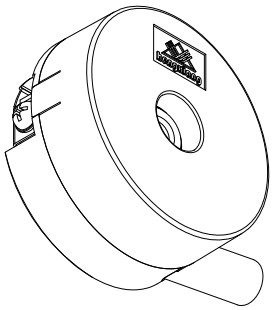
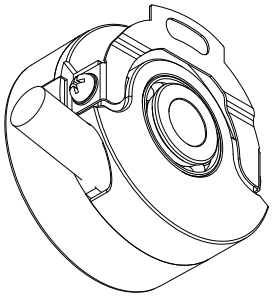
1. KN35 Incremental Optical Encoder (Hollow shaft)





1.1 Introduction:
KN35 is an ultra-thin multi-shaft type encoder with compact structure and miniaturization which is commonly used in servo motors and industrial automations.

1.2 Feature:
- Encoder external diameter Ø35mm、thickness 18mm、diameter of shaft up to Ø8mm;
- Adopt non-contact photoelectric principle;
- Reverse polarity protection;
- Short circuit protection;
- Multiple electrical interfaces available;
- Resolution per turn up to 32768PPR.

1.3 Application:
Servo motor, elevator, CNC and other automation control fields.

1.4 Connection:
- Radial cable (standard length 0.5M)

1.5 Protection:
IP40

1.6 Weight:
about 80g

2. Model Selection Guide

2.1 Model composition(select parameters)

KN35- | **J** | **6** | **C** | **1024** | **B8** | | | **-** | **000**

- **KN35-**: Product model series
- **J**: Connection method: J=Radial cable
- **6**: Output phase:
  1=A
  2=A+B
  3=A+B+Z
  (See table 1 for wiring)
  4=A+$\overline{A}$+B+$\overline{B}$
  6=A+B+Z
  +$\overline{A}$+$\overline{B}$+$\overline{Z}$
  (See table 2 for wiring)
  For servo motor:
  6=Less wiring type
  (See table 3 for wiring)
  12=A/$\overline{A}$/B/$\overline{B}$/Z/$\overline{Z}$/U/$\overline{U}$/V/$\overline{V}$/W/$\overline{W}$
  (See table 4 for wiring)
- **C**: Electrical interface:
  N=OC(NPN)❶
  NH=OC(NPN)❷
  P=OC(PNP)❶
  PH=OC(PNP)❷
  V=Voltage❷
  VL=Voltage❶
  F=Push-pull❶
  FH=Push-pull❷
  C=TTL (26LS31)
  E=HTL
  L=TTL (26C31)
  S=TTL(Less wiring type)
- **1024**: Resolution PPR:
  120; 250;
  360; 400;
  500; 720;
  800; 900;
  1000; 1024;
  1440; 1600;
  1800; 2000;
  2048; 2500;
  2500; 3600;
  4000; 4096;
  5000; 7200;
  8000; 8192;
  10000; 14400;
  16000; 16384;
  20000; 28800;
  32000; 32768
  For servo motor:
  Resolution/pole
  1000/4, /6, /8;
  1024/4, /6, /8;
  2048/4, /6, /8;
  2500/4, /6, /8;
  4096/4, /6, /8;
  5000/4, /6, /8;
- **B8**: Diameter of shaft:
  (Blind hole)
  B6=Ø6mm
  B8=Ø8mm
  (Through hole)
  Q6=Ø6mm
  Q8=Ø8mm
  (Hollow taper shaft)
  Z7=Ø7mm
  (Taper 1:10)
- (blank): Supply voltage:
  Blank=DC5V
  H=DC8-30V
- (blank): Special requirement:
  Blank=❸
- **000**: Management No.

2. 2 Note

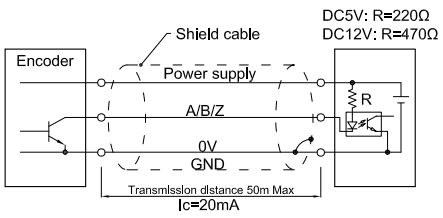
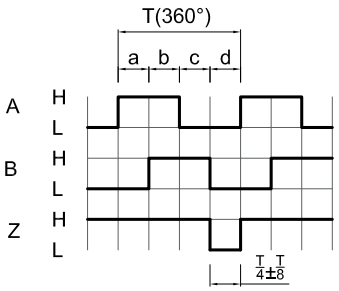
❶. Z signal is low level active.

