

# Technical Specifications/Main Components

## History of this Document

Changes in this document:

Rev. no.:	Date:	Description of change
1	2002-01-17	(adapting the document for V80 1,8 MW) Section 2.3: 60Hz added. 215 bar changed to 200 bar. "Weight with oil cooler - 525 kg (1.8MW)" added. Section 4: 50/60Hz types added. Section 5.1: 117 l/min changed to 100 l/min. Section 5.4: "HDU 15/25 PM-690V (60Hz)" added. Section 5.2, 5.6, 5.7 and 5.9 specified for L&S and Hansen gearboxes. Section 5.5: 60Hz type added. Section 6.3: 800 and $\varnothing$ 108 changed to 950 and $\varnothing$ 109. Section 8: New types added. Updating of section 8. Section 10: New types added. Updating of section 10.
2	2005-03-11	Section 1: "thread" added to "Stainless steel inserts" To "Colour" "custom-designed" has been added Section 2.3: Pressure, brake system: 50Hz and 60 Hz added Section 9.1: Weight for ABB generator changed Leroy Somer removed; Table added Section 10.1: V80 VRCC added; Table added Section 13.1: FT sensor added Drawing 950645 updated to revision 2 Drawing 950646 updated to revision 1

## Related Documentation

Item no.	Title
947905	V80 1,8/2,0MW, Klasse II, Tekniske specifikationer for hovedkomponenter

Contents .....	Page
1. Rotor .....	3
1.1 Blade .....	3
1.2 Blade Bearing.....	3
1.3 Nose Cone .....	3
1.4 Blade Hub.....	3
2. Pitch System .....	3
2.1 Hydraulic Cylinder .....	3
2.2 Linear Transducer in Cylinder .....	3
2.3 Hydraulic Power Unit.....	4
2.4 Hydraulic Block on Cylinder .....	4
2.5 Plain Bearing on Cylinder.....	4
2.6 Spherical Plain Bearing on Cylinder Rod.....	4

3.	Main Shaft Arrangement .....	4
3.1	Main Shaft .....	4
3.2	Front Main Bearing (nearest to the rotor) .....	4
3.3	Rear Main Bearing (furthest from the rotor) .....	5
3.4	Front Main Bearing Seal .....	5
3.5	Rear Main Bearing Seal .....	5
3.6	Hydraulic Cylinder for Rotor Locking .....	5
3.7	Manuel Hydraulic Pump for Rotor Locking .....	5
4.	Main Gearbox Arrangement .....	5
4.1	Gearbox .....	5
4.2	Shrink Disc .....	6
4.3	Torque Arm Rubber Spring .....	6
4.4	Brake Calibre .....	6
4.5	Brake Pad .....	6
4.6	Transmission Shaft .....	6
5.	Gearbox Oil System .....	7
5.1	Electrical Pump .....	7
5.2	Shaft Driven Pump .....	7
5.3	Oil Filter .....	7
5.4	Off-line Filter .....	7
5.5	Oil Coolers .....	7
5.6	Oil Heating Elements .....	7
5.7	Oil Level Switch .....	8
5.8	Oil Sump Temperature Sensor .....	8
5.9	Bearing Temperature Sensor .....	8
6.	Rotating Transference .....	8
6.1	Rotating Trafo .....	8
6.2	Rotating ARC-net .....	8
6.3	Rotating Hydraulic Union .....	9
7.	Machinery Foundation .....	9
7.1	Main beam (left & right) .....	9
7.2	Generator Foundation .....	9
8.	Yaw System .....	9
8.1	Yaw Ring .....	9
8.2	Yaw Gear .....	9
8.3	Yaw Gear Pinion .....	10
8.4	Yawing Plain Bearings .....	10
9.	Generator .....	10
9.1	Generator .....	10
10.	Trafo Arrangement .....	11
10.1	Trafo .....	11
11.	Crane .....	12
11.1	Service Crane .....	12
11.2	Component Crane (not included) .....	12
12.	Machine Cover .....	12
12.1	Cover Parts .....	12
12.2	Cover Support .....	12
13.	Wind Sensor .....	12
13.1	FT Sensor/Ultrasonic Sensor .....	12
14.	Tubular Tower .....	12
15.	Dimension Drawings .....	13
15.1	Nacelle Cover and Blade, Overall Dimensions .....	13
15.2	Nacelle, Side View .....	14

