

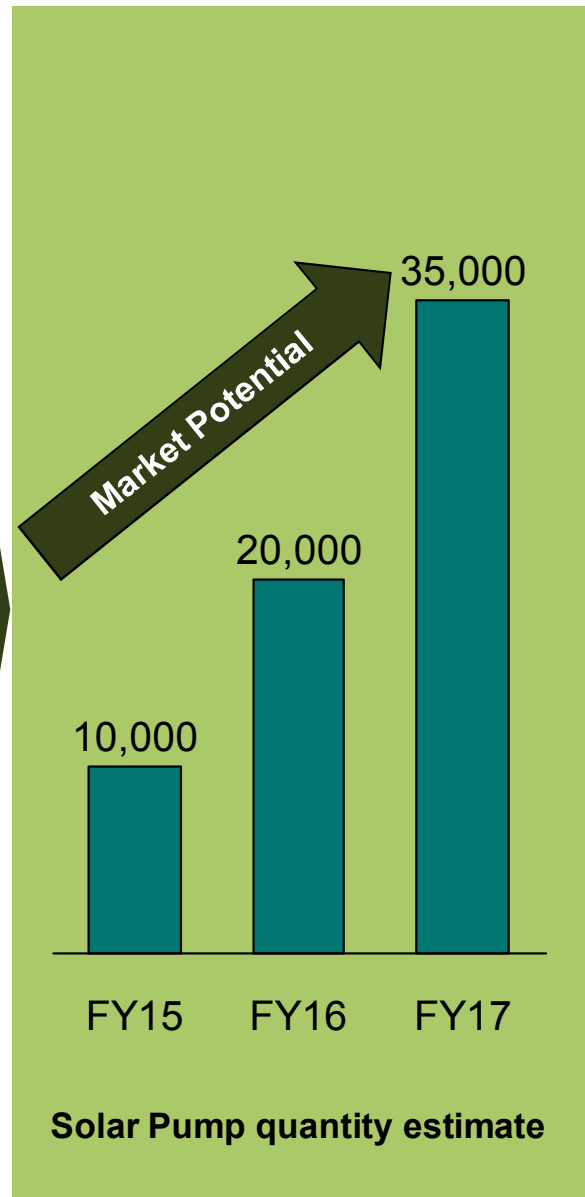


**SIEMENS**

# Solar pump using SINAMICS V20

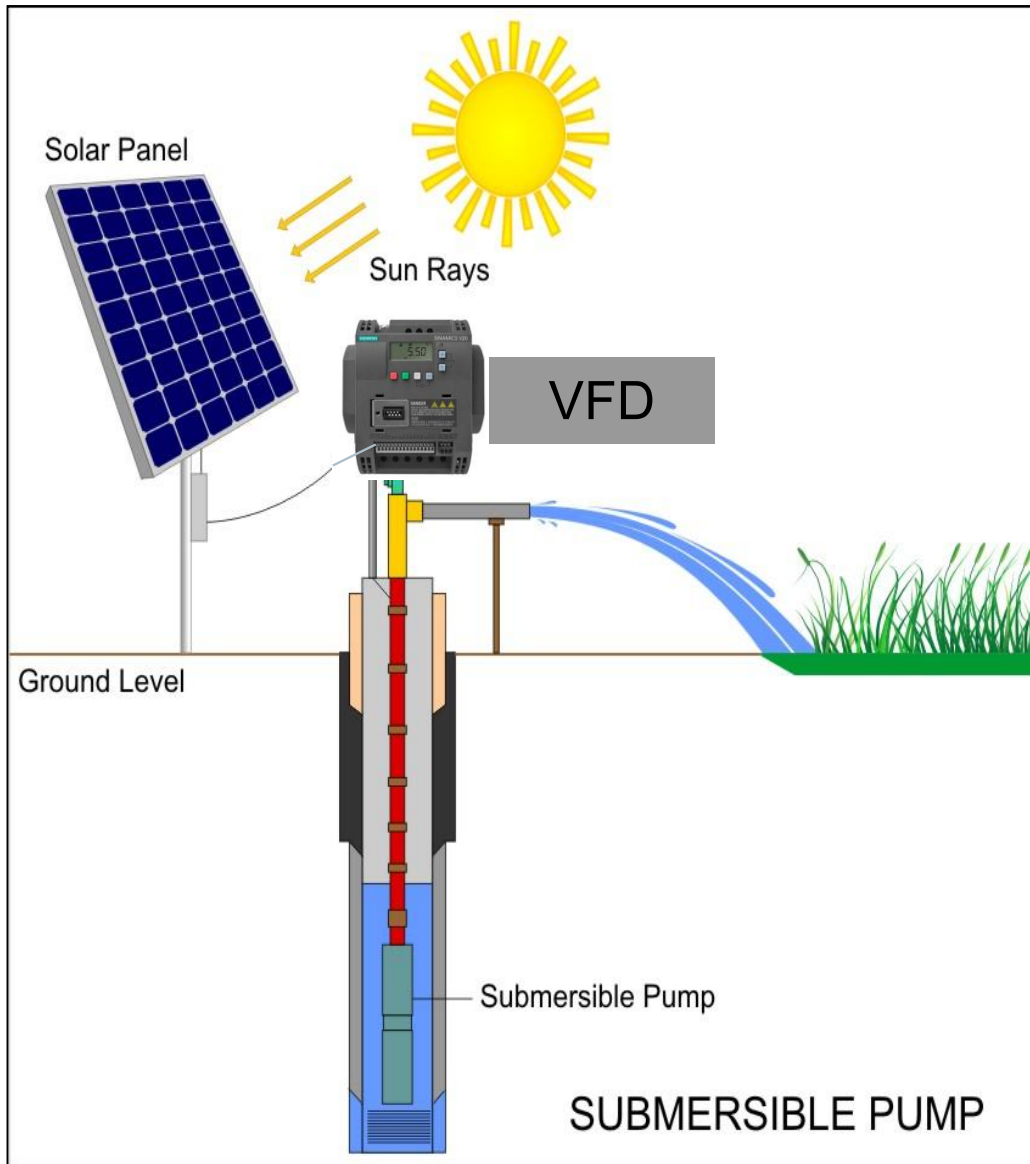
# Why Solar pump business is so important for us?