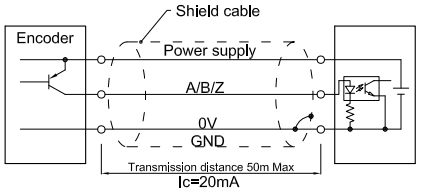
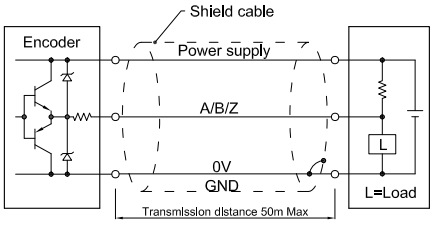
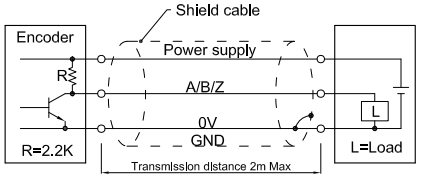
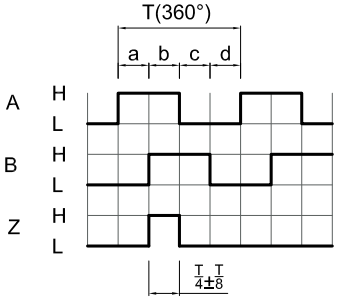
❷. Z signal is high level active.

❸. None indicated for IP40 and cable length of 0.5M, if need to change the length C+number, the longest is 100M (expressed by C100). For the specific length of use, pls refer to page 2 of the provision of output circuit.

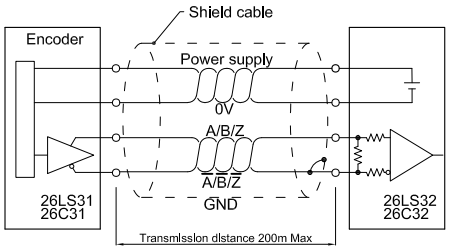
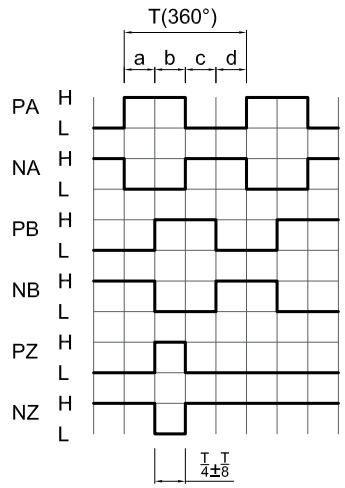
3. Output Mode

3.1 Incremental signal

<table>
<tr><th>Electrical interface</th><th>Output circuit</th><th>Output wave form</th></tr>
<tr><td>OC
NPN
open collector circuit</td><td> 
</td><td rowspan="3"> 

a.b.c.d=T/4±T/8
Phase A is ahead of B by T/4±T/8, viewing from shaft end, direction is clockwise rotation.
(See dimensional drawings)
CW direction
Z signal is low level active</td></tr>
<tr><td>OC
PNP
open collector circuit</td><td> 
</td></tr>
<tr><td>Push-pull</td><td> 
</td></tr>
<tr><td>Voltage</td><td> 
</td><td> 

a.b.c.d=T/4±T/8
Phase A is ahead of B by T/4±T/8, viewing from shaft end, direction is clockwise rotation.
(See dimensional drawings)
CW direction
Z signal is high level active</td></tr>
<tr><td>TTL
(DC5V)

