

Saws And Swagers

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Technical Information

Section 1



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.

A simple method to assist in remembering the key selection criteria is the anagram:

F.A.C.T.O.R.S.

F = Fluid

A = Application

C = Connections

T = Temperature

O = Operating Pressures

R = Rate(s) of Flow

S = Size

F - FLUID

The materials in the products selected must be compatible with the fluid that is to be conveyed.

Compatibility considerations will vary between products depending on the fluid in question.

When checking product fluid compatibility the following should be taken into account;

Hose; where the application requires the use of chemicals or special oils it is advisable to ensure that the cover is also resistant. For gaseous applications it is possible that permeation could occur. Permeation, sometimes referred to as effusion, is the migration of fluid through the pores of the tube polymer resulting in gradual fluid loss. Where permeation occurs it is important to ensure that as well as the hose tube the reinforcement and cover are compatible. When conveying gaseous liquids it is advisable to pin-prick the cover to prevent fluid build-up under the cover causing blistering. Continual build-up of fluid in this blistering could eventually cause the cover to split resulting in potential hazards such as the release of toxic fumes, fire or even explosions.

Couplings & other products; As well ensuring the body material is compatible any seals in hose connectors, positional adaptors, quick release couplings, ball Valves, live swivels etc are also compatible.

A - APPLICATION

When selecting products it is important to check how and where they are going to be used as this will help to assess the likely demands that will be placed on the products.

Some of the aspects to consider are;

- Is the product going to be installed on mobile equipment or industrial plant?
- Is the application static or dynamic?
- Any installation constraints?
- Any mechanical loadings? Care should be taken not subject products to tension or torsional loads.
- Will it be subjected to constant impulsing?
- What fluid lines best suit the application? Flexible or rigid?
 - ❖ Flexible (hose). Hose has advantages such as;
 - *Easier to route around obstacles*
 - *Helps to dampen sound*
 - *Can absorb pressure spikes*
 - *Less prone to damage from vibration or movement*
 - *Generally easier to replace in the field*
 - ❖ Rigid (pipe or tube). Advantages of rigid lines;
 - *Less susceptible to mechanical damage*
 - *Good heat dissipation*
 - *Tube can be bent to tight radii*
 - *Does not breakdown through ageing*
- If selecting hose consider the following:
 - ❖ Does the cover need to be abrasion resistant?
 - ❖ Does it need to be non-conductive?
 - ❖ Any requirement for the hose to meet any specific Industry specifications? Such as mining, marine, military etc.
 - ❖ O.D of hose if it to run over pulleys (forklift application)
 - ❖ Composition of hose, rubber or thermoplastic? Note; Thermoplastic hose types are excellent for use in the marine and food industries.

Taking the time to get a good overview of the application will help when considering other aspects in the selection process, some of which are interrelated (such as pressure, flow & size).

Some accessory products such as Quick Release Couplings & Ball valves have specific selection requirements that need to be considered. These are discussed in detail in the relevant training modules.

C - CONNECTIONS

When replacing an existing hose assembly match the existing end connections with the new ones.

If a new assembly is being specified consider what interface (thread/sealing face) type would best suit the application. In most cases the type of connection is determined by the exit thread of the adaptor fitted to the port machined into the component to which the assembly is being fitted.

Confirm what style of hose connection is required (or preferred by the customer), where wire braided hose is being used it is possible to fit either Crimp or Re-usable (field attachable) and in low pressure applications a Push-On.

For 90° hose connections check the configuration required e.g. compact or swept bend style.

Rigid lines: pipe or tube

For pipe the most common connection is the welded type, this can be either a socket or butt weld style. Of these the butt weld should be preferred for high pressure however the socket style is the most commonly used due to the ease of assembly.

For tube there are three main options;

1. Flareless type
2. Flare type
3. Socket weld

T - TEMPERATURE

Two aspects of temperature must be considered when selecting products;

1. Fluid temperature; Check capability of product to withstand system fluid temperature, both minimum and maximum. Hydraulic systems can generate heat but this should not be excessive in well designed systems. The most common causes of excessive heat are undersized components or flow restrictions within the system.

2. Ambient temperature;

The exposure to high or low ambient temperatures should also be considered. Generally there are not many issues associated with this.

