



Guidelines on signal list  
Technical regulation 3.2.5  
for wind power plants with a power output  
above 11 kW

0	Published UK edition	05.12.2014	12.12.2014	15.12.2014	15.12.2014	DATE
		KDJ	XLOC	BJA	TSK	NAME
REV.	DESCRIPTION	PREPARED	CHECKED	REVIEWED	APPROVED	
		<b>13/96336-34</b>				

**Revision view**

<b>Section no.</b>	<b>Text</b>	<b>Revision</b>	<b>Date</b>
	New document, UK edition	0	15.12.2014

## Table of contents

Revision view.....	2
Table of contents.....	3
Reading instructions .....	4
1. Signal list .....	5

## Reading instructions

These guidelines are prepared as an aid for understanding a few more details concerning the required signals for all categories of *wind power plants* which the *plants* must be able to exchange with the *electricity supply undertaking* at the *PCOM* interface in order to be connected to the *public electricity supply grid* in Denmark.

References made to the applied standards, norms, technical regulations etc. are described in Technical regulation 3.2.5. Abbreviations used are also described in Technical regulation 3.2.5.

These guidelines are published by Energinet.dk and are available at [www.energinet.dk](http://www.energinet.dk).

## 1. Signal list

Requirements for information, measuring signals, status signals and possibilities of activation are specified in Technical regulation 3.2.5, Section 7.

In the overview below, a few more details are described regarding the individual signals and a general explanation about the use of information, signals, etc.

The information must be available for the *wind power plant* at the *PCOM* interface.

Activation of the individual functions in the *plants* and configuration of the specific parameters and the scope of measuring signals for system operation must meet the requirements stated in Technical Regulation TR 5.8.1 – “Metering regulation for system operation purposes” dated 25 March 2008.

These guidelines and the remaining documents regarding requirements for grid connection can be downloaded from [www.energinet.dk](http://www.energinet.dk).

The signal list which follows on the next page is prepared in MS Excel file format and can also be downloaded from [www.energinet.dk](http://www.energinet.dk).

