RIVERTRACE

Cleaner. Smarter.

SMART ESM

Wash Water Monitor for
Ship Exhaust Gas Cleaning Systems

Rev 020 – Jan21

Key Features

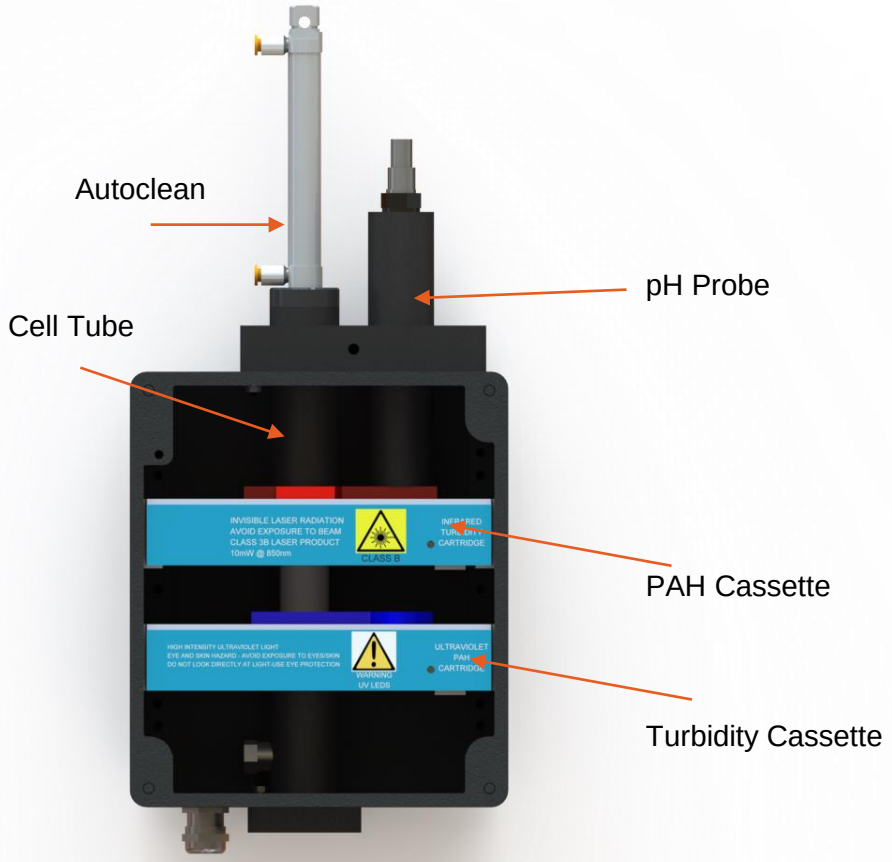
RIVERTRACE
Cleaner. Smarter.

- Ensures compliance of wash water discharge from ship in accordance with IMO MEPC 259(68)
- Compatible with Open Loop, Closed Loop and Hybrid systems
- Suitable for inlet and outlet monitoring
- Continuous real-time monitoring of wash water discharge including PAH, turbidity, Temperature and pH
- Customisable configuration to measure specific parameters as per customers requirement.
- Supported by a team with over 35 years of marine water quality monitoring and a global service network of engineers.

Measuring Cell

RIVERTRACE
Cleaner. Smarter.

- Glass tube runs through the measuring cell which contains the sample
- Automatic cleaning of optical path using a pneumatic plunger
- pH probe is submersed in the sample stream so is wet all the time



- Unique Plug and play maintenance design - Separate calibrated PaH and Turbidity cassettes fitted inside the measuring cell allow the calibrated parts to be swapped without the need of isolating the sample
- Easy calibration check kits or component replacement

Basic Specification

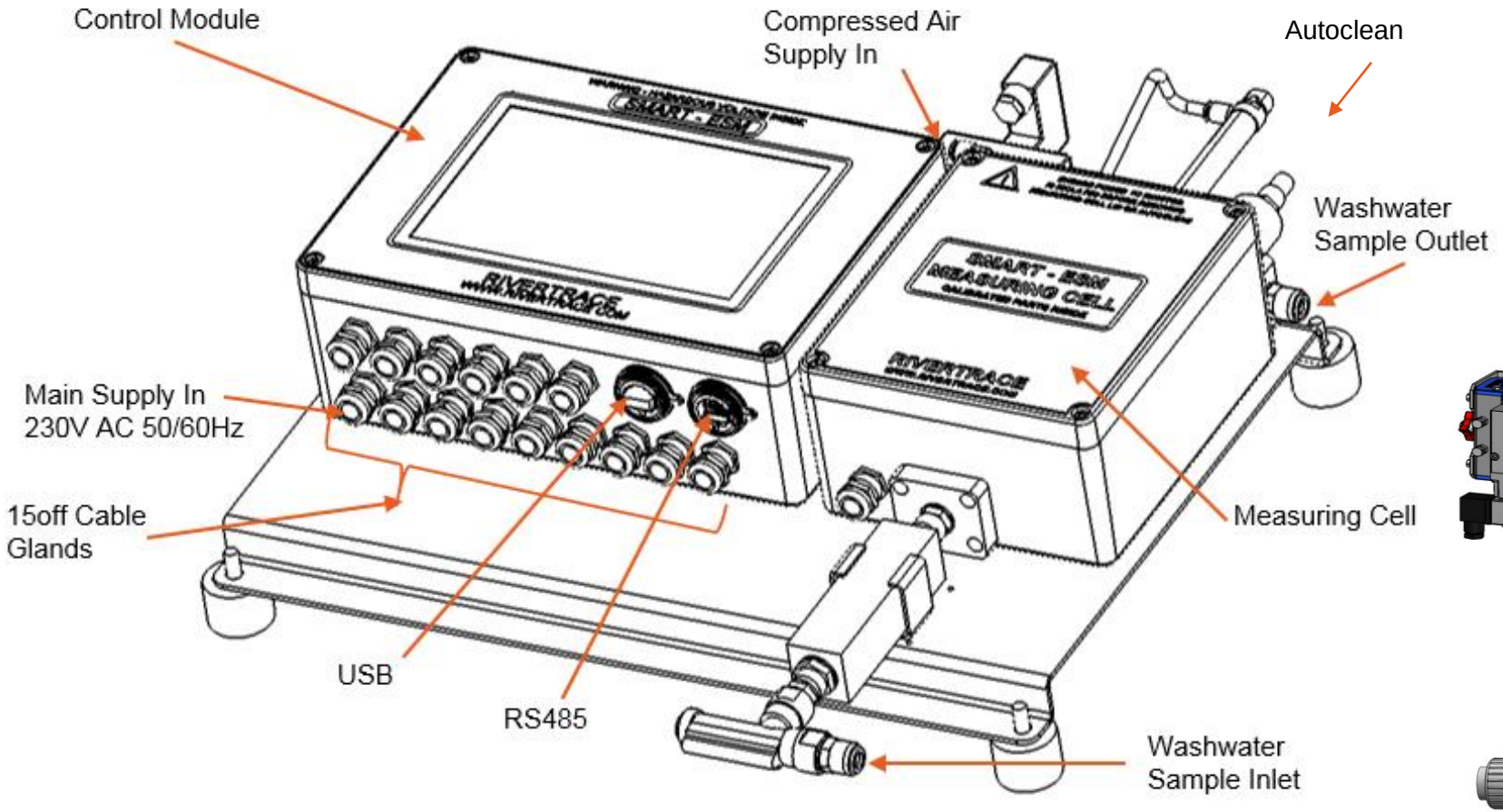
RIVERTRACE
Cleaner. Smarter.

