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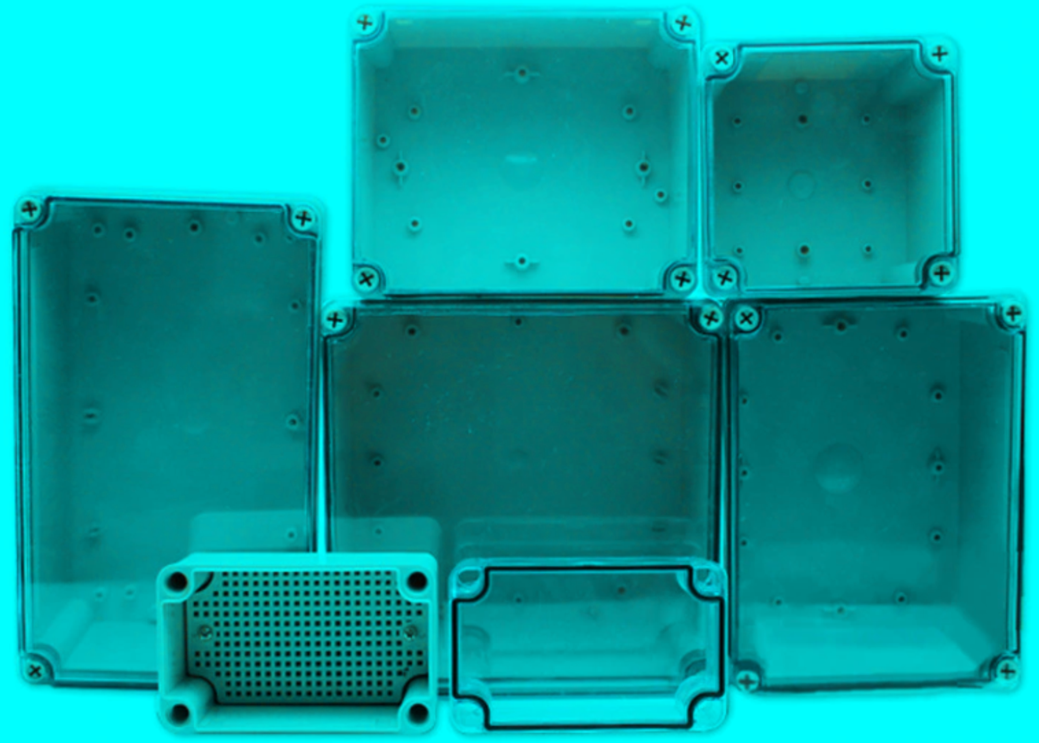
LORA / LORAWAN TUTORIAL 50

Enclosures & IP Rating



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INTRO

- In this tutorial I will explain the different types of enclosures and what IP ratings are.
- This subject is not specific LoRa or LoRaWAN related but I find it interesting enough to make a tutorial.

ENCLOSURES

- Your electronic project can be put inside an enclosure.

- These enclosures are called:
  - project boxes,
  - PVC boxes (PVC = Poly Vinyl Chloride),
  - ABS boxes (ABS = Acrylonitrile Butadiene Styrene)
  - plastic boxes,
  - electronic boxes,
  - etc…

- These enclosures are made of plastic or a metal.

- When plastic is used, it is often ABS or PVC.

ENCLOSURES

- ABS is always black and PVC is white or grey.
  ABS and PVC can be used above or below the ground, but ABS is more likely to deform when exposed to the sun.
  Both plastics are resistant to chemical and water degradation.

- ABS is highly durable with high impact strength.
  PVC is less durable, it is flexible and softer than usual plastics.

- For metal enclosures often steel, stainless steel or aluminium is used.

- LoRaWAN outdoor gateways often uses PVC or die cast aluminium enclosures.
  Die casting is a metal casting process where molten metal, under high pressure, is forced into a mould cavity.

