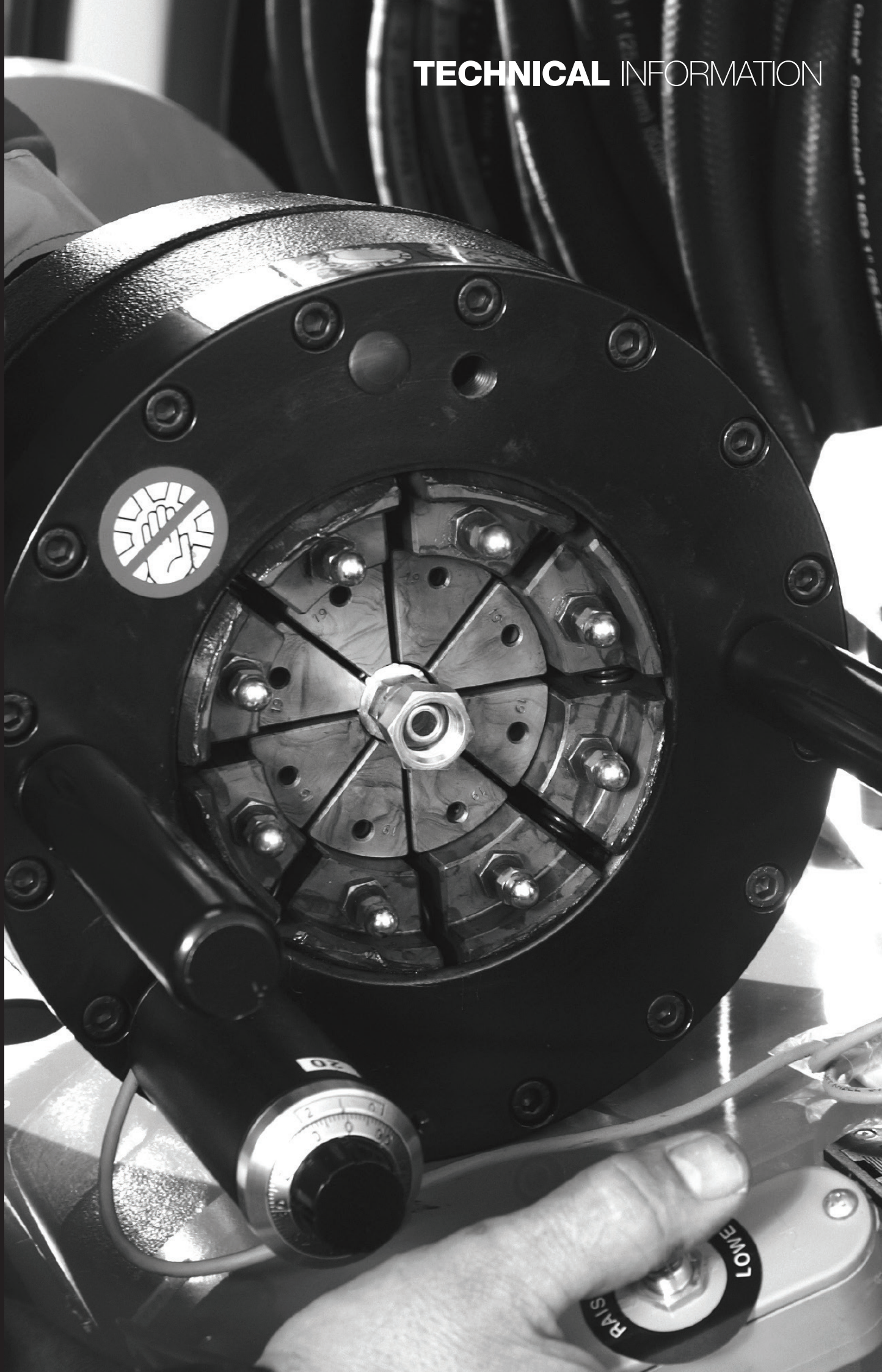
Stainless Steel Fittings

TECHNICAL INFORMATION



SECTION 1

Hydraulink Hose and Fittings

PRODUCT SELECTION

GENERAL INFORMATION

An essential step in ensuring that a hydraulic system is safe and delivers optimum performance and service life is selecting the correct fluid conveying components.

Although a lot of the work undertaken in this industry is the replacement of existing components with a duplicate it is still good practice to check the product against the application especially if the service life of the product to be replaced was not acceptable or when fault finding on an existing system.

In some cases a problem with a hose assembly or other fluid conveying products can point to an underlying problem with the system itself or possibly the products have been incorrectly specified originally.

INFORMATION - HOSE

HOSE SELECTION & SERVICE LIFE RECOMMENDATIONS

Hydraulic hose (and hose assemblies) have a finite life span that is dependent upon the actual operating conditions the assembly is subjected to. An effective way to remember hose selection criteria is to remember the word STAMPED. STAMPED is an acronym for the following:

S = Size
T = Temperature
A = Application
M = Medium or Media
P = Pressure
E = Ends
D = Delivery

1. Size - Hose Internal Diameter can be determined using the Nomographic Chart found in this section. The correct hose I.D. must be selected for the flow required. Too small an I.D. for a given volume will result in pressure drop, heat generation, fluid turbulence and possible internal tube damage. If in doubt, select the next size up.

2. Temperature. Hose selection is determined by two variables of temperature; the ambient (external) temperature and the fluid/material (internal) temperature. The hose should not be exposed to internal or external temperatures which exceed the manufacturer's stated maximum and minimum limits. Both continual and intermittent temperatures must be accommodated within the recommended limits. Extra care must be taken when specifying hoses that are routed near to (or terminate on) hot components such as engine manifolds.

3. Application. The determination of how the hydraulic hose or hose assembly will be used. Questions that may need to be answered to ensure correct hose selection could include: What is the suitable hose construction? What type of equipment is it used on? What are the end connections? Are there applicable Government or Industry standards to be satisfied? Questions that may need to be answered to ensure correct hose selection could include; What are the environmental conditions the hose will be used in? Does the hose require a special cover or armour? Are there unusual mechanical loads or excessive movement? What are the routing requirements? What are the required lengths and bend radius to satisfy those routing requirements? (Further data regarding Hose Installation Recommendation can be found in this section.)

4. Medium (or media, material) to be conveyed. Hose selection must ensure compatibility of the hose tube (liner) and outer cover with the oil, chemical or gas to be conveyed. A chemical resistance table to rubber compounds can be found in this section. Similar care to ensure compatibility should be taken when specifying end connections (hosetails and adaptors), especially those that contain o-rings.

5. Pressure. The pressure in a hydraulic system should not exceed the stated hose working pressure at any time. System pressure spikes and surges must be considered and accommodated within the stated working pressure limits. Minimum burst pressures are reference pressures, and are intended for destructive testing and design purposes only.

6. Ends. The thread portions of the hose assembly must of course, be compatible with what it is connecting to. Different thread types have different working pressures, always insure that the threaded ends selected meet or exceed the designed working pressure. Check the technical section of this catalogue for pressure ratings. Also the chemical compatibility of the end fittings must be checked as per the hose. Ensure that the ends chosen are of the type matched to the hose.

7. Delivery. When a product is actually needed is important. A decision of what product is used can need to be altered by what is available when needed. Always specify up, not down to meet a timeline. A simple change of adaptor may be all that is needed to meet a requirement.

Exposure of hose or hose assemblies to operating conditions which exceed recommended or stated limits will significantly reduce the expected service life. If in doubt, over-specify hose assemblies to ensure as much safety margin on the recommended limits as possible.

Notes;
The potential service life of products can be significantly reduced if they are constantly operating at maximum limits.
Some areas of the selection process are interrelated however the key to correct product selection is the understanding of the application and what is required of the product.

THREAD IDENTIFICATION

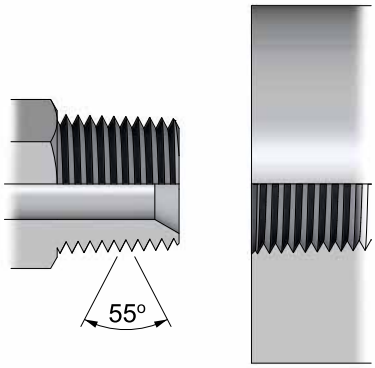
B.S.P.T. - BRITISH STANDARD PIPE TAPER

Taper: 1 in 16 by diameter

Thread Angle: 55°

The BSPT (British Standard Pipe Taper) male is intended to mate with the BSPT female only. Although the taper male will screw into BSP Parallel fixed female sockets, this is not recommended practice where avoidable as a reliable seal cannot be guaranteed.

While many BSPT males are coned 30° and will mate with BSP Parallel swivel nut females, this is not recommended practice as the taper form can deform the parallel thread and reduce the integrity of the seal.



Thread Size & TPI	Male Thread O.D. BSPT*	Female Thread I.D. BSPT
1/8-28	9.7	8.5
1/4-19	13.1	11.4
3/8-19	16.6	14.9
1/2-14	20.9	18.6
5/8-14	22.9	20.6
3/4-14	26.4	24.1
1-11	33.2	30.2
1.1/4-11	41.9	38.9
1.1/2-11	47.8	44.8
2-11	59.6	56.6

**Basic gauge plane diameter at basic gauge depth*

B.S.P.P. - BRITISH STANDARD PIPE PARALLEL

Thread Angle: 55°

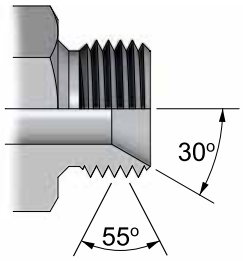
The British Standard Pipe Parallel (BSPP) male is typically coned 30° and will mate with either a BSPP swivel nut female or a BSPP female port.

BSPP female ports are normally spot faced, sealing is by either a soft metal washer, a bonded seal or a captive “O” ring.

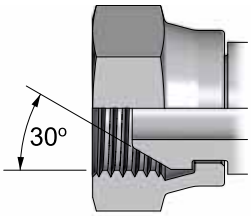
In some cases,the port is chamfered to accept an “O” ring seal. (Similar to the U.N.O. style).

Thread Size & TPI	Male Thread O.D. BSPP	Female Thread I.D. BSPP	Torque Settings BSPP nuts
1/8-28	9.7	8.5	12 Nm
1/4-19	13.1	11.4	26 Nm
3/8-19	16.6	14.9	47 Nm
1/2-14	20.9	18.6	79 Nm
5/8-14	22.9	20.6	104 Nm
3/4-14	26.4	24.1	128 Nm
1-11	33.2	30.2	160 Nm
1.1/4-11	41.9	38.9	200 Nm
1.1/2-11	47.8	44.8	270 Nm
2-11	59.6	56.6	350 Nm

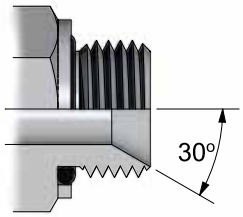
N.B. Torque values are nominal and supplied as a guide only.



