Linear Bearings Technical Information

STRUCTURE

The CYRUS linear bearings consists of an outer cylinder, ball retainer, balls and two end rings. The ball retainer which holds the balls in the recirculating trucks in held inside the outer cylinder by end rings.

The body metal is good SUJ2. The outer cylinder is maintained sufficient hardness by heat treatment, therefore if ensures the bushings projected travel life and satisfactory durability. The ball retainer is made from synthetics resin and steel to reduce running noise or high temperature.
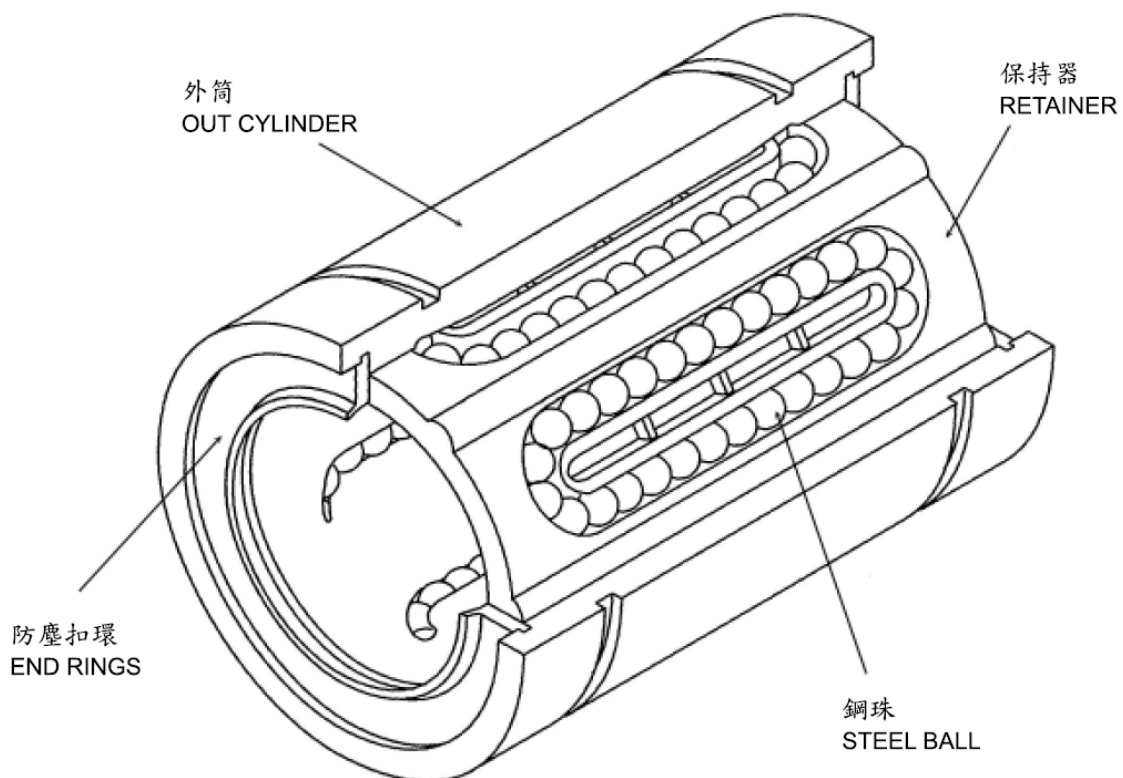

外筒
OUT CYLINDER

保持器
RETAINER

防塵扣環
END RINGS

鋼珠
STEEL BALL

Fig.26　The structure of linear bearings

Linear Bearings Technical Information

FEATURES

1 · The body is hardness.　High precision and rigidity.　High speed.

2 · Low friction.　Low wear and long life.

3 · Can be loaded from any direction, and the mounting surface can be machined easily.

4 · Standardize dimensions and exact precision control.　Ease of replacement.

5 · Variety of types.　The customer can choose from among these according to the designing application

LOAD RATING

1 · BASIC DYNAMIC LOAD RATING (C)

　　This term is arrived at based on an evaluation of a number of identical linear systems individually run in the same conditions, if 90% of them can run with the load for a distance of 50000 M without damage caused by rolling fatigue.

2 · BASIC STATIC LOAD RATING (C_0)

　　At the contacting position where the maximum stress is exercised, the sum of the permanent deformation of the rolling elements and that of the rolling plane is 0.0001 time of the diameter of rolling elements.

