

SWi5TE

FLANGE SPREADING WEDGE



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22/07/2018

1.

INTRODUCTION

The Equalizer™ SWi5TE has been developed to assist in the spreading of all flange joint types with a minimum access gap of 4.0 mm (0.16"). The tool can be used during pipework construction, commissioning or during routine maintenance.

The SWi tools have less moving parts and no finger pinch points. The tools have been developed to increase the spreading distance on each step while gaining easier access between any remaining stud-bolts within the flange joint. The SWi tools are supplied with a swivel handle and safety lanyard attachment as standard.



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

2.

TOOL SAFETY

2.1

GENERAL SAFETY

These instructions cover the safe operation and maintenance of THE EQUALIZER **SWi5TE** FLANGE SPREADING WEDGE tool. The use of this tool 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 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 700 bar (10 000 psi).



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.



CAUTION: Only use the designated anchor point for fixing the lanyard. Do not attach the lanyard to the plastic handle.



DANGER: Care should be taken when using the lanyard to avoid entanglement with body parts.



The vibration total value to which this tool is subjected does not exceed 2.5 m/s².

3.

SWi SPREADING WEDGE TOOL OPERATION

3.1

GENERAL GUIDANCE

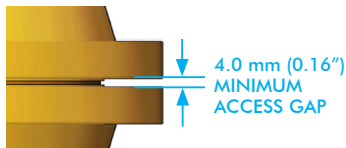
Before attaching the tool ensure at least two flange bolts remain in place. These should be 180 degrees apart with their nuts loosened sufficiently to enable flange work to be carried out. Leaving these bolts in place will help to reduce unwanted lateral flange movement during flange spreading.



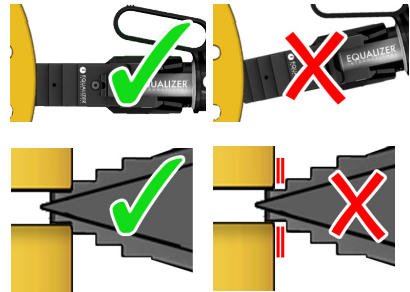
Prior to spreading, an assesment should be carried out to determine the most appropriate positioning of the tools around the joint. A minimum of 2 tools should always be used.



Determine the flange joint access gap - a minimum access gap of 4 mm (0.16") is required for the SWi5TE tools. The access gap is the clearance between the surfaces onto which the wedge will apply its spreading force.



Place the tool into the access gap, with the full width of the selected step fully inserted up to the heel.

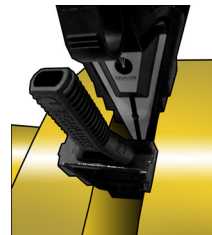


3.2

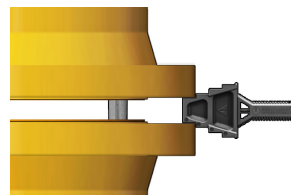
FLANGE SPREADING

Spread the flanges apart by actuating the tool.

Once the joint has been opened to the desired distance, or if the tool has reached its maximum travel, insert the Safety Blocks into the flange joint.



Ensure the full width of the selected Safety Block step is fully inserted before gradually retracting the tool until the flange load has been applied to them.



The wedges can then be retracted fully and inserted again, using the next step. In this way the flange joint can be iteratively opened further until the required spread is reached.

3.3

FLANGE WORK

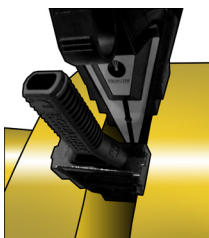


DANGER: Do not rely upon hydraulic systems for supporting the access gap during flange work. Do not allow fingers, hands or other body parts into the space created between the flanges.

3.4

FLANGE CLOSURE

Allow the flanges to return to their closed position by gradually retracting the tool. Consult the relevant section of the manual for instructions on how to retract the tool. Before the tool has fully retracted, insert the Safety Blocks into the flange joint. Ensure the full breadth of the selected Safety Block step is fully inserted, before gradually retracting the tool until the flange load has been applied to them.



To use the next smallest step, place the tool in the gap and actuate enough to relieve the load on the Safety Blocks. In this way the flange joint can be progressively closed.