Number of sample points	1 analyser per sample point with optional measurement parameters
PAH Range	0µg/L to 4500µg/L
PAH Accuracy	5% of measurement reading
PaH Measurement Principle	UV Fluorescence
Turbidity Range	0 – 500 NTU
Turbidity Accuracy	0.1NTU up to 100 NTU, 1NTU thereafter.
Turbidity Measurement Principle	IR Scattering
pH Range	0 – 14 pH
pH Accuracy	0.1 pH
pH Measurement Principle	pH Electrode
Approval	DNV-GL Certificate of Conformity
IP Rating	IP66
Supply Voltage	230VAC 50/60 Hz
Outputs	4-20mA for each Parameter

Wetted Parts materials	Stainless Steel, Glass, & Plastic
Automatic cleaning device fitted as standard	YES
Optimum Air pressure	6 BAR
Compressed Air normal / average consumption	450mL / Hr
Air Regulator included on standard Monitor	YES
Flow rate range (Sample / Clean)	1 to 4 LPM
Optimum flow rate (Sample / Clean)	3 LPM
Ambient Temperature range	1°C to 50°C
Sample Temperature range (Sample / Clean)	1°C to *40°C *Higher optional with a heat exchanger
Sample pressure range (Sample / Clean)	1 to 9 Bar *Motor/Pump provided if below 0.5 bar
Optimum Measuring pressure (Sample / Clean)	3 Bar
Air Supply required for Standard Monitor?	YES
Air Supply required pressure range	4 - 10 BAR

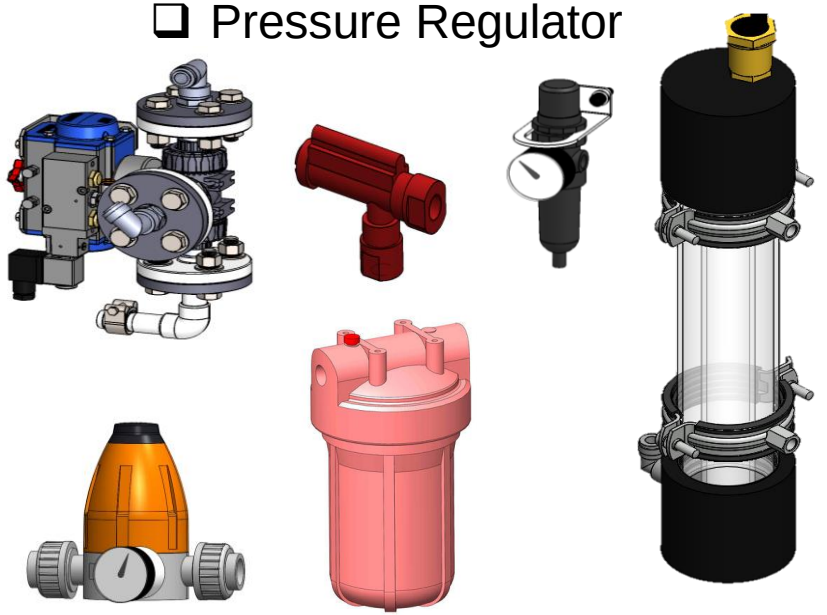
Control Module Overview

RIVERTRACE
Cleaner. Smarter.



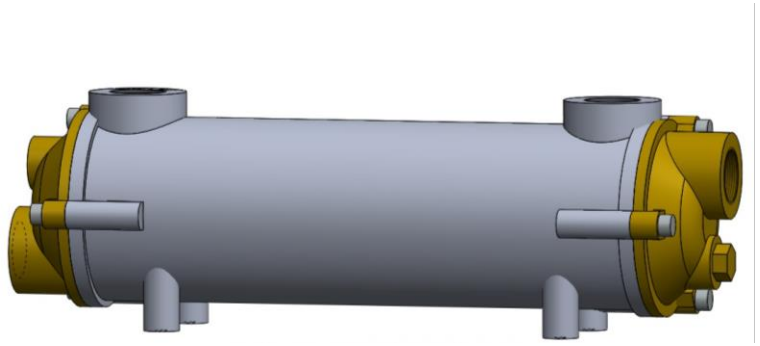
Standard Components

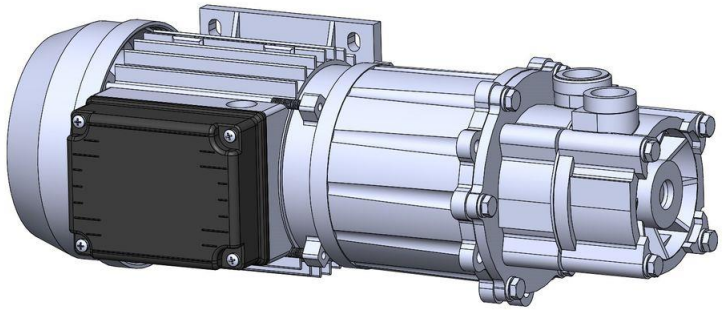
- ❑ Three-way ‘T’ valve
- ❑ Flow meter & switch
- ❑ Air regulator
- ❑ De-bubbler
- ❑ Filters
- ❑ Pressure Regulator



Optional Components

RIVERTRACE
Cleaner. Smarter.





