# World Series Pump with Integrated CAFS

**Models: WT_C or WS_C with FoamLogix 2.1A & 3.3 Systems**
**From October 2005**

# Installation & Operation Manual


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# AMENDMENT RECORD

Model: WT_C or WS_C with FoamLogix 2.1A or 3.3 Systems

| Number | Date | Page/s | Amendment | New Issue No. |
|---|---|---|---|---|
| 1 | November 2005 | All | New Issue | Issue 1, |
| 2 | February 2006 | 44-45 | Addition of Wiring Harness 60784/03 and 60784/04 in pages 44-45 | Issue 2. |
| 3 | April 2006 | 25 | Additional information about installation of Foam Tank Low Level Sensor, paragraphs 2 and 3 | Issue 3 |
| 4 | April 2006 | 6, 27 | References to the additional manuals supplied with this manual – FoamLogix 2.1A / 3.3, MDTII Manual Dual Tank Selector, Intelli-tank display | Issue 4 |
| 5 | July 2006 | 31 | Title clarified - Discharging Water / Foam Agent | Issue 5 |
| 5 | July 2006 | 37 | Added No-Air Fault tree | Issue 5 |
| 5 | July 2006 | 46, 47 | Revision of schematic diagrams (inc contents page) | Issue 5 |
| 6 | January 2007 | 26 | Addition of line recommending the use of ball valves in the CAFS discharge line | Issue 6 |
| 7 | February 2007 | 9 | FoamLogix 3.3 system data – Fuse rating changed from 60 / 40 amp to 70 / 40 amp | Issue 7 |
| 8 | February 2007 | 39 | Recommended spares for bi-annual service – quantity of air filter changed from 4 to 2 | Issue 7 |
| 9 | March 2007 | 25 | Addition of sentence on preventing foam tank over-pressurisation with venting | Issue 8 |
| 10 | March 2007 | 26 | Addition of sentence on ensuring access to all CAFS equipment through panels | Issue 8 |
| 11 | November 2007 | 28-32 | Warning on NOT using CAFS discharge with pressurised or hydrant fed supply | Issue 9 |
| 12 | May 2008 | 11 | Addition of text to stress the foam concentrate list relates to compatibility with the equipment and not an approval of fire fighting capability | Issue 10 |
| 13 | May 2008 | 31 | Discharging Water/Foam Agent Mixture, line 3. Additional text to clarify foam % selection and factory default settings | Issue 10 |
| 14 | April 2012 | 10 | Gearbox oil capacity – now 1.2 litres | Issue 11 |

# CONTENTS

## INTRODUCTION

This manual contains information relevant to Godiva single or multi-pressure World Series Pumps, when partnered with Compressed Air Foam Systems (CAFS) FoamLogix Models **2.1A** and **3.3**. Distinction between the two models regarding Installation, Maintenance, Operation and Specification is clearly noted with text and illustrations. Installation is the key difference between the two models with the **2.1A** being pump mounted and the **3.3** vehicle (remote) mounted. Other than performance, foam capability and installation of the FoamLogix units, the Godiva components are common.
For further information on the FoamLogix **2.1A** and **3.3** Foam Proportioning Systems, MDTII Manual Dual Tank Selector (for 3.3 system) and Intelli-tank Water/foam level display unit, please see the separate manuals supplied.

## IMPORTANT NOTES

Please read this manual before operating the pump.

**CRITICAL**: The pump Bearing Housing, Gearbox and Compressor are **NOT** filled with oil ex works. Refer to section Installation and Set-up (Oil Filling Points) before operation.

Correct lubrication and maintenance is essential if satisfactory performance is to be maintained.

Do not run the pump without water in the pump casing.

The heat exchanger system requires a minimum differential pressure of 3 bar to be maintained. To prevent overheating, adequate cool water must be circulated through the pump unit heat exchanger.

The terms ‘Left Hand’ (LH) and ‘Right Hand’ (RH) apply when the pump unit is viewed from the suction tube end; for the purposes of this document, this is regarded as the front of the assembly.

# SAFETY - RELEVANT DATA

**Thank you for purchasing a Godiva Pump.**

**Godiva Pumps are designed to give safe and reliable service. BEFORE use however, it is essential that the Operating and Installation Instructions are carefully read and understood.**

## Maintenance

It is the responsibility of the user to ensure that the equipment is maintained in a safe operational condition. Local legislative conditions may apply. UK only, Maintenance (Regulation 5) of the Provision and Use of Work Equipment Regulations 1998 applies.

## Training

It is ESSENTIAL that Godiva pumps are operated ONLY by TRAINED PERSONNEL. Please contact Godiva Ltd to discuss your training needs.
Follow the operating procedures laid down in this document and avoid personal injury.

## Safety Points

The following points apply to pumps driven by petrol, diesel or other means:

DO NOT OPERATE the unit close to flammable materials or structures.

DO NOT SMOKE while operating the unit.

DO NOT inhale fumes or gases.

Avoid prolonged skin contact with fluids, particularly if corrosive or carcinogenic.

When in use, keep ALL UNTRAINED people AWAY from the unit.

Where appropriate, eye protection should be worn.

Isolate the electrical supply when working on the pump.

Batteries produce EXPLOSIVE GASES, do not expose to sources of heat and naked flames.

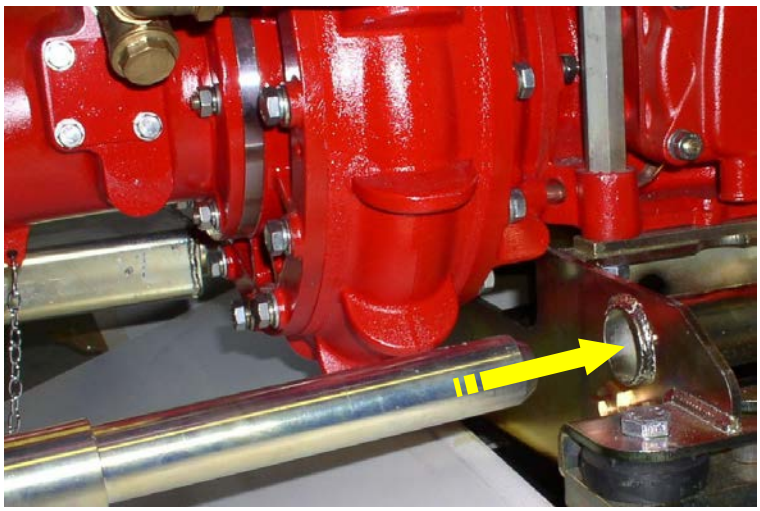
DO NOT lift heavy weights without assistance.

DO NOT remove protective guards or shields.

## Noise

Operators must wear suitable EAR PROTECTION when the pump is running.

## Lifting Points



Secure handling of the unit for installation and maintenance is vital. Use only the lifting points provided on the unit, in conjunction with fork Lift Adapters, part number **60275 / 18**. These items are available from Hale Products Europe.

***Lift Adapter Location***

***Lift Adapters Located***

## ENVIRONMENTAL PROTECTION

It is prohibited to pour engine oil and other contaminants onto the ground, down sewers, drains, or into water courses.
Dispose of lubricants through authorised waste disposal contractors, licensed waste disposal sites, or to the waste reclamation trade.
If in doubt, contact your Local Environmental Agency for advice regarding disposal policies.

# GENERAL DATA

## Compressor

| | |
|---|---|
| Model | Tempest 3 |
| Maximum Operating Speed | 10000 rev / min |
| Nominal speed of operation | 6250 rev / min |
| Nominal power consumption | 12.0kW |
| Direction of rotation | Anti-clockwise (viewed on pulley) |

## Cooling System

| | |
|---|---|
| Type | Oil / Water Shell & tube type |
| Cooling water flow-rate | 10 / 15 Litres / Min at 7.0 Bar |

## Foam Proportioning System 2.1A - Class A Foam Compatible

| | |
|---|---|
| Manufacturer | Hale Products Inc |
| Model | FoamLogix 2.1A |
| Type | Electronic foam proportioning system |
| Operating voltage | 12 and 24 volt systems available |
| Fuse rating 12V / 24V | 50 / 40 amp |
| Current draw (Operating) 12V / 24V | 25 / 13 amp |
| Current draw (Max) 12V / 24V | 40 / 20 amp |
| Wire size 12V / 24V | Minimum 6.0mm$^2$ |
| Max. Foam Agent Flow rate | 8.0 Litres / Minute |

## Foam Proportioning System 3.3 - Class A and B Foam Compatible

| | |
|---|---|
| Manufacturer | Hale Products Inc |
| Model | FoamLogix 3.3A |
| Type | Electronic foam proportioning system |
| Operating voltage | 12 and 24 volt systems available |
| Fuse rating 12V / 24V | 70 / 40 amp |
| Current draw (Operating) 12V / 24V | 30 / 24 amp |
| Current draw (Max) 12V / 24V | 60 / 30 amp |
| Wire size 12V / 24V | Minimum 8.5mm$^2$ |
| Max. Foam Agent Flow rate | 12 Litres / Minute |

## Direction of Rotation - Gearbox Input Flange

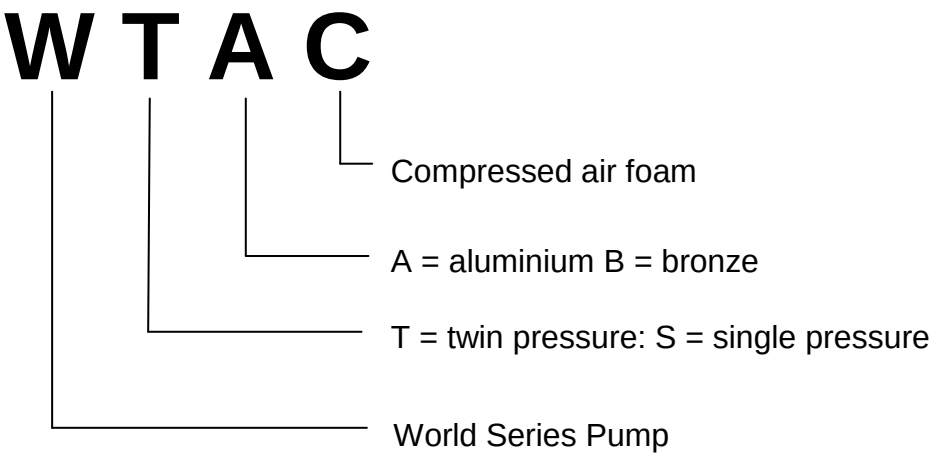
Clockwise only - viewed on gearbox input drive flange

## LUBRICANTS

| | |
|---|---|
| **Compressor** | **Recommended:** Screw compressor oil in compliance with ISO Viscosity grade 32 to 46.<br>**Alternative:** SAE 10W/40 automotive multigrade oil.<br>Capacity 3.5 litres - (approximately 4.0 litres with filter change) |
| **Pump Gearbox** | (Capacity 1.2 litres approximately)<br>**Recommended:** BP Energol GR XP 68 or similar |
| **Pump Bearing Housing** | (Capacity 0.75 litres approximately).<br>**Recommended:** 10W/40 or 15W/40 Multi-grade engine oil. |

**Model Identification System**

Variations of the World Series pump with CAFS are identified thus:



## RECOMMENDED FOAM AGENTS

Hale FoamLogix Models **2.1A** and **3.3** approved Foam compatibility list.

| Type of Foam Concentrate | Manufacturer | Brand Name |
|---|---|---|
| **CLASS A FOAM** | | |
| **US Forestry Service Approved** | ANSUL | Silvex Class A Foam Concentrate |
| | Angus | Forexpan S (0.1%-1.0%) |
| | Chubb National Foam | 1st Defense Class A Cold water Foam |
| | Chubb National Foam | Knock-Down |
| | Monsanto | PhosCheck WD881 |
| | Chemonics | Fire-Trol Fire Foam 103 |
| | Chemonics | Fire-Trol Fire Foam 104 |
| | 3M | Light Water FT-1150 |
| **Non U.S. Forestry Service Approved** | ChemGuard | Class A Plus |
| | Unifoam Co. Ltd. | UniA 1% |
| | 3M | Light Water SFFF |
| **CLASS B FOAM** | | |
| **AFFF- Alcohol Resistant Concentrates** | 3M | 3% Alcohol Type AFFF Conc. (P/N 98-0211-6573-7) |
| | Ansul | 3x3 Low Viscosity Alcohol Resistant Concentrate |
| | ChemGuard | AR 3%-6% Part # CAR36P |
| | ChemGuard | Ultraguard 1%-3% Part # C-133 |
| | Angus | ALCHOSEAL **3.3**% |
| | Chubb National Foam | Universal Gold 3% AR-AFFF |
| | Chubb National Foam | Universal Gold 1% - 3% AR-AFFF |
| | US Foam | 1-3% Alcohol Resistant AFFF (P/N US-AR13) |
| **AFFF** | Chubb National Foam | 1% Aero-Water |
| **SPECIALTY FOAM CONCENTRATES** | | |
| **Protein** | Chubb National Foam | Terra Foam 3% CF |
| | Chemonics | Durra Foam 3% |
| **FIRE FIGHTING WATER ADDITIVE** | | |
| | Hazard Control Tech. | F-500 (1%, 3%, 6%) |

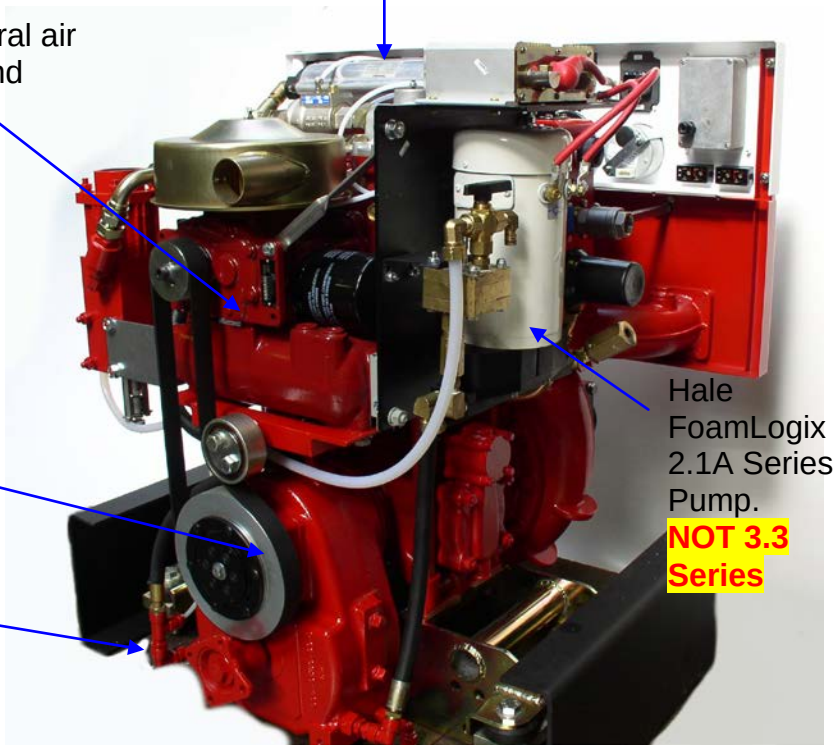
The above foam concentrates have been tested by Hale Products to ensure compatibility with FoamLogix models **2.1A** and **3.3**. This information is intended to assist the end user in selecting compatible foam concentrate(s) that will not adversely affect the foam pump components. The list should not be used to determine fire fighting capability of the foams. Always consult local application and environmental regulations before selecting a foam concentrate and refer to the FoamLogix user manual for additional information.

