滚珠线性轴承技术数据

结构

滚珠线性轴承是由圆形外筒、钢珠、钢珠保持器与两端扣环所组成。保持器置入外筒内，由两端扣环固定住保持器，使钢珠在轨道内重复循环。本体采用质量良好的轴承钢材质，外筒经良好的热处理而达到相当的硬度，以确保滑动时的稳定性及寿命。钢珠保持器有树脂及钢材两种，它可提供减低噪音或高温使用上的不同选择。

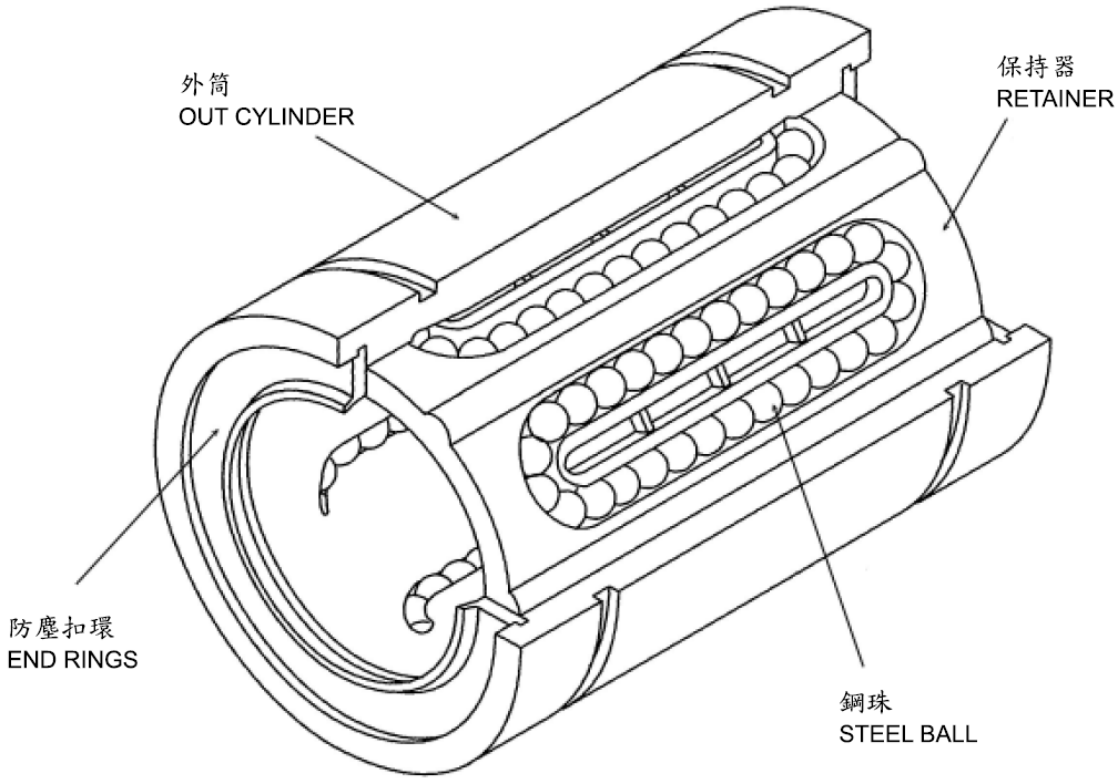


图 26　直线轴承基本构造

Fig.26　The structure of linear bearings

滚珠线性轴承技术数据

使用特性

1．具有高硬度的本体，高精度与高钢性，可高速运行。
2．耐磨性能好，摩擦系數小，使用寿命长。
3．可承受各方向的负荷，组装容易。
4．规格标准化，互换容易。
5．产品多样化，可提供设计使用不同的组合方式。

定额荷重

1．基本动定格荷重(C)

一组同样的直线运动系统在相同条件下逐一运动行进 50000 公尺，其中 90%能达到不发生疲劳现象所能承受之荷重即为基本动定额荷重。

2．基本静定额荷重(Co)

在静态荷重时，受到最大应力的接触部份，钢珠与轴承滑道表面永久变形量的总和为钢珠直径的 0.0001 倍时的荷重，即为基本静定额荷重。

3．静的安全系數

在不同的使用场合中对于容许荷重上的采用要加上安全系數上的考量。可參考表一

表一 静的安全系數(fs)下限 Table 1 static safety factors

使用条件 Condition of use	静的安全系數 Low limit of fs
普通的运动条件的使用环境 When the shaft has less deflection and shock	1～2
强调运作的性能的使用环境 When elastic deformation should be considered with respect to pinch load	2～4
有振动及冲击的使用环境 When the equipment is subject to vibration and impacts	3～5

