FRIEM®

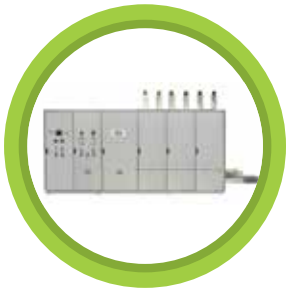
ENERGY
SOLUTIONS

Content

OUR COMPANY

Dedicated solutions for all energy demands: 68+ years' experience in Power Conversion

Made in Italy.
The Italian excellence in design and manufacturing grants maximum performance.

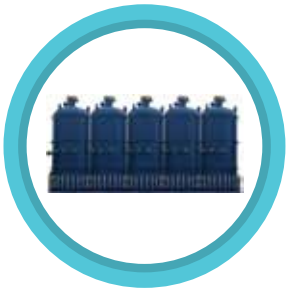


First Rectifier Unit
Manufacturing of first rectifier Unit for Chlor-Alkali industry

1956

1950

Year of Foundation

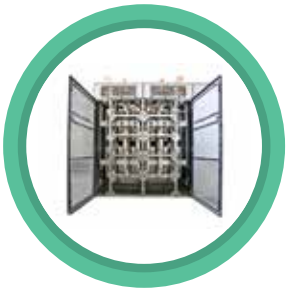


PolySilicon CVD Reactor
First Power Supply for a PolySilicon CVD Reactor

1984

1970

Traction Industry
Production of Rectifier Units for Traction Industry



RECon Line
A complete line of Inverters for Renewable Energies

2010

2009

AKTIF Group
Acquisition of Setas with AKTIF GROUP

It is a long history of passion, inventiveness and capabilities started in 1950 by Dr. Angelo Pagliai, continuing today with the third generation of the original holding family supported by a selected team of expert and enthusiast managers, engineers, technicians and workers.
Founded in 1950 in Milan, FRIEM is a reference in Power Electronics, manufacturing and delivering all over the world Power Converters for Industrial, Energy and Mobility applications.

