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SINUS K LIFT

FULL DIGITAL INVERTER

ADDENDUM TO THE OPERATION MANUAL

-Installation and Programming Instructions-

Upd. 01/08/06
R03_AD01

English

• This manual is integrant and essential to the product. Carefully read the instructions contained herein as they provide important hints for use and maintenance safety.
• This device is to be used only for the purposes it has been designed to. Other uses should be considered improper and dangerous. The manufacturer is not responsible for possible damages caused by improper, erroneous and irrational uses.
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• Any changes to the structure or operating cycle of the device must be performed or authorized by the Engineering Department of Elettronica Santerno.
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0.1. CHAPTERS

0.2. FIGURES

1. GENERAL INFORMATION

This Addendum updates the standard manual covering Installation Instructions for Sinus K inverters. If whole sections are updated, they will appear with the same paragraph number appearing in the standard Installation Instructions manual.

4.5. ENCODER BOARD ES836/2 (SLOT A)

Board for incremental, bidirectional encoder to be used as a speed feedback for inverters of the SINUS series. It allows the acquisition of encoders with power supply ranging from 5 to 15VDC (adjustable output voltage) with complementary outputs (line driver, push-pull, TTL outputs). It can also be connected to 24DC encoders with both complementary and single-ended push-pull or PNP/NPN outputs.
The encoder board is to be installed into SLOT A. See section Installing Encoder Board ES836/2 (SLOT A)

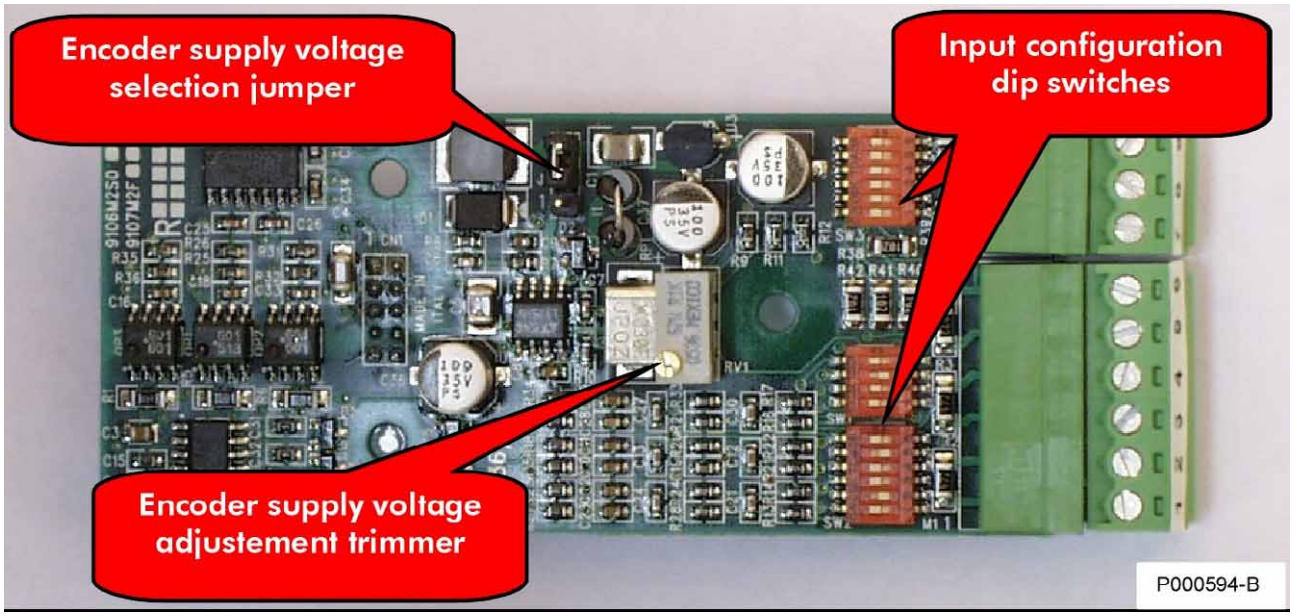

Figure 1: Picture of the encoder board ES836/2

DESCRIPTION	ID NUMBER	COMPATIBLE ENCODERS	
		POWER SUPPLY	OUTPUT
Encoder board ES836/2	ZZ0095834	5VDC to 15VDC, 24VDC	Complementary LINE DRIVER, NPN, PNP, PUSH-PULL outputs and single-ended NPN, PNP, PUSH-PULL outputs

4.5.1. ENVIRONMENTAL REQUIREMENTS

Operating temperature:	0 to +50 °C ambient temperature (contact Elettronica Santerno for higher ambient temperatures)
Relative humidity:	5 to 95% (non-condensing)
Max. operating altitude	4000 m (a.s.l.)

