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**Measurement and assessment of power quality characteristics of  
wind turbines generator systems**

( IEC 61400-21 :2008 , Wind turbines —  
Part 21 : Measurement and assessment of power quality characteristics  
of grid connected wind turbines , I D T )



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5 3

**maximum measured power for wind turbines**

3 6

**network impedance phase angle**

$$= \arctan \left( \frac{X}{R} \right)$$

$\frac{X}{R}$

3 7

**normal operation for wind turbines**

3 8

**operational mode for wind turbines**

3 9

**output power for wind turbines**

1 3 0

**point of common coupling PCC**

11 3

**power collection system for wind turbines**

12 3

**rated apparent power for wind turbines**

$$S = \sqrt{P^2 + Q^2}$$

1 3 6

**standstill for wind turbines**

1 3 7

**start up for wind turbines**

1 3 8

**switching operation for wind turbines**

1 3 9

**turbulence intensity**

2 3 0

**voltage change factor for wind turbines**

$$k ( ) = \sqrt{ } \times \frac{U - U}{U} \times \frac{S}{S}$$

U  
U  
U  
S  
S

k

k

k

k

k

21 3

**wind turbine WT**

22 3

**wind turbine terminals**

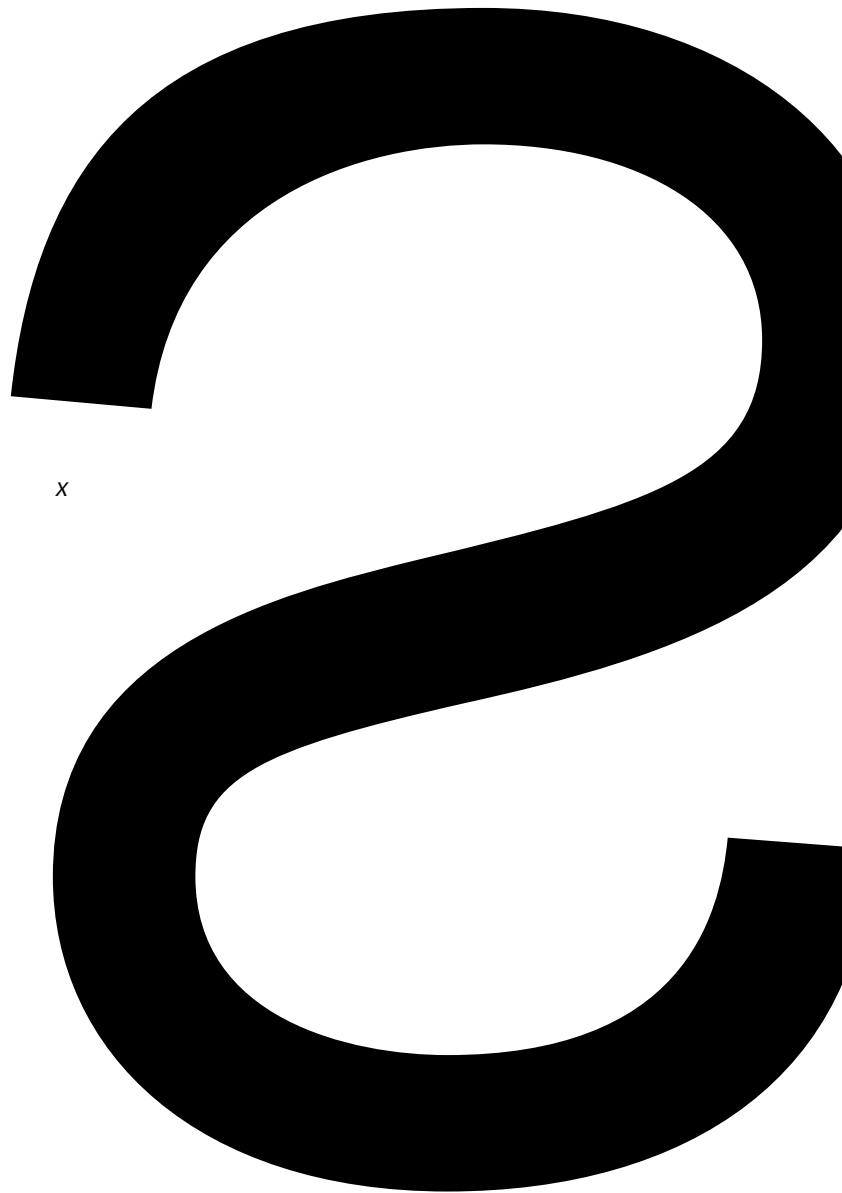
4

$$\frac{U}{U}$$

t

c

E i  
f  
f i i  
f  
f  
f i i  
h  
l h i i h  
i t  
l  
k  
k i  
k  
L  
N  
N  
N v  
n i i  
N  
N i i  
N i c x i  
N  
P  
P  
P  
P  
P  
P  
P c x c  
P  
P  
P  
Q  
R  
S  
S  
S