As the flange approaches its fully closed position, support the tool to avoid it dropping out of the joint. Ensure that care is taken to prevent objects being dropped. Dropped objects pose a risk of personal injury or equipment damage.

3.5

SAFETY BLOCKS

Each tool is supplied with a Safety Block. The Safety Block has been designed with steps that match the spreading distance of the SWi tools.



The Stepped Block Kit contains a larger Safety Block to cater for wider spreading distances.

3.6

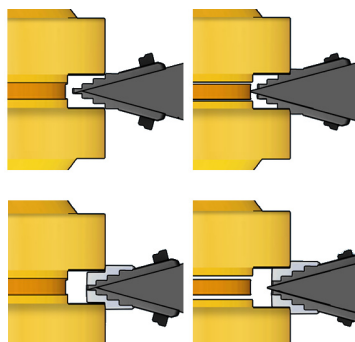
STEPPED BLOCKS

A pair of Stepped Blocks can be supplied as a kit item. These can be fixed to the jaws (individually or in pairs) to increase the effective jaw thickness and therefore the maximum spreading distance.

Use of the Stepped Blocks also enables the SWi5TE Flange Spreader to be used in a joint with a larger access gap.

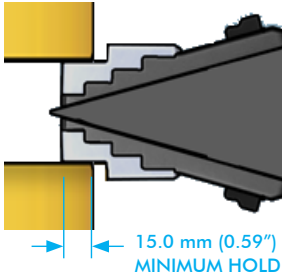
Wedge protrusion can be minimised by the use of Stepped Blocks, reducing the penetration into the joint. This enables, for example, spectacle blinds to be changed.

Attach the stepped block to the tool using the M6 counter-sunk screw. Use the hex-key supplied to tighten the screw into the threaded hole in the jaw of the tool. Repeat for second Stepped Block to further increase the effective jaw thickness if required.



To remove the Stepped Blocks unscrew the M6 counter-sunk screw. Do not force the screw out of the Stepped Block, it is deliberately retained to prevent it becoming misplaced.

Use the tool as per the Tool Operation instructions. Ensure that there is a minimum hold of 15 mm (0.59") and that the full width of the block is used.

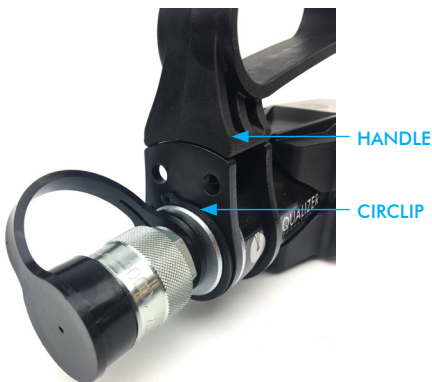


3.7

HANDLE

The handle can be swivelled around the central axis of the tool, to improve access to the Flange and allow the tool to be easily held in the vertical or horizontal orientation.

If the tool is being used in an application where access space is very limited, the handle can be removed temporarily. Remove circlip and handle. Special caution should be exercised when working with a tool in this configuration. Replace the handle immediately following the task.



3.8

LANYARD

The SWi tools are supplied with a secure anchor point and a lanyard. The lanyard should be used to minimise the risks associated with the tool dropping.

Attach one end of the lanyard to the tool using the supplied shackle. The other end of the lanyard should be fixed to a secure point close to the work-site using an appropriate shackle.

Avoid using the lanyard as a means for picking up or carrying the tool. Do not fix the lanyard to the handle.

The anchor point and lanyard have been engineered to safely sustain a drop over the full lanyard length. It is recommended that all parts are inspected following a drop incident, as damage may compromise the safety of the tool.



CAUTION: Only use the designated handle holes for fixing the lanyard. Do not attach the lanyard to the plastic handle.

