

## Fire Suppression

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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.

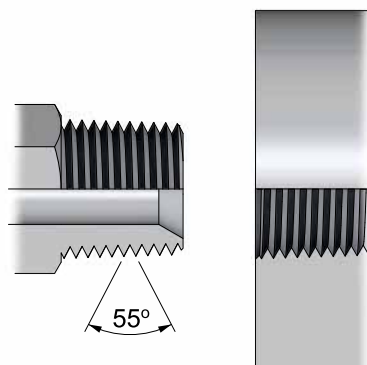
## B.S.P.T. - BRITISH STANDARD PIPE TAPER

**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

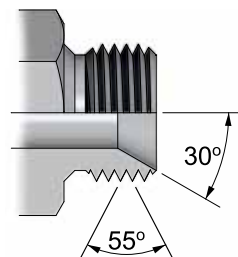
### B.S.P.P. - BRITISH STANDARD PIPE PARALLEL

**Thread Angle: 55°**

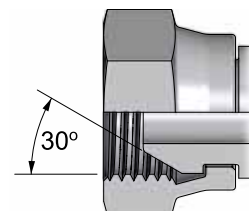
The British Standard Pipe Parallel (BSPP) male is typically coned 30° and will mate with either a BSPP swivel nut female or a BSPP female port.

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).

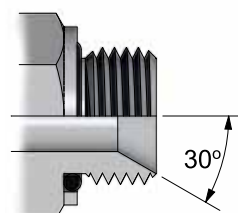


**BSPP male**



**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                    |

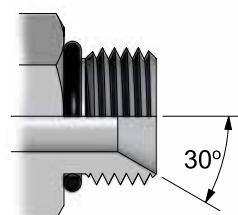


**BSPP male with captive o-ring seal**

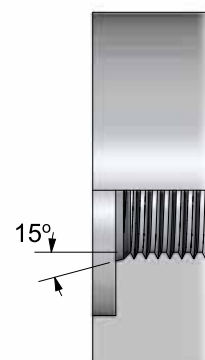


**BSPP female port (spot-faced)**

**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°

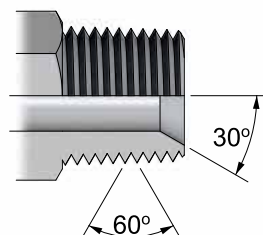
The National Pipe Taper Fuel (NPTF) male is coned 30° and will mate with the NPTF female port (taper), the National Pipe Straight Mechanical (NPSM) female (swivel nut female with 30° sealing cone), or the National Pipe Straight Fuel (NPSF) female port (parallel).

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

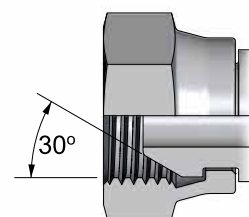
| Thread Size<br>& TPI | Male Thread O.D. | Female Thread I.D. |         |
|----------------------|------------------|--------------------|---------|
|                      |                  | NPTF               | NPSF/SM |
| 1/8-27               | 10.0             | 8.6                | 8.7     |
| 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**



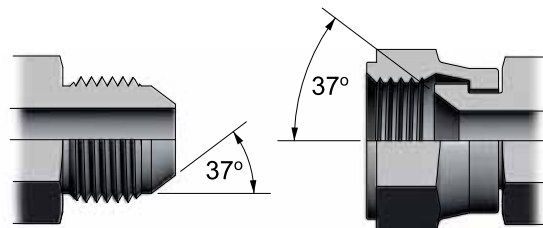
**NPSF female  
port (parallel)**

## 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.



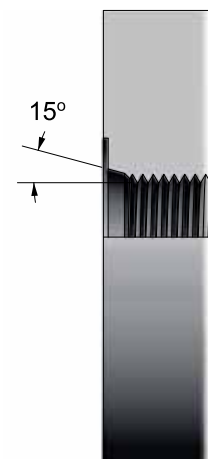
**JIC male**

**JIC swivel  
nut female**

| Thread<br>Size<br>& TPI | Female<br>Thread<br>I.D. | Tube O.D. | Torque<br>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)**

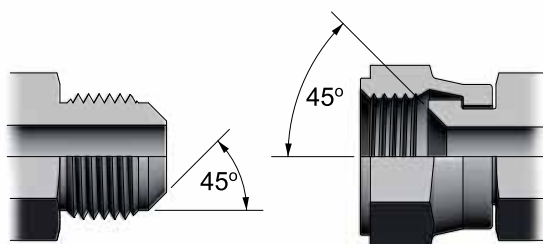
**N.B. Torque values are nominal and supplied as a guide only.**

## 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.

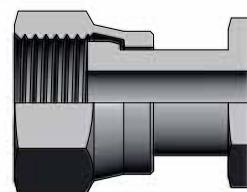


**SAE male**

**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        |

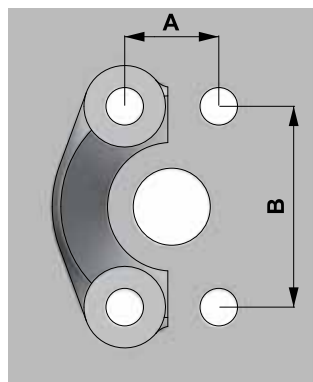
**N.B. Torque values are nominal and supplied as a guide only.**

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

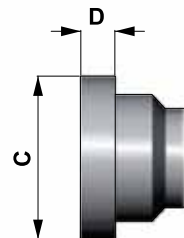
These connections utilise an “O”-Ring for sealing and are widely used for connecting to pump and motor parts as well as end terminations for pipe runs.