FRIEM Conversores
Foundation of
FRIEM Conversores

2012

Indonesian Branch
Opening of
Indonesian branch

2017

ESS market
Focusing mainly on mini-
gird and recharge fields

2018

2014

FRIEM S.Afica
Opening of
South African branch

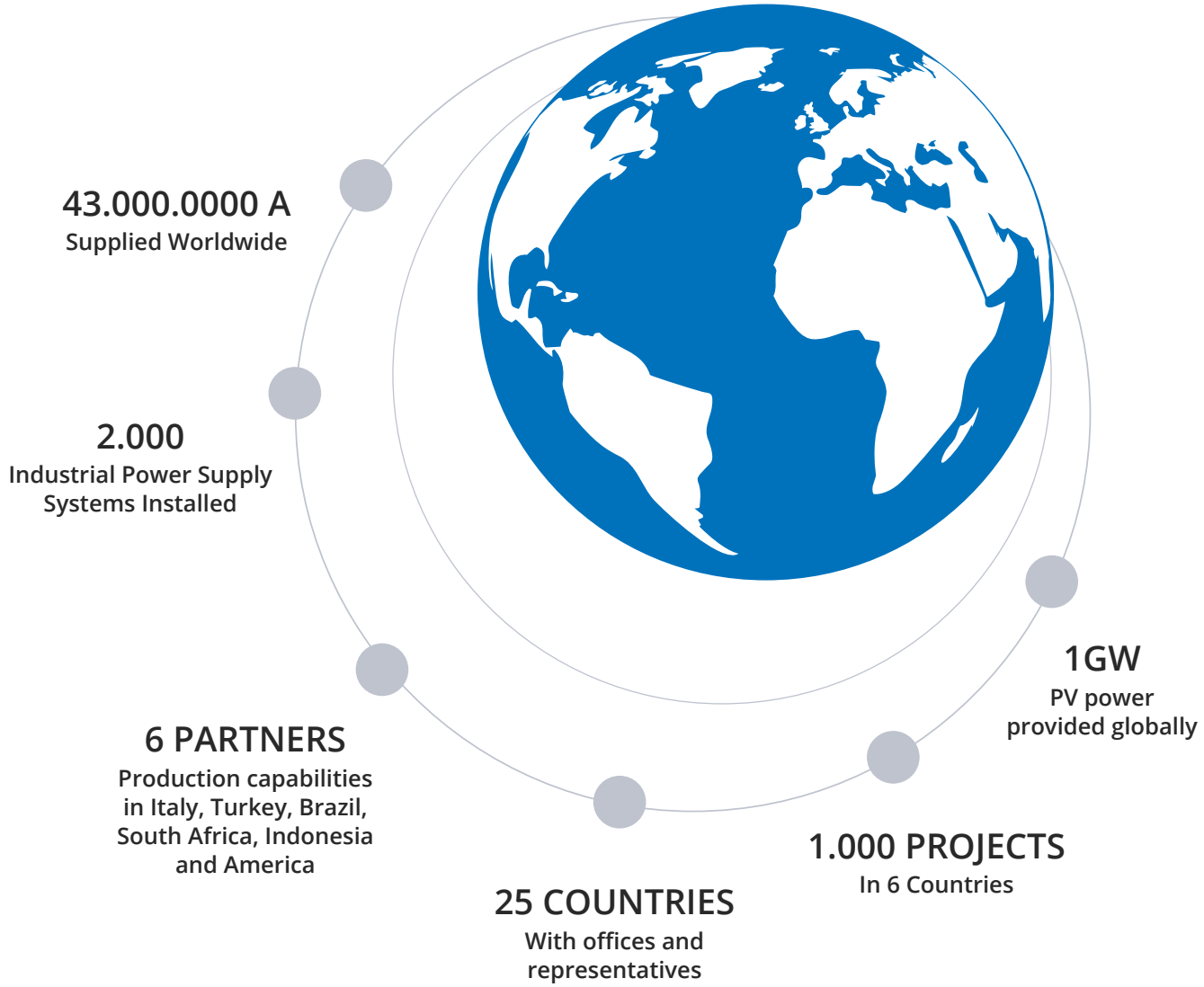
2018

New acquisition

At the forefront of the energy conversion industry since 1950.

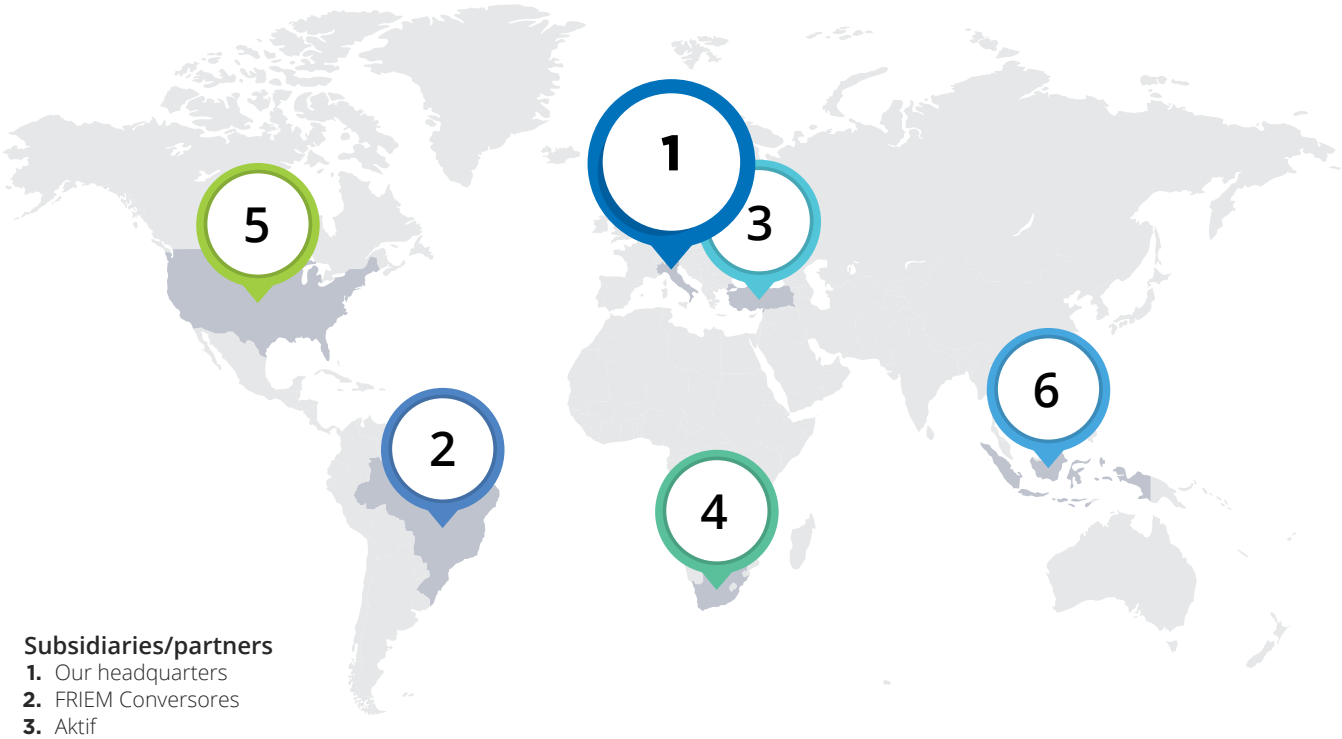
Thanks to its proven expertise in power electronics, FRIEM has become a reference for electric energy conversion in those special applications where products' quality and technical solutions are considerable. With continuous investments in research and development, FRIEM utilizes best-in-class technology to provide its customers reliable and high-performance products, besides solutions in line with the market requirements. These investments combined with a future oriented vision, have led FRIEM to invest in partnerships serving the customers with a wider range of products.

