# API 17H Hydraulic Interfaces for Hot Stabs

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#### Introduction

Pressure-balanced hot stabs are a common means to make both temporary and permanent subsea hydraulic connections. A large variety of types, sizes and standards have been used during the last 40 years. As the subsea industry has grown and standards have been independently developed and refined, inconsistencies have occurred that have adversely impacted the establishment of a universal standard.

The intent of Technical Report 17TR15 is to clarify and define the most commonly used hot stab types, as well as some obsolete sizes. It groups them into three major categories. The goal of the Technical Report is to increase standardization and to maintain backward compatibility and interchangeability with existing installations and with previous publications (API 17H, API 53, and API 16D).

The document utilizes a strategy of controlling the receptacle interface dimensions to allow more latitude for the male hot stab design.

This Technical Report is to be incorporated into the next edition of API 17H.

## API 17H Hydraulic Interfaces for Hot Stabs

## 1 Scope

This Technical Report describes a number of common or previously used ROV hydraulic hot stab and receptacle configurations. The intent is to ensure backward compatibility of the hot stab described in API 17H Second Edition, June 2013, and to align API 17H with API S53, API 17D, and API 16D. This Technical Report defines three major categories of hot stabs and describes the geometry to maintain compatibility across all manufacturers.

## 2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Recommended Practice 17H, Remotely Operated Tools and Interfaces on Subsea Production Systems

API Standard 53, Blowout Prevention Equipment for Drilling Wells

API Specification 16D, Control Systems for Drilling Well Control Equipment and Control Systems for Diverter Equipment

EEMUA Publication 194<sup>1</sup>, Guidelines for materials selection and corrosion control for subsea oil and gas production equipment

## 3 Terms, Definitions and Abbreviations

#### 3.1 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1.1

#### hot stab

Pressure balance coupling utilized for making temporary and permanent subsea fluid connections.

#### 3.1.2

#### manufacturer

Company responsible for the manufacture of the equipment.

## 3.2 Abbreviated Terms and Symbols

For the purposes of this document, the following abbreviated terms and symbols apply.

API	American Petroleum Institute
BOP	blowout preventer
BSP	British Standard Pipe
EEMUA	Engineering Equipment and Materials Users Association
NPT	National Pipe Thread
OD	outer diameter

<sup>&</sup>lt;sup>1</sup> The Engineering Equipment and Materials Users Association, 16 Black Friars Lane, London, U.K., EC4V 6EB

#### 4 Hot Stab Hydraulic Connections

#### 4.1 Function

The hot stab is a device designed to make fluid connections to subsea equipment. Often an ROV is used to supply fluid through the connection. A hot stab is characteristically a pressure balanced connection, where system pressure does not introduce disengagement forces into the connection. However the male stab can be hydraulically locked into the female receptacle or cause a hydraulic lock under certain conditions in subsea equipment. Separation forces can be introduced into the system when utilizing unsecured hoses with hot stab applications. The hot stab can include multiple separate hydraulic ports depending on type and size.

#### 4.2 Application

ROV hot stab receptacles can be utilized to perform any of the following tasks or functions:

- a) override existing systems,
- b) interface with systems (e.g. lower riser packages) with locking and unlocking functions,
- c) hydraulically activate valves and tools,
- d) hydro test and operate pigging functions,
- e) test seals and connections,
- f) dewater enclosed spaces,
- g) flushing of subsea components,
- h) BOP intervention,
- i) deliver hydraulic supply for interchangeable intervention tooling,
- j) termination of umbilicals or flying leads,
- k) chemical injection.

An ROV intervention is required as a secondary control system for subsea BOPs by API 53 and API 16D. Both API documents specify single-port docking receptacles designed in accordance with API 17H for critical functions on the BOP and provide a standard interface for intervention.

The applications for the hot stab are not limited to those listed in this document. Other applications may arise based on field or operator specific needs.

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#### 4.3 Types of Hot Stabs

This technical report defines three categories of hot stabs. Each category is defined by profile (single bore or dual bore) and diameter. The described categories are intended for all future standard designs. These types supersede the type A, B, C, and D described in the second edition of API 17H.

Type 1: Single-bore Multi-port

Type 2: Dual-bore Multi-port

Type 3: Single-port High Flow

Type 1 and Type 2 hot stabs are typically used for making a temporary hydraulic or gas connection to a remote piece of subsea equipment where high pressure/low flow applications are required.

