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NIETZ

Strain Wave (Harmonic) Gear

Since 2005

The Principle Of Harmonic Gear Transmission

■ Structure

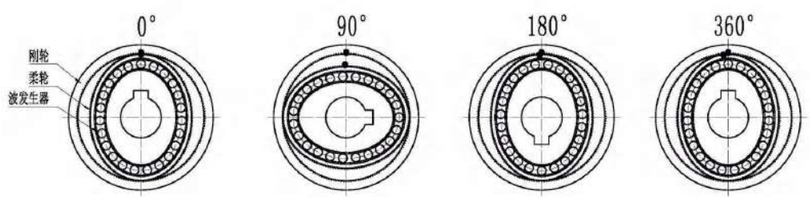
Utilizing a unique operating principle, the gear consists of only 3 basic parts: Wave Generator, Flexspline, and Circular Spline.

- The Wave Generator is a thin raced ball bearing fitted onto an elliptical hub. This serves as a high efficiency torque converter and is generally mounted onto the input or motor shaft.
- The Flex-spline is a non-rigid, thin cylindrical cup with external teeth on the open end of the cup. The Flexspline fits over the Wave Generator and takes on its elliptical shape. The Flexspline is generally used as the output of the gea.
- The Circular Spline is a rigid ring with internal teeth. It engages the teeth of the Flexspline across the major axis of the Wave Generator ellipse. The Circular Spline has two more teeth than the Flexspline and is generally mounted onto a housing.

波发生器 Circular-Spline　柔轮 Flex-Spline　刚轮 Wave Generator

■ Harmonic gear transmission deceleration principle

The harmonic gear drive's reduction mechanism utilizes the relative motion of the flexspline, rigid pulley, and wave generator , primarily the controlled elastic deformation of the flexspline, to achieve motion and power transmission. The elliptical cam within the wave generator rotates within the flexspline, causing it to deform. As the flexspline teeth at both ends of the wave generator's elliptical major axis engage with the rigid pulley teeth, the flexspline teeth at both ends of the minor axis disengage from the rigid pulley teeth. The teeth between the major and minor axes of the wave generator gradually enter a semi-engaged state within different sections along their circumferences, known as engagement. These teeth gradually exit the meshing state, known as disengagement. As the wave generator rotates continuously, the flexspline continuously deforms, causing the teeth on both wheels to continuously change their original working states through four motions: engagement, disengagement, and disengagement. This produces staggered tooth motion, achieving motion transmission from the active wave generator to the flexspline.



The flexible wheel wave generator is bent into an elliptical shape, so the rigid wheel and the flexible wheel are engaged in the long axis part and are completely disengaged in the short axis part.

TFix the rigid wheel and make the wave generator rotate clockwise, the flexible wheel will be elastically deformed and the meshing position with the rigid wheel will move sequentially.

After rotating 180 degrees, the flexspline moves only one tooth counterclockwise.

After the wave generator rotates one full revolution (360°), the flexspline moves two teeth counterclockwise because it has two fewer teeth than the rigid gear.

■ Numbering sequence

SPHG 017 050-SP
① ③ ④ ⑤ ⑥
SPHG 017 61 102 0
① ② ③ ④ ⑦ ⑧ ⑨

① Product Code
② Flexspline Structure Type (C - Cup, H - Hollow, D - Cylindrical) H0LL0W Cap Type (Hollow)
③ High Torque Models (Standard Torque F, High Torque G)
④ Structure Size Codes (014, 017, 020, 025, 032, 040)
⑤ Transmission Ratios (30/50/80/100/120/160)
⑥ Special Structure Codes for Harmonic Reducers (U for Complete Structure, SP for Simple Structure, Connection Method)
⑦ Component Code (00 - Assembly, 61 - Rigid Pulley, 62 - Flex Pulley, 63 - Hollow Oval Shaft, 64 - Oval Cam, 65 - Input Flange (Front Cover), 66 - Output Flange (Rear Cover), 67 - Cover, 68 - Inner Sleeve, 69 - Input Shaft, 70 - Connecting Flange, etc.)
⑧ Number of Gear Teeth
⑨ Design Sequence Number

