ORIGINAL POWER ACTUATOR

齿条、齿圈分册

KAMO SEIKO CORP.

2024 版

TCG

Trochoid
Cam
Gear

kamo

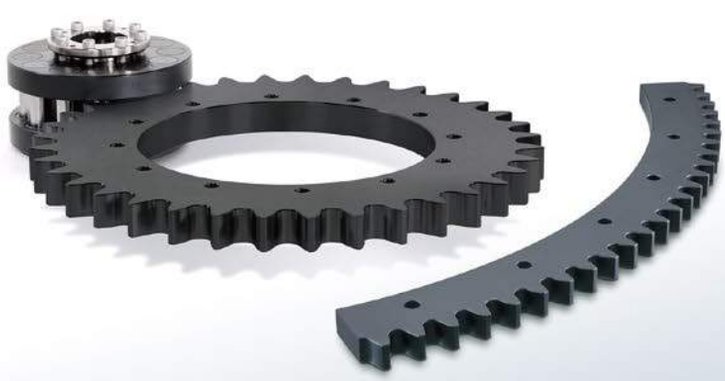
回转・直线的零背隙驱动方式

Linear and curvilinear Non backlash and Maintenance free machine elements.

● TCG 滚轮齿条
TCG Runner

● TCG 滚轮齿条 不锈钢款
TCG Runner Stainless-steel type

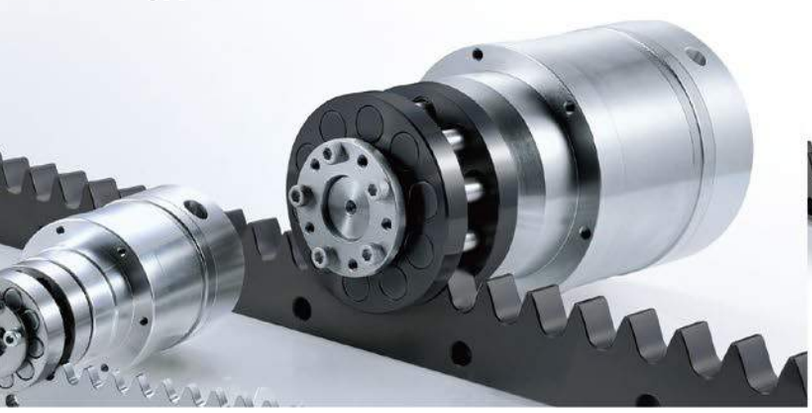
● TCG 齿圈
TCG Ring



● 自动润滑块
TLS

NEW

● 精密球减速机
SFP



● 精密重载减速机
NSP

NEW

KAMO SEIKO CORP.

Non-Backlash TCG Cam Rack/Ring & Roller Pinion

零背隙 TCG 齿条/齿圈&滚轮

零 背 隙 Non-backlash

齿（滚销）常时2–3处保持接触，正反方向上不会发生齿间背隙。

Trochoidal profiled tooth enables us to make a plurality of mutual teeth mesh at one time. The teeth always mesh via two or three portions and eliminate backlash when rotated in one or another direction.

高 精 度 High accuracy

进给精度（回转 — 直线比）和定位精度逼近精密滚珠丝杆。

Instead of gears, a combination of cam and roller makes a positioning accuracy and feeding accuracy (rotation-linearity ratio) as nearly as that of the ball-screw structure.

润 滑 免 维 护 Maintenance Free

通过搭配使用TCG自动润滑块TLS（详见P.37），
真正实现无需给油的完全免维护。（※一般环境）

Combination with TCG Lubrication system TLS (P. 37) eliminates the need for all the lubrication, and thereby realizes complete maintenance-free operation. (※for use in general environment)

低噪音・低振动 Low noise and low vibration

滚针轴承支撑的滚销在次摆线齿面上圆滑滚动，
不发生令人不悦的敲齿音和滚动声，同时也减少了振动。

Rollers smoothly mesh with the optimized trochoidal tooth surface so as to avoid rattling noise, tooth striking noise and rotating noise from being induced together with the least amount of vibration.

低 发 尘 Low dust

由于是圆滑的滚动接触，同时旋转部分是小径低速，低摩擦只产生微小的发热和发尘。

Due to the smooth rotation, the structure dispenses with a least amount of heat and dust generated and cope with a clean room operation.

实现长距离・高速化（齿条） Extended length line and high speed rolling (Cam Rack)

使用拼接齿规可以实现长距离传动。可以进行180m/min以上的高速行走。

Extendable with use of addition jig. Capable of high speed rolling of 180 m/minute or more.

实现分割・大直径（齿圈） The circular arc ring and large-diameter ring (Cam Ring)

通过精密加工，实现分割齿圈。
根据需要使用的度数以及通过组合分割齿圈来实现数十米大直径。

The circular arc ring has been realized by the precision processing.
Ring diameter up to tens of meters can be realized by combining the circular arc rings or can use only the necessary degree.

带滚轮一体式精密减速机（SFP/NSP） Precision reducers equipped with roller pinions (SFP/NSP)

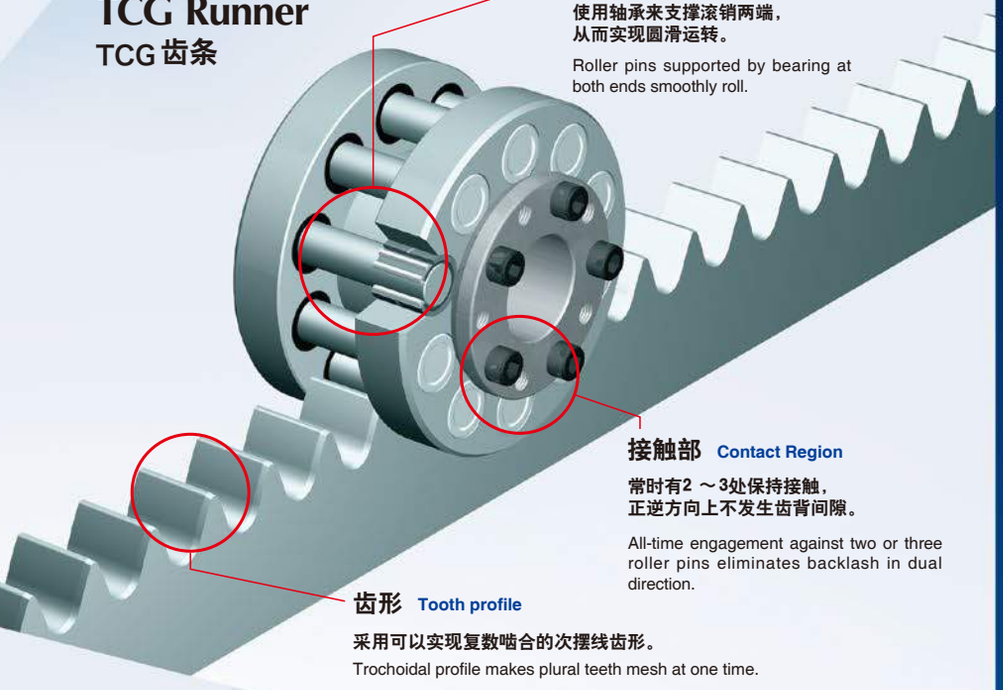
滚轮一体化的精密球减速机SFP以及
精密重载减速机NSP能够和TCG系列组合使用。
通过和TCG产品组合实现精密定位，同时也可以省去选型和装配的麻烦。

The lineup includes the precision Ball Reducer SFP and the precision Differential Reducer NSP that integrate roller pinions that can be combined with the TCG series.
Achieves more precise positioning when combined with TCG. It also eliminates the trouble of selecting and setting the Reducers.

精密球减速机 SFP
适配TCG系列 1210～2510型
Precision Ball Reducer SFP
for TCG Series 1210 – 2510

精密重载减速机 NSP
适配TCG系列 3212～4012型
Precision Differential Reducer NSP
for TCG Series 3212 – 4012

TCG Runner
TCG 齿条



滚销 Roller pins

使用轴承来支撑滚销两端，从而实现圆滑运转。

Roller pins supported by bearing at both ends smoothly roll.

接触部 Contact Region

常时有2 ～3处保持接触，正逆方向上不发生齿背间隙。

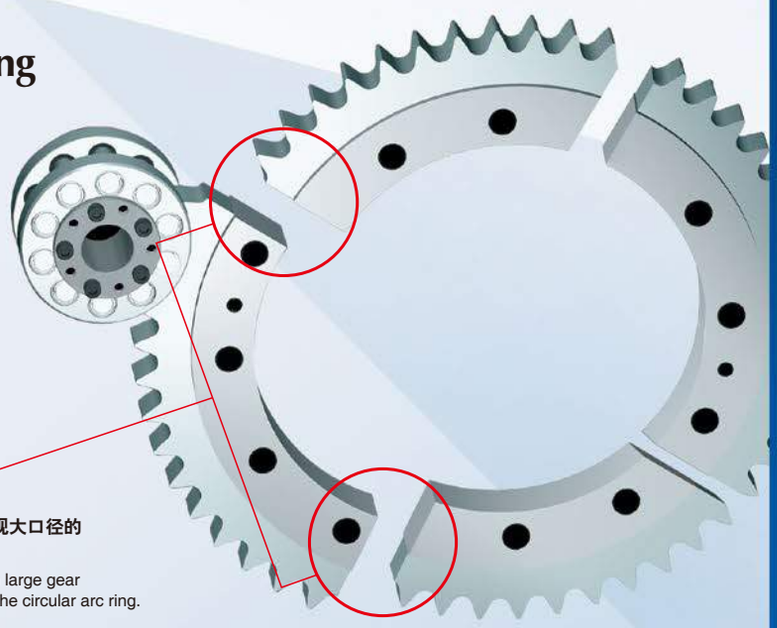
All-time engagement against two or three roller pins eliminates backlash in dual direction.

齿形 Tooth profile

采用可以实现复数啮合的次摆线齿形。

Trochoidal profile makes plural teeth mesh at one time.

TCG Ring
TCG 齿圈



通过分割实现大口径的零背隙齿圈

Non-backlash large gear produced by the circular arc ring.

TCG Lubrication system TLS
TCG 自动润滑块 TLS

NEW

TLS 装配示意图

TLS mounted image

通过采用高粘度润滑油含浸的特殊多孔树脂为接触部表面提供适量润滑剂。

安装简单，无需初期给油或中期维护。

By impregnating a special porous resin with high-viscosity lubricating oil, an appropriate amount of lubricating agent is supplied to the contact surface.
Easy installation on the Roller pinion and No initial lubrication apply and lubrication maintenance.

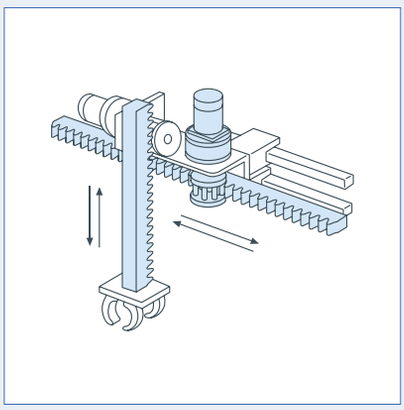
目录
Contents

应用例

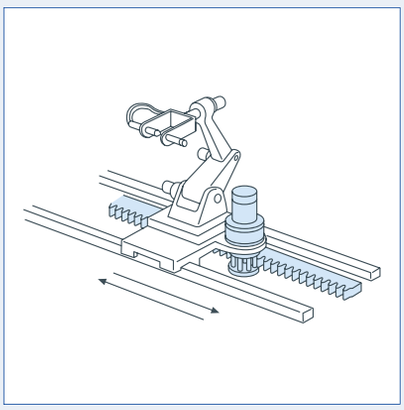
Application examples

TCG Cam Rack　TCG Cam Ring　SFP Series

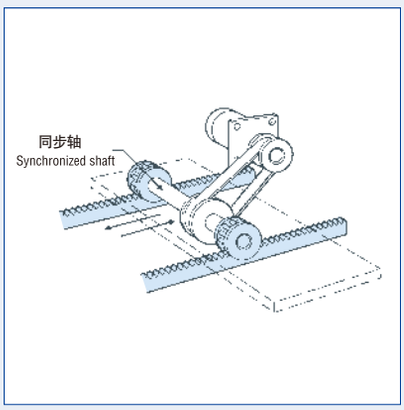
TCG 齿条・滚轮 / SFP 系列 应用案例　TCG Cam Rack & Roller Pinion / SFP series application examples



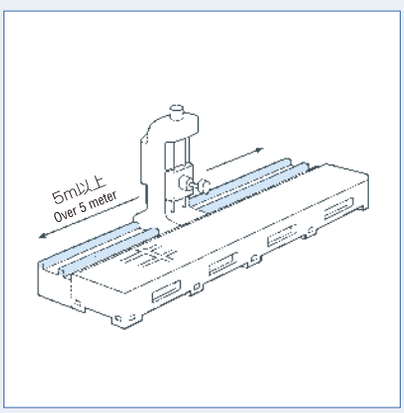
台架　装载机
Gantry loader



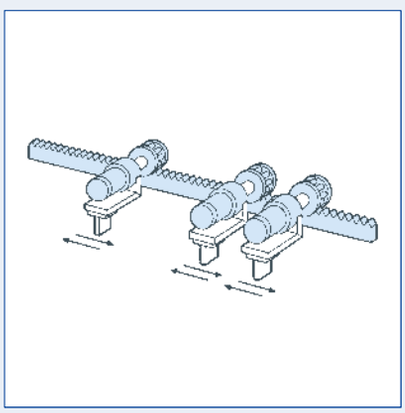
长行程移动机器人
Robotic run at long stroke



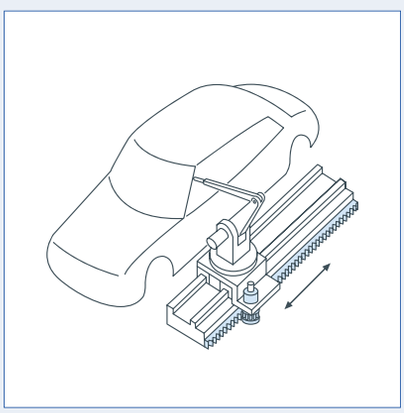
同步进给(防止宽幅传动的间隙)
Synchronized feeding
〈Prevent cogging interference with a wide breadth unit〉



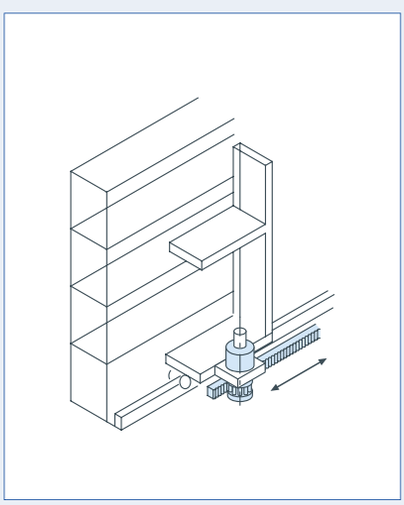
长行程加工机床
Long stroke type machining tool



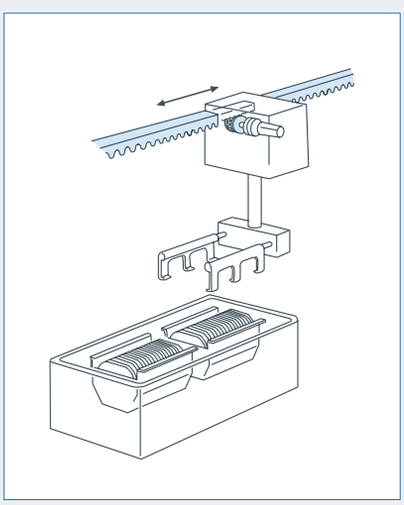
复数滚动头（例如纵切设备）
A plurality of heads
〈Applied to a slitter apparatus〉



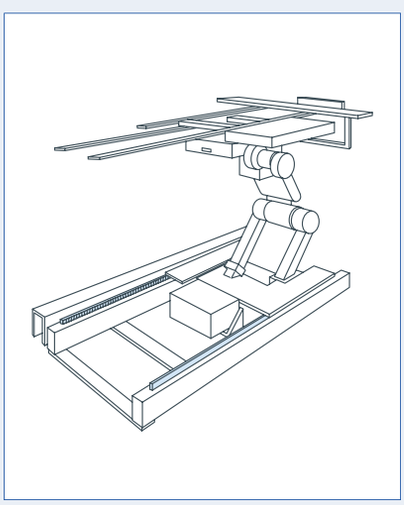
测量仪的进给
Measurement device feeding



堆料机的搬送
Stocker transfer



清洗线的搬送
Transfer to washing bath

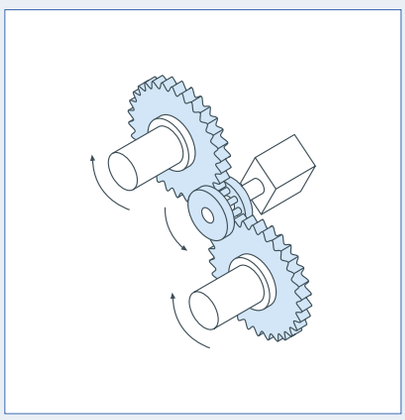


洁净室的机器人搬送
Robot transfer in clean room

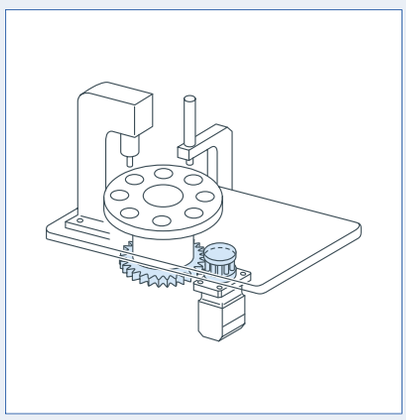
可以对应特殊形状・特殊材料的定制！
请与我们联系。

We can make the product by the special shape, special material and out of the catalogue dimensions etc.
Please feel free to contact us.

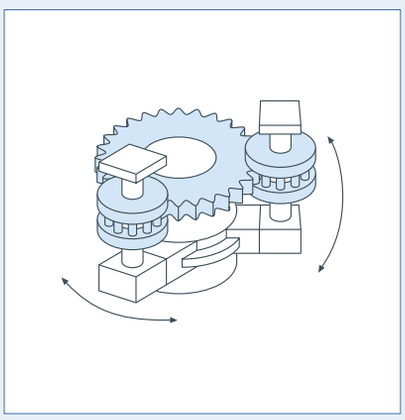
TCG 齿圈・滚轮　应用案例　TCG Cam Ring & Roller Pinion application examples



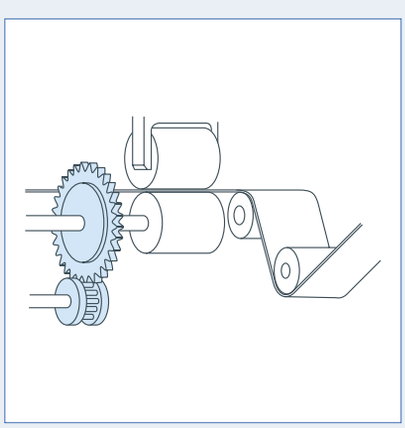
双轴同步驱动
Synchronized dual shaft drive



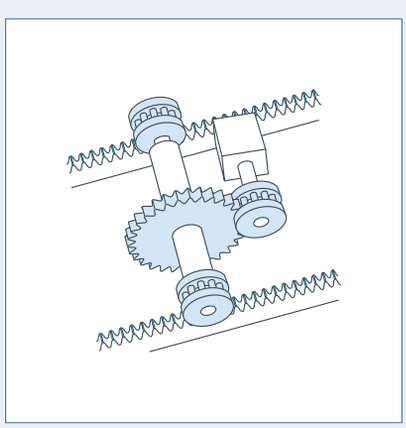
条件设定自由的分度转台
（正·逆，跳转）
Index table usable under flexible conditions
〈Normal & reverse rotation & jumping over〉



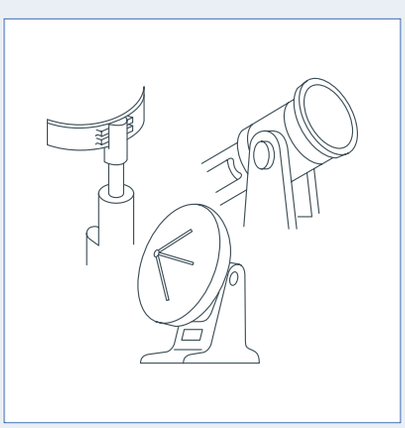
复数转台的驱动
Device for driving a plurality of tables



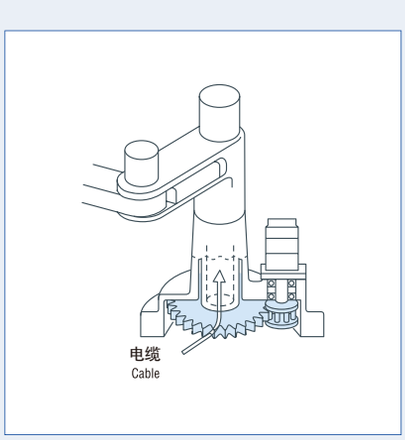
脉动很小的进给，卷绕
（薄膜、纸、薄片和细线）
Winding & feeding device with less pulsations
〈Film, Paper, Sheet & Thin wire〉



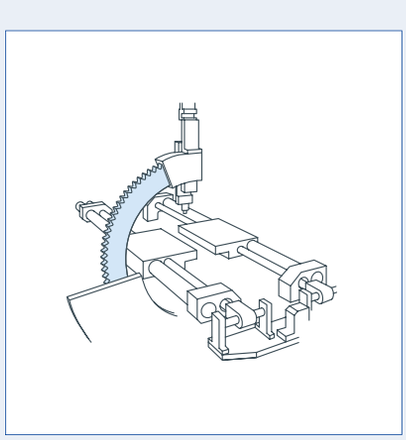
与TCG齿条的组合搭配
Combination with TCG Cam Rack



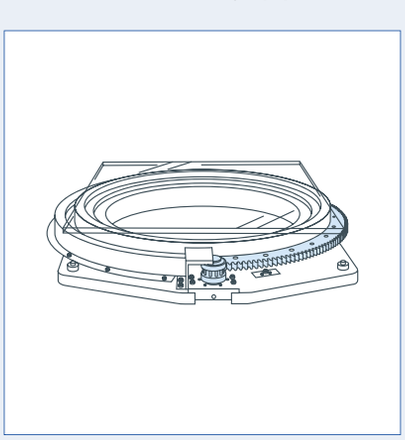
雷达、天线、监视摄像机、
观测机械的驱动
Device for driving radar, antenna, surveillance camera, observatory equipment



机器人旋转驱动（中空）
Pivotal drive device for robot 〈Hollow〉



旋转/定位（竖方向）
Circling / Positioning



TCG 齿圈组件（大型基板）反转装置等
TCG Cam Ring Unit 〈Large-scale〉 turn table

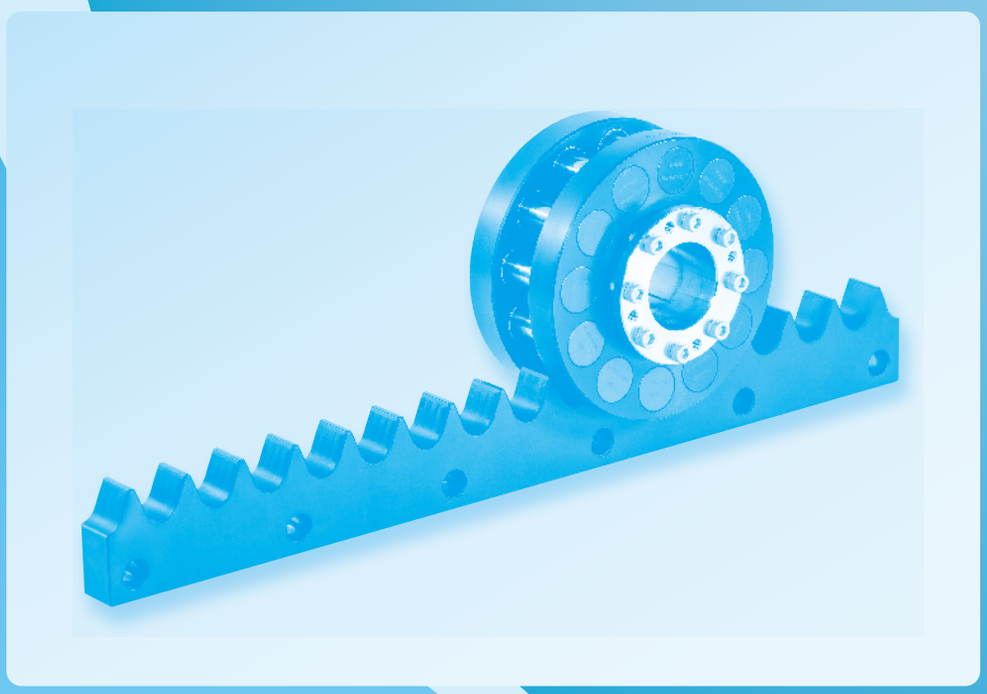
规格 • 尺寸表 • 型号

Specifications, Dimensions and Models

TCG齿条 & 滚轮

标准型 • 高精度型

TCG Cam Rack & Roller Pinion Standard Model, High accuracy Model



齿 条 Cam Rack

标准型规格 STANDARD Model Specifications

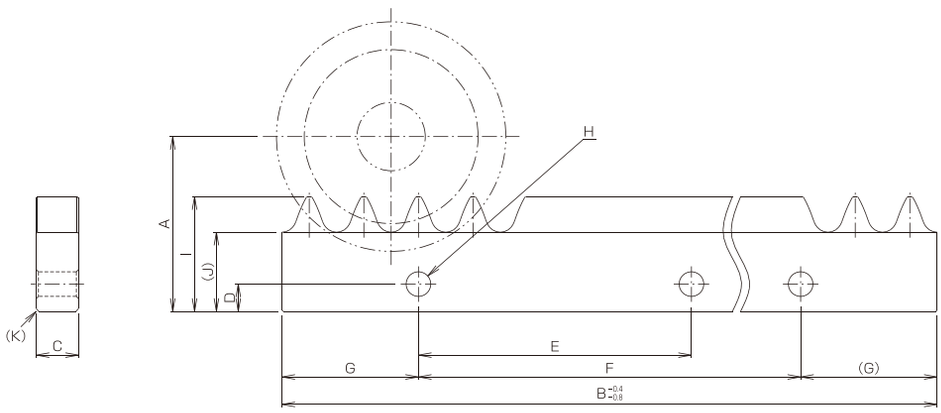
标准品有以下5种。 Standard products are summed up for the following five types.
标准型齿条和高精度型齿条共用相同的滚轮。 STANDARD Model and High accuracy model use the same pinion.

型 号 Model / 项 目 Items			CPA / CRE 系列 CPA / CRE series				
		滚 轮 Roller pinion	CPA1610B	CPA2010B	CPA2510B	CPA3212B	CPA4012B
		齿 条 Cam Rack	CRE1610A	CRE2010A	CRE2510A	CRE3212A	CRE4012A
通用规格 Common spec	基本动额定负载 Basic dynamic rated load	N	1000	1500	2200	3600	6000
	最大使用负载 Maximum working load	N	1700	2200	3100	6600	8500
	允许静额定负载 Allowable static rated load	N	2000	3000	4400	7200	12000
	基本动额定扭矩（注1)* Basic dynamic rated torque	N・m	25.5	47.7	87.5	220	458.4
	最大使用扭矩（注1)* Maximum working torque	N・m	43.3	70.1	123.4	403.3	619.4
	允许静额定扭矩（注1)* Allowable static rated torque	N・m	50.9	95.5	175.1	440	916.7
	滚轮回转一圈的移动距离 Displacement distance of pinion per rotation	mm／回转 mm／revolution	160	200	250	384	480
	最大压力角 Max pressure angle	°	30.7	30.1	30.7	30.1	30.0
	模数（滚子P.C.D／齿数） Module	mm	4.75	6	7.5	9.5	12
滚 轮 Roller pinion	齿数 Number of tooth	齿 teeth	10	10	10	12	12
	外径 Outer Diameter	mm	67	84	101	148	190
	节圆直径（注2)* Diameter of pitch circle	mm	50.9	63.7	79.6	122.2	152.8
	质量 Mass weight	kg	0.71	1.3	2.1	6.4	12.4
	转动惯量 Inertia moment	kg・m²	3.93×10^{-4}	10.5×10^{-4}	25.5×10^{-4}	169×10^{-4}	594×10^{-4}
齿 条 Cam Rack	节距 Pitch	mm	16	20	25	32	40
	定尺 Predetermined length	mm	992	1000	1000	992	1000
	齿数 Number of thooth	齿 teeth／length	62	50	40	31	25
	质量 Mass weight	kg	2.2	4.2	5.5	8.3	14

注1：基本动额定扭矩（最大使用扭矩、允许静额定扭矩）是指加载在滚轮滚销节圆直径上的基本动额定负载（最大使用扭矩、允许静额定负载）所产生的扭矩。
*1 Allowable dynamic rated torqu(allowable static rated torque) is value observed when applying allowable dynamic rated load(allowable static rated load) to roller pinion along diameter formed by pitch circle.
注2：是理论值，并非实际的滚销的节圆直径。
*2 The indicated pitch circle diameter values are theoretical, not representing the actual pitch circle diameters of the respective roller pinions.

外形尺寸图　Outside Dimensional Drawing

CRE 1610A-4012A



■尺寸表　Dimension Table

型　号 Model	A	B	C	D	E	F	G	H	I	J	K	节距 Pitch mm	长度 Predetermined length mm	齿数 Number of tooth	质量 Mass weight
CRE1610A	48	992	12.0	7	96	10×96	16	11-φ7	30.5	20.2	C1	16	992	62	2.2
CRE2010A	64	1000	16.0	10	100	9×100	50	10-φ9	42	29	C1	20	1000	50	4.2
CRE2510A	75	1000	19.0	12	100	9×100	50	10-φ11	48	31.5	C1	25	1000	40	5.4
CRE3212A	102	992	25.0	14	96	10×96	16	11-φ14	57	37	C1	32	992	31	8.4
CRE4012A	129	1000	32.0	16	120	7×120	80	8-φ18	72.6	46	C1	40	1000	25	13.8

■切断　Cutting

标准型的切断，顾客可以参照高精度型的切断尺寸自行切断，加茂不提供此项服务。
If you want to cut Rack for short length,Please refer to high accuracy rack model at P12.kamo does not prouide this service.

型号表示　Model indication

订货时请按照以下型号订货。 Please order us in accordance with the type indicated as follows:

● CRE1610A ～ CRE4012A

齿条型号
Cam Rack type number

CRE□□□□A-2CF-L1000

- □□□□ → 代号 Frame number: 1610 / 2010 / 2510 / 3212 / 4012
- 2CF → 表面处理 Surface treatment: 黑色镀铬处理 Black chromium plating(standard)
- L1000 → 齿条1根的长度(mm)〈CRE1610和CRE3212A为992mm〉 Length of Cam Rack (mm)〈992mm for CRE1610A and CRE3212A〉

● CPA1610B ～ CPA4012B

滚轮型号　（尺寸图参考P13页） Refer to outside dimensional drawing P.14.
Roller pinion type number

CPA□□□□B-2A-□

- □□□□ → 代号 Frame number: 1610 / 2010 / 2510 / 3212 / 4012
- 2A → 表面处理 Surface treatment: 黑色镀铬处理 Black chromium plating(standard)
- □ → TLS（TCG自动润滑块） With TCG lubrication system: 无记号 No code — 无 None; L — 有 Yes

※ 详情请参考 P.31
For details, refer to P.31

● CRE1610A ～ 4012A

拼接齿规　（尺寸图参考P11页） Refer to outside dimensional drawing P.11.
Connection Jig type number

CJ□□B

- □□ → 代号 Frame number: 16 / 20 / 25 / 32 / 40

※ 齿条标准长度为1000mm（CRE1610A和CRE3212A为992mm）
Length of the Cam Rack is 1000mm (992mm for CRE1610A and CRE3212A).

高精度型 High accuracy Model Specifications

标准品有以下8种规格，尺寸请参考后页。
Standard products are summed up for the following eight types. Dimensions are raised on back.

型 号 Model			CPA / CRA 系列 CPA / CRA series						CPC / CRC 系列 CPC / CRC series	
项 目 Items		滚 轮 Roller pinion	CPA1010B	CPA1210B	CPA1610B	CPA2010B	CPA2510B	CPA3212B	CPC3212A	CPC4012B
		齿 条 Cam Rack	CRA1010A	CRA1210A	CRA1610A	CRA2010A	CRA2510A	CRA3212A	CRC3212A	CRC4012A
通用规格 Common spec.	基本动额定负载 Basic dynamic rated load	N	250	500	1000	1500	2200	3600	6000	15000
	最大使用负载 Maximum working load	N	250	500	1700	2200	3100	6600	10500	18000
	允许静额定负载 Allowable static rated load	N	380	750	2000	3000	4400	7200	18900	26000
	基本动额定扭矩（注1）* Basic dynamic rated torque	N·m	4.0	9.5	25.5	47.7	87.5	220	366.6	1146
	最大使用扭矩（注1）* Maximum working torque	N·m	4.0	9.5	43.3	70.1	123.4	403.3	641.5	1375.2
	允许静额定扭矩（注1）* Allowable static rated torque	N·m	6.0	14.3	50.9	95.5	175.1	440	1150	1986.4
	滚轮回转一圈的移动距离 Displacement distance of pinion per rotation	mm／回转 mm／revolution	100	120	160	200	250	384	384	480
	最大压力角 Max pressure angle	°	31	30.2	30.7	30.1	30.7	30.1	30.1	30.0
	模数 （滚子P.C.D／齿数） Module	mm	3	3.6	4.75	6	7.5	9.5	9.5	12
滚 轮 Roller pinion	齿数 Number of tooth	齿 teeth	10	10	10	10	10	12	12	12
	节圆直径 （注2）* Diameter of pitch circle	mm	31.831	38.197	50.9	63.7	79.6	122.2	122.2	152.8
	质量 Mass weight	kg	0.20	0.31	0.71	1.3	2.1	6.4	6.4	14
	转动惯量 Inertia moment	$kg \cdot m^2$	0.41×10^{-4}	0.96×10^{-4}	3.93×10^{-4}	10.5×10^{-4}	25.5×10^{-4}	169×10^{-4}	169×10^{-4}	632×10^{-4}
齿 条 Cam Rack	节距 Pitch	mm	10	12	16	20	25	32	32	40
	定尺 Predetermined length	mm	480	480	512 / 992	500 / 1000	500 / 1000	512 / 992	512 / 992	520 / 1000
	齿数 Number of tooth	齿 teeth／length	48	40	32 / 62	25 / 50	20 / 40	16 / 31	16 / 31	13 / 25
	质量 Mass weight	kg	0.6	0.6	1.1 / 2.2	2.1 / 4.1	2.7 / 5.4	4.3 / 8.3	4.3 / 8.3	6.8 / 13

注 1 ：基本动额定扭矩（最大使用扭矩、允许静额定扭矩）是指加载在滚轮滚销节圆直径上的基本动额定负载（最大使用负载、允许静额定负载）所产生的扭矩。
＊1 Basic dynamic rated torque (maximum working torque, allowable static rated torque) is torque observed when applying basic dynamic rated load (maximum working load, allowable static rated load) to roller pinion along diameter formed by pitch circle.
注 2 ：是理论值，并非实际滚销的节圆直径。
＊2 The indicated pitch circle diameter values are theoretical, not representing the actual pitch circle diameters of the respective roller pinions.

用语说明 Explanation of terms

基本动额定负载 Basic dynamic rated load
：在一定速度连续运转时，满足额定寿命的基本负载。
Basic load to fulfill rated life span when constantly operated at fixed speed.

最大使用负载 Maximum working load
：在通常运转时候可以使用的负载最大值（包含加减速时峰值负载）。
The maximum value of load (including peak load at the time of acceleration/deceleration) applicable when constantly operated at fixed speed.

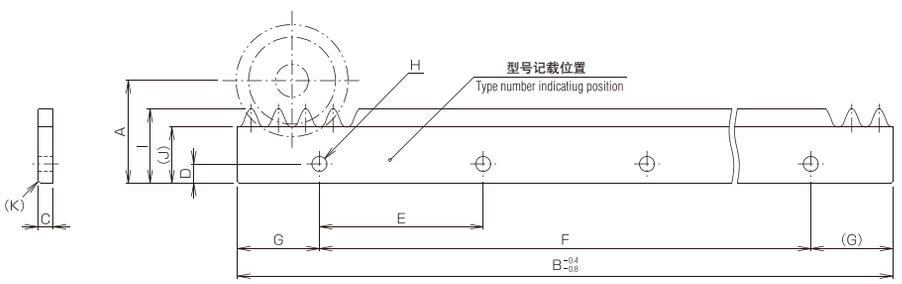
允许静额定负载 Allowable static rated load
：在紧急停止或者受到外力冲击等一些非常情况下负载的最大值。
The maximum value of load other than normal working load, such as impact load due to emergency stop or external application.

额定寿命 Rated life span
：将基本动额定负载作为负载，以一定的速度连续运转时的寿命称为额定寿命，以滚轮回转次数来表示。
额定寿命：1010型～1210型l为270,000,000回转（滚轮在300rpm寿命时间为15000小时）
1610型～4012型l为60,000,000回转（滚轮在100rpm寿命时间为10000小时）
Life span determined in terms of rotational numbers of roller pinion when consecutively operated with basic dynamic rated load at fixed speed.
Rated life span：270,000,000 times of revolution for 1010～1210（Upon operating roller pinion at 300rpm,serving life time results in 15,000 hours.）
60,000,000 times of revolution for 1610～4012（Upon operating roller pinion at 100rpm,serving life time results in 10,000 hours.）

齿条　Cam Rack

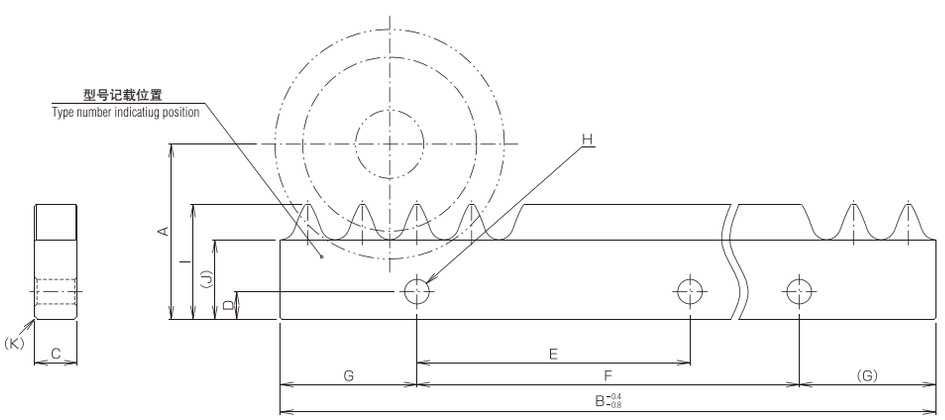
外形尺寸图　Outside Dimensional Drawing

CRA 1010A-1210A



※CRA1010A, 1210 无法选择底面螺栓孔选项。
Tap hole option at bottom surface is not applied to CRA1010A,CRA1210A.

CRA 1610A-3212A, CRC 3212A-4012A

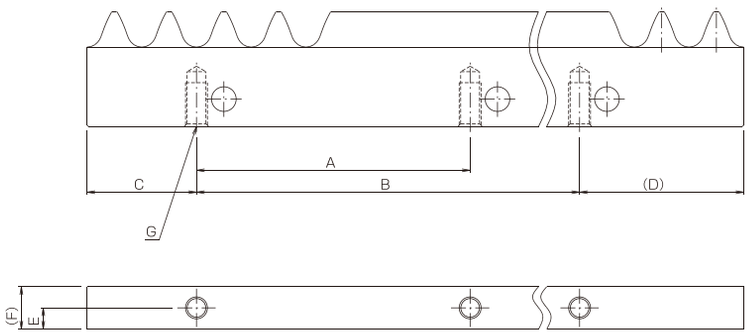


■尺寸表　Dimension Table

型　号 Model	A	B		C	D	E	F		G	H		I	J	K	节距 Pitch	长度 Predetermined length mm		齿数 Number of tooth		质量 Mass weight	
		L1	L2				L1	L2		L1	L2				mm	L1	L2	L1	L2	L1	L2
CRA1010A	37.5	480	–	5.7	7	60	7×60	–	30	8-ϕ5.5	–	27	20.5	C1	10	480	–	48	–	0.6	–
CRA1210A	40	480	–	5.7	7	60	7×60	–	30	8-ϕ5.5	–	27	19.5	C1	12	480	–	40	–	0.6	–
CRA1610A	48	992	512	11.5	7	96	10×96	5×96	16	11-ϕ7	6-ϕ7	30.5	20.2	C1	16	992	512	62	32	2.2	1.1
CRA2010A	64	1000	500	15.5	10	100	9×100	4×100	50	10-ϕ9	5-ϕ9	42	29	C1	20	1000	500	50	25	4.1	2.1
CRA2510A	75	1000	500	18.5	12	100	9×100	4×100	50	10-ϕ11	5-ϕ11	48	31.5	C1	25	1000	500	40	20	5.4	2.7
CRA3212A	102	992	512	24.5	14	96	10×96	5×96	16	11-ϕ14	6-ϕ14	57	37	C1	32	992	512	31	16	8.3	4.3
CRC3212A	102	992	512	24.5	14	96	10×96	5×96	16	11-ϕ14	6-ϕ14	57	37	C1	32	992	512	31	16	8.3	4.3
CRC4012A	129	1000	520	31.5	16	80	11×80	5×80	60	12-ϕ18	6-ϕ18	72.6	46	C1	40	1000	520	25	13	13	6.8

CRA 1610A-3212A, CRC 3212A-4012A（Y式样）

可选项–底面螺纹孔
Option-Tap at bottom surface

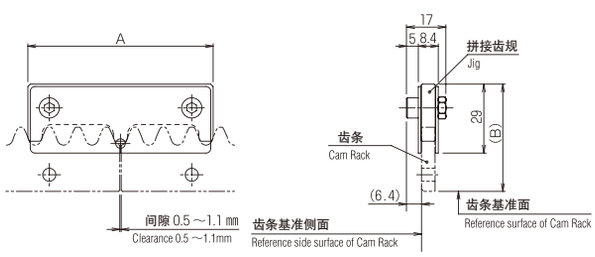


● 可选项–底面螺纹孔 **Tap at bottom surface Dimension Table**

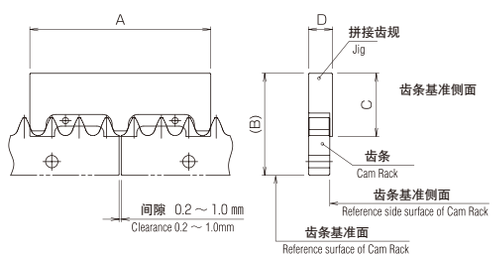
型 号 Model	A	B		C	D	E	F	G	
		L1	L2					L1	L2
CRA1610A	96	10×96	5×96	8	24	5.75	11.5	11-M6 深 12 Deep 12	6-M6 深 12 Deep 12
CRA2010A	100	9×100	4×100	40	60	7.75	15.5	10-M8 深 16 Deep 16	5-M8 深 16 Deep 16
CRA2510A	100	9×100	4×100	37.5	62.5	9.25	18.5	10-M10 深 20 Deep 20	5-M10 深 20 Deep 20
CRA3212A	96	9×96	4×96	48	80	12.25	24.5	10-M12 深 24 Deep 24	5-M12 深 24 Deep 24
CRC3212A	96	9×96	4×96	48	80	12.25	24.5	10-M12 深 24 Deep 32	5-M12 深 24 Deep 32
CRC4012A	80	12×80	6×80	20	20	15.75	31.5	13-M16 深 32 Deep 32	7-M16 深 32 Deep 32

齿条拼接齿规尺寸表 Dimensional drawing of connecting jig

●CJ10A～CJ12A的情况下
For CJ10A～CJ12A



●CJ16B～CJ40B的情况下（CRA和CRE齿条共用）
For CJ16B～CJ40B



齿条拼接齿规的尺寸图 Dimentional sizes for connecting jig

拼接齿规型号 Jig model	A	B	C	D
CJ10A	65	46.2	–	–
CJ12A	78	45.1	–	–
CJ16B	106	53.4	34	13.5
CJ20B	132	74.4	46	17.5
CJ25B	114	76.7	46	20.5
CJ32B	150	85	46	20.5
CJ40B	190	98.4	46	20.5

齿条　Cam Rack

齿条的切断尺寸　Cutting Cam Rack Sizes

CRA1010A

齿条长度（mm） Length of Cam Rack	齿数（齿） Number of teeth (teeth)	横孔数（个） Number of side mount hole (hole)	质量（kg） Mass weight
L 480	48	8	0.6
L 420	42	7	0.5
L 360	36	6	0.5
L 300	30	5	0.4
L 240	24	4	0.3
L 180	18	3	0.2

CRA1210A

齿条长度（mm） Length of Cam Rack	齿数（齿） Number of teeth (teeth)	横孔数（个） Number of side mount hole (hole)	质量（kg） Mass weight
L 480	40	8	0.6
L 420	35	7	0.5
L 360	30	6	0.5
L 300	25	5	0.4
L 240	20	4	0.3
L 180	15	3	0.2

CRA1610A

齿条长度（mm） Length of Cam Rack	齿数（齿） Number of teeth (teeth)	横孔数（个） Number of side mount hole (hole)	质量（kg） Mass weight	选 项：Y Option : Y 底孔数（个） Number of tap (tap)	选 项：Y Option : Y 质量（kg） Mass weight
L 992	62	11	2.2	11	2.1
L 896	56	10	2.0	10	1.9
L 800	50	9	1.8	9	1.7
L 704	44	8	1.6	8	1.5
L 608	38	7	1.4	7	1.3
L 512	32	6	1.1	6	1.1
L 416	26	5	1.0	5	0.9
L 320	20	4	0.8	4	0.7
L 224	14	3	0.5	3	0.5

CRA2010A

齿条长度（mm） Length of Cam Rack	齿数（齿） Number of teeth (teeth)	横孔数（个） Number of side mount hole (hole)	质量（kg） Mass weight	选 项：Y Option : Y 底孔数（个） Number of tap (tap)	选 项：Y Option : Y 质量（kg） Mass weight
L 1000	50	10	4.1	10	4.0
L 900	45	9	3.7	9	3.6
L 800	40	8	3.3	8	3.2
L 700	35	7	2.9	7	2.8
L 600	30	6	2.5	6	2.4
L 500	25	5	2.1	5	2.0
L 400	20	4	1.6	4	1.6
L 300	15	3	1.2	3	1.2

CRA2510A

齿条长度（mm） Length of Cam Rack	齿数（齿） Number of teeth (teeth)	横孔数（个） Number of side mount hole (hole)	质量（kg） Mass weight	选 项：Y Option : Y 底孔数（个） Number of tap (tap)	选 项：Y Option : Y 质量（kg） Mass weight
L 1000	40	10	5.4	10	5.3
L 900	36	9	4.9	9	4.8
L 800	32	8	4.3	8	4.2
L 700	28	7	3.8	7	3.7
L 600	24	6	3.3	6	3.2
L 500	20	5	2.7	5	2.7
L 400	16	4	2.2	4	2.1
L 300	12	3	1.6	3	1.6

CRA3212A

齿条长度（mm） Length of Cam Rack	齿数（齿） Number of teeth (teeth)	横孔数（个） Number of side mount hole (hole)	质量（kg） Mass weight	选 项：Y Option : Y 底孔数（个） Number of tap (tap)	选 项：Y Option : Y 质量（kg） Mass weight
L 992	31	11	8.3	10	8.1
L 896	28	10	7.5	9	7.3
L 800	25	9	6.7	8	6.5
L 704	22	8	5.9	7	5.7
L 608	19	7	5.1	6	5.0
L 512	16	6	4.3	5	4.2
L 416	13	5	3.5	4	3.4
L 320	10	4	2.7	3	2.6
L 224	7	3	1.9	无 No setting	

CRC3212A

齿条长度（mm） Length of Cam Rack	齿数（齿） Number of teeth (teeth)	横孔数（个） Number of side mount hole (hole)	质量（kg） Mass weight	选 项：Y Option : Y 底孔数（个） Number of tap (tap)	选 项：Y Option : Y 质量（kg） Mass weight
L 992	31	11	8.3	10	8.1
L 896	28	10	7.5	9	7.3
L 800	25	9	6.7	8	6.5
L 704	22	8	5.9	7	5.7
L 608	19	7	5.1	6	5.0
L 512	16	6	4.3	5	4.2
L 416	13	5	3.5	无 No setting	

※ CRC3212型最短截断长度为416mm。（选项Y底孔款最短截断长度为512mm）
The short length less than 416mm is not available for 3212.
(Option : Y is available up to 512mm in length)

CRC4012A

齿条长度（mm） Length of Cam Rack	齿数（齿） Number of teeth (teeth)	横孔数（个） Number of side mount hole (hole)	质量（kg） Mass weight	选 项：Y Option : Y 底孔数（个） Number of tap (tap)	选 项：Y Option : Y 质量（kg） Mass weight
L 1000	25	12	13	13	13
L 920	23	11	12	12	12
L 840	21	10	11	11	11
L 760	19	9	9.9	10	9.9
L 680	17	8	8.9	9	8.9
L 600	15	7	7.9	8	7.9
L 520	13	6	6.8	7	6.8

※ CRC4012型最短截断长度为520mm。
The short length less than 520mm is not available for 4012.

※ CRA3212型最短截断长度为224mm。（选项Y底孔款最短截断长度为320mm）
Regarding to CRA3212 series, these Cam Rack length are limited 320mm to 992mm in case of selecting option Y (Top at bottom surface)

关于齿条的切断　Cutting Cam Rack

在使用短长度的情况下，请将齿条切断使用。切断请选择在齿底部位进行。（因为齿面有淬火处理，请注意）
另外，CRA型和CRC型的切断可以在本公司进行，费用按照实际发生的金额进行加算。CRE型的切断，请客户自行加工。

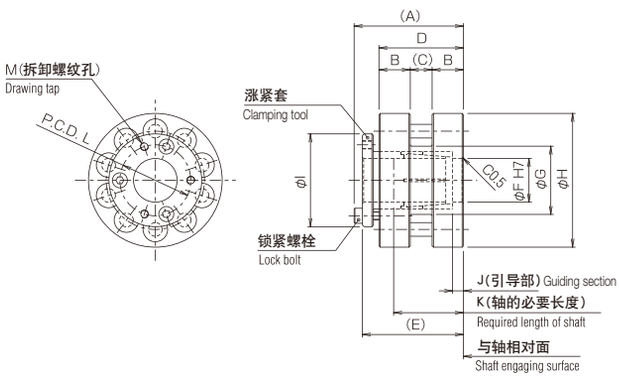
Cut Cam Rack when used as a short size tool. Cut at dedendum (root bottom) of tooth. Take care because dedendum is hardened.
CRA & CRC Cam Rack may be cut in our company at actual expense. CRE Cam Rack may be cut by customer.