We aim to be the partner of our Customers, sustaining their operations and results with our dependable, reliable and high technology solution.



With offices, workshops and representatives in more than 25 countries all over the world, today FRIEM is a Group of Companies specialised in providing the best solutions in Industrial, Energy Storage, Energy Management, Energy Distribution and Electric Mobility applications.

To support the growing markets in precise areas together with the strategy of making a local presence stronger, FRIEM has opened over the years subsidiaries and branches worldwide. As a result, customers can rely on the quality and performance of FRIEM's products, with the advantage of a local production and a constant support.



Subsidiaries/partners

1. Our headquarters
2. FRIEM Conversores
3. Aktif
4. FRIEM South Africa
5. FRIEM America
6. Indonesian office

5

FRIEM
AMERICA INC.

OUR SOLUTIONS

Working now for the future

Tailor made solutions.
We customize our equipment according to your specifications.

With the demand for reliable power increasing exponentially, to support the requirements in key areas for sustainable growth, such as Renewable Energy, Energy Storage and Energy Management, FRIEM consolidated its capabilities producing a wide range of inverters and power converters under the brand RECon and HYCon Line.

This is our contribution in feeding a new concept of Energy: safe, clean and mostly free from all the critical issues experienced with traditional energy sources.

Thanks to the combination of different products FRIEM provides customized solutions:

Solar Plants Solutions

1

Inverter, Accessories and Plug&Play solutions for PV Power Plants

BESS (Battery Energy Storage Systems)

2

Bidirectional Converter and fully integrated solutions for Battery Energy Storage Systems

Minigrid & Energy Management

3

Bidirectional Converter, EMS and fully Integrated solutions for Hybrid Power Plants

SOLAR PLANT SOLUTIONS: RECon Line

Inverter, Accessories and Plug&Play Solutions for PV Power Plants

The RECon Line concept is derived from the long experience FRIEM has achieved in Power Conversion and in the use of all kind of semiconductors. The line has been developed following FRIEM's traditional concept of reliability, efficiency and modularity devoted to high flexibility and easy maintenance.

All the models can be either used as single units or combined in parallel to reach the requested power.

Grid support function

- Compliance to the IEC 62116 (Islanding protection)
- Low and High voltage ride through (L/HVRT)
- Active power limitation (P-f curve)
- Dynamic Voltage regulation (P-Q)
- Reactive power regulation (Q)
- Q-night (optional)

Efficiency

High efficiency thanks to the modular design and the air cooling system

- Maximum Efficiency 99.23%
- EURO Efficiency 98.78%
- CEC Efficiency 99.01%

Safety

- Overvoltage protection with type II DC surge arrester
- Insulation Monitor Device (IMD) integrated
- Residual Current Monitor device (RCM)

Maintenance

- Modular design easy for maintenance
- Human Machine Interface (HMI) for real-time data and remote monitoring connection
- Simple spare parts management

Recon Station (RST)

FRIEM provides a complete "Plug and Play" solution assembled and tested in the factory, ready to be transported and installed on site, connected through the junction boxes to the photovoltaic field, then connected to the network through the MV switchgear.

