

HPP4-工程塑料轴承 Plastic Plain Bearings

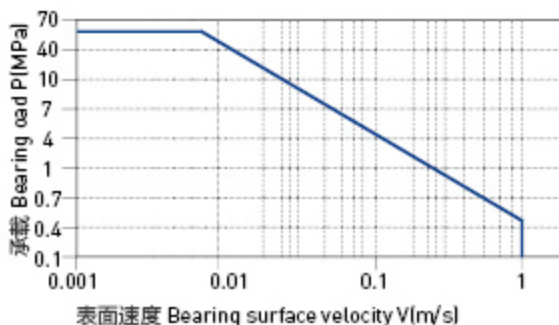
轴承PV值 PV Value

HPP4塑料轴承最大运行PV值为 $0.5\text{N/mm}^2 \times \text{m/s}$;由此决定轴承所承受的载荷与速度成反比, 详情查阅图表HPP4-1。

The max PV value of the HPP4 plastic bearing is $0.5\text{N/mm}^2 \times \text{m/s}$ which determines the load capacity of bearing is inversely proportional to the speed. Please refer to the chart for more detailed information (Graph HPP4-1).

图表 HPP4-1: PV 图表

Graph HPP3-1: Permissible PV value for HPP4



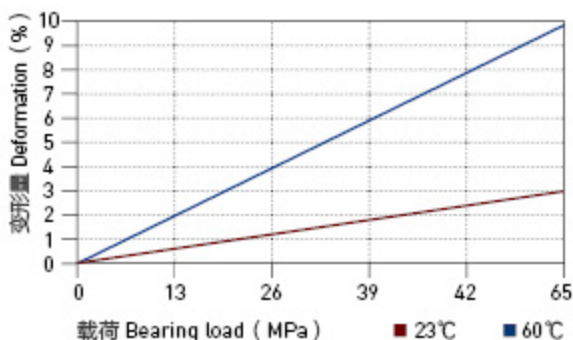
轴承的载荷、速度、温度 The Relation Of Load, Speed And Temperature

HPP4塑料轴承可承受最大静载荷为65Mpa, 在此载荷下轴承的最大压缩变形量参考图表HPP4-2; 轴承实际工作载荷小于65Mpa, 载荷还受到运行速度以及温度的影响, 速度越快 (Vmax: 1.0m/s)会导致摩擦温度上升, 而温度上升 (Tmax: 100℃)会导致轴承的承载能力逐渐减弱, 载荷随轴承工作温度变化情况参考图表HPP4-3。

HPP4 allows the max static load of 65Mpa, The max compressive deformation rate under the max load is listed in Graph HPP4-2; The actual load capacity of bearing is slightly less than 65Mpa, The bearing load is variable against the speed and temperature, Fast speed (Vmax: 1.0m/s) results into higher temperature (Tmax: 100℃) which decreases the load capacity of the bearing. Please refer to the Graph HPP4-3 for such variation.

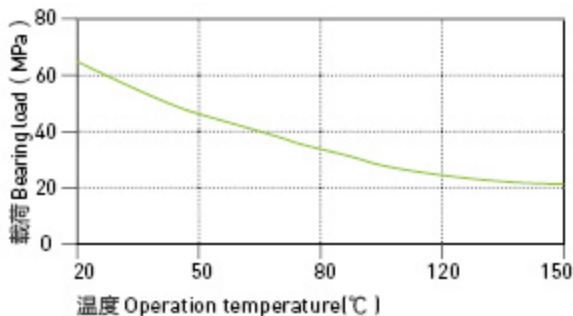
图表 HPP4-2: 载荷 - 温度 - 变形量图表

Graph HPP2-2: Load-Temperature deformation



图表 HPP4-3: 载荷 - 温度图表

Graph HPP4-3: Load-Temperature diagrams



HPP4-工程塑料轴承 Plastic Plain Bearings

轴承的摩擦系数、磨损、轴材料 Friction Factor, Wear And Shaft Material

■ 轴承的摩擦系数 Friction factor

图表HPP4-4表明HPP4轴承的摩擦系数随着运动速度的变化影响较小，而图表HPP4-5表明HPP4轴承的摩擦系数随着载荷的增加明显减小，在载荷超过20Mpa是逐渐趋于平稳；图表HPP4-6表明HPP4轴承的摩擦系数受轴粗糙度的影响也相对比较小；虽然如此，我们还是建议轴的表面不能太光滑，也不能过于出差，推荐使用轴的粗糙度为Ra0.3- 0.6 μ m；

