滾珠線性軸承技術資料

結構

滾珠線性軸承是由圓形外筒、鋼珠、鋼珠保持器與兩端扣環所組成。保持器置入外筒內，由兩端扣環固定住保持器，使鋼珠在軌道內重覆循環。本體採用品質良好的軸承鋼材質，外筒經良好的熱處理而達到相當的硬度，以確保滑動時的穩定性及壽命。鋼珠保持器有樹脂及鋼材兩種，它可提供減低噪音或高溫使用上的不同選擇。

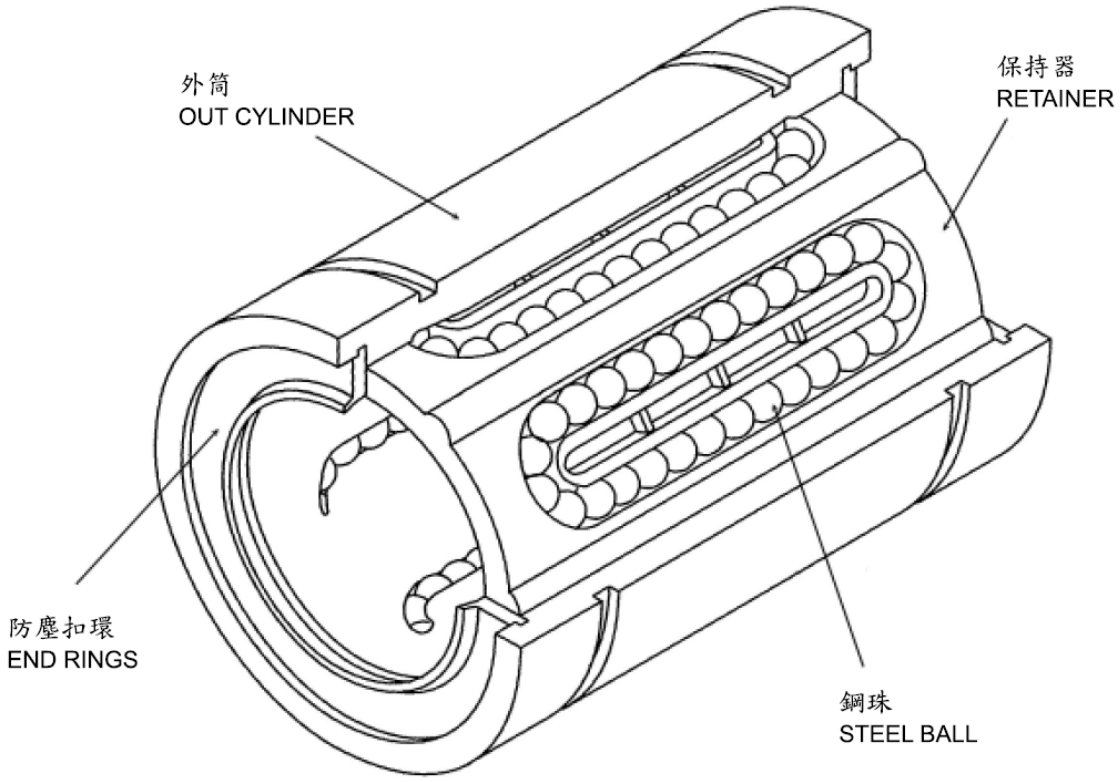


圖 26　直線軸承基本構造

Fig.26　The structure of linear bearings

滾珠線性軸承技術資料

使用特性

1．具有高硬度的本體，高精度與高鋼性，可高速運行。
2．耐磨性能好，摩擦係數小，使用壽命長。
3．可承受各方向的負荷，組裝容易。
4．規格標準化，互換容易。
5．產品多樣化，可提供設計使用不同的組合方式。

定額荷重

1．基本動定格荷重(C)

一組同樣的直線運動系統在相同條件下逐一運動行進 50000 公尺，其中 90%能達到不發生疲勞現象所能承受之荷重即為基本動定額荷重。

2．基本靜定額荷重(Co)

在靜態荷重時，受到最大應力的接觸部份，鋼珠與軸承滑道表面永久變形量的總和為鋼珠直徑的 0.0001 倍時的荷重，即為基本靜定額荷重。

3．靜的安全係數

在不同的使用場合中對於容許荷重上的採用要加上安全係數上的考量。可參考表一

表一 靜的安全係數(fs)下限 Table 1 static safety factors

使用條件 Condition of use	靜的安全係數 Low limit of fs
普通的運動條件的使用環境 When the shaft has less deflection and shock	1～2
強調運作的性能的使用環境 When elastic deformation should be considered with respect to pinch load	2～4
有振動及衝擊的使用環境 When the equipment is subject to vibration and impacts	3～5

