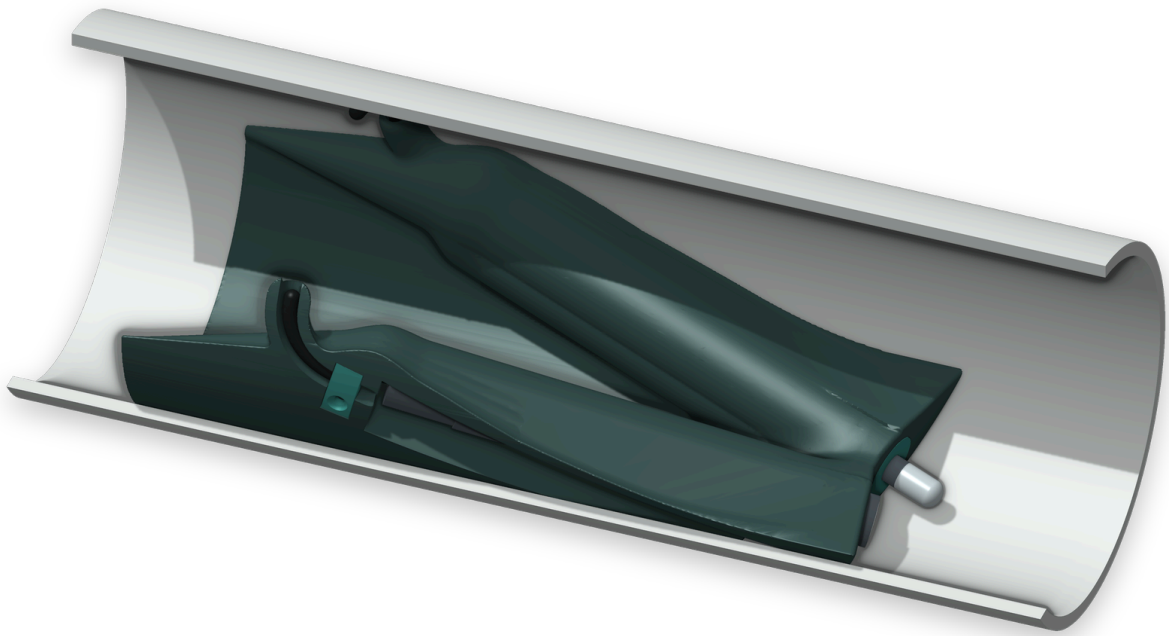
UNIVERSAL SENSOR MOUNT FOR GRAVITY SEWERS

Sensor Fort

Designed and built in Australia to solve the problem of installing analytical sensors in a gravity sewer network.

PATENT PENDING



Sensor Fort in a 150 mm sewer, shown with the pipe cut away

Nothing for rag to catch

A smooth saddle spans the invert and feathers into the pipe wall, so that flow and rag can only pass over it. Sensor bodies, clamps and cables remain inside the mount, and only the sensor tips meet the flow.

Any maker's sensors

A sleeve adapts each sensor to its bay. The larger the sewer, the larger the sensor its Sensor Fort accepts, from 12 mm electrodes to 80 mm sondes.

150 mm to 1050 mm sewers

There is one Sensor Fort for each pipe diameter. Each is fixed on an EDS expansion band in the pipe at a manhole and requires no drilling, no power and no moving parts.

THE PROBLEM

In a gravity sewer, the mount is the weak point.

In a gravity sewer, the difficulty lies less with the sensor than with the way it is held in the flow. Rag wraps around anything that divides the flow, grit buries whatever sits in slow water, fat coats whatever sits at the waterline, and low flows leave sensors dry. Each of the common mounting methods fails for a mechanical reason that no sensor can overcome.

NEEDS REGULAR CLEANING

Pole, chain or pendulum from above

Rag catches where the pole pierces the surface and on the sensor itself, while a ring of fat forms at the waterline.

BEST OF THE CURRENT METHODS, STILL RAGS

Sensor strapped to a band

Rag catches on the sensor body, the clamps and the cable, and silt settles in the lee of the sensor.

UNRELIABLE IN A SEWER

Float on a tether

Rag collects on the float and its tether, and at low flow the float grounds or tips over.

NEEDS A PUMP, POWER AND VISITS

Pumped bypass to a flow cell

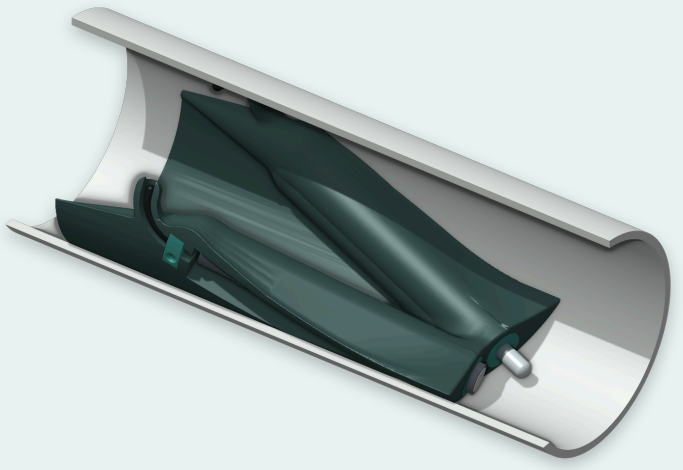
The intake blocks, and the tubing and the flow cell foul between visits.

THE IDEA

Hide everything but the tip.

Sensor Fort was designed and built in Australia to solve that problem. It is a low moulded saddle that sits on the invert of the pipe at a manhole. Two sensors lie inside the saddle and point downstream, so that only their tips are exposed, at the foot of a spill lip where the water runs fastest.

The mount gives rag nothing to wrap around, keeps every cable out of the flow and leaves no sensor body to be buried. It has no moving parts, requires no power and is designed to remain in the sewer for 12 months between visits.



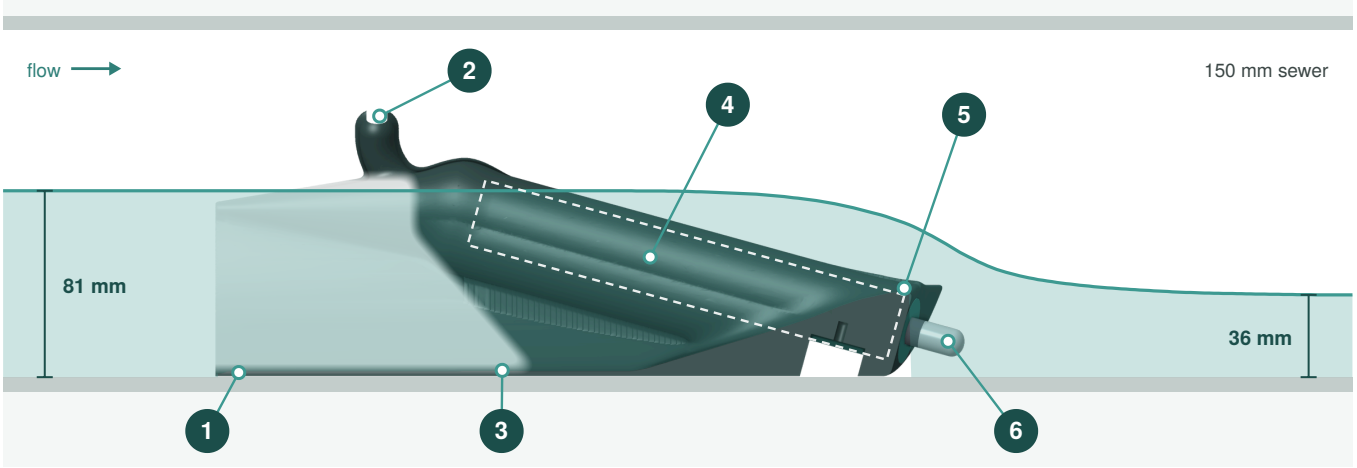
Two sensor tips sit below the spill lip, seen here from downstream

2 sensors	**12** months	**150 to 1050** mm	**Passive**
IN EACH MOUNT	DESIGN SERVICE INTERVAL	SEWER DIAMETER	NO POWER, NO MOVING PARTS

HOW IT WORKS

Shaped so the flow keeps the tips clear.

Sensor Fort is designed to work by shape alone. The flow rides up a feathered nose, gathers in the valley between two shoulders, spills over a lip and runs fast across the sensor tips. The same shape keeps every sensor body, clamp and cable out of the stream.



1. Feathered nose
2. Cable hood, clear of the stream
3. Valley for low flows
4. Sensor inside the shoulder
5. Spill lip
6. Sensor tips in fast water

Figure 1. Section along the centre line of the SF 150 in a 150 mm sewer. The water levels at each end were calculated for 1.9 L/s at a grade of 1%, and the surface between them is schematic. The pale area is the thin skin against the pipe wall.

SIX DESIGN RULES

RULE 1

No leading edge

Rag catches where flow divides around an edge. The saddle spans the invert, so flow can only pass over it.

RULE 2

Only the tips are exposed

Sensor bodies, clamps and cables remain inside, and the flow side has no seam, hole or fastener.

RULE 3

Tips at the lowest point

Each sensor lies 15° tip down, so its tip is the last part of the installation to go dry.

RULE 4

Tips in the fastest water

The tips sit just below the spill lip, where fast water keeps biofilm thin and grit moving.

RULE 5

No cable in the flow

Each cable leaves its bay beneath a hood and runs to the obvert in a covered channel.

RULE 6

Low and full width

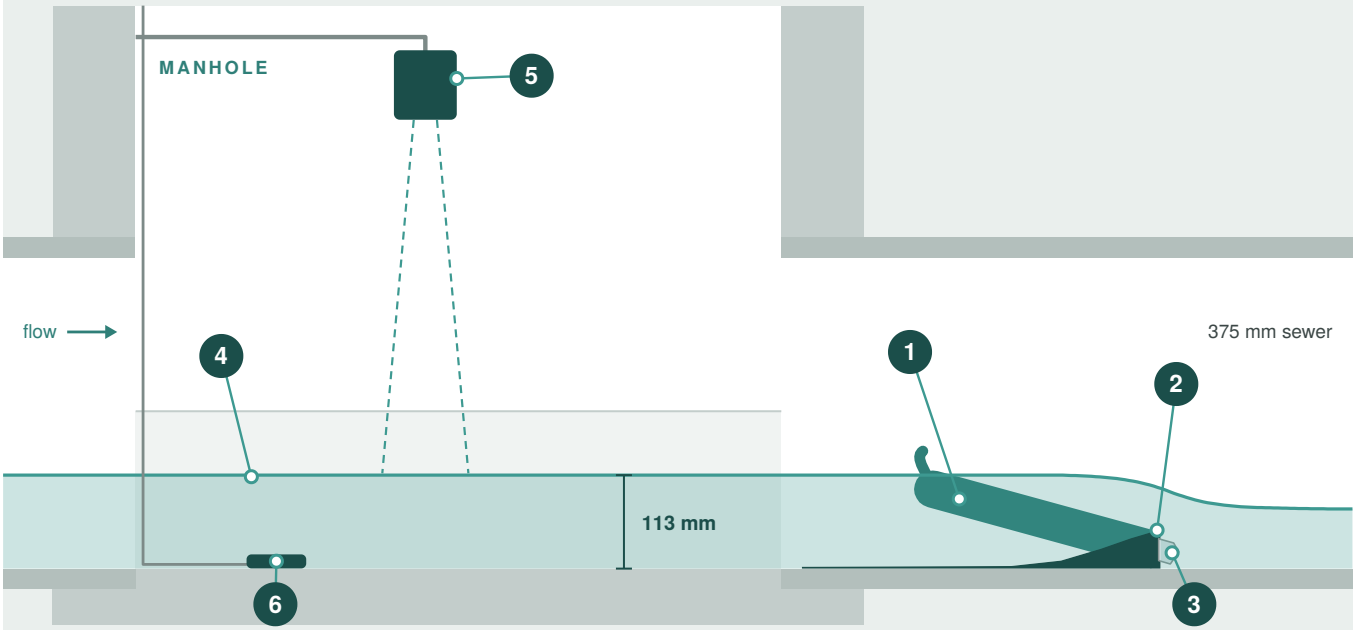
A low hump that fills the invert sheds debris over its top, where a post would hold it.

What no mount can do. No mount can prevent biofilm from growing or a pH reference from ageing, although fast water keeps biofilm thin. EDS therefore matches the sensor type and the data checks to the service interval that each site requires.

FLOW AS WELL AS WATER QUALITY

Flow and water quality from one site.

The spill lip of Sensor Fort acts as a hydraulic control, in the manner of a flume or weir, so the depth upstream of the mount rises predictably with flow. When the mount is installed in the outlet pipe of a manhole, it holds a pool in the chase, where a level sensor above the chase, or a pressure sensor in it, measures the depth. EDS converts that depth to flow with a rating curve for the mount, while the sensors continue to monitor water quality.



1 Sensor Fort in the outlet pipe
2 Spill lip, the hydraulic control
3 Sensor tips
4 Pool held in the chase
5 Level sensor above the chase
6 Or a pressure sensor in the chase

Figure 2. Sensor Fort in the outlet pipe of a manhole on a 375 mm sewer, with a level sensor above the chase. The depth shown was calculated for the SF 375 at a flow of 10 L/s and a grade of 0.5%. The figure is schematic.

CALCULATED RATING, SF 375 IN A 375 MM SEWER

Flow, L/s	1	2	5	10	20	40
Depth in the chase, mm	62	71	90	113	145	193

The rating applies while the flow over the lip is free. At flat grades the lip can drown at high flows, and the rating then no longer applies.

One site, one entry

Flow and water quality are measured, logged and reported together from a single installation.

Loads and context

Flow places every reading in context and allows loads to be calculated as well as concentrations.

No assumed roughness

A rating at a control does not depend on an assumed pipe roughness or grade, as an estimate from Manning's equation does.

