

TFA11TE  
TFA12TE  
TFA15TE  
TFA12TERD37H  
TFA15TERD37H

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EXTERNAL  
HYDRAULIC  
FLANGE  
ALIGNMENT  
TOOLS



# CONTENTS

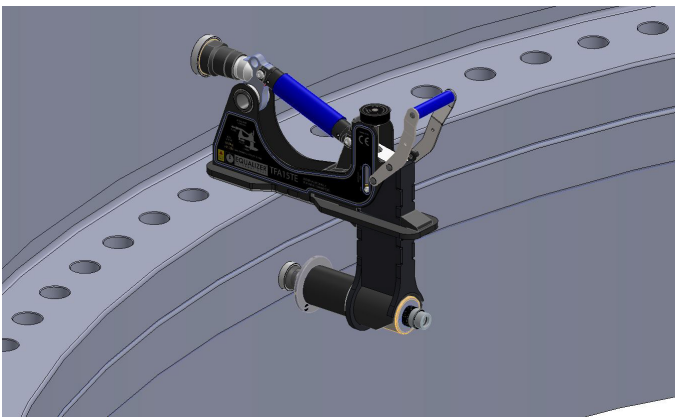
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27/04/2018

# 1.

## INTRODUCTION

The Equalizer™ range of TFA external hydraulic flange alignment tools have been developed to assist in the aligning of large flanges on the inside of large pipes, for example those which make up the tower sections of a wind-turbine.



The tools have been designed to cope with the larger loads and dimensions associated with these flange joints while remaining relatively lightweight and user-friendly.

It is essential that the users familiarise themselves with the contents of this manual prior to using the tool.

This manual contains information for the following tools:

- TFA11TE  
External Hydraulic Flange Alignment Tool
- TFA12TE  
External Hydraulic Flange Alignment Tool
- TFA15TE  
External Hydraulic Flange Alignment Tool
- TFA12TERD37H  
External Hydraulic Flange Alignment Tool
- TFA15TERD37H  
External Hydraulic Flange Alignment Tool

# 2.

## TOOL SAFETY

### 2.1

#### GENERAL SAFETY

These instructions cover the safe operation and maintenance of THE EQUALIZER RANGE OF **TFA EXTERNAL HYDRAULIC** FLANGE ALIGNMENT tools. The use of any tools should be as part of a broader task-based risk assessment, which should be carried out by the operation supervisor or other competent person.

Failure to comply with the safety information contained within this manual could result in personal injury or equipment damage. Read all instructions, warnings and cautions carefully, and follow all safety precautions.

The safety of the operator, any assisting personnel and the general public is of paramount importance. Always work in accordance with applicable national, local, site & company-wide safety procedures.

### 2.2

#### PERSONNEL COMPETENCY

Only personnel deemed competent in the use of mechanical and hydraulic equipment should use these tools.

### 2.3

#### DISCLAIMER

Equalizer cannot be held responsible for injury or damage resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. If in doubt as to the safety precautions and applications, contact Equalizer using the contact details at the back of this manual.

## 2.4

### DEFINITION OF TERMS

A **CAUTION** is used to indicate correct operating or maintenance procedures and practices to prevent damage to, or destruction of equipment or other property.

A **WARNING** indicates a potential danger that requires correct procedures or practices to avoid personal injury.

A **DANGER** is only used when your action or lack of action may cause serious injury or even death.



**DO:** an illustration showing how the tool should be used.



**DON'T:** an illustration showing an incorrect way to use a tool.

## 2.5

### HAZARDS



**WARNING:** ensure all hydraulic components are rated to a safe working pressure of 700 bar (10 000 psi).



**WARNING:** Do not overload equipment. The risk of hydraulic overloading can be minimised by using the Equalizer Hand Pump, which has a factory-set safety valve preventing the safe working pressure being exceeded.

If alternative hydraulic pumps are used, ensure that there are adequate systems to limit the working pressure to:

- 510 bar (7400 psi) for TFA11TE, TFA12TE & TFA12TERD37H
- 700 bar (10000 psi) for TFA15TE & TFA15TERD37H



**CAUTION:** ensure components are protected from external sources of damage, such as excessive heat, flame, moving machine parts, sharp edges and corrosive chemicals.



**CAUTION:** Take care to avoid sharp bends and kinks in hydraulic hoses. Bends and kinks can cause severe back-up pressure and cause hose failure. Protect hoses from dropped objects; a sharp impact may cause internal damage to hose wire strands. Protect hoses from crush risks, such as heavy objects or vehicles; crush damage can cause hose failure.



**WARNING:** Applying pressure to a damaged hose may cause it to rupture.



**WARNING:** Immediately replace worn or damaged parts. Use only genuine Equalizer parts from approved distributors or service centres. Equalizer parts have been engineered and manufactured to be fit-for-purpose.



**DANGER:** To minimise risk of personal injury keep hands and feet away from the tool and workpiece during operation.



**WARNING:** Always wear suitable clothing and Personal Protective Equipment (PPE). Do not handle pressurised hoses; escaping oil under pressure can penetrate the skin, causing serious injury. Seek medical attention immediately if oil penetration is suspected.



**WARNING:** Only pressurize complete and fully connected hydraulic systems. Do not pressurize systems that contain unconnected couplers.



**CAUTION:** Do not lift hydraulic equipment by the hoses or couplers. Use only the designated carrying handles.



**CAUTION:** Lubricate tools as directed in this manual prior to operation. Use only approved lubricants of high quality, following the lubricant manufacturers instructions.



The vibration total value to which this tool is subjected does not exceed 2.5 m/s<sup>2</sup>.

# 3.

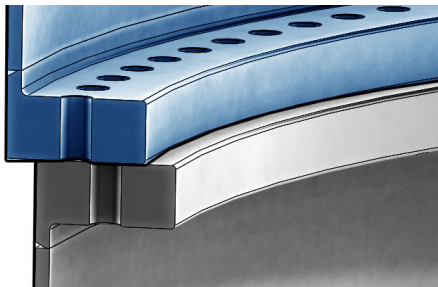
## TOOL OPERATION

### 3.1 GENERAL GUIDANCE

Prior to alignment, an assesment should be carried out to determine the most appropriate positioning of the tool on the flange joint.



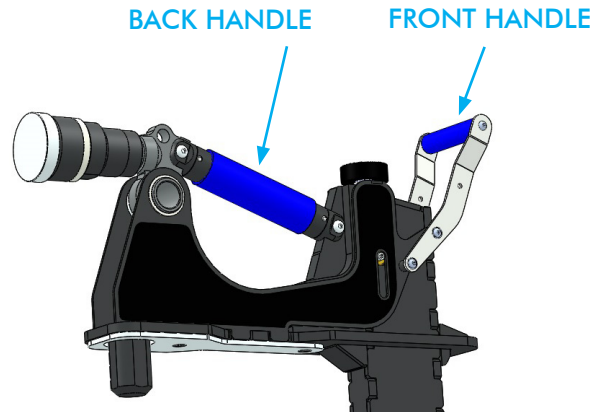
The TFA flange alignment tool should always be installed in such a way that the lower flange is closer to the user and the upper flange is further away. The tool is designed to hook into the bolt-hole of the upper flange and push the lower flange into alignment.



Prior to installation, ensure the Adjustment Leg and Cylinder Adjustment Sleeve are fully retracted. Ensure that the Alignment piston is fully retracted.

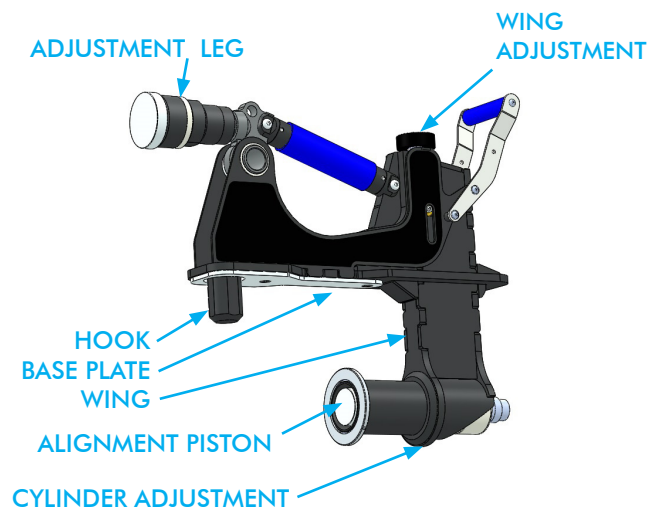
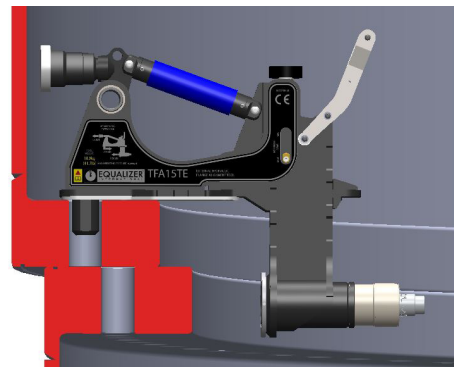
### 3.2 HANDLING

The tool should be lifted and manouvered using its two handles.



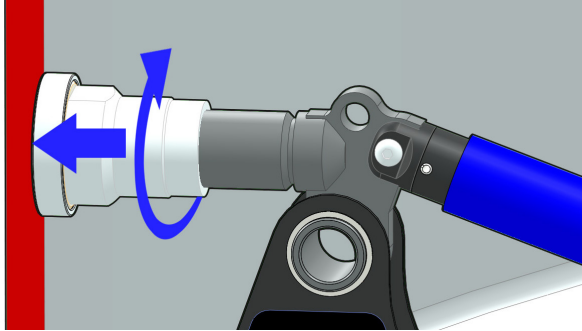
### 3.3 TOOL INSTALLATION

Position the tool into the bolt-hole ensuring that the hook is fully located into the bolt-hole and the base plate of the tool is sitting flat against the upper flange.



### 3.4 ADJUSTMENT LEG

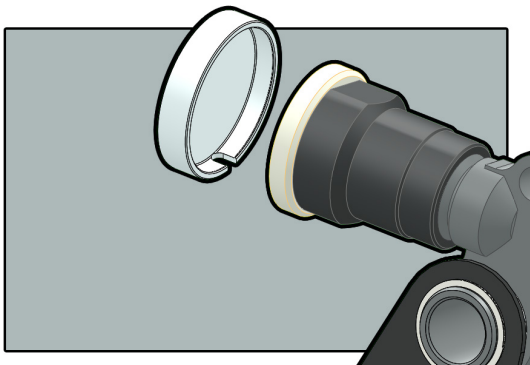
Extend the Adjustment Leg by turning the knurled foot clockwise until it contacts the pipe wall. Ensure that the tool is sitting squarely.



