

INVT Solar Pump Industry Product and Solution

Shenzhen INVT Electric Co., Ltd.

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Achieve Customers | Performance Orientation | Open and Win-Win | Striving for Innovation



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Product Profile



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Product profile



Profile

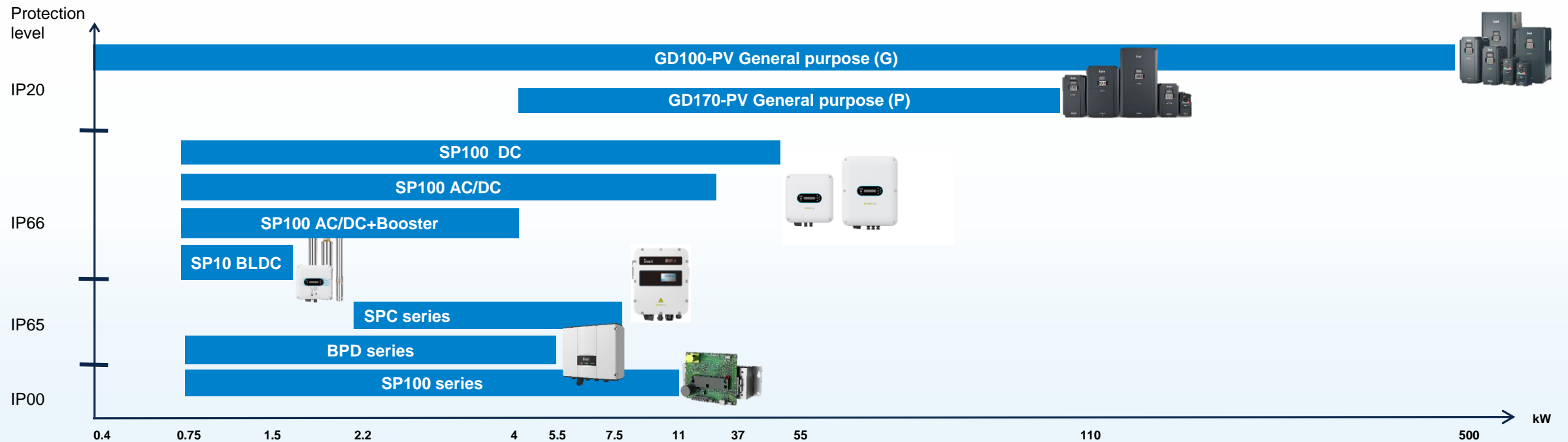
SP100

GD170

Solar pump product line



Product family



SP100 Series Solar Pump Controller



SP100 market positioning



New generation



Intelligent



High IP degree



SP100 Series Solar Pump Controller



Why IP66

Moisture



Sand / dust

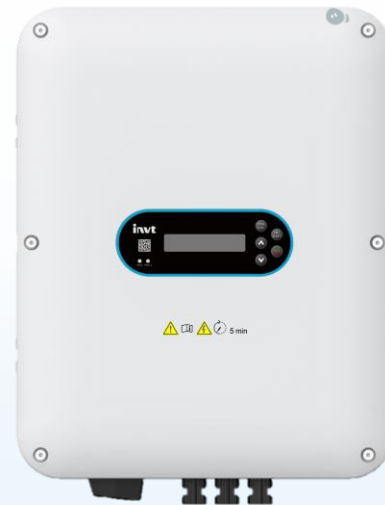


Insects
build nests



Reliability

Why IP66



Costs



Panel



Combiner box, busbar, fuse



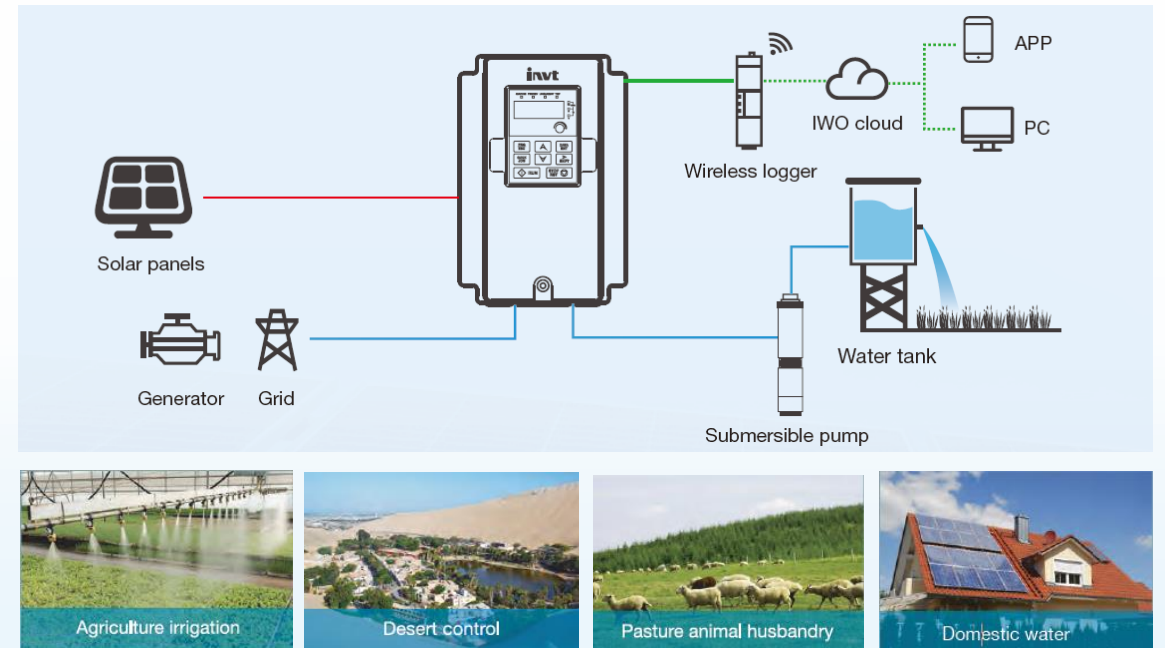
ACB, SPD, output reactor

SP100 Series Solar Pump Controller



Social—Green and low-carbon

The new generation SP100 intelligent high IP degree solar water pump controller uses solar energy as energy and is widely used in agricultural irrigation, animal husbandry, domestic water use, desert control and other occasions. In the process of energy conversion, we have been constantly trying to improve energy utilization efficiency. In addition, we use environmentally friendly and UV resistant materials in equipment production, which do not deform, discolor, or become brittle when used outdoors for a long time. Using high-quality products and services to promote agricultural development and contribute to a low-carbon future!



SP100 Series Solar Pump Controller



Strong——Strong adaptability

Demand

- Solar power not sufficient to meet water demand
- High cost of diesel power generation

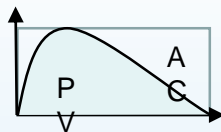
- Daily water flow can not meet the demand
- Can not support more panels in strings

- Controller far from the water pump, high output harmonic content
- Low groundwater level and deep well depth

- Constant pressure + MPPT

Advantages

AC/DC intelligent complementary



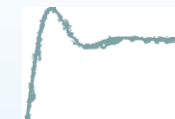
Standard DC 900V input

900V

Long distance



Solar PID constant pressure



Value

- Solar power in priority, intelligent complementarity of AC energy
- AC/DC energy display

- More efficient PV panels configuration solutions
- Start earlier and shut down later

- Support motor cable length up to 200 meters without output reactor

- Built in PID function, achieving constant pressure water supply based on MPPT

SP100 Series Solar Pump Controller



Saving——Save cost and time

Advantages



**Protection level IP66
Anti-theft design**

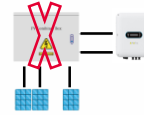
Value

- Direct outdoor installation without additional cabinets
- Fearless of sandstorm and rainstorm



Built in DC switch

- Users no need to install ACBs
- Power on and off devices more convenient and safe



Built-in combiner box(Partial ratings)

- Built in fuse and SPD
- Below 18.5kw no need combiner box
- Reduce user system costs



Aviation plug terminal

- No need to open the cover, more convenient wiring
- Reduce human risk

SP100 Series Solar Pump Controller



Smart——Smart IoT



Advantages

- Built in multiple IoT solutions
- 4G+Bluetooth
- WIFI+Bluetooth
- Bluetooth

- Multilingual LCD screen display (English, French, Portuguese, Spanish)
- Multilingual large screen LCD display (under development)

- Parameter upload and download
- Quick debugging mode

- Timed start stop function

Value

- Simplify APN settings, mobile phone updated settings
- Status monitoring
- Remote control
- Remote OTA

- Extremely simplified operation
- More comprehensive and clear display of device status information

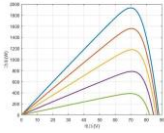
- Improve engineer debugging efficiency and reduce error risk

- Automatically run or stop according to the setting time, unattended.

