Installation Manual

Walara G3P Series PV Modules

Version 1.2

Safety Notes

Installation of modules requires professional skills and knowledge and is to be carried out by qualified personnel. Please read this manual carefully before installing and using this module. Installation personnel shall get familiar with mechanical and electrical requirements of this system. Please keep this manual properly as reference for future maintenance or upkeep or for sales and treatment of modules.

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1 About Tindo Modules

Thank you for choosing a Tindo solar Module.

Tindo PV modules transform the sun's light energy into electricity.

Please read the following instructions carefully. Failure to observe them may result in bodily injury and property damage. This manual only applies for installations in Australia.

And the installation altitude is up to 2000m.

This manual provides information on safety precautions to be used during the handling and installation of the Tindo Walara panel along with technical instructions to be followed during installation, mounting, wiring and commissioning.

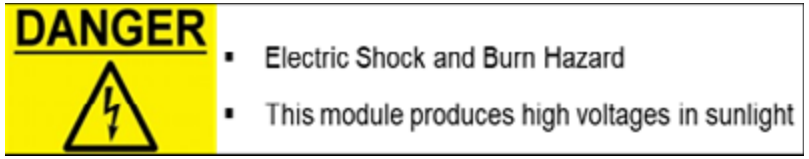
2 Applicable Products

This document is applicable to the series of solar module as listed below:

Walara – XXXG3P (-BL/-SL), System Voltage 1500V Module

3 General Warning & Caution

- Keep children and unauthorised people away from the modules and work site.
- Appropriate safety practices, suitable protective clothes and safety equipment must be used.
- Appropriate safety practices and equipment for working at heights must be used.
- Do not work alone. Always work with a team of at least two people.
- The modules are not suitable for mobile usage or for indoor installations.
- Transport the modules in its original packaging
- Do not expose PV modules to concentrated sunlight with mirrors or lenses.
- The Tindo Walara solar panel should only be installed and maintained by a qualified and licensed electrician with Clean Energy Council Solar PV accreditation.
- Make sure flammable gases are not generated near the installation site. Do not install the modules near open flame and flammable materials. Solar modules are not explosion-proof operating equipment.
- Artificially concentrated sunlight shall not be directed on the module or panel
- Front protective glass is utilized on module. Broken solar module glass is an electrical safety hazard (may cause electric shock and fire). These modules cannot be repaired and should be replaced immediately.



4 Before Installation

- Contact local authorities to determine local laws, permits and codes to make sure your installation is fully compliant.
- Make sure to strictly follow the local and national regulations for work safety and accident prevention.
- Observe local regulations concerning fire protection classification for rooftop installations.
- Only install undamaged modules. Ensure that the junction box, cable and connectors are undamaged prior to installation.
- Store the modules in cool dry rooms before installation.

5 During Installation

- There is a serious risk of various types of injury occurring during the installation.
- Do not work under rain, snow, hot or windy conditions.
- The solar panels, tools and other materials must be dry during installation.
- Completely cover the PV module surface with an opaque material during the entire installation and wiring of the PV module. Only then the module is reliably de-energised.
- DANGER! Danger due to electric shock! A solar module generates electricity and voltage even at a low intensity of illumination. Arcing can occur when contacts in a live electrical circuit are physically disconnected. This can result in grave or mortal injury. The severity increases when several modules are connected.
- During installation at heights, there is a danger that tools, panels or other materials could fall and injure people so take necessary precautions by blocking off danger areas before beginning work.
- Panels must not be installed flat and need a minimum tilt of 5 degrees.
- Materials : Fine-wire, tinned-copper conductor.
- Only use PV-KST4 EVO 2, PV-KBT4 EVO 2 / Staubli(MC4).
- Be very careful with the back of the module as the delicate thin solar cells may break.
- The PV panels are primarily made of glass and should be handled with caution.
- Ensure that adequate ventilation exists below the module to help avoid elevated module temperatures.
- Never touch the end of the connectors. Do not insert electrically conductive parts into the plugs and junction box. Do not touch the contacts or exposed terminals.
- Do not twist the frame of the module or subject the module to mechanical stress as the glass or solar cells may break.
- Do not touch the PV module with bare hands as the frame has sharp edges and may cause injury.
- Do scratch or hit the back sheet or damage it
- Do not stand or step on the module. Do not drop or place objects on the modules.
- Do not rest the module on its unprotected edges.
- Do not drop tools or hard objects on PV modules.
- Do not lift the modules by the cables or by the junction box.
- Do not open the junction box under any circumstances.
- Do not over bend the output cable as the insulation may break down.
- Do not drill holes in the aluminium frame.
- Do not scratch the aluminium frame as it will cause corrosion of the frame.
- Do not expose the modules to chemicals.
- Do not place the modules in standing water. The junction box is splash-proof only.
- Bind cables to ensure cables are not drooping behind the panels
- Make sure cables are not exposed to direct sunlight as they could be UV damaged.
- Observe the local requirements for functional grounding or earthing.
- Observe the local requirements and regulations for lightening protection.

6 After Installation

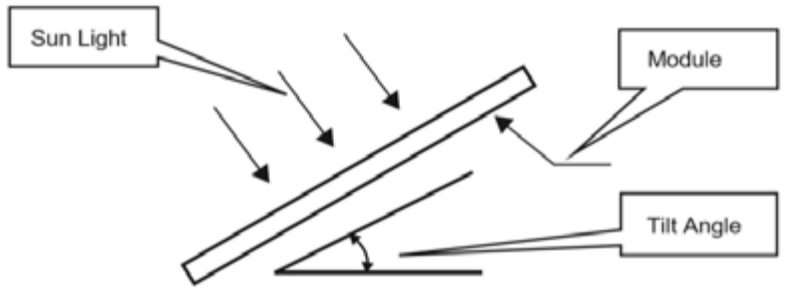
- Make sure the PV connectors are tightly sealed and connected properly. Do not disconnect or unplug the PV connectors when the solar system is under load. Ensure that the modules are first disconnected from the inverter prior to opening any contacts in the solar installation. Be absolutely certain to observe the time intervals specified by the manufacturer after switching off the inverter and prior to starting subsequent work such that the energized components can be discharged
- In the case of the glass surface of the PV modules is broken, make sure to be using the appropriate safety for the safe removal of the panels. The panel could live so ensure it is safely disconnected and isolated before touching the panel.
- Wear rubber gloves for electrical insulation during service.

