

## Silcovert FH



# The future starts with Nidec



## Silcovert FH



### Active Front End Transformerless

**Power range:**  
Up to 2.5 MVA  
**Voltage:**  
Up to 6.6 kV  
**Cooling:**  
Air cooled  
**Output Frequency:**  
0 to 75Hz

### Smarter, safer, more reliable, and eco-friendly

The Silcovert FH is an Active Front End (AFE), transformerless, multilevel voltage source inverter specifically designed with the environment in mind. The state-of-the-art control architecture offers highly reliable performance and 4 quadrant energy flow. This provides users the possibility of adding energy recovery to complex processes as well as greater control of unexpected variations in voltage and reactive power control.

### Typical Applications

Pumps, fans, compressors, blowers, chillers, conveyors, crushers, extruders, mixers, mills and test stands

### Markets

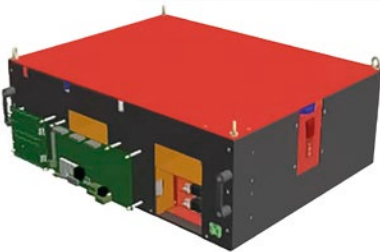
Water  
Metals  
Mining & Cement  
Oil & Gas  
Power Generation  
Marine  
Chemicals & Plastics  
Material Handling



# For higher availability and safety

## Silcovert FH Series is a NIDEC Patented topology

Our power module with very low commutating losses increases the lifetime of the component and the efficiency of the overall VFD without decreasing performance.



The drive is equipped with a redundant cooling fan to enhance performance and safety.

Power Converter cabinets

Motor connection cabinet

### CONTROL CABINET:

- Control card functionally tested
- All cards are coated to avoid contamination
- Serial Links are Redundant
- Hard wired for important signals

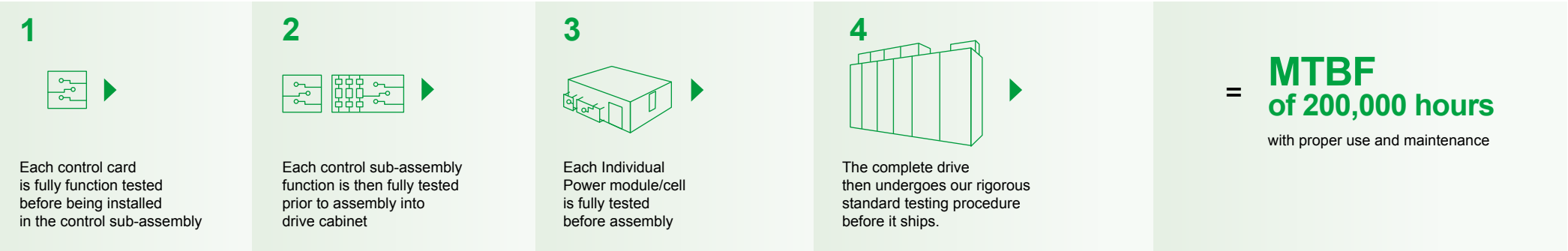
Input line reactor

The Silcovert FH is part of our Silcovert family of drives and is designed with the same robust features that characterize all of our drives using standard, modular components to ensure high reliability and availability under even the most demanding performance conditions.



Only 6.6 kV Arcproof certified at 40kA-0,2 sec  
The drive can be supplied with an Internal Arc Detector and is available certified Arc Proof.

All of our units undergo rigorous testing at each step of the manufacturing process





# System integration was never easier

The Silcovert FH has one of the most modern communication platforms available on the market today.

Operating on DeviceNet with 50 I/Os in the standard configuration.

Additional I/O can be provided as an option.

The drive can also be configured with any major communication fieldbus including, but not limited to: Profibus/Ethernet TCP/IP, CAN Open, Modbus RTU, IEC61850.

## Installation

The Silcovert FH is one of the most compact variable speed drives on the market today and is specifically designed to simplify installation in virtually any environment. The near sinusoidal waveform means the drive is compatible with standard motors and cables without the need for a power quality assessment. Three cables in, three cables out from top or bottom. It's that simple. The drive is transformer-less however we do offer customers an optional external transformer, which can be either oil or dry-type, typically wherever galvanic isolation from the power supply is required or other site conditions may warrant it. The drive can also be equipped with an output sine filter for connection with long motor cables (more than 400m) and/or retrofitting to very old motors with an aged insulation system.

## State-of-the-art cyber-security

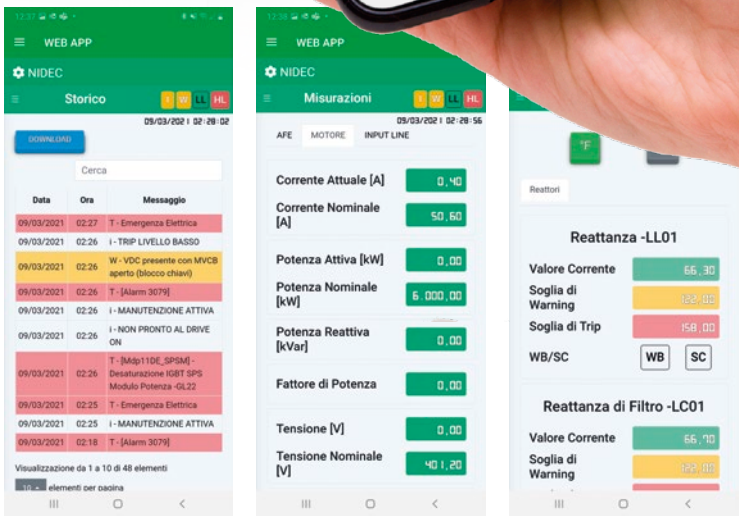
With Silcovert FH your assets are protected. The Silcovert FH control system has two levels of password protected access controls that can be set by the owner. These controls allow the designated manager to determine not only who can access the drive but also the level of access from "view only" to "full control" for expert service technicians for scheduled maintenance and repair activities. Passwords and access permissions can be modified by the designated manager at any time.

