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**Wave MiniBOSS MEPC 107(49)
Monitored Oil Removal System
OPERATION & MAINTENANCE MANUAL
110-240vAC & 24vDC Models**

NOTE: ALL AC VOLTAGE MODELS ARE NOW SUPPLIED WITH A 24vDC PUMP



OPERATIONS AND MAINTENANCE MANUAL

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1. SYSTEM DESCRIPTION

The MiniBOSS oil water separation system is a compact IMO MEPC 107(49) certified system utilizing easy to change, disposable sediment and oil removal cartridge filters. Its small footprint and designed to be wall mounted. It is designed to meet the discharge requirements on smaller craft .

The MiniBOSS oil water separation system includes the following basic components:

- Control Panel
- Pump/motor
- Sediment Filter
- 2 Wavestream System 3 filters
- Oil Content Monitor (OCM)
- Solenoid Type Two 2-way valves for recycle or discharge

1.1. Options

The Wave MiniBOSS has flow rate of 0.45 m³/hr. with 3 voltage options:

- 1) The standard Wave Mini-BOSS requires 24VDC .
- 2) The Wave MiniBOSS-110-240 requires 110-120VAC or 220-240VAC.

1.2. Process Description

Oily water is sucked into the system by the process pump P-101 (positive displacement diaphragm pump). The design capacity of the Wave MiniBOSS system is 0.45 M³/hr. at 1.72 bar back pressure and no vacuum on the inlet.

However, the actual flow rate achieved is a function of the system pressure. If the backpressure goes up the flow rate will go down. The flow rate will fluctuate depending on pressure and vacuum. There is no way to adjust the flow rate.

The water goes through a sediment filter to remove silt and suspended solids. The water then goes to 2 x Wavestream WS-C3 to remove free oil and emulsified oil. A sample of the discharge water goes through the oil content monitor whenever the system is operating. If the sample water has < 15ppm or optional 5ppm oil the OCM opens the the diverter valve.

If the sample water has > 15ppm or optional 5ppm oil the OCM shuts the discharge and opens the recycle diverter valve and the water is recycled back to the bilge.

The system is designed so that non specified water (15ppm or optional 5ppm) will not be allowed over board.

1.3. Oil Content Monitor

The Wave MiniBOSS system includes an Oil Content Monitor (“OCM” or “bilge alarm”) that has been certified to meet the MEPC 107(49) regulations. The OCM has the ability

to automatically return non-conforming discharge water back to the sump or bilge. The OCM is a 15 ppm oil content monitor that has been tested and approved in accordance with IMO Resolution MEPC.107 (49). The OCM is continually sampling the process stream and is designed to react quickly to any changes in the oil content.

If there is a requirement for a maximum of 5 ppm oil in the discharge water, the OCM can be adjusted to only allow discharge with less than 5 ppm oil by following the instructions referenced in 2.4 below. If required a non adjustable 5 ppm OCM can be supplied.

The Wave MiniBOSS pump is designed to discharge approx. 0.45 M3/hr at 1.72 bar..

The flow is processed through the separator and is either discharged or recycled, depending on the OCM reading. A small amount goes through the OCM and is recycled back to the bilge at all times, this is not part of the 0.45 M3/hr. calculated to be going overboard. If the discharge pressure changes, the flow rate will change according to the pump curve.

1.4. System Specifications

ALL UNITS

Specification	Basic Wave MiniBOSS (24VDC)	Wave MiniBOSS-110 (110-240VAC)
IMO MEPC Compliance	Monitor 107(49) certified	Monitor 107(49) certified
Dimensions	762 x 1016 x 254 mm	762 x 1016 x 254 mm
Dry Weight	37.2 kgs..	37.2 kgs..
Capacity, max	0.45 M3/hr	0.45 M3/hr.
Filter Media	Wavestream WS-C3	Wavestream WS-C3
Test barg	3.79	3.79
Operating Pressure	Up to 3.45 bar	Up to 3.45 bar
Operating Temp Range	1-55 C	1-55 C
Oil Content Monitor	IMO MEPC 107(49) certified monitor	IMO MEPC 107(49) certified monitor
Pump	Positive displacement diaphragm	Positive displacement diaphragm
Control Valve	Solenoid type double 2-way valves	Solenoid type double 2-way valves
Piping & Fittings	Stainless steel pipe& fittings, poly tubing & fittings	Stainless steel pipe& fittings, poly tubing & fittings
Single Phase Power Required	24 vdc	110-120 vac or 220-240 vac
Three Phase Power Options	Available only with separate transformer	Available only with separate transformer
Frequency	50 or 60 Hz	50 or 60 Hz
Max Amperage	8 amp breaker at 24 vdc	4 amp breaker @ 110vac, 1.6 amp@ 220vac

2. OPERATION

The diverter valve(s) are controlled directly by the OCM. The control panel controls the power to the system and the pump motor control.