7 Electrical Installation

- Use proper electrically rated insulated tools and do not use wet tools
- Tindo Walara modules must not be connected in series and parallel with other modules.
- For series connections, make sure the maximum open circuit Voltage is less than the specified maximum system Voltage and use a safety factor of 1.25
- For parallel connections, make sure cables are connected according the Australian electrical wiring standards and take proper measures to prevent reverse current flows. Use a safety factory of 1.25
- Ensure a safety factor of 1.25 when determining permitted voltages for components, cable sizes, fuse sizes and inverter sizes.
- Class of protection against electrical shock : Class II
- Solar panels must be installed in accordance with AS-5033 Installation of PV arrays. Other relevant standards are AS-3000 Electrical Wiring Rules, AS-1768 Lightening Protection, AS-1170.2 Wind Loads, AS-4777 Grid Connections of Energy Systems via Inverters.
- Do not pull the cables on the junction box as the cable may disconnect and could cause electric shock.
- Specifications for cables are Type Designation : H1Z2Z2-K 1x4mm^2, Rated Voltage : DC 1.5kV / AC 1kV, Ambient Temperature : -40ºC ~ +85ºC, Conductor.

8 Site Selection

- Make sure panels are installed in an un-shaded location throughout the year. Take into account both summer and winter sun paths and shading. This will ensure maximum yield from your solar panel. Avoid shading from chimneys, trees, air conditioners and other objects.
- If you are planning to install the PV modules in a salty environment such as near the beach, please consult with Tindo local agent first to determine whether or not the installation is appropriate for the PV module.
- Make sure to tilt the solar panel so that the energy yield throughout the year is maximized. As a rule of thumb, the tilt angle should be approximately equal to the latitude of the installation location.



- The modules are certified according to the norm IEC 61215, IEC 61730-1 and IEC 61730-2 for safe operation in moderate climates.
- Tindo recommends PV modules be installed in working environment with an ambient temperature range from - 30°C to + 50°C.
- The permitted module temperatures lie between -40 °C and +85 °C.

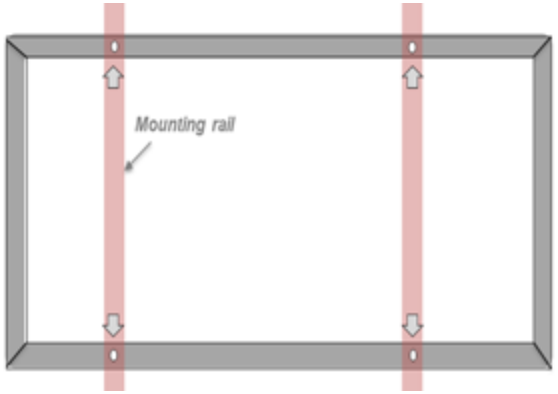
9 Installation Methods

Solar Panel and mounting system can be fixed by mounting holes or clamps. The installations shall be carried out as the illustrations and suggestions.

Only use genuine Tindo Mounting hardware for mounting the solar panel. Support structures that the PV modules are mounted to must be absolutely rigid.

9.1 Install modules through mounting holes

Make use of bolts to fix modules on the mounting system through frame mounting holes on the back of the module frame. This applies to both portrait and landscape installation orientations. Use four mounting holes.



Accessories recommended as follows:

Type	Bolt	Washer	Spring Washer	Nut
M8 Holes	M8 x 16mm	M8	M8	M8
M6 Holes	M6x 16mm	M6	M6	M6

Torque for fastening bolts: 16Nm~20Nm, Material is Stainless Steel

9.2 Install modules with clamps

Install modules on the mounting system with clamps. (Bolt M8)

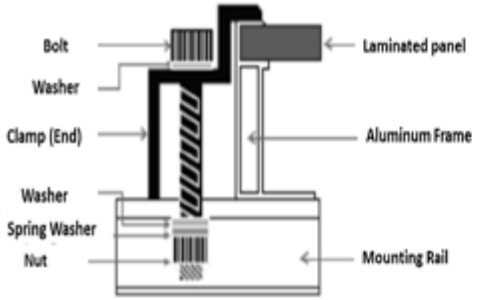
	Width	Thickness	Material
Specification	No less than 40mm	No less than 3mm	Aluminium 6063-T5

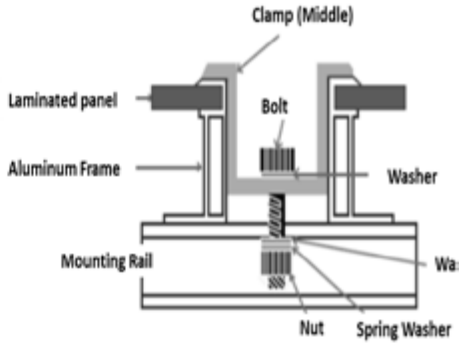
Torque for fastening bolts: 18Nm~ 24Nm

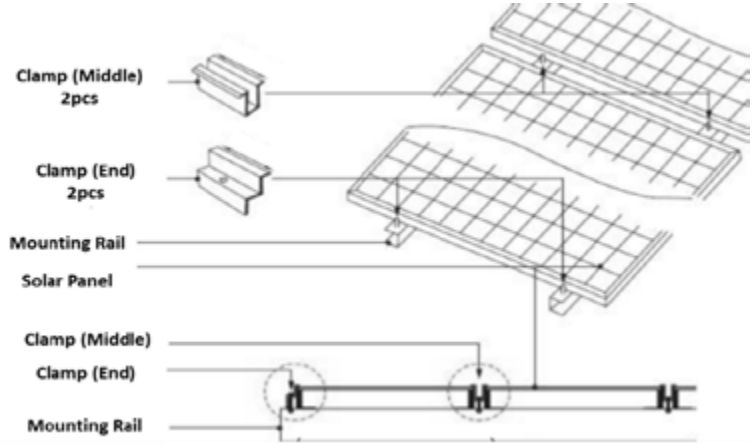
The clamps shall not contact glass or module frame deformed in any case. The contacting surface of the clamp contacting the front side the frame shall be even and smooth. Otherwise, the frame and module may be damaged. Make sure the clamp will not produce any shading effect.

Approved clamping areas are shown in the following drawing. The dimensions refer to the distance from the edge of the module to the centre of the clamp. This applies to both portrait and landscape installation orientations.

