

**CHOKE VALVE
INSTALLATION & MAINTENANCE MANUAL**

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CHOKE VALVE INSTALLATION & MAINTENANCE MANUAL

1. INTRODUCTION

This installation and maintenance manual covers the 8" class 1500 angle style choke valve supplied to BP Helvellyn, Contract No. 14019. The choke comprises of a low temperature carbon steel angle type body configuration with a bolted bonnet and manufactured with 8" 1500# integral flanges. The internals are made from Tungsten Carbide and Stainless Steel.

Note: Tungsten Carbide is a very hard and abrasion resistant material but is susceptible to fracture and so must be handled with extreme care

2. SIGNIFICANT EQUIPMENT DETAILS

- 2.1. The Mitech angle choke valve uses a top entry design to allow for easy trim inspection and if necessary the valve internals can be accessed without having to remove the valve from the line.
- 2.2. The choke valve has a dual packing system consisting of a S112 ECOPAEEK set in conjunction with a graphite packing set and stem wiper.
- 2.3. The design uses a bolted bonnet arrangement in conjunction with a high integrity body / bonnet spiral wound gasket.
- 2.4. The choke valve incorporates a pressure balanced One Stage trim and is designed to flow "over the plug".
- 2.5. The One Stage Retainer is wholly manufactured from Tungsten Carbide.
- 2.6. The plug and seat utilise solid tungsten carbide components in conjunction with 316 stainless steel substrate materials.
- 2.7. The plug design includes a pressure balance system incorporating a K007 ECOPUR seal.
- 2.8. The choke design is based on a linear rising stem configuration and has a travel of 80 mm.
- 2.9. The choke was designed and manufactured to fit with the existing Rotork IQML20F14 electric actuator.

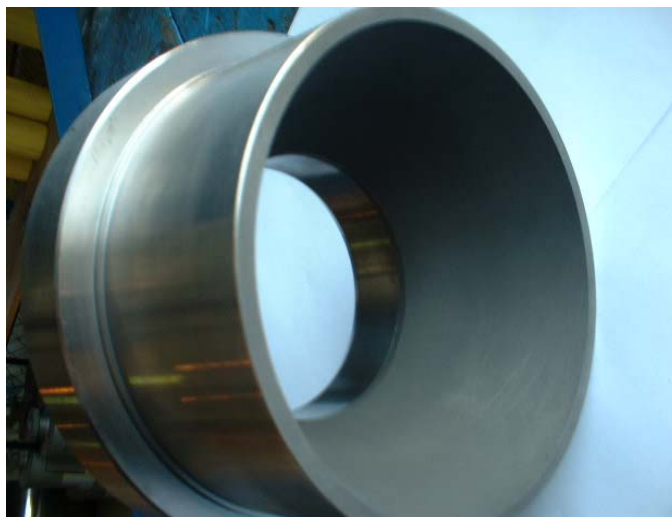


Figure 1: Tungsten Carbide Seat showing expansion venturi (Bottom)

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3. INSTALLATION GUIDELINES

3.1. Slings and lifting

- The valve can be supported and lifted by inserting a shackle through the 2 lifting lugs supplied.
- Care must be taken not to damage the actuator during the installation or removal processes.
- As indicated previously the trim components are constructed in solid Tungsten carbide and **care must be taken** not to drop the valve or cause any significant impact

3.2. Flow Direction

- The flow direction for this choke valve is “over the plug” i.e.: side inlet and bottom outlet.
- A flow arrow is cast on the body to indicate the correct flow direction

3.3. Orientation

- The preferred orientation for the valve is vertical with the actuator in the upright position

3.4. Actuator Installation

- The actuator should be mounted onto the valve with the valve/actuator stem clamp removed and the valve in the closed position. Stroke the actuator to the fully extended position then retract the stem by 3mm. Lightly fit the stem clamp, extract the actuator stem by approximately 20mm and tighten the stem clamp.
- **DO NOT** rotate the plug.

4. ROUTINE MAINTENANCE

Refer to general arrangement drawing (Appendix 1) to identify the component numbers

The valve does not normally require any routine maintenance or adjustments. The stem seal arrangement uses a dual packing system in conjunction with a stem wiper seal. After installation and pressurisation of the system the gland can be adjusted to eliminate any leakage. This would be undertaken by tightening the gland flange nuts (20), until the leaking ceases from the gland flange. Never over tighten the gland flange nuts as this may shorten the life of the gland packing and also have an effect on the smooth operation of the valve. The gland flange (18) must be tightened evenly and checked to ensure that it is central before operating the valve.