**The above list of foams is not an approval of the foams fire fighting capability**

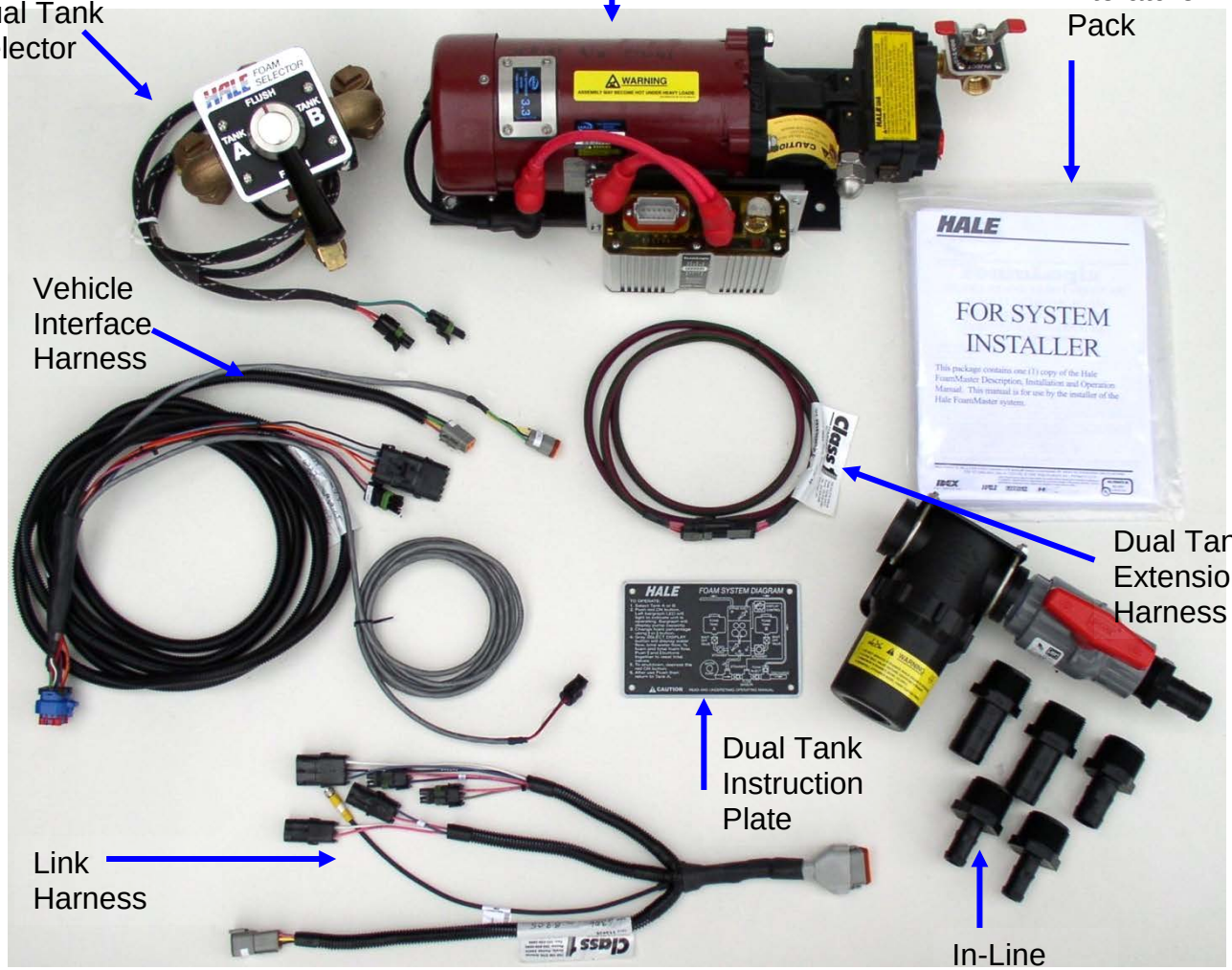
**Note:** Valid from May 2008. Please contact your Hale representative if your foam is not listed.

## MAJOR COMPONENTS AND CONTROLS

### General Arrangement

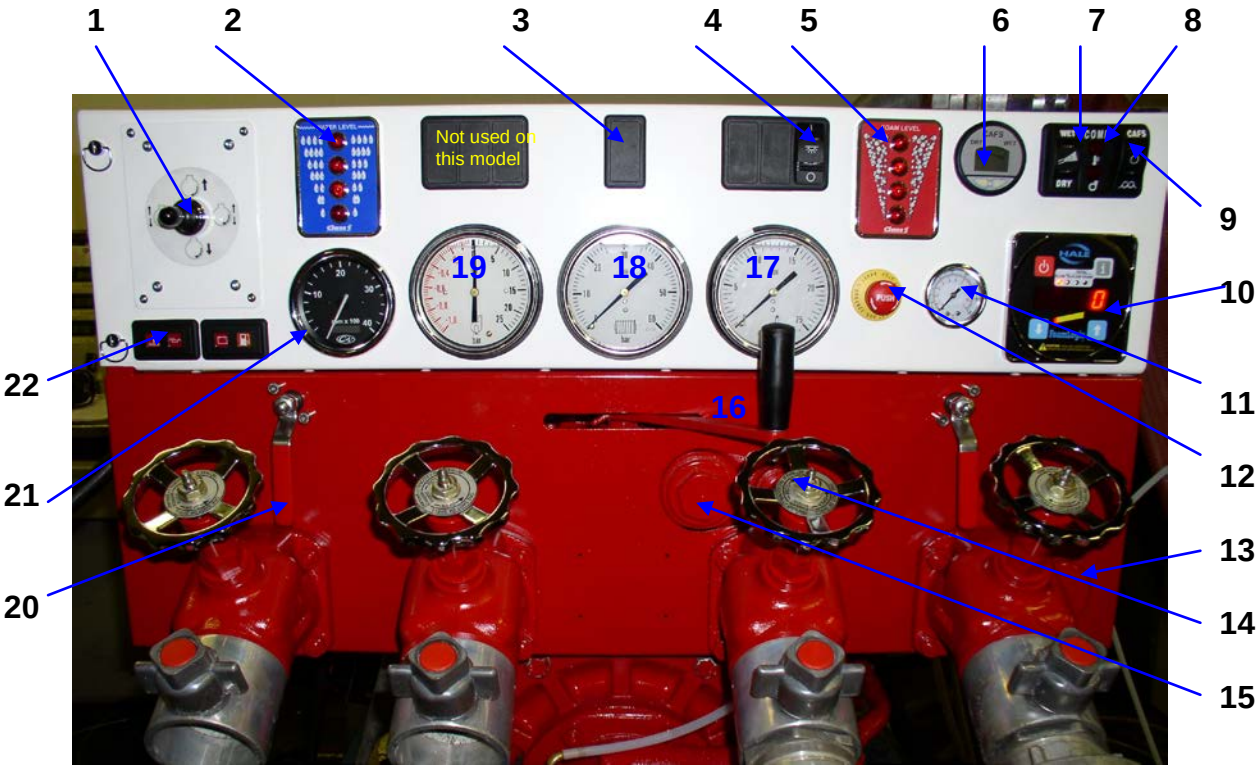


## FoamLogix 3.3 Component Group



## Control Panel FoamLogix 2.1A - typical

NB: Options and gauge types may vary.

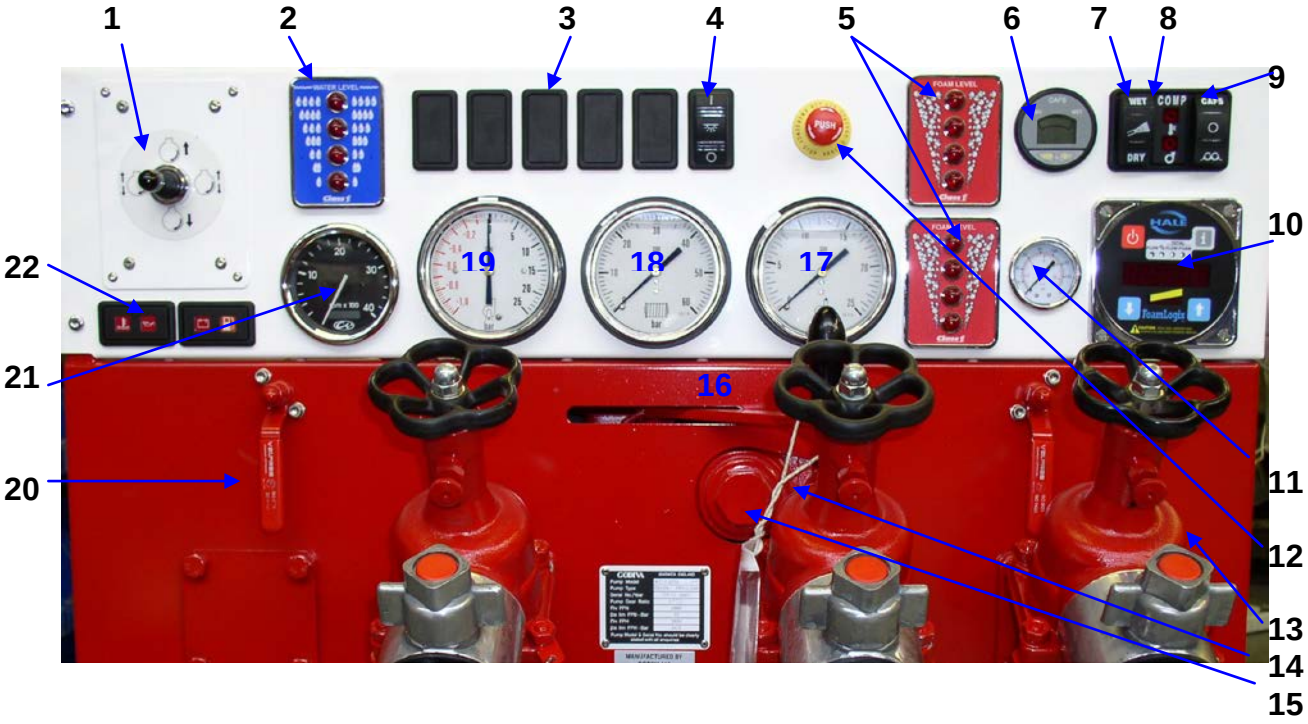



1 - Engine speed control - Up = increase, Down = decrease, Left or right = pre-set speeds.
2 - Water tank level gauge
3 - Low pressure / High pressure hose reel selection - option
4 - Vehicle bay light
5 - Foam tank level gauge
6 - Wet or dry foam indicator
7 - Wet or dry foam control
8 - Compressor temperature warning light
9 - Foam or CAFS selector switch
10 - FoamLogix Control Unit
11 - Compressor pressure
12 - Emergency STOP
13 - Strainer - CAFS Water Feed (beside delivery valve)
14 - Strainer - Primer Lift-Off (behind delivery valve)
15 - Strainer - High Pressure (Not WS series pump)
16 - Manual Pressure Control - High to the Right; Low to the Left
17 - Pump low pressure gauge
18 - Pump high pressure gauge
19 - Compound gauge
20 - High pressure discharge valves (1 LH + 1 RH)
21 - Pump Tachometer (rev / min) & Hour counter
22 - Vehicle status lamps: Engine - high coolant temperature. Engine - low oil pressure Vehicle - low battery charge. Vehicle - low fuel

Enlarged view of 7 8 9

## Control Panel FoamLogix 3.3 - typical

NB: Options and gauge types may vary.

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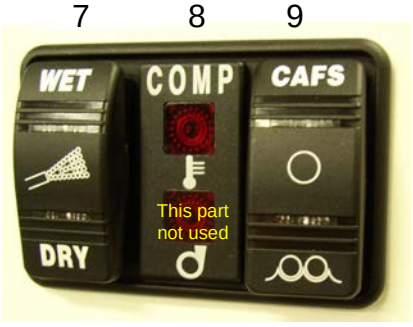


# SYSTEM OVERVIEW

The WT_C or WS_C is a Compressed Air Foam System comprising of three major components – Air compressor, FoamLogix (foam proportioning unit) and Manifold (foam mixing and control system).
For **2.1A** FoamLogix components are located behind the World Series pump, above the bearing housing and gearbox. The **3.3** FoamLogix pump / motor assembly however is separate from the WT(S)-C pump and is designed to be remote (vehicle) mounted.

A metered amount of foam is introduced into the Manifold and mixed with water from the pump discharge manifold. The foam and water blend is then fed to a control valve (ARC) where wet or dry foam may be selected (air ratio control section of manifold). Compressed air is then injected and the resulting foam / water / air combination is completely mixed by the X-mixers during discharge.

Safety interlocks are provided to ensure that:

1. Foam cannot be introduced unless water is flowing through the unit.

2. 'Slugging' (unmixed air and water) in the discharge line) is prevented. Air cannot be injected in the absence of foam and water.