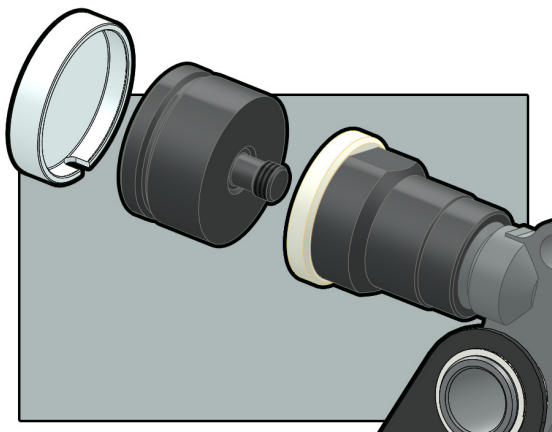
The TFA tools can be supplied with a Foot Extension that can be fixed to the adjustment leg to increase the effective leg length and therefore the range of application.

See the Range of Application at the end of Section 5.1.

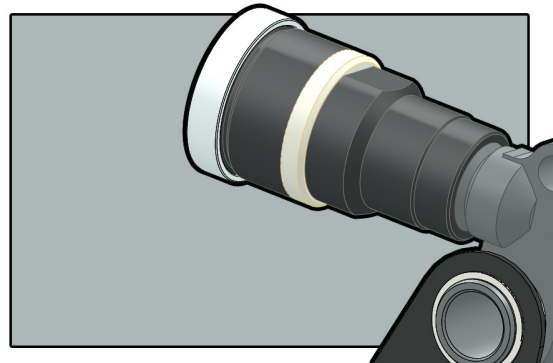
To fit the Foot Extension, first remove the plastic cap:



Screw in the Foot Extension fully until the screw-thread is no longer taking load and the foot feels slightly loose:

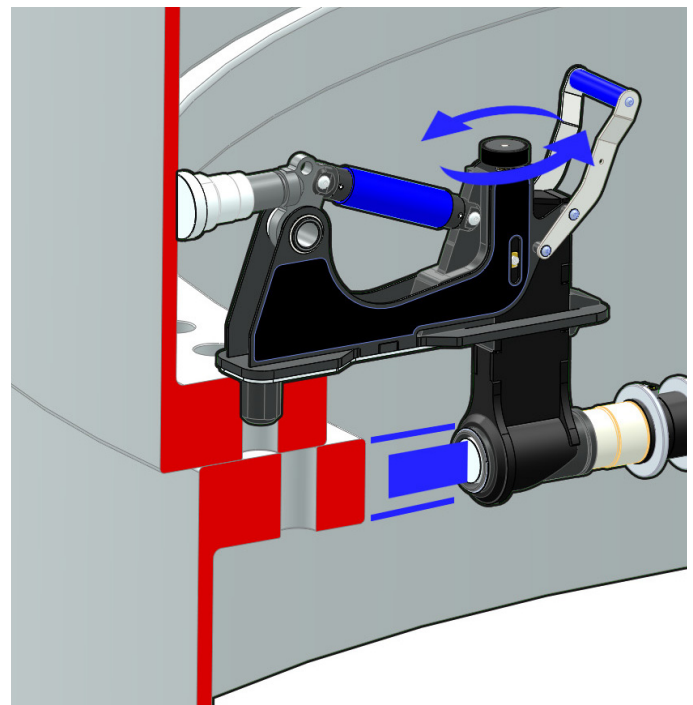


Fit the plastic cap onto the Foot Extension:



### 3.5 WING EXTENSION

The Alignment Piston is located on an adjustable wing which can be extended to enable the tool to be used on a variety of flange sizes.



**NOTE:**

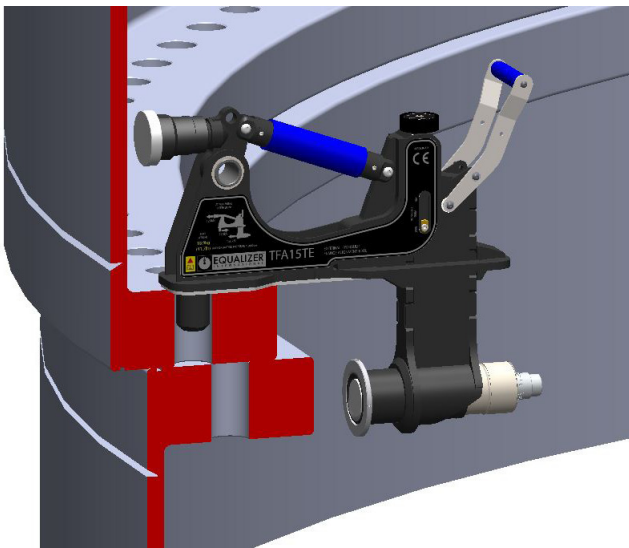
The TFA11 and TFA12 are longer reaching versions of the TFA15 and suitable for thicker flanges that require a longer wing.

Use the Wing Extension adjustment knob to lower the wing until the foot of the Alignment piston is positioned within the space between the upper and lower faces of the lower flange.

### 3.6 CYLINDER ADJUSTMENT SLEEVE

The Alignment Piston has a 65 mm stroke. The Cylinder Adjustment Sleeve extends the reach of the tool to fit a variety of flange sizes, without compromising its maximum alignment capacity.

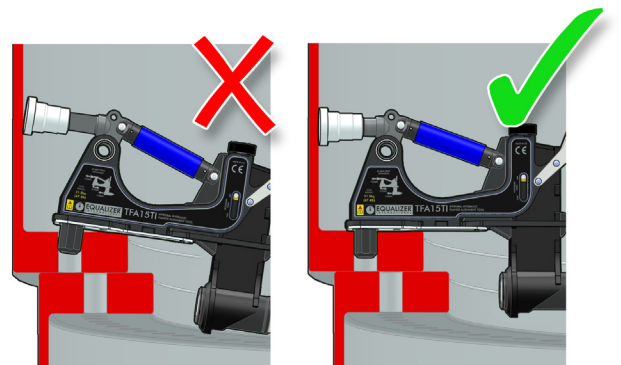
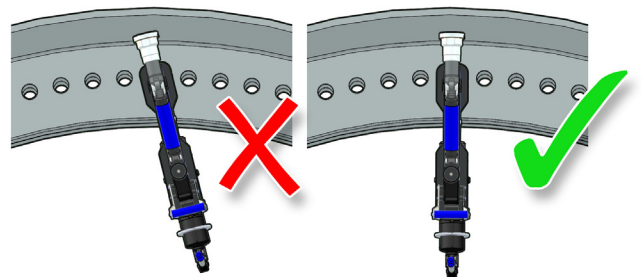
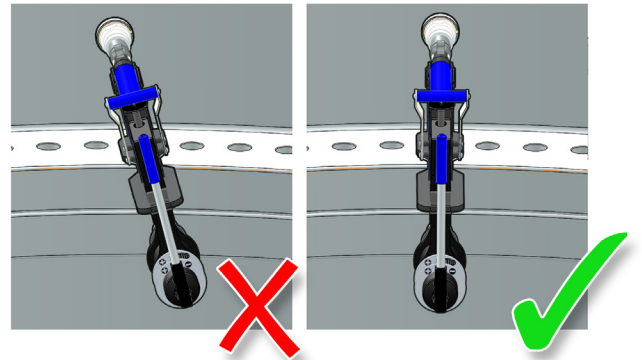
Turn the Cylinder Adjustment Sleeve by the knurled ring until the Alignment Foot is touching the lower flange.



### 3.7 TOOL CHECKS



**WARNING:** Ensure that the tool is sitting square on the flange, that the wing is parallel to the pipe wall and that the Adjustment Leg is adjusted prior to actuating the tool. Actuating the tool when it is not correctly installed could cause injury or equipment damage.

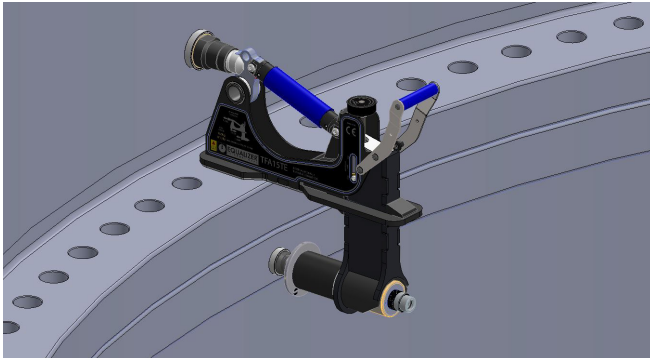
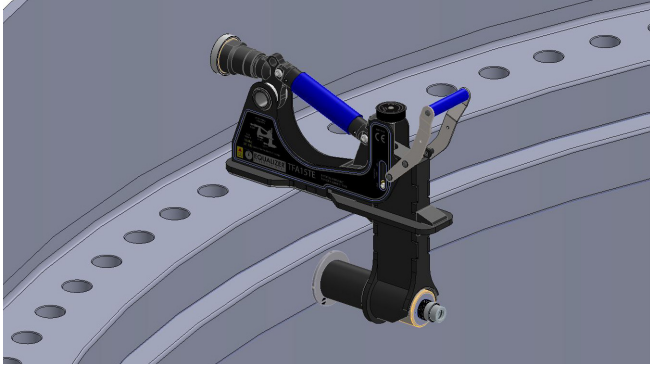


**WARNING:** Do not allow fingers, hands or other body parts to come into contact with the flange while actuating the tool. Only hold the tool by its designated handles.

## 3.8 ALIGNMENT

Refer to section 5.2 for tool actuation instructions.

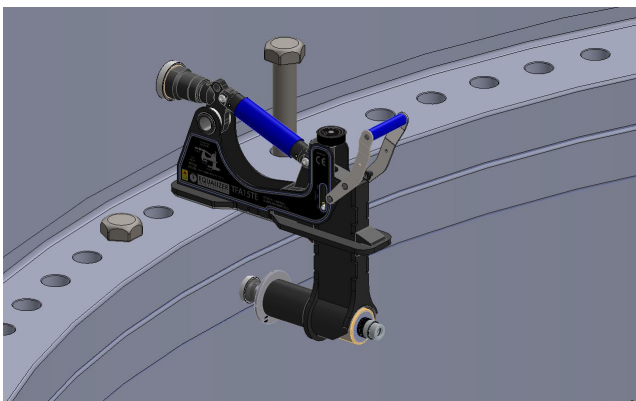
Actuating the tool will extend the Alignment Piston and align the flanges.



## 3.9 SECURING THE FLANGE JOINT

After the flange joint has been aligned it can be secured by installing as many bolts as possible into the bolt holes.

It may be necessary to repeat the alignment process several times while working around the flange joint.





# 4.

## TOOL MAINTENANCE

### 4.1 INSPECTION

A thorough inspection should be carried out prior to usage, storage or transportation to ensure the completeness and condition of the tool.

Inspection should include:

- visual inspection of the outer parts of the tool, checking for obvious damage, degradation or missing parts
- visual inspection of the Alignment Piston (requiring tool actuation). Damage to the Alignment Piston can be indicative of tool over-load.

Cleaning and servicing should be undertaken as required prior to the tool being used, stored or transported.

### 4.2 CLEANING

To lightly clean the tool, wipe gently with a damp cloth.

If more thorough cleaning is required (for example following immersion in water) carry out the following cleaning procedure:

- strip the tool down, observing the schematics in section 8
- clean the components using detergent, following the manufacturer's guidelines
- rinse the components to remove traces of detergent
- dry the components thoroughly

Inspect, service and lubricate the tool immediately after the cleaning process.

