

SD500 Series

ACCESSORIES



Getting Started Manual

Encoder Optional Board

SD500

Series

A C C E S S O R I E S

Getting Started Manual

Encoder Board

Edition: July 2015

SD50IM03AI Rev. A

SAFETY SYMBOLS

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



This symbol means improper operation may result in serious personal injury or death.



Identifies shock hazards under certain conditions. Particular attention should be given because dangerous voltage may be present. Maintenance operation should be done by qualified personnel.



Identifies potential hazards under certain conditions. Read the message and follow the instructions carefully.

Edition of July 2015

This publication could present technical imprecision or misprints. The information here included will be periodically modified and updated, and all those modifications will be incorporated in later editions.

To consult the most updated information of this product you might access through our website www.power-electronics.com where the latest version of this manual can be downloaded.

Revisions

Date	Revision	Description
17 / 07 / 2015	A	First edition

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SAFETY INSTRUCTIONS

IMPORTANT!

- Safety instructions showed in this manual are useful to teach user how to use the product in a correct and safety way with the purpose of preventing possible personal injuries or property damages.
- Safety messages included here are classified as it follows:



WARNING

Be sure to take ESD (Electrostatic Discharge) protection measures when you touch the board.

Otherwise, the optional board may get damaged due to static charges.

Implement wiring change on the optional board after checking that the power supply is off.

Otherwise, connecting error and damage to the board could occur.

Be sure to connect correctly the optional board to the drive.

Otherwise, connecting error and damage to the board could occur.

Do not remove the cover while the power is applied or the unit is in operation.

Otherwise, electric shock could occur.

Do not run the drive with the front cover removed.

Otherwise, you may get an electric shock due to the high voltage terminals or exposure of charged capacitors.

Do not remove the cover except for periodic inspections or wiring, even if the input power is not applied.

Otherwise, you may access the charged circuits and get an electric shock.

Operate the switches with dry hands.

Otherwise, you may get an electric shock.

Do not use cables with damaged insulation.

Otherwise, you may get an electric shock.

Do not subject the cables to abrasions, excessive stress, heavy loads or pinching.

Otherwise, you may get an electric shock.



WARNINGS

RECEPTION

- Material of Power Electronics is carefully tested and perfectly packed before leaving the factory.
 - In the event of transport damage, please ensure that you notify the transport agency and POWER ELECTRONICS: 902 40 20 70 (International +34 96 136 65 57) or your nearest agent, within 24hrs from receipt of the goods.
-

UNPACKING

- Make sure received merchandise corresponds with delivery note, models and serial numbers.
 - Each optional board is supplied with a technical manual.
-

RECYCLING

- The packing of the boards must be recycled. For this reason it is necessary to separate different materials (plastics, paper, cardboard, wood ...) and settle them in corresponding containers.
 - The residual parts of electrical devices must be collected in a selective manner in order to warranty the correct environmental treatment.
-

1. INTRODUCTION

1.1. Description of the Encoder Board

The optional Encoder board offers to drives of SD500 Series the possibility of connecting a Line Driver or an Open Collector encoder for the vector control, according to the requirements.

The implementation of the Encoder board is directly done over the own control board of the drive. For this, an additional space is not need when installing this board.

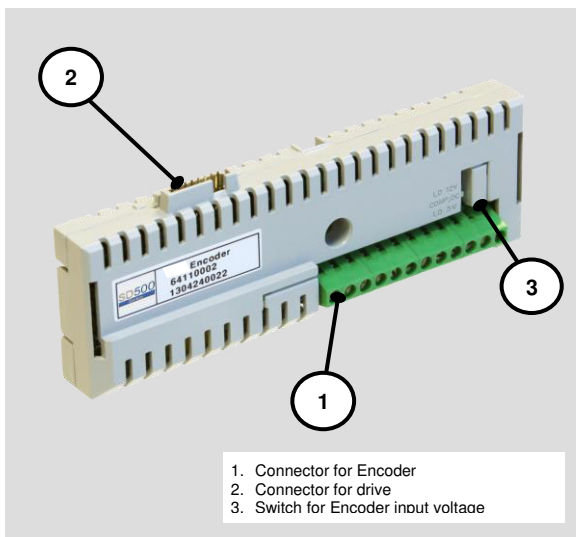


Figure 1.1 Description of Encoder Board

2. TECHNICAL CHARACTERISTICS

2.1. General Information

2.1.1. Contents of Encoder Board Kit

The kit of the Encoder board contents:

- 1 Encoder Board.
- 1 fixing screws M3x10.
- 1 Technical Manual.