Magnetic drive coupling

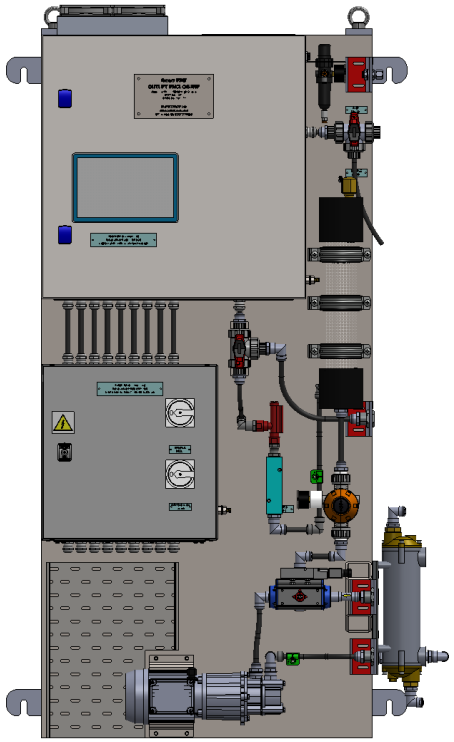
Optional components based on sample conditioning

1. Motor/pump – if flow is too low
2. Heat exchanger – if sample temp too high

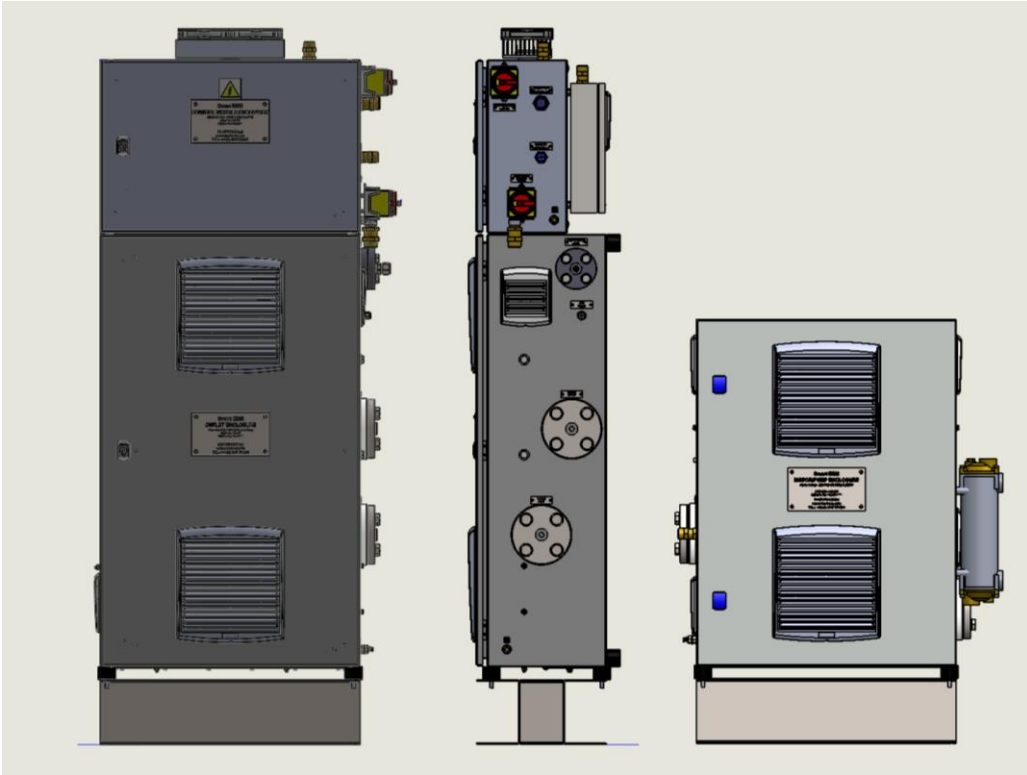
2 Design Options

RIVERTRACE
Cleaner. Smarter.

Frame Mounted (FM) System



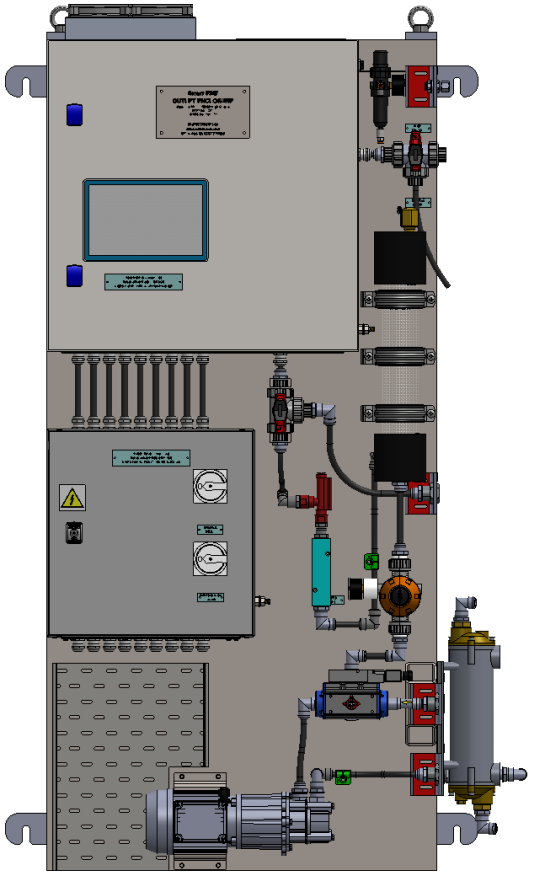
Box Mounted (BM) System



Smart ESM
Frame Mounted (FM) Configuration

RIVERTRACE
Cleaner. Smarter.

