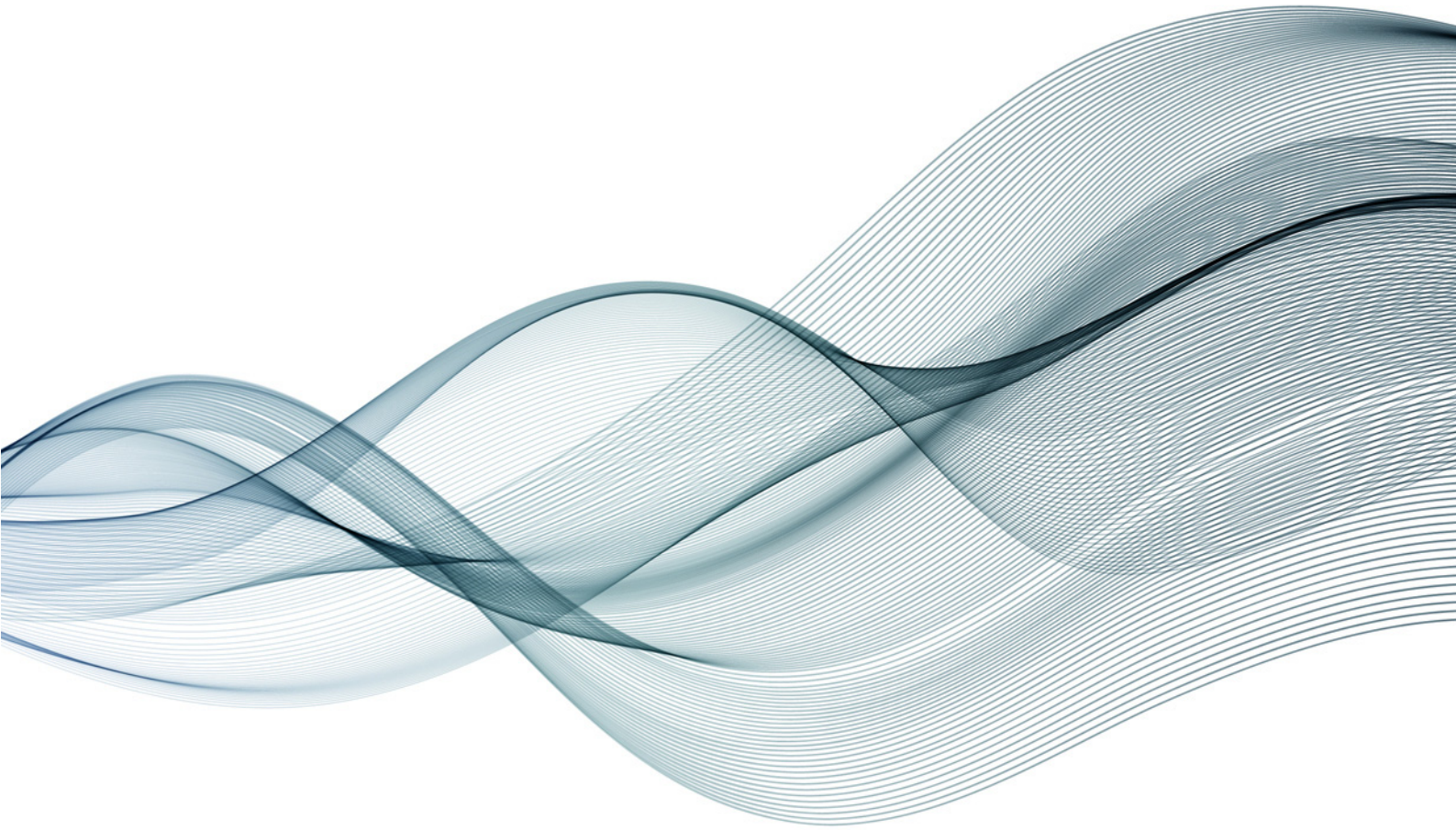

Operation and Maintenance Manual
Gaspure Chamber Gas Recovery System

Part No.	A1328A
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Document Rev.	11

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APPROVAL SHEET

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Advitium No	**Title**	**Classification**
P1829-OM-0181	Operation and Maintenance Manual Gaspure Chamber Gas Recovery System	Commercial in confidence

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By	J. Cusson	Technical Author
Checked	J. Craig	Electrical Engineer
Approved	J. Massie	Senior Mechanical Engineer

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Review

This document is subject to review and revision in accordance with ISO 9001.

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1 APPLICATION

Note ***Please refer to Appendix B, page 2, Gaspure Chamber Gas Recovery System Schematic A81328S1.***

Exhaust gas is routed from the chamber exhaust, medical locks, equipment locks, and the bell mating trunk via pressure piping to a three way valve (7).

The three way valve (7) routes gas to an overboard dump line or to the gas bag (3).

Note ***Gas is not normally recovered at depths much less than 66 fsw (20 msw) due to the relatively high oxygen percentage.***

Gas then enters the gas bag (3) inflating it until the gas bag level control sensors (4) sends a signal to turn on the gas compressor (not supplied with the Gaspure system). The gas bag level control sensors (4) also sends a signal to turn off the gas compressor after the gas bag has deflated to a pre-determined level.

Note ***The gas bag (3) is protected from over inflation by relief valves, which should be connected to the overboard dump line.***

The gas compressor draws from the gas bag (3) and discharges to the Gaspure Purification System (1) where water vapour, particles, bacteria, carbon dioxide, carbon monoxide, hydrogen sulphide, sulphur dioxide, ammonia, mercaptans, nitrous oxides, heavy hydrocarbons, methane and other light hydrocarbons are removed.

At the discharge point of the Gaspure purification system (1) a back pressure regulator maintains the minimum system pressure at approximately 2,000 psi (138 bar) ensuring efficient operation of each element of the Gaspure Purification System (1).

The purified gas is then routed to suitable high pressure gas stowage (not supplied with the Gaspure system) where it is analysed and then ready for re-use as chamber blow down gas.

The alarm panel (5), preferably situated close to the operational area where the Gaspure system is installed, indicates power on to the gas compressor, gas bag full, and change chemicals, which is triggered by a pre-determined hour meter on the gas compressor control panel (not supplied with the Gaspure system).

2 GASPURE SYSTEM

2.1 SYSTEM COMPONENTS

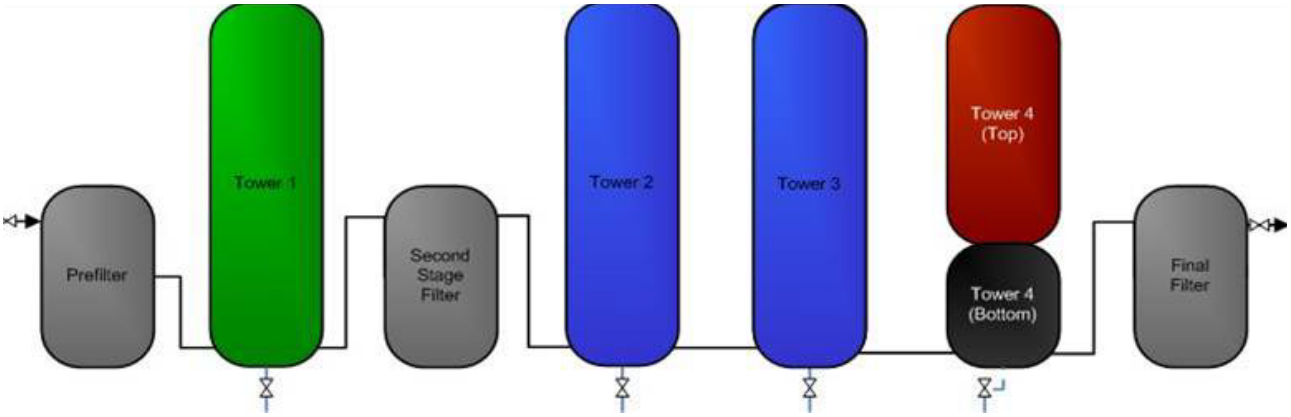
The following components are supplied by JFD with the Gaspure system or are supplied separately by JFD/others for integration to the complete Gaspure Chamber Gas Recovery System. (Appendix B, page 2, Gaspure Chamber Gas Recovery System Schematic A81328S1).

Item	Description	Part No	Supplied by JFD with the Gaspure system
1	GASPURE PURIFICATION SYSTEM	B1302D	YES
	Comprising: Prefilter Tower 1** 2nd Stage Filter Towers 2 & 3** Tower 4 for Top and Lower Cartridges (EMPTY)** Final Filter		
2	SOLENOID VALVE	VE002	YES
3	GAS BAG	C1515D	YES
4	LEVEL CONTROL SENSORS	C1349A	YES
5	ALARM PANEL	DM1865	YES
6	CHECK VALVE	VR001	YES
7	3-WAY VALVE	VB002	YES
8	RELIEF VALVE (SET AT 2PSI)	DM2560	YES
****The system is not supplied with the chemical packs required for operation. These are required to be ordered separately.**			
Qty required per system: 1 off B1591A Gaspure disposable cartridge set. 1 off B1592A Gaspure CO catalyst cartridge.			

2.2 TECHNICAL SPECIFICATION

2.2.1 GASPURE PURIFIER SYSTEM

The Gaspure Purifier System will remove water vapour, particles, bacteria, carbon dioxide, carbon monoxide, hydrogen sulphide, sulphur dioxide, ammonia, mercaptans, nitrous oxides, heavy hydrocarbons, methane and other light hydrocarbons. The Gaspure Purifier System comprises of the following components:



Prefilter	Tower 1	Second Stage Filter	Tower 2	Tower 3	Tower 4 (Top)	Tower 4 (Bottom)	Final Filter
Filters Particulate to 1 micron	Sodalime content removes CO2	Filters particulate to 0.01 micron	Removes H2O to 0.3ppm, H2S, mercaptan, methane	Removes H2O to 0.3ppm, H2S, mercaptan, methane	Removes impurities	Removes CO	Filters particulate to 1 micron

2.2.1.1 PRE-FILTER (F1)

The Pre-Filter (F1) will remove particles, both liquid and solid, down to a size of 1 micron. This filter is extremely effective in removing large quantities of liquid water and/or oil. The maximum remaining oil content downstream of the pre-filter is 0.5 ppm using a typical compressor lubricant. This filter is suitable for use with mineral, synthetic and even degraded lubricants.

2.2.1.2 TOWER 1 (GREEN)

Tower 1 (Green) will remove CO_2 from the gas stream. This scrubber utilises granular soda lime in an absorbent bed. The absorption reaction of CO_2 by soda lime occurs via the following reaction route:

$$CO_2 + Ca(OH)_2 \longrightarrow CaCO_3 + H_2O \text{ in the presence of moisture}$$

The reaction can be further broken down into three steps.

$$CO_2 \text{ gas} + H_2O \longrightarrow CO_2 \text{ in solution}$$

$$CO_{2\ aqua} + NaOH \longrightarrow NaHCO_3$$

$$NaHCO_3 + Ca(OH)_2 \longrightarrow NaOH + CaCO_3$$

The efficiency of soda lime increases in a moist atmosphere so this is the first process carried out on gas. Water vapour present in the gas or produced by the reaction is removed in subsequent filtration stages.