3. Air injection when the foam tank is empty is prevented. Foam tank low level switches are provided and MUST be fitted.

## Compressor

The rotary twin-screw compressor is rated at 50 scfm @ 7 bar and is driven by a Polydrive belt. The compressor is engaged, or disengaged from the pump drive, via an electro-magnetic clutch, being operated by the CAFS selector switch.

Compressor lubricating oil is cooled by water taken from the main pump, via the water supply line; cooling water being supplied from pump delivery and returned to pump suction. The compressor will reject approx. 8.0 kW of heat energy to cooling. The installer must consider this additional thermal load.
When the compressor is stationary, residual system pressure is vented by a blow-down valve.

**NOTE:** The compressor should not be run without cooling water.

## Manifold

The manifold incorporates an air ratio control valve through which degrees of wet or dry foam mixture can be selected. Compressed air is then injected and the resulting foam / water / air combination is thoroughly mixed by the X-mixers during discharge.

CAFS units are best suited for use with Fresh Water.

For salt water compatible foams, seek advice from the foam agent manufacturers.

### FoamLogix

The FoamLogix system consists of three main components:
1) Foam Pump / Motor Assembly.
2) Control Panel (integral with main pump control panel).
3) Flow measurement and injection manifold.

All three elements combine to provide accurate foam proportioning. From the control panel the operator can initiate the system, adjust the foam ratio, monitor 'real time' water flow rate and record total water and foam usage.

The FoamLogix system is powered up when the PTO is engaged. Foam agent is only injected when the **RED** **ON** control button is operated.

The Hale FoamLogix **2.1A** foam proportioning system provides consistent foam concentrate injection for Class A foam operations and is capable of delivering a ratio of 0.1% to 1.0% foam concentrate directly into the water discharge stream.

For **3.3** FoamLogix Class A or B foams, the foam concentration will be in the range of 0.1% to 6.0%.
Further information is available in the **FoamLogix Model 3.3 & 5.0** Description, Installation and Operation manual, part number 029-0020-68-0.

## INSTALLATION AND INITIAL SET-UP FOAMLOGIX 2.1A

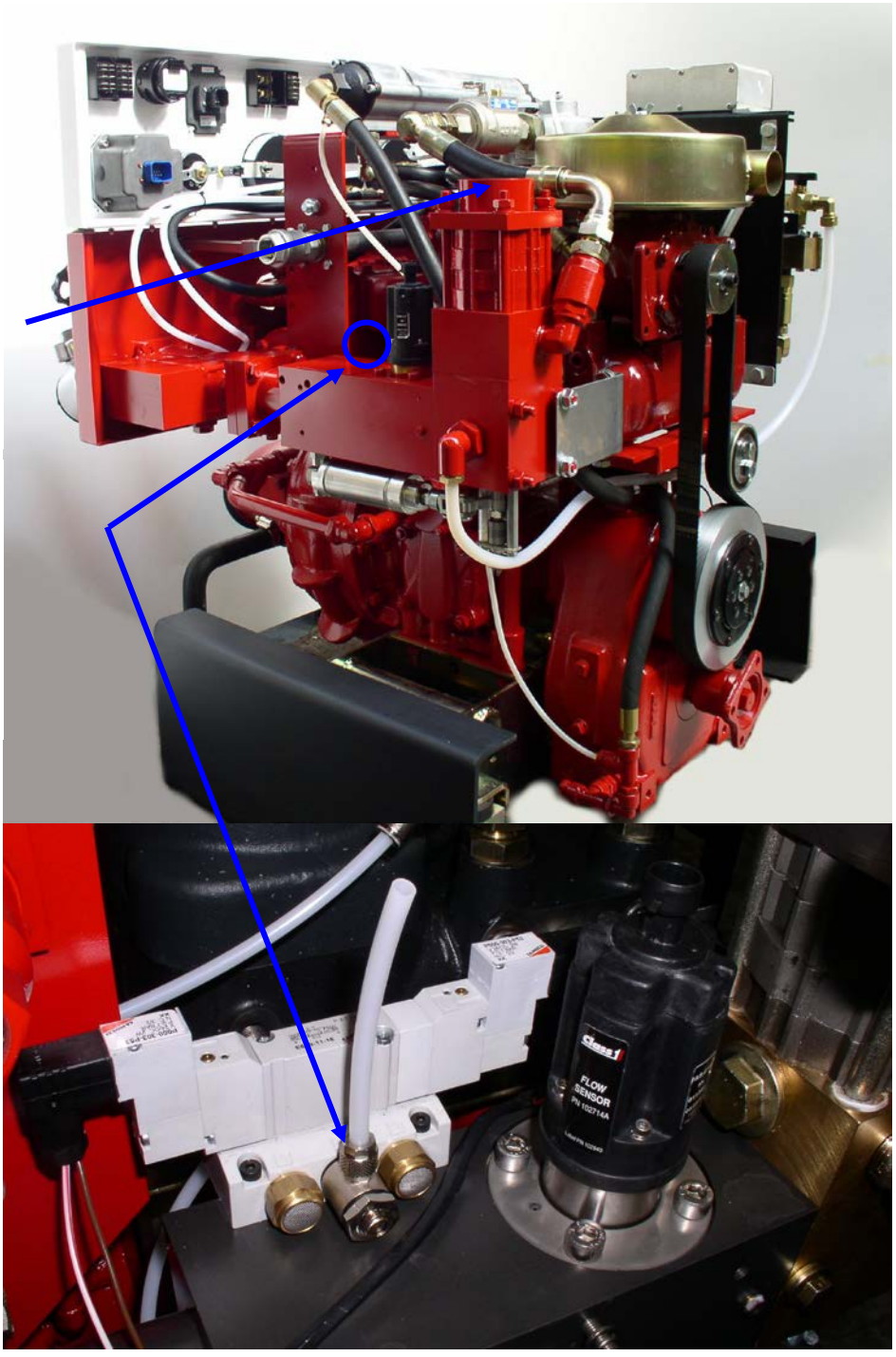
The following connection points should be considered when installing the WT_C or WS_C assembly into a vehicle.

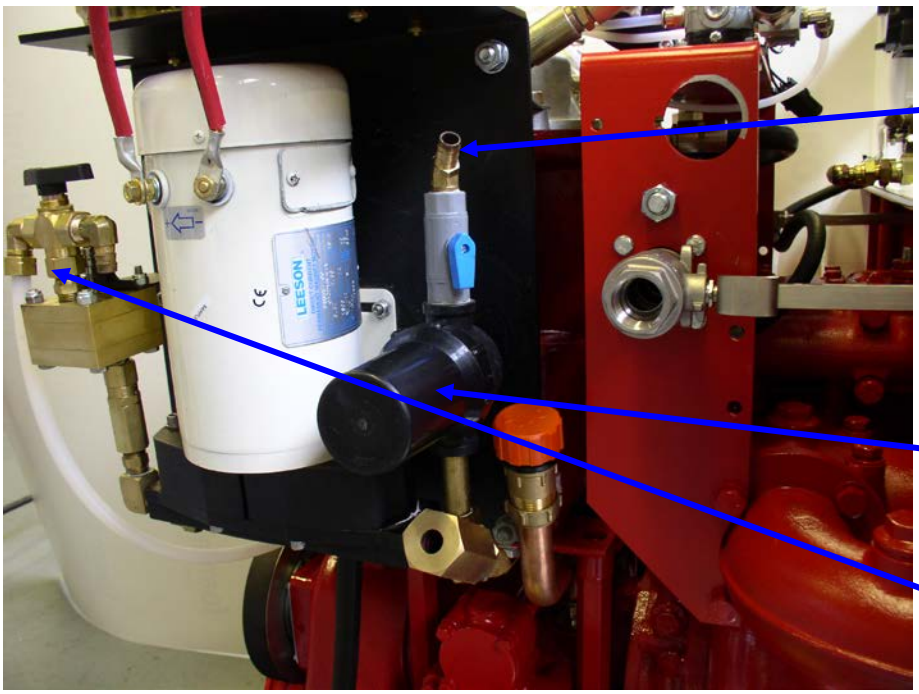
### Lifting Points

Secure handling of the unit for installation and maintenance is vital. Use only the lifting points provided on the unit in conjunction with fork Lift Adaptors, part number **60275 / 18**. These items are available from Hale Products Europe.

CAFS Discharge port (see installation drawing for dimensions)

Ø 6mm air connection for ARC valve. **Requires an external air supply**

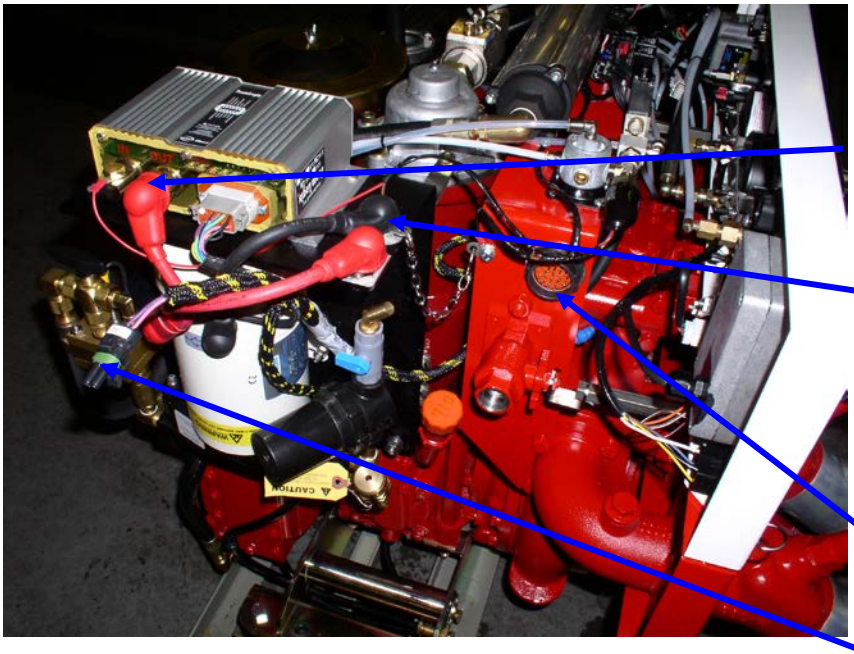




Inlet from Foam tank, Ø13mm ID pipe, airtight connection required
NOTE: the Foam tank must be located **above** FoamLogix unit

FoamLogix foam filter

By-pass valve and connection point



**FoamLogix pump**
Connect feed from Vehicle system, +24 V rated @ 20 A max, 12V system rated @ 40 A max Minimum 6.0mm$^2$ wire section

Ground connection point

**NOTE:** the main power supply to FoamLogix should only be energised when the PTO is engaged

Engine control and status Connector

Low foam switch connector

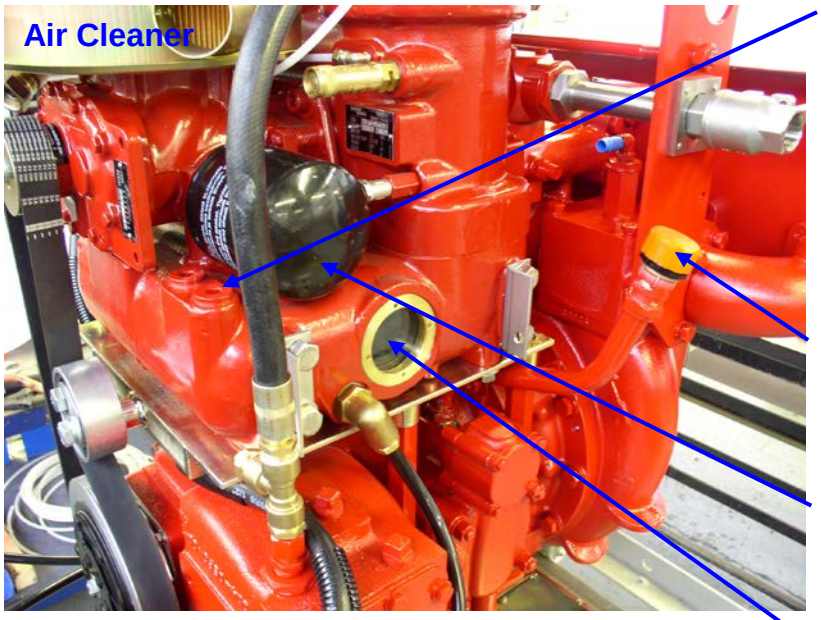
## Fluid Drain Points

Compressor, Bearing housing, and Gearbox oil drain points are located at the lower left side of the pump (viewed from the suction tube end).


Gearbox coolant and the CAFS manifold drain points are located at the lower right hand side of the pump. Please note that **both** manifold drains must be utilized.

## Oil Filling Points

The unit is supplied **without** oil and must be filled with the correct quantity and specification before starting the pump.
The oil filling points for the compressor and pump bearing housing are located at the left side of the pump (viewed from suction tube).




Compressor oil filling point. Note: the plug has a grooved thread to allow for a controlled release of internal pressure. For oil type and capacity refer to Recommended Lubricants

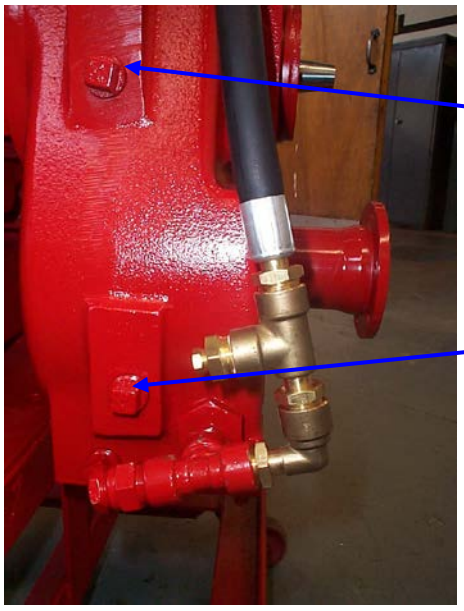
Pump bearing housing oil filling point and oil level check dipstick

Compressor oil filter

Compressor oil level – mid point on site glass

The pump gearbox filling point depends on the gearbox position in relation to the pump.