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<br>Flange<br>Size | A (mm)     |            | B (mm)     |            | C (mm)     |            | D (mm)     |            |
|---------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                           | Code<br>61 | Code<br>62 | Code<br>61 | Code<br>62 | Code<br>61 | Code<br>62 | Code<br>61 | Code<br>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<br>Flange<br>Size | Pressure Rating |            | "O"-ring size     |                  | UNC Bolt size |            | Bolt torque |            |
|---------------------------|-----------------|------------|-------------------|------------------|---------------|------------|-------------|------------|
|                           | Code<br>61      | Code<br>62 | Code<br>61 and 62 | AS568A<br>number | Code<br>61    | Code<br>62 | Code<br>61  | Code<br>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

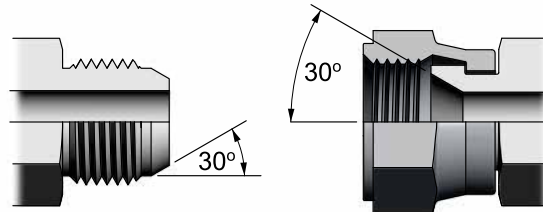
Type M; Metric, Male, 30° Cone

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

### “O”-Ring Flanges:

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

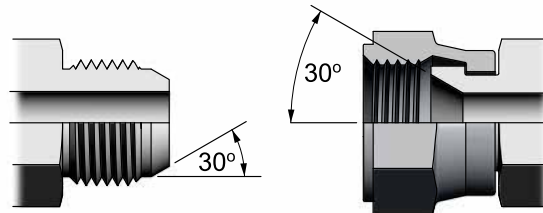
Type II; Equivalent to Code 62 (*Identical to SAE standard*)



Type F JIS male

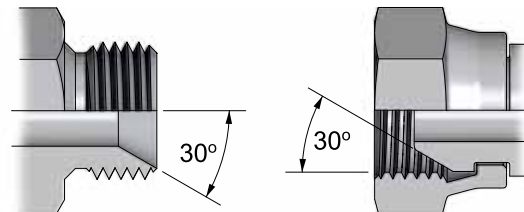
*For thread data please refer to BSPP section*

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:

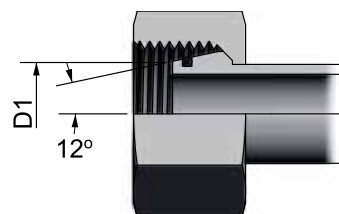
|            |                            |
|------------|----------------------------|
| Series LL; | Extra Light, up to 100 bar |
| Series L;  | Light up to 250 bar        |
| Series S;  | Heavy up to 640 bar        |

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.

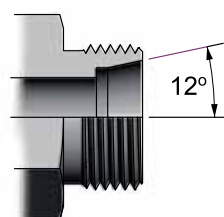
**N.B: Rated coupling pressures are subject to the design pressures of the tube or hose being used.**

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).



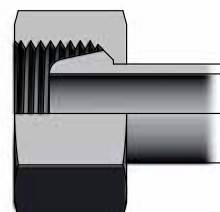
**DIN 24° cone female with o-ring**



**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) |
| <b>M12-1.5</b>                         | 10.5               | 7.2              | 6             |
| <b>M14-1.5</b>                         | 12.5               | 9.2              | 8             |
| <b>M16-1.5</b>                         | 14.5               | 11.6             | 10            |
| <b>M18-1.5</b>                         | 16.5               | 13.8             | 12            |
| <b>M22-1.5</b>                         | 20.5               | 16.8             | 15            |
| <b>M26-1.5</b>                         | 24.5               | 19.8             | 18            |
| <b>M30-2.0</b>                         | 28                 | 23.8             | 22            |
| <b>M36-2.0</b>                         | 34                 | 29.8             | 28            |
| <b>M45-2.0</b>                         | 43                 | 37.2             | 35            |
| <b>M52-2.0</b>                         | 50                 | 44.2             | 42            |

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

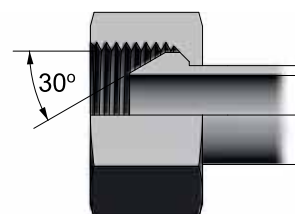
\* N.B. Diameter D1 is nominal and may vary between manufacturers.

