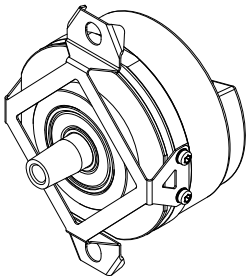
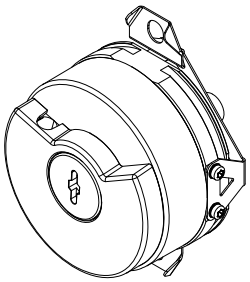
1. ST58 Sin/Cos Incremental Optical Encoder (Tapered Shaft)

1.1 Introduction：

ST58 is a rotary encoder installed in the motor. It can output 1Vpp 1024 or 2048 sin/cos periodic signals and 1Vpp absolute position value. Incremental digital signals TTL/HTL can also be selected. It is installed with expansion flange, which is simple to install. The product has a compact structure and high safety. It is widely used in elevators and high-resolution segments.

ST58





1.2 Feature：

- Encoder external diameter Ø58mm、thickness 38.2mm、diameter of shaft of Ø9.25mm (taper 1:10)；
- Bulit-in bearing, expansion flange installation;
- Adopting non-contact photoelectric principle;
- 1Vpp (analog signal): can output 2048 lines of 1Vpp and 1Vpp absolute position value per cycle;
- 1Vpp (analog signal + digital signal): can output 1024 or 2048 lines of 1Vpp and 1Vpp absolute position value per cycle;
- Incremental (digital signal): can output up to 32768 PPR per cycle;
- Reverse polarity protection ;
- Short circuit protection.

1.3 Application：

Elevator, motor, CNC and other automation control fields.

1.4 Connection：

- 1Vpp analog signal (PCB connector, 14pin);
- Analog + digital signal after generation (PCB connector, 12pin);
- Analog + digital signal before generation (PCB connector, 12pin);
- Incremental digital signal (PCB connector, 12pin).

1.5 Protection：

IP 40（after installation）

1.6 Weight：

About 240g

2. Model Selection Guide

Model composition(select parameters)

ST58-	S	2048			–	000
Product model series	Output signal： SIN/COS: S=1Vpp (differential) AS=After generation (differential) BS=Before generation (differential) Incremental No.： L=TTL (differential) H=HTL (differential)	Resolution PPR： SIN/COS：(1Vpp) 2048 SIN/COS： (after generation/ before generation) 1024； 2048 Incremental: TTL/HTL 500； 512； 1000； 1024； 2000； 2048； 2500； 3600； 4000； 4096； 5000； 7200； 8000； 8192； 10000； 16000； 16384； 32000； 32768	Supply voltage: Blank=DC5V H=DC8-30V	Sepcial specifications		Management No.

3. Technical Parameter

3.1 Electrical parameter

Parameter / Signal / Item	1Vpp (Analog signal)	After generation (Analog + digital)	Before generation (Analog + digital)	TTL	HTL
Supply voltage	DC5V±0.25V; DC8V-30V±0.25V			DC5V±0.25V	DC8V-30V±0.25V
Current consumption	≤130 mA (No load)				
Resolution	2048 (line No.)	1024 & 2048 (line No.)		500～32768PPR	
Interface (A & B)	∿ 1Vpp		∿ 0.5Vpp	⊓⊔	
Position value/RPM	Z1 track			–	
Incremental signal	∿ 1Vpp	–		–	
Reference point signal	One				
Cut-off frequency -3 dB	≥210 kHz			–	
System accuracy	2048±20″	1024±60″; 2048±20″		1/8T	
Electrical connection	PCB connector, 14-pin	PCB connector, 12-pin		PCB connector,12-pin	
Allowable ripple	–			≤3%rms	
Max. response frequency	–			≤300KHz	≤500KHz
Output current	–			≤±20mA	≤±50mA
Output voltage "H"	–			≥2.5V	≥Vcc-3 VDC
Output voltage "L"	–			≤0.5V	≤ 1V VDC
Phase shift between A & B	90°±10° potential angle (at low speed frequency)				
	90°±20° potential angle (at high speed frequency)				
Mark to space ratio	45% to 55%				
Rise & Fall time	–			Less than 1us(Cable length：2m)	
Reverse polarity protection	✔				
Short-circuit protection	–				✔❶
Insulation strength	AC500V 60s				
Insulation resistance	10MΩ				
GND	Not connect to encoder				

❶ Short-circuit to another channel, permitted for max 30s.