SP100 Series Solar Pump Controller



Stable——Stable quality and excellent performance



Advantages

- MPPT efficiency $\geq 99\%$
- MPPT rapid response and tracking

- Fully validated motor control algorithm

- High protection level design
- Industrial grade parts

- EU authoritative CE certification

Value

- Greater water output
- Prevent water hammer effect and protect pipelines

- Stable performance
- Capable of driving PM motors, AM motors, single-phase motors, BLDC motors, etc

- Special design for solar water pumps
- Adapt to harsh outdoor environments such as high temperature, low temperature, wind, sand, and water vapor

- Stable and reliable

GD170-PV Series Solar Pump Controller



GD170-PV profile

- GD170-PV is the new generation of solar pump controller. It has compact structure and outstanding performance in one.
- The advanced MPPT function makes sure providing the most energy efficient operation of the pump, and rich protection functions ensure the smooth and safe operation.
- In summary, it provides a excellent balance of Easy Installation, Easy operation, Advanced pump-control capacity.



Compact and powerful



Advanced MPPT algorithms



Effective protection function



Remote monitor

GD170-PV Series Solar Pump Controller



Specification

Type Selection

GD170 - 5R5 - 4 - PV
① ② ③ ④

No.	Sign	Description	Remarks
①	GD170	Product abbreviation	GD170
②	5R5	Power range	5R5: 5.5kW
③	4	Voltage degree	4: AC 3PH 380V (-15%)~440(+10%)
④	PV	Industrial code	PV stands for solar pump.

Product Specification

DC input

Max DC voltage(V)	800
Start voltage(V)	300
Min. work voltage(V)	250
Recommended MPPT voltage(V)	300~750
Recommended input work voltage(V)	550

AC input

Input voltage(Vac)	380V(-15%)~440(+10%)
Input frequency(Hz)	47~63

AC output

Output voltage(Vac)	0-input voltage
Output frequency(Hz)	0-400

Control performance

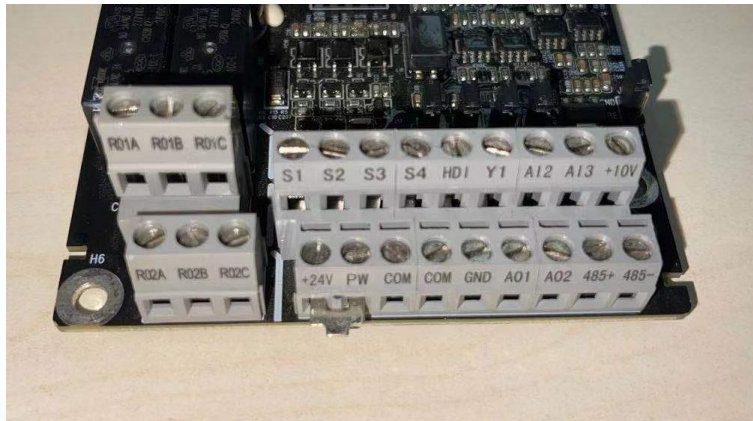
Motor type	Asynchronous and synchronous
Overload capability	120% of rated current: 1 minute 150% of rated current: 10 seconds

GD170-PV Series Solar Pump Controller



Comparison

GD100-PV



GD170-PV



Automatically RUN
Remote GPRS Monitoring
Water Level Sensor
ON/OFF Switch

150% / 60s
Rated Current

120% / 60s
Rated Current

GD170-PV Series Solar Pump Controller



Dimension Comparison

Optimized dimension for ease of use and installation

Model	Dimension
GD100-0R7G-4-PV	80*185*140.5
GD100-1R5G-4-PV	80*185*140.5
GD100-2R2G-4-PV	80*185*140.5
GD100-004G-4-PV	146*256*167
GD100-5R5G-4-PV	146*256*167
GD100-7R5G-4-PV	170*320*196.3
GD100-011G-4-PV	170*320*196.3
GD100-015G-4-PV	170*320*196.3
GD100-018G-4-PV	200*340.6*184.5
GD100-022G-4-PV	200*340.6*184.5
GD100-030G-4-PV	250*400*202
GD100-037G-4-PV	250*400*202
GD100-045G-4-PV	282*560*238

Model	Dimension
GD170-0R7G-4-PV	80*185*143.5
GD170-1R5G-4-PV	80*185*143.5
GD170-2R2-4-PV	80*185*143.5
GD170-004-4-PV	80*185*143.5
GD170-5R5-4-PV	146*256*166.5
GD170-7R5-4-PV	146*256*166.5
GD170-011-4-PV	170*320*196
GD170-015-4-PV	170*320*196
GD170-018-4-PV	170*320*196
GD170-022-4-PV	200*340.6*183.3
GD170-030-4-PV	200*340.6*183.3
GD170-037-4-PV	250*400*202
GD170-045-4-PV	250*400*202

GD170-PV Series Solar Pump Controller



Overall comparison

Item	GD170-PV	GD100-PV
Power Range	-4: 2.2-45KW -2:2.2KW	-SS2: 0.4-2.2KW -S2: 0.4-2.2KW -2: 1.5-7.5KW -4: 0.7-500KW
VFD Type	P TYPE	G TYPE
Control Board	ECO design: 3DI;485;1RO	4DI;2RO;485;2AI
Accessories	GPRS	GPRS,BOOST,Auto switch
Overload Capacibility	120% for 1 minute;	150% for 1 minute
Others	4kW,7.5kW,18.5kW,30kW,45kW dimension compare to GD100PV is smaller one level	/
Certificate	IEC62109	CE

In summary: GD170 retain some essential features terminal functions, make it easier to use for end user. High-end functions can be selected according to needs.

Accessories & Solution

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Accessories

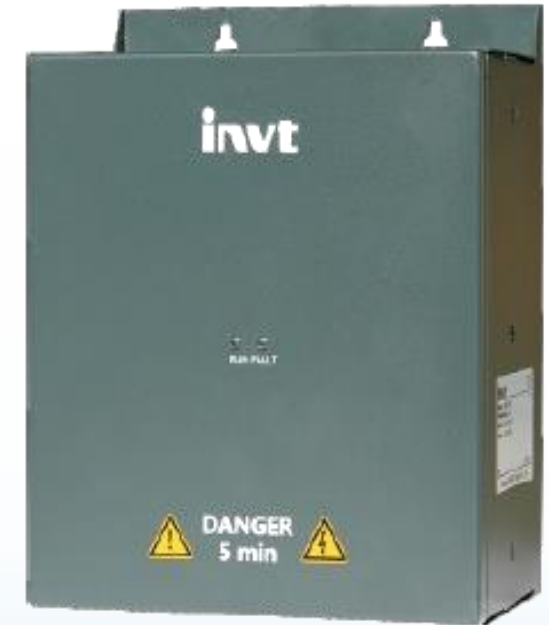
IoT solution

Others

Booster module (GD100-PV)

Booster module: Saving panels.

Model	PP100-3R2-PV
Input	
Max input power (kW)	3.2
Max. DC voltage (V)	600
Start-up voltage (V)	80
Min working voltage (V)	70
Max. input current (A)	12
Output	
Output voltage (V)	220V inverter: 350 380V inverter: 570



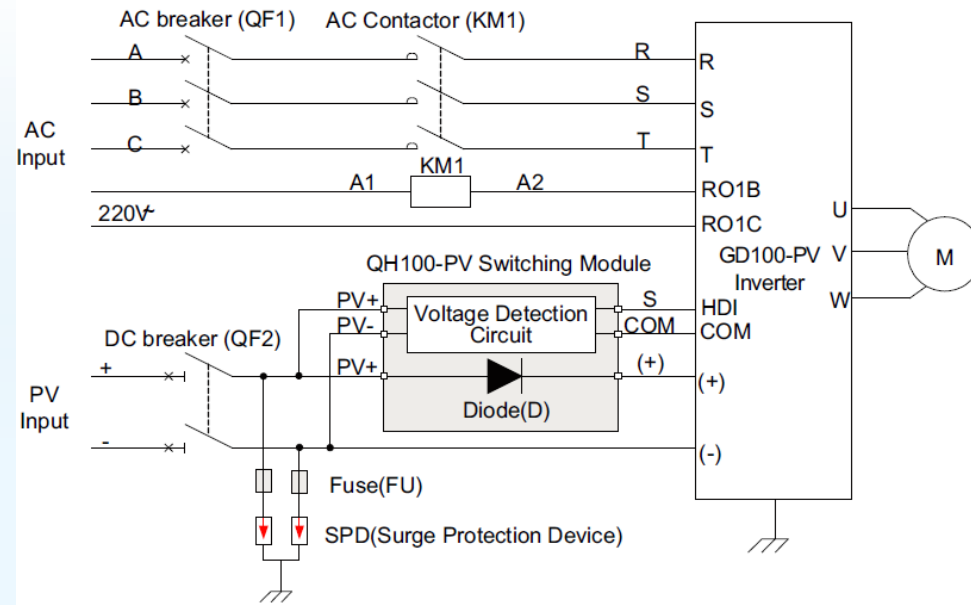
Pump	Number of solar panels		
	With boost module	Without boost module	Reduced
220V 0.4kW	4*1 /250W	11*1 /250W	7
220V 0.75kW	5*1 /250W	11*1 /250W	6
220V 1.5kW	8*1 /250W	11*1 /250W	3
380V 0.75kW	5*1 /250W	18*1 /250W	13
380V 1.5kW	8*1 /250W	18*1 /250W	10
380V 2.2kW	13*1 /250W	18*1 /250W	5