## Gearbox in Down Position

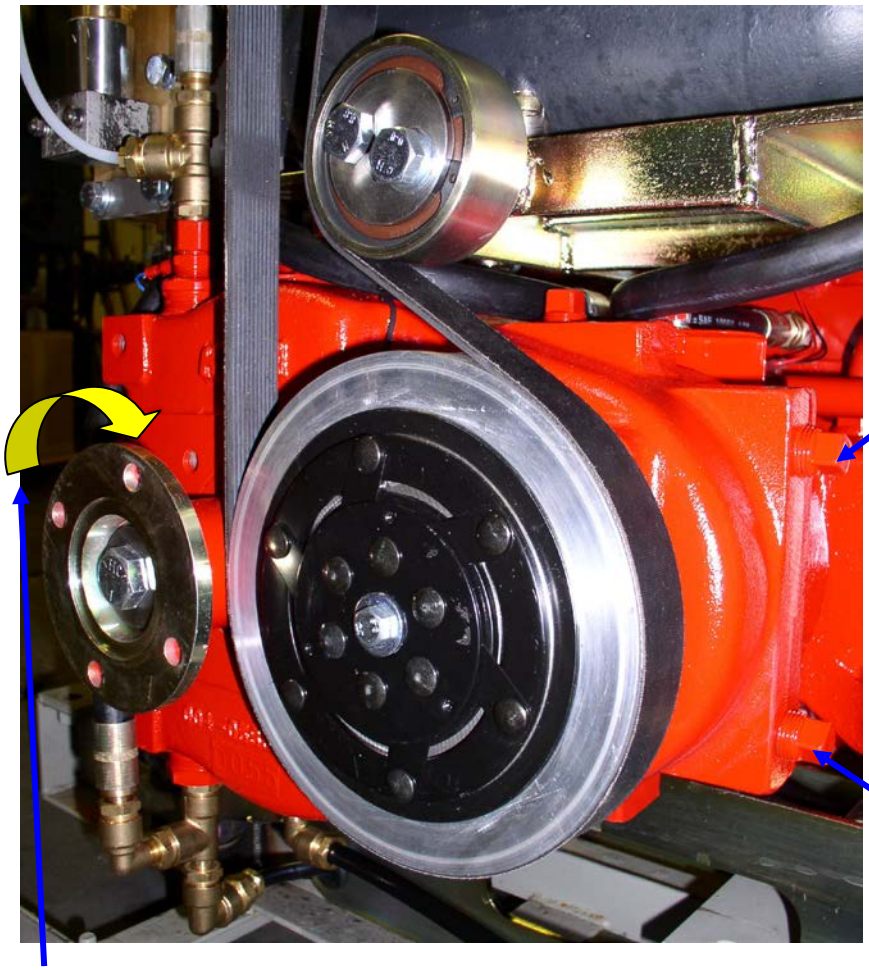


Oil filling point
For oil type and capacity refer to Recommended Lubricants

Oil level check

## Gearbox in Horizontal Position, Left or Right of pump

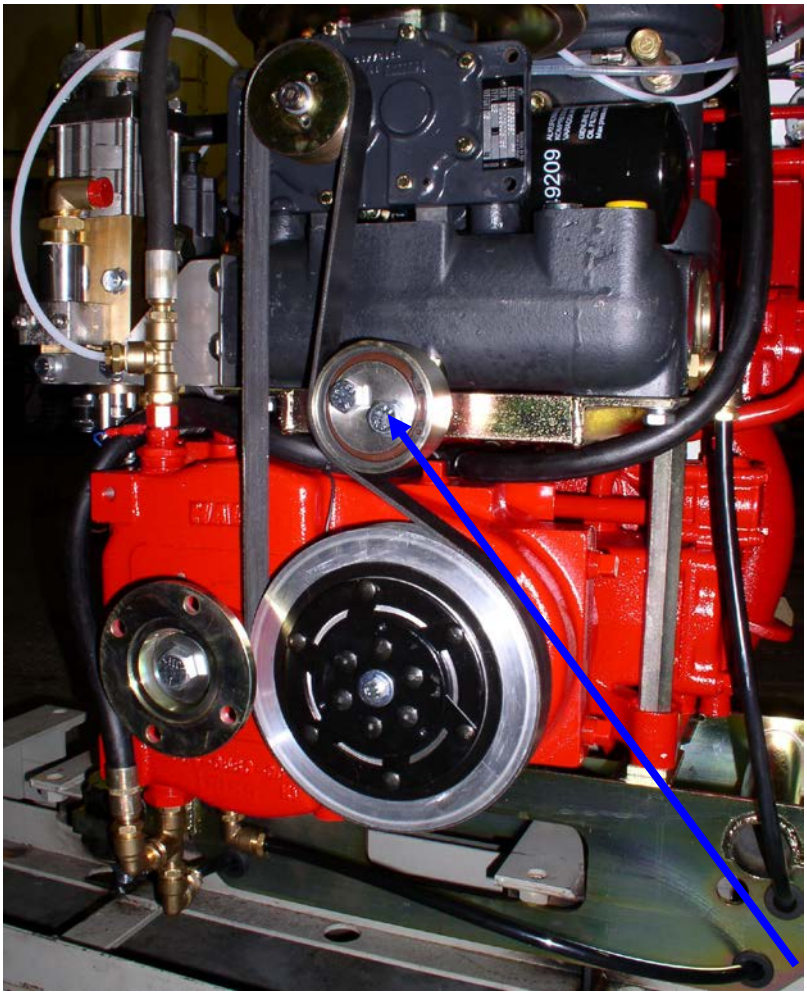
The oil filling point is on the side of the casing (RH gearbox shown) and is symmetrically opposite for LH gearbox.
The oil level check point is lower on the side. Oil capacity and type as Down position detail.

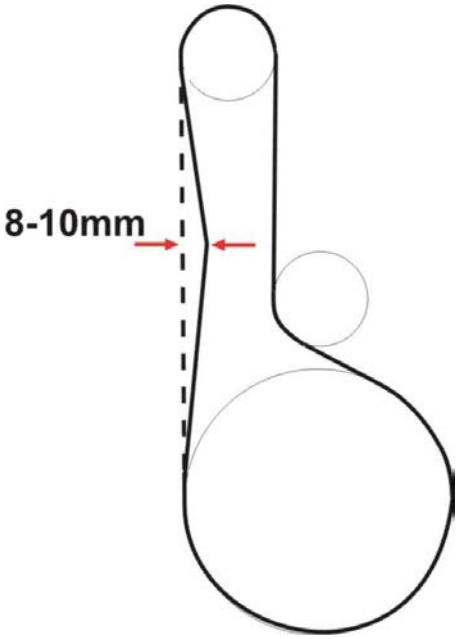



**Direction of rotation** –
Clockwise **only** – viewed on gearbox input drive flange

## Compressor Drive Belt

The compressor is driven by a *Polydrive* ribbed belt, specification 12PJ.
The installer must allow for access to adjust the jockey pulley belt tensioner. Tension the belt to achieve an 8 -10mm deflection with a 10kg load applied at mid span, see diagram below.

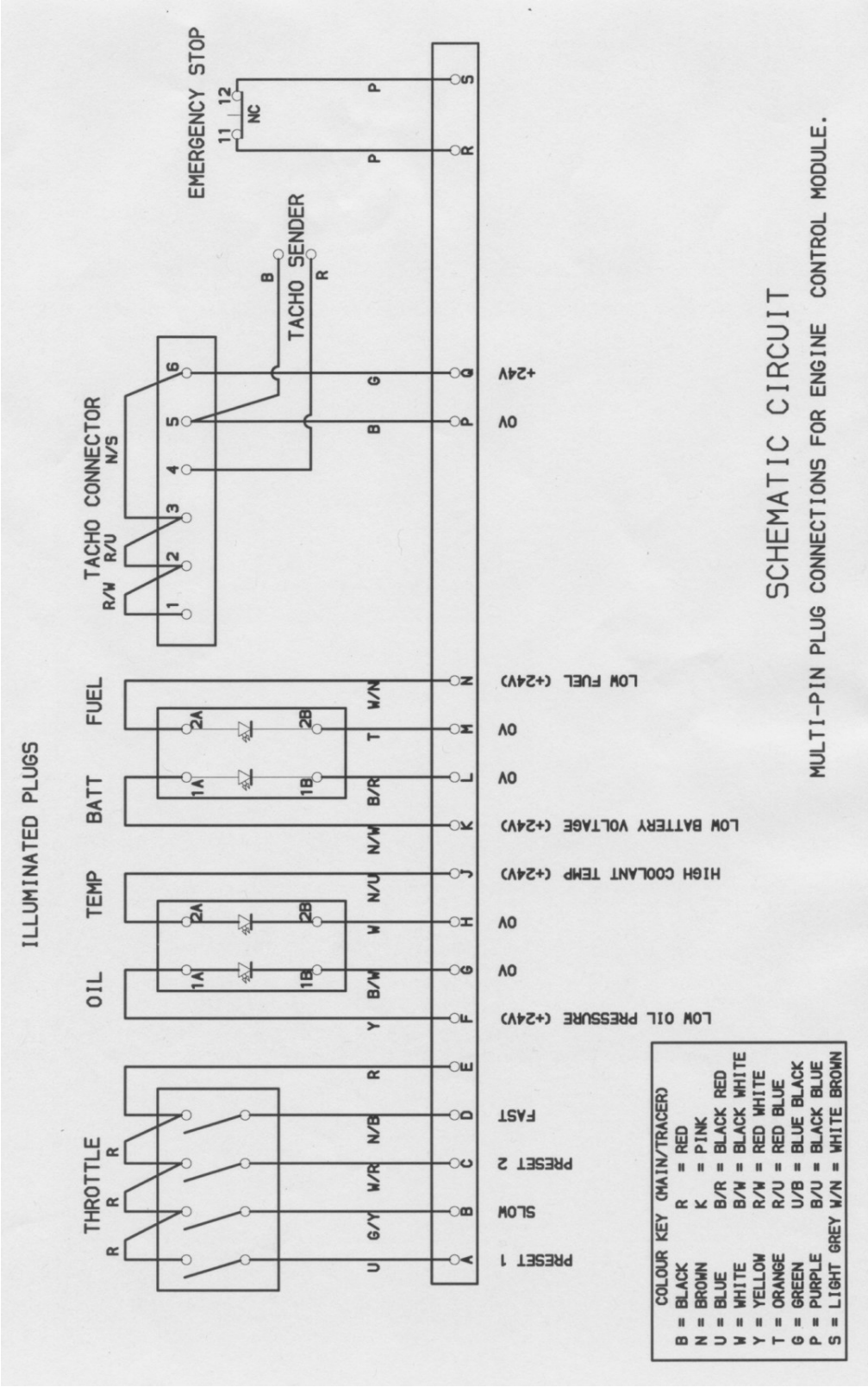





Slacken bolt, rotate tensioner to achieve specified deflection and secure

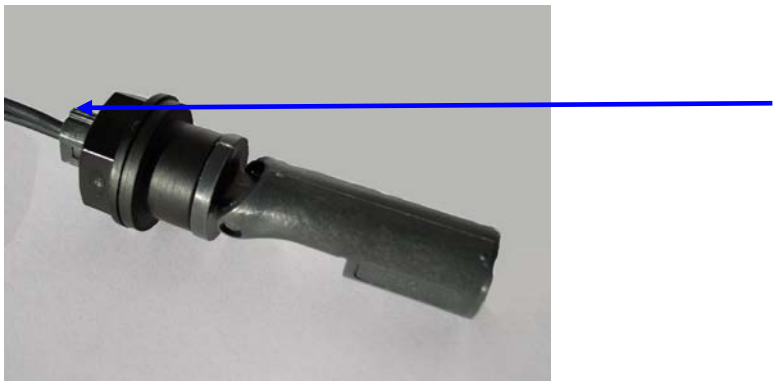
## Electrical Connections

Connect the engine control and warning light module to the vehicle electrical system with the multi-pin plug (supplied with the unit, part number 60764).



**Foam Tank**
**Low Level Sensor**
The unit is supplied with a connector for a low foam level sensor. The sensor is supplied with the unit ready for installation (instructions supplied with the sensor).

**Orientation**
**Note:** The low foam level sensor must be installed in the tank in the correct orientation. The sensor has a raised boss on the casing and must be installed with this boss at 12 o clock (top).
The foam tank requires a 23mm hole for secure fitting of the switch device and the maximum allowable thickness of the tank wall material is 4mm.
The centre of the level switch should be located a minimum of 40mm above the foam outflow to the foam pump.




**Additional Installation Points**
**Foam Tank to Foam Pump**
The foam feed line must not at any point be lower that the foam pump; have a 13mm bore and be fitted with an isolating tap for maintenance purposes. The isolating tap should be located as close to the tank as possible. A flushing point should be fitted close to the isolating tap to ensure that the maximum length of hose line can be flushed out. The flushing line should also be fitted with an isolating valve.
**The foam tank must be located to provide a positive head of foam agent to the FoamLogix unit, and the supply hose should be arranged to fall gradually from the tank to the foam pump inlet to avoid air pockets.**
The foam tank should be made of plastic or stainless steel, with a volume greater than the vehicle main tank by a factor of 0.005. Alternatively, a volume of at least 25 litres may be preferred to allow an entire drum of foam agent to be contained.

**To prevent over-pressurisation ensure the foam tank is adequately vented**.

**Note:** To ensure correct operation of the FoamLogix pump, all connections must be secure and pressure tight.

# VEHICLE DESIGN CONSIDERATIONS

**The following information is included to assist the vehicle builder to achieve a successful installation.**

The in-line foam strainer / valve assembly is a low-pressure device, rated at 3 bar and will NOT withstand high flushing water pressure.

Seal all electrical power and ground connections with silicone sealant to prevent corrosion.

The system will not operate correctly with poor electrical connections. Verify all electrical connections prior to start up.

Each Hale FoamLogix system is tested at the factory using the wiring harness provided. Improper handling and abuse of connections will cause harm and may result in other system damage.

Use fixings which are compatible with those foam concentrates used. Brass and 300 series stainless steel are suitable.

The areas containing the WT_C or WS_C components must be adequately shielded from the ingress of road spray / debris and chassis and vehicle power train lubricant. Exposure to dirt, water and grease will have a detrimental effect on the working life of the drive belt and electronics.

Please ensure adequate access to all CAFS equipment through appropriately sized access panels.

If the compressed air foam is to discharge through one or both of the side lockers and the vehicle builder is fitting the necessary pipe work and isolating ball valves, those components must have a consistent bore of 38mm up to the hose connector.

