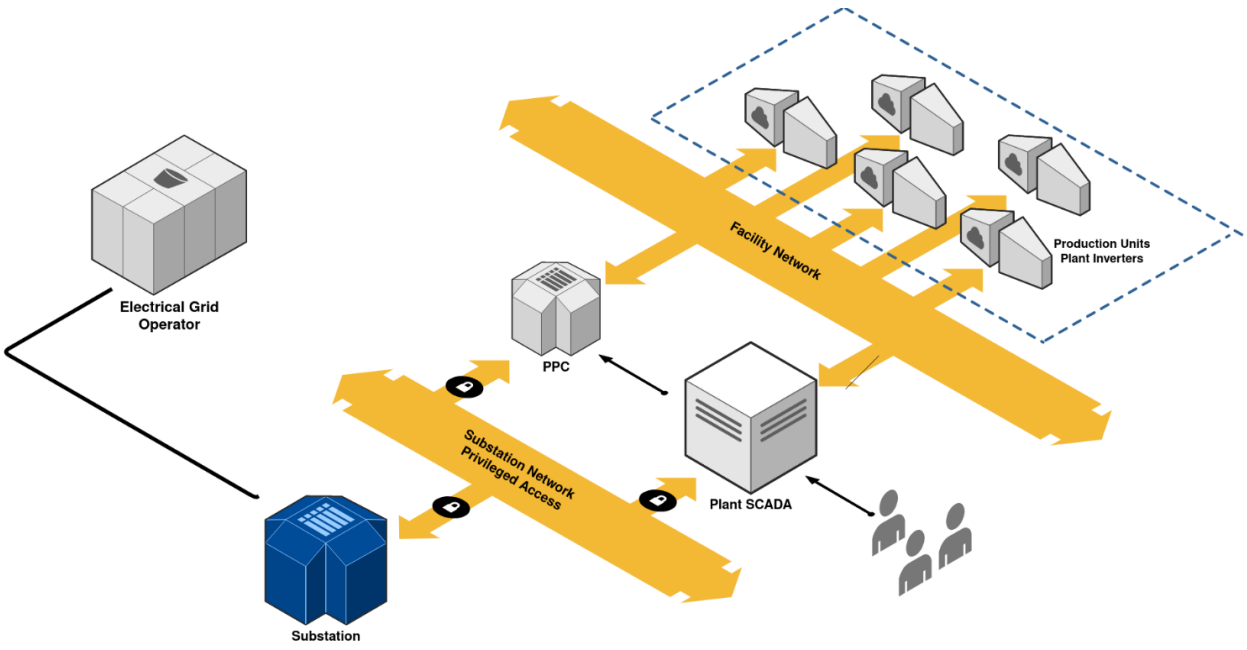
OPEN-PPC-X1

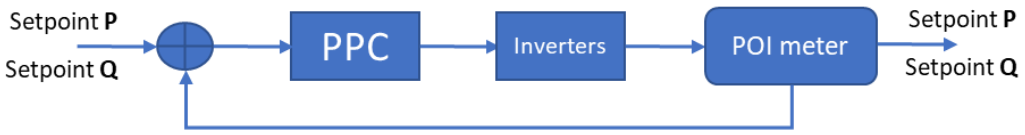
POWER PLANT CONTROLLER

Designed by ISEMAREN R&D development team for utility PV and storage power plants. It incorporates main improvements according to the state-of-the-art of photovoltaic market and according to main grid codes. Successfully deployed in different regions and certified according to UE 2016/631 including all the regulation features in power (active/reactive), frequency and voltage.

