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Hydraulic Hoses, Fittings and Equipment

Technical Handbook



ENGINEERING YOUR SUCCESS.

Parkrimp *No-Skive* and ParLock System

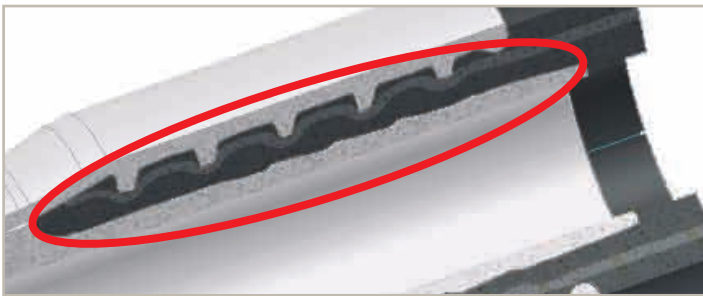
Along with the ever-growing power and efficiency of construction, agriculture and other machinery and increasing working pressures and flow

rates of their hydraulic systems, multispiral hose is gaining ever-increasingly important role in the machine design. Parker Hannifin, as the world

leader in the hydraulic hose market, answers to these high demanding requirements with 2 comprehensive systems – Parkrimp No-Skive and ParLock.

Parkrimp *No-Skive* system

is based on no-skiving technology (without removing rubber cover before assembling)



Each of the Parkrimp No-Skive and ParLock systems consists of integrated ranges of hose, fittings and assembling equipment and know-how which all are:

- Designed and developed together
- Tested and proved together
- Produced and supplied together

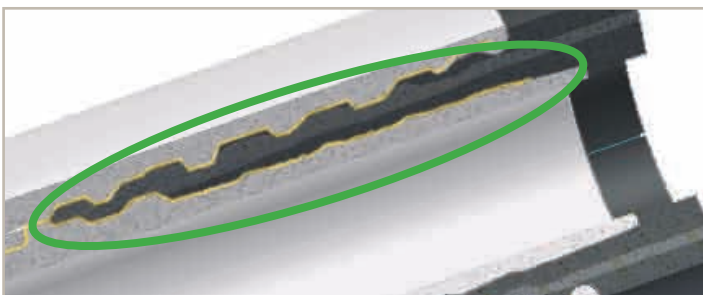
This way Parker Hannifin may guarantee:

- The highest quality and safety and the longest service life of the final product – to the end users, and at the same time:
- The easiest, most efficient and safe production process – to the assemblers.

This way Parker Hannifin also meets stipulations of SAE J1273 and ISO 17165-2 to pay particular attention to coupleability of hose with fittings and to their proven compatibility by the manufacturer.

ParLock system

uses external or internal and external skiving (Interlock) technology



Each of the two concepts has its indisputable advantages – selection of which depends on particular conditions of the application.

Parkrimp *No-Skive*

the system for great majority of high pressure applications

Parkrimp No-Skive is a synonym of the supreme solution for assembling hydraulic and related hose and fittings from both the technical and the manufacturing points of view!

Progressive rubber and metal compression and intact reinforcement layout of thoughtfully designed, tested and manufactured

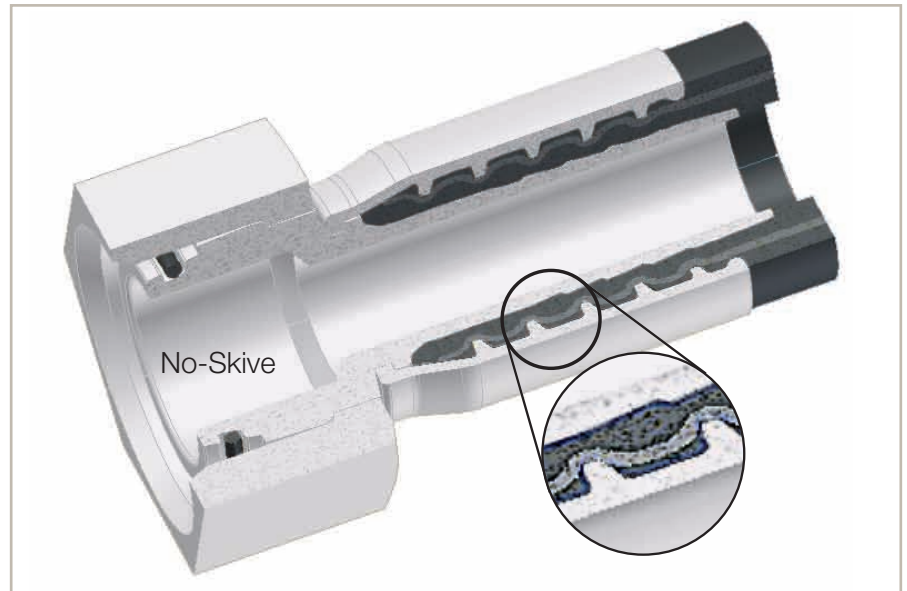
Parkrimp No-Skive hose and fittings along with the attested crimping diameters provide excellent mechanical connection of the hose with the fitting, absolute hydraulic tightness and longest service life even for the highest pressure 4- and 6-spiral hose assemblies.

Smartly designed and long-proven Parkrimp No-Skive assembling equipment and assembling know-how enable the simplest, mistake-proof, most efficient and safe assembling process, generating relevant cost and time savings to the assembler and guaranteeing defect-free, reliable and durable final product to the end user.

Parkrimp *No-Skive* Hose and Fittings

the system for fast and leak-free assemblies

- For crimping Parkrimp No-Skive fittings only
- No skiving tool needed
- No need to remove the cover
- Quick and easy: no gauges to set on the machine
- Portable machines for field repair
- Meets EN safety regulations



Parkrimp *No-Skive* Hose and Fittings

the system with the perfect match



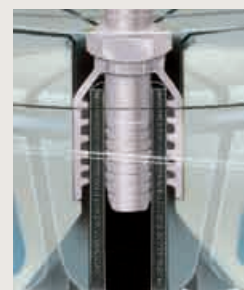
The perfect match

The complete system from one source. No-Skive hose, No-Skive fitting and crimping machine with world-wide guarantee and availability.



Parker's colour-coded die sets

No loose parts to mismatch or misplace – die set segments linked together. Die sets provide 360° evenly applied crimping forces for an ideal crimp result.



Parkalign®

Parker's exclusive Parkalign® positions the fitting in the dies perfectly every time.

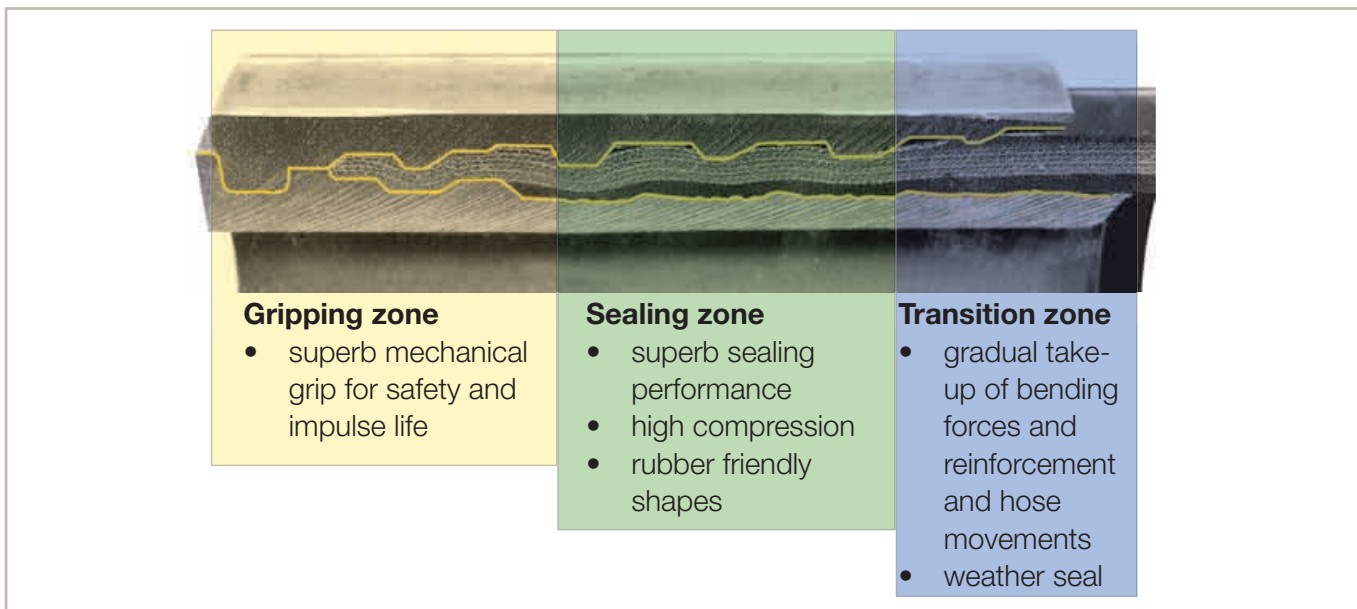


ParLock

the system for extremely dynamic pressure applications

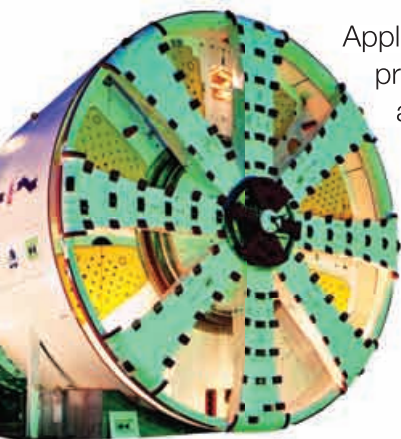
Applications requiring ParLock system

- Hydrostatic transmissions (combine harvesters, large tractors, excavators, etc.)
- Vibratory hammers
- Large injection molding machines
- Tunneling machines
- Forestry machines
- Large material handling machines (container handling)
- Excavator booms
- Blow-out preventers in oil and gas



For manufacturing the ParLock hose assemblies Parker Hannifin offers

- Sskiving machines for external and internal skiving
- Universal crimping machines with adjustable crimping diameter
- Detailed assembling instructions (see further in this catalogue)



Applications with extremely dynamic pressure profile, pressure surges and peaks, as well as applications with intense vibrations and hose flexing (bending), especially close to the fitting ends, require particularly strong mechanical connection of the hose with the fitting. To achieve this, the metal reinforcement of the hose has to be “locked” between the metal shell and the metal nipple – for which the rubber of the hose has to be removed

both externally and in a certain length also internally (a concept generally called “Interlock”). As a response to these most severe market requirements Parker Hannifin has developed the ParLock system with specific range of hose, fittings and assembling equipment and know-how.

Hydraulic Hoses and Fittings

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Hoses and Fittings Terminology

– The basics!

Hydraulic hose is a full-value part of the hydraulic system transmitting the hydraulic power – not just conveying a fluid – and deserves adequate attention as the other hydraulic components which generate, consume or control that power. Furthermore, it is just hydraulic hose assemblies that are usually most exposed to various extreme conditions in which they have to retain full functionality and assure serviceability of the hydraulic system and safety of the operators.

In spite of that, the importance of the hydraulic hose is often overlooked and underestimated.

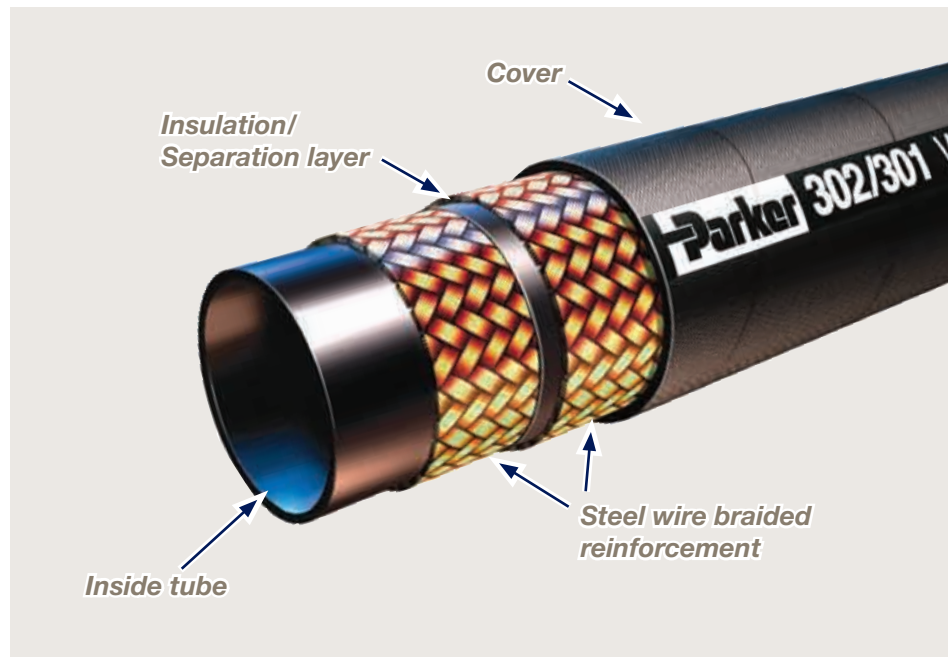
This catalogue is to provide guidelines to correct hoses and fittings selection and hose assembly manufacturing and to highlight the most important safety aspects for its service in the field.

Hydraulic Rubber Hoses

Tube – inner layer of rubber compound with chemical and physical properties to be long-term resistant to the fluid and working conditions.*

Reinforcement – 1 or 2 (exceptionally 3) layers of braided textile fibre or highly tensile steel wire or 4 or 6 layers of spiralled very highly tensile steel wire to bear high pressure but allow flexibility of the hose.

Cover – outer layer of rubber compound with chemical and physical properties to protect the reinforcement against ambient conditions and mechanical damage.



Depending on the pressure level we classify the hydraulic hoses in this catalogue into 4 groups:

- **Push-Lok**
 - low-pressure hoses with self-grip connection to fittings
- **Low-Pressure** and **Transportation**
 - 1 and 2 textile braided and 1 steel braided hoses
- **Medium-Pressure**
 - 1 and 2 steel braided hoses and suction hoses
- **High-Pressure**
 - 3 steel braided hoses and 4 or 6 steel spiralled hoses
 - 4 steel spiralled compact hoses

Depending on the method of hose and fittings assembling we offer 2 basic product concepts (integrated product lines of hoses, fittings, assembling equipment and know-how):

- **Parkrimp** *No-Skive*
 - complete range of braided and spiralled hose, not needing removing (skiving) of the hose cover before assembling.
- **ParLock**
 - specific range of 4 and 6 spiral hose for extreme applications which require skiving of the cover and for bigger sizes also of the inner tube.

Hose Fittings

Nipple (insert etc.) – the inner part of the fitting one end of which is coupled to the counterpart of a hydraulic component (termination end), while the other end is inserted inside the hose.

To assure coupleability and leak-free sealing of the hose fitting with the other connector, designs of termination ends are standardized according to numerous national and international standards.

The main role of the tail is to provide durable sealing between fitting and hose.



Shell (socket, ferrule etc.) – the outer part of the fitting providing mechanical connection of the fitting with the hose. To assure tough grip with the hose reinforcement, shells are mostly crimped during assembly operation. Invention of the tail and shell is in the sole responsibility of the manufacturer and it is just their design what makes the “art” of the hose business and the differences between the manufacturer.

Note

Parker Hannifin also offers limited range of 2-piece Parkrimp No-Skive fittings but being special products they are not included in this catalogue. For more information about 2-piece fittings, please contact our Division Helpdesk (HPDE_Helpdesk@parker.com)

In this catalogue we offer 3 kinds of fittings:

- **Push-Lok**

- special nipples connectable to Push-Lok hose without any shells.

- **1-piece fittings**

- pre-crimper shells on nipples making assembling hose with fittings much simpler, more effective and reliable.

- **2-piece fittings**

- for extreme applications requiring full metal-to-metal connection of the hose reinforcement with the shell or even with the nipple (external or external plus internal skiving).

Except Push-Lok, all fittings in this catalogue are crimped and includes:

- All Parker 1-piece fittings
 - suitable for the **Parkrimp No-Skive** product line
- All 2-piece fittings in this catalogue
 - suitable for the **ParLock** product line



Aa-4



Hose Assembly

It is the interplay between the fitting tail and shell designs and the hose design with its material properties that primarily determines performance, service, durability and safety of the final hose assembly. Yet compatibility of hose and fitting cannot be just theoretically projected and requires exhaustive and repetitive laboratory and field tests and further tuning of the designs.

Unverified coupleability of hose with fittings or even combination of hoses and fittings from different producers cannot only deteriorate performance of the hose assembly but may cause defects with serious health or life-threatening consequences! For this reason also the main international standards ISO 17165-2 and SAE J1273 strictly warn not to mix hose with fittings from different manufacturers without their approval.

Parker Hannifin has not approved products of any other manufacturer for combination with Parker hoses and/or Parker fittings and guarantees full coupleability, reliability and safety only for combinations of genuine Parker parts selected and assembled in accordance with guidelines included in this catalogue!

Hose Hint

NEVER MIX & MATCH one manufacturer's fittings with hoses from another manufacturer.

Parker hoses, fittings, assembling equipment and know-how are designed as an integrated system. Only this ensures optimum product performance, reliability and safety!



Pressure Rating

Hydraulic hose is a component transmitting hydraulic power and the pressure is obviously the main physical quantity determining the hydraulic power. For hydraulic hoses the following pressure ratings are used:

Working Pressure – the pressure for which the hose assembly is designed to operate over its whole service life - provided the other parameters (temperature in particular) stay within reasonable limits.

For apparently static applications (e.g. with hand pumps or water jetting) consult the Working Pressure with your Parker Hannifin Field Representative or with our Technical Support Division (HPDE_Helpdesk@parker.com).



Burst Pressure – the pressure which statically applied causes destruction of the hose. Technical standards for hydraulic hoses define the burst pressure to be equal to or higher than 4 times the working pressure (safety factor 4). This rule and the burst pressure in general serve to hose manufacturers for design and testing of the hose only! If you happen to know the burst pressure of certain hose, never use this rule backwards to deduce its working pressure!

$$4 \times \text{Working Pressure Gauge} = \text{Burst Pressure Gauge}$$



Hose and Fittings Terminology

Remember the Working Pressure

1. The HOSE ASSEMBLY WORKING PRESSURE is given by the weakest “link in the chain” - i.e. by the lowest of the working pressures of the hose and of both fittings. Do not forget to check the working pressure of the fittings when selecting components for a hose assembly (see pages **Ab-7** to **Ab-9** of this catalogue)!
2. The REAL HYDRAULIC SYSTEM OPERATING PRESSURE is not given by the system components setup but by the application which introduces into the system peaks and surges or by the functioning of the system itself (rapid closing or opening) which induces spikes and pulses. Such occurrences are detectable only by sensitive electronic pressure gauges and are usually not fully or not at all filtered out by safety or relief valves and exert excessive strain on the hydraulic system – hoses and tubes first of all!
3. The HOSE ASSEMBLY WORKING PRESSURE must always be EQUAL TO OR HIGHER THAN the REAL HYDRAULIC SYSTEM OPERATING PRESSURE incl. all peaks, surges, spikes and pulses!



Unit of measure

The most commonly used unit of measure for hydraulic pressure worldwide is MPa (Mega Pascal) – used also in this catalogue. In the US and in Anglo-Saxon markets also psi (pounds per square inch) is officially used and many European producers, users and even technical standards still use also bar.

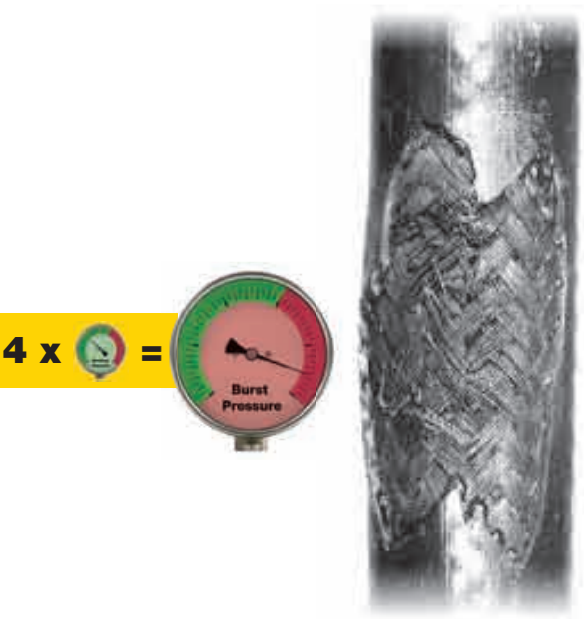
For the conversion chart of various units of measure see page **Ab-17**.

Hose Hint

Working pressure is a dynamic parameter, burst pressure is a static parameter. High burst pressure does not mean high working pressure!

In order to assure mutual compatibility, producers of hydraulic equipment, producers of machines and also international technical standards profess certain preferred pressure levels:

MPa	21	28	35	42
bar	210	280	350	420
psi	3000	4000	5000	6000



Hose Hint

- For highly demanding applications (dynamic pressure, high number of pressure cycles, high temperature etc.):
- Select hose with much higher working pressure than officially requested
 - Select multispiral hose instead of braided or ParLock instead of Parkrimp No-Skive
 - Select all of that in order to increase service life and safety!

Hose Size

The other parameter determining the hydraulic power in direct proportion is the flow rate – i.e. the fluid velocity. However, too high fluid velocity gives rise to turbulences, pressure drops and heating up the fluid, causing excessive ageing of hoses and other components or even their damage. To keep the fluid velocity below certain limits but achieve the required flow rate the size of hose has to be defined appropriately (see Flow Capacity Chart on page **Ab-19**).

As the first technical standards for hose came from the USA, dimensions of hose are defined in inches and hose sizes are expressed in inches or from inch-derived units. Global companies – such as Parker Hannifin – use **dash sizes** (-1 = 1/16”), while the European standards use DIN-based DN (diameter nominal).

Note

SAE 100 R5 hydraulic hose, SAE J1402 air-brake hose and SAE J2064 air-conditioning hose use sizes equivalent to corresponding metal tube I.D. – different from the other hydraulic hoses (see datasheets of these hoses in this catalogue).



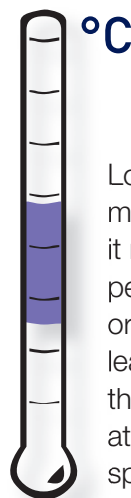
dash	inch	DN	mm
-3	3/16	05	4.8
-4	1/4	06	6.4
-5	5/16	08	7.9
-6	3/8	10	9.5
-8	1/2	12	12.7
-10	5/8	16	15.9
-12	3/4	19	19.1
-16	1	25	25.4
-20	1.1/4	31	31.8
-24	1.1/2	38	38.1
-32	2	51	50.8

Size	Inch	mm	DN
-6	6/16	6/16 * 25,4 = 9,525	10
↓	↓	↓	↓
-6	3/8	9,5	10

Ambient and Fluid Temperature

Temperature is one of the factors which most negatively affect rubber characteristics and so it deserves particular attention of the hydraulic system designers and hose users!

High temperature causes degradation of rubber and accelerated ageing of the hose – the effect which can be yet further intensified by chemical impact of the fluid. That is why the upper temperature limits specified in this catalogue refer to the fluid temperature and why they differ for various media. However, permanent or long-lasting use at temperatures close to the upper limit would considerably shorten the hose service life in any case and if it cannot be avoided the hose should be replaced more frequently once it shows first symptoms of deterioration (stiffness, hard cover and cracks).



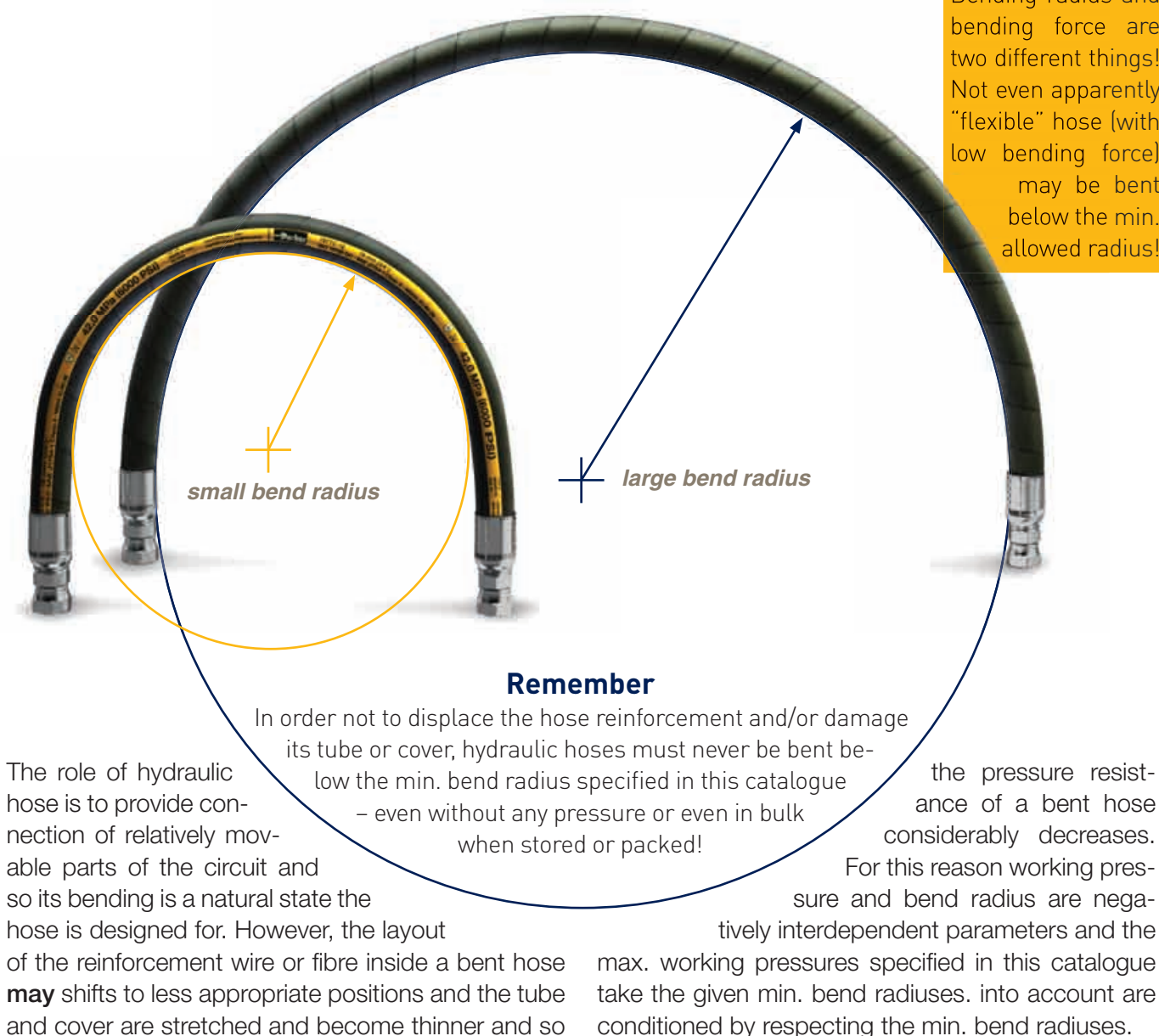
Aa-7

Hose Hint

The combination of high temperature and high pressure reduces the hose service life. Pay attention to regular inspection of such hoses and their preventive replacement if the cover is brittle or cracked!

Low temperature, on the other hand, affects mainly physical properties of rubber – making it more fragile – and so at extremely low temperatures hose being bent may crack in tube or cover which can cause immediate or later leakage, burst or reinforcement damage. As there are not many hydraulic fluids which flow at or below -40°C, the lower temperature limits specified in this catalogue refer rather to ambient temperature below which the hose should not be bent or otherwise hit from outside (while staying passively in it does not cause serious problems).

Hose Bending Radius



Recommended Fluids

As the power transmitting – not fluid conveying – element, hydraulic hose should be first of all used for the Primary Applications and with the Recommended Fluids specified in this catalogue!

For low pressure applications with various non-hydraulic fluids look for corresponding industrial hose – see our catalogue “**4401 Industrial Hoses**”. If for required higher pressure or for any other reason you cannot use industrial hoses, follow the instructions in this catalogue (pages **Aa-9** – Application, **Aa-11** – Fluid Compatibility and **Ab-21** to **Ab-29** - Chemical Resistance Table).

Safe Hose Assembly in 8 Steps

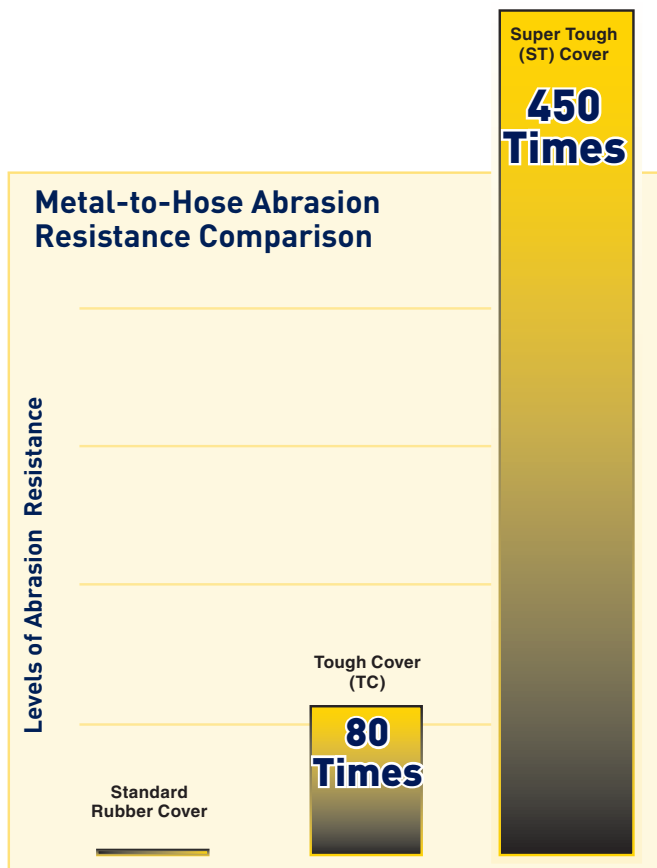
1. Application

There are so many operational factors affecting the functionality and service life of hydraulic rubber hoses and there is such a wide variety of external circumstances they have to work in that some few basic parameters such as pressure, size and fitting types cannot provide a sufficient basis for selecting and producing the proper product. The only unfailing way is to start ... from the end – to learn and thoroughly understand the application the hose assembly will work in.

