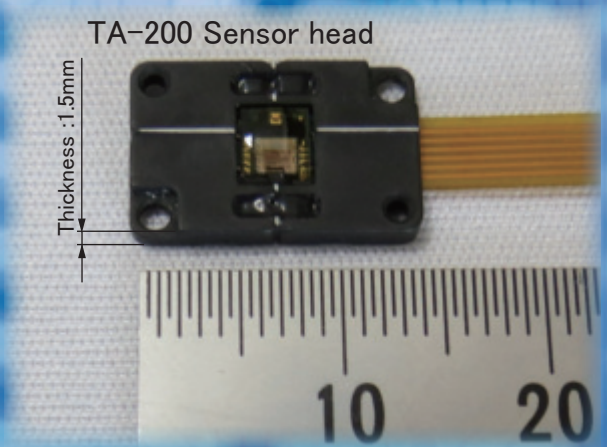
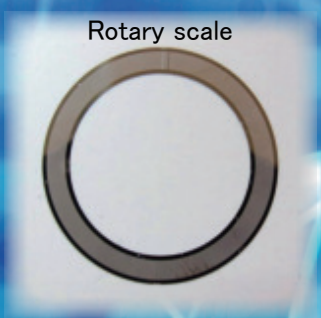
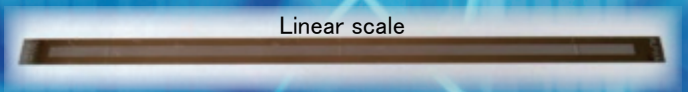
Optical Encoder

Tiny and high resolution Encoder

TA series
TAR series
TAL series







Technohands Co., Ltd.

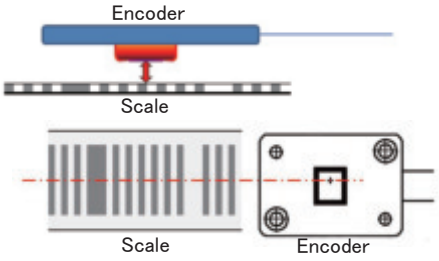
The TA series encoders are optical reflection incremental type encoders that have interpolator, combinate with linear/rotary scale, get small size, high resolution and low cost. Adopted a sensor of the diffraction image projection method for a optical head, that includes a LED light source and photo detector in a package. It outputs differential outputs with pure sine wave signal of 80 μ m in A,B phase. In addition, it outputs index signal by Z(index) phase signal from the same sensor. This TA series modules are packaged small and thin(1.5mm) optical head which is composed a rigid flexible print board (RFPCB) with embedded the sensor on it.
With its excellent pure sine wave outputs from the optical head of the module, achieved high interpolation ratio and up to 200 resolution for each of A,B phase. Hence up to 0.1 μ m resolution for linear and 0.000125° resolution for rotary is possible by combination with user's circuit.
Linear encoder products that have limit sensors on both of the head edges are available as well.

