SOLAR INVERTERS

ABB string inverters

PRO-33.0-TL-OUTD
33 kW



01

ABB string inverters cost-efficiently convert the direct current (DC) generated by solar modules into high quality three-phase alternating current (AC) that can be fed into the power distribution network (i.e. grid). Designed to meet the needs of the entire supply chain – from system integrators and installers to end users – these transformerless, three-phase inverters are designed for decentralized photovoltaic (PV) systems installed in commercial and industrial systems up to megawatt (MW) sizes.

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01 PRO-33.0-TL-OUTD outdoor string inverter

A three-phase inverter from the world's leading power technology company
ABB, a global leader in power and automation technologies, brings decades of experience, technology leadership and application know-how from renewable energies to this new string inverter.
Such experience and technology ensures high quality, safe and reliable solar inverters are delivered every time.

High power package for decentralized PV systems
ABB's three-phase PRO-33 string inverter is designed for medium and large decentralized PV systems either on large-scale commercial and industrial rooftops or ground-mounted PV plants.
The inverter offers cost-efficiency in a high power, wall-mountable package with very high conversion efficiency.
The all-in-one design with built-in and monitored PV plant protection devices reduces the need of costly external devices.

The single maximum power point tracker (MPPT) and optimized MPPT window are suitable for uniform-shaped PV plants with long strings connected to the inverter. The high maximum DC input voltage of up to 1100 V gives PV plant designers extra flexibility and allows more PV modules to be connected in series to reduce cabling costs.

Highlights
- Compact, high power wall-mountable package
- High maximum DC input voltage of up to 1100 V
- Configurable all-in-one design
- Advanced grid support functions
- Safe and intuitive user interface
- Robust enclosure, with IP65 rating suitable for outdoor installation

Configurable all-in-one design
The ABB PRO-33.0 string inverter comes in three product variants. The standard model with or without DC switch is designed for use with an external string combiner box. The all-in-one model with built-in string combiner box includes a DC switch, string current monitoring with alarm, PV fuses, monitored surge protection devices and tool-less solar quick connectors. The inverter's all-in-one design, with built-in and monitored PV plant protection devices, reduces the need of costly external devices.

High total efficiency maximizes return on investment
The PRO-33.0 inverter offers a high conversion and MPP tracking efficiency in all conditions. A flat efficiency curve provides high revenues in low and high radiation conditions.

Fast and easy commissioning
Fast PV plant commissioning is enabled via pre-programmed country grid code settings that are easily selectable. Extensive certification ensures wide grid code compatibility. Plug and Play DC and AC connectors enable fast and safe cabling. A touch protected installation area provides additional safety and comfort for inverter installation and maintenance.

ABB string inverters

PRO-33.0-TL-OUTD

33 kW

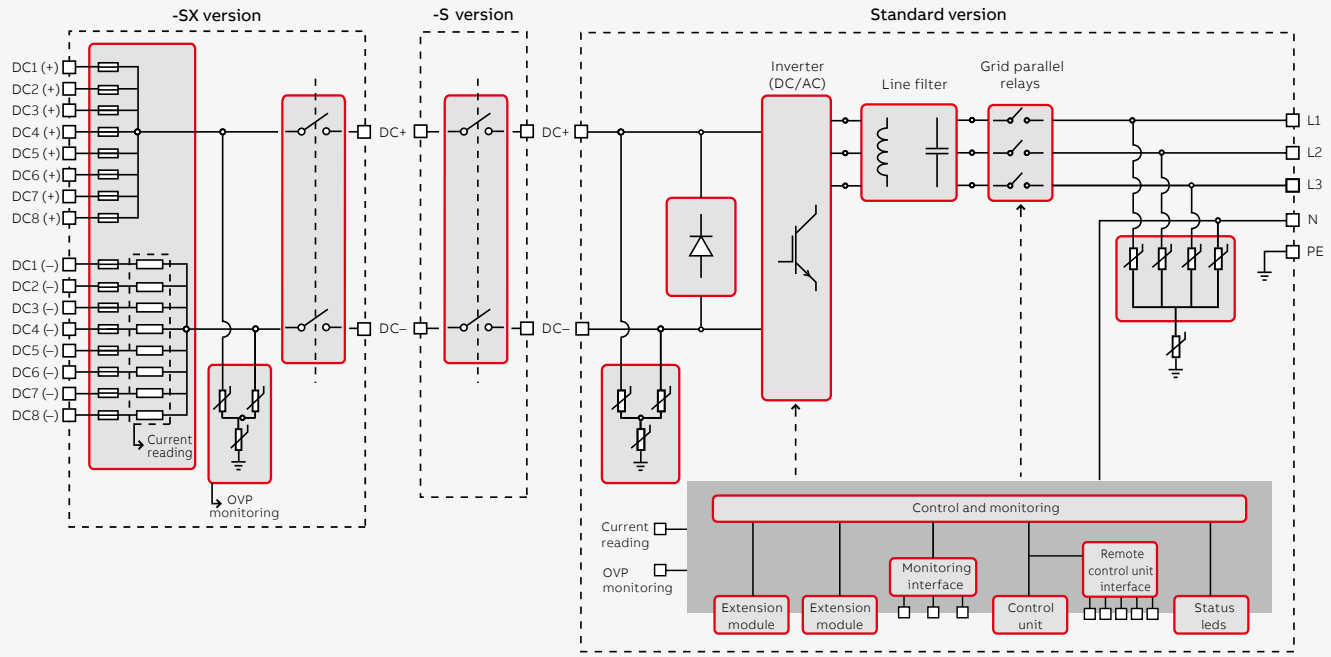


Technical data and types

Type designation	**33 kW** **PRO-33.0-TL-OUTD**
Input side	
Absolute maximum DC input voltage ($V_{max,abs}$)	1100 V [4]
Startup DC input voltage (V_{start})	610 V
Operating DC input voltage range (V_{dcmin}...V_{dcmax})	580 to 950 V
Rated DC input voltage (V_{dcr})	580 V
Rated DC input power (P_{dcr})	33 700 W
Number of independent MPPT	1
MPPT input DC voltage range ($V_{MPPTmin}$...$V_{MPPTmax}$) at P_{acr}	580 to 850 V
Maximum DC input current (I_{dcmax})/for each MPPT ($I_{MPPTmax}$)	58 A
Maximum input short circuit current for each MPPT	80 A
Number of DC input pairs for each MPPT	1 in Standard and -S version/8 in -SX version
DC connection type	PV quick fit connector [3] on -SX version / Screw terminal block on Standard and -S version
Input protection	
Reverse polarity protection	Yes, from limited current source
Input over voltage protection for each MPPT - varistor (-/S) version	Yes
Input over voltage protection - plug in modular surge arrester (-SX version)	Type 2
Photovoltaic array isolation control	According to local standard
DC switch rating for each MPPT (version with DC switch)	58 A / 1000 V, 50 A / 1200 V
Fuse rating (versions with fuses)	15 A / 1100 V
Output side	
AC grid connection type	Three-phase 3W+PE or 4W+PE
Rated AC power (P_{acr} @cosϕ>0.99)	33 000 W
Maximum apparent power (S_{max})	33 000 VA
Rated AC grid voltage ($V_{ac,r}$)	400 V
AC voltage range	320 to 480 V [1]
Maximum AC output current ($I_{ac,max}$)	50.3 A
Contributory fault current	50.3 A
Rated output frequency (f_r)	50 Hz/60 Hz
Output frequency range (f_{min}...f_{max})	47 to 53 Hz/57 to 63 Hz [2]
Nominal power factor and adjustable range	> 0.995, with P_{acr} = 33.0 kW, adj. ± 0.9 with P_{acr} =29.7 kW, adj. ± 0 to 1 with S = 33.0 kVA
Total current harmonic distortion	< 3%
AC connection type	Fixed plug type connector
Output protection	
Anti-islanding protection	According to local standard
Maximum external AC overcurrent protection	80 A
Output overvoltage protection - varistor	5

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ABB PRO-33.0-TL-OUTD string inverter block diagram



