



Ingeteam

Ingecon[®] μWind Interface

Installation manual



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This document may be changed.

Important safety precautions

This manual contains important instructions for the installation, handling and use of the Ingecon® μ Wind Interface (also termed IWI in this manual).

This manual should be read carefully before use and properly retained for future reference.

General warnings



The operations detailed in this manual may only be performed by suitably qualified personnel.

Qualified personnel, as referred to in this manual, means personnel who at least meet the requirements of all safety standards, rules, regulations, and legislation applicable to the equipment installation and operating tasks.

The responsibility for appointing qualified personnel shall always fall to the company at which the said personnel is employed. This company must decide which worker is suitable for each specific task, in order to ensure worker safety and comply with all occupational safety legislation.

The said companies are responsible for providing their personnel with adequate training in work with electrical equipment and for ensuring that such personnel is familiar with the contents of this manual.



You are reminded that it is mandatory to comply with all applicable safety legislation for electrical work. There is an electrical discharge hazard.

Compliance with the safety instructions set out herein or with the suggested legislation, is not an exemption for compliance with other standards and regulations specific to the installation, place, country or other circumstances affecting the inverter.



The opening of the enclosure does not mean that no voltage is present inside.

There is an electrical discharge hazard, even after having disconnected from the mains, the wind turbine and the auxiliary power supplies.

Only qualified personnel are permitted to open the enclosure, following the instructions provided in this manual.



It is mandatory to read and understand this entire manual before manipulating, installing or operating this equipment.



The basic country-specific safety regulations are as follows:

- *RD 614/2001* in Spain.
- *CEI 11-27* in Italy.
- *DIN VDE 0105-100* and *DIN VDE 1000-10* in Germany.
- *UTE C15-400* in France.



To check that no voltage is present, it is mandatory to use class III - 1000 Volt measuring devices.

Ingeteam assumes no liability for any damage caused by the improper use of its equipment.



When performing any operating or manipulation task, first ensure that no voltage is present.

As a minimum safety measure for this operation, the **5 Golden Rules** must be followed:

1. Disconnect.
2. Prevent any possible re-connection.
3. Check that no voltage is present.
4. Ground and short-circuit.
5. Protect against nearby live equipment, where appropriate, and place safety warning signs to demarcate the work area.

Non-live work cannot be authorised until all five steps have been completed. Therefore, any work prior to compliance with these steps shall be considered to be work on live parts.

Potential hazards for people

The following warnings should be taken into account, in order to protect your safety.



DANGER: Electric shock.

The equipment may still carry a charge even after disconnecting it from the wind turbine and power supply.

Strictly follow the mandatory voltage disconnection steps contained in this manual.



DANGER: Crushing and joint injuries.

Always follow the instructions contained in the manual when moving and positioning the equipment.



DANGER: High temperatures.

The airflow through the upper outlets can reach high temperatures which could cause injuries to anyone exposed to this hot air.

The equipment rear functions as a heat sink. Do not touch, there is a burn hazard.

Potential hazards for the equipment

In order to protect the equipment, the following warnings should be heeded.



CAUTION: Ventilation.

The equipment requires a good quality airflow during operation.

It is essential to keep the unit upright and not to obstruct the air inlets, in order to ensure that the equipment interior is well ventilated.



CAUTION: Connections.

Following any duly authorised manipulation work, before reconnection, check that the equipment is ready to start operating. Only then should the equipment be connected, following the instructions contained in the manual.



Do not touch the electronic boards or components. The more sensitive components could be damaged or destroyed by static electricity.



Do not disconnect or connect any terminals whilst the equipment is operating. You must first disconnect the equipment and check for the absence of voltage.

Personal Protection Equipment (PPE)

Use all the items comprising the protective equipment.

Chapter “4. Safety instructions” refers to the use of these items, depending on circumstances.



The personal protection equipment comprises:

- Safety glasses to protect against mechanical hazards.
- Safety glasses to protect against electrical hazards.
- Safety footwear.
- Helmet

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1. Overview

1.1. Introduction

This manual aims to describe the Ingecon® μ Wind Interface (IWI) and provide adequate guidelines for correct reception, installation, commissioning, maintenance and operation.

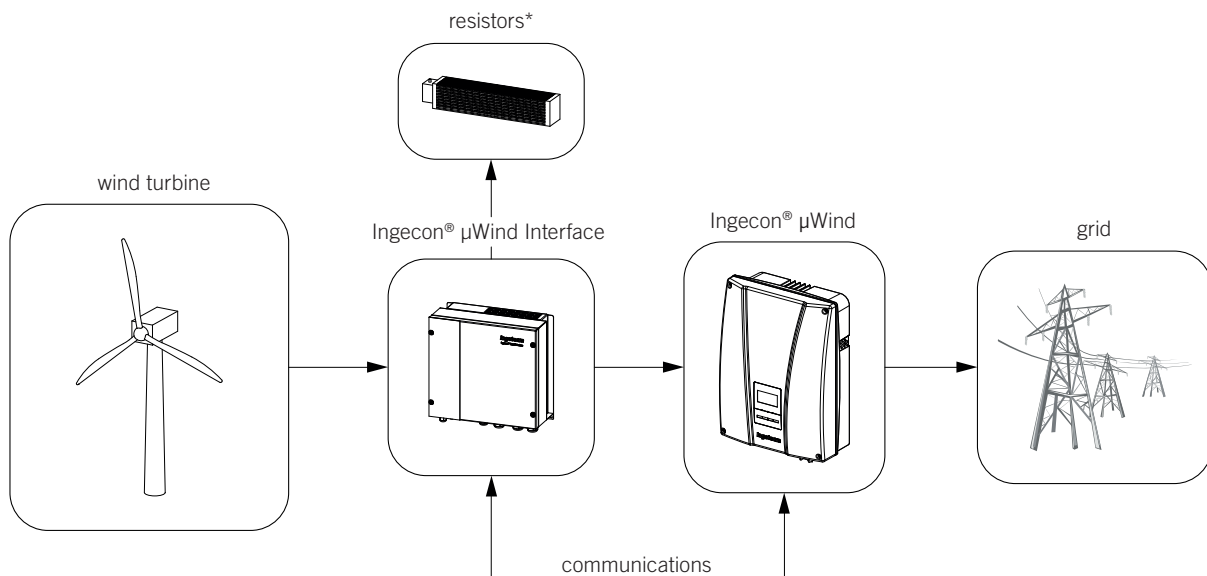
1.2. Equipment description

The Ingecon® μ Wind Interface has been designed to work together with the Ingecon® μ Wind inverters in the control and conversion of the energy generated by the wind turbine.

This equipment offers the following functions:

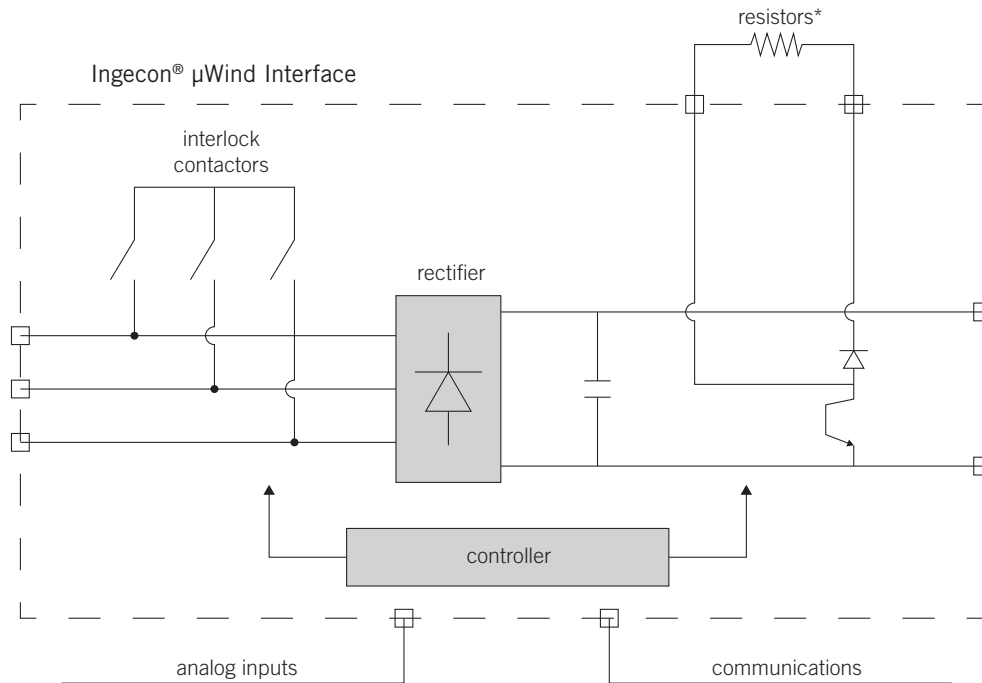
- Perform the AC-DC conversion, by adapting the AC voltage generated by the wind turbine to the Ingecon® μ Wind DC voltage input.
- Protect the system against an excessive rotational speed and over voltages and also to limit the power intake when the wind turbine is operating in conditions with strong winds.
- Stop the wind turbine.
- Remote control of the installation and to monitor additional wind farm variables.