*U*

*U*

*U*

*v*

*v*

$v_i$

*i*

$w_i$

*i*

*X*

*Z*

*Z*

263

v

c v

Q

$$F(v) = \dots$$





6 9

7

1 7

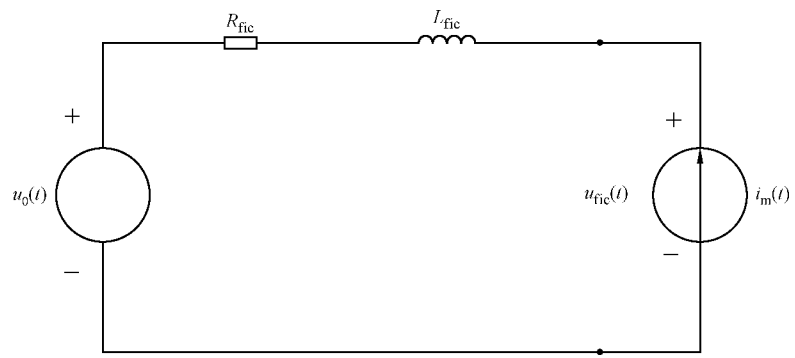
1 7

1

2

i

2

4

$u$   $t$   
 $i$   $t$      $i$   $t$

$R$      $L$

*u t*

$N_i$   $i$   
 $N$   
 $v$

$f_i$   $f_i$

$$W_i = \frac{f_i}{f_i}$$

$c$   $v$

$$P(c, x) = \frac{\sum_{i=1}^N W_i \times N_{i,c,x}}{\sum_{i=1}^N W_i \times N_i}$$

$N_{i,c,x}$   $i$   
 $N$

$x$

$P(c, x)$



1

2

3P

T

4

7 4





6

P P

P

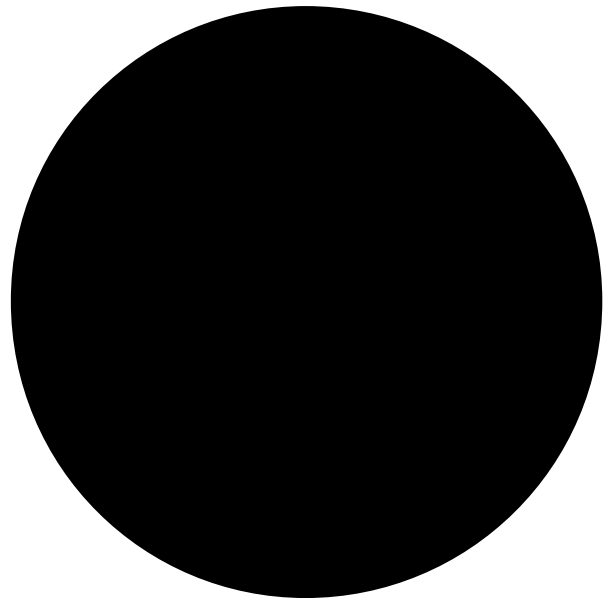
7 6

1 7 6

P

P

6



7 6 3

7 7

1 7 7

2 7 7





$$P = P = c ( v ) \times \frac{S}{S}$$

c v

v

S

S

*k*

1  
2

3 8

**A**

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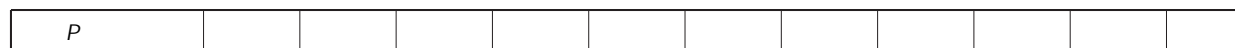


	$N$			
	$N$			
	$k$			
	$k$			

<sup>p</sup> b λ "



