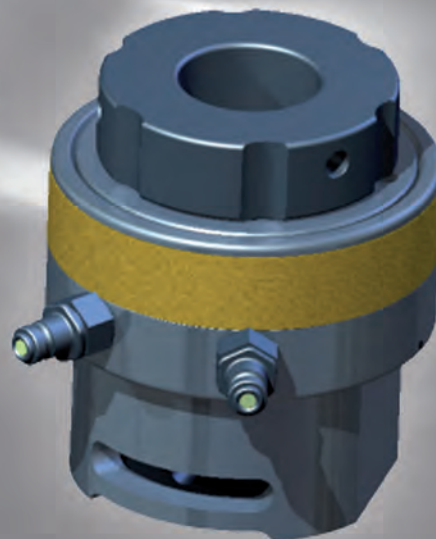


 **TRISTAR**
Bolting Solutions 



Innovations
based on
EXPERIENCE





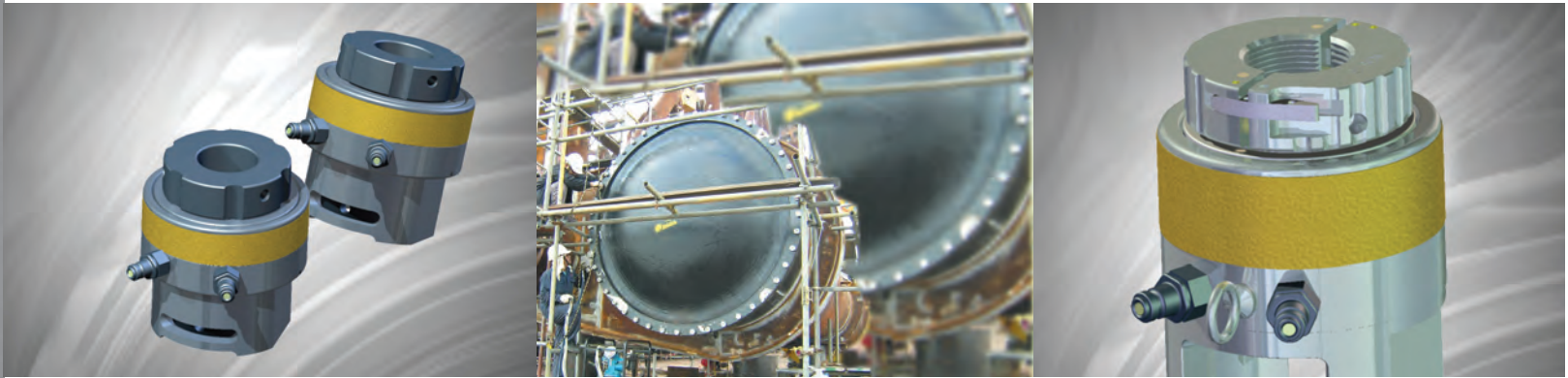
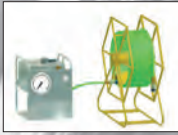
The Tri-Star Experience

Tri-Star has been in the oil & gas and power generation industry since 1983.

Tri-Star's Bolting Solutions Division supplies and rents a full range of bolt tightening tools and provides service (with engineers) around the world.

The Tri-Star experience results in unsurpassed knowledge in the design, manufacture and on-site commissioning of fasteners and bolting solutions, cable management and corrosion protection.





An Established System of Quality and Service

A key BOLTING SOLUTIONS provider, TRISTAR Bolting Solution has many years' cumulative experience in the Design, Manufacture and Application of Hydraulic Bolt Tightening Products.

Design with Experience

Customers benefit from our single most important asset, extensive application knowledge in a wide range of industries and bolting applications. This supported with for example, up-to-date Design Modelling techniques, Finite Element analysis and Strain Gauge Testing which enables us to provide the very best standard and bespoke bolting product design solutions available today.

Quality Accreditation and Manufacture

With the increasingly shorter and stringent time schedules in today's industrial work, product delivery is essential in maintaining and improving plant productivity. Managed by our accredited ISO 9001 quality system our modern in-house manufacturing and inspection facilities provide efficient and effective delivery of our products to meet your requirements.



Bolted Joint Integrity

Joint integrity, the ability of a bolted joint to maintain a safe and, in the case of flanged joints, leak free service over a prolonged period of time is a key requirement for safe and effective operation of plants. Clients have access to highly qualified and experienced engineers in a variety of industrial bolted joint applications. Combined with access to our Joint integrity software clients can attain fast solutions to bolted joint problems.



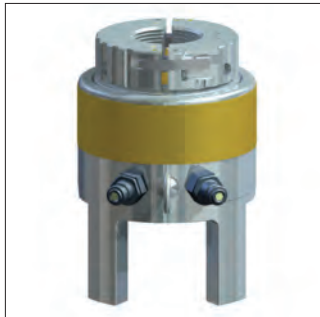
Onsite Solutions

TRI-STAR's onsite service and commissioning teams are trained in the use and application of our products and procedures over a wide variety of applications, bringing you onsite joint integrity 24 hours per day, 365 days per year. Our knowledge base is constantly being upgraded through our learning and thinking organization to meet the ever-changing needs of the market place.





STANDARD BOLT TENSIONING PRODUCT RANGE



SM Sub-Marine Tool

FOR SUBSEA APPLICATIONS

Revolutionary 'QUICK' SNAP CLOSED Reaction Nut provides the most RIGID, RELIABLE and LIGHT WEIGHT diver's operated tools available today.

- STAINLESS STEEL
- Piston mis-alignment compensation
- Long Piston Stroke (up to 30mm)



Flange Pulling System

PULL and ALIGN FLANGES

TOPSIDE AND SUBSEA

For use on connections where speed, reliability and simple operation are essential. The Flange Pulling System is a hydraulically operated tool being connected to a pump unit via a hydraulic harness assembly and downline.



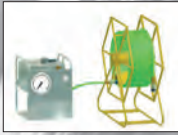
MPR Topside Tool

FOR SERVICE INDUSTRY

For companies frequently working on a variety of bolt tensioning projects, this tool offers LOAD and SIZE ideally suited to ANSI and API flange applications. INTEGRAL HEX INSERT and QUICK FIT BRIDGE provide efficient bolt size change over. No hex wrenches required and no lost hex inserts.

- ONLY 4 primary tools cover 1" to 3-1/2" (M24 – M90)
- ONLY 6 Primary tools cover 5/8" to 4" (M16 – M100)
- Additional Secondary tools add range flexibility





EV Topside Tool FOR COMPLETE FLEXIBILITY

Suited to a wide range of industrial applications, whether for a SINGLE OR MULTIPLE BOLT SIZE PROJECTS the EV range enable users to select the most ECONOMICAL and VERSATILE range to meet their particular requirements.

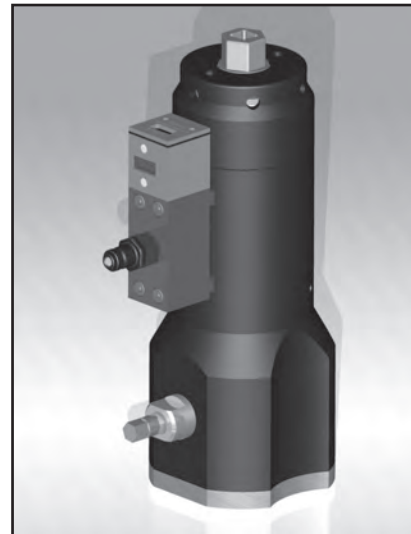
- Dual Bridge increases ECONOMY
- 13 Tools provide flexible range 3/4" to 4 " (M20 – M100)
- Select only 4 tools TO COVER 1" TO 3-1/2"



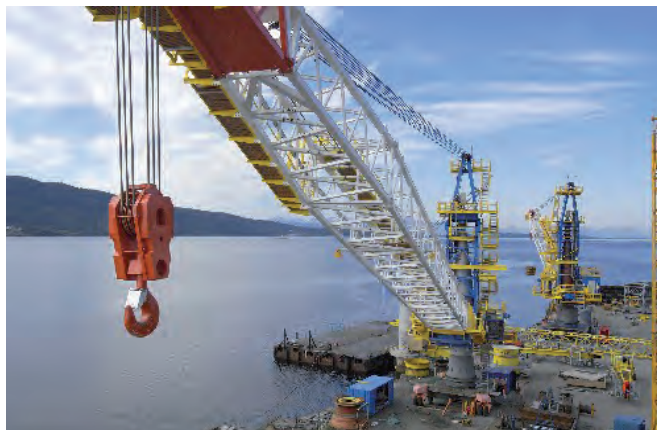
Dual Piston Tensioner FOR STRUCTURAL BOLTS AND CRANE SERVICES

