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## Kalmar Group Standard

# KGS 90101

Part

**Article Standard**

Name

**Designation - Hydraulic Fitting**

Group

**9. Hydraulic Components**

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## 1 Scope

The standard gives an overview of hydraulic fittings and designations with ORFS or JIC hose connections. This standard does not cover all hydraulic fittings available on the market; it covers the most common hydraulic fittings used in the Kalmar Group. For hydraulic fittings intended to adapt to another hydraulic fitting, whether in size, thread type, or orientation, see KGS 90102 - Designation - Hydraulic Fitting, Adapter.

This standard covers hydraulic fittings that connect to hoses, with the understanding that in the Kalmar Group, hose ends will have an ORFS or a JIC connecting end.

*Note:* The two standard or preferred types of hose connections in Kalmar are ORFS and JIC. This standard covers the designation of hydraulic fittings used to connect to these two types of hose connections.

## 2 Purpose

This standard specifies the designation of hydraulic fittings used in the Kalmar Group.

## 3 Responsibilities

Engineer, Standards Engineer - for the purpose of properly naming a hydraulic fitting and standardizing on a naming designation.

## 4 Definitions

**Hydraulic Fitting** - used to connect hydraulic hoses, tubes, and pipes to pumps, valves, cylinders and other parts of the hydraulic system; also used in place of the term "adaptor" - a device that allows connection of parts whose interfaces are dissimilar in size or type as defined in ISO 5598 §3.2.12; replacing the term "connector" as defined in ISO 5598 §3.2.122

**Stud end** - male external threaded end of a connector allowing connection to a port.

**ORFS** - abbreviation for O-Ring Face Seal. A metallic tube connection for fluid power and general use.

**JIC** - abbreviation for Joint Industry Council. A metallic tube connection for fluid power and general use with a 37° flared connection.

## 5 Records / references / attachments

KGS 90102, *Designation - Hydraulic Fitting, Adapter*

KGS 90103, *Designation - Hydraulic Fitting, Flange*

ISO 5598, *Fluid power systems and components – Vocabulary*

ISO 8434-2, *Metallic tube connections for fluid power and general use - Part 2: 37° flared connectors*

ISO 8434-3, *Metallic tube connections for fluid power and general use - Part 3: O-ring face seal connectors*

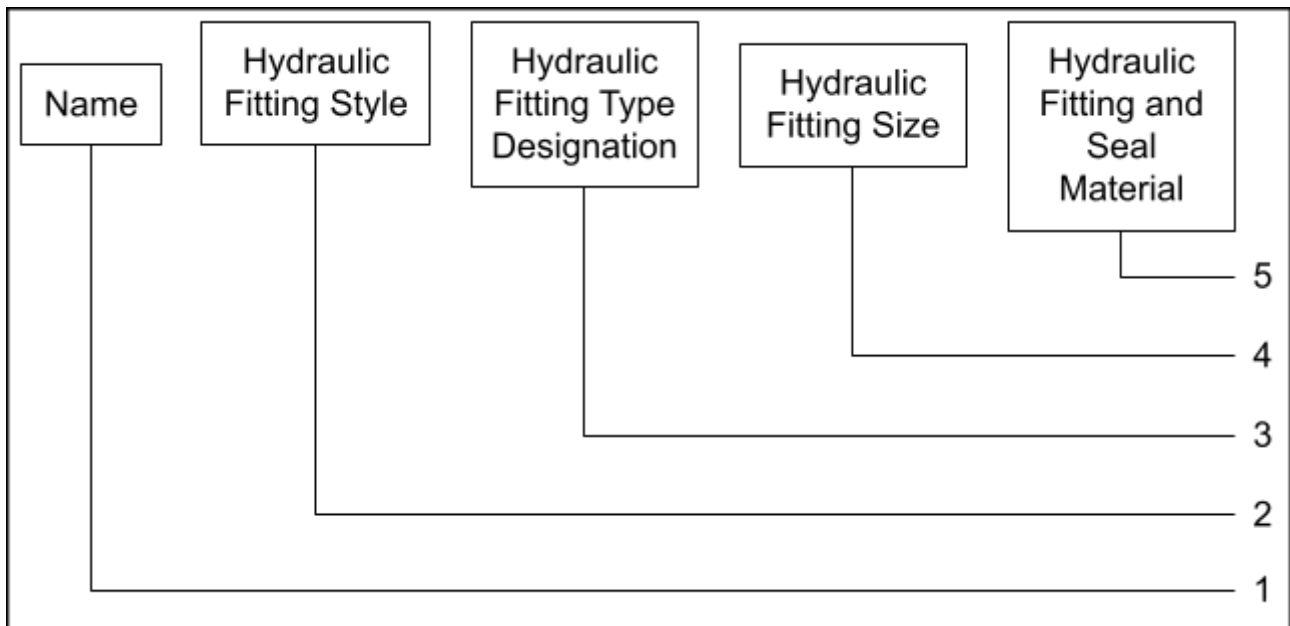
ISO 6149 (series), *Connections for hydraulic fluid power and general use – Ports and stud ends with ISO 261 metric threads and O-ring sealing*

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ISO 9974 (series), *Connections for general use and fluid power – Ports and stud ends with ISO 261 threads with elastomeric or metal-to-metal sealing*  
 ISO 1179 (series), *Connections for general use and fluid power – Ports and stud ends with ISO 228-1 threads with elastomeric or metal-to-metal sealing*  
 ISO/TS 11672:2016, *Connectors for fluid power and general use - Designation and nomenclature*  
 SAE J514, *Hydraulic Tube Fittings*  
 SAE J846, *Coding Systems for Identification of Fluid Conductors and Connectors*  
 SAE J1453-1, *Specification for O-Ring Face Seal Connectors: Part 1 - Tube Connection Details and Common Requirements for Performance and Tests*  
 SAE J1926 (series), *Connections for General Use and Fluid Power - Ports and Stud Ends with ASME B1.1 Threads and O-Ring Sealing*  
 SAE J476, *Dryseal Pipe Threads*

## 6 Procedure Description

Designations:

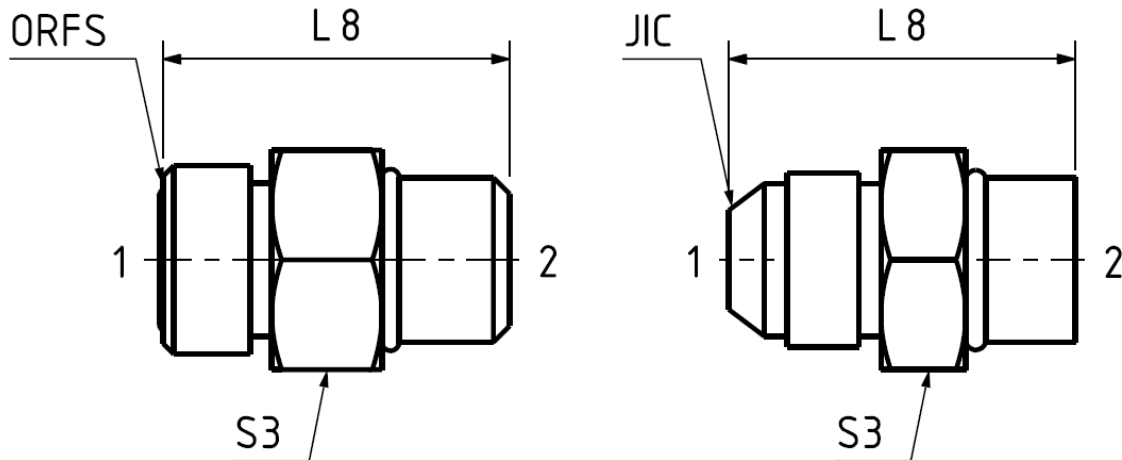


Key:

1. Name - Hydraulic Fitting - see §6.1.1
2. Hydraulic fitting Style - ORFS or JIC - see §6.1
3. Hydraulic fitting type designation - the abbreviated designation consists of symbol for connector end type (Table 1) followed by, when needed, symbol for connector shape (Table 2) followed by symbol for complete connector (Table 3), if so ordered. - see 6.3
4. Hydraulic fitting size - see §6.4
5. Hydraulic fitting material symbol (Table 8) followed by seal material (Table 9), where applicable.

6.1 Hydraulic fittings connecting directly to hoses shall be designated by an alphanumeric code to facilitate ordering. They shall be designated by the words “Hydraulic fitting” followed by a comma and a space, then by “JIC” or “ORFS” (as described in ISO 8434-2 and ISO 8434-3 respectively), followed by a space, then the connector style letter symbols (see 6.3), followed by a hyphen and, for the ends, the outside diameter of the tube with which they are to be connected, each separated by a multiplication symbol ( $\times$ ), followed by a hyphen and then the

material code (see 6.5). There shall be no spaces on either side of the multiplication symbol.  
 For stud ends, the thread designation of the stud end shall be added.



Example 1: For an O-Ring Face Seal (ORFS) hose connection - a straight stud connector (SDS) for use with 1/2" OD tubing with a M18x1.5 stud end, in accordance with ISO 6149-2, is designated as follows:

**Hydraulic Fitting, ORFS SDS-1/2xM18-S**

connector & seal material code  
 size code  
 connector style letter symbol

Example 2: For a 37° flared (JIC) hose connection - a straight stud connector (SDS) for use with 1/2" OD tubing with a M18x1.5 stud end, in accordance with ISO 6149-2, is designated as follows:

**Hydraulic Fitting, JIC SDS-1/2xM18-S**

connector & seal material code  
 size code  
 connector style letter symbol

- 6.1.1 Kalmar **Name\_1** used in internal systems like Sovelia and 3DEXperience shall be "Hydraulic Fitting".
- 6.1.2 Related to internal Kalmar system tools, the remainder of the designation, as noted above, shall go in the **Description** or **Additional Description** field.
- 6.2 In accordance with ISO 8434-2 & ISO 8434-3 §6.3, tube ends are assumed to be external male threaded ends and thus do not need to be designated as such in the connection type code. However, if another type of end type is involved, it shall be designated. Note (ISO 8434-2 & ISO 8434-3) §6.6 & §6.7 for the order of designation for tee and cross connectors.
- 6.3 Connector style letter symbol  
 The following letter symbols and combination thereof shall be used (reference ISO/TS 11672 and also ISO 8434-2 & ISO 8434-3). They shall designate the *connection end type*, the *shape*, the *component type*, the *completeness identification*, and the *stud end sealing type*.

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**Table 1 - Letter symbols to be used in designating connector types for fluid power and general use (reference ISO/TS 11672)**

<b>Connection End Type</b>	<b>Letter</b>
Banjo	BJ
Bulkhead	BH
Braze-on	BR
Cap	CP
Plug	PL
Port	P
Reducer	RD
Reducer with nut Reducer without nut	RDA RDB
Stud	SD
Swivel	SW
With sealing surface not exposed	SWA
With sealing surface exposed	SWB
Swivel with O-ring	SWO
Swivel bulkhead	SWBH
Swivel port	SWP
Tube end	TE
Weld-on / Weld-in	WD

**Table 2 - Letter symbols to be used in designating shapes of connectors for fluid power and general use (reference ISO/TS 11672)**

<b>Shape</b>	<b>Letter</b>
Branch tee	BT
90° elbow 90° long elbow	E EL
22.5° elbow	E22

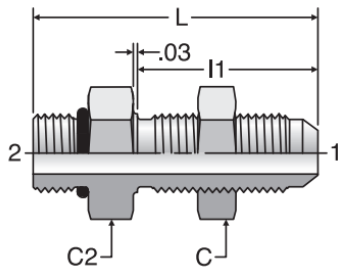
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30° elbow	E30
45° elbow	E45
60° elbow	E60
67.5° elbow	E67
Cross	K
Run tee	RT
Straight	S
Long straight	SL
Tee	T
Y shape	Y

**Table 3 - Letter symbols to be used in designating types of components of connectors for fluid power and general use** (reference ISO/TS 11672)

