SAFEBACK | SMART AQUACULTURE | GUANGZHOU, CHINA

48 V Solar Waterwheel Aerator

TK-YC750SP-48V · Twin impeller · 48 V DC · 0.75 kW · Oxygenation ≥1.2 kg/h

Horizontal waterwheel, PV direct drive · 666–3330 ㎡ per unit

Product datasheet (EN) · Rev. 2026-10 · Vietnam market | Factory model YC-0.75SP, 48 V build



Fig. 1 TK-YC750SP-48V: float platform, horizontal twin impellers, shore-mounted PV array

1. Product overview

TK-YC750SP-48V is the second solar-direct aerator in the TK series and the first waterwheel type. It shares the electrical and PV platform of the TK-YL1500SP — 48 V DC bus, AC/DC controller, permanent-magnet synchronous motor — and changes only the working end: a vertical single impeller becomes a horizontal twin impeller.

Why a waterwheel, not an impeller. An impeller aerator lifts water in place and throws it out as a ring of spray. Oxygen transfer is high, but the flow is radial and the pond has no defined direction. A waterwheel pushes water horizontally: the blades lift the water and drive it along the pond surface, so a slow circulation loop forms. That is what a shrimp pond needs — uneaten feed, faeces and moulted shells are carried to the centre or to the drain instead of rotting where they fall.

The second difference is depth. A horizontal impeller draws little water, so a pond 0.8 m deep will still circulate; a vertical impeller in the same pond stirs the bottom mud and the water gets dirtier the longer it runs. Many shrimp ponds around Tra Vinh and Soc Trang are shallow, which makes this point more decisive than the oxygenation figure on the label.

0.75 kW, twin impeller, 666–3330 ㎡ per unit. Half the power of the TK-YL1500SP, aimed at small and medium ponds, shrimp ponds, and as a circulation unit alongside larger aeration. The energy path is identical to the TK-YL1500SP: PV first, mains as back-up, installable where there is no three-phase supply or no supply at all.

The machine still splits into two groups: on the water, the float platform (3 pontoons), motor and gearbox, twin impellers and stainless support; on the bank, two PV modules and a stainless frame. One DC cable runs between them.

2. Key points

- **Circulation, not just aeration** — the twin impellers drive water along the surface in one direction and set up a circulation loop, carrying feed, faeces and moulted shells towards the centre or the drain. An impeller aerator cannot do this.
- **Works in shallow ponds** — horizontal layout, shallow draft, from 0.8 m of water; it does not stir the bottom mud.
- **Runs without a grid connection — 48 V permanent-magnet direct drive fed by PV. No three-phase, no supply, still installable.**
- **0.75 kW for 666–3330 ㎡** — one to five mu. Intensive ponds take 0.5–0.75 kW per 667 ㎡; shrimp ponds at higher density go to 1 kW per mu.

- **Symmetric twin impellers** — counter-rotating, so the side thrust cancels and the platform does not veer. If one side fouls, the other keeps pushing for a short while, but clear it promptly: the imbalance makes the whole unit rotate.
- **Carries in pieces** — motor 33 kg, impeller 1.75 kg each, pontoon 0.6 kg each, support 2.6 kg, controller 2.8 kg. Two people and a small boat can install it; no crane.
- **Shares the family interface** — controller, PV modules and frame are common with the TK-YL1500SP, so spares are shared; adding a TK-4G-GW gateway and DO probe later uses the same protocol.

3. The TK family and model coding

Every SAFEBACK aquaculture product is coded TK–category–size. The two-letter category marks the product class; the number is the single most decisive figure — rated power in watts for powered equipment, throughput for feeders, model index for sensors.

Categories in use: YL impeller aerator (vertical), YC waterwheel aerator (horizontal twin impeller), FS pneumatic feeder, 150D twin-hopper feeder, DO / pH / ORP probes, MP500 five-parameter probe, R12 twelve-way control board, 4G-GW IoT gateway, FA series power modules.

The factory model is the 48 V build of the YC-0.75SP, coded TK-YC750SP-48V: YC for waterwheel, 750 for the 750 W rating, SP for Solar Permanent-magnet, and the -48V suffix for the 48 V DC drive. The nameplate carries the TK code as primary, with the factory code and voltage suffix alongside.