■ Model Examples

BCSG – 17 – 80 – Form –Special specifications

Mode	Code	reduction ratio					Type (standard)	Special specifications
BCSF	14	50	80	100			2A= Special specifications 2UH= Combination Ⅰ : Standard Ⅱ : Oldham coupling	SP= Special specifications such as shape, performance, etc. Blank = standard product
	17	50	80	100	120			
	20	50	80	100	120	160		
	25	50	80	100	120	160		
	32	50	80	100	120	160		
	40	50	80	100	120	160		
BCSG	14	50	80	100			2A= Special specifications 2UH= Combination Ⅰ : Standard Ⅱ : Oldham coupling Ⅱ : Oldham coupling	SP=Special specifications such as shape, performance, etc. Blank = standard product
	17	50	80	100	120			
	20	50	80	100	120	160		
	25	50	80	100	120	160		
	32	50	80	100	120	160		
	40	50	80	100	120	160		
BSHF	14	50	80	100			2A= Special specifications 2UH= Combination Ⅰ : Standard Ⅱ : Oldham coupling Ⅲ : Hollow shaft type Ⅳ : Shaft input type	SP=Special specifications such as shape, performance, etc. Blank = standard product
	17	50	80	100	120			
	20	50	80	100	120	160		
	25	50	80	100	120	160		
	32	50	80	100	120	160		
	40	50	80	100	120	160		
BSHG	14	50	80	100			2A= Special specifications 2UH= Combination Ⅰ : Standard Ⅱ : Oldham coupling Ⅲ : Hollow shaft type Ⅳ : Shaft input type	SP=Special specifications such as shape, performance, etc. Blank = standard product
	17	50	80	100	120			
	20	50	80	100	120	160		
	25	50	80	100	120	160		
	32	50	80	100	120	160		
	40	50	80	100	120	160		

■ Code

Code	14	17	20	25	32	40
Diameter	35.56	43.18	50.8	63.5	81.28	101.6

■ Connection method

Type I: Standard type. The input shaft mates with the inner hole of the elliptical cam and is fastened with screws or a key.
Type II: Oldham coupling type. The input shaft and cam are connected using an Oldham coupling.
Type III: Hollow shaft type. The input end component is connected to the hollow elliptical shaft via screws.
Type IV: Solid shaft input type. The shaft is directly connected to the servo motor.

■ Shape

Special performance specifications, blank = standard, SP = special, LW = light weight

Harmonic reducer performance parameters

■ Starting torque (N.Cm)

Model	14			17			20				25				32			
Reduction ratio	50	80	100	50	80	100	50	80	100	120	50	80	100	120	50	80	100	120
BCSG Ⅰ Ⅱ	4.1	2.8	2.5	6.1	4	3.4	7.8	4.9	4.3	3.8	15	9.2	8	7.3	31	19	18	15
BSHG Ⅰ Ⅱ	4.1	2.8	2.5	6.1	4	3.4	7.8	4.9	4.3	3.8	15	9.2	8	7.3	31	19	18	15
BSHG– Ⅲ	8.8	7.5	6.9	27	25	24	36	33	32	31	56	50	49	48	85	74	72	68
BSHG– Ⅳ	5.7	4.4	3.7	9.7	7.2	6.5	14	11	9.9	9.3	22	15	14	13	41	29	27	24
BCSD	4	–	2.5	6	–	3.4	8		4.6		14.5		8.2		29		18	
BSHD	5.6	–	4.3	17.1	–	15.3	22.5		19.8		35		31		54		45	

