

# World Series Pump with Integrated CAFS

Models: WTAC or WSAC with FoamLogix 2.1A System


from November 2004


## Installation and Operation Manual




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## **IMPORTANT NOTES**

Please read this manual before operating the pump.

Every care has been taken during the manufacture of this fire pump to ensure that it leaves the factory capable of giving a long period of trouble-free running. Correct lubrication and maintenance is essential if satisfactory performance is to be maintained.

Do not run the pump for extended periods without water in the pump casing, as the water is used to cool and lubricate the gland-seal components. If it is necessary to run the pump for long periods, connect it to a water supply. Failure to take this precaution may result in severe damage to the gland seal components.

If a portable pump is fitted with a heat exchanger system (e.g. GP10/10) it is very important that a minimum differential pressure of 3 bar is maintained in the pump unit to ensure sufficient pumped cool water is being circulated through the heat exchanger to prevent overheating of the engine unit.

The terms 'Left Hand' (LH) and 'Right Hand' (RH) used in this book apply when the pumping unit is being viewed from the pump suction tube end, which is regarded for the purposes of this document 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 – however, BEFORE operation it is essential that the Operating Instructions are carefully read and understood.**

A risk-assessment of the pump has been conducted with the following results:

### **MAINTENANCE**

It is the responsibility of the user to ensure that the equipment is maintained in a safe operational condition, as per regulation 5 in the Provision and Use of Work Equipment Regulations 1998.

### **TRAINING**

It is **ESSENTIAL** that Godiva pumps are operated **ONLY** by **TRAINED PERSONNEL**. Manufacturer's training can be obtained on application to Hale Products Europe Ltd., Charles Street, Warwick CV34 5LR, England. Tel: +44 (0)1926 623600.

To avoid injury, the operators should take all necessary precautions to safeguard themselves and others and follow the operating procedures laid down in this book.

### **SAFETY POINTS**

The following points apply specifically to Godiva pumps driven by a petrol or diesel powered engine, but can apply to all types of pump in general:

- DO NOT OPERATE the unit close to flammable materials or structures.
- DO NOT SMOKE while operating the unit
- Keep ALL UNTRAINED people AWAY from the unit during operation.
- PETROL IS EXTREMELY FLAMMABLE and MUST be HANDLED WITH CARE.
- DO NOT REFUEL until the engine is cold.
- DO NOT refuel whilst smoking or allow sparks or flames into the refuelling area.
- DO NOT OVERFILL the fuel tank. After refuelling, ENSURE that the fuel cap is refitted.
- Be careful NOT TO SPILL fuel.
- DO NOT run the engine in an enclosed area as poisonous gases are given off which can cause injury.
- DO NOT expose volatile fluids or battery gases to a naked flame.
- Avoid prolonged skin contact with fluids, especially if corrosive or carcinogenic.
- Protect the eyes as necessary.



**The exhaust system becomes VERY HOT during operation and REMAINS HOT for a time AFTER the engine has been stopped. DO NOT TOUCH the exhaust whilst the engine is HOT.**

- On portable units the starting system is powered by battery. ALWAYS connect the battery positive (+ve) cable BEFORE the negative (-ve) and disconnect the negative BEFORE the positive.
- Disconnect the battery when working on the pump to avoid accidentally starting the unit.
- Batteries produce EXPLOSIVE GASES so do not expose to sources of heat and naked flames.
- DO NOT lift heavy weights without suitable assistance.
- DO NOT inhale fumes or gases.
- DO NOT remove protective guards or shields.

## **NOISE**

When the pump is running, suitable EAR PROTECTION should be worn at all times by personnel.

## **MANUAL HANDLING**

Godiva Portable Pump design incorporates suitable lifting handles or points. A manual-handling sheet is provided with each model. The secondary starting method (hand-start) provided MUST BE USED WITH CARE. Follow the operating instructions provided.

## **ENVIRONMENTAL PROTECTION**

It is illegal to pour engine oil and other contaminants onto the ground, down sewers or drains, or into water courses.

Dispose of these through authorised waste disposal contractors to licensed waste disposal sites, or to the waste reclamation trade.

If in doubt, contact the Local Authority for advice on disposal facilities.

F.W. Mason  
Managing Director

## **GENERAL DATA**

### **COMPRESSOR**

Model	HSC50-1
Maximum Operating Speed	10000 rpm
Nominal speed of operation	6250 rpm
Nominal power draw	12.0kW
Direction of rotation (when looking on pulley)	Anti-clockwise
Oil Capacity	3.5 l
Oil Capacity with filter change	4.0 l

### **COOLING SYSTEM**

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

### **FOAM PROPORTIONING SYSTEM**

Manufacturer	Hale Products Inc
Model	FoamLogix 2.1A
Type	Electronic foam proportioning system
Operating voltage	24 volts
Fuse rating	40 amp
Current draw (Operating)	10 amp
Current draw (Max)	20 amp
Wire size	Minimum 4.0mm <sup>2</sup>
Max. Foam Agent Flowrate	8.0 L/Min
Max. Foam solution Flowrate:	
3% Induction	267 L/Min
1% induction	800 L/Min
0.3% Induction	2670 L/Min

### **DIRECTION OF ROTATION**

Clockwise only – when looking on pump drive flange

## **RECOMMENDED LUBRICANTS**

### **COMPRESSOR LUBRICATING OIL (3.5 litres approximate)**

**Preferred:** Screw compressor oil meeting ISO Viscosity grade 32 to 46.

**Alternatively:** SAE 10W/40 automotive multigrade oil.

### **PUMP GEARBOX (1.5 litres approximate)**

**Preferred:** BP Energol GR XP 68 or similar

### **PUMP BEARING HOUSING (0.75 litres approximate)**

**Preferred:** 10W/40 or 15W/40 Multi-grade engine oil

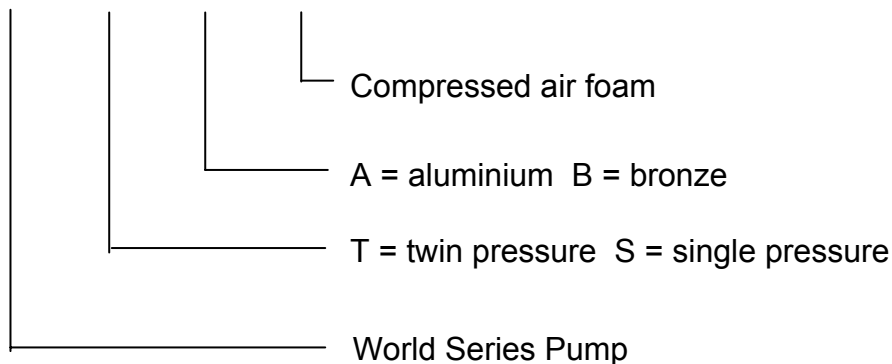
## RECOMMENDED FOAM AGENTS FOR USE WITH THE WTAC

Class A Foam	Manufacturer	Brand name
US Forestry Service Approved	ANSUL	Silvex Class A Foam Concentrate
	Angus	Forexpan S (0.1% - 1.0%)
	Chubb National Foam	1 <sup>st</sup> Defense Class A Coldwater 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

### MODEL IDENTIFICATION SYSTEM

Other variations of the World Series pump with CAFS are identified by these letters -

# W T A C



## MAJOR COMPONENTS AND CONTROLS

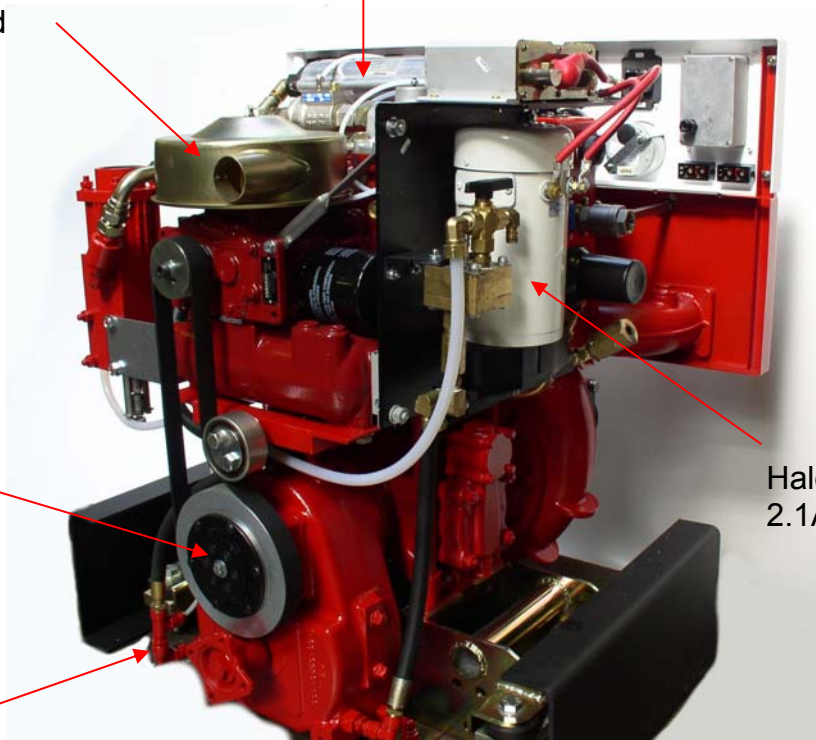
Rotary twin screw compressor with integral air receiver/separator and lubrication system