This tower will also remove the majority of the Hydrogen Sulphide and some low molecular weight mercaptans.

The CO_2 scrubber contains 3.3 litres or approximately 3.0kg (6.6lb) of soda lime. Canisters are easily changed and are available in pre-packed sets.

2.2.1.3 SECOND STAGE FILTER (F2)

The Second Stage Filter (F2) will remove particles, both liquid and solid, down to a size of 0.01 microns including bacteria. This translated into oil removal terms means maximum oil content downstream of the filter of 0.01 ppm.

The compressed gas passes first through the inner layer of the filter element consisting of an integral pre-filter material, which removes larger particles of dirt and liquid. This gives protection to the layer of high efficiency filter material, which removes even the finest of particles. Solid particles are trapped permanently within the filter material. The fine liquid particles, including aerosols, after initially being trapped by the fibres of the filter material coalesce forming larger droplets. These droplets along with any large droplets already present in the compressed gas are pushed to the outer support of the element. Here they meet the anti-re-entrainment barrier.

This collects the droplets as they break free and allows them to gravitate within its cellular structure forming a 'wet band' around the bottom of the filter element. Clean filtered air passes through the anti-re-entrainment barrier above the 'wet band' where the resistance to flow is less, leaving a quiet zone of zero gas movement in the bottom of the filter housing. Through this the separated liquid falls without being re-entrained and is removed by the drain on the bottom of the filter.

The life of filter elements thanks to their 'coalescing action' is independent of the amount of liquid contamination present. However, dirt particles do eventually bind up the filter material and the elements must be replaced, see Maintenance Schedule for Cartridge/Filter Replacement (Refer to 3.2 Installation of Cartridge Set B1591A on page 12).

2.2.1.4 TOWERS 2 & 3 (BLUE)

After filtration to remove oil and water droplets, the gas is passed through two cartridges. The primary purpose is to dry the gas in order to prolong the life of the catalyst bed, section 2.2.1.6, and also absorbs a variety of impurities notably hydrogen sulphide, mercaptans and methane. Water content of the gas leaving towers 2 & 3 will be less than 0.3 ppm, giving a gas dew point -50^{o}C (-58^{o}F).

T2 and T3 cartridges should be replaced when their useful life is completed; refer to Maintenance Schedule for Cartridge/Filter Replacement (Refer to 3.2 Installation of Cartridge Set B1591A on page 12) for details.

Note ***The drying effect of these cartridges is vital to the plant since the efficiency of all three reagents in tower 4 are greatly reduced in moist air.***

2.2.1.5 TOWER 4 TOP CARTRIDGE (RED)

The upper cartridge in T4 is composed of two sections. The gas first passes through a broad band absorbent and oxidant, removing a wide range of impurities from the gas, in particular sulphur dioxide, ammonia, nitrous oxides, other light hydrocarbons and any residual methane or hydrogen sulphide. The second section of this cartridge removes heavy hydrocarbons and will remove any remaining traces as well as remaining odours.

The life of this cartridge is independent of the amount of contamination absorbed or oxidised, it must be replaced when its useful capacity is finished. See Maintenance Schedule for Cartridge/Filter Replacement (Refer to 3.2 Installation of Cartridge Set B1591A on page 12).

2.2.1.6 TOWER 4 LOWER CARTRIDGE (BLACK)

During situations where significant quantities of carbon monoxide may be present, a bed of catalyst is used to oxidise the carbon monoxide to carbon dioxide. The quantity of carbon dioxide formed in this way is insignificant in terms of overall gas purity. The catalyst bed has a life of three years from date of manufacture; however the life of the bed is drastically reduced by the presence of moisture in the gas.

Because of this fact, silica gel moisture indicating beds are provided above and below the catalyst bed. Always check for colour changes during every cartridge change. If crystals have changed from orange to white/faded yellow, replace immediately. Refer to the Maintenance Schedule for Cartridge/Filter Replacement (Refer to 3.3 Installation of Cartridge B1592A on page 14) for the standard replacement frequency.

2.2.1.7 FINAL FILTER (F3)

The final filter is identical to the Pre-Filter (F1), (Refer to 3.4 F1, F2 and F3 Filter Replacement Schedule on page 15).

2.2.1.8 BACK PRESSURE REGULATOR

Maintains the minimum system pressure at approximately 2,000 psi (138 bar) ensuring efficient operation of each element of the purifying system.

2.2.2 SOLENOID VALVE

The solenoid valve is a 2-way, normally closed, internal pilot operated, aluminium bodied, valve. It is operated by the gas bag full alarm circuit and protects the gas bag from over pressurisation. When it closes gas is routed to the overboard dump via the relief valve.

2.2.3 GAS BAG

Material:	Modified vinyl based polymer, including up to 3% polyvinylidene chloride, and polymeric non-migrating plasticizers.
Thickness:	1.27mm/0.050”, non-backed
Specified Gravity:	1.28 – 1.32
Durometer Hardness “D”:	62 – 67
Tensile strength, psi:	3,000
Modulus at 300% elongation, psi:	2,100
Elongation at break,%:	325
Graves tear, lbs/in:	420
Low Temp. Brittleness Point:	-35.5^{O}C / -32 ^{O}F
Distortion Point:	176.6^{O}C / 350^{O}F
Maximum Temp Continuous operation:	65.5^{O}C / 150^{O}F
Extraction:	Loss less than 1% to 120,00 leach cycles in salt water 10% concentration at ambient temperature.
Water vapour Transmission:	Less than one cubic foot per twenty four hours per one thousand square feet at 0.050” thickness.
Test:	Test performed at five inches water pressure at 37.7^{O}C (100^{O}F).
Ultraviolet Resistance:	Field experience to show a performance of over ten year direct exposure to sun without failure, holding contents with pH of one or less.
Dimensions:	*S*izing depends upon application. Gas Bag included in standard pricing up to 23.8m^3 (840 ft^3) (Appendix B, page 5, Gasbag, Standard, 840 ft^3 (23.8 m^3) P182981515S1).

2.2.4 LEVEL CONTROL SENSORS

Each sensor is a photo switch. The photo switch consists of a transmitter/receiver, which sends an infrared-pulsed signal, which is returned by a reflector disc. The compressor start/ gas bag full switches are activated when the beam is broken and the compressor stop switch is activated when the beam is completed. The gas bag full alarm is also connected to the alarm panel.

2.2.5 ALARM PANEL

The alarm panel consists of two indicator lights for “power on” and “compressor running”, two switch/indicators for “gas bag full” and “change cartridges”. The switch indicators utilise their relevant alarms, one each for “gas bag full” and “change cartridges”.

2.2.6 CHECK VALVE

The Check Valve prevents gas from flowing back into the chamber from the gas bag.

2.2.7 3-WAY VALVE

The 3-way valve is connected so that chamber gas may be recovered or routed overboard to atmosphere.

2.2.8 RELIEF VALVE

The relief valve allows the continued venting of gas, should the gas bag become full and the solenoid valve closes, without the operation of any additional valves. The relief valve is set at 2 psi and diverts gas to the overboard dump.

2.2.9 ANALYSER

It is recommended that a sample from the Gaspure output placed to a storage system be taken at regular intervals and analysed to record the level of the major contaminants. In particular CO_2, CO, water vapour and oil mist levels should be recorded.

2.2.10 GAS COMPRESSOR

The Gas Transfer Compressor is not supplied by JFD as part of the standard Gaspure system. JFD would recommend the client uses the CompAir H5437 (JFD Part No. CR903AA). Heliox HP Heliox Compressor for use with the Gaspure System. This is a single acting, four stage water cooled HeO_2 compressor, capable of flow rates of 130 m^3/hr (76.5 cfm).

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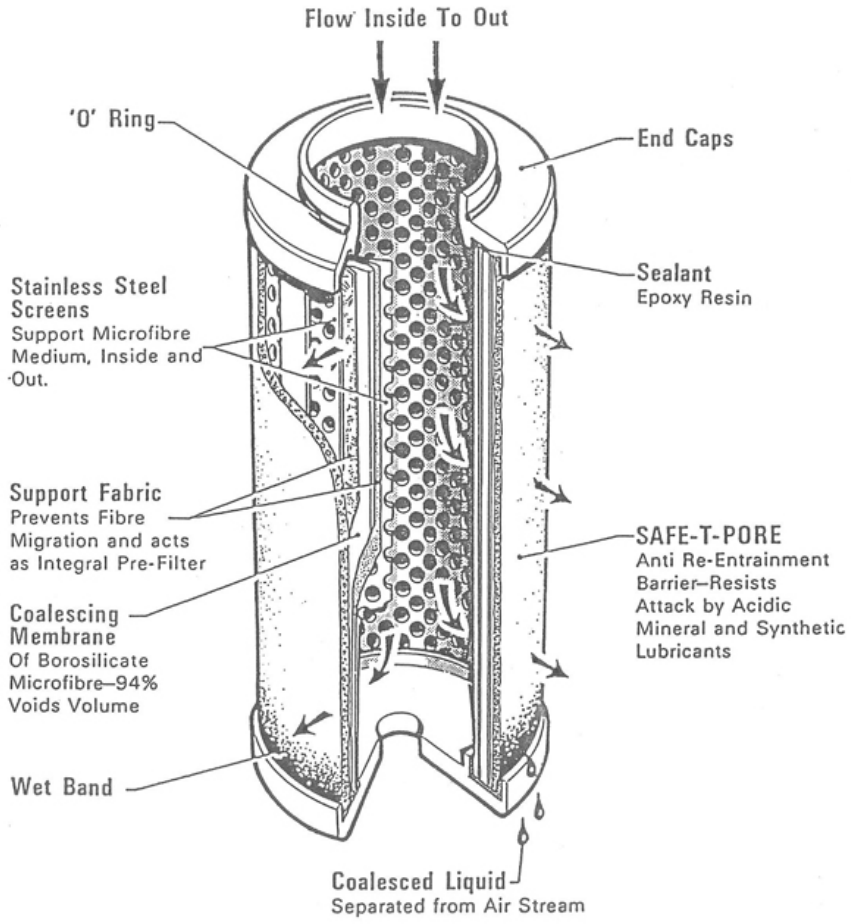
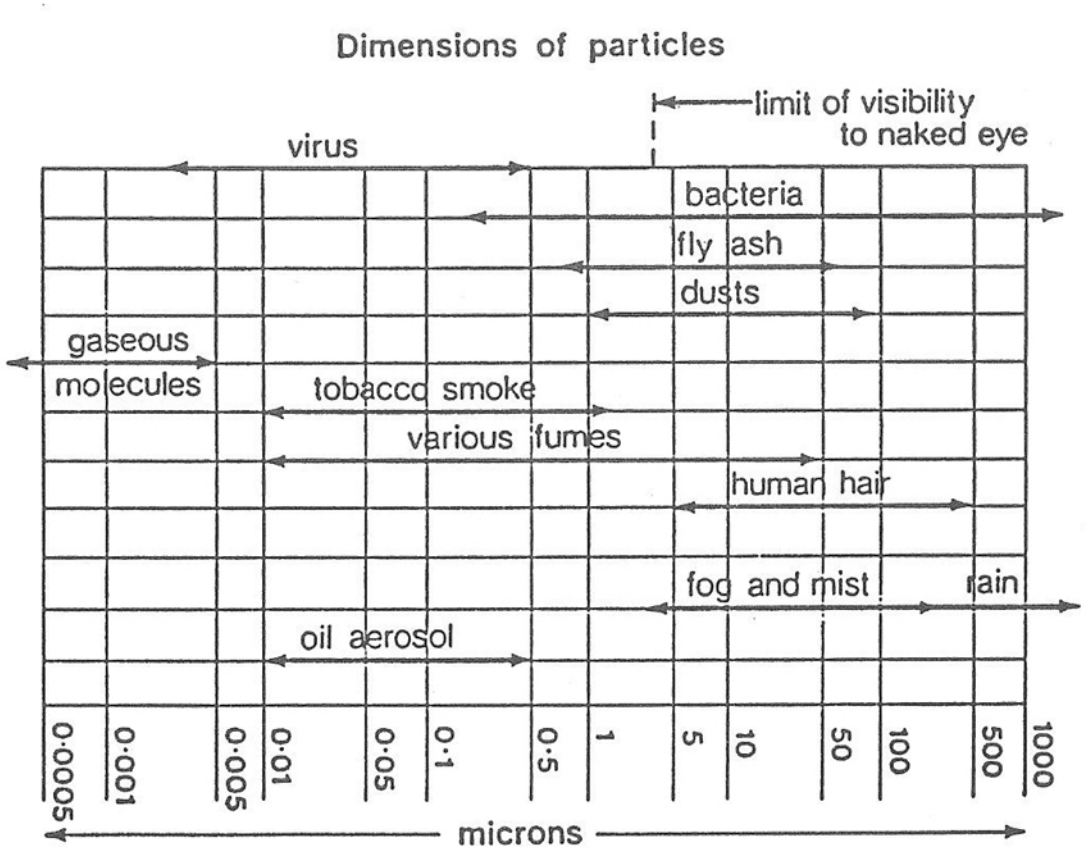


