Project:
Karcino Sarbia SICOM Webinar

Description:
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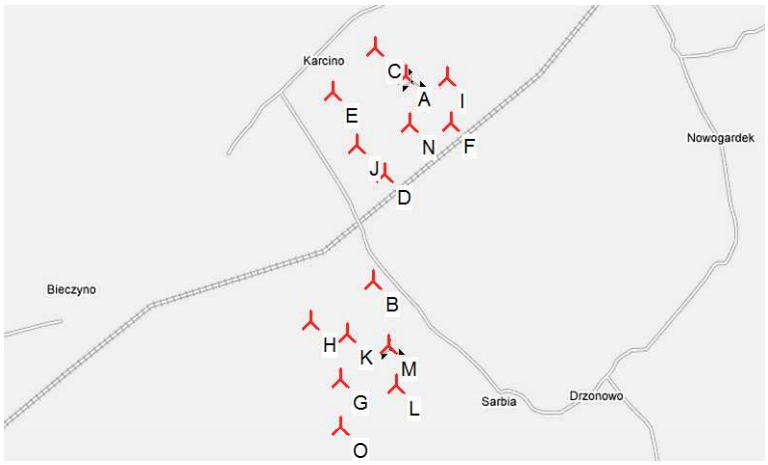
Calculated:
09/01/2014 15:34/2.9.269

Site compliance - Main result

Calculation: Webinar

Summary of data / calculations

Design standard	IEC61400-1 ed. 3 (2010)
Total new WTGs	15
WTG class IIB	Overrule all
Hub height	100.0 m
Site masts	2
Karcino 1 M179	49m, 1.0year(s), 100%recov
Karcino 2 M180	49m, 1.0year(s), 100%recov
WAsP calculation	WAsP 11
	Long-term corrected wind statistics
	Defaults used
WEng calculation	Wasp Engineering 3.00.0196
	Defaults used
Checks performed	7 of 7 Main checks
	3 of 3 Other checks



Scale: 75,000

Main result

Main checks

Terrain complexity	OK
Extreme wind	OK
Effective turbulence	*Caution*
Wind distribution	*Caution*
Flow inclination	OK
Wind shear	OK
Air density	*Caution*

Other checks

Seismic hazard	OK
Temperature range	OK
Lightning rate	OK

Result details

			WTG class	Method	Quality	WTG Mean	Max WTG	Min WTG	WTGs OK	WTGs Caution	WTGs Critical
Main checks											
Terrain complexity	ic	[-]		Active DEM		0.00	0.00	0.00	15	*0*	**0**
Extreme wind	u50y	[m/s]	IIB	POT-N	B+A	39.7	41.4	38.4	15	*0*	**0**
Effective turbulence	σeff(u)*	[-]	IIB	Mast	A+A	-	-	-	3	*12*	**0**
Wind distribution	pdf(u)*	[-]	IIB	WAsP Weibulls	A	-	-	-	0	*15*	**0**
Flow inclination	φmax	[°]		WEng	B	0	2	-2	15	*0*	**0**
Wind shear	α	[-]		Mast WEng	A	0.18	0.20	0.17	15	*0*	**0**
Air density	ρ	[kg/m³]		Mast	A/B	1.237	1.239	1.237	0	*15*	**0**
Other checks											
Seismic hazard	PGA	[m/s²]		GSHAP map		0.3	-	-			
Temperature range											
Normal range, hours outside		[h/year]	Std	Tail gauss		8.6	-	-			
Extreme range, hours outside		[h/year]	Std	Tail gauss		0.0	-	-			
Lightning rate		[flashes/year/km²]		NASA GHCC		1.5	-	-			

* Parameter checked for a range of windspeeds (u), a single summary value is not possible.

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Site compliance - WTG results

Calculation: Webinar

Main checks - WTGs

Criteria
- **Critical**
- *Caution*
- OK

Masts
- 1 Karcino 1 M179
- 2 Karcino 2 M180

Site data
- A Karcino 1 - long-term corrected in MCP
- B Karcino 2 - long-term corrected in MCP

	WTG-name	Class	Mast	Site data	Terrain complexity [-]	Extreme wind [m/s]	Effective turbulence [-]	Wind distribution [-]	Flow inclination [°]	Wind shear [-]	Air density [kg/m³]	Total
A	WTG 1	IIB	1	A	0.0	41.4	*Caution*	*Caution*	1	0.18	*1.237*	*Caution*
B	WTG 2	IIB	2	B	0.0	39.1	OK	*Caution*	-1	0.17	*1.237*	*Caution*
C	WTG 3	IIB	1	A	0.0	40.8	*Caution*	*Caution*	-1	0.19	*1.238*	*Caution*
D	WTG 4	IIB	1	A	0.0	40.2	OK	*Caution*	-1	0.19	*1.237*	*Caution*
E	WTG 5	IIB	1	A	0.0	40.6	*Caution*	*Caution*	1	0.19	*1.238*	*Caution*
F	WTG 6	IIB	1	A	0.0	40.5	*Caution*	*Caution*	2	0.19	*1.237*	*Caution*
G	WTG 7	IIB	2	B	0.0	38.9	*Caution*	*Caution*	-1	0.18	*1.237*	*Caution*
H	WTG 8	IIB	2	B	0.0	38.6	*Caution*	*Caution*	-2	0.17	*1.238*	*Caution*
I	WTG 9	IIB	1	A	0.0	40.5	*Caution*	*Caution*	1	0.20	*1.239*	*Caution*
J	WTG 10	IIB	1	A	0.0	40.0	*Caution*	*Caution*	0	0.19	*1.238*	*Caution*
K	WTG 11	IIB	2	B	0.0	38.7	*Caution*	*Caution*	0	0.18	*1.237*	*Caution*
L	WTG 12	IIB	2	B	0.0	38.4	*Caution*	*Caution*	-1	0.18	*1.237*	*Caution*
M	WTG 13	IIB	2	B	0.0	38.6	*Caution*	*Caution*	0	0.18	*1.237*	*Caution*
N	WTG 14	IIB	1	A	0.0	40.8	*Caution*	*Caution*	1	0.19	*1.237*	*Caution*
O	WTG 15	IIB	2	B	0.0	38.7	OK	*Caution*	0	0.18	*1.237*	*Caution*

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Site compliance - Details & Assumptions

Calculation: Webinar

General details, WTG results

		WTG Mean	Min WTG	Max WTG
u50y (extreme wind)	[m/s]	39.7	38.4	41.4
Mean wind speed	[m/s]	7.5	7.3	7.7
k-parameter ('combined Weibull')	[-]	2.4	2.4	2.4
I15 (mean TI@15 m/s)	[-]	0.11	0.10	0.12

Design parameters IEC classes

		Class IIB
Vref (extreme wind)	[m/s]	42.5
Mean wind speed	[m/s]	8.5
k-parameter	[-]	2.0
Iref (mean TI@15m/s)	[-]	0.14