Auto-switching module(GD100-PV)

Part no.	Description	Power range
90001-01626	GD100-PV;QH100-320A-4-PV(F);380V;320A;RoHS	75-160KW
90001-01625	GD100-PV;QH100-160A-4-PV(F);380V;160A;RoHS	45-55KW
90020-00094	GD100-PV;QH100-110A-4-PV(F);380V;110A;18.5~37kW	18.5-37KW
90001-01336	GD100-PV;QH100-055A-4-PV(F);380V; 55A ; 4-15KW	4-15KW



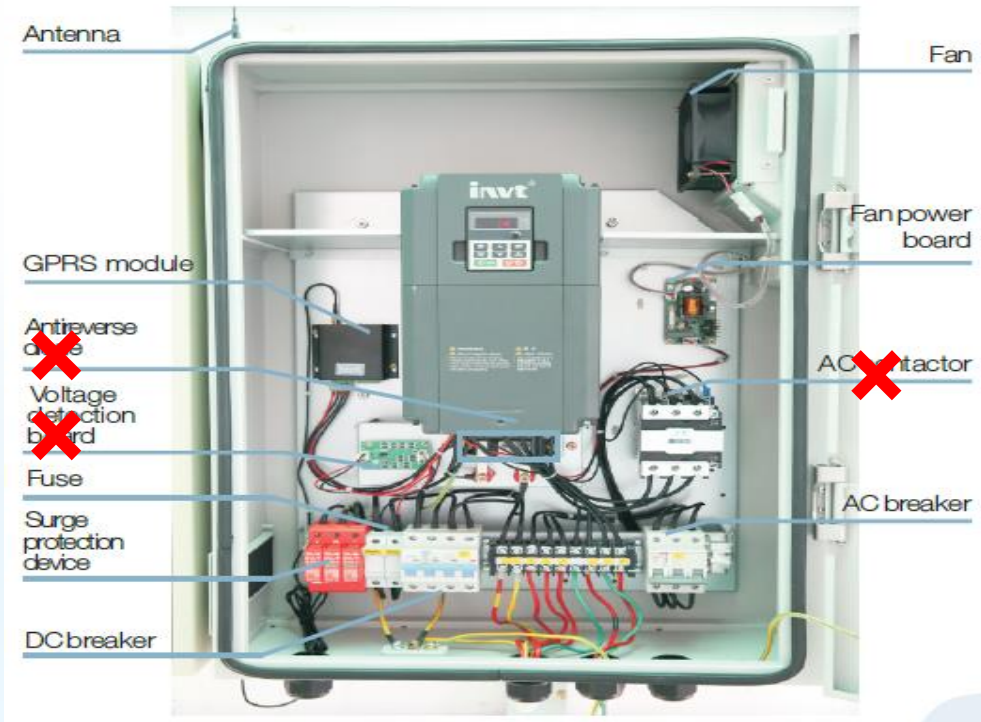
24-hour uninterrupted operation



Accessories



IP54 cabinet



If don't need auto switch



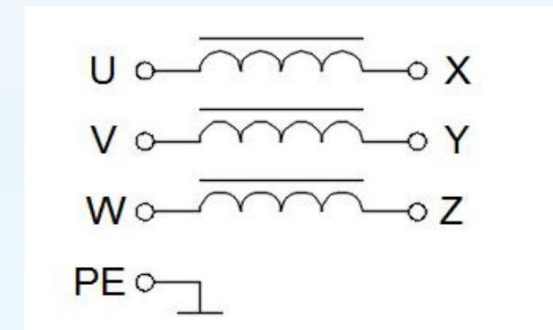
GD100-015G-45-PV-A9

Output reactor (upto 500m)

- Reduce dv/dt voltage
- Reduct the intererence
- Protect motor windings, prolong motor lifetime

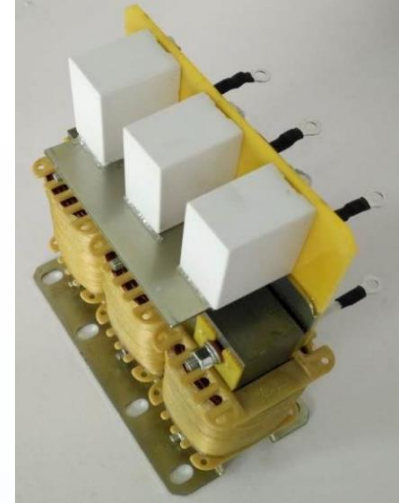


1% Voltage drop Model no.	Current (A)	Inductance (mH) 50-150m	Order no.	Inductance (mH) 150-500m	5% Voltage drop Model no.	Order no.
OCL2-1R5-4	3.7A	1.4	25006-00117	7	OCL2-2R2-4-5%	25006-00677
OCL2-2R2-4	5A	1	25006-00133	5		
OCL2-004-4	10A	0.7	25006-00052	3.5	OCL2-5R5-4-5%	25006-00717
OCL2-5R5-4	15A	0.47	25006-00069	2.35		
OCL2-7R5-4	20	0.35	25006-00076	1.75	OCL2-7R5-4-5%	25006-00515
OCL2-011-4	30	0.23	25006-00088	1.15	OCL2-015-4-5%	25006-00516
OCL2-015-4	40	0.18	25006-00104	0.9		
OCL2-018-4	50	0.14	25006-00108	0.7	OCL2-022-4-5%	25006-00695
OCL2-022-4	60	0.12	25006-00123	0.6		
OCL2-030-4	80	0.087	25006-00147	0.435	OCL2-037-4-5%	25006-00518
OCL2-037-4	90	0.078	25006-00147	0.39		
OCL2-045-4	120	0.058	25006-00056	0.29	OCL2-055-4-5%	25006-00725
OCL2-055-4	150	0.047	25006-00065	0.23	OCL2-055-4-5%	25006-00725
OCL2-075-4	200	0.035	25006-00099	0.175	OCL2-075-4-5%	25006-00694

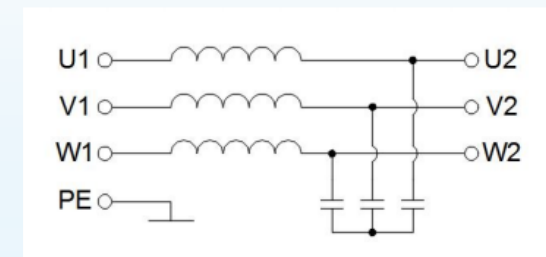


Sinewave filter (more than 500m)

- Smooth output waveform, eliminate voltage spikes
- Protecting motor and cable insulation
- Improve system reliability
- Ripple voltage less than 5%





Order number	Specifications	Model	Rated current (A)
26003-00015	Sine filter;380V;15A;4mH;18.84V;250*200*270;18kg	OSF15A40004-2	15
26003-00016	Sine filter;380V;20A;3mH;18.84V;250*220*280;22kg	OSF20A30004-2	20
26003-00017	Sine filter;380V;30A;2mH;18.84V;250*240*280;22kg	OSF30A20004-2	30
26003-00018	Sine filter;380V;40A;1.4mH;17.58V;250*240*280;26kg	OSF40A14004-2	40
26003-00012	Sine filter;380V;50A;1.2mH;18.8V;290*215*445mm	OSF50A12004-2	50
26003-00019	Sine filter;380V;60A;1mH;18.84V;290*250*290;31kg	OSF60A10004-2	60
26003-00020	Sine filter;380V;80A;0.8mH;20.1V;320*270*320;45kg	OSF80A08004-2	80
26003-00014	Sine filter;380V;90A;0.65mH;18.4V;320*400*300mm	OSF90A06504-2	90
26003-00021	Sine filter;380V;120A;0.52mH;19.6V;320*355*280mm;60kg	OSF120A05204-2	120
26003-00022	Sine filter;380V;150A;0.45mH;21.2V;520*270*350mm;85kg	OSF150A04504-2	150