滾珠線性軸承技術資料

定額荷重與壽命計算

1．定額壽命 L 計算公式：

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

L：定額壽命(KM) Travel life (KM)

Fh : 硬度係數(圖 27) Hardness coefficient (fig. 27)

fT：溫度係數(圖 28)
Temperature coefficient(fig. 28)

fc：接觸係數(表二) Contact coefficient(table2)

fw：負荷係數(表三) Load coefficient (table3)

P： 荷重(kgf) Load (kgf)

C： 基本動定額荷重(kgf)
Basic dynamic load ratin

2．定額壽命時間 Lh 計算公式：

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

Lh：壽命時間(hr) Travel life in time(hr)

L： 定額壽命(KM) Travel life (KM)

Ls：行程長度(m) Stroke distance(m)

n1：每分鐘往返次數(cpm)
Stroke frequency per min(cpm)

滾珠線性軸承技術資料

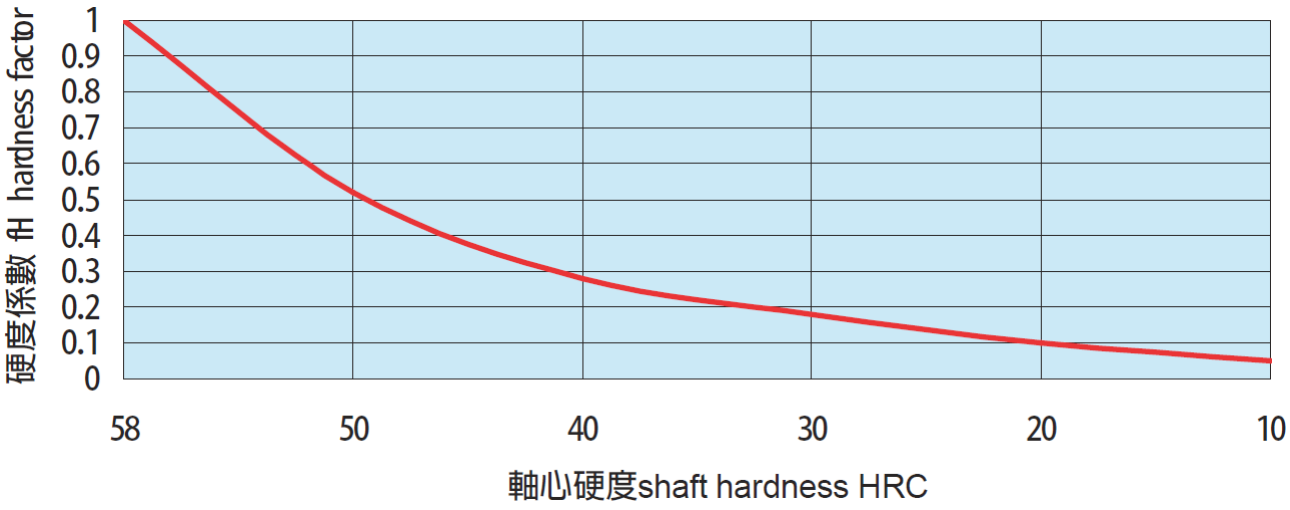


圖 27

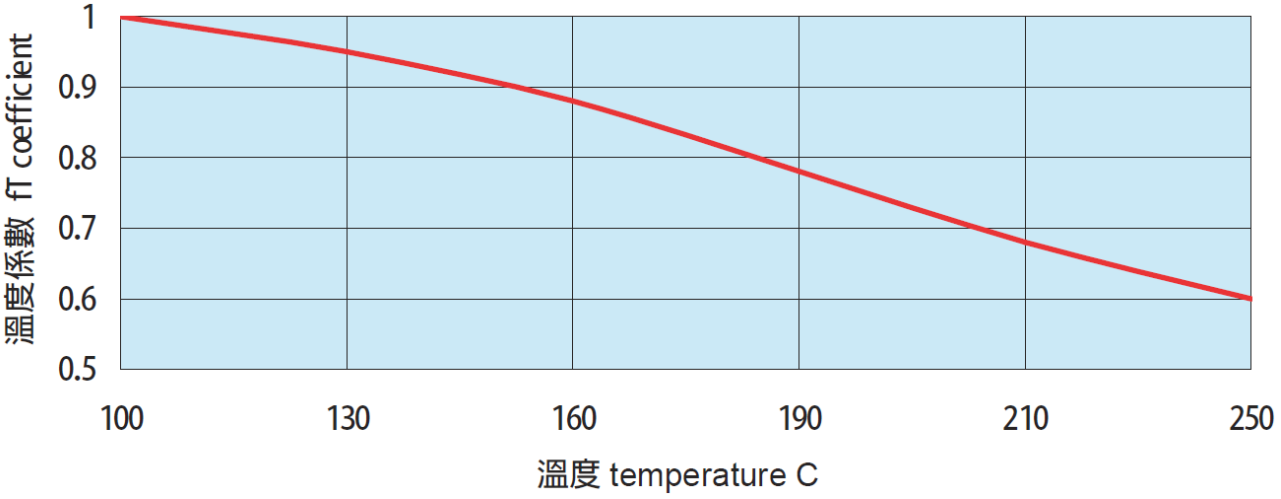


圖 28

表二　接觸係數　Table2 contact coefficient fc

每支軸心裝配軸承之個數 Number of linear systems per shaft	接觸係數 fc Contact coefficient fc
1	1.00
2	0.81
3	0.72
4	0.66