Mast data

Name	Purpose	Main height [m]	Shear heights [m]	Duration [year(s)]	Recovery [%]	Additional signals	Site data
Karcino 1 M179	Site mast	49.0	49.0,47.0,24.0	1.0	100.0	TI,T	Karcino 1 - long-term corrected in MCP
Karcino 2 M180	Site mast	49.0	49.0,48.0,24.0	1.0	100.0	TI,	Karcino 2 - long-term corrected in MCP

WAsP parameters

WAsP 11
Default WAsP parameters used
Site data
Karcino 1 - long-term corrected in MCP
Karcino 2 - long-term corrected in MCP

WAsP Engineering parameters

Wasp Engineering 3.00.0196

Sectors	12
Reduced geostrophic	h=10m, z0=0.05m, u=20m/s
Domain	Buffer: 5000m, Resoluton: 50m, Points N-S: 274, Points E-W: 231
Turbulence model	Kaimal
Site data	Karcino 2 - long-term corrected in MCP

Long term correction

Long corrected wind statistics used in WAsP

WTGs

	UTM WGS84 Zone: 34 East	North	Z [m]	Manufactorer	Type	Rated power [kW]	Rotor diameter [m]	Hub height [m]	Power curve Creator	Name
A	134,486	6,011,624	16.3	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
B	134,000	6,009,621	20.0	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
C	134,200	6,011,921	6.2	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
D	134,200	6,010,671	15.0	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
E	133,750	6,011,521	8.0	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
F	134,900	6,011,121	13.4	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
G	133,600	6,008,671	14.8	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
H	133,350	6,009,271	12.4	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
I	134,900	6,011,571	2.3	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
J	133,950	6,010,971	10.0	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
K	133,700	6,009,121	15.0	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
L	134,150	6,008,571	13.8	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
M	134,100	6,008,971	15.0	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
N	134,493	6,011,146	12.5	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -
O	133,557	6,008,202	15.0	Siemens	SWT-2.3-113-2300	2,300	113.0	100.0	EMD	Level 0 - - Standard setting 0dB -

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Site compliance - Terrain complexity

Calculation: Webinar

Result: OK

Check setup

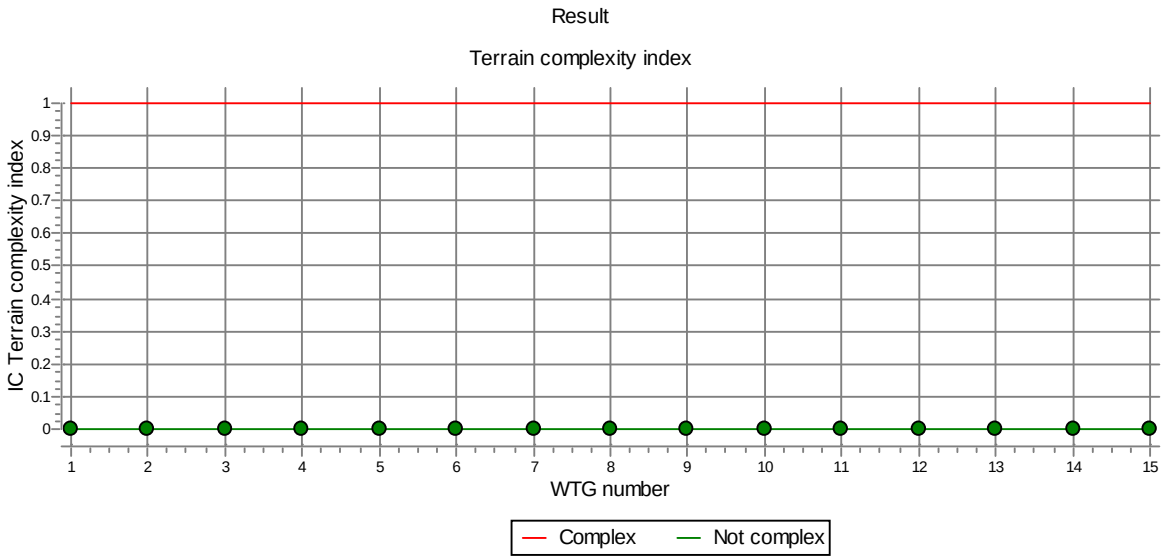
Method used	Active DEM
Method details	Active elevation model (Line or Elevation grid object) Grid resolution: 100 m
Methods available	Active DEM
User comment	

IEC limits

Terrain complexity index, Ic

Complex	Ic = 1
Partly complex	0 < Ic < 1
Not complex	Ic = 0

Results (Graphics)



Results (Table)

WTG	Class	Ic	Energy from complex sectors [%]
WTG 1	IIB	0.0	0.0
WTG 2	IIB	0.0	0.0
WTG 3	IIB	0.0	0.0
WTG 4	IIB	0.0	0.0
WTG 5	IIB	0.0	0.0
WTG 6	IIB	0.0	0.0
WTG 7	IIB	0.0	0.0
WTG 8	IIB	0.0	0.0
WTG 9	IIB	0.0	0.0
WTG 10	IIB	0.0	0.0
WTG 11	IIB	0.0	0.0
WTG 12	IIB	0.0	0.0
WTG 13	IIB	0.0	0.0
WTG 14	IIB	0.0	0.0
WTG 15	IIB	0.0	0.0

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Site compliance - Extreme wind

