Industrial Wall, Toronto, Canada

Solar Facade - Case Study

Project Overview

The Industrial Wall is a Solar Facade project on the West Wall of an Industrial building located in Toronto, Ontario. This wall incorporates Mitrex active and non-active modules featuring 5 different black and white colors shades to give a gradient effect throughout the entire wall.

Project Information

Total Project Area: **4,972 SQFT**
Active Area: **3,597 SQFT**
Non-Active Area: **685 SQFT**
Non-Solar Cladding Area: **690 SQFT**

The table below shows the active, non-active and non-solar cladding area (SQFT) of each building's orientation.

Orientation	Non-Solar Cladding	Mitrex Active Modules	Mitrex Non-Active Modules	Total
West	690	3,597	685	4,972

Please note that the orientation of the building is a west facing wall 18 degree to the North.

5 different Mitrex modules were used for this project:

Module Code	Pmax (W)	Voc (V)	Isc (A)	Vmp (V)	Imp (A)	Tolerance (%)
M330-SD051F	330	48.7	8.55	40.4	8.17	+/- 5
M225-SD061F	225	48.1	5.84	40.6	5.54	+/- 5
M185-SD011F	185	47.7	4.83	41.1	4.50	+/- 5
M155-SD011F	155	47.4	4.04	40.8	3.80	+/- 5
M085-SD021F	85	46.4	2.41	40.0	2.13	+/- 5

SD04-WHITE
Solar Solid Colors

SD03-WHITE
Solar Solid Colors

SD20-WHITE
Solar Solid Colors

SD23-GREY
Solar Solid Colors

SD24-GREY
Solar Solid Colors

A total of 166 modules were installed for this project.

- 58 panels of M330-SD051F
- 8 panels of M225-SD061F
- 37 panels of M185-SD011F
- 41 panels of M155-SD011F
- 22 panels of M085-SD021F

SMA Core 1 33.3kW Inverter with 166 Tigo TS4-A-O have been used to convert the energy production from Mitrex modules to 3 Phase 480V AC usable by the building.

Twelve strings have been prepared with each two strings in parallel to be connected to one MPPT.

Learn More:
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41 Racine Rd., Toronto, ON M9W 2Z4, Canada +1 (416) 497 7120

USA Office:
Chrysler Building, 405 Lexington Avenue Floor 26, NY, USA +1 (646) 583 4486

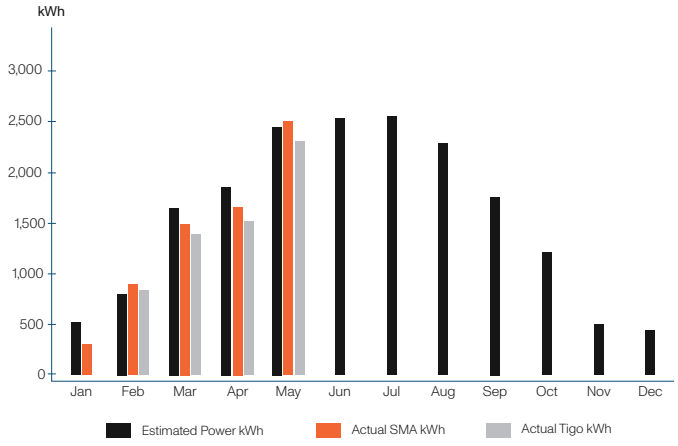
Please note that SMA Core1 33.3kW inverter has 6 MPPTs. MPPT 1 and 3 have strings of 15 panels, while MPPT 2, 4 and 5 have strings of 14 panels. The last one, MPPT 6, has two strings of 11 panels.

Pvsyst software has been used to estimate the generation of this project. Annual Energy production after inverter and optimizer losses is 18.53 MWh.

Comparative Table Between Estimated Power Vs Actual Power

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Estimation (kWh)	519	795	1648	1855	2448	2529	2552	2285	1757	1204	498	442
Actual SMA (kWh)	304	896	1493	1655	2504	-	-	-	-	-	-	-
Actual Tigo (kWh)	-	836	1390	1520	2300	-	-	-	-	-	-	-

Comparative Graphic Between Estimated Power Vs Actual Power



Since the total DC size of system is 36 kW, the specific production (Performance index) of this project is 513 kWh/kWp/Year (equal to 513 hours).