It is recommended that BALL VALVES are used in the compressed air foam discharge line as the use of other types of valve tends to degrade the foam quality.

To prevent compressed air from being trapped in the pipe work, sealed blank caps **MUST NOT** be used on CAFS discharges.

Direction of rotation of the input drive flange is clockwise, when viewed on the gearbox.

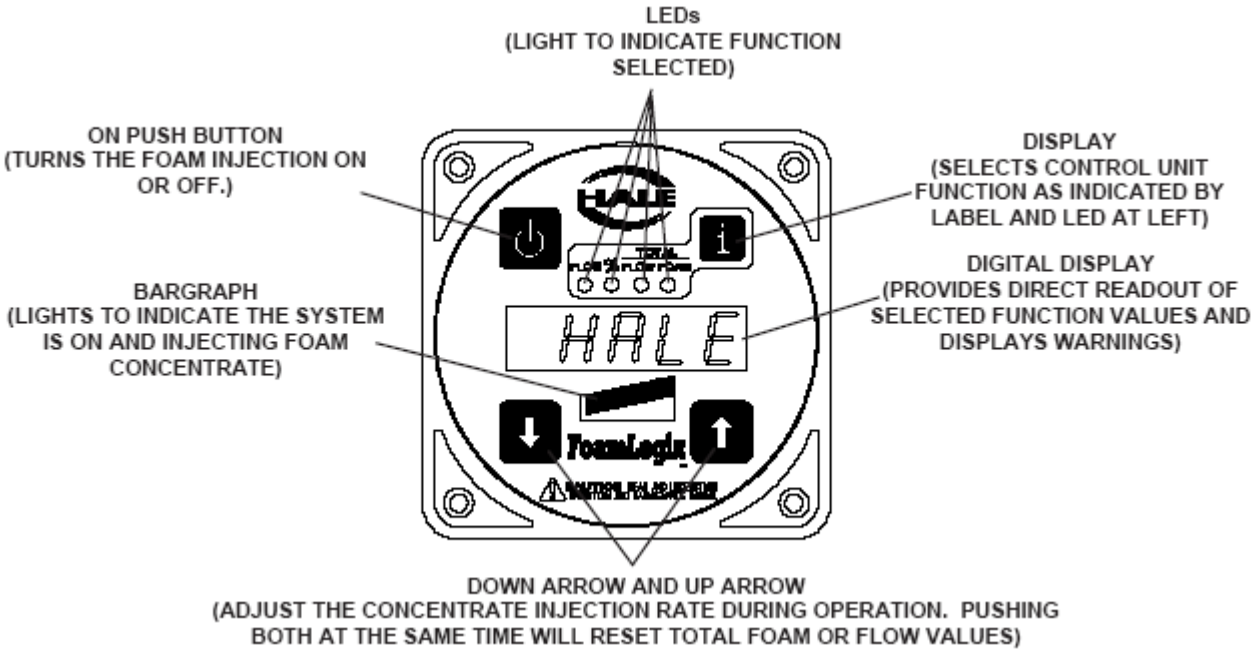
# INSTALLATION AND INITIAL SET-UP FOAMLOGIX 3.3

Installation of the WT_C or WS_C assembly into a vehicle, when sourced with a FoamLogix 3.3 system is the same as the integrated 2.1A option, with the exception of the remote mounted foam pump assembly.
For pump installation, please refer to the **FoamLogix Model 3.3 & 5.0** Description, Installation and Operation manual, part number 029-0020-68-0, supplied separately.

For further information on the MDTII Manual Tank Selector, please see the separate manual supplied - part number 029-0020-40-0.

# OPERATION

**CAUTION:** WT_C OR WS_C PUMPS SHOULD ONLY BE USED WHEN WORKING FROM OPEN WATER OR A TANK FEED. PROBLEMS WILL OCCUR WITH THE WATER / AIR PRESSURE RATIO, SHOULD PRESSURISED (HYDRANT) WATER SUPPLY BE APPLIED DIRECTLY TO THE SUCTION TUBE. HYDRANT SUPPLY MAY ONLY BE USED ONLY TO MAINTAIN THE WATER LEVEL IN THE VEHICLE TANK.




## FoamLogix Control Panel Functions

## Commissioning / Start-Up Procedure

1. Check that all the necessary connections have been correctly made.

2. Ensure that the compressor, pump gearbox and bearing housing are filled with the correct oil type and quantity.
3. Run the pump at 2-3 bar with compressor engaged.

4. Run the compressor for 30 seconds to allow oil to circulate.

5. Stop unit and check compressor oil level – top up if necessary.

6. Turn the bypass valve on the FoamLogix to bypass and provide a suitable receptacle to collect the foam, agent.

7. Ensure that there is sufficient foam agent in the tank(s). For **FoamLogix 3.3**, select tank **A**

8. Select simulated flow on the FoamLogix by pressing both up ↑ & down ↓ at the same time.

9. Press the **RED** **on** button, and the pump will prime itself. The pump will run for 30 seconds or until prime is achieved. If no prime is made, the display will show "**no Pr**". Repeat this step once more to attempt to prime the pump.
   "no Pr" = No prime display


10. **For 3.3 FoamLogix**, select tank **B** and repeat the priming procedure for that tank.

11. When prime is achieved, deselect simulated flow by pressing both up ↑ & down ↓ at the same time.

12. Return the bypass valve to the inject position.

The unit is now ready to run.

### Calibration of FoamLogix

The FoamLogix package as supplied is factory tested and calibrated and should not require further attention. However, should any calibration issue arise, please refer to the appropriate **FoamLogix Model** Description, Installation and Operation manual.

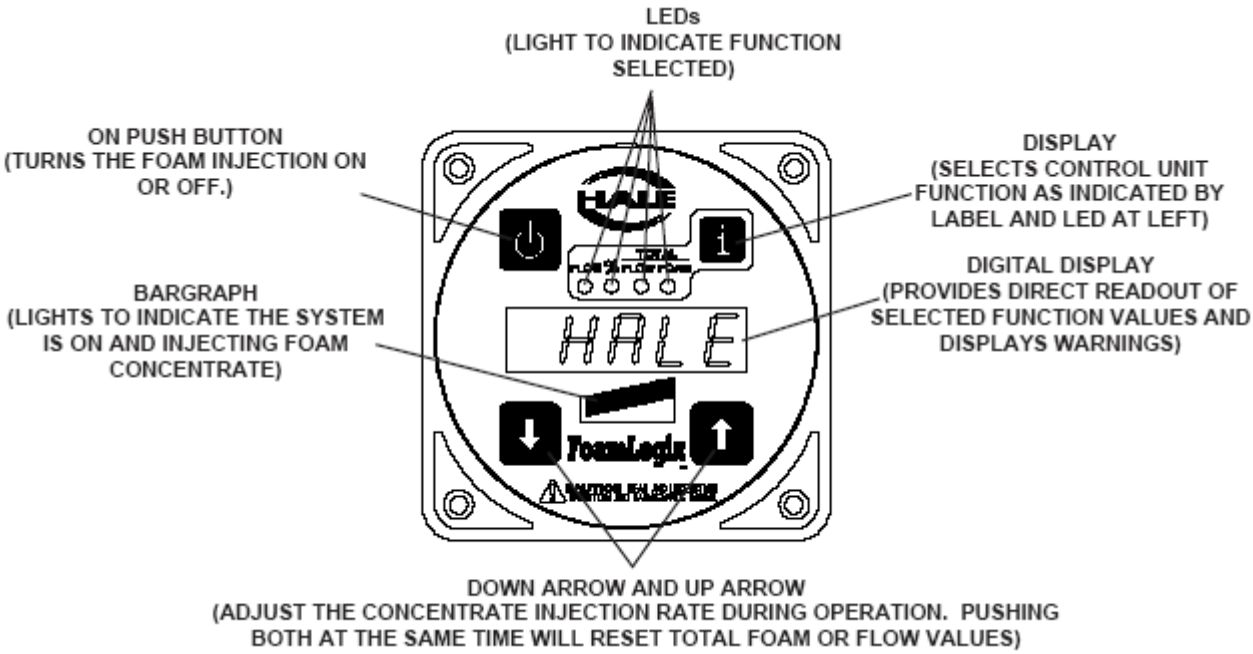
### Operating the WT_C WS_C from a Vehicle Water Source

1. Connect a suitable delivery hose and branch to the CAFS discharge. ϕ38 to ϕ45mm diameter lay flat hose is suitable for delivering compressed air foam. If a single discharge is being used, a ϕ25 to ϕ38mm smooth bore nozzle is suitable. If two delivery hoses are used, two ϕ19 nozzles are appropriate.

   **Note:** Superior foam quality is produced using a smooth bore nozzle and a delivery system with the least amount of valves and sharp bends. However, the scrubbing action of the foam on the hose wall tends to improve the foam quality.

   **Note:** A standard fog nozzle can be used with CAFS if used on the 'Flush' setting. Using the 'Fog' settings severely degrades foam quality.

## FoamLogix Control Panel

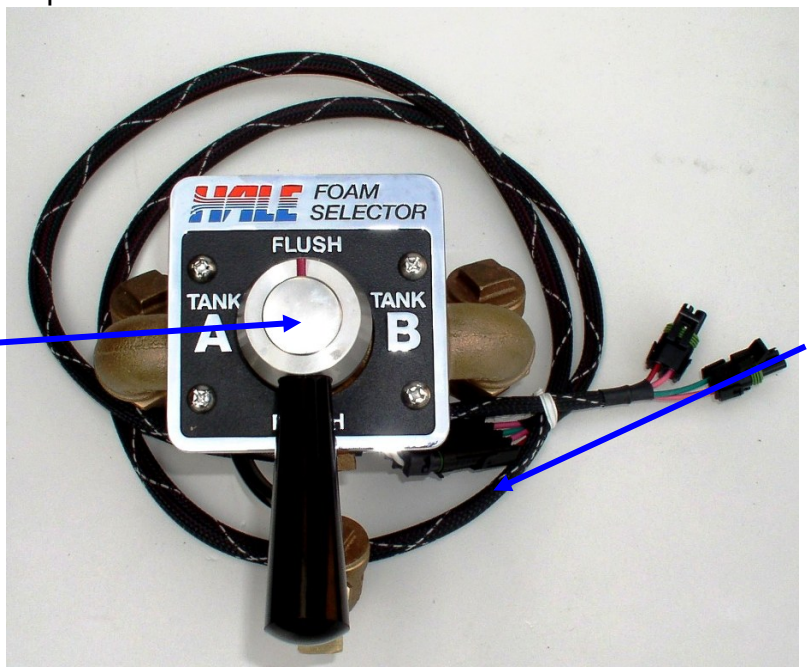



## Engaging PTO & Priming Main Pump

1. To ensure a clean pump prime and delivery when running from the tank, leave the pump wet, or if the pump is drained, run the pump at idle until a vacuum of approximately -0.5 bar is achieved and then slowly open the tank to pump valve.

## Tank Selection FoamLogix 3.3 only

For specific detail please refer to the **FoamLogix Model 3.3 & 5.0** Description, Installation and Operation manual.

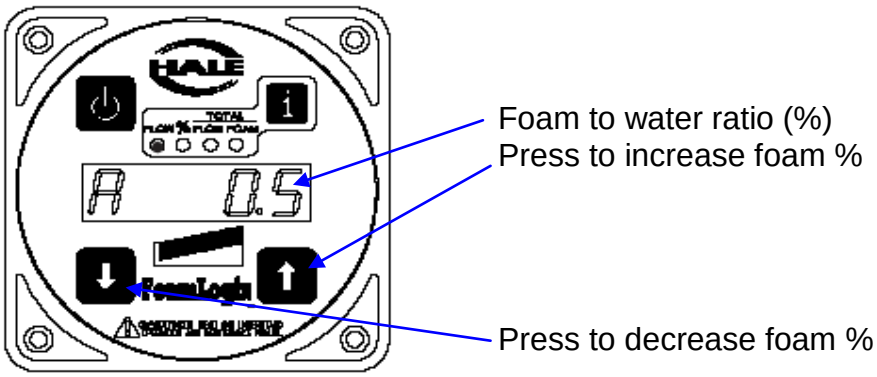


## Discharging Water / Foam Agent Mixture

Can be operated from open water, tank, or hydrant into pump suction

DO NOT OPERATE CAFS DISCHARGE WITH A PRESSURISED OR HYDRANT SUPPLY INTO THE PUMP INLET. THIS WILL AFFECT THE CAFS DISCHARGE.

1. Set pump at required pressure.
2. Ensure that the foam only option is selected by pressing the bottom of the Foam / CAFS Selector switch, marked with the symbol -  (No.9, Pages 14 or& 15).
3. Press the **RED on** button, and choose desired foam % setting to suit the foam agent being used and the operating conditions (factory default is 0.5% for Class A foam and 3% for Class B foam, if configured to run with two foam types).




4. Open CAFS discharge valves to deliver foam agent.

**Note:** the WET / DRY control (ARC valve) is only operable when CAFS is selected. The control will default to the wet condition when CAFS is turned off.

## Discharging CAFS

May be operated from open water or tank feed only.

DO NOT OPERATE CAFS DISCHARGE WITH A PRESSURISED OR HYDRANT SUPPLY INTO THE PUMP INLET. THIS WILL AFFECT THE CAFS DISCHARGE.

1. Set the pump to idle.
2. Select CAFS by pressing the top of the CAFS selector switch **– marked "CAFS"** (Item 9 Pages 14 or 15).
3. Increase pump speed to required operating pressure (4-10 Bar).

## Wet Foam or Dry Foam

1. The operator may vary the foam condition from WET to DRY by using the WET / DRY control (Item 7 Page 14).
2. An indication of wet / dry foam condition is given by the display (Item.6 Page 14).To optimize foam quality, the pump operator may regulate the liquid flow (as recorded on the FoamLogix control unit display) by use of the WET / DRY control.

Note: when discharging dry foam at low pump pressure, the possibility of hose kinking is increased and should be considered when deploying hoses.

## Shutting Down

1. Set WET / DRY selector switch to the WET foam setting.
2. Turn off compressor by setting the Foam / CAFS selector switch to foam position -  .
3. Turn off the FoamLogix, press **RED** button.
4. Set pump to fast idle.
5. Run water through the CAFS discharge system to flush out the foam agent.
6. Close the CAFS discharge valves.
7. Disengage PTO.
8. If frost is expected, drain the manifold and gearbox oil cooler.