Calculation: Webinar

Result: OK

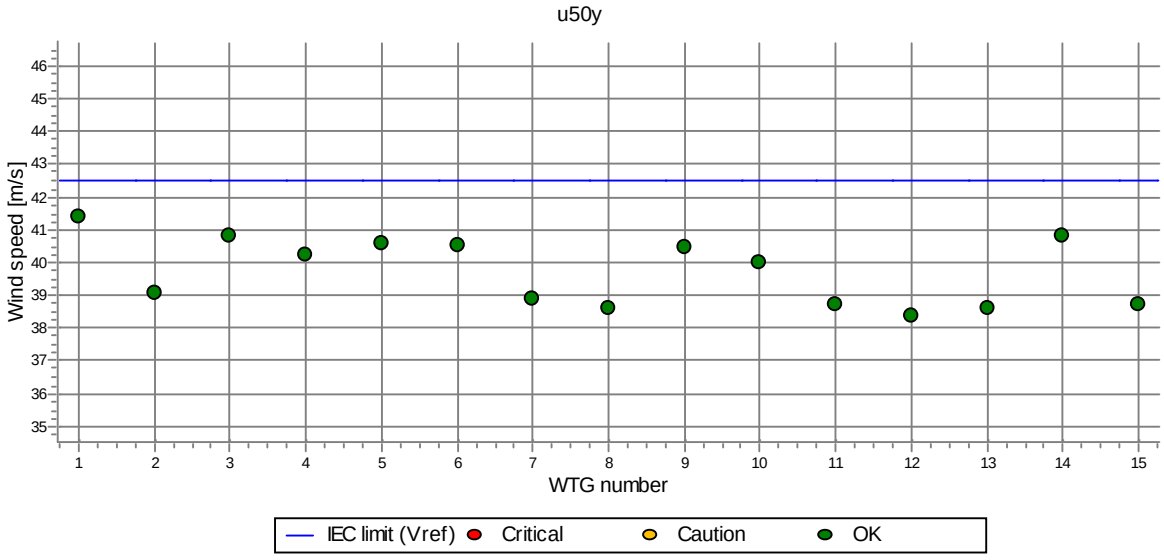
Check setup

Method used	POT-N_WEng	(Quality: B+A)	
Method details			
	Statistical model	POT-N & Gumbel	N = 20, Δt = 4 days
	Propagation model	WEng (sector-wise mast-to-wtg speedup)	
Methods available			
	Statistical model	Propagation model	Additional settings
	POT-N (B)	WEng (sector-wise mast-to-wtg speedup) (A)	Air density correction
	Weibull (C)	WAsP (sector-wise speedup) (B)	Long-term index correction
	Risø (C)	Shear (sector-wise vertical extrapolation only) (C)	k-factor preconditioning
	Eurocode (-)	No model (mast assumed representative) (C)	3s gust estimate
User comment			

IEC limits

IEC class	Max extreme wind (Vref) [m/s]
IIB	42.5

Results (Graphics)



Results (Table)

WTG	Class	Mast	Site data object	u50y [m/s]
WTG 1	IIB	1	A	41.4
WTG 2	IIB	2	B	39.1
WTG 3	IIB	1	A	40.8
WTG 4	IIB	1	A	40.2
WTG 5	IIB	1	A	40.6
WTG 6	IIB	1	A	40.5
WTG 7	IIB	2	B	38.9
WTG 8	IIB	2	B	38.6
WTG 9	IIB	1	A	40.5
WTG 10	IIB	1	A	40.0

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Site compliance - Extreme wind

Calculation: Webinar

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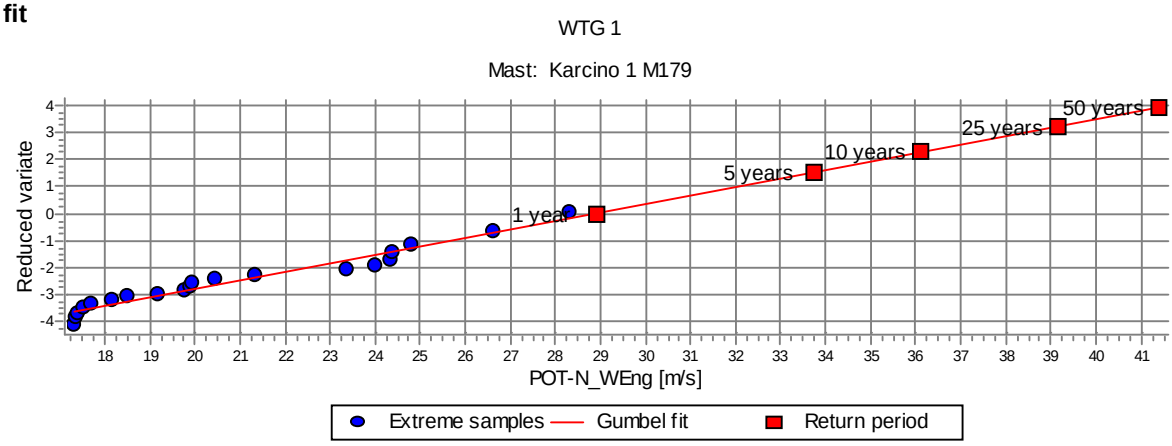
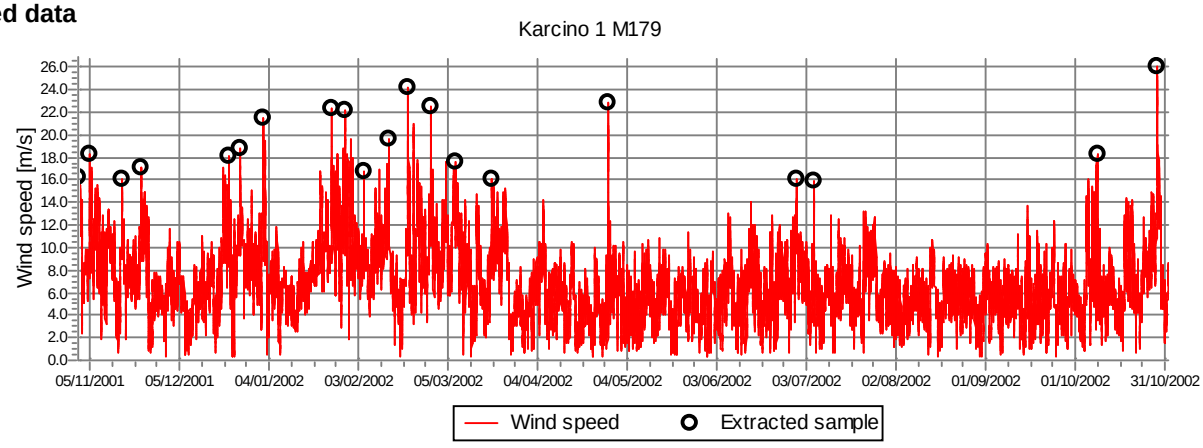
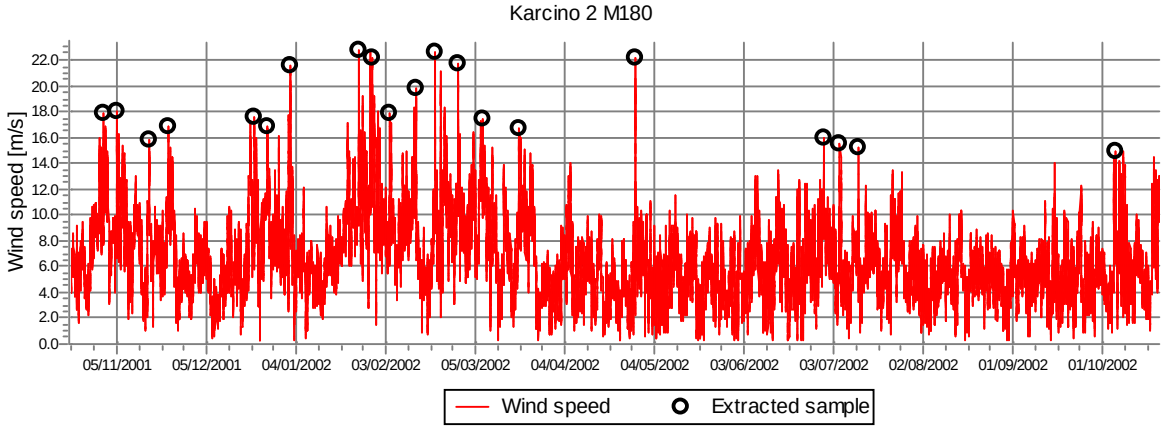
WTG	Class	Mast	Site data object	u50y [m/s]
WTG 11	IIB	2	B	38.7
WTG 12	IIB	2	B	38.4
WTG 13	IIB	2	B	38.6
WTG 14	IIB	1	A	40.8
WTG 15	IIB	2	B	38.7