Description	This option is based on a modular design all mounted onto a frame / backplate. It consists of a cooled cabinet housing the Control Module and Measuring Cell with a separate enclosure for the electronics. All other sample conditioning equipment would be mounted onto the frame.
Extreme Dimensions (WxHxD)	1005 x 1668 x 310 mm
Weight	~ 100 Kg
Mounting	Wall mounted using 4 x M12 Bolts
Sample Inlet Connection	½” BSP Female Thread
Sample Outlet Connections	½” BSP Female Thread
Clean Water Inlet Connection	½” BSP Female Thread
Air Connection	6mm pipe

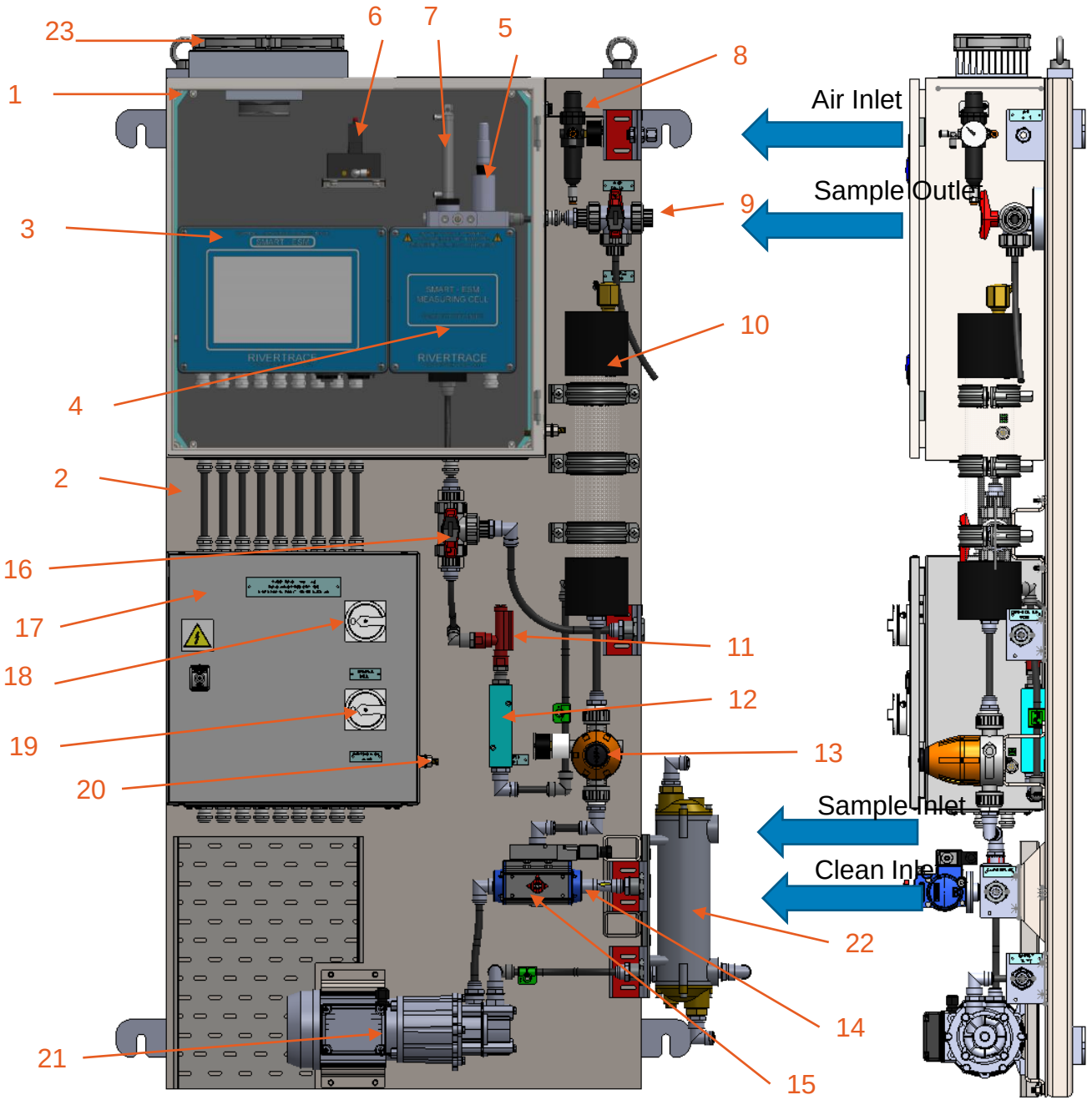


RIVERTRACE

Cleaner. Smarter.

FM SYSTEM
KEY TO MAIN COMPONENTS:

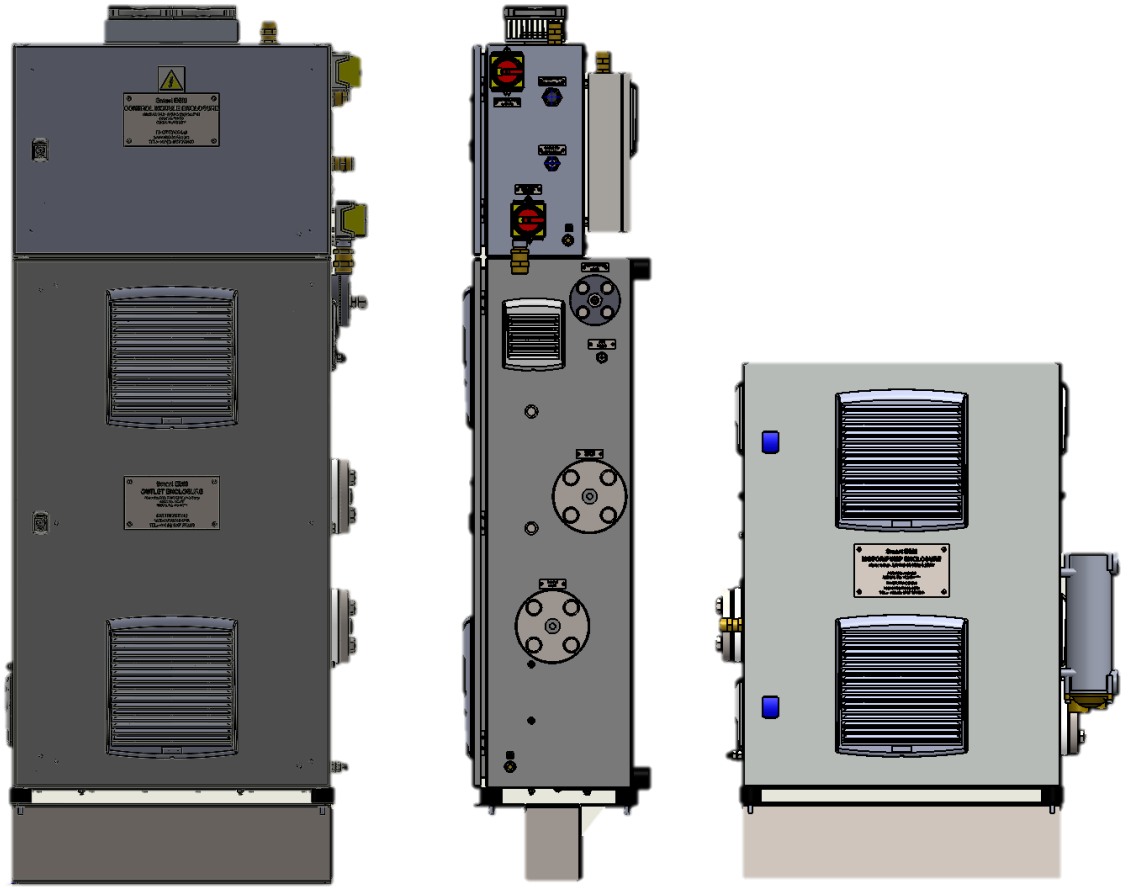
1. ENCLOSURE - MILD STEEL IP 66
2. BACK PLATE ON FRAME 316 STAINLESS STEEL
3. SMART ESM CONTROL MODULE ASSEMBLY
4. SMART ESM MEASURING CELL - PAH, TURBIDITY, pH & TEMP
5. pH PROBE
6. AUTOCLEAN SOLENOID
7. AUTOCLEAN PNEUMATIC CYLINDER
8. AIR REGULATOR
9. SAMPLE TAP OFF POINT DRAIN
10. DEBUBBLER
11. FLOW SWITCH
12. VARIABLE FLOW METER
13. PRESSURE REGULATOR
14. CLEAN WATER ONE WAY VALVE
15. SOLENOID ACTUATED THREE WAY BALL VALVE
16. CELL DRAIN VALVE
17. ELECTRICAL ENCLOSURE MILD STEEL IP66
18. MOTOR/PUMP ISOLATION SWITCH
19. MAINS ISOLATOR SWITCH - IP67
20. M10 EARTH STUD
21. OPTIONAL PUMP / MOTOR
22. OPTIONAL HEAT EXHANGER
23. CONTROL MODULE CABINET COOLER