## 1. Rotor

### 1.1 Blade

Manufacturer:	Vestas
Type no.:	VESTAS 39 m
Material:	Glass fibre reinforced epoxy (blade shells) Glass fibre reinforced epoxy (blade spar) Stainless steel thread inserts (root attachment)
Surface:	Epoxy gelcoat
Colour:	RAL 9010, RAL 7035 and custom-designed
Overall length:	39 m
Max. Chord:	3357 mm
Weight:	6500 kg

### 1.2 Blade Bearing

Manufacturer:	ROLLIX/ HOESCH ROETHE ERDE
Type:	Double row, 4 point contact ball bearing
Lubrication:	Grease: Aeroshell 14
Dimension:	ø2120/ ø1700 x 192 mm
Weight:	1475 kg

### 1.3 Nose Cone

Manufacturer:	Vestas
Form:	Length 4.14 m, diameter 3.46 m.
Material:	Glass fibre reinforced polyester coated with polyester gelcoat
Weight:	Approx. 600 kg

### 1.4 Blade Hub

Manufacturer:	Vestas
Material:	EN-GJSF400-18U-LT-D
Weight:	8463 kg

## 2. Pitch System

### 2.1 Hydraulic Cylinder

Manufacturer:	LJM
Type:	021 VD 125/80 x 760 – 808-g-T
Dimension:	305 x 178 x 1352 mm

### 2.2 Linear Transducer in Cylinder

Manufacturer:	Balluff
Type:	BTL5-A11-M0800-B-SA56-S32

### 2.3 Hydraulic Power Unit

Manufacturer:	PMC Technology
Pump motor:	18,5 kW, 690 V, 50/60 Hz, and 4 poles
Proportional valve:	NG10
Pump flow:	46,2 - 49 l/min - 50 Hz 40,8 - 44,9 l/min - 60 Hz
Pressure, pitch system:	180 - 200 bar
Pressure, pitch system, return:	Min. 6 bar
Pressure, brake system:	50Hz: 40 bar 60Hz: 34 bar
Size of oil reservoir:	300 l (gross volume)
Oil quantity (system):	320 l
Weight (without oil)	475 kg
Weight with oil cooler	525 kg (1.8 MW)

### 2.4 Hydraulic Block on Cylinder

Manufacturer:	PMC Technology
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### 2.5 Plain Bearing on Cylinder

Manufacturer:	SKF
Type:	PWM 809060
Dimension:	ø90/ ø60 x 40 mm

### 2.6 Spherical Plain Bearing on Cylinder Rod

Manufacturer:	SKF
Type:	GE100TG 3A-2RS
Dimension:	ø150/ ø100 x 70 mm

## 3. Main Shaft Arrangement

### 3.1 Main Shaft

Manufacturer:	Vestas
Material:	42CrMo4 / V / EN 10083
Size:	ø630/ flange ø1500/ length 2690 mm
Weight:	6078 kg

### 3.2 Front Main Bearing (nearest to the rotor)

Manufacturer:	SKF/FAG/Koyo
Type:	230/630 CA/W33
Dimension:	ø920 mm/ ø630 mm x 212 mm
Weight:	485 kg

**3.3 Rear Main Bearing (furthest from the rotor)**

Manufacturer: SKF/FAG/Koyo  
 Type: 24188 CA/W33  
 Dimension:  $\varnothing$ 720 mm/  $\varnothing$ 440 mm x 280 mm  
 Weight: 460 kg

**3.4 Front Main Bearing Seal**

Manufacturer: Seal Pool  
 Type:  $\varnothing$ 660/  $\varnothing$ 700 x 20 mm GVP

**3.5 Rear Main Bearing Seal**

Manufacturer: Seal Pool  
 Type:  $\varnothing$ 500/  $\varnothing$ 540 x 20 mm CB

**3.6 Hydraulic Cylinder for Rotor Locking**

Manufacturer: LJM  
 Type: SNH30 FD 63/30x60-360-G  
 Dimension:  $\varnothing$ 169 x 625 mm

**3.7 Manuel Hydraulic Pump for Rotor Locking**

Manufacturer: LJM  
 Type: HANSA TMP/GLDE20/I  
 Dimension: 100 x 290 x 700 mm

**4. Main Gearbox Arrangement****4.1 Gearbox**

Manufacturer: Lohmann & Stolterfoht  
 Type: GPV 440  
 Shaft displacement: 948 mm (horizontal)  
 Total length: 2689 mm  
 Weight: 14500 kg  
 Ratio: 50 Hz: 1:100,845  
 Ratio: 60 Hz: 1:121,28