## D.I.N. METRICS 60° CONE SYSTEM

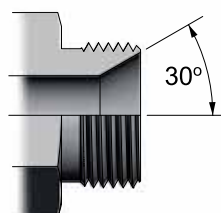
This series utilises a 60° cone seating angle and is used for the connection of hose assemblies and tube. It differs from the 24° series in that the threads are predominately 1.5mm pitch and there is no light or heavy pressure ranges.

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.

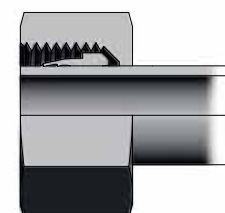
| THREAD SPECIFICATIONS  |                       |                  |
|------------------------|-----------------------|------------------|
| Thread O.D.<br>& Pitch | Female<br>Thread I.D. | Tube<br>O.D.(mm) |
| <b>M10-1.0</b>         | 9.0                   | 5                |
| <b>M12-1.5</b>    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



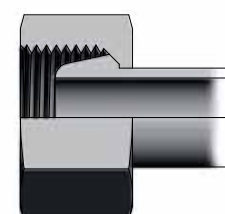
**DIN 60° cone female**



**DIN 60° cone male**



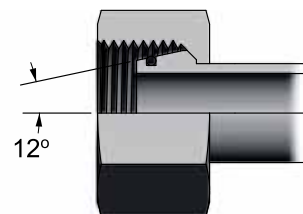
**DIN cutting ring and nut on tube**



**DIN female swivel nut with spherical seat**

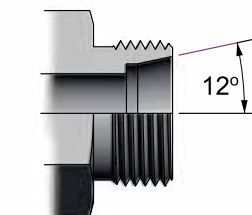
## I.S.O. METRICS (INTERNATIONAL STANDARDS ORGANISATION)

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.

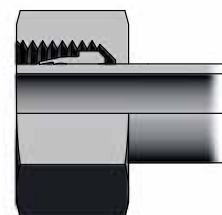


**ISO (24° cone)  
female with o-ring**

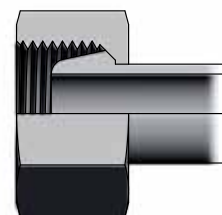
| THREAD SPECIFICATIONS  |                       |                  |
|------------------------|-----------------------|------------------|
| Thread O.D.<br>& Pitch | Female<br>Thread I.D. | Tube<br>O.D.(mm) |
| <b>M12-1.0</b>         | 11.0                  | 6                |
| <b>M14-1.5*</b>   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

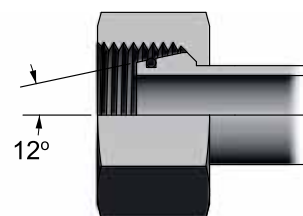
## FRENCH METRICS (GAZ & MILLIMETRIQUE SERIES)

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.

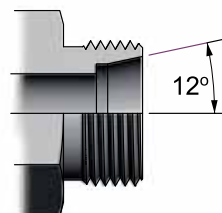
The Gaz and Millimetrique series are identical in all respects except for the O.D. of the tube:

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

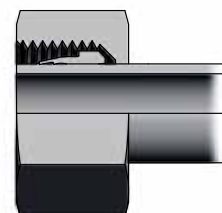


**French 24° cone female with o-ring**

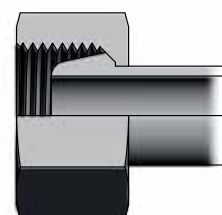
| THREAD SPECIFICATIONS LIGHT (L) SERIES |                    |          |               |
|----------------------------------------|--------------------|----------|---------------|
| Thread O.D. & Pitch                    | Female Thread I.D. | Diameter |               |
|                          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



