# **Brochure 21/22 Solar Inverters**

# **Solar Solutions**







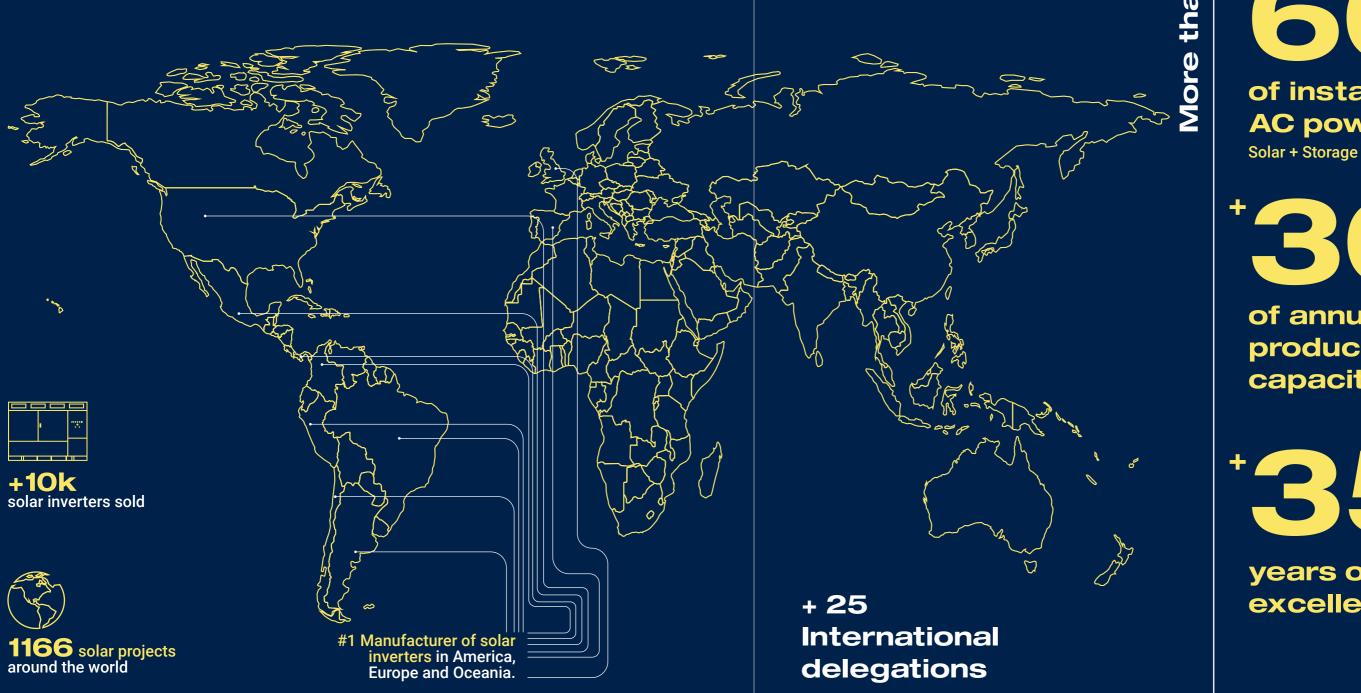
POWER ELECTRONICS CONTENTS

PE genetics
Cour products Page 8-52

Page. 53 – 55 Our secret

# We are the heart of photovoltaic plants

We handle everything in-house: from design and manufacture to testing.



60<sub>gw</sub> of installed **AC** power

of annual production capacity

years of excellence POWER ELECTRONICS OUR GENETICS



References

Our success around the world

Freesun is the Power Electronics solar inverters range. Power Electronics has become the leading supplier of utility-scale plant installations in America, Europe and Oceania and continues to expand worldwide.

# FRESUR SOLAR INVERTERS



**Long-lasting** 



**Compact** 



**Smart** 

Designed for utility-scale solar applications that require the advantages of a central inverter combined with the modular design of string architecture.

Our vertical integration gives us the flexibility and specialization to adapt customer requirements and still provide very short delivery times.

# SOLAR Page. 10-21 HEMK INVERTER ER HEMK

These product has the following characteristics



Scan me!

# HEMK

Offers the advantages of both central and string inverters. The full front access simplifies the maintenance tasks.



# **Easy maintenance**

The advantages of a central inverter with the modularity of the string inverters.



Includes up to 4 FRUs (Field Replaceable Units).



# **Bus Plus**

Combine solar and storage.

The Bus Plus feature allows the connection of up to four Freemaq DC/DC converters. It's the most cost-competitive solution for solar-plus-storage retrofits.



Active heating functionality is included by default and it is automatically activated avoiding internal condensation at very low temperatures when the inverter is not actively exporting power.

It also can shift to reactive power compensation mode.





Capable of operating on any power system.

Offering advanced grid support functionalities to comply with the most restrictive grid codes.

# Multilevel topology

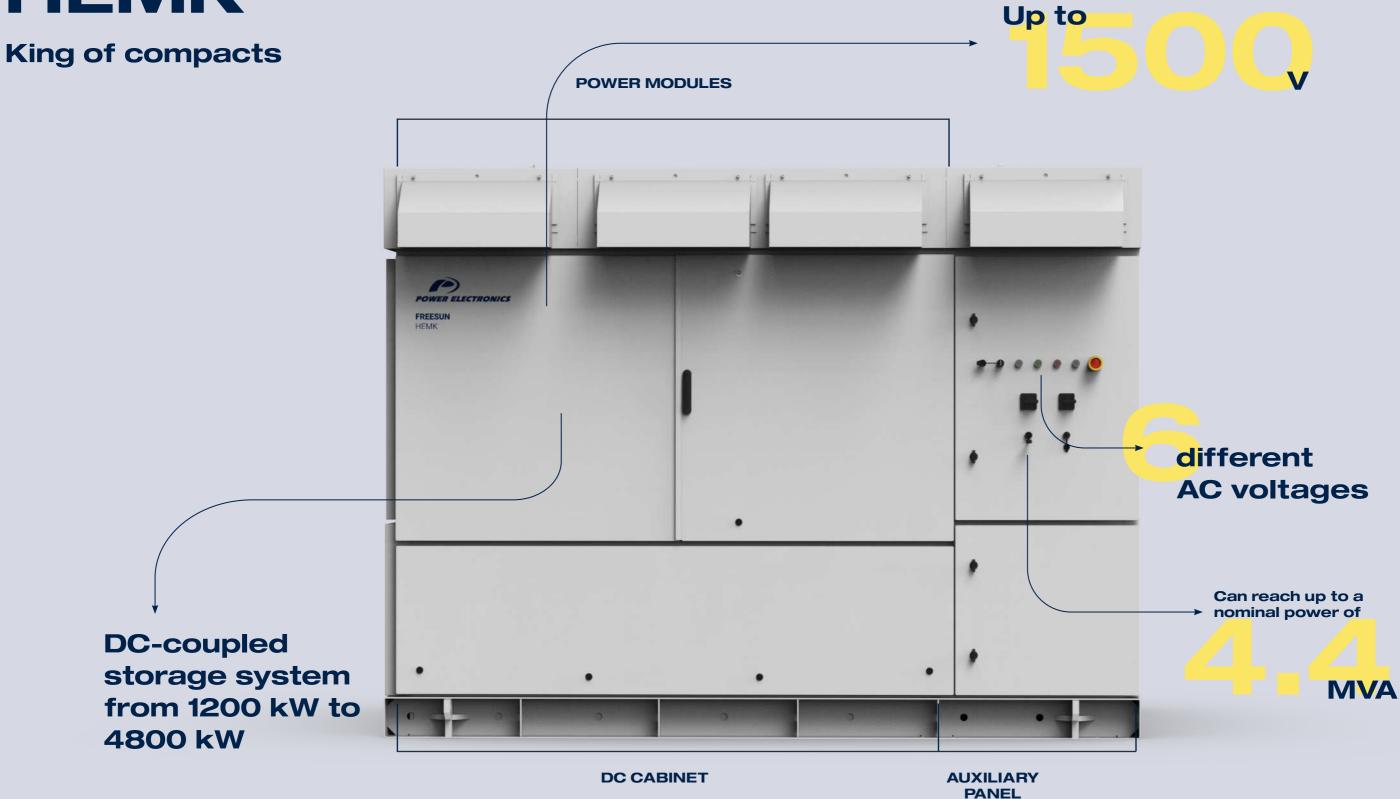
The 3 level IGBT topology reduces stage losses, increases inverter efficiency, and minimizes total harmonic distortion. High efficiency to deliver the lowest cost of energy (LCOE).





FREESUN HEMK





# **HEMK**

FRAME 2 FRAME 3 FRAME 4 **REFERENCES** FS2195K FS3290K FS4390K AC Output Power (kVA/kW) @40°C[1] 2195 3290 4390 AC Output Power (kVA/kW) @50°C[1] 2035 3055 4075 Max. AC Output Current (A) @40°C 1837 2756 3674 Operating Grid Voltage (VAC) 690V ±10% AC 50/60Hz Operating Grid Frequency (Hz) Current Harmonic Distortion (THDi) < 3% per IEEE519 0.5 leading ... 0.5 lagging adjustable / Power Factor (cosine phi)[2] Reactive power injection at night DC Voltage Range<sup>[3]</sup> 976V - 1500V Maximum DC Voltage 1500V Number of Inputs Up to 20 Up to 30 Up to 40 DC Max. DC Continuous Current (A)[4] 2295 3443 4590 Max. DC Short Circuit Current (A)[4] 3470 6940 5205 Number of Freemag DC/DC<sup>[4]</sup> Up to 4 Efficiency (Max) (η) (preliminary) 98.84% 98.87% 98.93% **EFFICIENCY** Euroeta (n) (preliminary) 98.45% 98.48% 98.65% Dimensions [WxDxH] (ft) 9.8 x 6.5 x 7.2 Dimensions [WxDxH] (m) 3.0 x 2.0 x 2.2 **CABINET** Weight (lbs) 11465 11795 12125 5200 5500 Weight (kg) 5350 Type of Ventilation Forced air cooling Degree of Protection NEMA 3R / IP55 Permissible Ambient Temperature [5] -25°C to +60°C, >50°C / Active Power derating **ENVIROMENT** Relative Humidity 4% to 100% non-condensing Max. Altitude (above sea level) 2000m / >2000m power derating (Max. 4000m) Modbus TCP Communication Protocol CONTROL Power Plant Controller Optional **INTERFACE** Keyed ON/OFF Switch Standard GFDI and isolation monitoring device **Ground Fault Protection Humidity Control** Active heating **PROTECTIONS** General AC Protection & Disconn. Circuit breaker General DC Protection & Disconn. Fuses, DC switch-disconnectors Overvoltage Protection Type 2 protection for AC and DC (optionally, Type 1+2) UL 1741 / CSA 22.2 No.107.1-16 / IEC 62109-1 / IEC 62109-2 Safety **CERTIFICATIONS** Installation NEC 2020 / IEC **& STANDARDS** 

