FA4TM & FA9TE

FLANGE ALIGNMENT TOOLS

Operator Instruction Manual

EQUALIZER™ INTERNATIONAL

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INNOVATION IN ITS MOST FUNCTIONAL FORM

INDEX

1. INTRODUCTION

The Equalizer FA4TM and FA9TE TOOLS are aids for use in normal maintenance and installation procedures, and enable the realignment of misaligned flanges within their respective working capacities. For example, all of the tools can be used to assist in the replacement of ring and other types of flange joint. The use of these instructions will promote safe use, and maximize the service life of the tools. It is recommended that the operator read the relevant sections of this instruction manual for the particular flange alignment tool to be used.

2. SAFETY INFORMATION

The operator MUST read this manual prior to using the tools.

Failure to comply with the following cautions and warnings could cause equipment damage and personal injury; read the manual fully!

Read all the following instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation.

Equalizer International Ltd cannot be responsible for damage or injury resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. Contact Equalizer International Ltd when in doubt as to the safety precautions and applications. To protect your warranty, use only good quality hydraulic oil of the grade 32cSt.

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

In all installations the site safety requirements must be adhered to. ALSO the safety of the operator, and when present, any assisting personnel, is of paramount importance along with the safety of others including, when present, the general public.

These instructions are only to cover the safe operation of THE EQUALIZER FA4TM AND FA9TE FLANGE ALIGNMENT TOOLS, during normal maintenance/installation operations. All other safety aspects must be controlled by the operation supervisor.

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.

IMPORTANT: Operator must be competent in the use of hydraulic equipment. The operator must have read and understood all instructions, safety issues, cautions and warnings before starting to operate the Equalizer equipment.

WARNING: To avoid personal injury and possible equipment damage, make sure all hydraulic components are rated to a safe working pressure of 700 bar (10,000 psi)

WARNING: Do not overload equipment. Overloading causes equipment failure and possible personal injury.
The risk of overloading can be avoided by using the Equalizer Hand Pump, which has its safety valve set to 700 bar by the factory. If alternative pumps are used, ensure they are rated at a safe working pressure of 700 bar (10,000 psi).

CAUTION: Make sure that all system components are protected from external sources of damage, such as excessive heat, flame, moving machine parts, sharp edges and corrosive chemicals.

CAUTION: Avoid sharp bends and kinks that will cause severe back-up pressure in hoses. Bends and kinks lead to premature hose failure. Do not drop heavy objects onto hoses. A sharp impact may cause internal damage to hose wire strands; applying pressure to a damaged hose may cause it to rupture. Do not place heavy weights on the hoses, or allow vehicles to roll over the hoses; crush damage will lead to premature hose failure.

WARNING: Immediately replace worn or damaged parts with genuine Equalizer parts. Equalizer parts are designed to fit properly and withstand rated loads. For repair or maintenance service contact your Equalizer distributor or service centre.

DANGER: To avoid personal injury keep hands and feet away from the tool and workpiece during operation.

WARNING: Always wear suitable clothing and Personal Protective Equipment (PPE).

DANGER: Do not handle pressurised hoses. Escaping oil under pressure can penetrate the skin, causing serious injury. If oil is injected under the skin, seek medical attention immediately.

WARNING: Never pressurize unconnected couplers. Only use hydraulic equipment in a connected system.

IMPORTANT: Do not lift hydraulic equipment by the hoses or couplers. Use the carrying handle or other means of safe transport.

CAUTION: Do not operate the equipment without lubricating all moving parts as in section 5.4, 6.4 & 7.4. Use only high pressure molybdenum disulphide grease.

3. TECHNICAL DATA

	Tool Description	**Aligning Force**
FA4TM	Mechanical Fixed Flange and Rotational Alignment Tool	4.0 T (40kN) from 50 ft/lbs (67.8 Nm) of torque
FA9TE	Hydraulic Fixed Flange and Rotational Alignment Tool	9.0 T (90 kN) from 10,000 psi (700 bar) of hydraulic pressure

4. FLANGE MISALIGNMENT DETERMINATION PROCEDURE

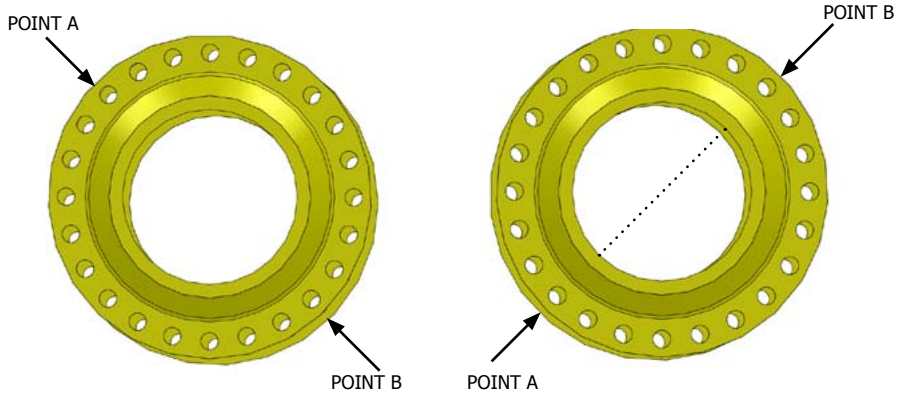
The tool being used must not be attached to a flanged joint prior to the misalignment procedure being carried out.

4.1 LATERAL MISALIGNMENT

1. Loosen and remove every second bolt around the flange , continue with this until misalignment occurs.

   A flanged joint, once broken down, may spring out of alignment at any point, or in any direction around its circumference. Misalignment may not occur until only a few bolts remain.

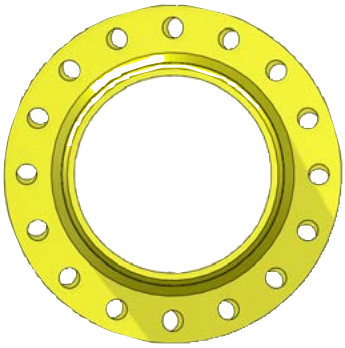
2. At this point the direction of any misalignment should become obvious. The alignment tool being used should be attached at the maximum point of misalignment (point A or B in the examples shown below).



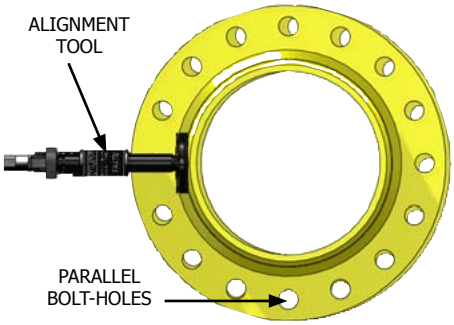
4.2 ROTATIONAL (TWIST) MISALIGNMENT

If the outer circumference of the flanges are in alignment but the operator is unable to fit the bolt into any two corresponding bolt-holes then rotational misalignment may have occured.

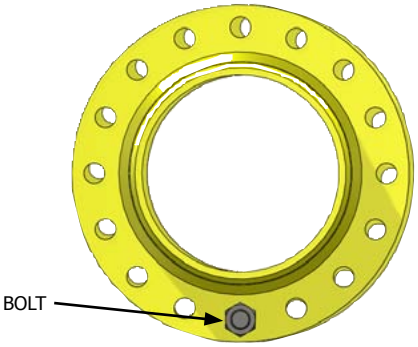
In this case the alignment tool can be attached to the most accessible point as misalignment occurs at all bolt-holes to the same degree.



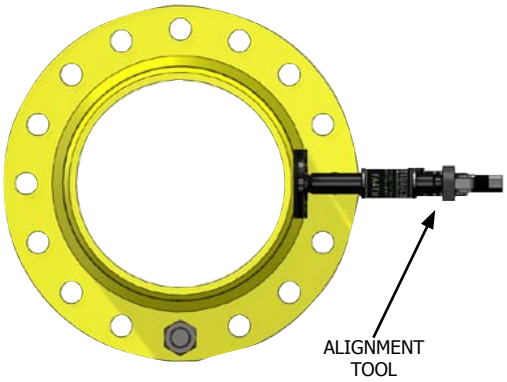
1. Attach the alignment tool at the most accessible/convenient point (as shown in sections) and use it to push the flanges out of alignment until one pair of bolt-holes becomes parallel.



2. Insert the bolt into the aligned bolt-hole and release the alignment tool. The load will transfer onto the bolt.



3. Repeat steps 1 and 2 at other points around the flange until all of the remaining bolt-holes are parallel and the rest of the bolts can be inserted.



5. FA4TM MECHANICAL FIXED FLANGE AND ROTATIONAL ALIGNMENT TOOL

5.1 KIT COMPONENTS

1 x FA4TM Tool
1 x 50 ft/lbs (67.8 Nm) Torque Wrench with 22 mm Socket
1 x Ratchet and Strap
1 x Instruction Manual
1 x Carry-Case

Product Code: FA4TMSTD

5.2 HOW THE FA4TM WORKS

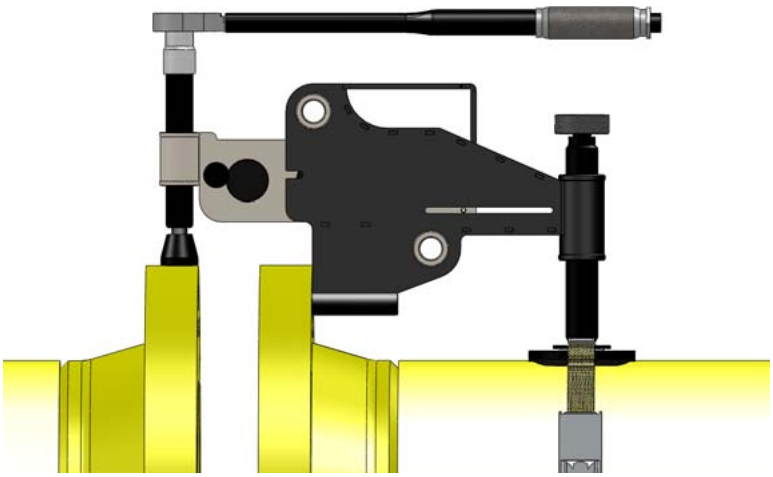
1. The FA4TM is secured to the lower of the two flanges by fully inserting the lift hook into the bolt-hole at the point of greatest misalignment.