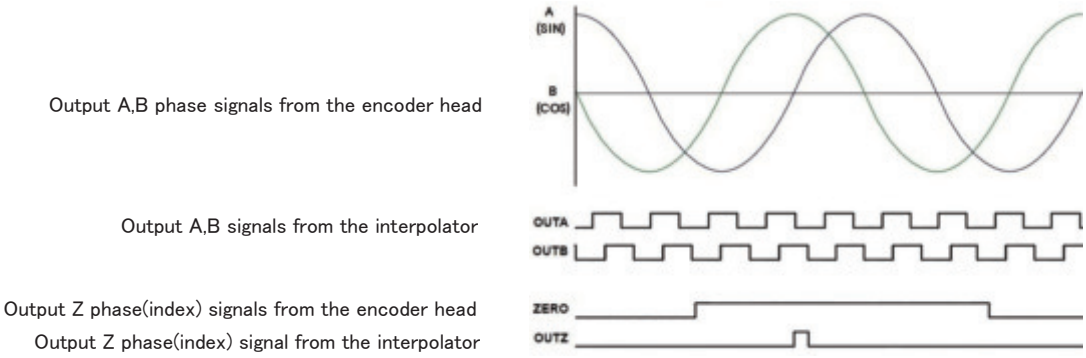
■ Features

- Enabling small thin type optical sensor head (10 × 15 × 1.5mm)
- Selectable interpolation resolution up to 200 times
- Available analog sine wave outputs from a optical reflection type sensor
- Easy to install because of its wide gap tolerance between a optical head and a scale, besides an auto calibration function of the sensor head
- Developed new products of encoder head with limit sensors
- Combined a pattern of scale for Z(index) phase with incremental patterns for A,B phase, hence achieved a narrow and thin scale
- Increased noise resistance by adopting a 6 layers shielded RFPCB(t=0.1mm)
- Enabling low cost by adopting nickel steel for a scale
- Available glass scales for high precision use

■ Principle

The scale reflects the LED light from the optical encoder sensor head, and difference of scale patterns is detected by photo detector, then the head outputs pure sine wave signals such as the right drawing. (A,B phase signals)
With the pure excellent sine wave signals of phase A,B, high resolution by a interpolator with selectable interpolation ratio can be achieved. Both of A,B phase can be divided up to 200 times.

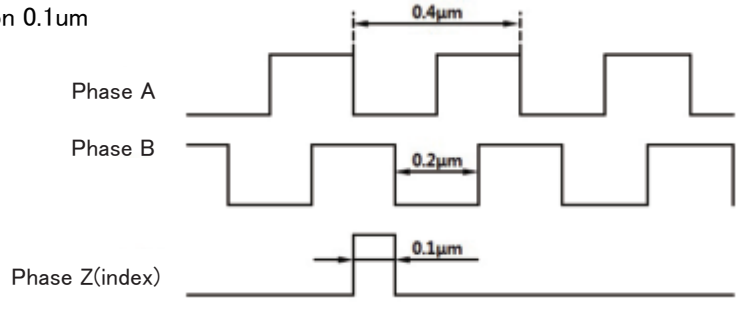




■ Output waveforms

Differential output signals of A+,A−,B+,B−,Z+,Z− enables high noise immunity.

<e.g.> minimum resolution 0.1um



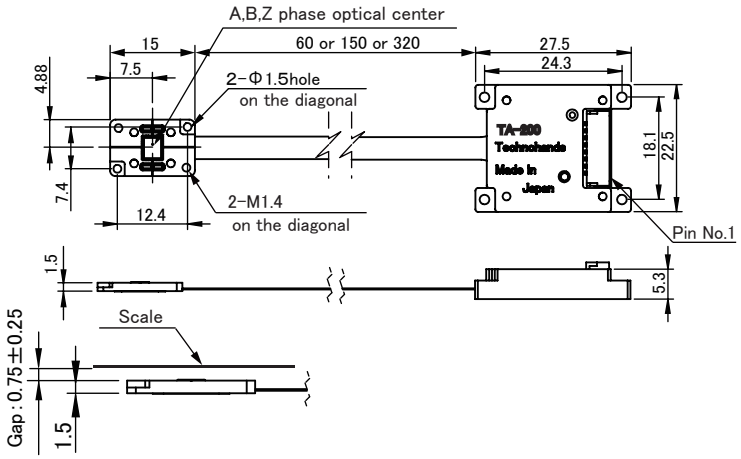
■ Linear encoder TA series

TA-200 is linear encoder for 80 μm pitch scale. 1to 200 interpolation is available.

・Connector pin assignment

Connector P/N : JST SM08B-GHS-TB

Pin No	Signal name
1	GND
2	DC5V
3	A+
4	A−
5	B+
6	B−
7	Z+
8	Z−



・Linear encoder type information

TA-200/ [60] − [04]

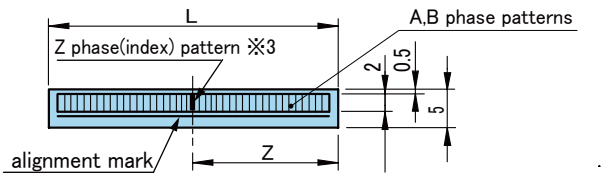
- [04] Resolution (04 : 0.4、 4 : 4、 20 : 20、 80 : 80 μm)
- [60] FPC length (60、150、320mm)

