Nidec
All for dreams

SILCOVERT-TH

SVTH 1K1 A60 30P

Medium Voltage Variable Frequency Converter (VFC)

Technical Data Sheet

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1. VARIABLE FREQUENCY CONVERTER GENERAL DESCRIPTION

The SILCOVERT-TH is a series of medium voltage, IGBT based, PWM controlled, multi-level voltage source inverter equipments for the variable frequency supply of induction motors.
The inverter size can be chosen in the range from 290kVA to 9.000kVA; its output current ranges from 70 A up to 720 A for the air cooled units. Depending on the output voltage 18, 24, 30 or 36 pulse diode front end (DFE) configurations are available for controlling the motor into 2 quadrants of operation. Its rated output voltage, which ranges from 2.400V to 7.200V, together with the scalar (V/Hz), sensorless or field oriented vector control are suitable for a wide range of applications.

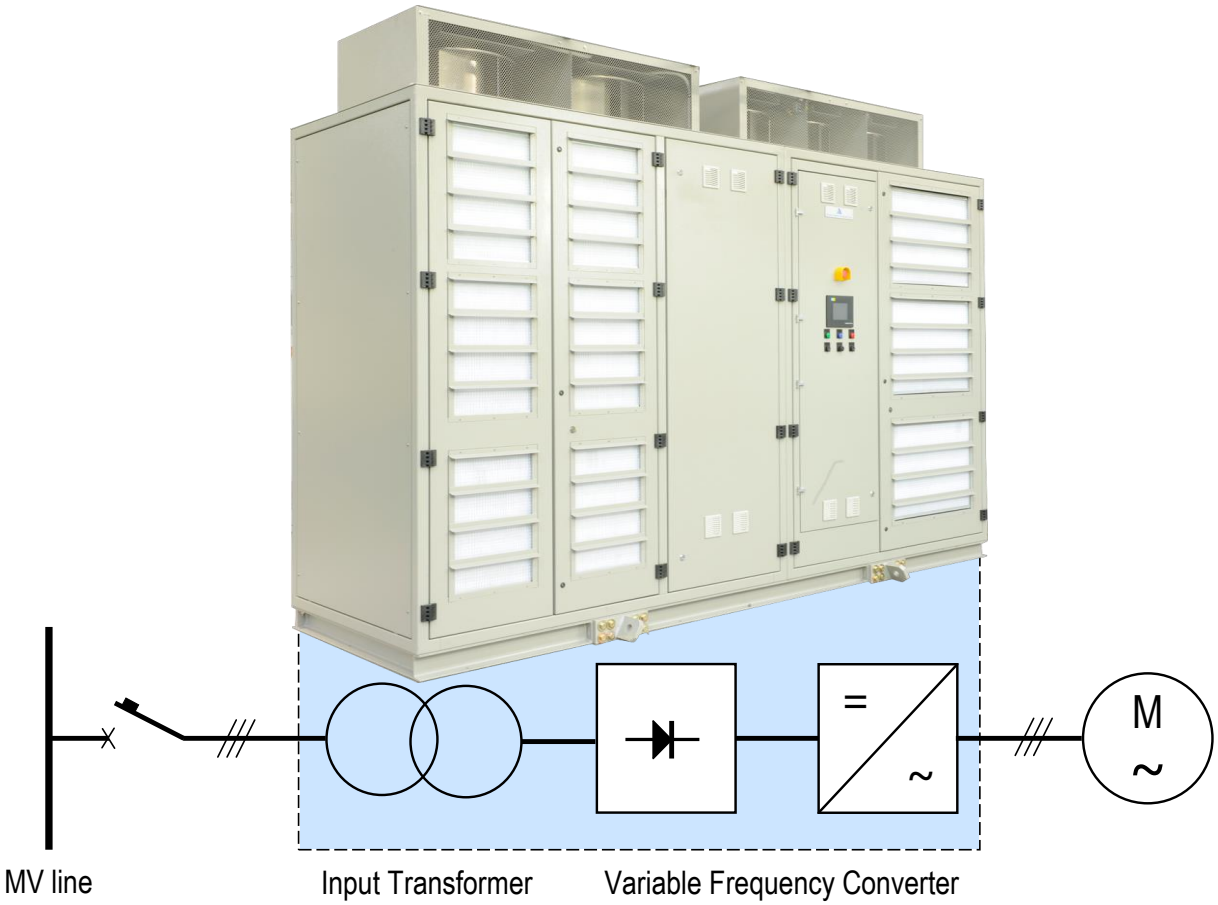

Figure 1: typical application with circuit breaker and induction motor

2. REFERENCES

The design of the VFC complies with the IEC EN applicable standards; the main reference rules are listed below.
Compliance with different standards and/or third party certifications are evaluated on request.

2.1 Reference standards

Step-down power transformer

IEC EN 61378-1		Converter transformer
	Part 1	Transformers for industrial applications
IEC EN 60076-_		Power transformers
IEC EN 61800-	Part 5	Safety requirements – Electrical, thermal and energy

Variable frequency converter

IEC EN 61800-_		Adjustable speed electric power drive system
	Part 3	EMC requirements and specific test methods
	Part 4	General requirements – Rating specifications for AC power drive systems above 1000 Vac and not exceeding 35 kV
	Part 5-1	Safety requirements – Electrical, thermal and energy
IEC EN 60146-1-_		Semiconductor converters General requirements and line commutated converters
	Part 1	Basic requirements
IEC EN 60204-_		Safety of machinery – Electrical equipment of machines
	Part 1	General requirements
	Part 11	Requirements for HV equipments for voltage above 1000 Vac and 1500 Vdc and not exceeding 36 kV
IEC EN 60529		Degree of protection provided by enclosures (IP code)

2.2 Incorporation rules