HPP4 Bearing Friction factor is not so sensitive to the operation speed [see Graph HPP4-4]. The friction factor is considerably decreased along with the loading increasing and it will be turned to be stable when the loading reaches 20Mpa. Graph HPP4-5 shows the friction factor of the bearing is also not sensitive to the shaft roughness but we still recommend that the roughness of the shaft should be neither too smooth nor too rough. It is recommended to keep the roughness of the shaft to be within the range of Ra0.3 to Ra0.6.

HPP4	干运行 Dry	油脂 Grease	油 Oil	水 Water
摩擦系数 μ Friction coef.	0.09-0.20	0.09	0.04	0.04

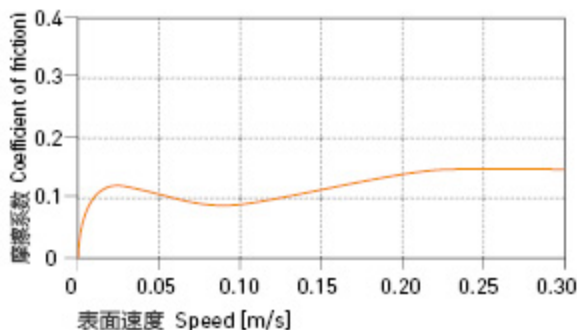
■ 磨损与轴材料 Wearing and shaft material

图表HPP4-7表明HPP4轴承在2Mpa下做旋转运动时，磨损随着轴材料的变化较大；通过实验表明HPP4轴承在做旋转运动时比较适合用于硬铬轴，硬化钢轴和硬铬轴上用于HPP4能获得良好的运行效果。图表HPP4-8表明硬铬轴更适合用于高载荷下的HPP4轴承，随着载荷的不断增加，轴承的磨损速率却变化较小，图表HPP4-8表明HPP4轴承在不同载荷下的差异。

Graph HPP4-7 shows that the HPP4 material is not sensitive with different materials under the rotating operation. It is suitable for hard shaft and high speed steel shaft as well as hard chrome steel shaft. Graph HPP4-8 shows that the hard chrome steel shaft is most suitable for using HPP4 bearing because the wearing speed is not sensitive when the loading is increased. From the Graph HPP4-8, it shows that HPP4 features different performance.