3.2 Mechanical parameter

Diameter of shaft	Tapered shaft Ø9.25mm; taper 1:10
Material of shaft	Stainless steel
Starting torque	≤0.01 Nm (at 20˚C)
Moment of inertia	$2.6 \cdot 10^{-6}$ kgm²
Allowable shaft force	Radial 30N; Axial 20N
Allowable static shaft displacement	±0.13mm (radial) ； ±0.50mm (axial)
Allowable dynamic shaft displacement	±0.13mm (radial) ； ±0.50mm (axial)
Mechanical allowable speed	≤15000 min^{-1}
Operating speed	≤6000min^{-1} ❶
Bearing life	$3.6x10^{9}$ ❷
Housing material	Aluminum alloy
Weight	About 240g

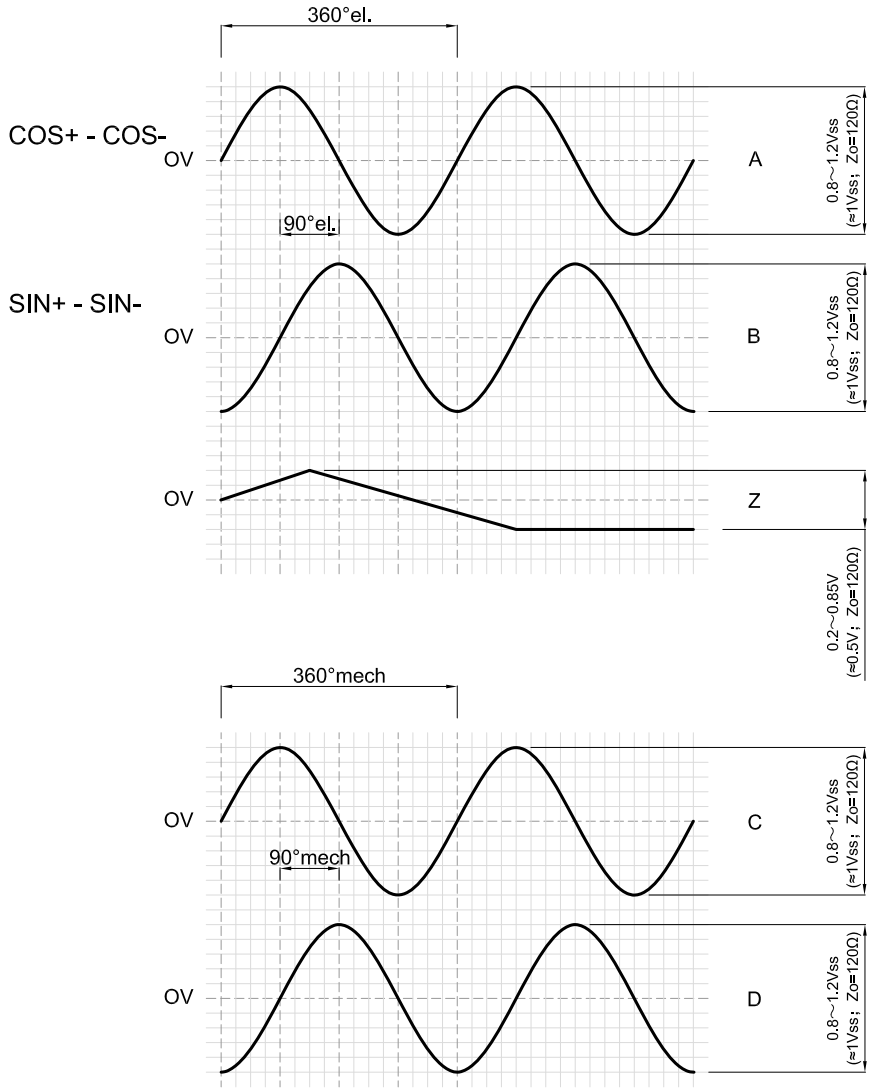
❶. Compatible with self-heating of approximately 3.0K/1000min^{-1} in the permissible operating temperature range.
❷. At maximum speed and temperature.