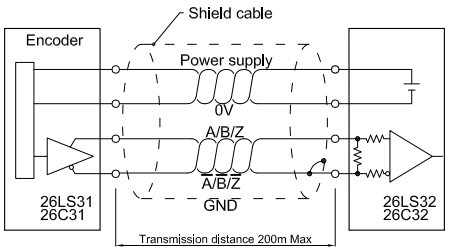
HTL
(DC8-30V)</td><td> 
</td><td> 

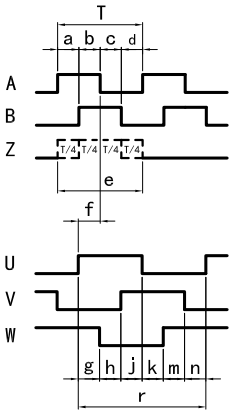
a.b.c.d=T/4±T/8
Phase A is ahead of B by T/4±T/8, viewing from shaft end, direction is clockwise rotation.
(See dimensional drawings)
CW direction</td></tr>
</table>

3.2 For servo motor(with UVW）

Electrical interface	Output circuit	Output wave form

TTL (DC5V)





Reverse signal not shown

pole	g.h.j.k.m.n	r
4	30±1°	180°
6	20±1°	120°
8	15±1°	90°

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

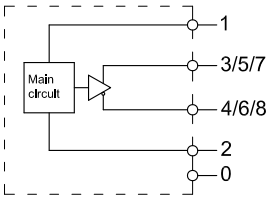
e=$T\pm\frac{T}{2}$

f: center of phase Z to rise point of phase U,that is ±1°

CCW direction ⟶

Viewed from shaft end when installing.
(See dimensional drawings)

TTL (DC5V) (Less wiring type)



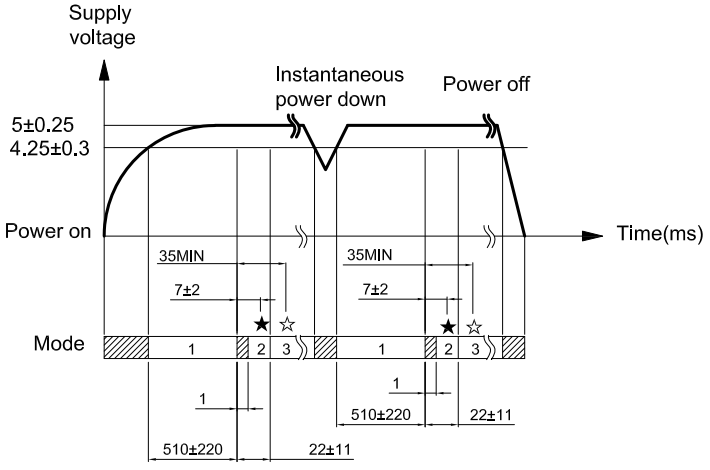
26LS31, 26C31
Transmission distance 200m Max

No.	Function / Color	Mode 1	2	3
3	white	HZ	U	A
4	white/ black	HZ	$\overline{U}$	$\overline{A}$
5	green	HZ	V	B
6	green/ black	HZ	$\overline{V}$	$\overline{B}$
7	yellow	HZ	W	Z
8	yellow/ black	HZ	$\overline{W}$	$\overline{Z}$
1	red	DC+5V		
2	black	OV		
0	shielding	GND		

Symbol signification

★: indicate position of UVW channel
☆: position to start counting ABZ channel
▨: non-using zone
HZ: high impedance

Timing Chart



4. Electrical Parameters

Parameter / Output type / Item			OC	Voltage	Push-pull	TTL	TTL (Less wiring type)	HTL
Supply voltage			DC+5V±5%；DC8V-30V±5%			DC+5V±5%		DC8-30V±5%
Consumption current			100mA Max			120mA Max		
Allowable ripple			≤3%rms					
Top response frequency			100KHz			300KHz		500KHz
Output capacity	Output current	Input	≤30mA	Load resistance 2.2K	≤30mA	≤±20mA		≤±50mA
		Output	—		≤10mA			
	Output voltage	"H"	—	—	≥[(Supply voltage) -2.5V]	≥2.5V		≥Vcc-3 VDC
		"L"	≤0.4V	≤0.7V(less than 20mA)	≤0.4V(30mA)	≤0.5V		≤ 1V VDC
	Load voltage		≤DC30V	—		—		
Rise & Fall time			Less than 2us(cable length：2m)			Less than 1us(Cable length：2m)		≤100ns
Insulation strength			AC500V 60s					
Insulation resistance			10MΩ					
Mark to space ratio			45% to 55%					
Reverse polarity protection			✔					
Short-circuit protection			—		✔①			
Phase shift between A & B			90°±10° (frequency in low speed)					
			90°±20° (frequency in high speed)					
Delay motion time ②			—				510±220ms	—
GND			Not connect to encoder					

① Short-circuit to another channel or GND permitted for max.30s.
② Phase A.B.Z are back of phase U.V.W when power on.