## Commissioning

Commissioning the drive is now easier with our new wireless app. Intuitive, drop down menus, quick settings and data transfer features allow users to quickly and easily configure and start the drive within hours. QR Code access to the full library of documentation on the drive including Manuals, Test Reports, Schematics, Spare Parts Lists, etc.

Moreover, connecting the drive to a higher-level factory supervisory system is simple thanks to a wide variety of field-bus adapters and communication protocols built into the drive.

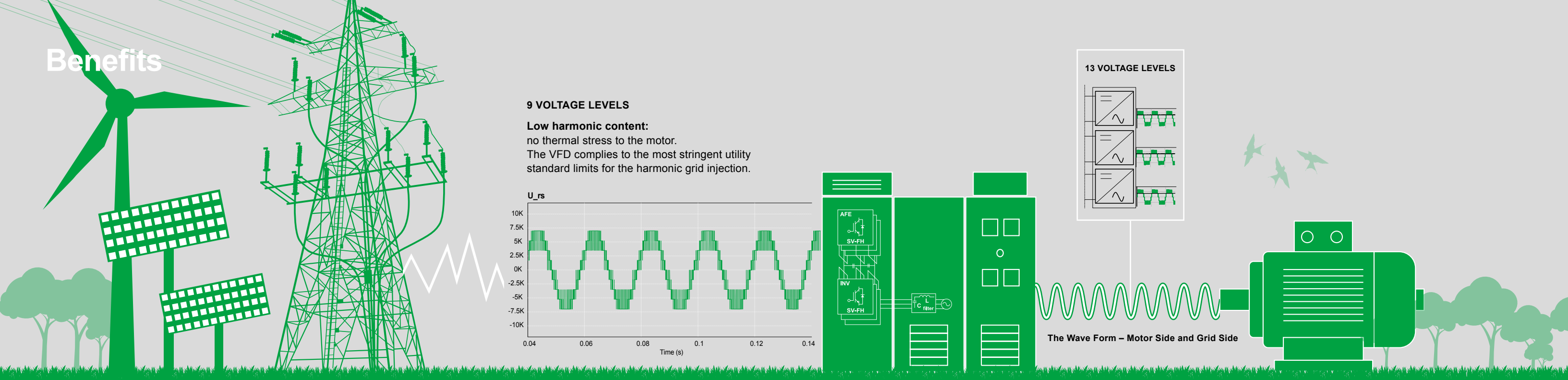
The drive can also support a redundant fieldbus port for multi-system integration where required.



Nidec Easy Start (Nidec EST) Commissioning App



# Benefits



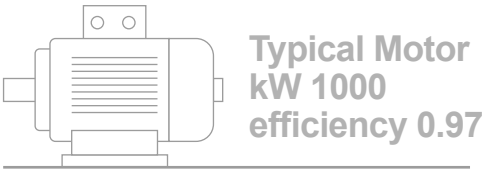
## Ultra-low Harmonics

Thanks to the ultra low harmonics the Silcovert FH is very motor friendly making it an ideal choice for retrofitting. It is also the perfect choice to help mitigate reactive power to the grid, especially for applications with frequent starts and stops.

## Grid matters

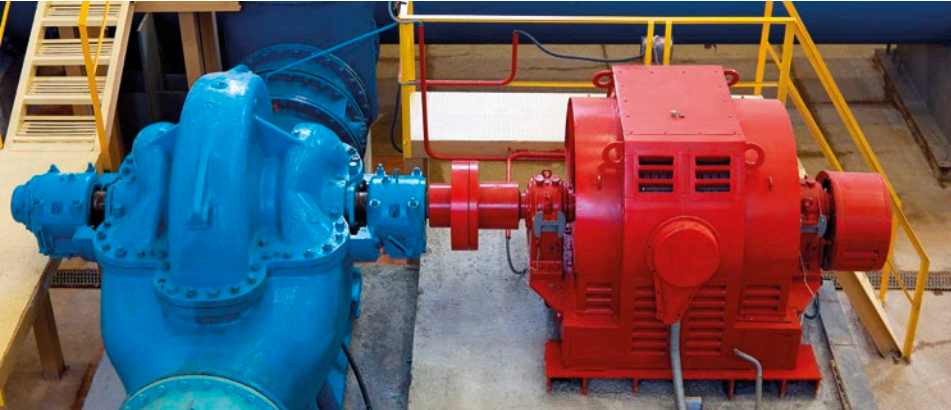
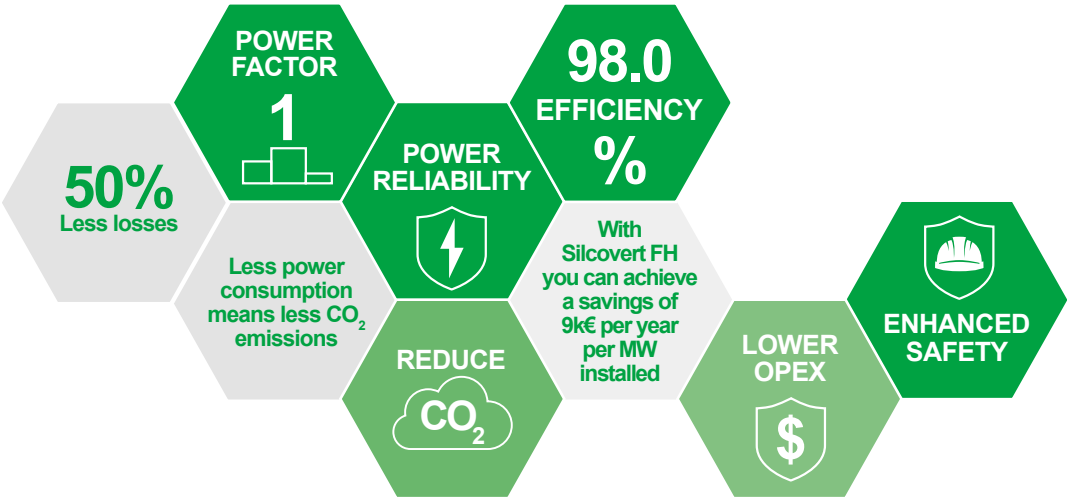
### The importance of Power Factor, Auxiliary Equipment Losses, and System Losses.