2. The drop leg is adjusted down to the pipe while the tool is held level in the bolt-hole

3. The wing retaining screw is loosened to allow the wing to be extended out.

4. The screw bolt is turned clockwise until the friction pad comes into contact with the circumference of the opposite flange.

5. The torque wrench is set to 50 ft/lbs (max), attached to the screw bolt and turned to screw down on the flange, bringing the joint into alignment.



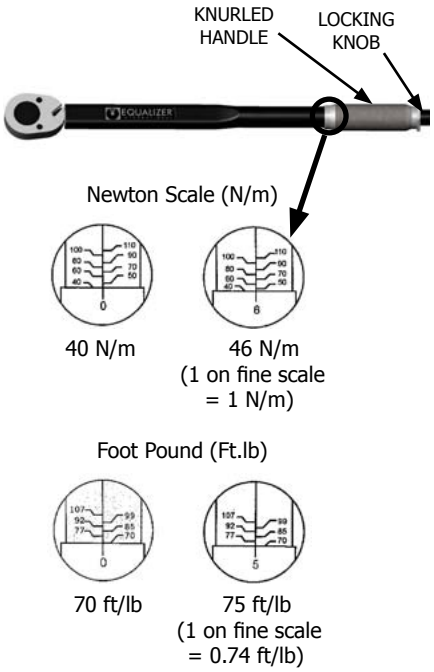
5.3 INSTALLATION AND OPERATION

How to use the torque wrench

Balance the wrench in your left hand and unlock the knurled handle by turning the locking knob anti-clockwise. Set the torque amount by turning the knurled handle - see example 40-46 N/m

1. Turn the handle till 0 on fine scale reach 40 N/m on base scale
2. To set 46 turn handle till fine scale reach 6
3. Lock handle by turning the locking knob clockwise

Install the proper socket and attach to the tool. Pull handle till you feel and/or hear the wrench click. Setting of ft/lb scale is done in the same way as above.

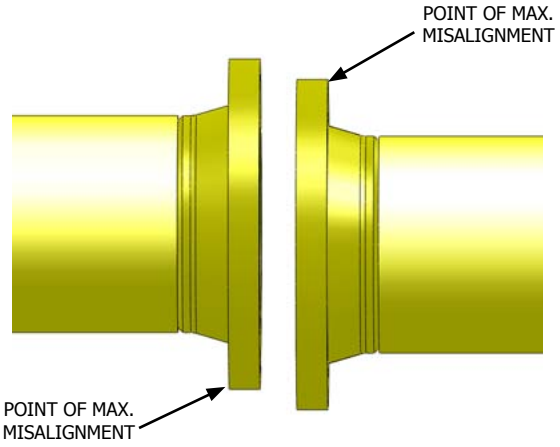


Do not pull after the wrench clicks. Use special care at low torque settings. If the wrench has not been used for some time: operate it several times at low torque to allow internal lubricant to recoat. When not in use set to lowest torque setting. Don't turn handle below lowest torque setting. Your torque wrench is a precision measuring instrument and should be treated as such. Clean only by wiping, do not use any type of cleaner which may affect the special internal lubricant with which this wrench is packed at the factory.

1. Do not attempt to turn the grip while it is locked
2. Do not turn the grip more than one turn below the lowest scale reading or above the highest scale reading

1. Carry out the Flange Misalignment Determination Procedure (see section 4) to determine the points of maximum misalignment.

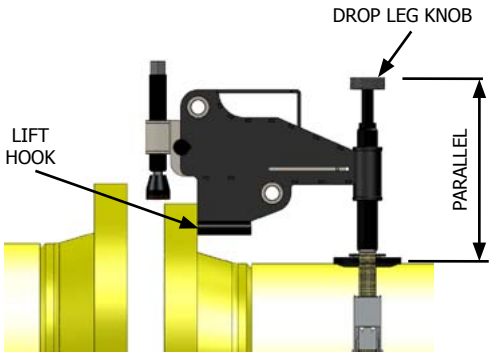
   In this example the points of maximum misalignment are at the top and bottom of the joint.



2. Guide the lift hook into the bolt-hole at the maximum point of misalignment.

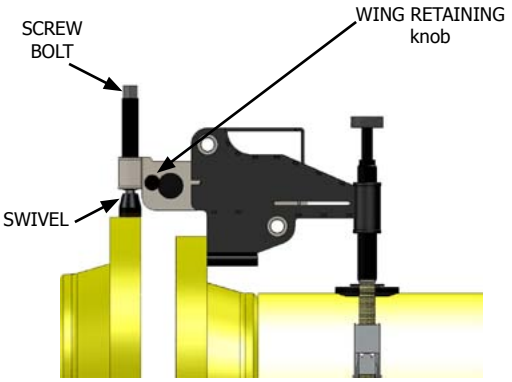
   Adjust the drop leg down onto the pipe by turning the adjusting knob in a clockwise direction. The tool should be held up level within the bolt-hole during adjustment.

   N.B. The tool must be parallel to the pipe at all times.

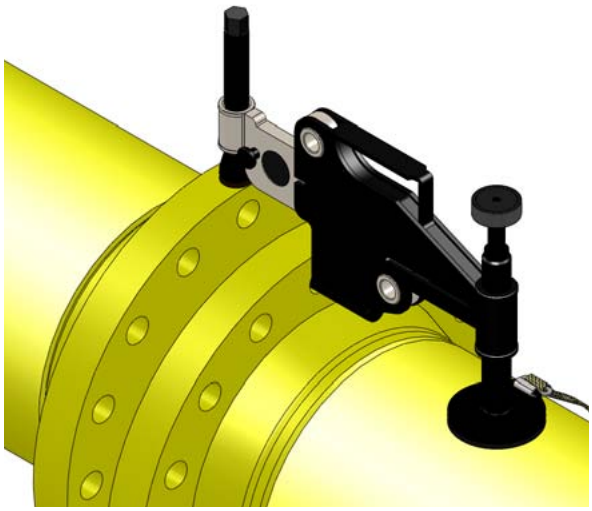


3. Loosen the wing retaining knob and extend the wing over to the opposite flange.

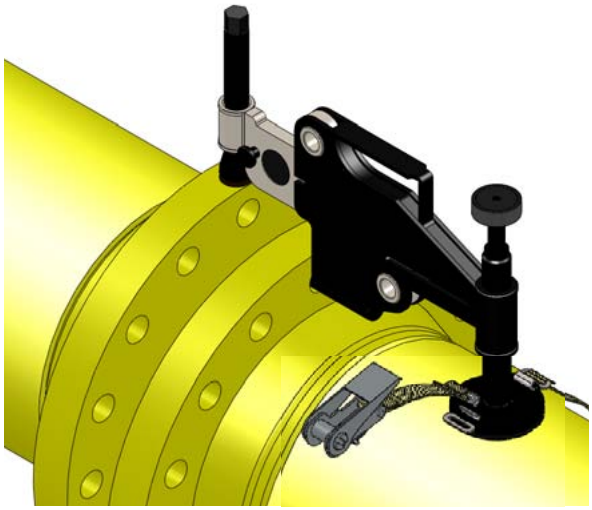
   Rotate the screw bolt onto the surface of the opposite flange. Ensure that the tool is sitting level and that the friction pad on the base of the swivel is in full and even contact with the surface of the opposite flange.



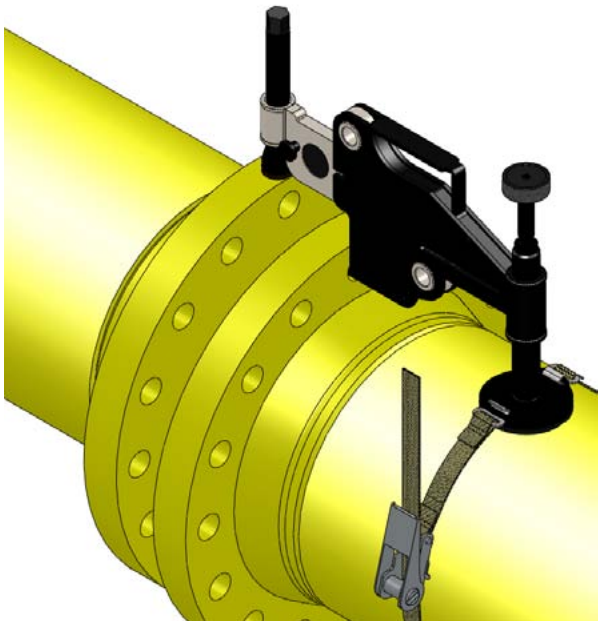
4. Attach the hook of the strap through the buckle on top of the base plate as shown.



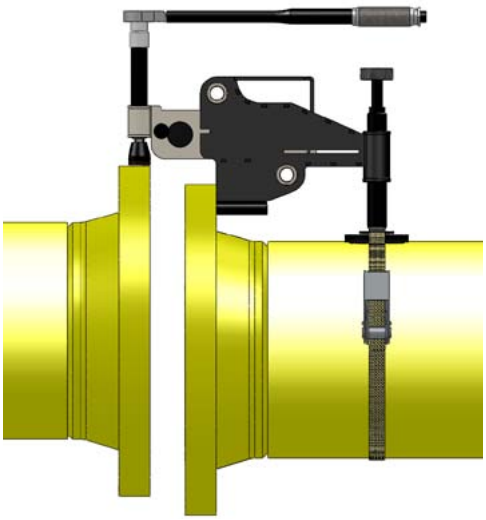
5. Now place the hook of the ratchet mechanism through the opposite side of the buckle as shown.



