EOL2020

wind data-logger

PowerTest **Module**

KINTECH
kinematic technology

CONTENTS

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January 2004

The *PowerTest* module is an accessory to the data logger *EOL2020*. This document is a guide to the module functions, which should be read in conjunction with the "User Guide" for the data-logger.

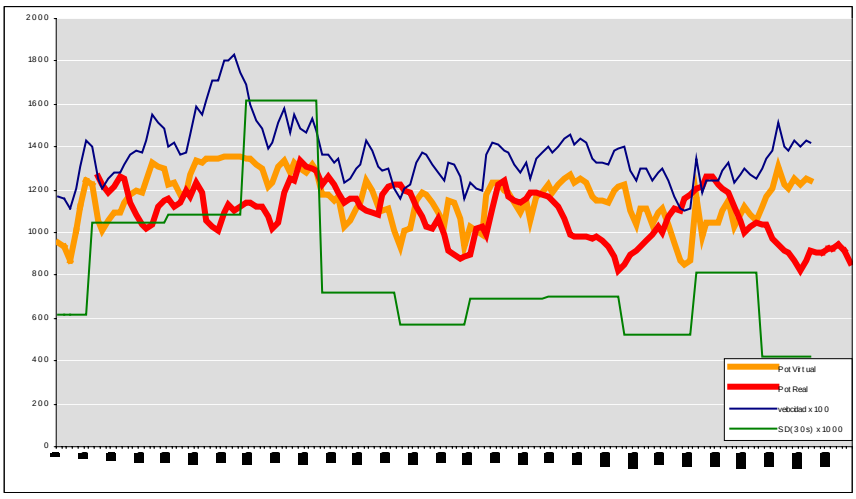
1. General description

The *PowerTest* module is a tool specifically designed to carry out the wind-turbine test known as the *Power Performance Test,* according to the procedure described in the standard IEC61400.

A special connection on the data-logger receives the active power signal produced by the wind turbine. The power data are processed and recorded together with other meteorological measurements. The software generates a combined presentation of the data which makes it easier to analyse the results.

The design of the *PowerTest* module has been based on the standards of the international organisations; IEA, IEC, AWEA and WMO. During the phase of calculations and operability, various work has been considered by the Spanish energy research organisations CIEMAT, IDAE and CIRCE. In particular, suggestions in the standard IEC 61400 have been included.

The *PowerTest* module is a special version of the *EOL2020* firmware and software. It has been produced with the same philosophy of both ease-of-use and security in data acquisition which is shared by the other EOL products.



2. Reliability and precision

The *PowerTest* module for the wind-farm logger maintains the same operating structure as the rest of the EOL range of products, from which it inherits its now well-known characteristics of precision and reliability.

The average speeds are calculated with an accuracy of sixteen bits. This means that in practice, the precision of the data downloaded only depends on the precision of the anemometer used.

The directions are calculated with an accuracy of eight bits, which implies a conversion error of 0.4%. In the other analogical inputs the accuracy is 12 bits or 0.001221 V.

The maximum and minimum speeds have an accuracy of ±0.05 metres per second.

3. Type and number of sensors

It is possible to connect the following directly to the *EOL2020®* logger: three anemometers, two vanes, a temperature sensor, two analogue sensors, (typically atmospheric pressure, relative humidity) and active power in the machine, and an external digital input which can be used as an instantaneous GSM call alarm.

The various types of sensors that can be connected include those most commonly used, whether for anemometers, vanes or analogue sensors.

The logger accepts coil, opto-chopper and reed-contact anemometers. It is also possible to connect propeller-type anemometers with voltage coded output, to measure vertical currents.

The vanes are usually of the potentiometer type with values of between 1KΩ and 10KΩ. It is also possible to connect absolute encoder vanes, coded in Gray.

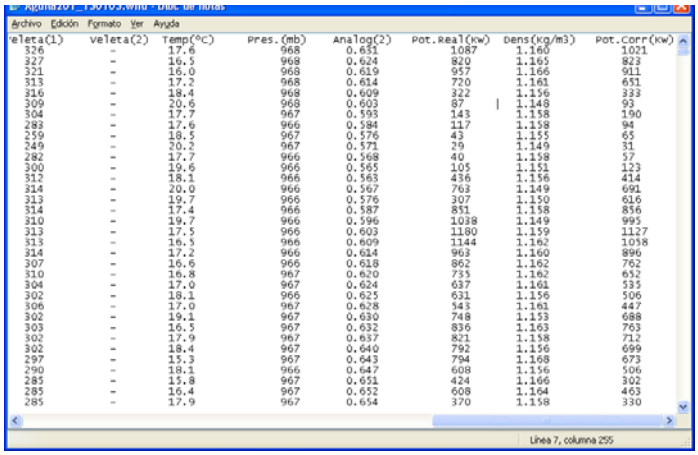
The analogue connections should have a power output, and accept values of up to five volts. If this is not the case, it will be necessary to use signal adaptors.

