



**HYBRID INVERTERS for**

# Energy Storage Systems



Renewable Energy  
on demand

# Content

Energy Storage Systems 2

## Hybrid Inverter Line

HYCon D84 Line 3

HYCon D168 Line 4

HYCon 10 Line 5

HYCon 30 Line 6

HYCon 2.30 Line 7



# Energy Storage Systems

FRIEM HYCon is a comprehensive line of Hybrid Inverters and Power Converters developed in order to respond to the multiple and different requirements of Energy Storage Systems applied to Mini-Grid and Energy Management. Thanks to the huge experience in Solar PV field and Industrial Automation, FRIEM's solution is able to integrate multiple sources and manage the Energy supplied to the Loads, optimising the reliability, availability and profitability of the Mini-Grid. All the most common Battery Technologies can be used (Li-ion, Lead, Red-Ox, Hydrogen) so that the ESS can be fully customised to the plant's requirements.



## RENEWABLE ENERGY GENERATION

**Renewable Energy Shifting and Firming:** release the stored energy during peak periods or according to a pre-defined generation pattern.

**Renewable Energy Smoothing:** store or release energy to smooth and keep constant the power generation.



## GRID ANCILLARY SERVICES

**Ancillary Services:** automatic control of Active and Reactive Power for Voltage and Frequency regulation.

**Peak Shaving and Investment Deferral:** stored energy can be used to manage peak demand.



## MINI GRID & ENERGY MANAGEMENT

**Energy Continuity and Diesel Abatement:** store Renewable Energy to guarantee the supply of the Loads and minimize the use of Diesel Gen Set.

**Energy Cost optimization:** store or release energy to minimize the electricity cost.

# HYCon D84 Line

HYCon		D84-30	D2.84-60	D3.84-90	
STEP-DOWN MODE	<b>Input (DC)</b>				
	Rated power	kW	30	60	90
	Voltage Range	V	550 ÷ 750		
	<b>Output (DC)</b>				
	Voltage Range	V	650 ÷ 850		
	Maximum Current	A	84	168	252
	Max. DC Ripple (pk-pk)	%	< 3 (of Max. DC Voltage)		
<b>Efficiency</b>					
Maximum efficiency	%	99,0			
STEP-UP MODE	<b>Input (DC)</b>				
	Rated power	kW	30	60	90
	Voltage Range	V	400 ÷ 590		
	<b>Output (DC)</b>				
	Voltage Range	V	650 ÷ 850		
	Maximum Current	A	46	92	138
	Max. DC Ripple (pk-pk)	%	< 3 (of Max. DC Voltage)		
<b>Efficiency</b>					
Maximum efficiency	%	99,0			
<b>DC Protections &amp; Switching</b>					
Overtoltage protection	-	Surge arrester type II (Optional)			
Switch	-	DC load break switch			
Other Protection	-	Insulation monitoring system (Optional)			
<b>Auxiliary power</b>					
Auxiliary supply from UPS	-	230 (110VA)			
Auxiliary supply voltage range	-	195 - 253			
Standby consumption	W	70			
<b>General information</b>					
Dimension (WxHxD)	mm	550 x 2200 x 825			
Weight	kg	350			
Protection class	-	IP 20			
Operating temperature range (1)	°C	-10 ÷ + 45			
Cooling system	-	Forced air			
Air flow	m3/h	700			
Maximum altitude (2)	m	4500 (for installation over 1000 m, please contact FRIEM)			
<b>Interfaces</b>					
Local user interface	-	Touch screen display (Optional)			
Communication Protocol	-	Modbus RTU or TCP/IP			
PC communication port	-	RS232 - RS485			
Remote communication port	-	Ethernet			
<b>Standards</b>					
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			

