INSTALLATION · OPERATION · MAINTENANCE

D20 Controller.
MP-5F Sensor.
One guide.

MP-5F · FCI · H2 CURRENT — FORMERLY MP5A

Plan, install, commission, calibrate and maintain a reagent-free free chlorine measurement point — start to finish.

DOCUMENT	REVISION	RELEASE DATE	APPLIES TO
D20-MP5F-PG	R1.18	October 17, 2026	D20 · MP-5F H2

Read this guide before you unpack, install or service the equipment.

Technical assistance: tech@halogensys.com · 775.832.0495 · halogensys.com/resources

Product labels and approved drawings take precedence over the generic illustrations in this guide.

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APPLICABILITY, SUPPORT, SAFETY LANGUAGE

Before You Begin

This guide covers the Halogen D20 controller and MP-5F free chlorine sensor, including WETTAP, PVC tee / PVCT, side-stream flow-cell and immersion installations. Work through the applicable mounting and startup procedures, then use the contents to find operation, calibration, maintenance and troubleshooting tasks.

4	13	4	1
STAGE INSTALLATION	SECTIONS	MOUNTING OPTIONS	COMMISSIONING RECORD

What this equipment does

The D20 powers the sensor, displays measurements, logs data to an SD card and provides analog and digital interfaces to external control systems. The MP-5F measures free chlorine and supporting water-quality parameters with no membranes and no chemical reagents. Continuous mechanical and electrochemical cleaning keeps the electrodes polished, which is what keeps routine maintenance low.

Confirm the product before you install it

NOTICE | Check the label first

Confirm the model number, part number, voltage, certifications and firmware shown on the product label before installation. Product-specific labels and approved drawings take precedence over the generic illustrations in this guide. If anything on the label does not match what you expected, stop and contact Halogen Systems.

Term used in this guide	What it refers to
D20	Display and controller: power, user interface, analog outputs, relays, data logging and Modbus RTU. Supports one MP sensor, with an optional turbidity sensor.
MP-5F	Free chlorine (FCl) sensor, H2 generation, current production. Bare-electrode amperometric measurement with pH, temperature, conductivity and ORP support. **Formerly designated MP5A.** The sensor is unchanged; only the designation has changed.
Side-stream flow cell	Low-flow sample installation using a flow cell with 3/8 in NPT and 1/4 in tubing connectors. The flow-cell pressure limit is lower than the sensor-body rating.

Safety signal words

These four words appear throughout the guide. Treat them as instructions, not commentary.

Signal word	Meaning
DANGER	A hazardous situation that **will** result in death or serious injury if it is not avoided.
WARNING	A hazardous situation that **could** result in death or serious injury if it is not avoided.
CAUTION	A hazardous situation that **could** result in minor injury or equipment damage if it is not avoided.
NOTICE	Information needed to prevent equipment damage, data loss or an unsuccessful procedure.

What changed in this revision

R1.18 expands Section 5 with illustrated WETTAP, PVCT and flow-cell installation guidance from Halogen Academy. It clarifies upward-flow and downward-flow discharge orientation and adds field checks. The R1.17 relay changes are retained. See Appendix D.

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OVERVIEW AND WORKFLOW

Getting Started

1

1.1 How the installation goes

Four stages. Do not skip ahead: a sensor powered up in a dry or air-locked flow cell will throw errors that look like sensor faults.

PLAN — Utilities, pressure, clearance, drainage — 01

›

MOUNT — D20 enclosure and signal wiring — 02

›

PLUMB — Flow cell, tubing, bubble-free sample — 03

›

COMMISSION — Power up, verify, configure, record — 04

Stage	What you do	Section
1 Plan	Confirm utilities, pressure, drainage, clearances and mounting location.	3
2 Mount the D20	Mount the controller and complete low-voltage signal wiring. A qualified electrician performs mains and relay wiring.	4
3 Plumb the sensor	Install the selected mount, set discharge direction, and flood/vent the cell. For MKIT, connect the bottom inlet and top outlet.	5
4 Commission	Connect the sensor, apply power, verify operation, configure outputs and complete the commissioning record.	6

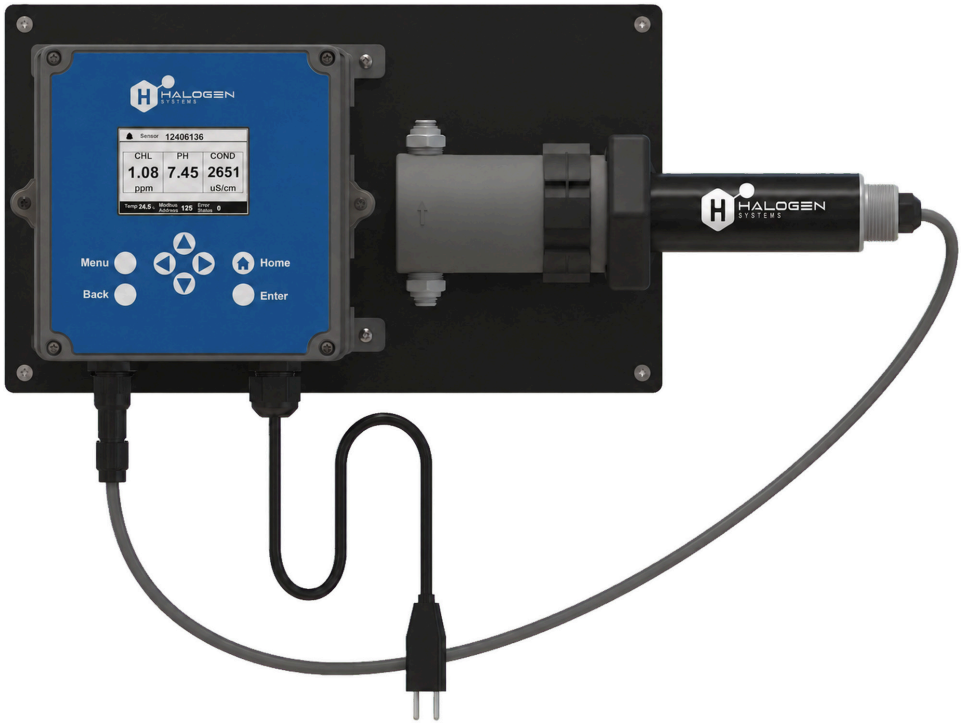


Figure 1. D20 controller and MP-5F flow-cell assembly on the panel-mount kit.

1.2 Controls and menu conventions

Use the arrow keys to move through menus or change a highlighted value. Press **Enter** to accept a selection, **Back** to return to the previous menu and **Home** to return to the measurement screen. Menu names in this guide are printed in the same capitalization used on the D20 screen, like this:

```
MENU > MAINTENANCE > SYSTEM TIME
```

The complete menu structure is on the next page. Use the task finder at the top of it to jump straight to a path without walking the tree.

OPERATOR REFERENCE

D20 Menu Map · MP-5F

Free chlorine · pH · conductivity
temperature · ORP

The D20 detects the connected sensor and shows only the applicable menu options. This map covers current MP-5F and D20 functions only.

Find what you need	Menu path
Calibrate free chlorine	`MENU > FAST CHL CALIBRATION` `MENU > CALIBRATE > CHLORINE`
Set a fixed pH value	`MENU > CONFIGURATION > MEASUREMENT SETTINGS > PH FIXED`
Choose Home-screen readings	`MENU > CONFIGURATION > DISPLAY OPTIONS`
Scale a 4-20 mA output	`MENU > CONFIGURATION > 4-20 mA OUTPUT SETTINGS >` `LOWER LIMIT / UPPER LIMIT`
Assign a measurement to an output	`MENU > CONFIGURATION > 4-20 mA OUTPUT SETTINGS >` `OUTPUT 1-4`
Change the Modbus address	`MENU > CONFIGURATION > MODBUS OPTIONS > CHANGE ADDRESS`
Adjust reading averaging	`MENU > CONFIGURATION > AVERAGING`
Replace the pH sensor	`MENU > MAINTENANCE > REPLACE PH SENSOR`
Clear errors	`MENU > DIAGNOSTICS > CLEAR ERRORS`
Test a 4-20 mA output	`MENU > DIAGNOSTICS > 4-20 mA CALIBRATION / TEST`
Set the time or date	`MENU > MAINTENANCE > SYSTEM TIME >` `TIME (24 HR) / DATE (MM/DD/YY)`
Save the configuration	`MENU > CLOUD DATA > SAVE SETTINGS TO SD CARD`

Top-level menu order

1	2	3	4	5	6	7
FAST CHL CALIBRATION	CALIBRATE	CONFIGURATION	MAINTENANCE	DIAGNOSTICS	CLOUD DATA	CONTROLLER

Keys

Arrow keys	ENTER	BACK	HOME
	Enter	**Back**	**Home**
Move through a menu, or change a highlighted value.	Accept the selection or save the entered value.	Return to the previous menu without saving.	Return to the measurement screen.

Full menu structure

Options shown depend on the connected sensor

1 FAST CHL CALIBRATION

- Quick free-chlorine slope calibration

2 CALIBRATE

Chlorine
- Zero / offset
- Slope — known value
- Delayed calibration

pH
- Zero — pH 7 buffer
- Slope — pH 4 or pH 10 buffer
- Known value

Conductivity
- Zero / offset
- Standard / slope
- Known value

Temperature
- Offset

ORP
- Standard
- Known value

3 CONFIGURATION

Measurement Options
- CHL Configuration
- Modbus Averaging
- Measure pH — on/off
- Measure Conductivity — on/off
- Measure ORP — on/off

Measurement Settings
- pH Fixed — enter compensation value
- Water Type — DW / BW / WW

Display Options
- Displayed parameters, slots 1–4
- One parameter in a larger format
- Conductivity or PSU
- Temperature units and backlight

4-20 mA Output Settings
- Outputs 1–4 — measurement source
- Lower Limit = 4 mA
- Upper Limit = 20 mA

Modbus Options
- Slave Address
- Change Address
- Bus Search
- Modbus Enabled

Averaging
- Chlorine — 1 to 20 measurements
- pH / Cond. / Temp. — 1 to 10 measurements

Restore Defaults
- Restore display and configuration defaults

4 MAINTENANCE

Stop
- Stop measurement before service

System Time
- Time (24 hr)
- Date (MM/DD/YY)

Replace pH Sensor
- Reset pH zero and slope values

Replace Wear Parts
- Reset maintenance hours

After Service
- Restart measurement and confirm readings
- Reset a counter only after the related service is complete

5 DIAGNOSTICS

Logs
- Enable all or default logging
- View the last log
- Erase logs

Clear Errors
- Clear acknowledged controller errors

4-20 mA Calibration / Test
- Hold the output at 4 mA
- Hold the output at 20 mA
- Adjust the 4 mA and 20 mA DAC values

Edit Calibration Values
- pH
- Free chlorine
- Conductivity
- Temperature
- ORP

System Information
- Firmware and bootloader version
- Connected sensor serial numbers

6 CLOUD DATA

Data Logging
- Log frequency
- Event log
- SD card status
- Save settings to SD card

7 CONTROLLER

Control
- PID settings and hysteresis
- Relay 1 — feed chlorine
- Relay 2 — feed acid
- Relay 3 — low alarm
- Relay 4 — high alarm
- Alarm parameter
- Low / high alarm
- No-flow and liquid-low inputs
- Control output source
- Feed time limit
- Feed Acid / Base / Chlorine

Operator Actions
- Hold outputs
- Acknowledge warnings
- Relay test
- Minimum on/off time
- Language
- Timezone

WARNING | Active 4-20 mA outputs

The 4-20 mA outputs are active, current-sourcing outputs and the D20 provides loop power. Connect each output only to a passive 4-20 mA input. Do not connect an external power supply or apply voltage to an analog output terminal. External power may permanently damage the output circuitry and void the warranty.

READ BEFORE UNPACKING

Safety

2

2.1 General requirements

- Read this guide before unpacking, installing, operating or servicing the equipment.
- Use the equipment only for the applications and environmental limits stated in this guide and on the product label.
- Do not use this guide for hazardous-location installation. Use the approved hazardous-location manual and control drawing for that application.
- Provide independent process protection wherever a controller, sensor, output or relay failure could create an unsafe condition.
- Do not modify safety barriers, grounding, enclosure seals or certified components.

DANGER | Electrical hazard

Disconnect all mains, relay and externally supplied circuit power before opening the D20. Lock out the disconnect, verify the absence of voltage, and keep the high-voltage shield installed except during authorized service.

WARNING | Pressure hazard

Close the sample isolation valve, relieve pressure and confirm zero pressure before loosening tubing, the flow-cell collar or the sensor. Direct the outlet to a safe drain.

WARNING | Chemical exposure

Follow the safety data sheet for calibration buffers, DPD reagents, cleaning agents and any diluted acid approved for the flow cell. Wear appropriate eye and skin protection.

2.2 Personal protective equipment

Wear the PPE required by the site procedure for the task at hand. As a minimum, Halogen recommends eye protection for any task that breaks into the sample stream or handles buffers, reagents or cleaning solutions; chemical-resistant gloves when handling those solutions; and lockout/tagout equipment for any task that opens the D20 enclosure.

2.3 Compliance and disposal

The MP-5F is listed to CE, FCC, Intertek ETL, IEC 61010-1, FCC Part 15 Subpart B Class A, ICES-003, EN 61326-1, EN 61000-3-2, EN 61000-3-3 and CISPR 11, and is certified to NSF/ANSI/CAN 61-2024 with PFAS included in the testing. Drinking-water certification applies only to the configurations and wetted components listed on the product certificate and label. Obtain current declarations and certificates from Halogen Systems before including certification language in project submittals.

Do not dispose of electrical or electronic equipment in domestic waste. Follow applicable local requirements or contact Halogen Systems for return and end-of-life instructions.

SITE REQUIREMENTS, CONTENTS, TOOLS

Planning and Unpacking

3

3.1 Site requirements

Requirement	Minimum planning requirement
Power	85–240 VAC, 50/60 Hz for the standard AC D20. Confirm the nameplate before connection.
Disconnect	A readily accessible, labeled disconnect located near the controller.
Clearance	At least 6.3 in (160 mm) for the door to open, plus working clearance for wiring and service.
Mounting	Rigid, upright, level mounting with minimal vibration.
Sample	Potable water, 0.1–1.0 L/min through the side-stream flow cell.
Flow-cell pressure	0.1–4 bar (1–60 psi), including backpressure. Regulate higher supply pressure.
Outlet	Top port to drain or return. Controlled backpressure is permitted; never deadhead the outlet.
Ambient	Within the D20 and sensor environmental limits. Protect from direct weather where required.

3.2 Package contents

Figure 2. Package contents: A, MP-5F sensor; B, D20 controller; C, MKIT flow-cell assembly. Contents vary by order.

A — Sensor package	B — D20 package	C — MKIT package
MP-5F free chlorine sensor	D20 controller	MKIT mounting panel and flow-cell assembly

A — Sensor package	B — D20 package	C — MKIT package
Ordered sensor cable and accessories	Four enclosure mounting tabs	Flow-cell tubing connectors or adapters, when ordered
Order-specific documentation	Signal-cable strain relief and product documentation	Order-specific mounting hardware and accessories

Inspect all components for shipping damage. Record model and serial numbers. Keep the packaging until installation and commissioning are complete. Contact Halogen Systems before proceeding if any item is damaged or missing.

> **NOTICE | Do not use product weights for freight planning**
> Carton count, dimensions and gross weight vary with the ordered configuration, cable length, accessories and quantity. Use the packing list or shipping confirmation for freight planning; the weights in the technical appendices are product weights, not shipping weights.

3.3 Tools and materials

- No. 1 and No. 2 Phillips screwdrivers and a small flat-blade terminal screwdriver.
- Drill, level, anchors and fasteners rated for the wall or panel.
- Eight-conductor 22 AWG cable for the four analog outputs. Verify the cable outside diameter fits the supplied gland.
- 1/4 in OD sample tubing, tubing cutter, isolation valve, pressure regulator and a flow adjustment device as required.
- Calibrated handheld DPD colorimeter, pH reference instrument and fresh calibration buffers.
- Lockout/tagout equipment and site-required personal protective equipment.