- Agriculture contributes to 17% of GDP
- Biggest cost for a farmer is to pay for the diesel
- Most of the state govt. investing on renewable energy initiatives
- Most of our competitors are highly focused on Solar pump



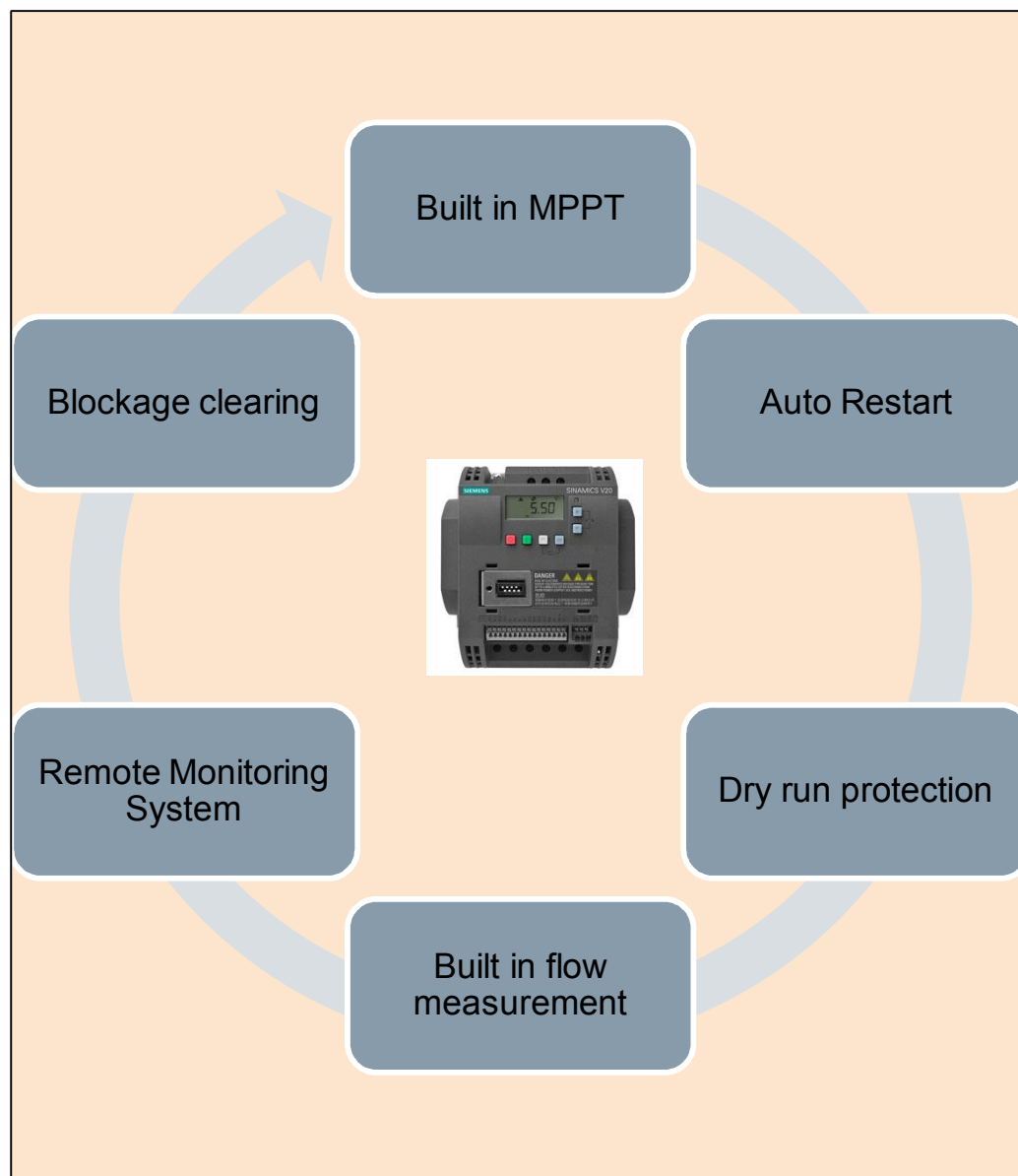
- Developed V20 with built in MPPT
- 38 OEMs using V20 for Solar pump
- Sold 1500+ drives for solar pumps in FY15
- **5000+** V20s targeted for FY16

# Working Principle



- Solar pump is used mainly in the irrigating crops in rural area , which faces the problem with electricity supply.
- As much as 18 percent of electricity generated goes into a agriculture.
- There are 9 million diesel pump sets in India.
- Even if 50 per cent of these are converted to solar powered pumps, it will save 25 billion liters of diesel per year
- Solar water pumping system consists of PV array, drive and water pump.
- DC Generated from PV arrays is directly connected to the DC Link terminals of SINAMICS V20.
- SINAMICS V20 converts the DC into the suitable AC output to run the pump.
- Speed of the pump and hence the flow will vary depending on the available sun intensity.

# Important Functions



- **Built in MPPT:**

MPPT stands for a maximum power point tracking. It provides the efficient use of power generated from solar panel. This is the software written in the firmware of SINAMICS V20.

- **Automatic Restart:**

Drive should start automatically without any manual intervention, if it has tripped because of under voltage (during cloudy conditions) then it should start automatically.

- **Dry-run Protection:**

Dry run protection function ensures that the pump does not run dry without pumping any water. This is achieved by using Load torque monitoring function in SINAMICS V20.

- **Pump Flow indication:**

We have to enter the pump power vs flow data in SINAMICS V20 drive. This data will be available from the pump catalog.