Cooling: oil to water heat exchanger

Gearbox with power take off for compressor drive, pulley includes electromagnetic clutch

Integral gearbox oil cooler

Hale FoamLogix 2.1A Series Pump

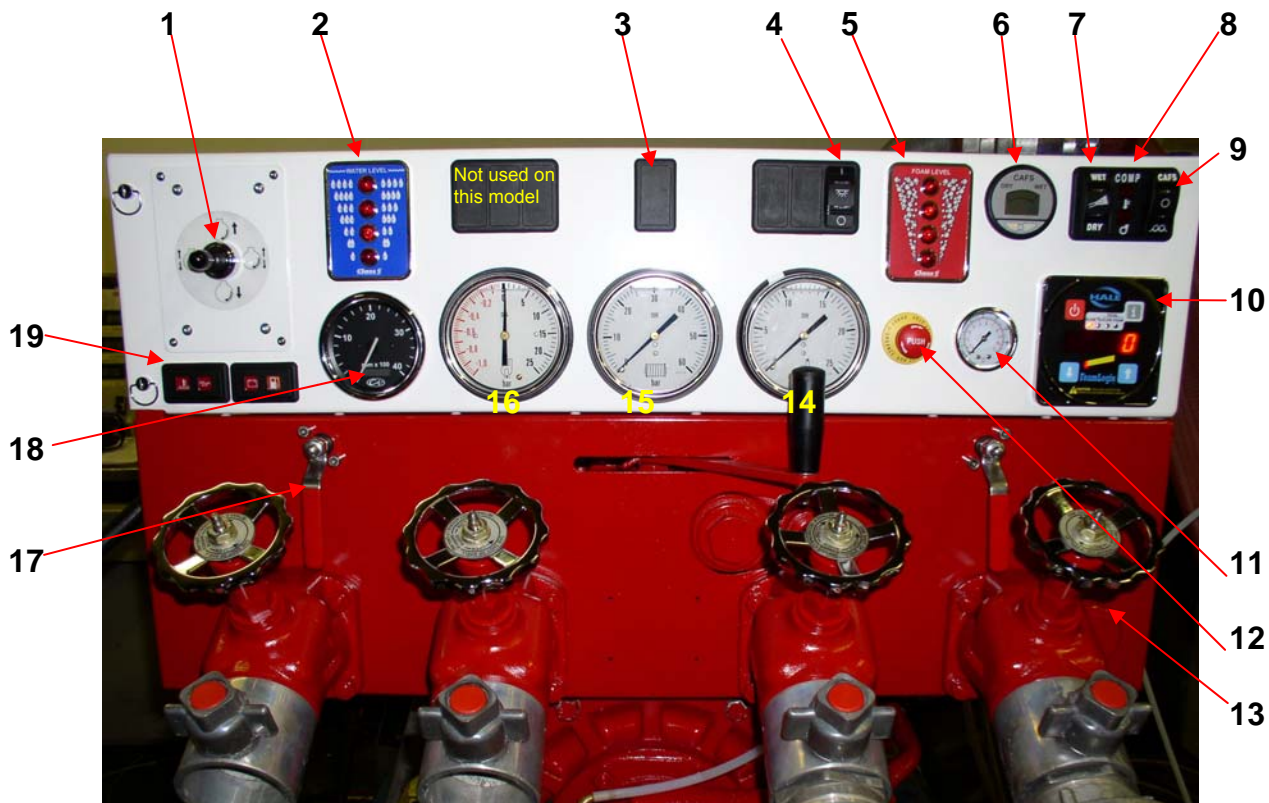


**CAF mixing and control**  
Mixing system:  
Hale X-mixer system  
Air ratio control: selectable wet or dry foam

**Foam Induction System**  
Electronic Foam  
Proportioning system



## World Series Control Panel (typical, options and type of gauge may vary)



- 1 - Engine speed control - Up – increase, Down – decrease, Left to 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 – foam proportioning control
- 11 - Compressor pressure
- 12 - Emergency stop
- 13 - Filter – CAFS water feed
- 14 - Pump low pressure gauge
- 15 - Pump high pressure gauge
- 16 - Compound gauge
- 17 - High pressure discharge valves
- 18 - Pump RPM
- 19 - Engine warning lights – Left to right, high coolant level temperature, low oil pressure, low battery charge, low fuel level

Enlarged view of  
7 8 9



## **SYSTEM OVERVIEW**

The WTAC is a Compressed Air Foam System comprising of three major components – air compressor, FoamLogix (foam proportioning unit) and manifold (foam mixing and control system).

All the components are in one integrated module located at the back of the World Series pump and above the pump bearing housing and gearbox.

Water is supplied from the pump discharge manifold and fed, via non-return valves, into a manifold assembly where flowrate is measured and a metered amount of foam is injected. This foam/water solution is then fed to an air control valve (ARC) at which wet or dry foam is selected (air ratio control section of manifold). Compressed air is then injected and the resulting foam/water/air solution is thoroughly mixed (X-mixers) before being fed to a discharge connection.

The unit is provided with several safety interlocks to ensure that: -

1. Foam cannot be injected unless water is flowing through the unit.
2. Air cannot be injected unless foam and water are flowing through the unit. This prevents “slugging” in the discharge line caused by air and water, which cannot mix
3. A low level switch in the foam tank will stop air injection when the tank is empty to prevent slugging

### **Compressor**

The rotary twin-screw compressor provides 50 scfm of compressed air at 7 bar and is driven by a belt drive connected to the pump drive-shaft. The compressor can be engaged or disengaged from the pump drive by the CAFS selector switch on the pump control panel, which activates an electro-magnetic clutch. **NOTE:** The compressor should never be run without the pump providing a water supply for cooling.

The oil in the rotary air compressor is cooled by water taken from the main pump via the water supply line. The water supply is taken from the pump delivery, and returned to pump suction. The compressor will reject approx. 8.0 kW of heat energy to cooling, and the installer must consider this additional thermal load

A blowdown valve is fitted to the compressor to remove any constrained pressure in the system when the compressor is stopped.

## FoamLogix

The FoamLogix 2.1 consists of three main components:

- 1) Foam Pump / Motor Assembly
- 2) Control Panel, mounted in main pump control panel
- 3) Flow measurement and injection manifold.

All three parts work together to provide accurate and reliable foam proportioning. From the control panel, the operator can turn the system on, adjust the foam injection percentage, read real time water flowrate 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 depressed

Hale FoamLogix foam proportioning systems are completely engineered; factory matched foam-proportioning systems that provide reliable, consistent foam concentrate injection for Class A foam operations. Hale FoamLogix systems accurately deliver from 0.1% to 9.9% foam concentrate directly into the water discharge stream. It is then fed as foam to the manifold apparatus and discharge piping.

## Manifold

The manifold incorporates an air ratio control valve at which varying wet or dry foam mixtures can be selected. Compressed air is then injected and the resulting foam/water/air mixture is mixed by passing through the X-mixer section before being fed to a discharge connection.