**French 24° cone male**



**Cutting ring and nut on tube**

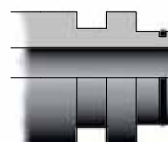


**French female swivel nut with spherical seat**

## 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.

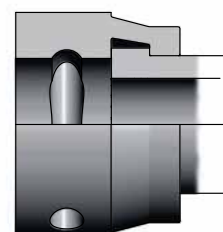


**Staple-lok male**



**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**

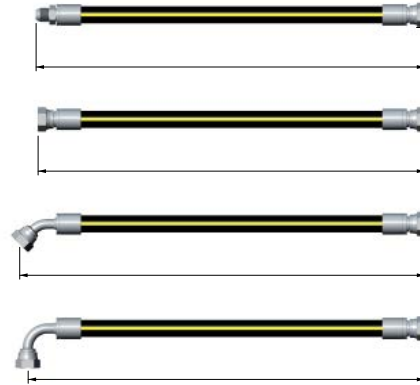


**Staple-lok staple**

## 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:

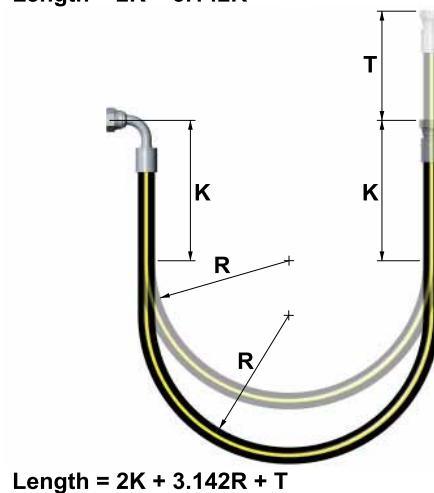
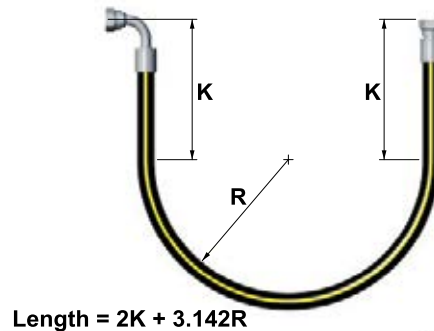
### Static Installations

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 |

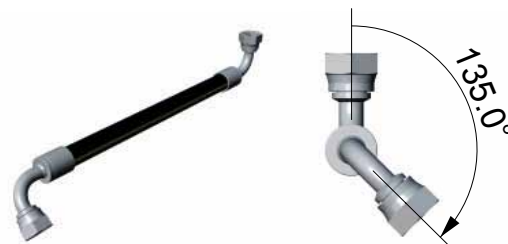
### Dynamic Installations

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

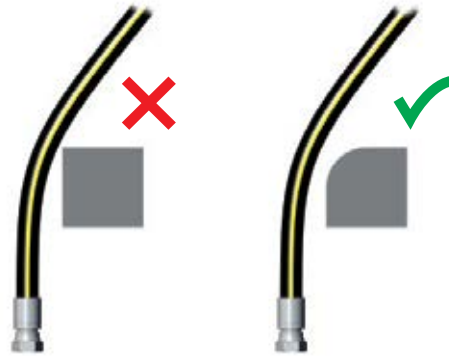
Place hose assembly in line of sight position with coupling furthest away facing upwards. Determine off-set angle by comparing relative position of closest coupling to the far coupling in a clockwise direction.