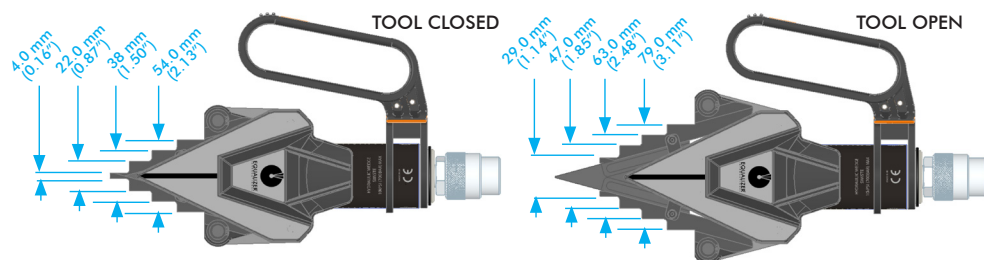


DANGER: Care should be taken when using the lanyard to avoid entanglement with body parts.

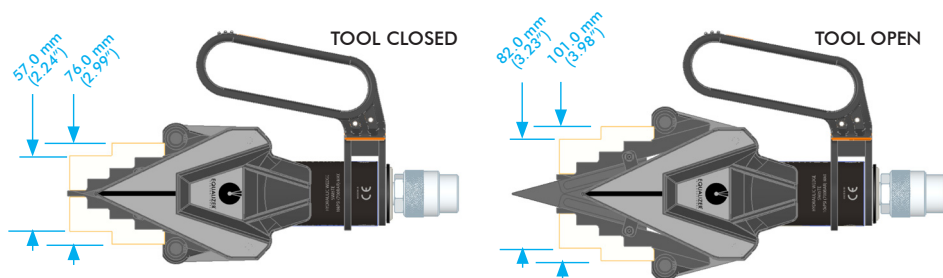
3.9

STEP DIMENSIONS & SPREADING DISTANCES

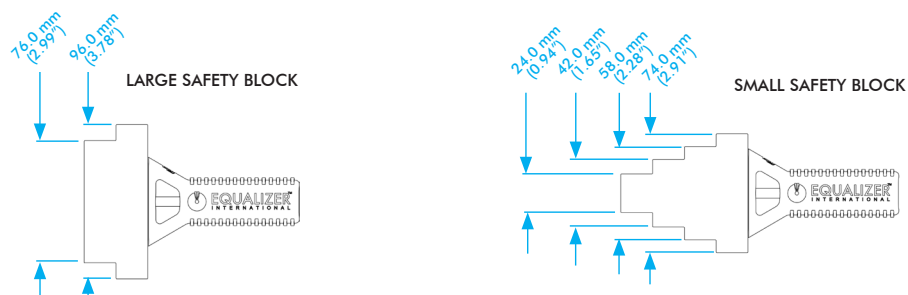
JAW DIMENSIONS (WITHOUT STEPPED BLOCKS ATTACHED)



JAW DIMENSIONS (WITH STEPPED BLOCKS ATTACHED)



SAFETY BLOCK DIMENSIONS



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 wedge-tip (requiring tool actuation or jaw removal). Damage to the wedge-tip is 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.

Remove the jaws as per the disassembly instructions.

Apply grease liberally to the following areas:

- the large flat surface on the underside of the jaws
- the internal flat surfaces in the square cut-out in the jaws

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

GREASE LIMITATIONS:

Minimum Temperature: -5 °C (23 °F)

Maximum Temperature: 40 °C (104 °F)

MECHANICAL TOOLS:

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

Maximum Jaw Contact Temperature: 150 °C (302 °F)

HYDRAULIC TOOLS:

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

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

4.6

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 vacuüm 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.

4.7

SUB-SEA USAGE

The Equalizer range of HP hydraulic hand pumps are fitted with a sealed-bladder type reservoir system that allows for sub-sea operation.

The SWi5TE is 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 HP350S/D hydraulic 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 HP350S/D 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 SWi5TE tool 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.

5.

SWi5TE

HYDRAULIC FLANGE SPREADING WEDGE

The SWi5TE Spreading Wedge uses an external hydraulic pump to drive the cylinder to advance the wedge and spread the jaws.



5.1

SWi5TE TOOL CAPABILITIES

SPREADING FORCE

With 700 bar (10 000 psi) of hydraulic pressure applied, the tool can apply 6.3 T (63 kN) spreading force on the 1st step, up to 7.7 T (77 kN) spreading force on the 4th step.

SPREADING GAP (SEE SECTION 3.9)

Using only the 1st step, the tool can spread from 4.0 mm to 29 mm (0.16" - 1.14").

Using all 4 steps, but without the stepped blocks, the tool can spread from 4 mm to 79 mm (0.16" - 3.1").