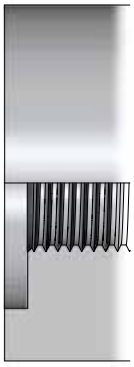
BSPP male



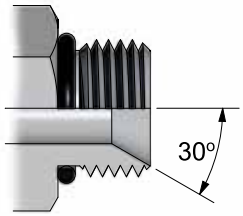
BSPP swivel nut female



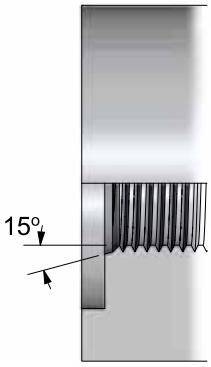
BSPP male with captive o-ring seal



BSPP female port (spot-faced)



BSPP male with o-ring seal



BSPP female port (chamfered)

N.P.T. - NATIONAL PIPE THREAD

N.P.T.F.; National Pipe Taper Fuel

N.P.S.M.; National Pipe Straight Mechanical

N.P.S.F.; National Pipe Straight Fuel

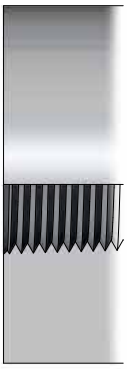
Taper: 1 in 16 by diameter.

Thread Angle: 60°

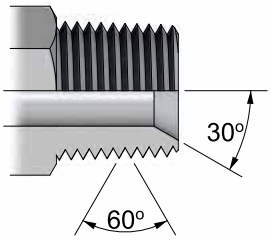
The National Pipe Taper Fuel (NPTF) male is coned 30° and will mate with the NPTF female port (taper), the National Pipe Straight Mechanical (NPSM) female (swivel nut female with 30° sealing cone), or the National Pipe Straight Fuel (NPSF) female port (parallel).

As NPTF is a “dryseal” thread, no sealing medium is required. However a sealing medium can be used to prevent thread galling.

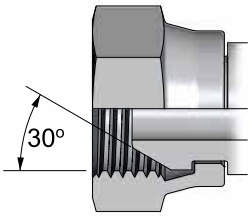
Thread Size & TPI	Male Thread O.D.	Female Thread I.D.	
	NPTF	NPTF	NPSF/SM
1/8-27	10.0	8.6	8.7
1/4-18	13.3	11.2	11.4
3/8-18	16.7	14.7	14.9
1/2-14	20.8	18.2	18.8
3/4-14	26.1	23.5	23.9
1-11.1/2	32.7	29.5	30.2
1.1/4-11.1/2	41.4	38.3	39.1
1.1/2-11.1/2	47.5	44.4	45
2-11.1/2	59.3	56.2	57



NPTF female port (taper)



NPTF male (taper)



NPSM swivel nut female

NPSF female port (parallel)

J.I.C / U.N. O-RING THREAD

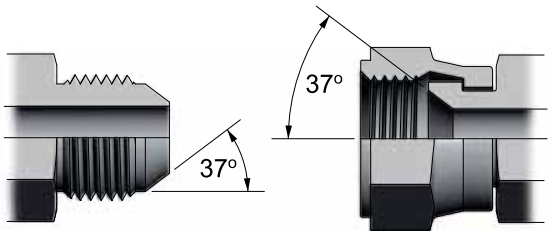
J.I.C. and U.N.“O”-Ring threads are both of the Unified National Form.

J.I.C. refers to the 37° flare type sealing face. The J.I.C. female is usually a swivel nut, but can also be a fixed socket (port) with a 37° sealing face in the base of the socket.

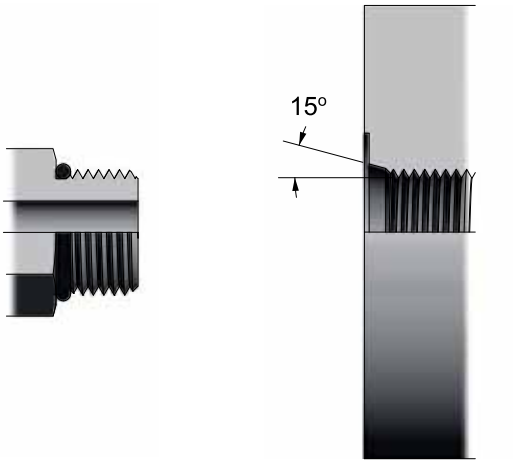
U.N.“O”-Ring refers to the thread type and “O”-Ring for sealing. The female U.N.O port has a chamfer to accept the o-ring.

Thread Size & TPI	Female Thread I.D.	Tube O.D.	Torque Settings JIC	Torque Settings UN"O"
7/16 x 20 UNF	9.8	1/4"	14 Nm	21 Nm
1/2 x 20 UNF	11.5	5/16"	19 Nm	25 Nm
9/16 x 18 UNF	13.0	3/8"	30 Nm	34 Nm
3/4 x 16 UNF	17.4	1/2"	50 Nm	72 Nm
7/8 x 14 UNF	20.3	5/8"	80 Nm	100 Nm
1 1/16 x 12 UN	24.8	3/4"	130 Nm	176 Nm
1 3/16 x 12 UN	28.2	7/8"	140 Nm	220 Nm
1 5/16 x 12 UN	31.2	1"	156 Nm	290 Nm
1 5/8 x 12 UN	39.2	1.1/4"	188 Nm	350 Nm
1 7/8 x 12 UN	45.5	1.1/2"	268 Nm	460 Nm
2 1/2 x 12 UN	61.5	2"	346 Nm	540 Nm

N.B. Torque values are nominal and supplied as a guide only.



JIC male **JIC swivel nut female**

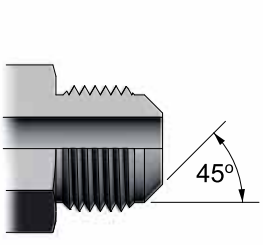


UNO male **UNO female port (chamfered)**

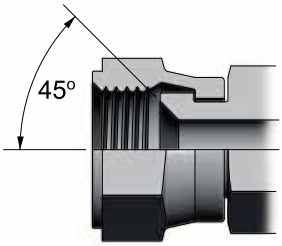
THREAD IDENTIFICATION

S.A.E. - SOCIETY OF AUTOMOTIVE ENGINEERS

This system utilises the U.N. thread series and a 45° flare sealing face. Primarily used in the automotive and refrigeration industries.



SAE male



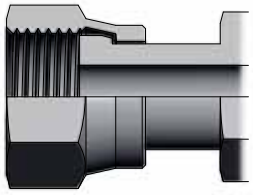
SAE swivel nut female

Thread Size & TPI	Tube O.D.	Female Thread I.D.
7/16-20	1/4"	9.8
1/2-20	5/16"	11.4
5/8-18	3/8"	14.3
11/16-16	7/16"	16
3/4-16	1/ 2"	17.5
7/8-14	5/8"	20.5
1.1/16-14	3/4"	24.8
1.1/4-12	7/8"	30.1
1.3/8-12	1"	33.2

O.R.F.S. - O-RING FACE SEAL

This system uses an “O”-Ring for sealing. The “O”-Ring is housed in the face of the male and is compressed by the face of the female on connection. Connecting threads are U.N. form.

ORFS male



ORFS swivel nut female

Thread Size & TPI	Female Thread I.D.	Tube O.D.	"O"-ring size	Torque Settings *
9/16-18 UNF	12.8	1/4"	5/16x1/16	14-16 Nm
11/16-16 UN	16.0	3/8"	3/8x1/16	24-27 Nm
13/16-16 UN	19.1	1/2"	1/2x1/16	43-47 Nm
1-14 UN	23.5	5/8"	5/8x1/16	60-69 Nm
1.3/16-12UN	26.1	3/4"	3/4x1/16	90-95 Nm
1.7/16-12 UN	34.2	1"	15/16x1/16	125-135 Nm
1.11/16-12 UN	40.6	1.1/4"	1.3/16x1/16	170-190 Nm
2-12 UN	48.0	1.1/2"	1.1/2x1/16	200-225 Nm

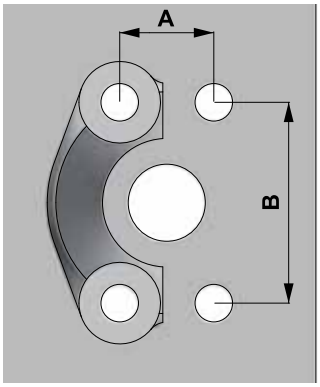
N.B. Torque values are nominal and supplied as a guide only.

S.A.E. O-RING FLANGES (SAE - J518)

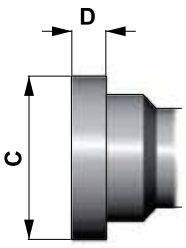
These connections utilise an “O”-Ring for sealing and are widely used for connecting to pump and motor parts as well as end terminations for pipe runs.

The “O”-Ring is housed in the flange head face and seals on a flat face female port, the flange is held in place by two clamp halves (or a one piece clamp) which are secured by four bolts.

SAE flanges are available in two pressure classes: **Standard Series, Code 61**, which goes to 5000 psi (dependent on size), and the **High Pressure Series, Code 62**, which is rated to 6000 psi for all sizes.



SAE flange clamp / port bolt spacing



SAE flange head dimensions

Nominal Flange Size	A (mm)		B (mm)		C (mm)		D (mm)	
	Code 61	Code 62	Code 61	Code 62	Code 61	Code 62	Code 61	Code 62
1/2	17.48	18.24	38.1	40.49	30.18	31.75	6.75	7.75
***5/8**	19.8	-	42.90	–	34.0	–	6.73	–
3/4	22.23	23.80	47.63	50.80	38.10	41.28	6.73	8.76
1	26.19	27.76	52.37	57.15	44.45	47.63	8.0	9.53
1.1/4	30.18	31.75	58.72	66.68	50.80	53.98	8.0	10.29
1.1/2	35.71	36.50	69.85	79.38	60.33	63.50	8.0	12.57
2	42.88	44.45	77.77	96.82	71.42	79.38	9.53	12.57

Nominal Flange Size	Pressure Rating		"O"-ring size		UNC Bolt size		Bolt torque	
	Code 61	Code 62	Code 61 and 62	AS568A number	Code 61	Code 62	Code 61	Code 62
1/2	5000 psi	6000 psi	3/4x1/8	210	5/16x1.1/4	5/16x1.1/4	20-25 Nm	20-25 Nm
3/4	5000 psi	6000 psi	1x1/8	214	3/8x1.1/4	3/8x1.1/2	28-40 Nm	34-45 Nm
1	5000 psi	6000 psi	1.5/16x1/8	219	3/8x1.1/4	7/16x1.3/4	37-48 Nm	56-68 Nm
1.1/4	4000 psi	6000 psi	1.1/2x1/8	222	7/16x1.1/2	1/2x1.3/4	48-62 Nm	85-102 Nm
1.1/2	3000 psi	6000 psi	1.7/8x1/8	225	1/2x1.1/2	5/8x2.1/4	62-79 Nm	158-181 Nm
2	3000 psi	6000 psi	2.1/4x1/8	228	1/2x1.1/2	3/4x2.3/4	73-90 Nm	271-294 Nm

**The 5/8* size flange is not part of the SAE`standard. It is included in the J.I.S. standards and is used by Komatsu and other O.E.M's.*

N.B. Torque values are nominal and supplied as a guide only

Caterpillar flanges used on XT3 hose are the same as the SAE Code 61, XT5 flanges have the same diameter as the SAE Code 62 but are thicker in the flange head.