## 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.

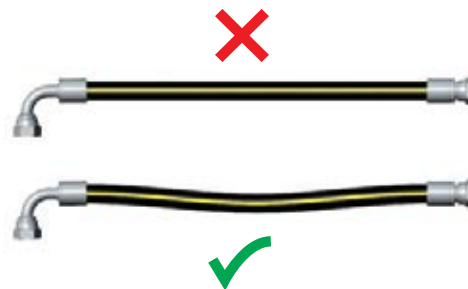
Fig. 1



## 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

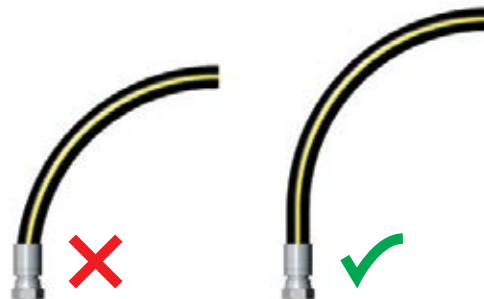


Fig. 4b

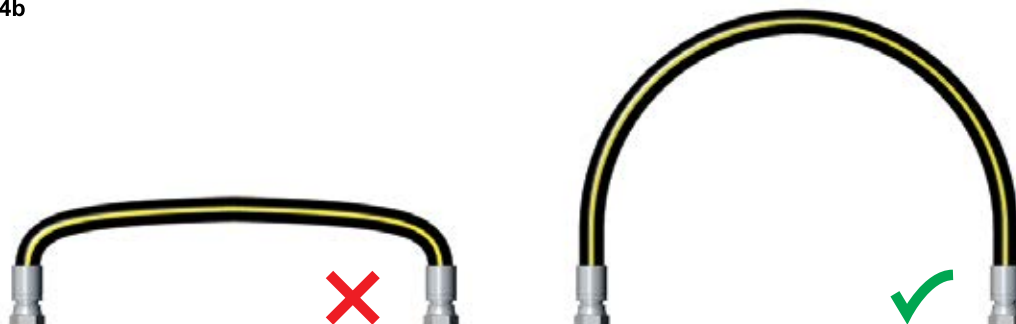


Fig. 4c



### 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.

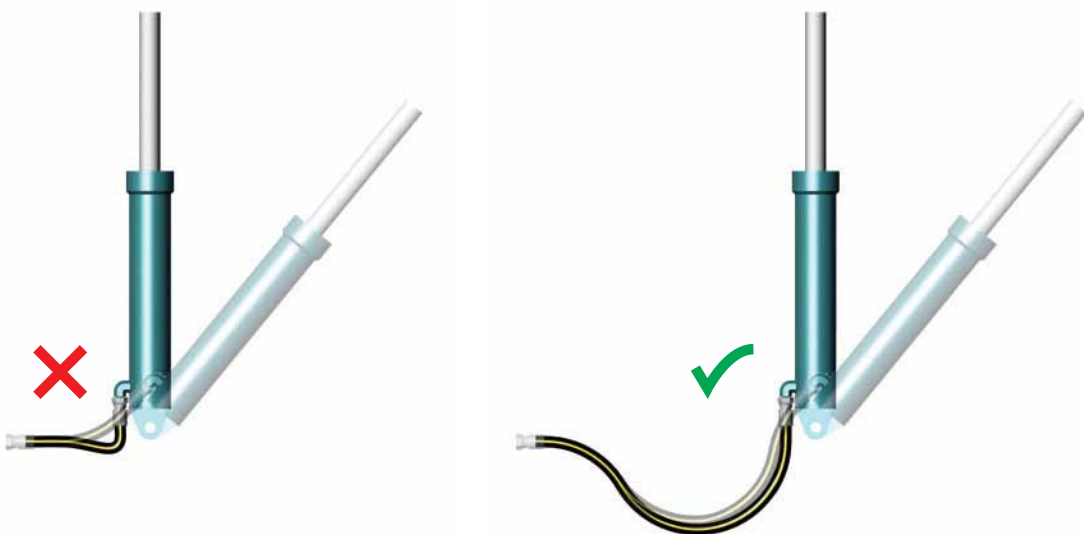
Fig. 5



### 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



# Fire Suppression Systems

## Section 25



Heavy, mobile and stationary equipment represents a substantial investment for any business. Due to the often heavy demands placed on equipment performance, a significant consideration of risk for any operation today is damage to equipment or potential loss of life resulting from the ever-present risk of fire.

Reality is that occasionally machines catch fire, and consideration must be given to the costs of machine replacement and lost production. These costs are however, insignificant compared to the loss of life.

While there are a few common causes, it is worthwhile considering the options available to protect your investment in the case of such an event. The installation of a Fire Suppression System has now become an essential part of a company's overall risk management plan in order to minimise the risk to both operator and equipment.

System design and installation is carried out by trained and qualified personnel. Every system design begins with a thorough risk assessment of the equipment to be protected. This ensures that all fuel and ignition sources are identified and assessed for protection, resulting in a more effective management of the asset and its fire risks.

MusterII is in full compliance with all tests within AS 5062-2016

ALARM PANELS

ALARM PANEL KIT  
MUSTER COMPLETE ALARM PANEL KIT

- Alarm Panel kit consists of: Alarm Panel with 1m cable and external data port, battery pack, 10m of 2 core silicone cable, electronic and LOP actuation tags, 2mm stainless steel bracket with bolts, 10 cable splices, 4 heat shrinks and installation manual.

| Part Number |
|-------------|
| FS-M2APK01  |

ALARM PANEL  
MUSTER ALARM PANEL & BATTERY ONLY



| Part Number |
|-------------|
| FS-M2AP01   |

ALARM PANEL SERVICING

BATTERY PACK  
LONG LIFE NON-RECHARGING LITHIUM ION  
BATTERY



Battery Pack

| Part Number |
|-------------|
| FS-M2BP01   |

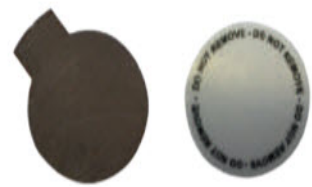
FUSE PACK  
2 AMP X 10 UNIT PACK



Fuse Pack

| Part Number |
|-------------|
| FS-M2FP01   |

ACTUATION TAG  
MUSTER ACTUATION BLANKING T  
LOP CONFIGURATION



LOP Tag (Discard for M2IPS Systems)

| Part Number |
|-------------|
| FS-M2AT01   |
| FS-M2AT02   |

### REMOTE ACTUATORS

#### REMOTE ACTUATOR

##### MUSTER LOP REMOTE ACTUATOR P

- Manual actuation is a process that puts the power into the hands of the operator. It is important for the operator to know where the manual activation panel is and how to use it. Muster II uses a small box with a single motion , in accordance to AS 5062 regulations. The fast actuation gives the operator and machine the best chance of a fast response and the best chances for protection.



LOP Actuator: M2RA32PB

| Part Number |
|-------------|
| FS-M2RA32PB |

### REMOTE ACTUATOR SERVICING

#### SECURITY TIE

##### MUSTER SECURITY TIE FOR ACTUATOR

- 9 inch security ties
- Thick tamper proof seals.



Security Tie

| Part Number |
|-------------|
| FS-M2ST01   |

### REPLACEMENT LABEL MUSTER LABEL REMOTE ACTUATOR

- UV stabilised, suits both remote actuators



Remote Actuator Label

| Part Number |
|-------------|
| FS-M2L31    |

### VALVE

### ELECTRONIC ASSEMBLY MUSTER ELECTRONIC LHD VALVE

- The new MusterII valve design enables the valve to be configured for use with MusterWire fire sensing wire system.
- Using state of the art transducer technology located within the valve provides continued monitoring of the cylinder pressure and feeds that information back to the Alarm Panel.
- Includes solenoid valve, digital pressure gauge M2PG01 and valve nipple M2VN32 (22mm to 11/16 JIC M).



| Part Number |
|-------------|
| FS-M2VA31   |

VALVE SERVICING

O-RING KIT  
O RING KIT FOR VALVE ASSEMBLY

- Includes tool, silicone O-ring grease suits M2VA31, M2VA32, M2VA33.



