

SD750

ACCESSORIES MANUAL

ENCODER BOARD



LOW VOLTAGE VARIABLE SPEED DRIVE

SD750

————— *LOW VOLTAGE VARIABLE SPEED DRIVE* —————

Accessories Manual

Encoder board

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ABOUT THIS MANUAL

PURPOSE

This manual contains important instructions for the installation, configuration and use of the **encoder** optional expansion board for Power Electronics' SD750 variable speed drives.

TARGET AUDIENCE

This manual is intended for qualified customers who will install, operate and maintain Power Electronics SD750 variable speed drives.

Only trained electricians may install and commission the drives.

REFERENCE MANUALS

The following reference documents are available for SD750 variable speed drives:

- Hardware and Installation Manual.
- Programming and Software Manual.
- Maintenance Manual.
- Pumps Application Manual.

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SAFETY SYMBOLS

Always follow safety instructions to prevent accidents and potential hazards from occurring.

In this manual, safety messages are classified as follows:

	WARNING	Identifies potentially hazardous situations where dangerous voltage may be present, which if not avoided, could result in minor personal injury, serious injury or death.
Be extremely careful and follow the instructions to avoid the risk of electrical shocks.		
	CAUTION	Identifies potentially hazardous situations, which if not avoided, could result in product damage, or minor or moderate personal injury.
Read the message and follow the instructions carefully.		
	NOTICE	Identifies important measures to take in order to prevent damage equipment and warranty lost, as well as encouraging good use and environmental practices.

Other symbols used in this manual for safety messages are the following:

	Hot surface. Be careful and follow the instructions to avoid burns and personal injuries.
	Risk of fire. Be careful and follow the instructions to prevent causing an unintentional fire.
	Caution, risk of electric shock. Energy storage timed discharge. Wait for the indicated time to avoid electrical hazards.
	Caution, risk of hearing damage. Wear hearing protection.

SAFETY INSTRUCTIONS

IMPORTANT!

Read carefully this manual to maximize the performance of the product and to ensure its safe installation and use.

In order to appropriately use the drive, please, follow all instructions described in the **Hardware and Installation Manual** which refer to transportation, installation, electrical connection and commissioning of the equipment.

For maintenance operations, follow the instructions from the **Maintenance Manual**.

Power Electronics accepts no responsibility for any damages resulting from incorrect use of equipment.



CAUTION

Read carefully the **Hardware and Installation Manual**, the **Maintenance Manual** and all documentation related to the drive to guarantee its safe use and avoid the risk of personal injuries and damages to the equipment.

Ensure compliance with local and national regulations of the installation site.



NOTICE

CAUTION IN CONNECTIONS

Use conductive paste between plates in every electrical connection. Otherwise, resistance will increase and an overheat in the contact zone of the conductors may occur.

INTRODUCTION

1

SD750 drives are compatible with several optional boards:

- Communication boards (Ethernet/IP, Profinet, CANopen...).
- Encoder board.
- Digital and analog I/O expansion boards.
- Optical fiber board.

...among others. Up to three optional boards can be connected, maximum two of the same type.

This manual focuses on the optional encoder board. The encoder board allows the SD750 to be connected to an encoder to measure the speed of the motor it controls. This card has two channels for the connection of this encoder, which will be essential to have for closed-loop controls.

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Encoder board specifications

- Device type: Encoder.
- Outputs for powering each encoder, programmable from 5VDC to 24VDC.
- Optical insulation between the encoder and the control board.
- Inputs for Channel A, /A, Channel B, /B and Channel Z, /Z (zero pass detection).
- Differential or 'single-ended' type inputs.
- Supports encoders with open collector output, voltage and 'push-pull'.

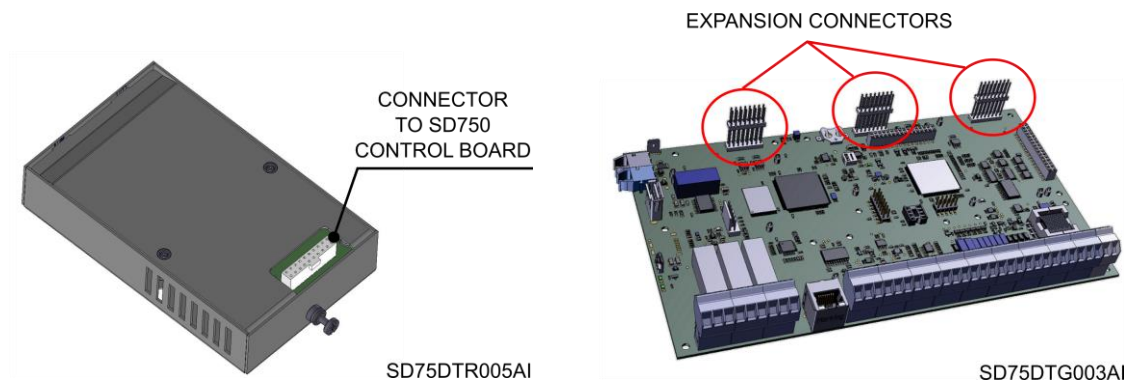
LED indicators

The encoder expansion board includes 1 LED indicator (status) that provides information about the operation of the card. See section "Connectors description and LED indicators" for more information.