Using both steps on the stepped blocks, the tool can spread 56 mm - 101 mm (2.2" - 4").

5.2

SWi5TE TOOL FUNCTION

HYDRAULIC TOOL OPERATION

The SWi5TE Spreading Wedge uses a hydraulic cylinder to advance the wedge and spread the jaws. The hydraulic pressure is applied using an external hand pump, enabling accurate control of the force applied.

HAND PUMP OPERATION

Consult the Instruction Manual for the Equalizer HP Hand-Pump.

ACTUATING THE SWi5TE

Follow the SWi Spreading Wedge Tool Operation instructions, using the following instructions to actuate the SWi5TE tool in particular:

When the Hand-Pump release valve is closed, pumping the Hand-Pump handle will advance the cylinder and spread the jaws.

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

Equalizer manufactures a twin-port hand pump which can be used to actuate two tools simultaneously.

RETRACTING THE SWi5TE

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.

AIR-LOCK RELIEF

If full pressure is not achieved an air-lock may be present in the hydraulic system. The following procedure can be executed to relieve any air-locks.

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.

5.3

SWi5TE KIT CONTENTS

SINGLE KIT

Product Code: SWi5TE-S

- 1 x SWi5TE Flange Spreader Wedgehead
- 1 x 700 bar (10 000 psi) Hydraulic Cylinder
- 1 x Safety Block
- 1 x Lanyard
- 1 x Instruction Manual
- 1 x Plastic Carry Case + Foam Insert



580 mm x 340 mm x 180 mm (22.8" x 13.4" x 7.1")

Gross kit Weight: 8.7 kg (19.1 lb)

Tool only weight: 5.2 kg (11.4 lb)

TWIN KIT

Product Code: SWi5TE-T

- 2 x SWi5TE Flange Spreader Wedgeheads
- 2 x 700 bar (10 000 psi) Hydraulic Cylinders
- 2 x Sets of Standard Safety Blocks
- 2 x Lanyards
- 1 x Set of Instruction Manuals
- 1 x Plastic Carry Case + Foam Inserts



580 mm x 340 mm x 180 mm (22.8" x 13.4" x 7.1")

Gross Kit Weight 14.4 kg (31.7 lb)
 Tool only weight: 5.2 kg (11.4 lb)

STEPPED BLOCK KIT

Product Code: 1640016-01

- 2 x SWi5TE Step Block
- 2 x M6 CSK Hex Screw
- 2 x Retaining Washer
- 1 x SWi5TE Large Safety Block
- 2 x 4mm Allen Key

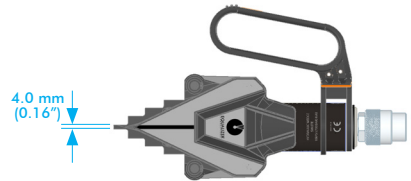
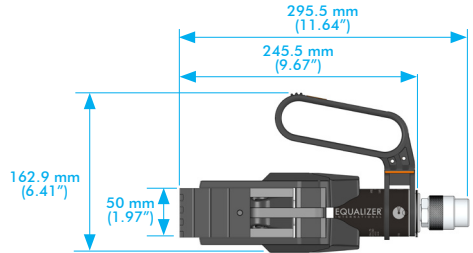


Gross Kit Weight 1.3 kg (2.9 lb)

5.4

SWi5TE DIMENSIONS

TOOL DIMENSIONS
 - CLOSED



6.

TROUBLESHOOTING

6.1

SWi5TE TROUBLESHOOTING

THE WEDGE IS ADVANCING BUT DOES NOT REACH FULL PRESSURE

POSSIBLE CAUSE:

There is air in the hydraulic system.

RECOMMENDED ACTION:

Follow the Airlock Relief instructions.