In addition to the capability of performing the AC-DC conversion, the Ingecon® μ Wind Interfaces also offer the possibility of connecting wind turbines with a DC output voltage. In this case, the protection, monitoring and remote control functionalities can still be used.



* resistors are not included with the equipment.

1.2.1. Functional diagram of the equipment



* resistors are not included with the equipment.

1.2.2. Options

For special applications, the Ingecon® μWind Interface features two digital opto-isolated inputs for voltages of 0 ~ 24V. In addition to two potential free contacts that can be used as digital communication outputs or as a system to activate the auxiliary braking systems or Pitch control system.

Optionally, it can access the Ingecon® Manager software to monitor system configuration, variables, and remote control.

1.3. Compliance with standards and regulations

The Ingecon® μWind Interface models can be fitted with kits to adapt them to the standards and regulations in all European countries and also those in force in other continents.

1.3.1. CE Marking

The CE marking is essential for marketing any product in the European Union, without prejudice to all applicable standards and regulations. The Ingecon® μWind Interface models bear the CE Marking through compliance with the following directives:

- Low Voltage Directive *2006/95/EC*
- Electromagnetic Compatibility Directive *2004/108/EC*

Low Voltage Directive

The Ingecon® μWind Interface models are sufficiently compliant with this directive by compliance with the applicable parts of harmonised standard *EN 50178 Electronic for use in power installations*.

Electromagnetic Compatibility Directive

The Ingecon® μWind Interface models are sufficiently compliant with this directive by compliance with the applicable parts of the following harmonised standards:

- *EN 61000-6-2 Electromagnetic Compatibility. Part 6-2: Generic Standards - Immunity for Industrial Environments*.

- *EN 61000-6-3 Electromagnetic Compatibility. Part 6-3: Generic Standards - Emission for residential environments.*

Compliance with these standards makes it necessary to comply with limits and procedures from other standards in the same series.

All other standards and regulations applicable to grid connected wind turbines are met by Ingecon® µWind.

2. System description

2.1. Location

This section provides guidelines for selecting and correctly adapting the equipment to a suitable site.

2.1.1. Site



Locate the equipment in a place which is easily accessible for installation and maintenance work



It is strictly forbidden to place objects of any type on the equipment.



The heat sink can reach temperatures of 85 °C. Do not place heat-sensitive material close to the inverter.

2.1.2. IP Rating

The Ingecon® µWind Interface models have an IP65 level of protection against the ingress of foreign matter, which means that outdoor installation is possible.

IP65 means that the equipment is fully dust tight and also protected against the impact of water jets in any direction, as defined for this protection rating in standard *IEC60529*.

Despite this, excessive humidity may activate the equipment protection system and cause it to shut itself down.



Locate the equipment in a place sheltered from the rain and away from corrosive environments.

2.1.3. Ambient temperature

The Ingecon® µWind Interface models are designed to operate between -20 °C and 70 °C.

2.1.4. Atmospheric conditions

The surrounding air must be clean, with a relative humidity of not more than 50% at more than 40 °C. Higher percentages of relative humidity, of up to 95%, are tolerable at temperatures below 30 °C.

Account should be taken of the fact that, occasionally, moderate condensation may occur as a result of temperature changes. For this reason, in addition to the equipment's own protection system, the equipment should also be monitored when operating at sites which may not come within the atmospheric conditions described above.

2.1.5. Contamination rating

The equipment has been designed for a grade 3 contamination rating.

2.1.6. Noise contamination

When operating, the equipment makes a slight buzzing noise.



Do not locate the equipment in an occupied room, or on lightweight supports that could amplify this buzzing noise. The mounting surface must be firm and adequate for the weight of the equipment.

2.1.7. Ventilation

The equipment is designed to be cooled by natural convection.

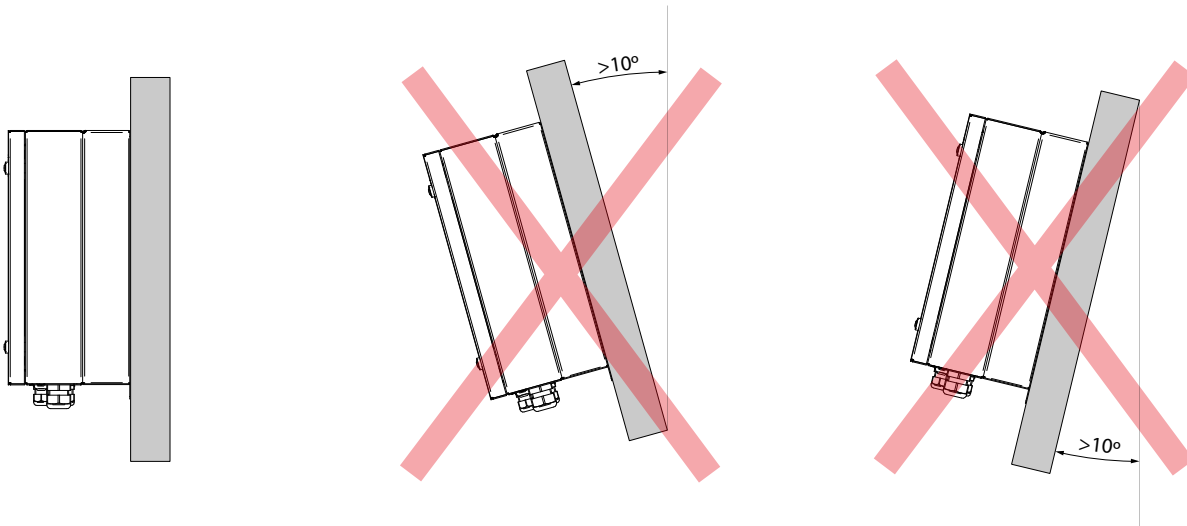
There must be a 30 cm obstacle-free area above the equipment and 20 cm around the base. This is to ensure that the inverter cooling system operates correctly.



Facilitate the circulation of incoming and outgoing air through the ventilation grids.