■ BCSF, BSHF series harmonic reducer performance parameters

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	5.4	18	6.9	35	8000	3500	20	10000
	80	7.8	23	11	47			20	12000
	100	7.8	28	11	54			15	12000
17	50	16	34	26	70	7000	3500	20	10000
	80	22	43	27	87			20	12000
	100	24	54	39	108			15	12000
	120	24	54	39	90			15	12000
20	50	25	56	34	98	6000	3500	20	10000
	80	34	74	47	127			20	12000
	100	40	82	49	147			20	12000
	120	40	87	49	147			15	12000
	160	40	92	49	147			15	12000
25	50	39	96	55	186	5500	3500	20	10000
	80	63	137	87	255			20	12000
	100	67	157	108	284			20	12000
	120	67	167	108	305			15	12000
	160	67	178	108	315			15	12000
32	50	76	216	108	382	4500	3500	20	10000
	80	118	304	167	569			20	12000
	100	137	334	216	647			20	12000
	120	137	353	216	686			15	12000
	160	137	372	216	686			15	12000
40	50	157	402	197	686	4000	3000	20	10000
	80	210	519	284	980			20	12000
	100	265	568	372	1080			20	12000
	120	295	617	451	1180			15	12000
	160	295	650	451	1180			15	12000

■ BCSG, BSHG series harmonic reducer performance parameters

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	7	23	9	46	8000	3500	20	10000
	80	10	30	14	61			20	12000
	100	10	36	14	70			15	12000
17	50	21	44	34	91	7000	3500	20	10000
	80	29	56	35	113			20	12000
	100	31	70	51	143			15	12000
	120	31	70	51	112			15	12000
20	50	33	73	44	127	6000	3500	20	10000
	80	44	96	61	165			20	12000
	100	52	107	64	191			20	12000
	120	52	113	64	191			15	12000
	160	52	120	64	191			15	12000
25	50	51	127	72	242	5500	3500	20	10000
	80	82	178	113	332			20	12000
	100	87	204	140	369			20	12000
	120	87	217	140	395			15	12000
	160	87	229	140	408			15	12000
32	50	99	291	140	497	4500	3500	20	10000
	80	153	395	217	738			20	12000
	100	178	433	281	841			20	12000
	120	178	459	281	892			15	12000
	160	178	484	281	892			15	12000
40	50	178	523	256	892	4000	3000	20	10000
	80	268	675	369	1270			20	12000
	100	346	738	484	1400			20	12000
	120	382	802	586	1530			15	12000
	160	382	841	586	1530			15	12000

■ BCSD, BSHD series harmonic reducer performance parameters

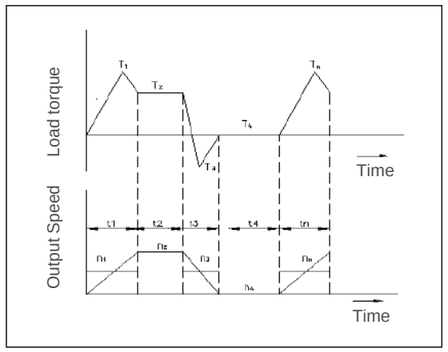
型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	5.4	18	6.9	35	8000	3500	20	10000
	80	7.8	23	11	47			20	12000
	100	7.8	28	11	54			15	12000
17	50	16	34	26	70	7000	3500	20	10000
	80	22	43	27	87			20	12000
	100	24	54	39	108			15	12000
	120	24	54	39	90			15	12000
20	50	25	56	34	98	6000	3500	20	10000
	80	34	74	47	127			20	12000
	100	40	82	49	147			20	12000
	120	40	87	49	147			15	12000
	160	40	92	49	147			15	12000
25	50	39	96	55	186	5500	3500	20	10000
	80	63	137	87	255			20	12000
	100	67	157	108	284			20	12000
	120	67	167	108	305			15	12000
	160	67	178	108	315			15	12000
32	50	76	216	108	382	4500	3500	20	10000
	80	118	304	167	569			20	12000
	100	137	334	216	647			20	12000
	120	137	353	216	686			15	12000
	160	137	372	216	686			15	12000
40	50	157	402	197	686	4000	3000	20	10000
	80	210	519	284	980			20	12000
	100	265	568	372	1080			20	12000
	120	295	617	451	1180			15	12000
	160	295	650	451	1180			15	12000

Selection Guide

Large torque applies at the starting and stopping moment of the gear. In addition, during mormal operation, there might be unexpected impact torque. In order to confirm gear size and ratio, those dynamic load torques have to be converted to an average torque.

■ Load Torque Characteristics

Calculation of average load torque and average output speed.