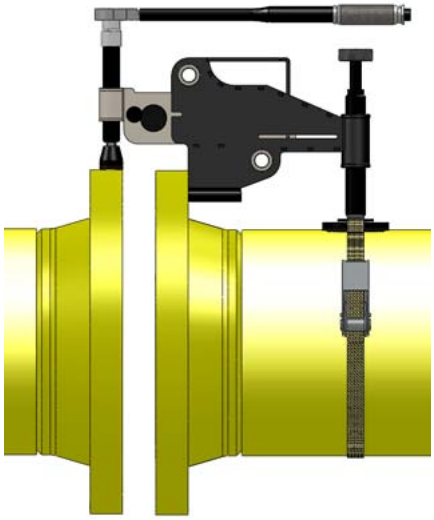
6. Feed the open end of the strap through the ratchet mechanism as shown. Tighten the strap using the ratchet mechanism.



7. The torque wrench should be set at 14 ft/lbs (19Nm) then attached to the screw bolt



8. Tighten the screw bolt in a clockwise direction until the flanges come into alignment; or the torque wrench "clicks"
If the torque wrench has clicked and the flanges are still mis-aligned adjust the torque wrench up to 24.2 ft/lbs (33 Nm) and continue until a maximum torque wrench setting of 50t/lbs (67.8N/m) is reached or the flanges are aligned.



The maximum safe working load is 50 ft/lbs (67.8 N/m)

exceeding 50 ft/lbs will result in damage to the tool

Once in alignment the bolts may be inserted and tightened.

After replacing all of the bolts (apart from the bolt which will go into the bolt-hole in which the FA4TM is located), remove the tool by reversing steps 2 -8.

Insert the last bolt and tighten.

Care should be taken not to drop any of the component parts when removing them from the flange joint. This action will prevent injuries to either the operator's lower limbs, or to passers-by.

5.4 EXAMINATION, MAINTENANCE AND STORAGE

- On return from each job and before allocation against subsequent work the completeness of the Equalizer FA4TM kit must be established and items examined to ensure that they are serviceable
- Any missing or damaged items are to be replaced as soon as possible and prior to the tool being used again
- Store the FA4TM in a cool dry place and ensure all machined surfaces are greased
- Return all items to carry case when not in use
- Ensure rollers, pins and wing remain grit free and that the rollers rotate freely
- Grease all moving parts regularly:

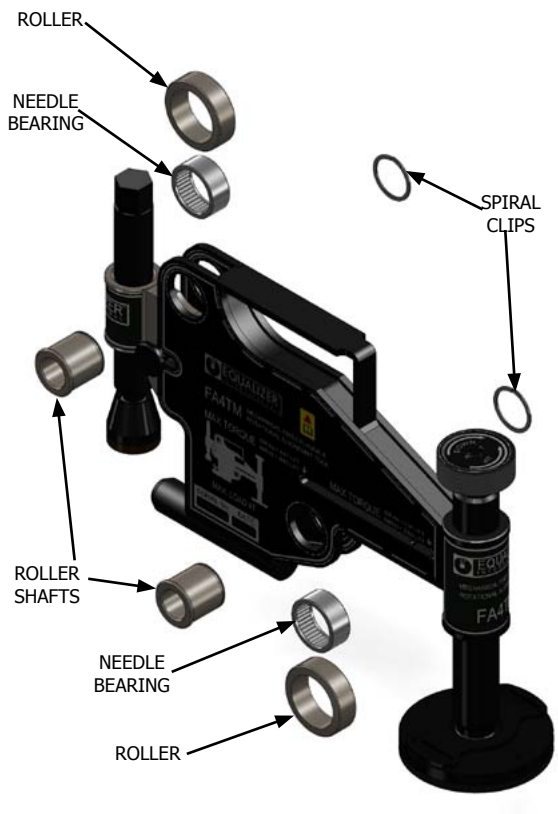
1. Secure the tool upright on a bench.

2. Using a small flat screw driver, lever out the end of the spiral clips and then rotate anti-clockwise and remove.

3. Slide the roller shafts out in order to remove the rollers and bearings for examination.

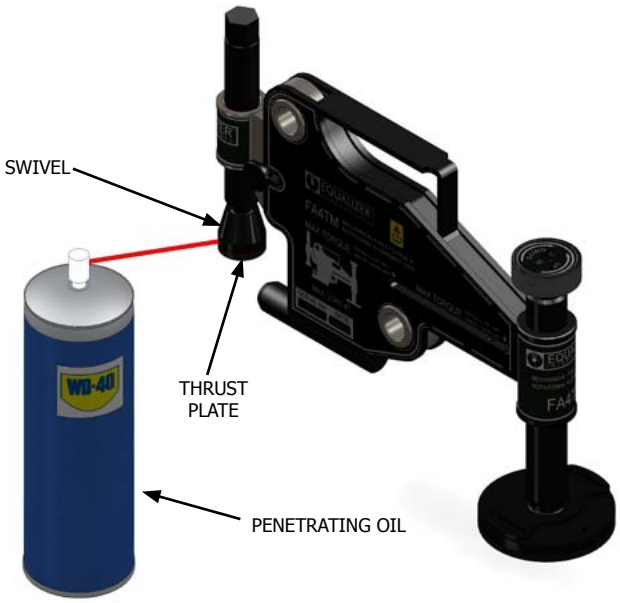
4. Inspect the roller shafts, rollers and bearings for damage. If there is no damage present then they can be cleaned, greased and re-assembled by reversing steps 1-4

   Recommended grease -
   Hi-load bearing grease
   e.g. Rocol Saphire hi-load

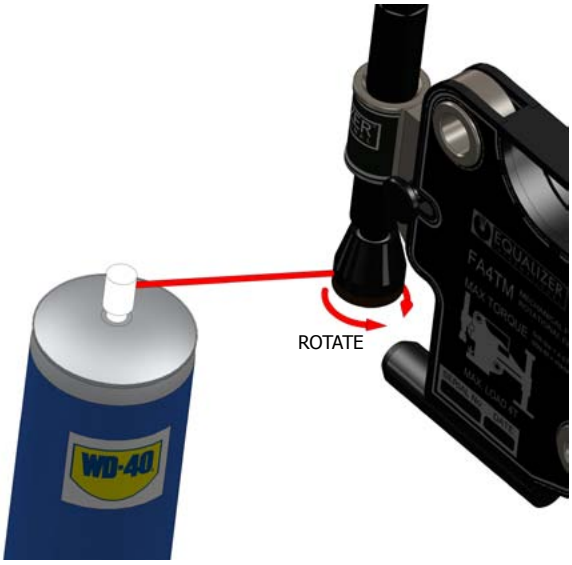


5. It is important that the thrust bearing is free from dirt and corrossion and rotates freely.

6. With the use of a penatrating oil such as WD 40 or similar. Spray the oil between the thrust plate and the swivel as shown opposite.



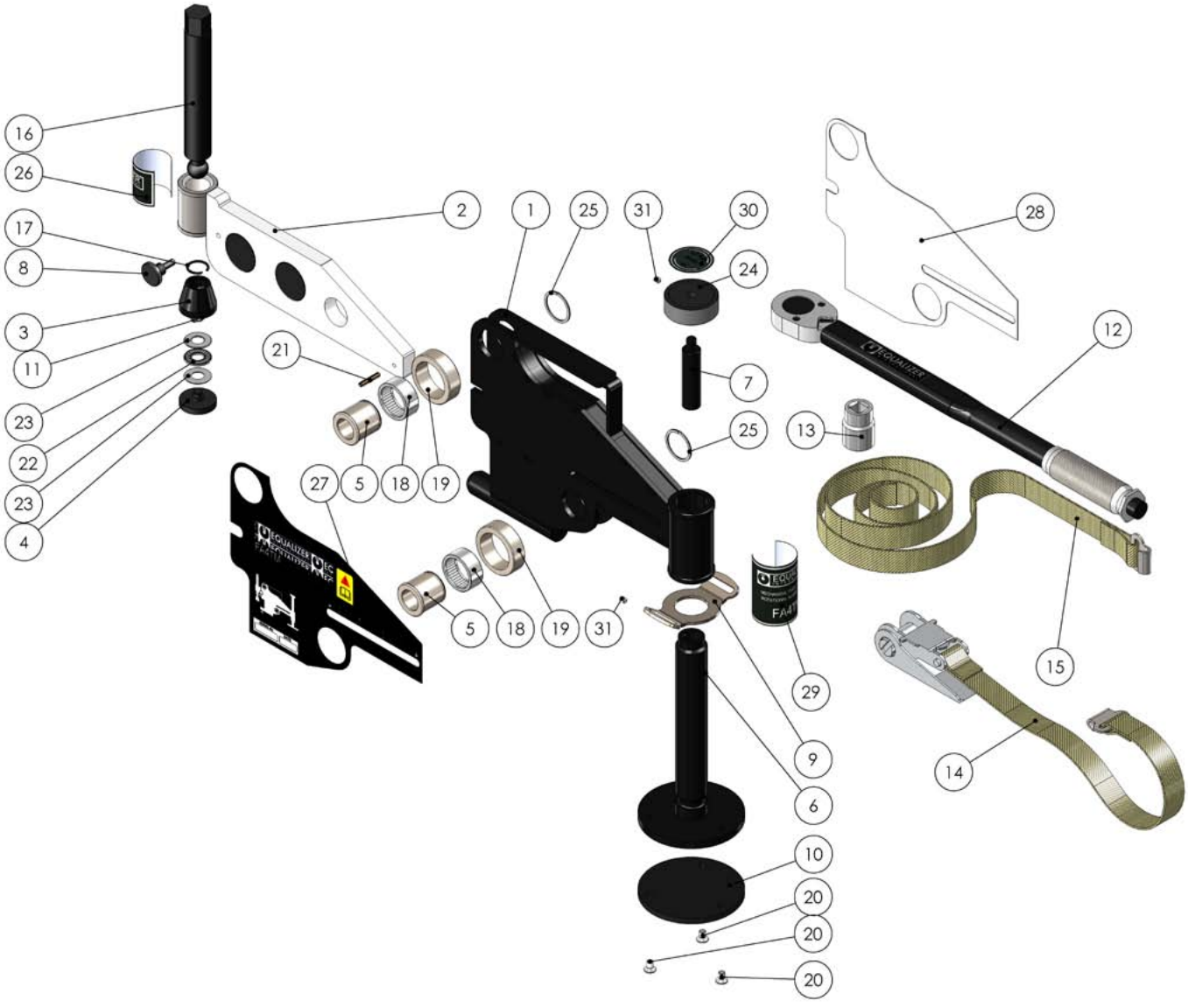
7. Ensure the thrust plate rotates freely before using the tool to align a flange jont.