Model	Type	kW	Capacity	Coverage	Energy
TK-YL1500	Impeller, vertical	1.5	≥2.3 kg/h	2000–4000 ㎡	AC 220 / 380 V
TK-YL1500SP	Impeller, solar	1.5	≥2.3 kg/h	2000–4000 ㎡	96 V DC PV + mains
TK-YC750SP-48V	Waterwheel, solar 48 V	0.75	≥1.2 kg/h	666–3330 ㎡	48 V DC PV + mains
TK-FS2000	Pneumatic feeder	2.0	25 kg / 8min	30 m throw	AC 220 V
TK-150D	Twin-hopper feeder	0.15	150 kg/h class	8–17 m spread	AC 220 V

Aerators handle oxygen, feeders handle feed, and the probes and terminals let you see the numbers in the pond. They can be bought separately or as a package from the configuration table below; the interfaces and protocol are the same, so later additions need no new system.

4. Technical data

Item	Value	Notes

Item	Value	Notes
Model	TK-YC750SP-48V	Factory model YC-0.75SP, 48 V build; dual nameplate recommended
Rated voltage	48 V DC	DC bus voltage, inside the 60 V SELV limit
Rated power	0.75 kW	Permanent-magnet synchronous motor
Rated current	approx. 15.6 A	0.75 kW ÷ 48 V; cable and breaker sized with ≥1.25× margin
PV open-circuit range	Matched to the tendered string	Controller input window set by the string; nameplate governs
PV module power	Per tender	Module type, count and total wattage as tendered; see Note 3
Oxygenation rate	≥1.2 kg/h	Factory lower limit; test conditions to be supplied
Impellers	2	Horizontal, counter-rotating
Coverage per unit	666–3330 ㎡	One to five mu, depending on shape and depth
Drive	PM synchronous motor + gearbox	Gearbox output to a transverse shaft
Controller	AC/DC hybrid	PV DC plus mains or generator input
Water depth	≥0.8 m	Shallow-water layout
Ingress protection	To be confirmed	IP54 or better recommended
Weight, on the water	approx. 45 kg	Excluding PV modules and shore frame
Weight, complete set	approx. 146 kg	45 on water + 54 modules + 47 frame

Weight breakdown, for packing and freight:

Component	Size (cm)	Unit weight (kg)	Qty	Subtotal (kg)
PM synchronous motor, with gearbox	30×25×72	33	1	33.0
Stainless support	35×105×4	2.6	1	2.6
Pontoon	165×32.5×19	0.6	3	1.8
Impeller	63×63×20	1.75	2	3.5
AC/DC controller	30.5×21.5×11.5	2.8	1	2.8
Accessory box	85×17.5×11.5	1.6	1	1.6
Subtotal, on the water	—	—	—	approx. 45.3
PV module	228×113.5×3.5	26.75	2	53.5
Stainless frame	nominal 4700×2380 mm	47	1	47.0
Total, complete set	—	—	—	approx. 145.8

Note 1 A value marked ≥ is the factory's lower limit; 'approx.' is a reference figure.

Note 2 Actual oxygen transfer depends on water temperature, salinity, atmospheric pressure, impeller immersion and water quality. Acceptance should be based on site measurement.

Note 3 This is the 48 V custom model built to a tender specification. The PV array follows the module type, module count and total wattage in your tender, not the catalogue default of "≥2000 W with two 228×113.5 cm modules"; the controller input window is matched to the open-circuit voltage of the specified string. The array in our offer is the tendered array, and the tender governs the module data.

Note 4 The stainless frame is listed at 47 kg, the same as the four-module frame of the TK-YL1500SP. With only two modules here, whether the frame is a shortened version and whether its weight drops accordingly is to be confirmed.