9.3 Mounting



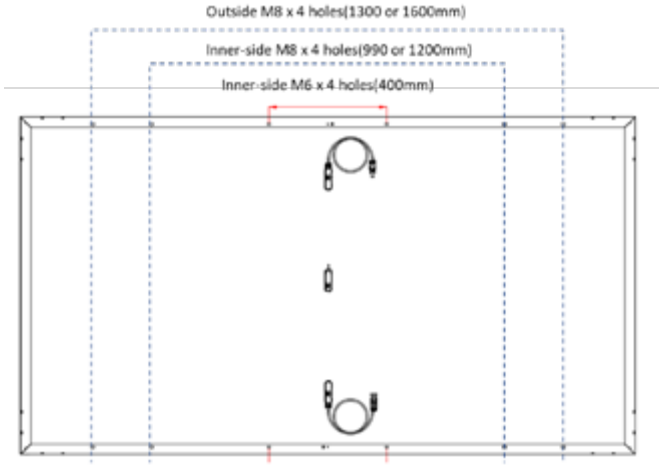




9.4 Position of Fixing Points

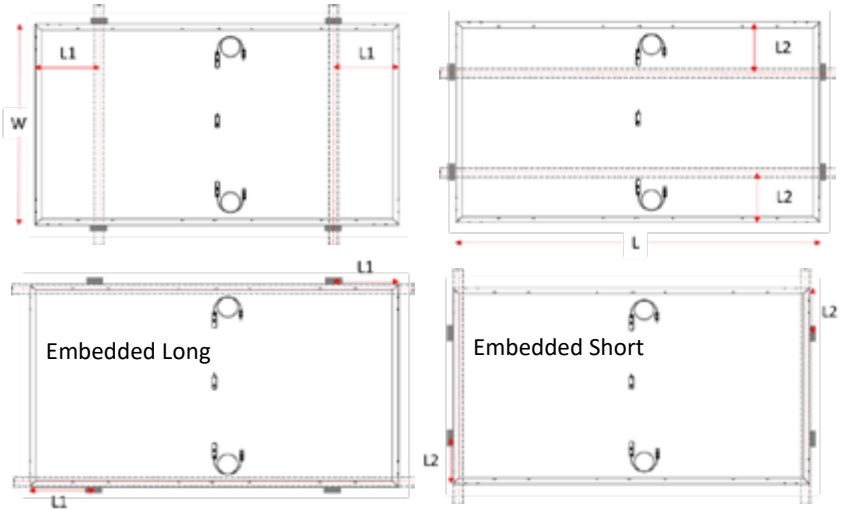
- Low/normal loading conditions apply to most environments: the maximum static pressure on the backside of the module is 2400pa (equal to wind load) and the maximum static pressure on the front side is 2400pa (equal to wind load and snow load).
- High loading conditions apply to severe environments (such as wind storm, heavy snow): the maximum static pressure on the backside of the module is 2400pa (equal to wind load) and the maximum static pressure on the front side is 5400pa (equal to wind load and snow load), which is the highest requirement on pressure in the IEC standards
- The modules can be installed in landscape or portrait. Make sure the junction box is positioned in the upper area of the modules with the wires hanging down.
- Ensure the drain holes in the solar panel frame are unobstructed to allow drainage of water.
- Install panels with a minimum tilt of 5 degrees.
- Install panels with a minimum distance of 10mm between modules.
- Ensure the panel and array conforms to local environmental codes especially for wind loading.
- Do not allow dissimilar metals to be in contact with each other giving rise to galvanic corrosion.
- Mechanical Load Test Condition

[Bolting Installation]



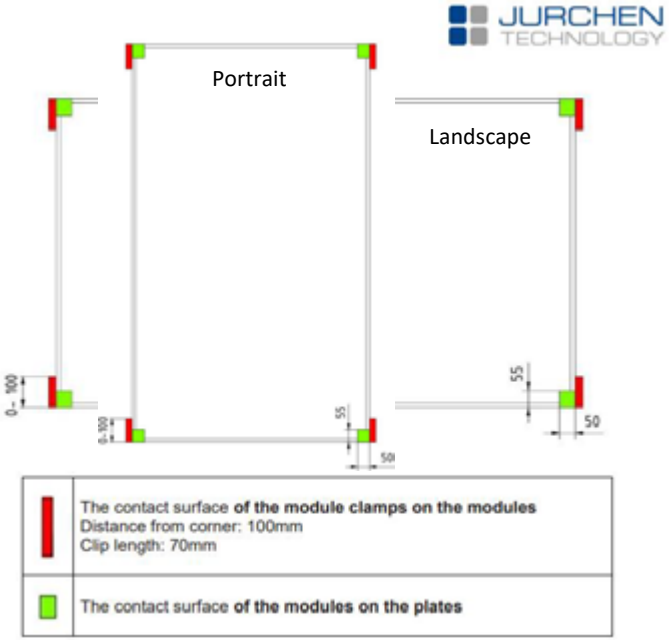
Loading Conditions	Position	Pitch(mm)	Design Load (Pa)	Test Load (Pa)
*Low	Inner-side 4 holes	Pitch 400	+1600 / -1600	+2400 / -2400
Low	Outside 4 holes	Pitch 1300 or 1600	+2400 / -1600	+3600 / -2400
*Normal	Inner-side 4 holes	Pitch 990 or 1200	+3600 / -1600	+5400 / -2400
High	Inner-side 4 holes + Middle Support	Pitch 990 or 1200	+3600 / -2400	+5400 / -3600

[Clamping Installation]

