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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

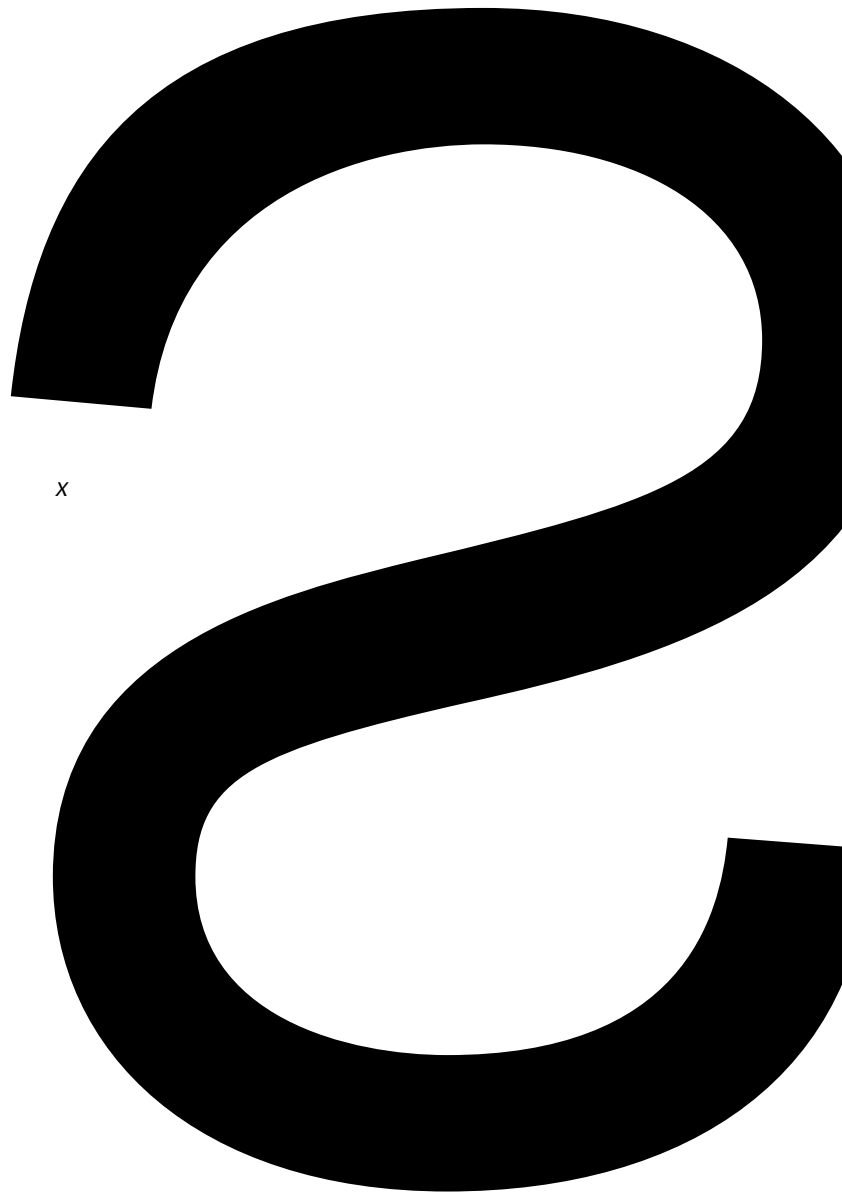
4

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

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
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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
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