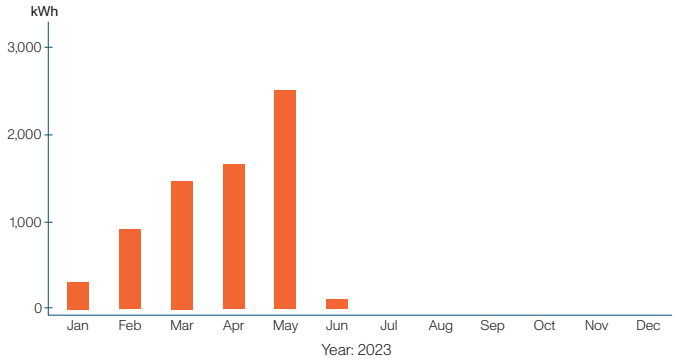
The Project was completed in December 2022 and was ON for test and commissioning. Tigo monitoring system was completed at the end of January 2023.

The Monitoring of this project is available through SMA Sunny Portal powered by ennexOS website and app. To access it, please use the following credentials:

Username: info@mitrex.com
Password: Mitrex2023$
Link to Access: https://ennexos.sunnyportal.com/login

From the Monitoring of the project, up to Jun 1st 2023, the production is as below:

SMA Energy Generation Monitoring

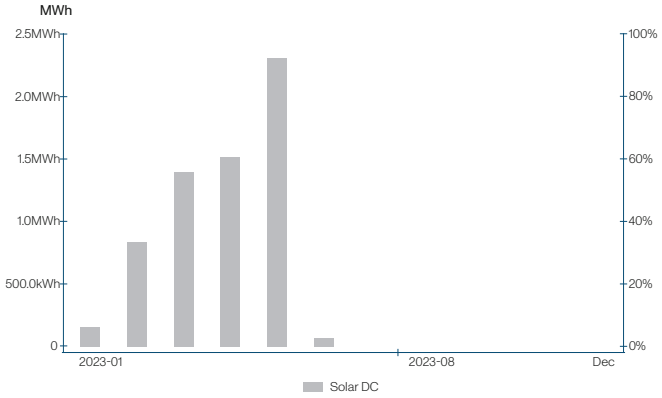


For Tigo monitoring system, every single module power and energy could be monitored at:

Link to Access: https://ei.tigoenergy.com/p/41RacineWestWall/

From Tigo monitoring, the energy production for different months is as below:

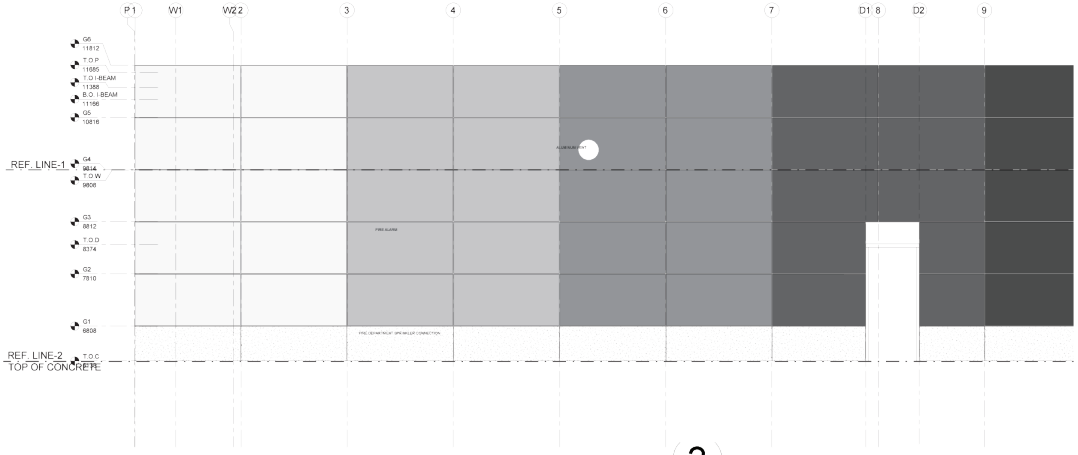
Tigo Energy Generation Monitoring

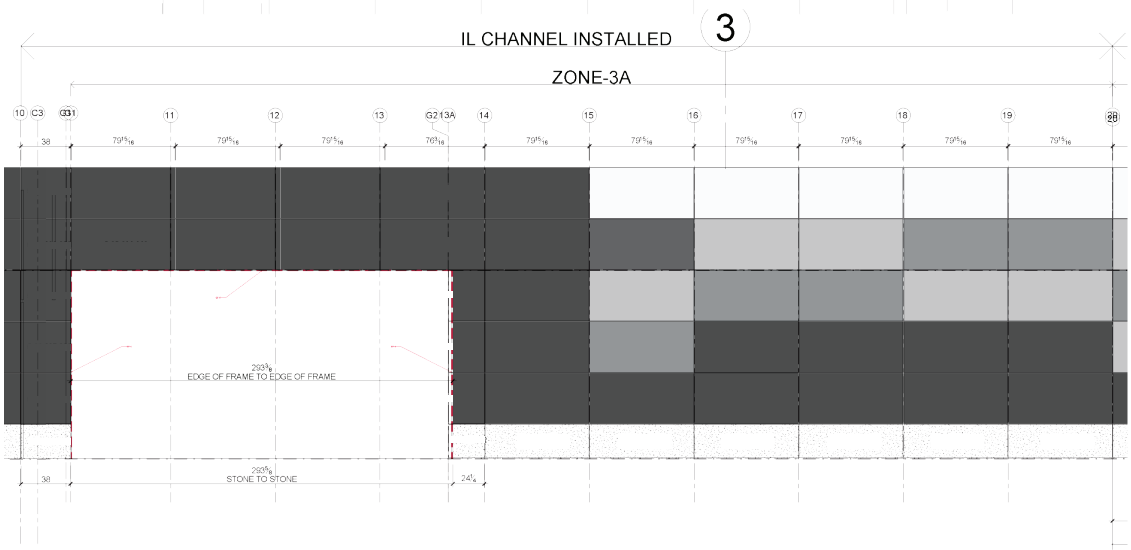


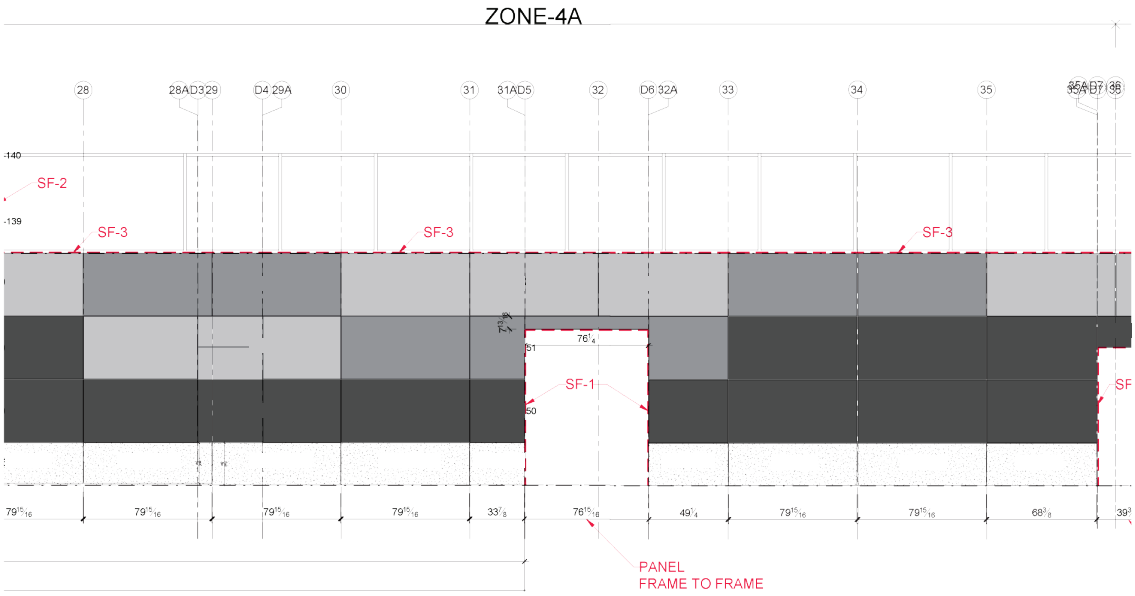
Tigo monitoring system shows variations in energy and power among different colored panels. The picture illustrates the North side of the West wall, with lighter to darker modules from left to right.