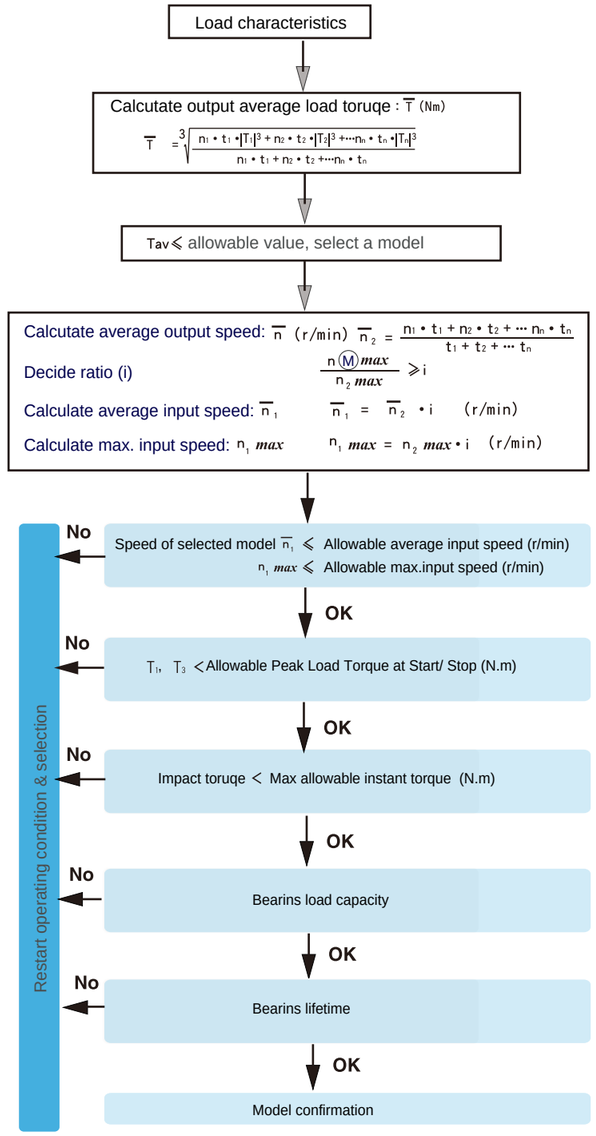


Calculation Instruction

Load Torque	T_n (Nm)
Time	t_n (sec)
Output Speed	n_n (r/min)
Acceleration	T_1、t_1、n_1
Normal Operation	T_2、t_2、n_2
Deceleration	T_3、t_3、n_3
Dwell	T_4、t_4、n_4
Max. Output Speed	$n_{2\,max}$
Max. Input Speed	$n_{1\,max}$
Reduction ratio	i

■ Selection Method

Please use the chart below for size selection.
Any parameter exceeding rated performance results in a different size or changing lad torque.