### 4.3 SERVICING

Replace missing worn or damaged parts. Use only genuine Equalizer parts from approved distributors or service centres. Equalizer parts have been engineered and manufactured to be fit-for-purpose.

Grease all moving parts by following the Lubrication Procedure prior to usage, storage or transportation.

If topping up or replacing hydraulic oil as part of a service, use only premium quality hydraulic oil of the grade 15 cSt.

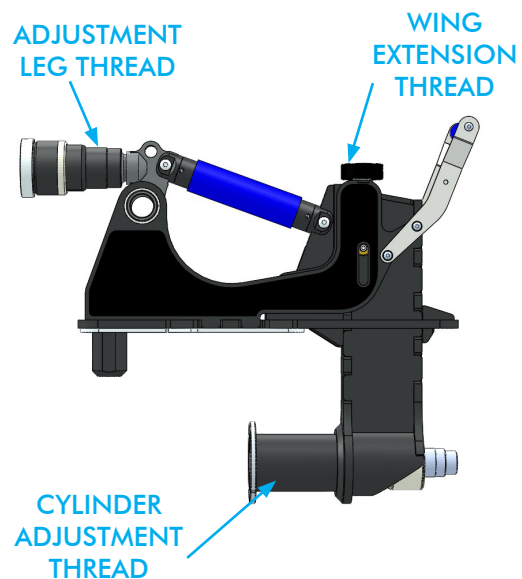
### 4.4 LUBRICATION PROCEDURE

Apply grease following cleaning and servicing, prior to usage, storage or transportation. Never assemble and leave a tool without following the greasing procedure as degradation or damage may occur.

Use only high pressure molybdenum disulphide grease.

Apply grease liberally to the following areas:

- the Adjustment Leg thread
- the Wing Extension thread
- the Cylinder Adjustment thread



## 4.5

### STORAGE & TRANSPORTATION

Equalizer tools should be stored in a cool dry place. Tools should always be cleaned, serviced and lubricated prior to storage. Ensure that tools are stored in their designated packing cases.

## 4.6

### OPERATING CONDITIONS

#### **HYDRAULIC TOOLS:**

Minimum Flange Contact Temperature: -30 °C (-22 °F)

Maximum Flange Contact Temperature: 70 °C (158 °F)

## 4.7

### SUB-SEA USAGE

#### **Using TFA external hydraulic tools Sub-Sea**

The TFA external hydraulic tools are actuated by means of single-acting spring-return hydraulic cylinder and can be used sub-sea providing the following actions are taken:

- The gauge and manifold are removed from the Equalizer HP hand-pump and the coupler is fitted directly to the pump outlet (tools in this configuration can be requested from Equalizer).
- The tool is connected to the Equalizer HP hand-pump whilst still top-side.
- The pump release valve is fully opened and remains open until the tool has descended to the working depth. This will allow the pressure to equalise.
- The tool is actuated via the hand-pump by a diver.
- Upon completion of works the release valve is left in the fully-open position until the tool has ascended to the surface.
- The tool and pump are stripped-down, cleaned and lubricated immediately to minimise corrosion.

Please note that a sub-sea TFA external hydraulic tools cannot be operated from top-side by use of a down-line. The return springs in the hydraulic cylinders do not have sufficient force to close the tool if used with a down-line from a top-side pump, therefore the standard hydraulic tools will not function correctly and may jam in place if used in this configuration.

## 4.8

### LONG-TERM STORAGE -

### MAINTENANCE PLAN

1. Rub components down with a dry cloth to remove moisture.
2. Coat EVERY surface and contact point with a corrosion inhibitor. Where necessary, coat inside and outside of component e.g. VC10
3. Nuts and threads must also be coated with a corrosion inhibitor.
4. Once surfaces have been coated, seal individual components in clear plastic bags or clear vacuum bags or clear shrink wrap.  
NOTE: bags/shrink wrap must be clear for visibility. Take care when using shrink wrap that the tool is/ components are still easy to see.
5. Remove all or, where not vacuum sealed, as much air from bags as possible.
6. Once bags have been closed and sealed DO NOT re-open. Any visual inspections must be done with closed and sealed bags. If bags are opened the components will have to be dried, re-coated and re-sealed in bags/ shrink wrap.
7. Replace silica gel (100g) EVERY TIME the case is opened.  
NOTE: depending on moisture content of air, silica gel should be changed weekly.
8. Visually inspect kits after 30-days and every 30-days thereafter. Remember to replace silica gel before closing case.

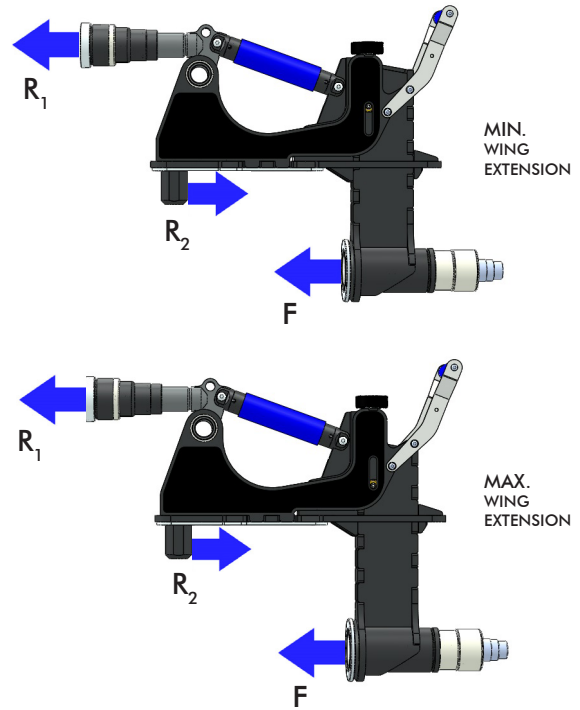
# 5.

## 5.1 TOOL CAPABILITIES

### ALIGNMENT FORCE

The TFA external hydraulic flange alignment tools use an external hydraulic cylinder to advance the alignment foot and align the flanges.

The following table shows the alignment force (F) through the alignment foot when the maximum external pump pressure is applied. Reaction forces ( $R_1$  &  $R_2$ ) vary depending on the extension of the wing.



FORCE			TFA11TE	TFA12TE	TFA15TE	TFA12TE RD37H	TFA15TE RD37H
F	ALIGNMENT FORCE	MIN	11 T	12 T	15 T	12 T	15 T
		MAX					
$R_1$	REACTION FORCE 1	MIN	10 T	10 T	9 T	7 T	6.5 T
		MAX	12 T	12 T	12 T	8.7 T	8.7 T
$R_2$	REACTION FORCE 2	MIN	21 T	22 T	24 T	19 T	21.5 T
		MAX	23 T	24 T	27 T	20.7 T	23.7 T

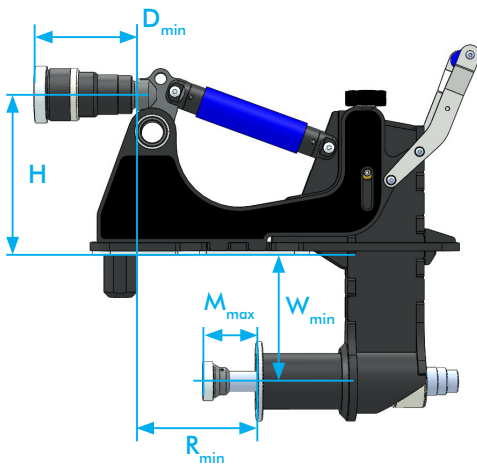
**RANGE OF APPLICATION**

	DIMENSION		TFA11TE	TFA12TE	TFA15TE	TFA12TE RD37H	TFA15TE RD37H
B	Bolt Hole Diameter	MIN	45 mm	45 mm	45 mm	39 mm	39 mm
		MAX	65 mm	65 mm	65 mm	65 mm	65 mm
M	Misalignment	MIN	0 mm	0 mm	0 mm	0 mm	0 mm
		MAX	65 mm	65 mm	65 mm	65 mm	65 mm
R	Rise	MIN	144 mm	144 mm	144 mm	148 mm	148 mm
		MAX	243 mm	243 mm	243 mm	247 mm	247 mm
D	Pipe Leg Drop	MIN	90 mm	90 mm	90 mm	53 mm	53 mm
		MAX	132 mm	132 mm	132 mm	94 mm	94 mm
W	Wing Reach	MIN	180 mm	160 mm	120 mm	160 mm	120 mm
		MAX	220 mm	200 mm	160 mm	200 mm	160 mm
H	Reaction Spacing	MIN	200 mm	200 mm	200 mm	275 mm	275 mm
		MAX					

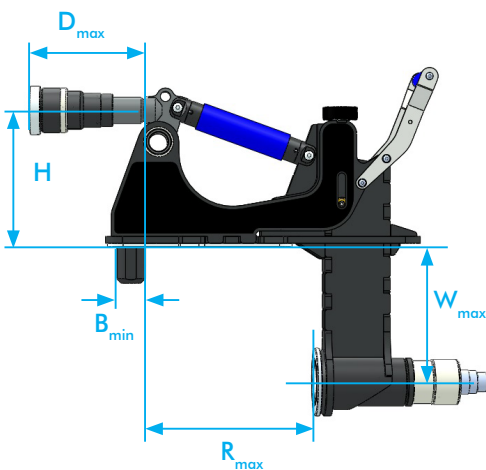
NOTES:

- By attaching extension foot to the adjustment leg, the pipe leg drop (D) dimensions are increased by 40mm.
- Various bushes can be attached to the hooks. This alters the pipe leg drop (D) and the rise (R). Please contact Equalizer International for more information.

**MINIMUM EXTENSION**



**MAXIMUM EXTENSION**



## 5.2

### **TOOL FUNCTION**

#### **HYDRAULIC TOOL OPERATION**

The TFA external hydraulic tools use a hydraulic cylinder to advance the Alignment Piston and align the flanges. The hydraulic pressure is applied using an external hand pump, enabling accurate control of the force applied. The maximum working pressure of the TFA11 and TFA12 tools are 510 bar (7400 psi). The maximum working pressure of the TFA15 tool is 700 bar (10000 psi).

#### **HAND PUMP OPERATION**

Consult the Instruction Manual for the Equalizer HP Hand-Pump supplied in the kit. Only use the supplied Hand-Pumps which have been regulated to the correct pressure to suit each tool.

#### **ACTUATING THE TFA EXTERNAL HYDRAULIC TOOL**

Follow the Tool Operation instructions (see Section 3), using the following instructions to actuate the TFA external hydraulic tool.

When the Hand-Pump release valve is closed, pumping the Hand-Pump handle will advance the Alignment Piston.

When using multiple tools, ensure that the spread of all tools correspond to keep the spreading force balanced.

#### **RETRACTING THE TFA EXTERNAL HYDRAULIC TOOL**

Opening the release valve will depressurise the cylinder and cause it to retract under the force of its internal spring. The handle does not need to be pumped to retract the tool.

When using multiple tools, exercise caution while retracting to keep the spreading force balanced as the gap is closed.