Hose is most likely to be affected, some situations where a problem could occur are;

When an installation requires hose to be run near a hot manifold it may be advisable to use a heat shield or sleeving.

Where a hose is subjected to a high ambient temperature in conjunction with an elevated fluid temperature the service life may be reduced.

Hose used in a cold environment, such as hoses on a forklift working in a coolstore, may have exhibit cracking on the cover.

Notes;

1. The viscosity rating of most hydraulic oils is set at a temperature of 40° Celsius.
2. Rubber polymers are affected differently by hot air than hot oil.
3. Rubber stores heat

O - OPERATING PRESSURES

Determine maximum system or circuit pressures, this may vary depending on the circuit function. Always take into account the possibility of pressure spikes when establishing the maximum pressures that could be generated in a system.

Remember to look at the application or function, this will help to visualise the possible loadings on the product.

For example, the crowd cylinder circuit on an excavator is more likely to be subjected to spike pressure than the slew circuit.

Always ensure that the product is working within a 4:1 safety factor. That is; the maximum pressure the product will be exposed to is less than 25% of the products minimum burst pressure. Where pressure spikes or impulsing can occur it is good practice, where this is possible, to specify a product that will be working at 75% of its pressure rating for normal system pressure, this will give a safety buffer to absorb spikes.

Note;

Any product fitted between the pump and valve will always be exposed to the highest pressures of the system.

R - RATES OF FLOW

There are two areas to look at with regards to fluid flow.

Volume;

This is the amount of fluid that will be flowing through the product in a given time. When selecting product it is best to look at the maximum flow that is to be conveyed. Maximum pump output is a good starting point but consideration should also be given to return flow from the piston side of cylinders, this can be high depending on the bore to annulus ratio of the cylinder.

Volume is usually measured in Gallons (imperial) or Litres (metric) per minute.

Velocity;

This is the speed of the fluid through the product and is directly related to the fluid volume and the product size. Fluid speed is a key factor in determining pressure drops and heat build up in systems.

Velocity is stated as; feet per second (imperial) or metres per second (metric)

S - SIZE

The size (flow area) of the product is key part in ensuring the system functions efficiently.

The flow area of the product and the volume of fluid determines the velocity of the fluid in the system. If the fluid velocity is too high then in some cases excessive pressure drop or heat generation can occur. A Nomograph is the easiest method of determining fluid velocity for any given volume versus product size.

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.

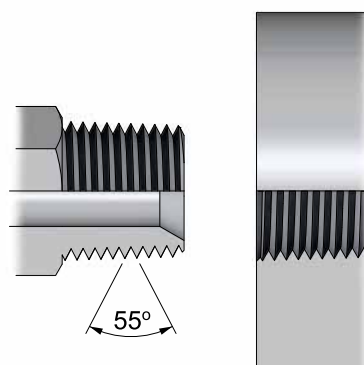
B.S.P.T. - BRITISH STANDARD PIPE TAPER

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

THREAD IDENTIFICATION

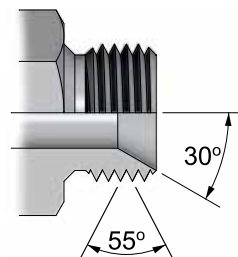
B.S.P.P. - BRITISH STANDARD PIPE PARALLEL

Thread Angle: 55°

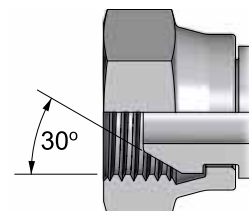
The British Standard Pipe Parallel (BSPP) male is typically coned 30° and will mate with either a BSPP swivel nut female or a BSPP female port.

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).