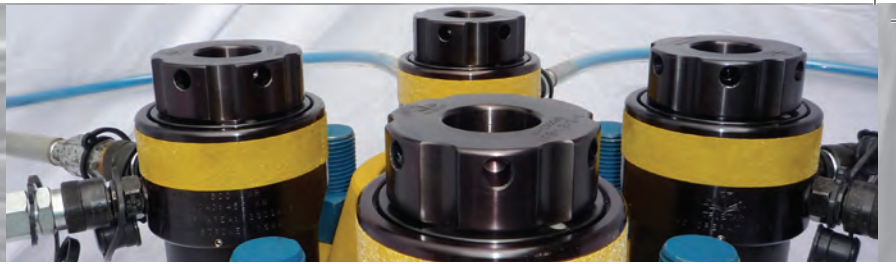
Dual Piston design provides small diameter compact tools

- suited to crane slewing bolts
- 30mm to 60mm 10.9 bolts
- Time saving
- Counter to ensure tool's monitored operation



APPLICATIONS IN DIFFERENT INDUSTRIES





BESPOKE BOLT TENSIONING PRODUCT DESIGN

Puller Bar Bolt Tensioning Tools

Many applications such as crane slew rings require bolt tensioning tools that provide high loads but with small diameter. TRISTAR Puller Bar Bolt Tensioning Tools provide solutions to such applications.

Single, dual or triple piston designs are available which utilises a puller bar that connects to the extended stud to be tightened. These pistons act on the puller bar to provide bolt extension during the bolt tightening operation.

TRISTAR Puller Bar Bolt Tensioning Tools may include additional features such as spring assisted spring return. Hydraulic connections can either be top or side entry to suit the intended application.



Threaded Piston Bolt Tensioning Tools

TRISTAR Threaded Piston Bolt Tensioning Tools provide solutions for applications with space restrictions where standard puller sleeve type tools will not fit. They can also be designed for applications which require higher bolt loads or smaller tools.

Conventional bolt tensioning tools utilise a separate threaded puller sleeve where as the Tri-Star Threaded Bolt Tensioning Tools has a threaded piston that engages with the stud bolt to be tightened. A top hydraulic connection also allows easy fitting of the Threaded Piston Bolt Tensioning Tool on to the application to be tightened. If there exist any height restrictions, a swivel connection is provided.



Hydraulic Nuts

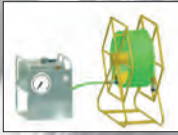
TRISTAR Hydraulic Nuts replace conventional hex nuts.

The use of TRISTAR Hydraulic Nuts significantly reduces down time on applications that require frequent maintenance involving joint breakout and re-assembly. Other than the supply of a hydraulic pump unit and hoses, no other equipment is needed.

To use, simply screw the TRISTAR Hydraulic Nuts onto the stud bolts to be tightened. Apply a predetermined hydraulic pressure via a pump and hoses and turn down the threaded collar. Release the hydraulic pressure, disconnect pump and hoses and the application is complete. Break out is simply the reverse procedure.

Depending upon the application, top collar or bottom collar designs are available in a range of loads to suit many industrial applications.





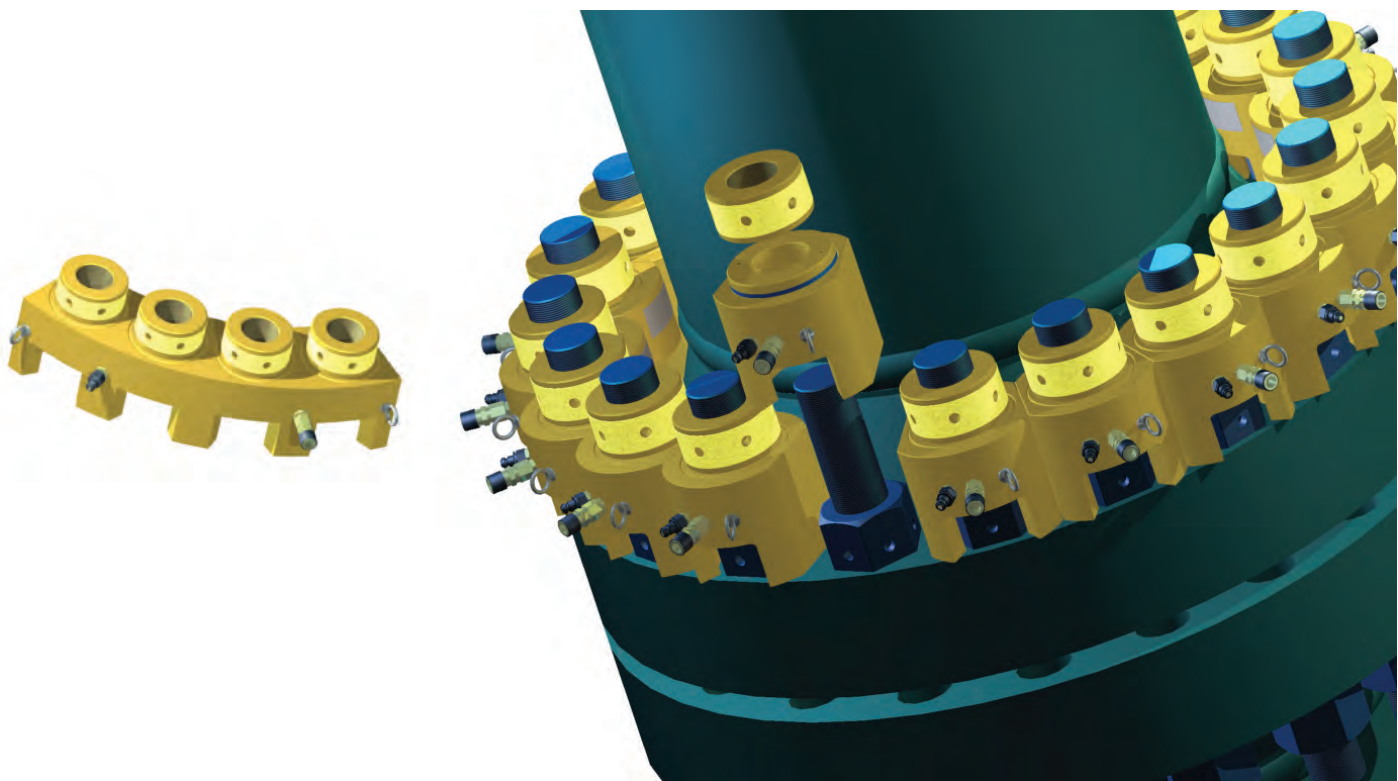
Segmented Bolt Tensioning Tools

When applications require all bolts to be tightened simultaneously, access to both sides of the joint is usually required so that half the quantity of bolts are tightened from one side and the remaining from the other side.

However, some applications have access restrictions, allowing bolt tensioning tools to be fitted to only one side of the joint to be tightened. TRISTAR Single Stud and Multi-Stud Segmented Bolt Tensioning Tools enable all bolts on a flanged joint to be tightened simultaneously from one side of the joint.

TRISTAR Multi-Stud Bolt Tensioning Tools provide fast assembly with minimum hose connections. These tools have multiple pistons fitted to a single segment, each segment provides tightening of a number of stud bolts usually ranging from 2 to 5 being tightened simultaneously.

For smaller diameter joint with up to 12 bolts, a TRISTAR Single Segment Bolt Tensioning Tool can be used to tighten all stud bolts simultaneously. These tools also provide the ideal solution when tool weight and handleability are significant considerations. Although they require more hose connections, they are much easier to handle in difficult to access situations or in challenging environments such as subsea applications.





JOINT INTEGRITY SOFTWARE

By providing Joint Integrity software our customers benefit from easy access to a broad application knowledge base available at the finger tips. Significant investment in it's development, users can be assured of attaining safe and consistent application information and recommendations.

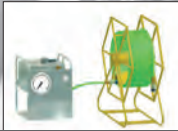
When the software identifies problems in attaining the bolt tightening requirements, help and optional solutions are provided.

Clients can create their own flange management data base. This built-in flexibility allows users to customise data base fields to suit their requirements.

Different application designs and operating conditions require different calculation and procedure processes. Information on a variety of commonly used flange and structural application types are also included as reference.