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 are applicable to EQUALIZER INTERNATIONAL LTD SWi5TE tools:

REGISTERED DESIGNS

- 002224980-0001
- 002224980-0002
- 002224980-0003
- 002224980-0004
- 084204
- 353180
- 256685
- ZL201330454407.8
- 93373
- D729603
- D168772
- 41538

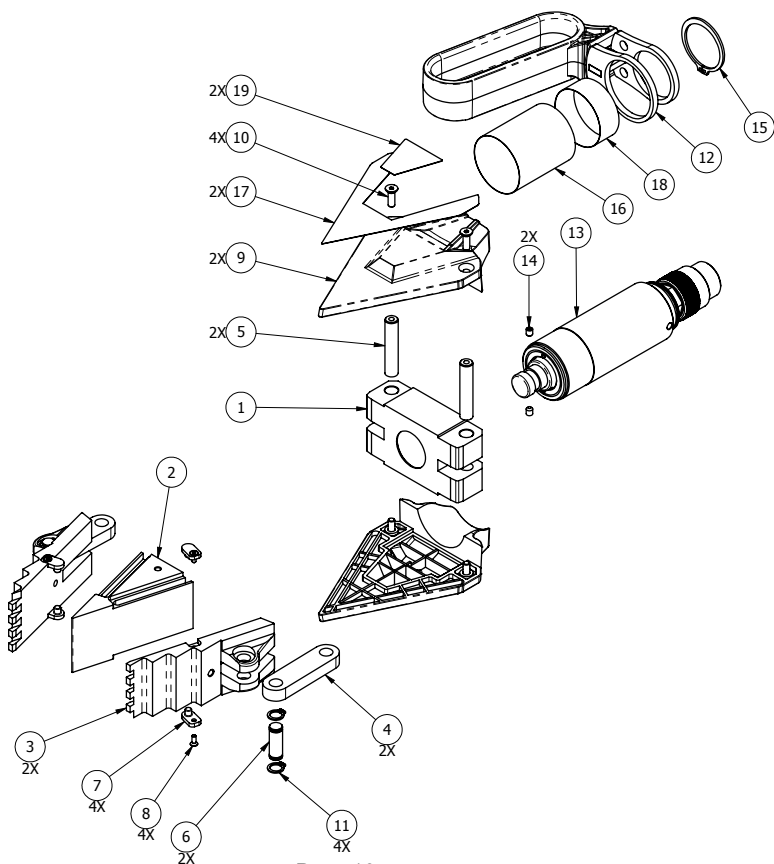
8.

PARTS LISTS & SERVICE KITS

SWi5TE PARTS LIST

1640000-01 REV 03

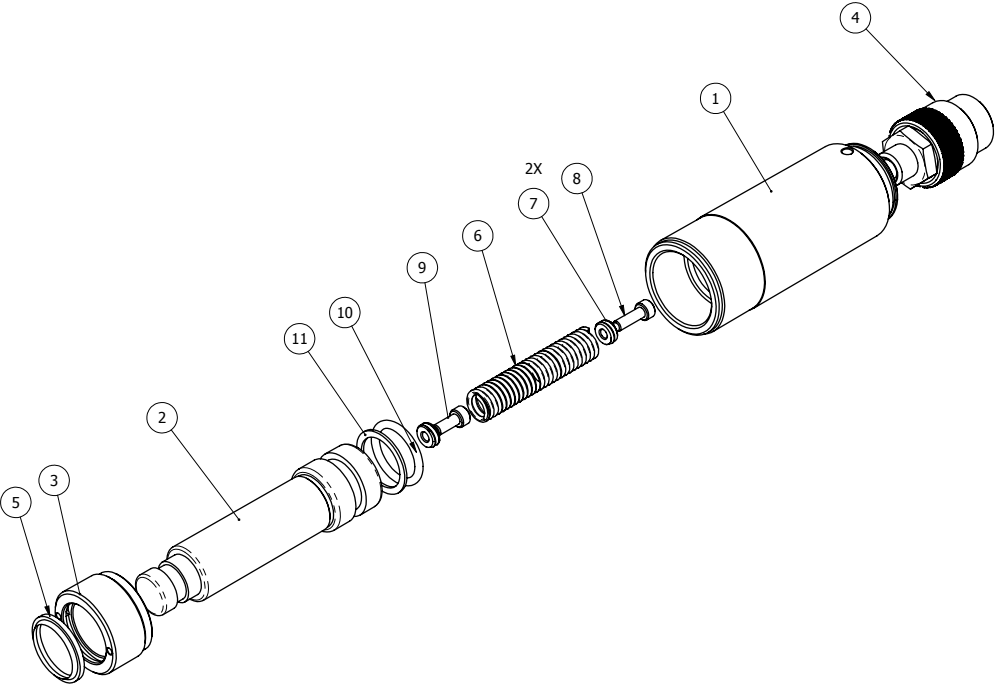
ITEM NO.	PART NO	DESCRIPTION	QTY
1	1640001-01	SWi5TE BODY	1
2	1640006-01	SWi5TE WEDGE COATING	1
3	1640002-01	SWi5TE JAW	2
4	1120003-01	SWi5TE LINK_FINISHED	2
5	1120007-01	SWi5TE PIN_FINISHED	2
6	1120008-01	SWi5TE PIN_FINISHED	2
7	1640007-01	SWi5TE JOINING PLATE	4
8	110006-01	M3 x 8 CSUNK SCREW	4
9	1640050-01	SWi5TE COVER PLATE	2
10	110007-01	M5 x 16 CSUNK SCREW	4
11	901301-01	EXTERNAL CIRCLIP	4
12	1640300-01	SWi5TE HANDLE ASSEMBLY	1
13	1640200-01	SSS050UK 5T CYLINDER	1
14	300401-01	M5 SCKT SET SCREW	2
15	1120017-01	EXTERNAL CIRCLIP - DIN 471 - 40 x 1.75	1
16	1640052-01	SWi5TE CYLINDER WRAP STICKER (LARGE)	1
17	1640053-01	SWi5TE COVER PLATE TRIANGLE STICKER	2
18	1640054-01	SWi5TE CYLINDER WRAP STICKER (SMALL)	1
19	1640204-01	SWi5TE WEDGE LOGO STICKER	2