5. Mechanical Specifications

Diameter of shaft	Ø6mm; Ø8mm; Ø7mm Taper shaft (optional)
Starting torque	Less than 5.9×10^{-3}N·m
Inertia moment	Less than 1.5×10^{-6} kg·m²
Shaft load	Radial 30N; Axial 20N
Slew speed	≤5000 rpm
Bearing Life	$1.5X10^{9}$ revs at rated load(100000hrs at 2500RPM)
Shell	Aluminium alloy
Weight	about 80g

6. Environmental Parameters

Environmental temperature	Operating:—20～+85°C(repeatable winding cable: -10°C); Storage:—20～+90°C
Environmental humidity	Operating and storage：35～85％RH(noncondensing)
Vibration(Endurance)	Amplitude 0.75mm,5~55Hz,2h for X,Y,Z direction individually
Shock(Endurance)	490m/s² 11ms three times for X,Y,Z direction individually
Protection	IP40

7. Wiring Table

7.1 OC/Voltage/Push-pull (Table 1)

	Supply voltage		Incremental signal		
Wire color	Red	Black	White	Green	Yellow
Function	Up	0V	A	B	Z

7.2 TTL/HTL (Table 2)

	Supply voltage		Incremental signal					
Wire color	Red	Black	White	White/BK	Green	Green/BK	Yellow	Yellow/BK
Function	Up	0V	A+	A-	B+	B-	Z+	Z-
Twisted-paired cable								

7.3 Less wiring type (Table 3)

	Supply voltage		Incremental signal					
Wire color	Red	Black	White	White/BK	Green	Green/BK	Yellow	Yellow/BK
Function	Up	0V	A+ (U+)*	A- (U-)*	B+ (V+)*	B- (V-)*	Z+ (W+)*	Z- (W-)*
Twisted-paired cable								

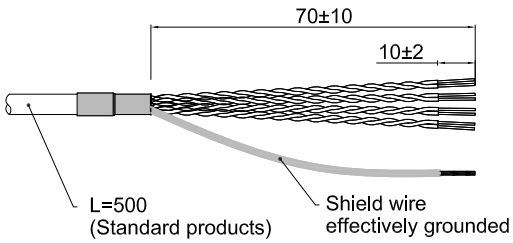
* For the functional status in less wiring mode, refer to the functional mode wiring table for output circuit on page3.

7.4 For servo motor （Table 4）

	Supply voltage		Incremental signal											
Wire color	Red	Black	White	White/BK	Green	Green/BK	Yellow	Yellow/BK	Blue	Blue/BK	Grey	Grey/BK	Pink	Pink/BK
Function	Up	0V	A+	A-	B+	B-	Z+	Z-	U+	U-	V+	V-	W+	W-
Twisted-paired cable														

