2.4 Modifications to the product

Changes or modifications made to the product by unauthorised persons may lead to malfunctions and are prohibited for safety reasons.

2.5 Use of spare parts and accessories

Use of unsuitable spare parts and accessories may cause damage to the product.

Use only the manufacturer's genuine spare parts and accessories (refer to chapter 9, page 11).

2.6 Liability information

The manufacturer shall not be liable for any direct or consequential damage resulting from failure to observe the technical instructions, guidelines and recommendations.

The manufacturer and the sales company shall not be liable for costs or damages incurred by the user or by third parties in the use or application of this device, particularly in case of improper use of the device, misuse or malfunction of the connection, malfunction of the device or of connected devices. The manufacturer or the sales

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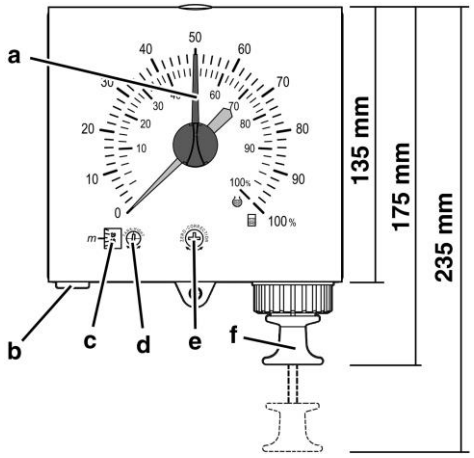
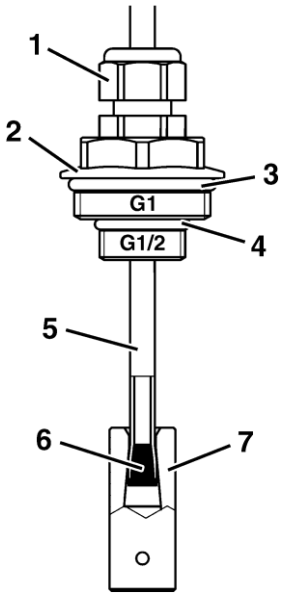
3 Product description



a Reference pointer
b Capillary connection
c Adjustment scale for measuring range
d Adjustment screw for measuring range
e Adjustment screw for zero point correction
f Pump plunger



1 Cable gland PG9
2 Screw-in tank adapter G½-G1
3 O ring Ø 30 x 3 mm
4 O ring Ø 18 x 2,5 mm
5 Stand pipe
6 Conical washer
7 Balance chamber

The gauge measures the hydrostatic liquid pressure at the tank bottom. The pressure varies according to liquid height and specific gravity of the medium to be measured. The pressure is measured approx. 20 mm above the tank bottom and displayed on the gauge dial.

When operating the pump of the gauge a pneumatic pressure is built up in the capillary measuring line until that pressure is equal to the liquid head pressure at the bottom of the tank. The pressure created by the pump has displaced the liquid in the capillary tubing inside the tank and the air bubbles out of the end of the standpipe in the tank. The pointer has reached its highest indication point and stops at that level.

The gauge enables the user to obtain a relatively accurate consumption control thereby allowing a timely reordering of fuel. The driver of the oil delivery vehicle can use the gauge to check whether the tank can accept the ordered quantity of fuel.

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4 Specifications

Parameter	Value
General	
Dimensions housing (W x H x D)	145 x 135 x 65 mm
Weight	400 g
Housing material	Impact resistant plastic
Remote indication	Up to 50 m
Measuring range	Fully adjustable: 900-3000 mm tank height for measurement of fuel oil EL or diesel fuel with an average density of 840 kg/m³ at +15 °C
Mechanism	Linear capsule type, overpressure protected
Accuracy	± 3 % of full scale value
Indication	Standard: 0-100 %-liquid height for rectangular and horizontal cylindrical tanks For additional slide-in scales with indication in litres for standardised tanks as well as special slide-in scales see chapter 9, page 11.
Operating temperature range	
Ambient	-5 °C to +55 °C

Tubing kit materials	
Stand pipe	PVC, Ø 4 x 1 mm
Conical washer	POM
Balance chamber	Stainless steel
O rings	NBR
Screw-in tank adapter	PA6

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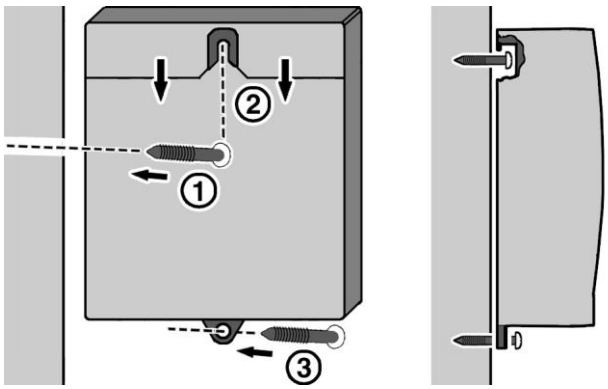
5 Installation and commissioning

5.1 Installing the device

Protect the gauge from rain and direct sunshine.



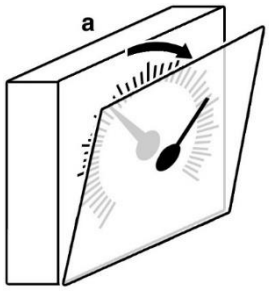
1 Drive screw into wall.

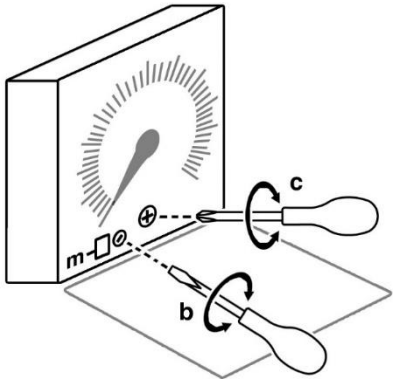
2 Hang housing onto screw.

3 Fix housing to wall with screw through lower fixing lug.

5.2 Adjusting the measuring range and the Zero correction

The accuracy of the gauge measurement is dependent on the exact adjustment of the measuring range and the Zero correction.





1. Determine measuring range:
Fuel oil EL and diesel fuel: Measuring range = Tank height. Other liquids: See table 4, page 12.
2. Remove front glass (**a**).
3. Adjust measuring range accurately (**b**).
4. Tap housing gently on the side.
5. Adjust Zero correction (**c**): Set pointer to “0” by turning screw either to the left or right by maximum 1 full turn.
6. If applicable, insert slide-in-scale and then refit front glass.

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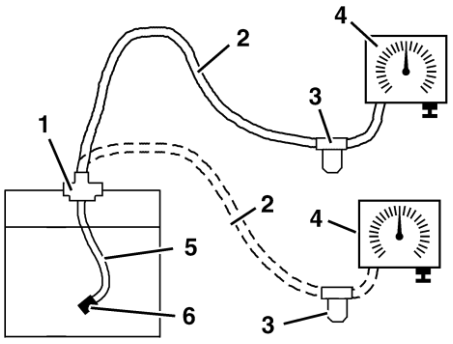
5.3 Installing capillary line

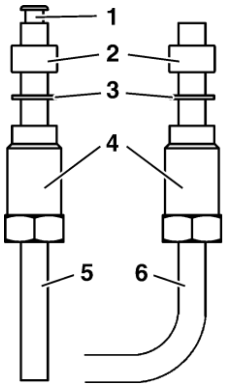


1	Screw-in tank adapter
2	Capillary tubing
3	Condensate trap
4	Unitel
5	Stand pipe
6	Balance chamber

If no separate gauge connection socket is provided on the tank, it is possible to combine a number of capillary lines by connecting a Euroflex 3 combination fitting to a G1"-socket on the tank.

If required, the capillary measuring line can be extended with PE capillary tubing. The maximum distance between tank adapter and the hydrostatic gauge must not exceed 50 m. Connect standpipe to capillary line, using for instance a hose connector.

1. The lower end of the capillary tube should end approx. 2 cm above the lowest point of the tank bottom. Tighten cable gland in order to fix the standpipe in the tank adapter.
2. Screw tank adapter into a vacant boss in the top of the tank.
3. Install capillary line with a steady slope towards the tank, avoiding any kinks or possible water traps in the line.
4. Install a condensate trap if the hydrostatic gauge is mounted below the max. liquid level in the tank or in a place where condensate may collect.
5. Push connector onto capillary tube.
6. Insert capillary line into connector and push in to the stop.
7. Tighten pressure screw gently.



1	Hollow rivet
2	Grommet seal
3	Washer
4	Connector
5	Capillary standpipe
6	Pipe

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6 Operation

The hydrostatic gauge provides a semi-permanent indication. The built-in pump closes off the measuring line when it reaches the end of its travel, the pointer stays temporarily at its last reading and then drops back very slowly. As a result of this the gauge mechanism is protected by an oil-stop air cushion.

Do not operate gauge during a tank filling operation as the gauge will not give a stable reading.

1. Pull out pump plunger to its stop and then release.
2. Repeat this process until the indication is stable.
3. Read tank contents on the dial of the gauge.

If the capillary measuring line has been installed absolutely airtight the pointer of the gauge will continue to show the last reading over a long period of time. In order to obtain an accurate up-to-date reading we recommend that you operate the pump everytime before a reading is taken.

The reference pointer can be adjusted manually. When set to the latest reading it serves for consumption control purposes.

7 Maintenance

When	Activity
Condensate trap contains water.	Empty condensate trap.
At time of tank servicing or tank cleaning.	Check the gauge for correct function and, if necessary, have the instrument readjusted.

8 Troubleshooting

Repair work may only be carried out by qualified, specially trained personnel.

Problem	Possible reason	Remedy
Pointer does not move when pump is operated or drops back again very quickly.	Connections are not airtight or the capillary lines are damged and leaking.	Tighten connections and check capillary lines for air tightness.
	Filling process.	Take measurement after the tank filling process.
Pointer goes beyond the 100 % mark or pump does not return fully to its stop.	Capillary line is either blocked or has a kink in it.	Check that capillary line has no kinks in it and clear any blockage. Install condensate trap.
	Condensate trap full.	Empty condensate trap.
	The wrong measuring range has been adjusted.	Check tank dimensions and correct measuring range, see chapter 5.2, page 7.
Wrong indication.	Measuring range adjusted wrongly.	See above.
	Zero correction not correctly set.	Reset Zero correction, see chapter 5.2, page 7.

Other malfunction. – Return the device to the manufacturer.

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9 Spare parts and accessories

Part	Part No.
Combination fitting Euroflex 3 with capillary tubing 2,15 m	20160
Combination fitting Euroflex 3 with capillary tubing 3,15 m	20164
Montagefix-extension set (10 m PE-capillary tubing 4 x 1 mm with capillary 20132 extension piece)	725...
Additional slide-in scales in litres for standardised tanks	

- When ordering, please specify the shape and capacity of tank.

Special slide-in scales for tanks of any shape and dimension 72599

- When ordering, please specify exact tank shape, size and capacity. 72599

10 Warranty

The manufacturer's warranty for this product is 24 months from date of purchase. This warranty applies to all countries in which this product is sold by the manufacturer or its authorised representatives.

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12 Appendix

12.1 Determining the measurement range

Tank height	Specific gravity (density) of liquid to be measured [kg/m³]							Fuel oil EL/diesel fuel								
[mm]	700	720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000
800													0,90	0,91	0,93	0,95
850											0,91	0,93	0,95	0,97	0,99	1,01
900								0,90	0,92	0,94	0,96	0,99	1,01	1,03	1,05	1,07
950						0,91	0,93	0,95	0,97	1,00	1,02	1,04	1,06	1,08	1,11	1,13
1000				0,90	0,93	0,95	0,98	1,00	1,02	1,05	1,07	1,10	1,12	1,14	1,17	1,19
1100	0,92	0,94	0,97	1,00	1,02	1,05	1,07	1,10	1,13	1,15	1,18	1,20	1,23	1,26	1,28	1,31
1200	1,00	1,03	1,06	1,08	1,11	1,14	1,17	1,20	1,23	1,26	1,29	1,31	1,34	1,37	1,40	1,43
1250	1,04	1,07	1,10	1,13	1,16	1,19	1,22	1,25	1,28	1,31	1,34	1,37	1,40	1,43	1,46	1,50
1300	1,08	1,11	1,14	1,18	1,21	1,24	1,27	1,30	1,33	1,36	1,39	1,42	1,45	1,48	1,52	1,55
1400	1,17	1,20	1,23	1,27	1,30	1,33	1,37	1,40	1,43	1,47	1,50	1,53	1,57	1,60	1,63	1,65
1500	1,25	1,28	1,32	1,36	1,39	1,43	1,46	1,50	1,54	1,57	1,60	1,64	1,68	1,71	1,75	1,79
1600	1,33	1,37	1,41	1,45	1,48	1,52	1,56	1,60	1,64	1,67	1,70	1,75	1,80	1,83	1,85	1,90
1700	1,42	1,46	1,50	1,54	1,58	1,62	1,65	1,70	1,75	1,78	1,82	1,85	1,90	1,95	1,98	2,00
1800	1,50	1,54	1,59	1,63	1,67	1,70	1,75	1,80	1,85	1,89	1,93	1,95	2,00	2,05	2,10	2,15
1900	1,58	1,63	1,67	1,72	1,75	1,80	1,85	1,90	1,95	2,00	2,08	2,12	2,10	2,15	2,20	2,25
2000	1,67	1,70	1,75	1,80	1,85	1,90	1,95	2,00	2,05	2,10	2,15	2,20	2,25	2,30	2,35	2,40
2100	1,75	1,80	1,85	1,90	1,95	2,00	2,05	2,10	2,15	2,20	2,25	2,30	2,35	2,40	2,45	2,50
2200	1,85	1,90	1,95	2,00	2,05	2,10	2,15	2,20	2,25	2,30	2,35	2,40	2,45	2,50	2,55	2,60
2300	1,95	2,00	2,05	2,10	2,15	2,20	2,25	2,30	2,35	2,40	2,45	2,50	2,55	2,60	2,65	2,70
2400	2,00	2,05	2,10	2,15	2,20	2,30	2,35	2,40	2,45	2,50	2,55	2,60	2,70	2,75	2,80	2,85
2500	2,10	2,15	2,20	2,25	2,30	2,40	2,45	2,50	2,55	2,60	2,70	2,75	2,80	2,85	2,90	3,00
2600	2,20	2,25	2,30	2,35	2,40	2,50	2,55	2,60	2,65	2,70	2,80	2,85	2,90	2,95	3,00	
2700	2,25	2,30	2,40	2,45	2,50	2,55	2,65	2,70	2,75	2,85	2,90	2,95	3,00			
2800	2,35	2,40	2,45	2,55	2,60	2,65	2,75	2,80	2,85	2,95	3,00					
2900	2,45	2,50	2,55	2,60	2,70	2,75	2,85	2,90	2,95							
3000	2,50	2,55	2,65	2,70	2,80	2,85	2,95	3,00								
3100	2,60	2,65	2,75	2,80	2,90	2,95										
3200	2,65	2,75	2,80	2,90	2,95											
3300	2,75	2,85	2,90	3,00												
3400	2,85	2,90	3,00													
3500	2,90	3,00														
3600	3,00															

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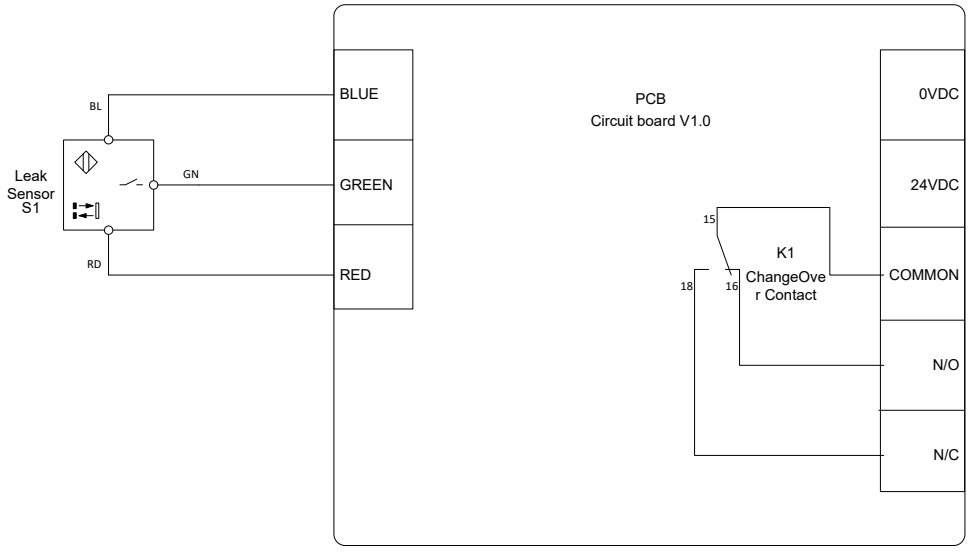
The sensor body is in a durable cast alloy body. The Photo-transistor trigger provides digital output indicating presence or absence of liquid to the internal circuit. In normal state when no liquid is detected the relay is energised when there is a power supply connected to the sensor. Should the power supply fail or the sensor the relay leak alarm signal is deenergised thus indicating a fault or a leak. When assembling box ensure all gaskets and glands are in place and sealed.

DC Supply 8-30VDC
Load 120mA
Temperature operating range -10 °C to 50 °C
IP67 rated enclosure
Conformal coated PCB
Leak alarm volt-free contacts 2A @250VAC resistive

Contact specification
Contact configuration 2 CO (DPDT)
Rated current/Maximum peak current A 2/3
Rated voltage/
Maximum switching voltage V AC 125/250
Rated load AC1 VA 125
Rated load AC15 (230 V AC) VA 25
Single phase motor rating (230 V AC) kW —
Breaking capacity DC1: 30/110/220 V A 2/0.3/—
Minimum switching load mW (V/mA) 10 (0.1/1)
Standard contact material AgNi + Au



Title	Liquid leak sensor	Project		Drawing No	7000-LS-007	Edited	27 Jun 2017	Scale	1 : 1
		Client	Bells Power Group Ltd	Drawn	H.J.G.	Created	9 May 2017	Page	1 of 1

Duplex Basket Strainers

Application

Duplex Basket Strainers are designed for applications where continuous flow must be maintained whilst cleaning filter baskets. The strainer uses integral 3 way stainless steel ball valves with PTFE seals. This design provides drop tight shutoff eliminating costly and potentially dangerous leakage into the chamber not in use which can occur in some other duplex strainer designs. This also eliminates some problems which can occur in particular suction conditions where in other designs air ingress could occur. All parts of the valve mechanism are accessible after removing the basket chamber without taking the strainer out of the pipeline. The handle covers the strainer chamber when in use and prevents accidental opening of the filter cover.

- Available in cast iron, bronze, carbon and stainless steel.
- Pipeline sizes from 20mm (3/4”) to 200mm (8”) (ask for details of sizes above 200mm).