Turn on the system disconnect and set the selector switch to the “ON” position. Verify that the OCM reads zero ppm. If it does not go down to zero in a reasonable period of time you may need to remove the cap to the OCM cell and use the supplied brush to clean the cell. Then turn on the system pump to pump oily water through the system. The design flow for the system is 0.45 M3/hr at 1.72 barg back pressure with no vacuum.

If the back pressure changes the flow rate will vary slightly. The flow rate cannot be adjusted.

There are pressure gauges on the inlet and outlet of the sediment filter. Take note of the pressure differential when the cartridges are new. The differential will increase as the sediment builds up. When the INLET gauge is reading 1.72 barg or above, the flow of 0.45 M3/hr has peaked. It will continue to process oily water but as the pressure goes up the flow will be reduced further. When the INLET gauge has reached 3.45 barg, the pump has now reached its maximum pressure and will just bypass the flow internally. At this point the flow is essentially zero. When this happens it is time to change the sediment filter. The oil removal filters are not designed to plug as long as the sediment filter is properly maintained. If the sediment filter is changed and there is still too much backpressure, then that means the oil removal filters have also been plugged and need to be changed. If the OCM consistently goes into recycle then the oil removal filters are full of oil and need to be changed.

2.1. Alarm and Action Conditions

The only alarm condition that requires operator action is when the oil removal filters have reached maximum hydrocarbon saturation.

At this point, the OCM will not be discharging water overboard but will be in a continuous recycle mode.

When this happens it is time to change the oil removal filters.

Oil in Discharge Water Alarm—If the oil in the discharge water is greater than 15 PPM the OCM will alarm. An OCM alarm will cause the system to automatically go into recycle mode until the condition no longer exists. The alarm light on the OCM panel display indicates that the system is in recycle and that oil greater than 15 PPM has been detected in the water.

2.2. Maintaining and Servicing the OCM

DO NOT ATTEMPT TO BREAK THE SEAL OR OPEN THE OCM TO DO ANY MAINTAINENCE OF THE OCM. BREAKING THE SEAL WILL VOID THE CALIBRATION.

The only work you can do on the OCM is to change the cell or clean the cell or perform some other minor functions explained in the oil content monitor instruction manual. Any other work must be done by the factory. A separate instruction manual for the oil content monitor is provided.

The OCM cell will need to be cleaned on a regular basis. Refer to the OCM manual for operating instructions for the OCM.

There are times when the OCM cell can be coated with material that is hard to get off. You may need to use soap or vinegar or some other non-abrasive cleaner to get the cell clean if it has built up too much to get a clean reading on the monitor.

2.3. Calibration of the OCM

At IOPP certificate renewal time every 5 years, the calibration of the OCM has to be current. The original calibration certificate is good for 5 years. The OCM calibration can be checked at any time using an approved calibration test kit. Once the cell calibration date has expired (5 years from the certificate date), the cell will need to be replaced. Check the calibration certificate that comes with the system in the O&M manual to verify the calibration date. If you have lost your calibration certificate Recovered Energy or your distributor can provide you with a copy. Replacement cells are kept in stock.

Should you wish to do a calibration check, a test kit that can be purchased either from your distributor or the factory to verify the calibration of the monitor. It is not necessary to test the calibration as long as the cell has a valid calibration certificate. The instructions for checking the calibration will be included in the calibration kit.

2.4. Changing the OCM Alarm Limit

In some areas the limit for discharge is lower (usually 5 ppm). If this is the case, the alarm limit can be set to 5 ppm or any other amount in the range of 1-15 ppm. Please refer to the Brannstrom OCM manual for instructions on changing the alarm value.

2.5. Special tools

There are no special tools, test equipment or materials needed for servicing and maintaining the system except the following:

- a. Calibration test kit to test the calibration of the monitor. This is totally optional and is generally not required.

2.6. Shutdown procedures

If a shutdown is required for any maintenance that requires servicing an electrical component, make sure that the unit is unplugged and the system is locked out and tagged according to standard lock-out, tag-out procedures.

To clean the cell, do not unplug the unit. You will need power to the system to operate the oil content monitor during the cleaning process.

2.7. Pre-screening

The separator is not designed to handle heavy solids. A Y-strainer or other suitable pre-screening filter needs to be installed by the customer in front of the separator to keep larger particles out of the system. A 5 micron sediment filter is included in the system to handle some turbidity and to protect the oil/emulsion filters.

3. MAINTENANCE

The system does not have installed redundancy. The general maintenance philosophy for most of the components is to replace the components as they fail. We have not developed a mean time between failure for most of the components because every situation is different. The system does not generally run continuously—only when the bilge level increases to a designated level. In general, there is adequate time to make any required repair without impacting the bilge water level. We recommend maintaining critical spare parts in inventory so that if there is a failure the part can be replaced quickly. Every component can be changed within a few minutes.

Components are fairly inexpensive and it is less expensive to replace the entire component than it is to buy the part and overhaul the component. The only exception to this is the oil content monitor, which is the most expensive component on the system. In the case of the oil content monitor, it is against IMO regulations for the customer to do any maintenance on the system other than cleaning the cell. If the monitor fails it generally has to be replaced. Any attempt by the customer to break the seal and open the monitor will void the validity of the monitor.