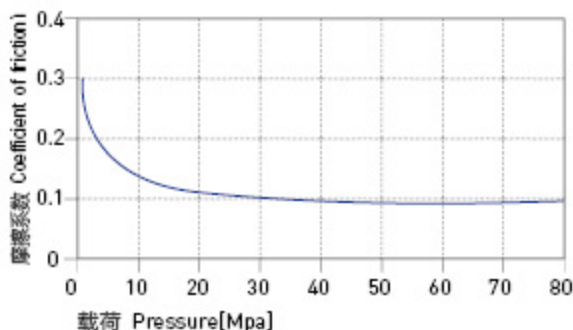
图表 HPP3-4: 摩擦系数与速度变化关系图表 P=2MPa

Graph HPP3-4: Coefficient of friction & the speed of bearing, P=2Mpa



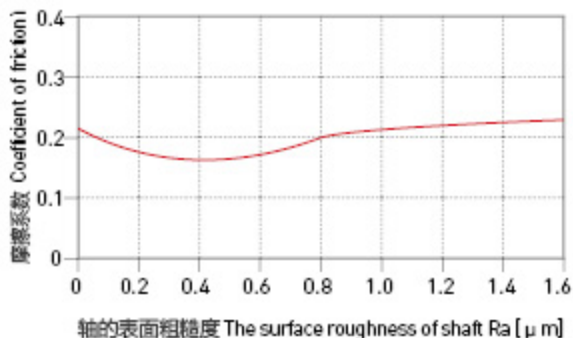
图表 HPP3-5: 摩擦系数与载荷变化关系图表 v=0.2m/s

Graph HPP3-5: Coefficient of friction & the pressure of bearing, v=0.2m/s



图表 HPP3-6: 摩擦系数与轴表面粗糙度关系图表

Graph HPP3-6: Coefficient of friction & the surface roughness of shaft



HPP4-工程塑料轴承 Plastic Plain Bearings

轴承的摩擦系数、磨损、轴材料 Friction Factor, Wear And Shaft Material

■ 化学抗性 Chemical Resistance

HPP4塑料轴承能抵抗弱碱以及各类润滑油的腐蚀。

HPP4 is good at chemical resistance against weak acidic medium and various kinds of lubricants.

■ 吸水性 Water Absorbability

在标准大气压中，HPP4塑料轴承的吸水率为1.3%，浸泡水中最大平衡吸水率为6.5%；由于此吸水率的特性，我们必须考虑此轴承的应用环境。

The water absorb rate of HPP4 is 1.3% under the atmospheric pressure while it is 6.5% when the material is immersed into water. The application environment has to be considered because of its water absorb properties.

■ 抗UV性能 UV Resistance

HPP4长久暴露在紫外线下颜色会发生褪变。材料性能基本不会发生改变。

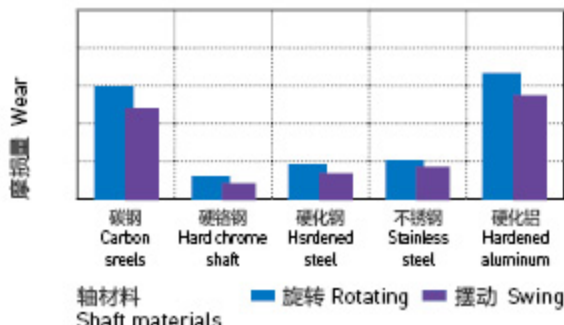
The color of HPP4 could be dimmed when it is exposed into the UV ray. The material performance stays stable.

■ 安装公差 Installation Tolerances

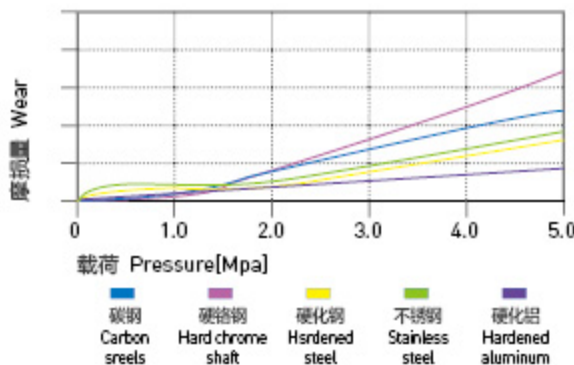
HPP4塑料轴承压装后公差Tolerances after pressfit

直径 DI. [mm]	HPP4 E10 [mm]	座孔 Housing H7 [mm]	轴 Shaft h9 [mm]
> 0~3	+0.014~+0.054	0~+0.010	0~-0.025
> 3~6	+0.020~+0.068	0~+0.012	0~-0.030
> 6~10	+0.025~+0.083	0~+0.015	0~-0.036
> 10~18	+0.032~+0.102	0~+0.018	0~-0.043
> 18~30	+0.040~+0.124	0~+0.021	0~-0.052
> 30~50	+0.050~+0.150	0~+0.025	0~-0.062
> 50~80	+0.060~+0.180	0~+0.030	0~-0.074
> 80~120	+0.072~+0.212	0~+0.035	0~-0.087
> 120~180	+0.085~+0.245	0~+0.040	0~-0.100