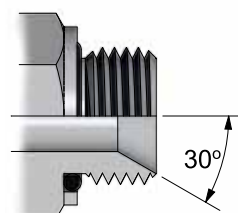


BSPP male



BSPP swivel nut female

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

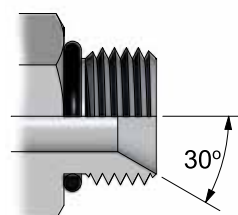


BSPP male with captive o-ring seal

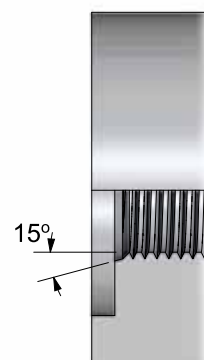


BSPP female port (spot-faced)

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



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°

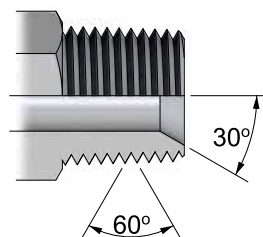
The National Pipe Taper Fuel (NPTF) male is coned 30° and will mate with the NPTF female port (taper), the National Pipe Straight Mechanical (NPSM) female (swivel nut female with 30° sealing cone), or the National Pipe Straight Fuel (NPSF) female port (parallel).

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

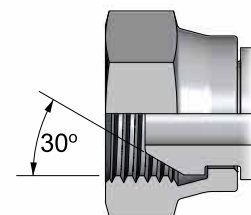
Thread Size & TPI	Male Thread O.D.	Female Thread I.D.	
		NPTF	NPSF/SM
1/8-27	10.0	8.6	8.7
1/4-18	13.3	11.2	11.4
3/8-18	16.7	14.7	14.9
1/2-14	20.8	18.2	18.8
3/4-14	26.1	23.5	23.9
1-11.1/2	32.7	29.5	30.2
1.1/4-11.1/2	41.4	38.3	39.1
1.1/2-11.1/2	47.5	44.4	45
2-11.1/2	59.3	56.2	57



**NPTF female
port (taper)**



**NPTF male
(taper)**



**NPSM swivel
nut female**



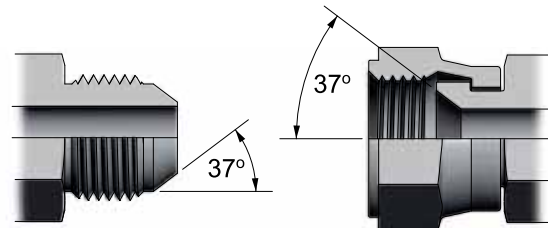
**NPSF female
port (parallel)**

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.

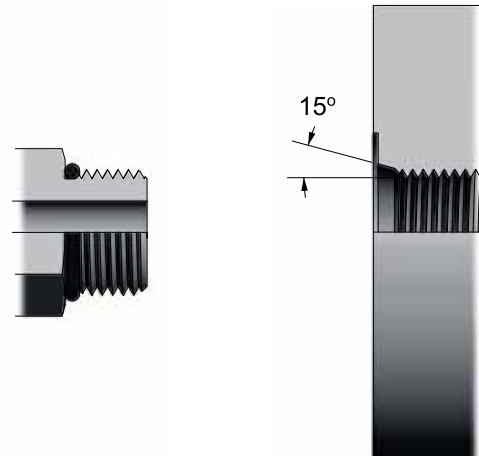
U.N. "O"-Ring refers to the thread type and "O"-Ring for sealing. The female U.N.O port has a chamfer to accept the o-ring.



JIC male

JIC swivel nut female

Thread Size & TPI	Female Thread I.D.	Tube O.D.	Torque Settings	
			JIC	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



UNO male

UNO female port (chamfered)

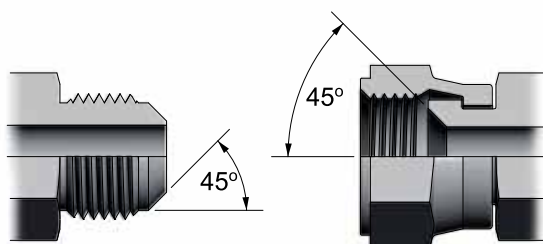
N.B. Torque values are nominal and supplied as a guide only.

THREAD IDENTIFICATION

S.A.E. - SOCIETY OF AUTOMOTIVE ENGINEERS O.R.F.S. - O-RING FACE SEAL

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

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.