4.5.2. ELECTRIC SPECIFICATIONS

Electric Specifications	*Ratings*			
	Min.	*Type*	*Max.*	*Unit*
Encoder supply current, + 24 V, protected with resettable fuse			200	mA
Electronically protected encoder supply current, +12V			350	mA
Electronically protected encoder supply current, +5V			900	mA
Adjustment range for encoder supply voltage (5V mode)	4.4	5.0	7.3	V
Adjustment range for encoder supply voltage (12V mode)	10.3	12.0	17.3	V
Input channels	Three channels: A, B, and zero notch Z			
Type of input signals	Complementary or single-ended			
Voltage range for encoder input signals	4		24	V
Pulse max. frequency with noise filter "on"	77kHz (1024ipls @ 4500rpm)			
Pulse max. frequency with noise filter "off"	155kHz (1024pls @ 9000rpm)			
Input impedance in NPN or PNP mode (external pull-up or pull-down resistors required)		15k		Ω
Input impedance in push-pull or PNP and NPN mode when internal load resistors (at max. frequency) are connected		3600		Ω
Input impedance in line-driver mode or complementary push-pull signals with internal load resistors activated via SW3 (at max. frequency)		780		Ω

ISOLATION:

The encoder supply line and inputs are galvanically isolated from the inverter control board grounding for a 500 VAC test voltage for 1 minute. Encoder supply grounding is in common with control board digital inputs available in the terminal board.

4.5.3. INSTALLING ENCODER BOARD ES836/2 (SLOT A) ON THE INVERTER

1) Remove voltage from the inverter and wait at least 5 minutes.
2) Remove the cover allowing to gain access to the inverter control terminals. The fixing spacers and the signal connector are located on the left.

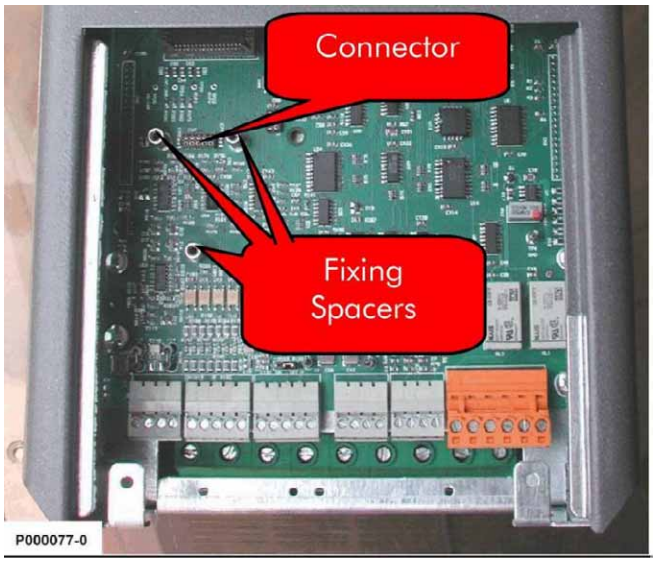

Figure 2: Position of slot A for the installation of the encoder board

3) Fit the encoder board and make sure that all contacts enter the relevant housing in the signal connector. Fasten the encoder board to the fixing spacers using the screws supplied.
4) Configure the Dip-switches and the jumper located on the encoder board based on the connected encoder. Check that the supply voltage delivered to the terminal output is correct.
5) Power on the inverter and set up parameters relating to the encoder feedback (see Sinus K's Programming Manual).

Figure 3: Encoder board fastened to its slot

4.5.4. TERMINALS IN ENCODER BOARD

A 9-pole terminal board is located on the front side of the encoder board for the connection to the encoder.

