



# OPEN

Compute Project

Universal Quick Disconnect (UQD) Specification  
Revision 1.0

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## 2. Scope & Overview

Scope:

This document defines the technical specifications for the Universal Quick Disconnect (UQD) used in non-combustible single-phase (water/glycol) systems for liquid cooling of electronics.

Overview:

In liquid cooled systems, fluid is transported under pressure within a Technology Cooling System (TCS) fluid loop [1]. The IT equipment loop is joined to the TCS using a fluid connector.

This specification defines the fluid connector as Universal Quick Disconnect (UQD) with interface dimensions for universal interchangeability and defines acceptable performance for a hand-mate, drip-free, hot-pluggable, fluid line connector for use in TCS for electronics. The UQD maintains a leak-tight seal under pressure when coupled and on both sides when decoupled.

### 2.1 Terms & Definitions

#### **Plug**

The male side of the coupling

#### **Socket**

The female side of the coupling

#### **Coupled**

The state when the plug and socket are fully engaged and locked together

#### **Coupling**

The act of connecting the plug and socket together so that they are locked together to join a fluid line.

#### **Cv**

Flow coefficient defined as  $C_v = Q/\sqrt{\Delta P}$ , where Q is flow rate in gallons/min (GPM) and  $\Delta P$  is pressure drop in lbs/in<sup>2</sup> (psi) for water at 60 degrees F

#### **Termination**

Both plug and socket have terminations on the ends to connect a tube or pipe to the coupling

#### **UQD**

Universal Quick Disconnect

#### **Break**

Act of de-coupling the plug and socket

#### **Make**

Act of coupling the plug and socket such that the pair are fully mated and locked

#### **Universal Quick Disconnect**

Fully interchangeable with other plug and socket parts meeting the UQD Requirements of the same nominal size

#### **KPI**

Key Performance Indicator

#### **UQD02**

Universal Quick Disconnect Dash 02 (1/8")

#### **UQD04**

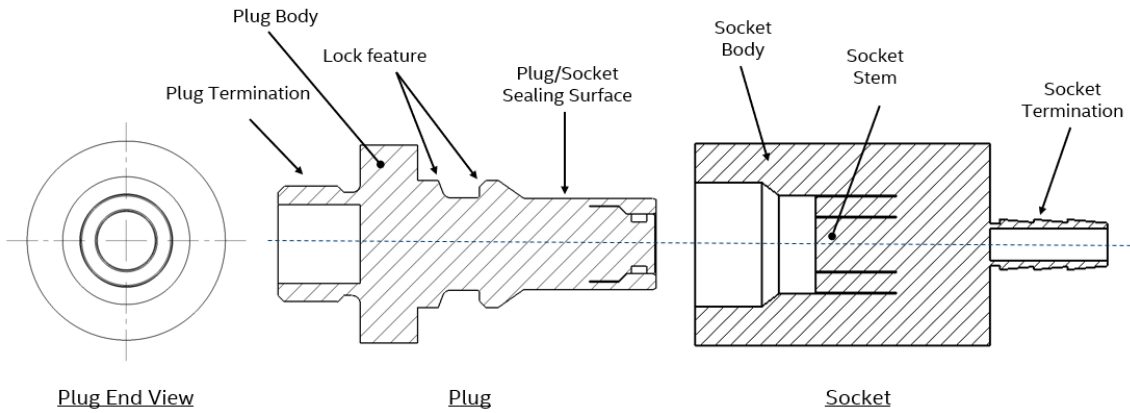
Universal Quick Disconnect Dash 04 (1/4")

#### **UQD06**

Universal Quick Disconnect Dash 06 (3/8")

#### **UQD08**

Universal Quick Disconnect Dash 08 (1/2")



**Figure 1 Universal Quick Disconnect Plug and Socket**

## 2.2 Key Performance Indicators

The following Key Performance Indicators (KPI's) are measured parameters that are key in defining the appropriate part selection. Suppliers should have data available to address the KPI's below:

- Flow Rating
- Temperature Rating
- Pressure Rating
- Burst Pressure Rating
- Fluid loss on disconnect
- Cv

### 3. Feature & Dimensional Requirements

Physical features of the socket shall conform to the dimensions shown in Figure 2 UQD Socket Dimensions and given in Table 1 UQD Socket Dimensional Specification. Physical features of the plug shall conform to the dimensions shown in Figure 3 UQD Plug Dimensions and given by Table 2 UQD Plug Dimensional Specification. Where no dimension is given the geometry is left to the discretion of the manufacturer and should consider end user (datacenter environment) requirements for fit and function.