MOUNTING, WIRING, OUTPUTS

Install the D20 Controller

4

4.1 Mounting

01 Choose a rigid, vertical mounting surface within reach of the disconnect and the sensor cable.

02 With the cover closed, place the controller face down on a protected surface.

03 Orient the four mounting tabs vertically or horizontally. Reinstall all tab screws and tighten evenly.

04 Level the enclosure and secure all four tabs with fasteners appropriate for the surface.

05 Open and close the cover to verify clearance and confirm that wiring will not be strained.

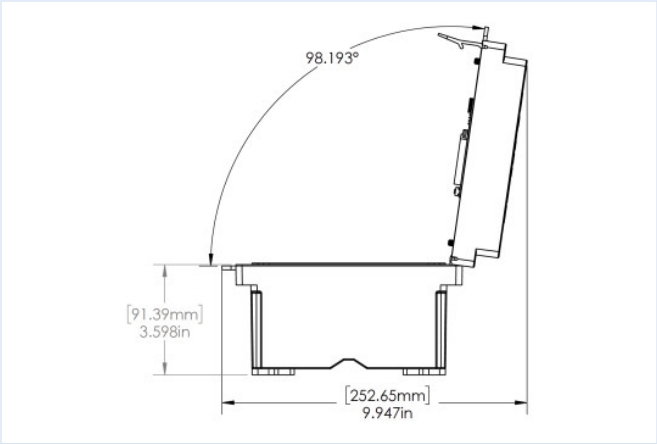


Figure 3. Door-opening clearance.

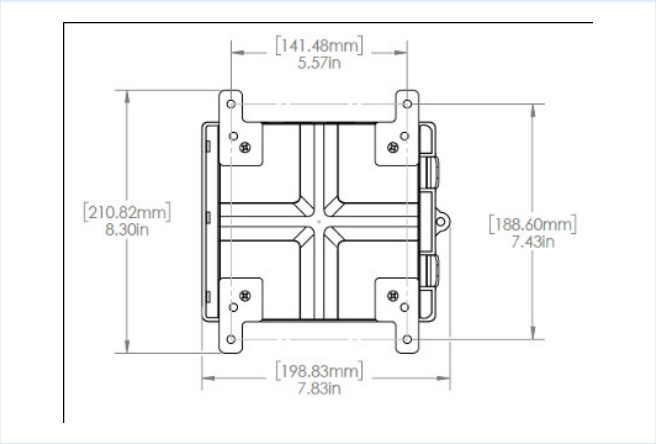


Figure 4. Wall-mount dimensions and alternate tab orientation.

NOTICE | Pole mounting

The optional pole-mount kit fits vertical or horizontal poles of 0.75 to 2.5 in diameter. Use only the Halogen-approved kit and its installation drawing. Do not attach the enclosure to a pole with improvised clamps that can distort the enclosure or defeat the environmental seal.

4.2 Connection overview

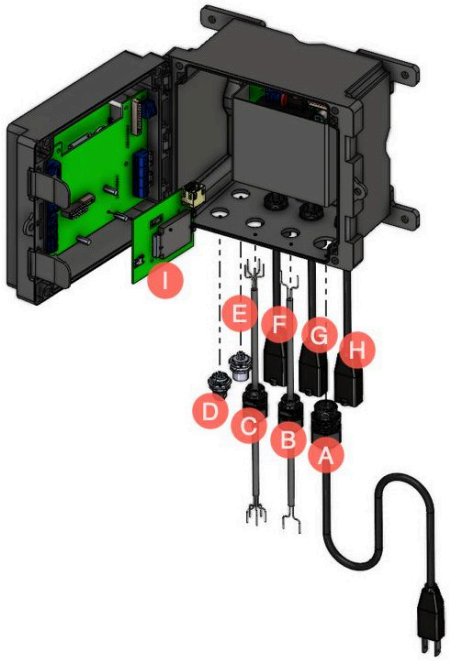


Figure 5. D20 cable-entry and connector locations.

Ref.	Connection	Requirement
A	AC input	AC models only. Standard 120 VAC cord. Field wiring for other approved voltages by a qualified electrician. DC models are powered through the 24VDC In terminal (Section 4.5).
B	Alarm / relay cable	AC models only (D20-H, D20-OTA-H). Four relays: two control and two alarm. Observe relay ratings. DC models have no relay outputs.
C	Liquid / flow input	Optional five-conductor cable.
D	Sensor	M12 four-pin connection for the Halogen sensor.
E	Analog outputs	Eight-conductor cable for four active outputs.
F–H	Controlled AC outputs	AC models only. Optional pump or control outputs. Qualified electrician only.
I	Communications module	Optional add-on, not included with the standard D20. Order separately. BLE or cellular hardware is present only when supplied.

NOTICE | Enclosure rating

Install the correct cable in every gland and keep approved plugs in unused openings. An empty gland or a loose plug defeats the enclosure rating.

4.3 AC power and relay wiring

The AC models, **D20-H** and **D20-OTA-H**, carry a relay board that also holds the power supply converting mains to the controller's internal supply. The DC models, **D20-L** and **D20-OTA-L**, have no relay board: they have no relay outputs, no mains connection and no mains fuse, and are powered through the 24VDC In terminal described in Section 4.5.

> **DANGER | Qualified personnel only**
> Mains and relay wiring must be carried out by a licensed or otherwise qualified electrician, following the controller nameplate, the internal wiring label, the approved control drawing and the local electrical code. The same applies when converting a cord-connected unit to 240 VAC or to conduit entry.

- Provide protective earth and maintain separation between mains, relay and low-voltage circuits.
- Use conductor sizes and temperature ratings suitable for the circuit and the enclosure.
- Do not exceed 5 A resistive or 1 A pilot duty on D20 relay contacts, or the lower rating stated on the product label. Maximum switching power is 1200 VA resistive and 360 VA pilot duty.
- Use 18 to 16 AWG conductors at the relay terminals. AC models have four relays: relay 1 feed chlorine, relay 2 feed acid, relay 3 low alarm, relay 4 high alarm.
- Install the high-voltage shield and close the enclosure before restoring power.

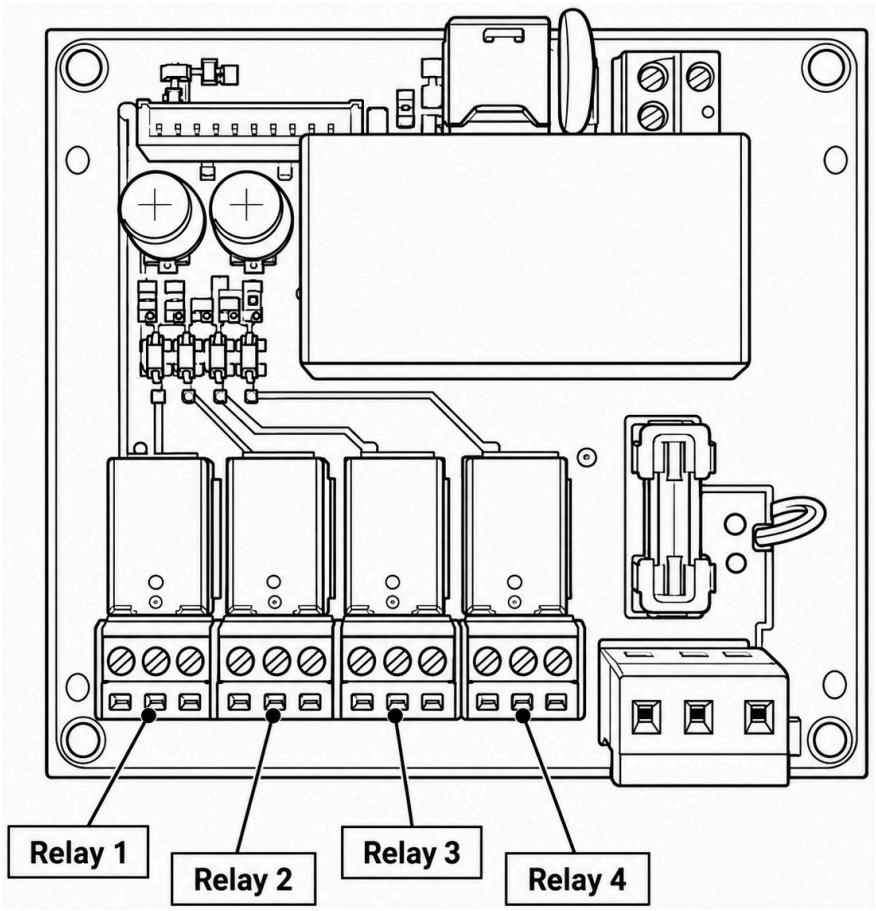


Figure 6. D20 relay and power-supply board, fitted to AC models only. Four relays, each with its own three-position terminal block. Relay numbering runs left to right.

Relay	Function	Type
1	Feed chlorine	Control
2	Feed acid	Control
3	Low alarm	Alarm
4	High alarm	Alarm

4.4 Fail-safe chlorine pump shutoff

On the AC models (D20-H, D20-OTA-H), a single relay can shut the chlorine pump off for two reasons: when chlorine reaches a high limit you choose, and when the D20 loses power. Relay 3 does both. It is held closed while the D20 is powered and chlorine is below the setpoint, so the pump can run. If chlorine reaches the setpoint, or the D20 loses power, the relay drops open and the pump stops. DC models have no relays and cannot provide this shutoff.

Condition	Relay 3 (COM-NO)	Chlorine pump
D20 powered, chlorine below the setpoint	Closed	**Can run**
Chlorine at or above the setpoint	Open	**Stopped**
D20 loses power	Open	**Stopped**

Step 1 — Set the shutoff point

```
MENU > CONTROLLER > ALARM
```

Setting	Value
Parameter	`Chlorine (ppm)`
Low Point	`Your shutoff value, for example 1.50 ppm — Relay 3`

Relay 3 is used because it is energized whenever chlorine is below its Low Point. That is what makes the shutoff fail-safe. Because of this, the D20 shows a low-alarm indication during normal operation; that is expected. Relay 4 is not part of the shutoff and stays available as a separate high alarm.

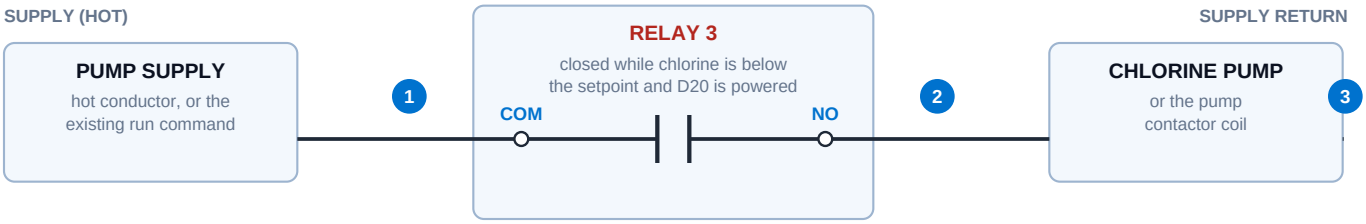
Step 2 — Wire relay 3 into the pump circuit

With all power sources disconnected and locked out, a qualified electrician wires relay 3 in series with the pump, so the pump only receives power while relay 3 is closed:

01 Supply hot conductor, or the existing pump run command, to Relay 3 COM.

02 Relay 3 NO to the chlorine pump, or to the pump contactor coil.

03 Pump neutral, or the other contactor coil connection, to the supply return.



Contact shown de-energized (open). Relay 3 holds the circuit closed only while it is energized; high chlorine or loss of D20 power opens it.
Logical connections only — use the printed terminal labels on the relay board.

Figure 7. Fail-safe chlorine pump shutoff using relay 3. The numbers match the wiring steps.

Pump size	How to wire it
Small chemical feed pump drawing no more than 1 A and 360 VA	Relay 3 can switch the pump directly, as shown in Figure 7.
Any larger pump	Use relay 3 to switch the coil of a contactor or interposing relay rated for the pump. Relay 3 then carries only the coil current.

WARNING | Stay within the relay rating

Do not switch a load larger than 1 A or 360 VA through relay 3 directly; a pump motor is an inductive load. Use the printed terminal labels on the relay board, since Figure 7 shows logical connections rather than screw positions. Keep the neutral and ground connections to the pump direct, and retain all existing interlocks.

Step 3 — Test it before putting it in service

With the pump isolated or running on water, check each of the following:

- Chlorine below the shutoff point: relay 3 is closed and the pump can run.
- Chlorine at or above the shutoff point: relay 3 opens and the pump stops.
- Unplug the D20 or switch it off: the pump stops.
- Restore D20 power: the pump does not run until the D20 has started up and is reading chlorine below the shutoff point.
- Disconnect the sensor: confirm what the pump does. A sensor fault must not allow unintended pumping.

CAUTION | Confirm before relying on it

Confirm on the installed unit that relay 3 energizes below the Low Point, and check how close to the setpoint the relay opens and recloses. If the relay does not open at the shutoff point, or the pump can run with the D20 unpowered, do not place the shutoff in service until the settings or the wiring are corrected.

NOTICE | What the shutoff does not cover

The shutoff acts on the measured chlorine value. A sensor fault that reads low keeps the relay closed, so the shutoff cannot by itself protect against a failed measurement. Keep any existing pump protections in place.

4.5 DC power input (12–24 VDC)

The main board carries a separate two-position terminal marked **24VDC In**. It is the power input on the DC models, D20-L and D20-OTA-L, which have no relay board. Land the supply positive on position 1 and the supply common on position 2. The terminal is at the top right of the board, boxed in red below.

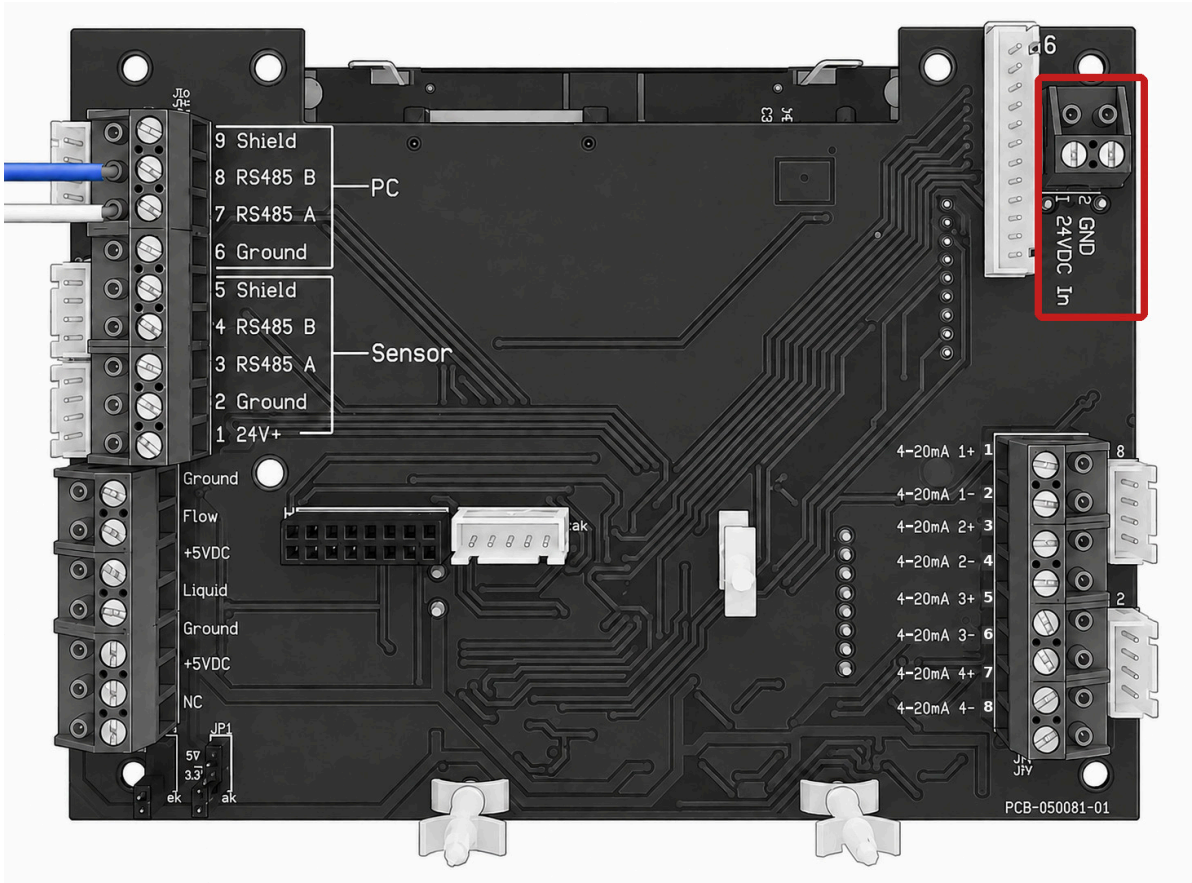


Figure 8. DC power input. The two-position terminal marked 24VDC In is at the top right of the main board: position 1 is the supply positive, position 2 is ground.