2.1.2. Specifications of Encoder Board

The Encoder board offers the following items:

- Inputs for Channel A, /A and Channel B, /B.
- Encoder Signal Return Pulse Verification (RT_A, RT_B).
- Supports encoders with Open Collector “Single-ended” output and Line Driver “Differential” output.
- Outputs for powering each encoder, programmable 5VDC or 12VDC for Line Drive type encoder and 12VDC or 15VDC for Open Collector encoder.

3. INSTALLATION AND CONNECTION

3.1. Installation of the Encoder Board

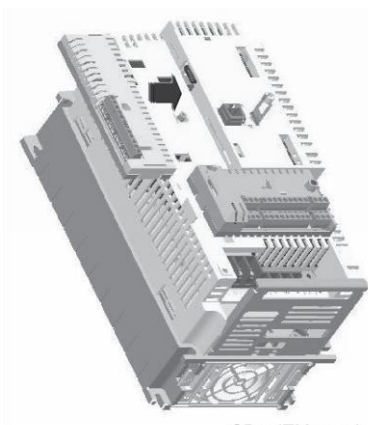
The Encoder board is directly connected to the SD500 drives of Power Electronics, as the following image shows.



CAUTION

The variable speed drives of Power Electronics operate with a high electric energy.

Make sure the power supply has been disconnected and wait for at least 10 minutes to guarantee that DC Link voltage is discharged, before installing the Encoder board. Otherwise, you may get personal injuries or an accident could occur.

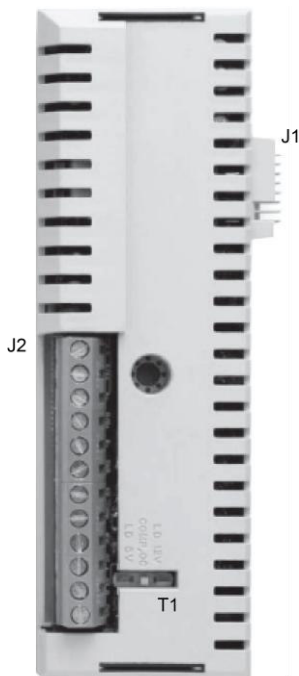


SD50ITM0004A

Figure 3.1 Installation of the Encoder Board into the drive

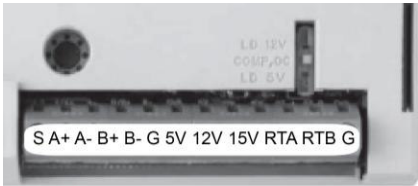
3.2. Connectors and Switches Description


There are two connectors on the Encoder board: one connector is used to connect the Encoder board to the control board of the drive (J1) and the other one is used to connect the motor encoder (J2). Additionally, there is a switch to select the input voltage for each encoder type (T1).