Terminal board, pitch 3.81 mm in two separate extractable sections (6-pole and 3-pole sections)		
Terminal	Signal	Type and Features
1	CHA	Encoder input channel A true polarity
2	$\overline{\text{CHA}}$	Encoder input channel A inverse polarity
3	CHB	Encoder input channel B true polarity
4	$\overline{\text{CHB}}$	Encoder input channel B inverse polarity
5	CHZ	Encoder input channel Z (zero notch) true polarity
6	$\overline{\text{CHZ}}$	Encoder input channel Z (zero notch) inverse polarity
7	+VE	Encoder supply output 5V...15V or 24V
8	GNDE	Encoder supply ground
9	GNDE	Encoder supply ground

For the encoder connection to the encoder board, see wiring diagrams on the following pages.

4.5.5. CONFIGURATION DIP-SWITCHES

Encoder board ES836/2 is provided with two dip-switch banks to be set up depending on the type of connected encoder. Dip-switches are located in the front left corner of encoder board ES836/2 and are adjusted as shown in the figure below.

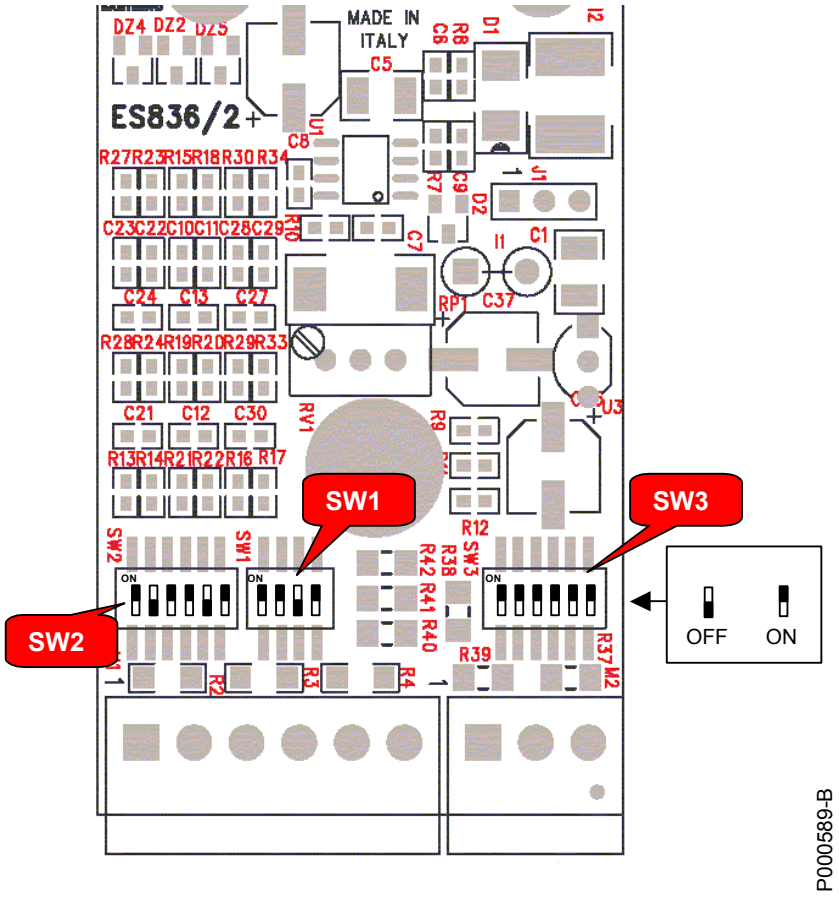

Figure 4: Positions of dip-switches and their factory-setting

Dip-switch functionality and factory-settings are detailed in the table below.

Switch (factory-setting)	*OFF - open*	*ON - closed*
SW2.1 (on)	Channel B, type NPN or PNP	Channel B, type Line driver or Push-Pull
SW2.2 (off)	Channel B with complementary signals	Channel B with only one single-ended signal
SW2.3 (on)	Channel B with no band limit	Channel B with band limit
SW2.4 (on)	Channel Z, type NPN or PNP	Channel Z, type Line driver or Push-Pull
SW2.5 (off)	Channel Z with complementary signals	Channel Z with only one single-ended signal
SW2.6 (on)	Channel Z with no band limit	Channel Z with band limit
SW1.1 (on)	12V Supply voltage (J1 in pos. 2-3)	5V Supply Voltage (J1 in pos. 2-3)
SW1.2 (on)	Channel A, type NPN or PNP	Channel A, type Line driver or Push-Pull
SW1.3 (off)	Channel A with complementary signals	Channel A with only one single-ended signal
SW1.4 (on)	Channel A with no band limit	Channel A with band limit
SW3.1 (on)	Load resistors disabled	Load resistors towards ground enabled for all encoder signals (required for 5V Line driver or Push-pull encoders, especially if long cables are used).
SW3.2 (on)		
SW3.3 (on)		
SW3.4 (on)		
SW3.5 (on)		
SW3.6 (on)		