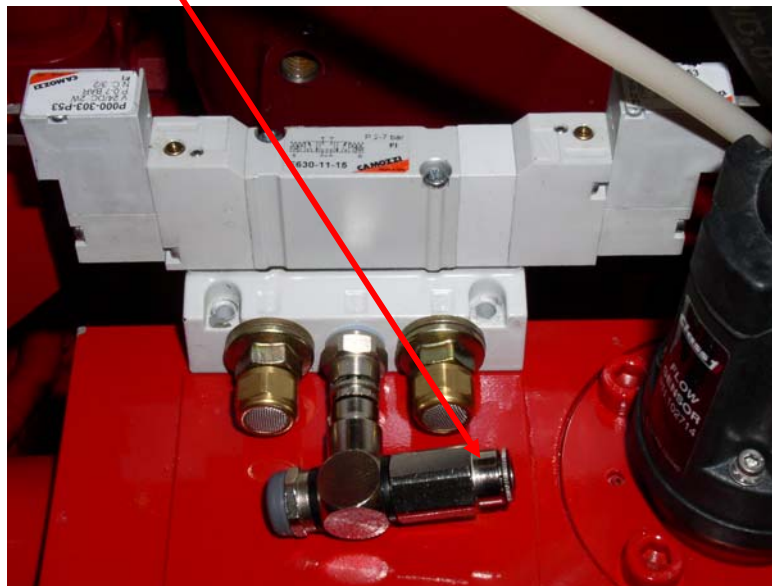
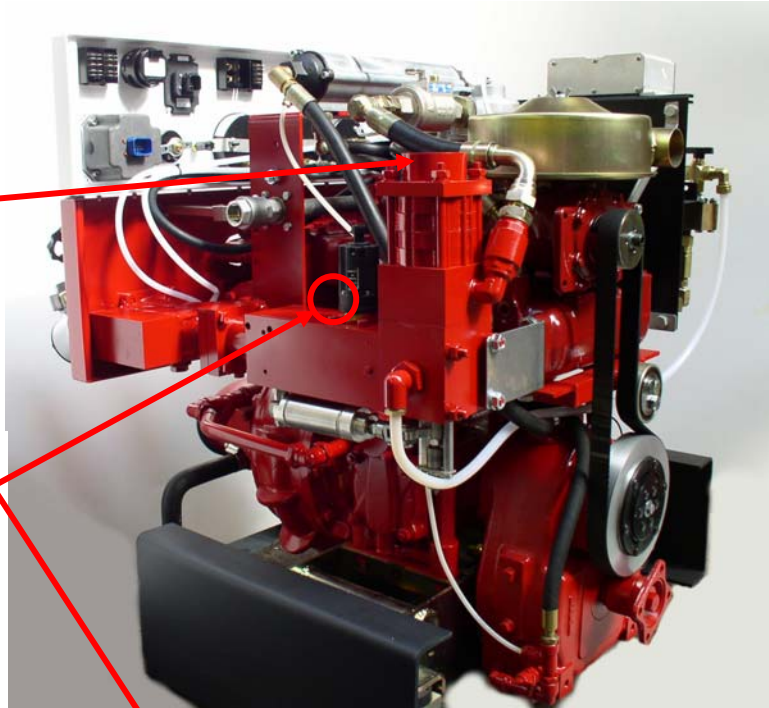
CAFS units are best suited for use with Fresh Water. For compatibility of foams in salt water conditions advice should be sought from the foam agent manufacturers

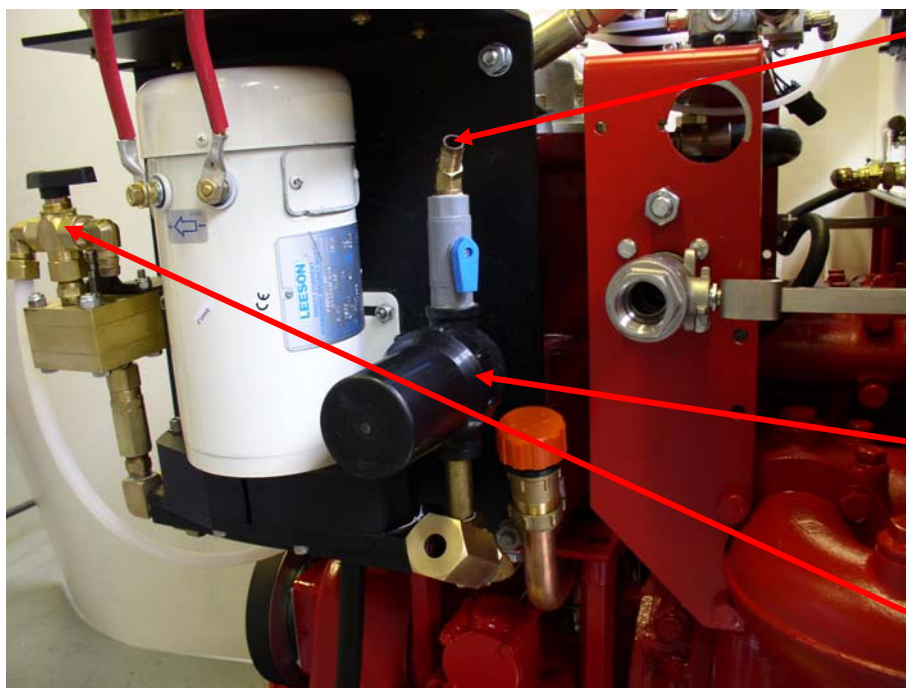
## INSTALLATION AND INITIAL SET-UP

The following connection points should be noted when installing the WTAC or WSAC unit into a vehicle –

CAFS  
Discharge  
port, see  
installation  
drawing for  
dimensions

Air connection for  
ARC valve  
operation  
Ø 6mm Pipe.  
**This requires an  
external air  
supply to  
operate**

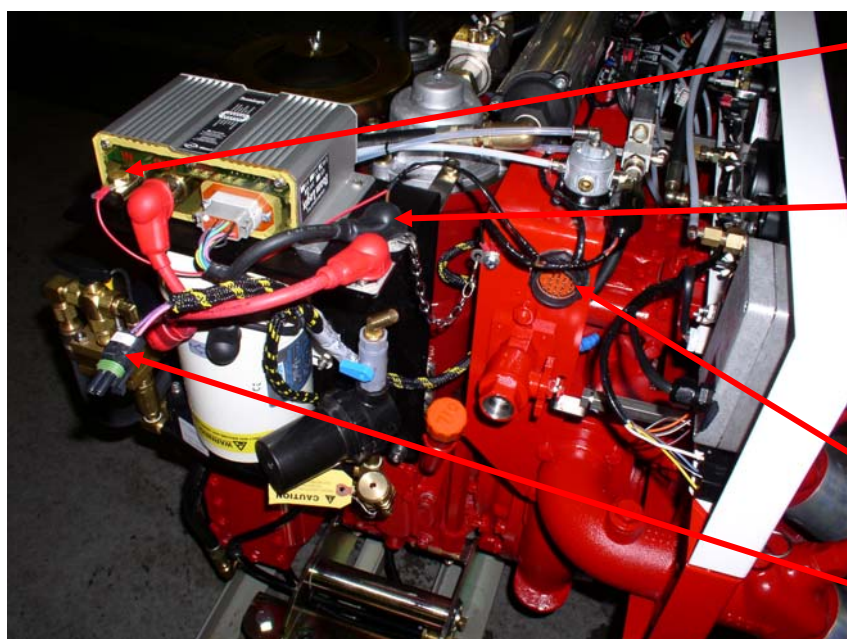




Foam feed from tank, Ø13mm tubing airtight connection required. NOTE: the tank must be located to provide a positive head of foam agent to the FoamLogix unit.

FoamLogix foam filter - Extract from left side of unit

By-pass valve and connection point



## FoamLogix pump

Connect +24V power feed from Vehicle system (20 Amp Max, Minimum 4.0mm<sup>2</sup> wire section)

Connect ground wire to here

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

Multi-way connection point for engine status / control.

Location of low foam switch connection

## Fluid drain connections

The drain points at the lower left side of the pump (looking from the suction tube end of the pump) are for draining the pump unit when changing the oil in the pump bearing housing, gearbox and compressor. The connection points are supplied fitted with a blanking plug.



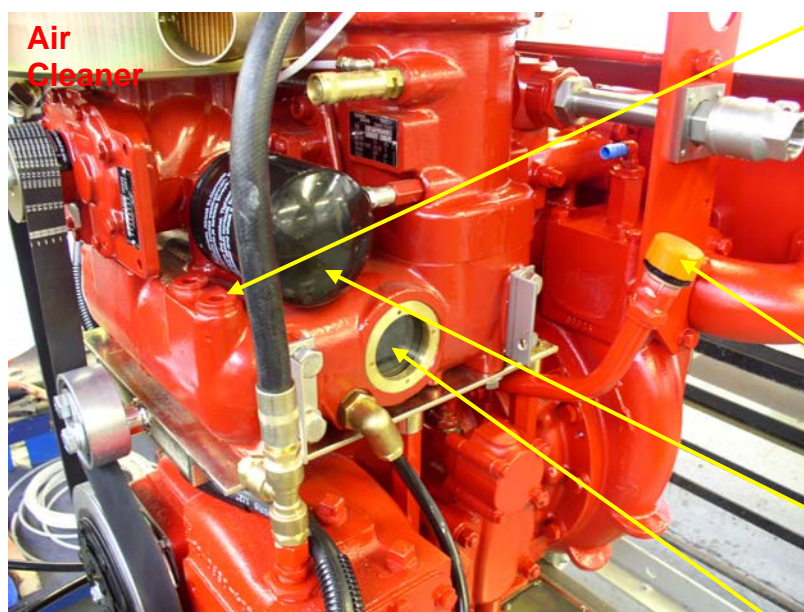
At the lower right hand side of the pump are similar connections points for draining the gearbox cooling system of coolant and the CAFS manifold of water.