Gumbel fit



Extracted data





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Site compliance - Effective turbulence

Calculation: Webinar

Result: *Caution*

Check setup

Method used Mast_WEng (Quality: A+A)

Method details

Turbulence data	Ambient turbulence from mast measurements Mean σ, Sector wise, N > 10 St.dev. σ, Weighted mean, N > 50, Use fit for all bins, Fit type: Automatic
Propagation model	WEng turbulence, Asymptotic
Turbulence structure correction	WEng turbulence components
Frandsen model	m = 10
Large wind farm correction	Automatic

Methods available

Turbulence data	Propagation model	Scaling	Turbulence structure correction	Large wind farm correction	Sector management
Mast (A)	WEng turbulence (A)	Asymptotic	Complexity check	Automatic	
WEng (B)	WAsP sector speed-up (B)	Constant σ-error	WEng turbulence components	All WTGs	
	No scaling (-)	Uniform	No correction	No WTGs	

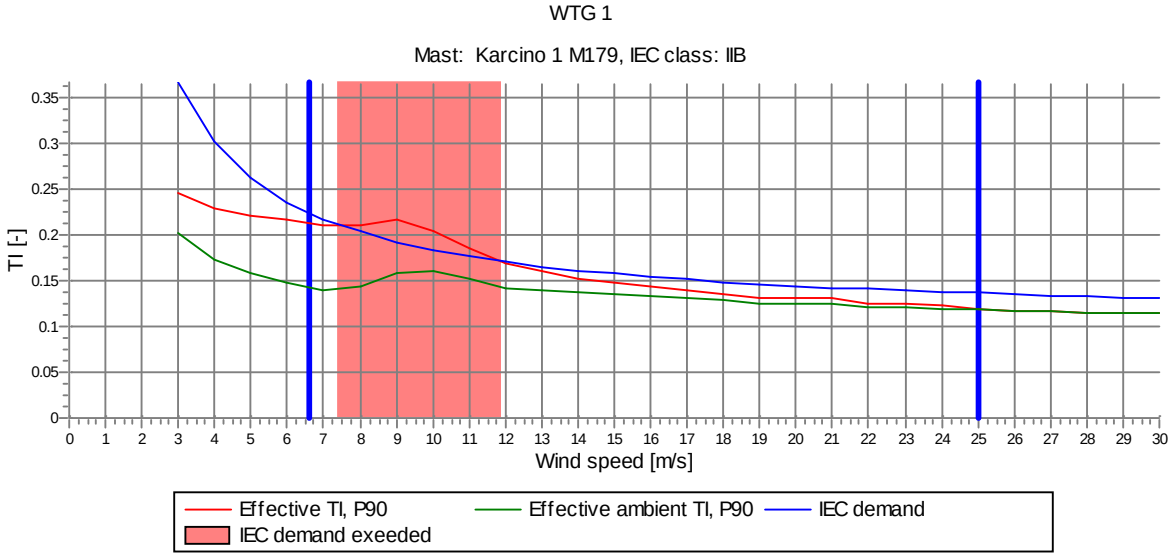
User comment

IEC limits

"Normal turbulence model" (TI) for each wind speed bin in m/s

IEC class	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]
IIB	0.22	0.20	0.19	0.18	0.18	0.17	0.17	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.14

Results (Graphics)



Results (Table)

Effective turbulence, P90 (TIeff(u)) for each wind speed bin in m/s

WTG	Class	Mast	Site data object	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
				[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]
WTG 1	IIB	1	A	0.21	*0.21*	*0.22*	*0.20*	*0.19*	0.17	0.16	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12
WTG 2	IIB	2	B	0.18	0.19	0.19	0.18	0.17	0.16	0.16	0.15	0.15	0.14	0.14	0.13	0.14	0.13	0.13	0.13	0.13	0.13	0.13

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Site compliance - Effective turbulence

Calculation: Webinar

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Effective turbulence, P90 (TIeff(u)) for each wind speed bin in m/s

WTG	Class	Mast	Site data object	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
				[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]
WTG 3	IIB	1	A	0.21	0.20	0.21	0.19	0.17	0.16	0.15	0.15	0.15	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12
WTG 4	IIB	1	A	0.19	0.19	0.19	0.18	0.17	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13
WTG 5	IIB	1	A	0.18	0.18	0.19	0.18	0.17	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12
WTG 6	IIB	1	A	0.21	0.21	0.21	0.20	0.19	0.18	0.17	0.17	0.16	0.16	0.15	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.13
WTG 7	IIB	2	B	0.20	0.20	0.20	0.18	0.17	0.16	0.16	0.15	0.15	0.14	0.14	0.13	0.14	0.13	0.13	0.13	0.13	0.12	0.12
WTG 8	IIB	2	B	0.21	0.21	0.20	0.19	0.17	0.16	0.15	0.15	0.15	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12
WTG 9	IIB	1	A	0.22	0.22	0.21	0.20	0.19	0.18	0.17	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.12
WTG 10	IIB	1	A	0.21	0.21	0.21	0.20	0.17	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13
WTG 11	IIB	2	B	0.22	0.22	0.22	0.20	0.19	0.18	0.17	0.16	0.16	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13
WTG 12	IIB	2	B	0.20	0.20	0.19	0.18	0.17	0.17	0.16	0.16	0.15	0.15	0.15	0.14	0.15	0.14	0.14	0.14	0.13	0.13	0.13
WTG 13	IIB	2	B	0.22	0.22	0.21	0.20	0.19	0.18	0.17	0.16	0.16	0.15	0.15	0.14	0.15	0.14	0.14	0.13	0.13	0.13	0.13
WTG 14	IIB	1	A	0.21	0.21	0.21	0.20	0.18	0.17	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13
WTG 15	IIB	2	B	0.18	0.18	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.14	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13

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Site compliance - Wind distribution