CAUTION

Put SW3 contacts to ON only if a complementary Push-pull or Line driver encoder is used (power supply: 5V or 12V). Otherwise, put contacts to OFF.

NOTE

Put ALL contacts in dip-switch SW3 to ON or OFF. Different configurations may cause the malfunctioning of the encoder board.

4.5.6. JUMPER SELECTING THE TYPE OF THE ENCODER SUPPLY

Two-position jumper J1 installed on encoder board ES836/2 allows to set the encoder supply voltage. It is factory-set to pos. 2-3. Set jumper J1 to position 1-2 to select non-tuned, 24V encoder supply voltage. Set jumper J1 to position 2-3 to select tuned, 5/12V encoder supply voltage. Supply values of 5V or 12V are to be set through dip-switch SW1.1 (see table above).

4.5.7. TUNING TRIMMER

Trimmer RV1 installed on board ES836/2 allows to adjust the encoder supply voltage. This can compensate voltage drops in case of long distance between the encoder and the encoder board, or allows to feed an encoder with intermediate voltage values if compared to factory-set values.

Tuning procedure:

1. Put a tester on the encoder supply connector (encoder side of the connecting cable); make sure that the encoder is powered.
2. Rotate the trimmer clockwise to increase supply voltage. Trimmer is factory set to deliver 5V and 12V (depending on the dip-switch selection) to the power supply termination lugs. For a power supply of 5V, supply may range from 4.4V to 7.3V; for a power supply of 12V, supply may range from 10.3V to 17.3V.

NOTE

Output voltage cannot be adjusted by trimmer RV1 (jumper J1 in pos. 1-2) for 24V power supply.

CAUTION

Power supply values exceeding the encoder ratings may damage the encoder. Always use a tester to check voltage delivered from board ES836 before wiring.

CAUTION

Do not use the encoder supply output to power other devices. Failure to do so would increase the hazard of control interference and short-circuits with possible uncontrolled motor operation due to the lack of feedback.

CAUTION

The encoder supply output is isolated from the common terminal of the analog signals incoming to the terminals of the control board (CMA). Do not link the two common terminals together.

4.5.8. ENCODER WIRING AND CONFIGURATION

The figures below show how to connect and configure the dip-switches for the most popular encoder types.

CAUTION

A wrong encoder-board connection may damage both the encoder and the board.

NOTE

In all the figures below, dip-switches SW1.4, SW2.3, SW2.6 are set to ON, i.e. 77 kHz band limit is on. If a connected encoder requires a higher output frequency, set dip-switches to OFF.

NOTE

The max. length of the encoder wire depends on the encoder outputs, not on encoder board ES836. See the encoder ratings.

NOTE

Dip-Switch SW1.1 is not shown in the figures below because its setting depends on the supply voltage required by the encoder. Refer to the dip-switch setting table to set SW1.1.

NOTE

Zero notch connection is optional and is required only for particular software applications. However, for those applications that do not require any zero notch, its connection does not affect the inverter operation. See SINUS K's Programming Manual for details.

