MK2 & MK3
Hydraulic Pan & Tilt Unit

Operator & Installation Manual

Document: 0691-SOM-00004, Issue 01

Outstanding Performance in Underwater Technology

Tritech

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TABLE OF CONTENTS

INTRODUCTION

Firstly, thank-you for purchasing and using this high quality Tritech International Ltd (TIL) product. If used correctly, we expect that it will provide you with many years of service.

This extremely rugged and compact hydraulic pan & tilt unit can accommodate a wide range of underwater industry standard cameras.

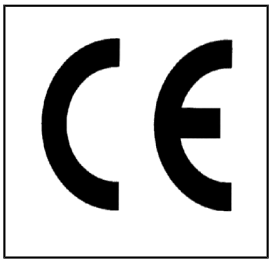
Standard rotational movements are 360 degrees for pan & 180 degrees for tilt functions. (Note that tilt can be configured for 360 degrees by removal of spacers). Maximum sweep rotations can be reduced simply by fitting plastic spacers (1448-DET).

Flow controllers are incorporated which allow precise speed control of both pan & tilt function.

This operation and maintenance manual has been devised with the intention of being simple, yet informative. The comprehensive set of quality pictorial assembly drawings show clearly how the unit is built in a step-by-step manner, allowing a technician to carry out any maintenance or repair work whilst in the field.

TIL operate a policy of continual development and product improvement. If there are any areas of this product (or even this manual) which you believe could be enhanced or improved, we would value your comments. Every attempt will be made to include them in future product updates.

CE CERTIFICATION (EMC DIRECTIVES)



The Hydraulic Pan & Tilt Unit complies with all the regulations relevant to the above certification subject to correct use in accordance with this manual.

SAFETY STATEMENT

Danger!

Throughout the manual certain safety related comments and requirements that could lead to injury or loss of life will be highlighted to the operator by indications in the margin identified as opposite.

Caution!

Throughout the manual certain safety related comments and requirements that could result in damage to the product or other property will be highlighted to the operator by indications in the margin identified as opposite.

TECHNICAL SUPPORT

Contact your local agent or Tritech International Ltd

	Mail	***Tritech International Ltd.*** Peregrine Road, Westhill Business Park, Westhill, Aberdeen, AB32 6JL, UK
	Telephone	++44 (0)1224 744111
	Fax	++44 (0)1224 741771
	Email	support@tritech.co.uk
	Web	www.tritech.co.uk

An out-of-hours emergency number is available by calling the above telephone number

If you have cause to use our Technical Support service, please ensure that you have the following details at hand **prior** to calling:

- System Serial Number (if applicable)
- Fault Description
- Any remedial action implemented
- Software Revision (if applicable)

Due to the expansion of equipment capabilities and the fact that new sub-modules are continually being introduced, this manual cannot detail every aspect of the operation.

1. SPECIFICATION

Pressure	200 Bar maximum input pressure
Torque Output	• Specific Torque: 0.28 Nm.bar • Torque @ 100 bar: 28 Nm • Torque @ 200 bar: 56 Nm
Rotation	360 degrees maximum in both pan and tilt axes. Plastic spacers available to reduce in 30 degree increments.
Weight	MK2/A2: 3 kg in air, 2 kg in water MK2/HD: 4.1 kg in air, 3.1 kg in water MK3: 4.1 kg in air, 3.1 kg in water
Bleed Screws	4 off main pressure bleed points and 2 off case bleeds
Mounting	4 off M8 stainless steel screws and hex nuts.
Recommended payload	8kg total air weight (single side limit 5kg) max. length of payload items 300mm

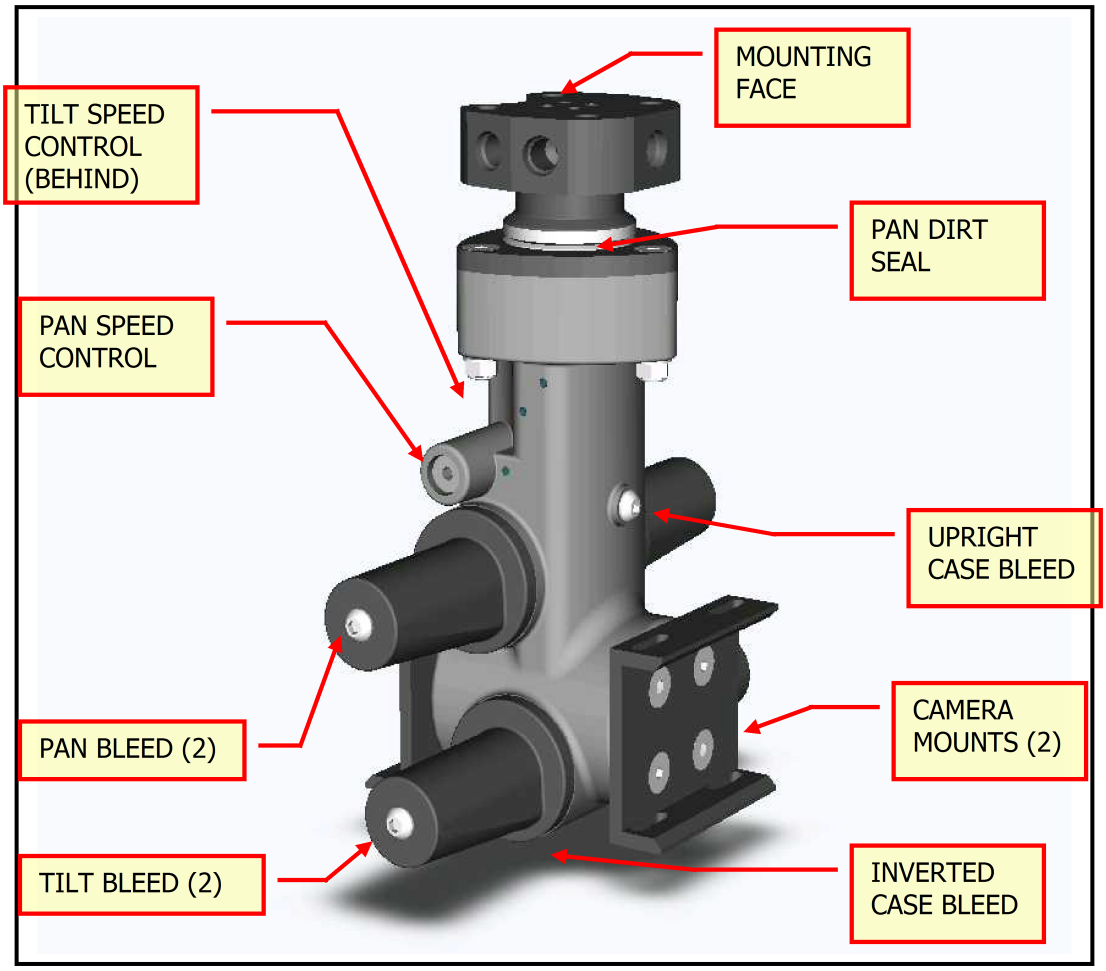
Model Variations

The MK2/HD and the MK3 are identical when viewed externally. The part numbers on the unit body will allow you to differentiate between the two.

SAPT3636/HD – Heavy Duty MK2 Pan and Tilt
SAPT3636/HD3 – MK3 Pan and tilt

The MK2/A2 has aluminium internals and a black anodised pan shaft rather than stainless steel and so is notably different. All MK2 units use the same seal kit.

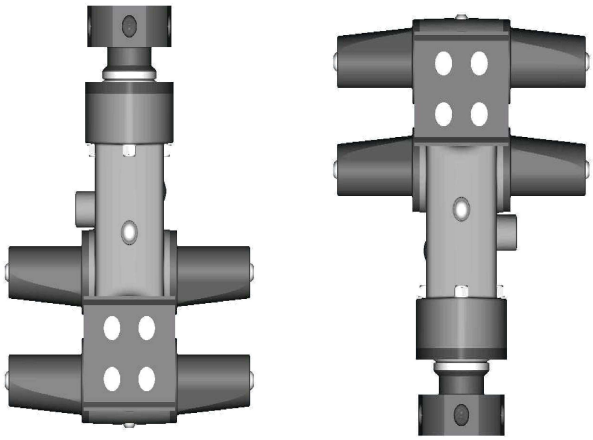
2. LOCATION OF FEATURES



3. INSTALLATION

Mounting

(Refer to General Arrangement Drawing, 1367-GA)



The unit can be mounted in two orientations as shown.

Attachment to supporting structure is by means of 4 off M8 stainless steel screws and hex nuts.

The support structure should be designed to allow clear access to all the hydraulic connections on the unit.

Hydraulic Connections

(Refer to General Arrangement Drawing, 1367-GA

Danger!

Care must be taken when working with high pressure hydraulics. Ensure that adequate personal protective equipment is worn.

The following connections are required:

Function	Quantity	Size	Comments
Pan	2	7/16" SAE Female	Plastic Capped
Tilt	2	7/16" SAE Female	Plastic Capped
Case Drain	1	7/16" SAE Female	Plastic Capped

Caution!

The Case Drain connection must be used otherwise the unit will suffer damage.

Best performance will be obtained by using hard plumbing. Flexible hoses should be avoided since they act as hydraulic accumulators and will cause functions to drift on instead of stopping when the supply to them is cancelled.

Hydraulic Oils

General mineral based hydraulic oils can be used. To ensure a long service life, make sure that the oil is filtered, clean and free from water.

Bleeding Air from Unit

All air should be bled from the cylinders to ensure smooth movements.

Caution!

This is of particular importance due to the inclusion of flow adjusters which inhibit air passing back to the vehicle system.

1. Firstly close the two flow adjuster by turning clockwise (do not tighten).
2. Operate the pan function in one direction and slightly open pan flow control until a slow movement occurs. Cancel function.

Danger!

Setting a slow speed is essential for safe implementation of step 4.

3. Open each pan bleed one full turn only.
4. Operate pan function while resisting the movement by hand in the opposite direction to expel air from cylinder. Cancel function and close bleed when complete.
5. Repeat in opposite pan direction.
6. Repeat tilt function in both directions

Caution!

DO NOT OVERTIGHTEN THE BLEED SCREWS.

DO NOT OPEN OR CLOSE BLEED SCREWS UNDER PRESSURE.

4. OPERATION

Once all the air is removed, the flow controls can be set to the desired speed of rotation. Cameras can then be fitted to the mounting brackets by means of stainless steel hose clip bands. So far is possible the units should be balanced such that the centre of gravity is close to the centre of rotation, and care taken to avoid cables interfering with the hydraulic connections. It is strongly recommended that long cameras are fitted with low profile right angle connectors to minimise interference problems. Routing of cables to allow the required pan and tilt excursions without snagging is essential.

5. PREVENTATIVE MAINTENANCE

Preventative maintenance is minimal and consists of carrying out the following checks: -

- Check for oil leaks.
- Check for any slack movements.

6. DRAWINGS

The following drawings are attached and should be used for installation and maintenance. See Appendix 1.

Drawing No.	Title
1367-GA	Hydraulic Pan & Tilt General Arrangement
1415-MAS	Hydraulic Pan & Tilt (MK2) Main Assembly Drawing
2359-MAS	Heavy Duty Pan & Tilt (MK2) Main Assembly Drawing
5735-MAS	Hydraulic Pan & Tilt (MK3) Main Assembly Drawing

7. SPARES

MK2 unit

The following Recommended Operational Spares Kit is available:

All other parts are available individually from Tritech International. Part Numbers are stated on the relevant Main Assembly Drawings.

Recommended Operational Spares Kit (ROSK) [MK2 units]		
Qty	**Description**	**Part No.**
4	Glyd Ring T & O-Ring	SAPT-SEA-0019
4	Wear Ring - 19 mm	SAPT-SEA-0020
1	Dirt Excluder Seal	SAPT-SEA-0021
2	Bleed Screw 6mm	SAPT-0267-DET
4	O-RING 1.78 x 39.45(BS 519)	SAPT-SOR-178-0395-N70
4	O-Ring 1.78 x 25.12 (BS-022)	SAPT-SOR-178-0251-N70
5	O-Ring 2.62 x 22.23 (BS-813)	SAPT-SOR-262-0222-N70
1	O-Ring 2.62 x 36.17 (BS-127)	SAPT-SOR-262-0361-N70
3	O-Ring 2.62 x 50.47 (BS-136)	SAPT-SOR-262-0505-N70
6	O-Ring 1.78 x 4.76 (BS-802)	SAPT-SOR-178-0048-N70
2	O-Ring 2.62 x 7.59 (BS-109)	SAPT-SOR-262-0076-N70
2	O-Ring 1.78 x 12.42 (BS-014)	SAPT-SOR-178-0124-N70

MK3 unit

The following recommended spares are available:

All other parts are available individually from Tritech International. Part Numbers are stated on the relevant Main Assembly Drawings.

Qty	Description	Part No.
4	Glyd Ring T & O-Ring	SAPT-SEA-0019
4	Wear Ring - 19 mm	SAPT-SEA-0020
1	Dirt Excluder Seal	SAPT-SEA-0021
2	Bleed Screw 6mm	SAPT-0267-DET
1	Turcon Roto Glyd Ring – 28mm	SAPT-SEA-0059
4	O-Ring 1.78 x 39.45(BS 519)	SAPT-SOR-178-0395-N70
4	O-Ring 1.78 x 25.12 (BS-022)	SAPT-SOR-178-0251-N70
1	Quad Ring 2.62 x 36.17 (QR 4137)	SAPT-SQR-262-0361-N70
3	Quad Ring 2.62 x 50.47 (QR 4136)	SAPT-SQR-262-0505-N70
6	O-Ring 1.78 x 4.76 (BS-802)	SAPT-SOR-178-0048-N70
2	O-Ring 2.62 x 7.59 (BS-109)	SAPT-SOR-262-0076-N70
2	O-Ring 1.78 x 15.60 (BS-016)	SAPT-SOR-178-0156-N70
2	O-Ring 1.78 x 7.94 (BS-804)	SAPT-SOR-178-0079-N70

MK3 Seal Installation

The seals (item 20 in drawing 5735-MAS) installed in the pan shaft require special attention. A full installation procedure can be found in the Turcon Roto Glyd Ring Manual in Appendix 2.

