

Operation and Maintenance Manual Bell Gas Management Panel with Electronic Alarms

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APPROVAL SHEET

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Review
<p>This document is subject to review and revision in accordance with ISO 9001.</p>

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DANGER, WARNING & CAUTION

Danger, Warnings, Cautions and Notes where used within this manual are placed prior to the text to which they are pertinent. Their uses are as follows;

DANGER

INFORMS THE READER OF AN OPERATION OR CONDITION WHICH MAY INVOLVE RISK TO LIFE.

WARNING

INFORMS THE READER OF AN OPERATION OR STATE WITH POTENTIAL FOR PERSONNEL INJURY.

CAUTION

Inform the reader of an operation or state with potential for damage to equipment.

Note *Inform the user of additional information for clarification or to assist with an operation.*

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ABBREVIATIONS

cm	Centimetre
CO ₂	Carbon Dioxide
ft	Foot or feet
H ₂ O	Water
in	Inch
J	Joule
kg	Kilogram
lb	Pound (weight)
LH	Left Hand
lpm	Litres per minute
Lt	Litre
m	Metre
mbar	Millibar
mm	Millimetre
msw	Metres seawater
Mk	Mark
N	Newton
NPD	Norwegian Petroleum Directorate
NUTEC	Norwegian Underwater Technology Centre
O ₂	Oxygen
psi	Pounds per square inch
RH	Right Hand
RMV	Respiratory Minute Volume
SI	Système International
SLS	Secondary Life Support
US	United States
WG	Water Gauge
WOB	Work of Breathing

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PREFACE

In 1983 the Department of Energy issued memorandum 10/83, this was then qualified in 1984 by AODC memorandum 028 (now issued by IMCA). The memoranda, require that the gas supply to a diver should be designed in such a way as to safeguard the integrity of other circuits in the diver gas system. This means that in the event of a failure in one diver's umbilical or equipment, the supply to any other diver or the standby diver in the same supply system remains unaffected. The requirement also extends to the main bell umbilical where a failure in the bell gas supply hose should not permit the venting of the on board emergency supplies. A manually operated system is not considered adequate with both memoranda requiring that any changeover functions should be accomplished automatically and that the independent emergency supplies should also be made available to each diver.

The following manual details the Divex Bell Gas Management panel for use in diving bells. The panel incorporates the patented Divex shuttle block which meets and exceeds the criteria laid down in the DoE memorandum 10/83 and qualifying AODC memorandum 028 and is fully compatible with commercially available gas recovery systems.

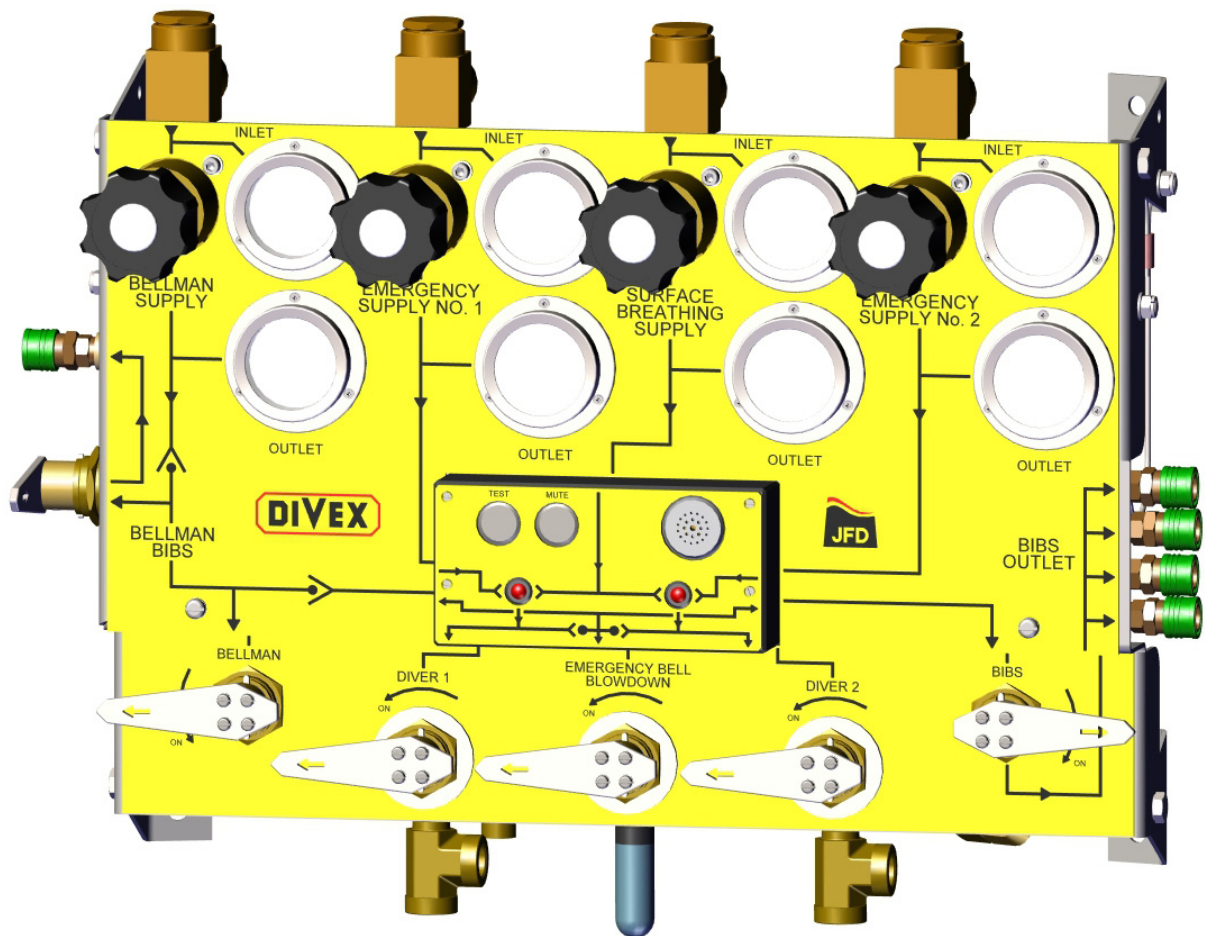
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1 Introduction

The Divex Bell Gas Management Panel manages four incoming high pressure gas supplies and provides pressure regulated gas to the divers and bellman.

The Divex Diver Gas Safety Shuttle Block mounted in the centre of the management panel provides visual and audible warning that the block has been activated and emergency gas is being consumed. The block is designed to respond to emergency requirements and return to normal function if and when conditions permit. As with activation to emergency supply, return to normal is a totally automatic function and the unit will cycle in order to take gas from the highest pressure source.

Figure 1 Bell Gas Management Panel with Electrical Shuttle Block Panel



2 Description

2.1 Gas Management

The bell gas management panel is used to regulate gas supply to the divers from surface supplied gas under normal operating conditions. Under emergency conditions it regulates emergency gas from banks 1, 2 and 3 prior to onward distribution to the three divers excursion umbilicals, the bell emergency BIBS and the emergency blowdown valve via the Shuttle Block. The panel is fitted to the bell inside wall in such a position as to make it easily visible to the bellman.

On entering the panel, the surface supply and banks 1, 2 and 3 gas supplies are filtered and then supplied to panel mounted regulators with upstream and downstream pressure gauges. The outputs from the regulators controlling the surface and emergency banks 1 and 2 supplies, feed a shuttle block which guarantees the emergency bank gas supplies to the two respective divers in the water. The bell BIBS and the emergency blowdown, take gas from the surface supply and either emergency bank 1 or 2 depending on the situation. The bellman is primarily supplied directly with bank 3 gas or his own dedicated surface supply (depending on bell configuration) through the bellman panel regulator, i.e. not through the shuttle block however the bellman also has access to surface supply and also emergency banks 1 and 2 from port F of the shuttle block if necessary. The bellmans BIBS supply is supplied from the same source as the bellmans diving gas. Emergency bank 3 is for the exclusive use of the bellman at all times, divers 1, 2, divers BIBS and bell blow down do not get access to this supply. Surface supplied breathing gas is always available to each recipient provided its source has not failed. Each outlet from the panel is valved and two relief valves, set at 24 barg (350 psi), protect the shuttle block downstream circuits should a regulator fail.

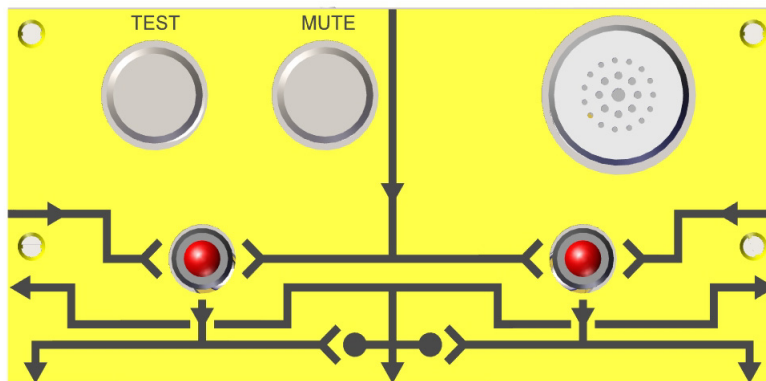
For the correct functioning of the bell gas management panel, the surface supply breathing gas regulator outlet must be set at 2 barg (30 psig) above the emergency banks 1 and 2 regulator outlets, and the bellman regulator is set at 1 barg (15 psig) above the setting of the surface supply gas. This initially biases the shuttle such that surface breathing gas supplies divers 1 and 2. If the normal surface gas pressure falls to less than that of the bank 1 and 2 regulators, the main shuttles activate to bring on emergency bank 1 and 2 gas and an alarm condition is activated.

Reinstatement of the surface gas restores the block to normal operating conditions. If the bellman supply gas pressure falls below the surface supply breathing gas regulator setting, the bellman will be supplied with gas from the shuttle block with either surface breathing gas supply or emergency bank 1 or 2. Should the diving depth, excessive diver demand or other restrictions in the main bell umbilical dictate, higher pressure differentials may be set.

2.2 Shuttle Block Panel

2.2.1 Electrical Panel

Figure 2 Shuttle Block Electrical Panel



The Electrical Panel is supplied with a 24 Vdc supply via a 6 way connector mounted on the back of the panel.

Note *Electrical supply to the panel should be configured such that the supply will be maintained by bell back-up batteries should the bell umbilical supply fail.*

The Electrical Panel is equipped with;

- Two Green/Red LED indicators (one for each diver supply)
- Test push button
- Mute push button (latching)
- Buzzer alarm speaker

LED Indicators on the panel and an audible alarm, electrically interconnected with the shuttle block, give a visual and audible indication of whether surface gas or emergency bank gas is being used by the divers. A green display indicates normal surface gas while a red display and audible buzzer indicates emergency gas. Each diver supply has an LED indicator while the buzzer is common to both diver supplies.

The two alarm signals are transmitted to the 6 way connector to provide a remote output. This output may be used to provide a remote indication of the alarm states.

The test push button is permanently illuminated green when the panel is powered. On pressing the test button the audible alarm will sound and the diver 1 and 2 red LEDs will illuminate, on releasing the button the panel will return to a its normal state.

The mute push button is located next to the test button. When pressed the mute push button mechanically latches and will illuminate red, the buzzer alarm will be disabled.

Figure 3 Panel 6 Way Electrical Connector

+24Vdc	1
0Vdc	2
Sensor 1 Signal	3
Sensor 1 Return	4
Sensor 2 Signal	5
Sensor 2 Return	6

2.3 Shuttle Block - Modes of Operation

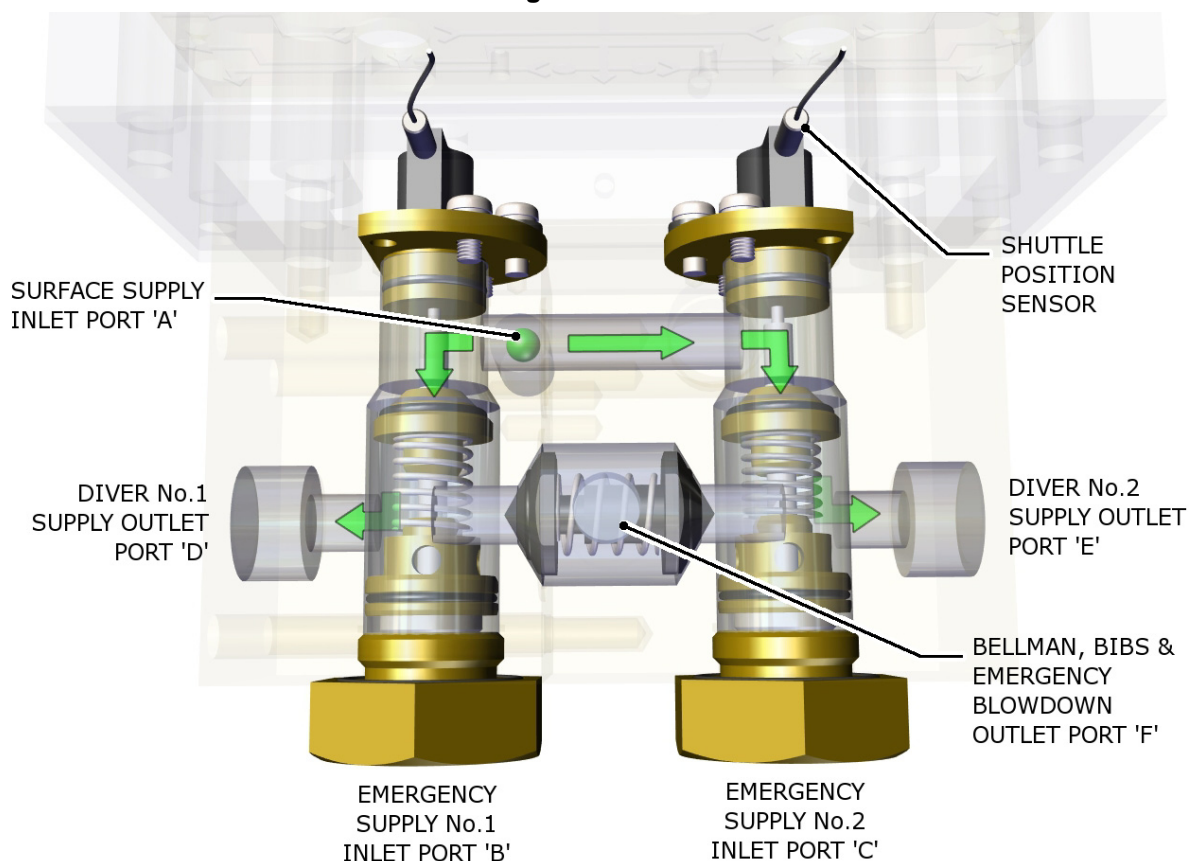
2.3.1 Mode 1, Normal conditions

All outlets supplied from port A - Surface Supply.