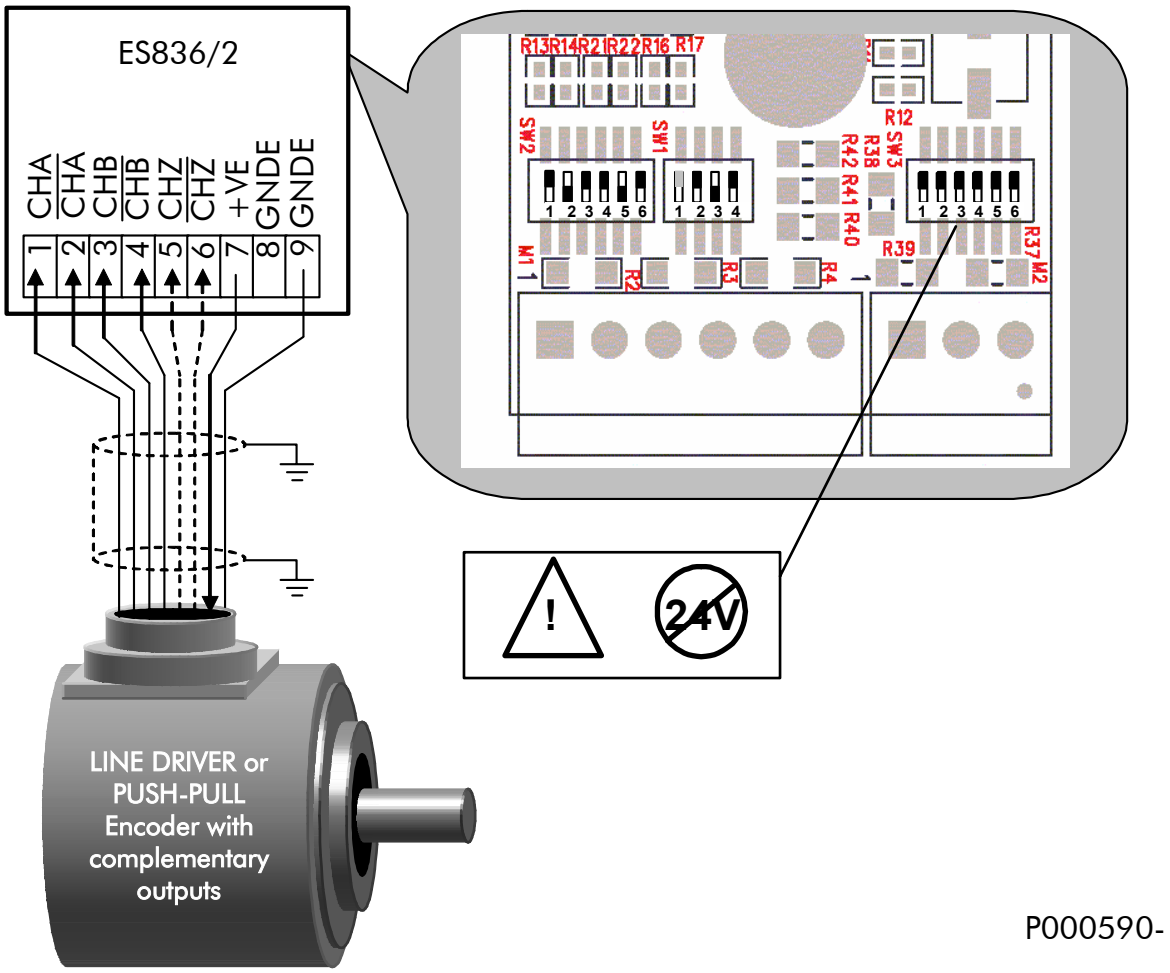

Figure 5: LINE DRIVER or PUSH-PULL encoder with complementary outputs

CAUTION Put SW3 contacts to ON only if a complementary Push-pull or Line driver encoder is used (power supply: 5V or 12V). If a 24V push-pull encoder is used, put contacts to OFF.