滚珠线性轴承技术数据

定额荷重与寿命计算

1．定额寿命 L 计算公式：

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

L：定额寿命(KM) Travel life (KM)

Fh :硬度系數(图 27) Hardness coefficient (fig. 27)

fT：温度系數(图 28)
Temperature coefficient(fig. 28)

fc：接触系數(表二) Contact coefficient(table2)

fw：负荷系數(表三) Load coefficient (table3)

P： 荷重(kgf) Load (kgf)

C： 基本动定额荷重(kgf)
Basic dynamic load ratin

2．定额寿命时间 Lh 计算公式：

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

Lh：寿命时间(hr) Travel life in time(hr)

L： 定额寿命(KM) Travel life (KM)

Ls：行程长度(m) Stroke distance(m)

n1：每分钟往返次數(cpm)
Stroke frequency per min(cpm)

滚珠线性轴承技术数据

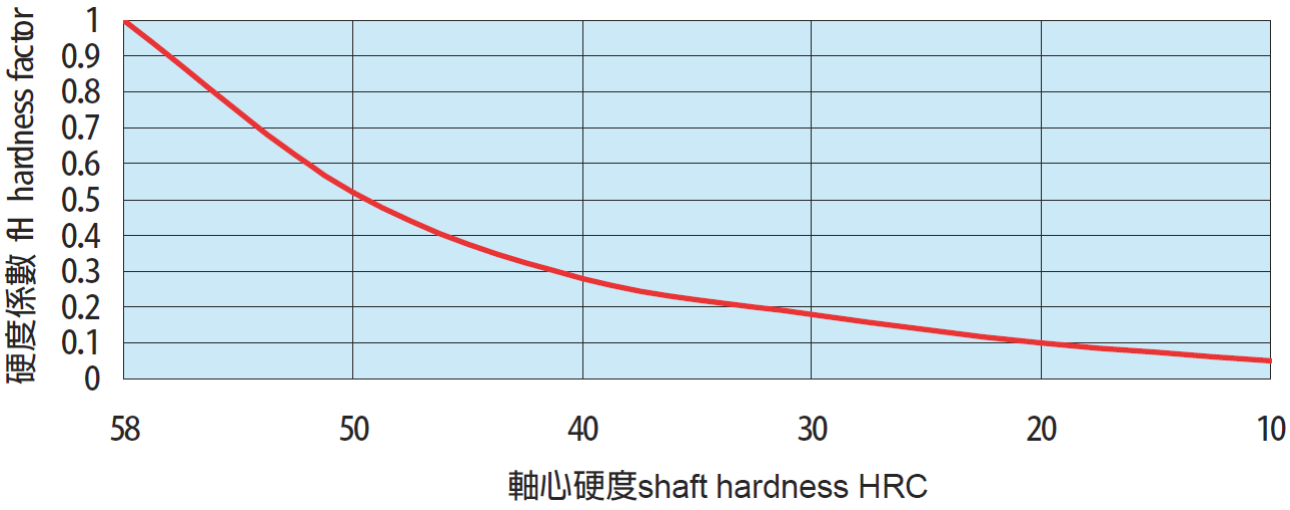


图 27

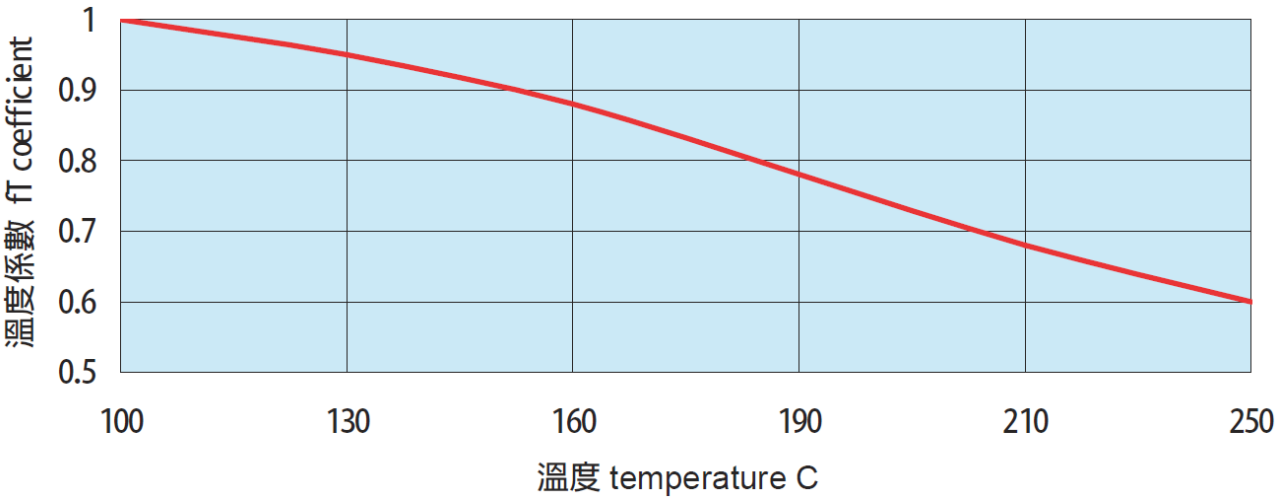


图 28

表二　接触系数　Table2 contact coefficient fc

每支轴心装配轴承之个数 Number of linear systems per shaft	接触系数 fc Contact coefficient fc
1	1.00
2	0.81
3	0.72
4	0.66
5	0.61

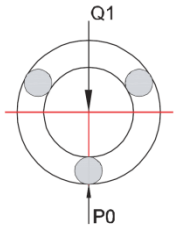
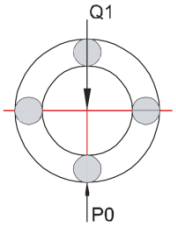
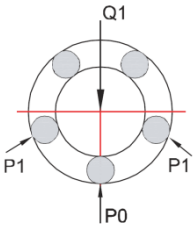
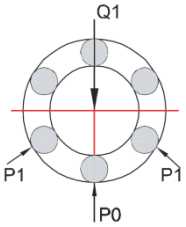
