

# RPH3 Panel mounting instructions



Document history			
Revision	Date	Chapter/Purpose	Author
A-1	23/02/2015	Creation	JSC
A-2	02/11/2015	Provide details about RPH3 E&C steps for S/S owner information & site facilities availability planning.	JSC

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## 1 DOCUMENT INTRODUCTION & REFERENCES

### 1.1 Purpose

This document aims to provide guidance and instructions for the integration of RPH3 Point-on-Wave controllers into Control & Relay Panels of HV substations.

### 1.2 Reference documents

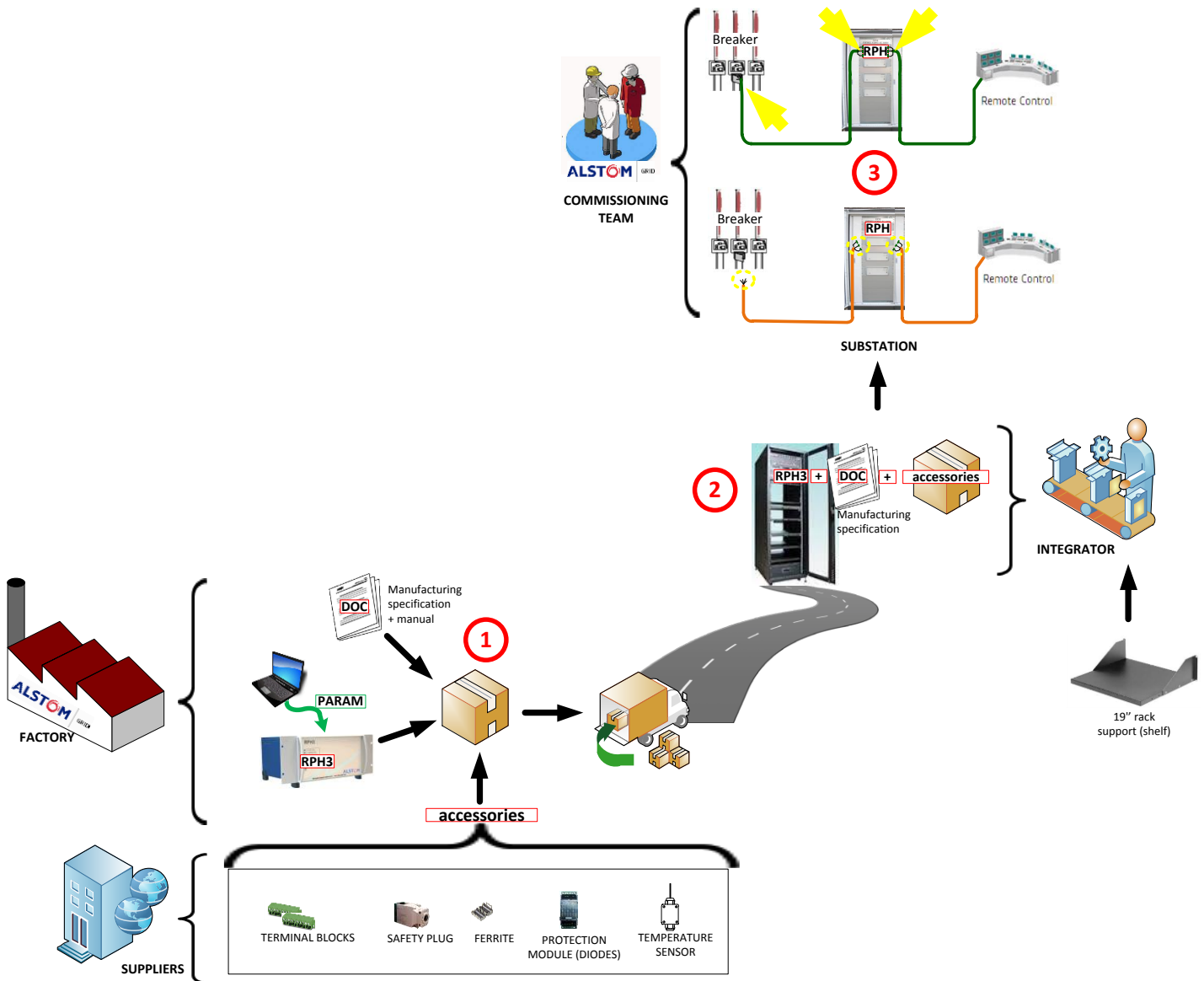
The following documents are applicable references. They shall be read carefully prior to performing any job with RPH3.

