



**An Energy Consulting and Power Engineering Firm**

Commercial and Industrial Solar energy...

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# About KGS

## The road to Energy Freedom

- ❑ KGS is a power engineering and consultancy company that believes in the importance of providing creative solutions for a world witnessing a historical transition to more sustainable, green and renewable energy sources.
- ❑ KGS provides comprehensive solutions: **Solar, hybrid energy services, management, monitoring & control.**
- ❑ KGS believes that linking the service to experiences, should be evolved because experiences are an independent economic offering. Solar services are not about equipment and technology only, it is about fulfilling the needs and providing sustainable turnkey solutions.



# Our Solutions

KGS designs, implements and manages solar energy solutions and provides unmatched experiences



## Our solutions in the field cover

- ❑ Smart solar power
- ❑ Hybrid power systems
- ❑ Renewable energy technologies
- ❑ Systems Management, monitoring & control

**KGS** provides a turnkey supply, installation and maintenance service for industrial solar panels

**Small & Family-owned factories**

**Large multinational organizations**

**KGS** helps a wide range of manufacturing companies to reduce their energy bills and improve their sustainability





# Solar Energy

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- Provides full **energy security & independence**
- Is a **100% clean**, renewable energy source
- Increases the **value of assets in companies**
- Systems generally **do not require** a lot of **maintenance**
- **Can be used very effectively** in all types of industrial processes
- Makes your business **more competitive**
- Will give you the ability to **market your business as Green**
- Helps in positioning your company as a **forward-thinking and innovative business**
- Can reduce or even **eliminate energy costs and increase productivity** and its benefits can be seen
- Helps your business **consume more energy for less cost**
- Reduces your **carbon footprints**
- Helps your business **consume** free power and **sell the excess**
- Makes it easy to **monitor** your **ROI by App**
- Is where **CSR** meets **sustainability**
- Has a significant storage capability that can **smooth electricity prices, manage evening energy ramps and provide backup power**





# KGS Believes In



01

- **Providing** solutions-oriented projects that give an exceptional experience in the world of solar energy.
- **Promoting** on/off Grid solar system with high-quality brand image.
- **Supplying** safe and reliable solar solutions with high quality and efficient PV modules, high-efficiency inverters and high tech. lithium batteries in addition to using reliable and renowned equipment while leveraging a wide range of products.
- **Becoming** the “Partner of choice” by our customers.
- **Entering** into synergy with our business partners.
- **Motivating** employees and increasing their engagement.

02

*Renewable sources of energy can help countries mitigate climate change, build resilience to volatile prices, and lower energy costs*

World Bank



# Through installing solar PV panels

Commercial and Industrial Businesses  
Are able To considerably

- ❑ Cut their overheads
- ❑ Improve business operations
- ❑ Increase their bottom line with up to 100% savings on their daytime electricity costs
- ❑ Ensuring business continuity and prosperity

Solar panel prices have dropped more  
than 80 percent globally since 2011

The **higher** the usage of solar energy  
The **higher** the savings and the **larger** the benefits  
Making the **commercial** and **industrial** sector the perfect case for  
solar panels and renewable energy technologies



# KGS.. Comprehensive Expertise

KGS employs a dedicated team of professionals, specializing in financial and technical feasibility studies of power projects and their conceptual design and

- Engineering
- Power project evaluation
- Value engineering design
- Optimization review
- Supervision of construction
- Commissioning and O&M of energy generation plants
- Transmission and distribution (T&D) systems
- Oil & Gas consultancy services

Powering Lebanon towards a  
Smart  
Clean energy future





Average commercial property owner can reduce overall energy costs by more than 75 percent by going solar

## EnergySage market data



**FuturaSun®**

*anticipate tomorrow*

# Our Partners In Solar World

## 01. FuturaSun

FuturaSun was established in 2008 by a team of managers in Veneto, Italy's hub of the photovoltaic industry.

However, FuturaSun is not one of those many solar companies which enjoyed extremely rapid growth during the years of the photovoltaic boom: The team actually started the company just at the time when the first signs of the sector's decline began to show in Italy, only to plummet in the subsequent years. So while several big players disappeared from the photovoltaic scene, FuturaSun has continued along its journey of growth, initially taking small steps and gaining momentum later.

Today FuturaSun sells in over 70 countries, and has achieved double-digit sales growth year on year.