Hose Hint

You do not always need additional sleeve to protect the hose against abrasion!

Parker high and extremely high abrasion resistant **TOUGH COVER** and **SUPER TOUGH** versions with 80-times and 450-times higher abrasion resistance do the same but better and cheaper!



Main operational factors:

- Market (agriculture, construction, marine, mining, ...)
- Machine / Equipment type
- Hydraulic system pressure
- Static / Dynamic
- Extreme pulses (frequency, amplitude)
- Surges, peaks, spikes
- Suction strains
- Flow rate
- Ambient / Fluid temperature (permanent, peak)
- Biodegradable oil
- Other fluid – liquid/gaseous
- Bending radius
- etc.

Main external circumstances:

- Extreme environmental conditions
- Ultraviolet light / Sunlight
- Ozon / Smog / Salt water
- Restricted space
- Abrasives / Sharp-edge objects
- Mechanical loads (strain, stress, torsion)
- Mechanical vibrations
- Fittings heated
- Fittings under voltage / current
- Electrical / Magnetic field
- Heat exposure
- Flame / Fire exposure
- etc.

Other requirements:

- Certificate / Approval needed
- Special (OEM) specification
- Environmental requirements
- Work Safety requirements

Safe Hose Assembly in 8 Steps

2. Pressure

Working pressures of both hose and fittings must be equal to or higher than the real hydraulic system operating pressure incl. all surges, peaks, spikes and pulses!

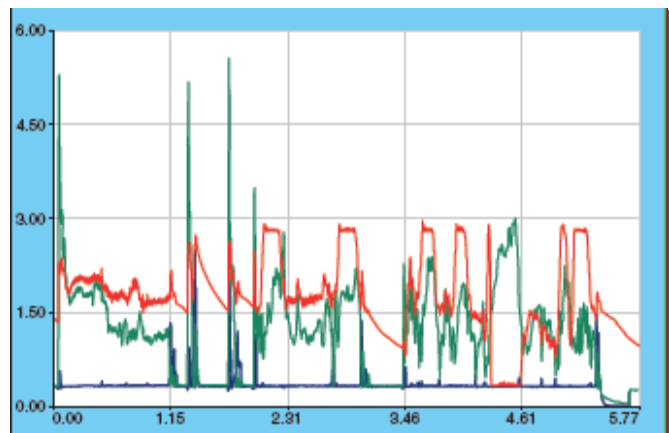


For hose working pressure rates see pages **Ab-2** to **Ab-3** Hose Overview.

For fittings working pressure rates see pages **Ab-7** to **Ab-9** Hose Fittings Pressure Ratings.

For the absolute majority of hydraulic applications incl. for the highest pressure 4- and 6-spiral hoses we advise to use the **Parkrimp No-Skive** product line. It provides really supreme solutions for hydraulic and related hoses and fittings from both the technical and the manufacturing points of view!

For applications with extremely pulsing dynamic pressure, pressure surges and peaks, as well as for applications with intense mechanical vibrations and hose flexing (bending), especially close to the fittings, we recommend using the **ParLock** product line.



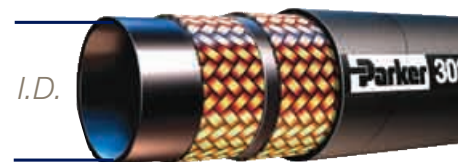
3. Size

To avoid turbulences and their negative consequences for hose and other components in the hydraulic circuit, certain limits for fluid velocity have been set based on long-term experience with hydraulic systems. The limits differ for pressure, return and suction lines, as the hydraulic flow tends to be turbulent, i.e. the more turbulent the lower the pressure is turbulences the more the lower the pressure.

Max. recommended fluid velocity:

- Pressure lines – max. 6 to 8 m/sec
- Return lines – max. 3 to 4 m/sec
- Suction lines – max. 1.2 to 1.5 m/sec

However, there is no need to calculate the velocity. Depending on the flow rate and kind of hydraulic line in which the hose is intended to serve (pressure / return / suction) you can assign the required hose size in the Flow Capacity Nomogram on page **Ab-19**.



Hose Hint

Don't try to save your own or your customer's money by downsizing the hose!

It would cost your customer more to replace damaged hoses, other components and oil, and it will cost YOU more as you may lose your customer!

The size of the hose is directly included in the hose part number: e.g. 302-6 – ISO 1436 / EN 853 2SN hose size -6 (3/8" - DN10)



High Temperature

For high temperature hoses choose the part numbers ending in “6”

– e.g. **436-12** - SAE 100 R16

High Temperature hose size -12

Low Temperature

For extremely low temperature hoses choose the part numbers ending in “LT” –

e.g. **461LT-16** – EN857-2SC

Low Temperature Hose size -16

4. Temperature

The main technical standards for hydraulic hoses specify the max - min temperature range usually (not always) as:

- EN standards and EN/DIN-based ISO standards
-40 °C to +100 °C
- SAE standards and SAE-based ISO standards
-40 °F to +250 °F / -40 °C to +121 °C

For Parker hoses you can find the permissible temperature ranges for recommended fluids and for water and air (when applicable) in the datasheet of each hose type in this catalogue.

Besides a complete range of standard hoses Parker also offers a wide range of special types for low and high temperatures – see pages **Ab-2** to **Ab-3** Hose Overview.

5. Fluid Compatibility

You can find Recommended Fluids for Parker hoses in the datasheet of each hose type in this catalogue.

If the required fluid is not mentioned in the Recommended Fluids Chart and if due to higher pressure or for any other reason you cannot use Parker industrial hoses (see Parker catalogue “4401 Industrial Hoses”) pay the highest attention to obtain as much information as possible about the fluid (temperature, pressure, state – liquid or gaseous etc.) and about the working conditions of the hose (see par. 1. Application).

Then check the compatibility of the fluid with the given hose and material of the fitting in the Chemical Resistance Table pages **Ab-21** to **Ab-29**.

The Chemical Resistance Table concerns solely the tube. Hydraulic hoses should never be submerged in the hydraulic fluids! If you need to know the resistance of the hose cover, consult our Technical Support Division (HPDE_Helpdesk@parker.com)

6. Fittings

Hose Hint

Although fittings are made of steel, their working pressure is often lower than that of hose! Don't forget to check both fittings working pressures when selecting components for hose assembly!

Even if the fitting termination end is given by the other component in the hydraulic circuit or the hose assembly is just for replacement, you have to pay attention to choose the correct fittings compatible with the given hose for the required working pressure and fluid.

To identify the corresponding termination end see pages **Ab-30** to **Ab-40** Identifying Fitting Types.

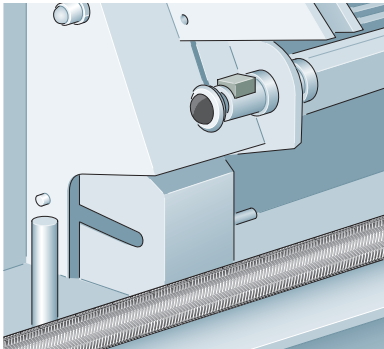
For each type of hose the series of the compatible fitting is indicated in the hose datasheets in this catalogue – e.g. Parker hose 701 is to be assembled only with Parker Fittings Series 70.

Always check the fitting working pressure – see pages **Ab-7** to **Ab-9** Hose Fittings Pressure Ratings.



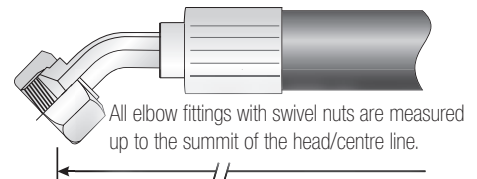
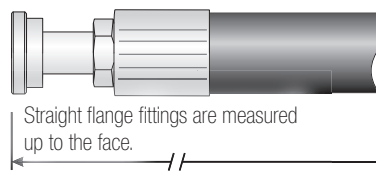
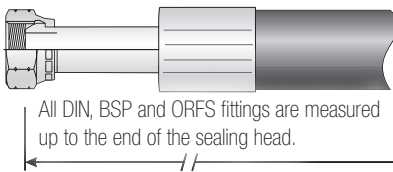
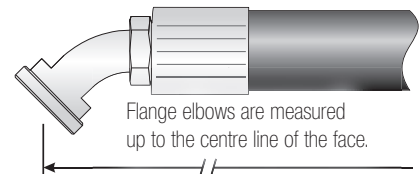
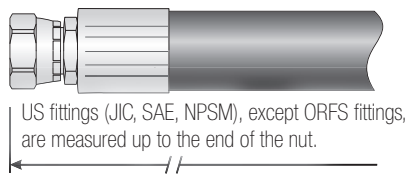
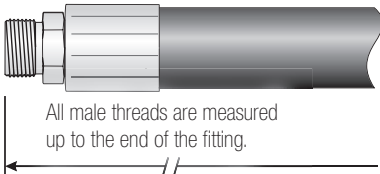
7a. Working Steps for One-Piece Parkrimp *No-Skive* Fittings

Cutting



Hose is cut to the desired length according to specifications. The correct hose cutting tool ensures a square, clean cut without damaging the pressure reinforcement. Depending on the hose type, different kinds of blades must be used:

- 1) Smooth blade:
for high tensile textile layer, return line hoses and steel wire braided hoses
- 2) Scalloped blade:
for hoses with 4- or 6 spiral layer of high tensile steel wire



Tolerances for hose assemblies

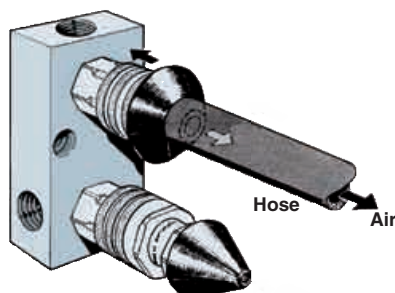
Length tolerance according to DIN 20066:2002-10 and EN 853 to EN 857

Hose assembly length	up to DN25 (size -16)	from DN32 (size -20) up to DN50 (size -32)	from DN60 (size -40)
up to 630	+7 -3	+12 -4	+25 -6
over 630 up to 1250	+12 -4	+20 -6	
over 1250 up to 2500	+20 -6	+25 -6	
over 2500 up to 8000		+1,5 % -0,5 %	
over 8000		+3 % -1 %	



According to EN 982, hose assemblies are not permitted to be manufactured from any components that have already been in use in other hose assemblies.

Cleaning after cutting



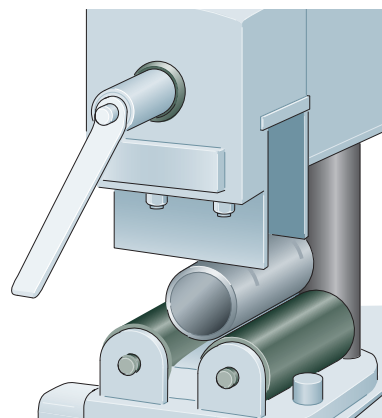
After cutting it is recommended to clean the hose with compressed air from both sides. Please make use of Parker's Cleaning System TH6-7 – A quick and simple system – Delivered with two plastic nozzles for hoses from size -4 up to -32.

The hose is pressed against the nozzle and thereby opens a valve to allow the compressed air to blow through the hose and blow out loose particles.

Marking

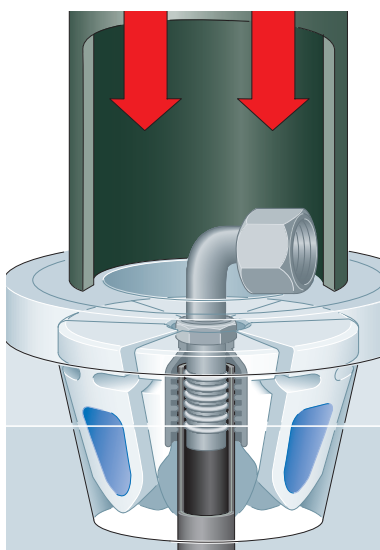
According to EN and ISO standards, hose assemblies must be clearly and permanently marked. They must bear the following information:

- Manufacturer's identification
- Date of production (year and month)
- Maximum permissible working pressure limit of hose assembly



Crimping One-Piece Parkrimp No-Skive Fittings

Crimping is the safest, fastest and most commonly used method of making a hose assembly. The Parker crimping systems ensure precise, leak-free and tear-proof assembly of hose and fitting. Reaching the exact crimping diameter is possible with Parkrimp crimping tools or adjustable crimping tools. When crimping, it is essential that hose, fitting and crimping tool (dies) match precisely. For crimping dimensions please refer our crimp charts on pages **Ed-1** to **Ed-11**.

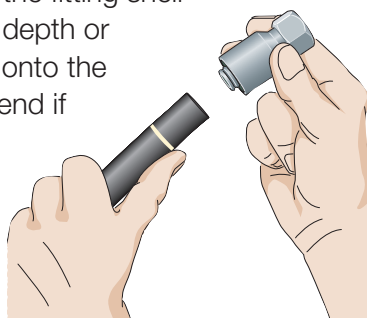


Furthermore, the insertion depth, a square cut hose, correct, burr-free and clean crimping are important to ensure a correctly formed and leak-free connection of hose and fitting. Using the Parkrimp hose crimpers or adjustable crimpers, the fitting is crimped onto the hose in one slow and smooth crimping procedure. A depth stop with automatic function ensures safe positioning of the fitting. This guarantees the correct crimping of hydraulic hose assemblies.

26, 46, 48, 70, 71, 73, 76, 77, 78, 79, S6 series:

Push the hose all the way into the coupling.

Place the hose next to the fitting shell and mark the insertion depth or the length of the fitting onto the hose – (lubricate hose end if necessary), push the hose into the fitting until the mark on the hose is even with the end of the shell.

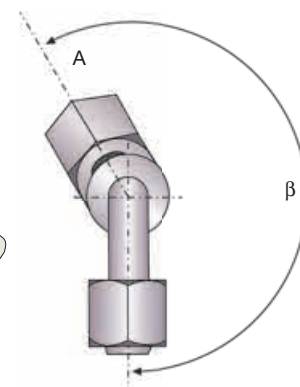
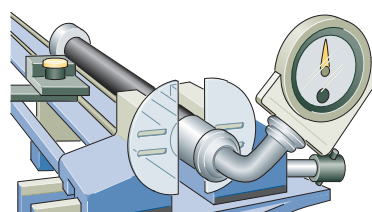


Angle setting

The displacement angle of a hose assembly is indicated only when two elbow fittings are assembled in a displaced way.

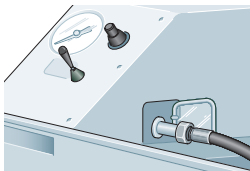
The angle always has to be indicated clockwise looking from the elbow fitting at the back to the one in the front. Please also consider the natural bending of the hose.

**Parker representatives
can support you with
training or advice !**



Safe Hose Assembly in 8 Steps

Testing (optional)



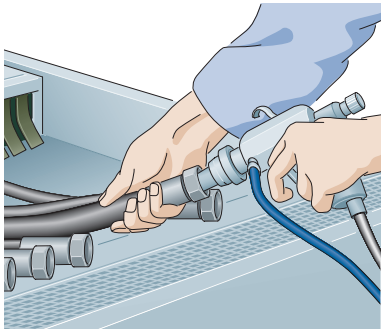
Static test pressure depending on the hose type and application is applied to the finished hose assembly for a pre-defined period of time. The test procedure can be documented using a test logging unit. The test pressure for Parker hydraulic hose assemblies is 2 times the value of the dynamic operating overpressure.

Proof Pressure Test

This test is typically carried out on customer request according to a method defined by the ISO 1402 standard. The test should be done at normal ambient temperature with a proof test bench using water or another suitable liquid. The hose assembly should be pressurised for between 30 to 60 seconds at twice the working pressure of the hose assembly. There should be no leakage or pressure drop. A complete test report should be provided together with the hose assembly to the customer.

Cleaning

The hydraulic systems have to reach a defined degree of cleanliness. For this purpose we use cleaning devices which ensure fast and efficient cleaning of hose assemblies. With the TH6-6 standard cleaning device, cleanliness class 17/14 according to ISO 4406 can be achieved. For higher degrees of cleanliness, the TH6-6 device needs to be equipped with a different filter cartridge (see chart).



This cleaning device first washes the hose assembly with a detergent and an anticorrosive agent and then blows it out with pressurised air. For permanent protection of the finished hose assembly against impurities we recommend using plastic caps.

ISO 4406	NAS 1638	SAE 749
11/8	2	
12/9	3	0
13/10	4	1
14/11	5	2
15/12	6	3
16/13	7	4
17/14	8	5
18/15	9	6
19/16	10	
20/17	11	
21/18	12	

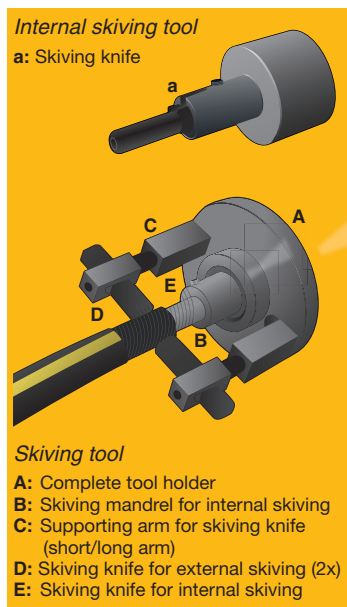


7b. Working Steps for Two-Piece ParLock Fittings

Cutting, cleaning after cutting and marking please see “Working Steps for One-Piece Parkrimp No-Skive”

Skiving

For the skiving of hydraulic hose, one distinguishes between internal skiving and external skiving. This system is applied for hose types with 4 or 6 spiral reinforcement layers, the so-called Parker Parlock System or Interlock.



Adjustment of tools for internal skiving

Select the skiving tool according to the manufacturing documents and the hose size. Insert the knife for the internal skiving mandrel into the borehole of the mandrel provided for this purpose and mark it with a lock collar at the straight surface. When adjusting the knife, observe the marking on the internal skiving knife and insert the mandrel into the tool holder.



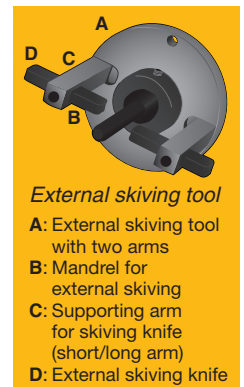
Adjustment of tools for external skiving

Attach the knives in the supporting arm. Select the supporting arm (long or short) depending on the hose size.

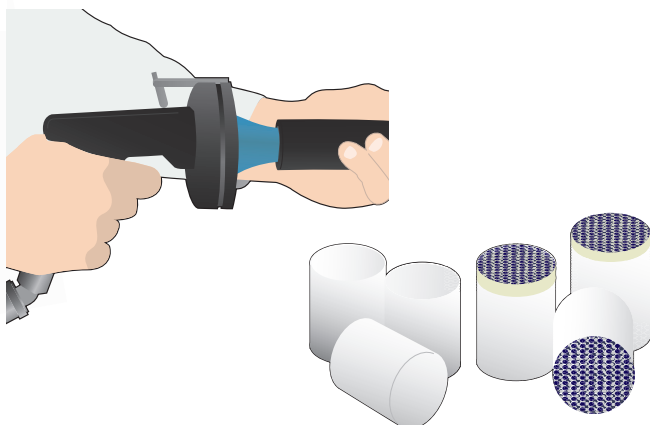
Adjust the knives according to the Parker working instructions and insert the tools into the machine. Push the mandrel onto the hose until it is close to the tool (external or internal skiving knife).

Adjustment of the sense of rotation of the machine

Always skive into the direction of the spiral layers. Please observe the operation instructions of the machine.



Cleaning after skiving



All hose types which have been skived externally or internally must be cleaned immediately after skiving. For this purpose we recommend using cleaning plugs which are shot through the hose using compressed air.

In addition to this working step, the finished hose assembly is cleaned from both ends using pressurised air after the completion of this working step.

Safe Hose Assembly in 8 Steps

Crimping Two-Piece ParLock Fittings



For crimping ParLock fittings V4 series a minimum of 320 tons crimping force is recommended. Min. of 350 tons for V6 series.

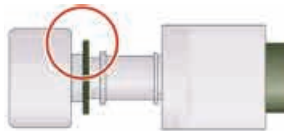
- 1) Select the appropriate crimping dies using the crimping diameter chart.
- 2) Before crimping hoses and fittings it must be ensured that you have the most recent crimping dimensions. For crimping dimensions please refer our crimp charts on page **Ed-12**.
- 3) Insert the dies into the crimping press and adjust the crimping diameter.
- 4) Place the pre-assembled hose assembly into the crimper and perform the crimping procedure.
- 5) Please observe the operating instructions of the crimper.



Two-piece fittings must not be crimped on Parkrimp crimpers – only with adjustable crimpers.



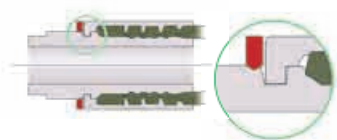
Make sure that the hose ends are cut squarely. Push the ferrule onto the hose. The cut end of the hose must be clearly visible.



Push the nipple down into the hose until it reaches the stop on the lower groove (plastic ring, fitting shoulder or metal stop). Use Hoze-Oil, if required.



The ferrule must bottom up against the plastic ring or metal stop.



After crimping, the ferrule must be located precisely in the groove of the nipple.

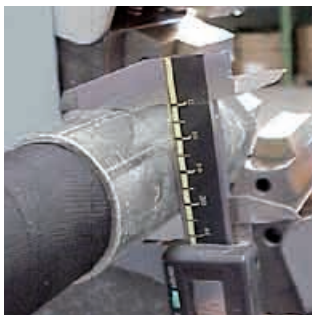
Angle setting

please see “Working Steps for One-Piece Parkrimp No-Skive”

Checking for the correct crimping diameter

In case of the ParLock System, the conicality is measured. It is measured at the beginning and the end of the ferrule in 2 measuring planes.

The conicality must be within the tolerance range specified in the Parker specification.



Measurement 1
in the plane of force



Measurement 2
displaced by 90°



Measurement 1
at the beginning and the
end of the ferrule

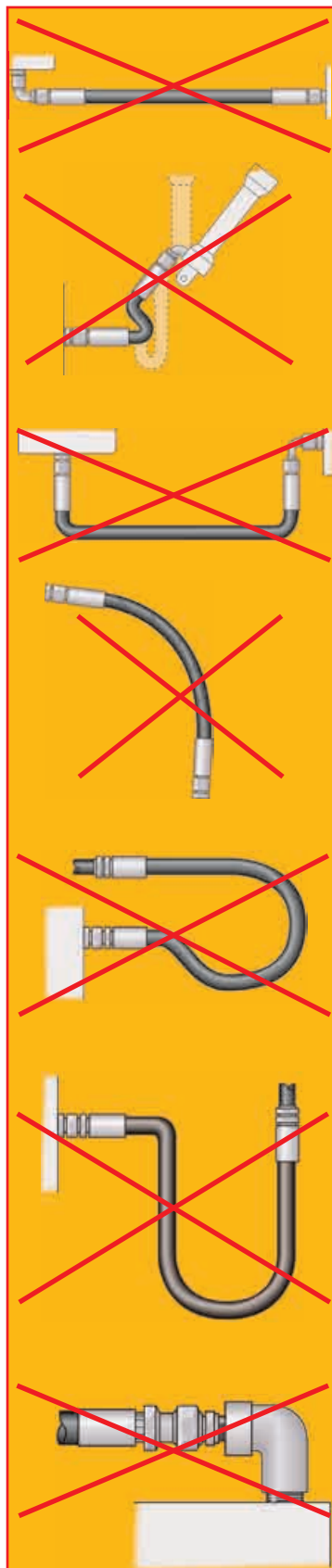


Measurement 2
at the beginning and
the end of the ferrule
(displaced by 90°)

Testing and cleaning please see
“Working Steps for One-Piece Parkrimp No-Skive Fittings”

8 Routing / Installation / Environmental Influences

wrong



The **routing** of the hose assembly and the environment in which the hose assembly operates directly influence the service life of the hose assembly. The following diagrams indicate the correct routing of hose assemblies that will maximise its service life and assure a safe working functionality.

When hose installation is straight, it must be assured that there is enough slack in the hose to allow for changes in length that occur when pressure is applied. When pressurized, hose that is too short may pull loose from its hose fittings or stress the hose fitting connections, causing premature metallic or seal failures.

The **hose length** must be determined so that the hose assembly has enough slack to allow the system components to move or vibrate without creating tension in the hose.

However, care needs to be taken not to allow too much slack and therefore introduce the risk of the hose snagging on other equipment or rubbing on other components.

Mechanical straining of the hoses needs to be avoided, so the hose must not be bent below its minimum bending radius or twisted during installation. The minimum bending radii for each hose is stated in the hose tables in the catalogue.

The plane of movement must also be considered and the hose routing selected accordingly.

Hose routing also plays an important role on the selection of the hose fittings, as the correct fittings can avoid straining the hoses, unnecessary hose length or multiple threaded joints.

right



Safe Hose Assembly in 8 Steps

wrong



Correct clamping (holding/supporting) of the hose should be exercised to securely route the hose or to avoid the hose contacting surfaces that will cause the hose damage.

It is however, vital that the hose be allowed to keep its functionality as a “flexible-pipe” and not be restricted from changing in length when under pressure.

It should also be noted that hoses for high- and low-pressure lines shall not be crossed or clamped together, as the difference in changes in length could wear the hose covers.

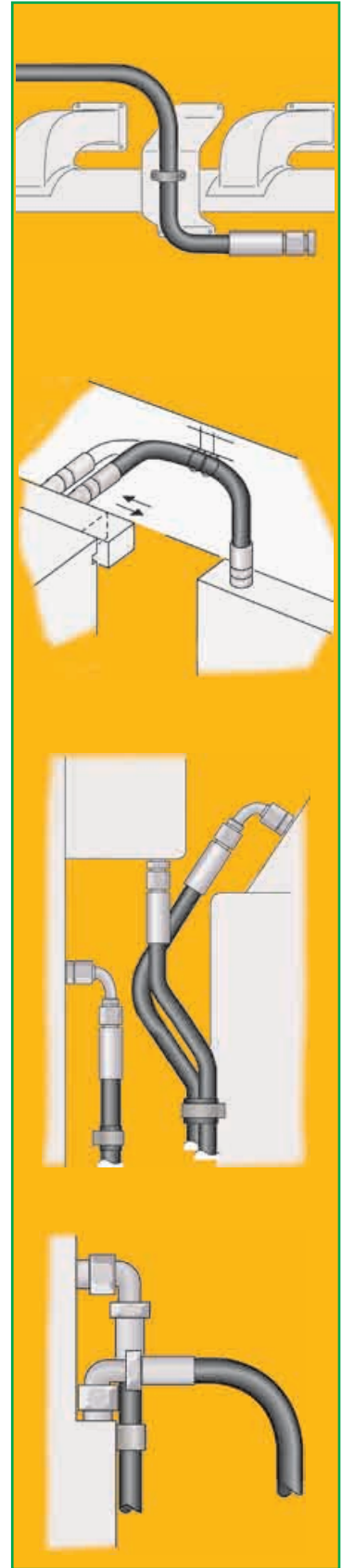
Hose should not be bent in more than one plane. If hose follows a compound bend, it shall be coupled into separate segments or clamped into segments that each flex in only one plane.

Hoses should be kept away from hot parts as high ambient temperatures shorten hose life. Protective insulation may need to be used in unusually high ambient temperature areas.

Whilst the importance of the functionality is prime the aesthetics and practicality of the installation should also be considered in the design.

It should be considered that maintenance might be necessary at some stage in the future, so prohibitive design routings should be avoided.

right



wrong



Abrasive influences

In general care should be taken that the hose is not exposed to direct surface contact that will cause abrasive wearing of the outer cover (either hose to object or hose to hose contact). If however, the application is such that this cannot be avoided, either a hose with a higher abrasion resistant hose cover or a protective sleeve need to be used.

Parker **TOUGH COVER** (TC) or **SUPER TOUGH** (ST) covers offer 80 times or respectively 1000 times the abrasion resistance of standard rubber covers.

right



Pollution of hydraulic circuits

Modern hydraulic equipment is becoming highly precise and as such more sensitive, so as a result the importance of a clean working fluid in the system is growing. Because as many as 75 % of hydraulic system failures are caused by contamination of the fluid by solid particles, the initial cleanliness of hydraulic components, as the main source of these contaminants, is vital. With hose assemblies most of the pollution/contaminates enter the hose assembly during its production and mainly during the cutting (or skiving) process.

In order to avoid system failures, all hose assemblies should be cleaned before use (cleaned and plugged before shipping) with suitable cleaning equipment such as the Parker TH6-6 machine. This cleaning device first washes the hose assembly with a detergent and an anticorrosive agent and then blows it out with pressurized air.

The level of contamination is defined in three popular norms: ISO4406, ISO4405 or NAS 1638. Most common however, is the ISO 4406, which describes the number and size of solid particles in the hydraulic system by means of a classification value e.g. 16/13.

With the Cleaning Machine TH6-6 you can reach the following classification values when using the 3 microns filter cartridge



ISO 4406	NAS 1638	SAE 749
11/8	2	
12/9	3	0
13/10	4	1
14/11	5	2
15/12	6	3
16/13	7	4
17/14	8	5
18/15	9	6
19/16	10	
20/17	11	
21/18	12	

How to Order

To make ordering Parker products easier, we have itemized the order numbers on this page. This will be especially helpful when you order hose assemblies. You can find further useful hints on the following page.

