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Universal Quick Disconnect Blind-Mate (UQDB) Specification
Revision 1.0

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2. Scope & Overview

Scope:

This document defines the technical specifications for the Universal Quick Disconnect Blind (UQDB) 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 (UQDB) 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 UQDB 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 ΔP is pressure drop in lbs/in² (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

UQDB

Universal Quick Disconnect Blind

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

UQDB02

Universal Quick Disconnect Blind Dash 02 (1/8")

UQDB04

Universal Quick Disconnect Blind Dash 04 (1/4")

UQDB06

Universal Quick Disconnect Blind Dash 06 (3/8")

UQDB08

Universal Quick Disconnect Blind Dash 08 (1/2")

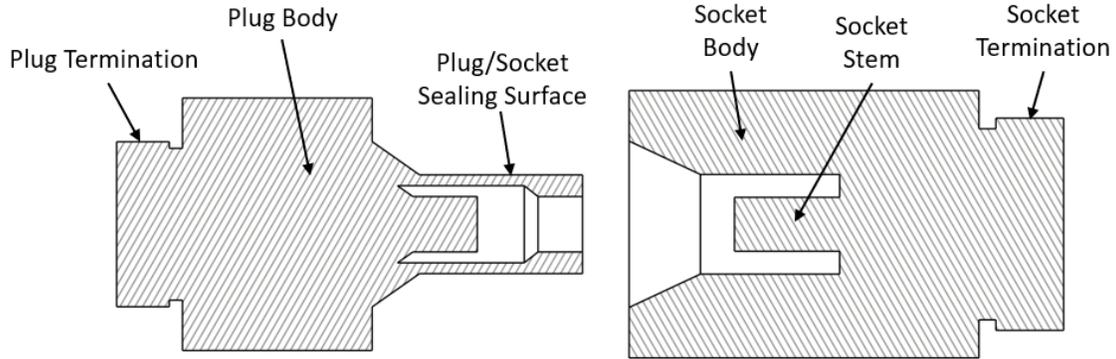


Figure 1 Universal Quick Disconnect Plug and Socket

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

2.3 UQDB Engagement

Plug and socket pairs shall meet Cv and Flow rating and performance requirements with insertion tolerance given in the table below.

Table 1 Engagement

Size	Nominal Engagement Stroke	<i>Min Engagement*</i>
UQD02	7.1	6.1
UQD04	10.4	9.4
UQD06	13.2	11.7
UQD08	16.0	14.5

* Only minimum engagement is considered. Assumption is that valve will be maximum area at nominal engagement and will not decrease for any further insertion beyond nominal prior to and including the hard stop position. Therefore, there is no specified tolerance for max engagement.

2.4 UQDB Coupling Insertion Panel to Panel Distance

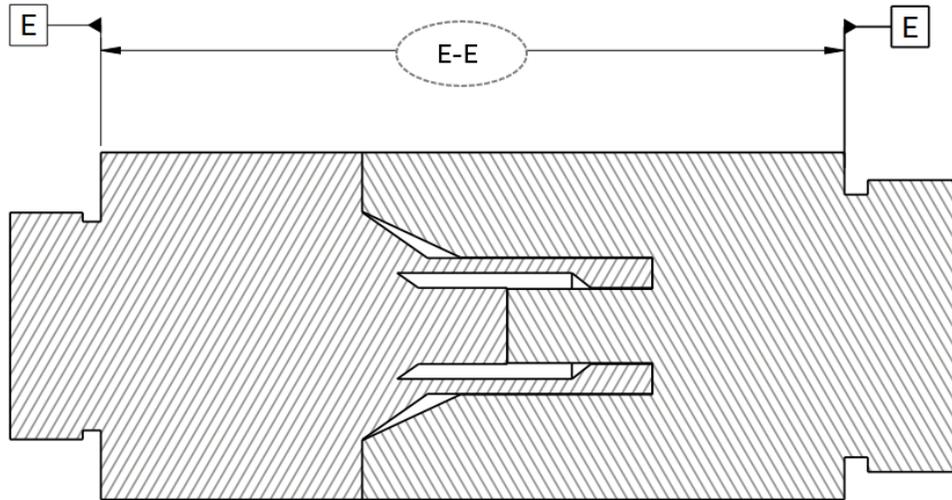


Figure 2 UQDB Coupling Panel to Panel Distance

Table 1 UQDB Panel-Panel Distance

Size	E-E Nominal Panel-Panel Distance (mm)
UQDB02	36.4
UQDB04	44.6
UQDB06	48.1
UQDB08	52.1

3. Feature & Dimensional Requirements

Physical features of the socket shall conform to the dimensions shown in Figure 3 UQDB Socket Dimensions and given in Table 3 UQDB Socket Dimensional Specification. Physical features of the plug shall conform to the dimensions shown in Figure 4 UQD Plug Dimensions and given by Table 4 UQDB 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.