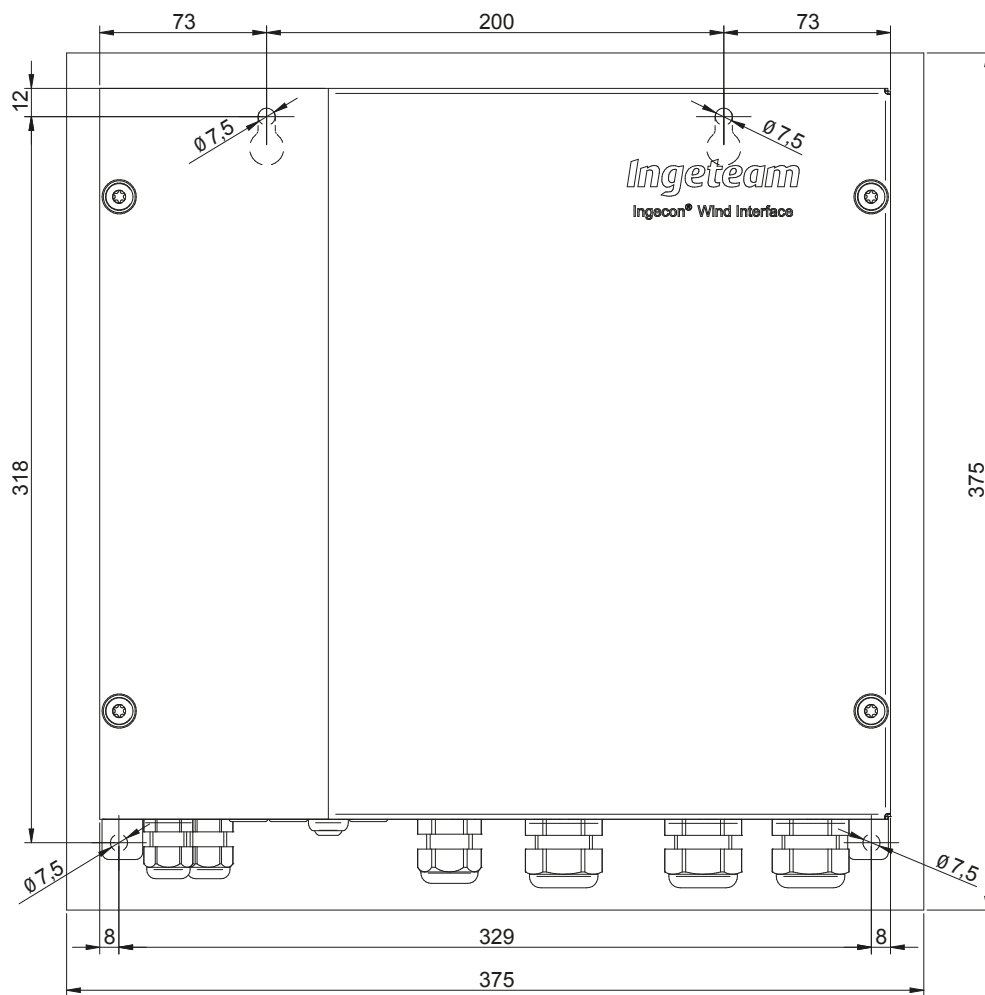
2.1.8. Mounting and anchorage surface

To guarantee correct heat dissipation and airtightness, the equipment must be mounted on a perfectly vertical wall or, failing this, with a maximum angle of inclination of $+10^\circ$ or -10° to the vertical.



The equipment should be mounted on a solid wall that will allow holes to be drilled and the insertion of lag screws and rawl plugs capable of withstanding the weight of the equipment.

The following figure provides the measurements in millimetres for drilling the holes.



2.2. Environmental characteristics

The environmental operating conditions are:

Environmental conditions	
Minimum temperature	-20 °C
Minimum temperature of the surrounding air	-20 °C
Maximum temperature of the surrounding air	70 °C
Maximum relative humidity with no condensation	95%

For more detailed information, please refer to Chapter “3. Operating, conservation and transport conditions”.

2.3. EMC Requirements

The Ingecon® μ Wind Interface models are compliant with the EMC requirements for industrial applications, in order to avoid causing disturbances in other, external equipment.

3. Operating, conservation and transport conditions



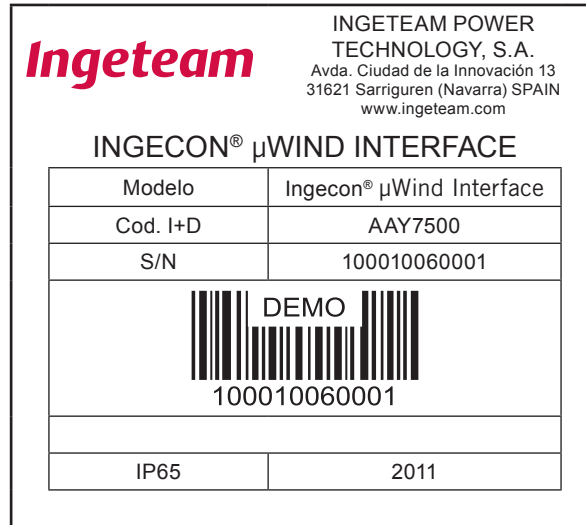
Failure to comply with the instructions provided in this section could cause damage to the equipment. Ingeteam assumes no liability whatsoever for damages derived from non-compliance with these instructions.

3.1. Receipt of the equipment

Receipt

On receipt, please check the terms indicated in the Delivery Note, sign the box: “Firma Receptor Mercancía” (signature of the recipient of the goods) and return the signed copy to the sender’s address.

Do not unpack the equipment until it is ready to be installed. It should remain in a horizontal position at all times.



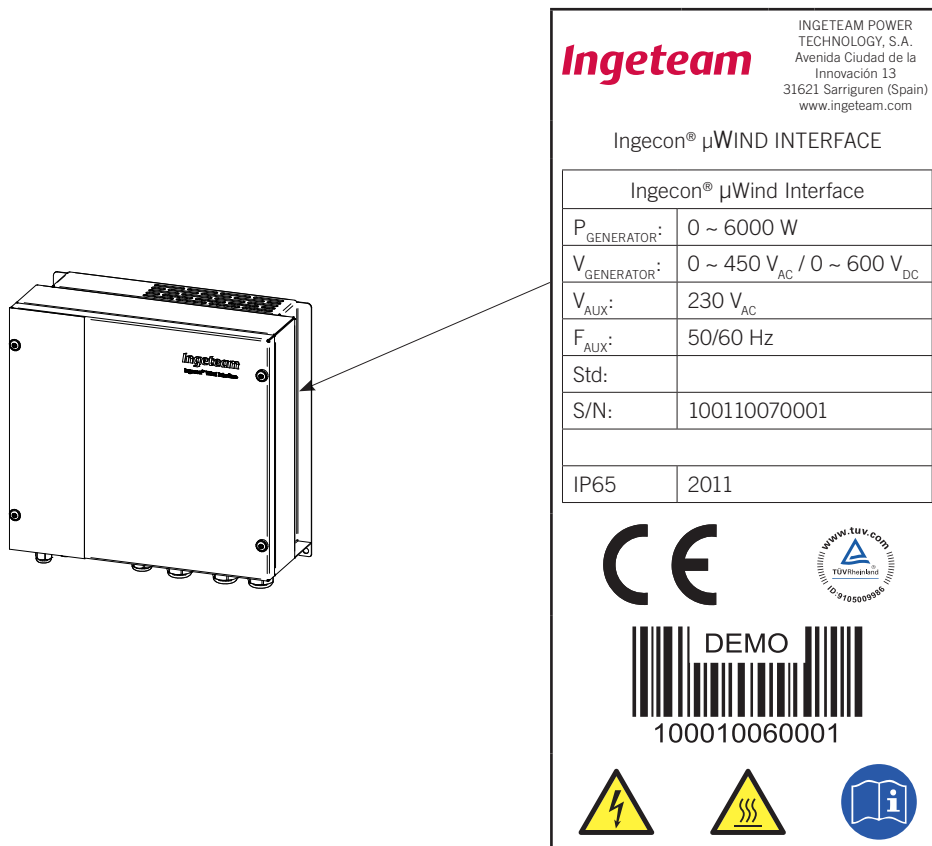
Ingecon® μWind Interface label

The packaging dimensions are as follows:

Type of packaging	Weight (Kg)	Length x Depth x Height (mm)
Cardboard box with foam	7	400 X 400 X 240

Unpacking the equipment

The equipment is clearly identified by its own, unique serial number. This number should be referred to in all communications with Ingeteam. It is indicated as S/N on the nameplate, as shown below.



Damage during carriage

Should the equipment sustain damage during carriage:

1. Do not install it.
2. Immediately notify your distributor of these circumstances, with 5 days as of the equipment reception date.

Should it be finally necessary to return the equipment to the manufacturer, then the original packaging should be used.

Packaging disposal

All the packaging can be given to an authorised manager of non-hazardous waste.

In any case, each part of the packaging should be disposed of as follows:

- Plastic (polystyrene, bag and bubble wrap): corresponding container (plastics and containers).
- Cardboard: Corresponding container (paper and cardboard).

3.2. Handling

Correct equipment handling is extremely important. This ensures that:

- The packaging remains intact and the equipment is maintained in optimum conditions right from shipment until unpacking.
- The equipment is not knocked and/or dropped, which could affect its mechanical characteristics, for example, improper door closure, loss of IP rating, etc.
- Vibrations are avoided as far as possible, which could lead to subsequent malfunctioning.

Any anomaly observed should be reported to Ingeteam immediately.

3.3. Transport

Correct equipment transport and storage are the first steps required for correct use and operation. Taking account of the instructions given in section “3.2. Handling” and as a preventive measure, Ingeteam would advise working with hauliers specialising in the carriage of special and/or fragile equipment.

All packaged equipment must be handled with tools that will not damage the packaging.

During transport and storage, the equipment should be protected against mechanical impact, vibrations, water projections (rain) and against any other product or circumstances that could damage the equipment or affect its performance.

Moving the equipment with a pallet jack

If a pallet jack is to be used to move various items of equipment at the same time, then at least the following instructions should be observed:

1. Position the packaged equipment so that it is centred over the forks.
2. Try to ensure that the equipment is positioned as close as possible to the connection between the fork and the handle.
3. In any event, observe the instructions provided in the pallet jack manual.