SD50ITC0020A

Figure 3.2 Location of the components on the Encoder Board

COMPONENT	DESCRIPTION																																							
Connector for Drive (J1)	The optional Encoder board is connected to the SD500 drive by means of this connector.																																							
Connector for Motor Encoder (J2)	<p>This connector is used to connect the Motor Encoder. In the following table, the terminals of the connector are described:</p> <table border="1"> <thead> <tr> <th>Terminal</th> <th>Signal</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>S</td> <td>S</td> <td>Shield connection.</td> </tr> <tr> <td>A+</td> <td>A</td> <td>Channel A (true polarity).</td> </tr> <tr> <td>A-</td> <td>/A</td> <td>Channel /A (inverse polarity).</td> </tr> <tr> <td>B+</td> <td>B</td> <td>Channel B (true polarity).</td> </tr> <tr> <td>B-</td> <td>/B</td> <td>Channel /B (inverse polarity).</td> </tr> <tr> <td>G</td> <td>G5I</td> <td>Common terminal for input voltage of Motor Encoder.</td> </tr> <tr> <td>5V</td> <td>+5V</td> <td>+5VDC power for encoders with Line Drive output. (4.5V to 5.5V, 0.2A)</td> </tr> <tr> <td>12</td> <td>+12V</td> <td>+12VDC power for encoder with Line Drive/Open Collector outputs. (11V to 13V, 0.07A)</td> </tr> <tr> <td>15</td> <td>+15V</td> <td>+15VDC power for encoder with Open Collector output. (14 to 16V, 0.07A)</td> </tr> <tr> <td>RTA</td> <td>RT_A</td> <td>Return signal of the channel A. (<17V, 0.01A)</td> </tr> <tr> <td>RTB</td> <td>RT_B</td> <td>Return signal of the channel B. (<17V, 0.01A)</td> </tr> <tr> <td>G</td> <td>G5I</td> <td>Common terminal for input voltage of Motor Encoder.</td> </tr> </tbody> </table>  <p style="text-align: right;">SD50ITC0019A</p> <p style="text-align: center;"><i>Figure 3.4 Detail of connector J2</i></p>	Terminal	Signal	Description	S	S	Shield connection.	A+	A	Channel A (true polarity).	A-	/A	Channel /A (inverse polarity).	B+	B	Channel B (true polarity).	B-	/B	Channel /B (inverse polarity).	G	G5I	Common terminal for input voltage of Motor Encoder.	5V	+5V	+5VDC power for encoders with Line Drive output. (4.5V to 5.5V, 0.2A)	12	+12V	+12VDC power for encoder with Line Drive/Open Collector outputs. (11V to 13V, 0.07A)	15	+15V	+15VDC power for encoder with Open Collector output. (14 to 16V, 0.07A)	RTA	RT_A	Return signal of the channel A. (<17V, 0.01A)	RTB	RT_B	Return signal of the channel B. (<17V, 0.01A)	G	G5I	Common terminal for input voltage of Motor Encoder.
Terminal	Signal	Description																																						
S	S	Shield connection.																																						
A+	A	Channel A (true polarity).																																						
A-	/A	Channel /A (inverse polarity).																																						
B+	B	Channel B (true polarity).																																						
B-	/B	Channel /B (inverse polarity).																																						
G	G5I	Common terminal for input voltage of Motor Encoder.																																						
5V	+5V	+5VDC power for encoders with Line Drive output. (4.5V to 5.5V, 0.2A)																																						
12	+12V	+12VDC power for encoder with Line Drive/Open Collector outputs. (11V to 13V, 0.07A)																																						
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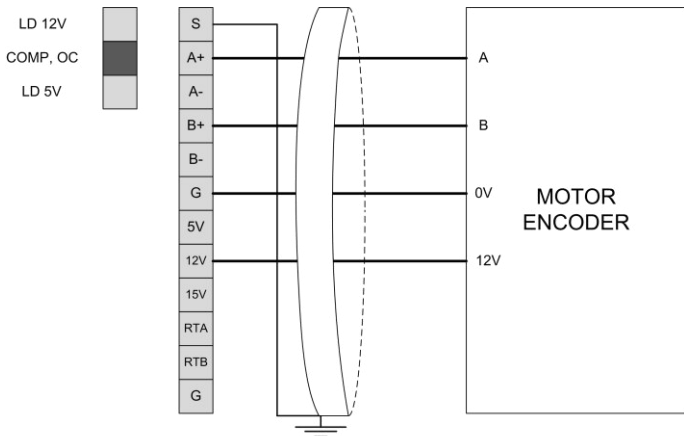
COMPONENT	DESCRIPTION								
Switch for Input Voltage of Motor Encoder (T1)	Sliding switch with three positions, LD 12V, COMP OC and LD 5V. The selected position depends on the input voltage and the encoder type required by the used motor encoder.								
	<table border="1"> <thead> <tr> <th data-bbox="342 283 470 317">Position</th> <th data-bbox="470 283 875 317">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="342 317 470 346">LD 12V</td> <td data-bbox="470 317 875 346">+12VDC power and Line Drive output.</td> </tr> <tr> <td data-bbox="342 346 470 394">COMP, OC</td> <td data-bbox="470 346 875 394">+12VDC or +15VDC power and Open Collector output.</td> </tr> <tr> <td data-bbox="342 394 470 420">LD 5V</td> <td data-bbox="470 394 875 420">+5VDC power and Line Drive output.</td> </tr> </tbody> </table>	Position	Description	LD 12V	+12VDC power and Line Drive output.	COMP, OC	+12VDC or +15VDC power and Open Collector output.	LD 5V	+5VDC power and Line Drive output.
	Position	Description							
	LD 12V	+12VDC power and Line Drive output.							
COMP, OC	+12VDC or +15VDC power and Open Collector output.								
LD 5V	+5VDC power and Line Drive output.								
									
SD50ITC0021A									
<i>Figure 3.5 Detail of the T1 switch</i>									

3.3. Connection Drawings

The following section shows the different encoder connections according to the input voltage and the output type of the encoder.

Example 1

Connection of motor encoder powered at 12V with Open Collector output.