Under normal conditions, the surface breathing gas is supplied to Port A. Due to the surface supply being set at 2 barg minimum above the emergency supplies, the lower main shuttles seal off against Ports B and C. Under static conditions, the main shuttle springs seal the upper part of the shuttles against their respective housings and the spring loaded auxiliary shuttle seals against each half of the shuttle block. Surface gas is available to all outlet Ports D, E and F also both main indicators are green.

As a diver inhales, the reduction in pressure created in the outlet port causes the top half of the diver's main shuttle to break its seal to replenish the gas. On exhalation, both diver indicators are green.

Figure 4 Mode 1

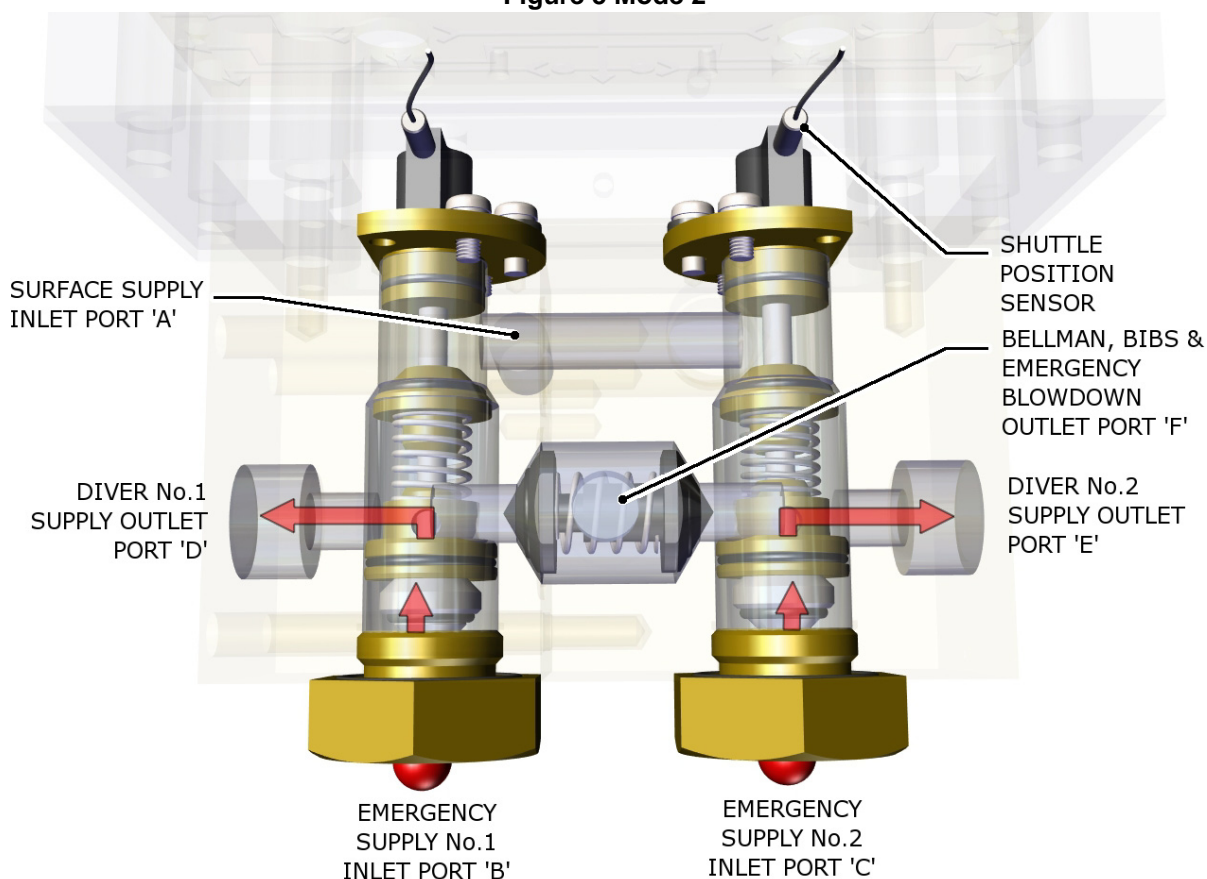


2.3.2 Mode 2, Severance of Surface Supply All outlets supplied through ports B and C - Emergency Supplies.

In the event of the main bell umbilical being ruptured, with the consequential loss of all gas to the diving bell, the pressure in Port A will fall to below the pressure bias set on Ports B and C causing the main shuttles to lift. The indicator rods will lift to give a red indication. The emergency supply No.1, Port B, is therefore available to supply outlet Ports D and F and the emergency supply No.2, Port C, is available to supply outlet Ports E and F. Under static conditions the spring loaded auxiliary shuttle lowers and forms a partial seal against the shuttle.

As a diver inhales, the reduction in pressure created in the outlet port causes the lower half of the main shuttle to lift against its spring to replenish the gas. On exhalation, the pressure in the outlet port equalises with that in the emergency supply port and the spring resets the lower half of the main shuttle against the lower half of the shuttle. During inhalation and exhalation, both diver indicators are red.

Figure 5 Mode 2



2.3.3 Mode 3, Severance of Diver 1 umbilical Diver 2 supplied from Port C - Emergency Supply No2.

If diver 1 umbilical is ruptured in the water, and the surface breathing supply is unable to maintain the flow, the pressure in Port A will reduce. As the pressure reduction falls below the preset differential, the indicator rods will lift to give a red indication. The auxiliary shuttle protects the other half of the block by sealing the leak path through Port D. The emergency supply No.1, Port B, is therefore available to supply outlet Port D, and the emergency supply bank 2, Port C is available to supply outlet Ports E and F.

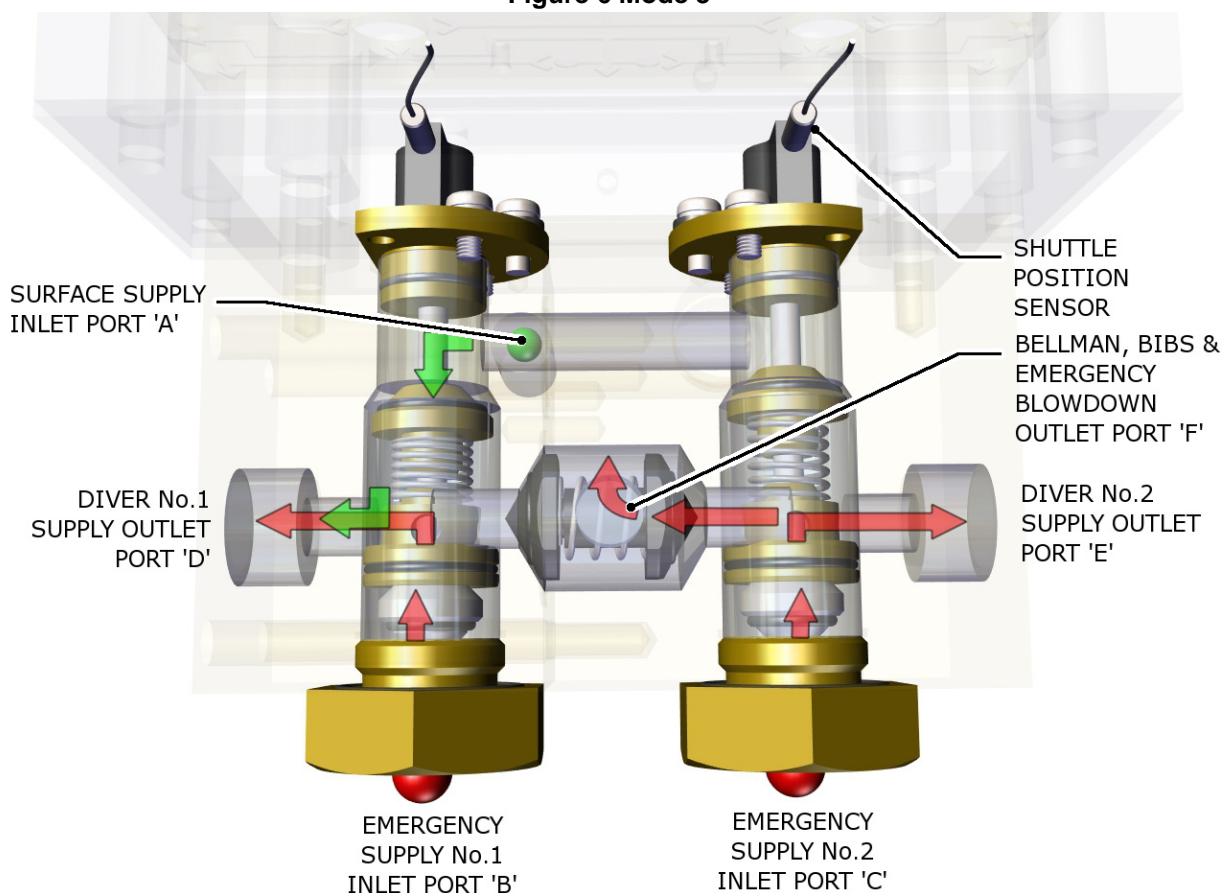
Due to the ruptured umbilical, the excessive continuous demand from Port D causes both the upper and the lower halves of diver 1 shuttle to provide gas. Diver 1 indicator will remain red until the emergency supply 1 bank has been depleted and the shuttle spring resets the lower half of the shuttle. At this point, diver 1 indicator LED will revert to green.

Diver 2 indicator will, however remain red. As diver 2 inhales and exhales, the piston seal above the lower half of diver 2 shuttle raises and lowers to replenish the inhaled gas in Port E.

Diver 1 must return to the bell on his bail out bottle gas supply.

Severance of the diver 2 umbilical produces a similar condition but on the opposite half of the block.

Figure 6 Mode 3



2.3.4 Mode 4, Divers on BIBS (Lost Bell)

All Outlets supplied form Ports B and C - Emergency Supplies.

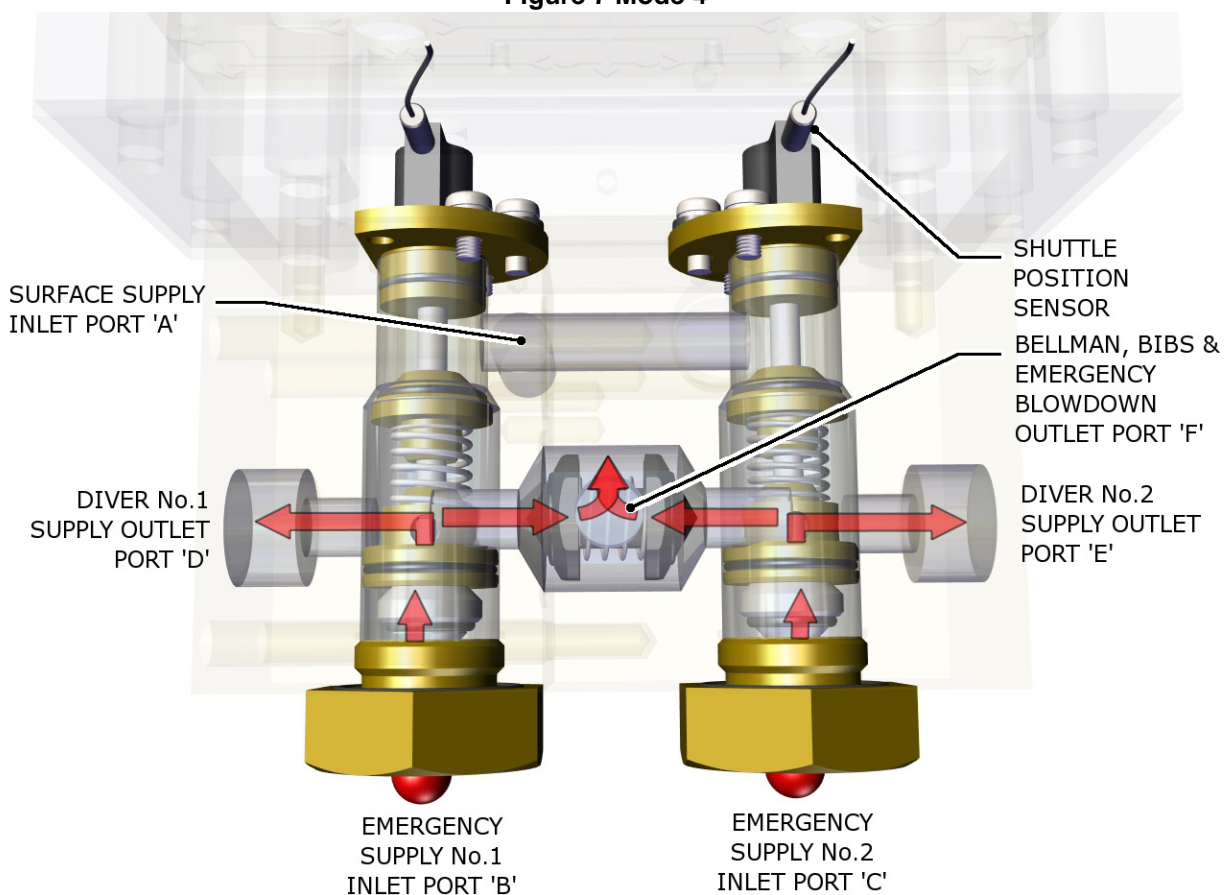
With the surface supply lost and the BIBS demanding gas, the 2 barg pressure differential, initially set up between the surface and the emergency supplies, diminishes and eventually equalises with the on board supply pressure. At this point the indicator rods lift to give a red indication.