Acronym	Title / reference	Date	Description	Emitter
[RPH3-UG]	RPH3 Service Manual – Volume 1 – Description	2012/12/17	Reference manual of the RPH3-TCR PoW controller	Grid Solutions
[CB TIMING AT SITE]	Procedure - breaker timings measurements for CSD	2016/03/03	Detailed description of the applicable procedure for CB timings to be measured at site in the case the CB is expected to be controlled switched.	Grid Solutions

## 2 RPH3 DELIVERY FLOW

### 2.1 Overview

As a reminder of GE's applicable process for IED<sup>1</sup> management, an extract of the delivery flow is provided below for an RPH3 CSD (Controlled Switching Device) :



<sup>1</sup> IED : Intelligent Electronic Device  
Print Date: 14/05/2018

## 2.2 Who should do what ? → scopes and responsibilities

Based on its experience, GE highly recommends the following sharing scheme, so that responsibilities would be easy to track in case of any inconvenience.  
However this scheme may be adjusted in case some projects would have specific constraints.

### 2.2.1 GE Power breaker factory

RPH3 Point-on-Wave controller is **NOT A PROTECTION DEVICE but an inner component of a HV circuit breaker**. (even if finally installed in C&R panel).

Therefore as a breaker supplier, GE Power factory is responsible for :

- Device manufacturing
- Device testing (dedicated test bench)
- Device hardware and software configuration
  - ⚠ includes UNIQUE association breaker ↔ RPH3 (based on Serial Numbers)
  - ⚠ includes UNIQUE set of breaker timings (as per factory routine tests)
  - ⚠ includes UNIQUE IP address assignment to the RPH3
- Documents printing
  - ⚠ includes traceability sheet (“manufacturing specification”)
  - ⚠ includes reference manual
- Accessories ordering
- Packaging (RPH3 + accessories + documents)
- Shipping to either the integrator or the end site (substation)

## 2.2.2 C&R panel integrator

In case the RPH3 is to be integrated into a C&R panel remotely (i.e. not directly on end-site), the integrator is responsible for :

- Device unpacking (refer to section 4 page 11 for unpacking and handling instructions)
- Rack support (shelf...) sourcing & installation
- Device mounting into the C&R panel (dimensions provided in section 3, page 9).



The device must NOT hang on its 4 front screws, but lay on a dedicated support (19" rack shelf)