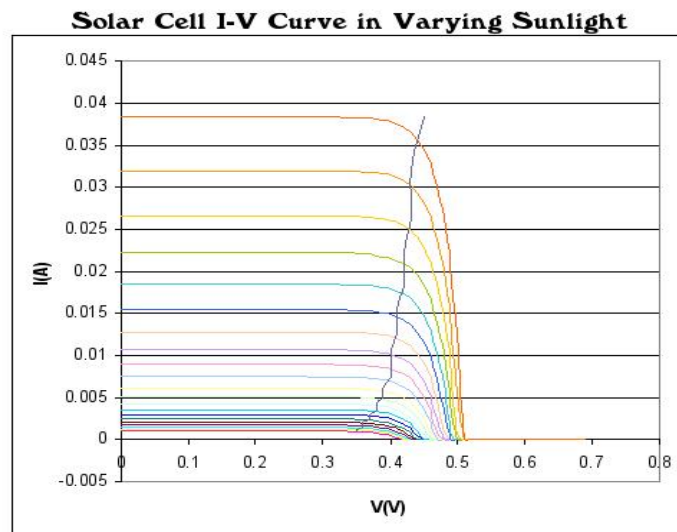
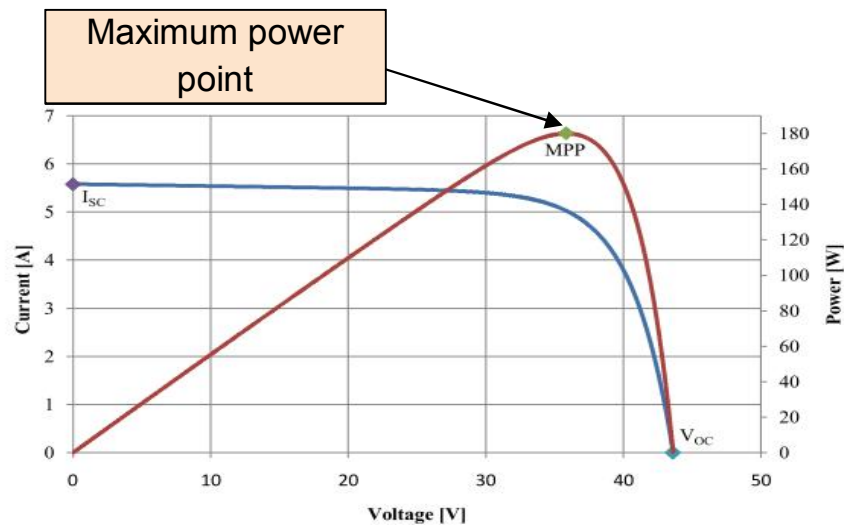
- **Remote monitoring System:**

Communicates with third party GPRS enabled remote monitoring device using modbus protocol.

- **Blockage Clearing:**


This startup mode momentarily reverses the rotation to clear a pump blockage.

# MPPT



- MPPT or maximum power point tracking is the algorithm in the drive used for extracting maximum available power from PV modules.
- MPPT is not a mechanical tracking system that physically moves the modules to make them point more directly at the sun.
- Diagram on left side is the characteristic of the solar panel.
- The maximum power is generated by the solar cell where the product of  $VI$  is maximum. This is known as the maximum power point.
- This characteristics will change depending on the irradiance and the temperature and that's why MPP will change continuously and it becomes important to track the MPP through algorithm..

# Solar panel specifications

Maximum Power	250 Wp -3/+3%
Open Circuit Voltage (Voc)	43.2 V
Short Circuit Current (Isc)	7.5 A
Voltage at Maximum Power (Vmp)	36.0 V
Current at Maximum Power (Imp)	6.95 A
Maximum System Voltage	DC 1000 V
Normal Operating Cell Temperature	45.5° C
Temperature Coefficient	-1.036 W/°C
Power measured in standard conditions (STC): Irradiation 1000 W/m <sup>2</sup> , AM 1.5, cell temperature 25° C	
Certified by UL for IEC 61215, IEC 61701, IEC 61730. MNRE Approved	
 <b>Warning : electric hazard !!</b> This unit produces electricity if exposed to light Do not disconnect under load	

- **Voc:**

This is the voltage you will see present at the solar panel's output when it is exposed to full sun and is not loaded.

- **Isc:**

This is the short circuit current. Set your multimeter to amps, and connect the leads across the solar panel's output terminals. In full sun, you should get Isc.

- **Vmp & Imp:**

This specifications are the voltage and the current at the maximum power point.

- **STC:**

Rating specified on the panel are calculated at standard conditions of irradiation of 1000 watts per square meter, temperature 25degree celcius, atmospheric density 1.5