Manufacturer: Lohmann & Stolterfoht  
 Type: GPV 441  
 Shaft displacement: 948 mm (horizontal)  
 Total length: 2689 mm  
 Weight: 14500 kg  
 Ratio: 50 Hz: 1:100,33 (Onshore)  
 Ratio: 60 Hz: 1:120,099

Manufacturer: Hansen Transmissions  
 Type: EH802N21 (Onshore)  
 Shaft displacement: 948 mm (horizontal)  
 Total length: 2689 mm

Weight: 14000 kg  
 Ratio: 60 Hz: 1:120,515  
 Ratio: 60 Hz: 1:111,36  
 Ratio: 50 Hz: 1:101,02 (Onshore)

#### 4.2 Shrink Disc

Manufacturer: Stüwe  
 Type: HSD 530-23  
 Dimension: ø980/ ø530 x 338 mm  
 Weight: 1200 kg

Manufacturer: Ovako  
 Type: OKCK 530  
 Dimension: ø950/ ø530 x 364 mm  
 Weight: 1225 kg

#### 4.3 Torque Arm Rubber Spring

Manufacturer: EFFBE-Werk  
 Type: Elastomer spring/ Urelast 90 h.A  
 Dimension: ø200/ ø44 x 40 mm

#### 4.4 Brake Calibre

Manufacturer: BREMBO  
 Type: PZ.I.4420.2802.10  
 STILFRENI  
 PR771401000  
 PR771301000

Piston diameter: ø75 mm  
 Weight: 16 kg  
 Max. pressure: 150 bar

#### 4.5 Brake Pad

Manufacturer: Micke  
 Type: MPM 030

#### 4.6 Transmission Shaft

Manufacturer: Vestas  
 Size: ø480 x 410 mm  
 Weight: 15 kg

## 5. Gearbox Oil System

### 5.1 Electrical Pump

Manufacturer: Settima  
Type: GR45 210 SMT 16B-2.2 kW-690 V (50 Hz)  
GR45 180 SMT 16B-2.2 kW-690 V (60 Hz)  
Capacity: 100l/min. (50/60 Hz).  
Pressure: Max. 15 bar

### 5.2 Shaft Driven Pump

Lohmann & Stolterfoht.  
Manufacturer: Rickmeier  
Type: R 4.5/45 FL-Z-UNI-SO  
Capacity: 65 l/min. at 1500 RPM  
Pressure: Max. 8 bar

Hansen Transmissions.  
Manufacturer: SHW  
Type: SHW40  
Capacity: 45 l/min. at 1500 RPM  
Pressure: Max. 15 bar

### 5.3 Oil Filter

Manufacturer: Mahle  
Type: HC35 SM-X 1511  
Filtration: 10 µm ABS.

### 5.4 Off-line Filter

Manufacturer: C.C. Jensen  
Type: HDU 15/25 PM - 1x230 V (50 Hz)  
HDU 15/25 PU - 690 V (60 HZ)  
Filtration: 3 µm

### 5.5 Oil Coolers

Manufacturer: Nissen Cooler  
Size: 502 x 620 mm, fan ø456 mm  
10 blades 25°, type 3HL  
Fan motors 50 Hz: 90S B14, 2 pole 1,5 kW/ 690 V  
Fan motors 60 Hz: 90L B14, 2 pole 3,0 kW/ 690 V

### 5.6 Oil Heating Elements

Lohmann & Stolterfoht.  
Manufacturer: Helios  
Connection: 2" BSPP  
Size: 2 x 980 W + 1 x 650 W

Hansen Transmissions.

Manufacturer:

Helios

Connection:

2" BSPP

Size:

1 x 1500 W + 1 x 750 W

### 5.7 Oil Level Switch

Lohmann & Stolterfoht.

Manufacturer:

Barksdale

Type:

UNS 1000-MS/T2-ST1

Voltage:

Voltage: 24 V DC

Hansen Transmissions.

Manufacturer:

KOBOLT

Type:

320-NBA1000

Voltage:

Voltage: 24 V DC

### 5.8 Oil Sump Temperature Sensor

Manufacturer:

Danfoss

Type:

MBT 5250

### 5.9 Bearing Temperature Sensor

Lohmann & Stolterfoht.

Manufacturer:

Bühler

Type:

TF-M-PT 100-VAL

Hansen Transmissions.

