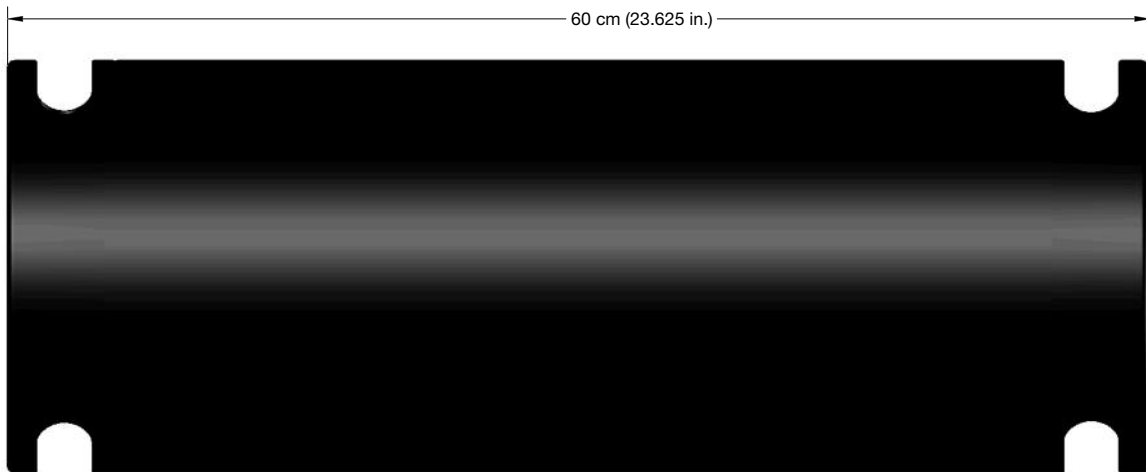
## Engineering Specifications

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 certified to cCSAus Approved for Class I and Division 1 for hazardous locations.
4. The flow meter shall utilize removable probes to measure depth and velocity. The probes, regardless of type, shall be certified to cCSAus Approved for Class I and Division 1 for hazardous locations.
5. All electrical components shall be housed in an UV resistant PVC enclosure rated NEMA 6P IP 67 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 with 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 306 days of 2 level readings and 2 velocity readings at 15 minute recording interval.
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. Monitoring 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 330 days typical at 15-minute recording intervals, with one level and one velocity, including weekly data downloads utilizing a single 14-volt, 16 amp hour lithium rechargeable 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.

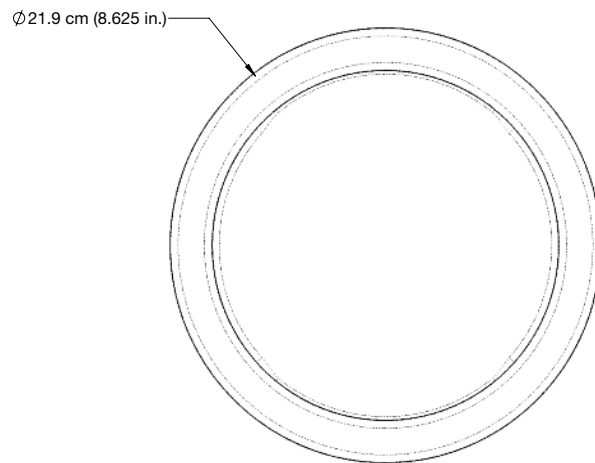
## Dimensions

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*



*Bottom View*



## 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

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- 4939** Submerged AV Mounting Plate; for pipe wall installation  
**9574** Insertion Tool, Street Level; for use with spring rings only

### Spring Rings

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- 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

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- 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.

## Complete CSO and stormwater monitoring solutions from Hach...

### Rain Gauge with Rain Logger



(see Lit. #3423)

Built to National Weather Service standards, the Rain Gauge accurately measures rainfall in 0.01-inch increments. The Rain Logger can be used for stand-alone, long-term rainfall recording or for portable use in storm water runoff monitoring.

### Sigma 900 Series Portable Samplers



(see Lit. #3405)

Hach Sigma 900 Portable Samplers are made with a molded ABS exterior and a tightly sealed controller that withstands humidity and hostile, corrosive environments. Even with a three-gallon polyethylene bottle installed, it weighs only 28 lbs.

**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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