- **Maximum power:**

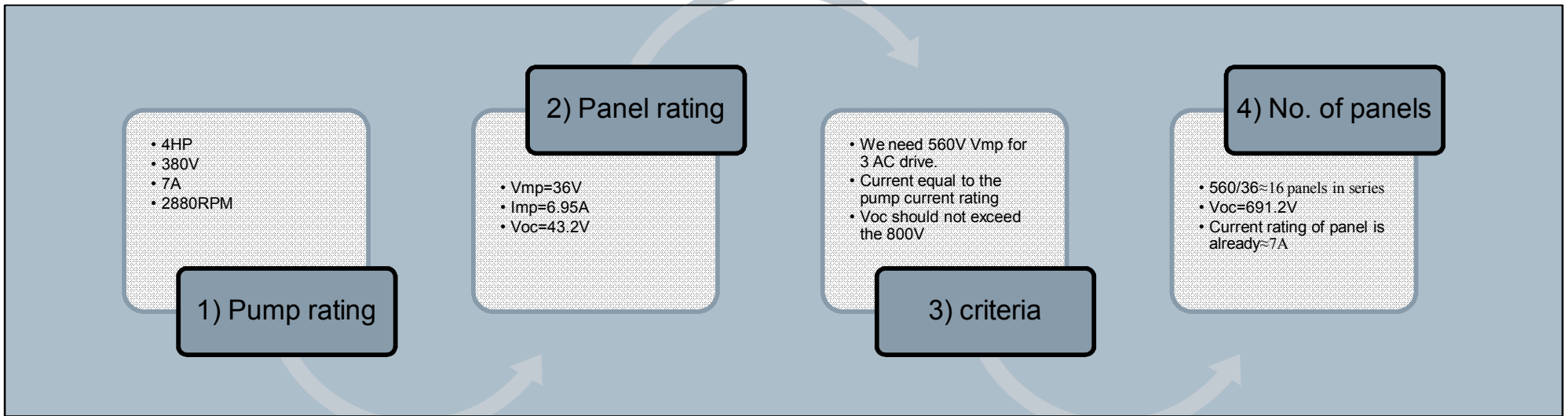
$V_{mp} \cdot I_{mp}$

- **Temperature coefficient:**

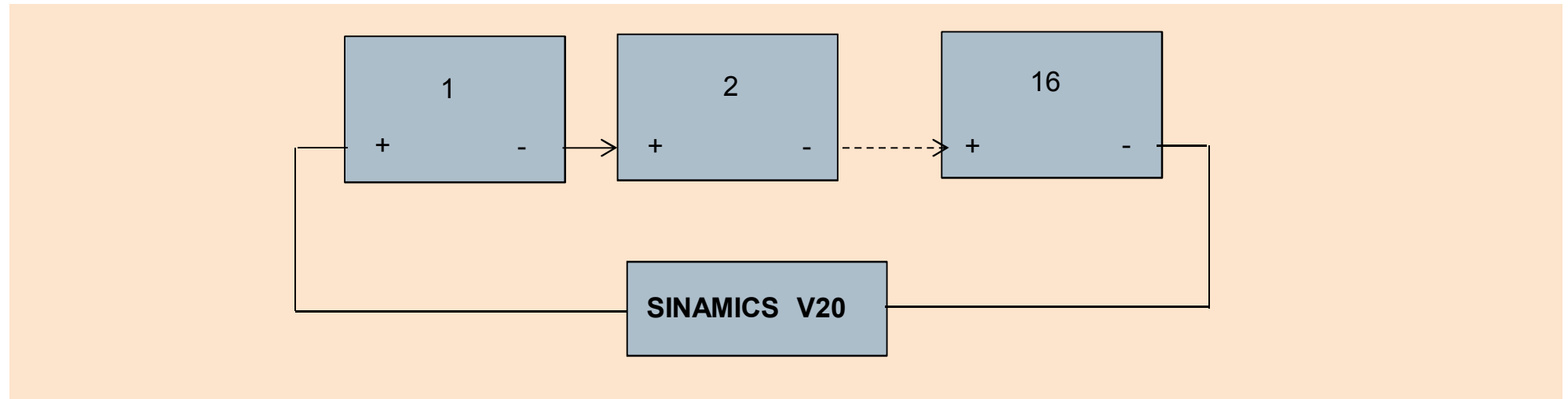
Indicates effect of temperature on the output power of solar panel

# Selection of panels

Example for 3 AC 400V pump :

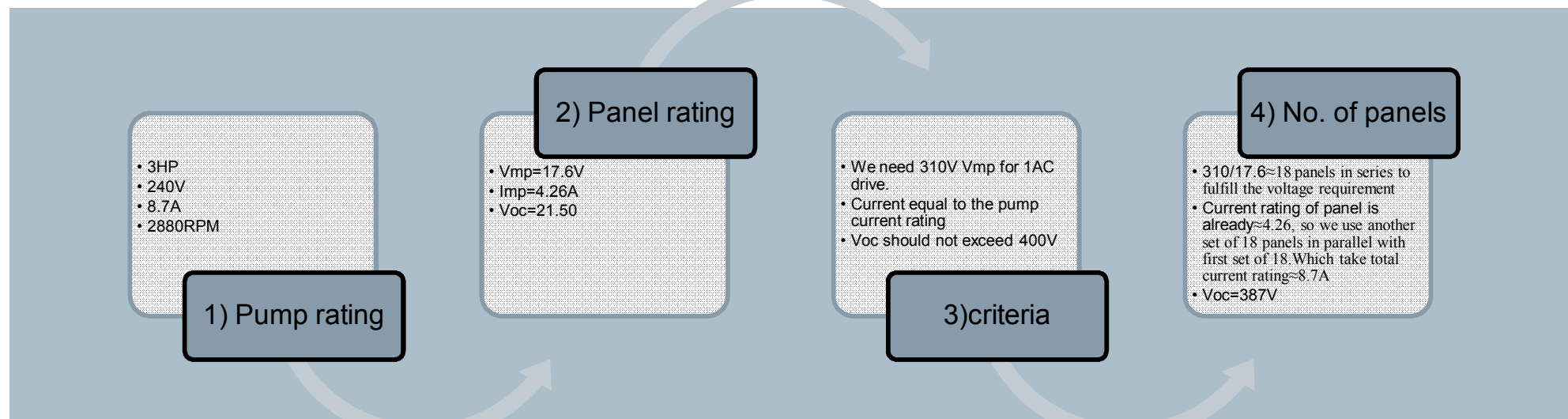


Final Panel Configuration:

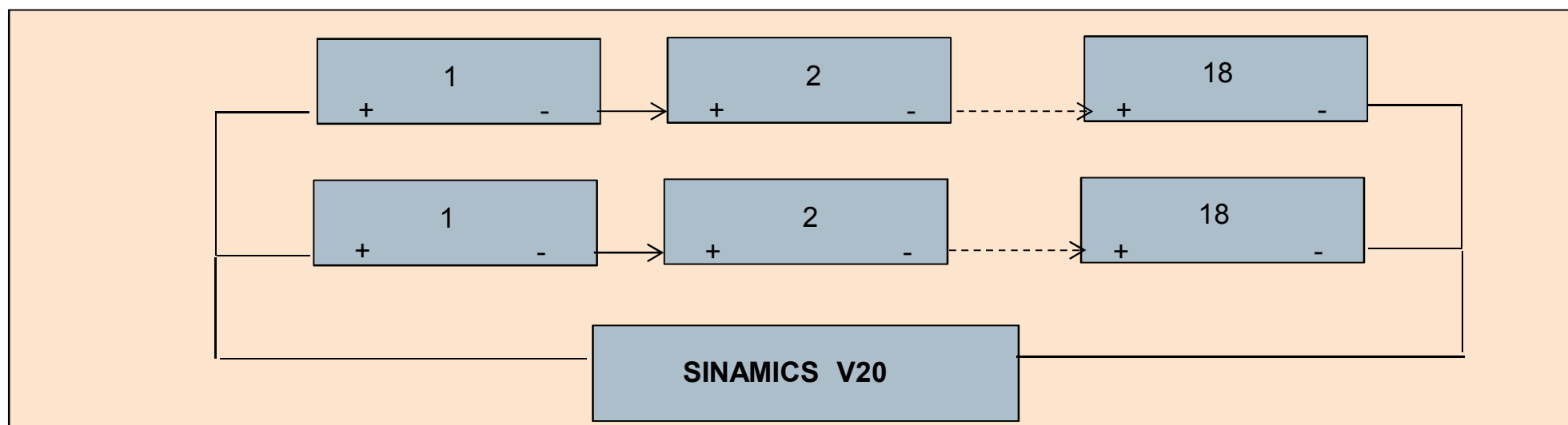


# Selection of panels

## Example for AC 200V pump:

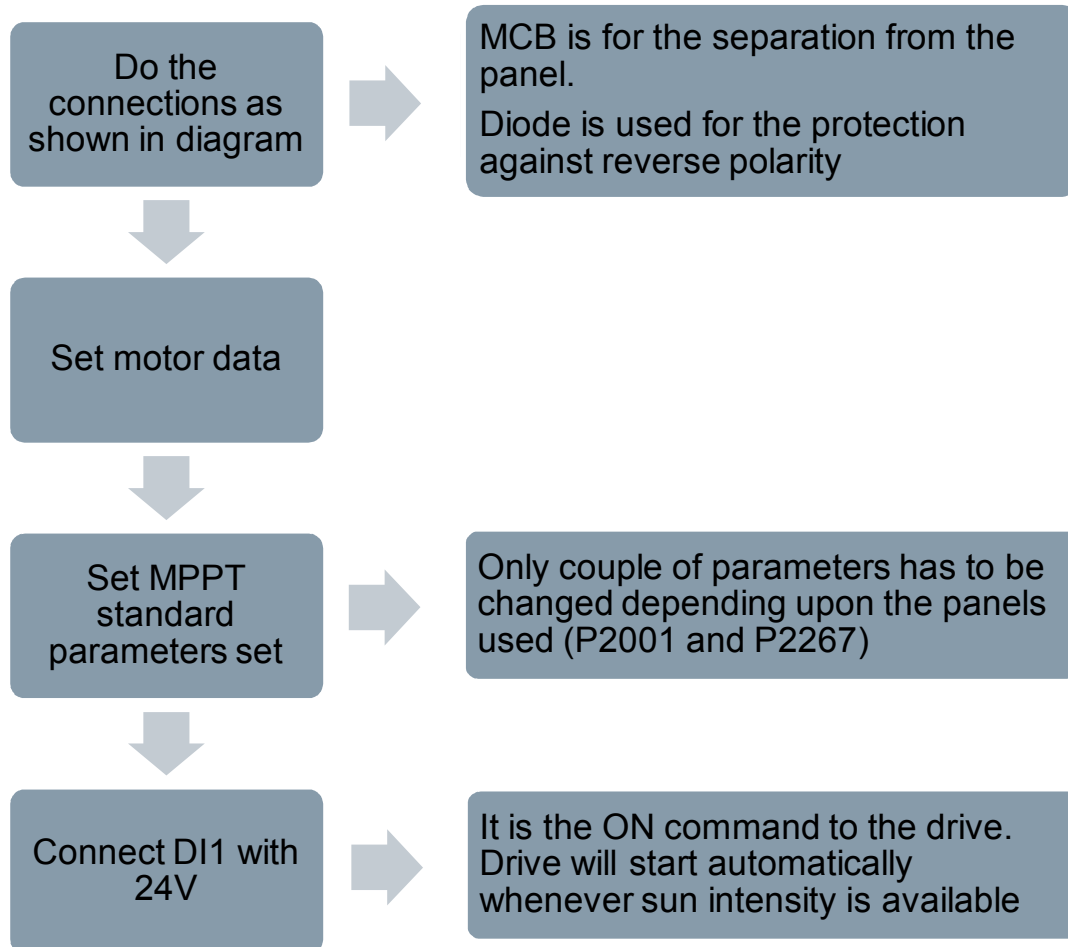
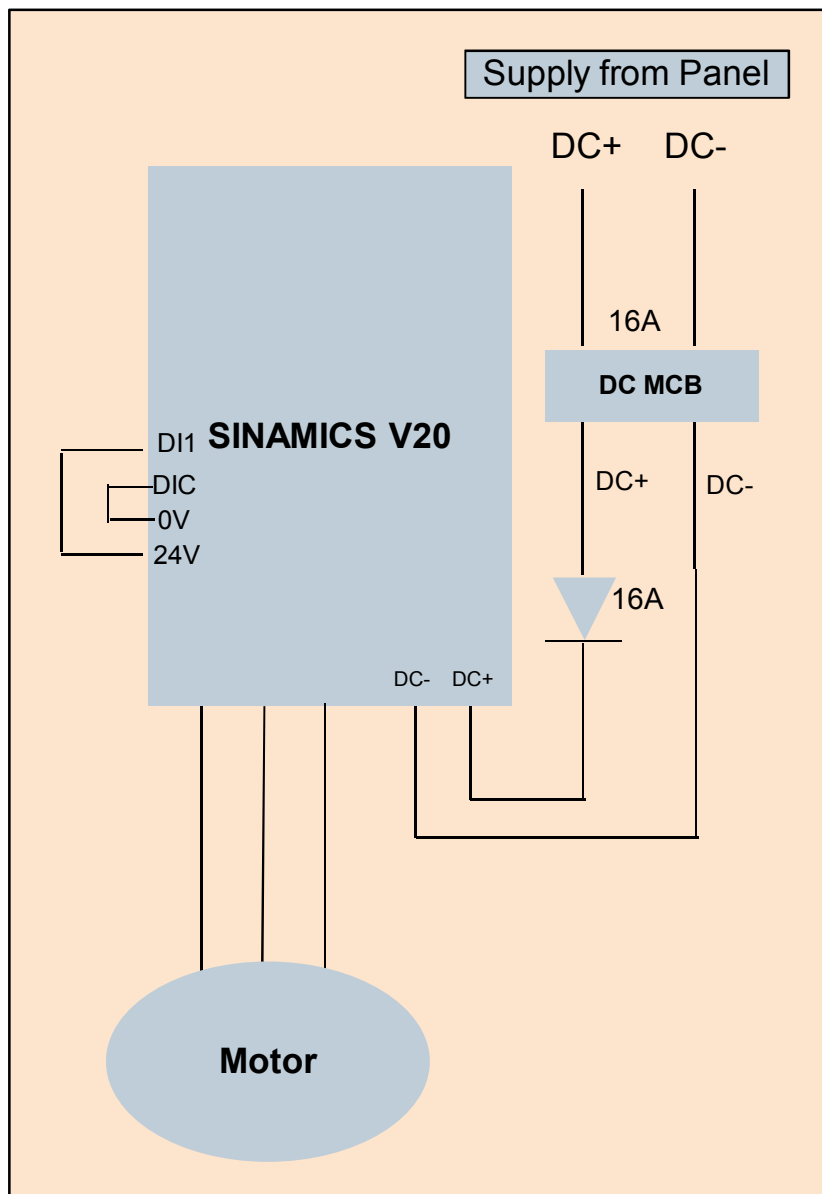