IEEE 1547:2018 / UL 1741 SB / IEC 62116:2014

# **HEMK**

GGOV/

|                               |                                      | FRAME 2                                    | FRAME 3                                       | FRAME 4         |
|-------------------------------|--------------------------------------|--|---|-----------------|
| REFERENCES                    |                                      | FS1910K                                    | FS2865K                                       | FS3820K         |
|                               | AC Output Power (kVA/kW) @40°C[1]    | 1910                                       | 2865  | 3820            |
|                               | AC Output Power (kVA/kW) @50°C[1]    |  | 2660  | 3545            |
|                               | Max. AC Output Current (A) @40°C     | 1837                                       | 2756  | 3674            |
| AC                            | Operating Grid Voltage (VAC)         |  | 600V ±10%                                     |                 |
| 40                            | Operating Grid Frequency (Hz)        |  | 50/60Hz                                       |                 |
|                               | Current Harmonic Distortion (THDi)   |  | < 3% per IEEE519                              |                 |
|                               | Power Factor (cosine phi)[2]         |  | ding 0.5 lagging adjustive power injection at |                 |
|                               | DC Voltage Range <sup>[3]</sup>      |  | 934V - 1500V                                  |                 |
|                               | Maximum DC Voltage                   |  | 1500V   |                 |
| 00                            | Number of Inputs                     | Up to 20                                   | Up to 30                                      | Up to 40        |
| DC                            | Max. DC Continuous Current (A)[4]    | 2295                                       | 3443  | 4590            |
|                               | Max. DC Short Circuit Current (A)[4] | 3470                                       | 5205  | 6940            |
|                               | Number of Freemaq DC/DC [4]          |  | Up to 4                                       |                 |
| FFEIGIFNOV                    | Efficiency (Max) (η) (preliminary)   | 98.81%                                     | 98.84%  | 98.90%          |
| EFFICIENCY                    | Euroeta (η) (preliminary)            | 98.45%                                     | 98.48%  | 98.65%          |
|                               | Dimensions [WxDxH] (ft)              |  | 9.8 x 6.6 x 7.2                               |                 |
|                               | Dimensions [WxDxH] (m)               |  | 3.0 x 2.0 x 2.2                               |                 |
| CABINET                       | Weight (lbs)                         | 11465                                      | 11795   | 12125           |
|                               | Weight (kg)                          | 5200                                       | 5350  | 5500            |
|                               | Type of Ventilation                  |  | Forced air cooling                            |                 |
|                               | Degree of Protection                 |  | NEMA 3R / IP55                                |                 |
| ENVIROMENT                    | Permissible Ambient Temperature [5]  | -25°C to +6                                | 0°C, >50°C / Active Po                        | wer derating    |
| LIA A IKOIMEIA I              | Relative Humidity                    | 4%   | to 100% non-condens                           | sing            |
|                               | Max. Altitude (above sea level)      | 2000m / >2000m power derating (Max. 4000m) |   | Max. 4000m)     |
| CONTROL                       | Communication Protocol               |  | Modbus TCP                                    |                 |
| INTERFACE                     | Power Plant Controller               | Optional                                   |   |                 |
| IN I ERFACE                   | Keyed ON/OFF Switch                  | Standard                                   |   |                 |
|                               | Ground Fault Protection              | GFDI a                                     | nd isolation monitoring                       | g device        |
|                               | Humidity Control                     |  | Active heating                                |                 |
| PROTECTIONS                   | General AC Protection & Disconn.     | Circuit breaker                            |   |                 |
|                               | General DC Protection & Disconn.     | Fuses, DC switch-disconnectors             |   |                 |
|                               | Overvoltage Protection               |  | on for AC and DC (opti                        |                 |
| OFDITIONATIONS                | Safety                               | UL 1741 / CSA 22.2                         | 2 No.107.1-16 / IEC 62                        | 109-1 / IEC 621 |
| ©ERTIFICATIONS<br>& STANDARDS | Installation                         |  | NEC 2020 / IEC                                |                 |
|                               | Utility Interconnect                 | IEEE 1547:20                               | 018 / UL 1741 SB / IEC                        | 62116:2014      |

[2] Consult Power Electronics for other configurations.

Utility Interconnect

[3] Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).

[4] Consult Power Electronics for derating curves.

[5] Consult Power Electronics for Freemag DC/DC connection configurations.

[6] Consult Power Electronics for temperatures below -25°C [7] Consult Power Electronics for altitudes above 1000m.

NOTES

[7] Consult Power Electronics for letriperatures below 25

<sup>[1]</sup> Values at 1.00·Vac nom and cosφ=1.Consult Power Electronics for derating curves.

<sup>[1]</sup> Values at 1.00-Vac nom and cos $\phi$ =1.Consult Power Electronics for derating curves.

<sup>[2]</sup> Consult Power Electronics for other configurations.

<sup>[3]</sup> Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).

<sup>[4]</sup> Consult Power Electronics for derating curves.

<sup>[5]</sup> Consult Power Electronics for Freemaq DC/DC connection configurations.[6] Consult Power Electronics for temperatures below -25°C.

# HEMK

FRAME 2 FRAME 3 FRAME 4 FS2055K **REFERENCES** FS3080K FS4105K AC Output Power (kVA/kW) @40°C[1] 2055 3080 4105 1905 AC Output Power (kVA/kW) @50°C[1] 2855 3810 Max. AC Output Current (A) @40°C 1837 2756 3674 Operating Grid Voltage (VAC) 645V ±10% AC 50/60Hz Operating Grid Frequency (Hz) Current Harmonic Distortion (THDi) < 3% per IEEE519 0.5 leading ... 0.5 lagging adjustable / Power Factor (cosine phi)[2] Reactive power injection at night DC Voltage Range<sup>[3]</sup> 913V - 1500V Maximum DC Voltage 1500V Number of Inputs Up to 20 Up to 30 Up to 40 DC Max. DC Continuous Current (A)[4] 2295 3443 4590 Max. DC Short Circuit Current (A)[4] 3470 6940 5205 Number of Freemag DC/DC<sup>[4]</sup> Up to 4 Efficiency (Max) (η) (preliminary) 98.78% 98.81% 98.87% **EFFICIENCY** 98.40% Euroeta (n) (preliminary) 98.43% 98.60% Dimensions [WxDxH] (ft) 9.8 x 6.5 x 7.2 Dimensions [WxDxH] (m) 3.0 x 2.0 x 2.2 **CABINET** 11465 11795 12125 Weight (lbs) 5200 5350 5500 Weight (kg) Type of Ventilation Forced air cooling Degree of Protection NEMA 3R / IP55 -25°C to +60°C, >50°C / Active Power derating Permissible Ambient Temperature [5] **ENVIROMENT** Relative Humidity 4% to 100% non-condensing Max. Altitude (above sea level) 2000m / >2000m power derating (Max. 4000m) Communication Protocol Modbus TCP CONTROL Power Plant Controller Optional **INTERFACE** Keyed ON/OFF Switch Standard **Ground Fault Protection** GFDI and isolation monitoring device **Humidity Control** Active heating **PROTECTIONS** General AC Protection & Disconn. Circuit breaker General DC Protection & Disconn. Fuses, DC switch-disconnectors Overvoltage Protection Type 2 protection for AC and DC (optionally, Type 1+2) UL 1741 / CSA 22.2 No.107.1-16 / IEC 62109-1 / IEC 62109-2 Safety **CERTIFICATIONS** NEC 2020 / IEC Installation **& STANDARDS** 

# HEMK

|                             |  | FRAME 2                        | FRAME 3                                      | FRAME 4            |
|-----------------------------|--|--------------------------------|--|--------------------|
| REFERENCES                  |  | FS2005K                        | FS3005K                                      | FS4010K            |
|                             | AC Output Power (kVA/kW) @40°C[1]      | 2005                           | 3005   | 4010               |
|                             | AC Output Power (kVA/kW) @50°C[1]      |                                | 2790   | 3720               |
|                             | Max. AC Output Current (A) @40°C       | 1837                           | 2756   | 3674               |
| AC                          | Operating Grid Voltage (VAC)           |                                | 630V ±10%                                    |                    |
| 40                          | Operating Grid Frequency (Hz)          |                                | 50/60Hz                                      |                    |
|                             | Current Harmonic Distortion (THDi)     |                                | < 3% per IEEE519                             |                    |
|                             | Power Factor (cosine phi)[2]           | 0.5 lead<br>Read               | ding 0.5 lagging adjutive power injection at | stable /<br>night  |
|                             | DC Voltage Range <sup>[3]</sup>        |                                | 891V - 1500V                                 |                    |
|                             | Maximum DC Voltage                     |                                | 1500V  |                    |
| OC                          | Number of Inputs                       | Up to 20                       | Up to 30                                     | Up to 40           |
| )C                          | Max. DC Continuous Current (A)[4]      | 2295                           | 3443   | 4590               |
|                             | Max. DC Short Circuit Current (A)[4]   | 3470                           | 5205   | 6940               |
|                             | Number of Freemaq DC/DC <sup>[4]</sup> |                                | Up to 4                                      |                    |
| EFFICIENCY                  | Efficiency (Max) (η) (preliminary)     | 98.76%                         | 98.79%                                       | 98.85%             |
|                             | Euroeta (η) (preliminary)              | 98.39%                         | 98.42%                                       | 98.59%             |
|                             | Dimensions [WxDxH] (ft)                |                                | 9.8 x 6.5 x 7.2                              |                    |
|                             | Dimensions [WxDxH] (m)                 |                                | 3.0 x 2.0 x 2.2                              |                    |
| CABINET                     | Weight (lbs)                           | 11465                          | 11795  | 12125              |
|                             | Weight (kg)                            | 5200                           | 5350   | 5500               |
|                             | Type of Ventilation                    |                                | Forced air cooling                           |                    |
|                             | Degree of Protection                   |                                | NEMA 3R / IP55                               |                    |
| ENVIROMENT                  | Permissible Ambient Temperature [5]    | -25°C to +60                   | 0°C, >50°C / Active Pov                      | wer derating       |
| INVIROIVILINI               | Relative Humidity                      | 4%                             | to 100% non-condens                          | ing                |
|                             | Max. Altitude (above sea level)        | 2000m / >20                    | 000m power derating (I                       | Max. 4000m)        |
| CONTROL                     | Communication Protocol                 |                                | Modbus TCP                                   |                    |
| NTERFACE                    | Power Plant Controller                 |                                | Optional                                     |                    |
| NILKIACL                    | Keyed ON/OFF Switch                    |                                | Standard                                     |                    |
|                             | Ground Fault Protection                | GFDI aı                        | nd isolation monitoring                      | g device           |
|                             | Humidity Control                       |                                | Active heating                               |                    |
| PROTECTIONS                 | General AC Protection & Disconn.       | Circuit breaker                |  |                    |
|                             | General DC Protection & Disconn.       | Fuses, DC switch-disconnectors |  |                    |
|                             | Overvoltage Protection                 | Type 2 protection              | on for AC and DC (option                     | onally, Type $1+2$ |
| DEDTIFICATIONS              | Safety                                 | UL 1741 / CSA 22.2             | No.107.1-16 / IEC 62                         | 109-1 / IEC 621    |
| CERTIFICATIONS<br>STANDARDS | Installation                           |                                | NEC 2020 / IEC                               |                    |
| & STANDARDS                 | Utility Interconnect                   | IEEE 1547:20                   | 018 / UL 1741 SB / IEC                       | 62116:2014         |

[3] Consult Power Electronics for derating curves.