The element relies on the latest technology using micro fibres to remove the particles of dirt and liquid water or oil. The gas passes first through a deep bed of graded density filter media increasing in efficiency in the direction of flow. The larger particles are trapped by the first layer of coarse material, and the smaller particles by the finer layers. Solid particles are trapped permanently within the filter material. The liquid particles after initially being trapped by the fibres of the filter material coalesce forming larger droplets. These droplets along with any large droplets already present in the compressed gas are pushed to the outer support of the element. Here they meet the anti-re-entrainment barrier. This collects the droplets as they break free and allows them to gravitate within its cellular structure, forming a 'wet band' around the bottom of the filter element. Clean filtered air passes through the anti-re-entrainment barrier above the 'wet band' where the resistance to flow is less leaving a quiet zone of zero gas movement in the bottom of the filter housing. Through this the separated liquid falls without being re-entrained and is removed by the drain on the bottom of the pre-filter.

The life of the filter elements, thanks to their 'coalescing action', is independent of the amount of liquid contamination present. However, dirt particles do eventually bind up the filter material and the elements must be replaced, see Maintenance Schedule for Cartridge/Filter Replacement (section 3).



2.3 ELECTRICAL SYSTEM OVERVIEW

The Electrical system components for the Gaspure system come in two major components the photo switches that act as the sensors to detect the state of the gas bag and the alarm panel that functions to repeat the alarms and give remote status indicators for the gas

compressor. The compressor for the Gaspure system is client supplied and therefore some of the functionality of the alarm panel may not be available.

The photo switches consist of a transmitter and a receiver. The transmitter sends out an infrared beam which is returned by reflector disk to the receiver. The transmitter and receiver assemblies are placed at heights along the frame of the gas bag area. As the gas bag inflates it will break the beam between the transmitter and receiver.

There are three sets of photo switches mounted at different heights on the frame. The first is a “Compressor Stop” sensor which will send a stop signal to the compressor when the gas bag is not inflated enough to break the beam. This stops the compressor from pulling air from the gas bag when it is under-inflated.

The second photo switch is a “Compressor Start” sensor which will send a start signal to the compressor. This sensor is mounted a little higher than the stop signal. The sensor will send the start signal when the beam is broken.

The final sensor is the “Gasbag Overfull” photo switch this switch is mounted much higher than the other two sensors and will activate when the gas bag is starting to be overfilled. When the gas bag is inflated to full it will break the beam for the overfull sensor and this will trigger the shut-off solenoid valve. This will safeguard the gas bag from over-inflation by routing gas to the overboard dump via the relief valve.

The alarm panel is the other major piece of electrical equipment and it functions as a remote status indicator for the compressor and gas bag. The alarm panel is set to run in parallel with the compressor starter panel. The alarm panel will provide a means of checking the following states of the compressor:

Power - light will illuminate if the compressor is powered.

Running - light will illuminate if the compressor is running.

Over - Alarm box will sound an alarm and illuminate a light if the Gasbag full signal is active. This buzzer alarm can be muted via the “Gas Bag Full” push-button switch.

PHR (Predetermining Hour Meter) – An alarm will sound and the associated light will illuminate once the preset number of running hours has expired. This function is set within the compressor. This alarm can also be muted via the “Change Cartridges” push-button switch.

Figure 1 Gaspure Alarm Panel

3 CARTRIDGE / FILTER REPLACEMENT

3.1 INSTALLATION PROCEDURE (T1 ONLY)

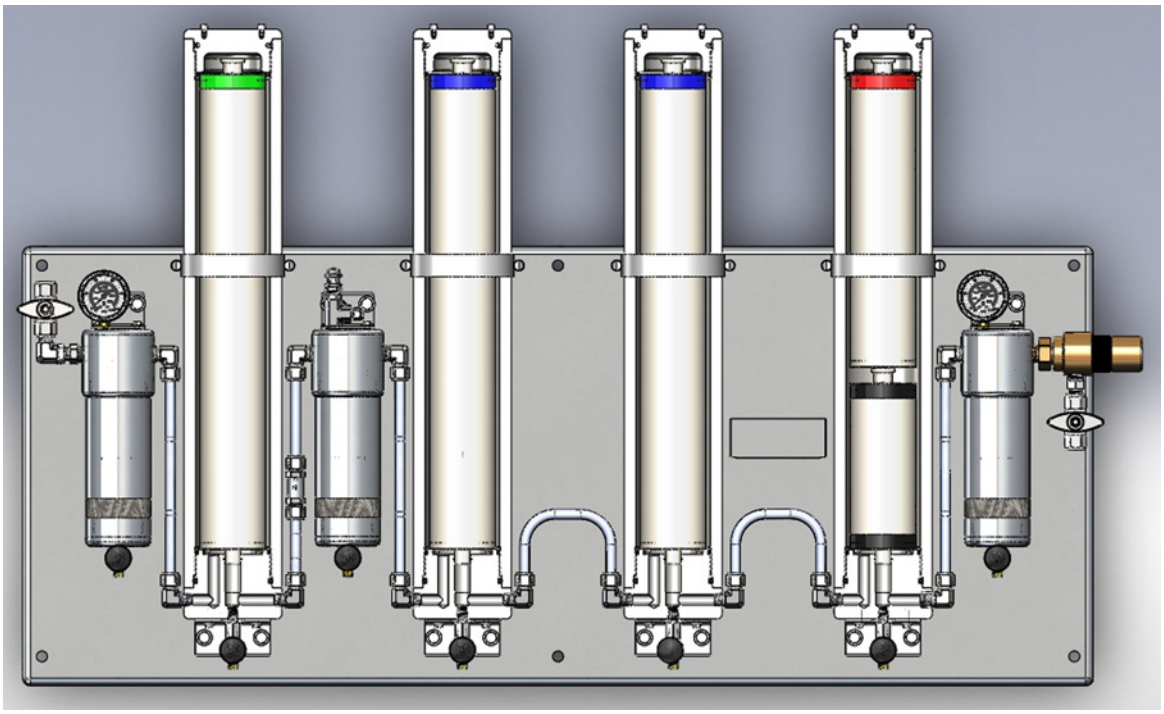
Note ***When only changing the cartridge in tower 1 use the following procedure:***

1. Close inlet valve.
2. Open drain valve on T1 (a non-return valve will prevent gas flowing back through the other towers) and vent all gas from the tower.
3. Remover top plug.
4. Remove disposable cartridge.
5. Remove the Two seal plugs from the new cartridge inlet and outlet.
6. Lightly lubricate the bottom nozzle with Dow Corning MS4 Silicone Compound.
7. Insert the new cartridge ensuring that it is fully inserted.
8. Check that the top cap is clean and lightly lubricate the O-ring with Dow Corning MS4 Silicone Compound.
9. Refit top plug.
10. Close drain valve.
11. Slowly open inlet valve.
12. Dispose of used cartridges sensibly.

3.2 INSTALLATION OF CARTRIDGE SET B1591A

B1591A Disposable Cartridge Set Gaspure contains materials for changing T1, T2, T3 and T4 Top.

Figure 2 Gaspure Cartridge



The disposable cartridge set is designed to process 100,000 standard cubic feet (2830m^3) of recovered chamber gas before replacement is required. See chart below for compressor running hours applicable.

Note ***When changing disposable cartridges, always check the colour of the silica gel beds in the CO catalyst cartridge. Replace CO catalyst cartridge if white / faded yellow.***

Compressor Flow Rate	Compressor Running Hrs.
15 scfm (25m^3/hr)	100
30 scfm (50m^3/hr)	50
60 scfm (100m^3/hr)	25
75 scfm (125m^3/hr)	20

3.2.1 INSTALLATION PROCEDURE

1. Close inlet and outlet valves.
2. Open drain valves on T1, T2, T3 and T4. Vent all gas from system.
3. Remove top plugs.
4. Remove disposable cartridges.

5. Check CO catalyst cartridge for colour change - if silica gel beds are white/faded yellow, replace with new cartridge. If orange, then refit in the bottom of T4.

6. Remove the Two seal plugs from the new canister inlet and outlet.

7. Lightly lubricate the bottom nozzles with Dow Corning MS4 Silicone Compound.

8. Insert the new cartridges ensuring that each cartridge is fully inserted in the tower according to the colour code and location stated on its label.