There are some routine maintenance functions that need to be performed to keep the system running at peak performance:

3.1. Component Maintenance

- 3.1.1.** Valve—The solenoid valve can be cleaned if it gets dirt in it. If the valve fails, it will need to be replaced with a new valve, it cannot be repaired..
- 3.1.2.** OCM—The OCM will need a periodic check of zero against clean water, and frequent cleaning of the glass sample cell. The OCM measuring cell has a life of 5 years. At the end of that period the measuring cell will need to be replaced.
- 3.1.3.** Filters— The filter cartridges will need to be replaced when they become spent.
- 3.1.4.** Controls components—The controls are minimal. Any maintenance can be done when the component fails.
- 3.1.5.** Pump—The pump is a diaphragm pump. You cannot purchase individual components of the pump, and a repair kit is not available. The pump is rated for continuous duty with a life expectancy of about 5,000 hours. The pump will self-prime up to 2.75 metres vertical lift.

4. TROUBLE SHOOTING

The following suggestions are provided for situations that have been encountered in the past:

4.1. Reduced flow through the system

If the flow through the system becomes reduced it could be caused by a plugged sediment filter. Remove and replace the filter.

4.2. Fault Alarms and Remote Monitoring Capabilities

The OCM is designed to alarm if the oil content exceeds the set limit or if the OCM system fails. If the oil content exceeds the set limit the OCM alarms internally and causes the system to go into recycle mode until the alarm condition no longer exists. The alarm will show on the OCM display and will be recorded by the OCM data logger. Under a system fault alarm the alarm will show on the OCM display. Any OCM alarm or fault condition will automatically put the system into the recycle mode. Potential causes of the OCM system fault include:

- a. loose or improperly inserted data card
 - b. loss of communication between the display and the detector (loose cable)
 - c. internal board or power supply failure
- (See separate OCM O&M manual for a more detailed explanation of the OCM.)

4.3. Solenoid Valve not working

If a solenoid valve does not work, the most likely cause is a failure of the coil or a loose wire or it needs to be cleaned. You can verify the electrical continuity from the control panel.

4.4. High oil content reading causing water to recycle and not discharge overboard.

- a. If you are running high concentrations of oil the filter may pass more than 15 ppm oil.
- b. Sometimes a high OCM reading has nothing to do with the filter and is simply caused by a dirty OCM cell. The glass in the cell should be cleaned on a regular basis. This should be the first thing checked when the monitor is in alarm mode.

5. SAFETY

a. 29 CFR, Part 1910

There are no exposed moving parts on the system

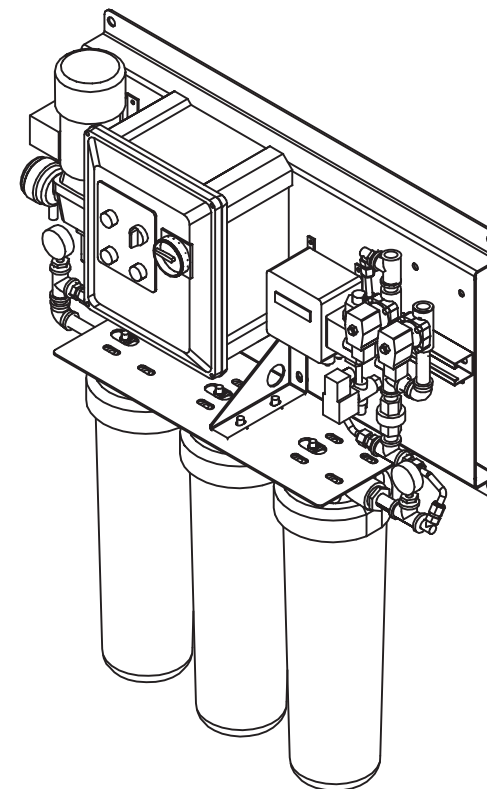
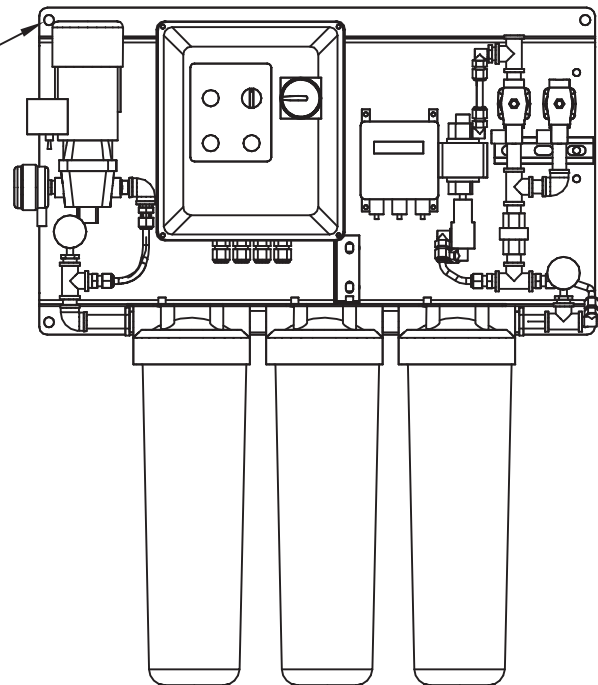
b. Federal Protection Standards

There are no hazardous substances or chemicals used in the system. The system is designed to separate oil from water. If there are other chemicals or substances in the oily water sump they should be evaluated individually to determine the impact.