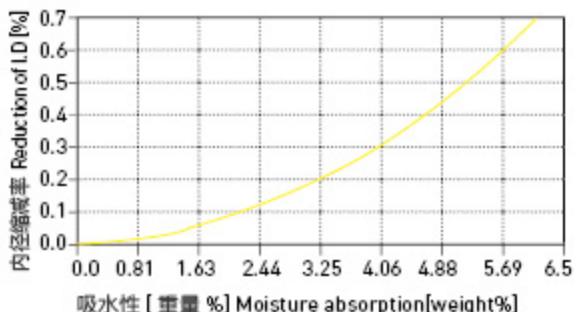
图表 HPP4-7: 在不同轴材料上旋转时的磨损量 $P=2\text{MPa}$, $v=0.2\text{m/s}$
 Graph HPP4-7: The bearing wear under rotating with different shaft materials, $p=2\text{MPa}$, $v=0.2\text{m/s}$



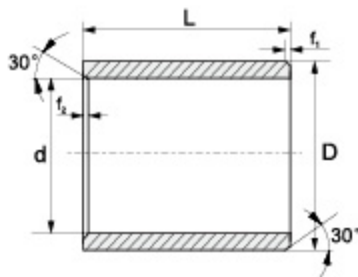
图表 HPP4-8: 旋转磨损随轴材料与压力变化关系 $v=0.2\text{m/s}$
 Graph HPP4-8: The bearing wear & pressure under rotating with different shaft materials, $v=0.2\text{m/s}$



图表 HPP4-9: 吸水性的影响
 Graph HPP4-9: Effect of moisture absorption on HPP4 bearings



HPP4标准规格Standard 直套Metric Cylindrical Bushings



推荐安装公差 Recommend fitting tolerance:

座孔 Housing: H7

轴 Shaft: h9

订购编码 Order P/N:

HPP4-0304-03

材料 Material

d	f ₁	f ₂
1-6	0.3	0.5
6-12	0.5	
12-30	0.8	
>30	1.2	

订购编码 Order PN	d [mm]	d- 公差 After fitting [mm]	D [mm]	L(h13) [mm]
HPP4-0304-03	3	+0.014/+0.054	4.5	3
HPP4-0304-05	3	+0.014/+0.054	4.5	5
HPP4-0304-06	3	+0.014/+0.054	4.5	6
HPP4-0405-04	4	+0.02/+0.068	5.5	4
HPP4-0405-06	4	+0.02/+0.068	5.5	6
HPP4-0405-08	4	+0.02/+0.068	5.5	8
HPP4-0405-10	4	+0.02/+0.068	5.5	10
HPP4-0507-05	5	+0.02/+0.068	7	5
HPP4-0507-08	5	+0.02/+0.068	7	8
HPP4-0507-10	5	+0.02/+0.068	7	10
HPP4-0608-06	6	+0.02/+0.068	8	6
HPP4-0608-08	6	+0.02/+0.068	8	8
HPP4-0608-09	6	+0.02/+0.068	8	9
HPP4-0608-10	6	+0.02/+0.068	8	10
HPP4-0608-11	6	+0.02/+0.068	8	11
HPP4-0810-06	8	+0.025/+0.083	10	6
HPP4-0810-08	8	+0.025/+0.083	10	8
HPP4-0810-10	8	+0.025/+0.083	10	10
HPP4-0810-12	8	+0.025/+0.083	10	12
HPP4-0810-13	8	+0.025/+0.083	10	13
HPP4-0810-15	8	+0.025/+0.083	10	15
HPP4-0810-21	8	+0.025/+0.083	10	21
HPP4-1012-04	10	+0.025/+0.083	12	4
HPP4-1012-06	10	+0.025/+0.083	12	6
HPP4-1012-08	10	+0.025/+0.083	12	8
HPP4-1012-10	10	+0.025/+0.083	12	10
HPP4-1012-12	10	+0.025/+0.083	12	12
HPP4-1012-20	10	+0.025/+0.083	12	20
HPP4-1214-05	12	+0.032/+0.102	14	5
HPP4-1214-06	12	+0.032/+0.102	14	6
HPP4-1214-10	12	+0.032/+0.102	14	10
HPP4-1214-12	12	+0.032/+0.102	14	12
HPP4-1214-15	12	+0.032/+0.102	14	15
HPP4-1214-20	12	+0.032/+0.102	14	20
HPP4-1214-25	12	+0.032/+0.102	14	25
HPP4-1416-10	14	+0.032/+0.102	16	10
HPP4-1416-15	14	+0.032/+0.102	16	15