## 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 (looking from suction tube)



**Air  
Cleaner**

Compressor oil filling point.  
Note: the oil plug has a groove running down the threaded section to allow for a slow release of the oil pressure.  
For oil type and capacity refer to Recommended Lubricants

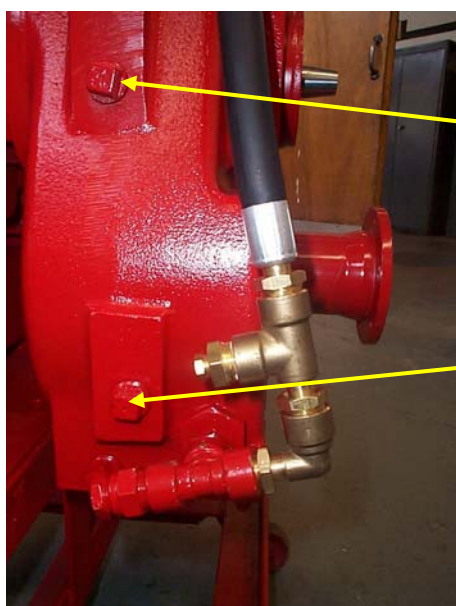
Pump bearing housing oil filling point and oil level check dipstick

Compressor oil filter. For oil type and capacity refer to Recommended Lubricants.

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 –**



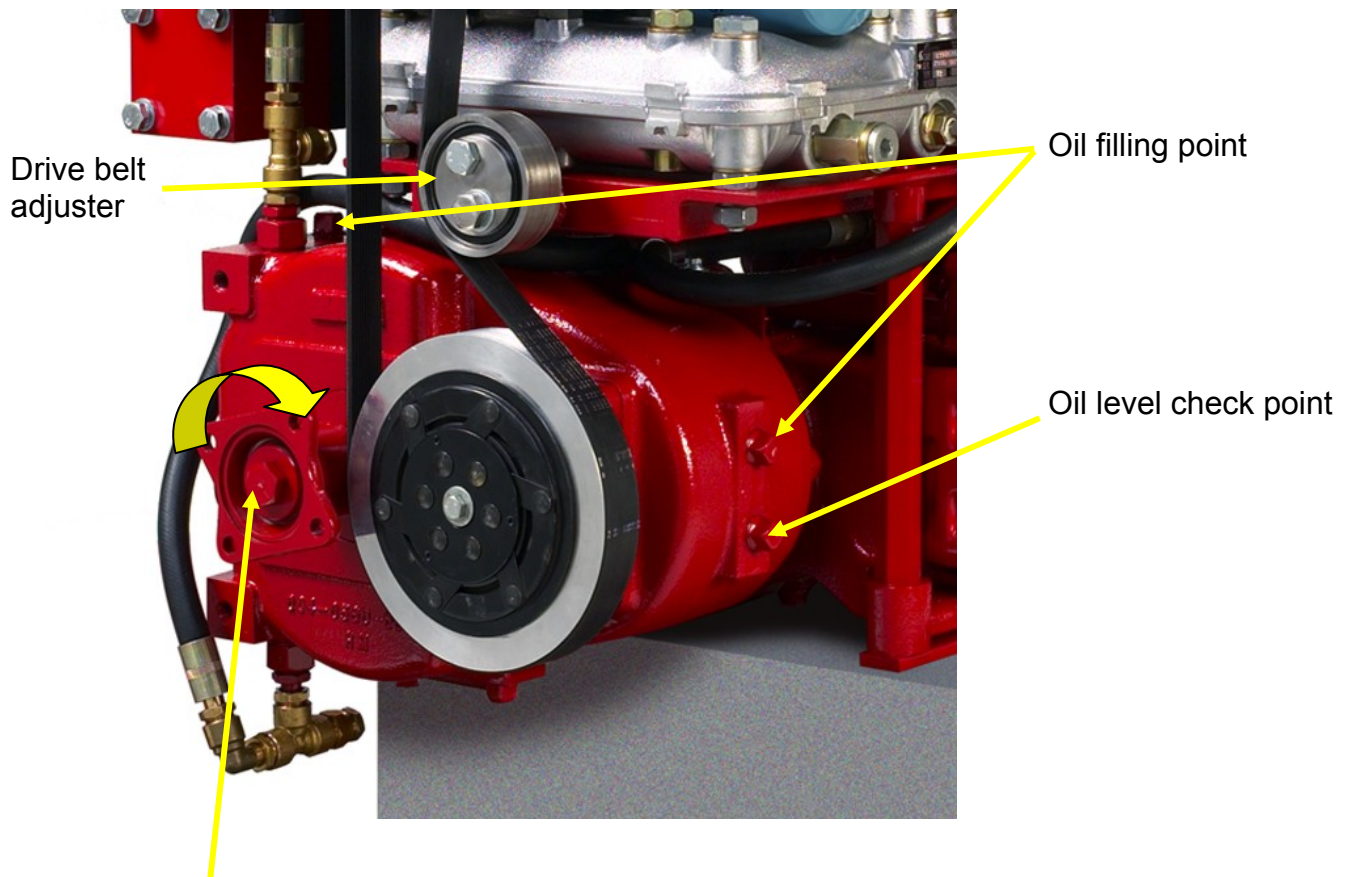
Oil filling point  
For oil type and capacity refer to Recommended Lubricants.

Oil level check point -  
When the gearbox is filled with 1.5 litres of oil, the oil will be level with this plug

## **Gearbox in horizontal position, to left or right of pump –**

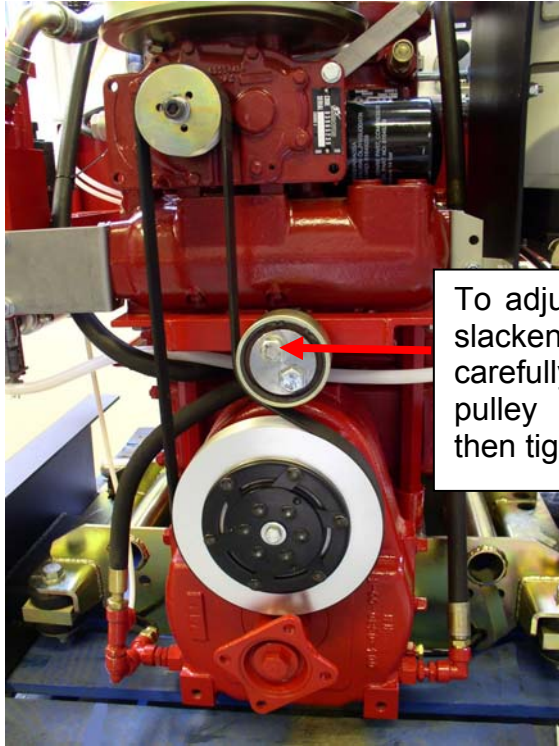
The oil filling point is on the top or the side of the housing as indicated

The oil level check point is lower on the side. Oil capacity and type as above.

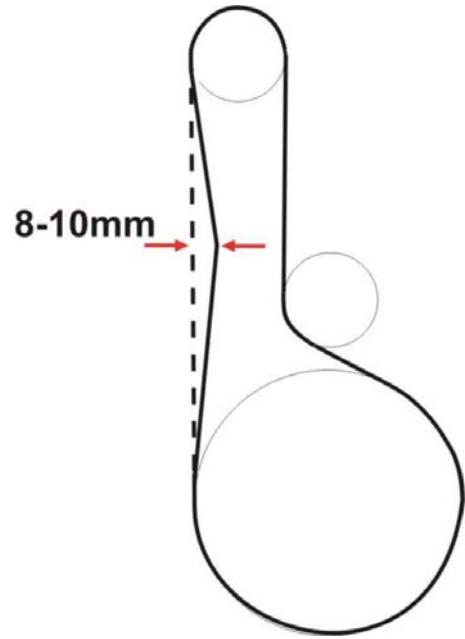


## Compressor Drive Belt

The compressor drive belt is a *Polydrive* ribbed belt, specification 12PJ. Provision must be made by the installer for access to adjust the belt tension with the jockey pulley on the non drive side of the belt. The belt is correctly tensioned when there is a 8-10mm deflection when a 10kg load is applied at mid span, see diagram below –



To adjust belt tension, slacken this nut and carefully move jockey pulley into position, then tighten





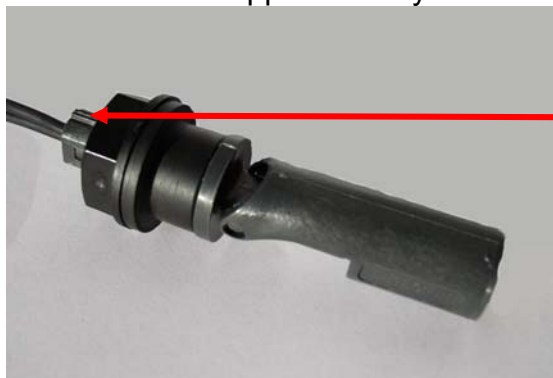
## Foam Tank Low Level Sensor

The unit is supplied with a connection point for a low foam level switch. The switch device is supplied with the unit ready for installation in the tank (instructions are supplied with the switch).