Calculation: Webinar

Result: *Caution*

Check setup

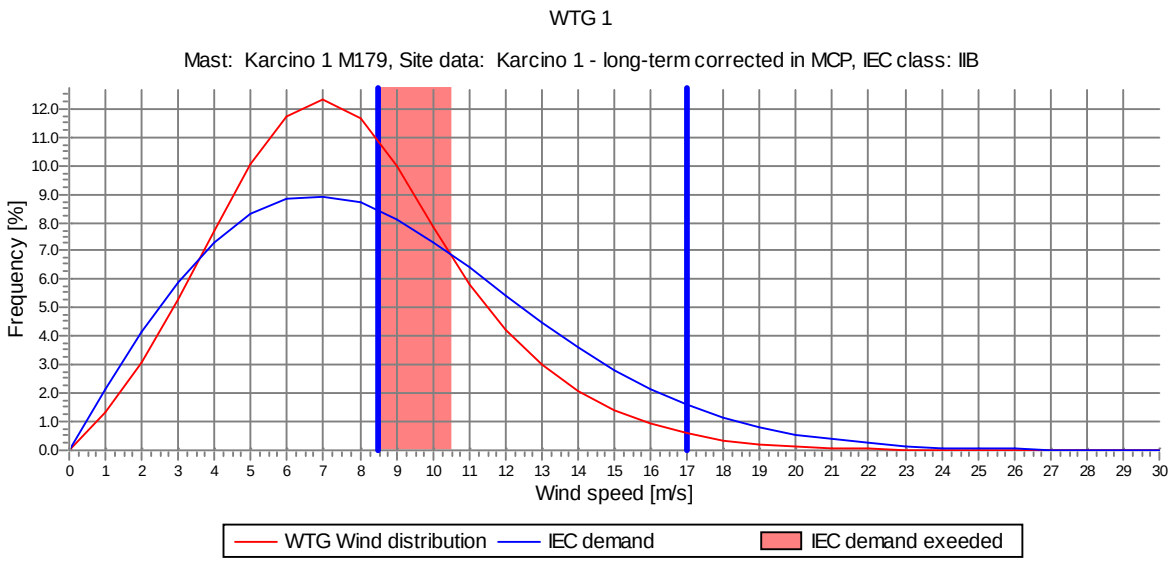
Method used	WAsP Weibulls	(quality: A)
Method details	WAsP sector Weibulls	
Methods available	WAsP Weibulls	(quality: A)
	Mast Weibull shear	(quality: B)
	Mast direct	(quality: C)
User comment		

IEC limits

Max frequency for each wind speed bin [m/s]

IEC class	9 [%]	10 [%]	11 [%]	12 [%]	13 [%]	14 [%]	15 [%]	16 [%]	17 [%]
IIB	8.1	7.3	6.4	5.5	4.5	3.6	2.8	2.2	1.6

Results (Graphics)



Results (Table)

WTG	Class	Mast	Site data object	Frequency for each wind speed bin [m/s] 9 [%]	10 [%]	11 [%]	12 [%]	13 [%]	14 [%]	15 [%]	16 [%]	17 [%]
WTG 1	IIB	1	A	*10.0*	*7.8*	5.8	4.2	3.0	2.1	1.4	0.9	0.6
WTG 2	IIB	2	B	*9.7*	*7.5*	5.5	3.9	2.7	1.8	1.2	0.8	0.5
WTG 3	IIB	1	A	*9.8*	*7.6*	5.6	4.0	2.8	1.9	1.3	0.8	0.5
WTG 4	IIB	1	A	*9.8*	*7.6*	5.6	4.0	2.8	1.9	1.3	0.8	0.5
WTG 5	IIB	1	A	*9.8*	*7.6*	5.6	4.0	2.8	1.9	1.3	0.8	0.5
WTG 6	IIB	1	A	*9.9*	*7.6*	5.6	4.0	2.8	1.9	1.3	0.8	0.5
WTG 7	IIB	2	B	*9.7*	*7.4*	5.3	3.7	2.5	1.7	1.1	0.7	0.4
WTG 8	IIB	2	B	*9.6*	7.3	5.3	3.7	2.6	1.7	1.1	0.7	0.4
WTG 9	IIB	1	A	*9.7*	*7.4*	5.4	3.9	2.7	1.8	1.2	0.8	0.5
WTG 10	IIB	1	A	*9.8*	*7.6*	5.6	4.0	2.8	1.9	1.2	0.8	0.5
WTG 11	IIB	2	B	*9.6*	*7.4*	5.3	3.7	2.6	1.7	1.1	0.7	0.4
WTG 12	IIB	2	B	*9.6*	7.3	5.3	3.7	2.5	1.7	1.1	0.7	0.4
WTG 13	IIB	2	B	*9.6*	*7.3*	5.3	3.7	2.6	1.7	1.1	0.7	0.4

To be continued on next page...

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Site compliance - Wind distribution

Calculation: Webinar

...continued from previous page

				Frequency for each wind speed bin [m/s]								
WTG	Class	Mast	Site data object	9 [%]	10 [%]	11 [%]	12 [%]	13 [%]	14 [%]	15 [%]	16 [%]	17 [%]
WTG 14	IIB	1	A	*9.8*	*7.6*	5.6	4.0	2.8	2.0	1.3	0.8	0.5
WTG 15	IIB	2	B	*9.7*	*7.4*	5.3	3.7	2.5	1.7	1.1	0.7	0.4

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Site compliance - Flow inclination

Calculation: Webinar

Result: OK

Check setup

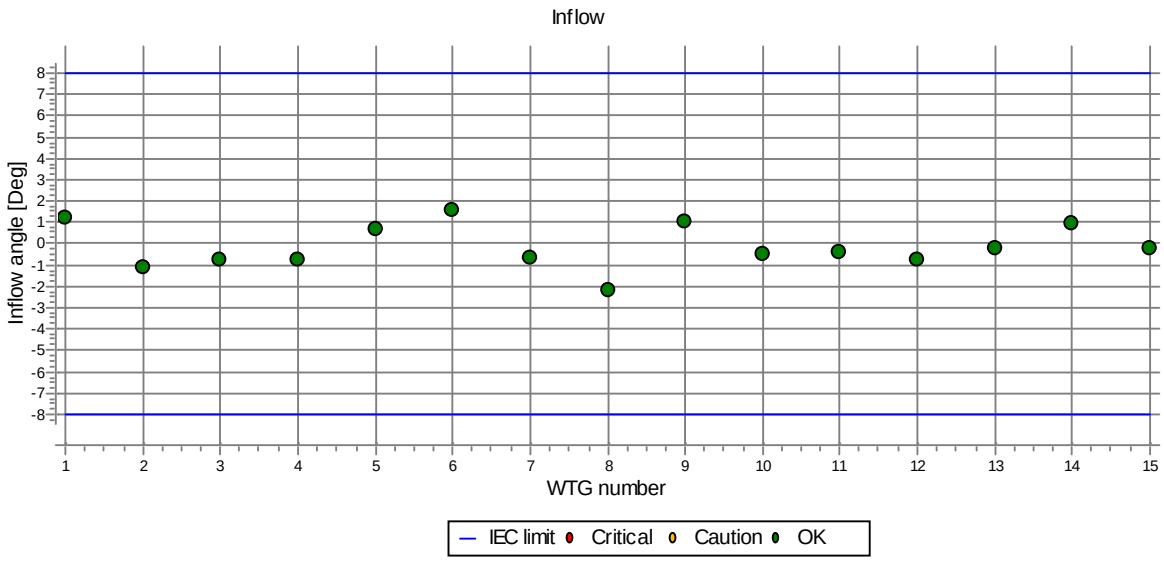
Method used	WEng	(quality: B)
Method details	WEng (WAsP Engineering), flow modelling results	
Methods available	WEng	(quality: B)
	Terrain fit	(quality: C)
User comment		

IEC limits

Flow inclination (max sector)

Min -8 deg
Max 8 deg

Results (Graphics)



Results (Table)

WTG	Class	Inflow angle [deg]	Direction [deg]
WTG 1	IIB	1.2	90
WTG 2	IIB	-1.1	30
WTG 3	IIB	-0.8	150
WTG 4	IIB	-0.8	120
WTG 5	IIB	0.7	0
WTG 6	IIB	1.6	0
WTG 7	IIB	-0.7	120
WTG 8	IIB	-2.2	90
WTG 9	IIB	1.0	30
WTG 10	IIB	-0.5	150
WTG 11	IIB	-0.4	60
WTG 12	IIB	-0.8	0
WTG 13	IIB	-0.2	0
WTG 14	IIB	0.9	0
WTG 15	IIB	-0.2	0

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Site compliance - Wind shear

Calculation: Webinar

Result: OK

Check setup

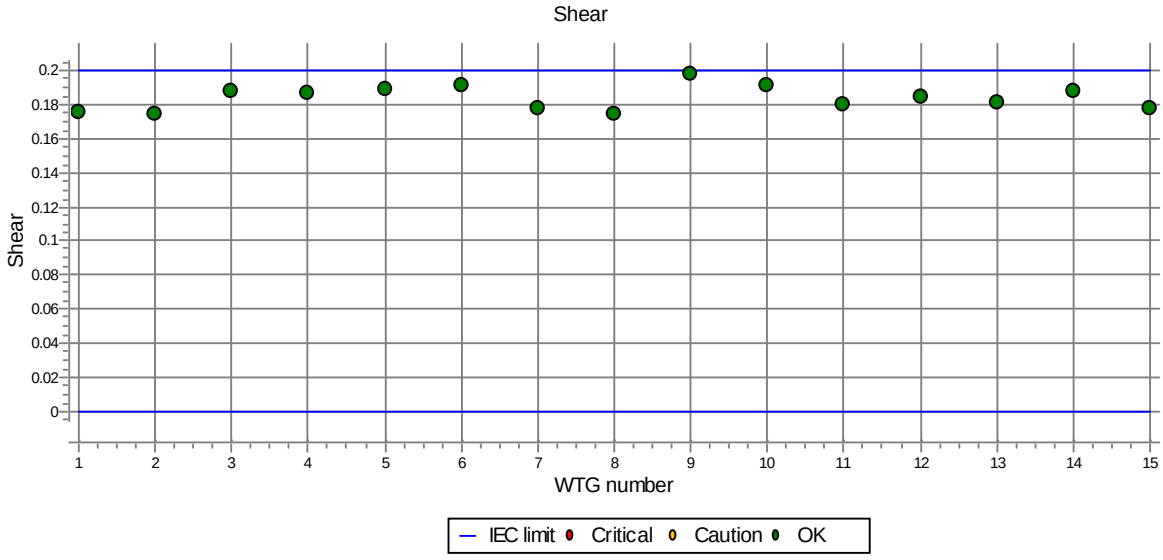
Method used	Mast WEng	(quality: A)
Method details	WEng shear adjusted using WEng error on mast shear *) *) assumes negligible turning of wind vertically and across site.	
Methods available	Mast WEng	(quality: A)
	Mast WAsP	(quality: A)
	WAsP	(quality: A/B)
	WEng	(quality: C)
	Mast	(quality: C)
User comment		

IEC limits

Average wind shear exponent

Min 0
Max 0.2

Results (Graphics)



Results (Table)

WTG	Class	Mast	Site data object	Average shear
WTG 1	IIB	1	A	0.18
WTG 2	IIB	2	B	0.17
WTG 3	IIB	1	A	0.19
WTG 4	IIB	1	A	0.19
WTG 5	IIB	1	A	0.19
WTG 6	IIB	1	A	0.19
WTG 7	IIB	2	B	0.18
WTG 8	IIB	2	B	0.17
WTG 9	IIB	1	A	0.20
WTG 10	IIB	1	A	0.19
WTG 11	IIB	2	B	0.18
WTG 12	IIB	2	B	0.18

To be continued on next page...

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Site compliance - Wind shear

Calculation: Webinar

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WTG	Class	Mast	Site data object	Average shear
WTG 13	IIB	2	B	0.18
WTG 14	IIB	1	A	0.19
WTG 15	IIB	2	B	0.18

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Site compliance - Air density

Calculation: Webinar

Result: *Caution*

Check setup

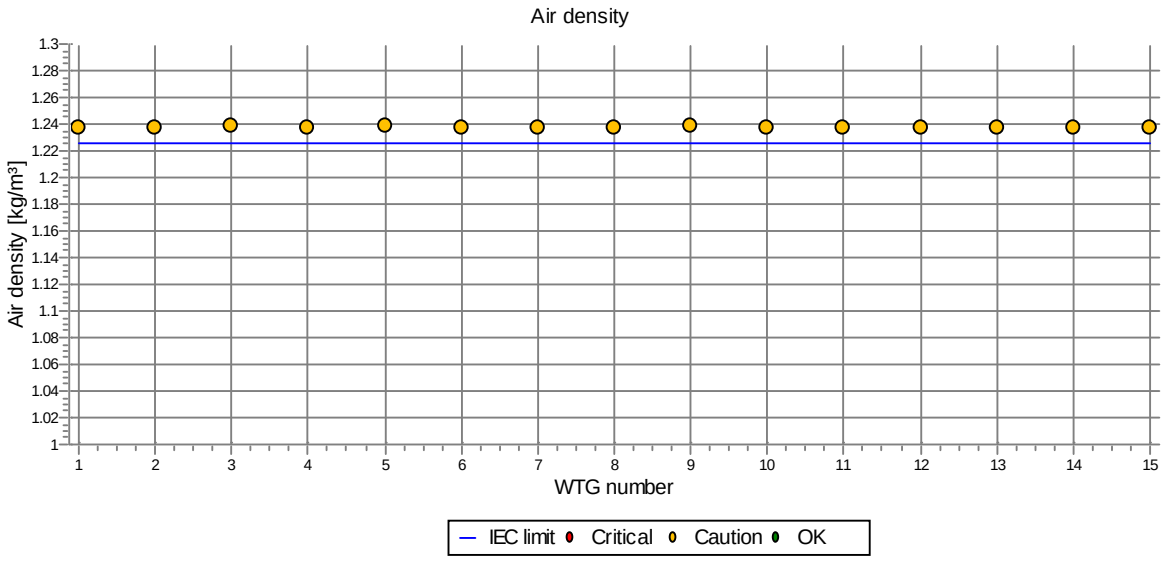
Method used	Mast_Karcino 1 M179	(quality: A/B)
Method details	Site or climate mast with Temperature (and Pressure) Mast: Karcino 1 M179	
Methods available	Mast	(quality: A/B)
	GHCN	(quality: C)
User comment		

IEC limits

Mean air density

	[kg/m³]
Max	1.225

Results (Graphics)



Results (Table)

WTG	Class	Mean air density [kg/m³]	Height difference [m]	Mean temperature at hub height [°C]	Mean pressure at hub height [hPa]
WTG 1	IIB	*1.237*	100	8.2	999
WTG 2	IIB	*1.237*	103	8.2	999
WTG 3	IIB	*1.238*	89	8.3	1000
WTG 4	IIB	*1.237*	98	8.2	999
WTG 5	IIB	*1.238*	91	8.3	1000
WTG 6	IIB	*1.237*	97	8.2	999
WTG 7	IIB	*1.237*	98	8.2	999
WTG 8	IIB	*1.238*	96	8.2	1000
WTG 9	IIB	*1.239*	86	8.3	1001
WTG 10	IIB	*1.238*	93	8.2	1000
WTG 11	IIB	*1.237*	98	8.2	999
WTG 12	IIB	*1.237*	97	8.2	999
WTG 13	IIB	*1.237*	98	8.2	999
WTG 14	IIB	*1.237*	96	8.2	1000
WTG 15	IIB	*1.237*	98	8.2	999

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Site compliance - Air density

Calculation: Webinar

Base data

Mean temperature	8.8	°C
Height above sea level	17	m
Atmospheric Lapse rate	-0.0065	K/m
Molar mass of dry air	0.02896442	kg/mol
Gravitational acceleration	9.80665	m/s²
Sealevel mean pressure	1013.25	hPa
Air density	1.249	kg/m³

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Site compliance - Seismic hazard

Calculation: Webinar

Result: OK

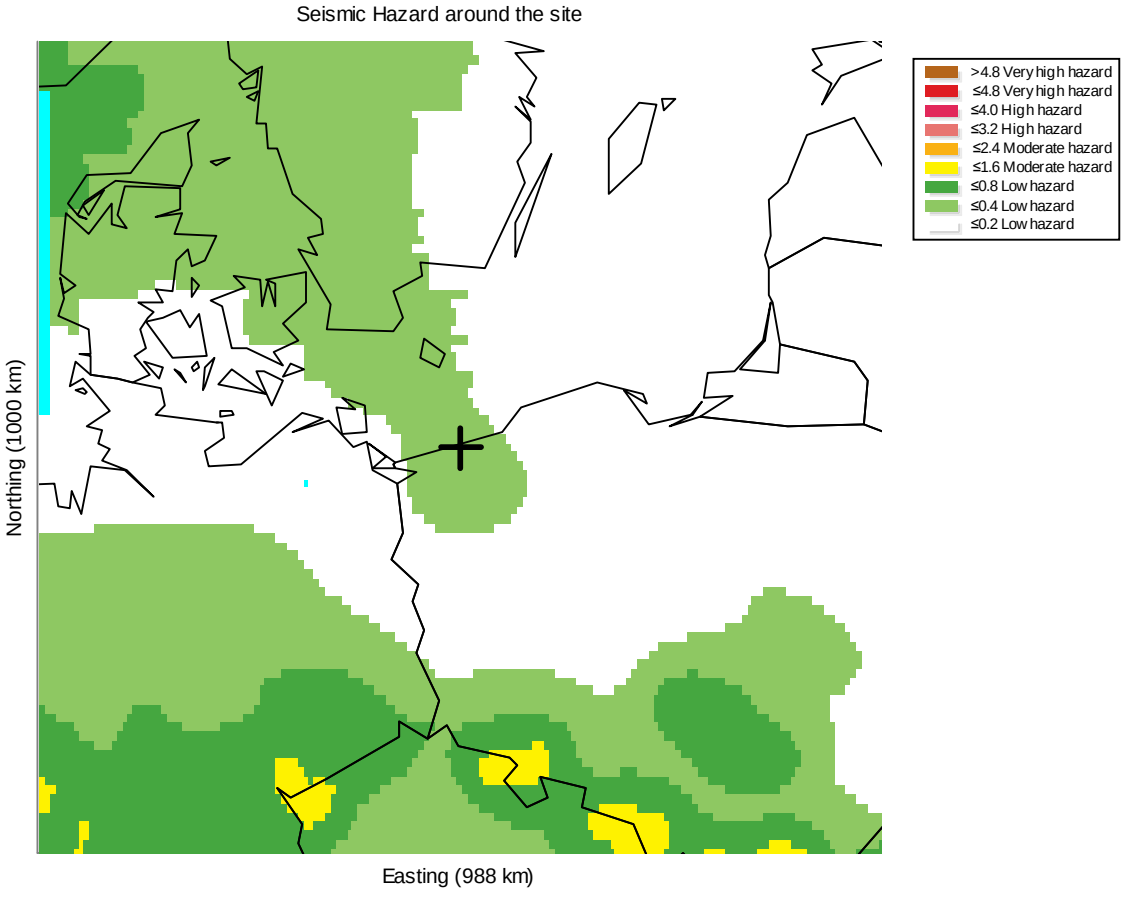
Check setup

Method used	GSHAP map
Method details	Global Seismic Hazard Assessment Program (GSHAP) Giardini, D., Grünthal, G., Shedlock, K. M. and Zhang, P.: The GSHAP Global Seismic Hazard Map. In: Lee, W., Kanamori, H., Jennings, P. and Kisslinger, C. (eds.): International Handbook of Earthquake & Engineering Seismology, International Geophysics Series 81 B, Academic Press, Amsterdam, 1233-1239, 2003.
Methods available	GSHAP map
User comment	

IEC limits

None

Results (Graphics)



Results (Table)

	Peak Ground Acceleration [m/s²]	Hazard level	Result
Seismic Hazard (475 years return period)	0.3	Low hazard	OK

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Site compliance - Temperature range