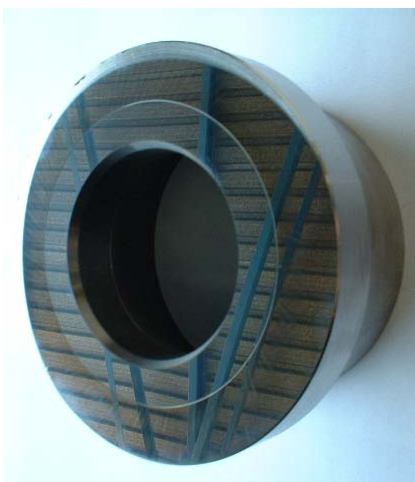


Figure 2: *Tungsten Carbide seat (top)*

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5. DISASSEMBLY OF THE CHOKE VALVE

Refer to general arrangement drawing (Appendix 1) to identify the component numbers

Should it become necessary to disassemble the valve, the following steps should be followed:

Warning: Depressurise the line to atmospheric pressure, isolate the valve and drain all line fluids before working on the valve. Failure to do so can result in serious injury. We strongly recommend removing the valve from the line before any maintenance work be started. (Except to adjust the gland flange)

- 5.1. Open the valve fully using the actuator in order to release the pressure on the plug and seat and to ensure the plug is out of the flow control area.
- 5.2. Remove the stem clamp (23) and the M16 x 70 bolts (31) that attach the electric actuator to the mounting flange (12) and remove actuator from the valve.
- 5.3. Remove all bonnet nuts (9) according to the conventional 8-pass system. Ensure that the bonnet flange (7) is released evenly.
- 5.4. Remove bonnet flange, bonnet (29), retainer (2) and plug (3) as a **complete assembly** by lifting the plug stem using lifting gear. Ensure that the assembly is withdrawn along its axis. **It should be noted that the first 100mm of travel/lift of the stem should be carefully controlled to ensure that the plug engages on the underside of the bonnet, without undue impact.** Ensure the retainer does not fall while lifting the assembly out of the body.
- 5.5. In order to check the plug thoroughly, loosen the gland flange nuts (20) and remove the retainer (2) from the bonnet bore.
- 5.6. Withdraw the plug from the bottom of the bonnet.
- 5.7. Remove the gland flange nuts and flange (18).
- 5.8. Remove the guide packing by using a dowel with a diameter of 31mm. The guides and packing must be removed through the top of the bonnet. Take note of the arrangement and material of packing and guides.
- 5.9. Remove seat ring (1) and both the bonnet gasket (8) and seat gasket (5).
- 5.10. Plug disassembly (if required) would be undertaken in the following manner:
 - Loosen and remove grub screws (Both in the same hole)
 - Remove pressure balance retaining ring
 - Remove old pressure balance seal (28) and "O" ring.

Notes: All old gaskets and seals must be discarded and replaced.

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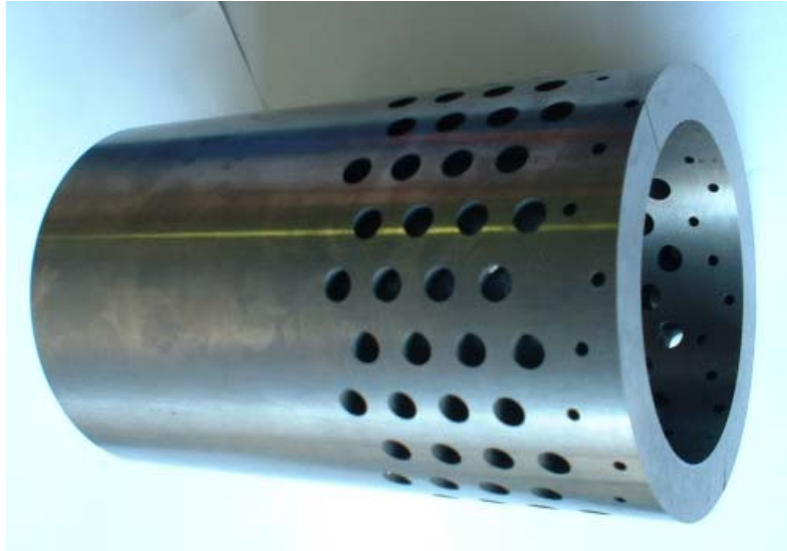


Figure 3: *Tungsten Carbide Retainer*

6. COMPONENT INSPECTION

The valve body, bonnet, retainer seat and plug assembly should be examined for the following types of damage.