## Overheat Shut down

1. Should the compressor oil temperature reach 105$^{o}$C, a control panel warning indicator will illuminate.
2. If the compressor oil temperature exceeds 110º C, the electromagnetic drive clutch will automatically disengage. The compressor can sustain 105º C for short periods without damage. The unit will automatically re-engage when the compressor has cooled.
3. The most probable cause of compressor overheating is insufficient cooling water flow.

## Flushing FoamLogix 3.3 only

When returning the apparatus to ready condition after using class B foam, the Hale FoamLogix foam pump **must** be flushed. This is because some Class B foam concentrates deteriorate rapidly.

**NOTE:** Approved class A foam concentrates do not deteriorate at the rate of class B foam concentrates. Provided that an approved class A foam concentrate is used and the system is used within 10-12 weeks, flushing is not required. After class B foam concentrate has been used, flush the system then select class A.

For detailed flushing instructions, please refer to the **FoamLogix Model 3.3 & 5.0** Description, Installation and Operation manual.

## MAINTENANCE SCHEDULE WT(S)_C

**Quarterly**

Check compressor oil level and adjust as necessary.
Check belt tension and condition - adjust as necessary.
Check hose connections.
Clean strainer - High Pressure.
Clean strainer - Primer.
Clean strainer - CAFS Water Feed.

**Annually or Every 200 Hours** (whichever comes first):

Renew compressor oil and filter.
Clean the FoamLogix foam filter.

**Annually or every 400 hours** (whichever comes first):

Renew compressor air cleaner element.
Renew pump bearing housing oil.
Renew pump gearbox oil.

**Bi Annually**:

Renew compressor drive belt.
Renew compressor oil separator element.

**Note:** Both the drive belt and the air cleaner may have to be renewed more often in dusty, dirty or heavy duty applications.

## MAINTENANCE SCHEDULE FOAMLOGIX 2.1A

**Quarterly**

If an approved foam concentrate has been left in the system without use, operate the foam system to move the concentrate and prevent jelling.

**Annually**

Inspect wiring, hoses, flow sensors, and connections for tightness, corrosion, leaks and/or damage. Refer to installation drawings.

**Bi annually**

Verify foam feedback calibration.

## MAINTENANCE SCHEDULE FOAMLOGIX 3.3

**After Each Use**

Flush the Hale FoamLogix foam pump if Class B foam concentrate has been used and select Class A.

**Annually**

Inspect wiring, hoses, flow sensors, and connections for tightness, corrosion, leaks and / or damage. Refer to installation drawings.

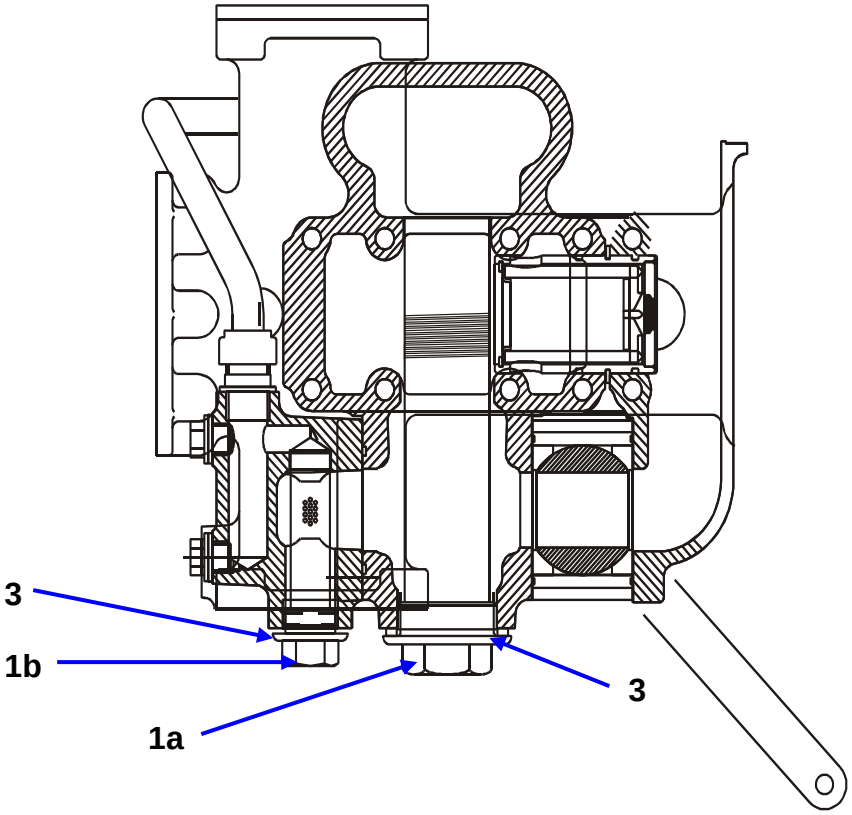
**Bi annually**

Verify foam feedback calibration.

# MAINTENANCE OPERATIONS WT(S)_C

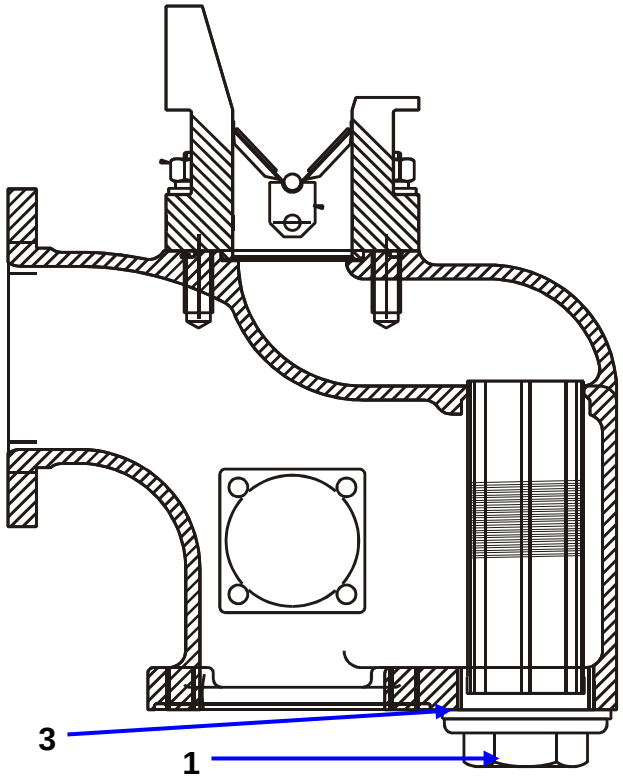
**Strainers - High Pressure & Primer**

1) Remove strainer / Cap assembly a) High Pressure or b) Primer Lift-Off.
2) With care, remove debris from the strainer by washing.
3) The Dowty seal may be reused if free from damage or cuts.
4) Re-fit the strainer assembly and secure.




**Strainer - CAFS Water Feed**

1) Remove strainer / Cap assembly.
2) With care, remove debris from the strainer by washing.
3) The Dowty seal may be reused if free from damage or cuts. .
4) Re-fit the strainer assembly and secure.



## MAINTENANCE OPERATIONS COMPRESSOR

**Compressor Oil Level Check - Oil / Filter Change**

Please refer to section **Installation and Initial Set-Up** for location of level checking, drain and filling features.

Drain oil and change the filter at the recommended intervals (with the compressor warm) in accordance with the **Gardener Denver Tamrotor Tempest** manual.

**Compressor Air Filter**

Change the air filter at the recommended intervals, in accordance with the **Gardener Denver Tamrotor Tempest** manual.

**Compressor Oil Separator Element**

Change the element at the recommended intervals, in accordance with the **Gardener Denver Tamrotor Tempest** manual.

**Compressor Drive Belt**

Check and adjust belt tension, as required, in accordance with section **Installation and Initial Set-Up**.

Change the drive belt at the recommended interval or if damage occurs.

To remove the belt, slacken the tensioner bolt and position the tensioner to allow belt removal.

Fit the new belt ensuring that belt alignment and position on the pulleys is uniform.

See section **Installation and Initial Set-Up, Compressor Drive Belt** for tension setting detail.

## MAINTENANCE OPERATIONS FOAMLOGIX

**Strainer - Foam**

Remove and clean the foam strainer screen(s) and flush as required. Please refer to the appropriate **FoamLogix** Description, Installation and Operation manual - System Plumbing Diagrams for location.

**Calibration**

Please refer to the appropriate model **FoamLogix** Description, Installation and Operation manual to calibrate water flow and foam feedback characteristics.

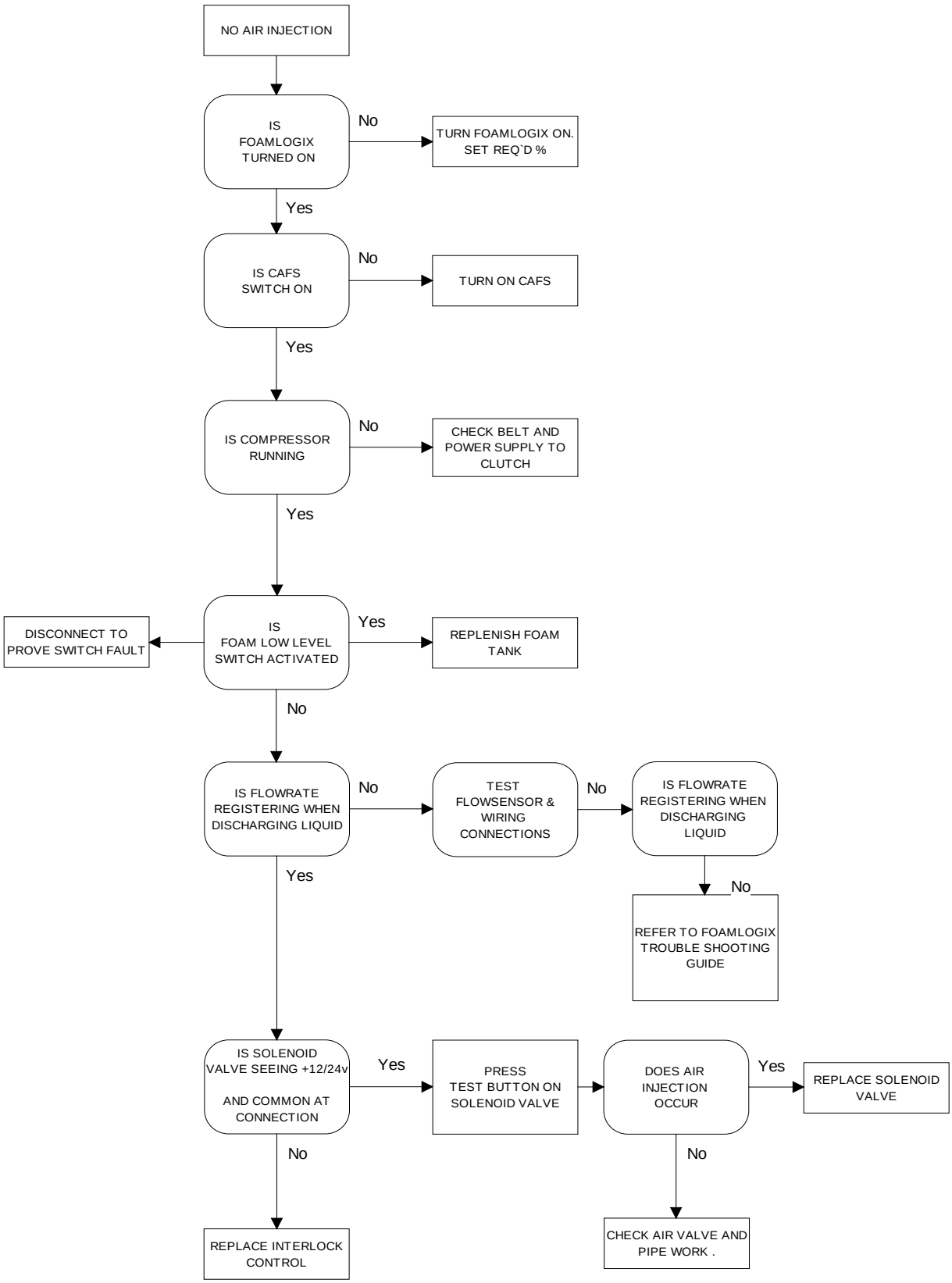
# FAULT FINDING

## General

| EFFECT | CAUSE | ACTION |
|---|---|---|
| Compressor overheats | No water supply or restricted flow | Check oil cooler pipe work for obstructions |
| | | |
| Unable to produce foam solution | FoamLogix not operating | Switch on FoamLogix |
| | No Foam in tank | Refill with foam agent |
| | FoamLogix not Primed | Prime FoamLogix |
| | | |
| No air injection | Compressor not selected | Turn switch on |
| | Low foam switch activated | Refill foam Tank |
| | FoamLogix not on | Turn FoamLogix on |
| Air and liquid not mixing (Slugflow) | Depleted foam supply (Low level switch not fitted) | Refill foam tank |
| | Foam % set too low | Increase foam % setting |
| Surging of hose and pressure gauge. | Insufficient air pressure in hose | Increase pump speed Reduce nozzle diameter. |

**Note:** For specific FoamLogix model trouble shooting, please refer to the relevant **FoamLogix 2.1A or 3.3** Description, Installation and Operation manual.

## No Air Inject Fault Tree



## WT(S) PUMP ILLUSTRATED PARTS LIST

Please refer to: **Hale Products Europe Ltd** publications:
**WT GP147/99**.
**WS GP 158/00**.

## COMPRESSOR ILLUSTRATED PARTS LIST

Please refer to:
**Gardener Denver Tamrotor Tempest** manual.

## FOAMLOGIX ILLUSTRATED PARTS LIST

Please refer to:
**FoamLogix Model 2.1A** Description, Installation and Operation manual, part number 029-0020-74-0.
**FoamLogix Model 3.3 & 5.0** Description, Installation and Operation manual, part number 029-0020-68-0.