Manufacturer:

SENSYCON GmbH

Type:

WM60F

## 6. Rotating Transference

### 6.1 Rotating Trafo

Manufacturer:

Weier

Type:

ETK160

Dimension:

ø360 x 405 mm

Weight: 147 kg

### 6.2 Rotating ARC-net

Manufacturer:

Vestas

Dimension:

ø280 mm



### 6.3 Rotating Hydraulic Union

Manufacturer:	Deublin
Type:	9110-950
Dimension:	ø109 x 203 mm

## 7. Machinery Foundation

### 7.1 Main beam (left & right)

Manufacturer:	Vestas
Material:	EN-GJSF400-18U-LT-D / EN 1560
Size:	4590 x 1200 x 1280 mm each
Weight:	4526 kg each

### 7.2 Generator Foundation

Manufacturer:	Vestas
Material:	S 355 J2H (EN 10025)
Size:	3560 x 2300 x 660 mm
Weight:	2500 kg

## 8. Yaw System

### 8.1 Yaw Ring

Manufacturer	Niebuhr Tandhjulsfabrik + Hoesch Rothe Erde
Material:	34CrNiMo 6 / V / 42CrMo 4 / V (EN 10083)
Normal module:	16
Number of teeth:	143
Tooth width:	96 mm
Weight:	767 kg

### 8.2 Yaw Gear

Before 01.10.01		
Manufacturer:	Bonfiglioli/Transmittal	SOM
Type:	709T2M	PG1802
Type Worm gear:	W110	MNRV110
Ratio/Planetary stages:	1:28	1:22,1
Ratio/Worm gear:	1:40	1:50
Ratio total:	1:112	1:1105
Electric motor spec.:	2.2 kW/6 pole/690 V	
Weight:	190 kg	

After.01.10.01

Manufacturer:	Bonfiglioli/Transmittal	SOM	Brevini
Type:	709T3M	PG1603	RPR3140
Type Worm gear:	W75	MNRV075	FRS85
Ratio/Planetary stages:	1: 110,17	1:149,5	1:131,8
Ratio/Worm gear:	1:10	1:7,5	1:8,5
Ratio total:	1:1101,7	1:1121	1:1119,9
Electric motor spec.:	2.2 kW/6 pole/690 V		
Weight:	190 kg		

### 8.3 Yaw Gear Pinion

Before 01.10.01

Manufacturer:	Bonfiglioli/SOM
Material:	18NiCrMo5 (UNI 8550)
Normal module:	16
Number of teeth:	11
Tooth width:	100 mm
Weight:	Included in yaw gear weight

After 01.10.01: All yaw gears are delivered with integrated pinion.

### 8.4 Yawing Plain Bearings

Manufacturer:	Vestas
Material:	PETP

## 9. Generator

### 9.1 Generator

Manufacturer:	ABB
Type:	AMK 500L4A BAYH
Poles:	4
Building size:	500
Degree of protection:	IP55
Insulation class:	H
Weight cooler:	430 kg
Weight generator:	5700 kg
Bearing drive end (DE):	6330M C3
Bearing non-drive end (NDE):	6330M C3

Manufacturer:	WEIER
Type:	DVSG500/4Msp
Poles:	4
Building size:	500
Degree of protection:	IP54
Insulation class:	F/H
Weight cooler:	650 kg
Weight generator:	5500 kg
Bearing drive end (DE):	6330M C4
Bearing non-drive end (NDE):	6330M C4

For both bearings the following applies:

Level of insulation:	1000 V DC
Max. radial run-out inner ring:	15 $\mu$ m radial 10 $\mu$ m axial

	V80 VCS 50Hz	V80 VCS 60Hz	V80 VRCC 60Hz
Generator supplier	ABB / Weier	ABB	ABB

## 10. Trafo Arrangement

### 10.1 Trafo

Standard:	IEC 60076-11 2004
Manufacturer:	SIEMENS/SGB/ABB/France TRANSFO
Type:	CAST-RESIN
Rated power:	2100 kVA
Rated HV:	6-34.5 kV
Highest equipment voltage:	36 kV ( $U_m$ )
Highest power frequency withstand voltage (IEC):	70 kV
Highest impulse withstand voltage (IEC):	170 kV
HV tap changer:	$\pm 2 \times 2.5\%$
Rated LV:	0.48/0.69 kV
Max. size:	2100 x 920 x 2150 mm
Max. weight:	5500 kg