Type 3 hot stabs utilize large bore connections intended for applications that require larger flow rates such as subsea BOP hydraulic control, flushing operations, and high flow circulation.

#### 4.4 Design Considerations

The geometry of the internal profile of the female receptacle is defined in this technical report. Design of the male stab is left open to interpretation to allow for variation in the selection of seal types, material, and fabrication tolerances.

All dimensions are interface dimensions and assume no coatings have been applied. If coatings are utilized, the interface dimensions given shall be measured after coating is applied.

Isolation valves (needle valve or ball valve) may be used on hydraulic ports to reduce water ingress/contamination into fluid and to reduce leakage/spill to environment.

Test port applications commonly use isolation valves to provide a hydraulic lock on the hydraulic circuit and prevent seawater ingress.

The hot stab should feature a flexible or compliant section between the handle and the stab body to assist manipulator access during insertion or retrieval.

The hot stab should be equipped with a guide nose to ensure first stage alignment of stab into receptacle during connection.

The hydraulic interface between the receptacle and subsea piping/tubing shall be an industry standard such as threaded Medium Pressure (MP)/High Pressure (HP)/BSP/SAE/NPT, API 17SS or 6BX flange.

Locking male hot stabs should fit into all locking and non-locking female receptacles to ensure backward compatibility.

High flow (locking) receptacles shall be compatible with high flow locking and non-locking male stabs.

Correct and full mating between male stab and female receptacle should be clearly visible using a standard ROV mounted subsea camera. The interface between the male stab and female receptacle should use contrasting colors as an aid.

Seal areas in female receptacles have been specified such that the male hot stabs can be produced with a variety of seal designs.

The length of the male stab should be designed such that the it does not extend beyond the recommended envelope in this technical report.

If plastic components are selected for use on the male ROV hot stab, the designer shall consider the short- and longterm effects of seawater exposure, including potential dimensional changes and swelling of plastics caused by absorption of seawater that may prevent the hot stab from being extracted from the receptacle.

The required stab force should be kept as low as possible. The required stab force should be verified and documented by the hot stab manufacturer.

Hot stab applications utilizing unsecured hoses can introduce separation forces into the system. In these applications, it is recommended to include a mechanical locking feature that will retain the male hot stab and prevent separation from the female receptacle.

#### 4.5 Mounting Considerations

Sufficient space shall be provided around the female receptacle to ensure full engagement of the male stab and for the removal of any debris from the receptacle. The recommended envelopes are shown in the figures and drawings.

The hot stab female receptacle should be mounted in the horizontal plane where possible to prevent debris from collecting in the receptacle.

A pressure-retaining blanking (or dummy) male stab is recommended to be inserted into the female receptacle subsea when the hot stab is not being utilized, unless using a pressure-retaining blanking (or dummy) male stab will be detrimental to equipment or application. The blanking (or dummy) male stab provides seal surface protection from calcification, debris, and marine growth, as well as acting as a secondary barrier to the hydraulic system. A non-pressure-retaining blanking (or dummy) male stab can also be utilized, but will not act a secondary barrier to the hydraulic system.

Where blanking (or dummy) male stabs are used, a parking slot can be provided for parking the blanking (or dummy) hot stab. Lanyards can be used to attach blanking (or dummy) hot stabs to subsea equipment to prevent loss when removed. It is important that lanyards are of sufficient length that they do not inhibit ROV manipulator operation.

When installing the hot stab receptacles onto ROV interface panels, the face of the female receptacle should be protruding above the outer surface of the ROV panel. If the receptacle is mounted to the inner surface of the ROV interface panel, the panel should be no greater than 0.75 in. (20 mm) thick with a free access area large enough to accommodate the male hot stab including the associated hydraulic fittings.

If the mounting flange on the receptacle utilizes a split flange design, then it should utilize an anti-rotation feature to prevent the receptacle from rotating.

## 4.6 Operations

Hot stabs may be operated by manipulator, TDU, deployment tool, or diver.

Grab bars should be positioned to allow linear actions of ROV manipulators when inserting hot stabs or blind stabs, which will reduce the risk of seal damage during hot stab manipulation.

