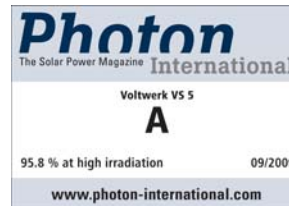


Voltwerk VS 3, 4, 5

String inverters 3, 4, 5 kW



- | Easy installation – 1 string per inverter
- | Highest yields –
peak efficiency factor of 97.7 %
- | Solar generator optimisation –
documentation of the U/I-curve
- | Wide range of applications –
outdoor installation (IP 65) in temperature
range up to +60 °C



The string inverters of the Voltwerk VS series set new standards. They are the result of Voltwerk's many years of experience in the development of photovoltaic inverters and meet the highest demands.

Efficiency

Thanks to the innovative patented VTL topology, Voltwerk inverters reach peak efficiency factors of 97.7 %. The new technology also ensures highest European efficiency factors of up to 97 %. The exceptionally fast and precise MPP tracking guarantees loss-free output in case of irradiation changes.

Reliability

The new patented PowerCool cooling concept optimises heat distribution in the inverter. The sophisticated cooling system and the high-quality components prevent premature ageing of the power electronics and guarantee a maximum service life for the inverters. The protection type IP 65 and the ambient temperature range of –20 °C to +60 °C allow an installation of the inverters in practically any environment.

Flexibility

Due to the wide input voltage range of the VS series, modules can be flexibly wired. The high input voltage (U_{DC} = up to 940V) permits maximum string lengths for low string losses and cost-effective photovoltaic module wiring.

Solar generator optimisation

Voltwerk string inverters allow an immediate documentation of the current voltage graph. Thereby in particular cases wiring faults in the generator field can already be determined and eliminated during commissioning on site.

Voltwerk VS series

Input side (PV-Generator)	Voltwerk VS 3 (Item no. V1-110-004)	Voltwerk VS 4 (Item no. V1-110-005)	Voltwerk VS 5 (Item no. V1-110-006)
Recommended solar generator connected load (STC)	3.2 kW	4.3 kW	5 kW
Maximum input voltage (V_{dcmax})	940 V	940 V	940 V
Minimum input voltage (V_{dcmin})	250 V	250 V	275 V
Start-up input voltage ($V_{dcstart}$)	220 V	220 V	220 V
Rated input voltage ($V_{dc,r}$)	700 V	700 V	700 V
Maximum MPP voltage (V_{mppmax})	750 V	750 V	750 V
Minimum MPP voltage (V_{mppmin})	250 V	250 V	275 V
Maximum input current (I_{dcmax})	19 A	19 A	19 A
Start-up power	25 W _{dc}	25 W _{dc}	25 W _{dc}
MPP tracker	1	1	1
DC input	Connector, MCIV compatible (4 mm ² included in delivery, max. 10 mm ² possible)		
Number of DC inputs	1	1	1
MPP accuracy	> 99 %	> 99 %	> 99 %
Output side (Grid connection)			
Rated grid voltage ($V_{ac,r}$)	230 V	230 V	230 V
Maximum grid voltage (V_{acmax})¹	264.5 V	264.5 V	264.5 V
Minimum grid voltage (V_{acmin})¹	184 V	184 V	184 V
Maximum output current (I_{acmax})	14 A	19 A	22 A
Rated power ($P_{ac,r}$)	3 kW	4 kW	5 kW ³
Maximum apparent power (S_{acmax})	3 kVA	4 kVA	5 kVA ³
Rated frequency (f_i)	50 Hz	50 Hz	50 Hz
Maximum frequency (f_{max})¹	51.5 Hz	51.5 Hz	51.5 Hz
Minimum frequency (f_{min})¹	47.5 Hz	47.5 Hz	47.5 Hz
Power factor (cos φ)	0.7 under-excited to 0.7 over-excited	0.7 under-excited to 0.7 over-excited	0.7 under-excited to 0.7 over-excited
Required grid type	TN grid / TT grid	TN grid / TT grid	TN grid / TT grid
Output current distortion (at rated power)	≤ 3 %	≤ 3 %	≤ 3 %
Output terminals	Connector included in delivery (flexible cable with a maximum of 6 mm ² in diameter)		
Feed in type	Single-phase	Single-phase	Single-phase
Stand-by consumption / nighttime consumption	0.2 W	0.2 W	0.2 W
Efficiency factor			
Maximum efficiency factor	97.6 %	97.7 %	97.7 %
European efficiency factor	96.4 %	96.8 %	97.0 %
Cooling			
Cooling type	Convection	Regulated ventilator ²	