The savings in kVAR reduces the size of the transformer and all the upstream equipment resulting in additional savings. Furthermore, grid operators demand reduction of reactive power. The Silcovert FH's AFE tranformerless design meets their criteria.



	STANDARD DFE	SILCOVERT FH	
Efficiency	96%	98%	<b>SAVING \$11K/year</b> WITH NIDEC SVFH TRANSFORMER LESS
Total Power Factor	0.95	1	
Total apparent Power	1130	1052	
Total active Power	1074	1052	
Total Reactive Power	353	0	
			<b>78 [kVA]</b>
			<b>22 [kW]</b>
			<b>353 [kVAR]</b>

Considerations for calculation VFD usage 80%, cost of electricity \$.07 /kWh



### Not sure about the integrity of your motor's insulation system?

Nidec's Service team can provide you with predictive diagnostics. Using infrared thermograph and partial discharge analysis we can assess the state of health of a motor's insulation system offering insight into the conditions of the unit to help.

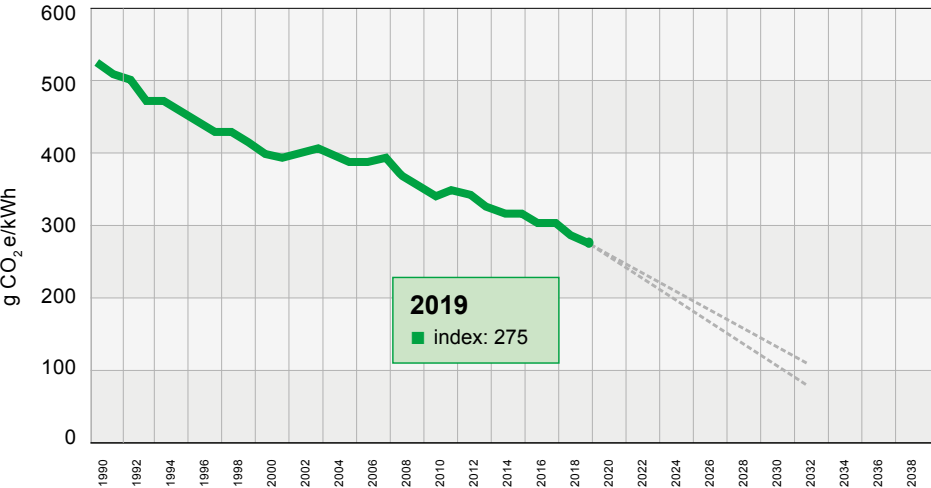


# The only sustainable choice



## You could be saving 42 tons of CO<sub>2</sub> per year with the Silcovert FH.

With an efficiency of more than 98%, the Silcovert FH has 50% fewer losses than a standard DFE drive. This leads to marginal economic savings which over the life of the system more than pay back the original investment. However, today, this benefit for our customers is no longer the only consideration. The use of our Silcovert FH can significantly contribute to the reduction of CO<sub>2</sub> as the calculations in the example below clearly illustrate.



European level - Greenhouse gas emission intensity of electricity generation

### CO<sub>2</sub> saving

Calculation of the CO<sub>2</sub> savings for a 1 MW drive

#### Standard VFD Usage

80%

#### Standard Usage in HOURS

365x24x80% = 7008 HOURS/YEAR

#### Energy Savings with Silcovert FH per MW

22 kW (See previous page)

#### CO<sub>2</sub> Consumption per kWh

275 g/kWh

Source: European Environment Agency 2019 report

#### TOTAL CO<sub>2</sub> saved

275 g x 7008 hours x 22 kW =  
42.3 tons/year



### Did you know?

It takes roughly 350 to 800 kg of copper to make a transformer. Experts debate over the amount of copper available today across the earth but everyone agrees that copper production is one of the highest energy intensive processes known today. By removing the transformer we are making a concrete contribution to reducing the environmental impact of our solutions.