5. Working principle

- **PV array — the module string specified in the tender feeds the controller input window and converts daylight to DC.**
- **Controller** — the AC/DC hybrid controller brings PV DC and mains or generator AC onto a 48 V DC bus, switching to mains when PV output falls.
- **Drive — the 48 V PM synchronous motor drives through a gearbox to a transverse shaft carrying one impeller at each end.**
- **Lift** — the impellers sit partly in the water; as the blades turn they lift water from below.
- **Push** — the lifted water is thrown tangentially and guided by a shroud into one direction, producing a steady surface current.
- **Aeration** — water leaving the blades breaks into droplets and spray, multiplying the surface area, and oxygen enters the water at that moment.
- **Circulation** — the current turns at the bank and travels around the pond, forming a slow loop that carries feed, faeces and moulted shells towards the centre or the drain.

The trade-off should be stated plainly: oxygen transfer per kW is lower than a vertical impeller (≥1.2 kg/h here), and what you get instead is directed flow and shallow-water tolerance. Decide whether the pond needs oxygen or current — impeller for oxygen, waterwheel for current, and both together is standard practice on larger ponds.

6. Installation and operation

- **Blade immersion 10–15 cm** — about one sixth to one quarter of the 63 cm impeller diameter. Judge by the spray: a continuous sheet of water, no heavy splashing, steady motor current. Too deep overloads the motor and raises current; too shallow spins in spray and loses both aeration and flow.
- **Floats and mooring** — three pontoons form the platform, moored at four corners. Check ropes and floats before the monsoon or a typhoon; a drifting unit will hit the bank or turn over.

- **Flow direction** — on a long pond, push along the long axis so the water travels a full loop. Do not aim straight at the bank or the inlet; it scours the slope.
- **Jog the motor first** — a DC motor reverses if the polarity is swapped, and then the water is pushed the wrong way. Jog, confirm direction, then run continuously.
- **Size the DC cable to the run** — at 48 V the current is about 15.6 A and is not small; an undersized cable drops voltage and shows up as 'the modules are generating but the impellers are slow'. Keep the controller-to-motor run short.
- **Ballast the shore frame** — two modules and the frame weigh about 100 kg with a large wind area. It needs a hard base plus ballast or ground anchors. This is the part that fails in a storm, not the part on the water.
- **Tilt and orientation** — due south in the northern hemisphere; 10–15° is enough in southern Vietnam (around 10° N). Shading is the real enemy: a tree, a shed, even one cable.
- **Clean the modules** — every one to two weeks. Bird droppings, dust and leaves are the first cause of lost output, more common than any fault.
- **Keep the controller out of the sun** — mount it in shade with air movement. It weighs 2.8 kg, so its position is flexible.
- **Fouling** — weed, netting and plastic bags around the impellers are the most common cause of a stop. Check every one to two weeks and clear it before the overload trips.
- **Brackish water** — the support and frame are stainless; motor and controller sit in the splash zone, so check seals and paint annually in high-salinity areas.

7. Configuration and sizing

The aerator is the actuator; the PV side decides how far it can sit from the grid. Choose by grid condition and running hours:

Option	Configuration	Suits	Notes
A Tender configuration	Module string per tender + AC/DC controller + twin impeller	Tender projects; daytime aeration with mains back-up	Array as tendered; meets the tender
B Enhanced	Larger array (larger frame) + same controller	Moderate sun, or more daytime output wanted	PV sized at 1.3–1.5× motor rating
C Mains back-up	Tendered string + mains or generator input	End of the rural feeder, long rainy season	Switch to mains in rain, no downtime
D Night running	Tendered string + battery bank + same controller	Pre-dawn operation (moulting, still nights)	Battery sized to the night hours, quoted separately

- **How many units** — intensive ponds take 0.5–0.75 kW per 667 ㎡; shrimp ponds at higher density go to 1 kW per mu. One unit covers 666–3330 ㎡: take the upper end for a regular shape and moderate depth, the lower end for a long or irregular pond.
- **How much PV — size the array at 1.3–1.5× the motor rating, so 1000–1200 W for a 0.75 kW motor, towards the upper end where the rainy season is long. Where the tender specifies the modules, the array follows that specification; see note 3 in section 4.**
- **Combining with impeller units** — on ponds above five mu, use impeller units for oxygen and waterwheel units for current. The impeller puts oxygen in, the waterwheel moves the water; together they beat either alone.

8. Notes for regional markets

The drive side of this unit is DC (PV direct), so grid frequency does not affect it; only the mains fallback side sees voltage and frequency. What differs between countries is solar resource, mains voltage and certification. Check the table first, then read the note for your region.