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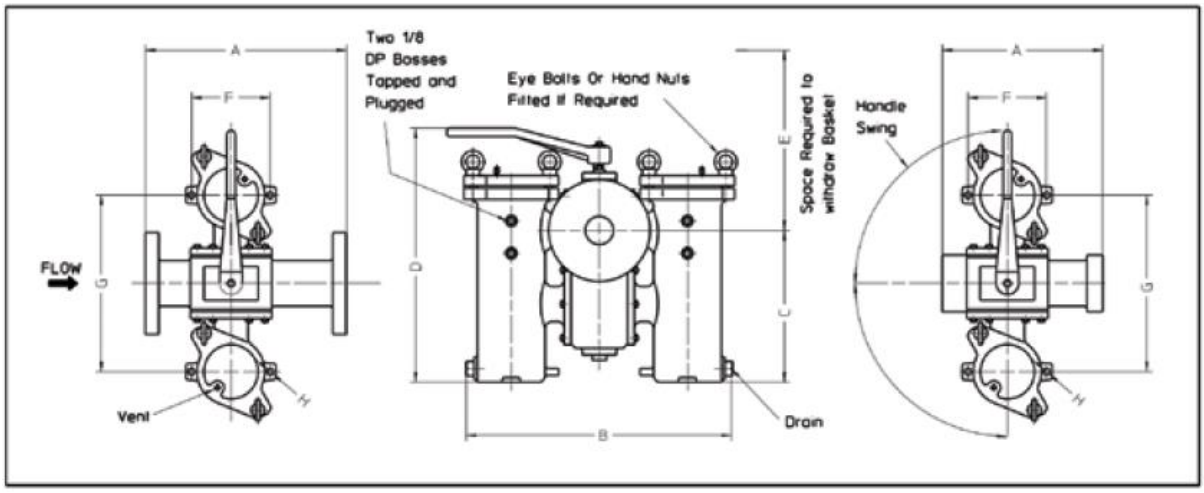
• Available flanged in all common drillings including PN16 and ANSI150 (ANSI300 and 600 on request) and screwed ports both BSP and NPT or socket weld.
• XD range up to 13.8 Barg (pressure stated at 50C, lower pressure at higher temperatures, ask if unsure). Temperature limited by chosen seal. Pressure also limited by flange rating. 200mm and above lower working pressure.
• Large filter baskets areas, manufactured in st. steel 316.
• Various options including differential pressure indicator, magnets and heating jackets.
• Can be coated internally and externally.

Dimensional Data



Bore Size	Flanged Filters	Threaded Filters	Common Dimensions (mm)							Basket Area	Mass (dry)	
											Flanged	Screwed
	A	A	B	C	D	E	F	G	H	CM sq	kg	kg
DN20/25	178	142	329	148	305	243	-	224	-	130	21	19.8
DN32/40	238	191	384	205	377	335	136	260	12	243	33.5	31.7
DN50	270	254	468	271	471	400	158	310	14	425	55	54
DN65	343	292	560	347	579	538	158	310	14	701	107.5	103
DN80	343	-	560	347	579	538	196	370	14	701	108	-
DN100	406	-	682	403	649	637	228	464	17	1057	169.5	-
DN150	559	-	897	621	905	640	310	600	24	2060	390	-
DN200	680	-	1368	772	1146	820	416	834	24	4161	763	-
DN250	928	-	1520	731	1226	820	500	1000	22	5774	900	-

N.B. Table data refers to PN16 & ANSI125/150 only

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Basket and Mesh Data

Meshes per linear inch	Size of aperture
20 mesh	0.91mm
30 mesh	0.56mm
40 mesh	0.38mm
60 mesh	0.25mm
80 mesh	0.19mm
120 mesh	0.13mm
200 mesh	0.08mm
300 mesh	0.05mm

The chart is for water (1cSt) flowing through a filter with an element coarser than 1 millimetre perforations. For correction factors for varying viscosity/mesh size, please see our Simplex data sheet.

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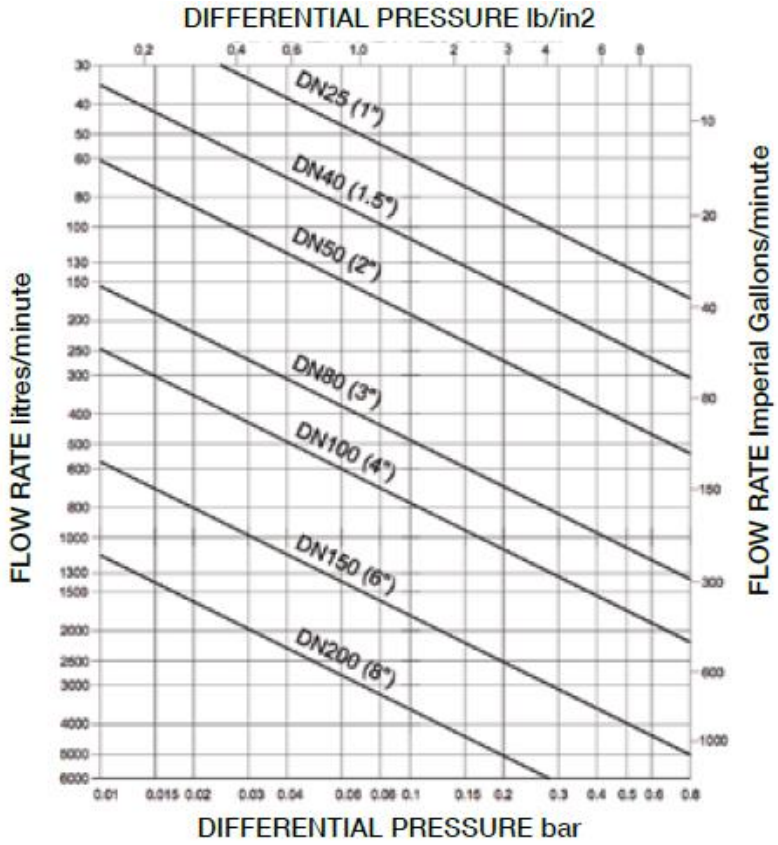
Flow Chart for Duplex Basket Strainers



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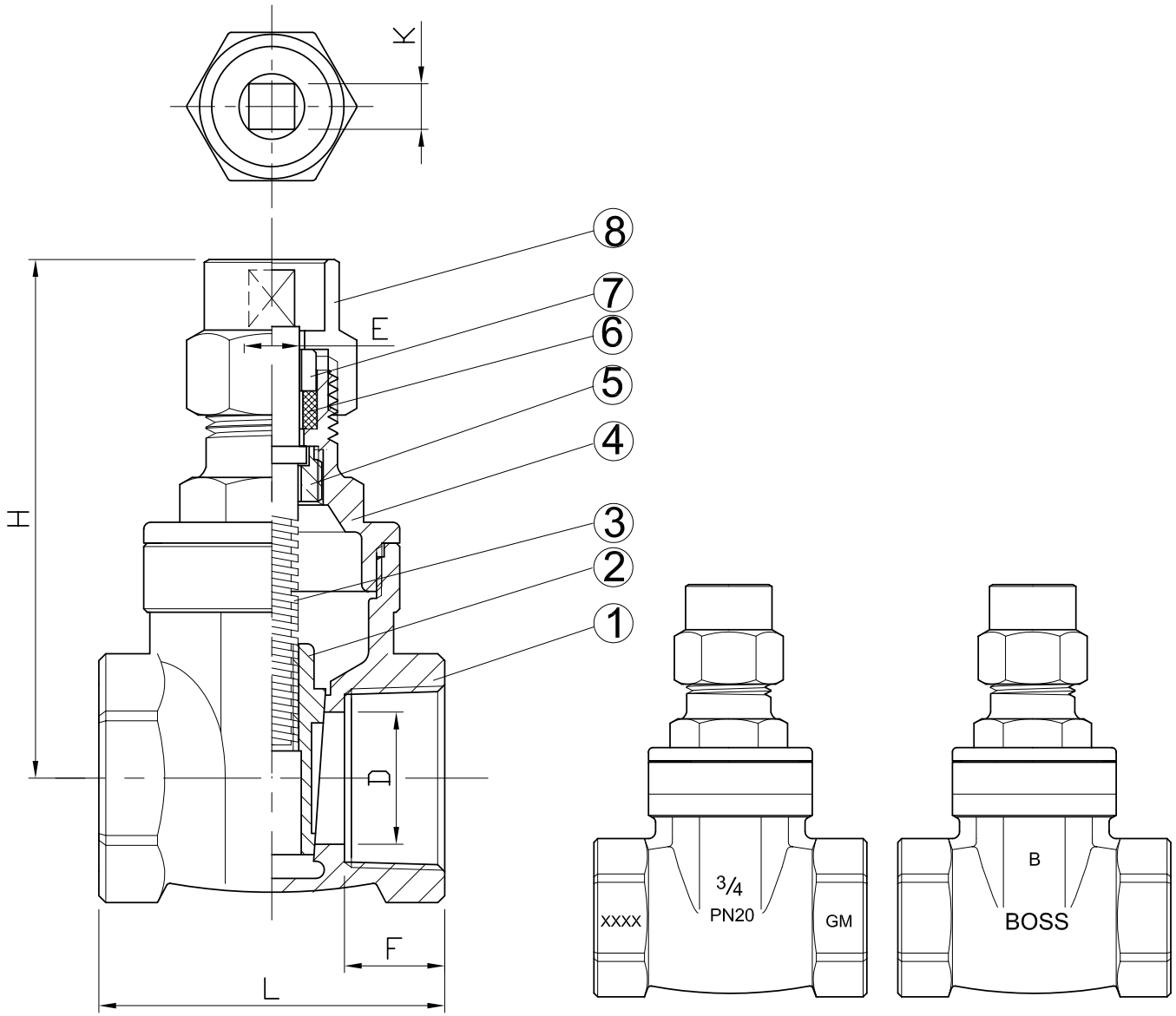

DIMENSIONS (mm)

SIZE	L	H	D	F	E	K
1/2"	50	63	12.7	13.8	7.9	6.77 6.70
3/4"	54	74	19.1	14.5	8.9	6.77 6.70
1"	62	87	25.4	17.8	10	8.00 7.92
1¼"	68.5	100	31.8	18.1	11	8.77 8.71
1½"	72.5	115	38.1	19.1	12.2	9.52
2"	87	135	50.8	20.1	13.5	9.52

MATERIALS LIST

NO	PART	MATERIAL
1	BODY	BS EN.1982 CC491K
2	DISC	BS EN.1982 CC491K
3	STEM	BS EN.12164 CW614N
4	BONNET	BS EN.1982 CC491K
5	LOCK NUT	BS EN.12164 CW614N
6	PACKING	GRAPHITE
7	GLAND	BS EN.12164 CW614N
8	LOCKSHIELD	BS EN.12164 CW614N

1.BS5154/B PN20 STANDARD

2.Pressure

Shell Test Pressure 30 bar
Seat Test Pressure 22 bar

3. FEMALE THREADED ENDS COMPLYING WITH BS21 [ISO 7]

BRONZE PN20 GATE VALVE (LOCKSHIELD)

25SMLS

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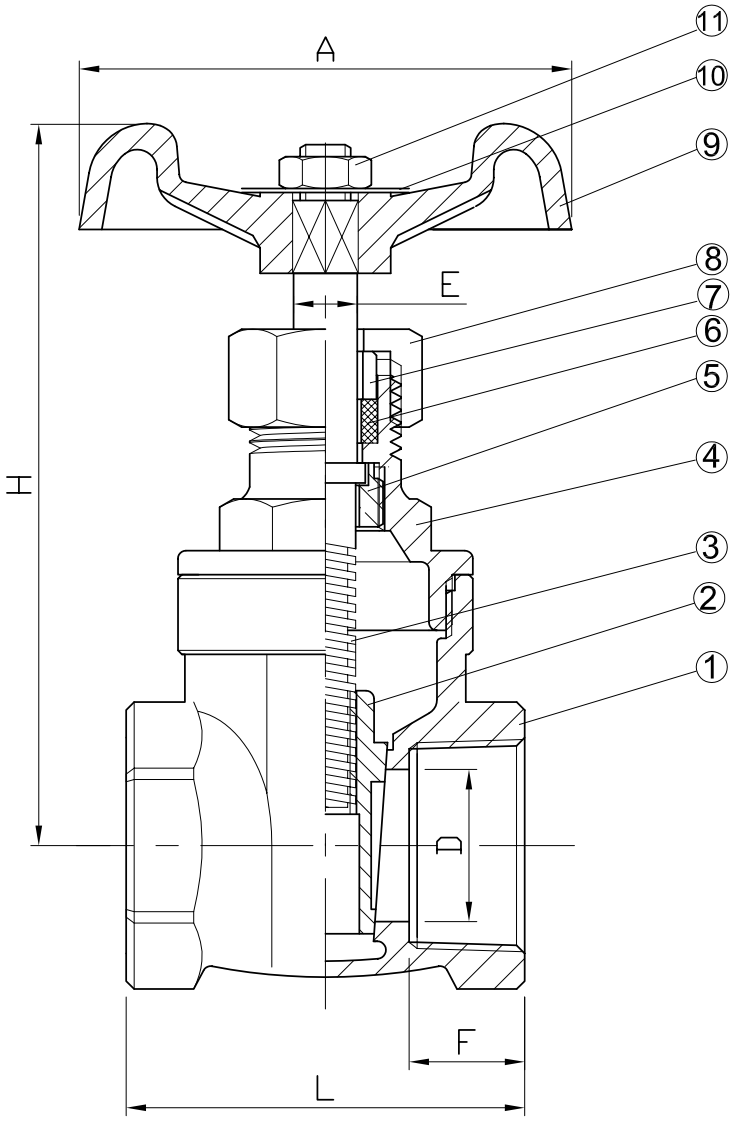
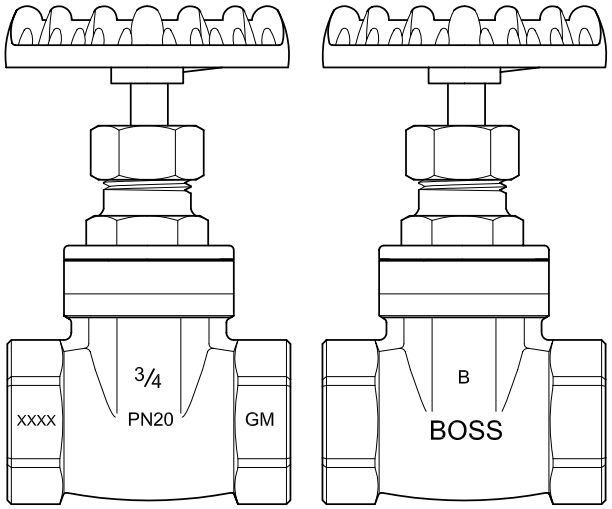
TEL: 886-4-7715522.7715945
FAX: 886-4-7715008





DIMENSIONS IPS(mm)

SIZE	ITEM No.	L	D	H	A	F	Weight(Kg)
½	AGV543	50	12.7	80	50	13.8	0.3
¾	AGV544	52	19	90	63	14.5	0.43
1"	AGV545	65	25.4	120	66	17.8	0.67
1¼	AGV546	66	31.7	120	76	18.1	0.91
1½	AGV547	68	38.1	130	88	19.1	1.2
2"	AGV548	80	50.8	170	100	20.1	2.07
2½	AGV549	102	63.5	210	117	29	3.78
3"	AGV550	110	76.2	223	127	30.5	5.06
4"	AGV511	120	96	274	154	35	7.1

MATERIALS LIST

NO	PART	MATERIAL
1	BODY	BS EN.1982:CC491K
2	DISC	BS EN.1982:CC491K
3	STEM	BS EN.12164 CW614N
4	BONNET	BS EN.1982:CC491K
5	LOCK NUT	BS EN.12164 CW614N
6	PACKING	GRAPHITE
7	GLAND	BS EN.12164 CW614N
8	PACKING NUT	BS EN.12164 CW614N
9	NAME PLATE	ALUMINUM
10	HANDWHEEL	CAST IRON
11	HANDLE NUT	STEEL

1.BS5154/B PN20 STANDARD

2.Pressure

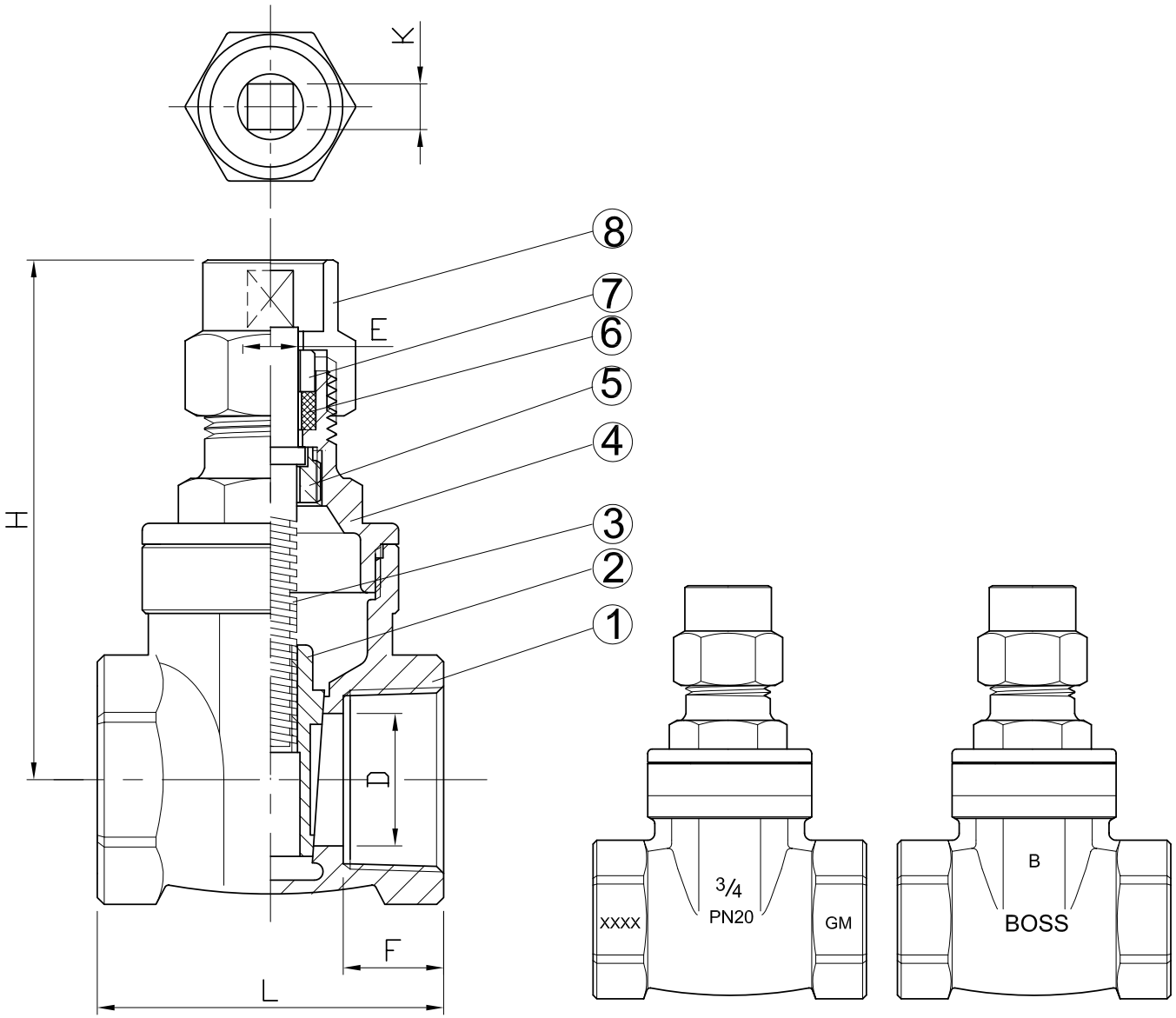
Shell Test Pressure 30 bar
Seat Test Pressure 22 bar

3. FEMALE THREADED ENDS COMPLYING WITH BS21 [ISO 7]

BRONZE PN20 GATE VALVE

25SM

萬彰五金股份有限公司
BAN CHANG HARDWARE CO.,LTD.
17. LANE 620. SEC 3. LU HO ROAD .LUKANG
CHANGHUA. TAIWAN. R.O.C.
TEL: 886-4-7715522.7715945
FAX: 886-4-7715008



DIMENSIONS (mm)