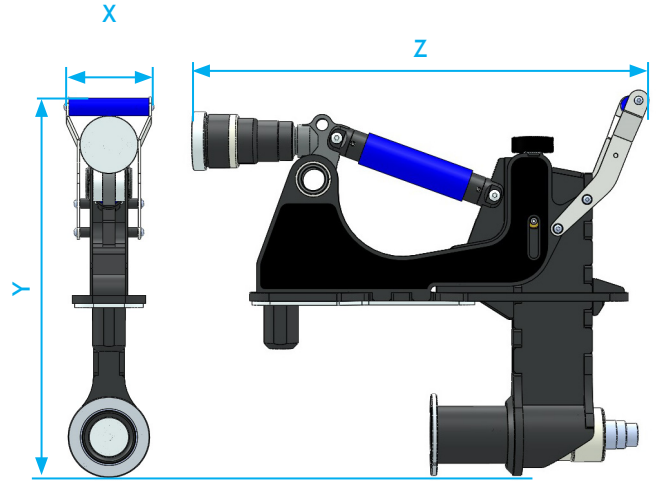
### 5.3 KIT CONTENTS

#### TOOL KITS

<b>TFA11TE MIN KIT</b>	1 x TFA11TE Tool 1 x Safety Lanyard 1 x Instruction Manual 1 x Carry Case  Product Code: TFA11TEMIN	640 mm (25.2") 540 mm (21.3") 165 mm (6.5")
<b>TFA12TE MIN KIT</b>	1 x TFA12TE Tool 1 x Safety Lanyard 1 x Instruction Manual 1 x Carry Case  Product Code: TFA12TEMIN	640 mm (25.2") 540 mm (21.3") 165 mm (6.5")
<b>TFA15TE MIN KIT</b>	1 x TFA15TE Tool 1 x Safety Lanyard 1 x Instruction Manual 1 x Carry-Case  Product Code: TFA15TEMIN	640 mm (25.2") 540 mm (21.3") 165 mm (6.5")
<b>TFA12TERD37H MIN KIT</b>	1 x TFA12TERD37H Tool 1 x Safety Lanyard 1 x Instruction Manual 1 x Carry-Case  Product Code: TFA12TERD37HMIN	890 mm (35.0") 570 mm (22.4") 165 mm (6.5")
<b>TFA15TERD37H MIN KIT</b>	1 x TFA15TERD37H Tool 1 x Safety Lanyard 1 x Instruction Manual 1 x Carry-Case  Product Code: TFA15TERD37HMIN	890 mm (35.0") 570 mm (22.4") 165 mm (6.5")



### 5.4 TOOL DIMENSIONS



	KIT WEIGHT	TOOL WEIGHT	X	Y	Z
TFA11TE	28.9 kg (63.7 lb)	20.7 kg (45.6 lb)	104 mm (4.10")	490 mm (19.3")	513 mm (20.2")
TFA12TE	30.0 kg (66.1 lb)	21.1 kg (46.5 lb)	104 mm (4.10")	470 mm (18.5")	513 mm (20.2")
TFA15TE	28.1 kg (61.9 lb)	18.9 kg (41.7 lb)	104 mm (4.10")	430 mm (16.9")	513 mm (20.2")
TFA12TE RD37H	32.0 kg (70.5 lb)	19.6 kg (43.2 lb)	104 mm (4.10")	522 mm (20.6")	484 mm (19.1")
TFA15TE RD37H	31.5 kg (69.5 lb)	19.1 kg (42.1 lb)	104 mm (4.10")	481 mm (18.9")	484 mm (19.1")

# 6.

## TROUBLESHOOTING

### THE ALIGNMENT PISTON IS ADVANCING BUT DOES NOT REACH FULL PRESSURE

#### POSSIBLE CAUSE:

There is air in the hydraulic system.

#### RECOMMENDED ACTION:

Follow the Airlock Relief instructions.

### AIR-LOCK RELIEF

Connect the hand pump to the tool with the hydraulic hose. Close the release valve on the pump, and prime the pump until the hydraulic cylinder is fully extended and a small pressure is achieved.

With the hand pump elevated above the level of the tool, and the tool in an upright position, open the hand pump release valve causing any air that is within the system to be forced up through the pump and vented into the oil reservoir.

Repeat this process three further times to ensure that all air is removed from the system. The tool should now reach full working pressure.

Disconnect the hand pump from the hydraulic hose, grip the baseplate of the hand pump body in a vice with the pump body vertical and the main handle at the top. Remove the four nuts holding the main handle and lift off. Grip the refilling plug with pliers and extract it by pulling and twisting simultaneously. Ensure the reservoir body is held down when removing the refilling plug as pulling up on the reservoir body will release the bladder within, and oil may spill out. Fill the reservoir to the top with a premium quality hydraulic oil of the grade 15 cSt. Reinsert the refilling plug, wipe away any oil, and reassemble by reversing the disassembly process.

# 7.

## REGULATORY INFORMATION

### 7.1

#### REGISTERED HEAD OFFICE

EQUALIZER INTERNATIONAL LTD.  
Equalizer House  
Claymore Drive  
Aberdeen  
Scotland  
AB23 8GD

### 7.2

#### APPLICABLE PATENT NUMBERS

The following list of Patents and Design Registrations are applicable to EQUALIZER INTERNATIONAL LTD TFA tools:

#### **REGISTERED PATENTS & DESIGN REGISTRATIONS**

- 5832582
- AU690191
- NO319697
- 6327763
- 318535
- 0916051B
- 0024229878
- 84481
- 95727
- 44142
- 45155

# 8.

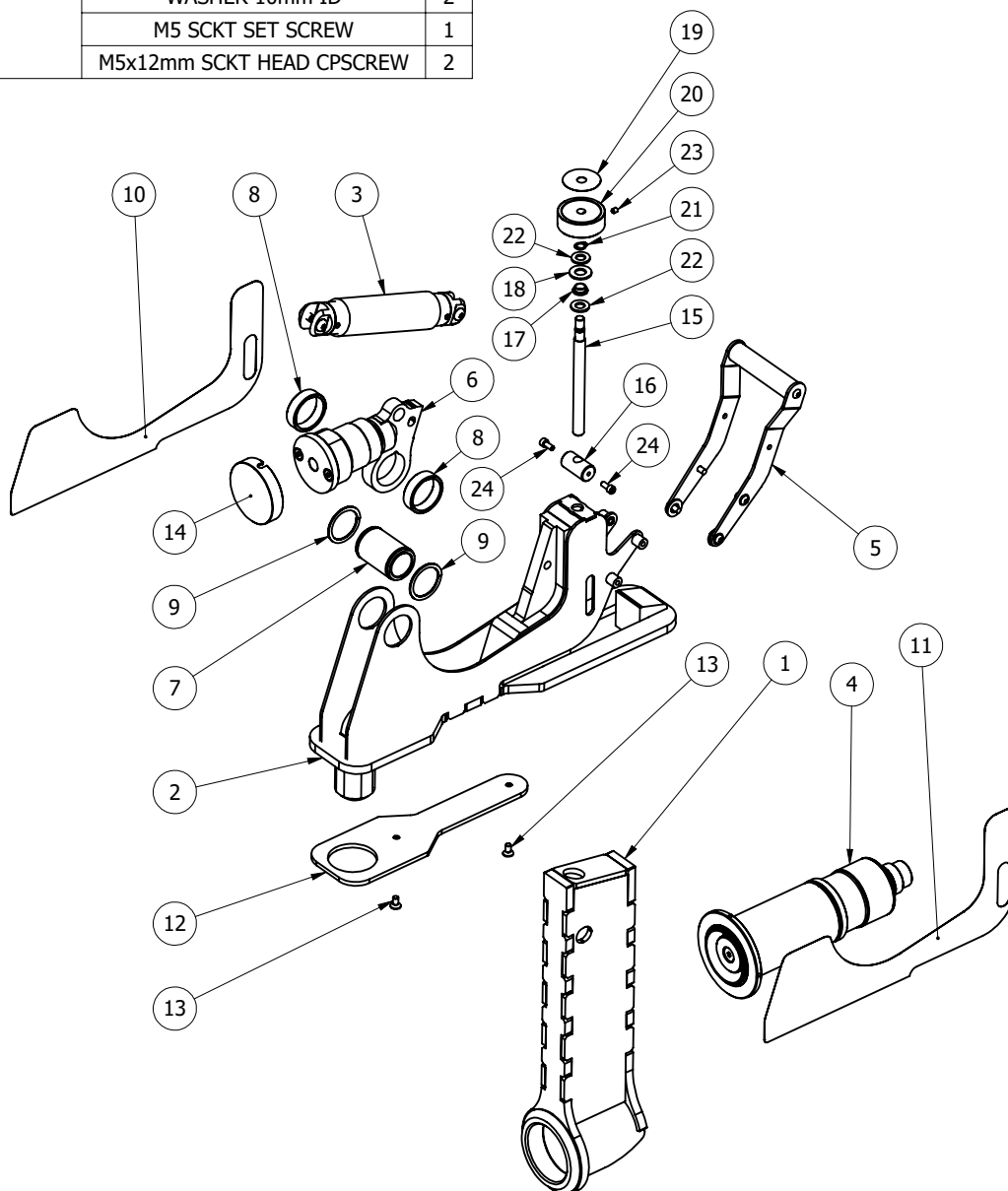
## PARTS LISTS & SERVICE KITS



# TFA11TE PARTS LIST

1990000-01 REV 02

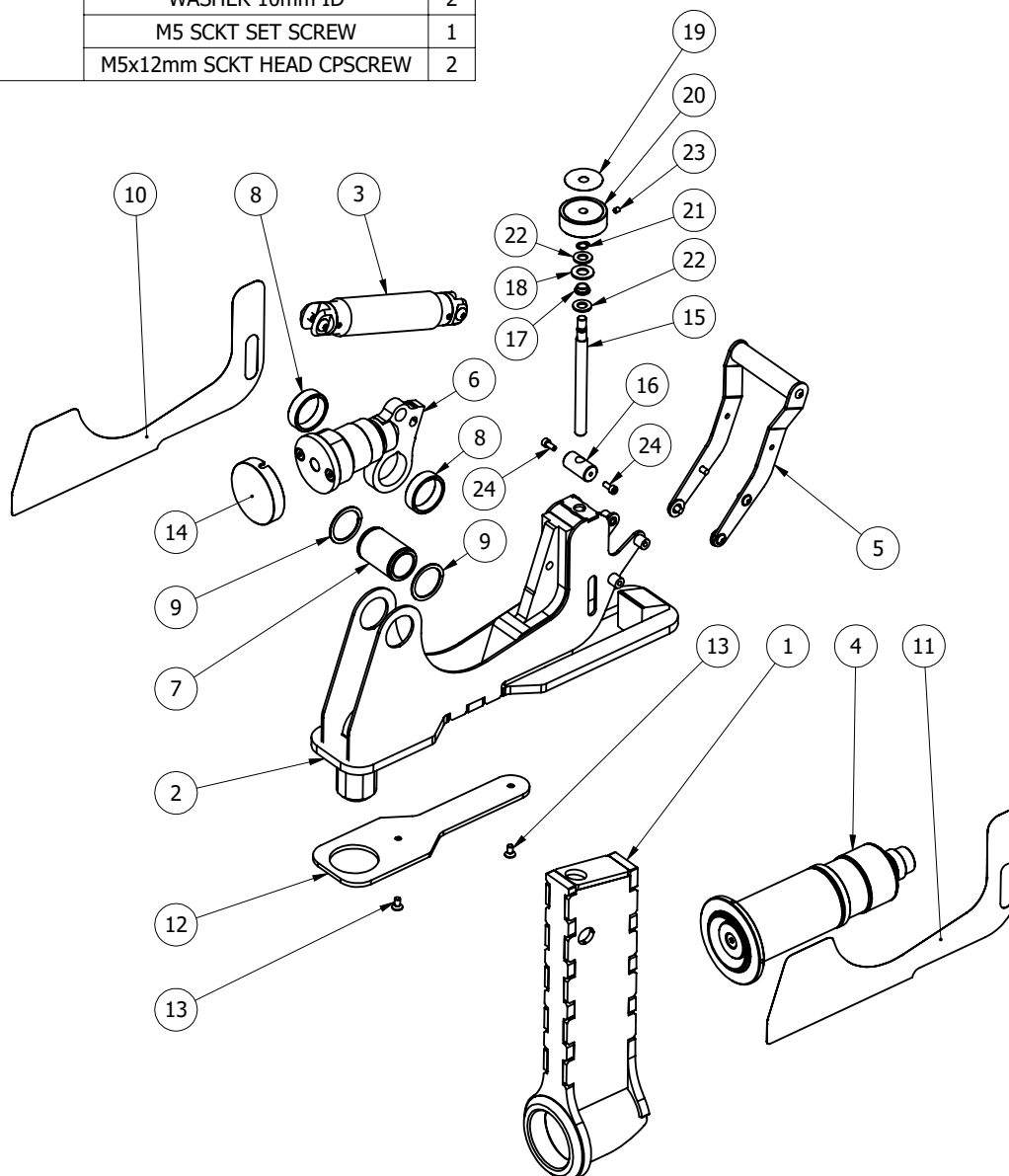
ITEM NO.	PART NO	DESCRIPTION	QTY
1	1990100-01	WING ARM WELDMENT	1
2	270200-01	BODY ASSEMBLY - WELDED	1
3	270300-01	STRUT ASSEMBLY	1
4	1320500-01	CYLINDER ASSEMBLY	1
5	271300-01	HANDLE ASSEMBLY	1
6	270400-01	ADJUSTABLE LEG ASS	1
7	270900-01	ADJUSTMENT LEG FIXING SHAFT	1
8	272000-01	SIDE SPACER BUSH	2
9	273300-01	SPIRAL CLIP	2
10	1990001-01	LHS STICKER	1
11	1990002-01	RHS STICKER	1
12		PROTECTION PAD FINISHED	1
13	KIT 271400-01	M6 CSK HEX SCREW	2
14		FOOT CAP TOWER	1
15		ADJUSTMENT ROD	1
16		ADJUSTER BOSS	1
17		NYLON BUSH	1
18		NYLON WASHER	1
19	KIT 271500-01	WING ADJUST DECAL_TFA15TI	1
20		RELEASE KNOB	1
21		EXTERNAL CIRCLIP	1
22		WASHER 10mm ID	2
23		M5 SCKT SET SCREW	1
24		M5x12mm SCKT HEAD CPSCREW	2



# TFA12TE PARTS LIST

1210000-01 REV.02

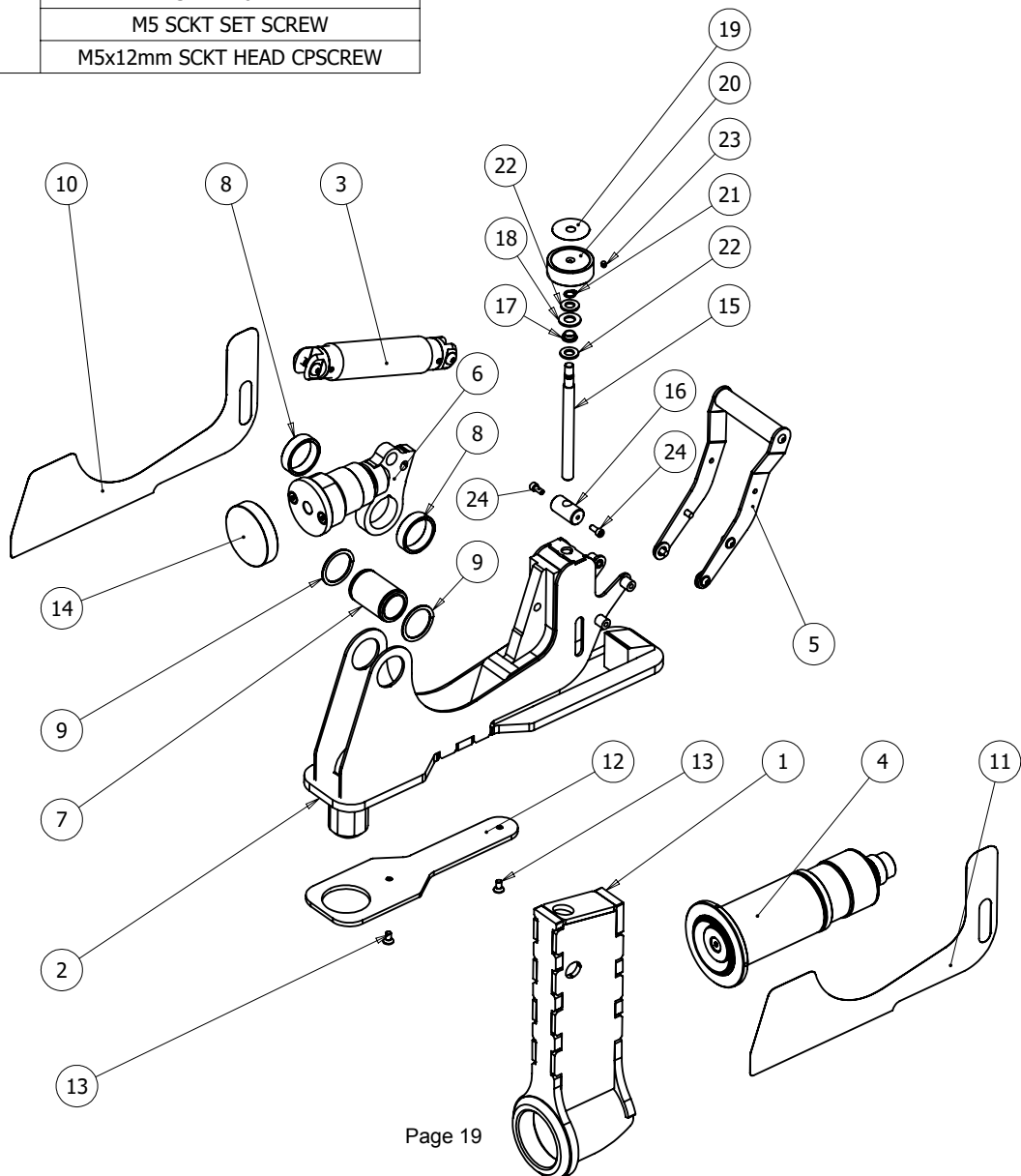
ITEM NO.	PART NO	DESCRIPTION	QTY
1	1210100-01	WING ARM WELDMENT	1
2	270200-01	BODY ASSEMBLY - WELDED	1
3	270300-01	STRUT ASSEMBLY	1
4	1320500-01	CYLINDER ASSEMBLY	1
5	271300-01	HANDLE ASSEMBLY	1
6	270400-01	ADJUSTABLE LEG ASS	1
7	270900-01	ADJUSTMENT LEG FIXING SHAFT	1
8	272000-01	SIDE SPACER BUSH	2
9	273300-01	SPIRAL CLIP	2
10	070410-01	LHS STICKER	1
11	070411-01	RHS STICKER	1
12		PROTECTION PAD FINISHED	1
13	KIT 271400-01	M6 CSK HEX SCREW	2
14		FOOT CAP TOWER	1
15		ADJUSTMENT ROD	1
16		ADJUSTER BOSS	1
17		NYLON BUSH	1
18		NYLON WASHER	1
19	KIT 271500-01	WING ADJUST DECAL_TFA15TI	1
20		RELEASE KNOB	1
21		EXTERNAL CIRCLIP	1
22		WASHER 10mm ID	2
23		M5 SCKT SET SCREW	1
24		M5x12mm SCKT HEAD CPSCREW	2



# TFA15TE PARTS LIST

1320000-01 REV.02

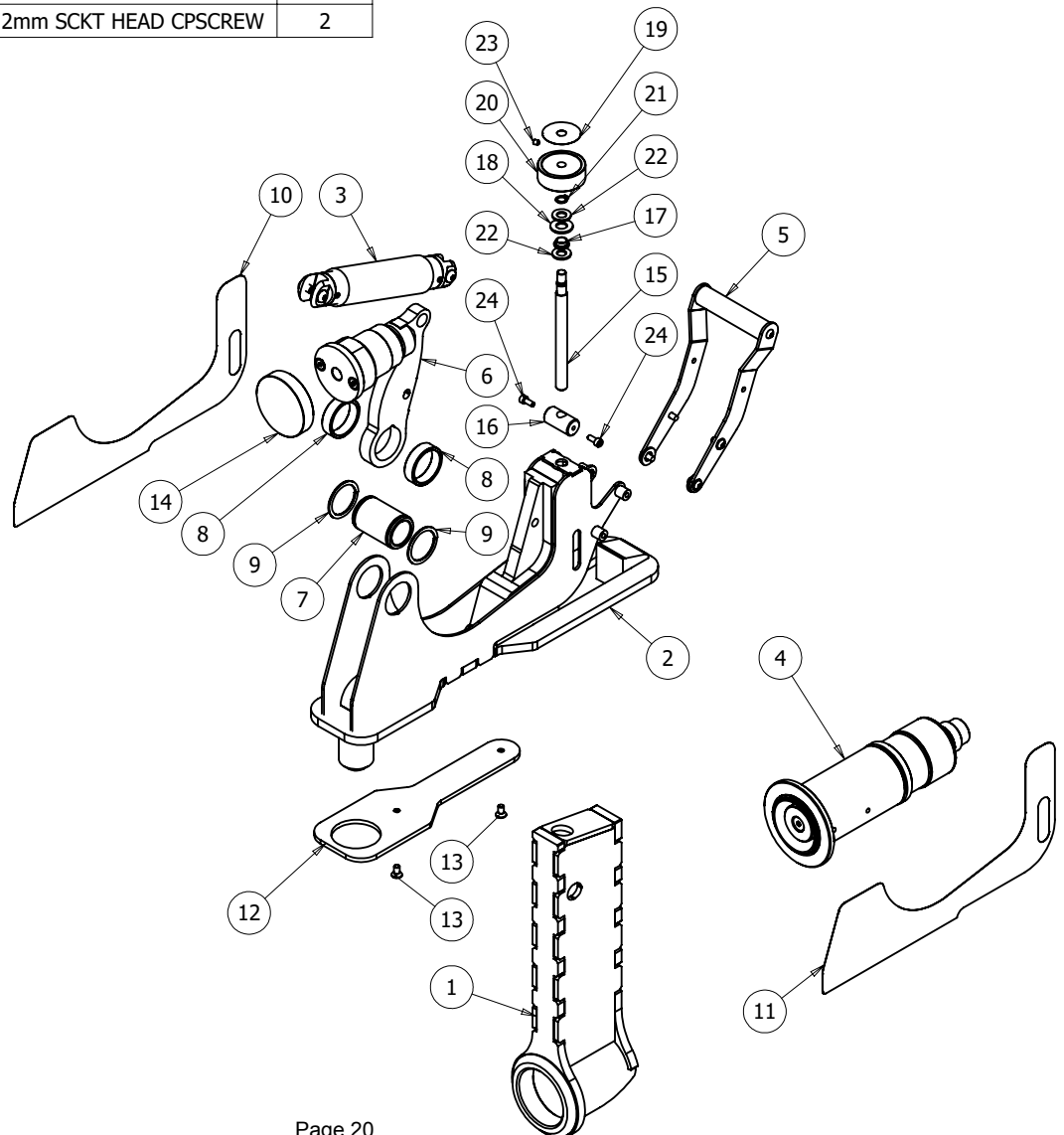
ITEM NO.	Part No	DESCRIPTION
1	270100-01	WING ARM WELDMENT
2	270200-01	BODY ASSEMBLY - WELDED
3	270300-01	STRUT ASSEMBLY
4	1320500-01	CYLINDER ASSEMBLY
5	271300-01	HANDLE ASSEMBLY
6	270400-01	ADJUSTABLE LEG ASS
7	270900-01	ADJUSTMENT LEG FIXING SHAFT
8	272000-01	SIDE SPACER BUSH
9	273300-01	SPIRAL CLIP
10	1323700-01	LHS STICKER
11	1323800-01	RHS STICKER
12	KIT 271400-01	PROTECTION PAD FINISHED
13		M6 CSK HEX SCREW
14		FOOT CAP TOWER
15	KIT 271500-01	ADJUSTMENT ROD
16		ADJUSTER BOSS
17		NYLON BUSH
18		NYLON WASHER
19		WING ADJUST DECAL
20		RELEASE KNOB
21		EXTERNAL CIRCLIP
22		WASHER 10mm ID
23		M5 SCKT SET SCREW
24		M5x12mm SCKT HEAD CPSCREW