9. Check that the top caps are cleaned and lightly lubricate the O-ring with Dow Corning MS4 Silicone Compound.

10. Refit top plugs.

11. Close all drain valves.

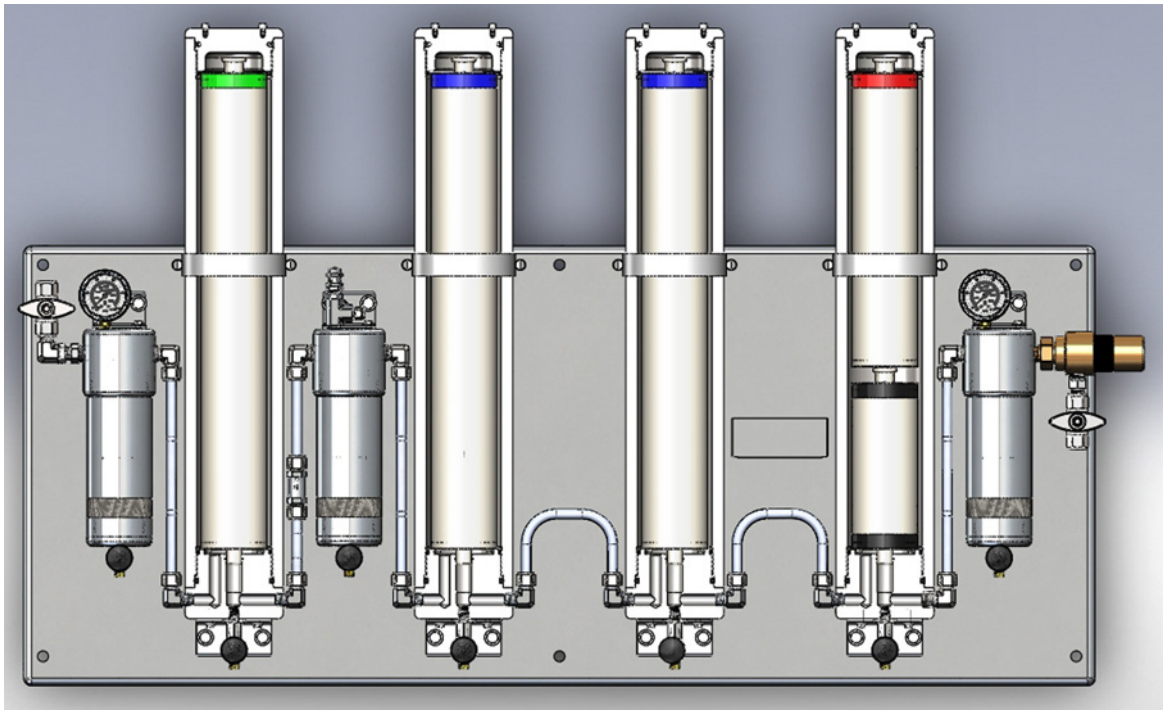
12. Slowly open outlet and inlet valves.

3.3 INSTALLATION OF CARTRIDGE B1592A

B1592A Gaspure CO Catalyst Cartridge contains materials for changing T4 Bottom.

The B1592A Gaspure CO Catalyst Cartridge has a maximum life of three years from date of manufacture.

Figure 3 Gaspure Cartridges



3.3.1 INSTALLATION PROCEDURE

1. Close inlet and outlet valves.
2. Open drain valve on T4. Vent all gas from the system.
3. Remove T4 top cap.
4. Remove disposable cartridge.
5. Remove CO catalyst cartridge.
6. Remove the Two seal plugs from the new canister inlet and outlet.
7. Lightly lubricate nozzle with Dow Corning MS4 Silicone Compound.
8. Insert the new CO catalyst cartridge.
9. Insert the disposable cartridge into the top of the CO catalyst cartridge.

Note ***Do not lubricate nozzle of disposable cartridge.***

10. Check that top cap is clean, lightly lubricate the O-ring with Dow Corning MS4 Silicone Compound.
11. Refit top cap.

12. Close all drain valves.

13. Slowly open outlet and inlet valves.

Note ***The CO catalyst cartridge contains platinum and palladium which are rare metals. This should therefore be recycled where possible.***

3.4 F1, F2 AND F3 FILTER REPLACEMENT SCHEDULE

Replace F1, F2 and F3 filter elements after every 250 hours of operation.

4 OPERATIONAL CHECK SHEETS

4.1 OPERATIONS

Attend each part of the Gaspure system during operations to check the gasbag inflation/ deflation is working in conjunction with the compressor operations.

4.2 PRE-OPERATION CHECK LIST

	Operation	**Initial**
1.	Close the Gaspure panel outlet valve.	.....
2.	Check the intended Gaspure panel outlet flow path is configured to the correct designated storage unit.	.....
3.	Check all Gaspure panel tower drain valves are closed.	.....
4.	Check for confirmation that all Gaspure filtration cartridges have sufficient run hours life-span for the duration of the intended run.	.....

Note ***To avoid inappropriate gas mixes, the system must be vented prior to operations commencing.***

5.	Open the Final Filter drain valve until the panel inlet gauge reads 0 bar then close the valve.	.....
6.	Check power Indication on the alarm panel is illuminated.	.....
7.	Check compressor has been set for correct operation.	.....
8.	Check gas bag is deflated.	.....
9.	Check the inlet valve at the Gaspure panel is open.	.....
10.	Check the 3-way diverter valve is set to flow gas to the gas bag.	.....
11.	If a Helipure panel is incorporated to the system ensure all pre-op checks have been carried out on the unit.	.....
12.	Confirm that the overload dump line is available for use.	.....

Note ***The Gaspure system is now considered ready for use.***

4.3 POST-OPERATION CHECK LIST

Operation		Initial
1.	Confirm exhaust valves at the chamber complex have been closed to reclaim operations.	.....
2.	Change the 3-way valve configuration to dump to overboard vent.	.....
3.	Check compressor is off-line and isolated from the Gaspure system.	.....
4.	Close the Gaspure panel inlet valve.	.....
5.	Close the Gaspure panel outlet valve.	.....
6.	Open the Gaspure panel tower drain valves to vent down the system.	.....
7.	Close tower drain valves when pressure gauges indicate ambient pressure levels.	.....
8.	Check the gas bag is deflated.	.....

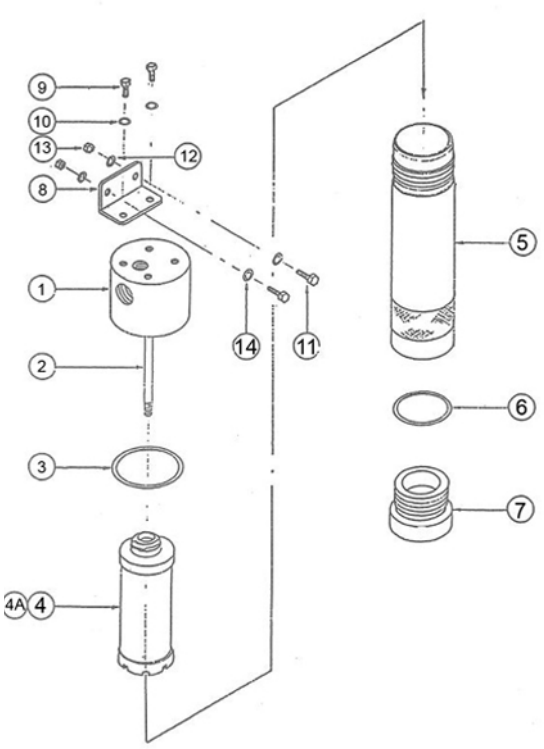
Note ***The Gaspure system is now considered off-line.***

5 SPARES LIST

5.1 GENERAL SPARES

Qty.	Description	Size/Use	JFD P/N
1	Valve Ball	3/8 FNPT	DM13540
2	Seal Kit	3/8” ball Valve	VK34
1	Valve, Shut off	1/4” MNPT	VS201
12	O-Ring	Filter Tower Top	RN341-7
4	O-Ring	Filter Tower, Bottom	RN343-7
8	O-Ring	Filter Tower, Internal	RN019-7
3	O-Ring	Filter, Bottom	RN229-7
6	O-Ring	Filter, Top	RN233-7
1	Gauge Pressure	0-4000 psi	GP212
1	Relief Valve (Set at 3300 psi)	1/4” NPT	VR293
1	Gasbag Repair Kit	-	RK212
1	Seal Kit for 4R3A Relief Valve	-	VK25P

5.2 FILTER ASSEMBLY



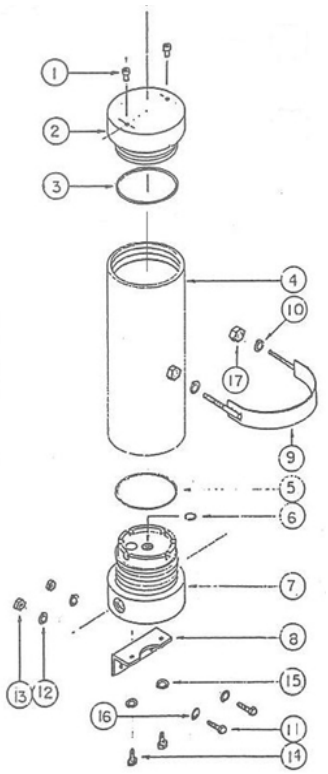
Design Code to	PD 5500
Working Pressure	3000 psi
Test Pressure	4500 psi
Weight	7kg (15lb)

Filters 1 and 3 have element FE002.

Filter 2 has element FE003.

Item	Qty	Description	Part No
1	1	Top Plug	C1286A
2	1	Support Rod	F1290
3	1	O-Ring	RN233-7
4	1	Element 1 Micron	FE002
4A	1	Element 0.01 Micron	FE003
5	1	Body	C1286A
6	1	O-Ring	RN229-7
7	1	Bottom Plug	C1286A
8	1	Bracket	J3041
9	2	Hex, Setscrew	FB002
10	2	Washer, Plain	FW003
11	2	Hex, Setscrew	FB014
12	2	Washer, Plain	FW005
13	2	Nut	FN004
14	2	Washer, Plain	FW004

5.3 SCRUBBER ASSEMBLY



Design Code to	PD 5500
Working Pressure	3000 psi
Test Pressure	4500 psi
Weight	7kg (15lb)

Item	Qty	Description	Part No
1	2	Socket Head Cap Screw	FB029
2	1	Top Plug	C1282B
3	1	O-Ring	RN341-7
4	1	Body	C1282B
5	1	O-Ring	RN343-7
6	1	O-Ring	RN019-7
7	1	Base Plug	C1282B
8	1	Support Bracket	J3042
9	1	Support Band	J3030
10	2	Spring Washer	FW008
11	2	Hex Setscrew	FB014
12	2	Plain Washer	FW005
13	2	Nut	FN004
14	2	Hex Setscrew	FB002
15	2	Plain Washer	FW003
16	2	Plain Washer	FW004
17	2	Hex Nut	FN007

APPENDIX A TABLE OF PRESSURE EQUIVALENTS

	Bar	kPa Kilo Pascal	kg/cm^2 Kilogram per square centimetre	cm Hg Centimetres Head of Mercury	in Hg Inches Head of Mercury	atm Standard Atmosphere	ft water Feet Head of Water	psi Pounds per square Inch
Bar	1	100	1.0197	75.006	29.53	0.98692	33.455	14.504
kPa	0.01	1	0.010197	0.75006	0.2953	0.009862	0.33455	0.14504
kg/cm^2	0.98067	98.067	1	73.556	28.950	0.96784	32.808	14.223
cm Hg	0.013332	1.3332	0.013595	1	0.3937	0.013158	0.44603	0.19337
in Hg	0.033864	3.3864	0.034532	2.54	1	0.033421	1.1329	0.49115
atm	1.0133	101.33	1.0332	76	29.921	1	33.899	14.696
ft water	0.029891	2.9891	0.03048	2.242	0.88267	0.0295	1	0.43353
psi	0.068948	6.8948	0.070307	5.1715	2.036	0.068046	2.3067	1

eg 1 bar = 100 kPa
= 1.01917 kg/cm^2
= 75.006 cm Hg
= 29.53 in Hg
= 0.986902 atm
= 33.455 ft water
= 14.504 psi

SI Units

1000 N/m^2 = 1 kN/m^2
= 1 kPa
100 000 N/m^2 = 1 bar
1 000 000 N/m^2 = 1 Mega Newton per Square Metre (MN/m^2)
= 1 Mega Pascal (MPa)
10^8 N/m^2 = 1 kilobar (kbar)