French Gaz (Poclain) flanges are completely different to, and will not interchange with the SAE flanges.

J.I.S. - JAPANESE INDUSTRIAL STANDARDS

Japanese Industrial Standards (J.I.S.) incorporate B.S.P. and metric threads as well as flanges in their connection standards.

Taper Threads:

Type R; BSPT Male *(Identical to BSP standard)*

Parallel Threads:

Type G; BSPP Male *(Identical to BSP standard)*

Type C; BSPP Swivel Nut Female *(Identical to BSP standard - for thread data please refer to BSPP section)*

Type F; BSPP Swivel Nut Female, 30° Flare Seat

Type M; Metric, Male, 30° Cone

Type MF; Metric, Swivel Nut Female, 30° Flare Seat

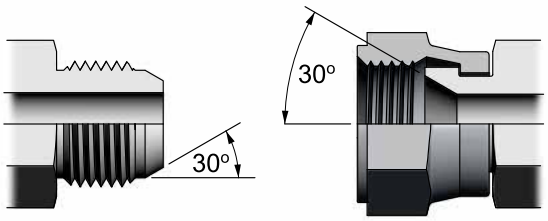
"O"-Ring Flanges:

Type I; Equivalent to Code 61 *(Identical to SAE standard)*

Type II; Equivalent to Code 62 *(Identical to SAE standard)*

THREAD SPECIFICATIONS			
Metric Threads (J.I.S)		Komatsu Threads (Metric)	
14-1.5*	12.5	**14-1.5***	12.5
18-1.5*	16.5	**18-1.5***	16.5
22-1.5*	20.5	**22-1.5***	20.5
27-2.0	25	**24-1.5**	22.5
33-2.0	31	**30-1.5**	28.5
42-2.0	40	**33-1.5**	31.5
50-2.0	48	**36-1.5**	34.5
60-2.0	58	**42-1.5**	40.5

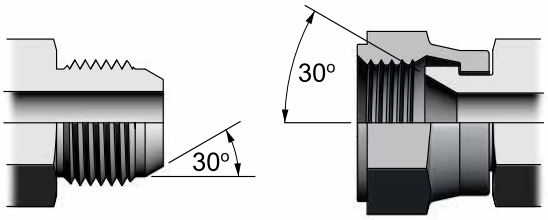
** denotes interchange sizes between JIS and Komatsu.*



Type F JIS male

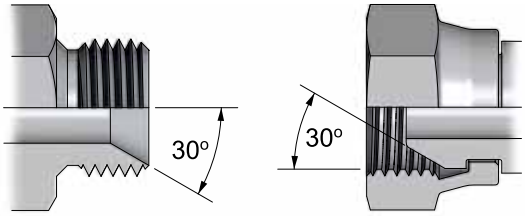
For thread data please refer to BSPP section

Type F JIS swivel nut female



Type MF JIS male

Type MF JIS swivel nut female



Type M JIS male

Type M JIS swivel nut female

D.I.N. METRICS 24° CONE SYSTEM

The D.I.N. System allows for the connection of hose assembies and tube in three main pressure series:

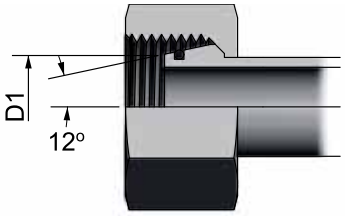
Series LL;	Extra Light, up to 100 bar
Series L;	Light up to 250 bar
Series S;	Heavy up to 640 bar

The pressure ranges are determined by the tube O.D. and the thread size e.g. a 12mm light coupling has an 18mm thread O.D. whereas a 12mm heavy coupling has a 20mm O.D. thread.

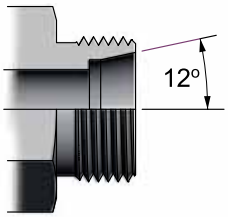
N.B: Rated coupling pressures are subject to the design pressures of the tube or hose being used.

Tubing is connected to the D.I.N. Male by the use of a cutting ring and nut. Hose assemblies can be connected by swivel nut females having either a spherical seal, 24° cone seal (can be fitted with “O”-Ring), or a standpipe with cuttting ring and nut. Hose can also be connected directly to tube by use of a hose tail with the D.I.N. Male form

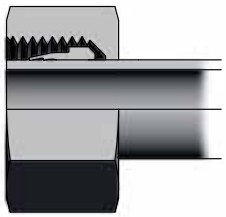
The male form will accept all three female styles shown (right).



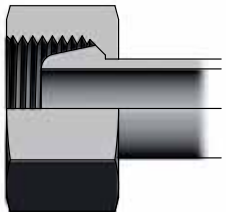
DIN 24° cone female with o-ring



DIN 24° cone male



DIN cutting ring and nut on tube



DIN female swivel nut with spherical seat

THREAD SPECIFICATIONS LIGHT (L) SERIES			
Thread O.D. & Pitch	Female Thread I.D.	Diameter D1 (mm)	Tube O.D.(mm)
M12-1.5	10.5	7.2	6
M14-1.5	12.5	9.2	8
M16-1.5	14.5	11.6	10
M18-1.5	16.5	13.8	12
M22-1.5	20.5	16.8	15
M26-1.5	24.5	19.8	18
M30-2.0	28	23.8	22
M36-2.0	34	29.8	28
M45-2.0	43	37.2	35
M52-2.0	50	44.2	42

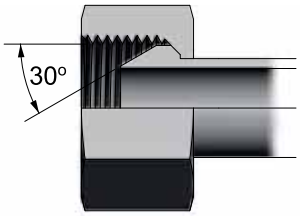
THREAD SPECIFICATIONS HEAVY (S) SERIES			
Thread O.D. & Pitch	Female Thread I.D.	Diameter D1 (mm)	Tube O.D.(mm)
M14-1.5	12.5	7.2	6
M16-1.5	14.5	9.2	8
M18-1.5	16.5	11.6	10
M20-1.5	18.5	13.8	12
M22-1.5	20.5	15.8	14
M24-1.5	22.5	17.8	16
M30-2.0	28	22	20
M36-2.0	34	27	25
M42-2.0	40	32	30
M52-2.0	50	40	38

** N.B. Diameter D1 is nominal and may vary between manufacturers.*

D.I.N. METRICS 60° CONE SYSTEM

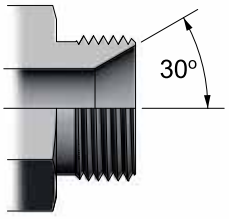
This series utilises a 60° cone seating angle and is used for the connection of hose assemblies and tube. It differs from the 24° series in that the threads are predominately 1.5mm pitch and there is no light or heavy pressure ranges.

The D.I.N. 60° male will accept the universal (spherical seat) female, a 60° coned female and tube fitted with a cutting ring and nut.

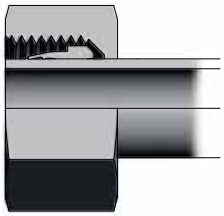


DIN 60° cone female

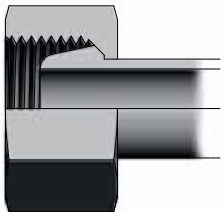
THREAD SPECIFICATIONS		
Thread O.D. & Pitch	Female Thread I.D.	Tube O.D.(mm)
M10-1.0	9.0	5
M12-1.5	10.5	6
M14-1.5	12.5	8
M16-1.5	14.5	10
M18-1.5	16.5	12
M22-1.5	20.5	15
M26-1.5	24.5	18
M30-1.5	28.5	22
M38-1.5	36.5	28
M45-1.5	43.5	35
M52-2.0	56.5	42



DIN 60° cone male



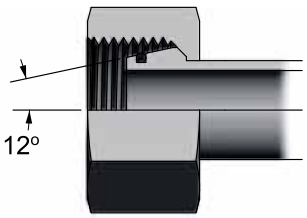
DIN cutiing ring and nut on tube



DIN female swivel nut with spherical seat

I.S.O. METRICS (INTERNATIONAL STANDARDS ORGANISATION)

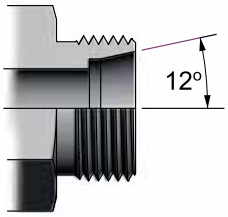
The I.S.O. series of couplings is similar to the D.I.N. light and heavy in function. The male has a 24° included angle sealing cone and a recessed counter bore for locating the tube when used in conjunction with a cutting ring and nut. The male will also accept a swivel nut female with either a cone or a spherical seal.



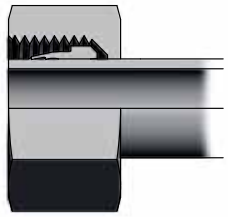
ISO (24° cone) female with o-ring

THREAD SPECIFICATIONS		
Thread O.D. & Pitch	Female Thread I.D.	Tube O.D.(mm)
M12-1.0	11.0	6
M14-1.5*	12.5	8
M16-1.5*	14.5	10
M18-1.5*	16.5	12
M20-1.5	18.5	14
M22-1.5*	20.5	15
M24-1.5**	22.5	16
M27-1.5	25.5	18
M30-1.5	28.5	22
M33-1.5	31.5	25
M36-1.5	34.5	28
M39-1.5	37.5	30
M42-1.5	40.5	32
M45-1.5	43.5	35
M48-1.5	46.5	38
M52-1.5	50.5	40

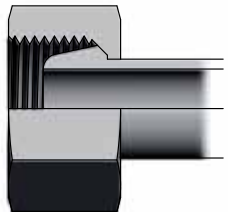
** Interchange with D.I.N. Light*
*** Interchange with D.I.N. Heavy*



ISO (24° cone) male



ISO cutting ring and nut on tube



ISO female swivel nut with spherical seat

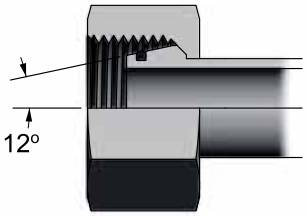
FRENCH METRICS (GAZ & MILLIMETRIQUE SERIES)

The series are similar to the D.I.N. 24° type where the male has a 24° included angle sealing cone and a recessed counterbore for locating the tube.