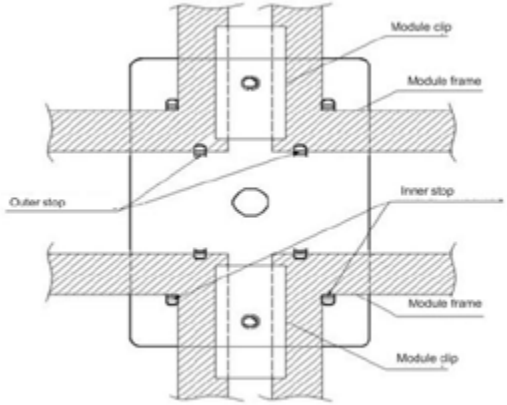


Loading Conditions	Position	L1 or L2 Range(mm)	Design Load (Pa)	Test Load (Pa)
Minimum	Any side(L1, L2)	0 < L1, L2 < L/4 or W/4	+1200 / -1200	+1800 / -1800
Low	Embedded Long, Long side(L1)	L/5-150 < L1 < L/5+200	+1600 / -1600	+2400 / -2400
	Embedded Short, Short side(L2)	W/5-50 < L2 < W/5+50	+1600 / -1600	+2400 / -2400
*Normal	Long side(L1)	L/5-50 < L1 < L/5+100	+3600 / -1600	+5400 / -2400
	Short side(L2)	W/5-100 < L2 < W/5+100	+3600 / -1600	+5400 / -2400
High	Long side(L1) + Middle Support	L/5-50 < L1 < L/5+100	+3600 / -2400	+5400 / -3600
	Short side(L2) + Middle Support	W/5-100 < L2 < W/5+100	+3600 / -2400	+5400 / -3600

[JURCHEN Method Installation]



- The modules are laid at 8 deg tilt on 4 plates of the PEG system located under the corners of the modules.
- The clamps are connected along the short edges of the modules and close to the corners, as shown in the drawings and photos included in this document.



Modules Mounting Layout (Top View)

Loading Conditions	Position	Design Load (Pa)	Test Load (Pa)
*Low	4 Corners	+1600 / -1600	+2400 / -2400
Normal	4 Corners + Middle Support	+3600 / -1600	+5400 / -2400

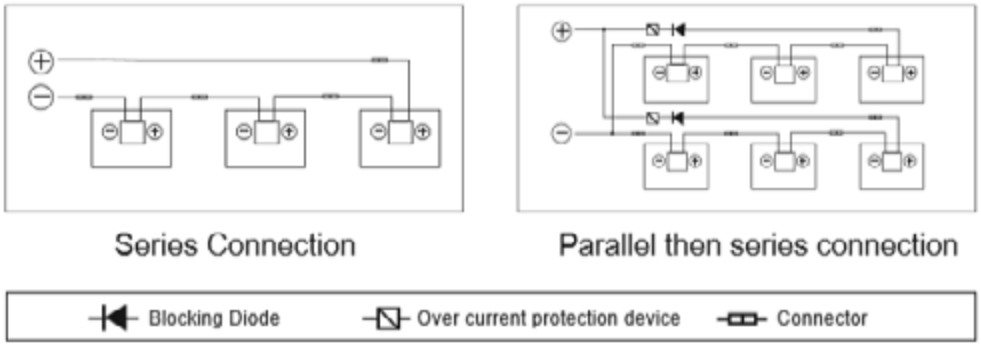
9.5 Limitation of mounting conditions

- The installation altitude is up to 2000m.
- The tilt angle should be approximately equal to the latitude of the installation location and the best direction is North in Australia.
- * Marked methods are verified by TUV.

10 Electric Installation

10.1 Electric Performance

Module electric performance parameters such as Isc, Voc and Pmax nominal values have ±3% error with those under standard testing conditions of: irradiance of 1000 W/m2, cell temperature of 25ºC and air mass of AM1.5. When modules are in series connection, the final voltage is sum of that of the single module. When modules are in parallel connection, the final current is sum of the single module as below shows. Modules with different electric performance models cannot be connected in series.



Series connection and parallel connection circuit diagram

The number of modules in series connection in each strand shall be calculated according to relative regulations. The open circuit voltage value under the expected lowest temperature shall not exceed the maximum system voltage value stipulated for modules and other values required by DC electric parts. (modules maximum system voltage is DC1000V/DC1500V---actually system voltage is designed based on the used modules model and inverter.)

The VOC factor can be calculated with the following formula. Voc=1-βVoc×(25-T) T: The expected lowest temperature of the installation site. β:VOC temperature coefficient (% /ºC) (Refer to modules manual for further detail)

10.2 Cables and Connecting Lines

In module design, adopt enclosed junction boxes with the protective level of IP67 for on-site connection to provide environmental influence protection for wires and connections and contacting protection for non-insulating electric parts. The junction box has well connected cables and connectors with the protective level of IP67. These designs facilitate parallel connection of modules. Each module has two independent wires connecting the junction box, one is negative pole and the other is positive pole. Two modules can be in series connection by inserting the positive pole at one end of wire of one module into the negative pole of the adjoining module.

According to local fire protection, building and electrical regulation, apply proper cable and connector; ensure the electrical and mechanical property of the cables (the cables should be coated in a catheter with anti-UV aging properties, and if is exposed to air, the cable itself should have anti-UV aging properties).

10.3 Connector

Please keep connectors clean and dry. Make sure connector nuts are fastened before connection. Do not connect connectors that are damp or dirty or under any other improper conditions. Avoid connectors from direct sun light and water immersion or falling onto ground or roof. Wrong connection may lead to electric arc and electric shock. Please make sure that all electric connection is reliable. Make sure all connectors with lock are fully locked.

10.4 Bypass diode

Solar module junction box contains bypass diode which is in parallel connection with the cell strands. If heat spot occurs locally with the module, the diode will come into operation to stop the main current from flowing through the heat spot cells in order to restrain module heating and performance loss. Notice, bypass diode is not the overcurrent protection device. If the diode is found or doubted to be out of order, the installer or system maintenance supplier shall contact us. Please do not try to open the module junction box on your own.

Schottky diode
Type : MK5045
If=50A ; VRRM=45V, Max. junction temperature 200 °C

10.5 Grounding

In design of modules, the anodized corrosion resistant aluminium alloy frame is used for rigidity support. For safety utilization and to protect modules from lightning and static-electricity damage, the module frame shall be grounded. The grounding device shall be in full contact with inner side of the aluminium alloy and penetrate the frame surface oxide film. Do not drill additional grounding holes on module frame. The grounding conductor or strap may be copper, copper alloy, or any other material acceptable for use as an electrical conductor per respective National Electrical Codes. The grounding conductor must then make a connection to earth using a suitable earth ground electrode. Holes marked with a grounding mark on the frame can only be used for grounding and not for component mounting. Frameless double glass modules have no exposed conductor, and therefore according to regulations it did not need to be grounded.