# FuturaSun Products



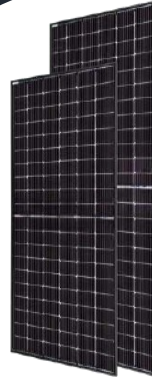
## FuturaSun

*Multi-Busbar PV Modules*



## FuturaSun

*Back Contact PV Modules*



## FuturaSun

*Glass PV Modules*



## FuturaSun

*BIPV Modules*



## FuturaSun

*Repowering PV Modules*



# Our Solutions



| ELECTRICAL DATA                                                                                                                                       |      |                           |                           |                           |                           |                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| MODULE SILK® Premium                                                                                                                                  |      | FU 490 M<br>SILK® Premium | FU 495 M<br>SILK® Premium | FU 500 M<br>SILK® Premium | FU 505 M<br>SILK® Premium | FU 510 M<br>SILK® Premium |
| Standard Test Conditions STC 1000 W/m <sup>2</sup> - AM 1.5 - 25 °C - tolerance: P <sub>max</sub> (±3%), V <sub>oc</sub> (±4%), I <sub>sc</sub> (±5%) |      |                           |                           |                           |                           |                           |
| Module power (P <sub>max</sub> )                                                                                                                      | W    | 490                       | 495                       | 500                       | 505                       | 510                       |
| Open circuit voltage (V <sub>oc</sub> )                                                                                                               | V    | 51.20                     | 51.40                     | 51.60                     | 51.80                     | 52.00                     |
| Short circuit current (I <sub>sc</sub> )                                                                                                              | A    | 12.17                     | 12.24                     | 12.31                     | 12.38                     | 12.44                     |
| Maximum power voltage (V <sub>mpp</sub> )                                                                                                             | V    | 42.47                     | 42.64                     | 42.85                     | 43.06                     | 43.26                     |
| Maximum power current (I <sub>mpp</sub> )                                                                                                             | A    | 11.54                     | 11.61                     | 11.67                     | 11.73                     | 11.79                     |
| Module efficiency                                                                                                                                     | %    | 20.42                     | 20.63                     | 20.84                     | 21.05                     | 21.25                     |
| Nominal Module Operating Temperature NMOJT800 W/m <sup>2</sup> - T=45 °C - AM 1.5                                                                     |      |                           |                           |                           |                           |                           |
| Module power (P <sub>max</sub> )                                                                                                                      | W    | 371                       | 375                       | 379                       | 382                       | 386                       |
| Open circuit voltage (V <sub>oc</sub> )                                                                                                               | V    | 48.40                     | 48.60                     | 48.80                     | 49.00                     | 49.2                      |
| Short circuit voltage (I <sub>sc</sub> )                                                                                                              | A    | 9.77                      | 9.83                      | 9.89                      | 9.94                      | 9.99                      |
| Maximum power voltage (V <sub>mpp</sub> )                                                                                                             | V    | 40.00                     | 40.20                     | 40.40                     | 40.60                     | 40.7                      |
| Maximum power current (I <sub>mpp</sub> )                                                                                                             | A    | 9.26                      | 9.32                      | 9.37                      | 9.43                      | 9.49                      |
| TEMPERATURE RATINGS                                                                                                                                   |      |                           |                           |                           |                           |                           |
| Temperature coefficient I <sub>sc</sub>                                                                                                               | %/°C | 0.05                      |                           |                           |                           |                           |
| Temperature coefficient V <sub>oc</sub>                                                                                                               | %/°C | -0.26                     |                           |                           |                           |                           |
| Temperature coefficient P <sub>max</sub>                                                                                                              | %/°C | -0.35                     |                           |                           |                           |                           |
| NMOT*                                                                                                                                                 | °C   | 43                        |                           |                           |                           |                           |
| Operating temperature                                                                                                                                 | °C   | from -40 to +85           |                           |                           |                           |                           |