FRIEM's Recon Station (RST) can be configured to satisfy customer's requirements. Suitable for outdoor installation and for use in harsh environmental conditions.

Plug and Play

- Modular inverter customisable according to power needs
- Medium voltage transformer and switchgear
- Low voltage distribution cabinet
- Meteorological station

Cost saving

- Low transportation cost
- Easy to install
- Grid support and Night Static Var Generator function (SVG)

Reliability

- Totally assembled and tested in factory
- Compact and robust design
- Simple cooling system
- Conform to the safety standards

Technical Data

RECon 30		200	400	600	800	1000	1200
DC Input							
Maximum input voltage (V_{OC})	V	1000					
Input voltage range	V	1,51 x V_{AC} - 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					
Auxillary Power							
Auxillary supply from UPS	V	230					
Standby consumption	W	110	220	330	440	550	660
General Information							
Width	mm	550	1100	1650	2200	2750	3300
Height	mm	2200					
Depth	mm	825					
Weight	kg	350	700	1050	1400	1750	2100
Air Flow	m^3/h	850	1700	2550	3400	4250	5100

RECon 2.30		409	818	1227
DC Input				
Maximum input voltage (V_{OC})	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	m^3/h	1700	3400	5100

Common Data

DC Input		
Type of connection	-	Ungrounded / Ground pole connection
Overvoltage protection	-	Surge arrester type II
Switch	-	DC load break switch
Other protection	-	Insulation monitoring system

AC Output		
Type of connection	-	IT
Power factor	-	> 0,99 at Rated Power and Rated Voltage
Total harmonic distortion (2)	%	≤ 3
Efficiency (Max, EU, CEC) (5)	%	99,23 - 98,78 - 99,01

General Information		
Installation	-	Indoor - conditioned
Protection class	-	IP 20
Storage temperature	°C	-25 ÷ + 70
Storage relative humidity	%	5 ÷ 85 without condensation
Operating temperature range (3)	°C	-10 ÷ + 40
Cooling system	-	Forced air
Maximum altitude a.s.l (4)	m	2500 (for installation over 1000 m, please contact FRIEM)

Interfaces		
Local user interface	-	Touch screen display
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) - IEC60730 (2010)
Grid requirements	-	CEI 0-16:2014-09 + V1:2014-12, SAGC (Version 2.6 November 2012), R.EXTRA CNE 501:2015, NTSyCS:2015, Ordinul Nr.30 din 17.05.2013, IEC 62116:2014 (ed. 2.0)
EMC	-	IEC EN 61000-6-2:2005, IEC EN 61000-6-4:2007 + A1:2011
Efficiency	-	IEC 61683:1999 (First Edition), EN 61683:2000

Note: Specifications are subject to change without notice, please contact FRIEM
(1) at 40°C
(2) at rated power
(3) no de-rating up to 40°C ; 1,5% de-rating per degree in temperature
(4) de-rating over 1000m
(5) without auxiliary power supply

Technical Data

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

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

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

Common Data

DC Input		
Type of connection	-	Ungrounded / Ground pole connection
Overvoltage protection	-	Surge arrester type II
Switch	-	DC load break switch
Other protection	-	Residual Current Detection Insulation monitoring system
Option	-	Zone Monitoring System

Auxiliary		
Auxiliary supply from UPS	V	230
Stand-by Consumption	W	250

General Information		
Installation	-	Outdoor
Protection class	-	IP 55
Storage temperature	°C	-25 ÷ + 70
Storage relative humidity	%	4 ÷ 100
Operating temperature range (3)	°C	-20 ÷ + 60
Cooling system	-	Forced air
Maximum altitude a.s.l (4)	m	4500