The male will accept a cutting ring and nut for use with tube or a swivel nut female with either a cone or spherical seal.

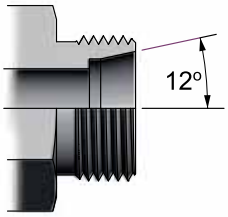
The Gaz and Millimetrique series are identical in all respects except for the O.D. of the tube:

- Gaz series uses fractional number O.D. metric tubing.
- Millimetrique series uses whole number O.D. metric tubing.

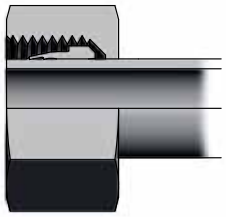


French 24° cone female with o-ring

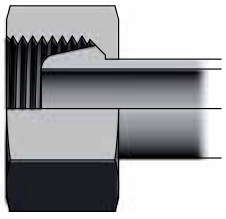
THREAD SPECIFICATIONS LIGHT (L) SERIES			
Thread O.D. & Pitch	Female Thread I.D.	Diameter GAZ	Diameter Millimetrique
M12-1.0	11.0	-	6
M14-1.5	12.5	-	8
M16-1.5	14.5	-	10
M18-1.5	16.5	-	12
M20-1.5	18.5	13.25	14
M22-1.5	20.5	-	15
M24-1.5	22.5	16.75	16
M27-1.5	25.5	-	18
M30-1.5	28.5	21.25	22
M33-1.5	31.5	-	25
M36-1.5	34.5	26.75	28
M39-1.5	37.5	-	30
M42-1.5	40.5	-	32
M45-1.5	43.5	33.5	35
M48-1.5	46.5	-	38
M52-1.5	50.5	42.25	40
M54-2.0	52.0	-	45
M58-2.0	56.0	48.25	-



French 24° cone male



Cutting ring and nut on tube

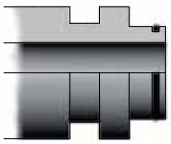


French female swivel nut with spherical seat

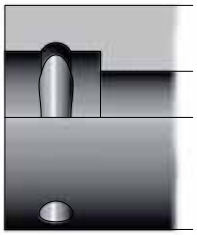
STAPLE-LOK COUPLINGS

Originally designed in Germany for underground mining equipment, the Staple-lok requires no spanners for connection or disconnection. The male and female are pushed together and held with a retaining staple or “U” clip.

Sealing is achieved by the captive “O”-Ring located on the male spigot. The female can either be fixed or swivel type. The coupling is not designed to swivel under pressure.

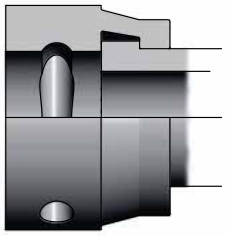


Staple-lok male



Staple-lok fixed female

THREAD SPECIFICATIONS					
Coupling Dash Size	Imperial Size	Male O.D. inch	Male O.D. mm	Female I.D. inch	Female I.D. mm
-4	1/4	0.58	14.8	.59	15.0
-6	3/8	0.78	19.8	.79	20.0
-8	1/2	0.94	23.9	.95	24.1
-12	3/4	1.13	28.8	1.14	29.0
-16	1	1.53	38.9	1.54	39.1
-20	1.1/4	1.80	45.7	1.81	46.0
-24	1.1/2	2.16	54.9	2.17	55.1
-32	2	2.52	64.0	2.53	64.3



Staple-lok swivel female

Staple-lok staple

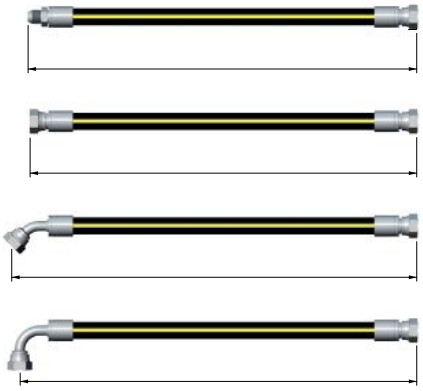
Hydraulink
Hose and Fittings

HOSE ASSEMBLY MEASUREMENT

STRAIGHT HOSE ASSEMBLY LENGTH

Overall hose assembly lengths are determined by measuring the centreline length between the coupling end faces for straight couplings, or through the sealing face centreline for angled couplings (examples to right).

Sufficient length allowance should be made to compensate for hose contraction and expansion under operating procedures.



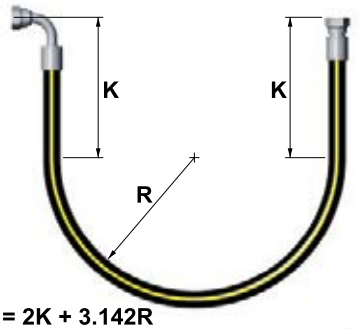
BENT HOSE ASSEMBLY LENGTH

For installations that require a 180° bend in the hose assembly, the overall length can be calculated as follows:

Static Installations

To avoid localised concentration of bending strain on the hose couplings, a free distance (K) of hose should be designed into the length of each assembly. Distance “K” includes length of coupling and adaptor (if used). Dimension “R” should not be less than the manufacturer’s recommended bend radius for the hose used. Refer to chart below for “K” dimensions of hoses with I.D. from 3/16” to 2”.

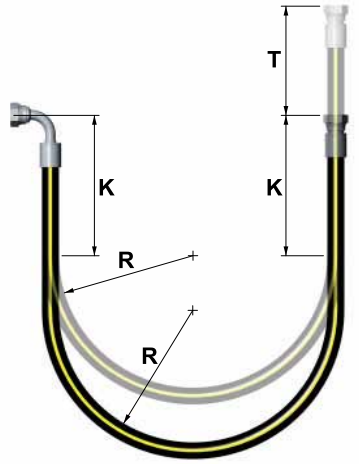
Hose I.D.	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	1.1/4	1.1/2	2
K (mm)	110	130	130	160	180	210	210	260	260	260	310



Length = 2K + 3.142R

Dynamic Installations

When a hose assembly is subjected to relative motion between the two end couplings, additional hose length is required to accomodate the travel distance. In the diagram (right) “T” represents the amount of travel.



Length = 2K + 3.142R + T

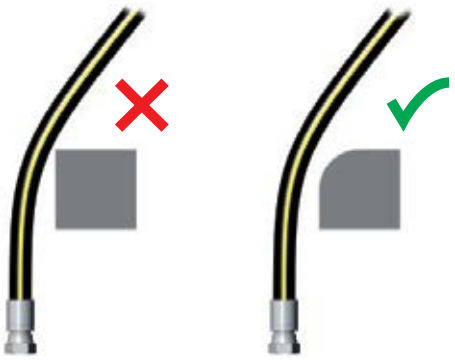
Off-Set Angle Measurement

Place hose assembly in line of sight position with coupling furthest away facing upwards. Determine off-set angle by comparing relative position of closest coupling to the far coupling in a clockwise direction.

HOSE INSTALLATION RECOMMENDATIONS

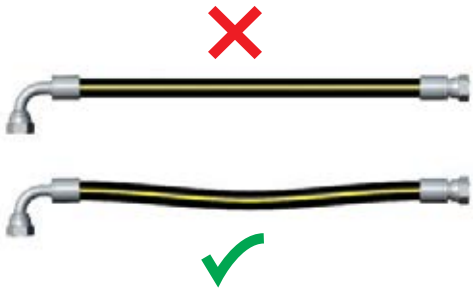
1. Hose Protection
Protect the hose cover from damage such as abrasion, erosion, snagging, and cutting. Where possible, route hose to reduce abrasion from hose rubbing other hose or objects that may abrade it (Fig. 1). Special abrasion-resistant hoses and hose guards are available for additional protection. Special consideration may also need to be given to hose assemblies near heat sources.

Fig. 1



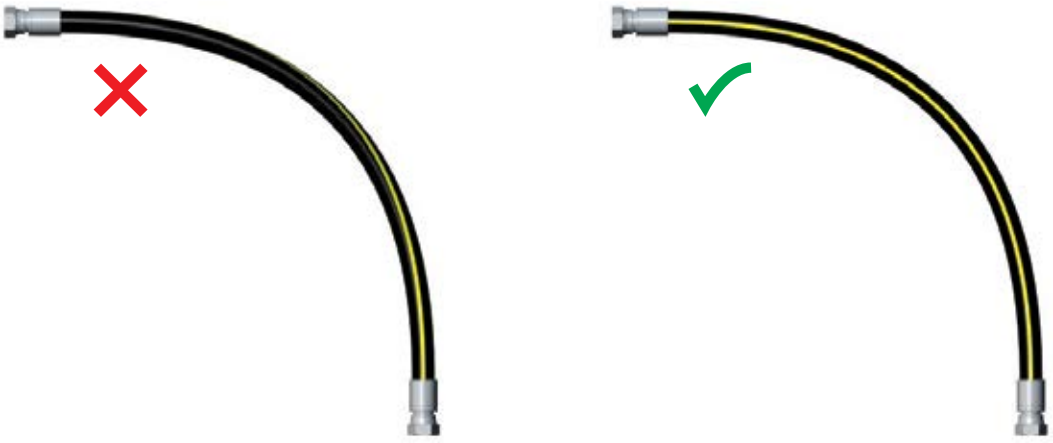
2. Hose And Machine Tolerances
Avoid tension on hose assemblies and adaptors. Design hose to allow for changes in length due to machine motion and tolerances (Fig. 2). Failure to do so may result in seal or assembly failure.

Fig. 2



3. Torsional Twist
Do not transfer torque to hose while installing. This transfer of torque can result in torsional twist, which may result in premature hose assembly failure. Use swivel type couplings or adaptors for ease of alignment as needed to prevent twisting during installation. Use the brand lay-line as a guide to ensure the hose is not pre-loaded with torsional twist when installed (Fig. 3).

Fig. 3



4. Minimum Bend Radius
The minimum bend radius for hose supplied by Hydraulink is detailed in this catalogue. Routing at less than minimum bend radius is not recommended and may reduce hose life.

Prevent sharp bending at the hose/fitting juncture (Fig. 4a). Unnecessary stress at this point may result in leaking, hose rupturing, or the hose assembly blowing apart.