10.6 Grounding methods below are permissible

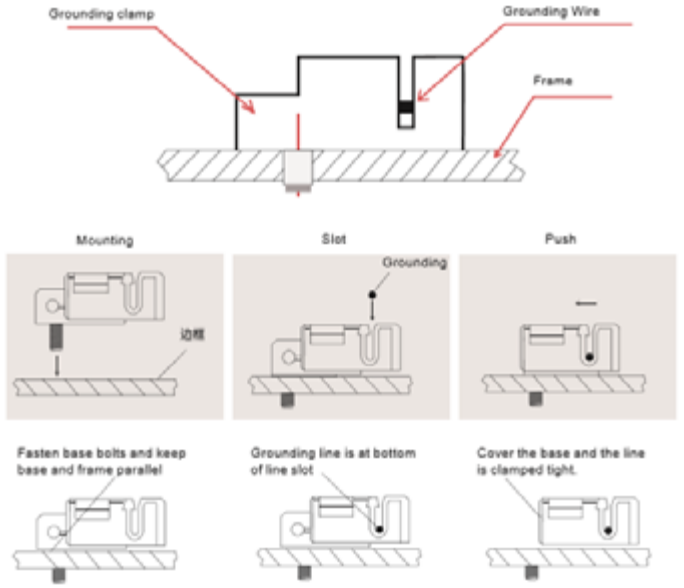
10.6.a Grounding by grounding clamp

There is a grounding hole with the diameter of Ø4.2 mm at the edge of the module back frame. The central line of the grounding sign also located on the edge of the module back frame overlaps with that of the grounding hole. Grounding between modules shall be confirmed by qualified electricians and grounding devices shall be manufactured by qualified electric manufacturer. The torque is recommended to be 2.3N•m. 12 AWG copper core wire is used for the grounding clamp. And copper wires cannot be pressed damaged during installation.

10.6.b Grounding by unoccupied mounting holes

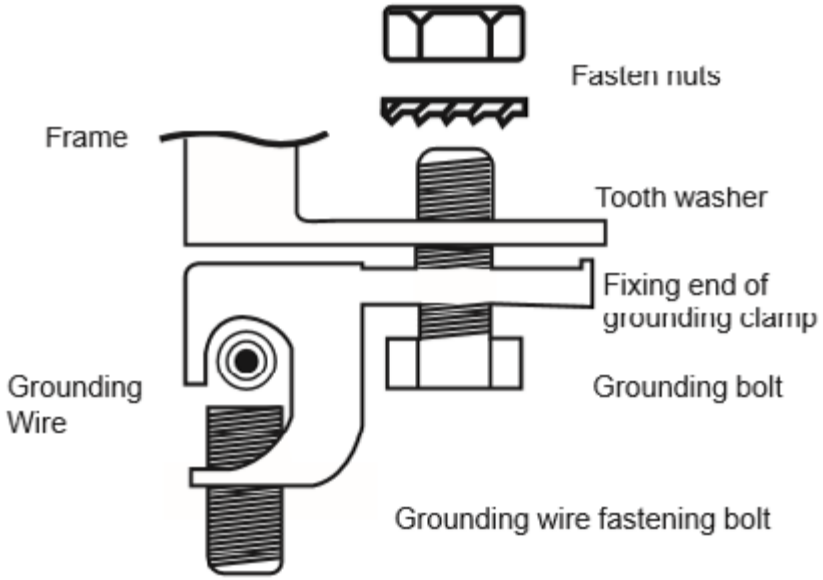
Mounting holes on modules that are not occupied can be used for installing grounding devices.

- Align grounding clamp to the frame mounting hole. Use grounding bolt to go through the grounding clamp and frame.
- Put the tooth side of the washer on the other side and fasten the nuts.
- Put grounding wires through the grounding clamp and grounding wire material and dimension shall meet requirements in local national and regional law and regulations.
- Fasten bolts of grounding lines and installation ends.



Grounding Clamp Installation Note: TYCO. 1954381-1 (recommended) is used in figures above

10.7 Install Method



11 Cleaning & Maintenance

Tindo panels are designed and built for long life and require minimal maintenance.

Most dirt is washed off the panel by rain. If dirt builds up becomes excessive:

- Wash or rinse of the panel to remove dust, dirt or other deposits with water.
- Clean the glass surface only with soft cloth using warm water or ethanol.
- No aggressive cleaner such as alkali chemicals including ammonia-based products on panel.

The solar system should be inspected annually by a specialist installer for:

- Secure fastening and corrosion-free system components.
- Secure connection, cleanliness and integrity of all electrical components.
- The contact resistances of the grounding.

11.1 Module Appearance Inspection

Check module appearance defects visually, especially:

- Module glass cracks.
- Corrosion at welding parts of the cell main grid: it is caused by moisture into the module due to damage of surface packaging materials during installation or transportation.
- Check whether there are traces of burning on the module back plate.
- Check PV modules for signs of aging including rodent damage, weather damage, connection tightness, corrosion and grounding condition.
- Check for any shape objects in contact with PV modules' surface
- Check for any obstacles shielding the PV modules
- Check for any loose or damage screws between the modules and bracket. If so, adjust and fix on time.
- Check connector sealing and cable connection.
- Look for gap on the sealant of the terminal box and confirm whether it is cracking.

12 Module Handling

12.1 Safety

- Solar panel weight up to and over 20kg, and at over 1.5m long can be cumbersome to handle. Care should be taken to avoid injury.
- It is hazardous to install solar panels in high wind conditions.
- It is hazardous to install solar panels in wet weather.