#### 4.7 Materials in Design

Material selection should be decided by the manufacturer. Material selection should follow EEMUA Publication 194 in conjunction with the following considerations.

a) Materials should be seawater corrosion resistant alloys and/or protected by a CP system. Design lifetime and cathodic protection must be assessed during material selection.

- b) Galling between mating parts should be carefully assessed and mitigating actions taken. Mitigating action(s) include the selection of non-galling materials or dissimilar metal used for mating parts.
- c) Materials should have the ability to withstand typical ROV impact loads as per API 17H.

NOTE Nitronic 50, Nitronic 60, AISI SS 316, Aluminum Bronze, Inconel 625, duplex, and super duplex are typical materials that have been used for subsea hot stab applications.

#### 4.8 Hot Stab Hydraulic Connection Type 1

The Type 1 hot stab is a multi-port design with single stab seal diameter. Different seal diameters and number of ports can be produced. Internal bore and hydraulic ports can be optimized for each design based on design pressure, interface requirements, and number of ports. The Type 1 hot stabs typically cover hot stabs with one to six individual ports. Figure 1 shows a typical example of a Type 1 hot stab. Figure 2 shows all the internal interfaces dimensions of the Type 1 multi-port hydraulic interface, including seal surface areas. Specific dimensions for each bore size can be found in Table 1.



Figure 2—Single-bore, Multi-port Hot Stab Receptacle

Nom. size in. (mm)	Α	В	С	Е	F	I
Ø 1 <sup>1</sup> /8 (28)	Ø 1.25 (32)	Ø 1.102/1.104 (28.00/28.05)	0.125 (3.18)	15 deg	45 deg	10 to 15 deg
**Ø 1 <sup>3</sup> /8 (35)	Ø 1.54 (39)	Ø 1.376/1.378 (34.95/35.00)	0.125 (3.18)	15 deg	45 deg	10 to 15 deg
**Ø 1 <sup>3</sup> /4 (43)	Ø 1.85 (47)	Ø 1.687/1.689 (42.85/42.90)	0.250 (6.35)	15 deg	45 deg	10 to 15 deg
**Ø 2 <sup>1</sup> /4 (55)	Ø 2.32 (59)	Ø 2.165/2.169 (55.00/55.10)	0.250 (6.35)	15 deg	45 deg	10 to 15 deg

Table 1—Principle Dimensions, Type 1 Receptacles

Nom size in. (mm)	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Ø 1 <sup>1</sup> /8	0.36	0.84	1.33	1.63	2.11	2.41	2.90	3.20	3.69	3.99
(28)	(9.1)	(21.3)	(33.7)	(41.3)	(53.7)	(61.3)	(73.7)	(81.3)	(93.7)	(101.3)
**Ø 1 <sup>3</sup> /8	0.37	0.87	1.75	2.24	3.11	3.61	4.48	4.98	5.85	6.26
(35)	(9.4)	(22.1)	(44.4)	(56.9)	(78.9)	(91.6)	(113.8)	(126.5)	(148.6)	(159.0)
**Ø 1 <sup>3</sup> /4	0.76	1.39	2.69	3.43	4.80	5.50	6.87	7.57	8.94	9.84
(43)	(19.3)	(35.3)	(68.3)	(87.1)	(121.9)	(139.7)	(175.5)	(192.3)	(227.1)	(249.9)
**Ø 2 <sup>1</sup> /4	0.63	1.13	2.06	2.51	3.44	3.89	4.81	5.26	6.19	6.64
(55)	(16.0)	(28.7)	(52.3)	(63.7)	(87.3)	(98.7)	(122.3)	(133.7)	(157.3)	(168.7)

NOTES

1. Smaller diameter male hot stabs (OD less than 1.25 in. (31.75 mm)) have historically been susceptible to bending during manipulation and are not recommended.

2. All dimensions are in imperial units with SI units in parentheses (mm).

3. All dimensions are given without coating. "P" dimensions and port details to be determined by manufacturer.

4. Multi-port dimensions can be determined by repeating dimensions S1–S4 along the bore.

5. Radius in intersections between seal surface and cavity angle recommended to avoid seal damage.

6. \*\*These sizes are considered recommended standards.

7. Surface roughness is given in micro-inches.

Figure 3 shows the envelope, which should be allocated around the hot stab receptacle for connection of hydraulic tubing/pipework, room for flushing of debris, stabber nose clearance, and lock interface on the Type 1 single-bore, multi-port hot stab. Recommended dimensions for the envelope can be found in Table 2. The end user should determine requirements for the envelope.