APPENDICES

THIRD ANGLE PROJECTION

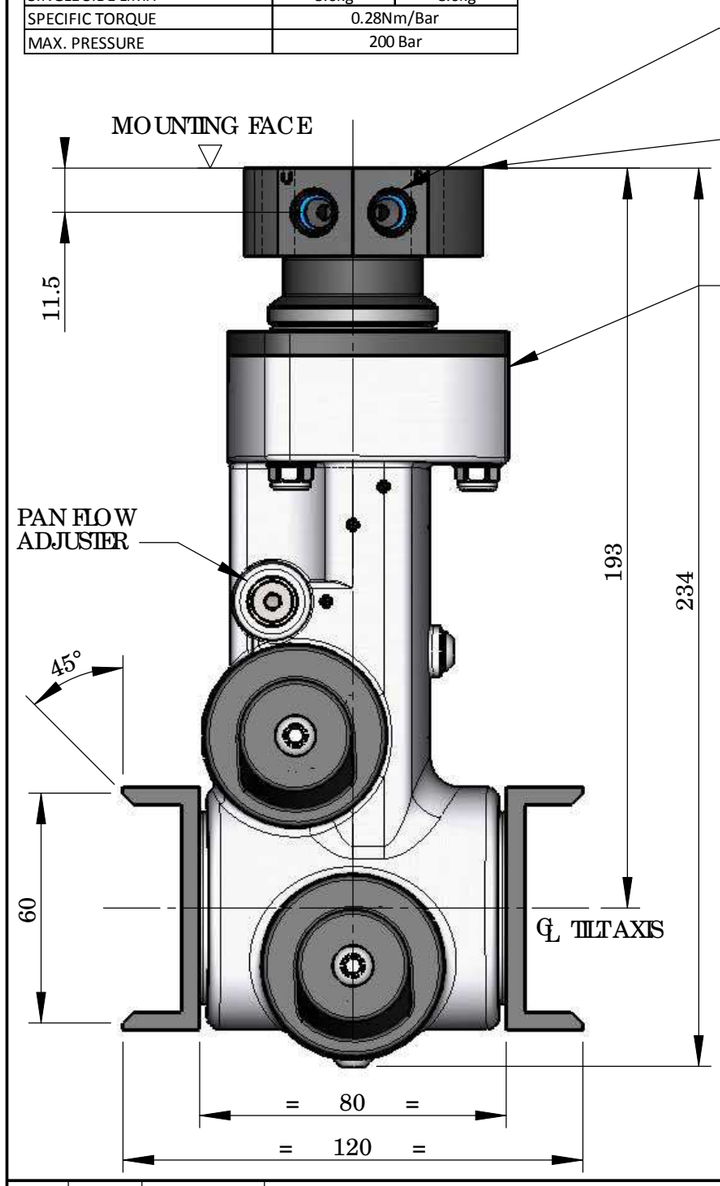
TWO VERSIONS AVAILABLE:

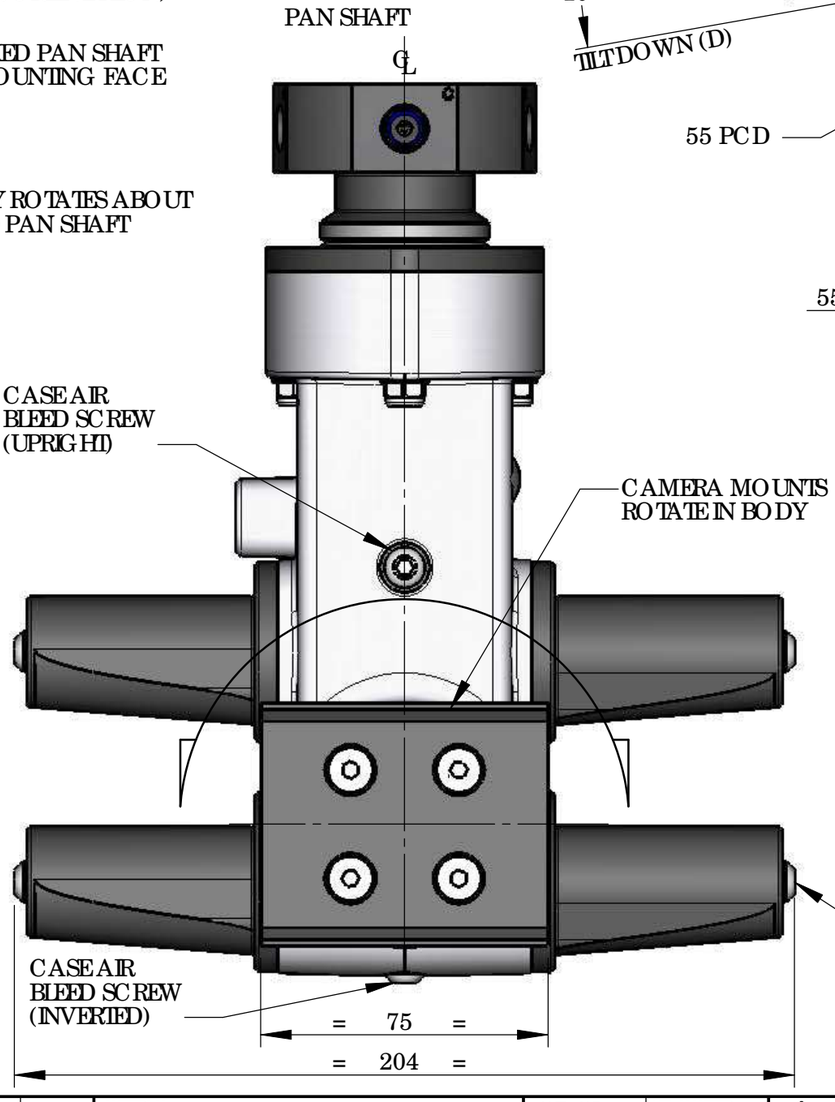
SPECIFICATIONS	STANDARD (1415-MAS)	HEAVY DUTY (2359-MAS)
WEIGHT IN AIR	3.0kg	4.1 kg
WEIGHT IN SEA WATER	2.0kg	3.1kg
RECOMMENDED MAX. PAYLOAD	8.0kg	12.0kg
SINGLE SIDE LIMIT	5.0kg	8.0kg
SPECIFIC TORQUE	0.28Nm/Bar	
MAX. PRESSURE	200 Bar	

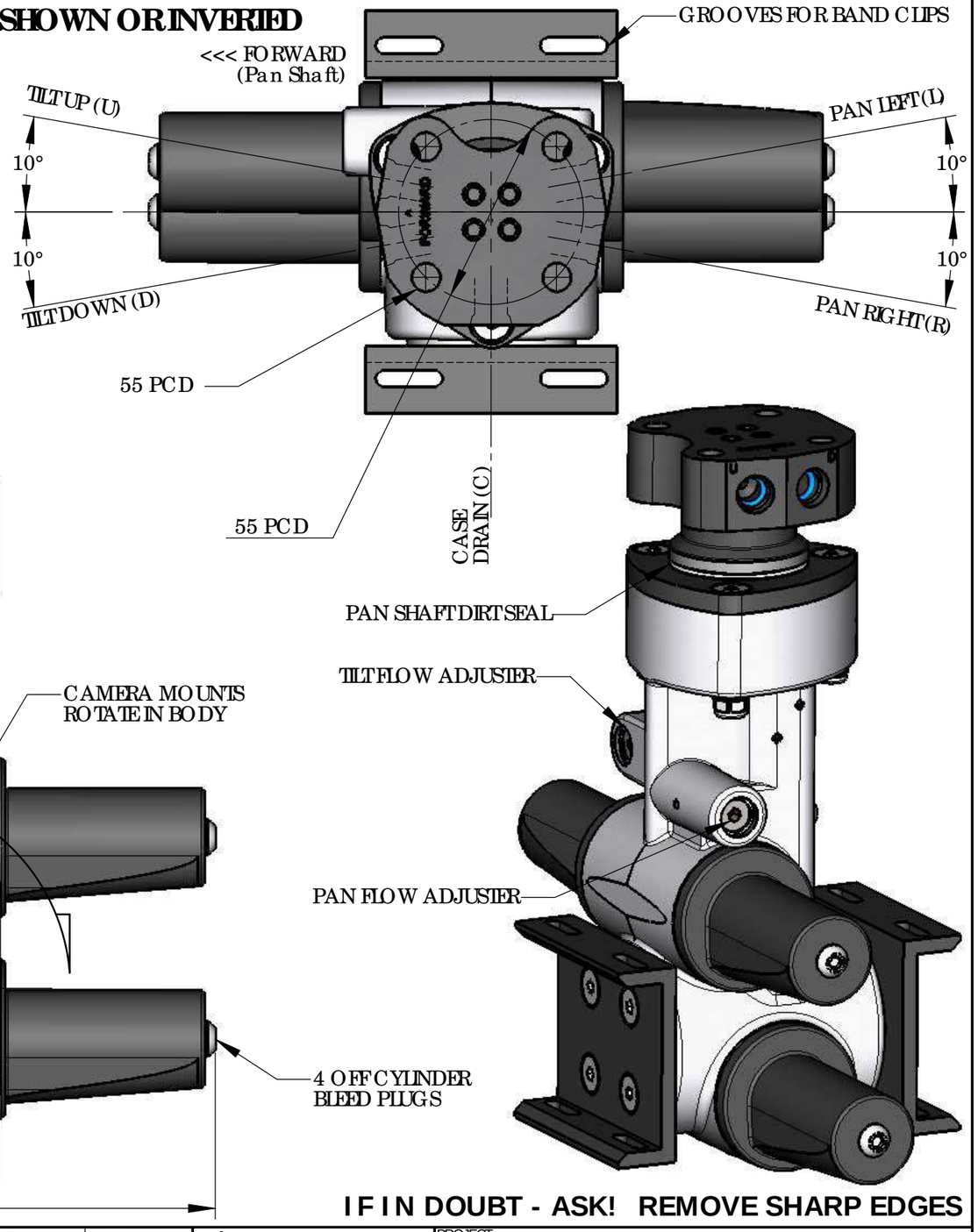
PAN & TILT MOVEMENTS ARE 360° MAXIMUM. MAXIMUM ANGLE CAN BE REDUCED BY REMOVING CYLINDERS AND FITTING 15° SPACERS INSIDE TO OBTAIN DESIRED ANGLE OF ROTATION.

PROPORTIONAL VALVES CAN BE USED TO MINIMISE DYNAMIC LOADS ON THE ACTUATOR BY PROVIDING A RAMP AT THE BEGINNING AND END OF MOVEMENTS.

CAN BE MOUNTED AS SHOWN OR INVERTED







IF IN DOUBT - ASK! REMOVE SHARP EDGES

REV	BY	DATE	DESCRIPTION	APP
3A	AJB	21/01/10	TABLE AND NOTES ADDED	Gordon Durward
3	MBI	25/03/02	BLEED SCREWS INCLUDED	CMI
2	CMI	22/11/01	APPROVED FOR COSNTRUCTION	CMI

RECORD OF REVISIONS

MATERIAL: ALUMINIUM, STAINLESS STEEL

FINISH: HARD ANODISED AND PAINTED

USO, TOLERANCES TO BE

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	CMI
DATE	13/11/01
CHECK	MBI
APPRV.	RWR
ENGR.	CMI

sub-Atlantic
Woodburn Road,
Blackburn Business Park, Blackburn,
Aberdeen. U.K. AB21 0PS
Tel: ++44 (0) 1224 798660
Fax: ++44 (0) 1224 798661

SCALE (UOS) 1:1.6

ORIG. SIZE A3

PROJECT: HYDRAULIC PAN & TILT (Mk2)