Utility Interconnect

IEEE 1547:2018 / UL 1741 SB / IEC 62116:2014

[5] Consult Power Electronics for temperatures below -25°C.

<sup>[1]</sup> Values at 1.00·Vac nom and cosφ=1.Consult Power Electronics for derating curves.

<sup>[2]</sup> Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).

<sup>[4]</sup> Consult Power Electronics for Freemaq DC/DC connection configurations (available for Frame 4).

<sup>[5]</sup> Consult Power Electronics for temperatures below -25°C.

<sup>[2]</sup> Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).

<sup>[3]</sup> Consult Power Electronics for derating curves.

<sup>[4]</sup> Consult Power Electronics for Freemaq DC/DC connection configurations (available for Frame 4).

# HEMK

FRAME 2 FRAME 3 FRAME 4 **REFERENCES** FS1955K FS2935K FS3915K AC Output Power (kVA/kW) @40°C[1] 1955 2935 3915 AC Output Power (kVA/kW) @50°C[1] 1815 2725 3635 Max. AC Output Current (A) @40°C 1837 2756 3674 Operating Grid Voltage (VAC) 615V ±10% AC 50/60Hz Operating Grid Frequency (Hz) Current Harmonic Distortion (THDi) < 3% per IEEE519 0.5 leading ... 0.5 lagging adjustable / Power Factor (cosine phi)[2] Reactive power injection at night DC Voltage Range<sup>[3]</sup> 870V - 1500V Maximum DC Voltage 1500V Number of Inputs Up to 20 Up to 30 Up to 40 DC Max. DC Continuous Current (A)[4] 2295 3443 4590 Max. DC Short Circuit Current (A)[4] 3470 6940 5205 Number of Freemag DC/DC [4] Up to 4 Efficiency (Max) (η) (preliminary) 98.76% 98.79% 98.84% **EFFICIENCY** Euroeta (n) (preliminary) 98.38% 98.41% 98.57% Dimensions [WxDxH] (ft) 9.8 x 6.5 x 7.2 Dimensions [WxDxH] (m) 3.0 x 2.0 x 2.2 **CABINET** Weight (lbs) 11465 11795 12125 5200 5350 5500 Weight (kg) Type of Ventilation Forced air cooling Degree of Protection NEMA 3R / IP55 Permissible Ambient Temperature [5] -25°C to +60°C, >50°C / Active Power derating **ENVIROMENT** Relative Humidity 4% to 100% non-condensing Max. Altitude (above sea level) 2000m / >2000m power derating (Max. 4000m) Modbus TCP Communication Protocol CONTROL Power Plant Controller Optional **INTERFACE** Keyed ON/OFF Switch Standard GFDI and isolation monitoring device **Ground Fault Protection Humidity Control** Active heating **PROTECTIONS** General AC Protection & Disconn. Circuit breaker General DC Protection & Disconn. Fuses, DC switch-disconnectors Overvoltage Protection Type 2 protection for AC and DC (optionally, Type 1+2) UL 1741 / CSA 22.2 No.107.1-16 / IEC 62109-1 / IEC 62109-2 Safety **CERTIFICATIONS** Installation NEC 2020 / IEC **& STANDARDS** Utility Interconnect IEEE 1547:2018 / UL 1741 SB / IEC 62116:2014

# HEMK

|                               |  | FRAME 2                        | FRAME 3  | FRAME 4              |
|-------------------------------|--|--------------------------------|--|----------------------|
| REFERENCES                    |  | FS1910K                        | FS2865K  | FS3820K              |
|                               | AC Output Power (kVA/kW) @40°C[1]      | 1910                           | 2865   | 3820                 |
|                               | AC Output Power (kVA/kW) @50°C[1]      | 1775                           | 2660   | 3545                 |
|                               | Max. AC Output Current (A) @40°C       | 1837                           | 2756   | 3674                 |
| AC                            | Operating Grid Voltage (VAC)           |                                | 600V ±10%  |                      |
| AC .                          | Operating Grid Frequency (Hz)          |                                | 50/60Hz  |                      |
|                               | Current Harmonic Distortion (THDi)     |                                | < 3% per IEEE519                                 |                      |
|                               | Power Factor (cosine phi)[2]           | 0.5 lead<br>Read               | ding 0.5 lagging adju<br>tive power injection at | ıstable /<br>: night |
|                               | DC Voltage Range <sup>[3]</sup>        |                                | 849V - 1500V                                     |                      |
|                               | Maximum DC Voltage                     |                                | 1500V  |                      |
| 0.0                           | Number of Inputs                       | Up to 20                       | Up to 30   | Up to 40             |
| DC                            | Max. DC Continuous Current (A)[4]      | 2295                           | 3443   | 4590                 |
|                               | Max. DC Short Circuit Current (A)[4]   | 3470                           | 5205   | 6940                 |
|                               | Number of Freemag DC/DC <sup>[4]</sup> |                                | Up to 4  |                      |
| EFFICIENCY                    | Efficiency (Max) (n) (preliminary)     | 98.76%                         | 98.78%   | 98.84%               |
|                               | Euroeta (n) (preliminary)              | 98.37%                         | 98.39%   | 98.56%               |
|                               | Dimensions [WxDxH] (ft)                |                                | 9.8 x 6.5 x 7.2                                  |                      |
|                               | Dimensions [WxDxH] (m)                 |                                | 3.0 x 2.0 x 2.2                                  |                      |
| CABINET                       | Weight (lbs)                           | 11465                          | 11795  | 12125                |
|                               | Weight (kg)                            | 5200                           | 5350   | 5500                 |
|                               | Type of Ventilation                    |                                | Forced air cooling                               |                      |
|                               | Degree of Protection                   |                                | NEMA 3R / IP55                                   |                      |
| ENIVIDOMENT.                  | Permissible Ambient Temperature [5]    | -25°C to +6                    | 0°C, >50°C / Active Po                           | wer derating         |
| ENVIROMENT                    | Relative Humidity                      | 4%                             | to 100% non-condens                              | sing                 |
|                               | Max. Altitude (above sea level)        | 2000m / >20                    | 000m power derating (                            | Max. 4000m)          |
| CONTROL                       | Communication Protocol                 |                                | Modbus TCP                                       |                      |
|                               | Power Plant Controller                 | Optional                       |  |                      |
| INTERFACE                     | Keyed ON/OFF Switch                    | Standard                       |  |                      |
|                               | Ground Fault Protection                | GFDI a                         | nd isolation monitoring                          | g device             |
|                               | Humidity Control                       | Active heating                 |  |                      |
| PROTECTIONS                   | General AC Protection & Disconn.       | Circuit breaker                |  |                      |
|                               | General DC Protection & Disconn.       | Fuses, DC switch-disconnectors |  | ectors               |
|                               | Overvoltage Protection                 | Type 2 protection              | on for AC and DC (opti                           | onally, Type 1+2     |
| 0EDTIEL0 ( T. 0 ) : 0         | Safety                                 | UL 1741 / CSA 22.2             | No.107.1-16 / IEC 62                             | 109-1 / IEC 621      |
| CERTIFICATIONS<br>& STANDARDS | Installation                           |                                | NEC 2020 / IEC                                   |                      |
| STANDARDS                     | Utility Interconnect                   | IEEE 1547:20                   | 018 / UL 1741 SB / IEC                           | C 62116:2014         |

[5] Consult Power Electronics for temperatures below -25°C.

<sup>[1]</sup> Values at 1.00·Vac nom and cosφ=1.Consult Power Electronics for derating curves.

<sup>[2]</sup> Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).

<sup>[3]</sup> Consult Power Electronics for derating curves.

<sup>[4]</sup> Consult Power Electronics for Freemaq DC/DC connection configurations (available for Frame 4).

<sup>[5]</sup> Consult Power Electronics for temperatures below -25°C.

<sup>[2]</sup> Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).

<sup>[3]</sup> Consult Power Electronics for derating curves.

<sup>[4]</sup> Consult Power Electronics for Freemaq DC/DC connection configurations (available for Frame 4).

# AMERICANI Page. 24-35 HEM

These product has the following characteristics



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# **HEM**

The turn-key solution, simplifies the task of designing the installation, and reduces connection costs.



# **Easy maintenance**

The advantages of a central inverter with the modularity of the string inverters.



Designed to be easily replaceable on the field with a safe, reliable, and fast Plug&Play assembly system.

Includes up to 4 FRUs (Field Replaceable Units).



Combine solar and storage.

The Bus Plus feature allows the connection of up to four Freemaq DC/DC converters. It's the most cost-competitive solution for solar-plus-storage retrofits.

# **ECON MODE**

Remove no-load losses.

Disconnecting the power station from the grid and taking the medium-voltage transformer out of the circuit, the continuous energy cost of noload losses is eliminated.



Capable of operating on any power system, Offering advanced grid support functionalities to comply with the most restrictive grid codes.

# iCOOL 3

The most innovative cooling system.

Our own air ventilation system provides a constant flow of clean air inside the equipment, without the need of liquid cooling.

# Active heating

Patented

Active heating functionality is included by default and is automatically activated avoiding internal condensation at very low temperatures when the inverter is not actively exporting power.

It also can shift to reactive power compensation mode.