#### 4.9 Hot Stab Hydraulic Connection, Type 2

The Type 2 hot stab connection typically has two individual ports utilizing a tapered design where each of the ports is located on a different seal bore. However, there have been designs that use up to six individual ports located on two seal diameters (see Annex A), but these are not considered a standard design. Internal bore and hydraulic ports can be optimized within each size and design based on design pressure, interface requirements, and number of ports. Figure 4 shows a typical Type 2 hot stab design. Figure 5 lists all the internal dimensions and seal surfaces for the Type 2 dual-bore, dual-port, tapered hot stab. It should be noted that vent port "O" is required to prevent a hydraulic lock during insertion and removal of male hot stabs. Specific dimensions for each bore size can be found in Table 3.



Figure 3—Type 1 Installation Envelope

Nom. size in. (mm)	X1	X2	Х3	X4	X5	X6
Ø 1 <sup>1</sup> /8	Min. 2.0	Min. Ø 2.8	Min. Ø 6.0	Min. 0.75	Max. 45 deg	Check Valve/Piping
(Ø28)	(55)	(72)	(150)	(20)		Requirement
Ø 1 <sup>3</sup> /8	Min. 2.5	Min. Ø 3.5	Min. Ø 6.0	Min. 0.75	Max. 45 deg	Check Valve/Piping
(Ø35)	(65)	(90)	(150)	(20)		Requirement
Ø 1 <sup>3</sup> /4	Min. 2.5	Min. Ø 3.5	Min. Ø 6.0	Min. 0.75	Max. 45 deg	Check Valve/Piping
(Ø43)	(65)	(90)	(150)	(20)		Requirement
Ø 2 <sup>1</sup> /4	Min. 3.0	Min. Ø 3.7	Min. Ø 6.0	Min. 0.75	Max. 45 deg	Check Valve/Piping
(Ø55)	(75)	(95)	(150)	(20)		Requirement



Figure 4—Type 2 Hot Stab



Figure 5—Dual-bore, Dual-port, Tapered Hot Stab Receptacle

Nom. Size in. (mm)	Α	В	С	D	E	F	I	М	0
Ø 1 <sup>1</sup> /8 X 1 <sup>3</sup> /8 (28/35) Dual	Ø1.25 (32)	Ø 1.102/1.104 (28.00/28.05)	Ø 1.54 (39)	Ø 1.376/1.378 (34.95/35.00)	15 deg	45 deg	0.250 (6.35)	10 to 15 deg	2.7 (68.5)
**Ø 1 <sup>3</sup> /8 X 1 <sup>3</sup> /4 (35/43) Dual	Ø 1.54 (39)	Ø 1.375/1.377 (34.92/34.98)	Ø 1.85 (47)	Ø 1.687/1.689 (42.85/42.90)	15 deg	45 deg	0.250 (6.35)	10 to 15 deg	4.5 (114.3)

Nom. Size in. (mm)	S1	S2	S3	S4	S5	S6	S7	S8
Ø 1 <sup>1</sup> /8 X 1 <sup>3</sup> /8	0.57	1.63	2.11	2.41	2.90	3.31	3.53	3.85
(28/35) Dual	(14.6)	(41.3)	(53.7)	(61.3)	(73.7)	(84)	(89.6)	(97.8)
**Ø 1 <sup>3</sup> / <sub>8</sub> X 1 <sup>3</sup> / <sub>4</sub>	0.76	1.39	2.69	4.14	4.87	5.98	7.03	8.0
(35/43) Dual	(19.3)	(35.3)	(68.3)	(105.2)	(123.7)	(151.9)	(178.6)	(203)

NOTES 1. Smaller diameter male hot stabs (OD less than 1.25 in. (31.75 mm)) have historically been susceptible to bending during manipulation and are not recommended.

2. All dimensions are in imperial units with SI units in parentheses (mm).

3. All dimensions are given without coating. "P" dimensions and port details to be determined by manufacturer.

4. Radius in intersections between seal surface and cavity angle recommended to avoid seal damage.

5. \*\* These sizes are considered recommended standards.