\*Nominal Module Operating Temperature

| MECHANICAL SPECIFICATIONS                 |                                                                               |
|-------------------------------------------|-------------------------------------------------------------------------------|
| Dimensions                                | 2185 x 1098 x 35 mm                                                           |
| Weight                                    | 26.3 kg                                                                       |
| Glass                                     | High transmission, Low iron, Tempered, ARC, Transparent, 32 mm                |
| Cell encapsulation                        | EVA (Ethylene Vinyl Acetate)                                                  |
| Cells                                     | 150 monocrystalline 1/3 cut MBB PERC cells 210 x 70 mm                        |
| Backsheet                                 | Composite multilayer film                                                     |
| Frame                                     | Anodized aluminium frame with mounting and drainage holes                     |
| Junction box                              | Certified according to IEC 62790, IP 68 approved, 3 bypass diodes             |
| Cables                                    | Solar cable, length 1300 mm or customized assembled with MC4-compatible plugs |
| Maximum reverse current (I <sub>r</sub> ) | 20 A                                                                          |
| Maximum system voltage                    | 1500 V<br>(1000 V on request)                                                 |
| Mechanical load (snow)                    | Design load: 3600 Pa<br>5400 Pa (including safety factor 1.5)                 |
| Mechanical load (wind)                    | Design load: 1600 Pa<br>2400 Pa (including safety factor 1.5)                 |
| Protection Class                          | II - accordance to IEC 61730                                                  |

Notice: All data and specifications are preliminary and subject to change without notice

## 02. FAAM

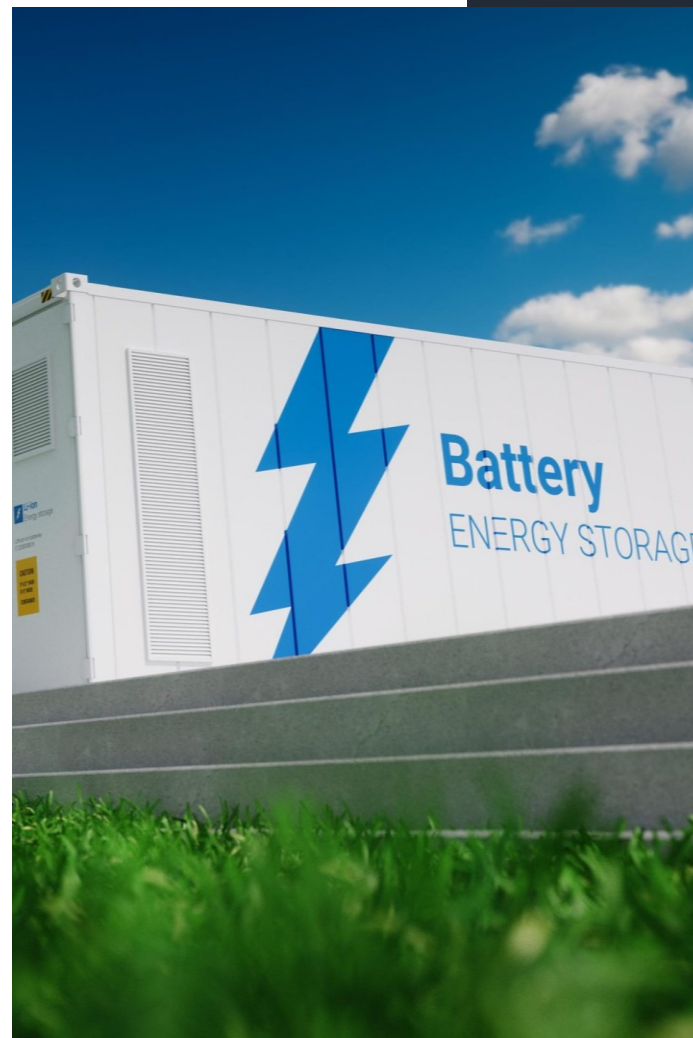
FAAM has been present in the battery market since 1974 with customized solutions and a complete Circular Economy model.

FAAM produces both lead-acid and lithium-ion batteries, with a strong focus on research and development.

In Teverola, FAAM has set up a highly innovative plant for the production of cells, modules and lithium-ion batteries.

Again in Teverola, FAAM is building the first Gigafactory in Southern Europe, and the only one in Italy, for the production of high-performance and green lithium cells and batteries.

FAAM investments are strongly pursuing the strategic goal of delivering innovative, safe and eco-friendly products in the market, controlling the entire production value chain.