Position	Marking	Connect
1	**24VDC**	Supply positive, 12–24 VDC
2	**GND**	Supply common / ground

01 Isolate and lock out every source of power to the controller, including the AC cord or mains connection, and verify the absence of voltage.

02 Confirm the supply output is within 12–24 VDC and is rated for the controller plus the connected sensor load. Appendix A gives 9 W DC with a sensor load and up to 20 W DC at full load; the MP-5F itself draws 100 mA nominal with a 200 mA inrush for 500 ms at startup.

03 Route the DC conductors through their own gland, kept separate from mains and relay wiring.

04 Land the supply positive on position 1 (24VDC) and the supply common on position 2 (GND). Observe polarity.

05 Tighten the terminal screws, dress the conductors clear of the shield, and close the enclosure before applying power.

06 Apply DC power and confirm the D20 completes its startup sequence and finds the sensor.

> **CAUTION | Polarity and source**
> Apply only 12–24 VDC to this terminal, with the correct polarity. Do not apply AC, do not apply mains voltage, and do not connect a DC supply here while the controller is also powered from AC unless Halogen has confirmed that arrangement for your unit. Reverse polarity or an incorrect source may damage the controller.

4.6 Connect the active 4–20 mA outputs

The D20 provides four active, current-sourcing analog outputs. Use eight-conductor 22 AWG cable and keep the analog wiring separated from mains and relay wiring.

> **WARNING | Internally powered analog outputs — connect only to passive inputs**
> **ACTIVE 4–20 mA OUTPUT. LOOP POWER PROVIDED.** The controller supplies all required loop power. Connect each output only to a passive 4–20 mA input. Do not connect an external power supply or apply voltage to any analog output terminal. Connecting a powered or active input, or an external loop supply, may permanently damage the output circuitry. **Damage caused by external power is not covered under warranty.**

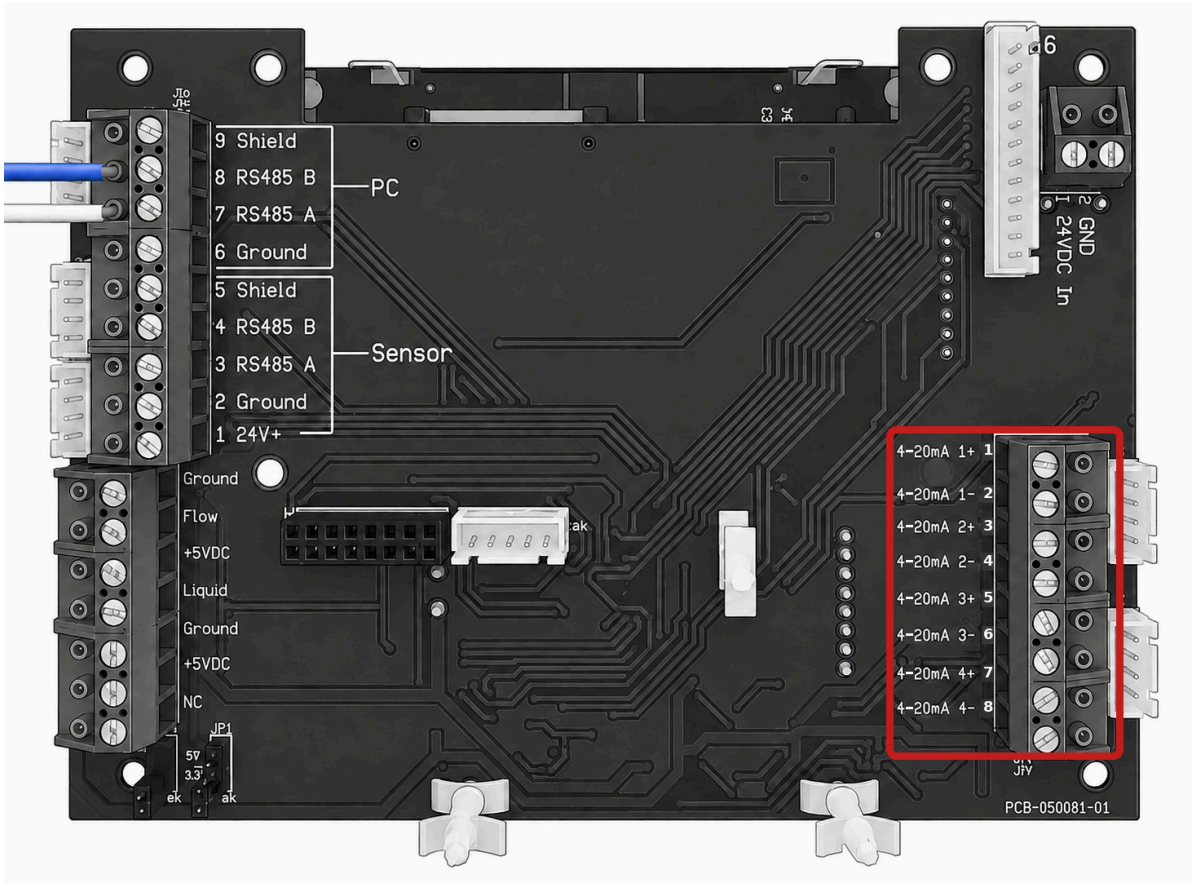


Figure 9. Four-channel analog output terminal block, boxed in red, with board terminals 1 through 8.

Output	Default parameter	Board terminals
1	Free chlorine	**1 (+) / 2 (–)**

Output	Default parameter	Board terminals
2	Conductivity	3 (+) / 4 (–)
3	Temperature	5 (+) / 6 (–)
4	pH	7 (+) / 8 (–)

There are four outputs and five measurements. **ORP has no default output assignment.** To send ORP to the control system, reassign one of the four channels in Section 9.2, or read ORP over Modbus instead.

01 Disconnect power from the D20 and from any connected PLC analog inputs.

02 Route the cable through the correct strain relief and leave service slack without sharp bends.

03 Connect each positive and negative conductor to the labeled terminal.

04 Tighten the strain relief around the cable jacket, reinstall shields and close the enclosure.

05 Restore power, assign each output channel, then confirm 4 mA and 20 mA scaling at the PLC.

4.7 Modbus RTU

The sensor and controller use Modbus RTU over RS-485. The default sensor communication setting is 19,200 baud, 8 data bits, 1 stop bit. Confirm the address under the D20 Modbus menu and ensure that only one device holds each address. Use shielded cable, terminate the bus correctly, and keep the RS-485 wiring separated from mains and relay wiring.

> **NOTICE | Integration data is documented separately**
> Contact Halogen Systems at tech@halogensys.com for the Modbus integration documentation that applies to the sensor and firmware supplied, and record which document you used in the commissioning record.

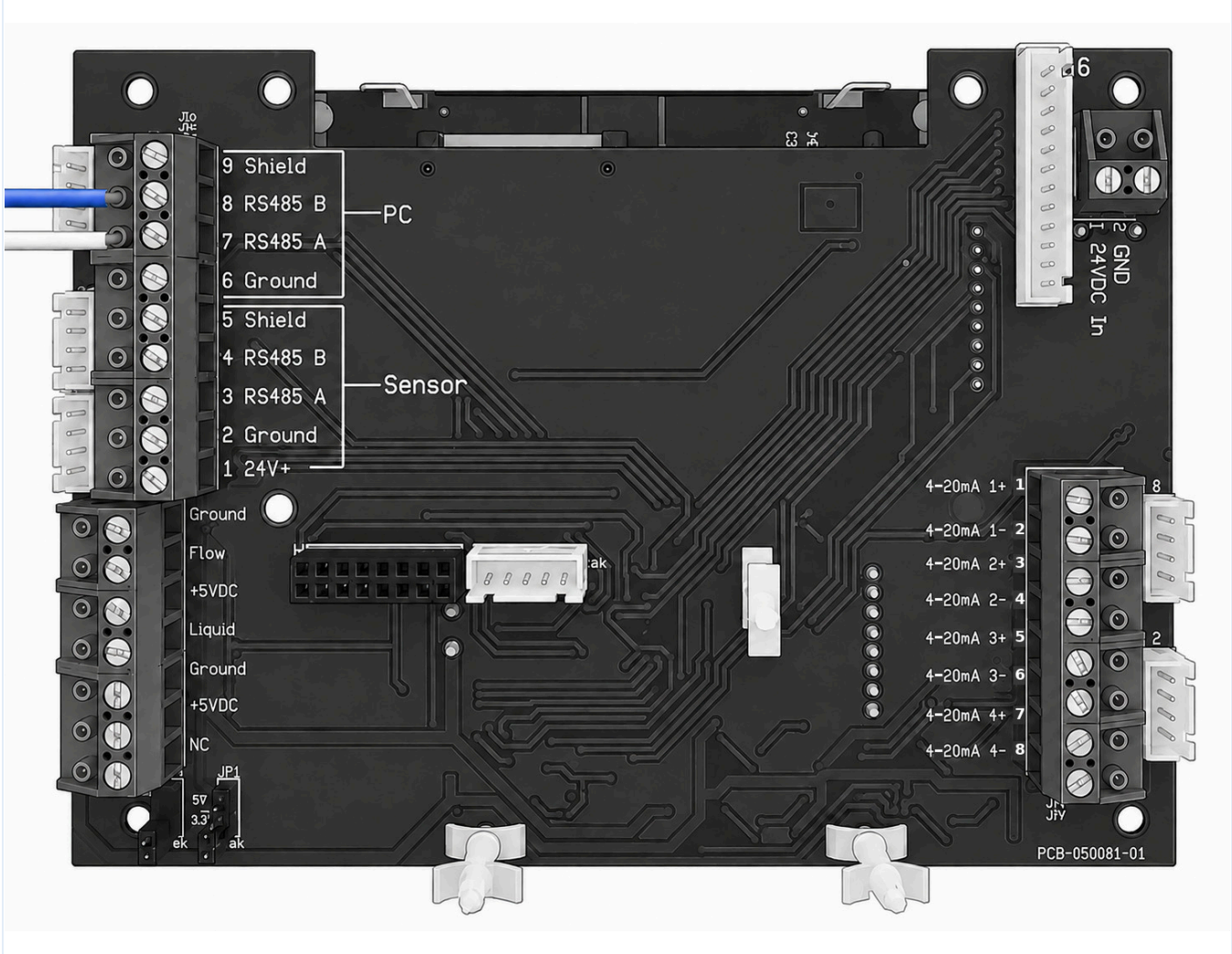


Figure 10. D20 main board. Pins 7 and 8 are the Modbus RTU RS-485 connection: pin 7 is the A channel and pin 8 is the B channel. Pins 1-5 serve the sensor bus.

Pin	Bus	Signal
9	Modbus RTU RS-485	**`Shield`**
8	Modbus RTU RS-485	**`RS485 B (B channel)`**
7	Modbus RTU RS-485	**`RS485 A (A channel)`**
6	Modbus RTU RS-485	**`Ground`**
5	Sensor bus	**`Shield`**
4	Sensor bus	**`RS485 B`**
3	Sensor bus	**`RS485 A`**
2	Sensor bus	**`Ground`**
1	Sensor bus	**`24V+`**

CAUTION | Two RS-485 buses on one terminal block

Pins 1-5 serve the sensor and pins 6-9 are the Modbus RTU RS-485 connection. Landing a PLC or gateway on the sensor pins will disrupt sensor communication. Confirm the pin numbers on the board before terminating.

Terminate the Modbus RTU RS-485 host connection on pins 7 and 8: **pin 7 is the A channel** and **pin 8 is the B channel**. In the wiring shown, the white conductor lands on pin 7 and the blue conductor on pin 8. Confirm the conductor colors of the cable actually supplied; color conventions vary between cable manufacturers and are not a substitute for the pin numbers.

FOUR CONFIGURATIONS / ONE AIR-RELEASE PRINCIPLE

Mounting Options and Installation

5.1 Choose the mounting configuration

Select the mount for the process, operating pressure and future service needs. Confirm the exact sensor, kit, fittings and approved assembly drawing. The lowest-rated component governs the complete installation.

Mount / part number	Published limit	Use and service requirement
WETTAP with remover D-H2WT-P	145 psi	Direct inline measurement where the main must remain in service. Use the compatible rated valve and insertion/removal system.
Side-stream flow cell MKIT-1002	60 psi	Accessible wall-mounted sample loop. Verify the supply, pressure control, outlet and return conditions.
PVC tee / PVCT D-H2MF-P	145 psi	Direct inline measurement where the sensor section can be isolated and depressurized for installation and removal.
Immersion D-H2LF-P	See Section 5.7	Open tank, basin or clearwell. Keep the cell below the lowest operating water level and allow retrieval.

5.2 Keep the cell flooded and give air an exit

A full pipe does not prove the sensing cell is free of air. Keep the electrodes wetted, provide an air-release path and verify internal impeller circulation. Low or zero external flow does not permit a dry cell or a stopped impeller.

> **Choose orientation from the actual flow direction**
> Upward process flow: discharge upward with the flow. Downward process flow in the WETTAP configuration: discharge sideways, perpendicular to flow. These are different installation cases with the same purpose: let water and air leave the sensing cell. See the illustrated guide on the next page.

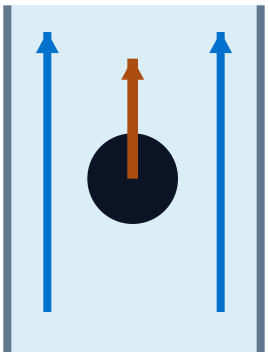
Prefer an upward-flowing location when the pipe arrangement allows it. Provide safe isolation and service clearance. Where draining or siphoning is possible, use a suitable flooded low point or trapped arrangement; verify that it stays full under actual operating conditions.

INSTALLATION / FLOODING / AIR RELEASE

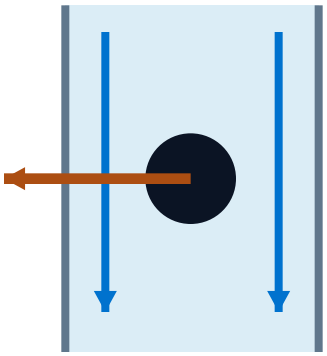
Discharge Direction Follows the Flow Case

Mounting position is where and at what angle the sensor enters the pipe. **Discharge orientation** is the direction of the outlet/ejection port at the sensing end. Rotating the outlet is a separate check; perpendicular discharge does not mean changing the sensor insertion axis.

UPFLOW: discharge up



DOWNFLOW: discharge left



DOWNFLOW: discharge right

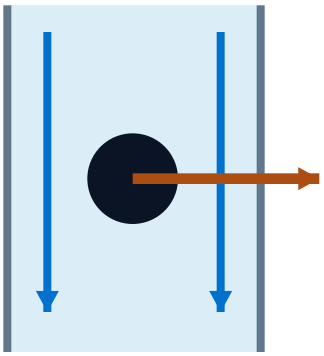


Figure 11A. Front views toward the sensor face. Blue arrows: process water. Orange arrows: sensor discharge. Drawings show direction only, not insertion depth or hardware.

Process condition	Required discharge direction	Reason
Vertical pipe, upward flow	Straight up, in the same direction as the water.	Buoyant bubbles rise with the process stream and leave the sensing cell.
Vertical pipe, downward flow WETTAP downflow case	Left or right, perpendicular to the downward process flow.	A sideways outlet lets air and water leave the cavity; the process stream carries the released bubbles away.
Horizontal pipe WETTAP case	Downstream, with the upward outlet orientation in the assembly drawing.	Check both downstream direction and upward elevation; a top view alone cannot show both.
MKIT flow cell	Sample enters the bottom port and leaves the top port.	Upward flow through the cell purges startup air. These plumbing ports are distinct from the sensor discharge port.