1. Hose

Example: **436-6**

436-6 > Hose type

436-6 > Hose inside diameter in size

436 - No-Skive Hose

I.D. = size -6

2. Hose Fittings

Example: **1 CA 48 12-6**

1 CA 48 12-6 > Fitting

1 **CA** 48 12-6 > End configuration nomenclature

1 CA **48** 12-6 > Parker Fitting series

1 CA 48 **12-6** > Thread or Tube size

1 CA 48 12-**6** > Hose size and hose fitting size

1 = Crimp Fitting

3 = PushLok Fitting

K = Nippel component (ParLock Fittings)
example: KC9VS-16-8

100 = Shell component (ParLock Fittings)
example: 100VS-8

End configuration nomenclature

Parker Fitting series

Thread or Tube size

Hose size and hose fitting size

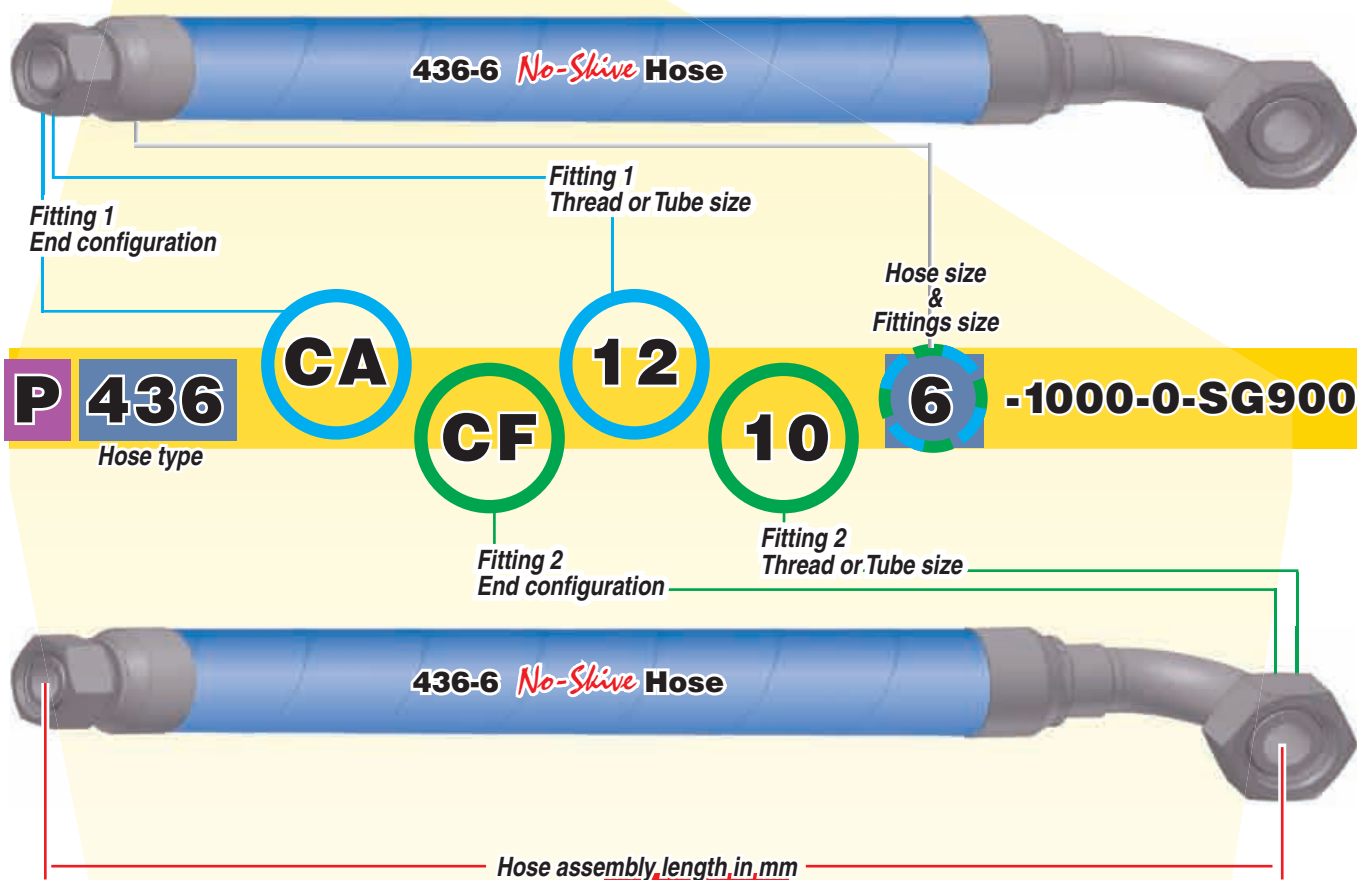
I.D. = size -6

Material/ specification:
Without suffix: steel, zinc plated
B: brass
C: stainless steel
K: without a plastic ring
SM: metric hexagon dimension

The content of the hose crimping tables shows the standard part numbers. For the availability of non standard parts/materials please contact your local Parker service centre. All part numbers printed in bold in the respective price list are available ex-stock.

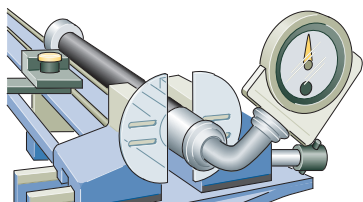
3. Hose Assemblies

Example: **P436CACF12106-1000-0-SG900**



P436CACF12106-1000-0-SG900

R = Low Pressure Push-Lok Fittings Series 82
P = Parkrimp *No-Skive* Fittings Series 26, 48
D = Parkrimp *No-Skive* Fittings Series 46
F = Parkrimp *No-Skive* Fittings Series 70, 71, 73, 76, 77, 78, 79 and S6
E = Parlock Skive Fittings Series VS
V = Parlock Skive Fittings Series V4
S = Parlock Skive Fittings Series V6



Displacement angle is relevant when the hose assembly has bent fittings

Accessory, e.g. spring guard 900 mm length



SG	Spring Guard
AG	Armour Guard
AS/PS	Partek Nylon protective sleeve
FS	Fire Sleeves
HG	PolyGuard-Hose Protector
PG	ParKoil-Hose Protector

Explanation of the example

Hose assembly with hose 436 in size -6 and fitting series 48. Hose assembly length 1000 mm.

Fitting 1: end configuration CA has a 12 mm pipe diameter and has a size -6 hose nipple

Fitting 2: end configuration CF has a 10 mm pipe diameter and has a size -6 hose nipple

The displacement angle for this combination is 0 degrees. On request a displacement angle can be specified for the bent fitting in relation with the hose curvature. A protection sleeve as a Spring Guard in length 900 mm is on the hose assembly.

Hose and Fittings Storage

It is a well-known fact that rubber properties deteriorate during the time of storage and service. A system of hose age control should be maintained to ensure that hose is used as long as it retains full capabilities for rendering the intended service. However, it is impossible to advise the ideal storage period and service life of rubber hose as it is subject

to a variety of factors which may affect the rubber characteristics and the suitability for use. That is also why various standardization committees take very different approaches to rubber hose storage period and service life. The main national and international standards defining rules for rubber hose storage are the following:

DIN 20066

Fluid power systems – Hose assemblies – Dimensions, requirements

Specifies bulk hose shelf life and hose assembly storage period and service life:

- The shelf life of bulk hose before assembling must not exceed 4 years;
- The service life of a hose assembly, incl. any period of storage, must not exceed 6 years;
- The period of storage of a hose assembly must not exceed 2 years.

Bulk Hose

Shelf life
– max. 4 years

Hose Assembly

Service life – max. 6 years
Storage
max. 2 years

BS 5244

Recommendations for application, storage and life expiry of hydraulic rubber hoses and hose assemblies

Specifies tests needed for various storage periods of hose (in bulk or hose assembly):

- Storage period does not exceed 3 years – no tests needed;
- Storage period is between 3 and 5 years – proof pressure test needed,
- Storage period is between 5 and 8 years – proof pressure, burst, impulse, cold flexibility and electrical tests needed;
- Bulk hose or a hose assembly older than 8 years must be scrapped.

For hose assembly service life no explicit limits are specified, whereas it is recommended to establish rules for each particular equipment and application on the basis of records taken from the real service.

ISO 17165-2 / SAE J1273

Hydraulic fluid power – Hose assemblies – Recommended practices for hydraulic hose assemblies

The specified max. shelf life of bulk hose or a hose assembly is 10 years (40 quarters) from the date of manufacture (vulcanization) of the hose, provided it has been stored in accordance with ISO 2230 (Rubber products - Guidelines for storage) and passes visual inspection and if need be also a proof pressure test. If visual inspection gives rise to any doubts as to the functionality of the hose (cracks in the cover or tube after hose flexing, excessive stiffness, reinforcement rust etc.), a proof pressure test should be carried out before use or the hose should be scrapped.

Hint

German and the British standards are the most rigorous.

ISO 8331

Rubber and plastic hoses and hose assemblies – Guide to selection, storage, use and maintenance

Specifies storage periods similar to DIN 20066 – bulk hose max. 4 years, a hose assembly max. 2 years. If the storage exceeds these limits the hose must be inspected and tested (tests are not specified). Hose assembly service life is not specified.

OEM regulations

In addition to these national and international standards, also some Original Equipment Manufacturers (OEMs) have their own regulations for age of hose used for production of hose assemblies.

We recommend generally observe the regulations relevant for your country or ISO 17165-2 (if there is no domestic regulation), plus the regulation of your customer's country or of your OEM customer in the extent in which they are more demanding.

Hoses storage

– best practices

Store hoses and hose assemblies in a cool, dark and dry room with capped ends in closed boxes (preferably in the original Parker packaging) and in the manner facilitating inspection of the hose condition and the first-in first-out (FIFO) inventory control system.

The main factors determining the hose storage are:

a) Temperature

- preferably between 15 °C and 25 °C, without rapid and frequent fluctuation.

b) Humidity

- preferably not higher than 65 %, protect hose against moisture and avoid atmospheric humidity condensation.

c) Heat

- store hose away from heat sources.

d) Light

- protect hose against direct sun light, light of discharge lamps and other ultraviolet sources.

e) Corrosive liquids and fumes

- do not store in the same room with corrosive chemicals.

f) Ozone

- avoid using high power electrical equipment and electrical spark sources in the storage room.

g) Oils and greases

- avoid direct contact.

h) Space and bends

- keep hose in stress-free shape never bent below the min. bend radius.

i) Electrical and magnetic fields

- store hose away from powerful electric transformers, motors and generators that could induce current in the hose metal reinforcement.

j) Rodents and insects

- protect against rodents and insects.

Fittings storage

– best practices

For storing fittings the same rules as for hose are applicable (especially for fittings with rubber sealing), in addition:

a) Mismatching and confusing

- avoid unnecessary repacking and store fittings in clearly marked closed containers (preferably in the original Parker packaging).

b) Damage of threads and sealing surfaces

- avoid unnecessary reloading and handling.

c) Fittings with O-rings

- assure that storage period of fittings with O-rings or other rubber sealing does not exceed 2 years (remember: first in-first out).

d) Caps

- hose assemblies fittings should be capped against damage and contamination.



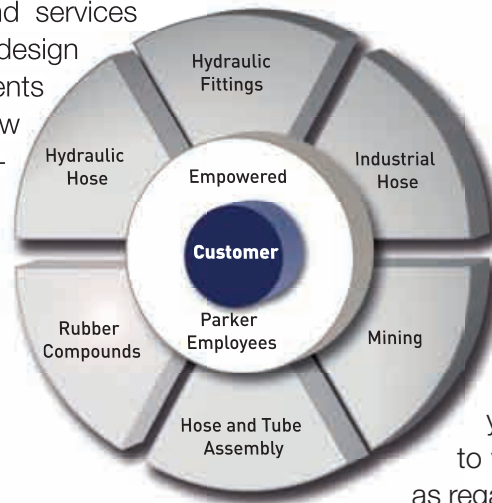
Safety First!

A hydraulic hose assembly is a POWER component and may cause property damage, personal injury or death!

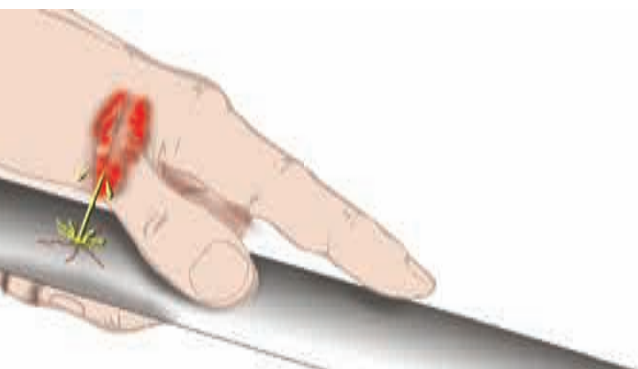
WARNING: Injuries in which hydraulic or other liquid is involved must be treated without delay and not the same way as an ordinary injury!

1. High pressure fluid injection can be almost invisible, leaking from a pinhole, but it can pierce the skin deep into the muscle!
2. If a fluid-injection accident occurs, search immediately for a medical treatment by a doctor!
3. Don't touch pressurized hydraulic hose assemblies and don't look at them from a short distance – especially not close to fittings!
4. Secure ends of hydraulic assemblies with high pulsing pressure and all high pressure air hose assemblies against blow-off of the hose from the fitting with appropriate whip restraints!
5. Stay out of hazardous areas while testing hose assemblies under pressure and wear proper protective clothing and goggles!

We in Parker Hannifin are making all efforts to develop, manufacture and deliver defect-free, durable and safe products and services – starting from integrated design and testing of all components through sharing our know-how with our customers and providing them with comprehensive support and training.



Please also make all efforts on your side to provide reliable and safe hose assemblies to your customers and forward to them the know-how you acquired, whether from us or due to your own unique experience, especially as regards the proper use and maintenance of hose assemblies.



Avoid injury to yourself and others by following these important rules



Carefully read and observe especially the following sections of this catalogue

- For selection of proper hose and fittings:
 - Safe Hose Assembly in 8 Steps (pages **Aa-9** ff)
 - Technical Data (pages **Aa-2** ff)
 - For manufacturing of hose assemblies:
 - Working Steps for One-Piece **Parkrimp** *No-Skive* Fittings (pages **Aa-12** ff)
 - Working Steps for Two-Piece **ParLock** Fittings (pages **Aa-15** ff)
 - For storing, packing and handling:
 - Hose and Fittings Storage (pages **Aa-22** ff)
 - For installation on machines:
 - Routing / Installation / Environmental Influences (pages **Aa-17** ff)
 - For inspection, maintenance and replacement:
 - Proactive Maintenance Program (page **Aa-26**)
 - **READ CAREFULLY AND OBSERVE:**
 - **Parker Safety Guide** for Selecting and Using Hose, Tubing, Fittings and Related Accessories (pages **Ab-41** ff)
 - **INVESTIGATE, STUDY AND OBSERVE all relevant international and national standards and directives** of your local trade, technical and work safety associations, such as:
 - **ISO 17165-1** *Hydraulic Fluid Power – Hose Assemblies*
 - **ISO 17165-2** *Hydraulic Fluid Power – Hose Assemblies*
 - **ISO 1433** *Hydraulic Power – General Rules and Safety Requirements for Systems and Components*
 - **SAE J1273** *Recommended Practices for Hydraulic Hose Assemblies*
 - **EN 982** *Safety of Machinery – Safety Requirements for Fluid Power Systems and Components*
- In Germany**
- **BGR 237** *Hydraulik-Schlauchleitungen – Regeln für den sicheren Einsatz*
 - **FA 015** *Hydraulik-Schlauchleitungen Prüfen und Auswechseln*
 - **BGI 5100** *Sicherheit bei der Hydraulik-Instandhaltung*
- In UK**
- **BFPDA D8** *Quality Control Procedures and Requirements for BFPDA Distributors*
 - **BFPDA D14** *A Simple Rule for Re-ending Hydraulic Hose Assemblies – Don't*
 - **BFPDA P47** *Guidelines for the Use of Hydraulic Fluid Power Hose and Hose Assemblies*

Hose Hint

There are several analogies between hydraulic and electric systems and it is not inappropriate to compare high-pressure hydraulic hoses to high-voltage electrical cables and to advise to regard and handle them with similar caution and care!

Proactive Maintenance Program

“All hoses will eventually fail, it’s just a matter of when” is an often ignored but essential fact to remember when working with hydraulic hoses. Moreover, if a hose suddenly fails, it can have direct consequences, including increased labor and

material cost, unscheduled downtime and, most seriously, injury or even death of the personnel close the hose. **Avoiding failure should be a prime directive for any work processes which use hydraulic hoses.**

Be proactive, not reactive!

A proactive hose maintenance program, including even preventive replacement of not-yet-failed hose assemblies, is far more cost-effective than reacting to a hose assembly failure plus it provides a number of other advantages. It’s essential not to look just at the initial purchase price of a new hose assembly but to the total costs in consequence of a potential failure:

- Cost of lost fluid
- Pollution-related costs
- Costs of other more expensive components damaged due to hose failure
- Machine downtime
- “Costs” related to safety and health – hard to identify and not at all expressible in numbers!



The Proactive Maintenance Program includes a scheduled plan of visual inspections and preventive hose replacement, in case the hose assembly shows signs of an impending failure:

- Damaged, cracked, cut or abraded hose cover
- Exposed reinforcement
- Cracked, damaged or corroded fittings
- Leaks in fitting, perspiring hose cover close to fitting
- Kinked, crushed, flattened or twisted hose
- Hard, stiff, cracked or charred hose
- Blistered, soft, degraded or loose cover
- Fitting slippage on hose
- etc.

Hose Hint

A good analogy is automobile tyres. Just like hose, tyres are made of rubber, age with time and experience a lot of strain from the conditions they work in. Most drivers are cautious to replace tyres once they show signs of wear, not leaving it to destiny when they break on the road! So why don't they do it with hydraulic hoses?

As there are countless factors influencing the hose life, there cannot be and are not any exact guidelines to determine when a hose assembly has to be replaced or to judge how long it will work. Yet, we do have a tool to influence and determine the hose life:

Visual Inspections + Preventive Replacement = Proactive Maintenance Program!

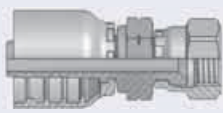
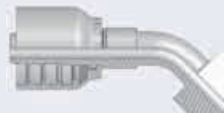
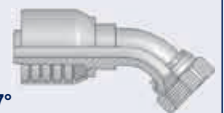







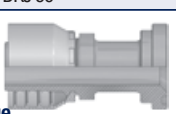


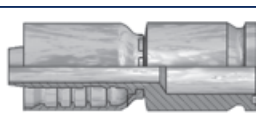
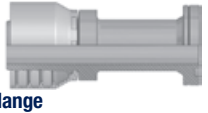
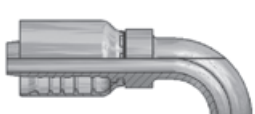
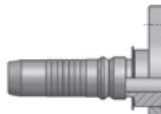
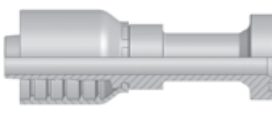
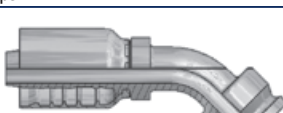
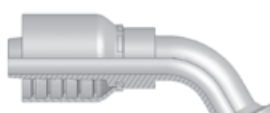










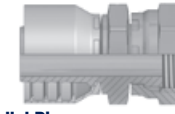
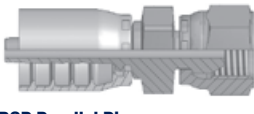
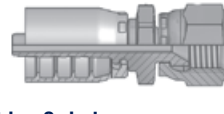
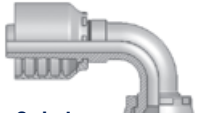
Technical Data

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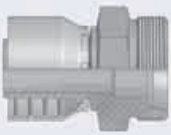


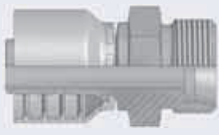

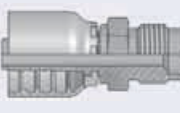
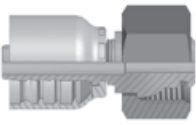
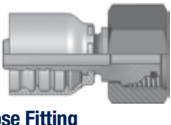
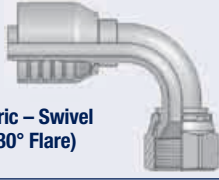
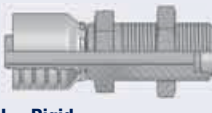
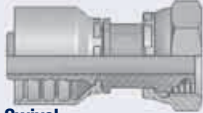
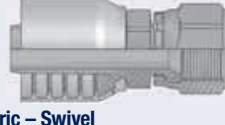
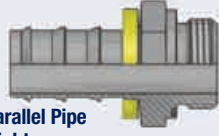

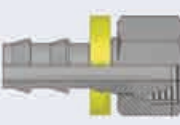
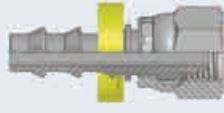

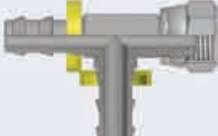
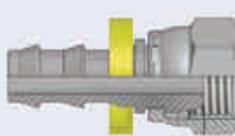

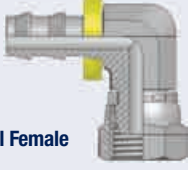
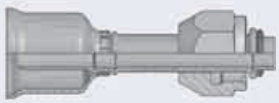
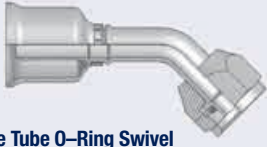
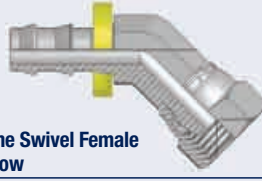
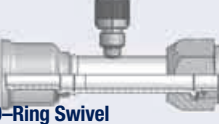

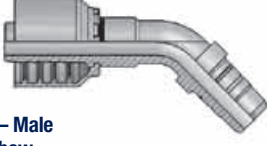
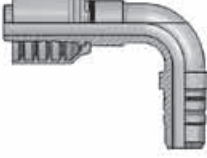

	Hose	Working Pressure (MPa) in Size											Temp.	Construction	Standard	Page	
		-3	-4	-5	-6	-8	-10	-12	-16	-20	-24	-32					
		Low-pressure															
Low-pressure	Push-Lok	Multipurpose	801Plus	2.4	2.4	2.1	2.1	2.1	1.4				-40/+100	1 braid, fibre	-	B1a-1	
			830M	1.6		1.6	1.6	1.6	1.6				-40/+80	1 braid, fibre	-	B1a-2	
			831	2.4	2.0	2.0	2.0	2.0	2.0				-40/+100	1 braid, fibre	-	B1a-3	
			837BM	1.6	1.6	1.6	1.6	1.6	1.6	1.4			-40/+100	1 braid, fibre	-	B1a-4	
			837PU	1.6	1.6	1.6	1.6	1.6	1.6				-40/+100	1 braid, fibre	-	B1a-5	
		Phosphate Ester	804	0.9	0.9	0.9	0.9		0.9				-40/+80	1 braid, fibre	-	B1a-6	
			Fire retardant	821FR	2.4	2.0	2.0		1.7				-40/+100	1 braid, fibre	-	B1a-7	
				836	1.7	1.7	1.7	1.7	1.7				-40/+150	1 braid, fibre	-	B1a-8	
			Transport + Hydraulic	838M	1.6	1.6	1.6	1.6	1.6	1.6				-40/+80	1 braid, fibre	-	B1a-9
	Standard	601		8.6		7.8	6.9	5.2	5.2	3.9			-40/+125	2 braids, fibre	EN854-R3 - SAE100R3		
		611		2.8		2.8	2.8	2.4	2.1				-40/+100	1 braid, fibre	EN854-R6		
		681		7.5	6.8	6.3	5.8	5.0	4.5	4.0			-40/+100	2 braids, fibre	EN854-2TE		
		High temperature		611HT	2.8		2.8	2.8	2.4	2.1				-40/+150	1 braid, fibre	EN854-R6	
	Railway		681DB	7.5	6.8	6.3	5.8	5.0	4.5	4.0			-40/+100	2 braids, fibre	EN854-2TE		
201			20.7	20.7	15.5	13.8	12.0	10.3	5.5	4.3	2.4	-40/+150	1 braid, wire	SAE100R5 - SAEJ1402All			
206			20.7	20.7	15.5	13.8	12.0	10.3	5.5	4.3	2.4	-48/+150	1 braid, wire	SAE100R5 - SAEJ1402All			
213			13.8	10.3	10.3	8.6	6.9	5.2	2.8	2.1	1.4	-45/+150	1 braid, wire	SAEJ1402AI			
293	3.5		3.5	3.5	3.5	3.1	3.1	3.1		-50/+150	1 braid, fibre	SAEJ1402AI					
Fire retardant	221FR		3.5	3.5	3.5	3.5	3.5	3.5			-20/+100	1 braid, wire	SAEJ1527TypR3				
	285	3.4		3.4	3.4	3.4	3.4	3.4			-30/+125	1 braid, wire	SAEJ2064TypC				
Medium-pressure		Standard	421SN	22.5	21.5	18.0	16.0	13.0	10.5	8.8	6.3	5.0	4.0	-40/+100	1 braid, wire	EN853-1SN - ISO1436-1SN/R1AT - SAE100R1AT	
			422	22.5	21.5	18.0	16.0	13.0	10.5	8.8	6.3	5.0	4.0	-40/+100	1 braid, wire	EN853-1SN - ISO1436-1SN/R1AT - SAE100R1AT	
			301SN	40.0	35.0	33.0	27.5	25.0	21.5	16.5	12.5	9.0	8.0	-40/+100	2 braids, wire	EN853-2SN - SAE100R2AT	
			302	40.0	35.0	33.0	27.5	25.0	21.5	16.5	12.5	9.0	8.0	-40/+100	2 braids, wire	EN853-2SN - ISO1436-2SN/R2AT - SAE100R2AT	
			441	34.5	29.3	27.5	24.0	19.0	15.5	13.8			-40/+125	1 braid, wire	ISO11237-R16 - SAE100R16		
			451	21.0		21.0	21.0	21.0	21.0	21.0			-40/+100	1/2braid, wire	ISO11237-R17 - SAE100R17		
			492	28.0	25.0	22.5	19.0	15.0	15.0	11.0	7.5		-40/+100	1 braid, wire	Exceeds EN857-1SC - ISO11237-1SC		
			462	42.5	40.0	35.0	31.0	28.0	28.0	21.0	17.2		-40/+100	2 braids, wire	Exceeds EN857-2SC - ISO11237-2SC		
			301TC	40.0	35.0	33.0	27.5	25.0	25.0	21.5	16.5	12.5	9.0	8.0	-40/+100	2 braids, wire	Exceeds EN853-2SN - ISO1436-2SN/R2AT
		High abrasion resistance MSHA approved	351TC	28.0		28.0	28.0	28.0	28.0	28.0			-40/+100	2 braids, wire	SAE 100 R19		
			451TC	21.0		21.0	21.0	21.0	21.0	21.0	21.0		-40/+100	1/2braid, wire	ISO11237-R17 - SAE100R17		
			471TC	40.0	36.0	35.0	29.7	25.0	25.0	21.5	17.5		-40/+100	2 braids, wire	EN857-2SC - ISO11237-2SC		
		Extreme abrasion resistance	472TC								15.7	12.5	9.0	-40/+100	2 braids, wire	EN857-2SC - ISO11237-2SC	
			492ST	28.0	25.0	22.5	19.0	15.0	15.0	11.0			-40/+100	1 braid, wire	EN857-1SC - ISO11237-1SC		
Low / High temperature	462ST	42.5	40.0	35.0	31.0	28.0	28.0	21.0			-40/+100	2 braids, wire	EN857-2SC - ISO11237-2SC				
	426	19.2		15.7	14.0	10.5	8.7	7.0			-48/+150	1 braid, wire	SAE100R1AT				
	436			27.5	24.0	19.0	15.5	13.8			-50/+150	2 braids, wire	SAE100R16				
Phosphate Ester	461LT	42.5	40.0	35.0	31.0	28.0	28.0	21.0			-50/+100	2 braids, wire	Exceeds EN857-2SC - ISO11237-2SC				
	424								6.9	4.3	3.5	2.4	-40/+85	1 braid, wire	SAE100R1AT		
	304	34.5		27.5	24.0			15.5	13.8	8.6	7.8	-40/+80	2 braids, wire	SAE100R2AT			

