

CONDUCTOR AND CONDUIT SCHEDULE W/ELECTRICAL CALCULATIONS														
ID	TYPICAL	CONDUCTOR	CONDUIT	CURRENT-CARRYING CONDUCTORS IN CONDUIT	OCPD	EGC	TEMP. CORR. FACTOR	CONDUIT FILL FACTOR	CONT CURRENT	MAX CURRENT (125%)	BASE AMP	DERATED AMP	TERM. TEMP. RATING	AMP TERMINAL
1	2	12 AWG THWN-2, COPPER, ENPHASE Q-CABLE	FREE AIR	N/A	N/A	6 AWG BARE, COPPER	0.96 (32.2°C)	1	11.6A	14.5A	30A	28.8A	75°C	25A
2	1	10 AWG THWN-2, COPPER	0.5" EMT	4	15A	10 AWG THWN-2, COPPER	0.96 (32.2°C)	0.8	11.6A	14.5A	40A	30.72A	75°C	35A
3	1	10 AWG THWN-2, COPPER	0.5" EMT	2	N/A	10 AWG THWN-2, COPPER	0.96 (32.2°C)	1	23.2A	29A	40A	38.4A	75°C	35A
4	1	10 AWG THWN-2, COPPER	0.5" EMT	2	30A	10 AWG THWN-2, COPPER	0.96 (32.2°C)	1	23.2A	29A	40A	38.4A	75°C	35A



CONTRACTOR

STRAWBERRY SOLAR

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NEW PV SYSTEM: 6,400 KWP

JO AND WILLIAMS RESIDENCE

6339 SANTA FE TRAIL FLINT TOWNSHIP, MI 48532
APN: 0707-507-008

ENGINEER OF RECORD

PAPER SIZE: 11" x 17" (ANSI B)

LINE DIAGRAM

DATE: 2023-08-04

DESIGN BY: N. KINAREIEV

CHECKED BY: UKRDRAFTING

REVISIONS

E-601

(SHEET 1)

SYSTEM SUMMARY			MODULES											
	BRANCH #1	BRANCH #2	REF.	QTY.	MAKE AND MODEL	PMAX	PTC	ISC	IMP	VOC	VMP	TEMP. COEFF. OF VOC	FUSE RATING	
INVERTERS PER BRANCH	8	8	PM1-16	16	HANWHA Q-CELLS Q.PEAK DUO BLK ML-G10+ 400	400W	371.50W	11.14A	10.77A	45.30V	10.77V	-0.122V/°C (-0.27%/°C)	20A	
MAX AC CURRENT	11.60A	11.60A	INVERTERS											
MAX AC OUTPUT POWER	2,792W	2,792W	REF.	QTY	MAKE AND MODEL	AC VOLTAGE	GROUND	OCPD RATING	RATED POWER	MAX OUTPUT CURRENT	MAX INPUT CURRENT	MAX INPUT VOLTAGE	CEC WEIGHTED EFFICIENCY	
ARRAY STC POWER	6,400W		I1-16	16	ENPHASE IQ8A-72-2-US	240A	FLOATING	20A	349W	1.45A	15A	60V	97.5%	
ARRAY PTC POWER	5,944W		DISCONNECTS											
MAX AC CURRENT	23.20A		REF.	QTY.	MAKE AND MODEL	RATED CURRENT	MAX RATED VOLTAGE	OCPDS						
MAX AC POWER	5,584W		SW1	1	SQUARE D DU221RB	30A	240V	REF.	QTY	RATED CURRENT	MAX VOLTAGE			
DERATED (CEC) AC POWER	5,584W		ASHRAE EXTREME LOW					32.2°C (90°F), SOURCE: FLINTBISHOP INTL (-83.75°; 42.97°)			CB1-3	3	15A	240V
			ASHRAE 2% HIGH					32.2°C (90°F), SOURCE: FLINTBISHOP INTL (-83.75°; 42.97°)			CB4	1	30A	240V