Why downflow is different: an upward-facing outlet opposes the downward main flow. A downward-facing outlet can leave buoyant bubbles at the top of the cavity because internal discharge velocity may not force them down and out. A sideways outlet provides the escape path for this case.

INSTALLATION / FLOODING / AIR RELEASE

Side-stream Flow Cell (MKIT)

5.3 Install for bottom-to-top sample flow

Mount the panel securely with access to the sensor, collar, tubing and isolation valve. Feed a representative sample into the **bottom port**; route the **top-port outlet** to an approved drain or suitable process return. This upward path allows startup air to rise out of the chamber.

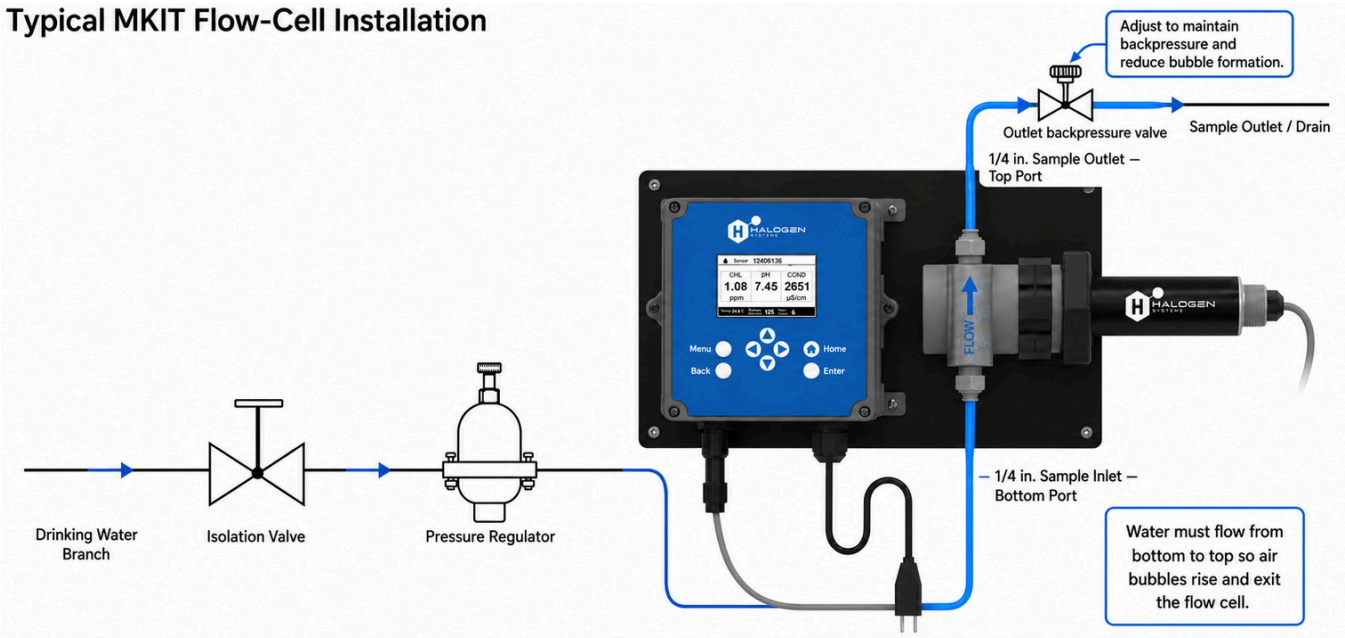


Figure 11. MKIT with an adjustable valve on the top-port outlet tubing. The downstream restriction maintains backpressure in the flow cell to reduce bubble formation.

Item	Installation requirement
Tubing / connectors	1/4 in OD tubing at the supplied flow-cell connectors.
Sample flow	0.1-1.0 L/min through the side-stream cell.
Flow-cell pressure	0.1-4 bar (1-60 psi), including downstream backpressure.
Sensor-body rating	-0.7 to 10 bar (-10 to 145 psi); this does not increase the flow-cell limit.
Sample quality	Keep tubing practical in length; long sample runs delay response. Confirm the sample reaches and exchanges through the cell.

Adjust the outlet valve after filling and venting the cell. Maintain 0.1-1.0 L/min and keep flow-cell pressure within 60 psi, including backpressure; never deadhead the outlet. A process return must also satisfy the applicable drinking-water and hydraulic requirements.

INSTALLATION / FLOODING / AIR RELEASE

Mount, Plumb and Vent the Flow Cell

5.4 Installation sequence

01 Close and lock the sample isolation valve. Relieve pressure and confirm zero pressure at the installation point.

02 Secure the MKIT panel to a rigid surface. Leave clearance to withdraw the sensor and service the connections.

03 Install pressure control if the source can exceed 4 bar (60 psi). Provide a means to adjust and verify sample flow. Check the return pressure as part of the same system.

04 Cut the 1/4 in OD tubing square. Connect the regulated sample line to the bottom port and the outlet line to the top port; fully seat both tubes.

05 Route and secure the outlet tubing to the approved drain or return. Prevent kinks, whipping and trip hazards.

06 Insert the sensor fully. Hand-tighten the collar until seated; do not use tools on the collar.

07 Open the sample valve slowly, adjust flow to 0.1-1.0 L/min and inspect every connection for leaks.

08 Fill and purge the cell with bottom-to-top flow before applying power. Verify that air clears and the sample continues through the outlet.

> **NOTICE | Pressure is an assembly limit**
> Never connect an 85-90 psi source directly to the MKIT based on the sensor body's 145 psi rating. Verify that the complete flow cell remains within 60 psi, including return pressure. Do not deadhead the outlet or create pressure impulses.

Controlled backpressure

Stable downstream backpressure can reduce bubble formation by keeping dissolved gases in solution. Set a controlled restriction or suitable pressurized return only after the chamber is full and flowing. Confirm both pressure and sample flow; adding a return line or throttling an outlet does not automatically create an acceptable installation.

Before accepting readings: confirm a flooded, air-free cell and functioning impeller. Investigate Error 31 or persistent air before calibration. Recheck after draining, refilling or servicing the sample path.

INSTALLATION / FLOODING / AIR RELEASE

PVC Tee / PVCT: Direct Inline Installation

5.5 D-H2MF-P pipe installation

Use PVCT where the sensor section can be isolated, depressurized and drained for installation and later removal. A bypass can keep the main in service while the sensor section is isolated. PVCT is not a live-line insertion/removal assembly.

Figure 12. Sensor in PVC tee.

Figure 13. Upward-flowing field installation.

Plan the location and fittings

Prefer the upward-flowing riser in a raised loop. In the P-trap shown on the following pages, the lower horizontal position and upward riser are preferred. Keep the cell flooded, provide isolation and leave withdrawal clearance. Check every fitting's pressure and temperature rating.

Check tee and adapter sizes separately. The sensor adapter has a 2 in connection; that does not establish the tee's main-run size. Confirm the supplied drawing before ordering fittings. The guide cites installations using a 3 in tee.

01 Isolate and drain the sensor section; confirm zero pressure.

02 Solvent-weld the supplied adapter into the tee branch using the cement manufacturer's procedure. Allow the full cure time before pressurizing.

03 Check that the O-rings are present, undamaged and lightly lubricated with compatible silicone grease.

04 Pass the sensor through the collar and seat its flange in the adapter. Set discharge orientation for the flow case and supplied assembly drawing; hand-tighten the collar.

05 Restore flow slowly, clear trapped air and inspect for leaks. Confirm a full sensing chamber before applying power.

INSTALLATION / FLOODING / AIR RELEASE

PVCT Location: Raised Pipe Loop

Follow the complete flow path

Water enters from the left, rises, crosses the top, descends the right leg and exits to the right. The letters show **alternative locations for one sensor**, not a requirement to fit three sensors.

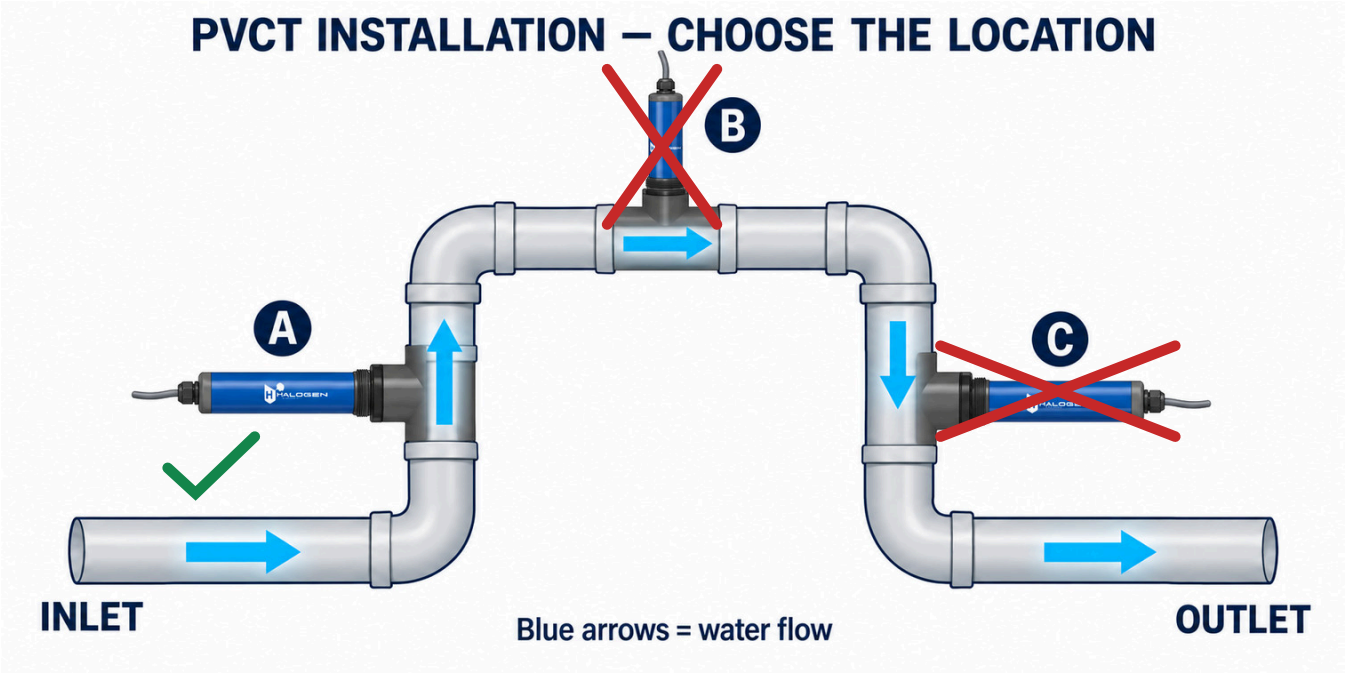


Figure 12A. Install at A, the upward-flowing riser (green check). The unsuitable alternatives B and C are crossed out in red. Blue arrows show process flow.

Position	Installation decision	Why
A - upward riser	Preferred location for this arrangement.	Water and rising bubbles travel upward together past the sensor.
B - top section	Avoid the illustrated high point.	Air can accumulate at the top of the raised loop.
C - downward leg	Not the selected PVCT location in this arrangement.	Downward water opposes the natural rise of bubbles, allowing air to gather near the sensor.

The WETTAP downflow discharge rule explains how to orient an outlet when that flow case is used. It does not make every downward-flowing PVCT location preferable to an available upward riser. Location selection and outlet direction are separate decisions.

INSTALLATION / FLOODING / AIR RELEASE

PVCT Location: Flooded P-trap

A low horizontal section differs from a high point

Here water enters from the left, travels down the left leg, across the lower horizontal run, up the right riser and out to the right. Use the complete flow path to judge whether air can continue past the sensor.

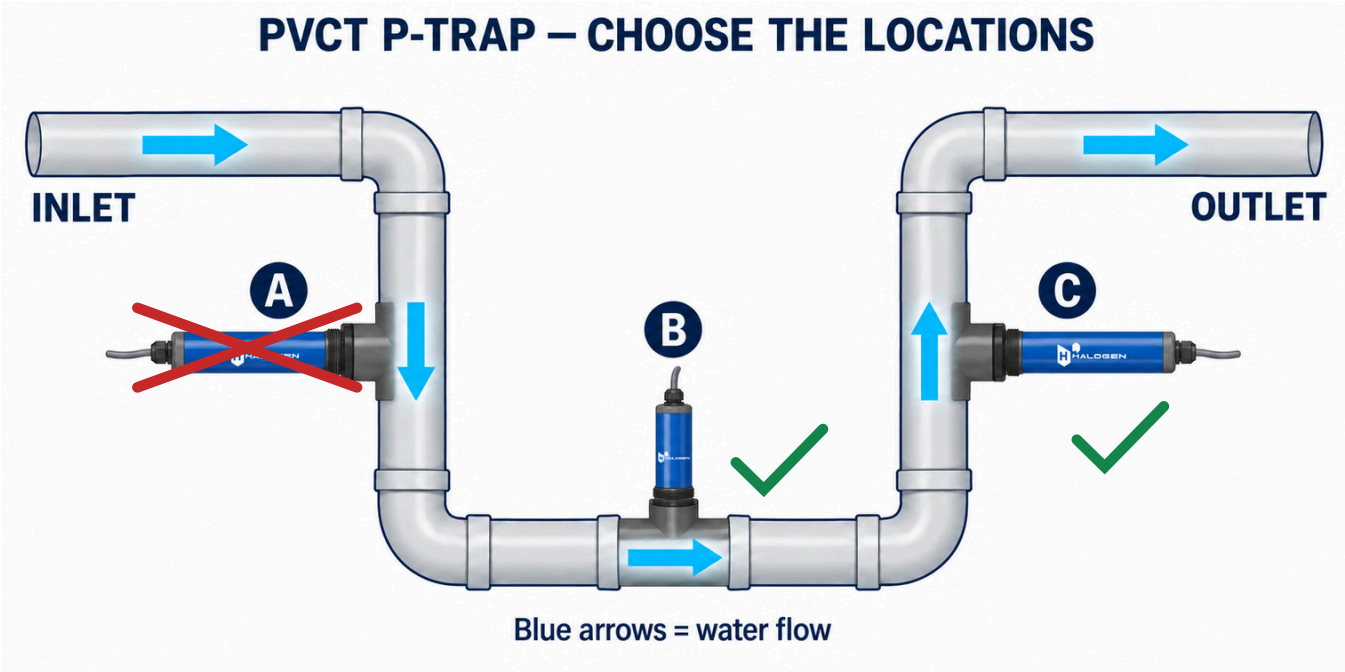


Figure 12B. Install at B or C (green checks). The unsuitable downward-leg location A is crossed out in red. Blue arrows show process flow.

Position	Installation decision	Why
A - downward leg	Avoid this location in the illustrated P-trap.	Air may gather near the sensor and the turn into downward flow.
B - lower horizontal run	Preferred: sensor points straight up from the lower pipe, as shown.	Bubbles can continue through the pipe and past the sensor; this is a flooded low section.
C - upward riser	Preferred.	Upward flow carries rising bubbles along the pipe.

Do not transfer the WETTAP horizontal-pipe mounting-position exercise to this PVCT geometry. Follow the mounting arrangement shown for the specific configuration. Verify flooding when flow stops and provide isolation for safe removal.

INSTALLATION / FLOODING / AIR RELEASE

WETTAP: Hardware, Reach and Safe Service

5.6 D-H2WT-P with rated remover assembly

Use a compatible WETTAP assembly where the line must remain pressurized during insertion and removal. Confirm the complete assembly rating, specified corporation stop, saddle, sensor extension and service access. The published sensor/mount pressure limit is 145 psi.

> **DANGER | Live pressurized insertion**
> Only personnel trained in the specified WETTAP procedure may perform this work. Incorrect retention can eject the sensor under pressure. Fit and use the retaining rods, nuts and locking cap nut exactly as specified in the kit's installation/removal procedure.

Figure 14. Remover, corporation stop and saddle.

Figure 15. Field installation on a main.

Figure 16. Withdrawal using the remover tool.