SIZE	L	H	D	F	E	K
1/2"	50	63	12.7	13.8	7.9	6.77 6.70
3/4"	54	74	19.1	14.5	8.9	6.77 6.70
1"	62	87	25.4	17.8	10	8.00 7.92
1¼"	68.5	100	31.8	18.1	11	8.77 8.71
1½"	72.5	115	38.1	19.1	12.2	9.52
2"	87	135	50.8	20.1	13.5	9.52

MATERIALS LIST

NO	PART	MATERIAL
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3	STEM	BS EN.12164 CW614N
4	BONNET	BS EN.1982 CC491K
5	LOCK NUT	BS EN.12164 CW614N
6	PACKING	GRAPHITE
7	GLAND	BS EN.12164 CW614N
8	LOCKSHIELD	BS EN.12164 CW614N

1.BS5154/B PN20 STANDARD

2.Pressure

Shell Test Pressure 30 bar
Seat Test Pressure 22 bar

3. FEMALE THREADED ENDS COMPLYING WITH BS21 [ISO 7]

BRONZE PN20 GATE VALVE (LOCKSHIELD)

25SMLS

萬彰五金股份有限公司
BAN CHANG HARDWARE CO.,LTD.
17. LANE 620. SEC 3. LU HO ROAD .LUKANG
CHANGHUA. TAIWAN. R.O.C.
TEL: 886-4-7715522.7715945
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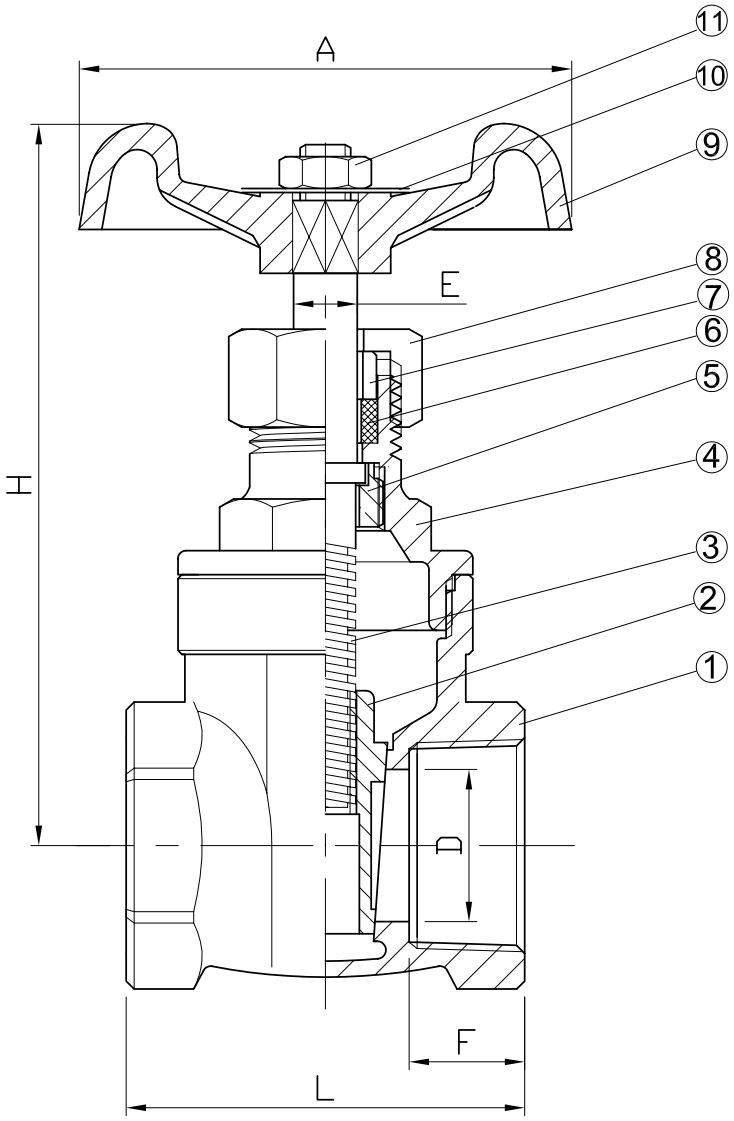

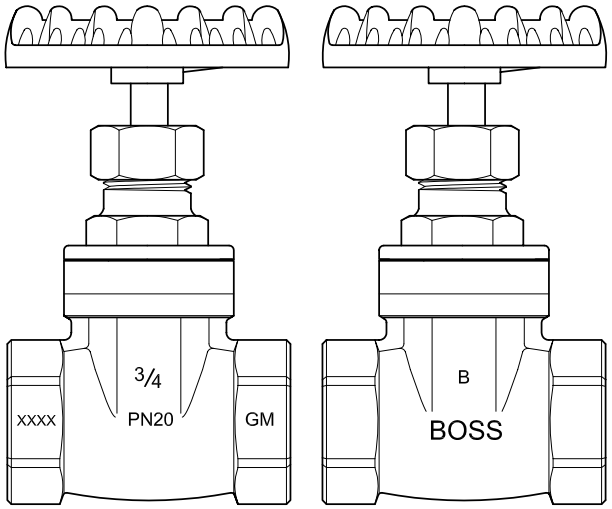

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1.BS5154/B PN20 STANDARD

2.Pressure

Shell Test Pressure 30 bar
Seat Test Pressure 22 bar

3. FEMALE THREADED ENDS COMPLYING WITH BS21 [ISO 7]

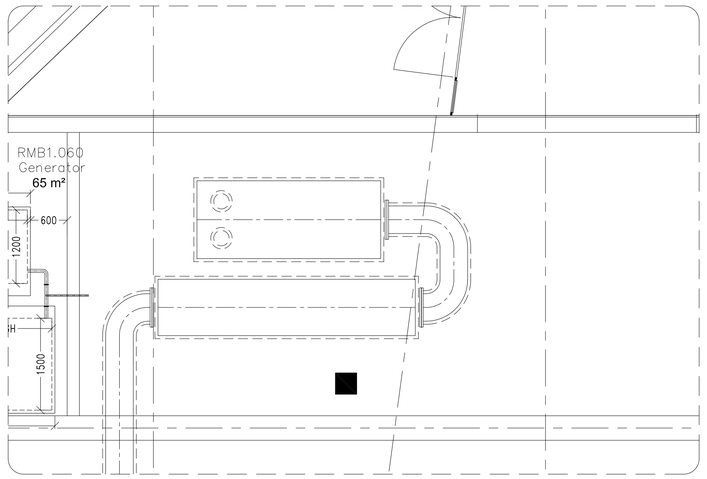
BRONZE PN20 GATE VALVE

25SM

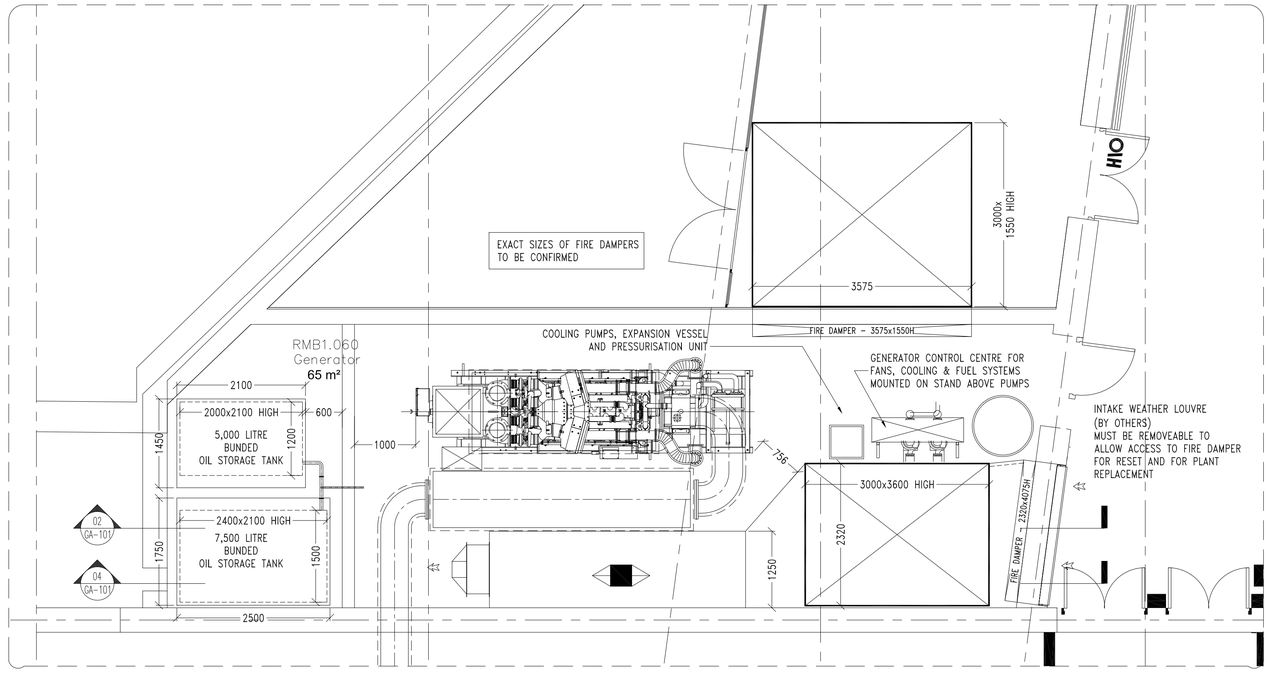
萬彰五金股份有限公司
BAN CHANG HARDWARE CO.,LTD.
17. LANE 620. SEC 3. LU HO ROAD .LUKANG
CHANGHUA. TAIWAN. R.O.C.
TEL: 886-4-7715522.7715945
FAX: 886-4-7715008

A1

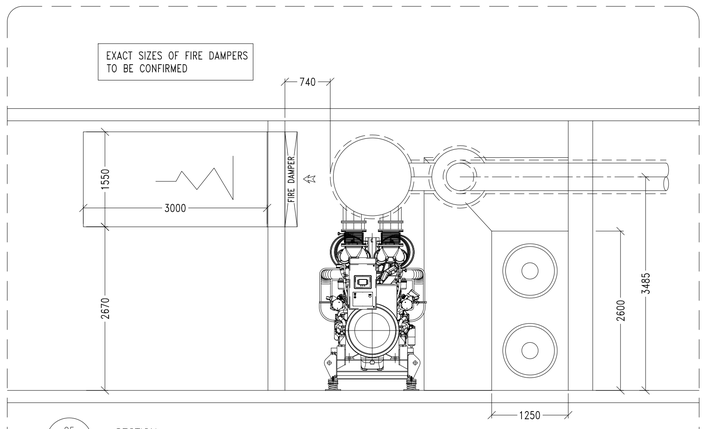
ANY DIMENSIONS SCALED FROM THIS DRAWING MUST BE VERIFIED ON SITE.



03 GA-101 SILENCER AND FLUE ARRANGEMENT
1:50



01 GA-101 PLAN
1:50



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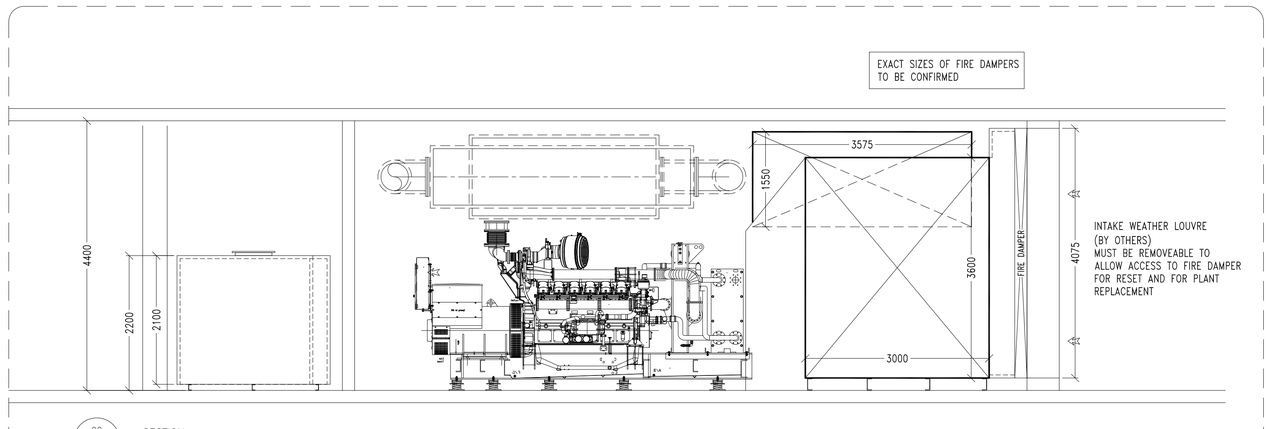

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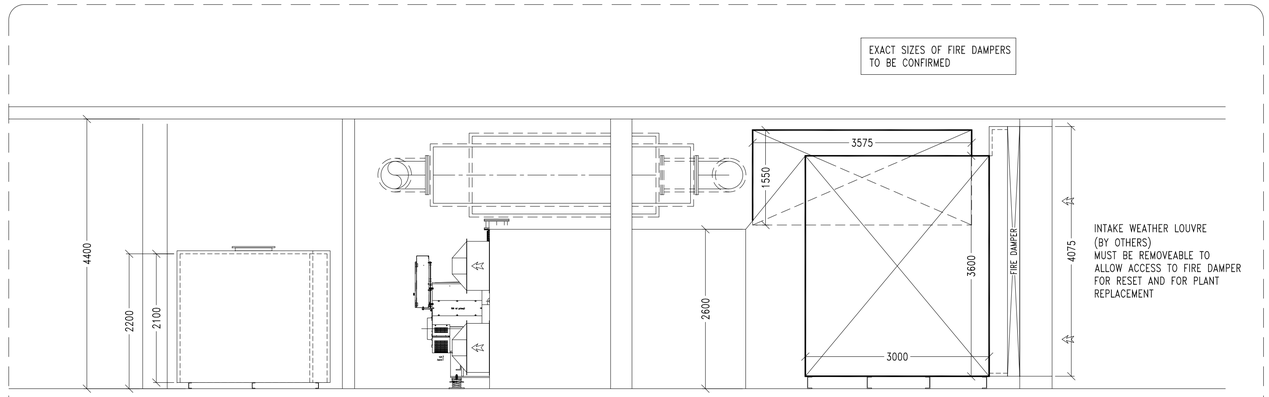

04 GA-101 SECTION
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06	LOUVRE NOTE REVISED, TANKS UPDATED	15.11.2021
05	FIRE DAMPERS INDICATED, INTAKE ATTENUATOR RELOCATED TO SUIT	11.10.2021
04	TANKS REVISED, SECTION ADDED	22.09.2021
03	REVISED	09.09.2021
02	REVISED & FLUE DETAILS ADDED	24.02.2021
01	GENSET UPDATED, SECTION REVISED	11.03.2020
00	PRELIMINARY	02.03.2020

BELLS
THE STANDBY POWER SPECIALISTS

BELLS POWER SOLUTIONS LTD
70-72, Clifton Street, London EC2A 4HB
Tel: 0203 259 0100
Email : contact@bellspowergroup.co.uk
Web : www.bellspowergroup.co.uk

Status: PROPOSED

Bells Job Number:

Project:
UCLH - ION
GENERATOR SERVICES

Title:
GENERATOR ROOM G.A. FOR P1500P3 GENSET
60dBA@1M INTAKE, 50@1M DISCHARGE
70dBA@1M FLUE

Scale: 1:50@A1

Date: MAR 2020

Drg No: Q4105-GA-101

Rev: 06

Remote Cooling Technical Submittal
UCL ION/DRI
Q4105

Bells Power Solutions Ltd
70 Clifton Street
London
EC2A 4HB

020 3259 0100
contact@bellspowersolutions.co.uk
www.bellspowersolutions.co.uk

BELLS THE STANDBY POWER SPECIALISTS	TECHNICAL SUBMITTAL SHEET TS No: 004 R0 Project: UCL ION/DRI Date: 30th April 2021 Job No: Q4105	MJL MICHAEL J.LONSDALE *Creating the right environment*

To: Adrian Wells	From: James Murphy
Company: M J Lonsdale	Technical Enclosures: Remote Cooling
Date answer is required:	Date answer was received:

SUBJECT:

Please find attached for approval technical information for the AVMs:-

Oakfield System Design Review c/w equipment datasheets – Cooling Pump, DAC & Pressurisation Unit

Remote Cooling Schematic

RESPONSE / STATUS	A	B	C

COMMENTS:

Oakfield
Technical Services Ltd
Ravensbourne, High Meadow, Norbury, Stafford ST20 0PD
☎ +44 (0)7811 997081 dave.maddison@oakfieldts.co.uk
www.oakfieldts.co.uk

Engineers Report

Ref: ER-BPG03-180321-B

Cooling System Review – UCL (ION)

Originator:	D.W. Maddison.
Date/Issue:	18 March 2021
Contract Ref:	UCL ION, London - Bells Power Group Q4105
Application:	Engine cooling – Perkins 4012-46 TAG2A

Introduction

Oakfield Technical Services Ltd was asked by Bells Power Group to review the cooling system design for one Perkins 4012-46 TAG2A driven generator to be installed at UCL, London.

Cooling is to be provided via a Covrad/API Heat Transfer remote cooling package and a Güntner dry air cooler at roof level with a separate duplex pump set and pressurisation/expansion module.

Some of the equipment has already been pre-selected. The basement to roof Ø80 pipework has not yet been installed.

The system is to include flushing bypass lines across the cooler and across the generator cooling package. It has been specified that an additional 15% flow rate is required for the flushing duty.

The pump module is to include duty/standby pumps. Pumps with integrated inverter speed control have been selected which provide for the normal operating duty at <100% speed and also provide in excess of the +15% flushing duty when the bypass lines are open.

A possible pressurisation unit has been discussed, although for a closed system this isn't actually necessary, providing a suitable slave pump is available for filling purposes.

General

No drawings were provided indicating the installation general arrangement and roof layout. General information pertaining to the pipework run has been provided by email and appears at Appendix A.

Appendices B and C show information provided pertaining to the pre-selected equipment.

Appendices D1 pump selection for the operating duty, pump is an end-suction configuration.

Appendix D2 is a performance illustration of the end-suction pump option under flushing

conditions. Appendix E shows information pertaining to an example pressurisation unit.

Appendix F is an analysis of the expansion vessel requirements.

Appendix G is the Grundfos datasheet for the selected GT-U+ 10 bar 750 litre expansion vessel.

Appendix H is an assessment of the linear expansion of the riser pipework.

Data

The Perkins 4012-46TAG2A engine has a temperate rating of 1331kWb Prime and 1459kWb Standby, corresponding to 1500kVA Prime and 1650kVA Standby. The engine is air-to-air charge cooled and at the standby rating, rejects a total of 924kW via the remote cooling pack, as indicated in Appendix B.

The heat rejection figure is, however, subject to tolerance as well as variation due to operating conditions, as per ISO 3046.

Whilst the engine cooling circuit will require a heavy-duty ethylene glycol-based coolant at, ideally 50% concentration, the secondary cooling equipment has been pre-specified at 25% concentration. See comments later.

The secondary circuit flow rate is 8.5 litres/s (30.6m³/h) at 91.7°C flow, 64.0°C return, in accordance with the data in Appendix B.

Pipework Run

Based on the flow rate of 8.5 litres/s, the appropriate pipework size for the entire system is Ø80 NB. It has been assumed that standard heavy grade ('Red Band') carbon steel pipework to BS EN 10255:2004 will be installed (actual bore size of 79.2mm) with PN16 flanges.

The flow velocity in Ø80 NB pipework will be 1.73m/s, which is satisfactory for the length of run.

It has been advised that the physical height between basement floor level and the top of the remote cooler is 35m and that the total pipe run is 120m + 120m = 240m. Please see Appendix A.