Moving the equipment with a fork-lift truck

If a fork-lift truck is to be used to move various items of equipment at the same time, then at least the following instructions should be observed:

1. Position the packaged equipment so that it is centred over the forks.
2. Try to ensure that the equipment is positioned as close as possible to the connection between the fork and the chassis.
3. Ensure that the forks are perfectly level, to prevent the equipment from possibly being tipped off.
4. In any event, observe the instructions provided in the fork-lift truck manual.

Once the equipment has been moved to the place of installation, it should be left in the packaging until it is ready to be installed.

At that point, it can be moved vertically, or a short distance, without the packaging. The following point should be observed.

Moving the equipment once the packaging has been removed

At least the following instructions should be observed:

1. Use the side grips to grasp the equipment with both hands.
2. Follow the ergonomic advice given for lifting heavy objects.
3. Do not let go of the equipment until it is perfectly anchored in position or is firmly in place.
4. Ask another person to direct the movements to be made.

3.4. Storage

If the equipment is not to be installed immediately after receipt, then the following points should be taken into account in order to prevent deterioration:

- The package should be stored in the position in which the box was received.
- Keep the equipment free from dirt (dust, shavings, grease, etc.) and out of the reach of rodents.
- Avoid contact with water jets, welding sparks, etc.
- Protect the equipment with a breathable protective cover in order to prevent condensation caused by ambient humidity.
- The equipment should not be stored in ambient conditions other than those indicated in section “2.2. Environmental characteristics”.
- It is extremely important to protect the equipment from contact with chemicals, which could cause corrosion, and also from saline environments.

3.5. Conservation

In order to correctly conserve the equipment, the original packaging should not be removed until just before the equipment is to be installed.

In the event of storage for a long period of time, you are advised to do so in a dry place, avoiding abrupt temperature changes as far as possible.

Damaged packaging (cuts, holes, etc.) means that the equipment will not be maintained in optimum conditions before installation.

Ingeteam assumes no liability for possible damage, if this condition is not met.

3.6. Waste disposal

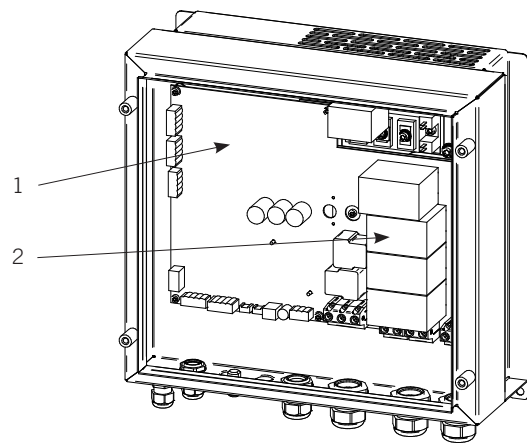
During the installation, commissioning and maintenance procedures, the waste generated must be adequately treated in compliance with the country-specific regulations.

At the end of the useful life of the equipment, the waste must be given to an authorised manager.

In this section, Ingeteam, in its commitment to an environmentally friendly policy, provides Authorised Managers with information on the location of the components to be decontaminated.

Those equipment components which must be specifically treated are:

1. Printed circuit boards
2. Electrolytic capacitors or containing a PCB



4. Safety instructions

4.1. Contents

This section contains the safety instructions to be followed when installing, operating and accessing the equipment.

Failure to comply with these “Safety Instructions” may result in bodily injury or even death, or cause damage to the equipment.

Before operating the equipment, please read these “Safety instructions” carefully.

4.2. Symbols

Safety warnings provide information on conditions that could cause serious bodily injury or death and/or damage to the equipment. Together with the warning sign, instructions are given as to how to avoid such hazards to persons and equipment.

These symbols are listed below with an explanation of their meaning.



DANGER: electric shock
A warning that the high voltage present in the equipment could cause bodily injury or even death and/or damage to the equipment.



General warning: regarding conditions that could result in bodily injury and/or damage to the equipment.



Caution hot surface: warning about the presence of hot parts that could cause serious burns.

All work-specific safety warnings and notes are included in each corresponding chapter and are also repeated and completed at the critical points in that chapter.



Please read this information carefully. It has been written with your personal safety in mind, whilst ensuring the maximum service life for the equipment itself and for any devices connected to it.

4.3. Definition of the tasks to be performed



The installation, commissioning, inspection and maintenance operations may only be performed by suitably qualified personnel, trained to work with electrical equipment (hereinafter qualified personnel). You are reminded that it is mandatory to comply with all safety regulations and standards applicable to electrical work.



The opening of the equipment door in no way implies that no voltage is present inside. Access is therefore restricted to qualified personnel, observing the safety conditions established in this document.



The set of conditions detailed below should be considered to be the minimum requirements. It is always advisable to disconnect from the mains. The installation could be faulty, causing undesirable voltage returns. There is an electrical discharge hazard.



In addition to the safety measures indicated in this manual, any general measures that may be applicable should also be taken into account (installation-specific, country-specific, etc.).



The electrical installation must not entail fire or explosion hazards. Workers must be properly protected against the risk of accidents caused by direct or indirect contact. The electrical installation and the protective devices must take account of the voltage, all external conditioning factors and the competence of those people having access to the installation parts.



All work equipment must be adequate for protecting exposed workers against the risk of direct or indirect contact with electricity. At any event, the electrical parts of the equipment must comply with the provisions of the corresponding specific standards and regulations.



All workers performing work in the open air shall stop work in the event of storms, heavy rainfall, strong winds, snow or any other unfavourable environmental condition that hinders visibility or the handling of tools. Work on indoor installations directly connected to overhead electricity lines must be interrupted in the event of a storm.



Ingeteam assumes no liability whatsoever for damages caused by the improper use of the equipment. Any work on any of this equipment and involving a change in the original electrical layout, must first be proposed to Ingeteam. This proposed new layout must then be studied and authorised by Ingeteam.



The necessary safety measures must be in place to prevent unauthorised persons from handling the equipment and to keep them away from the vicinity of the equipment.

- Warning signs to indicate the presence of personnel at work.
- Lockout mechanisms or mechanical locking, by padlocks with keys.



These instructions must be easily accessible, close to the equipment and within easy reach of all users.

Before installing and commissioning the equipment, please read these safety instructions and warnings carefully and all the warning signs placed on the equipment. Ensure that all warning signs are perfectly legible and that any damaged or missing signs are replaced.

4.3.1. Inspection tasks

Tasks involving the opening of the enclosure to make visual inspections.

4.3.2. Operational tasks

Tasks involving loading software from the communications connector and tasks involving the start-up of the wind turbine.

4.3.3. Manipulation tasks

Tasks involving the mounting and/or replacement of parts (fuses, switchgear in general, etc.), voltage disconnection and reconnection tasks, connection of other equipment to the unit, and connection of the communication wiring to the equipment. All tasks not considered to be Inspection or Operational tasks shall be classed as Manipulation tasks.

4.4. General points

This section defines the preventive measures to be adopted when performing all types of work on the equipment, in order to work safely and control unavoidable hazards.

Protection against direct contact is provided by the enclosure which has a protection rating of IP 65.

The equipment has been tested to the applicable standards and regulations to ensure that it complies with the safety

requirements, the isolation distance values and the leakage lines for the voltages used.

The tools and/or equipment used for the equipment manipulation tasks must have double reinforced insulation (class II).

4.4.1. Hazards present and general preventive measures

Impact against stationary objects:

- Inform the workers of the hazard.
- Adequate lighting.
- Work carefully.
- Maintain sufficient distance to avoid contact with the hazard.

Knocks, punctures and cuts with objects and/or tools:

- Keep the cover closed when not working in the cubicle.
- Adequate lighting.
- Good housekeeping.
- Mandatory use of a helmet, safety footwear and gloves when required.

4.4.2. Hazards and additional measures in manipulation tasks

Thermal contact

- Inform the workers of the hazard.
- It is advisable to wear gloves.
- Disconnect the power supply and wait 10 minutes to allow the hot parts inside the equipment time to cool down.

4.4.3. Personal Protection Equipment (PPE)

It is mandatory to wear safety footwear compliant with standard *EN 345-1:1992*. It is also mandatory to wear kid gloves.

It is also mandatory to wear dielectric gloves that are compliant with the *EN-60903-1992* standard and a safety face mask that provides protection against electric shocks and is compliant with the *EN-168-1994* standard for tasks involving checking voltages.