Miscellaneous Units

1 m of water = 0.1 kg/cm^2
1 ft^3 = 28.32 litres
1 m^3 = 35.31 ft^3

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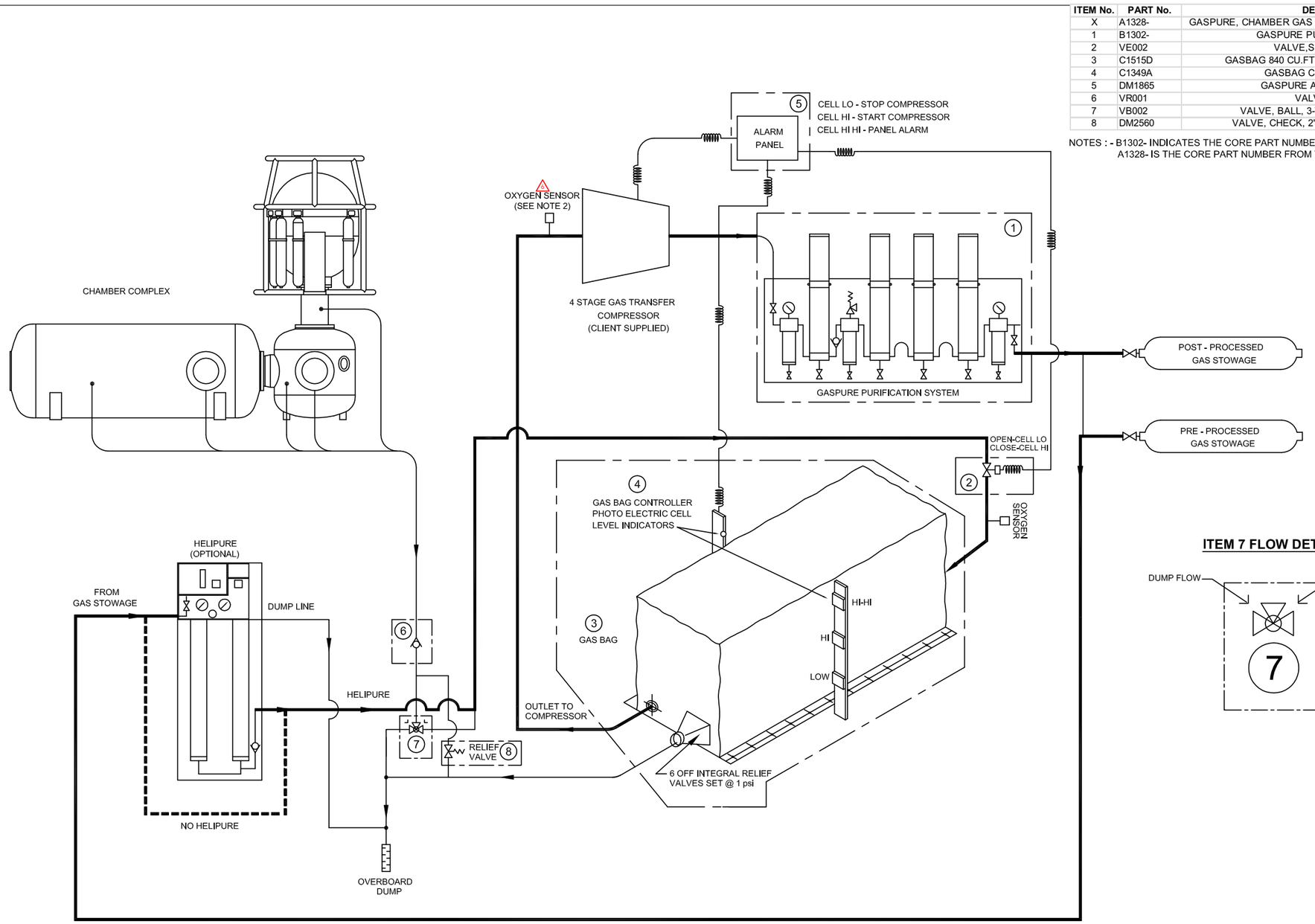
Title **Page**

Gaspure Chamber Gas Recovery System Schematic A81328S1

ITEM No.	PART No.	DESCRIPTION
X	A1328-	GASPURE, CHAMBER GAS RECOVERY SYSTEM C/W GAS BAG
1	B1302-	GASPURE PURIFICATION SYSTEM
2	VE002	VALVE,SOLENOID 2" FNPT
3	C1515D	GASBAG 840 CU.FT (23.8 CU M) C/W REPAIR KIT
4	C1349A	GASBAG CONTROLLER, ELEC.
5	DM1865	GASPURE ALARM BOX, 110 VAC
6	VR001	VALVE,RELIEF,2"
7	VB002	VALVE, BALL, 3-WAY, 2" FEMALE PORTS
8	DM2560	VALVE, CHECK, 2" FNPT MODIFIED, ORSEAL

NOTES : - B1302- INDICATES THE CORE PART NUMBER FOR THE GASPURE RANGE.
A1328- IS THE CORE PART NUMBER FROM THE VARIANT RANGE.



ITEM 7 FLOW DETAIL

NOTES:
1. REFER ALSO TO THE GASPURE P&ID, P1829900S1 FOR THE GASPURE OPERATING PARAMETERS.

PART OF GASPURE SYSTEM.

2. ALTERNATE LOCATION OF OXYGEN SENSOR IF COMPRESSOR IS GARDNER DENVER 5437. (JFD PART NO. CR903AA) ⚠

MATERIAL N/A
FINISH N/A
ALL DIMENSIONS ARE IN mm (UOS)
ALL DIMENSIONS BEFORE PLATING (UOS)
REMOVE ALL SHARP EDGES AND BURRS

MACHINING TOLERANCE		FABRICATION TOLERANCE	
NO DECIMAL PLACE	±1.0	>0 <100	±0.5
ONE DECIMAL PLACE	±0.2	>100 <500	±1.5
TWO DECIMAL PLACE	±0.05	>500	±3.0
ANGULAR TOLERANCE	±0.5°		

⚠ DENOTES CHANGES MADE AT THIS REVISION

REV	DESCRIPTION	ECN	BY	DATE	AUTH.
R06	OXYGEN SENSOR & NOTE ADDED, NEW BORDER	23916	CB	04/07/19	AN
R05	UPDATED TO SHOW GASPURE ASPECT WITHIN OVERALL SYSTEM	17249	ZD	01/12/14	MS
R04	UPDATED TO REFLECT CURRENT BUILD	12169	GC	13/03/09	RTW
R00	ISSUED FOR MANUFACTURE	X	EB	26/10/82	DR

THIRD ANGLE PROJECTION
DO NOT SCALE DRAWING

TITLE: GASPURE CHAMBER GAS RECOVERY SYSTEM SCHEMATIC
DRAWING NO. A81328S1 REV R06
PART NO. N/A PRODUCT / PROJECT No. GASPURE
SIZE A2 SCALE (UOS) 2:1 SHEET 1 OF 1

JFD WESTHILL
ENTERPRISE DRIVE,
WESTHILL, ABERDEEN,
AB32 6TQ, UK
TEL: +44 (0)1224 740145
E: enquiries@jfdglobal.com
W: jfdglobal.com

Gaspure Purification System GA1009002S1

Sheet 1 of 2

CONNECTIONS

I.D.	DESCRIPTION	FITTING
C1	GAS INLET	3/8" NPT - FEMALE 316 STNLS
C2	GAS OUTLET	3/8" NPT - FEMALE 316 STNLS

CONNECTION POINT COORDINATES

I.D.	X	Y	Z
C1	30	538	111
C2	1399	314	111

FIXING POINTS COORDINATES

I.D.	X	Y	Z
B1	25	579	25
B2	711	579	25
B3	1397	579	25
B4	25	25	25
B5	711	25	25
B6	1397	25	25

UNIT RATINGS

MAXIMUM WORKING PRESSURE = 207 BAR (3000 PSI)

PRV SETTING = 227.5 BAR (3300 PSI)
STAGE 1.

BPR SETTING = 138 BAR (2000 PSI)
OUTLET STAGE

SERVICES

GAS INLET

FROM GAS STORAGE DISTRIBUTION SERVICE
MAX PRESSURE = 207 BAR (3000 PSI)