ENCLOSURES

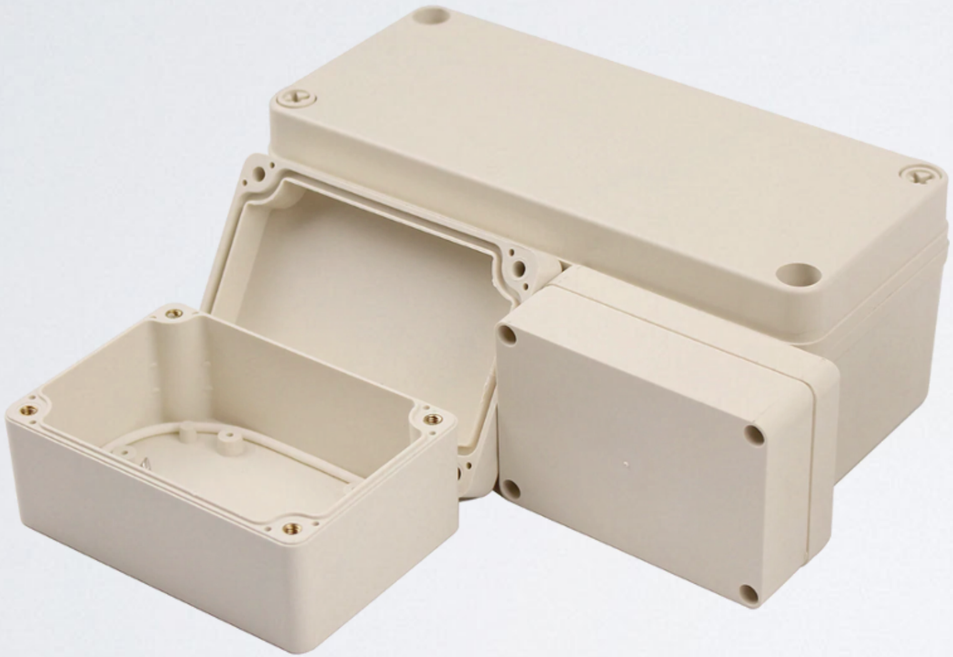
- There is no international standard for these enclosures.
  If you have a 3D printer you can print your own enclosure or you can just buy one.

- Enclosures have:
  - no mounting possibilities or
  - have some slots to slide appropriately sized PCBs or
  - have built-in standoffs to attach the PCB using self-tapping screws.

- If there are no mounting possibilities, drill holes in the enclosure and attach the PCB to the enclosure with screws and standoffs.