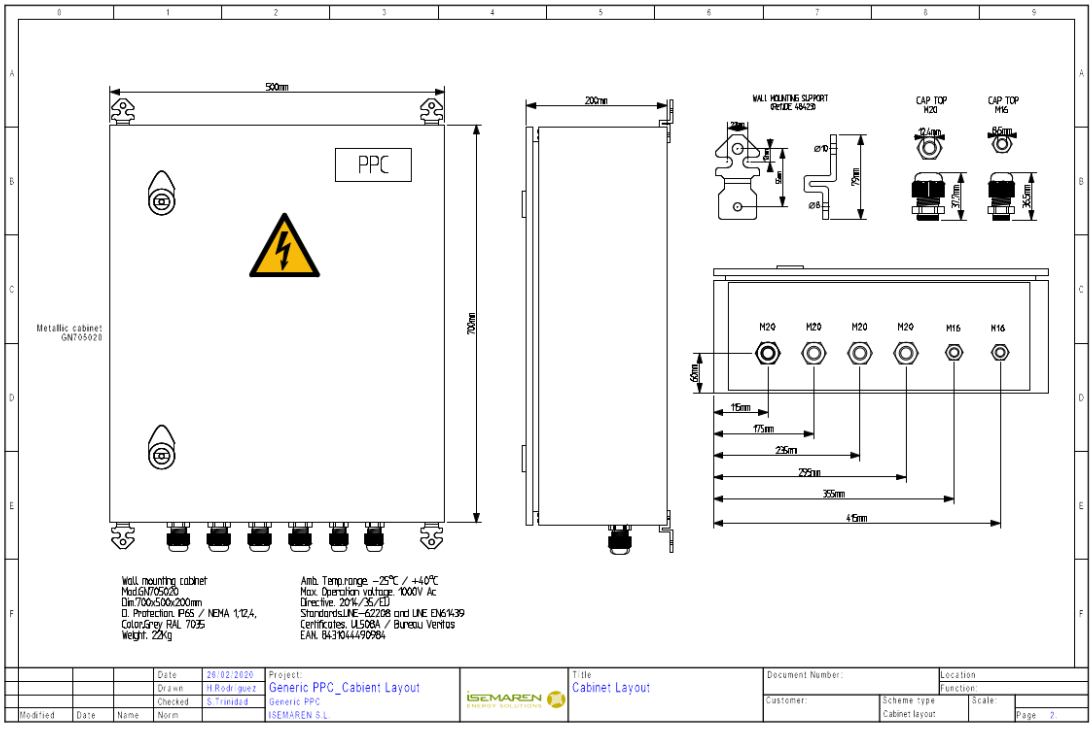
- Compatible with any inverter in the market (both string and central). Native support of most standardized solar plant buses.
- Dynamic regulation customized according to plant characteristics. Predictive control for fast response.
- User friendly web-based interface and HMI touch screen.
- Dual redundant PLCs for assuring long-term availability and reliability of the system.
- PSS/E and DIgSILENT certified simulation models.
- Available with internal Power Meter or compatible with any external one.
- Advance functionalities: Power Oscillation Damping (POD), Battery Energy Storage Systems (BESS) and Zero Injection.



Technical Characteristics

Hardware	
PLC	Schneider Modicon TM251
Nº of PLCs	Two (Active redundancy)
Ethernet Switch	L2 6/8 Fast/Gigabit Ethernet (Option: manageable Switch L3, with redundancy protocols and F.O)
HMI (optional)	Touchscreen 7” w/ remote web-service terminal
Power Grid Meter (optional)	Meter 0,2s class according to IEC 62053-22. 2ETH, AC/DC measures.
Router	Router/Firewall Ethernet w/ 4G and GPS (NTP)
Digital I/Os / Analog inputs	Optional I/O modules
Power Supply	Switching power supply 24 V DC/5 A
Nº PS	Two (redundancy)
UPS	UPS power supply UPS DC 12-48V/20A w/ battery 24Vdc / 1.3A/h
Isolation	2.5kV
MTBF	>50.000 hours
Protections	Magnetothermal-differential circuit breaker
Communications	
Communication Protocols	Modbus / TCP, Modbus RTU (RS-485) optional: IEC 61850, IEC 60 870-5-101 / -104, DNP 3, Profibus/Profinet, Ethernet/IP
Connectivity	Embedded 4G Router 4G w/ VPN and firewall functionality for remote commissioning and maintenance.
Room temperature	0ºC – 55ºC
Relative humidity	95% w/o condensation
IP Protection Degree	IP64 (IP52 w/ optional display)
Ventilation	Natural convection (optional forced)
Regulation Functions	
Compatible w/ different grid codes	
Extendable w/ extra functions (i.e.: cell control or automatic generation control)	
Local / Remote mode	
Manual / Automatic mode	
Active Power regulation	
Reactive Power regulation	
Power Factor regulation	
Voltage regulation	
Power Oscillation Damping (POD)	
Battery Energy Storage Systems (BESS)	
Zero Injection	
Block Diagram	
Visualization / User Interface / Data Log	
	Integrated VPN (IPSec, OpenVPN, SSL) for remote control or maintenance. Integrated web service
	Local data storage. Extendable by SD memory card
	Integrated FTP server. Firmware Hot-Backup and restorage
Approvals	
Certificates	P.O.12.2 NTS UE 2016/631 V2 SEPE v1 SENP ANSI/ISA, CSA, CE EN/IEC, CE, UL. UNE, Bureau Veritas, EAN.
ROHS	Compliance