It has been further advised that the installed pipework will include a total of 36 bends, which have been assumed to be standard 1.5D radius.

An allowance has also been made for flexible couplings/bellows and butterfly valves, plus various fittings and devices, generally as Appendix I.

On the above basis, the pressure drop for the pipework, bends and fittings is calculated to be 206kPa. The pipework capacity will be approximately 1180 litres.

Covrad/API Heat Transfer Remote Cooling Package

The data sheet for the pre-selected equipment from API (Appendix B) indicates that the design is based on the published heat rejection value, with no tolerance band added, and assumes 25% EG coolant.

The data provided does not indicate what fouling or duty margins have been applied in the specification of the heat exchangers although this is a well-established product and it is likely that suitable margins have been included in its design.

The heat exchanger pressure drop is given as 50kPa. The capacity is not given but is estimated at 60 litres, including the local pipe connections.

Güntner Dry Air Cooler

The data sheet for the pre-selected equipment from Güntner (Appendix C) indicates that the design is based on the published heat rejection value and assumes 25% EG coolant. No duty margin has been added and there is only 0.7% surface margin to allow for fouling.

It is recommended that consideration is given to requesting an alternative selection which provides for heat rejection tolerances as per ISO 3046 and suitable duty and surface margins.

The pressure drop and capacity are given as 79kPa and 127 litres respectively for the selected cooler.

Pressure Drop Assessment & Pump Duty

The pipework has been assumed to be heavy grade ('Red Band') carbon steel to BS EN 10255:2004 with an actual bore size of 79.2mm, with standard 1.5D bends and flanged PN16.

Approx length of straight pipework – total for both runs:	240m
Number of bends – total for both runs:	36 off
Flow rate:	8.5 L/s
Calculated pipework pressure drop, inc valves etc:	206kPa
Heat exchanger module pressure drop:	50kPa
Cooler circuit pressure drop:	79kPa
Total system pressure drop:	335kPa

Pump Selection

Appendix D1 details the pump selected based on the operating design flow rate of 8.5 l/s and a pressure drop of 375kPa which allows a further operating margin of >10% to allow for any minor variation in the actual installation.

Appendix D1 shows an end-suction pump, Grundfos NBE 40-160/175. This has a variable speed 7.5kW motor with integral inverter drive but doesn't include an integrated differential pressure sensor. Via the electronic display it is simple to set up and optimise the pump operation during commissioning, but it would require an external differential pressure or flow measuring instrument to be used.

It can be seen that, at the duty point (8.5 l/s, 375kPa), the pump would also run at some 96% speed. Note that it has a Ø65 NB inlet connection and a Ø40 outlet connection and would therefore require suitable reducer fittings.

Flushing Conditions

With regard to the required flushing duty, it must be noted that this would only apply when the flushing bypass lines are open and the heat exchangers/cooler are isolated. Therefore, the system pressure drop will be that associated with the pipework and bypass lines only.

It has been specified that under flushing conditions the attained flow rate should be at least 15% greater than the design flow rate of 8.5 l/s under normal conditions. ie; 8.5 l/s X 1.15 = 9.8 l/s.

The pressure drop (pipework & bypass lines only) at 9.8 l/s = 305kPa. With a 5% margin = 320kPa

Appendix D2 is an illustration, based on the end-suction NBE pump, of the operation at 9.8 l/s and 320kPa. By projection of the system curve, it can be seen that, at 100% pump speed, a flow rate of approximately 10.5 l/s will be attained, which is well over 20% above normal operating flow.

The flushing duty is therefore easily achieved with the pump option selected.

System Capacity

The total system capacity has been assessed as follows:

Pipework system:	1180 L
Heat exchanger module:	60 L
Dry air cooler:	127 L
Total system working capacity:	1367 L
With +5% tolerance:	1435 L

Fill & Expansion

Appendix F is an analysis of the expansion requirement. In order to keep the maximum operating pressure within reasonable bounds, a total expansion capacity of 750 litres and 10bar rating is considered appropriate. This can be a single vessel as indicated or two smaller vessels connected in parallel if space restrictions dictate. Appendix G provides the dimensional details of the unit selected.

Note that an air pre-charge pressure of 3.7 bar has been proposed with a cold fill static pressure of 3.9 bar, making provision for a draw-down capacity of 30 litres held within the vessel(s).

Appendix E shows a Grundfos fill/pressurisation unit of a type which Bells are known to have used previously in similar applications. This unit would suffice for the purpose although it incorporates a break tank and mains water float valve. If this system is used, it is strongly recommended that the automatic make-up system (break tank) should be charged with pre-mixed coolant and that any mechanism that can add un-treated tap water to the system must be avoided. On that basis, a mains cold water feed will not be required, and the ball valve should be removed and discarded. An overflow to drain must also be avoided.

Coolant

As noted above, the pre-selected equipment is designed on the basis of 25% EG. This will provide reasonable corrosion protection, although at least 40% would have been more satisfactory.

25% EG will offer frost protection down to approx. -12°C. (40% EG offers -25°C).
In central London, this may be sufficient protection, but careful consideration should be given to this matter, particularly since the cooler is exposed in a roof location. It must be noted though, that if a coolant concentration greater than 25% is used, this will have an adverse impact on the performance of the cooler and the heat exchanger package.

It is strongly recommended that the coolant is obtained as a pre-mix with de-mineralised water.

Data Summary

Heat rejection (subject to tolerance)	kW	924
Flow rate	L/s (m^3/h)	8.5 (30.6)
Pipe size (carbon steel)	mm	Ø80 NB
Total pipe run assumed	m	240
System pressure drop	kPa (bar)	335 (3.35)
Flow temperature	°C	91.7
Return temperature	°C	64.0
System capacity (+5% tolerance)	Litres	1435
Expansion vessel capacity	Litres	750
Expansion vessel air pre-charge pressure	kPa (bar)	370 (3.70)
Static head assumed	m	35
Cold fill pressure	kPa (bar)	390 (3.90)
Max operating pressure (hot) at pump inlet	kPa (bar)	427 (4.27)
Max operating pressure (hot) at pump discharge	kPa (bar)	762 (7.62)
Ethylene Glycol concentration	%	25

Setting – PRV at pump inlet	kPa (bar)	470 (4.70)
Setting – PRV at pump discharge	kPa (bar)	800 (8.00)

Remarks & Observations

- The details of the pipework run, pressure drop and capacities are all based on the information provided. If the actual installation differs significantly from the assumptions made, there will be an impact on the operating parameters, especially the expansion vessel capacity, in which case a further review may be required.

- The frost and corrosion protection afforded by 25% EG coolant may be adequate for the location, but careful consideration should be given to this. If it is chosen to increase the concentration, this will have a negative impact on the equipment performance and a further review will be needed.

- As noted, the published heat rejection data has been used directly without any tolerance or duty margin (certainly for the cooler). If the generator will only run on a Prime duty, this is unlikely to present a significant risk, but there is a greater risk associated with operation at Standby rating (110%) which may be required as part of a site acceptance test, if the ambient temperature is elevated at the time.

- It is essential that a manual and automatic air venting provision is made at the highest point of the system (on the inlet to the cooler).

- A non-return valve is necessary between the pressurisation unit (if used) and the connection onto the expansion line.

- Any valve installed in the expansion line between the expansion vessel and the main circuit must be lockable in the open position with permanent warning signs/labels.

- Note that the pump delivery pressure (cold) approaches 725kPa. When at normal working temperature, this maximum pressure attains over 760kPa (7.6 bar). The charge air cooler which forms part of the heat exchanger module is rated at 8 bar and so this is within acceptable limits providing the installation data provided is accurate.

- It is *essential* that suitable pressure relief valves are installed at appropriate locations. The settings are also included in the Data Summary table above.

- As noted under 'Coolant' above, the provision of a CWS make-up to the pressurisation unit is not appropriate. Rather, the pressurisation unit (if used) make-up tank should be charged with pre-mixed coolant.

- Appendix H is an assessment of the thermal expansion of the vertical riser pipework (taken as 35m). The assessed value is nominally 32mm. It is important to advise those responsible for the installation of the riser pipework that the expansion bellows installed at the top of the riser must accommodate the anticipated expansion.

APPENDIX A Installation Details

Basic installation details were provided by email on 09 March 2021 as reproduced below.

This has been interpreted as follows:

Static head of the top of the dry air cooler above the pump module = 35m

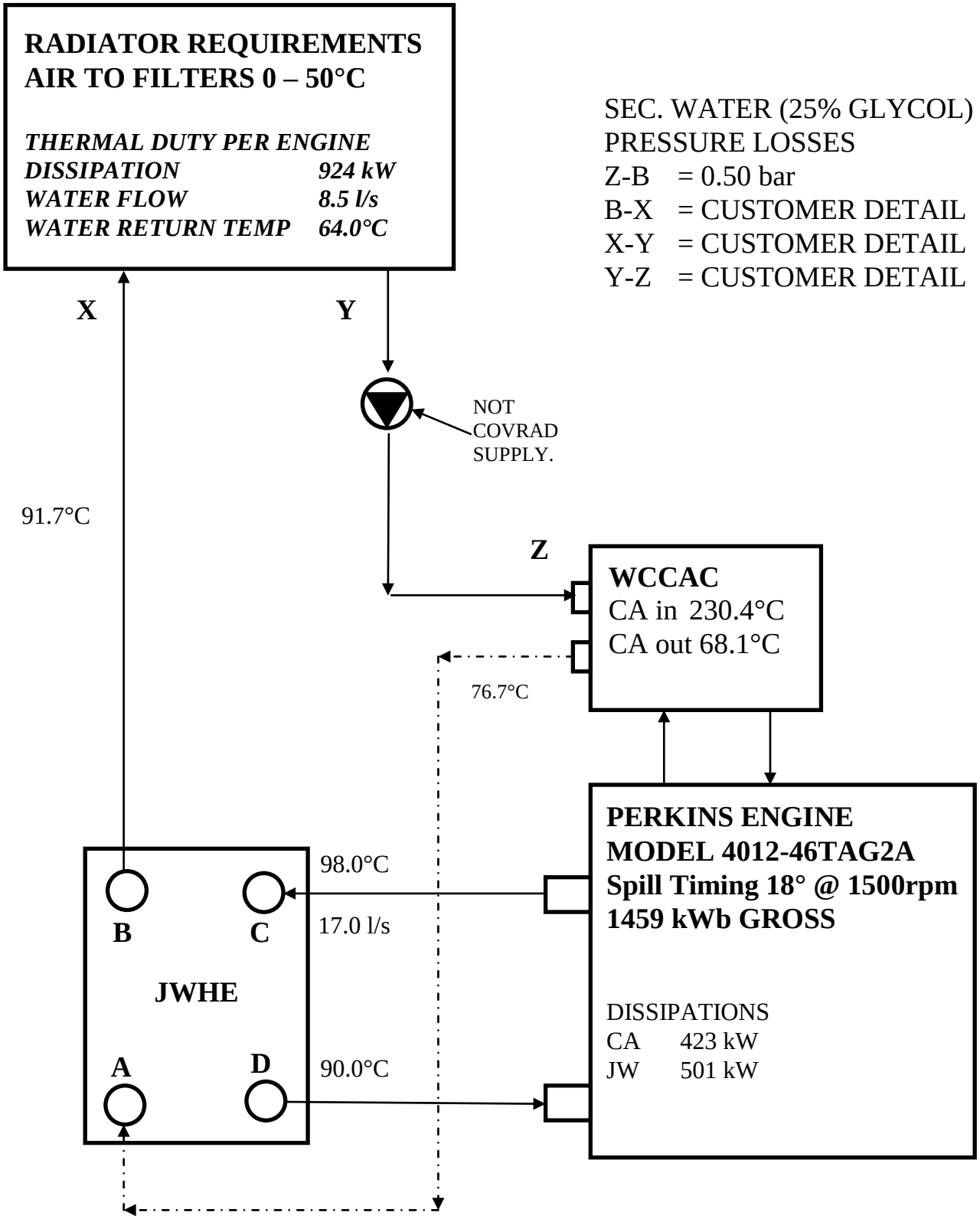
Total number of bends = 36

Total pipework run = 240m, including the riser.
ie; 85m horizontal + 35m riser = 120m per line.

Additional pump flow capacity required for flushing purposes = 15%

REMOTE COOLING KIT
CRDA1648-B4 (CAT NI 128-501)
TECHNICAL DATA

Covrad GT
An API Heat Transfer Company



C Round
(Standard remote kits)
Issue 1
Date: March 2013

*

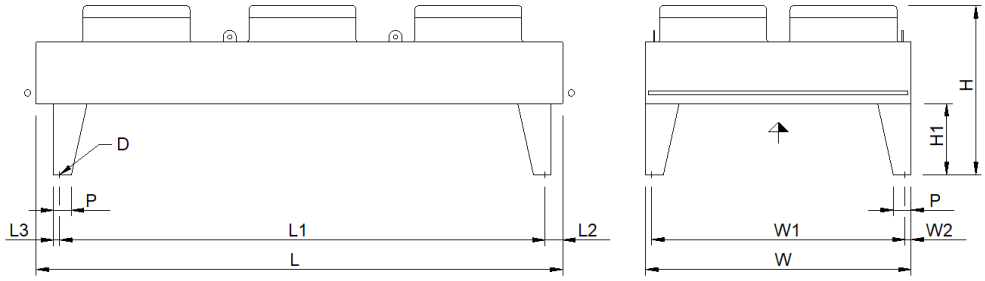
Date: 2021-02-01
Enquiry dated:
Project:
Quotation-no.:
Item:
Reference:

Drycooler GFHV FD 100.2OF/23A-46

Capacity:	924.0 kW	**Medium:**	Ethylene glycol 25 Vol. %(1)
Surface reserve:	0.7 %	Inlet:	91.7 °C
Air flow:	96969 m³/h	Outlet:	64.0 °C
Air inlet:	35.0 °C	Pressure drop:	0.79 bar
Altitude:	0 m	Volume flow:	30.25 m³/h
Fans (AC):	6 Piece(s) 3~400V 50HzY/(Δ)	Noise pressure level:	58 dB(A)(2)
Data per motor (nominal data):		at a distance of:	1.0 m
Speed:	480 min-1 / (620 min-1)	Noise power level:	78 dB(A)
Capacity (mech./el.):	0.40 kW/0.74 kW	ErP:	Compliant(3)
Current:	1.40 A(4)		
Total el. power consumption: 4.49 kW		Energy efficiency class:	D (2014)
Casing:	Galv. Steel, RAL 7035	Tubes:	Copper(5)
Surface:	1028.1 m²	Fins:	Aluminum(5)
Tube volume:	126.7 l	Connections per unit:	
Fin spacing:	2.10 mm	Inlet:	88.9 * 2.00 mm
Dry weight:	1283 kg(6)	Outlet:	88.9 * 2.00 mm
Max. operating pressure:	10.0 bar	PED classification:	Art. 4, par. 3(7)
		Passes:	3

Dimensions:(6)

L =	6990 mm
W =	2241 mm
H =	1330 mm
H1 =	600 mm
L1 =	6650 mm
L2 =	197 mm
L3 =	52 mm
P =	150 mm
W1 =	2137 mm
W2 =	52 mm
D =	17 mm



Attention: Drawing and dimensions not valid for all accessory options!

Attention: Medium inlet and outlet on opposite sides!
UI: 02HD.21Z

Accessories	Piece(s)
Welding neck flanges DN80 PN16 B1 (DIN EN 1092-1)(8)	2
Temp. sensor with stainless steel pocket (5209566)	1
Mounting and wiring (Control cabinet, Fan, Temperature sensor)	1
GMM step + Guentner Control Panel(9)	1

1 x (5209182) Disconnect non fused 32A (24A/AC23A)
3 x (5215284) Motor Start Protection (MSP) with Thermo Contact Module (Manual Reset / Step) 16A
1 x (5209174) Power Line Bus Bar for MSP (Manual Reset) 3x
1 x (5209246) GMM Step Controller (Single) Basic, 4x OUT
1 x (5209133) GMM Step Signal Interface Terminals Set
1 x (5209196) Power Supply for Control Voltage 24VDC 1,75A
1 x (5209039) Circuit Breaker 1ph+N, 6A
1 x (5209027) Panel Housing (Steel) 400x650x300 [mm]

Important remarks / explanatory notes:

(1) Fluid group 2 according to pressure equipment directive 2014/68/EU

(2) According to the enveloping surface method defined in EN 13487/EN 9614-1; Eurovent tolerance = +2 dB(A). Applies only for AC fans, AC fans with sine control and EC fans. Noise caused by other control methods, water spraying systems or sound reflexions occurring at the installation site are not taken into account and may result in an increased sound pressure level.

(3) This unit is equipped with fans that meet the efficiency requirements of Directive 2009/125/EC (ErP Directive).

(4) The current consumption can differ in dependence of the air temperature and of the variations of system voltage according to the VDE guidance.

(5) The unit may not be suitable for very corrosive atmospheres (close to shores, in smoke rooms, etc.). For further information see program menu "?", "Material recommendations brochure", or ask your sales partner.

(6) Dimensions and weights are not valid for all possible options! They may differ for units with accessories or special units (S-...).

(7) Piping (DN = 84.9 mm, TSmax = 100 °C, liquid). Final classification according to pressure equipment directive 2014/68/EU during order processing.

(8) Incl. counter flange, screws and gaskets are intended for transport only and must be replaced

(9) (GSTI06-0140MPS-NLNANUN-N-001) Width x Height x Depth: 400 mm x 650 mm x 300 mm, weight: 24 kg, Protect. system IP 54, one control cabinet for all units, Operating temperature range: -20.0 °C - 49.2 °C, Power supply: 400 VAC / 50 Hz / 3-Ph+N+PE, Full load amperage (FLA): 8.4 A, Maximum overload protection (MOP): 16.0 A(gL/gG)

Company name: Oakfield Technical Services Ltd
Created by:
Phone:

Date:

Qty.	Description
1	**NBE 40-160/172 ASF2ABQQE**

Note! Product picture may differ from actual product

Product No.: 99100093

Non-self-priming, single-stage, centrifugal volute pump designed according to ISO 5199 with dimensions and rated performance according to EN 733 (10 bar).

Flanges are PN 16 with dimensions according to EN 1092-2. The pump has an axial suction port, radial discharge port, horizontal shaft and a back pull-out design enabling removal of the motor, motor stool, cover and impeller without disturbing the pump housing or pipework.

The unbalanced rubber bellows seal is according to DIN EN 12756.

The pump is close-coupled to a fan-cooled, permanent-magnet synchronous motor.

The motor includes a frequency converter and PI controller in the motor terminal box. This enables continuously variable control of the motor speed, which again enables adaptation of the performance to a given requirement.

