Magnetic Integrated Technology

17 BIT SINGLE TURN ABSOLUTE ENCODER SPECIFICATION (Open Type)

FILE NO	KEM17S-OT V1.0
VER DATE	2022-4-5
ORG. RELEASE	2019-7-30

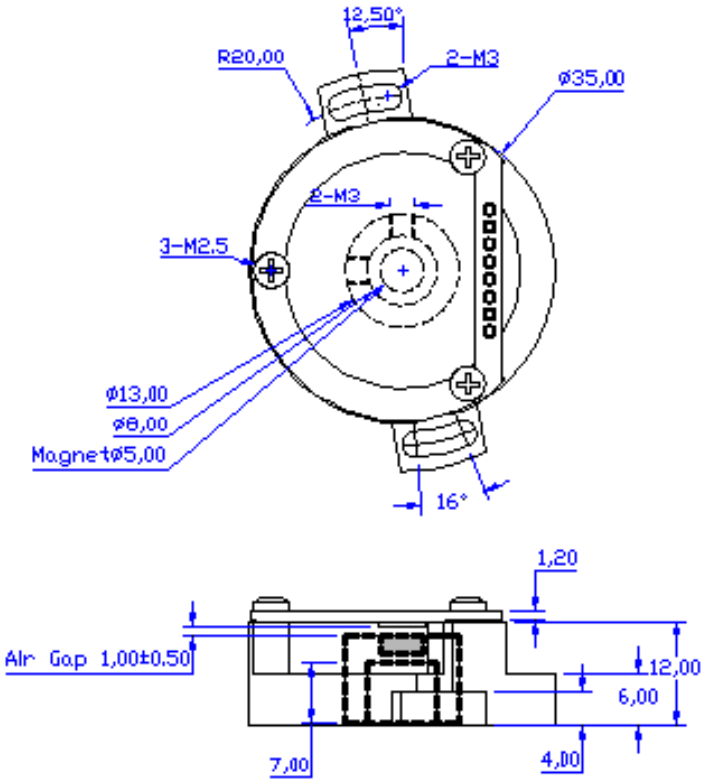
ITEM	MIT Ordering Information	CUSTOMER P/N
1	KEM17S-OT	NA

MODEL	PRODUCT DESCRIPTION	Encoder Assembly

KEM17S-OT	17 BIT ABSOLUTE ENCODER, SINGLE-TURN SEPARATE	Incl. 1000mm long, ø5.4mm cable with 4-AWG#28 wire & shielding

1. DIMENSIONS

1-1. OUTLINE DIMENSION



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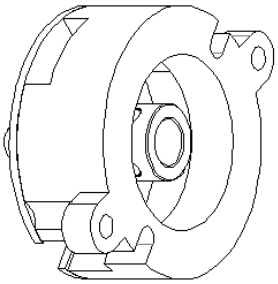
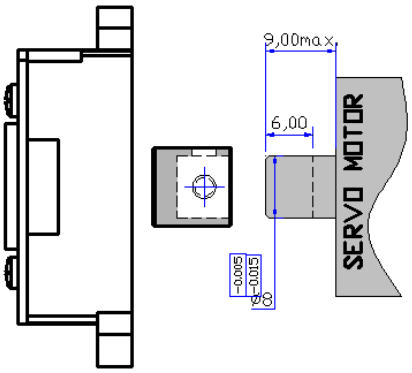
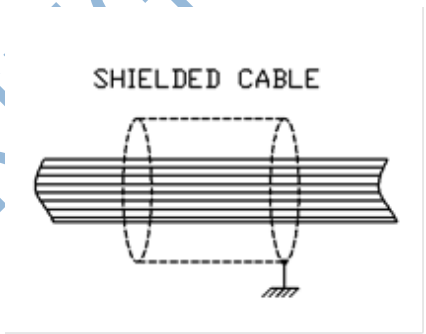
1-2. ENCODER HOLLOW SHAFT & MOTOR SHAFT INSTALLATION





Refer to Appendix for other details.