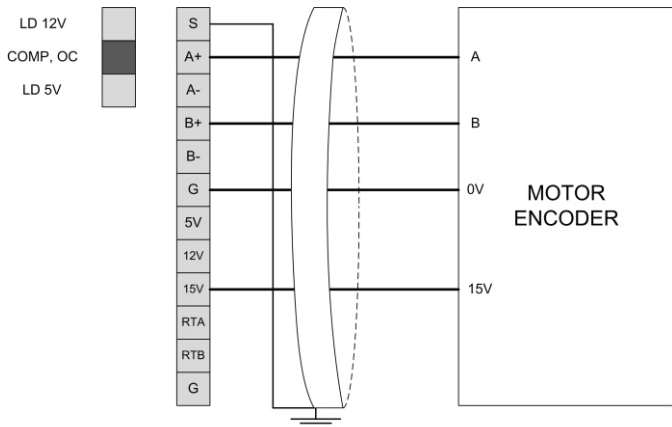
Note: Ground connection using shielded cable on the drive side only

SD50DTC0019A

Figure 3.7 Example 1. Connection of motor encoder at 12V and Open Collector output

Example 2

Connection of motor encoder powered at 15V with Open Collector output.



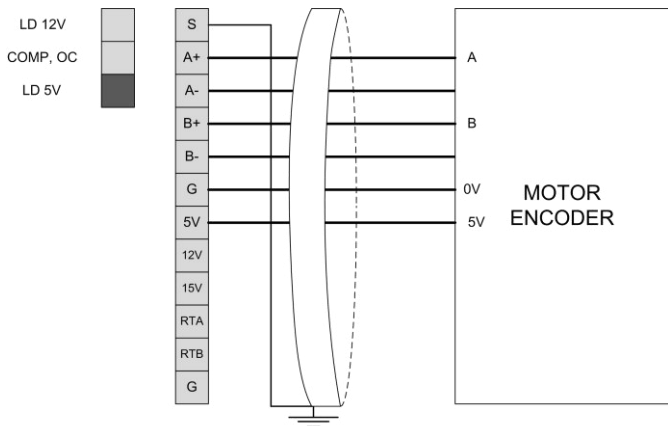
Note: Ground connection using shielded cable on the drive side only

SD50DTC0020A

Figure 3.8 Example 2. Connection of motor encoder at 15V and Open Collector output

Example 3

Connection of motor encoder powered at 5V with Line Drive output.



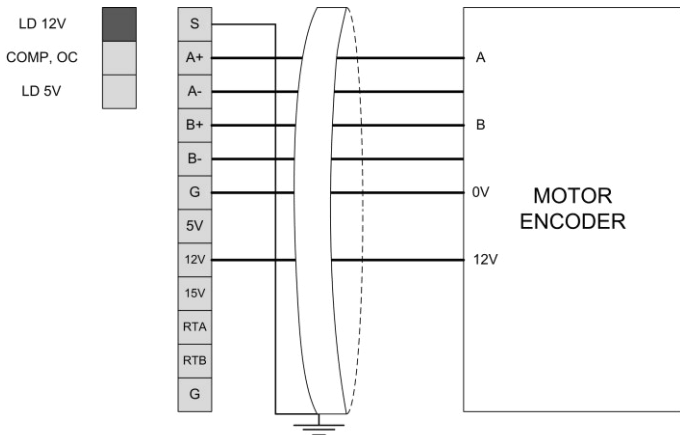
Note: Ground connection using shielded cable on the drive side only

SD50DTC0021A

Figure 3.9 Example 3. Connection of motor encoder at 5V and Line Drive output

Example 4

Connection of motor encoder powered at 12V with Line Drive output.



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

SD50DTC0022A

Figure 3.10 Example 4. Connection of motor encoder at 12V and Line Drive output

4. PARAMETER SETTINGS AND VISUALIZATION

4.1. Parameters SV.1 – Motor Visualization

Screen	Units	Description
Mtr I out=0.0 MTR O/P current	A	Shows the current running through the motor, corresponding to the second field of the status line → OFF 0.0A +0.0Hz
Mtr Freq= 0.00Hz Motor Frequency	Hz	Shows the motor frequency
Mtr Sp= 0rpm Motor Speed(rpm)	rpm	Shows the motor speed in rpm
Mtr FBSp=+0rpm MTR FBK Speed	rpm	Shows the motor encoder speed. The value will be only shown if an encoder board has been installed in the drive.
Mtr Vout=0V MTR O/P voltage	V	Shows the motor voltage
Mtr Pow = 0.00kW MTR O/P power	kW	Shows the motor instantaneous power consumption
Mtr Torqe = 0.0% MTR O/P torque	% Motor torque	Shows the torque applied to the motor.
EncMon= 0 Hz (*)	Hz	Shows the encoder speed in terms of motor frequency.
PulMo = 0 kHz (*)	kHz	Shows the encoder speed in terms of encoder pulses.