Interpolation factor ※1	Resolution (μm) ※2	Maximum speed (mm/sec)
1	80	9,600
4	20	9,600
20	4	9,600
40	2	9,600
200	0.4	3,200

※1 : factors for each of A,B phase ※2 : possible to further dividing 4 times by external circuit/software

・Standard linear scales

80 μm pitch



Unit : mm

Type	Stroke	Materials	Thickness(t)	L	Z
S80L30N	30	Nickel Steel	0.2	35	17.5
S80L30G	30	Glass	1	35	17.5
S80L50N	50	Nickel Steel	0.2	60	30
S80L50G	50	Glass	1	60	30
S80L100N	100	Nickel Steel	0.2	105	52.5
S80L100G	100	Glass	1	105	52.5

※3 The Z phase(index) pattern position in center can be changed by customer's request. Scale length can be customized as well.

■ Scale information

・Thermal expansion coefficient of Ni steel scales

$13.3X10^{-6}$/℃	20～100℃
$14.4X10^{-6}$/℃	20～300℃

・Thermal expansion coefficient of glass scales

$8.5X10^{-6}$/℃	20～350℃

・Scale type information

S [80] [L] [30] [N]

- [80] Scale pitch (80 μm)
- [L] L : Linear R : Rotary
- [30] Linear : effective length(mm) Rotary : pulse number
- [N] Material N: Ni steel G: Glass

■ Operation environment and electrical specifications

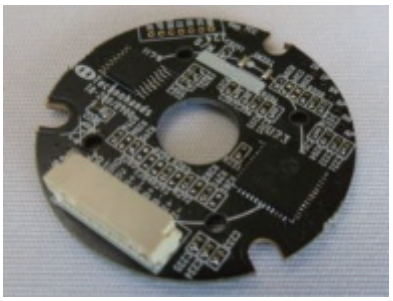
Method		Optical diffraction reflection method
Power supply		DC5V±5%, max 50mA
Environment condition	Operation temperature/humidity	−10～60℃, below 90%RH
	Storage temperature/humidity	−20～80℃, below 90%RH

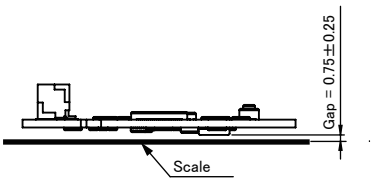
■ Custom design

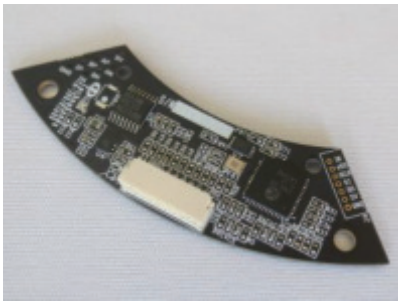
Custom designing for scales and encoder head boards are available.
Please contact us if any question/request.

■ Rotary encoder TAR series

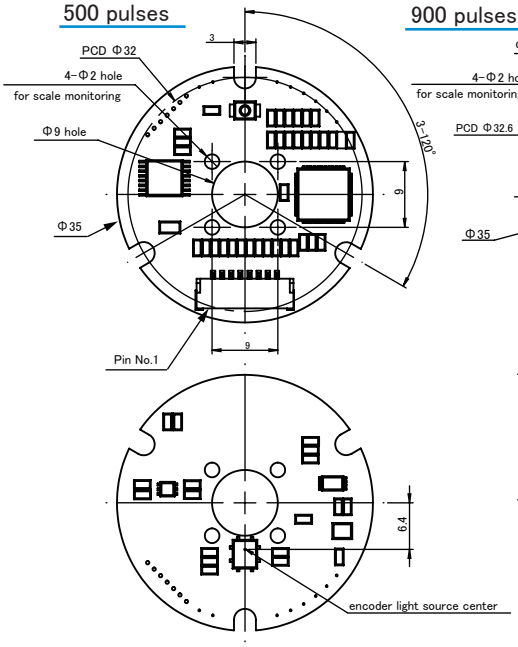
TAR-200 series are rotary encoders using with 80 μ m pitch scales, and its interpolation ratio is selectable from 1 to 200 times.
Rotary encoders and scales for 1024 or 2000 period cycles sine wave output per rotation will be available soon.