	Hose	Working Pressure (MPa) in Size											Temp.	Construction	Standard	Page	
		-3	-4	-5	-6	-8	-10	-12	-16	-20	-24	-32					
Medium-pressure	Railway	441RH		34.5	29.3	27.5	24.0	19.0	15.5	13.8				-40/+125	1 braid, wire	ISO11237-R16 - SAE100R16	
	Water cleaning	421RH										6.3	5.0	4.0	1 braid, wire	EN853-1SN - ISO1436-1SN/R1AT - SAE100R1AT	
		493		20.0	20.0	20.0	17.5							max.+120	1 braid, wire	-	
	Pilot	463		40.0	40.0	40.0	35.0							max.+120	2 braids, wire	-	
		402		10.0	10.0	10.0	10.0							-40/+100	1 braid, wire	-	
	Wire cover	412	12.0	12.0	12.0	12.0								-40/+100	1 braid, wire	-	
		421WC		19.0		15.5	13.8		8.6	6.9				-40/+121	1 braid, wire	ISO1436-1SN/R1AT - SAE100R1AT	
	Powerlift	477		45.0	42.5	40.0	38.0	35.0	35.0	25.0				-40/+125	2 braids, wire	Excels EN853-2SN - EN856-2SC	
	Extremely flexible	477ST		45.0	42.5	40.0	38.0	35.0	35.0	25.0				-40/+125	2 braids, wire	Excels EN853-2SN - EN856-2SC	
		692		21.0	21.0	21.0	21.0	21.0						-40/+100	1/2 braids, wire	Excels SAE100R17	
High-Pressure	Suction	692Twin	21.0	21.0	21.0	21.0	21.0							-40/+100	1/2 braids, wire	Excels SAE100R17	
		811						2.1	1.7	1.4	1.0	0.7	-40/+100	1 braid, 1steelspiral	SAE100R4		
	881						2.1	1.7	1.4	1.0	0.7	-40/+121	1 braid, 1steelspiral	SAE100R4			
	Standard	372				44.5	41.5	35.0	35.0	28.0			-40/+100	3braids, wire	-		
	Low temperature	371LT				44.5	41.5	35.0	35.0	28.0			-50/+100	3braids, wire	-		
		372TC				44.5	41.5	35.0	35.0	28.0			-40/+100	3braids, wire	-		
	Railway	372RH				44.5	41.5	35.0	35.0	28.0			-40/+100	3braids, wire	-		
	Standard	701				45.0	41.5	35.0	35.0	28.0			-40/+100	4spiral, wire	EN856-4SP - ISO3862-4SP		
		731							42.0	38.0	32.0	29.0	25.0	-40/+100	4spiral, wire	EN856-4SH - ISO3862-4SH	
	High-Pressure	Phosphate Ester	781						35.0	35.0	35.0	35.0		-40/+125	4/6spiral, wire	EN856-R13 - ISO3862-R13 - SAE100R13	
P35												35.0	-40/+125	6spiral, wire	EN856-R13 - ISO3862-R13 - SAE100R13		
Extreme pressure		774						28.0	28.0	28.0	21.0	17.5	17.5	-40/+80	4spiral, wire	ISO3862-R15 - SAE100R15	
		F42				42.0		42.0	42.0	42.0	42.0			-40/+80	4/6spiral, wire	-	
High abrasion resistance		761						56.0	56.0				-40/+125	6spiral, wire	-		
		721TC				28.0	28.0	28.0	28.0	28.0	21.0	17.5	17.5	-40/+125	4spiral, wire	EN856-R12 - ISO3862-R12 - SAE100R12	
MSHA approved		782TC						35.0	35.0	35.0	35.0	35.0		-40/+125	4/6spiral, wire	EN856-R13 - ISO3862-R13 - SAE100R13	
		791TC						42.0	42.0	42.0	42.0	42.0		-40/+125	4/6spiral, wire	ISO3862-R15 - SAE100R15	
Low temperature		792TC						42.0	42.0				-40/+125	4/6spiral, wire	ISO3862-R15 - SAE100R15		
Compact spiral !		772LT					28.0	28.0	28.0	28.0	21.0	17.5		-57/+100	4spiral, wire	EN856-R12 - ISO3862-R12 - SAE100R12	
		787TC					35.0	35.0	35.0	35.0				-40/+125	4spiral, wire	ISO 18752-DC	
ParLock	Standard	797TC					42.0	42.0	42.0	42.0			-40/+125	4spiral, wire	ISO 18752-DC		
		H31	50.0		44.5	41.5	39.0	35.0	31.0	35.0	31.0		-40/+100	4spiral, wire	Excels EN856-4SP - ISO3862-4SP		
	High abrasion resistance	H29						43.0	40.0	35.0	31.0	28.0	-40/+100	4spiral, wire	Excels EN856-4SH - ISO3862-4SH		
		R35						35.0	35.0	35.0	35.0	35.0	35.0	-40/+100	4/6spiral, wire	EN856-R13 - ISO3862-R13 - SAE100R13	
	MSHA approved	R42					42.0	42.0	42.0	42.0	42.0	42.0	-40/+100	4/6spiral, wire	ISO3862-R15 - SAE100R15		
		H31TC	50.0		44.5	41.5	39.0	35.0	31.0	35.0	31.0		-40/+100	4spiral, wire	Excels EN856-4SP - ISO3862-4SP		
	Extreme abrasion resistance	H29TC						43.0	40.0	35.0	31.0	28.0	-40/+100	4spiral, wire	Excels EN856-4SH - ISO3862-4SH		
		R35TC						35.0	35.0	35.0	35.0	35.0	35.0	-40/+100	4/6spiral, wire	EN856-R13 - ISO3862-R13 - SAE100R13	
	Railway	R42TC					42.0	42.0	42.0	42.0	42.0	42.0	42.0	-40/+100	4/6spiral, wire	ISO3862-R15 - SAE100R15	
		H31ST	50.0		44.5	41.5	39.0	35.0	31.0	35.0	31.0		-40/+100	4spiral, wire	Excels EN856-4SP - ISO3862-4SP		
	Railway	H29ST						43.0	40.0	35.0	31.0	28.0	-40/+100	4spiral, wire	Excels EN856-4SH - ISO3862-4SH		
		R42ST					42.0	42.0	42.0	42.0	42.0	42.0	42.0	-40/+100	4/6spiral, wire	ISO3862-R15 - SAE100R15	
	H29RH						40.0	40.0	35.0	31.0		-40/+100	4spiral, wire	Excels EN856-4SH - ISO3862-4SH			

<div>DIN</div> <div>→</div>	<div>CA</div> <div></div> <div>Female Metric 24° Light Series with O-Ring Swivel – Straight ISO 12151-2-SWS-L – DKOL</div>	<div>CE</div> <div></div> <div>Female Metric 24° Light Series with O-Ring Swivel – 45° Elbow ISO 12151-2-SWE 45°-L – DKOL 45°</div>	<div>CF</div> <div></div> <div>Female Metric 24° Light Series with O-Ring Swivel – 90° Elbow ISO 12151-2-SWE-L – DKOL 90°</div>
<div>D0</div> <div></div> <div>Male Metric 24° Light Series – Rigid Straight ISO 12151-2-S-L – CEL</div>	<div>C0</div> <div></div> <div>Female Metric Very Light Series LL Swivel – Straight (Ball Nose) DKM</div>	<div>C3</div> <div></div> <div>Female Metric Light Series – Swivel Straight (Ball Nose) DKL</div>	<div>C4</div> <div></div> <div>Female Metric Light Series – Swivel 45° Elbow (Ball Nose) DKL 45°</div>
<div>C5</div> <div></div> <div>Female Metric Light Series – Swivel 90° Elbow (Ball Nose) DKL 90°</div>	<div>1D</div> <div></div> <div>Metric Standpipe Light Series – Rigid Straight ISO 8434-1 – BEL</div>	<div>DD</div> <div></div> <div>Metric Standpipe Light Series – Rigid 45° Elbow BEL 45°</div>	<div>5D</div> <div></div> <div>Metric Standpipe Light Series – Rigid 90° Elbow ISO 8434-1 – BEL 90°</div>
<div>C9</div> <div></div> <div>Female Metric 24° – Swivel Heavy Series with O-Ring Straight ISO 12151-2-SWS-S – DKOS</div>	<div>0C</div> <div></div> <div>Female Metric 24° – Swivel Heavy Series with O-Ring 45° Elbow ISO 12151-2 – SWE 45°-S – DKOS 45°</div>	<div>1C</div> <div></div> <div>Female Metric 24° – Swivel Heavy Series with O-Ring 90° Elbow ISO 12151-2-SWE-S – DKOS 90°</div>	<div>D2</div> <div></div> <div>Male Metric 24° – Rigid Heavy Series – Straight ISO 12151-2-S-S – CES</div>
<div>C6</div> <div></div> <div>Female Metric – Swivel Heavy Series – Straight (Ball Nose) DKS</div>	<div>3D</div> <div></div> <div>Metric Standpipe – Rigid Heavy Series – Straight ISO 8434-1 – BES</div>	<div>49</div> <div></div> <div>Metric Banjo Straight DIN 7642</div>	<div>9B</div> <div></div> <div>Female Metric Swivel Light Series 45° Elbow</div>
<div>9C</div> <div></div> <div>Female Metric Swivel Light Series 90° Elbow</div>	<div>BSP</div> <div>→</div>		<div>92</div> <div></div> <div>Female BSP Parallel Pipe Swivel – Straight (60° Cone) BS5200-A – DKR</div>
<div>B2</div> <div></div> <div>Female BSP Parallel Pipe Swivel 90° Elbow (60° Cone) BS 5200-B – DKR 90°</div>	<div>B4</div> <div></div> <div>Female BSP Parallel Pipe Swivel – 90° Elbow Block Type (60° Cone) BS 5200-E – DKR 90°</div>	<div>EA</div> <div></div> <div>BSP Swivel Female with O-Ring (60° Cone) BS 5200 – ISO 12151-6 – DKOR</div>	<div>EB</div> <div></div> <div>BSP Swivel Female with O-Ring 45° Elbow (60° Cone) BS 5200 – ISO 12151-6 – DKOR 45°</div>
<div>EC</div> <div></div> <div>BSP Swivel Female with O-Ring 90° Elbow (60° Cone) BS 5200 – ISO 12151-6 – DKOR 90°</div>	<div>D9</div> <div></div> <div>Male BSP Parallel Pipe Rigid – Straight (60° Cone) BS5200 – AGR</div>	<div>91</div> <div></div> <div>Male BSP Taper Pipe – Rigid Straight BS5200 – AGR-K</div>	<div>B5</div> <div></div> <div>Female BSP Parallel Pipe Swivel Straight (Flat Seat)</div>
<div>34</div> <div></div> <div>Inch Standpipe (Brass)</div>	<div>SAE</div> <div>→</div>		<div>01</div> <div></div> <div>Male NPTF Pipe Rigid – Straight SAE J476A / J516 – AGN</div>
<div>03</div> <div></div> <div>Male JIC 37° – Rigid Straight ISO12151-5-S – AGJ</div>	<div>04</div> <div></div> <div>Male SAE 45° – Rigid Straight SAE J516</div>	<div>05</div> <div></div> <div>Male SAE Straight Thread with O-Ring – Rigid Straight ISO 11926 – SAE J516</div>	<div>06/68</div> <div></div> <div>Female – JIC 37° SAE 45° Dual Flare Swivel – Straight ISO12151-5-SWS – DKJ</div>

08  Female SAE 45° – Swivel Straight SAE J516	33  Male JIC 37° – Rigid 45° Elbow ISO 12151-5 – AGJ 45°	37/3V  Female JIC 37° SAE 45° – Dual Flare Swivel Female 45° Elbow ISO 12151-5-SWE 45° – DKJ 45°	39/3W  Female JIC 37° SAE 45° – Dual Flare Swivel Female 90° Elbow ISO 12151-5-SWES – DKJ 90°
41/3Y  Female JIC 37° / 45° Swivel Female 90° Elbow (Long) ISO 12151-5-SWEL – DKJ 90° L	L9  Female JIC 37° – Swivel 90° Elbow – Medium Drop ISO 12151-5-SWEM – DKJ 90° M	Flange 	
16  SAE Code 61 – Flange Head 22.5° Elbow ISO 12151-3-E22ML – SFL 22.5° 3000 psi	17/4F  SAE Code 61 Flange 45° Elbow ISO 12151-3 – E45S – L – SFL 45° 5000 psi	19/4N  SAE Code 61 Flange 90° Elbow ISO 12151-3-E-L – SFL 90° 5000 psi	15/4A  SAE Code 61 Flange Straight ISO 12151-3-S-L – SFL 5000 psi
6F  SAE Code 62 Flange 45° Elbow – Heavy Series ISO 12151-3 – E45-S – SFS 45° 6000 psi	6N  SAE Code 62 Flange 90° Elbow ISO 12151-3 – E-S – SFS 90° 6000 psi	X5  Flange – Straight Full flange system for Code 61 or Code 62	6A  SAE Code 62 Flange Straight ISO 12151-3-S-S – SFS 6000 psi
X9  Flange – 90° Elbow Full flange system for Code 61 or Code 62	PY  Flange – 24° Male French Gas Straight	XA  Caterpillar® Flange Straight	X7  Flange – 45° Elbow Full flange system for Code 61 or Code 62
XG  Caterpillar® Flange 60° Elbow	XN  Caterpillar® Flange 90° Elbow	ORFS 	
JS  ORFS Swivel Female (Long) ISO 12151-1-SWSB SAE J516 – ORFS	J7  Female ORFS – Swivel 45° Elbow ISO 12151-1 – SWE 45° SAE J516 – ORFS 45°	J9  Female ORFS – Swivel 90° Elbow – Short Drop ISO 12151-1 – SWES SAE J516 – ORFS 90°	J1  Female ORFS – Swivel 90° Elbow – Long Drop ISO 12151-1 – SWEL SAE J 516 – ORFS 90° L
J5  Female ORFS – Swivel 90° Elbow – Medium Drop ISO 12151-1 – SWEM – ORFS 90° M	JM  ORFS Male ISO 12151-1-S – SAE J516	JD  Male ORFS Bulkhead with Locknut Straight (with O-ring) ISO 12151-1 – SAE J516	JIS 
FU  Female BSP Parallel Pipe Swivel – Straight (30° Flare) ISO 228-1 – JIS B8363 – GUI	GU  Female BSP Parallel Pipe Swivel – Straight (60° Cone) ISO 228-1 – JIS B8363 – GUO	MU  Female Metric – Swivel Straight (30° Flare) JIS B8363 – MU	
			MZ  Female Metric – Swivel 90° Elbow (30° Flare) JIS B8363



French Standard →	FG  Male French Gas Series Rigid – Straight (24° Cone)	F2  Female French Gas Series Swivel – 90° Elbow	F4  Female French Gas Series Swivel – Straight (Ball Nose)
	F6  French Male Metric Series (24° Cone)	F9  French Female Metric Series Swivel – (Ball Nose)	FA  Metric Male For Agriculture Valves
CW  Power Cleaner Connection	NW  Female Kärcher Metric Cleaning Hose Fitting Swivel – Straight (New Design)	Others →	
XY  Female Metric – Swivel 90° Elbow (30° Flare) JIS B8363	DK  Male Metric L – Rigid Bulkhead with Locknut (24° Cone)	DX  Female Metric Swivel (M27x2) O-Ring Light Series	XU  Female Metric – Swivel Straight (30° Flare) JIS B8363
AF  Male BSP Parallel Pipe Rigid – Straight (with O-ring Seal)	NM  Male BSP Parallel Pipe L Series – Rigid – Straight ED-Seal ISO 1179	VW121  BSP Swivel Female (VW-Norm 39-V-16631)	FF  Metru-Lok Swivel Female
DP  Metric Swivel Female Tee Male Stud	DR  Metric Swivel Female Tee	5C  60° Cone Swivel Female	82  Push-Lok® Union
7C  60° Cone Swivel Female 90° Elbow	5S  Female Tube O-ring Swivel Short Pilot	5H  Female Tube O-Ring Swivel 45° Elbow – Short Pilot	6C  60° Cone Swivel Female 45° Elbow
59PT  Male Tube O-Ring Swivel Long Pilot With Charge Port at 180° for R134a	5LPT  Female Tube O-Ring Swivel 90° Elbow – Long Pilot With Charge Port at 180° for R134a	UPTC →	
EU  UPTC – Male 45° Elbow	ET  UPTC – Male 90° Elbow	EN  UPTC – Male Straight	

Hose Fittings Pressure Ratings

Fitting end connection	Description	Metric tube size in mm Maximum working pressure (MPa) – safety factor 4:1									
		4	5	6	8	10	12	16	20	24	32
92, B1, B2, B4, B5	BSP swivel female	63.0		55.0	43.0	37.5	35.0	28.0	25.0	21.0	21.0
EA, EB, EC	BSP swivel female with O-ring	40.0		40.0	35.0	35.0	31.5	25.0	20.0	16.0	12.5
91, D9	BSP male	63.0		55.0	43.0		35.0	28.0	25.0	21.0	21.0
01	NPTF male	34.5		27.5	24.0		21.0	17.0	15.0	14.0	14.0
02	NPTF female	34.5		27.5	24.0		21.0	17.0	15.0	14.0	14.0
03, 33	SAE (JIC) 37° male	41.0	41.0	34.5	34.5	34.5	34.5	27.5	20.0	17.0	17.0
04	SAE 45° male	41.0	41.0	34.5	34.5	34.5	34.5	27.5	20.0	17.0	17.0
05	SAE male with O-ring	41.0	41.0	34.5	34.5	34.5	34.5	27.5	20.0	17.0	17.0
06/68, 37/3V, 39/3W, L9, 41/3Y	SAE (JIC) 37° swivel female	41.0	41.0	34.5	34.5	34.5	34.5	27.5	20.0	17.0	17.0
93	Female SAE (JIC) 37° 90° Elbow	41.4	41.0	34.5	34.5	34.5	34.5	27.5	20.0	17.0	17.0
07	Female NPSM-pipe swivel	34.5		27.5	24.0		21.0	17.0			
08, 77, 79	Female SAE 45° swivel	41.0	41.0	34.5	34.5	34.5	34.5	27.5	20.0	17.0	17.0
1L	Male NPTF pipe swivel 90° Elbow	21.0	21.0	21.0	21.0	19.0	15.5	14.0	11.0	9.0	8.0
S2	Female NPTF pipe swivel	21.0	21.0	21.0	21.0	19.0	15.5	14.0	11.0	9.0	8.0
0G, 0L	Male SAE O-Ring	21.0	21.0	21.0	21.0	19.0	15.5	14.0	11.0	9.0	8.0
28, 67, 69	SAE Male inverted 45° swivel	19.0	17.0	15.0	14.0						
15, 16, 17, 18, 19, 26, 27, 89, X5, X7, X9	SAE flange Code 61				34.5	34.5	34.5	34.5	27.5	21.0	21.0
4A, 4N, 4F	SAE flange 5000 psi								34.5	34.5	34.5
6A, 6E, 6F, 6G, 6N, XA, XF, XG, XN, X5, X7, X9	SAE flange Code 62 6000 psi				41.0		41.0	41.0	41.0	41.0	41.0

Fitting end connection	Description	Metric tube size in mm Maximum working pressure (MPa) – safety factor 4:1									
		4	5	6	8	10	12	16	20	24	32
JM, J6, J8, J0, JU	ORFS male	41.0		41.0	41.0	41.0	41.0	41.0	27.5	27.5	
JC, JS, J3, J7, J9, J5, J1	ORFS swivel female	41.0		41.0	41.0	41.0	41.0	41.0	27.5	27.5	
JD	Male ORFS Bulkhead with Locknut with O-ring	41.0		41.0	41.0	41.0	41.0	41.0	27.5	27.5	
GU	JIS / BSP swivel female 60° cone	35.0	35.0	35.0	35.0	28.0	28.0	21.0	17.5		
FU	Female JIS / BSP 30° parallel pipe swivel	35.0	35.0	35.0	35.0	28.0	28.0	21.0	17.5		
MU	JIS 30° metric swivel female	35.0	35.0	35.0	35.0	28.0	28.0	21.0	17.5		
MZ	Metric swivel female 90° Elbow	35.0	35.0	35.0	35.0	28.0	28.0	21.0	17.5		
UT	JIS / BSP male 60° cone	35.0		35.0	35.0		28.0	21.0	17.5		
V1	Banjo soft seal with UNF bolt	25.0	25.0		21.5	21.5	20.0				
V3	Banjo soft seal with BSPP bolt	25.0	25.0		21.5	21.5	20.0				

Fitting end connection	Description	Metric tube size in mm • Light series – L Maximum working pressure (MPa) – safety factor 4:1									
		6	8	10	12	15	18	22	28	35	42
C3, C4, C5	DIN 20078 swivel female Form A	25.0	25.0	25.0	25.0	25.0	16.0	16.0	10.0	10.0	10.0
CA, CE, CF	DIN 20066:2002-10 swivel female with O-ring, Form N	31.5	42.5	40.0	35.0	31.5	31.5	28.0	21.0	16.0	16.0
DO, DF DG, DK	DIN 20066:2002-10 male stud, Form D	25.0	42.5	40.0	35.0	31.0	28.0	28.0	21.0	16.0	16.0
DX	Metric swivel female with O-ring	31.5	42.5	40.0	35.0	31.5	31.5	28.0	21.0	16.0	16.0
1D, DD 5D	Metric standpipe	25.0	25.0	25.0	25.0	25.0	16.0	16.0	10.0	10.0	10.0
CW, NW	High pressure cleaning hose connection					40.0					
PW	High pressure cleaning hose connection			22.5							
EN, ET, EU	Universal push-in connector		40.0	35.0	35.0	29.5	28.0	21.5			

Fitting end connection	Description	Metric tube size in mm • Very light series – LL Maximum working pressure (MPa) – safety factor 4:1									
		8	10	12	15	18	22	28	35	42	50
C0	DIN 20066:2002-10 swivel female DKLL						6.3	6.3	6.3	6.3	4.0

Fitting end connection	Description	Metric tube size in mm • Metric Maximum working pressure (MPa) – safety factor 4:1										
		6	8	10	12	14	16	18	20	22	25	27
49	Metric Banjo - straight (DIN 7642)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
V2	Banjo soft seal with metric bolt				25.0	25.0		21.5		21.5		20.0

Fitting end connection	Description	Metric tube size in mm • Heavy series – S Maximum working pressure (MPa) – safety factor 4:1									
		6	8	10	12	14	16	20	25	30	38
C6, C7, C8	Swivel female	63.0	63.0	63.0	63.0	63.0	40.0	40.0	40.0	25.0	25.0
C9, 0C, 1C	Swivel female DIN 20066:2002-10 with O-ring, Form P	63.0	63.0	63.0	63.0	63.0	42.0	42.0	42.0	42.0	42.0
D2	Male stud	63.0	63.0	63.0	63.0	63.0	42.0	42.0	42.0	42.0	42.0
3D	Metric standpipe	63.0	63.0	63.0	63.0	63.0	40.0	40.0	40.0	25.0	25.0

Fitting end connection	Description	Metric tube size in mm • French gas series Maximum working pressure (MPa) – safety factor 4:1				
		13	17	21	27	33
F2	Swivel female 90° Elbow	36.0	27.0	25.5	20.0	17.0
F4	Swivel female (Ball Nose)	36.0	27.0	25.5	20.0	17.0
FG	Male stud	36.0	27.0	25.5	20.0	17.0
GE	Metric standpipe	36.0	27.0	25.5	20.0	17.0

Fitting end connection	Description	Metric tube size in mm • French metric series Maximum working pressure (MPa) – safety factor 4:1						
		10	12	14	18	20	22	30
F9	Swivel female	20.0		14.0	16.0	14.0	13.0	12.2
F6	Male agricultural valves	20.0		14.0	16.0	14.0	13.0	12.2
FA	Male agricultural valves		25.0					

Hose Fittings Nomenclature

End Configu- ration	Description	Standards	Common Terms
01	Male NPTF Pipe – Rigid – Straight	SAE J476A / J516	AGN
02	Female NPTF Pipe – Rigid – Straight	SAE J476A / J516	
03	Male JIC 37° – Rigid – Straight	ISO12151-5-S	AGJ
04	Male SAE 45° – Rigid – Straight	SAE J516	
05	Male SAE Straight Thread with O-ring – Rigid – Straight	ISO 11926, SAE J516	
06	Female JIC 37° Swivel – Straight	ISO12151-5-SWS	DKJ
06/68	Female – JIC 37° / SAE 45° Dual Flare – Swivel – Straight	ISO12151-5-SWS	DKJ
07	Female NPSM Pipe Swivel		
08	Female SAE 45° – Swivel – Straight	SAE J516	
0C	Female Metric 24° – Heavy Series with O-ring – Swivel – 45° Elbow	ISO 12151-2 – SWE 45°-S	DKOS 45°
0G	Male O-ring Straight		
0L	Male O-ring 90° Elbow		
11	„Ferrul-Fix“		
12	Female Sae Flareless Swivel – Straight (24° Cone)		
13	Male NPTF Pipe Swivel	SAE J476A / J516	
15	SAE Code 61 – Flange Head – Straight	ISO 12151-3-S-L	SFL / 3000 psi
15/4A	SAE Code 61 – Flange Head – Straight / SAE Flange Head 5000 psi	ISO 12151-3-S-L	SFL
16	SAE Code 61 – Flange Head – 22.5° Elbow	ISO 12151-3-E22ML	SFL 22.5° / 3000 psi
17	SAE Code 61 – Flange Head – 45° Elbow	ISO 12151-3 – E45 – L	SFL 45° / 3000 psi
17/4F	SAE Code 61 – Flange – 45° Elbow – 45° Elbow (5000 psi)	ISO 12151-3 – E45S – L	SFL 45°
18	SAE Code 61 – Flange – 67.5° Elbow	DIN 20078 R	SFL 67.5°
19	SAE Code 61 – Flange Head – 90° Elbow	ISO 12151-3 – E– L	SFL 90° / 3000 psi
19/4N	SAE Code 61 – Flange Head – 90° Elbow (5000 psi)	ISO 12151-3-E-L	SFL 90°
1C	Female Metric 24° – Heavy Series with O-ring – Swivel – 90° Elbow	ISO 12151-2-SWE-S	DKOS 90°
1D	Metric Standpipe – Light Series – Rigid – Straight	ISO 8434-1	BEL
1L	Male NPTF Pipe Swivel – 90° Elbow		
26	SAE Code 61 Flange – 30° Elbow		SFL 30°
27	SAE Code 61 Flange – 60° Elbow		SFL 60°
28	SAE Male Inverted 45° Elbow		
33	Male JIC 37° – Rigid – 45° Elbow	ISO 12151-5	AGJ 45°
34	Inch Standpipe (Brass)		
37	Female JIC 37° – Swivel – 45° Elbow	ISO 12151-5-SWE 45°	DKJ 45°
37/3V	Female JIC 37° /SAE 45° – Dual Flare – Swivel Female 45° Elbow	ISO 12151-5-SWE 45°	DKJ 45°
39	Female JIC 37° – Swivel – 90° Elbow	ISO 12151-5-SWES	DKJ 90°
39/3W	Female JIC 37° / SAE 45° – Dual Flare – Swivel Female 90° Elbow	ISO 12151-5-SWES	DKJ 90°
3D	Metric Standpipe – Heavy Series – Rigid – Straight	ISO 8434-1	BES
3V	Female JIC 37°/SAE – 45° Swivel – 45° Elbow		DKJ 45°
3W	Female JIC 37°/SAE – 45° Swivel – 90° Elbow		DKJ 90°
3Y	Female JIC 37°/SAE – 45° Swivel – 90° Elbow (Long)		DKJ 90°
41	Female JIC 37° Swivel – 90° Elbow (Long)		DKJ 90°
41/3Y	Female JIC 37° / 45° Swivel Female 90° Elbow (Long)	ISO 12151-5-SWEL	DKJ 90°L
45	Male Tube O-ring Swivel – Long Pilot		
49	Metric Banjo – Straight	DIN 7642	
4A	5000 psi SAE Code 61 – Flange – Straight		
4F	5000 psi SAE Code 61 – Flange – 45° Elbow		
4N	5000 psi SAE Code 61 – Flange – 90° Elbow		
59	Female Tube O-ring Swivel – Long Pilot		
59PT	Male Tube O-ring Swivel – Long Pilot	With Charge Port at 180° for 134a	
5C	60° Cone Swivel Female		
5D	Metric Standpipe – Light Series – Rigid – 90° Elbow	ISO 8434-1	BEL 90°

End Configu- ration	Description	Standards	Common Terms
5G	Male Tube O-ring Rigid Port (3 step) Straight		
5GPR	Female Tube O-ring Rigid Port (3 step) Straight	With Charge Port for R12	
5H	Female Tube O-ring Swivel – 45° Elbow – Short Pilot		
5K	Male Tube O-ring Swivel – 90° Elbow – Short Pilot		
5LPR	Female Tube O-ring Swivel – 90° Elbow – Long Pilot		
5LPT	Female Tube O-ring Swivel – 90° Elbow – Long Pilot	With Charge Port at 180° for 134a	
5MPR	Male Tube O-ring Swivel – 90° Elbow – Long Pilot	With Charge Port at 180° for R12	
5MPV	Male Tube O-ring Swivel – 90° Elbow – Long Pilot	With Charge Port at 270° for 134a	
5N	Female Tube O-ring Swivel – 45° Elbow – Long Pilot		
5P	Female Tube O-ring Swivel – 45° Elbow – Long Pilot		
5R	Male Tube O-ring Swivel – 45° Elbow – Short Pilot		
5S	Female Tube O-ring Swivel – Short Pilot		
5T	Female Tube O-ring Swivel – 90° Elbow – Short Pilot		
5V	Female Compressor – Swivel 45° Elbow		
5W	Female Compressor – Swivel 90° Elbow		
5Z	Female Compressor – Swivel 90° Elbow – Block Type		
67	SAE Male Inverted Flare Swivel – 45° Elbow		
68	Female JIC 37° / SAE 45° Swivel		DKJ
69	SAE Male Inverted Flare Swivel – 90° Elbow		
6A	SAE Code 62 – Flange – Straight	ISO 12151-3-S-S	SFS / 6000 psi
6B	SAE Code 62 – Flange – 22.5° Elbow		SFS 22.5°
6C	60° Cone Swivel Female – 45° Elbow		
6E	SAE Code 62 – Flange – 30° Elbow		SFS 30°
6F	SAE Flange 45° Elbow – Heavy Series	ISO 12151-3 – E45-S	SFS 45° / 6000 psi
6G	SAE Code 62 – Flange – 60° Elbow		SFS 60°
6N	SAE Code 62 – Flange – 90° Elbow	ISO 12151-3 – E-S	SFS 90° / 6000 psi
77	Female SAE 45° Swivel – 45° Elbow		
79	Female SAE 45° Swivel – 90° Elbow		
7C	60° Cone Swivel Female – 90° Elbow		
7D	Male Standpipe Metric S – Rigid – 90° Elbow		BES 90°
82	Push-Lok® Union		
89	SAE Code 61 – Flange – 90° Elbow (Long) – Standard Series	DIN 20 078 R	
91	Male BSP Taper Pipe – Rigid – Straight	BS5200	AGR-K
92	Female BSP Parallel Pipe – Swivel – Straight (60° Cone)	BS5200-A	DKR
93	Female JIC 37° – Swivel – 90° Elbow (Block Type)		
9B	Metric – Swivel Female 45° Elbow – Light Series		
9C	Light Series Metric Swivel Female 90° Elbow		
AF	Male BSP Parallel Pipe – Rigid – Straight (with O-ring Seal)		
B1	Female BSP Parallel Pipe – Swivel – 45° Elbow (60° Cone)	BS 5200-D	DKR 45°
B2	Female BSP Parallel Pipe – Swivel – 90° Elbow (60° Cone)	BS 5200-B	DKR 90°
B4	Female BSP Parallel Pipe – Swivel – 90° Elbow Block Type (60° Cone)	BS 5200-E	DKR 90°
B5	Female BSP Parallel Pipe – Swivel – Straight (Flat Seat)		
C0	Female Metric – Very Light Series LL – Swivel – Straight (Ball Nose)		DKM
C3	Female Metric – Light Series – Swivel – Straight (Ball Nose)		DKL
C4	Female Metric – Light Series – Swivel – 45° Elbow (Ball Nose)		DKL 45°
C5	Female Metric – Light Series – Swivel – 90° Elbow (Ball Nose)		DKL 90°
C6	Female Metric – Heavy Series – Swivel – Straight (Ball Nose)		DKS
C7	Female Metric Swivel – 45° Elbow “Heavy” Series	DIN 20 078	DKS 45°
C8	Female Metric Swivel – 90° Elbow “Heavy” Series	DIN 20 078	DKS 90°
C9	Female Metric 24° – Heavy Series with O-ring – Swivel – Straight	ISO 12151-2-SWS-S	DKOS

