

# Sigma 930 and 930T Area Velocity Flow Meters



*Sigma 930 and Sigma 930T Flow Meters are the most advanced flow meters of their kind. They support three interchangeable sensors, have an exceptionally long battery life, increased data storage, and offer optional interfaces with samplers.*

- *The Sigma 930 flow meter is designed for long-term/ permanent flow studies with approximately 365-day battery life and a rugged NEMA 6P PVC enclosure.*
- *The Sigma 930T flow meter has the added versatility of integrated modem technology.*

*Both models provide a single supplier solution for the collection and integration of information throughout wastewater and collection system. Get continuous, real-time access to data in remote locations.*

## Features and Benefits

### Versatile Set-up

Use a single Sigma 930 Area Velocity Flow Meter or Sigma 930T Remote Communications Area Velocity Flow Meter for multi-point and/or redundant monitoring. Up to three depth and velocity sensors can be used with a single meter.

### Long Battery Life

The meters will typically operate for 140 to 365 days based on model, sensor configuration, logging interval, and reporting interval.

### Reliability and Wireless Operation with Multiple Communications Options

The Sigma 930T Remote Communications Flow Meter bundles all the advantages of the Sigma 930 Flow Meter with the added versatility of integrated modem technology for reliable, cost-effective wireless flow monitoring for long term/permanent flow studies or temporary installations in inaccessible locations. Choose from RS232, landline telephone, wireless CDMA, and 1XRTT communications to retrieve data. Web-based data retrieval and presentation lets users distribute data via the internet. For networked computer systems, data can be routed over the Internet.

### Optional Interfaces for Rain Gauges, Samplers, and Modem

An optional rainfall-logging feature records and characterizes rain events—a true innovation in water

monitoring. The optional sampler pacing capabilities are ideal for CSO and stormwater monitoring. Add an optional internal modem to the Sigma 930 Flow Meter to automate data retrieval, paging, and reporting.

### Rugged Construction

The enclosure of both the Sigma 930 and 930T flow meters are NEMA 6P-sealed to withstand submergence and prolonged surcharge conditions.

### Accurate Depth Measurement

These flow meters automatically correct the effects of temperature on depth measurement using Hach's patented\* drawdown correction feature.

*\*Patent number 5691914*

### Superior Submersible Area Velocity Sensor for Open Channel Applications

Sigma 930 and 930T flow meters use advanced ultrasonic, twin one-MHz Doppler technology for flow measurements. This technology avoids 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.