5.5 PARTS LIST

Item	Part	Description	Qty
01	220100-01	Main Body	01 ea
02	220200-01	Sliding Arm	01 ea
03	220300-01	Swivel	01 ea
04	220400-01	Friction Pad	01 ea
05	220500-01	Roller Shaft	02 ea
06	220600-01	Leg Screw	01 ea
07	220701-01	Leg Extension Rod	01 ea
08	230203-01	M6 Release Knob	01 ea
09	230802-01	Buckle	01 ea
10	230803-01	Round Base Pad	01 ea
11	212000-01	Spring Ring 8 mm	01 ea
12	400203-01	Torque Wrench	01 ea
13	400204-01	22 mm Socket	01 ea
14	400270-01	Ratchet	01 ea
15	400280-01	Ratchet Strap	01 ea
16	400301-01	Screw Bolt	01 ea

Item	Part	Description	Qty
17	400401-01	Spring Clip	01 ea
18	401501-01	Needle Bearing	02 ea
19	401601-01	Outer Roller	02 ea
20	402601-01	Ctrs Screw M6x10	03 ea
21	403201-01	Roller Pin	01 ea
22	404701-01	Thrust Race	01 ea
23	404801-01	Thrust Washer	02 ea
24	713001-01	Release Knob	01 ea
25	901601-01	Spirol Clip	02 ea
26	070004-01	Logo For Wing	01 ea
27	070270-01	Body Plate Sticker L.	01 ea
28	070271-01	Body Plate Sticker R.	01 ea
29	070272-01	Equalizer L. For Boss	01 ea
30	070273-01	Drop Leg Knob Sticker	01 ea
31	300401-01	M5X6 Socket Set Scrw.	02 ea



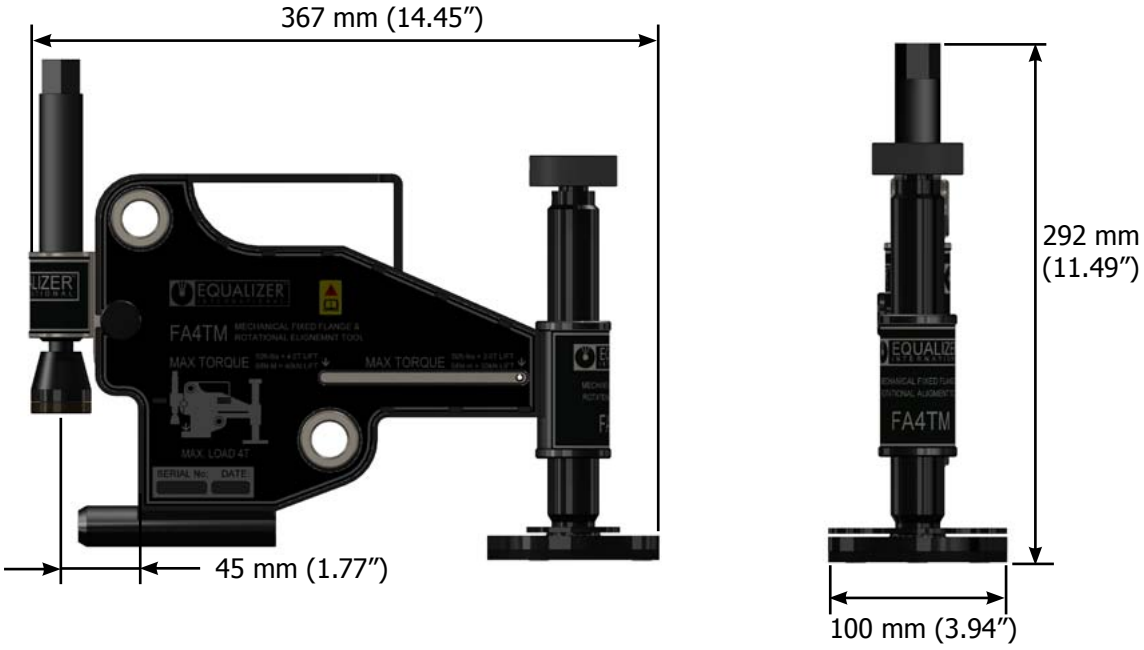
5.6 WEIGHTS AND DIMENSIONS

WEIGHTS

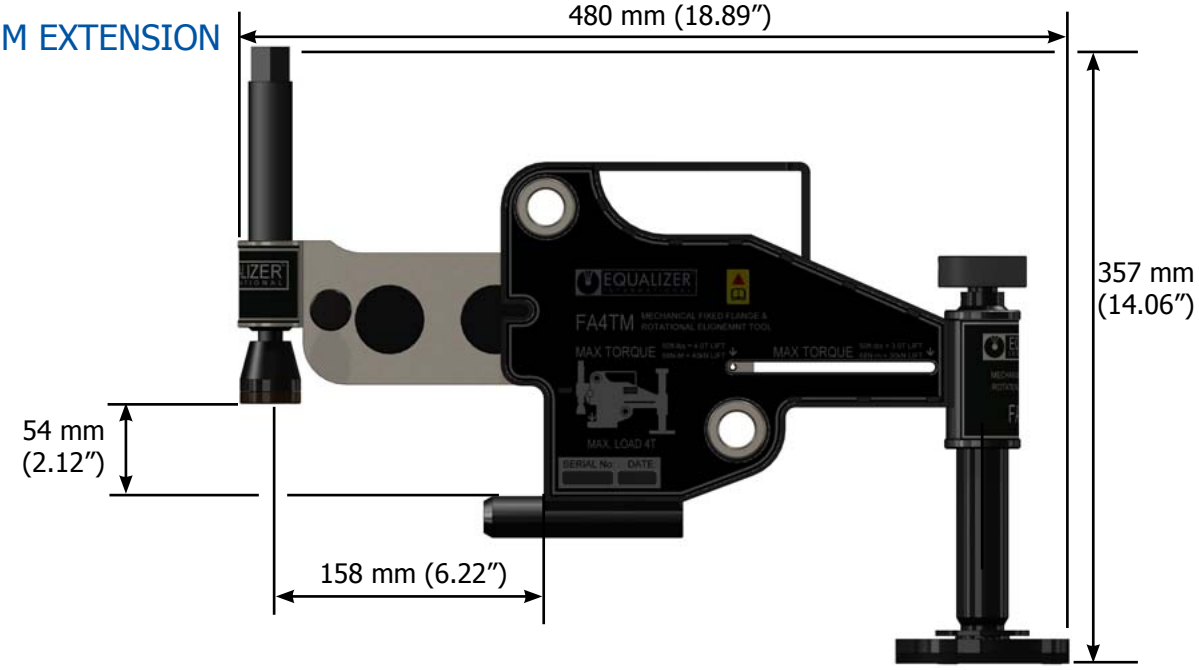
Tool only	= 8.6 kg (18.96 lbs)
Torque wrench/socket	= 0.9 kg (1.98 lbs)
Plastic Carry-Case	= 2.52 kg (5.55 lbs)
GROSS KIT WEIGHT	= 11.7 kg (25.8 lbs)

DIMENSIONS

MINIMUM EXTENSION



MAXIMUM EXTENSION



5.7 TROUBLESHOOTING

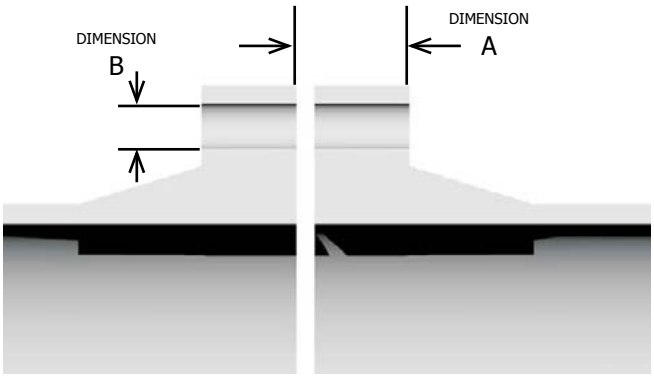
Problem: The thrust plate is sliding along the circumferance of the opposite flange as the tool is aligning the joint	
Grit or Dirt on wing, rollers or bearings	Ensure the rollers are rotating freely and that there is no restrictions to the rollers on the wing surfaces such as grit or dirt
Wing is at full extension	Ensure the wing has sufficient travel left in order to allow the joint to align
Problem: The tool is attached and appears to be functioning properly, but the joint will not align	
There may be something restricting the joint from aligning	Check the area around the joint to establish if there is an obstruction to the joint
The joint may require more than 4.0T (40 kN) force to align	If the joint requires more force than that of the 4.0 T (40kN) tool, then another method of aligning should be adopted
Problem: The thrust plate is twisting on the circumferance of the flange when the screw bolt is tightened	
There may be Grit or Dirt within the swivel / thrust plate	Check that the thrust plate rotates freely. If the thrust plate is not rotating then spray some penetrating liquid into the gap betweeen the swivel and thrust plate in order to loosen it