Voltwerk VS series

Environment requirements	Voltwerk VS 3 (Item no. V1-110-004)	Voltwerk VS 4 (Item no. V1-110-005)	Voltwerk VS 5 (Item no. V1-110-006)
Ambient temperature	-20 °C / +60 °C	-20 °C / +60 °C	-20 °C / +60 °C
Maximum temperature for lasting rated power	+50 °C	+50 °C	+50 °C
Relative humidity (not-condensing)	0–95 %	0–95 %	0–95 %
Installation altitude	≤ 2.000 m	≤ 2.000 m	≤ 2.000 m
Site of installation	indoor / outdoor	indoor / outdoor	indoor / outdoor
Protection / Safety			
Protection type	IP 65	IP 65	IP 65
Protection class	Class I, after IEC 62103	Class I, after IEC 62103	Class I, after IEC 62103
Ground fault monitoring	Yes (isolation measurement + RCD type B)	Yes (isolation measurement + RCD type B)	Yes (isolation measurement + RCD type B)
Over load behaviour	Working point adjustment	Working point adjustment	Working point adjustment
Over temperature behaviour	Derating	Derating	Derating
Surge protection PV input	Varistors (Overload protection type 3)	Varistors (Overload protection type 3)	Varistors (Overload protection type 3)
Surge protection AC output	Varistors (Overload protection type 3)	Varistors (Overload protection type 3)	Varistors (Overload protection type 3)
Leakage current switch type B integrated	Yes	Yes	Yes
DC load disconnecter	Yes	Yes	Yes
Grid monitoring			
Delay time after grid failure¹	60 seconds	60 seconds	60 seconds
Trip time¹	< 200 milliseconds	< 200 milliseconds	< 200 milliseconds
Grid monitoring meets the requirements	VDE 0126-1-1 Germany, France, Greece, Benelux, RD1663 Spain, DK5940 Italy; others on demand		
Dimensions / Weight			
Dimensions (W x H x D)	390 x 675 x 229 mm	390 x 675 x 229 mm	390 x 675 x 229 mm
Weight	22 kg	22 kg	22 kg
Conformity			
Transient emissions (EMC)	DIN EN 61000-6-3:2007-09	DIN EN 61000-6-3:2007-09	DIN EN 61000-6-3:2007-09
Interference resistance (EMV)	DIN EN 61000-6-2:2006-03	DIN EN 61000-6-2:2006-03	DIN EN 61000-6-2:2006-03
Grid quality	IEC 61000-3-2 / -3-12 (harmonics); IEC 61000-3-3 / -3-11 (flicker)		
Equipment reliability	IEC 62109-1:2003, IEC 62109-2:2005, IEC 62103:2003 and DIN EN 50178:1998		
CE conformity	Yes	Yes	Yes
GS approval	Yes	Yes	Yes
In accordance with Renewable Energy Law 2009, § 6,1	Yes	Yes	Yes
In accordance with VDE-AR-N 105	Yes	Yes	Yes
Other			
Display	LCD	LCD	LCD
Communication interface	CAN	CAN	CAN
Topology	Transformerless	Transformerless	Transformerless
Warranty	5 Years, optional prolongable		

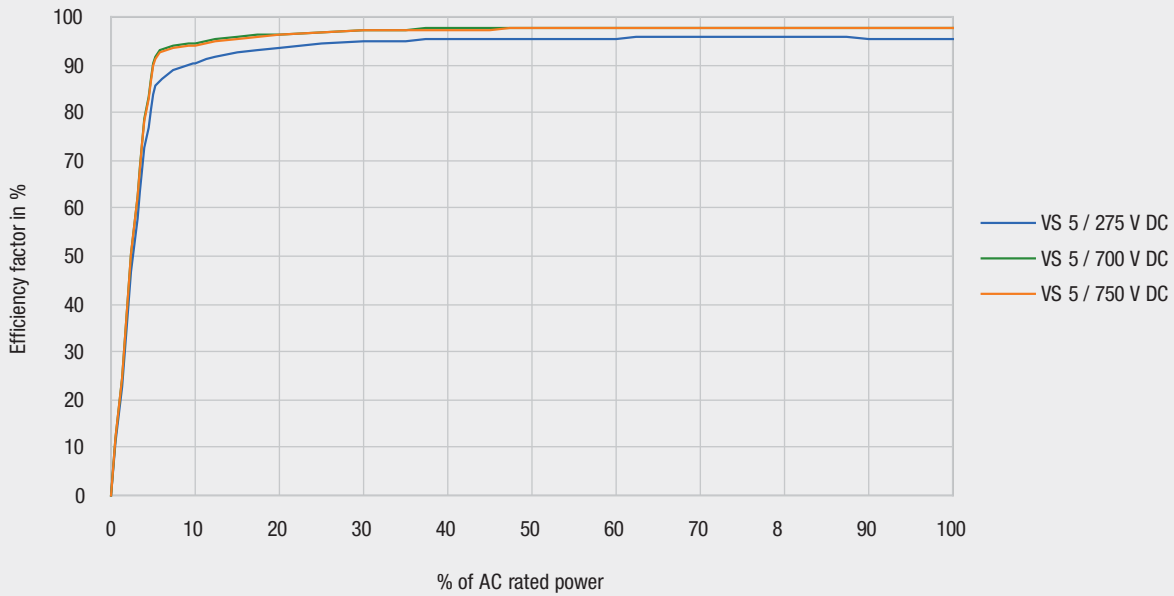
¹ Values for Germany; values vary according to country setting.