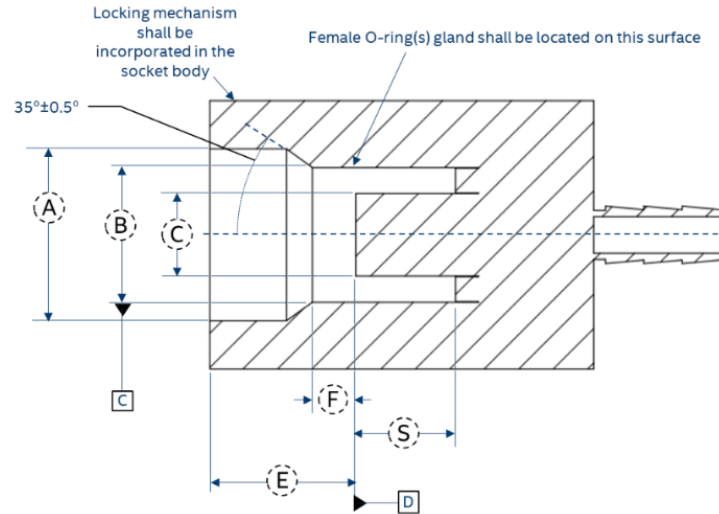


Figure 2 UQD Socket Dimensions

Table 1 UQD Socket Dimensional Specification

UQD Size	Dimension (see Fig 2 above)	A	B	C	E	F	S
	Tolerance value	MIN	±0.025	±0.025	Max Min	±0.10	MIN
UQD Size	UQD02	Ø11.25	Ø6.71	Ø3.63	13.7 12.8	3.3	7.1
	UQD04	Ø15.65	Ø11.15	Ø7.14	18.1 16.6	4.7	10.4
	UQD06	Ø18.85	Ø14.38	Ø9.47	18.8 17.3	5.4	13.2
	UQD08	Ø22.05	Ø17.56	Ø10.75	20.0 18.5	6.6	16.0

Dimensions are in millimeters.

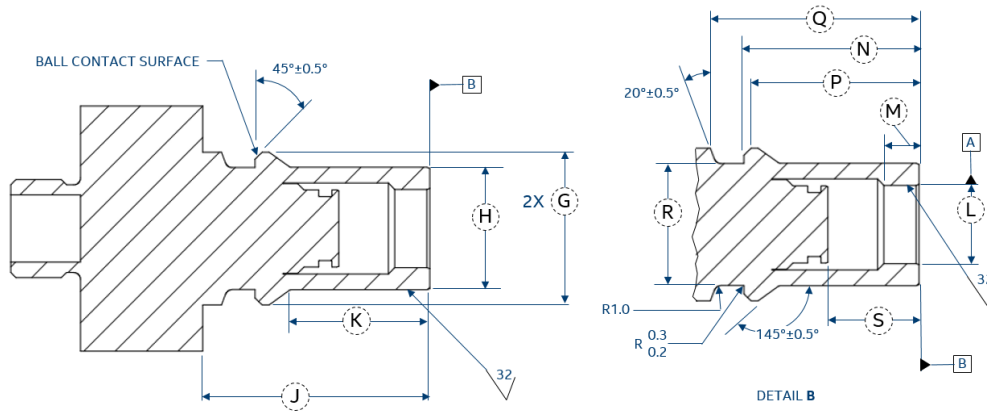


Figure 3 UQD Plug Dimensions

Table 2 UQD Plug Dimensional Specification

	Dimensions (See figure 3 above)	G	H	J	K	L	M	N	P	Q	R	S
	Tolerance Value	±0.025	±0.025	MIN	±0.3	±0.025	MAX	±0.1	±0.06	±0.3	MAX	MIN
UQD Size	UQD02	Ø11.0	Ø6.65	21.0	11.0	Ø3.73	3.0	15.5	14.8	19.4	Ø6.78	7.1
	UQD04	Ø15.4	Ø11.07	29.0	16.1	Ø7.24	4.0	21.5	20.7	26.5	Ø11.2	10.4
	UQD06	Ø18.6	Ø14.3	32.5	19.6	Ø9.75	5.0	25.0	24.2	30.0	Ø14.2	13.2
	UQD08	Ø21.8	Ø17.48	36.5	23.6	Ø11.17	6.0	29.0	28.2	34.0	Ø17.4	16.0