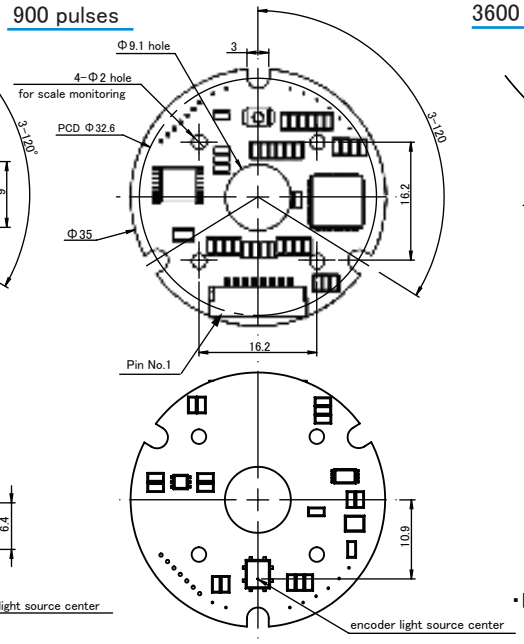




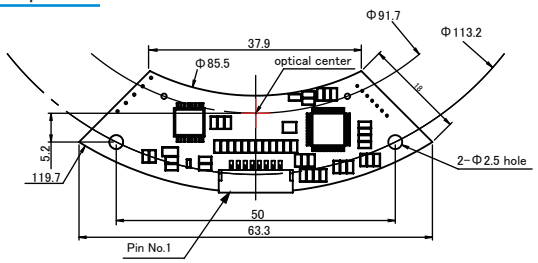
500 pulses



900 pulses



3600 pulses



・Connector pin assignment

Connector P/N : JST SM08B-GHS-TB

Pin No	Signal name
1	GND
2	DC5V
3	A+
4	A−
5	B+
6	B−
7	Z+
8	Z−

・Rotary encoder type information

TAR-200/ [500] − [1]

Interpolation factor (1、4、20、40、200)

Pulses (500、900、3600)

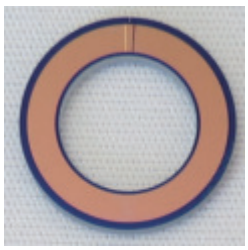
Interpolation factor ※1	500 pulses			900 pulses			3,600 pulses		
	Resolution CPR ※2	Resolution degree ※2	Max. speed RPM	Resolution CPR ※2	Resolution degree ※2	Max. speed RPM	Resolution CPR ※2	Resolution degree ※2	Max. speed RPM
1	500	0.72	14,400	900	0.4	8,000	3,600	0.1	2,000
4	2,000	0.18	14,400	3,600	0.1	8,000	14,400	0.025	2,000
20	10,000	0.036	14,400	18,000	0.02	8,000	72,000	0.005	2,000
40	20,000	0.018	14,400	36,000	0.01	8,000	144,000	0.0025	2,000
200	100,000	0.0036	4,800	180,000	0.002	2,667	720,000	0.0005	667

※1 : factors for each of A,B phase ※2 : possible to further dividing 4 times by external circuit/software

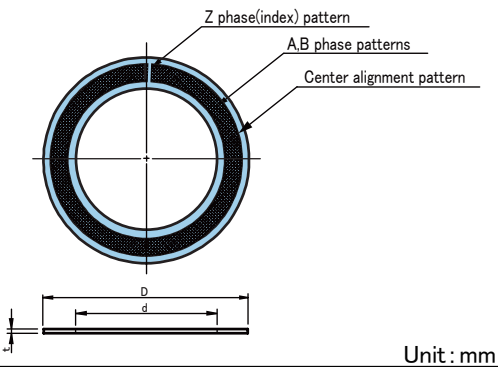
・Standard rotary scales

80 μ m pitch

Ni steel scale



Glass scale ※3



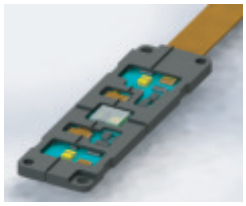
Unit : mm

Type	Pulse number	Materials	Thickness(t)	D	d	Optical center position
S80R500N	500	Nickel Steel	0.2	Φ16	Φ9	Φ12.73
S80R900N	900	Nickel Steel	0.2	Φ26	Φ19	Φ22.92
S80R3600N	3600	Nickel Steel	0.2	Φ96	Φ86	Φ91.67