※若有其他尺寸需求，请与我们联系。
Please ask us about sizes other than the above.

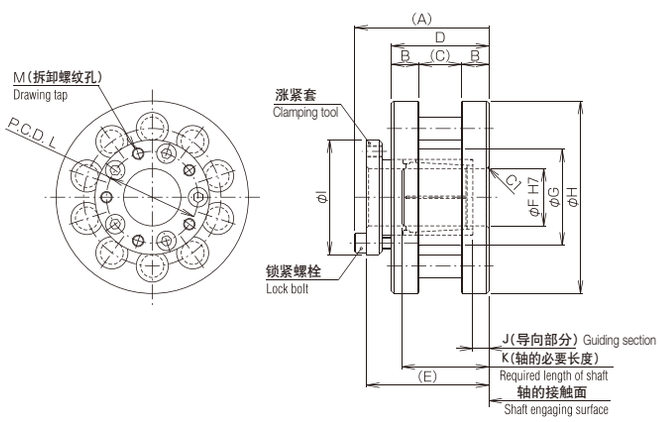
滚轮 Roller Pinion

外形尺寸图 Outside Dimensional Drawing

CPA 1010B, 1210B



CPA 1610B-3212B, CPC 3212A



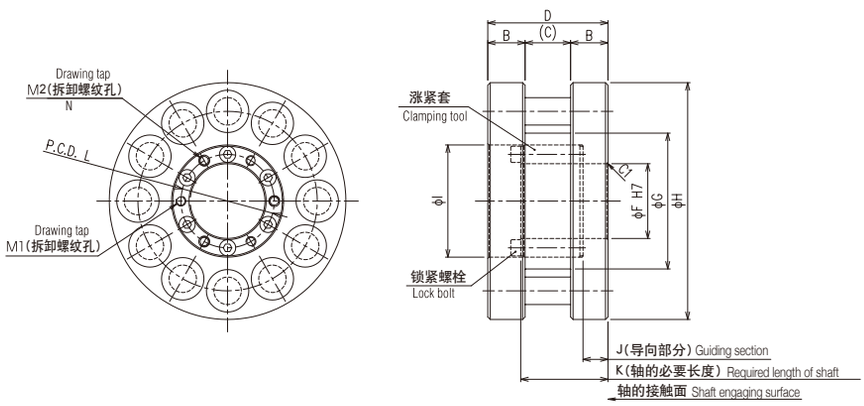
■ 尺寸表 Dimension Table

型 号 Model	模 数 Module	齿 数 Number of tooth	A	B	C	D	E	F	G	H	I	J	K	L	M
CPA1010B	3	10	37	10.5	8	29	34.5	12	20	41	27	5	23	20	3-M2.5
CPA1210B	3.6	10	40.1	11.5	8	31	37.1	16	25	49	34	4	25.6	26	3-M3
CPA1610B	4.75	10	52.5	12	14.5	38.5	48.5	20	33	67	42	7.5	33.5	33	5-M4
CPA2010B	6	10	58.5	12	18.5	42.5	53.5	25	42	84	50	7	38	40	5-M5
CPA2510B	7.5	10	67.5	14	21.5	49.5	61.5	30	51	101	63	7.5	43.5	51	5-M6
CPA3212B	9.5	12	88.5	20	28.5	68.5	82.5	45	88	148	82	11	58	68	4-M6
CPC3212A	9.5	12	88.5	20	28.5	68.5	82.5	45	88	148	82	11	58	68	4-M6

滚轮 Roller Pinion

外形尺寸图 Outside Dimensional Drawing

CPC 4012B



■尺寸表 Dimension Table

型 号 Model	模 数 Module	齿 数 Number of tooth	A	B	C	D	E	F	G	H	I	J	K	L	M		N
															M1	M2	
CPC4012B	12	12	–	30	36.5	96.5	–	60	109	190	90	20	70	75	3-M8	3-M8	口部 ϕ 8.8 Counterbore hole ϕ 8.8

型号表示 Model indication

订货时请按照以下型号订货。 Please order us in accordance with the type indicated as follows:

● CPA1010B ～ CPA1210B

滚轮型号
Roller pinion type number

CPA□□□□B-□□

代号 Frame number	可选项 Option: 表面处理 Surface treatment	精度 Accuracy
1010	1：无表面处理 No surface treatment	A：普通级(标准) Standard grade (standard)
1210	2：黑色镀铬处理（标准） Black chromium plating (standard)	B：精密级 Premium grade

● CRA1010A ～ CRA1210A

齿条型号
Cam Rack type number

CRA□□□□A-□□F-L480

齿条1根的长度(mm) Length of Cam Rack (mm)

代号 Frame number	可选项 Option: 表面处理 Surface treatment	Accuracy
1010	1：无表面处理 No surface treatment	A：普通级(标准) Standard grade (standard)
1210	2：黑色镀铬处理（标准） Black chromium plating (standard)	B：精密级 Premium grade

※ 对于CPA1210B、CPA1010B，如希望可选项2的情况下，滚针轴承和滚销没有进行表面处理。
If Option 2 is selected for CPA1210B and CPA1010B, the needle bearing and the roller pin are no surface treatment.

※ 标准齿条长度为480mm。标准以外的短尺寸(在齿底进行切断)参照P12订货时，请明示此尺寸。
The length of the standard Cam Rack is 480mm. For the non-standard shorter dimensions (cut at the tooth root), please refer to P.12. When you place an order, please indicate such dimensions.

● CPA1610B ～ CPA3212B

滚轮型号
Roller pinion type number

CPA□□□□B-□□-□

TLS (TCG自动润滑块) With TCG lubrication system

无记号 No code	无 None
L	有 Yes

※ 详情请参考 P.37 For details, refer to P.37

代号 Frame number	可选项 Option: 表面处理 Surface treatment	精度 Accuracy
1610	1：无表面处理 No surface treatment	A 普通级(标准) Standard grade (standard)
2010	2：黑色镀铬处理（标准） Black chromium plating (standard)	B：精密级 Premium grade
2510	3：氟化黑色镀铬处理 Fluorine black chromium plating	
3212		

● CRA1610A ～ CRA3212A

齿条型号
Cam Rack type number

CRA□□□□A-□□□-L1000
-L500

齿条1根长度 (mm) Length of Cam Rack (mm)

L1000	CRA1610A 和 CRA3212A 是 992mm 992mm for CRA1610A and CRA3212A
L500	CRA1610A 和 CRA3212A 是 512mm 512mm for CRA1610A and CRA3212A

代号 Frame number	可选项 Option: 表面处理 Surface treatment	精度 Accuracy	安装孔 Mounting hole
1610	1：无表面处理 No surface treatment	A：普通级(标准) Standard grade (standard)	F：横孔(标准) Side mount hole only (standard)
2010	2：黑色镀铬处理（标准） Black chromium plating (standard)	B：精密级 Premium grade	Y：+追加底面螺栓孔 + Tap at bottom surface
2510			
3212			

※ 标准齿条的长度为1,000mm和500mm(CRA1610A和CRA3212A为992mm和512mm)。
关于非标准的短尺寸(从齿底切断)请参考第12页，订单时，请明示此尺寸。
Standard length of the Cam Rack is 1000mm and 500mm (992mm and 512mm for CRA1610A and CRA3212A). Regarding the availability of the short length other than the standard ones, please refer to P.12 . These odd length are cut at dedendum of tooth. Please mention the length upon order.

※ 滚轮的表面处理，选择2、3的情况下，滚针轴承将作黑色镀铬处理。滚销没有任何表面处理。
When option 2 or 3 is specified as surface treatment of roller pinion, the surface of bearing used is raydented. The surface of roller pin used is bare (not raydented).

型号表示　Model indication

● CPC3212A ～ 4012B

滚轮型号
Roller pinion type number

CPC□□□□□-□□-□

型号
Frame number

3212A
4012B

TLS（TCG自动润滑块）With TCG lubrication system	
无记号 No code	无 None
L	有 Yes

※ 详情请参考 P.37
For details, refer to P.37

可选项 Option

表面处理 Surface treatment	精度 Accuracy
1：无表面处理 No surface treatment	A：普通级（标准） Standard grade (standard)
2：黑色镀铬处理（标准） Black chromium plating (standard)	B：精密级 Premium grade
3：氟化黑色镀铬处理 Fluorine black chromium plating	

● CRC3212A ～ 4012A

齿条型号
Cam Rack type number

CRC□□□□A-□□□-L1000
-L520

型号
Frame number

3212
4012

齿条1根的长度（mm）
Length of Cam Rack

可选项 Option

表面处理 Surface treatment	精度 Accuracy	安装孔 Mounting hole
1：无表面处理 No surface treatment	A：普通级（标准） Standard grade (standard)	F：横孔（标准） Side mount hole only (standard)
2：黑色镀铬处理（标准） Black chromium plating (standard)	B：精密级 Premium grade	Y：+追加底面螺纹孔 + Tap at bottom surface

※ 标准齿条的长度：CRC3212A为992mm和512mm，CRC4012A为1000mm和520mm。
关于非标准的短尺寸（从齿底切断）请参考P.12，订单时，请明示此尺寸。
Standard length of the Cam Rack is 992mm and 512mm for CRC3212A, 1000mm and 520mm for CRC4012A. Regarding the availability of the short length other than the standard ones, please refer to P.12. These odd length are cut at dedendum of tooth. Please mention the length upon order.

※ 滚轮的表面处理方法选择2、3的情况下，滚针轴承将作黑色镀铬处理。滚销没有任何表面处理。
When option 2 or 3 is specified as surface treatment of roller pinion, the surface of bearing used is raydented. The surface of roller pin used is bare (not raydented).

拼接齿规型号
Connection Jig type number

● CPA1010B ／ CRA1010A ～ CPA1210B ／ CRA1210A

CJ□□A

型号
Frame number

10
12

● CPA1610B ／ CRA1610A ～ CPC4012B ／ CRC4012A

CJ□□B

型号
Frame number

16
20
25
32
40

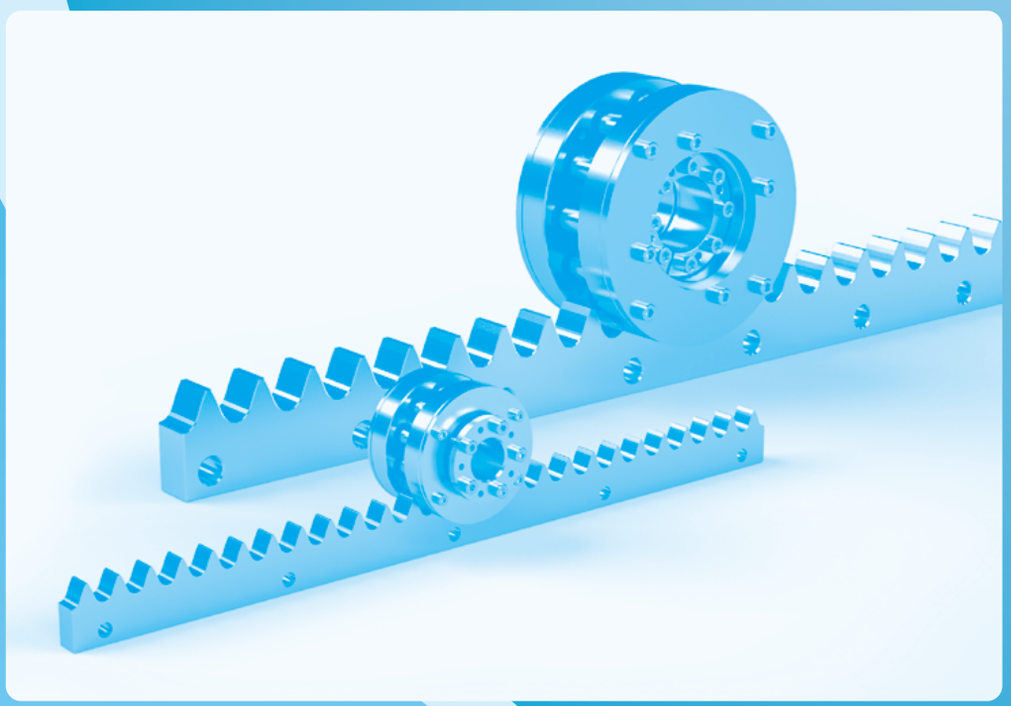
※ CRA32和CRC32的拼接齿规可以兼顾使用。
The same connection jig is applicable to CRA32 and CRC32.

规格 · 尺寸表

Specification Dimensional Table

不锈钢（SUS）齿条&滚轮

Stainless steel Cam Rack & Roller Pinion



SUS齿条&滚轮规格表 SUS Cam Rack & Roller Pinion Specification

项 目 Items		型 号 Model		CPS / CRS 系列 CPS / CRS series				
		滚 轮 Roller pinion		CPS1610A	CPS2010A	CPS2510A	CPS3212A	CPS4012A
		齿 条 Cam Rack		CRS1610A	CRS2010A	CRS2510A	CRS3212A	CRS4012A
通用规格 Common spec.	基本动额定负载 Basic dynamic rated load		N	1000	1500	2200	3600	6000
	最大使用负载 Maximum working load		N	1700	2200	3100	6600	9000
	允许静额定负载 Allowable static rated load		N	2000	3000	4400	7200	10940
	基本动额定扭矩 ※1 Basic dynamic rated torque		N・m	25.5	47.7	87.5	220.0	458.4
	最大使用扭矩 ※1 Maximum working torque		N・m	43.3	70.1	123.4	403.3	687.6
	允许静额定扭矩 ※1 Allowable static rated torque		N・m	50.9	95.5	175.1	440.0	836.0
	滚轮回转一圈的移动距离 Displacement distance of pinion per rotation		mm／回转 mm／revolution	160	200	250	384	480
	最大压力角 Max pressure angle		°	30.7	30.1	30.7	30.1	30.0
	模数 （滚子P.C.D／齿数） Module		mm	4.75	6	7.5	9.5	12
滚轮 Roller pinion	齿数 Number of tooth		齿 teeth	10	10	10	12	12
	节圆直径 ※2 Diameter of pitch circle		mm	50.9	63.7	79.6	122.2	152.8
	质量 Mass weight		kg	0.81	1.5	2.4	6.8	16
	转动惯量 Inertia moment		kg・m²	4.56	12.5	29.6	200	728
齿条 Cam Rack	节距 Pitch		mm	16	20	25	32	40
	定尺 Predetermined length		mm	992	1000	1000	992	1000
	齿数 Number of tooth		齿 teeth／length	62	50	40	31	25
	质量 Mass weight		kg	2.2	4.1	5.4	8.3	13

※1：基本动额定扭矩（最大使用扭矩、允许静额定扭矩）是指加载在滚轮滚销节圆直径上的基本动额定负载（最大使用负载、允许静额定负载）所产生的扭矩。

＊1 Basic dynamic rated torque (maximum working torque, allowable static rated torque) is torque observed when applying basic dynamic rated load (maximum working load, allowable static rated load) to roller pinion along diameter formed by pitch circle.

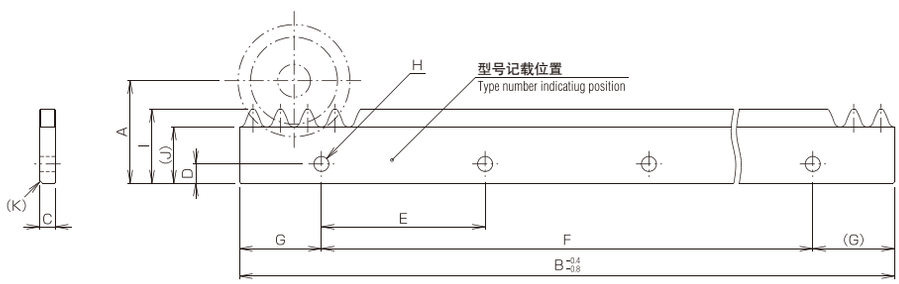
※2：是理论值，并非实际滚销的节圆直径。

＊2 The indicated pitch circle diameter values are theoretical, not representing the actual pitch circle diameters of the respective roller pinions.

SUS齿条 SUS Cam Rack

外形尺寸图 Outside Dimensional Drawing

CRS 1610A-4012A



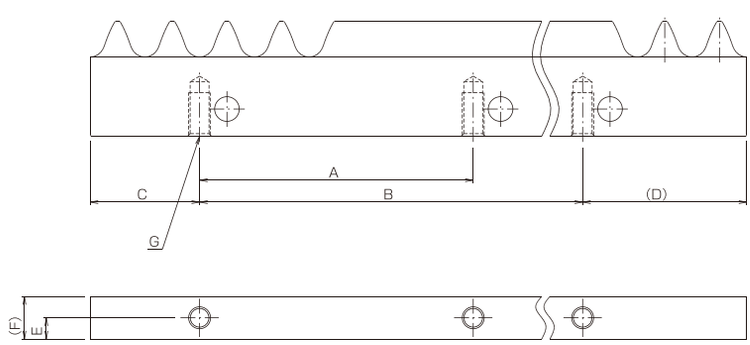
■尺寸表 Dimension Table

型 号 Model	A	B	C	D	E	F	G	H	I	J	K
CRS1610A	48	992	11.5	7	96	10×96	16	11-φ7	30.5	20.2	C1
CRS2010A	64	1000	15.5	10	100	9×100	50	10-φ9	42	29	C1
CRS2510A	75	1000	18.5	12	100	9×100	50	10-φ11	48	31.5	C1
CRS3212A	102	992	24.5	14	96	10×96	16	11-φ14	57	37	C1
CRS4012A	129	1000	31.5	16	120	7×120	80	8-φ18	72.6	46	C1

注：若选择精密清洗，型号贴纸将不再贴上产品，而是随产品包装。
Note: If the precision cleaning option is selected, the model sticker is not attached to the product but packed together.

CRS 1610A-4012A（可选项Y）

可选项-底面螺纹孔
Option-Tap at bottom surface



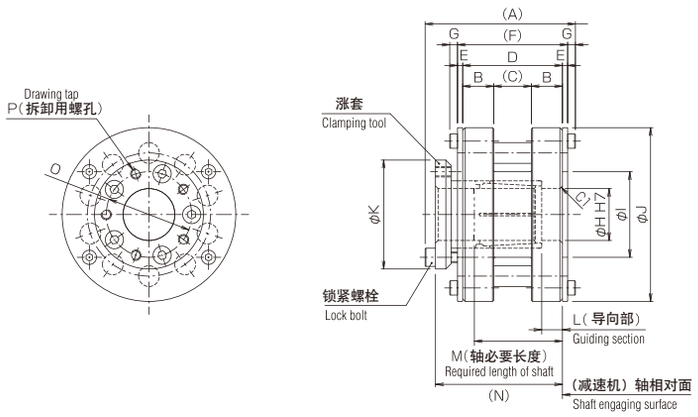
●可选项-底面螺纹孔 Tap at bottom surface Dimension Table

型 号 Model	A	B	C	D	E	F	G
CRS1610A	96	10×96	8	24	5.75	11.5	11-M6 深12 Deep 12
CRS2010A	100	9×100	40	60	7.75	15.5	10-M8 深16 Deep 16
CRS2510A	100	9×100	37.5	62.5	9.25	18.5	10-M10 深20 Deep 20
CRS3212A	96	9×96	48	80	12.25	24.5	10-M12 深24 Deep 24
CRS4012A	120	8×120	20	20	15.75	31.5	10-M16 深32 Deep 32

SUS滚轮 SUS Roller Pinion

外形尺寸图 Outside Dimensional Drawing

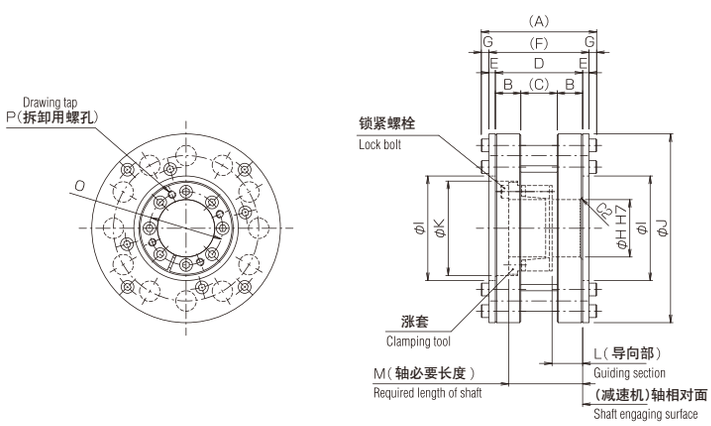
CPS 1610A-2510A



■尺寸表 Dimension Table

型 号 Model	模 数 Module	齿数 Number of tooth	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
CPS1610A	4.75	10	58	12	14.5	38.5	2	42.5	3	20	33	67	42	8	34	49	33	5-M4
CPS2010A	6	10	67	12	18.5	42.5	3	48.5	4	25	43	84	50	8.5	39.5	55	40	5-M5
CPS2510A	7.5	10	76	14	21.5	49.5	3	55.5	4	30	53	101	63	9	45	63	51	3-M6

CPS 3212A-4012A



■尺寸表 Dimension Table

型 号 Model	模 数 Module	齿数 Number of tooth	A	B	C	D	E	F	G	H	I	J	K	L	M	O	P
CPS3212A	9.5	12	90.5	20	28.5	68.5	5	78.5	6	45	82	148	74	24	58	57.5	4-M6
CPS4012A	12	12	120.5	31	36.5	98.5	5	108.5	6	50	95	190	79	35	71.5	63.5	5-M6

型号表示 Model indication

请按照以下型号订货。 Please order us in accordance with the type indicated as follows:

● 滚轮型号
Roller pinion type number

CPS1610A ～ 2510A

CPS □□□□ A- □□□

代号 Frame number	润滑脂封入※1 Sealed grease	精密清洗※3 Precision cleaning	锁紧螺栓 Lock bolt
1610 2010 2510	A：标准 Standard	A：无 No	A：标准 Standard
	G：客户提供润滑脂 Supplied grease	S：有 Yes	B：带排气孔 With gas-vent holes

CPS3212A ～ 4012A

CPS □□□□ A- □□ A

代号 Frame number	润滑脂封入※1 Sealed grease	精密清洗※3 Precision cleaning
3212 4012	A：标准 Standard	A：无 No
	G：客户提供润滑脂 Supplied grease	S：有 Yes

※1 润滑脂封入：若选择G，由客户提供润滑脂，因润滑脂特性不同，本品或有达不到样品规格值的情况，请悉知。
Sealed grease: If G (supplied grease) is selected, please note that the specification values may not be satisfied depending on the properties of the grease.

※2 滚销使用马氏体不锈钢，故包装时，在滚销表面采用以下防锈处理：
For the reason that the rollers are made of martensitic stainless steel, the following rust-preventive treatment is provided to the roller surfaces in the packing process:
精密清洗：A（无）：涂抹防锈油。
Precision cleaning: If A (No) is selected: Rust-preventive oil is applied.
精密清洗：S（有） 的情况下：
Precision cleaning: If S (Yes) is selected:
润滑脂封入：A：（标准）涂抹Alvania Grease S2(日本壳牌）。
Sealed grease: If A (Standard) is selected: Alvania Grease S2 (Shell Lubricants Japan) is applied.
润滑脂封入：G：（客户提供润滑脂）涂抹客户提供的润滑脂。
Sealed grease: If G (Supplied grease) is selected: Supplied grease is applied.

※3 精密清洗：S（有）：防锈处理后进行真空包装。
Precision cleaning: If S (Yes) is selected: Vacuum packing is done after rust-preventive treatment is provided.

※4 CPS3212A、CPS4012A 涨套结构可以排气，锁紧螺栓只提供标准规格。
For Models CPS3212A and CPS4012A, because gas is released due to the structure of the clamping tool, lock bolts are provided only to the standard specifications.

※5 按压板螺栓为贯通螺纹底孔，故不需要排气规格的螺栓。
For the hold-down plate lock bolt, because the tap drill hole is a through hole, there is no specification for bolts with gas-vent hole.

●齿条型号
Cam Rack type number

CRS □□□□ A- □ - L □□□ - □

代号
Frame number

1610
2010
2510
3212
4012

安装孔 Mounting hole
F：横孔（标准） Side mount hole only (standard)
Y：＋追加底面螺栓孔 ＋ Tap at bottom surface

齿条1根长度(mm)
详情参照别页※1
Length of Cam Rack (mm)
Reter to the attached page

精密清洗※2、※3 Precision cleaning
1：无 No (standard)
2：有 ＋ 包装时涂抹标准润滑脂 Yes + Standard grease is applied in the packing process.
3：有 ＋ 包装时涂抹客户提供润滑脂 Yes + Supplied grease is applied in the packing process.

※1 齿条长度相关 请参照P23 “齿条的切断尺寸”
For the length of the cam rack, refer to “Cutting Dimensions of Cam Rack” on P.23.

※2 齿条使用马氏体不锈钢，故在包装时，全体表面做以下防锈处理：
For the reason that the cam rack is made of martensitic stainless steel, the following rust-preventive treatment is provided to all over the surfaces in the packing process:
精密清洗 ：1（ 无 ）：涂抹防锈油
Precision cleaning: If 1 (No) is selected: Rust-preventive oil is applied.
精密清洗 ：2（有＋标准润滑脂）：涂抹Alvania Grease S2(日本壳牌)
Precision cleaning: If 2 (Yes + Standard grease) is selected: Alvania Grease S2 (Shell Lubricants Japan) is applied.
精密清洗 ：3（有＋客户提供润滑脂）：涂抹客户提供润滑脂
Precision cleaning: If 3 (Yes + Supplied grease) is selected: Supplied grease is applied.

※3 若选择精密清洗，防锈处理后将采用真空包装。
Precision cleaning: If Yes is selected: Vacuum packing is done after rust-preventive treatment is provided.

●齿条拼接齿规型号
Connection jig type number

CJ □□ B

代号
Frame number

16	32
20	40
25	

※1 齿条拼接齿规可兼用于CRA、CRC系列。
The connection jig is shared with CRA and CRC Series.

材质 Materials

产品的零部件材质如下所示：
The materials of the parts used for the products are as follows:

●齿条 Cam Rack
马氏体不锈钢
Martensitic stainless steel

●齿条拼接齿规 Connection jig
机械构造用碳素钢
Carbon steel for structural use

●滚轮 Roller pinion

滚轮本体 Pinion body	奥氏体不锈钢 Austenitic stainless steel
按压板 Hold-down plate	
螺栓 Bolt	
涨套 Clamping tool	
滚销 Roller	马氏体不锈钢 Martensitic stainless steel
密封 Seal	丁腈橡胶 (NBR) Nitrile rubber (NBR)

齿条的切断尺寸 Cutting Cam Rack Sizes

CRS1610A

齿条长度 (mm) Length of Cam Rack	齿 数 Number of teeth	横孔数量 Number of side mount hole	质 量 Mass weight	可选项 : Y Option : Y	
				底孔数量 Number of tap	质 量 Mass weight
L 992	62	11	2.2	11	2.1
L 896	56	10	2.0	10	1.9
L 800	50	9	1.8	9	1.7
L 704	44	8	1.6	8	1.5
L 608	38	7	1.4	7	1.3
L 512	32	6	1.1	6	1.1
L 416	26	5	1.0	5	0.9

CRS2010A

齿条长度 (mm) Length of Cam Rack	齿 数 Number of teeth	横孔数量 Number of side mount hole	质 量 Mass weight	可选项 : Y Option : Y	
				底孔数量 Number of tap	质 量 Mass weight
L 1000	50	10	4.1	10	4.0
L 900	45	9	3.7	9	3.6
L 800	40	8	3.3	8	3.2
L 700	35	7	2.9	7	2.8
L 600	30	6	2.5	6	2.4
L 500	25	5	2.1	5	2.0
L 400	20	4	1.6	4	1.6

CRS2510A

齿条长度 (mm) Length of Cam Rack	齿 数 Number of teeth	横孔数量 Number of side mount hole	质 量 Mass weight	可选项 : Y Option : Y	
				底孔数量 Number of tap	质 量 Mass weight
L 1000	40	10	5.4	10	5.3
L 900	36	9	4.9	9	4.8
L 800	32	8	4.3	8	4.2
L 700	28	7	3.8	7	3.7
L 600	24	6	3.3	6	3.2
L 500	20	5	2.7	5	2.7
L 400	16	4	2.2	4	2.1

CRS3212A

齿条长度 (mm) Length of Cam Rack	齿 数 Number of teeth	横孔数量 Number of side mount hole	质 量 Mass weight	可选项 : Y Option : Y	
				底孔数量 Number of tap	质 量 Mass weight
L 992	31	11	8.3	10	8.1
L 896	28	10	7.5	9	7.3
L 800	25	9	6.7	8	6.5
L 704	22	8	5.9	7	5.7
L 608	19	7	5.1	6	5.0
L 512	16	6	4.3	5	4.2
L 416	13	5	3.5	4	3.4
L 320	10	4	2.7	无设定	No setting

CRS4012A

齿条长度 (mm) Length of Cam Rack	齿 数 Number of teeth	横孔数量 Number of side mount hole	质 量 Mass weight	可选项 : Y Option : Y	
				底孔数量 Number of tap	质 量 Mass weight
L 1000	25	8	13	9	13
L 880	22	7	12	8	11
L 760	19	6	10	7	9.7
L 640	16	5	8.4	6	8.1
L 520	13	4	6.9	5	6.6

关于齿条的切断 Cutting Cam Rack

在使用短长度的情况下，请将齿条切断使用。切断请选择在齿底部位进行。（齿面有淬火处理，请注意。）

Cut Cam Rack when used as a short size tool. Cut at dedendum (root bottom) of tooth. Take care because dedendum is hardened.
Cam Rack may be cut in our company at actual expense.

※上述以外尺寸，请与我公司联系。
Please ask us about sizes other than the above.

Memo

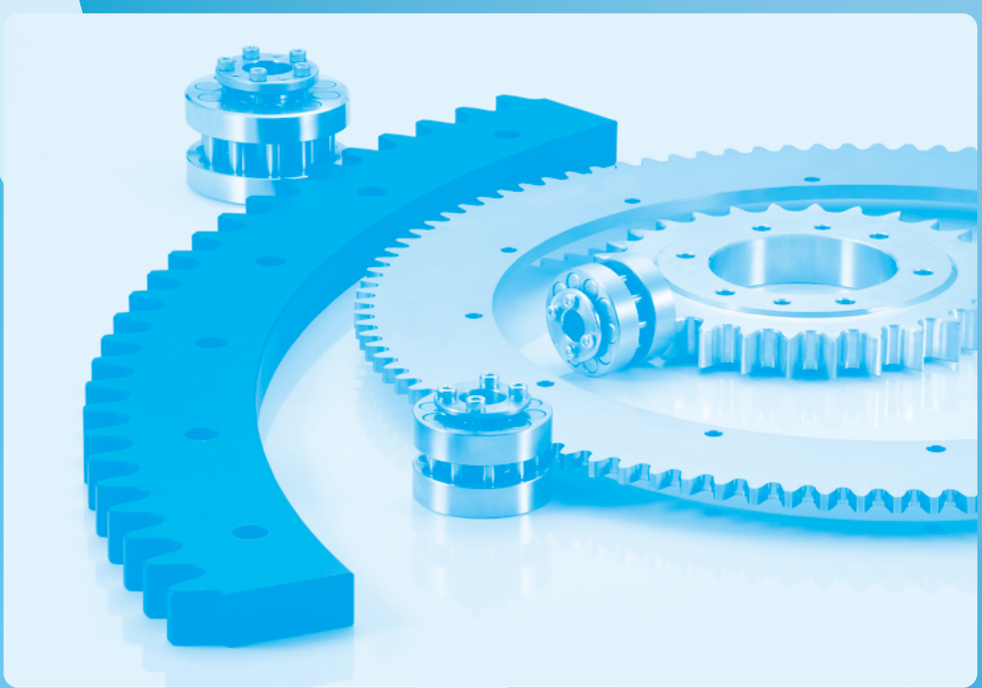
规格・尺寸表・型号

Specifications, Dimensions and Models

TCG齿圈 & 滚轮

一体式齿圈・分割式齿圈

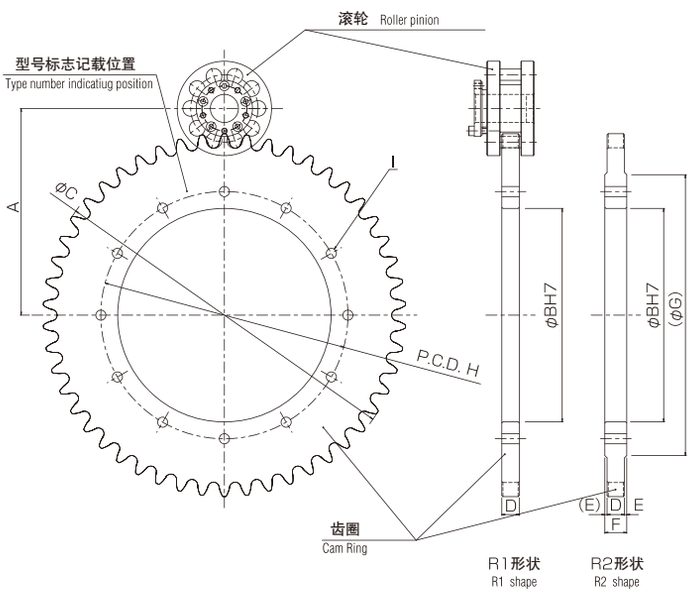
TCG Cam Ring & Roller Pinion Full Ring type, Split Ring type



齿圈 Cam Ring

外形尺寸图 Outside Dimensional Drawing

RGF（一体式齿圈） Full Ring type



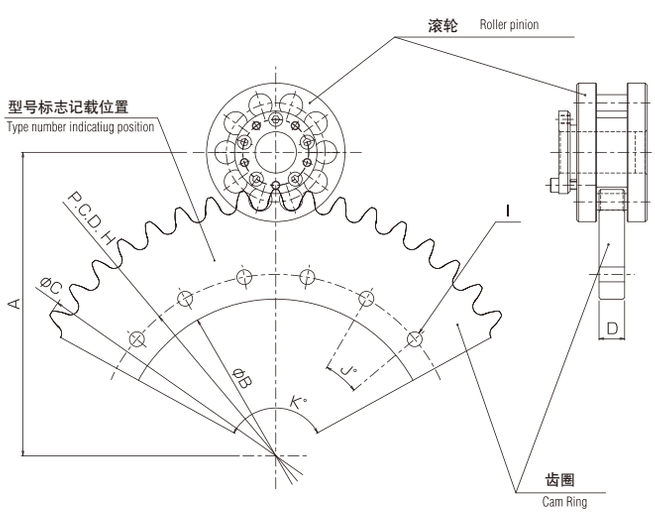
■尺寸表 Dimension Table

型 号 Model	齿数 Number of tooth	减速比 Reduction ratio	啮合节圆直径 Diameter of pitch circle 齿圈 Cam ring	滚轮 Roller pinion
CPA1010B RGF1010A	30	3	93.000	31.000
	50	5	155.000	31.000
	70	7	217.000	31.000
	80	8	248.899	31.111
	100	10	310.909	31.091
CPA1210B RGF1210A	30	3	111.000	37.000
	50	5	186.667	37.333
	70	7	260.750	37.250
	80	8	298.667	37.333
	100	10	372.727	37.273
CPA1610B RGF1610A	30	3	147.000	49.000
	40	4	195.200	48.800
	50	5	243.333	48.667
	60	6	291.429	48.571
	70	7	338.625	48.375
	80	8	391.111	48.889
	100	10	487.273	48.727
CPA2510B RGF2510A	30	3	231.000	77.000
	40	4	308.800	77.200
	50	5	383.333	76.667
	60	6	459.429	76.571
	70	7	539.000	77.000
CPA3212B RGF3212A	36	3	352.500	117.500
	48	4	467.200	116.800
	60	5	585.000	117.000
CPC3212A RFC3212A	36	3	352.500	117.500
	48	4	467.200	116.800
	60	5	585.000	117.000
CPC4012B RFC4012A	36	3	445.500	148.500
	48	4	590.400	147.600

RGD（分割齿圈） Split Ring type

● 1010及1210的分割齿圈也可以提供，请联系我们。

Be able to make the circular arc ring for 1010 and 1210 models too, not stated the catalogue Please ask us.



※1 齿数为整圆所使用的齿数。

This is number of teeth in case with used as a full Ring.

※2 惯量以及质量为分割齿圈1片的参数。

The number of inertia moment and mass weight are for a piece of RGD

■尺寸表 Dimension Table

型 号 Model	齿数※1 Number of tooth	减速比 Reduction ratio	啮合节圆直径 Diameter of pitch circle 齿圈 Cam ring	滚轮 Roller pinion
CPA1610B RGD1610A	140	14	690.667	49.333
	200	20	971.429	48.571
	240	24	1163.520	48.480
	300	30	1455.484	48.516
	400	40	1941.463	48.537
CPA2510B RGD2510A	90	9	694.800	77.200
	125	12.5	959.259	76.741
	150	15	1153.125	76.875
	190	19	1459.200	76.800
	250	25	1923.077	76.923
CPA3212B RGD3212A	75	6.25	732.759	117.241
	100	25/3	973.214	116.786
	120	10	1172.727	117.273
	150	12.5	1462.963	117.037
	200	50/3	1954.717	117.283
CPC3212A RDC3212A	75	6.25	732.759	117.241
	100	25/3	973.214	116.786
	120	10	1172.727	117.273
	150	12.5	1462.963	117.037
	200	50/3	1954.717	117.283
CPC4012B RDC4012A	60	5	736.667	147.333
	80	20/3	987.826	148.174
	96	8	1182.222	147.778
	120	10	1476.364	147.636
	160	40/3	1962.791	147.209

A	B	C	D	E	F	G	H	I	形状 Sharp	基本动额定扭矩 Allowable dynamic rated torque N・m	最大使用扭矩 Maximum working torque N・m	允许静额定扭矩 Allowable static rated torque N・m	惯量 Inertia moment ×10-4kg・m²	质量 Mass weight kg
62	50	103	6	—	—	—	65	6-φ5.5通孔 6-φ5.5Thru	R1	11	11	16	3.55	0.24
93	100	165	6	—	—	—	120	8-φ5.5通孔 8-φ5.5Thru	R1	19	19	28	23.9	0.55
124	160	227	6	—	—	—	175	8-φ5.5通孔 8-φ5.5Thru	R1	27	27	40	77.3	0.84
140	190	259	6	-	-	-	205	12-φ5.5通孔 12-φ5.5Thru	R1	31	31	46	125	1.0
171	230	321	6	-	-	-	245	12-φ5.5通孔 12-φ5.5Thru	R1	38	38	57	318	1.7
74	65	122	6	-	-	-	80	6-φ5.5通孔 6-φ5.5Thru	R1	27	27	40	6.87	0.32
112	120	198	6	-	-	-	135	8-φ5.5通孔 8-φ5.5Thru	R1	46	46	69	50.2	0.79
149	190	272	6	-	-	-	205	12-φ5.5通孔 12-φ5.5Thru	R1	65	65	97	163	1.3
168	230	310	6	-	-	-	245	12- φ5.5通孔 12-φ5.5Thru	R1	74	74	111	253	1.4
205	280	384	6	-	-	-	295	12-φ5.5 通孔 12-φ5.5Thru	R1	93	93	139	636	2.4
98	70	161	11.5	-	-	-	90	6-φ7通孔 6-φ7Thru	R1	73	120	146	40.8	1.2
122	120	209	11.5	-	-	-	145	8-φ7通孔 8-φ7Thru	R1	97	165	194	114	1.7
146	160	257	11.5	-	-	-	180	12-φ7通孔 12-φ7Thru	R1	120	200	240	258	2.4
170	190	305	11.5	-	-	-	220	12-φ9通孔 12-φ9Thru	R1	145	245	290	529	3.5
193.5	260	352	11.5	-	-	-	285	12-φ9通孔 12-φ9Thru	R1	165	285	330	766	3.4
220	280	405	11.5	-	-	-	305	12-φ9通孔 12-φ9Thru	R1	195	330	390	1548	5.3
268	360	501	11.5	2	15.5	450	390	12-φ9通孔 12-φ9Thru	R2	240	410	480	4296	9.5
154	120	254	18.5	-	-	-	145	6-φ9 通孔 φ14沉孔 深 8.5 6-φ9Thru φ14counter bore,depth8.5	R1	250	360	500	397	4.5
193	190	331	18.5	-	-	-	220	12-φ9通孔 φ14沉孔 深 8.5 12-φ9Thru φ14counter bore,depth8.5	R1	335	485	670	1153	6.8
230	260	404	18.5	-	-	-	285	12-φ9通孔 φ14沉孔 深 8.5 12-φ9Thru φ14counter bore,depth8.5	R1	420	600	840	2499	9.2
268	330	480	18.5	-	-	-	360	16-φ11 通孔 φ18沉孔 深 10.5 16-φ11Thru φ18counter bore,depth10.5	R1	505	720	1010	4705	12
308	400	560	18.5	2	22.5	490	430	16-φ11 通孔 φ18沉孔 深 10.5 16-φ11Thru φ18counter bore,depth10.5	R2	590	845	1180	9494	17
235	220	380	24.5	-	-	-	250	12-φ11 通孔 φ18沉孔 深 10.5 12-φ11Thru φ18counter bore,depth10.5	R1	630	1160	1260	2565	12
292	330	493	24.5	-	-	-	360	16-φ11 通孔 φ18沉孔 深 10.5 16-φ11Thru φ18counter bore,depth10.5	R1	840	1540	1680	6893	17
351	400	610	24.5	2	28.5	490	430	16-φ11 通孔 φ18沉孔 深 10.5 16-φ11Thru φ18counter bore,depth10.5	R2	1050	1930	2100	18615	30
235	220	380	24.5	-	-	-	250	12-φ11通孔 φ18沉孔 深 10.5 12-φ11Thru φ18counter bore,depth10.5	R1	1000	1800	3400	2565	12
292	330	493	24.5	-	-	-	360	16-φ11通孔 φ18沉孔 深 10.5 16-φ11Thru φ18counter bore,depth10.5	R1	1400	2400	4600	6893	17
351	400	610	24.5	2	28.5	490	430	16-φ11通孔 φ18沉孔 深 10.5 16-φ11Thru φ18counter bore,depth10.5	R2	1750	3000	5800	18615	30
297	320	480	31.5	-	-	-	360	8-φ18 通孔 φ26沉孔 深 17.5 8-φ18Thru φ26counter bore,depth17.5	R1	3300	4000	5700	6998	19
369	390	622	31.5	2	35.5	490	430	12-φ18通孔 φ26沉孔 深 17.5 12-φ18Thru φ26counter bore,depth17.5	R2	4400	5300	7600	24747	40

注)基本动额定扭矩、最大使用扭矩、允许静额定扭矩，请参考TCG齿条的用语说明(P9)。
Note) For the terms of basic dynamic rated torque, maximum working torque and allowable static rated torque, refer to the terminology of TCG Cam Rack and Pinion (P.9).

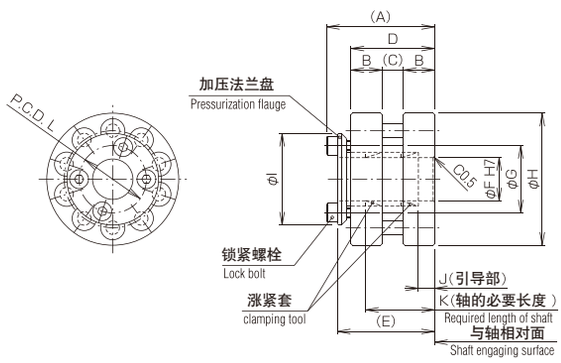
A	B	C	D	H	I		J	K		基本动额定扭矩 Allowable dynamic rated torque	最大使用扭矩 Maximum working torque	允许静额定扭矩 Allowable static rated torque	惯量※2 Inertia moment ×10-4kg・m²		质量※2 Mass weight kg	
					K1	K2		K1	K2	N・m	N・m	N・m	K1	K2	K1	K2
370	610	705	11.5	640	6-φ11 通孔 6-φ11Thru	3-φ11 通孔 3-φ11Thru	12	72	36	345	585	690	1562	779	1.5	0.73
510	860	984	11.5	900	6-φ11 通孔 6-φ11Thru	3-φ11 通孔 3-φ11Thru	12	72	36	485	825	970	6048	3019	2.9	1.5
606	1050	1176	11.5	1090	6-φ11 通孔 6-φ11Thru	3-φ11 通孔 3-φ11Thru	10	60	30	580	990	1160	9046	4516	3.0	1.5
752	1340	1468	11.5	1380	6-φ11 通孔 6-φ11Thru	3-φ11 通孔 3-φ11Thru	6	36	18	725	1230	1450	11039	5508	2.3	1.2
995	1820	1954	11.5	1860	6-φ11 通孔 6-φ11Thru	3-φ11 通孔 3-φ11Thru	6	36	18	970	1650	1940	28442	14199	3.3	1.7
386	610	716	18.5	640	6-φ11通孔 φ18沉孔 深 10.5 6-φ11Thru φ18counter bore,depth10.5	3-φ11 通孔 φ18 沉孔 深10.5 3-φ11Thru φ18counter bore,depth10.5	12	72	36	760	1080	1520	2667	1331	2.5	1.3
518	860	980	18.5	900	6-φ11通孔 φ18沉孔 深 10.5 6-φ11Thru φ18counter bore,depth10.5	3-φ11 通孔 φ18 沉孔 深10.5 3-φ11Thru φ18counter bore,depth10.5	12	72	37.4	1050	1510	2100	8539	4441	4.1	2.2
615	1050	1174	18.5	1090	6-φ11通孔 φ18沉孔 深 10.5 6-φ11Thru φ18counter bore,depth10.5	3-φ11 通孔 φ18 沉孔 深10.5 3-φ11Thru φ18counter bore,depth10.5	10	60	31.2	1260	1810	2520	13125	6825	4.3	2.3
768	1340	1480	18.5	1380	6-φ11通孔 φ18沉孔 深 10.5 6-φ11Thru φ18counter bore,depth10.5	3-φ11 通孔 φ18 沉孔 深10.5 3-φ11Thru φ18counter bore,depth10.5	6	36	18.9	1600	2280	3200	18428	9702	3.8	2.0
1000	1820	1944	18.5	1860	6-φ11通孔 φ18沉孔 深 10.5 6-φ11Thru φ18counter bore,depth10.5	3-φ11 通孔 φ18 沉孔 深10.5 3-φ11Thru φ18counter bore,depth10.5	6	36	18.7	2110	3020	4220	38492	20017	4.4	2.3
425	610	758	24.5	640	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	3-φ18通孔 φ26沉孔 深 17.5 3-φ18Thru φ26counter bore,depth17.5	12	72	38.4	1310	2410	2620	5334	2863	4.7	2.5
545	860	998	24.5	900	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	3-φ18通孔 φ26沉孔 深 17.5 3-φ18Thru φ26counter bore,depth17.5	12	72	36	1750	3200	3500	12641	6311	6.0	3.0
645	1050	1198	24.5	1090	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	3-φ18通孔 φ26沉孔 深 17.5 3-φ18Thru φ26counter bore,depth17.5	10	60	30	2110	3870	4220	20498	10233	6.6	3.3
790	1340	1487	24.5	1380	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	3-φ18通孔 φ26沉孔 深 17.5 3-φ18Thru φ26counter bore,depth17.5	6	36	19.2	2630	4810	5260	23907	12812	4.9	2.6
1036	1820	1979	24.5	1860	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	3-φ18通孔 φ26沉孔 深 17.5 3-φ18Thru φ26counter bore,depth17.5	6	36	18	3510	6430	7020	65996	32947	7.4	3.7
425	610	758	24.5	640	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	—	12	72	—	2150	3800	7200	5344	—	4.7	—
545	860	998	24.5	900	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	—	12	72	—	2900	5100	9600	12641	—	6.0	—
645	1050	1198	24.5	1090	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	—	10	60	—	3500	6100	11500	20498	—	6.6	—
790	1340	1487	24.5	1380	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	—	6	36	—	4350	7600	14500	23907	—	4.9	—
1036	1820	1979	24.5	1860	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	—	6	36	—	5800	10000	19000	65996	—	7.4	—
442	610	768	31.5	640	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	—	12	72	—	5500	6600	9500	7071	—	6.1	—
568	860	1020	31.5	900	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	—	12	72	—	7400	8800	12500	18890	—	8.8	—
665	1050	1214	31.5	1090	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	—	10	60	—	8800	10500	15000	28588	—	9.1	—
812	1340	1507	31.5	1380	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	—	6	36	—	11000	13000	18500	34685	—	7.0	—
1055	1820	1992	31.5	1860	6-φ18通孔 φ26沉孔 深 17.5 6-φ18Thru φ26counter bore,depth17.5	—	6	36	—	14500	17500	25000	89584	—	10	—

注)基本动额定扭矩、最大使用扭矩、允许静额定扭矩，请参考TCG齿条的用语说明(P9)。
Note) For the terms of basic dynamic rated torque, maximum working torque and allowable static rated torque, refer to the terminology of TCG Cam Rack and Pinion (P.9).