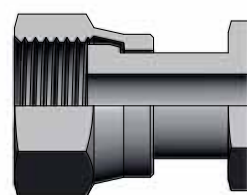


SAE male

**SAE swivel
nut female**



ORFS male



**ORFS 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

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

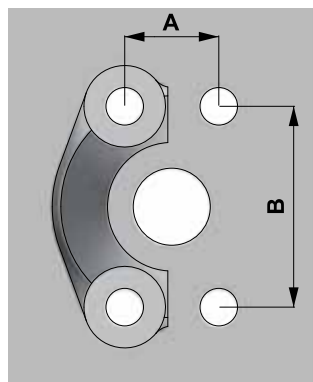
N.B. Torque values are nominal and supplied as a guide only.

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

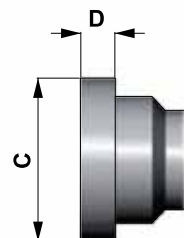
These connections utilise an “O”-Ring for sealing and are widely used for connecting to pump and motor parts as well as end terminations for pipe runs.

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

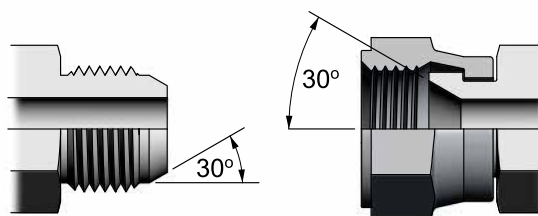
Type M; Metric, Male, 30° Cone

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

“O”-Ring Flanges:

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

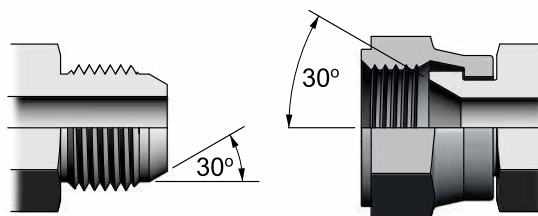
Type II; Equivalent to Code 62 (*Identical to SAE standard*)



Type F JIS male

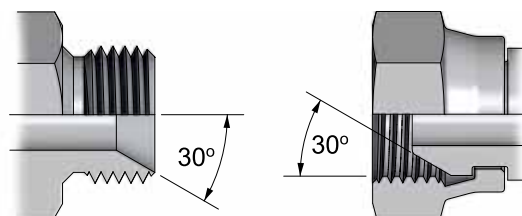
For thread data please refer to BSPP section

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

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.

D.I.N. METRICS 24° CONE SYSTEM

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

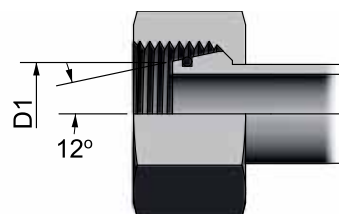
Series LL;	Extra Light, up to 100 bar
Series L;	Light up to 250 bar
Series S;	Heavy up to 640 bar

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.

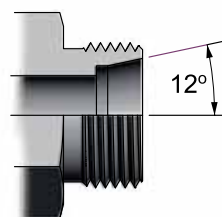
N.B: Rated coupling pressures are subject to the design pressures of the tube or hose being used.

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 cutting 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).



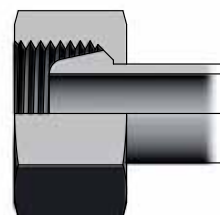
DIN 24° cone female with o-ring



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

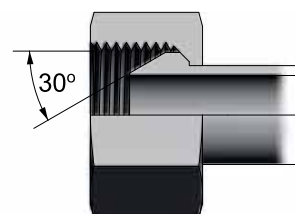
* N.B. Diameter D1 is nominal and may vary between manufacturers.

D.I.N. METRICS 60° CONE SYSTEM

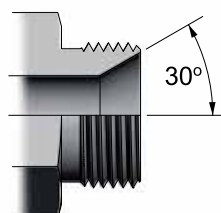
This series utilises a 60° cone seating angle and is used for the connection of hose assemblies and tube. It differs from the 24° series in that the threads are predominately 1.5mm pitch and there is no light or heavy pressure ranges.

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.