Standard:	IEC 60076-11 2004
Manufacturer:	SIEMENS
Type:	CAST-RESIN
Rated power:	1850 kVA
Rated HV:	6-34.5 kV
Highest equipment voltage:	36 kV ( $U_m$ )
Highest power frequency withstand voltage (IEC):	70 kV
Highest impulse withstand voltage (IEC):	170 kV
HV tap changer:	$\pm 2 \times 2.5\%$
Rated LV:	0.69 kV
Max. size:	2100 x 920 x 2150 mm
Max. weight:	5500 kg

	V80 VCS	V80 VRCC
Trafo supplier	SIEMENS/SGB/ABB/France TRANSFO	SIEMENS

## 11. Crane

### 11.1 Service Crane

Manufacturer:	ABB
Type:	B 4.2 500/1-12 690V, BAU-LIFTKET
Lifting capacity (max.):	800 kg
Lifting speed:	12 m/min.

### 11.2 Component Crane (not included)

Manufacturer:	Secalt/Tractel
Type:	T 1000 P, 690V, Tirak
Lifting capacity:	6400 kg
Lifting speed:	4.5/18 m/min.
Length of wire:	500 m

## 12. Machine Cover

### 12.1 Cover Parts

Manufacturer:	Vestas
Material:	Reinforced glass fibre

### 12.2 Cover Support

Manufacturer:	Vestas
Vibration dampers:	IKAS Novibra RA 800 EMB

## 13. Wind Sensor

### 13.1 FT Sensor/Ultrasonic Sensor

Manufacturer:	FT Technologies Ltd
Type:	FT702LT
Size:	ø50 x 160 mm
Weight:	0.3 kg

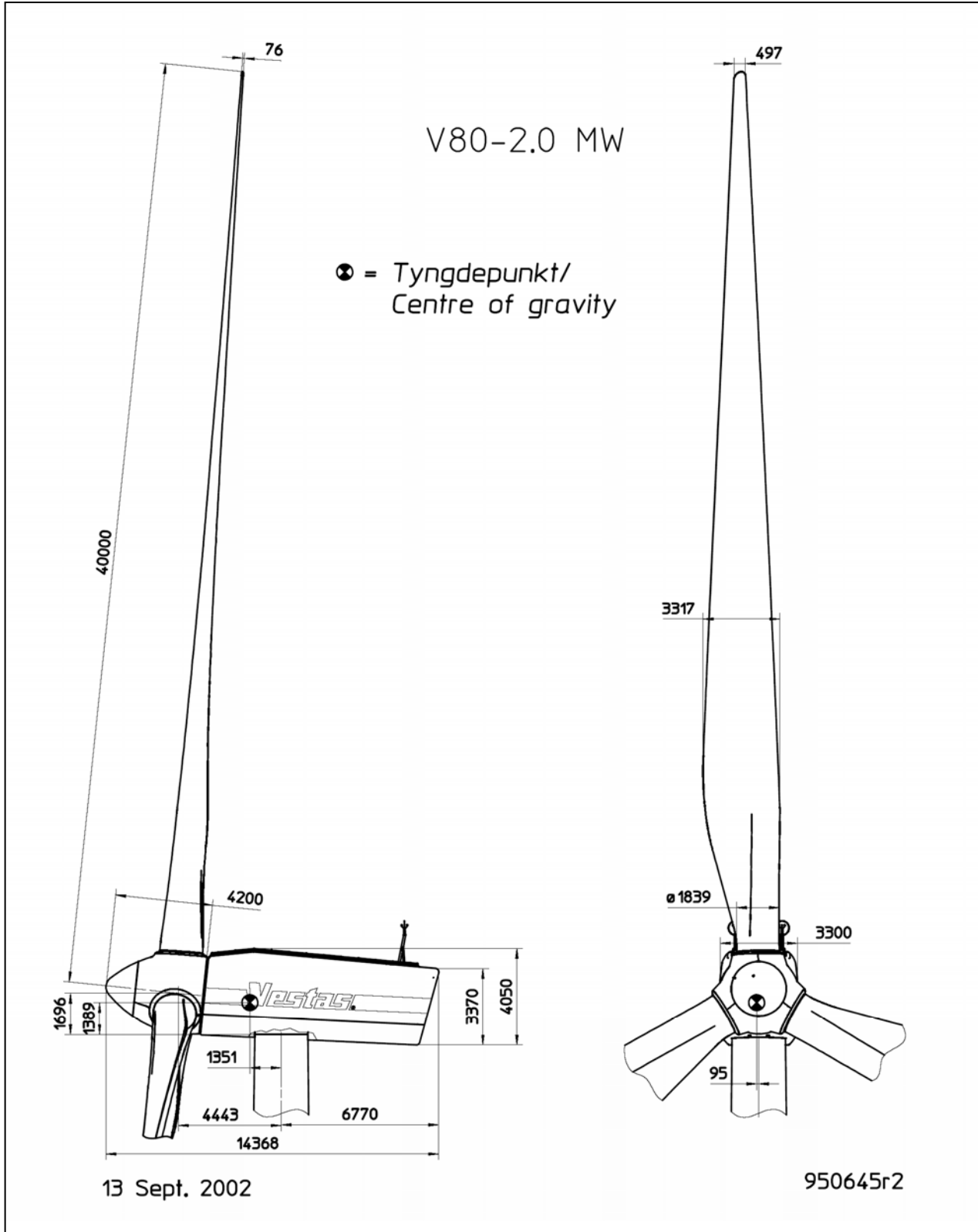
Manufacturer:	Vestas
Type:	VUS2D 2.0
Size:	ø70/ ø275 x 422 mm
Weight:	2.5 kg