According to the EU Machinery Directive 2006/42/EC the PDS is not a complete machine and it shall be incorporated into a system before to be operated; Nidec ASI supply the “certificate of incorporation” as requested by the law. All the functional safety relating functions needed by the system shall be guaranteed by the System Integrator.

3. TECHNICAL DATA

TYPE			SVTH 1K1 A60 30P
description		unit	characteristic
ENVIRONMENTAL CONDITIONS	Installation		Indoor (1)
	Environment		Industrial, non-hazardous, safe area
	Ambient temperature (design range)	°C	+ 5 .. + 40
	Storage temperature range	° C	- 20 .. + 70
	Relative humidity (max.)	%	< 95 non condensing
	Altitude (max.)	m	1.000 a.s.l.
INPUT TRANSFORMER (in built)	Design / duty type		Converter transformer / continuous
	Rated power	kVA	1000 (preliminary)
	Primary rated voltage	kV	6,0 ± 10 %, 3ph
	Rated frequency	Hz	50 / 60 ± 2 %
	Secondary voltage	V	15 x 690
	Vector group		Suitable for 30 pulse reaction
	Winding material		Aluminium
	Tap changer / type	%	± 5 / off-load
	Insulation class / temperature class		H / F
	Cooling type		Forced air
VARIABLE FREQUENCY CONVERTER (VFC)	Rated / application output voltage	V	6.000
	Output frequency	Hz	0,5 .. 140
	Rated current: continuous / overload	A	105 / 100 (2)
	Overload capacity	%	110 for 60 sec, once every 10 min
	Driven motor type		induction
	Driven motor rated power	kW	Up to 700kW
	No. of pulses line side		30
	Inverter technology / control type		LV IGBT based / PWM
	Cooling type		Forced air
	Voltage dip (continuous operation)	%	-20
	Controller		Microprocessor based, full digital
	Control mode		V/Hz or sensorless vector control
	Operation mode		1 quadrant, no braking
	Low voltage auxiliary feeders	Vac	3ph+N for cooling fans [max 25 kA] 1ph+N for space heaters [max 10 kA] 1ph+N for logics & controller (3) [max 10 kA]
ELECTRIC CABINET (input transformer + VFC)	Overall dimensions (L x W x H)	mm	3.450 x 1.200 x 2.770
	Overall weight	kg	5.900 (preliminary)
	Protection degree / open door		IP 42, fan enclosures IP 21 / IP20
	Painting colour / cycle		RAL 7035 / ASI standard
	Cable inlet / outlet		Bottom / bottom
	Motor cable length (max.)		600
	Cooling air flow	m^3/h	13500 (preliminary)
	Noise level @ 1 m	dB(A)	≤ 80 (average, according to ISO 1680/1, §8.2)
	Accessibility		Front