Software features include:-

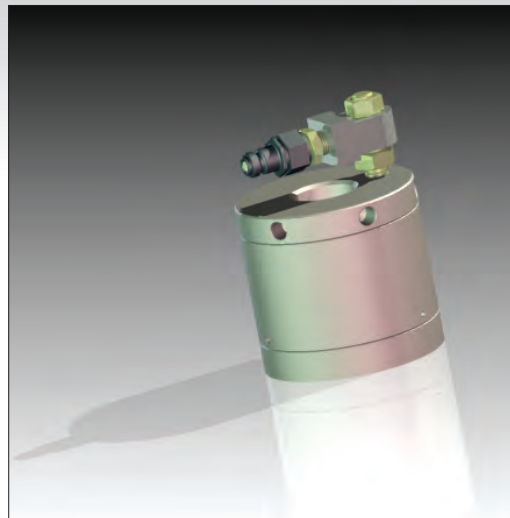
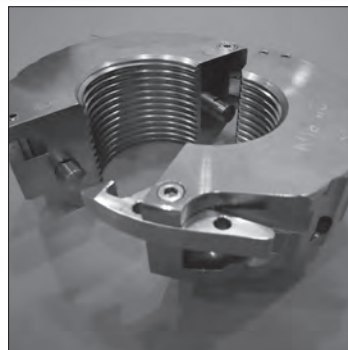
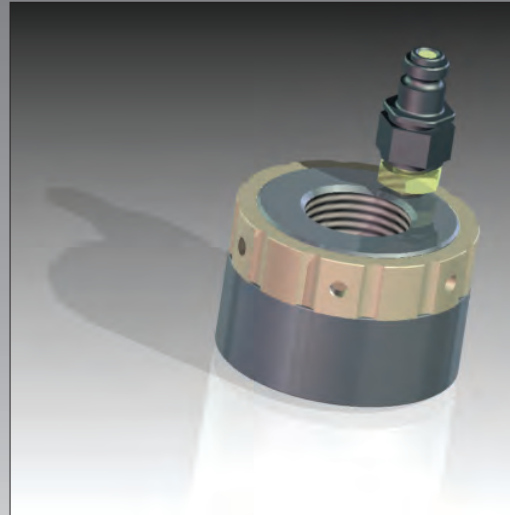
- Enhanced health and safety algorithms
- Problem solving algorithms
- Safety alerts
- Customisable Flange Management data base
- ANSI and API flange applications
- Structural applications
- Special flange applications
- Bolt material data base
- High temperature applications
- Tension and torque tightening calculation
- Tension and torque tightening procedures
- Tool fit checks
- Standard Tristar product data base
- User input bespoke tools



TECHNICAL SPECIFICATIONS

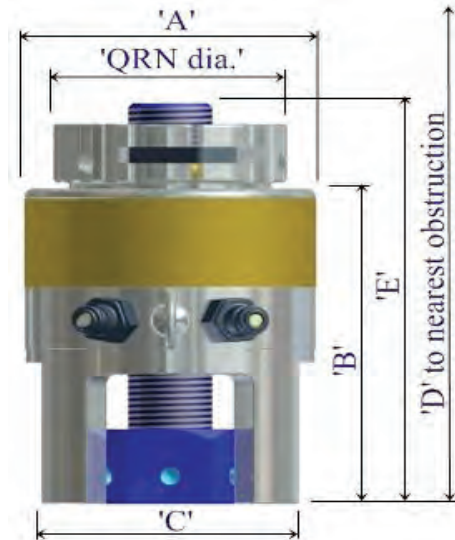
Bolt Tensioning is a simple and reliable method of applying a preload to a fastener assembly. Bolt Tensioning applies a force directly to the bolt and stretches it axially, eliminating most of the factors which provide control problems using other tightening methods such as torque tightening.

The Bolt Tensioner is placed over each stud bolt on the joint to be tightened. They are then interconnected via a harness assembly to a single pump unit. This allows each bolt tensioning tool to be pressurised simultaneously providing even loading around the joint. Extension is applied directly to the stud bolt, which is then retained by the stud bolts and nuts. This in turn provides the clamping force necessary to maintain the joint.





SUBMARINE BOLT TENSIONING SYSTEM

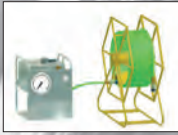


Compact design covers ANSI and API Flange

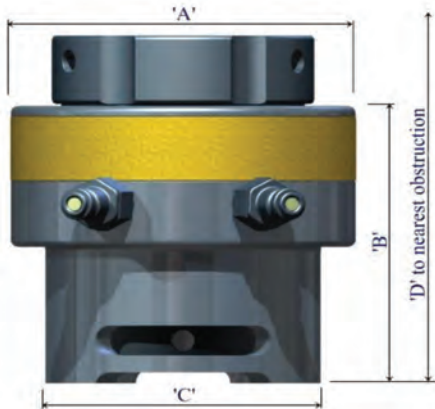
- 5/8" to 4" Imperial Bolting, M16 to M100 Metric Bolting
- Only 5 'PRIMARY' tools cover 3/4" to 3-1/2" bolt sizes (SM1, SM2, SM3, SM4, SM5)
- Stainless Steel - No Corrosion
- Option Carbon Steel Electro-less Nickel Plated
- Improved on-site durability
- Piston mis-alignment compensation
- Hinged quick reaction nut - improved operation
- Long piston stroke
- Piston over-stroke safety feature
- Max working pressure 1500 Bar (21750psi).

Tool Ref	Bolt Size		Piston Stroke mm	Hydraulic Area sq mm	Tool Load kN	QRN Dia. mm	A mm	B mm	C(1) mm	D mm	E(2) mm	Wt(2) kg
	ins	mm(3)										
SMC	5/8	16	20	1081	162	62	65	103	52	146	206	1.7
	3/4	20										
	7/8	22										
SM0	5/8	16	25	1667	250	72	80	117.5	66	146	221	2.2
	3/4	20										
	7/8	22										
	1	24										
SM1	3/4	20	30	2413	362	82	93	134	74	170	255	4.1
	7/8	22										
	1	24										
	1-1/8	27										
	1-1/4	33										
SM2	1-3/8	36	30	3417	513	87	110	145	93	186	276	5.8
	1-1/2	39										
	1-5/8	42										
	2	52										
SM3	1-3/4	45	30	5342	801	106	132	160.5	108	203	303	8.7
	1-7/8	48										
	2	52										
	2-1/4	56										
SM4	2-1/2	64	30	10409	1561	135	177	180	140	230	350	15.6
	2-3/4	72										
	3	76										
	3-1/4	85										
SM5	3-1/2	90	30	17173	2576	150	220	202	180	264	399	30.0
	3-3/4	95										
	4	100										
SM6	3-1/2	90	30	24017	3602	182	262	240	214	304	464	40.0
	4	100										

- Notes:
- 1) Dimension 'C' for guidance only. For detailed foot print details request a General Arrangement Drawing.
 - 2) Dimension 'E' for guidance only. For tool removal add 2 x piston stroke used.
 - 3) Weight excludes Quick Reaction Nut.
 - 4) Specifications may change without prior notice. For updated information request a General Arrangement Drawing.



TOPSIDE BOLT TENSIONER



Compact design covers ANSI and API Flange

- 5/8" to 4" Imperial Bolting, M16 to M100 Metric Bolting.
- COST SAVING : Only 4 'PRIMARY' tools (suffix 'P') needed to cover 1" to 3-1/2" (M27 to M90) bolt sizes.
- Only 6 'PRIMARY' tools cover 5/8" to 4" bolt sizes.
- 3 'SECONDARY' tools (suffix 'S') add range flexibility.
- Bayonet fitting Bridge with integral Nut Rotating Disc.
- Built in automatic piston mis-alignment compensation combats flange rotation.
- Maximum Piston Stroke Indicator helps prevent piston over stroking.
- Optional tool finishes available to suit budget and technical requirements, including Stainless Steel.
- Twin Port arrangement eliminated expensive 'Tee' Block hose assemblies.
- Maximum operating pressure 1500 bar.
- Improved Reliability - High cycle self energising seal arrangement.