订购编码 Order PN	d [mm]	d- 公差 After fitting [mm]	D [mm]	L(h13) [mm]
HPP4-1416-20	14	+0.032/+0.102	16	20
HPP4-1416-25	14	+0.032/+0.102	16	25
HPP4-1517-10	15	+0.032/+0.102	17	10
HPP4-1517-20	15	+0.032/+0.102	17	20
HPP4-1517-25	15	+0.032/+0.102	17	25
HPP4-1618-08	16	+0.032/+0.102	18	8
HPP4-1618-15	16	+0.032/+0.102	18	15
HPP4-1618-20	16	+0.032/+0.102	18	20
HPP4-1618-25	16	+0.032/+0.102	18	25
HPP4-1820-20	18	+0.032/+0.102	20	20
HPP4-2022-15	20	+0.04/+0.124	22	15
HPP4-2023-10	20	+0.04/+0.124	23	10
HPP4-2023-15	20	+0.04/+0.124	23	15
HPP4-2023-20	20	+0.04/+0.124	23	20
HPP4-2023-23	20	+0.04/+0.124	23	23
HPP4-2023-30	20	+0.04/+0.124	23	30
HPP4-2225-15	22	+0.04/+0.124	25	15
HPP4-2225-20	22	+0.04/+0.124	25	20
HPP4-2225-25	22	+0.04/+0.124	25	25
HPP4-2225-30	22	+0.04/+0.124	25	30
HPP4-2528-12	25	+0.04/+0.124	28	12
HPP4-2528-20	25	+0.04/+0.124	28	20
HPP4-2528-25	25	+0.04/+0.124	28	25
HPP4-2528-30	25	+0.04/+0.124	28	30
HPP4-2832-20	28	+0.04/+0.124	32	20
HPP4-2832-25	28	+0.04/+0.124	32	25
HPP4-2832-30	28	+0.04/+0.124	32	30
HPP4-3034-20	30	+0.04/+0.124	34	20
HPP4-3034-25	30	+0.04/+0.124	34	25
HPP4-3034-30	30	+0.04/+0.124	34	30
HPP4-3034-40	30	+0.04/+0.124	34	40
HPP4-3236-20	32	+0.05/+0.15	36	20
HPP4-3236-30	32	+0.05/+0.15	36	30
HPP4-3236-40	32	+0.05/+0.15	36	40
HPP4-3539-20	35	+0.05/+0.15	39	20
HPP4-3539-30	35	+0.05/+0.15	39	30
HPP4-3539-40	35	+0.05/+0.15	39	40

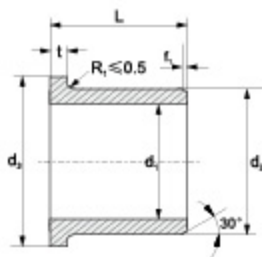
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HPP4-3539-50	35	+0.05/+0.15	39	50
HPP4-4044-20	40	+0.05/+0.15	44	20
HPP4-4044-30	40	+0.05/+0.15	44	30
HPP4-4044-40	40	+0.05/+0.15	44	40
HPP4-4044-50	40	+0.05/+0.15	44	50

订购编码 Order PN	d [mm]	d- 公差 After fitting [mm]	D [mm]	L(h13) [mm]
HPP4-5055-40	50	+0.05/+0.15	55	40
HPP4-5055-50	50	+0.05/+0.15	55	50

*d 公差为压入标准 H7 座孔 (ISO3547-1) 后公差

*Tolerance d: after being pressed into housing H7(ISO3547-1)

翻边轴套 Metric Flange Bushings



推荐安装公差 Recommend fitting tolerance:

座孔 Housing: H7

轴 Shaft: h9

订购编码 Order P/N:

HPP4 F-0304-03

d_1 d_2 L
 翻边轴套 Flange bushes
 材料 Material

d	f
1-6	0.3
6-12	0.5
12-30	0.8
>30	1.2

订购编码 Order PN	d_1 [mm]	d_1 - 公差 After fitting [mm]	d_2 [mm]	d_2 [d13] [mm]	L[h13] [mm]	$t_{0.16}$ [mm]
HPP4F-0304-03	3	+0.014/+0.054	4.5	7.5	3	0.75
HPP4F-0304-05	3	+0.014/+0.054	4.5	7.5	5	0.75
HPP4F-0405-03	4	+0.02/+0.068	5.5	9.5	3	0.75
HPP4F-0405-04	4	+0.02/+0.068	5.5	9.5	4	0.75
HPP4F-0405-06	4	+0.02/+0.068	5.5	9.5	6	0.75
HPP4F-0506-15	5	+0.02/+0.068	6	10	15	0.5
HPP4F-0507-04	5	+0.02/+0.068	7	11	4	1
HPP4F-0507-05	5	+0.02/+0.068	7	11	5	1
HPP4F-0507-10	5	+0.02/+0.068	7	11	10	1
HPP4F-0608-04	6	+0.02/+0.068	8	12	4	1
HPP4F-0608-06	6	+0.02/+0.068	8	12	6	1
HPP4F-0608-08	6	+0.02/+0.068	8	12	8	1
HPP4F-0608-10	6	+0.02/+0.068	8	12	10	1
HPP4F-0810-04	8	+0.025/+0.083	10	15	4	1
HPP4F-0810-05	8	+0.025/+0.083	10	15	5	1
HPP4F-0810-07	8	+0.025/+0.083	10	15	7	1
HPP4F-0810-08F2.5	8	+0.025/+0.083	10	15	8	2.5
HPP4F-0810-09	8	+0.025/+0.083	10	15	9	1
HPP4F-0810-10	8	+0.025/+0.083	10	15	10	1
HPP4F-0810-30	8	+0.025/+0.083	10	15	30	1
HPP4F-1012-06	10	+0.025/+0.083	12	18	6	1
HPP4F-1012-07	10	+0.025/+0.083	12	18	7	1
HPP4F-1012-10	10	+0.025/+0.083	12	18	10	1
HPP4F-1012-12	10	+0.025/+0.083	12	18	12	1
HPP4F-1012-15	10	+0.025/+0.083	12	18	15	1
HPP4F-1012-17	10	+0.025/+0.083	12	18	17	1

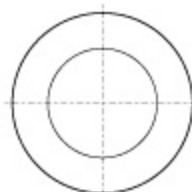
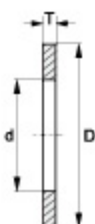
订购编码 Order PN	d_1 [mm]	d_1 - 公差 After fitting [mm]	d_2 [mm]	d_2 [d13] [mm]	L[h13] [mm]	$t_{0.16}$ [mm]
HPP4F-1214-04	12	+0.032/+0.102	14	18	4	1
HPP4F-1214-07	12	+0.032/+0.102	14	18	7	1
HPP4F-1214-09	12	+0.032/+0.102	14	18	9	1
HPP4F-1214-10	12	+0.032/+0.102	14	18	10	1
HPP4F-1214-11	12	+0.032/+0.102	14	18	11	1
HPP4F-1214-12	12	+0.033/+0.102	14	18	12	1
HPP4F-1214-15	12	+0.032/+0.102	14	18	15	1
HPP4F-1214-17	12	+0.032/+0.102	14	18	17	1
HPP4F-1214-20	12	+0.032/+0.102	14	18	20	1
HPP4F-1416-12	14	+0.032/+0.102	16	22	12	1
HPP4F-1416-17	14	+0.032/+0.102	16	22	17	1
HPP4F-1517-12	15	+0.032/+0.102	17	23	12	1
HPP4F-1517-17	15	+0.032/+0.102	17	23	17	1
HPP4F-1517-20	15	+0.032/+0.102	17	23	20	1
HPP4F-1618-09	16	+0.032/+0.102	18	24	9	1
HPP4F-1618-12	16	+0.032/+0.102	18	24	12	1
HPP4F-1618-17	16	+0.032/+0.102	18	24	17	1
HPP4F-1820-17	18	+0.032/+0.102	20	26	17	1
HPP4F-1820-22	18	+0.032/+0.102	20	26	22	1
HPP4F-2023-11.5	20	+0.04/+0.124	23	30	11.5	1.5
HPP4F-2023-16.5	20	+0.04/+0.124	23	30	16.5	1.5
HPP4F-2023-21.5	20	+0.04/+0.124	23	30	21.5	1.5
HPP4F-2528-11.5	25	+0.04/+0.124	28	35	11.5	1.5
HPP4F-2528-16.5	25	+0.04/+0.124	28	35	16.5	1.5
HPP4F-2528-21.5	25	+0.04/+0.124	28	35	21.5	1.5
HPP4F-3034-16	30	+0.04/+0.124	34	42	16	2