Check	Requirement retained from the product guide
Pipe / insertion	Straight pipe length at least 1.5 pipe diameters. Sensor tip protrudes at least 30 mm past the inner pipe wall.
Service clearance	Allow 401 mm (15.8 in) along the sensor axis for withdrawal; verify access for the actual remover.
Valve / threads	Recommended corporation stop: male-by-male. KITS-WT10: 2 in female NPT. KITS-WT20: female Rc 2 BSPT. Corporation stop and saddle supplied by others.

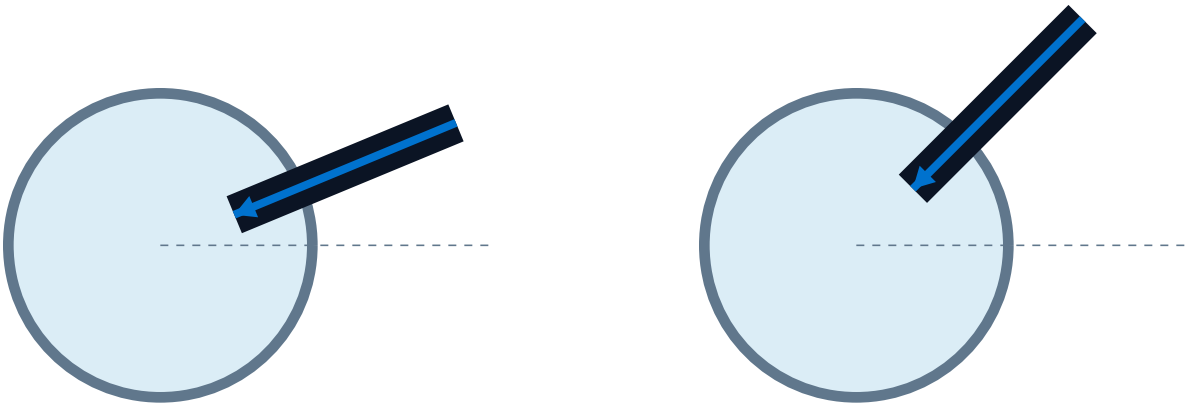
Use the separate WETTAP manual for the exact insertion, retention, isolation and removal sequence. The following pages show correct installation arrangements and flow-dependent orientation guidance; they do not replace the pressure-handling sequence.

INSTALLATION / FLOODING / AIR RELEASE

WETTAP: Horizontal Pipe

Check mounting position first

For the horizontal-pipe training configuration, use **22.5° or 45° above the horizontal side**. The sensor enters from the upper side and points inward and downward. The top, horizontal side and bottom positions are not accepted positions in this illustrated configuration.



22.5° above the side **45° above the side**

Figure 14A. End views adapted from the site training component. Process water travels into or out of the page. The blue arrows indicate sensor insertion direction, not process flow. Angles are measured upward from the horizontal side.

Then check discharge direction

Face the discharge downstream and retain the upward outlet orientation required by the assembly drawing. For left-to-right process flow, downstream is right. Neither an upstream outlet nor a sideways outlet satisfies this horizontal-flow case.

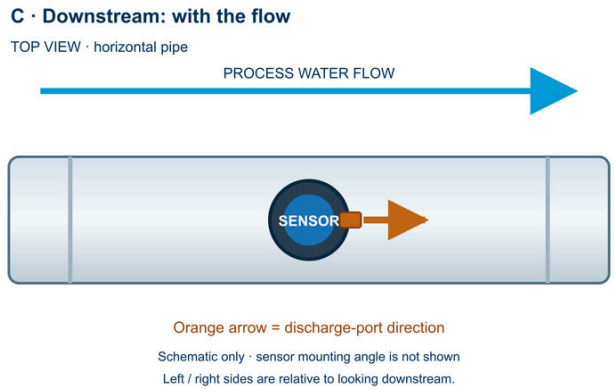


Figure 14B. Correct downstream discharge in the training top view. Orange indicates discharge direction. The drawing does not show mounting elevation; check Figure 14A and the exact assembly drawing separately.

Two independent checks: correct mounting angle does not prove correct discharge direction. Verify both before tightening and commissioning.

INSTALLATION / FLOODING / AIR RELEASE

WETTAP: Vertical Upflow and Downflow

Upward-flowing riser: discharge straight up

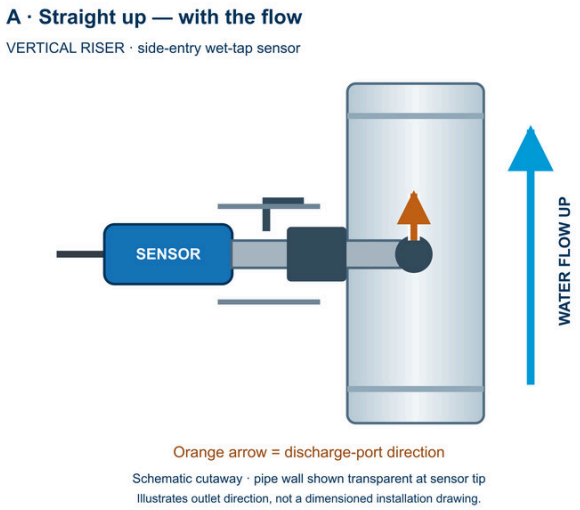
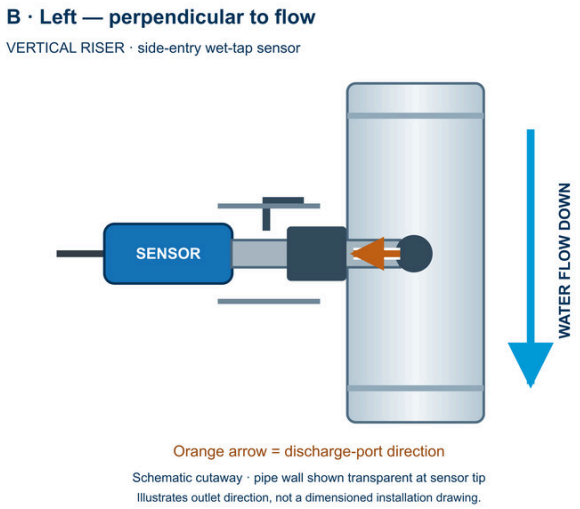


Figure 14C. Preferred upward-flow case. The discharge points upward, in the same direction as process water. Rising bubbles can leave the sensing cavity with the flow.

The blue arrow shows process flow; the orange arrow shows the discharge. The sensor enters from the side. Do not confuse that side entry with the outlet direction.

Downward-flowing vertical pipe: discharge sideways



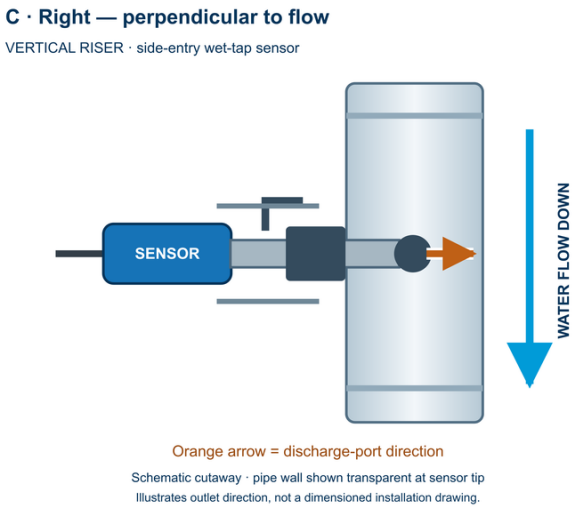


Figure 14D. Either sideways outlet is acceptable for the WETTAP downflow scenario. The discharge port is perpendicular to the downward main flow. Blue arrows: process flow; orange arrows: discharge.

An upward outlet must oppose the downward stream; a downward outlet can leave buoyant air trapped at the top of the cell. Sideways discharge allows water and air to leave the cavity, after which the process stream carries bubbles away. The upflow and downflow rules serve the same air-release purpose.

INSTALLATION / FLOODING / AIR RELEASE

WETTAP: Correct Installation Examples

These field examples show the recommended corporation-stop arrangement. Use the complete assembly drawing to confirm the valve, sensor extension, installed tip position and service clearance for the actual site.

Figure 15A. Recommended valve arrangement.
Confirm the corporation stop and complete insertion path against the supplied assembly drawing.

Figure 15B. Correct field installation.
Verify mounting position, sensor reach and discharge direction for the actual process-flow case.

Confirm valve, extension and service access

Use the specified corporation stop between the main pipe and the WETTAP assembly. Match the sensor extension to the complete installed length so that the tip reaches its required position. Confirm compatibility whenever the valve, nipples or other fittings change.

> **Verify the completed assembly**
> Check the pressure rating, insertion depth, retention hardware and full withdrawal clearance. Set the discharge direction for the actual flow case and confirm that the cell remains flooded and can release air.

INSTALLATION / FLOODING / AIR RELEASE

WETTAP: Final Installation Review

Confirm the installation before commissioning

Check	Correct installation condition
Mounting position	Horizontal pipe: upper-side mounting at the specified angle. Vertical pipe: use the arrangement shown for the actual flow case.
Discharge direction	Upflow: upward with the flow. Downflow: sideways, perpendicular to flow. Horizontal flow: downstream with the required upward outlet orientation.
Valve and extension	Specified corporation stop and compatible extension; sensor tip reaches its required installed position.
Safe service	Rated assembly, specified retention hardware and clearance for the complete insertion/removal travel.
Water and air	Flooded sensing cell, clear air-release path and functioning internal impeller.

Choose a representative measurement location

Dosing pumps can introduce concentrated slugs before complete mixing. Review mixing, dosing pulses and sample transport if readings oscillate. Where needed, use a suitably designed upstream mixer or a location farther downstream that is verified to be well mixed. There is no universal spacing distance. Outlet rotation alone does not mix the main pipe.

> **Before accepting the reading**
> Confirm the mount, valve, extension, pressure rating, discharge direction and service clearance. Flood the cell, release air and verify internal circulation. After reimmersion, allow stabilization and at least 20 minutes in process water before calibration. Investigate air alarms first. Record the flow case, outlet direction and commissioning observations.

Recheck these conditions after draining, refilling, changing the mounting or servicing the impeller. Continue with immersion and sensor connection in Sections 5.7-5.8, then the startup procedure in Section 6.

5.7 Immersion (D-H2LF-P)

Immersion mounting suspends the sensor directly in an open tank, clearwell, basin or channel. There is no pipe connection and no minimum flow: the sensor works at zero flow because it generates its own sample movement. Depth is adjustable to suit a varying water level.

Figure 17. Immersion sensor on a rail mount, set to the 22° working angle.

Figure 18. Lifting eye and carabiners at the sensor head.

> **CAUTION | Mount the sensor at 22°, not vertical**
> The immersion sensor must hang at **22°**, as shown in Figure 17. A sensor hung straight down traps air against the sensor end and at the electrode face, where it will not clear. The angled mount lets air escape and keeps the measuring chamber flooded.

Installation

01 Choose a location in moving, representative water, clear of walls, inlets, aerated zones and anywhere air is entrained.

02 Assemble the rail or boom mount and clamp it to the structure. Confirm the assembly holds the sensor at 22°.

03 Fit the lifting eye and carabiners at the sensor head. Support the sensor weight on the lifting assembly, never on the sensor cable.

04 Set the depth so the sensor stays fully submerged at the lowest expected water level, and remains accessible for service at the highest.

05 Lower the sensor, then confirm no air remains trapped at the sensor end. Tilt or raise and lower the sensor once to release any air.

06 Secure and strain-relieve the cable so the sensor cannot swing, chafe or be lifted by water movement.

> **NOTICE | Immersion depth**
> The MP-5F is rated to 30 ft immersion depth. Do not exceed it. Confirm the depth rating of the mounting hardware separately.

5.8 Connect the sensor

01 Verify that the sensor is flooded and that no air remains around the sensor end. On a flow-cell installation, confirm flow through the cell first.

02 Remove the protective cap from the D20 sensor connector and retain it for future service.

03 Align the M12 connector, hand-tighten it, and route the cable without tension or sharp bends.

04 Keep the cable away from mains wiring, relay wiring, hot surfaces and moving equipment.

FIRST POWER-UP AND ACCEPTANCE

Startup and Commissioning

6

6.1 Power-up sequence

01 Confirm the D20 cover is closed, sample flow is established and all outlet tubing is secure.

02 Apply power at the disconnect, or plug the approved power cord into a grounded receptacle.

03 Observe the D20 startup, sensor search and sensor-found messages.

04 Confirm the impeller starts and a steady stream exits the sensor outlet port.

05 Check the measurement screen for free chlorine, pH, temperature, conductivity and ORP values.

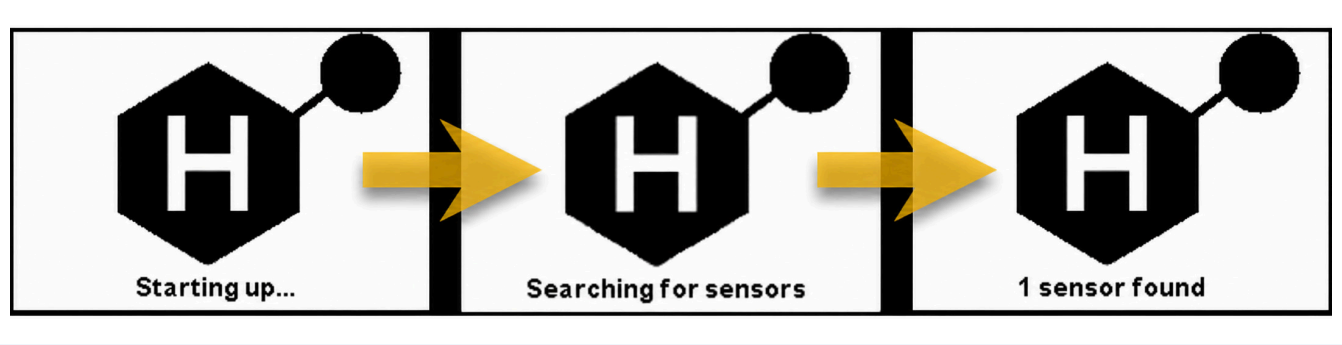


Figure 19. D20 startup sequence with one sensor found.

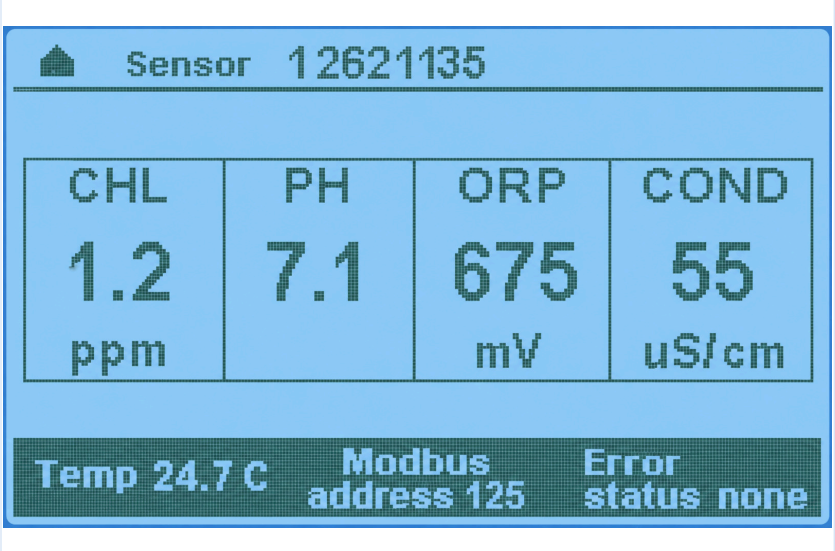


Figure 20. D20 home screen.

NOTICE | Give it time to stabilize

The pH display may begin stabilizing within about 5 minutes after wetting. Wait at least 20 minutes with stable flow before making any commissioning calibration decision.

6.2 Commissioning acceptance checks

Check	Acceptance criterion
Leaks	No visible leakage at tubing, flow-cell fittings, collar, cable entries or enclosure.
Flow	MKIT: 0.1-1.0 L/min. All mounts: flooded, air-free cell and correct orientation.
Sensor	Detected by the D20; impeller operating; no active Level 2 error.
pH	Compared with a calibrated reference. Calibrate pH before chlorine if adjustment is needed.
Chlorine	Compared with a fresh DPD reference sample collected at the sensor outlet.
Outputs	Each channel assigned, scaled and verified at the PLC.
Time	Date and time correct, so SD-card records are usable.
Records	Model, serial number, firmware, reference results, calibration changes and installer recorded.