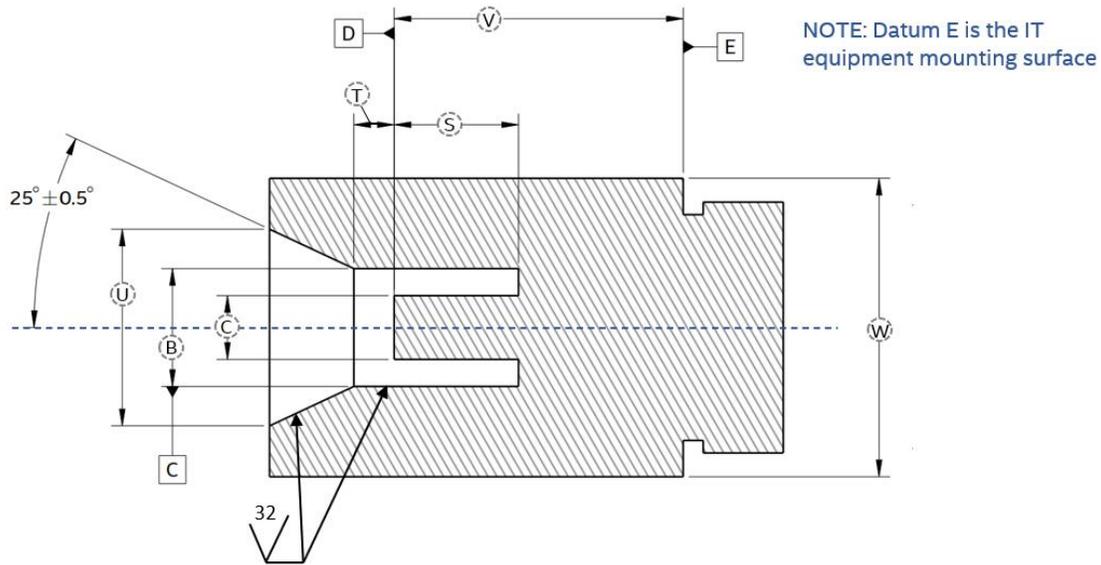


Figure 3 UQDB Socket Dimensions

Table 3 UQDB Socket Dimensional Specification

	Size	B	C	T	U	V	W	S
	Tolerance Value	±0.025	±0.025	±0.1	±0.1	±0.1	MAX	REF
UQD Size	UQDB02	Ø6.71	Ø3.63	2.3	11.2	16.5	21.4	7.1
	UQDB04	Ø11.15	Ø7.14	3.7	16.0	19.6	25.4	10.4
	UQDB06	Ø14.38	Ø9.47	4.4	19.0	22.4	28.4	13.2
	UQDB08	Ø17.56	Ø10.75	5.6	22.0	25.2	31.4	16.0

Dimensions are in millimeters.

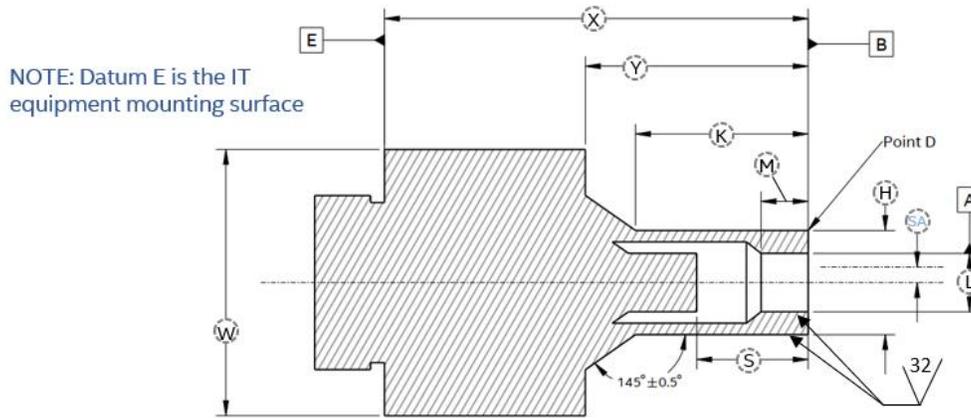


Figure 4 UQD Plug Dimensions

Table 4 UQDB Plug Dimensional Specification

	Size	H	K	L	M	X	Y**	W***	S	SA*
	Tolerance Value	±0.025	±0.30	±0.025	MAX	±0.10	MIN	MAX	REF	+0.30 -0.00
UQD Size	UQDB02	Ø6.65	11.0	Ø3.73	3.0	27.0	14.2	21.4	7.1	1.0
	UQDB04	Ø11.07	16.1	Ø7.24	4.0	35.4	19.3	25.4	10.4	1.0
	UQDB06	Ø14.3	19.6	Ø9.75	5.0	38.9	22.8	28.4	13.2	1.0
	UQDB08	Ø17.48	23.6	Ø11.17	6.0	42.9	26.8	31.4	16.0	1.0

Dimensions are in millimeters.