TITLE: HYDRAULIC PAN & TILT GENERAL ARRANGEMENT DRAWING GA DRAWING Sheet 1 of 1

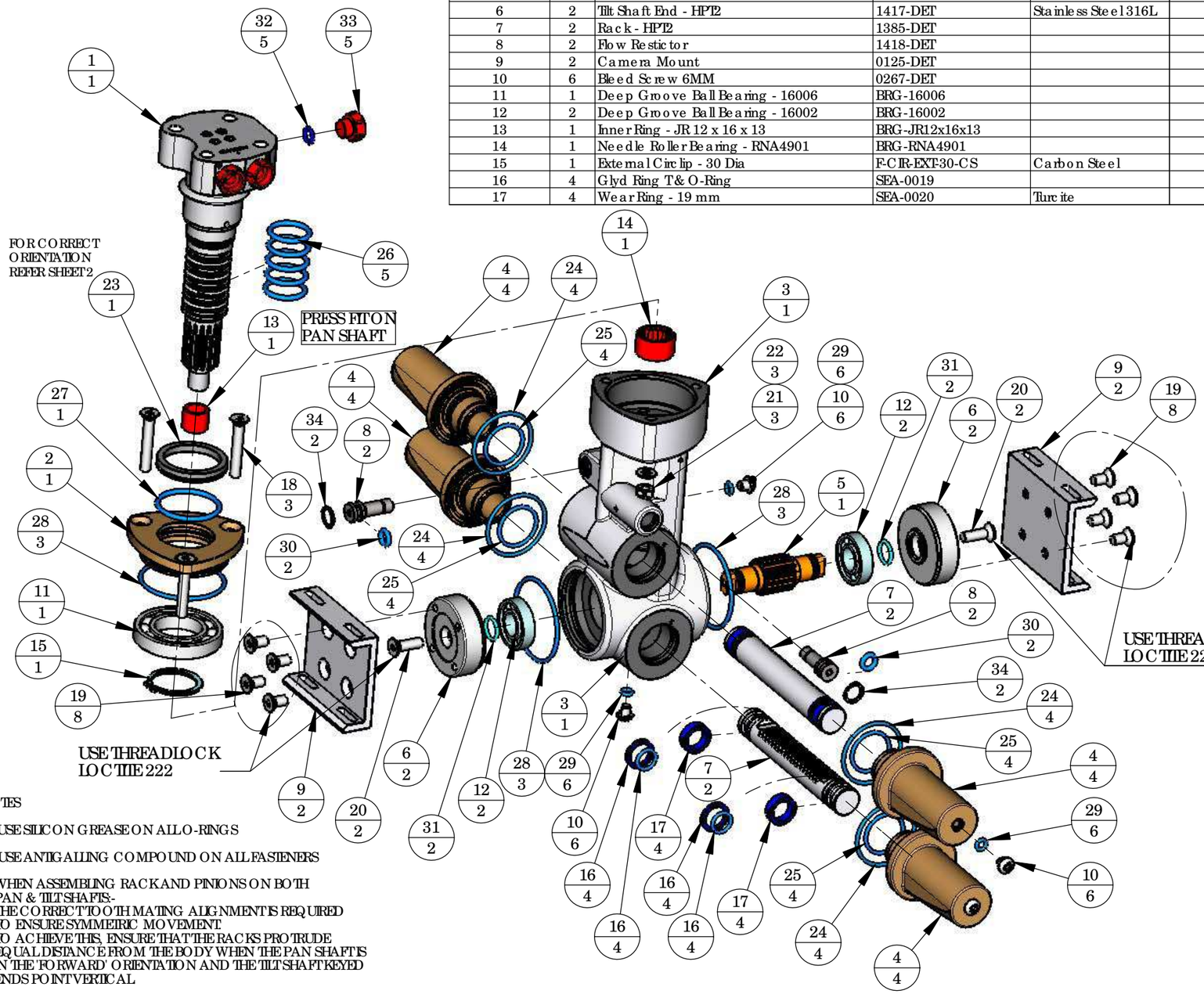
DOC. No. 1367-GA

REV 3A

THIRD ANGLE PROJECTION

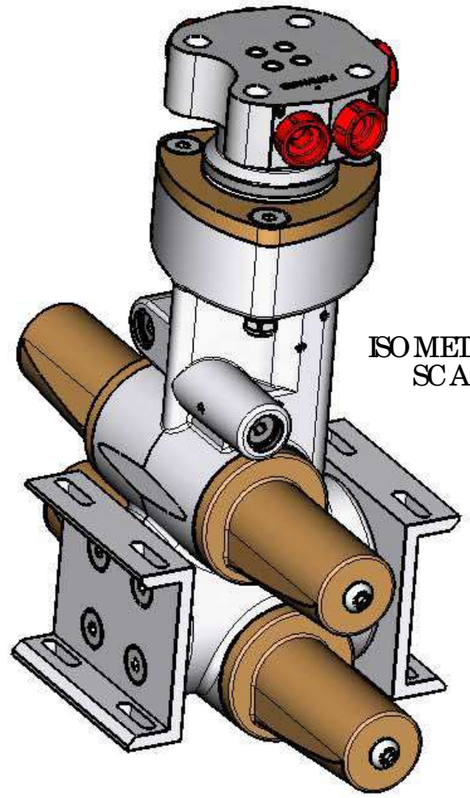
I F I N DOUBT - ASK!

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material	Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pan Shaft	1416-IAS		18	3	C-Sunk Head Socket Screw M6 x 40 long	F-CSHS-M6-40-A470	Stainless Gr A4-70
2	1	End Cap - HPT2	1383-DET		19	8	C-Sunk Head Socket Screw M6 x 12 long	F-CSHS-M6-12-A470	Stainless Gr A4-70
3	1	Body	1400-IAS		20	2	C-Sunk Head Socket Screw M6 x 20 long	F-CSHS-M6-20-A470	Stainless Gr A4-70
4	4	Cylinder	1387-DET		21	3	Nylok Hex Nut M6	F-NL-M6-A470	Stainless Gr A4-70
5	1	Tilt Shaft - HPT2	1384-DET	Anodised Aluminium	22	3	Plain Washer M6	F-PW-M6-B-A470	Stainless Gr A4-70
6	2	Tilt Shaft End - HPT2	1417-DET	Stainless Steel 316L	23	1	Dirt Excluder Seal	SEA-0021	
7	2	Rack - HPT2	1385-DET		24	4	O-RING 1.78 x 39.45(BS 519)	SOR-178-0394-N70	Nitrile 70
8	2	Flow Restictor	1418-DET		25	4	O-Ring 1.78 x 25.12 (BS-022)	SOR-178-0251-N70	Nitrile 70
9	2	Camera Mount	0125-DET		26	5	O-Ring 2.62 x 22.23 (BS-813)	SOR-262-0222-N70	Nitrile 70
10	6	Bleed Screw 6MM	0267-DET		27	1	O-Ring 2.62 x 36.17 (BS-127)	SOR-262-0362-N70	Nitrile 70
11	1	Deep Groove Ball Bearing - 16006	BRG-16006		28	3	O-Ring 2.62 x 50.47 (BS-136)	SOR-262-0505-N70	Nitrile 70
12	2	Deep Groove Ball Bearing - 16002	BRG-16002		29	6	O-RING 1.78 x 4.76 (BS 802)	SOR-178-0048-N70	Nitrile 70
13	1	Inner Ring - JR 12 x 16 x 13	BRG-JR12x16x13		30	2	O-Ring 2.62 x 7.59 (BS-109)	SOR-262-0076-N70	Nitrile 70
14	1	Needle Roller Bearing - RNA4901	BRG-RNA4901		31	2	O-RING 1.78 x 12.42 (BS-014)	SOR-178-0124-N70	Nitrile 70
15	1	External Circlip - 30 Dia	F-CIR-EXT-30-CS	Carbon Steel	32	5	O-RING 1.78 x 7.94(BS-804)	SOR-178-0079-N70	Nitrile 70
16	4	Glyd Ring T & O-Ring	SEA-0019		33	5	Plug - Plastic - 7~16 SAE	HYD-0047	
17	4	Wear Ring - 19 mm	SEA-0020	Turcite	34	2	Spiral Retaining Ring - Int Dia 13mm	F-SRR-INT-13-SS	Stainless Steel



PAN RANGE IS ± 360° AND TILT RANGE ±180°. MAXIMUM MOVEMENT CAN BE LIMITED BY FITTING 30° SPACERS INSIDE CYLINDERS. (PART No. 1448-DET)

4 SUPPLIED PER PAN & TILT UNIT



ISOMETRIC VIEW
SCALE 1:2

NOTES

1. USE SILICON GREASE ON ALL O-RINGS
2. USE ANTIGALLING COMPOUND ON ALL FASTENERS
3. WHEN ASSEMBLING RACK AND PINIONS ON BOTH PAN & TILT SHAFTS:-
   THE CORRECT TOOTH MATING ALIGNMENT IS REQUIRED TO ENSURE SYMMETRIC MOVEMENT.
   TO ACHIEVE THIS, ENSURE THAT THE RACKS PROTRUDE EQUAL DISTANCE FROM THE BODY WHEN THE PAN SHAFT IS IN THE 'FORWARD' ORIENTATION AND THE TILT SHAFT KEYED ENDS POINT VERTICAL

REV	BY	DATE	DESCRIPTION	APP
6A	AJB	21/01/10	CLERICAL CHANGE TO BORDER	Gordon Durward
6	IFH	06/05/08	O-RINGS ADDED & MISC BALLOONS ADDED, SEAL 23 ORIENTATION CLARIFIED. ECR'S 0012/0016/0021	GDU
5	MBL	13/12/04	NOTE RE-PAN RANGE CORRECTED - ECN-327-04	CMI
4	EBR	22/11/04	SPIRAL RETAINING RINGS ADDED TO ASSY. ECN-324-04	CMI
3	EBR	25/10/04	THREADLOCK NOTES ADDED	CMI
2	EBR	22/03/02	BILL OF MATERIALS UPDATED	CMI

RECORD OF REVISIONS

MATERIAL: SEE BILL OF MATERIALS

FINISH

USO, TOLERANCES TO BE

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	EBR
DATE	21/11/01
CHECK	CMI
APPRV.	CMI
ENGR.	CMI

sub-Atlantic
Woodburn Road,
Blackburn Business Park, Blackburn,
Aberdeen. U.K. AB21 0PS
Tel: ++44 (0) 1224 798660
Fax: ++44 (0) 1224 798661

SCALE (UOS): 1:3

ORIG. SIZE: A3

PROJECT: HYDRAULIC PAN & TILT - Mk2

TITLE: HYDRAULIC PAN & TILT - Mk2
MAIN ASSEMBLY DRAWING

Sheet 1 of 2

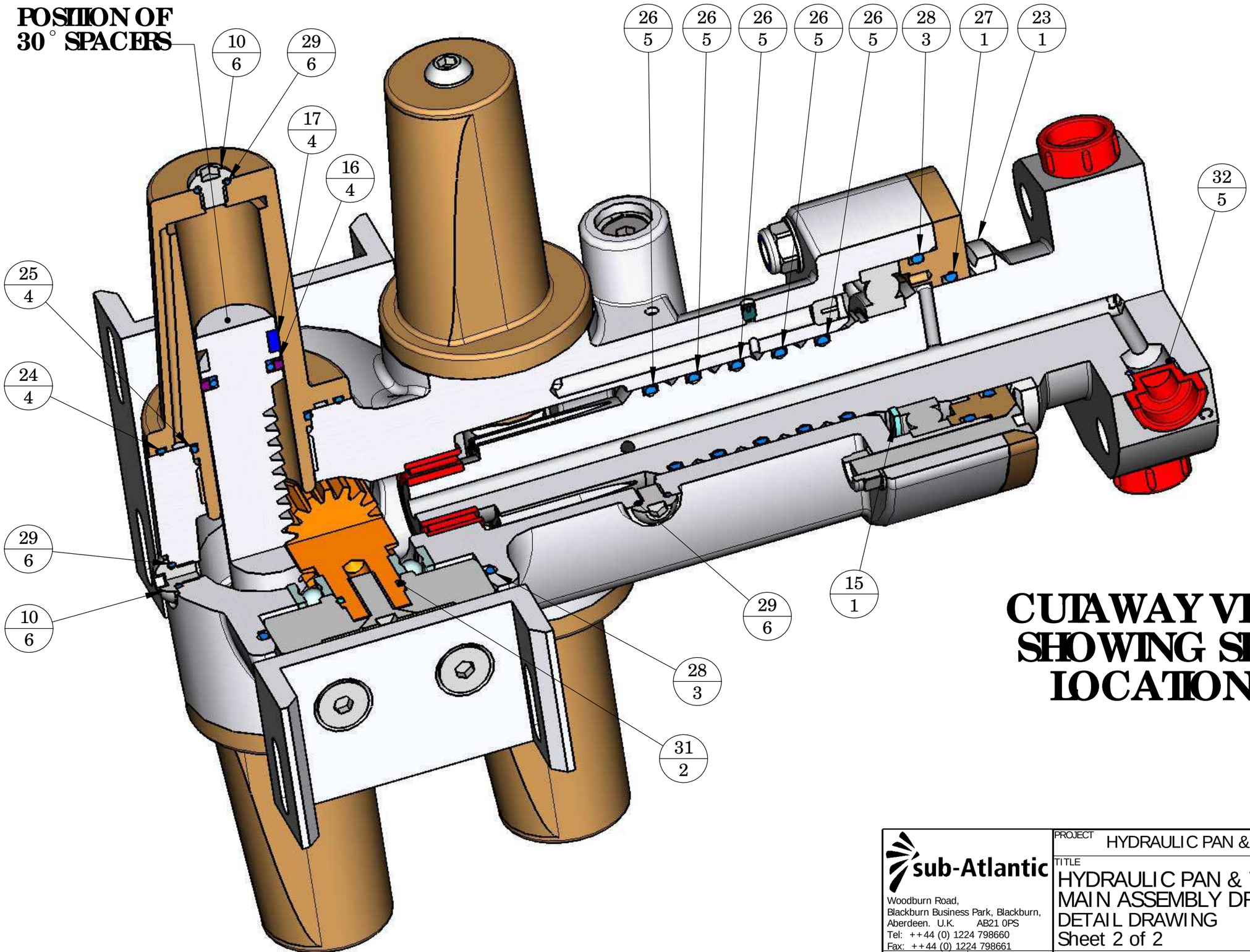
DOC. No. 1415-MAS

REV 6A

THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

REMOVE SHARP EDGES



CUTAWAY VIEW SHOWING SEAL LOCATIONS

sub-Atlantic
Woodburn Road,
Blackburn Business Park, Blackburn,
Aberdeen. U.K. AB21 0PS
Tel: ++44 (0) 1224 798660
Fax: ++44 (0) 1224 798661

PROJECT	HYDRAULIC PAN & TILT Mk2
TITLE	HYDRAULIC PAN & TILT - MK2 MAIN ASSEMBLY DRAWING DETAIL DRAWING Sheet 2 of 2
SCALE (USO)	1.2:1
ORIG. SIZE	A3
DOC. No.	1415-MAS
REV	6A