MITREX

Technical Drawings Per Wall Section

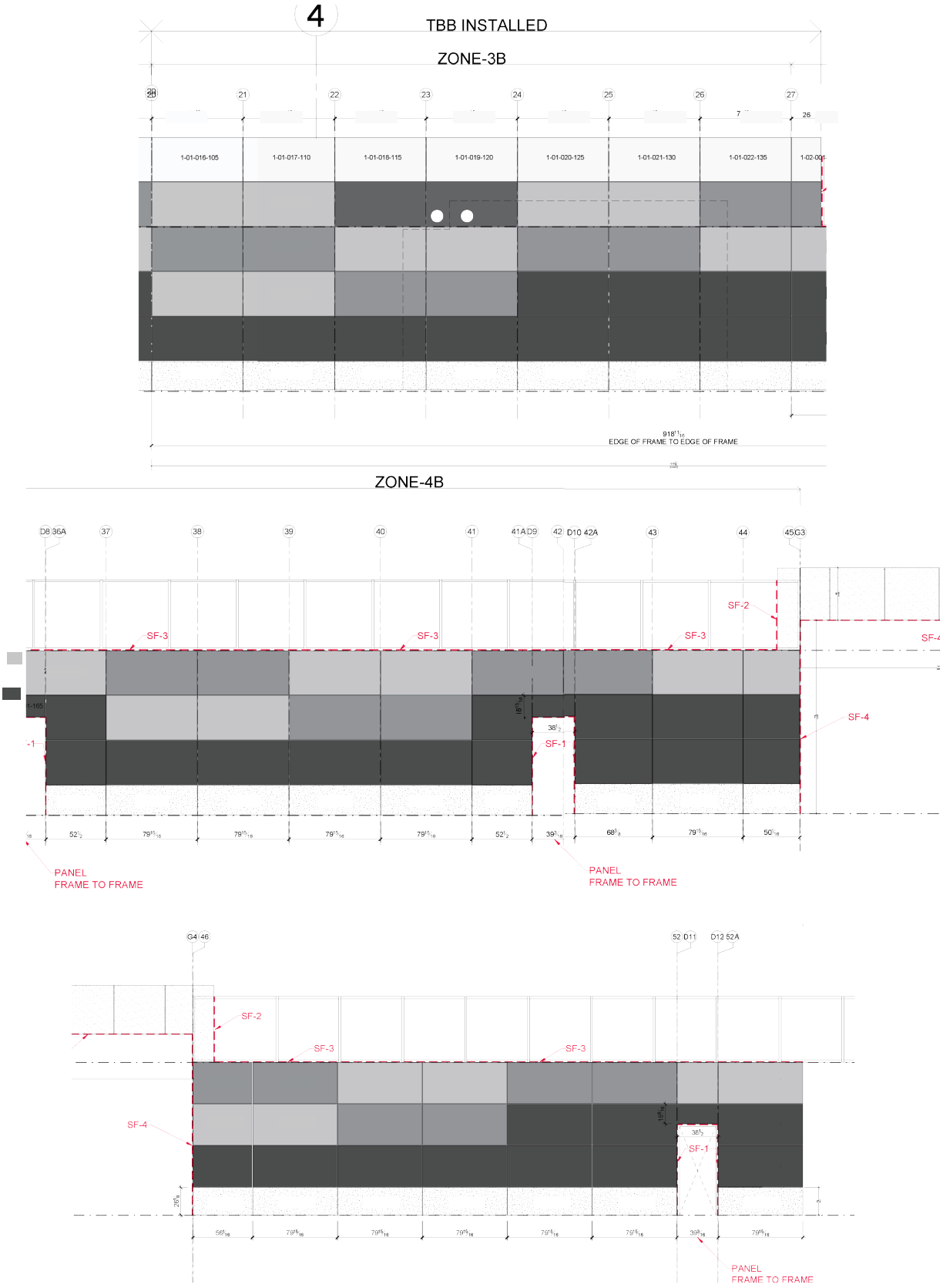






MITREX

Technical Drawings Per Wall Section



Electical Connections

Note 1: Positive and Negative homerun cables are RPVU 90 CU #10 AWG
Note 2: Jumper Cables are RPVU 90 CU #10 AWG

Tigo® Flex MLPE

TS4-A-O

PV Module Advanced Add-On

The TS4-A-O (Optimization) is the advanced add-on optimization solution that brings smart module functionality to standard PV modules for higher reliability. Improve energy efficiency by upgrading underperforming PV systems or adding smart features to new installations.

The TS4-A-O with UHD-Core technology and expanded specifications supports PV modules up to 500W.