6.3 Set system time

MENU > MAINTENANCE > SYSTEM TIME > TIME (24 HR) / DATE (MM/DD/YY)

01 Use the left and right arrows to move between digits.

02 Use the up and down arrows to change the highlighted value.

03 Press Enter, then select SAVE NOW.

04 Return to the Home screen and verify the displayed date and time.

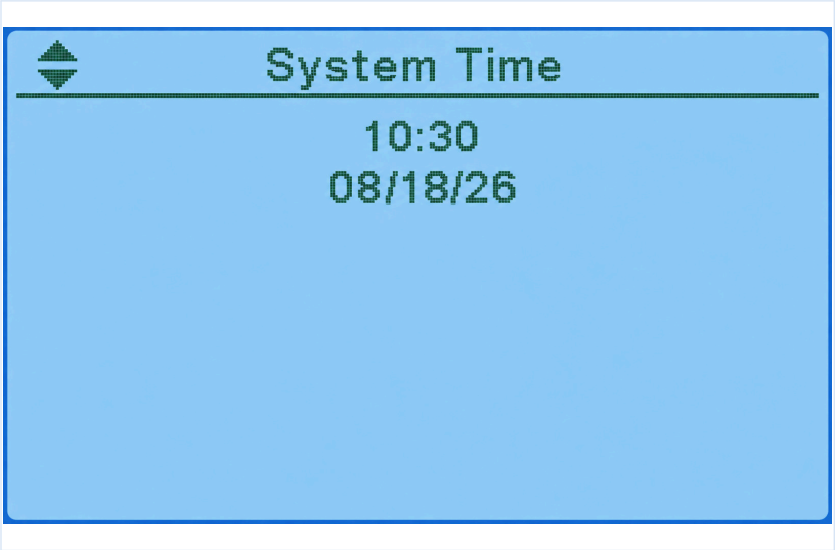


Figure 21. System time screen.

READING THE SCREEN

Normal Operation

7

7.1 Measurement screen

The Home screen displays free chlorine and the enabled reference measurements. A stable value does not by itself prove accuracy. Confirm performance against the site reference method at the interval required by the operating procedure.

Indication	Meaning	Operator action
Normal values	Sensor is measuring and no active fault is stopping the cycle.	Review trends and complete routine reference checks.
! warning	A calibration, tolerance or maintenance condition needs attention.	Press the down arrow, read the warning and correct the cause.
Level 1 error	Accuracy or measurement quality may be affected.	Correct promptly. The measurement cycle can continue.
Level 2 error	The fault stops the cycle or makes the measurement invalid.	Correct before using the measurement for control. Fault output may be 3.8 mA or lower.
Sensor not found	The D20 cannot communicate with the sensor.	Check the M12 connection, address, power and cable condition.

7.2 Stop and restart

Use the Maintenance menu **Stop** function before removing the sensor from service, where the firmware provides that option. A Stop command is not electrical or pressure isolation: close the sample valve, relieve pressure and disconnect power before any physical service. Use **Restart System** after maintenance, or when an error procedure directs you to.

REFERENCE PRACTICE AND PROCEDURES

Calibration 8

8.1 Order of work and reference practice

- Allow at least 20 minutes of stable operation before commissioning calibration.
- Calibrate pH before free chlorine when both require adjustment.
- Collect the reference sample as close as possible to the sensor outlet and test it immediately.
- Use a calibrated reference instrument and fresh reagents or buffers within their expiration dates.
- Record the before value, reference value, applied calibration, date, operator and lot numbers.
- Do not calibrate through an active air, motor, communication or temperature-sensor error.

8.2 Free chlorine reference calibration

01 Verify stable flow, no visible air and no active error affecting the measurement.

02 Rinse the sample container with process water, then collect a fresh sample at the sensor outlet.

03 Immediately measure the sample using the approved DPD reference method.

04 On the D20, open MENU > CALIBRATE > CHLORINE and select the known-value reference calibration.

05 Enter the DPD result and press Enter to save.

06 Allow two complete measurement cycles, collect a second reference sample and verify the result.

07 If the result remains outside the published accuracy of ±5% of the calibrated reference or 0.06 ppm, whichever is greater, restore factory calibrations and troubleshoot before repeating calibration.

NOTICE | Chlorine zero

Perform a chlorine-zero calibration only with confirmed chlorine-free water and an approved site procedure. Chlorine remaining in the water can create a Chlorine Zero warning and inaccurate low-range readings.

8.3 Reference measurement calibrations

Measurement	Procedure
Conductivity	MENU > CALIBRATE > COND. Enter the known conductivity value and press Enter.
ORP	MENU > CALIBRATE > ORP. Enter the known ORP value and press Enter.
Temperature	MENU > CALIBRATE > TEMP. Enter the traceable reference temperature and press Enter.
Single-point pH	MENU > CALIBRATE > pH > SINGLE POINT. Enter the known value and press Enter.
Two-point pH	Use fresh pH 7 and pH 10 buffers. The D20 auto-detects the calibration buffer. Rinse between buffers, allow the reading to stabilize and complete both prompted buffer steps.

NOTICE | Buffer handling

Do not pour used buffer back into its container. Rinse the sensor between buffers and prevent cross-contamination.

8.4 Fixed pH

Use Fixed pH only when the source pH is stable and the site operating procedure permits it.

MENU > CONFIGURATION > MEASUREMENT SETTINGS > pH FIXED

01 Press MENU and select CONFIGURATION.

02 Select MEASUREMENT SETTINGS, then pH FIXED.

03 Enter the pH value to be used for chlorine compensation, then press Enter to save.

CAUTION | What Fixed pH actually does

While Fixed pH is active the sensor stops measuring actual pH and uses the entered value for chlorine compensation. It cannot compensate for real changes in water pH, so chlorine accuracy can drift if the source pH is not stable. Record the fixed value and the reason for using it.

NOTICE | Confirm why pH is fixed

Determine whether Fixed pH was selected deliberately or because the pH probe was disabled after an error. If an error caused the change, troubleshoot the pH measurement and restore live pH operation instead of treating Fixed pH as the intended configuration.

8.5 Restore factory calibrations

01 Open MENU > CALIBRATE > CALIBRATION DEFAULTS.

02 Confirm the command. The sensor will restart.

03 Allow the sensor to stabilize, confirm reference measurements, then repeat only the calibrations required by the site procedure.

OPTIONS, OUTPUTS, MODBUS, AVERAGING

Configuration

9

9.1 Measurement and display options

MEAS OPTIONS carries five settings. Use the arrow keys to select an option and press Enter to toggle it. **X** = enabled, **–** = disabled. Display preferences such as temperature units, backlight and Home-screen layout are set under DISPLAY OPTIONS, not here.

Option	Use
CHL CONFIGURATION	Free chlorine measurement configuration.
MODBUS AVERAGING	Controls averaging of Modbus values.
MEASURE PH	Controls live pH measurement. When disabled and Fixed pH is active, the entered value is used for chlorine compensation.
MEASURE COND	Controls conductivity measurement.
MEASURE ORP	Controls ORP measurement. Disabling ORP can reduce the measurement cycle time.

9.2 Assign and scale the 4–20 mA outputs

MENU > CONFIGURATION > 4-20 mA OUTPUT SETUP

01 Select DEFINE OUTPUT CHANNELS and assign a measurement to each output.

02 Set the LOWER LIMIT to the value represented by 4 mA.

03 Set the UPPER LIMIT to the value represented by 20 mA.

04 Enter the same lower and upper engineering units in the PLC.

05 Verify each channel at the PLC. Use 4-20 mA CAL only if the measured current does not match the commanded value.

Parameter	Recommended span
Free chlorine	**0–10 ppm**
Conductivity	**50–15,000 µS/cm, or a narrower site-specific span**
Temperature	**5–45 °C for the standard free-chlorine application**
pH	**6.5–9.0 for chlorine compensation**
ORP	**No default output. Assign a channel only if ORP is required as an analog signal. Use the project-specific range; the target-specification reference is –200 to 1100 mV.**

NOTICE | A wider menu limit is not a wider specification

The D20 can display configuration ranges wider than the connected sensor's approved operating range. Setting a wider menu limit does not expand the sensor specification.

9.3 Modbus menu

Menu item	Function
SLAVE ADDRESSES	Displays the address of the connected sensor, and of the turbidity sensor if one is fitted.
CHANGE ADDRESS	Changes a connected sensor address. Connect only one sensor while this command runs.
START BUS SEARCH	Searches the bus for the connected sensor.
BAUD SETTINGS	Selects the supported baud rate. Default is 19,200.

9.4 Measurement averaging

Averaging smooths short-term fluctuation but also slows the displayed response. The default value is 1, which applies no averaging. Select an integer from 1 to 20 and verify that the resulting response remains suitable for process control.

WHAT THE SCREEN IS TELLING YOU

Warnings and Error Codes

10

10.1 Warnings

Message	Cause	Corrective action
Chlorine Zero	Zero calibration outside the allowed raw-signal range.	Restore factory calibrations, confirm chlorine-free water, and repeat only if the site procedure requires a zero.
Chlorine Slope	Reference calibration outside slope tolerance.	Confirm the reference method, restore defaults, inspect and clean the electrode, then recalibrate.
pH Calibration Slope	Two-point pH slope outside tolerance.	Restore defaults, repeat pH 7 and pH 10 calibration, and replace the pH electrode if it fails.
pH Calibration Offset	Single-point or pH 7 offset outside tolerance.	Confirm pH measurement is enabled, restore defaults, recalibrate, and replace the pH electrode if needed.
Replace Wear Parts	The 8,040-hour service reminder has triggered.	This is a reminder to reorder and schedule service, not a fault. Fit a new WP-NH-H2 wear parts kit and reset the wear-parts timer.

10.2 Error summary

Code	Level	Meaning	First response
1	1	Persistent air condition after repeated Error 31 cycles.	Section 10.3. Escalate if the condition returns.
10	2	Temperature-board or sensor communication failure.	Section 10.4. Internal electronics are not field repairable.
31	1	Air trapped in the sensor, or sensor running without water.	Section 10.5 to restore flow and clear trapped air.
33	2	Motor stalled or impeller restricted.	Section 10.6. Inspect the impeller and wear parts.
35	2	Motor-related fault on some firmware revisions.	Section 10.6. Contact Halogen support if it returns.

10.3 Persistent air — Error 1

Error 1 appears after ten consecutive measurement cycles report Error 31. It means the underlying air or electrode condition has not cleared.

01 Complete every Error 31 corrective step in Section 10.5, including flooding, bottom-to-top flow, trapped-air removal, controlled-backpressure verification and one CLEAR ERRORS command.

02 Perform the safe sensor function test in Section 11.2 and verify free impeller rotation and a steady water stream.

03 If Error 1 returns, remove the sensor from process control and record the serial number, installation photos, error history and function-test result.

04 There is no additional field-level correction for a persistent Error 1. The chlorine electrode or internal circuit board may have failed. Contact Halogen Technical Support for replacement or factory-service instructions.

10.4 Electronics or temperature — Error 10

Error 10 indicates communication loss or a fault in the internal temperature-sensor electronics. Typical signs are a frozen or implausible temperature, a missing or invalid serial number, lost calibration values, or inaccurate measurements.

01 Remove the sensor measurement from process control. Record the displayed temperature, serial number, stored settings, calibration values, firmware and the exact screen message.

02 Disconnect power, inspect and reseat the external M12 sensor cable, then restore power and restart the system once.

03 If communication returns, restore factory calibration defaults, allow the sensor to stabilize, and verify temperature, serial number, stored settings and reference measurements before returning it to service.

04 If Error 10 returns, the temperature remains frozen or implausible, or stored data is missing, stop troubleshooting. There is no field-level repair for the internal temperature board or EEPROM.

05 Install a verified spare sensor if required for operation, and contact Halogen Technical Support with the recorded information.

10.5 Trapped air — Error 31

01 Confirm the sensor is fully flooded and the sample flows from the bottom inlet to the top outlet.

02 Confirm steady outlet flow, verify any controlled backpressure is within the flow-cell limit, and remove trapped air.

03 Open MENU > DIAGNOSTICS > CLEAR ERRORS. The sensor will run its priming sequence.

04 Observe the impeller and outlet stream for at least one complete cycle.

05 If Error 31 returns, remove the sensor under the pressure-isolation procedure and perform the function test.

10.6 Motor — Error 33 or 35

01 Use CLEAR ERRORS once and observe whether normal operation resumes.

02 If the error returns, isolate pressure and power, remove the sensor, and check the impeller for free rotation.

03 Fit a new WP-NH-H2 wear parts kit if debris, wear or binding is present.

04 Reassemble and function-test the sensor in clean water.

05 Replace the sensor and contact Halogen support if the impeller or internal motor still does not operate normally.

SCHEDULE AND SERVICE PROCEDURES

Maintenance

11

11.1 Maintenance schedule

The D20 raises a Replace Wear Parts reminder at approximately 8,040 operating hours. It is a prompt to reorder the kit and schedule the work with enough lead time, not a hard limit and not a fault. Measurement continues normally while it is displayed.

Interval	Task
Each site inspection	Check leaks, tubing, flow, trapped air, error history, reference readings and date/time accuracy.
As needed	Clean the flow cell and sensor exterior using approved materials. Calibrate only after confirming the cause of an offset.
Annually, or when the 8,040-hour reminder triggers	Fit a new WP-NH-H2 wear parts kit: impeller, impeller bearing, sensor cover assembly and cleaning balls. Replace worn tubing and the flow-cell O-ring (ORNG-0015). Reset the wear-parts timer.
When pH cannot be calibrated	Fit a new KITS-0201 H2 pH sensor replacement kit and complete pH 7 and pH 10 calibration.
When time resets	Replace the D20 real-time-clock battery with the exact installed type.
Five years	Return the sensor for factory rebuild, including the motor assembly and worn internal components.

11.2 Safe removal and function test

01 Stop the measurement cycle if the firmware provides a Stop command.

02 Close and lock the sample isolation valve. Relieve pressure and verify zero pressure.

03 Disconnect sensor power and the M12 cable.

04 Loosen the flow-cell collar by hand and remove the sensor while controlling residual water.

05 Place the sensor end in clean water, reconnect it to a safe power source or the D20, and confirm free impeller rotation and a steady outlet stream.

11.3 Replace the annual wear parts

Order **WP-NH-H2** for the wear parts alone, or **AKIT-0201** for the annual kit, which adds the H2 pH electrode replacement kit. The wear parts kit contains an impeller, an impeller bearing, a sensor cover assembly and cleaning balls. Follow the bead count and any spare-pack instruction supplied with the kit.

01 Keep the sensor vertical. Hold the cover in place while removing the two cover screws so the beads do not spill.

02 Remove the cover, impeller, impeller bearing and old cleaning balls. Discard the replaced wear parts.

03 If needed, wipe the sensor end with a lint-free cloth lightly moistened with isopropyl alcohol. Do not scratch the electrode.

04 Install the new impeller bearing and the new impeller in the impeller well.

05 Place exactly 15 cleaning beads in the electrode compartment of the sensor cover. Do not place beads in the impeller cavity.

06 Align the cover with the temperature-sensor and impeller openings. Tighten both screws evenly until the gasket is lightly compressed and no gap remains.

07 Function-test the sensor. If the impeller binds, loosen each screw one-quarter turn evenly until the impeller turns freely.