Smart ESM
Box Mounted (BM) Configuration

RIVERTRACE
Cleaner. Smarter.

Description	This option is based on a twin enclosure design. It consists of a cooled cabinet housing the Control Module and electronics and a separate compartment for the Measuring Cell and sample conditioning equipment. A second cabinet is provided for the motor/pump assembly.
Extreme Dimensions (WxHxD)	Control Cabinet 695 x 1655 x 350 mm Motor/Pump Cabinet 820 x 980 x 350 mm
Weight	Control Cabinet ~ 100 Kg Motor/Pump assy Cabinet ~ 77 Kg
Cabinet Mounting	Wall Mounted using 4 x M8 Rubber Shock Mounts Or Floor Mounted using 6 x M10 BOLTS
Sample Inlet Connection	JIS 10K BLANK FLANGE FITTED FOR 32A PIPE TAPED 1/2 " BSP
Sample Outlet Connections	JIS 10K BLANK FLANGE FITTED FOR 32A PIPE TAPED 1/2 " BSP
Clean Water Inlet Connection	15mm bite type fitting
Air Connection	6mm pipe

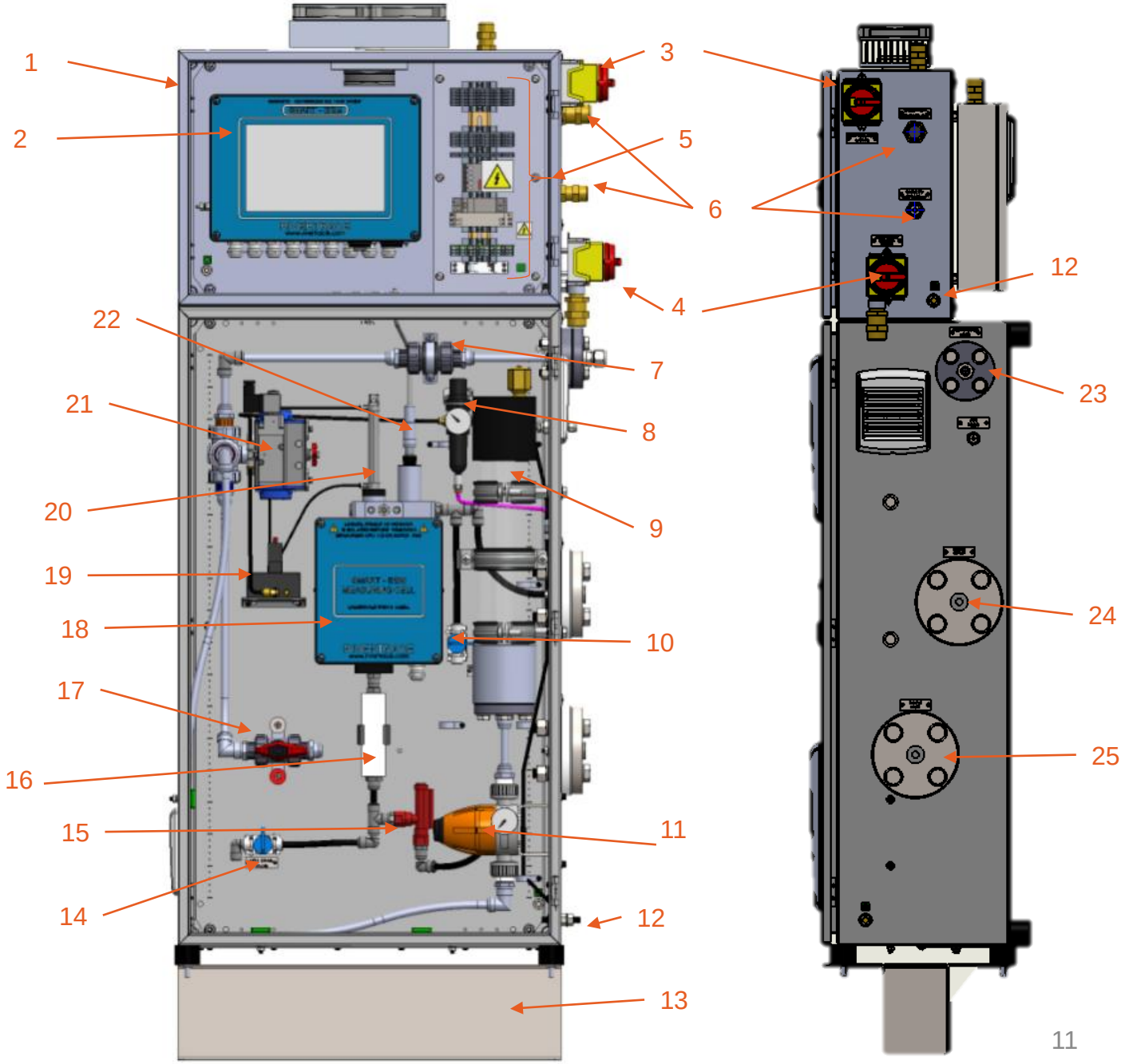


RIVERTRACE

Cleaner. Smarter.