End Configu- ration	Description	Standards	Common Terms
CA	Female Metric 24° – Light Series with O-ring – Swivel – Straight	ISO 12151-2-SWS-L	DKOL
CE	Female Metric 24° – Light Series with O-ring – Swivel – 45° Elbow	ISO 12151-2-SWE 45°-L	DKOL 45°
CF	Female Metric 24° – Light Series with O-ring – Swivel – 90° Elbow	ISO 12151-2-SWE-L	DKOL 90°
CW	Power Cleaner Connection		
D0	Male Metric 24° – Light Series – Rigid – Straight	ISO 12151-2-S-L	CEL
D2	Male Metric 24° – Heavy Series – Rigid – Straight	ISO 12151-2-S-S	CES
D9	Male BSP Parallel Pipe – Rigid – Straight (60° Cone)	BS5200	AGR
DD	Metric Standpipe – Light Series – Rigid – 45° Elbow		BEL 45°
DE	Double Banjo Union		
DK	Male Metric L – Rigid – Bulkhead with Locknut (24° Cone)		
DP	Metric Swivel Female Tee / Male Stud		
DR	Metric Swivel Female Tee		
DS	Metric Swivel Female Tee / Standpipe		
DW	Female Metric Swivel „Light“ Series		TGL
DX	Female Metric Swivel (M27x2) O-ring – Light Series		
EA	BSP Swivel Female with O-ring (60° Cone)	BS 5200, ISO 12151-6	DKOR
EB	BSP Swivel Female with O-ring – 45° Elbow (60° Cone)	BS 5200, ISO 12151-6	DKOR 45°
EC	BSP Swivel Female with O-ring – 90° Elbow (60° Cone)	BS 5200, ISO 12151-6	DKOR 90°
EN	UPTC – Male – Straight		
ET	UPTC – Male – 90° Elbow		
EU	UPTC – Male – 45° Elbow		
F2	Female French Swivel Female – Gas Series 90° Elbow		
F4	Female French Gas Series – Swivel – Straight (Ball Nose)		
F6	French Male Metric Series (24° Cone)		
F9	French Swivel Female Metric Series – (Ball Nose)		
FA	Metric Male For Agriculture Valves		
FB	French Metric		
FF	Metru-Lok Swivel Female		
FG	Male French Gas Series – Rigid – Straight (24° Cone)		
FU	Female BSP Parallel Pipe – Swivel – Straight (30° Flare)	ISO 228-1, JIS B8363	GUI
GE	French Gas Standpipe		
GU	Female BSP Parallel Pipe – Swivel – Straight (60° Cone)	ISO 228-1, JIS B8363	GUO
J1	Female ORFS – Swivel – 90° Elbow – Long Drop	ISO 12151-1 – SWEL, SAE J 516	ORFS 90° L
J5	Female ORFS – Swivel – 90° Elbow – Medium Drop	ISO 12151-1 – SWEM	ORFS 90° M
J7	Female ORFS – Swivel – 45° Elbow	ISO 12151-1 – SWE 45°, SAE J516	ORFS 45°
J9	Female ORFS – Swivel – 90° Elbow – Short Drop	ISO 12151-1 – SWES, SAE J516	ORFS 90°
JC	Female ORFS – Swivel – Straight – Short	ISO 12151-1 – SWSA, SAE J516	ORFS
JD	Male ORFS – Bulkhead with Locknut – Straight (with O-ring)	ISO 12151-1 – SAE J516	
JM	ORFS Male	ISO 12151-1-S, SAE J516	
JS	ORFS Swivel Female (Long)	ISO 12151-1-SWSB, SAE J516	ORFS
L9	Female JIC 37° – Swivel – 90° Elbow – Medium Drop	ISO 12151-5-SWEM	DKJ 90° M
MU	Female Metric – Swivel – Straight (30° Flare)	JIS B8363	MU
MZ	Female Metric – Swivel – 90° Elbow (30° Flare)	JIS B8363	
NM	Male BSP Parallel Pipe – L Series – Rigid – Straight – ED-Seal	ISO 1179	
NW	Female Kärcher Metric Cleaning Hose Fitting – Swivel – Straight	(New Design)	
PW	Male Kärcher Metric Cleaning Hose Fitting – Rigid – Straight		
S2	Female NPTF Pipe Swivel		
S5	Male Tube O-ring Swivel – Short Pilot		
T1	Male Refrigerant Tube Mender – Straight (with Nut and Ferrule)		
UT	Male BSP Taper Pipe – Rigid – Straight (60° Cone)	JIS B 8363-R	

End Configu- ration	Description	Standards	Common Terms
V1	Ermeto standard Pressure Banjo – Straight (with UNF Bolt and O-ring)		
VW	Push In Connector	(VW-Standard 39-V-16619)	
VW121	BSP Swivel Female	(VW-Norm 39-V-16631)	
VW39D	Push In Connector	(VW-Standard 39D-1401)	
WKS	Rubber hand grip		
X5	Flange – Straight – Full flange system for Code 61 or Code 62		
X7	Flange – 45° Elbow – Full flange system for Code 61 or Code 62		
X9	Flange – 90° Elbow – Full flange system for Code 61 or Code 62		
XA	Caterpillar® Flange Head – Straight		
XF	Caterpillar® Flange Head – 45° Elbow		
XG	Caterpillar® Flange Head – 60° Elbow		
XN	Caterpillar® Flange Head – 90° Elbow		
XU	Female Metric – Swivel – Straight (30° Flare)	JIS B8363	
XY	Female Metric – Swivel – 90° Elbow (30° Flare)	JIS B8363	
YW	Male Standpipe – Rigid – Straight – A-Lok	Metric Size Tube O.D. with Vee Notch	



		Hose	Construction	Standard	GL (1)	DNV (2)	RINA (3)	DB/DIN 5510 (4)	LR (5)	MOD (6)	ABS (7)	DOT (8)	USCG (9)	MSHA (10)	BV (11)	NF (12)	BS 6853 (13)	MarED (14)	UNI CEI (15)	Page
Medium-pressure																				
High-Pressure																				
3-braids																				
Parkrimp No-Skive																				
ParLock																				
Medium-pressure		Railway	441RH	1 braid, wire	ISO11237-R16 - SAE100R16															
			421RH	1 braid, wire	EN853-TSN - ISO1436-1SN/R1AT - SAE100R1AT															
		Water cleaning	493	1 braid, wire	-															
			463	2 braids, wire	-															
		Pilot	402	1 braid, wire	-															
			412	1 braid, wire	-															
		Wire cover	421WC	1 braid, wire	ISO1436-1SN/R1AT - SAE100R1AT															
			477	2 braids, wire	Excels EN853-2SN - EN856-2SC															
		Powerlift	477ST	2 braids, wire	Excels EN853-2SN - EN856-2SC															
			692	1/2 braids, wire	Excels SAE100R17															
High-Pressure		Extremely flexible	692Twin	1/2 braids, wire	Excels SAE100R17															
			811	1 braid, 1steelspiral	SAE100R4															
		Suction	881	1 braid, 1steelspiral	SAE100R4															
			372	3braids, wire	-															
		Standard	371LT	3braids, wire	-															
			372TC	3braids, wire	-															
		Low temperature res.	372RH	3braids, wire	-															
			701	4spiral, wire	EN856-4SP - ISO3862-4SP															
		Railway	731	4spiral, wire	EN856-4SH - ISO3862-4SH															
			781	4/6spiral, wire	EN856-R13 - ISO3862-R13 - SAE100R13															
Parkrimp No-Skive		Standard	P35	6spiral, wire	EN856-R13 - ISO3862-R13 - SAE100R13															
			774	4spiral, wire	-															
		Phosphate Ester	F42	4/6spiral, wire	ISO3862-R15 - SAE100R15															
			761	6spiral, wire	-															
		Extreme pressure	721TC	4spiral, wire	EN856-R12 - ISO3862-R12 - SAE100R12															
			782TC	4/6spiral, wire	EN856-R13 - ISO3862-R13 - SAE100R13															
		High abrasion resistance MSHA approved	791TC	4/6spiral, wire	ISO3862-R15 - SAE100R15															
			792TC	4/6spiral, wire	ISO3862-R15 - SAE100R15															
		Low temperature	772LT	4spiral, wire	EN856-R12 - ISO3862-R12 - SAE100R12															
			787TC	4spiral, wire	ISO 18752-DC															
ParLock		Compact spiral !	797TC	4spiral, wire	ISO 18752-DC															
			H31	4spiral, wire	Excels EN856-4SP - ISO3862-4SP															
		Standard	H29	4spiral, wire	Excels EN856-4SH - ISO3862-4SH															
			R35	4/6spiral, wire	EN856-R13 - ISO3862-R13 - SAE100R13															
		High abrasion resistance MSHA approved	R42	4/6spiral, wire	ISO3862-R15 - SAE100R15															
			H31TC	4spiral, wire	Excels EN856-4SP - ISO3862-4SP															
		Extreme resistance MSHA approved	H29TC	4spiral, wire	Excels EN856-4SH - ISO3862-4SH															
			R35TC	4/6spiral, wire	EN856-R13 - ISO3862-R13 - SAE100R13															
		Extreme abrasion resistance	R42TC	4/6spiral, wire	ISO3862-R15 - SAE100R15															
			H31ST	4spiral, wire	Excels EN856-4SP - ISO3862-4SP															
Railway			H29ST	4spiral, wire	Excels EN856-4SH - ISO3862-4SH															
			R42ST	4/6spiral, wire	ISO3862-R15 - SAE100R15															
Railway			H29RH	4spiral, wire	Excels EN856-4SH - ISO3862-4SH															

Classification Bodies

The mission of classification bodies is to contribute to the development and implementation of technical standards for the protection of life, property and the environment.

(1) Germanischer Lloyd (GL)

German independent organisation of technical experts approving products for the German mercantile marine and the energy sector – GLIS (oil and gas, wind energy, etc...)

(2) Det Norske Veritas (DNV)

Norwegian service company for managing risk in ship classification, off-shore industry, etc...

(3) RINA (Registro Italiano Navale)

Italian company offering certification, verification, control, assistance in marine, energy & process, transport and industry.

(4) Deutsche Bahn (DB) - German Standard DIN 5510 - Part 2

The German rail authority (DB) approves the behaviour of products with respect to their resistance to burning and their ability to self-extinguish after a fire, according the DIN 5510-2 requirements.

(5) Lloyd's Register (LR)

English independent organisation providing certification around the world. Marine services, Rail services and Energy services are their main activities.

(6) Ministry of Defence (MOD)

British ministry of defence providing approvals for military equipment according the MOD DefStan (Defence Standard) 47-2 specification.

(7) American Bureau of Shipping (ABS)

US company providing rules for safety in the marine environment.

(8) US Department of Transportation (DOT)

US organisation providing certifications to ensure a fast, safe, efficient, accessible and convenient transportation system in this country.

(9) USCoast Guard (USCG)

Provides maritime safety, law enforcement, recreational boating safety, and environmental protection information for merchant mariners. The approved hoses are not accepted for all applications automatically. If the column contains "H", the hose is accepted for hydraulic systems only and not for fuel and lube systems.

(10) Mine Safety and Health Administration (MSHA)

US organisation for safety in the mining industry

(11) Bureau Veritas (BV)

Bureau Veritas is today the most widely recognized certification body in the world, offering solutions in the key strategic fields of operations: Quality, Health & Safety, Environment and Social Responsibility.

(12) French Standard NF F-16-101/102 (NF)

Tests the fire behaviour and fire effluents of the hose cover material for rail applications.

(13) British Standard (BS 6853)

Tests the fire behaviour and fire effluents of the hose cover material for rail applications.

(14) MarED

MarED is the Group of Notified Bodies for the Implementation of the Marine Equipment Directive.

(15) UNI CEI 11170

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EN	European Standard
ISO	International Organisation for Standardization
SAE	Society of Automotive Engineers (US organisation)



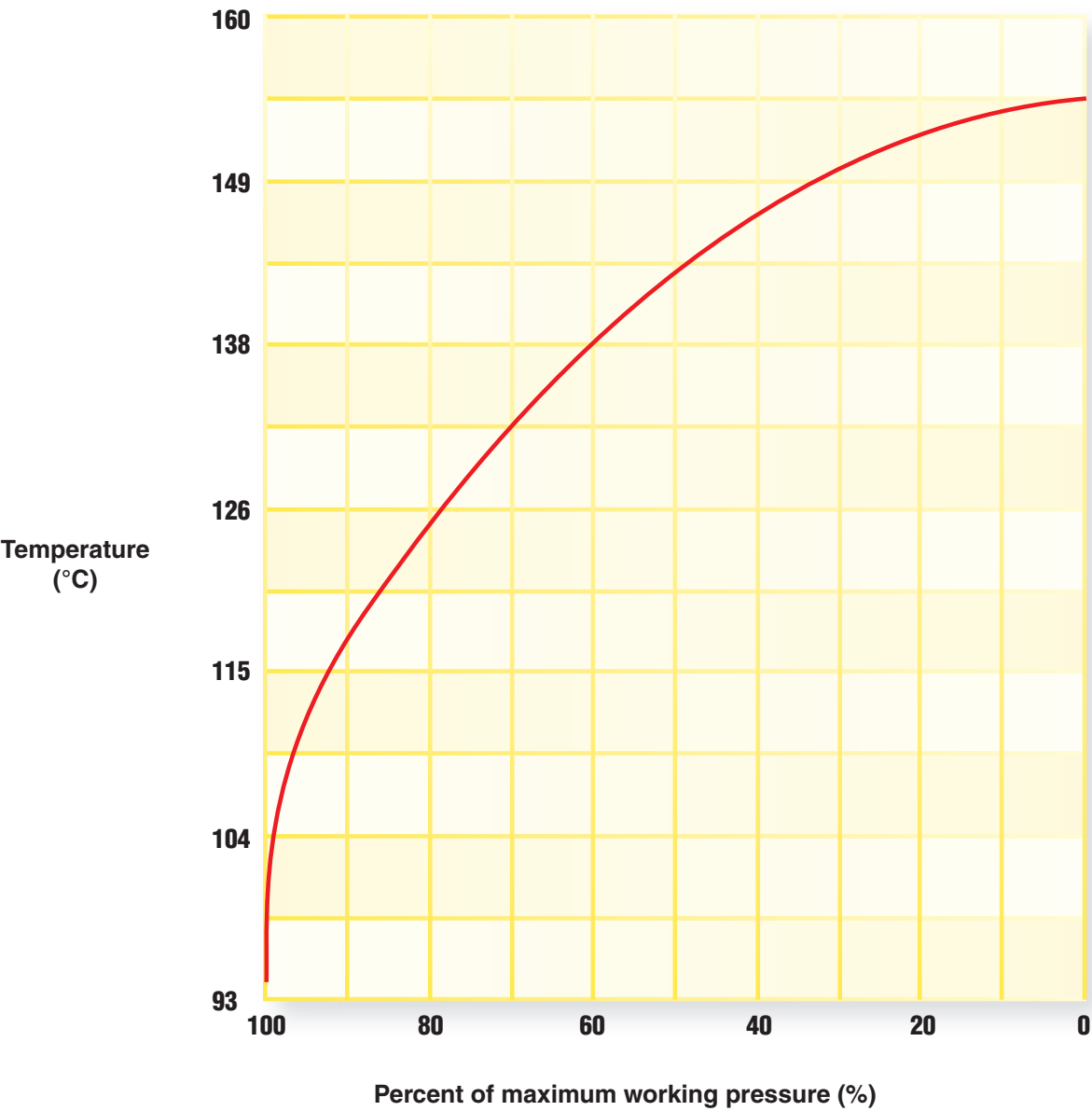
Conversion Chart

	Unit	Base Unit	Conversion Unit	Factor
Length	1 inch	in	mm	25.4
	1 millimetre	mm	in	0.03934
	1 foot	ft	m	0.3048
	1 metre	m	ft	3.28084
Area	1 square inch	sq in	cm ²	6.4516
	1 square centimetre	cm ²	sq in	0.1550
Volume	1 gallon (UK)	gal	l	4.54596
	1 litre	l	gal (UK)	0.219976
	1 gallon (US)	gal	l	3.78533
	1 litre	l	gal (US)	0.264177
Weight	1 pound	lb	kg	0.453592
	1 kilogramme	kg	lb	2.204622
Torque	1 pound foot	lb • ft	kg • m	1.488164
	1 Newton metre	kg • m	lb • ft	0.671969
Pressure	1 pound per square inch	psi	bar	0.06895
	1 bar	bar	psi	14.5035
	1 pound per square inch	psi	MPa	0.006895
	1 mega pascal	MPa	psi	145.035
	1 kilo pascal	kPa	bar	0.01
	1 bar	bar	kPa	100
	1 mega pascal	MPa	bar	10
	1 bar	bar	MPa	0.1
Velocity	1 foot per second	ft / s	m / s	0.3048
	1 metre per second	m / s	ft / s	3.28084
Flow rate	1 gallon per minute (UK)	gal / min.	l / min.	4.54596
	1 litre per minute	l / min.	gal / min. (UK)	0.219976
	1 gallon per minute (US)	gal / min.	l / min.	3.78533
	1 litre per minute	l / min.	gal / min. (US)	0.264178
Temperature	Fahrenheit degree	°F	°C	5/9 • (°F-32)
	Celsius degree	°C	°F	°C • (9 / 5) +32

(UK) Unit of United Kingdom
(US) Unit of USA

Temperature / Pressure Chart

Reference 201, 206, 213 and 293 hose.



EXAMPLE: 201-8 hose to be used at 121 °C

Maximum Working Pressure up to 100 °C	Multiplication Factor x from Chart	=	Maximum Working Pressure at 121 °C
13.8 MPa (2000 psi)	x 85%	=	11.7 MPa (1700 psi)

Flow Capacity Nomogram

Flow Capacities of Parker Hoses at Recommended Flow Velocities

The chart below is provided as an aid in the determination of the correct hose size.

Example: at 10 gallons per minute (gal/min), what is the proper hose size within the recommended velocity range for pressure lines?

Locate 10 gallons per minute in the left-hand column and 20 feet per second in the right-hand column (the maximum recommended velocity range for pressure lines). Lay a straight line across these two points. The inside diameter shown in the centre column is above -6 so we have to use -8 (1/2"). For suction hose, follow the same procedure except use recommended velocity range for intake lines in the right-hand column.

where: Q = flow in gallons per minute (gal/min & l/min)

V = velocity in feet per second (f/s & m/s)

d = hose inside diameter (mm & dash size)

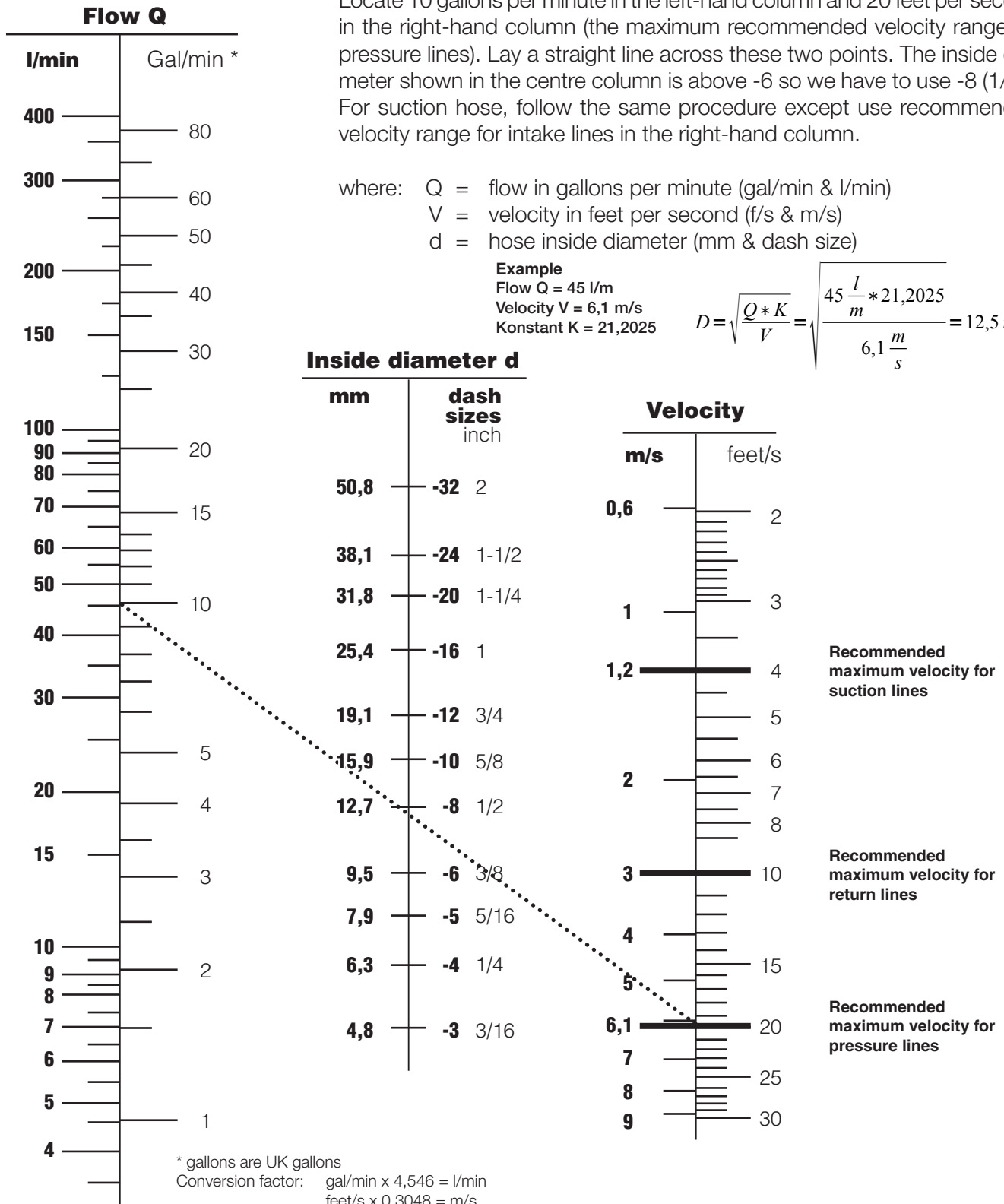
Example

Flow Q = 45 l/min

Velocity V = 6,1 m/s

Konstant K = 21,2025

$$D = \sqrt{\frac{Q \cdot K}{V}} = \sqrt{\frac{45 \frac{l}{m} \cdot 21,2025}{6,1 \frac{m}{s}}} = 12,5 \text{ mm}$$



* Recommended velocities are according to hydraulic fluids of maximum viscosity 315 S.S.U. at 38°C working at roomtemperature within 18° and 68°C.

The Correct Method to Fit Female Swivel Ends

To ensure a leakproof seal between swivel female hose ends shown in this catalogue and the appropriate adaptors it is necessary to follow the procedure below which is different from hydraulic tube assembly.

Flats From Wrench Resistance (FFWR)



Parker's recommended assembly method for JIC 37° flare, SAE 45° flare and ORFS swivel female is Flats From Wrench Resistance (FFWR). The torque values assigned by size are for reference only, and are only applicable to Parker system components using the FFWR method with trivalent chromate passivation on zinc plating of carbon steel components without lubrication.

Metal-to-metal seal


Screw the nut up hand tight and then tighten further with a spanner according to the values mentioned in the table below. Ensure that in all cases the hose is correctly aligned before tightening the nut onto the corresponding adaptor.

Spanner torque values

Metric swivel female

 Thread metric	 Tube O.D.	Nm	
		nominal	min. - max.
M 12x1,5	06L	16	15 - 17
M 14x1,5	08L	16	15 - 17
M 16x1,5	10L	26	25 - 28
M 18x1,5	12L	37	35 - 39
M 22x1,5	15L	47	45 - 50
M 26x1,5	18L	89	85 - 94
M 30x2	22L	116	110 - 121
M 36x2	28L	137	130 - 143
M 45x2	35L	226	215 - 237
M 52x2	42L	347	330 - 363
M 14x1,5	06S	26	25 - 28
M 16x1,5	08S	42	40 - 44
M 18x1,5	10S	53	50 - 55
M 20x1,5	12S	63	60 - 66
M 22x1,5	14S	79	75 - 83
M 24x1,5	16S	84	80 - 88
M 30x2	20S	126	120 - 132
M 36x2	25S	179	170 - 187
M 42x2	30S	263	250 - 275
M 52x2	38S	368	350 - 385


BSP swivel female

 Thread BSPP		Nm	
		nominal	min. - max.
G1/4	-4	20	15 - 25
G3/8	-6	34	27 - 41
G1/2	-8	60	42 - 76
G5/8	-10	69	44 - 94
G3/4	-12	115	95 - 135
G1	-16	140	115 - 165
G1.1/4	-20	210	140 - 280
G1.1/2	-24	290	215 - 365
G2	-32	400	300 - 500


Note

Values given in tables are typical to achieve the recommended assembly methods when fitting material is steel zinc plated. For other materials different values will be applicable (see our recommendations for other materials on this page).

JIC 37° swivel female

 Thread UNF	size	Flats From Wrench Resistance (FFWR)	Swivel Nut Torque Nm (Ref)
7/16-20	-4	2	18
1/2-20	-5	2	23
9/16-18	-6	1-1/2	30
3/4-16	-8	1-1/2	57
7/8-14	-10	1-1/2	81
1.1/16-12	-12	1-1/4	114
1.5/16-12	-16	1	160
1.5/8-12	-20	1	228
1.7/8-12	-24	1	265
2.1/2-12	-32	1	360

ORFS swivel female

 Thread UNF	size	Flats From Wrench Resistance (FFWR)	Swivel Nut Torque Nm (Ref)
9/16-18	-4	1/2 to 3/4	26
11/16-16	-6	1/2 to 3/4	42
13/16-16	-8	1/2 to 3/4	57
1-14	-10	1/2 to 3/4	85
1.3/16-12	-12	1/3 to 1/2	122
1.7/16-12	-16	1/3 to 1/2	156
1.11/16-12	-20	1/3 to 1/2	200
2-12	-24	1/3 to 1/2	256
2-1/2x12	-32	-	-

Note: The assembly torques listed are higher than the test torques published in SAE J1453.

The torque values for other materials are as follows:

- Brass fittings and adapters
 - 65 % of the torque value for steel.
- Stainless steel and Monel
 - Use 5% higher than listed for steel.
 - Threads to be lubricated for these materials.
- Dissimilar metals
 - Use torque value designated for the lower of the two metals.
- All fittings are dry except as noted above.

Chemical Resistance Table

Warning ! This chemical compatibility guide must not be used in conjunction with any other compatibility guides from previous or future catalogue editions, bulletins or publications. Incorrect use of these charts could result in death, personal injury or property damage.

Hose Selection by Medium and Hose Type

This hose compatibility chart is a ready reference of Parker hose compatibility with various fluid media. It is intended as a guide to chemical compatibility with inner tube materials and assembly lubricants applied internally.

The outer cover of the hose is intended to protect the reinforcement layer(s) from mechanical influences (abrasion, weathering etc), as such the cover compounds are not designed to exhibit the same chemical resistance as the tube compounds. The Hose Division Technical Department should be consulted about the compatibility of the cover should the application involve the extended exposure or immersion in a liquid.

The specific recommendations are based upon field experience, the advice of various polymer or fluid suppliers, and specific laboratory experiments. It must be stressed, however, that this information is offered only as a guide. Final hose selection depends also upon pressure, fluid temperature, ambient temperature, and special requirements or variations, which may not be known by Parker Hannifin. Legal and other regulations must be followed with particular care.

Where an external compatibility problem may occur, or for fluids not listed, we encourage you to first contact the fluid manufacturer for a recommendation prior to contacting your Parker Hannifin Field Representative or the Technical Department, Hose Products Division Europe (HPDE_Helpdesk@parker.com)

Use the Chart as Follows:

1. Locate medium to be carried using the Chemical Resistance Table on the following pages.
2. Select suitability of hose and fitting material from the table based on the letter rating in the table. See resistance rating key below for explanation of compatibility ratings. See list of numerals below for an explanation when a numeral, or a numeral and a letter rating are present in the table.
3. The Column headings on the Chemical Resistance Table, I, II, III, IV, V refer to specific groups of hoses.
4. Locate hose part number under Column I, II, III, IV, V, VI from the list below.
5. For fitting material availability refer to appropriate fitting section of catalogue.
6. Check hose specifications in this catalogue. Contact Hose Division Technical Department on any items not catalogued.

Resistance Rating Key

A = Preferred, good to excellent with little or no change in physical properties.

F = Fair, marginal or conditional with noticeable effects on physical properties.

X = Unsuitable, severe effects on physical properties.

~ = No rating, insufficient information.

Numerals

1. For air or gaseous applications above 250 PSI (1,7 MPa), the cover should be pin pricked.
2. Legal and insurance regulations must be considered. Contact HPDE Technical Department for more information.
3. Push-Lok hoses (801, 804, 821, 821FR, 831, 836, 837BM, 837PU, 830M, 838M) are not recommended for any type of fuel.
4. Use 285, 235 or 244 hoses. The compatibility of the system's refrigeration oil with these hoses needs to be evaluated on a case by case basis. Contact HPDE Technical Department for more information. Do not use mineral oil or alkyl benzene refrigeration oils with 244 hose. Chemical compatibility does not imply low permeation.
5. 65 °C (150 °F) maximum.
6. Satisfactory at some concentrations and temperatures, unsatisfactory at others.
7. For phosphate ester fluids use 304, 424, 774, 804 or F42 hoses.
8. Acceptable for flushing hose assemblies.
9. 221FR hose recommended.
10. For dry air applications, hoses with inner tubes from columns IV and V are preferred. See hose specifications for maximum recommended temperatures with air.
11. 100 °C (212 °F) maximum.
12. 121 °C (250 °F) maximum.
13. Hoses for gas application are available from Parker. Please contact the Technical Department for more information about the products as well as the legal application requirements.
14. Hoses for gas application are available from Parker. Please contact the Technical Department for more information about the products as well as the legal application requirements.
15. 70 °C maximum for hoses 801, 837BM, 837PU
16. No rating / insufficient information about chemical compatibility for hoses 801, 837BM, 837PU.