Controls:

Frequency converter:	Built-in

Liquid:

Pumped liquid:	Ethylene Glycol
Liquid temperature range:	-25 .. 120 °C
Concentration:	25 %
Selected liquid temperature:	20 °C
Density:	1017 kg/m³
Kinematic viscosity:	0.76 mm2/s

Technical:

Pump speed on which pump data are based:	2901 rpm
Actual calculated flow:	8.5 l/s
Resulting head of the pump:	375 kPa
Actual impeller diameter:	172 mm
Nominal impeller diameter:	160
Shaft seal arrangement:	Single
Code for shaft seal:	BQQE
Curve tolerance:	ISO9906:2012 3B2
Bearing design:	Standard

Materials:

Pump housing:	Cast iron EN-GJL-250 ASTM class 35
Wear ring:	Brass
Impeller:	Cast iron EN-GJL-200 ASTM class 30
Shaft:	Stainless steel EN 1.4301 AISI 304

Installation:

GRUNDFOS

Company name: Oakfield Technical Services Ltd
Created by:
Phone:

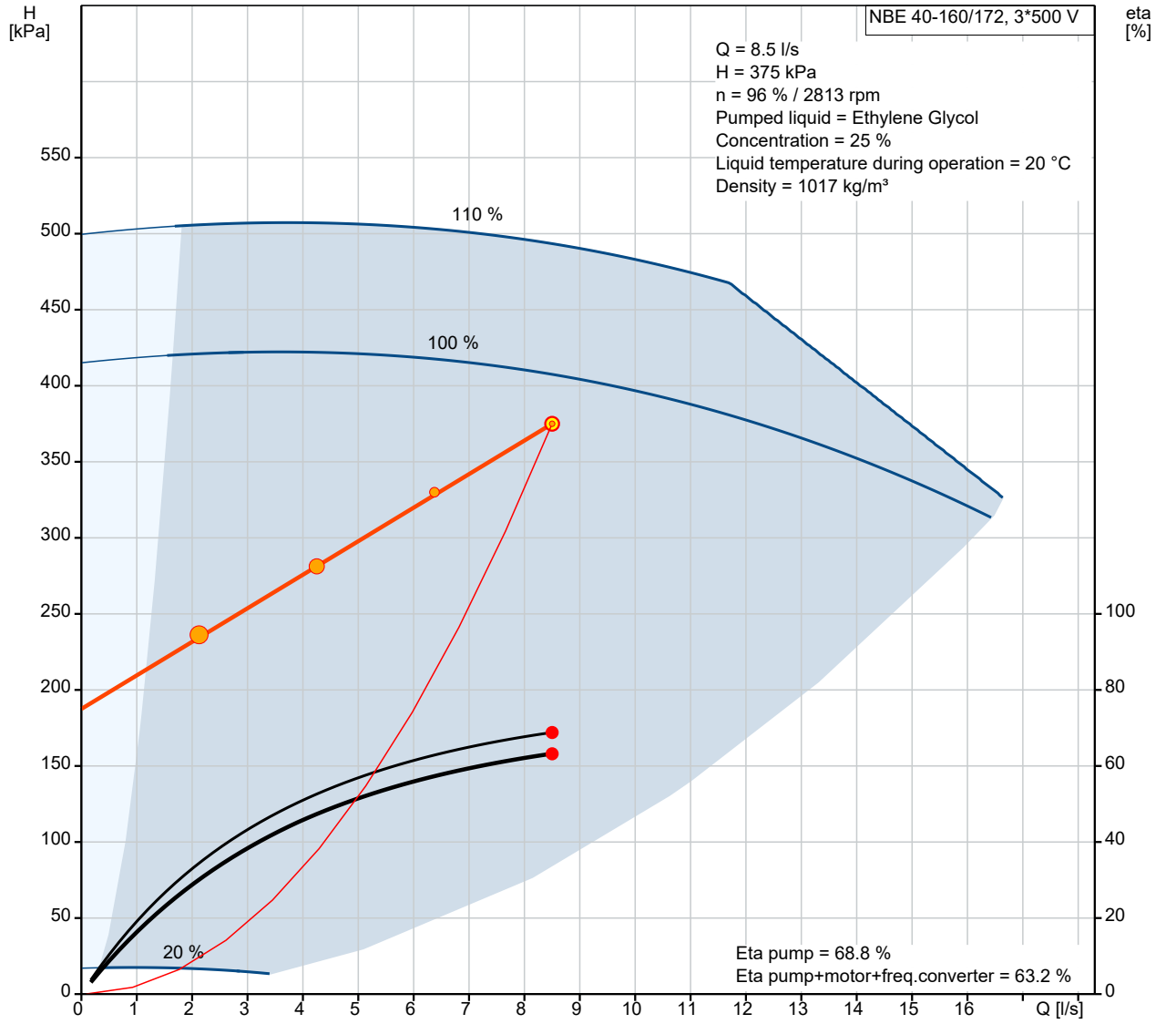
Date:

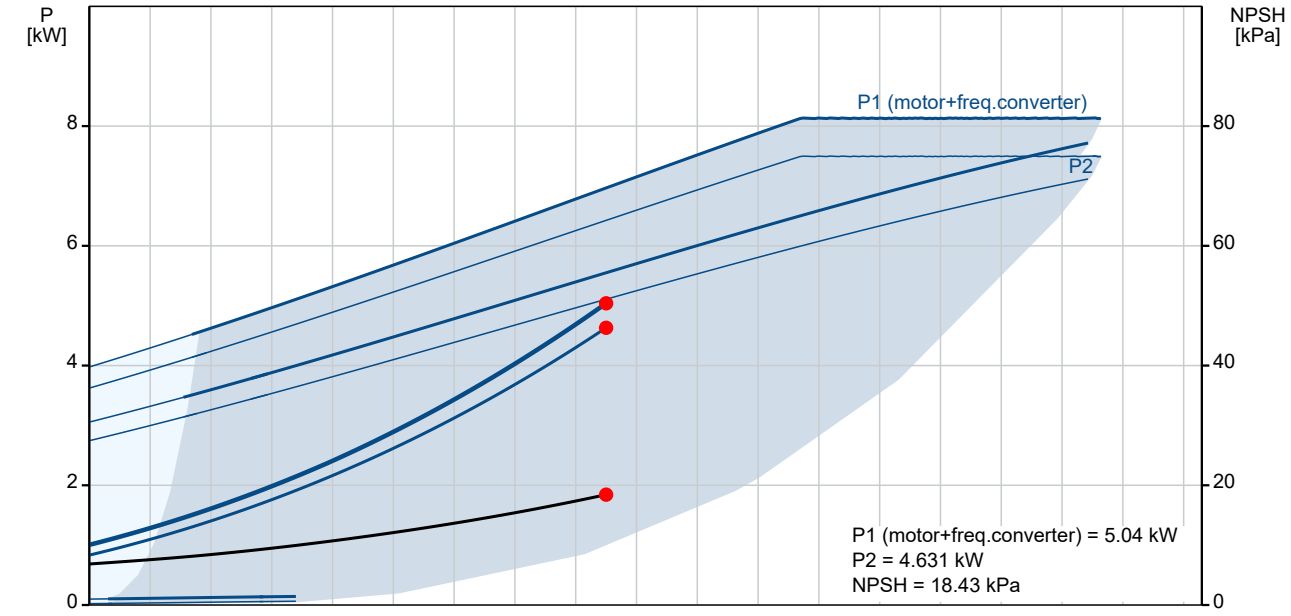
Qty.	Description	
	Maximum ambient temperature:	50 °C
	Maximum operating pressure:	16 bar
	Pipe connection standard:	EN 1092-2
	Size of inlet connection:	DN 65
	Size of outlet connection:	DN 40
	Pipe connection standard:	EN 1092-2
	Pressure rating for connection:	PN 16
	Pump housing with feet:	Yes
	Support block:	Y
	Electrical data:	
	IE Efficiency class:	IE5
	Rated power - P2:	7.5 kW
	Mains frequency:	50 Hz
	Rated voltage:	3 x 380-500 V
	Rated current:	14.1-11.2 A
	Cos phi - power factor:	0.93-0.89
	Rated speed:	360-4000 rpm
	Efficiency:	92.5%
	Motor efficiency at full load:	92.5 %
	Number of poles:	2
	Enclosure class (IEC 34-5):	IP55
	Insulation class (IEC 85):	F
	Motor No:	98971272
	Others:	
	Minimum efficiency index, MEI ≥:	0.70
	Net weight:	85 kg
	Gross weight:	102 kg
	Shipping volume:	0.315 m³
	Country of origin:	HU
	Custom tariff no.:	84137051

Company name: Oakfield Technical Services Ltd
Created by:
Phone:

Date:

99100093 NBE 40-160/172 ASF2ABQQE 50 Hz





APPENDIX D NBE 40-160/172 Under Flushing Conditions

It has been specified that under flushing conditions the attained flow rate should be at least 15% greater than the design flow rate of 8.5 l/s under normal conditions.

8.5 l/s X 1.15 = 9.8 l/s.

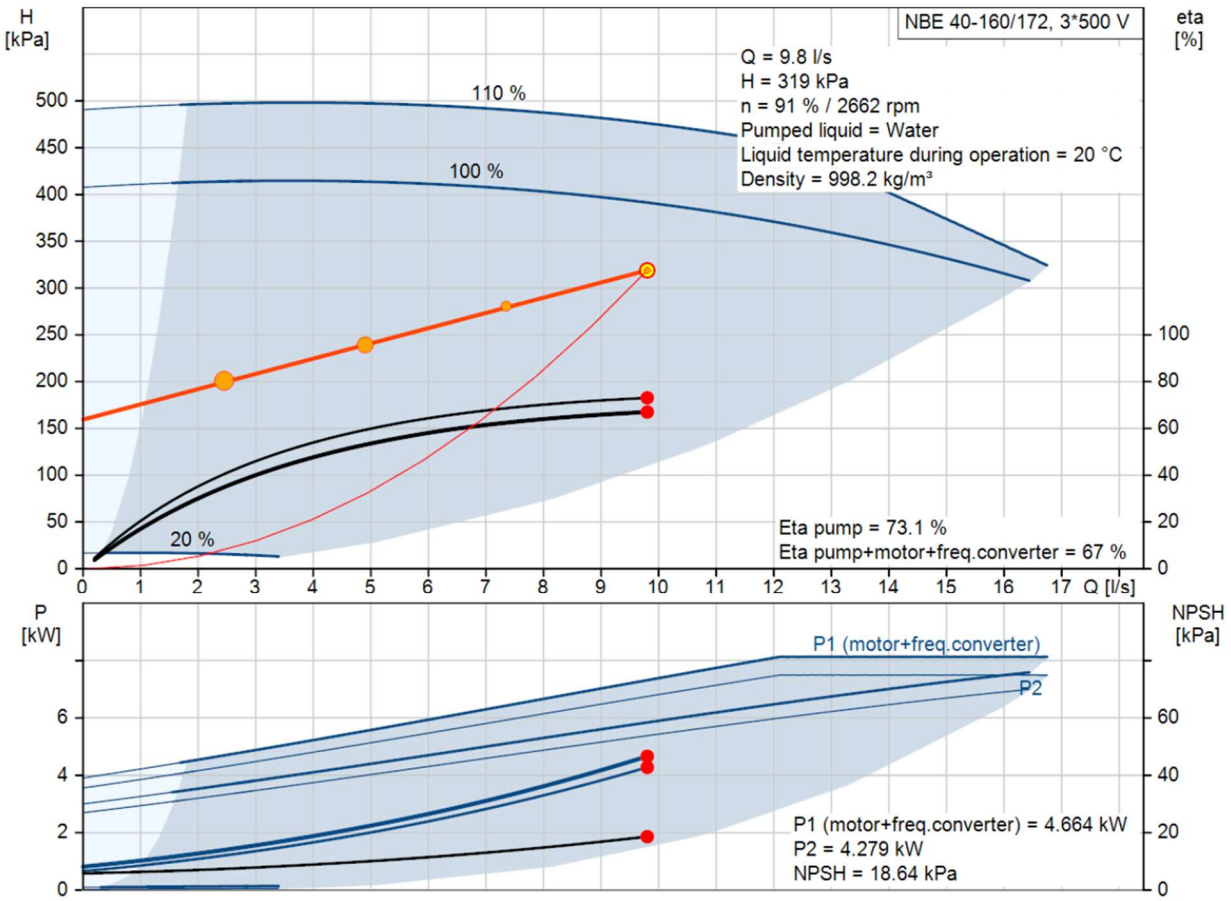
With the flushing bypass lines open and the heat exchangers/cooler isolated, the system pressure drop will be that associated with the pipework and bypass lines only.

Pressure drop (pipework & bypass lines only) at 9.8 l/s = 305kPa. With a 5% margin = 320kPa

The illustration below, taken for the end-suction pump option, shows the operating point at 9.8 l/s and 320kPa.

By projection of the system curve, it can be seen that, at 100% pump speed, a flow rate of approximately 10.5 l/s will be attained, which is well over 20% above normal operating flow.

The performance of the in-line pump option would be similar.



PHT A F Pressurisation Units

Floor standing totally enclosed digital pressurisation unit with pressure transducer and user-friendly interface for use on sealed systems in order to provide a minimum systems pressure requirement

Standard Features

- Password protection for parameter entry
- Service reminder option (12 months).
- Pump anti-seize option (1 second pulse if inactive for 30/60/90 days)
- Flood detection
- Event log, up to 30 historic fault conditions
- 5 Volt free contacts: 1x Boiler interlock, 1x common fault, 3x programmable outputs
- 17.5 litre break tank with type AB Air Gap Fluid Cat 5
- Low water level sensor
- Durable powder coated enclosure

Optional extras:

•High water level sensor
•BACnet or MODBUS communications via Grundfos CIM

Pressure rating	PN10 (system connection)
Electrical Requirements	230V, 50Hz, 1 Phase
Noise output	<70 dB(A)
Fluid Category Protection	5 AB Weir Overflow Air Gap
Liquid temperature range	+1°C to +60°C
Max system temperature	+85°C (unit to be fitted on return side of the system)
Ambient temperature	+1°C to 40°C
Relative humidity	95% (non-condensing)
Usage	Indoor (Outdoor, subject to restrictions found)
IP	cabinet IP24, controller compartment IP54
Type of protection	Class 1 (earthed) equipment
EMC Environment	B (light industrial, commercial and residential)
Inlet pressure max	3 bar

Certifications and Standards Applied:

Machinery Directive (2006/42/EC).
Standards used: EN ISO 12100:2010
Low Voltage Directive (2014/35/EU).
Standard used: EN 60335-1:2012 +A11:2014
EMC Directive (2014/30/EU)
Standard used: EN 61000-6-1:2007 and EN 61000-6-3:2007+A1:2011
Standard used: EN 60730-1:2016

EC/EU declaration of conformity is available in Grundfos Installation and Operating instructions

Air Gap: BS EN 13077
IP rating: BS EN 60529
Electrical wiring: BS 7671

Application of Use:

Light Commercial, residential
System Volume (Guide): < 60,000 Litres

Selection Details:

- Required fill pressure (Static height of the system above the pressurisation unit (meters) plus required pressure margin)
- Systems content (litres, if unknown the boiler power in kW can be used to estimate the systems content)
- Flow and return temperatures
- Glycol content (%) if required
- Final working pressure

Material of Construction:

Cabinet: 1.5mm Mild steel S275
Break tank: MDPE
Connections:
Overflow - Polypropylene
Mains fill, system - Brass
Internal pipework: brass, nickel plated brass, braided flexible hose
Finish: PPC Black RAL 9005 matt

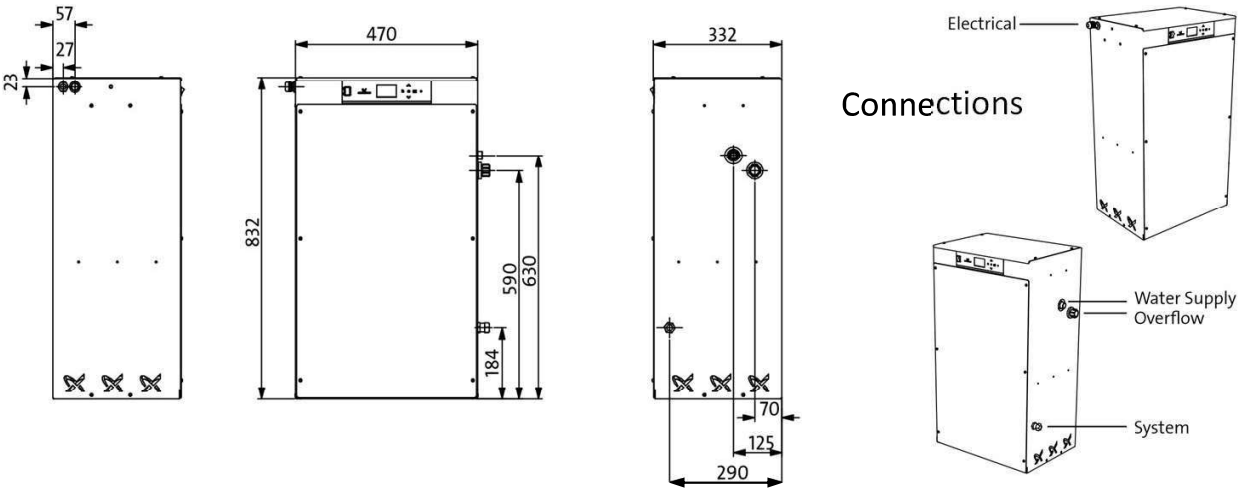
Installation & Placement:

The PHT-D pressurisation unit should be installed in a frost-free and humidity free area, and connected to the system return pipe, at the same point as the expansion vessel.

This unit is not suitable for system filling.

PHT A F Pressurisation Units

Product Name	Pump Qty	Max Cold Fill Pressure [bar]	Power Consumption [kW]	Full Load Current [A]	Dry Weight [kg]	Product Code
PHT A F125	1	2.5	0.41	1.83	31	99264963
PHT A F225	2	2.5	0.41	1.83	38	99264966
PHT A F150	1	5	0.9	3.94	32	99264964
PHT A F250	2	5	0.9	3.94	39	99264967
PHT A F180	1	8	1.15	5.2	37	99264965
PHT A F280	2	8	1.15	5.2	46	99264968

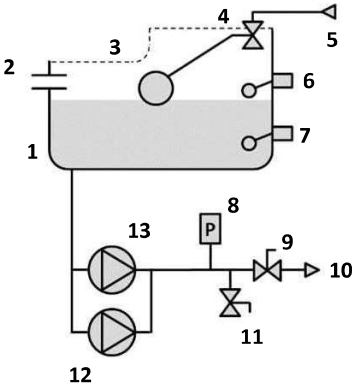


Break Tank Capacity	Dimensions (mm)			Connections		
	Width	Depth	Height	System	Mains Supply	Drain
17.5 litre	470	332	832	1/2”	1/2”	3/4”

Required access for examination and service:

- minimum of 50 cm above all units
- minimum of 50 cm to the system connection side of all units
- minimum of 100 cm at the front of the units

INTERNAL SCHEMATIC DIAGRAM



1. Break tank
2. Drain overflow
3. Weir overflow
4. Float valve
5. Water supply
6. High level float switch
7. Low level float switch
8. System pressure transmitter
9. System isolation valve
10. System connection
11. Drain valve
12. Pump 1
13. Pump 2 (only PHT A F2xx)

Oakfield Technical Services Ltd

Expansion Vessel Analysis

Generator remote cooling system (secondary circuit) at UCL (ION) for Bells Power Group (Ref. Q4105)

EXPANSION VESSEL CAPACITY	litres	750

FLUID	25% Eth Glycol	

System capacity (+5% tolerance)	litres	1435
Static head	m	35.0
	kPa	357

Cold fill temperature	°C	10.0
Operating flow temperature	°C	91.7
Operating return temperature	°C	64.0

Cold Fill Pressure	kPa	390
Draw down volume required	litres	30.0
Expansion volume (cold)	litres	720
Air pre-charge pressure	kPa	370

Mean operating temperature	°C	77.9
Fluid density - cold fill	kg/m³	1041
Fluid density - operating mean	kg/m³	1006
Fluid expansion factor		1.0348

Max operating pressure	kPa	427

Fluid expansion	litres	49.9

SUMMARY

Expansion vessel Capacity		Litres	750
Vessel Selection Options	Grundfos:	GT-U+ - 750V 10bar. Product code: 99082701	
Vessel Location	Low level. Basement plantroom		

Air Pre-Charge Pressure	kPa (bar)	370	(3.7)
Cold Fill Pressure	kPa (bar)	390	(3.9)
Max Operating Pressure	kPa (bar)	427	(4.27)

NOTE:

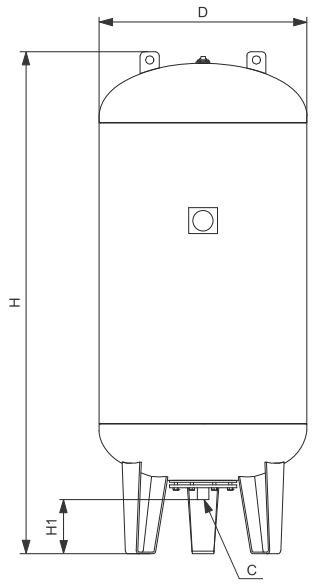
The above expansion vessel selection and associated operating parameters are based on the system capacity, static head and temperatures shown. If the actual installation or operating conditions differ from those shown, the operating parameters may no longer be valid.