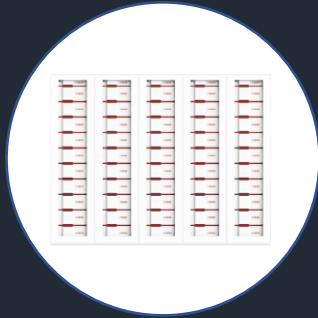


# FAAM Products



**FAAM**

*LiHOME Sun Storage  
Inverter*



**FAAM**

*Energy Storage Systems*



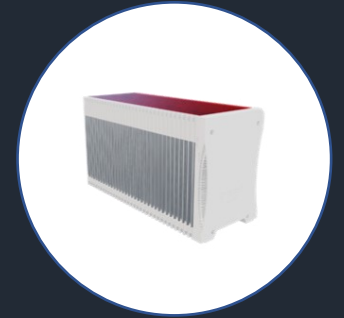
**FAAM**

*Li-ION Cell*



**FAAM**

*LC01 CELL*



**FAAM**

*Kombi Module*



**FAAM**

*LiSTORAGE 10.2*



**FAAM**

*LiSTORAGE LSi4880*



**FAAM**

*LiSTORAGE LSh4880*



**FAAM**

*LiRACK*



**FAAM**

*FAAM LiTRACTION*



**FAAM**

*Li-BESS 10.2*



**FAAM**

*STA OPzS Flooded  
Batteries*



**FAAM**

*HPS Flooded Batteries*



**FAAM**

*STG OPzV VRLA Gel  
Batteries*



**FAAM**

*FTG VRLA Gel Batteries*



**FAAM**

*FLG VRLA Gel Batteries*



**FAAM**

*FLL VRLA AGM Batteries*



**FAAM**

*FMR VRLA AGM Batteries*



**FAAM**

*FHP VRLA AGM  
Batteries*



**FAAM**

*FTS VRLA AGM  
Batteries*



### 03. FRIEM

FRIEM has expertise and reliability in the global electric energy converter market. In 1950 Mr. Angelo Pagliai endowed with a tenacious entrepreneurial attitude, laid the foundation of FRIEM. Enhancing experience, reputation and know-how, today the third generation of the shareholders, who wear even the role of managers, is going to organize an industrial group that is intended to evolve with continuity into its own history. Today FRIEM Group, through the affiliated company F&F, provides the market with products and solutions for renewable energies (energy storage). Moreover, the subsidiary Eyes serves the sustainable mobility market with EV charging systems and vehicle electrification.



# FRIEM Products



## FRIEM

*RECon Line Concept –  
Single or Combined*



## FRIEM

*Recon Station (RST)*



## FRIEM

*String Box*



## FRIEM

*RMS - RECon Monitoring  
System*



## FRIEM

*BESS (Battery Energy  
Storage Systems)*



## FRIEM

*HYCon-Line converters*



## FRIEM

*HYCon Station Plug &  
Play solution*



# FRIEM RECon 30

200

400

600

800

1000

1200

## DC Input

|                                          |   |                              |   |   |   |   |   |
|------------------------------------------|---|------------------------------|---|---|---|---|---|
| Maximum input voltage (V <sub>oc</sub> ) | V | 1000                         |   |   |   |   |   |
| Input voltage range                      | V | 1,51 x V <sub>AC</sub> - 885 |   |   |   |   |   |
| Nr of MPPT                               | - | 1                            | 2 | 3 | 4 | 5 | 6 |
| Maximum input DC current                 | A | 325 ÷ 1950                   |   |   |   |   |   |
| Maximum input short circuit current      | A | 360 ÷ 2160                   |   |   |   |   |   |

## AC Output

|                               |    |            |     |     |     |      |      |
|-------------------------------|----|------------|-----|-----|-----|------|------|
| Voltage Range (Phase-Phase)   | V  | 200 - 400  |     |     |     |      |      |
| Frequency                     | Hz | 50 / 60    |     |     |     |      |      |
| Power @ 200 (Phase-Phase) (1) | kW | 100        | 200 | 300 | 400 | 500  | 600  |
| Power @ 400 (Phase-Phase) (1) | kW | 200        | 400 | 600 | 800 | 1000 | 1200 |
| Rated current @40°C           | A  | 290 ÷ 1740 |     |     |     |      |      |

## General Information

|                           |   |     |     |     |     |     |     |
|---------------------------|---|-----|-----|-----|-----|-----|-----|
| Auxillary supply from UPS | V | 230 |     |     |     |     |     |
| Standby consumption       | W | 110 | 220 | 330 | 440 | 550 | 660 |

## Auxillary Power

|          |      |      |      |      |      |      |      |
|----------|------|------|------|------|------|------|------|
| Width    | mm   | 550  | 1100 | 1650 | 2200 | 2750 | 3300 |
| Height   | mm   | 2200 |      |      |      |      |      |
| Depth    | mm   | 825  |      |      |      |      |      |
| Weight   | kg   | 350  | 700  | 1050 | 1400 | 1750 | 2100 |
| Air Flow | m³/h | 850  | 1700 | 2550 | 3400 | 4250 | 5100 |