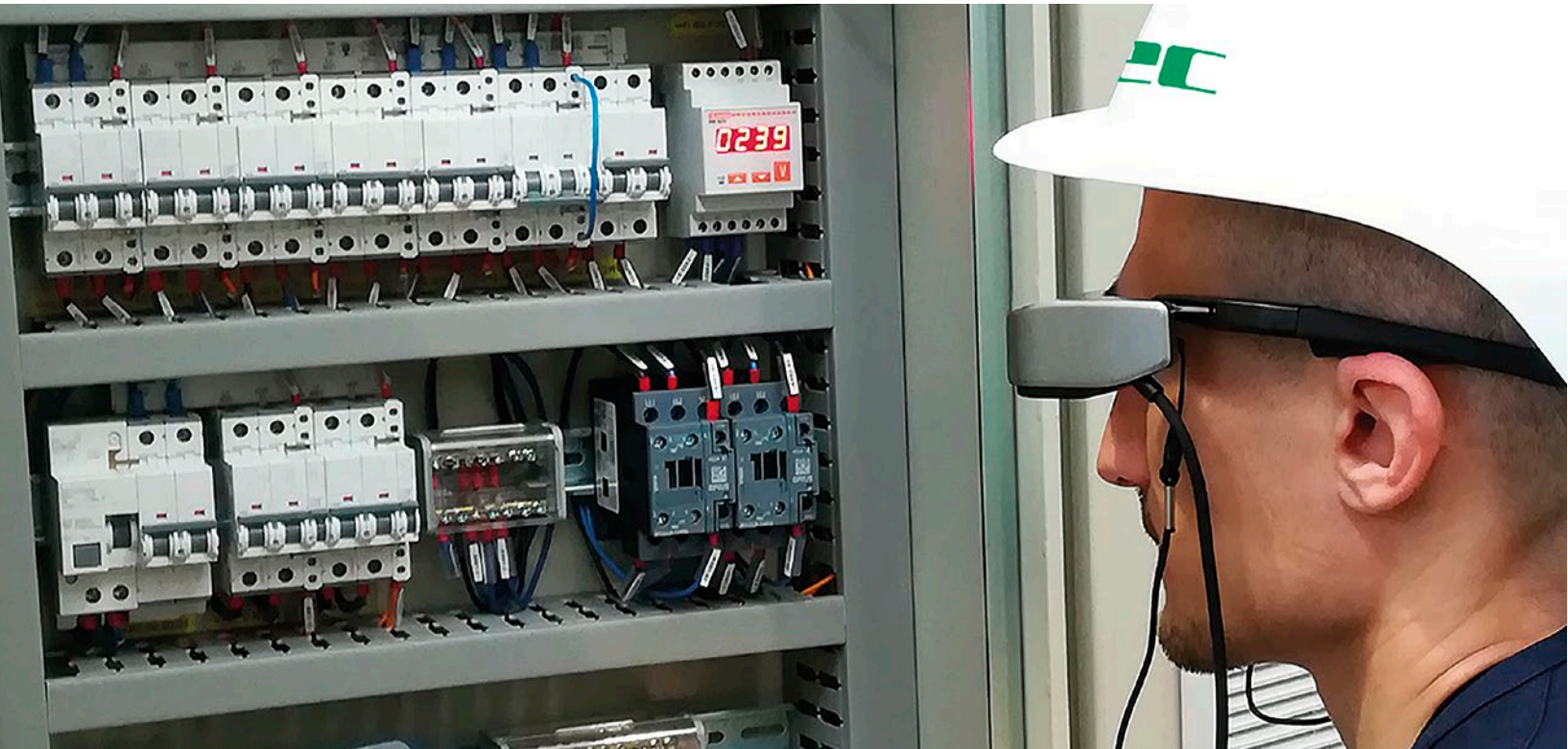


### The full package

Nidec is one of the world's leading suppliers of electric motors from a fractional watt up to 100MW so it should come as no surprise that we have a full line of very high efficiency motors which can be supplied with the drive if needed. These IE5 MV motors (efficiency, cos phi) are fully compliant with Circular Economy Life Cycle regulations. In fact more than 95% of the materials used are fully recyclable at the end of the life cycle.



Service Support



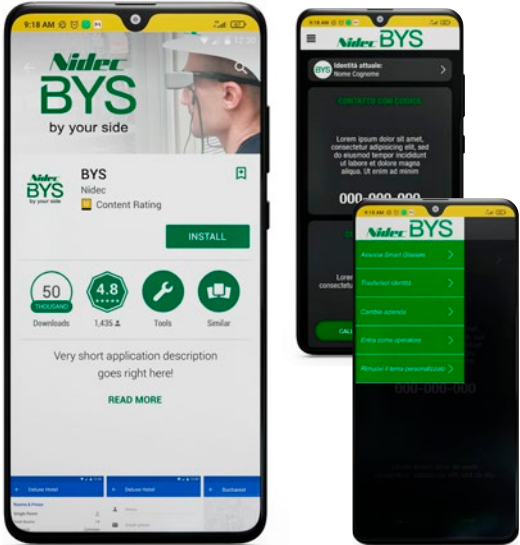
With you everywhere.

- Technical Support
- Remote Diagnostics
- Training
- Upgrades
- Service Agreements

Nidec by your side™

Nidec's global footprint ensures customer proximity for spare parts and technical assistance. In addition, with **BYS app (By Your Side)** our expert technicians are never more than just a click away. The **BYS app**, which can be downloaded from Google Play Store or Apple, allows local technicians to connect to our senior experts across the globe for real-time support to commission, troubleshoot, inspect and make simple repairs on the drive.