Calculation: Webinar

Result: OK

Check setup

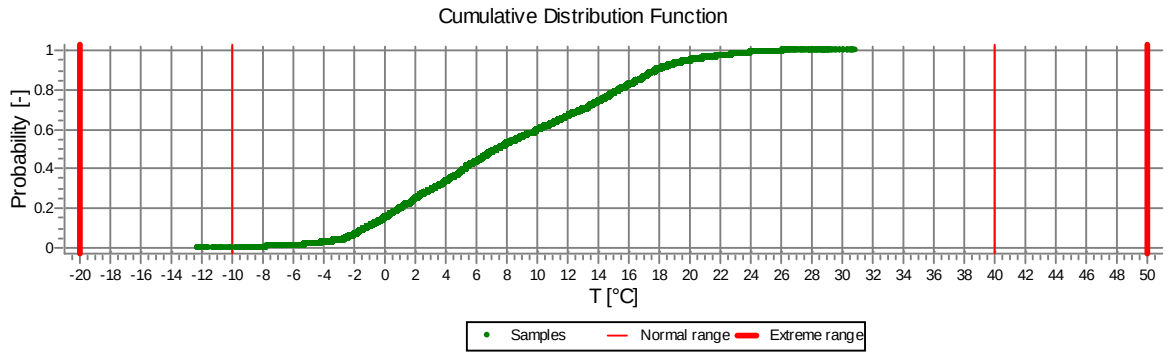
Method used	Tail gauss
Method details	Tail gaussian fit
	Mast: Karcino 1 M179
	Fit upper and lower fraction: 10 %
Methods available	Full gauss
	Tail gauss
User comment	

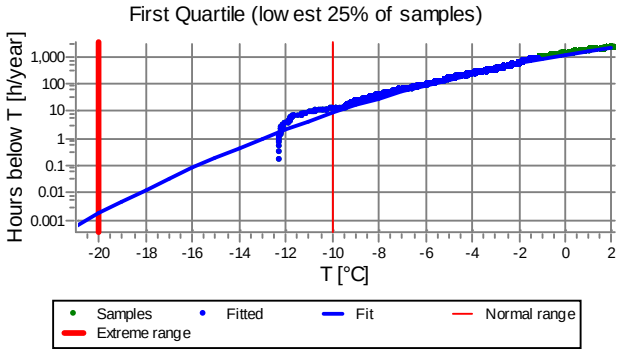
IEC limits

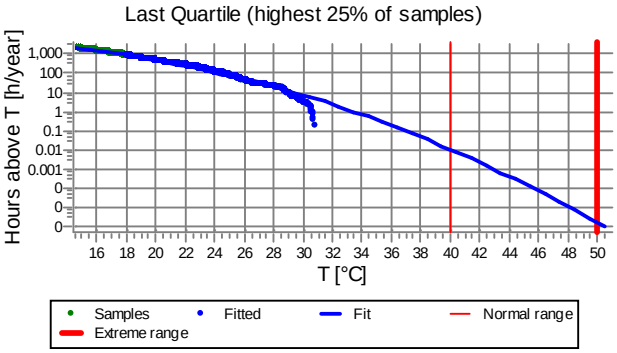
Temperature design limits

		Standard [°C]
Normal temperature		
	Tmin	-10
	Tmax	40
Extreme temperature		
	Tmin	-20
	Tmax	50

Results (Graphics)







Results (Table)

Check	Class	hours < Tmin h/year	hours > Tmax h/year	Total hours outside range h/year
Normal range	Standard	8.5	0.0	8.6
Extreme range	Standard	0.0	0.0	0.0

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Site compliance - Temperature range

Calculation: Webinar

Base data

Duration	1.0	year(s)
Mean temperature	8.8	°C
Standard deviation temperature:	7.4	°C
Max temperature:	31.5	°C
Min temperature:	-11.6	°C
Measure height above sea level:	17	m
Mean hub height above sea level:	113	m
Atmospheric Lapse rate	-0.0065	K/m

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Site compliance - Lightning rate

Calculation: Webinar

Result: OK

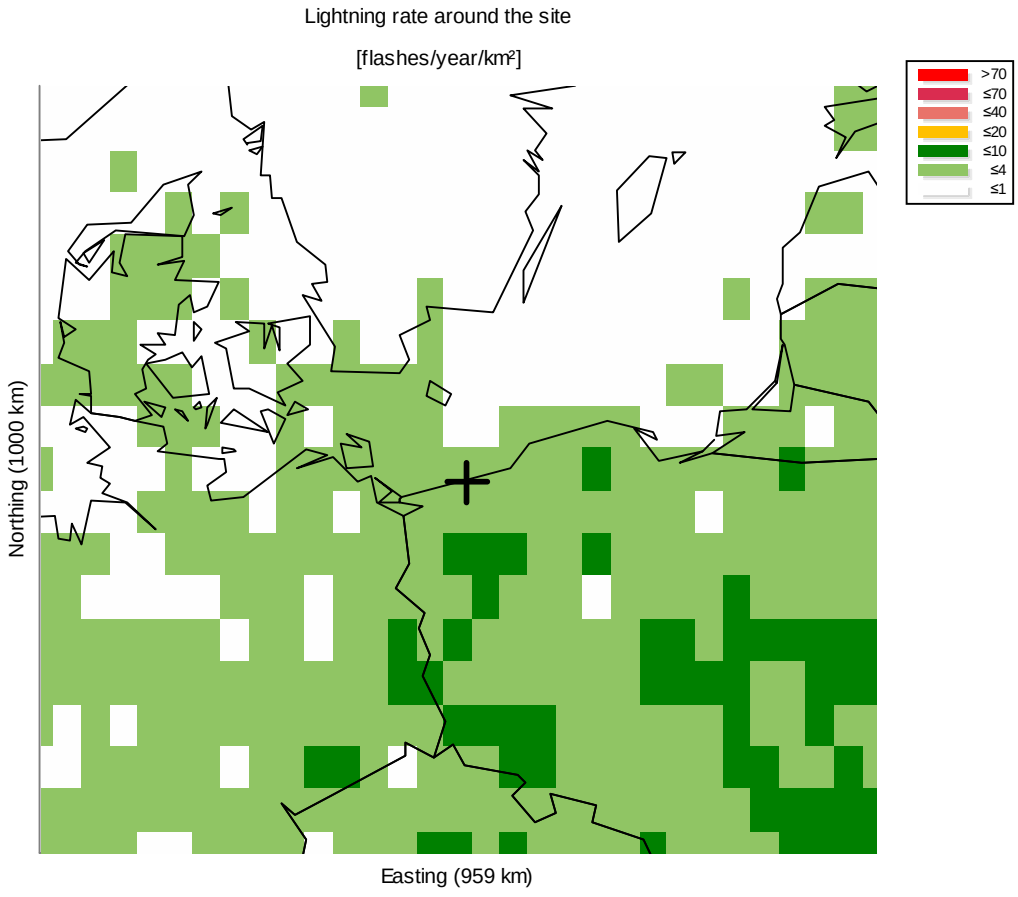
Check setup

Method used	NASA GHCC
Method details	NASA Global Hydrology and Climate Center (GHCC) lightning data sets The gridded data are compiled using data from two types of satellite detectors: LIS (Lightning Imaging Sensor) and OTD (Optical Transient Detector).
Methods available	NASA GHCC
User comment	

IEC limits

None

Results (Graphics)



Results (Table)

	[flashes/year/km²]	Result
Lightning rate	1.5	OK

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