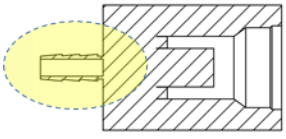
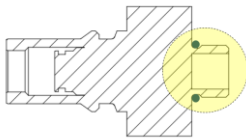
Dimensions are in millimeters.

In the ball contact surface area, identified in Figure 3 UQD Plug Dimensions, the minimum hardness is 24HRC.

### 3.1 Terminations

Termination options are left to the discretion of the manufacturer. At a minimum, a barbed termination on the socket and a straight thread o-ring boss (ORB) termination on the plug shall be available in the sizes described in Table 3 UQD Terminations.

Table 3 UQD Terminations

		
Size	Socket	Plug
UQD02	Straight, Barbed to mate with 1/4" reinforced EPDM tubing (ex. Parker 804-4-RL)	Straight, O-Ring Boss, Stud End -04 PER ISO 11926-3 to mate with port per ISO 11926-1 -4
UQD04	Straight, Barbed to mate with 3/8" reinforced EPDM tubing (ex. Parker 804-6-RL)	Straight, O-Ring Boss, Stud End -06 PER ISO 11926-3 to mate with port per ISO 11926-1 -6
UQD06	Straight, Barbed to mate with 1/2" reinforced EPDM tubing (ex. Parker 804-8-RL)	Straight, O-Ring Boss, Stud End -08 PER ISO 11926-3 to mate with port per ISO 11926-1 -8
UQD08	Straight, Barbed to mate with 5/8" reinforced EPDM tubing (ex. Parker 804-10-RL)	Straight, O-Ring Boss, Stud End -10 PER ISO 11926-3 to mate with port per ISO 11926-1 -10

Terminations shall meet the operating and burst pressure performance requirements specified in this document. For the barbed termination, barb design and number of barbs are at the discretion of the supplier, supplier shall publish any requirements specific to the barb and hose assembly.

### 3.2 Latching Requirements

The socket shall include a mechanism that latches and locks the socket to the plug in the area identified in Figure 3 UQD Plug Dimensions bounded by dimensions R, G, P, Q. This locking mechanism must be utilized to meet the pressure and durability requirements specified in this document in its coupled state. The mechanism shall be housed in the socket body.

### 3.3 Outer Envelope Requirements

The limiting use case for all sizes are the following:

- For height envelope assume multiple units stacked on a pitch of one rack unit height (1U) or 44.45mm.
- For overall diameter it is recommended to minimize to allow for finger access.
- For length it is recommended to minimize to allow for a maximum clearance within the cabinet.

## 4. Performance Requirements

In order to comply with this document, the coupling shall meet or exceed the performance requirements listed below.



#### 4.1 Ergonomics Requirements

It is recommended to minimize coupling and decoupling forces for hand mate connectors see Table 4 Ergonomic Requirements.

QD pairs shall lock together in the coupled condition.

**Table 4 Ergonomic Requirements**

Parameter	Requirement	Priority
Maximum coupling force	Supplier to publish coupling force versus pressure	Required
Latching mechanism	Visual, tactile, and/or audible feedback.	Recommended

#### 4.2 Shelf & Service Life Requirements

UQD performance requirements shall be met when exposed to the following life cycles at end of life.

**Table 5 Life Requirements**

Parameter	Requirement	Priority
Shelf Life <sup>1</sup>	5 years	Required
Service Life <sup>2</sup>	10 Years	Required

#### 4.3 Durability Requirements

The socket must withstand 5000 make and break cycles. All performance requirements listed in Section 4 Performance Requirements must be met or exceeded when the socket and plug are mated in the first (time 0) and 5000<sup>th</sup> cycle and at end of service life required in Table 5

#### 4.4 Fluid Loss Requirements

The fluid loss per couple and decouple shall meet or exceed the performance requirements given in Table 6 Fluid Loss Requirement. Fluid loss requirements to be measured with water as the fluid medium.