With the aide of smart viewing glasses, our experts can guide local service support through the various steps and procedures for any activity on the drive.



SPARE PARTS KITS

Description	BASIC	EXTENDED
Control Board - Box frame		
Electr. Card type SYSTEM 2	1	2
Electr. Card type MODSYS-CC		1
Electr. Card type SIZES		1
Electr. Card type TADATT-2H		1
Electr. Card type INTSYNCB		1
Supply Board		
Electr. Card type GAAPA		2
Power supply 24Vcc 150W (Control Unit)		2
Power supply 24Vcc 100W (Control Unit)		2
Power supply 24Vcc 100W		2
Power supply 24Vcc 25W		2
Card 80kHz supply TALIMC		2
Transformer TRAL 80		2
Automation Board		
Ethernet Switch		1
WAGO – Modbus RTU Fielbus Coupler		1
WAGO - Internal System Supply Module		1
WAGO - Filter Module		1
WAGO – 8 digital input		1
WAGO – 2 digital output relay		1
WAGO – 2 Analog input Pt100		1
WAGO – 2 Analog output 4÷20mA		1
Air cooling		
Motor fan – 50/60Hz Inverter cubicle 2,6kW		2
Motor fan – 50/60Hz In/Out cubicle 290W		1
Air Filter Viledon 415x556		4
MV fuses		
Main input/output fuses 7200V 125A	3	12
Precharge circuit fuses. 12kV 16A	2	3
Synchronism T.V. fuses. 3/7,2 kV 0.5 A	2	3
Power devices		
Complete IGBT power module		1
Transducer		
Output Attenuator Resistors 7.2 kV		1
Card PARTER		1
Synchronism T.V. 8000/100:√3 12kV		1
Other		
Aux Fan 230V 50/60Hz (204x204mm)		2
Aux fuses 230V 50Hz 20A 10x38		6
Aux fuses 400V 50Hz 50A NH000 aM		6

Technical Specifications

Description		Unit	Characteristic
ENVIRONMENTAL CONDITIONS	Installation		indoor
	Working temperature	°C	+ 5 +40 <sup>(1)</sup>
	Storage temperature	°C	-20 +70
	Relative humidity (max.)	%	< 95 non condensing
	Altitude (max.)	m ft	< 1000 a.s.l. <sup>(2)</sup> < 3300 a.s.l. <sup>(2)</sup>
	Pollution degree		2 Without conductive pollution in accordance with IEC 61800-5-1
INCOMING LINE	Voltage Rated Value	kV	3.3 – 4.16 – 6.0 – 6.6
	Voltage tollerance		± 10 %
	Voltage unbalance		< 2%
	Frequency	Hz	50 / 60 ± 3 %
	Max available short circuit power	kA	40
	Min short circuit power		20 times of installed power
	Power factor		≅ 1
	Line harmonics		Compliant with IEC 61000-2-4, IEEE 519
	Input protection		Fuses
VARIABLE FREQUENCY CONVERTER (VFD)	Type		Multilevel
	Rated output voltage	kV	3.3 – 4.16 – 6.0 – 6.6
	Output frequency	Hz	5 ÷ 75
	Rated output current and overload	A	Up to 150%
	Total full load efficiency		> 0.98
	Line side inverter		IGBT based inverter
	Motor side Inverter		IGBT based inverter
	Cooling type		AF – Forced air with redundant fans (n-1)
	Operation mode		4 quadrants: AFE
	Maxim motor cable length	m	1000 <sup>(3)</sup>
ELECTRIC CABINET (VSI)	Safety		Mechanical door interlock
	Protection degree		IP 42
	Painting colour / cycle		RAL 7035 / Nidec ASI standard
	Cable inlet / outlet		Bottom / bottom
	Noise level @ 1 m	dB(A)	Air cooling: ≤ 80
	Accessibility		Front

(1) For ambient temperature between 40°C and 50 °C

(2) For altitudes between 1000mt (3300ft) and 2000mt (6600ft)  
(available with power derating)

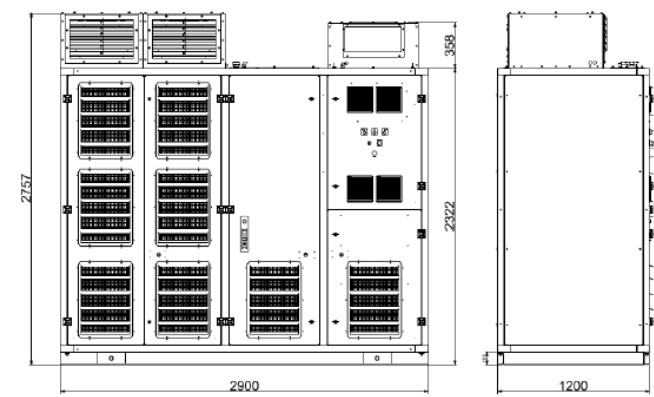
(3) Output filter/reactors may be necessary based on installation conditions