**Note:** the low foam level switch must be installed in the tank in the correct orientation. The switch device has a raised marker on the casing where the wires enter the device. This marker must be installed at the 12 o'clock (top) position for correct functioning.

The foam tank requires a 23mm hole for secure fitting of the switch device and the maximum allowable thickness of tank wall material is 4mm.

The switch device should be installed at a location in the tank wall that allows for activation when there are approximately 3 litres of foam left before running out.



This marker must be at 12 o'clock (top) when the switch device is installed

## Additional Installation Points –

### Foam Tank to Foam Pump

The foam feed line should 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. It is also good practise to provide a flushing point 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.**

The foam tank should be of plastic or stainless steel with a volume  $\geq$  main tank volume x 0.005. Alternatively, a volume of at least 25litres may be preferred to allow an entire drum of foam agent to be contained.

Connect the foam agent supply to the inlet connection on the FoamLogix pump.

**Note.** These connections must be secure and pressure tight if the FoamLogix pump is to operate correctly.

## VEHICLE DESIGN CONSIDERATIONS

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

1. The in-line strainer/valve assembly is a low-pressure device and WILL NOT withstand high flushing water pressure. It is rated for 3 Bar.
2. Prevent corrosion of power and ground connections by sealing these connections with silicone sealant.
3. The system can only perform when the electrical connections are sound. Verify all electrical connections prior to start up.
4. Each Hale FoamLogix system is tested at the factory using the wiring harness provided. Improper handling and forcing connections can damage these cables, which could result in other system damage.
5. Use mounting hardware that is compatible with all foam concentrates to be used in the system. Use washers, lockwashers and capscrews made of brass or 300 series stainless steel.
6. The areas containing the WTAC components must be adequately shielded from the ingress of road spray / debris and surplus grease from universal joints etc. Ingress of dirt, water and grease will have a detrimental effect on the working life of the drive belt and electronics.
7. Access to compressor oil fill and level checkpoint must be catered for.
8. 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, then any pipe work or valves fitted should have a clear through bore of 38mm as far as the hose connector. Sealed blank caps **MUST NOT** be used on CAFS discharges. This is to prevent compressed air from being trapped in the pipe work.
9. Direction of rotation is clockwise only – when looking on to the pump drive flange.

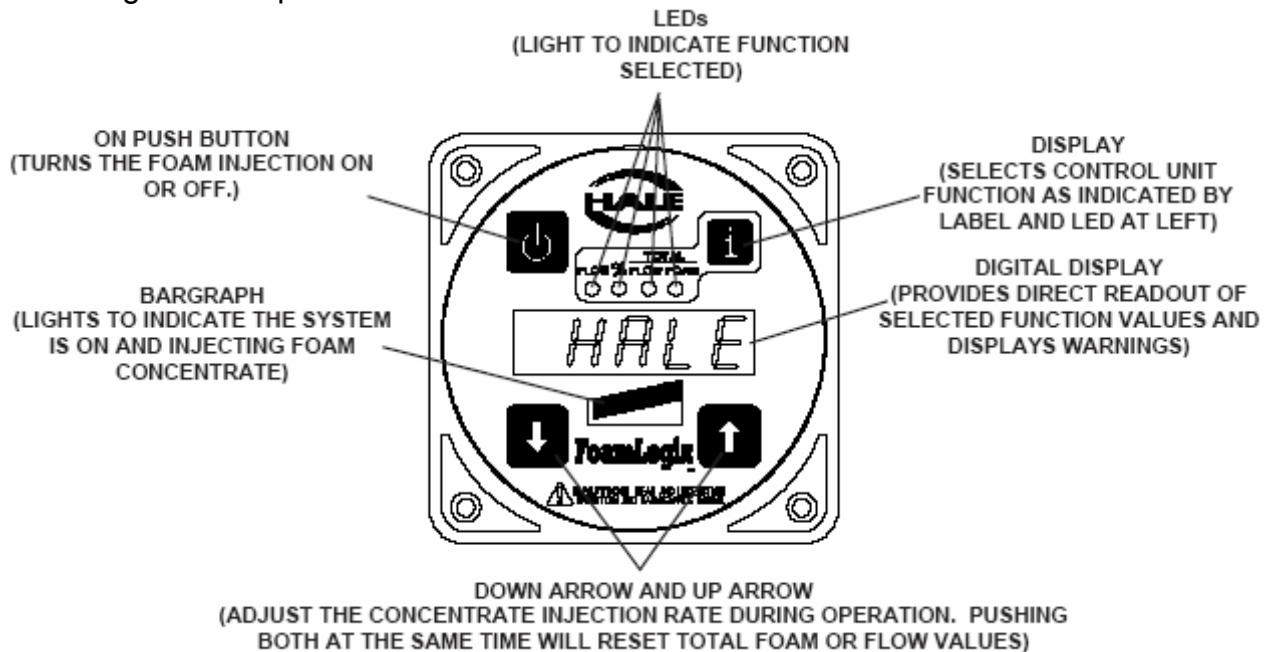


# OPERATION

## OPERATING THE SYSTEM

**Caution:** The WTAC should only be used when working from open water or a tank feed. It must not be used directly from a pressurised suction (hydrant) because this will interfere with the water / air pressure ratio. If hydrant support is required this must 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 made as described in the previous sections
2. The compressor, pump gearbox and bearing housing are filled with the required oil  
Run the pump at 2-3 bar with compressor engaged
3. Run the compressor for 30 seconds to allow oil to circulate.
4. Stop unit and check compressor oil level – top up if necessary.
5. Turn the bypass valve on the FoamLogix to bypass and provide a suitable receptacle to collect the foam, agent.
6. Ensure that there is sufficient foam agent in the tank.
7. Select simulated flow on the FoamLogix by pressing both up ↑ & down ↓ at the same time.
8. 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 pri”. Repeat this step once more to attempt to prime the pump.

"no Pr" = No prime display



9. When prime is achieved, deselect simulated flow by pressing both up ↑ & down ↓ at the same time.
10. Return the bypass valve to the inject position.

The unit is now ready to run.

## OPERATING WTAC FROM A VEHICLE WATER SOURCE

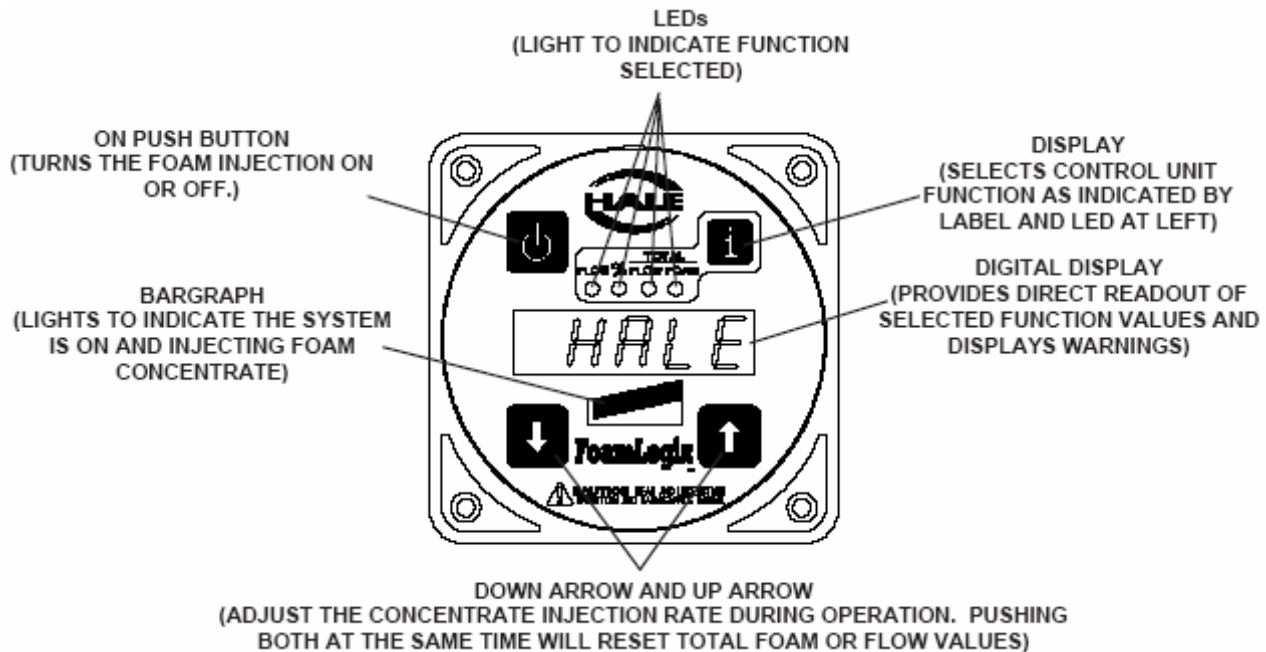
1. Connect a suitable delivery hose and branch to the CAFS discharge.  $\phi 38$  to  $\phi 45$ mm diameter layflat hose is suitable for delivering compressed air foam. If a single discharge is being used, a  $\phi 25$  to  $\phi 38$ mm smooth bore nozzle would be suitable. If two delivery hoses were to be deployed, then two  $\phi 19$  nozzles would be appropriate.