BM SYSTEM
KEY TO MAIN COMPONENTS:

1. ENCLOSURE - MILD STEEL IP 66
2. SMART ESM CONTROL MODULE ASSEMBLY
3. MAINS ISOLATOR SWITCH - IP67
4. MOTOR/PUMP ISOLATION SWITCH
5. ELECTRICAL CONNECTIONS & TERMINALS
6. CABLE GLAND M20
7. CLEAN WATER ONE WAY VALVE
8. AIR REGULATOR
9. DEBUBBLER
10. SAMPLE TAP OFF POINT DRAIN
11. PRESSURE REGULATOR
12. M10 EARTH STUD
13. PLINTH 316 STAINLESS STEEL
14. CELL DRAIN VALVE
15. FLOW SWITCH
16. VARIABLE FLOW METER
17. SAMPLE ISOLATION VALVE
18. SMART ESM MEASURING CELL - PAH, TURBIDITY, pH & TEMP
19. AUTOCLEAN SOLENOID
20. AUTOCLEAN PNEUMATIC CYLINDER
21. SOLENOID ACTUATED THREE WAY BALL VALVE
22. pH PROBE
23. CLEAN WATER INLET
24. SAMPLE OUTLET
25. SAMPLE INLET

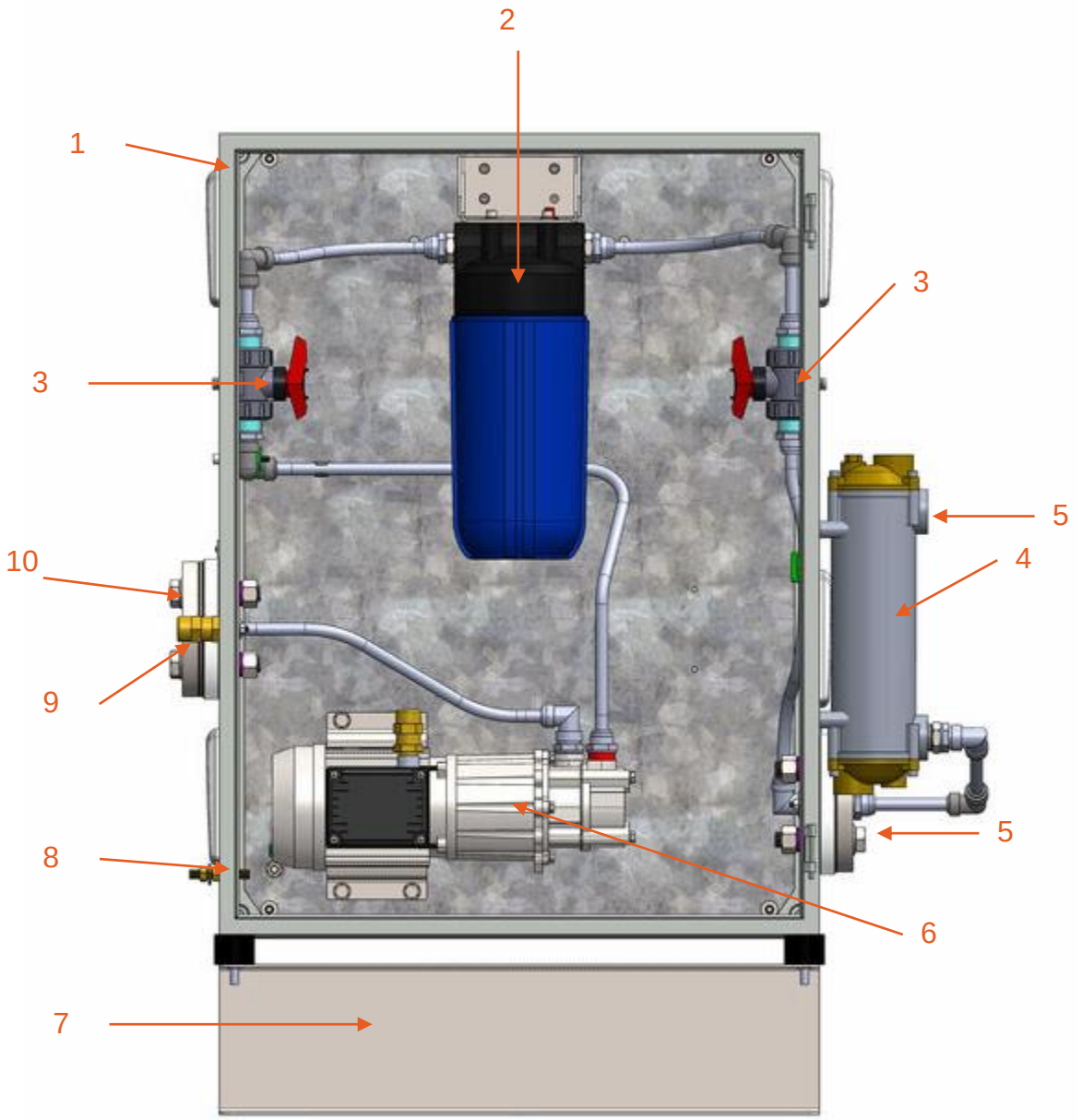


RIVERTRACE

Cleaner. Smarter.

BM SYSTEM
KEY TO MAIN COMPONENTS:

1. ENCLOSURE - MILD STEEL IP 66
2. FILTER UNIT
3. ISOLATION VALVE
4. OPTIONAL SAMPLE HEAT EXCHANGER
5. SAMPLE INLET (With or without Heat Exchanger)
6. OPTIONAL 230VAC MOTOR WITH MAGNETIC DRIVE PUMP
7. PLINTH 316 STAINLESS STEEL
8. M10 EARTH STUD
9. CABLE GLAND M20 - IP67
10. SAMPLE OULTET



Response Time

RIVERTRACE
Cleaner. Smarter.