Standard Features and Options

	Base	Option
INCOMING LINE CONNECTION		
Bottom Entry	<input type="checkbox"/>	
Input manual disc. switch + earth switch		<input type="checkbox"/>
Input earthing balls		<input type="checkbox"/>
Input power cable top entry		<input type="checkbox"/>
MOTOR SIDE CONNECTION		
Bottom Entry	<input type="checkbox"/>	
Output reactor for cable length > 400mt		<input type="checkbox"/>
Output sinusoidal filter		<input type="checkbox"/>
Output manual disc. switch + earth switch		<input type="checkbox"/>
Output earthing balls		<input type="checkbox"/>
Output power cable top entry		<input type="checkbox"/>
CERTIFICATIONS		
Base conf. : CE / IEC conformity	<input type="checkbox"/>	
GOST TR-CU, UL, AND OTHERS		<input type="checkbox"/>
PAINTING		
Base conf. : RAL 7035	<input type="checkbox"/>	
Special color		<input type="checkbox"/>
COOLING CONFIGURATION (REDUNDANT)		
Front cooling air output without coupling flange for air duct	<input type="checkbox"/>	
Front cooling air output with coupling flange for air duct		<input type="checkbox"/>
Rear cooling air output without coupling flange for air duct		<input type="checkbox"/>
Rear cooling air output with coupling flange for air duct		<input type="checkbox"/>
AUXILIARY SUPPLY		
50Hz/380+480V/230V UPS/230V	<input type="checkbox"/>	
60Hz/380+480V/120V UPS/120V	<input type="checkbox"/>	
50Hz/380+480V/internal UPS/230V		<input type="checkbox"/>
60Hz/380+480V/internal UPS/120V		<input type="checkbox"/>
50Hz/380+480V+230V/230V UPS/230V		<input type="checkbox"/>
60Hz/380+480V+230V/120V UPS/120V		<input type="checkbox"/>
50Hz/380+480V+230V/internal UPS/230V		<input type="checkbox"/>
60Hz/380+480V+230V/internal UPS/120V		<input type="checkbox"/>
CONTROL		
Remote by HW / net – Local by APP	<input type="checkbox"/>	
Rem/Local control by HMI		<input type="checkbox"/>
Cubicle Light & anti-condensation heaters		<input type="checkbox"/>
Motor temp. monit. by n° 5 pt100 (Wind+Bear.)		<input type="checkbox"/>
FIELDBUS COMUNICATION PROTOCOL		
Profibus / Ethernet TCP/IP	<input type="checkbox"/>	
Third Fielbus: Device net		<input type="checkbox"/>
Third Fielbus: CAN Open		<input type="checkbox"/>
Third Fielbus: Modbus RTU		<input type="checkbox"/>
DOCUMENTATION		
Documentation in Italian / English language	<input type="checkbox"/>	
Other language		<input type="checkbox"/>
TESTS		
Factory routine tests	<input type="checkbox"/>	
Heat run test		<input type="checkbox"/>
No load noise measurements		<input type="checkbox"/>
Witnessed test		<input type="checkbox"/>



Product Range



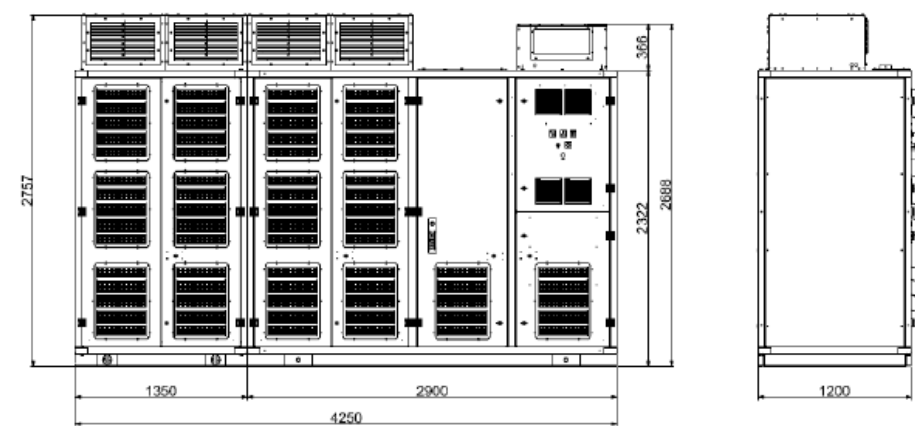
Frame general arrangement - figure 1

3300V								
A	V	kW	kVA	LENGTH (mm)	WIDTH [mm]	HEIGHT [mm]	WEIGHT [kg]	LAYOUT
40	3300	200	229	2.900	1.200	2.757	2.720	Fig 1
50	3300	250	286	2.900	1.200	2.757	2.720	Fig 1
60	3300	299	343	2.900	1.200	2.757	2.720	Fig 1
70	3300	349	400	2.900	1.200	2.757	2.720	Fig 1
85	3300	424	486	2.900	1.200	2.757	3.360	Fig 1
100	3300	499	572	2.900	1.200	2.757	3.360	Fig 1
120	3300	599	686	2.900	1.200	2.757	3.360	Fig 1
140	3300	698	800	2.900	1.200	2.757	3.360	Fig 1
160	3300	799	915	2.900	1.200	2.757	3.800	Fig 1
180	3300	898	1029	2.900	1.200	2.757	3.800	Fig 1
200	3300	998	1143	2.900	1.200	2.757	3.800	Fig 1
220	3300	1097	1257	2.900	1.200	2.757	3.800	Fig 1