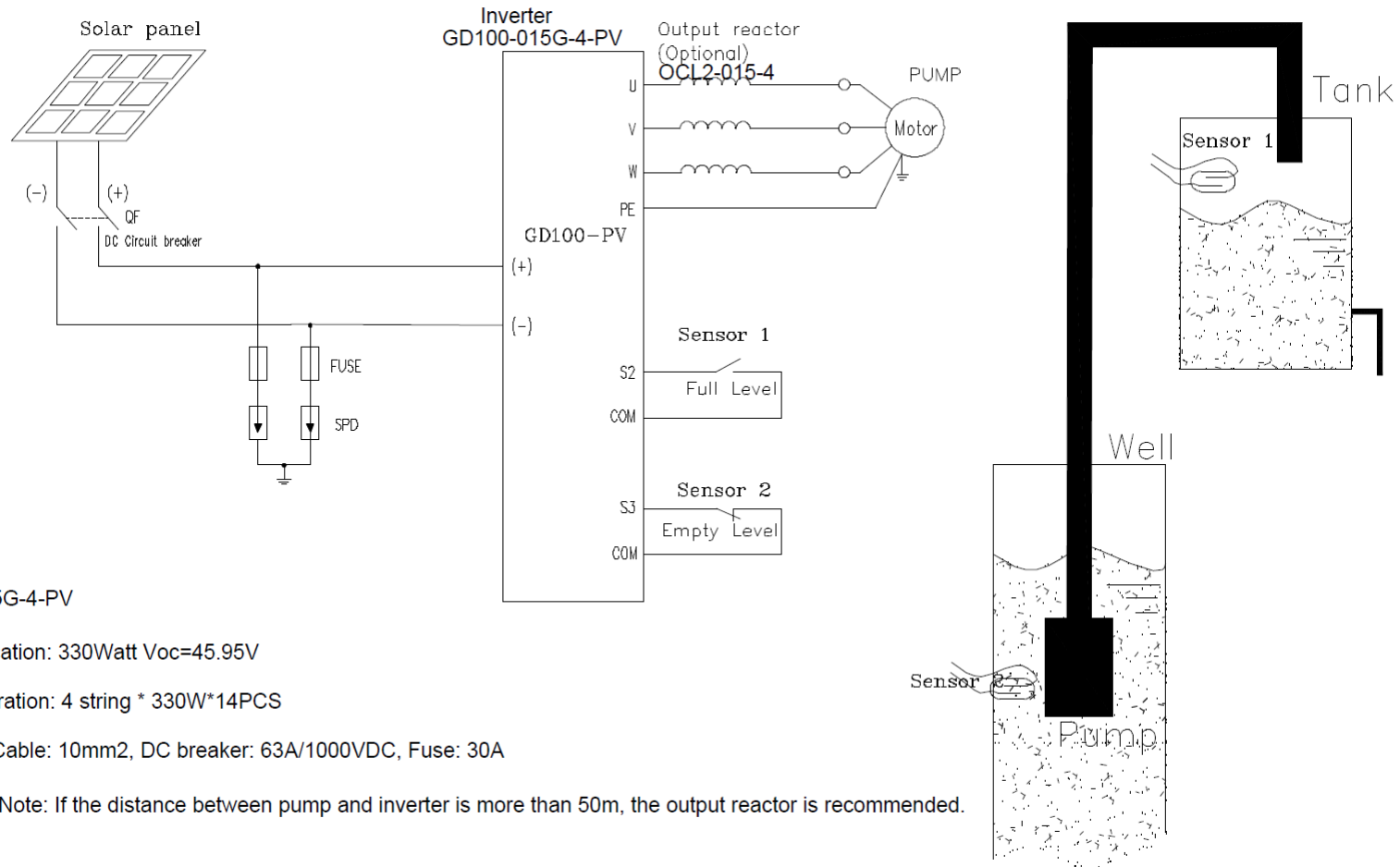
IOT—4G/Wifi



IOT—Model no. and function

Type	Model no.	IP Degree	Part no.	Photo	Controller model
4G	ICA400-06N-CN	IP65	11095-00030		SP100
WIFI	ICA100-06N		11095-00030		
4G	ICA400-02-CN ICA400-02-LA ICA400-02-EU	IP20	11095-00004 11095-00013 11095-00012		GD100-PV GD170-PV
WIFI	ICA100-02		11095-00008		

PV input only



Solutions:

GD100-015G-4-PV

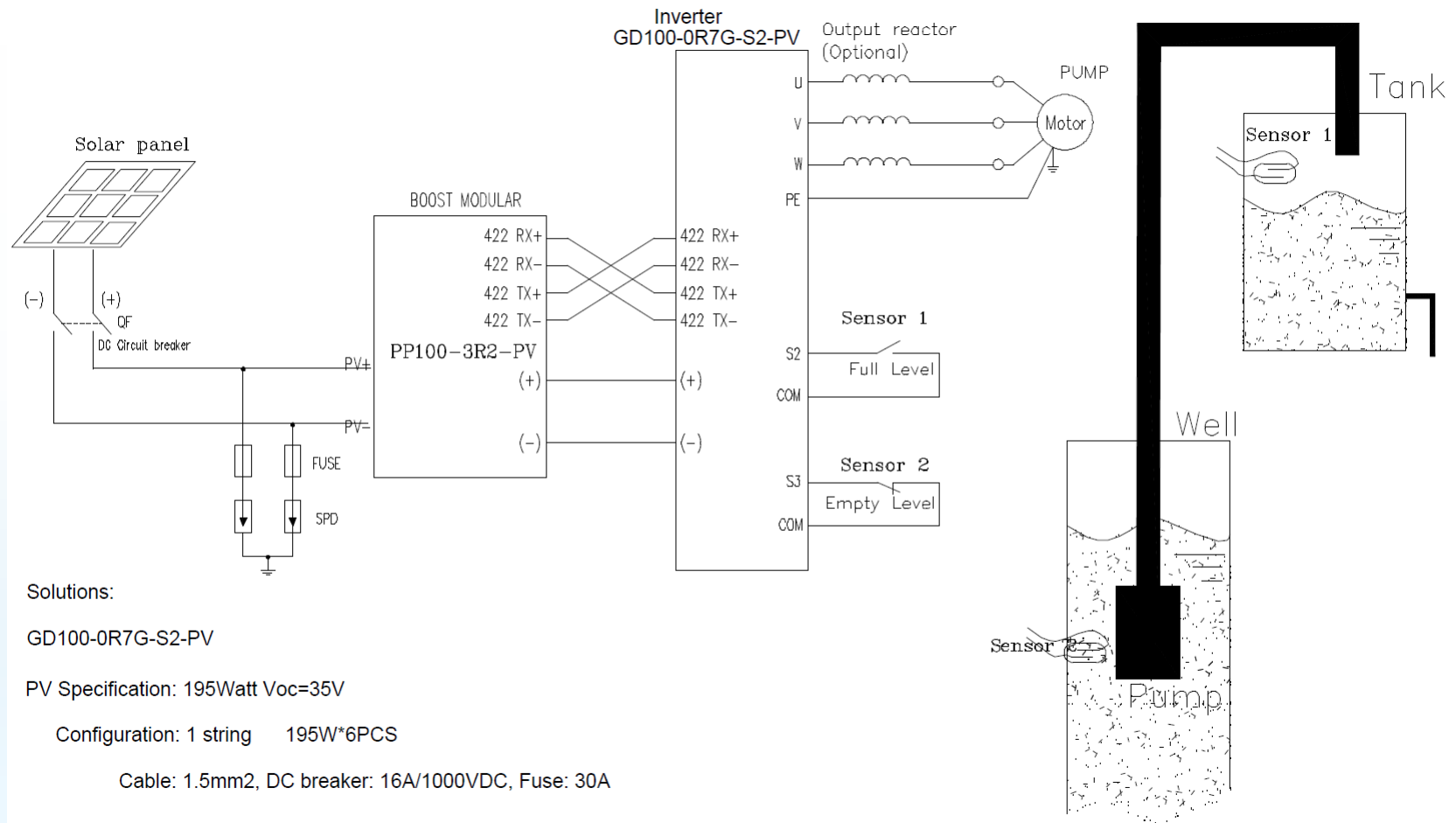
PV Specification: 330Watt Voc=45.95V

Configuration: 4 string * 330W*14PCS

Cable: 10mm², DC breaker: 63A/1000VDC, Fuse: 30A

Note: If the distance between pump and inverter is more than 50m, the output reactor is recommended.