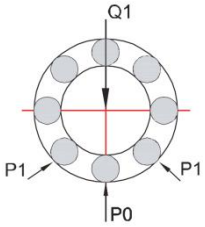
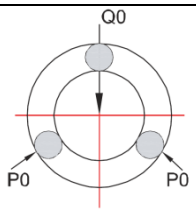
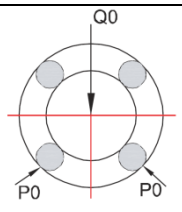
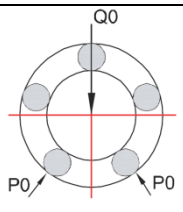
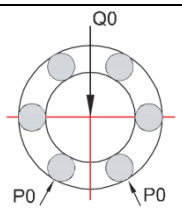
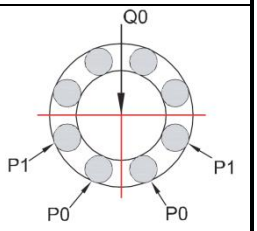
表三　负荷系数　Table3 load coefficient fw

使用条件 Operating conditions	负荷系数 fw Load coefficient fw
没有外部冲击及振动 低速时 15m/min 以下。Operation at low speed (15m/min or less) without impulsive shock from outside.	1.0~1.5
没有明显冲击及振动 中速时 60m/min 以下。Operation at intermediate speed (60m/min or less) without impulsive shock.	1.5~2.0
有外部冲击及振动，高速时 60m/min 以上。Operation at at high speed (over 60m/min) without impulsive shock from outside.	2.0~3.5

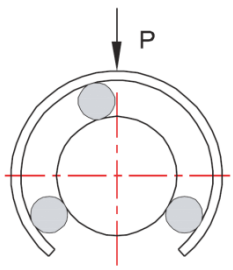
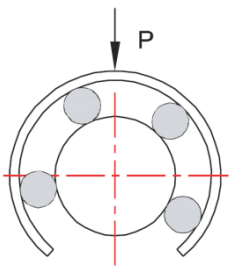
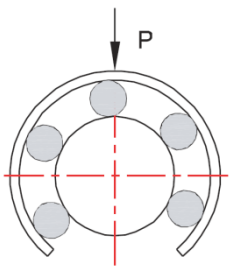
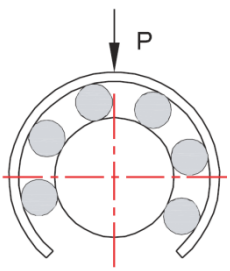
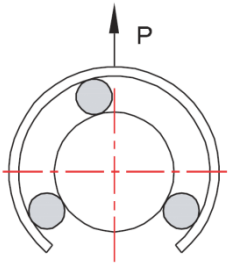
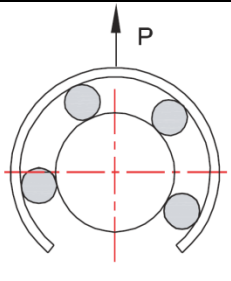
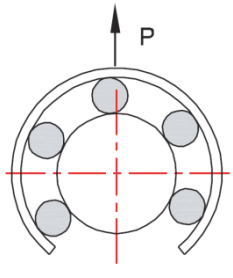
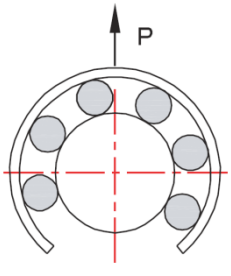
滚珠线性轴承技术数据