Hose Types

Column I:	201, 225, 601, 701, 721, 721TC, 731, 761, 77C, P35, 781, 791TC, 881, H31, H29, R35, R42, H31TC, H29TC, R35TC, R42TC, H31ST, H29ST, R42ST, H29RH	
Column II:	301TC, 351TC, 371LT, SS25UL, 421WC, 431, 441, 441RH, 451, 451TC, 451ST, 461LT, 463, 471TC, 471ST, 493, 681, 681DB, 772LT, 811	
Column III:	221FR, 301SN, 302, 372, 372RH, 372TC, 402, 412, 421RH, 421SN, 422, 462, 462ST, 472TC, 477, 477ST, 492, 492ST, 692, 692Twin, 772TC, 772ST, 782TC, 782ST, 792TC, 792ST, 821, 831	
Column IV:	206, 213, 226, 266, 293, 426, 436, 611, 611HT, 821FR, 836, 801*, 837BM*, 837PU*	Note: * See Numeral 15,16
Column V:	304, 424, 604, 774, 804, F42 - Special EPDM hose for Phosphoric Ester	
Column VI:	830M, 838M	For hoses 787TC and 797TC, please ask our helpdesk

Caution: The fluid manufacturer's recommended maximum operating temperature for any specific name-brand fluid should be closely observed by the user. Specific name brand fluids can vary greatly between manufacturers even though they are considered to be from the same family of fluids. Using fluids above the manufacturer's maximum recommended temperature can cause the fluid to break down, creating by-products that can be harmful to elastomers or other materials used in the system. When selecting a hose type, both the fluid manufacturer and hose manufacturer's maximum temperature limit must be taken into consideration, with the lower of the two taking precedence.

Medium	I	II	III	IV	V	VI	STEEL	BRASS	SS
3M FC-75	A	A	A	A 16	A	A	A	A	A
A									
Acetic Acid	X	X	X	A 16	6	X	X	X	A
Acetone	X	X	X	A 16	A	X	A	A	A
Acetylene	X	X	X	X	X	-	-	-	-
AEROSHELL Turbine Oil 500 (See MIL-L-23699)	X	X	F	X	X	-	A	A	A
Air	A, 1, 10	A, 1, 10	A, 1, 10	A 1, 10	A, 1, 10	A	A	A	A
Air (dry)	X	F, 1, 10	F, 1, 10	A 1, 10	A, 1, 10	A	A	A	A
Alcohol (Methanol-Ethanol)	F	F	F	A 16	F	-	F	A	A
Ammonia (Anhydrous)	X	X	X	X	X	-	X	X	X
Ammonium Chloride	A	A	A	A 16	A	A	X	X	X
Ammonium Hydroxide	F	F	F	A 16	A	X	F	X	A
Ammonium Nitrate	A	A	A	A 16	A	-	F	X	A
Ammonium Phosphate	A	A	A	A 16	A	-	X	X	F
Ammonium Sulfate	A	A	A	A 16	A	-	F	X	F
Amoco 32 Rykon	X	A	A	F 15	X	A	A	A	A
Ampol PE 46	X	X	X	X	A, 7	F	A	A	A
AMSOIL Synthetic ATF	F	A	A	A 16	X	F	A	A	A
Amyl Alcohol	X	X	X	A 16	F	-	X	A	A
Anderol 495,497,500,750	X	X	X	A 16	X	X	A	A	A
Aniline	X	X	X	A 16	A	X	A	X	A
Animal Fats	X	F	F	A 16	F	-	6	6	A
Aquacent Light, Heavy	X	A	A	X	X	A	A	A	A
Argon	A	A	A	A	A	A	A	A	A
Aromatic 100,150	X	F	F	-	X	F	A	A	A
Arrow 602P	A	A	A	A 15	X	A	A	A	A
Asphalt	X	F	F	F 15	X	A	F	F	A
ASTM #3 Oil	F	F	F	A 16	X	-	A	A	A
ATF-M	F	A	A	A 15	X	A	A	A	A
Automotive Brake Fluid	X	X	X	X	-	X	X	X	X
AW 32,46,68	F	A	A	A 15	X	A	A	A	A
B									
BCF	F	F	F	F 16	-	-	A	A	A
Benz Petraulic 32,46,68,100,150,220,320,460	F	A	A	A 15	X	A	A	A	A
Benzene, Benzol	X	X	X	A 16	X	F	A	A	A
Benzgrind HP 15	-	A	A	A 16	X	-	A	A	A
Benzine	X	X	X	F 16	X	-	A	A	A
Biodegradable Hydraulic Fluid 112B	X	A	A	X	-	-	A	A	A
Biodiesel E20	X	F	X	X	X	X	-	-	-
Biodiesel E100	X	F	X	X	X	X	-	-	-
Biodiesel E60	X	F	X	X	X	X	-	-	-
Biodiesel E80	X	F	X	X	X	X	-	-	-
Borax	F	F	F	A 16	A	-	F	A	A
Boric Acid	A	A	A	X	A	X	X	6	A
Brayco 882	X	A	A	A 16	X	-	A	A	A
Brayco Micronic 745	X	X	A	F 15	X	A	A	A	A
Brayco Micronic 776RP	F	A	A	F 15	X	A	A	A	A
Brayco Micronic 889	X	F	F	-	X	-	A	A	A
Brine	F	F	F	A 16	A	-	X	F	F
Butane		See 2 & 13				F	A	A	A
Butyl Alcohol, Butanol	F	F	F	A 16	F	-	F	F	A
C									
Calcium Chloride	A	A	A	A 16	A	-	F	F	X
Calcium Hydroxide	A	A	A	A 16	A	-	A	A	A

Medium	I	II	III	IV	V	VI	STEEL	BRASS	SS
Calcium Hypochlorite	X	X	X	A 16	A	-	X	F	X
Calibrating Fluid	A	A	A	A 15	X	A	A	A	A
Carbon Dioxide, gas	F	F	F	F 16	6	-	A	A	A
Carbon Disulfide	X	X	X	A 16	X	-	A	F	A
Carbon Monoxide (hot)	F	F	F	A 16	6	-	F	6	A
Carbon Tetrachloride	X	X	X	A 16	X	-	6	6	6
Carbonic Acid	F	F	F	X	F	X	X	X	F
Castor Oil	A	A	A	A 16	A	-	A	A	A
Castrol 5000	X	F	F	A 16	X	X	A	A	A
Cellosolve Acetate	X	X	X	X	A	-	X	X	A
Cellugard	A	A	A	-	A	-	A	A	A
Cellulube 90, 150, 220 300, 550, 1000	X	X	X	-	A	-	A	A	A
Chevron Clarity AW 32, 46, 68	A	A	A	A 15	X	A	A	A	A
Chevron FLO-COOL 180	F	F	F	-	X	-	A	A	A
Chevron FR-8, 10, 13, 20	X	X	X	X	A, 7	F	A	A	A
Chevron Hydraulic Oils AW MV 15, 32, 46, 68, 100	A	A	A	A 15	X	A	A	A	A
Chevron HyJet IV (9)	X	X	X	X	A, 7	F	A	A	A
Citric Acid	F	A	A	X	A	X	X	X	6
Commonwealth EDM 242, 244	A	A	A	-	X	A	A	A	A
CompAir CN300	X	X	X	A 16	X	X	A	A	A
CompAir CS100, 200, 300, 400	X	X	X	A 16	X	X	A	A	A
Coolanol 15, 20, 25, 35, 45	A	A	A	A 16	A	X	A	A	A
Copper Chloride	F	A	A	X	A	-	X	X	X
Copper Sulfate	A	A	A	X	A	-	X	X	F
Cosmolubric HF-122, HF-130, HF-144	X	F	A	X	X	-	A	A	A
Cosmolubric HF-1530	X	F	A	X	X	-	A	A	A
Cottonseed Oil	F	A	A	F 16	X	-	A	A	A
CPI CP-4000	X	X	X	A 16	X	-	A	A	A
Crude Petroleum Oil	F	A	A	A 15	X	A	F	F	A
CSS 1001 Dairy Hydraulic Fluid	F	A	A	A 16	X	-	A	A	A
D									
Daphne AW32	A	A	A	A 15	X	A	A	A	A
Dasco FR 201-A	A	A	A	-	X	-	A	A	A
Dasco FR150, 200, 310	F	A	A	-	A	-	A	A	A
Dasco FR300, FR2550	X	X	X	-	X	F	A	A	A
Dasco FR355-3	X	F	A	X	X	X	A	A	A
Deicer Fluid 419R	A	A	A	-	-	A	A	A	A
Deionized Water	A	A	A	A 16	A	-	F	F	A
Dexron II ATF	F	A	A	A 15	X	A	A	A	A
Dexron III ATF	X	F, 11	F, 11	A 16, 12	X	-	A	A	A
Diesel Fuel	F, 3	A, 3	A, 3	A 16, 3	X	A(2)	A	A	A
Diester Fluids	X	X	X	A 16	X	X	A	A	A
Dow Corning 2-1802 Sullair (24KT)	-	-	-	F 16	-	-	A	A	A
Dow Corning DC 200, 510, 550, 560, FC126	A	A	A	A 16	-	-	A	A	A
Dow HD50-4	F	F	F	-	-	-	-	-	A
Dow Sullube 32	-	-	-	F 16	-	-	A	A	A
Dowtherm A,E	X	X	X	A 16	X	-	A	A	A
Dowtherm G	X	X	X	X	X	-	A	A	A
Duro AW-16, 31	A	A	A	-	X	-	A	A	A
Duro FR-HD	A	A	A	-	X	-	A	A	A
E									
EcoSafe FR-68	A	A	A	-	X	X	A	A	A
Ethanol	F	F	F	A 16	F	-	F	A	A
Ethers	X	X	X	A 16	X	-	A	A	A

Medium	I	II	III	IV	V	VI	STEEL	BRASS	SS
Ethyl Acetate	X	X	X	A 16	F	-	F	A	A
Ethyl Alcohol	F	F	F	A 16	F	-	F	A	A
Ethyl Cellulose	F	F	F	A 16	F	-	X	F	F
Ethyl Chloride	X	X	X	X	A	-	F	F	F
Ethylene Dichloride	X	X	X	A 16	X	-	X	A	X
Ethylene Glycol	F	A	A	A	A	A	A	F	A
Exxon 3110 FR	A	A	A	A 16	X	A	A	A	A
Exxon Esstic	A	A	A	A 15	A	A	A	A	A
Exxon Nuto H 46, 68	A	A	A	A 15	X	A	A	A	A
Exxon Tellura Industrial Process Oils	A	A	A	A 15	X	A	A	A	A
Exxon Terresstic, EP	A	A	A	A 15	A	A	A	A	A
Exxon Turbo Oil 2380	X	F	F	A 16	X	X	A	A	A
Exxon Univolt 60, N61	F	A	A	A 15	X	A	A	A	A
F									
FE 232 (Halon)	X	X	X	X	F	-	A	A	A
Fenso 150	-	A	A	-	X	A	A	A	A
Formaldehyde	X	X	X	A 16	A	-	X	F	A
Formic Acid	X	X	X	X	A	X	X	6	X
Freons see refrigerants	-	-	-	-	-	-	-	-	-
Fuel Oil	F, 3	A, 3	A, 3	A 16, 3	X	A(2)	A	A	A
Fyre-Safe 120C, 126, 155, 1090E, 1150, 1220, 1300E	X	X	X	X	A, 7	F	A	A	A
Fyre-Safe 200C, 225, 211	F	A	A	A	A	F	A	A	A
Fyre-Safe W/O	A	A	A	A 16	X	A	A	A	A
Fyrguard 150, 150-M, 200	A	A	A	A	A	F	A	A	A
Fyrquel 60, 90, 150, 220, 300, 550, 1000	X	X	X	X	A, 7	F	A	A	A
Fyrquel EHC, GT, LT, VPF	X	X	X	X	A, 7	F	A	A	A
Fyrtek MF, 215, 290, 295	X	X	X	X	X	F	A	A	A
G									
Gardner-Denver GD5000, GD8000	X	X	X	A 16	X	X	A	A	A
Gasoline		See 9				-	A	A	A
Glue	F	F	F	-	X	-	A	F	A
Glycerine, Glycerol	A	A	A	A 16	A	-	A	F	A
Grease	A	A	A	A 15	X	A	A	A	A
Gulf-FR Fluid P37, P40, P43, P45, P47	X	X	X	A 16	A	-	A	A	A
H									
H-515 (NATO)	A	A	A	-	X	-	A	A	A
Halon 1211, 1301	F	F	F	F 16	-	-	A	A	A
Helium Gas	X	X	X	X	X	-	A	A	A
Heptane	X	F	F	A 16	X	-	A	A	A
Hexane	X	F	F	A 16	X	-	A	A	A
HF-20, HF-28		A	A	A	A	F	A	A	A
Houghto-Safe 1055, 1110, 1115, 1120, 1130 (9)	X	X	X	X	A, 7	F	A	A	A
Houghto-Safe 271 to 640	F	A	A	A	A	F	A	A	A
Houghto-Safe 419 Hydraulic Fluid	A	A	A	-	X	-	A	A	A
Houghto-Safe 419R Deicer Fluid	A	A	A	-	-	A	A	A	A
Houghto-Safe 5046, 5046W, 5047-F	A	A	A	A 16	X	-	A	A	A
HP 100C (Jack hammer oil)	F	A	A	A 15	X	A	A	A	A
HPWG 46B	F	A	A	A	-	F	A	A	A
Hul-E-Mul	A	A	A	-	X	-	A	A	A
Hychem C, EP1000, RDF	A	A	A	A 16	A	-	A	A	A
Hydra Safe E-190	A	A	A	A 16	X	-	A	A	A
Hydra-Cut 481, 496	A	A	A	-	X	-	A	A	A
Hydrafluid 760	A	A	A	-	X	-	A	A	A
Hydrochloric Acid	X	X	X	X	X	X	X	X	X

Medium	I	II	III	IV	V	VI	STEEL	BRASS	SS
Hydrofluoric Acid	X	X	X	X	X	X	X	6	X
Hydrogen Gas	X	X	X	X	X	-	A	A	A
Hydrogen Peroxide	X	X	X	A 16	X	-	X	X	6
Hydrogen Sulfide	X	X	X	X	A	-	X	X	6
Hydrolube	A	A	A	A 16	A	-	A	A	A
Hydrolubric 120-B, 141, 595	F	A	A	A 16	A	-	A	A	A
Hydrosafe Glycol 200	A	A	A	A	A	F	A	F	A
HyJet IV	X	X	X	X	A, 7	-	A	A	A
I									
Ideal Yellow 77	A	A	A	A 16	X	-	A	A	A
Imol S150 to S550	X	X	X	-	-	-	A	A	A
Ingersoll Rand SSR Coolant	X	X	X	A 16	X	X	A	A	A
Isocyanates	X	X	X	A 16	X	-	A	-	A
Isooctane	X	F	F	A 16	X	-	A	A	A
Isopar H	X	X	X	X	X	-	A	A	A
Isopropyl Alcohol	F	F	F	A 16	F	-	F	A	A
J									
Jayflex DIDP	X	X	X	X	A	-	A	A	A
JP3 and JP4	X	A,3	A,3	-	X	A(2)	A	A	A
JP5	X	A,3	A,3	F 16,3	X	A(2)	A	A	A
JP9	X	X	X	X	X	-	A	-	A
K									
Kaeser 150P, 175P, 325R, 687R	X	X	X	A 16	X	-	A	A	A
Kerosene	X	A	A	F 15	X	A	A	A	A
KSL-214, 219, 220, 222	X	X	X	A 16	X	-	A	A	A
L									
Lacquer	X	X	X	A 16	X	-	X	A	A
Lacquer Solvents	X	X	X	A 16	X	-	X	A	A
Lactic Acids	X	X	X	X	X	X	X	X	A
Lindol HF	X	X	X	A 16	A	-	A	A	A
Linseed Oil	A	A	A	A 16	A	-	A	A	A
LP-Gas		See 13				-	A	A	A
M									
Magnesium Chloride	A	A	A	A 16	A	-	X	X	X
Magnesium Hydroxide	F	F	F	A 16	A	-	F	F	F
Magnesium Sulfate	A	A	A	A 16	A	-	A	F	A
Mercaptans	X	X	X	X	X	-	-	-	-
Methane		See 14				-	A	A	A
Methanol	F	F	F	A 16	F	-	F	A	A
Methyl Alcohol	F	F	F	A 16	F	-	F	A	A
Methyl Chloride	X	X	X	A 16	X	-	A	A	A
Methyl Ethyl Ketone (MEK)	X	X	X	A 16	X	-	F	A	A
Methyl Isopropyl-Ketone	X	X	X	X	X	-	F	A	A
Metsafe FR303, FR310, FR315, FR330, FR350	X	X	X	X	X	F	A	A	A
Microzol-T46	X	A	A	-	X	-	A	A	A
MIL-B-46176A	X	X	X	X	X	-	X	X	X
MIL-H-46170	X	F	F	A 16	X	-	A	A	A
MIL-H-5606	F	A	A	A 15	X	A	A	A	A
MIL-H-6083	F	A	A	A 16	X	-	A	A	A
MIL-H-7083	F	A	A	A 16	X	-	A	A	A
MIL-H-83282	F	A	A	A 16	X	-	A	A	A
MIL-L-2104, 2104B	F	A	A	A 15	X	A	A	A	A
MIL-L-23699	X	X	X	X	X	X	A	A	A
MIL-L-7808	F	A	A	-	X	-	A	A	A

Medium	I	II	III	IV	V	VI	STEEL	BRASS	SS
Mine Guard FR	A	A	A	-	A	-	A	A	A
Mineral Oil	A	A	A	F 15	X	A	A	A	A
Mineral Spirits	8	8	8	8	X	-	A	A	A
Mobil Aero HFE	F	A	A	F 15	X	A	A	A	A
Mobil DTE 11M, 13M, 15M, 16M, 18M, 19M	F	A	A	A 15	X	A	A	A	A
Mobil DTE 22, 24, 25, 26	F	A	A	A 15	X	A	A	A	A
Mobil EAL 224H	X	A	A	X	-	-	A	A	A
Mobil EAL Artic 10, 15, 22,32, 46, 68, 100	X	X	X	X	X	X	A	A	A
Mobil Glygoyle 11, 22, 30, 80	A	A	A	-	X	-	A	A	A
Mobil HFA	F	A	A	A 16	X	-	A	A	A
Mobil Jet 2	X	F	F	A 16	X	-	A	A	A
Mobil Nylvac 20, 30, 200, FR	F	A	A	A	A	F	A	A	A
Mobil Rarus 824, 826, 827	X	X	X	A 16	X	X	A	A	A
Mobil SHC 600 Series	F	A	A	A 16	X	-	A	A	A
Mobil SHC 800 Series	F	A	A	A 16	X	-	A	A	A
Mobil SHL 624	-	A	A	A 16	X	-	A	A	A
Mobil Vactra Oil	A	A	A	F 15	X	A	A	A	A
Mobil XRL 1618B	X	X	X	X	A, 7	F	A	A	A
Mobilfluid 423	F	A	A	A 15	X	A	A	A	A
Mobilgear SHC 150, 220, 320, 460, 680	F	F	F	A 16	X	-	A	A	A
Mobilrama 525	A	A	A	F 15	X	A	A	A	A
Molub-Alloy 890	X	X	X	A 16	X	-	A	A	A
Moly Lube "HF" 902	F	F	F	F 15	X	A	A	A	A
Monolec 6120 Hydraulic Oil	A	A	A	A 15	X	A	A	A	A
Morpholine (pure additive)	X	X	X	X	X	-	X	X	A
N									
Naptha	X	F	F	A 16	X	-	A	A	A
Napthalene	X	X	X	A 16	X	-	A	A	A
Natural Gas		See 14				-	A	A	A
Nitric Acid	X	X	X	X	X	X	X	X	F
Nitrobenzene	X	X	X	A 16	X	-	X	X	A
Nitrogen, gas	F, 1	F, 1	F, 1	F 16, 1	F, 1	-	A	A	A
NORPAR 12, 13, 15	8	8	8	8	X	-	A	A	A
Nuto H 46, 68	A	A	A	A 15	X	A	A	A	A
Nylvac 20, 30, 200, FR	F	A	A	A	A	F	A	A	A
Nylvac Light	X	X	X	-	A	-	A	A	A
O									
Oceanic HW	F	A	A	A	X	F	A	A	A
Oxygen, gas	X	X	X	X	X	-	X	A	A
Ozone	F	F	F	-	A	-	A	A	A
P									
Pacer SLC 150, 300, 500, 700	X	X	X	A 16	X	-	A	A	A
Pennzbell AWX	F	A	A	F 15	X	A	A	A	A
PENTOSIN CHF 11S	F	A	A	F	A	X	A	A	A
Perchloroethylene	X	X	X	X	X	-	F	X	A
Petroleum Ether	X	F	F	F 15	X	A	A	A	A
Petroleum Oils	A	A	A	A 15	X	A	A	A	A
Phenol (Carbolic Acid)	X	X	X	A 16	X	X	X	F	A
Phosphate Ester Blends	X	X	X	X	X	F	A	A	A
Phosphate Esters	X	X	X	X	A, 7	-	A	A	A
Phosphoric Acid	X	X	X	X	X	X	X	X	F
Plurasafe P 1000, 1200	F	A	A	A	F	F	A	A	A
Polyalkylene Glycol	A	F	F	-	X	-	A	A	A
Polyol Ester	X	F	A	X	X	-	A	A	A

Medium	I	II	III	IV	V	VI	STEEL	BRASS	SS
Potassium Chloride	A	A	A	A 16	A	-	X	F	F
Potassium Hydroxide	X	X	X	A 16	A	-	6	X	A
Potassium Sulfate	A	A	A	A 16	A	-	A	A	A
Propane		See 13				-	A	A	A
Propylene Glycol	F	A	A	A 16	A	-	F	F	F
Pydraul 10-E, 29-E, 50-E, 65-E, 90-E, 115-E	X	X	X	X	A, 7	F	A	A	A
Pydraul 230-C, 312-C, 68-S	X	X	X	X	A, 7	F	A	A	A
Pydraul 60, 150, 625, F9	X	X	X	X	A, 7	-	A	A	A
Pydraul 90, 135, 230, 312, 540, MC	X	X	X	X	X	-	A	A	A
Pydraul A-200	X	X	X	A 16	X	-	A	A	A
Pyro Gard 43, 230, 630	X	X	X	X	X	-	A	A	A
Pyro Gard C, D, R, 40S, 40W	F	A	A	F 16	X	A	A	A	A
Pyro Guard 53, 55, 51, 42	X	X	X	X	A, 7	-	A	A	A
Q									
Quintolubric 700	A	A	A	A 16	A	-	A	F	A
Quintolubric 807-SN	F	A	A	-	X	-	A	A	A
Quintolubric 822, 833	X	F, 5	A, 5	X	X	X	A	A	A
Quintolubric 822-68EHC (71°C, 160°F maximum)	X	F, 5	A, 5	-	-	-	A	A	A
Quintolubric 888	X	F, 5	A, 5	X	X	-	A	A	A
Quintolubric 957, 958	F	A	A	A	A	F	A	A	A
Quintolubric N822-300	~	~	A	-	-	-	A	A	A
Quintolubric N888	X	A	F	X	-	X	A	A	A
R									
Rando	A	A	A	A 15	X	A	A	A	A
Rayco 782	X	F	A	X	X	-	X	X	X
Refrigerant 124		See 4				X	A	A	A
Refrigerant Freon 113, 114	X	X	X	X	X	X	A	A	A
Refrigerant Freon 12		See 4		X		X	A	A	A
Refrigerant Freon 22		See 4		X		X	A	A	A
Refrigerant Freon 502		See 4		X		X	A	A	A
Refrigerant HFC134A		See 4		X		X	A	A	A
Reolube Turbofluid 46	X	X	X	X	A, 7	-	A	A	A
Rotella	A	A	A	A 15	X	A	A	A	A
Royal Bio Guard 3032, 3046, 3068, 3100	X	~	A	X	X	X	A	A	A
Royco 2200, 2210, 2222, 2232, 2246, 2268	X	X	X	X	X	X	A	A	A
Royco 4032, 4068, 4100, 4150	X	X	X	A 16	X	X	A	A	A
Royco 756, 783	A	A	A	A 15	X	A	A	A	A
Royco 770	X	F	F	F 16	X	-	A	A	A
RTV Silicone Adhesive Sealants	X	X	X	X	X	-	A	A	A
S									
Safco-Safe T10, T20	-	-	-	-	A	-	F	F	A
Safety-Kleen ISO 32, 46, 68 hydraulic oil	F	A	A	-	X	A	A	A	A
Safety-Kleen Solvent	8	8	8	8	X	-	A	A	A
Santoflex 13	F	F	F	-	F	-	A	A	A
Santosafe 300	X	X	X	-	X	-	A	A	A
Santosafe W/G 15 to 30	-	-	-	A 16	A	-	A	A	A
Sea Water	F	F	F	A 16	A	-	X	F	A
Sewage	F	F	F	A 16	F	-	X	F	A
Shell 140 Solvent	8	8	8	8	X	-	A	A	A
Shell Clavus HFC 68	X	X	X	X	X	X	A	A	A
Shell Comptella Oil	F	F	F	A 15	X	A	A	A	A
Shell Comptella Oil S 46, 68	F	F	F	A 15	X	A	A	A	A
Shell Comptella Oil SM	F	F	F	A 15	X	A	A	A	A
Shell Diala A, (R) Oil AX	F	A	A	F 15	X	A	A	A	A

Medium	I	II	III	IV	V	VI	STEEL	BRASS	SS
Shell FRM	-	-	-	-	X	-	A	A	A
Shell IRUS 902, 905	A	A	A	-	A	-	A	A	A
Shell Naturelle HF-E	F	A	A	F	A	X	A	A	A
Shell Pella-A	A	A	A	A 16	X	-	A	A	A
Shell Tellus	F	A	A	A 15	X	A	A	A	A
Shell Tellus TD 46	A	A	A	A	A	X	A	A	A
Shell Thermia Oil C	A	A	A	A 15	X	A	A	A	A
Shell Turbo R	X	F	F	A 16	X	X	A	A	A
SHF 220, 300, 450	X	X	A	X	X	X	A	A	A
Silicate Esters	A	F	F	A 16	X	-	A	A	A
Silicone Oils	A	A	A	-	-	-	A	A	A
Silicone Sealants	X	X	X	X	X	-	A	A	A
Skydrol 500B-4, LD-4	X	X	X	X	A, 7	F	A	A	A
Soap Solutions	X	F	F	F 16	A	-	A	A	A
Soda Ash, Sodium Carbonate	A	A	A	A 16	A	-	A	F	A
Sodium Bisulfate	F	F	F	A 16	A	-	F	A	F
Sodium Chloride	F	F	F	A 16	A	-	X	F	A
Sodium Hydroxide	X	X	X	A 16	A	-	A	X	A
Sodium Hypochlorite	F	F	F	X	F	-	X	X	X
Sodium Nitrate	F	F	F	A 16	A	-	A	F	A
Sodium Peroxide	X	X	X	X	A	-	X	X	A
Sodium Silicate	A	A	A	A 16	A	-	A	A	A
Sodium Sulfate	A	A	A	A 16	A	-	A	A	A
Soybean Oil	F	A	A	A 16	A	-	A	A	A
SSR Coolant	X	X	X	A 16	X	X	A	A	A
Steam	X	X	X	X	X	-	F	A	A
Stoddard Solvent	8	8	8	8	X	-	A	A	A
Sulfur Chloride	X	X	X	A 16	X	-	X	X	X
Sulfur Dioxide	X	X	X	X	F	-	X	F	F
Sulfur Trioxide	X	X	X	A 16	F	-	X	X	X
Sulfuric Acid (0% to 30% room temperture)	F, 6	F, 6	F, 6	X	F, 6	-	6	X	6
Summa-20, Rotor, Recip	X	X	X	A 16	X	-	A	A	A
Summit DSL-32,68,100,125	X	X	X	A 16	X	-	A	A	A
Sun Minesafe, Sun Safe	X	F	F	A 16	X	-	A	A	A
Sundex 8125	X	F	F	-	A	-	A	A	A
Suniso 3GS	A	A	A	A 15	X	A	A	A	A
Sun-Vis 722	X	F	F	-	X	-	A	A	A
Super Hydraulic Oil 100, 150, 220	A	A	A	A 15	X	A	A	A	A
SUVA MP 39, 52, 66	X	X	X	X	X	X	A	A	A
SYNCON Oil	X	X	X	X	X	-	A	A	A
Syndale 2820	X	F	F	-	-	-	A	A	A
Synesttic 32,68,100	X	X	X	X	X	X	A	A	A
Syn-Flo 70,90	X	X	X	A 16	X	-	A	A	A
SYN-O-AD 8478	X	X	X	X	A, 7	F	A	A	A
T									
Tannic Acid	F	A	A	A 16	A	X	X	F	X
Tar	F	F	F	A 16	X	-	X	F	A
Tellus (Shell)	F	A	A	A 15	X	A	A	A	A
Texaco 760 Hydrafluid	-	-	-	-	X	-	A	A	A
Texaco 766, 763 (200 - 300)	-	-	-	-	A	-	F	F	A
Texaco A-Z Oil	A	A	A	F 15	X	A	A	A	A
Texaco Spindura Oil 22	F	F	F	F 15	X	A	A	A	A
Texaco Way Lubricant 68	A	A	A	A 15	X	A	A	A	A
Thanol-R-650-X	X	F	F	-	X	-	A	A	A

Medium	I	II	III	IV	V	VI	STEEL	BRASS	SS
Thermanol 60	X	X	X	X	X	-	A	A	A
Toluene, Toluol	X	X	X	X	X	-	A	A	A
Transmission Oil	A	A	A	A 15	X	A	A	A	A
Tribol 1440	X	F	F	X	X	F	A	A	A
Trichloroethylene	X	X	X	A 16	X	-	X	A	A
Trim-Sol	F	A	A	A 16	X	-	A	A	A
Turbinol 50, 1122, 1223	X	X	X	X	A, 7	-	A	A	A
Turpentine	X	X	X	A 16	X	-	A	A	A
U									
Ucon Hydrolubes	F	A	A	A	A	F	A	A	A
UltraChem 215,230,501,751	X	X	X	A 16	X	-	A	A	A
Univis J26	A	A	A	A 15	X	A	A	A	A
Unleaded Gasoline		See 9				-	A	A	A
Unocal 66/3 Mineral Spirits	8	8	8	8	X	-	A	A	A
Urea	F	F	F	A 16	F	-	F	-	F
Urethane Formulations	A	A	A	A 16	-	-	A	A	A
V									
Van Straaten 902	A	A	A	A 16	X	-	A	A	A
Varnish	X	X	X	A 16	X	-	F	F	A
Varsol	8	F	F	8	X	-	A	A	A
Versilube F44, F55		A	A	A 16	-	-	A	A	A
Vinegar	X	X	X	A 16	A	-	F	X	A
Vital 29, 4300, 5230, 5310	X	X	X	X	X	-	A	A	A
Volt Esso 35	A	A	A	A 16	X	-	A	A	A
W									
Water	F	A	A	A	A	A	F	A	A
Water / Glycols	A	A	A	A	A	F	A	F	A
X									
Xylene, Xylol	X	X	X	X	X	-	A	A	A
Z									
Zerol 150	A	A	A	A 15	X	A	A	A	A
Zinc Chloride	A	A	A	X	A	-	X	X	F
Zinc Sulfate	A	A	A	X	A	-	X	A	A

Identifying Fitting Types

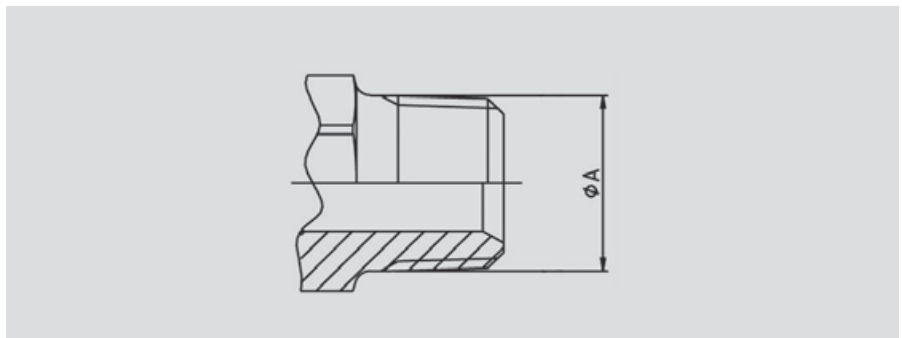
In general fittings can be identified by their visual appearance, their sealing surface/sealing type or by their thread type/form. Viewing the following pages the visual identification will be self explanatory. The sealing mechanism and the method of thread identification, however, needs further explanation

Determining Sealing Mechanisms:

- Thread interface
- O-ring
- Matching angle or metal-to-metal joint
- Mated angle with O-ring

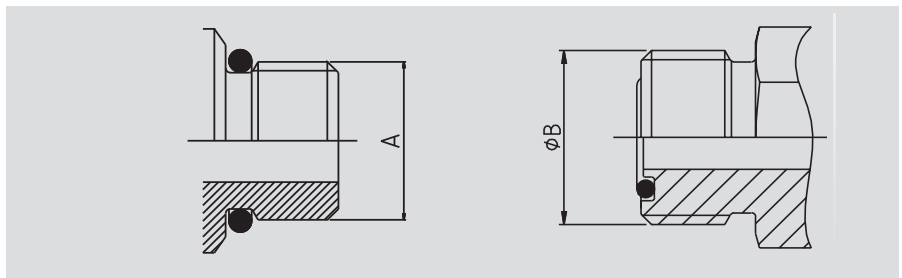
Thread Interface

The sealing is assured by the flattening of the edges of the threads when the male is screwed into the female fitting. Typically the front of the male fittings is narrower than the back of the fittings – often referred to as tapered threads.