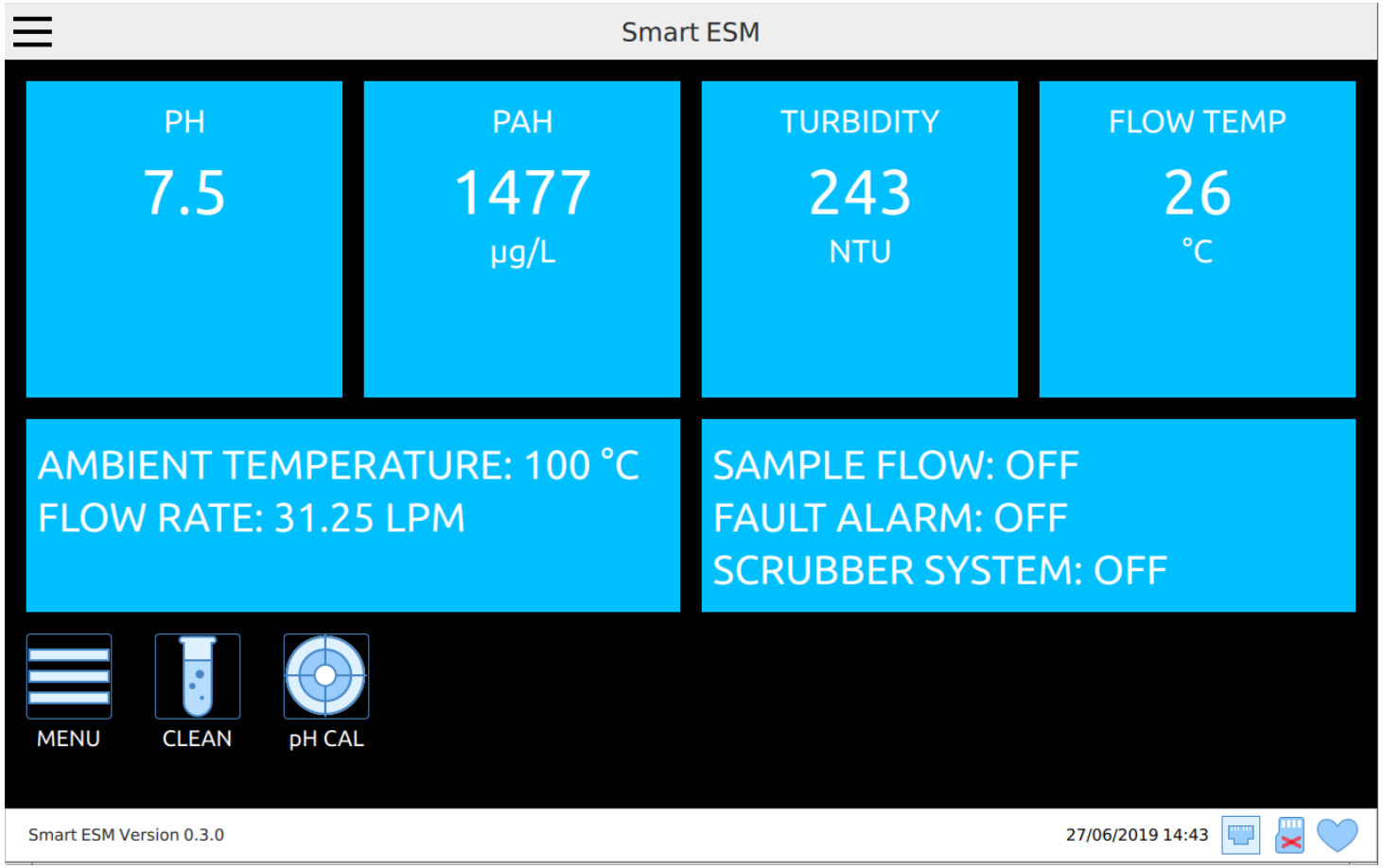
- The response time for each parameter meeting their 1% and 99% targets is indicated in the table below.

Parameter on test	Clean water (Mains water)	Sample readings from sample tank	Calculated 1% of value	Calculated 99% of value	T1 - Time taken to exceed calculated 1% of value from clean water readings. (Seconds)	T99 - Time taken to reach calculated 99% of value from clean water readings. (Seconds)
PAH (µg/L)	0	2602	26	2575.98	131	266
Turbidity (NTU)	2	296	3	293.04	122	212
pH	7.9	2.8	7.8	2.828	127	250

- At 1 Litre per minute flow rate (Minimum permissible flow), the response time of the least responsive parameter is 266 seconds, including sample transit and sample analysis time.