The emergency supply bank 1, Port B, is therefore available to supply outlet ports D and F and the emergency supply bank 2, Port C, is available to supply outlet ports E and F. With no demands from the divers umbilicals, emergency gas from ports B and C both supply port F via the auxiliary shuttle valve, in turn Port F supplies the bellmans BIBS and the four diver BIBS.

Under static conditions the spring loaded auxiliary shuttle valve seals against each half of the block. On inhale from BIBS reduced pressure in Port F allows one or both sides of the auxiliary shuttle to unseat and replenish the gas.

When the surface supply is restored and the 2 barg differential reinstated, the indicator rods reset and the indicator return to the green status.

Figure 7 Mode 4



2.3.5 Severance of Divers 1 and 2 umbilicals Bellman supplied with emergency Bank 3.

If the divers 1 and 2 umbilicals are ruptured in the water and the surface breathing supply is unable to maintain the flow, the pressure in Port A will reduce. As it falls below the preset differential the indicator rods will lift to give a red indication, and the on board emergency banks 1 and 2 will be brought on line to both Ports B and C.

Due to the ruptured umbilicals causing excessive demands from Ports D and E both the upper and lower halves of Diver's 1 and 2 shuttle provide gas.

Both indicators will remain at red until the two on board banks are depleted, at which point they will revert to green and only surface breathing gas will be fed to Ports D and E.

Diver's 1 and 2 must return to the bell on their bail out bottle gas supplies.

The bellman is supplied from emergency bank 3 and remains unaffected by the loss of gas to divers 1 and 2.

3 Pre-Dive Checks

WARNING

HAVE YOU READ AND UNDERSTOOD THE GENERAL DESCRIPTION AND METHOD OF OPERATION OF THE SHUTTLE VALVE? OPERATING PRESSURES CAN BE CHANGED BUT SURFACE SUPPLY MUST BE A MINIMUM OF 2 BARG (30 PSIG) GREATER THAN EMERGENCY SUPPLY PRESSURES. BELLMAN SUPPLY MUST BE A MINIMUM OF 1 BARG (15 PSIG) GREATER THAN THE SURFACE SUPPLY.

ANY MALFUNCTIONS HIGHLIGHTED BY THE FOLLOWING CHECK-LIST MUST BE RECTIFIED AND RE-CHECKED BEFORE DIVING COMMENCES.

- 1 Check the diver gas outlet valves, emergency blow-down valve and BIBS valve are closed.
- 2 Check that the four panel regulators are backed right-off.
- 3 Open the surface breathing gas supply hull stop valve.
- 4 Set surface supply regulator to 14 bar.
- 5 Check shuttle valve indicating LEDs are both GREEN.
- 6 Check that the gas supply is available to Divers 1, 2 and 3, emergency blow-down and BIBS.
- 7 Open the emergency supply No.1 hull stop valve.
- 8 Set the emergency supply No.1 regulator to 12 bar (2 bar bias)
- 9 Close the surface breathing gas supply hull stop valve.
- 10 Open diver 1 supply valve to vent pressure from the surface supply regulator. Emergency supply No.1 will trip in when 2 bar bias pressure equalises.
- 11 Left hand indicator LED should now be RED.
- 12 Check that the gas supply is available to divers 1 and 3, emergency blow down and BIBS. Confirm that diver 2 is isolated.
- 13 Back surface supply regulator right off.
- 14 Open surface breathing gas supply hull stop valve.
- 15 Set surface supply regulator to 14 bar.
- 16 Check that both LEDs are GREEN.
- 17 Back emergency supply No.1 regulator right off.
- 18 Open the emergency supply No.2 hull stop valve.

- 19 Set the emergency supply regulator No.2 to 12 bar (2 bar bias).
- 20 Close surface breathing gas supply hull stop valve.
- 21 Open diver 2 supply valve to vent pressure from the surface supplied regulator. Emergency supply No.2 will trip in when 2 bar bias pressure equalises.
- 22 Right hand indicator LED should now be RED.
- 23 Check that the gas supply is available to divers 2 and 3, emergency blow-down and BIBS. Confirm that diver 1 is isolated.
- 24 Back surface supply regulator right off.
- 25 Open surface breathing gas supply hull stop valve.
- 26 Set surface supply regulator to 14 bar.
- 27 Set emergency supply No.1 regulator to 12 bar.
- 28 Check the emergency supply No.2 regulator is set at 12 bar.
- 29 Check that both shuttle valve indicator LEDs are GREEN.
- 30 Open the emergency supply No.3 gas supply hull stop valve.
- 31 Set the bellman panel regulator to 15 bar.
- 32 Close the surface breathing gas, bank No.1 and bank No.2 hull stop valves.
- 33 Open divers 1 and 2 supply valves to vent firstly the surface supply regulator then emergency bank supply regulators. The LED indicators will change from GREEN to RED.
- 34 Check that gas is available to the bellman and that the bellmans supply is isolated from divers 1, 2, BIBS and bell blow down.
- 35 Back the surface and emergency supplies regulators right off and open the respective hull stop valves.
- 36 Set the surface supply regulator to 14 bar, emergency supply regulators to 12 bar then check the bellman regulator is set to 15 bar.
- 37 Check that both shuttle valve indicator LEDs are GREEN. The gas panel and safety shuttle valve are now fully operational.

4 Maintenance

Pre-Dive checks are carried out on the panel prior to each dive (section 3, page 9).

Malfunctions highlighted by these checks requiring servicing of parts such as a regulator main valve seat or cleaning of a filter element must be rectified and rechecked before diving commences.

WARNING

ENSURE THE VENT HOLES IN THE UNDERSIDE OF THE ELECTRICAL ENCLOSURE ARE NOT BLOCKED OR OBSTRUCTED AT ANY TIME.

Monthly or between each saturation. Grease the main shuttle valve o-rings using silicon grease. Items 24, 28, 31 and 32 on drawing P21753S1.

Access to this shuttle block for maintenance is via the rear of the gas panel. This is achieved by uncoupling the panel's interconnecting supply lines, releasing the top two bracket retaining bolts and swinging facia downwards through 90 degrees. The supply lines to be uncoupled are as follows:

- Surface Supplied Breathing Gas
- Emergency Bank 1
- Emergency Bank 2
- Emergency Bank 3
- Diver No.1 SAEKO Valve Supply
- Diver No.2 SAEKO Valve Supply

The shuttle o-rings are accessed by removing the two ½" OD Tungum emergency bank supply lines and removing the two retaining adaptors (Item 3 on drawing P21753S1). Once the adaptor has been removed, the compressed internal spring (21) extends and pushes the piston (4) and indicator rod (13) out of the block.

The complete shuttle valve assembly (Items 4, 21, 5 and 13) can then be lifted out of the block for maintenance.

5 Recommended Spares

Description	Divex Part No	Qty.
Regulator Soft Seals Kit	RK027	12
Regulator Standard Repair Kit	RK27374	3
Spares for Filter		
Washer	FW076	3
Filter Element	FE025	3
O-Ring Seal (Nitrile)	RN210-7	3
Spares for Shuttle Block		
Soft Seals Kit	C10450	4
Spring	MC355	2
Indicator Rod	D4707	2
Spring	MC356	1
Auxiliary Shuttle Valve – Female	D46030	1
Auxiliary Shuttle Valve – Male	D47090	1

6 Links

Pressure Regulator

http://www.documentation.emersonprocess.com/groups/public/documents/data_sheets/d44130549x012.pdf

Shuttle Block Electrical Connector

http://www.farnell.com/datasheets/2322705.pdf?_ga=2.62856812.1174431446.1500631805-339229443.1500631805

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APPENDIX A SYSTEM DRAWINGS

Drawing Title	Page
Panel, Gas Management, Bell, 3 Diver, AV Alarm P2175100	A.2
Sheet 1 of 5	A.2
Sheet 2 of 5	A.3
Sheet 3 of 5	A.4
Sheet 4 of 5	A.5
Sheet 5 of 5	A.6
P&ID, Panel, Gas Management Bell, 3 Diver, 500 MSW P2175101	A.7
Shuttle Block Assy, MARA Panel c/w AV Alarm P2175102	A.8
Sheet 1 of 2	A.8
Sheet 2 of 2	A.9
Electrical Assembly, MARA Panel Alarm P18362590	A.10
Sheet 1 of 2	A.10
Sheet 2 of 2	A.11
Filter Assembly, 3/4" NPT Male/Female P21754005	A.12
Modified Ball Valve Assembly, ACW On, Outward Arrow P2175201	A.13
Ball Valve, Modified Assembly, CW On, Inward Arrow P2175204	A.14
Ball Valve, Assembly, CW On, Outward Arrow P2175205	A.15
PCB, MARA Panel, Alarm, Routing, Assembled DO4641500	A.16

Panel, Gas Management, Bell, 3 Diver, AV Alarm P2175100
Sheet 1 of 5

ITEM	PART No.	DESCRIPTION	QTY.
1	A4698303	MANIFOLD BLOCK, BIBS, 4 PORT, BELL PANEL	1
2	A46983102	SHUTTLE BLOCK ASSY, MARA PANEL C/W AV ALARM	1
3	A46983302	FABRICATION, FRAME, 3 DIVER BELL PANEL	1
4	A46983304	SPACER, TOP HAT, 3 DIVER BELL PANEL	4
5	A46983306	FASCIA, UPPER, BGMP, C/W AV ALARM	1
6	A46983307	BRACKET, LH, MOUNTING, PROXIMITY SENSOR, MARA PANEL	1
7	A46983309	BRACKET, RH, MOUNTING, PROXIMITY SENSOR, MARA PANEL	1
8	A46983310	FASCIA, LOWER, BGMP, C/W AV ALARM	1
9	C2590	ELECTRICAL ASSEMBLY, MARA PANEL ALARM	1
10	C3590	FASCIA, ALARM, MARA PANEL	1
11	C3593	BACK COVER, ALARM, MARA PANEL	1
12	CA46230	FILTER ASSEMBLY, 3/4" NPT MALE/FEMALE	4
13	D4632	WASHER, BALL VALVE RETAINING	3
14	D46310	DVR EQP, MOUNTING COLLAR ASSY	4
15	DM47100	BALL VALVE, MODIFIED ASSY, ACW ON, OUTWARD ARROW	4
16	DM47110	BALL VALVE, MODIFIED ASSY, CW ON, INWARD ARROW	1
17	DM47111	BALL VALVE ASSEMBLY, CW ON, OUTWARD ARROW	1
18	E10073	SOCKET, QUICK CONNECT, 3/8" (M) NPT	5
19	FB175	SCREW, M/C, PAN HD, M5 X 0.8 X 1.5, A4 SS	2
20	FB226	SETSCREW, HEX, M10 X 1.5 X 25, S6	4
21	FB227	SCREW, CAP, SCKT, M5 X 20 LONG, A2-70	8
22	FB263	SCREW, M/C, CSK, SLOTTED, M4 X 12 MM LONG, SS 316	4
23	FB280	SCREW, M/C, PAN HD, M6 X 15MM	2
24	FB449	BOLT, HEX, M8 X 1.25 X 25 LG, SS 316	4
25	FB502	SCREW, M3 X6MM LG, CSK HD, POZIDRIVE, SS316	4
26	FB509	SCREW, M3 X 10MM LG, CSK HD, POZIDRIVE, SS316	24
27	FB602	SCREW, CAP, SCKT, M8X1.25X45LG, 316 SS	4
28	FB744	SCREW, SOCKET CAP HEAD, M10 X 1.5P X 25 LG, A4-70	2
29	FB946	SCREW, CAP, SKT, M6 X 1 X 16, 316 SS	8
30	FJ217	ELBOW, MALE 90°, 4-JIC X 1/4" MNPT, BRASS, WP227B	8
31	FJ228	CONNECTOR, FEMALE C/W NUT&FERRULE, 4JIC-1/4" FNPT	8
32	FJ407	ELBOW CONNECTOR, 8JIC - 1/2" NPT(F) BRASS	1
33	FJ420	CONNECTOR, 8-JIC-1/2" NPT(M), BRASS, MWP227BAR	4
34	FJ423	ELBOW, MALE, 8-JIC X 1/2" MNPT, BRASS, WP227BAR	11
35	FN059	NUT, AEROTIGHT, M8	4
36	FN136	NUT, CLINCH, CSK, SERRATED, 2.5-4MM, ST. STEEL, M6	2
37	FN138	NUT, CLINCH, CSK, SERRATED, 2.5-4MM, ST. STEEL, M8	4
38	FN140	NUT, CLINCH, CSK, 2.5-4MM, ST. STEEL, M10	4
39	FP309	ELBOW, STREET, 3/8" MNPT-3/8" FNPT, BRASS, WP 206BAR	1
40	FP405	TEE, STREET, 1/2" NPT(M) X 1/2" NPT(F), BRASS, MWP 131BAR	3
41	FP406	REDUCER, PIPE THREAD, 1/2" MNPT-3/8" FNPT	2
42	FP407	TEE, FEMALE, 1/2" NPT(F), BRASS, MWP131BAR	1
43	FP414	ADAPTOR, MALE-FEMALE, 1/2" MNPT-1/2" FNPT	2
44	FP417	ELBOW, FEMALE-FEMALE, 1/2" (F) NPT	2
45	FP418	TEE, MALE, 1/2" NPT(M), BRASS, WP269BAR	1
46	FP434	FTG, NIPPLE, CLOSE	4
47	FP435	CROSS, FEMALE, 1/2" FNPT BRASS	1
48	FP607	REDUCER, PIPE THRD, 3/4NPT(M)-1/2NPT(F), BRASS, MWP 227BAR	4
49	FP2029	PLUG, HOLLOW HEX, 1/2" NPT(M), BRASS	1
50	FW037	WASHER, PLAIN, 6MM, SS	10
51	FW044	WASHER, PLAIN, M8, S316	4
52	FW075	WASHER, SPRING, M5, SS 316	2
53	FW126	WASHER, SPRING, M10, TYPE A, SS 316	4
54	GP208	GAUGE, 0-1500PSI [DUAL SCALE], 1/4" NPT	4
55	GP239	GAUGE, 63MM, DUAL SCALE, 0-400PSI, 1/4" NPT	4
56	MC357	SILENCER, POROUS POLYETHYLENE, 1/2 NPT MALE	1
57	MC359	WIRE ROPE SLING, 580 LG, 4MM X 7 X 19, ALL 316SS	2
58	RP616	REGULATOR, TESCOM, 1/4" NPT GAUGE PORTS, SEA WATER	4
59	TM205	TUBE, TUNGUM, 1/4" X 20 SWG, WP287BAR, TCL100/B	AS REQD
60	TM401	TUBE, TUNGUM, SEAMLESS, 1/2" OD X 16 SWG	AS REQD
61	VC409	VALVE, CHECK, BRASS, 1/2 MNPT, FIXED PRESSURE 1PSIG	2
62	VR307	VALVE, RELIEF, SET 20-40BAR, 3/8" NPT MALE	3