Type of connector component	Letter
Cutting ring	CR
One-piece flange clamp	FC <sup>1</sup>
Split flange clamp pair	FCS <sup>1</sup>
Flange head	FH <sup>2</sup>
Locknut	LN
Sleeve: For metric tube For inch tube	SL MSL ISL
Nut Standard strength nut High strength nut	N NA NB
Nipple For metric tube For inch tube	NP MNP INP

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Example 3: For a straight JIC bulkhead hose connection with a locknut - for use with 1/2" OD tubing with a 1/2" UN thread stud end, is designated as follows:

Hydraulic Fitting, JIC **BHSLN**-1/2x1/2UN-S  
 connector & seal material code  
 size code  
 connector style letter symbol

**Table 4 - Letter symbols to be used in designating completeness, with sleeve(s) or cutting ring(s) and nut(s), of connectors for fluid power and general use (Only used with JIC connectors. Reference ISO/TS 11672)**

Completeness indication	Letter
Complete connector	C

**Table 5 - Letter symbols to be used in designating stud end sealing types of connectors for fluid power and general use (reference ISO/TS 11672)**

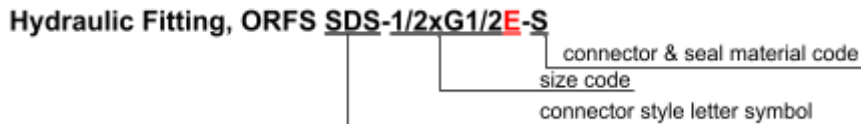
Typically used with G-Code (ISO 1179) or Metric ISO 9974 flat face ports. The sealing type designation follows the thread designation.

*Kalmar Group preferred sealing type is elastomeric sealing (E).*

Stud end sealing types	Letter
Metal-to-metal sealing	B
Elastomeric sealing	E
O-ring sealing	F
O-ring retaining ring: Type G	G
Type H	H

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Example: For an O-Ring Face Seal (ORFS) hose connection - a straight stud connector (SDS) for use with 1/2" OD tubing with a 1/2" G-thread stud end that includes a flat face elastomeric seal, is designated as follows (this assumes the manufacturer does not provide the elastomeric seal as standard with the fitting and Kalmar prefers to have them included with the fitting):



**Table 6 - Letter symbols to be used in designating working pressure levels (duty) of connectors for fluid power and general use (reference ISO/TS 11672)**

Working pressure series	Letter
Extra light-duty	LL
Light-duty	L
Heavy-duty	S

6.4 Hydraulic fitting size and stud end thread specification or flange end specification

6.4.1 Hydraulic fitting size and stud thread end shall begin first with the tube end of the hydraulic fitting, then the stud end.

6.4.1.1 Tube ends, as noted in §6.2, are assumed to be male (unless otherwise designated initially with an "F" for female) and do not need the threads specified - only the tube size.

6.4.1.2 Tube end size is designated by the external diameter of the tube (which is the same as the internal diameter of a hose).

6.4.2 Stud end threads: The options for threaded stud ends are vast, beyond simple differences of metric and imperial.

6.4.2.1 Stud end designation requires size and thread type and are noted by the thread size and type.

6.4.2.2 The Kalmar, preferred threaded stud ends are:

- for US imperial - UN/UNF-2A (SAE J1926-2) [also referred to as SAE-ORB (O-Ring Boss)]
- for British imperial - G Code, also known as BSPP (ISO 1179 / BS 5200)

For a metric threaded stud end - type ISO 6149 - it is assumed this is the "standard" metric type (as noted in the ISO 8434 standards) and no further clarification is necessary other than the use of "M".

The following letter/number symbols and combination thereof shall be used for designation of the stud end. The \* notes on which side of the code the thread size shall be designated.

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**Table 7a - Symbols used in designating threaded stud ends and their thread type**

Threaded Stud End type	Code (*thread size designation)
<u>Metric</u>	
ISO 6149 - Metric Straight Thread O-Ring Port	M*
ISO 9974 - Metric Straight Thread Flat Face Port	M(9974)*
<u>Inch</u>	
SAE J1926 (ISO 11926) - SAE Straight Thread O-Ring Port (ORB)	*UN
ISO 1179 - British Standard Pipe Parallel (BSPP) Flat Face Port	G*
SAE J476 - NPTF Dryseal American Standard Taper Pipe	*NPT
JIS/BSPT - British Standard Pipe Taper (BSPT)	R*

Example(s):

...SDS-1/2xM18-S  
 size code 1/2" tube size x 18mm metric threads for ISO 6149 port

...SDS-1/2xM(9974)18-S  
 size code 1/2" tube size x 18mm metric threads for ISO 9974 port

...SDS-1/2xG1/2-S  
 size code 1/2" tube size x G1/2" threads for ISO 1179 port

...SDS-1/2x3/4-16UN-S  
 size code 1/2" tube size x 3/4-16UN threads for SAE J1926 O-ring port

### 6.4.3 Flange ends

6.4.3.1 An option to a threaded stud end can be a flange end. Hydraulic flange ends follow the ISO 6162 series and can be either Code 61 or Code 61.



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**Table 7b - Symbols used in designating hydraulic flange ends and their type**

<b>Flange End type</b>	<b>Code</b>
ISO 6162-1 (Code 61)	Code 61
ISO 6162-2 (Code 62)	Code 62

- 6.4.3.2 Reference ISO/TS 11672 for the compatibility with flange connections and the appropriate connector type and component type codings. Several examples are given at the end of this document.
- 6.4.3.3 For additional Code 61 and Code 62 flange components, refer to KGS 90103 for the designation of the flange clamps; refer to KGS 90102 for the designation of similar non-ORFS and non-JIC connection ends.
- 6.5 Material identification (reference ISO/TS 11672 Table 7 and SAE J846 §3.1.4)
- 6.5.1 Hydraulic Fitting material  
The material identification shall consist of a letter code for the material with protective finish, where applicable, as shown in the following table.