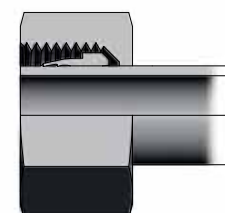
THREAD SPECIFICATIONS		
Thread O.D. & Pitch	Female Thread I.D.	Tube O.D.(mm)
M10-1.0	9.0	5
M12-1.5	10.5	6
M14-1.5	12.5	8
M16-1.5	14.5	10
M18-1.5	16.5	12
M22-1.5	20.5	15
M26-1.5	24.5	18
M30-1.5	28.5	22
M38-1.5	36.5	28
M45-1.5	43.5	35
M52-2.0	56.5	42



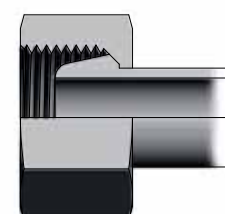
DIN 60° cone female



DIN 60° cone male



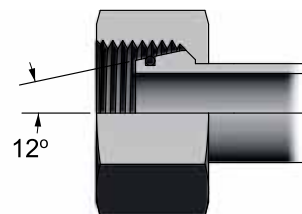
DIN cutting ring and nut on tube



DIN female swivel nut with spherical seat

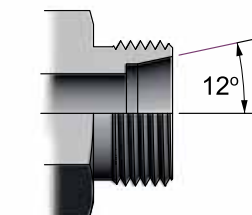
I.S.O. METRICS (INTERNATIONAL STANDARDS ORGANISATION)

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.

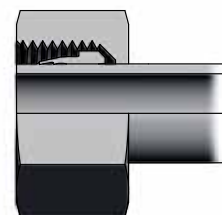


**ISO (24° cone)
female with o-ring**

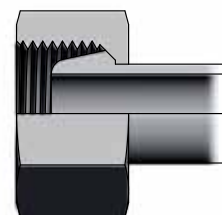
THREAD SPECIFICATIONS		
Thread O.D. & Pitch	Female Thread I.D.	Tube O.D.(mm)
M12-1.0	11.0	6
M14-1.5*	12.5	8
M16-1.5*	14.5	10
M18-1.5*	16.5	12
M20-1.5	18.5	14
M22-1.5*	20.5	15
M24-1.5**	22.5	16
M27-1.5	25.5	18
M30-1.5	28.5	22
M33-1.5	31.5	25
M36-1.5	34.5	28
M39-1.5	37.5	30
M42-1.5	40.5	32
M45-1.5	43.5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



**ISO (24° cone)
male**



**ISO cutting ring and
nut on tube**



**ISO female swivel
nut with spherical
seat**

* Interchange with D.I.N. Light

** Interchange with D.I.N. Heavy

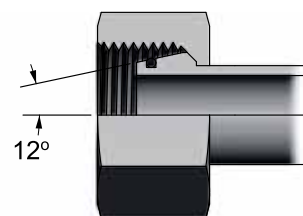
FRENCH METRICS (GAZ & MILLIMETRIQUE SERIES)

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.

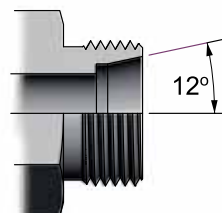
The Gaz and Millimetrique series are identical in all respects except for the O.D. of the tube:

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

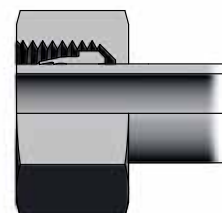


French 24° cone female with o-ring

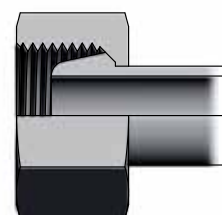
THREAD SPECIFICATIONS LIGHT (L) SERIES			
Thread O.D. & Pitch	Female Thread I.D.	Diameter	
		GAZ	Millimetrique
M12-1.0	11.0	-	6
M14-1.5	12.5	-	8
M16-1.5	14.5	-	10
M18-1.5	16.5	-	12
M20-1.5	18.5	13.25	14
M22-1.5	20.5	-	15
M24-1.5	22.5	16.75	16
M27-1.5	25.5	-	18
M30-1.5	28.5	21.25	22
M33-1.5	31.5	-	25
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

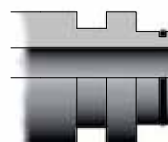


French female swivel nut with spherical seat

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.