5	0.61

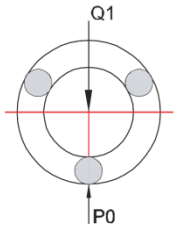
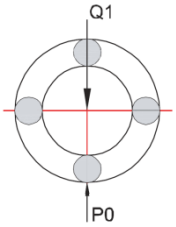
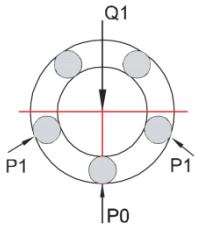
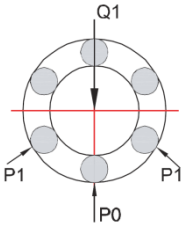
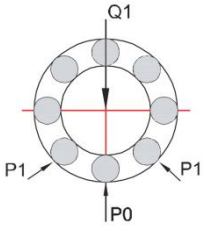
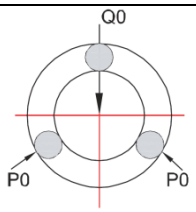
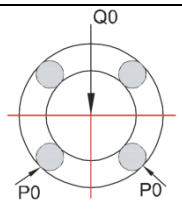
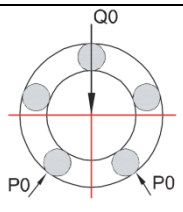
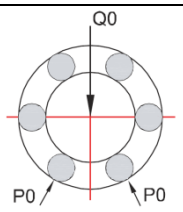
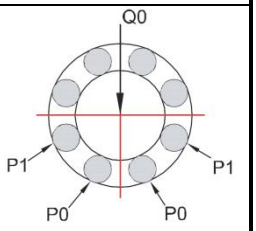
表三　負荷係數　Table3 load coefficient fw

使用條件 Operating conditions	負荷係數 fw Load coefficient fw
沒有外部衝擊及振動，低速時 15m/min 以下。Operation at low speed (15m/min or less) without impulsive shock from outside.	1.0~1.5
沒有明顯衝擊及振動，中速時 60m/min 以下。Operation at intermediate speed (60m/min or less) without impulsive shock.	1.5~2.0
有外部衝擊及振動，高速時 60m/min 以上。Operation at at high speed (over 60m/min) without impulsive shock from outside.	2.0~3.5