3.3 Environment parameter

Enclosure protection grade	IP40(after installation)
Permitted relative humidity	35～85%RH（no condensation）
Operating temperature range	-40°C...+115°C
Storage temperature range	-40°C...+115°C
Shock resistance	≤1000 m/s² (6ms)
Frequency range of vibration resistance	≤300 m/s² (55-2000 Hz)

4. Output Waveform

4.1 1Vpp sin incremental signal

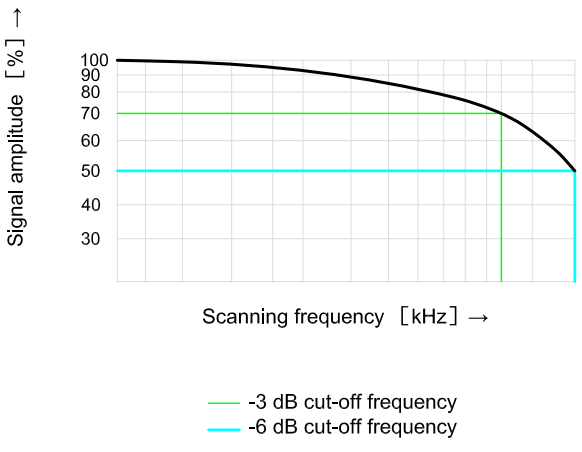


Shaft that rotates clockwise when viewed from the shaft end. (see dmensional drawing)