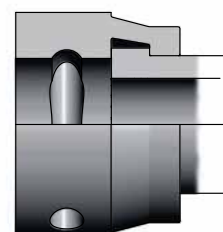


Staple-lok male



Staple-lok fixed female

Coupling Dash Size	Imperial Size	Male O.D.		Female I.D.	
		inch	mm	inch	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

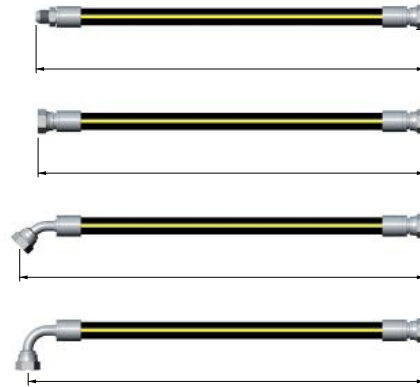


Staple-lok staple

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:

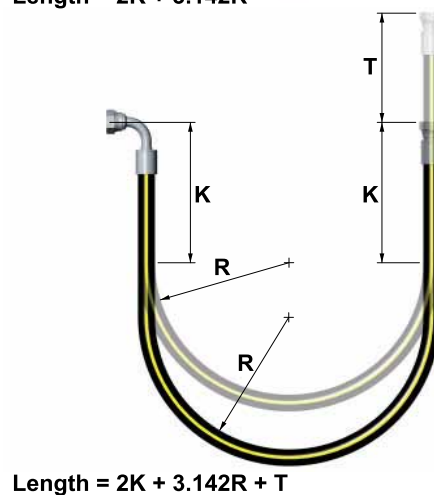
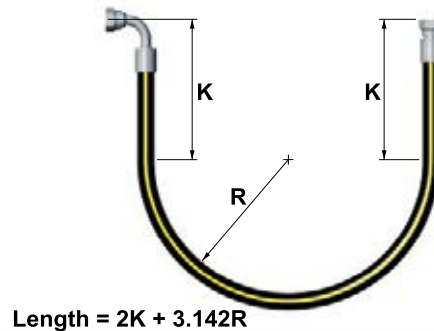
Static Installations

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

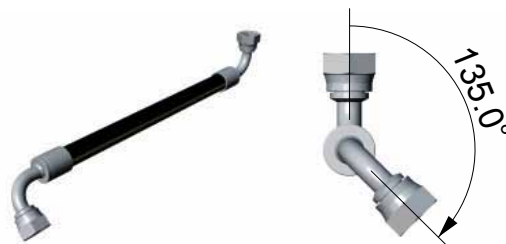
Dynamic Installations

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



Off-Set Angle Measurement

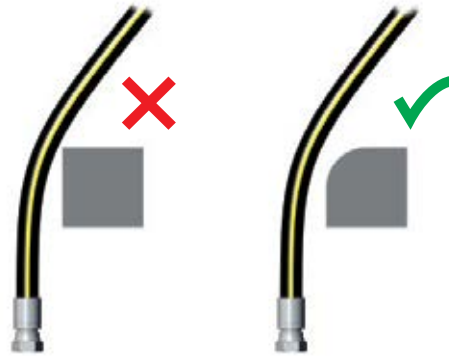
Place hose assembly in line of sight position with coupling furthest away facing upwards. Determine off-set angle by comparing relative position of closest coupling to the far coupling in a clockwise direction.



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.

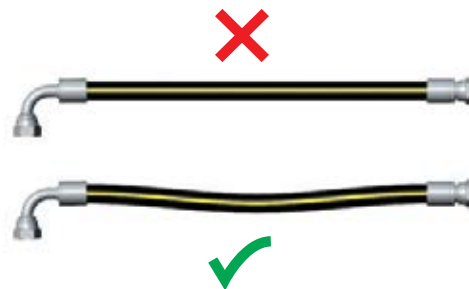
Fig. 1



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

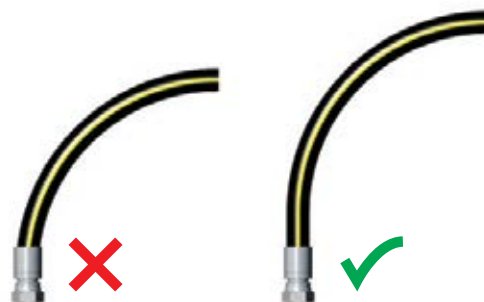


Fig. 4b



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.