(*) Available if parameter G19.1.1 =VECTOR.

4.2. Group 8 – G8: Outputs

4.2.1. Subgroup 8.1 – S8.1: Digital O/P

Screen / Default Value	Name / Description	Range	Function	Set on RUN				
2 RLY1= Trip Function Relay 1	G8.1.2 / Relay 1 Control Source Selection	NONE FDT-1 FDT-2 FDT-3 FDT-4 OVERLO AD IOL UNDRLO AD VENTWA RN OVERVO LT LOWVOL T OVERHE AT RUN STOP STEADY SPD SRCH READY PUMP TRIP ENCODE R DIR COMPAR AT BRCTRL	Configures each relay and digital output according to the options of the following table: <table border="1" data-bbox="456 761 871 860"> <thead> <tr> <th>OPTION</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>ENCODER DIR (*)</td> <td>It is a warning of the encoder. The relay will be active when the encoder is misplaced.</td> </tr> </tbody> </table>	OPTION	FUNCTION	ENCODER DIR (*)	It is a warning of the encoder. The relay will be active when the encoder is misplaced.	YES
OPTION	FUNCTION							
ENCODER DIR (*)	It is a warning of the encoder. The relay will be active when the encoder is misplaced.							
3 RLE2= Run Function Relay 2	G8.1.3 / Relay 2 Control Source Selection							
4 DOP1= FDT-1 Digital Output1	G8.1.4 / Digital Output 1 Control Source Selection							

(*) Available if parameter G19.1.1 =VECTOR.

4.3. Group 10 – G10: Limits

4.3.1. Subgroup 10.8 – S10.8: Vector Lim

Screen / Default Value	Name / Description	Range	Function	Set on RUN				
1 TqLimRef = LOCAL	G10.8.1 / Torque lim Ref	LOCAL AI1 AI2 AI3 AI4 MDBUS ENCOD COMMS PLC	<p>The user is able to select the source to introduce the torque limit reference.</p> <table border="1"> <thead> <tr> <th>OPTION</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>ENCOD</td> <td>The reference will be taken from the encoder</td> </tr> </tbody> </table>	OPTION	FUNCTION	ENCOD	The reference will be taken from the encoder	NO
OPTION	FUNCTION							
ENCOD	The reference will be taken from the encoder							

4.4. Group 18 – G18: Encoder

Screen / Default Value	Name / Description	Range	Function	Set on RUN								
1 EncMode = None	G18.1 / Encoder Function	None FBK REF	<p>Select the encoder function:</p> <table border="1"> <thead> <tr> <th>OPTION</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>The encoder function is not active</td> </tr> <tr> <td>FBK</td> <td>The encoder is used as feedback</td> </tr> <tr> <td>REF</td> <td>The encoder is used as reference</td> </tr> </tbody> </table>	OPTION	FUNCTION	None	The encoder function is not active	FBK	The encoder is used as feedback	REF	The encoder is used as reference	YES
OPTION	FUNCTION											
None	The encoder function is not active											
FBK	The encoder is used as feedback											
REF	The encoder is used as reference											
2 Type = LineDrive	G18.2 / Encoder Type Select	LineDrive Totem/Com Open Coll	Select signal delivery method of encoder.	NO								
3 Pulse = (A+B)	G18.3 / Encoder Pulse Select	(A+B) -(A+B) (A)	<p>Set the way of encoder pulse.</p> <table border="1"> <thead> <tr> <th>OPTION</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>(A+B)</td> <td>Forward operation</td> </tr> <tr> <td>-(A+B)</td> <td>Reverse operation</td> </tr> <tr> <td>(A)</td> <td>Only one channel is used</td> </tr> </tbody> </table>	OPTION	FUNCTION	(A+B)	Forward operation	-(A+B)	Reverse operation	(A)	Only one channel is used	NO
OPTION	FUNCTION											
(A+B)	Forward operation											
-(A+B)	Reverse operation											
(A)	Only one channel is used											
4 PulseNum = 1024	G18.4 / Number of Encoder Pulses	10 to 4096	Set the number of pulses per rotation	NO								
5 EncMo = 0 Hz	G18.5 / Feedback Monitor	-300 to 300 Hz	Shows the encoder speed in terms of motor frequency.	YES								