Tool Ref	Bolt Size		Piston Stroke mm	Hydraulic Area sq mm	Tool Load kN	A mm	B mm	C mm	D(1) mm	Wt(2) kg
	ins	mm(3)								
MPR0-P	5/8	16	10	1188	178	72	88.5	49.6	132.5	1.9
	3/4	20					91.5	51.6	135.5	
	7/8	22					91.0	64.0	135.0	
MPR1-S	7/8	22	10	2000	300	87	97.5	63.5	143.5	2.8
	1	24					97.5	63.5	143.5	
	1-1/8	27					100.5	70.00	150.0	
	1-1/8	30					103.5	75.5	156.0	
MPR2-P	1	27	15	3033	455	105	108.5	75.0	160.0	3.7
	1-1/8	30					111.5	80.0	166.0	
	1-1/4	33					114.5	84.0	172.0	
	1-3/8	36					118.0	88.5	179.0	
MPR3-S	1-1/4	33	15	4533	680	117	115.0	87.0	173.5	5.3
	1-3/8	36					118.0	92.0	180.0	
	1-1/2	39					121.0	95.0	186.0	
	1-5/8	42					123.5	95.0	192.5	
MPR3.5-S	1-3/4	36	15	5000	798	131	121	110.0	182.0	7.9
	1-1/2	39					121	112.0	188.0	
	1-5/8	42					124.5	114.0	195.0	
	1-3/4	45					127.5	117.0	201.0	
MPR4-P	1-1/2	39	15	6933	1040	145.6	121.0	112.0	192.0	8.7
	1-5/8	42					124.5	109.0	198.5	
	1-3/4	45					127.5	110.0	205.0	
	1-7/8	48					130.5	110.0	211.0	
	2	52					134.0	119.0	217.5	
MPR5-P	2	52	15	12400	1860	182	134.0	119.0	220.5	12.9
	2-1/4	56					140.5	132.0	233.0	
	2-1/2	60					140.5	132.0	233.0	
	2-1/2	64					146.5	144.5	246.0	
	2-3/4	68					146.5	144.5	246.0	
2-3/4	72	152.5	159.2	258.5						
MPR6-P	2-3/4	72	20	18805	2820	234.5	178.0	166.5	298.5	29.5
	3	76					184.0	168.5	311.5	
	3-1/4	80					184.0	168.5	311.5	
	3-1/4	85					191.0	188.5	324.0	
	3-1/2	90					197.0	187.5	337.0	
MPR7-P	3-1/2	90	20	24873	3730	265	197.0	193.0	337.0	47
	3-3/4	95					203.5	225.0	349.5	
	4	100					209.0	228.0	362.0	

Notes: 1) Dimension 'D' for guidance and applies to imperial bolt sizes assuming stud protrusion above the nut=1 bolt diameter. As a general rule, for tool removal after bolt tensioning add 2 x piston stroke used.

2) Weight excludes puller sleeve and varies dependent upon Cylinder/Bridge combination.

3) For metric sizes, the imperial bridge indicated is used.

4) Specifications may change without prior notice. For updated information request a General Arrangement drawing.



FLANGE PULLING SYSTEM

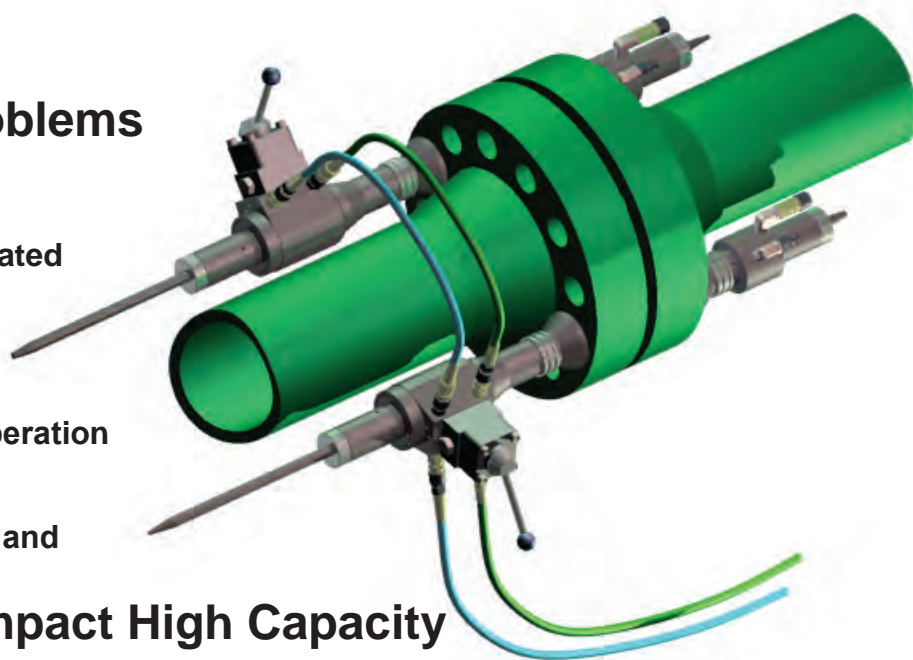
High Tensile Cable No 'Bird Nesting' Problems

High Tensile Cable eliminates 'Bird Nesting' problems associated with products using wire rope.

- Multiple configuration modes:
- Single or multiple operation
 - Individual or simultaneous operation
 - Integral or Remote valve

Reaction Clamp - Rapid set-up and decommissioning

Compact High Capacity 248kN/25 Ton



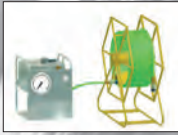
Introduction

The TRI-STAR Flange Pulling system has been developed for use on subsea flanged connections where speed, reliability and simple operation are essential. They are hydraulically operated tools being connected to a pump unit via a hydraulic harness assembly and downline.

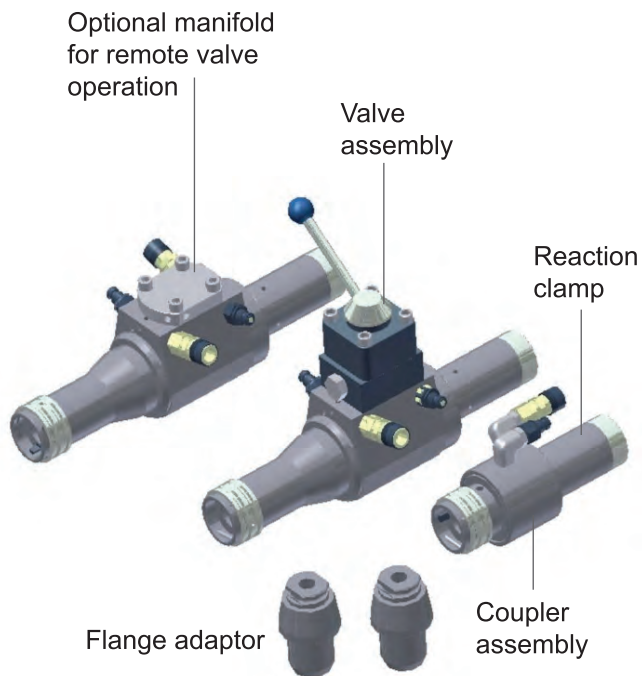
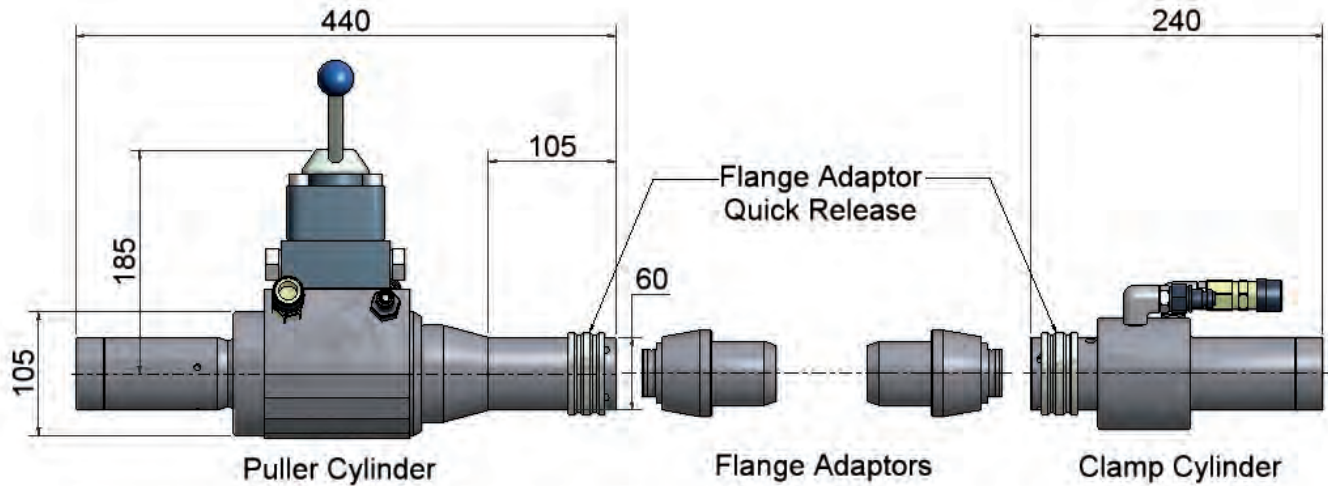
The system comprises a hydraulic puller cylinder, hydraulic reaction clamp and length of high tensile cable. The high tensile cable is placed through corresponding bolt holes on each of the flanges. The clamp cylinder is located on the cable at the back of one of the flanges and acts as a reaction point for the system. The clamp cylinder 'grips' the cable via an integral hydraulically activated and de-activated collet system. The pulling cylinder is located at the opposite end of the high tensile cable (at the rear of the opposite flange). Collets located at the front and rear of the puller cylinder alternatively 'grip' the cable as the piston in the puller cylinder extends and retracts. As the piston extends the rear collet grips the cable and the puller moves forward bringing the flanges together. The piston is then retracted and front collets grip the cable holding the puller in position. This operation is repeated until the flanges are brought together.