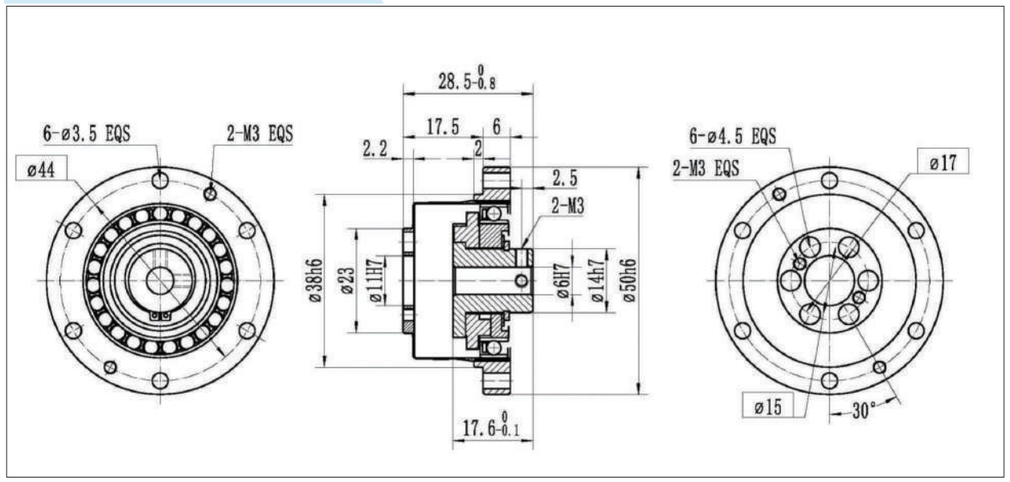


BCSF-I series harmonic reducer

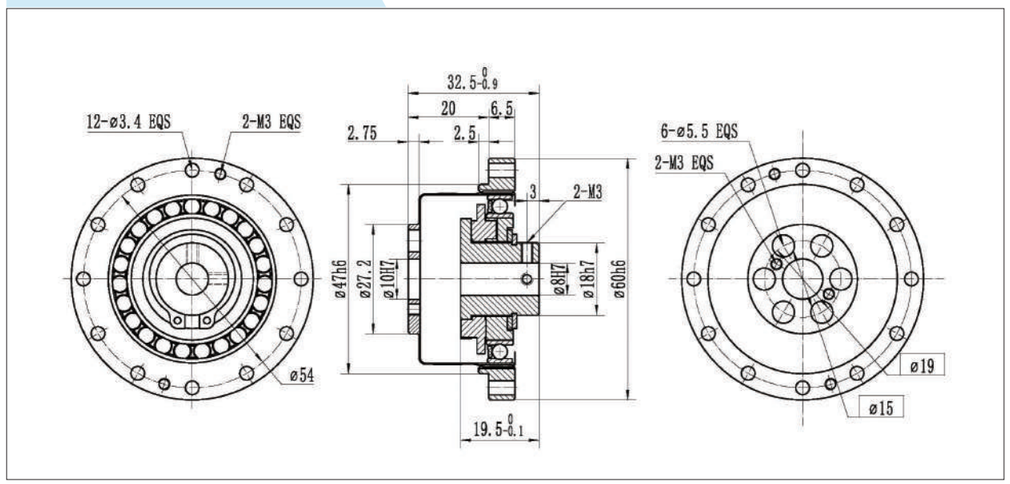
■ BCSF-I series harmonic reducer performance parameters

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	⩽	Hour
14	50	5.4	18	6.9	35	8000	3500	20	10000
	80	7.8	23	11	47			20	12000
	100	7.8	28	11	54			15	12000
17	50	16	34	26	70	7000	3500	20	10000
	80	22	43	27	87			20	12000
	100	24	54	39	108			15	12000
	120	24	54	39	90			15	12000
20	50	25	56	34	98	6000	3500	20	10000
	80	34	74	47	127			20	12000
	100	40	82	49	147			20	12000
	120	40	87	49	147			15	12000
	160	40	92	49	147			15	12000
25	50	39	96	55	186	5500	3500	20	10000
	80	63	137	87	255			20	12000
	100	67	157	108	284			20	12000
	120	67	167	108	305			15	12000
	160	67	178	108	315			15	12000
32	50	76	216	108	382	4500	3500	20	10000
	80	118	304	167	569			20	12000
	100	137	334	216	647			20	12000
	120	137	353	216	686			15	12000
	160	137	372	216	686			15	12000
40	50	157	402	197	686	4000	3000	20	10000
	80	210	519	284	980			20	12000
	100	265	568	372	1080			20	12000
	120	295	617	451	1180			15	12000
	160	295	650	451	1180			15	12000