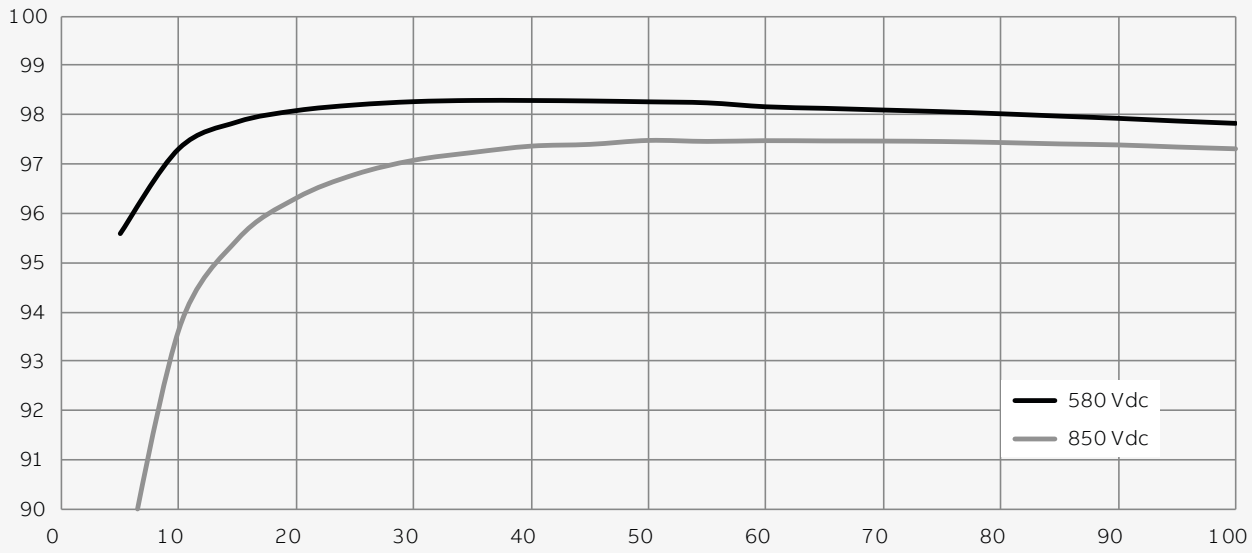
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Technical data and types

Type designation	**33 kW**
	PRO-33.0-TL-OUTD
Operating performance	
Maximum efficiency (η_{max})	98.3%
Weighted efficiency (EURO/CEC)	98.0% / 98.1%
Feed in power threshold	20 W
Night consumption	< 1 W
Communication	
Remote monitoring	VSN700 Data Logger (opt.)
User interface	Detachable graphical display
Environmental	
Ambient temperature range	-25 to +60°C /-13 to 140°F wi th derating above 45°C/113°F
Relative humidity	0 to 100% condensing
Sound pressure level, typical	67 dBA @ 1 m
Maximum operating altitude without derating	3000 m / 9840 ft
Physical	
Environmental protection rating	IP65 (IP54 fans)
Cooling	Forced
Dimension (H x W x D) mm/inch	740 x 520 x 300 mm / 29.1" x 20.5" x 11.8"
Weight kg / lb	< 66.0 kg / 146 lbs (standard version)
Mounting system	Wall bracket
Safety	
Isolation level	Transformerless
Marking	CE, RCM
Safety and EMC standard	IEC/EN 62109-1, IEC/EN 62109-2, EN61000-6-2, AS/NZS 3200, EN61000-6-3, EN61000-3-11, EN61000-3-12
Grid standard (check availability)	CEI 0-21, CEI 0-16, DIN V VDE V 0126-1-1, VDE-AR-N 4105, G59/3, C10/11, EN 50438 (not for all national appendices), PPC Greece, RD 1699, RD 413, RD 661, P.O. 12.3, UNE206007-1, AS 4777, BDEW, NRS-097-2-1, SAGC, MEA, PEA, IEC 61727, IEC 62116, ABNT NBR16149/16150, VFR-2014
Available product variants	
Standard	PRO-33.0-TL-OUTD-400
With DC switch	PRO-33.0-TL-OUTD-S-400
With DC switch, fuses and DC surge arresters	PRO-33.0-TL-OUTD-SX-400

[1] The AC voltage range may vary depending on specific country grid standard
[2] The frequency range may vary depending on specific country grid standard
[3] Please refer to the document “String inverters – Product manual appendix” available at www.abb.com/solarinverters for information on the quick-fit connector brand and model used in the inverter
[4] Inverter does not start >1000 V
Remark. Features not specifically listed in the present data sheet are not included in the product

Efficiency curves of PRO-33.0-TL-OUTD



For more information please contact your local ABB representative or visit:

www.abb.com/solarinverters
www.abb.com

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SOLAR INVERTERS

ABB string inverters

TRIO-5.8/7.5/8.5-TL-OUTD
5.8 to 8.5 kW



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TRIO-5.8/7.5/8.5-TL-OUTD outdoor string inverter

The all-in-one residential three-phase TRIO-5.8, 7.5 and 8.5 kW inverters deliver performance, ease of use and installation, monitoring and control.
With their 98% peak efficiency and wide input voltage range, the residential TRIO inverter means flexible installations and powerful output.

Commercial grade engineering at residential scale
The topology of the larger, commercial TRIO inverters has been redesigned to ensure that the TRIO-5.8/7.5/8.5 models also enjoy high conversion efficiency across a wide range of input voltages. Optional integrated dataloggers and smart grid functionality, remote firmware updating and elegantly simple sliding front covers make these all-in-one devices easy to install and maintain. In short, they are commercial grade engineering at residential scale.

Inverters packed with powerful features
The double maximum power point tracker (MPPT) gives maximum installation flexibility for an optimal energy production (TRIO-7.5/8.5 models). This line of inverters can integrate power control, monitoring functionalities and environmental sensor inputs, without requiring external components.

A compact Ethernet expansion card provides data logging functionality for monitoring the main parameters of the plant as well as advanced O&M operations both locally (with the integrated webserver) and remotely (with the AV Plant Portfolio Manager portal), via a LAN connection.

The outer cover with its natural cooling mechanism qualifies at IP65 environmental protection level for external use. It provides maximum reliability and ease of installation, with a sliding front panel giving access to the connection and configuration area without requiring the complete removal of the cover.

Highlights
- Three-phase bridge topology for DC/ AC output converter
- Transformerless topology
- Two independent MPPT channels for TRIO-7.5/8.5 allow optimal energy harvesting from two sub-arrays oriented in different directions (one MPPT channel for TRIO-5.8)
- Flat efficiency curves ensure high efficiency at all output levels enabling consistent and stable performance across the entire input voltage and output power range
- Wide input voltage range
- Remote inverter upgrade
- Reactive power management
- DC switch version available (-S)
- Natural convection cooling for maximum reliability
- Outdoor enclosure for unrestricted use under any environmental conditions (IP65)
- Sliding cover for the easiest installation and maintenance
- Data logger and smart grid functionalities integrated on expansion cards:
  - PMU expansion card option, with external sensor inputs for monitoring environmental conditions and additional RS-485 for Modbus protocol
  - Ethernet expansion card option with integrated web server and remote monitoring capability via web portal (Modbus/TCP supported)
- Availability of auxiliary DC output voltage (24 V, 100 mA)

