



## Magnetic Integrated Technology

# 17 BIT SINGLE TURN ABSOLUTE ENCODER SPECIFICATION (Separate Type)

FILE NO	1-KEM17S-OT V0.1
VER DATE	2020-7-30
ORG. RELEASE	2019-7-30

ITEM NO	MODEL	CUSTOMER P/N
	KEM17S-OT	
	=====	

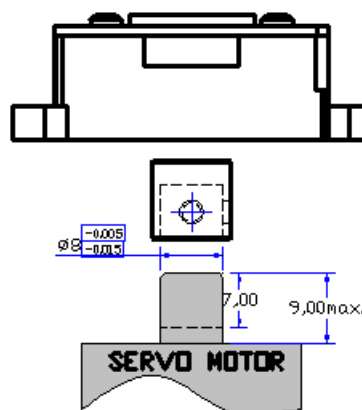
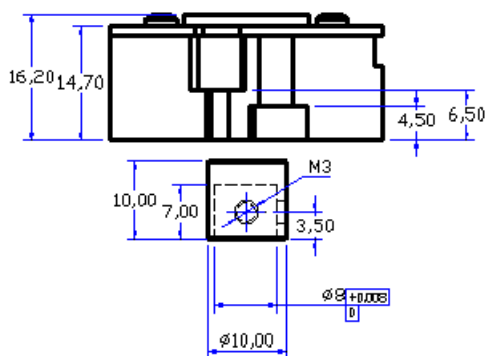
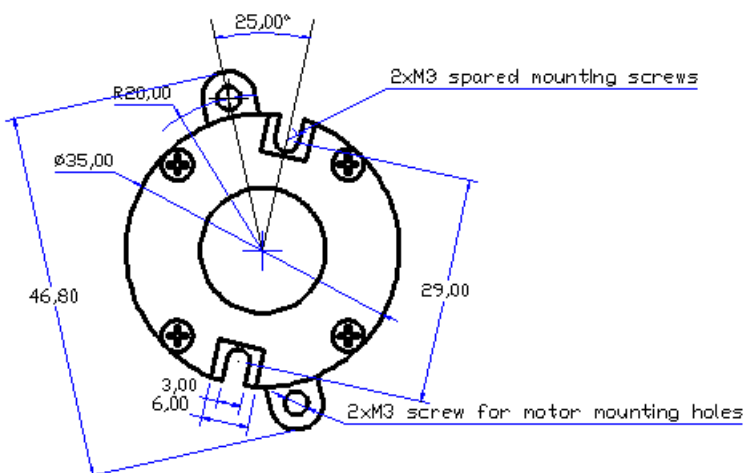
MANAGER	MARKETING	ENG	QA

CUSTOMER APPROVAL		

MODEL	PRODUCT DESCRIPTION	Encoder Assembly Incl. 500mm long, $\phi$ 5.4mm cable with 4-AWG# wire & shielding screen.
KEM17S-OT	17 BIT ABSOLUTE ENCODER, SINGLE-TURN SEPARATE	

1. DIMENSIONS

1-1. OUTLINE DIMENSION



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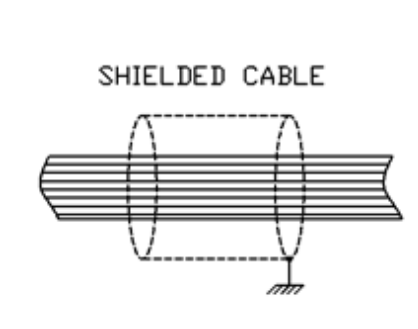
DRAWING NUMBER  
1-KEM17S-OT

DATE  
2020.7.30

## 1-2. ENCODER HOLLOW SHAFT & MOTOR SHAFT INSTALLATION

Refer to index

## 1-3. SHIELDING WIRE CONNECTION



## 2. WIRING DESCRIPTION

Cable Specification:  $\varnothing$ 5.8 shielded, 500mm length, 4-AWG#26 wire.