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

Standards		
Product standard	-	'2014/35/UE, 2014/30/UE, CEI EN 62109-1:2010, CEI EN 62109-2:2012, IEC 60730:2010
Grid requirements	-	OVFRT, LVFRT, Qf(V), Pf(f),
EMC	-	IEC EN 61000-6-2:2005, IEC EN 61000-6-4:2007 + A1:2011
Efficiency	-	IEC 61683:1999-11, EN 50530

Note: Specifications are subject to change without notice, please contact FRIEM
(1) at 45°C
(2) at rated power
(3) no de-rating up to 45°C ; 1,5% de-rating per degree in temperature
(4) de-rating over 2000m

Accessories

String Box

FRIEM string box enables the parallel connection through a disconnecting switch, up to 24 inputs to the Inverter. The continuous measurement of current, irradiation and temperature of the panels for each string, through a dedicated sensor, allows a complete check of the operation of the solar modules. Measures and protection status are integrated in the monitoring system thanks to the serial communication.
The string box is equipped with an overvoltage protection device. The cover of the string box is realized in strong, weatherproof, polyester laminated glass with IP65 protection degree suitable for indoor and protected outdoor installation.

- Waterproof case suitable for outdoor installation

- Fully protected for safe operation
- Overvoltage protection with type II DC surge arrester

- String Current measures
- Wind, sun radiation and temperature measures
- Overvoltage protection device status
- DC disconnector status

STR String Box

Electric characteristics		
Number of inputs	-	8 - 24 (1)
DC Input voltage	V	1000 / 1500
DC Output current	A	80 ÷ 240
Short circuit current ma	A	96 ÷ 288
DC fuses	-	Yes
Auxiliary supply from UPS	V	230

General information		
Surge arrester with microswitch	-	Yes
Under voltage coil	-	Optional
Shunt coil	-	Optional
Reverse current diode protection	-	Optional

Interfaces		
Communication protocol	-	Modbus RTU or TCP/IP
Communication port	-	RS485

Note: Specifications are subject to change without notice, please contact FRIEM
(1) Different models available upon request

RMS - RECon Monitoring System

FRIEM RMS offers a complete system for the remote control and supervision of photovoltaic systems. Thanks to a web application the user can access to a dedicated web portal and monitor the system performances. The web portal shows data in real time, with diagrams and tables, information on measures and also data elaboration. Thanks to its standard communication, the RMS can be integrated into existing monitoring systems interfaces and in preinstalled software libraries.
RMS is a multi-protocol and multi-standard data logger for real-time acquisition. The device can be used for industrial systems, home automation and developing applications for the “Internet of Things”. Data can be shared, received and sent via Ethernet, Wi-Fi and/or the integrated GSM/GPRS modem.

Display

Display real time and historical data from sensors in each site, collect information from any local data-logger or SCADA.

Storage

Storage of documentation and equipment data and performances.

Maintenance

Manage maintenance activities in a dedicated O&M section, send customized sms and/ or e-mails alerts for optimization of plants assistance.

Reports

Produce reports and summary tables.

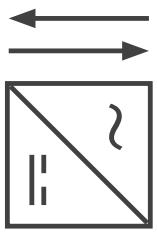
BESS (Battery Energy Storage Systems)

Bidirectional Converter and Fully Integrated Solutions for Battery Energy Storage Systems

FRIEM offers a wide range of Battery Energy Storage Systems (BESS) to enable a better integration of renewable energy sources both from RE power plant and grid stability point of view.
FRIEM's BESS are fitted with Bi-Directional and Hybrid Converters (HYCon Line) and powered by a smart and effective Energy Management System (EMS) and Battery Management System (BMS). Those are designed to store the energy and release it during peak periods, or according to pre-defined patterns or to smooth and stabilize the power generation.

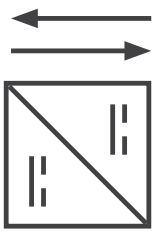
The disruption of Energy generation and the arising of different needs are the key driver of the deployment of new technologies like Battery Energy Storage System in the power generation chain.