PV input + Booster



Solutions:

GD100-0R7G-S2-PV

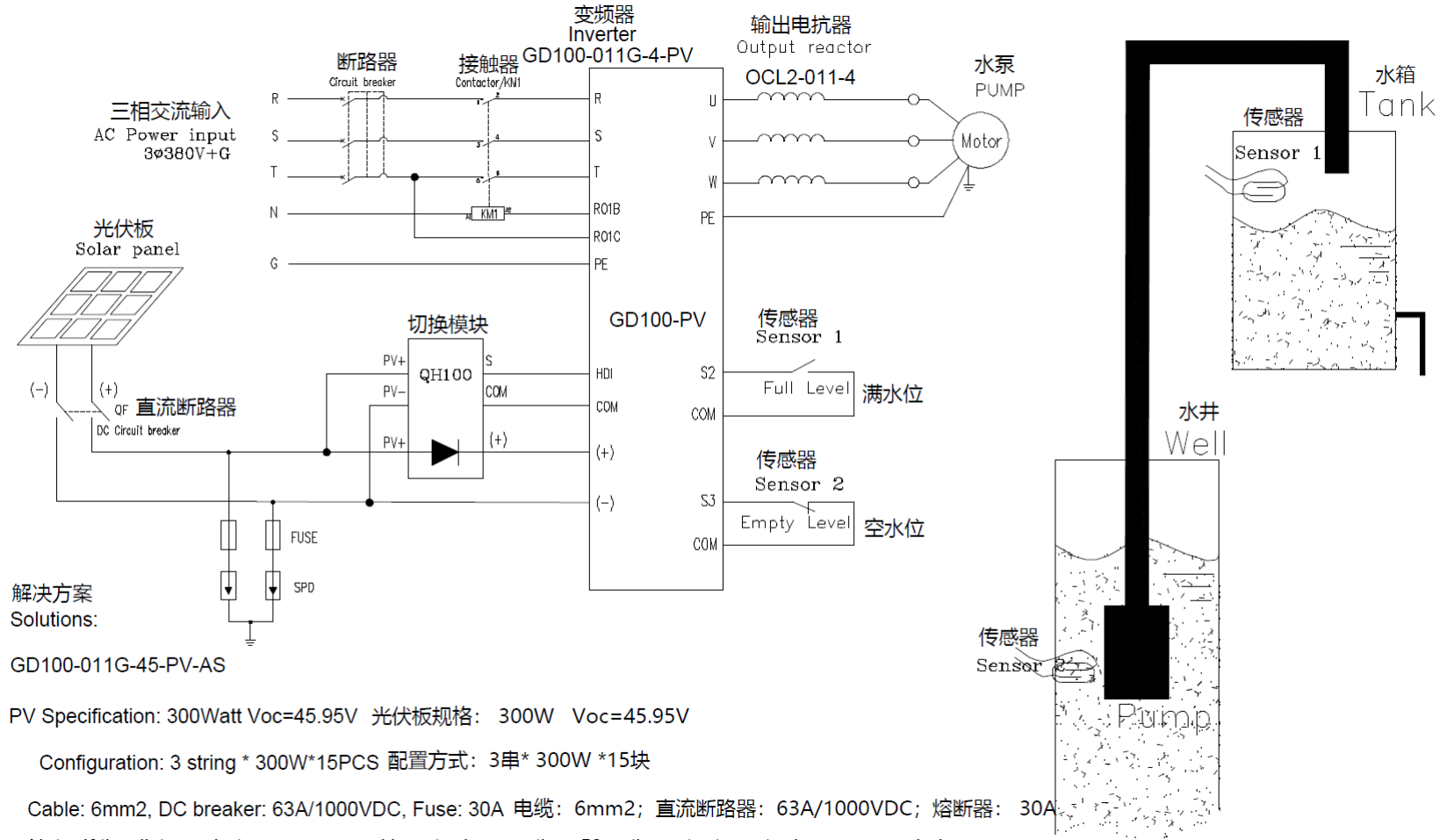
PV Specification: 195Watt Voc=35V

Configuration: 1 string 195W*6PCS

Cable: 1.5mm², DC breaker: 16A/1000VDC, Fuse: 30A

Note: If the distance between pump and inverter is more than 50m, the output reactor is recommended.

PV + AC input + Auto switching



解决方案
Solutions:

GD100-011G-45-PV-AS

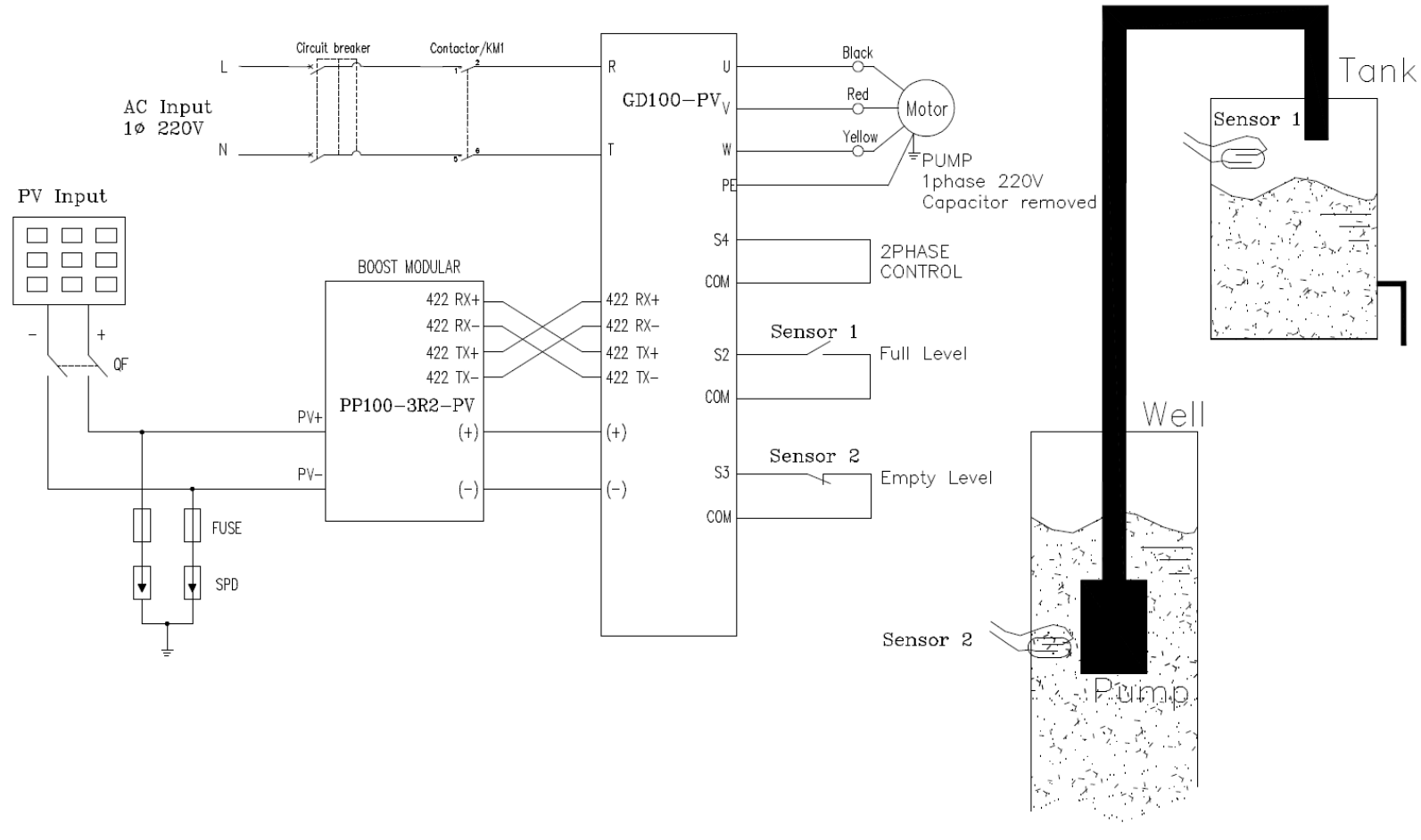
PV Specification: 300Watt Voc=45.95V 光伏板规格: 300W Voc=45.95V