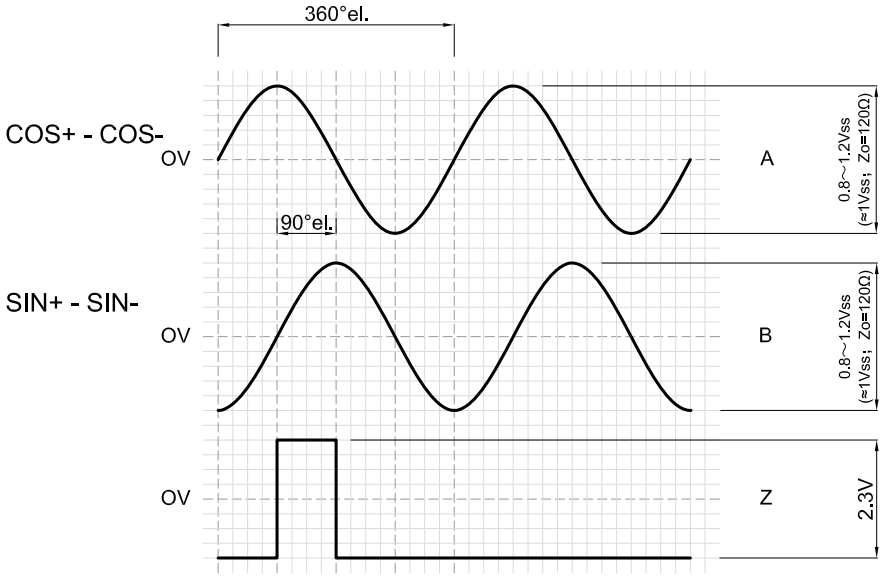
CW direction →

4.2 Cut-off frequency

Typical signal amplitude and scanning frequency relationship curve



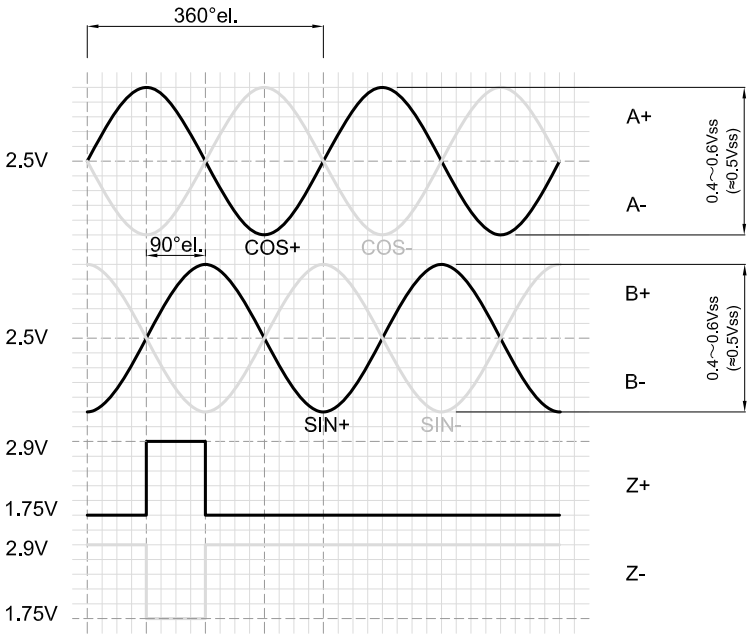
4.3 Incremental signal SIN/COS after differential generation



Clockwise rotation of the shaft as viewed from the shaft end (see dmensional drawing)

CW direction

4.4 Incremental signal SIN/COS before differential generation



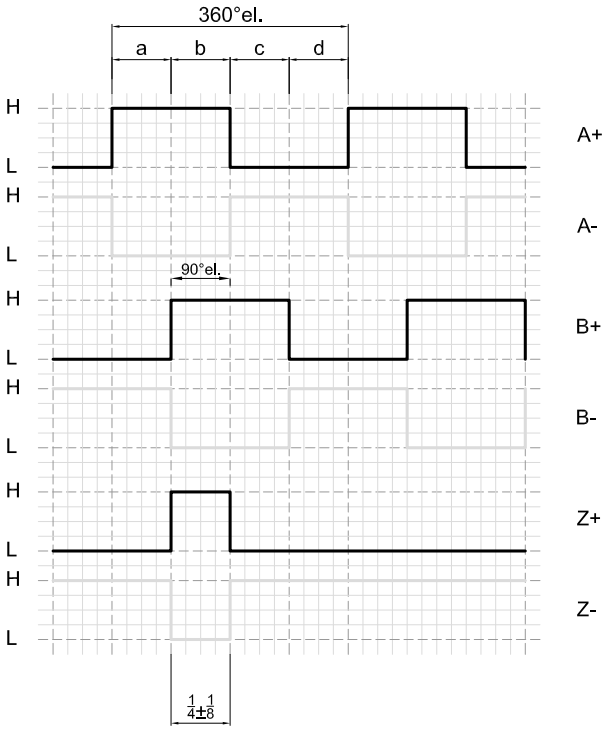
Clockwise rotation of the shaft as viewed from the shaft end (see dmensional drawing)

CW direction

4.5 Basic parameter table before and after generation

Supply voltage	Signal	Interface signals	Interface signals after differential generation		Interface signals before differential generation	
			Output	Signal offset	Output	Signal offset
DC5V; DC8V...30V	A+ A- B+ B-	Analog,differential	SIN/COS 1.0 Vss	0V±10%	0.5Vss±20%	2.5V±10%
	Z+ Z-	Digital,differential	High:1.15V±15%, Low:-1.15V±15%		High:2.9V±15%, Low:1.75V±15%	

4.6 TTL/HTL differential incremental signal

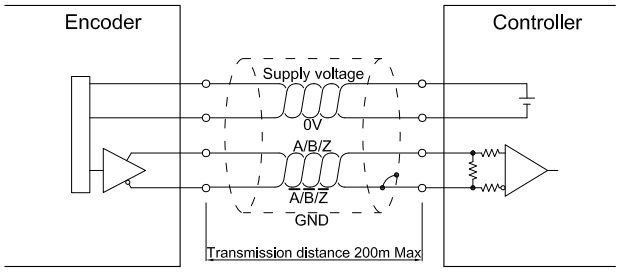


a.b.c.d=$\frac{T}{4}\pm\frac{T}{8}$

Phase A is ahead of B by $\frac{T}{4}\pm\frac{T}{8}$, viewing from shaft end, direction is clockwise rotation.
(See dimensional drawings)