ASSEMBLED ISOMETRIC VIEW

NOTES:

REV	DESCRIPTION	ECN	BY	DATE	AUTH.
R00	ISSUED FOR MANUFACTURE		DR	08/08/17	AN

THIRD ANGLE PROJECTION

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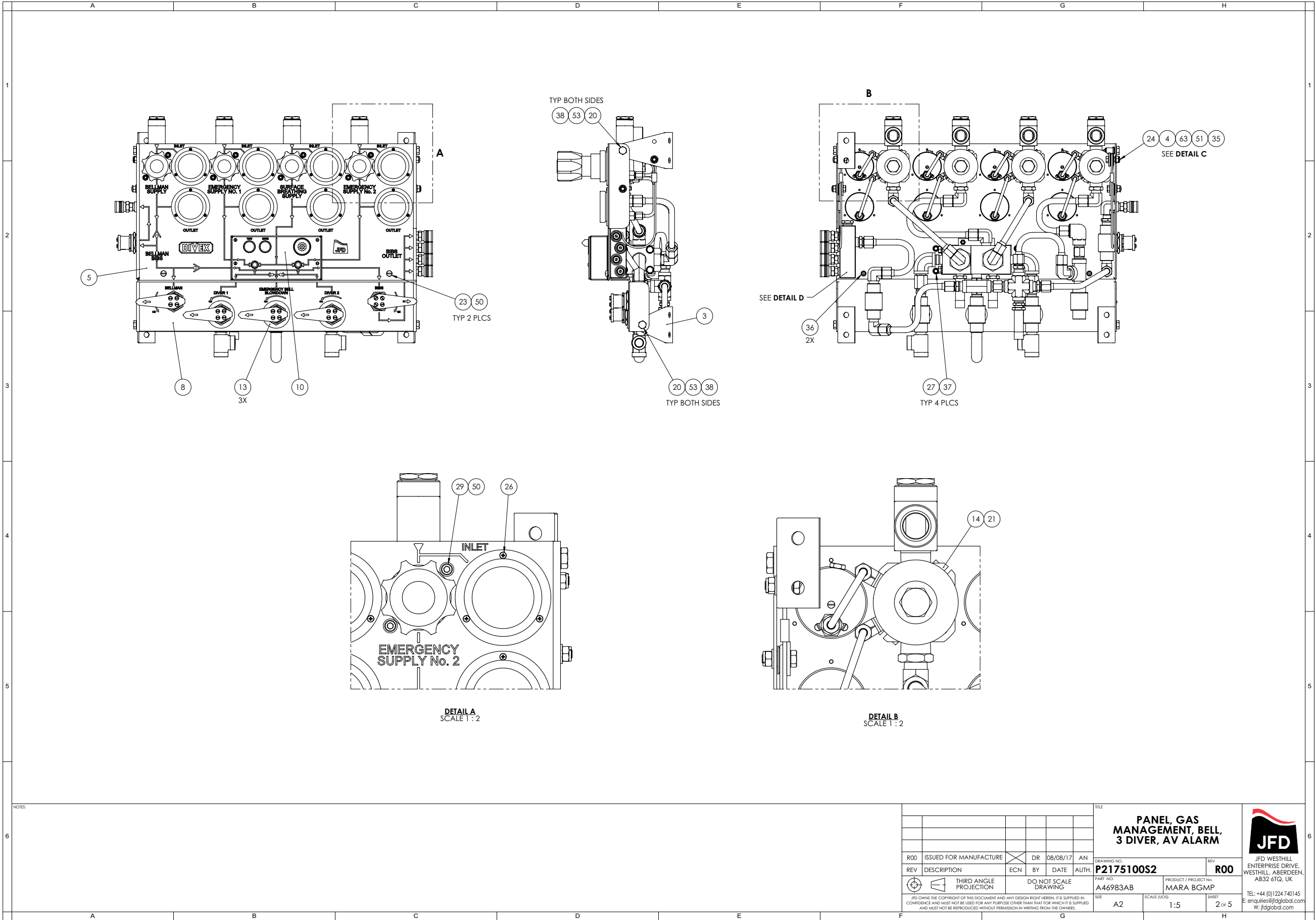
DRAWING NO. P2175100S1		REV R00
PART NO. A46983AB	PRODUCT / PROJECT NO. MARA BGMP	
SIZE A2	SCALE (XDS) 1:2	SHEET 1 of 5

PANEL, GAS MANAGEMENT, BELL, 3 DIVER, AV ALARM

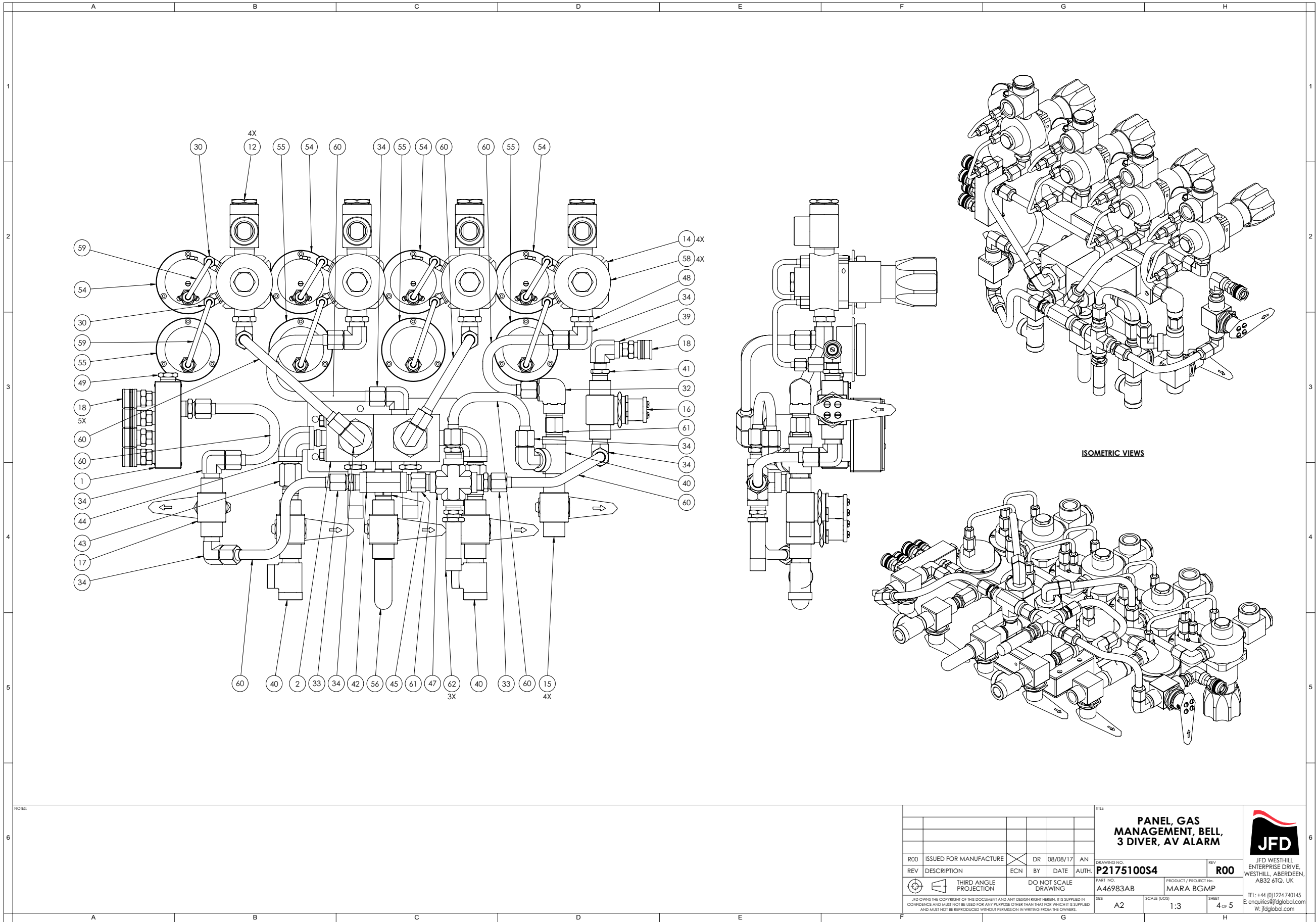
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JFD WESTHILL
ENTERPRISE DRIVE,
WESTHILL, ABERDEEN,
AB32 6TQ, UK

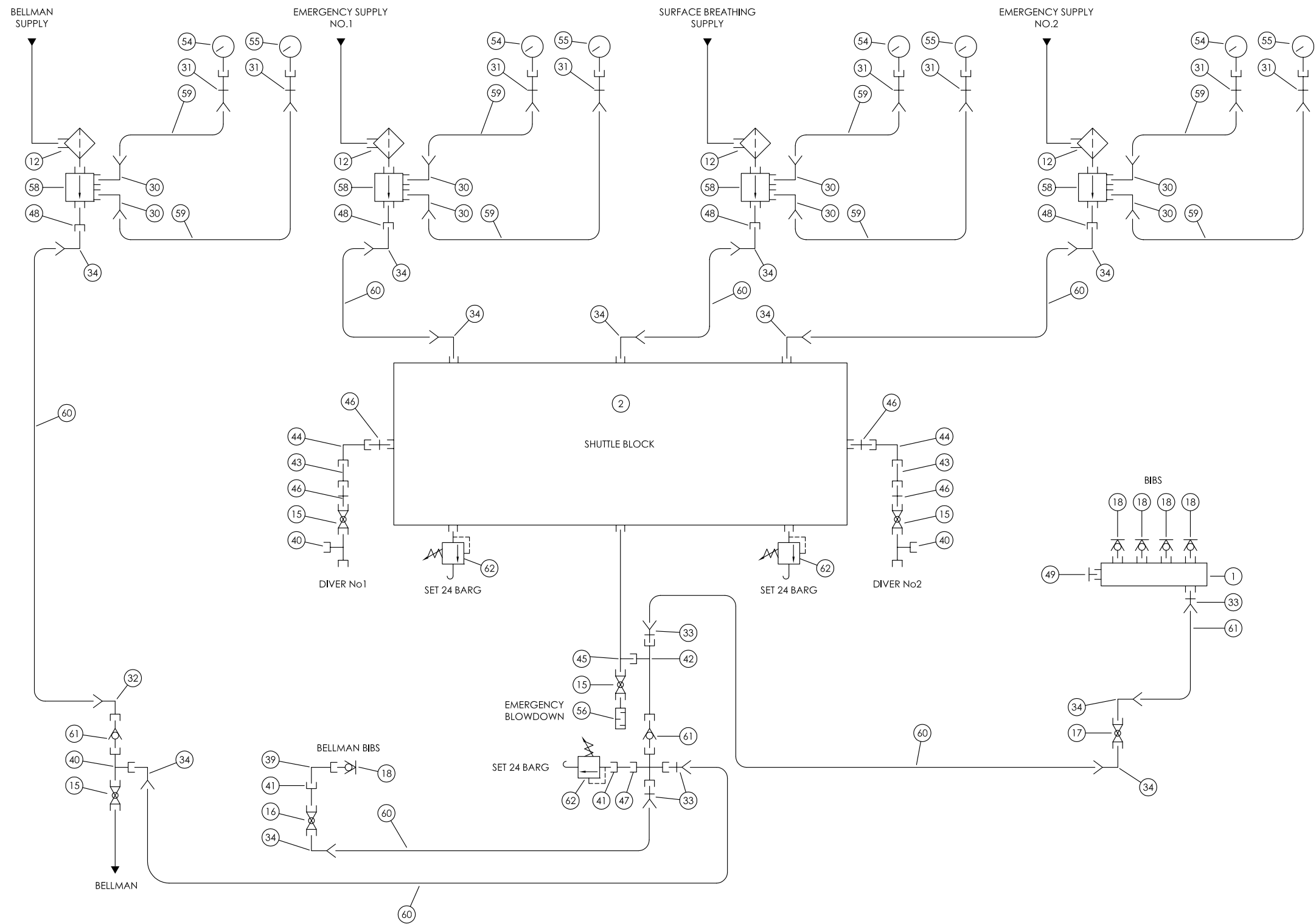
TEL: +44 (0) 1224 740145
E: enquiries@jfdglobal.com
W: jfdglobal.com