**Note:** The best foam quality is produced using a smooth bore nozzle with the foam going through the minimum number 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 will severely degrade the foam quality.

**Note:** the following controls on the FoamLogix Control Panel -


## FoamLogix Control Panel

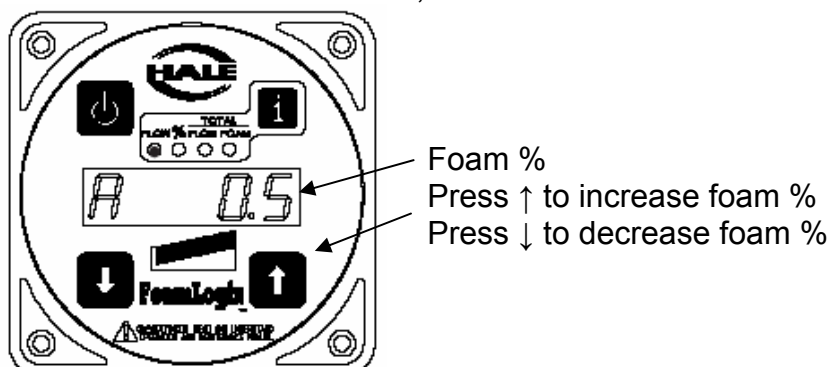


### Engaging PTO and priming main pump.

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 about -.5 bar is achieved, and then slowly open the tank to pump valve

### Discharging foam agent only (Can be operated from open water, tank, or hydrant into pump suction)

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, Page 9)
3. Press the red **on** button, and choose desired foam % setting. (Default is 0.5%)



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** (Can be operated from open water or tank feed only. Do not apply hydrant pressure to pump suction)

1. Bring pump to idle.
2. Select CAFS by pressing the top of the CAFS selector switch – **marked “CAFS”** (No.9 Page 9)
3. Increase pump speed to required operating pressure (4-10 Bar)

## Wet Foam or Dry Foam

1. A continuous variable foam type from WET to DRY is available, selectable by the pump operator.
2. The WET or DRY foam composition is selected by using the WET/DRY control on the panel (No.7 Page 9). An indication of foam type is given by the WET or DRY foam indicator (No.6 Page 9), but the pump operator may choose to optimise the liquid flow as displayed in the Foamlogix display.
3. To increase the WET or DRY property of the foam, press the WET/DRY control (No.7) at the top for WET or the bottom for DRY.
4. Note: when discharging dry foam at low pump pressure, the possibility of hose kinking is increased and should be considered when deploying hoses on the fire ground.

## Shutting Down

1. Set WET/DRY selector switch to the WET foam setting (Press in **bottom** of switch)
2. Turn off compressor by setting the Foam/CAFS selector switch to foam position -  

3. Turn off the FoamLogix, press RED button.
4. Bring 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 cold weather is expected, open the drains to drain the manifold and gearbox oil cooler.

## Overheat Shut down

1. If the compressor is running hot, a warning indicator light will illuminate on the control panel when oil temperature reaches 105°C.
2. If the compressor oil temperature exceeds 110° C, the unit should disengage the drive automatically. The compressor can sustain 105° C temperatures for short periods without damage. The unit can be re-engaged when the compressor has cooled.
3. The most likely cause of compressor overheat problems is insufficient cooling water flow.

## **MAINTENANCE SCHEDULE**

### Monthly:

- Check the compressor oil level and top up if necessary.
- Check the belt tension/condition and adjust if necessary.
- Check the hose connections.

### Every 100 hours or every 6 months (whichever comes first):

- Change compressor oil and filter. Filter P/N 59271/01
- Clean the FoamLogix foam filter.

### Annually or every 400 hours:

- Change the compressor air cleaner - P/N 59271
- Change pump bearing housing oil
- Change pump gearbox oil

### Every Two Years:

- Change drive belt

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

## **FAULT FINDING**

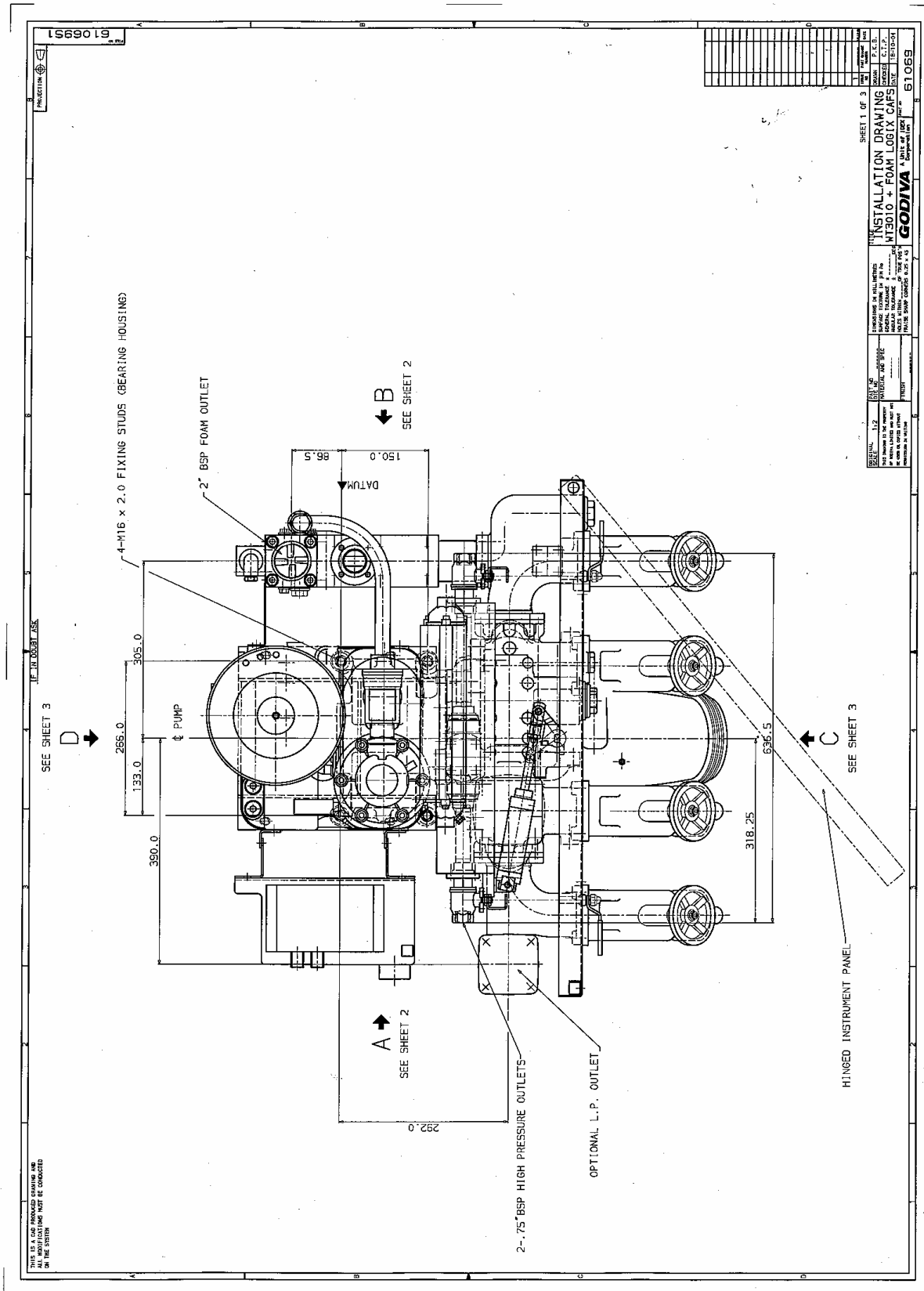
<b>EFFECT</b>	<b>CAUSE</b>	<b>ACTION</b>
Compressor overheats	No water supply or restricted flow	Check oil cooler pipe work for obstructions
Unable to produce foam solution	FoamLogix not operating	Switch on FoamLogix Blown Fuse (Investigate cause)
	No Foam in tank	Refill with foam agent
	FoamLogix not 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.