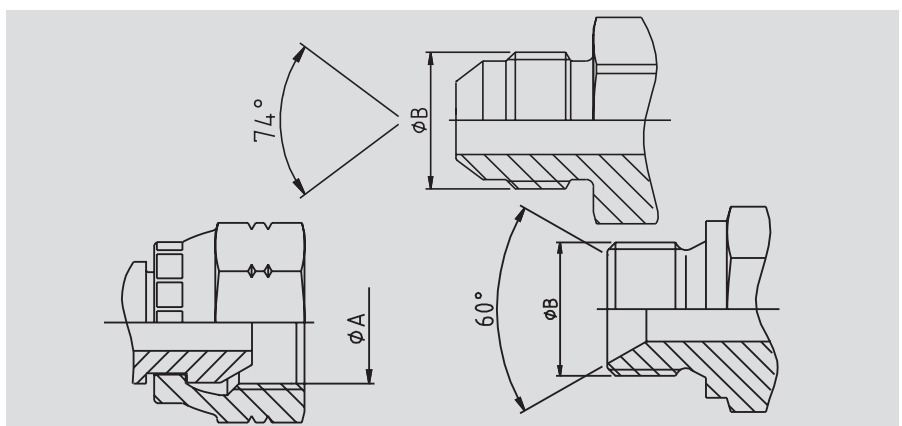
O-ring

The O-ring on the male is compressed against the corresponding female and assures the seal. This type of sealing mechanism should be the preferred choice for high-pressure applications.



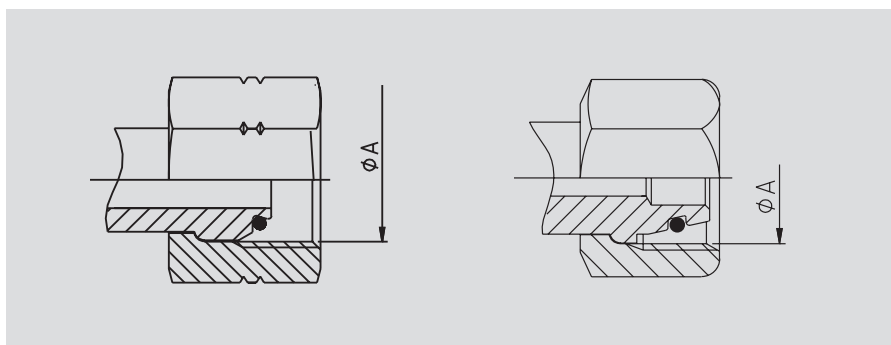
Matching Angle or Metal-to-Metal Joint

Sealing takes place where the two angled faces of the male and corresponding female meet and are wedged into one another by the tightening of the threaded nut. The sealing surfaces can either be convex or concave (seat) on the male or in the head of the pipe of the female as shown.



Matching Angle with O-ring

These fittings combine the functionality of both the matching angle seal with the O-ring. The O-ring is in the angled sealing surface of the fitting so that when the threaded male and female are screwed together the sealing surfaces wedge together and at the same time deform the O-ring between them.



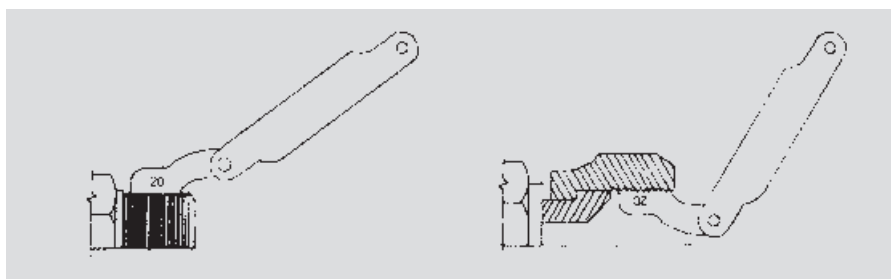
Determining the Thread Type

In general the threads of various fittings look similar and hinder the easy identification of the thread. To assure the correct identification, the threads must be measured and compared to the tables listed in the following section.

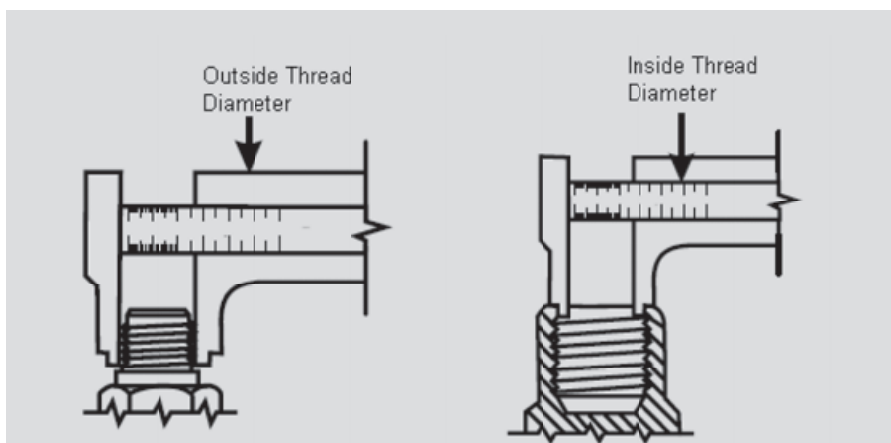
Thread Gauge

Using a thread gauge, the number of threads per inch can be determined.

Holding the gauge and coupling threads in front of a lighted background helps to obtain an accurate measurement.

**Caliper Measure**

A vernier caliper should be used to measure the thread diameter of the largest point. (Outside diameter (O.D.) of male threads – Inside Diameter (I.D.) of female threads.)



German DIN Hose Fittings

(DIN – Deutsches Institut für Normung)

Often referred to as metric fittings, these fittings seal using the angled sealing surfaces (metal-to-metal) or the combination of metal-to-metal with O-rings.

They are available in **very light (LL)**, **light (L)** or **heavy series (S)**.

The sealing face angles are either 24° with or without O-rings, or 24°/60° universal cones.

Identification is made by measuring the thread size and also the tube outside diameter.

Defined by the outside diameter and the pitch (distance between 2 crests of the thread) example: M22x1.5 - pitch of 1,5mm.



DIN Very Light Series (LL)

The male 60° cone will mate with the female 60° cone only.

The male has a 60° sealing angle (seat) and straight metric thread.

The female has a 60° seat and straight metric thread.

Standard

DIN 20078 Part 3 ¹⁾

Parker end configurations

C0

DIN Light (L) and Heavy Series (S) without O-ring

The male 60° cone will mate with the female universal 24° or 60° cone only.

The male has a 60° sealing angle (seat) and straight metric threads.

The female has a 24° and 60° universal seat and straight metric threads.

Standard

DIN 20078 Part 2 1)

(previously known as

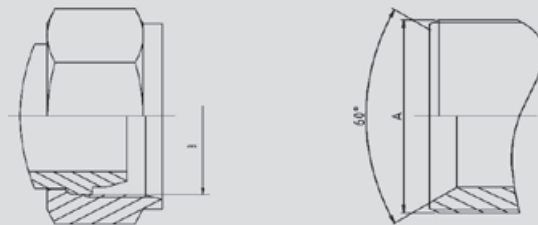
DIN 20078 A, D & E)

Parker end configurations

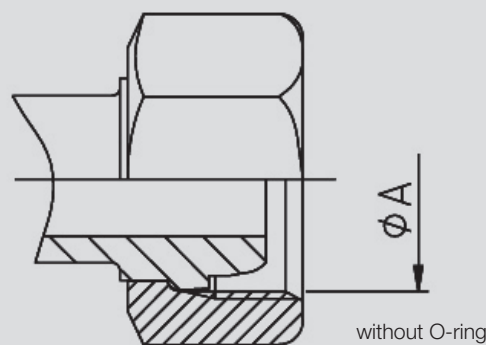
light series

C3, C4, C5, C6

(Often also referred to as "Ball nose cones")



DN	Metric thread	ØA (mm)	ØB (mm)
20	M30x1.5	30,00	28,50
25	M38x1.5	38,00	36,50
32	M45x1.5	45,00	43,50
40	M52x1.5	52,00	50,50
50	M65x2	65,00	63,00



¹⁾ obsolete standard, no exact replacement

DIN 24° Light (L) and Heavy Series (S) with O-ring

The male has a 24° sealing angle cone seat with straight metric threads.

The female has a 24° convex cone with O-ring and a swivel straight metric threaded nut.

Standard

ISO 12151-2 / ISO 8434-1 & ISO 8434-4

(Previously

DIN 20 078 Part 4, 5, 8, 9)

Parker end configurations

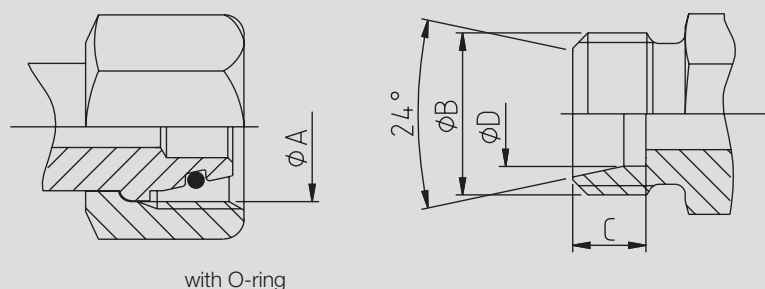
light series

CA, CE, CF, D0

Parker end configurations

heavy series

C9, 0C, 1C, D2



Tube OD	Specif.	Metric thread	ØA (mm)	ØB (mm)	C (mm)	ØD (mm)
6,00	6L	M12X1.5	10,50	12,00	7,00	6,20
6,00	6S	M14X1.5	12,50	14,00	7,00	6,20
8,00	8L	M14x1.5	12,50	14,00	7,00	8,20
8,00	8S	M16x1.5	14,50	16,00	7,00	8,20
10,00	10L	M16x1.5	14,50	16,00	7,00	10,20
10,00	10S	M18x1.5	16,50	18,00	7,50	10,20
12,00	12L	M18x1.5	16,50	18,00	7,00	12,20
12,00	12S	M20x1.5	18,50	20,00	7,50	12,20
14,00	14S	M22x1.5	20,50	22,00	8,00	14,20
15,00	15L	M22x1.5	20,50	22,00	7,00	15,20
16,00	16S	M24x1.5	22,50	24,00	8,50	16,20
18,00	18L	M26x1.5	24,50	26,00	7,50	18,20
20,00	20S	M30x2	27,90	30,00	10,50	20,20
22,00	22L	M30x2	27,90	30,00	7,50	22,20
25,00	25S	M36x2	33,90	36,00	12,00	25,20
28,00	28L	M36x2	33,90	36,00	7,50	28,20
30,00	30S	M42x2	39,90	42,00	13,50	30,20
35,00	35L	M45x2	42,90	45,00	10,50	35,30
38,00	38S	M52x2	49,90	52,00	16,00	38,30
42,00	42L	M52x2	49,90	52,00	11,00	42,30

British Standard Pipe (BSP)

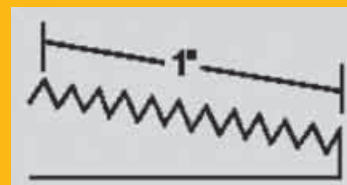
Also referred to as Whitworth threads, the BSP thread type fittings seal using metal-to-metal angled surfaces or a combination of metal-to-metal and an O-ring.

The angle of the sealing surfaces is 60° for both forms.

There are two popular thread forms:

British Standard Pipe Parallel (BSPP) and
British Standard Pipe Tapered (BSPT).

Identification is made by measuring the outside diameter of the thread and the number of threads per inch (25.4 mm)



BSPP

metal-to-metal without O-ring

Standard

BS5200

Parker end configurations

92, B1, B2, B4, D9

BSPP

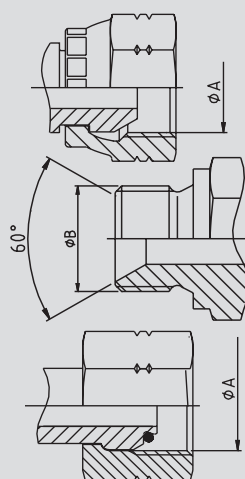
metal-to-metal with O-ring

Standard

ISO 12151-6 ²⁾

Parker end configurations

EA, EB, EC, EE, D9



Tube OD	Size	BSP thread	ØA (mm)	ØB (mm)
6/10	-2	1/8-28	8,60	9,70
8/13	-4	1/4-19	11,50	13,20
12/17	-6	3/8-19	14,90	16,70
15/21	-8	1/2-14	18,60	20,90
18/23	-10	5/8-14	20,60	22,90
20/27	-12	3/4-14	24,10	26,40
26/34	-16	1"-11	30,30	33,20
33/42	-20	1.1/4-11	38,90	41,90
40/49	-24	1.1/2-11	44,90	47,80
50/60	-32	2-11	56,70	59,60

BSPT

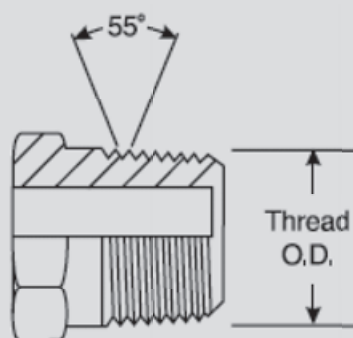
fittings seal through the thread interface mechanism. Care should be taken not to confuse the BSPT fitting with the NPTF male fitting.

BSPT has a 55° thread angle.

NPTF has 60° thread angle.

Parker end configuration

91



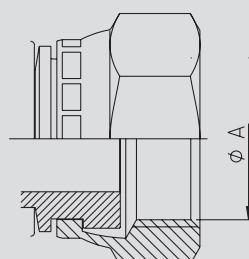
Tube	size	BSP thread	ØA (mm)
5/10	-2	1/8-28	9,73
8/13	-4	1/4-19	13,16
12/17	-6	3/8-19	16,66
15/21	-8	1/2-14	20,96
20/27	-12	3/4-14	26,44
26/34	-16	1"-11	33,25
33/42	-20	1.1/4-11	41,91
40/49	-24	1.1/2-11	47,80
50/60	-32	2-11	59,61

BSP Flat Seal

These fittings have BSP parallel threads but the sealing surface is flat. The seal is made when the composite seal is compressed against the female flat face.

Parker end configurations

B5, B6, B7



Tube OD	Size	BSP thread	ØA (mm)
6/10	-2	1/8-28	8,6
8/13	-4	1/4-19	11,5
12/17	-6	3/8-19	14,9
15/21	-8	1/2-14	18,6
18/23	-10	5/8-14	20,6
20/27	-12	3/4-14	24,1
26/34	-16	1"-11	30,3

²⁾ standard in preparation

French Gas fittings

Typical to the French market the French Gas fittings have a 24° sealing surfaces seat with metric straight threads. Although similar to German DIN fittings the threads differ in some sizes as the French Gas fittings have fine threads in all sizes whereas the German DIN fittings use standard threads in the larger sizes.

French Metric 24° Cone Gas Fittings

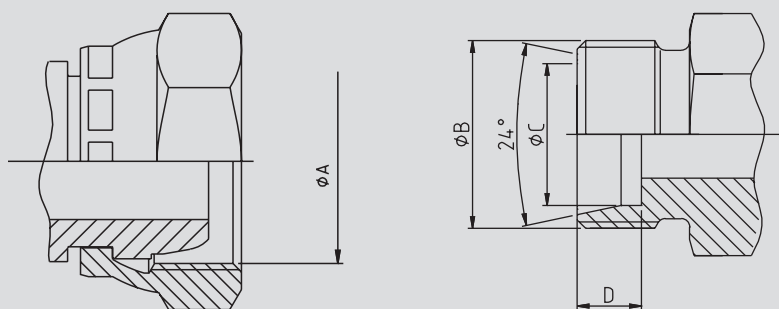
The sealing mechanism is metal-to-metal.

The fittings are not specified in any international standard.

Parker end configurations

F6, F9 (metric tube)

FG, F2, F4 (gas tube)



Tube OD	Specif.	Metric thread	ØA (mm)	ØB (mm)	ØC (mm)	D (mm)
6,00	6N	M12x1	11,00	12,00	6,20	9,00
8,00	8N	M14x1.5	12,50	14,00	8,15	9,00
10,00	10N	M16x1.5	14,50	16,00	10,20	9,00
12,00	12N	M18x1.5	16,50	18,00	12,15	9,00
13,25	13G	M20x1.5	18,50	20,00	13,50	9,00
14,00	14N	M20x1.5	18,50	20,00	14,15	9,00
15,00	15N	M22x1.5	20,50	22,00	15,15	9,00
16,00	16N	M24x1.5	22,50	24,00	16,15	9,00
16,75	17G	M24x1.5	22,50	24,00	17,00	9,00
18,00	18N	M27x1.5	25,50	27,00	18,15	9,00
20,00	20N	M27x1.5	25,50	27,00	20,15	9,00
21,25	21G	M30x1.5	28,50	30,00	21,50	9,00
22,00	22N	M30x1.5	28,50	30,00	22,15	9,00
25,00	25N	M33x1.5	31,50	33,00	25,15	9,00
26,75	27G	M36x1.5	34,50	36,00	27,00	9,00
28,00	28N	M36x1.5	34,50	36,00	28,25	9,00
30,00	30N	M39x1.5	37,50	39,00	30,25	9,00
32,00	32N	M42x1.5	40,50	42,00	32,25	9,00
33,25	34G	M45x1.5	43,50	45,00	33,80	9,00
35,00	35N	M45x1.5	43,50	45,00	35,25	9,00
38,00	38N	M48x1.5	46,50	48,00	38,25	9,00
40,00	40N	M52x1.5	50,50	52,00	40,35	9,00
42,25	42G	M52x1.5	50,50	52,00	42,55	9,00
48,25	49G	M58x2	55,90	58,00	49,00	11,00

North American Thread Types

This type of fitting uses the thread interface to seal and as such has a tapered thread that deforms and forms the seal.

They have 30° sealing angle surfaces, forming a 60° inverted (concave) seat.

The fittings are most frequently seen on machines of US origin.

Dryseal American Standard Taper Pipe Thread (NPTF)

The NPTF male will mate with the NPTF, NPSF, or NPSM females.

Care should be taken not to confuse the NPTF fitting with the BSPT male fitting. NPTF fittings have a 60° thread angle.

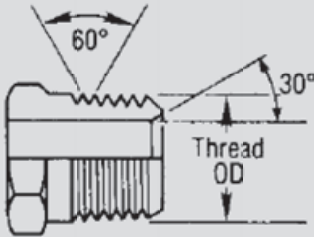
BSPT has a 55° thread angle.

Standard

SAE J516

Parker end configuration

01



ØA dimension is measured on the 4th pitch of the thread

size	NPTF thread	ØA (mm)	ØB (mm)
-2	1/8-27	10,24	8,73
-4	1/4-18	13,61	11,90
-6	3/8-18	17,05	15,90
-8	1/2-14	21,22	19,05
-12	3/4-14	26,56	24,60
-16	1-11,5	33,22	30,95
-20	1.1/4-11,5	41,98	39,69
-24	1.1/2-11,5	48,05	45,24
-32	2-11,5	60,09	57,15

SAE JIC 37°

Commonly referred to as JIC fittings, these metal-to-metal sealing type fittings have a 37° flare (sealing surface angle) and straight United National Fine Threads (UNF).

The original design specification for the fittings comes from the Society of Automotive Engineers (SAE) and these fittings are the most common American fitting types in Europe.

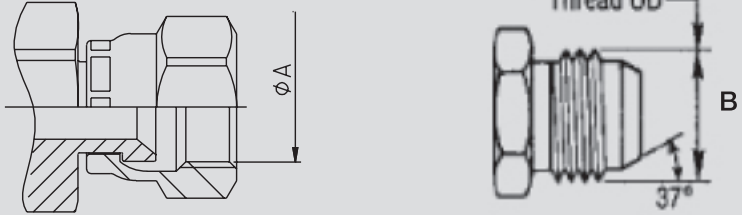
Standard

ISO 12151-5 ²⁾, ISO8434-2 and SAE J516

Parker JIC hose fittings are fully compatible with Parker Triple-Lok Tube Fittings and adapters.

Parker end configurations

03, 06/68, 37/3V, 39/3W, 41/3Y, L9



Tube OD	Tube D (mm)	UNF thread	Size	ØA (mm)	ØB (mm)
3/16"		3/8-24	-3	8,60	9,50
1/4"	6	7/16-20	-4	10,00	11,10
5/16"	8	1/2-20	-5	11,60	12,70
3/8"	10	9/16-18	-6	13,00	14,30
1/2"	12	3/4-16	-8	17,60	19,10
5/8"	14-15-16	7/8-14	-10	20,50	22,20
3/4"	18-20	1.1/16-12	-12	24,60	27,00
7/8"	22	1.3/16-12	-14	28,30	30,10
1"	25	1.5/16-12	-16	31,30	33,30
1.1/4"	30-32	1.5/8-12	-20	39,20	41,30
1.1/2"	38	1.7/8-12	-24	45,60	47,60
2"		2.1/2-12	-32	61,50	63,50

²⁾ standard in preparation

SAE 45° Flare

The angle of the flare is commonly used as a name when referring to these metal-to-metal sealing fittings.

The female fittings have a 90° concave inverted seat, created by the 45° angle sealing surfaces.

The SAE 45° flare male will mate with an SAE 45° flare female only or a dual seat JIC 37°/SAE45°.

Standard

SAE J516

Parker end configurations

04, 08/68, 77/3V, 79/3W, 81/3Y

SAE O-ring (Boss Type)

This male fitting has straight threads, a sealing face and an O-ring. It is compatible only with female boss type fittings generally found in the ports of machines. Sealing is achieved through the O-ring of the male and through the sealing face of the female.

Parker end configuration

05

O-ring Face Seal (ORFS)

ORFS fittings are becoming the most popular international fitting type used on global OEM machines due to their high level of sealing and their good vibration resistance. The fittings use the O-ring compression mechanism to seal.

The female fittings have flat faces and straight threaded UNF swivel nuts. The male fittings have the O-ring in a groove in the flat face. Seen as a major advantage, these fittings offer the possibility to build the hose assemblies into fixed distances/spaces, without having to move back other system components due the flat faces of the male and female fittings – the hose assembly can be slotted in.

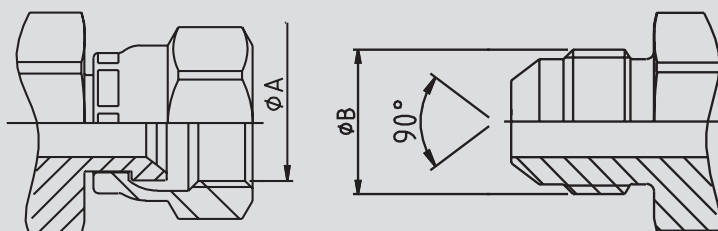
Standard

ISO 12151-1, ISO8434-3 and

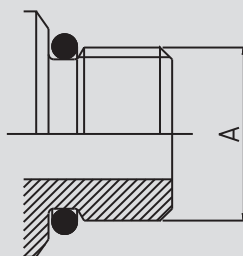
SAE J516

Parker end configurations

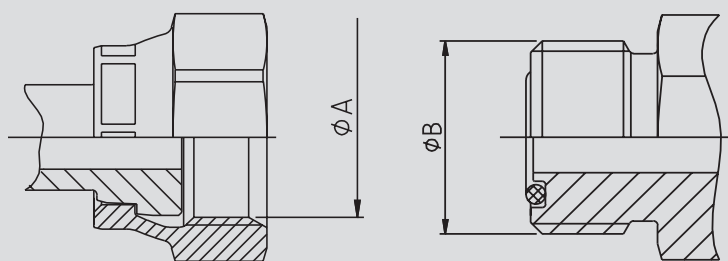
JC, JM/J0, JS, JU, J1, J3, J5, J7, J9



Tube OD	Size	UNF thread	ØA (mm)	ØB (mm)
1/4"	-4	7/16-20	9,90	11,10
5/16"	-5	1/2-20	11,50	12,70
3/8"	-6	5/8-18	14,30	15,90
1/2"	-8	3/4-16	17,50	19,10
5/8"	-10	7/8-14	20,60	22,20
3/4"	-12	1.1/16-14	25,00	27,00



UNF thread	size	ØA (mm)
5/16-24	-2	7,93
3/8-24	-3	9,52
7/16-20	-4	11,11
1/2-20	-5	12,70
9/16-18	-6	14,28
3/4-16	-8	19,10
7/8-14	-10	22,22
1.1/16-12	-12	27,00
1.3/16-12	-14	30,10
1.5/16-12	-16	33,30
1.5/8-12	-20	41,30
1.7/8-12	-24	47,60
2.1/2-12	-32	63,50



Tube OD	Tube D (mm)	UNF thread	Size	ØA (mm)	ØB (mm)
1/4"	6	9/16-18	-4	13,00	14,20
3/8"	10	11/16-16	-6	15,90	17,50
1/2"	12	13/16-16	-8	19,10	20,60
5/8"	16	1-14	-10	23,80	25,40
3/4"	20	1.3/16-12	-12	28,20	30,10
1"	25	1.7/16-12	-16	34,15	36,50
1.1/4"	32	1.11/16-12	-20	40,50	42,90
1.1/2"	38	2-12	-24	48,80	50,80

Flange Fittings Code 61 and Code 62

The 4-bolt split flange (or full flange) fitting is used worldwide for connecting high-pressure hoses typically to pumps, motors and cylinders, where the hose assemblies are subjected to large pressure loadings.

The sealing mechanism is through compression of the O-ring in the face of the flange head against the surface of the port/connection.

The flange fittings are generally separated into two pressure classes referred to as 3000 psi (SFL) or 6000 psi (SFS). ISO 12151-3 refers to the flange fittings as code 61 for the 3000 psi and code 62 for the 6000 psi. In addition to these flanges, customer-specific Komatsu® and CATERPILLAR® flanges can also be found in the market.

Parker end configurations
Code 61 (3000 psi)

15, 16, 17, 19, P5, P7, P9

5000 psi (Code 61 dimensions)

4A, 4F, 4N

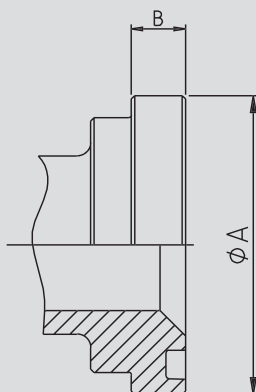
Code 62 (6000 psi)

6A, 6F, 6N, PA, PF, PN, 89

Caterpillar flange

XA, XF, XG, XN

Although not in the SAE or the ISO standard the size -10 (5/8) flange head is gaining popularity. This flange is often found on Komatsu equipment or hydrostatic drives in agricultural machines.