# FRIEM RECon 2.30

## DC Input

|                                     |   |                  |   |   |
|-------------------------------------|---|------------------|---|---|
| Maximum input voltage (Voc)         | V | 1000             |   |   |
| Input voltage range                 | V | 1,51 x VAC - 885 |   |   |
| Nr of MPPT                          | - | 1                | 2 | 3 |
| Maximum input DC current            | A | 650 ÷ 1950       |   |   |
| Maximum input short circuit current | A | 720 ÷ 2160       |   |   |

## AC Output

|                               |    |            |     |      |
|-------------------------------|----|------------|-----|------|
| Voltage Range (Phase-Phase)   | V  | 200 ÷ 400  |     |      |
| Frequency                     | Hz | 50 / 60    |     |      |
| Power @ 200 (Phase-Phase) (1) | kW | 200        | 400 | 600  |
| Power @ 400 (Phase-Phase) (1) | kW | 400        | 800 | 1200 |
| Rated current @40°C           | A  | 580 ÷ 1740 |     |      |

## Auxillary Power

|                           |   |     |     |     |
|---------------------------|---|-----|-----|-----|
| Auxillary supply from UPS | V | 230 |     |     |
| Standby consumption       | W | 110 | 220 | 330 |

## General Information

|          |      |      |      |      |
|----------|------|------|------|------|
| Width    | mm   | 1100 | 2200 | 3300 |
| Height   | mm   | 2200 |      |      |
| Depth    | mm   | 825  |      |      |
| Weight   | kg   | 570  | 1400 | 1710 |
| Air Flow | m³/h | 1700 | 3400 | 5100 |

# FRIEM RECon 75HV

Rated Voltage 570VAC

| RECon 75HV | 780 | 1560 | 2340 |
|------------|-----|------|------|
|------------|-----|------|------|

DC Input

|                                     |   |            |      |      |
|-------------------------------------|---|------------|------|------|
| Maximum input voltage (Voc)         | V | 1500       |      |      |
| Input voltage range                 | V | 855 - 1300 |      |      |
| Nr of MPPT                          | - | 1          |      |      |
| Maximum input DC current            | A | 900        | 1800 | 2700 |
| Maximum input short circuit current | A | 1200       | 2400 | 3600 |

AC Output

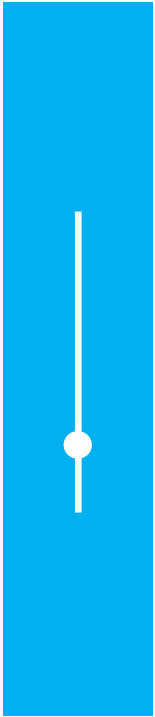
|                             |    |               |                  |                  |
|-----------------------------|----|---------------|------------------|------------------|
| Voltage Range (Phase-Phase) | V  | 570           |                  |                  |
| Frequency                   | Hz | 50 / 60       |                  |                  |
| Power @ 25, 45, 50°C        | kW | 770, 740, 688 | 1540, 1480, 1376 | 2310, 2220, 2064 |
| Rated current (1)           | A  | 750           | 1500             | 2250             |

General Information

|                               |   |        |  |  |
|-------------------------------|---|--------|--|--|
| Type of connection            | - | IT     |  |  |
| Power factor (2)              | - | > 0,99 |  |  |
| Total harmonic distortion (2) | % | ≤ 3    |  |  |

Dimension and Weight

|                      |    |                  |                  |                  |
|----------------------|----|------------------|------------------|------------------|
| Width, Height, Depth | mm | 2750, 2252, 1052 | 3750, 2252, 1052 | 4750, 2252, 1052 |
| Weight               | kg | 1500             | 2100             | 3000             |





# FRIEM RECon 75HV



Rated Voltage 600VAC

| RECon 75HV | 780 | 1560 | 2340 |
|------------|-----|------|------|
|------------|-----|------|------|

DC Input

|                                     |   |            |      |      |
|-------------------------------------|---|------------|------|------|
| Maximum input voltage (Voc)         | V | 1500       |      |      |
| Input voltage range                 | V | 900 - 1300 |      |      |
| Nr of MPPT                          | - | 1          |      |      |
| Maximum input DC current            | A | 900        | 1800 | 2700 |
| Maximum input short circuit current | A | 1200       | 2400 | 3600 |