※1 : factors for each of A,B phase ※2 : possible to further dividing 4 times by external circuit/software
※3 : Glass scales are available as well. Please contact us for more detail information.

■ Linear encoder with limit sensors　TAL series

TAL-200 has limit sensors(both edge side) in addition to the encoder sensor head which specification is same as TA-200 to avoid collision. Please refer to the specifications for interpolation factor, resolution, and maximum speed, etc.



・Linear encoder with limit sensors type

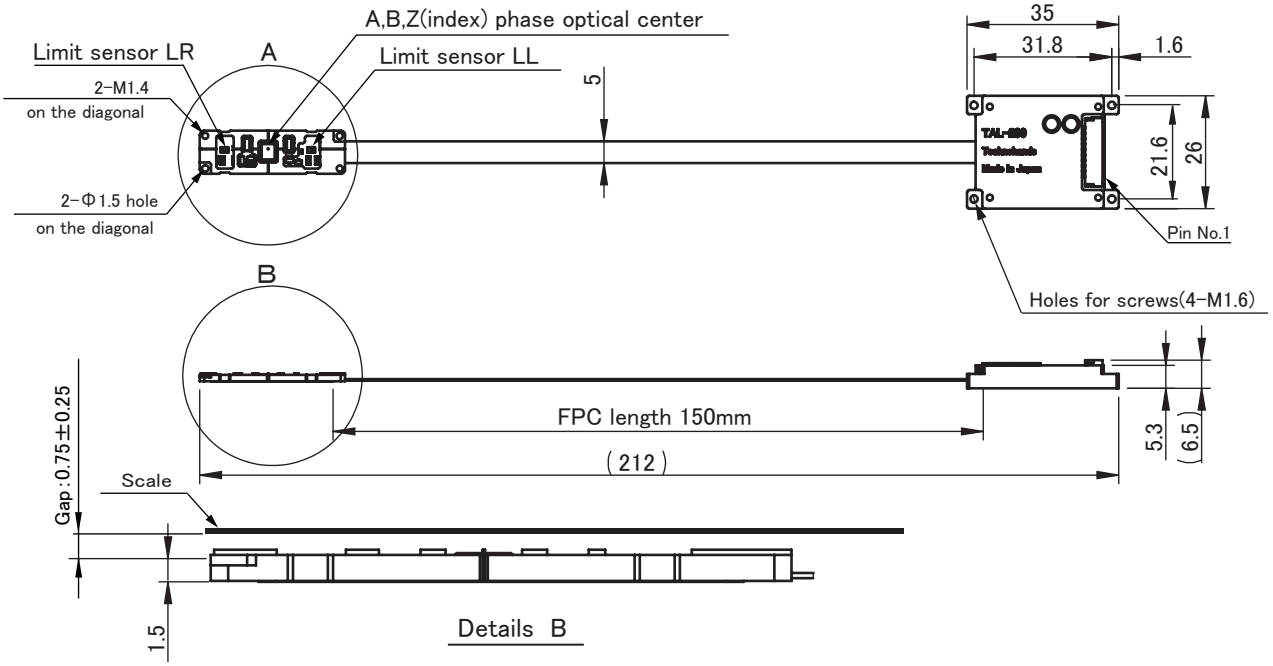
TAL-200/ [150] – [04]

Resolution
(04 : 0.4、 4 : 4、 20 : 20、 80 : 80μm)

