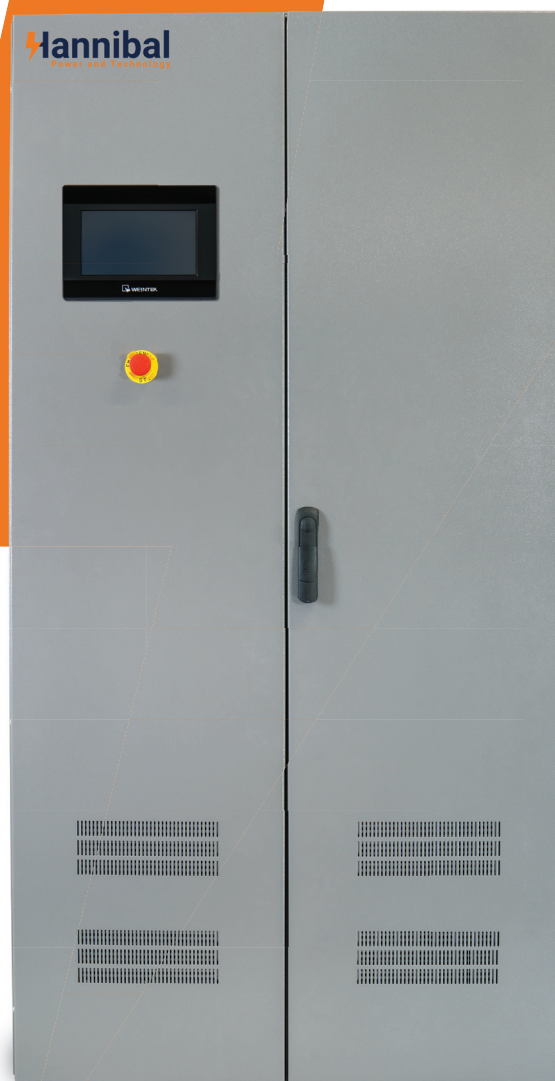


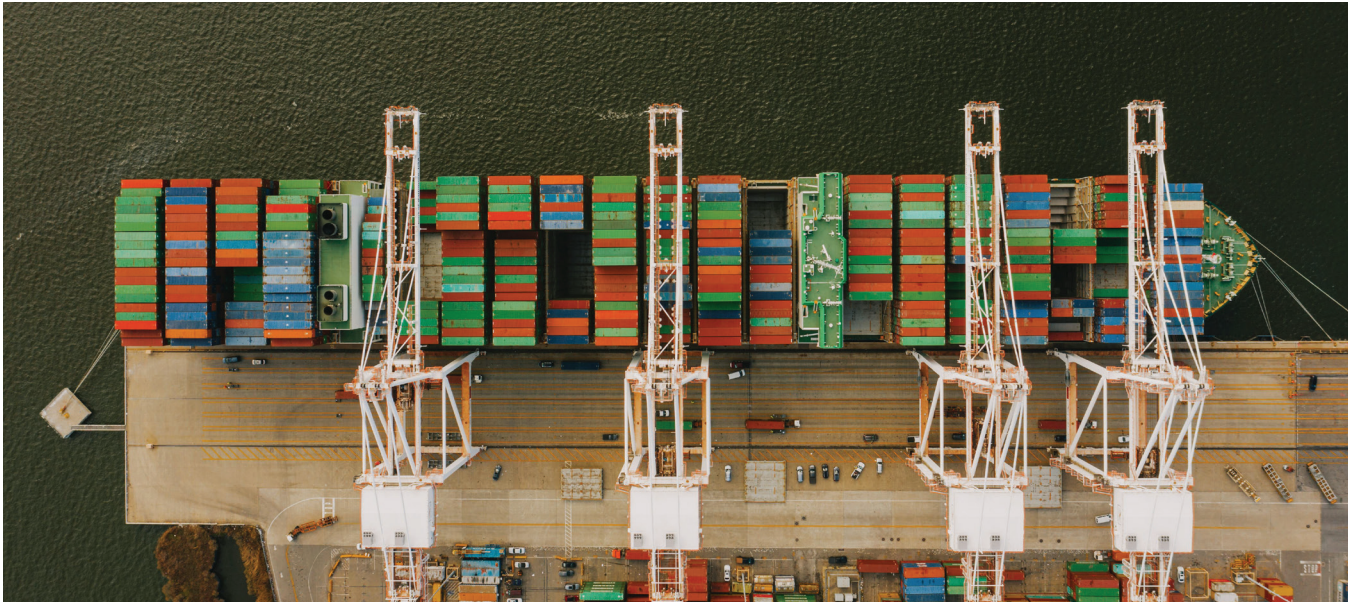
Industrial Static Frequency Converter FC Series