钢珠列数与额定荷重

标准型

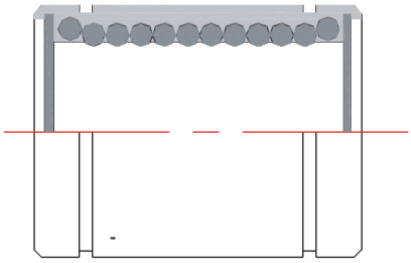
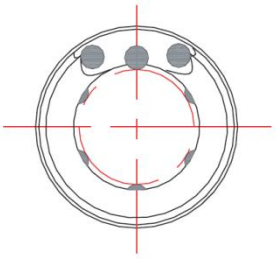
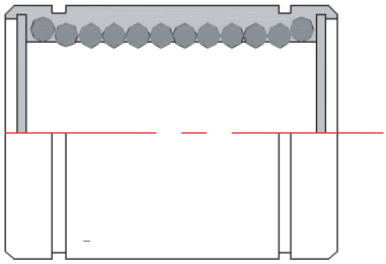
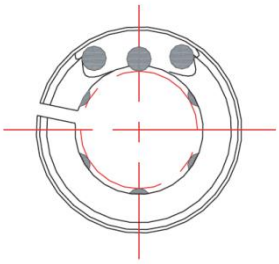
钢珠列数 / 荷重位置	3	4	5	6	8
条列位置	 Q1=P0	 Q1=P0	 Q1=1.106P0	 Q1=1.354P0	 Q1=1.84P0
条列位置	 Q0=P0	 Q0=P0	 Q0=1.618P0	 Q0=1.732P0	 Q0=2.052P0
荷重比	Q0/Q1=1	Q0/Q1=1.141	Q0/Q1=1.463	Q0/Q1=1.280	Q0/Q1=1.115