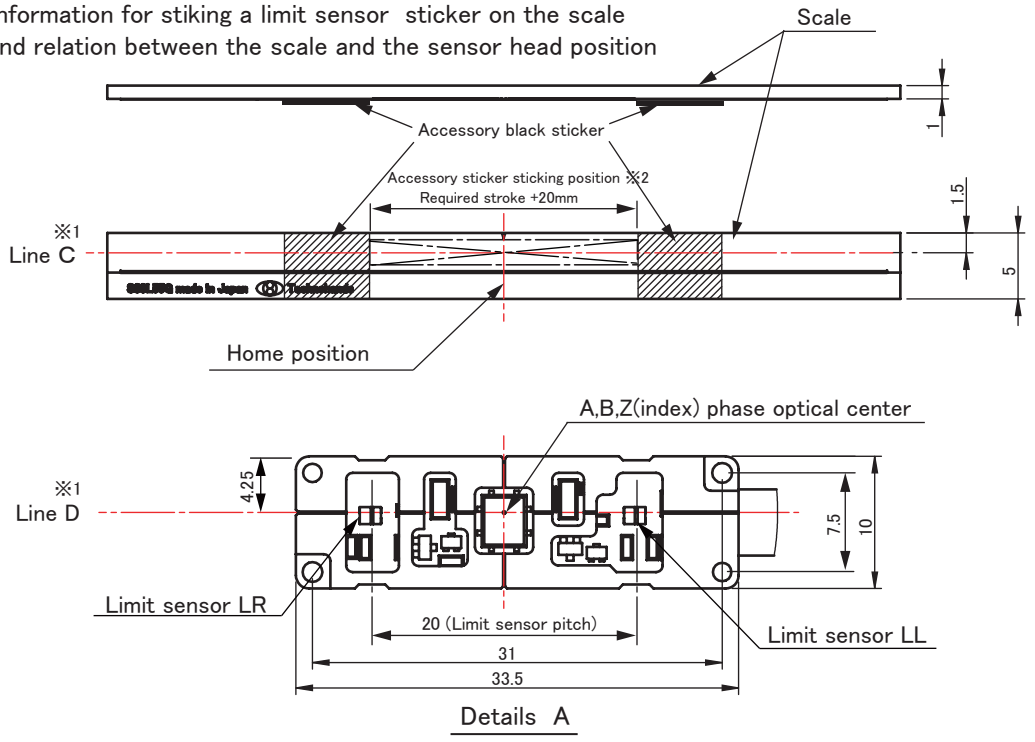
FPC length (currently 150mm only available)

・Connector pin assignment
Connector P/N　JST : SM10-GHS-TB

Pin No	信号名
1	GND
2	DC5V
3	A+
4	A-
5	B+
6	B-
7	Z+
8	Z-
9	LR(Limit sensor R)
10	LL(Limit sensor L)



■Information for stiking a limit sensor sticker on the scale and relation between the scale and the sensor head position

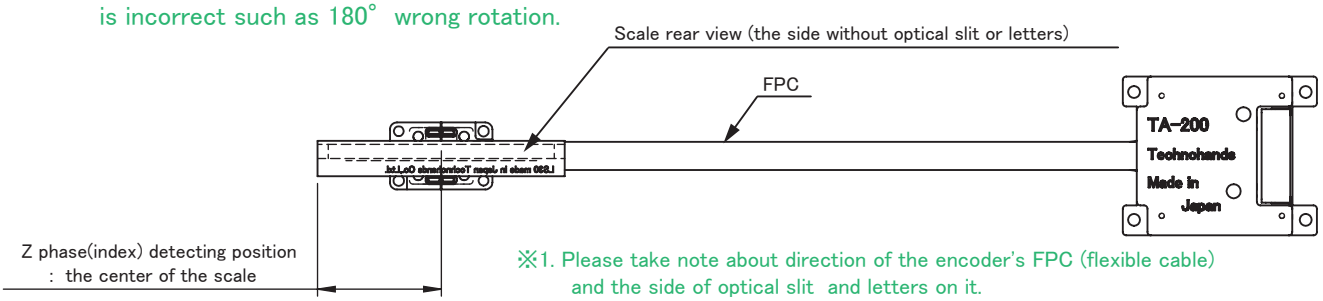


※1. For installation, please arrange the encoder head and slit side of the scale opposited, aligning Line C with Line D.