**Table 8 - Letter symbols to be used in designating connector material of connectors for fluid power and general use (reference ISO/TS 11672)**

<b>Connector Material and Finish</b>	<b>Code</b>
Brass - no added finish treatment, Copper and copper alloys	B
Carbon steel - oil dipped for brazing or welding	CX
Composite material - non-metallic	K
Steel	S
Stainless steel	SS

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### 6.5.2 Seal material

**Table 9 - Letter symbols to be used in designating seal material of connectors for fluid power and general use** (reference ISO/TS 11672)

Seal Finish	Code
Acrylonitrile-butadiene rubber (commonly known as nitrile rubber or NBR)	N
Hydrogenated NBR	H
Terpolymer of ethylene, propylene and a diene or EPDM (not commonly used)	E
Fluoro rubber (commonly known as Viton)	F

### 6.6 Miscellaneous feature designations

**Table 10 - Letter symbols to be used in designating miscellaneous features of connectors for fluid power and general use** (reference ISO/TS 11672)

Miscellaneous designations	Code
Short	S
Medium	M
Long	L
External hex	EH
Internal hex	IH
Metric	M
Inch	I
Sealing (style) O-ring	A
Sealing (style) without O-ring	B

6.7 For further details, examples, or clarifications regarding designations, reference ISO 8434-2 & ISO 8434-3 §6.

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## 7 Specifications

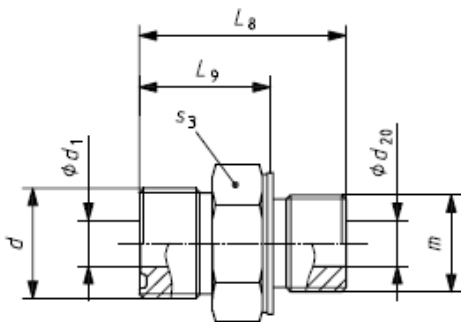
Specifications: Reference KGS 90201 for specifications regarding the ORFS and KGS 90202 for specifications regarding the JIC hydraulic fittings.

## 8 Designation examples

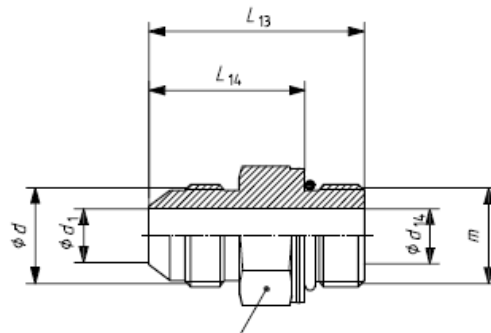
(not inclusive - see ISO 8434 standards and SAE J514 standard for additional examples)

Examples detail the *connector style letter symbols* for the primary types of connection ends and shapes

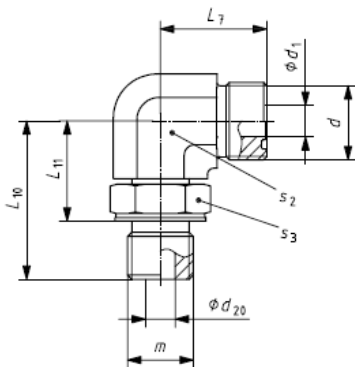
### 8.1 Stud (port) hydraulic fitting:



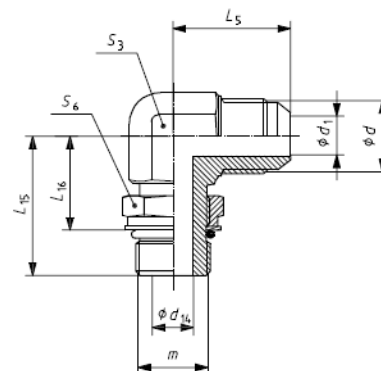
Hydraulic Fitting, ORFS SDS-



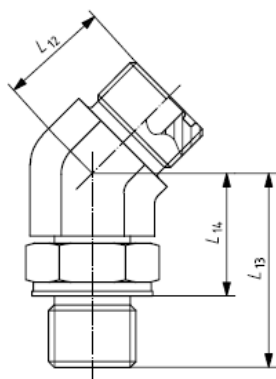
Hydraulic Fitting, JIC SDS-



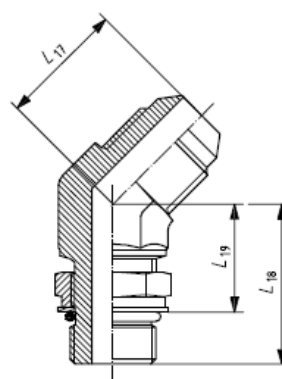
Hydraulic Fitting, ORFS SDE-



Hydraulic Fitting, JIC SDE-

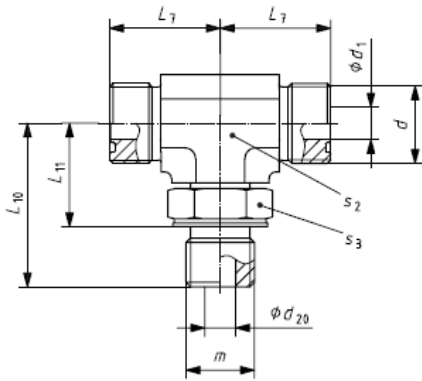


Hydraulic Fitting, ORFS SDE45-

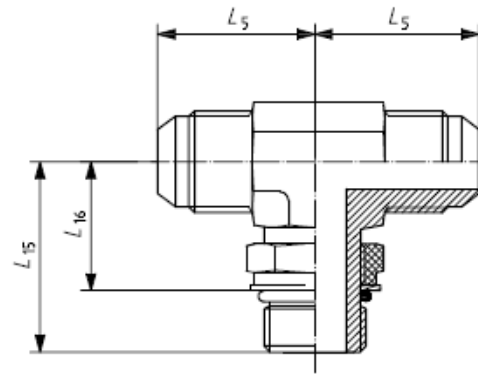


Hydraulic Fitting, JIC SDE45-

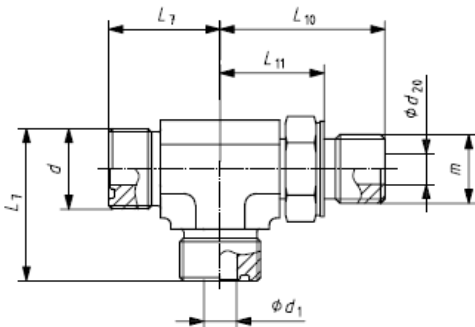
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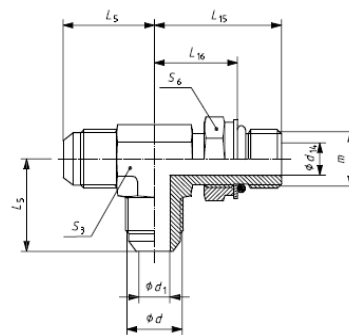
Hydraulic Fitting, ORFS SDBT-