ABB string inverters

TRIO-5.8/7.5/8.5-TL-OUTD

5.8 to 8.5 kW

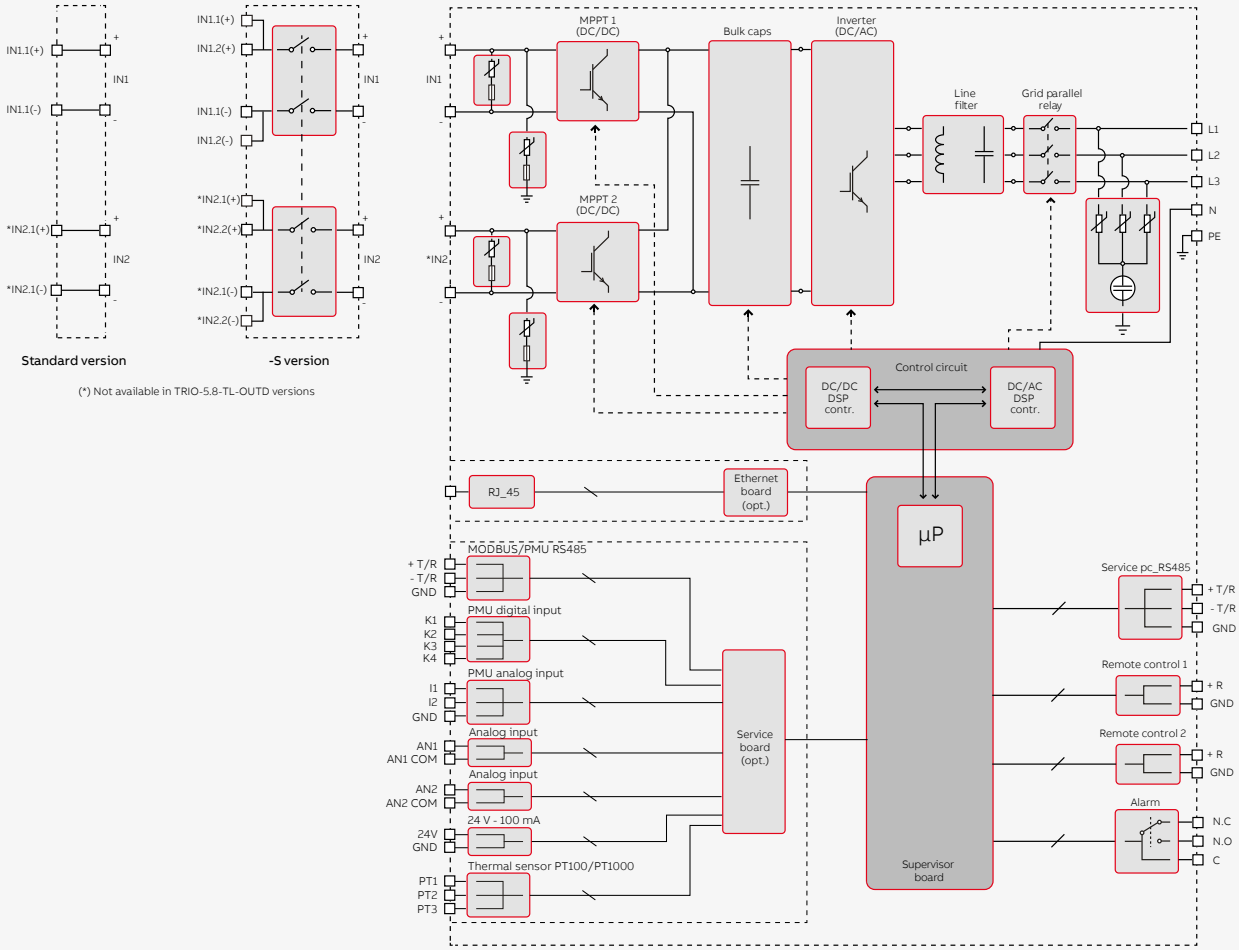


Technical data and types

Type code	TRIO-5.8-TL-OUTD	TRIO-7.5-TL-OUTD	TRIO-8.5-TL-OUTD
Input side			
Absolute maximum DC input voltage ($V_{max,abs}$)		1000 V	
Start-up DC input voltage (V_{start})		350 V (adj. 200...500 V)	
Operating DC input voltage range (V_{dcmin}...V_{dcmax})		0.7 x V_{start}...950 V (min 200 V)	
Rated DC input voltage (V_{dcr})		620 V	
Rated DC input power (P_{dcr})	5950 W	7650 W	8700 W
Number of independent MPPT	1	2	2
Maximum DC input power for each MPPT ($P_{MPPTmax}$)	6050 W Linear derating from max to null [800 V≤V_{MPPT}≤950 V]	4800 W	4800 W
MPPT input DC voltage range ($V_{MPPTmin}$ ... $V_{MPPTmax}$) at P_{acr}	320...800 V	-	-
DC input voltage range with parallel configuration of MPPT at P_{acr}	-	320...800 V	320...800 V
DC power limitation with parallel configuration of MPPT	-	Linear derating from max to null [800 V≤V_{MPPT}≤950 V]	
DC power limitation for each MPPT with independent configuration of MPPT at P_{acr}, max unbalance example	-	4800 W [320 V≤V_{MPPT}≤800 V] the other channel: P_{dcr}-4800 W [215 V≤V_{MPPT}≤800 V]	4800 W [320 V≤V_{MPPT}≤800 V] the other channel: P_{dcr}-4800 W [290 V≤V_{MPPT}≤800 V]
Maximum DC input current (I_{dcmax}) / for each MPPT ($I_{MPPTmax}$)	18.9 A	30.0 A / 15.0 A	30.0 A / 15.0 A
Maximum input short circuit current for each MPPT	24.0 A	20.0 A	20.0 A
Number of DC input pairs for each MPPT		2 (-S version)	
DC connection type		PV quick fit connector [3] on -S version / Screw terminal block on standard version	
Input protection			
Reverse polarity protection		Yes, from limited current source	
Input over voltage protection for each MPPT - varistor		Yes, 4	
Photovoltaic array isolation control		According to local standard	
DC switch rating for each MPPT (version with DC switch)		16 A /1000 V, 25 A / 800 V	
Output side			
AC grid connection type		Three-phase 3W+PE or 4W+PE	
Rated AC power (P_{acr} @cosϕ=1)	5800 W	7500 W	8500 W
Maximum apparent power (S_{max})	5800 VA	7500 VA	8500 VA
Rated AC grid voltage ($V_{ac,r}$)		400 V	
AC voltage range		320...480 V [1]	
Maximum AC output current ($I_{ac,max}$)	10.0 A	12.5 A	14.5 A
Contributory fault current	12.0 A	14.5 A	16.5 A
Rated output frequency (f_r)		50 Hz / 60 Hz	
Output frequency range (f_{min}...f_{max})		47...53 Hz / 57...63 Hz [2]	
Nominal power factor and adjustable range	> 0.995, adj. ± 0.9 with P_{acr}=5.22 kW, ± 0.8 with max 5.8 kVA	> 0.995, adj. ± 0.9 with P_{acr}=6.75 kW, ± 0.8 with max 7.5 kVA	> 0.995, adj. ± 0.9 with P_{acr}=7.65 kW, ± 0.8 with max 8.5 kVA
Total current harmonic distortion		< 2%	
AC connection type		Screw terminal block, cable gland M32	
Output protection			
Anti-islanding protection		According to local standard	
Maximum external AC overcurrent protection	16.0 A	16.0 A	20.0 A
Output overvoltage protection - varistor		4 plus gas arrester	
Operating performance			
Maximum efficiency (η_{max})		98.0%	
Weighted efficiency (EURO/CEC)	97.4% / -	97.5% / -	97.5% / -
Feed in power threshold	32 W	36 W	36 W
Night consumption		< 3 W	

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ABB TRIO-5.8/7.5/8.5-TL-OUTD string inverter block diagram



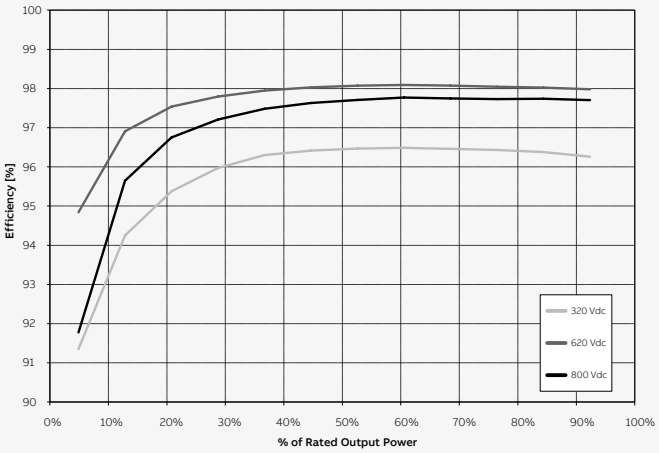
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Technical data and types