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



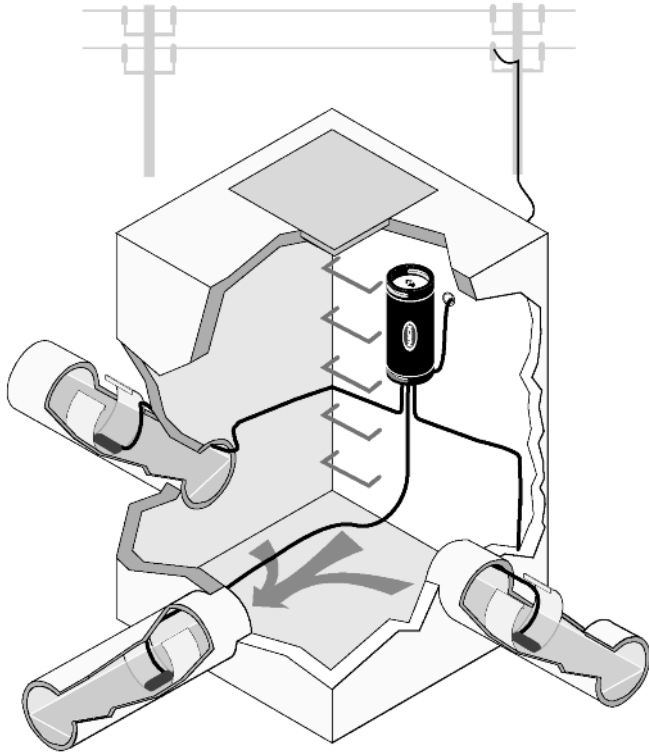
Be Right™

WW

IW

C

## Applications



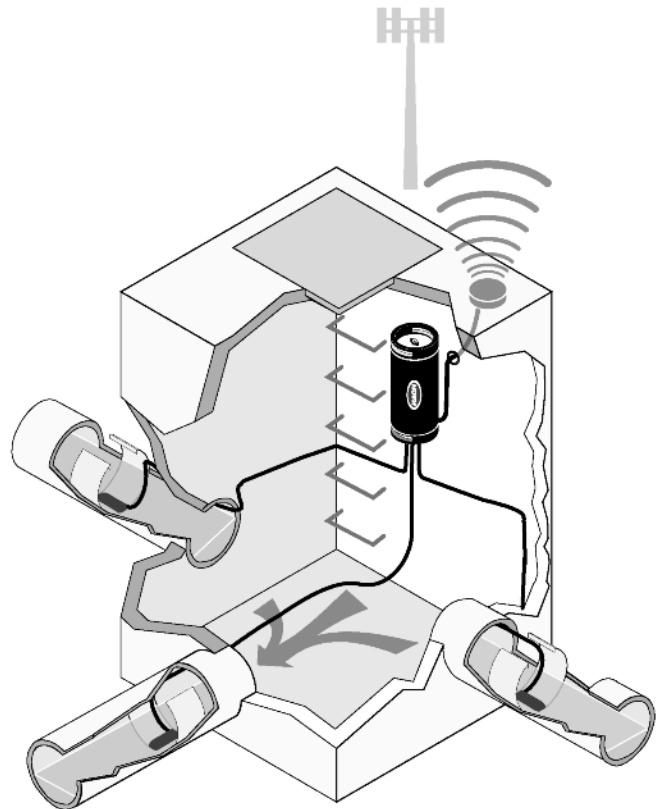
*Shown with landline modem.*

### **Sigma 930** **Area Velocity Flow Meter**

Ideal for long-term flow monitoring, sanitary sewer evaluation studies, CSO studies and monitoring, NPDES stormwater compliance, and permanent collection system monitoring.

### **Sigma 930T** **Remote Communications Area Velocity Flow Meter**

Ideal for permanent collection system monitoring, long-term flow monitoring, sanitary sewer evaluation studies, and CSO and SSO studies and monitoring.



*Shown with burial antenna.*

## Specifications\*

### Flow Meter

#### Units of Measurement

Depth: 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.,

#### Recording 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

930: IBM-compatible PC; DTU

930T: IBM-compatible PC

#### Program Memory

Non-volatile programmable flash, can be updated via RS232 port

#### Data Storage

##### Model 930

Capacity: 175 days of 3 level readings, 3 velocity readings, and rain measurements at a 15-minute recording interval

Data Types: Level, velocity, rainfall

Storage Mode: Wrap or slate

##### Model 930T

RAM memory: 128K or 256K total (in addition to the 930 standard memory)

#### Communications

##### Model 930

RS232 serial connection to PC computer with Sigma data management software

Optional Modem: 14400, V.32 bis, V.42, MNP2-4 error correction. V.42 bis, MNP5 data compression. MNP10EC Cellular Protocol

Local Terminal: RS232 at 19.2 k baud

##### Model 930T

RS232 serial connection with Sigma data management software or Telog Analysis Software (Teloger for Windows)

Modem: AnyDATA 1XRTT/CDMA: circuit or packet switched IP protocol data over Verizon™ 800 MHz cellular network, 9600 baud or Telog M-324 dial-up telephone land terminal, 2400 baud, Local Terminal: RS232 at 19.2 k baud

#### Output Conditions

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

#### Enclosure

Material: PVC

Rating: NEMA 6P (IP67)

#### Power Source

Six Energizer 529 or EN529-CAN, alkaline 6 Vdc batteries

### Battery Life

#### Model 930

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

#### Model 930T

140 to 250 days (typical) based on sensor configuration, logging interval, and reporting interval

### Dimensions

21.9 D x 60.33 L cm (8.6 x 23.75 in.)

### Weight

16.2 kg (35.7 lbs.) with batteries

## Submerged Depth/Velocity Sensor

### VELOCITY MEASUREMENT

#### Method

Doppler ultrasound Twin 1 MHz piezoelectric crystals

#### Accuracy

±2% of reading

#### Recommended Range

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

#### Typical Minimum Depth

2 cm (0.8 in.)