HYDRAULIC CYLINDER PARTS LIST

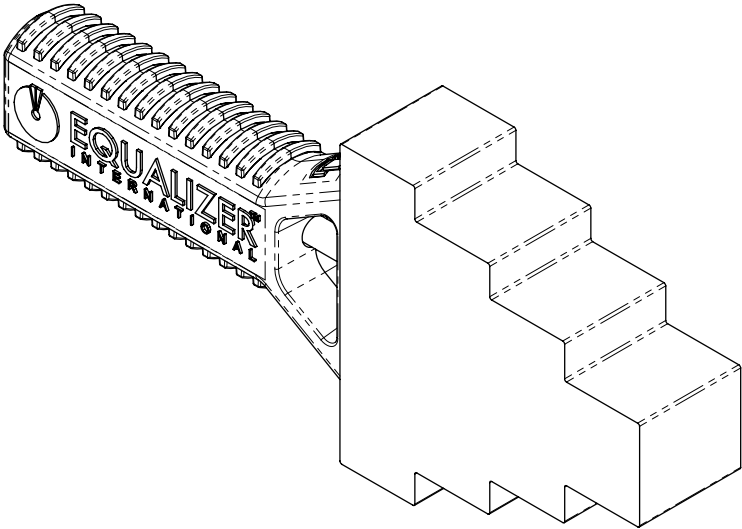
1640200-01 REV 01

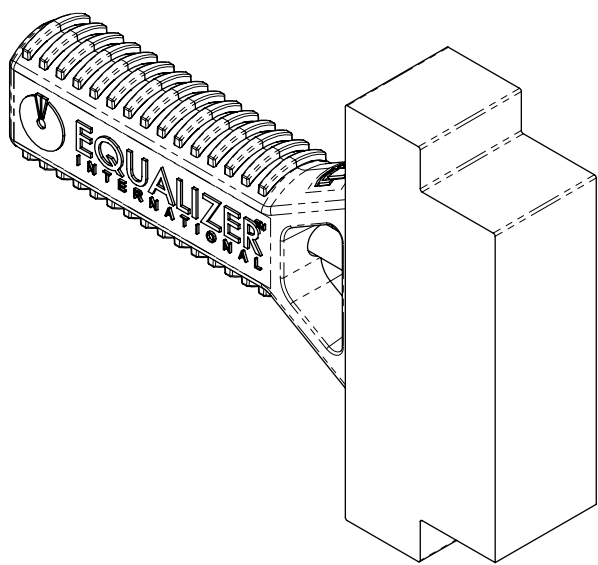
ITEM NO.	Part No	DESCRIPTION	QTY
1	1640201-01	CYLINDER BODY	1
2	1640202-01	CYLINDER PISTON	1
3	1640203-01	CYLINDER ENDCAP	1
4	300901-01	COUPLER	1
5	KIT 1640213-01	CYLINDER WIPER SEAL	1
6		CYLINDER TENSION DIE SPRING	1
7		CYLINDER SPRING LOCK	2
8		CYLINDER M5x16 CAP SCREW	1
9		CYLINDER M5x12 CAP SCREW	1
10		CYLINDER O-RING	1
11		CYLINDER BACKUP RING	1