6. Vent port "O" is required to allow venting during insertion and removal of male hot stab.

7. Surface roughness is given in micro-inches.

Figure 6 shows the envelope, which should be allocated around the hot stab receptacle for connection of hydraulic tubing/pipework, room for flushing of debris, stabber nose clearance, and lock interface on the Type 2 dual-bore tapered hot stab. Recommended dimensions for the envelope can be found in Table 4. The end user should determine requirements for the envelope.



Figure 6—Type 2 Installation Envelope

	iope Dimensi	ions, type z i	Receptacies	

Nom. size in. (mm)	X1	X2	Х3	X4	X5
Ø 1 <sup>1</sup> /8 X 1 <sup>3</sup> /8	Min. 2.0	Min. Ø 3.0	Min. Ø 6.0	Min. 0.50	Min. 45 deg
(28/35) Dual	(55)	(75)	(150)	(10)	
Ø 1 <sup>3</sup> / <sub>8</sub> X 1 <sup>3</sup> / <sub>4</sub>	Min. 2.5	Min. Ø 3.5	Min. Ø 6.0	Min. 0.75	Min. 45 deg
(35/43) Dual	(65)	(90)	(150)	(20)	

#### 4.10 Hot Stab Hydraulic Connection, Type 3

The Type 3 hot stab connection is a single-port connection intended for applications that require high flow rates such as subsea BOP hydraulic control and flushing operations.

All high flow hot stab assemblies shall include a mechanical locking feature that will retain the male hot stab and prevent separation from the female receptacle.

Typically for BOP operations, both the male hot stab and female receptacle utilize a nominal 1 in. (25 mm) port.

For other applications, hydraulic porting connection type and dimensions are defined by port diameters, pressure ratings, and user requirements. Figure 7 shows a typical Type 3 hot stab design. Internal dimensions and seal surfaces for the Type 3 single-bore, high flow hot stab receptacle are shown in Figure 8. Specific dimensions for each bore size can be found in Table 5.

Figure 9 shows the envelope, which should be allocated around the hot stab receptacle for connection of hydraulic tubing/pipework, room for flushing of debris, stabber nose clearance, and lock interface on the Type 3 single-port, high flow hot stab. Recommended dimensions for the envelope can be found in Table 6. The end user should determine requirements for the envelope.



Figure 7—Type 3 Hot Stab



Figure 8—Single-port, High Flow Hot Stab Receptacle

Nom. size in. (mm)	Α	В	С	D	Е	F
Ø1.5	Ø1.65	Ø1.496/1.498	0.250	10 to 15 dog	4E dog	0.500
(38)	(42)	(38.00/38.05)	(6.35)	TO IO TO deg	45 deg	(12.7)
**Ø1.7	Ø2.8	Ø1.687/1.689	0.250	10 to 15 dog	4E des	0.500
(43)	(71)	(42.85/42.90)	(6.35)	TO IO TO deg	45 deg	(12.7)
Ø2.0	Ø2.17	Ø1.968/1.970	0.250	10 to 15 dog	4E dog	0.500
(50)	(55)	(50.00/50.05)	(6.35)	TO TO TO DEG	45 deg	(12.7)
Ø2.2	Ø2.75	Ø2.165/2.167	0.250	10 to 15 dog	4E dog	0.500
(55)	(70)	(55.00/55.05)	(6.35)	TO TO TO DEG	45 deg	(12.7)
Ø2.5	Ø2.76	Ø2.559/2.561	0.250	10 to 15 dog	4E dog	0.500
(65)	(70)	(65.00/65.05)	(6.35)	TO TO TO DEG	45 deg	(12.7)
**Ø3.1	Ø3.54	Ø3.150/3.152	0.250	10 to 15 dog	45 dog	0.500
(80)	(90)	(80.00/80.05)	(6.35)	TO TO TO DEG	45 ueg	(12.7)
Ø3.5	Ø4.12	Ø3.500/3.502	0.250	10 to 15 dog	45 dog	0.500
(89)	(104.6)	(88.90/88.95)	(6.35)	TO TO TO DEG	45 ueg	(12.7)
Ø4.0	Ø4.56	Ø3.937/3.939	0.250	10 to 15 dog	4E dog	0.500
(100)	(116)	(100.00/100.05)	(6.35)	TO TO TO DEG	45 ueg	(12.7)
Ø6.0	Ø6.50	Ø5.906/5.908	Ν/Λ	NI/A	15 dog	0.870
(150)	(165)	(150.0/150.05)	11//4	11//4	10 deg	(22)
<sup>a</sup> Ø6.0	Ø6.50	Ø6.000/6.003	0.250	10 to 15 dog	45 dog	0.500
(150)	(165)	(152.40/152.47)	(6.35)	TO IO TO DEG	40 deg	(12.7)