NOTES:												TITLE						PANEL, GAS MANAGEMENT, BELL, 3 DIVER, AV ALARM						 JFD WESTHILL ENTERPRISE DRIVE, WESTHILL, ABERDEEN, AB32 6TQ, UK TEL: +44 (0) 1224 740145 E: enquiries@jfdglobal.com W: jfdglobal.com					



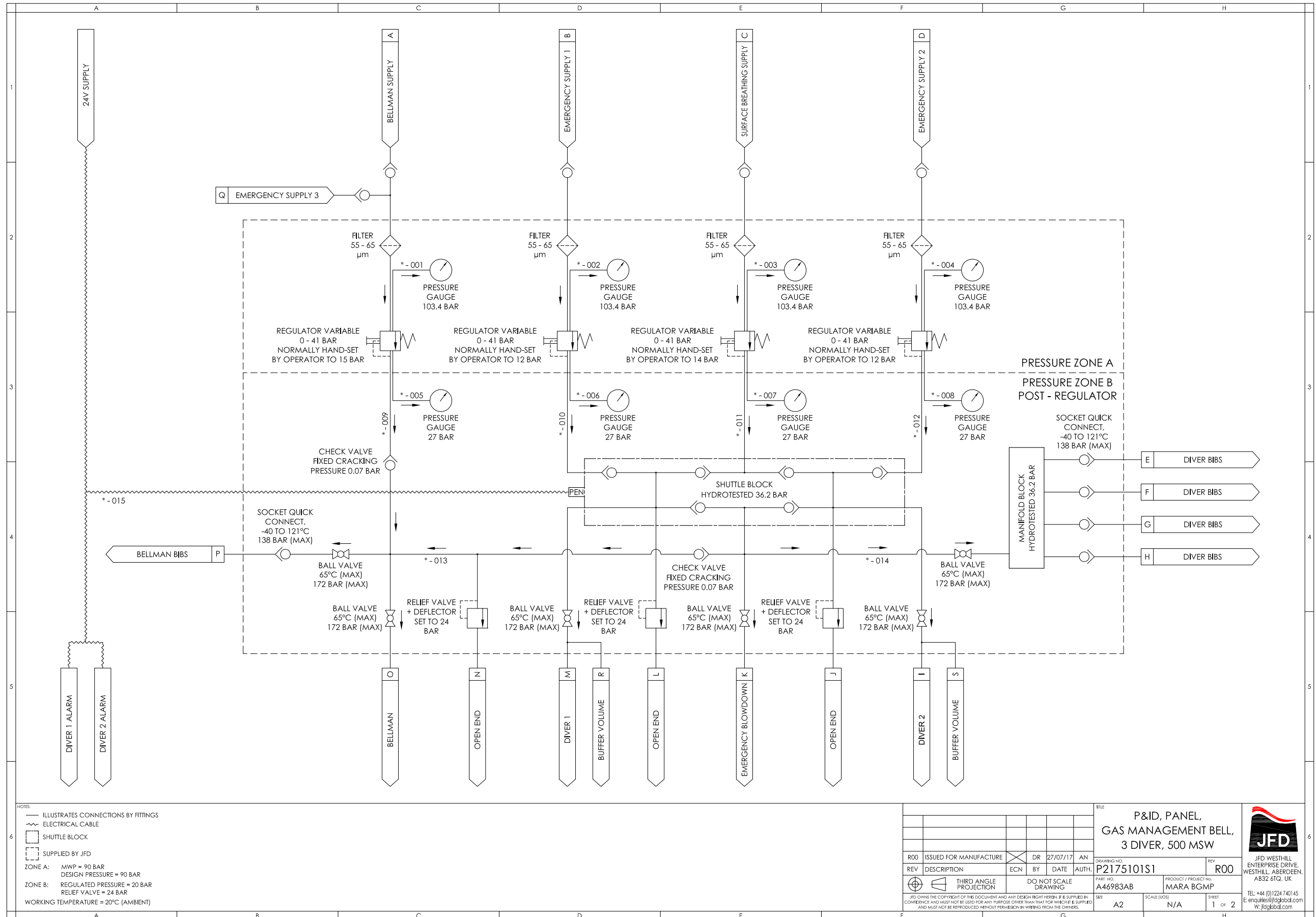
NOTES:

REV						TITLE	
R00	ISSUED FOR INFORMATION	DR	08/08/17	AN		PIPING SCHEMATIC, PANEL, GAS MANAGEMENT, BELL, 3 DIVER, AV ALARM	
REV	DESCRIPTION	ECN	BY	DATE	AUTH.	DRAWING NO. P2175100S5	REV. R00
THIRD ANGLE PROJECTION		DO NOT SCALE DRAWING		PART NO. A46983AB		PRODUCT / PROJECT NO. MARA BGMP	
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P&ID, Panel, Gas Management Bell, 3 Diver, 500 MSW P2175101

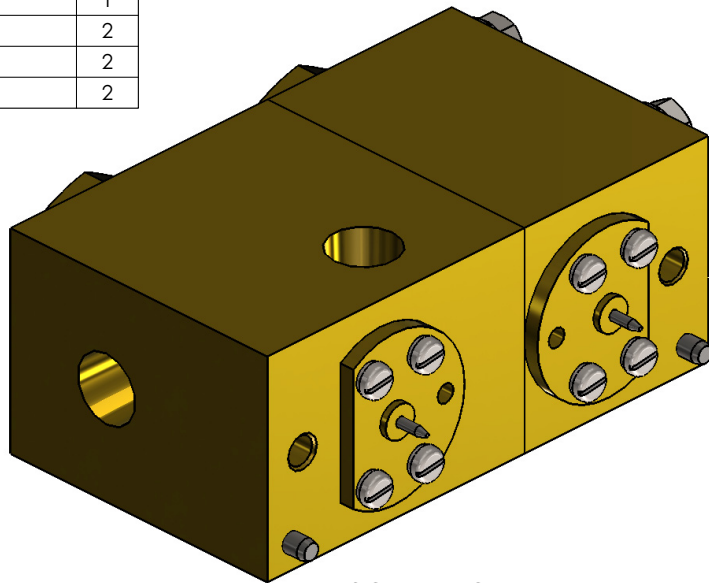




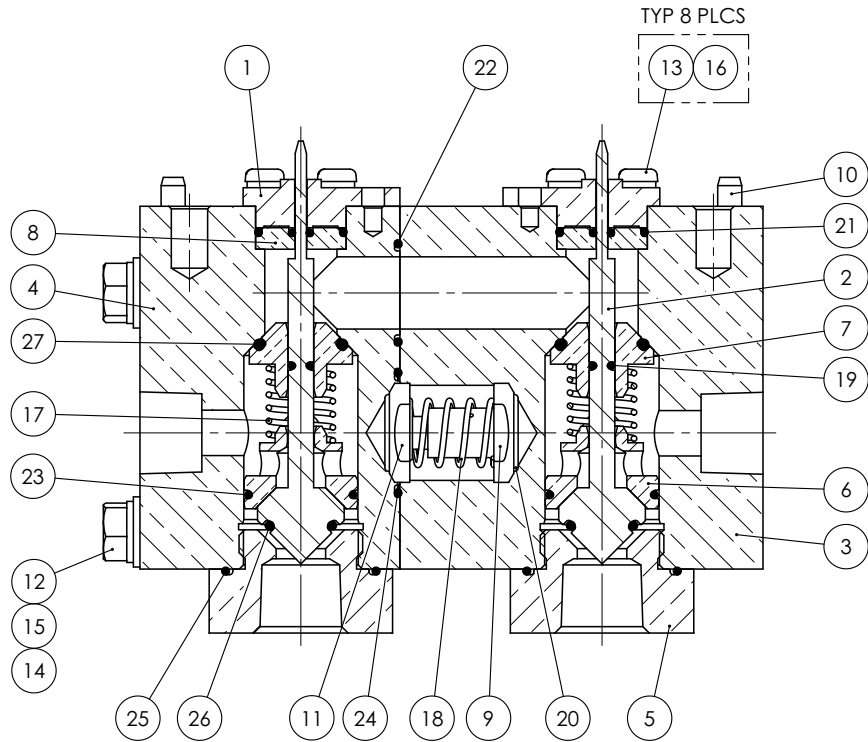
Shuttle Block Assy,MARA Panel c/w AV Alarm P2175102

Sheet 1 of 2

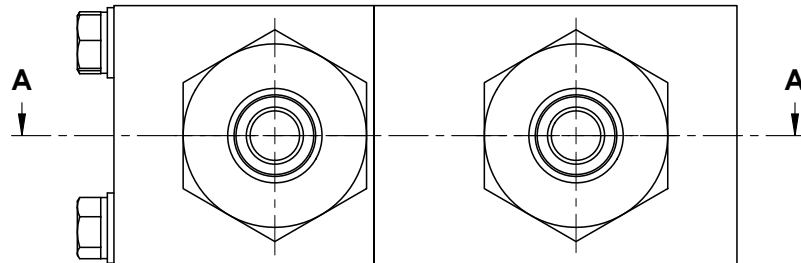
A				B				C				D				E				F				G				H			
ITEM		PART No.		DESCRIPTION								QTY.																			
1	1	A46983308		RETAINING CAP, SEAL HOUSING, BGMP, AV ALARM VARIANT								2																			
	2	D4707		ROD, INDICATOR, MECHANICAL BLOCK, 84MM STEM								2																			
	3	D45910		VALVE BLOCK, MARA PANEL								1																			
	4	D45920		DVR EQP, VALVE BLOCK								1																			
	5	D45930		DVR EQP, MAIN SHUTTLE V/V RETAINING ADAPTOR								2																			
	6	D45950		DVR EQP, PISTON SEAL								2																			
	7	D45960		DVR EQP, TOP VALVE								2																			
	8	D45970		INDICATOR ROD SEAL HOUSING								2																			
2	9	D46030		AUXILIARY SHUTTLE VALVE, FEMALE								1																			
	10	D46040		DVR EQP, DOWEL PIN								4																			
	11	D47090		DVR EQP, AUX.SHUTTLE V/V (M)								1																			
	12	FB229		BOLT,HEX, M8 X 80 LONG, SS								4																			
	13	FB527		SCREW, M5 X 10MM LG, PAN HD, SLOTTED, SSA2								8																			
	14	FW044		WASHER, PLAIN, M8, S316								4																			
	15	FW074		WASHER, SPRING, M8 SINGLE COIL, S316								4																			
	16	FW075		WASHER, SPRING, M5, SS 316								8																			
3	17	MC355		SPRING, COMPRESSION								2																			
	18	MC356		SPRING, COMPRESSION								1																			
	19	RN005-7		O-RING								4																			
	20	RN015-7		O-RING								2																			
	21	RN018-7		O-RING								2																			
	22	RN020-7		O-RING								1																			
	23	RN021-7		O-RING								2																			
	24	RN026-7		O-RING								1																			
	25	RN028-7		O-RING								2																			
	26	RN111-7		O-RING								2																			
	27	RN112-7		O-RING								2																			