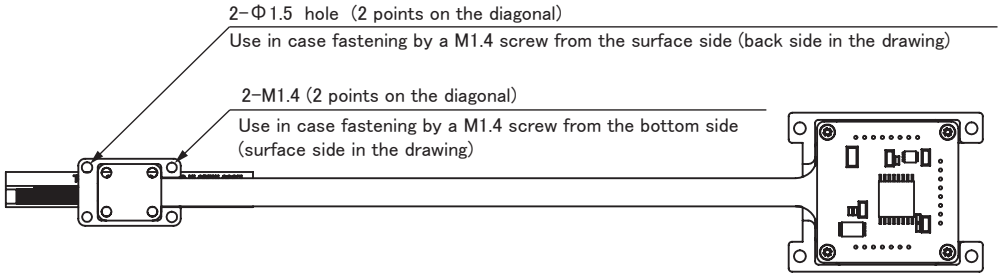
※2. For correct limit sensor's function, please stick the accessory black stickers of the limit sensor with "required stroke +20mm" apart.

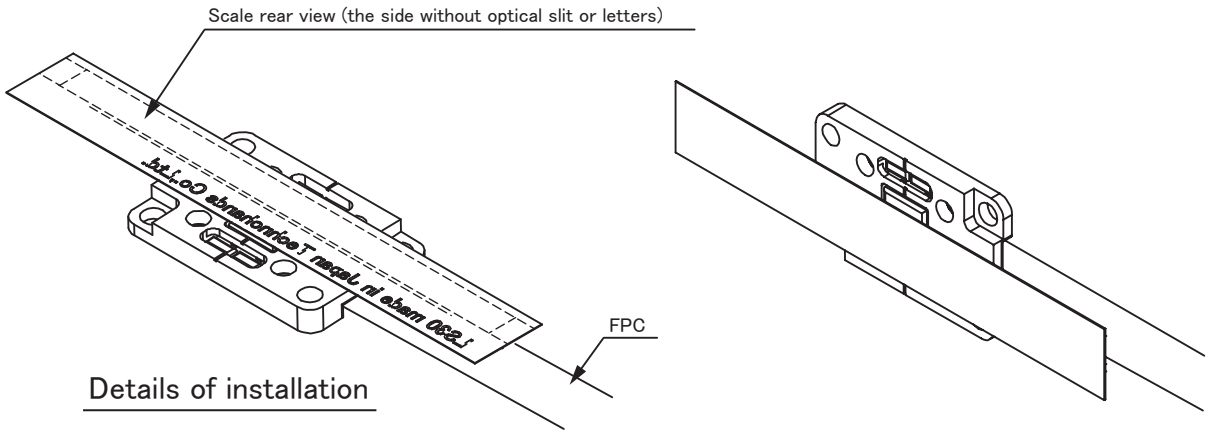
■ Installing the linear encoder

Please install the encoder head and the scale as below.
Please arrange the encoder head and slit side(face side) of the scale opposited.
Notice: Position limit detection can't function if the position relation between the encoder head and the scale is incorrect such as 180° wrong rotation.



※1. Please take note about direction of the encoder's FPC (flexible cable) and the side of optical slit and letters on it. (refer to "Detail drawing of installation")





■ Recommendation of adhesive

There is some difference of thermal expansion coefficient between scale and body that is to be sticked.
Hence, in the case of using stiff(after hardening) adhesive and under wide temperature changing,
the sticked part appears likely to be peeled off, or precise positioning appears likely to be impossible due to scale variation from the body's expansion and shrinkage. In case of adopting glass scale, irrecoverable damage can happen.
Then the silicon adhesive shown as below is recommended because of its flexibility.
Recommended adhesive: Cemedine Super X8008 (Black)

Technohands Co., Ltd.
1-9-1 Maruyama, Isogo-ku, Yokohama-shi, Kanagawa-ken, 235-0011, Japan
TEL : +81-45-370-8010 FAX :+81-45-370-8015
www.technohands.co.jp