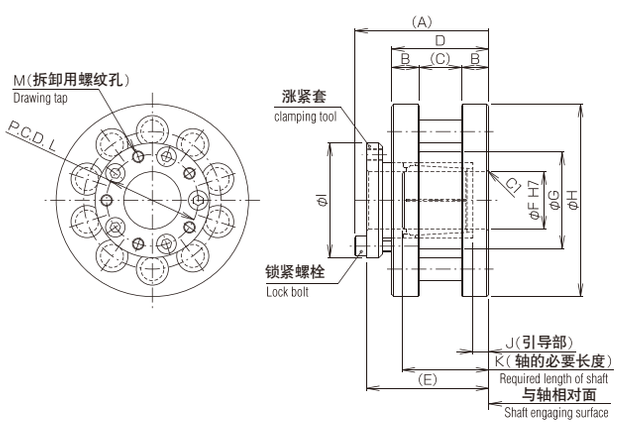
滚轮 Roller Pinion

外形尺寸图 Outside Dimensional Drawing

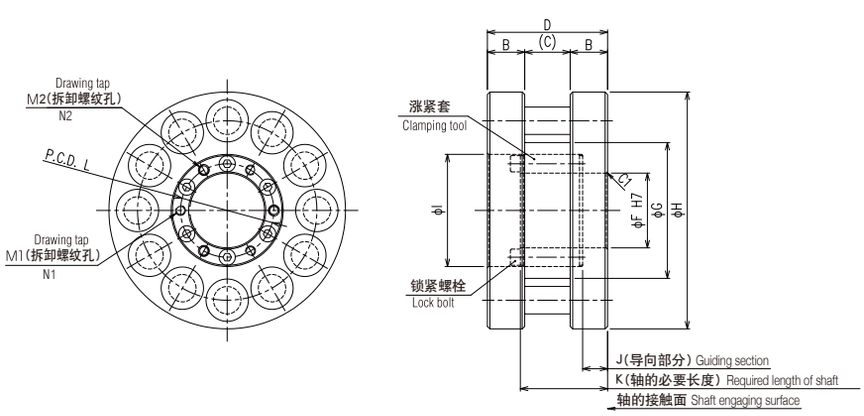
CPA 1010B, 1210B



CPA 1610B-3212B, CPC 3212A



CPC 4012B



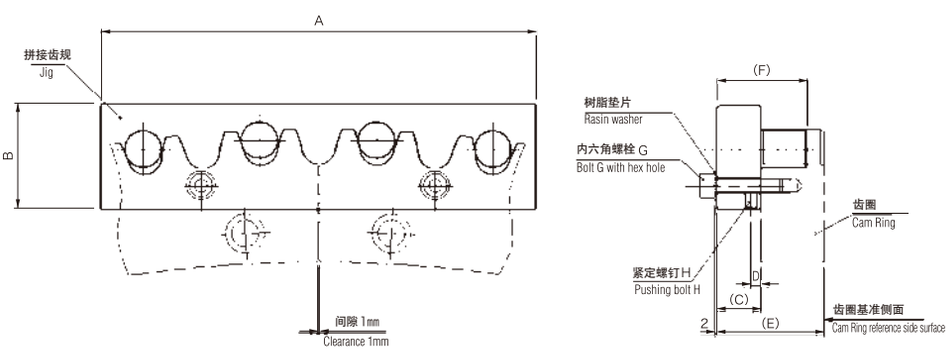
■ 尺寸表 Dimension Table

型 号 Model	模 数 Module	齿 数 Number of tooth	A	B	C	D	E	F	G	H	I	J	K	L	M
CPA1010B	3	10	37	10.5	8	29	34.5	12	20	41	27	5	23	20	3-M2.5
CPA1210B	3.6	10	40.1	11.5	8	31	37.1	16	25	49	34	4	25.6	26	3-M3
CPA1610B	4.75	10	52.5	12	14.5	38.5	48.5	20	33	67	42	7.5	33.5	33	5-M4
CPA2010B	6	10	58.5	12	18.5	42.5	53.5	25	42	84	50	7	38	40	5-M5
CPA2510B	7.5	10	67.5	14	21.5	49.5	61.5	30	51	101	63	7.5	43.5	51	5-M6
CPA3212B	9.5	12	88.5	20	28.5	68.5	82.5	45	88	148	82	11	58	68	4-M6
CPA3212A	9.5	12	88.5	20	28.5	68.5	82.5	45	88	148	82	11	58	68	4-M6

■ 尺寸表 Dimension Table

型 号 Model	模 数 Module	齿 数 Number of tooth	A	B	C	D	E	F	G	H	I	J	K	L	M		N
															M1	M2	
CPC4012B	12	12	–	30	36.5	96.5	–	60	109	190	90	20	70	75	3-M8	3-M8	口部 ϕ 8.8 Counterbore hole ϕ 8.8

■ 齿圈拼接齿规尺寸表 Dimensional drawing of connecting jig



拼接齿规型号 Jig model	A	B	C	D	E	F	G	H
RJ1610B	120（90）	31.5	12	3.5	23.5	20	M6	M4
RJ2510B	180	43	16	5	34.5	30	M8	M6
RJ3212B	230	58	25	6.5	49.5	45	M10	M8
RJ4012B	280	73.6	32	6.5	63.5	58	M10	M8

※内六角螺栓、树脂垫片以及紧定螺钉都是拼接齿规的附带零件。 Moumting jig bolt, plastic washer and setscrew are attached to adding jig.
※RJ1610B的A尺寸有两种，RGD1610–C140、300为90，其余均为120。
A-dimension of RJ1610B has two kinds, one (C140,300) is referred to 90 and the other referred to 120.

型号表示　Model indication

● 一体式齿圈型号
FullRing type number

RGF □□□□A-□□-C□□□
RFC □□□□A-□□-C□□□

齿数 Number of tooth
参照规格表 Black chromium plating

代号 Frame number

1010	2510	3212
1210	3212	4012
1610		

可选项 Option

表面处理 Surface treatment	精度 Accuracy
1：无表面处理 No surface treatment	A：普通级（标准） Standard grade (standard)
2：黑色镀铬处理（标准） Black chromium plating (standard)	B：精密级 Premium grade

● 拼接齿规型号
Connection Jig type number

RJ□□□□B-C□□□

代号 Frame number

1610	3212
2510	4012

齿数 Number of tooth
参照规格表 P. 26-27 Refer to P. 26-27

※拼接齿规上带有内六角螺栓，树脂垫片以及紧定螺钉。
Hex socket head cap bolt, plastic washer and setscrew are attached to adding jig.

● 分割齿圈型号
Circular arc ring type number

RGD□□□□A-□□-C□□□-A□□
RDC□□□□A-□□-C□□□-A□□

齿数 Number of tooth
参照规格表 Black chromium plating

单片齿圈的角度 Ring of angle
参照规格表K1，K2 Refer to Specifications K1,K2

K2尺寸用两位数字填写
ex.）K2=37.4° 的情况下，请填写37度
Please enter K2 dimention by two digits.
ex.） In the case K2=37.4° degress Please enter "37".
※）请输入0或1
Please enter the 0 or 1.

代号 Frame number

1610	3212
2510	4012
3212	

可选项 Option

表面处理 Surface treatment	精度 Accuracy
1：无表面处理 No surface treatment	A：普通级（标准） Standard grade (standard)
2：黑色镀铬处理（标准） Black chromium plating (standard)	B：精密级 Premium grade

※齿数不同的分割齿圈无法使用拼接齿规进行拼接。
Don't add to circular arc rings each having different number of tooth.
※将分割齿圈进行拼接的情况下需要使用RJ拼接齿规。
Use a specified tool RJ when adding to circular arc rings.
※不需要整圆地情况下，除了单侧1个齿（两侧2个齿）之外，其余为可使用角度。
Available angle is obtained by excluding a single one tooth of split ring at one end side (two teeth at both end sides) when circular arc rings are not used in full circumference.

● 滚轮型号
Roller pinion type number

CPA□□□□B-□□

代号 Frame number

1010
1210

可选项 Option

表面处理 Surface treatment	精度 Accuracy
1：无表面处理 No surface treatment	A：普通级（标准） Standard grade (standard)
2：黑色镀铬处理（标准） Black chromium plating (standard)	B：精密级 Premium grade

※可选项2的情况下，滚针轴承和滚销没有表面处理。
If Option 2 is selected for CPA1010B and CPA1210B,the needle bearing and the roller pin are no surface treatment.

CPA□□□□B-□□-□

代号 Frame number

1610
2510
3212

可选项 Option

表面处理 Surface treatment	精度 Accuracy
1：无表面处理 No surface treatment	A：普通级（标准） Standard grade (standard)
2：黑色镀铬处理（标准） Black chromium plating (standard)	B：精密级 Premium grade
3：氟化黑色镀铬处理 Fluorine black chromium plating	

TLS（TCG 自动润滑块） With TCG lubrication system	
无记号 No code	无 None
L	有 Yes

※ 详情请参考 P.31
For details, refer to P.31

※ 选择2、3的情况下，滚针轴承有表面处理，滚销没有表面处理。
When option 2 or 3 is specified as surface treatment of roller pinion, the surface of bearing used is raydented.
The surface of roller pin of used is bare (not raydented).

CPC□□□□□-□□-□

代号 Frame number

3212A
4012B

可选项 Option

表面处理 Surface treatment	精度 Accuracy
1：无表面处理（标准） No surface treatment (standard)	A：普通级（标准） Standard grade (standard)
2：黑色镀铬处理 Black chromium plating	B：精密级 Premium grade
3：氟化黑色镀铬处理 Fluorine black chromium plating	

TLS（TCG 自动润滑块） With TCG lubrication system	
无记号 No code	无 None
L	有 Yes

※ 详情请参考 P.31
For details, refer to P.31

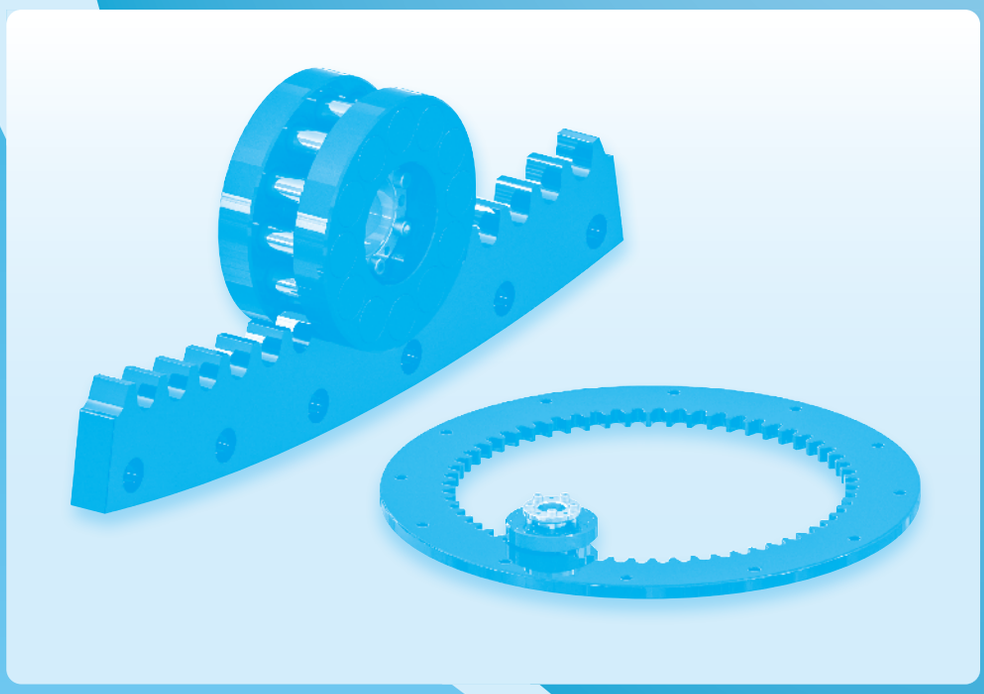
※ 选择2、3的情况下，滚针轴承有表面处理，可选项4的情况下，滚针轴承没有表面处理。所有情况下，滚销没有表面处理。
When option 2 or 3 is specified as surface treatment of roller pinion, the surface of bearing used is raydented.
The surface of roller pin of used is bare (not raydented).

规格• 尺寸表

Specification Dimensional Table

TCG内齿圈

TCG Ring Internal-gear type



TCG内齿圈规格表 TCG Ring Internal-gear type Specification

UGF1610A-3212A，UFC3212A-4012A（一体式内齿圈）

型号 Model		通用规格 Common spec.			一体式内齿圈规格 Full Ring, Internal-gear type spec.						滚轮规格 Roller pinion spec.		
滚轮 Roller pinion	一体式内齿圈 Full Ring, Internal-gear type	减速比 Reduction ratio	啮合节圆直径 Diameter of pitch circle		齿数 Number of tooth	基本动额定扭矩 Basic dynamic rated torque	最大使用扭矩 Maximum working torque	允许静额定扭矩 Allowable static rated torque	惯量 Inertia moment	质量 Mass weight	齿数 Number of tooth	惯量 Inertia moment	质量 Mass weight
			齿圈 Cam ring	滚轮 Roller pinion		N・m	N・m	N・m	×10⁻⁴kg・m²	kg		×10⁻⁴kg・m²	kg
CPA1610B	UGF1610A	6	292.800	48.800	60	165	245	330	1390	4.8	10	3.93	0.71
		8	390.857	48.857	80	220	330	440	3030	6.2			
CPA2510B	UGF2510A	5	385.000	77.000	50	435	605	870	5060	11	10	25.5	2.1
		6	463.200	77.200	60	525	730	1050	10600	16			
CPA3212B	UGF3212A	4	469.333	117.333	48	1030	1550	2060	14800	21	12	169	6.4
CPC3212A	UFC3212A	4	469.333	117.333	48	1400	2460	4600	14800	21	12	169	6.4
CPC4012B	UFC4012A	3	444.000	148.000	36	3320	3990	5780	21300	32	12	632	14

UGD1610A-3212A，UDC3212A-4012A（分段式内齿圈）

型号 Model		通用规格 Common spec.			分段式内齿圈规格 Circular arc Ring, Internal-gear type spec.						滚轮规格 Roller pinion spec.		
滚轮 Roller pinion	分段式内齿圈 Circular arc Ring, Internal-gear type	减速比 Reduction ratio	啮合节圆直径 Diameter of pitch circle		齿数※1 Number of tooth	基本动额定扭矩 Basic dynamic rated torque	最大使用扭矩 Maximum working torque	允许静额定扭矩 Allowable static rated torque	惯量※2 Inertia moment	质量※2 Mass weight	齿数 Number of tooth	惯量 Inertia moment	质量 Mass weight
			齿圈 Cam ring	滚轮 Roller pinion		N・m	N・m	N・m	×10⁻⁴kg・m²	kg		×10⁻⁴kg・m²	kg
CPA1610B	UGD1610A	12.8	629.153	49.153	128	355	535	710	3140	2.7	10	3.93	0.71
		16.5	809.032	49.032	165	460	690	920	5060	2.7			
		26.4	1288.819	48.819	264	725	1090	1450	11900	2.7			
		37	1808.889	48.889	370	1025	1540	2050	25400	3.0			
CPA2510B	UGD2510A	12	927.273	77.273	120	1050	1460	2100	14800	6.0	10	25.5	2.1
		22.5	1737.209	77.209	225	1960	2730	3920	49200	6.1			
		30	2317.241	77.241	300	2620	3650	5240	85200	6.0			
CPA3212B	UGD3212A	11.25	1317.073	117.073	135	2890	4340	5780	32800	6.8	12	169	6.4
		18	2117.647	117.647	216	4660	6990	9320	97100	8.1			
		25	2916.667	116.667	300	6400	9600	12800	200000	9.0			
CPC3212A	UDC3212A	11.25	1317.073	117.073	135	3950	6910	13000	32800	6.8	12	169	6.4
		18	2117.647	117.647	216	6350	11100	20800	97100	8.1			
		25	2916.667	116.667	300	8750	15300	29000	200000	9.0			
CPC4012B	UDC4012A	65/6	1608.475	148.475	130	12000	14400	20800	72200	11	12	632	14
		17.5	2587.879	147.879	210	19400	23200	33600	191000	11			
		24	3558.261	148.261	288	26600	32000	46400	406000	13			

※1 齿数为整圈所使用的的齿数。
This is number of tooth in case with used as a full ring.

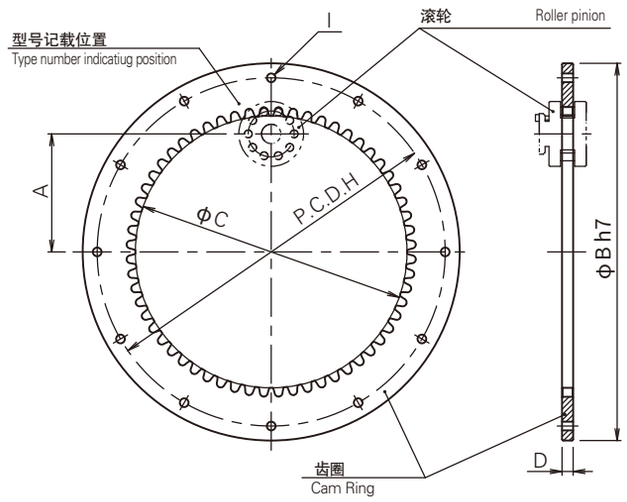
※2 惯量以及质量为分段齿圈单片参数。惯量为换算到回转轴的值。
The number of inertia moment and mass weight are for a piece of a circular arc ring. The inertia moment is a value converted to the rotation axis.

齿圈 Cam Ring

外形尺寸图 Outside Dimensional Drawing

UGF1610A-3212A,　UFC3212A-4012A（一体式内齿圈）

● 1010型、1210型、2010型一体式内齿圈也可进行定制。
Be able to make the full ring, internal-gear type for 1010, 1210 and 2010 models too, not stated the catalogue. Please ask us.

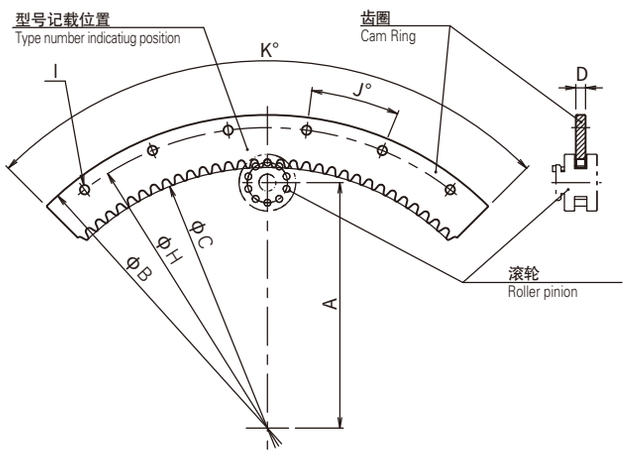


■尺寸表 Dimension Table

型　号 Model	齿数 Number of tooth	A	B	C	D	H	I
UGF1610A	60	122	390	281	11.5	360	12×φ9 通孔
	80	171	490	379	11.5	460	16×φ9 通孔
UGF2510A	50	154	490	368	18.5	460	16×φ9通孔 φ14沉孔 深8.5 16-φ9Thru φ14counter bore,depth8.5
	60	193	590	445	18.5	560	16×φ11通孔 φ18沉孔 深10.5 16-φ11Thru φ18counter bore,depth10.5
UGF3212A	48	176	600	448	24.5	560	12×φ18通孔 φ26沉孔 深17.5 12-φ18Thru φ26counter bore,depth17.5
UFC3212A	48	176	600	448	24.5	560	12×φ18通孔 φ26沉孔 深17.5 12-φ18Thru φ26counter bore,depth17.5
UFC4012A	36	148	600	416	31.5	560	12×φ18通孔 φ26沉孔 深17.5 12-φ18Thru φ26counter bore,depth17.5

UGD1610A-3212A, UDC3212A-4012A（分段式内齿圈）

● 1010型、1210型、2010型一体式内齿圈也可进行定制。
Be able to make the circular arc ring, internal-gear type for 1010, 1210 and 2010 models too, not stated the catalogue. Please ask us.



■尺寸表 Dimension Table

型 号 Model	齿数※1 Number of tooth	A	B	C	D	H	I	J	K
UGD1610A	128	290	740	616	11.5	710	6×φ11 通孔	15	90
	165	380	920	796	11.5	890	6×φ11 通孔	12	72
	264	620	1400	1276	11.5	1370	6×φ11 通孔	7.5	45
	370	880	1920	1796	11.5	1890	6×φ11 通孔	6	36
UGD2510A	120	425	1060	908	18.5	1020	6×φ11通孔 φ18沉孔 深10.5 6-φ11Thru φ18counter bore,depth10.5	12	72
	225	830	1870	1718	18.5	1830	6×φ11通孔 φ18沉孔 深10.5 6-φ11Thru φ18counter bore,depth10.5	7.2 ※2	40
	300	1120	2450	2298	18.5	2410	6×φ11通孔 φ18沉孔 深10.5 6-φ11Thru φ18counter bore,depth10.5	5	30
UGD3212A	135	600	1470	1294	24.5	1420	6×φ18通孔 φ26沉孔 深17.5 6-φ18Thru φ26counter bore,depth17.5	7.2 ※2	40
	216	1000	2270	2094	24.5	2220	6×φ18通孔 φ26沉孔 深17.5 6-φ18Thru φ26counter bore,depth17.5	5	30
	300	1400	3070	2894	24.5	3020	6×φ18通孔 φ26沉孔 深17.5 6-φ18Thru φ26counter bore,depth17.5	4	24
UDC3212A	135	600	1470	1294	24.5	1420	6×φ18通孔 φ26沉孔 深17.5 6-φ18Thru φ26counter bore,depth17.5	7.2 ※2	40
	216	1000	2270	2094	24.5	2220	6×φ18通孔 φ26沉孔 深17.5 6-φ18Thru φ26counter bore,depth17.5	5	30
	300	1400	3070	2894	24.5	3020	6×φ18通孔 φ26沉孔 深17.5 6-φ18Thru φ26counter bore,depth17.5	4	24
UDC4012A	130	730	1770	1580	31.5	1720	6×φ18通孔 φ26沉孔 深17.5 6-φ18Thru φ26counter bore,depth17.5	6	36
	210	1220	2750	2560	31.5	2700	6×φ18通孔 φ26沉孔 深17.5 6-φ18Thru φ26counter bore,depth17.5	4	24
	288	1705	3720	3530	31.5	3670	6×φ18通孔 φ26沉孔 深17.5 6-φ18Thru φ26counter bore,depth17.5	3.6 ※2	20

※1 齿数为整圈所使用的的齿数。整圈或多段使用时，请使用UJ拼接齿规进行拼接。
This is number of teeth in case with used as a full Ring. When using as a full ring, or connecting two or more rings, please use the dedicated connection jig UJ.
※2 拼接齿规安装孔为非等分角度。
When used the circular arc ring by connecting, the angles of the mounting holes on the extensions are not evenly spaced.

型号表示　Model indication

● CPA1610B～CPA3212B　滚轮
Roller pinion type number

CPA□□□□B-□□-□

代号 Frame number

1610	2510	3212

TLS（TCG自动润滑块） With TCG lubrication system	
无记号 No code	无 None
L	有 Yes

※详情请参考P.37
For details , refer to P. 37

表面处理 Surface treatment
1: 无表面处理 No surface treatment
2: 黑的镀铬处理（标准） Black chromium plating (standard)
3: 氟化黑色镀铬处理 Fluorine black chromium plating

精度 Accuracy
A: 普通级（标准） Standard grade (standard)
B: 精密级 Premium grade

※滚轮表面处理选择2、3的情况下，滚针轴承部将做黑色镀铬处理，滚销不做表面处理。
When option 2 or 3 is specified as surface treatment of roller pinion, the surface of bearing used is raydented. Also, the surface of roller pin is no surface treatment (not raydented).

● UGF1610A～UGF3212A　一体式内齿圈
Full ring, internal-gear type number

UGF□□□□A-□□-C□□□

代号 Frame number

1610
2510
3212

表面处理 Surface treatment
1: 无表面处理 No surface treatment
2: 黑的镀铬处理（标准） Black chromium plating(standard)

精度 Accuracy
A: 普通级 Standard grade
B: 精密级 Premium grade

齿数 Number of tooth

请参考P.32 规格表 Refer to P.32 TCG Ring Specification

● UGD1610A～UGD3212A　分段式内齿圈
Circular arc Ring, Internal-gear type number

UGD□□□□A-□□-C□□□-A□□

代号 Frame number

1610	2510	3212

齿数 Number of tooth

请参考P.32规格表 Refer to P.32 TCG Ring Specification

单片齿圈角度 Ring of angle

请参考P.34尺寸表K尺寸 Refer to P.34 Dimension table K

表面处理 Surface treatment
1: 无表面处理 No surface treatment
2: 黑的镀铬处理（标准） Black chromium plating(standard)

精度 Accuracy
A: 普通级 Standard grade
B: 精密级 Premium grade

※齿数不同的分段齿圈无法拼接使用。　Don't connect to circular arc rings each having different number of tooth.
※将分段齿圈拼接使用时，需要使用UJ拼接齿规。　Use the connection jig UJ when connecting to circular arc rings.
※非整圈使用的情况下，除单侧1个齿（两侧2个齿）之外，其余均为可使用角度。
Available angle is obtained by excluding a single one tooth of split ring at one end side (two teeth at both end sides) when circular arc rings are not used in full circumference.

● CPC3212A～CPC4012B 强化型滚轮
Enhanced roller pinion type number

CPC□□□□□-□□-□

代号 Frame number
3212A
4012B

表面处理 Surface treatment
1：无表面处理 No surface treatment
2：黑的镀铬处理（标准） Black chromium plating (standard)
3：氟化黑色镀铬处理 Fluorine black chromium plating

精度 Accuracy
A：普通级（标准） Standard grade (standard)
B：精密级 Premium grade

TLS（TCG自动润滑块） With TCG lubrication system	
无记号 No code	无 None
L	有 Yes

※请参考P.37 For details , refer to P. 37

※滚轮表面处理选择2、3的情况下，滚针轴承部将做黑色镀铬处理，滚销不做表面处理。
When option 2 or 3 is specified as surface treatment of roller pinion, the surface of bearing used is raydented. Also, the surface of roller pin is no surface treatment (not raydented).

● UFC3212A～UFC4012A 强化型一体式内齿圈
Enhanced Full ring, internal-gear type number

UFC□□□A-□□-C□□□

代号 Frame number
3212
4012

表面处理 Surface treatment
1：无表面处理 No surface treatment
2：黑的镀铬处理（标准） Black chromium plating(standard)

精度 Accuracy
A：普通级 Standard grade
B：精密级 Premium grade

齿数 Number of tooth
请参考P.32 规格表 Refer to P.32 TCG Ring Specification

● UDC3212A～UDC4012A 强化型分段式内齿圈
Enhanced Circular arc Ring, Internal-gear type number

UDC□□□□A-□□-C□□□-A□□

代号 Frame number	
3212	4012

齿数 Number of tooth
请参考P.32规格表 Refer to P.32 TCG Ring Specification

单片齿圈角度 Ring of angle
请参考P.34尺寸表K尺寸 Refer to P.34 Dimension table K

表面处理 Surface treatment
1：无表面处理 No surface treatment
2：黑的镀铬处理（标准） Black chromium plating(standard)

精度 Accuracy
A：普通级 Standard grade
B：精密级 Premium grade

※齿数不同的分段齿圈无法拼接使用。 Don't connect to circular arc rings each having different number of tooth.
※将分段齿圈拼接使用时，需要使用UJ拼接齿规。 Use the connection jig UJ when connecting to circular arc rings.
※非整圈使用的情况下，除单侧1个齿（两侧2个齿）之外，其余均为可使用角度。
Available angle is obtained by excluding a single one tooth of split ring at one end side (two teeth at both end sides) when circular arc rings are not used in full circumference.

● UJ1610B ～ UJ4012B 内齿圈拼接齿规
Connection Jig type number

UJ□□□□B-C□□□

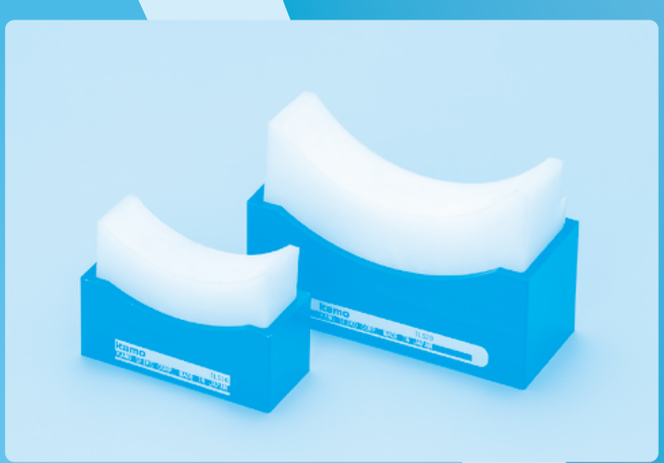
代号 Frame number	
1610	3212
2510	4012

齿数 Number of tooth
请参考P.32规格表 Refer to P. 32

※UGD3212与UDC3212拼接齿规为通用。
The same connection jig is applicable to UGD3212 and UDC3212.
※拼接齿规上有内六角螺栓、树脂垫片以及紧定螺钉。
Hex socket head cap bolt, plastic washer and setscrew are attached to adding jig.

TCG自动润滑块 TLS(可选项)

TCG Lubrication System



特色・结构 Features and structure

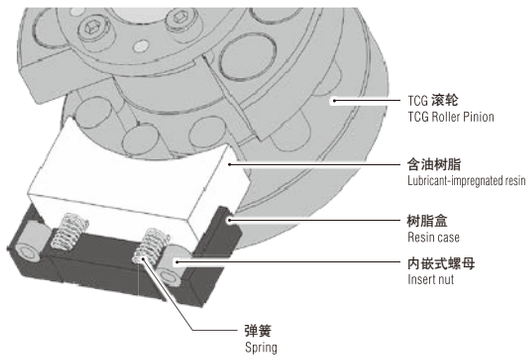
TLS是为TCG系列提供润滑剂的自动润滑块。（只适用于一般环境）
A system to supply lubricant to TCG Series.(for general environments)

采用高粘度润滑油含浸的特殊多孔树脂，并且通过弹簧结构使含油树脂与滚轮的滚销相接触，为接触部表面提供适量润滑剂。

Special porous resin impregnated with a high-viscosity lubricant is brought into contact with the roller pinion by a spring to supply appropriate quantities of lubricant to the contact region surfaces.

滚轮回转时，润滑剂被持续涂抹在滚销上，进而在滚销与齿条的啮合面上形成常态化油膜。

When the pinion rotates, lubricant is supplied to the roller, and thereby an oil film is always formed on the surfaces in mesh with the rack.



无需初期给油，无需追加给油，到滚轮回转寿命结束为止无需更换，真正实现免维护。
This system has realized maintenance-free with no need of lubricant replacement until the pinion rotation life span comes to end, no need of initial lubrication, and no need of additional lubrication.

型号表示 Model indication

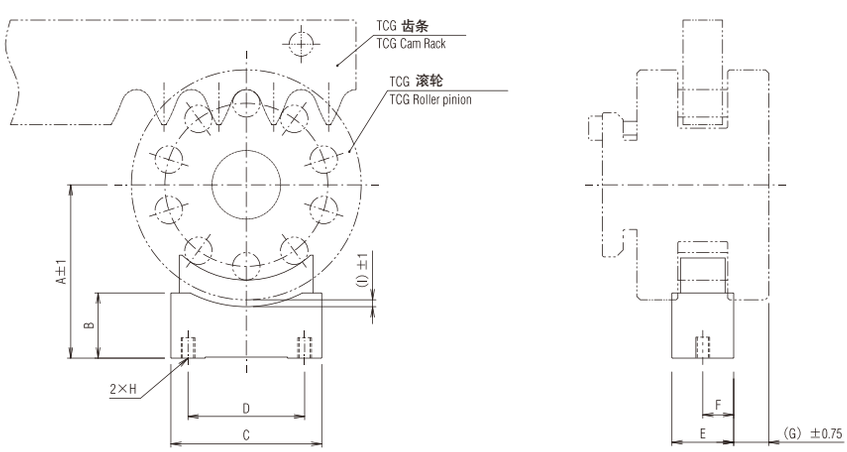
若需要TLS配件，请在订购滚轮（CPA／CPC）或带滚轮减速机(SFP／NSP）时追加“L”标记.
If you want TLS, please select option: L when ordering the Roller pinion(CPA/CPC) or reducer with roller pinion(SFP/ NSP).

型号例）CPA□□□□B-□□-L ／ CPC□□□□A-□□-L

※ CPA1010B,CPA1210B 型暂无TLS配件可选。
For Models CPA1010B and CPA1210B, there is no setting of the TLS option.

TLS（TCG 自动润滑块） With TCG lubrication system	
无标记 No code	无 None
L	有 Yes

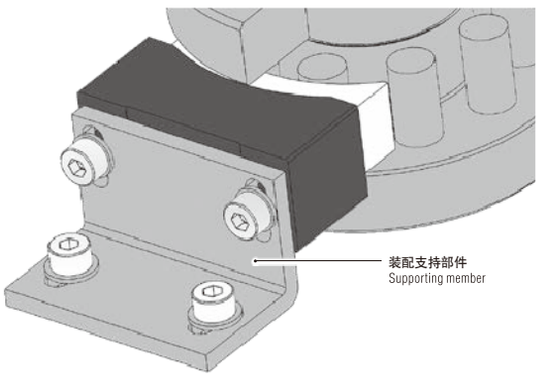
外形尺寸图 Outside Dimensional Drawing



滚轮型号 Roller pinion model	A±1	B	C	D	E	F	G±0.75	H	I±1
CPA1610B	50.5	19	44	34	18	9	(10.25)	M4 深 6 Deep 6	(2)
CPA2010B	63	27	64	52	25	12.5	(7.5)	M5 深 7 Deep 7	(2)
CPA2510B	74	27	64	52	25	12.5	(12.25)	M5 深 7 Deep 7	(4.5)
CPA3212B	93	27	104	90	40	20	(10.25)	M6 深 7 Deep 7	(2)
CPC3212A	93	27	104	90	40	20	(10.25)	M6 深 7 Deep 7	(2)
CPC4012A	114	27	104	90	40	20	(28.25)	M6 深 7 Deep 7	(2)

※ 尺寸I为装配时的预估值，表示滚轮外径与树脂盒的间距。
The measurement I is to be used as a rough standard for mounting, which indicates a distance between the outside surface of the pinion and the resin case.

装配相关 Mounting



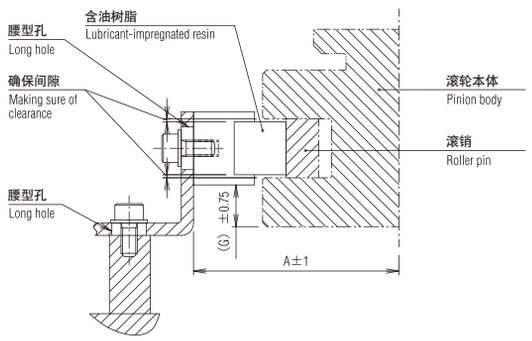


図 1 TLS 装配相关 Fig. 1 — Mounting TLS —

●TLS无法直接装配到TCG滚轮上，请额外准备装配支持部件。装配时，请确保滚轮本体和含油树脂之间留有间隙（如图1所示），两侧间隙约为1.5mm。
若滚轮本体和含油树脂相互干涉，可能会使含油树脂朝向滚销的推力不足，从而导致润滑不良。此状况下推荐通过腰型孔等进行位置调整。

TLS cannot be mounted on TCG Roller Pinion. For mounting TLS, prepare a supporting member separately. When mounting TLS, make sure of a clearance between the pinion main body and the lubricant-impregnated resin as shown in Fig. 1. The clearance must be approx. 1.5mm on both sides each.
If the pinion main body and the lubricant-impregnated resin interfere with each other, pushing strength of the lubricant-impregnated resin against the roller pins becomes insufficient, which could result in deficient lubrication. It is recommendable, therefore, to provide a positional adjustment means, such as a long hole.

●若尺寸A超出公差范围，润滑剂可能无法被有效供给。

If the measurement A is out of its tolerance, lubricant could not be supplied.

装配注意事项 Cautions for handling

●使用TLS时，为有效提供润滑剂，请确保滚轮回转数大于1。

When TLS is in use, the pinion must make one rotation or more to supply lubricant.

●请勿清洗含油树脂。此外，请避免在滴液环境下使用。

Do not clean the lubricant-impregnated resin. Also, do not use the lubricant-impregnated resin in the liquid-dripping environment.

●含油树脂采用防脱落设计，强行拉拔等外力作用可能会导致变形及润滑不良。

The lubricant-impregnated resin is equipped with a stopper to prevent itself from being dropped out of the resin case.
Avoid such an external force as an unreasonable pull-out force, which could cause deformation or deficient lubrication.

Memo

技 术 资 料

Technical Data

TCG Series

通 用 项

Common Data

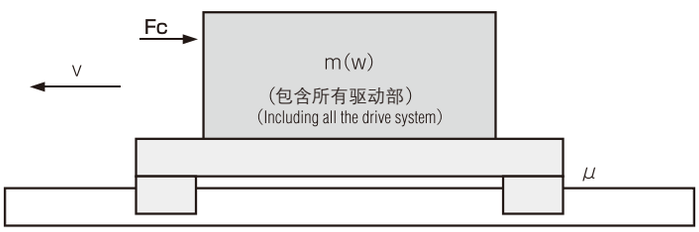
型号的选定 Selection of Type Number

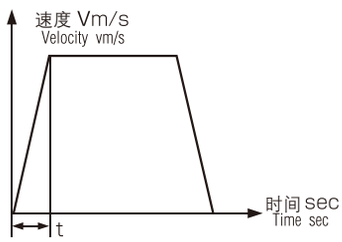
齿条型号的选定 Cam Rack Selection of Type Number

运用下列计算方式选出型号。

Calculate the load by the method mentioned below.

● 选型案例 Selection Example





● 选型条件 Specifications

质　量	Mass	：	m ＝300kg（重量 Weight：w＝300kg f）
速　度	Velocity	：	V ＝1m／sec
加速时间	Acceleration	：	t ＝0.4sec
外　力	Outer force	：	Fc＝100N
摩擦系数	Coefficient of friction	：	μ ＝0.01（Table1）
负载系数	Coefficient of weight	：	fw＝1.5（Table2）
重力加速度	Gravitational acceleration	：	g ＝9.80665m／sec²

(Table1) 摩擦系数 Coefficient of friction (μ)

滚动导轨 Rolling guide	0.005～0.02
滑动导轨 Swliding guide	0.1～0.2

(Table2) 负载系数 Coefficient of weight (fw)

无冲击的圆滑的运转 Smooth operation with no impact	1.0～1.2
普通的运转 Normal operation without eccessive impact	1.2～1.5
有冲击的运转 Operation with impact	1.5～3.0

● 计算 Calculation

SI单位制 SI unit system
1．负载加速度 Load acceleration $Aw=\frac{V}{t}=\frac{1}{0.4}=2.5m/sec^2$
2．加速时负载 Load applied at acceleration Fa＝m・Aw＝300×2.5＝750N
3．摩擦负载 Frictional resistance load Fb＝g・m・μ＝9.80665×300×0.01＝29.4N
4．总负载 Total load weight F＝fw×(Fa+Fb+Fc)＝1.5×(750+29.4+100)＝1.5×879.4＝1319.1N
5．选定型号 Selection 根据F (F') 的结果选定 TCG[CPA1610B/CRA1610A] 最大使用负载 1700N From the result of F (F'), the rack runner is selected as [CPA1610B / CRA1610A]TCG Runner, and allowable dynamic rated load as 1700N.

寿命计算 Life Calculation

TCG 齿条 & 滚轮通过滚轮的回转次数来计算出寿命时间。

For TCG Cam Rack & Roller Pinion, the life is calculated from the number of revolutions of the roller pinion.

＜设定条件＞

额定寿命　1010型～1210型　270×10^6回转（将基本动额定扭矩作为负载）（滚轮 300rpm 寿命时间为15000H）

额定寿命　1610型～4012型　60×10^6回转（将基本动额定扭矩作为负载）（滚轮 100rpm 寿命时间为10000H）

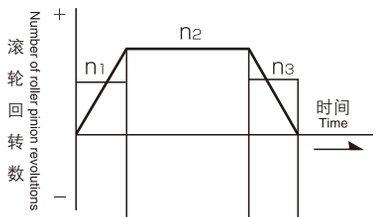
＜Setting conditions＞

Rated life 1010～1210 = 270×10^6 revolutions (under the load of basic dynamic rated torque) (300rpm of the roller pinion is correspondent to 15,000 hours of life.)

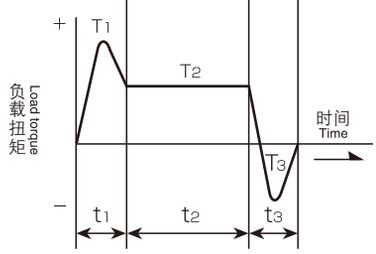
Rated life 1610～4012 = 60×10^6 revolutions (under the load of basic dynamic rated torque) (100rpm of the roller pinion is correspondent to 10,000 hours of life.)

●运转条件（参考）Operating Conditions (Reference)

〈速度类型〉
Velocity pattern



〈负载类型〉
Load pattern



	起动时 Starting	定速时 Steady operation	停止时 Stoppage
负载扭矩 (Nm) Load torque	T_1	T_2	T_3
滚轮回转数 (rpm) Number of roller pinion revolutions	n_1 ($=0.5n_2$)	n_2	n_3 ($=0.5n_2$)
时间 (sec) Time	t_1	t_2	t_3

●平均负载扭矩 Average Load Torque Tm（N·m）

$$Tm=\sqrt[10/3]{\frac{n_1\cdot t_1\cdot T_1^{10/3}+n_2\cdot t_2\cdot T_2^{10/3}+n_3\cdot t_3\cdot T_3^{10/3}}{n_1\cdot t_1+n_2\cdot t_2+n_3\cdot t_3}}$$

●平均回转数 Average Number of Revolutions Nm（rpm）

$$Nm=\frac{t_1n_1+t_2n_2+t_3n_3}{t_1+t_2+t_3}$$

●寿命时间 Life Length Lh（H）

$$Lh=Lh_0\times\frac{N_0}{Nm}\times\left(\frac{T0}{fd\cdot fset\cdot Tm}\right)^{10/3}$$

$$=\frac{4.5\times10^6}{Nm}\times\left(\frac{T0}{fd\cdot fset\cdot Tm}\right)^{10/3}\text{（1010型～1210型）}$$

$$=\frac{10^6}{Nm}\times\left(\frac{T0}{fd\cdot fset\cdot Tm}\right)^{10/3}\text{（1610型～4012型）}$$

额定寿命时间	Rated life length	: Lh_0 (Table1)
滚轮基本回转数	Basic number of roller pinion revolutions	: N_0 (Table1)
基本动额定扭矩 (N·m)	Basic dynamic rated torque	: T0 (Table2)
平均负载扭矩 (N·m)	Average load torque	: Tm
滚轮平均回转数 (rpm)	Average number of roller pinion revolutions	: Nm
负载系数	Coefficient of load	: fd (Table3)
安装精度系数	Coefficient of installation precision	: fset (Table4)

(Table1) 额定寿命 Rated life

型号 Model	Lh_0 (H)	N_0 (rpm)
1010～1210	15000	300
1610～4012	10000	100

(Table2) 基本动额定扭矩 Basic dynamic rated torque

型号 Model	T0 (N·m)
CPA 1010	4.0
CPA 1210	9.5
CPA 1610	25.5
CPA 2010	47.7
CPA 2510	87.5
CPA 3212	220
CPC 3212	366.6
CPC 4012	1146.0

(Table3) 负载系数 Coefficient of load

运转条件 Operating conditions	fd
没有冲击的圆滑运转 Smooth operation with no impact	1.0～1.2
普通运转 Normal operation without eccessive impact	1.2～1.5
有冲击的运转 Operation with impact	1.5～3.0

(Table4) 安装精度系数 Coefficient of installation precision

安装精度 Installation precision	fset
推荐安装精度 以内 Recommended installation precision (within)	1.0
动作允许范围 以内 Allowable operation range (within)	1.2

■计算案列 Calculation Example

●平均负载扭矩 Average Load Torque Tm（N·m）

$$Tm=\sqrt[10/3]{\frac{n_1\cdot t_1\cdot T_1^{10/3}+n_2\cdot t_2\cdot T_2^{10/3}+n_3\cdot t_3\cdot T_3^{10/3}}{n_1\cdot t_1+n_2\cdot t_2+n_3\cdot t_3}}$$

$$=\sqrt[10/3]{\frac{150\times0.1\times30^{10/3}+300\times5\times10^{10/3}+150\times0.1\times30^{10/3}}{150\times0.1+300\times5+150\times0.1}}$$

$$=11.8\text{(N·m)}$$

使用条件 Working conditions

	起动时 Starting	定速时 Steady operation	停止时 Stoppage
负载扭矩 (Nm) Load torque	$T_1=30$	$T_2=10$	$T_3=30$
滚轮回转数 (rpm) Number of roller pinion revolutions	n_1 ($=0.5n_2$) $=150$	$n_2=300$	n_3 ($=0.5n_2$) $=150$
时间 (sec) Time	$t_1=0.1$	$t_2=5$	$t_3=0.1$

●平均输入回转数 Average Input Rotational Frequency Nm（rpm）

$$Nm=\frac{t_1n_1+t_2n_2+t_3n_3}{t_1+t_2+t_3}=\frac{0.1\times150+5\times300+0.1\times150}{0.1+5+0.1}=294.2\text{(rpm)}$$

●寿命时间 Life Length Lh（H）

从起动扭矩T1值（使用时最大扭矩）从规格表最大使用扭矩中选择型号「CPA1610B」

根据(Table2) To=25.5、从使用条件选定负载系数fd=1.5 (Table3)，安装精度系数选择为fset=1.0 (Table4) 的话。

Select the roller pinion model number "CPA1610B" from the specified maximum working torque based on the starting torque T1 (maximum working torque).
When To = 25.5 from Table 2, and the coefficient of load fd = 1.5 (Table 3) and the coefficient of installation precision fset = 1.0 (Table 4) from the working conditions,

$$Lh=\frac{10^6}{Nm}\times\left(\frac{T0}{fd\cdot fset\cdot Tm}\right)^{10/3}=\frac{10^6}{294.2}\times\left(\frac{25.5}{1.5\times1.0\times11.8}\right)^{10/3}=11479\text{(H)}$$

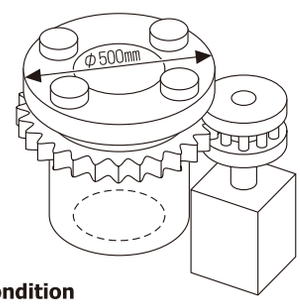
型号的选定 Selection of Type Number

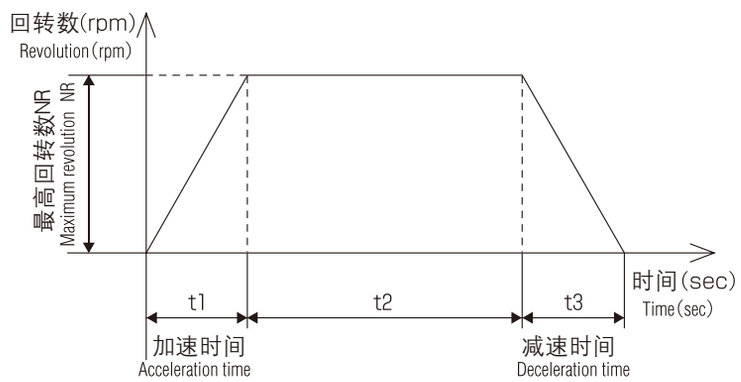
齿圈型号的选定 Cam Ring Selection of Type Number

● 选型案例 Selection Example

使φ500，20kg 圆盘进行回转的情况下
Upon rotating a disk (φ500mm , 20kg)

质　　量 Mass weight：20kg
总 惯 量 Moment of inertia：0.9kgm²





● 负载条件 Load Condition

质　　量	Mass weight	:	m	=	20	(kg)
惯　　量	Moment of inertia	:	J	=	0.9	(kgm²)
最高回转数	Maximum number of revolution	:	NR	=	100	(rpm)
加速时间	Acceleration time	:	t1	=	0.1	(sec)
外力扭矩 (包含摩擦扭矩)	Outer force torque including frictional torque	:	Tc	=	30	(Nm)
负载系数	Coefficient of load	:	fw	=	1.5	

没有冲击的圆滑运转 Smooth operation with no impact	1.0～1.2
普通的运转 Normal operation without eccessive impact	1.2～1.5
有冲击的运转 Operation with impact	1.5～3.0

● 选型计算 Calculation

角　速　度 Angular velocity : $\omega = NR \times 2 \cdot \pi / 60$
$= 100 \times 2 \times 3.14 / 60$
$= 10.47$ (rad/sec)

角加速度 Angular acceleration : $\dot{\omega} = \omega / t1$
$= 10.47 / 0.1$
$= 104.7$ (rad/sec²)

加速扭矩 Accelerative torque : $Ta = J \times \dot{\omega}$
$= 0.9 \times 104.7$
$= 94.2$ (Nm)

最大负载扭矩 Maximum load torque : $Tmax = fw \times (Ta + Tc)$
$= 1.5 \times (94.2 + 30)$
$= 186.3$ (Nm)

● 齿圈型号假定 Provisional Cam Ring Selection

在式样表中，根据允许扭矩假定RGF2510A-C30.
根据RGF2510A-C30的式样表：
RGF2510 is provisionally selected from the allowable torque in the specification (RGF2510A-C30) .

最大扭矩 Allowable torque		360 (Nm)
齿圈的惯量 Moment of inertia	Jg Jg	397×10⁻⁴ (kgm²)

● 再计算 Calculation

考虑齿圈部分再次进行计算 Re-calculation upon considering the Cam Ring portion

加速扭矩 Accelerative torque : $Ta' = (J + Jg) \times \dot{\omega}$
$= (0.9 + 397 \times 10^{-4}) \times 104.8$
$= 98.4$ (Nm)

最大负载扭矩 Maximum load torque : $Tmax' = fw \times (Ta' + Tc)$
$= 1.5 \times (98.4 + 30)$
$= 192.6$ (Nm)

RGF2510A–C30的最大使用扭矩 : 360 (Nm)
Maximum working torque of RGF2510A-C30

所以 OK
This re-calculation shows that type of RGF2510A-C30 is appropriate.

● 选定 Selection

通过以上选定RGF2510A–C30 RGF2510A-C30 is selected.

寿命计算 Life Calculation

TCG齿圈 & 滚轮通过滚轮的回转次数来计算出寿命时间。

For TCG Cam Ring, the life is calculated from the number of revolutions of the roller pinion.

＜设定条件＞

额定寿命 1010型～1210型 270×10^6回转(将基本动额定扭矩作为负载)（滚轮300rpm寿命时间为15000小时）

额定寿命 1610型～4012型 60×10^6回转(将基本动额定扭矩作为负载)（滚轮100rpm寿命时间为10000小时）

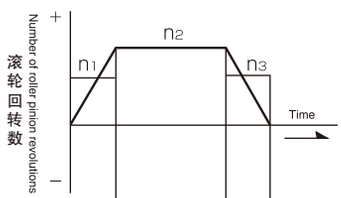
<Setting conditions>

Rated life 1010・1210 = 270×10^6 revolutions (under the load of basic dynamic rated torque) (300rpm of the roller pinion is correspondent to 15,000 hours of life.)

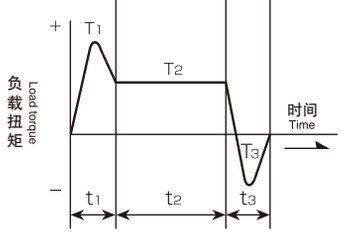
Rated life 1610～4012 = 60×10^6 revolutions (under the load of basic dynamic rated torque) (100rpm of the roller pinion is correspondent to 10,000 hours of life.)