4. Downloading and logger interface

The method to download from the logger has not been modified.

The files of output data show columns with average wind speeds, standard deviations, gusts, estimated power, directions, temperature, other analogues, and in addition:

- Actual wind-turbine power: Record of reading averages from analogue channel 3, with a sampling rate of ten times per second.
- Air density: Calculation of the air density, with a time interval of ten minutes, using air pressure and temperature data.
- Corrected power: Correction of air density measured, for production estimated, which is carried out by the data-logger for a simulated machine.



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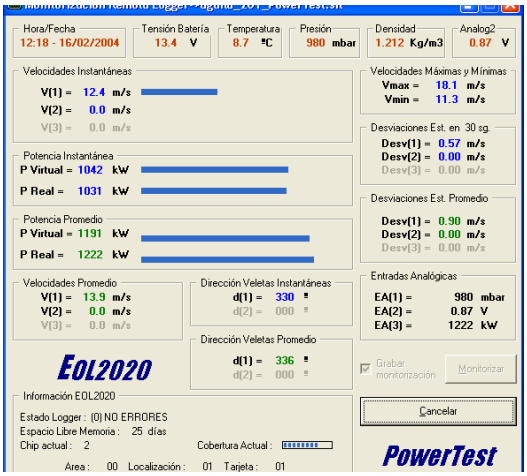
Veleta(1)	Veleta(2)	Temp(°C)	Pres.(mb)	Analog(2)	Pot.Real(Kw)	Dens(Kg/m3)	Pot.Corr(Kw)
326	-	17.6	968	0.631	1087	1.160	1021
327	-	16.5	968	0.624	820	1.165	823
321	-	16.0	968	0.619	957	1.166	911
313	-	17.2	968	0.614	720	1.161	691
316	-	18.4	968	0.609	322	1.156	333
309	-	20.6	968	0.603	87	1.148	93
304	-	17.7	967	0.593	143	1.158	190
283	-	17.6	966	0.584	117	1.158	94
259	-	18.5	967	0.576	43	1.155	65
249	-	20.2	967	0.571	29	1.149	31
282	-	17.7	966	0.568	40	1.158	57
300	-	19.6	966	0.565	105	1.151	123
312	-	18.1	966	0.563	436	1.156	414
314	-	20.0	966	0.567	763	1.149	691
313	-	19.7	966	0.576	307	1.150	616
314	-	17.4	966	0.587	851	1.158	856
310	-	19.7	966	0.596	1038	1.149	995
313	-	17.5	966	0.603	1180	1.159	1127
313	-	16.5	966	0.609	1144	1.162	1058
314	-	17.2	966	0.614	963	1.160	896
307	-	16.6	966	0.618	862	1.162	762
310	-	16.8	967	0.620	735	1.162	652
304	-	17.0	967	0.624	637	1.161	535
302	-	18.1	966	0.625	631	1.156	506
306	-	17.0	967	0.628	543	1.161	447
302	-	19.1	967	0.630	748	1.153	688
303	-	16.5	967	0.632	836	1.163	763
302	-	17.9	967	0.637	821	1.158	712
302	-	18.4	967	0.640	792	1.156	699
297	-	15.3	967	0.643	794	1.168	673
290	-	18.1	966	0.647	608	1.156	506
285	-	13.8	967	0.651	424	1.166	302
285	-	16.4	967	0.652	608	1.164	463
285	-	17.9	967	0.654	370	1.158	330

Línea 7, columna 255

In the software, a screen with a real-time link shows slight modifications to add new data. These data, with specific positions, provide the actual power produced by the wind turbine, pressure and air density.

The manner and format in which these data are presented on screen enables the user to quickly see the evolution of the wind, with the actual production and the estimated production.



5. Installation

Measurement of actual wind-turbine power, which at first was only envisaged as a short term project, quite often becomes a permanent feature at a wind farm. For this reason, it is recommended to plan the trenches and other aspects right from the beginning of the civil engineering work at the wind farm.

For the power supply and connecting the sensors, refer to the general procedure for the installation set out in the “User Guide” for the *EOL2020*.

The power-output signal, at analogue input 3, should be connected so as to establish the correct insulation between the wind-turbine where the measurement is taken and the data-logger. Various signal adjusters available on the market can be used to do this. These also allow us to adapt the voltage levels to the input range of the data-logger.

Bearing in mind the distance between the wind-turbine and the data-logger, it is best to transmit the signal in intensity loop. With regards to the cable, it is recommended to use screened cable specially designed for signal transmission.

It is also strongly advisable to use separate earthing rod for the data-logger to that used for the rest of the tower.

The installation and use of the software is identical to that of the basic module. Consult the documentation for installation and use.