O-ring Kit for Valve Assemblies

| Part Number |
|-------------|
| FS-M2OK31   |

NIPPLE  
NIPPLE 1.1/16 JICM X M22  
1.1/16 JICM X M22

- Stainless steel replacement outlet nipple.



Discharge Outlet Nipples

| Part Number | Thread 1    | Thread 2  |
|-------------|-------------|-----------|
| FS-M2VN31   | 3/4 JICM    | M22 x 1.5 |
| FS-M2VN32   | 1 1/16 JICM | M22 x 1.5 |

## MUSTER SEAL

### MUSTER THREAD SEAL 25ML TUBE

- MusterSeal has been designed specifically for stainless to stainless bonding.



MusterSeal

| Part Number |
|-------------|
| FS-M2TS01   |

## PRESSURE GAUGES

### MECHANICAL PRESSURE

#### MUSTER FIELD REPLACEABLE GAUGE

- The MusterII system offers two types of pressure gauges; digital or mechanical. The digital gauge is electronic and comes with its own battery power supply. The digital gauge has a greater range of measurement allowing for more accurate cylinder pressure within 0.1% utilising state of the art transducer technology. The mechanical gauge is to assist with cold climates and underground mining applications.

| Part Number |
|-------------|
| FS-M2PGR02  |

ACTUATION COMPONENTS

LOP  
MUSTER FIRE SENSOR TUBE KIT 8M

- A complete range of actuation components are available. Manifold block and fire sensing tube are available for LOP. The LOP transducer assembly converts the air pressure in the fire sensor tube to an electronic signal. This is then sent to the Remote Actuator or Alarm Panel, reducing the length of air filled tube that is needed by the system.



Fire Sensor Tube

| Part Number |
|-------------|
| FS-M2MB01   |
| FS-M2TA02   |
| FS-M2STK01  |
| FS-M2STK02  |

CYLINDERS

CYLINDER KITS

MUSTER 110L CYLINDER KIT

- Stainless steel components have been used to ensure longevity and durability in harsh conditions, culminating in a high quality product with greater accuracy in performance. Constructed to AS 2470, the cylinders and brackets are made from 304 grade stainless steel including; the ring neck, relief valve and handles, and completed in a UV stabilised powder coated finish.
- Cylinders are manufactured in stainless steel and externally powder coated.
- Each cylinder incorporates a stainless steel filler plug and a safety relief valve.
- Cylinder assemblies use flexible pick-up tubes to allow the cylinders to be mounted from a 45° angle to vertical.
- Heavy duty welded stainless steel cylinder brackets have been designed to integrate with the cylinder to minimize space usage.
- The robust base plate has been designed for compactness and provides the smallest footprint possible.
- Vibration eliminators are available for applications where assemblies are subject to continuous movement or vibration.



| Part Number |
|-------------|
| FS-M2CK022  |
| FS-M2CK038  |
| FS-M2CK066  |
| FS-M2CK110  |

### CYLINDER SERVICING

#### CYLINDER CHARGING KIT MUSTER CHARGE RIG KIT

- Used for cylinder commissioning
- Includes hard case
- Harris 825 N2 regulator
- 15m and 1m x 1/4 hose
- Ball valve
- Pressure gauge
- Type 51 nitrogen adaptor and other required adaptors.



Cylinder Charging Kit

| Part Number | Suits cylinder |
|-------------|----------------|
| FS-M2CR01   | 66L and 110L   |

#### FILLING TUBE MUSTER FILLING TUBE FOR CYLINDER



Filling Tube

- The filling tube is a newly designed tool to ensure the highest degree of constant accuracy when filling the cylinders. All 4 cylinders are covered with a simple and easy locking adjustment. The tube is finished in a hard anodised finish to protect it in harsh environments.

| Part Number |
|-------------|
| FS-M2FT01   |

#### DATE TEST TAG MUSTER ALUMINIUM DATE TEST TAG



| Part Number |
|-------------|
| FS-M2TT01   |

## METAL SPLIT SECURITY

### MUSTER SPLIT SECURITY RING



| Part Number | Suits cylinder |
|-------------|----------------|
| FS-M2SR01   | 22L            |

## CYLINDER ACCESSORIES

### CYLINDER BRACKETS

#### MUSTER BRACKET FOR 66L & 110L CYLINDERS



Cylinder Bracket

| Part Number  | Suits cylinder |
|--------------|----------------|
| FS-M2CB02238 | 66L            |
| FS-M2CB66110 | 110L           |