# TFA12TERD37H PARTS LIST

2010000-01 REV. 01

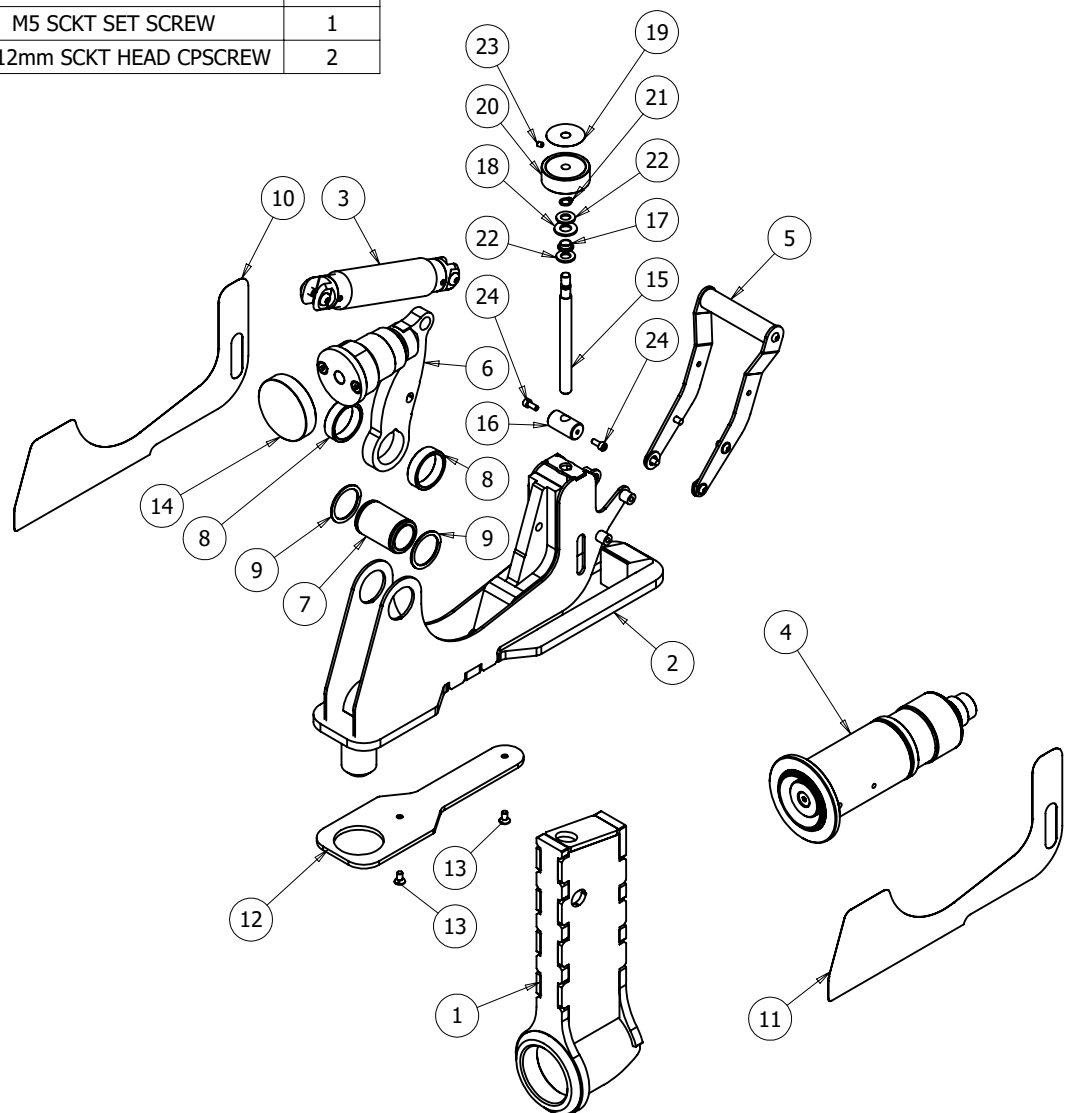
ITEM NO.	PART NO	DESCRIPTION	QTY
1	1210100-01	WING ARM WELDMENT	1
2	1690100-01	BODY ASSEMBLY WELDED	1
3	270300-01	STRUT ASSEMBLY	1
4	1320500-01	CYLINDER ASSEMBLY	1
5	271300-01	HANDLE ASSEMBLY	1
6	1690200-01	ADJUSTABLE LEG ASSY	1
7	270900-01	ADJUSTMENT LEG FIXING SHAFT	1
8	272000-01	SIDE SPACER BUSH	2
9	273300-01	SPIRAL CLIP	2
10	2010001-01	RHS Sticker	1
11	2010002-01	LHS Sticker	1
12	KIT 271400-01	PROTECTION PAD FINISHED	1
13		M6 CSK HEX SCREW	2
14		FOOT CAP TOWER	1
15	KIT 271500-01	ADJUSTMENT ROD	1
16		ADJUSTER BOSS	1
17		NYLON BUSH	1
18		NYLON WASHER	1
19		WING ADJUST DECAL_TFA15TI	1
20		RELEASE KNOB	1
21		EXTERNAL CIRCLIP	1
22		WASHER 10mm ID	2
23		M5 SCKT SET SCREW	1
24		M5x12mm SCKT HEAD CPSCREW	2



# TFA15TERD37H PARTS LIST

2020000-01 REV. 01

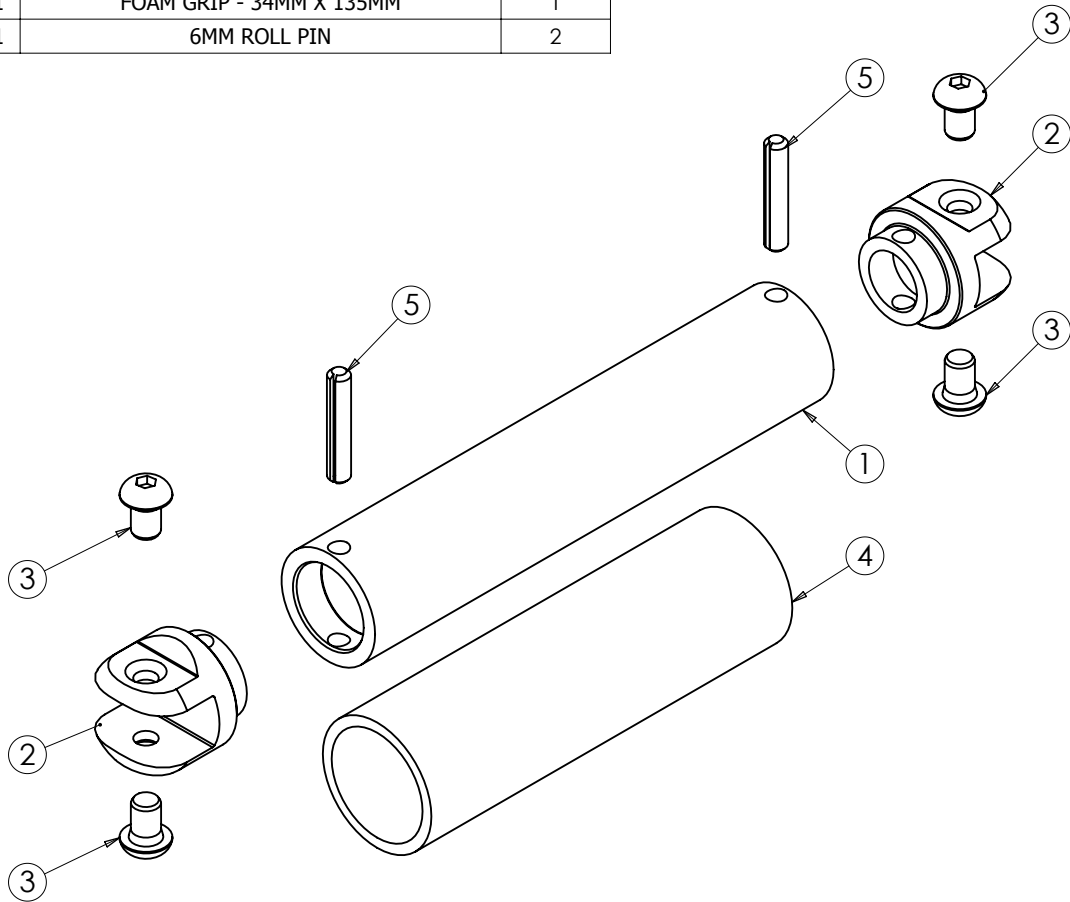
ITEM NO.	PART NO	DESCRIPTION	QTY
1	270100-01	WING ARM WELDMENT	1
2	1690100-01	BODY ASSEMBLY WELDED	1
3	270300-01	STRUT ASSEMBLY	1
4	1320500-01	CYLINDER ASSEMBLY	1
5	271300-01	HANDLE ASSEMBLY	1
6	1690200-01	ADJUSTABLE LEG ASSY	1
7	270900-01	ADJUSTMENT LEG FIXING SHAFT	1
8	272000-01	SIDE SPACER BUSH	2
9	273300-01	SPIRAL CLIP	2
10	2020001-01	RHS Sticker	1
11	2020002-01	LHS Sticker	1
12	KIT 271400-01	PROTECTION PAD FINISHED	1
13		M6 CSK HEX SCREW	2
14		FOOT CAP TOWER	1
15	KIT 271500-01	ADJUSTMENT ROD	1
16		ADJUSTER BOSS	1
17		NYLON BUSH	1
18		NYLON WASHER	1
19		WING ADJUST DECAL_TFA15TI	1
20		RELEASE KNOB	1
21		EXTERNAL CIRCLIP	1
22		WASHER 10mm ID	2
23		M5 SCKT SET SCREW	1
24		M5x12mm SCKT HEAD CPSCREW	2