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

Note (B): 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

# HYCon D168 Line

HYCon		D168-100	D2.168-200	D3.168-300	
STEP-DOWN MODE	<b>Input (DC)</b>				
	Rated power	kW	100	200	300
	Voltage Range	V	650 ÷ 850		
	<b>Output (DC)</b>				
	Voltage Range	V	400 ÷ 590		
	Maximum Current	A	168	336	504
	Max. DC Ripple (pk-pk)	%	< 3 (of Max. DC Voltage)		
<b>Efficiency</b>					
Maximum efficiency	%	99,0			
STEP-UP MODE	<b>Input (DC)</b>				
	Rated power	kW	100	200	300
	Voltage Range	V	400 ÷ 590		
	<b>Output (DC)</b>				
	Voltage Range	V	650 ÷ 850		
	Maximum Current	A	153	306	459
	Max. DC Ripple (pk-pk)	%	< 3 (of Max. DC Voltage)		
<b>Efficiency</b>					
Maximum efficiency	%	99,0			
<b>DC Protections &amp; Switching</b>					
Overvoltage protection	-	Surge arrester type II (Optional)			
Switch	-	DC load break switch			
Other Protection	-	Insulation monitoring system (Optional)			
<b>Auxiliary power</b>					
Auxiliary supply from UPS	-	230 (110VA)			
Auxiliary supply voltage range	-	195 - 253			
Standby consumption	W	70			
<b>General information</b>					
Dimension (WxHxD)	mm	550 x 2200 x 825			
Weight	kg	500			
Protection class	-	IP 20			
Operating temperature range (1)	°C	-10 ÷ + 45			
Cooling system	-	Forced air			
Air flow	m3/h	1500			
Maximum altitude (2)	m	4500 (for installation over 1000 m, please contact FRIEM)			
<b>Interfaces</b>					
Local user interface	-	Touch screen display (Optional)			
Communication Protocol	-	Modbus RTU or TCP/IP			
PC communication port	-	RS232 - RS485			
Remote communication port	-	Ethernet			
<b>Standards</b>					
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			

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

Note (B): 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

# HYCon 10 Line

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

## AC Side

Voltage range (Phase-Phase) <sup>(1)</sup>	V	200-400					
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
Power factor	-	> 0,99 at Rated Power and Rated Voltage					
Total harmonic distortion	%	< 3					
Type of connection	-	Copper bars					

## AC Protections & Switching

Overvoltage protection	-	Surge arrester (Optional)					
Switch	-	AC load break switch					
Anti Islanding protection	-	Yes with automatic disconnection					
Other Protection	-	AC short circuits and overloads (fuses)					

## Efficiency

Maximum efficiency	%	98,5					
EURO Efficiency	%	98					

## DC Side

Charging Voltage Range @ V <sub>NAC</sub>	V	650 - 850					
Maximum current @ 40°C	A	110	220	330	440	550	660
Maximum number of output	-	1	2	3	4	5	6
Max. DC Ripple (pk-pk)	%	< 3 (of Max. DC Voltage)					
Type of storage <sup>(2)</sup>	-	LA, Li-ion, Flow Batteries, DLC, SMES					
Type of connection	-	Copper bars					

## DC Protections & Switching

Overvoltage protection	-	Surge arrester type II					
Switch	-	DC load break switch					
Other Protection	-	Insulation monitoring system					

## Auxiliary power

Auxiliary supply from UPS	-	230 (110VA/module)					
Auxiliary supply voltage range	-	195 - 253					
Standby consumption	w	50	100	150	200	250	300

## Auxiliary power

Dimension (WxHxD) <sup>(1)</sup>	mm	550x2200x825	1100x2200x825	1650x2200x825	2200x2200x825	2750x2200x825	3300x2200x825
Weight <sup>(1)</sup>	kg	350	700	1050	1400	1750	2100
Protection class	-	IP 20					
Operating temperature range <sup>(3)</sup>	°C	-10 ÷ + 45					
Cooling system	-	Forced air					
Air flow	m <sup>3</sup> /h	700	1400	2100	2800	3500	4200
Maximum altitude <sup>(4)</sup>	-	4500 (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 & Functions

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 ED. III (2012) - VDE 0126-1-1 (2006) - SAGC2.6					
EMC	-	EN 61000 - 6 - 2 / EN 61000 - 6 - 4					
Euro Efficiency	-	IEC 61683: 1999-11					
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 (A): 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



# HYCon 30 Line

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

## AC Side

Voltage range (Phase-Phase) (1)	V	200-400					
Frequency	Hz	50 / 60					
Power @ 400 V (Phase-Phase)	kW	203	406	609	812	1015	1218
Rated current @ 40°C	A	293	586	879	1172	1465	1758
Power factor	-	> 0,99 at Rated Power and Rated Voltage					
Total harmonic distortion	%	< 3					
Type of connection	-	Copper bars					

## AC Protections & Switching

Overvoltage protection	-	Surge arrester (Optional)					
Switch	-	AC load break switch					
Anti Islanding protection	-	Yes with automatic disconnection					
Other Protection	-	AC short circuits and overloads (fuses)					