SIZE AND DIMMENSIONS


500mm
PPC
700mm
Metallic cabinet
GN705028
200mm
WALL MOUNTING SUPPORT
REFIDE 48429
CAP TOP
M20
CAP TOP
M16
M20
M20
M20
M20
M16
M16
115mm
175mm
235mm
295mm
355mm
415mm
Wall mounting cabinet
Mod:GM705020
Dim:700x500x200mm
D. Protection. IP65 / NEMA 1,12,4,
Color:Grey RAL 7035
Weight: 22Kg
Amb. Temp.range. -25ºC / +40ºC
Max. Operation voltage: 1000V Ac
Directive: 2014/35/EU
Standards:UNE-62208 and UNE EN61439
Certificates. UL508A / Bureau Veritas
EAN. 8431044490984
Date 28/02/2020
Drawn M.Rodriguez
Checked S.Trinidad
Norm
Project:
Generic PPC_Cabient Layout
Generic PPC
ISEMAREN S.L.
Title
Cabinet Layout
Document Number:
Location
Function:
Customer:
Scheme type
Cabinet layout
Scale:
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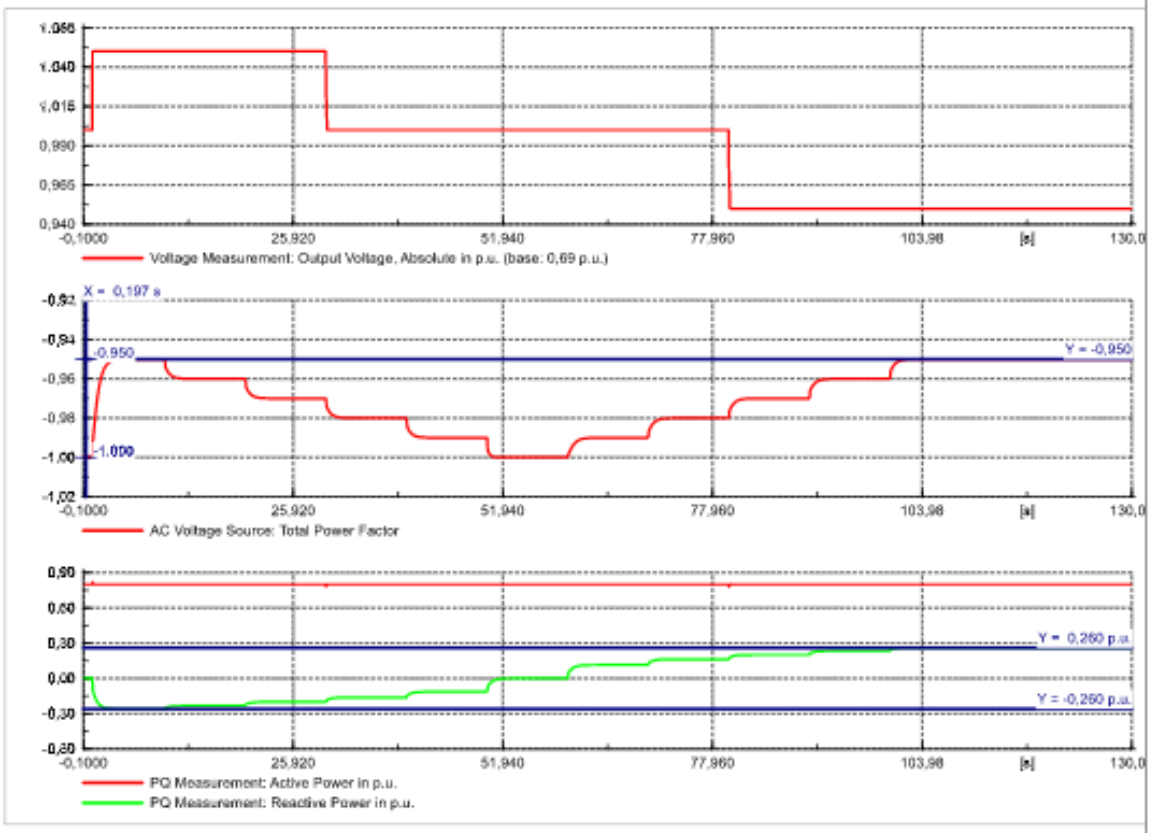
MAIN PPC CONTROL FUNCTIONS