SWi5TE SAFETY BLOCK (SMALL)

1640015-01 REV 03

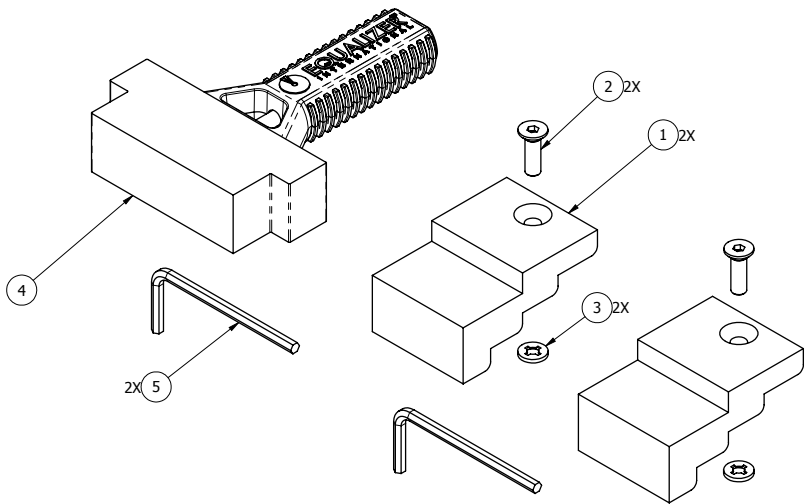




SWi5TE STEP BLOCK (PAIR) KIT

1640016-01 REV 03

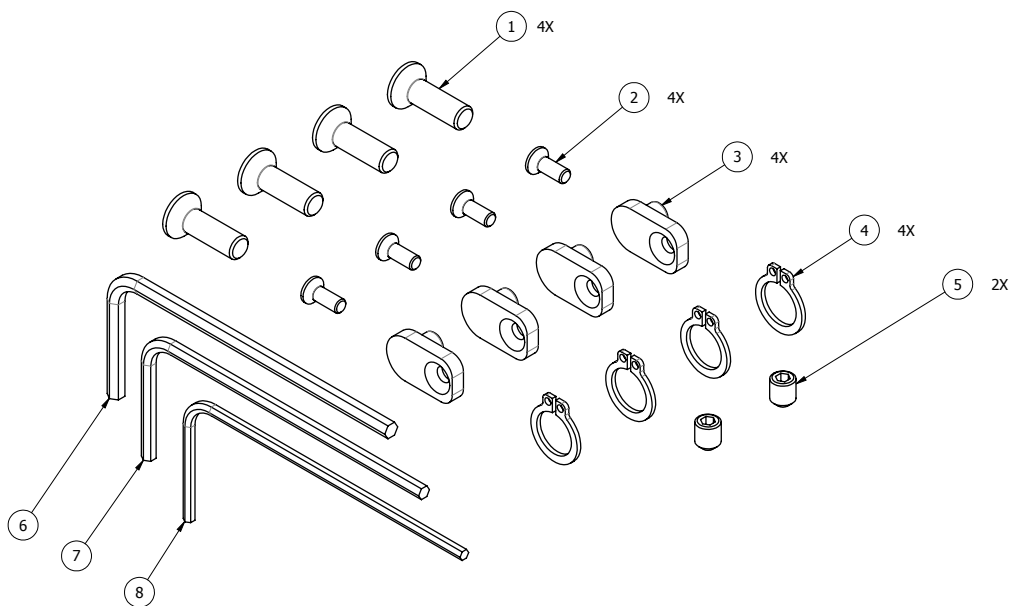
ITEM NO.	PART NO	DESCRIPTION	QTY
1	1640011-01	SWi5TE STEP BLOCK	2
2	503703-01	M6 CSK HEX SCREW	2
3	830901-01	RETAINING WASHER	2
4	1640017-01	SWi5TE LARGE SAFETY BLOCK ASSEMBLY	1
5	060701-01	4mm ALLEN KEY	2