Table 5—Principle Dimensions, Type 3 Receptacles

Nom. size in. (mm)	S1	S2	S3	<b>S</b> 4	S5	S6
Ø1.5	1.00	1.37	1.46	2.77	2.87	3.24
(38)	(25.4)	(34.8)	(37.2)	(70.4)	(72.9)	(82.4)
**Ø1.7	0.76	1.39	1.67	2.41	2.69	3.44
(43)	(19.3)	(35.3)	(42.4)	(61.2)	(68.3)	(87.4)
Ø2.0	1.00	1.49	1.59	3.36	3.46	3.95
(50)	(25.4)	(37.9)	(40.4)	(85.3)	(87.9)	(100.4)
Ø2.2	1.00	1.54	1.83	3.42	3.71	4.25
(55)	(25.4)	(39.2)	(46.6)	(86.8)	(94.2)	(108.0)
Ø2.5	1.00	1.64	1.74	4.10	4.20	4.84
(65)	(25.4)	(41.7)	(44.2)	(104.1)	(106.7)	(123.0)
**Ø3.1	1.00	1.79	1.98	4.75	4.94	5.72
(80)	(25.4)	(45.4)	(50.4)	(120.5)	(125.4)	(145.4)
Ø3.5	1.38	2.00	2.20	4.80	5.00	5.63
(90)	(35.1)	(50.8)	(55.9)	(121.9)	(127.0)	(143.0)
Ø4.0	1.00	1.98	2.29	5.61	5.92	6.90
(100)	(25.4)	(50.4)	(58.2)	(142.5)	(150.4)	(175.4)
Ø6.0	0.63	2.40	2.72	7.52	7.83	9.61
(150)	(16.0)	(61.0)	(69.0)	(191.0)	(199.0)	(244.0)
<sup>a</sup> Ø6.0	3.05	3.70	3.78	8.22	8.30	8.95
(150)	(77.5)	(94.0)	(96.0)	(208.8)	(210.8)	(227.3)

Table 5–Principle Dimensions, Type 3 Receptacles (continued)

NOTES

1. Smaller diameter male hot stabs (OD less than 1.25 in. (31.75 mm)) have historically been susceptible to bending during manipulation and are not recommended.

2. All dimensions are in imperial units with SI units in parentheses (mm).

3. All dimensions are given without coating. "P" dimensions and port details to be determined by manufacturer.

4. Radius in intersections between seal surface and cavity angle recommended to avoid seal damage.

5. \*\* These sizes are considered recommended standards.

6. Vent port "O" is required to allow venting during insertion and removal of male hot stab.

7. Surface roughness is given in micro-inches.

8. a Alternate 6 in. diameter values that are permitted



Figure 9—Type 3 Installation Envelope

Nom. size in. (mm)	X1	X2	Х3	X4	X5	X6	X7
Ø1.5	Min. 2.0	Min. Ø 3.0	Min. Ø 6.0	Min. 0.75	Min. 45 deg	Check Valve/Piping	Min. 2.0
(38)	(50)	(75)	(150)	(20)		Requirement	(50)
Ø1.7	Min. 2.5	Min. Ø 4.0	Min. Ø 8.0	Min. 0.75	Min. 45 deg	Check Valve/Piping	Min. 2.0
(43)	(65)	(100)	(200)	(20)		Requirement	(50)
Ø2.0	Min. 3.0	Min. Ø 4.0	Min. Ø 8.0	Min. 0.75	Min. 45 deg	Check Valve/Piping	Min. 2.0
(50)	(75)	(100)	(200)	(20)		Requirement	(50)
Ø2.2	Min. 3.0	Min. Ø 4.5	Min. Ø 9.0	Min. 0.75	Min. 45 deg	Check Valve/Piping	Min. 2.0
(55)	(75)	(115)	(230)	(20)		Requirement	(50)
Ø2.5	Min. 4.0	Min. Ø 5.0	Min. Ø 9.0	Min. 0.75	Min. 45 deg	Check Valve/Piping	Min. 2.0
(65)	(100)	(130)	(230)	(20)		Requirement	(50)
Ø3.1	Min. 4.5	Min. Ø 6.5	Min. Ø 10.0	Min. 0.88	Min. 45 deg	Check Valve/Piping	Min. 2.0
(80)	(115)	(165)	(250)	(22)		Requirement	(50)
Ø3.5	Min. 5.0	Min. Ø 7.0	Min. Ø 10.0	Min. 0.88	Min. 45 deg	Check Valve/Piping	Min. 2.0
(90)	(130)	(175)	(250)	(22)		Requirement	(50)
Ø4.0	Min. 6.0	Min. Ø 8.0	Min. Ø 10.0	Min. 0.88	Min. 45 deg	Check Valve/Piping	Min. 2.0
(100)	(150)	(205)	(250)	(22)		Requirement	(50)
Ø6.0	Min. 6.0	Min. Ø 8.0	Min. Ø 10.0	Min. 0.88	Min. 45 deg	Check Valve/Piping	Min. 2.0
(150)	(150)	(205)	(250)	(22)		Requirement	(50)