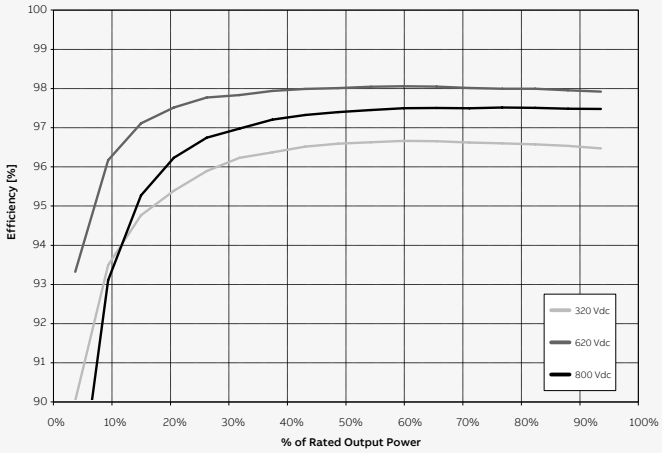
Type code	TRIO-5.8-TL-OUTD	TRIO-7.5-TL-OUTD	TRIO-8.5-TL-OUTD
Communication			
Wired local monitoring	Ethernet card with webserver (opt.), PVI-USB-RS232_485 (opt.)		
Remote monitoring	Ethernet card (opt.), VSN300 Wifi Logger Card (opt.), VSN700 Data Logger (opt.)		
Wireless local monitoring	VSN300 Wifi Logger Card (opt.)		
User interface	Graphic display		
Environmental			
Ambient temperature range	-25...+60°C /-13...140°F with derating above 50°C/122°F		
Relative humidity	0...100% condensing		
Sound pressure level, typical	50 dBA @ 1 m		
Maximum operating altitude without derating	2000 m / 6560 ft		
Physical			
Environmental protection rating	IP65		
Cooling	Natural		
Dimension (H x W x D)	641mm x 429 mm x 220 mm/ 25.2” x 16.9” x 8.7” (855 mm x 429 mm x 237 mm/ 33.7” x 16.9” x 9.3” with open front cover)		
Weight	25.0 kg / 55.1 lbs	28.0 kg / 61.7 lbs	28.0 kg / 61.7 lbs
Mounting system	Wall bracket		
Safety			
Isolation level	Transformerless		
Marking	CE (50 Hz only), RCM		
Safety and EMC standard	EN 62109-1, EN 62109-2, AS/NZS3100, EN 61000-6-2, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3		
Grid standard (check your sales channel for availability)	CEI 0-21, CEI 0-16, DIN V VDE V 0126-1-1, VDE-AR-N 4105, G83/2, G59/3, RD 1699, RD 413, NRS-097-2-1, AS 4777, IEC 61727, IEC 62116, VFR 2014		
Available products variants			
Standard	TRIO-5.8-TL-OUTD-400	TRIO-7.5-TL-OUTD-400	TRIO-8.5-TL-OUTD-400
With DC switch	TRIO-5.8-TL-OUTD-S-400	TRIO-7.5-TL-OUTD-S-400	TRIO-8.5-TL-OUTD-S-400

[1] The AC voltage range may vary depending on specific country grid standard
[2] The Frequency range may vary depending on specific country grid standard
[3] Please refer to the document “String inverters – Product manual appendix” available at www.abb.com/solarinverters for information on the quick-fit connector brand and model used in the inverter
Remark. Features not specifically listed in the present data sheet are not included in the product

Efficiency curves of TRIO-5.8-TL-OUTD



Efficiency curves of TRIO-8.5-TL-OUTD



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BCD.00376_EN REV F 15.05.2017

SOLAR INVERTERS

ABB string inverters

TRIO-20.0/27.6-TL-OUTD
20 to 27.6 kW



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The TRIO 20.0/27.6 commercial inverter offers more flexibility and control to installers who have large installations with varying aspects or orientations.

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TRIO-20.0/27.6-TL-OUTD
outdoor string inverter

The dual input section containing two independent Maximum Power Point Tracking (MPPT), allows optimal energy harvesting from two sub-arrays oriented in different directions.

The TRIO features a high speed and precise MPPT algorithm for real power tracking and improved energy harvesting.

High efficiency at all output levels
Flat efficiency curves ensure high efficiency at all output levels guaranteeing consistent and stable performance across the entire input voltage and output power range.

This device has an efficiency rating of up to 98.2%.

The very wide input voltage range makes the inverter suitable for installations with reduced string size.

Highlights

- True three-phase bridge topology for DC/AC output converter
- Transformerless topology
- Each inverter is set on specific grid codes which can be selected in the field
- Detachable wiring box to allow an easy installation
- Wide input voltage range
- Integrated string combiner with different options of configuration which include DC and AC disconnect switch in compliance with international standards (S2, S1J, -S2J, -S2F and -S2X versions)
- Natural convection cooling for maximum reliability
- Outdoor enclosure for unrestricted use under any environmental conditions
- Capability to connect external sensors for monitoring environmental conditions
- Availability of auxiliary DC output voltage (24 V, 300 mA)