3 · STATIC SAFETY FACTOR (fs)

　　This factor is used based on the application condition as show on table 1.

Table 1 static safety factors (fs)

Condition of use	Low limit of fs
When the shaft has less deflection and shock	1 ~ 2
When elastic deformation should be considered with respect to pinch load	2 ~ 4
When the equipment is subject to vibration and impacts	3 ~ 5

Linear Bearings Technical Information

LOAD RATING AND LIFE EXPECTANCY

1 · The rated life can be obtained from the following equation with the basic dynamic load rating and the load on the linear system :

$$L= \left(\frac{fH \bullet fT \bullet fC}{fW} \bullet \frac{C}{P} \right)^3 \bullet 50$$

L : Travel life (KM)

Fh : Hardness coefficient (fig. 27)

fT : Temperature coefficient(fig. 28)

fc : Contact coefficient(table2)

fw : Load coefficient (table3)

P : Load (kgf)

C : Basic dynamic load ratin

2 · The rating life in hours can be calculated by obtaining the traveling distance per unit time. The rating life in hours can be obtained from the following expression when the stroke length and the number of strokes are constant :

$$Lh= \frac{L \bullet 10^3}{2 \bullet ls \bullet n1 \bullet 60}$$

Lh : Travel life in time(hr)

L : Travel life (KM)

Ls : Stroke distance(m)

n1 : Stroke frequency per min(cpm)

Linear Bearings Technical Information
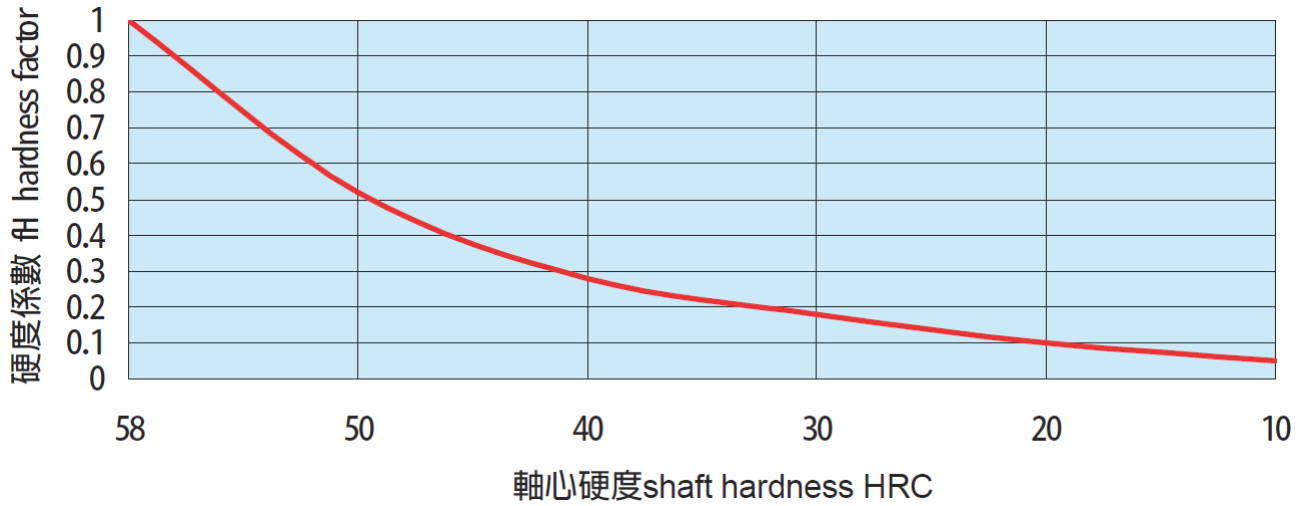
Fig. 27
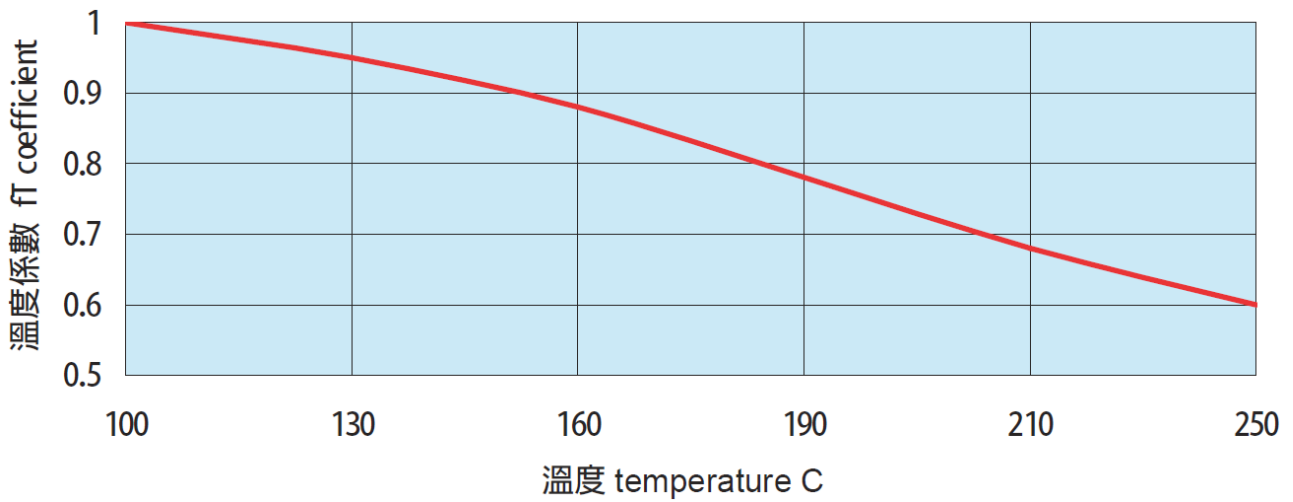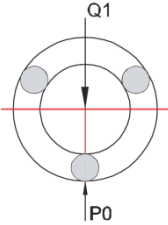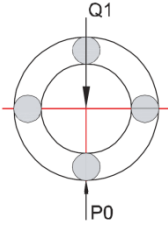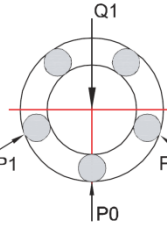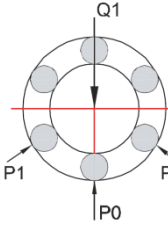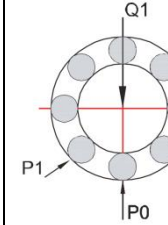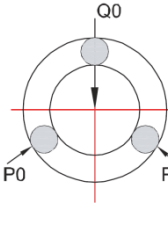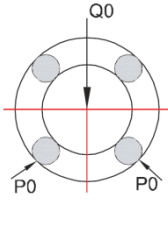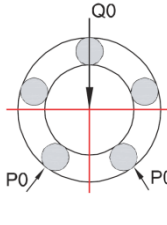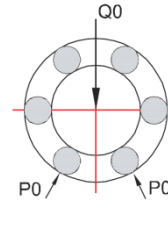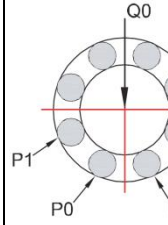
Fig. 28