DRAIN PORTS

(X) 1/4" NPT-MALE BRASS

BPR

(B) BACK PRESSURE REGULATOR

FILTERS

(F1) = 1 MICRON (F2) = 0.01 MICRON (F3) = 1 MICRON

GENERAL / INFORMATION

CONNECTION DIMENSIONS

±0.1m

LEGEND

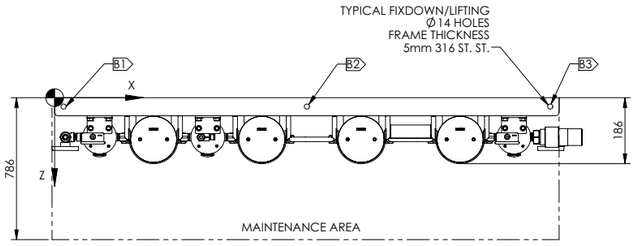
DATUM

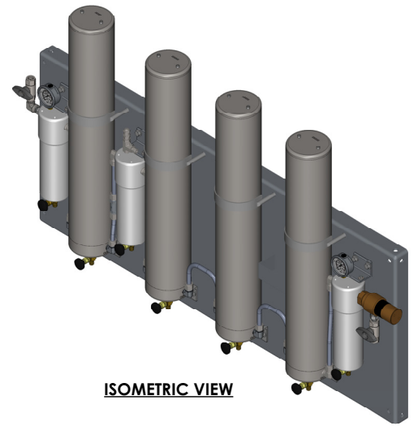
F1, F2, F4 CARTRIDGE REMOVAL AREA

MAIN SCRUBBER TOWER CARTRIDGE < 5kg

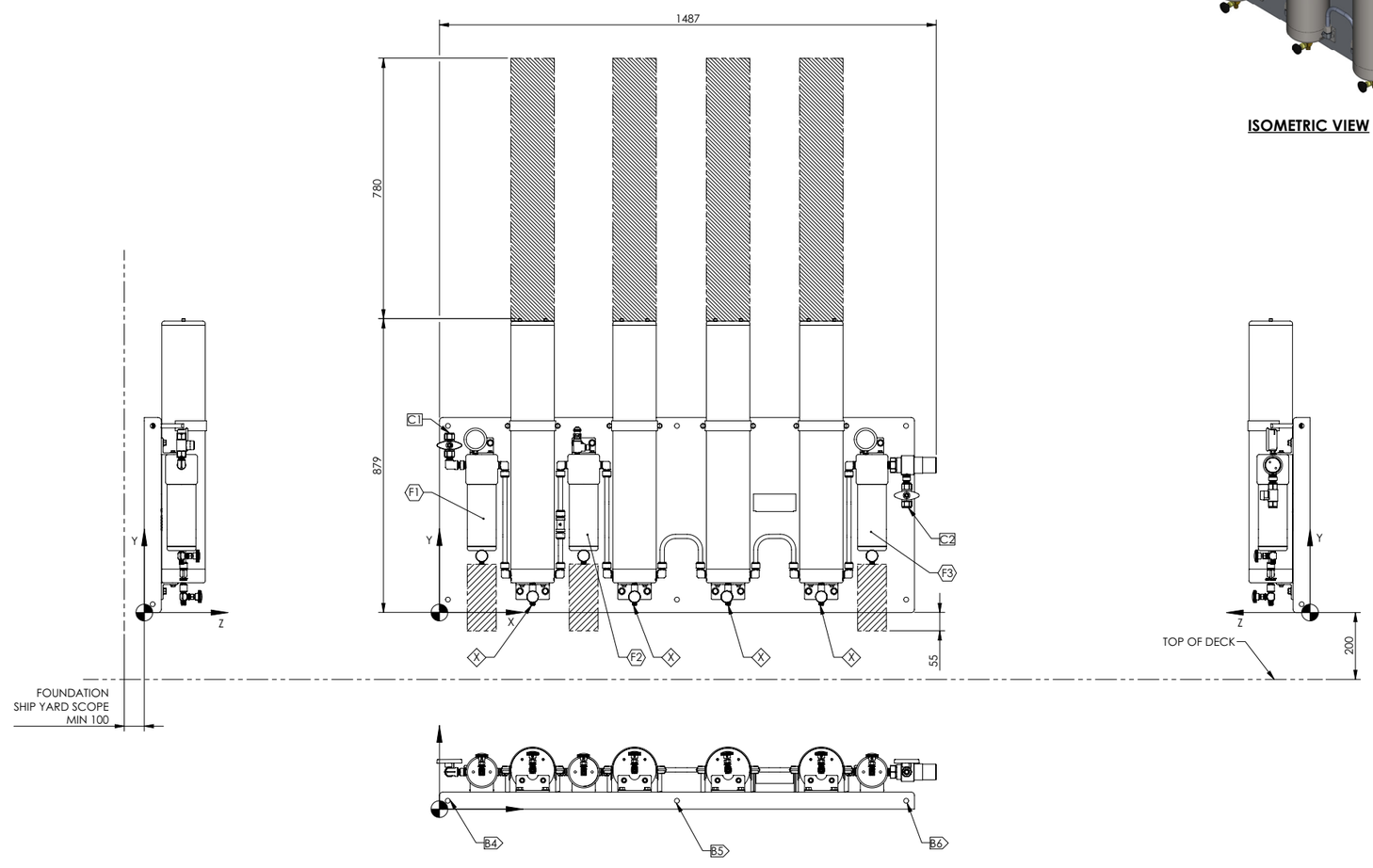
NOTES

ALL DIMENSIONS REFERENCE ONLY





ISOMETRIC VIEW



NOTES:

MATERIAL	N/A
FINISH	N/A

ALL DIMENSIONS ARE IN mm (UOS)
ALL DIMENSIONS BEFORE PLATING (UOS)
REMOVE ALL SHARP EDGES AND BURRS

MACHINING TOLERANCE		FABRICATION TOLERANCE	
NO DECIMAL PLACE	±1.0	>0 <100	±0.5
ONE DECIMAL PLACE	±0.2	>100 <500	±1.5
TWO DECIMAL PLACE	±0.05	>500	±3.0
ANGULAR TOLERANCE	±0.5°		

THIRD ANGLE PROJECTION

DENOTES CHANGES MADE AT THIS REVISION

REV	DESCRIPTION	ECN	BY	DATE	AUTH.
R03					
R02					
R01	SHEET 2 ADDED	19672	MJ	28/06/16	AN
R00	ISSUED FOR MANUFACTURE		ZD	15/07/14	MS

DO NOT SCALE DRAWING

TITLE: **GASPURE PURIFICATION SYSTEM**

DRAWING NO.: **GA1009002S1** REV: **R01**

PART NO.: B1302D

PRODUCT / PROJECT No.: GA100

SIZE: A2 SCALE (UOS): 1:10 SHEET: 1 OF 2

JFD WESTHILL
ENTERPRISE DRIVE,
WESTHILL, ABERDEEN,
AB32 6TQ, UK

TEL: +44 (0)1224 740145
E: enquiries@jfdglobal.com
W: jfdglobal.com

CENTRE OF GRAVITY COORDINATES			
I.D.	X	Y	Z
COG	415	725	82

GENERAL / INFORMATION

UNIT WEIGHT (DRY)

219kg (483 lbs)

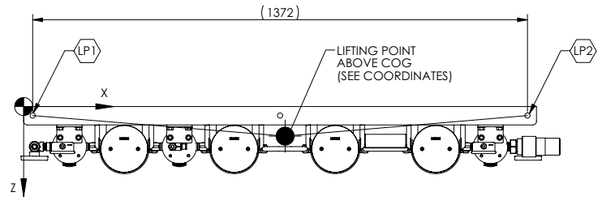
LEGEND

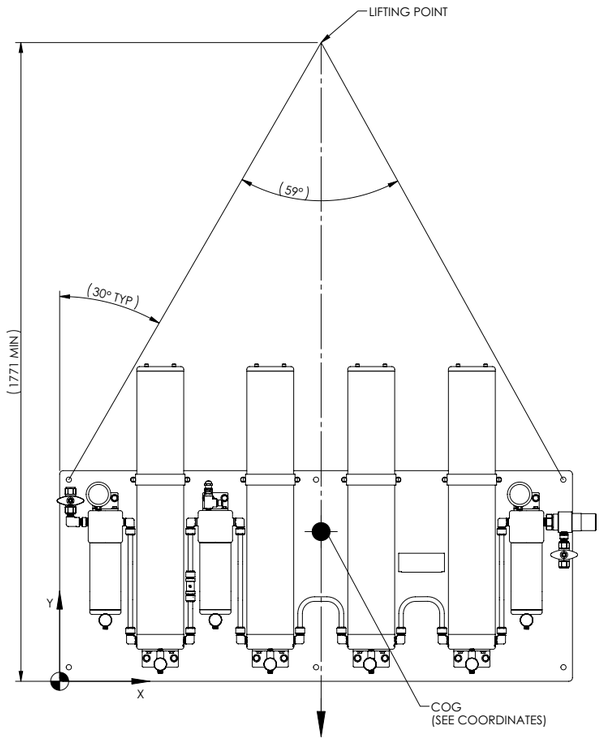
DATUM

CENTRE OF GRAVITY (COG)

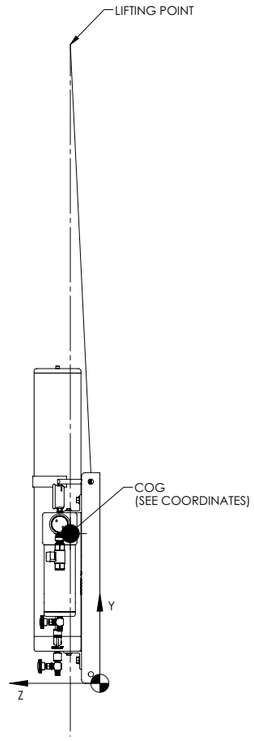
LIFT POINTS

(LP) LOCAL DEDICATED LIFT POINTS





219kg
(DRY WEIGHT)



LIFTING ARRANGEMENT

NOTES:

MATERIAL: N/A

FINISH: N/A

ALL DIMENSIONS ARE IN mm (UOS)
ALL DIMENSIONS BEFORE PLATING (UOS)
REMOVE ALL SHARP EDGES AND BURRS

MACHINING TOLERANCE		FABRICATION TOLERANCE	
NO DECIMAL PLACE	±1.0	>0 <100	±0.5
ONE DECIMAL PLACE	±0.2	>100 <500	±1.5
TWO DECIMAL PLACE	±0.05	>500	±3.0
ANGULAR TOLERANCE	±0.5°		

DENOTES CHANGES MADE AT THIS REVISION

REV	DESCRIPTION	ECN	BY	DATE	AUTH.
R03					
R02					
R01	SHEET 2 ADDED	19672	MJ	28/06/16	AN
R00	ISSUED FOR MANUFACTURE		ZD	15/07/14	MS

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

TITLE: **GASPURE PURIFICATION SYSTEM**

DRAWING NO.: **GA100900252** REV: **R01**

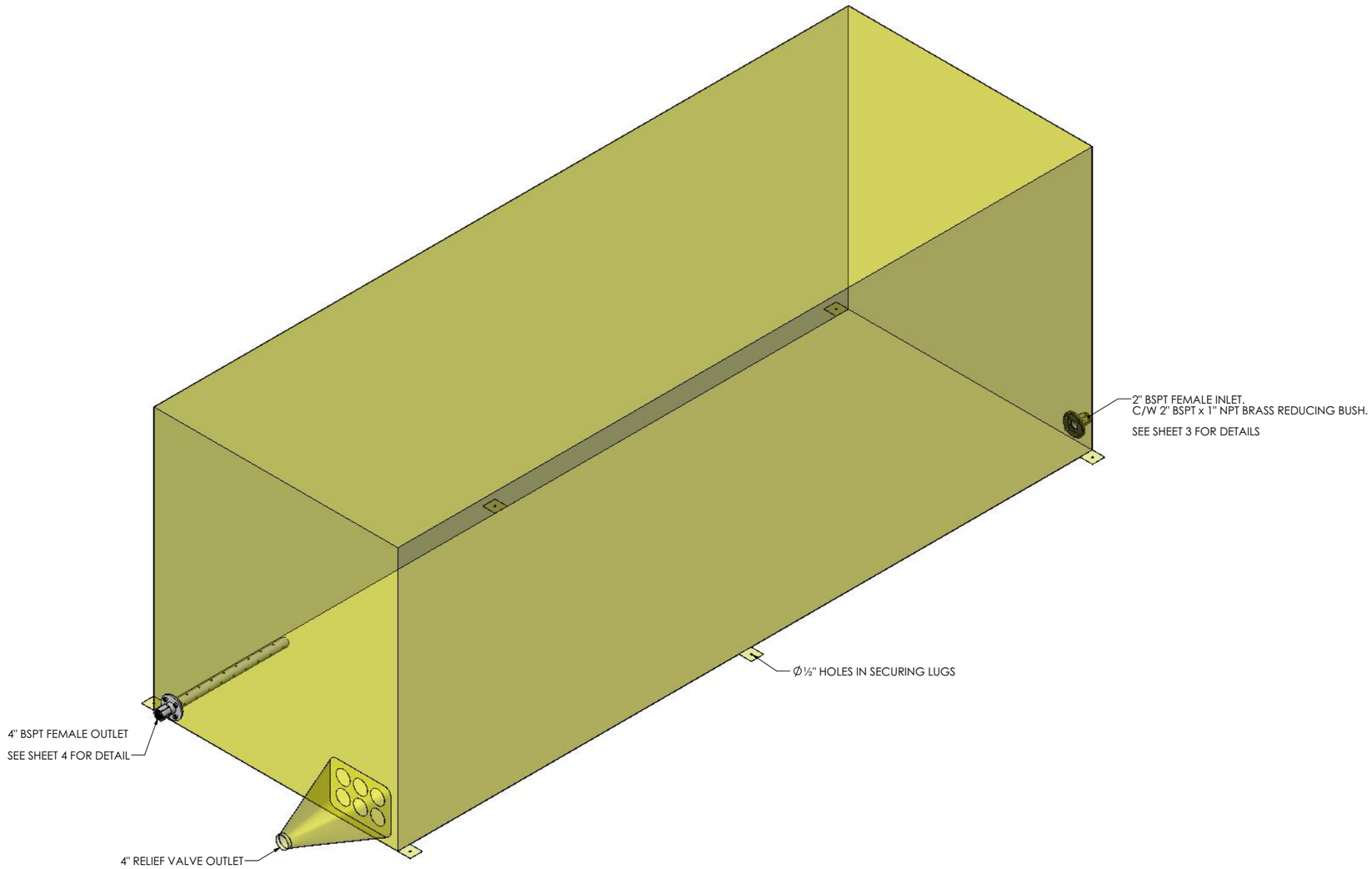
PART NO.: B1302D PRODUCT / PROJECT No.: GA100