Component	Criteria		
	Erosion	Corrosion	Galling
Body (4)	X	X	
Bonnet (29)	X	X	
Plug Assembly (3)	X	X	X
Seat (1)	X	X	
One Stage Retainer (2)	X	X	X

Any significant area of damage should be reported to Valve Solutions Ltd or Mitech directly



Figure 4: *Retainer through side inlet of body*

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7. REASSEMBLY OF THE CHOKE VALVE

Refer to general arrangement drawing (Appendix 1 & 2) to identify the component numbers

Notes:

On reassembly the following parts must be replaced:

- Gland packing (26)
- Bonnet gasket (8)
- Seat gasket (5)
- Plug stem seals (27)
- Pressure balance seal (28)
- Pressure Balanced seal retention ring plug (Mitech Part No. – P3883D.400)
- Plug Head “O” Ring (Mitech Part No. –M2248.655)
- Plug stem wiper seal (25)

N.B. Under no circumstances should the spiral wound gasket be re-used

The valve must be built from the body up and in the vertical position.

The valve body must be secured to prevent movement during assembly.

All parts must be clean.

7.1. Plug assembly (if required) would be undertaken by the following.

- Lightly grease and replace the plug head “O’ Ring
- Lightly grease then place the new pressure balance seal (28) onto the plug (3). The pressure will be from the bottom and the seal must be fitted as the picture i.e. larger diameter away from stem.
- Replace the Pressure Balanced retention ring plug.
- Screw pressure balance retaining ring against shoulder retaining the seal.
- Insert pressure balanced seal retaining ring plug.
- Insert grub screws into retainer and tighten separately.

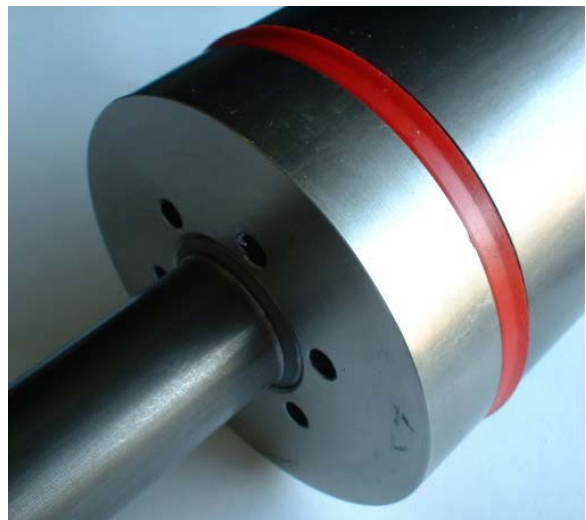


Figure 5: Plug head showing pressure balance bonnet and seal

- 7.2. Insert new seat gasket (5) on the seat ring recess in the body.
- 7.3. Position a new bonnet gasket (8) into the body recess.
- 7.4. **Take extreme care not to damage the components.**
- 7.5. Apply a light film of grease to the bore of the pressure balance sleeve.

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7.6. The arrangement for the stuffing box is as follows: See appendix 3

- Lower Guide (15)
- S112 ECOPAEK set (27)
- Packing spacer (16)
- Graphite packing rings (26)
- Upper Guide with liner (17)