Industrial frequency converter, also known as a frequency changer, is a device that alters the electrical frequency of power supplied to industrial machinery and equipment. It plays a crucial role in various industrial applications where equipment designed for one frequency needs to be operated on a different frequency power supply.

Frequency converters can be static (electronic circuits) or rotary (motor-generator). They enable regional compatibility, improve energy efficiency, reduce equipment wear, and enhance motor speed control for smoother, more flexible industrial operations.

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Benefits

Strengthened reliability:

- Streamlined cooling design for airflow optimization.
- Reduced operation temperature of critical components.

Improved maintainability:

- "True" front access to all replaceable components to reduce MTTR.
- Simplified design of major subassemblies to allow complete replacement in minutes.
- Easier maintenance of paralleled systems thanks to unique Hannibal Smart Parallel Switching function.

Increased availability:

- Multiplied redundancy with Hannibal.
- Smart Parallel Switching function that dynamically controls paralleled systems.
- Remote support from experts to efficiently update settings as required.

Industrial grade inverters

- Industrial grade inverters are based on transformer technology for robustness and endurance. The output isolation transformer protects the semiconductors against peak currents and distortion, supplying short circuit currents and filtering noise. Transformer based technologies offer therefore a longer service life and higher degree of protection.

Range Overview

Hannibal system range is based on SCR/IGBT technology with proven digital control. It is available from 2.5 to 250 kVA in single-phase output version and from 5 to 600 kVA in three-phase output version. It is configurable with a set of industrial options such as custom protection devices, bypass transformer and/or stabilizer, various communication solutions, etc.

Designed as an industrial system, it includes most frequently specified features as default, for example dual cooling channel, input and output transformers, conformal coating of all printed circuit boards, halogenfree flame retardant internal cables.

The architecture of the system allows the segregation of different pre-defined functions that help to increase personnel safety on site as well as improve overall system availability.

Applications

- Marine and ports.
- Industry.
- Military.
- Mining.
- Transportation.



FC industrial Frequency converter advantage:

- Compact design, high power density.
- No moving elements - low maintenance.
- High reliability and availability.
- Precise output frequency generation.
- Remote monitoring and control through Ethernet, Modbus TCP/IP protocols.
- Flexible in-built features.
- Optional operation with battery.
- Highly customizable.
- Easy maintenance and serviceability.

Front panel LED Standard:

- Operation.
- General Alarm.
- Inverter failure.
- High Temperature.
- Output out of limits.



The above illustrations show some examples of finished systems. As each system is customized to specification, the internal layout might be different for different units.



Key Features

- 6- or 12-pulse thyristor rectifier at the core of the best-in-class reliability.
- Reduced inrush current $\leq 10 \times I_n$ to avoid oversizing upstream protection and 2-step strat-up.
- $<10\%$ THDI in 12-pulse SCR system is possible without additional harmonic filters.
- $<5\%$ THDI in IGBT Base system is possible with additional harmonic filters.
- Smart access to FC data via a large color touchscreen with 2000-event exportable log.
- Unmatched overload and short-circuit capacity at 315% for 100ms*.