5.8 APPLICATION DIMENSIONS

MINIMUM AND MAXIMUM FLANGE SIZES

Dimension A: must be between 30 and 133 mm (1.18″ and 5.23″)

Dimension B: bolt-hole diameter must be 24 mm (0.95″) or greater



6. FA9TE HYDRAULIC FLANGE ALIGNMENT TOOL

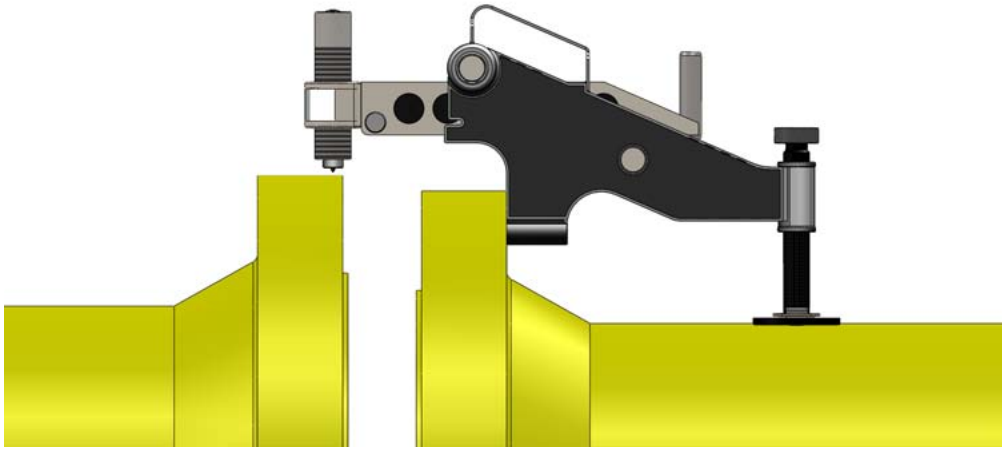
6.1 KIT COMPONENTS

1 x FA9TE Tool c/w 6T Hydraulic Cylinder
1 x 10,000 psi (700 bar) Hydraulic Hose, 2m(78.75")
1 x 10,000 psi (700 bar) HP350S Sealed
Hand Pump with Gauge
1 x Instruction Manual
1 x Carry-Case
1 x Ratchet & Strap

Product Code: FA9TESTD

6.2 HOW THE FA9TE WORKS

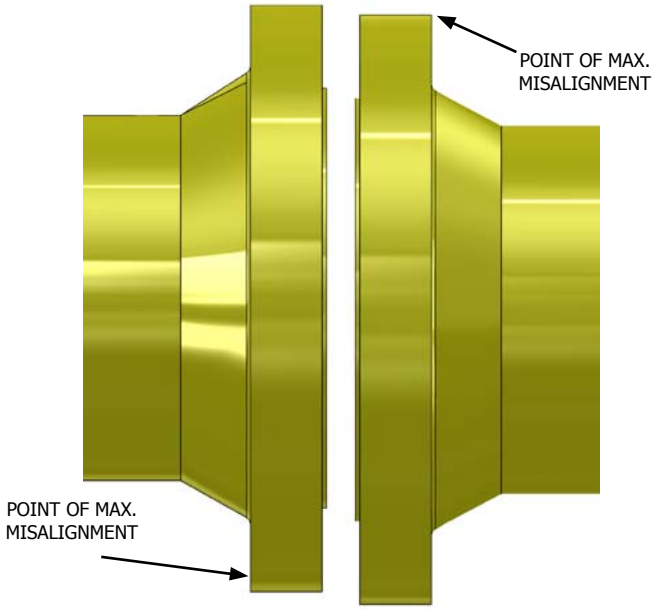
1. The FA9TE is secured to the lower of the two flanges by fully inserting the lift hook into the bolt-hole which is parallel with the bolt-hole at the point of greatest misalignment.
2. The drop leg is adjusted down onto the pipe while the tool is held up level in the bolt hole.
3. The release knob should be loosened to allow the wing to be extended out to the required distance.
4. The hydraulic cylinder should then be adjusted down onto the circumference of the flange opposite by rotating it in a clockwise direction.
5. The hydraulic hose and pump are attached to the cylinder and the hand pump is primed, bringing the joint into alignment.



6.3 INSTALLATION AND OPERATION

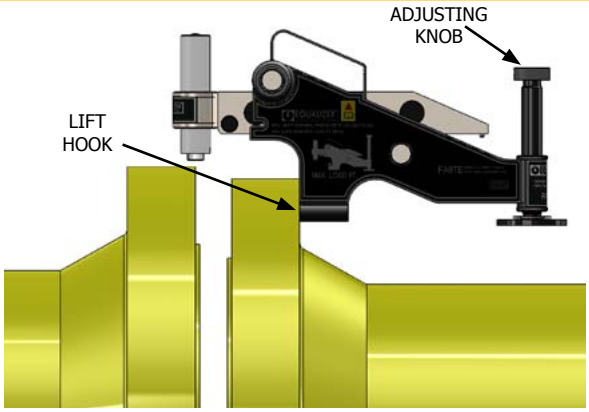
1. Carry out the Flange Misalignment Determination Procedure (see section 4) to determine the points of maximum misalignment.

   In this example the points of maximum misalignment are at the top and bottom of the joint.



2. Guide the lift hook into the bolt-hole at the maximum point of misalignment.

   Adjust the drop leg onto the pipe (using the adjusting knob) while holding the lift hook up level with the bolt-hole.

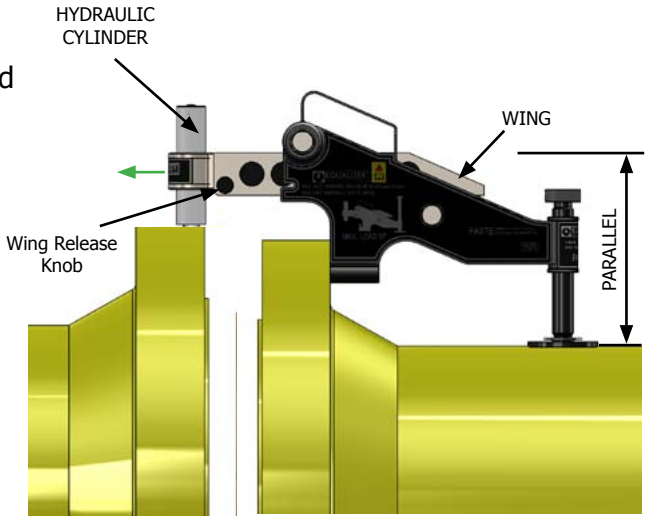


3. Loosen the wing release knob and extend the wing out to the required distance.

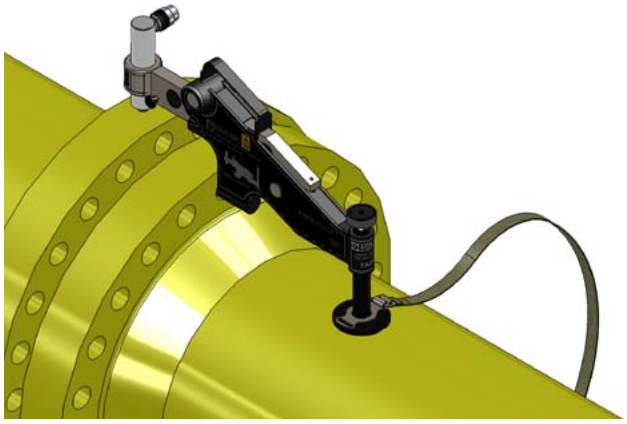
   Rotate the hydraulic cylinder down until the base of the cylinder locates onto the surface of the opposite flange.

   Ensure that the tool is sitting level and that the cylinder is in full and even contact with the surface of the opposite flange.

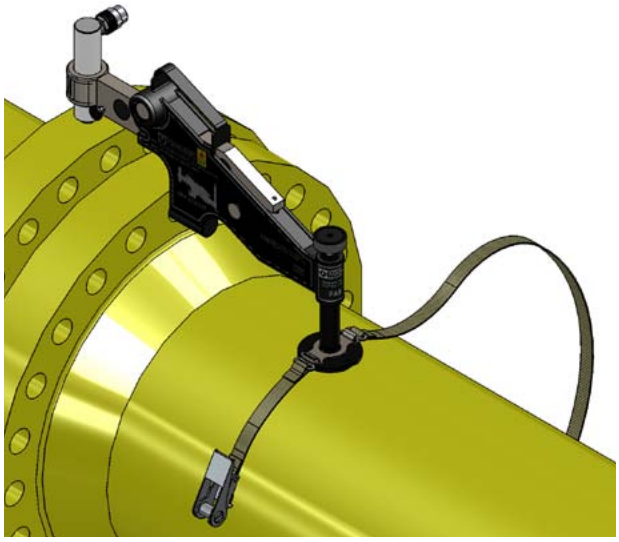
   N.B. Ensure tool is parallel to pipe.