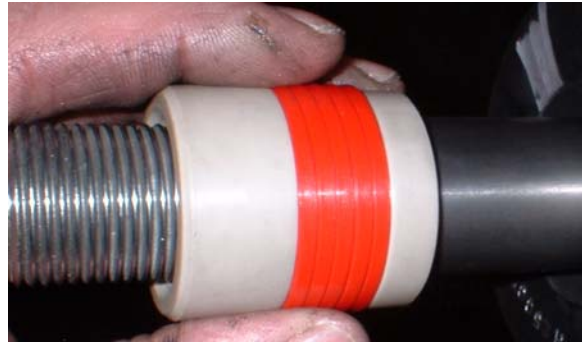


Figure 6: S112 ECOPAEK set

- 7.7. First fit lower guide and the ECOPAEK packing set into the bonnet bore. Insert packing spacer and whilst holding this down with a suitable tube to ensure that the packing set does not push up beyond the shoulder gently insert the plug stem from the bottom of the bonnet. Remove tool and fit graphite packing braid followed by the upper guide assembly.
- 7.8. Insert the pressure balance retainer into reassembled plug/bonnet assembly.
- 7.9. Fit bonnet flange (7)
- 7.10. Replace the lifting lugs and the bonnet flange nuts (9) and hand tighten.
- 7.11. Place Gland flange (18) and locate nuts (20) onto gland flange studs (19).
- 7.12. Gradually and uniformly tighten the bonnet nuts – checking regularly for parallelism of the bonnet flange (7) to the body. Move the plug up and down regularly to ensure freedom of movement.
- 7.13. Tighten the body nuts to 460 Nm according to the conventional 8 – pass system. Measure the gap between the body and the bonnet flange.
- 7.14. Once the bonnet is fully tightened into the body, replace the actuator mounting bars (11) and actuator flange (12). Tighten the actuator mounting flange cap screws (13).
- 7.15. Fit the actuator (30) onto the mounting flange using the M16 x 70 bolts (31).
- 7.16. The actuator should be mounted onto the valve with the valve/actuator stem clamp removed and the valve in the closed position. Stroke the actuator to the fully extended position then retract the stem by 3mm. Lightly fit the stem clamp, extract the actuator stem by approximately 20mm and tighten the stem clamp.

8. TESTING

- 8.1. Service leak testing and pressure testing to be carried out in accordance with normal operating procedures.

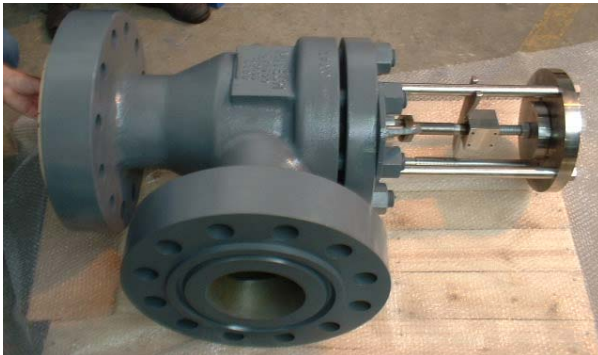


Figure 7: Body without Actuator

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Appendix 1:

CONTROL VALVE TROUBLE SHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Valve operation not smooth	Gland Flange over tightened Plug head pressure balance sleeve bore Alignment of actuator stem and plug. Actuator faulty	Loosen Gland Flange Nuts and re tighten just over finger tight. Strip valve and check plug and retainer bore for signs of galling and foreign matter Check actuator tight on mounting flange. Refer to Rotork manual
Valve passing excessive product when closed	Calibration out Plug not achieving full travel Incorrect flow direction Damaged Seat or Plug surfaces	Position valve on seat Check plug travel against indicator plate Check flow corresponds with direction on valve. Check Plug and Seat (See section 6)
Valve not opening fully	Calibration out Plug not achieving full travel	Check actuator settings. Check plug travel against indicator plate.
Poor Control	Speed and accuracy of response	Check that the speed of response and the position of the plug correspond with signal changes.