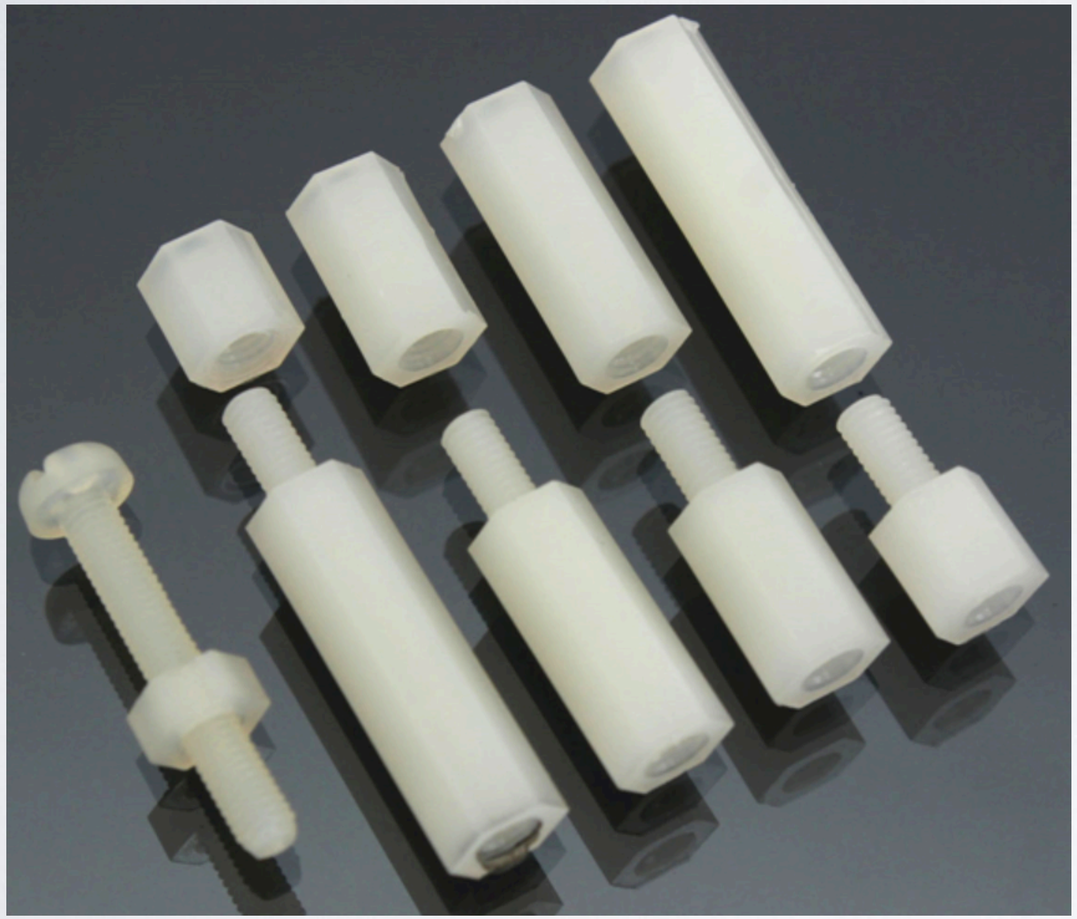
ENCLOSURES

- Example: PVC enclosures



ENCLOSURES

- Example: Nylon screws, nuts and standoffs to attach the PCB to the enclosure.



IP RATING

- IP (Ingress Protection) ratings defines level of sealing effectiveness of electrical enclosures against intrusion from solids (hand, tool, dirt, etc.) and water.

- IP ratings are defined in the International Standard EN 60529.

- The IP rating consists of two numbers. The first number specifies the level of protection against solids, the second number specifies the level of protection against water, for example IP67.

IP RATING SOLIDS PROTECTION LEVEL

1st Digit	Description
X	Not assessed/tested for solid protection.
0	No solids protection
1	Protected against a solid object greater than 50 mm such as a hand.
2	Protected against a solid object greater than 12.5 mm such as a finger.
3	Protected against a solid object greater than 2.5 mm such as a screwdriver.
4	Protected against a solid object greater than 1 mm such as a wire.
5	Dust protected. Limited ingress of dust permitted. Dust must not enter in sufficient quantity to interfere with the satisfactory operation of the equipment.
6	Dust tight. No ingress of dust. A vacuum must be applied. Test duration of up to 8 hours based on air flow.

IP RATING WATER PROTECTION LEVEL

2nd Digit	Description
X	Not assessed/tested for water protection.
0	No water protection
1	Protected against vertically falling drops of water. Limited ingress permitted.
2	Protected against vertically falling drops of water with enclosure tilted up to 15° from the vertical. Limited ingress permitted.
3	Protected against spays of water up to 60° from the vertical. Limited ingress permitted for 3 minutes.
4	Protected against water splashes from all directions. Limited ingress permitted.
5	Protected against low pressure jets of water from all directions (hose pipes). Limited ingress permitted.
6	Protected against high pressure jets of water from all directions or heavy seas.
7	Protection against the effects of immersion in water between 15 cm and 1 m for 30 minutes.
8	Protection against complete continuous submersion in water beyond 1 m.
9	Protection against high pressure temperature water jet from all directions.

IP RATING

- IP ratings are assessed in lab conditions, which means they can't always account for real-life situations.

- Some manufacturers err on the side of caution and will not highlight a product's IP rating or will understate the level of protection.