## CYLINDER STRAPS

MUSTER CYLINDER STRAP 66L &110L



Cylinder Straps

| Part Number |
|-------------|
| FS-M2CS02   |

## VIBRATION ELIMINATOR

MUSTER VIBRATION ELIMINATOR ASSEMBLY 34MM  
HIGH DENSITY RUBBER



Vibration Eliminator

| Part Number | Suitable for |
|-------------|--------------|
| FS-M2VE34   | MusterII     |

PICK UP HOSE

MUSTER PICK UP HOSE 110L



| Part Number | Suitable for |
|-------------|--------------|
| FS-M2PU022  | FSI          |
| FS-M2PU038  | ETI 38mm     |
| FS-M2PU066  | ETI 32mm     |
| FS-M2PU110  | Chubb/QTEC   |

SAFETY RELIEF VALVE

MUSTER SAFETY RELIEF VALVE  
INCLUDES FILL PLUG



Safety Release Valve

| Part Number | Size |
|-------------|------|
| FS-M2SRVP   | 22L  |

### CYLINDER ADAPTORS

#### MUSTER SANDVIK CYLINDER ADAPTOR

- MusterII introduces great versatility with a range of optional cylinder adaptor nuts. Designed to suit a range of cylinders, the adaptors will suit most brands on the market.
- Stainless steel
- Used to upgrade existing systems after a compliant Risk assessment process
- 7 types available
- Suits M2VA31 and M2VA32 valve assemblies



Cylinder Adapter

| Part Number | Size  | Suits cylinder |
|-------------|-------|----------------|
| FS-M2CA32   | 304ml | 38L            |
| FS-M2CA36   | 20L   |                |
| FS-M2CA37   | 200L  |                |

STANDARD FOAM

AFFF 1% CONCENTRATE  
MUSTER STANDARD 1% AFFF FOAM 20L

- The Foam Fire Suppression System utilises high grade AFFF at a 1% concentrate. AFFF is the leading agent used to fight large Class B (diesel and oils) flammable liquid fires and is used throughout the world typically in oil refineries, oil tank storage facilities, diesel depots and mobile applications. With a 99% water composition, AFFF is also effective in controlling both Class A fires (normal combustibles, wood, plastic, paper etc.) and Class B fires (Diesel, Oils, etc.).
- Sold as a concentrate
- Packaging designed by cylinder size
- Capable of suppressing a range of fire classes



| Part Number | Description           |
|-------------|-----------------------|
| FS-M2SFB020 | Single mount assembly |

### NOZZLE ASSEMBLIES

#### INLINE

##### MUSTER INLINE SS TWIN MOUNT ASSEMBLY

- The range of nozzle assemblies are fully adjustable and can be configured to suit a variety of applications and environments. They can easily be positioned and angled to maximise their effectiveness. High quality stainless steel fittings come complete with a stainless steel mounting bracket.
- Stainless steel construction
- Inline and end of line available
- Easy to position
- Note: Nozzle type to be ordered separately. Mounting bracket and bolts included.



| Part Number | Thread 1 | Thread 2 |
|-------------|----------|----------|
| FS-M2BA01   | 3/4 JICM | 3/4 JICM |

NOZZLES

NOZZLES

MUSTER NOZZLE CAP RED  
60° & 120° SPRAY PATTERNS

- Key to a fire systems effectiveness are the discharge nozzles. Nozzles must be protected to reduce the chance of contaminants. MusterII nozzles come with the new high tech MusterCaps offering a tight tongue and groove seal on the nozzle face reducing the chance of the cap vibrating off and quick release feature that ensures the nozzle ejects the cap fast and effectively.
- Machined stainless steel
- Choice of either 60° or 120° spray patterns
- Durable and soft nozzle caps with quick release feature



| Part Number | Thread 1  | Thread 2  |
|-------------|-----------|-----------|
| FS-M2NA01   | 1/8 BSPTM | 7/16 JICM |
| FS-M2NA02   | 1/4 BSPTM | 7/16 JICM |
| FS-M2NC01   | 66L       |           |

### FITTINGS

#### BULKHEADS

MUSTER BULKHEAD NIPPLE 1/16  
JIC MALE

- All standard fittings such as bulkheads, nipples, adaptors are stainless steel to ensure durability in harsh working environments.

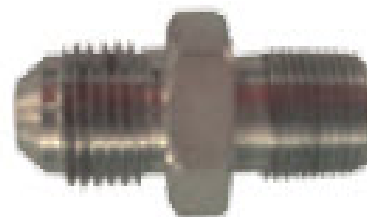


| Part Number | Thread      |
|-------------|-------------|
| FS-M2BH01   | 7/16 JICM   |
| FS-M2BH02   | 3/4 JICM    |
| FS-M2BH03   | 1 1/16 JICM |

#### NIPPLES

MUSTER BULKHEAD NIPPLE 1/4 BSPM  
BSPTM - JICM

- All standard fittings such as bulkheads, nipples, adaptors are stainless steel to ensure durability in harsh working environments.