# **STRUT ASSEMBLY PARTS LIST**

## **270300-01 REV.01**

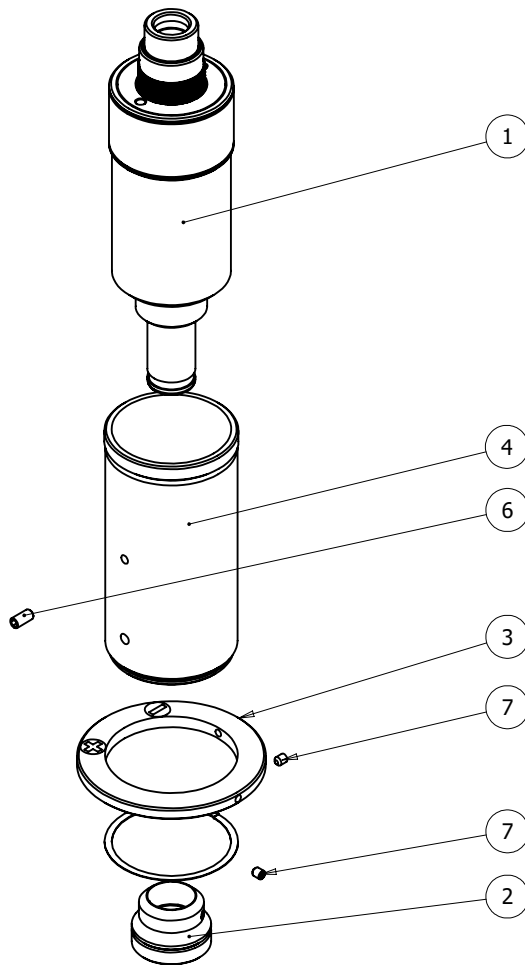
ITEM NO.	PART NO	DESCRIPTION	QTY/ASS
1	270301-09	STRUT TUBE	1
2	270302-09	CLEVIS	2
3	270303-01	M8X12mm BUTTON HEAD HEX SCREW	4
4	273000-01	FOAM GRIP - 34MM X 135MM	1
5	273100-01	6MM ROLL PIN	2



# **TFA TE CYLINDER ASSEMBLY PARTS LIST**

**1320500-01 REV 02**

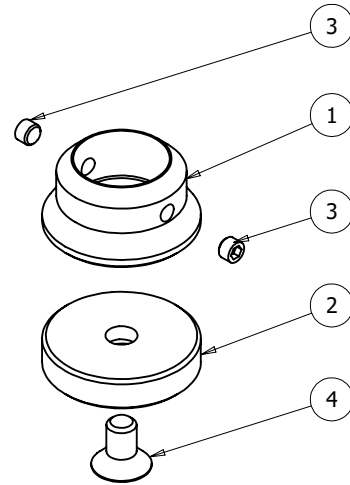
ITEM NO.	Part No	DESCRIPTION	QTY
1	830300-01	HYDRAULIC CYLINDER - 10,000 PSI	1
2	270600-01	CYLINDER FOOT ASSEMBLY	1
3	270701-01	CYLINDER ADJUSTING RING	1
4	270501-01	TI CYLINDER SLEEVE	1
5	830313-01	SPIRAL RETAINING RING	1
6	301301-01	M6 SCKT SET SCREW	1
7	300401-01	M5 SCKT SET SCREW	2



# **CYLINDER FOOT PARTS LIST**

**270600-01 REV 02**

ITEM NO.	PART NO	DESCRIPTION	QTY/ASS
1	270601-01	CYLINDER FOOT	1
2	270602-01	CYLINDER FOOT PAD	1
3	271200-01	M6 SET SCREW	2
4	271900-01	M8 CSK HEX	1

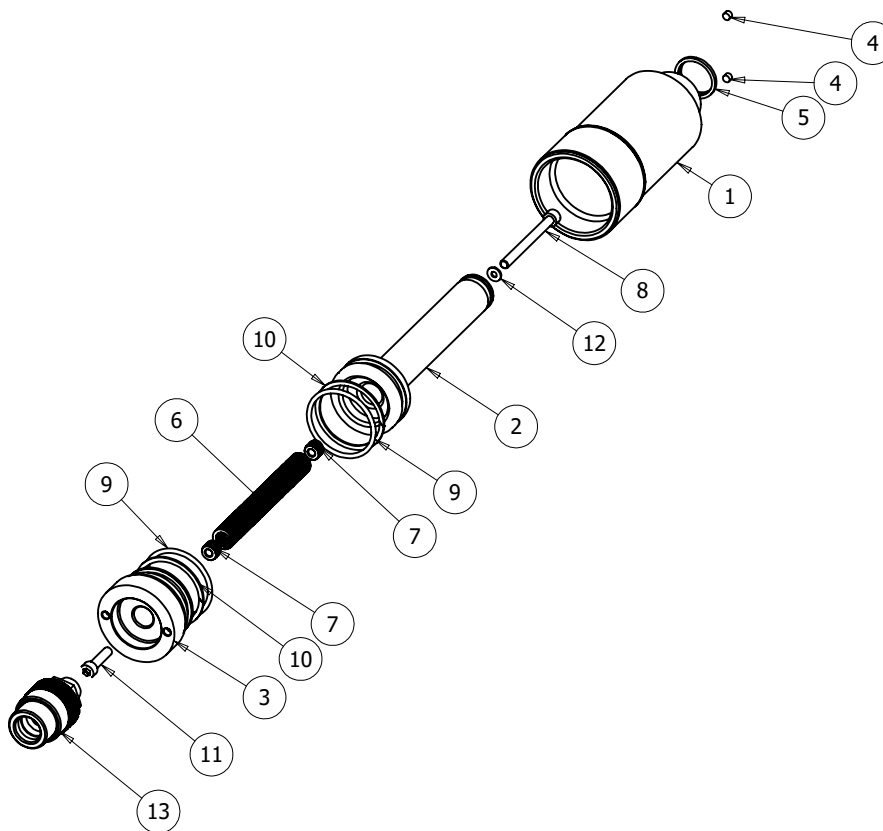




# **TE HYDRAULIC CYLINDER PARTS LIST**

**830300-01 REV 05**

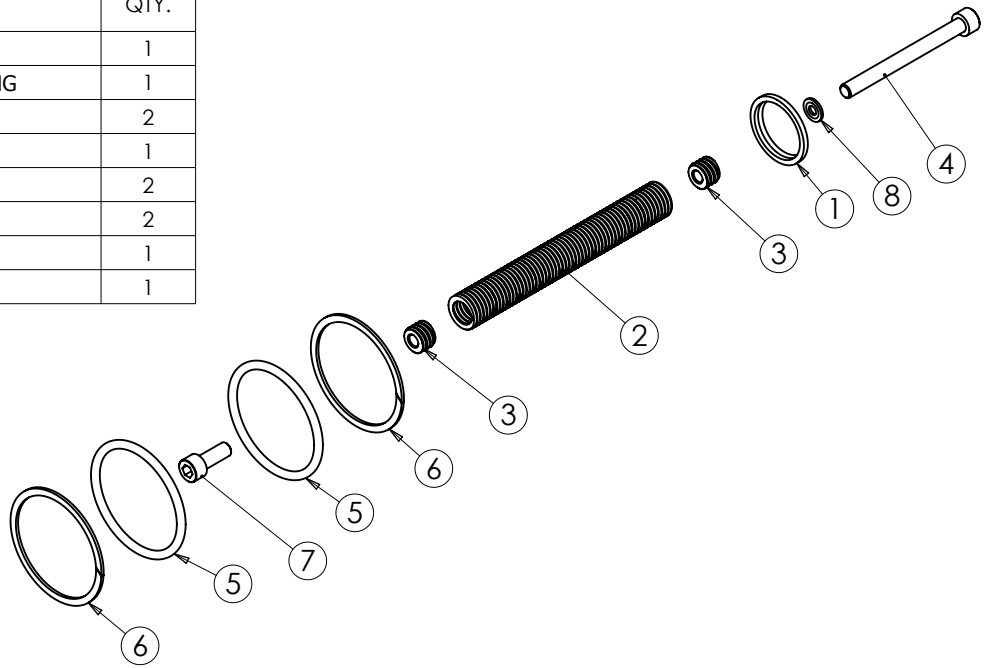
ITEM NO.	PART NO	DESCRIPTION	QTY.
1	830301-01	CYLINDER BODY	1
2	830302-01	PISTON	1
3	830303-01	CYL END CAP	1
4	830310-01	CYL VENT PLUG	2
5	KIT 840110-01	WIPER SEAL	1
6		TENSION DIE SPRING	1
7		SPRING LOCK	2
8		M6 CAPSCREW	1
9		O-RING	2
10		BACK-UP RING	2
11		M6X25 SCKT H. SCREW	1
12		M6 GASKET SEAL	1
13	300901-01	COUPLER	1



# CYLINDER SERVICE KIT

**840110-01 REV.02**

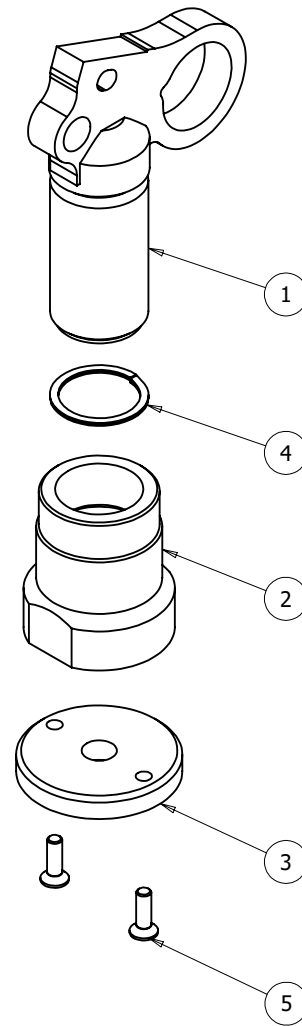
ITEM NO.	DESCRIPTION	QTY.
1	WIPER SEAL	1
2	TENSION DIE SPRING	1
3	SPRING LOCK	2
4	M6 CAPSCREW	1
5	O-RING	2
6	BACK-UP RING	2
7	SCREW	1
8	M6 GASKET SEAL	1