Color	Function	Note
RED	DC5V	POWER SUPPLY
BLACK	GROUND	
YELLOW	RS485 A	SERIAL DATA SIGNAL
GREEN	RS485 B	

3.	APPLICATION SCOPE	This encoder is suitable for servo motors for robot.	
4.	MODEL & DESCRIPTION	KEM17S-OT 17-bit Single-Turn Absolute Encoder	
5.	APPEARANCE	There shall be no remarkable damage in visual inspection. Products shall be judged by boundary samples if there are any doubts.	
6.	DIMENSIONS	REFER TO CLAUSE 1 OUTLINE DIMENSIONS	
7.	RATINGS		
	NO.	ITEM	SPECIFICATION
	7.1	Operating Temp	-40 ~ +85°C (M type : -60 ~ +85°C)
	7.2	Storage Temp	-40 ~ +105°C
	7.3	Operating Voltage	5.0 ± 0.5 VDC
8.	SPECIFICATION		
	8.1	Operating Type	Motor Shaft Operating
	8.2	Resolution	17-bit, 131, 072 absolute positions
	8.3	Output Signals	Pure Binary
	8.4	Rated Power	0.1W @ Vdd=5V
	8.5	Power-up Time	3ms max.
	8.6	Consumption Current	@Vdd=5.0V, T <sub>A</sub> ≤-20°C
	8.7	Rotation Speed	RPM
	8.8	Output Delay	5 μs
	8.9	Output Digital Voltage	PUSH-PULL (I <sub>out</sub> =2mA) HIGH: V <sub>OH</sub> ≥4.9V LOW: V <sub>LO</sub> ≤0.1V
	8.10	Magnet	NdFeB, N35~N40, supplied w/ encoder Dimension Ø5x2 or Ø6x2; Radial magnetized.
	8.11	DATA MEMORY	EEPROM
	8.12	Serial Communication	RS485

<b>9. RELIABILITY</b>			
9.1	Cycle Life		Infinite
9.2	Weight		40g±10g
9.3	High Temp	16 hours@80±2°C	Output variation <0.2%;
9.4	Low Temp	16 hours@-20±2°C	Output variation <0.2%;
9.5	Humid	2 hours@60±2°C, 90~95% RH	Output variation <0.1%;
9.6	Insulation Resistance	100ns by DC 500V Megohm meter, between Case & Ground	50MΩ
9.7	Dielectric Strength	1 minute, between Case & Ground	AC500V
9.8	PMS		
9.9	DIPi		
9.10	Shock	490 m/s <sup>2</sup> (50G), 11 ms	2 hrs each axis, total 18 hrs
9.11	Vibration	5 ~ 40Hz , Amplitude 1.5 mm; 40 ~ 200Hz , 49m/s <sup>2</sup> (5G)	2 hrs each axis, total 6 hrs
<b>10. ENVIRONMENTAL</b>		ROHS	Compliant
10.1	ESD; HUMAN	MIL-STD-883G Method 3015.7	(±)1000V ~ 4000V, Step : (±)500V
10.2	ESD; MACHINE	JEDEC EIA/JESD22-A115	(±)100V ~ 300V, Step : (±)50V
<b>11. COMMUNICATION PROTOCOL</b>			
11.1	Frame Format		
	Data Readout from EM35ARS017		
11.1.1	Request to encoder		
	Respond Data out from encoder		
	#Abbreviation	CF: Control Field; SF: Status Field; DF: Data Field	

	Details																																														
11.1.2	CF (Control Field)	<p>Start Bit: Fixed "0" Sink Code: Fixed "010" Data ID Code: Server sending request in one of the DATA ID CODE that lists in Table 1, then the specific responding data shown in Table 2 will be transmitted from encoder.</p> <p style="text-align: center;"><b>Table 1</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Request</th> <th rowspan="2">DATA ID</th> <th colspan="4">CODE</th> <th>Parity</th> </tr> <tr> <th>cc0</th> <th>cc1</th> <th>cc2</th> <th>cc3</th> <th>cc4</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Readout Data</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>2</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>3</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Reset</td> <td>8</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>Error Correction</td> <td>9</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> </tr> </tbody> </table> <p>Delimiter: Fixed "1"</p>	Request	DATA ID	CODE				Parity	cc0	cc1	cc2	cc3	cc4	Readout Data	0	0	0	0	0	0	2	0	1	0	0	1	3	1	1	0	0	0	Reset	8	0	0	0	1	1	Error Correction	9	1	0	0	1	0
	Request	DATA ID			CODE				Parity																																						
cc0			cc1	cc2	cc3	cc4																																									
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	3	1	1	0	0	0																																									
Reset	8	0	0	0	1	1																																									
Error Correction	9	1	0	0	1	0																																									
SF (Status Field)	<p>Start Bit: Fixed "0" dd0:dd3: "0000" , Reserved for future use ea0: "1" ,when error occurs. i.e., encoder counting error. (Mostly due to magnetic reasons) ea1: "1" , Reserved ca0:ca1: "00" , Reserved</p>																																														

Note\*:

When Communication alarm is occurred, the received data should be invalid, and transmit the same Request signal again. Check the Encoder and repower if necessary.

Delimiter: Fixed "1"

**Table 2**

DATA ID CODE	DF0	DF1	DF2	DF3	DF4	DF5	DF6	DF7
0	ABSA0	ABSA1	ABSA2					
2	ENID							
3	ABSA0	ABSA1	ABSA2	ENID	ABSA0	ABSA1	ABSA2	ALMC
8	ABSA0	ABSA1	ABSA2					
9	ABSA0	ABSA1	ABSA2	ALMC				

Note: Blank in above table means no data to be transmitted.