SIZE: A2 SCALE (UOS): 1:10 SHEET: 2 OF 2

JFD WESTHILL
ENTERPRISE DRIVE,
WESTHILL, ABERDEEN,
AB32 6TQ, UK

TEL: +44 (0)1224 740145
E: enquiries@jfdglobal.com
W: jfdglobal.com

Gasbag, Standard, 840 ft^3 (23.8 m^3) P182981515S1



NOTES

ALL DIMENSIONS SHOWN ARE IN MM (UOS)
ALL DIMENSIONS BEFORE PLATING (UOS)
REMOVE ALL SHARP EDGES AND BURRS

DIMENSIONAL TOLERANCES

MACHINING		FABRICATION	
NO DECIMAL PLACES	±1.0	SIZE >0 <100	±0.5
ONE DECIMAL PLACE	±0.2	SIZE >100 <500	±1.5
TWO DECIMAL PLACE	±0.05	SIZE >500	±3.0
ANGULAR TOLERANCE	±0.5°	ANGULAR TOLERANCE	±0.5°

MATERIAL: REINFORCED PVC

FINISH: NATURAL

THIRD ANGLE PROJECTION

REV	DESCRIPTION	ECN No	BY	DATE	AUTH.BY
R06					
R05					
R04					
R03					
R02	AMEND TOLERANCING	11158	LS	20/08/08	JM
R01	REFER TO ECN	10057	SJ	23/01/08	RTW
R00	ISSUED FOR MANUFACTURE		GC	XX/XX/XX	RTW

DO NOT SCALE DRAWING

TITLE: GASBAG, STANDARD, 840ft^3 (23.8m^3)

PRODUCT / PROJECT No.: GASPURE

PART No.: C1515D

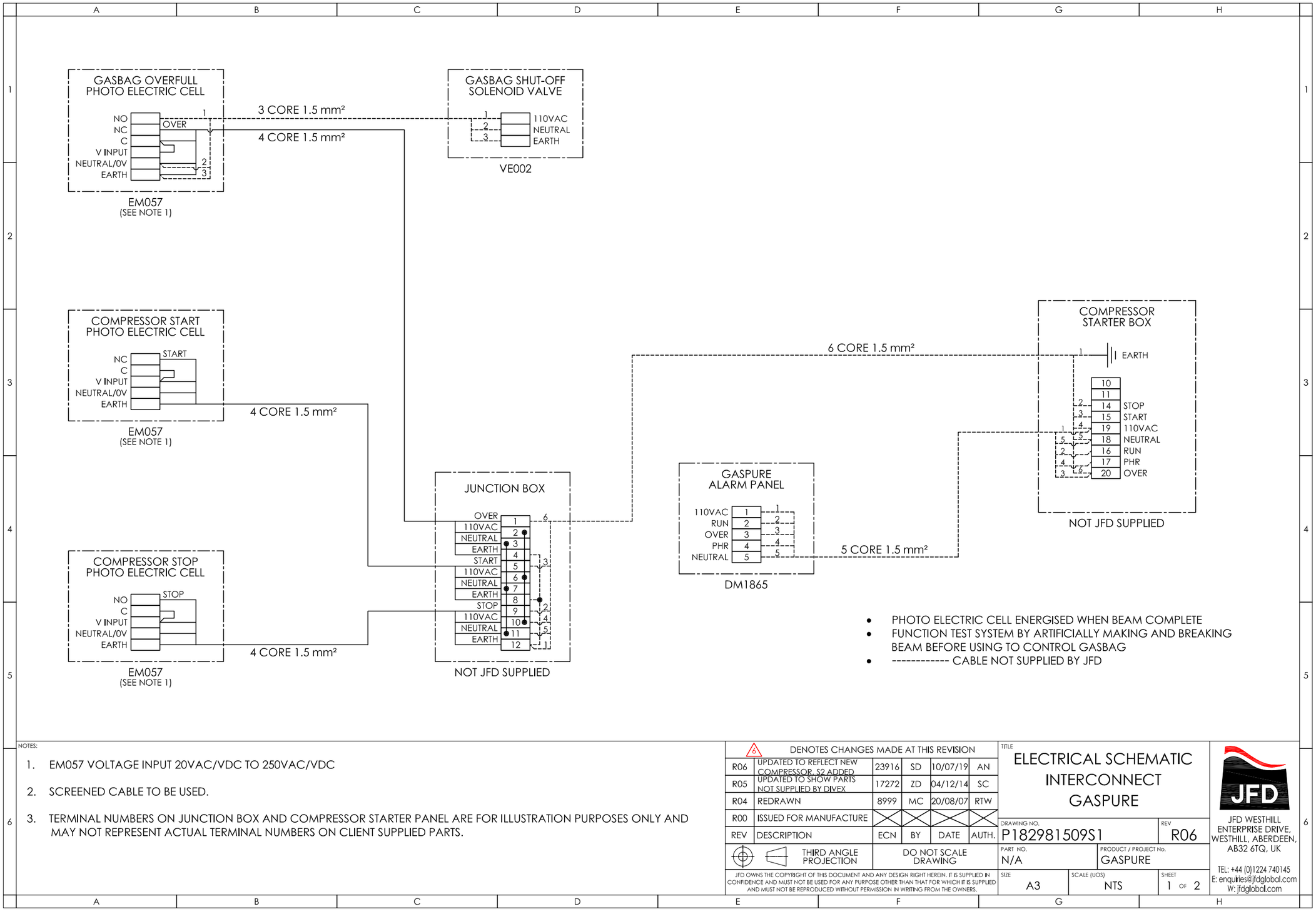
DRAWING No.: P182981515S1

SIZE	SCALE	SHT	OF	REV
A1	1:50	1	4	R02

DIVEX
DIVEX LIMITED
ENTERPRISE DRIVE
WESTHILL
ABERDEEN
AB32 6TQ
UNITED KINGDOM
Tel : +44(0)1224 740145
Fax : +44(0)1224 740172
email : info@divexglobal.com
www.divexglobal.com

Gaspure Interconnect Wiring (Photo - Electric Cell) P182981509S1

Sheet 1 of 2



NOTES:

1. EM057 VOLTAGE INPUT 20VAC/VDC TO 250VAC/VDC
2. SCREENED CABLE TO BE USED.
3. TERMINAL NUMBERS ON JUNCTION BOX AND COMPRESSOR STARTER PANEL ARE FOR ILLUSTRATION PURPOSES ONLY AND MAY NOT REPRESENT ACTUAL TERMINAL NUMBERS ON CLIENT SUPPLIED PARTS.

6	DENOTES CHANGES MADE AT THIS REVISION				
R06	UPDATED TO REFLECT NEW COMPRESSOR, S2 ADDED	23916	SD	10/07/19	AN
R05	UPDATED TO SHOW PARTS NOT SUPPLIED BY DIVEX	17272	ZD	04/12/14	SC
R04	REDRAWN	8999	MC	20/08/07	RTW
R00	ISSUED FOR MANUFACTURE				
REV	DESCRIPTION	ECN	BY	DATE	AUTH.

THIRD ANGLE PROJECTION | DO NOT SCALE DRAWING

TITLE: ELECTRICAL SCHEMATIC INTERCONNECT GASPURE

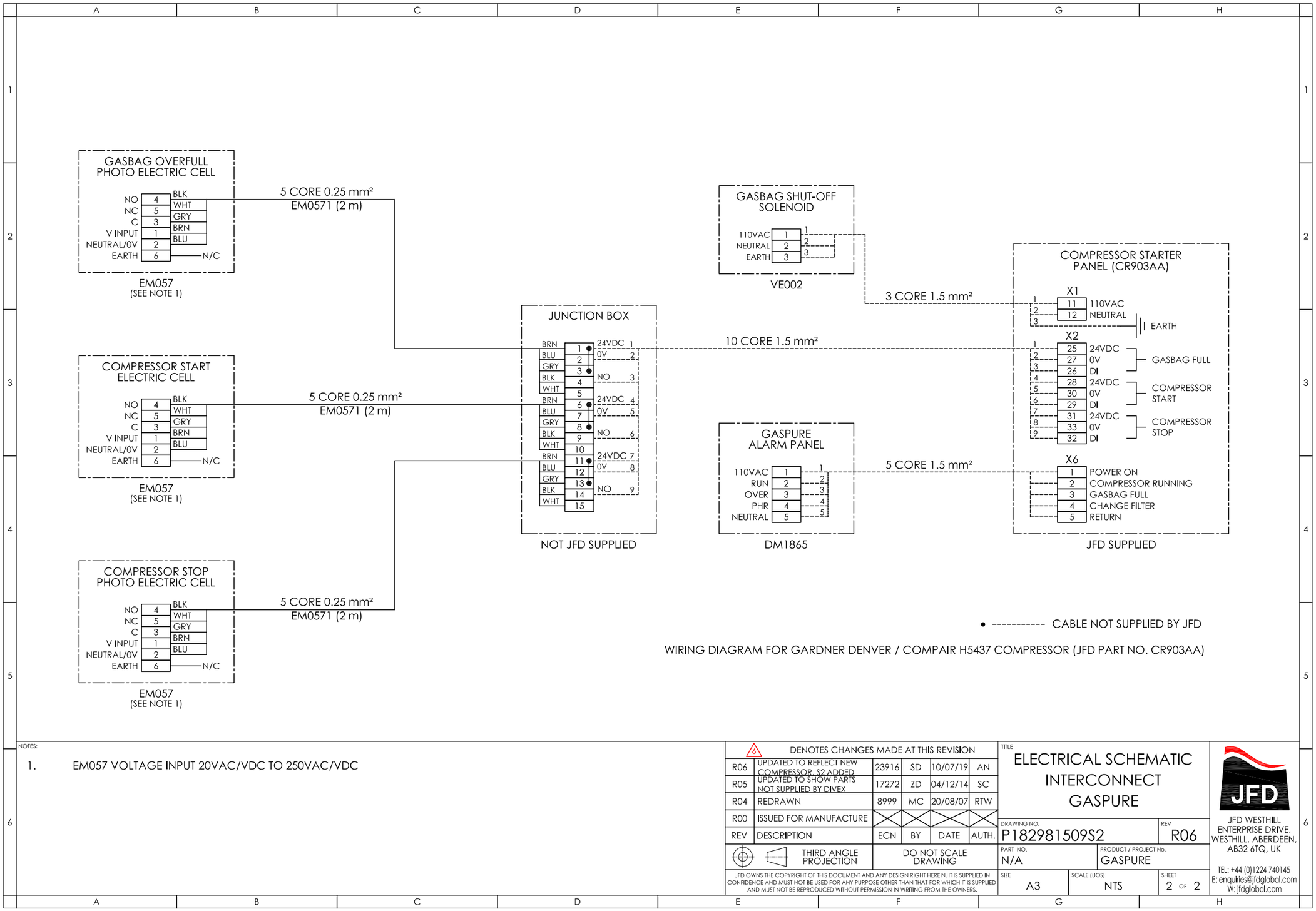
DRAWING NO. P182981509S1 | REV R06

PART NO. N/A | PRODUCT / PROJECT No. GASPURE

SIZE A3 | SCALE (UOS) NTS | SHEET 1 OF 2

JFD WESTHILL
ENTERPRISE DRIVE,
WESTHILL, ABERDEEN,
AB32 6TQ, UK

TEL: +44 (0)1224 740145
E: enquiries@jfdglobal.com
W: jfdglobal.com



• ---------- CABLE NOT SUPPLIED BY JFD

WIRING DIAGRAM FOR GARDNER DENVER / COMPAIR H5437 COMPRESSOR (JFD PART NO. CR903AA)

NOTES:

1. EM057 VOLTAGE INPUT 20VAC/VDC TO 250VAC/VDC

	DENOTES CHANGES MADE AT THIS REVISION				
R06	UPDATED TO REFLECT NEW COMPRESSOR, S2 ADDED	23916	SD	10/07/19	AN
R05	UPDATED TO SHOW PARTS NOT SUPPLIED BY DIVEX	17272	ZD	04/12/14	SC
R04	REDRAWN	8999	MC	20/08/07	RTW
R00	ISSUED FOR MANUFACTURE				
REV	DESCRIPTION	ECN	BY	DATE	AUTH.