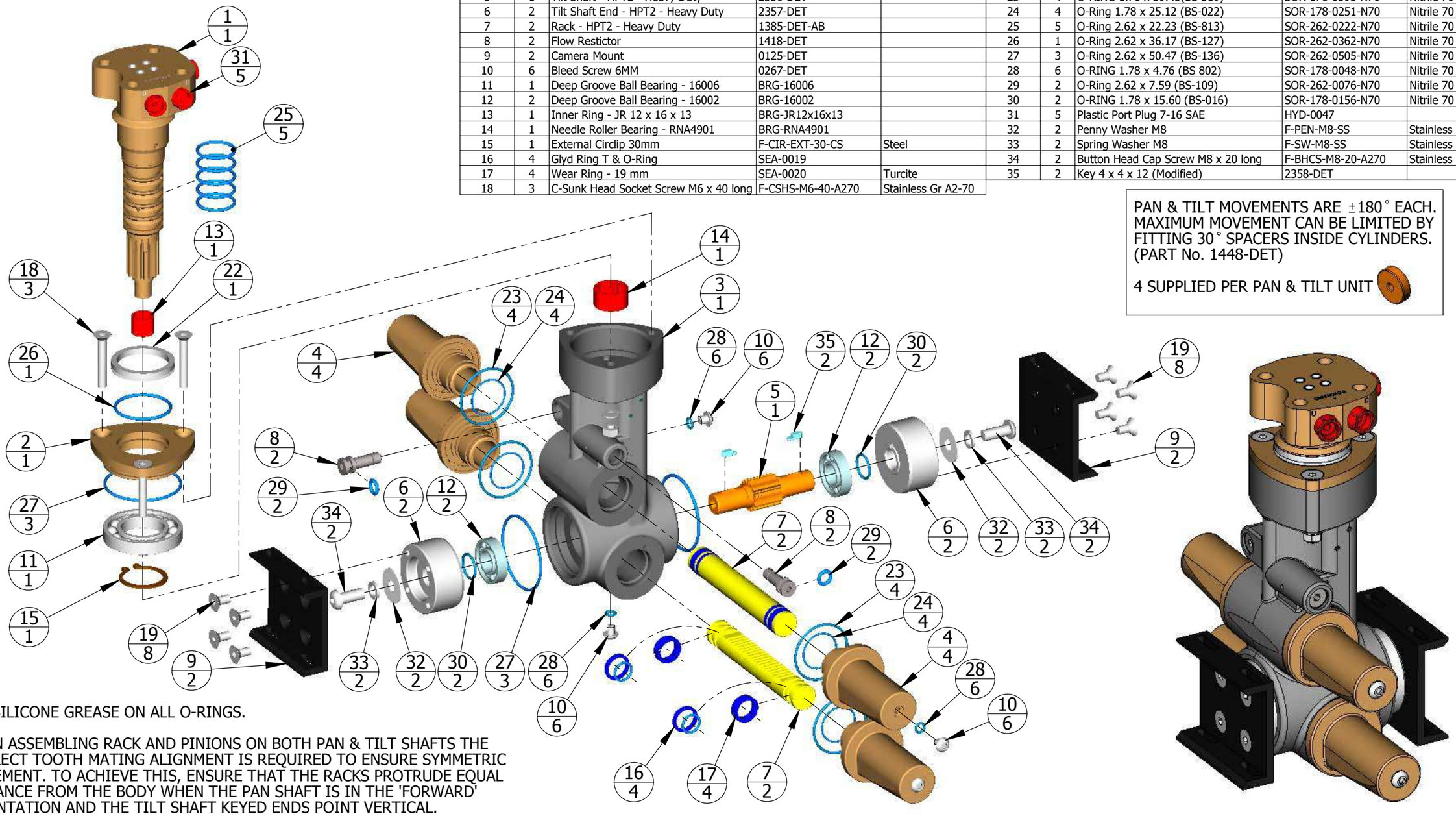
THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material	Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pan Shaft HPT2 - Heavy Duty	2360-IAS		19	8	C-Sunk Head Socket Screw M6 x 12 long	F-CHSS-M6-12-A270	Stainless Gr A2-70
2	1	End Cap - HPT2	1383-DET		20	3	Nylok Hex Nut M6	F-NL-M6-A270	Stainless Gr A2-70
3	1	Body	1400-IAS		21	3	Plain Washer M6	F-PW-M6-SS	Stainless Steel
4	4	Cylinder	1387-DET		22	1	Dirt Excluder Seal	SEA-0021	
5	1	Tilt Shaft - HPT2 - Heavy Duty	2356-DET		23	4	O-RING 1.78 x 39.45(BS 519)	SOR-178-0395-N70	Nitrile 70
6	2	Tilt Shaft End - HPT2 - Heavy Duty	2357-DET		24	4	O-Ring 1.78 x 25.12 (BS-022)	SOR-178-0251-N70	Nitrile 70
7	2	Rack - HPT2 - Heavy Duty	1385-DET-AB		25	5	O-Ring 2.62 x 22.23 (BS-813)	SOR-262-0222-N70	Nitrile 70
8	2	Flow Restictor	1418-DET		26	1	O-Ring 2.62 x 36.17 (BS-127)	SOR-262-0362-N70	Nitrile 70
9	2	Camera Mount	0125-DET		27	3	O-Ring 2.62 x 50.47 (BS-136)	SOR-262-0505-N70	Nitrile 70
10	6	Bleed Screw 6MM	0267-DET		28	6	O-RING 1.78 x 4.76 (BS 802)	SOR-178-0048-N70	Nitrile 70
11	1	Deep Groove Ball Bearing - 16006	BRG-16006		29	2	O-Ring 2.62 x 7.59 (BS-109)	SOR-262-0076-N70	Nitrile 70
12	2	Deep Groove Ball Bearing - 16002	BRG-16002		30	2	O-RING 1.78 x 15.60 (BS-016)	SOR-178-0156-N70	Nitrile 70
13	1	Inner Ring - JR 12 x 16 x 13	BRG-JR12x16x13		31	5	Plastic Port Plug 7-16 SAE	HYD-0047	
14	1	Needle Roller Bearing - RNA4901	BRG-RNA4901		32	2	Penny Washer M8	F-PEN-M8-SS	Stainless Steel
15	1	External Circlip 30mm	F-CIR-EXT-30-CS	Steel	33	2	Spring Washer M8	F-SW-M8-SS	Stainless Steel
16	4	Glyd Ring T & O-Ring	SEA-0019		34	2	Button Head Cap Screw M8 x 20 long	F-BHCS-M8-20-A270	Stainless Gr A2-70
17	4	Wear Ring - 19 mm	SEA-0020	Turcite	35	2	Key 4 x 4 x 12 (Modified)	2358-DET	
18	3	C-Sunk Head Socket Screw M6 x 40 long	F-CSHS-M6-40-A270	Stainless Gr A2-70					

PAN & TILT MOVEMENTS ARE ±180° EACH. MAXIMUM MOVEMENT CAN BE LIMITED BY FITTING 30° SPACERS INSIDE CYLINDERS. (PART No. 1448-DET)

4 SUPPLIED PER PAN & TILT UNIT



NOTES

1. USE SILICONE GREASE ON ALL O-RINGS.
2. WHEN ASSEMBLING RACK AND PINIONS ON BOTH PAN & TILT SHAFTS THE CORRECT TOOTH MATING ALIGNMENT IS REQUIRED TO ENSURE SYMMETRIC MOVEMENT. TO ACHIEVE THIS, ENSURE THAT THE RACKS PROTRUDE EQUAL DISTANCE FROM THE BODY WHEN THE PAN SHAFT IS IN THE 'FORWARD' ORIENTATION AND THE TILT SHAFT KEYED ENDS POINT VERTICAL.

REV	BY	DATE	DESCRIPTION	APP
-	-	-	-	
1	EBR	10/03/04	APPROVED FOR CONSTRUCTION	RWR

RECORD OF REVISIONS

MATERIAL: SEE BILL OF MATERIALS

FINISH: -

USO, TOLERANCES TO BE: -

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	EBR
DATE	10/03/04
CHECK	SSM
APPRV.	RWR
ENGR.	CMI

sub-Atlantic
Unit 12, Airways Industrial Estate
Pitmedden Road, Dyce.
Aberdeen. U.K. AB21 0DT
Tel: ++44 (0) 1224 723623
Fax: ++44 (0) 1224 723822

SCALE (USO) | ORIG. SIZE A3

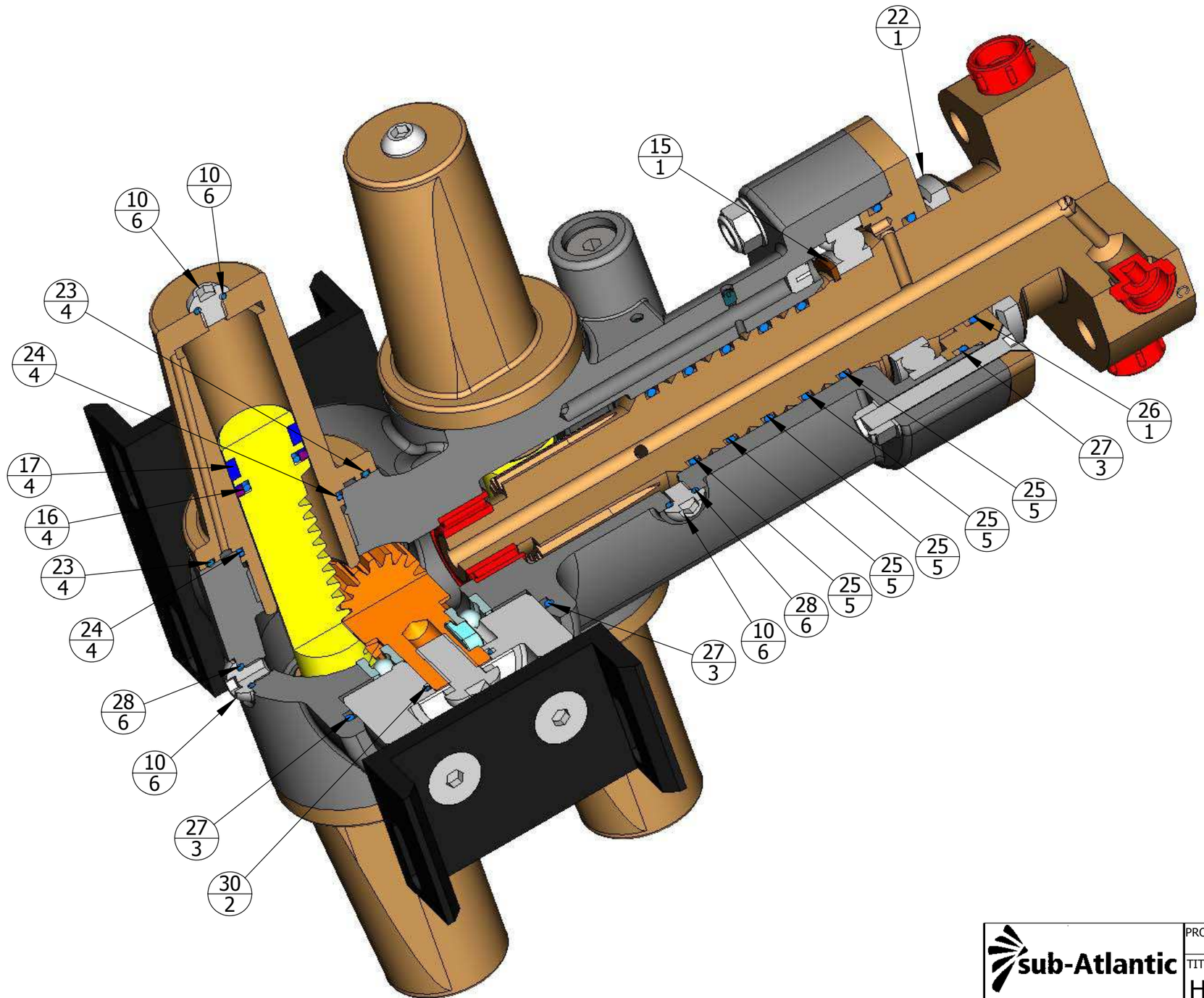
PROJECT: HYDRAULIC PAN & TILT MK 2

TITLE: HYDRAULIC PAN & TILT Mk 2 - HEAVY DUTY - DETAIL DRAWING Sheet 1 of 1

DOC. No. 2359-MAS | REV 1

THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



sub-Atlantic
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Pitmedden Road, Dyce.
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PROJECT	HYDRAULIC PAN & TILT Mk 2
TITLE	HYDRAULIC PAN & TILT Mk 2- HEAVY DUTY - MAIN ASSY DRAWING Sheet 1 of 1
SCALE (USO)	
ORIG. SIZE	A3
DOC. No.	2359-MAS
REV	1

THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

Item No.	Qty	Description	Sub-Atlantic Part Ref.	Material
1	1	Pan Shaft Mk3	5736-IAS	
2	1	End Cap - HPT2	1383-DET	
3	1	Body	1400-IASZ	
4	4	Cylinder	1387-DET	
5	1	Tilt Shaft - HPT2 - Heavy Duty	2356-DET	
6	2	Tilt Shaft End - HPT2 - Heavy Duty	2357-DET	
7	2	Rack - HPT2 - Heavy Duty	1385-DET-AB	
8	2	Flow Restictor	1418-DET	
9	2	Camera Mount	0125-DET	
10	6	Bleed Screw 6MM	0267-DET	
11	2	Key 4 x 4 x 12 (Modified)	2358-DET	
12	1	Deep Groove Ball Bearing - 16006	BRG-16006	
13	2	Deep Groove Ball Bearing - 16002	BRG-16002	
14	1	Inner Ring - JR 12 x 16 x 13	BRG-JR121613	
15	1	Needle Roller Bearing - RNA4901	BRG-RNA4901	
16	1	External Circlip - 30 Dia	F-CIR-EXT-30-CS	Carbon Steel
17	4	Glyd Ring T & O-Ring	SEA-0019	
18	4	Wear Ring - 19 mm	SEA-0020	Turcite
19	1	Dirt Excluder Seal	SEA-0021	
20	5	Turcon Roto Glyd Ring 28mm	SEA-0059	
21	4	O-RING 1.78 x 39.45(BS 519)	SOR-178-0394-N70	Nitrile 70
22	4	O-RING 1.78 x 23.5 (BS 021)	SOR-178-0235-N70	Nitrile 70
23	1	Quad-Ring 2.62 x 36.17 (QR 4127)	SQR-262-0362-N70	Nitrile 70
24	3	Quad-Ring 2.62 x 50.47 (QR 4136)	SQR-262-0505-N70	Nitrile 70
25	6	O-RING 1.78 x 4.76 (BS 802)	SOR-178-0048-N70	Nitrile 70
26	2	O-Ring 2.62 x 7.59 (BS-109)	SOR-262-0076-N70	Nitrile 70
27	2	O-RING 1.78 x 15.00	SOR-178-0150-N70	Nitrile 70
28	5	O-RING 1.78 x 7.94(BS-804)	SOR-178-0079-N70	Nitrile 70
29	5	Plug - Plastic - 7~16 SAE	HYD-0047	
30	3	C-Sunk Head Socket Screw M6 x 40 long	F-CSHS-M6-40-A470	Stainless Gr A4-70
31	8	C-Sunk Head Socket Screw M6 x 12 long	F-CSHS-M6-12-A470	Stainless Gr A4-70
32	3	Nylok Hex Nut M6	F-NL-M6-A470	Stainless Gr A4-70
33	3	Plain Washer M6	F-PW-M6-B-A470	Stainless Gr A4-70
34	2	Penny Washer M8	F-PEN-M8-25-A470	Stainless Gr A4-70
35	2	Spring Washer M8	F-SW-M8-A-A470	Stainless Gr A4-70
36	2	Button Head Cap Screw M8 x 20 long	F-BHCS-M8-20-A470	Stainless Gr A4-70
37	2	Spiral Retaining Ring - Int Dia 13mm	F-SRR-INT-13-SS	Stainless Steel