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<sup>1</sup> Shelf life is defined as the period of time after manufacturing and prior to service that the component must remain useable.

<sup>2</sup> Service life is defined as the period of time following a period of shelf life (storage), including time zero up to the maximum shelf life, that last up to end of service life.

Table 6 Fluid Loss Requirement

Parameter	UQD02	UQD04	UQD06	UQD08	Priority
Maximum fluid loss per couple/decouple cycle at 0 psi	0.020 ml	0.025 ml	0.035 ml	0.070 ml	Required

#### 4.5 Flow Rate, Pressure and Temperature Requirements

Table 7 Flow and Temperature Requirements

Parameter	UQD02	UQD04	UQD06	UQD08	Priority
Maximum operating pressure	100 psi				Required
Minimum burst pressure	300 psi				Required
Minimum Cv <sup>3</sup>	0.25	0.80	1.60	2.50	Required
Flow Rating <sup>4</sup>	At least 0.55 GPM	At least 1.7 GPM	At least 3.0 GPM	At Least 4.7 GPM	Recommended Manufacturer discretion (ratings shall be published by supplier)
Operating temperature range <sup>5</sup>	17°C - 65°C				Required
Shipping temperature range <sup>6</sup>	-40°C – 75°C				Required

<sup>3</sup> Cv are reported for water.

<sup>4</sup> Flow rating is for water.

<sup>5</sup> Support for higher temperature range is desirable as an option as there are known solutions that may operate in the range 17°C - 75°C. It is expected that rating would be published by supplier.

<sup>6</sup> Shipping may include charged systems.

## 5. Marking Requirements

Identification as UQD and nominal size are required per Table 8 Color and Marking Requirements. Marking can be positioned per manufacturer’s discretion on any visual external surface of the plug and socket.

**Table 8 Color and Marking Requirements**

Parameter	Requirement	Priority
Identification as Universal Quick Disconnect indicating universal interchangeability and size on both plug and socket	Must have visual identifier as follows corresponding to the associated size  <b>UQD02</b> <b>UQD04</b> <b>UQD06</b> <b>UQD08</b>	Required
Color Coding Options	At a minimum supplier shall provide color options of <i>Red</i> or <i>Blue</i> to limit probability of inadvertent crossing of fluid lines, Color coding should be visually noticeable	Required

### 5.1 Identification

Within digital or printed catalogs supplier shall identify products meeting these requirements as “Dimensional & performance requirements conform to OCP Universal Quick Disconnect (UQD) Specification rev 1.0”

## 6. Wetted Materials

Wetted materials shall be compatible with DOW Chemical DOWFROST™ LC25 [9] and Huntsman Chemical JEFFCOOL® ISF-25 heat transfer fluids [10]. Supplier is responsible to confirm all materials used in the UQD are compatible with the coolant fluids above and within the operating parameters specified in this document. If coolant fluid is other than stated above supplier should confirm the materials used are compatible with end user fluid chemistry.

## 7. Safety and Regulatory Requirements

As a minimum supplier shall meet the requirements of IEC62368-1 clause G.15.

## 8. Acknowledgements

Would like to thank the following companies and people for their contribution to this specification. From Avic Jonhon Optronic Technology Company, Ella Li and Hanyu Lou. From CPC (Colder Products Company), Dennis Downs, Elizabeth Langer and Barry Nielsen. From Fujikura, Thang Nguyen and Vijit Wuttijumnong. From Intel Corporation, Peggy Burroughs, Juan Cevallos, Peipei Ding, Jessica Gullbrand, Jordan Johnson, David Shia, Rodel Samiley, Sean Sivapalan and Casey Winkel. From LBNL Open Specification for a Liquid Cooled Rack Working Group, Dale Sartor. From Parker Hannifin Corporation, Quick Coupling Division, Cameron Koller, Todd Lambert, Timothy Marquis and Lenny Nick. From Stäubli, Jean-Christophe Duisit and Nicolas Monnier.

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