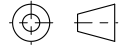
ISOMETRIC VIEW

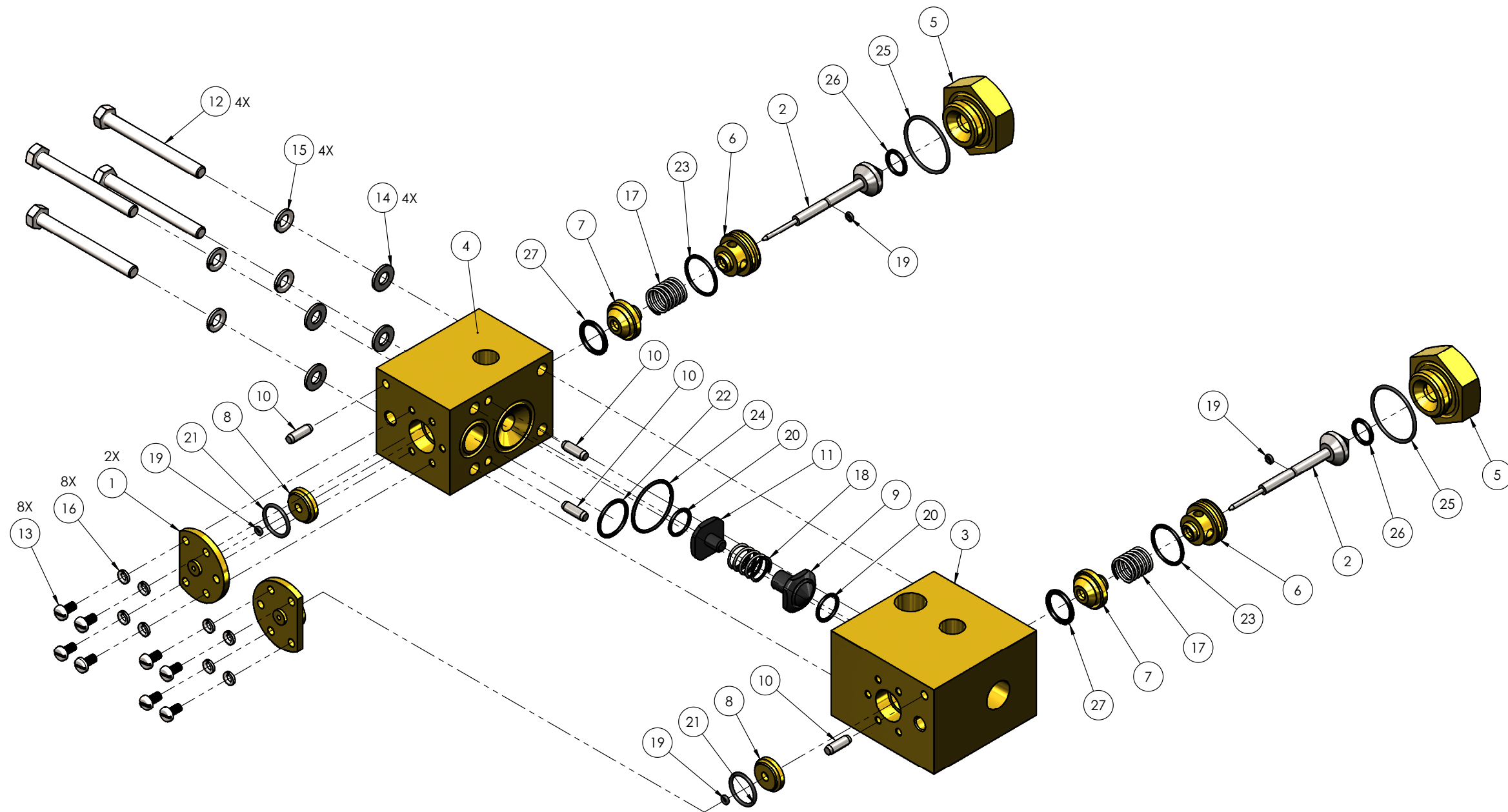


SECTION A-A



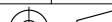


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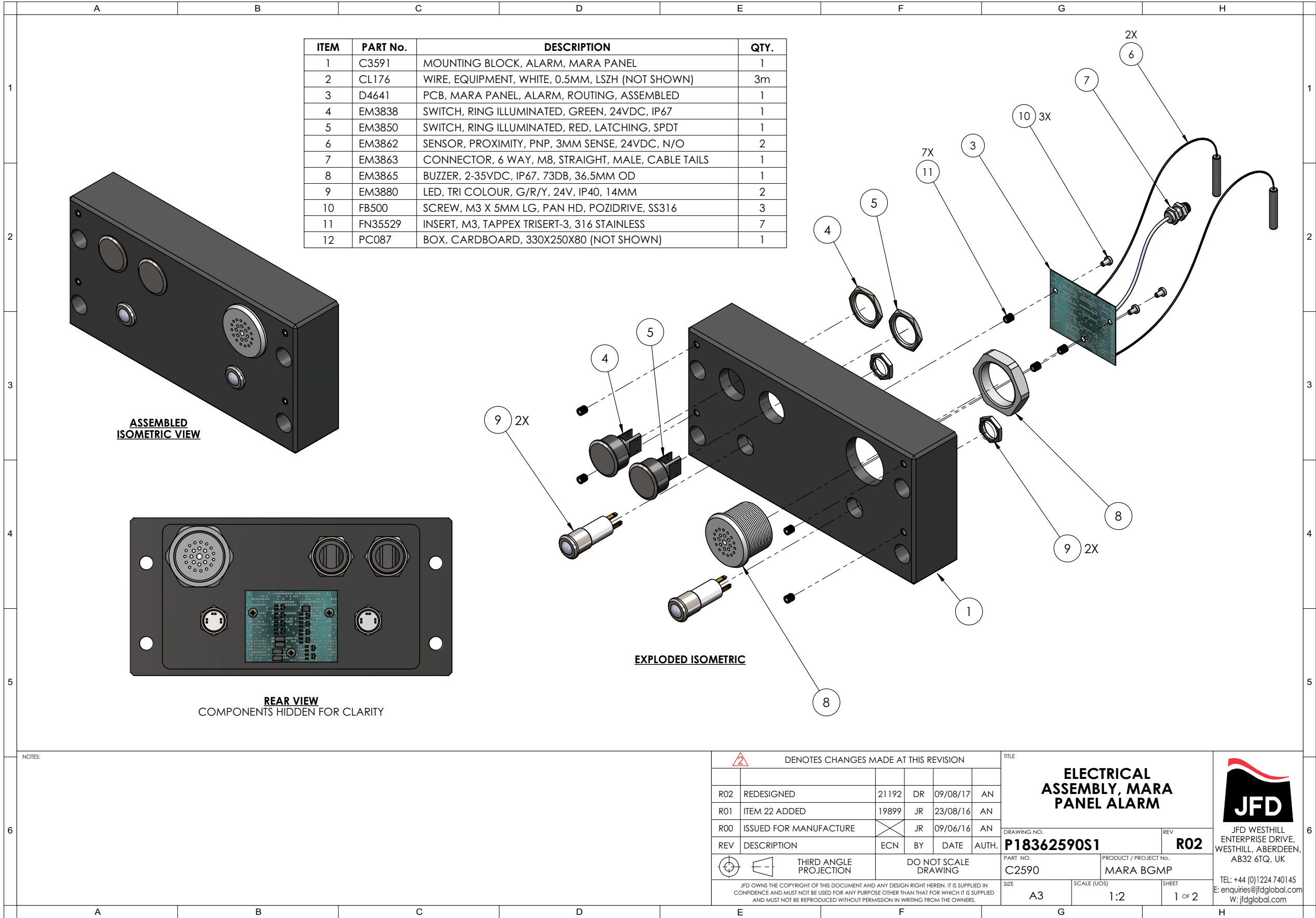
						TITLE				 <div>JFD WESTHILL ENTERPRISE DRIVE, WESTHILL, ABERDEEN, AB32 6TQ, UK TEL: +44 (0)1224 740145 E: enquiries@jfdglobal.com W: jfdglobal.com</div>			
						SHUTTLE BLOCK ASSY, MARA PANEL C/W AV ALARM							
						DRAWING NO.				REV			
R00 ISSUED FOR MANUFACTURE						X DR 27/07/17 AN				P2175102S1 R00			
REV DESCRIPTION						ECN BY DATE AUTH.				PART NO. PRODUCT / PROJECT No.			
										A46983102 MARA BGMP			
 THIRD ANGLE PROJECTION						DO NOT SCALE DRAWING				SIZE SCALE (UOS) SHEET			
										A3 1:1.5 1 OF 2			
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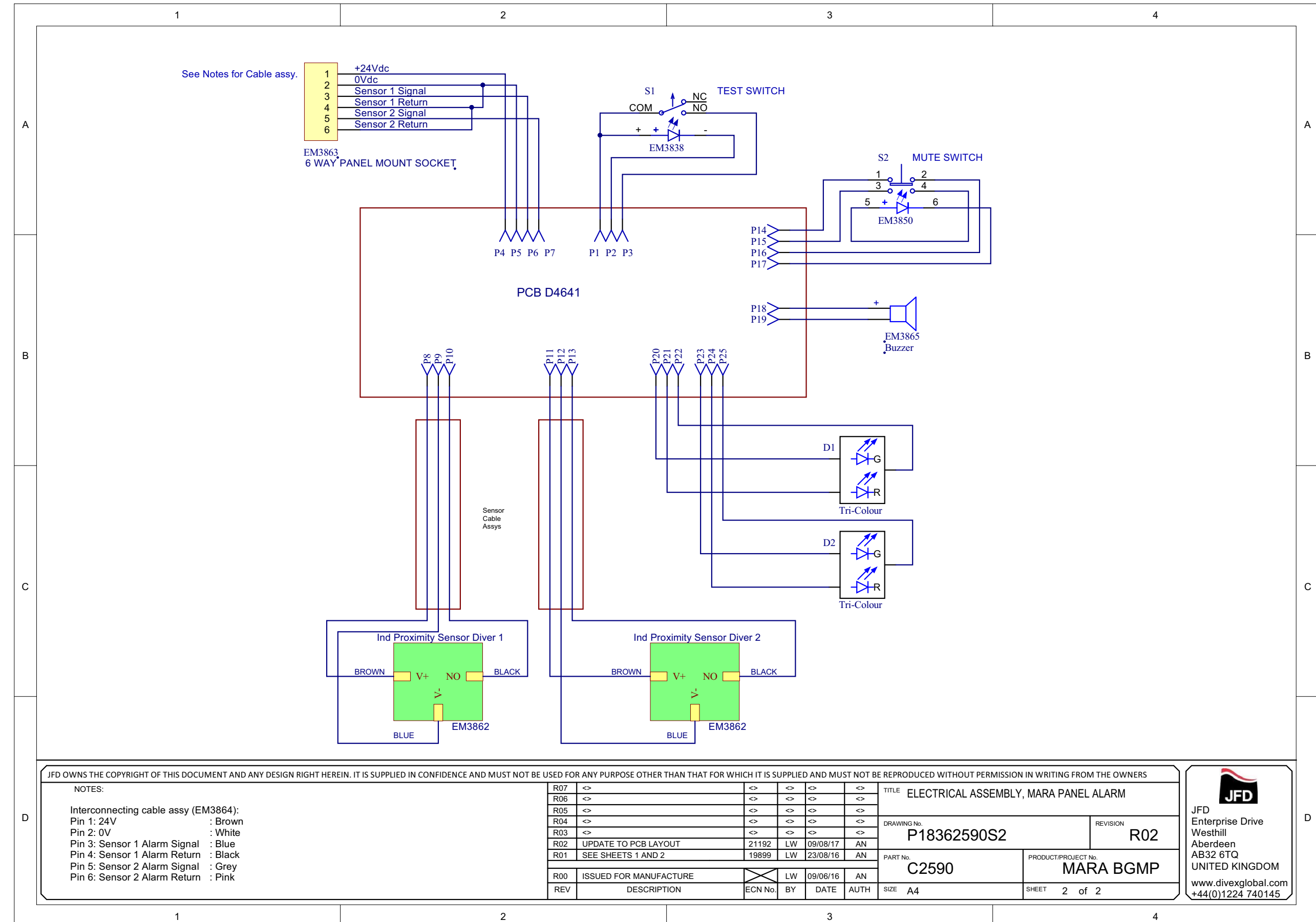
NOTES:

						TITLE		<div><p>JFD WESTHILL ENTERPRISE DRIVE, WESTHILL, ABERDEEN, AB32 6TQ, UK</p><p>TEL: +44 (0)1224 740145 E: enquiries@jfdglobal.com W: jfdglobal.com</p></div>	6
						SHUTTLE BLOCK ASSY, MARA PANEL C/W AV ALARM			
R00	ISSUED FOR MANUFACTURE		DR	27/07/17	AN	DRAWING NO.	REV		
REV	DESCRIPTION	ECN	BY	DATE	AUTH.	P2175102S2	R00		
		THIRD ANGLE PROJECTION		DO NOT SCALE DRAWING		PART NO. A46983102	PRODUCT / PROJECT NO. MARA BGMP		
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E		E				G		H	