Configuration: 3 string * 300W*15PCS 配置方式: 3串* 300W *15块

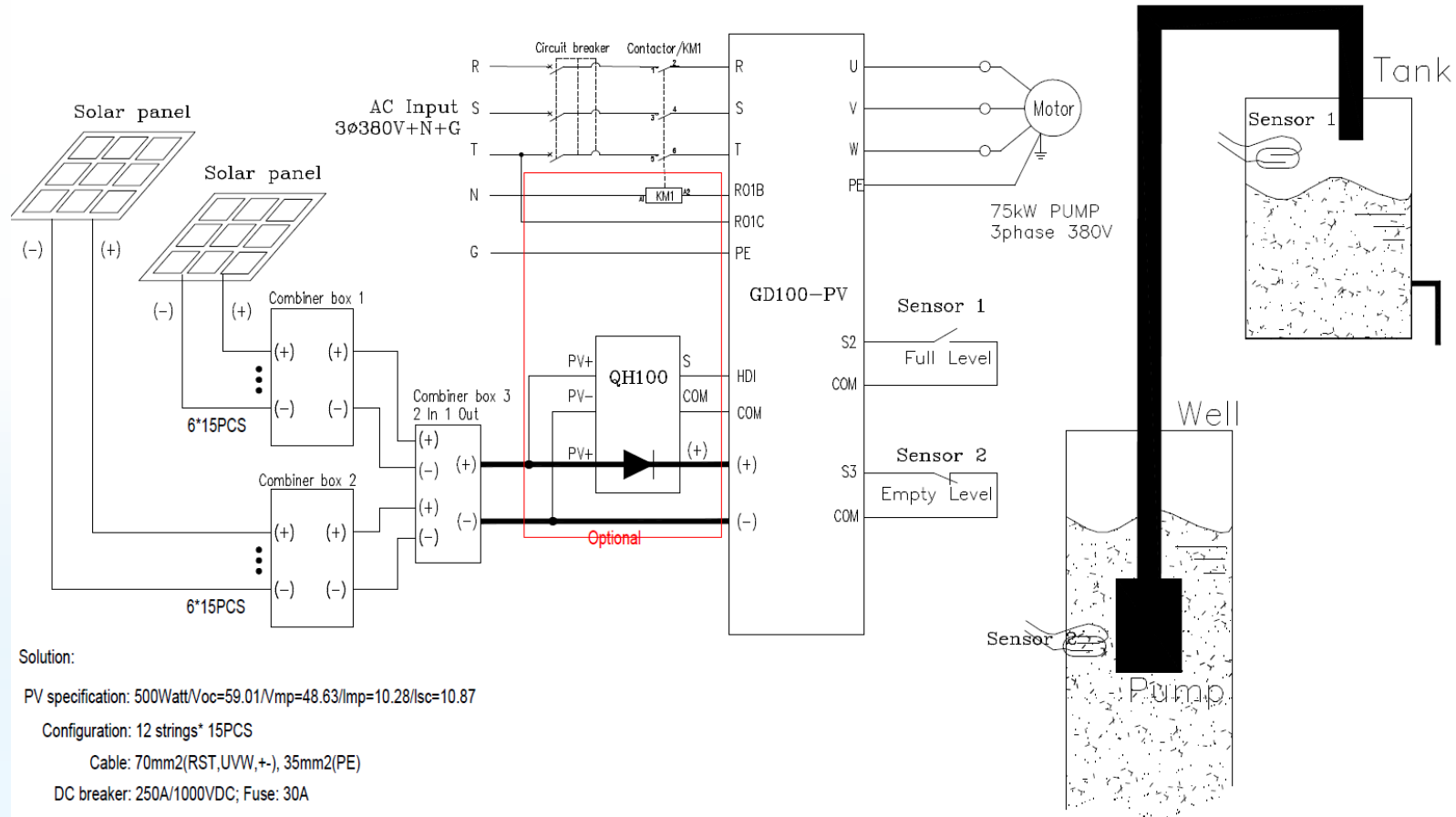
Cable: 6mm², DC breaker: 63A/1000VDC, Fuse: 30A 电缆: 6mm²; 直流断路器: 63A/1000VDC; 熔断器: 30A

Note: If the distance between pump and inverter is more than 50m, the output reactor is recommended.

PV + AC input + Booster + Single phase motor



PV (Combiner box) + AC input + Auto switching



Solution:

PV specification: 500Watt/Voc=59.01V/mp=48.63/Imp=10.28/lsc=10.87

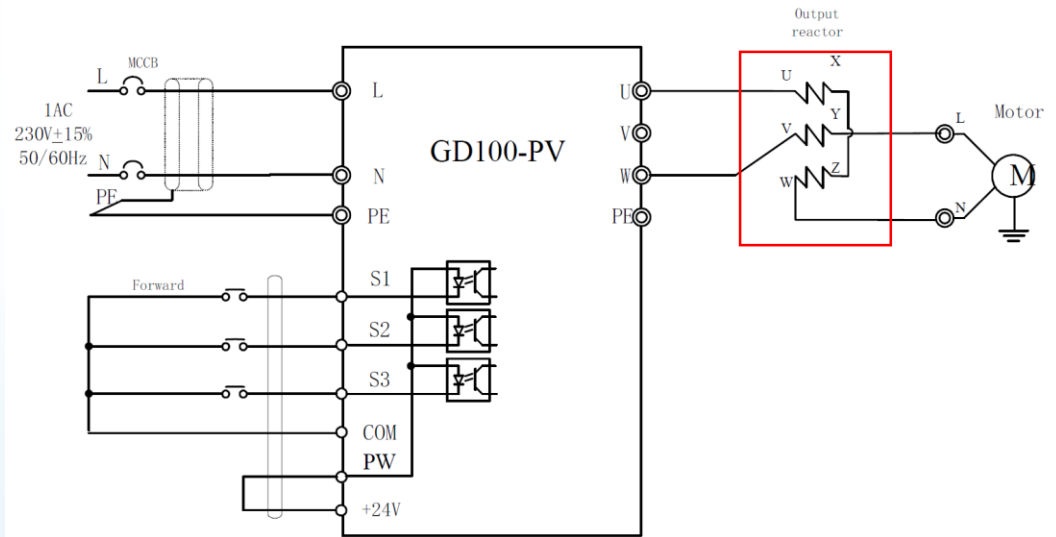
Configuration: 12 strings* 15PCS

Cable: 70mm2(RST,U,V,W,+), 35mm2(PE)

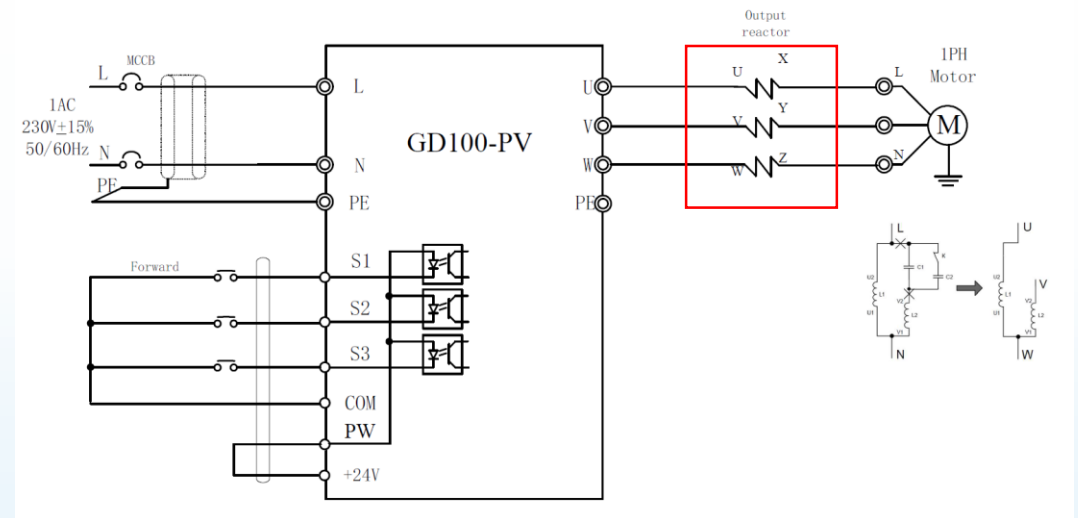
DC breaker: 250A/1000VDC; Fuse: 30A

Note: If the distance between pump and inverter is more than 50m, the output reactor is recommended.

Single phase motor + Output reactor

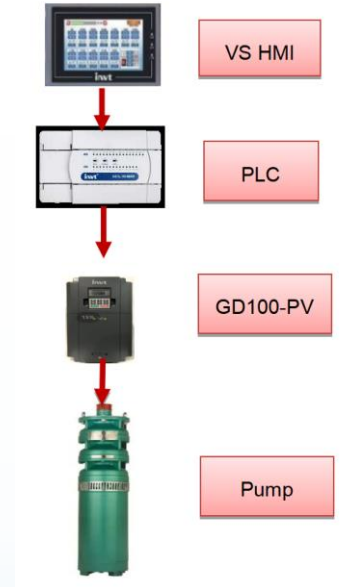


Motor with Capacitors



Motor without Capacitors

Solar water distribution system



Product	Model No.	Qty
PLC	IVC1L-1614MAT	1
HMI	VS-070HE-1	1
VFD	GD100-1R5G-4-PV	1
Analogmodule	IVC1L-4AD	2

Advantage:

- Automatically pump water meet the demand, and auto rectifier the hardness
- Friendly interface: HMI display the system status: pressure, flow, head, water level
- Modbus communciation, easy and fast to get the feedback singal.

A photograph of a modern building facade with a grid of light-colored tiles. The building features large windows with green-tinted glass. The sky is a clear, bright blue. The INVT logo is prominently displayed on the upper left side of the building.

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FAQ

Rated parameters

- **U1 Max DC voltage:** $U1 \leq$ DC bus capacitors working voltage
- **U2 Lowest working voltage:** SMPS starting voltage $\leq U2 \leq$ Inverter start-up voltage
- **U3 Start-up voltage:** $U3 > U2$
 PV: $U3 = U2 + 50$; BPD: $U3 = U2 + 20$ (1.5~4kW 220V)/ $U3 = U2 + 40$ (2.2~5.5kW 380V)
- **U4 Recommended Voc:** $U4$, $U4(\min) = U3$, $U4(\max) < U1$
- **U5 Recommended Vmpp:** DC bus voltage that inverter can run at 50Hz.