## RECOMMENDED SPARES

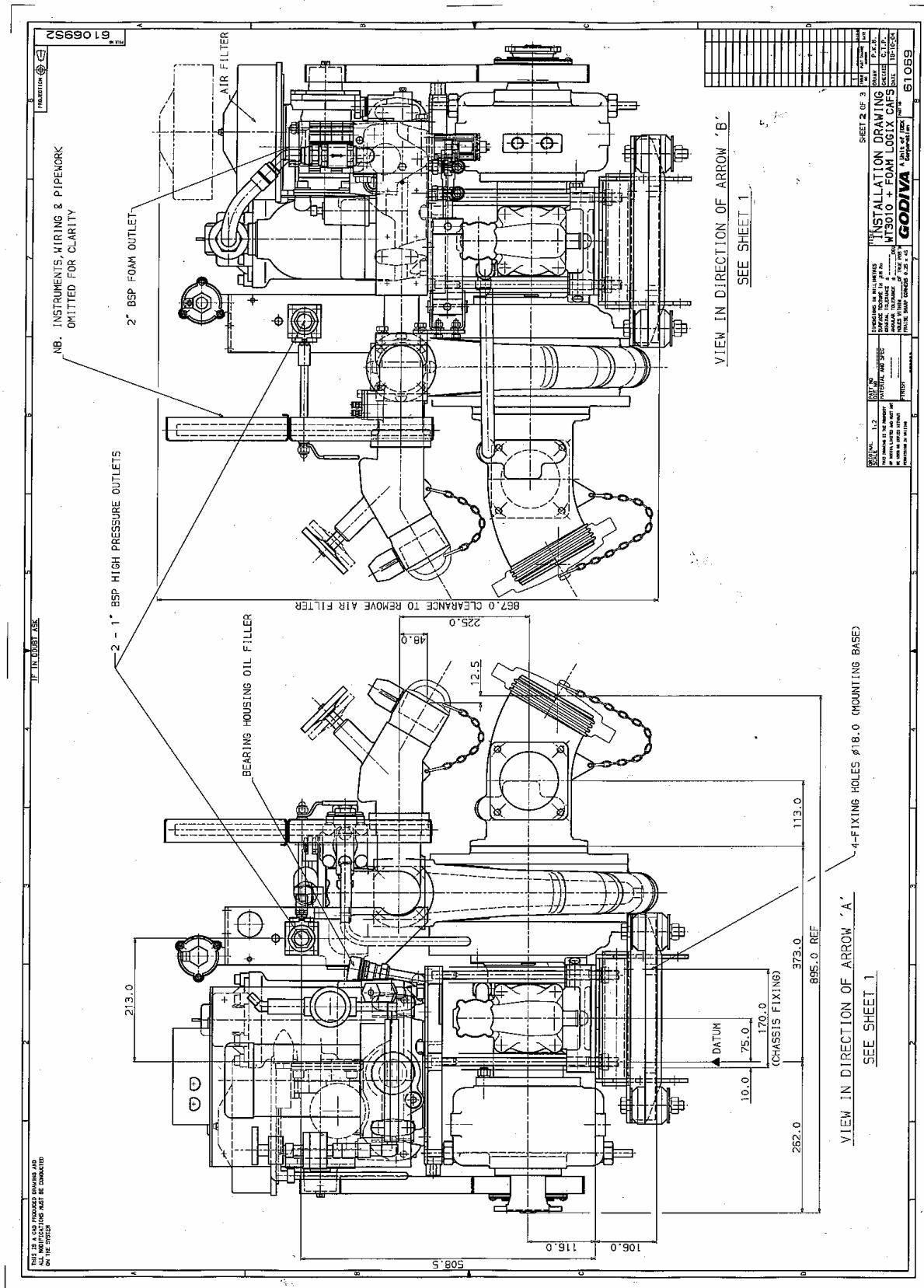
### FOR 2 YEARS OPERATION

<u>ITEM</u>	<u>PART No</u>	<u>QTY</u>	<u>DESCRIPTION</u>	<u>COMMENTS</u>
<b>COMPRESSOR GROUP</b>				
1	59271/01	4	OIL FILTER	
2	59271	2	AIR FILTER	
3	60578/01	1	DRIVE BELT	
4	UFP2303/8	2	DOWTY WASHER	DRAIN PLUGS AND OIL LINES
<b>MANIFOLD GROUP</b>				
1	UFP2303/10	1	DOWTY WASHER	NRV - AIR INLET
2	53866	5	O-RING	X-MIXER SECTIONS
1	UFP2303/15	1	WASHER	FILTER, DISCHARGE

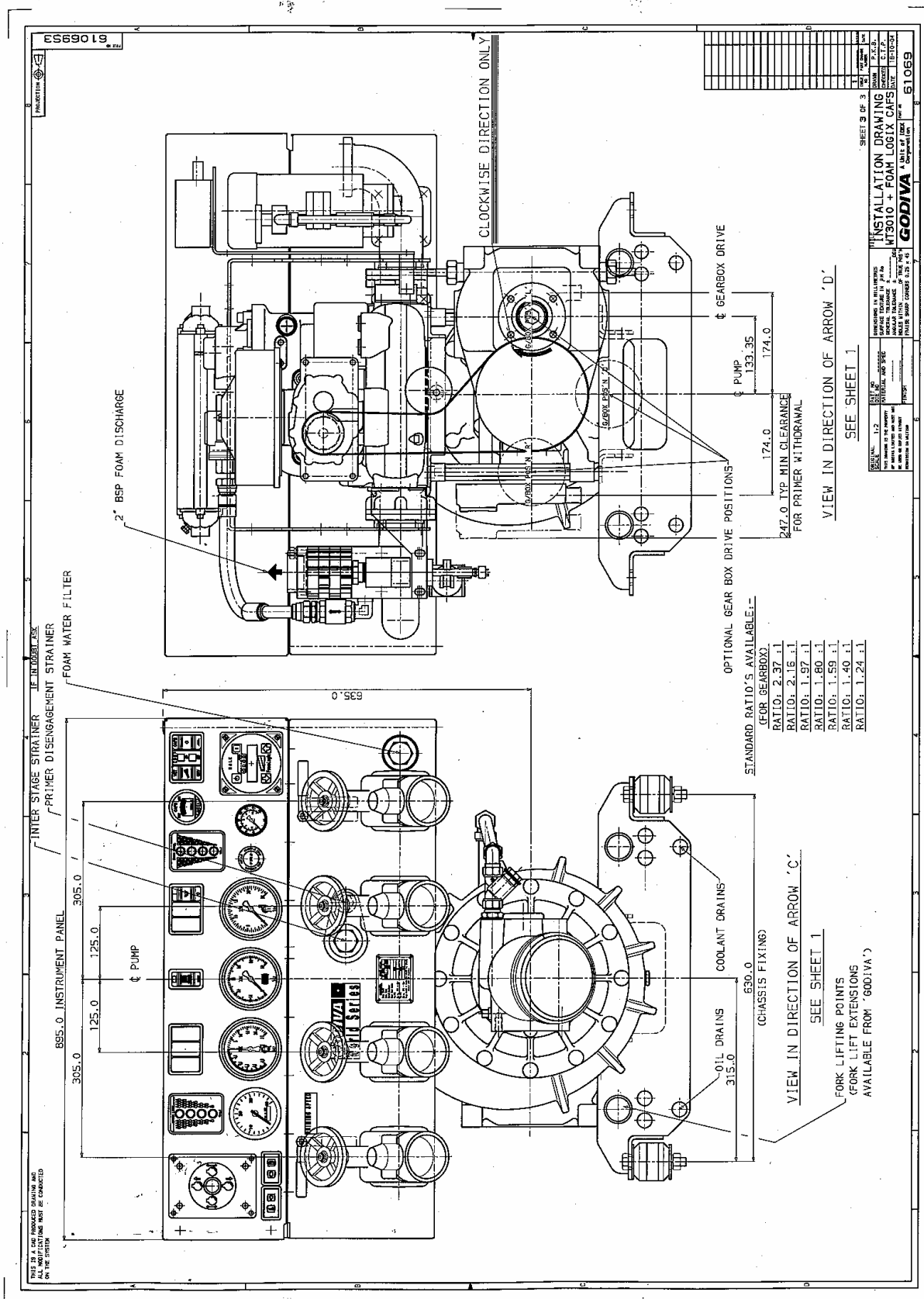
## INSTALLATION DRAWINGS – WT with FoamLogix CAFS Sheet 1 of 3