## Final Panel Configuration:

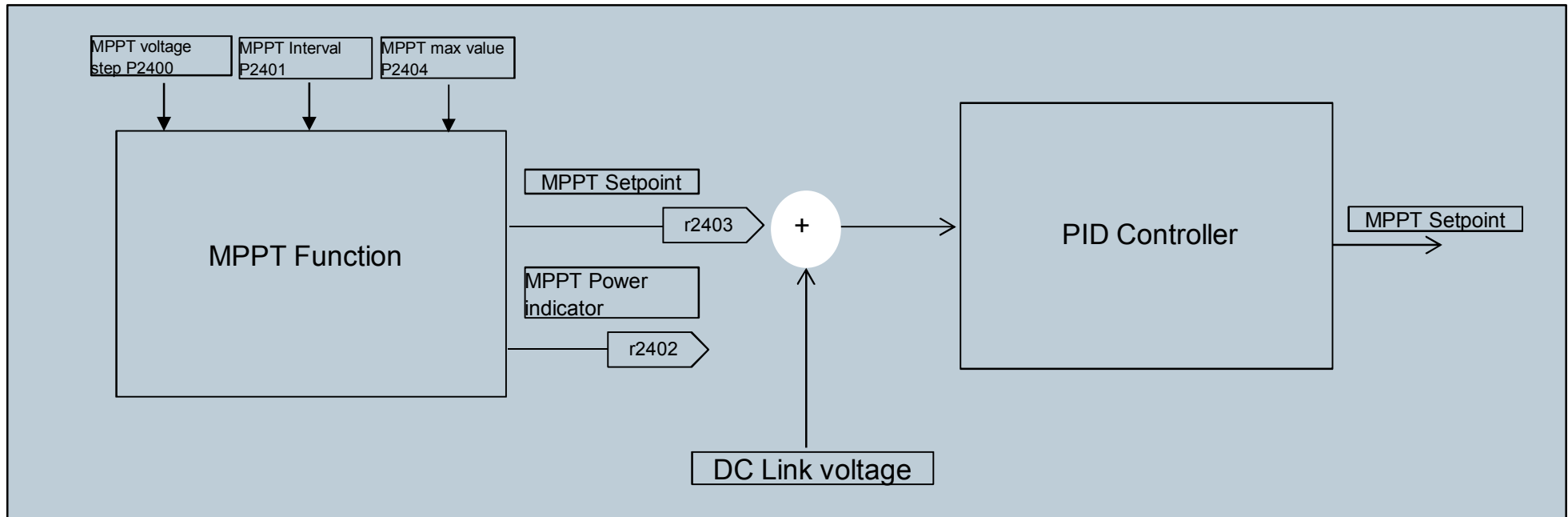




# Commissioning procedure



# MPPT Block Diagram



**Only change P2001 and P2267**

P2001	380 /3 AC 230/1 AC	Determines 100% in PID
P2267	190	Maximum value for PID Feedback