Screen / Default Value	Name / Description	Range	Function	Set on RUN	
6 Pulse Monitor = 0 kHz	G18.6 / Ref Monitor	-200 to 200 kHz	Shows the encoder speed in terms of encoder pulses.	YES	
7 Filter = 3 ms	G18.7 / Encoder I/P Filter	0 to 10000ms	Set the time constant of the encoder filter.	YES	
8 X1 = 0 kHz	G18.8 / Encoder IP Min Pulse	0 to [G18.10]	Set the minimum number of pulses in harmony with the encoder specification in kHz.	YES	
9 Y1 = 0 %	G18.9 / Perc. Encoder Min Pulse	0 to 100%	Set the minimum frequency of the input encoder.	YES	
10 X2 = 100 kHz	G18.10 / Encoder IP Max Pulse	[G18.8] to 200 kHz	Set the maximum number of pulses in harmony with the encoder specification in kHz.	YES	
11 Y2 = 100%	G18.11 / Perc Encoder Max Pulse	0 to 100%	Set the maximum frequency of the input encoder.	YES	
12 WireChk = N	G18.12 / Encoder option connection check	N Y	Set if you want to check or not the state of encoder connection.	YES	
			OPTION		FUNCTION
			N		Encoder connection won't be checked
Y	Encoder connection will be checked				
13 ChTim = 1s	G18.13 / Encoder Connection Check Time	0.1 to 1000s	Set the time during which check is being done.	YES	

4.5. Group 19 – G19: Fine Tuning

4.5.1. Subgroup 19.1 – S19.1: IGBT Control

Screen / Default Value	Name / Description	Range	Function		Set on RUN
1 CTRL T.= V/Hz Control Type	G19.1.1 / Control Type Selection	V/Hz SlipCom S-less1 VECTOR	This selection determines the drives control type.		NO
			OPT.	FUNCTION	
			V/Hz	Scalar control mode, where control is carried out applying to the motor a voltage/frequency ramp.	
			SlipCom	Whenever this function is active, it compensates the slip produced in the motor. In case a heavy load capable of producing a big slip during the start, set the parameter as 'SlipCom'. This option can be adjusted with parameters [G19.2.1 'InertiaRate'] and [G19.2.6 'RtSlip'].	
			S-less1	This function applies a vector control without encoder.	
VECTOR(*)	This function applies a vector control with encoder.				
4 Torque CTRL(*) = N	G19.1.4 / Speed or Torque Control	N Y	The user is able to set the control mode:		NO
			OPTION	FUNCTION	
			NO	Speed control is selected	
YES	Torque control is selected				
5 Auto Tuning = NONE(*)	G19.1.5 / Auto tuning	None All Allst Rs+Lsig Enc test Tr	Set the type of auto tuning:		NO
			OPT.	FUNCTION	
			All	The motor parameters are measured with the motor rotating. The stator resistance (Rs), leak inductance (Lσ), stator inductance (Ls), no-load current and rotor time constant are all measured. The encoder state is also measured. The encoder related functions should be rightly set. If load is connected to the motor axis, the parameter might not be correctly measured so remove the load before measurement.	
Enc test	When the encoder optional card is connected, the motor checks connection and misconnection of A and B pulses. The encoder related functions should be rightly set.				

(*) Available if parameter G19.1.1 =VECTOR.

4.5.2. Subgroup 19.3 – S19.3: Motor Model

Screen / Default Value	Name / Description	Range	Function	Set on RUN
1 Rs= Stator Resistor	G19.3.1 / Stator Resistor (Rs)	*	Stator resistor fine setting.	NO
2 LSigma= Leak Inductor	G19.3.2 / Leak Inductor	*	Leak inductor fine setting.	NO
3 Ls= Stator Inductor	G19.3.3 / Stator Inductor	*	Inductor stator fine setting.	NO
4 Tr= Rotor Time Const	G19.3.4 / Rotor Time Constant	25 to 5000ms	Rotor time constant fine setting.	NO
5 ASR P1 = 50 % (*)	G19.3.5 / Vector Gain Prop. 1	10 to 500%	Set the proportional gain 1 of the speed controller (ASR). The higher the proportional gain, the faster the response will be. But if the gain is too high, the speed of the motor might oscillate.	YES
6 ASR I1 = 300 ms (*)	G19.3.6 / Vector Integral Time 1	10 to 9999ms	Set the integral gain 1 of the speed controller (ASR).	YES
7 ASR P2 = 50 % (*)	G19.3.7 / Vector Gain Prop. 2	10 to 500%	Set the proportional gain 2 of a separate controller. The higher the proportional gain, the faster the response will be. But if the gain is too high, the speed of the motor might oscillate.	YES
8 ASR I2 = 300 ms (*)	G19.3.8 / Vector Integral Time 2	10 to 9999ms	Set the integral gain 2 of a separate controller.	YES
9 SwASR = 0 Hz (*)	G19.3.9 / Switch G ASR	0 to 120Hz	Set the gain change frequency between gain 1 and gain 2.	YES
10 dlASR = 0.10 s (*)	G19.3.10 / Delay Switch ASR	0 to 100s	The gain of the speed controller changes from gain 1 to gain 2 after this time if one of the digital inputs is configured as ASR GAIN 2.	YES
11 RASRf = 0 ms (*)	G19.3.11 / Filter Ref. ASR	0 to 20000ms	Set the time constant of the speed controller reference filter in the vector speed mode.	YES
12 OurFVec = 0 ms (*)	G19.3.12 / Out Filter Vector	0 to 2000ms	Set the time constant of the speed controller reference filter in the vector speed mode and set the time constant of the torque command filter in the vector torque mode.	YES

