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SINUS PENTA

Drive for AC three-phase induction
and PM-synchronous motors

SINUS PENTA 0162 4T BA2K2 Model

(picture is for illustration purposes only)

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SINUS PENTA – Product Line Description

The inverters of the **SINUS PENTA** series manufactured in Italy by Elettronica Santerno SpA allow adjusting speed and torque values of three-phase asynchronous and synchronous motors by way of several control modes. Control modes may be user-defined and allow obtaining the best performance in terms of fine-tuning and energy saving for any industrial application.

Highlights

- Easy commissioning with preset parameters for the most common applications
- Wide range of STANDARD I/O
- Most encoder input directly to control board
- Open loop speed precision: ±0.5% of max. speed. Closed loop (with an encoder) speed precision: < 0.01% of max. speed
- Intelligent cooling system. Through-Hole mounting, segregation of forced air flow channels
- Programmable logic blocks
- Automatic calibration for motor parameters tuning
- Programmable multiple acceleration and deceleration ramps. Programmable S ramps.
- Automatic DC braking
- Motor PTC thermal probe control. Integrated motor thermal protection
- In case of power failure, total control of the motor, down to 0 RPM
- Master-slave function for the operation of several motors connected to the same drive shaft (VTC and FOC)
- PID Function / Second PID Function / 2-zone PID
- Skip frequency
- Integrated digital potentiometer. Integrated multifunctional tester
- Fire Mode function available
- Trip Log
- Regulation of output frequency from 0 to 599Hz depending on the models (up to 1000Hz on request)
- Lower motor noise with random modulation and carrier frequency up to 16kHz (depending on models)
- Safe Torque Off certificate function, level SIL 3 PL "d". By using this function, short-time operations and/or maintenance work on non-electrical parts of the machinery can be performed without switching off the power supply to the drive.
- Global standard compliance [(1)]: CE, UL, RCM, EAC
- Thorough manufacture with first class materials, fully Made in Italy

NOTE
[(1)] Depending on the model and the degree of protection of the product

SINUS PENTA - One product, 5 integrated motor control modes:

- **IFD** (Inverter Frequency Drive): vector modulation function for general-purpose applications (V/F pattern).
- **VTC** (Vector Torque Control): sensorless vector function for high-torque demanding applications.
- **FOC** (Field Oriented Control): vector function with encoder for high torque precision and wide speed range control mode.
- **SYN**(2) (Synchronous): vector function with encoder for brushless synchronous motors with permanent magnets, high torque precision joined to high energy efficiency level.
- **RGN**(2) (Regenerative): sinusoidal power factor cosfi =1, AC/DC feeder function for direct supply of a series of drives.

Models Configuration

The following model configurations are available on **SINUS PENTA** inverters (more than one configuration is allowed). The required final configuration must be specified when ordering the equipment.

Braking Module

From size S05 to size S32, **SINUS PENTA** inverters can be supplied with a built-in braking module. An external braking unit is available for size greater than S32.

EMC Input Filters

The inverters of the **SINUS PENTA** series may be delivered with input filters in compliance with EN61800-3 2nd ed; in that case, models are marked with A1, A2, B in the ID number. If built-in filters are fitted, disturbance amplitude ranges between allowable emission limits.

IP54 Protection Degree

IP54 frame configuration is available from size S05 to size S32.

Emergency Push Button

IP54 model can be also supplied with Front key-operated selector switch for LOCAL/REMOTE control and EMERGENCY pushbutton.

NOTE
(2) Functions available by re-programming the firmware, this can be done by the user as well

SINUS PENTA 0162 4T BA2K2 - Main technical features

Main Features	
Model [3]	SINUS PENTA 0162 4T BA2K2
Size	S30
Integrated braking module	Yes
Integrated EMC filter	Yes A2 type - EN 61800-3 issue 2 SECOND ENVIRONMENT Category C3, EN55011 gr.2 cl. A for industrial users
Degree of protection	IP20
Operating temperature range	-10 ÷ 55°C
Max. operating temperature without derating [4]	Light Application 40 °C Standard Application 40 °C Heavy Application 50° C Strong Application 50 °C
Storage temperature range	-25 ÷ 70 °C
Max. operating altitude [5]	2000 m a.s.l.
Input Ratings	
Input frequency	50/60 Hz (±20%)
DC power supply voltage range	530..705 Vdc (-15%, +10%)
AC power supply voltage range	380..500 Vac (-15%, +10%)
Maximum voltage imbalance	±3%
Output Ratings (AC)	
Continuous rated current	240 A
Maximum current (for 120 seconds every 20 min)	290 A
Peak current (deliverable current for max. 3 seconds)	324 A
Maximum output frequency	500Hz

NOTE

[3] External inductors are not mandatory

[4] Apply 2% derating of the rated current for every degree over the max. operating temperature but not exceeding 55°C

[5] Up to 1000m without derating, apply derating of the rated current by 1% every 100m up to 2000m. Above 2000m up to 4000m only on request.

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For more information, please refer to the Sinus Penta's Installation Instructions Manual – www.santerno.com

SINUS PENTA 0162 4T BA2K2 – General features	
Dimensions and Weight	
Inverter dimensions (WxHxD)	302x748x421 mm
Inverter weight	51 kg
Additional Information	
Short circuit current (according to UL508C, with external fuses)	18 kA
Dissipated power at rated current	2700 W
Noise emission	< 66 db(A)
Display	Removable alphanumerical display/keypad with saved operating parameters
Maximum value for relative humidity	95% non-condensing
Cooling system	Forced air-cooling
Vibrations	IEC 61800-5-1, DNV 2.4
Communication	RS485 with Modbus RTU protocol up to 38400 Baud
Analog Signals	
Analog inputs	n. 3 inputs to be configured as voltage/current inputs
Analog outputs	n. 3 configurable analog outputs (–10÷10Vdc, 0÷10Vdc, 0(4)÷20mA)
Digital Signals	
Digital inputs	n. 7 configurable digital inputs n. 2 preset inputs for the STO function
Digital outputs	n. 4 configurable digital outputs
Protections	
Built-in protections	▪ Inverter thermal protection ▪ Motor thermal protection ▪ Mains failure ▪ Overvoltage and undervoltage ▪ Overcurrent at constant speed or ground failure ▪ Overcurrent while accelera tinga and decelerating ▪ Overcurrent during speed search (IFD and VTC only) ▪ Auxiliary trip from digital input ▪ Serial communication failure ▪ Control board failure ▪ Precharge circuit failure ▪ Inverter overload conditions for long duration ▪ Unconnected motor ▪ Encoder (if any) failure ▪ Overspeed

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Model Selection

The inverters of the **SINUS PENTA** serie are dimensioned based on the application allowable current and overload.

The **SINUS PENTA** series is characterized by 3 current values:

- Rated current (Inom) is the continuous current that can be delivered
- Maximum current (Imax) is the max. current that can be delivered under overload conditions for a time period of 120s every 20 min or for a time period of 60s every 10 min based on the different inverter models.
- Peak current (Ipeak) is the maximum current that can be delivered under overload conditions for a time period of 3s.

Each inverter model may be connected to different motor power sizes depending on load performance. Four types of torque/current overloads are available:

Application	Overload up to		
	(60s/120s)	(3s)	
LIGHT	120%	144%	Light loads with constant/quadratic torque (pumps, fans, etc.);
STANDARD	140%	168%	Standard loads with constant torque (conveyors, mixers, extruders, etc.);
HEAVY	175%	210%	Heavy loads with constant torque (lifts, presses, bridge cranes, mills, etc.);
STRONG	200%	240%	Very heavy loads with constant torque (spindles, axis control, etc.).

SINUS PENTA 0162 4T BA2K2

Applicable motor power according to overload application [6]

	380-415Vac			440-460Vac			480-500Vac		
	kW	HP	A	kW	HP	A	kW	HP	A
LIGHT Application	132	180	228	150	200	230	175	238	240
STANDARD Application	132	180	228	150	200	230	160	220	218
HEAVY Application	110	150	191	132	180	198	140	190	191
STRONG Application	90	125	159	110	150	166	110	150	153

NOTE

[6] Only for reference. Data contained in the tables relate to standard 4-pole IE2 motors.