#### Zero Stability

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

### DEPTH MEASUREMENT

#### Method

Pressure transducer with stainless steel diaphragm

#### Accuracy (static)<sup>1</sup>

±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)

#### Depth Range

Standard: 0 to 3 m (0 to 10 ft.)

Extended: 0 to 9 m (0 to 30 ft.)

#### Maximum Allowable Depth

Standard: 10.5 m (34.5 ft.)

Extended: 31.5 m (103.5 ft.)

#### Velocity-Induced Error on Depth (Drawdown Correction)

Compensated based on pipe geometry and flow velocity

#### Air Intake

Atmospheric pressure reference is desiccant protected

<sup>1</sup>For temperatures above 40°C (104°F) add ±0.3 cm/°C (0.03 in./°F).

Continued on next page.

## Specifications *continued*

### GENERAL

#### Material

Noryl® plastic outer shell with epoxy potting within

#### Power Consumption

≤ 1.2 W @ 12 Vdc

#### Cable

*Material:* Urethane sensor cable with air vent

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

*Custom Length:* 0.75 m to 76 m (0 to 250 ft) maximum

*Diameter:* 0.91 cm (0.36 in)

#### Sensor Dimensions

2 H x 3.8 W x 13.5 L cm (0.8 x 1.5 x 5.3 in.)

#### Operating Temperature

0 to 70°C (32 to 158°F)

#### Depth Compensated Temperature

0 to 70°C (32 to 158°F)

#### Connector

Hard anodized: satisfies Military Spec 5015

#### Nose Angle

20 degrees from horizontal

### 75 kHz In-Pipe Ultrasonic Level Sensor

#### Accuracy

0.038 to 2.4 m ±0.003 m (0.125 to 8 ft. ±0.01 ft.) at 22°C (72°F) still air and 40 to 70% relative humidity

#### Range

From sensor to liquid, 0 to 2.4 m (0 to 8 ft.)

#### Span

0.038 to 4.57 m (0.125 to 15 ft.)

#### Ambient 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

#### Resolution

0.019 cm (0.0075 in.)

#### Crystal Specification

7° beam angle

#### Material

Stat-Kon® A-E ABS Plastic

#### Cable

4 Conductor

*Standard Length:* 7.6 m (25 ft.)

*Custom Length:* Up to 305 m (1000 ft.) using RS485 two-wire remote sensor option

#### Dimensions

4.44 D x 31.5 L cm (1.75 x 12.4 in.)

#### Connection

Bare lead connection via 3658 junction box or quick connect

Low Profile Velocity-Only Sensor and 75 kHz Ultrasonic Downlooking Sensor also available with 930 and 930T Flow Meters.