Appendix 2

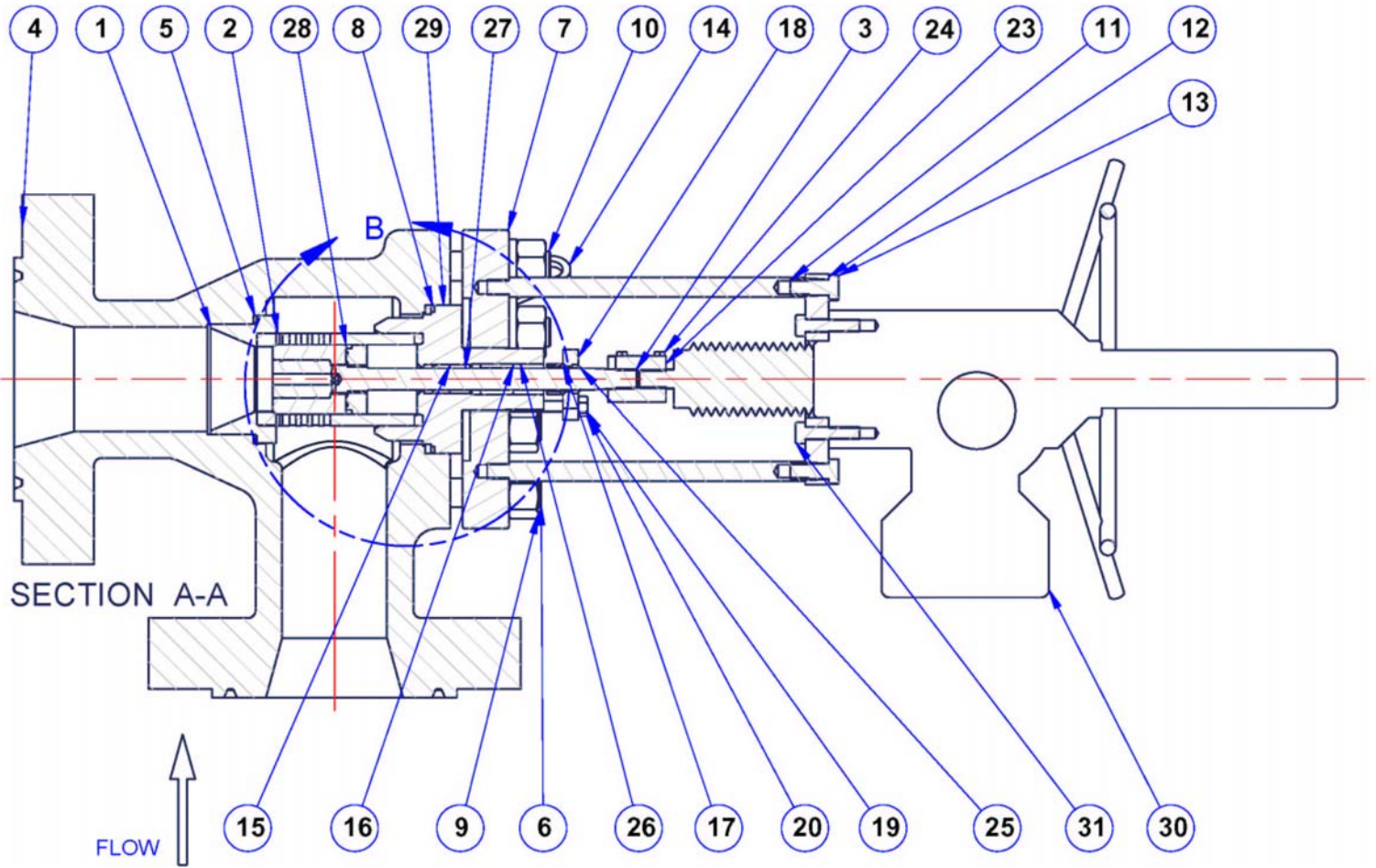
SPARE PARTS

SPARES LIST				
<u>150mm #1500 ANGLE GCV + ROTORK 14/16ML + T/CARB CC</u>				
ITEM	DESCRIPTION	QTY	PART	MAT.
1	SEAT RING 150 #1500 CC SD90 T/C	1	P3882	.888
2	RET 150 #1500 CC CV303 BI-LIN PB	1	P3890	.888
3	PLUG 150mm SD90 CC PB T/CARB	1	P3883	.888
5	GASKET SEAT CB150	1	P1463	.846
8	GASKET BONN CB150	1	P1464	.846
15	GUIDE 80/100mm SOLID 38 O/D	1	P3877	.825
17	GUIDE RETAINER 80/100 GRAFOIL	1	P1195	.150
25	WIPER ROD 28/38/11/8	1	M5990	.999
26	PACK BRB GRAF - 396 6mm	0.8	P1196	.846
27	SEAL KIT S211 ECOPAK	1	P3891	.999
28	PB SEAL	1	P3892	.999