To bring the flanges together evenly and in alignment, 2 puller cylinders and associated clamp cylinders are normally used. Alternative arrangements are readily set-up for individual or simultaneous operation from either integral valves or remote valves. Once the flanges are brought together the clamps can be hydraulically de-activated and removed from the cable, this then allows the puller units and the cables to be removed and recovered to the surface.

Tool Ref.	Maximum Working Pressure		Maximum Load			Piston Stroke		Cable DIA.
	Bar	PSI	Tonf. Long	Tonf. Short	kN	ins	mm	mm
Puller Cylinder	700	10,000	25.0	28.0	248.0	3.0	76	18
Reaction Clamp						-	-	



- Integral Operating Valve • Optional Manifold for Remote Valve Operation
- Pre-Stress Cables provide Increased Rigidity as Joints are closed



Flange Adaptors

Unique Quick-connect/Dis-connect flange adaptors are used to assist in the alignment of flanges during the pulling operation. Sizes available for all imperial & metric bolt holes.

Valve Assembly

Valve design incorporates a centre 'hold' position, allowing the hydraulic supply/down line to be disconnected and the puller units to stay in position. This will ensure there is no separation of the joint during periods of weather downtime or bell changeovers.

Valve design also permits the pullers to be operated simultaneously or individually, allowing the operator to control the alignment of the flanges during the pulling operation.

Reaction Clamps

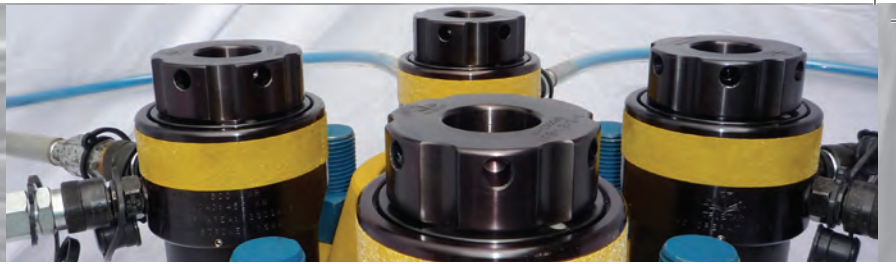
Hydraulically activated and released reaction clamps eliminate collect lock-on and allow fast application and removal of the tool.

Coupler Assembly

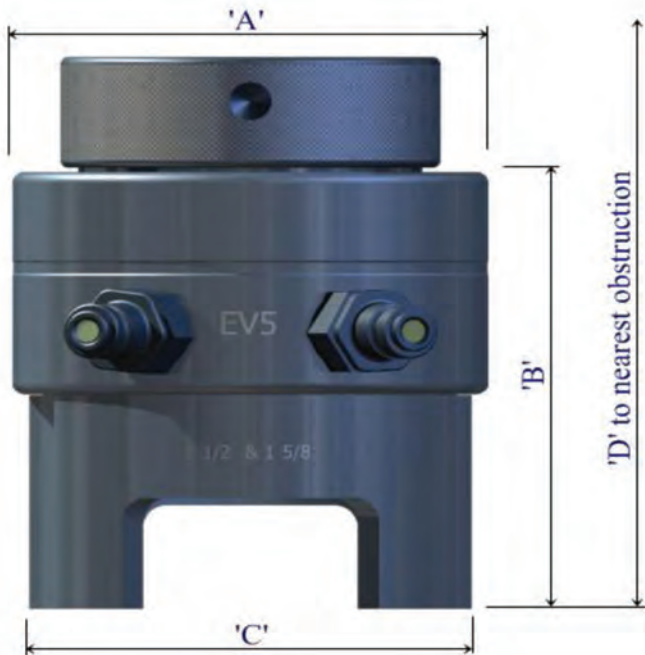
Simple 'quick disconnect' coupler system offers quick connection and removal of the harness assembly.

High Tensile Cable

18mm High Tensile Cable is used, the structure of the wire eliminates the possibility of the strands falling under load preventing 'bird nesting' from taking place. The cable is flexible over longer distances (2-3m) but becomes almost rigid over short lengths (around 12"), this aids in the alignment of flanges as they are drawn together.



EV BOLT TENSIONING TOOL



FOR COMPLETE FLEXIBILITY

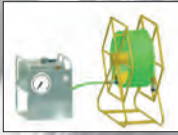
Suited to a wide range of industrial application. Whether for SINGLE OR MULTIPLE BOLT SIZE PROJECTS, the EV range enable users to select the most economical and versatile range to meet their particular requirement.

- Dual Bridge
increase ECONOMY
- 13 Tools provide flexible range
3/4" to 4" (M20 - M100)
- Select only 4 tools
TO COVER 1" to 3-1/2"