ACTIVE POWER CONTROL MAIN FEATURES	
Active Power Range	0 – 100%
Minimum Steps	0,5%
Maximum Error	0,5%

MRPFL-O - LIMITED-OVERFREQUENCY POWER-FREQUENCY REGULATION MODE	
Operation Range	50,2Hz activation
Droop	5% - adjustable between 2% and 12% if required by SO
Response time	Decreasing P -> Tr ≤ 2s (90%ΔP up to 50%Pmax) Increasing P -> Tr ≤ 10s (90%ΔP up to 50%Pmax)
Activation Time	Ta ≤ 2s
Stabilization time (Setpoint +/-5% ΔP)	Decreasing P -> Te ≤ 20s Increasing P -> Te ≤ 30s
Priority	When this mode is active, its set point must prevail over any other set point
MRPFL-U - Limited-underfrequency Power-frequency regulation mode	
Operation Range	49,8Hz activiation
Droop	5% - adjustable between 2% and 12% if required by SO
Response time	Decreasing P -> Tr ≤ 2s (90%ΔP up to 50%Pmax) Increasing P -> Tr ≤ 10s (90%ΔP up to 50%Pmax)
Activation Time	Ta ≤ 2s
Stabilization time (Setpoint +/-5% ΔP)	Decreasing P -> Te ≤ 20s Increasing P -> Te ≤ 30s
Power limit	When the maximum limit of 10% of the reserve power is exceeded, power will only be given as long as there is the capacity to give it
Priority	When this mode is active, its set point must prevail over any other set point
MRPF - Power-frequency regulation mode	
Operation range	49,8Hz – 50,2Hz
Droop	5%
$\frac{\lvert \Delta P_1 \rvert}{P_{max}}$	8%
Insensitivity of response to frequency variation	10 mHz
Deadband response with frequency variation	0 mHz
Response time	Decreasing P -> Tr ≤ 2s (90%ΔP up to 50%Pmax) Increasing P -> Tr ≤ 10s (90%ΔP up to 50%Pmax)
Activation Time	Ta ≤ 2s
Stabilization time (Setpoint +/- 5% ΔP)	Decreasing P -> Te ≤ 20s re P -> Te ≤ 30s
Cumulative control of P(f): MRPFL-U, MPRFL-O, MPRF	
Operation range	49,8Hz activation MRP L-U 50,2Hz activation MRP L-O

REACTIVE POWER CONTROL LOGICS - Main Features	
Reactive Power Range	0 – 100%
Minimum Steps	0,5%
Maximum Error	0,5%
Control priority	P control in V limits Q control out of V limits
Voltage control mode	
Voltage set point range @ POC	0,95 – 1,05 p.u. in steps not exceeding 0,01 p.u.
Reactive power control mode - Q=f(V)	
Response range	0 - Pmax
Response time	T1 = 1s up to 90% of Setpoint T2 = 5s up to 100% of Setpoint
Slope	2%
Deadband	0%
Power Factor control mode	
Response range	0 - Pmax
Response time	T1 = 1s up to 90% of Setpoint T2 = 5s up to 100% of Setpoint
Slope	2%
Deadband	0%

Graphic of General Simulation



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