- Connecting C&R inner wires to RPH3 green terminal blocks

**⚠ DO NOT PLUG THESE TERMINAL BLOCKS INTO RPH3 CONNECTORS**



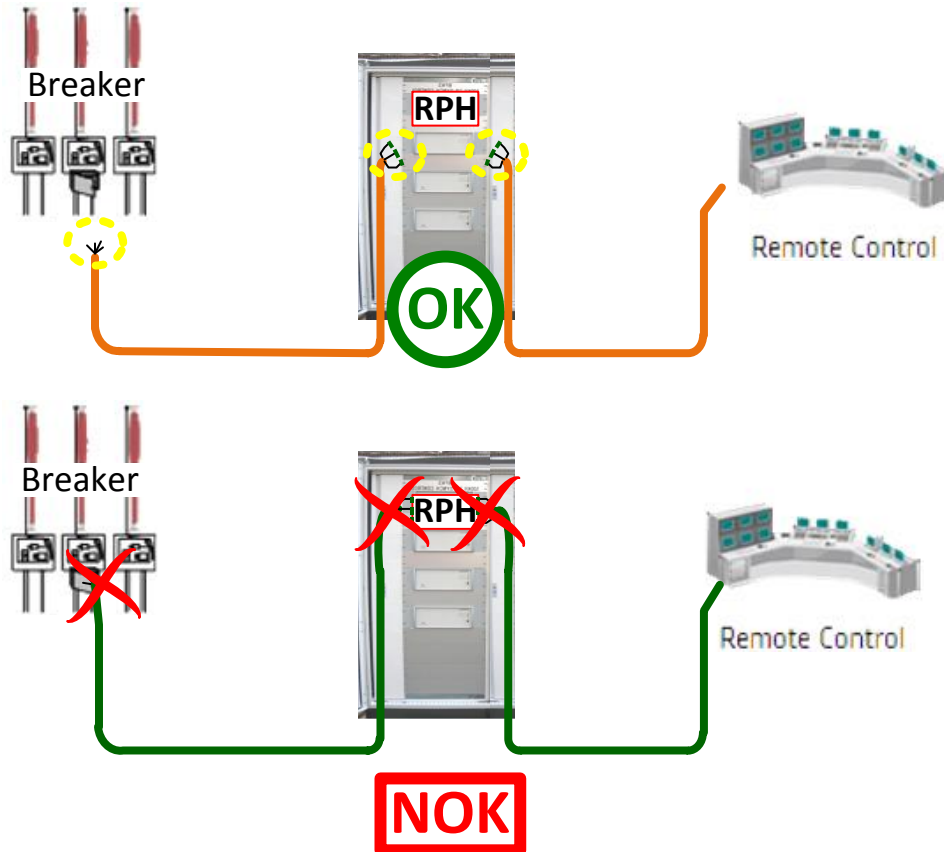
**⚠ let them just hanging on wires near the RPH3 device**

- Delivering NOT ONLY the device itself to the customer end-site, but as well :
  - ✓ ALL accessories initially present in the pack
  - ✓ ALL documents present in the pack
- **DO NOT perform any functional test of the RPH3** (cannot be tested WITHOUT a real breaker).

**Otherwise any damage would NOT be covered by GE warranty.**

### 2.2.3 Substation owner (customer, EPC and/or end user)

The customer (or its subcontractors) is responsible for **installing** the connection cables on site, but **MUST NOT connect** these cables:



The connections are to be done by GE-certified commissioning staff only.

Otherwise any damage would NOT be covered by GE warranty.

Furthermore, the S/S owner is in charge of arranging RPH3 Erection & Commissioning planning so that the certified E&C staff can apply the process and complete the whole FOUR STEPS of RPH3 Erection & Commissioning as described in section 2.2.4 of the current document (page 8):

## 2.2.4 On-site Commissioning team

Commissioning is DEDICATED to specific supervision staff only, ie. staff that has been explicitly trained and certified by GE Power for this purpose of RPH3 Erection & Commissioning. Basically RPH3 E&C is splitted into FOUR CONSECUTIVE STEPS as detailed below, that might be scheduled continuously or not (depending on the contract and S/S owner constraints):

- **STEP1: "BREAKER TIMINGS"**: CB actual timings measurement (using a CB analyzer eg. Megger TM1800 or equivalent equipment). This requires an access to the HV parts of the breaker, which implies breaker isolation + earthing and implies the availability at site of either a manlift + driver or a ladder. Refer to document [\[CB TIMING AT SITE\]](#) for further details.  
**NOTE:** such a breaker timings measurement is mandatorily required in any case at time of RPH3 erection & commissioning, even if a first set of measurements has been performed upon sole breaker erection & commissioning.
- **STEP2: "ERECTION"**: RPH3 installation into P&C panel, step-by-step safe connection to pre-installed cables, correct assignment between L1/L2/L3 RPH3 inputs & outputs at one side and actual electrical HV phases at the other side (R/Y/B...). Software configuration, bypass circuit checking, records consistency checking, alarms triggering conditions, etc. S/S level data collection + checking (CT & VT ratio, CT&VT correct coupling, source-side VT and load-side VT connections, etc.)  
Protection & Control related data collection: breaker failure protection timeout setting, auto-reclosing strategy and timings, BCU interlocking logics, connection philosophy for protection relays (1 contact per pole or 1 contact for 3 poles), insulation between DC source batteries...
- **STEP3: "DRY TESTS"**: operate the CB via RPH3 while it is physically still isolated from the network (series disconnectors must be OFF), using a fake reference voltage (or an actual one as issued from source-side VT secondary windings if available). Check the RPH3 records consistency, absence of alarms, acceptable matching between CB mechanical timings as expected and as measured. Test of the correct operation of the bypass circuit, if any (both manual bypass and automatic bypass). Test of coils continuity monitoring feature. Reset and initialize the adaptive control algorithm where applicable and check that it gives no algorithmic divergence over ~10 consecutive switchings.
- **STEP4: "LIVE TESTS"**: de-isolate the breaker and operate it via the RPH3. Then check the RPH3 records consistency as well as electrical waveforms consistency (current and/or voltage transients, depending on the controlled switching application). Adjust RPH3 software settings accordingly (optimize pre-arcing times and arcing time settings). Then operate again via RPH3 and check the final performance level versus applicable contractual acceptance criteria (provided that such criteria have been explicitly mentioned on a contractual document during contract negotiation or execution).