GT-U+, 10 bar

Vertical installation.
Maximum pressure: 10 bar.
Precharge pressure: 4 bar.

Dimensions, weights and product numbers

100 to 3000 litres



TM07 0604 0418

Fig. 8 Dimensional sketch

Tank type	Size [l]	Dimensions [mm]				Gross weight [kg]	Replaceable bladder	Product number
		D	H	H1	C			
GT-U+ 100 PN 10	100	453	983	130	G 1	76.5	•	99082696
GT-U+ 150 PN 10	150	504	1056	125	G 1	91.5	•	99082697
GT-U+ 200 PN 10	200	604	1103	115	G 1 1/4	123.3	•	99082698
GT-U+ 300 PN 10	300	654	1286	190	G 1 1/4	148.3	•	99082699
GT-U+ 500 PN 10	500	754	1561	190	G 1 1/4	195.5	•	99082700
GT-U+ 750 PN 10	750	756	1834	190	G 2	231.0	•	99082701
GT-U+ 1000 PN 10	1000	806	2376	280	G 2	327.5	•	99082702
GT-U+ 1500 PN 10	1500	958	2435	270	G 2	391.5	•	99082703
GT-U+ 2000 PN 10	2000	1110	2505	270	G 2	459.0	•	99082704
GT-U+ 3000 PN 10	3000	1210	2932	250	G 2 1/2	892.0	•	99082705

Note: For some GT-U+ tanks, the bladder is available as a spare part. The part number can be found on Grundfos.com (GPC).

Oakfield Technical Services Ltd

Linear Expansion of Riser Pipework

Generator remote cooling system (secondary circuit) at
UCL (ION), London for Bells Power (Q4105)

Pipework Material		1 Carbon Steel
Expansion Coefficient	α	0.0000121

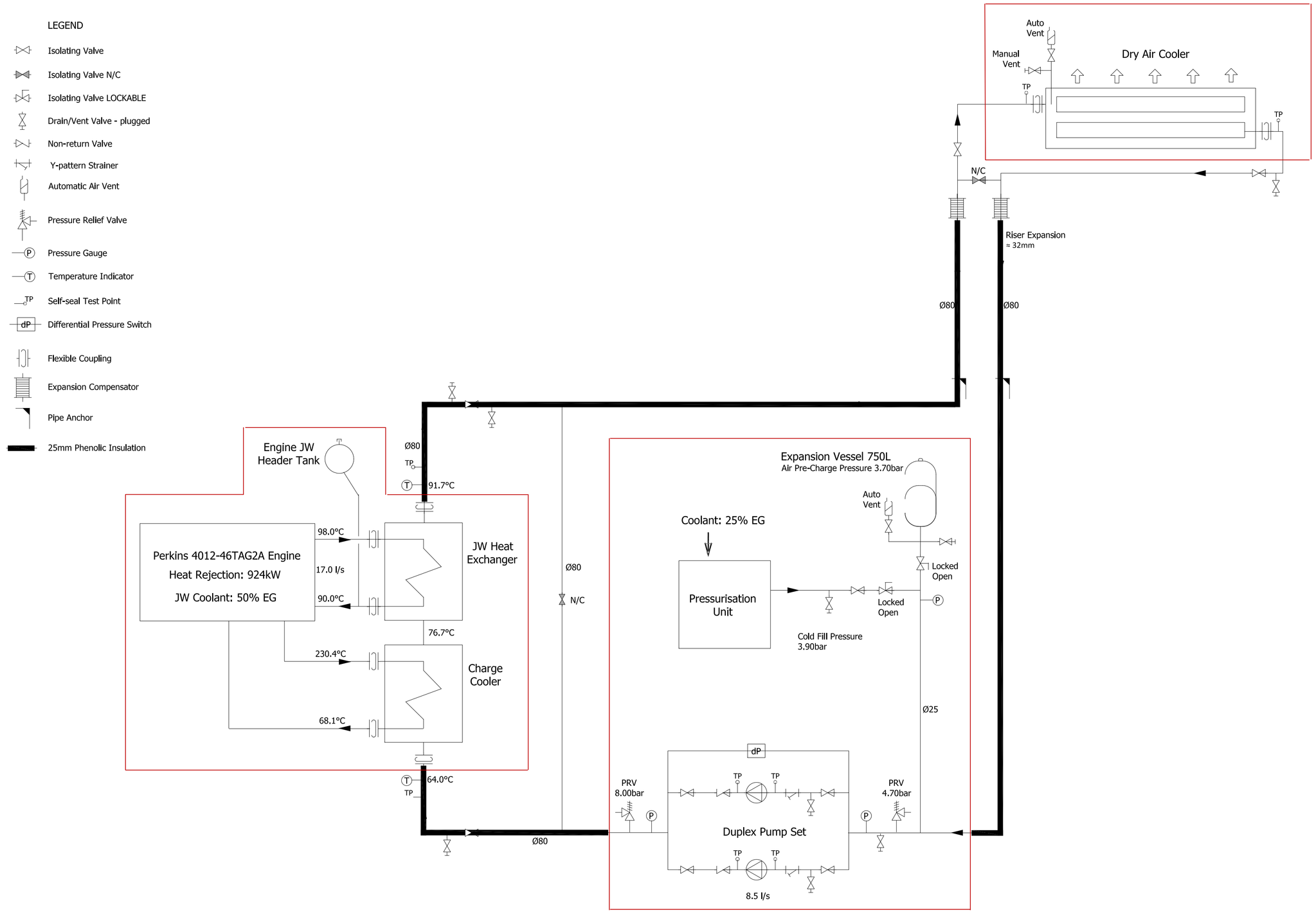
Initial Temperature	°C	15.0
Maximum Temperature	°C	91.7
Temperature Rise	°C	76.7

Length of Pipe Run	m	35.0

EXPANSION	**mm**	**32.482**

A1

ANY DIMENSIONS SCALED FROM THIS DRAWING MUST BE VERIFIED ON SITE.



01	REVISED	01.04.2021
00	PROPOSED	15.02.2021

BELLS
THE STANDBY POWER SPECIALISTS

BELLS POWER SOLUTIONS LTD
70-72, Clifton Street, London EC2A 4HB
Tel: 0203 259 0100
Email : contact@bellspowergroup.co.uk
Web : www.bellspowergroup.co.uk

Status: PROPOSED

Bells Job Number

Project
UCL ION
GENERATOR SERVICES

Title
GENSET COOLING WATER SYSTEM
SCHEMATIC DIAGRAM

Scale: NTS@A1 | Date: APR 2020

Drg No: Q4105-SCH-002 | Rev: 01

Technical Submittal Sheet

3 - Schedules

BEMP-MJL-P1-XX-TS-E-00-0012	Project: UCL IoN/DRI

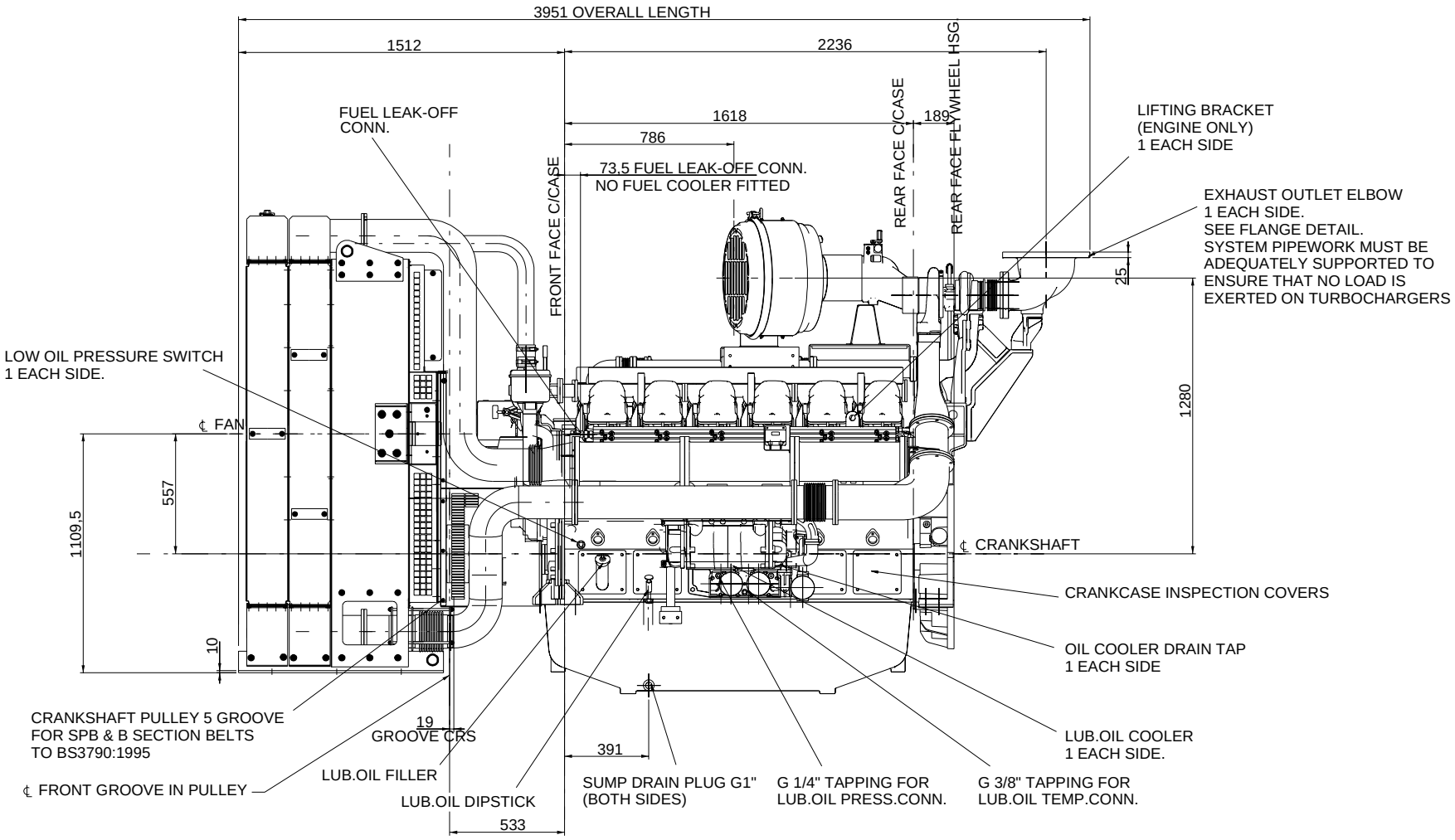
N/A

Technical Submittal Sheet

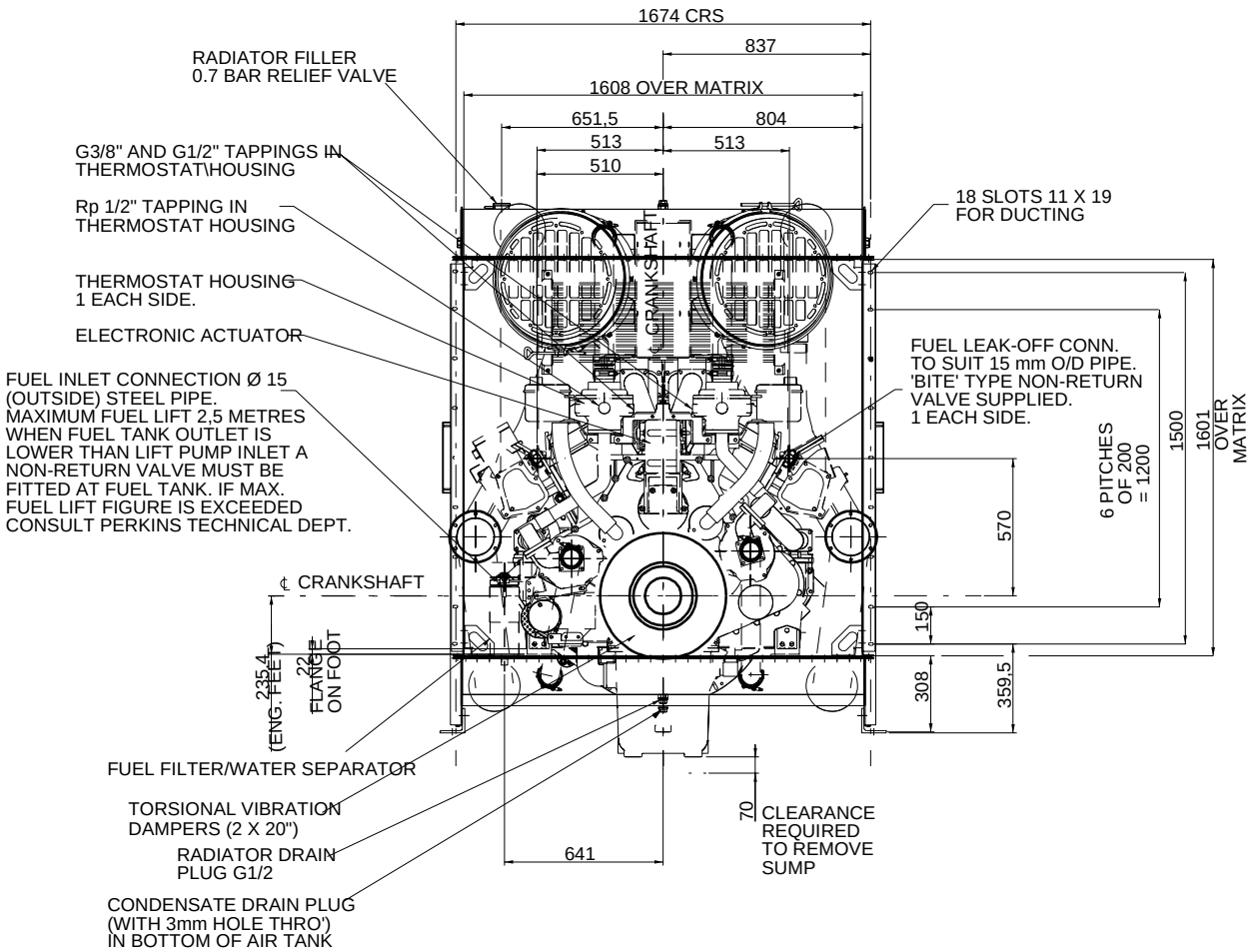
4 - Drawings

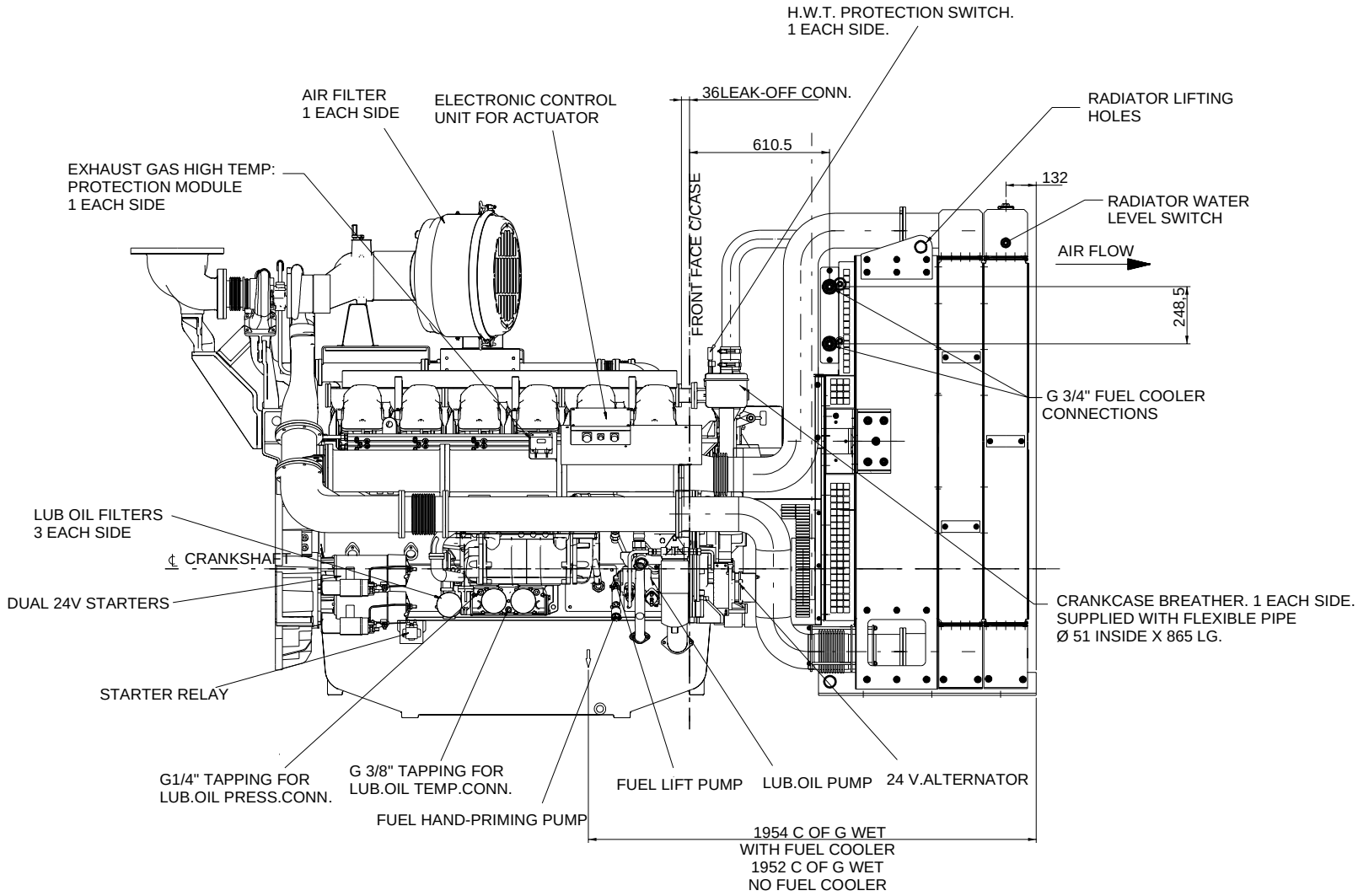
BEMP-MJL-P1-XX-TS-E-00-0012	Project: UCL IoN/DRI

P1500P3 Open Generator Set GA – 467-3103
4012-46TAG2A Left Hand Side View
4012-46TAG2A Front View
4012-46TAG2A Right Hand Side View
4012-46TAG2A Rear View
4012-46TAG2A Plan View of Support Pads, Exhaust Outlet Flange and Flywheel
Generator Room GA – Q4105-GA-101
Rear Entry Fill Point Cabinet

