Technical Note: Regulation 31(4)(b) Small Surface Area

MP5, MP6 and MP Total in-situ chlorine sensors · Water Supply (Water Quality) Regulations 2016 · DWI Advice Sheet 8

Manufacturer	Halogen Systems Inc., 8985 Double Diamond Pkwy, Unit B10, Reno, NV 89521, USA
Products	MP5, MP6 and MP Total multi-parameter amperometric sensors (model series MP-XXX)
Application	In-situ continuous monitoring of cold drinking water in distribution mains, 100 mm to 2 m diameter
Purpose	To support water companies' assessment of the sensors for use under regulation 31(4)(b)

1. Summary

The MP5, MP6 and MP Total meet both criteria of DWI Advice Sheet 8 for use under regulation 31(4)(b):

- **Small surface area contact ratio.** In-situ sensors and probes are named on the Advice Sheet 8 exemplar list of product types that fall under regulation 31(4)(b) without the need to calculate a contact risk score. A supporting calculation for all wetted metal parts under extreme assumptions gives a contact ratio of about 4.1, against the threshold of 100.
- **No odour, flavour or microbial growth.** Every polymer wetted material has passed BS 6920, including the odour and flavour (part 2.2.1) and growth of aquatic micro-organisms (part 2.4) tests that Advice Sheet 8 recommends.

Apart from the polymers, the only wetted materials are the platinum, gold and silver electrodes and the lead-free pH glass. The electrodes are supplied specifically for use with drinking water, a route that Advice Sheet 8 allows for metallic components, and the glass is an inert inorganic material. The complete sensor, all electrodes included, is also certified to NSF/ANSI/CAN 61, with annual independent surveillance.

2. Product description

The sensors are inserted directly into the main. An internal turbine draws mains water through a solid plastic cap, across the measuring electrodes, and out through an ejection port, so the electrodes see continuously refreshed water and a constant flow regardless of velocity in the main. The cap material is one of the BS 6920-tested materials listed in Section 4.

Every sensor in the MP-XXX series also includes a pH electrode, whose materials are covered in Section 4 and its reference electrolyte in Section 6.

The measuring electrodes are bare platinum and gold, in direct contact with the water: two flat discs, each 2 mm in diameter, with a combined area of about 6.3 mm². The silver reference electrode is a flush 4 mm diameter disc, with an area of about 12.6 mm². The total wetted metal area is about 18.8 mm² (0.188 cm²). The sensors are designed for cold drinking water.

3. Criterion (i): small surface area contact ratio

Advice Sheet 8 lists "in-situ sensors and probes (including pressure transducers and level sensors), together with their cable coverings" among the product types that, used within their normal scope, are likely to fall under regulation 31(4)(b) without calculation. Installation in a distribution main for continuous monitoring is the normal scope of use of the MP5, MP6 and MP Total.

4. Criterion (ii): odour, flavour and microbial growth

All polymer wetted materials were tested by NSF Wales Ltd (UKAS No. 0626). Six passed the full BS 6920 programme for cold water. The seventh, a glass-filled PPS component, passed the reduced set of tests that Advice Sheet 8 specifies for small surface area products: odour and flavour, growth of micro-organisms, and substances of concern to public health. Every polymer has therefore passed the odour and flavour and microbial growth tests (parts 2.2.1 and 2.4) that Advice Sheet 8 recommends.

Material	Part	NSF Wales report	Rating
EPON 815C epoxy	Cast component, polished	J-00553871, 08 Oct 2026	Hot (85 °C) and cold
Veradel PES 3600	Sensor body	J-00526026, 23 Dec 2025	Hot (85 °C) and cold
Polypropylene 3620WZ	Strainer	J-00526027, 23 Dec 2025	Hot (85 °C) and cold
PTFE PB12000W (porous)	pH electrode salt bridge	J-00526022, 23 Dec 2025	Hot (85 °C) and cold
CPVC	Moulded part	J-00526021, 23 Dec 2025	Cold
Acrylic	Cleaning balls	J-00526023, 23 Dec 2025	Cold
PPS/GF, MPPSFG40BK (Modified Plastics)	Moulded component	FI20231211060752 (J-00466515), 11 Dec 2023	Cold, Advice Sheet 8 tests
O-rings and seals	Sealing	Supplier BS 6920 / WRAS approval	Approved

pH electrode. The salt bridge is porous PTFE: the PTFE PB12000W listed above, which passed the full BS 6920 programme. The measuring membrane is lead-free pH glass, an inorganic material that contains no organic matter, so it cannot provide nutrients for microbial growth or give rise to odour or flavour. The glass was included in the whole-sensor NSF/ANSI/CAN 61 testing.