AC/DC Bidirectional Inverter HYCon-Line



Power range: 70kW - 1200kW (@400V)
AC Voltage range: 200V to 400V
Maximum efficiency: 98.5%
DC Voltage range: 1,51xVac-885V
Protection degree: IP20

DC/DC Bidirectional Converter HYCon D-Line



Power range: 30kW - 300kW
Input DC Current range: 84A to 252A (step-up configuration)
Input DC Voltage range: 120V - 0,9 Vdc out (step-up configuration)
Max output DC voltage: 885V
Maximum efficiency: 98.5%
Protection degree: IP20

MINIGRID & ENERGY MANAGEMENT

A Minigrid is a small-scale electricity network fed by renewable energy sources, solar PV typically. The generated electricity is supplied - directly or indirectly via batteries - to clients who are connected to this minigrid electricity network.
Minigrids are a practical and cost-effective electricity solution for communities without access to the electric distribution network; they can supply electricity for a localised group of consumers including households, institutions, hospitals and businesses. Compared to individual customer systems, minigrids may provide an enhanced service level to ensure the continuous operation and sustainability of the system.
Thanks to the combination of different products FRIEM provides customized solutions dedicated to Minigrids.

With HYCon line products FRIEM has all the bricks to build up dedicated solutions to satisfy the multiple and different requirements of Minigrids.

FRIEM EMS
Energy Management System

FRIEM EMS

Smart and dynamic system to manage the Hybrid Power Plant or Mini-Grid and control the Energy flows
Forecast-based battery charging and discharging
Grid-tied and Off-Grid seamless transition functionality.

FRIEM HYCon Station
Plug & Play

Flexible, smart, turn-key containerised system that supplies a stable and reliable power by connecting a wide range of loads and power sources (GENSET, PV, grid, battery) in grid-tied and off-grid mode.
Power range: 50kW - multi MW.

Our Products

HYCon-Line converters

HYCon-Line is a comprehensive line of Bidirectional Inverters and Power Converters developed to meet the multiple and different requirements of Battery Energy Storage Systems applied to Minigrid, Ancillary Services and Energy Management.

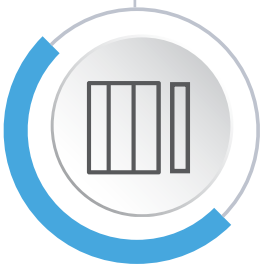
HYCon-Line converters can be used as core component together with the most common battery technologies (Li-ion, Lead, Red-Ox, Hydrogen, etc.) to fully customise the BESS to the plant's requirements.

Flexible

- System Sizing
- Retrofitting of Existing Power Plant
- Battery Technology Independence

Smart

- Full access and manage of the parameters through the EMS+
- Forecast-based battery charging
- Grid and Off-Grid functions already implemented



Available

- Modularity
- Smart spare parts management
- Easy replacement of the main components

Thanks to the huge experience in Solar PV field and Industrial Automation, FRIEM's solution can integrate multiple sources and manage the Energy supplied to the Loads or Grids, by optimising the reliability, availability and profitability of the provided solution.

Available Support Functions

- Renewable Stabilization
- Investment Deferral
- Peak Shaving
- Minigrids
- Load Shifting
- Power Quality
- Ancillary Services

Technical Data

Bidirectional Inverter HYCon-Line

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 @ V_{nAC}	V	1,51 x V_{AC} - 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	m^3/h	700	1400	2100	2800	3500	4200
Standby consumption	W	50	100	150	200	250	300

HYCon 30		200	400	600	800	1000	1200
AC Side							
Voltage range (Phase-Phase) (1)	V	200 - 400 (±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 @ V_{nAC}	V	1,51 x V_{AC} - 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	m^3/h	850	1700	2550	3400	4250	5100
Standby consumption	W	110	220	330	440	550	660

HYCon 2.30		400	800	1200
AC Side				
Voltage range (Phase-Phase) (1)	V	200 - 400 (±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 @ V_{nAC}	V	1,51 x V_{AC} - 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	m^3/h	1700	3400	5100
Standby consumption	W	110	220	330

Common Data

HYCon-Line

AC Side		
Over voltage protection	-	Surge arrester type II (Optional)
Switch	-	AC load break switch
Anti Islanding protection	-	Yes with automatic disconnection
Other protection	-	AC short circuits and overloads (fuses)
Type of connection	-	Copper bars
Power factor	-	> 0,99 at Rated Power and Rated Voltage
Total harmonic distortion	%	< 3