BCSF–14 –I



BCSF–17 –I



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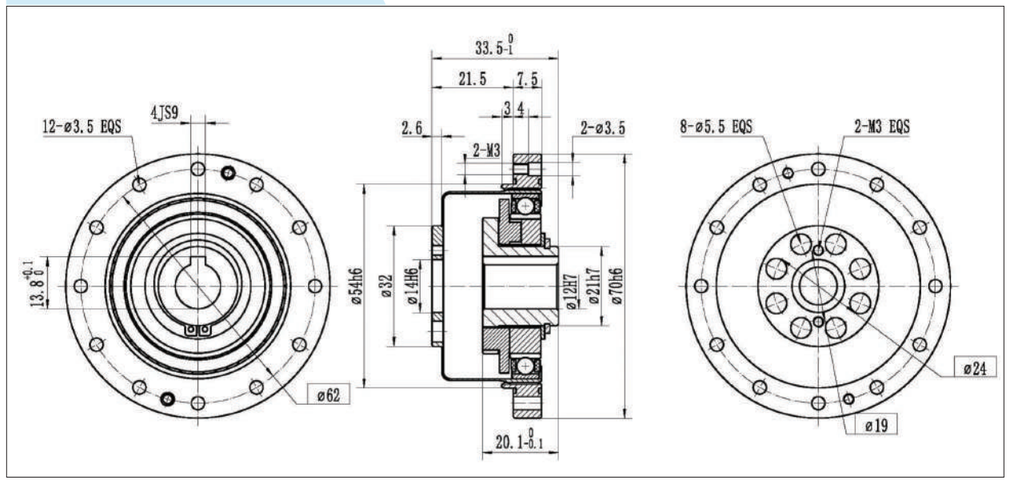
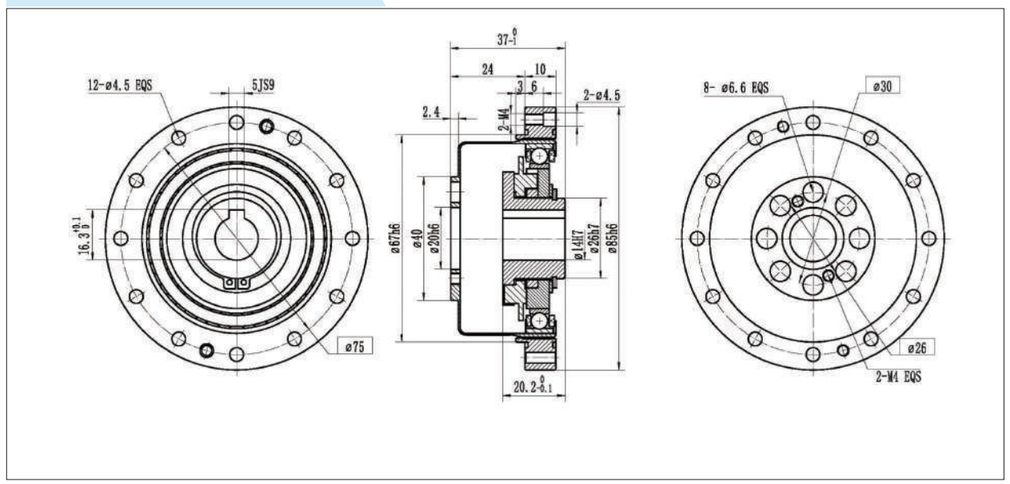
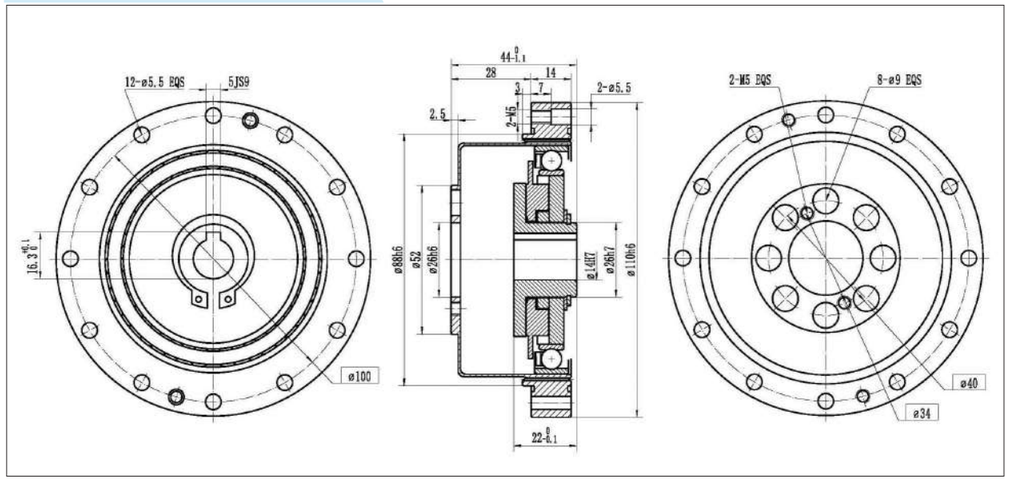