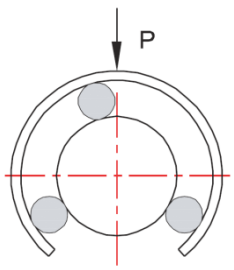
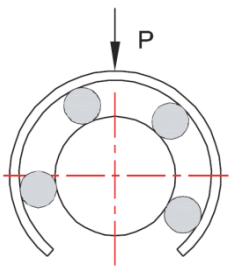
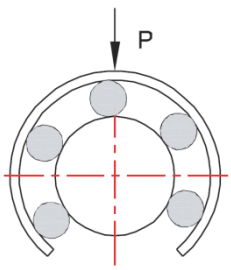
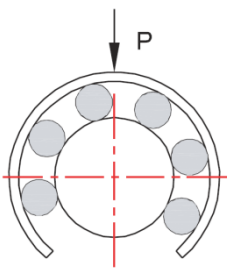
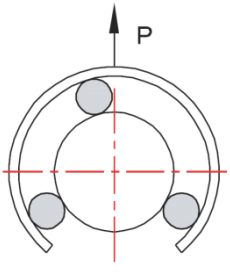
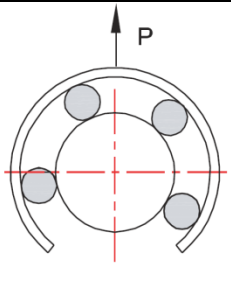
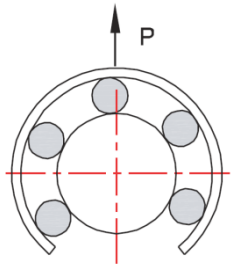
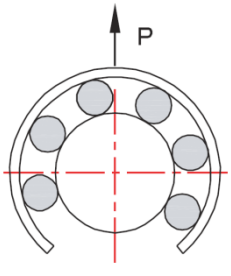
滾珠線性軸承技術資料

鋼珠列數與額定荷重

標準型

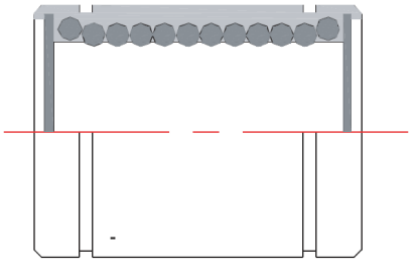
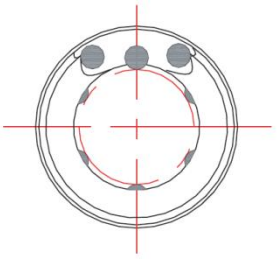
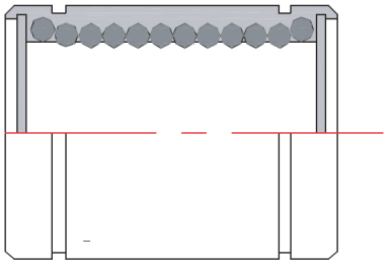
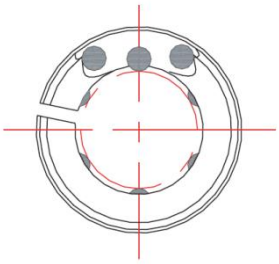
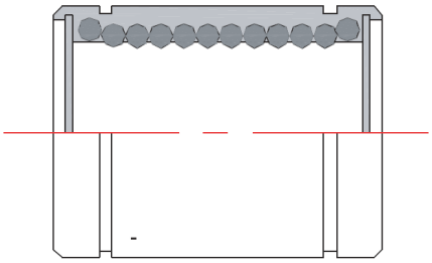
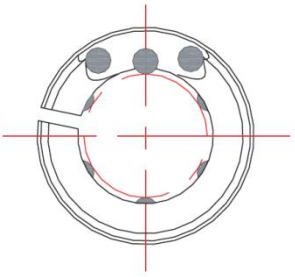
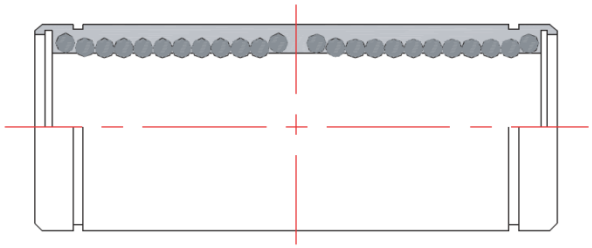
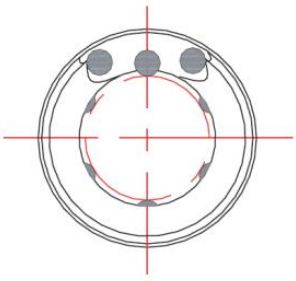
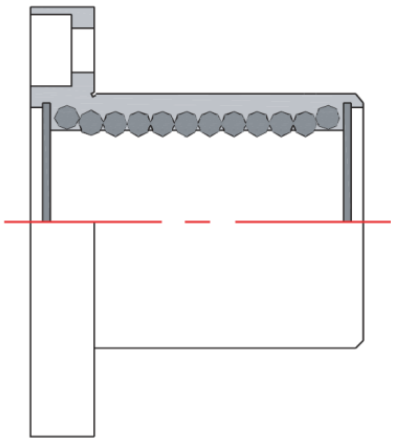
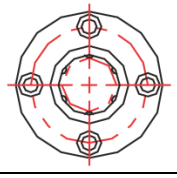
鋼珠列數 / 荷重位置	3	4	5	6	8
條列位置	 Q1=P0	 Q1=P0	 Q1=1.106P0	 Q1=1.354P0	 Q1=1.84P0
條列位置	 Q0=P0	 Q0=P0	 Q0=1.618P0	 Q0=1.732P0	 Q0=2.052P0
荷重比	Q0/Q1=1	Q0/Q1=1.141	Q0/Q1=1.463	Q0/Q1=1.280	Q0/Q1=1.115