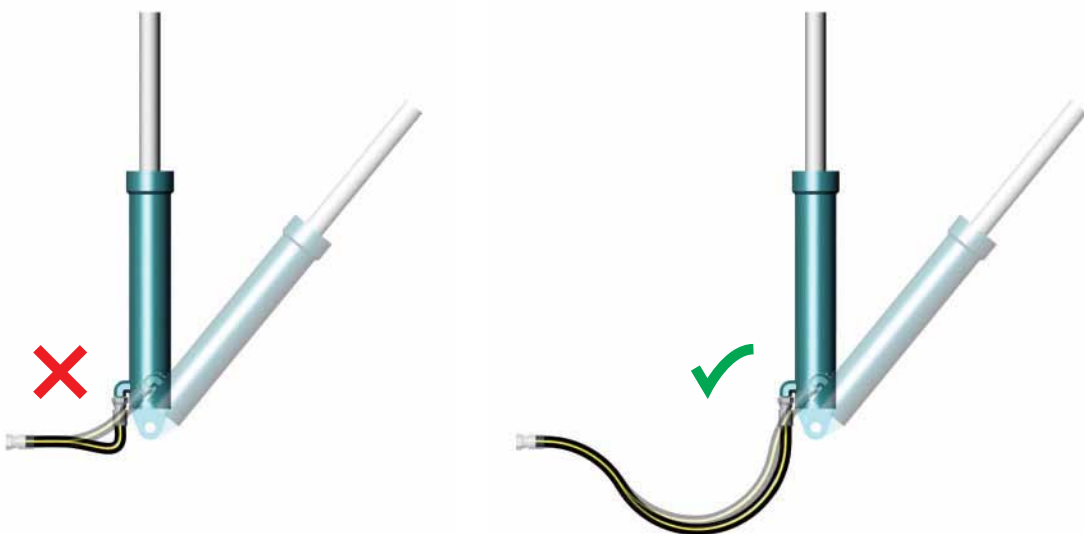
Fig. 5



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 occurring that are smaller than the minimum bend radius (Fig. 6a).

Fig. 6a



SWAGERS

XP16

FINNPOWER P16 SWAGER

SWAGER FOR HOSE ASSEMBLIES TO 1 INCH



Part Number	Swaging Range (mm)	Swaging Force (kN)	Power Source	Swage Control	Length - mm	Width - mm	Height - mm	Weight - kg
XP16-HPZ	10 - 45	955	Handpump	Vernier	331	386	271	26

XP20

FINNPOWER P20 SWAGER

SWAGER FOR HOSE ASSEMBLIES TO 1 1/4 INCH



Part Number	Swaging Range (mm)	Swaging Force (kN)	Power Source	Swage Control	Length - mm	Width - mm	Height - mm	Weight - kg
XP20-CS-12 V	10 - 61	1370	12V DC	MS*	571	533	387	83
XP20N-MS-1PH	10 - 61	1370	12V DC	MS*	650	510	620	140

XP32

FINNPOWER P32 SWAGER

SWAGER FOR HOSE ASSEMBLIES TO 2 INCH



Part Number	Swaging Range (mm)	Swaging Force (kN)	Power Source	Swage Control	Length - mm	Width - mm	Height - mm	Weight - kg
XP32-CS-24 V	10 - 87	2000	24V DC	MS**	626	543	421	116
XP32N-MS-3PH	10 - 87	2000	3 phase	MS**	675	520	620	205

CUTOFF SAWS

XCM30

FINNPOWER CM30 CUT-OFF SAW
BENCH MOUNTED 3Kw CUT-OFF SAW

- CM30 is designed for workshop use. CM30 is manually operated and easy to use and it comes with a fume exhaust connection



Part Number	Max Hose Size	Power Source	Control	Length - mm	Width - mm	Height - mm	Weight - kg
XCM30-12V	1 1/4 ID 1&2 wire & 3/4 spiral	12V DC (1.1kW)	manual	600	503	739	50
XCM30-230V	2 ID 1&2 wire & 1 1/4 spiral	1 Phase / 230V (2.2kW)	manual	600	503	739	50