Country / region	Single-phase	Three-phase	Frequency	Relation to this unit
Vietnam	220 V	380 V	50 Hz	Identical
Thailand	220 V	380 V	50 Hz	Identical
Indonesia	220 V	380 V	50 Hz	Identical
Cambodia	220 V	380 V	50 Hz	Identical
Bangladesh	220 V	380 V	50 Hz	Identical
Mongolia	220 V	380 V	50 Hz	Identical
Myanmar	230 V	400 V	50 Hz	+5%
Singapore	230 V	400 V	50 Hz	+5%
Malaysia	240 V	415 V	50 Hz	+9%
India	230 V	400 / 415 V	50 Hz	+5–9%
Philippines	220 V	380 / 480 V	60 Hz	Frequency differs

8.1 Fully compatible — 380 V / 50 Hz

- **Vietnam, Thailand, Indonesia, Cambodia, Bangladesh, Mongolia** — These six markets use the same low-voltage system as China: 380 V three-phase, 220 V phase-to-neutral, 50 Hz. The machine connects directly — no transformer, no re-wound motor. This is where the TK series is easiest to sell against European or American equipment.
- **Vietnam is the reference market** — 0.4 kV three-phase four-wire, 380 V between phases, 220 V phase-to-neutral, 50 Hz — the same as China. Small ponds in the south often have only a

single-phase 220 V service, or three-phase with too little capacity; tell us the service type, transformer rating and existing load before ordering. If a single-phase machine is required, specify the D configuration.

- **Phase loss and voltage sag** — Voltage sag at the end of a rural feeder, and phase loss, are the number-one cause of burnt motors — not the voltage level. Fit a phase-failure overload relay per machine; if you run demand-based aeration (C configuration), the control board already provides that protection.

8.2 Wide-range coverage — 400 to 528 V / 50 Hz

- **Malaysia 415 V, India 400–415 V, Singapore 400 V, the Philippines 480 V — no transformer needed** — These voltages look higher than 380 V, but they are not a problem for our machines: the control supply is a 90–528 VAC wide-range input. Single-phase 220 V, 380 V phase-to-phase, 440 / 480 V — all accepted, and 100–745 VDC as well. No step-down transformer, no country-specific model. One machine covers Southeast Asia.
- **CE covers 100–400 VAC only — say so plainly** — Operation between 480 and 528 VAC is fine, but it sits outside the CE certification range. Quote within 400 VAC for tenders and certification files; where 480 V is genuinely used, state it in the technical deviation sheet rather than glossing over it — this is exactly what a customer's acceptance engineer will check.
- **The motor side still deserves a glance** — A wide-range control supply does not make the motor wide-range. A 380 V three-phase motor on a 415 V supply sees +9.2%, which is inside the ±10% window of IEC 60034-1 and will run; but in hot, humid pond-side enclosures the thermal margin is thin, so for continuous full-load duty confirm the actual voltage once, or take one frame size up. Same logic for 240 V single-phase in Malaysia.

8.3 Different frequency — the Philippines at 60 Hz

- **A 50 Hz motor must not be connected to a 60 Hz supply** — The Philippines runs 220 V / 60 Hz nationwide, with 380 V or 480 V three-phase for industry. On 60 Hz a 50 Hz motor turns 20% faster; for impeller and fan loads shaft power rises with the square to cube of speed, so the demand reaches 1.4–1.7 times rated power — this is not 'a bit faster', it is guaranteed overload.
- **Three ways out — decide before ordering** — ① Order a 60 Hz motor; cleanest. ② Run a VFD with the frequency clamped to 50 Hz, at the cost of about 17% of output. ③ Size up one frame and run it at 60 Hz. This has to be settled at the order stage; it cannot be fixed in the field.
- **Confirm the three-phase voltage as well** — Both 380 V and 480 V three-phase exist in the Philippines — legacy US-era projects are usually 480 V, local distribution usually 380 V. Ask the customer to photograph the panel nameplate before ordering.