開放型

鋼珠列數 / 荷重位置	3	4	5	6
來自上方的荷重				
	C	C	C	C
來自下方的荷重				
	0.64C	0.54C	0.57C	0.35C

滾珠線性軸承技術資料

軸承型式

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
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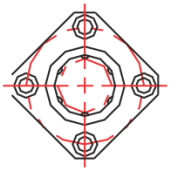
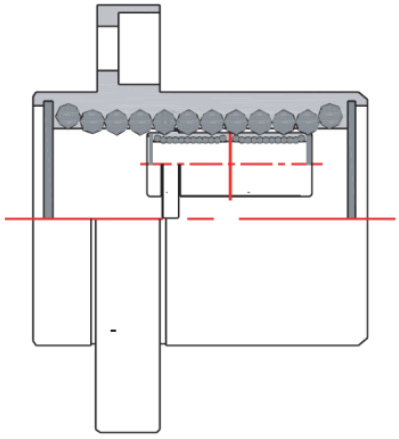
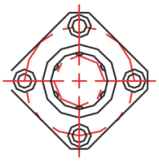
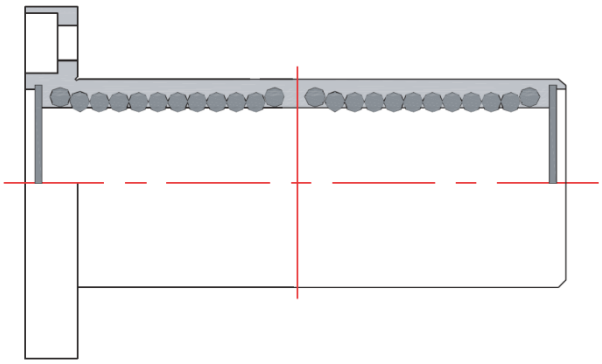
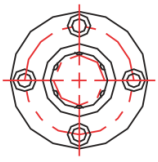
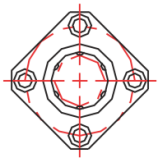
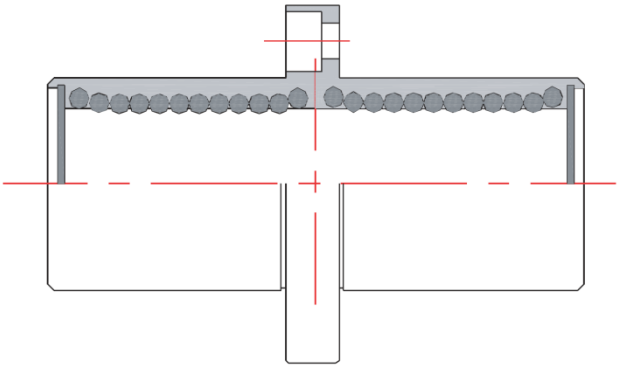
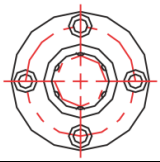
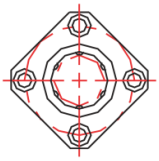
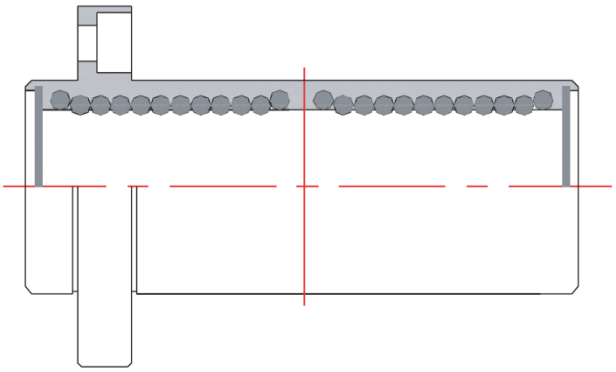
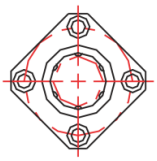
		SWF	SWF-N
		LMK	LMK-N
		KBK	KBK-N
		SWK	SWK-N
		LMT	LMT-N
		KBT	KBT-B
		SWT	SWT-N