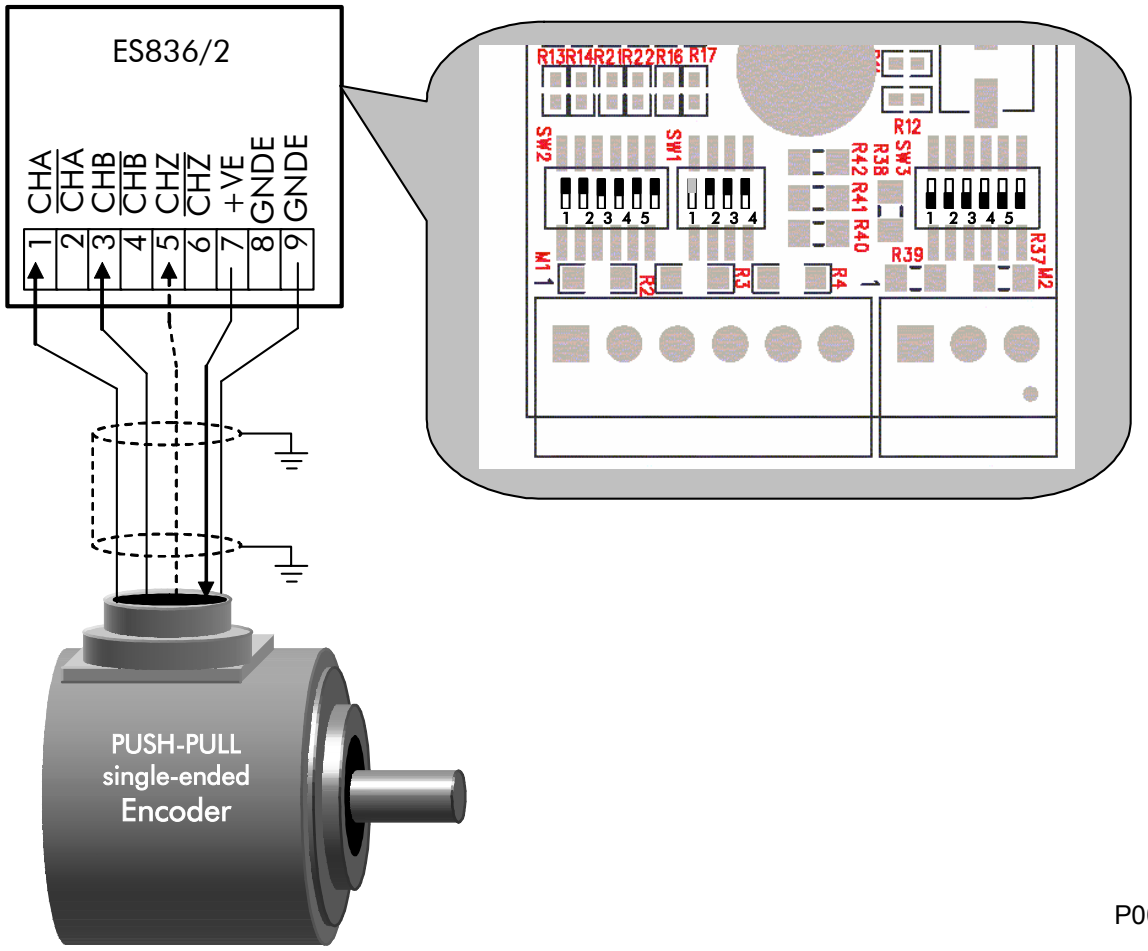

Figure 6: PUSH-PULL encoder with single-ended outputs

CAUTION

Because settings required for a single-ended encoder deliver a reference voltage to terminals 2, 4, 6, the latter are not to be connected. Failures will occur if terminals 2, 4, 6 are connected to encoder conductors or to other conductors.

NOTE

Only push-pull, single-ended encoders may be used, with an output voltage equal to the supply voltage. Only differential encoders may be connected if their output voltage is lower than the supply voltage.

NOTE

Some manufacturers use the acronym HTL for push-pull outputs with a power supply ranging from 18Vdc to 30Vdc. For the acquisition of this type of encoder, the same configuration used for push-pull inverters shall be used for the encoder board.

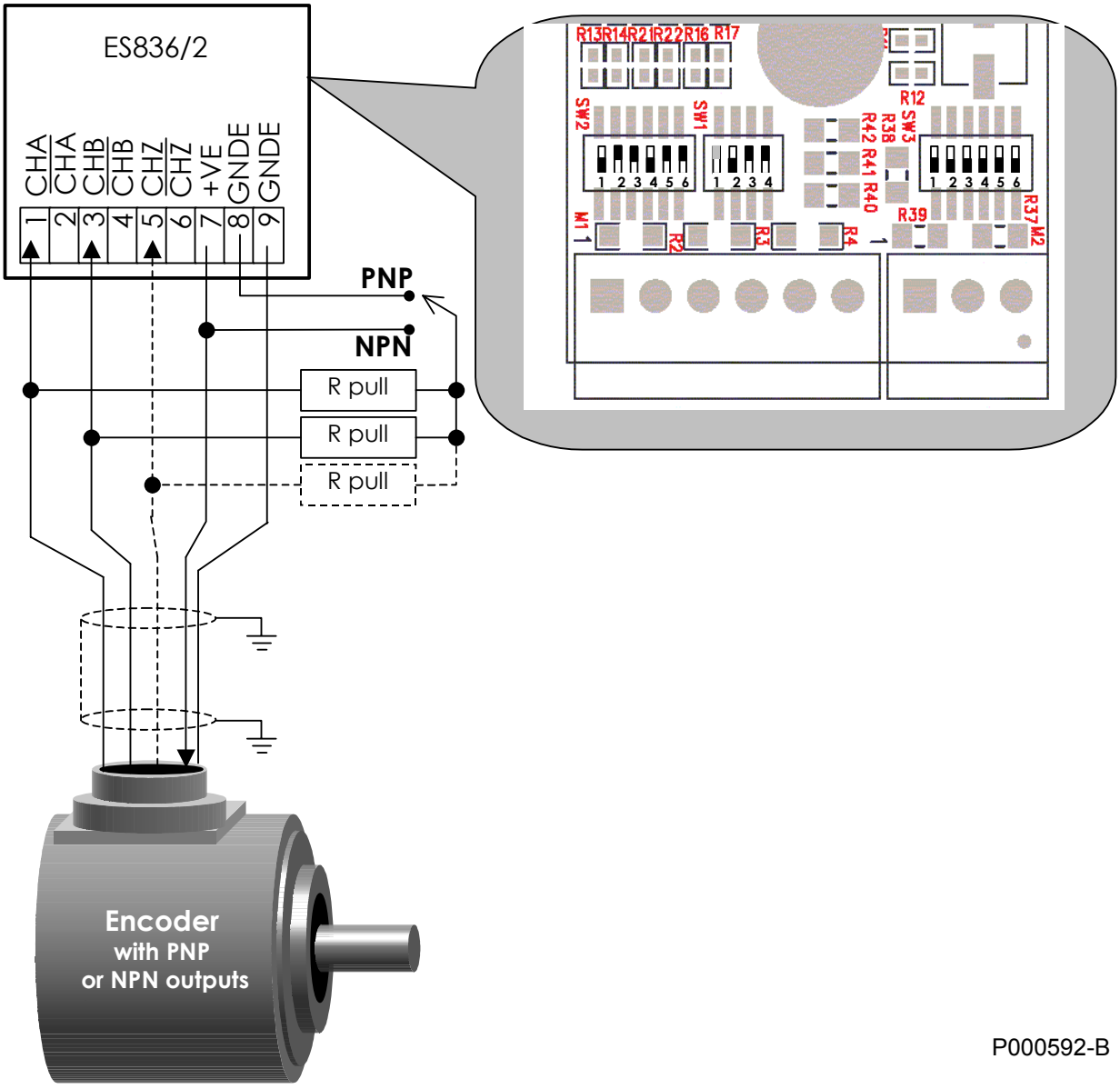

Figure 7: PNP or NPN encoder with single-ended outputs and load resistors with external wiring

NOTE

NPN or PNP encoder outputs require a pull-up or pull-down resistive load to the supply or to the common. As load resistor ratings are defined by the manufacturer of the encoder, external wiring is required, as shown in the figure above. Connect the resistor common to the supply line for NPN encoders supply or to the common for PNP encoders.