6. RECOMMENDED SPARE PARTS

Wave MiniBOSS Spare Parts List				
item #	Part Description	24v-New	110v	220v
40452	24v Bilgmon 488 OCM	1	1	1
40456	Bilgmon 488 Measuring cell	1	1	1
40466	Cleaning Brush Bilgmon 488 Measuring cell	1	1	1
WSS3A	BB20 Cartridge Housings	3	3	3
WSBB002	BB20 o-rings	3	3	3
SW4	BB20 Cartridge filter wrench	1	1	1
WP5P20BB	5 Micron Sediment Cartridge	1	1	1
WS-C3	Wavestream oil removal Cartridge	2	2	2
42465	24v Solenoid Valves	2	2	2
42422	Plastic Check Valve	1	1	1
42016	24v pump	1		
42501	110v pump		1	
42574	220v pump			1
42575	plastic bowl strainer	1	1	1
40353	1/4x3/8 elbow plastic fitting	3	3	3
40358	1/2x3/8 straight plastic fitting	1	1	1
42595	1/2x1/2 straight plastic fitting	3	3	3
42405	1/2x1/2 elbow plastic fitting	1	1	1
40371	Pressure Gauges	2	2	2
42928	1/2 Strut Clamps	2	2	2

MOUNTING HOLES
4 @ 5/8" 4PLCS



UTILITY REQUIREMENTS

120-240VAC SINGLE PHASE OPTION:
2KVA POWER SERVICE REQUIRED
24VDC OPTION: 10AMPS REQUIRED

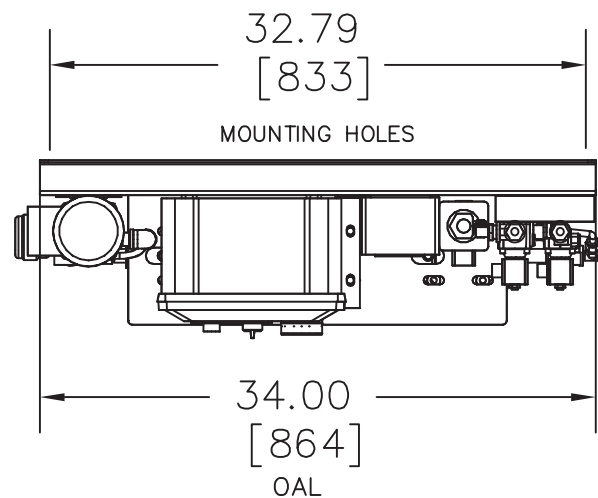
2L/MIN FRESH WATER MAINTENANCE CELL

PAINT SYSTEM:

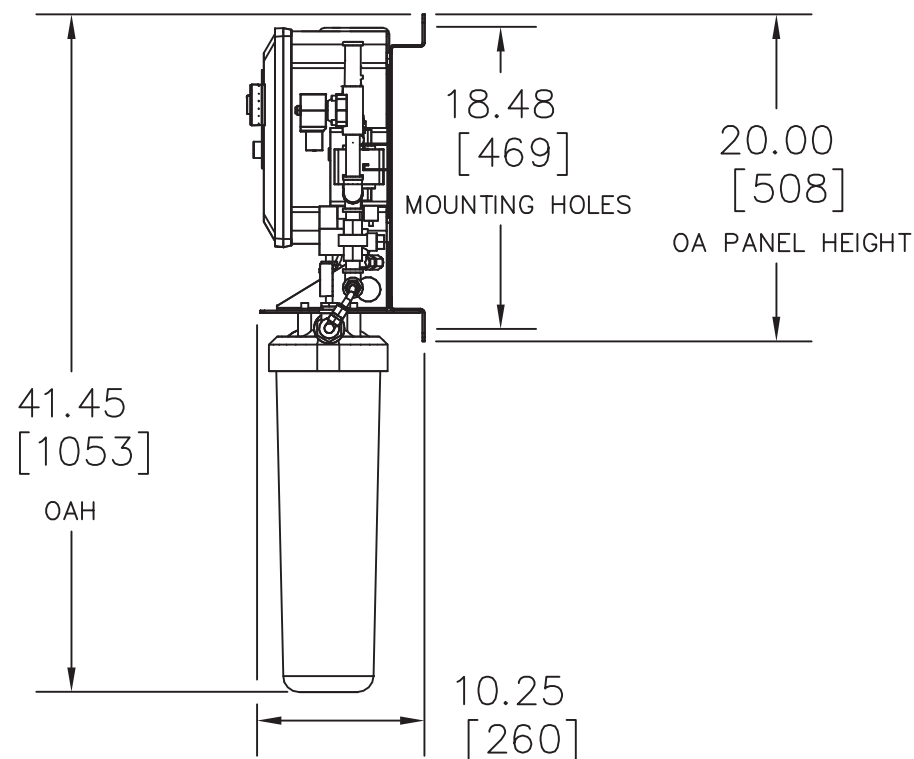
BLAST SSPC SP-10 1.0 - 1.5 MIL PROFILE
PAINT SIGNAL WHITE RAL9003