滾珠線性軸承技術資料

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

滾珠線性軸承技術資料

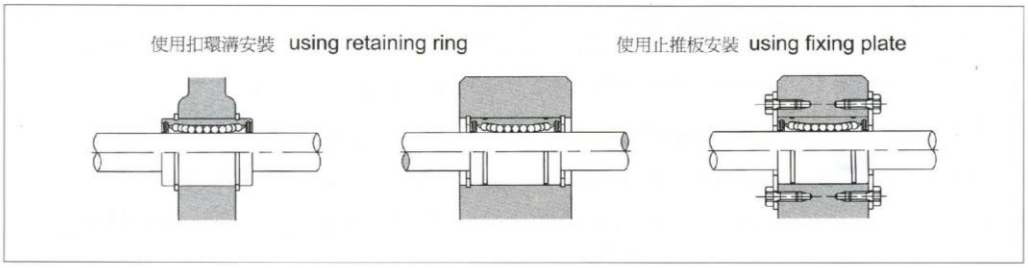
間隙及組件方式

1．建議間隙及配合公差

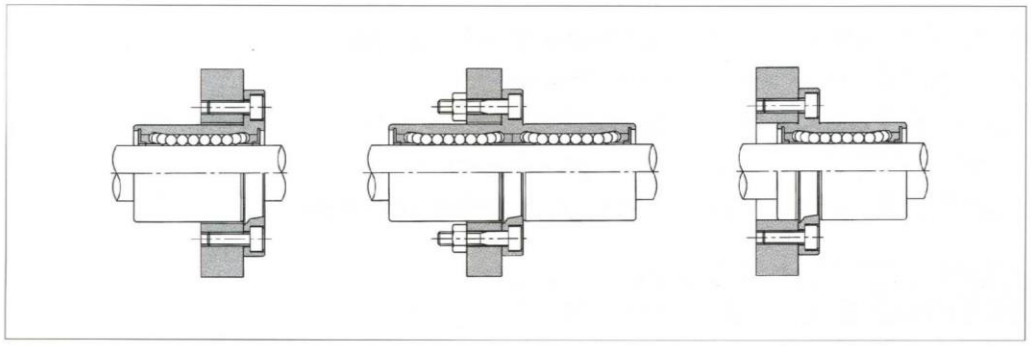
軸承型式 Model	精度等級 Division	軸心 Shaft		軸承座 Housing	
		一般間隙 Normal fit	緊密間隙 Transitional fit	鬆配合 Loose fit	緊配點 Tight fit
LM	上級 High class	g6	h6	H7	J7
	精密級 Pracision	g5	h5	H6	J6
LM-L	上級 High class	g6		H7	
KB	上級 High class	h6	j6	H7	J7
KB-L	上級 High class	h6		H7	
SW	上級 High class	g6	h6	H7	J7
	精密級 Pracision	g5	h5	H7	J6
SW-L	上級 High class	g6		H7	

2．建議組配方式

標準形 standard type



法蘭形式 flange type



軸承塞入孔座建議 insertion of slide bush

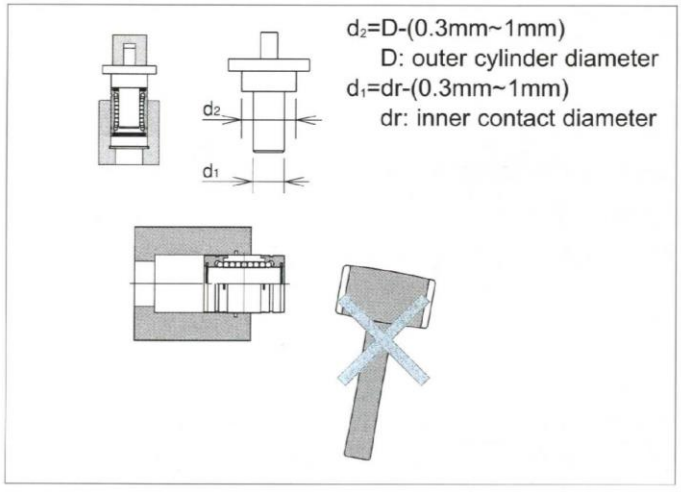


圖 29