BILL OF MATERIAL							
CATEGORY	MAKE	MODEL NUMBER	REF	QTY	UNIT	QTY/UNIT	DESCRIPTION
PV MODULE	HANWHA Q-CELLS	Q.PEAK DUO BLK ML-G10+ 400	PM1-16	16	PIECE	1	HANWHA Q-CELLS Q.PEAK DUO BLK ML-G10+ 400 400.0W, 6 × 22 MONOCRYSTALLINE Q.ANTUM SOLAR HALF CELLS
INVERTER	ENPHASE	IQ8A-72-2-US	I1-16	16	PIECE	1	ENPHASE IQ8A-72-2-US 349W MICROINVERTER
DISCONNECT	SQUARE D	DU221RB	SW1	1	PIECE	1	SQUARE D DU221RB, NON-FUSED, 2-POLE, 30A, 240VAC, NEMA 3R OR EQUIVALENT
AC COMBINER PANEL	ENPHASE	IQ COMBINER 4	EP1	1	PIECE	1	ENPHASE IQ COMBINER 4 125A COMBINER PANEL
MONITORING	ENPHASE	ENPHASE-ENVOY	ENV1	1	PIECE	1	ENPHASE ENVOY
WIRING	GENERIC	Q-12-10-240	WR1	68	FEET	1	ENPHASE Q-CABLE
WIRING	GENERIC	GEN-6-AWG-BARE-CU	WR1	68	FEET	1	6 AWG BARE, COPPER (GROUND)
WIRING	GENERIC	GEN-10-AWG-THWN-2-CU-RD	WR2-4	30	FEET	1	10 AWG THWN-2, COPPER, RED (LINE 1)
WIRING	GENERIC	GEN-10-AWG-THWN-2-CU-BLK	WR2-4	30	FEET	1	10 AWG THWN-2, COPPER, BLACK (LINE 2)
WIRING	GENERIC	GEN-10-AWG-THWN-2-CU-GR	WR2-4	30	FEET	1	10 AWG THWN-2, COPPER, GREEN (GROUND)
WIRING	GENERIC	GEN-10-AWG-THWN-2-CU-WH	WR3-4	20	FEET	1	10 AWG THWN-2, COPPER, WHITE (NEUTRAL)
WIREWAY	GENERIC	GEN-EMT-0.5"-DIA	WW2-4	30	FEET	1	EMT CONDUIT 0.5" DIA
OCPD	GENERIC	GEN-CB-15A-240VAC	CB1-3	3	PIECES	1	CIRCUIT BREAKER, 15A, 240VAC
OCPD	GENERIC	GEN-CB-30A-240VAC	CB4	1	PIECE	1	CIRCUIT BREAKER, 30A, 240VAC
TRANSITION ENCLOSURE	GENERIC	GEN-AWB-TB-4-4X	JB1	1	PIECE	1	TRANSITION/PASS-THROUGH BOX, WITH 4 TERMINAL BLOCKS

powered by
Q.ANTUM DUO Z

Q.PEAK DUO BLK ML-G10+

385-405

ENDURING HIGH
PERFORMANCE



Quality
Controlled PV

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BREAKING THE 20% EFFICIENCY BARRIER

Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.9%.



THE MOST THOROUGH TESTING PROGRAMME IN THE INDUSTRY

Q CELLS is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.



INNOVATIVE ALL-WEATHER TECHNOLOGY

Optimal yields, whatever the weather with excellent low-light and temperature behavior.



ENDURING HIGH PERFORMANCE

Long-term yield security with Anti LID Technology, Anti PID Technology¹, Hot-Spot Protect and Traceable Quality Tra.Q™.



EXTREME WEATHER RATING

High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa).



A RELIABLE INVESTMENT

Inclusive 25-year product warranty and 25-year linear performance warranty².

¹ APT test conditions according to IEC/TS 62804-1:2015, method A (~1500 V, 96 h)

² See data sheet on rear for further information.