Efficiency		
Maximum efficiency	%	98,5
Euro Efficiency	%	98

DC Side		
Over voltage protection	-	Surge arrester type II
Switch	-	DC load break switch
Other protection	-	Insulation monitoring system
Type of connection	-	Copper bars
Type of storage (2)	-	LA, Lithium, Flow Batteries

Auxiliary power		
Auxiliary supply from UPS	V	230
Auxiliary supply voltage range	-	195 - 253

General Information		
Protection class	-	IP 20
Operating temperature range (3)	°C	-10 ÷ + 40
Cooling system	-	Forced air
Maximum altitude a.s.l (4)	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

Note: Specifications are subject to change without notice, please contact FRIEM
(1) without integrated LV/LV transformer
(2) for other technologies, please contact FRIEM
(3) no de-rating up to 40°C ; 1,5% de-rating per degree in temperature
(4) de-rating over 1000m

Technical Data

DC/DC Bidirectional Converter HYCon D-Line

	HYCon D84		1	2	3
STEP-DOWN MODE	**DC Input**				
	Voltage range	V		1,1 x V_{MAXOUT} ÷ 885	
	DC Output				
	Voltage Range	V		120 ÷ 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 ÷ V_{minOUT} / 1,1	
	Maximum Current	A	84	168	252
	DC Output				
	Voltage Range	V		1,1 x V_{MAXIN} ÷ 885	
	Max. DC Ripple (pk-pk)	%		< 3 (@ Max. DC Voltage)	
	Efficiency				
	Maximum efficiency	%		99	
	Weight & Air Flow				
	Weight	kg	180	210	240
	Air flow	m^3/h		700	

	HYCon D168		1	2	3
STEP-DOWN MODE	**DC Input**				
	Voltage range	V		1,1 x V_{MAXOUT} ÷ 885	
	DC Output				
	Voltage Range	V		120 ÷ V_{minIN} / 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 ÷ V_{minOUT} / 1,1	
	Maximum Current	A	168	336	504
	DC Output				
	Voltage Range	V		1,1 x V_{MAXIN} ÷ 885	
	Max. DC Ripple (pk-pk)	%		< 3 (@ Max. DC Voltage)	
	Efficiency				
	Maximum efficiency	%		99	
	Weight & Air Flow				
	Weight	kg	220	250	290
	Air flow	m^3/h		850	

Common Data

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

Note: Specifications are subject to change without notice, please contact FRIEM
Note: Models available with MPPT features
(1) no de-rating up to 40°C ; 1,5% de-rating per degree in temperature
(2) de-rating over 1000m

EMS - Energy Management System

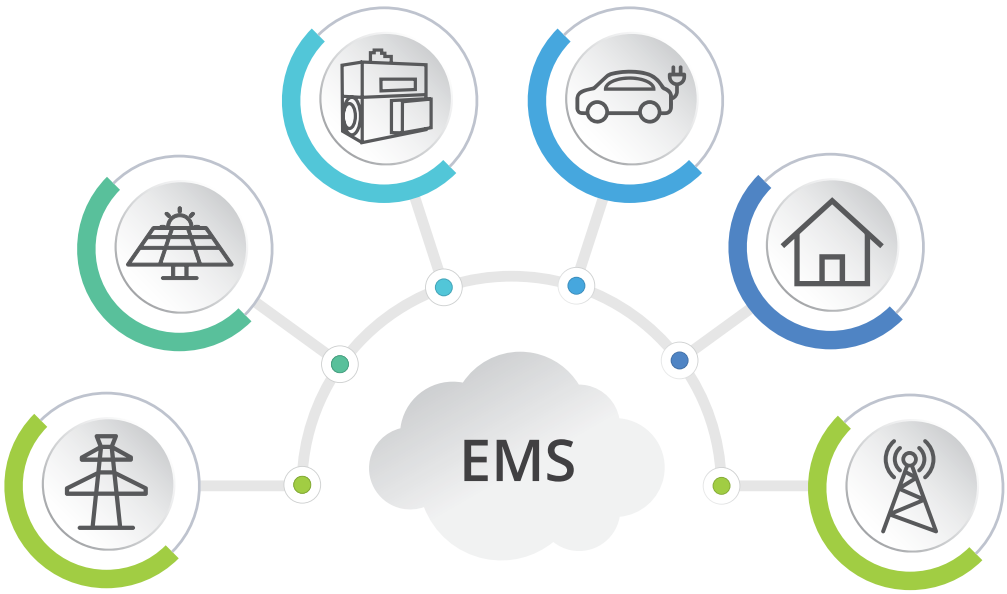
FRIEM EMS collects all the information (measurement, signals, alarms, status, etc.) of the plant and manages all the components by implementing functions required, whether it is a BESS or a Minigrid. It also provides user interaction for real-time and historical data visualization, real-time parameter settings for power flow control and remote communication features.