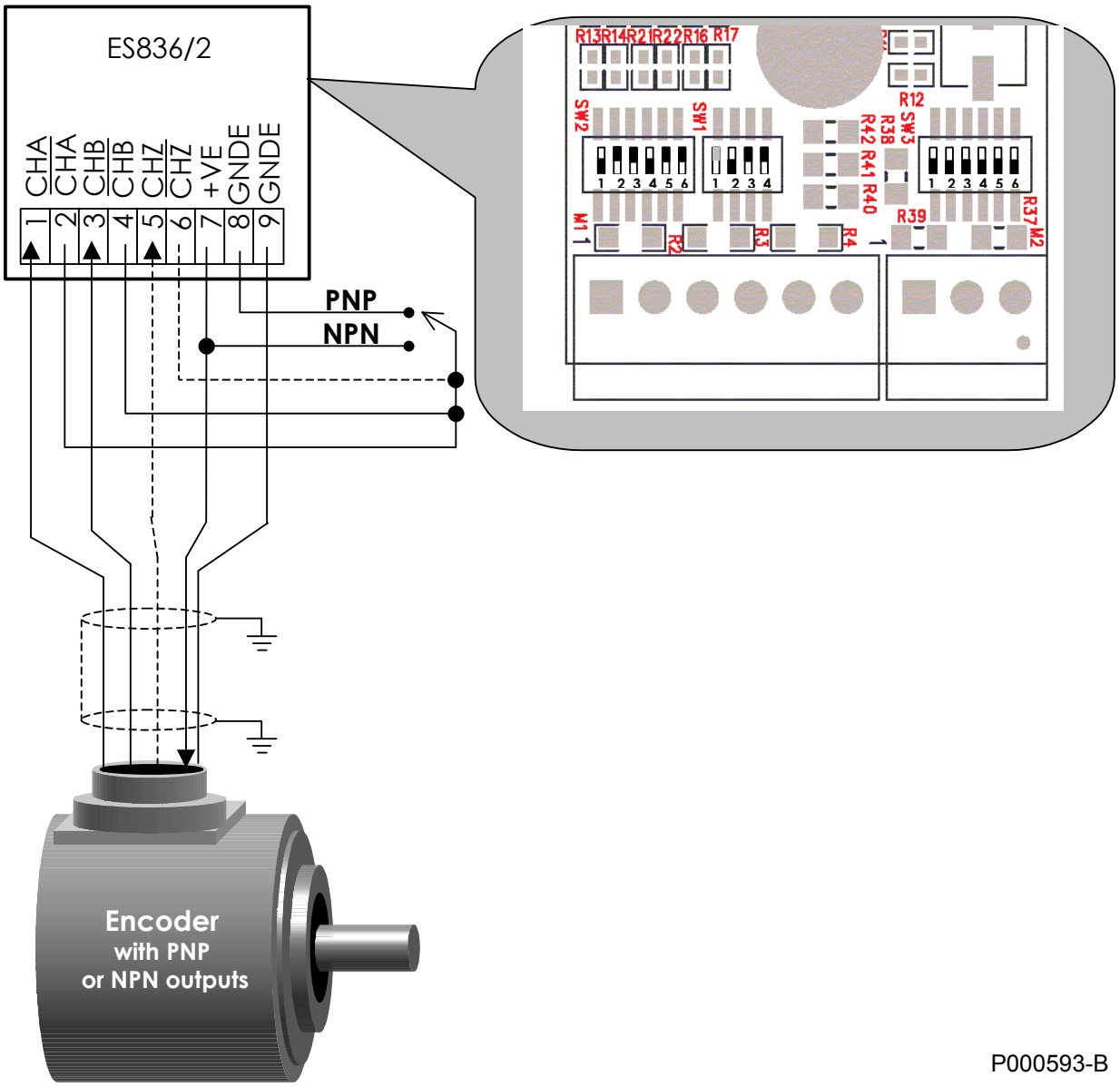

Figure 8: PNP or NPN encoder with single-ended outputs and internal load resistors

NOTE

Incorporated load resistors may be used only if NPN or PNP encoders are compatible with pull-up or pull-down external resistors (4.7kΩ).

NOTE

NPN or PNP encoders cause pulse distortions due to a difference in ramp up and ramp down edges. Distortion depends on the load resistor ratings and the wire stray capacitance. PNP or NPN encoders should not be used for applications with an encoder output frequency exceeding a few kHz dozens. For such applications, use encoders with Push-Pull outputs, or better with a differential line-driver output.

4.5.9. WIRING THE ENCODER CABLE

Use a screened cable to connect the encoder to its control board; screening should be grounded to both ends of the cable. Use the special clamp to fasten the encoder wire and ground the cable screening to the inverter.

Figure 9: Wiring the encoder cable

Do not stretch the encoder wire along with the motor supply cable.
Connect the encoder directly to the inverter using a cable with no intermediate devices, such as terminals or return connectors.
Use a model of encoder suitable for your application (as for connection length and max. rev number).
Preferably use encoder models with complementary LINE-DRIVER or PUSH-PULL outputs. Non-complementary PUSH-PULL, PNP or NPN open-collector outputs offer a lower immunity to noise.
The encoder electrical noise occurs as difficult speed adjustment or uneven operation of the inverter; in the worst cases, it can lead to the inverter stop due to overcurrent conditions.