Electrical Assembly, MARA Panel Alarm P18362590
Sheet 1 of 2

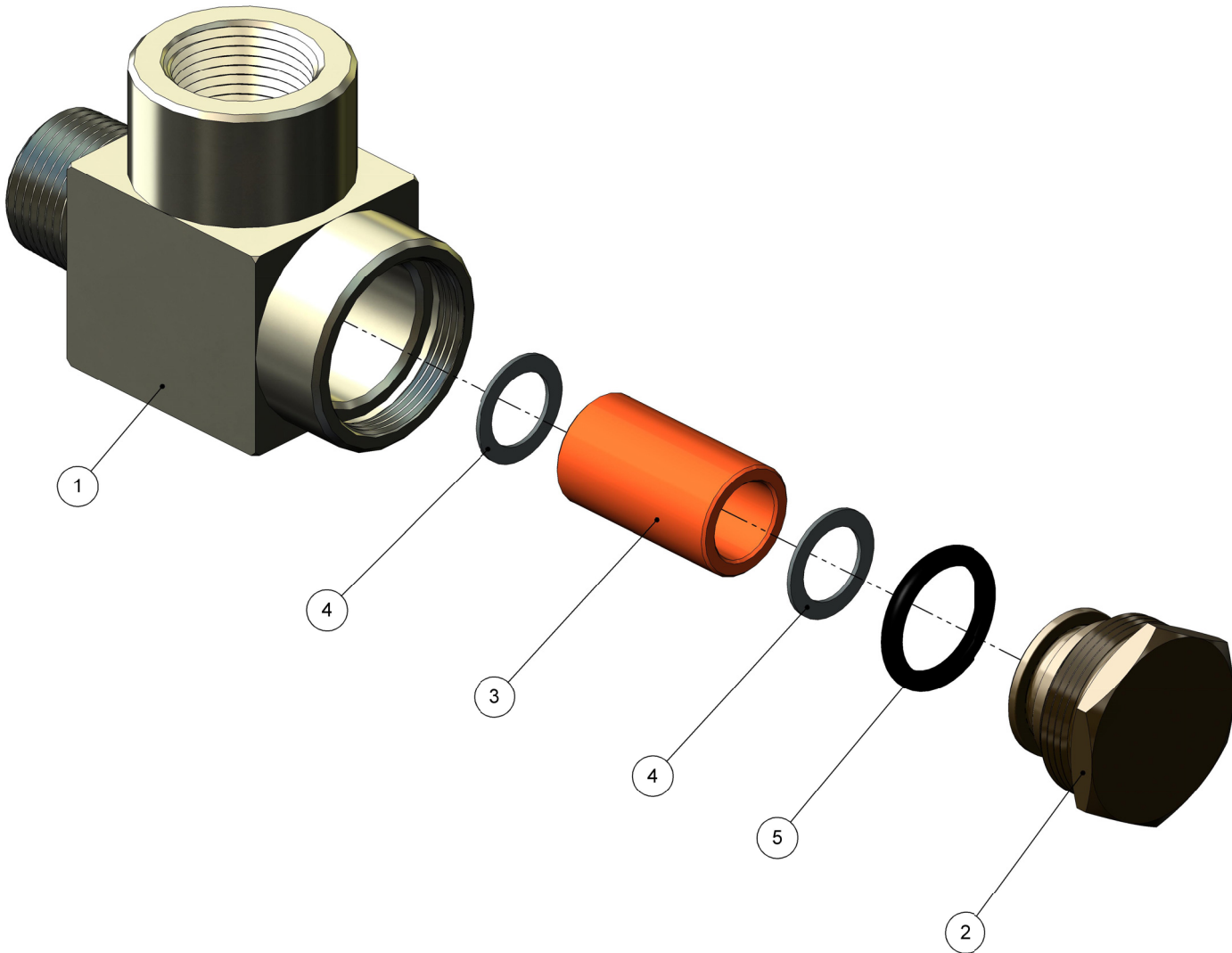
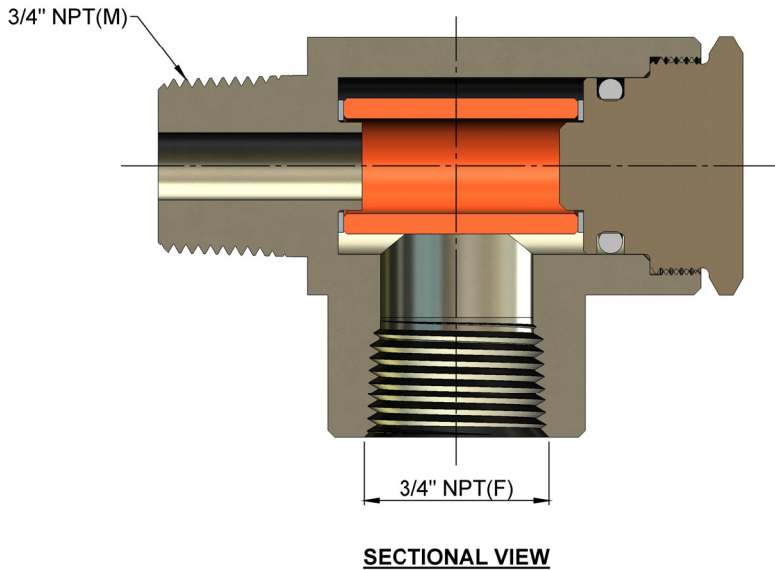


Sheet 2 of 2

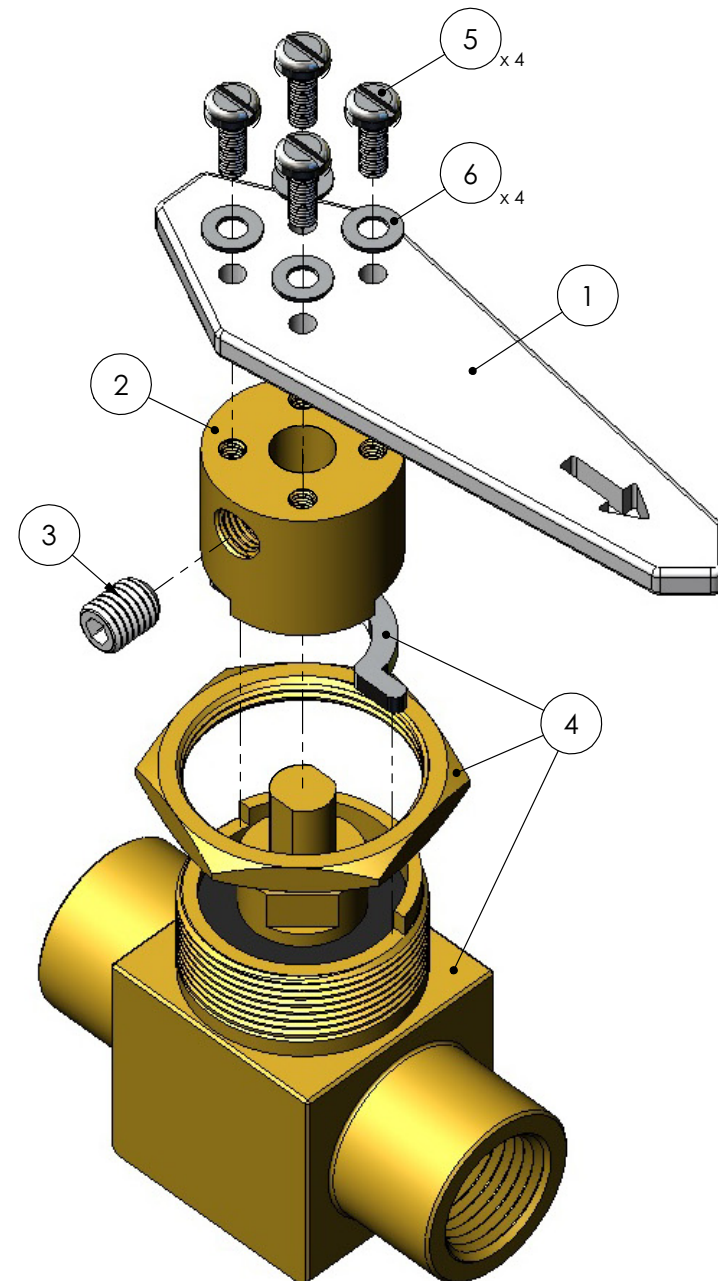


Filter Assembly, 3/4" NPT Male/Female P21754005

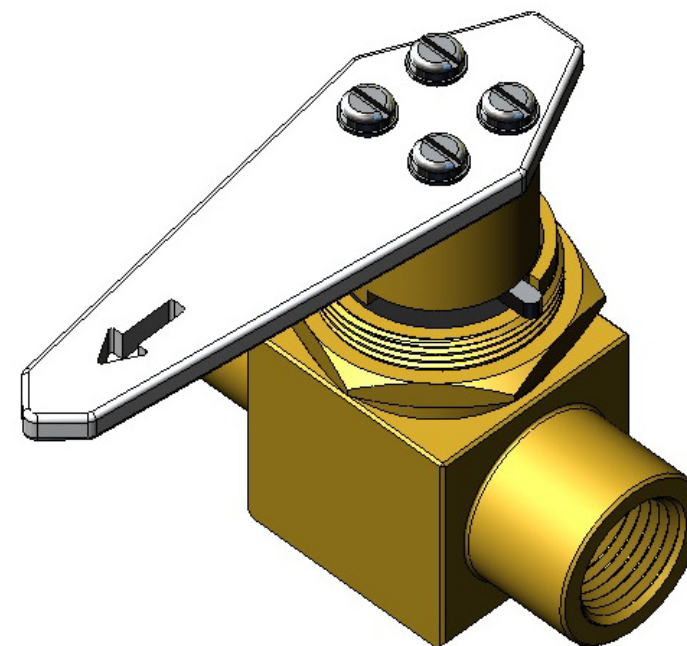
ITEM No.	PART No.	DESCRIPTION	Qty.
1	F4609	Housing, Filter	1
2	F4610	Cap, Element Retaining, Filter Housing	1
3	FE025	Element, Filter, 55 - 65 Microns	1
4	FW076	Washer, Flat, Copper, Annealed	2
5	RN210-7	O-Ring	1



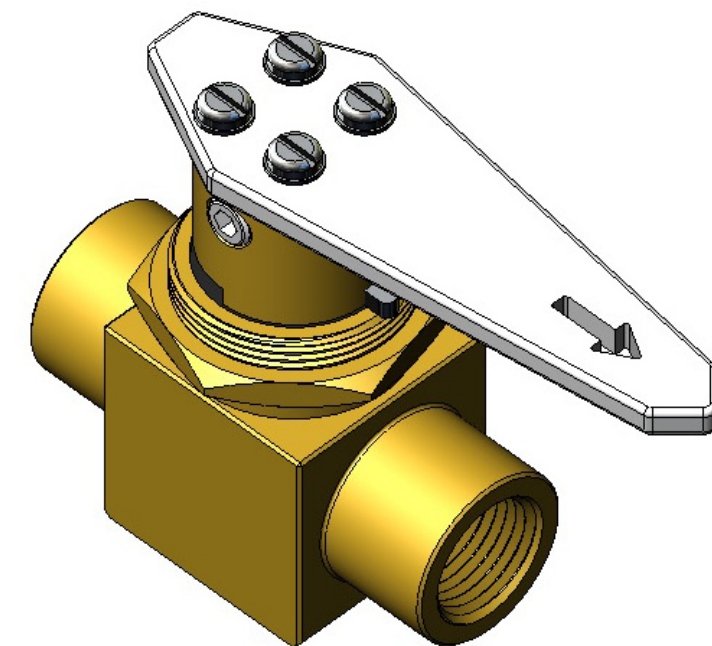
Modified Ball Valve Assembly, ACW On, Outward Arrow P2175201




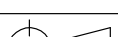
ITEM	PART No.	DESCRIPTION	Qty.
1	D4627	Handle, Valve, Outward Arrow Cut-Out	1
2	D46280	Boss, Valve Handle, ACW ON	1
3	FB237	Screw, Socket Set, Flat Bottom, M8 x 10 Lg.	1
4	VB402	Valve, Ball, Whitey, 1/2"NPT(F) Series 40, Brass	1
5	FB168	Screw, Pan Hd. M4 x 12 Lg. 316L St. Steel	4
6	FW131	WASHER, PLAIN, SS316, M4	4