ABB string inverters

TRIO-20.0/27.6-TL-OUTD

20 to 27.6 kW

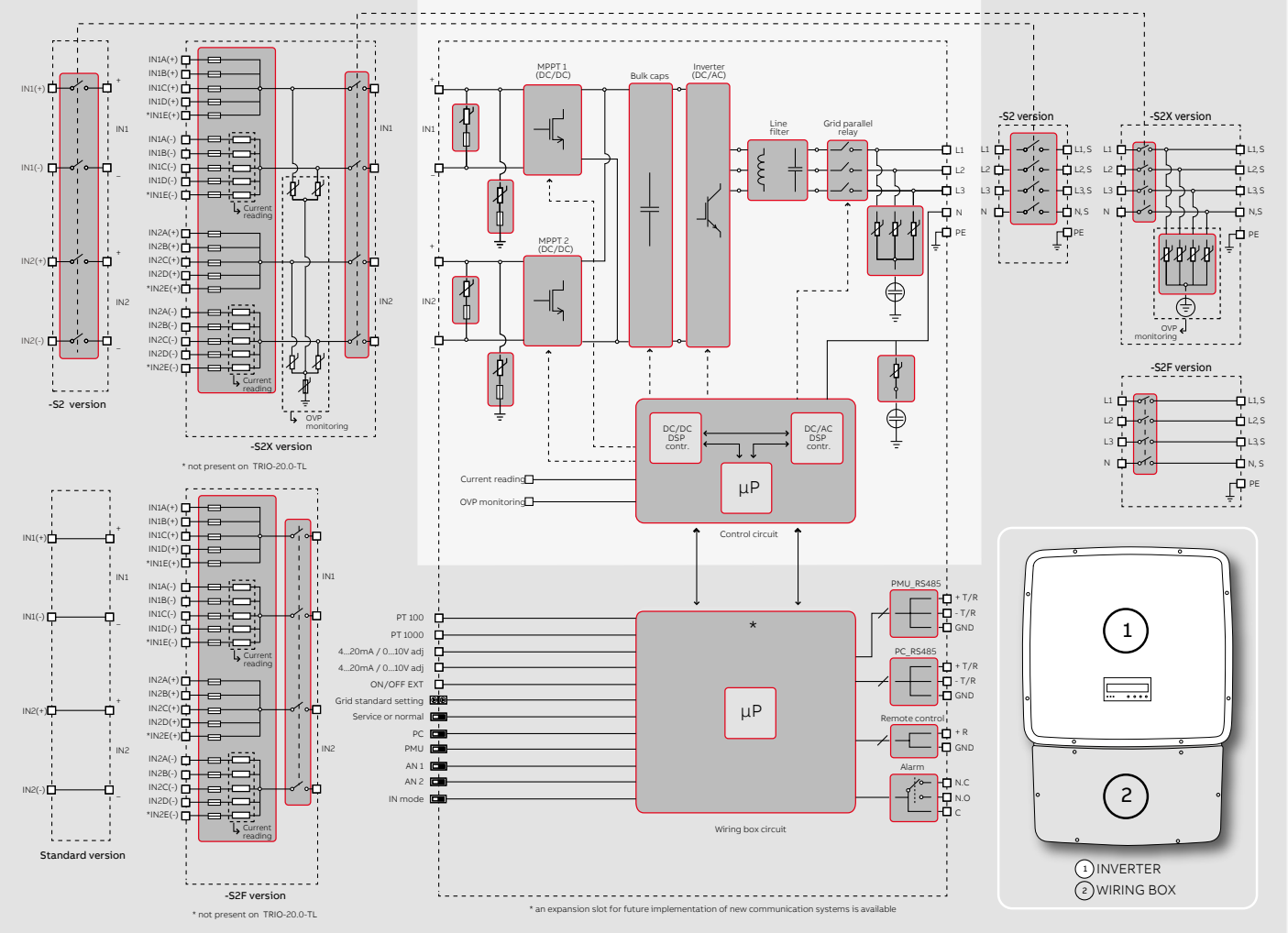


Technical data and types

Type code	TRIO-20.0-TL-OUTD	TRIO-27.6-TL-OUTD
Input side		
Absolute maximum DC input voltage ($V_{max,abs}$)	1000 V	
Start-up DC input voltage (V_{start})	430 V (adj. 250...500 V)	
Operating DC input voltage range (V_{dcmin}...V_{dcmax})	0.7 x V_{start}...950 V (min 200 V)	
Rated DC input voltage (V_{dcr})	620 V	
Rated DC input power (P_{dcr})	20750 W	28600 W
Number of independent MPPT	2	
Maximum DC input power for each MPPT ($P_{MPPTmax}$)	12000 W	16000 W
DC input voltage range with parallel configuration of MPPT at P_{acr}	440...800 V	500...800 V
DC power limitation with parallel configuration of MPPT	Linear derating from max to null [800 V≤V_{MPPT}≤950 V]	
DC power limitation for each MPPT with independent configuration of MPPT at P_{acr}, max unbalance example	12000 W [480 V≤V_{MPPT}≤800 V] the other channel: P_{dcr}-12000 W [350 V≤V_{MPPT}≤800 V]	16000 W [500 V≤V_{MPPT}≤800 V] the other channel: P_{dcr}-16000 W [400 V≤V_{MPPT}≤800 V]
Maximum DC input current (I_{dcmax}) / for each MPPT ($I_{MPPTmax}$)	50.0 A / 25.0 A	64.0 A / 32.0 A
Maximum input short circuit current for each MPPT	30.0 A	40.0 A
Number of DC input pairs for each MPPT	1 (4 in -S2X, -S2F, -S1J, -S2J versions)	1 (5 in -S2X and -S2F versions, 4 in -S1J and -S2J)
DC connection type	PV quick fit connector [3] / Screw terminal block on Standard and -S2 versions	
Input protection		
Reverse polarity protection	Yes, from limited current source	
Input over voltage protection for each MPPT - varistor	Yes, 4	
Input over voltage protection for each MPPT - plug In modular surge arrester (-S2X, -S1J and -S2J versions)	-S2X: Type 2; -S1J, -S1J: Type 1+2	
Photovoltaic array isolation control	According to local standard	
DC switch rating for each MPPT (version with DC switch)	40 A / 1000 V	
Fuse rating (versions with fuses)	15 A / 1000 V	
Output side		
AC grid connection type	Three-phase 3W+PE or 4W+PE	
Rated AC power (P_{acr} @cosϕ=1)	20000 W	27600 W
Maximum AC output power (P_{acmax} @cosϕ=1)	22000 W [4]	30000 W [5]
Maximum apparent power (S_{max})	22200 VA	30670 VA
Rated AC grid voltage ($V_{ac,r}$)	400 V	
AC voltage range	320...480 V [1]	
Maximum AC output current ($I_{ac,max}$)	33.0 A	45.0 A
Contributory fault current	35.0 A	46.0 A
Rated output frequency (f_r)	50 Hz / 60 Hz	
Output frequency range (f_{min}...f_{max})	47...53 Hz / 57...63 Hz [2]	
Nominal power factor and adjustable range	> 0.995, adj. ± 0.9 with P_{acr}=20.0 kW, ± 0.8 with max 22.2 kVA	> 0.995, adj. ± 0.9 with P_{acr}=27.6 kW, ± 0.8 with max 30 kVA
Total current harmonic distortion	< 3%	
AC connection type	Screw terminal block, cable gland PG36	
Output protection		
Anti-islanding protection	According to local standard	
Maximum external AC overcurrent protection	50.0 A	63.0 A
Output overvoltage protection - varistor	4	
Output overvoltage protection - plug in modular surge arrester (-S2X version)	4 (Type 2)	
Operating performance		
Maximum efficiency (η_{max})	98.2%	
Weighted efficiency (EURO/CEC)	98.0% / 98.0%	
Feed in power threshold	40 W	
Night consumption	< 0.6 W	
Communication		
Wired local monitoring	PVI-USB-RS232_485 (opt.)	
Remote monitoring	VSN300 Wifi Logger Card (opt.), VSN700 Data Logger (opt.)	
Wireless local monitoring	VSN300 Wifi Logger Card (opt.)	
User interface	Graphic display	

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ABB TRIO-20.0/27.6-TL-OUTD string inverter block diagram



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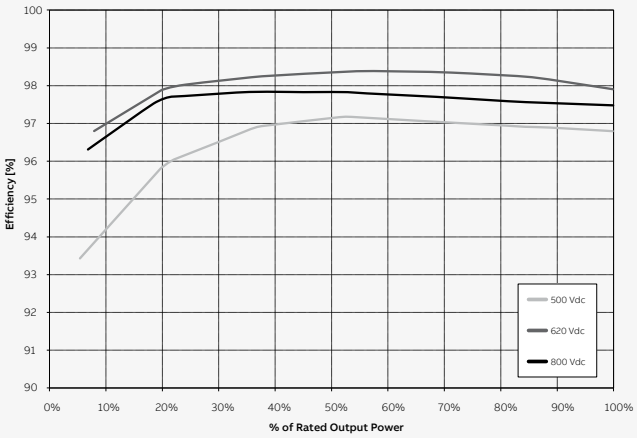
Technical data and types

Type code	TRIO-20.0-TL-OUTD	TRIO-27.6-TL-OUTD
Environmental		
Ambient temperature range	-25...+60°C /-13...140°F with derating above 45°C/113°F	
Relative humidity	0...100% condensing	
Sound pressure level, typical	50 dBA @ 1 m	
Maximum operating altitude without derating	2000 m / 6560 ft	
Physical		
Environmental protection rating	IP65	
Cooling	Natural	
Dimension (H x W x D)	1061 mm x 702 mm x 292 mm / 41.7" x 27.6" x 11.5"	
Weight	< 70.0 kg / 154.3 lbs (Standard version)	< 75.0 kg / 165.4 lbs (Standard version)
Mounting system	Wall bracket	
Safety		
Isolation level	Transformerless	
Marking	CE (50 Hz only), RCM	
Safety and EMC standard	EN 50178, IEC/EN 62109-1, IEC/EN 62109-2, AS/NZS 3100, AS/NZS 60950.1, EN 61000-6-2, EN 61000-6-3, EN 61000-3-11, EN 61000-3-12	
Grid standard (check your sales channel for availability)	CEI 0-21, CEI 0-16, DIN V VDE V 0126-1-1, VDE-AR-N 4105, G59/3, C10/11, EN 50438 (not for all national appendices), RD 1699, RD 413, RD 661, P.O. 12.3, AS 4777, BDEW, NRS-097-2-1, MEA, IEC 61727, IEC 62116, Ordinul 30/2013, VFR 2014	
Available products variants		
Standard	TRIO-20.0-TL-OUTD-400	TRIO-27.6-TL-OUTD-400
With DC+AC switch	TRIO-20.0-TL-OUTD-S2-400	TRIO-27.6-TL-OUTD-S2-400
With DC+AC switch and fuse	TRIO-20.0-TL-OUTD-S2F-400	TRIO-27.6-TL-OUTD-S2F-400
With DC+AC switch, fuse and surge arrester	TRIO-20.0-TL-OUTD-S2X-400	TRIO-27.6-TL-OUTD-S2X-400
With DC+AC switch, fuse and 1 DC surge arrester Type 1 + 2	TRIO-20.0-TL-OUTD-S1J-400	TRIO-27.6-TL-OUTD-S1J-400
With DC+AC switch, fuse and 2 DC surge arrester Type 1 + 2	TRIO-20.0-TL-OUTD-S2J-400	TRIO-27.6-TL-OUTD-S2J-400