- Standard Code 61 for 3000 to 5000 psi max., depending on size
- High Pressure Code 62 for 6000 psi max. regardless of size

Flange (inch)	size	code 61	Code 62
1/2	-8	34,5 / 5000	41,3/ 6000
3/4	-12	34,5/ 5000	41,3/ 6000
1	-16	34,5/ 5000	41,3/ 6000
1.1/4	-20	27,5/ 4000	41,3/ 6000
1.1/2	-24	20,7/ 3000	41,3/ 6000
2	-32	20,7/3000	41,3/ 6000

Code 61 - SAE 3000PSI

Flange (inch)	Size	ØA (mm)	B (mm)	O-Ring
1/2"	-8	30,18	6,73	18,64x3,53
3/4"	-12	38,10	6,73	24,99x3,53
1"	-16	44,45	8,00	32,92x3,53
1.1/4"	-20	50,80	8,00	37,69x3,53
1.1/2"	-24	60,33	8,00	47,22x3,53
2"	-32	71,42	9,53	56,74x3,53
2.1/2"	-40	84,12	9,53	69,44x3,53
3"	-48	101,60	9,53	85,32x3,53

Code 62 - SAE 6000 PSI

Flange (inch)	Size	ØA (mm)	B (mm)	O-Ring
1/2"	-8	31,75	7,75	18,64x3,53
3/4"	-12	41,28	8,76	24,99x3,53
1"	-16	47,63	9,53	32,92x3,53
1.1/4"	-20	53,98	10,29	37,69x3,53
1.1/2"	-24	63,50	12,57	47,22x3,53
2"	-32	79,38	12,57	56,74x3,53

CATERPILLAR®

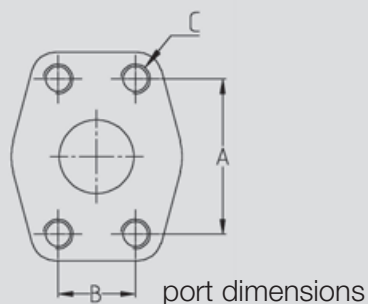
Flange (inch)	Size	ØA (mm)	B (mm)	D-Ring
3/4"	-12	41,28	14,22	25,40x5,00
1"	-16	47,63	14,22	31,90x5,00
1.1/4"	-20	53,98	14,22	38,20x5,00
1.1/2"	-24	63,50	14,22	44,70x5,00

Flange (inch)	Size	ØA (mm)	B (mm)	O-Ring
5/8"	-10	34,25	6,00	21,7x3,5

4-Bolt Split Flange

A 4-bolt split flange is used to attach the flange fittings to their ports.

- Standard Code 61 for 3000 to 5000 psi max., depending on size
- High Pressure Code 62 for 6000 psi max., regardless of size



CODE 61 - SAE 3000 psi

Flange	Size	A (mm)	B (mm)	C	
				(inch)	(metr.)
1/2"	-8	38.1	17.5	5/16-18	M8x1,25
3/4"	-12	47.6	22.3	3/8-16	M10x1,5
1"	-16	52.4	26.2	3/8-16	M10x1,5
1-1/4"	-20	58.7	30.2	7/16-14	M10x1,5
1-1/2"	-24	69.9	35.7	1/2-13	M12x1,75
2"	-32	77.8	42.8	1/2-13	M12x1,75*

CODE 62 - SAE 6000 psi

Flange	Size	A (mm)	B (mm)	C	
				(inch)	(metr.)
1/2"	-8	40.5	18.2	5/16-18	M8x1,25
3/4"	-12	50.8	23.8	3/8-16	M10x1,5
1"	-16	57.2	27.8	7/16-14	M12x1,75
1-1/4"	-20	66.7	31.8	1/2-13	M12x1,75*
1-1/2"	-24	79.4	36.5	5/8-11	M16x2
2"	-32	96.8	44.4	3/4-10	M20x2,5

*M14x2 still used in the market but no longer in accordance with ISO6162

Japanese fittings

The Japanese Industrial Standard (JIS) is seen on most Japanese equipment and uses a 30° sealing angle seat and either British Standard Pipe Parallel or metric threads.

Care must be taken not to confuse the JIS fittings with BSP or JIC fittings.

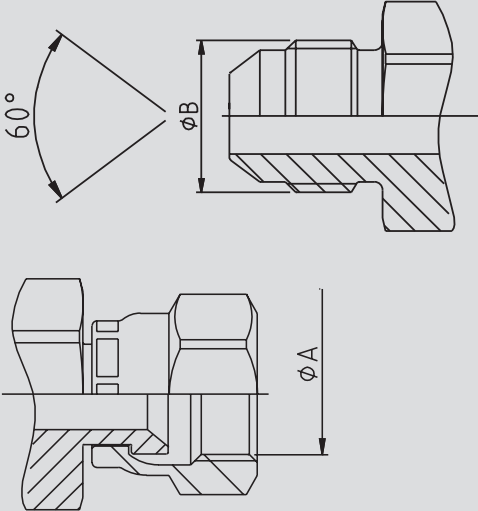
Japanese fittings - JIS

The sealing mechanism of the fittings is the 30° metal-to-metal angled surfaces

Parker end configurations

MU, XU (Metric)

FU (BSP)



JIS 30° metric

	Symbol	Metric thread	ØA (mm)	ØB (mm)
	MU-6	M14x1.5	12,50	14,00
	MU-9	M18x1.5	16,50	18,00
	MU-12	M22x1.5	20,50	22,00
	MU-15	M27x2	25,00	27,00
	MU-19	M27x2	25,00	27,00
	MU-25	M33x2	31,00	33,00
	MU-32	M42x2	40,00	42,00
	MU-38	M50x2	48,00	50,00
	MU-50	M60x2	58,00	60,00

JIS 30° BSP

	Symbol	BSP thread	ØA (mm)	ØB (mm)
	GUI-3	1/8-28	8,60	9,70
	GUI-5/-6	1/4-19	11,50	13,20
	GUI-8/-9	3/8-19	14,90	16,70
	GUI-12	1/2-14	18,60	20,90
	GUI-15/-19	3/4-14	24,10	26,40
	GUI-25	1"-11	30,30	33,20
	GUI-32	1.1/4-11	38,90	41,90
	GUI-38	1.1/2-11	44,90	47,80
	GUI-50	2-11	56,70	59,60

Parker Safety Guide for Selecting and Using Hose, Tubing, Fittings and Related Accessories

Parker Publication No. 4400-B.1

Revised: November, 2007



WARNING

Failure or improper selection or improper use of hose, tubing, fittings, assemblies or related accessories ("Products") can cause death, personal injury and property damage. Possible consequences of failure or improper selection or improper use of these Products include but are not limited to:

- Fittings thrown off at high speed.
- High velocity fluid discharge.
- Explosion or burning of the conveyed fluid.
- Electrocution from high voltage electric powerlines.
- Contact with suddenly moving or falling objects that are controlled by the conveyed fluid.
- Injections by high-pressure fluid discharge.
- Dangerously whipping Hose.
- Contact with conveyed fluids that may be hot, cold, toxic or otherwise injurious.
- Sparking or explosion caused by static electricity buildup or other sources of electricity.
- Sparking or explosion while spraying paint or flammable liquids.
- Injuries resulting from inhalation, ingestion or exposure to fluids.

Before selecting or using any of these Products, it is important that you read and follow the instructions below.
Only Hose from Parker's Stratoflex Products Division is approved for in flight aerospace applications.

1.0 GENERAL INSTRUCTIONS

1.1 Scope: This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) these Products. For convenience, all rubber and/or thermoplastic products commonly called "hose" or "tubing" are called "Hose" in this safety guide. All assemblies made with Hose are called "Hose Assemblies". All products commonly called "fittings", "couplings" or "adapters" are called "Fittings". All related accessories (including crimping and swaging machines and tooling) are called "Related Accessories". This safety guide is a supplement to and is to be used with the specific Parker publications for the specific Hose, Fittings and Related Accessories that are being considered for use. Parker publications are available at www.parker.com. SAE J1273 (www.sae.org) and ISO 17165 2 (www.ansi.org) also provide recommended practices for hydraulic Hose Assemblies.

1.2 Fail-Safe: Hose, Hose Assemblies and Fittings can and do fail without warning for many reasons. Design all systems and equipment in a fail safe mode, so that failure of the Hose, Hose Assembly or Fitting will not endanger persons or property.

1.3 Distribution: Provide a copy of this safety guide to each person responsible for selecting or using Hose and Fitting products. Do not select or use Parker Hose or Fittings without thoroughly reading and understanding this safety guide as well as the specific Parker publications for the Products.

1.4 User Responsibility: Due to the wide variety of operating conditions and applications for Hose and Fittings, Parker does not represent or warrant that any particular Hose or Fitting is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the Products.
- Assuring that the user's requirements are met and that the application presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the Products are used.
- Assuring compliance with all applicable government and industry standards.

1.5 Additional Questions: Call the appropriate Parker technical service department if you have any questions or require any

additional information. See the Parker publication for the Products being considered or used, or call 1 800 CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2.0 HOSE AND FITTING SELECTION INSTRUCTIONS

2.1 Electrical Conductivity: Certain applications require that the Hose be nonconductive to prevent electrical current flow. Other applications require the Hose and the Fittings and the Hose/Fitting interface to be sufficiently conductive to drain off static electricity. Extreme care must be exercised when selecting Hose and Fittings for these or any other applications in which electrical conductivity or nonconductivity is a factor. The electrical conductivity or nonconductivity of Hose and Fittings is dependent upon many factors and may be susceptible to change. These factors include but are not limited to the various materials used to make the Hose and the Fittings, Fitting finish (some Fitting finishes are electrically conductive while others are nonconductive), manufacturing methods (including moisture control), how the Fittings contact the Hose, age and amount of deterioration or damage or other changes, moisture content of the Hose at any particular time, and other factors. The following are considerations for electrically nonconductive and conductive Hose. For other applications consult the individual catalog pages and the appropriate industry or regulatory standards for proper selection.

2.1.1 Electrically Nonconductive Hose: Certain applications require that the Hose be nonconductive to prevent electrical current flow or to maintain electrical isolation. For applications that require Hose to be electrically nonconductive, including but not limited to applications near high voltage electric lines, only special nonconductive Hose can be used. The manufacturer of the equipment in which the nonconductive Hose is to be used must be consulted to be certain that the Hose and Fittings that are selected are proper for the application. Do not use any Parker Hose or Fittings for any such application requiring nonconductive Hose, including but not limited to applications near high voltage electric lines, unless (i) the application is expressly approved in the Parker technical publication for the product, (ii) the Hose is marked "nonconductive", and (iii) the manufacturer of the equipment on which the Hose is to be used specifically approves the particular Parker Hose and Fittings for such use.

2.1.2 Electrically Conductive Hose: Parker manufactures special Hose for certain applications that require electrically conductive

Hose. Parker manufactures special Hose for conveying paint in airless paint spraying applications. This Hose is labeled "Electrically Conductive Airless Paint Spray Hose" on its layline and packaging. This Hose must be properly connected to the appropriate Parker Fittings and properly grounded in order to dissipate dangerous static charge buildup, which occurs in all airless paint spraying applications. Do not use any other Hose for airless paint spraying, even if electrically conductive. Use of any other Hose or failure to properly connect the Hose can cause a fire or an explosion resulting in death, personal injury, and property damage. Parker manufactures a special Hose for certain compressed natural gas ("CNG") applications where static electricity buildup may occur. Parker CNG Hose assemblies comply with the requirements of ANSI/IAS NGV 4.2-1999; CSA 12.52-M99, "Hoses for Natural Gas Vehicles and Dispensing Systems" (www.ansi.org). This Hose is labeled "Electrically Conductive for CNG Use" on its layline and packaging. This Hose must be properly connected to the appropriate Parker Fittings and properly grounded in order to dissipate dangerous static charge buildup, which occurs in, for example, high velocity CNG dispensing or transfer. Do not use any other Hose for CNG applications where static charge buildup may occur, even if electrically conductive. Use of other Hoses in CNG applications or failure to properly connect or ground this Hose can cause a fire or an explosion resulting in death, personal injury, and property damage. Care must also be taken to protect against CNG permeation through the Hose wall. See section 2.6, Permeation, for more information. Parker CNG Hose is intended for dispenser and vehicle use at a maximum temperature of 180°F (82°C). Parker CNG Hose should not be used in confined spaces or unventilated areas or areas exceeding 180°F (82°C). Final assemblies must be tested for leaks. CNG Hose Assemblies should be tested on a monthly basis for conductivity per ANSI/IAS NGV 4.2-1999; CSA 12.52-M99. Parker manufactures special Hose for aerospace in flight applications. Aerospace in flight applications employing Hose to transmit fuel, lubricating fluids and hydraulic fluids require a special Hose with a conductive inner tube. This Hose for in flight applications is available only from Parker's Stratoflex Products Division. Do not use any other Parker Hose for in flight applications, even if electrically conductive. Use of other Hoses for in flight applications or failure to properly connect or ground this Hose can cause a fire or an explosion resulting in death, personal injury and property damage. These Hose assemblies for in flight applications must meet all applicable aerospace industry, aircraft engine and aircraft requirements.

2.2 Pressure: Hose selection must be made so that the published maximum working pressure of the Hose and Fittings are equal to or greater than the maximum system pressure. The maximum working pressure of a Hose Assembly is the lower of the respective published maximum working pressures of the Hose and the Fittings used. Surge pressures or peak transient pressures in the system must be below the published maximum working pressure for the Hose. Surge pressures and peak pressures can usually only be determined by sensitive electrical instrumentation that measures and indicates pressures at millisecond intervals. Mechanical pressure gauges indicate only average pressures and cannot be used to determine surge pressures or peak transient pressures. Published burst pressure ratings for Hose is for manufacturing test purposes only and is no indication that the Product can be used in applications at the burst pressure or otherwise above the published maximum recommended working pressure.

2.3 Suction: Hoses used for suction applications must be selected to insure that the Hose will withstand the vacuum and pressure of the system. Improperly selected Hose may collapse in suction application.

2.4 Temperature: Be certain that fluid and ambient temperatures, both steady and transient, do not exceed the limitations of the Hose. Temperatures below and above the recommended limit can degrade Hose to a point where a failure may occur and

release fluid. Properly insulate and protect the Hose Assembly when routing near hot objects (e.g. manifolds). Do not use any Hose in any application where failure of the Hose could result in the conveyed fluids (or vapors or mist from the conveyed fluids) contacting any open flame, molten metal, or other potential fire ignition source that could cause burning or explosion of the conveyed fluids or vapors.

2.5 Fluid Compatibility: Hose Assembly selection must assure compatibility of the Hose tube, cover, reinforcement, and Fittings with the fluid media used. See the fluid compatibility chart in the Parker publication for the product being considered or used. This information is offered only as a guide. Actual service life can only be determined by the end user by testing under all extreme conditions and other analysis. Hose that is chemically compatible with a particular fluid must be assembled using Fittings and adapters containing likewise compatible seals.

2.6 Permeation: Permeation (that is, seepage through the Hose) will occur from inside the Hose to outside when Hose is used with gases, liquid and gas fuels, and refrigerants (including but not limited to such materials as helium, diesel fuel, gasoline, natural gas, or LPG). This permeation may result in high concentrations of vapors which are potentially flammable, explosive, or toxic, and in loss of fluid. Dangerous explosions, fires, and other hazards can result when using the wrong Hose for such applications. The system designer must take into account the fact that this permeation will take place and must not use Hose if this permeation could be hazardous. The system designer must take into account all legal, government, insurance, or any other special regulations which govern the use of fuels and refrigerants. Never use a Hose even though the fluid compatibility is acceptable without considering the potential hazardous effects that can result from permeation through the Hose Assembly. Permeation of moisture from outside the Hose to inside the Hose will also occur in Hose assemblies, regardless of internal pressure. If this moisture permeation would have detrimental effects (particularly, but not limited to refrigeration and air conditioning systems), incorporation of sufficient drying capacity in the system or other appropriate system safeguards should be selected and used.

2.7 Size: Transmission of power by means of pressurized fluid varies with pressure and rate of flow. The size of the components must be adequate to keep pressure losses to a minimum and avoid damage due to heat generation or excessive fluid velocity.

2.8 Routing: Attention must be given to optimum routing to minimize inherent problems (kinking or flow restriction due to Hose collapse, twisting of the Hose, proximity to hot objects or heat sources). For additional routing recommendations see SAE J1273 and ISO 17165-2. Hose Assemblies have a finite life and if possible, should be installed in a manner that allows for ease of inspection and future replacement. Rubber Hose because of its relative short life, should not be used in residential and commercial buildings for HVAC (heating, ventilating and air conditioning) applications.

2.9 Environment: Care must be taken to insure that the Hose and Fittings are either compatible with or protected from the environment (that is, surrounding conditions) to which they are exposed. Environmental conditions including but not limited to ultraviolet radiation, sunlight, heat, ozone, moisture, water, salt water, chemicals and air pollutants can cause degradation and premature failure.

2.10 Mechanical Loads: External forces can significantly reduce Hose life or cause failure. Mechanical loads which must be considered include excessive flexing, twist, kinking, tensile or side loads, bend radius, and vibration. Use of swivel type Fittings or adapters may be required to insure no twist is put into the Hose. Unusual applications may require special testing prior to Hose selection.

2.11 Physical Damage: Care must be taken to protect Hose from wear, snagging, kinking, bending smaller than minimum bend radius and cutting, any of which can cause premature Hose failure.

Any Hose that has been kinked or bent to a radius smaller than the minimum bend radius, and any Hose that has been cut or is cracked or is otherwise damaged should be removed and discarded.

2.12 Proper End Fitting: See instructions 3.2 through 3.5. These recommendations may be substantiated by testing to industry standards such as SAE J517 for hydraulic applications, or MIL-A-5070, AS1339, or AS3517 for Hoses from Parker's Stratoflex Products Division for aerospace applications.

2.13 Length: When establishing a proper Hose length, motion absorption, Hose length changes due to pressure, and Hose and machine tolerances and movement must be considered.

2.14 Specifications and Standards: When selecting Hose and Fittings, government, industry, and Parker specifications and recommendations must be reviewed and followed as applicable.

2.15 Hose Cleanliness: Hose components may vary in cleanliness levels. Care must be taken to insure that the Hose Assembly selected has an adequate level of cleanliness for the application.

2.16 Fire Resistant Fluids: Some fire resistant fluids that are to be conveyed by Hose require use of the same type of Hose as used with petroleum base fluids. Some such fluids require a special Hose, while a few fluids will not work with any Hose at all. See instructions 2.5 and 1.5. The wrong Hose may fail after a very short service. In addition, all liquids but pure water may burn fiercely under certain conditions, and even pure water leakage may be hazardous.

2.17 Radiant Heat: Hose can be heated to destruction without contact by such nearby items as hot manifolds or molten metal. The same heat source may then initiate a fire. This can occur despite the presence of cool air around the Hose.

2.18 Welding or Brazing: When using a torch or arc welder in close proximity to hydraulic lines, the hydraulic lines should be removed or shielded with appropriate fire resistant materials. Flame or weld spatter could burn through the Hose and possibly ignite escaping fluid resulting in a catastrophic failure. Heating of plated parts, including Hose Fittings and adapters, above 450°F (232°C) such as during welding, brazing or soldering may emit deadly gases.

2.19 Atomic Radiation: Atomic radiation affects all materials used in Hose assemblies. Since the long-term effects may be unknown, do not expose Hose assemblies to atomic radiation.

2.20 Aerospace Applications: The only Hose and Fittings that may be used for in flight aerospace applications are those available from Parker's Stratoflex Products Division. Do not use any other Hose or Fittings for in flight applications. Do not use any Hose or Fittings from Parker's Stratoflex Products Division with any other Hose or Fittings, unless expressly approved in writing by the engineering manager or chief engineer of Stratoflex Products Division and verified by the user's own testing and inspection to aerospace industry standards.

2.21 Unlocking Couplings: Ball locking couplings or other Fittings with quick disconnect ability can unintentionally disconnect if they are dragged over obstructions, or if the sleeve or other disconnect member, is bumped or moved enough to cause disconnect. Threaded Fittings should be considered where there is a potential for accidental uncoupling.

3.0 HOSE AND FITTING ASSEMBLY AND INSTALLATION INSTRUCTIONS

3.1 Component Inspection: Prior to assembly, a careful examination of the Hose and Fittings must be performed. All components must be checked for correct style, size, catalog number, and length. The Hose must be examined for cleanliness, obstructions, blisters, cover looseness, kinks, cracks, cuts or any other visible defects. Inspect the Fitting and sealing surfaces for burrs, nicks, corrosion or other imperfections. Do NOT use any component that displays any signs of nonconformance.

3.2 Hose and Fitting Assembly: Do not assemble a Parker Fitting on a Parker Hose that is not specifically listed by Parker for that Fitting, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division. Do not assemble a Parker Fitting on another manufacturer's Hose or a Parker Hose on another manufacturer's Fitting unless (i) the engineering manager or chief engineer of the appropriate Parker division approves the Assembly in writing or that combination is expressly approved in the appropriate Parker literature for the specific Parker product, and (ii) the user verifies the Assembly and the application through analysis and testing. For Parker Hose that does not specify a Parker Fitting, the user is solely responsible for the selection of the proper Fitting and Hose Assembly procedures. See instruction 1.4. To prevent the possibility of problems such as leakage at the Fitting or system contamination, it is important to completely remove all debris from the cutting operation before installation of the Fittings. The Parker published instructions must be followed for assembling the Fittings on the Hose. These instructions are provided in the Parker Fitting catalog for the specific Parker Fitting being used, or by calling 1 800 CPARKER, or at www.parker.com.

3.3 Related Accessories: Do not crimp or swage any Parker Hose or Fitting with anything but the listed swage or crimp machine and dies in accordance with Parker published instructions. Do not crimp or swage another manufacturer's Fitting with a Parker crimp or swage die unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division.

3.4 Parts: Do not use any Parker Fitting part (including but not limited to socket, shell, nipple, or insert) except with the correct Parker mating parts, in accordance with Parker published instructions, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division.

3.5 Field Attachable/Permanent: Do not reuse any field attachable Hose Fitting that has blown or pulled off a Hose. Do not reuse a Parker permanent Hose Fitting (crimped or swaged) or any part thereof. Complete Hose Assemblies may only be reused after proper inspection under section 4.0. Do not assemble Fittings to any previously used hydraulic Hose that was in service, for use in a fluid power application.

3.6 Pre-Installation Inspection: Prior to installation, a careful examination of the Hose Assembly must be performed. Inspect the Hose Assembly for any damage or defects. DO NOT use any Hose Assembly that displays any signs of nonconformance.

3.7 Minimum Bend Radius: Installation of a Hose at less than the minimum listed bend radius may significantly reduce the Hose life. Particular attention must be given to preclude sharp bending at the Hose to Fitting juncture. Any bending during installation at less than the minimum bend radius must be avoided. If any Hose is kinked during installation, the Hose must be discarded.

3.8 Twist Angle and Orientation: Hose Assembly installation must be such that relative motion of machine components does not produce twisting.

3.9 Securement: In many applications, it may be necessary to restrain, protect, or guide the Hose to protect it from damage by unnecessary flexing, pressure surges, and contact with other mechanical components. Care must be taken to insure such restraints do not introduce additional stress or wear points.

3.10 Proper Connection of Ports: Proper physical installation of the Hose Assembly requires a correctly installed port connection insuring that no twist or torque is transferred to the Hose when the Fittings are being tightened or otherwise during use..

3.11 External Damage: Proper installation is not complete without insuring that tensile loads, side loads, kinking, flattening, potential abrasion, thread damage or damage to sealing surfaces are corrected or eliminated. See instruction 2.10.

3.12 System Checkout: All air entrapment must be eliminated and the system pressurized to the maximum system pressure (at or below the Hose maximum working pressure) and checked

for proper function and freedom from leaks. Personnel must stay out of potential hazardous areas while testing and using.

3.13 Routing: The Hose Assembly should be routed in such a manner so if a failure does occur, the escaping media will not cause personal injury or property damage. In addition, if fluid media comes in contact with hot surfaces, open flame or sparks, a fire or explosion may occur. See section 2.4.

3.14 Ground Fault Equipment Protection Devices (GFEPDs): WARNING! Fire and Shock Hazard: To minimize the danger of fire if the heating cable of a Multitube bundle is damaged or improperly installed, use a Ground Fault Equipment Protection Device. Electrical fault currents may be insufficient to trip a conventional circuit breaker. For ground fault protection, the IEEE 515:1989 (www.ansi.org) standard for heating cables recommends the use of GFEPDs with a nominal 30 milliampere trip level for "piping systems in classified areas, those areas requiring a high degree of maintenance, or which may be exposed to physical abuse or corrosive atmospheres".

4.0 HOSE AND FITTING MAINTENANCE AND REPLACEMENT INSTRUCTIONS

4.1 Even with proper selection and installation, Hose life may be significantly reduced without a continuing maintenance program. The severity of the application, risk potential from a possible Hose failure, and experience with any Hose failures in the application or in similar applications should determine the frequency of the inspection and the replacement for the Products so that Products are replaced before any failure occurs. A maintenance program must be established and followed by the user and, at minimum, must include instructions 4.2 through 4.7.

4.2 Visual Inspection Hose/Fitting: Any of the following conditions require immediate shut down and replacement of the Hose Assembly:

- Fitting slippage on Hose;
- Damaged, cracked, cut or abraded cover (any reinforcement exposed);
- Hard, stiff, heat cracked, or charred Hose;
- Cracked, damaged, or badly corroded Fittings;
- Leaks at Fitting or in Hose;
- Kinked, crushed, flattened or twisted Hose; and
- Blistered, soft, degraded, or loose cover.

4.3 Visual Inspection All Other: The following items must be tightened, repaired, corrected or replaced as required:

- Leaking port conditions;
- Excess dirt buildup;
- Worn clamps, guards or shields; and
- System fluid level, fluid type, and any air entrapment.

4.4 Functional Test: Operate the system at maximum operating pressure and check for possible malfunctions and leaks. Personnel must avoid potential hazardous areas while testing and using the system. See section 2.2.

4.5 Replacement Intervals: Hose assemblies and elastomeric seals used on Hose Fittings and adapters will eventually age, harden, wear and deteriorate under thermal cycling and compression set. Hose Assemblies and elastomeric seals should be inspected and replaced at specific replacement intervals, based on previous service life, government or industry recommendations, or when failures could result in unacceptable downtime, damage, or injury risk. See section 1.2. Hose and Fittings may be subjected to internal mechanical and/or chemical wear from the conveying fluid and may fail without warning. The user must determine the product life under such circumstances by testing. Also see section 2.5. See section 1.2.

4.6 Hose Inspection and Failure: Hydraulic power is accomplished by utilizing high pressure fluids to transfer energy and do work. Hoses, Fittings and Hose Assemblies all contribute to this by transmitting fluids at high pressures. Fluids under pressure can be dangerous and potentially lethal and, therefore, extreme caution must be exercised when working with fluids under pressure and handling the Hoses transporting the fluids. From

time to time, Hose Assemblies will fail if they are not replaced at proper time intervals. Usually these failures are the result of some form of misapplication, abuse, wear or failure to perform proper maintenance. When Hoses fail, generally the high pressure fluids inside escape in a stream which may or may not be visible to the user. Under no circumstances should the user attempt to locate the leak by "feeling" with their hands or any other part of their body. High pressure fluids can and will penetrate the skin and cause severe tissue damage and possibly loss of limb. Even seemingly minor hydraulic fluid injection injuries must be treated immediately by a physician with knowledge of the tissue damaging properties of hydraulic fluid. If a Hose failure occurs, immediately shut down the equipment and leave the area until pressure has been completely released from the Hose Assembly. Simply shutting down the hydraulic pump may or may not eliminate the pressure in the Hose Assembly. Many times check valves, etc., are employed in a system and can cause pressure to remain in a Hose Assembly even when pumps or equipment are not operating. Tiny holes in the Hose, commonly known as pinholes, can eject small, dangerously powerful but hard to see streams of hydraulic fluid. It may take several minutes or even hours for the pressure to be relieved so that the Hose Assembly may be examined safely. Once the pressure has been reduced to zero, the Hose Assembly may be taken off the equipment and examined. It must always be replaced if a failure has occurred. Never attempt to patch or repair a Hose Assembly that has failed. Consult the nearest Parker distributor or the appropriate Parker division for Hose Assembly replacement information. Never touch or examine a failed Hose Assembly unless it is obvious that the Hose no longer contains fluid under pressure. The high pressure fluid is extremely dangerous and can cause serious and potentially fatal injury.

4.7 Elastomeric seals: Elastomeric seals will eventually age, harden, wear and deteriorate under thermal cycling and compression set. Elastomeric seals should be inspected and replaced.

4.8 Refrigerant gases: Special care should be taken when working with refrigeration systems. Sudden escape of refrigerant gases can cause blindness if the escaping gases contact the eye and can cause freezing or other severe injuries if it contacts any other portion of the body.

4.9 Compressed natural gas (CNG): Parker CNG Hose Assemblies should be tested after installation and before use, and at least on a monthly basis per ANSI/IAS NGV 4.2-1999; CSA 12.52-M99 Section 4.2 "Visual Inspection Hose/ Fitting". The recommended procedure is to pressurize the Hose and check for leaks and to visually inspect the Hose for damage. Caution: Matches, candles, open flame or other sources of ignition shall not be used for Hose inspection. Leak check solutions should be rinsed off after use.

5.0 HOSE STORAGE

5.1 Age Control: Hose and Hose Assemblies must be stored in a manner that facilitates age control and first-in and first-out usage based on manufacturing date of the Hose and Hose Assemblies. The shelf life of rubber Hose or Hose Assemblies that have passed visual inspection and a proof test is 10 years (40 quarters) from the date of manufacture. The shelf life of thermoplastic and polytetrafluoroethylene Hose or Hose Assemblies is considered to be unlimited.

5.2 Storage: Stored Hose and Hose Assemblies must not be subjected to damage that could reduce their expected service life and must be placed in a cool, dark and dry area with the ends capped. Stored Hose and Hose Assemblies must not be exposed to temperature extremes, ozone, oils, corrosive liquids or fumes, solvents, high humidity, rodents, insects, ultraviolet light, electromagnetic fields or radioactive materials.