# Multilevel topology

The 3 level IGBT topology reduces stage losses, increases inverter efficiency, and minimizes total harmonic distortion. High efficiency to deliver the lowest cost of energy (LCOE).



# HEM

The ultimate medium-voltage inverter



**OUR PRODUCTS POWER ELECTRONICS** 

# **HEM**



| REFERENCES                    |  | FS4200M   |
|-------------------------------|--|---|
|                               | AC Output Power (kVA/kW) @40°C[1]      | 4200  |
|                               | AC Output Power (kVA/kW) @50°C[1]      | 3900  |
|                               | Operating Grid Voltage (kV)[2]         | 34.5kV ±10%   |
| AC                            | Operating Grid Frequency (Hz)          | 60Hz  |
|                               | Current Harmonic Distortion (THDi)     | < 3% per IEEE519  |
|                               | Power Factor (cosine phi)[3]           | 0.5 leading 0.5 lagging adjustable /<br>Reactive power injection at night |
|                               | DC Voltage Range <sup>[4]</sup>        | 934V - 1500V  |
|                               | Maximum DC Voltage                     | 1500V   |
| DC                            | Number of Inputs                       | Up to 40  |
|                               | Max. DC Continuous Current (A)[5]      | 4590  |
|                               | Max. DC Short Circuit Current (A)[5]   | 6940  |
|                               | Number of Freemaq DC/DC <sup>[5]</sup> | Up to 4   |
| EFFICIENCY                    | Efficiency (Max) (η) (preliminary)     | 97.8% including MV transformer  |
| EFFICIENCY                    | Euroeta (η) (preliminary)              | 97.51% including MV transformer   |
| CABINET                       | Dimensions [WxDxH] (ft)                | 21.3 x 6.5 x 7.2  |
|                               | Dimensions [WxDxH] (m)                 | 6.5 x 2.0 x 2.2   |
|                               | Weight (lbs)                           | 30865   |
|                               | Weight (kg)                            | 14000   |
|                               | Type of Ventilation                    | Forced air cooling  |
|                               | Degree of Protection                   | NEMA 3R   |
| ENVIROMENT                    | Permissible Ambient Temperature [6]    | -25°C to +60°C, >50°C / Active power derating                             |
| ENVIROIVIENI                  | Relative Humidity                      | 4% to 100% non-condensing   |
|                               | Max. Altitude (above sea level) [7]    | 2000m   |
| CONTROL                       | Communication Protocol                 | Modbus TCP  |
| NTERFACE                      | Power Plant Controller                 | Optional  |
| NIERFACE                      | Keyed ON/OFF Switch                    | Standard  |
|                               | Ground Fault Protection                | GFDI and isolation monitoring device                                      |
|                               | Humidity Control                       | Active heating  |
| PROTECTIONS                   | General AC Protection & Disconn.       | MV switchgear (20 or 25 kA)   |
|                               | General DC Protection & Disconn.       | Fuses, DC switch-disconnectors  |
|                               | Overvoltage Protection                 | Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)        |
| OEDTIFICATIONS                | Safety                                 | UL 1741 / CSA 22.2 No.107.1-16  |
| CERTIFICATIONS<br>& STANDARDS | Installation                           | NEC 2020  |
|                               | Utility Interconnect                   | IEEE 1547:2018 / UL 1741 SB   |

# **HEM**



| REFERENCES                    |   | FS4200M   |
|-------------------------------|---|---|
|                               | AC Output Power (kVA/kW) @40°C[1]             | 4200  |
|                               | AC Output Power (kVA/kW) @50°C[1]             | 3900  |
|                               | Operating Grid Voltage (kV)[2]                | 34.5kV ±10%   |
| AC                            | Operating Grid Frequency (Hz)                 | 60Hz  |
|                               | Current Harmonic Distortion (THDi)            | < 3% per IEEE519  |
|                               | Power Factor (cosine phi)[3]                  | 0.5 leading 0.5 lagging adjustable /<br>Reactive power injection at night |
|                               | DC Voltage Range <sup>[4]</sup>               | 934V - 1500V  |
|                               | Maximum DC Voltage                            | 1500V   |
| DC                            | Number of Inputs                              | Up to 40  |
|                               | Max. DC Continuous Current (A) <sup>[5]</sup> | 4590  |
|                               | Max. DC Short Circuit Current (A)[5]          | 6940  |
|                               | Number of Freemaq DC/DC <sup>[5]</sup>        | Up to 4   |
| EFFICIENCY                    | Efficiency (Max) (η) (preliminary)            | 97.8% including MV transformer  |
| EFFICIENCY                    | Euroeta (η) (preliminary)                     | 97.51% including MV transformer   |
|                               | Dimensions [WxDxH] (ft)                       | 21.3 x 6.5 x 7.2  |
|                               | Dimensions [WxDxH] (m)                        | 6.5 x 2.0 x 2.2   |
| CABINET                       | Weight (lbs)                                  | 30865   |
|                               | Weight (kg)                                   | 14000   |
|                               | Type of Ventilation                           | Forced air cooling  |
|                               | Degree of Protection                          | IP55  |
| ENIVIDONENT                   | Permissible Ambient Temperature [6]           | -25°C to +60°C, >50°C / Active power derating                             |
| ENVIROMENT                    | Relative Humidity                             | 4% to 100% non-condensing   |
|                               | Max. Altitude (above sea level) [7]           | 2000m   |
| CONTROL                       | Communication Protocol                        | Modbus TCP  |
|                               | Power Plant Controller                        | Optional  |
| NTERFACE                      | Keyed ON/OFF Switch                           | Standard  |
|                               | Ground Fault Protection                       | GFDI and isolation monitoring device                                      |
|                               | Humidity Control                              | Active heating  |
| PROTECTIONS                   | General AC Protection & Disconn.              | MV switchgear (2L+V)  |
| PROTECTIONS                   | General DC Protection & Disconn.              | Fuses, DC switch-disconnectors  |
|                               | Overvoltage Protection                        | Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)        |
| CERTIFICATIONS<br>& STANDARDS | Safety  | IEC 62477-2   |

 <sup>[1]</sup> Values at 1.00·Vac nom and cosφ=1.Consult Power Electronics for derating curves.
 [2] Consult Power Electronics for other configurations.
 [3] Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).
 [4] Consult Power Electronics for derating curves.

<sup>[5]</sup> Consult Power Electronics for Freemaq DC/DC connection configurations.
[6] Consult Power Electronics for temperatures below -25°C
[7] Consult Power Electronics for altitudes above 1000m.

<sup>[3]</sup> Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).
[4] Consult Power Electronics for derating curves.
[5] Consult Power Electronics for Freemaq DC/DC connection configurations.

<sup>[6]</sup> Consult Power Electronics for temperatures below -25°C.
[7] Consult Power Electronics for altitudes above 1000m.