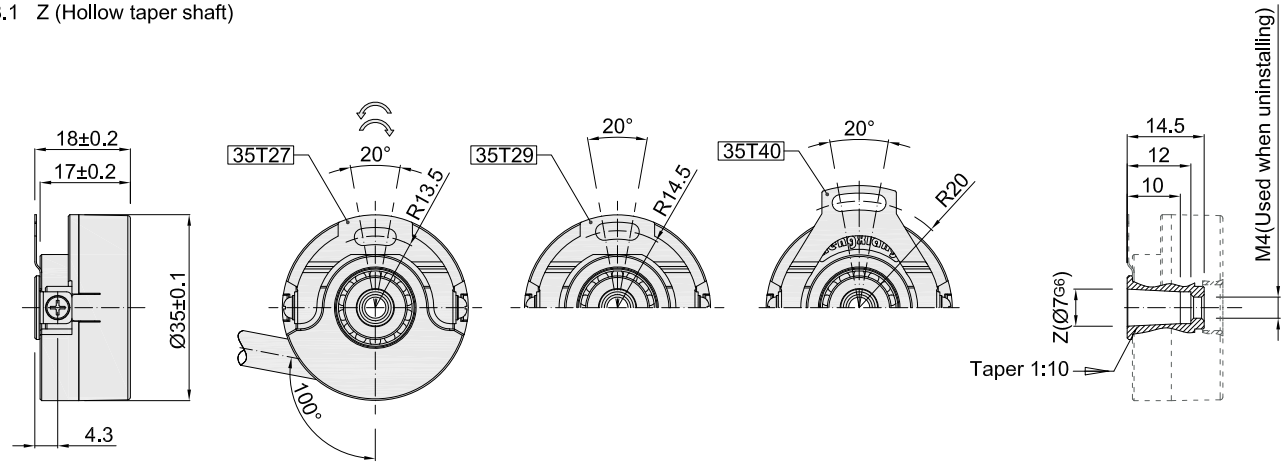
Up=Supply voltage.
Shield wire is not connected to the internal circuit of encoder.

Cable connection

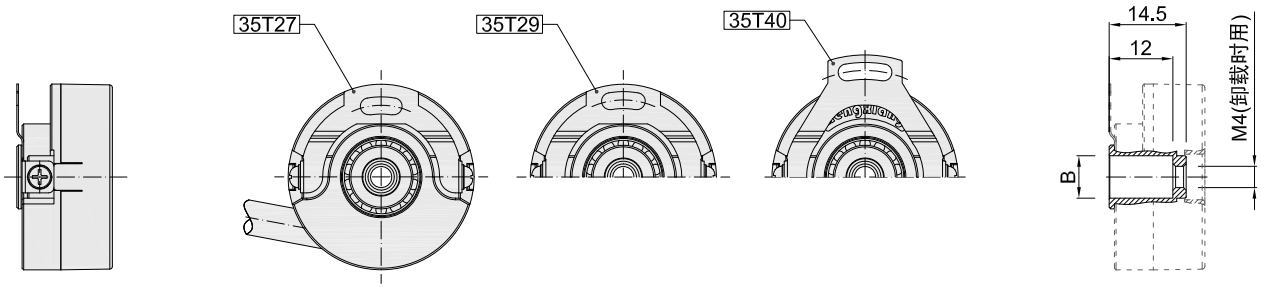


8. Basic Dimensions

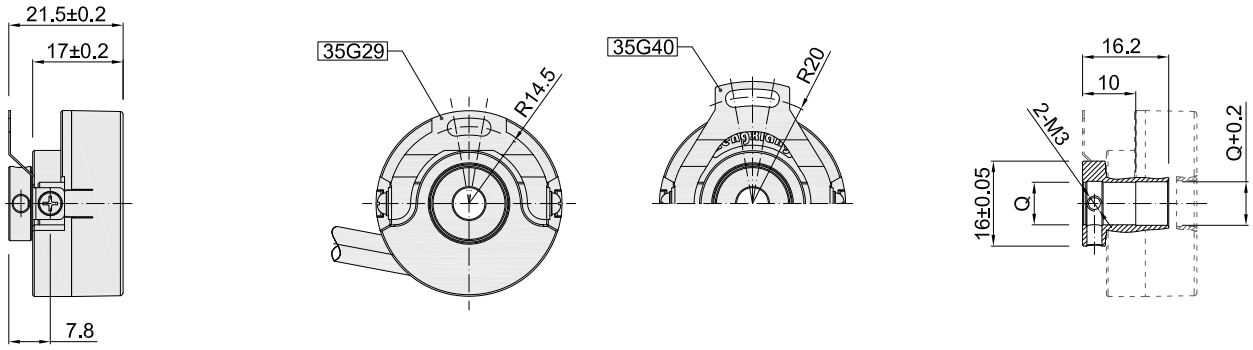
8.1 Z (Hollow taper shaft)



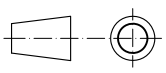
8.2 B (Blind shaft)