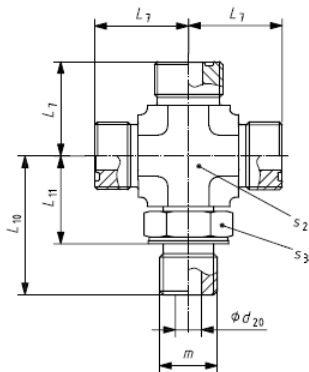
Hydraulic Fitting, JIC SDBT-



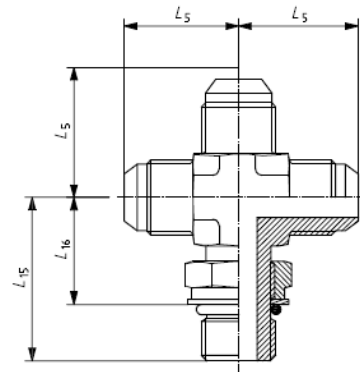
Hydraulic Fitting, ORFS SDRT-



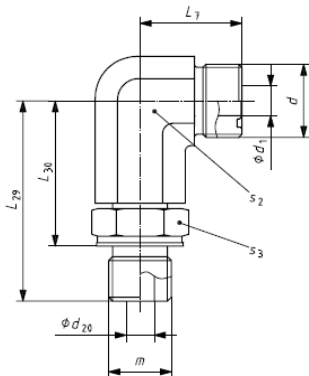
Hydraulic Fitting, JIC SDRT-



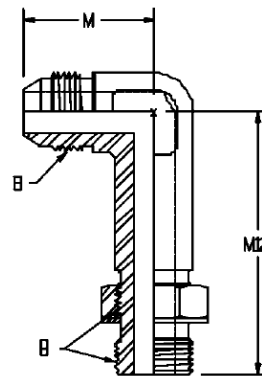
Hydraulic Fitting, ORFS SDK-



Hydraulic Fitting, JIC SDK-

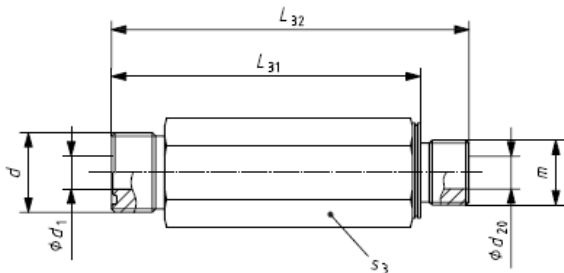


Hydraulic Fitting, ORFS SDEL-

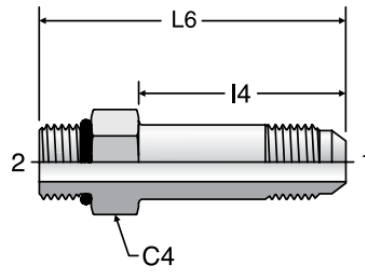


Hydraulic Fitting, JIC SDEL-

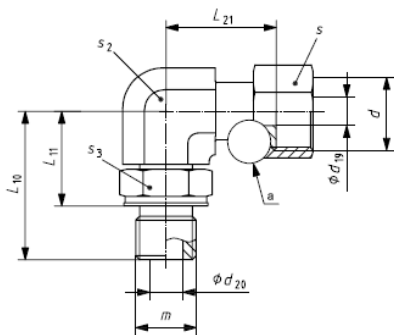
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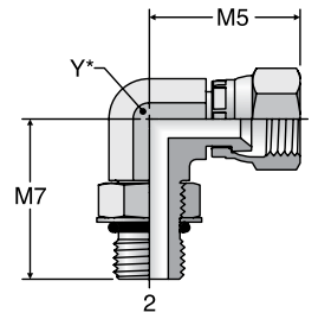
Hydraulic Fitting, ORFS SDSL-



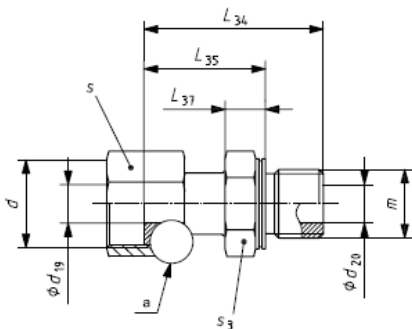
Hydraulic Fitting, JIC SDSL-



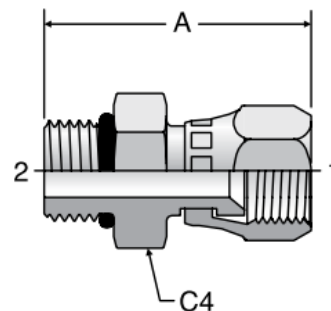
Hydraulic Fitting, ORFS SDSWE-  
 (the swivel nut end is the ORFS or JIC end)



Hydraulic Fitting, JIC SDSWE-

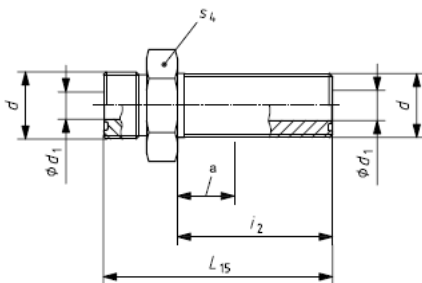


Hydraulic Fitting, ORFS SDSWS-  
 (the swivel nut end is the ORFS or JIC end)