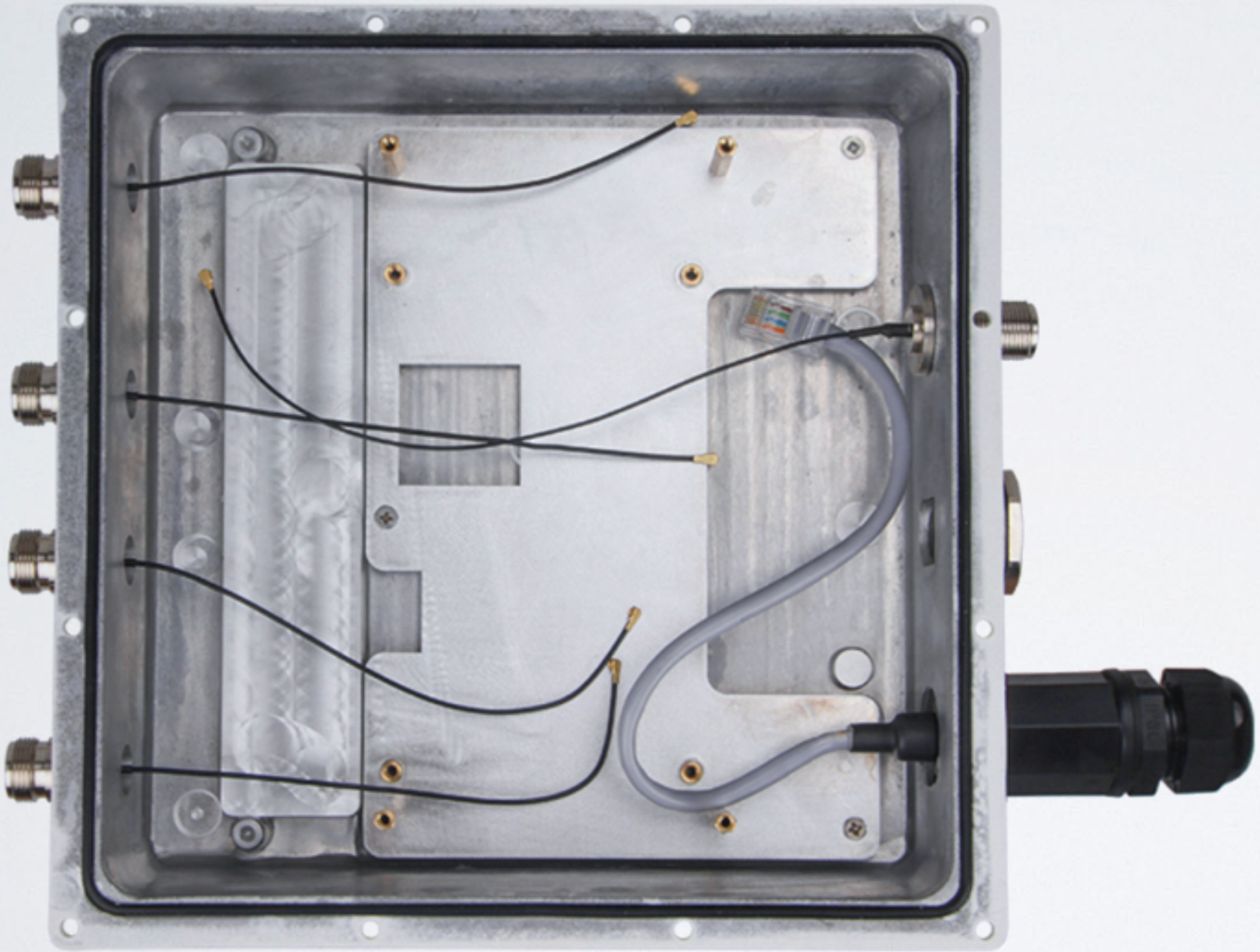
IP RATING

- Example: RakWireless outdoor gateway enclosure - 5x N-type antenna connectors
  https://store.rakwireless.com/products/outdoor-gateway-enclosure

Enclosure: **IP67**

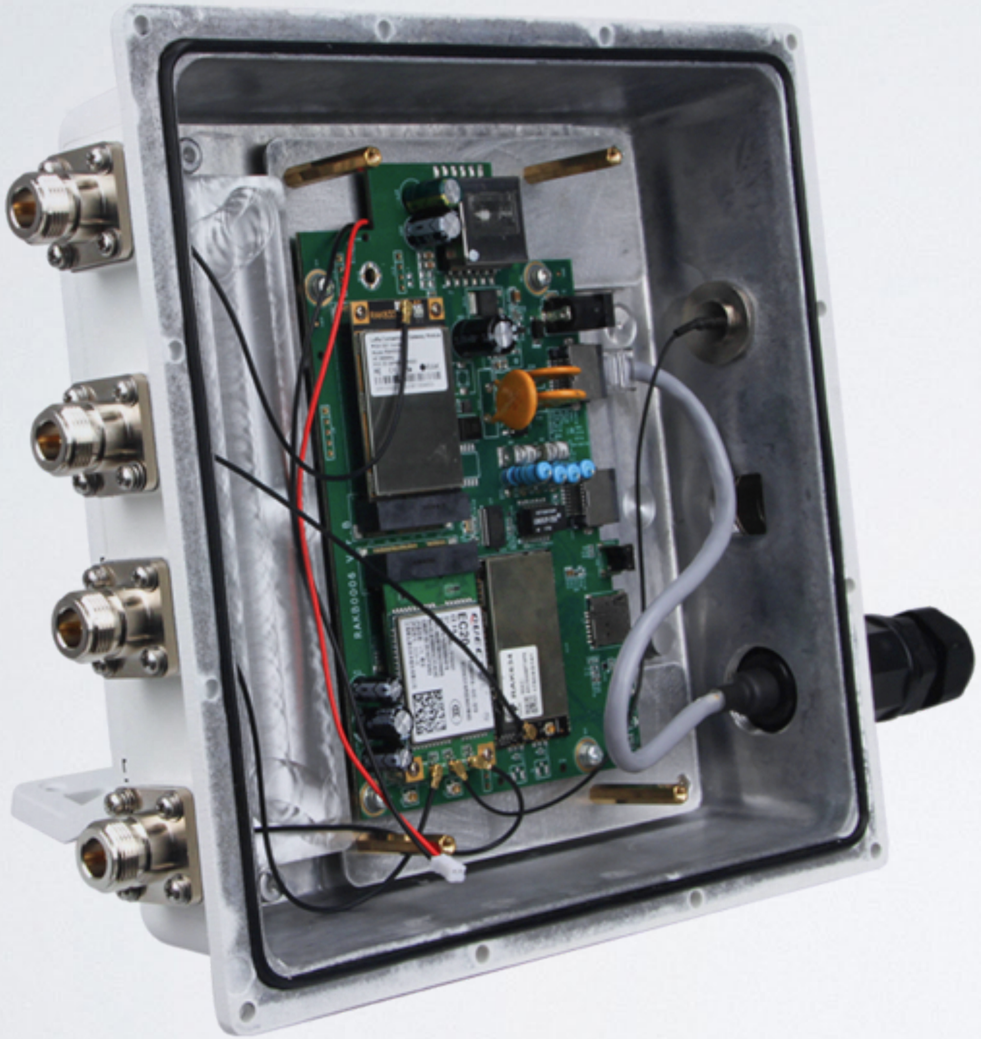
This gateway is dust tight (**6**) and protected against the effects of immersion in water between 15 cm and 1 m for 30 minutes (**7**).