DRY WEIGHT - 83 LBS/37.6 KG
WET WEIGHT - 132 LBS/60 KG

WEIGHTS INCLUDE MEDIA



PLAN VIEW



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MODEL: MiniBOSS

CONFIGURATION:
ALL MODELS
.45 M3/HR
GENERAL ARRANGEMENT

CUSTOMER: —



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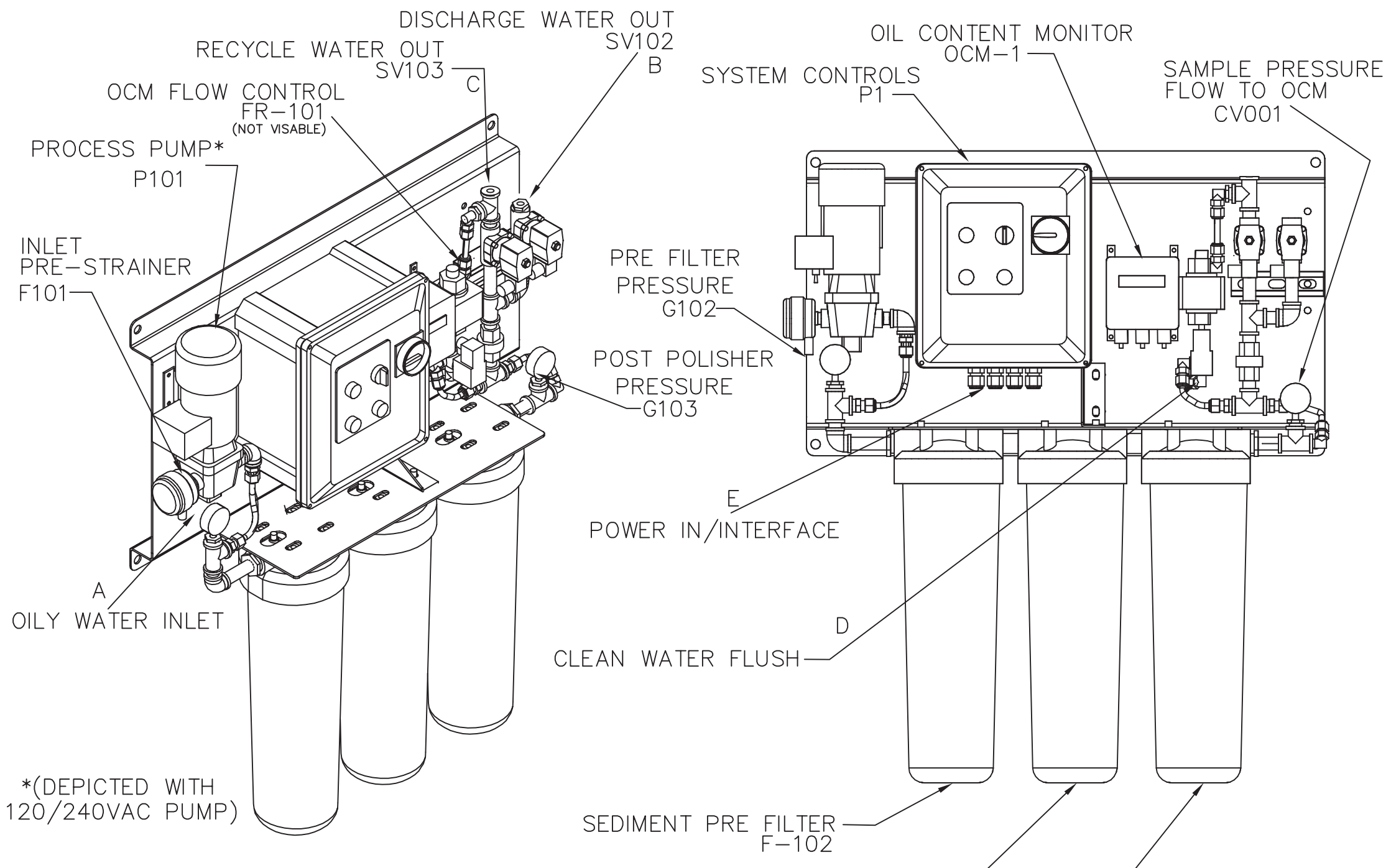
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VALVE & COMPONENT SCHEDULE				
MARK	DESCRIPTION	MAT	SIZE	USE
CV-001	CHECK VALVE	NL	1/2"NPT	BACKPRESSURE FLOW TO OCM
F-101	INLET SCREEN 20 MESH SS	PP	1/2" TUBE	INLET PRE-STRAINER
F-102	4"x20" CARTRIDGE HOUSING	PP	4.0X20"	SEDIMENT WSWP5P20BB
F-103	WAVESTREAM SYSTEM 3 HOUSING	PP	4.0X20"	OIL REMOVAL WAVESTREAM WS-C3
F-105	WAVESTREAM SYSTEM 3 HOUSING	PP	4.0X20"	OIL REMOVAL WAVESTREAM WS-C3
FR-101*	FLOW RESTRICTOR, ORIFICE	NL	WHITE	OCM FLOW CONTROL
G-102	PRESSURE GAUGE 100PSI/BAR	SS	1/4"	PRE-FILTER PRESSURE
G-103	PRESSURE GAUGE 100PSI/BAR	SS	1/4"	POST-POLISHER PRESSURE
OCM-1	OIL CONTENT MONITOR	AL	NA	OIL CONTENT MONITOR
P1	BOSS CONTROL PANEL	FG	NA	SYSTEM CONTROLS
P-101	DIAPHRAGM PUMP	PP	3/8"	PROCESS PUMP
SV-102	SOLENOID VALVE	NL	1/2"NPT	DISCHARGE WATER OUT
SV-103	SOLENOID VALVE	NL	1/2"NPT	RECYCLE WATER OUT