CONNECTION TO THE DRIVE

2

The encoder expansion board can be connected directly, through the connector on its back side, to any of the three expansion connectors of the SD750 drive central control board. Once connected, it allows integrating an encoder through its connection to the expansion board.



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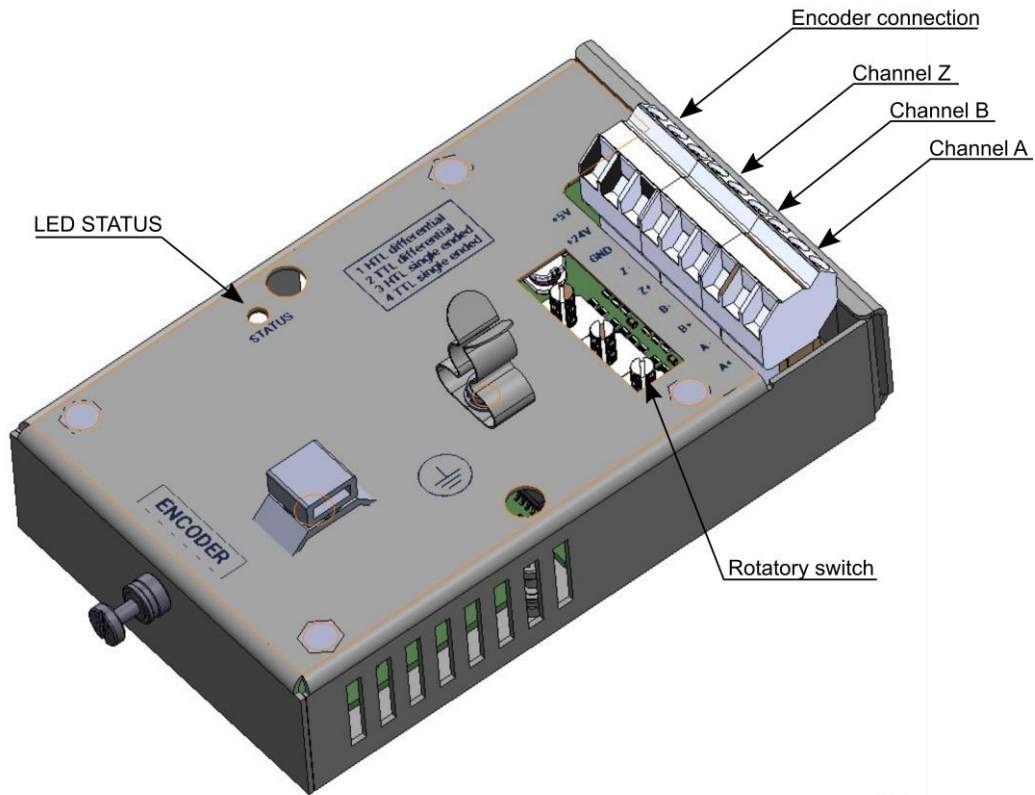
CAUTION

Power Electronics' SD750 drives operate with high electric energy.

Make sure the power supply has been disconnected and wait for at least 10 minutes to guarantee that the DC bus is discharged before installing the expansion board. Otherwise, there is a risk of personal injuries or accidents.

Connectors description and LED indicators

The LED indicators on the encoder expansion board provide information about the board and communication status.



SD75DTR007AI

The encoder expansion board has a single green LED that indicates if the own board is powered, and whose frequency changes according to the system operating status.

All LED statuses are explained in the following table:

LED	COLOR / FREQUENCY	DESCRIPCIÓN
STATUS	Green, normal blinking	The system is operating correctly ¹ .
	Red, slow blinking	The board cannot establish communication with the network controller or initialize the protocol.
	Red, fast blinking	The board cannot establish communication with the SD750 central board.