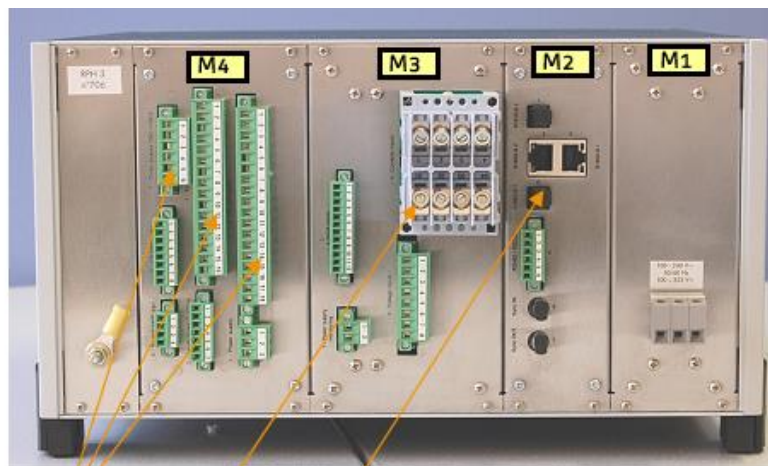


### 3 RPH3 DIMENSIONS

The RPH3 is a standalone PoW controller implemented as a standalone device composed of 5 electronic modules assembled into a metallic case as illustrated on Figure 1 and Figure 2 below :



**Figure 1 : RPH3 3/4 & front views**



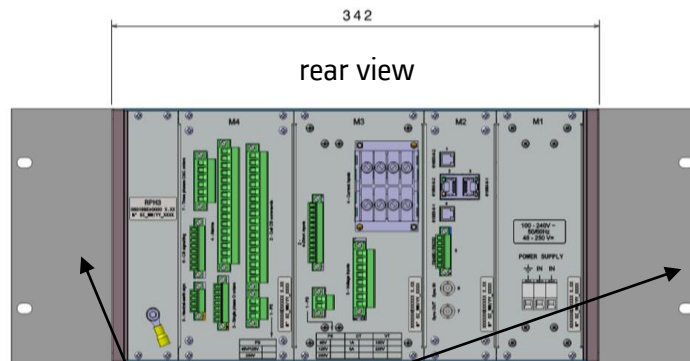
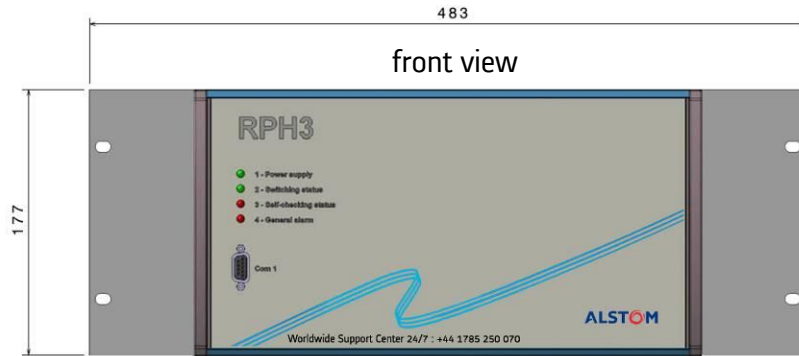
**interfaces connections**