	description	unit	characteristic
MAIN BUILT-IN PROTECTIONS	Input transformer over temperature		Provided
	Speed ≥ 105 % of max. value		Provided
	Speed ≤ 95 % of min. value for 10 sec		Provided
	Overload		Provided
	Over current		Provided
	DC-bus overvoltage		Provided
	DC-bus under voltage		Provided
	Over temperature of power modules		Provided
	Earth fault		Provided
	CPU fault		Provided
	Cooling fan fault		Provided
	External trip		Provided
MAIN I/O	Analog signals (4 .. 20 mA)		• In: reference speed • Out: motor current, voltage, power, speed
	Digital signals (potential free contacts)		• In: start permissive, motor start, motor stop, external trip • Out: ready, run, stop, warning, trip
OTHER FEATURES	Main embedded functions (4)		PID regulator, torque control and limitations, digital potentiometer, shaped ramp, auto restart, flying restart, ride through (kinetic recovery), diagnostics
	Cooling fan redundancy "N 1" type		Included
	VFC anti-condensation heaters		Included
	Internal service lights and socket		Included
	Key interlock system		Included
	Door mounted operator interface HMI		Included
	Local indication included on HMI		motor power and current, motor speed reference and feedback
	Local and remote control capability		Included
	Profibus Slave (5) communication		Included
	Routine factory tests		Included, according to product std. QCP
	Special and type tests		Not supplied
	Documentation package (6)		Included, in Italian / English (7)

Note (1): pollution degree 2 or better, according to EN 61800-5-1
Note (2): this rating will be reduced because the input transformer rating is based on the motor size
Note (3): from UPS feeder; if not available from plant, Nidec ASI can include a small UPS unit as option, or a regular single phase feeder can be used
Note (4): ride through function requires the UPS feeder
Note (5): different industrial standard protocols available as option on request
Note (6): documentation package according to the IEC standard, composed of electrical diagram, terminal boards diagram, use and maintenance manual.
Document revisions included are "first issue", "as built" and "after commissioning"
Note (7): different languages available as option