表二　接觸係數　Table2 contact coefficient fc		表三　負荷係數　Table3 load coefficient fw	
Number of linear systems per shaft	Contact coefficient fc	Operating conditions	Load coefficient fw
1	1.00	Operation at low speed (15m/min or less) without impulsive shock from outside.	1.0~1.5
2	0.81	Operation at intermediate speed (60m/min or less) without impulsive shock.	1.5~2.0
3	0.72	Operation at at high speed (over 60m/min) without impulsive shock from outside.	2.0~3.5
4	0.66		
5	0.61		
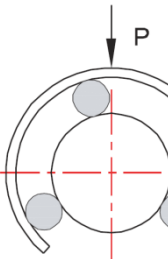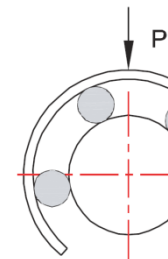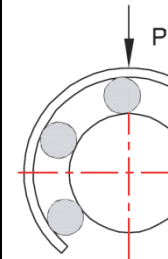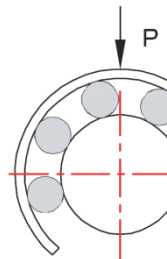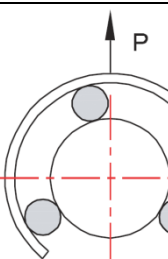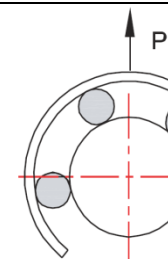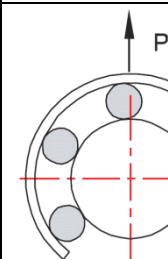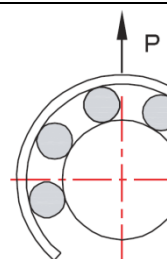
Linear Bearings Technical Information