12.2 General

- Take care when transporting and handling solar panels. Many issues caused by rough handling will arise years after the installation. Taking additional care can save considerable time and money from avoided service calls and replacements.
- Never walk on a solar module
- Never drop a heavy object on a solar module
- Do not work on the modules with sharp objects
- Record module serial numbers for system documentation

12. 3 Transport

- Transport vehicles and equipment should be fit for purpose ad well maintained.
- Treat boxes and pallets with care, do not drop or allow the boxes to receive impacts.
- Any panels transported outside of their boxes should be properly secured and not allowed to move independently

13.4 Module Appearance Inspection

- Check module appearance defects visually, especially:
- Module glass cracks.
- Corrosion at welding parts of the cell main grid: it is caused by moisture into the module due to damage of surface packaging materials during installation or transportation.
- Check whether there are traces of burning on the module back plate.
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- Check connector sealing and cable connection.
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Performance at NMOT for Walara-xxxG3P (-BL/-SL)

STC Pmax	Pmax	Vmp	Imp	Voc	Ioc
410	312.5	29.85	10.47	36.47	11.09
415	316.4	30.02	10.54	36.64	11.16
420	320.2	30.19	10.60	36.81	11.22
425	324.0	30.36	10.67	36.98	11.29
430	327.8	30.53	10.73	37.15	11.35
435	331.6	30.70	10.80	37.32	11.41
455	346.8	33.20	10.45	40.84	11.07
460	350.7	33.35	10.52	41.00	11.13
465	354.5	33.50	10.58	41.15	11.20
470	358.3	33.65	10.64	41.30	11.26
475	362.1	33.80	10.71	41.45	11.32
480	365.9	33.95	10.77	41.60	11.39
505	385.0	36.84	10.46	44.96	11.04
510	388.8	36.99	10.52	45.11	11.11
515	392.6	37.14	10.57	45.26	11.17
520	396.4	37.29	10.63	45.41	11.23
525	400.2	37.44	10.68	45.57	11.30
530	404.0	37.59	10.74	45.72	11.36
550	419.3	40.18	10.43	49.01	10.98
555	423.1	40.32	10.49	49.16	11.06
560	426.9	40.46	10.55	49.30	11.13
565	430.7	40.60	10.60	49.44	11.20
570	434.5	40.74	10.66	49.58	11.27
575	438.3	40.88	10.72	49.73	11.34

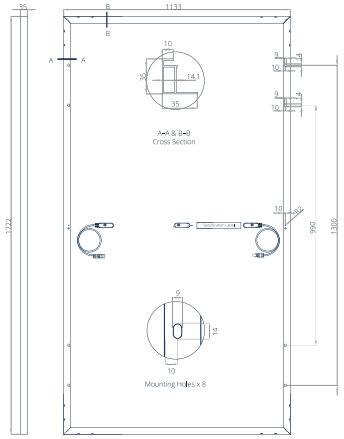
NMOT-Nominal Module Operating Temperature (20°C, 800 W/m2)

Performance at low irradiance for Walara-xxxG3P (-BL/-SL)

STC Pmax	Pmax	Vmp	Imp	Voc	Ioc
410	78.7	31.63	2.50	35.77	2.66
415	79.7	31.81	2.51	35.94	2.68
420	80.7	31.99	2.53	36.11	2.70
425	81.6	32.17	2.54	36.27	2.71
430	82.6	32.35	2.56	36.44	2.73
435	83.5	32.53	2.58	36.61	2.74
455	87.4	35.18	2.49	40.06	2.66
460	88.4	35.34	2.51	40.21	2.67
465	89.3	35.50	2.52	40.36	2.69
470	90.3	35.66	2.54	40.51	2.70
475	91.2	35.82	2.55	40.66	2.72
480	92.2	35.98	2.57	40.81	2.74
505	97.0	39.04	2.49	44.10	2.65
510	98.0	39.20	2.51	44.25	2.67
515	98.9	39.36	2.52	44.40	2.68
520	99.9	39.52	2.54	44.55	2.70
525	100.8	39.68	2.55	44.70	2.71
530	101.8	39.84	2.56	44.84	2.73
550	105.6	42.57	2.49	48.08	2.64
555	106.6	42.72	2.50	48.22	2.66
560	107.6	42.87	2.52	48.36	2.67
565	108.5	43.02	2.53	48.50	2.69
570	109.5	43.17	2.54	48.64	2.71
575	110.4	43.32	2.56	48.78	2.72

Measure at 25°C cell temperature and 200 W/m2 irradiance

Walara 415–430G3P Data Sheet



Mechanical Characteristics

Cells per panel	108 Half Cells
Cell Type	N-Type Cells (182 x 182mm)
Panel Dimension	1722 x 1133 x 35 mm
Panel Weight	22 Kg
Front Glass	3.2mm Fully tempered Double ARC Glass
Frame	Anodized Aluminum Alloy (T6) / Black
Junction Box	3 bypass diodes / IP68 rated
Cable	1200 mm(+/-), 4mm2 or Customised Length
Connector Type	Stabli-MC4 / KST4-EV0 2(M), KBT4-EVO 2(F)

Electrical characteristics

[Positive power tolerance 0 ~ + 5]

108HC Cell Module		Walara-415G3P		Walara-420G3P		Walara-425G3P		Walara-430G3P	
ITEM	UNIT	STC*	NMOT**	STC*	NMOT**	STC*	NMOT**	STC*	NMOT**
Max. Power (Pmax)	Wp	415	316.4	420	320.1	425	323.9	430	327.7
Max. Power voltage (Vmp)	V	31.84	30.02	32.02	30.19	32.2	30.36	32.38	30.53
Max. Power current (Imp)	A	13.04	10.54	13.12	10.6	13.2	10.67	13.28	10.73
Open circuit voltage (Voc)	V	38.55	36.64	38.73	36.81	38.91	36.98	39.09	37.15
Short circuit current (Isc)	A	13.84	11.16	13.92	11.22	14	11.29	14.08	11.35
Module efficiency	%	21. 3		21.5		21.8		22.0	

*STC (Standard Test Condition): 1,000 W/m2 , AM 1.5, 25°C ・**NMOT(Nominal Module Operating Temperature) : Irradiance at 800W/m, Ambient Temperature 20°C, Wind Speed 1m/s, air mass of AM1.5 ・# Tolerance of Measuring Pmax, Voc & Isc ± 3% within each watt class at STC

Thermal Characteristics

RATING		UNIT	VALUE
Operating Temperature		%	–40 ~ +85
Maximum System Voltage (IEC)		VDC	1500
Maximum Series Fuse Rating		A	30
Nominal Module Operating Temperature		°C	45 ± 2
Temperature Coefficient	Isc	%/°C	0.045
	Voc	%/°C	–0.25
	Pmax	%/°C	–0.32

Qualification test

Thermal cycling test	- 40°C to 85°C for 200 cycles
Damp heat test	85°C and 85% relative humidity for 1000 hr
Mechanical Load test	5400Pa (Front) / 2400Pa (Rear)
PID test	1500 VDC, 96h, 85% RH, 85°C
Hail Impact test	25mm hail at 23m/s from 1m distance

Cyclone tested by Structural Engineering Consultants Australia (SECA) Pty Ltd - certificate available on request