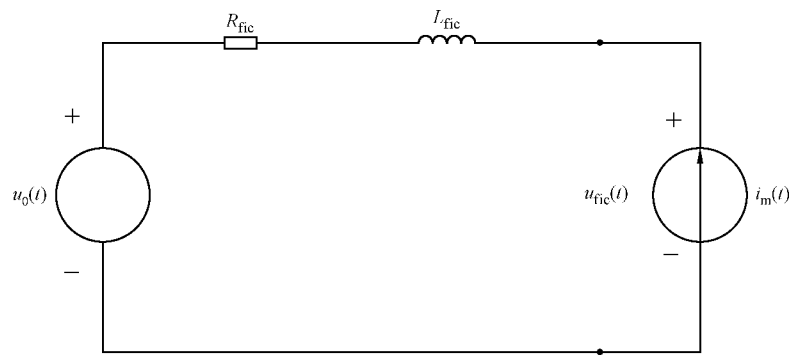
1 7

1

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2



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u t
 i t i t

R L

u t

$$\frac{N_i}{N} v$$

$$f_i f_i$$

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

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

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

$$P(c, x)$$

1

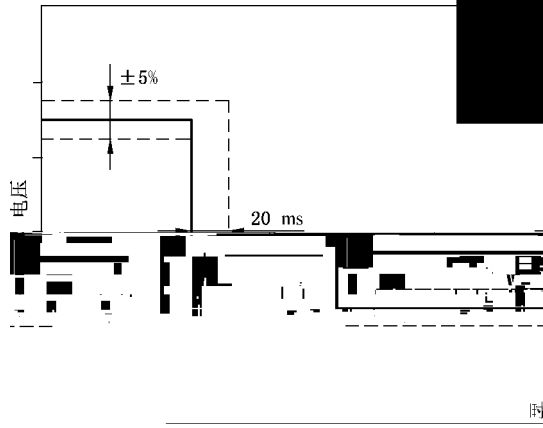
2

3P

T

4

7 4



6

P

P

P

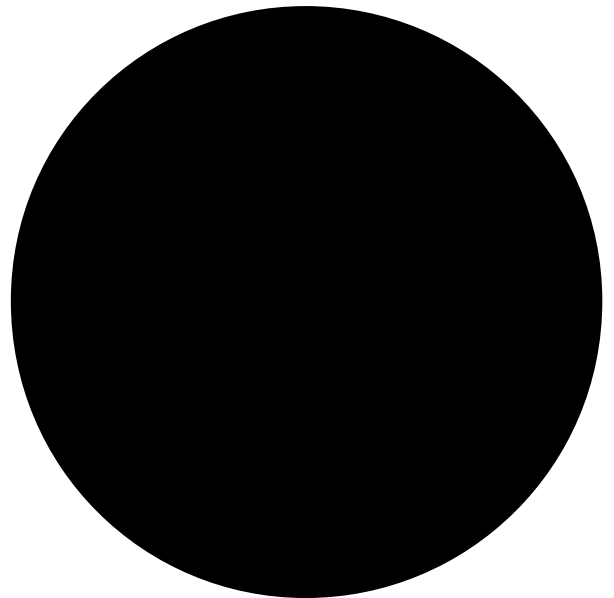
7 6

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

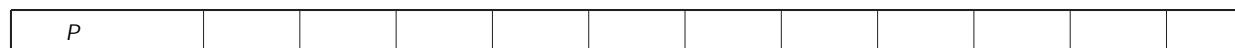
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	N			
	N			
	k			
	k			

^p b λ “

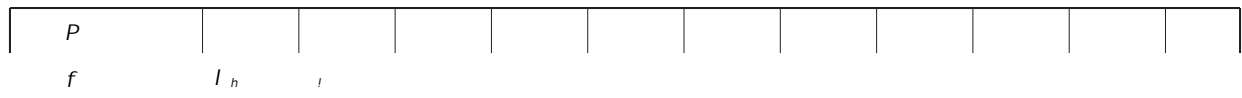


A 2 3



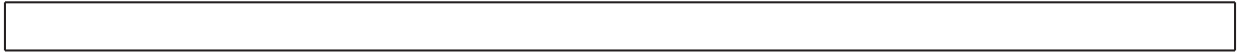
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33



A

4



P *P*

P

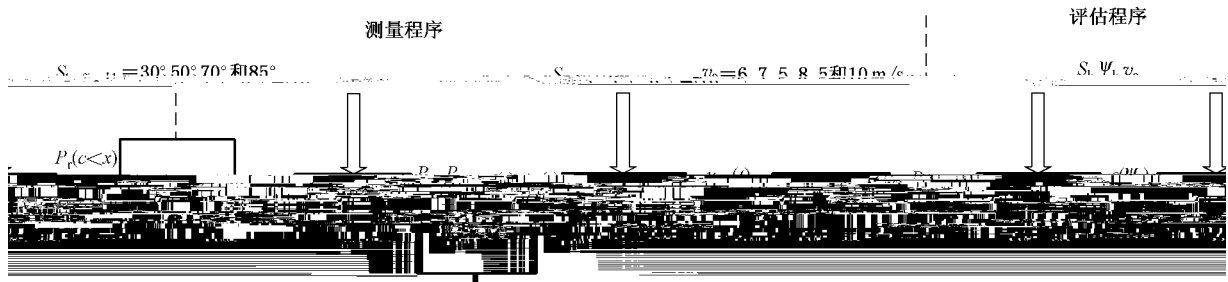
A 5 3

A

8

B

B 1



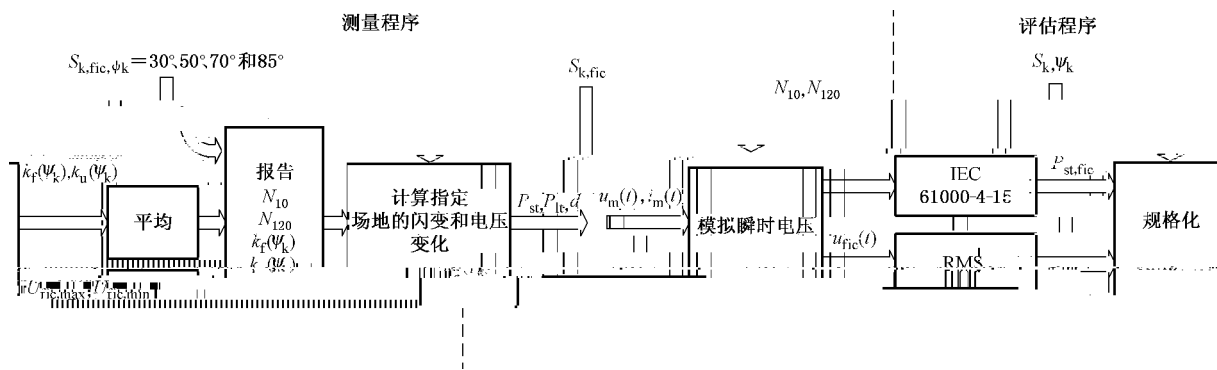
B 1

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

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
TM 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

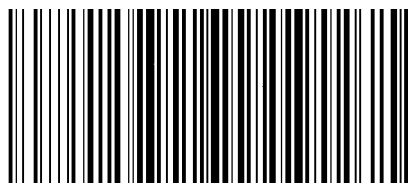
u t
u t

C

!

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





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