8. 3 Q（Through shaft）



单位：mm



= Direction of shaft rotation for incremental signal output

= Direction of shaft rotation for servo motor-specific signal output

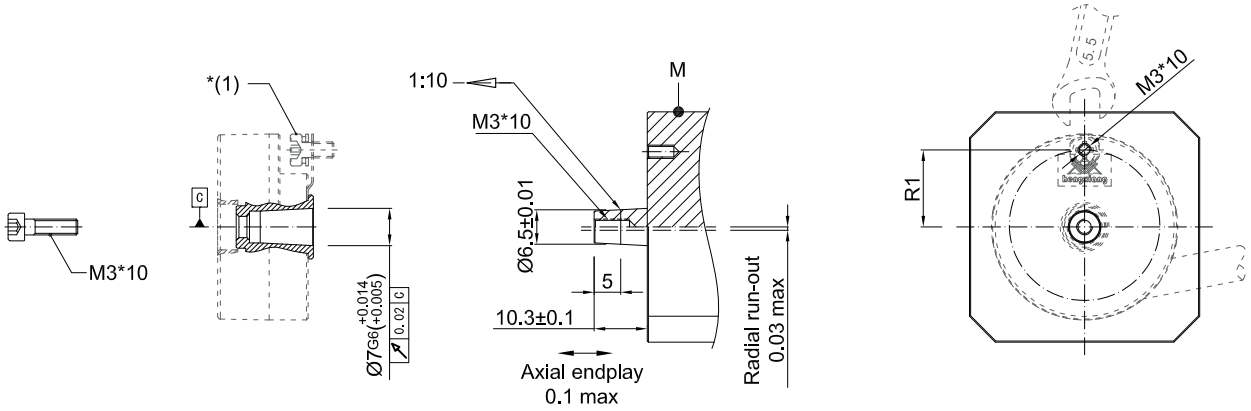
35T27 35T29 35T40 35G29 35G40 = Leaf Spring (Please refer to the specifications 9)

About vibration

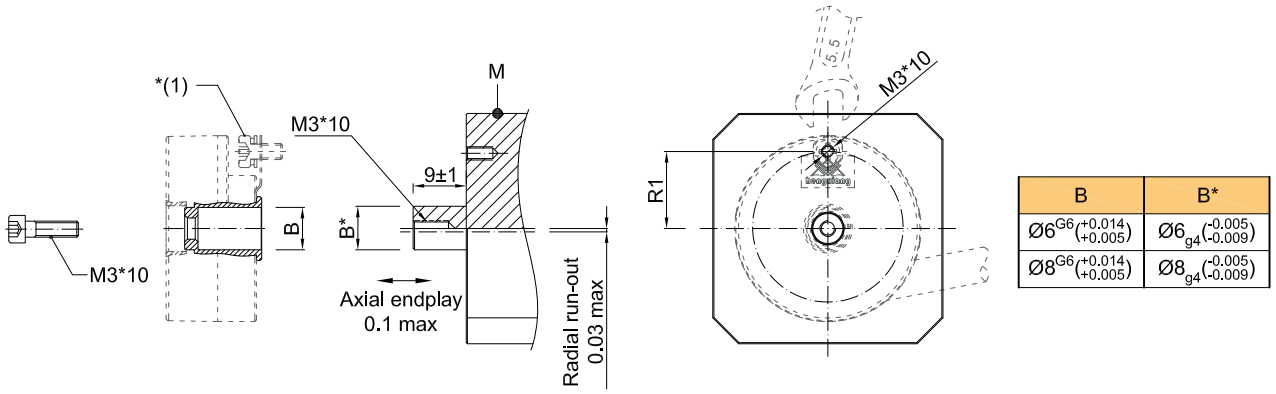
Vibration act on encoder always cause wrong pulse, so we should pay attention to working place.More pulse per revolution, narrower groovy spacing of grating, more effect to encoder by vibration, when rev is low or stop, vibration act on shaft or main body would cause grating vibrating, so encoder might make wrong pulse.