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# **HEM**



| AC Output Power (kVA/kW) @40°C <sup>[1]</sup>   |                               |  |  |
|---|-------------------------------|--|--|
| AC Output Power (kVA/kW) @50°C¹¹¹         3810           Operating Grid Voltage (kV)²¹²         34.5kV ±10%           Operating Grid Frequency (Hz)         60Hz           Current Harmonic Distortion (THDi)         < 3% per IEEE519           Power Factor (cosine phi)¹³¹         0.5 leading 0.5 lagging adjustable / Reactive power injection at night           DC Voltage Range⁴⁴         913V - 1500V           Maximum DC Voltage         1500V           Number of Inputs         Up to 40           Max. DC Continuous Current (A)¹⁵¹         4590           Max. DC Short Circuit Current (A)¹⁵¹         6940           Number of Freemaq DC/DC¹⁵¹         Up to 4           EFFICIENCY         Efficiency (Max) (n) (preliminary)         97.76% including MV transformer           Euroeta (n) (preliminary)         97.50% including MV transformer           Euroeta (n) (preliminary) | REFERENCES                    |  | FS4105M  |
| Operating Grid Voltage (kV)    34.5kV ±10%  |                               | AC Output Power (kVA/kW) @40°C[1]      | 4105   |
| AC  |                               | AC Output Power (kVA/kW) @50°C[1]      | 3810   |
| Current Harmonic Distortion (THDi)   Current Harmonic Distortion (THDi)   Current Harmonic Distortion (THDi)   Cosine phi)   Sa% per IEEE519  |                               | Operating Grid Voltage (kV)[2]         | 34.5kV ±10%  |
| Power Factor (cosine phi) <sup>[3]</sup> DC Voltage Range <sup>[4]</sup> DC Voltage Range <sup>[4]</sup> Power Factor (cosine phi) <sup>[3]</sup> DC Voltage Range <sup>[4]</sup> Power injection at night  Maximum DC Voltage  Number of Inputs  Up to 40  Max. DC Continuous Current (A) <sup>[5]</sup> Max. DC Short Circuit Current (A) <sup>[5]</sup> Number of Freemaq DC/DC <sup>[5]</sup> Up to 4  Efficiency (Max) (n) (preliminary)  Puroeta (n) (preliminary)  Poimensions [WxDxH] (ft)  Poimensions [WxDxH] (m)  Poimensions [WxDxH] (m)  Poignet (kg)  Type of Ventilation  Permissible Ambient Temperature (a)  Permissible Ambient Temperature (b)  Power Plant Controller  Reactive power injection at night  Prescription (A)  Reactive power injection at night  Possible Ambient Temperature (a)  Power Plant Controller  Reyed ON/OFF Switch  Ground Fault Protection GFDI and isolation monitoring device   | AC                            | Operating Grid Frequency (Hz)          | 60Hz   |
| DC         Voltage Range <sup>[A]</sup> 913V - 1500V           Maximum DC Voltage         1500V           Number of Inputs         Up to 40           Max. DC Continuous Current (A) <sup>[S]</sup> 4590           Max. DC Short Circuit Current (A) <sup>[S]</sup> 6940           Number of Freemaq DC/DC <sup>[S]</sup> Up to 4           EFFICIENCY         Efficiency (Max) (η) (preliminary)         97.76% including MV transformer           Euroeta (η) (preliminary)         97.50% including MV transformer           Dimensions [WxDxH] (ft)         21.3 x 6.5 x 7.2           Dimensions [WxDxH] (m)         6.5 x 2.0 x 2.2           Weight (lbs)         30865           Weight (kg)         14000           Type of Ventilation         Forced air cooling           ENVIROMENT         Permissible Ambient Temperature [6]         -25°C to +60°C, >50°C / Active power derating           Relative Humidity         4% to 100% non-condensing           Max. Altitude (above sea level) [7]         2000m           CONTROL         Power Plant Controller         Optional           INTERFACE         GFDI and isolation monitoring device   |                               | Current Harmonic Distortion (THDi)     | < 3% per IEEE519   |
| DC         Maximum DC Voltage         1500V           Number of Inputs         Up to 40           Max. DC Continuous Current (A) <sup>[S]</sup> 4590           Max. DC Short Circuit Current (A) <sup>[S]</sup> 6940           Number of Freemaq DC/DC <sup>[S]</sup> Up to 4           EFFICIENCY         Efficiency (Max) (η) (preliminary)         97.76% including MV transformer           Euroeta (η) (preliminary)         97.50% including MV transformer           Dimensions [WxDxH] (ft)         21.3 x 6.5 x 7.2           Dimensions [WxDxH] (m)         6.5 x 2.0 x 2.2           Weight (lbs)         30865           Weight (kg)         14000           Type of Ventilation         Forced air cooling           ENVIROMENT         Degree of Protection         NEMA 3R           Permissible Ambient Temperature [6]         -25°C to +60°C, >50°C / Active power derating           Relative Humidity         4% to 100% non-condensing           Max. Altitude (above sea level) [7]         2000m           CONTROL         Modbus TCP           Power Plant Controller         Optional           Keyed ON/OFF Switch         Standard           Ground Fault Protection         GFDI and isolation monitoring device  |                               |  |  |
| DC         Number of Inputs         Up to 40           Max. DC Continuous Current (A) <sup>[S]</sup> 4590           Max. DC Short Circuit Current (A) <sup>[S]</sup> 6940           Number of Freemaq DC/DC <sup>[S]</sup> Up to 4           EFFICIENCY         Efficiency (Max) (η) (preliminary)         97.76% including MV transformer           Euroeta (η) (preliminary)         97.50% including MV transformer           Dimensions [WxDxH] (ft)         21.3 x 6.5 x 7.2           Dimensions [WxDxH] (m)         6.5 x 2.0 x 2.2           Weight (lbs)         30865           Weight (kg)         14000           Type of Ventilation         Forced air cooling           Permissible Ambient Temperature [6]         -25°C to +60°C, >50°C / Active power derating           Relative Humidity         4% to 100% non-condensing           Max. Altitude (above sea level) [7]         2000m           CONTROL INTERFACE         Communication Protocol         Modbus TCP           Power Plant Controller         Optional           Keyed ON/OFF Switch         Standard           Ground Fault Protection         GFDI and isolation monitoring device  |                               |  | 913V - 1500V   |
| Max. DC Continuous Current (A) 5  |                               | <u>_</u>                               | 1500V  |
| Max. DC Continuous Current (A)   5   4590   | nc                            |  | Up to 40   |
| Number of Freemaq DC/DC[5]Up to 4Efficiency (Max) (η) (preliminary)97.76% including MV transformerEuroeta (η) (preliminary)97.50% including MV transformerDimensions [WxDxH] (ft)21.3 x 6.5 x 7.2Dimensions [WxDxH] (m)6.5 x 2.0 x 2.2Weight (lbs)30865Weight (kg)14000Type of VentilationForced air coolingPermissible Ambient Temperature [6]-25°C to +60°C, >50°C / Active power deratingRelative Humidity4% to 100% non-condensingMax. Altitude (above sea level) [7]2000mCONTROL<br>INTERFACECommunication ProtocolModbus TCPPower Plant ControllerOptionalKeyed ON/OFF SwitchStandardGround Fault ProtectionGFDI and isolation monitoring device  | DC                            | Max. DC Continuous Current (A)[5]      | 4590   |
| EFFICIENCYEfficiency (Max) (η) (preliminary)97.76% including MV transformerEuroeta (η) (preliminary)97.50% including MV transformerDimensions [WxDxH] (ft)21.3 x 6.5 x 7.2Dimensions [WxDxH] (m)6.5 x 2.0 x 2.2Weight (lbs)30865Weight (kg)14000Type of VentilationForced air coolingDegree of ProtectionNEMA 3RPermissible Ambient Temperature [6]-25°C to +60°C, >50°C / Active power deratingRelative Humidity4% to 100% non-condensingMax. Altitude (above sea level) [7]2000mCONTROL<br>INTERFACECommunication ProtocolModbus TCPPower Plant Controller<br>Keyed ON/OFF SwitchStandardGround Fault ProtectionGFDI and isolation monitoring device  |                               | Max. DC Short Circuit Current (A)[5]   | 6940   |
| Euroeta (n) (preliminary)   97.50% including MV transformer   |                               | Number of Freemaq DC/DC <sup>[5]</sup> | Up to 4  |
| Euroeta (ŋ) (preliminary)   97.50% including MV transformer   | EEEICIENOV                    | Efficiency (Max) (η) (preliminary)     | 97.76% including MV transformer                                    |
| Dimensions [WxDxH] (m)  Weight (lbs) Weight (kg) Type of Ventilation  Permissible Ambient Temperature [6] Relative Humidity Max. Altitude (above sea level) [7]  CONTROL INTERFACE  Dimensions [WxDxH] (m)  Reight (lbs) 30865  Weight (kg) 14000  Forced air cooling  NEMA 3R  Permissible Ambient Temperature [6] -25°C to +60°C, >50°C / Active power derating 4% to 100% non-condensing Modbus TCP  Power Plant Controller  Keyed ON/OFF Switch Ground Fault Protection  GFDI and isolation monitoring device   | EFFICIENCI                    | Euroeta (η) (preliminary)              | 97.50% including MV transformer                                    |
| Weight (lbs) Weight (kg) Type of Ventilation Forced air cooling  Degree of Protection NEMA 3R Permissible Ambient Temperature [6] Relative Humidity Max. Altitude (above sea level) [7]  CONTROL INTERFACE  Weight (lbs) 30865 NEMA 3R -25°C to +60°C, >50°C / Active power derating 4% to 100% non-condensing 2000m Modbus TCP Power Plant Controller Keyed ON/OFF Switch Ground Fault Protection GFDI and isolation monitoring device   | CABINET                       | Dimensions [WxDxH] (ft)                | 21.3 x 6.5 x 7.2   |
| Weight (kg) Type of Ventilation Forced air cooling  Degree of Protection NEMA 3R Permissible Ambient Temperature [6] Relative Humidity Max. Altitude (above sea level) [7]  CONTROL INTERFACE  Weight (kg) 14000 Forced air cooling NEMA 3R Permissible Ambient Temperature [6] -25°C to +60°C, >50°C / Active power derating 4% to 100% non-condensing 2000m Communication Protocol Modbus TCP Power Plant Controller Optional Keyed ON/OFF Switch Standard Ground Fault Protection GFDI and isolation monitoring device   |                               | Dimensions [WxDxH] (m)                 | 6.5 x 2.0 x 2.2  |
| Type of Ventilation  Forced air cooling  Degree of Protection  Permissible Ambient Temperature [6]  Relative Humidity  Max. Altitude (above sea level) [7]  CONTROL  INTERFACE  Type of Ventilation  NEMA 3R  -25°C to +60°C, >50°C / Active power derating  4% to 100% non-condensing  2000m  Communication Protocol  Modbus TCP  Power Plant Controller  Keyed ON/OFF Switch  Ground Fault Protection  GFDI and isolation monitoring device   |                               | Weight (lbs)                           | 30865  |
| Degree of Protection Permissible Ambient Temperature [6] Relative Humidity Max. Altitude (above sea level) [7]  CONTROL INTERFACE  Degree of Protection NEMA 3R -25°C to +60°C, >50°C / Active power derating 4% to 100% non-condensing 2000m 2000m  Communication Protocol Modbus TCP Power Plant Controller Optional Keyed ON/OFF Switch Ground Fault Protection GFDI and isolation monitoring device   |                               | Weight (kg)                            | 14000  |
| Permissible Ambient Temperature [6] -25°C to +60°C, >50°C / Active power derating Relative Humidity 4% to 100% non-condensing Max. Altitude (above sea level) [7] 2000m  CONTROL COMMUNICATION Modbus TCP  Power Plant Controller Optional Standard Ground Fault Protection GFDI and isolation monitoring device  |                               | Type of Ventilation                    | Forced air cooling   |
| Relative Humidity  Max. Altitude (above sea level) [7]  CONTROL INTERFACE  Relative Humidity  Max. Altitude (above sea level) [7]  Communication Protocol  Power Plant Controller  Keyed ON/OFF Switch  Ground Fault Protection  Modbus TCP  Optional  Standard  GFDI and isolation monitoring device   |                               | Degree of Protection                   | NEMA 3R  |
| Relative Humidity 4% to 100% non-condensing  Max. Altitude (above sea level) [7] 2000m  CONTROL INTERFACE  Communication Protocol Modbus TCP  Power Plant Controller Optional  Keyed ON/OFF Switch Standard  Ground Fault Protection GFDI and isolation monitoring device   | ENIVIDOMENT                   | Permissible Ambient Temperature [6]    | -25°C to +60°C, >50°C / Active power derating                      |
| CONTROL   Communication Protocol   Modbus TCP   | ENVIROIVIENI                  | Relative Humidity                      | 4% to 100% non-condensing  |
| Power Plant Controller  Keyed ON/OFF Switch  Ground Fault Protection  Power Plant Controller  Optional  Standard  GFDI and isolation monitoring device  |                               | Max. Altitude (above sea level) [7]    | 2000m  |
| Power Plant Controller Optional Keyed ON/OFF Switch Standard Ground Fault Protection GFDI and isolation monitoring device   | CONTROL                       | Communication Protocol                 | Modbus TCP   |
| Ground Fault Protection GFDI and isolation monitoring device  |                               | Power Plant Controller                 | Optional   |
|   | INTERFACE                     | Keyed ON/OFF Switch                    | Standard   |
| Humidity Control Active heating   |                               | Ground Fault Protection                | GFDI and isolation monitoring device                               |
|   |                               | Humidity Control                       | Active heating   |
| General AC Protection & Disconn.  MV switchgear (20 or 25 kA)   | PROTECTIONS                   | General AC Protection & Disconn.       | MV switchgear (20 or 25 kA)  |
| General DC Protection & Disconn.  Fuses, DC switch-disconnectors  |                               | General DC Protection & Disconn.       | Fuses, DC switch-disconnectors                                     |
| Overvoltage Protection  Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)  |                               | Overvoltage Protection                 | Type 2 protection for AC and DC (optionally, Type 1+2 for DC side) |
| Safety UL 1741 / CSA 22.2 No.107.1-16   | 0EDTIFIO 4710110              | Safety                                 | UL 1741 / CSA 22.2 No.107.1-16                                     |
| Inglallation NEL 7171   | CERTIFICATIONS<br>& STANDARDS | Installation                           | NEC 2020   |
| Utility Interconnect IEEE 1547:2018 / UL 1741 SB  |                               | Litility Intercensed                   | IEEE 15/7:0010 / III 17/11 OD                                      |