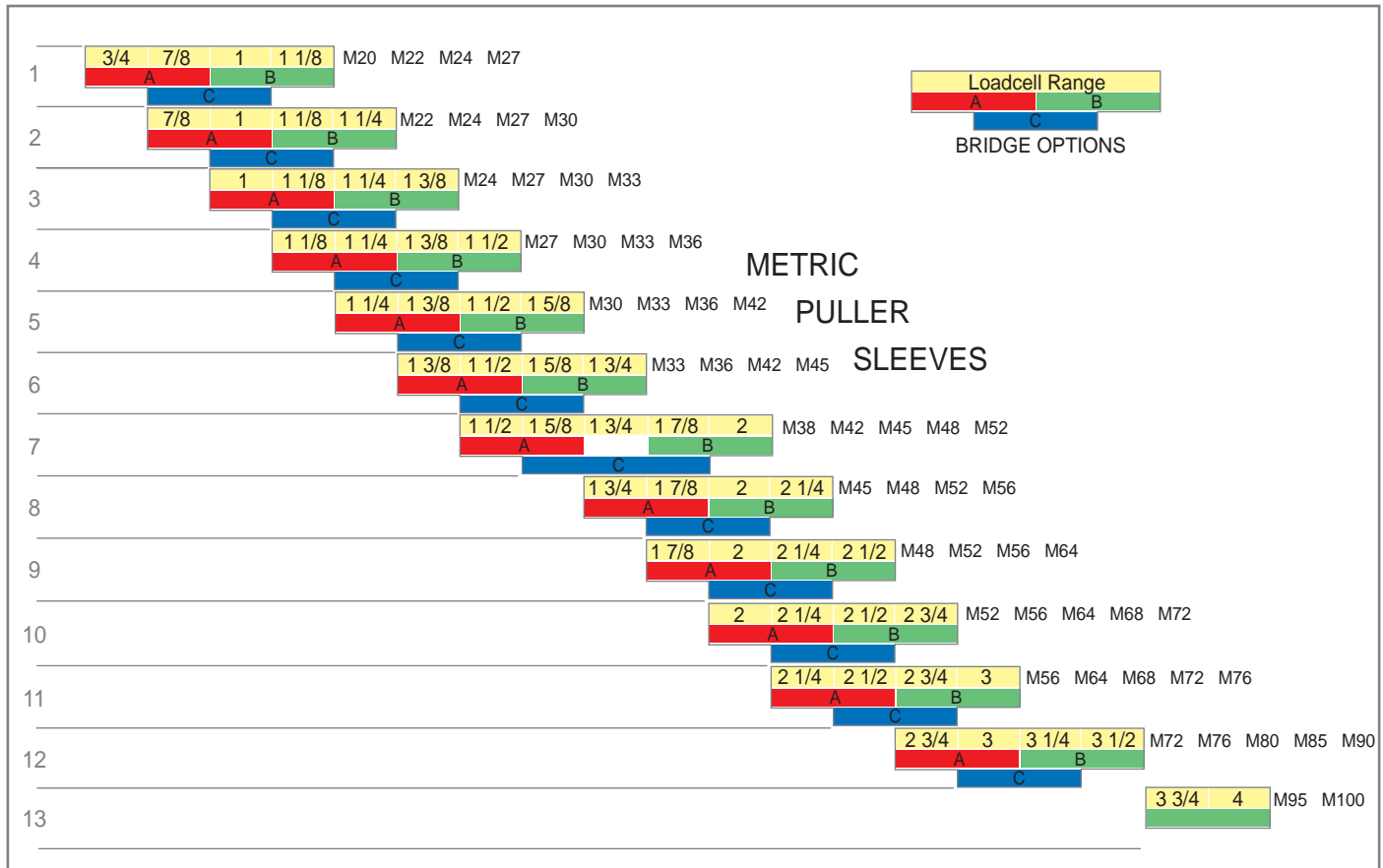


Tool Ref	Piston Stroke mm	Hydraulic Area sq mm	Tool Load kN	A mm	B mm	C(3) mm	D(1) mm	Wt (2) kg
EV1	15	1510	226	82.4	104.5	80	176	1.9
EV2	15	1990	297	90.6	111.0	85	180	3.3
EV3	15	2540	381	99.6	114.0	96	185	4.7
EV4	15	3130	469	107.6	121.0	104	196	5.7
EV5	15	3810	571	115.9	120.0	110	199	6.1
EV6	15	4581	687	124.4	125.0	118	214	8.6
EV7	15	6207	931	142.5	131.0	140	220	10.0
EV8	15	7130	1069	150.6	137.0	150	248	11.7
EV9	15	9201	1380	167.7	143.0	162	255	14.1
EV10	15	11416	1712	185.0	150.0	176	266	16.8
EV11	15	14125	2118	201.0	179.0	194	326	20.7
EV12	15	20065	3010	235.2	192.0	230	347	24.7
EV13	15	26866	4030	267.6	205.0	250	377	33.6

- Notes:
- 1) Dimension 'C' for guidance and varies considerably dependent upon bolt size and thread protrusion above the nut. For more detailed information ask for General Arrangement drawing.
 - 2) Weight excludes puller sleeve and varies dependent upon Cylinder/Bridge combination.
 - 3) Varies with bolt size, worse case shown. For detailed information ask for General Arrangement drawing.
 - 4) Specifications may change without prior notice. For updated information request a General Arrangement Drawing.



EV Range Table



For maximum economy, select the Puller Sleeve and Bridge combinations that best suit your current and future requirements.

Some examples shown here.





DPS DUAL PISTON STRUCTURAL BOLT TENSIONER

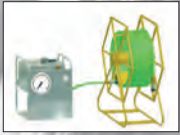


- Dual Piston design providing small diameter compact tool operating at 1500 Bar
- Ideally suited to crane slewing and foundation bolt applications
- Time saving Rapid Piston Reset suitable for multiple bolt high frequency use
- Standard tools provided for grade 10.9 structural bolting and below
- Tools for higher strength typically grade 12.9/14.9 structural bolting can be provided
- Optional bridge designs for hex and round nut applications
- Joint quality - Optional geared bridge improves bolt residual load and consistency between bolts
- Stroke counter helps monitor tool life and service intervals to ensure reliable usage.

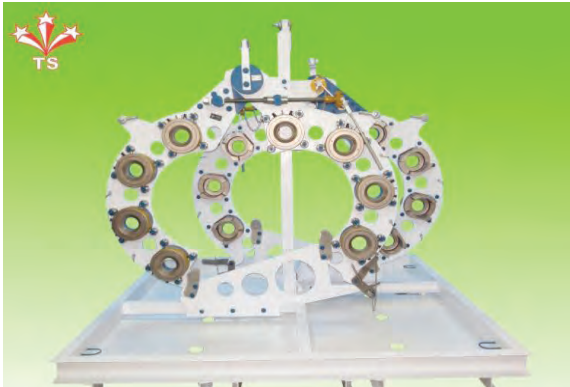
Tool Ref	Bolt Size mm	Piston Stroke mm	Hydraulic Area sq mm	Tool Load kN	A (1) mm	B(2) mm
DPS30	30	8	3228	465.60	75	230
DPS33	33	8	3840	576.00	79	237
DPS36	36	8	4562	678.52	84	244
DPS39	39	8	5401	810.08	94	291
DPS42	42	8	6197	929.60	100	301
DPS45	45	8	7249	1087.30	106	304
DPS48	48	8	8134	1220.10	113	319
DPS52	52	10	9739	1460.80	124	365
DPS56	56	10	11233	1684.90	133	364
DPS60	60	10	13060	1959.00	143	375

Notes:

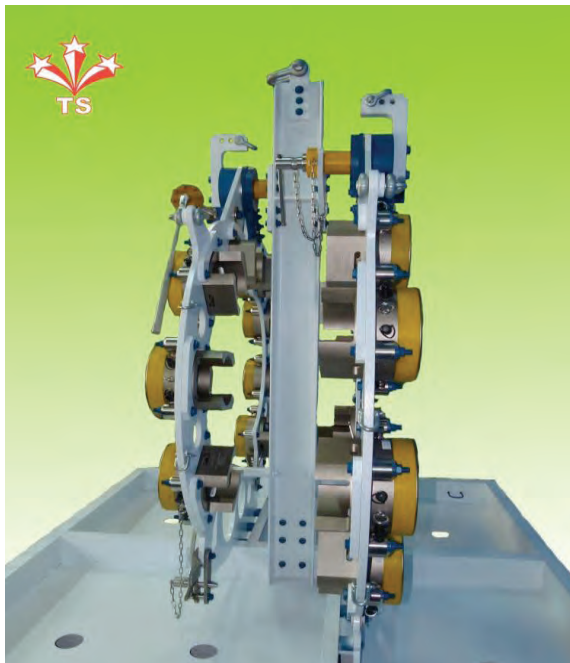
- 1) Final dimensions depend upon your specific application and bridge detail
- 2) Typical value, Tool Height depends upon your specific application and bridge used
- 3) Specifications may change without prior notice. For updated information request a General Arrangement Drawing.



SUBSEA TENSIONER TOOLS PLATES



- Easy handling and mobilities (Diver's friendly)
- Faster and economical completion of joints
- Design to fit
- Can accommodate large size tensioners
- Skid mounted for easy transportation to site
- Maintenance free



Bolt Tensioning SPEED Plates - The ULTIMATE Bolt Tensioning Fixture

TRI-STAR Industries is capable of designing and producing bolt tensioning SPEED plates for bolt tensioning applications.

SPEED plates significantly reduce set-up and operation time especially for the subsea environment where tight schedule always persist. With the introduction of our SPEED plate, divers no longer need to 'lock-in' tensioners, one at a time on each stud bolts. This time consuming task is made easier for all bolt sizes including large sized bolt tensioner e.g. 3.0" to 4.0" bolt sizes. Simply makeover the SPEED plate into position and adjust the jacking screw to allow tensioners to slide into studs. Large SPEED plates may be securely mounted on a skid base, designed to be lowered to the sea bed. Subsequently, air lifting bags are used to lift them off the skid to be aligned onto each flange for tensioning.

Concurrent 50% tightening will need only 1 set of SPEED plate, whereas concurrent 100% tightening will need 2 sets of SPEED plates, saving diving time and costs!



PUMPS AND ACCESSORIES



AIR DRIVEN TENSIONER PUMP

Max Air Inlet Pressure : 100psi / 6.9 Bar / 56 cfm
Max Working Pressure : 22,500psi / 1550 Bar
Dimension : 18" x 15" x 18.25"
Approx Wt : 40 lbs

AIR DRIVEN FLANGE PULLER PUMP

Max Air Inlet Pressure : 100psi / 6.9 Bar / 56 cfm
Max Working Pressure : 13,500psi / 930 Bar
Dimension : 18" x 15" x 18.25"
Approx Wt : 40 lbs



AIR DRIVEN TORQUE WRENCH PUMP

Max Air Inlet Pressure : 100psi / 6.9 Bar / 50 cfm
Max Working Pressure : 10,000psi / 680 Bar
Dimension : 16.55" x 9.5" x 19.8"
Approx Wt : 65 lbs



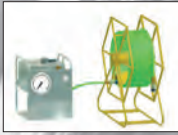
SINGLE/TWIN HOSE REEL & DOWNLINE

Standard hose downline of 210metres for Subsea applications.
Longer downline can be provided according to client's requirement.
Reels are constructed from Stainless Steel or Coated Steel Structure.