Technical Data

Input	
Rectifier Bridge Topology	- Thyristor 6 Pulses - Standard - Thyristor 12 Pulses- Optional - IGBT - Optional
Input Voltage -Single Phase	110/120/200/220/240/277 V
Input Voltage -Three Phase	208/220/240/380/400/415/480 V
Voltage tolerance	+/- 15 %
Frequency	50 Hz (60 Hz)
Frequency tolerance	+/- 5 %
Efficiency	90% to 95%
Power Factor	0.8
THD	$<30\%$ for 6 pulses Rectifier - $<12\%$ for 12 Pulses version
Inrush current	$\leq 10 \times I_n(4)$
Ripple	- $<5\%$ 1Ph - $<2\%$ 3Ph

Output	
Inverter Bridge Topology	IGBT with output isolation Transformer
AC Voltage - Single phase - Three phase	1 x 230 V (220, 240) ; 1 x 110 V (115, 120) ⁽⁴⁾ 3 x 400 V (380, 415) ; 3 x 220 V (200, 208, 230) ⁽⁴⁾
AC Voltage Tolerance	1%
Frequency	50 Hz (60 Hz)
Frequency Tolerance	+/- 0.05 %
Inverter overload capability	
- 1 minute - 10 minute	150 % of nominal power 125% of nominal power
Short circuit clearance (in % of nominal current)	
- 1-ph output - 3-ph output Ph-N: - 3-ph output Ph-Ph:	250 % / 100ms - 175% / 5s 315 % / 100 ms - 220 % / 5 s 190 % / 100 ms - 135 % / 5 s
Harmonic voltage distortion	
- With 100 % linear load - With 100 % non-linear load	$< 3\%$ SS as per IEC/EN 62040-3
Power Factor	0.8
Efficiency	90%
Allowable crest factor	up to 3/1

General Data

Title	
Operating temperature	0 to 40 °C ⁽⁴⁾
Storage temperature	-20 to +70 °C
Relative humidity	$< 95\%$ non condensing
Operating altitude	1000 m max without derating ⁽⁴⁾
Cooling	Fan Forced, free cooling -Optional
MTBF	$<150,000$ h
External protection	IP 20 ⁽⁴⁾ according to IEC 60529
Internal protection	Protection against unintentional direct contacts, as per IEC 60950-1/62477-1
Noise (at 1m in front of the unit)	60 – 75 dB according to rating
Cabinet colour	RAL 7035 ⁽⁴⁾
Touch Panel " HMI"	Optional
Communication	- RTU RS232-Standard - TCP/ IP – Optional - RTU RS485- Optional
Dimensions	Varying according to ratings and options

Standards

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IEC62040-1:2017	Uninterruptible power systems (UPS) - Part 1: Safety requirements
IEC62040-2:2016	Uninterruptible power systems (UPS) – Part 2: Electromagnetic compatibility (EMC) requirements
IEC62040-3:2011	Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements
IEC61439-1:2011	Low voltage switchgear and controlgear assemblies - Part 1: General rules
IEC60529:1989 +AMD1:1999	Degrees of protection provided by enclosures (IP Code)
IEC60076-11:2004	Power transformers – Part 11: Dry type transformers
* 3-ph output only (1) at power factor 0.8 lagging (2) 1-ph output only	(3) Up to 250 kVA 1-ph output or up to 500kVA 3-ph output on request (4) (5)

Conformity	
Low voltage directive	2006/95/EC and 2014/35/EU
EMC directive	2004/108/EC and 2014/30/EU
CE Mark	

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Options

Consult us for any other requirements, subject to feasibility

Rectifier charger

- . 12-pulse rectifier
- . IGBT Rectifier
- . Harmonic filter on 12P for THDi $\approx 5\%$ (+/- 1pt)
- . Other input voltage (3 x 190 to 3 x 690 VAC)
- . Surge and/or lightning protections
- . Rectifier output switch

Communication

- . Front panel analogue meters (72x72, class 1.5)
- . Transducers 4-20mA
- . Additional volt-free contacts
- . Modbus / TCP
- . IEC61850 protocol
- . Monitoring software
- . Mimic panel:
 - Passive mimic of the system
 - Active mimic with integrated LEDs Lamp indicator on front panel (22 mm diameter)

Mechanical

- . External ingress protection up to IP42
- . Top cable entry
- . Specified color of panels
- . Special feet height (200mm or 300mm)
- . Special keylock
- . Non-magnetic gland plate (brass or aluminum)
- . Specified cabinet identification (tag, nameplate)