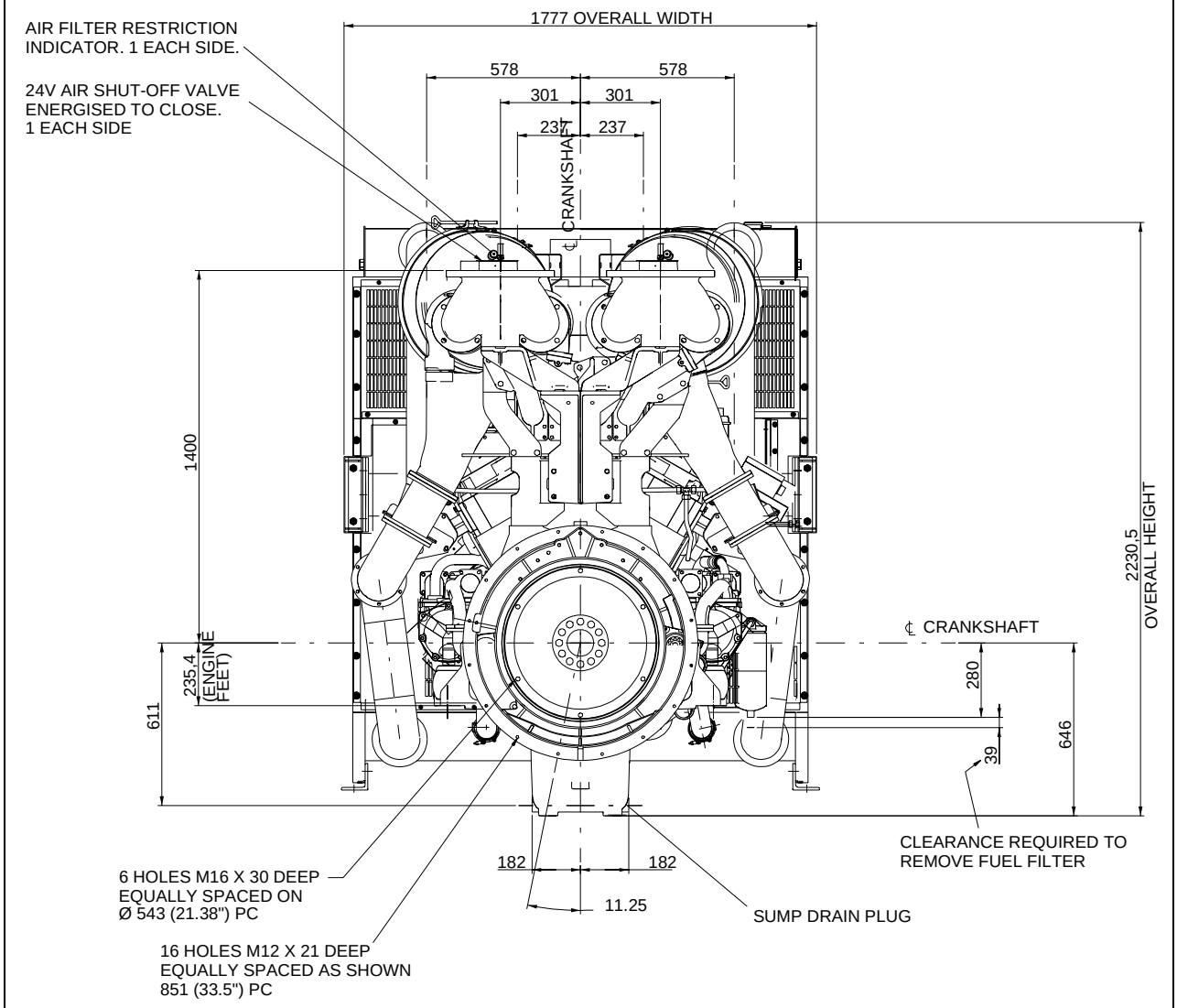

3951 OVERALL LENGTH
1512
2236
1618
786
189
FUEL LEAK-OFF CONN.
73,5 FUEL LEAK-OFF CONN. NO FUEL COOLER FITTED
FRONT FACE C/CASE
REAR FACE C/CASE
REAR FACE FLYWHEEL HSG
LIFTING BRACKET (ENGINE ONLY) 1 EACH SIDE
EXHAUST OUTLET ELBOW 1 EACH SIDE. SEE FLANGE DETAIL. SYSTEM PIPEWORK MUST BE ADEQUATELY SUPPORTED TO ENSURE THAT NO LOAD IS EXERTED ON TURBOCHARGERS
25
1280
LOW OIL PRESSURE SWITCH 1 EACH SIDE.
℄ FAN
557
1109.5
10
℄ CRANKSHAFT
CRANKCASE INSPECTION COVERS
OIL COOLER DRAIN TAP 1 EACH SIDE
LUB.OIL COOLER 1 EACH SIDE.
CRANKSHAFT PULLEY 5 GROOVE FOR SPB & B SECTION BELTS TO BS3790:1995
19 GROOVE CRS
℄ FRONT GROOVE IN PULLEY
LUB.OIL FILLER
LUB.OIL DIPSTICK
533
391
SUMP DRAIN PLUG G1" (BOTH SIDES)
G 1/4" TAPPING FOR LUB.OIL PRESS.CONN.
G 3/8" TAPPING FOR LUB.OIL TEMP.CONN.

4012-46TAG1A / 4012-46TAG2A Temperate - Front view

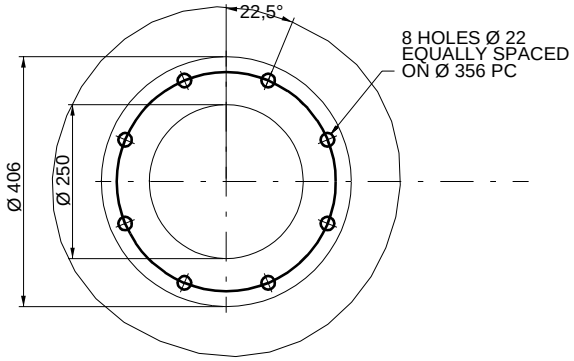



H.W.T. PROTECTION SWITCH.
1 EACH SIDE.
AIR FILTER
1 EACH SIDE
ELECTRONIC CONTROL
UNIT FOR ACTUATOR
36LEAK-OFF CONN.
RADIATOR LIFTING
HOLES
610.5
132
EXHAUST GAS HIGH TEMP:
PROTECTION MODULE
1 EACH SIDE
FRONT FACE C/CASE
RADIATOR WATER
LEVEL SWITCH
AIR FLOW
248.5
G 3/4" FUEL COOLER
CONNECTIONS
LUB OIL FILTERS
3 EACH SIDE
℄ CRANKSHAFT
DUAL 24V STARTERS
CRANKCASE BREATHER. 1 EACH SIDE.
SUPPLIED WITH FLEXIBLE PIPE
Ø 51 INSIDE X 865 LG.
STARTER RELAY
G1/4" TAPPING FOR
LUB.OIL PRESS.CONN.
G 3/8" TAPPING FOR
LUB.OIL TEMP.CONN.
FUEL LIFT PUMP
LUB.OIL PUMP
24 V.ALTERNATOR
FUEL HAND-PRIMING PUMP
1954 C OF G WET
WITH FUEL COOLER
1952 C OF G WET
NO FUEL COOLER

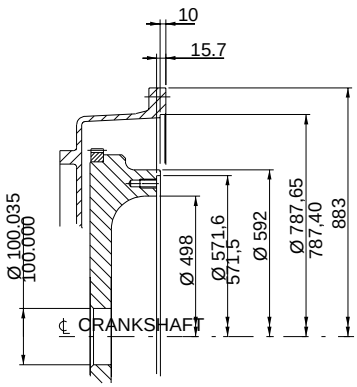
4012-46TAG1A / 4012-46TAG2A Temperate - Rear view



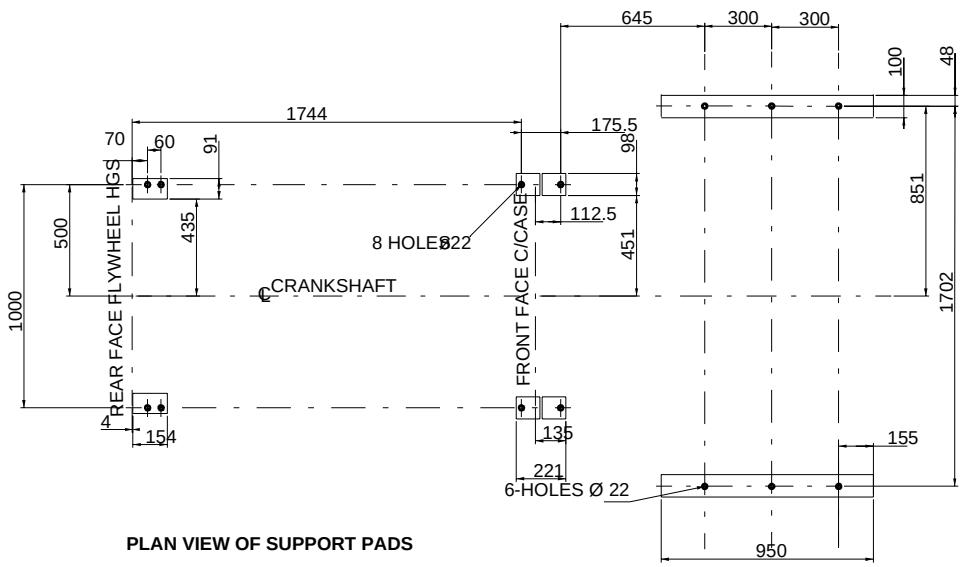
4012-46TAG1A / 4012-46TAG2A Temperate - Plan view of support pads, exhaust outlet flange and flywheel



DETAIL OF EXHAUST OUTLET FLANGE
(B.S.10 TABLE D)
SCALE 1:5

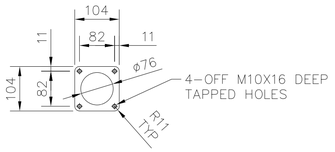


DETAIL OF SAE 518 FLYWHEEL
AND\SAE 00 FLYWHEEL HOUSING
(METRIC TAPPINGS)
SCALE 1:5

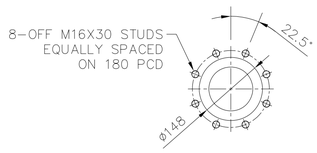


PLAN VIEW OF SUPPORT PADS

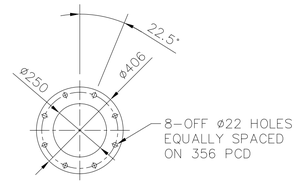
ITEM	QTY.	AUXILLARY CONNECTORS	DIM X	DIM Y	DIM Z
A	1	HEAT EXCHANGER DRIP TRAY DRAIN – 3/4" BSP LHS	1600	68	64
B	1	HEAT EXCHANGER DRIP TRAY DRAIN – 3/4" BSP RHS	1600	68	1286
C	1	FUEL SUPPLY – 3/4" BSP RHS ONLY	2270	280	1286
D	1	FUEL RETURN – 3/4" BSP RHS ONLY	2420	280	1286
E	1	OIL DRAIN – 1" BSP RHS ONLY	2270	100	1286
F	1	ENGINE DRIP TRAY DRAIN – 3/4" BSP LHS	3870	51	64
G	1	ENGINE DRIP TRAY DRAIN – 3/4" BSP RHS	3870	51	1286



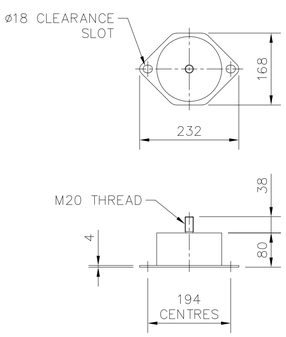
DETAIL OF SECONDARY WATER (SW) INLET FLANGE
N.T.S.



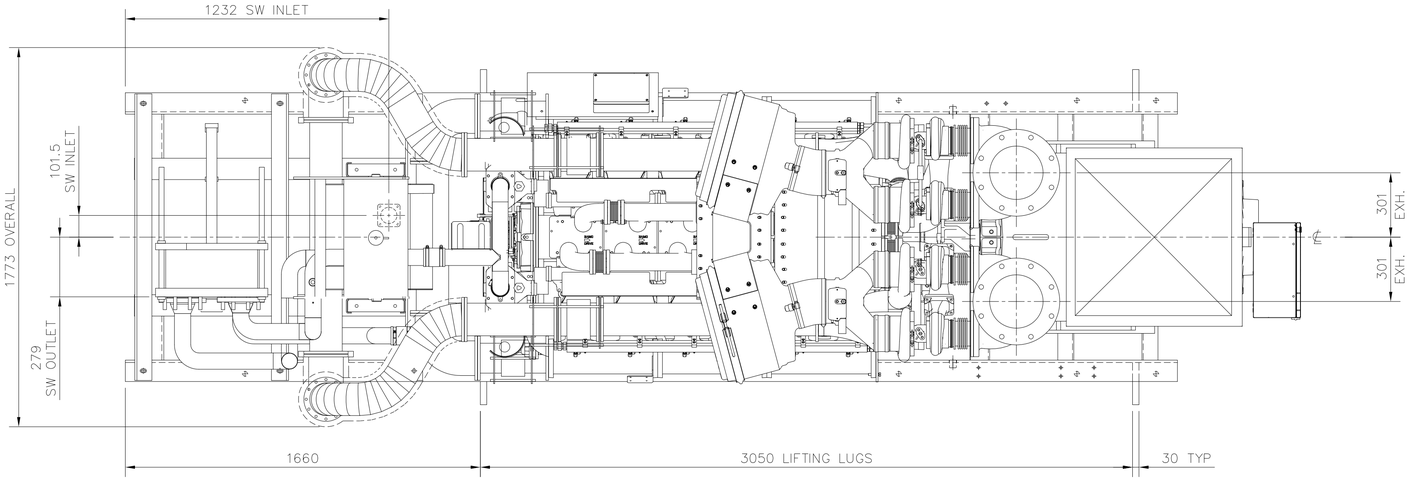
DETAIL OF SECONDARY WATER (SW) OUTLET FLANGE
N.T.S.



DETAIL OF EXHAUST OUTLET FLANGE
N.T.S.



DETAIL OF ANTI–VIBRATION MOUNT
N.T.S.

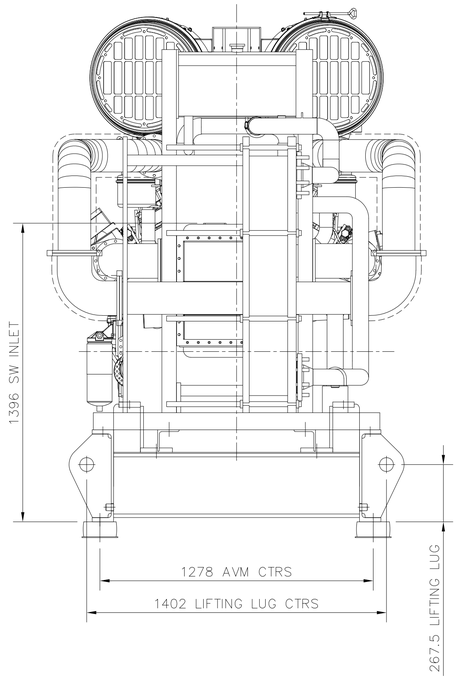


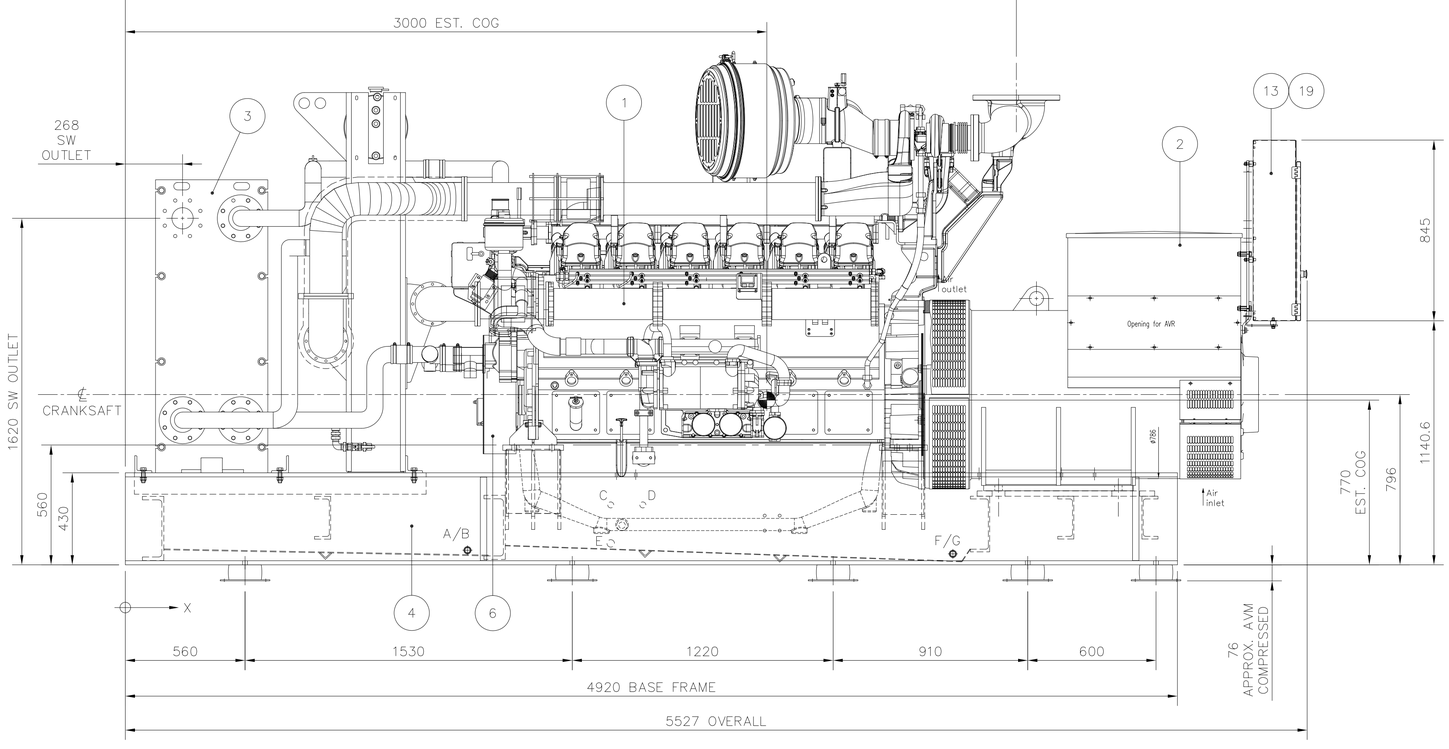
ITEM	QTY.	DESCRIPTION	DRG./PART No.
1	1	ENG 4012–46TAG2A 50Hz	291–6115BL
2	1	ALT LL8224N R450 SAE 00/18	114–493BL
3	1	COOLING KIT CRDA1648–B4	128–501
4	1	SPECIAL BASE AS. SKID	464–9636
* 5	1	BASE GP–GEN (UPFIT)	431–0222
6	1	DAMPER GUARD	MGS1014
* 7	1	SWITCH/SENDER GROUP	MGS4312
* 8	1	KITS: EXHAUST OPEN 4012–46TAG	MGS6902
* 9	1	WH: WATER HEATER. 4012–46TAG	372–2841
* 10	1	WS1: COOL LEVEL S/D. 4000 SERIES	MGS4167
* 11	1	DRAIN GP–COOLANT 4012–46TAG	390–3309
* 12	1	BATTERY GP	367–4953
13	1	CONTROL PANEL ENCL. (EASYGEN 3200)	MDA4747
* 14	1	FLT: FUEL LINES 4012–46TAG	MGS4338
* 15	1	LV1: LUBE OIL DRAIN 4012–46TAG	MGS4953
* 16	1	COUPLING LL8. 4012	MGS4212
* 17	1	FGW: DECALS OPEN 4012	MGS3425
* 18	1	HAZARD LABELS OPEN 4012	MGS4211
19	1	PANEL SUPPORT GP (EASYGEN 3200)	MGS7527
* 20	1	CEC: TURBO HEAT SHIELD 4012–46TAG	331–9912
21	1	CHARGE AIR PIPE INSULATION KIT	450–3642