Safety factor of *static load test: 1.5 (Test load = Design load x Safety factor)
NexTracker installation : Front load 1800 Pa / Back Load 1800 Pa

Safety Ratings & Warranties

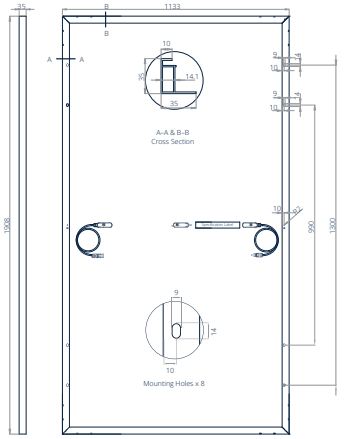
Safety Application Class	Class II
Fire Safety Classification	Class C
Certifications	IEC 61215 , IEC 61730
Warranty	25 years limited product warranty
Performance Guarantee	25 years limited warranty 87.4% power

Packaging

Stacking Method	Horizontal	Vertical (Optional)
Panels per Pallet	30	31
Loading Capacity (40HQ)	600	806

Walara 415–430G3P V01-240912 – Note:
・The specifications included in this datasheet are subject to change without notice.
・The electrical data given here is for reference purpose only.

Walara 460–475G3P Data Sheet



Mechanical Characteristics

Cells per panel	120 Half Cells
Cell Type	N-Type Cells (182x182mm)
Panel Dimension	1908 x 1133 x 35 mm
Panel Weight	24kg
Front Glass	3.2mm, Fully tempered Double ARC Glass
Frame	Anodized Aluminum Alloy (T6) / Black
Junction Box	3 bypass diodes / IP68 rated
Cable	1200 mm(+/-), 4mm2 or Customised Length
Connector Type	Stabli-MC4 / KST4-EV0 2(M), KBT4-EVO 2(F)

Electrical characteristics

[Positive power tolerance 0 ~ + 5]

120HC Cell Module		Walara-460G3P		Walara-465G3P		Walara-470G3P		Walara-475G3P	
ITEM	UNIT	STC*	NMOT**	STC*	NMOT**	STC*	NMOT**	STC*	NMOT**
Max. Power (Pmax)	Wp	460	350.6	465	354.4	470	358.2	475	362
Max. Power voltage (Vmp)	V	35.37	33.35	35.53	33.5	35.69	33.65	35.85	33.80
Max. Power current (Imp)	A	13.01	10.52	13.09	10.58	13.17	10.64	13.25	10.71
Open circuit voltage (Voc)	V	42.80	40.68	42.96	40.83	43.12	40.98	43.28	41.13
Short circuit current (Isc)	A	13.81	11.13	13.89	11.20	13.97	11.26	14.05	11.32
Module efficiency	%	21. 3		21.5		21.8		22.0	

*STC (Standard Test Condition): 1,000 W/m2 , AM 1.5, 25°C ・**NMOT(Nominal Module Operating Temperature) : Irradiance at 800W/m, Ambient Temperature 20°C, Wind Speed 1m/s, air mass of AM1.5 ・# Tolerance of Measuring Pmax, Voc & Isc ± 3% within each watt class at STC

Thermal Characteristics

RATING		UNIT	VALUE
Operating Temperature		%	–40 ~ +85
Maximum System Voltage (IEC)		VDC	1500
Maximum Series Fuse Rating		A	30
Nominal Module Operating Temperature		°C	45 ± 2
Temperature Coefficient	Isc	%/°C	0.045
	Voc	%/°C	–0.25
	Pmax	%/°C	–0.32

Qualification test

Thermal cycling test	- 40°C to 85°C for 200 cycles
Damp heat test	85°C and 85% relative humidity for 1000 hr
Mechanical Load test	5400Pa (Front) / 2400Pa (Rear)
PID test	1500 VDC, 96h, 85% RH, 85°C
Hail Impact test	25mm hail at 23m/s from 1m distance

Cyclone tested by Structural Engineering Consultants Australia (SECA) Pty Ltd - certificate available on request

Safety factor of *static load test: 1.5 (Test load = Design load x Safety factor)
NexTracker installation : Front load 1800 Pa / Back Load 1800 Pa

Safety Ratings & Warranties

Safety Application Class	Class II
Fire Safety Classification	Class C
Certifications	IEC 61215 , IEC 61730
Warranty	25 years limited product warranty
Performance Guarantee	25 years limited warranty 87.4% power

Packaging

Stacking Method	Horizontal	Vertical (Optional)
Panels per Pallet	30	31
Loading Capacity (40HQ)	600	744

Walara 460–475G3P V01-240912 – Note:
・The specifications included in this datasheet are subject to change without notice.
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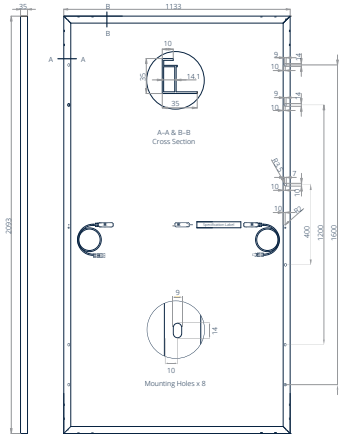
Walara 510–525G3P Data Sheet



Mechanical Characteristics

Cells per panel	132 Half Cells
Cell Type	N-type Cells (182 x 182mm)
Panel Dimension	2093 x 1133 x 35 mm
Panel Weight	26 Kg
Front Glass	3.2mm Fully tempered Double ARC Glass
Frame	Anodized Aluminum Alloy (T6) / Black
Junction Box	3 bypass diodes / IP68 rated
Cable	1200 mm(+/-), 4mm2 or Customised Length
Connector Type	Stabli – MC4 / KST 4-EVO2(M), KBT4-EV02(F)

Electrical characteristics

[Positive power tolerance 0 ~ + 5]

132HC Cell Module		Walara-510G3P		Walara-515G3P		Walara-520G3P		Walara-525G3P	
ITEM	UNIT	STC*	NMOT**	STC*	NMOT**	STC*	NMOT**	STC*	NMOT**
Max. Power (Pmax)	Wp	510	388.9	515	392.6	520	396.3	525	400.1
Max. Power voltage (Vmp)	V	39.23	36.99	39.39	37.14	39.55	37.29	39.71	37.44
Max. Power current (Imp)	A	13.01	10.52	13.08	10.57	13.15	10.63	13.22	10.68
Open circuit voltage (Voc)	V	47.46	45.11	47.62	45.26	47.78	45.41	47.94	45.57
Short circuit current (Isc)	A	13.78	11.11	13.86	11.17	13.94	11.23	14.02	11.30
Module efficiency	%	21. 5		21.7		22.0		22.2	