*Noryl® is a registered trademark of the General Electric Company.*

*\*Specifications subject to change without notice.*

## Engineering Specifications

### Flow Meter

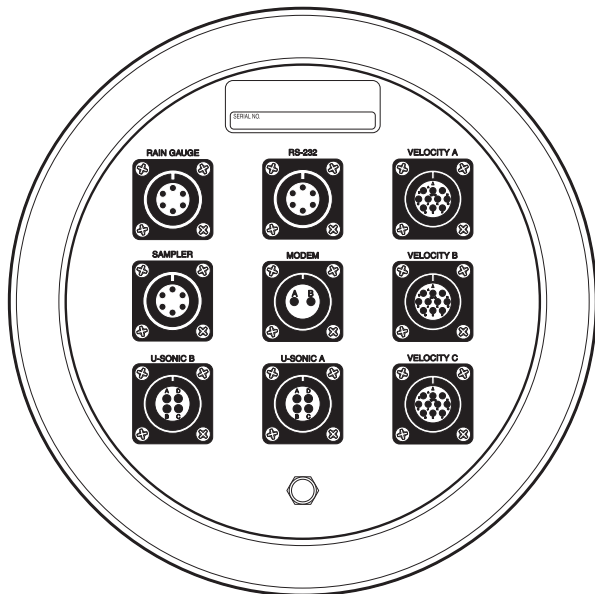
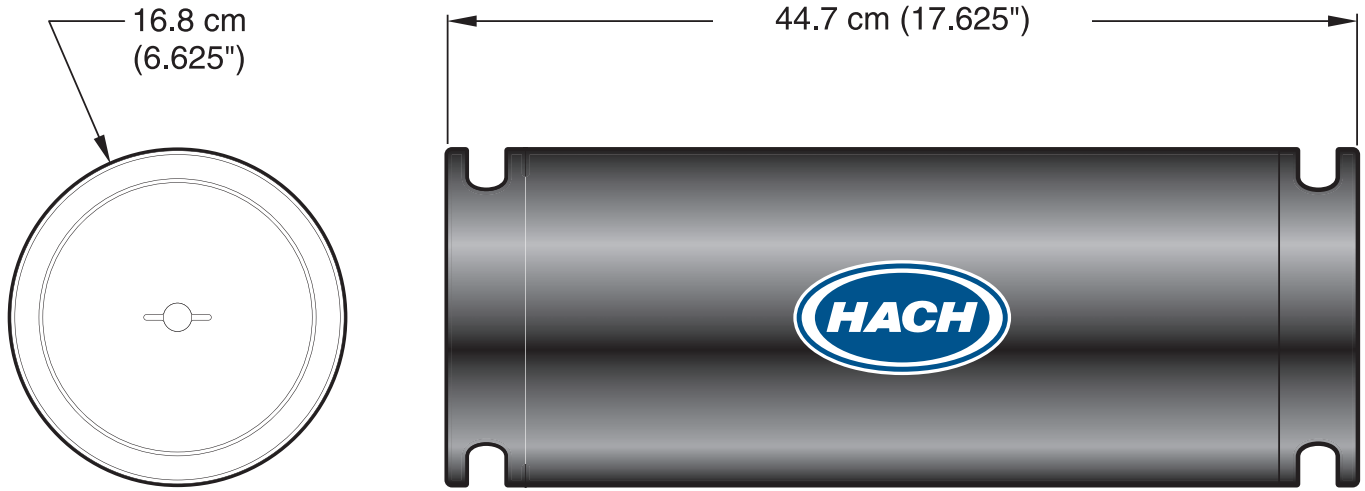
- The flow meter shall be capable of directly measuring average velocity.
- The method of velocity measurement shall be Doppler ultrasonic.
- The transducer type shall be twin 1-MHz piezoelectric crystal.
- The range of velocity measurement shall be -1.52 to 6.10 m/s.
- The flow meter shall be NEMA 6P sealed to withstand submergence and prolonged surcharge conditions.
- The flow meter shall be capable of either:
  - Storing at least 116,000 data points (240 days at 15 minute logging intervals of (3) level, (3) velocity and rainfall).
  - OR
  - Storing data in non-volatile, programmable flash memory that can be updated via RS232, landline telephone, wireless CDMA, and 1XRTT communications.
- Exterior dimensions shall not exceed 8.625 inches diameter and 23.625 inches length.
- The flow meter and sensor shall be the Sigma Model 930 Area Velocity Flow Meter OR Sigma Model 930T Remote Communications Flow Meter manufactured by Hach Company.
- The range of depth measurement shall be 0 to 3 m (0 to 10 ft.), standard, and 0 to 9 m (0 to 30 ft.), extended.
- The body material of the sensor shall be Noryl® plastic outer shell with epoxy potting.
- The connector of the sensor shall be hard anodized and satisfy Military Spec 5015.
- Power consumption of the sensor shall be less than or equal to 1.2 W at 12 Vdc.
- The sensor shall be the Sigma AV Sensor Flow Sensor manufactured by Hach Company.