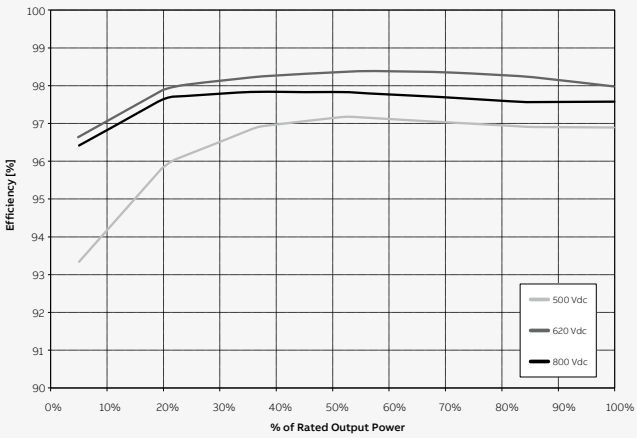
[1] The AC voltage range may vary depending on specific country grid standard
[2] The Frequency range may vary depending on specific country grid standard
[3] Please refer to the document "String inverters – Product manual appendix" available at www.abb.com/solarinverters for information on the quick-fit connector brand and model used in the inverter
[4] Limited to 20000 W for Germany
[5] Limited to 27600 W for Germany

Remark. Features not specifically listed in the present data sheet are not included in the product

Efficiency curves of TRIO-20.0-TL-OUTD



Efficiency curves of TRIO-27.6-TL-OUTD



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BCD.00379_EN REV G 03.05.2017

SOLAR INVERTERS

ABB string inverters

TRIO-TM-50.0-400 / TRIO-TM-60.0-480
50 to 60 kW



01

The TRIO-TM-50.0/60.0 is ABB's latest three-phase string solution for cost efficient large decentralized photovoltaic systems for both commercial and utility applications.

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01 TRIO-TM-50.0/60.0 outdoor string inverter

This new addition to the TRIO family, with 3 independent MPPT and power ratings of up to 60 kW (480 V version), has been designed with the objective to maximize the ROI in large systems with all the advantages of a decentralized configuration for both rooftop and ground-mounted installations.

Modular design
The TRIO-TM-50.0/60.0 has a modular design to guarantee maximum flexibility, thanks to the different versions available.
The separate and configurable AC and DC compartments increase the ease of installation and maintenance with their ability to remain separately wired from the inverter module inside the system.
The TRIO comes with the most complete wiring box configurations available including up to 15 DC inputs with fast connectors, string protection fuses, AC and DC switches and type II AC and DC surge arresters.

Design flexibility
The double stage conversion topology offers the advantage of a wide input voltage range for maximum flexibility of system design.
The TRIO-TM comes with a forced air cooling system, used also in the previous TRIO products, designed for a simple and fast maintenance, allowing a maximum flexibility of plant design. The inverter comes with mounting supports for both horizontal and vertical installations, which allow for the best use of space available beneath the solar panels.
Embedded multi communication interfaces (WLAN, Ethernet, RS485) combined with a Sunspec compliant Modbus protocol (RTU/TCP) allow the inverter to be easily integrated with any third party monitoring and control systems.

Improved commissioning and maintenance
Thanks to the build-in Web User Interface (WUI) the installer can commission the inverter wirelessly and change advanced parameters by using any standard WLAN enabled device (smartphone, tablet or PC).
Integrated logging capability allows remote monitoring of the plant without the need of any additional external loggers.
Remote firmware update of the inverter system and components via Aurora Vision®.

Highlights
- 3 Independent MPPT
- Transformerless inverter
- Double stage topology for a wide input range
- Large set of specific grid codes available which can be selected directly in the field
- Separate AC and DC compartments are available in different configurations
- Both vertical and horizontal installation
- 2 available sizes, 50 and 60 kW with 400 and 480 Vac of output voltage, respectively
- Wireless access to embedded user interfaces
- Ethernet daisy chain enabled
- Modbus TPC/RTU Sunspec compliant
- Remote monitoring and firmware update via Aurora Vision® (logger free)