* This value depends on the motor.

(*) Available if parameter G19.1.1 =VECTOR

5. SUMMARY OF MODBUS ADDRESSES

Visualization Parameters

Param.	Screen	Description	Address	Modbus Range
SV1.1	Mtr I out=0.0	Shows the current running through the motor, corresponding to the second field of the status line → OFF 0.0A +0.0Hz	40784	Real Value = (Modbus Value / 10)
SV1.2	Mtr Freq= 0.00Hz	Shows the motor frequency	40785	Real Value = (Modbus Value / 100)
SV1.3	Mtr Sp= 0rpm	Shows the motor speed in rpm	40786	Real Value = Modbus Value
SV1.4	Mtr FBSp=+0rpm	Motor feedback speed	40787	Real Value = Modbus Value
SV1.5	Mtr Vout=0V	Shows the motor voltage.	40788	Real Value = Modbus Value
SV1.6	Mtr Pow = 0.00kW	Shows the motor instantaneous power consumption	40790	Real Value = (Modbus Value / 10)
SV1.7	Mtr Torqe = 0.0%	Shows the torque applied to the motor.	40791	Real Value = (Modbus Value / 10)
SV1.8	EncMon = 0 Hz	Shows the encoder speed in terms of motor frequency	46664	Real Value = (Modbus Value /100)
SV1.9	PulMo = 0 kHz	Shows the encoder speed in terms of encoder pulses	46665	Real Value = (Modbus Value /100)

Programming Parameters

Param.	Screen	Description	Address	Range	Modbus Range
				NONE	0
				FDT-1	1
				FDT-2	2
				FDT-3	3
				FDT-4	4
				OVERLOAD	5
				IOL	6
				UNDRLOAD	7
				VENTWARN	8
				OVERVOLT	10
G8.1.2	2 RLY1= Trip	Relay 1 Control Source Selection	45663	LOWVOLT	11
				OVERHEAT	12
				RUN	14
				STOP	15
				STEADY	16
				SPD SRCH	19
				READY	22
				PUMP	25
				TRIP	29
				ENCODER DIR	33
				COMPARAT	34
				BRCTRL	35
G8.1.3	3 RLE2= Run	Relay 2 Control Source Selection	45664	See [G8.1.2]	See [G8.1.2]
G8.1.4	4 DOP1= FDT-1	Digital Output 1 Control Source Selection	45665	See [G8.1.2]	See [G8.1.2]
				LOCAL	0
				AI1	2
				AI2	3
				AI3	4
G10.8.1	1 TqLimRef = LOCAL	Torque lim Ref	45173	AI4	5
				MDBUS	6
				ENCOD	7
				COMMS	8
				PLC	9
				None	0
G18.1	1 EncMode = None	Encoder Function	46657	FBK	1
				REF	2
				LineDrive	0
G18.2	2 Type = LineDrive	Encoder Type Select	46660	Totem/Com	1
				Open Coll	2