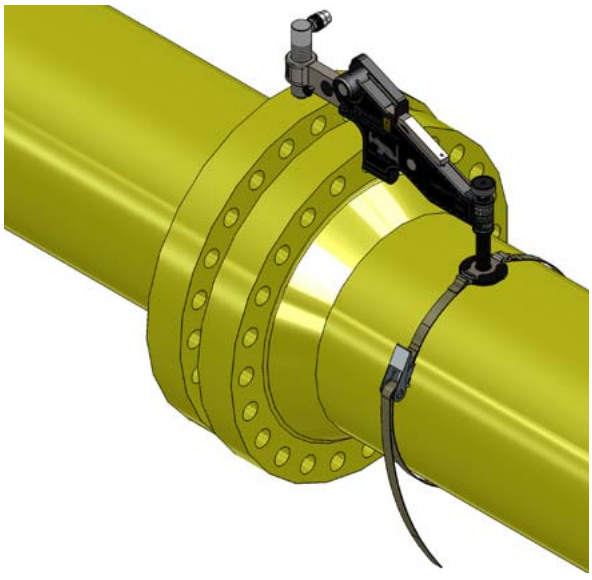
4. Attach the hook on the strap through the base plate as shown.



5. Now place the hook of the ratchet mechanism through the base on the opposite side as shown.

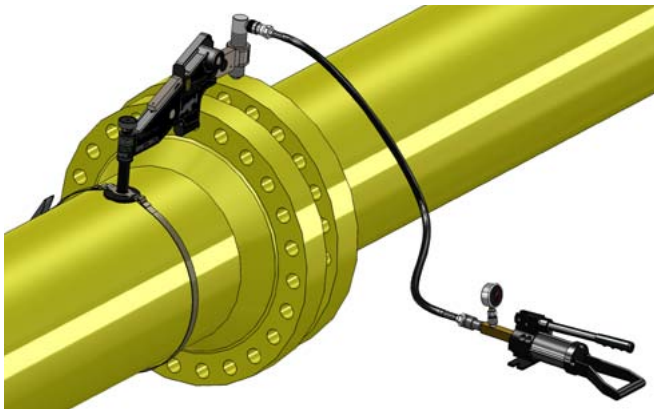


6. Feed the open end of the strap through the ratchet mechanism as shown. Tighten the strap using the ratchet mechanism.



7. Connect the hydraulic pump to the hydraulic hose, and the hose to the hydraulic adjusting cylinder.

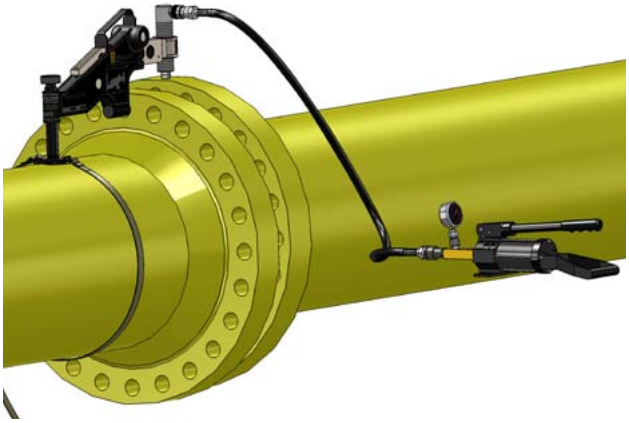
Prime the pump until the joint comes into alignment.



8. Once in alignment the bolts may be inserted and tightened.

After replacing all of the bolts (apart from the bolt which will go into the bolt-hole in which the FA9TE is located), remove the tool by reversing steps 2 - 4.

Insert the last bolt and tighten.



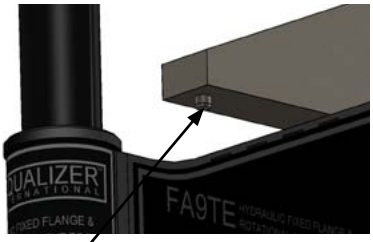
Care should be taken not to drop any of the component parts when removing them from the flange joint. This action will prevent injuries to either the operator's lower limbs, or to passers-by.

6.4 EXAMINATION, MAINTENANCE AND STORAGE

- On return from each job and before allocation against subsequent work the completeness of the Equalizer FA9TE kit must be established and items examined to ensure that they are serviceable
- Any missing or damaged items are to be replaced as soon as possible and prior to the tool being used again
- Store the FA9TE tool in a cool dry place and ensure all machined surfaces are greased
- Return all items to carry case when not in use
- Ensure rollers, pins and wing remain grit free and that the rollers rotate freely
- Grease all moving parts regularly:

1. Place the tool on a work bench and secure it in an upright position.

2. Remove the grub screw on the rear underside of the wing as shown.



Grub Screw

3. The wing can now be removed from the main body by sliding it forward.

4. Remove the circlip using a circlip pliers (not illustrated)

5. Remove the shaft and two bearings.

Inspect the bearing housing, shaft, and needle bearings for any sign of damage, dirt or grit. Clean then smear a small amount of grease onto the shaft and into the needle bearings.

Recomended grease - Rocol or Saphire Hi-Load.

6. Remove the spirol retaining clips from the lower shaft and slide the shaft out from the main body.

The roller and needle bearing can be removed through the upper section of the tool as shown.

Inspect the roller, shaft and needle bearings for any sign of damage, dirt or grit. Clean and then smear a small amount of grease onto the shaft and into the needle bearings.

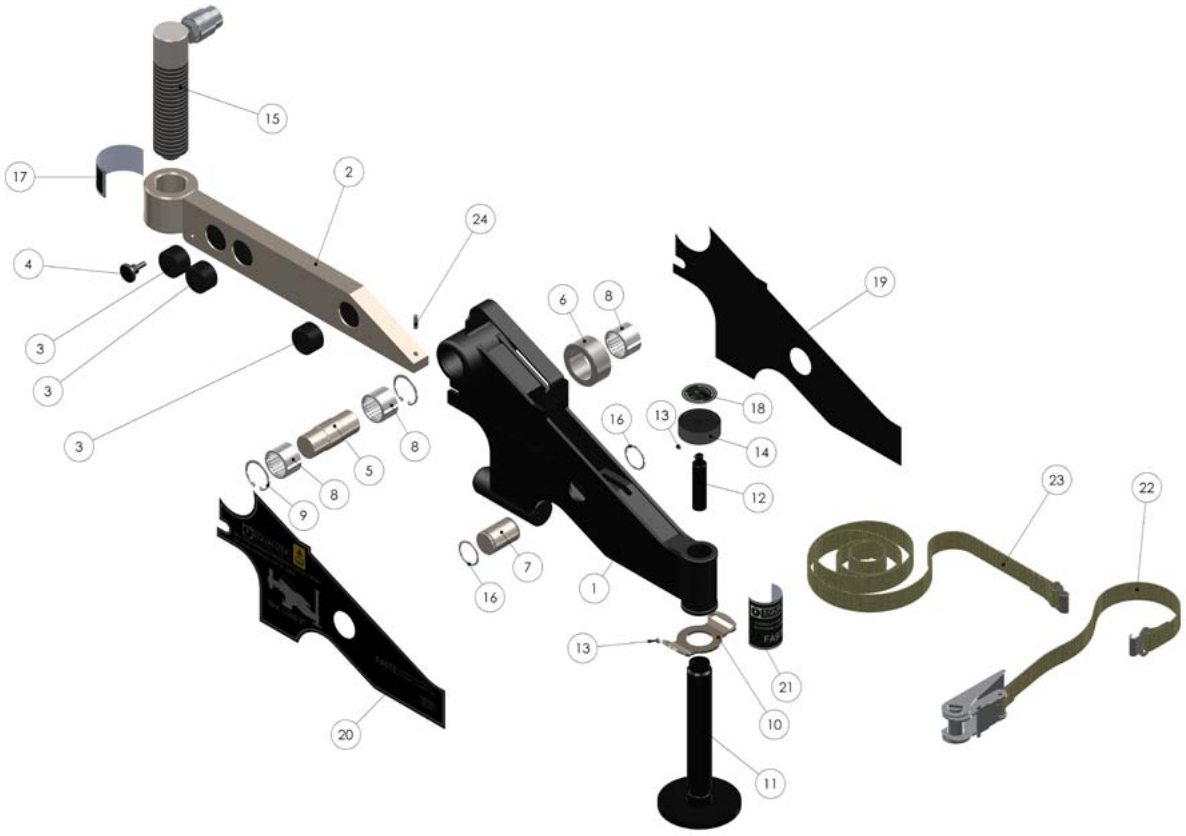
Recommended grease -
Rocol Sapphire Hi-Load
or equivalent Hi-Load Bearing grease

7. Re-assemble by reversing steps 2-6.

6.5 PARTS LISTS

Item	Part	Description	Qty
01	230100-01	Main Body	01 ea
02	230200-01	Wing Arm	01 ea
03	230202-01	Plastic Insert	03 ea
04	230203-01	M6 Release Knob	03 ea
05	230300-01	Front Roller Pin	01 ea
06	230400-01	Rear Roller	01 ea
07	230500-01	Rear Roller Pin	01 ea
08	230600-01	Needle Bearing	03 ea
09	230700-01	Circlip O/D 40	01 ea
10	230802-01	Buckle	01 ea
11	220600-01	Leg Screw	01 ea
12	220700-01	Leg Screw Ext.	01 ea
13	300401-01	M5x6 Set Screw	01 ea
14	713001-01	Release Valve	01 ea
15	903101-01	6T H. Cylinder	01 ea

Item	Part	Description	Qty
16	901601-01	Spirol Clip	01 ea
17	070233-01	Logo For Wing	02 ea
18	070273-01	Drop L. Knob Sticker	01 ea
19	070276-01	Body Plate Sticker L.	01 ea
20	070277-01	Body Plate Sticker R.	01 ea
21	070278-01	Eq. Logo For Boss	01 ea
22	400270-01	Ratchet	01 ea
23	400280-01	Ratchet Strap	01 ea
24	641201-01	Dowel Pin 6x18	01 ea