ABB string inverters

TRIO-TM-50.0-400
TRIO-TM-60.0-480
50 to 60 kW

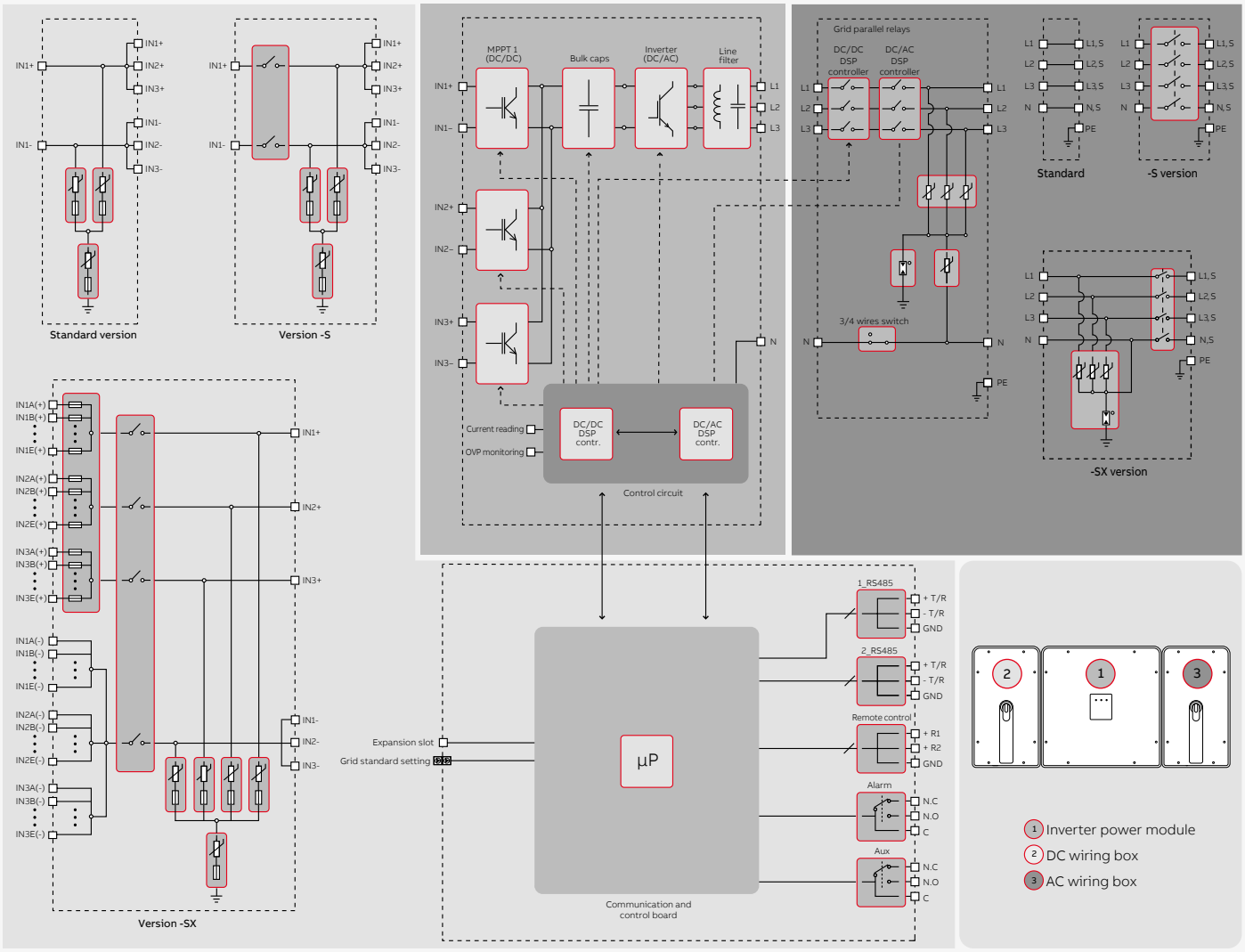


Technical data and types

Type code	TRIO-TM-50.0-400	TRIO-TM-60.0-480
Input side		
Absolute maximum DC input voltage ($V_{max,abs}$)	1000 V	
Start-up DC input voltage (V_{start})	420…700 V (Default 420 V)	420…700 V (Default 500 V)
Operating DC input voltage range (V_{dcmin}…V_{dcmax})	0,7xV_{start} …950 V (min 300 V)	0,7xV_{start} …950 V (min 360 V)
Rated DC input voltage (V_{dcr})	610 Vdc	720 Vdc
Rated DC input power (P_{dcr})	52000 W	61800 W
Number of independent MPPT	3	
Maximum DC input power for each MPPT ($P_{MPPT,max}$)	17500 W	21000 W
MPPT input DC voltage range ($V_{MPPTmin}$ … $V_{MPPTmax}$) at P_{acr}	480-800 Vdc	570-800 Vdc
Maximum DC input current (I_{dcmax}) for each MPPT	36 A	
Maximum input short circuit current for each MPPT	55 A (165 A in case of parallel MPPT)	
Number of DC input pairs for each MPPT	5	
DC connection type	Screw terminal block (Standard and -S version) or PV quick fit connector [3] (-SX and SX2 version)	
Input protection		
Reverse polarity protection	Yes, from limited current source	
Input over voltage protection for each MPPT - varistor	Yes, 1 for each MPPT	
Input over voltage protection for each MPPT - plug In modular surge arrester	Type 2 (option) with monitoring	
Photovoltaic array isolation control	According to local standard	
DC switch rating for each MPPT (version with DC switch)	60 A / 1000 V for each MPPT (180 A in case of parallel MPPT)	
Fuse rating (version with fuses)	15 A / 1000 V	
Output side		
AC grid connection type	Three-phase (3W+PE or 4W+PE)	
Rated AC power (P_{acr} @cosϕ=1)	50000 W	60000 W
Maximum AC output power (P_{acmax} @cosϕ=1)	50000 W	60000 W
Maximum apparent power (S_{max})	50000 VA	60000 VA
Rated AC grid voltage ($V_{ac,r}$)	400 V	480 V
AC voltage range	320…480 V [1]	384…571 V [1]
Maximum AC output current ($I_{ac,max}$)	77 A	
Contributory fault current	92 A	
Rated output frequency (f_r)	50 Hz / 60 Hz	
Output frequency range (f_{min}…f_{max})	47…53 Hz / 57…63 Hz [2]	
Nominal power factor and adjustable range	> 0.995; 0…1 inductive/capacitive with maximum S_{max}	
Total current harmonic distortion	<3%	
Maximum AC cable	95 mm² copper only (150 mm² copper/alluminum with TRIO-AC-WIRING-KIT)	
AC connection type	Screw terminal block, cable gland PG42	
Output protection		
Anti-islanding protection	According to local standard	
Maximum external AC overcurrent protection	100 A	
Output overvoltage protection - varistor	Yes	
Output overvoltage protection - plug In modular surge arrester	Type 2 (option) with monitoring	
Operating performance		
Maximum efficiency (ηmax)	98.3%	98.5%
Weighted efficiency (EURO)	98.0% / -	98.0% / -
Communication		
Embedded communication interfaces	2x RS485, 2x Ethernet (RJ45), WLAN (IEEE802.11 b/g/n @ 2,4 GHz)	
Communication protocols	Modbus RTU / TCP (Sunspec compliant); Aurora Protocol	
Remote monitoring services	Standard level access to Aurora Vision monitoring portal	
Advanced features	Integrated Web User Interface; Display (option); Embedded logging and direct transferring of data to Cloud	
Environmental		
Ambient temperature range	-25…+60°C (-13…140 °F) with derating above 45 °C (113 °F)	-25…+60°C (-13…140 °F) with derating above 45 °C (113 °F)
Relative humidity	4%… 100% condensing	
Sound pressure level, typical	75 dB(A) @1 m	
Maximum operating altitude	2000m / 6561ft	
Physical		
Environmental protection rating	IP65 (IP54 for cooling section)	
Cooling	Forced air	
Dimension (H x W x D)	725 mm x 1491 mm x 315 mm / 28.5” x 58.7” x 12.4”	
Weight	95 kg / 209 lbs overall, 66 kg / 145 lbs electronic compartment, 15 kg / 33 lbs AC wiring box (full optional), 14kg / 31 lbs DC wiring box (full optional)	
Mounting system	Wall bracket, horizontal support	

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ABB TRIO-TM-50.0-400 / TRIO-TM-60.0-480 string inverter block diagram



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Technical data and types

Type code	**TRIO-TM-50.0-400**	**TRIO-TM-60.0-480**
Safety		
Isolation level	Transformerless	
Marking	CE	
Safety and EMC standard	IEC/EN 62109-1, IEC/EN 62109-2, EN 61000-6-2, EN 61000-6-3, EN 61000-3-11, EN 61000-3-12	
Grid standard (check your sales channel for availability)	CEI 0-21, CEI 0-16, DIN V VDE V 0126-1-1, VDE-AR-N 4105, G59/3, EN 50438 (not for all national appendices), RD 1699, RD 413, RD 661, P.O. 12.3, AS 4777, BDEW, NRS-097-2-1, MEA, PEA, IEC 61727, IEC 60068, IEC 61683, VFR-2014, IEC 62116	
Available product variants		
Inverter power module	TRIO-TM-50.0-400-POWER MODULE	TRIO-TM-60.0-480-POWER MODULE
DC wiring box options [4]		
Input connections with terminal blocks	DCWB-TRIO-TM-50.0-400	DCWB-TRIO-TM-60.0-480
Input connections with terminal blocks + DC switch	DCWB-S-TRIO-TM-50.0-400	DCWB-S-TRIO-TM-60.0-480
15 quick input connections + fuses (single pole) + DC switch [5]	DCWB-SX-TRIO-TM-50.0-400	DCWB-SX-TRIO-TM-60.0-480
15 quick input connections + fuses (both poles) + DC switch [5]	DCWB-SX2-TRIO-TM-50.0-400	DCWB-SX2-TRIO-TM-60.0-480
AC wiring box options		
AC output connections with terminal blocks	ACWB-TRIO-50.0-TL-OUTD	ACWB-TRIO-60.0-TL-OUTD
AC output connections with terminal blocks + AC switch [5]	ACWB-SX-TRIO-50.0-TL-OUTD	ACWB-SX-TRIO-60.0-TL-OUTD
Optional available		
TRIO-GROUNDING-KIT	Available	Available
TRIO-AC-WIRING-KIT	Available	Available

[1] The AC voltage range may vary depending on specific country grid standards
[2] The Frequency range may vary depending on specific country grid standards
[3] Please refer to the document “String inverters – Product manual appendix” available at www.abb.com/solarinverters for information on the quick-fit connector brand and model used in the inverter

[4] DCWB with display is available as optional, with dedicated wiring box version
[5] Type 2 surge arresters available as optional, with dedicated wiring box version
Remark. Features not specifically listed in the present data sheet are not included in the product

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SOLAR INVERTERS

ABB monitoring and communications
VSN300 Wifi Logger Card



The VSN300 Wifi Logger Card is an advanced expansion board for ABB's UNO and TRIO string inverters which provides residential and commercial users with an advanced and cost-effective solution for monitoring and controlling their photovoltaic system.