5. Metallic components

Advice Sheet 8 notes that no equivalent test assessments are readily available for metallic products, and allows metallic components that conform to a recognised specification, or are supplied specifically for use with drinking water, to be used in small surface area applications. The wetted metal parts meet this on the following basis:

- **Supplied for drinking water.** The platinum, gold and silver electrodes are an integral part of a sensor designed and supplied specifically for drinking water monitoring.
- **Whole-sensor certification.** The complete assembled sensor, including the electrodes and every other wetted surface, is certified by ALS Group USA, Corp. (ANAB-accredited) to NSF/ANSI/CAN 61-2022, Drinking Water System Components – Health Effects, and NSF/ANSI/CAN 372-2022, at a contact temperature of 82 ± 2 °C. This assessment includes extraction testing of the assembled product with toxicological evaluation of the results to NSF/ANSI/CAN 600. ALS carries out annual surveillance, an independent check that the product and its materials remain unchanged, and the certification covers the current build.
- **Tiny wetted area.** The electrodes total about 6.3 mm², roughly one fifty-thousandth of the internal surface of one metre of 100 mm main. With the silver reference electrode, all wetted metal parts together total about 18.8 mm².
- **Established metals.** Platinum and gold are among the least soluble metals. Gold is authorised in the EU as food additive E175, and platinum is widely used in long-term contact with the body in medical electrodes and dental alloys. Silver has a long history of use in contact with drinking water, and the World Health Organization has not set a health-based guideline value for it.

- **Short contact.** In operation, water passes the electrodes and is ejected within seconds. If the turbine stops, the electrodes sit within the small, enclosed volume of the cap, isolated from the main.
- **Operating modes.** Mains-powered sensors operate continuously, so the electrodes are always in flowing, refreshed water. In the optional intermittent mode used for battery-powered installations, the electrodes are powered only during each brief measurement cycle and are unpowered between cycles, further reducing their operating exposure.

6. pH reference electrolyte

Regulation 31 applies to substances introduced into water as well as to products. The only substance released by the sensors is the reference electrolyte of the pH electrode:

- **Composition.** The electrolyte is potassium chloride (KCl) solution. Potassium and chloride are natural constituents of drinking water and are present in it at far higher concentrations than any contribution from the electrode.
- **Quantity.** The outflow through the salt bridge is very small and is diluted immediately into the flow in the main.
- **Certification.** The pH electrode, including its electrolyte, was part of the complete sensor tested and certified by ALS Group USA to NSF/ANSI/CAN 61.

7. Supporting calculation

Because in-situ sensors are on the exemplar list, no contact risk score is required. For completeness, the contact ratio c = s × t / v from Advice Sheet 8 is calculated below for all wetted metal parts under deliberately extreme assumptions: stagnant water held for two days in one metre of the smallest main the sensor is installed in.

Term	Value	Basis
s, wetted surface area	0.188 cm²	Two 2 mm platinum and gold discs and one 4 mm silver disc
v, static volume in contact	7,854 cm³	1 m of 100 mm main
t, worst-case contact time	172,800 s	Two days, no flow
c = s × t / v	**≈ 4.1 s·cm⁻¹**	**Threshold: 100**

For comparison, the Advice Sheet 8 worked example for 100 mm butterfly valves gives 0.2 per valve. In normal operation, with continuous flow, the contact time is seconds, and the ratio is several orders of magnitude lower still.

8. Supporting documents

The following are available on request. NSF Wales reports are supplied complete and unaltered, as NSF requires.

- NSF Wales BS 6920 reports J-00553871, J-00526026, J-00526027, J-00526022, J-00526021 and J-00526023
- NSF Wales Advice Sheet 8 report FI20231211060752 (job J-00466515), PPS/GF component, 11 December 2023
- ALS Group USA certified product listing, NSF/ANSI/CAN 61 and 372, model series MP-XXX, issued 15 November 2024
- O-ring and seal supplier approval certificates
- Halogen wetted materials compliance statement (BS 6920 and NSF/ANSI/CAN 61)

9. Contact

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