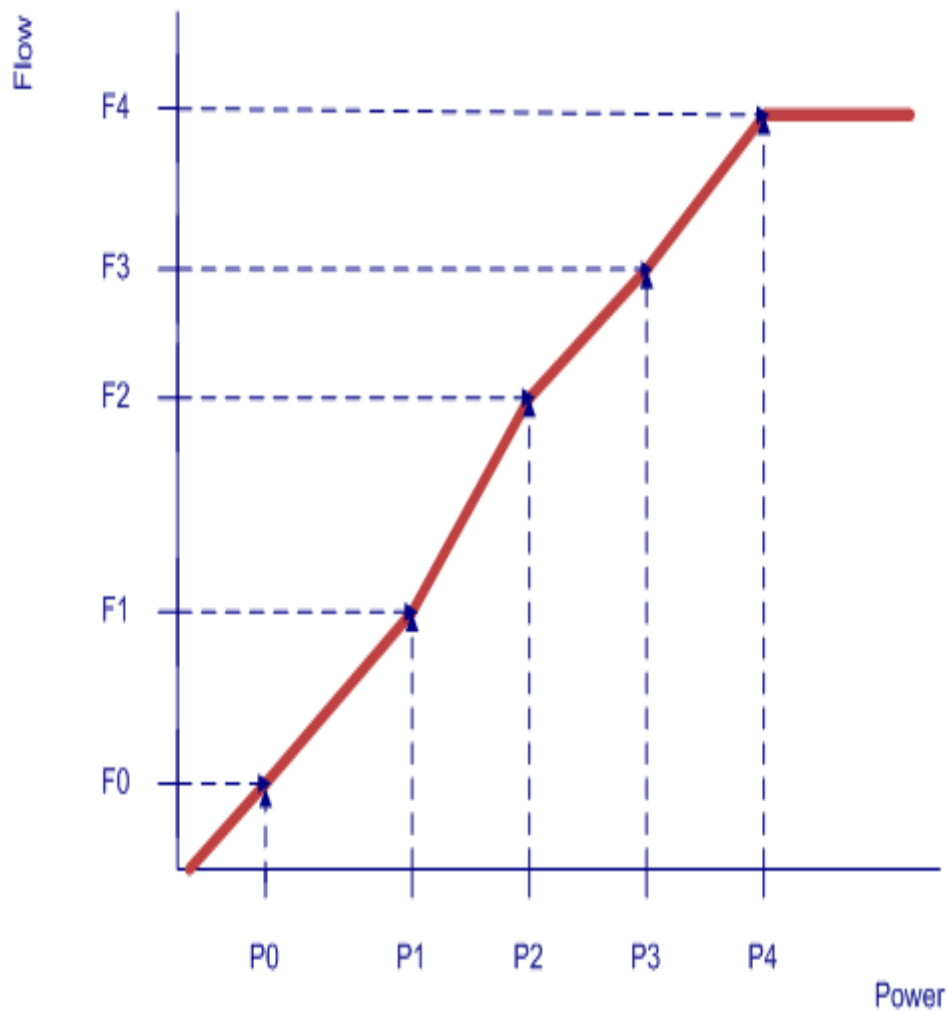
3 AC Drive

If Voc=690V then 690/380=1.81.  
We can set P2267=181

1 AC Drive

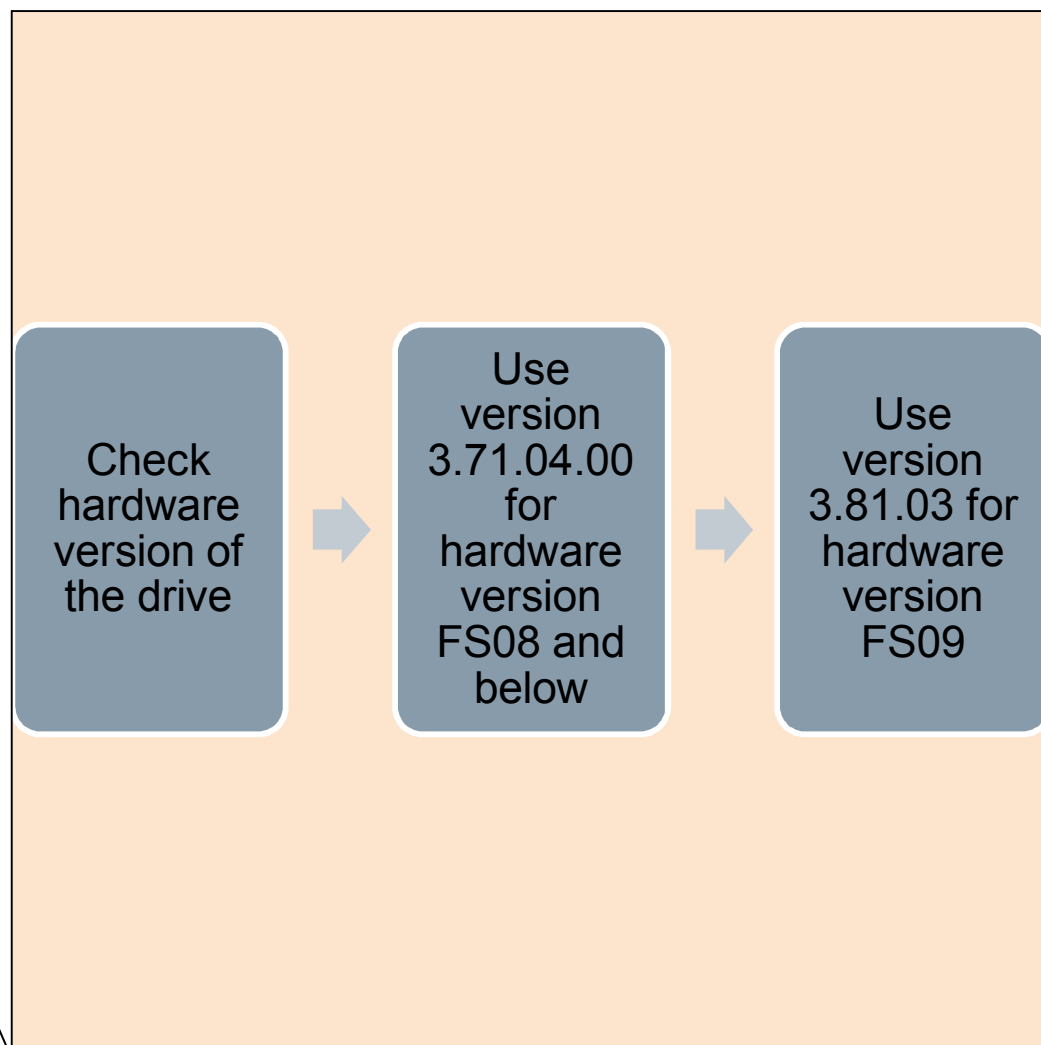
If voc=380 then 380/230=1.65  
Set P2267=165