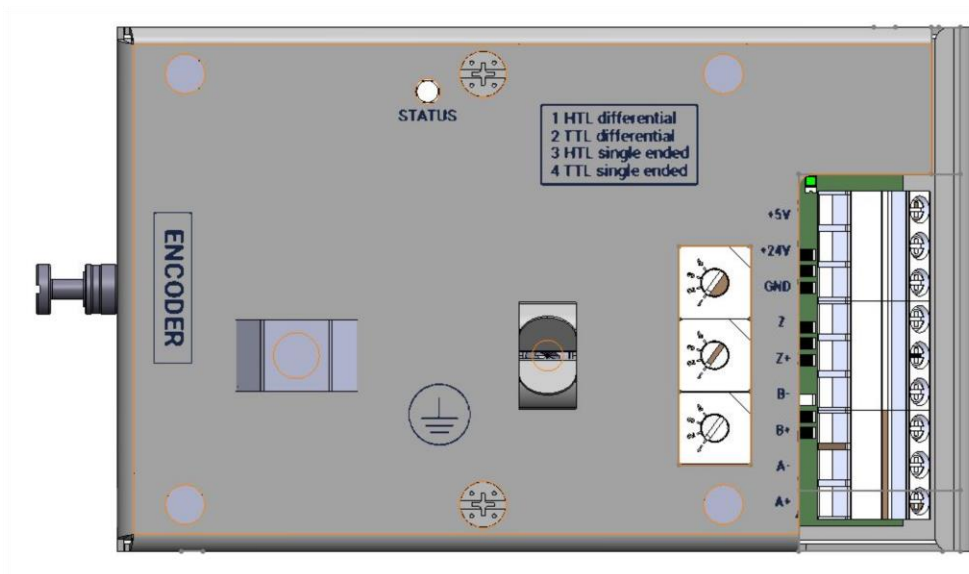
There are two connectors on the encoder board: one is for connecting the encoder board to the inverter control board (located at the back side of the board). The other connector is used for connecting the motor encoder, it is located at the front side. It consists of 9 terminals, each terminal description is shown in the following table.

¹ When it is stated that the system operates correctly, it means that the communication between the expansion board, the network controller and the central SD750 microcontroller is correct. This does not mean, however, that the communication with the PLC is correct.

TERMINAL	DESCRIPTION
+5V	Input voltage for motor encoder +5VDC
+24V	Alimentación del encoder +24VDC
GND	Common terminal for input voltage of motor encoder
Z-	Channel Z (inverse polarity).
Z+	Channel Z
B-	Channel B (inverse polarity)
B+	Channel B
A-	Channel A (inverse polarity)
A+	Channel A

The expansion card includes three rotatory switches where each one corresponds to a different channel (A, B or Z). These switches have 4 alternative configurations, according to the encoder type:

TERMINAL	DESCRIPTION
HTL diferencial	Differential encoder, +24VDC signal
TTL diferencial	Differential encoder, +5VDC signal
HTL single ended	Single-ended encoder, +24VDC signal
TTL single ended	Single-ended encoder, +5VDC signal

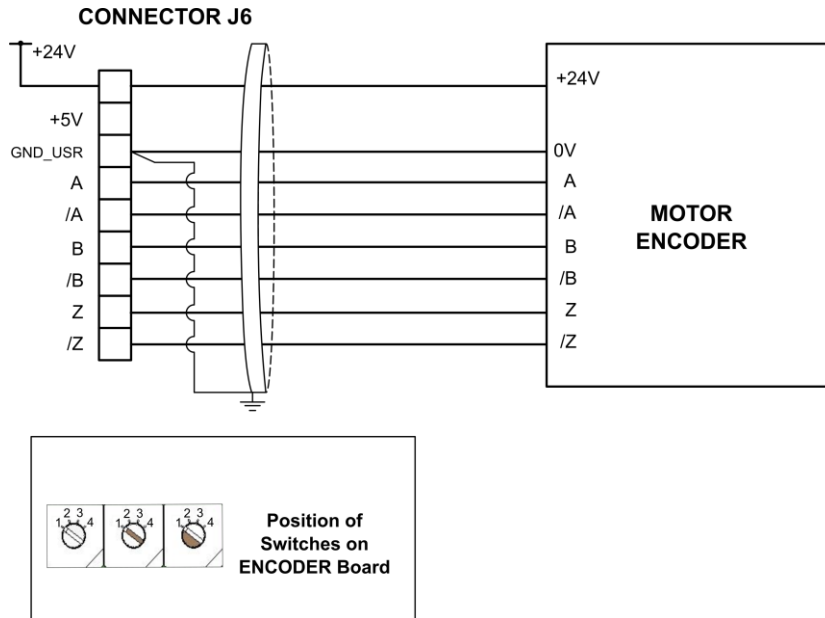


Connection drawings

The following section shows two encoder wiring examples according to the input voltage and the output type of the encoder.