*NOTE FR-101 IS NOT USED WITH THE 220VAC PUMP OPTION

UNIT CONNECTIONS

- (A) - OILY WATER INLET 1/2" NPT MALE
- (B) - DISCHARGE WATER OUT 1/2" NPT FEMALE
- (C) - RECYCLE WATER OUT 1/2" NPT FEMALE
- (D) - CLEAN WATER FLUSH 3/8" TUBE PUSH FIT
- (E) - POWER IN/CUSTOMER CONNECTIONS

P-101 PUMP OPTIONS:

- 24 VOLT DC
- 115 VOLT AC
- 240 VOLT AC

CHECK UNIT VOLTAGE WHEN INSTALLING

*(DEPICTED WITH 120/240VAC PUMP)

PIPE FITTINGS ARE 1/2" 304 STAINLESS
ALL TUBING CONNECTIONS ARE 3/8" OR 1/2" POLY PUSH FIT

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MODEL: MiniBOSS

CONFIGURATION:

ALL MODELS
.45 M3/HR

P&ID IDENTIFICATION

CUSTOMER: —



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VALVE & COMPONENT SCHEDULE				
MARK	DESCRIPTION	MAT	SIZE	USE
CV-001	CHECK VALVE	NL	1/2"NPT	BACKPRESSURE FLOW TO OCM
F-101	INLET SCREEN 20 MESH SS	PP	1/2" TUBE	INLET PRE-STRAINER
F-102	4"X20" CARTRIDGE HOUSING	PP	4.0X20"	SEDIMENT WSWP5P20BB
F-103	WAVESTREAM SYSTEM 3 HOUSING	PP	4.0X20"	OIL REMOVAL WAVESTREAM WS-C3
F-105	WAVESTREAM SYSTEM 3 HOUSING	PP	4.0X20"	OIL REMOVAL WAVESTREAM WS-C3
FR-101*	FLOW RESTRICTOR, ORIFICE	NL	WHITE	OCM FLOW CONTROL
G-102	PRESSURE GAUGE 100PSI/BAR	SS	1/4"	PRE-FILTER PRESSURE
G-103	PRESSURE GAUGE 100PSI/BAR	SS	1/4"	POST-POLISHER PRESSURE
OCM-1	OIL CONTENT MONITOR	AL	NA	OIL CONTENT MONITOR
P1	BOSS CONTROL PANEL	FG	NA	SYSTEM CONTROLS
P-101	DIAPHRAGM PUMP	PP	3/8"	PROCESS PUMP
SV-102	SOLENOID VALVE	NL	1/2"NPT	DISCHARGE WATER OUT
SV-103	SOLENOID VALVE	NL	1/2"NPT	RECYCLE WATER OUT

*NOTE FR-101 IS NOT USED WITH THE 220VAC PUMP OPTION

LEGEND:
 MB - MARINE BRONZE
 SS - STAINLESS STEEL
 PP - POLYPROPYLENE
 FG - FILLED FIBERGLASS
 NL - ENGINEERED NYLON
 AL - ALUMINUM