6 BUSBAR
CELL TECHNOLOGY

12 BUSBAR
CELL TECHNOLOGY

THE IDEAL SOLUTION FOR:



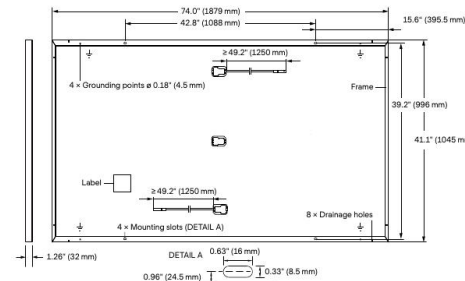
Rooftop arrays on
residential buildings

Engineered in Germany

Q CELLS

MECHANICAL SPECIFICATION

Format	74.0 in × 41.1 in × 1.26 in (including frame) (1879 mm × 1045 mm × 32 mm)
Weight	48.5 lbs (22.0 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm ² Solar cable; (+) ≥ 49.2 in (1250 mm), (-) ≥ 49.2 in (1250 mm)
Connector	Stäubli MC4; IP68



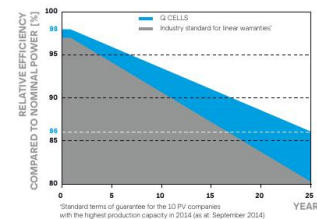
ELECTRICAL CHARACTERISTICS

POWER CLASS		385	390	395	400	405
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC ¹ (POWER TOLERANCE +5 W / -0 W)						
Minimum	Power at MPP ¹	P _{MPP} [W]	385	390	395	405
	Short Circuit Current ¹	I _{SC} [A]	11.04	11.07	11.10	11.17
	Open Circuit Voltage ¹	V _{OC} [V]	45.19	45.23	45.27	45.34
	Current at MPP	I _{MPP} [A]	10.59	10.65	10.71	10.83
	Voltage at MPP	V _{MPP} [V]	36.36	36.62	36.88	37.13
	Efficiency ¹	η [%]	≥ 19.6	≥ 19.9	≥ 20.1	≥ 20.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT ¹						
Minimum	Power at MPP	P _{MPP} [W]	288.8	292.6	296.3	300.1
	Short Circuit Current	I _{SC} [A]	8.90	8.92	8.95	8.97
	Open Circuit Voltage	V _{OC} [V]	42.62	42.65	42.69	42.72
	Current at MPP	I _{MPP} [A]	8.35	8.41	8.46	8.51
	Voltage at MPP	V _{MPP} [V]	34.59	34.81	35.03	35.25

¹ Measurement tolerances P_{MPP} ± 3%; I_{SC} V_{OC} ± 5% at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • 2800 W/m², NMOT, spectrum AM 1.5

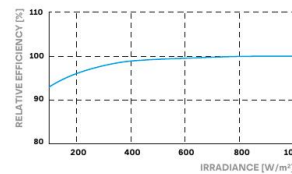
Q CELLS PERFORMANCE WARRANTY

PERFORMANCE AT LOW IRRADIANCE



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²)

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I _{SC}	α	[%/K]	+0.04	Temperature Coefficient of V _{OC}	β	[%/K]	-0.27
Temperature Coefficient of P _{MPP}	γ	[%/K]	-0.34	Nominal Module Operating Temperature	NMOT	[°F]	109 ± 5.4 (43 ± 3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V _{sys}	[V]	1000 (IEC) / 1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI / UL 61730	TYPE 2
Max. Design Load, Push / Pull ¹	[lbs/ft ²]	75 (3600 Pa) / 55 (2660 Pa)	Permitted Module Temperature on Continuous Duty	-40 °F up to +185 °F (-40 °C up to +85 °C)
Max. Test Load, Push / Pull ¹	[lbs/ft ²]	113 (5400 Pa) / 84 (4000 Pa)		

¹ See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 61730, CE-compliant,
Quality Controlled PV - TÜV Rheinland,
IEC 61215:2016, IEC 61730:2016,
U.S. Patent No. 9,893,215 (solar cells).