# **HEM**



| REFERENCES                            |   | FS4105MH   |
|---------------------------------------|---|--|
|                                       | AC Output Power (kVA/kW) @40°C[1]             | 4105   |
|                                       | AC Output Power (kVA/kW) @50°C[1]             | 3810   |
|                                       | Operating Grid Voltage (kV)[2]                | 34.5kV ±10%  |
| AC                                    | Operating Grid Frequency (Hz)                 | 60Hz   |
|                                       | Current Harmonic Distortion (THDi)            | < 3% per IEEE519   |
|                                       | Power Factor (cosine phi)[3]                  | 0.5 leading 0.5 lagging adjustable / Reactive power injection at night |
|                                       | DC Voltage Range <sup>[4]</sup>               | 913V - 1500V   |
|                                       | Maximum DC Voltage                            | 1500V  |
| OC                                    | Number of Inputs                              | Up to 40   |
| )C                                    | Max. DC Continuous Current (A) <sup>[5]</sup> | 4590   |
|                                       | Max. DC Short Circuit Current (A)[5]          | 6940   |
|                                       | Number of Freemaq DC/DC <sup>[5]</sup>        | Up to 4  |
| EFFICIENCY                            | Efficiency (Max) (η) (preliminary)            | 97.76% including MV transformer  |
| EFFICIENCY                            | Euroeta (η) (preliminary)                     | 97.50% including MV transformer  |
|                                       | Dimensions [WxDxH] (ft)                       | 21.3 x 6.5 x 7.2   |
|                                       | Dimensions [WxDxH] (m)                        | 6.5 x 2.0 x 2.2  |
| CABINET                               | Weight (lbs)                                  | 30865  |
| , , , , , , , , , , , , , , , , , , , | Weight (kg)                                   | 14000  |
|                                       | Type of Ventilation                           | Forced air cooling   |
|                                       | Degree of Protection                          | IP55   |
| ENVIROMENT                            | Permissible Ambient Temperature [6]           | -25°C to +60°C, >50°C / Active power derating                          |
| ENVIRONIENI                           | Relative Humidity                             | 4% to 100% non-condensing  |
|                                       | Max. Altitude (above sea level) [7]           | 2000m  |
| CONTROL                               | Communication Protocol                        | Modbus TCP   |
|                                       | Power Plant Controller                        | Optional   |
| NTERFACE                              | Keyed ON/OFF Switch                           | Standard   |
|                                       | Ground Fault Protection                       | GFDI and isolation monitoring device                                   |
|                                       | Humidity Control                              | Active heating   |
| PROTECTIONS                           | General AC Protection & Disconn.              | MV switchgear (2L+V)   |
| NO LO HORO                            | General DC Protection & Disconn.              | Fuses, DC switch-disconnectors   |
|                                       | Overvoltage Protection                        | Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)     |
| CERTIFICATIONS<br>& STANDARDS         | Safety  | IEC 62477-2  |

[1] Values at 1.00·Vac nom and cosφ=1.Consult Power Electronics for derating curves. [2] Consult Power Electronics for other configurations. [3] Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2). [4] Consult Power Electronics for derating curves. [5] Consult Power Electronics for Freemaq DC/DC connection configurations. [6] Consult Power Electronics for temperatures below -25°C [7] Consult Power Electronics for altitudes above 1000m.

NOTES

[1] Values at 1.00-Vac nom and  $cos\phi$ =1.Consult Power Electronics for derating curves. [2] Consult Power Electronics for other configurations.

[3] Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).
[4] Consult Power Electronics for derating curves.
[5] Consult Power Electronics for Freemaq DC/DC connection configurations.

[6] Consult Power Electronics for temperatures below -25°C.
[7] Consult Power Electronics for altitudes above 1000m.

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# **HEM**



| REFERENCES                    |  | FS4010M   |
|-------------------------------|--|---|
|                               | AC Output Power (kVA/kW) @40°C[1]      | 4010  |
|                               | AC Output Power (kVA/kW) @50°C[1]      | 3720  |
|                               | Operating Grid Voltage (kV)[2]         | 34.5kV ±10%   |
| AC                            | Operating Grid Frequency (Hz)          | 60Hz  |
|                               | Current Harmonic Distortion (THDi)     | < 3% per IEEE519  |
|                               | Power Factor (cosine phi)[3]           | 0.5 leading 0.5 lagging adjustable /<br>Reactive power injection at night |
|                               | DC Voltage Range <sup>[4]</sup>        | 891V - 1500V  |
|                               | Maximum DC Voltage                     | 1500V   |
| DC                            | Number of Inputs                       | Up to 40  |
|                               | Max. DC Continuous Current (A)[5]      | 4590  |
|                               | Max. DC Short Circuit Current (A)[5]   | 6940  |
|                               | Number of Freemaq DC/DC <sup>[5]</sup> | Up to 4   |
| EFFICIENCY                    | Efficiency (Max) (η) (preliminary)     | 97.75% including MV transformer   |
| EFFICIENCY                    | Euroeta (η) (preliminary)              | 97.48% including MV transformer   |
| CABINET                       | Dimensions [WxDxH] (ft)                | 21.3 x 6.5 x 7.2  |
|                               | Dimensions [WxDxH] (m)                 | 6.5 x 2.0 x 2.2   |
|                               | Weight (lbs)                           | 30865   |
|                               | Weight (kg)                            | 14000   |
|                               | Type of Ventilation                    | Forced air cooling  |
|                               | Degree of Protection                   | NEMA 3R   |
| ENVIROMENT                    | Permissible Ambient Temperature [6]    | -25°C to +60°C, >50°C / Active power derating                             |
| ENVIROIVIENI                  | Relative Humidity                      | 4% to 100% non-condensing   |
|                               | Max. Altitude (above sea level) [7]    | 2000m   |
| CONTROL                       | Communication Protocol                 | Modbus TCP  |
| NTERFACE                      | Power Plant Controller                 | Optional  |
| NIERFACE                      | Keyed ON/OFF Switch                    | Standard  |
|                               | Ground Fault Protection                | GFDI and isolation monitoring device                                      |
|                               | Humidity Control                       | Active heating  |
| PROTECTIONS                   | General AC Protection & Disconn.       | MV switchgear (20 or 25 kA)   |
| PROTECTIONS                   | General DC Protection & Disconn.       | Fuses, DC switch-disconnectors  |
|                               | Overvoltage Protection                 | Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)        |
| DEDITIES ATIONS               | Safety                                 | UL 1741 / CSA 22.2 No.107.1-16  |
| CERTIFICATIONS<br>& STANDARDS | Installation                           | NEC 2020  |
|                               | Utility Interconnect                   | IEEE 1547:2018 / UL 1741 SB   |

# **HEM**



| REFERENCES                    |  | FS4010MH  |
|-------------------------------|--|---|
|                               | AC Output Power (kVA/kW) @40°C[1]      | 4010  |
|                               | AC Output Power (kVA/kW) @50°C[1]      | 3720  |
|                               | Operating Grid Voltage (kV)[2]         | 34.5kV ±10%   |
| AC                            | Operating Grid Frequency (Hz)          | 60Hz  |
|                               | Current Harmonic Distortion (THDi)     | < 3% per IEEE519  |
|                               | Power Factor (cosine phi)[3]           | 0.5 leading 0.5 lagging adjustable /<br>Reactive power injection at night |
|                               | DC Voltage Range[4]                    | 891V - 1500V  |
|                               | Maximum DC Voltage                     | 1500V   |
| С                             | Number of Inputs                       | Up to 40  |
|                               | Max. DC Continuous Current (A)[5]      | 4590  |
|                               | Max. DC Short Circuit Current (A)[5]   | 6940  |
|                               | Number of Freemaq DC/DC <sup>[5]</sup> | Up to 4   |
| EEICIENCV                     | Efficiency (Max) (η) (preliminary)     | 97.75% including MV transformer   |
| EFFICIENCY                    | Euroeta (η) (preliminary)              | 97.48% including MV transformer   |
|                               | Dimensions [WxDxH] (ft)                | 21.3 x 6.5 x 7.2  |
|                               | Dimensions [WxDxH] (m)                 | 6.5 x 2.0 x 2.2   |
| CABINET                       | Weight (lbs)                           | 30865   |
|                               | Weight (kg)                            | 14000   |
|                               | Type of Ventilation                    | Forced air cooling  |
|                               | Degree of Protection                   | IP55  |
| NIVIDOMENIT                   | Permissible Ambient Temperature [6]    | -25°C to +60°C, >50°C / Active power derating                             |
| ENVIROMENT                    | Relative Humidity                      | 4% to 100% non-condensing   |
|                               | Max. Altitude (above sea level) [7]    | 2000m   |
| CONTROL                       | Communication Protocol                 | Modbus TCP  |
|                               | Power Plant Controller                 | Optional  |
| NTERFACE                      | Keyed ON/OFF Switch                    | Standard  |
| PROTECTIONS                   | Ground Fault Protection                | GFDI and isolation monitoring device                                      |
|                               | Humidity Control                       | Active heating  |
|                               | General AC Protection & Disconn.       | MV switchgear (2L+V)  |
|                               | General DC Protection & Disconn.       | Fuses, DC switch-disconnectors  |
|                               | Overvoltage Protection                 | Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)        |
| CERTIFICATIONS<br>& STANDARDS | Safety                                 | IEC 62477-2   |

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# NOTES

Values at 1.00-Vac nom and cosφ=1.Consult PowerElectronics for derating curves.
 Consult Power Electronics for other configurations.
 Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).
 Consult Power Electronics for derating curves.
 Consult Power Electronics for Freemaq DC/DC connection configurations.
 Consult Power Electronics for temperatures below -25°C
 Consult Power Electronics for altitudes above 1000m.

<sup>[1]</sup> Values at 1.00-Vac nom and  $cos\phi$ =1.Consult Power Electronics for derating curves. [2] Consult Power Electronics for other configurations.

<sup>[3]</sup> Consult P-Q charts available: Q(kVAr)=√(S(kVA)2-P(kW)2).
[4] Consult Power Electronics for derating curves.
[5] Consult Power Electronics for Freemaq DC/DC connection configurations.

<sup>[6]</sup> Consult Power Electronics for temperatures below -25°C.
[7] Consult Power Electronics for altitudes above 1000m.