Example 1

Connection of motor encoder powered at 24V with differential output.

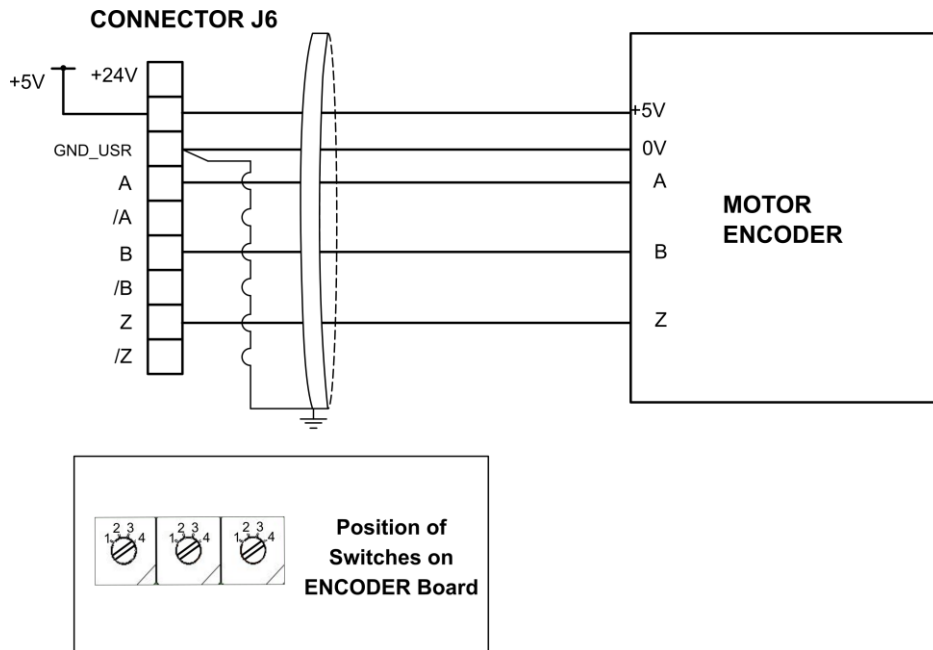


Note: Ground connection using shielded cable on the drive side only.

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Example 2

Connection of motor encoder powered at 5V with 'single-ended' output.



Note: Ground connection using shielded cable on the drive side only.

SD75DTC0013AI

COMMISSIONING

3

The encoder expansion board allows connecting an encoder to the drive SD750 in order to measure the controlled engine speed.

The following steps must be followed:

1. After stopping and de-energizing the drive, connect the expansion board to the connector of the equipment prepared for the expansion boards that are free.
2. Check that the communication with the SD750 is correct (by displaying group G18-Encoder). See that the encoder expansion board status is activated in the group.
3. Connect the encoder to the expansion board.
4. Select in the rotatory switch of each channel the encoder mode according to its options.
5. Enable encoder (G18.1-Enable encoder).
6. Select the number of pulses per revolution (G18.2-Encoder PPR).
7. Select the position to read by the encoder (G18.3-Axis position).
8. Configure the position calculation method used by the encoder (G18.4-Position calculation).
9. Select the control mode to be applied to the motor.

The parameters that are activated once the board is connected are summarized below:

NOTICE

For more details about the Modbus address and value range, see the *SD750 Drive Programming and Software Manual*.

Parameters setting

Group 18: Encoder

Group G18 of the SD750 drive allows configuring and displaying the status of the encoder expansion board.

Screen	Range	Function	Set on RUN								
G18.1-Enable encoder = No	No Yes	Allows enabling or disabling the encoder. <table border="1"> <thead> <tr> <th>OPT.</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>No</td> <td>The encoder is enabled.</td> </tr> <tr> <td>Yes</td> <td>The encoder is disabled.</td> </tr> </tbody> </table>	OPT.	FUNCTION	No	The encoder is enabled.	Yes	The encoder is disabled.	NO		
OPT.	FUNCTION										
No	The encoder is enabled.										
Yes	The encoder is disabled.										
G18.2-Encoder PPR = 1024 PPR	0 to 8191 PPR	Allows configuring the pulses per encoder revolution, according to the specifications of the connected encoder. Available if [G18.1 = Yes].	NO								
G18.3-Axis position = 0.00 °	0.00 to 360.00 °	Refers to the position read by the encoder. Visible if [G19.1.1 = PMSM] y [G18.1 = Yes].	NO								
G18.4-Position calculation = Always	Always First start Dynamic autotune	Allows to configure the position calculation method used by the encoder. Visible if [G19.1.1 = PMSM] y [G18.1 = Yes]. <table border="1"> <thead> <tr> <th>OPT.</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>Always</td> <td>The offset is calculated in each start-up.</td> </tr> <tr> <td>First start</td> <td>The offset is calculated in the first start-up.</td> </tr> <tr> <td>Dynamic autotune</td> <td>The offset is calculated in the Auto Tuning.</td> </tr> </tbody> </table>	OPT.	FUNCTION	Always	The offset is calculated in each start-up.	First start	The offset is calculated in the first start-up.	Dynamic autotune	The offset is calculated in the Auto Tuning.	NO
OPT.	FUNCTION										
Always	The offset is calculated in each start-up.										
First start	The offset is calculated in the first start-up.										
Dynamic autotune	The offset is calculated in the Auto Tuning.										