●运转条件（参考） Operating Conditions (Reference)

〈速度类型〉 Velocity pattern



〈负载类型〉 Load pattern



	起动时 Starting	定速时 Steady operation	停止时 Stoppage
负载扭矩 (Nm) Load torque	T_1	T_2	T_3
滚轮回转数 (rpm) Number of roller pinion revolutions	n_1 (=0.5n_2)	n_2	n_3 (=0.5n_2)
时间(sec) Time	t_1	t_2	t_3

● 平均负载扭矩 Average Load Torque Tm（N·m）

$$Tm=\sqrt[10/3]{\frac{n_1\cdot t_1\cdot T_1^{10/3}+n_2\cdot t_2\cdot T_2^{10/3}+n_3\cdot t_3\cdot T_3^{10/3}}{n_1\cdot t_1+n_2\cdot t_2+n_3\cdot t_3}}$$

● 平均回转数 Average Number of Revolutions Nm（rpm）

$$Nm=\frac{t_1n_1+t_2n_2+t_3n_3}{t_1+t_2+t_3}$$

●寿命时间 Life Length Lh（H）

$$Lh=Lh_0\times\frac{N_0}{Nm}\times\left(\frac{T0}{fd\cdot fset\cdot Tm}\right)^{10/3}$$

$$=\frac{4.5\times10^6}{Nm}\times\left(\frac{T0}{fd\cdot fset\cdot Tm}\right)^{10/3}\text{（1010型～1210型）}$$

$$=\frac{10^6}{Nm}\times\left(\frac{T0}{fd\cdot fset\cdot Tm}\right)^{10/3}\text{（1610型～4012型）}$$

额定寿命时间	Rated life length	: Lh_0(Table1)
滚轮基本回转数	Basic number of roller pinion revolutions	: N_0(Table1)
基本动额定扭矩(N·m)	Basic dynamic rated torque	: T0(参考参数表)
平均负载扭矩（N·m）	Average load torque	: Tm
滚轮平均回转数(rpm)	Average number of roller pinion revolutions	: Nm
负载系数	Coefficient of load	: fd(Table2)
安装精度系数	Coefficient of installation precision	: fset(Table3)

(Table1) 额定寿命 Rated life

型号 Model	Lh_0 (H)	N_0 (rpm)
1010～1210	15000	300
1610～4012	10000	100

(Table2) 负载系数 Coefficient of load

运转条件 Operating conditions	fd
没有冲击的圆滑运转 Smooth operation with no impact	1.0～1.2
普通的运转 Normal operation without eccessive impact	1.2～1.5
有冲击的运转 Operation with impact	1.5～3.0

(Table3) 安装精度系数 Coefficient of installation precision

安装精度 Installation precision	fset
推荐安装精度 以内 Recommended installation precision (within)	1.0
动作允许范围 以内 Allowable operation range (within)	1.2

■计算案例 Calculation Example

●平均负载扭矩 Average Load Torque Tm（N·m）

$$Tm=\sqrt[10/3]{\frac{n_1\cdot t_1\cdot T_1^{10/3}+n_2\cdot t_2\cdot T_2^{10/3}+n_3\cdot t_3\cdot T_3^{10/3}}{n_1\cdot t_1+n_2\cdot t_2+n_3\cdot t_3}}$$

$$=\sqrt[10/3]{\frac{50\times0.1\times128.6^{10/3}+100\times0.5\times30^{10/3}+50\times0.1\times68.6^{10/3}}{50\times0.1+100\times0.5+50\times0.1}}$$

$$=64.5\text{(N·m)}$$

使用条件 Working conditions

	起动时 Starting	定速时 Steady operation	停止时 Stoppage
负载扭矩 (Nm) Load torque	T_1=128.6	T_2=30	T_3=68.6
滚轮回转数 (rpm) Number of roller pinion revolutions	n_1 (=0.5n2) =50	n_2=100	n_3 (=0.5n2) =50
时间(sec) Time	t_1=0.1	t_2=0.5	t_3=0.1

●平均输入回转数 Average Input Rotational Frequency Nm（rpm）

$$Nm=\frac{t_1n_1+t_2n_2+t_3n_3}{t_1+t_2+t_3}\times i=\frac{0.1\times50+0.5\times100+0.1\times50}{0.1+0.5+0.1}\times3=257.1\text{(rpm)}$$

※ i是齿圈和滚轮之间的减速比。根据前页“型号的选定”，已经选定RGF2510A—C30，i=30÷10=3

"i" is a reduction ratio between Cam Ring gear and roller pinion.

RGF2510A-C30 is selected at previous paragragh, there fore "i"= 30÷10=3

●寿命时间 Life Length Lh（H）

从使用条件选定负载系数fd=1.5（Table 2），安装精度系数fset=1.0(Table3)的话：

Select the roller pinion model number "CPA2010" from the T0 value (Table 2) based on the starting torque T1 (max. working torque).

When the coefficient of load fd = 1.5 (Table 3) and the coefficient of installation precision fset = 1.0 (Table 4) from the working conditions,

$$Lh=\frac{10^6}{Nm}\times\left(\frac{T0}{fd\cdot fset\cdot Tm}\right)^{10/3}=\frac{10^6}{257.1}\times\left(\frac{250}{1.5\times1.0\times64.5}\right)^{10/3}=92086\text{(H)}$$

精度规格 Specifications

项目 Items		型号・精度等级 Frame number・Accuracy grade	1010		1210		1610		
			高精度型 High accuracy model		高精度型 High accuracy model		高精度型 High accuracy model		标准型 Standard model
			精密级 Premium grade	普通级 Standard grade	精密级 Premium grade	普通级 Standard grade	精密级 Premium grade	普通级 Standard grade	
标准型齿条 高精度型齿条 齿圈 通用规格 Standard model High accuracy model Cam Ring Common spec	传动精度 Transmitting accuracy	[μm]	±30	±50	±30	±50	±30	±50	±100
	单一节距误差 Meshing error per pitch	[μm]	40	70	40	70	40	70	100
	重复定位精度 Repetitive halting precision Note1)	[μm]	10	20	10	20	10	20	20
标准型 高精度型 齿 条 Standard model High accuracy model Cam Rack	齿顶高误差 Error of addendum height against reference plane	[μm]	20	30	20	30	20	30	60
	齿高方向弯曲度 Bending in tooth depth direction	[mm/1根] mm/pc	0.2	0.3	0.2	0.3	0.15	0.2	—
	齿侧方向弯曲度 Bending in tooth side direction	[mm/1根] mm/pc	—	—	—	—	0.2	0.3	—

※以上数值为在弊社推荐的安装精度条件下，并装配温度在20° 情况下的数值。
Numerical values are at 20 degrees centigrade as measurement temperature upon assemble based on attaching requirement stipulated by our company.

※齿圈的传动精度是指啮合节圆上的误差数值。
The transmitting accuracy of Cam Ring is the error value on the pitch circle.

※齿条及RGD（分割齿圈）拼接时请考虑比以上表内数值（±10μm×拼接数量）的误差。
Please consider the count marginal errors (±10μm×number of added cam racks or circular arc rings) to values shown at above table when adding cam racks or circular arc rings.

ex. 使用三片RGD1610A–C400–A36（精密级）的传动精度（参考值）
±30+(±10×2)＝±50μm
换算为角度的话，RGF1610A–C400–A36的啮合节圆直径通过参照P26–27外形尺寸图为1941.46mm
±0.05÷1941.46π×3600×360=±10.6 arc·sec

ex. The transmitting accuracy (reference value) when 3 pcs of RGD1610A-C400-A36 (premium grade) are used
±30+(±10×2) = ±50μm
When the diameter of the working pitch circle of RGD1610A-C400-A36 is converted to angle, 1941.46mm
±0.05÷1941.46π×3600×360 = ±10.6 arc・sec from the outside dimension drawing on P. 26-27.

TCG 齿条 不锈钢款 精度规格 TCG Runner Stainless-steel type Accuracy Specifications

项目 Items	型号 Frame number	1610	2010	2510	3212	4012
传动精度 Transmitting accuracy	[μm]	±50	±50	±50	±50	±50
单一节距误差 Meshing error per pitch	[μm]	70	70	70	70	70
重复定位精度 Repetitive positioning accuracy	[μm]	20	20	20	20	20
齿顶高度误差 Error of addendum height against reference plane	[μm]	30	30	30	30	30
齿高方向弯曲度 Bending in tooth depth direction	[mm/1个] mm/pc	0.2	0.2	0.2	0.15	0.15
齿侧方向弯曲度 Bending in tooth side direction	[mm/1个] mm/pc	0.3	0.3	0.3	0.2	0.2

2010			2510			3212			4012		
高精度型 High accuracy model		标准型 Standard model	高精度型 High accuracy model		标准型 Standard model	高精度型 High accuracy model		标准型 Standard model	高精度型 High accuracy model		标准型 Standard model
精密级 Premium grade	普通级 Standard grade		精密级 Premium grade	普通级 Standard grade		精密级 Premium grade	普通级 Standard grade		精密级 Premium grade	普通级 Standard grade	
±30	±50	±100	±30	±50	±100	±30	±50	±100	±30	±50	±100
40	70	100	40	70	100	40	70	100	40	70	100
10	20	20	10	20	20	10	20	20	10	20	20
20	30	60	20	30	60	20	30	60	20	30	60
0.15	0.2	—	0.15	0.2	—	0.08	0.15	—	0.08	0.15	—
0.2	0.3	—	0.2	0.3	—	0.15	0.2	—	0.15	0.2	—

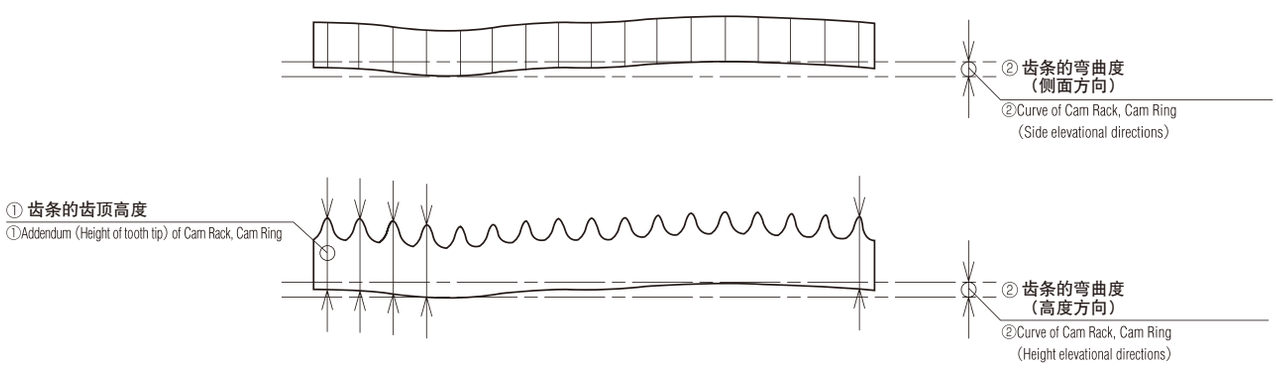
齿条精度 Precision of Cam Rack

齿条单品的精度定义如下所述。

Followings are definition of precision for single Cam Rack .

① 齿顶高度 Addendum (Height of tooth tip)

② 弯曲度（齿条齿顶高方向、侧面方向） Curve (in height and side elevational directions)



齿条精度表（摘要） Cam Rack Precision List (Excerpt)

●回转－直线传动精度 Rotation-to-linearity transmission precision

根据滚轮的回转来测定齿条移动距离误差。

Rack's displacement error is measured against one rotation of the roller pinion.

测 量 品：CPA1610B-1B/CRA1610A-1BF-L992

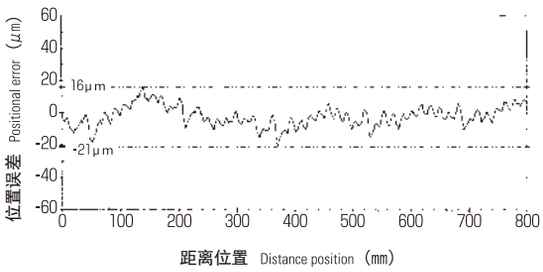
Measurement specimen：CPA1610B-1B / CRA1610A-1BF-L992

测量温度：20℃

Ambient temperature：20℃

※在弊公司推荐的安装精度以及条件内进行组装测试

This is measured under recomended mounting precision and conditions.



图表的看法 How to see the graph

小波显示的是每个齿的啮合误差。大波显示的是滚轮每次回转的误差，没有发生累计误差。

Small wave signs indicate meshing error between the teeth. Errors are indicated each time when the roller pinion rotates. No accumulated errors are measured.

●重复定位精度 Repetitive halting precision

对任意位置测定其重复定位精度(位置再现性)

Repetitive halting precision is measured against an arbitary position (positional reproduction).

测 量 品：CPA1610B-1B/CRA1610A-1BF-L992

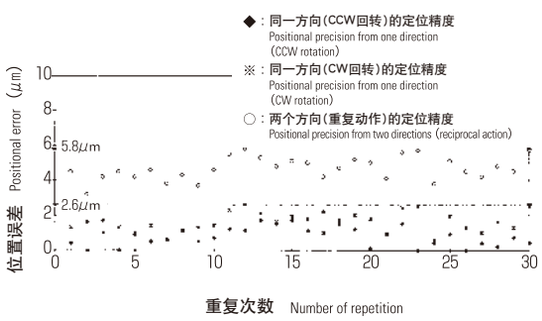
Measurement specimen：CPA1610B-1B / CRA1610A-1BF-L992

测量温度：20℃

Ambient temperature：20℃

※在弊公司推荐的安装精度以及条件内进行组装测试。

This is measured under recomended mounting precision and conditions.



图表的看法 How to see the graph

定位精度约为3μm背隙也大概有3μm。黑色点群和白色点群中间的差表示背隙。

The halting precision is 3 μ m with the backlash assumed as approximately 3 μ m. The backlash is represented by a difference between the black dot and the white dot.

●噪 音 Drive noises

测试各种速度下的滚轮回转噪音。

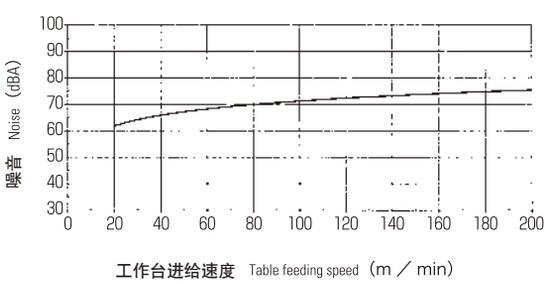
Noise is measured at each speed when the roller pinion is driven to rotate.

测 量 品：CPA1610B-1B/CRA1610A-1BF-L992

Measurement specimen : CPA1610B-1B / CRA1610A-1BF-L992

※ 在弊公司推荐的安装精度以及条件内进行组装测试。

This is measured under recomended mounting precision and conditions.



注）包括电机，导轨等关联驱动系的噪音。

Note: including related-noise (e.g., noise caused from motor and guide, etc.,)

※以上各测定值是实际测量数据，与厂家的保证精度不同

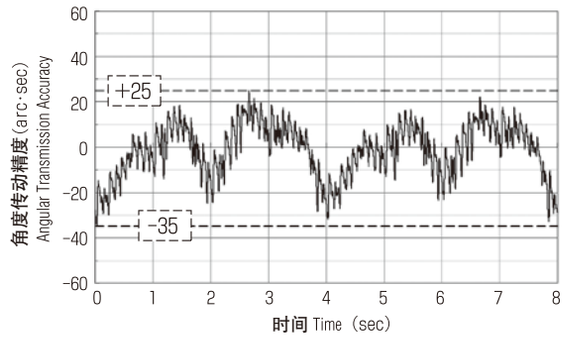
Each measurement values are based on practical measurement, and differs from precision values that Manufacturer guarantees.

齿圈精度表 Cam Ring Precision List

●角度传动精度 Angular transmitting accuracy

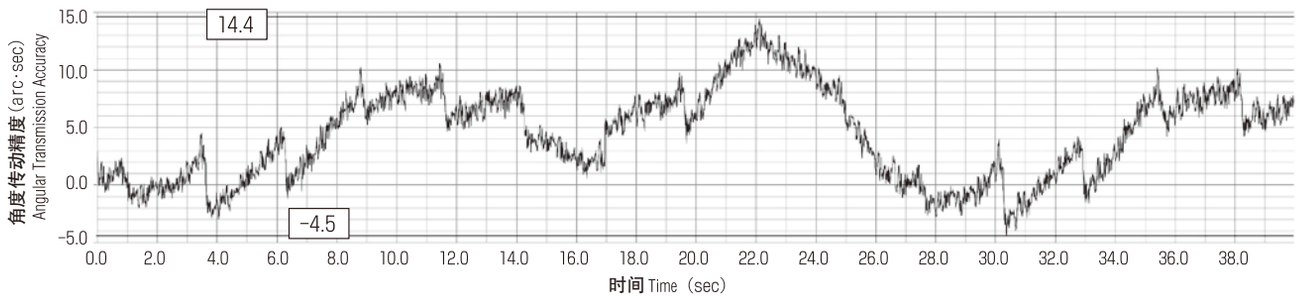
测 量 品：RGF2510A-2A-C40 / CPA2510B-2A
Measurement specimen：RGF2510A-2A-C40 / CPA2510B-2A

滚轮输入回转数 60 rpm Pinion input revolution
测量齿圈2圈回转 Values measured when split Cam Rings achieve two revolutions



测 量 品：RGD1610A-2A-C400-A36 / CPA1610B-2A
Measurement specimen：RGD1610A-2A-C400-A36 / CPA1610B-2A

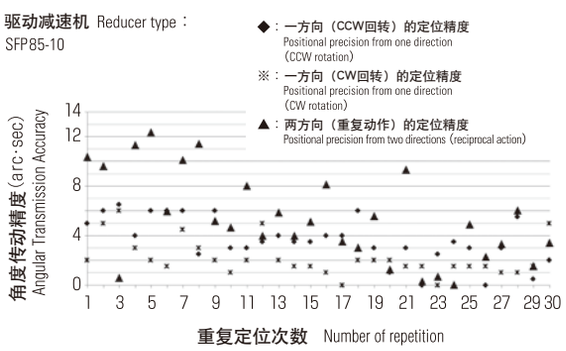
滚轮输入回转数 60 rpm Pinion input revolution.
测量齿圈回转1.5圈 Values measured when circular arc rings achieve one and half revolutions
齿圈整圆（10片）拼接进行测量 Values measured when adding ten circular arc rings in full circumference



●重复定位精度 Repetitive halting precision

测 量 品：RGD1610A-2A-C400-A36 / CPA1610B-2A
Measurement specimen：RGD1610A-2A-C400-A36 / CPA1610B-2A

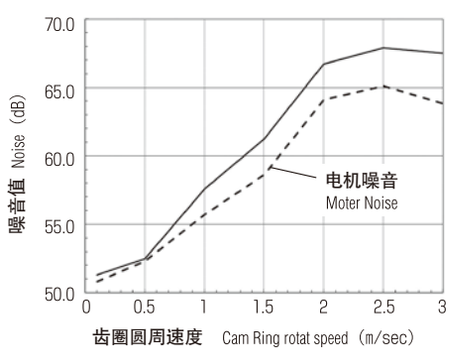
※包含驱动用减速机（SFP85-10）的误差
which allows entry of errors while driving a speed-reducer machine (SFP85-10) for measurement (footnote)



●噪音 Drive noises

测 量 品：RGF2510A-2A-C40 / CPA2510B-2A
Measurement specimen：RGF2510A-2A-C40 / CPA2510B-2A

※包含回转用电机噪音
Include related-noise(e.g., noise caused from motor and reducer,etc.,)



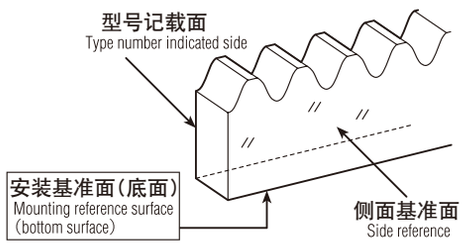
TCG齿条、滚轮安装方法 How to assembling TCG Cam Rack and Roller Pinion

TCG齿条＆滚轮安装方法 How to TCG Cam Rack & Roller Pinion

●请将齿条贴紧在安装基面上 Secure Cam Rack tightly to reference surface

为了校正齿条的弯曲度，请扎实地将齿条固定在非常平直的安装面上。
否则齿面本身的弯曲沉浮会保持原样，会是发生停止精度误差以及产生背隙等的原因。
型号记载面的反面为侧面基准面。

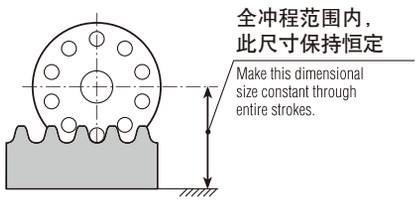
In order to correct warp of Cam Rack, firmly secure to straight surface of mounting portion. Undulation of tooth surface leads to feeding error, reduced cessation precision and appearance of backlash.
Side reference surface is placed opposite to where type number is depicted.

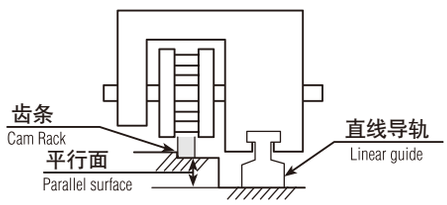


●直线导轨为必需品 Linear guide is one of necessities

在与齿条安装基准面平行的平面上安装直线导轨。

Set linear guide to straight surface to be parallel with reference surface where Cam Rack is mounted.



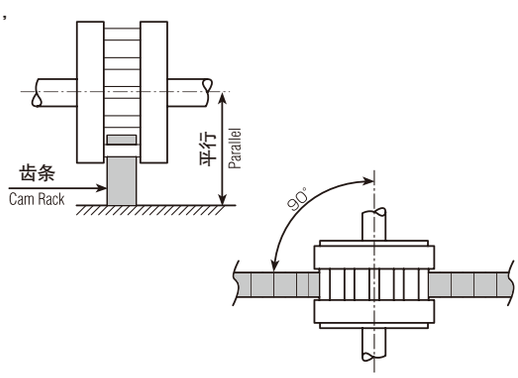


●滚轮的回转轴保持与齿面平行！与前进方向保持直角！

Set rotary shaft of roller pinion in roller parallel with tooth of Cam Rack to be perpendicular to advancing direction!

如果滚轮轴相对于齿条发生倾斜的话，那么滚销和齿面的接触为“单侧接触”，此情况会对精度，噪音，振动，寿命带来负面影响。另外在重载的情况下，滚轮轴会弯曲上浮，所以滚轮轴为两侧支持的结构最为理想。

另外，滚轮与滚轮驱动轴，安装时尽可能保证同心。滚轮的偏心回转会产生精度不稳定、产生背隙等情况。特别需要注意涨紧套的安装。



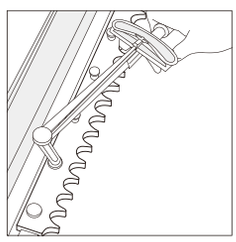
When shaft of roller pinion inclines against Cam Rack, partial engagement occurs between teeth to affect on precision, noise, vibration and service life span. As high load would curve shaft to float it upward, it is better to support at both ends of shaft to avoid upward float.
Concentrically set roller pinion with drive shaft of roller pinion as much as possible. Eccentrical rotation may affect on feeding precision and occurrence of backlash. Especially pay attention upon tightening clamping tool.

TCG齿条的安装方法 Assembling Procedures for TCG Cam Rack & Roller Pinion

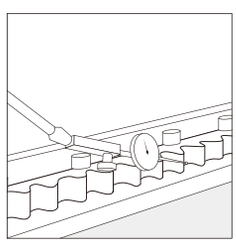
● 装配流程 Assembling Procedures

1．将粘在基座部以及齿条的污垢擦拭干净。
Wipe out dirt and dust from base part and Cam Rack.

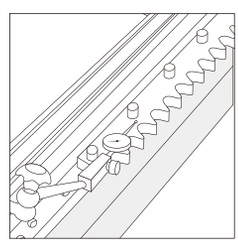
2．齿条相对于基座基准面，使用夹紧器或者用齿条底面的螺栓孔，把齿条牢牢地紧固地贴紧在基准面上。
（参照图1，用齿条安装螺钉进行假装配。<建议为扭矩的50%，请参照推荐扭矩表>）
Set Cam Rack to reference surface of base, and tightly attach Cam Rack to reference surface with use of clamp, base bolt or the like.
(Refer to Fig. 1, provisionally tighten mounting bolt for Cam Rack. 〈approx. 50 % of recommended torque refer to list of recommended tightening torque〉)



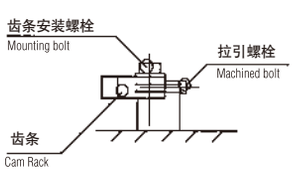
3．以直线导轨为基准将齿条调节平行(图2参照)
相对于导轨，使用百分表确认齿条齿顶的平面部(或齿底面)以及侧面的跳动，请调整到齿条安装的精度值以下。
（参考P52安装精度表）
Check parallelism between linear guide and Cam Rack (refer to Fig. 2).
Confirm shifted width between guide block and tooth tip of Cam Rack (tooth surface) and adjust it below mounting precision of Cam Rack.
(refer to list of mounting precision P.52)



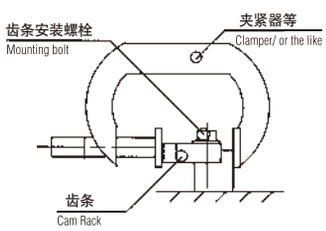
齿顶测定方法
Tooth tip measuring method



侧面测定方法
Tooth side measuring method



利用齿条底面螺栓
Use of base bolt for Cam Rack



使用夹紧器
Use of clamper

图1 齿条平行的调整方法 Fig. 1 — Setting procedures for parallelism of Cam Rack —

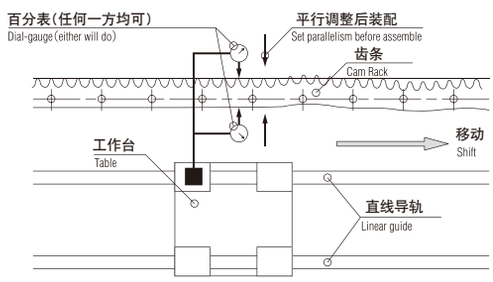


图2 齿条平行度测量方法 Fig. 2 — Measuring procedures for parallelism of Cam Rack —

4．齿条装配螺栓按照推荐扭矩来进行拧紧(请参照下表推荐扭矩)
Completely fighten fastening bolt with recommend torque. (Refer to recommended torque shown at Table follow)

5．请再次确认齿条齿顶平面部（或者底面）和侧面的安装精度。
Reconfirm mounting precision of tooth tip flat part (or bottom face) and tooth side of Cam Rack.

■ 推荐扭矩表 /List of recommended tightening torque

●内六角螺栓 Bolt with hex hole
螺栓强度区分：10.9～12.9的情况下
Strength division for bolt for 10.9-12.9 (N·m)

对方材质 Mated material / 螺栓规格 Nominal designation of bolt	拧紧扭矩 Tightening torque 钢 Steel	铸件 Cast metal	铝合金 Aluminum
M5	8.2	5.4	4
M6	14	9.2	6.8
M8	31	20	14.5
M10	68	45	33
M12	120	78	58
M14	157	105	78
M16	196	131	98

●六角螺栓以及不锈钢螺栓 Hex bolt of stainless steel
螺栓强度区分：6.8～8.8的情况下
Strength division for bolt for 6.8-8.8 (N·m)

对方材质 Mated material / 螺栓规格 Nominal designation of bolt	拧紧扭矩 Tightening torque 钢 Steel	铸件 Cast metal	铝合金 Aluminum
M5	5	5	4
M6	8.5	8.5	6.8
M8	19	19	14.5
M10	41	41	33
M12	70	70	58
M14	110	105	78
M16	137	131	98

TCG齿条＆滚轮安装精度表 List of Mounting Precision for TCG Cam Rack & Roller Pinion

①推荐安装精度 Recommended mounting precision

为达到TCG齿条＆滚轮的全部样本精度、性能而必要的安装精度。

All catalogue precisions required for TCG Cam Rack & Roller Pinion and mounting precision to which design brochure is referred

（mm）

型 号 Model	齿条安装精度 Mounting precison of Cam Rack				滚轮安装精度 Mounting precison of roller pinion
	齿顶部(或齿底面)的平行度 Parallelism of addendum or dedendum	侧面的平行度 Parallelism of side surface			轴跳动 Off-center oscillation
	全冲程 Whole	1根齿条 Cam Rack 1pc	全冲程 Whole	连接部高度差 Difference in grade at connector pieces	
CRA1010	0.05	0.2	0.6	0.4	0.03
CRA1210					
CRA1610					
CRA2010					
CRA2510					
CRA3212					
CRC3212					
CRC4012	0.05	0.2	0.8	0.6	

②动作允许范围 Allowable range of operation

TCG齿条＆滚轮可以使用的安装精度。

Mounting precision for TCG Cam Rack & Roller Pinion to be usable

（mm）

型 号 Model	齿条安装精度 Mounting precison of Cam Rack				滚轮安装精度 Mounting precison of roller pinion
	齿顶部(或齿底面)的平行度 Parallelism of addendum or dedendum	侧面的平行度 Parallelism of side surface			轴跳动 Off-center oscillation
	全冲程 Whole	1根齿条 Cam Rack 1pc	全冲程 Whole	连接部高度差 Difference in grade at connector pieces	
CRA1010	0.1	0.4	0.8	0.4	0.05
CRA1210					
CRA(E)1610					
CRA(E)2010					
CRA(E)2510					
CRA(E)3212					
CRC3212					
CRC(E)4012	0.1	0.4	1	0.6	

＜注意＞

按照②动作允许范围内的组装精度来进行安装的情况下，TCG齿条的传动精度、背隙、允许负载能力上面都会有所影响。
影响的程度估值如下：
对背隙的影响　参考值：[齿顶 平行度（mm）+ 滚轮的轴跳动（mm）]×0.8（mm）
对于允许负载能力的影响，请考虑齿条选型计算的安装精度系数。
但是，上述数值只是TCG单体的数值，根据设备构成、刚性、安装方法等不同，可能会受到更大的影响。

＜Note＞

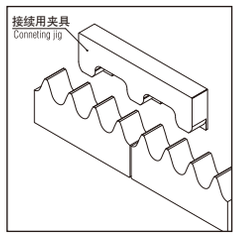
Upon mounting according to assemble precision within (②allowable range of operation,) torque-transmission precision, backlash, and allowable capacity of TCG Cam Rack & Roller Pinion are influenced.
Indications of influences are as follows：

Influence indication of backlash ：[addendum parallelism (mm) +off-center oscillation of roller pinion (mm)] ×0.8 (mm)
Influence indication of allowable capacity ：refer to mounting precision coefficient used at Cam Rack selection calculation.

Note that above values are for TCG Cam Rack & Roller Pinion itself, and may be further influenced depending on structure, rigidity and mounting methods.

齿条的接续方法 Splicing Procedures for Cam Rack

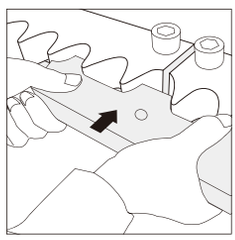
对齿条进行接续时，请使用拼接齿规。
Use special jig when splicing Cam Rack.



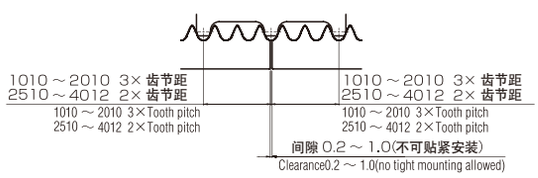
长冲程的情况下需要将齿条进行接续，请务必确认邻接的节距，此时请使用专用拼接齿规来确认(需要单独购买)。
Upon splicing Cam Rack for an extended stroke, it is necessary to determine neighboring pitch size.
We are in supply with jigs. Contact us when you need jig.

1. **以基准侧第1根为原点，接续第2根，第3根时请使用拼接齿规。**
   Use jig to splice second and third Cam Rack pieces with first one Cam Rack piece in the reference side as an original member.
2. **被切断的短尺寸齿条，切断面请放置在最末端。**
   Use severed Cam Rack piece with severed surface as an end portion.
3. **被切断的短尺寸齿条，原则上不要将其作为第1根或者放在中间位置使用。**
   Don't set severed Cam Rack piece generally as first or middle Cam Rack piece.
4. **如果必须将切断的尺寸的齿条放在第1根或者中间的话，需要讨论切断长度公差、切断面。需要进行标准外的加工。(需要进行式样的协商)**

   When severed Cam Rack piece has to be set as first or middle Cam Rack piece, it is necessary to check severed length allowance and severed surface.
   It belongs to non-standard assemble, and requires meeting about its design with us in advance.



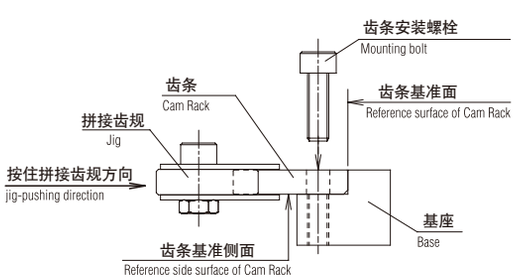
调整节距
Adjust pitch.



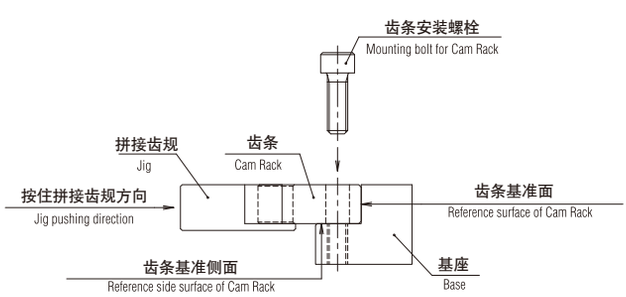
● 齿条连接安装顺序 Splicing procedures for Cam Rack

1. **将第1根齿条按照安装顺序(P.51)进行安装调整。**
   Set and adjust first Cam Rack piece of reference side in accordance with assembling procedures (P.51).
2. **将第2根齿条在基座上与第1根端面对齐。**
   Abut second Cam Rack piece on first Cam Rack piece on base surface.
3. **把齿条安装螺栓轻轻拧上，进行假装配。(齿条可以轻轻推动的程度地假装配)**
   Provisionally tighten mounting bolt for Cam Rack (with Cam Rack kept lightly shiftable).
4. **将拼接齿规按在连接缝的上侧，用手进行按住，或者用螺栓或者夹紧器进行固定。(注意拼接齿规的倾斜以及偏斜)**
   Push jig on Cam Rack pieces. Hold them by hand, otherwise fix them with clamp or the like (Be attentive to inclination and shift of jig).
5. **将第2根齿条跟第1根齿条同样按照安装顺序(P.51) 进行调整安装。**
   Set and adjust second Cam Rack piece as done by first Cam Rack piece in accordance with assembling procedures (P.51).
6. **拆卸拼接齿规。**
   Remove jig.
7. **在齿条上再次用手按住拼接齿规，确认拼接齿规没有间隙或者晃动。(如果拼接齿规有间隙或者晃动的情况，意味着齿条的连接节距或者平行度不合格。再次从顺序3开始纠正。)**
   Put adding jig on split Cam Rack by hand, and make sure that no jounce occurs to adding jig. If jounce occurs to adding jig, split Cam Racks fail to achieve precise pitch intervals. In this case, try steps again from procedure 3.
8. **第3根以后采用同样地方式进行连接。**
   Set and splice third Cam Rack piece as done by second Cam Rack piece.

●CRA1010A～CRA1210A的情况下
For CRA1010A～CRA1210A

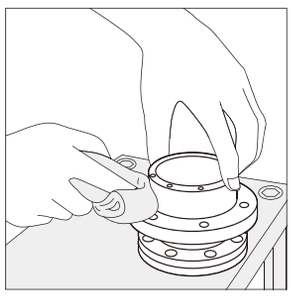
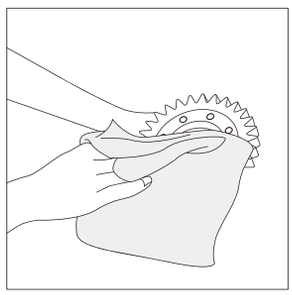


●CRA1610A～CRA3212A・CRC3212A～CRC4012A的情况下
For CRA1610A～CRA3212A・CRC3212A～CRC4012A

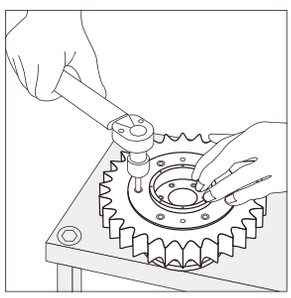


TCG齿圈安装方法 Assembling Procedures for TCG Cam Ring

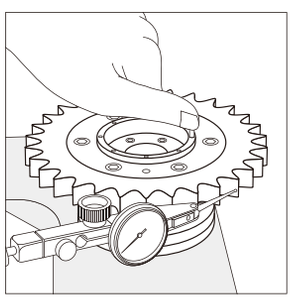
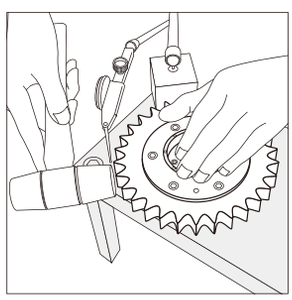
1. 请清除在安装基准面、齿圈内径以及齿圈基准面上附着的脏物。
Remove dust and dirt settled on reference surface, inner surface of Cam Rings and basal spigot joint.

2. 齿圈可以轻微被推动的程度，进行螺栓假装配。
Tighten fastening bolts provisionally so that Cam Rings can lightly moves.



3. 确认齿圈的齿顶跳动，进行调整（参照P.56安装精度表）
请确认齿圈齿顶部以及齿圈内径轴回转时的跳动量。
Adjust Cam Rings and make sure that Cam Rings do not shake (refer to mounting precison shown in Table P.56). Make sure how much Cam Rings shake their tooth tip and inner diameter when rotated around their axial direction.

4. 将齿圈安装螺栓按照对角线的顺序慢慢均匀地拧紧（按照推荐扭矩30%左右）、慢慢地增加扭矩将其拧紧。
Slowly and evenly tighten Cam Ring-fastening bolts along a diagonal direction with around 30% of recommended torque, and gradually increase the torque to tighten the fastening bolts.

5. 将齿圈安装螺栓按照推荐扭矩进行最终拧紧（参照下图推荐扭矩一览表）。
Completely tighten fastening bolts with recommeded torque (refer to Table below for recommended torques).

6. 请再次确认齿圈的齿顶跳动。
Reassure that Cam Rings do not shake.

■推荐力矩表 /List of recommended tightening torque

● 内六角螺栓 Bolt with hex hole
螺栓强度区分：10.9～12.9的情况下
Strength division for bolt for 10.9-12.9

(N·m)

对方材质 Mated material / 螺栓规格 Nominal designation of bolt	拧紧扭矩 Tightening torque		
	钢 Steel	铸件 Cast metal	铝合金 Aluminum
M5	8.2	5.4	4
M6	14	9.2	6.8
M8	31	20	14.5
M10	68	45	33
M12	120	78	58
M14	157	105	78
M16	196	131	98

● 六角螺栓以及不锈钢螺栓 Hex bolt of stainless steel
螺栓强度区分：6.8～8.8的情况下
Strength division for bolt for 6.8-8.8

(N·m)

对方材质 Mated material / 螺栓规格 Nominal designation of bolt	拧紧扭矩 Tightening torque		
	钢 Steel	铸件 Cast metal	铝合金 Aluminum
M5	5	5	4
M6	8.5	8.5	6.8
M8	19	19	14.5
M10	41	41	33
M12	70	70	58
M14	110	105	78
M16	137	131	98

RGD • RDC（分割齿圈）接续步骤 Splicing procedures for circular arc ring (RGD)

分割齿圈（RGD • RDC）的接续请使用专用拼接齿规。

Use special jig when circular arc ring.

●将分割齿圈数片进行拼接时（全周拼接除外）。

For adding a plurality of circular arc rings (except for adding in full circumference)

1. 将第1片齿圈按照安装步骤进行安装调整。
   Mount first circular arc ring while adjusting first circular arc rings according to mounting instructions.
2. 将其余齿圈轻微晃动地程度进行假装配。
   Mount other circular arc rings provisionally so that the circular arc rings can lightly move.
3. 将拼接齿规安装在齿圈第1片与第2片上。
   首先，将两根拼接齿规专用安装螺栓紧固。（中间请放置树脂垫片）之后，在拼接齿规上两处安装紧定螺钉。
   【参照表1】紧定螺钉的紧固从第一片齿圈的那一侧开始进行。
   Set adding jig on first and second circular arc rings. Tighten two jig-fastening bolts through plastic washer (refer to Table 1).
   There after tighten setscrews at two locations. Start to tighten setscrews from circular arc ring side (refer to Table 1).
4. 结合第一片齿圈的跳动量，确认第二片的跳动量并且进行调整。（参照P56安装精度表）
   Make sure to adjust that second circular arc ring does not shake while adjusting first circular arc ring (refer to mounting precison shown in Table P.56).
5. 将第二片的安装螺栓按照推荐扭矩（P.54推荐扭矩表）的30%来进行拧紧。
   Tighten fastening bolt for second circular arc ring with around 30% of the recommended torque (refer to recommended torques shown at Table P.54).
6. 将拼接齿规拆下。（慢慢地将调整螺栓拧松，将拼接齿规安装螺栓拆卸下来）
   Remove adding jig (Loosen setscrews before removing jig-fastening bolts).
7. 将拼接齿规用手按在齿圈上，确认拼接齿规和齿圈之间是否有间隙。
   （如果有间隙的话，齿圈的接续节距就不正确，请从步骤3开始重新进行）
   Put adding jig on circular arc ring by hand, and make sure that no jounce occurs to adding jig. If jounce occurs to adding jig, circular arc rings fail to achieve precise pitch intervals. In this case, try steps again from procedure 3.
8. 第三片开始按照同样方法进行，全部调整完过后，将齿圈的安装螺栓都按照推荐扭矩（P.54推荐扭矩表）进行拧紧。
   Mount third circular arc ring and others followed by first circular arc ring. After circular arc rings are completely adjusted, tighten Cam Ring-fastening bolts with recommended torque (refer to recommended torque shown at Table P.54).

※分割齿圈角度为K2的产品（请参照P26,P27扭矩推荐表），请务必在末端部进行使用。
另外角度为K2的产品，仅和K1在顺时针方向的一侧可使用拼接齿规连接。
Be sure to use circular arc ring with angle K2 (refer to outside dimension table on P. 26 and 27) for the end part. Circular arc ring with angle K2, which has one add-on mounting tap, is shaped as to be added to the CW side of K1.

●将分割齿圈进行全周连接的情况下（要使用数量与齿圈分割数相等的拼接齿规）

For adding circular arc rings in full circumference (using adding tools having identical number of circular arc rings)

1. 将第一片齿圈进行安装，确认齿顶跳动量以及进行调整，安装螺栓的扭矩请参考（P.54推荐扭矩表）的30%来进行拧紧。
   其余齿圈按照可以被轻轻移动的程度来进行假装配。
   Mount first circular arc ring and make sure to adjust that the first circular arc ring does not shake. Thereafter tighten fastening bolt with around 30% of recommended torque (refer to recommended torques shown at Table P.54).
   Mount other circular arc rings provisionally so that circular arc rings can lightly move.
2. 第二、三片按照顺序安装拼接齿规。
   Mount adding tools to second and third circular arc rings in this order.
3. 确认从第一片齿圈开始的齿顶跳动量、随时进行调整。
   如调整了齿顶跳动，将齿圈的安装螺栓请参考（P.54推荐扭矩表）30%的力来进行拧紧。
   Make sure to adjust shaking occurrence from first circular arc rings to other circular arc rings followed by.
   After adjusting shaking occurrence, tighten Cam Ring-fastening bolts in turn with around 30% of recommended torque (refer to recommended torque shown at Table P.54).
4. 确认齿圈整圈的跳动，确保在安装精度范围内，反复进行1—3的调整步骤。
   Make sure to adjust that circular arc rings do not shake in full circumstance. After ending adjustment, repeat procedures from steps 1 to 3 so that shaking errors stay within mounting precison shown in Table.

【表1】拼接齿规和紧定螺钉的拧紧扭矩 [Table 1]Tightening torque of Mounting jig bolt and Pushing bolt （N·cm）

型 号 Model	螺栓名称 Bolt No.		拧紧扭矩 Tightening torque	
	拼接齿规安装螺栓 Mounting jig bolt	紧定螺钉 Pushing bolt	拼接齿规安装螺栓 Mounting jig bolt	紧定螺钉 Pushing bolt
RJ1610B	M6	M4	150	150
RJ2510B	M8	M6	200	250
RJ3212B	M10	M8	250	300
RJ4012B				

TCG齿圈 & 滚轮的安装精度 Assembling procedures for TCG Cam Ring & Roller Pinion

● 推荐安装精度 Recommended mounting precision

样本精度、规格所需要的装配精度。

All Catalogue precisions required for Cam Ring and mounting precision to which design brochure is referred.

型 号 Model	齿圈安装精度 Mounting precison of Cam Ring				滚轮安装精度 Mounting precison of pinion
	齿顶跳动 Oscillation of addendum	侧面平行度 Parallelism of side surface			
	整体 Whole	单片齿圈（针对单片RGD，RDC） 1pcs (for RGD, RDC)	整体（RGF，RFC，RGD，RDC连接的情况下） Whole (for RGF, RFC, RGD, RDC)	连接部高度差（RGD/RDC连接处） Difference in grade at connector pieces	轴跳动 Off-center oscillation
RGF1010	0.05	—	0.6	—	0.03
RGF1210					
RGF/RGD1610		0.2（仅为RGD） (Only RGD)		0.4（仅为RGD） (Only RGD)	
RGF/RGD2510					
RGF/RGD3212					
RFC/RDC3212	0.05	0.2（仅为RDC） (Only RDC)	0.6	0.4（仅为RDC） (Only RDC)	
RFC/RDC4012	0.05	0.2（仅为RDC） (Only RDC)	0.8	0.6（仅为RDC） (Only RDC)	

● 动作允许范围 Allowable range of operation

齿圈可以使用的安装精度

Mounting precision for Cam Ring to be usable.

型 号 Model	齿圈安装精度 Mounting precison of Cam Ring				滚轮安装精度 Mounting precison of pinion
	齿顶跳动 Oscillation of addendum	侧面平行度 Parallelism of side surface			
	整体 Whole	单片齿圈（针对单片RGD，RDC） 1pcs (for RGD, RDC)	整体（RGF，RFC，RGD，RCD连接的情况下） Whole (for RGF, RFC, RGD, RCD)	连接部高度差（RGD连接处） Difference in grade at connector pieces	轴跳动 Off-center oscillation
RGF1010	0.1	—	0.8	—	0.05
RGF1210					
RGF/RGD1610		0.4（仅为RGD） (Only RGD)		0.4（仅为RGD） (Only RGD)	
RGF/RGD2510					
RGF/RGD3212					
RFC/RDC3212	0.1	0.4（仅为RGD） (Only RGD)	0.8	0.4（仅为RGD） (Only RGD)	
RFC/RDC4012	0.1	0.4（仅为RGD） (Only RGD)	1	0.6（仅为RGD） (Only RGD)	

滚轮以及SUS滚轮（CPS1610A ～ CPS2510A）的安装
Mounting of Roller Pinion and SUS Roller Pinion（CPS1610A – CPS2510A）

●CPA1010B～CPA3212B、CPC3212A～CPC4012B、CPS1610A～CPS2510A的情况下
For CPA1010B～CPA3212B、CPC3212A～CPC4012B、CPS1610A～CPS2510A

1. 请清除在轴以及滚轮内径、涨紧套内外径上附着的锈迹、脏物等。
   Wipe out rust, dirt, etc. from the shaft, the inner surface of the roller pinion and the inner and outer surfaces of the clamping tool.
2. 在轴和滚轮直径接触部分，涨紧套各锥面接触部，锁紧螺栓螺纹部以及头部座面轻涂抹上润滑油或者润滑脂。（图1、3、5）
   Lightly apply oil or grease to shaft which directly contacts with roller pinion, tapered area of clamping tool, screwed area and head seat of lock bolt (Fig. 1, 3 and 5).
3. 将涨套的外圈插入滚轮孔后，按照在轴上安装滚轮、涨紧套内圈的顺序进行装配。此时注意让涨紧套内圈和外圈的缺口错开。（图2、4）
   Insert the outer race of the clamping tool into the roller pinion, and then fit the roller pinion and the inner race of the clamping tool on the shaft in this order. At this time, shift the allocated positions of the inner race and outer race of the clamping tool (Fig. 2 and 4).
4. 拧紧锁紧螺栓至轴和涨紧套有少量预压。
   Fasten the lock bolt until slight contact pressure is applied to the shaft and the roller pinion.
5. 确认轴与滚轮的同轴度偏心跳动量，尽量调到在滚轮安装精度值以内。跳动量请按照滚轮滚销部回转时的跳动量来确认。（请参照图1、3、5以及P.56安装精度表）
   Confirm off-center oscillation between roller pinion and shaft during operation (Fig. 1, 3 and 5 refer to list of mounting precision P.56).
6. 调整后，将锁紧螺栓按照对角线的顺序（图2、4、6），按照规定拧紧扭矩的约1／4均等地增加拧紧扭矩来拧紧螺栓。
   After the adjustment, fasten the lock bolts diagonally (Fig. 2, 4 and 6) and uniformly starting at 25% or so of the recommended tightening torque with gradual increase.
7. 按照规定扭矩拧紧。
   Then, fasten the lock bolts with a torque wrench at the specified tightening torque.
8. 为了确保锁紧螺栓按照规定扭矩拧紧，按照圆周方向地。顺序反复数次拧紧。
   Fasten the lock bolts one by one in the circumferential direction. Repeat this fastening cycle several times. Then, confirm that the lock bolts have been fastened at the specified tightening torque.
9. 拧紧完毕后，请再次确认轴与滚轮的同轴度、偏心跳动量。
   After the fastening, recheck the coaxiality and eccentricity of the shaft and roller pinion.

SUS 滚轮（CPS3212A ～ CPS4012A）的安装　Mounting of SUS Roller Pinion（CPS3212A – CPS4012A）

●CPS3212A～CPS4012A的情况下　For CPS3212A～CPS4012A

1. 请清除在轴以及滚轮内径、涨紧套内外径上附着的锈迹、脏物等。**特别注意，润滑油、润滑脂等务必清除干净且请勿使用。**
   Wipe out rust, dirt, oil, etc. from the shaft, the inner surface of the roller pinion and the inner and outer surfaces of the clamping tool.
   Especially, thoroughly wipe out oil, grease, etc., and never use them.
2. 将涨套的外圈插入滚轮孔后，在轴上安装滚轮。若涨套难以插入，可适当放松锁紧螺栓。此时注意让涨紧套内圈和外圈的缺口错开。
   Insert the outer race of the clamping tool into the roller pinion, and then fit the roller pinion and the inner race of the clamping tool on the shaft in this order.
   If it is difficult to insert the outer race of the clamping tool, loosen the lock bolts. At this time, shift the allocated positions of the inner race and outer race of the clamping tool.
3. 拧紧锁紧螺栓至轴和涨套有少量预压。
   Fasten the lock bolt until slight contact pressure is applied to the shaft and the roller pinion.
4. 确认轴与滚轮的同轴度偏心跳动量，尽量调到在滚轮安装精度值以内。跳动量请按照滚轮滚销部回转时的跳动量来确认。（请参照图7以及P.56安装精度表）
   Confirm off-center oscillation between roller pinion and shaft during operation (Fig. 7 refer to list of mounting precision P.56).
5. 调整后，将锁紧螺栓按照对角线的顺序，按照规定拧紧扭矩的约1／4均等地增加拧紧扭矩来拧紧螺栓。（图8）
   After the adjustment, fasten the lock bolts diagonally and uniformly starting at 25% or so of the recommended tightening torque with gradual increase (Fig. 8).
6. 按照规定扭矩拧紧。
   Then, fasten the lock bolts with a torque wrench at the specified tightening torque.
7. 为了确保锁紧螺栓按照规定扭矩拧紧，按照圆周方向地顺序反复数次拧紧。
   Fasten the lock bolts one by one in the circumferential direction. Repeat this fastening cycle several times. Then, confirm that the lock bolts have been fastened at the specified tightening torque.
8. 拧紧完毕后，请再次确认轴与滚轮的同轴度、偏心跳动量。
   After the fastening, recheck the coaxiality and eccentricity of the shaft and roller pinion.

●CPA1010B～CPA1210B的情况下　For CPA1010B～CPA1210B

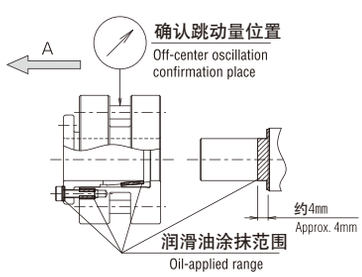


图1　Fig.1

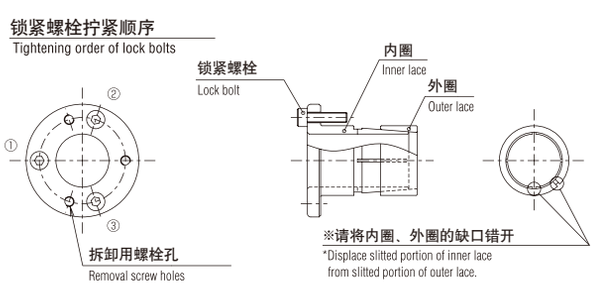


图 2　Fig.2

●CPA1610B～CPA3212B、CPC3212A、CPS1610A～CPS2510A的情况下 For CPA1610B～CPA3212B、CPC3212A、CPS1610A～CPS2510A

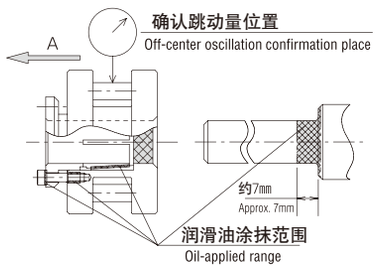


图3 Fig.3

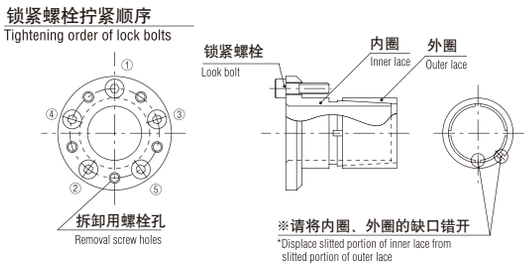


图4 Fig.4

●CPC4012B的场合 For CPC4012B

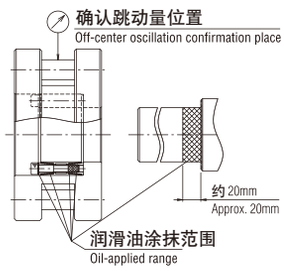


图5 Fig.5

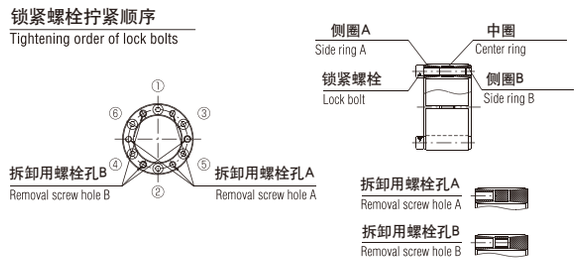


图6 Fig.6

●CPS3212A～CPS4012A的情况下 For CPS3212A～CPS4012A

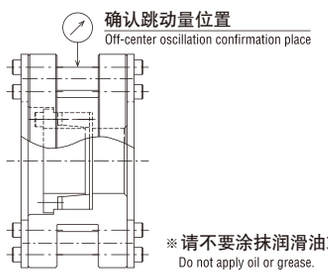


图7 Fig.7

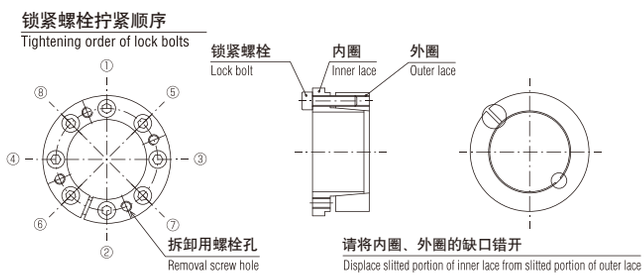


图8 Fig.8

●涨紧套、锁紧螺栓的推荐拧紧扭矩表

Recommended tightening torque table for lock bolts and clamping tool

滚　轮 Pinion	螺栓规格 Bolt No.	根　数 Pcs	拧紧扭矩 Torque (N・m)
CPA1010B	M2.5	3根	0.7
CPA1210B	M 3	3根	1.2
CPA1610B	M 4	5根	3.5
CPA2010B	M 5	5根	7.0
CPA2510B	M 6	5根	12.0
CPA3212B	M 6	8根	12.0

滚　轮 Pinion	螺栓规格 Bolt No.	根　数 Pcs	拧紧扭矩 Torque (N・m)
CPC3212A	M 6	8根	12.0
CPC4012B	M 8	6根	33.0
CPS1610A	M 4	5根	2.7
CPS2010A	M 5	5根	5.6
CPS2510A	M 6	5根	9.6
CPS3212A	M 6	8根	9.0
CPS4012A	M 6	10根	9.0

※为了得到所规定的性能，CPA1010B、CPA1210B建议配合轴的公差为h6级，表面粗糙度为Ra1.6，
CPA1610B～CPA3212B、CPC3212A、CPC4012B、CPS1610A～CPS4012A 建议配合轴的公差为h7，表面粗糙度为Ra1.6。

For satisfy the required performance, CPA1010B and CPA1210B are recommended using the shaft of the h6 class tolerance and Ra1.6 surface roughness, CPA1610B to CPA3212B and CPC3212A, CPC4012B, CPS1610A to CPS4012A are the shaft of the h7 class tolerance and the Ra1.6 surface roughness.

安装时注意事项 Cautions of assemble

注1. 拧紧锁紧螺栓的时候，请务必使用带有调整刻度的扭力扳手，拧到指定扭矩范围值内。
请不要使用板式扭矩扳手，该类型的扳手的扭矩难以确认，可能会引起打滑和变形，造成故障。
When fastening the lock bolts, be sure to use a torque wrench with torque adjustment graduations and fasten at the specified tightening torque. If a torque wrench of plate type is used, since it is difficult to confirm the specified torque on the wrench, slip, deformation or other trouble may be caused.

注2. 请绝对不要使用含钼以及含极压添加剂的油和脂，会引起允许扭矩大幅度下降和打滑问题。
Never use oil or grease of molybdenum series or containing extreme-pressure additive, or the substantial decrease of allowable torque or slip may be caused.

注3. 锁紧螺栓请务必使用附带的锁紧螺栓。
Be sure to use the provided lock bolts.

注4. 拧紧锁紧螺栓时，滚轮会朝着图1、图3箭头A方向有若干移动。请注意与齿条侧面的干涉
（CPA1010B～CPA3212B、CPC3212A、CPS1610A～CPS2510A 型为对象）
Since the roller pinion moves slightly in the arrow A direction of Figs. 1 and 3 when the lock bolts are fastened, watch out the roller pinion for the interference with the gear side (for CPA1010B to CPA3212B, CPC3212A, and CPS1610A to CPS2510A types).

注5. 轴上带有键槽的情况下，如果键槽宽度在JIS标准范围可以使用，允许扭矩会减少15%～20%。请去掉键槽的翻边和毛刺后进行使用。
For shaft with keyway, shaft is usable so long as keyway has JIS-stipulated width although allowable torque drops by 15-20%. Before use, remove burrs from keyway.

注6. 中空轴（管）的情况下，由于管壁的影响可能会出现无法充分抱紧的情况。
For hollowed shaft, it may fail to attain sufficient surface pressure depending on thickness dimension.

滚轮及SUS滚轮的拆卸 Dismounting of Roller Pinion and SUS Roller Pinion

●CPA1010B～CPA3212B、CPC3212A、CPS1610A～4012A的情况下 For CPA1010B～CPA3212B, CPC3212A, CPS1610～4012A

1．切断动力源，确认滚轮上没有扭矩和轴向力，并且确认没有掉落的危险。
Turn off the power supply, and check the roller pinion to confirm no torque or thrust on it and it is free of falling risk.

2．按顺序慢慢拧松锁紧螺栓。
Loosen the lock bolts gradually one by one.

3．把螺栓拧进所有的拆卸用螺栓孔中，对角逐渐均等增加扭矩，滚轮即可卸下。
Insert the lock bolts into all dismounting screw holes, and fasten them diagonally, uniformly and gradually, and the roller pinion can be dismounted.

●CPC4012B的情况下 For CPC4012B

1．切断动力源，确认滚轮上没有扭矩和轴向力，并且确认没有掉落的危险。
Turn off the power, and confirm that the roller pinion is free from torque, thrust and possible falling.

2．按顺序慢慢拧松锁紧螺栓。
Loosen the lock bolts gradually one by one.

3．把螺栓拧进所有拆卸用螺栓孔A中，逐渐均等增加扭矩，拆卸下侧圈A。
Lock bolts into all removal screw holes A and slowly tighten removal bolts with uniform force to remove sidering A.

4．接下来，把螺栓拧进所有的拆卸用的螺栓孔B中，逐渐均等增加扭矩，滚轮即可卸下。
Lock bolts into all the removal screw holes B and slowly tighten removal bolts with uniform force to remove.

拆卸时注意事项 Cautions when removing roller pinion

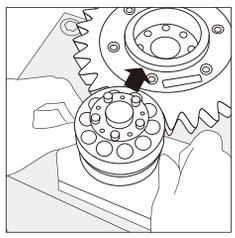
注1．在拆卸前请先确认安全后再进行作业。
Before removal, confirm safety and start operation.

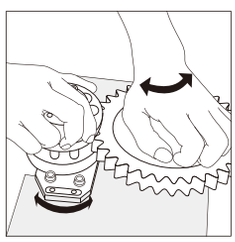
注2．在锁紧螺栓上涂抹油。但是，在拆卸CPS3212A及CPS4012A时，请勿涂抹润滑油等。
Apply oil or grease to lock bolts.When dismounting Models CPS3212A and CPS4012A, do not apply oil, such as lubricant.

注3．请把拆卸螺纹孔全数使用（可以防止法兰部变形）。
Use all removal screw holes to avoid flange against deformations.

※再次使用的情况时，请确认了产品各部位没有变形、缺损的情况下再使用。
When in reuse, make sure that there are no defect and deformation on component parts of product.

预压的实施方法 How to apply preload





TCG齿条通过齿间的常时接触，将背隙控制为零。
因此，对于齿面有必要实施适当的预压。
预压不足时，会导致背隙的发生，过度的预压也会影响到精度，声音，振动，以及寿命。
TCG齿条如果按照式样表中的中心距（允许误差0.01mm、周围温度在20° C）的情况下进行组装的话，
设计上可以满足有适当预压的要求。
为了实施预压，推荐使用右侧所记述的调整结构。

TCG eliminates the backlash by realizing perpetual tooth-to-tooth contact. For this purpose, the application of an appropriate amount of preload against the tooth faces is required.
The insufficient amount of preload will cause backlash, and the excessive amount of preload will degrade the precision, increase the noise and the vibration, and shorten the life.
TCG is designed so that when it is mounted with the center-to-center distance given in the specifications (tolerance: 0.01mm, ambient temperature: 20ºC), the appropriate amount of preload can be obtained.
In order to obtain the appropriate amount of preload, it is recommended that the adjusting mechanism as follows should be used.

适当的预压量（需要零背隙的情况下）

预压力（压在滚轮上的力量） 1010～1210型 2Kgf以下（ 摩擦等除外 ）
1610～4012型 5Kgf以下（ 摩擦等除外 ）

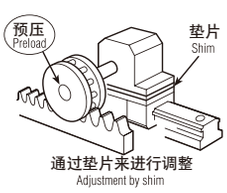
中心间距调整量 0～−0.01㎜

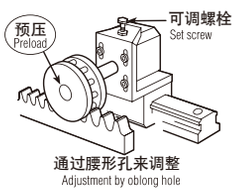
（允许量为-0.02～0.1mm，但是在中心距增加的方向上装配时，将产生中心距离开量×0.8mm的背隙）

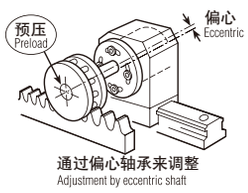
Appropriate preload amount (to ensure zero backlash)

Preload (Roller pinion pressing force) Models 1010 to 1210: 2kgf or less (excluding friction, etc.)
Models 1610 to 4012: 5kgf or less (excluding friction, etc.)

Center-to-center distance adjustment amount 0 to −0.01mm
(Allowable amount: −0.02 to 0.1mm. If assembly is made in positive direction, backlash appears with amount of center-to-center displaced distance × 0.8mm.)

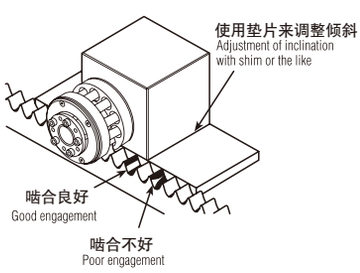


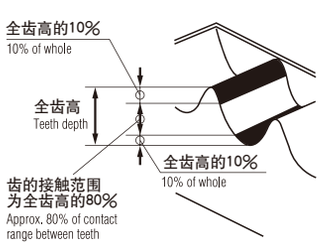


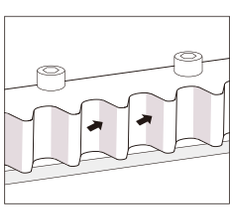


齿条以及齿圈滚轮倾斜度的确认 Check inclination of Cam Rack against roller pinion

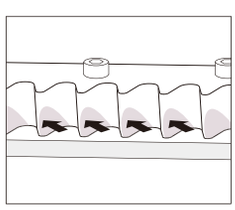
1. 为了确认齿面与滚销的啮合情况，在齿面上涂红丹粉。
   Apply red lead to tooth surface of Cam Rack to check how Cam Rack engages with roller pinion.
2. 让滚轮与齿条涂红丹粉的部位啮合。
   Make roller pinion engage with Cam Rack where red lead is applied.
3. 观察啮合情况，确认啮合宽度（下图）。
   Check whether Cam Rack engages with roller pinion properly by confirming widths of pressure marks by red lead (refer to drawing below).







OK



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齿的接触范围，齿高接触率的参考值：
推荐安装精度以内：80%以上
允许运转范围以内：60%以上

Widths of pressure marks are judged by contact range between teeth.
Within recommended mounting precision : more than 80 %
Within operational range allowable : more than 60 %

4. 出现啮合不好的情况下，需要使用垫片来调整倾斜。
   Adjust inclination by shim or the like when you find poor engagement between pinion and Cam Rack.

关于润滑 Regarding Lubrication

- 支撑滚销的轴承中充填了润滑脂，口部有油封密封。
  Bearings are filled with grease to support roller and sealed by simple rubber.
- 请一开始就在齿面上涂抹润滑脂。
  Apply grease to tooth surface first.

防尘对策 Measure against Dust and Dirt

- 如果齿面上、齿底部等附着脏物、异物的话，可能会引起动作不良。
  When Cam Rack collects dust or foreign matters on tooth surface or the like, it may cause malfunction.
- 如果在恶劣环境中使用的情况下，请采取全面防尘罩的措施。
  Set cover on all surface when used under adverse environment.

Memo

规格・尺寸表

Specification Dimensional Table

SFP Series

TCGシリーズ 1210～2510型用 精密球减速机

Precision Ball Reducers for TCG Series 1210－2510

零　背　隙　Non-backlash

●使用钢球取代齿轮，实现零背隙。

● Steel balls replace gear and eliminate backlash.

电机安装简单　Easy attachment of motor

●采用对应电机圆轴的标准夹紧式样，
使各类电机安装变得更为简单。

● Any company's motor can be easily mounted as clamp for round-shaft motor is adopted as standard.

减轻装配选型烦恼　Reduced man-hours for assembling and selecting

●自带滚轮，节约客户选型时间。（P型号）

● The preset roller pinion cuts down on your man-hours (Type P).

低　噪　音　Low noise

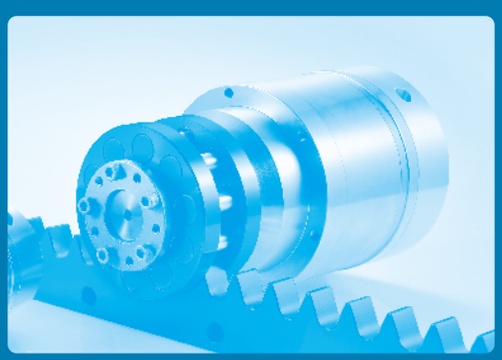
●回转部为滚动接触，无齿面敲击音，运行非常安静。

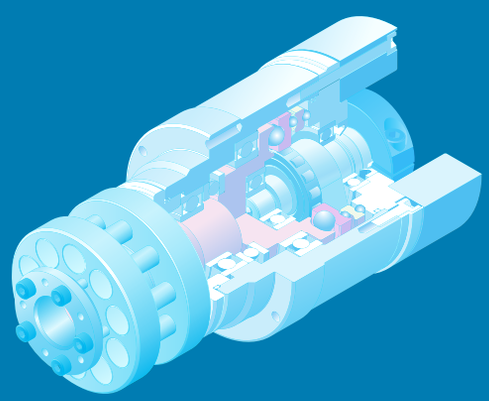
● No noise comes out when meshing with each other because of rolling contact.

高精度定位　High accuracy in positioning

●没有齿背间隙，故适合于需要高精度正反转的精密定位。

● Non-backlash structure enables to have high positioning accuracy in one or another direction.





SFP-P型式样 SFP-P Specifications

型　号 Model		SFP70PCA				SFP85PCA				SFP100PCA				SFP125PCA				
组合滚轮型号 Combined roller pinion type		CPA1210B				CPA1610B				CPA2010B				CPA2510B				
减速比 Reduction ratio		8	10	20	30	10	20	30	40	10	20	30	40	10	20	30	40	50
回转方向（相对输入轴，输出轴的回转方向） Rotation direction (Rotation direction of output shaft correlated to input shaft)		反方向 Reverse		同方向 Forward		反方向 Reverse	同方向 Forward			反方向 Reverse	同方向 Forward			反方向 Reverse	同方向 Forward			
允许额定扭矩 Allowable rated torque	N・m	9.50				25.5				47.7				87.5				
加速峰值扭矩 Acceleration peak torque	N・m	9.50				40.7				70.1				123.4				
瞬间最大扭矩 Max. instantaneous torque	N・m	14.3				50.9				95.5				175.1				
输出轴允许径向负载 ※1 Allowable radial load at output shaft	N	500				1000				1500				2200				
允许平均输入回转数 Allowable average number of input revolutions	rpm	3000				3000				2000				2000				
最高输入回转数 Max input rpm	rpm	4500				4500				4000				4000				
换算到输入轴的惯量 ※2 Inertia moment converted to input shaft	$\times 10^{-4}$kg・m²	0.164	0.159	0.161	0.162	0.523	0.441	0.418	0.408	1.68	1.46	1.40	1.37	3.71	3.05	2.89	2.83	2.79
推荐电机容量 Recommendable motor capacity	W	200	200	100	100	400	200	200	100	750	400	400	200	1500	750	750	400	400
输入轴孔径 Input shaft hole diameter	mm	14				14				19				24				
		11				11				16				22				
		8				8				14				19				
										11				16				
														14				

※1　允许径向负载为轴方向的负载位置在滚轮节圆直径上的情况下。
This allowable radial load value is realized when the load positioned in the axial direction is applied to the pitch circle diameter of the roller pinion.

※2　减速机与滚轮组合情况下的数值。　This value is realized when the reducer is used in combination with the roller pinion.

型号表示 Model Indication

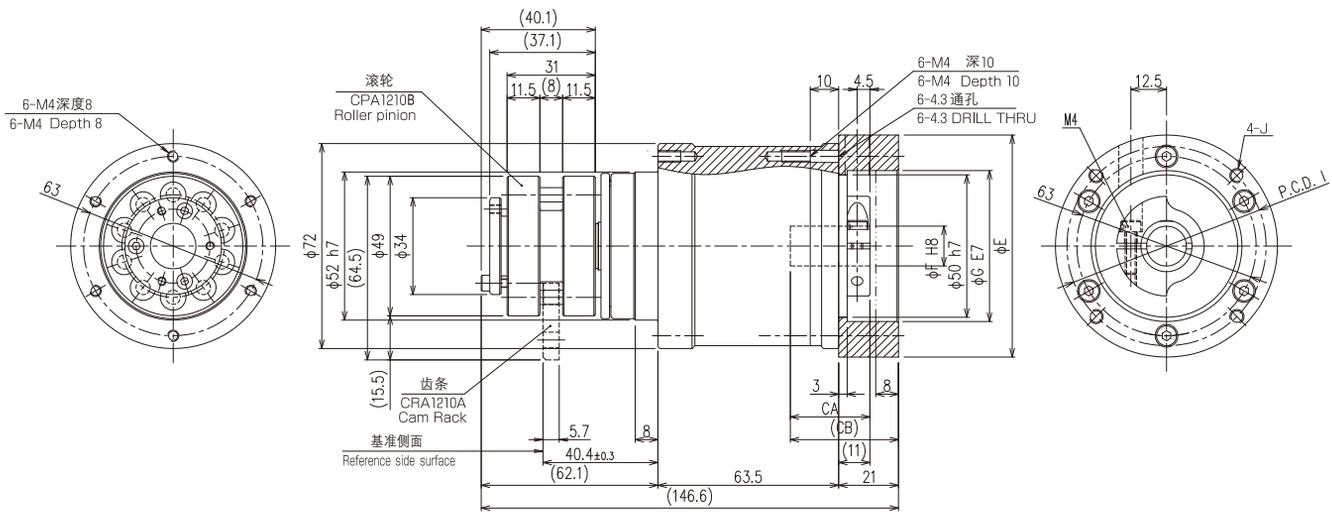
SFP型号(P型)　Model SFP (Type P)

SFP □□□ P C A－□□－□□□□□－□□□□0□□

- TLS（TCG自动润滑块）：无记号…无，L… 有
  TLS(TCG lubrication system): No sign…None, L…Yes
- 安　装　板：F… 带安装板 、0…不带安装板
  Mounting plate: F … Available, 0 … None
- 滚　轮　精　度：A…标准级 、B…精密级
  Accuracy of roller pinion: A … Medium, B … Precise
- 滚 轮 表 面 处 理：1…无表面处理 、2… 黑色镀铬处理、3… 氟化黑色镀铬处理
  Surface treatment of roller pinion: 1 … None, 2 … Black chromium plating, 3 … Fluorine black chromium plating,
- 输出轴径：16…SFP70型(CPA1210B)
  20…SFP85型(CPA1610B)
  25…SFP100型(CPA2010B)
  30…SFP125型(CPA2510B)
  Output shaft diameter: 16 … Model SFP70 (CPA1210B-complied)
  20 … Model SFP85 (CPA1610B-complied)
  25 … Model SFP100 (CPA2010B-complied)
  30 … Model SFP125 (CPA2510-complied)
- 电机安装记号　：例 …A0108（记入5位数字）
  ※没有中间法兰的情况下填写 000□□ 的5位数字
  输入孔径：8～24
  ※请参照电机・减速机对应表P.68–70
  Motor mounting code: Example … A0108 (Enter 5-digit number.)
  ※When no intermediate flange is used, enter 5-digit number of 000□□.
  Input hole diameter: 8 – 24
  ※For Motor and Reduction Ratio Corresponding Table, refer to P. 68–70.
- 减速比：8（仅为70型）、10、20、30、40（70型以外）、50（仅为125型）
  Reduction ratio:
  8 (70 only), 10, 20, 30, 40 (Excluding 70 type), 50 (125 only)
- 输入轴形状：C　Input shaft shape: C
- 输出轴形状：P… 带滚轮形式
  Output shaft shape: P … Roller pinion type
- 代号：70、85、100、125　Frame number : 70, 85, 100, 125

外形尺寸图 Outside Dimensional Drawing

SFP70

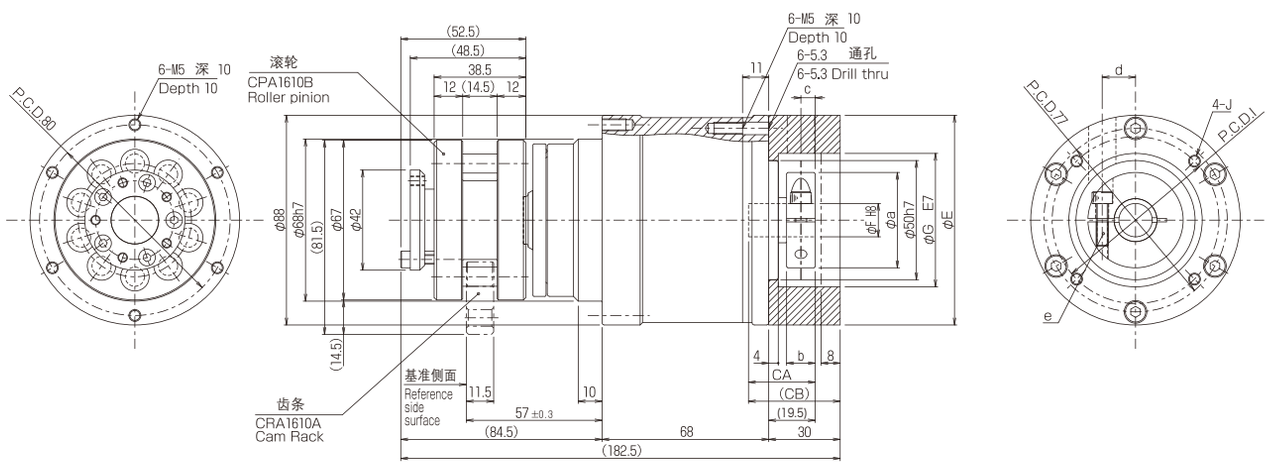


■尺寸表 Dimension Table

型 号 Model	CA	CB	E	F	G	I	J	质量 Mass weight kg
A01	23	33	72	8	22	48	M3×6	1.7
A02					30	45		
A03						46	M4×8	
B01			78	8	50	70		
	28	38		11				
B02	23	33		8			M5×10	
	28	38		14				

※不带中间法兰盘情况下的质量为：1.6kg　　Mass with no moter attachment ⋯ 1.6kg

SFP85



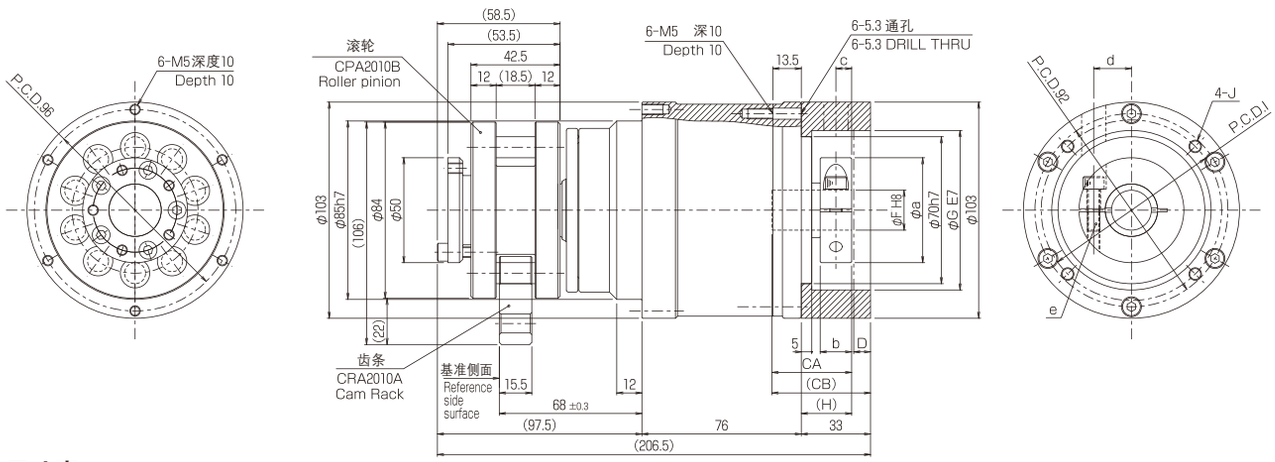
■尺寸表 Dimension Table

型 号 Model	CA	CB	E	F	G	I	J	a	b	c	d	e	质量 Mass weight kg
C01	23	33.5	88	8	30	45	M3×6	30	10	5	10	M4	4.3
C02						46	M4×8						
C03	28	38.5		11・14	50	70		40	12	6	14	M5	
C04	23	33.5		8			M5×10	30	10	5	10	M4	
	28	38.5		14				40	12	6	14	M5	
D01			98	11・14	70	90							
D02				14			M6×12						

※不带中间法兰盘情况下的质量为：3.9kg　　Mass with no intermediate flange: ⋯ 3.9kg

外形尺寸图 Outside Dimensional Drawing

SFP100

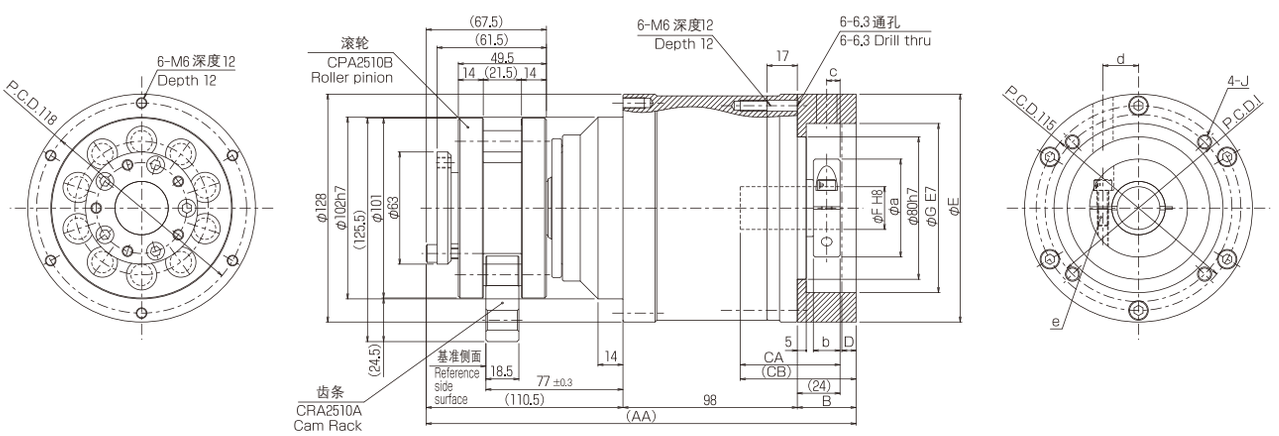


■尺寸表 Dimension Table

型 号 Model	CA	CB	D	F	G	H	I	J	a	b	c	d	e	质量 Mass weight kg
E01	28	40	5	11・14	50	21	70	M4 ×8	40	12	6	14	M5	7.1
E02				14				M5×10						
E03			8	11・14	70		90							
E04	38	47		19		24			50	15	7.5	18	M6	7.0
E05	28	40		14		21		M6×12	40	12	6	14	M5	
E06	38	47		16・19		24			50	15	7.5	18	M6	

※不带中间法兰盘情况下的质量为：6.6kg Mass with no intermediate flange: ⋯ 6.6kg

SFP125



■尺寸表 Dimension Table

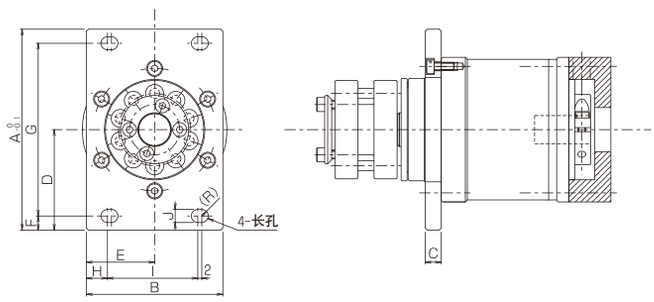
型 号 Model	AA	B	CA	CB	D	E	F	G	I	J	a	b	c	d	e	质量 Mass weight kg
F01	241.5	33	38	47	5	128	14	50	70	M4×10	40	12	6	14	M5	13.0
F02										M5×10						
F03					8		19	70	90		50	15	7.5	18	M6	12.9
F04							14			M6×12	40	12	6	14	M5	
							16・19				50	15	7.5	18	M6	
F05							14	80	100		40	12	6	14	M5	
							16・19				50	15	7.5	18	M6	
F06			56	65			24	95	115		55			20		12.8
F07										M8×16						
F08			38	47			16・19				50			18		
G01	252.5	44		58	10	158		110	145							13.8
G02			56	76			22・24				55			20		

※不带中间法兰盘情况下的质量为：12.2 kg Mass with no intermediate flange: ⋯12.2kg

可选项 Option

■SFP（P型）安装板 SFP (Type P) Mounting Plate

型 号 Model	A	B	C	D	E	F	G	H	I	J
SFP70	100	68	8	50	34	7	86	10.5	45	6.5
SFP85	125	88	10	62.5	44	8.5	108	13	60	9
SFP100	145	103	12	72.5	51.5	10	125	13	75	11
SFP125	170	128	14	85	64	10	150	18	90	11



电机・减速机对应表　Motor and Reduction Ratio Correspondence Table

以下为电机・减速机对应简易表。请务必进行选型计算。电机瞬间最大扭矩×减速比×效率的值不得超过减速机加速时的峰值扭矩。没有记载上的电机型号请向弊社进行咨询。

Since the Motor and Reduction Ratio Correspondence Table is a simplified presentation, be sure to make a model selecting calculation. Limit the product of "(Maximum instantaneous torque)×(Reduction ratio)×(Efficiency)" of the motor to the acceleration peak torque when the reduction gear is accelerating. For any motor model not listed here, please consult us.

三菱电机　Mitsubishi Electric

70型 70 type ■ 85型 85 type ■ 100型 100 type ■ 125型 125 type

型号 Model			电机容量 Motor capacity W	额定扭矩 Rated torque N・m	电机额定回转数 Motor rated number of revolutions rpm	减速比 Reduction ratio 8	10	20	30	40	50
J4	HG-KR	13	100	0.32	3000	A0308				C0208	
		23	200	0.64		B0214		C0414		E0214	
		43	400	1.3			C0414	E0214		F0214	
		73	750	2.4			E0619	F0419			
	HG-MR	13	100	0.32	3000	A0308				C0208	
		23	200	0.64		B0214		C0414		E0214	
		43	400	1.3			C0414	E0214		F0214	
		73	750	2.4			E0619	F0419			
	HG-SR	51	500	4.8	1000						
		52	500	2.4	2000			G0224			
		102	1000	4.8							
J3	HF-KP	13	100	0.32	3000	A0308				C0208	
		23	200	0.64		B0214		C0414		E0214	
		43	400	1.3			C0414	E0214		F0214	
		73	750	2.4			E0619	F0419			
	HF-MP	13	100	0.32	3000	A0308				C0208	
		23	200	0.64		B0214		C0414		E0214	
		43	400	1.3			C0414	E0214		F0214	
		73	750	2.4			E0619	F0419			
	HF-SP	51	500	4.77	1000						
		52	500	2.39	2000			G0224			
		102	1000	4.77							
	HC-LP	52	500	2.39	2000			G0224			
		102	1000	4.78							
	HC-RP	103	1000	3.18	3000		F0724				
		153	1500	4.78							
J2-super	HC-KFS	13	100	0.32	3000	A0308				C0208	
		23	200	0.64		B0214		C0414		E0214	
		43	400	1.3			C0414	E0214		F0214	
		73	750	2.4			E0619	F0419			
	HC-MFS	13	100	0.32	3000	A0308				C0208	
		23	200	0.64		B0214		C0414		E0214	
		43	400	1.3			C0414	E0214		F0214	
		73	750	2.4			E0619	F0419			
	HC-SFS	052	500	2.39	2000			G0224			
		102	1000	4.78							
		053	500	1.59	3000			G0224			
		103	1000	3.18							
		153	1500	4.78							
	HC-RFS	103	1000	3.18	3000		F0724				
		153	1500	4.78							
	HC-LFS	52	500	2.39	2000			G0224			
		102	1000	4.78							
	HC-UFS	13	100	0.32	3000	B0208				C0408	
		23	200	0.64			D0214			E0514	
		43	400	1.3				E0514		F0414	
		73	750	2.4			G0119				

电机・减速机对应表　Motor and Reduction Ratio Correspondence Table

安川电机　Yaskawa Electric

70型 70 type ■ 85型 85 type ■ 100型 100 type ■ 125型 125 type

型　号 Model			电机容量 Motor capacity W	额定扭矩 Rated torque N・m	电机额定回转数 Motor rated number of revolutions rpm	减速比 Reduction ratio 8	10	20	30	40	50
ΣV	SGMJV	01A	100	0.318	3000	A0308					
		C2A	150	0.477				C0208			
		02A	200	0.637		B0214		C0414		E0214	
		04A	400	1.27			C0414	E0214		F0214	
		06A	600	1.91			E0214	F0214			
		08A	750	2.39			E0619	F0419			
	SGMAV	01A	100	0.318	3000	A0308					
		C2A	150	0.477				C0208			
		02A	200	0.637		B0214		C0414		E0214	
		04A	400	1.27			C0414	E0214		F0214	
		06A	550	1.75			E0214	F0214			
		08A	750	2.39			E0619	F0419			
		10A	1000	3.18							
	SGMGV	03A	300	1.96	1500		F0514				
		05A	450	2.86			F0516				
	SGMSV	10A	1000	3.18	3000		F0624				
		15A	1500	4.9							
ΣⅢ	SGMAS	01A	100	0.318	3000	A0308					
		C2A	150	0.477				C0208			
		02A	200	0.637		B0214		C0414		E0214	
		04A	400	1.27			C0414	E0214		F0214	
		06A	600	1.91			E0214	F0214			
		08A	750	2.39			E0616	F0416			
		12A	1150	3.66							
	SGMPS	01A	100	0.318	3000	B0208				C0408	
		02A	200	0.637			D0214			E0514	
		04A	400	1.27				E0514		F0414	
		08A	750	2.39			G0116				
		15A	1500	4.77			G0119				
	SGMSS	10A	1000	3.18	3000		F0624				
		15A	1500	4.9							
ΣⅡ	SGMAH	01A	100	0.318	3000	A0308				C0208	
		02A	200	0.637		B0214		C0414		E0214	
		04A	400	1.27			C0414	E0214		F0214	
		08A	750	2.39			E0616	F0416			
	SGMPH	01A	100	0.318	3000	B0208				C0408	
		02A	200	0.637			D0214			E0514	
		04A	400	1.27				E0514		F0414	
		08A	750	2.39			G0116				
		15A	1500	4.77			G0119				

电机・减速机对应表　Motor and Reduction Ratio Correspondence Table

Panasonic

70型 70 type ■ 85型 85 type ■ 100型 100 type ■ 125型 125 type ■

型号 Model			电机容量 Motor capacity W	额定扭矩 Rated torque N・m	电机额定回转数 Motor rated number of revolutions rpm	减速比 Reduction ratio 8	10	20	30	40	50
A5	MSME	01	100	0.32	3000	A0208				C0108	
		02	200	0.64		B0111		C0311		E0111	
		04	400	1.3			C0314	E0114		F0114	
		08	750	2.4			E0419	F0319			
	MDME	10	1000	4.77	2000		G0222				
	MHME	10	1000	4.77	2000		G0222				
A4	MAMA	01	100	0.19	5000	A0108					
		02	200	0.38		B0111			C0311		
		04	400	0.76		B0114		C0314		E0114	
		08	750	1.43			E0419			F0319	
	MSMD	01	100	0.32	3000	A0208				C0108	
		02	200	0.64		B0111		C0311		E0111	
		04	400	1.3			C0314	E0114		F0114	
		08	750	2.4			E0419	F0319			
	MQMA	01	100	0.32	3000	B0108				C0308	
		02	200	0.64			D0111			E0311	
		04	400	1.3			D0114	E0314		F0314	
	MDMA	10	1000	4.8	2000		G0222				
	MFMA	04	400	1.9	2000		G0119				
	MHMA	05	500	2.38	2000		G0222				
		10	1000	4.8							

※使用Panasonic公司产的A4 MAMA的情况下，使用时，请不要超过SFP系列的瞬间最大扭矩（参照P.52）

If Panasonic A4 MAMA is used, be careful not to exceed the maximum instantaneous torque of SFP Series (P.52).

富士电机　Fuji Electric

70型 70 type ■ 85型 85 type ■ 100型 100 type ■ 125型 125 type ■

型号 Model		电机容量 Motor capacity W	额定扭矩 Rated torque N・m	电机额定回转数 Motor rated number of revolutions rpm	减速比 Reduction ratio 8	10	20	30	40	50
GYS	101	100	0.318	3000	A0308				C0208	
	201	200	0.637		B0214		C0414		E0214	
	401	400	1.27			C0414	E0214		F0214	
	751	750	2.39			E0616	F0416			
	102	1000	3.18			F0724				
	152	1500	4.78							
GYC	101	100	0.318	3000	B0208				C0408	
	201	200	0.637			D0214			E0514	
	401	400	1.27				E0514		F0414	
	751	750	2.39			F0816				
	102	1000	3.18			G0224				
	152	1500	4.78							
GYG	501	500	2.39	2000		G0119				
	751	750	3.58							
	102	1000	4.77			G0222				

技 术 资 料

Technical Data

SFP Series

通 用 项

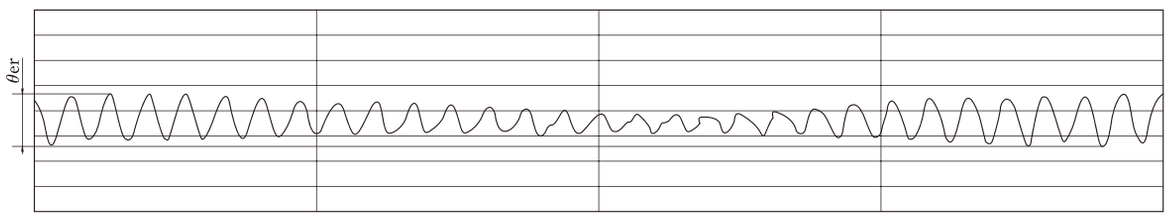
Common Data

角度传递精度 Angular Transmission Accuracy

角度传递精度为给输入轴任意的回转角（θ_1），输出轴的理论回转角（θ_2）和实际回转角（θ'_2）之间的差。输出轴1回转所产生的最大误差用角度传递精度（θ er）来表示。

The angular transmission accuracy generally refers to the difference between the angle of theoretical rotation (θ2) of the output shaft when any angle of rotation (θ1) is applied to the input shaft side and the angle of the actual rotation (θ'2), and particularly refers to the maximum difference caused when the output shaft makes a 360-degree roll (θer).

$$\theta er = \theta'_2 - \theta_2 = \theta'_2 - \theta_1 / R$$ （R：减速比 Reduction ratio）



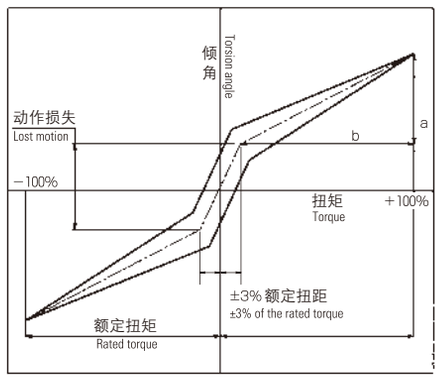
型 号 Model	减速比 Reduction ratio	角度传递精度 Angular transmitting accuracy arc · min
SFP70	1／8	7
	1／10	
	1／20	
	1／30	
SFP85	1／10	4
	1／20	
	1／30	
	1／40	
SFP100	1／10	3
	1／20	
	1／30	
	1／40	
SFP125	1／10	3
	1／20	
	1／30	
	1／40	
	1／50	

刚性 Rigidity

固定输入轴、在输出轴加上扭矩、输出轴会产生跟扭矩几乎呈比例的倾角、可以描绘出迟滞曲线。为了能够定量的表示，连接额定扭矩的3%与100%的点作出折线图。

・弹性定数＝b／a
・动作损失：定义为额定扭矩为±3%的迟滞曲线中间点的倾角。

When the input shaft is fixed and the output shaft is torqued, the output shaft generates torsion in near proportion to the torque, drawing a hysteresis curve. To express this quantitatively, a line graph connecting the 3% point of the rated torque to the 100% point of the rated torque, and the following are defined :
- Spring coefficient = b/a
- Lost motion : The torsion angle of the intermediate point of the hysteresis curve at ±3% of the rated torque



型　号 Model	减速比 Reduction ratio	动作损失 Lost motion arc・min	弹性定数　b／a Spring constant ×10⁴N・m/rad
SFP70	1／8	3	0.10
	1／10		0.12
	1／20		0.15
	1／30		
SFP85	1／10		0.26
	1／20		0.32
	1／30		
	1／40		
SFP100	1／10		0.53
	1／20		0.65
	1／30		
	1／40		
SFP125	1／10		1.2
	1／20		1.6
	1／30		
	1／40		
	1／50		

SFP 重复定位精度 Repetitive positioning precision

减速机+滚轮组合 Cam Rack・Cam Ring combined model	重复定位精度 Repetitive positioning precision	
	普通级 Standard grade μm	精密级 Premium grade μm
SFP70PCA	37	27
SFP85PCA	42	32
SFP100PCA	48	38
SFP125PCA	55	45

※重复定位精度为滚轮节圆直径上的数值。　The repetitive positioning precision shows values on the roller pinion pitch circle diameter.

输入起动扭距 Input Start-up Torque

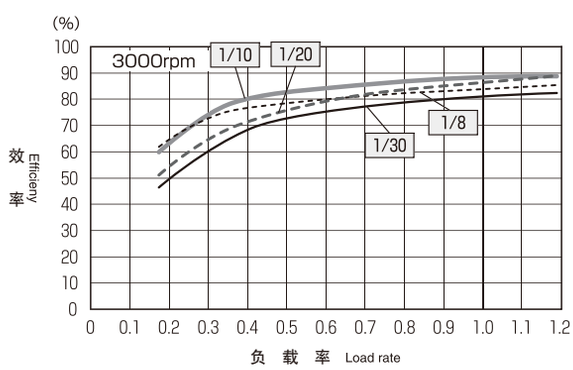
型 号 Model	减速比 Reduction ratio	输入起动扭距 Input start-up torque	
		N・m	kgf・cm
SFP70	1／8	0.088	0.8
	1／10		
	1／20		
	1／30		
SFP85	1／10	0.098	1.0
	1／20		
	1／30	0.088	0.9
	1／40	0.078	0.8
SFP100	1／10	0.147	1.5
	1／20		
	1／30	0.137	1.4
	1／40		
SFP125	1／10	0.196	2.0
	1／20		
	1／30	0.186	1.9
	1／40	0.176	1.8
	1／50		

效率数据 Efficiency Data

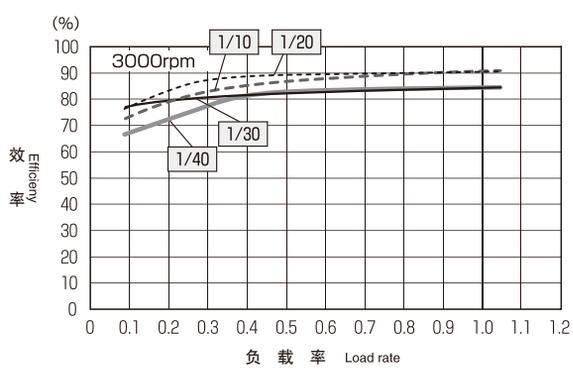
根据各个型号不同，相对于负载率（相对于额定扭矩的负载比例）表示的效率值。＜测定条件＞周围温度25℃

The graphs show the ball reducer efficiency at each load factor (the ratio of the rated torque to the load) per the each rotation of the input shaft for each model. 〈Measurement condition〉 the ambient temperature 25℃

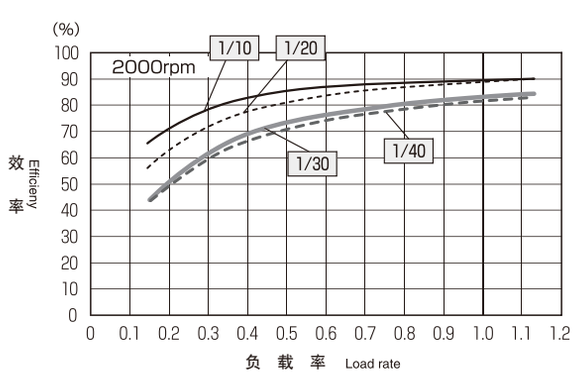
SFP70型 效率 SFP 70 Type Efficiency



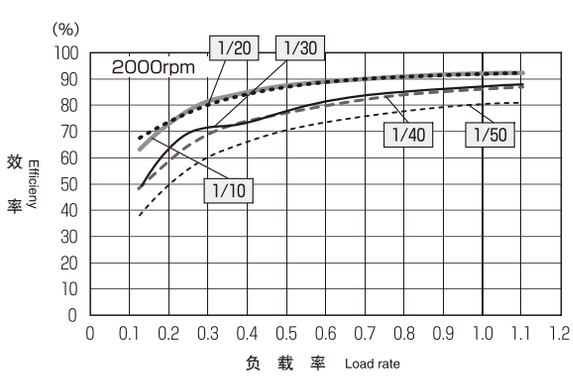
SFP85型 效率 SFP 85 Type Efficiency



SFP100型 效率 SFP 100 Type Efficiency



SFP125型 效率 SFP 125 Type Efficiency



使用减速机时的注意点 Attention in the Use Speed Reducer

●选型时请考虑负载系数。

Consider load factor when select a model.

●请讨论在运转过程中，不能超过加速时的峰值扭矩。

Care should be taken that the peak torque at acceleration not be exceeded during normal operation.

●瞬间最大扭矩并不是通常使用条件下的最大扭矩。

Max. instantaneous torque is not maximum torque under normal operating condition.

● **球减速机不具备自锁的性能。电机电源关闭时或者输入解除时以及不平衡负载情况下，会出现回转的情况，请注意。**

The Speed Reducer has no self-locking function. When unbalanced load is applied to input shaft even with power source OFF, be careful of the possibility that shaft accidentally set in motion.

减速机・电机安装要领 Installation of Reduction Gear and Motor

减速机与电机安装时请按照以下顺序进行.

Install the reduction gear and the motor by using the following procedures:

1. 请将减速机输入轴内径或电机轴上附着的脏物、油渍等清理干净。

   Clean the inside diameter of the input shaft of the Speed Reducer and the motor shaft of dirt, oil, etc.

⬇

2. 将减速机输入轴夹紧衬套的螺栓对准中间法兰盘作业孔的位置。

   Insert the attachment into the input shaft of the Speed Reducer, and position the set collar bolt to the work hole of the intermediate flange.

⬇

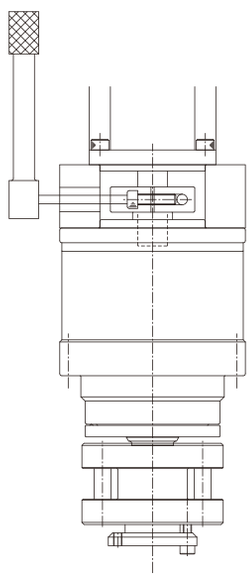
3. 保持将减速机与电机之间不发生倾斜，将电机轴慢慢地插入到减速机孔底部。拧紧螺栓，将电机固定在减速机上。

   Insert the set collar bolt to the depth slowly, being careful not to allow the Speed Reducer and the motor to tilt, and fix the motor with the bolt.

⬇

4. 将夹紧衬套的锁紧螺栓用规定的扭矩拧紧。 （ 参照P.76锁紧螺栓拧紧扭距一览表 ）

   Fix the set collar at the specified tightening torque.
   (Refer to tightening torque table for clamp bolts P.76)



关于滚轮拆分 Attachment/detachment of the roller pinion

●SFP—P型会将滚轮以及减速机按照图纸的尺寸进行调整，然后出货。

For SFP Series Type P, the roller pinion and Reducer are adjusted to the dimensions on the drawing before shipping.

●在进行滚轮的安装或者拆卸时，请参照TCG系列样本的安装（P.57）、拆卸（P.59）。

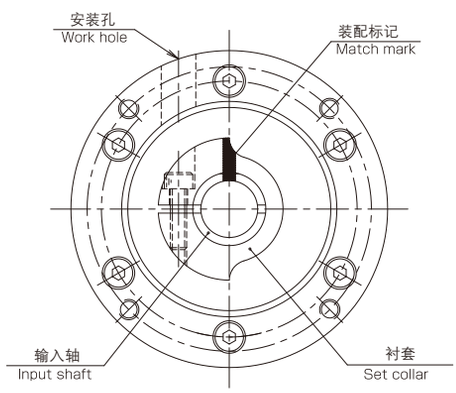
When attaching/detaching the roller pinion, refer to the catalog of mounting of roller pinion (P.57), dismounting of roller pinion (P.59).

夹紧衬套的安装要领 Set collar mounting procedure

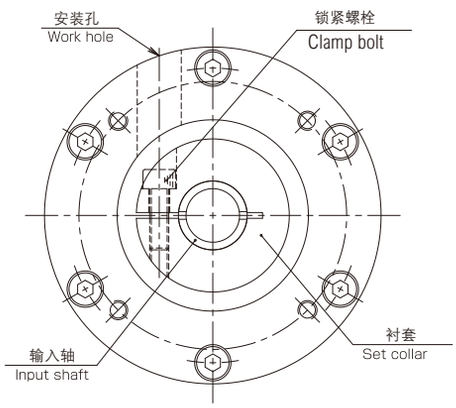
减速机SFP系列，在输入轴上存在切缝然后通过拧紧衬套螺栓，使输入轴变形从而来夹紧电机轴。
衬套在安装时，输入轴以及衬套的切缝位置按照下图的式样进行拧紧。
如果在衬套以及输入轴切缝偏离的情况下进行夹紧的话，可能会造成输入轴损坏以及降低夹紧力的风险。
关于SFP70、衬套也同时承担着平衡作用、所以在螺栓拧紧的情况下出货的。
因此，客户虽然不需要对衬套的方向过分注意，但万一衬套的朝向有移动的情况下，请务必调整输入轴的对准标记处进行拧紧。

As Reducer SFP Series have slits on the input shaft, the input shaft is deformed to clamp the shaft when the set collar bolt is fastened. In fastening the set collar, match the slit position of the input shaft with that of the set collar as shown on the below figure. If the slit position of the input shaft and that of the set collar are out of alignment, the input shaft could be broken and the clamp power could be lowered.
For Model SFP70, the set collar also acts as a balancer. It is fixed with a set screw before shipping. Therefore, you are not requested to bring your attention to the direction of the set collar. However, if the set collar should be displaced, match the set collar with the input shaft by referring to the match mark before fastening.

SFP70

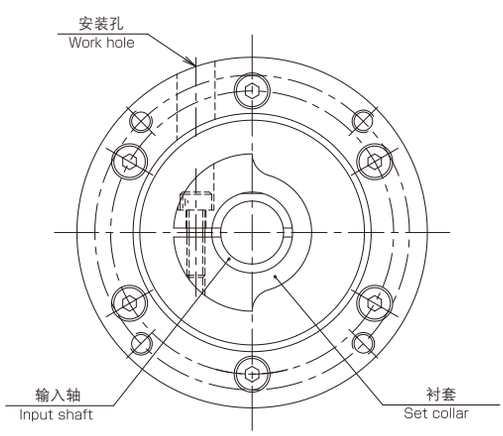


SFP85／100／125



夹紧螺栓拧紧扭矩一览表 Tightening Torque Table for Clamp Bolts

夹紧螺栓 Clamp bolt	拧紧扭矩 Tightening torque N・m
M4	4.5
M5	9.0
M6	15.3



请务必按照以上拧紧扭矩来进行拧紧。
如果无法满足拧紧扭矩时，可能会造成滑动等原因，请注意。

Be sure to fix at the above tightening torque.
Please note that insufficient tightening torque will cause slipping and/or other problems.

※推荐使用力矩扳手。
※Use of a torque wrench is recommended.

规格・尺寸表

Specification Dimensional Table

NSP Series

TCG系列3212～4012型用 精密重载减速机

Precision Differential Reducers for TCG Series 3212－4012

高 刚 性 High rigidity

- 高啮合率使负载得以分散，因而刚性极高。
- High contact ratio and resultant load dispersion realizes the extremely high degree of rigidity.

高 精 度 High precision

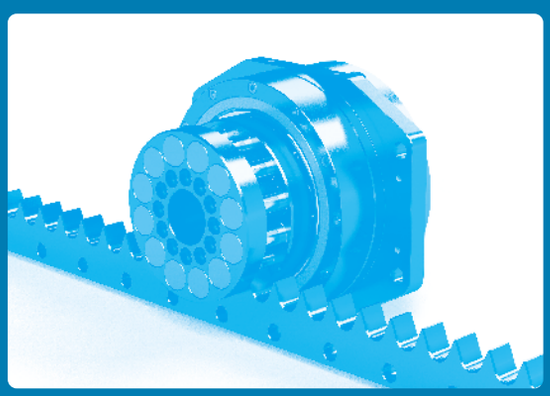
- 次摆线齿轮与精密滚销复数啮合，实现高精度传动。
- More than one contact of precision trochoid gear with high-precision roller enables ever higher force transmission.

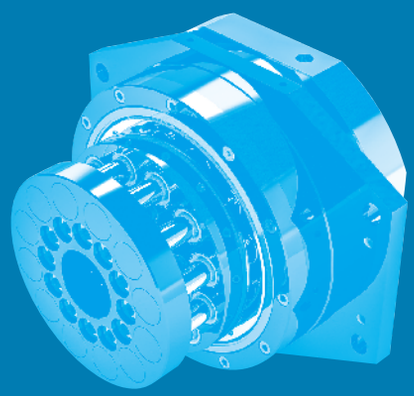
电机安装简单 Easy installation of motor

- 拥有匹配各公司电机的法兰，购买之后可以立即安装电机。
- With the availability of various manufacturers' servo-motor attachments, motor can be installed immediately after purchase.

减轻装配选型烦恼 Reduction in assembly man-hours

- 自带滚轮，节约客户选型时间。
- Preset roller pinion reduces your man-hours.





NSP规格 NSP Specifications

型　号 Model		NSP32A		NSP32C		NSP40C	
对应齿条、齿圈 Applicable Cam Rack and Cam Ring		CRA3212A、RGF3212A RGD3212A		CRC3212A、RFC3212A RDC3212A		CRC4012A、RFC4012A RDC4012A	
减速比 Reduction ratio		19	39	19	39	19	39
回转方向（相对于输入轴，输出轴的回转方向） Rotation direction (Rotation direction of output shaft correlated to input shaft)		反方向 Reverse		反方向 Reverse		反方向 Reverse	
允许额定扭矩 Allowable rated torque	N・m	220		366.6		1146	
加速峰值扭矩 Acceleration peak torque	N・m	403.3		641.5		1375.2	
瞬间最大扭矩 Max. instantaneous torque	N・m	440		1150		1986.4	
输出轴允许径向负载 ※1 Allowable radial load at output shaft	N	3600		6000		15000	
允许平均输入回转数 Allowable average number of input revolutions	rpm	2500		2500		1500	
最高输入回转数 Max input rpm	rpm	4500		4500		2500	
换算到输入轴的惯量 ※2 Inertia moment converted to input shaft	$\times10^{-4}$kg・m²	13.38	12.49	13.38	12.49	70.32	66.64
推荐电机容量 ※3 Recommendable motor capacity	kW	0.75～2.5		0.85～5		1～7	
输入轴孔径 Input shaft hole diameter	mm	35		35		55	
		28		28		42	
		24		24		35	
		22		22		28	
		19		19		24	
						22	

※1 允许径向负载是指轴方向的负载位置处于滚轮节圆直径的情况下的负载。
This allowable radial load value is realized when the load positioned in the axial direction is applied to the pitch circle diameter of the roller pinion.
※2 本表为减速机组合滚轮后所得值。 This value is realized when the reducer is used in combination with the roller pinion.
※3 推荐电机容量为预估值，请在选定电机之后再使用本产品。 This recommended motor capacity is a guideline. Please be sure to select a motor before use.
※4 若有连续回转或高频度往复运转的使用场景，请与我公司联系。
Please contact us if you intend to use the product for continuous rotation or high-frequency repetitive operation.

型号表示 Model Indication

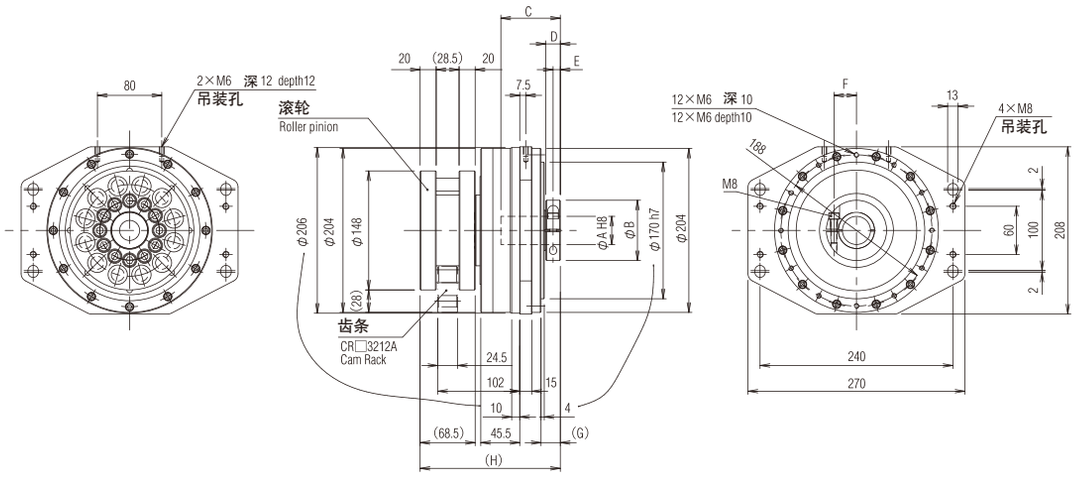
NSP型号 Model NSP

NSP □□□ P C A－□□－□□□□□－□□－□

- TLS（TCG 润滑供给系统）：无记号…无、L…有
  TLS (TCG Lubrication System): No sign … None, L … Yes
- 滚轮精度：A…标准级、B…精密级
  Accuracy of roller pinion: A … Standard, B … Premium
- 滚轮表面处理：1 … 无表面处理
  2 … 黑色镀铬处理
  3 … 氟化黑色镀铬处理
  Surface treatment of roller pinion: 1 … None
  2 … Black chromium plating
  3 … Fluorine black chromium plating
- 电机安装记号 ：例 …A0119（计入5位数字）
  ※没有中间法兰的情况下填写 000□□ 的5位数字
  └ 输入孔径 ：19～55
  ※请参照电机・减速机对应表 P.82–85
  Motor mounting code: Example … A0119 (Enter 5-digit number.)
  ※When no moter attachment is used, enter 5-digit number of 000□□.
  Input hole diameter: 19 – 55
  ※For Motor and Reduction Ratio Corresponding Table, refer to P.82-85
- 减速比：19、39 Reduction ratio: 19, 39
- 输入轴形状：C Input shaft shape: C
- 输出轴形状：P Output shaft shape: P
- 代号：32A、32C、40C Frame number : 32A, 32C, 40C

规格尺寸图 Outside Dimensional Drawing

NSP32A, NSP32C

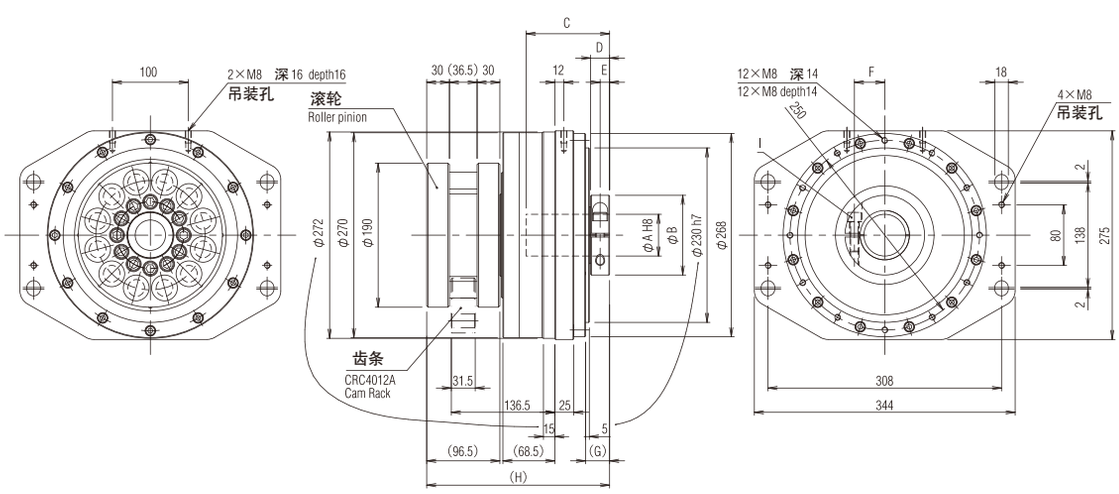


■尺寸表 Dimension Table

型 号 Model	A	B	C	D	E	F	G	H	质量 Mass weight
NSP32□PCA-□□-00019	19	60	34	20	10	23	26	176.5	25
NSP32□PCA-□□-00022	22	60	60	20	10	23	26	176.5	25
NSP32□PCA-□□-00024	24	60	55	20	10	23	26	176.5	25
NSP32□PCA-□□-00028	28	70	53	18	9	26	24	174.5	25
NSP32□PCA-□□-00035	35	75	74	18	9	28	24	174.5	25

※NSP 附带的滚轮为专门设计，普通滚轮 (CPA/CPC) 无法安装。
Since the roller pinion of the NSP is specially designed for the NSP, the standard roller pinion (CPA/CPC) cannot be combined to the NSP.

NSP40C



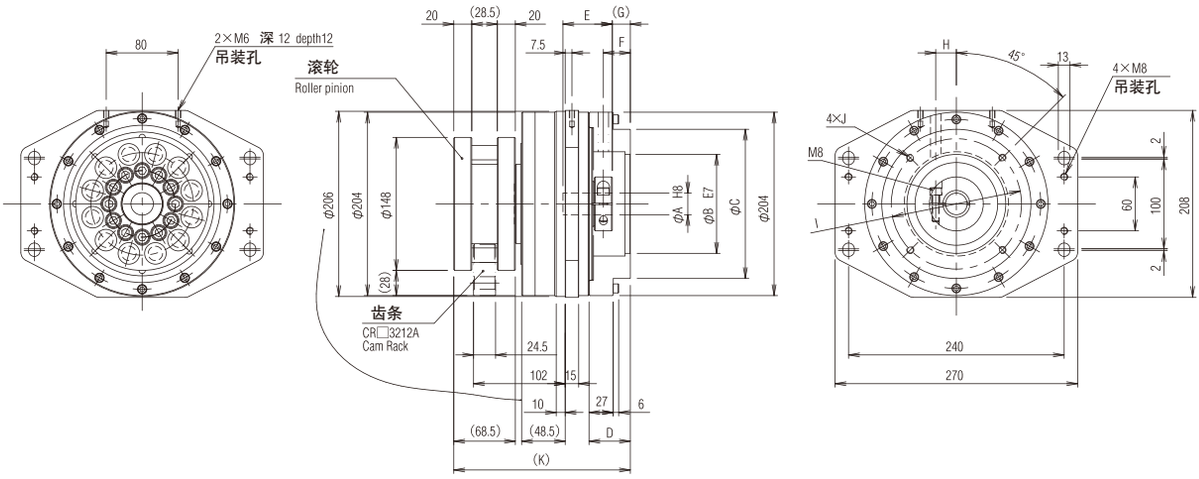
■尺寸表 Dimension Table

型 号 Model	A	B	C	D	E	F	G	H	I	质量 Mass weight
NSP40CPCA-□□-00022	22	60	60	20	10	23	27	236.5	M8	57
NSP40CPCA-□□-00024	24	60	55	20	10	23	27	236.5	M8	57
NSP40CPCA-□□-00028	28	70	53	18	9	26	25	234.5	M8	57
NSP40CPCA-□□-00035	35	75	103	18	9	28	25	234.5	M8	57
NSP40CPCA-□□-00042	42	85	107	22	11	32	29	238.5	M10	57
NSP40CPCA-□□-00055	55	105	110	25	12.5	40	32	241.5	M12	57

※NSP 附带的滚轮为专门设计，普通滚轮 (CPA/CPC) 无法安装。
Since the roller pinion of the NSP is specially designed for the NSP, the standard roller pinion (CPA/CPC) cannot be combined to the NSP.

电机法兰 Motor Attachment

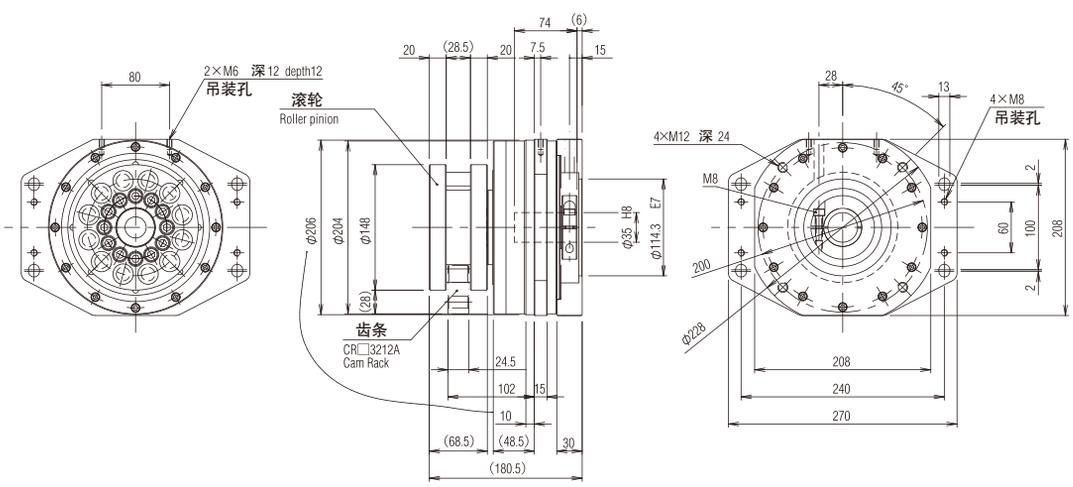
记号：A□□□ Motor mounting code : A□□□



■尺寸表 Dimension Table

型号 Model	记号 Sign	A	B	C	D	E	F	G	H	I	J	K	质量 Mass weight
NSP32□	**A0119**	19	80	120	32	34	16	6	23	100	M6 深 12 Deep 12	182.5	30
	A0224	24	95	136	33	55	17	7	23	115	M6 深 12 Deep 12	183.5	29
	A0319	19	95	136	33	34	17	7	23	115	M8 深 16 Deep 16	183.5	29
	A0324	24	95	136	33	55	17	7	23	115	M8 深 16 Deep 16	183.5	29
	A0422	22	110	166	36	60	20	10	24.5	145	M8 深 16 Deep 16	186.5	30
	A0424	24	110	166	36	55	20	10	24.5	145	M8 深 16 Deep 16	186.5	30
	A0428	28	110	166	36	53	20	12	24.5	145	M8 深 16 Deep 16	186.5	30
	A0519	19	110	166	46	34	30	20	23	145	M8 深 16 Deep 16	196.5	30
	A0522	22	110	166	46	60	30	20	23	145	M8 深 16 Deep 16	196.5	30
	A0524	24	110	166	46	55	30	20	23	145	M8 深 16 Deep 16	196.5	30

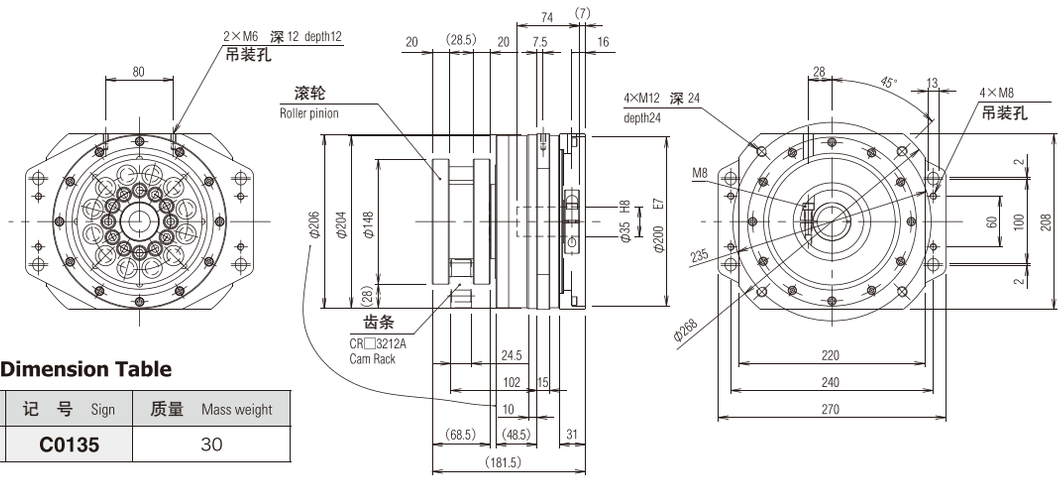
记号：B□□□ Motor mounting code : B□□□



■尺寸表 Dimension Table

型 号 Model	记 号 Sign	质量 Mass weight
NSP32□	**B0135**	31

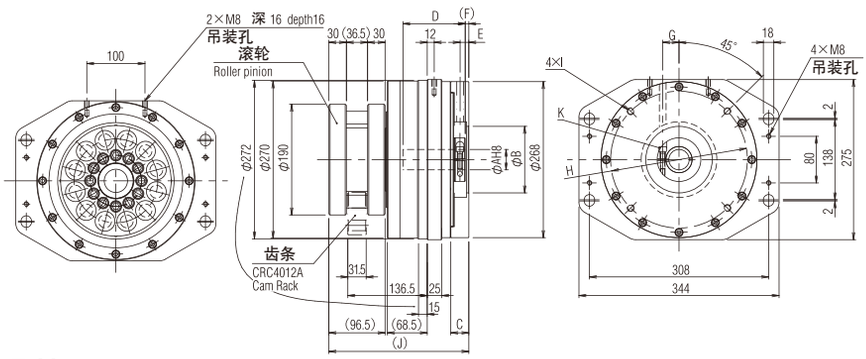
记号：C□□□ Motor mounting code : C□□□



■尺寸表 Dimension Table

型 号 Model	记 号 Sign	质量 Mass weight
NSP32□	C0135	30

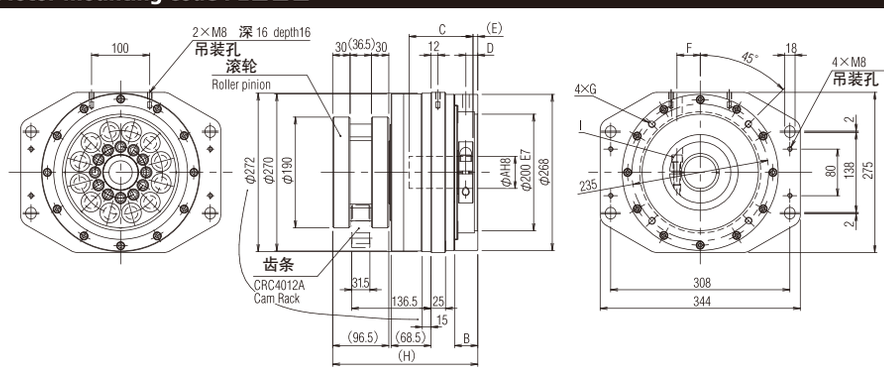
记号：D□□□ Motor mounting code : D□□□



■尺寸表 Dimension Table

型 号 Model	记 号 Sign	A	B	C	D	E	F	G	H	I	J	K	质量 Mass weight
NSP40C	D0122	22	110	37	60	20	10	24.5	145	M8 深 16 Deep 16	246.5	M8	69
	D0124	24	110	37	55	20	10	24.5	145	M8 深 16 Deep 16	246.5	M8	69
	D0128	28	110	37	53	20	12	24.5	145	M8 深 16 Deep 16	246.5	M8	69
	D0224	24	110	47	55	30	20	23	145	M8 深 16 Deep 16	256.5	M8	72
	D0335	35	114.3	31	103	15	6	28	200	M12 深 24 Deep 24	240.5	M8	66
	D0442	42	114.3	35	107	16	6	32	200	M12 深 24 Deep 24	244.5	M10	67

记号：E□□□ Motor mounting code : E□□□



■尺寸表 Dimension Table

型 号 Model	记 号 Sign	A	B	C	D	E	F	G	H	I	质量 Mass weight
NSP40C	E0135	35	34	103	18	9	28	M12 深 18 Deep 18	243.5	M8	63
	E0242	42	37	107	19	8	32	M12 深 20 Deep 20	246.5	M10	63
	E0355	55	40	110	20.5	8	40	M12 深 24 Deep 24	249.5	M12	64

电机・减速机对应表 Motor and Reduction Ratio Correspondence Table

以下为电机・减速机简易对应表，请务必进行选型计算。电机瞬间最大扭矩×减速比×效率值超过减速机峰值扭矩的情况下，请限制电机的扭矩来使用。没有记载的电机型号请向弊公司进行咨询。

Since the Motor and Reduction Ratio Correspondence Table is a simplified presentation, be sure to make a model selecting calculation. Limit the product of "(Maximum instantaneous torque)×(Reduction ratio)×(Efficiency)" of the motor to the acceleration peak torque when the reduction gear is accelerating. For any motor model not listed here, please consult us.

三菱电机 Mitsubishi Electric

NSP32A ■ NSP32C ■ NSP40C ■

型 号 Model			电机容量 Motor capacity kW	额定扭矩 Rated torque N・m	电机额定回转数 Motor rated number of revolutions rpm	减速比 Reduction ratio	
						19	39
J5	HK-KT	153W	1.5	4.8	3000	A0119	A0119
		203W	2	6.4			
		202W	2	9.5	2000	A0119	
	HK-RT	203W	2	6.4	3000	A0119	A0119
		353W	3.5	11.1		A0424	D0124
		503W	5	15.9			
	HK-ST	102W	1	6.4	2000	A0424	A0424
		172W	1.75	8.4			
		202W	2	9.5		B0135	D0335
		352W	3.5	16.7			
		302W	3	14.3		A0424	D0124
		502W	5	23.9		D0335	
		702W	7	33.4			
		353W	2.6	8.3	3000	A0424	A0424
		503W	5	15.9		A0424	D0124
		1024W	0.6	5.7	1000	A0424	A0424
		1724W	0.85	8.1			
		2024AW	1	9.5		A0424	D0124
		2024W	1.2	11.5		B0135	D0335
		3024W	1.5	14.3		A0424	D0124
		3524W	2	19.1		B0135	D0335
		5024W	3	28.6		D0335	
		7024W	4.2	40.1			
J4	HG-SR	81	0.85	8.1	1000	A0424	A0424
		121	1.2	11.5		B0135	D0335
		201	2	19.1			
		301	3	28.6		D0335	
		421	4.2	40.1			
		152	1.5	7.2	2000	A0424	A0424
		202	2	9.5		B0135	D0335
		352	3.5	16.7			
		502	5	23.9		D0335	
		702	7	33.4			
	HG-JR	353	3.3	10.5	3000	A0428	D0128
		503	5	15.9			
		703	7	22.3		D0335	
		601	6	57.3	1000	E0242	
		801	8	76.4		E0355	
		701M	7	44.6	1500	E0242	
		11K1M	11	70		E0355	
	HG-RR	203	2	6.4	3000	A0324	A0324
		353	3.5	11.1		A0428	D0128
		503	5	15.9			
	HG-UR	202	2	9.5	2000	C0135	E0135
		352	3.5	16.7			

电机・减速机对应表　Motor and Reduction Ratio Correspondence Table

安川电机　Yaskawa Electric

NSP32A ■ NSP32C ■ NSP40C ■

型　号 Model			电机容量 Motor capacity kW	额定扭矩 Rated torque N・m	电机额定回转数 Motor rated number of revolutions rpm	减速比 Reduction ratio 19	39
ΣX	SGMXG	9A	0.85	5.39	1500	A0524	A0524
		13A	1.3	8.34			D0224
		20A	1.8	11.5		A0524	
		30A	2.9	18.6		D0335	
		44A	4.4	28.4			
		55A	5.5	35		D0442	
		75A	7.5	48			
Σ7	SGM7A	15A	1.5	4.9	3000	A0224	A0224
		20A	2	6.36			
		25A	2.5	7.96			
		30A	3	9.8		A0428	D0128
		40A	4	12.6			
		50A	5	15.8			
	SGM7G	9A	0.85	5.39	1500	A0524	A0524
		13A	1.3	8.34			
		20A	1.8	11.5		A0524	D0224
		30A	2.4	18.6		B0135	D0335
		44A	4.4	28.4		D0335	
		55A	5.5	35		D0442	
		75A	7.5	48			
ΣV	SGMSV	15A	1.5	4.9	3000	A0224	A0224
		20A	2	6.36			
		25A	2.5	7.96			
		30A	3	9.8		A0428	D0128
		40A	4	12.6			
		50A	5	15.8			
	SGMGV	9A	0.85	5.39	1500	A0519	A0519
		13A	1.3	8.34		A0522	A0522
		20A	1.8	11.5		A0524	D0224
		30A	2.9	18.6		B0135	D0335
		44A	4.4	28.4		D0335	
		55A	5.5	35		D0442	
		75A	7.5	48			

电机・减速机对应表 Motor and Reduction Ratio Correspondence Table

Panasonic

NSP32A ■ NSP32C ■ NSP40C ■

型 号 Model			电机容量 Motor capacity kW	额定扭矩 Rated torque N・m	电机额定回转数 Motor rated number of revolutions rpm	减速比 Reduction ratio 19	39
A6	MSMF	20	2	6.37	3000	A0319	A0319
		30	3	9.55		A0422	D0122
		40	4	12.7			
		50	5	15.9			
	MDMF	15	1.5	7.16	2000	A0422	A0422
		20	2	9.55		A0422	D0122
		30	3	14.3		A0424	D0124
		40	4	19.1		B0135	D0335
		50	5	23.9		D0335	
		75	7.5	47.8	1500	D0442	
	MGMF	13	1.3	8.28	1500	A0422	A0422
		18	1.8	11.5		A0422	D0122
		24	2.4	15.3		B0135	D0335
		29	2.9	18.5			
		44	4.4	28		D0335	
		55	5.5	35		D0442	
	MHMF	15	1.5	7.16	2000	A0422	A0422
		20	2	9.55		B0135	D0335
		30	3	14.3			
		40	4	19.1			
		50	5	23.9		D0335	
		75	7.5	47.8	1500	D0442	
A5	MSME	20	2	6.37	3000	A0319	A0319
		30	3	9.55		A0422	D0122
		40	4	12.7		A0424	D0124
		50	5	15.9			
	MDME	15	1.5	7.16	2000	A0422	A0422
		20	2	9.55		A0422	D0122
		30	3	14.3		A0424	D0124
		40	4	19.1		B0135	D0335
		50	5	23.9		D0335	
		75	7.5	47.8	1500	D0442	
	MFME	15	1.5	7.16	2000	B0135	B0135
		25	2.5	11.9		C0135	E0135
		45	4.5	21.5			
	MGME	9	0.9	8.59	1000	A0422	A0422
		20	2	19.1		B0135	D0335
		30	3	28.7		D0335	
		45	4.5	43		D0442	
		60	6	57.3			
	MHME	15	1.5	7.16	2000	A0422	A0422
		20	2	9.55		B0135	D0335
		30	3	14.3			
		40	4	19.1			
		50	5	23.9		D0335	
		75	7.5	47.8	1500	D0442	

电机・减速机对应表　Motor and Reduction Ratio Correspondence Table

富士电机　Fuji Electric

NSP32A ■ NSP32C ■ NSP40C ■

型　号 Model			电机容量 Motor capacity kW	额定扭矩 Rated torque N・m	电机额定回转数 Motor rated number of revolutions rpm	减速比 Reduction ratio	
						19	39
ALPHA7	GYS	202D7	2	6.37	3000	A0324	A0324
		302D7	3	9.55		A0428	D0128
		402D7	4	12.7			
		502D7	5	15.9			
	GYG	132B7	1.3	8.28	1500	A0522	A0522
		182B7	1.8	11.5		A0422	D0122
		152C7	1.5	7.16	2000	A0422	A0422
		202C7	2	9.55		A0422	D0122
ALPHA5	GYS	202D5	2	6.37	3000	A0324	A0324
		302D5	3	9.55		A0428	D0128
		402D5	4	12.7			
		502D5	5	15.9			
	GYG	132B5	1.3	8.28	1500	A0522	A0522
		152C5	1.5	7.16	2000	A0422	A0422
		202C5	2	9.55		A0422	D0122

Memo

技 术 资 料

Technical Data

NSP 系列

通 用 项

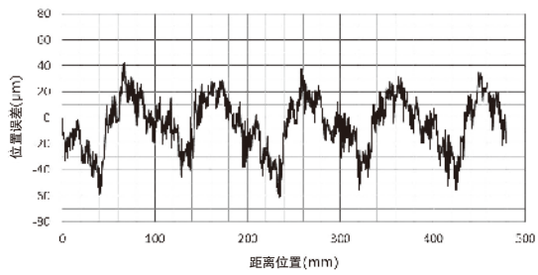
Common Data

传递精度　Transmission Accuracy

传递精度指当输入轴旋转任意角度时，滚轮在齿条上回转的理论移动距离与实际移动距离的差值。
齿圈的传递精度指在滚轮和齿圈的啮合节圆上传动的误差数值。

This Transmitting accuracy is the difference between the movement distance on the theoretical cam rack and the actual movement distance in roller pinion rotation that an arbitrary rotation angle is given to the input shaft side.
In case of the cam ring is the error value on the meshing pitch circumference of the roller pinion and cam ring.

型　号 Model	传递精度　transmitting accuracy	
	普通级　Standard grade μm	精密级　Premium grade μm
NSP32□	±83	±58
NSP40C	±87	±62



往复定位精度　Repetitive positioning accuracy

型　号 Model	往复定位精度　Repetitive positioning accuracy	
	普通级　Standard grade μm	精密级　Premium grade μm
NSP32□	74	64
NSP40C	87	77

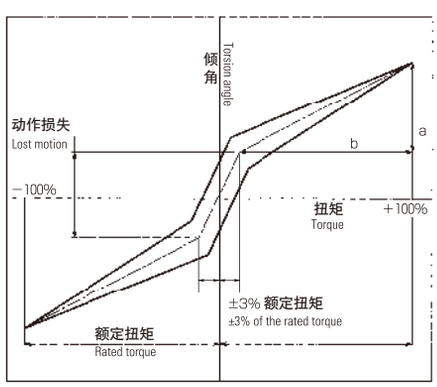
※此值包含减速机背隙。　This value includes backlash of the reducer.

刚性　Rigidity

固定输入轴，在输出轴上加上扭矩，输出轴会产生和扭矩几乎成比例的倾角，
此时描绘出迟滞曲线。为了能定量表示，
连接额定扭矩的3%与100%的点作出折线图。

- 弹性定数＝b／a
- 动作损失：定义为额定扭矩为±3%的迟滞曲线中间点的扭转角度。

When the input shaft is fixed and the output shaft is torqued, the output shaft generates torsion in near proportion to the torque, drawing a hysteresis curve. To express this quantitatively, a line graph connecting the 3% point of the rated torque to the 100% point of the rated torque, and the following are defined :
- Spring coefficient = b/a
- Lost motion : The torsion angle of the intermediate point of the hysteresis curve at ±3% of the rated torque



型　号 Model	减速比　Reduction ratio	动作损失　Lost motion arc・min	弹性定数　b／a　Spring constant ×10⁴N・m/rad
NSP32□	1／19	3	37.6
	1／39	3	38.6
NSP40C	1／19	3	78.2
	1／39	3	79.5

输入启动扭矩　Input Start-up Torque

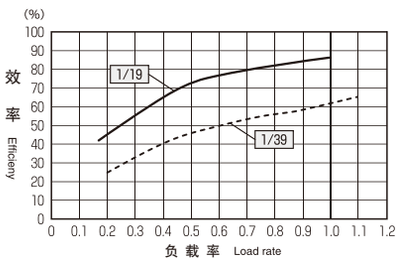
型　号 Model	减速比　Reduction ratio	输入启动扭矩　Input start-up torque	
		N・m	kgf・cm
NSP32□	1／19	0.78	8
	1／39	0.78	8
NSP40C	1／19	1.79	18.3
	1／39	1.79	18.3

效率数据　Efficiency Data

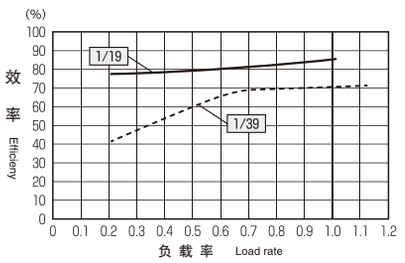
图表表示各型号相对于负载率（对于额定扭矩的负载比例）的效率值。
<测定条件>周围温度25℃，回转数 NSP32：2500rpm，NSP40：1500rpm

The graphs show the reducer efficiency at each load factor (the ratio of the rated torque to the load) per the each rotation of the input shaft for each model.
〈Measurement condition〉 the ambient temperature 25℃ , Rotational speed NSP32 : 2500 rpm , NSP40 : 1500rpm.

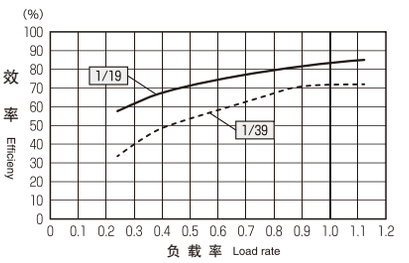
NSP32A



NSP32C



NSP40C



减速机・电机安装要领　Installation of Reduction Gear and Motor

安装减速机与电机时请按照以下顺序进行。
Install the reduction gear and the motor by using the following procedures:

1. 请将减速机输入轴内径及电机轴上附着的赃物、油渍等清理干净。
   Clean the inside diameter of the input shaft of the reducation gear and the motor shaft of dirt, oil, etc.

⬇

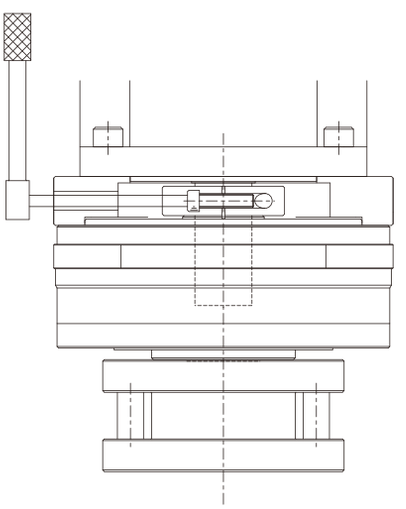
2. 将减速机输入轴夹紧衬套的螺栓对准中间法兰作业孔的位置。
   Position the set collar bolt of the input shaft of the reducation gear of to the work hole of the motor attachment.

⬇

3. 保持减速机与电机之间不发生倾斜，将电机慢慢插入到减速机孔底部，拧紧螺栓，固定电机。
   Insert the set collar bolt to the depth slowly, being careful not to allow the reducation gear and the motor to tilt, and fix the motor with the bolt.

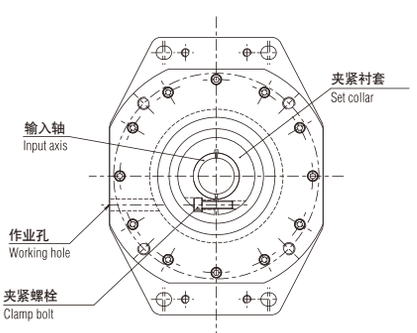
⬇

4. 将夹紧衬套的锁紧螺栓用规定的扭矩拧紧。
   Fix the set collar at the specified tightening torque.



夹紧螺栓拧紧扭矩一览表　Tightening Torque Table for Clamp Bolts

夹紧螺栓 Clamp bolt	拧紧扭矩 Tightening torque N・m
M8	31
M10	68
M12	120



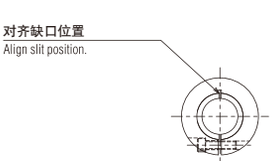
请务必按照以上拧紧扭矩来进行拧紧。
如无法满足拧紧扭矩，可能会造成滑动等状况产生。

Be sure to fix at the above tightening torque.
Please note that insufficient tightening torque will cause slipping and/or other problems.

※ 推荐使用力矩扳手。
※Use of a torque wrench is recommended.

本产品的夹紧衬套在出货时已由锁紧螺丝固定，您无需关注衬套方向。
如有松动情况发生，请将衬套缺口对齐后拧紧（如右图）。

Since the set collar has been screwed before shipping, you do not need to pay attention to the orientation of the set collar.
However, should the set collar be displaced, please align the slit position and then screw the set collar.



Memo

TCG 齿圈组件

RGU Series

高精度・高刚性・同时实现中空大口径，零背隙减速组件

A non-backlash reduction unit featured by the realization of high precision, high rigidity and large-caliber hollow hole

KAMO SEIKO CORP.

特　性　Features

■ 组件化　Unitization

TCG齿圈和球减速机组件化。省去烦琐的设计和装配，提高客户效率。

Unitization of TCG Cam Ring and Ball Reducer has reduced the man-hours required for designing and assembling.

■ 零背隙・高精度　Non-backlash and high precision

零背隙，可以实现高精度。

Non-backlash has realized high-precision positioning.

■ 中空大口径　Large-caliber hollow hole

中空大口径贯通结构，方便配线，配管，转台组件整体上结构紧凑。

The large-caliber through, hollow hole can pass wiring and piping through there to make the entire unit neat and ordered.

■ 低噪音・低振动　Low noise and low vibration

驱动部分全部为滚动接触，因此没有敲齿音，振动也很小。

All contacts of the drive unit by means of rolling has eliminated gear rattle and reduced vibration.

■ 高负载・高刚性　High load and high rigidity

旋转轴的轴承采用交叉滚子轴承。
可以强有力地支撑作用在转台上的外力。

Cross-roller bearing employed for the slewing shaft can adequately receive external force acting on the table.

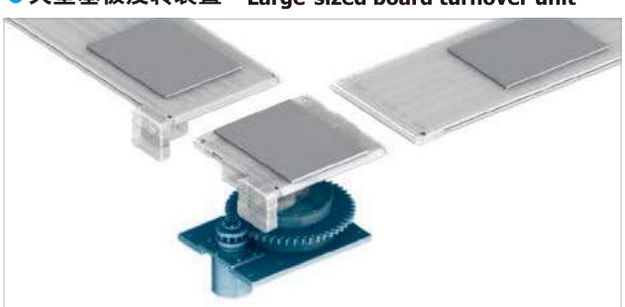
■ 电机安装简单　Easy-to-mount motor

配有各公司标准的伺服电机安装对应表，便于电机安装。

Motor mounting is easy with the availability of various attachments applicable to standard servo motors of various manufacturers.

用途例　Use Examples

● 大型基板反转装置　Large-sized board turnover unit

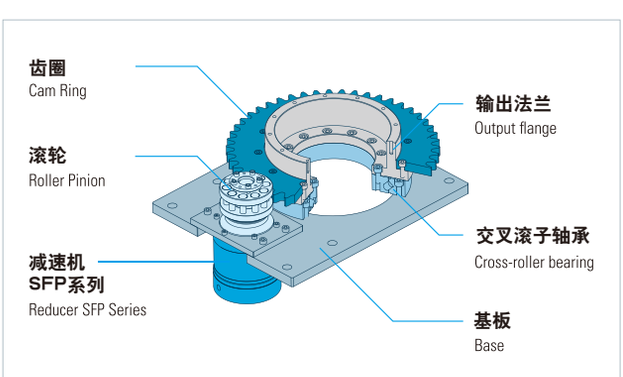


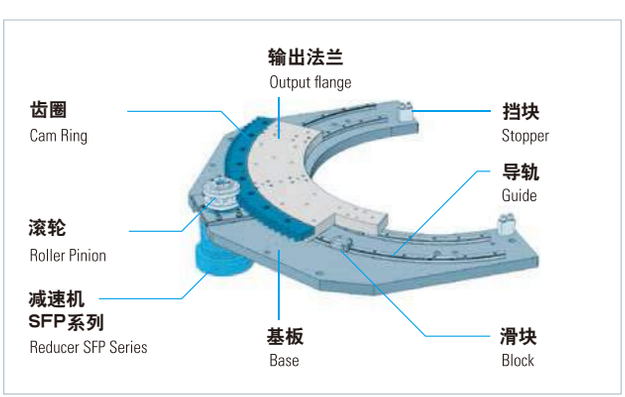
● 机器人周边装置　Peripheral units for robot

● 检查装置　Inspection unit

● 加工工作台的分度装置　Indexing of processing table

构造图　Structural Drawing



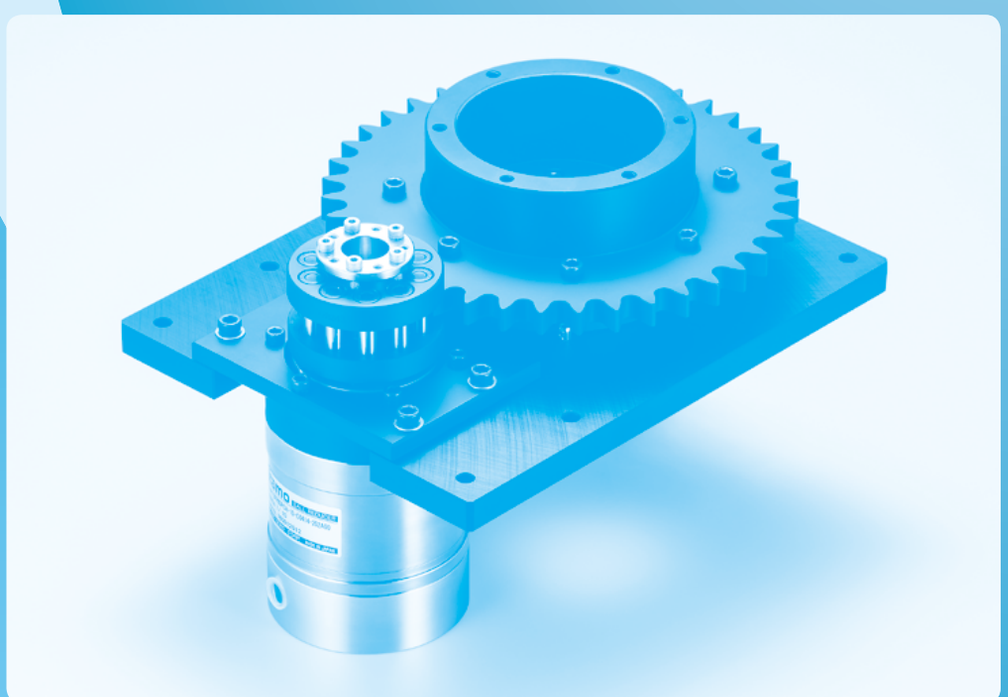


规格・尺寸表

Specification Dimensional Table

TCG齿圈组件

TCG Cam Ring Unit



规格・型号・外形图　Specifications, Models, Outline Drawings

规格表　Specification Table

型　号 Model	总减速比 Total reduction ratio	基本动额定扭矩 Basic dynamic rated torque N・m	最大使用扭矩 Maximum working torque N・m	允许静额定扭矩 Allowable static rated torque N・m	驱动部分转动惯量 Inertia moment of drive unit ×10⁻⁴ kg·m²	允许平均输入回转数 Allowable average number of input revolutions rpm	最高输入回转数 Maximum number of input revolutions rpm	允许平均输入回转速 Allowable average number of output revolutions rpm	最高输出回转数 Maximum number of output revolutions rpm	输入轴转动惯量 Inertia moment converted to input shaft ×10⁻⁴ kg·m²	推荐电机容量 Recommendable motor capacity W	输入轴孔径 Input shaft hole diameter mm	质量 Mass kg
RGU1610A-C40-	40	83	143	143	212	3000	4500	75.0	112.5	0.695	400	14・11・8	16
	80							37.5	56.3	0.484	200		
	120							25.0	37.5	0.437	200		
	160							18.8	28.1	0.419	100		
RGU1610A-C60-	60	125	237	290	1149			50.0	75.0	0.881	400		30
	120							25.0	37.5	0.531	200		
	180							16.7	25.0	0.458	200		
	240							12.5	18.8	0.430	100		
RGU1610A-C80-	80	165	316	390	4135			37.5	56.3	1.208	400		54
	160							18.8	28.1	0.612	200		
	240							12.5	18.8	0.494	200		
	320							9.4	14.1	0.451	100		
RGU1610A-C100-	100	205	395	480	12007			30.0	45.0	1.763	400		83
	200							15.0	22.5	0.751	200		
	300							10.0	15.0	0.556	200		
	400							7.5	11.3	0.486	100		
RGU2510A-C40-	40	290	479	670	2017	2000	4000	50.0	100.0	5.28	1500	24・22・19・16・14	48
	80							25.0	50.0	3.45	750		
	120							16.7	33.3	3.07	750		
	160							12.5	25.0	2.91	400		
	200							10.0	20.0	2.85	400		
RGU2510A-C50-	50	360	598	840	5443			40.0	80.0	6.19	1500		72
	100							20.0	40.0	3.68	750		
	150							13.3	26.7	3.17	750		
	200							10.0	20.0	2.97	400		
	250							8.0	16.0	2.89	400		
RGU2510A-C60-	60	430	718	1010	12074			33.3	66.7	7.37	1500		94
	120							16.7	33.3	3.97	750		
	180							11.1	22.2	3.30	750		
	240							8.3	16.7	3.05	400		
	300							6.7	13.3	2.93	400		
RGU2510A-C70-	70	510	838	1180	22095			28.6	57.1	8.52	1500		126
	140							14.3	28.6	4.26	750		
	210							9.5	19.0	3.43	750		
	280							7.1	14.3	3.12	400		
	350							5.7	11.4	2.98	400		
RGU2510A-C125-	125	910	1496	2100	249165			16.0	32.0	19.96	1500		342
	250							8.0	16.0	7.12	750		
	375							5.3	10.7	4.70	750		
	500							4.0	8.0	3.83	400		
	625							3.2	6.4	3.44	400		

基本动额定扭矩 Basic dynamic rated torque
：在一定速度运转时，满足额定寿命的基本扭矩。
Basic torque required for satisfying the rated lifetime during a constant-speed, continuous operation.

最大使用扭矩 Maximum working torque
：正常运转可以使用的扭矩（包含加减速的峰值）的最大值。
Maximum value of torque for normal operation (including the peak torque during acceleration/ deceleration).

允许静额定扭矩 Allowable static rated torque
：非常条件下停止或者外部冲击等，情况下的最大扭矩。
Maximum value of torque for non-normal use, such as emergency stop and external shock.

驱动部分转动惯量 Inertia moment of drive unit
：输出侧回转部分的转动惯量，计算负载扭矩时，负载转动惯量需要一并算出。
Inertia moment of the output side rotation unit. To calculate load torque, add the load inertia moment.

输入轴换算转动惯量 Inertia moment converted to input shaft
：齿圈组件全体的换算值。
Converted value of the entirety of Ring Unit.

型号表示　Model Indication

RGU □□□□ A－C □□□－□□□－□□□□□□－□

型　号 Bracket No.	齿圈齿数 Number of ring teeth	总减速比 ※1 Total reduction ratio	电机安装记号 ※2、※3 Motor mounting code	可选项 Option
1610	40			A：带盖板 ※4 With cover （标准品时，不用填写）
	60			
	80			
	100			
2510	40			
	50			
	60			
	70			
	125			

※1：规格表参照
Refer to Specification Table.

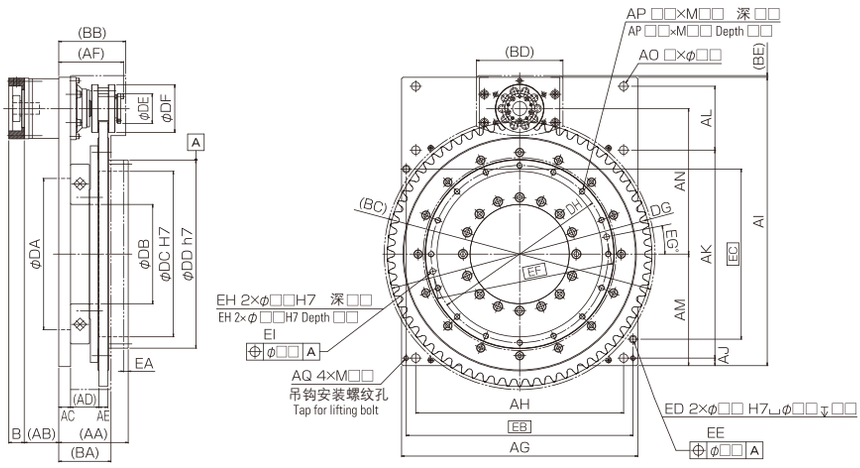
※2：没有选择电机安装法兰的情况下 000□□ 内填写输入轴轴径
输入轴轴径 Input shaft hole diameter
For models with no motor attachment, enter 5-digit figure of "000□□."

※3：电机对应参照表P.102–105
Refer to Motor Corresponding Table on P.102-105

※4：盖板是为了安全，并不是用来防尘的，盖板的尺寸图参照P95–96页。
The cover is a safety cover, not a dustproof cover. For the outline dimensions of models with cover, refer to Outline Dimensional Drawings on P.95-96

外形尺寸图　Outline dimensional drawings

● RGU□□□□A-C□□□-□□□-□□□□□



尺寸图　Dimension table

型　号 Model	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
RGU1610A-C40	90	73	15	26	11.5	80	210	180	270	12	190	55	102	122	6×φ12	6×M6　深12 6×M6 Depth 12	无 None
RGU1610A-C60	101	62	15	37	11.5	91	300	250	355	14	250	75	139	170	6×φ12	12×M8　深16 12×M8 Depth 16	M8
RGU1610A-C80	116	48	20	47	11.5	106	400	330	450	19	330	80	184	220	6×φ18	12×M10　深20 12×M10 Depth 20	M10
RGU1610A-C100	125	38	20	56	11.5	115	460	400	530	16	400	95	216	268	6×φ18	16×M12　深24 16×M12 Depth 24	M10
RGU2510A-C40	122	97	15	45	18.5	112	320	270	405	11	270	110	146	193	6×φ18	12×M8　深16 12×M8 Depth 16	M8
RGU2510A-C50	141	78	20	59	18.5	131	400	330	480	19	330	110	184	230	6×φ12	12×M10　深20 12×M10 Depth 20	M10
RGU2510A-C60	142	78	20	60	18.5	132	440	380	540	16	380	125	206	268	6×φ18	16×M12　深24 16×M12 Depth 24	M10
RGU2510A-C70	147	73	25	60	18.5	137	500	440	610	16	440	135	236	308	6×φ18	16×M12　深24 16×M12 Depth 24	M10
RGU2510A-C125	125	97	30	30	18.5	112	820	750	990	31	750	175	406	518	6×φ22	16×M16　深32 16×M16 Depth 32	M16

型　号 Model	BA	BB	BC	BD	BE	DA	DB	DC	DD	DE	DF	DG	DH
RGU1610A-C40	63.6	84.6	222	133.2	3.6	94	55	90	118	42	67	209	105
RGU1610A-C60	76.6	95.6	318	133.2	3.6	168	90	150	188	42	67	305	170
RGU1610A-C80	91.6	110.6	418	133.2	3.6	246	160	240	278	42	67	405	260
RGU1610A-C100	102.6	119.6	514	133.2	3.6	320	210	310	358	42	67	501	335
RGU2510A-C40	83.6	116.6	344	183.2	3.6	168	90	150	188	63	101	331	170
RGU2510A-C50	102.6	135.6	417	183.2	3.6	246	160	220	258	63	101	404	240
RGU2510A-C60	103.6	136.6	493	183.2	3.6	320	210	280	328	63	101	480	305
RGU2510A-C70	110.6	141.6	573	183.2	3.6	320	210	350	398	63	101	560	375
RGU2510A-C125	83.6	116.6	993	183.2	3.6	560	600	740	860	63	101	980	820

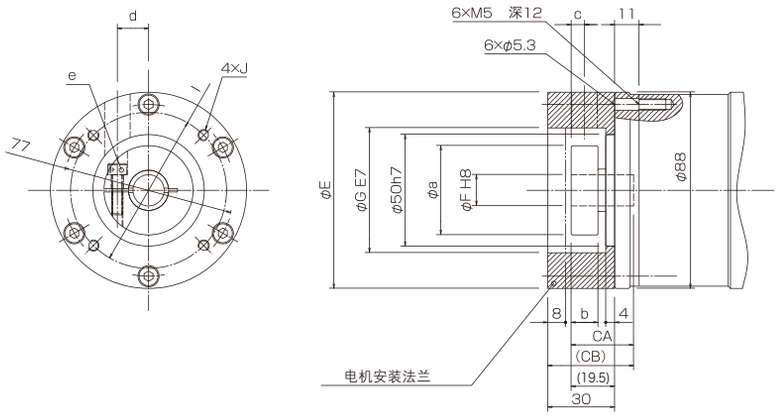
型　号 Model	EA	EB	EC	ED	EE	EF	EG	EH	EI
RGU1610A-C40	10	192	144	2×φ8H7　锪孔　φ12　深7 2×φ8H7　φ12 Counter bore　Depth 7	φ0.05	105	0	2×φ6H7　深6 2×φ6H7　Depth 6	φ0.03
RGU1610A-C60	10	280	210	2×φ10H7　锪孔　φ14　深5 2×φ10H7　φ14 Counter bore　Depth 5	φ0.07	170	15	2×φ8H7　深8 2×φ8H7　Depth 8	φ0.03
RGU1610A-C80	10	368	276	2×φ12H7　锪孔　φ16　深8 2×φ12H7　φ16 Counter bore　Depth 8	φ0.07	260	15	2×φ10H7　深10 2×φ10H7　Depth 10	φ0.03
RGU1610A-C100	10	440	330	2×φ12H7　锪孔　φ16　深8 2×φ12H7　φ16 Counter bore　Depth 8	φ0.07	335	11.25	2×φ12H7　深12 2×φ12H7　Depth 12	φ0.05
RGU2510A-C40	10	296	222	2×φ10H7　锪孔　φ14　深5 2×φ10H7　φ14 Counter bore　Depth 5	φ0.07	170	15	2×φ8H7　深8 2×φ8H7　Depth 8	φ0.03
RGU2510A-C50	10	368	276	2×φ12H7　锪孔　φ16　深8 2×φ12H7　φ16 Counter bore　Depth 8	φ0.07	240	15	2×φ10H7　深10 2×φ10H7　Depth 10	φ0.03
RGU2510A-C60	10	416	312	2×φ12H7　锪孔　φ16　深8 2×φ12H7　φ16 Counter bore　Depth 8	φ0.07	305	11.25	2×φ12H7　深12 2×φ12H7　Depth 12	φ0.05
RGU2510A-C70	10	480	360	2×φ12H7　锪孔　φ16　深13 2×φ12H7　φ16 Counter bore　Depth 13	φ0.07	375	11.25	2×φ12H7　深12 2×φ12H7　Depth 12	φ0.05
RGU2510A-C125	20	800	660	2×φ12H7　锪孔　φ16　深18 2×φ12H7　φ16 Counter bore　Depth 18	φ0.1	820	11.25	2×φ16H8　深16 2×φ16H8　Depth 16	φ0.06

B□ 是可选项A（带盖板）选择时的尺寸表示。　　B□ dimensions enable when choose option A (With cover)

外形尺寸图　Outline dimensional drawings

● 电机安装部分详细图(RGU1610A型)

Detailed drawing of motor mounted portion (Model RGU1610A)

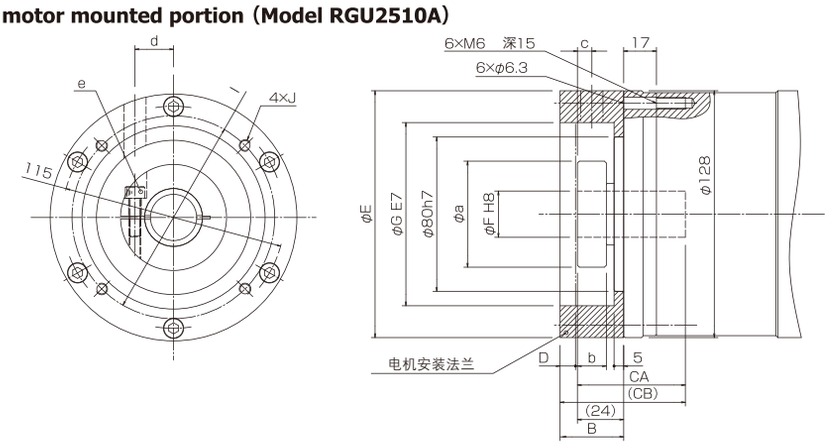


尺寸表　[电机安装部分详细图(RGU1610A型)]　　**Dimension table [Detailed drawing of motor mounted portion (Model RGU1610A)]**

型　号 Model	CA	CB	E	F	G	I	J	a	b	c	d	e
C01	23	33.5	88	8	30	45	M3×6	30	10	5	10	M4
C02						46	M4×8					
C03	28	38.5		11・14	50	70		40	12	6	14	M5
C04	23	33.5		8			M5×10	30	10	5	10	M4
	28	38.5		14				40	12	6	14	M5
D01			98	11・14	70	90						
D02				14			M6×12					

● 电机安装部分详细图(RGU2510A型)

Detailed drawing of motor mounted portion (Model RGU2510A)



尺寸表[电机安装部分详细图(RGU2510A型)]　　**Dimension table [Detailed drawing of motor mounted portion (Model RGU2510A)]**

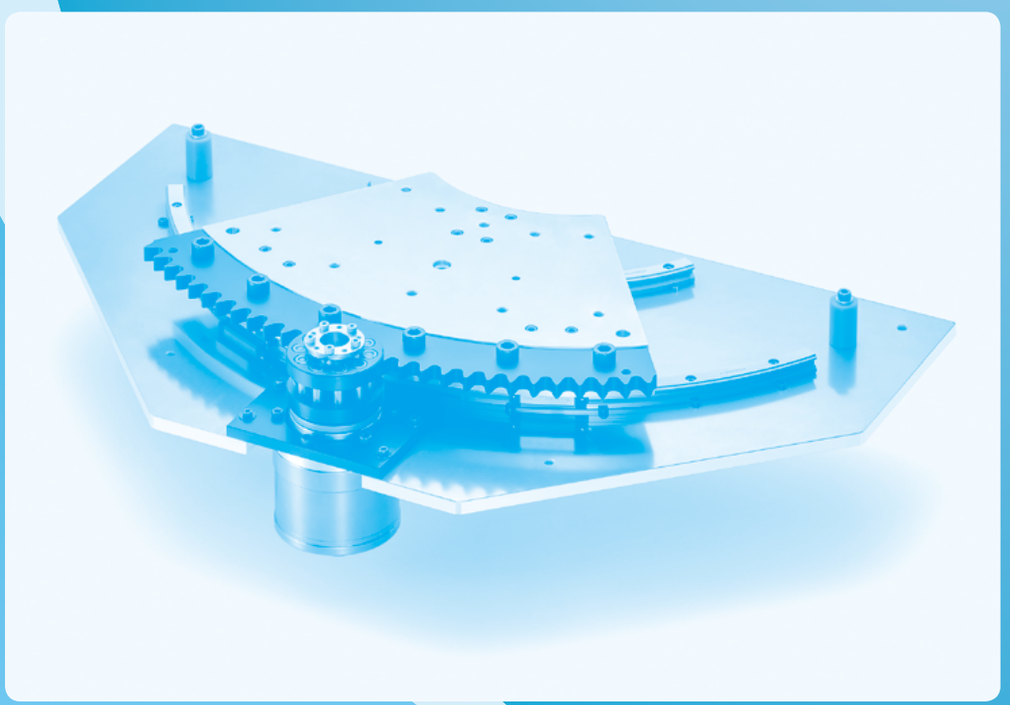
型　号 Model	B	CA	CB	D	E	F	G	I	J	a	b	c	d	e
F01	33	38	47	5	128	14	50	70	M4×10	40	12	6	14	M5
F02									M5×10					
F03				8		19	70	90		50	15	7.5	18	M6
F04						14			M6×12	40	12	6	14	M5
						16・19				50	15	7.5	18	M6
F05						14	80	100		40	12	6	14	M5
						16・19				50	15	7.5	18	M6
F06		56	65			24	95	115		55			20	
F07									M8×16					
F08		38	47			16・19				50			18	
G01	44		58	10	158		110	145						
G02		56	76			22・24				55			20	

规格·尺寸表

Specification Dimensional Table

TCG分割型齿圈组件

TCG Circular Arc Cam Ring Unit



规格・型号・外形图 Specifications, Models, Outline Drawings

规格图 Specification Table

型 号 Model	动作角度 Deg deg	总减速比 Total reduction ratio	基本动额定扭矩 Basic dynamic rated torque N・m	最大使用扭矩 Maximum working torque N・m	允许静额定扭矩 Allowable static rated torque N・m	驱动部分转动惯量 Inertia moment of drive unit ×10⁻⁴ kg·m²	允许平均输入回转数 Allowable average number of input revolutions rpm	最高输入回转数 Maximum number of input revolutions rpm	允许平均输出回转数 Allowable average number of output revolutions rpm	允许最高输出回转数 Maximum number of output revolutions rpm	输入轴转动惯量 Inertia moment converted to input shaft ×10⁻⁴ kg·m²	推荐电机容量 Recommendable motor capacity W	输入轴孔径 Input shaft hole diameter mm	质量 Mass kg
RGU1610A-C240	30	240	500	945	1160	26998	3000	4500	12.5	18.8	0.992	400	14・11・8	60
		480							6.3	9.4	0.559	200		
		720							4.2	6.3	0.471	200		
		960							3.1	4.7	0.438	100		
	90	240				71233			12.5	18.8	1.760	400		158
		480							6.3	9.4	0.751	200		
		720							4.2	6.3	0.556	200		
		960							3.1	4.7	0.486	100		
	360	240				313398			12.5	18.8	5.964	400		270
		480							6.3	9.4	1.802	200		
		720							4.2	6.3	1.023	200		
		960							3.1	4.7	0.749	100		
RGU1610A-C300	30	300	620	1180	1450	70633			10.0	15.0	1.308	400		88
		600							5.0	7.5	0.638	200		
		900							3.3	5.0	0.506	200		
		1200							2.5	3.8	0.458	100		
	90	300				180002			10.0	15.0	2.524	400		238
		600							5.0	7.5	0.942	200		
		900							3.3	5.0	0.641	200		
		1200							2.5	3.8	0.534	100		
	360	300				849955			10.0	15.0	9.967	400		476
		600							5.0	7.5	2.802	200		
		900							3.3	5.0	1.468	200		
		1200							2.5	3.8	0.999	100		
RGU2510A-C150	30	150	1090	1795	2520	35368	2000	4000	13.3	26.7	5.332	1500	24・22・19・16・14	75
		300							6.7	13.3	3.463	750		
		450							4.4	8.9	3.075	750		
		600							3.3	6.7	2.919	400		
		750							2.7	5.3	2.853	400		
	90	150				94382			13.3	26.7	7.955	1500		177
		300							6.7	13.3	4.119	750		
		450							4.4	8.9	3.367	750		
		600							3.3	6.7	3.083	400		
		750							2.7	5.3	2.958	400		
	360	150				334632			13.3	26.7	18.633	1500		292
		300							6.7	13.3	6.789	750		
		450							4.4	8.9	4.553	750		
		600							3.3	6.7	3.750	400		
		750							2.7	5.3	3.385	400		
RGU2510A-C190	30	190	1375	2270	3200	93783			10.5	21.1	6.358	1500		105
		380							5.3	10.5	3.720	750		
		570							3.5	7.0	3.189	750		
		760							2.6	5.3	2.983	400		
		950							2.1	4.2	2.894	400		
	90	190				241070			10.5	21.1	10.438	1500		262
		380							5.3	10.5	4.740	750		
		570							3.5	7.0	3.642	750		
		760							2.6	5.3	3.238	400		
		950							2.1	4.2	3.058	400		
	360	190				1064555			10.5	21.1	33.250	1500		548
		380							5.3	10.5	10.443	750		
		570							3.5	7.0	6.177	750		
		760							2.6	5.3	4.664	400		
		950							2.1	4.2	3.970	400		

基本动额定扭矩 Basic dynamic rated torque ：在一定速度运转时，满足额定寿命的基本扭矩。
Basic torque required for satisfying the rated lifetime during a constant-speed, continuous operation.

最大使用扭矩 Maximum working torque ：正常运转可以使用的扭矩（包含加减速的峰值）的最大值。
Maximum value of torque for normal operation (including the peak torque during acceleration/ deceleration).

允许静额定扭矩 Allowable static rated torque ：非常条件下停止或者外部冲击等，情况下的最大扭矩。
Maximum value of torque for non-normal use, such as emergency stop and external shock.

驱动部分转动惯量 Inertia moment of drive unit ：输出侧回转部分的转动惯量，计算负载扭矩时，负载转动惯量需要一并算出。
Inertia moment of the output side rotation unit. To calculate load torque, add the load inertia moment.

输入轴换算转动惯量 Inertia moment converted to input shaft ：齿圈组件全体的换算值。
Converted value of the entirety of Ring Unit.

型号表示 Model Indication

RGU□□□□A-C□□□-A□□-□□□-□□□□□□-□

型 号 Bracket No.	齿圈齿数 Number of ring teeth	动作角度※1 Deg	总减速比※2 Total reduction ratio	电机安装记号※3、※4 Motor mounting code	可选项 Option
1610	240	30：30° 90：90° 空白：360° Blank			A： 带盖板※5 With cover (标准情况下无记号)
	300				
2510	150				
	190				

※1： 仅非整圆的时候需要填写，-A□□
整圆型则为空白。
Only Circular arc model do state "-A□□", Round model do state Blank.

※2： 规格表参照 Refer to Specification Table.

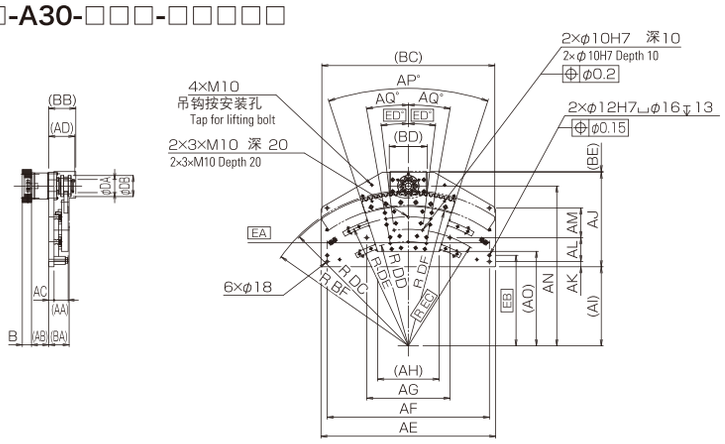
※3： 没有选择电机安装法兰的情况下
000□□ 内填写输入轴轴径
↓ 输入轴轴径 Input shaft hole diameter
For models with no motor attachment, enter 5-digit figure of "000□□."

※4： 电机对应参照表P.102–105
Refer to Motor Corresponding Table on P.102-105

※5： 盖板为安全盖板，并不是用来防尘的，盖板的尺寸图参照P.99–100
The cover is a safety cover, not a dustproof cover. For the outline dimensions of models with cover, refer to Outline Dimensional Drawings on P.99-100

外形尺寸图 Outline dimensional drawings

●RGU□□□□A-C□□□-A30-□□□-□□□□□



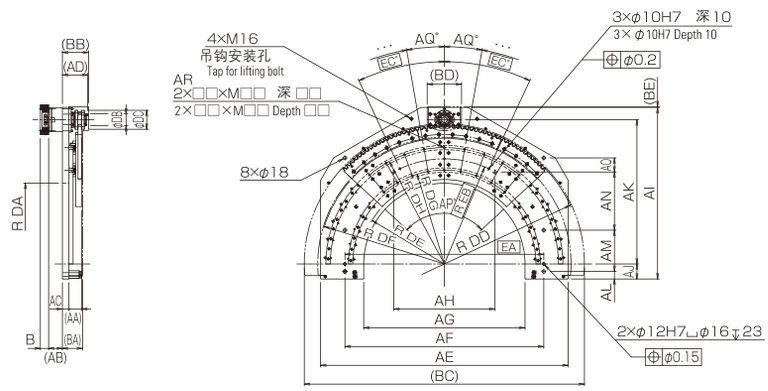
尺寸表 Dimension table

型 号 Model	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
RGU1610A-C240	48	52.5	25	100	660	610	400	233.9	301	351	25	79	136	606	360	36	10
RGU1610A-C300	60	40.5	25	112	840	780	400	295	380	418	25	115	140	752	454	36	10
RGU2510A-C150	56	95.5	25	113	660	610	400	233.9	301	380	25	77	138	615	360	36	10
RGU2510A-C190	68	83.5	25	125	840	780	400	295	380	454	25	115	142	768	454	36	10

型 号 Model	BA	BB	BC	BD	BE	BF	DA	DB	DC	DD	DE	DF	EA	EB	EC	ED
RGU1610A-C240	88.5	104.6	657.9	133.2	3.6	594.6	42	67	588	400	500	525	610	356	450	8
RGU1610A-C300	100.5	116.6	830.8	133.2	3.6	740.6	42	67	734	500	620	670	780	435	560	8
RGU2510A-C150	85.5	117.6	653.4	183.2	3.6	593.6	63	101	587	400	500	525	610	356	450	8
RGU2510A-C190	97.5	129.6	831.8	183.2	3.6	746.6	63	101	740	500	620	670	780	435	560	8

B□是可选项A(带盖板)选择时的尺寸表示。 B□ dimensions enable when choose option A (With cover)

●RGU□□□□A-C□□□-A90-□□□-□□□□□



尺寸表 Dimension table

型 号 Model	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
RGU1610A-C240	48	42.5	35	110	1057	850	700	420	737	85	606	30	210	245	75	97.5	15	2×7×M10 深 20 2×7×M10 Depth 20
RGU1610A-C300	60	30.5	35	122	1320	1060	860	540	878	80	752	40	220	310	75	94.8	10	2×9×M10 深 20 2×9×M10 Depth 20
RGU2510A-C150	56	85.5	35	123	1057	850	700	420	766	85	615	30	210	245	75	98.4	15	2×7×M10 深 20 2×7×M10 Depth 20
RGU2510A-C190	68	73.5	35	135	1320	1060	860	540	914	80	768	40	220	310	75	94.7	10	2×9×M10 深 20 2×9×M10 Depth 20

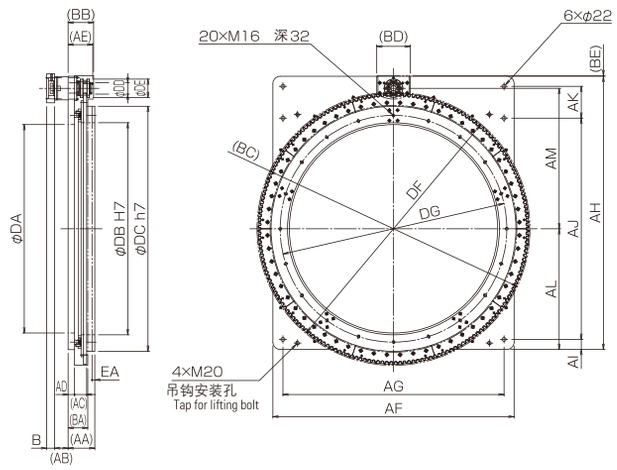
型 号 Model	BA	BB	BC	BD	BE	DA	DB	DC	DD	DE	DF	DG	DH	EA	EB	EC
RGU1610A-C240	98.5	114.6	1189.2	133.2	3.6	350	42	67	588	365	525	400	500	850	450	20
RGU1610A-C300	110.5	126.6	1481.2	133.2	3.6	430	42	67	734	450	670	500	620	1060	560	25
RGU2510A-C150	95.5	127.6	1187.2	183.2	3.6	350	63	101	587	365	525	400	500	850	450	20
RGU2510A-C190	107.5	139.6	1493.2	183.2	3.6	430	63	101	740	450	670	500	620	1060	560	25

B□是可选项A(带盖板)选择时的尺寸表示。 B□ dimensions enable when choose option A (With cover)

规格・型号・外形图　Specifications, Models, Outline Drawings

外形尺寸图　Outline dimensional drawings

●RGU□□□□A-C□□□-A360-□□□-□□□□□



尺寸表　Dimension table

型　号 Model	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
RGU1610A-C240	123	47.5	47.5	30	105	1057	940	1181	59	940	123	529	606
RGU1610A-C300	133	30.5	59.5	35	122	1320	1210	1458	55	1210	138	660	752
RGU2510A-C150	127	90.5	54.5	30	118	1057	940	1210	59	940	152	529	615
RGU2510A-C190	146	73.5	66.5	35	135	1320	1210	1494	55	1210	174	660	768

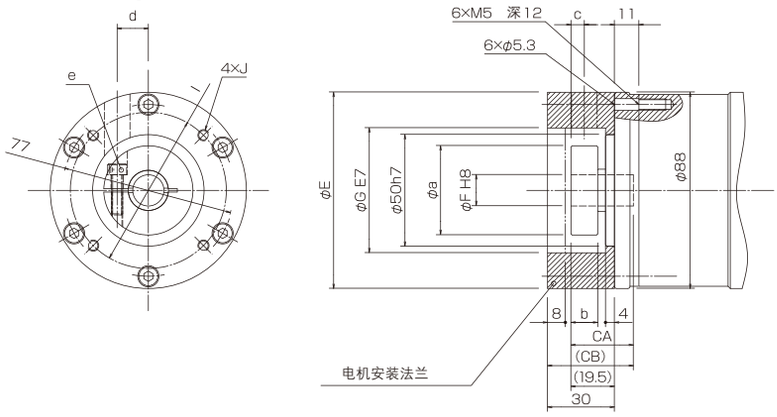
型　号 Model	BA	BB	BC	BD	BE	DA	DB	DC	DD	DE	DF	DG	EA
RGU1610A-C240	93.5	109.6	1189.2	133.2	3.6	920	940	1050	42	67	1176	1000	15
RGU1610A-C300	110.5	126.6	1481.2	133.2	3.6	1140	1160	1340	42	67	1468	1240	15
RGU2510A-C150	90.5	122.6	1187.2	183.2	3.6	920	940	1050	63	101	1174	1000	15
RGU2510A-C190	107.5	139.6	1493.2	183.2	3.6	1140	1160	1340	63	101	1480	1240	15

B□是可选项A(带盖板)选择时的尺寸表示。　　B□ dimensions enable when choose option A (With cover)

外形尺寸图　Outline dimensional drawings

● 电机安装部详细图(RGU1610A型)

Detailed drawing of motor mounted portion（Model RGU1610A）

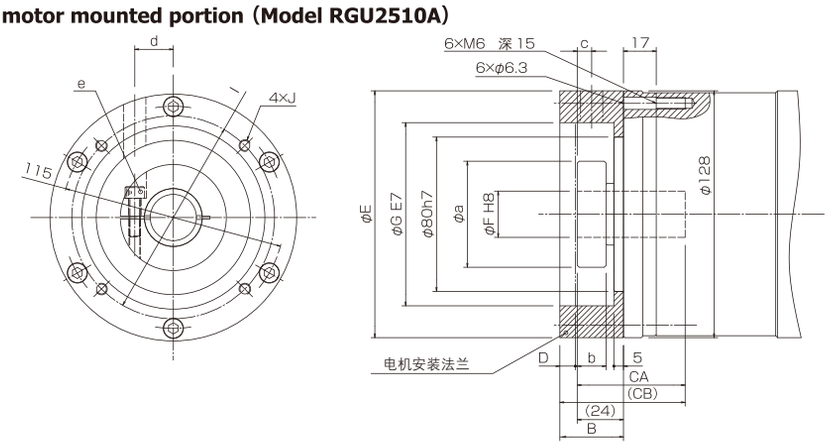


尺寸表　[电机安装部详细图(RGU1610A型)]　　**Dimension table [Detailed drawing of motor mounted portion（Model RGU1610A）]**

型　号 Model	CA	CB	E	F	G	I	J	a	b	c	d	e
C01	23	33.5	88	8	30	45	M3×6	30	10	5	10	M4
C02						46	M4×8					
C03	28	38.5		11・14	50	70		40	12	6	14	M5
C04	23	33.5		8			M5×10	30	10	5	10	M4
	28	38.5		14				40	12	6	14	M5
D01			98	11・14	70	90						
D02				14			M6×12					

● 电机安装部详细图(RGU2510A型)

Detailed drawing of motor mounted portion（Model RGU2510A）



尺寸表　[电机安装部详细图(RGU2510A型)]　　**Dimension table [Detailed drawing of motor mounted portion（Model RGU2510A）]**

型　号 Model	B	CA	CB	D	E	F	G	I	J	a	b	c	d	e
F01	33	38	47	5	128	14	50	70	M4×10	40	12	6	14	M5
F02									M5×10					
F03				8			70	90		50	15	7.5	18	M6
F04						19			M6×12	40	12	6	14	M5
						14				50	15	7.5	18	M6
F05						16・19				40	12	6	14	M5
						14	80	100		50	15	7.5	18	M6
F06		56	65			16・19								
F07						24	95	115		55			20	
F08		38	47						M8×16					
G01	44		58	10	158	16・19	110	145		50			18	
G02		56	76			22・24				55			20	

电机对应表　Motor Corresponding Table

电机简单对应表。选项时请务必进行计算。电机的瞬间最大扭矩*减速比的值请不要超过齿圈组件的最大使用扭矩。
关于没有刊登到的电机型号，请务必联系我们。

Motor Corresponding Table is an abridged table. Be sure to make a model selecting calculation. In using the motor, ensure that the product of "(Instantaneous maximum torque)×(Reduction ratio)" of the motor is not more than the maximum working torque of Ring Unit. For models not listed in the table, contact us for inquiry.

三菱电机　Mitsubishi Electric

RGU1610型　RGU2510型

型号 Model			电机容量 Motor capacity W	额定扭矩 Rated torque N·m	电机额定转速 Rated rotational speed of motor rpm	齿圈组件型号 Model of Ring Unit					
						RGU1610A-	C40-40 C60-60 C80-80 C100-100 C240-240 C300-300	C40-80 C60-120 C80-160 C100-200 C240-480 C300-600	C40-120 C60-180 C80-240 C100-300 C240-720 C300-900	C40-160 C60-240 C80-320 C100-400 C240-960 C300-1200	
						RGU2510A-	C40-40 C50-50 C60-60 C70-70 C125-125 C150-150 C190-190	C40-80 C50-100 C60-120 C70-140 C125-250 C150-300 C190-380	C40-120 C50-150 C60-180 C70-210 C125-375 C150-450 C190-570	C40-160 C50-200 C60-240 C70-280 C125-500 C150-600 C190-760	C40-200 C50-250 C60-300 C70-350 C125-625 C150-750 C190-950
J4	HG-KR	13	100	0.32	3000	电机安装记号 Installation symbol of motor				C0208	
		23	200	0.64				C0414			
		43	400	1.3			C0414			F0214	
		73	750	2.4				F0419			
	HG-MR	13	100	0.32	3000					C0208	
		23	200	0.64				C0414			
		43	400	1.3			C0414			F0214	
		73	750	2.4				F0419			
	HG-SR	51	500	4.8	1000						
		52	500	2.4	2000			G0224			
		102	1000	4.8							
J3	HF-KP	13	100	0.32	3000					C0208	
		23	200	0.64				C0414			
		43	400	1.3			C0414			F0214	
		73	750	2.4				F0419			
	HF-MP	13	100	0.32	3000					C0208	
		23	200	0.64				C0414			
		43	400	1.3			C0414			F0214	
		73	750	2.4				F0419			
	HF-SP	51	500	4.77	1000						
		52	500	2.39	2000			G0224			
		102	1000	4.77							
	HC-LP	52	500	2.39	2000			G0224			
		102	1000	4.78							
	HC-RP	103	1000	3.18	3000			F0724			
		153	1500	4.78							

安川电机 Yaskawa Electric

RGU1610型 RGU2510型

型号 Model			电机容量 Motor capacity W	额定扭矩 Rated torque N·m	电机额定转速 Rated rotational speed of motor rpm	齿圈组件型号 Model of Ring Unit					
						RGU1610A-	C40-40 C60-60 C80-80 C100-100 C240-240 C300-300	C40-80 C60-120 C80-160 C100-200 C240-480 C300-600	C40-120 C60-180 C80-240 C100-300 C240-720 C300-900	C40-160 C60-240 C80-320 C100-400 C240-960 C300-1200	
						RGU2510A-	C40-40 C50-50 C60-60 C70-70 C125-125 C150-150 C190-190	C40-80 C50-100 C60-120 C70-140 C125-250 C150-300 C190-380	C40-120 C50-150 C60-180 C70-210 C125-375 C150-450 C190-570	C40-160 C50-200 C60-240 C70-280 C125-500 C150-600 C190-760	C40-200 C50-250 C60-300 C70-350 C125-625 C150-750 C190-950
Σ7	SGM7J	01A	100	0.318	3000	电机安装记号 Installation symbol of motor		C0208		F0214	
		C2A	150	0.477				C0414			
		02A	200	0.637			C0414				
		04A	400	1.27				F0214			
		06A	600	1.91				F0419			
		08A	750	2.39							
	SGM7A	01A	100	0.318	3000			C0208		F0214	
		C2A	150	0.477				C0414			
		02A	200	0.637			C0414				
		04A	400	1.27				F0214			
		06A	550	1.75				F0214			
		08A	750	2.39				F0419			
		10A	1000	3.18			F0419				
	SGM7P	01A	100	0.318	3000					C0408	
		02A	200	0.637				D0214			
		04A	400	1.27						F0414	
		08A	750	2.39				G0119			
		15A	1500	4.77							
	SGM7G	03A	300	1.96	1500			F0516			
		05A	450	2.86							
		09A	850	5.39			G0224				
ΣV	SGMJV	01A	100	0.318	3000			C0208		F0214	
		C2A	150	0.477				C0414			
		02A	200	0.637			C0414				
		04A	400	1.27				F0214			
		06A	600	1.91				F0214			
		08A	750	2.39				F0419			
	SGMAV	01A	100	0.318	3000			C0208		F0214	
		C2A	150	0.477				C0414			
		02A	200	0.637			C0414				
		04A	400	1.27				F0214			
		06A	550	1.75				F0214			
		08A	750	2.39				F0419			
		10A	1000	3.18			F0419				
	SGMGV	03A	300	1.96	1500			F0514			
		05A	450	2.86			F0516				
	SGMSV	10A	1000	3.18	3000		F0624				
		15A	1500	4.9							

松下电机 Panasonic

RGU1610型 RGU2510型

型号 Model			电机容量 Motor capacity W	额定扭矩 Rated torque N·m	电机额定转速 Rated rotational speed of motor rpm	齿圈组件型号 Model of Ring Unit					
						RGU1610A-	C40-40 C60-60 C80-80 C100-100 C240-240 C300-300	C40-80 C60-120 C80-160 C100-200 C240-480 C300-600	C40-120 C60-180 C80-240 C100-300 C240-720 C300-900	C40-160 C60-240 C80-320 C100-400 C240-960 C300-1200	
						RGU2510A-	C40-40 C50-50 C60-60 C70-70 C125-125 C150-150 C190-190	C40-80 C50-100 C60-120 C70-140 C125-250 C150-300 C190-380	C40-120 C50-150 C60-180 C70-210 C125-375 C150-450 C190-570	C40-160 C50-200 C60-240 C70-280 C125-500 C150-600 C190-760	C40-200 C50-250 C60-300 C70-350 C125-625 C150-750 C190-950
A6	MSMF	01	100	0.32	3000	电机安装记号 Installation symbol of motor				C0108	
		02	200	0.64				C0311			
		04	400	1.27			C0314			F0114	
		08	750	2.39				F0319			
		09	1000	3.18							
	MQMF	01	100	0.32	3000					C0308	
		02	200	0.64				D0111			
		04	400	1.27			D0114			F0314	
	MHMF	01	100	0.32	3000					C0208	
		02	200	0.64				C0311			
		04	400	1.27			C0314			F0114	
		08	750	2.39				F0319			
		09	1000	3.18							
		10	1000	4.77			G0222				
	MDMF	10	1000	4.77	2000		G0222				
A5	MSME	01	100	0.32	3000					C0108	
		02	200	0.64				C0311			
		04	400	1.3			C0314			F0114	
		08	750	2.4				F0319			
	MDME	10	1000	4.77	2000		G0222				
	MHME	10	1000	4.77	2000		G0222				
A4	MAMA	02	200	0.38	5000				C0311		
		04	400	0.76				C0314			
		08	750	1.43						F0319	
	MSMD	01	100	0.32	3000					C0108	
		02	200	0.64				C0311			
		04	400	1.3			C0314			F0114	
		08	750	2.4				F0319			
	MQMA	01	100	0.32	3000					C0308	
		02	200	0.64				D0111			
		04	400	1.3			D0114			F0314	
	MDMA	10	1000	4.8	2000		G0222				
	MFMA	04	400	1.9	2000			G0119			
	MHMA	05	500	2.38	2000			G0222			
		10	1000	4.8							

富士电机 Fuji Electric

RGU1610型 RGU2510型

型 号 Model		电机容量 Motor capacity W	额定扭矩 Rated torque N·m	电机额定转速 Rated rotational speed of motor rpm	齿圈组件型号 Model of Ring Unit					
					RGU1610A-	C40-40 C60-60 C80-80 C100-100 C240-240 C300-300	C40-80 C60-120 C80-160 C100-200 C240-480 C300-600	C40-120 C60-180 C80-240 C100-300 C240-720 C300-900	C40-160 C60-240 C80-320 C100-400 C240-960 C300-1200	
					RGU2510A-	C40-40 C50-50 C60-60 C70-70 C125-125 C150-150 C190-190	C40-80 C50-100 C60-120 C70-140 C125-250 C150-300 C190-380	C40-120 C50-150 C60-180 C70-210 C125-375 C150-450 C190-570	C40-160 C50-200 C60-240 C70-280 C125-500 C150-600 C190-760	C40-200 C50-250 C60-300 C70-350 C125-625 C150-750 C190-950
GYS	101	100	0.318	3000	电机安装记号 Installation symbol of motor				C0208	
	201	200	0.637				C0414			
	401	400	1.27			C0414			F0214	
	751	750	2.39				F0416			
	102	1000	3.18			F0724				
	152	1500	4.78							
GYC	101	100	0.318	3000					C0408	
	201	200	0.637			D0214				
	401	400	1.27						F0414	
	751	750	2.39			F0816				
	102	1000	3.18			G0224				
	152	1500	4.78							
GYG	501	500	2.39	2000		G0119				
	751	750	3.58							
	102	1000	4.77			G0222				

型号选择 流程图　Model No. Selection Flow Chart

从使用条件来进行选型

Select the model according to the operating conditions.

运转负载条件　Operating load conditions

负载惯量 Load inertia moment	I = ☐ kg・m²	
最高输出转速 Maximum revolution	NR = ☐ rpm	
加速时间 Acceleration time	t1 = ☐ sec	
外力扭矩 Outer force torque	Tc = ☐ N・m	
驱动部惯量 Inertia moment of drive unit	Ic = ☐ kg・m²	参照P.3　Refer to P. 3
负载系数 Coefficient of weight	fw = ☐	参照右表　Refer to the right table.

YES

回转数判定　Determination of number of revolutions

RGU最高输出回转速(参照P.3) Maximum number of output revolutions of RGU (Refer to p. 3.)

NR < ☐

NO → 减速比，回转数重新修改 Review of reduction ratio and number of revolutions

YES

负载扭矩计算　Calculation of load torque

角速度 Angular velocity	ω = NR×2π/60 = ☐ rad/sec
角加速度 Angular acceleration	α = ω/t1 = ☐ rad/sec²
加速扭矩 Accelerative torque	Ta = (I+Ic)×α = ☐ N・m
最大负载扭矩 Maximum load torque	Tmax = fw ×(Ta+Tc) = ☐ N・m

RGU最大使用扭矩（参照P.3） Maximum working torque of RGU (Refer to p. 3.)

Tmax < ☐

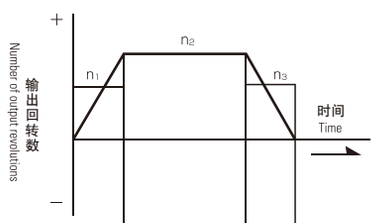
NO → 型号提升或者负载降低 Review of model upgrade or load

YES

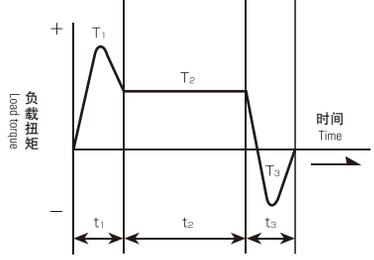
平均负载扭矩，平均输出回转速计算　Calculation of average load torque and average number of output revolutions

运转条件（参考）Operating conditions (Reference)

〈速度曲线〉 Velocity pattern



〈负载曲线〉 Load pattern



平均负载扭矩　Average load torque

$$Tm = \sqrt[10/3]{\frac{n_1 t_1 T_1^{10/3} + n_2 t_2 T_2^{10/3} + n_3 t_3 T_3^{10/3}}{n_1 t_1 + n_2 t_2 + n_3 t_3}}$$

平均输出回转速　Average number of output revolutions

$$Nm = \frac{t_1 n_1 + t_2 n_2 + t_3 n_3}{t_1 + t_2 + t_3}$$

项　目 Item	起动时 Starting	稳定时 Steady operation	停止时 Stoppage
负载扭矩 Load torque N・m	T_1	T_2	T_3
输出回转速 Number of output revolutions rpm	n_1 (=0.5 n_2)	n_2	n_3 (=0.5 n_2)
时　间 Time sec	t_1	t_2	t_3

→ 寿命计算 To life Calculation

负载系数　Load coefficient

运　转　条　件 Operating conditions	fw
没有冲击的圆滑运转时 In smooth operation with no impacts	1.0～1.2
普通运转时 In normal operation	1.2～1.5
伴随冲击和振动运转时 In operation with impacts and vibrations	1.5～3.0

寿命计算 Life Calculation

平均负载扭矩 Tm = ＿＿＿＿ N·m
Average Load Torque

平均输出回转数 Nm = ＿＿＿＿ rpm
Average output revolutions

平均输入回转数 N1 = Nm×Ru
Average Input revolutions = ＿＿＿＿ rpm

寿命时间 Life Length Lh

$$Lh = Lh_0 \times \frac{N_0}{N_1} \times \left(\frac{T_0}{fw \times T_m}\right)^{10/3} \quad (H)$$

- Lh_0：额定寿命时间 Rated life length — 参照右表 Refer to right table.
- N_0：允许平均输入回转数 Allowable average number of input revolutions — 参照右表 Refer to right table.
- T_0：基本动额定扭矩 Basic dynamic rated torque — 参照右表 Refer to right table.
- T_m：平均负载扭矩 Average Load Torque
- N1：平均输入回转速 Average Input revolutions
- Ru：RGU总速比 Total reduction ratio of RGU
- fw：负载系数 Coefficient of weight

定格寿命 Rated lifetime

型号 Model	总减速比 Total reduction ratio Ru	Lh_0 H	T_0 N·m	N_0 rpm
RGU1610A-C40	40	5600	83	3000
	80	11000		
	120	16000		
	160	16000		
RGU1610A-C60	60	5400	125	
	120	10000		
	180	16000		
	240	16000		
RGU1610A-C80	80	5800	165	
	160	11000		
	240	17000		
	320	17000		
RGU1610A-C100	100	5600	205	
	200	11000		
	300	16000		
	400	17000		
RGU2510A-C40	40	8000	290	2000
	80	16000		
	120	16000		
	160	16000		
	200	16000		
RGU2510A-C50	50	8300	360	
	100	16000		
	150	16000		
	200	16000		
	250	16000		
RGU2510A-C60	60	8500	430	
	120	16000		
	180	16000		
	240	16000		
	300	16000		
RGU2510A-C70	70	8000	510	
	140	15000		
	210	15000		
	280	15000		
	350	15000		
RGU2510A-C125	125	8000	910	
	250	15000		
	375	15000		
	500	15000		
	625	15000		

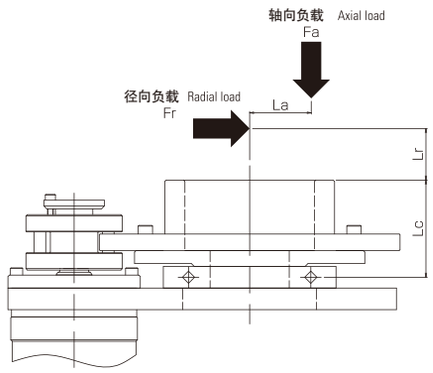
型号 Model	总减速比 Total reduction ratio Ru	Lh_0 H	T_0 N·m	N_0 rpm
RGU1610A-C240	240	5400	500	3000
	480	10000		
	720	11000		
	960	11000		
RGU1610A-C300	300	5600	620	
	600	11000		
	900	11000		
	1200	11000		
RGU2510A-C150	150	8100	1090	2000
	300	15000		
	450	15000		
	600	15000		
	750	15000		
RGU2510A-C190	190	8200	1375	
	380	16000		
	570	16000		
	760	16000		
	950	16000		

交叉滚子轴承的计算　Calculation of Cross-Roller Bearing

最大负载力矩载荷的计算(Mmax)　Calculation of maximum load moment load (Mmax)

$$M\ max = Fr\ max\ (Lr + Lc / 1000) + Fa\ max \cdot La$$

Fr max：最大径向负载　Maximum radial load　(N)
Fa max：最大轴向负载　Maximum axial load　(N)
Lr：径向负载位置　Radial load position　(m)
La：轴向负载位置　Axial load position　(m)



确认最大使用负载惯量是否在以下允许惯量负载范围内

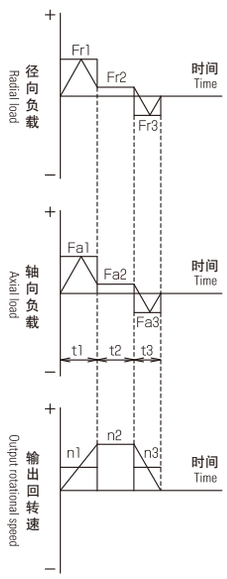
Check whether the maximum load moment load is equal to or less than the allowable moment load.

$M\ max \leqq Mc$　（允许的负载请参照下表）
(For the allowable moment load, refer to the following table.)

型　号 Model		允许力矩负载 Allowable moment load Mc（N・m）	允许径向负载 Allowable radial load (N)	允许轴向负载 Allowable axial load (N)	Lc (mm)
RGU1610A-C40-	40	140	3300	4900	68.5
	80	140	3400	5000	
	120	140	3400	5000	
	160	150	3700	5500	
RGU1610A-C60-	60	610	8200	12200	73.5
	120	620	8400	12500	
	180	610	8300	12300	
	240	660	9000	13400	
RGU1610A-C80-	80	1950	17100	25500	78.5
	160	1980	17400	25900	
	240	1960	17300	25800	
	320	2140	18800	28000	
RGU1610A-C100-	100	3870	26000	38800	85
	200	3890	26200	39100	
	300	3930	26400	39400	
	400	4200	28300	42200	
RGU2510A-C40-	40	610	8300	12300	94.5
	80	610	8300	12300	
	120	690	9400	14000	
	160	750	10200	15200	
	200	800	10900	16200	
RGU2510A-C50-	50	1980	17400	25900	103.5
	100	2000	17600	26200	
	150	2260	19900	29700	
	200	2460	21700	32300	
	250	2630	23200	34600	
RGU2510A-C60-	60	3860	25900	38600	102
	120	3930	26400	39400	
	180	4430	29800	44400	
	240	4830	32500	48500	
	300	5170	34800	51900	
RGU2510A-C70-	70	3930	26400	39400	102
	140	4000	26900	40100	
	210	4520	30400	45300	
	280	4930	33100	49400	
	350	5270	35400	52800	
RGU2510A-C125-	125	14390	38900	58000	56
	250	14670	39700	59200	
	375	16570	44800	66800	
	500	18060	48900	72900	
	625	19310	52300	78000	

允许径向负载，允许轴向负载对于交叉滚子轴承来说只是单纯的径向负载或者轴向负载。
是负担在任何一个负载的情况下，而满足齿圈组件的寿命的值。（径向负载：Lr + Lc = 0　轴向负载：La = 0）
The allowable radial load and the allowable axial load are the values that satisfy the lifetime of Ring Unit when either the net radial load or the net axial load is imposed on Cross-Roller Bearing. (Radial load: Lr + Lc = 0, Axial load: La = 0).

平均负载的计算公式　Calculation formulas of average load



平均径向负载　　Fra　(N)

Average radial load

$$Fra=\sqrt[10/3]{\frac{n1t1(|Fr1|)^{10/3}+n2t2(|Fr2|)^{10/3}+\cdots+nntn(|Frn|)^{10/3}}{n1t1+n2t2+\cdots+nntn}}$$

平均轴向负载　　Faa　(N)

Average axial load

$$Faa=\sqrt[10/3]{\frac{n1t1(|Fa1|)^{10/3}+n2t2(|Fa2|)^{10/3}+\cdots+nntn(|Fan|)^{10/3}}{n1t1+n2t2+\cdots+nntn}}$$

平均输出回转速　Nm　(rpm)

Average output revolutions

$$Nm=\frac{n1t1+n2t2+\cdots+nntn}{t1+t2+\cdots+tn}$$

平均力矩负载　Ma　(N・m)

Average moment load

$$Ma=Fra(Lr+Lc)+Faa\cdot La$$

径向系数（X）轴向系数（Y）的计算公式　Calculation formulas of radial coefficient and axial coefficient

区　分 Classification	径向系数（X） Radial coefficient	轴向系数（Y） Axial coefficient
$\frac{Fa}{Fr+2M/Dpw}\leqq 1.5$	1	0.45
$\frac{Fa}{Fr+2M/Dpw}>1.5$	0.67	0.67

负载系数　Load coefficient　(fw)

负　载　状　态 Load state	fw
没有冲击的圆滑运转时 In smooth operation with no impacts	1.0～1.2
正常运转 In normal operation	1.2～1.5
伴随冲击・振动的运转时 In operation with impacts and vibrations	1.5～3.0

型　号 Model	基本动额定负载 Basic dynamic rated load C　(N)	滚销的节円直径 Roller pitch circle diameter Dpw　(m)
RGU1610A-C40	20300	0.085
RGU1610A-C60	49100	0.1475
RGU2510A-C40		
RGU1610A-C80	104000	0.2275
RGU2510A-C50		
RGU1610A-C100	156000	0.2973
RGU2510A-C60		
RGU2510A-C70		
RGU2510A-C125	230000	0.73823

寿命计算　Life Calculation　(Lh)

对于交叉滚子轴承，使用以下公式计算寿命

For the cross roller bearing, calculate the life hours by using the following formula

$$Lh=\left(\frac{10^6}{60\cdot Nm}\right)\cdot\left(\frac{C}{fw\cdot Pc}\right)^{10/3}\quad (H)$$

动等价径向负载　Kinetic Equivalent Radial Load　(Pc)

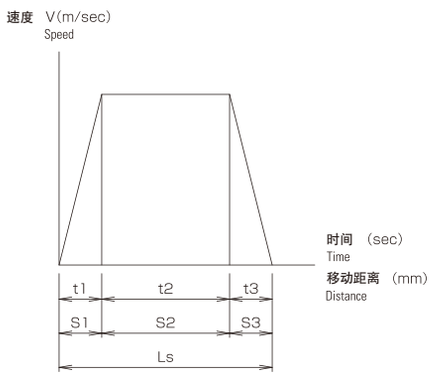
$$Pc=X\cdot\left(Fra+\frac{2Ma}{Dpw}\right)+Y\cdot Fa\quad (N)$$

滑块的计算　Calculation of Guide Blocks

动作角度 30度 90度　　Deg for 30deg, 90deg

运转条件　Operating conditions

负载质量 Total load mass：m（kg）
输出法兰回转数　RPM of output flange：NR（rpm）
重力加速度 Gravitational acceleration：g（m/sec²）
负载系数 Load factor：fw、fs



● 负载力的计算　Calculation of applied load

滑块速度 Block speed （m/sec）

$$V=\frac{R\times NR\times \pi}{30000}$$

加速度 Acceleration （m/sec²）

$$an=\frac{V}{tn}$$

加速时负载 Load in acceleration （N）

$$Pa1=\frac{mg}{n}-\frac{m\times a1\times L2}{2\times L0}\qquad Pat1=\frac{m\times a1\times L3}{2\times L0}$$

$$Pb1=\frac{mg}{n}+\frac{m\times a1\times L2}{2\times L0}\qquad Pbt1=-\frac{m\times a1\times L3}{2\times L0}$$

匀速时负载 Load in constant speed （N）

$$Pa2=\frac{mg}{n}$$

$$Pb2=\frac{mg}{n}$$

减速时负载 Load in deceleration （N）

$$Pa3=\frac{mg}{n}+\frac{m\times a1\times L2}{2\times L0}\qquad Pat3=-\frac{m\times a1\times L3}{2\times L0}$$

$$Pb3=\frac{mg}{n}-\frac{m\times a1\times L2}{2\times L0}\qquad Pbt3=\frac{m\times a1\times L3}{2\times L0}$$

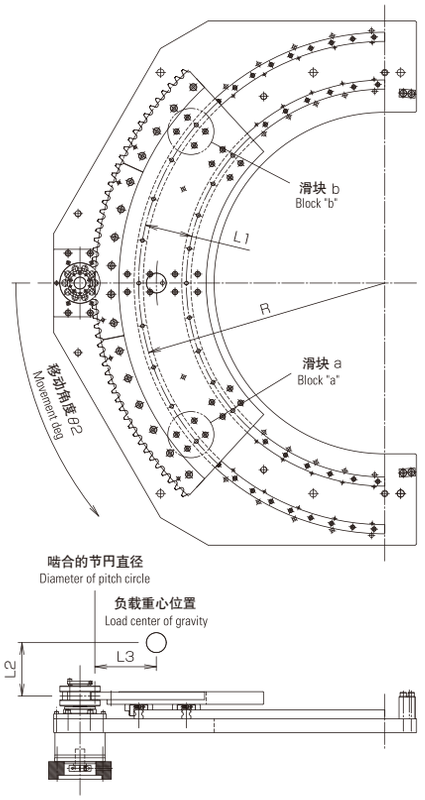
负载合成 Load synthesis （N）

$$Pae1=|Pa1|+|Pat1|\qquad Pae3=|Pa3|+|Pat3|$$

$$Pbe1=|Pb1|+|Pbt1|\qquad Pbe3=|Pb3|+|Pbt3|$$

Maximum load （N）

$$Pr=MAX(Pae1,\ Pbe1,\ Pa2,\ Pb2,\ Pae3,\ Pbe3)$$



静安全系数　Static safety factor （N）

$$\frac{Co}{Pr}\geqq fs$$

负载系数 Load factor　fs

负　载　条　件 Load conditions		fs
无冲击振动的运转时	No vibration, shock	1.0～3.5
伴随冲击振动的运转时	Applied vibration, shock	2.0～5.0

● 额定寿命的计算　Calcuration of rated life time

平均负载力　Average load （N）

$$Pam=\sqrt[3]{\frac{Pae1^3\times S1+Pa2^3\times S2+Pae3^3\times S3}{LS}}\qquad Pbm=\sqrt[3]{\frac{Pbe1^3\times S1+Pb2^3\times S2+Pbe3^3\times S3}{LS}}$$

额定寿命 Rated life time （km）

$$Lkm=\left(\frac{C}{fw\times Pc}\right)^3\times 50$$

$$Pc=MAX(Pam,\ Pbm)$$

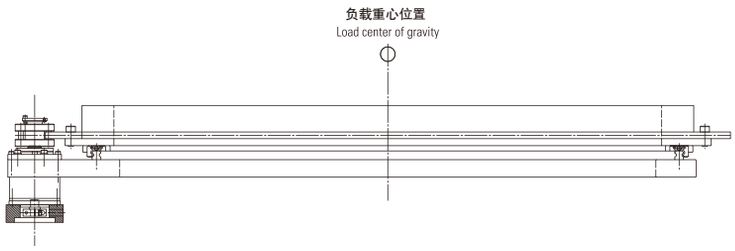
负载系数 Load factor　fw

振动，冲击 Vibration, shock	速度V(m/sec)（参考） speed V (m/sec) (reference)	fw
微　Minute	V≦0.25	1.0～1.2
小　Small	0.25＜V≦1.0	1.2～1.5
中　Medium	1.0＜V≦2.0	1.5～2.0
大　Large	2.0＜V	2.0～3.5

动作角度 360度　Deg for 360deg

运转条件　Operating conditions

负载质量 Total load mass：m（kg）
输出法兰回转数　RPM of output flange：NR（rpm）
重力加速度 Gravitational acceleration：g（m/sec²）
负载系数 Load factor：fw、fs



● 负载力的计算　Calculation of applied load

滑块速度 Block speed （m/sec）

$$V=\frac{R\times NR\times \pi}{30000}$$

加速度 Acceleration （m/sec²）

$$an=\frac{V}{tn}$$

加速时负载　匀速时负载　减速时负载（N）
Load in acceleration, Load in constant speed, Load in deceleration

$$P1=P2=P3=\frac{mg}{n}$$

最大载重 Maximum load （N）

$$Pr=P1$$

静载安全系数 Static safety factor （N）

$$\frac{Co}{Pr}\geqq fs$$

● 额定寿命计算　Calcuration of rated life time

平均负载力 Average load （N）

$$Pm=\sqrt[3]{\frac{P1^3\times S1+P2^3\times S2+P3^3\times S3}{LS}}$$

额定寿命 Rated life time （km）

$$Lkm=\left(\frac{C}{fw\times Pc}\right)^3\times 50$$

$$Pc=MAX(Pam,\ Pbm)$$

● 设计上的注意　Notes on consideration

请注意承重台的重心位置，
动作角度30度・90度需要在内外侧导轨间设定。
动作角度360度需要在回转中心设定。
超过上述的使用范围请与我们联系。

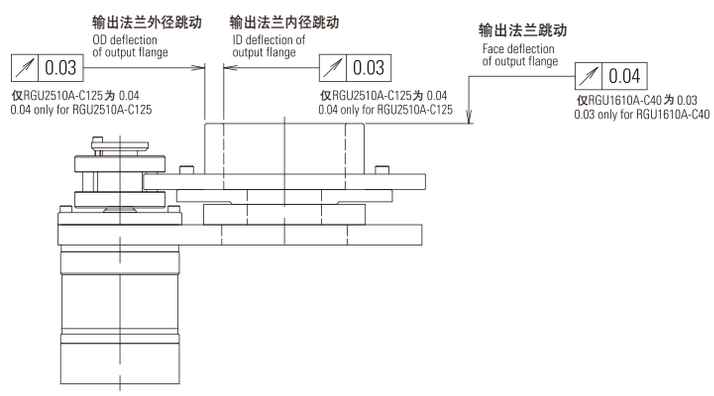
Pay attention to load center of gravity. It set Deg for 30deg and 90deg between the inner guide and the outer guide, and set Deg for 360deg to the center of rotation. If you use beyond the above range, please contact to us.

型　号 Model	动作角度 Deg deg	总减速比 Total reduction ratio	基本动额定负载 Basic dynamic rated load C（N）	基本静额定负载 Basic static rated load Co（N）	滑块数 Number of Blocks n（个pieces）	滑轨 Block interval L0（mm）	滑轨半径 Guide radius R（mm）	滑轨长 Guide interval L1（mm）	啮合圆直径 Diameter of pitch circle Dp（mm）
RGU1610A-C240	30	240	7300	11593	4	174.5	500	100	1163.52
		480							
		720							
		960							
	90	240	7284	11577	6	698.1			
		480							
		720							
		960							
	360	240	7092	11385	5	–			
		480							
		720							
		960							
RGU1610A-C300	30	300	18853	32462	4	173.1	620	120	1455.48
		600							
		900							
		1200							
	90	300	18826	32435	6	822.4			
		600							
		900							
		1200							
	360	300	18490	32099	5	–			
		600							
		900							
		1200							
RGU2510A-C150	30	150	6090	9859	4	174.5	500	100	1153.13
		300							
		450							
		600							
		750							
	90	150	6069	9838	6	698.1			
		300							
		450							
		600							
		750							
	360	150	5876	9645	5	–			
		300							
		450							
		600							
		750							
RGU2510A-C190	30	190	18838	30718	4	173.1	620	120	1459.2
		380							
		570							
		760							
		950							
	90	190	18803	30683	6	822.4			
		380							
		570							
		760							
		950							
	360	190	18388	30268	5	–			
		380							
		570							
		760							
		950							

精度规格 Precision Standard

型 号 Model	角度传动精度 Angular transmission accuracy arcmin	双方向重复定位精度 Bidirectional repetitive positioning accuracy arcsec	输出法兰面跳动 Face deflection of output flange mm	输出法兰内外径跳动 ID-OD deflection of output flange mm
RGU1610A-C40	5	90	0.03	0.03
RGU1610A-C60	3	60	0.04	
RGU1610A-C80	3	45		
RGU1610A-C100	2	35		
RGU2510A-C40	3	75	0.04	0.03
RGU2510A-C50	3	60		
RGU2510A-C60	2	50		
RGU2510A-C70	2	45		
RGU2510A-C125	2	25		0.04

型 号 Model	动作角度 Deg deg	角度传递精度 Angular transmission accuracy arcmin	双方向重复定位精度 Bidirectional repetitive positioning accuracy arcsec	输出法兰面跳动 Face deflection of output flange mm	输出法兰内外径跳动 ID-OD deflection of output flange mm
RGU1610A-C240	30	0.8	25	0.04	–
	90	0.9		0.08	
	360	1.5		0.12	0.10
RGU1610A-C300	30	0.6	12	0.04	–
	90	0.8		0.08	
	360	1.6		0.12	0.12
RGU2510A-C150	30	0.8	20	0.04	–
	90	1		0.08	
	360	1.6		0.12	0.10
RGU2510A-C190	30	0.7	16	0.04	–
	90	0.9		0.08	
	360	1.6		0.12	0.12

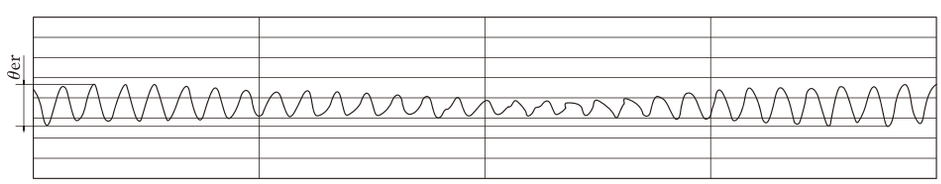


● 角度传动精度 Angular transmission accuracy

角传动精度为给输入轴任意的回转角（θ1）时，输出轴的理论回转角（θ2）和实际回转角（θ，2）之间的差，
输出轴1回转产生的最大差（θer）称之为角度传动精度。

The angular transmission accuracy generally refers to the difference between the angle of theoretical rotation ($\theta 2$) of the output shaft when any angle of rotation ($\theta 1$) is applied to the input shaft side and the angle of the actual rotation ($\theta'2$), and particularly refers to the maximum difference caused when the output shaft makes a 360-degree roll (θer).

$$\theta er = \theta'_2 - \theta_2 = \theta'_2 - \theta_1 / R$$ （R：减速比 Reduction ratio）



● 双方向重复定位精度 Bidirectional repetitive positioning accuracy

朝着目标位置正方向定位停止时的位置，和反方向定位停止时的位置的最大差。

This precision refers to the maximum difference between the stop position when positioning is made in a positive direction toward the target position and the stop position when positioning is made in a negative direction toward the target position.

使用注意　Precautions for Use

关于润滑　Lubrication

第一次使用时，请在齿面涂润滑脂。漏涂可能会造成磨损等状况出现。
First of all, apply grease to the tooth surface. Otherwise, friction and other troubles could be caused.

防尘对策　Dust preventive measures

齿面和齿底等部位如有灰尘或者异物附着可能会造成运转不良。
If dust, dirt and foreign matter contaminate the tooth surface, the tooth bottom, etc., malfunction could be caused.

电机安装要点　Motor mounting procedure

电机安装时，请按照以下的顺序：
Mount the motor by using the following procedure:

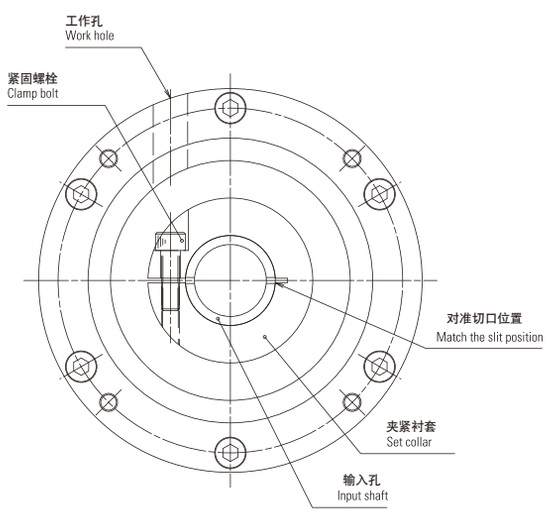
1. **将减速机输入孔和电机输出轴上附着的赃物，油渍等清理干净。**
   Completely remove dust, dirt, oil, etc. from the inside diameter of the input shaft of the reducer and the motor shaft.
2. **将衬套的夹紧螺栓对准中间法兰盘作业孔位置。**
   Match the set-collar clamp bolt of the input shaft of the reducer to the work hole of the motor attachment.
3. **保持减速机和电机不发生倾斜，将电机轴缓慢插入减速机孔底部，然后拧紧螺栓固定电机。**
   Carefully insert the clamp bolt into the working hole all the way seated in such a manner that the reducer and the motor do not tilt, and fix the motor by tightening the bolt.
4. **将螺栓用规定的扭矩拧紧。**
   Tighten the set-collar clamp bolt with the specified tightening torque.

夹紧螺栓 Clamp bolt	拧紧扭矩 Tightening torque N・m
M5	9.0
M6	15.3

请务必按照以上拧紧扭矩进行扭紧。
如果没有满足拧紧扭矩，可能会导致滑动等情况出现。
Be sure to tighten the clamp bolt with the above-specified tightening torque.
If the tightening torque is deficient, slip or other trouble could be caused.

减速机的输入孔上有切口，外面套有环形夹紧衬套，
衬套上的螺栓拧紧后，会使输入孔产生变形，从而把电机轴抱紧。
衬套拧紧的时候，输入孔以及衬套上的切口请按照右图指示相互对准，
然后再拧紧螺栓。
衬套和输入孔的切口没有对齐就抱紧的情况下，
可能会引起输入轴的破损以及抱紧力的下降。

The input shaft of the reducer is slit up. Because of this, when the set-collar clamp bolt is tightened, the input shaft is deformed to clamp the input shaft.
When the set collar is fastened, match the slit of the input shaft to the slit of the set collar as shown on the right figure, and tighten the clamp bolt.
If the shaft is clamped with the slit of the set collar and the slit of the input shaft in the mismatched condition, the input shaft could be broken or the clamp force could be lowered.



PSR / PSL series

精致且坚固的超薄型减速机

Ultrathin speed reducer with a built-in elaborate, strong differential reduction mechanism

PSR series PSR70 PSR110 PSR135

超薄型减速机
Ultrathin differential speed reducer

超扁平&结构紧凑 Ultra-flat and compact

通过采用差动减速机构和交叉滚子轴承，实现扁平形状。为设备的尺寸紧凑做出贡献。

The adoption of a differential reduction mechanism and a thin cross-roller bearing has enabled an ultra-flat form. This contributes to the realization of contraction and compactification of equipment.

高精度&高刚性 High precision & High rigidity

通过精密次摆线齿轮和高精度滚销的复数啮合，实现高传动精度和高刚性。

Plural meshing of precision trochoid gears and high-precision rollers has realized high-precision transmission and high-rigidity.

高效率 High efficiency

通过设定合适的压力角实现圆滑动作和高效率。

Appropriate pressure angle setting has made operation smooth and highly efficient.

低背隙 Small backlash

通过各部件间隙的最佳化配置，可以实现背隙3arcmin以下的高精度定位。

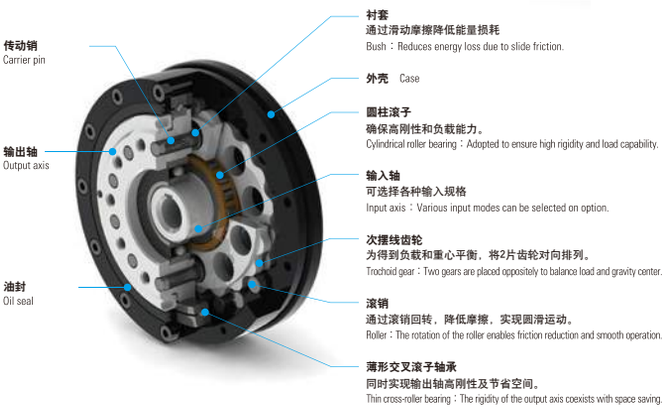
The optimization of each part clearance enables high-precision positioning with the backlash of 3 arcmin or less.

免维护 Maintenance-free

封入油脂，免维护，无需给油，自由安装。

Grease inclusion has eliminated the need of maintenance. There is no need of greasing, and there is no limiting to mounting posture.

构 造 Structure

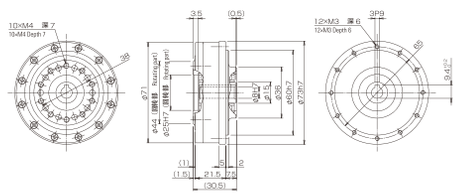


规 格 Specifications

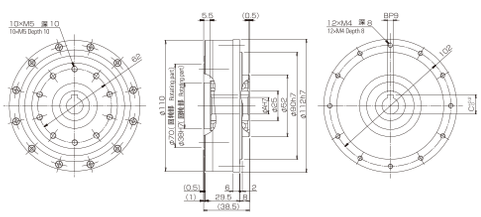
型 号 Model		PSR70			PSR110			PSR135		
减速比 Reduction ratio		19	39	49	19	39	59	19	39	59
输入轴对输出轴的回转方向 Rotational direction of output axis to input axis		逆方向 Reverse direction			逆方向 Reverse direction			逆方向 Reverse direction		
允许额定扭矩 Allowable rated torque	N・m	16	26	26	32	65	65	65	130	130
加速峰值扭矩 Accelerating peak torque	N・m	32	52	52	65	130	130	130	260	260
瞬间最大扭矩 Maximum instantaneous torque	N・m	48	90	96	96	195	195	195	390	390
允许平均输入回转数 Allowable average rotational speed	rpm	3000			3000			3000		
最高输入回转数 Maximum rotational speed	rpm	4500			4500			4500		
背隙 Backlash	arcmin	4			3			3		
输入轴对输出轴的回转方向 Recommended motor capacity	W	100			200・400			750		
换算到输入轴的惯量 Input axis equivalent inertia moment	$\times 10^{-4}$kg・m^2	0.037	0.036	0.036	0.310	0.298	0.295	1.337	1.295	1.287
输入轴孔径 Input axis hole diameter	mm	6・8			8・10・11・14			14・16・19		
质量（不含电机法兰） Mass (without motor attachment)	kg	0.6			2.1			4.1		

外形尺寸图 Outline dimensional drawings

● PSR70FHA-□□-00008



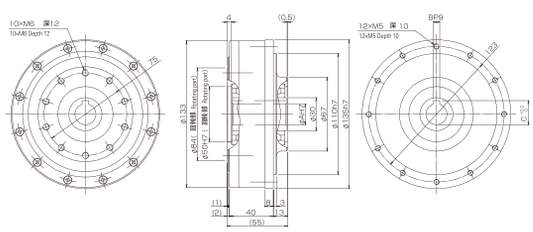
● PSR110FHA-□□-000□□



尺寸表 Dimensional table

型 号 Model	A	B	C
PSR110FHA-□□-00008	8	3	9.4
PSR110FHA-□□-00010	10	3	11.4
PSR110FHA-□□-00011	11	4	12.8
PSR110FHA-□□-00014	14	5	16.3

● PSR135FHA-□□-000□□



尺寸表 Dimensional table

型 号 Model	A	B	C
PSR135FHA-□□-00014	14	5	16.3
PSR135FHA-□□-00016	16	5	18.3
PSR135FHA-□□-00019	19	6	21.8

PSR/PSL series 应用例 PSR series application examples

脚踏式移动工具
Mobility

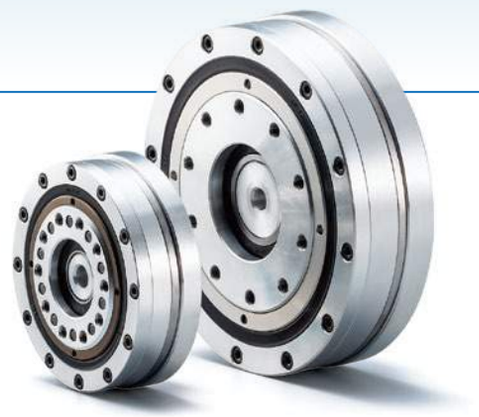
探查机
Probe vehicle

人形机器人
Humanoid robot

行走辅助装置
Assist suit

PSL series PSL70 PSL110

超轻量薄型减速机
Ultrathin differential speed reducer lightweight model



■实现轻量化 Light Weight

减速机主要零部件由铝材制成的轻量型号。相比之前，实现30%的轻量化。

Released the light weight model "PSL" which is used Aluminium to the main construct part for Reducer.This is realized to decrease the mass about 30% from the conventional model.

规 格 Specifications

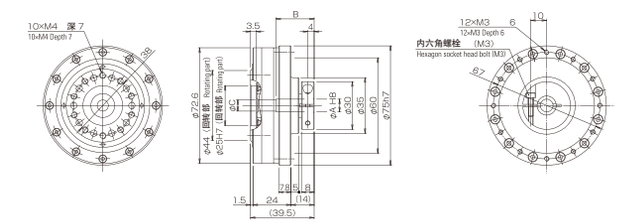
型 号 Model		PSL70			PSL110		
减速比 Reduction ratio		19	39	49	19	39	59
相对输入轴，输出轴的回转方向 Rotational direction of output axis to input axis		逆方向 Reverse direction			逆方向 Reverse direction		
允许额定扭矩 Allowable rated torque	N・m	12	20	20	26	52	52
加速峰值扭矩 Accelerating peak torque	N・m	26	42	42	52	104	104
瞬间最大扭矩 Maximum instantaneous torque	N・m	48	78	78	96	195	195
允许平均输入回转数 Allowable average rotational speed	rpm	3000			2000		
最高输入回转数 Maximum rotational speed	rpm	4500			4500		
背隙 Backlash	arcmin	4			3		
推荐电机容量 Recommended motor capacity	W	100			200・400		
换算到输入轴的惯量 Input axis equivalent inertia moment	$\times 10^{-4}$kg・m^2	0.041	0.040	0.040	0.256	0.247	0.246
输入轴孔径 Input axis hole diameter	mm	6・8			8・10・11・14		
质量（不含电机法兰） Mass (without motor attachment)	kg	0.42			1.4		

PSR/PSL 精度规格 Precision Standard

型 号 Model	速 比 Speed ratio	角度传动精度 Angular transmission accuracy arcmin	动作损失 Lost motion arcmin	弹性系数 b/a Spring constant b/a $\times 10^4$N・m/rad
PSR70	19	5	4	0.6
	49			0.9
PSR110	19	4	3	1.7
	59			3.3
PSR135	19	3	3	5.2
	59			11.0
PSL70	19	5	4	0.6
	49			0.9
PSL110	19	4	3	1.7
	59			3.3

外形尺寸图 Outline dimensional drawings

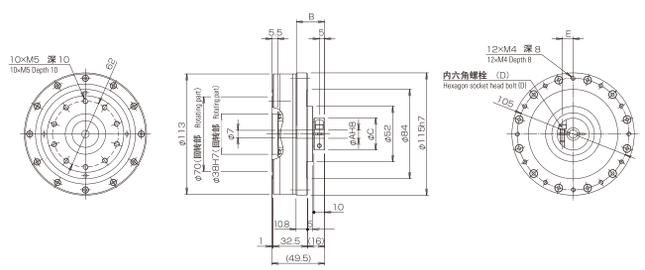
●PSL70FCA-□□-000□□



尺寸表 Dimensional table

型 号 Model	A	B	C
PSL70FCA-□□-00006	6	17.5	5
PSL70FCA-□□-00008	8	21.5	7

●PSL110FCA-□□-000□□



尺寸表 Dimensional table

型 号 Model	A	B	C	D	E
PSL110FCA-□□-00008	8	21.5	30	M4	10
PSL110FCA-□□-00010	10	21.5	40	M5	14
PSL110FCA-□□-00011	11	26.5	40	M5	14
PSL110FCA-□□-00014	14	34.5	40	M5	14

PSR/PSL series 应用例 PSR series application examples

多关节机器人
Articulated robot

关节机器人
SCARA robot

医疗看护类机械
Care and welfare equipment

与TCG系列的组合装置
Combination with TCG Series

BR series

零背隙精密球减速机

Non-backlash precision ball reducer

JFR series

JFR60 JFR90 JFR120

同心轴薄型球减速机

Just-fit Ball Reducer

减速比：10.5 ～ 40
电机推荐容量：200 ～ 1500W

Reduction ratio : 10.5-40
Motor capacity : 200-1500W

零背隙 Non-backlash

减速部不使用齿轮，而是采用大量钢球。
通过预压，保持常时滚动接触，没有背隙。

Many steel balls are employed to reduction portion instead of toothed wheels.
Rolling contact due to preset pressure enables users to minimize amount of backlash.

低噪音 Low Level Noise

回转部全部滚动接触，所以只有钢球的滚动声。完全没有像齿轮啮合那样的敲齿声。
也适用于对于安静程度较高的医疗设备行业。

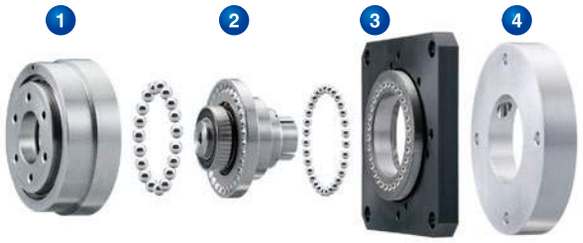
There is only rolling ball noise due to the rolling contact of steel balls at all rotating members.
There is no meshing or flexing gear noise at all. Therefore, The ball reducer is used for medical equipment, which requires quiet.

结构紧凑 & 简洁 Compact & Simple

将减速机构部分和输入、输出的轴承部内藏于外壳中，外形紧凑。
作为输入、输出同心轴型的减速机，可以实现简单安装。

By integrating a reducer mechanism and an input / output part into the housing the unit is assembled to be compact size, and the reducer with the concentricity of the input / output has materialized no dead space installation.

JFR 球减速机结构 Structual Drowing of Just-fit Ball Reduction



❶ 预 压 部 PRELOADING

通过拧紧预压螺母，在各个部分给与相应的预压，让啮合变得更加准确，消除背隙。

By fastening the preloading nut of the housing, preload is applied to each portion to ensure mating and eliminate backlash.

❷ 减 速 部 REDUCER

由偏心板、减速用钢球以及输出板构成，通过偏心板的公转运动(偏心回转)给与减速用的钢球以摆线运动。

The speed reducer is composed of an eccentric plate, reduction balls and an output plate. When the eccentric plate performs an orbital motion (eccentric rotation), a cycloid motion is transferred to the reduction ball.

❸ 十字滑板机构部 OLDHAM

由固定板(圆环沟槽)、偏心板(单侧有圆环沟槽)、钢球构成，消除偏心板的自转运动。

The Oldham's joint, composed of a fixed plate (doughnut groove), an eccentric plate (doughnut groove on one side) and balls, is designed to eliminate the auto-rotational motion from the eccentric plate.

❹ 输 入 部 INPUT

由外部输入的回转运动，通过输入轴的偏心轴部（曲轴）让偏心板产生公转运动（偏心回转）。

By the eccentric shaft (crank shaft) portion of the input shaft, the rotational force inputted from the outside is converted into the orbital rotational motion (eccentric rotation) of the eccentric plate.

SFP-S series

SFP70SCA SFP85SCA
SFP100SCA SFP125SCA

同心轴强化型球减速机

Strong Type Ball Reducer

减速比：1/8 ～ 1/50
电机推荐容量：100 ～ 1500W

Reduction ratio : 8-50
Motor capacity : 100-1500W

改良摆线曲线，允许扭矩比BR系列提升1.5倍。
输出轴、径向负载强化为2倍。
同样具备零背隙、高效率的特征。

Regarding SFP series, this cycloidal curve has been improved to increase the allowable torque to 1.5 times and Three output shaft bearings and double the radial load compared with the BR series. It inherits the features of Zero-backlash and high efficiency similar to the Ball reducers.

BR-S series

BR50S BR65S BR85S
BR100S BR125S BR160S

同心轴球减速机

Standard Type Ball Reducer

减速比：1/10 ～ 1/50
电机推荐容量：50 ～ 1500W

Reduction ratio : 10-50
Motor capacity : 50-1500W

BR-U series

BR50U BR65U BR85U
BR100U BR125U BR160U

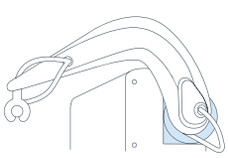
同心轴球减速机

Standard Type Ball Reducer

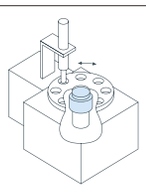
减速比：1/10 ～ 1/50
电机推荐容量：50 ～ 1500W

Reduction ratio : 10-50
Motor capacity : 50-1500W

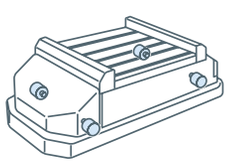
BR series 应用例 BR series application examples



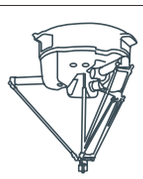
机器人手臂的驱动
Driving a robot arm shaft



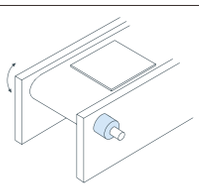
分度转台的驱动
Driving an index table



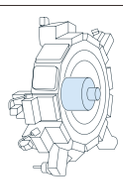
AGV车轮的驱动
Driving an AGV wheel



并联机器人的驱动
Joint Driving for Parallel Link Robot



皮带的驱动部
Driving a belt conveyor



机械加工设备的ATC驱动
ATC drive unit for machine tools

INDEX Air Motive Power Actuator series

结构精简的气动分度器

Pneumatic Indexer contributes to simplify your device configuration

MINIDEX MDF20 MDF30

气动分度器

Air Index Cylinder

■紧凑&结构简单 Compact & Simple

使用简单的分度机构，
将气动驱动部和分度机构紧凑地组件化。

Simple indexing mechanism has compactly unitized it with the pneumatic drive unit.

■节省空间 Space conservation

本体外形是圆柱体，仅仅连接气管就可以分度，可以有效节约设备空间。

Installation space can be saved due to cylindrical main unit and indexing only by air-supply piping.

■低成本 Low cost

气动分度器，不需要电气控制部分，可以降低设备整体的成本。

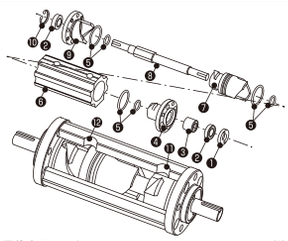
Free electric control mechanism by air index contributes cost saving on system.

■高速分度 High-speed indexing

改进为活塞单程就可以实现1次分度，实现高速化。贡献设备节拍短缩。

Indexing time has been more shortened by changing the indexing movement than previous model.

MDF内部构造 Internal structure of MDF(MINIDEX)



❶	轴承螺母 Bearing nut	❼	凸轮活塞 Cam piston
❷	深槽滚珠轴承 Deep groove ball bearing	❽	轴 Shaft
❸	单向离合器 One-way clutch	❾	凸轮盖 Cam cap
❹	从动盖 Follower cap	❿	卡环 Circlip
❺	O型圈 O-ring	⓫	气口 Air port
❻	缸体 Tube	⓬	气口 Air port

※ 图片为MDF30型。
※ 密封部分全部为JIS标准品。
※ 反转因单向离合器无法产生。

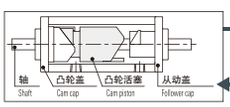
※ The above figure shows MDF30.
※ All seals are JIS-compliant.
※ Inverse rotation is disabled by the action of the internal one-way clutch.

规 格 Specifications

型 号 Model		MDF20		MDF30	
分度数 Number of divisions		4・6・8		4・6・8・10・12	
分度时间 Indexing time	sec	0.1～		0.1～	
分度精度 Indexing precision	± arc・min	±30			
允许负载惯量 Allowable inertia moment	$\times10^{-4}$kg・m²	12.5		25	
允许负载扭矩 Indexing torque	N・m	0.13～1.3		0.3～3.5	
最高使用压力 Max. working pressure	MPa	0.7			
最低动作压力 Min. working pressure	MPa	0.2			
允许径向负载 Allowable radial load	N	14.7		29.4	
允许轴向负载 Allowable thrust load	N	9.8		24.5	
质 量 Mass weight	kg	0.5		0.9	
内部容积 Internal volume	cm³	P1加压	P2加压	P1加压	P2加压
		12	11	26	24

动作原理 Operating principle

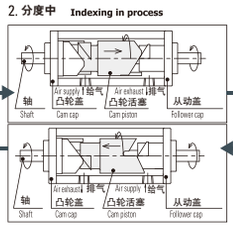
1. 分度完毕（停止）Indexing completed (at a stop)



凸轮活塞和凸轮盖啮合的状态。

The cam piston and the cam cap are in engagement.

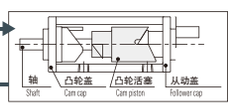
2. 分度中 Indexing in process



由于气阀的切换，凸轮活塞向右（左）方向推动。与凸轮盖（从动盖）的啮合开始分离后，就开始与从动盖（凸轮盖）啮合，随即产生回转。凸轮活塞的回转动作传递给输出轴。

When the solenoid valve is switched, the cam piston moves directly to the right (left). When the cam piston is disengaged from the cam cap (follower cap), the cam piston starts engagement with the follower cap (cam cap), and rotates. The rotation of the cam piston is transmitted to the shaft.

3. 分度完毕（停止）Indexing completed (at a stop)



凸轮活塞与从动盖完全啮合后，1次分度结束。

The cam piston and the follower cap become in complete engagement, and complete one indexing.

※MDF系列推荐搭配使用双向电磁阀。
For MDF Series, it is recommended to use with double solenoid valve.

MINITABLE MT70 MT100 MT125 MT200

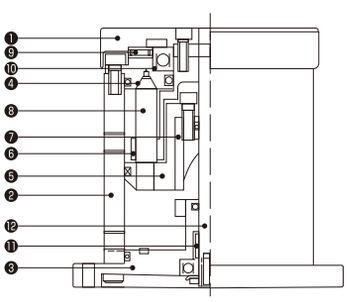
气动分度转台

Air Index Table

兼备高刚性・高精度
可以覆盖广泛使用范围的万能部件

A high-rigidity, high-precision, universal unit with a wide coverage

MT内部构造 Internal structure of MT(MINITABLE)



❶	回转台 Rotating table	❼	凸轮 Bell cam
❷	缸体 Tube	❽	定位销 Locate pin
❸	从动盖 Follower cap	❾	推力轴承 Thrust bearing
❹	孔盖 Hole cap	❿	球轴承 Ball bearing
❺	活塞 Piston	⓫	单向离合器 One-way clutch
❻	分度板 Indexing plate	⓬	轴 Shaft

※ MT70 型，没有 ❶ 推力轴承、❾单向离合器。
MT 70 is not equipped with ❶ thrust bearing and ❾ one-way clutch.

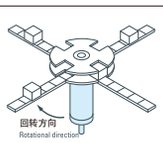
※ 密封件部分全部是JIS规格品。
All seals are JIS-compliant.

规 格 Specifications

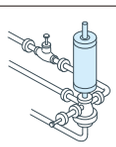
型 号 Model		MT70	MT100	MT125	MT200	备注 Remarks
回转方向 Rotational direction		R・L	R・L	R・L	R・L	从回转台上方看的方向 Direction viewed from rotating table top
分度数 Number of divisions		2・3・4・6	2・3・4・5・6・8	2・3・4・5・6・8・10・12	3・4・5・6・8・10・12・⑯	⑯ 是半标准品 ⑯ is a semi-standard product.
分度时间 Indexing speed	sec	0.5～	0.8～	1.0～	1.5～	用速度控制来调整（数值是无负载时） Speed controller adjustment (Value with no load)
分度精度 Indexing precision	± arc min	4	3	2	1	
允许负载扭矩 Allowable load torque	N・m	2.0	11.7	29.4	98.1	4分度 气压0.4MPa时 For 4 divisions under air pressure 0.4MPa
允许负载惯量 Allowable inertia moment	kg・cm²	18.8	125	1250	7500	
锁定扭矩 Locking torque	N・m	2.9	11.7	29.4	98.1	气压0.4MPa时 For air pressure 0.4MPa
内部容积 Internal volume	cm³	36	250	500	1300	
最高使用压力 Max. pressure	MPa	0.7	0.7	0.7	0.7	
最低动作压力 Min. working pressure	MPa	0.3	0.3	0.3	0.3	
附属转台直径 Sub-table diameter	φ	120	180	250	400	推荐直径 Recommendable diameter
最大装载重量 Laden max. mass weight	kg	1	3	15	35	最大转载时，不可高速运转 High-speed operation not acceptable when the loading capacity is maximum
作业负载 Working load	轴向 Thrust N	98	980	2940	4900	最大转载时，不可高速运转 External load when table stops
	径向 Radial N	29	245	490	1960	
质 量 Mass weight	kg	2	5	10	22	

※ MT系列推荐使用单向电磁阀。
For MT Series, it is recommended to use with single solenoid valve.

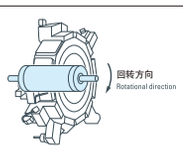
MDF / MSF / MT series 应用例 MDF / MSF / MT series application examples



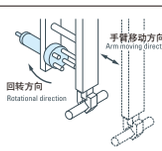
工件的分类(MDF)
Work sorter (MDF)



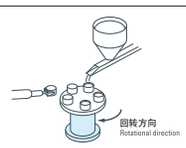
阀门的切换(MDF)
Valve selector (MDF)



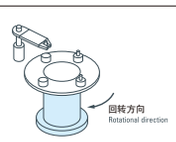
换刀装置的驱动(MDF)
Tool changer drive (MDF)



停止位置切换装置的驱动(MSF)
Stop position selection unit drive (MSF)



可燃性容积的填充装置(MT)
Combustible solvent filler (MT)



转台驱动(MT)
Table drive (MT)

INDEX Pearl Index System series

应用球减速机技术，实现了低价格 ・高精度的电机驱动式分度器

Low-cost, high-precision motor-drive type index realized by applying ball-reducer technology

PDW series PDW06 PDW08 PDW10 PDW12 PDW16

电动分度器

PearIdex with Induction motor

组件化 Unitization

使用带齿轮箱的电机（东方马达公司产）、传感器、确认块

Packaging: Motor with Gear-head (Made by Oriental Motor corp.), sensor and dog

凸轮曲线 Cam curve

采用变正弦加速度曲线（MS曲线），实现圆滑的运动特性

Smooth motion characteristics realized by employing modified sine acceleration curve (MS curve)

免维护 Maintenance-free

润滑脂已经封入，无需维护

Maintenance-free realized by making grease inclusive

小型 Small-sized

60到160方形紧凑尺寸

Compact size of □60-160

低价格 Low cost

组件化同时实现低价

Unitized but cost reduction

对应世界电源 ・ 电压 Applicable to power voltages in the world

单相 110/115V 220/230V 提供标准品

Lineup of single-phase 110/115V and 220/230V as standard

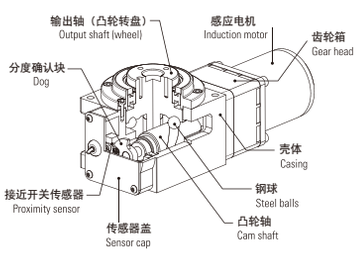
规格・精度 Specifications・Precision Standard

型号 Model	分度精度 Indexing accuracy arc sec	二方向定位精度 Bidirectional positioning arc sec	重复定位精度 Repetitive positioning arc sec	分度扭矩 ※ Indexing torque N·m	允许惯量※ Allowable inertia moment ×10⁻⁴ kg·m²	输出轴 允许径向负载 Allowable radial load N	输出轴 允许轴向负载 Allowable thrust load N
PDW08	±90	90	30	0.38～3.43	40～1750	245	147
PDW10	±90	90	30	0.9～6.6	92～5000	343	196
PDW12	±90	90	30	1.5～12.3	140～7500	490	294
PDW16	±90	90	30	3.6～25.7	335～12500	735	490

※分度扭矩和允许惯量因使用频率、分度数、减速比不同而不同。详细请参考样本页面。

The indexing torque and allowable inertia moment vary depending on the Hz, the number of stations, and the reduction ratio. Please check the product catalogue for details.

构 造 Structure

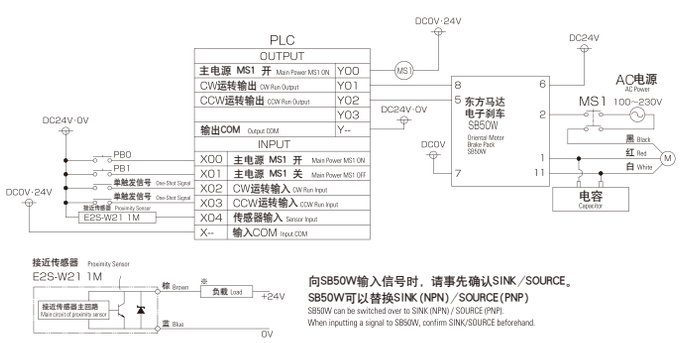


制动方法 How to control Brake Pack

[可编程序控制器接线图] Sequence Diagram

●使用SB50W的情况下

When SB50W is used



向SB50W输入信号时，请事先确认SINK／SOURCE。

SB50W可以替换SINK (NPN)／SOURCE(PNP)

SB50W can be switched over to SINK (NPN) / SOURCE (PNP).

When inputting a signal to SB50W, confirm SINK/SOURCE beforehand.

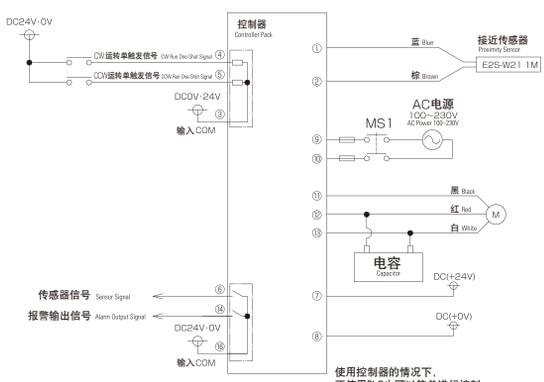
※记号部的负载可以任意接在+24侧或者0侧。

The load on the ※-marked portion can be connected to both the +24 side and the 0 side.

[可编程序控制器接线图] Sequence Diagram

●使用控制器(可选项：E）的情况下

When Controller Pack (Option E) is used



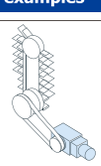
使用控制器的情况下，不使用PLC也可以简单进行控制。

When Controller Pack is used, operation control can be made easily without using PLC.

PDW series 应用例 PDW series application examples

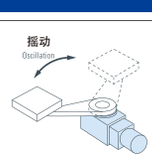
奇数分度驱动

Odd number indexing drive



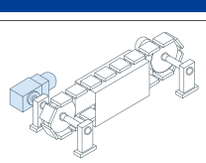
垂直定节距搬送

Vertical pitch transfer



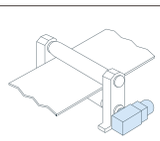
摇动驱动

Oscillation drive



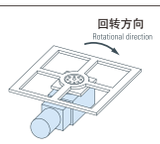
水平定节距搬送

Horizontal pitch transfer



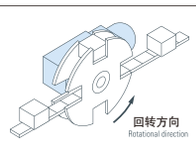
定量裁切进给

Quantitative sheet feed



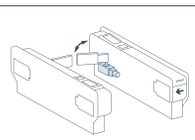
反转装置

Turnover device



垂直反转装置

Vertical turnover device



自动门的开闭

Automatic door opening/closing

零背隙TCG・SFP系列　Non-backlash TCG・SFP Series

TCG·SFP

Trochoid Cam Gear

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SFP系列
SFP Series

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PDW

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分度器 PDW系列
PearIdex PDW Series

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Indexing Actuator

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迷你分度器 MDF系列
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中　国　加茂传动科技（南京）有限公司
地址：江苏省南京市秦淮区太平南路166号远洋国际中心3幢1单元901室
TEL 025-5223-0890　ZIP: 210001
URL www.kamoasia.com　E-mail ztc@kamoasia.com

总公司
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KAMO SEIKO CORPORATION

CHINA　Kamo Drive Technology (Nanjing) Co., Ltd.
Add: Room901, Block 3, Ocean International Center, No.166 South Taiping Road, Qinhuai District, Nanjing, Jiangsu CHINA　ZIP:210001
Tel. +86-25-5223-0890
URL www.kamoasia.com　E-mail ztc@kamoasia.com

HEAD OFFICE
1166 Kamewari, Mitsukuri-cho, Toyota-city, Aichi-prefecture 470-0424, JAPAN
Tel. +81-565-76-0029　Fax. +81-565-76-0023(Rep)
URL www.kamo.co.jp　E-mail market@kamo.co.jp

KOREA
KAMO FA 1Dong-216Ho IT Castle' Gasan-dong, Geumcheon-gu, Seoul, Rep of KOREA
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