订购编码 Order PN	d_1 [mm]	d_1 - 公差 After fitting [mm]	d_2 [mm]	d_2 [d13] [mm]	L[h13] [mm]	$t_{0.15}$ [mm]
HPP4F-3034-26	30	+0.04/+0.124	34	42	26	2
HPP4F-3034-37	30	+0.04/+0.124	34	42	37	2
HPP4F-3236-16	32	+0.05/+0.15	36	40	16	2
HPP4F-3236-26	32	+0.05/+0.15	36	40	26	2
HPP4F-3539-09	35	+0.05/+0.15	39	47	9	2
HPP4F-3539-16	35	+0.05/+0.15	39	47	16	2
HPP4F-3539-26	35	+0.05/+0.15	39	47	26	2

订购编码 Order PN	d_1 [mm]	d_1 - 公差 After fitting [mm]	d_2 [mm]	d_2 [d13] [mm]	L[h13] [mm]	$t_{0.15}$ [mm]
HPP4F-4044-30	40	+0.05/+0.15	44	52	30	2
HPP4F-4550-50	45	+0.05/+0.15	50	58	50	2
HPP4F-5055-40	50	+0.05/+0.15	55	63	40	2

* d_1 公差为压入标准 H7 座孔 (ISO3547-1) 后公差
 *Tolerance d_1 : after being pressed into housing H7(ISO3547-1)

垫片 Metric Thrust Washers



订购编码 Order PN:

HPP4 W-0509-006



 垫片 Washer
 材料 Material

订购编码 Order PN	$d^{+0.25}$ [mm]	$D_{-0.25}$ [mm]	$T_{-0.05}$ [mm]
HPP4W-0509-006	5	9	0.6
HPP4W-0615-015	6	15	1.5
HPP4W-0620-015	6	20	1.5
HPP4W-0815-005	8	15	0.5
HPP4W-0815-015	8	15	1.5
HPP4W-0818-005	8	18	0.5
HPP4W-0818-010	8	18	1.0
HPP4W-0818-015	8	18	1.5
HPP4W-1018-010	10	18	1.0
HPP4W-1018-015	10	18	1.5
HPP4W-1018-020	10	18	2.0
HPP4W-1224-012	12	24	1.2
HPP4W-1224-015	12	24	1.5
HPP4W-1426-015	14	26	1.5
HPP4W-1524-015	15	24	1.5

订购编码 Order PN	$d^{+0.25}$ [mm]	$D_{-0.25}$ [mm]	$T_{-0.05}$ [mm]
HPP4W-1630-015	16	30	1.5
HPP4W-1832-015	18	32	1.5
HPP4W-2032-010	20	32	1.0
HPP4W-2036-015	20	36	1.5
HPP4W-2238-015	22	38	1.5
HPP4W-2442-015	24	42	1.5
HPP4W-2644-015	26	44	1.5
HPP4W-2848-015	28	48	1.5
HPP4W-3254-015	32	54	1.5
HPP4W-3862-015	38	62	1.5
HPP4W-4266-015	42	66	1.5
HPP4W-4874-020	48	74	2.0
HPP4W-5278-020	52	78	2.0
HPP4W-6290-020	62	90	2.0

* 根据要求提供定位孔设计 The fixing bore design upon request