Stress at this point can be minimised by ensuring adequate hose length (Fig. 4b), or by use of angled adaptors and couplings (Fig 4c).

Fig. 4a

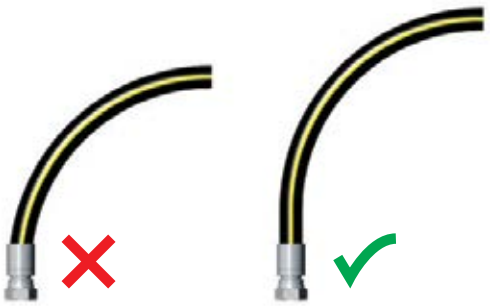


Fig. 4b

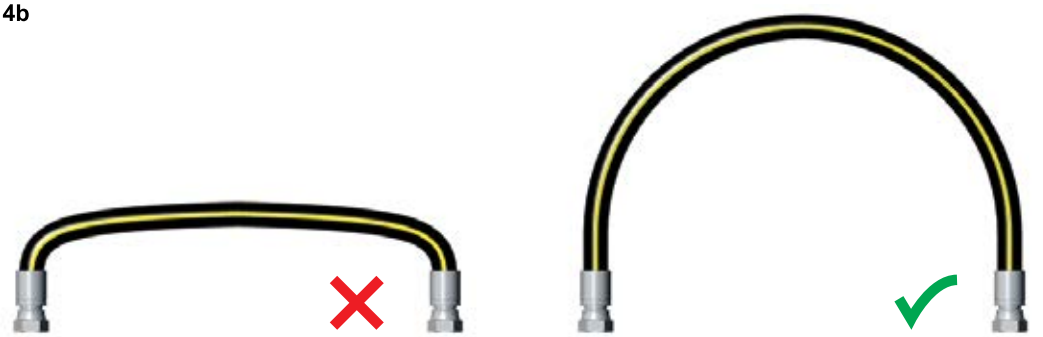


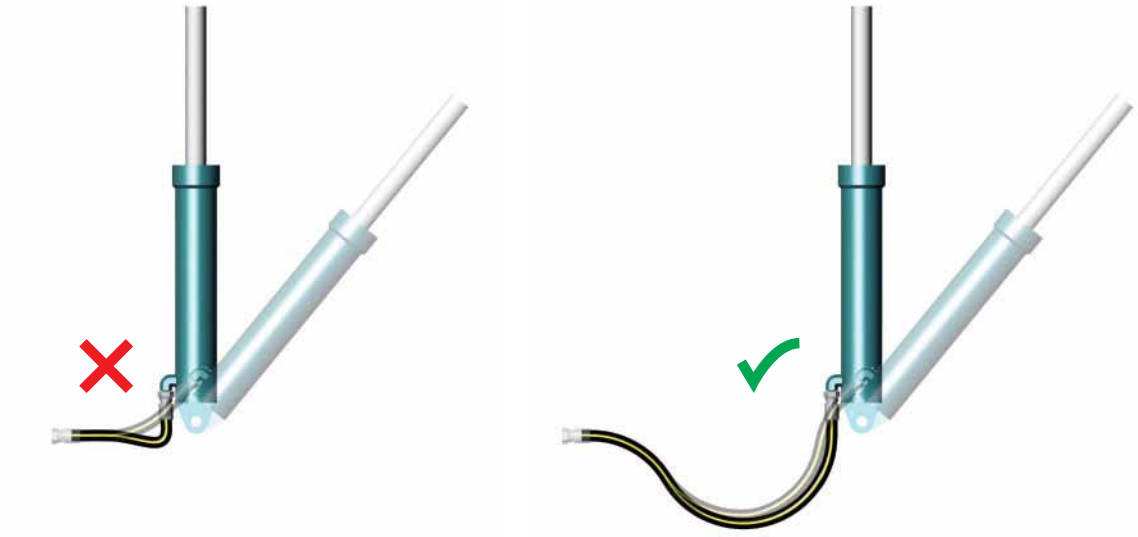
Fig. 4c

5. Hose Length Change
Hydraulic hose can expand longitudinally when pressurised, and this hose length change must be considered when specifying or installing hose assemblies (Fig. 5) When clamping hose lengths, always place clamps to avoid stressing the fitting end.

Fig. 5

6. Relative Movement
When specifying or installing hoses that have movement relative to each other, provide adequate hose length to absorb the required movement and prevent bends occuring that are smaller than the minimum bend radius (Fig. 6a).

Fig. 6a



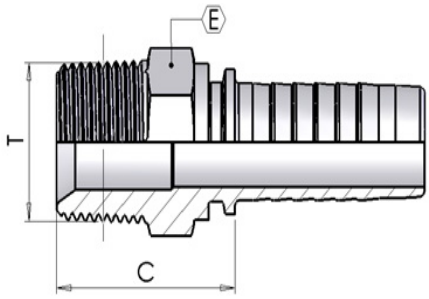
STAINLESS STEEL FITTINGS

SECTION 20

SWAGETAILS

SS15

BSPT MALE STRAIGHT
BSP TAPERED MALE STRAIGHT

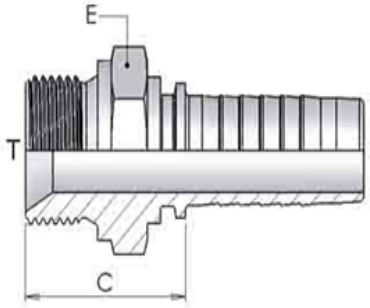


Part Number	BSPT Male Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Hex A/F (E)	Cutoff - C
SS15-1212	3/4-14	3/4	19	12	30	39
SS15-1616	1-11	1	25.4	16	36	47
SS15-0404	1/4-19	1/4	6.4	04	17	28
SS15-0604	3/8-19	1/4	6.4	04	19	28
SS15-0606	3/8-19	3/8	9.5	06	19	29.5
SS15-0806	1/2-14	3/8	9.5	06	22	29.5
SS15-0808	1/2-14	1/2	12.7	08	22	29.5
SS15-1208	3/4-14	1/2	12.7	08	22	29.5

SS12

BSPP MALE STRAIGHT
BSP 60° CONE MALE STRAIGHT

- ISO 12151-6

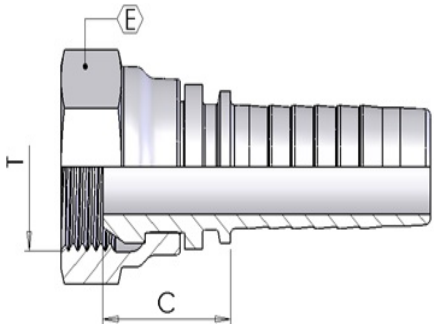


Part Number	BSPP Male Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Hex A/F (E)	Cutoff - C
SS12-0404	1/4-19	1/4	6.4	04	19	26.5
SS12-0606	3/8-19	3/8	9.5	06	22	29.5
SS12-0808	1/2-14	1/2	12.7	08	27	29.5
SS12-1212	3/4-14	3/4	19	12	32	35.5

SS01

BSP FEMALE STRAIGHT
BSP 60° CONE FEMALE SWIVEL NUT STRAIGHT

- ISO 12151-6

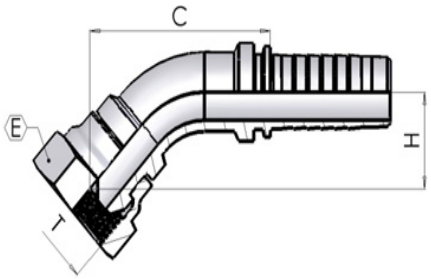


Part Number	BSPP Female Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Hex A/F (E)	Cutoff - C
SS01-0404	1/4-19	1/4	6.4	04	19	16
SS01-0406	1/4-19	3/8	9.5	06	19	16
SS01-0604	3/8-19	1/4	6.4	04	22	17.5
SS01-0606	3/8-19	3/8	9.5	06	22	18
SS01-0608	3/8-19	1/2	12.7	08	22	19.3
SS01-0806	1/2-14	3/8	9.5	06	27	19
SS01-0808	1/2-14	1/2	12.7	08	27	19
SS01-1010	5/8-19	5/8	15.9	10	30	20.8
SS01-1208	3/4-14	1/2	12.7	08	32	22.5
SS01-1212	3/4-14	3/4	19	12	32	24
SS01-1616	1-11	1	25.4	16	41	27.5

SS60

BSP FEMALE 45° ELBOW
BSP 60° CONE FEMALE SWIVEL NUT 45° ELBOW

- ISO 12151-6

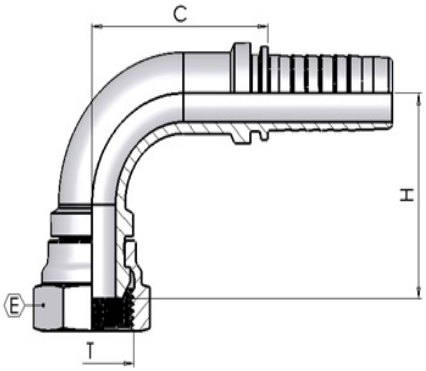


Part Number	BSPP Female Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Hex A/F (E)	Drop - H	Cutoff - C
SS60-0404	1/4-19	1/4	6.4	04	19	15.5	46.5
SS60-0606	3/8-19	3/8	9.5	06	22	20.6	62.1
SS60-0808	1/2-14	1/2	12.7	08	27	22.3	67.8
SS60-1212	3/4-14	3/4	19.0	12	32	27.1	102.1
SS60-1616	1-11	1	25.4	16	41	36.6	125.6

SS51

BSP FEMALE 90° ELBOW
BSP 60° CONE FEMALE SWIVEL NUT 90° ELBOW

- ISO 12151-6

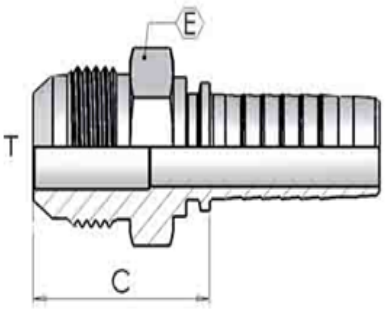


Part Number	BSPP Female Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Hex A/F (E)	Drop - H	Cutoff - C
SS51-0404	1/4-19	1/4	6.4	04	19	31.5	28
SS51-0606	3/8-19	3/8	9.5	06	22	39	38.5
SS51-0808	1/2-14	1/2	12.7	08	27	44	42.5
SS51-1212	3/4-14	3/4	19	12	32	63	66
SS51-1616	1-11	1	25.4	16	41	79.5	79