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01
VSN300 Wifi Logger Card

The VSN300 Wifi Logger Card is easy to install, for new and most existing string inverters by using the inverter's internal expansion slot.

The built-in IP networking connectivity and innovative Wi-Fi commissioning techniques enable this card to be easily configured for most Wi-Fi networks and access points without installing any additional external devices.

Complete, remote and local monitoring with Wifi Logger Card and mobile app.
Users have a complete remote and local monitoring experience when combining VSN300 Wifi Logger Card with ABB's mobile app; "Plant Viewer for Mobile", available for both iOS and Android based devices.

The local web server in VSN300 Wifi Logger Card adds the ability to use a standard web browser to access inverter data.

The Wi-Fi Certified™ mark assures interoperability, security, easy installation and reliability.
With innovative commissioning and upgrade features, the VSN300 Wifi Logger Card provides the best user experience for ABB's customers.

Not only is the VSN300 Wifi Logger Card suitable for most of ABB's string inverters currently deployed, but it also takes advantage of the Hyperlink bus found in new inverters for obtaining real-time data that can be used for grid control power management.

Highlights
- The Wi-Fi Certified™ mark assures interoperability with IEEE 802.11b/g/n networks over the 2.4 GHz band
- Easily installed on new and existing UNO and TRIO string inverters
- IEEE 802.11b/g/n (2.4 GHz) support
- Local and remote monitoring in one solution
- High performance non-volatile data logging
- High-speed inverter data exchange through Hyperlink [where available]
- Modbus TCP server for SCADA integration
- SunSpec certified Modbus mapping for easy integration
- Secured and encrypted data transfer to Aurora Vision® Plant Management Platform
- Remote reading and writing of inverter parameters for advanced operations
- California Rule 21 ready

ABB monitoring and communications
VSN300 Wifi Logger Card



Technical data and types

Type code	VSN300 Wifi Logger Card
Communication interfaces	
Inverter interface	Hyperlink (CAN@1 Mbps + RS485@115 kBaud) / Legacy (Serial link TTL @ 19.2 KBaud)
User interface	Wi-Fi Certified™ IEEE 802.11 b/g/n (2,4 GHz)
Communication protocols	
LAN/WAN Protocols	HTTPS, DHCP, NTP, SSL, SSH, XML, Modbus TCP (Sunspec)
Monitoring	
Web user interface (WUI)	Integrated
Local monitoring	Wirelessly allowed via any Wi-Fi® device connecting the integrated WUI or running Plant Viewer for Mobile
Remote monitoring	Plant Portfolio Manager® / Plant Viewer™ / Plant Viewer for mobile
Data logging specifications	
Data sampling rate	High frequency data sampling (1 minute sample rate)
Local data storage	Log data for 30 days based on 15-minute intervals
Upgradeability	Remotely via Aurora Vision® Plant Management Platform / locally via integrated Web User Interface [1]
Advanced functionalities	
Remote O&M operations	Inverter's parameters setting [2] / inverter's firmware upgrade [2]
Smart grid functionalities	Grid control power-management enabled [2]
Power supply	
DC power supply output	~ 2 W
Environmental parameters	
Ambient temperature range	[-20; +85]°C
Environmental protection	IP20
Relative humidity	< 85% non-condensing
Mechanical parameters (per unit)	
Dimensions (H x W x D)	105 mm x 46 mm x 16 mm (4,1’ x 1.8’ x 0.6’)
Weight	0.026 kg (0.06 lbs)
Mounting System	Inverter's expansion slot
Warranty	
Standard warranty	Two years
Compliance	
Marking	CE / RCM / Wi-Fi Certified™
Emissions	47 CFR FCC Part 15 Subpart C, EN 55022 Conducted and radiated emission
Immunity	EN55024

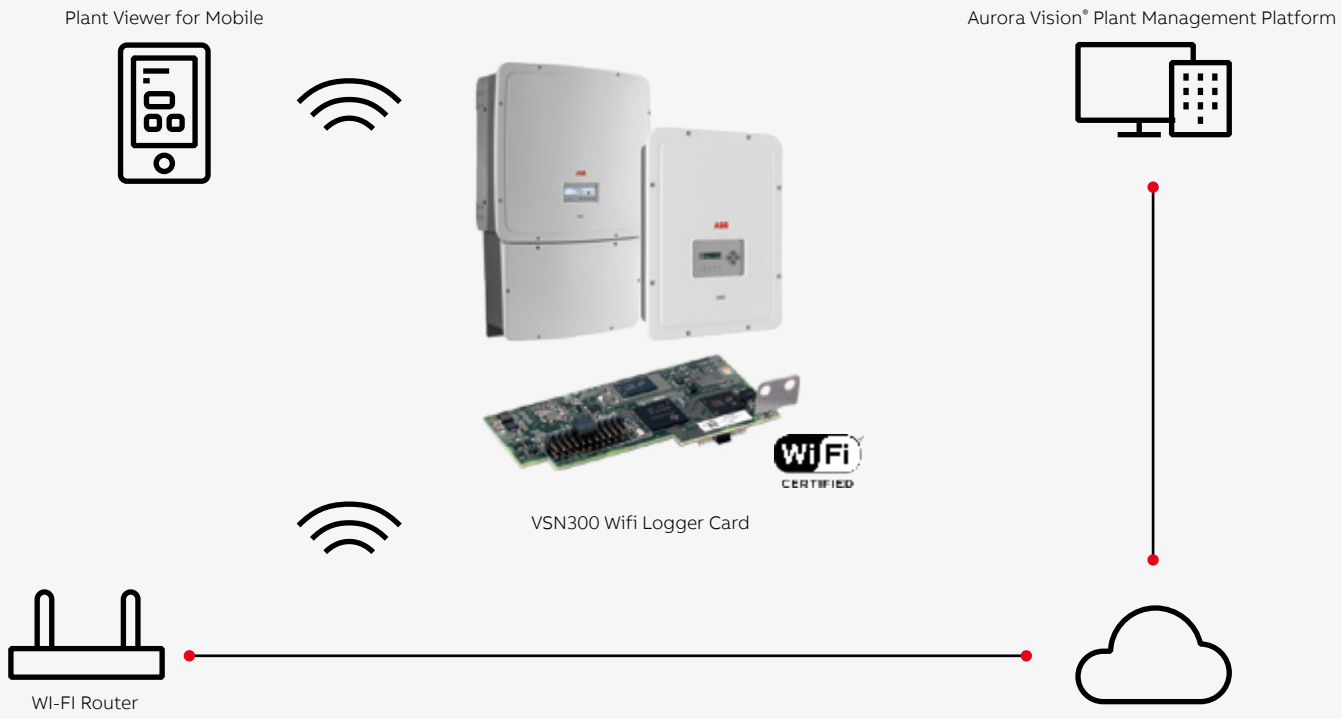
[1] Available from FW version FW 1.8.x

[2] Check for availability

Remark. Features not specifically listed in the present data sheet are not included in the product

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Application with VSN300 Wifi Logger Card



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Inverter matrix compatibility

Inverter family	Monitoring	Remote O&M Operations [1]
UNO-2.0/2.5-I	Yes	No
PVI-3.0/3.6/4.2-TL	Yes	No
UNO-2.0/3.0/3.6/4.2-TL	Yes	Yes
PVI-3.8/4.6-TL	Yes	No
PVI-5000/6000-TL	Yes	No
PVI-6.0/8.0-TL	Yes	No
UNO-7.6/8.6	Yes	Yes
PVI-10.0/12.5-TL	Yes	No
TRIO-5.8/7.5/8.5-TL	Yes	Yes
TRIO-20.0/27.6-TL	Yes	No
PRO-33.0-TL	No	No
TRIO-50.0/60.0-TL	Yes	Yes

[1] Inverter's parameters setting and inverter's firmware upgrade (from FW version 1.8.x)

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