**CT connection**

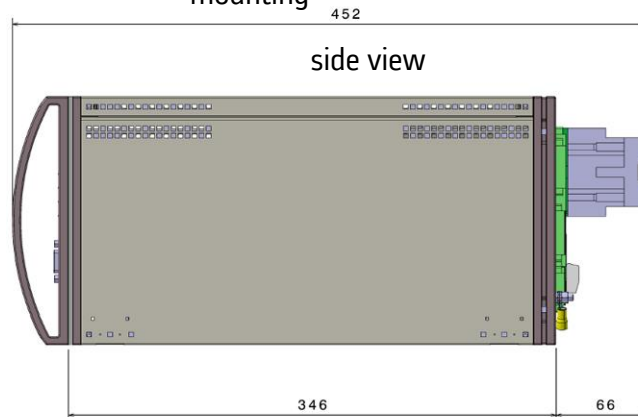
**communication ports**

**Figure 2 : RPH3 rear view**

Below quotations are given in mm :



removable handles for 19" rack  
mounting



**RPH3 outline dimensions**

## 4 SAFETY AND WARNING INSTRUCTIONS



**NOTE :** Electrostatic discharges (ESD) may cause unrecoverable damage on the RPH3 device.

Observe the necessary safety precautions when handling components that are vulnerable to electrostatic discharge (EN 61340-5-1 and EN-61340-5-2 as much as IEC 61340-5-1 and IEC 61340-5-2).



**NOTE :** Prior to any power appliance, check that connecting cables are securely locked into connector terminals using the integrated screws.



### **HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

- Turn power off before installing, removing, wiring or maintaining.
- Confirm that the product power supply voltage and its tolerances are compatible with those of the network.
- The installation, use and maintenance of RPH3 and related products described in this manual must be restricted exclusively to qualified engineers or persons instructed by them since RPH3 users must also be qualified to operate High Voltage switching systems.
- No responsibility can be assumed by GE for any consequences arising out of the use of this product.

### **FAILURE APPLYING THESE INSTRUCTIONS MAY RESULT WITH DEATH OR SERIOUS INJURIES**

### **Handling the RPH3 as an electronic equipment**

The RPH3 device contains electrical and electronic components that may still be charged after disconnection. The user may suffer electrical shock if precautions and instructions are not followed before handling or opening the device case.

- **Before any use of the RPH3 device, it must be grounded via the functional ground connection and the housing grounding terminal / lug.**
- Before use, check that all plug-in cable connectors are securely locked to the RPH3.
- On the RPH3, the continuity of secondary wiring of the current transformers is assumed by an internal connection inside the connector (“make before break” connection). Before removing these connectors, make sure to avoid any damage on the personal safety and on the current transformers devices.

### **Unpacking**

Despite the general robust construction of the RPH3, it shall be handled with care before installation. Before accepting the RPH3 it should be checked for damage which could have

originated during transportation. If you have cause for complaint, please refer to the transport company and notify your usual contact person within GE Power.

## Storage

If the RPH3 is not to be installed immediately upon receipt, it should be stored in a place which is free of dust and moisture, in its original packaging. If a moisture-absorption bag is in the packaging, keep it as it is. The efficiency of the drying agent is impaired if the unprotected bag is exposed to the surrounding conditions.

Before the Point-on-Wave Controller is placed in the box again, warm the drying bag slightly in order to regenerate the drying agent.

Storage temperature range: -40 °C to +70 °C.

## Installation

The RPH3 shall be installed in the control room or the relay room of the substation. Its position should be chosen for easy inspection, which implies an easy access to the RPH3 rear connections in case of need.

The RPH3 shall be well lit and properly locked to its housing location, taking its weight into account (care shall be taken to weight distribution issues, especially in case of an installation in a location exposed to large vibrations).

The RPH3 Point-on-Wave Controller can be installed in a standard 19" rack, provided that a suitable support (shelf) is provided by the C&R panel integrator.



As the RPH3 can be located up to several hundreds of meters away from the breaker (e.g. in the control room), please check that the requirements noted on GE LV drawing are respected, and especially that there is no injections of current (even some milliamps like a coil supervision device) on the outputs of the RPH3.

Whatever its location, the RPH3 frame shall be appropriately grounded prior to be supplied.