REFER TO NOTE 4

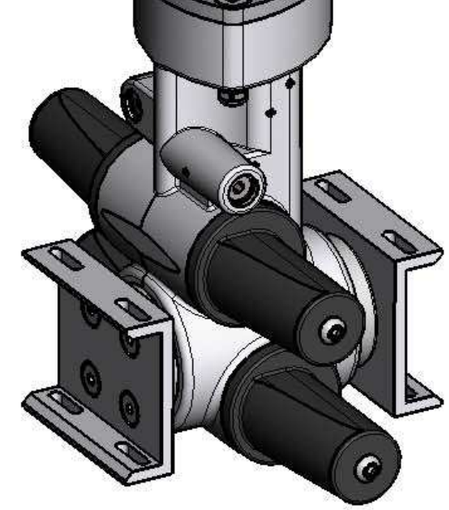
FOR CORRECT ORIENTATION REFER TO SHEET 2

REFER TO NOTE 3

REFER TO NOTE 3

PAN RANGE IS ± 360° & TILT RANGE IS ± 180°.
MAXIMUM MOVEMENT CAN BE LIMITED BY FITTING 30° SPACERS INSIDE CYLINDERS. (PART No. 1448-DET)

4 SUPPLIED PER PAN & TILT UNIT



NOTES

1. USE SILICONE GREASE ON ALL O-RINGS.
2. WHEN ASSEMBLING RACK AND PINIONS ON BOTH PAN & TILT SHAFTS THE CORRECT TOOTH MATING ALIGNMENT IS REQUIRED TO ENSURE SYMMETRIC MOVEMENT. TO ACHIEVE THIS, ENSURE THAT THE RACKS PROTRUDE EQUAL DISTANCE FROM THE BODY WHEN THE PAN SHAFT IS IN THE 'FORWARD' ORIENTATION AND THE TILT SHAFT KEYED ENDS POINT VERTICAL.
3. USE LOCKTITE 222 ON ITEM 31 CAMERA FIXING SCREWS
4. USE INSTALLATION TOOLS 5719-DET, 5718-DET AND 5717-DET FOR INSTALLATION OF ITEM 20.

RECORD OF REVISIONS

REV	BY	DATE	DESCRIPTION	APP
4	ABL	17/05/2013	ITEMS 23 & 24 CHANGED FROM 'O'-RINGS TO QUAD-RINGS (ECR-1393)	Gordon Durward
3	ABL	03/08/2012	'O'-RING CHANGE (ECR-1304)	GDU
2	ABL	06/03/2012	'O'-RING CHANGE (ECR-1236)	GDU
1	JGO	19/08/2010	ISSUED FOR CONSTRUCTION	GDU

MATERIAL: SEE BILL OF MATERIALS

FINISH

USO, TOLERANCES TO BE

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	JGO
DATE	19/08/10
CHECK	GDU
APPRV.	GDU
ENGR.	JGO

sub-Atlantic
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Blackburn Business Park, Blackburn,
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SCALE (UOS): 1:3

ORIG. SIZE: A3

PROJECT: HYDRAULIC PAN & TILT UNIT MK3

TITLE: HYDRAULIC PAN & TILT UNIT MK3 HEAVY DUTY ASSEMBLY DRAWING Sheet 1 of 2

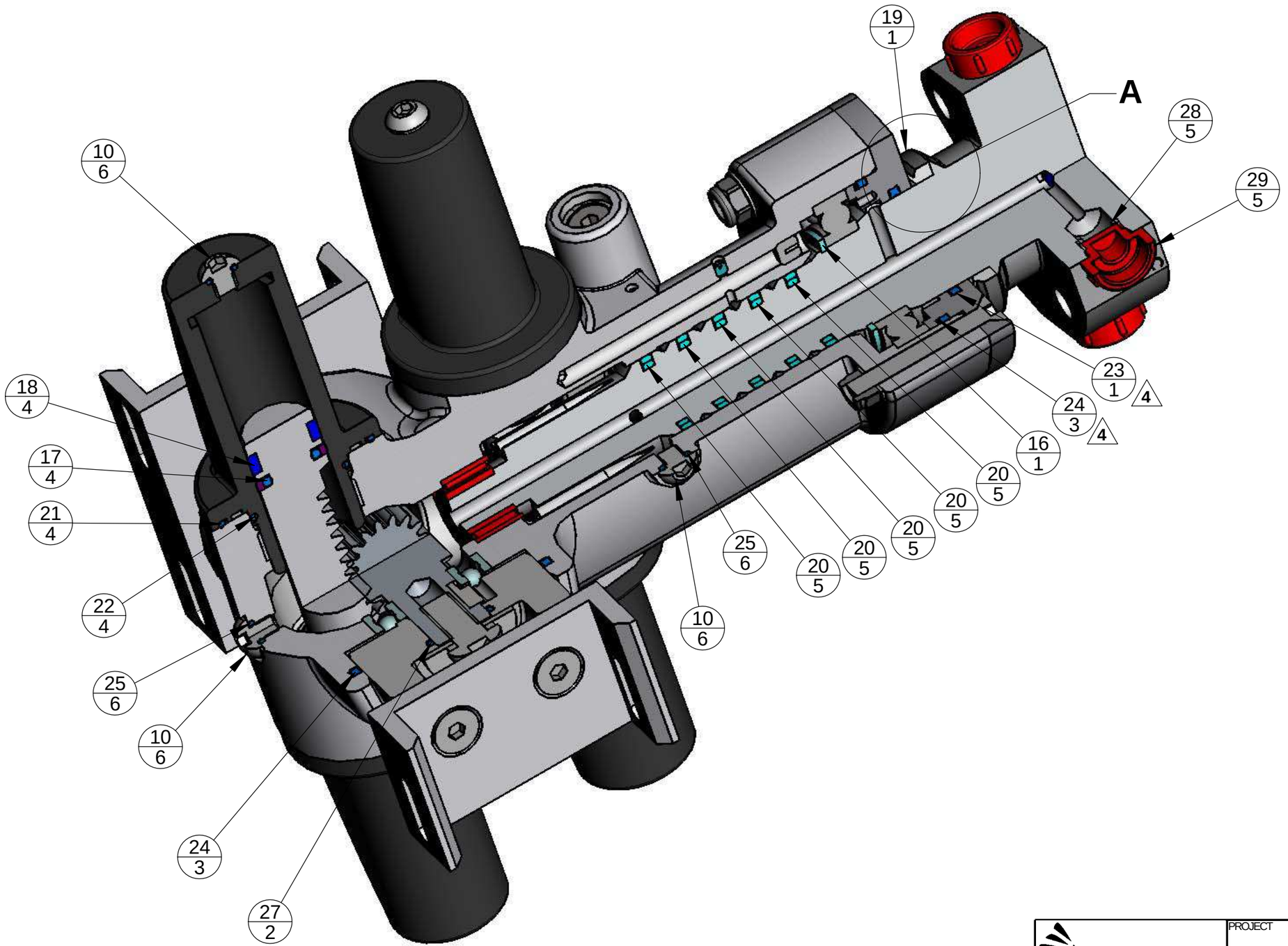
DOC. No. 5735-MAS

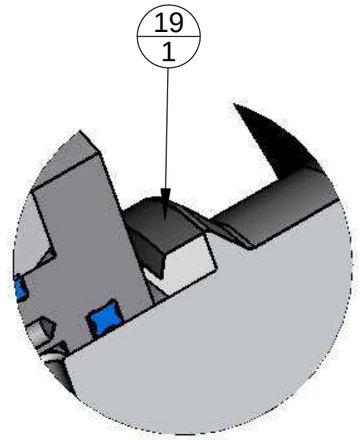
REV 4

THIRD ANGLE PROJECTION

I F I N DOUBT - ASK!

REMOVE SHARP EDGES





DETAI L A
SCALE 2 : 1

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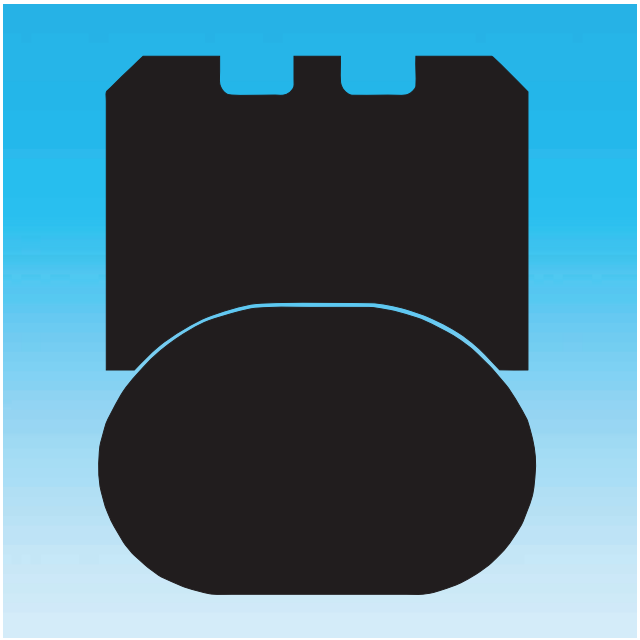
PROJECT	HYDRAULIC PAN & TILT UNIT MK3
TITLE	HYDRAULIC PAN & TILT UNIT MK3 HEAVY DUTY ASSEMBLY DRAWING Sheet 2 of 2
SCALE (USO) 1:3 / ORIG. SIZE A3	DOC. No. 5735-MAS / REV 4

Turcon® Roto Glyd Ring®



■ TURCON® ROTARY SEALS - ELASTOMER ENERGIZED

■ Turcon® Roto Glyd Ring®

Description

The Turcon® Roto Glyd Ring® is used to seal rods, shafts, axles, bores, rotary transmission leadthroughs, journals, swivels etc. with rotary or oscillating movement.

The seal is double-acting and can be exposed to pressure from one, or from both sides.

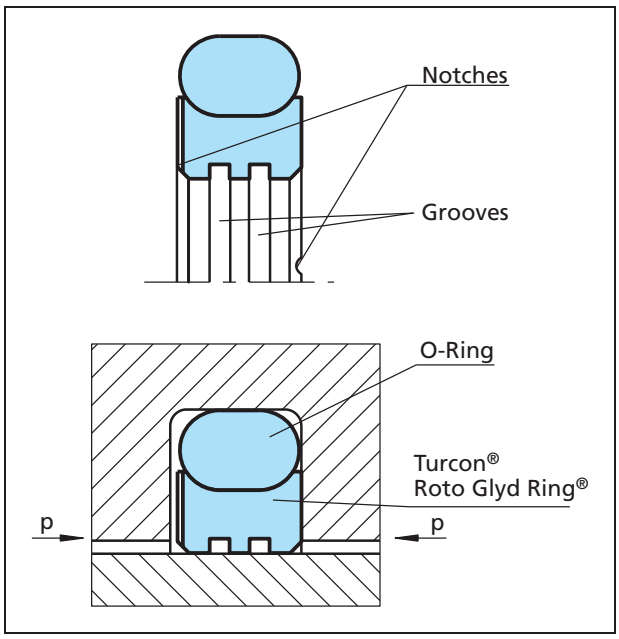


Figure 111 Turcon® Roto Glyd Ring®

It consists of a seal ring of Turcon® material and is activated by an O-Ring as an elastic energizing element.

The contact surface profile of the seal ring is specially designed for use under high pressures and at low sliding speeds.

Depending on the profile cross-section of the seal, the contact surface has one or two continuous machined grooves. These have the following functions:

- Improved seal efficiency by increasing the specific surface load pressure against the sealed surface
- Formation of lubricant reservoir and reduction in friction.

In order to improve the pressure activation of the O-Ring, the Roto Glyd Ring® has notched end faces as standard.

The rear face which holds the O-Ring has a concave form. This increases the contact surface and shall prevent the seal from turning with the rotating surface.

A standard diameter range for each profile size is assigned to the series numbers in Table LXXVI and LXXVIII. This recommendation applies to all new constructions. Different dimensions are available on request.

Advantages

- Available for internal and external sealing applications
- Low friction
- Stick-slip-free starting, no sticking
- High abrasion resistance and dimensional stability
- Simple groove design, small groove dimensions
- Lubricant reservoir
- Available in all sizes up to 2700 mm diameter (to 2600 mm for rod seals)

Technical data

Operating pressure:	Up to 30 MPa
Speed:	Up to 2 m/s
Temperature:	- 45°C to + 200 °C *) (depending on O-Ring material)
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally safe hydraulic fluids (bio-oils), water, air and others, depending on O-Ring material.
Note:	For continuous operation at temperatures over +60 °C, pressure and speed must be limited.

Important Note:
The above data are maximum values and cannot be used at the same time, e. g. the maximum operating speed depends on material type, pressure and temperature.

***) Important Note:**
In the case of unpressurized applications in temperatures below 0°C please contact our application engineers for assistance!

Frictional power

Guide values for the frictional power can be determined from the graph in Figure 112. They are shown as a function of the sliding speed and operating pressure for a shaft diameter of 50 mm with an oil temperature of 60° C. At higher temperatures, these application limits must be reduced.

Guide values for other shaft diameters can be calculated using the formula:

$$P \simeq P_{50} \times \left(\frac{d}{50\ mm}\right)\ [W]$$

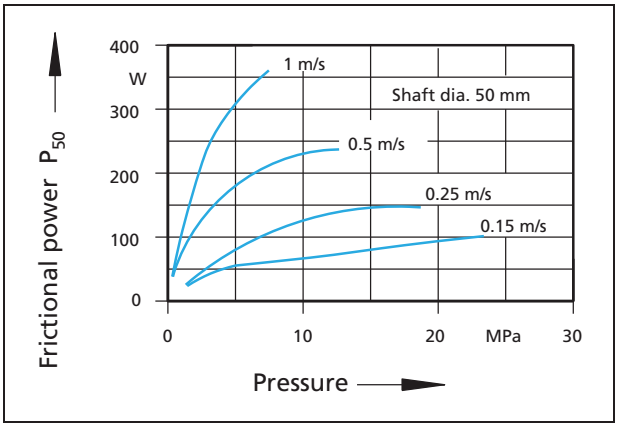


Figure 112 Frictional power for Turcon® Roto Glyd Ring®

The guide values apply for constant operating conditions. Changes in operating conditions such as pressure fluctuations or alternating directions of shaft rotation can result in considerably higher friction values.