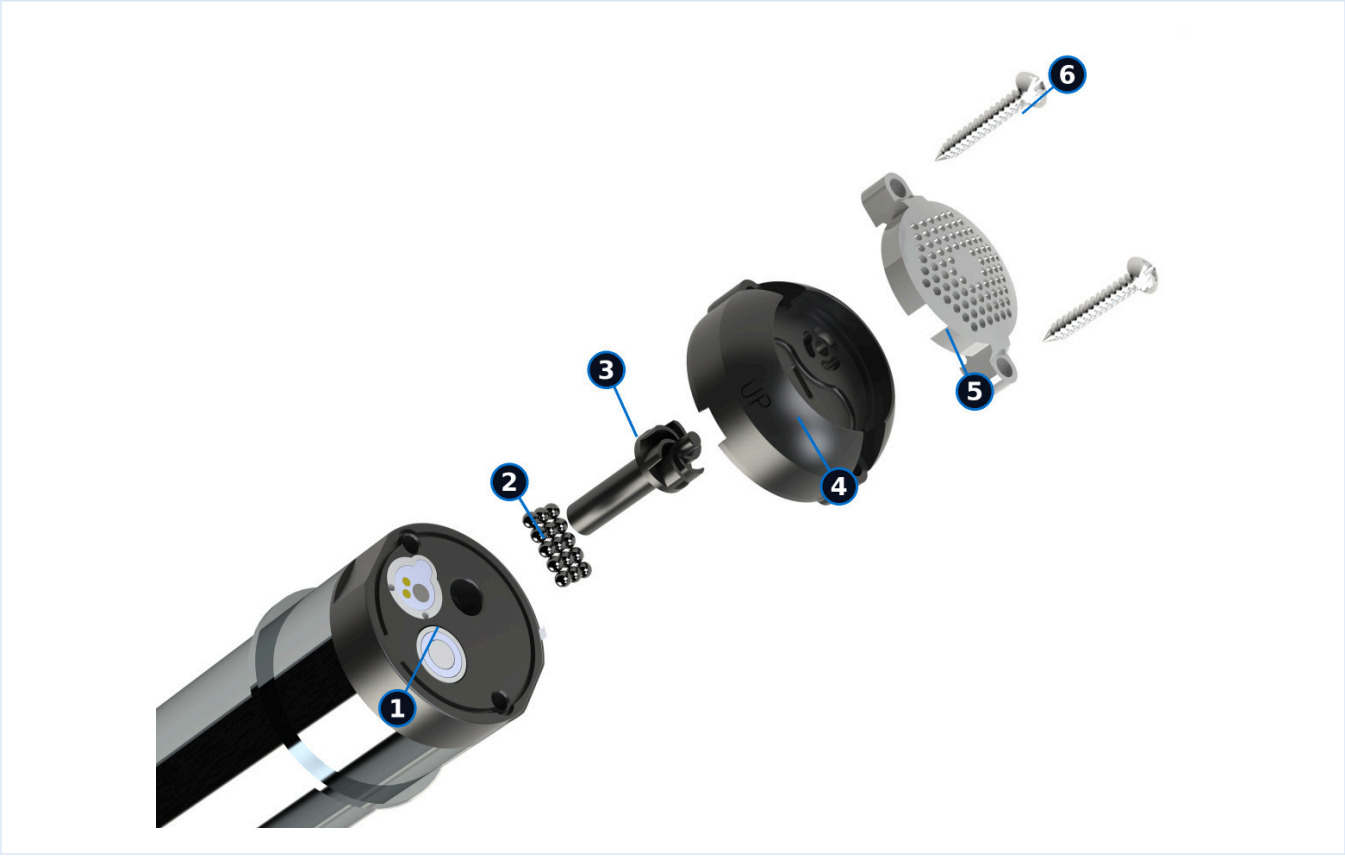


Figure 22. H2 sensor end, exploded. Keep the sensor vertical while the cover is off so the cleaning beads cannot spill.

Item	Component	Notes
1	Sensor end: electrode face and temperature sensor	Wipe with a lint-free cloth lightly moistened with isopropyl alcohol only if needed. Do not scratch the electrode.
2	Cleaning balls	Into the electrode compartment only. None in the impeller cavity.
3	Impeller	Seats in the impeller well. Must turn freely after reassembly.
4	Sensor cover, marked UP	Align with the temperature-sensor and impeller openings before tightening.
5	Impeller bearing / retaining plate	Held by the two cover screws. Supplied in the WP-NH-H2 kit.
6	Cover screws (2)	Tighten evenly until the gasket is lightly compressed and no gap remains.

11.4 Replace and calibrate the pH electrode

CAUTION | Fragile glass electrode

The pH electrode contains a fragile glass membrane. Wear eye protection, handle it carefully and avoid tool contact with the glass.

01 Isolate pressure and power, remove the sensor, and remove the sensor cover while keeping the sensor vertical.

02 Use the H2 pH sensor removal tool supplied in KITS-0201 to loosen and remove the old pH electrode.

03 Remove the protective caps from the replacement electrode, rinse away storage solution, and confirm the O-ring is present and undamaged.

04 Insert the electrode by hand. Use the tool only on the approved flats and tighten until the glass membrane is flush with the sensor end.

05 Reinstall exactly 15 cleaning beads in the electrode compartment, then reinstall the cover and function-test the impeller.

06 Place the sensor in fresh pH 7 buffer, allow it to stabilize and complete pH 7 calibration.

07 Rinse, place the sensor in fresh pH 10 buffer, allow it to stabilize and complete pH 10 calibration.

08 Rinse and return the sensor to service. Record the electrode part or lot number and the calibration results.

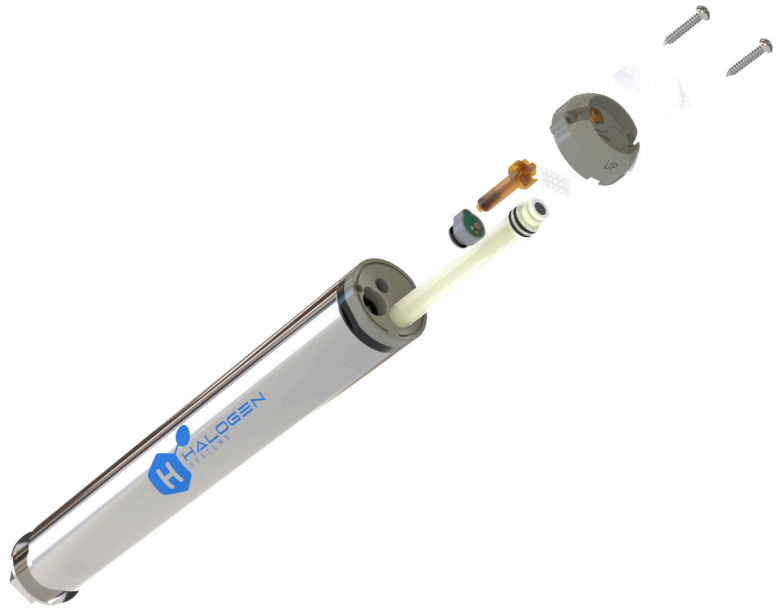


Figure 23. H2 sensor pH-electrode and wear-parts assembly.

11.5 Flow-cell cleaning

01 Isolate pressure, drain the flow cell, disconnect tubing and remove the sensor.

02 Wash the flow cell with warm water and mild detergent. Use only a diluted acid specifically approved by Halogen and by the site safety procedure.

03 Do not use solvents on an acrylic flow cell (FC-06). They can cause crazing or cracking. Confirm the body material before selecting any cleaning agent.

04 Rinse thoroughly with clean water. Inspect the O-ring and replace it if stiff, cut, flattened or worn. Order ORNG-0015.

05 Apply a thin film of compatible silicone grease to the O-ring, reassemble, restore flow slowly and inspect for leaks.

11.6 SD card

DANGER | Power isolation

Disconnect and lock out all power before opening the D20. Use ESD precautions when handling the SD card or circuit board.

01 Disconnect power, verify zero voltage and open the D20 cover.

02 Locate the SD-card holder on the display circuit board and press the card to release it.

03 Copy the requested log files using a computer with an SD-card reader. Do not rename or alter the original files sent to technical support.

04 Reinsert the card in the same orientation until it latches. Close the enclosure before restoring power.

05 Display and sensor firmware updates are also loaded from the SD card. Use only firmware supplied by Halogen Systems for the installed hardware.

06 Verify the system time and confirm that new measurements are being logged.

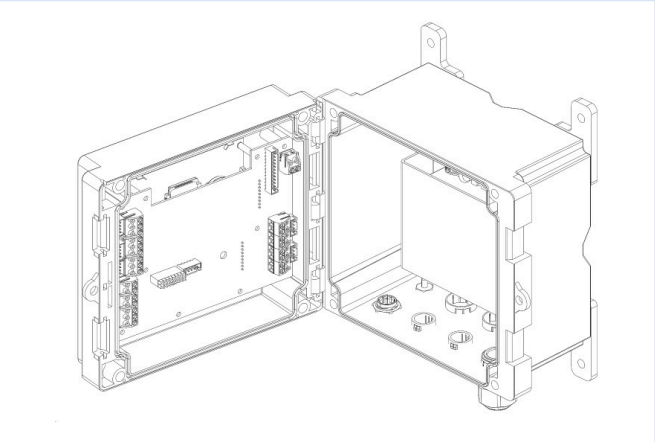


Figure 24. D20 SD-card location.

Figure 25. D20 real-time-clock battery location.

11.7 Real-time-clock battery

01 Disconnect and lock out all power. Verify zero voltage and use ESD precautions.

02 Open the D20 and locate the coin-cell holder on the display circuit board.

03 Record the battery type and polarity shown on the installed battery and holder. Replace only with the identical approved type.

04 Lift the holder as designed, remove the battery and install the replacement with the same polarity.

05 Close the enclosure, restore power, set the system time, then power-cycle once to confirm the time is retained.

11.8 Fuse replacement

The fuse is on the relay and power-supply board, under the high-voltage shield. It is fitted to the AC models, D20-H and D20-OTA-H, only. The DC models have no relay board and no mains fuse.

DANGER | Authorized service personnel only

Fuse replacement exposes the high-voltage compartment. Only qualified service personnel may perform this procedure.

01 Disconnect and lock out mains, relay and externally supplied circuits. Verify zero voltage.

02 Open the D20, remove the four high-voltage shield screws and lift the shield without disturbing wiring.

03 Replace a failed fuse only with a 5 × 20 mm slow-blow 3.5 A fuse having the same voltage rating and breaking capacity as the installed fuse.

04 Reinstall the shield and the enclosure cover before restoring power.

05 If the replacement fuse opens, disconnect power and contact Halogen support. Do not install a higher-rated fuse.

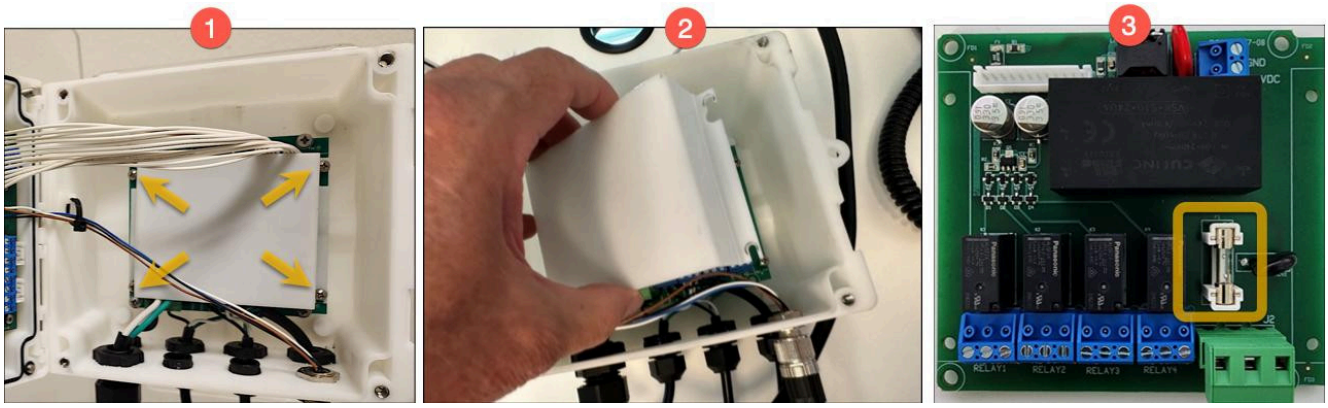


Figure 26. High-voltage shield (1, 2) and the fuse on the relay and power-supply board (3). AC models only.

DIAGNOSE IN ORDER

Troubleshooting 12

12.1 Diagnostic sequence

01 Read and record every warning or error code before clearing it.

02 Check power, the sensor connector, cable condition, flow, orientation, trapped air and leaks.

03 Verify settings, sensor address, output assignment, scaling and system time.

04 Compare the D20 reading with a fresh reference measurement taken at the sensor outlet.

05 Perform the safe function test when motor, air or zero-reading symptoms remain.

06 Substitute a known-good cable or sensor only after recording serial numbers and configuration.

12.2 Symptom guide

Symptom	Check	Action
Sensor Not Found	M12 connection, cable, sensor address, power	Reconnect with power off, search the bus, and replace the cable or sensor if communication does not return.
Erratic chlorine	Air, flow, pH stability, motor, reference method	Purge air, correct orientation, function-test, confirm pH, then repeat the DPD check.
Low or zero chlorine	Errors, air, motor, factory calibration, actual sample	Correct the mechanical cause, restore defaults, then reference-calibrate only if needed.
High chlorine	Reference sample, recent calibration, flow	Confirm the DPD result and sample timing. Restore defaults or recalibrate.
Inaccurate pH	Buffer age, glass condition, fixed-pH setting	Confirm pH is enabled, recalibrate in fresh buffers, or replace the electrode.
PLC value incorrect	Channel assignment, active input, polarity, scaling	Match the D20 and PLC lower and upper limits. Verify current with a calibrated meter.
Modbus offline	Address, baud, RS-485 polarity, termination	Correct the settings and the wiring. Confirm only one device holds each address.

NOTICE | 4–20 mA is not a communications link

An analog output is a current signal, not a data connection. Diagnose assignment, polarity, current and scaling rather than Modbus settings.

12.3 What to send technical support

- Customer or site name, location, sales order or RMA number, and contact information.
- D20 and sensor model, serial number, firmware, installation type and installation date.
- Photos showing sensor orientation, flow cell, tubing, D20 wiring and screen messages.
- Exact error codes, when they occur, and the troubleshooting already completed.
- Reference-test results with time, pH, temperature, conductivity, reagent or buffer lot, and calibration history.
- Original SD-card log files covering the event.

SIGN IT, KEEP IT, SEND A COPY

Installation and Commissioning Checklist

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Complete this page at commissioning and retain it with the site records.

	Task	Recorded result
■	Confirm model, voltage, certifications, firmware and serial numbers	_____
■	Confirm mounting, clearance, disconnect, grounding and enclosure seals	_____
■	MKIT: confirm 0.1-4 bar (1-60 psi), including backpressure. Other mounts: confirm complete assembly pressure rating.	_____
■	MKIT: 0.1-1.0 L/min, bottom inlet / top outlet. All mounts: confirm discharge direction, flooded cell, no air or leaks.	_____
■	Confirm sensor detected, impeller operating, no Level 2 error	_____
■	Wait at least 20 minutes before commissioning calibration	Start: _____ End: _____
■	Compare pH with calibrated reference and calibrate first if needed	D20: _____ Ref: _____
■	Compare free chlorine with fresh DPD sample and calibrate if needed	D20: _____ Ref: _____
■	Assign and verify every 4–20 mA output at the PLC	_____
■	Confirm Modbus settings: address, baud rate and termination	_____
■	Set date and time, and verify SD-card logging	_____
■	Train the operator on warnings, errors, isolation and routine checks	_____
■	Record installer and acceptance date	_____

INSTALLED BY _____ DATE _____

ACCEPTED BY _____ DATE _____

Appendix A · D20 Technical Specifications

Values below are taken from the Halogen D20 technical specification, derived from the D20 data sheet. Confirm the ratings on the product label and the approved drawing for the specific model supplied; where the label is more restrictive, the label governs.