AC Output

|                             |    |               |                  |                  |
|-----------------------------|----|---------------|------------------|------------------|
| Voltage Range (Phase-Phase) | V  | 600           |                  |                  |
| Frequency                   | Hz | 50 / 60       |                  |                  |
| Power @ 25, 45, 50°C        | kW | 811, 780, 725 | 1622, 1560, 1450 | 2433, 2340, 2175 |
| Rated current (1)           | A  | 750           | 1500             | 2250             |

General Information

|                               |   |        |  |  |
|-------------------------------|---|--------|--|--|
| Type of connection            | - | IT     |  |  |
| Power factor (2)              | - | > 0,99 |  |  |
| Total harmonic distortion (2) | % | ≤ 3    |  |  |

Dimension and Weight

|                      |    |                  |                  |                  |
|----------------------|----|------------------|------------------|------------------|
| Width, Height, Depth | mm | 2750, 2252, 1052 | 3750, 2252, 1052 | 4750, 2252, 1052 |
| Weight               | kg | 1500             | 2100             | 3000             |



# FRIEM RECon 75HV

Rated Voltage 630VAC

|            |     |      |      |
|------------|-----|------|------|
| RECon 75HV | 780 | 1560 | 2340 |
|------------|-----|------|------|

DC Input

|                                     |   |                |
|-------------------------------------|---|----------------|
| Maximum input voltage (Voc)         | V | 1500           |
| Input voltage range                 | V | 945 - 1300     |
| Nr of MPPT                          | - | 1              |
| Maximum input DC current            | A | 900 1800 2700  |
| Maximum input short circuit current | A | 1200 2400 3600 |

AC Output

|                             |    |                                                 |
|-----------------------------|----|-------------------------------------------------|
| Voltage Range (Phase-Phase) | V  | 630                                             |
| Frequency                   | Hz | 50 / 60                                         |
| Power @ 25, 45, 50°C        | kW | 851, 818, 761 1702, 1636, 1522 2533, 2454, 2283 |
| Rated current (1)           | A  | 750 1500 2250                                   |

General Information

|                               |   |        |
|-------------------------------|---|--------|
| Type of connection            | - | IT     |
| Power factor (2)              | - | > 0,99 |
| Total harmonic distortion (2) | % | ≤ 3    |

Dimension and Weight

|                      |    |                                                    |
|----------------------|----|----------------------------------------------------|
| Width, Height, Depth | mm | 2750, 2252, 1052 3750, 2252, 1052 4750, 2252, 1052 |
| Weight               | kg | 1500 2100 3000                                     |

Rated Voltage 630VAC  
DC Input  
AC Output  
General Information  
Dimension and Weight



# FRIEM HYCon 10



| HYCon 10 | 70 | 140 | 210 | 280 | 350 | 420 |
|----------|----|-----|-----|-----|-----|-----|
|----------|----|-----|-----|-----|-----|-----|

## AC Side

|                                 |    |                  |     |     |     |     |     |
|---------------------------------|----|------------------|-----|-----|-----|-----|-----|
| Voltage range (Phase-Phase) (1) | V  | 200 - 400 (±10%) |     |     |     |     |     |
| Frequency                       | Hz | 50 / 60          |     |     |     |     |     |
| Power @ 400 V (Phase-Phase)     | kW | 70               | 140 | 210 | 280 | 350 | 420 |
| Rated current @ 40°C            | A  | 100              | 200 | 300 | 400 | 500 | 600 |

## DC Side

|                                  |   |                  |     |     |     |     |     |
|----------------------------------|---|------------------|-----|-----|-----|-----|-----|
| Charging Voltage Range @ VnAC    | V | 1,51 x VAC - 885 |     |     |     |     |     |
| Maximum current @ 40°C           | A | 110              | 220 | 330 | 440 | 550 | 660 |
| Maximum number of DC connections | - | 1                | 2   | 3   | 4   | 5   | 6   |

## General Information

|                     |      |      |      |      |      |      |      |
|---------------------|------|------|------|------|------|------|------|
| Weight (1)          | kg   | 290  | 580  | 870  | 1160 | 1450 | 1740 |
| Width               | mm   | 550  | 1100 | 1650 | 2200 | 2750 | 3300 |
| Height              |      | 2200 |      |      |      |      |      |
| Depth               |      | 825  |      |      |      |      |      |
| Air Flow            | m3/h | 700  | 1400 | 2100 | 2800 | 3500 | 4200 |
| Standby consumption | W    | 50   | 100  | 150  | 200  | 250  | 300  |