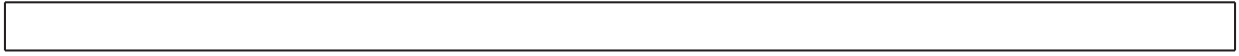
A            2 3





A

4



*P*    *P*

*P*

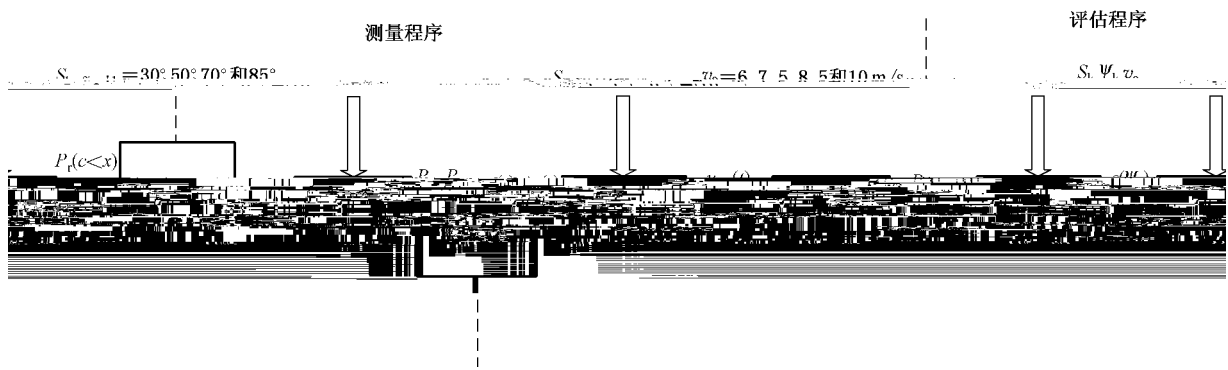
A 5 3

A

8


B

B 1



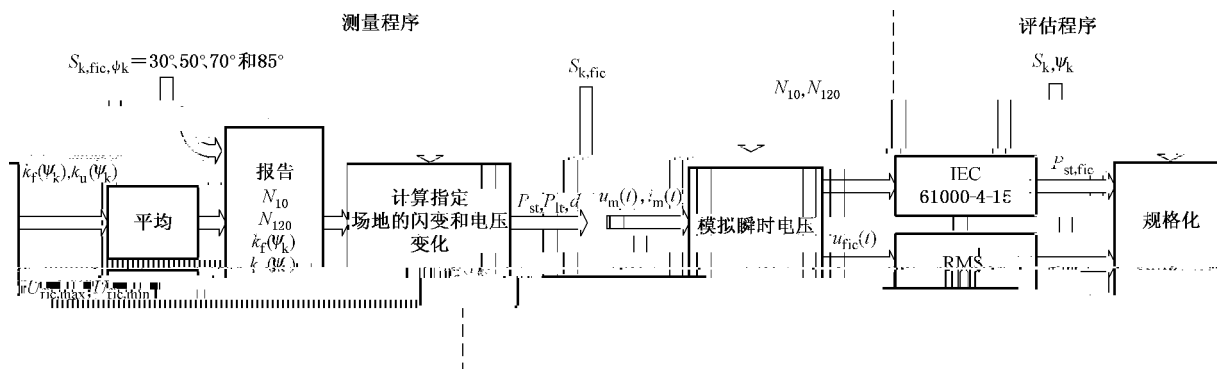
B 1

u t i t  
S

u t  
u t

P

P



B 2

u t i t  
S

u t  
u t

P  
U  
U  
P



<sup>2</sup> TM

TM

**B** 2

	$W_i$	$W_i$	$W_i$	$W_i$

**B** 3

$V$				
$\sum_{i=1}^N W_i \times N_i$				

TM

C

TMTM

TM

TM

C

C

$P$ <sub>TM</sub> C

TM

TM

**B**

**4**

		<i>P c x</i>	<i>P c x</i>	<i>P c x</i>	<i>P c x</i>
1	5 900			99 0 00	
	5 888		299 0 0		

*C V*

**B**

**5**

<i>v</i>				

!

!

**B** 4

**B** 1 4

$P$   $P$   $S$   $P$   $S$

$$P = c(\ ) \times \frac{S}{S}$$

$S$

$c$

$$c(\ ) = P \times \frac{S}{S}$$

**B** 2 4

$F$

$k$

$$d = k(\ ) \times \frac{S}{S} \times$$

$d$

$d$   $t$

$$t = . \times d$$

$P$

$$P = \left( \frac{t}{T} \right)$$

ú Kl T

GB T 22 2 1/0 03 0

$$k ( ) = \sqrt{\quad} \times \frac{U}{U} \times \frac{S}{S}$$

U  
U

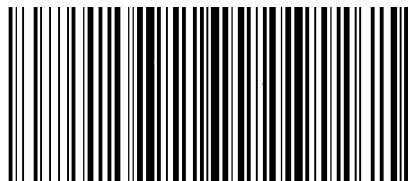
u t  
u t

C

!

$$u = \sqrt{-(u + u)}$$





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0 2 0 2 0 2 0 2 0 2

0 2

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