Included Features

Optimization

Module-level **optimization** for increased energy yield and greater design flexibility

Safety

Enhanced **safety** for NEC 690.12 rapid shutdown compliance

Monitoring

Module-level **monitoring** for energy production tracking and system management

Easy Installation

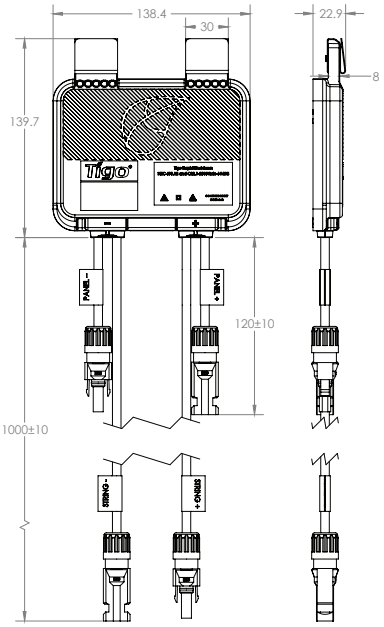
Snap to standard module frame or remove brackets for rack mounting

Smart Commissioning

Configure and commission with your Android or iOS mobile device

TS4-A-O SPECIFICATIONS

Environmental	
Operating Temperature Range	-40°C to +85°C (-40°F to +185°F)
Outdoor Rating	IP68, NEMA 3R
Mechanical	
Dimensions	138.4mm x 139.7mm x 22.9mm
Weight	520g
Electrical	
Total Max Input Voltage (V_{OC} @ Lowest Temperature)	90V
Voltage Range	16 - 90V
Maximum Current	12A
Maximum Power	500W
Output Cable Length	1.2m (standard)
Connectors	MC4 (standard)
Communication Type	Wireless
Rapid Shutdown UL Listed (NEC 2014 & 2017 690.12)	Yes
Recommended fuse rating	15A



TAP required for rapid shutdown and CCA required for monitoring with TS4-A-O.

Photovoltaic Rapid Shutdown Equipment NEC 690.12 and C22.1-2015 Rule 64-218
This rapid shutdown system is required to be connected to an automatic system which initiates rapid shutdown upon the activation of the AC system disconnect.

ORDERING INFORMATION

Standard	
451-00252-32	1500V UL / 1000V TÜV, 1.2m cable, MC4

For sales info:
sales@tigoenergy.com or 1.408.402.0802

For product info:
Visit tigoenergy.com/products

For technical info:
Visit support.tigoenergy.com

For additional info and product selection assistance, use Tigo's online design tool at tigoenergy.com/design

Distributed Generation Optimization Module, QIIO
Photovoltaic Rapid Shutdown System Equipment, QIJW
E469960

SUNNY TRIPOWER CORE1 33-US / 50-US / 62-US

Fully integrated

- Innovative design requires no additional racking for rooftop installation
- Integrated DC and AC disconnects and overvoltage protection
- 12 direct string inputs for reduced labor and material costs

Increased power, flexibility

- Multiple power ratings for small to large scale commercial PV installions
- Six MPP trackers for flexible stringing and maximum power production
- ShadeFix, SMA's proprietary shade management solution, optimizes at the string level

Enhanced safety, reliability

- Integrated SunSpec PLC signal for module-level rapid shutdown compliance to 2017 NEC
- Next-gen DC AFCI arc-fault protection certified to new Standard UL 1699B Ed. 1

Smart monitoring, control, service

- Advanced smart inverter grid support capabilities
- Increased ROI with SMA ennexOS cross sector energy management platform
- SMA Smart Connected proactive O&M solution reduces time spent diagnosing and servicing in the field

SUNNY TRIPOWER CORE1 33-US / 50-US / 62-US

It stands on its own

The Sunny Tripower CORE1 is the world's first free-standing PV inverter for commercial rooftops, carports, ground mount and repowering legacy solar projects. From distribution to construction to operation, the Sunny Tripower CORE1 enables logistical, material, labor and service cost reductions, and is the most versatile, cost-effective commercial solution available. Integrated SunSpec PLC for rapid shutdown and enhanced DC AFCI arc-fault protection ensure compliance to the latest safety codes and standards. With Sunny Tripower CORE1 and SMA's ennexOS cross sector energy management platform, system integrators can deliver comprehensive commercial energy solutions for increased ROI.