SS18

JIC MALE STRAIGHT
JIC 37° FLARE MALE STRAIGHT

- ISO 12151-5/SAE J516

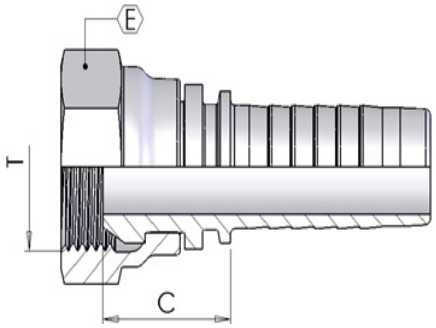


Part Number	JIC Male Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Hex A/F (E)	Cutoff - C
SS18-0704	7/16-20	1/4	6.4	04	14	30
SS18-0904	9/16-18	1/4	6.4	04	15	26.6
SS18-0906	9/16-18	3/8	9.5	06	15	27.1
SS18-1206	3/4-14	3/8	9.5	06	22	29.5
SS18-1208	3/4-14	1/2	12.7	08	22	30
SS18-1408	7/8-14	1/2	12.7	08	24	29.5
SS18-1712	1.1/16-12	3/4	19	12	27	38.4
SS18-2116	1.5/16-12	1	25.4	16	36	45

SS05

JIC FEMALE STRAIGHT
JIC 37° FLARE FEMALE SWIVEL NUT STRAIGHT

- ISO 12151-5/SAE J516

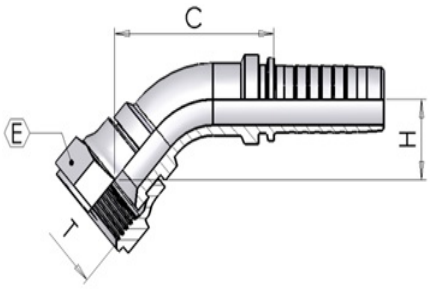


Part Number	JIC Female Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Hex A/F (E)	Cutoff - C
SS05-0703	7/16-20	3/16	4.8	03	14	14.5
SS05-0704	7/16-20	1/4	6.4	04	14	15
SS05-0804	1/2-20	1/4	6.4	04	17	16
SS05-0904	9/16-18	1/4	6.4	04	19	17
SS05-0906	9/16-18	3/8	9.5	06	19	17
SS05-1206	3/4-16	3/8	9.5	06	24	19
SS05-1208	3/4-16	1/2	12.7	08	24	19.5
SS05-1408	7/8-14	1/2	12.7	08	27	20.5
SS05-1410	7/8-14	5/8	15.9	10	27	20.5
SS05-1708	1.1/16-12	1/2	12.7	08	32	23.5
SS05-1710	1.1/16-12	5/8	15.9	10	32	21
SS05-1712	1.1/16-12	3/4	19.0	12	32	23
SS05-2112	1.5/16-12	3/4	19.0	19	41	22.7
SS05-2116	1.5/16-12	1	25.4	16	38	24.5
SS05-2616	1.5/8-12	1	25.4	16	41	23.7

SS64

JIC FEMALE 45° ELBOW
JIC 37° FLARE FEMALE SWIVEL NUT 45° ELBOW

- ISO 12151-5/SAE J516

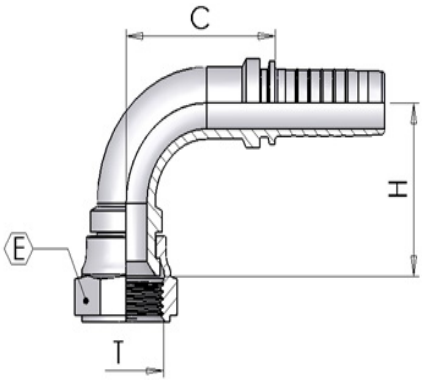


Part Number	JIC Female Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Hex A/F (E)	Drop - H	Cutoff - C
SS64-0704	7/16-20	1/4	6.4	04	14	14.8	45.8
SS64-0904	9/16-18	1/4	6.4	04	19	15.9	46.9
SS64-0906	9/16-18	3/8	9.5	06	19	19.9	61.4
SS64-1206	3/4-16	3/8	9.5	06	24	21.3	62.8
SS64-1208	3/4-16	1/2	12.7	08	24	22.3	67.8
SS64-1408	7/8-14	1/2	12.7	08	27	23.4	68.9
SS64-1712	1.1/16-12	3/4	19	12	32	26.4	101.4
SS64-2116	1.5/16-12	1	25.4	16	38	34.1	123.1

SS55

JIC FEMALE 90° ELBOW
JIC 37° FLARE FEMALE SWIVEL NUT 90° ELBOW

- ISO 12151-5/SAE J516

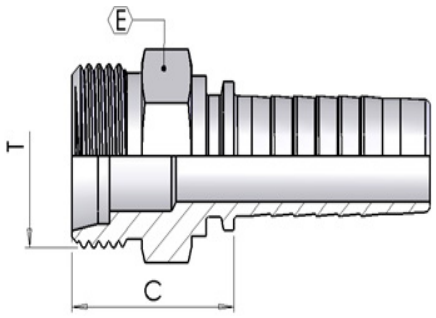


Part Number	JIC Female Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Hex A/F (E)	Drop - H	Cutoff - C
SS55-0704	7/16-20	1/4	6.4	04	14	30.5	28
SS55-0904	9/16-18	1/4	6.4	04	19	32	28
SS55-0906	9/16-18	3/8	9.5	06	19	38	38.5
SS55-1206	3/4-16	3/8	9.5	06	24	40	38.5
SS55-1208	3/4-16	1/2	12.7	08	24	44	42.5
SS55-1408	7/8-14	1/2	12.7	08	27	45.5	43
SS55-1410	7/8-14	5/8	15.9	10	27	44	43.1
SS55-1712	1.1/16-12	3/4	19	12	32	62	66
SS55-2112	1.5/16-12	3/4	19	12	41	58	56
SS55-2116	1.5/16-12	1	25.4	16	38	76	79

SS78

MET HEAVY MALE STRAIGHT
METRIC 24° CONE HEAVY MALE STRAIGHT

- ISO 12151-5

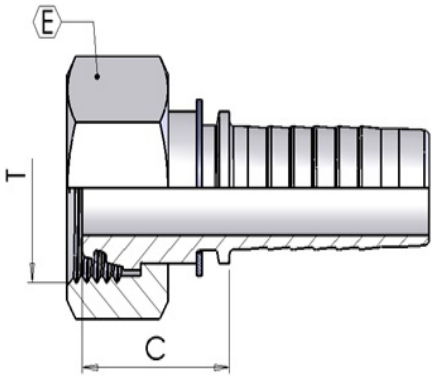


Part Number	Metric Male Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Tube Size	Hex A/F (E)	Cutoff - C
SS78-M1604	M16-1.5	1/4	6.4	04	8	17	26.5
SS78-M1806	M18-1.5	3/8	9.5	06	10	19	29.5
SS78-M2006	M20-1.5	3/8	9.5	06	12	22	29.5
SS78-M2206	M22-1.5	3/8	9.5	06	14	24	29.5
SS78-M2408	M24-1.5	1/2	12.7	08	16	27	29.5
SS78-M3012	M30-2	3/4	19	12	20	32	39
SS78-M3616	M36-2	1	25.4	16	25	41	47

SS79

MET HEAVY FEMALE STRAIGHT
METRIC 24° CONE HEAVY FEMALE SWIVEL NUT STRAIGHT

- ISO 12151-5

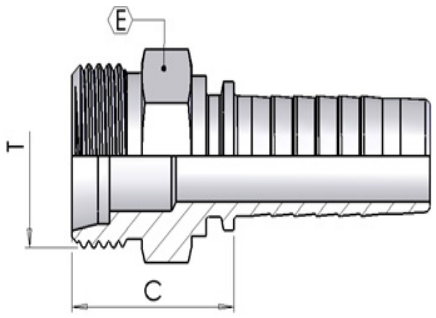


Part Number	Metric Female Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Tube Size	Hex A/F (E)	Cutoff - C
SS79-M1604	M16-1.5	1/4	6.4	04	8	19	25
SS79-M1804	M18-1.5	1/4	6.4	04	10	22	26
SS79-M2006	M20-1.5	3/8	9.5	06	12	24	23
SS79-M2206	M22-1.5	3/8	9.5	06	14	27	33
SS79-M2408	M24-1.5	1/2	12.7	08	16	30	35
SS79-M3010	M30-2	5/8	15.9	10	20	36	36.8
SS79-M3012	M30-2	3/4	19	12	20	36	33.6
SS79-M3612	M36-2	3/4	19	12	25	46	43

SS80

MET LIGHT MALE STRAIGHT
METRIC 24° CONE LIGHT MALE STRAIGHT

- ISO 12151-5

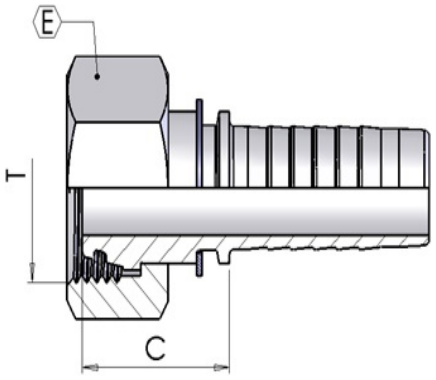


Part Number	Metric Male Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Tube Size	Hex A/F (E)	Cutoff - C
SS80-M1604	M16-1.5	1/4	6.4	04	10	17	28
SS80-M1606	M16-1.5	3/8	9.5	06	12	17	29.5
SS80-M1806	M18-1.5	3/8	9.5	06	12	19	29.5
SS80-M2208	M22-1.5	1/2	12.7	08	15	24	29.5

SS81

MET LIGHT FEMALE STRAIGHT
METRIC 24° CONE LIGHT FEMALE SWIVEL NUT STRAIGHT

- ISO 12151-5

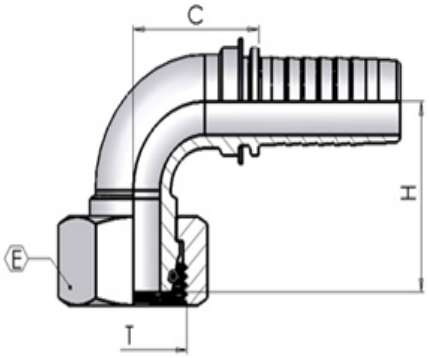


Part Number	Metric Female Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Tube Size	Hex A/F (E)	Cutoff - C
SS81-M1604	M16-1.5	1/4	6.4	04	10	19	22
SS81-M1606	M16-1.5	3/8	9.5	06	10	19	24
SS81-M1806	M18-1.5	3/8	9.5	06	12	22	23
SS81-M2208	M22-1.5	1/2	12.7	08	15	27	29
SS81-M2610	M26-1.5	5/8	15.9	10	18	32	30.5
SS81-M3012	M30-2	3/4	19	12	22	46	32.5