HP350S HAND PUMP

ITEM	PART No.	DESCRIPTION	KIT QUANTITY	PUMP QUANTITY
01	710101-01	**PUMP HOUSING**		01
	715100-01	**SERVICE KIT A:**		
02		- OIL FILTER	01	01
03		- O-RING	01	01
04		- RESERVOIR BLADDER	01	01
05		- REFILLING PLUG	01	01
06	710601-01	**RESERVOIR**		01
	725200-01	**SERVICE KIT B:**		
07		- TAIL BASE	01	01
08		- SCREW	04	04
09		- SPRING WASHER	04	04
10		- NUT	04	04
	715300-01	**SERVICE KIT C:**		
11		- O-RING	01	01
12		- BACK-UP RING	01	01
13		- PUMP PISTON	01	01
14		- SNAP RING	01	01
15		- O-RING	01	01
16		- BACK-UP RING	01	01
17		- PUMP PISTON	01	01
	715400-01	**SERVICE KIT D:**		
18		- HANDLE	01	01
19		- YOKE	01	01
20		- PISTON PIN	01	01
21		- YOKE PIN	01	01
22		- RETAINING RING	01	01
23		- HANDLE GRIP	01	01
24		- SCREW	01	01
	715500-01	**SERVICE KIT E:**		
25		- YOKE BASE	01	01
26		- SPRING PIN	01	01
	715600-01	**SERVICE KIT F:**		
27		- RELEASE VALVE SCREW	01	01
28		- WASHER	01	01
29		- SEAL	01	01
30		- SCREW	01	01
31		- RELEASE KNOB	01	01
32		- COUPLERS	01	01
33		- CHECK BALL	01	01
	715700-01	**SERVICE KIT G:**		
34		- SPRING	02	02
35		- STEEL BALL	02	02
36		- OUTLET BALL SPRING	02	02
37		- COPPER WASHER	02	02
38		- VALVE COVER SCREW	02	02
39		- STEEL BALL	02	02

ITEM	PART No.	DESCRIPTION	KIT QUANTITY	PUMP QUANTITY
	715800-01	**SERVICE KIT H:**		
40		- STEEL BALL	01	01
41		- SPRING END CAP	01	01
42		- L.P. SPRING	01	01
43		- O-RING	02	02
44		- OVERLOAD COVER SCREW	01	01
45		- CAP	02	02
46		- OVERLOAD COVER SCREW	01	01
47		- CONE SEAT	01	01
48		- CONE	01	01
49		- LONG SEPARATOR SPRING	01	01
	715900-01	**SERVICE KIT I:**		
50		- BASE PLATE	01	01
51		- SCREW	02	02
	716100-01	**SERVICE KIT K:**		
52		- SCREW	04	03
53		- SCREW	01	01
24		- SCREW	01	01
33		- CHECK BALL	04	03
	716200-01	**SERVICE KIT L:**		
54		- GAUGE COUPLER MALE	01	01
55		- GAUGE	01	01
	716300-01	**SERVICE KIT M:**		
56		- GAUGE COUPLER FEMALE	01	01
57		- COUPLER	01	01
58		- GAUGE PORT ADAPTOR	01	01

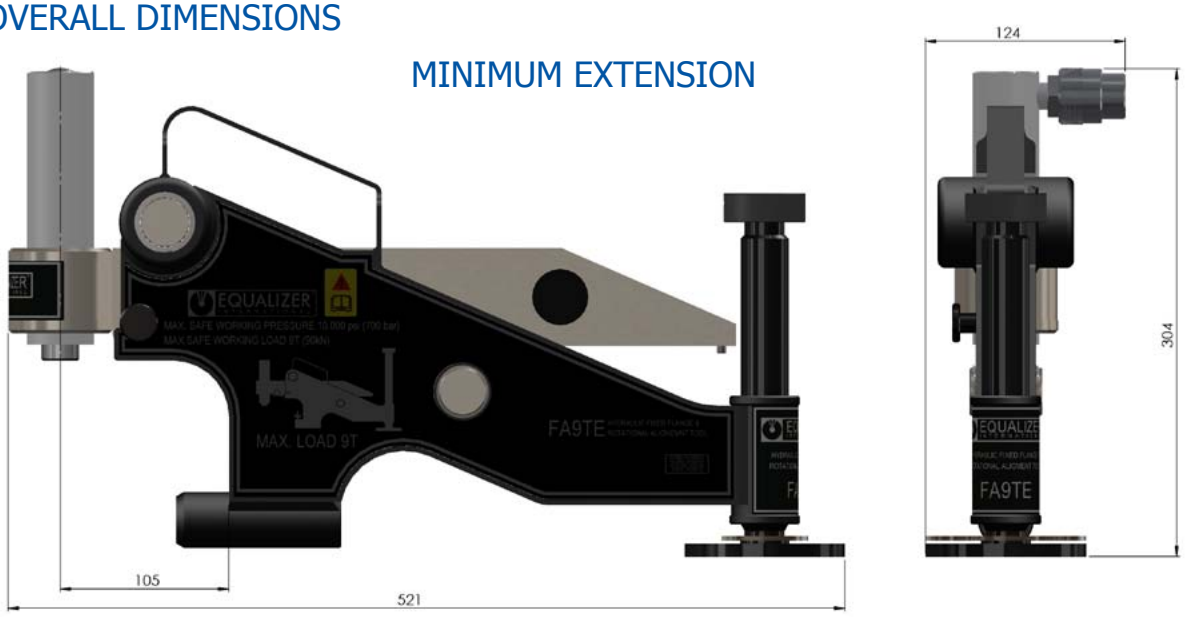
6.6 WEIGHTS AND DIMENSIONS

WEIGHTS

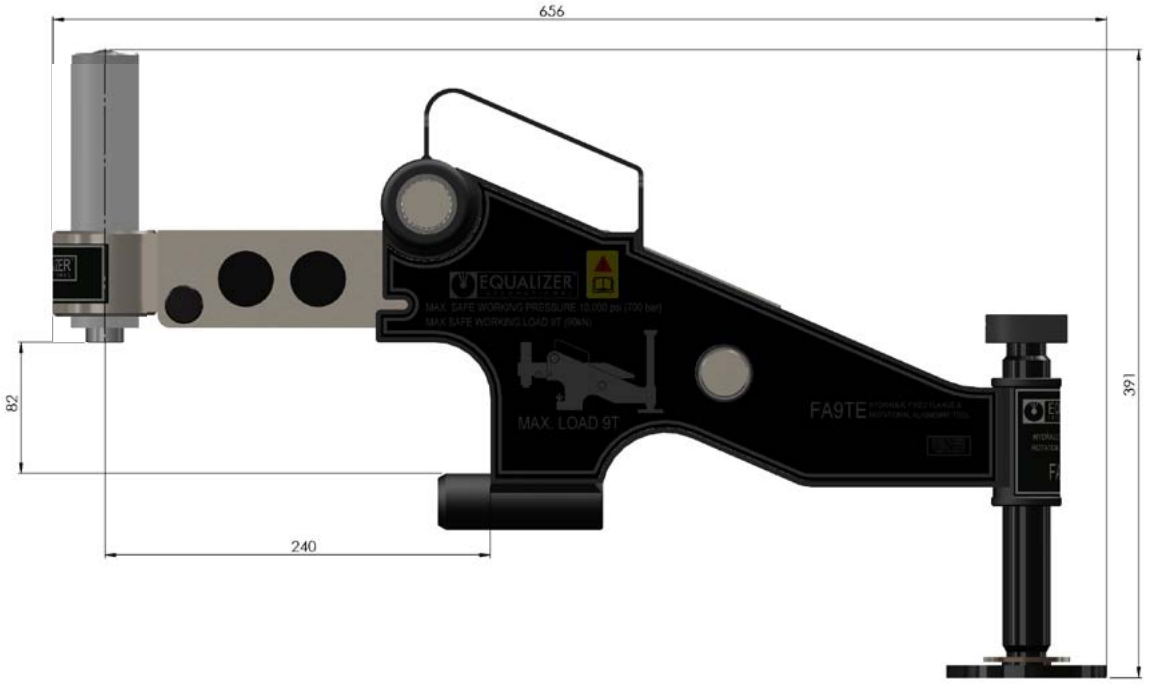
Tool with Hydraulic Cylinder	= 15.5 kg (34.1 lbs)
HP350S Hand Pump	= 4.5 kg (9.9 lbs)
Hydralic Hose	= 1.0 kg (2.2 lbs)
Plastic Carry-Case	= 7.5 kg (16.5 lbs)
GROSS KIT WEIGHT	= 28.5 kg (62.8 lbs)

OVERALL DIMENSIONS

MINIMUM EXTENSION



MAXIMUM EXTENSION



6.7 TROUBLESHOOTING

Problem: The tool is advancing but does not reach full pressure

➥ Air could be present in the hydraulic system

➡ Use the airlock removal procedure as follows:

1. Connect the hand pump to the tool with the hydraulic hose
2. Close the release valve on the pump, and prime the pump until the hydraulic cylinder is fully extended and a small pressure is achieved
3. With the hand pump held above the tool and the tool in an upright position, open the release valve causing any air that is within the system to be forced up through the pump and vented into the oil reservoir
4. Repeat steps 1 - 3 three or four times to ensure that all air is removed from the system and the tool will reach full working pressure
5. 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
6. Remove the four nuts holding the main handle and lift off
7. 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 will spill out.
8. Fill the reservoir to the top with a good quality hydraulic oil of the grade 32 cSt
9. Reinsert the refilling plug, wipe away any oil, and reassemble by reversing the disassembly process