* SA = Self Alignment. Shall be incorporated into the connector housing the dimension specified is a radial allowance.

** Dimension is to the Keep-Out-Zone (KOZ) which is a volume bounded by the datum B, the features defined by dimensions H and K, the 145-degree angle and the dimension V and extends radially outward from the cylindrical plug to cylindrical keep in volume bounded by dimension W.

Datum E. This surface is the mating surface to the chassis datum and controls the location of the mounting surface relative to Datum B so that IT equipment can be designed to accept UQDB by using the following equation to calculate the nominal fully engaged distance between mating surface: : $X(\text{Plug}) + V(\text{socket}) - S = \text{nominal distance}$

*** The drawing above does not show the minimum required diameter for the termination seal defined in ISO 11926-3 and ISO 11926-1 supplier is responsible to define the geometry for the termination features

In the ball contact surface area, identified in Figure 4 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 straight thread o-ring boss (ORB) termination on the socket and plug shall be available in the sizes described in Table 5 UQD Terminations.

Table 5 UQD Terminations

Size	Plug	Socket
UQD02	Straight, O-Ring Boss, Stud End -04 PER ISO 11926-3 to mate with port per ISO 11926-1 -4	Straight, O-Ring Boss, Stud End -06 PER ISO 11926-3 to mate with port per ISO 11926-1-6
UQD04	Straight, O-Ring Boss, Stud End -06 PER ISO 11926-3 to mate with port per ISO 11926-1 -6	Straight, O-Ring Boss, Stud End -08 PER ISO 11926-3 to mate with port per ISO 11926-1-8
UQD06	Straight, O-Ring Boss, Stud End -08 PER ISO 11926-3 to mate with port per ISO 11926-1 -8	Straight, O-Ring Boss, Stud End -10 PER ISO 11926-3 to mate with port per ISO 11926-1-10
UQD08	Straight, O-Ring Boss, Stud End -10 PER ISO 11926-3 to mate with port per ISO 11926-1 -10	Straight, O-Ring Boss, Stud End -12 PER ISO 11926-3 to mate with port per ISO 11926-1-12

Terminations shall meet the operating and burst pressure performance requirements specified in this document.

3.2 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

Parameter	Requirement	Priority
Maximum coupling force	Supplier to publish coupling force versus pressure	Required

Table 6:

Ergonomic Requirements

Parameter	Requirement	Priority
Maximum coupling force	Supplier to publish coupling force versus pressure	Required

Table 7: Coupling Force

Size	Maximum Coupling force @ Zero Pressure	Coupling force @ Pressure
UQDB02	< 12 lbf	Supplier to publish coupling force versus pressure
UQDB04	< 14 lbf	Supplier to publish coupling force versus pressure
UQDB06	< 15 lbf	Supplier to publish coupling force versus pressure
UQDB08	< 16 lbf	Supplier to publish coupling force versus pressure

4.2 Shelf & Service Life Requirements

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

Table 8 Life Requirements

Parameter	Requirement	Priority
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Shelf Life ¹	5 years	Required
Service Life ²	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 5000th cycle and at end of service life required in Table 8

4.4 Fluid Loss Requirements

The fluid loss per couple and decouple shall meet or exceed the performance requirements given in Table 9 Fluid Loss Requirement. Fluid loss requirements to be measured with water as the fluid medium.

Table 9 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

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

² 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.

4.5 Flow Rate, Pressure and Temperature Requirements

Table 10 Flow and Temperature Requirements

Parameter	UQDB02	UQDB04	UQDB06	UQDB08	Priority
Maximum operating pressure	100 psi				Required
Minimum burst pressure	300 psi				Required
Minimum Cv ³ at minimum engagement	0.25	0.80	1.55	2.40	Required
Flow Rating ⁴	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 ⁵	17°C - 65°C				Required
Shipping temperature range ⁶	-40°C – 75°C				Required

³ Cv are reported for water.

⁴ Flow rating is for water.

⁵ 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.

⁶ Shipping may include charged systems.

5. Marking Requirements

Identification as UQD and nominal size are required per Table 11 Marking Requirements. Marking can be positioned per manufacturer’s discretion on any visual external surface of the plug and socket.

Table 11 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 UQDB02 UQDB04 UQDB06 UQDB08	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 Blind-Mate (UQDB) Specification rev 1.0”

6. Wetted Materials

Supplier to ensure materials used in the construction of UQDB are compatible with end user cooling loop fluid.

7. Safety and Regulatory Requirements

In order for systems to comply with end-product Information Communication and Technology (ICT) equipment safety standards, liquid filled component (LFC) component manufacturers need to ensure parts are compliant with IEC 62386-1:2018 (or later) standard, clause G.15.

8. Acknowledgements

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