4.5. Inspection, operational and manipulation tasks

Defined below are the mandatory safety measures required to perform the inspection, operational and/or manipulation tasks on this equipment.



Opening system: the cover can only be opened and closed by removing or inserting the mounting hardware.



It is strictly forbidden to access the equipment interior by any point other than the access cover designed for this purpose.

4.5.1. Inspection tasks

If the equipment interior is to be inspected, then this should only be done through the front cover.

Once the inspection work has been completed, replace the front cover and secure it with the appropriate screws.

4.5.2. Operational work

Manual start-up/shutdown of the wind turbine

The IWI is equipped with an ON/OFF button to manually start-up / shutdown the wind turbine. When the button is enabled (the LED on the button is on) the IWI unblocks the wind turbine and allows it to operate normally. When the button is disabled (LED off), the IWI performs the wind turbine shutdown and subsequent blocking, guaranteeing that the wind turbine is stopped from moving.



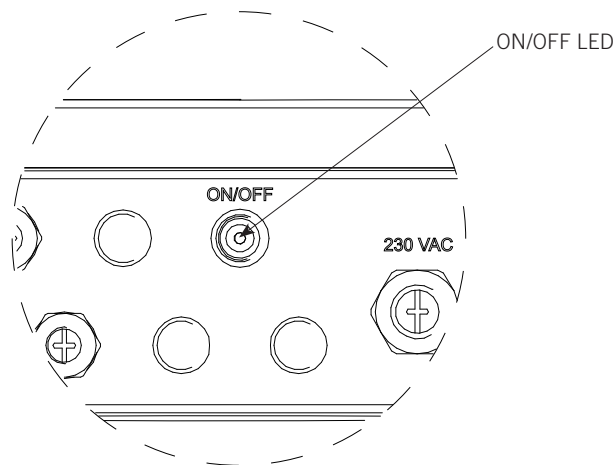
- Any wind present will cause the wind turbine to rotate.
- If there is no control over the wind turbine, then its speed of rotation may increase above the design limits, leading to bodily injury and/or material damage.
- You are advised to use wind turbines equipped with mechanical speed limitation systems (mechanical braking devices or by aerodynamic design) to ensure that the speed of rotation remains within acceptable values in order to guarantee system safety.
- Before starting up the system, you are advised to use mechanical blocking or the short-circuiting of the output terminals to prevent the wind turbine from moving.
- Once the wind turbine has been connected to the IWI, the latter short circuits the turbine.
- Do not turn on the IWI until all the devices have been installed (brake resistor and μ Wind) and grid voltage is available to dissipate the energy produced to the power grid.

4.5.3. Manipulation work

All tasks not considered to be Inspection or Operational tasks shall be classed as Manipulation tasks.

For manipulation work, you need to ensure that no voltage is present. Follow the protocol detailed below:

1. Shutdown the wind turbine. To do so, press the ON/OFF button located on the bottom of the Ingecon[®] μ Wind Interface. In position OFF, the LED on the button will not light up.



2. Once the wind turbine has stopped completely, disconnect the power cable connecting the Ingecon[®] μ Wind Interface DC output with the Ingecon[®] μ Wind DC input. You are advised to disconnect the quick connector from the Ingecon[®] μ Wind.
3. Block the wind turbine using some additional braking system. Disconnect the connection between the wind turbine and the Ingecon[®] μ Wind Interface, isolate it, sign it and protect it.
4. Disconnect the auxiliary power from the Ingecon[®] μ Wind Interface.
5. Wait 10 minutes for the internal capacitors to discharge and any hot parts to cool down.
6. Open the cover and check for the absence of voltage in the work area.

The PPE stated in section “4.4.3. Personal Protection Equipment (PPE)” should be worn for any work on live parts indicated in this document.



Any work on any of this equipment and involving a change in the original electrical layout, must first be proposed to Ingeteam. This proposed new layout must then be studied and authorised by Ingeteam

5. Installation

Before installing the Ingecon® µWind Interface, the packaging should be removed, taking particular care not to damage the enclosure.

The packaging interior should be checked for dampness. Should there be any signs of moisture, then the equipment should not be used until it has completely dried out.



All installation operations must observe the rules and regulations in force.

Before commencing the steps described in this point, it is important to identify each part described in this section and to ensure that the right tools are on hand for the installation work.

5.1. General installation requirements



The distance between the Ingecon® µWind Interface and the Ingecon® µWind must not be more than 3 metres.

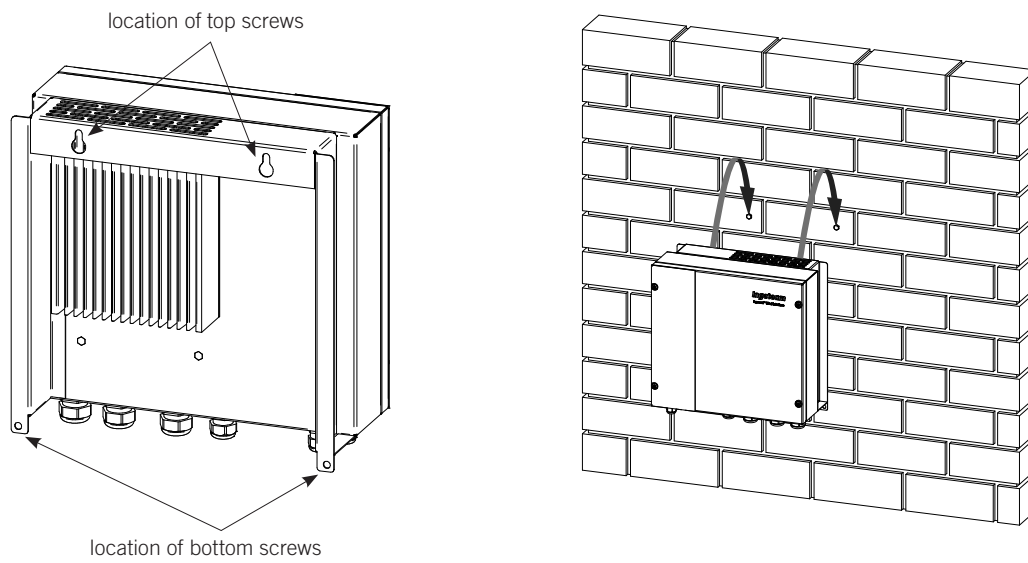
- The equipment environment must be suitable, and must comply with the guidelines set out in section “2. System description”. Furthermore, the items used in the rest of the installation must be compatible with the equipment and comply with the applicable legislation.
- The ventilation and work space must be suitable for maintenance tasks, in compliance with the rules and regulations in force.
- The external connection devices must be suitable and must be sufficiently close, as established in the rules and regulations in force.
- The lead in cables must have a section that is adequate for the maximum current.
- Particular care should be taken to ensure that there are no obstacles blocking the equipment air inlets and outlets, which would prevent the adequate ventilation of the equipment.

5.2. Wall mounting the equipment

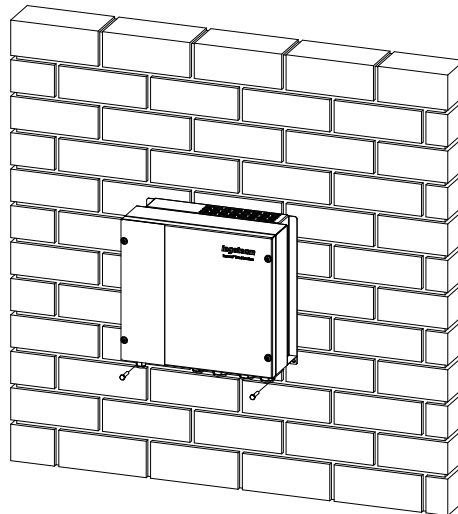
The Ingecon® µWind Interface models are equipped with a wall mounting system in the form of an anchor plate.

Follow the steps described below for correct anchorage:

1. Mark the two upper drill points on the wall.
2. Drill holes in the wall with a suitable bit for the screw to be used to hang the equipment.
3. Insert the two screws, made of stainless steel to prevent corrosion, and hang the equipment from the screws.



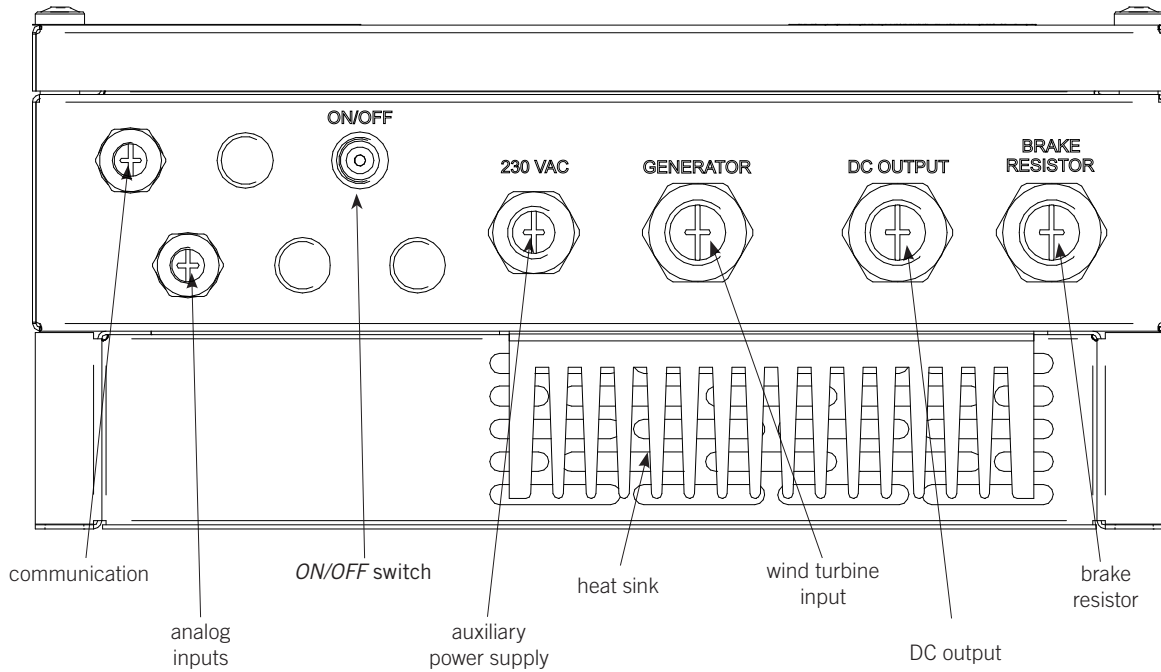
4. Drill the two bottom holes and insert the appropriate screws.



5. Check that the equipment is firmly anchored in position.

5.3. Electrical connection

Once the equipment has been mounted in its definitive location, and is firmly anchored in place, the next step is to make the electrical connections.



5.3.1. Description of cable ports



Whilst the wind is acting on the turbine, the resistor cables could be subject to high voltages that could be hazardous.
 Never manipulate the connections without first performing the shutdown protocol explained in “4.5.3. Manipulation work”.

The Ingecon® μWind Interface cable ports are located at the bottom of the enclosure. Each type is described below:

Communication

To connect the communication cable between the IWI and the Ingecon® μWind.

Analog inputs

A general purpose analog input connector.

Auxiliary power supply

Connector for the 230 V single phase cable for the auxiliary power supply to the equipment.

Wind turbine input

Enables the connection between the wind turbine power cable and the IWI.

DC output

To connect the DC voltage power cable between the IWI and the Ingecon® μWind.

Braking resistors

The Ingecon® μWind Interface models are equipped with a wind turbine resistor braking system. The cable for this should be passed through this cable gland.

5.3.2. Order in which the equipment connections should be made



Ensure that the connection polarity is correct in all cases

The basic equipment connections should be made in the following order:

1. Connection of the analog inputs (optional).
2. Communication line.
3. Connection of the DC OUTPUT to the Ingecon® μ Wind DC quick connectors.
4. Connection of the braking resistors.
5. Connection with the wind turbine.
6. Connection of the auxiliary power supply.

The following sections describe how these connections should be made.

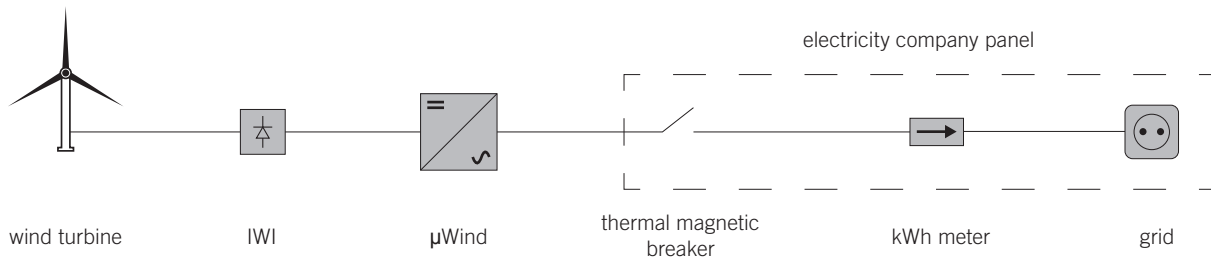
5.3.3. System diagram

The system diagram corresponds to the configurations found in the majority of installations.

The regulations applicable to each installation and to each country in which the equipment is to be located, should always be complied with.

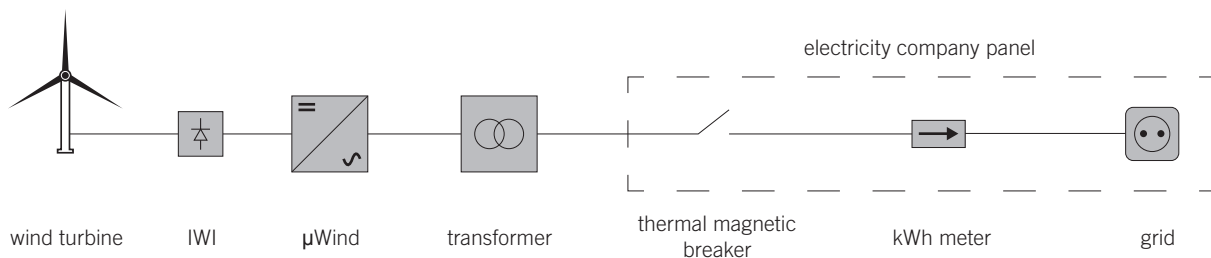
Wiring diagram for the Ingecon® μ Wind TL equipment with a connection to the Ingecon® μ Wind Interface (IWI)

For Ingecon® μ Wind 2.5 TL, 3 TL, 3.3 TL, 3.68 TL, 4.6 TL, 5 TL and 6TL Interfaces with a connection to the Ingecon® μ Wind Interface.



Wiring diagram for the Ingecon® μ Wind TL equipment with a transformer and connection to the Ingecon® μ Wind Interface (IWI)

For Ingecon® μ Wind 2.5, 3.3 and 5 Interfaces with a connection to the Ingecon® μ Wind Interface.

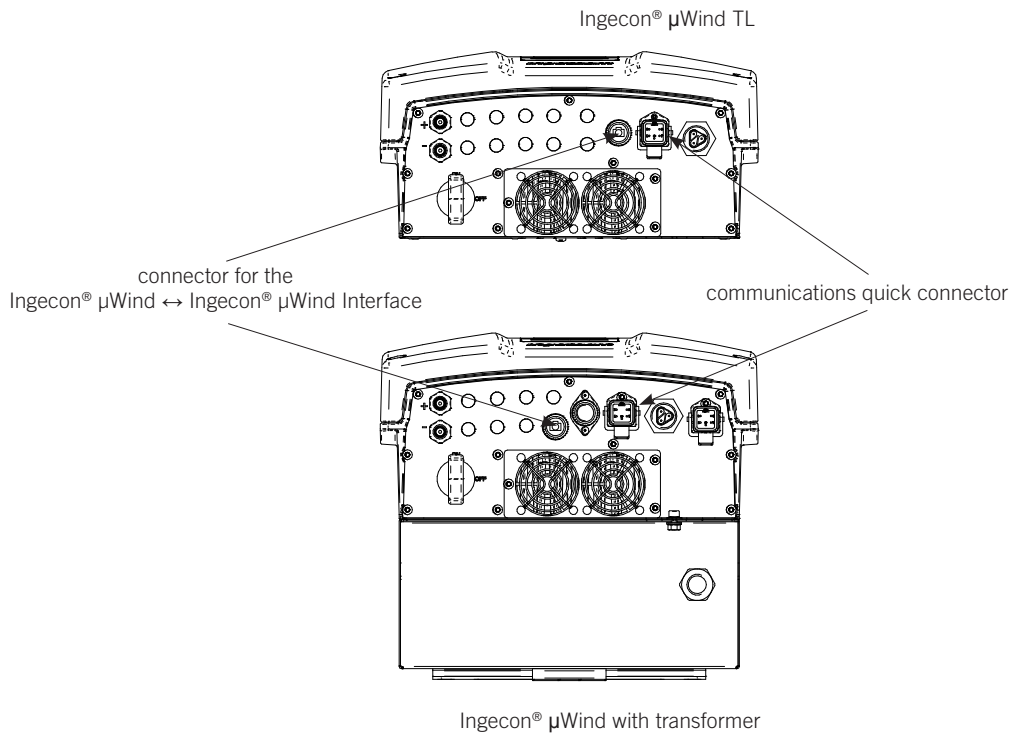


5.3.4. Communication

The communication system between the Ingecon® μ Wind Interface and the Ingecon® μ Wind allows both items of equipment to operate together, in addition to the remote control and system monitoring tasks.

The process for the correct connection of the communication system is as follows:

1. Connection of the communications cable supplied with the equipment, to the quick connector located on the Ingecon® μ Wind. The Ingecon® μ Wind Interface communication kit (AAY0089) should be requested together with the Ingecon® μ Wind.

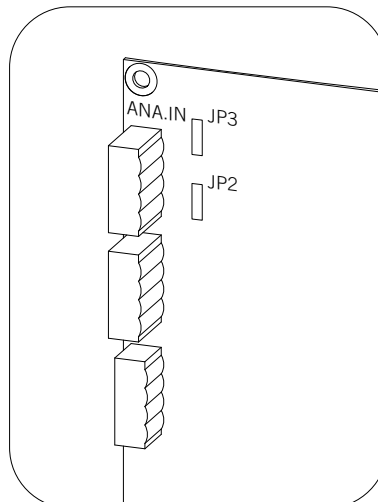


2. Once the push-pull connector has been inserted, screw down the hood to guarantee the IP65 insulating rating.

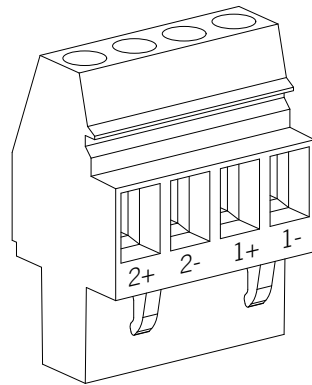
Once the assembly has been completed, it will be possible to establish communications with the Ingecon® μ Wind Interface through the quick connector located in the Ingecon® μ Wind.

5.3.5. Analog inputs

The equipment has two general purpose analog inputs located in the ANA.IN connector. These inputs can be used to connect a number of devices, such as an anemometer or thermometer.



By default, both inputs are configured as analog inputs for a current of 0-20 mA. Should this need to be changed to voltage inputs of 0-10 V, simply disconnect bridges JP2 (analog input 1) and JP3 (analog input 2).



Check that the connector terminals have been correctly tightened. Re-insert the connector in the correct position.

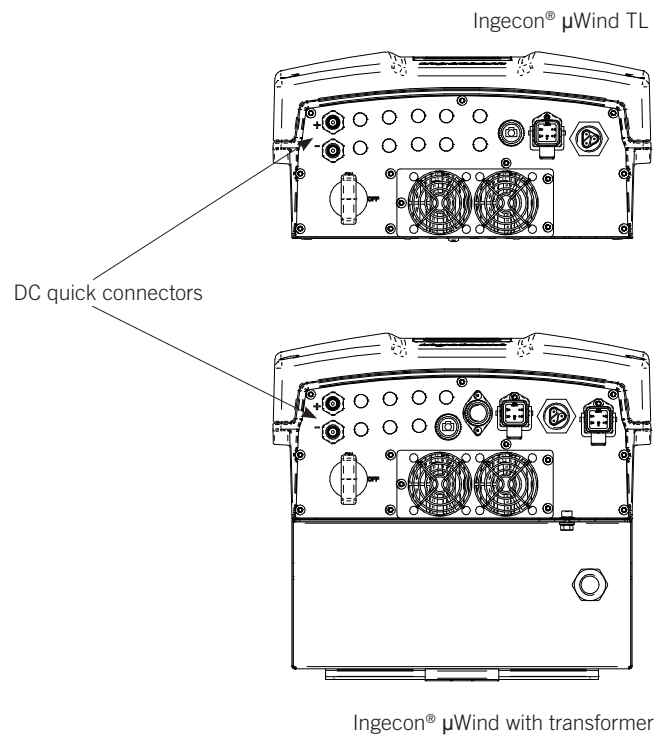
Tighten the cable gland to ensure that the equipment is airtight.

The analog input cable diameter must not be greater than 9 mm.

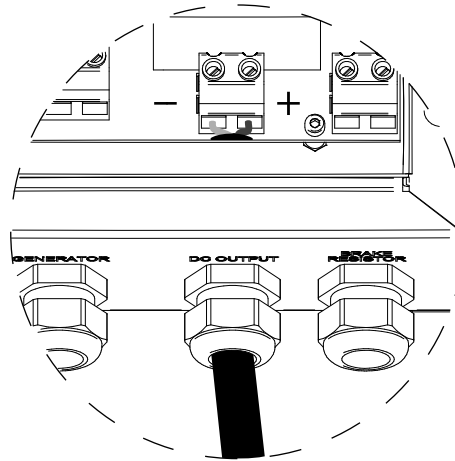
5.3.6. DC output

The Ingecon® μ Wind Interface and the Ingecon® μ Wind power stages are connected through the DC voltage cable supplied with the Ingecon® μ Wind.

1. Connect the push-pull terminals of this cable to the inverter.



2. Run the cables through the Ingecon® µWind Interface DC OUTPUT connector cable gland and then wire the cable terminals to the central terminal as shown in the following figure.



3. Check that the cable terminals have been tightened correctly at the connector terminals.
4. Tighten the cable glands to ensure that the equipment is airtight.



It is essential to ensure that the connection polarity is correct. Given the fact that, an incorrect connection will cause the equipment to malfunction

5.3.7. Connection of the braking resistors

The purpose of the resistors is to limit the power and perform the wind turbine emergency stop. The resistors must be sized according to the wind turbine characteristics (power and output voltage).

The power delivered by the wind turbine is governed by the following equation:

$$P = k \cdot C_p \cdot V^3$$

where:

P: power

k: constant

C_p: wind turbine aerodynamic performance coefficient

V: wind speed

Analysing the equation above, it should be emphasised that, for high wind speeds, if there is no mechanical braking or auto-braking system, then high powers will be generated.

It is important to bear in mind that, for wind turbines with no mechanical speed limitation system, the resistors are the only way of braking the wind turbine.

Ingecon® µWind Interface Limits

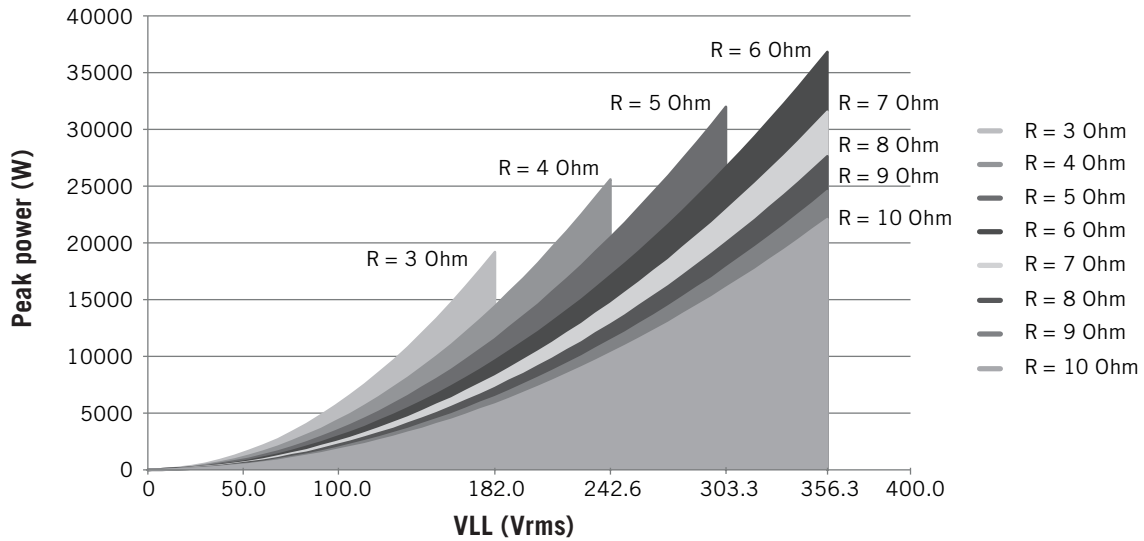
The parameters to be met by the braking resistors in order to adapt to the functional limits of the equipment are:

Parameters	
Maximum current	80 A
Resistive value range	3 ~ 235 Ω



Based on the resistive value selected on the installation, the following safe operating areas will be obtained, within which the Ingecon® μ Wind Interface is able to brake the wind turbine in any wind conditions.

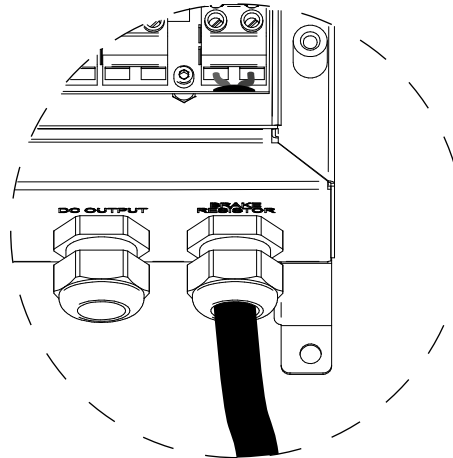
If the wind turbine is operating outside the area established in the Ingeteam graph, then the Ingecon® μ Wind Interface braking capacity is not guaranteed.



	3 Ohm	4 Ohm	5 Ohm	6 Ohm	7 Ohm	8 Ohm	9 Ohm	10 Ohm
Peak power (W)	19200	25600	32000	36816.7	31557.1	27612.5	24544.4	22090
VLL (Vrms)	182	242.6	303.3	356.3	356.3	356.3	356.3	356.3

Connection

1. The braking resistors shall be connected at the R.OUT terminal as shown below



2. Check that the cable terminals have been correctly tightened at the connector terminals.
3. Tighten the cable glands to ensure that the equipment is airtight.

The cable diameter of the resistors must not be greater than 17 mm.

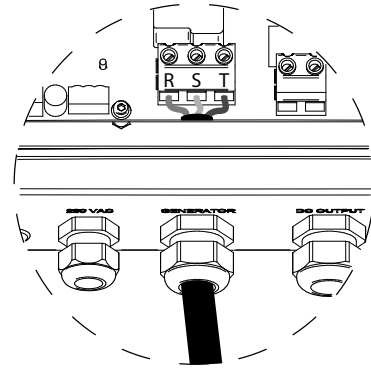
5.3.8. Connection to the wind turbine

When connecting the equipment to the wind turbine, the connections to be made will depend on whether the wind turbine output voltage is DC or AC. Each situation has a different procedure.

Connection to a wind turbine with an AC voltage output

If the wind turbine delivers AC voltage, then the Ingecon® µWind Interface will make the conversion to DC, in order to be connected to the Ingecon® µWind.

In this case, make the connection as shown in the following figure, through the GENERATOR cable gland.



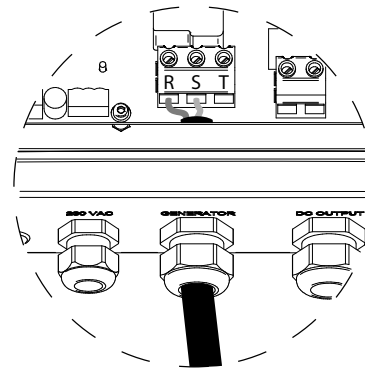
Connection to a wind turbine with a DC voltage output

If the wind turbine delivers DC voltage, then the Ingecon® µWind Interface will not make any conversion at all.

The connection shall be made as indicated in the figure below, through the GENERATOR cable gland, connecting the R and S terminals only. Connect the positive to the terminal marked as R and the negative to the terminal marked as S.

Never forget that when the wind turbine is moving, voltage may be present at its terminals.

In both cases, the wind turbine cable diameter must not be greater than 17 mm.



5.4. Electrical disconnection

Pay particular heed to the following warnings.



The equipment contains electrical capacitors that can hold high voltages even after disconnection from the wind turbine and grid.

and remember:



The Ingecon® µWind Interface models should only be opened by authorised personnel.

During the equipment installation and maintenance operations, it is mandatory to use personal protective equipment, safety helmet, gloves and footwear.



Do not touch the equipment sides and rear, which can reach high temperatures

Any installation work requiring the equipment to be opened must be performed in a dry environment, to prevent the ingress of moisture that could condense and damage the electronics.

Ingeteam assumes no liability for damages cause by the improper use of its equipment.

6. Commissioning

6.1. Equipment inspection

This section contains the instructions for operating the equipment once it is correctly wired and sealed.

The Ingecon® μ Wind Interface units manage all or part of a generating plant. A check should be made to ensure that the plant status is correct before starting up the units.

Each plant has its own particular characteristics, depending on the country of location and other specific conditions. In any event, before start-up, it should be ensured that the plant is compliant with all applicable legislation and regulations and that at least the part to be powered up, has been completed.

6.1.1. Inspection

Prior to the equipment power-up, a general inspection of the equipment should be made, primarily consisting in:

Cabling inspection

- Check that the cables are connected correctly to their connectors located on the bottom of the enclosure.
- Check that these cables are in good condition and that there are no nearby hazards which could cause them to deteriorate, such as intense heat sources, sharp objects or devices which could impact against or pull on the cables.

Check that the equipment is firmly anchored in position

Check that the equipment is firmly anchored and runs no risk of tipping over.

6.1.2. Hermetic seal of the equipment

During installation, a check should be made to ensure that the equipment connection operations have not altered the IP rating of the equipment.

Ensure that the connectors are correctly tightened, and that the cable glands and front cover are sealed correctly.

Connectors

For all connections through the cable glands, allow sufficient cable hose length to ensure that there is no pull on the internal electrical connections.

Firmly tighten the cable glands used, in order to ensure that these are airtight.

Cover

If the front cover has been opened at any time, then secure it to the unit with its four screws, following the guidelines detailed below:

1. Lubricate the screws.
2. Ensure that the cover is correctly aligned with the casing. This is easy to see, checking that the cover and enclosure holes are concentric.
3. Manually insert the four screws in their threaded holes, starting with the one in the top right, followed by the bottom left, and finally the other two.
4. Screw down the screws to a maximum torque per screw of 5 Nm, using a calibrated tool.
5. Check for airtightness.



The warranty does not cover damage caused by the inadequate sealing of the equipment.

Whenever the equipment is opened, it is mandatory to lubricate the screws before re-closing in order to prevent the screws from jamming or seizing up.

6.2. Power-up



It is mandatory to perform the tasks indicated in this point with the equipment sealed, thereby avoiding any possible contact with live parts.

Once you have made a general visual inspection, checked the wiring between the equipment and ensured that the equipment is sealed correctly, you can proceed to power up the system. To do so:

1. Power up the Ingecon® μ Wind Interface through the auxiliary power supply input.
2. Press the ON/OFF button so that the LED lights up.

7. Preventive maintenance

Unless indicated to the contrary, the recommended preventive maintenance tasks should be performed on an annual basis.

7.1. Maintenance tasks



The various maintenance operations should be performed by qualified personnel. There is an electrical discharge hazard.



To access the various compartments, account should be taken of the safety recommendations set out in chapter "4. Safety instructions".



All the maintenance checks set out herein must be performed with the entire machine shutdown, in safe manipulation conditions, including those specified by the customer for this type of operation.

The condition of the enclosure

A visual inspection should be made of the condition of the enclosure, checking the condition of the seals and covers. A check should also be made to ensure that the equipment is firmly secured to the wall. Likewise, the enclosure should also be checked for knocks or scratches that could degrade the equipment or lower its Protection Rating. Should any defects of this nature be observed, then the parts affected should either be repaired or replaced.

Check that there is no moisture in the enclosure interior. If moisture is present, then the enclosure should be dried out before the electrical connections are made.

Check that the enclosure components are firmly secured to their appropriate anchors.

Condition of the cables and terminals

- Check that the cables run correctly so that there is no contact with live parts.
- Check the insulation for damage and hot points, inspecting the colour of the insulation and terminals.
- Visually check that the connections are firmly secured.

Ventilation

- Clean the heat sink vanes and the ventilation grids.

Surrounding area

Check the characteristics of the surroundings to ensure that the buzzing noise is not amplified or transmitted.

8. Troubleshooting

For any query or problem relating to the equipment, please call the Ingeteam customer service:

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