

QUICK GUIDE to IP RATINGS

Understanding ingress protection, choosing the right enclosure, and preserving its protection during installation

What does IP mean?

IP stands for **International Protection** and is commonly referred to as **Ingress Protection**. The rating system classifies the protection provided by electrical enclosures against contact/solid objects and harmful ingress of water. The source material identifies EN 60529 as the relevant standard.

How to read an IP code

An IP code normally contains the letters **IP** followed by two numerals. For example, in **IP56**, the first digit describes protection against access to dangerous parts and solid foreign bodies; the second digit describes protection against harmful water ingress. An **X** can replace a numeral when that aspect is not applicable or not required.

IP	5	6
Protection code	First digit: solids / contact	Second digit: water

Important: IP ratings describe ingress protection. The supplied material notes that the tests are comparative and use fresh water; they do not by themselves demonstrate resistance to salt water, chemicals, acid rain, UV exposure or corrosion.

First digit - protection from contact and solid objects

Digit	Protection level	Test / practical meaning
0	No contact or solid-object protection	No specified protection.
1	Large-area contact; objects > 50 mm	A 50 mm sphere must not fully penetrate.
2	Finger contact; objects > 12 mm	A 12.5 mm sphere must not fully penetrate.
3	Tools/wires; objects > 2.5 mm	A 2.5 mm sphere must not penetrate.
4	Tools/wires; objects > 1 mm	A 1.0 mm sphere must not penetrate.
5	Dust protected	Dust is not totally excluded, but must not enter in a quantity that interferes with satisfactory operation.
6	Dust tight	No penetration of dust.

The source material also gives an example of **IP4X**: protection against the 1.0 mm probe is required, while no water-protection requirement is specified.

Second digit - protection from water

Digit	Protection level	Definition / test concept
0	No protection	No specified water protection.
1	Vertically falling dripping water	Vertical drops shall have no harmful effects.
2	Dripping water with enclosure tilted up to 15°	Vertical drops shall have no harmful effects when tilted up to 15° either side of vertical.
3	Falling spray up to 60° from vertical	Sprayed water up to 60° either side of vertical shall have no harmful effects.
4	Splashing water from all directions	Splashing from any direction shall have no harmful effects.
5	Water jets from all directions	A water jet directed at the enclosure shall have no harmful effects.
6	Powerful / heavy water jets	Powerful jets from every direction shall have no harmful effects.
7	Temporary immersion	Temporary immersion must not allow harmful quantities of water to enter.
8	Long-term / continuous immersion	Continuous immersion must not allow harmful quantities of water to enter.
9	High-pressure, high-temperature water	Powerful high-pressure/hot water jets shall have no harmful effects.

Note on IP68/IP69: the supplied articles describe IP68 as a high level of dust and immersion protection and discuss specialised protection against high-pressure, high-temperature water. Exact immersion depth/time and test conditions should be checked against the product manufacturer's declaration and the applicable standard.

Choosing the right IP rating

A higher IP number is not automatically the best specification. The source material warns that over-specifying an enclosure can increase cost and may be less suitable where ventilation, pressure compensation or drainage is needed. The enclosure should be selected around the actual installation environment and operating needs.

1. Identify the exposure

Consider dust/particles, dripping or splashing water, water jets, immersion, humidity and temperature changes.

2. Consider heat and condensation

Ventilation can help enclosed equipment operate within its intended performance range. Louvres, vents, pressure compensation and drainage can also help manage condensation, but openings may affect the IP rating.

3. Check the material

Ingress protection is not the same as corrosion or chemical resistance. Consider salt, chemicals, acids and UV exposure separately and consult material data where the environment is hostile.

4. Plan cable entries

Every cable entry can compromise the enclosure's designed-in protection. Use an entry sealing method suitable for the required IP level and environment.

5. Think about maintenance

Gel-filled solutions can provide strong internal protection but can make later access and maintenance slower because the gel must be disturbed and replaced.

How IP protection can be achieved

The supplied technical article highlights several design approaches: integrated or separate lid seals, screw-fixed lids that compress seals, push-click closures for less demanding ratings, gel filling for some IP68 applications, and carefully designed knock-outs or customised entry points. Different products can achieve the same nominal IP rating in different ways, affecting cost, installation time, serviceability and longevity.

Installation: protect the rating you specified

Specifying the correct enclosure is only part of the job. Installation details can create new paths for water or dust and undermine the intended protection.

Avoid	Why it matters
Top-side cable entries on outdoor enclosures	Water can collect around the seal and may be drawn in as temperature changes cause expansion and contraction.
Screwing signs or caution labels through the lid	Perforating the enclosure creates a direct ingress path.
Ignoring humidity / temperature differentials	Where appropriate, breather valves or pressure-management measures may help reduce condensation risk.
Fixing through the back panel without suitable sealing	Fasteners can compromise the protected internal space; use the enclosure's intended mounting method or suitable sealing provisions.
Allowing loose gaskets to move or fold	A displaced seal can prevent the lid from sealing correctly.

Quick specification checklist

What solids/dust are present? • What form of water exposure is realistic? • Will the enclosure be immersed? • Is condensation likely? • Does the material suit chemicals, corrosion and UV? • How will cables enter? • How will it be mounted? • Will routine access or maintenance be needed?