Model	-SS2	-S2	-2	- 4
AC input voltage(V)	220 (-15%)–240 (+10%) (1PH)		220(-15%)–240(+10%) (3PH)	380(-15%)–440(+10%) (3PH)
U1: Max DC voltage(V)		440		800
U3: Start-up voltage(V)		200		300
U2: Lowest working voltage(V)		150		250
U4: Recommended Voc (V)		200~400		300~750
U5: Recommended Vmpp(V)		330		550

Controller rating and parts selection

- 1, Motor parameters (single phase motor 1.4 times)
- 2, Environment temperature, altitude
- 3, General parts: reactors, sine-wave filter
- 4, Booster module
- 5, IP degree
- 6, Remote monitor(GPRS)
- 7, Auto-switching



PV panel configuration

Solar pumping inverter model	Open-circuit voltage degree of solar module			
	37±1V		45±1V	
	Module power±5Wp	Modules per string * strings	Module power±5Wp	Modules per string * strings
GD100-0R4G-SS2-PV	250	11*1	300	9*1
GD100-0R7G-SS2-PV	250	11*1	300	9*1
GD100-1R5G-SS2-PV	250	11*1	300	9*1
GD100-2R2G-SS2-PV	250	11*1	300	9*1
GD100-0R4G-S2-PV	250	11*1	300	9*1
GD100-0R7G-S2-PV	250	11*1	300	9*1
GD100-1R5G-S2-PV	250	11*1	300	9*1
GD100-2R2G-S2-PV	250	11*1	300	9*1
GD100-1R5G-2-PV	250	11*1	300	9*1
GD100-2R2G-2-PV	250	11*1	300	9*1
GD100-004G-2-PV	250	11*2	300	9*2
GD100-5R5G-2-PV	250	11*3	300	9*3
GD100-7R5G-2-PV	250	11*4	300	9*4
GD100-0R7G-4-PV	250	18*1	300	15*1
GD100-1R5G-4-PV	250	18*1	300	15*1
GD100-2R2G-4-PV	250	18*1	300	15*1
GD100-004G-4-PV	250	20*1	300	18*1
GD100-5R5G-4-PV	250	18*2	300	15*2
GD100-7R5G-4-PV	250	18*2	300	15*2
GD100-011G-4-PV	250	18*3	300	15*3
GD100-015G-4-PV	250	18*4	300	15*4
GD100-018G-4-PV	250	18*5	300	15*5
GD100-022G-4-PV	250	18*6	300	15*6
GD100-030G-4-PV	250	18*8	300	15*8
GD100-037G-4-PV	250	18*9	300	15*9
GD100-045G-4-PV	250	18*11	300	15*11
GD100-055G-4-PV	250	18*14	300	15*14
GD100-075G-4-PV	250	18*19	300	15*19

- -4: Panel pcs $n_s \leq 21(37V)$, $V_{oc} = 21 * 37 = 777V$
- -4: 400V capacitor used, 2 nos in serial.
- PV panels calculation:

$$n = P_m / \eta_m / \eta_{VFD} / \eta_{PV} / P_0$$

$$n_p = \text{roundup}(n / n_s)$$

P_m : Motor power

η_m : Motor Effi

η_{VFD} : VFDeffi

η_{PV} : Matrixeffi

P_0 : Panel power

n_p : Strings

n_s : Pcs / string

Note:

$$1 / \eta_m / \eta_{VFD} / \eta_{PV} = 1.2$$

PV panel configuration

- Example: GD100-015G-4-PV Panel spec: Pmax=250W Voc=37V, $1 / \eta_m / \eta_{VFD} / \eta_{PV} = 1.2$

$$n = P_m / \eta_m / \eta_{VFD} / \eta_{PV} / P_0$$

After calculation: n=72

$$n_p = \text{roundup}(n / n_s)$$

After calculation :

$$n_p = \text{roundup}(72 / 21) = 4$$

$$n_s = 72 / 4 = 18$$

Solar pumping inverter model	Open-circuit voltage degree of solar module			
	37±1V		45±1V	
	Module power±5Wp	Modules per string * strings	Module power±5Wp	Modules per string * strings
GD100-0R4G-SS2-PV	250	11*1	300	9*1
GD100-0R7G-SS2-PV	250	11*1	300	9*1
GD100-1R5G-SS2-PV	250	11*1	300	9*1
GD100-2R2G-SS2-PV	250	11*1	300	9*1
GD100-0R4G-S2-PV	250	11*1	300	9*1
GD100-0R7G-S2-PV	250	11*1	300	9*1
GD100-1R5G-S2-PV	250	11*1	300	9*1
GD100-2R2G-S2-PV	250	11*1	300	9*1
GD100-1R5G-2-PV	250	11*1	300	9*1
GD100-2R2G-2-PV	250	11*1	300	9*1
GD100-004G-2-PV	250	11*2	300	9*2
GD100-5R5G-2-PV	250	11*3	300	9*3
GD100-7R5G-2-PV	250	11*4	300	9*4
GD100-0R7G-4-PV	250	18*1	300	15*1
GD100-1R5G-4-PV	250	18*1	300	15*1
GD100-2R2G-4-PV	250	18*1	300	15*1
GD100-004G-4-PV	250	20*1	300	16*1
GD100-5R5G-4-PV	250	18*2	300	15*2
GD100-7R5G-4-PV	250	18*2	300	15*2
GD100-011G-4-PV	250	18*3	300	15*3
GD100-015G-4-PV	250	18*4	300	15*4
GD100-018G-4-PV	250	18*5	300	15*5
GD100-022G-4-PV	250	18*6	300	15*6
GD100-030G-4-PV	250	18*8	300	15*8
GD100-037G-4-PV	250	18*9	300	15*9
GD100-045G-4-PV	250	18*11	300	15*11
GD100-055G-4-PV	250	18*14	300	15*14
GD100-075G-4-PV	250	18*19	300	15*19

Max DC input current calculation

$$I_{DC,AVG,n} = P_M / \eta_M / \eta_{VFD} / V_{bus}$$

$$I_{DC,max} = I_{DC,AVG,n} \times K_1$$

DC breaker calculation:

$$I_{DC,Switch} = I_{DC,AVG,n} \times K_2$$

Protection diode selection can refer to the index of

$I_{DC,Switch}$

P_m : Motorpower

η_m : MotorEffi

η_{VFD} : VFDeffi

V_{bus} : RatedDCbusVoltage

$I_{DC,max}$: MaxInputDCcurr

$I_{DC,AVG,n}$: RatedDCbusCurr

K_1 : OLcoeffi = 1.1

K_2 : SeleccionMargin = 1.2

Max DC input current calculation

■ Example: GD100-022G-4-PV DC breaker and protection diode

$$I_{DC,AVG,n} = 22000 / 0.905 / 0.95 / 540 = 47.4A$$

$$I_{DC,max} = 47.4 \times 1.1 = 52.1A$$

$$I_{DC,Switch} = 47.4 \times 1.2 = 56.9A$$

※In manual $I_{DC,max} = 60A$, roundup applied.

※DC breaker can select 63A, voltage 1000VDC

※Protection diode should be $\geq 56.9A$, can select 100A, 110A

Notes:

Diode spec: 25/35/100/110/160/150/200 (56/57/90/95/207/248)

Breaker spec: 50/63/100/125/160/225/250 (38/40/65/80)

Diesel generator power supply

Pay attention: need to wait for the diesel generator to run stably before connecting to the inverter, otherwise it may burn out the inverter.

Diesel generator/AC grid + PV

A) Booster module

PV connected to the booster module and AC connected to the GD100-PV, PV and AC didn't work at the same time.

Booster module output 350/570VDC, it's bigger than the DC voltage that converter from AC($380 \times 1.414 = 537V$)

B) Switching module

AC is controlled by the contactor, when contactor acted, PV and AC power work at the same time.

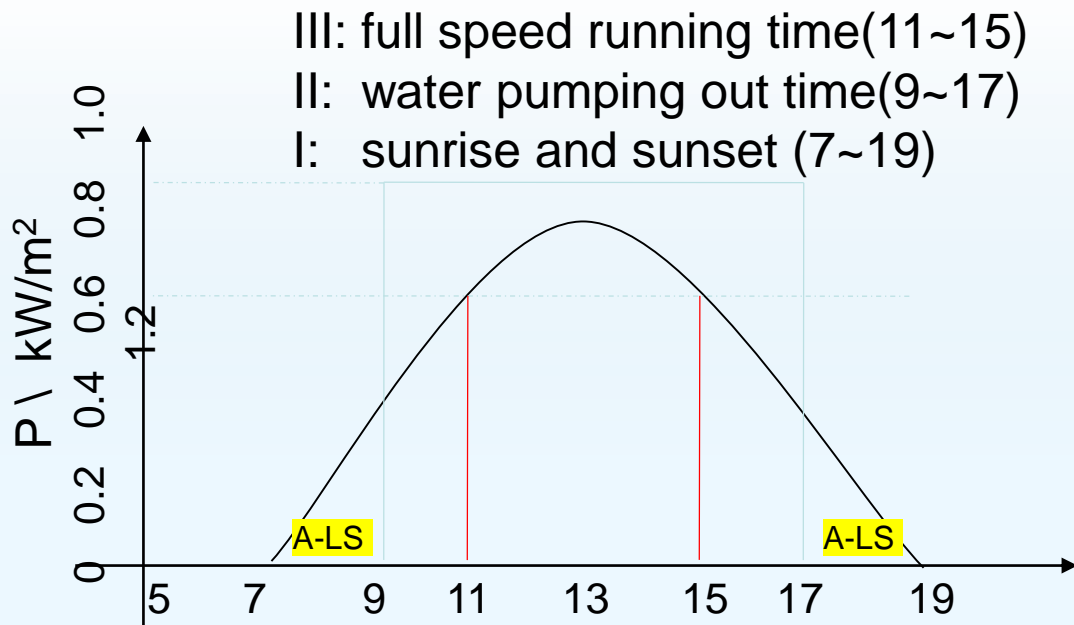
C) Manually power on AC

Need to power on at the same time or power on the $\text{Max}(PV_{DC}, AC_{DC})$ first. Otherwise there is risk to damage the inverter. (Don't power on AC during running).