# RECOMMENDED SPARES FOR BI-ANNUAL SERVICE

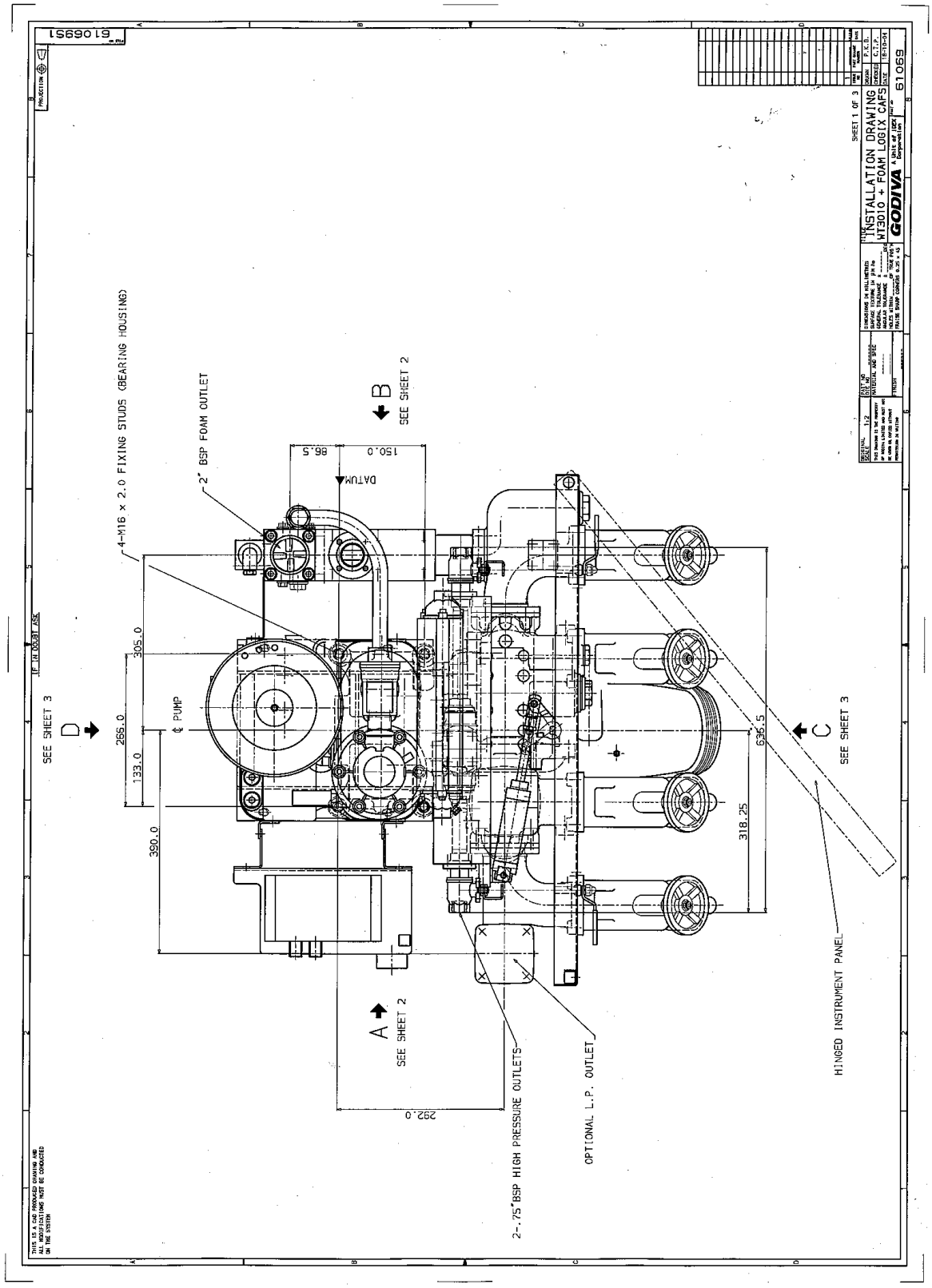
| Qty | Item | Unit | Comment |
|---|---|---|---|
| | | **Compressor** | |
| 1 | Separator | 59271/02 | |
| 2 | Filter - Oil | 59271/01 | |
| 2 | Filter - Air | 59271 | |
| 1 | Belt - Drive | 60578/01 | |
| AR | Tensioner - Belt drive | 60579 | |
| | | **FoamLogix** | |
| 1 | Strainer - Foam | C1-510-0200-02-0 | Class 1 part |
| | | **WT(S)-C** | |
| 5 | Sealing (O) ring | 53866 | |
| AR | Strainer - CAFS water feed | 60051/01 | |
| AR | Strainer - Hi Pressure | 60051MA | Not WS series |
| AR | Strainer - Primer | 57456 | |
| 4 | Washer - Dowty - Fluid drain | UFP 2303/08 | |
| 2 | Washer - Dowty - CAFS Water Feed & Hi Pressure | UFP 2303/15 | Common part |
| 2 | Washer - Dowty - NRV Inlet & Primer | UFP 2303/10 | Common part |

**Notes**

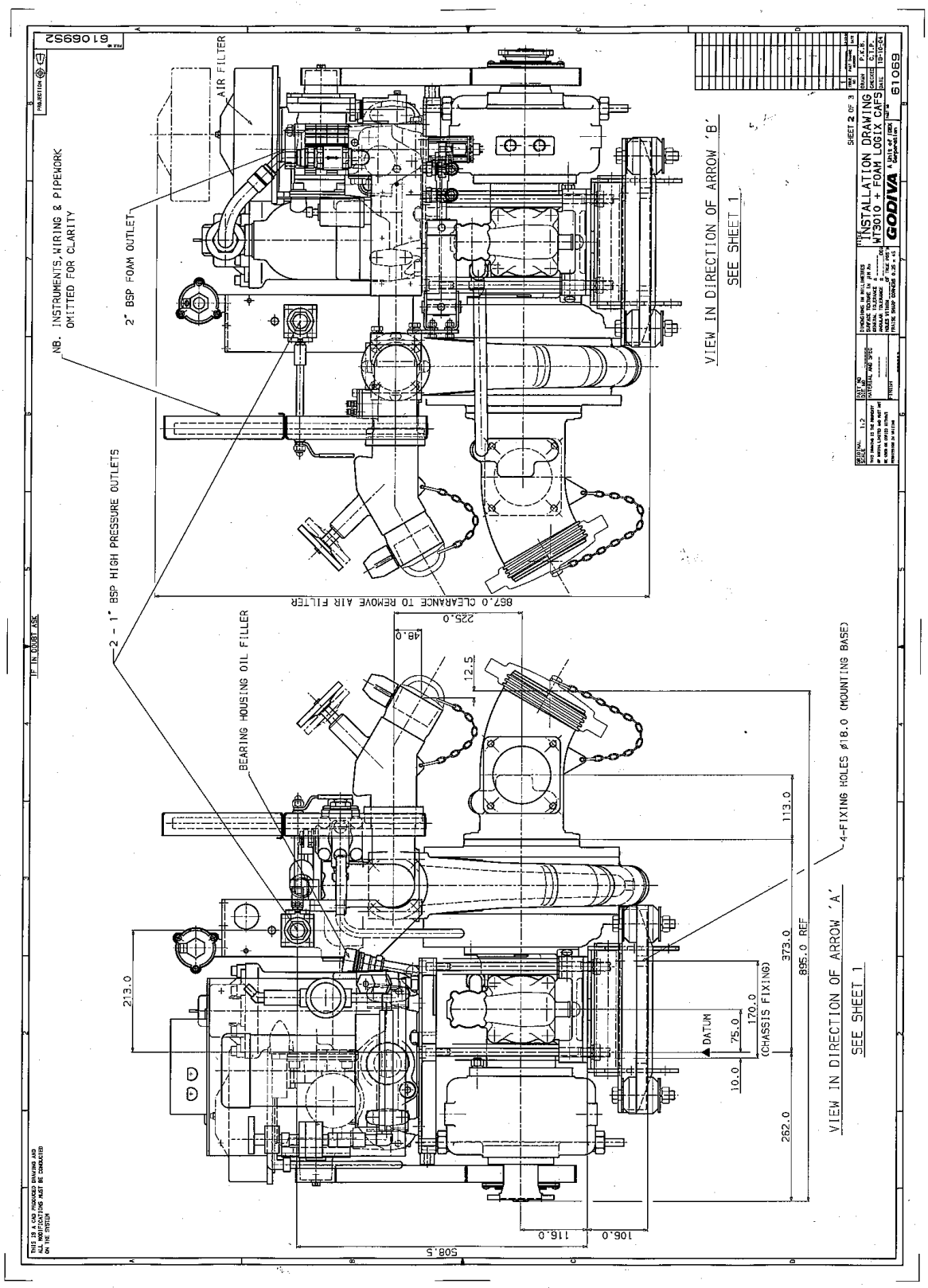
Under normal conditions those items marked AR (As Required) are not deemed to be disposable. However, fluid strainers may be easily damaged during the cleaning process. Please exercise care when handling. It is at the customer's discretion whether said items are carried as 'off the shelf' spares.

# INSTALLATION DRAWINGS – WT WITH FOAMLOGIX CAFS

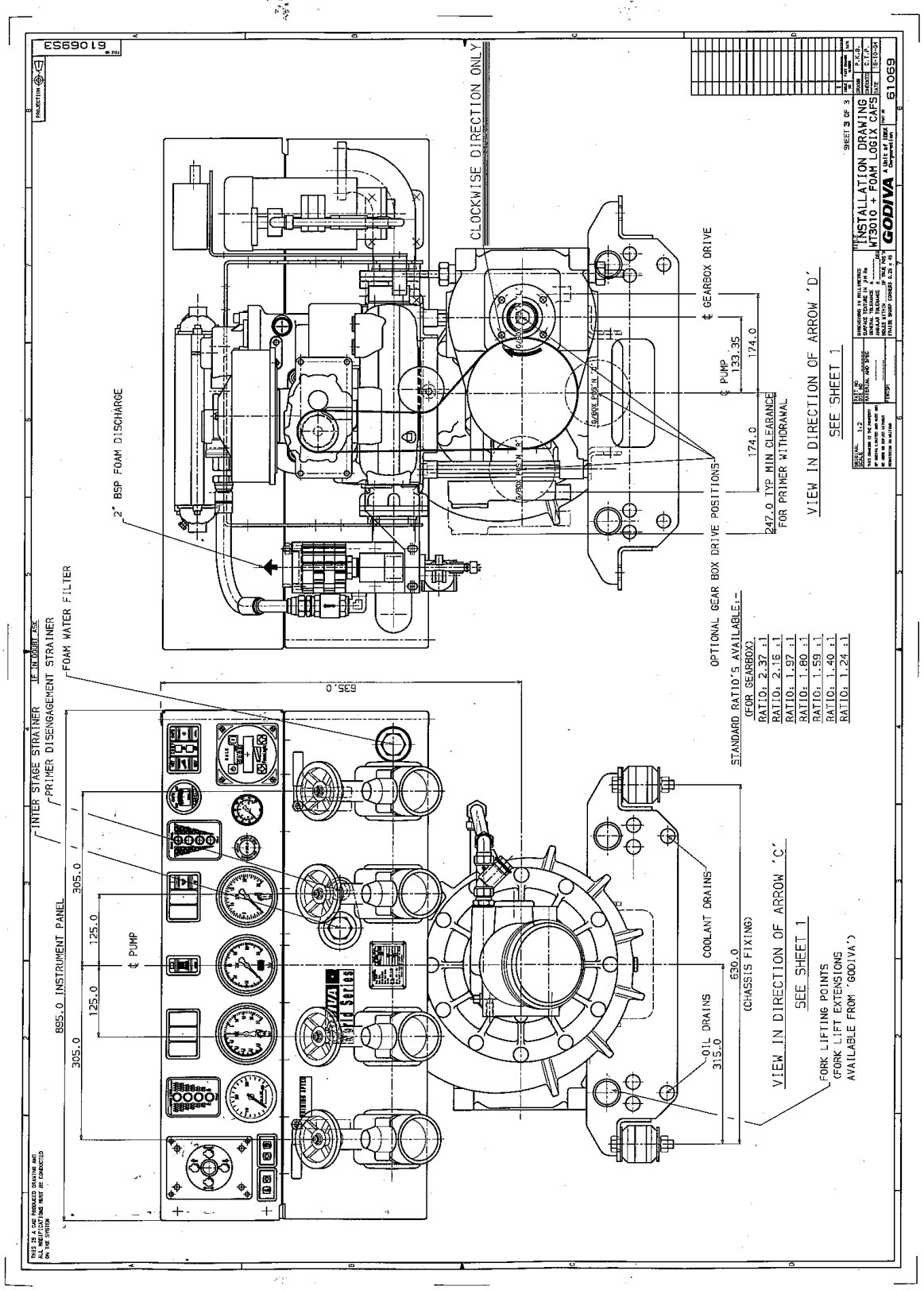
## Sheet 1 of 3 (WT)