### Submerged Depth/Velocity (AV) Sensor

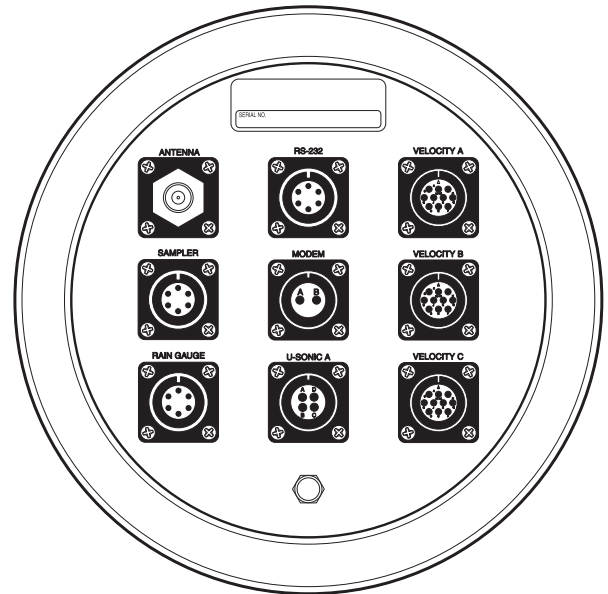
- The sensor shall be capable of directly measuring average velocity.
- The method of velocity measurement shall employ transducer type that is twin 1-MHz piezoelectric crystals.
- The method of depth measurement shall be pressure transducer with stainless steel diaphragm.
- Velocity range shall be -1.52 to 6.10 m/s (-5 to 20 ft./s)

## Dimensions

Sigma 930 and Sigma 930T Area Velocity Flow Meters should not 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.



930 Connectors



930T Connectors

## Ordering Information

### Flow Meter Only

Accommodates two submersible area velocity (Sub-AV) sensors and two ultrasonic sensors. Each Sub-AV receptacle accommodates one Sub-AV sensor, or one wafer velocity sensor.

- 4800** Sigma 930 Area Velocity Flow Meter; includes six lantern batteries and expanded memory.
- 4800T** Sigma 930T Remote Communications Area Velocity Flow Meter; includes six lantern batteries and expanded memory.

### Optional Flow Meter Sensor Configurations

- 4848** First additional input for second sensor; for submerged area velocity or velocity sensor
- 4849** Second additional input for third submerged area velocity or velocity Sensor
- 4869** Input for 75 kHz Ultrasonic Sensor; requires ultrasonic sensor
- 4882** Second Input for 75 kHz Ultrasonic Sensor; requires option 4869 and ultrasonic sensor
- 4869T** 930T input for 75kHz Ultrasonic sensor; requires ultrasonic sensor

### Modem Selection for Sigma 930T Flow Meters Only

- 4872** Sigma Landline communication option (for 930 only)
- 6241600** Telog Landline communication option
- 6241700** Telog or Verizon communication option
- 6241701** Telog AT&T or T-Mobile modem option
- 6241702** Telog Sprint communication option

### Antenna Options for Sigma 930T Flow Meters Only

- 6236100** Verizon 1XRTT or AT&T GPRS Half Wave
- 6246200** Verizon or AT&T Burial
- 5228400** Sprint 1XRTT or T-Mobile GPRS Half Wave
- 6683000** Sprint or T-Mobile Burial
- 5255400** Manhole lid antenna, all providers
- 6241804** Mini wing antenna, all providers - non stainless steel connector
- 5241000** Mounting bracket

### Sensors

#### *Non-oil Filled Standard Submerged Depth/Velocity (AV) Sensors (0 to 10 ft. range)*

- 77065-030** Non-oil Filled Standard Sigma Submerged AV Sensor; 30 ft. cable with connector
- 77065-050** Non-oil Filled Standard Sigma Submerged AV Sensor; 50 ft. cable with connector
- 77065-075** Non-oil Filled Standard Sigma Submerged AV Sensor; 75 ft. cable with connector
- 77065-100** Non-oil Filled Standard Sigma Submerged AV Sensor; 100 ft. cable with connector

#### *Oil Filled Standard Submerged Depth/Velocity (AV) Sensors (0 to 10 ft. range)*

- 77064-030** Oil Filled Standard Sigma Submerged AV Sensor; 30 ft. cable with connector
- 77064-050** Oil Filled Standard Sigma Submerged AV Sensor; 50 ft. cable with connector
- 77064-075** Oil-Filled Standard Sigma Submerged AV Sensor; 75 ft. cable with connector
- 77064-100** Oil-Filled Standard Sigma Submerged AV Sensor; 100 ft. cable with connector