Application examples

The Turcon® Roto Glyd Ring® is the preferably used as a double acting rotary seal for hydraulic and pneumatic equipment in sectors such as:

- Rotary distributors
- High pressure valve stems
- Manipulators
- Pivoting motors in mobile hydraulic and machine tools
- Hydraulic motors

Application limits

The maximum application data for temperature, pressure and speed given in this catalogue have a mutual effect on one another and can thus not be exploited simultaneously.

Seal performance is further influenced by such factors as lubrication capability of the sealed medium and heat dissipation in the hardware, it follows that testing should always be made.

With good lubrication, the following pv value can be assumed as guide:

Turcon® Roto Glyd Ring®: up to pv = 2.5 MPa · m/s

The value must be reduced for diameters < 50 mm.

Lead-in chamfers

In order to avoid damage during installation, lead-in chamfers and rounded edges must be provided on the housing and on the rod (Figures 124 and 125). If this is not possible for design reasons, a separate installation tool is recommended.

The minimum length of the lead-in chamfer depends on the profile size of the seal and can be seen from the following tables. If concentricity between the parts is not ensured during installation the lead-in chamfers must be increased correspondingly.

For the surface quality of the lead-in chamfer, the same recommendations apply as given for the sealing surfaces in Table LXXV.

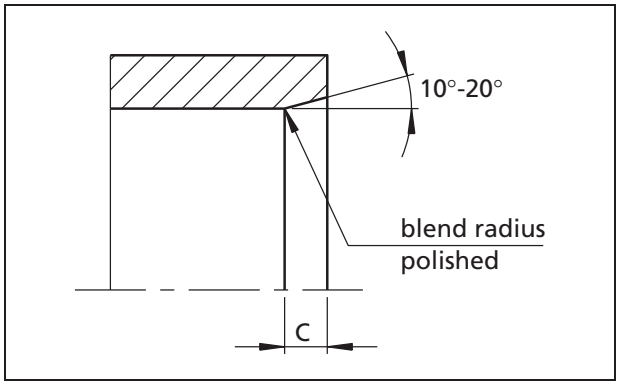


Figure 113 Lead-in chamfer on bore

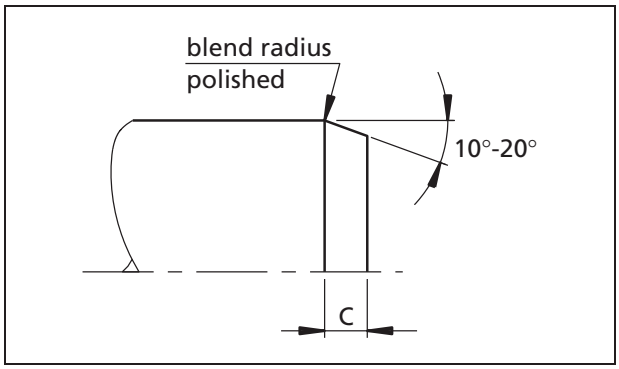


Figure 114 Lead-in chamfer on rod

Table LXXII Lead-in chamfers for Turcon® Roto Glyd Ring®

Series No.		Lead-in chamfers length C min.
Bore	Rod	
TG40	TG30	2.0
TG41	TG31	2.5
TG42	TG32	3.5
TG43	TG33	5.0
TG44	TG34	6.5
TG45	TG35	7.5

Table LXXIII Surface roughness

Surface roughness µm		
Parameter	Mating surface	Groove surface
	Turcon® materials	
R_{max}	0.63 - 2.50	< 16.0
$R_{z\ DIN}$	0.40 - 1.60	< 10.0
R_a	0.05 - 0.20	< 1.6

The material contact area R_{mr} should be approx. 50 to 70%, determined at a cut depth c = 0.25 x R_z, relative to a reference line of C_{ref}. 5%.

For ceramic coated surfaces, like plasma sprayed, additional focus on surface texture is necessary. Peaks and sharp edges from pores have to be polished away (e.g. with diamond paste on soft "pad") to avoid premature seal wear.

Closed grooves

Turcon® Roto Glyd Ring® for external and internal sealing can be installed in closed grooves at diameters from Ø 15 and Ø 12 respectively. Seal cross sections used outside of their recommended diameter range require split grooves according to table below.

Table LXXIV Groove type - closed or split

Series	Series	Split grooves required below	
Bore	Rod	Turcite® T40	Turcite® T10
TG40	-	ø 15	ø 25
TG41	-	ø 25	ø 38
TG42	-	ø 32	ø 50
TG43	-	ø 50	ø 75
-	TG30	ø 20	
-	TG31	ø 30	
-	TG32	ø 40	
-	TG33	ø 60	

■ Installation of Turcon® Roto Glyd Ring®

Installation instructions

The following points should be observed before installation of the seals:

- Check whether housing or rod has a lead-in chamfer; if not, use an installation sleeve
- Deburr and chamfer or round sharp edges, cover the tips of any screw threads
- Remove machining residues such as chips, dirt and other foreign particles and carefully clean all parts
- The seals can be installed more easily if they are greased or oiled. Attention must be paid to the compatibility of the seal materials with these lubricants. Use only grease without solid additives (e.g. molybdenum disulfide or zinc sulfide)
- Do not use installation tools with sharp edges

Installation of Turcon® Roto Glyd Ring® in split grooves

"Internal and external sealing"

Installation in split grooves is simple. During final assembly - insertion of the rod - the Turcon® Roto Glyd Ring® must be sized. The rod itself can be used for this purpose, provided it has a long lead-in chamfer. Alternatively a corresponding mandrel can be used.

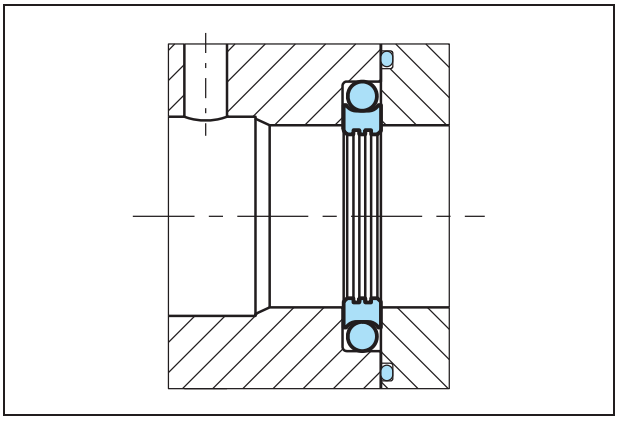


Figure 115 Installation in a split groove

The following installation sequence is recommended:

- Pull the O-Ring onto the Roto Glyd Ring®
- Press the seal element into the groove. The O-Ring must not be allowed to twist

Installation of Turcon® Roto Glyd Ring® in closed grooves

"Internal sealing"

The installation of our seal elements is unproblematic.

- Place the O-Ring into the groove (avoid twisting the ring!)
- Compress the Turcon® Roto Glyd Ring® into a kidney shape. The seal must have no sharp bends

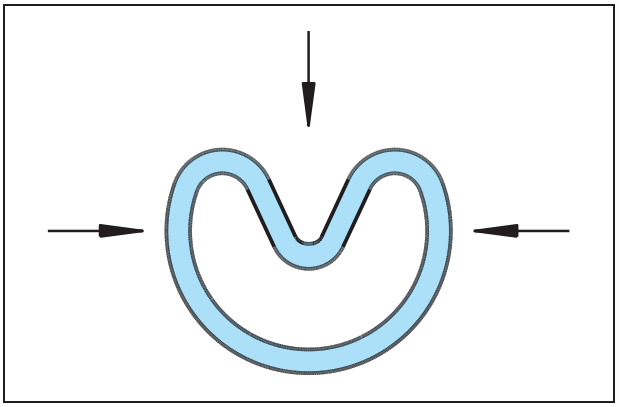


Figure 116 Kidney-shaped deformation of the seal ring

- Place the seal ring in compressed form into the groove and push against the O-Ring in the direction of the arrow.

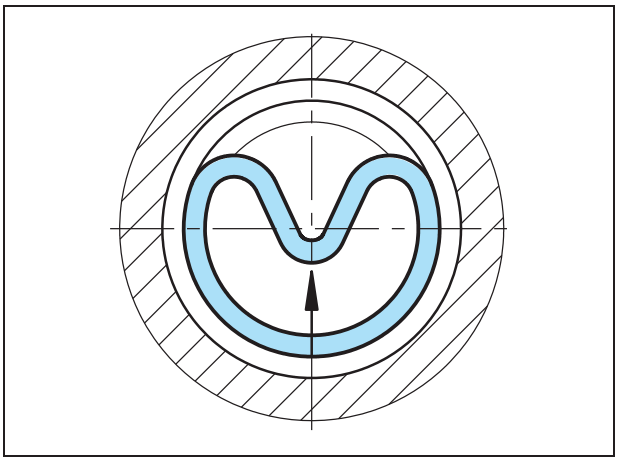


Figure 117 Inserting the seal ring into the closed groove

- Finally size the seal ring using a mandrel which should have a chamfer of 10° to 15° over a length of approx. 30 mm

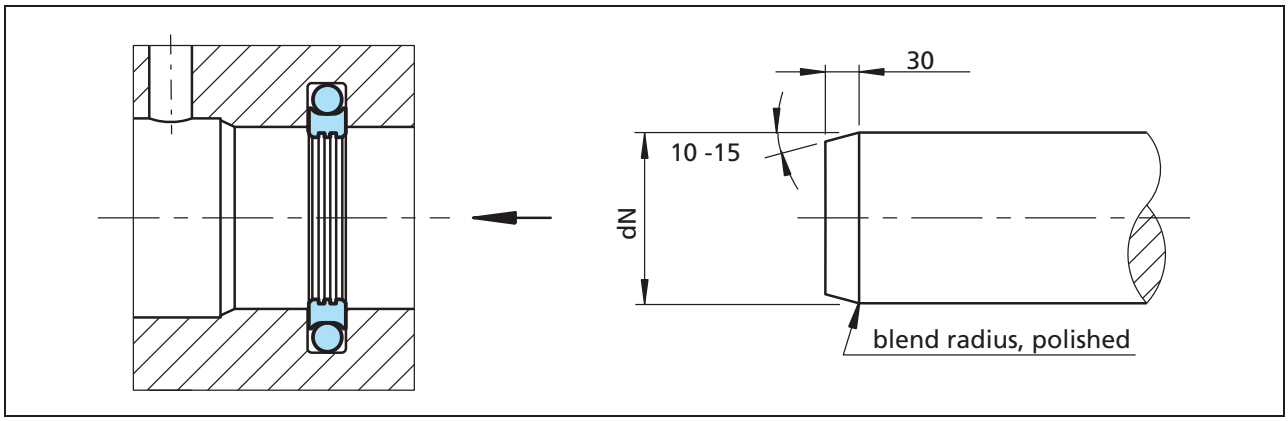


Figure 118 Sizing of the installed seal

The rod itself can also be used for sizing, provided that it has a sufficiently long lead-in chamfer as per our recommendations in Table LXXII.

Sizing mandrels should be made from a polymer material (e.g. polyamide). In order to avoid damage to the seals, a smooth surface with rounded and polished lead-in chamfer is necessary.

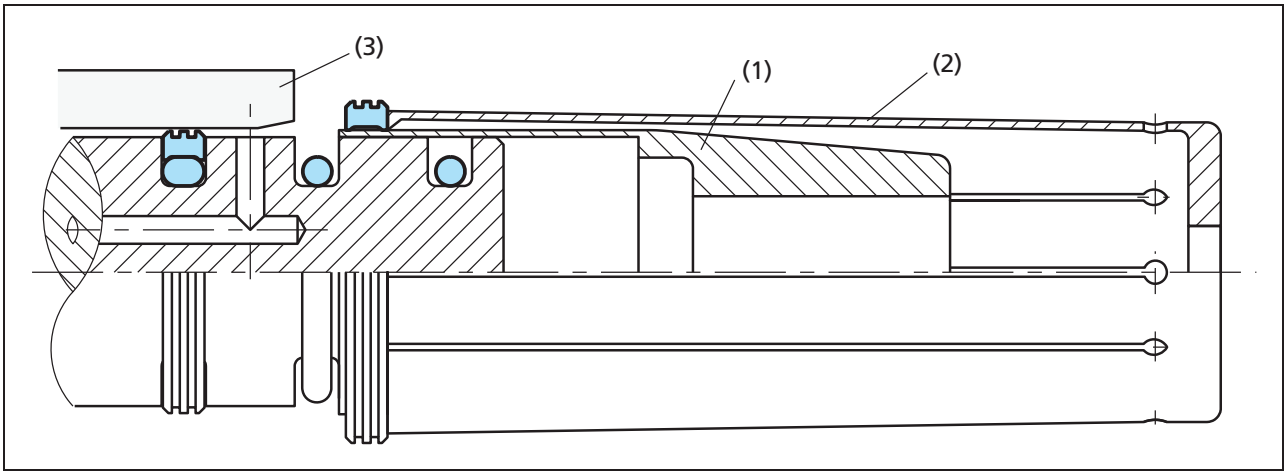


Figure 119 Expanding the Turcon® Roto Glyd Ring® over the installation sleeve using an expanding sleeve

Installation with installation tools (external sealing)

Use of a three-piece installation tool is recommended for series production installation of the Turcon® Roto Glyd Ring®.

The tool consists of:

- Installation sleeve (1)
- Expanding sleeve (2)
- Sizing sleeve (3).

All parts should be made of a polymer material (e.g. polyamide) with a good surface finish to avoid damage to the seals.