## Sheet 2 of 3 (WT)

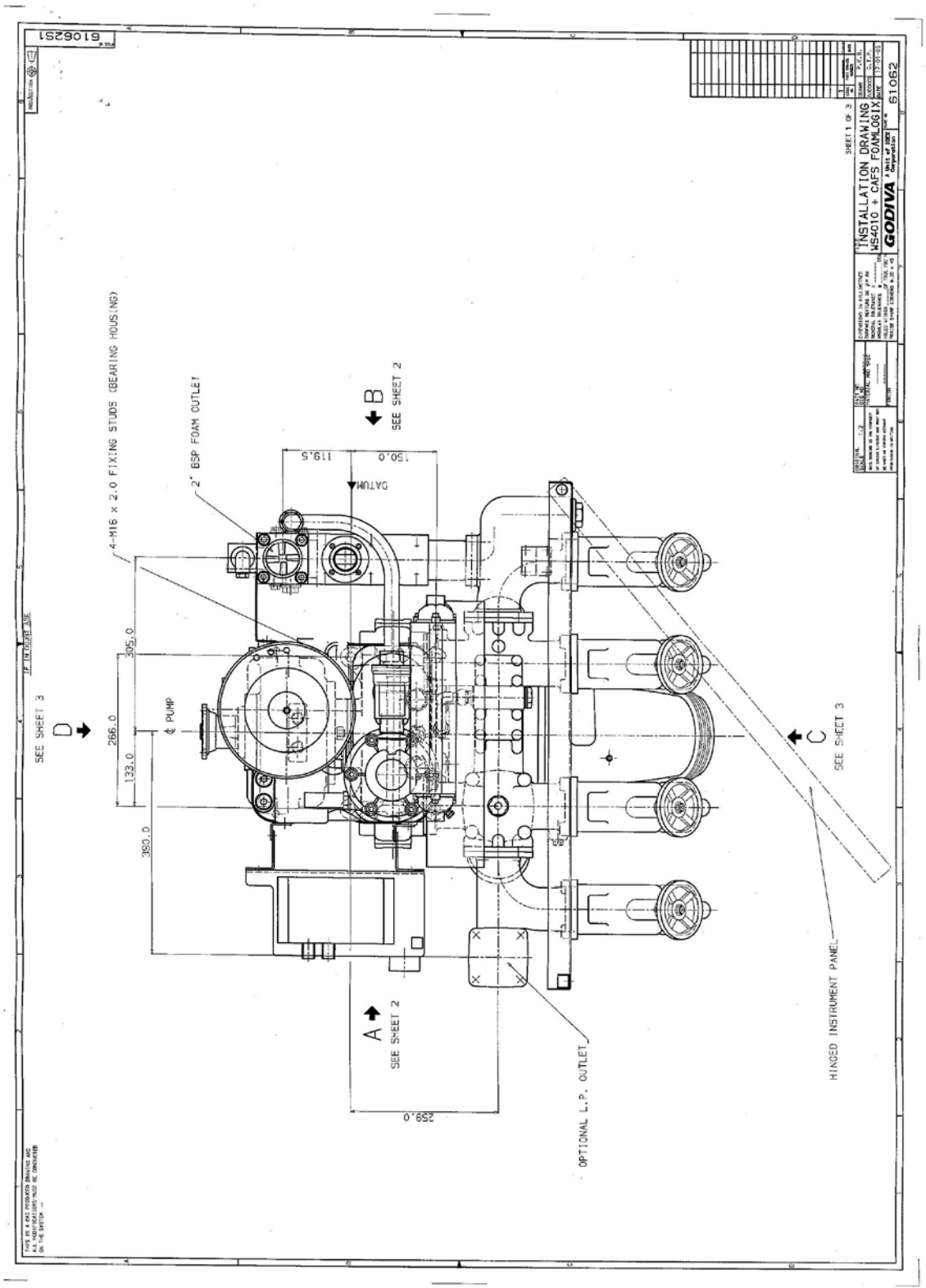


## Sheet 3 of 3 (WT)

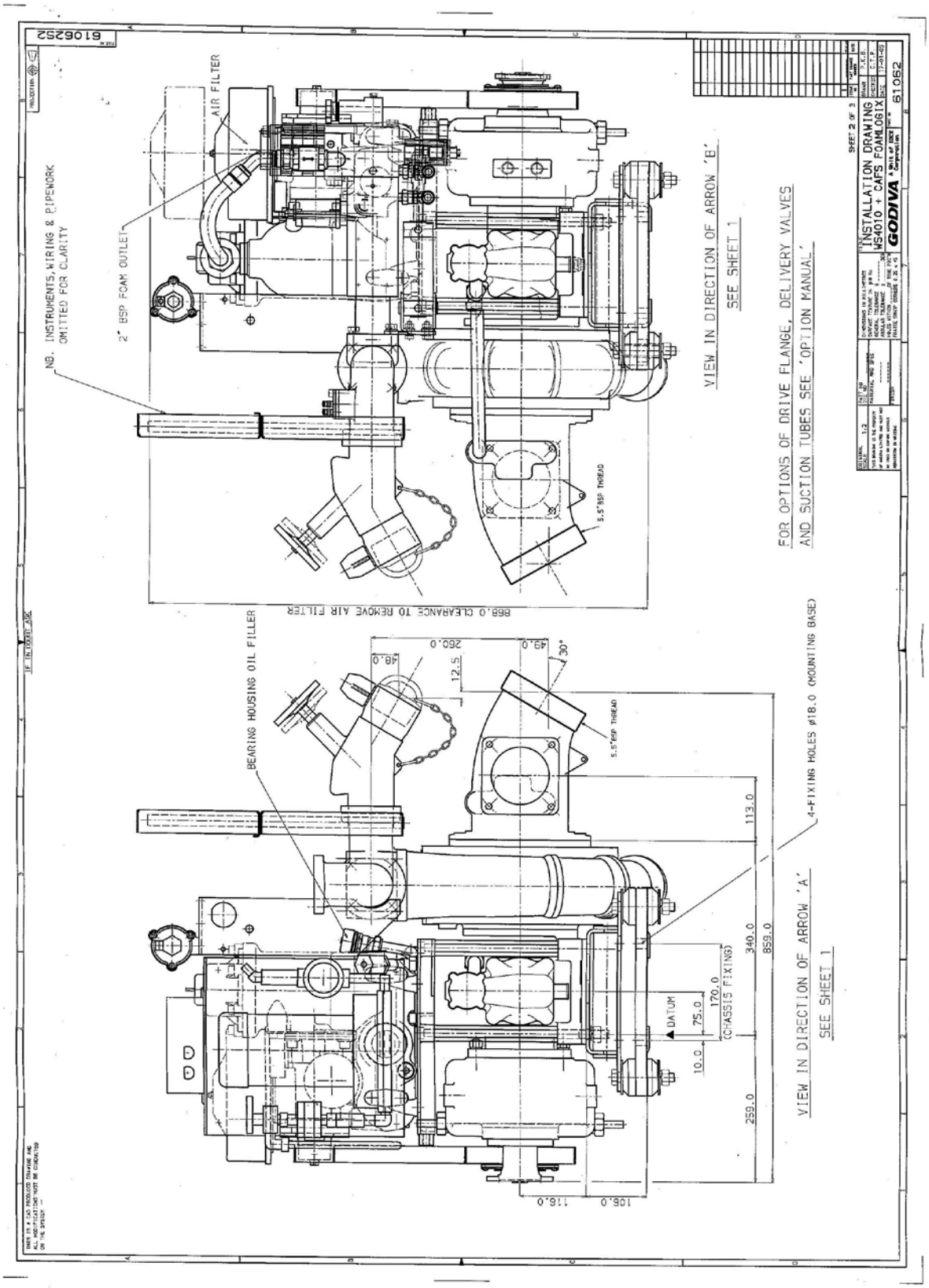


# INSTALLATION DRAWINGS – WS WITH FOAMLOGIX CAFS

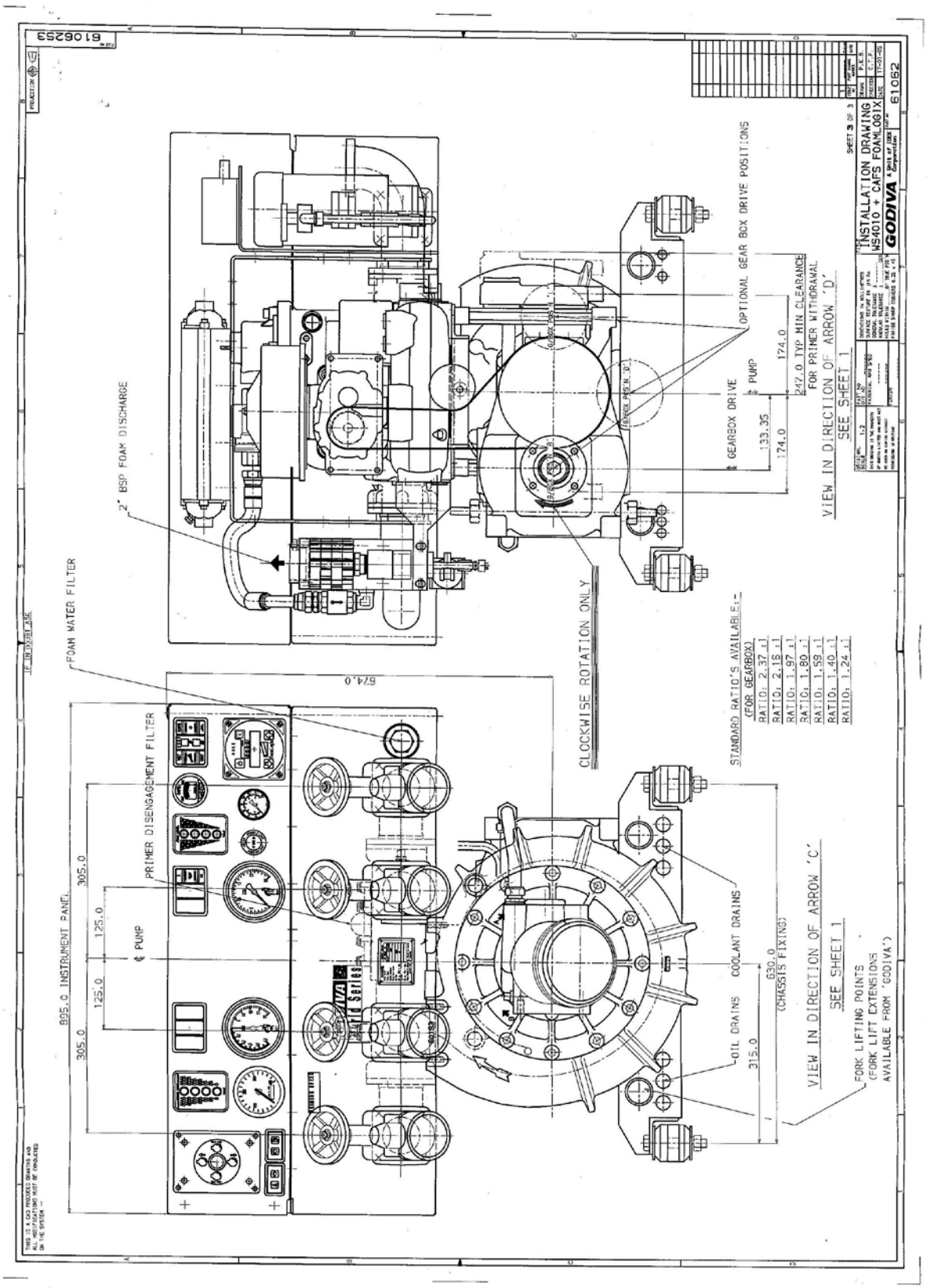
## Sheet 1 of 3 (WS)



## Sheet 2 of 3 (WS)

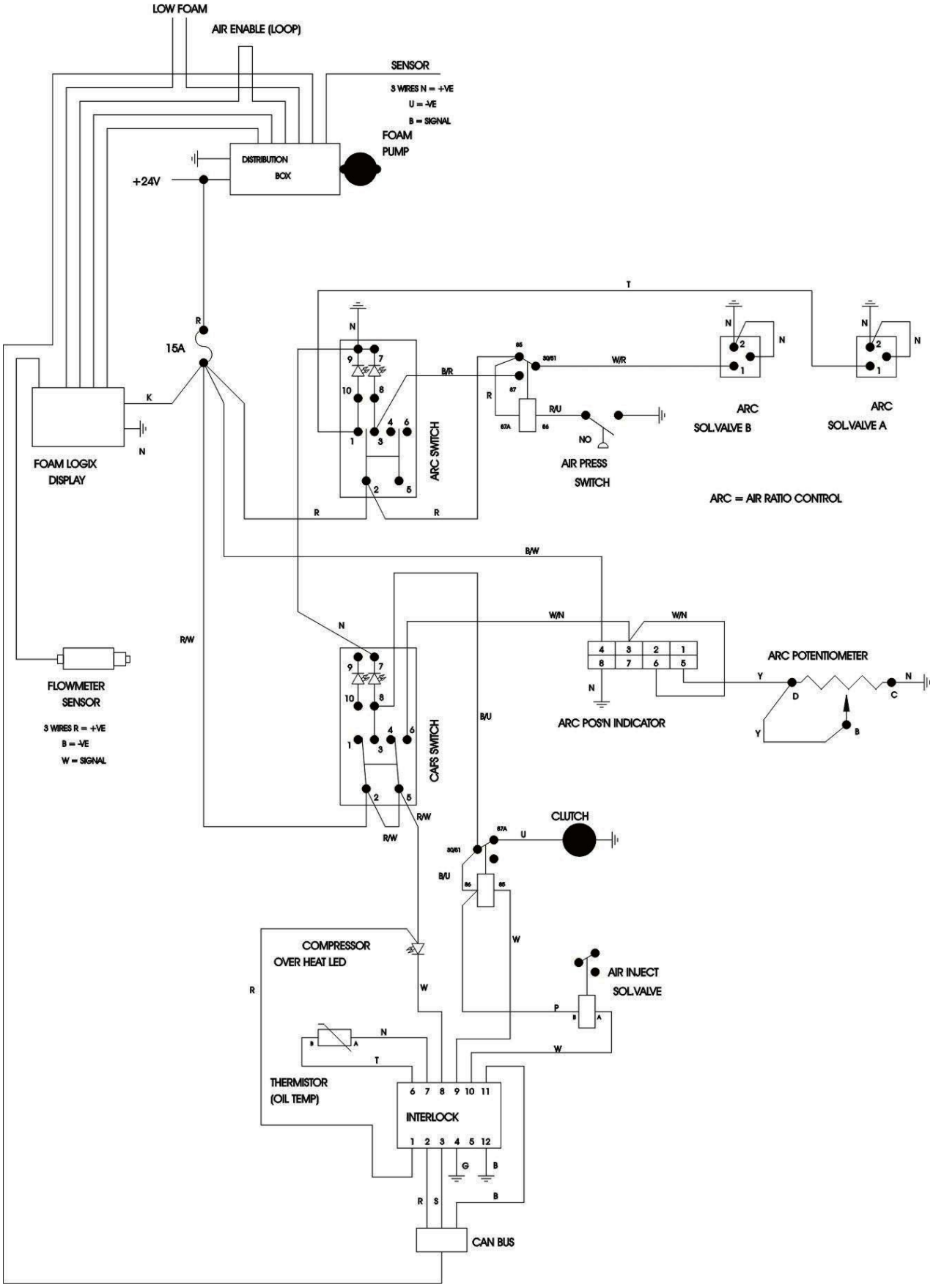


## Sheet 3 of 3 (WS)



# SCHEMATIC WIRING DIAGRAMS

## Schematic - CAFS 60784/03



## Schematic - Engine Control 60784/04