Param.	Screen	Description	Address	Range	Modbus Range
G18.3	3 Pulse = (A+B)	Encoder Pulse Select	46661	(A+B) -(A+B) (A)	0 1 2
G18.4	4 PulseNum = 1024	Number of Encoder Pulses	46662	10 to 4096	10 to 4096
G18.5	5 EncMo = 0 Hz	Feedback Monitor	46664	-300 to 300 Hz	-30000 to 30000
G18.6	6 Pulse Monitor = 0 kHz	Ref Monitor	46665	-200 to 200 kHz	-20000 to 20000
G18.7	7 Filter = 3 ms	Encoder I/P Filter	46666	0 to 10000 ms	0 to 10000
G18.8	8 X1 = 0 kHz	Encoder IP Min Pulse	46667	0 to [G18.10]	0 to [G18.10]
G18.9	9 Y1 = 0 %	Perc. Encoder Min Pulse	46668	0 to 100 %	0 to 10000
G18.10	10 X2 = 100 kHz	Encoder IP Max Pulse	46669	[G18.8] to 200 kHz	[G18.8] to 20000
G18.11	11 Y2 = 100%	Perc Encoder Max Pulse	46670	0 to 100 %	0 to 10000
G18.12	12 WireChk = N	Encoder option connection check	46689	N Y	0 1
G18.13	13 ChTim = 1s	Encoder Connection Check Time	46690	0.1 to 1000 s	1 to 10000
G19.1.1	1 CTRL T. = V/Hz	Control Type Selection	44361	V/Hz SlipCom S-less1 VECTOR	0 2 3 4
G19.1.4	4 Torque CTRL = N	Speed or Torque Control	44362	N Y	0 1
G19.1.5	5 Auto Tuning = NONE	Auto Tuning	44628	None All Allst Rs+Lsig Enc test Tr	0 1 2 3 4 5
G19.3.1	1 Rs=	Stator Resistor (Rs)	44629	-	-
G19.3.2	2 Lsigma=	Leak Inductor	44630	-	-

Param.	Screen	Description	Address	Range	Modbus Range
G19.3.3	3 Ls=	Stator Inductor	44631	-	-
G19.3.4	4 Tr=	Rotor Time Constant	44632	25 to 5000ms	25 to 5000
G19.3.5	5 ASR P1 = 50%	Vector Gain Prop.1	45132	10 to 500 %	100 to 5000
G19.3.6	6 ASR I1 = 300ms	Vector Integral Time 1	45133	10 to 9999 ms	10 to 9999
G19.3.7	7 ASR P2 = 50%	Vector Gain Prop.2	45135	10 to 500 %	100 to 5000
G19.3.8	8 ASR I2 = 300ms	Vector Integral Time 2	45136	10 to 9999 ms	10 to 9999
G19.3.9	9 SwASR = 0Hz	Switch G ASR	45138	0 to 120 Hz	0 to 12000
G19.3.10	10 dIASR = 0.1s	Delay Switch ASR	45139	0 to 100 s	0 to 10000
G19.3.11	11 RASRf = 0ms	Filter Ref. ASR	45171	0 to 20000 ms	0 to 20000
G19.3.12	12 OurFVec = 0ms	Out Filter Vector	45172	0 to 2000ms	0 to 2000

6. COMMISSIONING

Once the Encoder board is connected and the encoder is fitted on the motor shaft, and after programming the parameters described in the previous section, the following steps are recommended:

▪ Accessing to the motor shaft

1. With the drive in 'ON' status, select the control type 'VECTOR' in the parameter G19.1.1.
2. Turn over the motor shaft manually in positive rotation direction (clockwise). In order to check the rotation direction, look at how to change the motor shaft speed in %. This value is shown in the top left corner of the display, concretely in 'Status Line' and in the SV1.4 parameter. In this way:
 - If the speed value is positive, the motor shaft is rotated in positive direction.
 - If the speed value is negative, turn over the motor shaft in opposite rotation direction.
 - If the value does not change, there is some problem with the encoder (not operating correctly, not receiving power, wiring error, ...).

▪ Without accessing to the motor shaft

1. With the drive in 'ON' status, select V/Hz as control type. For this, set the parameter G19.1.1 to 'V/Hz'.
2. Introduce a positive speed reference, in parameter G3.3 (see the '*Programming and Software Manual*' of SD500).
3. Give the start command to the drive (by keypad, by digital input or by communications).
4. Check that the motor speed value in rpm displayed in parameter SV1.3 is similar to the speed value displayed in parameter SV1.4. This means that the encoder is correctly connected and operates properly.

On the other hand, if the speed value is negative in parameter SV1.4, exchange the connection of signals A+ by A- (inverse polarity). Now, check that the speed value is positive.

In case that the speed (SV1.4) don't change, there is some problem with the encoder (not operating correctly, not receiving power, wiring error, ...).

7. FAULT MESSAGES

7.1. Description of Fault List

There are two possible faults linked with the encoder use:

DISPLAY	DESCRIPTION
F18 Encoder Error	Drive trips due to a problem with the encoder.

7.2. Procedure for Fault Solution

DISPLAY	POSSIBLE CAUSE	ACTIONS
F18 Encoder Error	Encoder connection is incorrect.	Check connections.

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