Table 6—Envelope Dimensions, Type 3 Receptacles

## Annex A (informative)

## Quad- and Hex-port Taper Hot Stab (Not Typical)

Figures A.1, A.2, and A.3 and Table A.1 are for a unique hot stab and should be considered project specific. This design is not considered a standard and is presented here for historical purposes. It is not recommended to use this design going forward.



Figure A.1—Principle Internal Dimensions, Type 2 Dual-bore, Quad-port ,Tapered Hot Stab Ø28/35 Receptacle



Figure A.2—Principle Dimensions, Ø35/43 Quad-port Receptacle



Figure A.3—Principle Dimensions, Type 2 Ø43/55 Hexa-port Receptacle

Nom size in. (mm)	Α	В	С	D	Е	F	I	к	м	0	w
Ø 1 1/8 X 1 3/8 (28/35) Quad	Ø 1.18 (30)	Ø 1.102/1.104 (28.00/28.05)	Ø1.46 (37)	Ø 1.378/1.380 (35.00/35.06)	N/A	45 deg	N/A	6.50 (165)	18 deg	3.406 (86.5)	45 deg
Ø1 3/8 X 1 3/4 (35/43) Quad	Ø1.50 (38)	Ø 1.375/1.377 (34.92/34.98)	Ø1.81 (46)	Ø 1.687/1.689 (42.85/42.90)	12 deg	45 deg	0.25 (6.7)	12.02 (305)	12 deg	6.58 (167)	N/A
Ø1 3/4 X 2 1/8 (43/55) Hex	Ø 1.85 (47)	Ø 1.689/1.693 (42.90/43.00)	Ø 2.32 (59)	Ø 2.161/2.165 (54.90/55.00)	15 deg	N/A	N/A	9.96 (253)	20 deg	5.12 (130)	N/A

Table A.1—Principle Dimensions, Type 2 Quad- and Hex-port Receptacles

Nom size in. (mm)	S1	S2	S3	S4	S5	S6	S9	S10	S11	SX (min)	SY (min)
Ø 1 1/8 X 1 3/8	0.49	0.67	1.48	2.26	3.05	3.31	4.49	5.28	6.06	0.32	0.28
(28/35) Quad	(12.5)	(17)	(38)	(58)	(78)	(84)	(114)	(134)	(154)	(8)	(7)
Ø1 3/8 X 1 3/4 (35/43) Quad	1.07 (27.3)	3.07 (78)	5.15 (131)	6.21 (158)	6.95 (176)	7.71 (196)	N/A	N/A	N/A	0.51 (13)	0.67 (17)
Ø1 3/4 X 2 1/8	0.47	0.75	2.01	3.27	4.53	4.84	7.13	8.39	9.65	0.51	N/A
(43/55) Hex	(12)	(19)	(51)	(83)	(115)	(123)	(181)	(213)	(245)	(13)	

#### NOTES:

1. Smaller diameter male hot stabs (OD less than 1.25 in. (31.75 mm)) have historically been susceptible to bending during manipulation and are not recommended.

2. All dimensions are in imperial units with SI units in parentheses (mm).

3. All dimensions are given without coating. "P" dimensions and port details to be determined by manufacturer.

4. These designs are provided for historical purposes and are not recommended as a standard.



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