RELATION BETWEEN BALL CIRCUITS AND LOAD RATING

Standard type
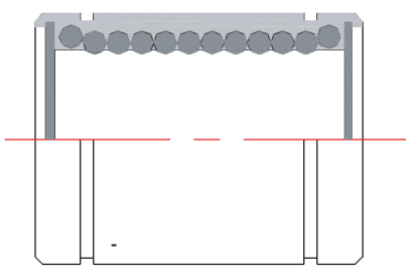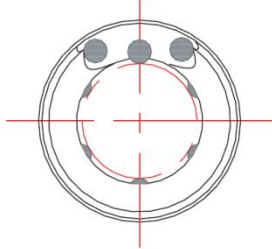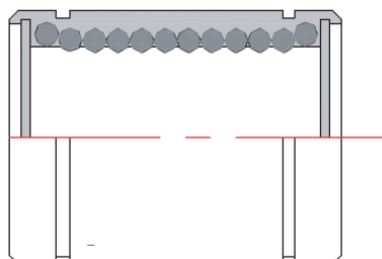
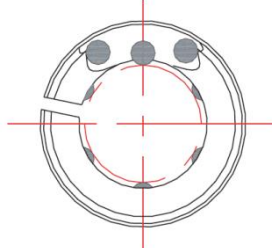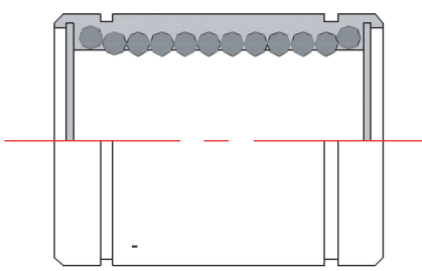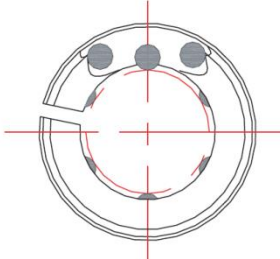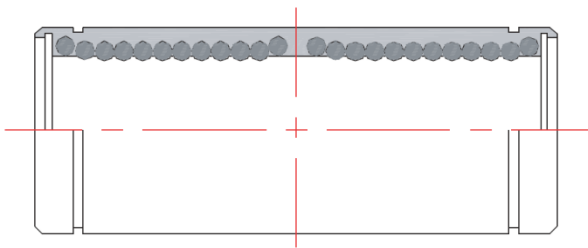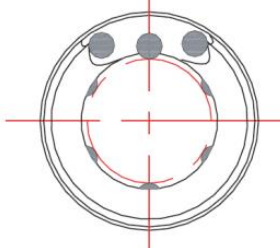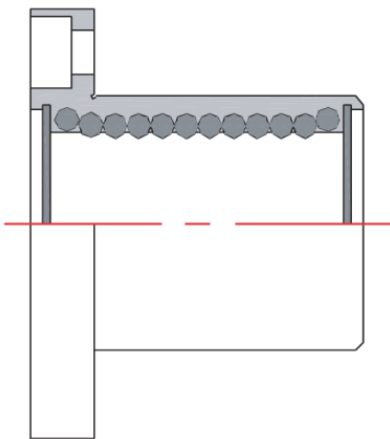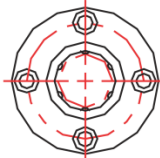| Number of rows / Row position loadration	3	4	5	6	8
Row position	Q1=P0	Q1=P0	Q1=1.106P0	Q1=1.354P0	Q1=1.84P0
Row position	Q0=P0	Q0=P0	Q0=1.618P0	Q0=1.732P0	Q0=2.052P0
Load ratio	Q0/Q1=1	Q0/Q1=1.141	Q0/Q1=1.463	Q0/Q1=1.280	Q0/Q1=1.115