# FRIEM HYCon 30



| HYCon 30 | 200 | 400 | 600 | 800 | 1000 | 1200 |
|----------|-----|-----|-----|-----|------|------|
|----------|-----|-----|-----|-----|------|------|

## AC Side

|                                 |    |                          |     |     |      |      |       |
|---------------------------------|----|--------------------------|-----|-----|------|------|-------|
| Voltage range (Phase-Phase) (1) | V  | 200 - 400 ( $\pm 10\%$ ) |     |     |      |      |       |
| Frequency                       | Hz | 50 / 60                  |     |     |      |      |       |
| Power @ 400 V (Phase-Phase)     | kW | 200                      | 400 | 600 | 800  | 1000 | 12000 |
| Rated current @ 40°C            | A  | 290                      | 580 | 870 | 1160 | 1450 | 1740  |

## DC Side

|                                  |   |                  |     |     |      |      |      |
|----------------------------------|---|------------------|-----|-----|------|------|------|
| Charging Voltage Range @ VnAC    | V | 1,51 x VAC - 885 |     |     |      |      |      |
| Maximum current @ 40°C           | A | 325              | 650 | 975 | 1300 | 1625 | 1950 |
| Maximum number of DC connections | - | 1                | 2   | 3   | 4    | 5    | 6    |

## General Information

|                     |      |      |      |      |      |      |      |
|---------------------|------|------|------|------|------|------|------|
| Weight (1)          | kg   | 350  | 700  | 1050 | 1400 | 1750 | 2100 |
| Width               | mm   | 550  | 1100 | 1650 | 2200 | 2750 | 3300 |
| Height              |      | 2200 |      |      |      |      |      |
| Depth               |      | 825  |      |      |      |      |      |
| Air Flow            | m3/h | 850  | 1700 | 2550 | 3400 | 4250 | 5100 |
| Standby consumption | W    | 110  | 220  | 330  | 440  | 550  | 660  |

# FRIEM HYCon 2.30

| HYCon 2.30 | 400 | 800 | 1200 |
|------------|-----|-----|------|
|------------|-----|-----|------|

## AC Side

|                                 |    |                          |      |      |
|---------------------------------|----|--------------------------|------|------|
| Voltage range (Phase-Phase) (1) | V  | 200 - 400 ( $\pm 10\%$ ) |      |      |
| Frequency                       | Hz | 50 / 60                  |      |      |
| Power @ 400 V (Phase-Phase)     | kW | 400                      | 800  | 1200 |
| Rated current @ 40°C            | A  | 580                      | 1160 | 1740 |

## DC Side

|                                  |   |                  |      |      |
|----------------------------------|---|------------------|------|------|
| Charging Voltage Range @ VnAC    | V | 1,51 x VAC - 885 |      |      |
| Maximum current @ 40°C           | A | 650              | 1300 | 1950 |
| Maximum number of DC connections | - | 1                | 2    | 3    |

## General Information

|                     |      |      |      |      |
|---------------------|------|------|------|------|
| Weight (1)          | kg   | 570  | 1140 | 1710 |
| Width               | mm   | 1100 | 2200 | 3300 |
| Height              |      | 2200 |      |      |
| Depth               |      | 825  |      |      |
| Air Flow            | m3/h | 1700 | 3400 | 5100 |
| Standby consumption | W    | 110  | 220  | 330  |



# FRIEM HYCon D84

| HYCon D84 | 1 | 2 | 3 |
|-----------|---|---|---|
|-----------|---|---|---|

|                |                        |   |                                  |
|----------------|------------------------|---|----------------------------------|
| STEP-DOWN MODE | DC Input               |   |                                  |
|                | Voltage range          | V | $1,1 \times V_{MAXOUT} \div 885$ |
|                | DC Output              |   |                                  |
|                | Voltage Rangev         | V | $120 \div V_{minIN} / 1,1$       |
|                | Maximum Current        | A | 84 168 252                       |
|                | Max. DC Ripple (pk-pk) | % | < 3 (@ Max. DC Voltage)          |
| Efficiency     |                        |   |                                  |
|                | Maximum efficiency     | % | 99                               |

|              |                        |   |                                 |
|--------------|------------------------|---|---------------------------------|
| STEP-UP MODE | DC Input               |   |                                 |
|              | Voltage range          | V | $120 \div V_{minOUT} / 1,1$     |
|              | Maximum Current        | A | 84 168 252                      |
|              | DC Output              |   |                                 |
|              | Voltage Range          | V | $1,1 \times V_{MAXIN} \div 885$ |
|              | Max. DC Ripple (pk-pk) | % | < 3 (@ Max. DC Voltage)         |
| Efficiency   |                        |   |                                 |
|              | Maximum efficiency     | % | 99                              |

|                   |      |     |         |
|-------------------|------|-----|---------|
| Weight & Air Flow |      |     |         |
| Weight            | kg   | 180 | 210 240 |
| Air flow          | m3/h | 700 |         |