XCM35

FINNPOWER CM30 CUT-OFF SAW
STAND MOUNTED 3Kw CUT-OFF SAW

- CM35 is designed for workshop use. CM35 capacity is same as the CM30 but it comes with manual foot pedal. CM35 is easy to use and it comes with a fume exhaust connection



Part Number	Max Hose Size	Power Source	Control	Length - mm	Width - mm	Height - mm	Weight - kg
XCM35-230V	2 ID 1&2 wire & 1 1/4 spiral	1 Phase / 230V (2.2kW)	manual	600	503	739	60

SPARE PARTS

PARTS

FINNPOWER CRIMPER SPARES



Part Number	Description
CS-003361	SCALE STICKER FOR P20HP/P20CS
CS-048102	P20 PISTON SEAL
CS-048201	P20 CYLINDER SEAL
CS-053001	P20 MASTER DIE SPRING
CS-053003	P32 MASTER DIE SPRING
CS-053089	P16 MASTER DIE SPRING (OUTER)
CS-053092	P16 MASTER DIE SPRING (INNER)
CS-053093	SPRING FOR P16-HP
CS-053202	P20 GAS RETURN CYLINDER
CS-062014	P20 & P32 CONTROLLER DIAL ASS
CS-093450	P20 MASTER POWER SWITCH
CS-11006	P20 SCALE PIN
CS-11010	P20 DIE PINS (NON-QUICKCHANGE
CS-11026	LOCK BOLT FOR P20 SCALE PIN CO
CS-11030	P20 SCALE PIN COLLAR
CS-111134	PIN FOR QC TOOL
CS-112043/LP	P20 MASTER DIE LOCK-PIN ASSY -
CS-112044	P20 DIE-PIN - QUICKCHANGE TYPE
CS-11380	P20 MASTER DIE LOCK-PIN ASSY -
CS-60424	P20CS CONTROL VERNIER
CS-60426	P32CS CONTROL VERNIER
CS-691043	P20 QUICKCHANGE TOOL
CS-691561	P16 CONTROL VERNIER
CS-702932	P32 FOAM INSERTS FOR MASTER-DI
CS-702933	P20 FOAM INSERTS FOR MASTER-DI
CS-703528	P32MS CONTROL VERNIER
CS-703643	P20MS CONTROL VERNIER

D16

FINNPOWER P16 DIE SEGMENTS



Part Number	Description
D16-10	P16 CRIMPER 10mm DIE SEGMENT
D16-14	P16 CRIMPER 14mm DIE SEGMENT
D16-16	P16 CRIMPER 16mm DIE SEGMENT
D16-19	P16 CRIMPER 19mm DIE SEGMENT
D16-23	P16 CRIMPER 23mm DIE SEGMENT
D16-27	P16 CRIMPER 27mm DIE SEGMENT
D16-31	P16 CRIMPER 31mm DIE SEGMENT

D20

FINNPOWER P20 DIE SEGMENTS



Part Number	Description
D20-10	P20 CRIMPER 10mm DIE SEGMENT
D20-14	P20 CRIMPER 14mm DIE SEGMENT
D20-16	P20 CRIMPER 16mm DIE SEGMENT
D20-19	P20 CRIMPER 19mm DIE SEGMENT
D20-23	P20 CRIMPER 23mm DIE SEGMENT
D20-27	P20 CRIMPER 27mm DIE SEGMENT
D20-31	P20 CRIMPER 31mm DIE SEGMENT
D20-36	P20 CRIMPER 36mm DIE SEGMENT
D20-41	P20 CRIMPER 41mm DIE SEGMENT
D20-47	P20 CRIMPER 47mm DIE SEGMENT

D32
FINNPOWER P32 DIE SEGMENTS



Part Number	Description
D32-16	P32 CRIMPER 16mm DIE SEGMENT
D32-22	P32 CRIMPER 22mm DIE SEGMENT
D32-39	P32 CRIMPER 39mm DIE SEGMENT
D32-47	P32 CRIMPER 47mm DIE SEGMENT
D32-57	P32 CRIMPER 57mm DIE SEGMENT
D32-74	P32 CRIMPER 74mm DIE SEGMENT