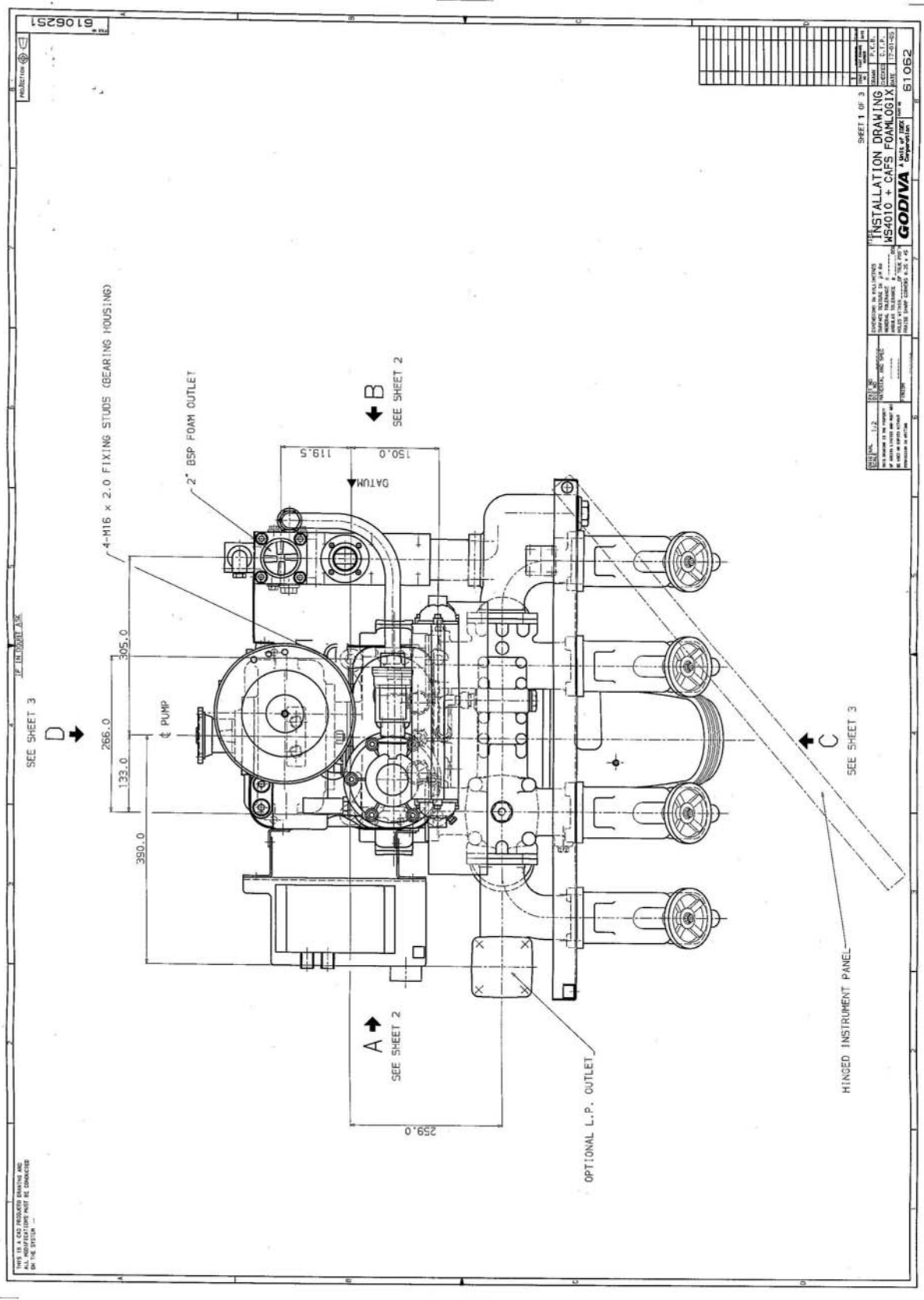
## INSTALLATION DRAWINGS – WT with FoamLogix CAFS Sheet 2 of 3



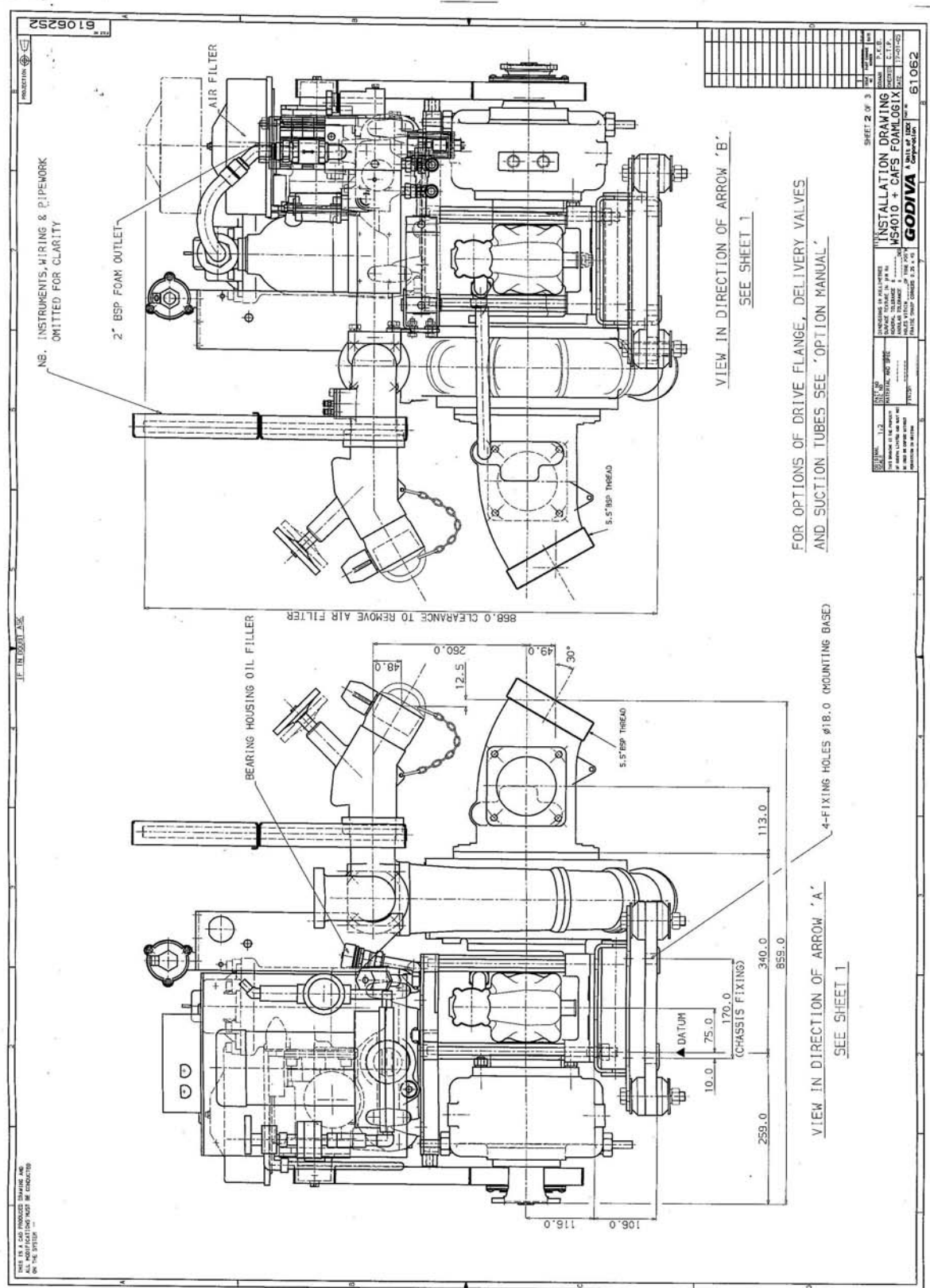
## INSTALLATION DRAWINGS – WT with FoamLogix CAFS Sheet 3 of 3



## INSTALLATION DRAWINGS – WS with FoamLogix CAFS Sheet 1 of 3



## INSTALLATION DRAWINGS – WS with FoamLogix CAFS Sheet 2 of 3



## INSTALLATION DRAWINGS – WS with FoamLogix CAFS Sheet 3 of 3