8.4 Running cost — 48 V DC direct drive

- **48 V DC, no inverter in the path** — A 48 V system stays below the high-voltage DC safety threshold and can run from a 48 V supply or directly from PV; size the cable for 15.6 A rated current — voltage drop shows up quickly over distance.
- **Annual cost at local tariffs** — 0.75 kW at 8 h a day, 300 days — about 1,800 kWh: Vietnam about USD 145–170; Thailand 225; Indonesia 140–160. Check the local bill.
- **DC protection is not AC protection** — DC has no zero crossing, so breaking requires a DC-rated breaker. An AC breaker is not a substitute — this is the same in every country and does not change with the market.

8.5 Climate and corrosion

- **Hot and humid** — Southern Vietnam, central Thailand, the Philippines, Indonesia, Malaysia: year-round humidity plus afternoon convective storms. Control enclosures IP55 or better, surge protection on the incoming supply; check mooring lines and floats before typhoon season.
- **Brackish and salt water** — Ca Mau, Bac Lieu, Soc Trang and Ben Tre in Vietnam, southern Thailand, coastal Indonesia: high salinity, aggressive corrosion. Shaft and frame are stainless; the motor and gearbox sit in the splash zone, so inspect oil seals and paint annually. Tell us in advance for long-term high-salinity sites.
- **Monsoon flooding** — India, Bangladesh, Myanmar: monsoon flooding with salt spray. Raise the enclosure base, keep every cable joint on the bank.

8.6 Certification and documents

- **Mandatory certification differs by country** — Vietnam CR (QCVN 4:2009/BKHCN for low-voltage equipment), Thailand TISI, Indonesia SNI, the Philippines BPS/PS or ICC, Malaysia SIRIM / ST, India BIS. Most schemes are mandatory only for certain power ranges — confirm against the local customs requirement.
- **CE and IEC reports are the passport** — Beyond the local schemes, a CE declaration and IEC test reports are the two documents customers ask for most, tenders in particular. Ask before ordering and we ship them with the goods.
- **Language of the documents** — Standard documentation is bilingual Chinese/English. Vietnamese, Thai, Indonesian or Tagalog manuals and nameplates must be requested in advance — they are typeset separately, priced separately, and extend the lead time.

8.7 Five questions before ordering

① Is the pond service three-phase or single-phase? What is the transformer rating?

② What is the measured voltage on site? — the actual reading, not the nominal figure.

③ Is the frequency 50 Hz or 60 Hz? — the Philippines must be confirmed separately.

④ Is the water fresh, brackish or salt? Roughly what salinity?

⑤ Which language do you need for the manual and the nameplate?

This table is a general judgement. Province-level differences — a rural feeder that sits low all year, an extra clearance step at a particular port, a local subsidy scheme — should be added by the local sales team to the project file. For a country not listed here, judge by the same three dimensions: voltage, frequency, certification; if in doubt, ask the factory.

9. Questions we are asked

- **Waterwheel or impeller?** — decide whether the pond needs current or oxygen. Circulation, waste concentration, shallow water and shrimp point to the waterwheel; maximum oxygen per kW, depth above 1.5 m and fish point to the impeller. They do not conflict, and larger ponds often use both.
- **How many mu does 0.75 kW cover?** — 666–3330 ㎡, one to five mu. Intensive ponds take 0.5–0.75 kW per mu; shrimp ponds at higher density go to 1 kW per mu.
- **What about rainy days?** — PV output falls with light and the controller switches to mains or a generator. A pure PV configuration should not be expected to ride out a long rainy spell; option C is the answer for the wet season.
- **Do I need batteries?** — not for daytime direct drive. For pre-dawn running you do: lead-acid is cheap but replaced every two to three years, lithium costs more and lasts five to eight. Work out the total before deciding.
- **Are two modules enough?** — at 1.3–1.5× the motor rating you need 1000–1200 W. If a module is 500–600 W, two are enough; if the module rating is lower, add modules. The factory's ≥2000 W figure differs, so confirm before ordering.
- **Can water get into the motor?** — the motor sits on the floats above the water line. The ingress rating is to be confirmed; IP54 or better is recommended for open ponds.
- **Can it run in brackish water?** — yes: support and frame are stainless. Motor and controller need an annual check in high-salinity areas; tell us in advance for long-term use so a corrosion package can be specified.
- **Is maintenance heavy?** — three things: clean the modules, clear fouling from the impellers, check the mooring. Fouling is the most common cause of a stop, more common than any electrical fault.