Signal list for wind power plants - TR 3.2.5:2014													
Version: 1.0		date: 15.12.2014											
Rated output													
A	B	C	D	Signal description	Comments	Possible interval	Recommended value	Unit	Type of data	Purpose	Typical operator	Typical user	Energinet.dk reference
		X	X	Grid disconnection in POC	Open/closed	Open/closed	-	-	Status	Monitor coupling state for wind power plants and infrastructure of units/plants	-	PBR, Electricity supply undertaking	TR 5.8.1
		X	X	Switch gear status in plant infrastructure	Active power control	0 - P <sub>n</sub>	-	kW	Metering	Input for active power regulation	-	PBR, Electricity supply undertaking	TR 5.8.1
		X	X	Active power regulation - activated/deactivated	Active power control	Active/inactive	Active	-	Status	Monitor the electricity system	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Active power regulation - gradient for upward and downward regulation	Active power control	dP/dt	100 kW/s	kW/second	Set point	Check the speed for upward and downward regulation	PBR	PBR	TR 3.2.5
		X	X	Active power regulation - requested active power in POC	Active power control	0 - P <sub>n</sub>	-	kW	Set point	Check the active power generated by the wind power plant	PBR	PBR	TR 3.2.5
		X	X	Reactive power - import/export in POC	Active power control	Q <sub>HAK</sub> to Q <sub>HK</sub>	-	kvar	Metering	Input for reactive power regulation	-	PBR, Electricity supply undertaking	TR 5.8.1
		X	X	Power factor - measured in POC	Reactive power control	0 - 1	-	-	Metering	Input for reactive power regulation	-	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Power factor - requested power factor in POC	Reactive power control	0 - 1	1	-	Set point	Power factor control	Electricity supply undertaking	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Reactive power regulation - activated/deactivated	Reactive power control	Active/inactive	Active	-	Status	Monitor control for reactive compensation	PBR	PBR	TR 3.2.5
		X	X	Reactive power regulation - requested reactive power in POC	Reactive power control	Q <sub>HAK</sub> to Q <sub>HK</sub>	0	kvar	Set point	Mvar control	PBR	PBR	TR 3.2.5
		X	X	Voltage in the voltage reference point	Voltage control	0 - U <sub>c</sub> +15%	-	V	Metering	Input for voltage control in POC	Electricity supply undertaking	PBR, Electricity supply undertaking	TR 5.8.1
		X	X	Voltage control - active/inactive	Voltage control	Active/inactive	Inactive	-	Status	Monitor voltage control	Electricity supply undertaking	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Voltage in voltage reference point	Voltage control	0 - U <sub>c</sub> +15%	-	V	Metering	Monitor voltage mode in wind power plant	-	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Voltage control - droop for voltage control	Voltage control	2 - 8%	6%	% of U <sub>n</sub>	Set point	Droop for voltage control in the voltage reference point	Electricity supply undertaking	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Voltage regulation - requested voltage in the voltage reference point	Voltage control	U <sub>c</sub> +/-10%	-	V	Set point	Voltage control	Electricity supply undertaking	PBR, Electricity supply undertaking	TR 3.2.5
X	X	X	X	Frequency response - activated/deactivated	Frequency response	Active/inactive	-	-	Status	Provide frequency support in overfrequency	-	PBR, Electricity supply undertaking	TR 3.2.5
X	X	X	X	Frequency response - start frequency for downward regulation - f <sub>2</sub>	Frequency response	50.000 - 52.000	51.5	Hz	Set point	Provide frequency support in overfrequency	-	PBR, Electricity supply undertaking	TR 3.2.5
X	X	X	X	Frequency response - droop for downward regulation from f <sub>2</sub>	Frequency response	0 - 100%	40%	% of P <sub>n</sub> /Hz	Set point	Provide frequency support in overfrequency	-	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - activated/deactivated	Frequency control	Active/inactive	-	-	Status	Monitor frequency control	-	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - regulation limit - low frequency	Frequency control	46.50 - 47.50	47.0	Hz	Set point	Lower control limit value for frequency control	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - regulation limit - high frequency	Frequency control	51.5 - 53	52.0	Hz	Set point	Upper control limit value for frequency control	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - regulation reserve - P <sub>min</sub>	Delta control	0 - P <sub>n</sub>	20% of P <sub>n</sub>	kW	Set point	Input for frequency control in POC	PBA	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - start frequency for control band - f <sub>1</sub>	Frequency control	49.750 - 50,00	49.8	Hz	Set point	Input for frequency control in POC	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - droop for upward regulation from f <sub>1</sub> to f <sub>2</sub>	Frequency control	0 - 50%	4%	% of P <sub>n</sub> /Hz	Set point	Input for frequency control in POC	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - start frequency for dead band - f <sub>2</sub>	Frequency control	49.800 - 50.000	49.88	Hz	Set point	Input for frequency control in POC	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - end frequency for dead band - f <sub>1</sub>	Frequency control	50.000 - 50.200	50.02	Hz	Set point	Input for frequency control in POC	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - end frequency for control band - f <sub>1</sub>	Frequency control	50.000 - 50.250	50.2	Hz	Set point	Input for frequency control in POC	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - end frequency for regulation up to f <sub>1</sub>	Frequency control	50.000 - 51.700	50.5	Hz	Set point	Input for frequency control in POC	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - droop for downward regulation from f <sub>1</sub> to f <sub>2</sub>	Frequency control	0 - 50%	6%	% of P <sub>n</sub> /Hz	Set point	Input for frequency control in POC	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - end frequency for regulation up to f <sub>2</sub>	Frequency control	51.100 - 50.300	50.2	Hz	Set point	Input for frequency control in POC	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - droop for downward regulation from f <sub>2</sub> to f <sub>1</sub>	Frequency control	0-50%	6%	% of P <sub>n</sub> /Hz	Set point	Input for frequency control in POC	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	Frequency control - frequency limit for reclosure if active power is reduced to below P <sub>min</sub> - f <sub>2</sub>	Frequency control	50.000 - 50.100	50.05	Hz	Set point	Input for frequency control in POC	Electricity supply undertaking	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	P <sub>min</sub>	Frequency control	0 - 20%	10%	-	Set point	Lower limit for frequency control in POC	PBR	PBR, Electricity supply undertaking	TR 3.2.5
		X	X	System protection	Protection	Active/inactive	Inactive	-	Control	Activation/deactivation of system protection feature	Electricity supply undertaking	PBR, Electricity supply undertaking	TR 3.2.5
X	X	X	X	Stop signal	Protection	Active/inactive	Inactive	-	Control	Activation/deactivation of stop signal	Electricity supply undertaking	PBA, Electricity supply undertaking	TR 3.2.5
X	X	X	X	On hold signal - released for start	Protection	Active/inactive	Inactive	-	Control	Activation/deactivation of reclosure	Electricity supply undertaking	PBR, Electricity supply undertaking	TR 3.2.5