Motor efficiency: 0.97 / power factor 0.9

4160V								
A	V	kW	kVA	LENGTH (mm)	WIDTH [mm]	HEIGHT [mm]	WEIGHT [kg]	LAYOUT
40	4160	251	288	2.900	1.200	2.757	2.720	Fig 1
50	4160	314	360	2.900	1.200	2.757	2.720	Fig 1
60	4160	377	432	2.900	1.200	2.757	2.720	Fig 1
70	4160	440	504	2.900	1.200	2.757	2.720	Fig 1
85	4160	534	612	2.900	1.200	2.757	3.360	Fig 1
100	4160	629	721	2.900	1.200	2.757	3.360	Fig 1
120	4160	755	865	2.900	1.200	2.757	3.360	Fig 1
140	4160	881	1009	2.900	1.200	2.757	3.360	Fig 1
160	4160	1007	1153	2.900	1.200	2.757	3.800	Fig 1
180	4160	1132	1297	2.900	1.200	2.757	3.800	Fig 1
200	4160	1258	1441	2.900	1.200	2.757	3.800	Fig 1
220	4160	1384	1585	2.900	1.200	2.757	3.800	Fig 1

Motor efficiency: 0.97 / power factor 0.9



Frame general arrangement - figure 2

6000V								
A	V	kW	kVA	LENGTH (mm)	WIDTH [mm]	HEIGHT [mm]	WEIGHT [kg]	LAYOUT
40	6000	363	416	2.900	1.200	2.757	3.100	Fig 1
50	6000	454	520	2.900	1.200	2.757	3.100	Fig 1
60	6000	545	624	2.900	1.200	2.757	3.100	Fig 1
70	6000	635	727	2.900	1.200	2.757	3.100	Fig 1
85	6000	771	883	4.250	1.200	2.757	5.060	Fig 2
100	6000	907	1039	4.250	1.200	2.757	5.060	Fig 2
120	6000	1089	1247	4.250	1.200	2.757	5.060	Fig 2
140	6000	1270	1455	4.250	1.200	2.757	5.060	Fig 2
160	6000	1452	1663	4.250	1.200	2.757	5.500	Fig 2
180	6000	1633	1871	4.250	1.200	2.757	5.500	Fig 2
200	6000	1814	2078	4.250	1.200	2.757	5.500	Fig 2
220	6000	1996	2286	4.250	1.200	2.757	5.500	Fig 2

Motor efficiency: 0.97 / power factor 0.9

6600V								
A	V	kW	kVA	LENGTH (mm)	WIDTH [mm]	HEIGHT [mm]	WEIGHT [kg]	LAYOUT
40	6600	399	457	2.900	1.200	2.757	3.100	Fig 1
50	6600	499	572	2.900	1.200	2.757	3.100	Fig 1
60	6600	599	686	2.900	1.200	2.757	3.100	Fig 1
70	6600	698	800	2.900	1.200	2.757	3.100	Fig 1
85	6600	849	972	4.250	1.200	2.757	5.060	Fig 2
100	6600	998	1143	4.250	1.200	2.757	5.060	Fig 2
120	6600	1198	1372	4.250	1.200	2.757	5.060	Fig 2
140	6600	1397	1600	4.250	1.200	2.757	5.060	Fig 2
160	6600	1597	1829	4.250	1.200	2.757	5.500	Fig 2
180	6600	1797	2058	4.250	1.200	2.757	5.500	Fig 2
200	6600	1996	2286	4.250	1.200	2.757	5.500	Fig 2
220	6600	2196	2515	4.250	1.200	2.757	5.500	Fig 2

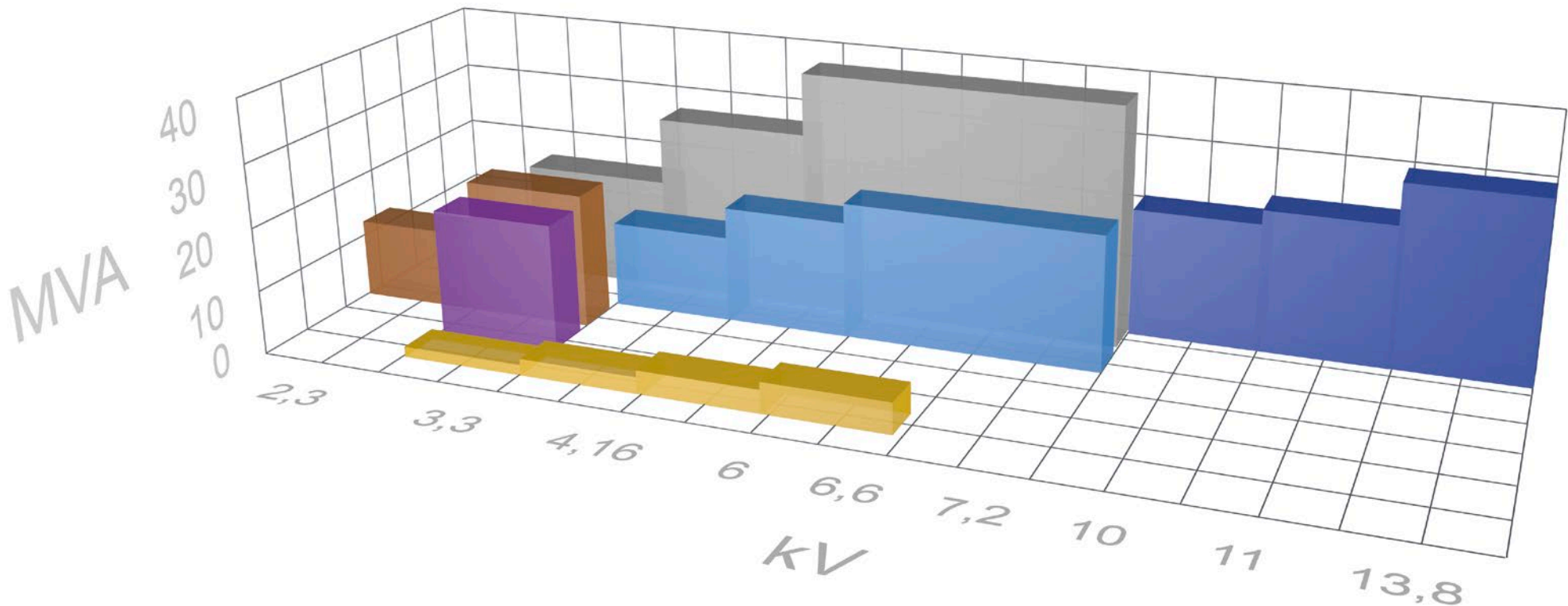
Motor efficiency: 0.97 / power factor 0.9