THIRD ANGLE PROJECTION | DO NOT SCALE DRAWING

TITLE: ELECTRICAL SCHEMATIC INTERCONNECT GASPURE

DRAWING NO. P182981509S2 | REV R06

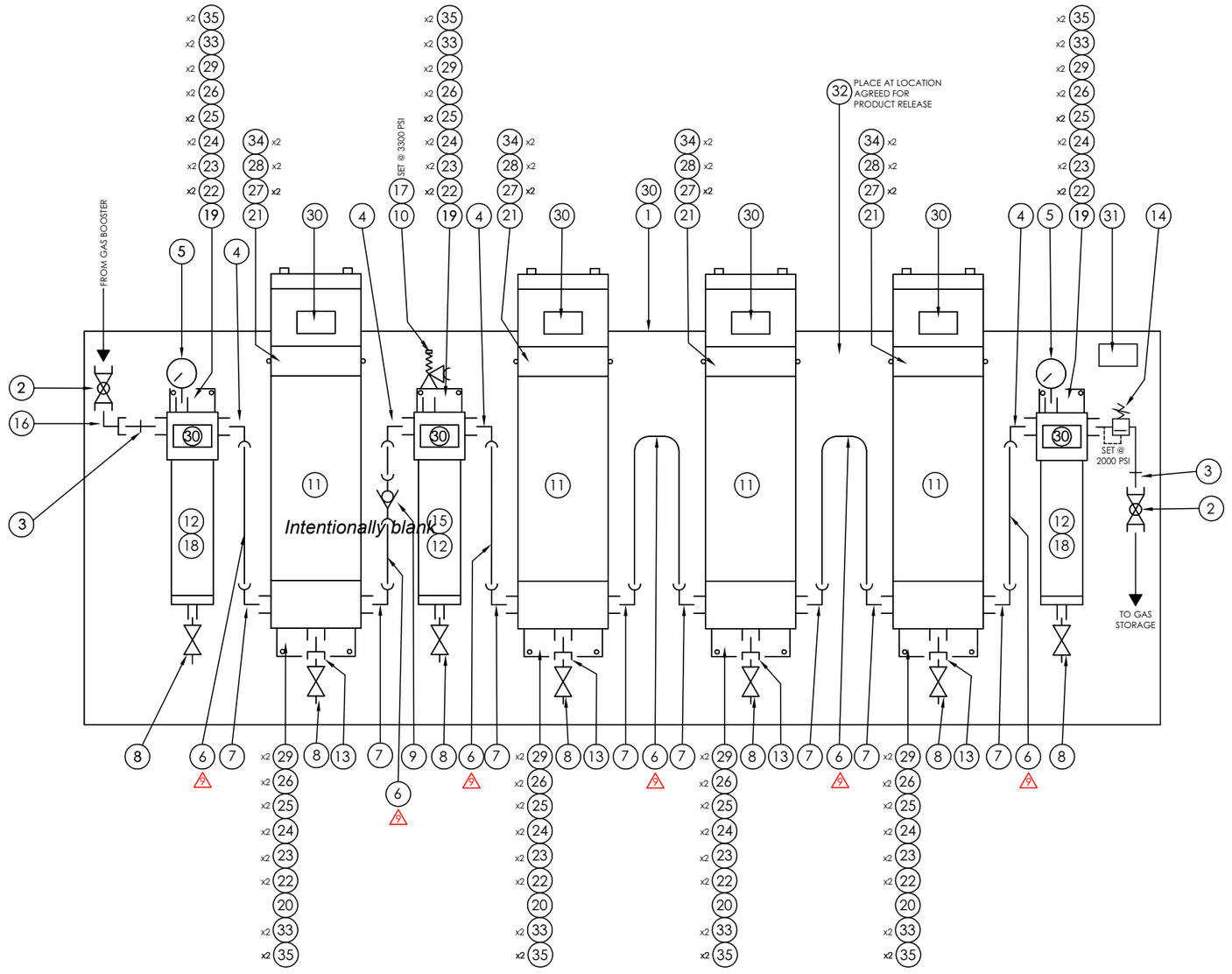
PART NO. N/A | PRODUCT / PROJECT No. GASPURE

SIZE A3 | SCALE (UOS) NTS | SHEET 2 OF 2

JFD WESTHILL ENTERPRISE DRIVE, WESTHILL, ABERDEEN, AB32 6TQ, UK
TEL: +44 (0)1224 740145
E: enquiries@jfdglobal.com
W: jfdglobal.com

Fit-out Schematic P182981305S1

ITEM No.	DESCRIPTION	PART No.	QTY	MATERIAL	MWP
1	PANEL, GASPURE FILTRATION UNIT	P301F	1	ST.ST.	-
2	VALVE,BALL,ASSY(REF VB397), 3/8"FNPT	DM13540	2	ST.ST.	3000 PS
3	NIPPLE,HEX, 1/2"(M)NPT-3/8"(M)NPT,ST.ST.	FP499	2	ST.ST.	7800 PS
4	FTG,ELBOW,MALE, 1/2"TUBE-1/2"MNPT	FS496	4	ST.ST.	3700 PS
5	GAUGE, 63MM,0-3600PSI/250BAR, 1/4"NPT BOTTOM ENTRY	GP212	2	ST.ST.	3600 PS
6	TUBE, STAINLESS 316, SEAMLESS, 1/2" OD X 16SWG	TM23151	6 ft	ST.ST.	3700 PS
7	FTG, ELBOW,MALE, 1/2"TUBE-3/8"MNPT	FS497	8	ST.ST.	3700 PS
8	VALVE,SHUT OFF, 1/4" MNPT	VS201	7	BRASS	6000 PS
9	VALVE,CHECK,1/2"TUBE	VC498	1	ST.ST.	3000 PS
10	VALVE,RELIEF, NUPRO R3A, 1/4"NPTM, 1/4" TUBE	VR293	1	ST.ST.	6000 PS
11	SCRUBBER HOUSING,ASSY, 3000PSI	C1282B	4	ST.ST.	3000 PS
12	FILTER HOUSING,ASSY, 3000PSI	C1286A	3	ST.ST.	3000 PS
13	ADAPTOR,MALE-FEMALE, 1/4"MNPT X 1/4"FNPT	NP203	4	ENP BRASS	3800 PS
14	VALVE,BACK PRESS.MAINTAINING, SET @ 2000 PSI	VP401	1	BRASS	4500 PS
15	FILTER,ELEMENT, 0.01 MICRON	FE003	1	ST.ST.	-
16	ELBOW, STREET, 3/8" NPT M/F, SS, WP386BAR	FP392	1	ST.ST.	5600 PS
17	SPRING,WHITE,FOR NUPRO RELIEF VALVE, 3000-4000 PSI	VM030	1	-	-
18	FILTER,ELEMENT, 1 MICRON	FE002	2	ST.ST.	-
19	BRACKET,FILTER,GASPURE	J3041	3	ST.ST.	-
20	BRACKET,SCRUBBER,GASPURE	J3042	4	ST.ST.	-
21	BRACKET,TOWER,GASPURE	J3030	4	ST.ST.	-
22	SETSCREW,HEX, 1/4"UNC X 3/4", 316 SS	FB002	14	ST.ST.	-
23	WASHER,PLAIN, 1/4", SS 316	FW003	14	ST.ST.	-
24	SETSCREW,HEX, 3/8"UNC X 1"	FB014	14	ST.ST.	-
25	WASHER,PLAIN, 3/8"	FW004	14	ST.ST.	-
26	WASHER,PLAIN, 3/8", SS 316	FW005	14	ST.ST.	-
27	NUT,HEX, 1/2"UNC	FN007	8	ST.ST.	-
28	WASHER,SPRING, 1/2", SS316	FW008	8	ST.ST.	-
29	NUT,HEX, 3/8"UNC, SS 316	FN004	14	ST.ST.	-
30	TAG,STICKER,CLEANED FOR BREATHING GAS	T4290	7	-	-
31	NAMEPLATE, DIVEX,GENERAL	T1060	1	-	-
32	LABEL,DIVEX LOGO,SELF ADHESIVE,100MM X63MM,WHITE	T1068	1	-	-
33	WASHER,SPRING, 3/8", TYPE A, SS 316	FW128	14	ST.ST.	-
34	WASHER,PLAIN, 1/2", STAINLESS STEEL	FW007	8	ST.ST.	-
35	WASHER,SPRING, 1/4", SS 316	FW002	14	ST.ST.	-



NOTES:

1. WP = 207 BAR (3000 PSI) DP = 227 BAR (3300 PSI)
2. REFER TO THE GASPURE P&ID, P1829900S1, FOR THE GASPURE OPERATING PARAMETERS.

REV	DESCRIPTION	ECN	BY	DATE	AUTH.
9	DENOTES CHANGES MADE AT THIS REVISION				
R09	TM497 REPLACED WITH TM23151	21114	ZD	09/06/17	AN
R08	NOTES ADDED & PARTS LIST UPDATED	17244	ZD	28/11/14	MS
R07	NOTES ADDED & PARTS LIST UPDATED	16804	MJ	03/07/14	MS
R00	ISSUED FOR MANUFACTURE				

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

TITLE: FIT-OUT SCHEMATIC

DRAWING NO. P182981305S1 | REV R09

PART NO. C1305A | PRODUCT / PROJECT No. GASPURE

SIZE A3 | SCALE (UOS) NTS | SHEET 1 OF 1

JFD WESTHILL
ENTERPRISE DRIVE,
WESTHILL, ABERDEEN,
AB32 6TQ, UK

TEL: +44 (0)1224 740145
E: enquiries@jfdglobal.com
W: jfdglobal.com