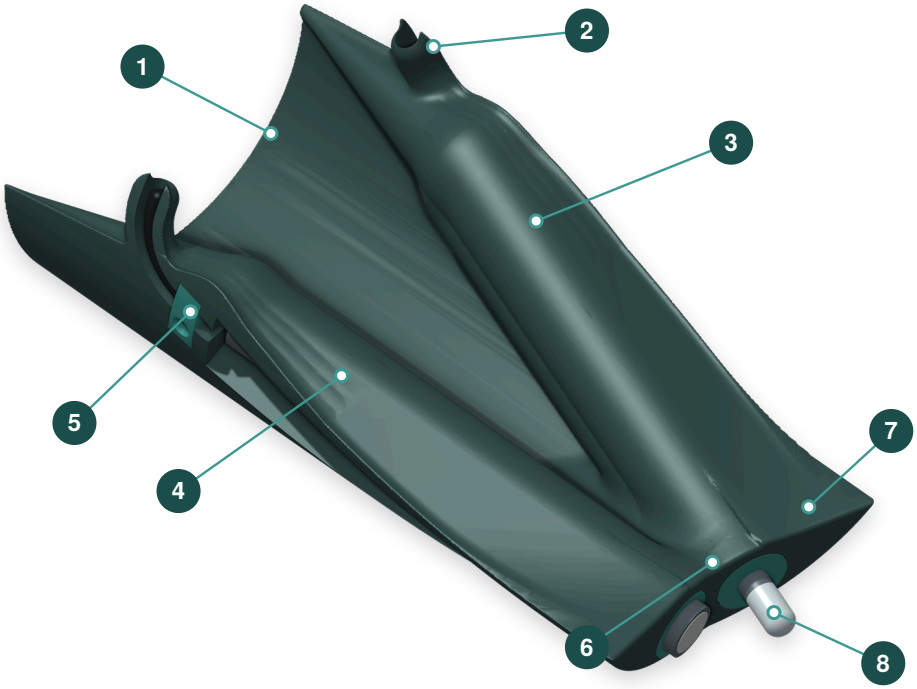
Confidence in the data

The depth record shows when the sensor tips are covered and when the sewer runs dry.

INSIDE SENSOR FORT

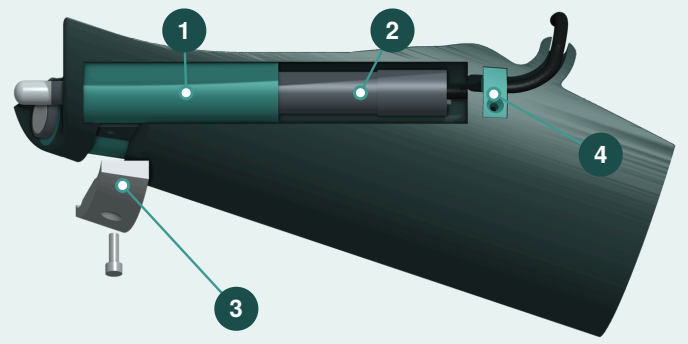
One body. Two protected bays.

The sensors lie in two straight bays beneath the shoulders, 15° tip down, and show only their tips at the stern. Each cable leaves beneath a hood on its shoulder, and the surface that faces the flow is one continuous skin.



1. Feathered nose
2. Cable hood
3. Shoulder over a sensor bay
4. Valley
5. Cable clamp
6. Spill lip
7. Stern face
8. Sensor tips

FASTENING



The open side of a bay, with the clamp bar and its screw drawn clear. The numbers correspond to the steps.

1. **Sleeve the sensor.** A 12 mm electrode screws into its sleeve by its PG13.5 thread, while a larger body is fitted with a split sleeve.
2. **Lay it in the open bay.** With the mount turned over on the bench, the sensor is laid in and slid downstream until its sleeve meets the stern ring.
3. **Tighten one screw.** A single clamp bar beneath the stern presses both sleeves home, so one M5 screw fastens both sensors.
4. **Clamp the cable.** A small clamp holds each cable in its groove, so that a pull on the cable never reaches the sensor.

One screw for two sensors

The clamp bar sits in a pocket beneath the stern, so no fastener faces the flow.

The pipe wall closes the bays

Each bay opens only towards the pipe wall, which leaves the flow side seamless.

A solid stop for every sensor

Each sleeve bears on the stern ring, so that drag and the 15° tilt both press the sensor home.

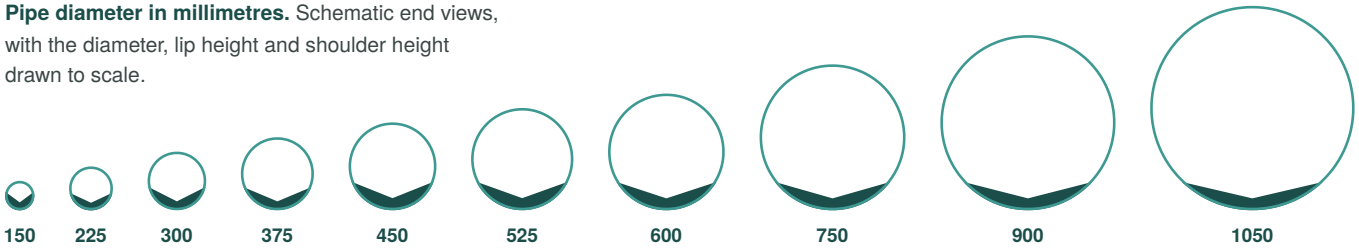
SENSOR FIT AND RANGE

Your sensors. Your sewer.