# Flow indication



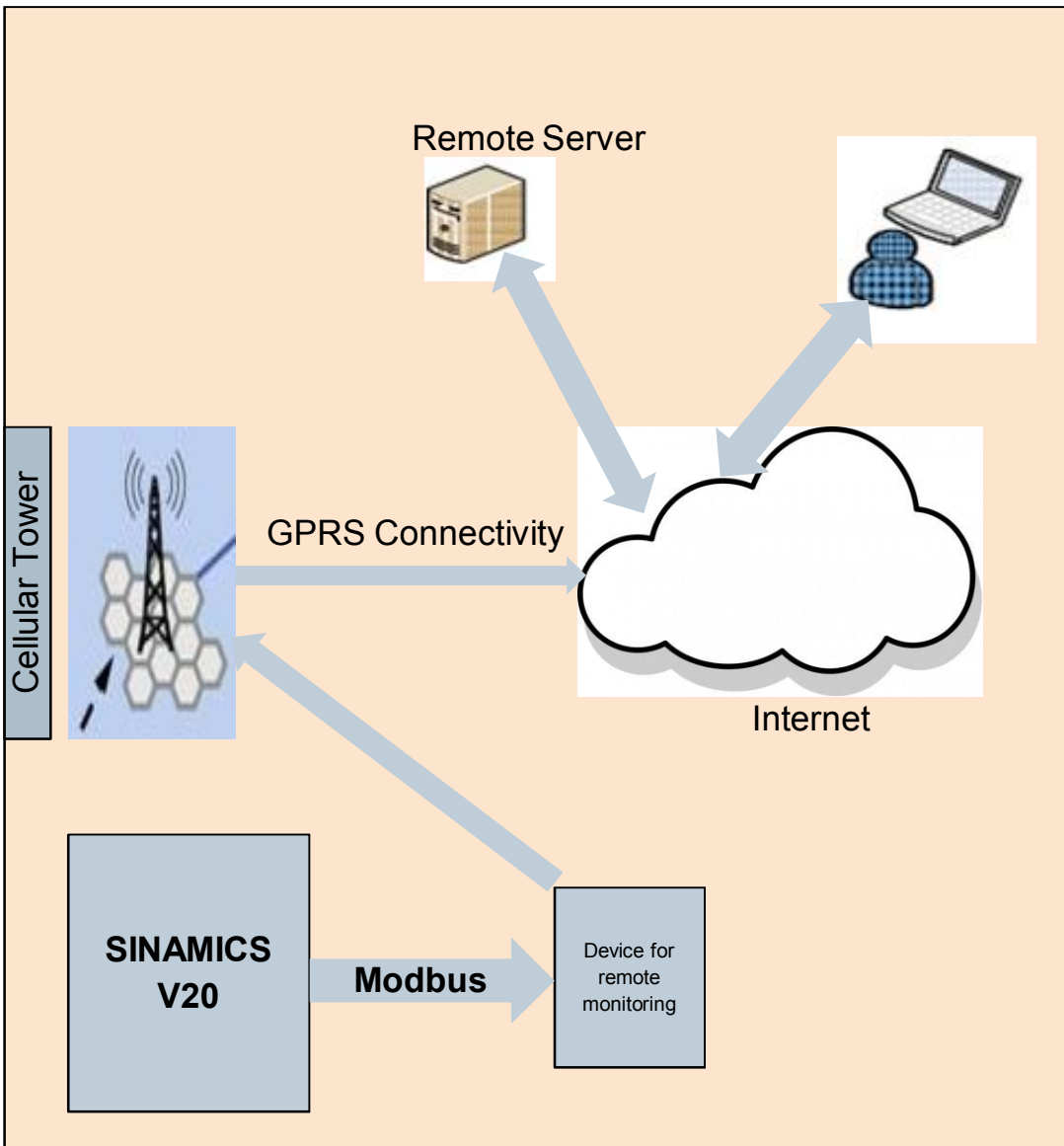
P2410 [5]	Pump Power
P2411 [5]	Pump Flow
r2412	Flow
r2413	DC Link Power

# Firmware versions and compatibility



Hardware Version

# Remote monitoring system



- As per the MNRE specifications there should be a provision for remote monitoring of the pump related parameters.
- We use third party monitoring device , which supports modbus communication can be used.
- long with the device there will be a application software , through which the remote monitoring of the drive parameters are possible.

## Third party vendors

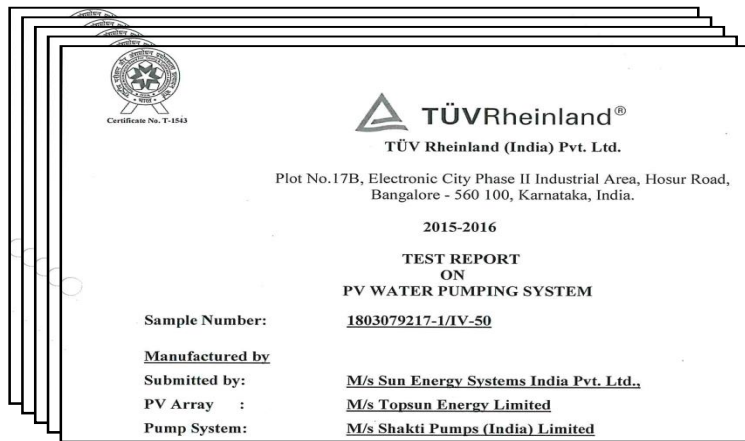


Flexi MC Solutions  
PVT LTD.



Srivatsan Embedded  
Systems & Technologies

# MNRE / TUV CERTIFICATION



## 12 TUV CERTIFICATIONS

- HYDERABAD 6 OEM'S CERTIFIED
- BENGALURU 3 OEM'S CERTIFIED
- COIMBATORE 1 OEM CERTIFIED

Mandatory for Government Tender bidding

**10** OEMs Certified with V20



Up to **40%** Higher output than MNRE

No Product certifications for SWP application

Simulator based Testing facility at TUV

# MNRE WARRANTY CLAUSE



Ministry of New and Renewable Energy  
Jawaharlal Nehru National Solar Mission  
SOLAR PHOTOVOLTAIC WATER PUMPING SYSTEMS  
(2015-16)

## WARRANTY

The PV Modules must be warranted for output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years. The whole system including submersible/ surface pumps shall be warranted for 5 years. Required Spares for trouble free operation during the Warrantee period should be provided along with the system.

- 5yr warranty will be considered from **Date of Supply** .
- 5 yr warranty for **Government Tender** installations only.
- The **Serial Numbers** should be shared with Invoice details in advance.

**SIEMENS**

**Thank You**

[siemens.com/answers](https://www.siemens.com/answers)