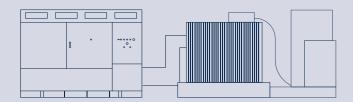
# MEDIUM MV SKID TWIN SKIBTATION

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Combine the HEMK with our MV stations. Utility scale solar stations.

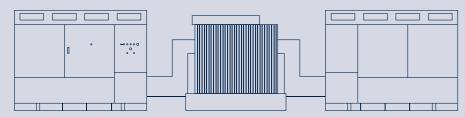
# MV Skid Compact & Twin Skid Compact

From low to medium voltage.



### **MV SKID COMPACT**

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TWIN SKID COMPACT

Page. 42 - 43



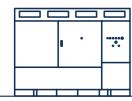


# **Turn-key solution**

The SKID family facilitates the project design and reduces the installation costs.







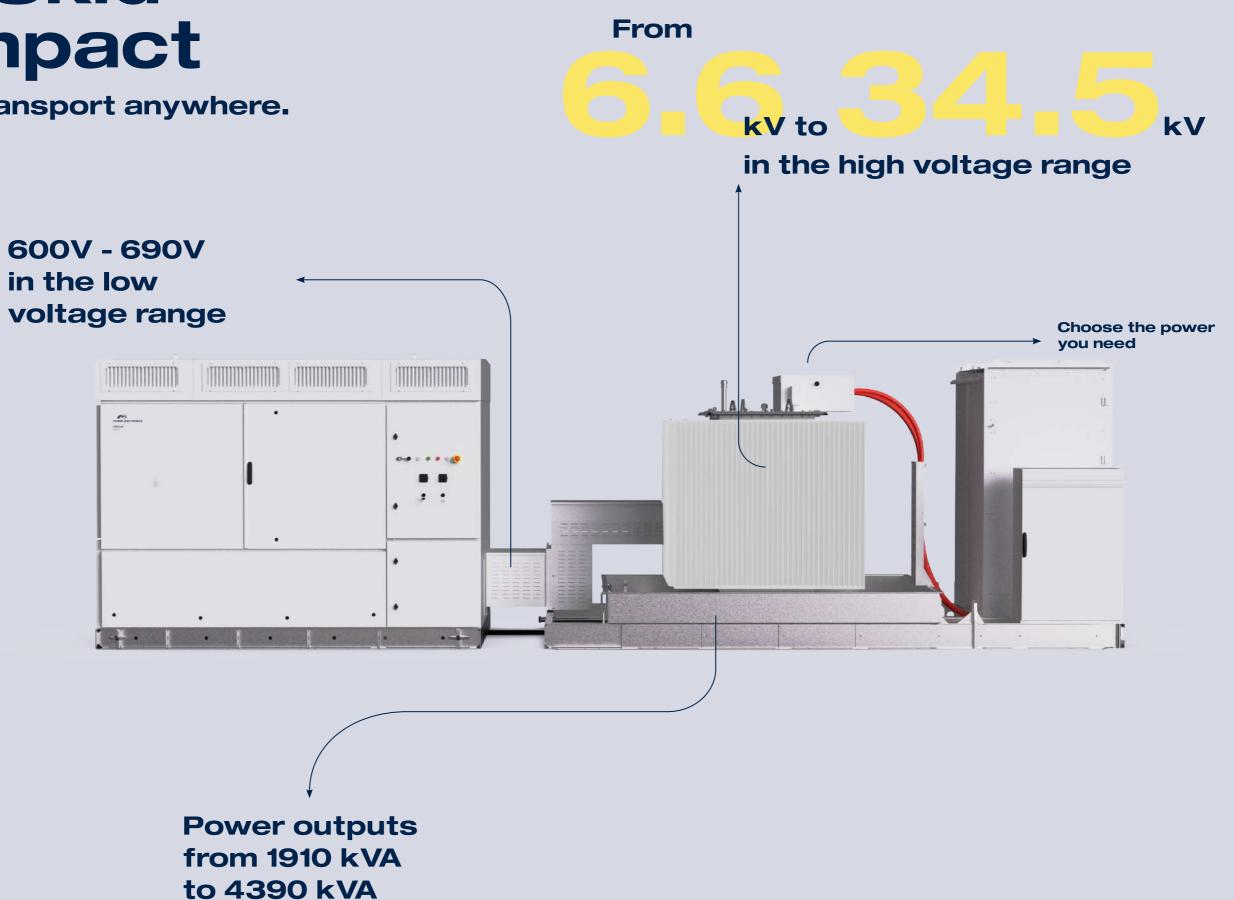


# Simplify your commissioning

All the medium voltage equipment is already integrated.

# **MV Skid** Compact

Easy to transport anywhere.



From

# **Twin Skid** Compact

For largest solar plants.

from 3820 kVA

to 8780 kVA

Extra high power density. kV to in the high voltage range 600 V - 690 V in the low voltage range **Choose the distribution** that fits better on you solar plant **Power outputs** 

# **MV Skid Compact**

| Power range @ 40 °C                 | 1910 kVA - 4390 kVA  |
|-------------------------------------|--|
|                                     | 1775 kVA - 4075 kVA  |
|                                     | 6.6 kV / 11 kV / 13.2 kV / 13.8 kV / 15 kV / 20 kV / 22 kV /   |
| MV voltage range                    | 23 kV / 25 kV / 30 kV / 33 kV / 34.5 kV  |
| LV voltage range                    | 600 V /615 V /630 V / 645 V / 660 V / 690 V  |
| Transformer cooling                 | ONAN   |
| Transformer vector group            | Dy11   |
|                                     | Protection relay for pressure, temperature   |
| Transformer protection              | (two levels) and gassing   |
| Transformer protection              | Monitoring of dielectric level decrease  |
|                                     | PT100 optional.  |
| Transformer index of protection     | IP54   |
| Transformer losses                  | IEC standard or IEC Tier-2   |
| Oil retention tank                  | Galvanized steel. Integrated with hydrocarbon filter. Optional   |
| Switchgear configuration            | Double feeder (2L)   |
| Switchgear protection               | Circuit breaker (V)  |
| Switchgear short circuit rating [1] | 16 kA 1 s  |
| Switchgear IAC [1]                  | A FLR 16 kA 1 s  |
| LV-MV connections                   | Close coupled solution (plug & play)   |
| LV protection                       | Motorized circuit breaker included in the inverter   |
| HV AC wiring                        | MV bridge between transformer and  |
|                                     | protection switchgear prewired   |
|                                     | -10 °C +50 °C (T > 50 °C power derating)   |
| . ,                                 | Up to 1000 m   |
| Relative humidity                   | 4% to 95% non condensing   |
| User power supply options           | 5 kVA / 40 kVA at 400 V (3-phase), 50 / 60 Hz (Integrated in the inverter)   |
| User cabinet                        | Integrated in the inverter (by default). Optionally, LV cabinet in the skid.   |
| Cooling                             | Forced air   |
| HW communication                    | Ethernet (fiber optic or RJ45)   |
| UPS system <sup>[1]</sup>           | 1 kVA/0.8 kW (10 minutes). Optional  |
| Safety mechanism                    | Interlocking system  |
|                                     |  |
| Fire extinguishing system           | Transformer oil tank retention accessory. Optional.  |
|                                     | Transformer vector group  Transformer protection  Transformer index of protection  Transformer losses Oil retention tank Switchgear configuration Switchgear protection Switchgear short circuit rating [1] Switchgear IAC [1]  LV-MV connections LV protection  HV AC wiring  Ambient temperature range [2] Maximum altitude (above sea level) [1] Relative humidity  User power supply options  User cabinet  Cooling HW communication UPS system [1] Safety mechanism |

# **Twin Skid Compact**

| RATINGS               | Power range @ 40 °C                    | 3820 kVA - 8780 kVA   |
|-----------------------|--|---|
|                       | Power range @ 50 °C                    | 3550 kVA - 8150 KVA   |
|                       | MV voltage range                       | 11 kV / 13.2 kV/ 13.8 kV/ 15 kV / 20 kV / 22 kV / 23 kV / 25 kV / 30 kV / 33 kV / 34.5 kV |
|                       | LV voltage range                       | 600 V /615 V /630 V / 645 V / 660 V / 690 V   |
|                       | Transformer cooling                    | ONAN  |
|                       | Transformer vector group               | Dy11y11   |
|                       | Tourse                                 | Protection relay for pressure, temperature (two levels) and gassing.                      |
| MEDIUM                | Transformer protection                 | Monitoring of dielectric level decrease.  |
| VOLTAGE               |  | PT100 optional.   |
| EQUIPMENT             | Transformer index of protection        | IP54  |
|                       | Transformer losses                     | IEC standard or IEC Tier-2.   |
|                       | Oil retention tank                     | Galvanized steel. Integrated with hydrocarbon filter. Optional                            |
|                       | Switchgear configuration               | Double feeder (2L)  |
|                       | Switchgear protection                  | Circuit breaker (V)   |
|                       | Switchgear short circuit rating [1]    | 16 kA 1 s   |
|                       | Switchgear IAC [1]                     | A FLR 16 kA 1 s   |
|                       | LV-MV connections                      | Close coupled solution (plug & play)  |
| CONNECTIONS           | LV protection                          | Motorized circuit breaker included in the inverter  |
| CONNECTIONS           | HV AC wiring                           | MV bridge between transformer and protection switchgear prewired                          |
|                       | Ambient temperature range [2]          | -10 °C +50 °C (T > 50 °C power derating)  |
| ENVIRONMENT           | Maximum altitude (above sea level) [1] | Up to 1000 m  |
|                       | Relative humidity                      | 4% to 95% non condensing  |
| AUXILIARY<br>SERVICES | User power supply options              | 5 kVA / 40 kVA at 400 V (3-phase), 50 / 60 Hz (Integrated in the inverter)                |
|                       | User cabinet                           | Integrated in the inverter (by default). Optionally, LV cabinet in the skid.              |
|                       | Cooling                                | Forced air  |
|                       | HW communication                       | Ethernet (fiber optic or RJ45)  |
|                       | UPS system <sup>[1]</sup>              | 1 kVA/0.8 kW (10 minutes). Optional   |
| OTLIED FOLUDATES      | _ Safety mechanism                     | Interlocking system   |
| OTHER EQUIPMEN        | Fire extinguishing system              | Transformer oil tank retention accessory. Optional.                                       |
| STANDARDS             | Compliance                             | IEC 62271-212, IEC 62271-200, IEC 60076, IEC 61439-1                                      |
| STANDARDS             | Ооттрианое                             | 120 0227   212, 120 0227   200, 120 00070, 120 01439-1                                    |

Page. 48-49 PPC PRO
EMS
Page. 51-52
EMS
INITIAL
INITIA

ADVANCED CONTROL SOLUTIONS

# PPC PRO

The Power Plant Controller is the interface between the grid operator and the inverters, designed to meet the most demanding grid connection requirements.