DF (Data Field)

ABSA0~ABSA2: Absolute data within single-turn revolution.

ENID: Encoder ID, Fixed "06H"

ALMC: Encoder Error Alarm

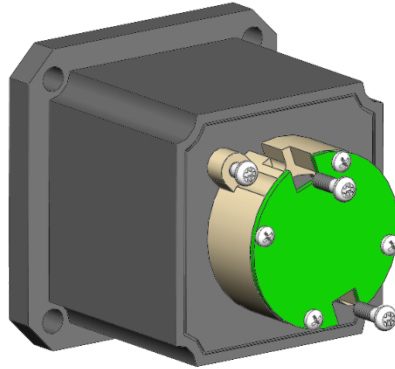
BIT	DF <sub>7</sub> 0	DF <sub>7</sub> 1	DF <sub>7</sub> 2	DF <sub>7</sub> 3	DF <sub>7</sub> 4	DF <sub>7</sub> 5	DF <sub>7</sub> 6	DF <sub>7</sub> 7
Error occurred	1	0	1	0	0	0	0	0

DF<sub>7</sub>0: when the rotation speed exceeding the upper limitation, this bit is set to high (1).

DF<sub>7</sub>2: Counting Error (CE), mostly caused by magnetic error.

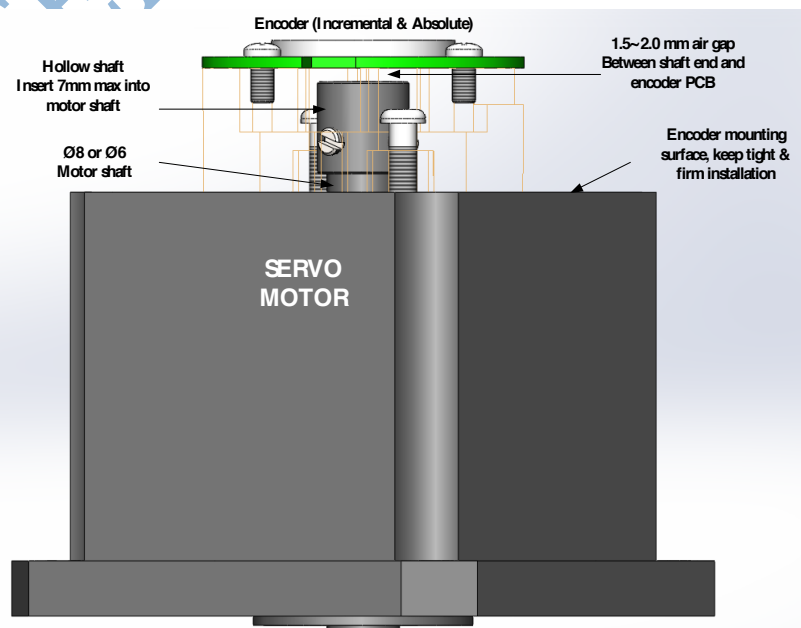
DF<sub>7</sub>0~DF<sub>7</sub>7: LSB first.

## 12. Appendix: The Installation



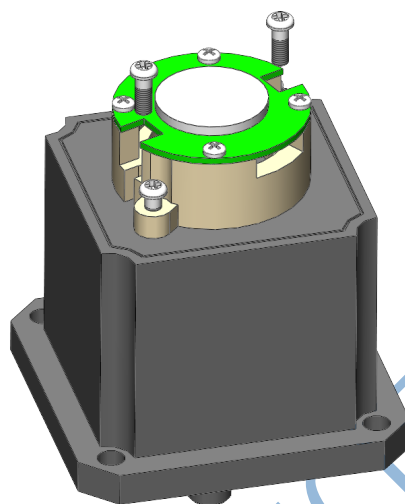
KEM encoder is usually using hollow shaft to allow motor shaft directly inserting in, no flexible mounting plate is needed.

Encoder is installed at the rear end of servo motor, shown as below pictures. The 8mm dia. motor shaft is standard and 6mm is optional. Insert the motor rear shaft into encoder's hollow shaft for 7mm depth, tighten the M3 hex screws into the hollow shaft after the neural position alignment, then firmly install the encoder mounting surface onto motor rear end by two M3 screws. An additional installation method is available for the 29mm mounting pitch, see above picture for reference.





After coupling the encoder hollow shaft with the rigid motor shaft, always fasten attached screws securely. Be sure to firmly tighten two hex-screws that located at encoder's hollow shaft, apply threads-lock glue and tightly screwed in for long-term use. Also follow above procedures for the encoder M3 screws when mounting the encoder onto servo motor.



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