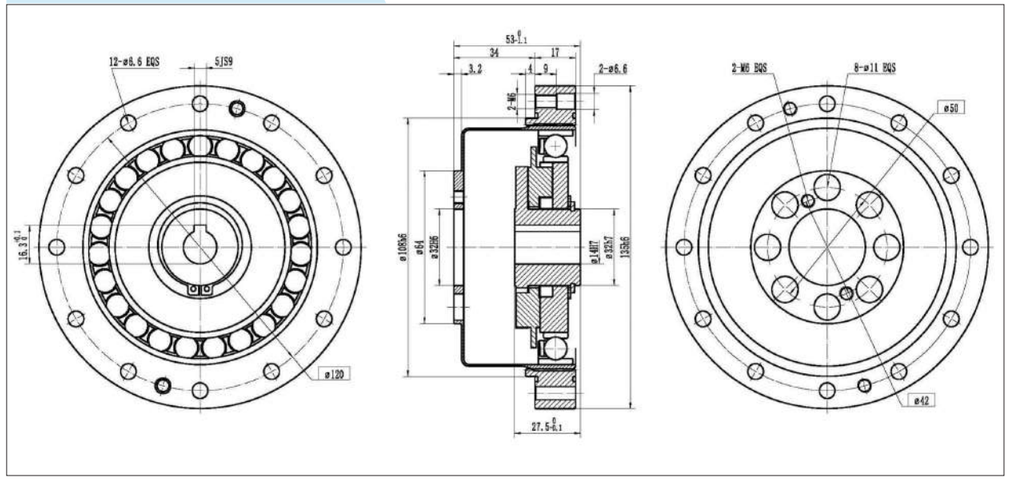
BCSF–25 –I



BCSF–32 –Ⅰ



BCSF–40 –Ⅰ

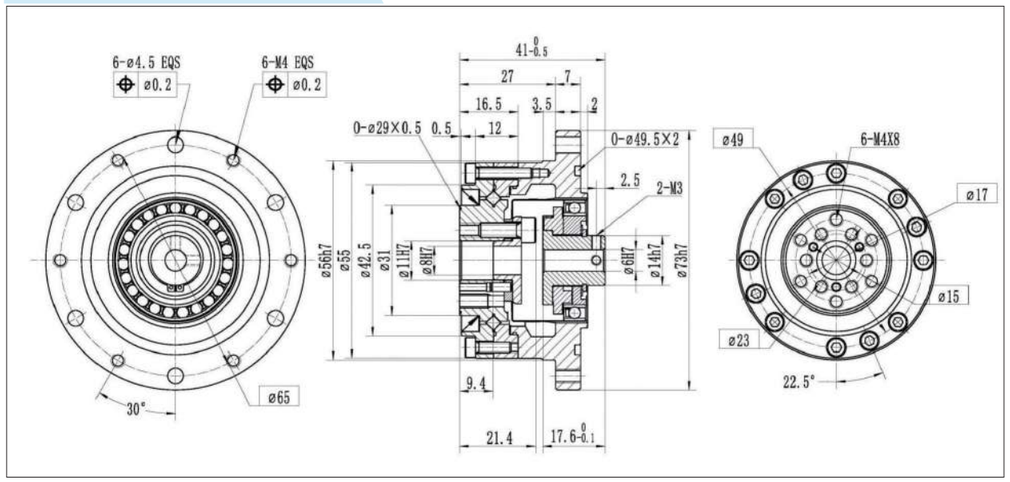


BCSF-II series harmonic reducer

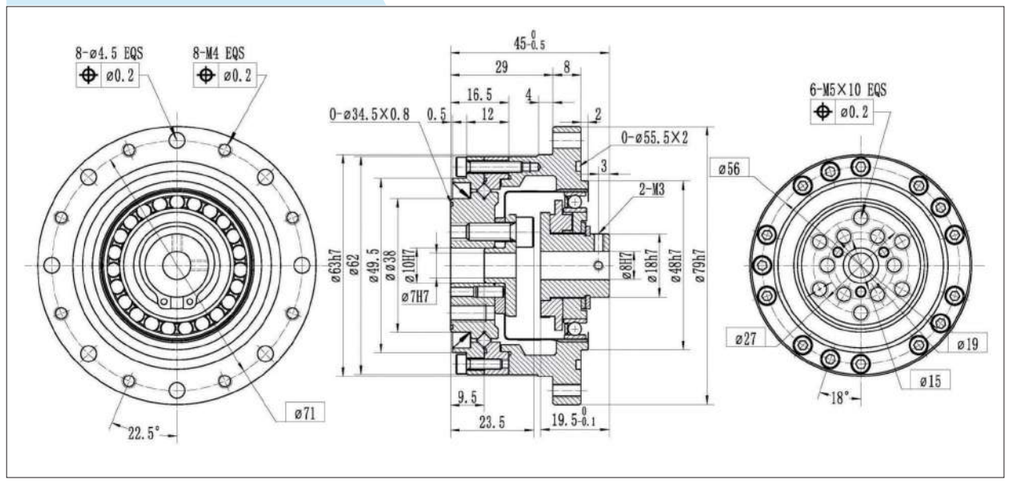
■ BCSF-II series harmonic reducer performance parameters

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	5.4	18	6.9	35	8000	3500	20	10000
	80	7.8	23	11	47			20	12000
	100	7.8	28	11	54			15	12000
17	50	16	34	26	70	7000	3500	20	10000
	80	22	43	27	87			20	12000
	100	24	54	39	108			15	12000
	120	24	54	39	90			15	12000
20	50	25	56	34	98	6000	3500	20	10000
	80	34	74	47	127			20	12000
	100	40	82	49	147			20	12000