SWi5TE FASTENERS SERVICE KIT

1640400-01 REV 02

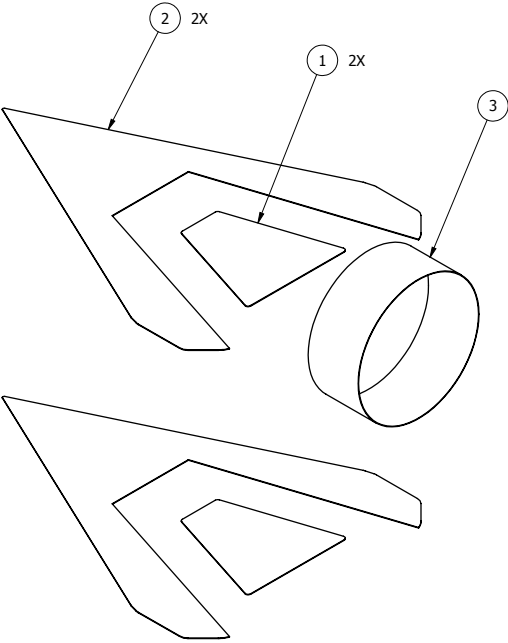
ITEM NO.	Description	QTY
1	M5 x 16 CSUNK SCREW	4
2	M3 x 8 CSUNK SCREW	4
3	SWi5TE JOINING PLATE	4
4	EXTERNAL CIRCLIP	4
5	M5 SCKT SET SCREW	2
6	3 mm ALLEN KEY	1
7	2.5 mm ALLEN KEY	1
8	2 mm ALLEN KEY	1



STICKERS SERVICE KIT

1640500-01 REV 01

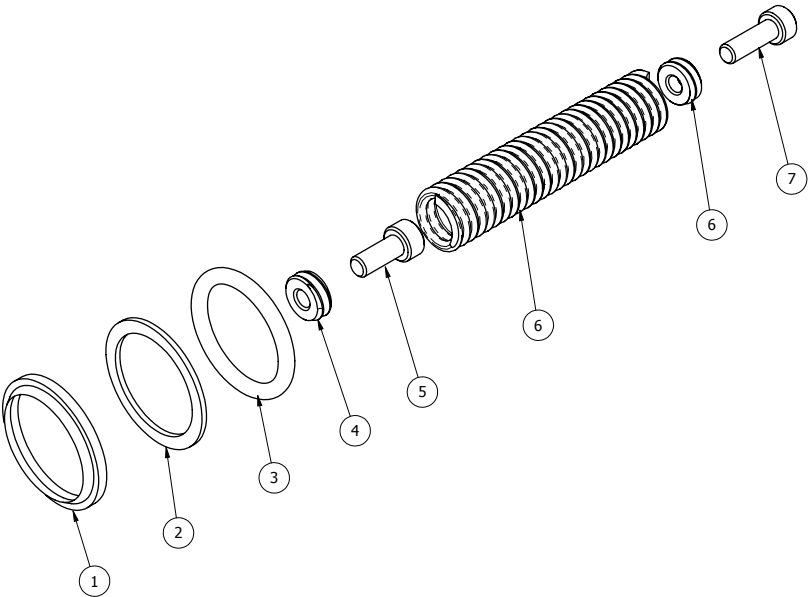
ITEM NO.	Description	QTY
1	WEDGE LOGO STICKER	2
2	COVER PLATE TRIANGLE STICKER	2
3	CYLINDER WRAP STICKER (SMALL)	1



HYDRAULIC CYLINDER SERVICE KIT

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ITEM NO.	DESCRIPTION	QTY
1	CYLINDER WIPER SEAL	1
2	CYLINDER BACKUP RING	1
3	CYLINDER O-RING	1
4	CYLINDER SPRING LOCK	2
5	CYLINDER M5x12 CAP SCREW	1
6	CYLINDER TENSION DIE SPRING	1
7	CYLINDER M5x16 CAP SCREW	1





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