Horizontal packaging	76.4 in 1940 mm	43.3 in 1100 mm	48.0 in 1220 mm	1656 lbs 751 kg	24 pallets	24 pallets	32 modules
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Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

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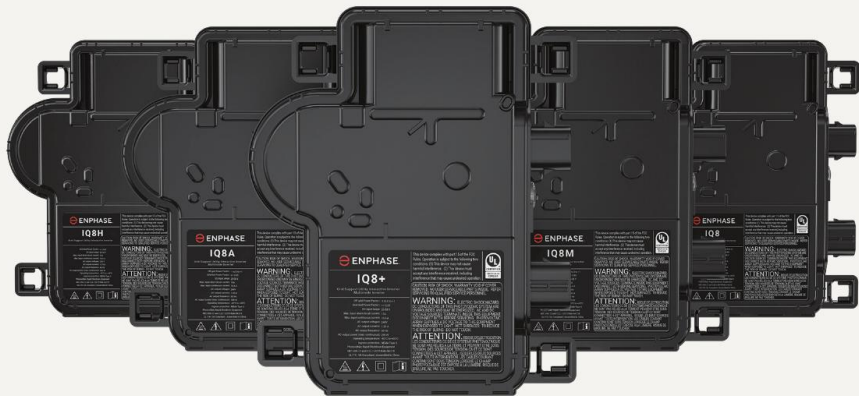
REVISIONS

R-001

(SHEET 3)



DATA SHEET



IQ8 Series Microinverters

Our newest IQ8 Microinverters are the industry's first grid-forming microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

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IQ8SE-DS-0001-01-EN-US-2021-10-19

Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produce power even when the grid is down
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Grid-forming

- Complies with the latest advanced grid support
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

IQ8 Series Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US ¹	
Commonly used module pairings ²	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+	
Module compatibility		60-cell/120 half-cell						
MPPT voltage range	V	27 – 37	29 – 45	33 – 45	36 – 45	38 – 45	38 – 45	
Operating range	V	25 – 48	25 – 58					
Min/max start voltage	V	30 / 48	30 / 58					
Max input DC voltage	V	50	60					
Max DC current ³ [module Isc]	A	15						
Overvoltage class DC port		II						
DC port backfeed current	mA	0						
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit						
OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US	
Peak output power	VA	245	300	330	366	384	366	
Max continuous output power	VA	240	290	325	349	380	360	
Nominal (L-L) voltage/range ⁴	V	240 / 211 – 264						208 / 183 – 250
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73	
Nominal frequency	Hz	60						
Extended frequency range	Hz	50 – 68						
Max units per 20 A (L-L) branch circuit ⁵		16	13	11	11	10	9	
Total harmonic distortion		<5%						
Overvoltage class AC port		III						
AC port backfeed current	mA	30						
Power factor setting		1.0						
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging						
Peak efficiency	%	97.5	97.6	97.6	97.6	97.6	97.4	
CEC weighted efficiency	%	97	97	97	97.5	97	97	
Night-time power consumption	mW	60						
MECHANICAL DATA								
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)						
Relative humidity range		4% to 100% (condensing)						
DC Connector type		MC4						
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")						
Weight		1.08 kg (2.38 lbs)						
Cooling		Natural convection – no fans						
Approved for wet locations		Yes						
Acoustic noise at 1 m		<60 dBA						
Pollution degree		PD3						
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure						
Environ. category / UV exposure rating		NEMA Type 6 / outdoor						
COMPLIANCE								
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01						
		This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.						

(1) The IQ8H-208 variant will be operating in grid-tied mode only at 208V AC. (2) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility> (3) Maximum continuous input DC current is 10.6A (4) Nominal voltage range can be extended beyond nominal if required by the utility. (5) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

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