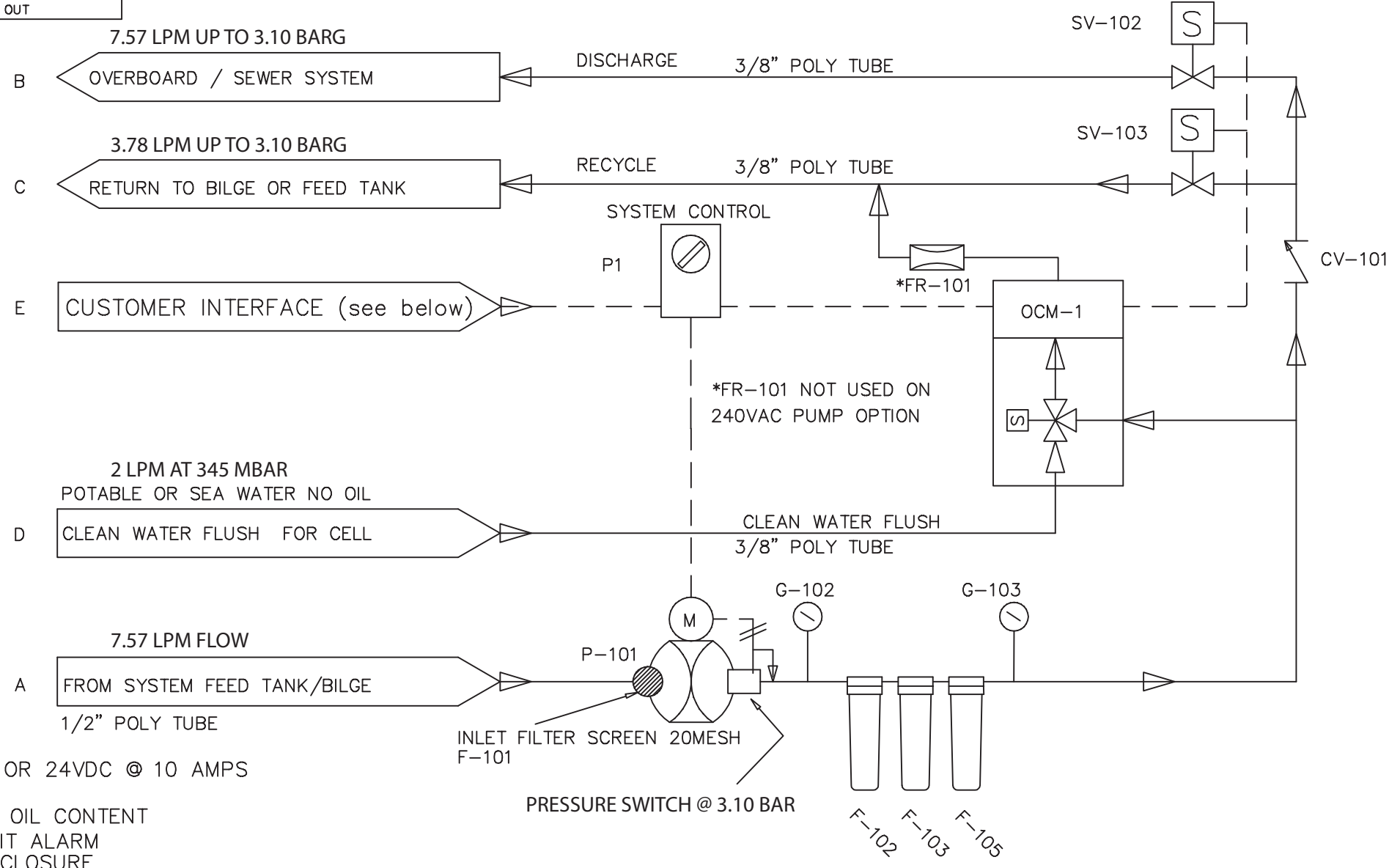
LEGEND

- FLOW RESTRICTOR
- FILTER/STRAINER
- SOLENOID VALVE
- CHECK VALVE
- PRESSURE GAUGE

SOS - SCOPE OF SUPPLY

- CV - CHECK VALVE
- F - FILTER/STRAINER
- FR - FLOW RESTRICTING ORIFICE
- G - GAUGE
- M - ELECTRIC MOTOR
- OCM - OIL MONITOR
- P - PUMP
- SV - SOLENOID VALVE

MiniBOSS



CUSTOMER INTERFACE

INPUT POWER: 110-240VAC @2KVA OR 24VDC @ 10 AMPS
 REMOTE START/STOP CONTACT CLOSURE
 ALARM SIGNAL 4-20 MA 1-15PPM OIL CONTENT
 ALARM #2 1-15 PPM OVER LIMIT ALARM
 INTERNAL CONTACT CLOSURE
 3A @ 250VAC

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CONFIGURATION:
 ALL MODELS
 .45 M3/HR
 P&ID