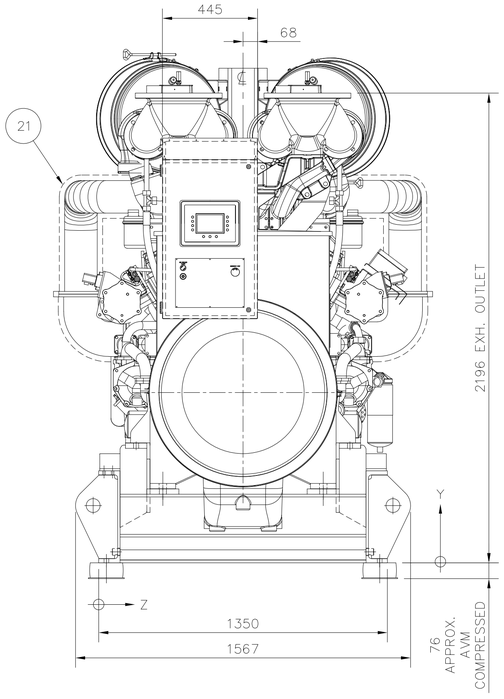
* ITEMS NOT SHOWN

ITEM	QTY.	SHIP LOOSE	DRG./PART No.
& –	10	MOUNT ANTI–VIB 4014	591–003
& –	1	FUEL COOLER (ELEC.)	128–745
& –	2	EXHAUST BELLOWS	131–131

& ALSO SHIP LOOSE ASSOCIATED PARTS I.E. NUTS, BOLTS WASHERS, GASKETS, ADAPTORS ETC (REF. THE BOM FOR RELEVANT BREAKDOWN OF PARTS)







EST. MASS (KG)	
DRY	WITH OIL & COOLANT
9900 KG	10224 KG

ISSUE	DESCRIPTION	ECR/DCR	BY	DATE
00	FIRST ISSUE (BASED ON 448–7806 & 457–5570)	–	P.F.	01/10/14

TOLERANCES EXCEPT WHERE OTHERWISE STATED
0 – 500mm ± 1mm
500 – 2000mm ± 2mm
OVER 2000mm ± 3mm
STRUCTURAL ± 3mm
ANGULAR ± 1°

DO NOT SCALE

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED

3rd ANGLE PROJECTION

DRAWING CLASS: CUSTOM PROD
DRAWING CONTROL: NB760

DRN. BY	P.FITZSIMMONS
DATE	01/10/14
APPD. BY	R.MONTEITH
DATE	01/10/14

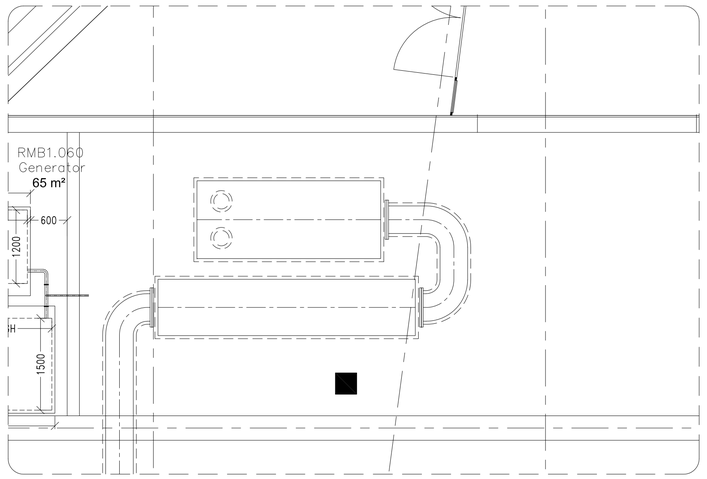
TITLE
GA OF P1500P3 OPEN GENSET
4012–46TAG2A, LL8224N, CRDA1648–B4

SHEET SIZE	ORIGINAL SCALE	DRAWING NO.	ISSUE
A1	1:15	467–3103	00

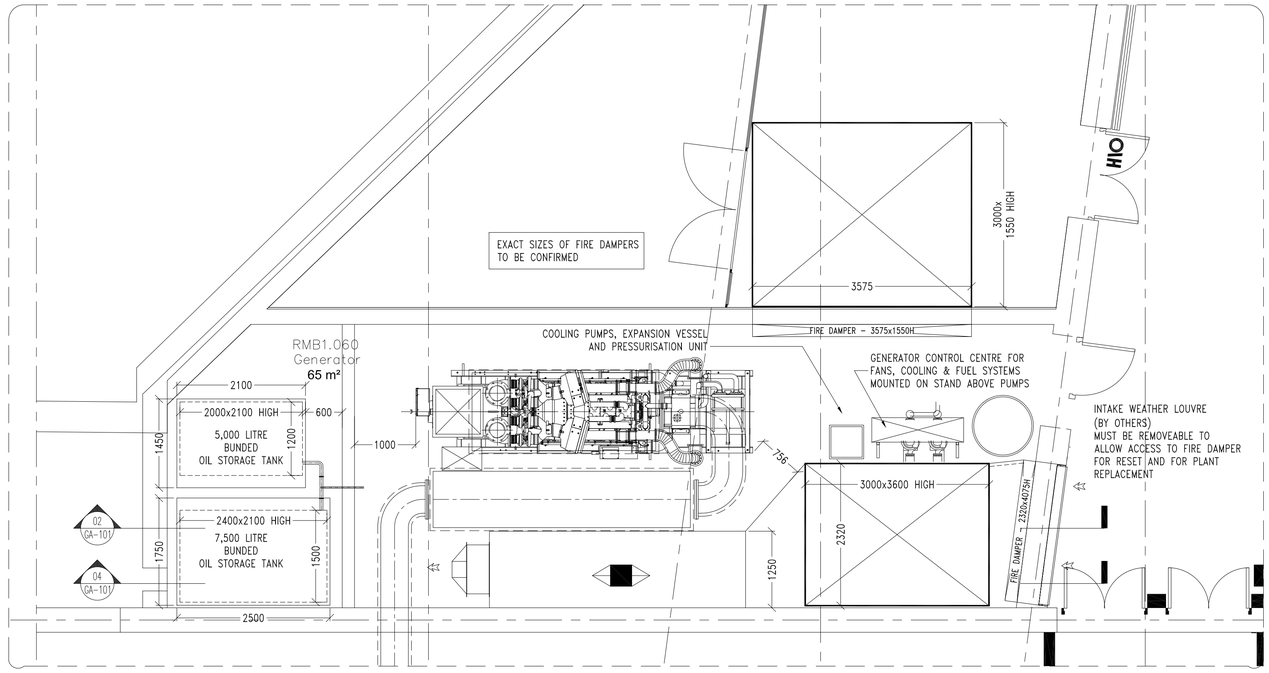
UNB/M/A1/01

A1

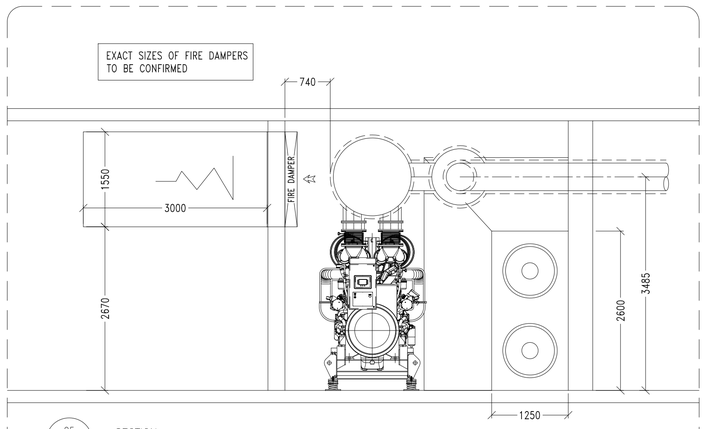
ANY DIMENSIONS SCALED FROM THIS DRAWING MUST BE VERIFIED ON SITE.



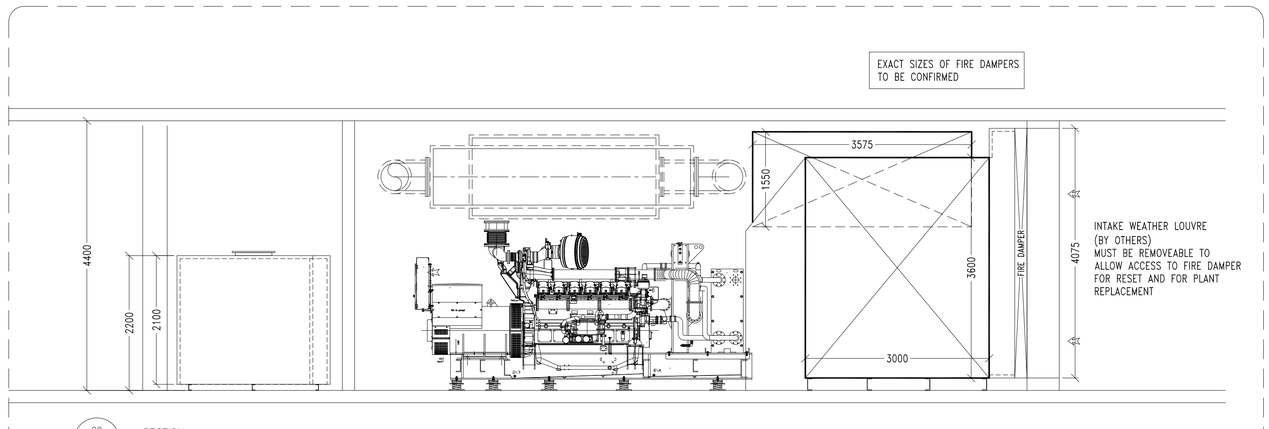
03 GA-101 SILENCER AND FLUE ARRANGEMENT
1:50



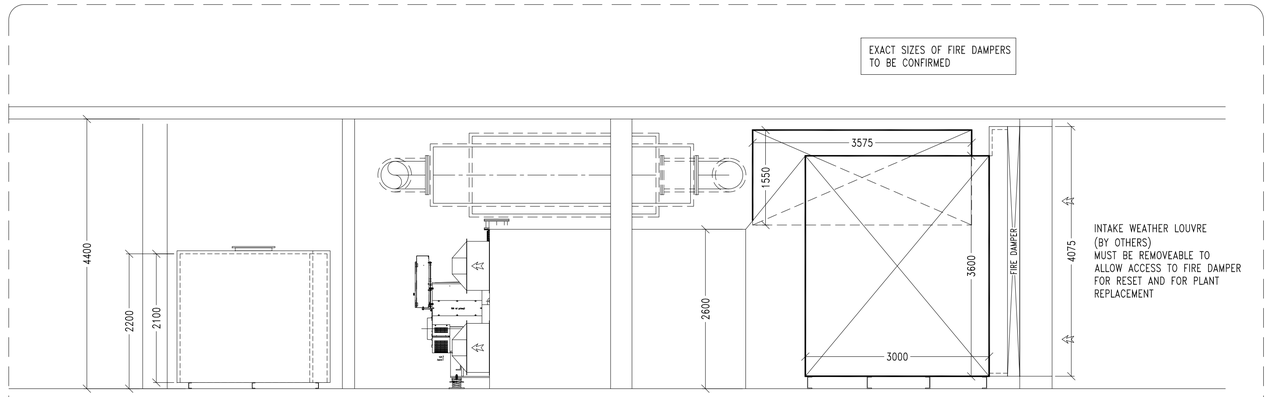
01 GA-101 PLAN
1:50



05 GA-101 SECTION
1:50



02 GA-101 SECTION
1:50



04 GA-101 SECTION
1:50

06	LOUVRE NOTE REVISED, TANKS UPDATED	15.11.2021
05	FIRE DAMPERS INDICATED, INTAKE ATTENUATOR RELOCATED TO SUIT	11.10.2021
04	TANKS REVISED, SECTION ADDED	22.09.2021
03	REVISED	09.09.2021
02	REVISED & FLUE DETAILS ADDED	24.02.2021
01	GENSET UPDATED, SECTION REVISED	11.03.2020
00	PRELIMINARY	02.03.2020

BELLS
THE STANDBY POWER SPECIALISTS

BELLS POWER SOLUTIONS LTD
70-72, Clifton Street, London EC2A 4HB
Tel: 0203 259 0100
Email : contact@bellspowergroup.co.uk
Web : www.bellspowergroup.co.uk

Status: PROPOSED

Bells Job Number:

Project:
UCLH - ION
GENERATOR SERVICES

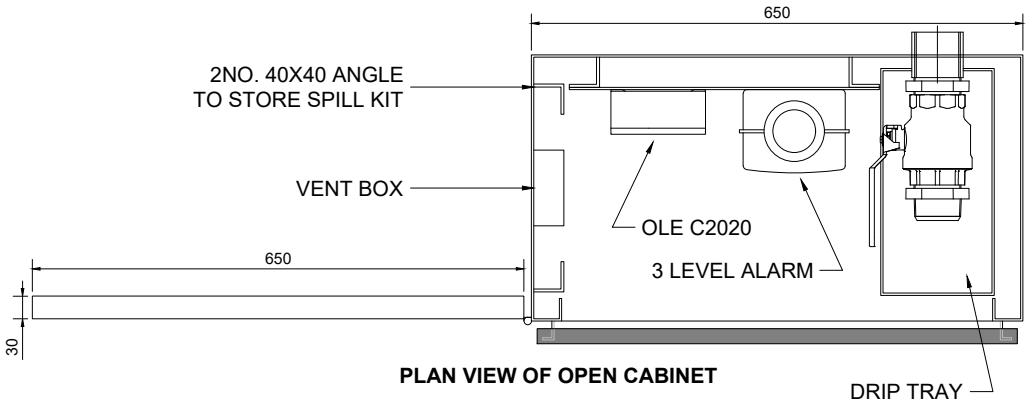
Title:
GENERATOR ROOM G.A. FOR P1500P3 GENSET
60dBA@1M INTAKE, 50@1M DISCHARGE
70dBA@1M FLUE

Scale: 1:50@A1

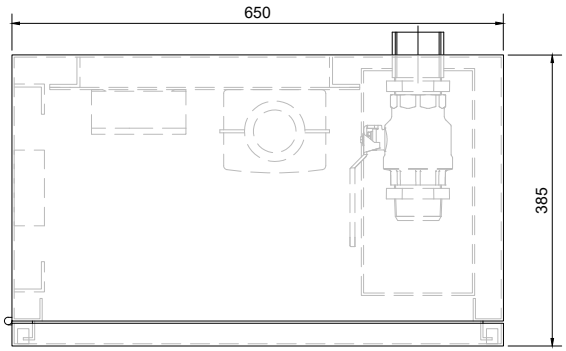
Date: MAR 2020

Drg No: Q4105-GA-101

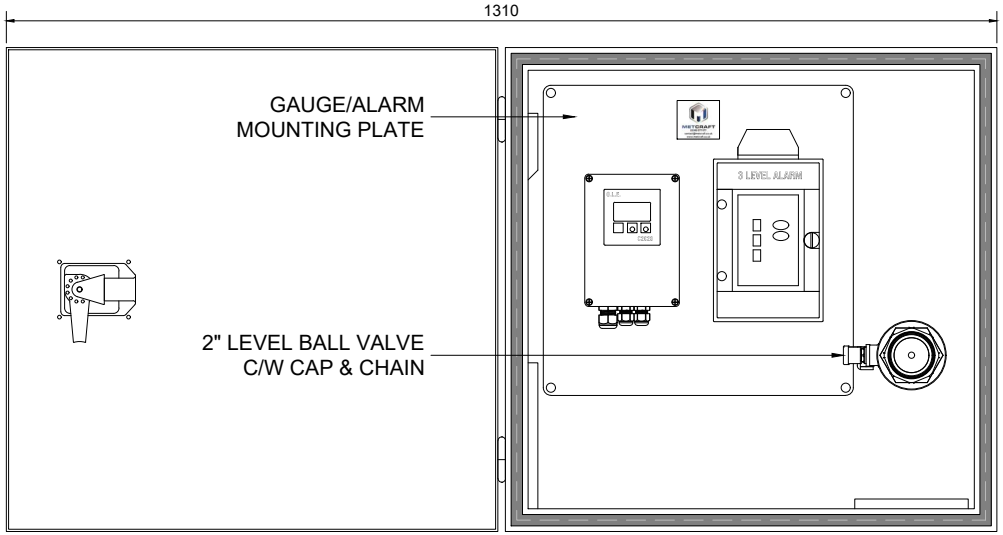
Rev: 06



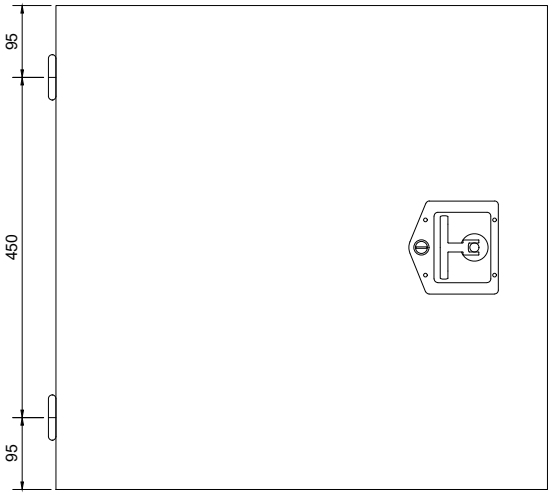
PLAN VIEW OF OPEN CABINET



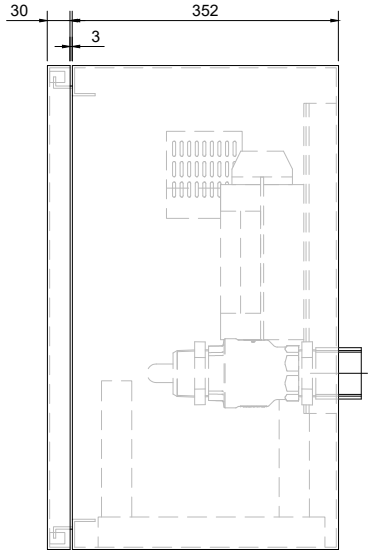
PLAN VIEW OF CLOSED CABINET



FRONT ELEVATION OF OPEN CABINET



FRONT ELEVATION OF CLOSED CABINET



SIDE ELEVATION OF CLOSED CABINET

CABINET EXTERNAL DIMS: 650X385X640
APPROXIMATE WEIGHT OF CABINET: 48KG

COLOUR:	T.B.C
TOLERANCE.	± 20MM
DIMENSIONS.	MM

REV	DATE	COMMENTS
00	XX/XX/XX	ISSUED FOR COMMENT

METCRAFT

METCRAFT GROUP LTD
4 OLD MILL LANE
AYLESFORD
KENT
ME20 7DT

CUSTOMER.	T.B.C
PROJECT REF.	T.B.C
CUSTOMER ORDER NO.	T.B.C
TITLE.	REAR ENTRY FILL POINT CABINET
SCALE.	1:10
JOB REF.	A####
QTY REQ.	1
DATE.	XX/XX/XX
DATE REQUIRED.	XX/XX/XX
SHEET No.	1 OF 1
DRAWN BY.	SE
DRAWING NO.	T.B.C

Technical Submittal Sheet

5 - Schematics

BEMP-MJL-P1-XX-TS-E-00-0012	**Project:** **UCL IoN/DRI**

N/A

Technical Submittal Sheet

6 – Design Calculations

BEMP-MJL-P1-XX-TS-E-00-0012	Project: UCL IoN/DRI

Included within Section 2