SS83

MET HEAVY FEMALE 90° ELBOW
METRIC 24° CONE HEAVY FEMALE SWIVEL NUT 90° ELBOW

- ISO 12151-5

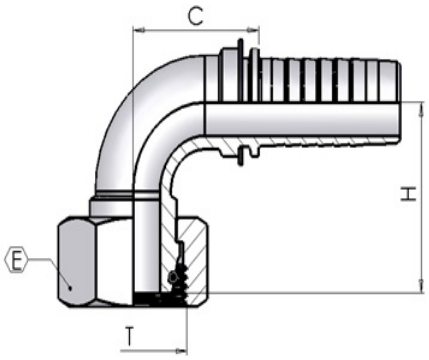


Part Number	Metric Female Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Tube Size	Hex A/F (E)	Drop (H)	Cutoff - C
SS83-M2006	M20-1.5	3/8	9.5	06	12	24	34	33.5
SS83-M2408	M24-1.5	1/2	12.7	08	16	30	41	40
SS83-M3612	M36-2	3/4	19	12	25	46	58.5	56.2

SS86

MET LIGHT FEMALE 90° ELBOW
METRIC 24° CONE LIGHT FEMALE SWIVEL NUT 90° ELBOW

- ISO 12151-5

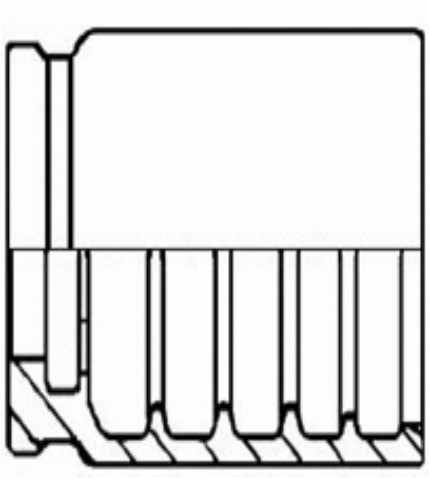


Part Number	Metric Female Thread (T)	Hose I.D (Inches)	Hose I.D (mm)	Dash size	Tube Size	Hex A/F (E)	Drop (H)	Cutoff - C
SS86-M1606	M16-1.5	3/8	9.5	06	10	19	45	38.5
SS86-M1806	M18-1.5	3/8	9.5	06	12	22	41	38.5
SS86-M2208	M22-1.5	1/2	12.7	08	15	27	47.5	42.5
SS86-M3012	M30-2	3/4	19	12	20	46	52	54

FERRULES

SSCN

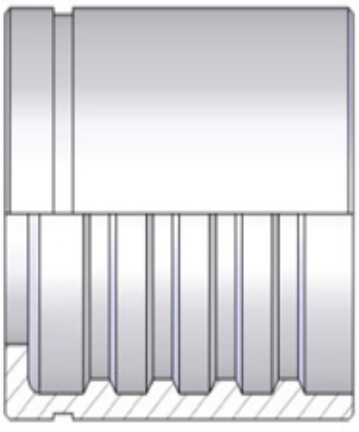
BRAIDED HOSE SWAGE FERRULE
NON-SKIVE SWAGE FERRULE FOR ONE & TWO-WIRE HOSE



Part Number	Hose I.D inches	Hose I.D (mm)	Dash size	O.A Length	I.D - mm	O.D - mm
SSCN-04	1/4	6.4	04	30.0	15.6	23.0
SSCN-06	3/8	9.5	06	31.0	19.7	26.0
SSCN-08	1/2	12.7	08	32.0	23.0	29.0
SSCN-10	5/8	15.9	10	36.0	26.3	33.0
SSCN-12	3/4	19	12	42.5	30.2	37.0
SSCN-16	1	25.4	16	51.0	39.2	46.0

SSCNT

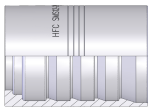
THERMOPLASTIC HOSE FERRULE
NON-SKIVE SWAGE FERRULE FOR THERMOPLASTIC HOSE



Part Number	Hose I.D inches	Hose I.D (mm)	Dash size	O.A Length	I.D - mm	O.D - mm
SSCNT-03	3/16	4.8	03	26.5	11.3	14.0
SSCNT-04	1/4	6.4	04	30.5	14.0	18.0
SSCNT-06	3/8	9.5	06	33.0	17.8	22.0
SSCNT-08	1/2	12.7	08	34.0	21.0	26.0

SSMS

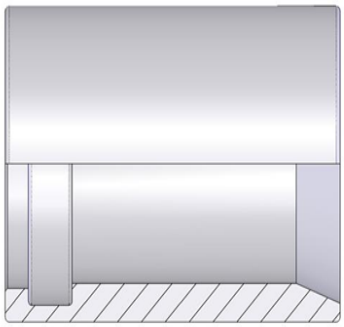
SPIRAL HOSE SWAGE FERRULE
SKIVE SWAGE FERRULE FOR GATES SPIRAL 4
WIRE HOSE



Part Number	Hose I.D inches	Hose I.D (mm)	Dash size	O.A Length	I.D - mm	O.D - mm
SSMS12-06	3/8	9.5	06	24.5	16.7	26.0
SSMS12-08	1/2	12.7	08	32.0	22.2	30.0
SSMS12-10	5/8	15.9	10	36	25.4	33.0
SSMS12-12	3/4	19	12	42.5	29.2	38.0
SSMS12-16	1	25.4	16	51.0	36.4	46.0

SSP1

PTFE SWAGE FERRULE
SWAGE FERRULE FOR PTFE SMOOTH TRUE BORE HOSE

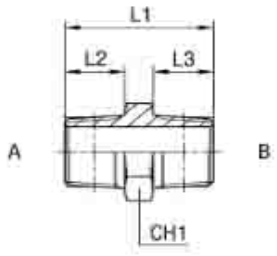


Part Number	Hose I.D inches	Hose I.D (mm)	Dash size	O.A Length	I.D - mm	O.D - mm
SSP1-03	3/16	4.8	03	30.0	10.0	14.0
SSP1-04	1/4	6.4	04	30.0	11.0	15.0
SSP1-06	3/8	9.5	06	30.0	14.0	18.0
SSP1-08	1/2	12.7	08	32.0	19.0	24.0
SSP1-12	3/4	19	12	33.5	24.9	30.0

STRAIGHT ADAPTORS

SA-A

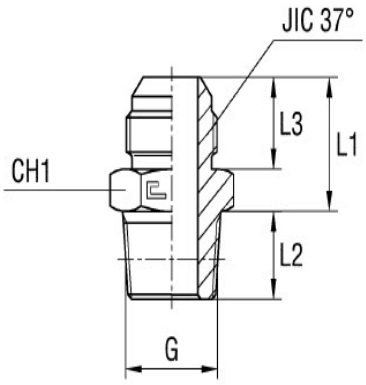
BSPT MALE X BSPT MALE
BSPT MALE X BSPT MALE STRAIGHT ADAPTOR



Part Number	BSPT Male Thread (A)	BSPT Male Thread (B)	Overall Length mm (L1)	Thread Length - mm (L2)	Thread Length - mm (L3)	Hex A/F (CH1)
SA-A-0404	1/4-19	1/4-19	34	14	13.5	14
SA-A-0606	3/8-19	3/8-19	41	14.5	14.5	19
SA-A-0808	1/2-14	1/2-14	46	18.5	18.5	22
SA-A-1212	3/4-14	3/4-14	52	20	20	27
SA-A-1616	1-11	1-11	58	24	24	35

SA-G

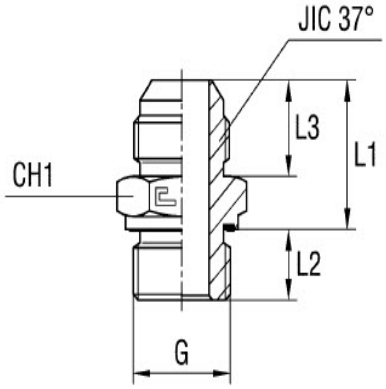
BSPT MALE X JIC MALE
BSPT MALE X JIC MALE STRAIGHT



Part Number	BSPT Male Thread (G)	JIC Male Thread (JIC)	Length mm (L1)	Thread Length - mm (L2)	Thread Length - mm (L3)	Hex A/F (CH1)
SA-G-0207	1/8-28	7/16-20	21	10	14	14
SA-G-0407	1/4-19	7/16-20	21	15	14	14
SA-G-0409	1/4-19	9/16-18	22	15	14	17
SA-G-0609	3/8-19	9/16-18	22	15	14	17
SA-G-0612	3/8-19	3/4-16	25	15	17	22
SA-G-0812	1/2-14	3/4-16	25	19	17	22
SA-G-0814	1/2-14	7/8-14	29	19	20	24
SA-G-1217	3/4-14	1.1/16-12	34	19	22	30

SB-G

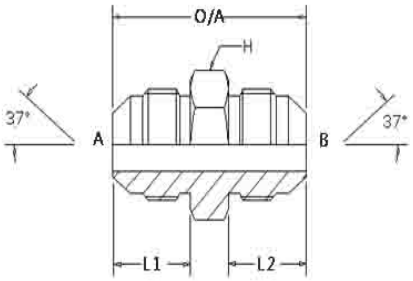
BSPP MALE X JIC MALE
BSPP MALE X JIC MALE STRAIGHT



Part Number	BSPP Male Thread (G)	JIC Male Thread (B)	Thread (L1)	Overall Length mm (L2)	Thread Length - mm (L3)	Hex A/F (CH1)
SB-G-0207	1/8-28	7/16-20	28.5	8	14.5	14
SB-G-0209	1/8-28	9/16-18	28.5	8	14.5	16
SB-G-0407	1/4-19	7/16-20	23	12	14	19
SB-G-0409	1/4-19	9/16-18	23	12	14	19
SB-G-0607	3/8-19	7/16-20	34.5	12	14.5	22
SB-G-0609	3/8-19	9/16-18	24	12	14	22
SB-G-0612	3/8-19	3/4-16	27	12	17	22
SB-G-0812	1/2-14	3/4-16	29	14	17	27
SB-G-0814	1/2-14	7/8-14	31	14	19	27
SB-G-1217	3/4-14	1.1/16-12	35	16	22	32
SB-G-1221	3/4-14	1.5/16-12	51	16	23	35
SB-G-1621	1-11	1.5/16-12	38	18	23.1	41