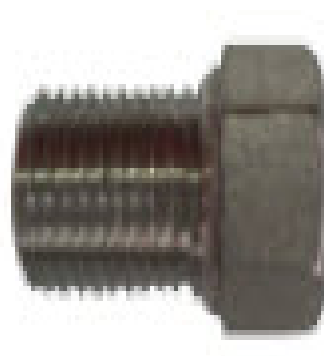


| Part Number | Thread 1    | Thread 2        | Thread 3    |
|-------------|-------------|-----------------|-------------|
| FS-M2NP0207 | 1 1/16 JICM | 1.1/16 JICF S/N | 1.1/16 JICM |
| FS-M2NP0407 | 3/4 JICM    | 3/4 JICF S/N    | 3/4 JICM    |

### PLUGS

#### MUSTER SS PLUG 1/4 BSPTM

- All standard fittings such as bulkheads, nipples, adaptors are stainless steel to ensure durability in harsh working environments.



| Part Number | Description | Thread 1  | Thread 2  |
|-------------|-------------|-----------|-----------|
| FS-M2PL02   | 45°         | 1/4 BSPTM | 1/4 BSPTF |
| FS-M2PL04   | 110L        |           |           |

### TEES

#### MUSTER SS TEE 7/16 JIC M-F-M JICM M-F-M

- All standard fittings such as bulkheads, nipples, adaptors are stainless steel to ensure durability in harsh working environments.



| Part Number | Size |
|-------------|------|
| FS-M2MT01   | 2mm  |
| FS-M2MT02   | 5mm  |
| FS-M2T07    | 90°  |

GROMMETS  
MUSTER RED SILICONE GROMMET

- Holds MusterWire, use with P clamps.



| Part Number | I.D (inches) |
|-------------|--------------|
| FS-M2G01    | 3/4          |
| FS-M2G02    | 1/4          |

### HOSE

#### FIRE SUPPRESSION HOS

MUSTER RED FIRE HOSE 3/4 ID

MSHA APPROVED



- MusterII hoses are available in 3/4, 1/2 and 1/4 diameters. Smooth covered, with a natural and synthetic rubber which is abrasion, ozone and weather resistant. Red in colour, hoses are temperature rated to -40°C to +100°C.
- MSHA approved hose
- High tensile braid material
- Bright red colour for easy identification in the engine bay

| Part Number | Suits hose |
|-------------|------------|
| FS-M2SH01   | 3/4        |
| FS-M2SH02   | 7/16-20    |
| FS-M2SH03   | 3/4-16     |

### HOSE TAILS

#### JIC FEMALE STRAIGHT

MUSTER PUSH LOCK HOSE TAIL STR

STAINLESS STEEL



- Push on hose fittings speed up the installation process. Strong barbs remove the need to crimp the hose, assembly can be done on the machine.
- Straight or 90° fitting types available
- Removes the need to crimp a hose

| Part Number | JIC Female Thread | Hose I.D Inches |
|-------------|-------------------|-----------------|
| FS-M2HTP02  | 1 1/16-12         | 3/4             |
| FS-M2HTP03  | 7/16-20           | 1/4             |

### JIC FEMALE 90° ELBOW

MUSTER PUSH LOCK HOSE TAIL 90  
STAINLESS STEEL

- Push on hose fittings speed up the installation process. Strong barbs remove the need to crimp the hose, assembly can be done on the machine.
- Straight or 90° fitting types available
- Removes the need to crimp a hose



| Part Number |
|-------------|
| FS-M2HTP04  |
| FS-M2HTP05  |
| FS-M2HTP06  |

### JIC FEMALE STRAIGHT

MUSTER FIELD ATTACHABLE JIC HOSE TAIL  
CARBON STEEL

- Field attachable hose fittings speed up the installation process. Eliminating the requirement for expensive Swaging Machines. Assembly can be done on the machine.

| Part Number | Size |
|-------------|------|
| FS-M2HTP01  | 66L  |

## TUBE &amp; TUBE FITTINGS

## NUT &amp; OLIVE

## MUSTER COMPRESSION NUT FOR SS TUBE

- To improve installation time the stainless steel tube does not require flaring. Instead MusterII uses a compression sleeve fitting; the nut and olive are also made from stainless steel eliminating oxidation which can happen with brass.
- Stainless steel
- 304 grade tube, olive and nut
- Removes the need for flaring



| Part Number |
|-------------|
| FS-M2SST02  |

LABELS

LABELS

MUSTER REMOTE ACTUATOR LOCATION LABEL

- A range of replacement labels for cylinders and actuators are readily available. It is important to inspect the tags and labels ensuring all are clearly identifiable during system inspection.
- UV stabilised
- Peel off numbers for shutdown time frame
- Part numbers printed on labels for easy reordering

| Part Number | Description   |
|-------------|---------------|
| FS-M2CL01   | 22L           |
| FS-M2CL02   | 38L           |
| FS-M2CL04   | 66L           |
| FS-M2CL06   | 110L          |
| FS-M2L09    | 110L          |
| FS-M2L10    | Warning (sml) |
| FS-M2L11    | Warning (lge) |
| FS-M2L12    | Arrow         |