- **Will fouling burn out the motor?** — the controller has overload protection, so a jammed impeller trips rather than burns. Repeated tripping shortens controller life, so clear it promptly.
- **What is the warranty?** — one year on the machine from the date of dispatch; PV modules usually carry a separate power warranty on the module maker's terms; impellers and seals are wear parts and can be ordered separately.

10. Tender compliance

The tender calls for a DC48V solar waterwheel aerator with twin impellers. The TK-YC750SP-48V is the 48 V build made to that requirement: impellers, gearbox and float platform carry over from the 96 V machine, while the motor winding, controller and DC-side cable and breaker are re-selected for 48 V. The table maps each field the tender asks us to state.

Field	Tender requirement	Our response
Relation to reference	State identical, technically equivalent, or alternate design	Alternate design: the type (waterwheel, horizontal twin impeller) matches the reference, the drive is supplied at the tendered 48 V, model TK-YC750SP-48V
Drive voltage	48 V DC	48 V DC bus, inside the 60 V SELV limit
Impeller configuration	2 or 4 impellers	2 impellers, horizontal, counter-rotating
48 V motor power	State the 48 V motor power	0.75 kW permanent-magnet synchronous motor (PMSM), rated current approx. 15.6 A
Module power and array total	State module wattage and total array wattage	Module type, count and total wattage as tendered; controller input matched to the open-circuit voltage of the string
Controller and battery	State the controller and battery configuration	AC/DC hybrid controller with PV DC and mains or generator input; battery bank optional and quoted separately
Day and night operating hours	State daytime and nighttime running hours	Daytime direct drive; about 4-5 h at 4.5 peak-sun hours. Night running needs a battery bank (optional), sized to the hours required
Oxygenation performance	State the oxygenation capacity	>= 1.2 kg O2/h (factory lower limit); 666-3330 sqm per unit
Mounting and dimensions	State the mounting method and overall dimensions	Three pontoons (165 x 32.5 x 19 cm each); impeller diameter 63 cm; shore frame nominal 4700 x 2380 mm; water depth >= 0.8 m
Module warranty	State the module warranty	Per the power warranty of the module maker named in the tender
System scope	Motor, impellers, floats/frame, modules, controller, wiring and protections	Complete set: water unit + three pontoons + shore frame + modules + controller + DC breaker and SPD; battery or hybrid quoted separately
Wiring and protections	Included	DC-side breaker and SPD; AC-side breaker; DC cable and RS485 signal cable in separate trays, >= 100 mm apart
First order and expansion	10/20 sets first order, 50/100 sets expansion	10 or 20 sets can be quoted; volume lead time and container loading confirmed against the production schedule
Certification and import	To meet Vietnamese import requirements	Tariffs and certification for modules and controllers are for the buyer and forwarder to confirm; we supply the technical documents

The table above is the complete response to the tender; no further deviations apply beyond the items

listed. Supplied with the first shipment: the 48 V motor nameplate data, controller model and input window, module string layout, and the DC protection selection table.

11. Packing, delivery and commercial terms

- **Packing** — shipped in pieces: motor with gearbox, two impellers, stainless support, three pontoons, controller and accessory box; two PV modules in the module maker's original packing (crate or carton); stainless frame bundled disassembled.
- **Container loading — about 146 kg per set on a two-module build (adjust to the actual module weight where the tendered modules differ); the two modules (228×113.5×3.5 cm) and the frame (nominal 4700×2380 mm) take the most volume, so 20GP and 40HQ loading must be measured rather than assumed.**
- **Lead time** — scheduled after order confirmation; stock position advised separately.
- **Port of loading** — Nansha or Yantian, China.
- **Documents supplied** — installation and operation instructions in Chinese and English; a Vietnamese version can be arranged if requested in advance.
- **Not included** — battery bank, extension cable, mooring ropes, concrete base or ground anchors, installation service.

12. Contact

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Specifications are subject to change without notice as the product is improved; confirm current data before tendering or volume orders.