SG-G

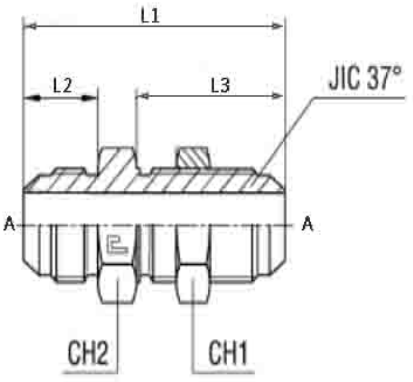
JIC MALE X JIC MALE
JIC MALE X JIC MALE STRAIGHT ADAPTOR



Part Number	JIC Male Thread (A)	JIC Male Thread (A)	L1 - mm	L2 - mm	L3 - mm	Hex A/F (CH1)
SG-G-0707	7/16-20	7/16-20	35	14	14	12
SG-G-0709	7/16-20	9/16-18	36	14	14	17
SG-G-0909	9/16-18	9/16-18	36	14	14	17
SG-G-1212	3/4-16	3/4-16	41	16.7	16.7	22
SG-G-1414	7/8-14	7/8-14	48	19.3	19.3	24
SG-G-1717	1.1/16-12	1.1/16-12	55	21.9	21.9	30

SG-GK

JIC MALE X JIC BULKHEAD
JIC MALE X JIC BULKHEAD

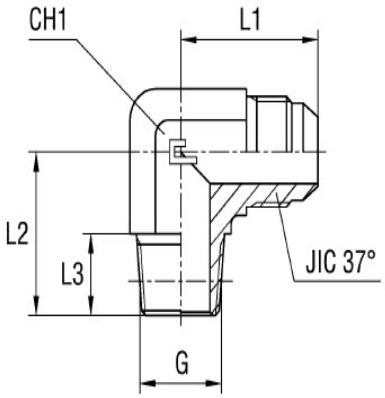


Part Number	JIC Male Thread (A)	L1 - mm	L1 - mm	L2 - mm	L3 - mm	Hex A/F (CH1)
SG-GK-0707	7/16-20	21	31.5	14	17	17
SG-GK-0909	9/16-18	22	33.5	14.1	22	22
SG-GK-1212	3/4-16	24.4	36.6	16.7	24	24
SG-GK-1414	7/8-14	28.4	41.1	19.3	30	30
SG-GK-1717	1.1/16-12	33.1	45.4	21.9	36	36
SG-GK-2121	1.5/16-12	34.6	45.4	23.1	41	41

90 DEGREE ADAPTORS

SA-G-90

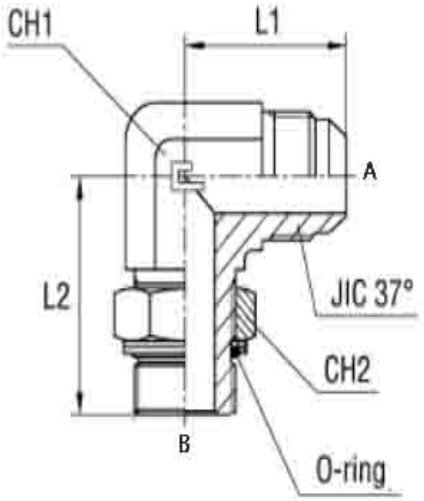
BSPT MALE X JIC MALE
BSPT MALE X JIC MALE 90° ELBOW



Part Number	BPST Male Thread (G)	JIC Male Thread (JIC)	L1 - mm	L2 - mm	L3 - mm	Hex A/F (CH1)
SA-G-90-0207	1/8-28	7/16-20	21	22.5	12	12
SA-G-90-0407	1/4-19	7/16-20	24	28	14.5	14
SA-G-90-0409	1/4-19	9/16-18	27	27	14.5	14
SA-G-90-0609	3/8-19	9/16-18	30	31	14.5	19
SA-G-90-0612	3/8-19	3/4-16	32	31	14.5	19
SA-G-90-0812	1/2-14	3/4-16	32	37.5	19	22
SA-G-90-0814	1/2-14	7/8-14	37	38	19	22
SA-G-90-1217	3/4-14	1.1/16-12	42	40	19	27

SG-BP-90

JIC MALE X BSPP POSITIONAL 90°
JIC MALE X BSPP MALE 90° ADJUSTABLE

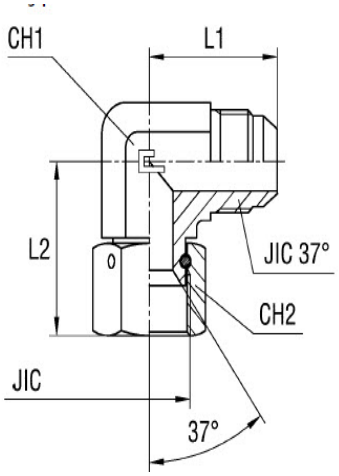


Part Number	JIC Male Thread (A)	BSPP Male Thread (B)	L1 - mm	L2 - mm	Hex A/F (CH1)	Hex A/F (CH2)
SG-BP-90-0704	7/16-20	1/4-19	24	32	14	19
SG-BP-90-0706	7/16-20	3/8-19	29	37	19	22
SG-BP-90-0904	9/16-18	1/4-19	28	32	14	19
SG-BP-90-0906	9/16-18	3/8-19	29.5	37	19	22
SG-BP-90-1208	3/4-16	1/2-14	34	43	22	27
SG-BP-90-1712	1.1/16-12	3/4-14	42	49	27	36
SG-BP-90-2116	1.5/16-12	1-11	46	52	33	41

SG-J-90

JIC MALE X JIC FEMALE
JIC MALE X JIC FEMALE SWIVEL NUT 90° ELBOW

- ISO 8434-2

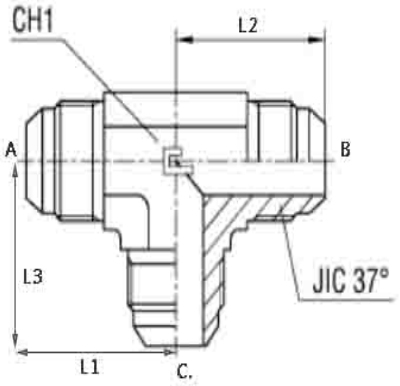


Part Number	JIC Male Thread (A)	JIC Female Thread (JIC)	L1 - mm	L2 - mm	Hex A/F (CH1)	Hex A/F (CH2)
SG-J-90-0707	7/16-20	7/16-20	23	27	11	14
SG-J-90-0909	9/16-18	9/16-18	28	31	14	19
SG-J-90-1212	3/4-16	3/4-16	32	36	19	22
SG-J-90-1414	7/8-14	7/8-14	37	42	22	27
SG-J-90-1717	1.1/16-12	1.1/16-12	42	44	27	32
SG-J-90-2121	1.5/16-12	1.5/16-12	46	51.4	33	41

TEE ADAPTORS

SG-G-G

JIC MALE X JIC MALE X JIC MALE
JIC EQUAL MALE TEE

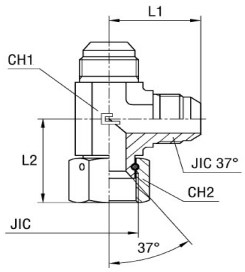


Part Number	JIC Male Thread (A)	L1 - mm	Hex A/F (CH1)
SG-G-G-070707	7/16-20	23	11
SG-G-G-090909	9/16-18	27.5	14
SG-G-G-121212	3/4-16	32	19
SG-G-G-141414	7/8-14	37	22
SG-G-G-171717	1.1/16-12	42	27

SG-J-G

JIC MALE X JIC FEMALE X JIC MALE
JIC MALE X JIC FLARE FEMALE SWIVEL NUT X JIC MALE RUN TEE

- ISO 8434-2

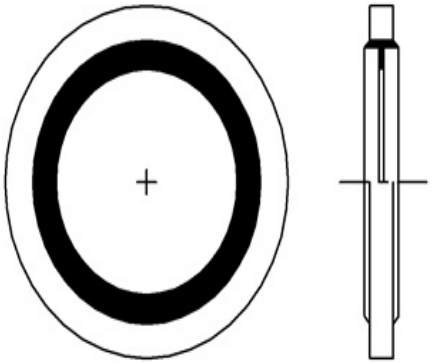


Part Number	JIC Male Thread (JIC 37)	JIC Female Thread (JIC)	L1 - mm	L2 - mm	Hex A/F (CH1)	Hex A/F (CH2)
SG-J-G-070707	7/16-20	7/16-20	23	27	11	14
SG-J-G-090909	9/16-18	9/16-18	28	31	14	19
SG-J-G-121212	3/4-16	3/4-16	32	36	19	22
SG-J-G-141414	7/8-14	7/8-14	37	42	22	27
SG-J-G-171717	1.1/16-12	1.1/16-12	42	44	27	32

REPLACEMENT SEALS

SD

BONDED SEAL
SELF CENTERING BONDED (DOWTY) SEAL

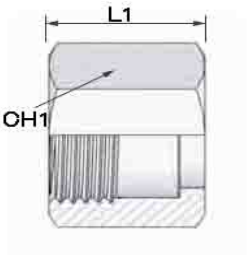


Part Number	Internal dimension - mm	Suits thread
SD-02	8.5	1/8-28BSPP
SD-04	13.7	1/4-19 BSPP
SD-06	17.3	3/8-19 BSPP
SD-08	21.5	1/2-14 BSPP
SD-12	27.1	3/4-14 BSPP
SD-16	33.9	1-11 BSPP
SD-20	42.9	1.1/4-11 BSPP

JIC FLARE TYPE TUBE FITTINGS

STJN

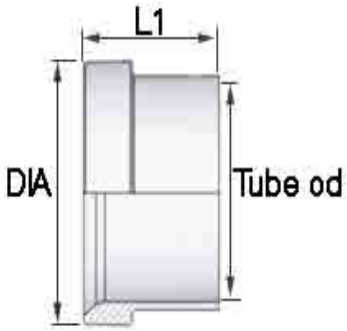
JIC TUBE NUT
JIC 37° FLARE TUBE NUT



Part Number	suits tube	JIC Female Thread	L1 - mm	Hex A/F (CH1)
STJN-07	1/4	7/16-20	15.494	14
STJN-09	3/8	9/16-18	18.288	18
STJN-12	1/2	3/4-16	21.336	22
STJN-14	5/8	7/8-14	24.638	25
STJN-17	3/4	1.1/16-12	25.908	32

STJS

JIC FLARE SLEEVE
JIC 37° FLARE TUBE SLEEVE



Part Number	suits tube	L1 - mm	Diameter - mm
STJS-04	1/4	10.414	10
STJS-06	3/8	12.7	13
STJS-08	1/2	14.224	17
STJS-10	5/8	16.764	20
STJS-12	3/4	17.272	25