Technical data	Sunny Tripower CORE1 33-US	Sunny Tripower CORE1 50-US	Sunny Tripower CORE1 62-US
Input (DC)			
Maximum array power	50000 Wp STC	75000 Wp STC	93750 Wp STC
Maximum system voltage		1000 V	
Rated MPP voltage range	330 V … 800 V	500 V … 800 V	550 V … 800 V
MPPT operating voltage range		150 V … 1000 V	
Minimum DC voltage / start voltage		150 V / 188 V	
MPP trackers / strings per MPP input		6 / 2	
Maximum operating input current / per MPP tracker		120 A / 20 A	
Maximum short circuit current per MPPT / per string input		30 A / 30 A	
Output (AC)			
AC nominal power	33300 W	50000 W	62500 W
Maximum apparent power	33300 VA	53000 VA	66000 VA
Output phases / line connections		3 / 3-(N)-PE	
Nominal AC voltage		480 V / 277 V WYE	
AC voltage range		244 V … 305 V	
Maximum output current	40 A	64 A	80 A
Rated grid frequency		60 Hz	
Grid frequency / range		50 Hz, 60 Hz / -6 Hz … +6Hz	
Power factor at rated power / adjustable displacement		1 / 0.0 leading … 0.0 lagging	
Harmonics THD		<3 %	
Efficiency			
CEC efficiency	97.5%	97.5%	97.5%
Protection and safety features			
Load rated DC disconnect		●	
Load rated AC disconnect		●	
Ground fault monitoring: Riso / Differential current		● / ●	
DC AFCI arc-fault protection		●	
SunSpec PLC signal for rapid shutdown		●	
DC reverse polarity protection		●	
AC short circuit protection		●	
DC surge protection: Type 2 / Type 1+2		O / O	
AC surge protection: Type 2 / Type 1+2		O / O	
Protection class / overvoltage category (as per UL 840)		I / IV	
General data			
Device dimensions (W / H / D)		621 mm / 733 mm / 569 mm (24.4 in x 28.8 in x 22.4 in)	
Device weight		84 kg (185 lbs)	
Operating temperature range		-25 °C … +60 °C (-13 °F … +140 °F)	
Storage temperature range		-40 °C … +70 °C (-40 °F … +158 °F)	
Audible noise emissions (full power @ 1m and 25 °C)		65 dB(A)	
Internal consumption at night		5 W	
Topology		Transformerless	
Cooling concept		OptiCool (forced convection, variable speed fans)	
Enclosure protection rating		Type 4X, 3SX (as per UL 50E)	
Maximum permissible relative humidity (non-condensing)		100 %	
Additional information			
Mounting		Free-standing with included mounting feet	
DC connection		Amphenol UTX PV connectors	
AC connection		Screw terminals - 4 AWG to 4/0 AWG CU/AL	
LED indicators (Status / Fault / Communication)		●	
Network interfaces: Ethernet / WLAN / RS485		● (2 ports) / ● / O	
Data protocols: SMA Modbus / SunSpec Modbus / Webconnect		● / ● / ●	
Multifunction relay		●	
ShadeFix technology for string level optimization		●	
Integrated Plant Control / Q on Demand 24/7		● / ●	
Off-Grid capable / SMA Fuel Save Controller compatible		● / ●	
SMA Smart Connected (proactive monitoring and service support)		●	
Certifications			
Certifications and approvals		UL 1741, UL 1699B Ed. 1, UL 1998, CSA 22.2 107-1, PV Rapid Shutdown System Equipment	
FCC compliance		FCC Part 15 Class A	
Grid interconnection standards		IEEE 1547, UL 1741 SA - CA Rule 21, HECO Rule 14H	
Advanced grid support capabilities		L/HFRT, L/HVRT, Volt-VAr, Volt-Watt, Frequency-Watt, Ramp Rate Control, Fixed Power Factor	
Warranty			
Standard		10 years	
Optional extensions		15 / 20 years	
O Optional features ● Standard features – Not available			
Type designation	STP 33-US-41	STP 50-US-41	STP 62-US-41

Accessories

SMA Data Manager M
EDMM-US-10

SMA Sensor Module
MD.SEN-US-40

Universal Mounting System
UMS_KIT-10

AC Surge Protection Module Kit
AC_SPD_KIT1-10, AC_SPD_KIT2_T1T2
DC Surge Protection Module Kit
DC_SPD_KIT4-10, DC_SPD_KIT5_T1T2

STPCORE1-DS-en-27

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