## 14. Tubular Tower

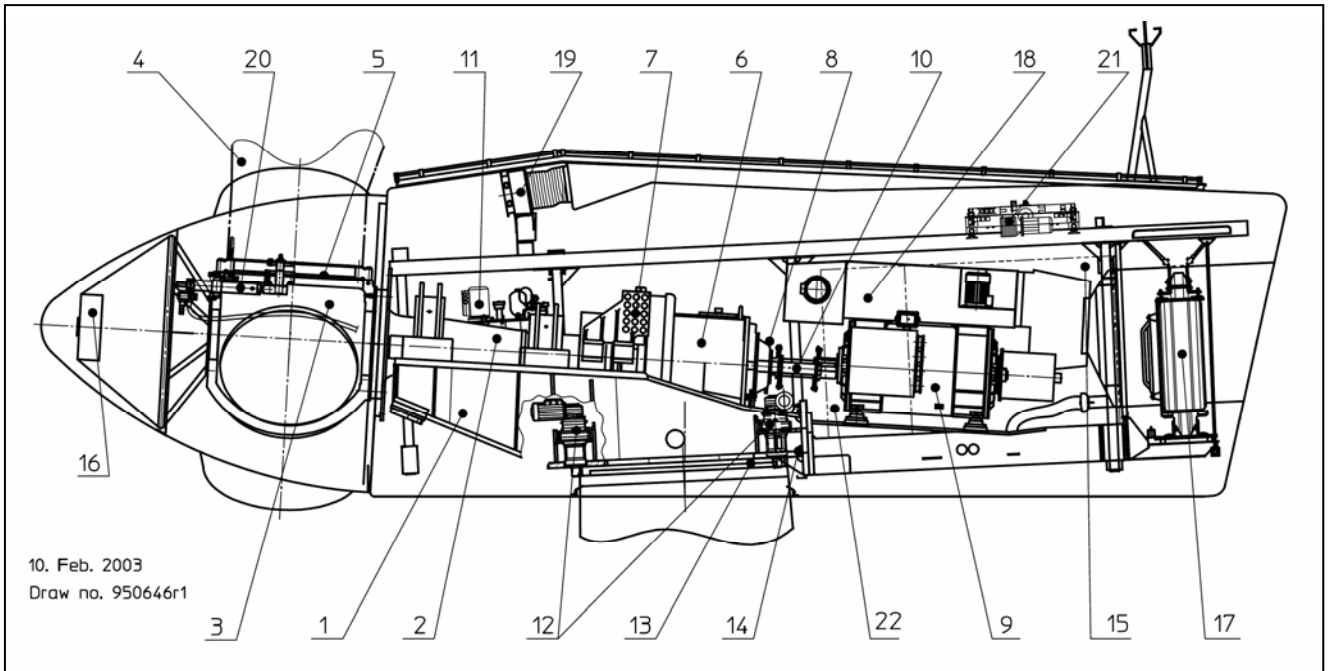
Manufacturer:	Vestas
Material:	S235 J0/JR
Heights:	60 m, 67 m, 78 m, 100 m
Top diameter:	2.3 m
Bottom diameter:	4.0 m

# 15. Dimension Drawings

## 15.1 Nacelle Cover and Blade, Overall Dimensions



### 15.2 Nacelle, Side View



Please disregard the position numbers.