Realtime DSP grid measurement module
Surveillance of 3 currents and 3 voltages
New, improved algorithms for precise, fast and reliable grid measurements
Calculation of all grid data
Grid protection
Supports FRT/LVRT
Supplies data for machine control
Supplies data for production statistics
Intelligent thermal control
Configurable measuring modes to present Power, Energy and Powerfactor

The WP4x00 MK II Control Concept
The WP-Line 151 MK II Grid Measurement module is part of the WP4x00 MK II Control Concept which has been specially designed to control large wind turbines - on- and offshore. The WP4x00 MK II Control Concept ensures optimal operation, high security, and advanced data collection.

The concept typically consists of a power supply/backbone module, a WP4x00 MK II controller, a grid measurement module as well as an analog/digital I/O module dependent on the specific configuration task. The WP4x00 MK II Control Concept makes it possible to have redundant solutions. The concept is constructed as a plug-and-play system with automatic module detection and error reporting.

Advantages of the WP4x00 MK II Control Concept:
› Corrosion robust construction
› Robust WP-Line interconnection
› Fast and easy DIN-rail mounting
› Automatic node assignment of WP-Line modules
› Simplified module status indication
› Supports removable LED matrix display
› Service-friendly

The WP-Line 151 MK II
The WP-Line 151 MK II module has three voltage and three current analog inputs. The module is powered from the WP-Line BUS.

The WP4x00 MK II controller can automatically update the programs via the network. The communication to the WP4x00 MK II controller is event-based, which means that only changed values are transmitted via the network. Analog part is based on 16 bit precision ADC.

The WP-Line 151 MK II module performs three basic functions:
› Calculates main grid parameters
› Switches turbine off the grid in case of grid fault
› Provides WP4x00 MK II controller with data

Main grid parameters like voltage, current, active and reactive powers, etc. are used by the WP4x00 control application for turbine overall control. Calculation of main grid parameters by precise and reliable DSP algorithms has the following features:
› Frequency calculation algorithm assures measurement accuracy 0.01 Hz and higher
› Voltage and currents are calculated using FFT algorithms
› Powers and energies are measured according to IEC 61400-21 standard
› Precise DSP algorithms and high update rate make support for FRT/LVRT
Apart from just measuring main grid parameters the WP-Line 151 MK II module can perform grid protection functions. In particular, it can protect the grid in case of the following grid faults:

- Over/under voltage
- Over/under average voltage
- Over current
- Over/under frequency
- Over power
- Reactive power high/voltage low
- Vector jump
- Rate of change of frequency (ROCOF) high

By default, the grid protection functionality of the WP-Line 151 MK II module is disabled. For the WP-Line 151 MK II module to perform grid protection functions it must be properly configured. The grid protection functionality of the WP-Line 151 MK II module provides two level of grid protection:

- The first level is passive, that is, faults are only detected and registered but no active actions are undertaken.
- The second level is active, that is, when grid fault happens the relay is activated and thus the turbine is switched off the grid.

Furthermore, there is an option for manual relay activation regardless of grid faults state. Relay can be reset (closed) automatically, if voltage and frequency is within the specified range or manually. Grid protection by WP-Line 151 MK II module operates with such definitions as threshold, dropout level and timeout.

- Threshold level defines a value crossing of which up or down – dependent on whether it is high or low threshold - leads to activation of “timeout” timer.
- Dropout level defines a value crossing of which down or up – dependent on whether it is high or low threshold - leads to fault clearance.
- Timeout value defines time interval between crossing threshold and fault activation.

Once the relay is activated, it stays in this state during certain minimum period which is configurable value. There is an option for programmatical inversion of relay behavior - relay activation can be associated with either relay open or relay close state.

Fault reaction time, that is, time interval between fault detection and relay activation is configurable timeout value. If minimum reaction time is required then timeout is set to 0.

In case of voltage fault maximum relay reaction time is 30 ms. In case of frequency fault maximum relay reaction time is 50 ms.

Over/under voltage protection, over/under frequency protection and automatic relay closing are certified by TUV according to the BDEW 2008 standard. Certificate registration number is 44 797 15179701. The certificate is valid till 2021-03-14.
## Technical Data

### WP-Line BUS Supply Voltage
- **Nominal**: 12 VDC
- **Allowed range**: 10.5 to 13.5 VDC

### Current Consumption (WP-Line BUS)
- **Typical**: 0.40 A
- **Maximum**: 0.45 A
- **Standard module load**: 2

### Module Power Dissipation
- **Typical**: 4.6 W

### Grid Measurement Input
- **No. of current inputs**: 3
- **Current input range**: 5 A RMS
- **Current input impedance**: 10 mΩ
- **No. of voltage inputs**: 3
- **Voltage input range**: 18 V RMS
- **Voltage input impedance**: 8.3 kΩ
- **Resolution**: 16 bit
- **Accuracy**: 0.2 % of full scale
- **Sample speed**: 4 kHz

### Relay output
- **Max. switching current**: 1A
- **Max. switching voltage**: 125 VDC/AC
- **Max. response time**: 20 ms

### Permissible Ambient Conditions
- **Operation temperature**: -30 to +60 °C (fanless operation)
- **Storage temperature**: -40 to +85 °C
- **Relative humidity**: Max. 95 % RH (non-condensing @ 40 °C)
- **Operation altitude**: Max. 2000 m above sea level (up to 4000 m at derated temperature)

### Mechanical Information
- **Dimensions (WxHxD)**: 85 x 165 x 65 mm
- **Required gap (top/buttom)**: Min. 25 mm
- **Weight**: 0.35 Kg (incl. plug in terminal blocks)
- **Degree of protection**: IP30

### Applied Standards
- **Damp heat**: EN60068-2-78
- **Vibration**: EN 60068-2-6
- **Bump**: EN 60068-2-27
- **Shock**: EN 60068-2-27
- **Temperature**: EN 60068-2-1, EN 60068-2-2 and EN 60068-2-14
- **EMC**: EN 61000-6-2 (Immunity standard for industrial environments) EN 61000-6-4 (Emission standard for industrial environments)

Specifications subject to change
MT_WP-Line 151 MK II_DataSheet_R8_0

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Mita-Teknik Ordering Information

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