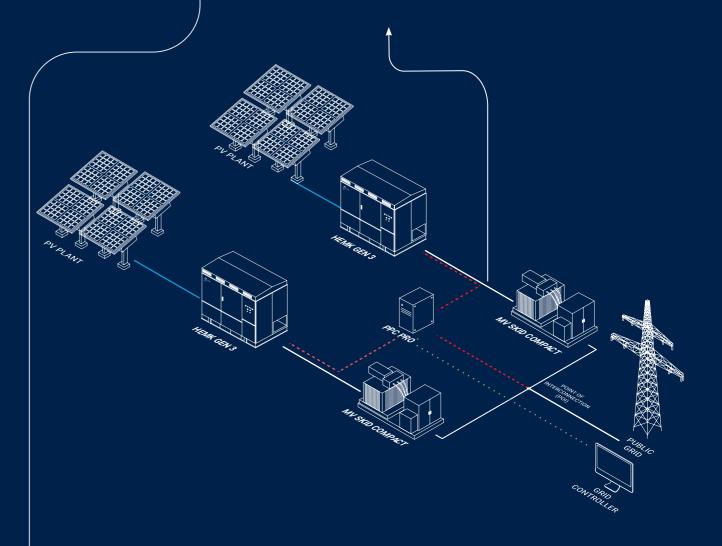
Regardless of where you are.



# The governor

# **Smart Q distribution**

This algorithm allows to distribute the reactive power between the inverters depending on the available active power, maximizing the energy production.



<u>(i</u>

**O&M diagnosis functions** 

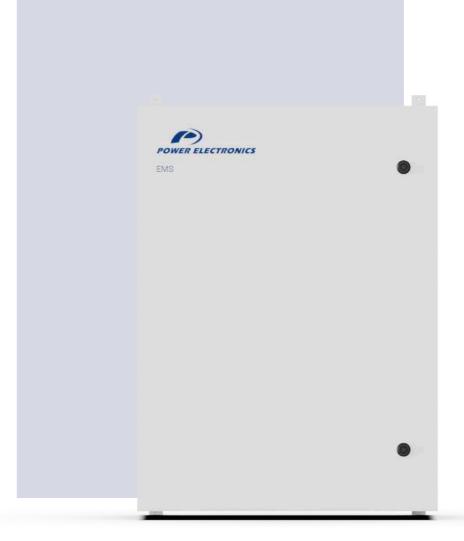
Reports warning / fault messages and enables user management...

# **Common Technical Characteristics**

|                              | Material                | Polycarbonate  |
|------------------------------|-------------------------|--|
|                              | Assembly                | Wall or struture mounted   |
| GENERAL DATA                 | Flammability            | Halogen-free, self-extinguishing enclosure material (UL94-5V).   |
|                              | Power Supply            | 48 W [220/240 Vac (IEC) - 110/125 Vac (UL)]  |
|                              | Compatible inverters    | HEM, HEMK, Freemaq Statcom   |
| COMMUNICATIONS               | Communication protocols | Modbus TCP. Consult with Power Electronics for other options   |
|                              | Fiber optic switch      | To connect with the utility / SCADA system and inverters   |
|                              | Temperature range       | From -20 to +50 C.   |
|                              | Humidity                | From 15 to 95 % (0 to 95 % non-condensing).  |
| ENVIRONMENTAL CONDITIONS     | Protection degree       | IP54 / NEMA 3  |
| CONDITIONS                   | Pollution degree        | Type II  |
|                              | Maximum altitude        | 4000 m   |
| CERTIFICATIONS               | Marking                 | CE   |
|                              | Active power control    | Active power control, frequency response (with /without reserve), ramp rate.   |
| FUNCTIONALITIES <sup>1</sup> | Reactive power control  | Reactive power control, power factor control, voltage control, Q(V)curve, cosphi(P) curve, ramp rate, statcom control,capacitor bank control, negative and positive active power setpoints |
|                              | Diagnosis functions     | Warning / fault messages, user management, real-time data monitoring, change log.  |
|                              | Others                  | Internal measurement, compatibility with power analyzers, SQL data base. Consult Power Electronics for other functionalities   |
|                              | Web server              | For local and remote monitoring / control.   |
| OTHERS                       | Customizable solution   | Flexible solution based on a powerful modular and programmable   |
|                              |                         |  |

# **EMS**

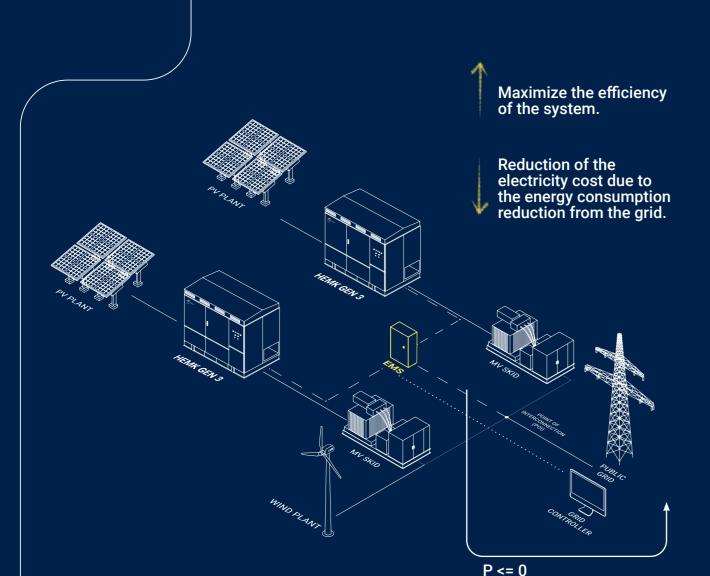
Designed to match energy production and consumption



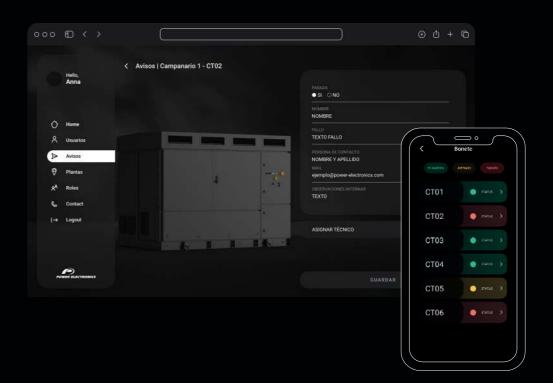
Monitor, control and optimize the energy performance.

The energy management system.

• Is the best solution for selfconsumption applications such as zero grid injection systems.







# Our secret

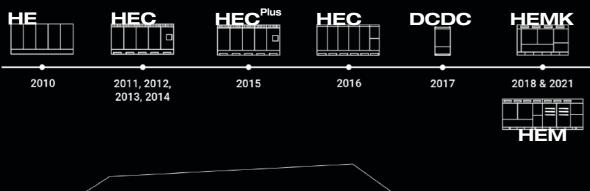
The key of our success for more than 35 years, our 24/7 after sales service, Power On Support.

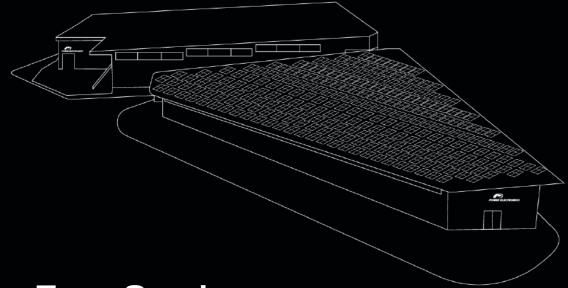
# **OUR SECRET** We are here to help you

# We take care

# of the legacy generations

Each new generation of inverters involves adapting the manufacturing lines to optimize the production of these new devices. Power Electronics has optimized facilities for the production of limited units from previous generations, where we manufacture current subcomponents adapted to equipment that is no longer in production, but which allows for an extended life.





# **Long Term Service**

We repare subcomponents or even manufacture equivalent units in our **Dedicated Service Factory located near** our Production Plant

Power Electronics has experience in repowering old photovoltaic plants, where we supply state-of-the-art equipment adapting its electrical characteristics to be compatible with the existing configuration, while providing all the advantages of the latest generation inverters.

# Vertical Integration



Scan me!

# throughout the entire process

We complement your spare parts strategy with our own thanks to our Dedicated Service Factory warehouse, informing you when any of them is going to be discontinued so you can plan accordingly.

# **Before commissioning**

- · Technical applications & design requirement review
- · Dedicated Project Management Support
- Hands on functional & safety product training

# **During commissioning**

- Dedicated commissioning teams
- · Rigorous execution on through site operation

# After commissioning

- Support 24/7, 365 days a year.
   Full warranty coverage with options for extension and full preventative maintenance packages
   Advanced offerings for remote monitoring, detailed
- performance reporting, and interactive portals for tracking metrics direct with the PE Service Org

You have the control

### CONTACT

# WARRANTY

Power Electronics (the Seller) warrants that their products solar inverters are free of faults and defects for a period of 5 years, valid from the date of delivery to the Buyer. It shall be understood that a product is free of faults and defects when its condition and performance is in compliance with its specification.

The warranty shall not extend to any Products whose defects are due to (i) careless or improper use, (ii) failure to observe the Seller's instructions regarding the transport, installation, functioning, maintenance and the storage of the Products, (iii) repairs or modifications made by the Buyer or third party without prior written authorization of the Seller, (iv) negligence during the implementation of authorized repairs or modifications, (v) if serial numbers are modified or illegible, (vi) anomalies caused by, or connected to, the elements coupled directly by the Buyer or by the final customer, (vii) accidents or events that place the Product outside its storage and operational specification, viii) continued use of the Products after identification of a fault or defect.

The warranty excludes components that must be replaced periodically such as Fuses + DC switch, lamps & air filters or consumable materials subject to normal wear and tear.

The warranty excludes external parts that are not manufactured by the Seller under the brand of Power Electronics.

The Seller undertakes to replace or to repair, himself, at their discretion, any Product or its part that demonstrates a fault or defect, which is in conformance with the aforementioned terms of the warranty.

Reasonable costs associated with the disassembly/ assembly, transport and customs of equipment will also be undertaken by the Seller except in cases of approved intervention by the Buyer and/or their representative where cost allocation has been previously agreed.



Power Electronics reserves the right to modify whole or part of the content of this brochure at any time and without prior notice. May 2021.

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