# MV PE Portfolio Products

Nidec Industrial Solutions has nearly fifty years of experience in designing and manufacturing inverters and power quality solutions. At Nidec, reliability is the foundation of our product design. Using proven IGBT/IGCT or traditional LCI technology our variable frequency drives are custom engineered to provide outstanding static and dynamic performance with a high level of efficiency across the driven equipment's entire operating range. Our Variable Frequency Drives' built-in WINDOWS® based diagnostic tools and streamlined modular design result in easy maintenance and repair. In addition, the flexibility of our modular design allows us to configure compact solutions granting you greater flexibility in terms of plant layout. Our remote diagnostics features can play an important role in your Maintenance and Operating strategies, contributing to a significant reduction in Life Cycle Costs for your equipment by making it possible for plant managers and technicians to monitor equipment performance from any position across the globe. This combination of technologies and background is the base of our expertise in engineering flexible, customized solutions for global industrial markets at competitive prices. Our modular and flexible solution is suitable for cabinet and container installation for a wide variety of applications.

The new SVFH series are AFE, high efficiency, direct-to-line connection (transformerless) VFDs with very low grid harmonics, 30% more compact and 60% less bulky when compared with VFDs with transformer, very simple to integrate in a system, easy and fast to commission, with 4 quadrants operation capability to enable regenerative breaking of the motor load, regeneration and power factor correction. The Silcovert N Series (TN , GN) is a high performance neutral point clamped voltage source drive for induction and synchronous motors. Both field oriented and V/Hz controls are available for different applications. Silcovert TH is a series of medium-voltage PWM Voltage Source Inverters for the most demanding applications where reliability and performance are fundamental requirements. Built around the most up-to-date IGBT technology, its multi-level structure makes it suitable for driving any motor at variable speed in the power range from 400 kVA to 100 MVA (4 containers/VFD in parallel), up to 13.8 kV. The Silcovert S is a load-commutated current source inverter (LCI) for synchronous motors and provides speed regulation, motoring and braking torque regulation, and programmable V/Hz profiles. It has a rugged, compact design and is highly efficient and reliable.



Silcovert TN

**Power range:**  
Air cooling 1300/10400 kVA  
Water cooling up to 21600 kVA

**Voltage:**  
Up to 3300 V

**Drive Topology:**  
Neutral Point Clamped (NPC)  
Active Front End (AFE)

**Output Frequency:**  
Normal 5 - 70 Hz  
Extended 5 - 140 Hz



Silcovert GN

**Power range:**  
Water cooling 9000 - 24000 kVA  
(higher power on request)

**Voltage:**  
Up to 3300V

**Drive Topology:**  
Neutral Point Clamped (NPC)  
Active Front End (AFE)

**Output Frequency:**  
Normal 10 - 65 Hz  
Extended 10 - 100 Hz



Silcovert FH

**Power range:**  
Air cooled up to 2.5 MVA

**Voltage:**  
Up to 6600V

**Drive Topology:**  
Multi-level  
Active Front End (AFE)

**Output Frequency:**  
Up to 75Hz



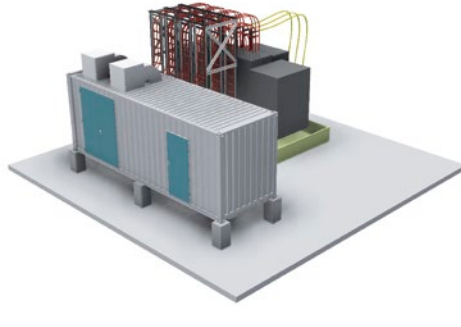
Silcovert TH-7000

**Power range:**  
Air cooling up to 9000 kVA  
Water cooling up to 21200 kVA

**Voltage:** 2400 to 7200 V

**Drive Topology:**  
Multi-level  
Diode Front End (DFE)

**Output Frequency:**  
Normal 250 Hz  
Extended 330 Hz with derating



Silcovert TH-14000

**Power range:**  
Air cooling: up to 7600 kVA  
(up to 14 MVA in parallel configuration)  
Water cooling: up to 30100 kVA  
(up to 100 MVA in parallel configuration)

**Voltage:** 6600 to 13800 V

**Drive Topology:**  
Multi-level  
Diode Front End (DFE)

**Output Frequency:**  
Normal 250 Hz  
Extended 330 Hz with derating



Silcovert S

**Power range:**  
Air cooling up to 20000 kVA  
Water cooling up to 75000 kVA

**Voltage:**  
Air cooling up to 6600 V  
Water cooling up to 10000 V

**Drive Topology:**  
LCI

**Output Frequency:**  
5 - 95 Hz