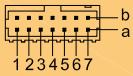
CW direction →

5. Electrical Interface

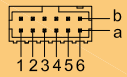


6. Connection Definition Table of PCB Connector

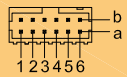
6.1 1Vpp sin/cos incremental signal

	Supply voltage				Incremental signal									
PCB connector (pin No.)	1b	7a	5b	3a	6b	2a	3b	5a	4b	4a	7b	1a	2b	6a
Function	Up	Sensor Up	OV	Sensor OV	A+	A−	B+	B−	Z+	Z−	C+	C−	D+	D−

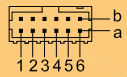
6.2 Sin/cos interface incremental signals after differential generation

	Supply voltage				Incremental signal							
PCB connector (pin No.)	2a	2b	1a	1b	6a	6b	5a	5b	4a	4b	3a	3b
Function	Up	Sensor Up	OV	Sensor Up	A+	A−	B+	B−	Z+	Z−	/	/

6.3 Sin/cos interface incremental signals before differential generation

	Supply voltage				Incremental signal							
PCB connector (pin No.)	2a	2b	1a	1b	6a	6b	5a	5b	4a	4b	3a	3b
Function	Up	Sensor Up	OV	Sensor Up	A+	A−	B+	B−	Z+	Z−	/	/

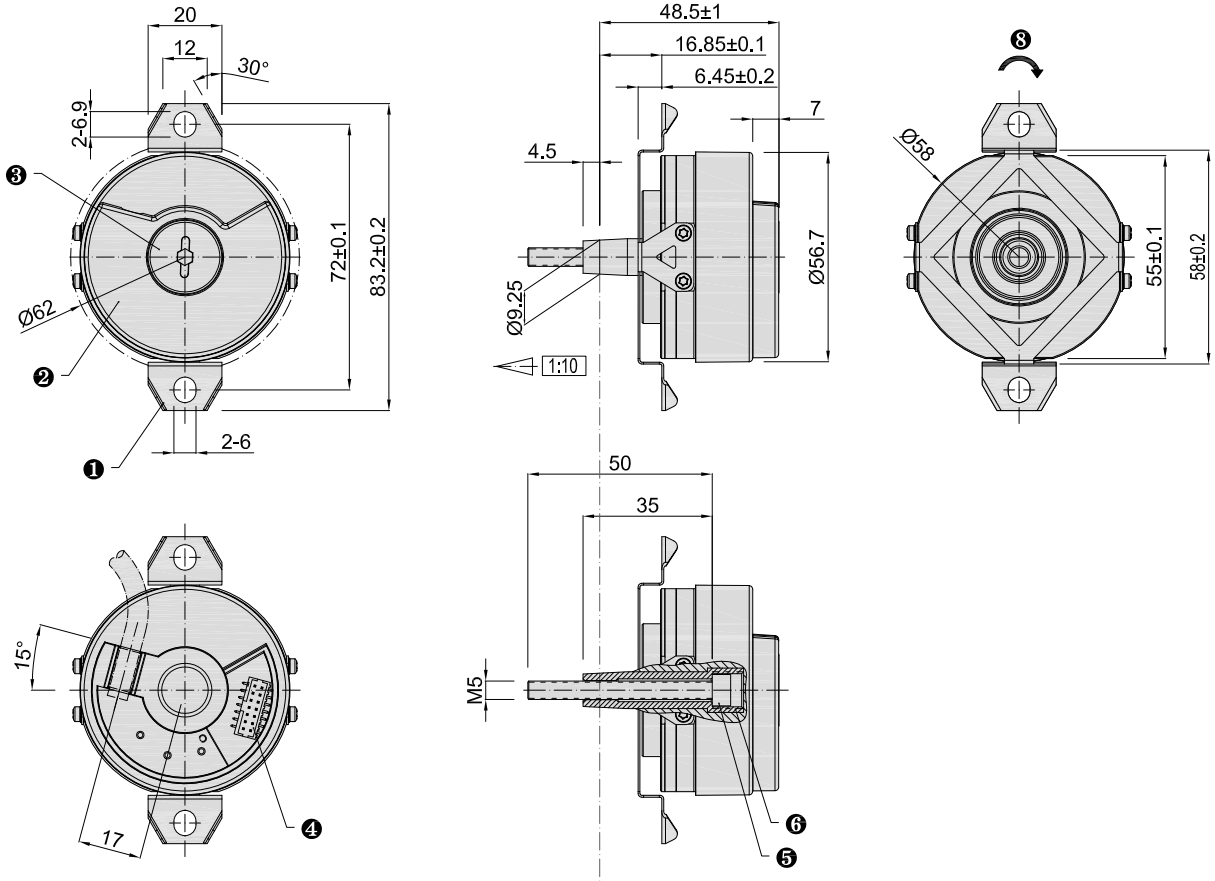
6.4 TTL/HTL differential digital incremental signal