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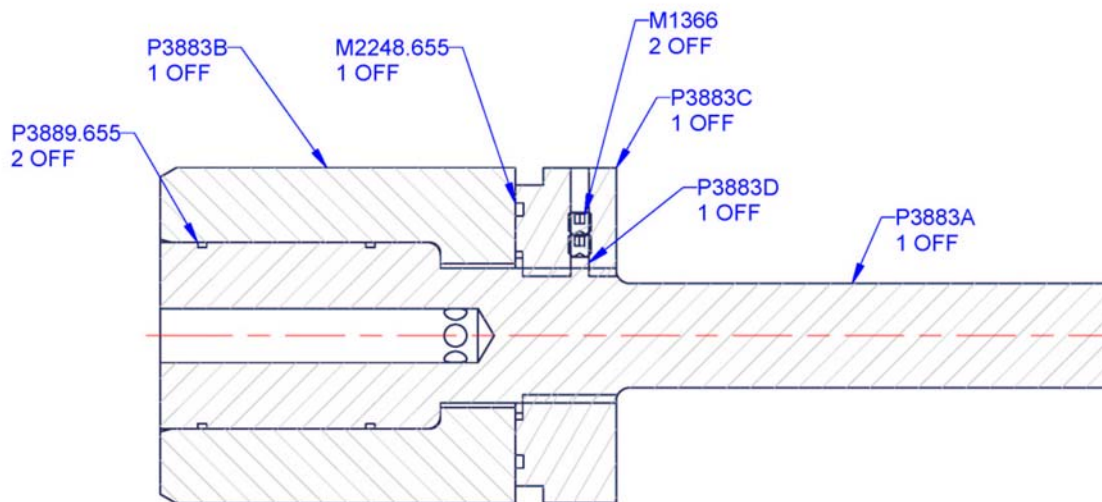
Appendix 3

GENERAL ARRANGEMENT DRAWING



Appendix 4:

PLUG



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Appendix 4

PARTS LIST

PARTS DISCRIPTION			
150mm #1500 ANGLE GCV + ROTORK 14/16ML + T/CARB CC			
ITEM	DESCRIPTION	QTY	PART MAT.
1	SEAT RING 150 #1500 CC SD90 T/C	1	P3882.888
2	RET 150 #1500 CC CV303 BI-LIN PB	1	P3890.888
3	PLUG 150mm SD90 CC PB T/CARB	1	P3883.888
4	BODY ANGLE 150 #1500 RTJ	1	P3879.005
5	GASKET SEAT CB150	1	P1463.846
6	STUD 1.5" - 8 UNC 165 LONG	4	P3557.016
7	FLANGE BONN ANGLE 150 #1500	1	P3880.029
8	GASKET BONN CB150	1	P1464.846
9	NUT 1.50" 8 TPI GRADE 2H	8	P2405.015
10	STUD 1.5" - 8 UNC 175 LONG	4	P2464.016
11	MTG BAR CA100 - 25 EXT	4	P3915.151
12	MTG FLANGE 14/16 ML 240PCD	1	P3884.130
13	BOLT (SET) M20 x 50	4	M2618.151
14	LIFTING LUG 150mm #1500 AGCV	2	P3898.029
15	GUIDE 80/100mm SOLID 38 O/D	1	P3877.825
16	PACK SPACER 100mm #2500	1	P3840.150
17	GUIDE RETAINER 80/100 GRAFOIL	1	P1195.150
18	GLAND FLNG CB100 #2500 WIPER	1	P3887.150
19	GLAND FLG STUD M14 x 120	2	P3842.150
20	NUT M14	2	M4176.151
21	GRUBSCREW M5 x 5	2	M1245.151
22	IND PLATE CA100 80ST	1	P1944.150
23	STEM CLAMP M24 - 1" UNF 240PCD	1	P3886.130
24	BOLT (SET) M8 x 50	4	P1384.151
25	WIPER ROD 28/38/11/8	1	M5990.999
26	PACK BRB GRAF - 396 6mm	0.8	P1196.846
27	SEAL KIT S211 ECOPAK	1	P3891.999
28	PB SEAL	1	P3892.999
29	BONNET PB 150mm #1500 ANGLE	1	P3881.150
30	ACTUATOR ROTORK IQML 20	1	
31	BOLT (SET) M16 x 70	4	M4231.151