## Efficiency

Maximum efficiency	%	98,5					
EURO Efficiency	%	98					

## DC Side

Charging Voltage Range @ V <sub>NAC</sub>	V	650 - 850					
Maximum current @ 40°C	A	325	650	975	1300	1625	1950
Maximum number of output	-	1	2	3	4	5	6
Max. DC Ripple (pk-pk)	%	< 3 (of Max. DC Voltage)					
Type of storage (2)	-	LA, Li-ion, Flow Batteries, DLC, SMES					
Type of connection	-	Copper bars					

## DC Protections & Switching

Overvoltage protection	-	Surge arrester type II					
Switch	-	DC load break switch					
Other Protection	-	Insulation monitoring system					

## Auxiliary power

Auxiliary supply from UPS	-	230 (110VA/module)					
Auxiliary supply voltage range	-	195 - 253					
Standby consumption	w	50	100	150	200	250	300

## Auxiliary power

Dimension (WxHxD) (1)	mm	550x2200x825	1100x2200x825	1650x2200x825	2200x2200x825	2750x2200x825	3300x2200x825
Weight (1)	kg	500	1000	1500	2000	2500	3000
Protection class	-	IP 20					
Operating temperature range (3)	°C	-10 ÷ + 45					
Cooling system	-	Forced air					
Air flow	m3/h	1500	3000	4500	6000	7500	9000
Maximum altitude (4)	-	4500 (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 & Functions

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 ED. III (2012) - VDE 0126-1-1 (2006) - SAGC2.6					
EMC	-	EN 61000 - 6 - 2 / EN 61000 - 6 - 4					
Euro Efficiency	-	IEC 61683: 1999-11					
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 (A): 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

# HYCon 2.30 Line

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

## AC Side

Voltage range (Phase-Phase) <sup>(1)</sup>	V	200-400		
Frequency	Hz	50 / 60		
Power @ 400 V (Phase-Phase)	kW	406	812	1218
Rated current @ 40°C	A	586	1172	1758
Power factor	-	> 0,99 at Rated Power and Rated Voltage		
Total harmonic distortion	%	< 3		
Type of connection	-	Copper bars		

## AC Protections & Switching

Overvoltage protection	-	Surge arrester (Optional)		
Switch	-	AC load break switch		
Anti Islanding protection	-	Yes with automatic disconnection		
Other Protection	-	AC short circuits and overloads (fuses)		

## Efficiency

Maximum efficiency	%	98,5		
EURO Efficiency	%	98		

## DC Side

Charging Voltage Range @ VnAC	V	650 - 850		
Maximum current @ 40°C	A	650	1300	1950
Maximum number of output	-	1	2	3
Max. DC Ripple (pk-pk)	%	< 3 (of Max. DC Voltage)		
Type of storage <sup>(2)</sup>	-	LA, Li-ion, Flow Batteries, DLC, SMES		
Type of connection	-	Copper bars		

## DC Protections & Switching

Overvoltage protection	-	Surge arrester type II		
Switch	-	DC load break switch		
Other Protection	-	Insulation monitoring system		

## Auxiliary power

Auxiliary supply from UPS	-	230 (110VA/module)		
Auxiliary supply voltage range	-	195 - 253		
Standby consumption	w	50	100	150

## Auxiliary power

Dimension (WxHxD) <sup>(1)</sup>	mm	1100x2200x825	2200x2200x825	3300x2200x825
Weight <sup>(1)</sup>	kg	1000	2000	3000
Protection class	-	IP 20		
Operating temperature range <sup>(3)</sup>	°C	-10 ÷ + 45		
Cooling system	-	Forced air		
Air flow	m3/h	3000	6000	9000
Maximum altitude <sup>(4)</sup>	m	4500 (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 & Functions

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 ED. III (2012) - VDE 0126-1-1 (2006) - SAGC2.6		
EMC	-	EN 61000 - 6 - 2 / EN 61000 - 6 - 4		
Euro Efficiency	-	IEC 61683: 1999-11		
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 (A): 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





**Power Supply System  
Power Electronics & Automation**

FRIEM S.p.A. - Via Edison, 1  
20090 Segrate - Milano - Italy  
Tel.: +39 02 87235350 Fax: +39 02 26923036  
sales@friem.com  
www.friem.com



**ISO 9001-2008  
STANDARD**