Open type
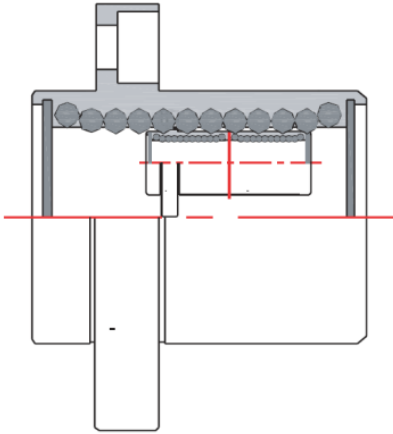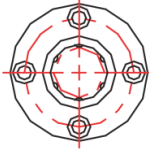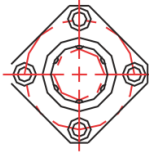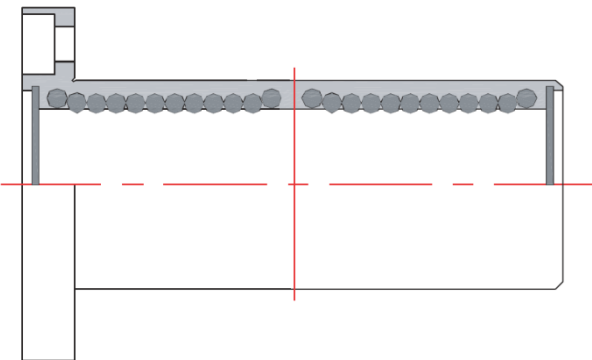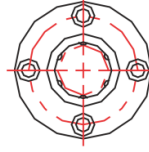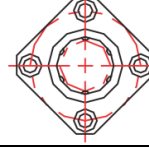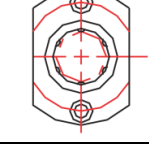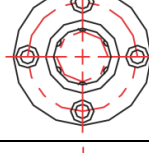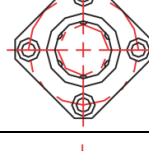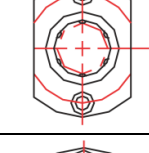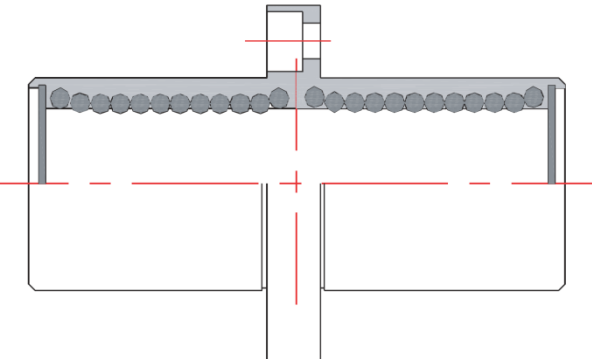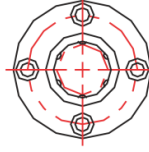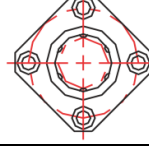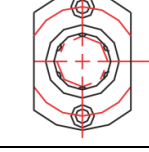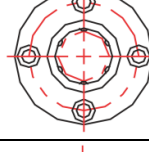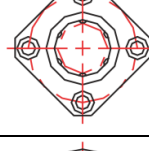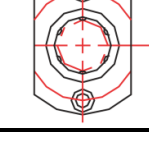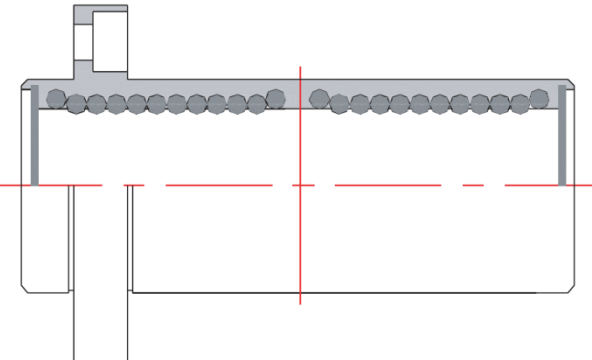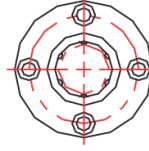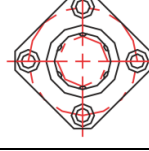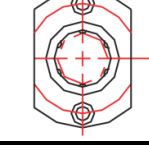
Number of rows / Row position loadration	3	4	5	6
Loading from above	C	C	C	C
Loading from below	0.64C	0.54C	0.57C	0.35C