开放型

钢珠列数 / 荷重位置	3	4	5	6
来自上方的荷重				
	C	C	C	C
来自下方的荷重				
	0.64C	0.54C	0.57C	0.35C

滚珠线性轴承技术数据

轴承型式

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
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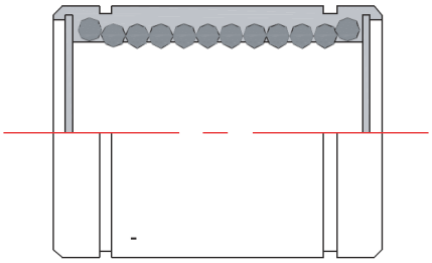
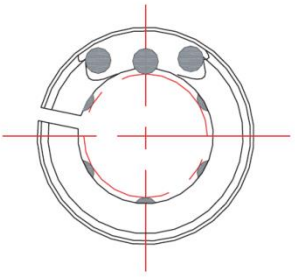
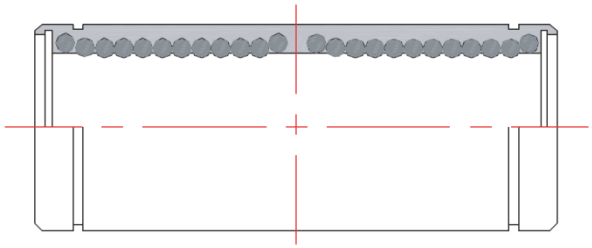
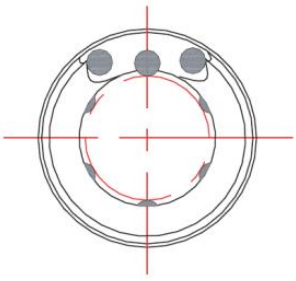
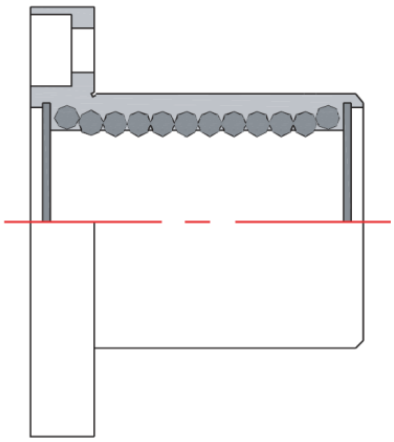
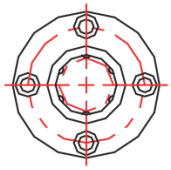
Open(OP) type 		LM-OP	LM-NOP
		KB-OP	KB-NOP
		SW-OP	SW-NOP
Double-wide type 		LM-L	LM-L-N
		KB-L	KB-L-N
		SW-L	SW-L-M
Flange type 		LMF	LMF-N
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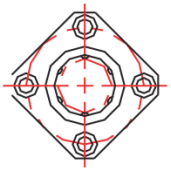
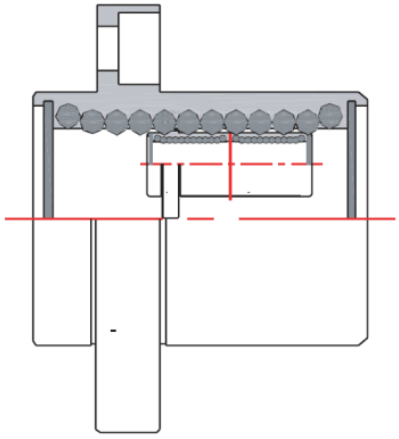
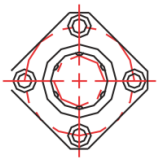
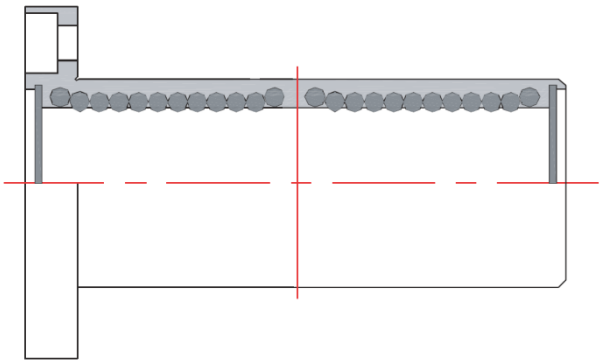
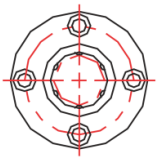
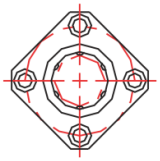
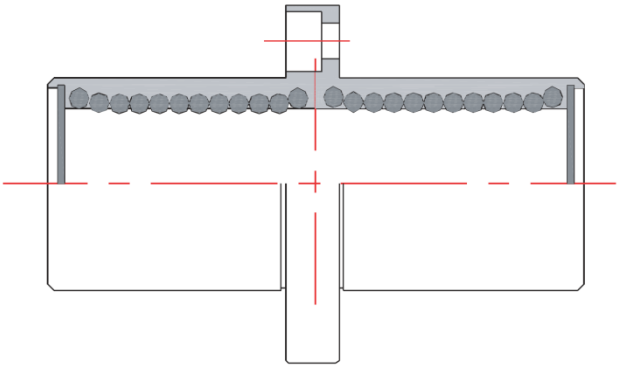
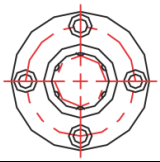
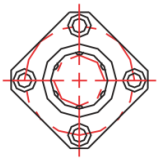
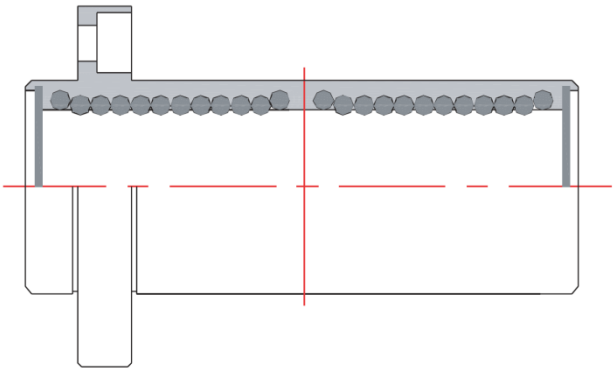
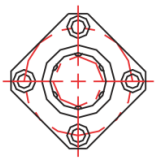
		SWF	SWF-N
		LMK	LMK-N
		KBK	KBK-N
		SWK	SWK-N
		LMT	LMT-N
		KBT	KBT-B
		SWT	SWT-N