*STC (Standard Test Condition): 1,000 W/m2 , AM 1.5, 25℃ • **NMOT(Nominal Module Operating Temperature) : Irradiance at 800W/m, Ambient Temperature 20°C, Wind Speed 1m/s, air mass of AM1.5 • # Tolerance of Measuring Pmax, Voc & Isc ± 3% within each watt class at STC

Thermal Characteristics

RATING		UNIT	VALUE
Operating Temperature		%	–40 ~ +85
Maximum System Voltage (IEC)		VDC	1500
Maximum Series Fuse Rating		A	30
Nominal Module Operating Temperature		°C	45 ± 2
Temperature Coefficient	Isc	%/°C	0.045
	Voc	%/°C	–0.25
	Pmax	%/°C	–0.32

Qualification test

Thermal cycling test	- 40°C to 85°C for 200 cycles
Damp heat test	85°C and 85% relative humidity for 1000 hr
Mechanical Load test	5400Pa (Front) / 2400Pa (Rear)
PID test	1500 VDC, 96h, 85% RH, 85°C
Hail Impact test	25mm hail at 23m/s from 1m distance

Cyclone tested by Structural Engineering Consultants Australia (SECA) Pty Ltd - certificate available on request

Safety factor of *static load test: 1.5 (Test load = Design load x Safety factor)
NexTracker installation : Front load 1800 Pa / Back Load 1800 Pa

Safety Ratings & Warranties

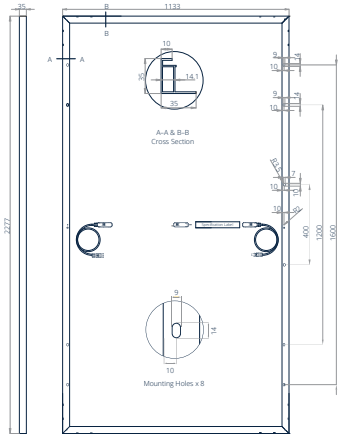
Safety Application Class	Class II
Fire Safety Classification	Class C
Certifications	IEC 61215 , IEC 61730
Warranty	25 years limited product warranty
Performance Guarantee	25 years limited warranty 87.4% power

Packaging

Stacking Method	Horizontal	Vertical (Optional)
Panels per Pallet	30	31
Loading Capacity (40HQ)	600	682

Walara 510–525G3P V01-240912 – Note:
• The specifications included in this datasheet are subject to change without notice.
• The electrical data given here is for reference purpose only.

Walara 560–575G3P Data Sheet



Mechanical Characteristics

Cells per panel	144 Half Cells
Cell Type	N-type Cells (182 x 182mm)
Panel Dimension	2277 x 1133 x 35 mm
Panel Weight	28 Kg
Front Glass	3.2mm Fully tempered Double ARC Glass
Frame	Anodized Aluminum Alloy (T6) / Black
Junction Box	3 bypass diodes / IP68 rated
Cable	500 mm(+/-), 4mm2 or Customised Length
Connector Type	Stabli – MC4 / KST 4-EVO2(M), KBT4-EV02(F)

Electrical characteristics

[Positive power tolerance 0 ~ + 5]

144HC Cell Module		Walara-560G3P		Walara-565G3P		Walara-570G3P		Walara-575G3P	
ITEM	UNIT	STC*	NMOT**	STC*	NMOT**	STC*	NMOT**	STC*	NMOT**
Max. Power (Pmax)	Wp	560	426.8	565	430.5	570	434.4	575	438.2
Max. Power voltage (Vmp)	V	42.91	40.46	43.06	40.6	43.21	40.74	43.36	40.88
Max. Power current (Imp)	A	13.05	10.55	13.12	10.60	13.19	10.66	13.26	10.72
Open circuit voltage (Voc)	V	51.87	49.30	52.02	49.44	52.17	49.58	52.32	49.73
Short circuit current (Isc)	A	13.80	11.13	13.89	11.20	13.98	11.27	14.06	11.34
Module efficiency	%	21.7		21. 9		22.1		22.3	

*STC (Standard Test Condition): 1,000 W/m2 , AM 1.5, 25℃ • **NMOT(Nominal Module Operating Temperature) : Irradiance at 800W/m, Ambient Temperature 20°C, Wind Speed 1m/s, air mass of AM1.5 • # Tolerance of Measuring Pmax, Voc & Isc ± 3% within each watt class at STC

Thermal Characteristics

RATING		UNIT	VALUE
Operating Temperature		%	–40 ~ +85
Maximum System Voltage (IEC)		VDC	1500
Maximum Series Fuse Rating		A	30
Nominal Module Operating Temperature		°C	45 ± 2
Temperature Coefficient	Isc	%/°C	0.045
	Voc	%/°C	–0.25
	Pmax	%/°C	–0.32

Qualification test

Thermal cycling test	- 40°C to 85°C for 200 cycles
Damp heat test	85°C and 85% relative humidity for 1000 hr
Mechanical Load test	5400Pa (Front) / 2400Pa (Rear)
PID test	1500 VDC, 96h, 85% RH, 85°C
Hail Impact test	25mm hail at 23m/s from 1m distance

Cyclone tested by Structural Engineering Consultants Australia (SECA) Pty Ltd - certificate available on request

Safety factor of *static load test: 1.5 (Test load = Design load x Safety factor)
NexTracker installation : Front load 1800 Pa / Back Load 1800 Pa

Safety Ratings & Warranties

Safety Application Class	Class II
Fire Safety Classification	Class C
Certifications	IEC 61215 , IEC 61730
Warranty	25 years limited product warranty
Performance Guarantee	25 years limited warranty 87.4% power

Packaging

Stacking Method	Horizontal	Vertical (Optional)
Panels per Pallet	30	31
Loading Capacity (40HQ)	600	620

Walara 560–575G3P V01-240912 – Note:
• The specifications included in this datasheet are subject to change without notice.
• The electrical data given here is for reference purpose only.