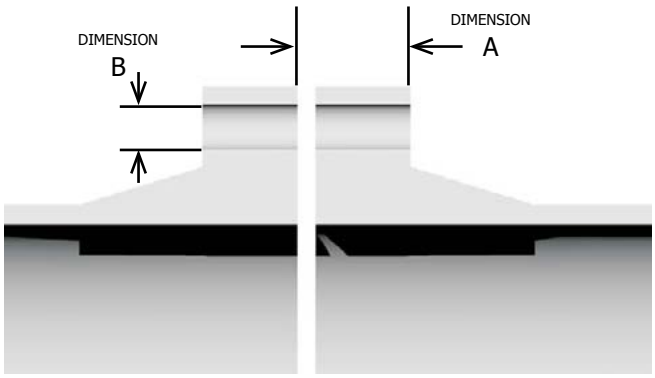
	Problem: The friction pad is sliding in the circumference of the opposite flange as the tool is aligning the joint		
➥	Grit or dirt on wing, rollers or bearings	➥	Ensure the rollers are rotating freely and that there is no restriction to the rollers on the wing surfaces such as dirt or grit
➥	Wing is at full extension	➥	Check that the wing is not at full extension when aligning the joint. Ensure that there is enough extension left to allow the tool to expand as the joint is aligned.
	Problem: The tool is attached and appears to be functioning properly, but the joint will not align		
➥	There may be something restricting the joint at a point close to the flanges	➥	Check the area around the joint to establish if there is an obstruction to the joint
➥	The joint may require more than 9.0 T (90 kN) force to align	➥	If the joint requires more force than that of the 9.0 T (90 kN) tool, then another method of aligning the joint should be adopted

6.8 RANGE OF APPLICATION

MINIMUM AND MAXIMUM FLANGE SIZES

Dimension A: must be between 93 and 228 mm (3.75″ and 9″)

Dimension B: bolt-hole diameter must be 31.5 mm (1.25″) or greater



7.1 BS10 FLANGE RANGE OF APPLICATION

CLASS A

NPS	3 1/2"	4"	5"	6"	7"	8"	9"	10"	12"	13"	14"	15"	16"	17"	18"	19"	20"	21"	22"	23"	24"	26"	27"	29"	30"	33"	35"	36"	39"	42"	45"	48"	54"	60"	66"	72"
TOOL	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	Not suitable	Not suitable	FA1TM	FA1TM	Not suitable	FA1TM	Not suitable	FA4TM	FA4TM	Not suitable	Not suitable	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM

CLASS D

NPS	4"	5"	6"	7"	8"	9"	10"	12"	13"	14"	15"	16"	17"	18"	19"	20"	21"	22"	23"	24"	29"	30"	33"	35"	36"	39"	42"	45"	48"	54"	60"	66"	72"	78"	84"	96"	108"	120"
TOOL	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE

CLASS E

NPS	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	7"	8"	9"	10"	12"	13"	14"	15"	16"	17"	18"	19"	20"	21"	22"	23"	24"	27"	29"	30"	33"	35"	36"	39"	42"	45"	48"
TOOL	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE

CLASS F

NPS	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	7"	8"	9"	10"	12"	13"	14"	15"	16"	17"	18"	19"	20"	21"	22"	23"	24"	27"	29"	30"	33"	35"	36"	39"	42"	45"	48"
TOOL			FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	FA9TE

CLASS H

NPS	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	7"	8"	9"	10"	12"	13"	14"	15"	16"	17"	18"	19"	20"	21"	22"	23"	24"
TOOL	Not suitable	Not suitable	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM

CLASS J

NPS	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	7"	8"	9"	10"	12"	13"	14"	15"	16"	17"	18"	19"	20"	21"	22"	23"	24"
TOOL	Not suitable	Not suitable	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE

CLASS K

NPS	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	7"	8"	9"	10"	12"	13"	14"	15"	16"	17"	18"	19"	20"
TOOL	Not suitable	Not suitable	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE

CLASS R

NPS	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	7"	8"	9"	10"	12"	13"	14"	15"	16"	17"	18"	19"	20"
TOOL	Not suitable	Not suitable	FA1TM	FA1TM	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE

CLASS S

NPS	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	4 1/2"	5"	6"	7"	8"	9"	10"	11"	12"	13"	14"	15"	16"
TOOL	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE

CLASS T

NPS	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	4 1/2"	5"	6"	7"	8"	9"	10"	11"	12"	13"
TOOL	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE

Colour	Meaning
Blue	SUITABLE FOR FA1TM TOOL
Yellow	SUITABLE FOR FA4TM TOOL
Green	SUITABLE FOR FA19TE TOOL
Grey	NOT SUITABLE FOR TOOLS

API6BX WELD NECK FLANGE RANGE OF APPLICATION

CLASS		1 13-16"	2 1-16"	2 9-16"	3 1-8"	4 1-16"	5 1-8"	7 1-16"	9"	11"	13 5-8"	16 3-4"
CLASS 2K	TOOL	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	FA9TE	FA9TE
CLASS 3K	TOOL	FA1TM	FA1TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	Not suitable	Not suitable	Not suitable	Not suitable
CLASS 5K	TOOL	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable

(NPS row repeated for each class: 1 13-16", 2 1-16", 2 9-16", 3 1-8", 4 1-16", 5 1-8", 7 1-16", 9", 11", 13 5-8", 16 3-4")

API6B WELD NECK FLANGE RANGE OF APPLICATION

CLASS		2 1-16"	2 9-16"	3 1-8"	4 1-16"	5 1-8"	7 1-16"	9"	11"	13 5-8"	16 3-4"	21 1-4"
CLASS 2K	TOOL	FA1TM	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA4TM	FA9TE	Not suitable	Not suitable	Not suitable
CLASS 3K	TOOL	FA1TM	FA1TM	FA4TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	Not suitable	Not suitable	Not suitable
CLASS 5K	TOOL	FA1TM	FA1TM	FA4TM	FA4TM	FA9TE	FA9TE	FA9TE	FA9TE	Not suitable	Not suitable	Not suitable

(NPS row repeated for each class: 2 1-16", 2 9-16", 3 1-8", 4 1-16", 5 1-8", 7 1-16", 9", 11", 13 5-8", 16 3-4", 21 1-4")

7.2 ASME B16.5 FLANGE RANGE OF APPLICATION

CLASS 150	NPS	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	TOOL					FA1TM								FA4TM						
CLASS 300	NPS	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	TOOL					FA1TM							FA4TM				FA9TE			
CLASS 400	NPS	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	TOOL					FA1TM			FA4TM						FA9TE					
CLASS 600	NPS	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	TOOL				FA1TM				FA4TM					FA9TE						
CLASS 900	NPS	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	TOOL	FA1TM			FA4TM								FA9TE							
CLASS 1500	NPS	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	TOOL	FA1TM			FA4TM						FA9TE									
CLASS 2500	NPS	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	TOOL	FA1TM			FA4TM				FA9TE											

ASME B16.47 FLANGE RANGE OF APPLICATION

CLASS 150	NPS	22"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
	TOOL	FA4TM						FA9TE						
CLASS 300	NPS	22"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
	TOOL	FA4TM						FA9TE						
CLASS 400	NPS	22"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
	TOOL	FA4TM						FA9TE						
CLASS 600	NPS	22"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
	TOOL	FA4TM						FA9TE						
CLASS 900	NPS	22"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
	TOOL	FA9TE												

DIN WELD NECK FLANGE RANGE OF APPLICATION

CLASS PN16	NPS	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	7"	8"	10"	12"	14"	16"	18"	20"	24"	28"	32"	36"	40"	48"	56"	72"	80"
	TOOL	FA1TM															FA4TM						FA9TE	
CLASS PN25	NPS	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	7"	8"	10"	12"	14"	16"	18"	20"	24"	28"	32"	36"	40"	
	TOOL					FA1TM											FA4TM								
CLASS PN40	NPS	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	7"	8"	10"	12"	14"	16"	18"	20"									
	TOOL	FA1TM											FA4TM											
CLASS PN64	NPS	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	7"	8"	10"	12"	14"	16"									
	TOOL		FA1TM							FA4TM														
CLASS PN100	NPS	1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	7"	8"	10"	12"	14"									
	TOOL			FA1TM					FA4TM					FA9TE										
CLASS PN160	NPS	3/8"	1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	7"	8"	10"	12"									
	TOOL				FA1TM				FA4TM					FA9TE										

	SUITABLE FOR FA1TM TOOL
	SUITABLE FOR FA4TM TOOL
	SUITABLE FOR FA19TE TOOL
	NOT SUITABLE FOR TOOLS

7.3 SPO FLANGE RANGE OF APPLICATION

CLASS 150	TOOL\NPS	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
	TOOL											FA1TM										FA4TM						
CLASS 300	TOOL\NPS	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
	TOOL							FA1TM						FA4TM								FA9TE						
CLASS 600	TOOL\NPS	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
	TOOL									FA4TM					FA9TE													
CLASS 900	TOOL\NPS	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
	TOOL								FA4TM				FA9TE															
CLASS 1500	TOOL\NPS	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
	TOOL				FA4TM				FA9TE																			
CLASS 2500	TOOL\NPS	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"													
	TOOL		FA4TM					FA9TE																				
CLASS 5000	TOOL\NPS	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"													
	TOOL					FA4TM		FA9TE																				
CLASS 7500	TOOL\NPS	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"													
	TOOL		FA4TM				FA9TE																					
CLASS 10000	TOOL\NPS	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"													
	TOOL				FA4TM			FA9TE																				
CLASS 15000	TOOL\NPS	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"													
	TOOL	FA4TM																										

	SUITABLE FOR FA1TM TOOL
	SUITABLE FOR FA4TM TOOL
	SUITABLE FOR FA19TE TOOL
	NOT SUITABLE FOR TOOLS