Visualization parameters

Group V1: Motor visualization

This group shows information related to motor parameters.

Screen	Units	Description
SV1.17-Encoder speed = 0 rpm	rpm	Shows the real speed measured by the encoder, in revolutions per minute. Visible if [G18.1 = Yes].

Group V9: Last fault regs

These registers show the conditions that were present at the moment when the last fault occurred. They are divided into the following subgroups:

- Subgroup V9.1: Motor registers

Screen	Units	Description
SV9.1.16-Encoder pulses = 0	-	Shows the pulse count of the encoder.
SV9.1.17-Encoder speed = 0 rpm	rpm	Shows the speed measured by the encoder.

- Subgroup V9.6: Local motor reg

Screen	Units	Description
SV9.6.16-Encoder pulses = 0	-	Shows the pulse count of the encoder.
SV9.6.17-Encoder speed = 0 rpm	rpm	Shows the speed measured by the encoder in revolutions per minute.

Group V13: Local Motor vis.

This group shows general local motor's controls on the device configured as master. It will only appear when parameter G25.1-Role is configured as Local Master, Global Master or Global Slave; or parameter G25.7-Paral. Drives Number is configured to be greater than 1; or if parameter G1.9-Master/slave config = Enable.

Screen	Units	Description
SV13.17-Encoder speed = 0 rpm	rpm	Shows the speed measured by the encoder in revolutions per minute. Visible if [G18.1 = YES].

Summary of Modbus addresses

Visualization parameters

Parameter	Screen	Description	Address	Modbus Range
SV1.17	Encoder speed = 0 rpm	Real speed measured by the encoder.	42021	Real Value = Modbus Value
SV9.1.16	Encoder pulses = 0	Shows the pulse count of the encoder.	42470	Real Value = Modbus Value
SV9.1.17	Encoder speed = 0 rpm	Shows the speed measured by the encoder.	42471	Real Value = Modbus Value
SV9.6.16	Encoder pulses = 0	Shows the pulse count of the encoder.	42574	Real Value = Modbus Value
SV9.6.17	Encoder speed = 0 rpm	Shows the speed measured by the encoder in revolutions per minute.	42575	Real Value = Modbus Value
SV13.17	Encoder speed = 0 rpm	Shows the speed measured by the encoder in revolutions per minute.	41691	Real Value = Modbus Value

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Programming parameters

Parameter	Screen	Address	Range	Modbus Range	Access ^[1]
G18.1	Enable encoder = No	40581	No Yes	0 to 1	RW
G18.2	Encoder PPR = 1024 PPR	40582	0 to 8191 PPR	0 to 8191	RW
G18.3	Axis position = 0.00 °	40584	0.00 to 360.00 °	0 to 36000	RW
G18.4	Position calculation = Always	40583	Always	0	RW
			First start	1	
			Dynamic autotune	2	

[1] Access: RW: Read and write. RO: Read only.

FAULTS AND WARNINGS LIST

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Please, consult the full list of fault and warning messages in the *Software and Programming Manual* for SD750 drives.

Description of fault list

DISPLAY	DESCRIPTION
F36: Encoder card com.	There is a communication problem between the encoder card and central control.
F37: Encoder card timeout	The encoder card is not detected.
F38: Encoder	Incorrect encoder measurement while working in closed loop.

Troubleshooting

DISPLAY	POSSIBLE CAUSE	ACTIONS
F36: Encoder card com.	There is a communication problem between the encoder card and central control.	Remove drive power supply and turn it on again. Check the encoder configuration.
F37: Encoder card timeout	The encoder card is not detected.	Verify the card is connected correctly.
F38: Encoder	Wrong encoder reading	Check the encoder wiring and its power.



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