No water or less water pumping out

Cause analysis and solutions:

- 1, **Reverse running**: test by changing the running direction of motor;
- 2, **Motor block or parameter setting wrong**: check the parameter setting, especially check the motor parameters;
- 3, **Input power not enough**: According to the law of conservation of energy, the loss of inverter is about 4%, and the rest is output to the motor. If there is no water or the water is less, it can only indicate that the input power is not enough and more PV panels need to be configured.



Pump motor power calculation:

1, Pump shaft power: $P_{\text{shaft}} = Q \cdot H / 102 / \eta$

Q: Flow, L/s H: Head, m

2, Motor power: $P_{\text{motor}} = K \cdot P_{\text{shaft}}$

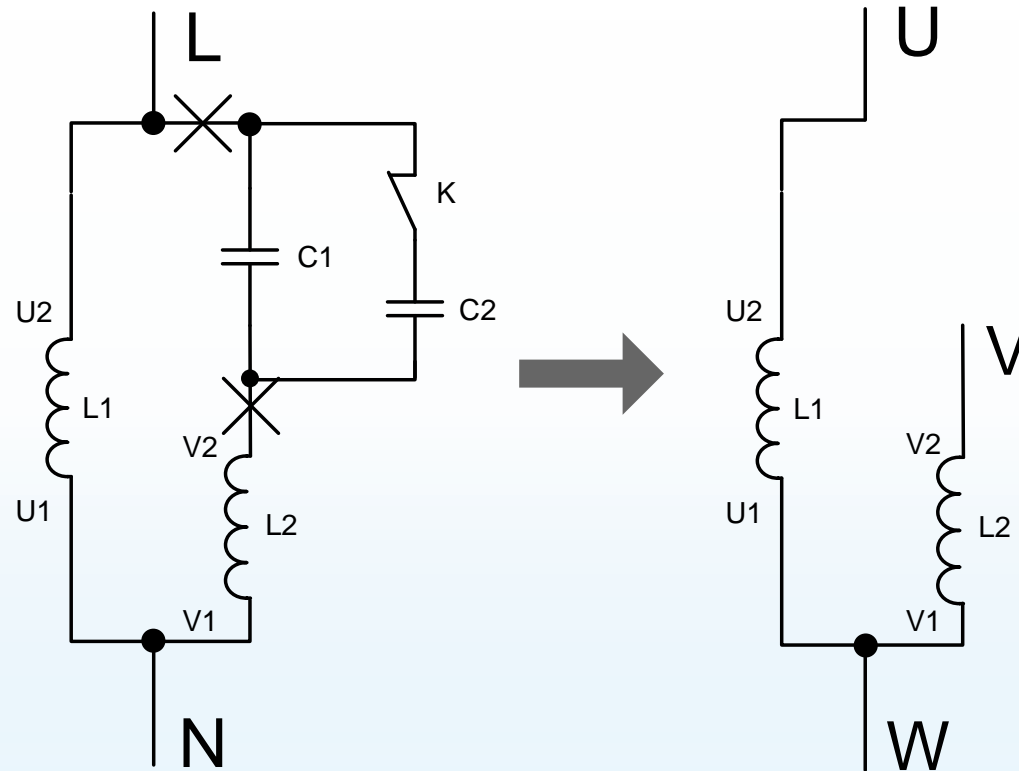
K: Backup coeffi: $P_{\text{shaft}} = 2 \sim 5 \text{ kW}$, $K = 1.5 \sim 1.3$

$P_{\text{shaft}} = 5 \sim 10 \text{ kW}$, $K = 1.3 \sim 1.25$

Relationship: Power, flow, Head

Pump Specification		PV input			Running status				
		DC voltage (V)	DC current (A)	DC power (kW)	Frequency (Hz)	Current Flow	Current Head	Current power	Efficiency
Rated flow	200			0	10	40	2	0.032	
Rated head	50			0	20	80	8	0.256	
Rated RPM	2880			0	30	120	18	0.864	
Rated Hz	50			0	40	160	32	2.048	
Rated power	4			0	50	200	50	4	

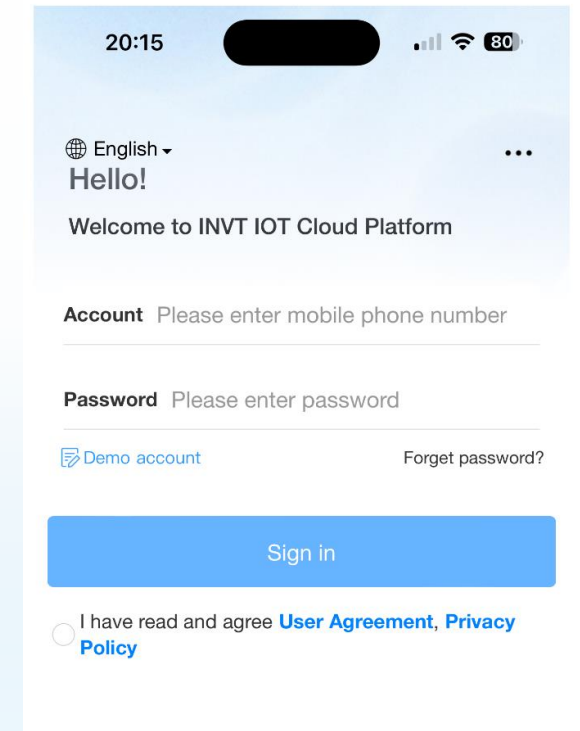
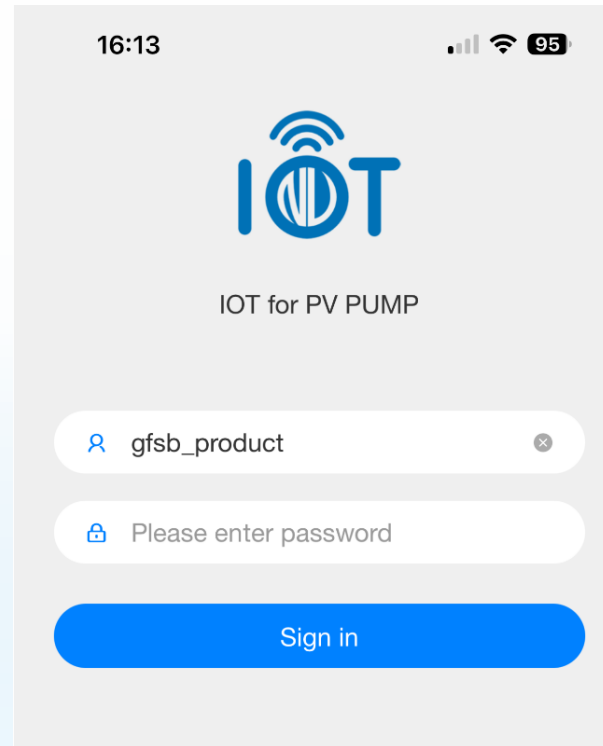
Single phase motor(capacitors removed)



- Starting windings L2, Running windings L1, $R_{L2} > R_{L1}$
- Starting capacitor C2, Running capacitor C1, $C2 > C1$, eg: C1=20uF, C2=350uF

IoT module application

- APN: Need to provide SIM card APN.
- Indian Server:
<http://149.129.190.130:21000/login>
APP: PV Pump
- China Server:
http://iot.invt.com:21000/login?lang=en_US
APP: INVT IOT
- User ID: Contact the service engineer



Commissioning steps

- Press JOG get into manual operation(REMOTE LED is off).
 1. Restore all parameters first, P00.18=1
 2. Set motor parameters: P02.01~P02.05(AM); P02.15~P02.23(PM)
 3. Test the motor running direction, if reverse just need to exchange UW cable.
 4. Set functions like: Lower limit, A-LS, A-LL, auto-switching, etc
 - Lower limit: P15.05 (min frequency that water pumping out)
 - Water level control: P15.11~P15.18
 - Low-load protection: P15.19~P15.22
 - Low sunshine protection: P15.23~P15.24
 - Auto-switching: P15.32~P15.34
 5. Press RUN to run pump, monitor the output frequency, adjust KP, KI, if fluctuation



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