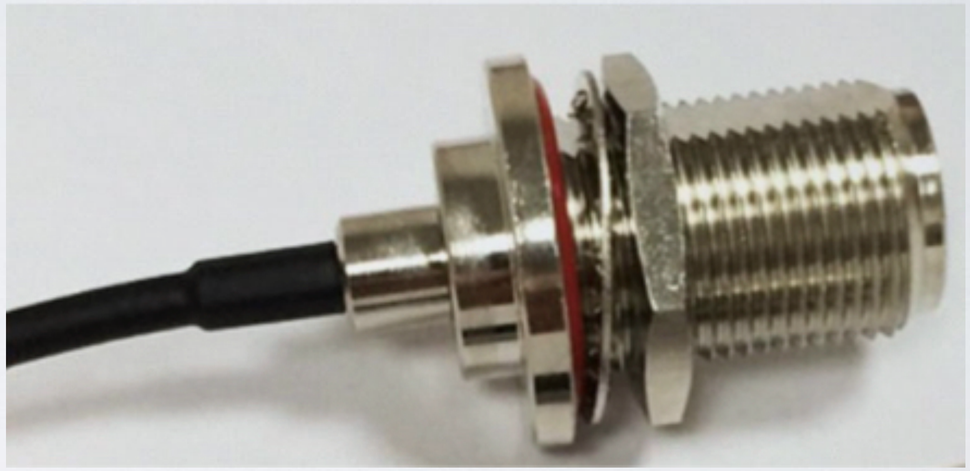
IP RATING



Photo's by courtesy of RakWireless

IP RATING

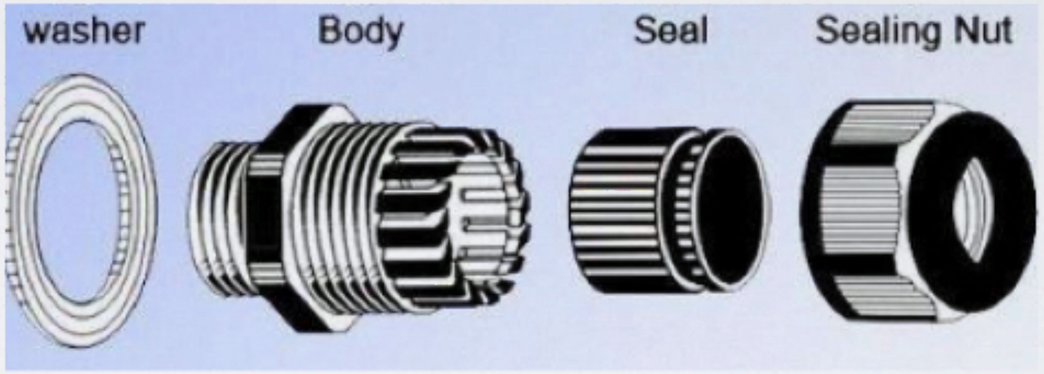




Photo's by courtesy of RakWireless

IP RATING

The tail of the body has claws, which can compress the Seal.



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