HIGH PRESSURE FITTINGS; COUPLING; GAUGES

Lead hose; inter-connecting hoses and torque wrench hoses are approved manufacturer supplied with universal threads to suit connection's requirements.
High pressure above 1500 bars hoses and fittings are also available.



HYDRAULIC TORQUE WRENCHES



Square Drive & Low Profile Hydraulic Wrenches

- Light weight design reduces operator fatigue
- 360° Swivel Fittings (Patented) - Allows hose movement without hose binding
- Safe - Hydraulic Wrenches eliminate unsafe hammer wrenches, hydraulic jacks or cranes, and other hazardous equipment currently being used to turn these nuts
- Drive Pin Design (Patented) - Reduces overall dimensions of hex head including a thinner "nose" radius. Fits more applications, including all 57 A.P.I. flanges



SU-XL / IU-XL

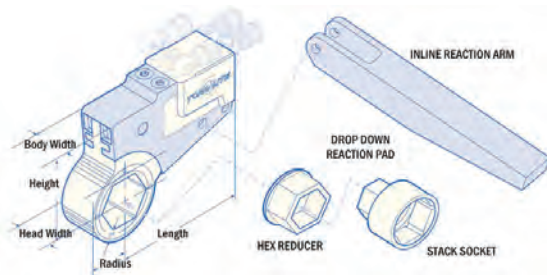
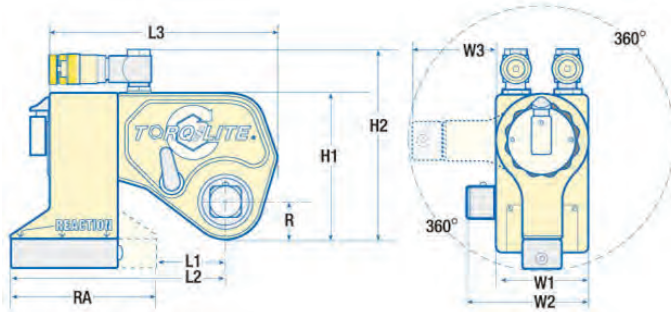
Square Drive / Low Profile Models

Capacity:

SU-XL : 60,000 ft/lbs / **IU-XL** : 50,000 ft/lbs

Square Drive / Nut A/F Range:

3/4" - 2 1/2" / 3/4" - 7 1/4"



IU-XL Series	Max. Ft. Lbs @10,000 psi	Length	Height	Body Width	Head Width	Range	Weight with Head
IU-1XL ^β	1,350	6.250"	4.000"	1.100"	0.950"	3/4" to 2"	7.25 lbs
IU-3XL	3,300	7.000"	5.750"	1.450"	*1.075" or †1.200"	1-1/4" to 2-15/16"	9.25 lbs
IU-7XL	7,200	9.750"	6.250"	1.500"	1.500"	2" to 3-7/8"	4.00 lbs
IU-10XL	10,600	9.250"	8.000"	1.950"	1.950"	2-3/8" to 4-1/4"	24.50 lbs
IU-17XL	17,100	11.250"	9.250"	1.950"	2.450"	2-3/4" to 5-3/8"	42.00 lbs
IU-25XL	25,600	11.250"	9.250"	2.900"	2.950"	3-1/2" to 5-3/4"	57.00 lbs
IU-50XL ^β	50,000	15.375"	10.500"	2.900"	2.950"	4-5/8" to 7-1/4"	85.00 lbs

* 1-1/4" to 2" Heads † 2-3/16" to 2-15/16" Heads ^β Steel Cylinders only

Information !

When selecting a torque wrench consider your un-tightening requirements. As a rule of thumb it can take up to 150% of the tightening torque to loosen.

SU-XL Series	Square Drive	Max. Ft. Lbs @10,000 psi	Weight	Reaction Area-RA	Length L1	Length L2	Length L3	Radius R	Height H1	Height H2	Width W1	Width W2	Width W3
SU-1XL	3/4"	1,400	5.25 lbs	3.685"	1.567"	5.252"	5.978"	1.200"	4.100"	5.725"	1.980"	2.730"	2.200"
SU-3XL	1"	3,300	11.25 lbs	5.335"	1.865"	7.200"	7.970"	1.260"	4.870"	6.520"	2.775"	3.600"	3.172"
SU-6XL	1-1/2"	6,000	17.20 lbs	5.460"	2.150"	7.610"	8.410"	1.953"	6.250"	7.850"	3.000"	4.475"	3.501"
SU-11XL	1-1/2"	11,300	29.90 lbs	6.500"	2.245"	8.745"	9.500"	2.062"	7.375"	9.125"	3.900"	5.350"	4.982"
SU-20XL	2-1/2"	20,100	62.00 lbs	7.525"	3.460"	10.375"	11.600"	3.000"	9.184"	10.784"	4.950"	7.450"	5.557"
SU-30XL	2-1/2"	30,200	75.00 lbs	7.525"	3.460"	10.875"	11.725"	3.125"	9.777"	11.377"	5.875"	8.375"	5.555"

SU-XL Series	Square Drive	Max. Ft. Lbs @10,000 psi	Weight	Reaction Area-RA	Length L1	Length L2	Length L3	Radius R	Height H1	Height H2	Width W1	Width W2	Width W3
SU-45	2-1/2"	46,200	145.00 lbs	7.425"	7.337"	12.537"	13.312"	3.000"	11.000"	12.600"	5.750"	8.250"	5.500"
SU-60	2-1/2"	60,000	295.00 lbs	8.781"	5.887"	14.668"	16.000"	3.750"	14.000"	15.600"	7.250"	9.750"	5.750"



HYDRAULIC & MECHANICAL FLANGE SPREADERS



ENERPAC

FSH / FSM Hydraulic & Mechanical Flange Spreader

- Unique interlocking wedge design - eliminates the risk of the wedge slipping out the joint
- Stepped spreader arm - each step can spread under full load
- Requires a very small access gap of only 6mm
- Up to 12 Ton spreading force
- Light weight, portable and easy to operate
- Single acting spring return piston for fast operation
- Safety block prevent the joint from springing closed

FSH / FSM
Hydraulic Spreader /
Mechanical Spreader

Tip Clearance / Maximum Spread
6mm / 81mm*

Maximum Spreading Force
8 - 12 Ton



Step Blocks FSB-1

Step blocks increase spreader opening to 81mm. Fits both FSH-14 and FSM-8 spreaders.



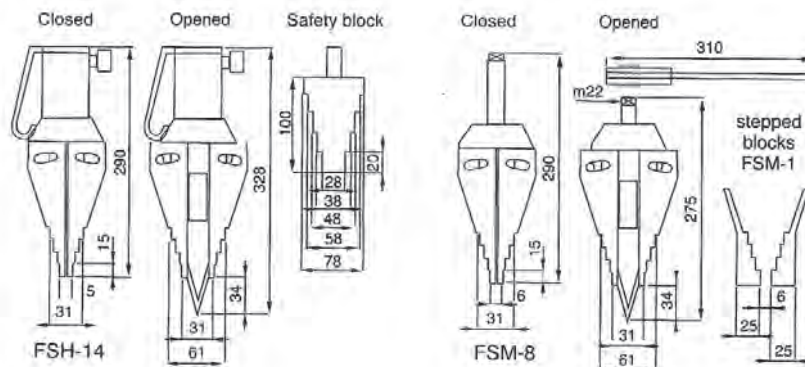
Spreader Kits

FSH hydraulic spreaders can be made up as a MAXI KIT.

The kit includes a hand pump, hoses and manifold which allows the individual operation of two spreaders from a single pump unit

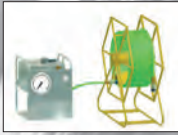


Hydraulic Flange Spreaders easily separate an ANSI flange set during maintenance operations on a gas plant



Max Lifting Force kN (Ton)	Model	Tip Clearance (mm)	Max Spread* (mm)	Type	Weight (kg)
125 12.5	FSH-14	6	81	Hydraulic	7.1
72 7	FSM-8	6	81	Manual	6.5

* Using stepped blocks FSB-1



HYDRAULIC NUT SPLITTERS



ENERPAC

Hydraulic Nut Splitters

- Compact and ergonomic design
- Lightweight and easily handled
- Angled head permits nut splitting on large flat surfaces
- Heavy duty blades can be re-ground
- Single acting piston for fast operation
- Seven tools cover the main standard nut sizes

Pump Units

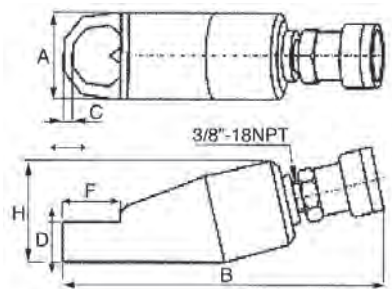
Hand, Air, Electric or Battery powered pump unit options are available for the operation of Enerpac Nut Splitters.