Description	Microprocessor-controlled, menu-driven display/controller
Display	3.5 in TFT graphic display
Dimensions	6.3 x 6.3 x 4.0 in (160 x 160 x 101.6 mm), H x W x D
Weight	3 lb (1.36 kg)
Enclosure	IEC/EN 60529 IP65; NEMA 250 Type 4X; plastic
Mounting	Wall mount standard; optional pole mount, 0.75-2.5 in diameter, vertical or horizontal
Operating temperature	-20 to 60 °C (-4 to 140 °F) at 8 W AC / 9 W DC load; -20 to 45 °C (-4 to 113 °F) at full load, 28 W AC / 20 W DC
Thermal derating	-1.33 W/°C between 45 and 60 °C
Storage temperature	-20 to 70 °C (-4 to 158 °F)
Relative humidity	0 to 95%, noncondensing
Altitude	2,000 m (6,562 ft) maximum
Pollution degree	4
Installation category	Category II
Input power	85-240 VAC +/-10%, 50/60 Hz, 1 A standard; optional 24 VDC; optional hard-wired 120/240 VAC
Power consumption	8 W AC / 9 W DC with sensor load
Sensor power	5.1 W per MP5 sensor; up to 28 W AC / 20 W DC total
Sensor capacity	One MP sensor; optional turbidity sensor may be added
Protection class	Class I; connection to protective earth required
Relays	AC models (D20-H, D20-OTA-H): four relays, 1 feed chlorine, 2 feed acid, 3 low alarm, 4 high alarm; 100-240 VAC maximum switching voltage; 5 A resistive / 1 A pilot duty maximum current; 1200 VA resistive / 360 VA pilot duty maximum power

Relay wire range	**0.75-1.5 mm^2 (18 to 16 AWG)**
Relays, DC models	**None. D20-L and D20-OTA-L have no relay board**
Analog outputs	**Four 0-20 mA or 4-20 mA outputs, active current sourcing**
Digital communication	**Modbus RTU standard. Optional Modbus TCP/IP, Ethernet/IP, BACnet/IP. Profibus coming soon; contact Halogen Systems**
Connectors	**M12 4-pin for sensors**
Optional communications	**Cellular LTE CAT-M1 / 4G with eSIM, Ethernet 10/100 Mbps, Bluetooth Low Energy, cloud connectivity**
SD card	**Data logging and firmware update; over 1 million data points**
Real-time clock	**Battery-backed; battery life estimated at five years**
Compliance	**ETL certified to UL and CSA standards; CE marking; FCC; EU and UKCA declarations**
Warranty	**12 months from date of purchase**

Observe the ratings on the product label and the approved drawing where they are lower than the values above.

Appendix B · MP-5F Technical Specifications

Values below are taken from the Halogen master specification for the MP-5F free chlorine sensor (formerly MP5A).

Measurement	Free chlorine; bare-electrode amperometric, reagentless, three-electrode system
Free chlorine range	0-10 ppm as Cl2
Limit of detection	30 ppb (0.03 ppm)
Display resolution	0.001 ppm
Accuracy	+/-5% of the calibrated reference or 0.06 ppm, whichever is greater
T90 response	90 seconds at stable temperature and pH
Measurement cycle	Approximately 50 seconds
Interferences	Monochloramine (<5%), chlorine dioxide, ozone
Total chlorine	Not applicable
Calibration frequency	Greater than 6 months
Self-cleaning	Yes, SensiCLENE
Cleaning method	Continuous mechanical and electrochemical cleaning
pH measurement range	2 to 12
pH accuracy	+/-0.1
pH resolution	0.01 pH units
pH operating range for chlorine	6.5 to 9.0
ORP measurement range	-200 to 1100 mV
ORP resolution	+/-1 mV
Conductivity operation	50 to 15,000 uS
Conductivity accuracy	+/-5% from 100 to 10,000 uS. Not specified above 10,000 uS
Salinity display	50 to 15,000 uS
Temperature accuracy	+/-1 °C maximum, from -10 to +85 °C
Sample temperature range	0 to 45 °C
Ambient temperature operation	-10 to 55 °C
Storage temperature	-20 to 40 °C

Pressure rating	-0.7 to 10 bar (-10 to 145 psi)
Pressure range, if so equipped	1 to 145 psi, temperature compensated
Immersion depth	30 ft
Flow velocity	0 to 4 m/s
Zero flow, immersion	Acceptable
Ingress protection	IP65
Weight	1 kg, depending on version
Input power	12 to 24 VDC; 100 mA; 200 mA for 500 ms at startup
Communication	Modbus RTU; M12 connector
Cable	5 ft, 10 ft, 25 ft or custom length, 22 AWG
Wetted materials	CPVC, PPO, PPS-GF, SS316, PES, Victrex, PMMA
Process connections	2 in CPVC slip adapter for tee; 2 in MIP threaded SS316 adapter for tee insertion; flow cell, 3/8 NPT with 1/4 in tubing connectors; 2 in corp-stop wet tap remover; immersion
Type approvals	FCC, Intertek ETL, CE
Certifying body	ALS
Drinking water	NSF/ANSI/CAN 61-2024, PFAS included in testing
Standards	IEC 61010-1:2010 AMD1:2016; FCC Part 15 Subpart B Class A; ICES-003; EN 61326-1; EN 61000-3-2; EN 61000-3-3; CISPR 11

Appendix C · Ordering Information

Part numbers below are from the current Halogen price book. Contact Halogen Systems or your distributor for pricing, lead time and configuration. Confirm the part number on the quotation or sales order before installation.

D20 display and controller

Part number	Input power	Description
D20-H	85-240 VAC	Controller. Four 4-20 mA outputs, Modbus RTU RS-485, M12 connector, four relays, SD card.
D20-L	12-24 VDC	Display. Four 4-20 mA outputs, M12 connector, SD card. No relay board; no relay outputs.
D20-OTA-H	85-240 VAC	Controller with over-the-air capability. Four 4-20 mA outputs, M12 connector, four relays, SD card, LTE Cat M1 cellular for USA, Canada and Mexico.
D20-OTA-L	12-24 VDC	Display with over-the-air capability. Four 4-20 mA outputs, M12 connector, SD card, LTE Cat M1 cellular for USA, Canada and Mexico. No relay board; no relay outputs.

Panel and wall mount kits

Part number	Description
MKIT-1002	Municipal side-stream mounting kit with D20-H display and flow cell. Panel mount, 120 VAC. Sensor ordered separately.
MKIT-1002-L	Municipal side-stream mounting kit with D20-L display and flow cell. Panel mount, 12-24 VDC. Sensor ordered separately.
MKIT-1002-OTA	Municipal side-stream mounting kit with D20-OTA display and flow cell. Panel mount, 120 VAC, cellular. Sensor ordered separately.
MKIT-1004-B-NA	Sample station kit: back plate, FC-02 flow cell and Halogen Connect with Bluetooth module and North America cellular modem.

Maintenance kits and consumables

Part number	Applies to	Description
AKIT-0201	H2 sensors	Annual maintenance kit: one WP-NH-H2 wear parts kit and one H2 pH electrode replacement kit. **Order this for the MP-5F.**
WP-NH-H2	H2 sensors	Wear parts kit: impeller, impeller bearing, sensor cover assembly and cleaning balls.
KITS-0201	H2 sensors	H2 pH sensor replacement kit: one H2 pH sensor and one H2 pH sensor removal tool.
CHLS-0203	H2 sensors	Calibrated H2 chlorine sensor assembly.
AKIT-0001	Non-hazardous sensors	Annual maintenance kit: one WP-NH wear parts kit and one pH electrode replacement kit.
WP-NH	Non-hazardous sensors	Wear parts kit: impeller, impeller bearing, sensor cover assembly and cleaning balls.
KITS-0001	Non-hazardous sensors	pH sensor replacement kit.

NOTICE | Order the H2 kits for this sensor

The MP-5F is an H2 sensor. Use AKIT-0201, WP-NH-H2 and KITS-0201. The WP-NH, AKIT-0001 and KITS-0001 kits are for non-hazardous sensors and are listed here only so the two families are not confused on a purchase order.

Items not supplied as a kit

Item	Used in	Order reference
D20 real-time-clock coin cell	Section 11.7	Match the installed type
Fuse, 5 × 20 mm slow-blow 3.5 A	Section 11.8	Match the installed rating

Process mounting and adapters

Part number	Description
PT-01	Retaining collar, threaded adapter with 2 in slip, and double O-ring. The 2 in PVC tee is not included.
PT-02	316 stainless retaining collar, 2 in NPT 316SS adapter, and double O-ring. Add two ORNG-0014 O-rings.
KITS-0012	Immersion kit: stainless immersion mount with carabiner for chain-style mounting. Contains ADAP-0007 and NHOT-0006.

Flow cells

Part number	Body material	Description
FC-06	Acrylic	Molded flow cell assembly. Contains FLWC-0102 acrylic body, SVRC-0101, fittings and pipe clamp.
FC-07	CPVC	Molded flow cell assembly. Contains FLWC-0102 CPVC body, SVRC-0101, fittings and pipe clamp.
FC-03	Rev A4 body	Flow cell assembly with Rev A4 body. No fittings.

NOTICE | Confirm the flow-cell body material before cleaning

FC-06 is acrylic and FC-07 is CPVC. The cleaning restrictions in Section 11.5 are written for the acrylic body. Confirm which body is installed before selecting a cleaning agent.

Wet tap

Part number	Description
VALV-0003	Valve, drinking-water wet tap. Lead-free 2 in MIP x MIP corporation stop, AWWA IP 2 in x MIP 2 in.
RMR-WT	Wet tap sensor removal kit. 2 in FIP for 2 in MIP thread.
RKIT-1101	Remover tool. 3/4 in dual hex with 3/8 in square drive.

Seals and plugs

Part number	Description
ORNG-0015	O-ring kit for flow cell and wet tap. #224, NSF, quantity 2.
WKIT-0001	Wet tap remover O-ring kit. Three O-rings.
PLUG-0005	Pressure plug, 1.5 in x 1.5 in PVC, for PT-01.

Items without a current part number

Item	Used in	Order reference
D20 real-time-clock coin cell	Section 11.7	Match the installed type
Fuse, 5 × 20 mm slow-blow 3.5 A	Section 11.8	Match the installed rating

Appendix D · Revision History

Revision	Release date	Summary
R1.00	08/01/2024	Initial release
R1.01	02/16/2026	Removed the EXT option
R1.02–R1.11	08/18/2026	Internal pre-release drafts consolidated before external publication
R1.12	08/18/2026	Clarified that the Ref. I communications module is an optional add-on
R1.13	08/18/2026	Consolidated engineering review, terminology, error procedures, callouts and revision history
R1.14	08/18/2026	Added the internally powered analog-output warning and passive-input requirement
R1.15	08/18/2026	Added Section 5 mounting options: wet tap, PVC tee, immersion and side-stream MKIT, with the air-removal rules that apply to all four. Renamed the sensor MP-5F (formerly MP5A). Rebuilt Appendix A, Appendix B and Appendix C against the Halogen master specification and price book, including D20 models, mounting kits, mounting and flow-cell accessories, wet tap items, seals and maintenance kit part numbers. Rebuilt on the current Halogen document design: new cover, section system, callout hierarchy, figure treatment, contents and commissioning record. Added the D20 menu map, the RS-485 terminal figure and pin assignments, and clickable contents entries and PDF bookmarks. Editorial rewrite for readability. Specification values unchanged. Internal specification-source references moved off customer-facing pages.
R1.16	10/14/2026	Added the fail-safe chlorine feed interlock (Section 4.4). Corrected the relay alarm assignments: relay 3 is the low alarm and relay 4 the high alarm. Identified the relay and power-supply board as fitted to AC models only; DC models have no relays and no mains fuse. Revised the Section 4.3 electrician warning. Replaced Figure 9 with a high-resolution board image. Removed references to the Modbus register map. Improved pagination so headings stay with their content.
R1.17	10/14/2026	Simplified the fail-safe in Section 4.4 to a single relay: relay 3 shuts the chlorine pump off on high chlorine and on loss of D20 power. Added a three-step setup, pump-size wiring guidance and a redrawn Figure 7.

R1.13–R1.14 detailed change record

Area	Change made
Document control	Aligned cover, metadata, footer, filename and revision history; consolidated R1.02–R1.11 as internal pre-release drafts.
Product identity	Removed incorrect MP6 references and standardized body text on MP-5F.
Navigation	Replaced broken bookmarks and appendix lettering; rebuilt the heading hierarchy and contents; removed the obsolete index.
Safety	Rewrote signal-word definitions; added electrical isolation, pressure relief, chemical handling, ESD and qualified-personnel requirements.
Electrical	Clarified that field mains conversion and relay wiring require a qualified electrician and approved drawings; identified the communications module as an optional add-on.
Analog output	Standardized on eight-conductor 22 AWG cable; clarified active current-sourcing outputs and polarity; added the passive-input warning.
Modbus	Added default baud-rate and addressing guidance.
Flow cell	Clarified bottom-inlet / top-outlet flow and installation steps; replaced the flow-cell figure with the current MKIT diagram.
Pressure	Separated the 0.1–4 bar flow-cell range from the 10 bar sensor-body rating and covered controlled downstream backpressure.
Startup	Corrected the startup graphic to one supported sensor found; replaced the measurement-screen photo with the current home screen.
Commissioning	Added measurable acceptance criteria and a recordable commissioning checklist.
Calibration	Added the DPD reference-calibration procedure, verification cycle and zero-calibration warning; rewrote conductivity, ORP, temperature and pH procedures.
Fixed pH	Added the complete menu sequence and clarified the effect on chlorine compensation.
Configuration	Corrected MEAS OPTIONS labels and output limit instructions; tied recommended spans to the published specification.
Error codes	Added dedicated Error 1 and Error 10 procedures; retained Errors 31, 33 and 35; identified where no field-level repair exists.
Maintenance	Completed previously empty sections and added a preventive-maintenance schedule.
Wear parts	Clarified that exactly 15 beads go in the electrode compartment, not the impeller cavity.
pH electrode	Corrected tool name, removal and installation order, glass handling and buffer sequence.
Flow-cell cleaning	Removed vague solvent and acid language; added material compatibility, PPE, isolation, rinsing and leak checks.
SD card / battery / fuse	Added power isolation, ESD control, exact-type replacement, polarity, shield replacement and no-upsizing warnings.
Troubleshooting	Removed unsafe direct wiring tests; added a diagnostic sequence and a symptom/action table.

Area	Change made
Accessibility	Applied real heading styles, repeating table headers, image alt text, readable contrast and consistent captions.

R1.18 - installation revision | October 17, 2026

Expanded Sections 5.1-5.6 with the new-site training material, diagrams and field photos. Replaced the general upward-flow requirement, the blanket downflow prohibition and the notice describing orientation as inconsistent.

Clarified that upward-flowing risers use an upward discharge, while the WETTAP downward-flow case uses a sideways discharge perpendicular to the main flow. Separated mounting position from discharge direction.

Added WETTAP horizontal mounting examples, correct field installations, PVCT raised-loop and P-trap location guidance, and MKIT installation/pressure/air-removal checks. Figure 11 now shows an outlet-tubing valve to maintain backpressure and reduce bubble formation. Incorrect PVCT alternatives are crossed out. Removed bad-installation photographs and corrected the middle photograph on page 30. Retained the assembly-specific pressure-handling and removal procedures.

Updated applicability, workflow, commissioning checks, contents, bookmarks, pagination and revision identifiers. Earlier R1.17 relay changes remain in place.

Publication authorized by Travis Silveri on October 17, 2026. Technical instructions unchanged.

Appendix E · Glossary

Term	Definition
4–20 mA	Analog current signal in which 4 mA represents the configured lower limit and 20 mA the upper limit.
Bare-electrode amperometric	Electrochemical measurement using exposed electrodes without a membrane or reagent feed.
DPD	Colorimetric reference method commonly used to measure chlorine.
LOD	Limit of detection.
M12	Threaded circular electrical connector used between the sensor and controller.
Modbus RTU	Serial communications protocol used over RS-485.
ORP	Oxidation-reduction potential, expressed in millivolts.
PLC	Programmable logic controller.
PSU	Practical salinity unit.
T90	Time required for the measurement to reach 90% of a step change under stated conditions.
TRO	Total residual oxidant. Do not use TRO as a substitute for free chlorine unless the application and method define it.

Limited Warranty

Halogen Systems warrants its products to the original purchaser against defects caused by faulty material or workmanship for 12 months from the date of purchase unless the product documentation states otherwise. During the warranty period, Halogen Systems may repair or replace the defective product or refund the purchase price, excluding original shipping and handling. A repaired or replacement product is covered only for the remainder of the original warranty period.

The warranty does not cover consumable items, misuse, neglect, accident, improper application or installation, unauthorized repair, use contrary to supplied instructions, freight, expedited shipment, or travel associated with onsite service. Products may not be returned without authorization from Halogen Systems.

To request support or return authorization, contact Halogen Systems and provide the model, serial number, sales order or RMA number, failure description, installation photos, reference data and available log files. Current warranty terms are available at halogensys.com/information.

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