	Supply voltage				Incremental signal							
PCB connector (pin No.)	2a	2b	1a	1b	6a	6b	5a	5b	4a	4b	3a	3b
Function	Up	Sensor Up	OV	Sensor Up	A+	A−	B+	B−	Z+	Z−	/	/

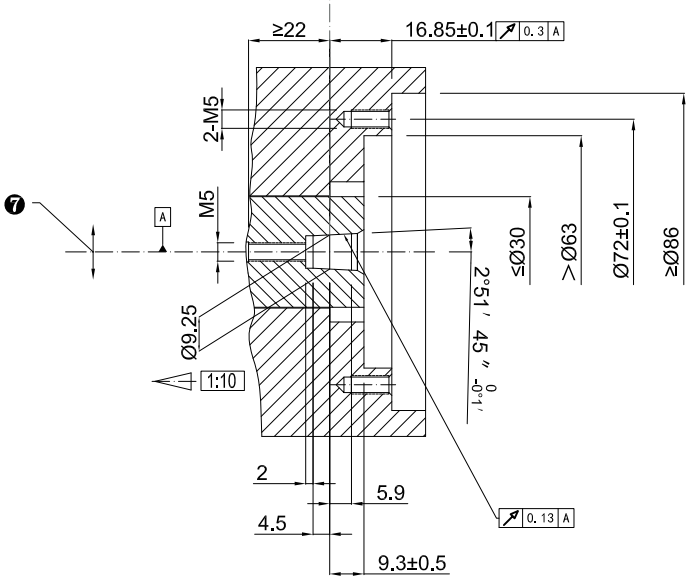
Up=Power supply voltage positive.
The shielded wire is not connected to the internal circuit of the encoder.

7. Basic Dimension

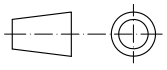
7.1 Dimension



7.2 Mounting shaft requirement



Unit: mm



❶ = Spring plate model No. 58Z72
❷ = Die-cast cover
❸ = Sealed cover
❹ = PCB connector
❺ = Bolt M5*50
❻ = Screw hole M10
❼ = Mounting tolerance and thermal expansion compensation, dynamic movement is not allowed
❽ = Shaft rotation direction for incremental signal output

8. Caution

8.1 Caution for operation

- The working temperature shall not exceed the storage temperature.
- The working humidity shall not exceed the storage humidity.
- Do not use where the temperature changes dramatically and have fog.
- Do not close to corrosive and flammable gas.
- Keep away from dust,salt and metal powder.
- Keep away from places where you will use water, oil, or medicine.
- Undue vibration and shock will impact the encoder.

8.2 Caution for Installation

- Electrical components should not be subjected to excessive pressure, etc., and electrostatic assessment of the installation environment should be conducted.
- Do not close the cable of the motor power to the encoder.
- The FG wire of the motor and mechanical device should be grounded.
- The shielding wire must be effectively grounded since the shielding is not connected to the encoder.

8.3 Caution for wiring

- Use the encoder under the specified supply voltage. Please note that the supply voltage range may drop due to the wiring length.
- Do not put the encoder wiring and other power lines through the same duct, and do not use them by bundling in parallel.
- Please use twisted pair wires for the signal and power wires of encoder.
- Please do not apply excessive force to the cable of encoder, or it will may be damaged.