9. Mounting shaft requirements

9.1 Z (Taper hole)

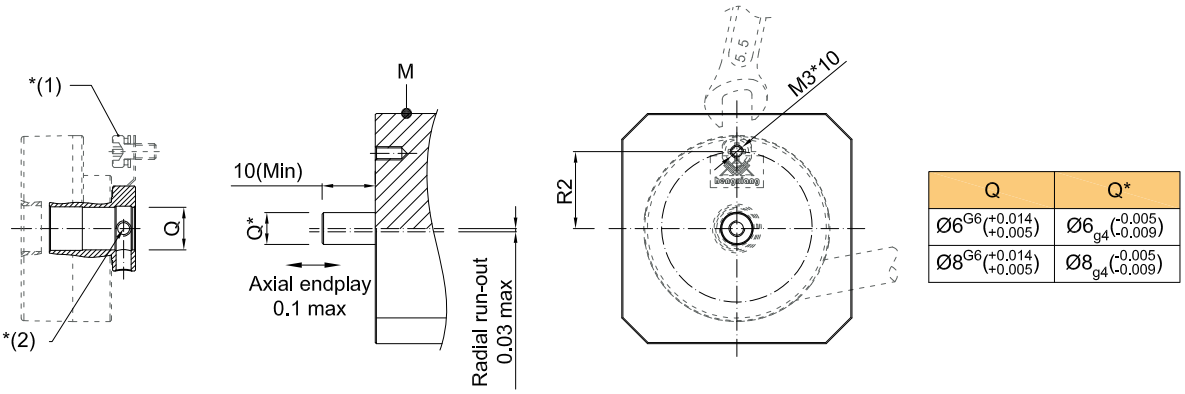


9.2 B (Blind hole)



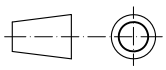
B	B*
Ø6G6(+0.014 +0.005)	Ø6g4(-0.005 -0.009)
Ø8G6(+0.014 +0.005)	Ø8g4(-0.005 -0.009)

8.3 Q(Through shaft)



Q	Q*
Ø6G6(+0.014 +0.005)	Ø6g4(-0.005 -0.009)
Ø8G6(+0.014 +0.005)	Ø8g4(-0.005 -0.009)

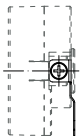
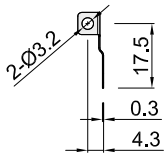
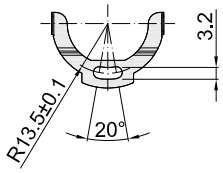
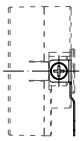
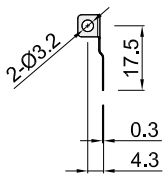
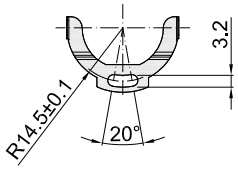
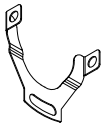
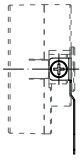
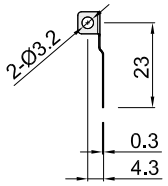
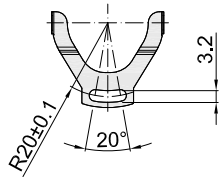
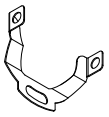
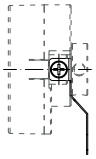
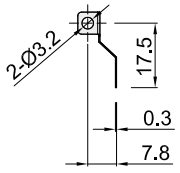
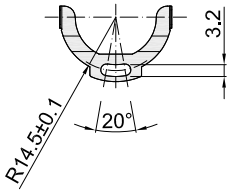
Unit: mm



M = Motor

Note:
*(1): Outer hexagon screw M3*10 with flat gasket and spring ring is recommended to use
*(2): Apply threadglue to the surface of the two M3*3 screws Tightening force is 0.6N.m
R1: R13.5±0.1 & R14.5±0.1 & R20±0.1(Choose the spring plate to determine the installation size)
R2: R14.5±0.1 & R20±0.1(Choose the spring plate to determine the installation size)

10. Accessory (Spring plate options)

35T27 No:03700116 			
35T29 No:03700117 			
35T40 No:03700118 			
35G29 No:03700119 			
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