Main options

The following options are available on **SINUS PENTA** inverters:

Keypad Remoting Kits

The inverter keypad may be remoted. A special kit is supplied, which includes the material needed to installing the keypad on the front door or on the wall of a cabinet.

Input three – phase Inductors

Three-phase inductor can be installed on the supply line to obtain the following benefits:

- limit input current peaks on the input circuit of the inverter and value di/dt
- reducing supply harmonic current
- increasing power factor and the duration of line capacitors inside the inverter

Input DC Inductors

The DC inductance can be connected to all inverter models for reducing the THD. For sizes S15, S20, S30 and modular sizes S65 up S90 the DC inductance must be specified when ordering the equipment. DC inductance for other sizes can be ordering also later.

Output Inductors (DU/DT Filters)

Using du/dt filters is always recommended when the motor cable length is over 100m. The output inductor is always required when using parallel-connected inverters. When using parallel-connected motors, always consider the total length of the cables being used.

Sinusoidal Filter

The sinusoidal filter can be installed between the inverter and the motor to enhance the equipment performance: reduces the voltage peak in the motor terminals, motor losses, motor noise, the probability of EMC disturbance. Moreover allows controlling transformers and also the inverter can be used as a voltage generator at constant voltage and constant frequency.

Resistive Braking

When a large braking torque is required or the load connected to the motor is pulled, the power regenerated by the motor is to be dissipated. This can be obtained by dissipating energy to braking resistors (in that case a Braking Module is required). The braking resistor is to be connected outside the inverter.

Heatsink Segregation kit (THROUGH-PANEL ASSEMBLY)

This kit allows segregating the air flow cooling the power section in order to avoid dissipating power related to inverter loss inside the inverter case. The inverters available for through-panel assembly are from size S05 to S52, both IP20 and IP00. As a result, unless other features are included, the IP44 rating for the cabinet becomes IP40.

Output Toroid Filters

Ferrite is a simple radiofrequency filter. Ferrite cores are high-permeable ferromagnetic materials used to weaken cable disturbance.

Custom Cabinet

Santerno offers a custom solution in box or cabinet that can integrate all the required options.

Optional Boards

Board	Function	Slot [7]
ES836/2	Encoder Board - for incremental, bidirectional encoder to be used as a speed feedback. It allows the acquisition of encoders with power supply ranging from 5 to 15VDC with complementary outputs	A
ES860	SIN/COS Encoder Board - allows interfacing encoders provided with 1Volt peak-to-peak analog outputs. Those encoders may be used to provide speed feedback and/or position feedback	A
ES913	Line Driver Encoder Board - for incremental, bidirectional encoder to be used as a speed feedback. It allows the acquisition of encoders with power supply ranging from 5 to 24VDC with line driver outputs	A
ES822	Isolated Serial Board RS232/485 - allows connecting a computer through RS232 interface or allows a multidrop connection of Modbus devices through RS485 interface. It provides galvanic isolation	B
ES851	Multifunction communications board: RS232/485, Ethernet, PSTN/GSM/GPRS modem with data logger and WEB server.	B
ES851 RTC	The Real Time Clock ES851 RTC board is provided with a clock indicating date and time that is functioning even when the inverter is not powered	B
ES919	This communications boards allow Metasys N2- and BACnet-based systems	B
Anybus-S	PROFIdrive / CANopen	B
B40 [8]	ProfibusDP – CC-Link - DeviceNet – Modbus/TCP - Ethernet/IP –Profinet/IRT – EtherCAT - PowerLink	B
ES847	Analog/digital I/O expansion Board	C
ES861	Encoder/resolver with repeated encoder	C
ES870	Relay I/O Expansion Board	C
ES950	BiSS/EnDat Encoder Board - allows connecting absolute encoders with digital serial interface	C
ES966	Hiperface encoder - enables interfacing absolute encoders with digital serial outputs based on Hiperface protocol	C
ES988	I/O Expansion board 120/240Vac - allows incrementing voltage range	C

NOTE
[7] Only one board on each slot type is admitted.
[8] Please contact Elettronica Santerno to check the availability of the communication protocols CC-Link, PowerLink, EtherCAT and Ethernet/IP.