滚珠线性轴承技术数据

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

滚珠线性轴承技术数据

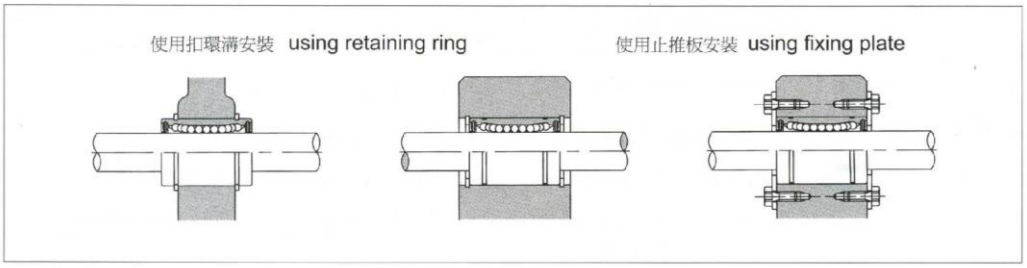
间隙及组件方式

1．建议间隙及配合公差

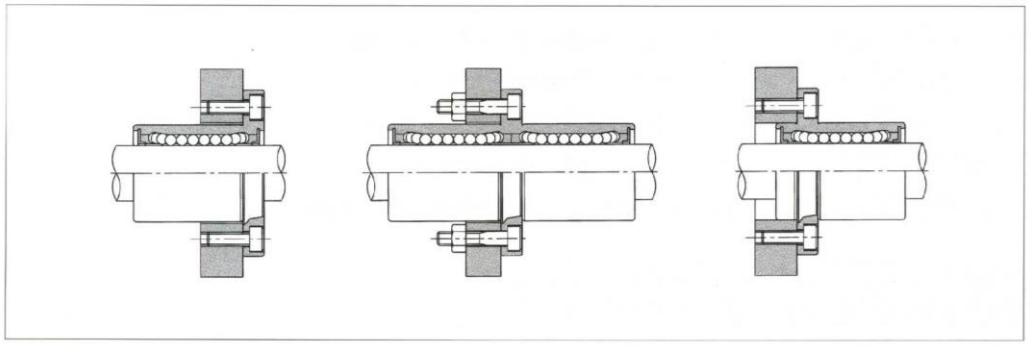
轴承型式 Model	精度等级 Division	轴心 Shaft		轴承座 Housing	
		一般间隙 Normal fit	紧密间隙 Transitional fit	松配合 Loose fit	紧配点 Tight fit
LM	上级 High class	g6	h6	H7	J7
	精密级 Pracision	g5	h5	H6	J6
LM-L	上级 High class	g6		H7	
KB	上级 High class	h6	j6	H7	J7
KB-L	上级 High class	h6		H7	
SW	上级 High class	g6	h6	H7	J7
	精密级 Pracision	g5	h5	H7	J6
SW-L	上级 High class	g6		H7	

2．建议组配方式

標準形 standard type



法蘭形式 flange type



軸承塞入孔座建議 insertion of slide bush

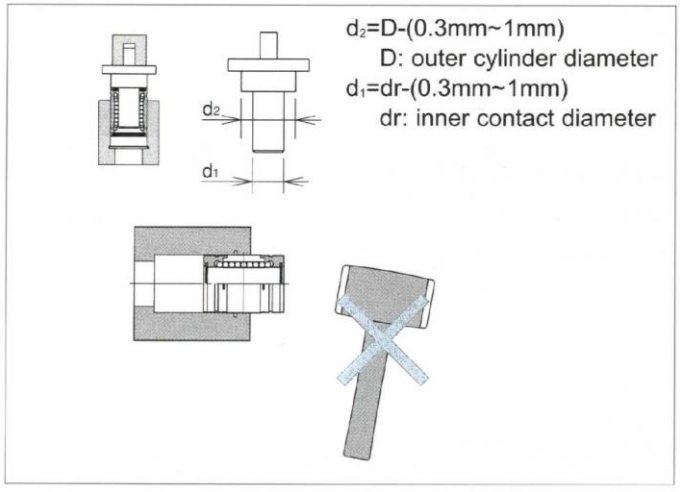


图 29