1-3. SHIELDING WIRE CONNECTION



2. WIRING DESCRIPTION

Cable Specification: ø5.4 shielded, 1000mm length, 4-AWG#28 wire.

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

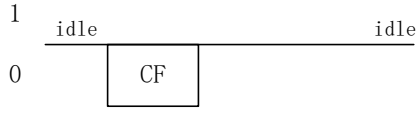
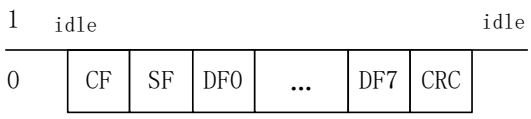
3. APPLICATION SCOPE	This encoder is suitable for servo motors for robot.
4. MODEL & DESCRIPTION	KEM17S-OT 17-bit Single-Turn Absolute Encoder
5. APPEARANCE	There shall be no remarkable damage in visual inspection. Products shall be judged by boundary samples if there are any doubts.
6. DIMENSIONS	REFER TO CLAUSE 1 OUTLINE DIMENSIONS

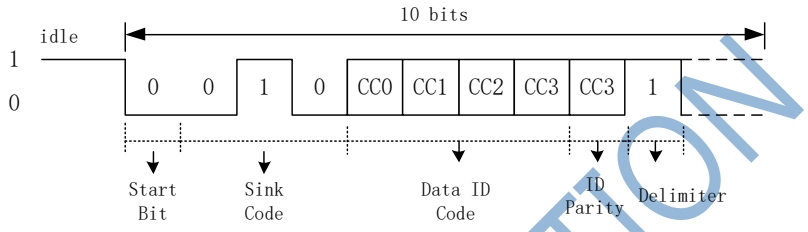
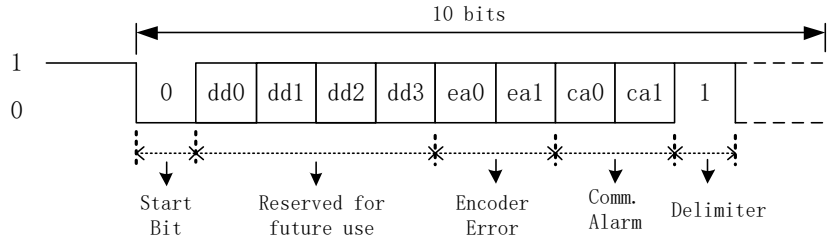
7. RATINGS

NO.	ITEM	CONDITION	SPECIFICATION
7.1	Operating Temp		Normal : -30℃ ~ +85℃ Special Model : -60℃ ~+85℃
7.2	Storage Temp		-20℃ ~ +85℃
7.3	Operating Voltage		5.0 ± 0.5 VDC

8. SPECIFICATION

8.1	Operating Type		Motor Shaft Operating
8.2	Resolution	Single Turn, 17-bit, 131, 072 absolute positions	
8.3	Output Signals	Pure Binary	
8.4	Rated Power		0.1W @ Vdd=5V for normal model.
8.5	Power-up Time		3ms max.
8.6	Consumption Current	@Vdd=5.0V, $T_A \leqslant$-30℃	500mA max.
8.7	Rotation Speed	RPM	⩽6K Recommended
8.8	Output Delay		5 μs
8.9	Output Digital Voltage	Push-pull (Iout=2mA)	High: $V_{OH} \geqslant 4.9V$ Low: $V_{LO} \leqslant 0.1V$
8.10	Magnet	NdFeB, N35~N40, supplied w/ encoder	Dimension Ø5x2 or Ø6x2; Radial Magnetized.
8.11	DATA MEMORY	EEPROM	762 bytes
8.12	Serial Communication	RS485	Communication rate 2.5Mbps

9. RELIABILITY			
9.1	Cycle Life		Infinitive
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/s2 (50G), 11 ms	2 hrs each axis, total 18 hrs
9.11	Vibration	5 ~ 40Hz , Amplitude 1.5 mm; 40 ~ 200Hz , 49m/s2 (5G)	2 hrs each axis, total 6 hrs
10. ENVIRONMENTAL		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
11. COMMUNICATION PROTOCOL			
11.1	Frame Format		
11.1.1	Data Readout from EM35ARS017		
	Request to encoder		
	Respond Data out from encoder		