CUSTOMER: —

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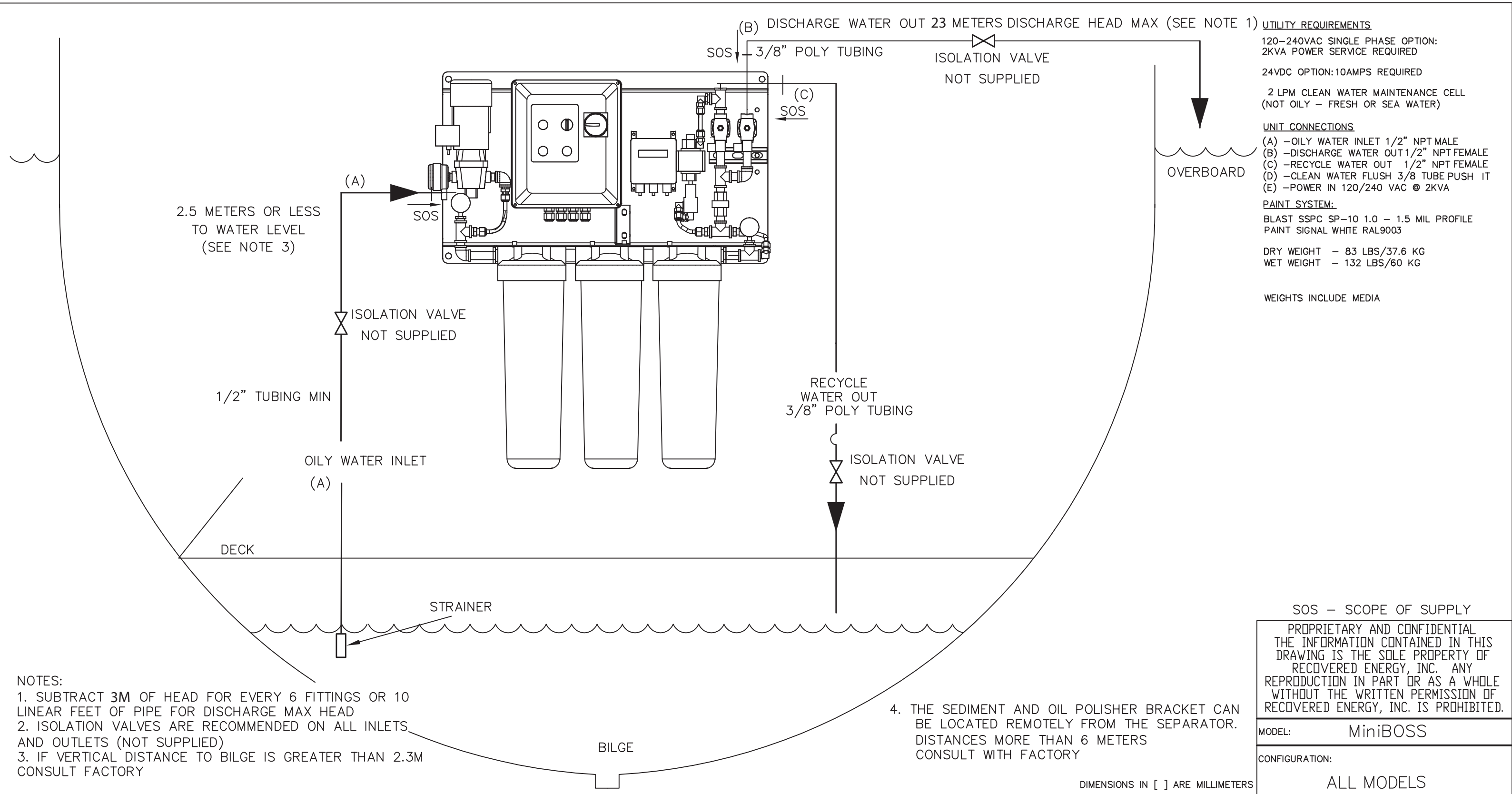
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UTILITY REQUIREMENTS
 120-240VAC SINGLE PHASE OPTION:
 2KVA POWER SERVICE REQUIRED

24VDC OPTION: 10AMPS REQUIRED

2 LPM CLEAN WATER MAINTENANCE CELL
 (NOT OILY - FRESH OR SEA WATER)

UNIT CONNECTIONS
 (A) - OILY WATER INLET 1/2" NPT MALE
 (B) - DISCHARGE WATER OUT 1/2" NPT FEMALE
 (C) - RECYCLE WATER OUT 1/2" NPT FEMALE
 (D) - CLEAN WATER FLUSH 3/8" TUBE PUSH IT
 (E) - POWER IN 120/240 VAC @ 2KVA

PAINT SYSTEM:
 BLAST SSPC SP-10 1.0 - 1.5 MIL PROFILE
 PAINT SIGNAL WHITE RAL9003

DRY WEIGHT - 83 LBS/37.6 KG
 WET WEIGHT - 132 LBS/60 KG

WEIGHTS INCLUDE MEDIA

- NOTES:**
1. SUBTRACT 3M OF HEAD FOR EVERY 6 FITTINGS OR 10 LINEAR FEET OF PIPE FOR DISCHARGE MAX HEAD
 2. ISOLATION VALVES ARE RECOMMENDED ON ALL INLETS AND OUTLETS (NOT SUPPLIED)
 3. IF VERTICAL DISTANCE TO BILGE IS GREATER THAN 2.3M CONSULT FACTORY

4. THE SEDIMENT AND OIL POLISHER BRACKET CAN BE LOCATED REMOTELY FROM THE SEPARATOR. DISTANCES MORE THAN 6 METERS CONSULT WITH FACTORY

SOS - SCOPE OF SUPPLY

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MODEL: MiniBOSS

CONFIGURATION:
 ALL MODELS
 .45 M3/HR
 INSTALLATION



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