# **ADJUSTMENT LEG ASSEMBLY PARTS LIST**

## **270400-01 REV.02**

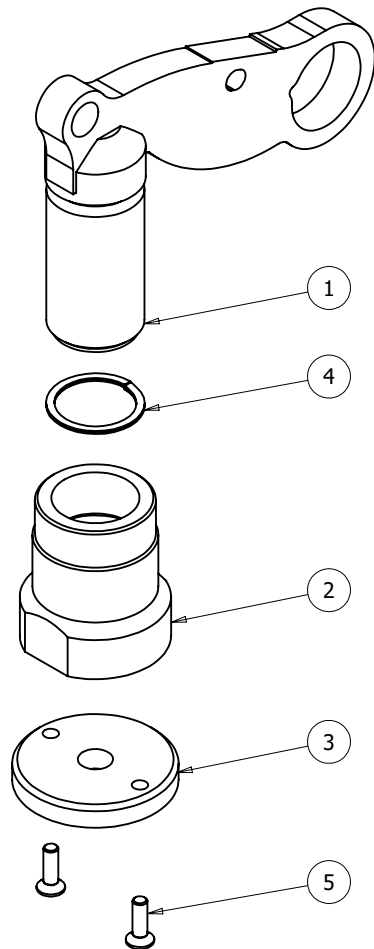
ITEM NO.	PART NO	DESCRIPTION	QTY
1	270401-01	CLEVIS WELDED ASSEMBLY	1
2	270402-01	ADJUSTMENT FOOT	1
3	1213602-01	ADJUSTMENT FOOT PAD	1
4	273200-01	SPIRAL CLIP (XDNS35)	1
5	503703-01	M6 CSK HEX SCREW	2



# **ADJUSTMENT LEG ASSEMBLY PARTS LIST**

## **1690200-01 REV.02**

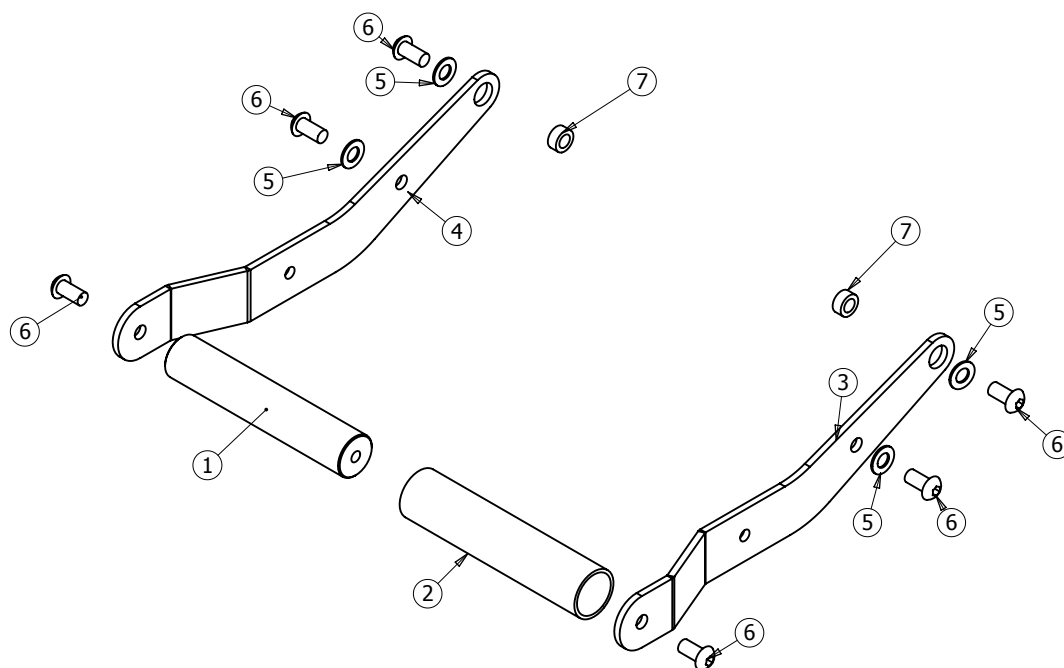
ITEM NO.	PART NO	DESCRIPTION	QTY
1	1690201-09	CLEVIS WELDED ASSEMBLY	1
2	270402-01	ADJUSTMENT FOOT	1
3	1213602-01	ADJUSTMENT FOOT PAD	1
4	273200-01	SPIRAL CLIP (XDNS35)	1
5	503703-01	M6 CSK HEX SCREW	2



# **HANDLE ASSEMBLY PARTS LIST**

## **271300-01 REV.01**

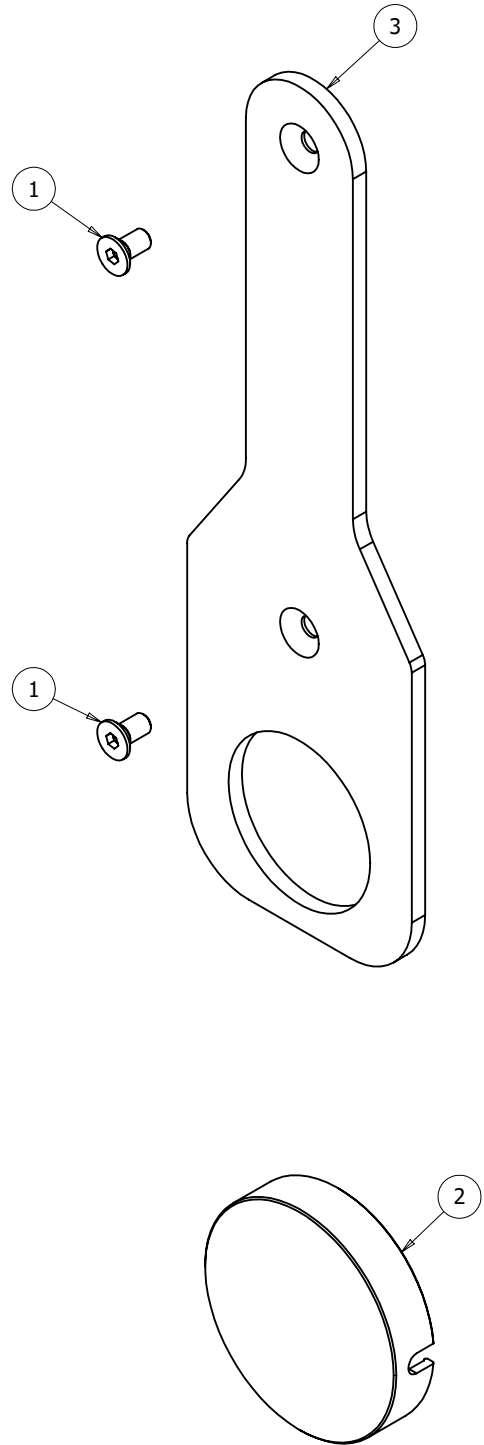
ITEM NO.	PART NO	DESCRIPTION	QTY/ASS
1	501301-01	HANDLE BAR	1
2	201203-01	BLUE HANDLE SLEEVE	1
3	501101-01	HANDLE LEFT	1
4	501201-01	HANDLE RIGHT	1
5	503401-01	WASHER (0.8MM)	6
6	402902-01	SCREW FOR HANDLE	6
7	503501-01	SPACER	



# **PROTECTIVE PAD SERVICE KIT**

**271400-01 REV 02**

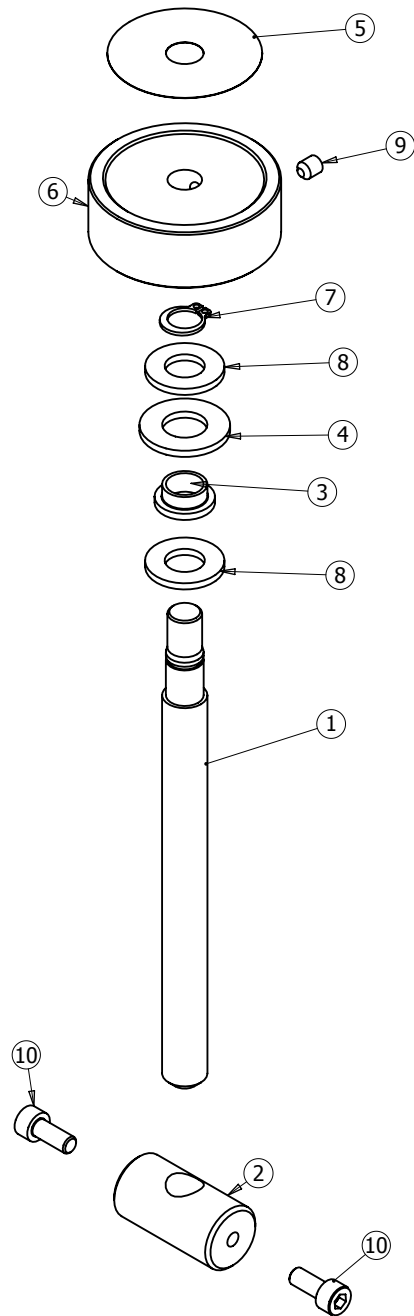
ITEM NO.	PART NO	DESCRIPTION	QTY
1	273400-01	M6 CSK HEX SCREW	2
2	272700-01	FOOT CAP TOWER	1
3	272500-01	PROTECTION PAD FINISHED	1



# **WING ADJUSTMENT SERVICE KIT**

**271500-01 REV.01**

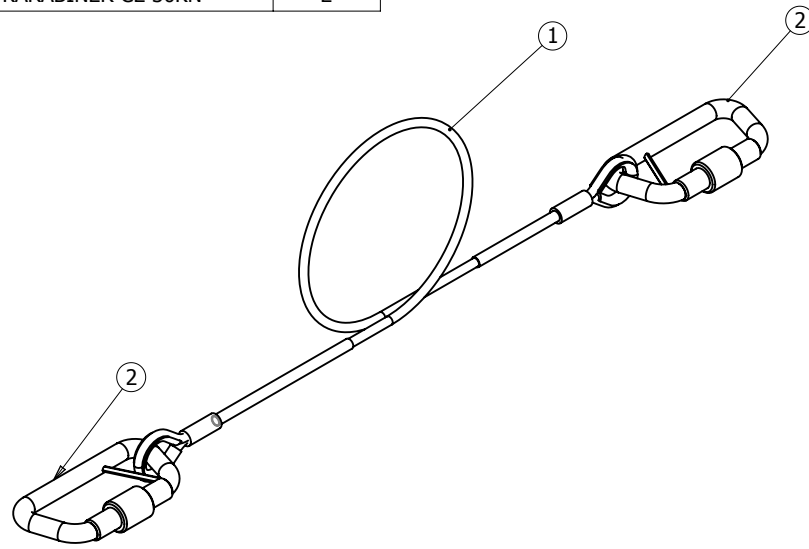
ITEM NO.	DESCRIPTION	QTY/ASS
1	ADJUSTMENT ROD	1
2	ADJUSTER BOSS	1
3	NYLON BUSH	1
4	NYLON WASHER	1
5	WING ADJUST DECAL_TFA15TI	1
6	RELEASE KNOB	1
7	EXTERNAL CIRCLIP	1
8	WASHER 10mm ID	2
9	M5 SCKT SET SCREW	4
10	M5x12mm SCKT HEAD CPSCREW	2



# **SAFETY BOND ASSEMBLY PARTS LIST**

**270800-01 REV.01**

ITEM NO.	PART NO	DESCRIPTION	QTY/ASS
1	270801-01	TFA SAFETY BOND WIRE 5MM	1
2	270802-01	TFA KARABINER CE 30KN	2









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