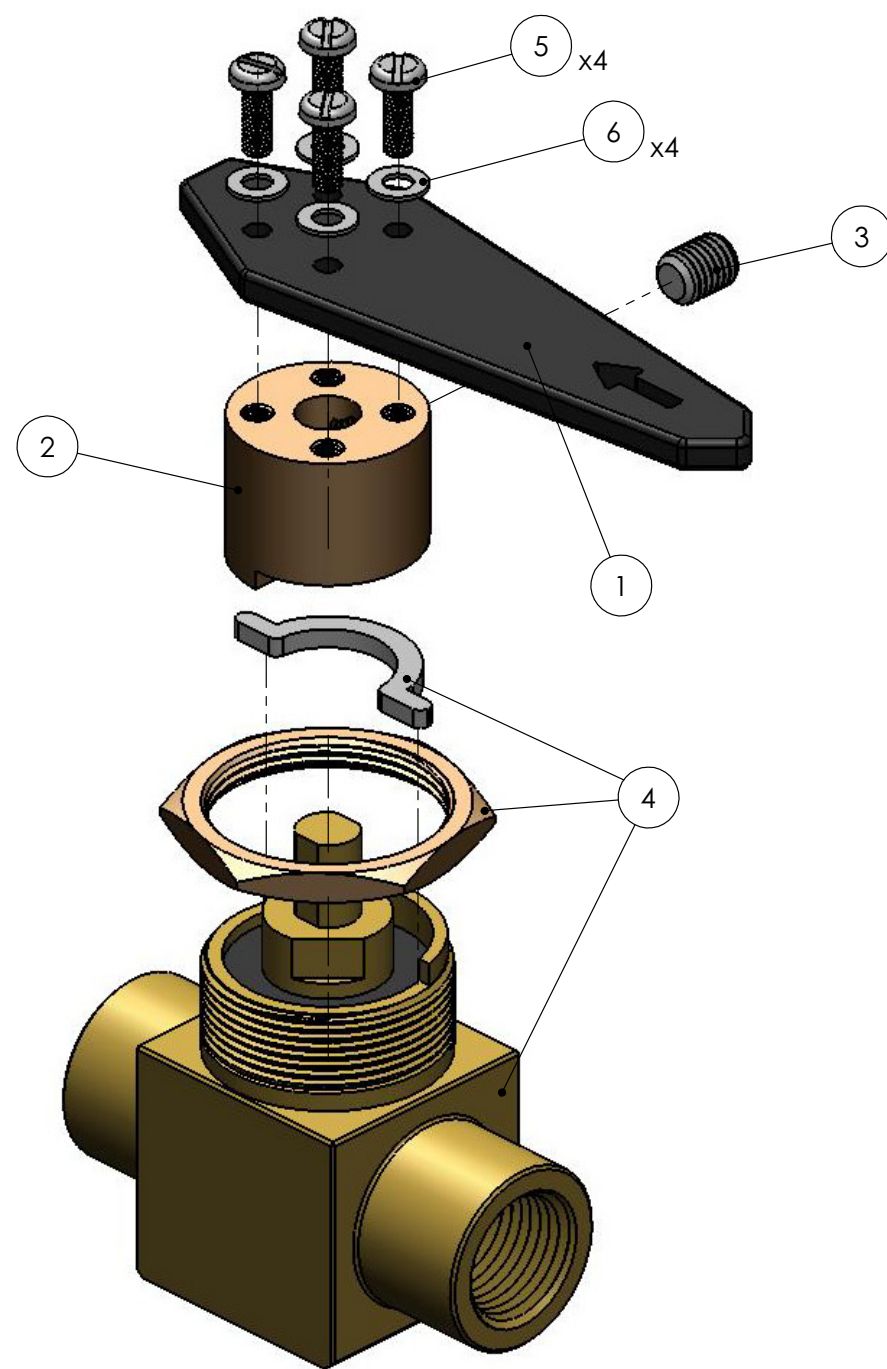
**VALVE SHOWN IN
'CLOSED' POSITION**



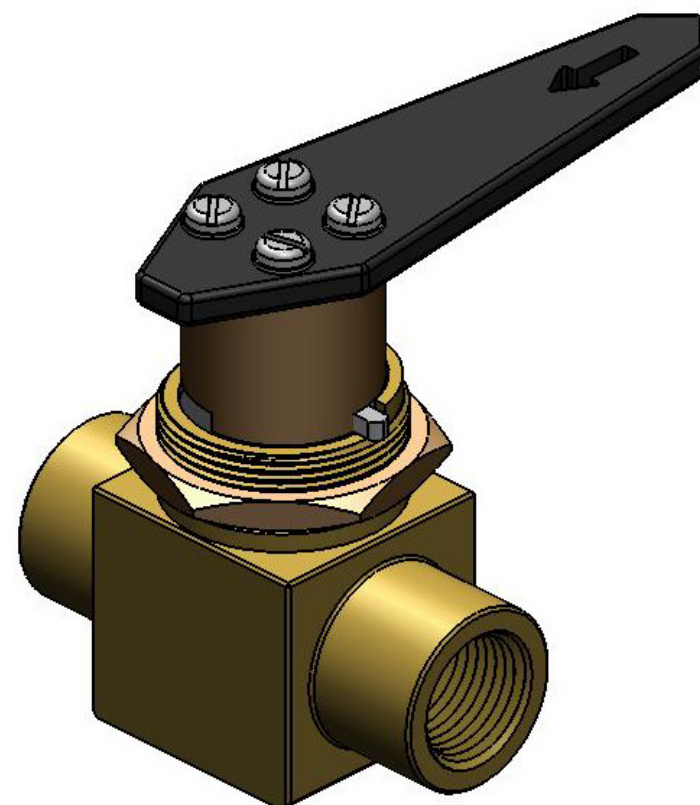
**VALVE SHOWN IN
'OPEN' POSITION**

			REFER TO PARTS LIST		MATERIAL:		DIVEX OWNS THE COPYRIGHT OF THIS DOCUMENT AND ANY DESIGN RIGHT EMBODIED HEREIN. IT IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED WITHOUT PERMISSION IN WRITING FROM THE OWNERS		<div><div>DIVEX LIMITED ENTERPRISE DRIVE WESTHILL ABERDEEN, AB32 6TQ UNITED KINGDOM. TEL : +44 (0)1224 740145 FAX : +44 (0)1224 740172 email : info@divex.co.uk www.divex.co.uk</div></div>		A3				
					ALL DIMENSIONS IN MM (UOS)		SCALE	PRODUCT	TITLE						
							1 : 1	MARA							
					R02		ORIENTATION OF VALVE HANDLE CORRECTED	9823	FINISH: -		REMOVE SHARP EDGES & BURRS		PART No.		DM47100
REV		DESCRIPTION OF REVISION		ECN			DIMENSIONAL TOLERANCES: NO DECIMAL PLACES ±1.0 ONE DECIMAL PLACE ±0.2 TWO DECIMAL PLACES ±0.05 ANGULAR TOLERANCE ±0.5°				DRAWN BY K.Baxter		DATE 21/05/2008		
<div><div>3RD ANGLE PROJECTION</div></div>			DO NOT SCALE DRAWING							DRG No.		SHEET		REV	
										P2175201S1		1 of 1		R02	

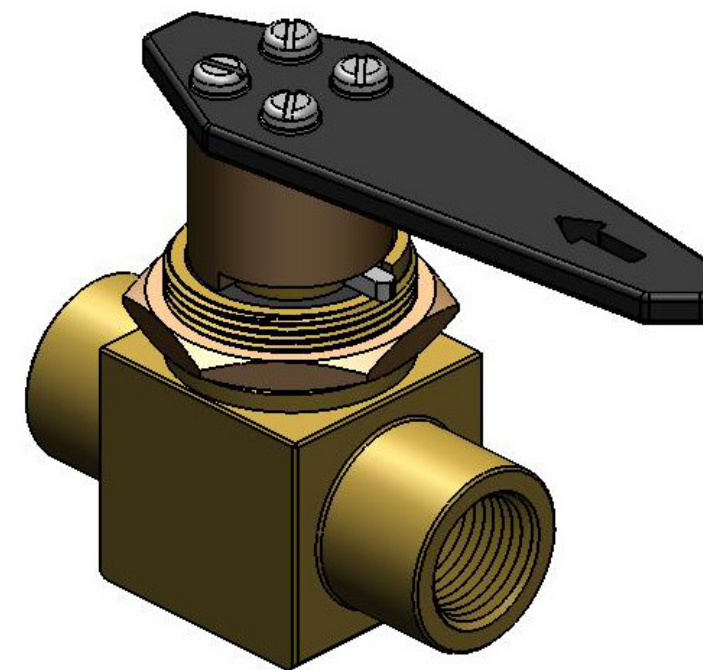
Ball Valve, Modified Assembly, CW On, Inward Arrow P2175204





ITEM No.	PART No.	DESCRIPTION	Qty.
1	D4633	HANDLE, VALVE, INWARD ARROW CUTOUT, BELL PANEL	1
2	D4634	BOSS, VALVE HANDLE, CW ON, BELL PANEL	1
3	FB237	SCREW, SOCKET SET, FLAT BOTTOM, M8 x 10 LONG	1
4	VB402	VALVE, BALL, WHITEY, 1/2"NPTF, BRASS, SERIES 40	1
5	FB168	SCREW,M/C,PAN HD, M4 X 12, 316L ST. STEEL	4
6	FW131	WASHER, PLAIN, SS316, M4	4



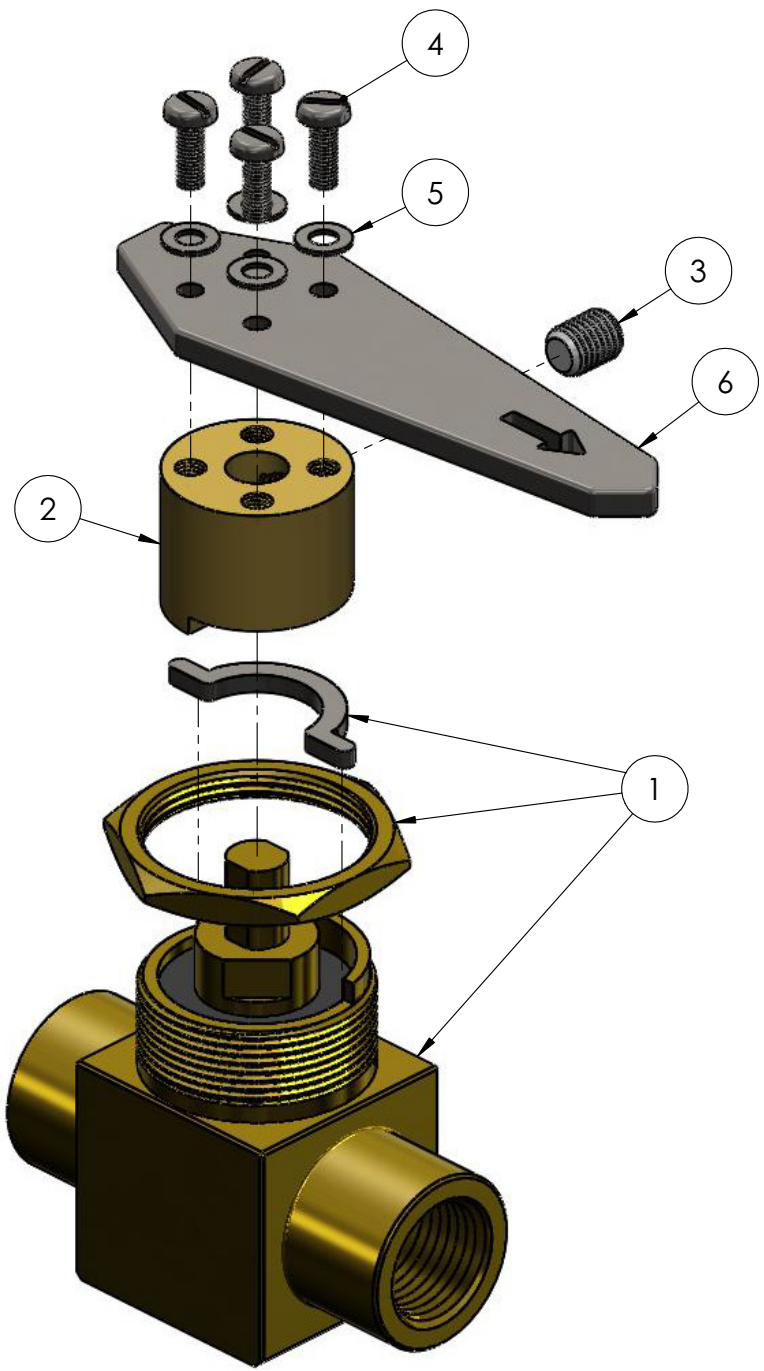
**VALVE SHOWN IN
'CLOSED' POSITION**



**VALVE SHOWN IN
'OPEN' POSITION**

NOTES :					MATERIAL: REFER TO PARTS LIST	DIVEX OWNS THE COPYRIGHT OF THIS DOCUMENT AND ANY DESIGN RIGHT EMBODIED HEREIN. IT IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED WITHOUT PERMISSION IN WRITING FROM THE OWNERS			<div><div>DIVEX LIMITED ENTERPRISE DRIVE WESTHILL ABERDEEN, AB32 6TQ UNITED KINGDOM. TEL : +44 (0)1224 740145 FAX : +44 (0)1224 740172 email : info@divex.co.uk www.divex.co.uk</div></div> <div>A3</div>		
						ALL DIMENSIONS IN MM (UOS)	SCALE	PRODUCT	TITLE BALL VALVE, MODIFIED ASSEMBLY, CW ON, INWARD ARROW		
							1:1	MARA			
						ALL DIMENSIONS BEFORE PLATING (UOS)	PART No. DM47110				
		R02	BOSS ROTATED TO CORRECT POSITION	9823	REMOVE SHARP EDGES & BURRS						
REV	DESCRIPTION OF REVISION	ECN	FINISH: N/A	DIMENSIONAL TOLERANCES: NO DECIMAL PLACES ±1.0 ONE DECIMAL PLACE ±0.2 TWO DECIMAL PLACES ±0.05 ANGULAR TOLERANCE ±0.5°		DRAWN BY M.McCaskill	DATE 22/05/2008	DRG No. P2175204S1	SHEET 1 of 1	REV R02	
<div>3RD ANGLE PROJECTION</div> <div>DO NOT SCALE DRAWING</div>											

Ball Valve, Assembly, CW On, Outward Arrow P2175205



ITEM NO.	PART NUMBER	Description	QTY.
1	VB402	VALVE, BALL, WHITEY, 1/2"NPTF, BRASS, SERIES 40	1
2	D4634	BOSS, VALVE HANDLE, CW ON, BELL PANEL	1
3	FB237	SCREW, SOCKET SET, FLAT BOTTOM, M8 x 10 LONG	1
4	FB168	SCREW,M/C,PAN HD, M4 X 12, 316L ST. STEEL	4
5	FW131	WASHER, PLAIN, SS316, M4	4
6	D4627	HANDLE, VALVE, OUTWARD ARROW CUTOUT, BELL PANEL	1



VALVE SHOWN IN
'CLOSED' POSITION



VALVE SHOWN IN
'OPEN' POSITION

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NOTES	ALL DIMENSIONS SHOWN ARE IN MM (UOS) ALL DIMENSIONS BEFORE PLATING (UOS) REMOVE ALL SHARP EDGES AND BURRS		MATERIAL SEE PARTS LIST		R06 R05 R04 R03 R02 R01		TITLE BALL VALVE, ASSEMBLY, CW ON, OUTWARD ARROW	
	DIMENSIONAL TOLERANCES MACHINING NO DECIMAL PLACES ±1.0 ONE DECIMAL PLACE ±0.2 TWO DECIMAL PLACE ±0.05 ANGULAR TOLERANCE ±0.5°		FINISH N/A		R00 ISSUED FOR MANUFACTURE ECN No. BY DATE AUTH. BY		DRAWING No. P2175205S1 REV R00	
	FABRICATION SIZE >0 <100 ±0.5 SIZE >100 <500 ±1.5 SIZE >500 ±3.0 ANGULAR TOLERANCE ±0.5°		THIRD ANGLE PROJECTION		PART No. DM47111		PRODUCT / PROJECT No. MARA	
					DO NOT SCALE DRAWING		SIZE A3 SCALE 1:1 SHEET 1 OF 1	



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PCB, MARA Panel, Alarm, Routing, Assembled DO4641500