The O-Ring should be pulled over the piston into the groove (take care not to burst the O-Ring).

The Roto Glyd Ring® element should be expanded over the Installation sleeve using the Expanding sleeve using a fast but smooth movement.

After installation the Roto Glyd Ring® element should be sized using the Sizing sleeve.

In view of the large number of sizes and the application-specific installation conditions, this installation tool cannot be supplied as standard by Trelleborg Sealing Solutions.

Drawings for installation tools are available on request.

Installation without installation tools (external sealing)

If installation has to be performed without installation tools, however, the following points should be observed:

- The Roto Glyd Ring® can be installed more easily by heating in oil, water or using a hot air fan to approx. 80° C to 100° C (expanding and then sizing)
- Use no sharp edged tools to expand the seal rings
- Installation should be performed as quickly as possible so that an optimum snap-back of the seal element is assured
- Sizing of the seal ring can be carried out in the corresponding housing, provided that it has a long lead-in chamfer as per Table LXXII. Otherwise use a sizing sleeve.

Materials

Standard materials:

Turcon® seal ring: Turcon® T10 and Turcon® T40
O-Ring: NBR, 70 Shore A

For specific applications, other material combinations as listed in Table LXXV.

Table LXXV Standard Turcon® materials for Turcon® Roto Glyd Ring®

Material, applications, properties	Code	O-Ring material	Code	O-Ring operating temp.* °C	Mating surface material	MPa max.
Turcon® T10 Hydraulics and pneumatics for all lubricating and non-lubricating fluids, high extrusion resistance, good chemical resistance, BAM. Carbon, graphite filled Color: Black	T10	NBR - 70 Shore A	N	-30 to +100	Steel Steel, Chrome plated Stainless steel	30
		NBR - Low temp. 70 Shore A	T	-45 to +80		
		FKM - 70 Shore A	V	-10 to +200		
		EPDM-70 Shore A	E**	-45 to +145		
Turcon® T40 For all lubricating and non-lubricating hydraulic fluids, water hydraulics, soft mating surfaces. Carbon fiber filled Color: Grey	T40	NBR - 70 Shore A	N	-30 to +100	Steel Steel, Chrome plated Cast iron Stainless steel, Aluminum Bronze Alloys	20
		NBR - Low temp. 70 Shore A	T	-45 to +80		
		FKM - 70 Shore A	V	-10 to +200		
		EPDM-70 Shore A	E**	-45 to +145		

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil.
** Material not suitable for mineral oils.
BAM: Approved by "Bundes Anstalt Materialprüfung, Germany".

Highlighted materials are standard.

■ Installation recommendation - external sealing

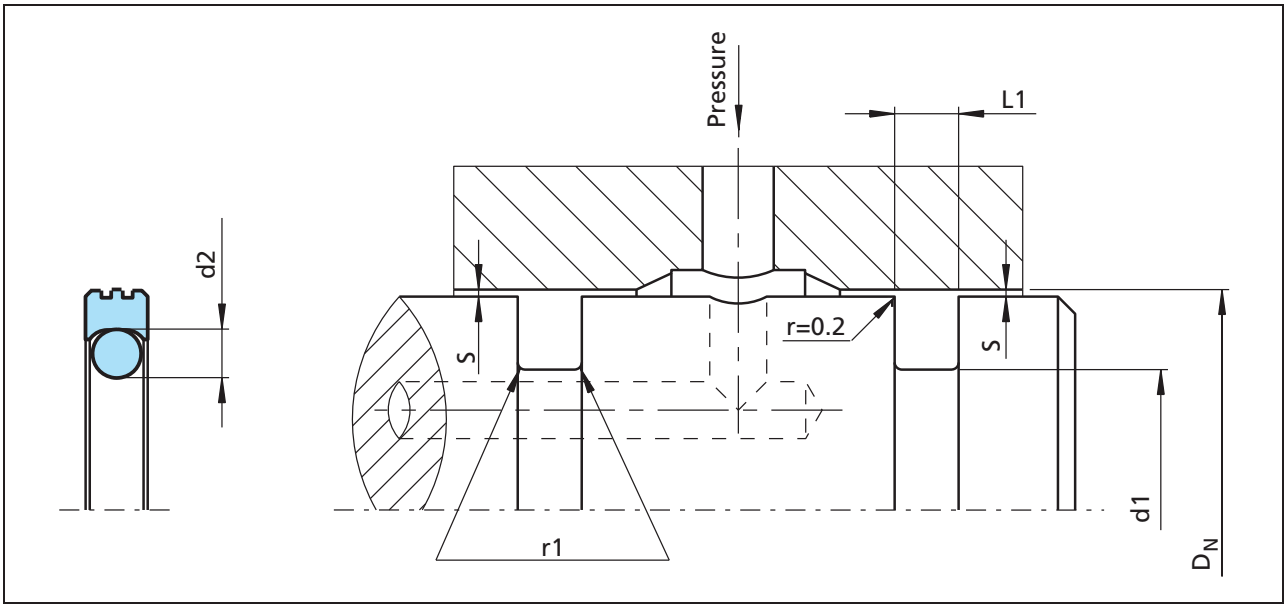


Figure 120 Installation drawing

Table LXXVI Installation dimensions

Series no.	Bore diameter D_N H9		Groove diameter	Groove width	Radial clearance S max. *		Radius	O-Ring cross sec.	Number of grooves in the sealing surface
	Standard range	Available range	d_1 h9	L_1 +0.2	10 MPa	20 MPa	r_1	d_2	
TG40	8 - 39.9	8 - 135.0	D_N- 4.9	2.20	0.15	0.10	0.40	1.78	0
TG41	40 - 79.9	14 - 250.0	D_N- 7.5	3.20	0.20	0.15	0.60	2.62	1
TG42	80 - 132.9	22 - 460.0	D_N- 11.0	4.20	0.25	0.20	1.00	3.53	1
TG43	133 - 329.9	40 - 675.0	D_N- 15.5	6.30	0.30	0.25	1.30	5.33	2
TG44	330 - 669.9	133 - 690.0	D_N- 21.0	8.10	0.30	0.25	1.80	7.00	2
TG45	670 - 999.9	670 - 999.9	D_N- 28.0	9.50	0.45	0.30	2.50	8.40	2

Provide split housing grooves according to diameter, see Table LXXIV.
At pressures > **10 MPa** it is recommended that for the cross section you choose the next larger profile according to the column "Available Range" i.e. for bore Ø80 mm: TG 43 00 800-.
* At pressures > **30 MPa**: Use diameter tolerance H8/f8 (bore / rod) in area of seal.

Ordering Example

Turcon® Roto Glyd Ring®, complete with O-Ring, external sealing, series TG42 (from Table LXXVI).

Bore diameter: D_N = 80.0 mm
TSS Part No.: TG4200800 (from Table LXXVII)

Select the material from Table LXXV. The corresponding code numbers are appended to the TSS Part No. (from Table LXXVII). Together they form the TSS Article No.

For all intermediate sizes not shown in Table LXXVIII, the Order No. can be determined from the example opposite.

** For diameters ≥ 1000.0 mm multiply only by factor 1.
Example: TG45 for diameter 1200.0 mm.
TSS Article No.: TG45**X1200** - T40N.

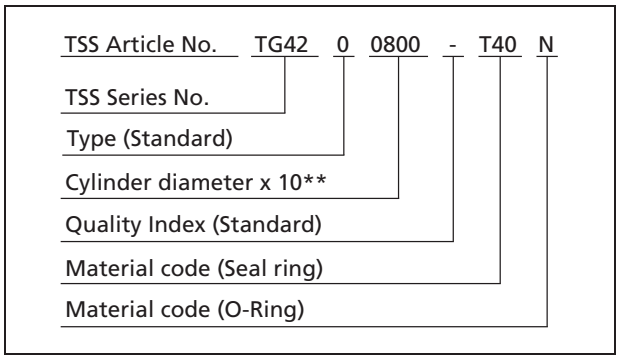


Table LXXVII Preferred Dimension / TSS Part No.

Bore diameter	Groove diameter	Groove width	TSS Part No.	O-Ring size
D_N H9	d_1 h9	L_1 +0.2		
8.0	**3.1**	**2.2**	**TG4000080**	**2.90 x 1.78**
10.0	**5.1**	**2.2**	**TG4000100**	**4.80 x 1.8**
12.0	**7.1**	**2.2**	**TG4000120**	**6.70 x 1.8**
14.0	9.1	2.2	TG4000140	8.75 x 1.8
15.0	10.1	2.2	TG4000150	9.25 x 1.78
16.0	**11.1**	**2.2**	**TG4000160**	**10.82 x 1.78**
18.0	13.1	2.2	TG4000180	12.42 x 1.78
20.0	**15.1**	**2.2**	**TG4000200**	**14.00 x 1.78**
22.0	17.1	2.2	TG4000220	17.17 x 1.78
25.0	**20.1**	**2.2**	**TG4000250**	**18.77 x 1.78**
28.0	23.1	2.2	TG4000280	21.95 x 1.78
30.0	25.1	2.2	TG4000300	25.12 x 1.78
32.0	**27.1**	**2.2**	**TG4000320**	**26.70 x 1.78**
35.0	30.1	2.2	TG4000350	29.87 x 1.78
40.0	**32.5**	**3.2**	**TG4100400**	**31.42 x 2.62**
42.0	34.5	3.2	TG4100420	32.99 x 2.62
45.0	37.5	3.2	TG4100450	36.17 x 2.62
48.0	40.5	3.2	TG4100480	39.34 x 2.62
50.0	**42.5**	**3.2**	**TG4100500**	**40.94 x 2.62**
52.0	44.5	3.2	TG4100520	44.12 x 2.62
55.0	47.5	3.2	TG4100550	45.69 x 2.62

The bore diameters printed in **bold** type conform to the recommendations of ISO 3320.
Other dimensions and all intermediate sizes up to 2.700 mm diameter including inch sizes can be supplied.

Bore diameter	Groove diameter	Groove width	TSS Part No.	O-Ring size
D_N H9	d_1 h9	L_1 +0.2		
60.0	52.5	3.2	TG4100600	52.07 x 2.62
63.0	**55.5**	**3.2**	**TG4100630**	**53.64 x 2.62**
65.0	57.5	3.2	TG4100650	56.82 x 2.62
70.0	62.5	3.2	TG4100700	61.60 x 2.62
75.0	67.5	3.2	TG4100750	66.34 x 2.62
80.0	**69.0**	**4.2**	**TG4200800**	**66.27 x 3.53**
85.0	74.0	4.2	TG4200850	72.62 x 3.53
90.0	79.0	4.2	TG4200900	78.97 x 3.53
95.0	84.0	4.2	TG4200950	82.14 x 3.53
100.0	**89.0**	**4.2**	**TG4201000**	**88.49 x 3.53**
105.0	94.0	4.2	TG4201050	91.67 x 3.53
110.0	99.0	4.2	TG4201100	98.02 x 3.53
115.0	104.0	4.2	TG4201150	101.19 x 3.53
120.0	109.0	4.2	TG4201200	107.54 x 3.53
125.0	**114.0**	**4.2**	**TG4201250**	**113.89 x 3.53**
130.0	119.0	4.2	TG4201300	117.07 x 3.53
135.0	119.5	6.3	TG4301350	116.84 x 5.33
140.0	124.5	6.3	TG4301400	123.19 x 5.33
150.0	134.5	6.3	TG4301500	132.72 x 5.33
160.0	**144.5**	**6.3**	**TG4301600**	**142.24 x 5.33**
170.0	154.5	6.3	TG4301700	151.77 x 5.33
180.0	164.5	6.3	TG4301800	164.47 x 5.33
190.0	174.5	6.3	TG4301900	170.82 x 5.33
200.0	**184.5**	**6.3**	**TG4302000**	**183.52 x 5.33**
210.0	194.5	6.3	TG4302100	189.87 x 5.33
220.0	204.5	6.3	TG4302200	202.57 x 5.33
230.0	214.5	6.3	TG4302300	208.92 x 5.33
240.0	224.5	6.3	TG4302400	221.62 x 5.33
250.0	**234.5**	**6.3**	**TG4302500**	**234.32 x 5.33**
280.0	264.5	6.3	TG4302800	266.07 x 5.33
300.0	284.5	6.3	TG4303000	278.77 x 5.33
320.0	**304.5**	**6.3**	**TG4303200**	**304.17 x 5.33**
350.0	329.0	8.1	TG4403500	329.57 x 7.00
400.0	**379.0**	**8.1**	**TG4404000**	**267.67 x 7.00**
420.0	399.0	8.1	TG4404200	393.07 x 7.00
450.0	429.0	8.1	TG4404500	417.96 x 7.00

The bore diameters printed in **bold** type conform to the recommendations of ISO 3320.
Other dimensions and all intermediate sizes up to 2.700 mm diameter including inch sizes can be supplied.

Bore diameter	Groove diameter	Groove width	TSS Part No.	O-Ring size
D_N H9	d_1 h9	L_1 +0.2		
480.0	459.0	8.1	TG4404800	456.06 x 7.00
500.0	**479.0**	**8.1**	**TG4405000**	**468.76 x 7.00**
600.0	579.0	8.1	TG4406000	582.68 x 7.00
700.0	672.0	9.5	TG4507000	670.00 x 8.40

The bore diameters printed in **bold** type conform to the recommendations of ISO 3320.
Other dimensions and all intermediate sizes up to 2.700 mm diameter including inch sizes can be supplied.