Linear Bearings Technical Information

BEARINGS TYPE

TYPE		Standard	NI Coating
Standard type		LM	LM-N
		KB	KB-N
		SW	SW-N
Clearance-adjustable(AJ) type		LM-AJ	LM-NAJ
		KB-AJ	KB-NAJ
		SW-AJ	SW-NAJ
Open(OP) type		LM-OP	LM-NOP
		KB-OP	KB-NOP
		SW-OP	SW-NOP
Double-wide type		LM-L	LM-L-N
		KB-L	KB-L-N
		SW-L	SW-L-M
Flange type		LMF	LMF-N
		KBF	KBF-N
		SWF	SWF-N
		LMK	LMK-N
		KBK	KBK-N
		SWK	SWK-N
		LMT	LMT-N
		KBT	KBT-B
		SWT	SWT-N

Flange type with pilot end			
		LMFP	LMFP-N
		LMKP	LMKP-N
		LMTP	LMTP-N
		LMF-L	LMF-LN
		KBF-L	KBF-LN
		SWF-L	SWF-LN
		LMK-L	LMK-LN
		KBK-L	KBK-LN
		SWK-L	SWK-LN
		LMT-L	LMT-LN
		LMFC-L	LMFC-LN
		KBFC-L	KBFC-LN
		SWFC-L	SWFC-LN
		LMKC-L	LMKC-LN
		KBKC-L	KBKC-LN
		SWKC-L	SWKC-LN
		LMTC-C	LMTC-CN
		LMFP-L	LMFP-LN
		LMKP-L	LMKP-LN
		LMTP-L	LMTP-LN

Linear Bearings Technical Information

CLEARANCE AND FIT

1・Normal Clearances

Model	Division	Shaft		Housing	
		Normal fit	Transitional fit	Loose fit	Tight fit
LM	High class	g6	h6	H7	J7
	Pracision	g5	h5	H6	J6
LM-L	High class	g6		H7	
KB	High class	h6	j6	H7	J7
KB-L	High class	h6		H7	
SW	High class	g6	h6	H7	J7
	Pracision	g5	h5	H7	J6
SW-L	High class	g6		H7	

2・Mounting

標準形　standard type

使用扣環溝安裝　using retaining ring　　使用止推板安裝　using fixing plate
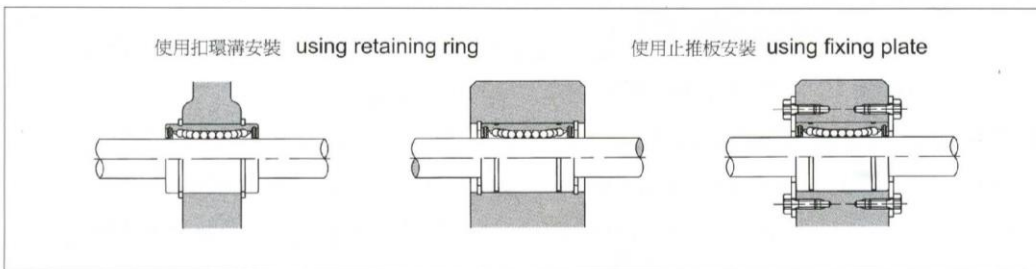
法蘭形式　flange type
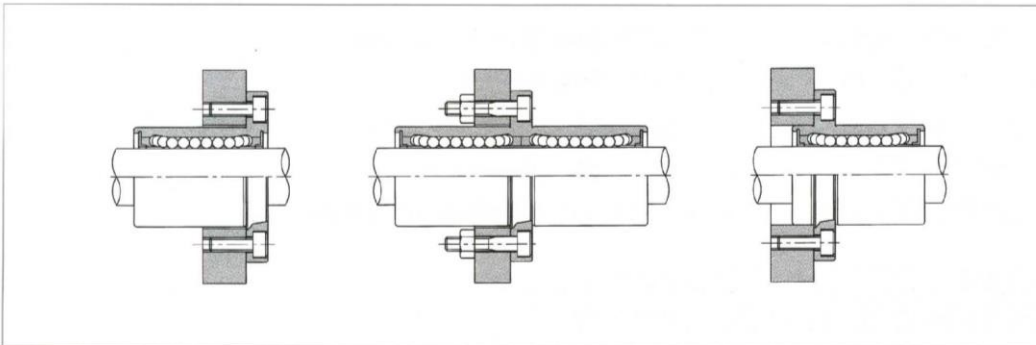
軸承塞入孔座建議　insertion of slide bush

$d_2 = D - (0.3mm \sim 1mm)$
  D: outer cylinder diameter
$d_1 = dr - (0.3mm \sim 1mm)$
  dr: inner contact diameter

Fig. 29