All the information is displayed on a 7" touch screen HMI with advanced graphical capabilities. Internal flash memory is available to store trend data, events, alarms, user settings, also in case of converter switched-off.

Thanks to its digital inputs/outputs, the EMS can manage the interaction of the photovoltaic and storage system with the main network and/or with the Genset.

FRIEM EMS has been designed as a smart component to be used for plant's customisation and management, that integrates all the logics required by the system architecture.

When connected to an ethernet network, the EMS is accessible by using a PC or tablet through the standard VNC protocol.



EMS

Technical Data

Display	7"
Resolution	800 x 480
Memory (flash & ram)	128 + 128 MB
Ethernet port	10/100 Base T
USB host	2.0
Com port	Com1: RS232/RS485 2W/4W Com3: RS485 2W
Power supply	24VDC
I/O Ports	6 Digital Input 2 Digital Output
Energy Meters	2 x Multifunction meters with RS485 ModBus communication

Note: Specifications are subject to change without notice, please contact FRIEM

HYCon Station Plug & Play solution

FRIEM HYCon Station is a customised "Plug&Play" containerised solution, assembled and tested in factory and ready to be transported and commissioned on site. Completely customizable according to the customer's request, can be equipped with different solutions. The different level of integration starts from the conversion part up to the complete system, and includes the whole package built in cooperation with selected and qualified partners.

Flexible, smart and cost saving, supplies a stable and reliable power by connecting a wide range of loads and power sources, both in grid-tied and/or off-grid mode.

Flexible

- System Sizing
- Different integration levels
- Ready for future extension

Cost saving

- Low transportation cost
- Easy commissioning and stating up
- Ready for future extension

Maintainable

- Modular design
- Simple spare parts management
- Remote access for easy trouble shooting

SERVICE AND MAINTENANCE

Partners to our customers

We ensure to operate immediately on the equipment in case of fault, keep a record of each customer's machine in order to provide the most efficient technical and economical solution.

Thanks to our after-sales service organization we can count on worldwide local partners to be trained to provide immediate on-site support.

We ensure to operate immediately on the equipment in case of fault, keep a record of each customer's machine in order to provide the most efficient technical and economical solution.

Our activities include:

Erection Supervision

Our installation supervisors can coordinate the installation company in order to minimize installation time losses and to proper follow FRIEM installation documentation.

Commissioning & Start-Up

Thanks to its team of specialized technicians and to a network of Local Service Partners, FRIEM can provide Commissioning and Start-Up of its equipment all over the world.

Yearly Maintenance Contracts

The right way to extend the lifetime of the equipment, by scheduling maintenance customized activities in advance, monitoring the spare parts stocks.

On Call Service

A top class service assistance: 24 hours/7 days phone availability and minimized reaction times with an immediate feedback of our skilled engineers.

Remote Supervision

The remote monitoring of the equipment allows our skilled engineers to provide technical support via phone, e- mail and web connection.

Conversion System Efficiency Assessment

Our specialized technician will evaluate the actual efficiency of the conversion system with proper high accuracy measuring devices, in order to propose how to improve its performances.

Revamping and Upgrade

FRIEM Service Department can propose the best technical and economical solution in order to defeat the obsolescence of the spare parts or to improve the actual operation of the old conversion system.

Training

Dedicated training can be provided to the Customer's Engineers in FRIEM's Test Room and facilities or to the Customer's site.

Notes

Power Supply System

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ISO 9001:2015
ISO 14001:2015
ISO 45001:2018
STANDARD

05/2019