	#Abbreviation	CF: Control Field; SF: Status Field; DF: Data Field CRC:CRC Field;(ALL is LSB first)
11.1.2	Details	
	CF (Control Field)	 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. **Table 1** **Request** / **DATA ID** / **CODE** (cc0 cc1 cc2 cc3) / **Parity** (cc4) Readout Data — 0X02: 0 0 0 0 0 Readout Data — 0X92: 0 1 0 0 1 Readout Data — 0X1A: 1 1 0 0 0 Reset — 0XC2: 0 0 0 1 1 Error Correction — 0X4A: 1 0 0 1 0 Delimiter: Fixed "1"
	SF (Status Field)	 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

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”

DF (Data Field)

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.

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

ABSA0：Always 0;

ENID: Encoder ID, Fixed “06H”

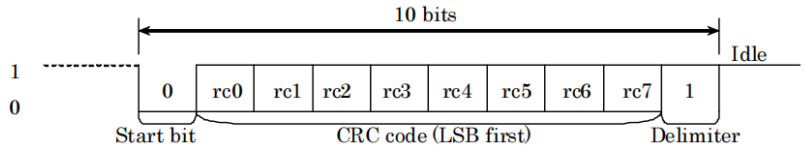
ALMC: Encoder Error Alarm

BIT	DF_70	DF_71	DF_72	DF_73	DF_74	DF_75	DF_76	DF_77
Error occurred	1	0	1	0	0	0	0	0

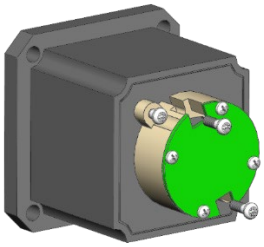
DF_70: when the rotation speed exceeding the upper limitation, this bit is set to high (1).

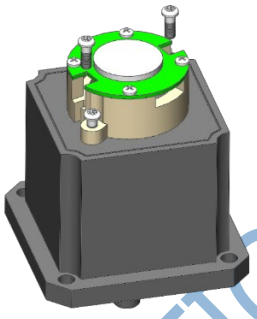
DF_72: Counting Error (CE), mostly caused by magnetic error.

DF_70~DF_77: LSB first.

	CRC(CRC Field)	The structure of CRC field is shown in Fig. 10.  **Fig. 10 Structure of CRC Field** (1) Start bit: Fixed. (2) CRC code: This code conforms with the equation of $G(X) = X^8 + 1$ (X = rc0 ～ rc7). The data is arranged in LSB first. The code is calculated from all bits without Start bit and Delimiter, of all fields except CRC field. (3) Delimiter: Fixed.

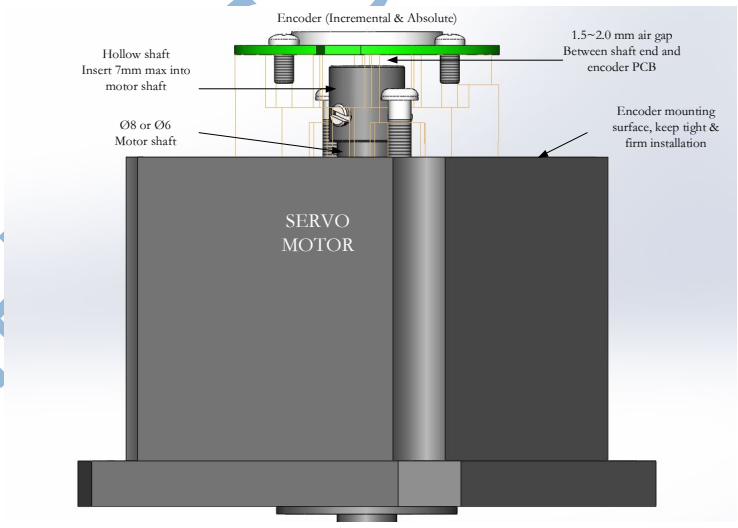
12. Appendix: The Installation





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 encoders 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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