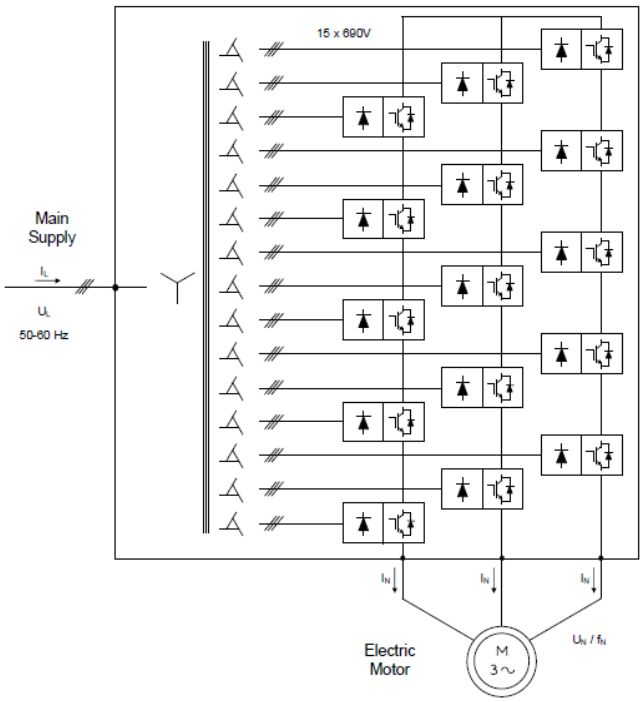

Figure 2: typical block diagram for 30-pulse line side converter

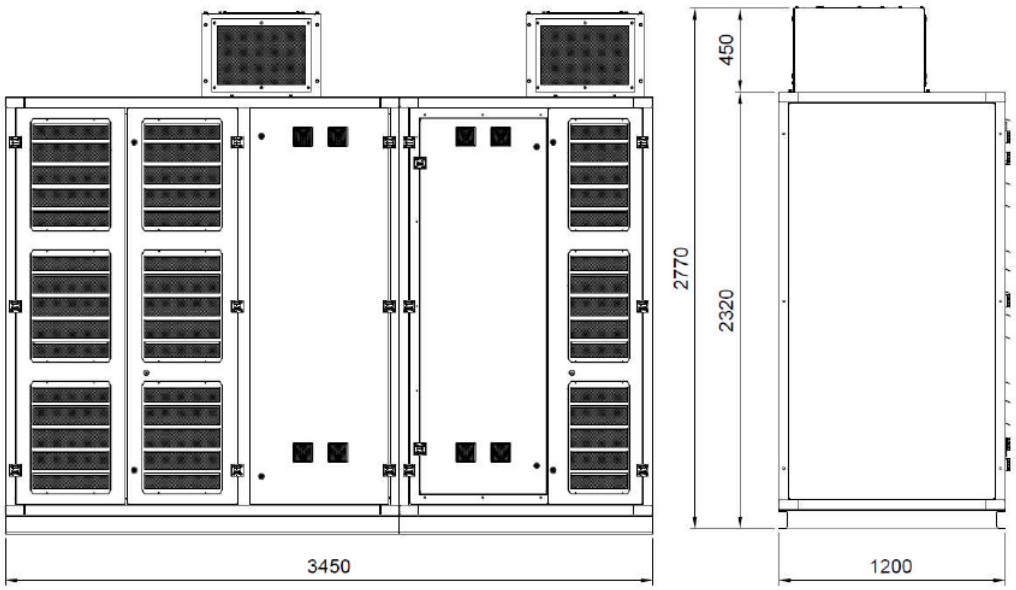

Figure 3: SVTH 1K1 A60 30P overall dimensions

Auxiliary Supply	Characteristics
Cooling Unit Supply	3 ph - 380 ÷ 480V - 50/60Hz
Internal Service Supply	1 ph - 120 ÷ 230V - 50/60Hz
Control Supply	1 ph - 120 ÷ 230V - 50/60Hz – UPS

Input from DCS	Characteristics
Drive ON/OFF	Digital Input
Start / Stop	Digital Input
Driven Equipment Enable	Digital Input
Automatic / Manual	Digital Input
Up reference	Digital Input
Down reference	Digital Input
Electrical Emergency	Digital Input
Emercency Shutdown	Digital Input
Selection Ramp Inp 1	Digital Input
Selection Ramp Inp 2	Digital Input
Select Fix Speed Inp 1	Digital Input
Select Fix Speed Inp 2	Digital Input
Forward	Digital Input
Reverse	Digital Input
Reset	Digital Input
Motor Speed Reference	Analog input – 4÷20mA
Motor Torque Reference	Analog input – 4÷20mA

Input from Medium Voltage Circuit Breaker	
MV Breaker Closed	Digital Input
MV Breaker Open	Digital Input
MV Breaker Ready	Digital Input
MV Breaker Trip	Digital Input

Output to DCS	Characteristics
VSD Ready to AUX ON	Digital Output
VSD Ready to Power ON	Digital Output
VSD Ready to Start Motor	Digital Output
Motor Running	Digital Output
General Alarm	Digital Output
General Trip	Digital Output
VSD in Remote Mode	Digital Output
I/O Error	Digital Output
Motor Current Feedback	Analog Output - 4÷20mA
Motor Speed Feedback	Analog Output - 4÷20mA
Motor Power Feedback	Analog Output - 4÷20mA
Motor Torque Feedback	Analog Output - 4÷20mA
Motor Voltage Feedback	Analog Output - 4÷20mA

Output to Medium Voltage Circuit Breaker	
Closing MV Breaker En	Digital Output
MV Breaker Closing Command	Digital Output
MV Breaker Opening Command (shunt coil)	Digital Output
MV Breaker Opening Command (undervoltage coil)	Digital Output

Figure 4: Field I/O interface – BASE configuration