# FRIEM HYCon D168

| HYCon D168        |                        | 1   | 2                       | 3       |
|-------------------|------------------------|-----|-------------------------|---------|
| STEP-DOWN MODE    | DC Input               |     |                         |         |
|                   | Voltage range          | V   | 1,1 x VMAXOUT ÷ 885     |         |
|                   | DC Output              |     |                         |         |
|                   | Voltage Range          | V   | 120 ÷ VminIN / 1,1      |         |
|                   | Maximum Current        | A   | 168                     | 336 504 |
|                   | Max. DC Ripple (pk-pk) | %   | < 3 (@ Max. DC Voltage) |         |
|                   | Efficiency             |     |                         |         |
|                   | Maximum efficiency     | %   | 99                      |         |
| STEP-UP MODE      | DC Input               |     |                         |         |
|                   | Voltage range          | V   | 120 ÷ VminOUT           | / 1,1   |
|                   | Maximum Current        | A   | 168                     | 336 504 |
|                   | DC Output              |     |                         |         |
|                   | Voltage Range          | V   | 1,1 x VMAXIN ÷ 885      |         |
|                   | Max. DC Ripple (pk-pk) | %   | < 3 (@ Max. DC Voltage) |         |
|                   | Efficiency             |     |                         |         |
|                   | Maximum efficiency     | %   | 99                      |         |
| Weight & Air Flow |                        |     |                         |         |
| Weight            | kg                     | 220 | 250                     | 290     |
| Air flow          | m3/h                   | 850 |                         |         |

# FRIEM HYCon D-Line



## DC Protections & Switching

|                         |   |                                         |
|-------------------------|---|-----------------------------------------|
| Over voltage protection | - | Surge arrester type II (Optional)       |
| Switch                  | - | DC load break switch                    |
| Other protection        | - | Insulation monitoring system (Optional) |

## Auxiliary power

|                                |   |           |
|--------------------------------|---|-----------|
| Auxiliary supply from UPS      | - | 230       |
| Auxiliary supply voltage range | - | 195 - 253 |
| Standby consumption            | W | 50        |

## General Information

|                                 |    |                                                           |
|---------------------------------|----|-----------------------------------------------------------|
| Dimension (WxHxD)               | mm | 550x2200x825                                              |
| Protection class                | -  | IP 20                                                     |
| Operating temperature range (1) | °C | -10 ÷ + 40                                                |
| Cooling system                  | -  | Forced air                                                |
| Maximum altitude a.s.l (2)      | m  | 4500 (for installation over 1000 m, please contact FRIEM) |

## Interfaces

|                           |   |                                 |
|---------------------------|---|---------------------------------|
| Local user interface      | - | Touch screen display (Optional) |
| Communication protocol    | - | Modbus RTU or TCP/IP            |
| PC communication port     | - | RS232 - RS485                   |
| Remote communication port | - | Ethernet                        |

## Standards

|                  |   |                                                                                             |
|------------------|---|---------------------------------------------------------------------------------------------|
| Product standard | - | 2004/108/EC - 2006/95/EC - CEI EN 62109-1 (2010) - CEI EN 62109-2 (2012) - IEC 60730 (2010) |
| EMC              | - | EN 61000 - 6 - 2 / EN 61000 - 6 - 4                                                         |
| Euro Efficiency  |   | IEC 61683: 1999-11                                                                          |

## Functions

|                        |   |                                                                                                                                                                                                                                                                   |
|------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Grid Support Functions | - | On-Demand Production, Ramp Rate Control, Frequency Regulation, Active Power Reserve, Energy Time Shifting, Peak Shaving, Reactive Compensation, Power Factor Control, Automatic Voltage Regulation, Voltage Drop Control, Black Start Capability, Power Stability |
|------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



# THANKYOU

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