² Ventilator in the devices works temperature regulated.

³ Germany $S_{ac,max}$ 4,6 kVA, $P_{ac,r}$ 4,6 kW

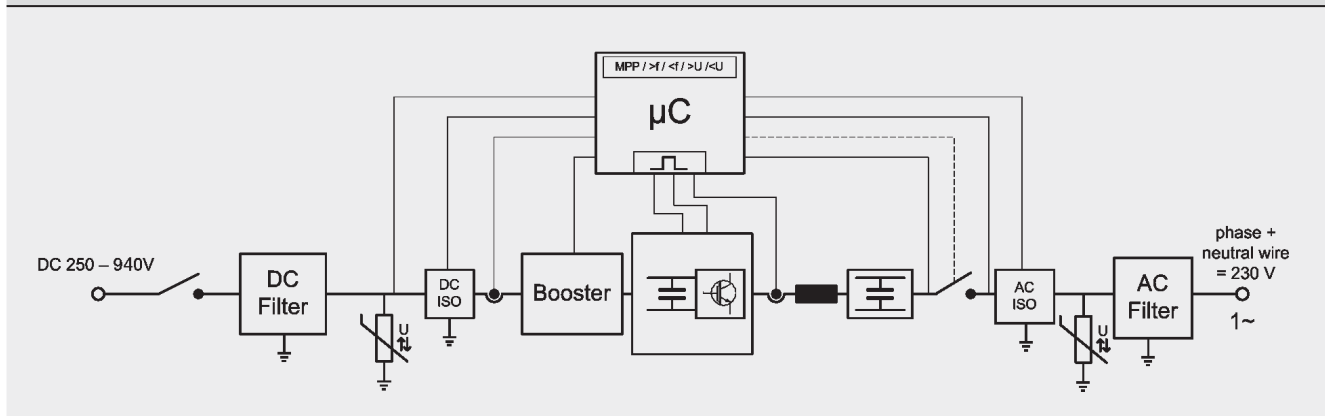
Voltwerk VS series

Efficiency curves with different input voltages



P _{nenn}	VS 3			VS 4			VS 5		
	250 V	700 V	750 V	250 V	700 V	750 V	275 V	700 V	750 V
5 %	77.4 %	86.5 %	84.4 %	80.6 %	88.4 %	87.5 %	83.6 %	90.3 %	89.6 %
10 %	85.5 %	92.3 %	91.0 %	88.2 %	93.4 %	93.0 %	90.1 %	94.4 %	94.1 %
20 %	91.1 %	95.4 %	94.9 %	92.6 %	96.0 %	95.8 %	93.6 %	96.5 %	96.4 %
25 %	92.3 %	96.1 %	95.6 %	93.5 %	96.5 %	96.4 %	94.3 %	96.9 %	96.8 %
30 %	93.1 %	96.5 %	96.1 %	94.1 %	96.9 %	96.7 %	94.7 %	97.2 %	97.1 %
50 %	94.6 %	97.3 %	97.1 %	95.1 %	97.5 %	97.3 %	95.5 %	97.6 %	97.5 %
75 %	95.3 %	97.6 %	97.4 %	95.5 %	97.7 %	97.6 %	95.7 %	97.7 %	97.6 %
100 %	95.5 %	97.6 %	97.6 %	95.5 %	97.7 %	97.6 %	95.6 %	97.6 %	97.5 %

Internal layout



voltwerk electronics GmbH
 Anckelmannsplatz 1
 20537 Hamburg/Germany
 info@voltwerk.com
 www.voltwerk.com

Available at: