ORBITAL - Profibus interfaced WIND TURBINE control modules

- Profibus DP interface
- Minimize number of control modules
- Minimize PLC program code
- Computed measurements
- Programmable parameter values
- Compact DIN-rail snap-on mounting
- Simple wiring and configuration
- Low cost, easy to install

The Orbital IEC system is a high performance wind turbine controller based on standard industrial components. Key words are open technology, independence, simplicity, flexibility and nearly unlimited possibilities for expansion.

Orbital designed various specific modules, focusing onto a standard PLC with integrated Profibus interface for communicating with the applied modules.

This controller, an integration of standard components with new developed wind turbine specific control modules, can be installed in any standard wind turbine without an appreciable re-design of the existing hardware concept of the nacelle- and bottom construction. The small size design of the IEC modules also permit retrofit applications.

To achieve independence, the Orbital designed high-integrated wind turbine specific control modules can at any time be replaced by commercial standard modules.

There is no longer a demand for placing all control units traditionally in the control cabinet, the IEC Profibus opens the possibility to place control at any location where control is suitable, e.g. both in the bottom cabinet and in the nacelle.

Traditional multi cabling from bottom to top can be replaced by ProfiBus, a 2-wired RS485 based communication line or on request, fiber optics. This saves cobber and expenses.

The wind turbine control algorithms are no longer a secret of the provider. By using the PLC related open programming language now the customer at any time has the freedom to create his own software and adjust or modify the entire control philosophy – without entering a proceeding technical dialogue with the manufacturer of the hardware.

To improve the functionality and performance of the wind turbine, easily additional control modules can be integrated into the existing system and implemented into the software.
**OrbiGrd**  Grid monitoring module

- Monitoring a 3-phased grid.
  - 3 Voltage inputs.
  - 3 Current inputs.
  - 2 Analogue outputs. (U/I selectable)
  - 2 Digital inputs.
  - 2 Relay outputs.

**Measurement:**
- 3-phased Voltage/Current [V/A]
- Active Power [kW]
- Reactive Power [kVAR]
- Grid frequency [Hz]
- Cos (phi), Power Factor
- Excess indication of measured values

ProfiBus interface

**OrbiMix**  Timer/counter/temperature module

- Monitoring of temperatures and high-speed counter / timer signals.
  - 8 (16) Pt100 sensors. (3-wired)
  - 6 Hi speed counter / timer.
  - 2 Digital inputs.
  - 2 Relay outputs.

**Measurements:**
- Temperature [°C/°F]
- Revolution [RPM]
- Wind speed [mps/mph]
- Frequency [Hz]
- Excess indication of measured values
- Yaw control

ProfiBus interface
OrbiThy  Thyristor control module

OrbiThy

3-phased dual polarity thyristor trigger unit for soft motor start and soft generators connection.

- 3 Thyristor trigger outputs.
- 2 Digital inputs.
- 2 Relay outputs.
- Available as “Stand Alone” module

**Measurements:**
- Grid frequency \([\text{Hz}]\)
- Phase sequence
- Thyristor trigger angle \([\text{[°]}]\)
- Excess indication of measured values

ProfiBus interface

OrbiVib  Vibration monitoring module

OrbiVib

Vibration / RPM guard.
Monitoring vibration bands, temperatures and counter / timer signals
Configurable as Stand Alone system. Available as Lite version without Pt100 inputs

- 1 External dual axis accelerometer
- 8 Pt100 sensors. (3-wired)
- 2 Digital Inputs (encoder / timer).
- 2 Relay outputs.

**Measurement:**
- 8 fixed LF vibration bands \([\text{Hz}]\)
- 1 programmable vibration band \([\text{Hz}]\)
- Temperatures \(\text{[°C/F]}\)
- Revolution \([\text{RPM}]\)
- CW/CCW indication
- Excess indication of measured values

ProfiBus interface
**OrbiVib**

Vibration / RPM guard / Datalogger
Monitoring vibration bands and counter / timer signals
Configurable as Stand Alone system.

- 1 External dual axis accelerometer
- 2 Digital Inputs (revolutions / encoder).
- 2 Relay outputs.
- USB interface

**Measurement:**
- 8 programmable vibration bands [Hz]
- Revolution measurement [RPM]
- CW/CCW indication (encoder mode)
- Excess indication of measured values
- Real Time Clock
- Data Log Buffer
- Trace buffer for condition monitoring

ProfiBus interface

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**OrbiCap**

Solid State Power Factor Control

OrbiCap provides dynamic control of the reactive power and improves the grid quality by transient free switching of the capacitors.

OrbiCap can work automatically in a Profibus environment or manually as a Stand Alone System by using the 4 Digital Control Inputs. Security Klixons

**Control:**
- 4 Digital Inputs
- 4 Digital Security Klixon Inputs
- Available with Profibus DP interface
Bottom / Top Connections via **ProfiBus**

**Nacelle** top level

- OrbiMix
  - RPM, Wind, Yaw
- OrbiVib
  - Vibration / RPM guard
- I/O Bus terminal
- Top Inputs
- Top Outputs
- Contactors:
  - Feed Back
  - Hydraulic pressure OK
  - Oil level indication
  - Brake released
  - Brake worn out
  - Yaw Count
  - Cable Twist
  - Rewind signals
  - Temperature Limit
  - Thermo relays
  - Emergency Stop
  - Top Control

**Control Cabinet** ground level

- PLC with digital In/Outs and ProfiBus Interface
- OrbiGrid
  - Grid Control
- OrbiThy
  - Generator Control
- Bottom Inputs
- Bottom Outputs
- Service Key
- Contactor Feedback
- Lightning Arrestors
- Thermo relays
- Thyristor Temperature
- Emergency Stop
- Generator Contactor
- Bypass Contactor
- Power Factor Control
- Main Switch Trip
**Meteorological Equipment**

### Anemometer
- PNP digital output
- Short circuit protected
- Brass / Stainless Steel Construction
- Start wind > 1.0 m/s
- 10 m cable
- 0.75 kg
- Accuracy < 4%
- Calibration on request

### Wind Vane
- PNP digital output
- “Black and White” detection
- “In Wind” indication
- Short circuit protected
- Brass / Stainless Steel Construction
- Start wind > 1.5 m/s
- 10 m cable

### Wind Direction sensor
- PNP digital output
- 64 sectors
- Short circuit protected
- 1.35 Kg
- Brass/Stainless steel construction
- Start wind: > 1.5 m/s
- Resolution 5.6°
- Gray Code