FACT SHEET

# INGRESS PROTECTION (IP-CODE) FAQs

Answers to some of your most frequently asked questions

**If your product is expected to withstand elements such as rain, snow, dust, or offer protection against other foreign elements an Ingress Protection (IP) test should be part of your plan to go to market. This FAQ sheet offers details on the different types of IP testing, what the codes mean, and more helpful information.**

### 1. What is it?

An Ingress Protection (IP) rating system is used to indicate the degree of protection provided by an enclosure against access, foreign objects and/or water and to give additional information in connection with such parts.

Standardized IP test methods provide guidelines on how to verify the protection provided by an enclosure against access, foreign objects and/or water.

### 2. What are common standards that relate to Ingress Protection?

International Electrotechnical Commission's IEC 60529 "Degrees of protection provided by enclosures (IP Code)", and International Organization for Standardization's ISO 20653 "Road vehicles — Degrees of protection (IP-Code) — Protection of electrical equipment against foreign objects, water and access" are the two most referenced IP standards tested at Intertek Grand Rapids and Plymouth, MI.

### 3. What are the differences between ISO 20653 and IEC 60529?

ISO 20653 was adopted from IEC 60529 specifically for enclosures of electrical equipment of road vehicles while IEC 60529 is, in general, for enclosures for electrical equipment with a rated voltage not exceeding 72,5 kV.

The IP-codes used in ISO 20653 are generally like IEC 60529 with some exceptions. ISO 20653 introduces IP codes for road vehicles that are not cited in IEC 60529. The IP codes unique to ISO 20653 includes the degrees of protection against access and foreign objects; "5K" and "6K", and degrees of protection against water; 4K and 6K.

Recently IEC 60529 added the degrees of protection against water IP code of "9" for "small enclosures" that is similar to the test conditions of ISO 20653 IP code of "9K". The IEC 60529 IP code "9" distinguishes between "small enclosures" (with the largest dimension less than 250 mm), and large enclosures; and a variation of the test conditions is applicable based on the enclosure dimensions.

Currently, ISO 20653 does not make any accommodations for IP code "9K" based on the enclosure dimensions potentially resulting in challenges with conducting the test on large road vehicle enclosures with non-symmetrical dimensions. Even with the many similarities between the ISO 20653 and IEC 60529 IP codes, the variations that exist warrants a thorough review of the most recent edition of each standard including any published corrigenda.

### 4. What is the value or purpose of Ingress Protection Testing?

IP testing provides an opportunity to standardize evaluations of an enclosure's resistance to various operating environments that may include the presence of water, dust, loose solid objects, and human contact.

### 5. What are the Categories of Tests?

Both ISO 20653 and IEC 60529 have designation codes for the protection against access to hazardous parts, the protection against solid foreign objects, and protection against ingress of water.

# INGRESS PROTECTION (IP CODE) FAQ

### 6. What do the codes mean?

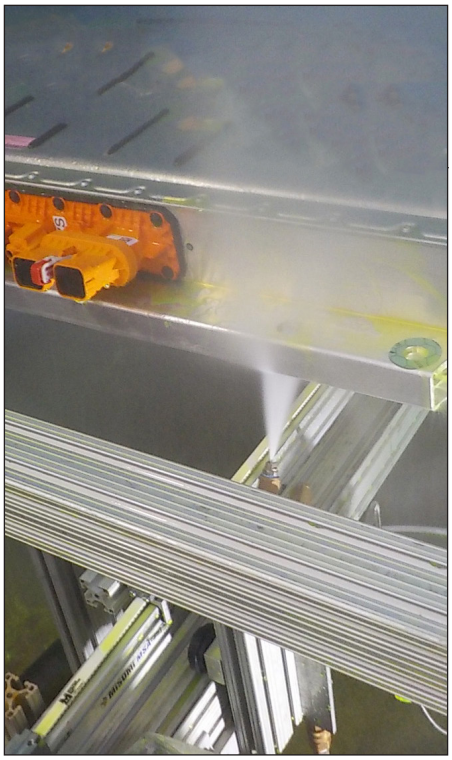
IP codes are identified in tables provided in ISO 20653 and IEC 60529. The IP codes begin with an identification of the requirements for protection against access and foreign objects followed by the requirements for protection against water. The IP code may conclude with optional letters that may indicate additional or supplementary requirements. In general, the structure of the IP codes includes the following:

- The code is prefixed with the letters "IP".
- First numeral ranging from 0 to 6, or letter X) indicating the Degrees of protection against access to hazardous parts and Degrees of protection against solid foreign objects. The letter "X" in place of the numerals ranging from 0 to 6 would indicate that the requirements are not defined. ISO 20653 may also include the letter "K" following the numeral "5" or "6".
- Second numeral ranging from (numerals 0 to 9, or letter X) indicating the Degrees of protection against ingress of water. The letter "X" in place of the numerals ranging from 0 to 9 would indicate that the requirements are not defined. ISO 20653 may also include the letter "K" following the numeral "4", "6", and "9".
- Additional letter (optional) (letters A, B, C, D) – Degrees of protection against access to hazardous parts. These additional letters are defined in IEC 60529.
- Supplementary letter (optional) (letters H, M, S, W for IEC 60529, M and S for ISO 20653). These supplementary letters are defined in the respective standards.

### 7. The first IP code numeral lists two test methodologies for the same degree of protection. Do I need to perform both tests?

Yes, the first IP code numeral is used to show conformance to the corresponding designation for both the protection against foreign objects as well as protection against access.

Tables are provided in ISO 20653 and IEC 60529 that indicate the tests associated with the protection against foreign objects and an independent set of tables provide the tests required for protection against access. Some of the numerical codes have similar test strategies for both the protection against foreign objects and protection against access; however, there some variations that must be addressed to ensure that all the relevant



test conditions are executed and meet all the criteria associated with the first IP code numeral. There may be enclosures that do not meet both the protection against foreign objects and protection against access for a first IP code numeral. ISO 20653 and IEC 60529 provide the opportunity to classify an enclosure's protection against access with an "additional letter". The "additional letter" will indicate the test that is to be conducted to verify compliance.

In all cases, the enclosure needs to show conformity to both the protection against foreign objects and protection against access unless an "X" is stated in place of the first IP numeral.

### 8. Do I have to test to all codes?

For the first IP code numeral, an enclosure shall only be designated with a stated degree of protection if it also complies with all lower degrees of protection. The tests establishing compliance with any one of the lower degrees of protection may not have to be carried out provided that these tests would obviously be met if applied. For the second IP code numeral related to the degrees of protection against water; up to and including 6 (or 6K), the numeral designation implies compliance with all lower numerals; however, IEC 60529 prompts a judgment indicating that compliance with any one of the lower degrees of protection may not have to be carried out provided that these tests would obviously be met if applied.

For the second IP code numerals 7, 8, 9 (and 9K); due to different physical effects from the tests, compliance to lower designations does not apply automatically and a lower degree of protection may be required using a separate IP code designation.

### 9. Which code should I choose?

To determine which level of protection is relevant for your products an assessment should be made of the operating environment. ISO 20653 and IEC 60529 provide standardized test methods for evaluating the resistance to a diverse range of environments and conditions to define its requirements for the quote.

### 10. What samples need to be submitted?

Any sample that has a part providing protection of equipment against certain external influences and, in any direction, protection against direct contact.


**FOR MORE INFORMATION**

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