#### *Down-looking 75 KHz Ultrasonic Depth Sensor*

- 1176-01** Down-looking 75 kHz Ultrasonic Sensor with connector
- 1176-03** Down-looking 75 kHz Ultrasonic Sensor with bare leads

#### *In-pipe 75 KHz Ultrasonic Depth Sensor*

- 3702-01** In-pipe 75 kHz In Pipe Ultrasonic Sensor with connector
- 3702-02** In-pipe 75 kHz In Pipe Ultrasonic Sensor with bare leads

## Ordering Information *continued*

### Sensor Mounting Hardware

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#### *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

#### *Miscellaneous*

- 3263** Sensor Mounting Clip; for 88000, wafer velocity, and bubbler level velocity sensors
- 3868** Portable Bracket; for in-pipe ultrasonic sensor mounting clip
- 3875** Permanent In-Pipe Ultrasonic Sensor Mounting Bracket
- 3305** Velocity Sensor Mounting Plate
- 9574** Insertion Tool for Non-confined Space Entry
- 2974** Permanent Wall Mount Bracket; for down-looking ultrasonic sensor.
- 2904** Floor or Wall Adjustable Mounting Bracket; for down-looking ultrasonic sensor
- 9538** Tripod Mounting Bracket; for down-looking ultrasonic sensor.
- 2883** Cable Straightener; for down-looking ultrasonic sensor
- 3183** Cable Grip; for down-looking ultrasonic sensor

#### *Cables and Interfaces*

- 6242500** Telogers™ for Windows Software
- 6242300** PC to Telog Modem Configuration Cable
- 1727** Sampler or Flow Meter to PC Cable
- 3358** RS232 Extension Cable

### Accessories

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- 5254** Insight Software (free of charge)
- 8764499** Flo-Center Software, Disk Only
- 8764500** Flo-Center Software, Disk with RS232
- 8764600** Flo-Center Software Disk with RS232 and USB
- 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

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

## Sigma 900 Series Portable Samplers



(see Lit. 2565 900MAX and Lit. 2591 SD900)

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.

## Rain Gauge with Rain Logger



(see Lit. 2618 Rev 1)

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.

**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.**

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 4539 Metropolitan Court  
 Frederick, MD 21704-9452, U.S.A  
 Telephone: (800) 368-2723  
 Fax: 301-874-8459  
 E-mail: [hachflowsales@hach.com](mailto:hachflowsales@hach.com)  
[www.hachflow.com](http://www.hachflow.com)

*In Europe for all countries except France, Spain and Great Britain:*  
**FLOW-TRONIC**  
 Rue J.H. Cool 19a  
 B-4840 Welkenraedt, Belgium  
 Telephone: +32-87-899797 or 899799  
 Fax: +32-87-899790  
 E-mail: [info@flow-tronic.com](mailto:info@flow-tronic.com)  
[www.flow-tronic.com](http://www.flow-tronic.com)

*For France*  
**HACH LANGE FRANCE, S.A.S.**  
 8, mail Barthélémy Thimonnier  
 77185 LOGNES cedex  
 Telephone: 0 820 20 14 14 (In France)  
 (+33)(1) 69 67 34 00 (General)  
 Fax: (+33)(1) 69 67 34 99  
 E-mail: [info@hach-lange.fr](mailto:info@hach-lange.fr)  
[www.hach-lange.fr](http://www.hach-lange.fr)

*For Spain*  
**HACH LANGE, S.L.U.**  
 Edif. Arteaga Centrum  
 C/Larrauri, 1C, 2ª Pl.  
 E-48160 Derio/Vizcaya  
 Telephone: (+34) 94 657 33 88  
 Fax: (+34) 94 657 33 97  
 E-mail: [info@hach-lange.es](mailto:info@hach-lange.es)  
[www.hach-lange.es](http://www.hach-lange.es)

*For Great Britain*  
**HACH LANGE, LTD.**  
 Pacific Way Salford  
 Manchester, M50 1DL  
 Telephone: (+44) 161 872 1487  
 Fax: (+44) 161 848 7324  
 E-mail: [info@hach-lange.co.uk](mailto:info@hach-lange.co.uk)  
[www.hach-lange.co.uk](http://www.hach-lange.co.uk)

Lit. No. 2540 Rev 6

K111 Printed in U.S.A.

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