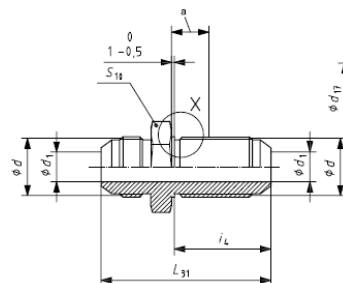


Hydraulic Fitting, JIC SDSWS-

## 8.2 Bulkhead hydraulic fitting:

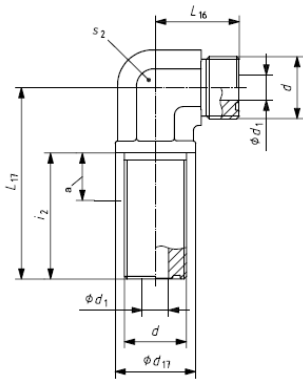


Hydraulic Fitting, ORFS BHS-

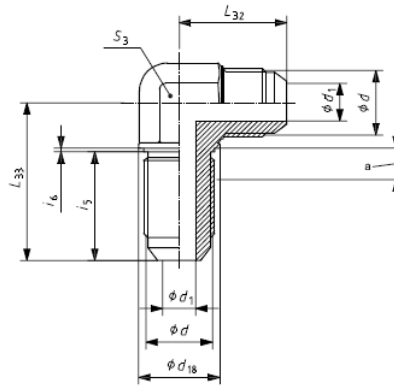


Hydraulic Fitting, JIC BHS-

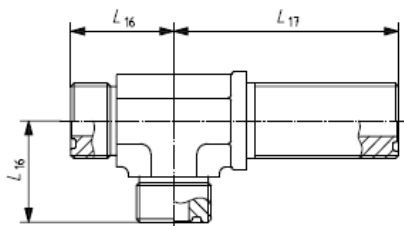
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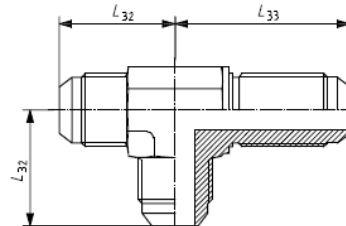
Hydraulic Fitting, ORFS BHE-



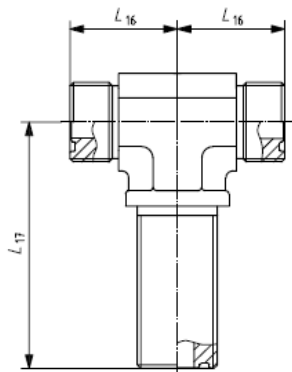
Hydraulic Fitting, JIC BHE-



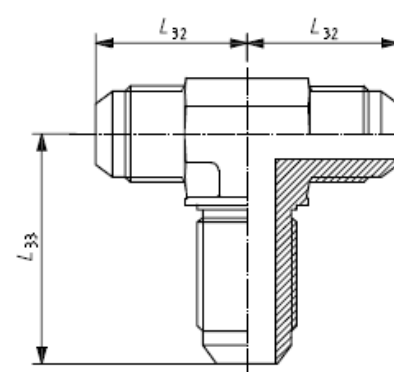
Hydraulic Fitting, ORFS BHRT-



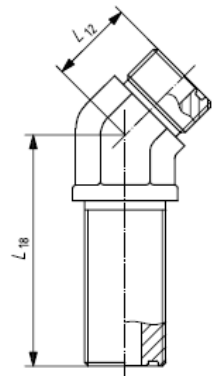
Hydraulic Fitting, JIC BHRT-



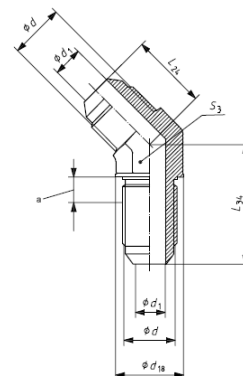
Hydraulic Fitting, ORFS BHBT-



Hydraulic Fitting, JIC BHBT-

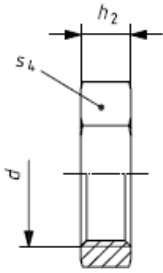


Hydraulic Fitting, ORFS BHE45

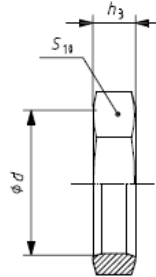


Hydraulic Fitting, JIC BHE45-

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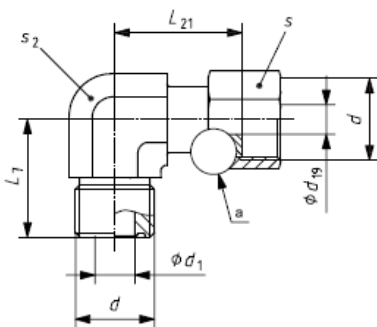


Hydraulic Fitting, ORFS BHLN-

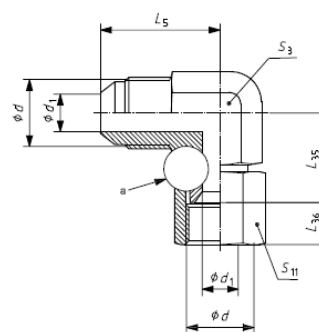


Hydraulic Fitting, JIC BHLN

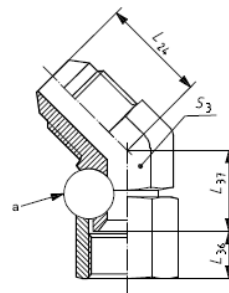
### 8.3 Swivel hydraulic fitting:



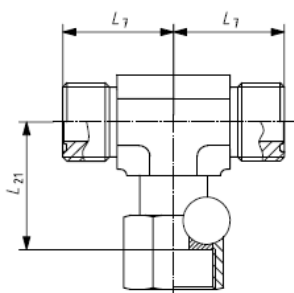
Hydraulic Fitting, ORFS SWE-



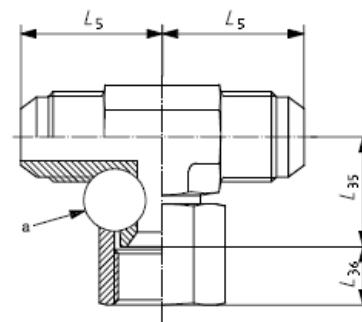
Hydraulic Fitting, JIC SWE-



Hydraulic Fitting, JIC SWE45-

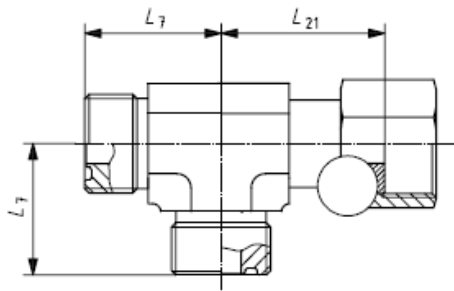


Hydraulic Fitting, ORFS SWBT-

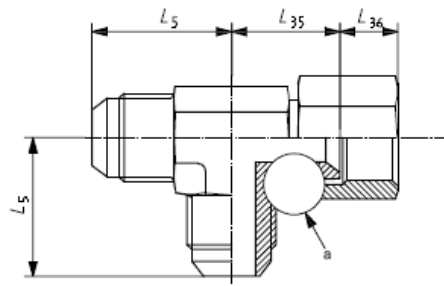


Hydraulic Fitting, JIC SWBT-

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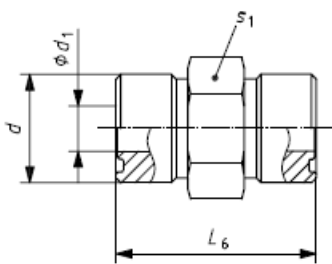


Hydraulic Fitting, ORFS SWRT-

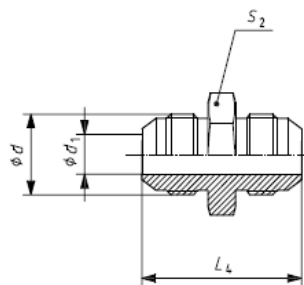


Hydraulic Fitting, JIC SWRT

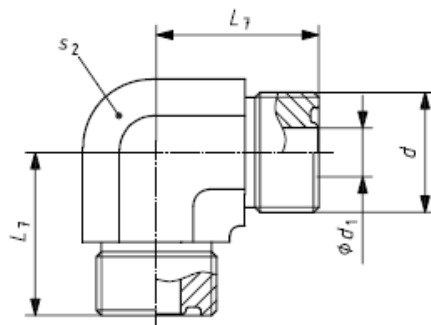
8.4 Union hydraulic fitting:



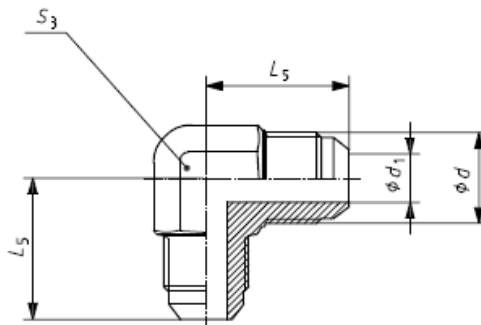
Hydraulic Fitting, ORFS S-



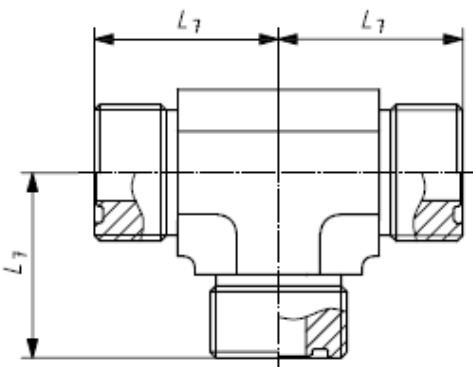
Hydraulic Fitting, JIC S-



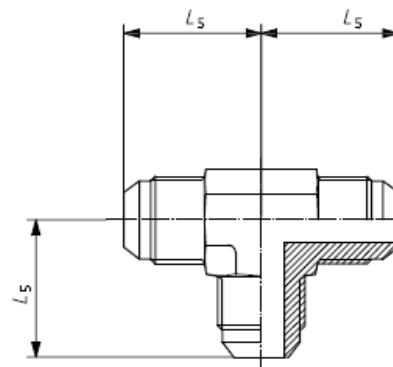
Hydraulic Fitting, ORFS E-



Hydraulic Fitting, JIC E-



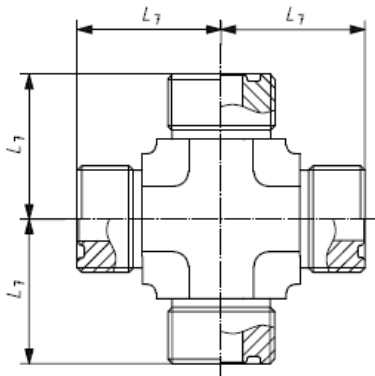
Hydraulic Fitting, ORFS T-



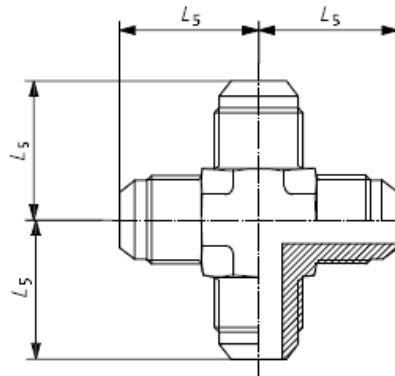
Hydraulic Fitting, JIC T-



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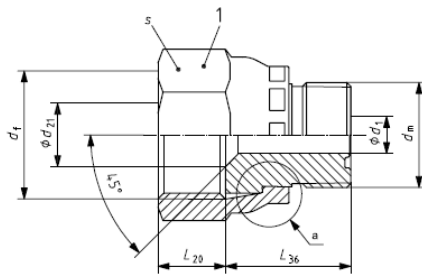