EDS surveyed 48 pH, conductivity and dissolved oxygen sensor models from 22 makers and sized the sensor bays to suit them. There is one Sensor Fort for each pipe diameter, and the larger the sewer, the larger the sensor it accepts. A sleeve adapts each sensor to its bay, so clients fit their own sensors, certified for their own zones.

MODEL	PIPE DIAMETER	LARGEST SENSOR BODY	TYPICAL SENSOR FORMATS
SF 150, SF 225	150 and 225 mm	28.5 mm by 190 mm	12 mm electrodes in a sleeve, compact 22 mm sensors and 3/4 inch NPT bodies
SF 300, SF 375	300 and 375 mm	35.5 mm by 270 mm	In addition, 1 inch NPT bodies and 35 mm differential sensors
SF 450 to SF 1050	450 to 1050 mm	51 mm by 315 mm	In addition, 1.5 inch NPT bodies, 51 mm differential sensors and optical oxygen sensors
To order	525 mm and larger	80 mm by 600 mm	Multiparameter sondes and long armatures

Pipe diameter in millimetres. Schematic end views, with the diameter, lip height and shoulder height drawn to scale.



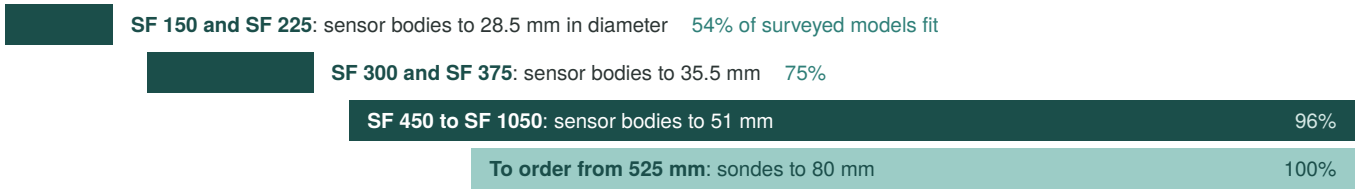


Figure 3. One Sensor Fort for each pipe diameter. The bands show the largest sensor body that each model accepts and the share of the 48 surveyed sensor models that fit. Sizes between those shown are made to order.

SERVICE

1 Load

Each sensor is sleeved, clamped in its bay, calibrated and capped wet on the bench.

2 Install

The loaded mount is fixed on its EDS expansion band in the pipe, with nothing drilled.

3 Leave

The mount is designed to remain in the sewer for 12 months between visits.

4 Swap

The whole mount is exchanged for a freshly loaded one, and the old one is refurbished.

Supplied as part of an EDS monitoring solution

Complete sites. EDS supplies Sensor Fort with the Metalog 4G logger, an upstream level sensor where flow is required, and commissioning into FlowSense.

Your sensors. Use the sensors that your network already trusts. EDS supplies the mount and the sleeves, and matches the data checks to the service interval.

Your own system. The mount has no electrical parts, so sensors with 4 to 20 mA or Modbus outputs connect to any RTU, logger or SCADA host.

SENSOR FORT

Designed and built in Australia.



Sensor Fort for a 150 mm sewer, with two sensors fitted

Patent pending

TALK TO EDS ABOUT SENSOR FORT

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Environmental Data Services
13/20 to 22 Ellerslie Road, Meadowbrook QLD 4131

EDS designed and built Sensor Fort in Australia to solve the problem of installing analytical sensors in a gravity sewer network.

Tell us the pipe diameter and grade, the flows you expect and the sensors you wish to use. We will confirm the Sensor Fort model and the sleeves for your sensors, and plan the installation with your network team.

Australian owned and operating in the water and wastewater industry since 1991. Installation, commissioning and support from Brisbane, with field crews across Australia.

Sensor Fort is patent pending. EDS reserves the right to change specifications without notice.