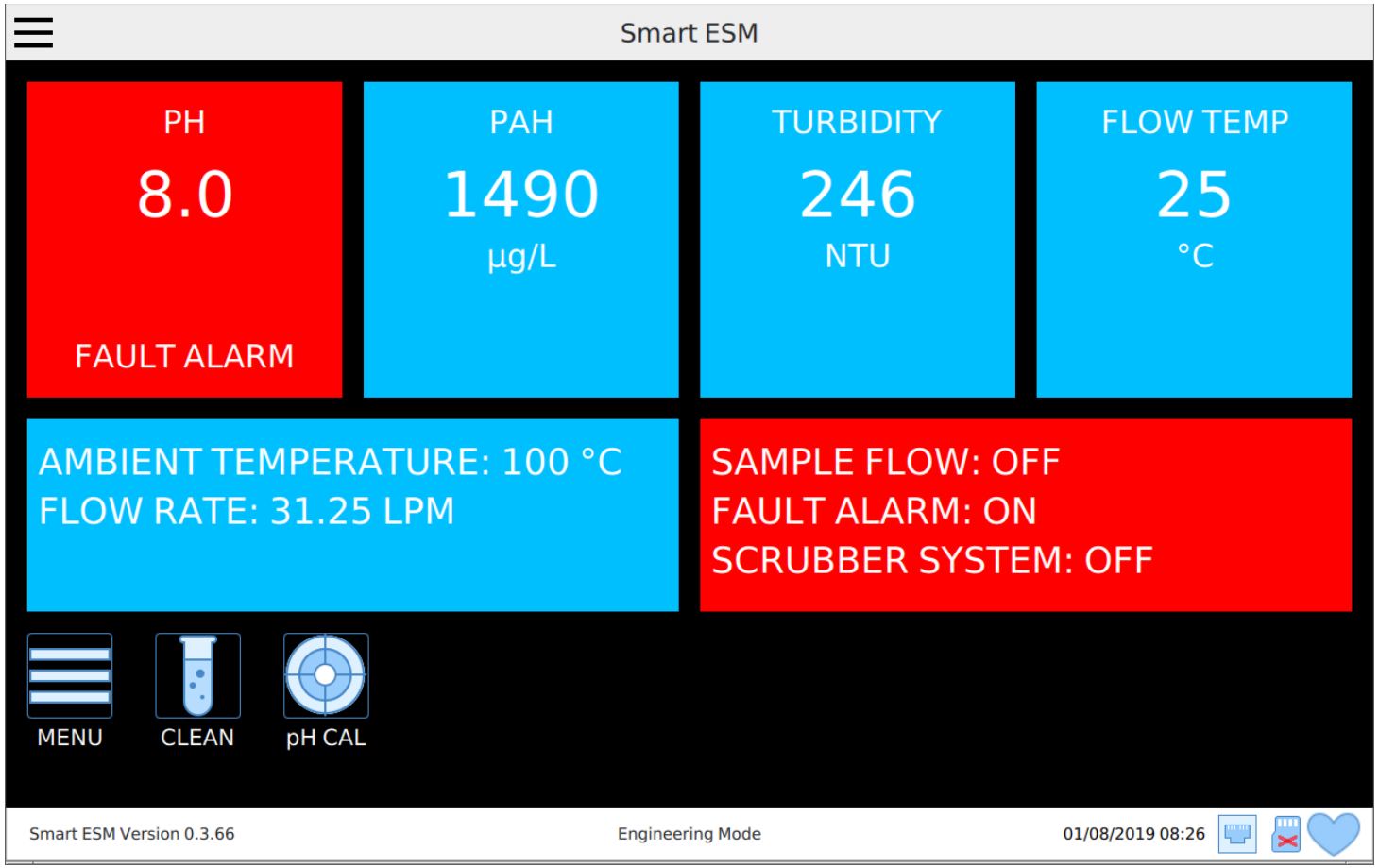
SMART ESM Control Module Screen

RIVERTRACE
Cleaner. Smarter.



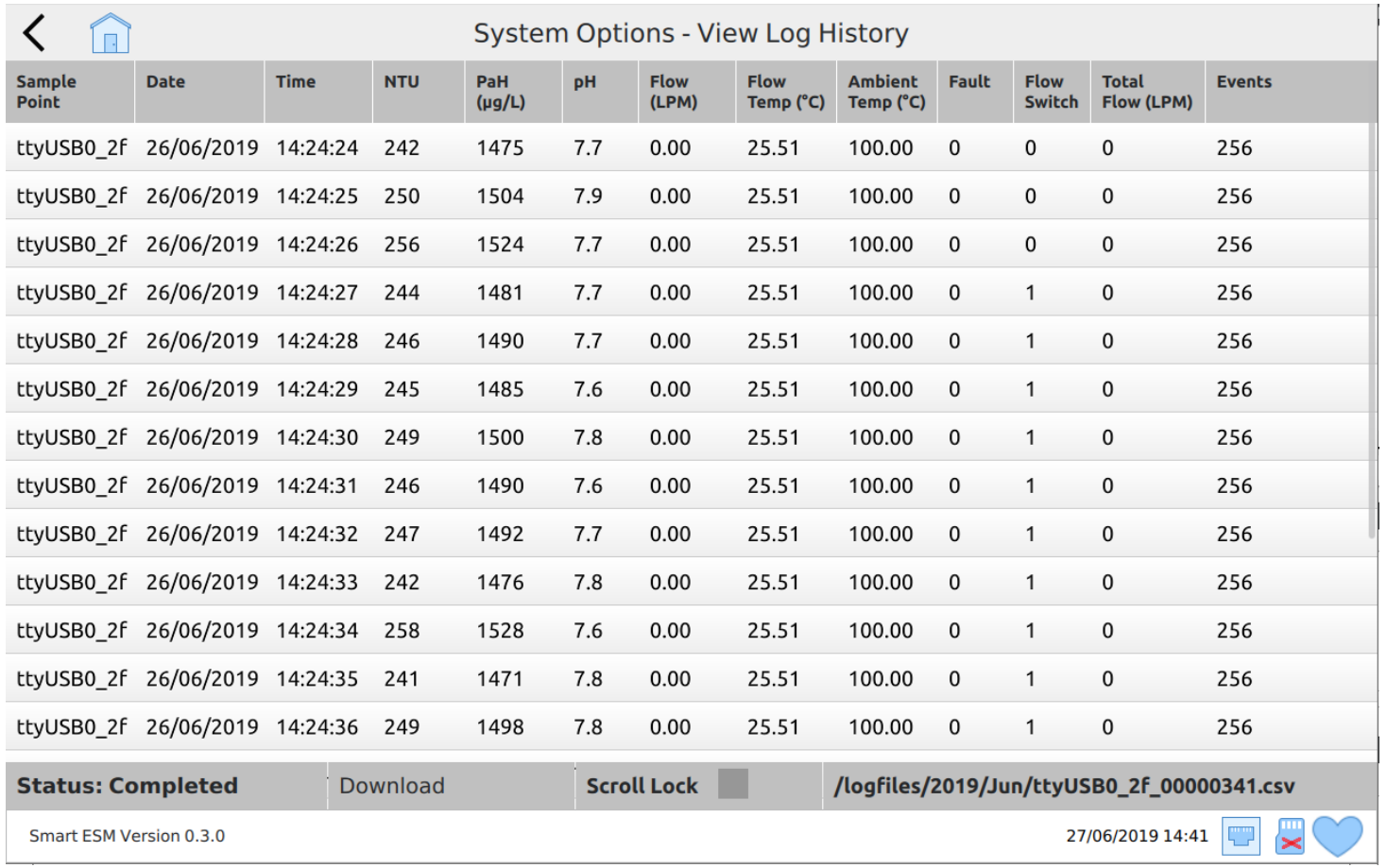
Home Screen with Fault Alarm

RIVERTRACE
Cleaner. Smarter.



System Log History

RIVERTRACE
Cleaner. Smarter.



Maintenance Schedule

RIVERTRACE
Cleaner. Smarter.

Action	Frequency				
	1 Month	3 months	6 Months	12 months	As Needed
Remove and clean the filter. Replace as needed.	O				O
Pressure relief valve set point check (4±0.2 bar)			O		O
Calibrate pH probe using Rivertrace buffer solution		O			O
Check PAH and Turbidity parameter accuracy using on-site check kits.			O		O
Replace PAH Cassette				O	O
Replace Turbidity Cassette				O	O
Replace pH probe				O	O
Replacement of Auto clean wiper blade by crew				O	O
Replace Desiccator				O	O

* Maintenance schedules should be evaluated based on sample conditions