Hydraulic Fitting, ORFS K-

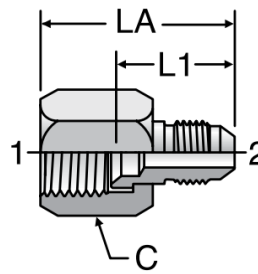


Hydraulic Fitting, JIC K-

8.5 Reducer (with nut) hydraulic fitting [sometimes called a tube end reducer] - RDA:

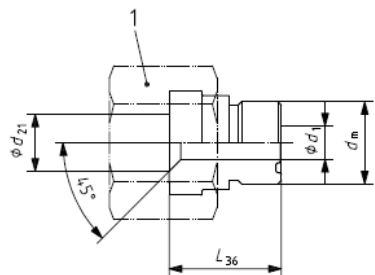


Hydraulic Fitting, ORFS RDA-

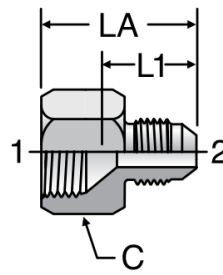


Hydraulic Fitting, JIC RDA-

8.6 Reducer (without nut) hydraulic fitting [often just called a reducer] - RDB:

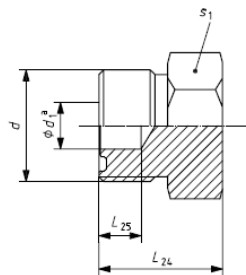


Hydraulic Fitting, ORFS RDB-

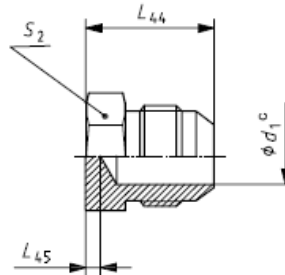


Hydraulic Fitting, JIC RDB-

8.7 Plug - PL:



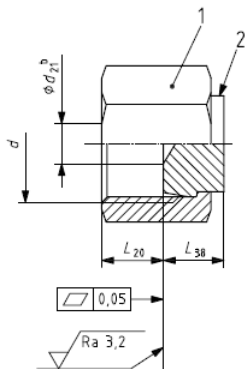
Hydraulic Fitting, ORFS PL-



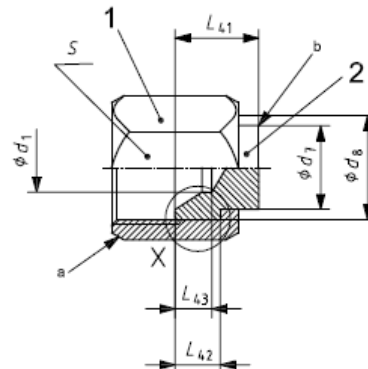
Hydraulic Fitting, JIC PL-

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### 8.8 Cap - CP:



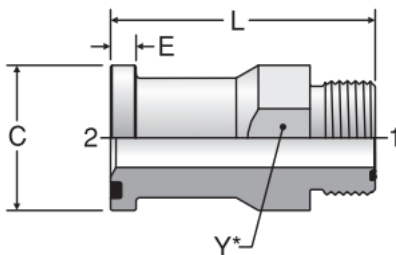
Hydraulic Fitting, ORFS CP-



Hydraulic Fitting, JIC CP-

### 8.9 Flange Head - FH:

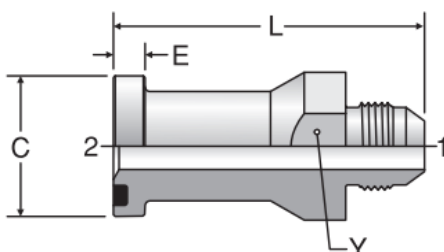
Example: For an O-Ring Face Seal (ORFS) hose connection - a straight flange head connector (FHS) for use with 1-1/2" OD tubing with a Code 62 end, in accordance with ISO 6162-2, is designated as follows:



Hydraulic Fitting, ORFS **FHS-1-1/2xCode 62-S**

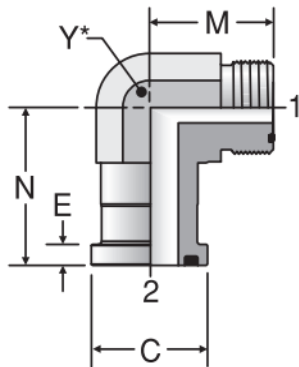
size code	1-1/2" tube size x Code 62 flange end Flange head, straight
Flange head designation	

Example: For a 37° flared (JIC) hose connection - a straight flange head connector (FHS) for use with 1-1/4" OD tubing with a Code 61 end, in accordance with ISO 6162-1, is designated as follows:

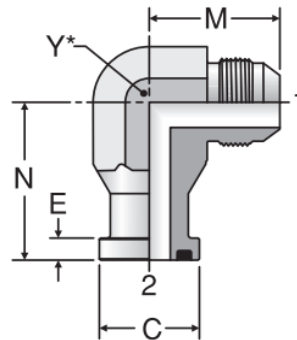


Hydraulic Fitting, JIC FHS-1-1/4xCode 61-S

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Hydraulic Fitting, ORFS FHE-



Hydraulic Fitting, JIC FHE-

### 8.10 Flange Port - P:

Example: For an O-Ring Face Seal (ORFS) hose connection - to a straight flange port connector (PS) for use with 1-1/2" OD tubing with a Code 61 end, in accordance with ISO 6162-1, is designated as follows:



Hydraulic Fitting, ORFS **PS-1-1/2xCode 61-S**

Flange port designation	size code	1-1/2" tube size x Code 61 flange end
		Flange port, straight



Hydraulic Fitting, JIC **PS-1-1/2xCode 61-S**

Flange port designation	size code	1-1/2" tube size x Code 61 flange end
		Flange port, straight

Note: For additional Code 61 and Code 62 flange components, refer to KGS 90103 for the designation of the flange clamps