■ Installation recommendation - internal sealing

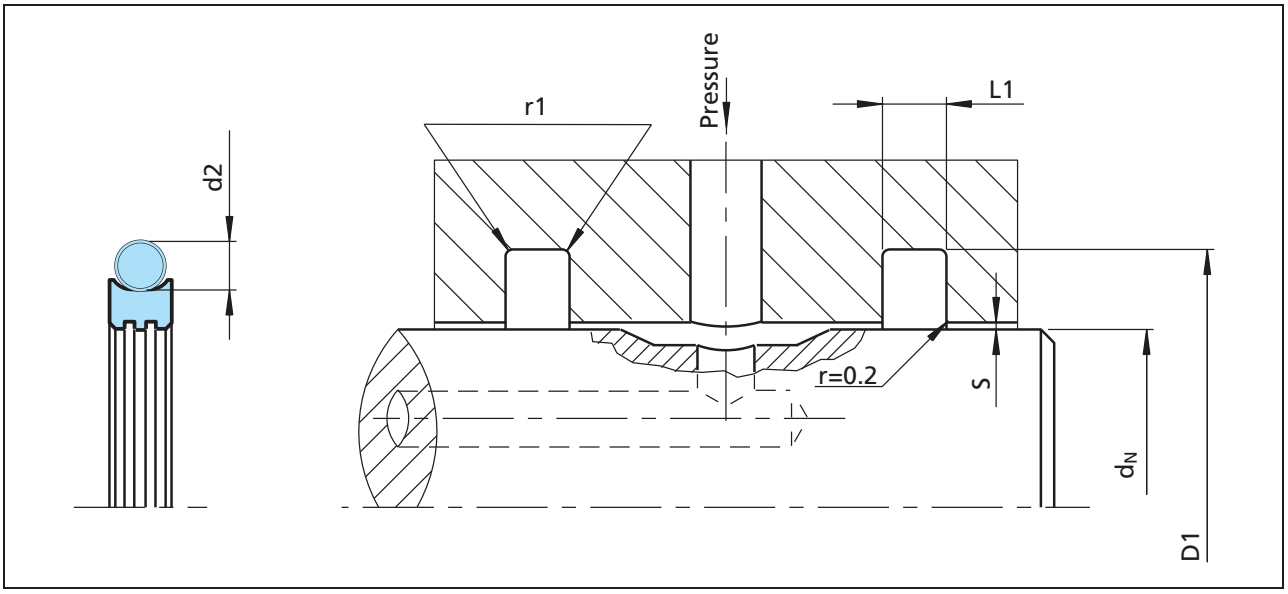


Figure 121 Installation drawing

Table LXXVIII Installation dimensions

Series no.	Rod diameter d_N f8/h9		Groove diameter	Groove width	Radial clearance S max. *		Radius	O-Ring cross sec.	Number of grooves in the sealing surface
	Standard range	Available[1)] range	D_1 H9	L_1 +0.2	10 MPa	20 MPa	r_1	d_2	
TG30	6 - 18.9	6 - 130.0	d_N+ 4.9	2.20	0.15	0.10	0.40	1.78	0
TG31	19 - 37.9	10 - 245.0	d_N+ 7.5	3.20	0.20	0.15	0.60	2.62	1
TG32	38 - 199.9	19 - 455.0	d_N+ 11.0	4.20	0.25	0.20	1.00	3.53	1
TG33	200 - 255.9	38 - 655.0	d_N+ 15.5	6.30	0.30	0.25	1.30	5.33	2
TG34	256 - 649.9	120 - 655.0	d_N+ 21.0	8.10	0.30	0.25	1.80	7.00	2
TG35	650 - 999.9	650 - 999.9	d_N+ 28.0	9.50	0.45	0.30	2.50	8.40	2

Provide split housing grooves according to diameter, see Table LXXIV.
At pressures > **10 MPa** it is recommendable that for the cross section you choose the next larger profile according to the column "Available range" i.e. for shaft Ø80 mm: TG 33 00 800-.
* At pressures > **30 MPa**: Use diameter tolerance H8/f8 (bore / rod) in area of seal.

Ordering example

Turcon® Roto Glyd Ring®, complete with O-Ring, internal sealing, series TG32 (from Table LXXVIII).

Rod diameter: d_N = 80.0 mm
TSS Part No.: TG3200800 (from Table LXXIX)

Select the material from Table LXXV. The corresponding code numbers are appended to the TSS Part No. Together they form the TSS Article No.

For all intermediate sizes not shown in Table LXXVIII, the TSS Article No. can be determined from the example below.

** For diameters ≥ 1000.0 mm multiply only by factor 1.
Example: TG35 for diameter 1200.0 mm.
TSS Article No.: TG35**X1200** - T40N.

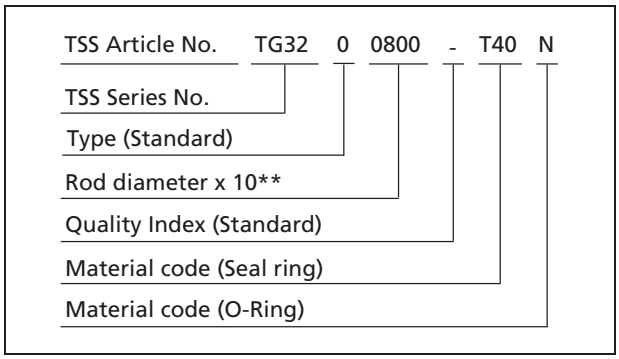


Table LXXIX Preferred Dimension / TSS Part No.

Rod diameter	Groove diameter	Groove width	TSS Part No.	O-Ring size
d_N f8/h9	D_1 H9	L_1 +0.2		
6.0	**10.9**	**2.2**	**TG3000060**	**7.65 x 1.78**
8.0	**12.9**	**2.2**	**TG3000080**	**9.5 x 1.8**
10.0	**14.9**	**2.2**	**TG3000100**	**11.8 x 1.8**
12.0	**16.9**	**2.2**	**TG3000120**	**14.00 x 1.78**
14.0	**18.9**	**2.2**	**TG3000140**	**15.60 x 1.78**
15.0	19.9	2.2	TG3000150	17.17 x 1.78
16.0	**20.9**	**2.2**	**TG3000160**	**17.17 x 1.78**
18.0	**22.9**	**2.2**	**TG3000180**	**18.77 x 1.78**
20.0	**27.5**	**3.2**	**TG3100200**	**21.89 x 2.62**
22.0	**29.5**	**3.2**	**TG3100220**	**25.07 x 2.62**
25.0	**32.5**	**3.2**	**TG3100250**	**28.24 x 2.62**
28.0	**35.5**	**3.2**	**TG3100280**	**31.42 x 2.62**
30.0	37.5	3.2	TG3100300	32.99 x 2.62
32.0	**39.5**	**3.2**	**TG3100320**	**34.59 x 2.62**
35.0	42.5	3.2	TG3100350	37.77 x 2.62
36.0	**43.5**	**3.2**	**TG3100360**	**39.34 x 2.62**
40.0	**51.0**	**4.2**	**TG3200400**	**44.04 x 3.53**
42.0	53.0	4.2	TG3200420	47.22 x 3.53
45.0	**56.0**	**4.2**	**TG3200450**	**50.39 x 3.53**
48.0	59.0	4.2	TG3200480	53.57 x 3.53
50.0	**61.0**	**4.2**	**TG3200500**	**53.57 x 3.53**

The rod diameters printed in **bold** type conform to the recommendations of ISO 3320.
Other dimensions and all intermediate sizes up to 2.600 mm diameter including inch sizes can be supplied.

Rod diameter	Groove diameter	Groove width	TSS Part No.	O-Ring size
d_N f8/h9	D_1 H9	L_1 +0.2		
52.0	63.0	4.2	TG3200520	56.74 x 3.53
55.0	66.0	4.2	TG3200550	59.92 x 3.53
56.0	**67.0**	**4.2**	**TG3200560**	**59.92 x 3.53**
60.0	71.0	4.2	TG3200600	63.09 x 3.53
63.0	**74.0**	**4.2**	**TG3200630**	**66.27 x 3.53**
65.0	76.0	4.2	TG3200650	69.44 x 3.53
70.0	**81.0**	**4.2**	**TG3200700**	**75.79 x 3.53**
75.0	86.0	4.2	TG3200750	78.97 x 3.53
80.0	**91.0**	**4.2**	**TG3200800**	**85.32 x 3.53**
85.0	96.0	4.2	TG3200850	88.49 x 3.53
90.0	**101.0**	**4.2**	**TG3200900**	**94.84 x 3.53**
95.0	106.0	4.2	TG3200950	101.19 x 3.53
100.0	**111.0**	**4.2**	**TG3201000**	**104.37 x 3.53**
105.0	116.0	4.2	TG3201050	110.72 x 3.53
110.0	**121.0**	**4.2**	**TG3201100**	**113.89 x 3.53**
115.0	126.0	4.2	TG3201150	120.24 x 3.53
120.0	131.0	4.2	TG3201200	123.42 x 3.53
125.0	**136.0**	**4.2**	**TG3201250**	**129.77 x 3.53**
130.0	141.0	4.2	TG3201300	136.12 x 3.53
135.0	146.0	4.2	TG3201350	139.29 x 3.53
140.0	**151.0**	**4.2**	**TG3201400**	**145.64 x 3.53**
150.0	161.0	4.2	TG3201500	151.99 x 3.53
160.0	**171.0**	**4.2**	**TG3201600**	**164.69 x 3.53**
170.0	181.0	4.2	TG3201700	177.39 x 3.53
180.0	**191.0**	**4.2**	**TG3201800**	**183.74 x 3.53**
190.0	201.0	4.2	TG3201900	196.44 x 3.53
200.0	**215.5**	**6.3**	**TG3302000**	**208.92 x 5.33**
210.0	225.5	6.3	TG3302100	215.27 x 5.33
220.0	**235.5**	**6.3**	**TG3302200**	**227.97 x 5.33**
240.0	255.5	6.3	TG3302400	247.02 x 5.33
250.0	**265.5**	**6.3**	**TG3302500**	**253.37 x 5.33**
280.0	**301.0**	**8.1**	**TG3402800**	**291.47 x 7.00**
300.0	321.0	8.1	TG3403000	304.17 x 7.00
320.0	**341.0**	**8.1**	**TG3403200**	**329.57 x 7.00**
350.0	371.0	8.1	TG3403500	354.97 x 7.00
360.0	**381.0**	**8.1**	**TG3403600**	**367.67 x 7.00**

The rod diameters printed in **bold** type conform to the recommendations of ISO 3320.
Other dimensions and all intermediate sizes up to 2.600 mm diameter including inch sizes can be supplied.

Rod diameter	Groove diameter	Groove width	TSS Part No.	O-Ring size
d_N f8/h9	D_1 H9	L_1 +0.2		
400.0	421.0	8.1	TG3404000	405.26 x 7.00
420.0	441.0	8.1	TG3404200	430.66 x 7.00
450.0	471.0	8.1	TG3404500	456.06 x 7.00
480.0	501.0	8.1	TG3404800	494.16 x 7.00
500.0	521.0	8.1	TG3405000	506.86 x 7.00
600.0	621.0	8.1	TG3406000	608.08 x 7.00
700.0	728.0	9.5	TG3507000	713.00 x 8.40

The rod diameters printed in **bold** type conform to the recommendations of ISO 3320.
Other dimensions and all intermediate sizes up to 2.600 mm diameter including inch sizes can be supplied.

■ Special solutions for rotary applications

The sealing of rotary movements in machine engineering and hydraulics often demands solutions which cannot be achieved using standard seal elements.

On request, we will be pleased to draw up specific seal proposals for your application.

Axial seals

Our extensive Turcon® seal range also permits solutions with modified standard seals.

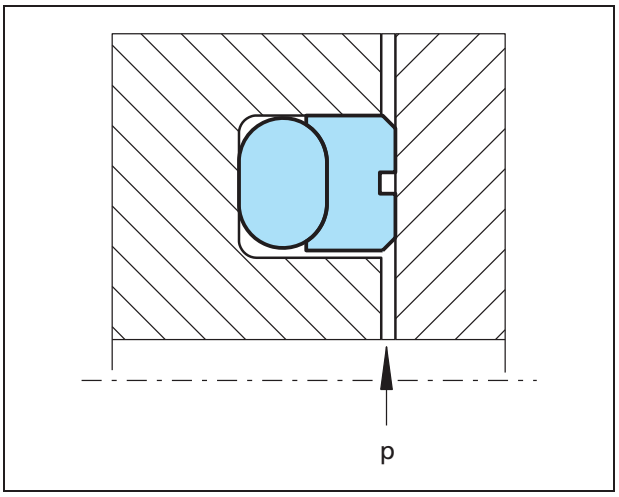


Figure 122 Axial acting Turcon® Roto Glyd Ring®

Figure 122 shows an axial acting Turcon® Roto Glyd Ring®. It is pressed axially against the mating surface by the O-Ring. In the same way, a Turcon® Stepseal® K can also be used here. The max. production diameter is 2700 mm.

The surface roughness of the mating surface must be as specified in Table LXXIII.

Special model with pressure relief

The Roto Glyd Ring® can also be supplied with pressure relief grooves. As can be seen in Figure 123 the continuous radial groove is linked on one side to the pressure chamber. The seal is thus relieved of pressure and can be used for higher pv values. The double-acting sealing function is maintained, but the relieved side should be installed on the side with the higher pressure.

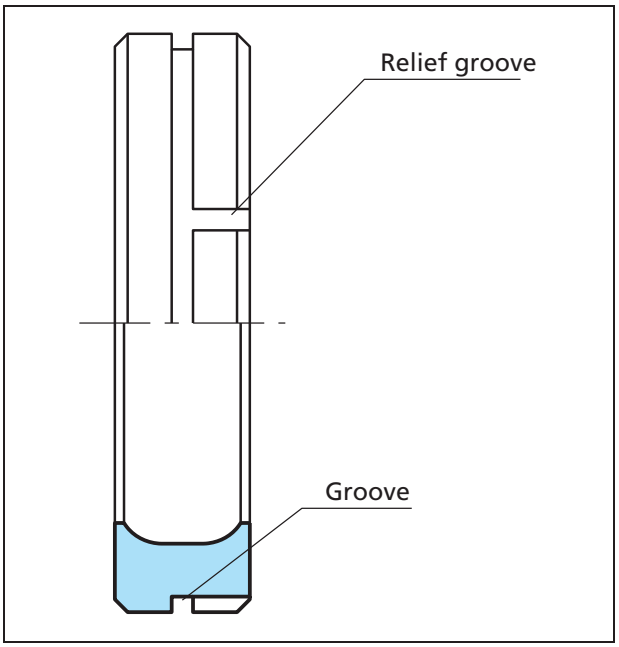


Figure 123 Turcon® Roto Glyd Ring® with pressure relief

The installation direction must be observed in this case. This version is identified in the article number by a “K” as the 5th digit.