



## Pressure Resistance Definitions

### I. **Scope**

This document establishes the BIRNS definitions of degrees of withstanding of hydrostatic pressure by underwater electrical connectors.

### II. **Background**

There is no general agreement in the deep-submergence field on definitions relating to withstanding of hydrostatic pressure by underwater electrical connectors. Various terms are freely used, for example "water-blocked" and "waterproof", yet there is no definition or explanation of what is precisely meant.

Further, certifying authorities' independent standards typically do not extend to deep-submergence applications. For example, the International Electrotechnical Commission Standard IEC 529 ("Degrees of protection provided by enclosures"), also known as the "IP Code", does not adequately define protection under these conditions<sup>1</sup>.

Finally, designers and manufacturers of underwater connectors frequently rate their connectors to a certain pressure, or claim that the connectors are "water-blocked" (without specifying what that means), without verification of the results by documented testing. This is particularly so in the case of old designs, where pressure ratings are accepted without challenge, and the original design rationales are lost; assumptions that the designers "knew what they were doing" or that the designs are "proven in service" are often prevalent.

Therefore, in the absence of standardized definitions, BIRNS has unilaterally defined the following terms and codes of degrees of withstanding of hydrostatic pressure by underwater electrical connectors.

(<sup>1</sup>The IP Code describes the second characteristic numeral of '8' as "Protected against the effects of continuous immersion in water", defined by IEC as "Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7.")



### III. Definitions

#### A. Mating Conditions

1. "Mated"

Means the connector pair is fully and properly mated in accordance with the manufacturer's instructions.

2. "Open-face"

Means the connector pair is not mated at all; alternatively, for some reason full ambient water pressure is freely in direct contact on the mating portion of the connector which, under normal conditions, would be sealed or otherwise protected from ambient pressure.

#### B. Protection Terms

1. "Resist" - Means to take a stand against, to exert effort in opposition, but not necessarily to be successful in repelling an attack.

2. "Withstand"- Means to successfully resist an attack.

3. "Proof" -Means to be firm or successful in resisting or repelling and attack, or to be impervious to it.

#### C. Classes of Protection

1. Class A

- Definition:

- Withstands open-face pressure (i.e. no water ingress) to specified pressure or depth, without measurable degradation in any mechanical or electrical properties.



- Terminology:
  - "Pressure-proof to xxx MSW"
- Symbol: "WPA"

## 2. Class B

- Definition:
  - Prevents any water ingress while subjected to specified open-face pressure, but suffers measurable degradation in one or more mechanical and/or electrical properties.
- Terminology:
  - "Pressure-resistant to xxx meters".
- Symbol: "RPB"

## 3. Class C

- Definition:
  - Does not prevent water ingress when subjected to open-face pressure. (However, it does withstand pressure while fully and properly mated, without any measurable degradation in any mechanical or electrical properties.)
- Terminology:
  - "Not pressure resistant."
- Symbol: "XPC"

## D. Not rated (as an underwater connector)

- A connector that does not withstand pressure (i.e. it permits water ingress or suffers measurable degradation in one or more mechanical or electrical properties), even while fully and properly mated, is not an underwater connector. It should not be used underwater in normal operations.