NC
Nut Splitter Range

Capacity:
5 - 90 Ton

Bolt Size / Nut A/F
Range:
M6 - M48 / 10 - 75MM

Caution !
Do not use on square nuts.
Maximum allowable nut
hardness to split is HRc-44



Easy removal of corroded nuts on rail-track maintenance is just one of many application examples for the Enerpac Nut Splitters.

Bolt Range	Nut A/F (mm)	Model No.	Capacity (Ton)	A (mm)	B (mm)	C (mm)	D (mm)	F (mm)	H (mm)	Weight (kg)
M6-M12	10-19	NC-1319	5	40	170	7	19	28	48	1.2
M12-M16	19-24	NC-1924	10	54	191	10	26	40	62	2
M16-M22	24-32	NC-2432	15	64	222	13	29	51	72	3
M22-M27	32-41	NC-3241	20	75	244	17	36	66	88	4.4
M27-M33	41-50	NC-4150	35	94	288	21	45	74	105	8.2
M33-M39	50-60	NC-5060	50	106	318	23	54	90	128	11.8
M39-M48	60-75	NC-6075	90	156	393	26	72	110	181	34.1



LOAD ASSURANCE

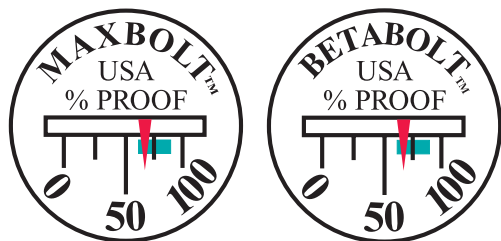


Maxbolt Load Indicating Fastener

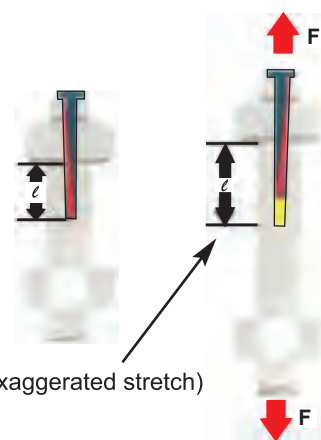
Maxbolt load indicating fasteners continuously displays the amount of tension in a bolt or stud. They offer a simple method for accurate joint assembly, and it is the only product available (for most applications) that will continuously monitor clamping force while the fastener is in service.

Maxbolt load indicating fasteners are manufactured by inserting extremely accurate and durable load monitoring devices into high quality bolts and studs. Now, even inexperienced workers can complete complex assemblies with full assurance that fasteners are at the proper tension. Maxbolt also provide in-service monitoring which will warn users of any loosening in order to avoid premature wear, unnecessary downtime, or catastrophic failure.

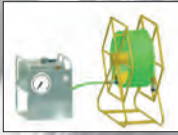
Our Maxbolt Load Indicating Fasteners comes in various shapes and sizes. It can be manufactured from standard ANSI materials to exotic materials.



Red Indicator continually displays fastener tension



Using Hooke's law ($\text{Force} = \text{Constant} \times \text{Elongation}$), a small mechanical amplifier (patent pending) continually monitors fastener elongation, converting it to tensile load and registering it on the easy-to-read scale on top of the bolt.



SPC4 Load Indicating Fastener

The SPC4 load indicating fastener allows users to install a bolted assembly with confidence. The user can constantly monitor the clamp load of any SPC4 bolted joint whether static or dynamic, by attaching a probe to the datum disc located on the end of the fastener and reading the value on a hand held battery powered digital monitor. Optional data gathering and storage of the bolted joint are available.

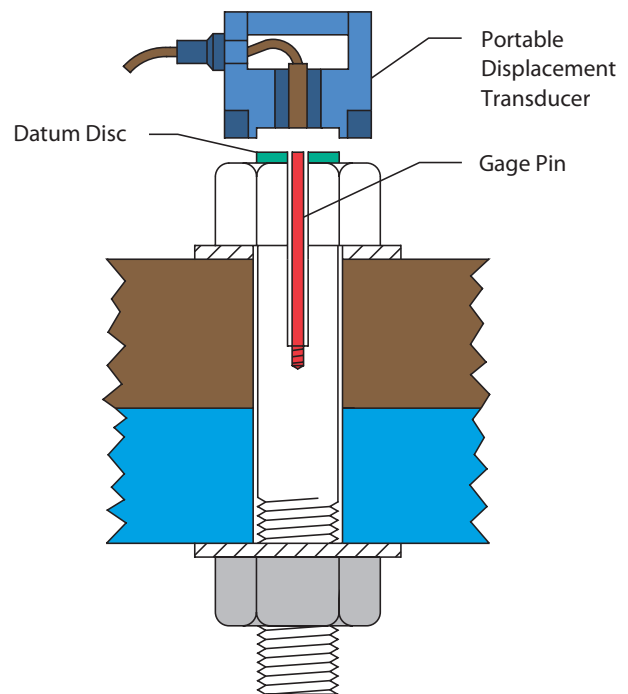
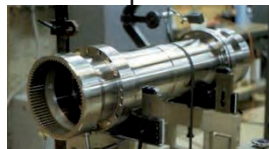
The integrity of a bolted joint is jeopardized when fasteners lose their tension. This loss of clamping force begins during assembly due to elastic interactions and joint relaxation. Self-loosening continues when the joint is put in service due to vibrations, temperature changes, shock, etc. The SPC4 joint allows the end-user to retighten only the bolts or studs that have lost their clamp load resulting in a tremendous saving of maintenance time, money, and replacement parts. For a minimal investment, the SPC4 offers maximum joint integrity with optimum performance.

The SPC4 may be manufactured to many of the ASTM, ISO, SAE, or any specific customer standards with various types of head configurations.

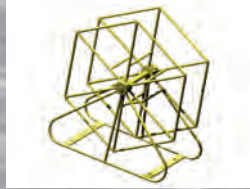


APPLICATIONS

- Oil Rigs
- Cranes / Slew Ring
- Transmission Couplings
- Nuclear Development
- Grinding Mills
- Rotating Flanges
- Autoclave
- Subsea Wellheads
- Heat Exchangers
- Rotational Equipment
- Mud Pumps
- Foundations
- High Maintenance Joints
- Critical Bolting Applications



Minimal Modification to Bolt Assures Basic Bolt Design Integrity



TRI-STAR INDUSTRIES PTE LTD
 36 Joo Koon Road, Singapore 628988
 Tel (65) 6266 3636
 Fax (65) 6265 3635 / 6265 2801
 Email sales@tristar.com.sg
 Web www.tristar.com.sg

Associated Companies

SBN INDUSTRIES SDN BHD
JOHOR FACTORY
 Tel (607) 388 2521
 Fax (607) 388 2523
 Email sales@sbnbiz.com
 Web www.sbnbiz.com

KL OFFICE
 Tel (603) 2288 1831 / 1832
 Fax (603) 2288 1833
 Email sbnkl@sbnbiz.com

SARAWAK OFFICE
 Tel (608) 565 1600
 Fax (608) 565 7180
 Email sbnmiri@sbnbiz.com

TRENGGANU OFFICE
 Tel (609) 859 7600
 Fax (609) 859 7701
 Email sbnkmm@sbnbiz.com

PT SOUTHERN TRISTAR
JAKARTA FACTORY
 Tel (62 21) 893 5162
 Fax (62 21) 893 5163
 Email sales@ptsts.com

BATAM FACTORY
 Tel (62 778) 748 2263
 Fax (62 778) 748 2262
 Email batamsales@ptsts.com

SATELLITE COATING CO LTD
CHINA FACTORY
 Email sales@satellitecoating.com

TRI STAR MIDDLE EAST INDUSTRIES LLC
DUBAI FACTORY
 Tel 971 (4) 8847 707
 Fax 971 (4) 8847 709
 Email sales@tristar-mideast.com

DIMET ANTI-CORROSION PTY LTD
PERTH FACTORY
 Tel (61) 8 9494 2151
 Fax (61) 8 9494 9206
 Email sales@dimet.asia

LINUS PRODUCTS INC
HOUSTON DISTRIBUTION CENTRE
 Tel (1 713) 466 6466
 Fax (1 713) 466 1814
 Email sales@linusproducts.com