	120	40	87	49	147			15	12000
	160	40	92	49	147			15	12000
25	50	39	96	55	186	5500	3500	20	10000
	80	63	137	87	255			20	12000
	100	67	157	108	284			20	12000
	120	67	167	108	305			15	12000
	160	67	178	108	315			15	12000
32	50	76	216	108	382	4500	3500	20	10000
	80	118	304	167	569			20	12000
	100	137	334	216	647			20	12000
	120	137	353	216	686			15	12000
	160	137	372	216	686			15	12000
40	50	157	402	197	686	4000	3000	20	10000
	80	210	519	284	980			20	12000
	100	265	568	372	1080			20	12000
	120	295	617	451	1180			15	12000
	160	295	650	451	1180			15	12000

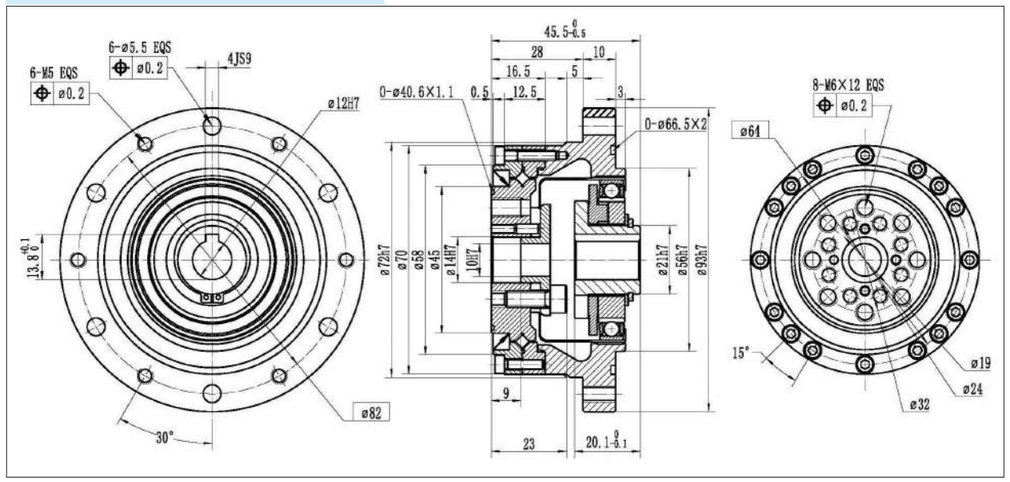
BCSF-14-XXX-Ⅱ



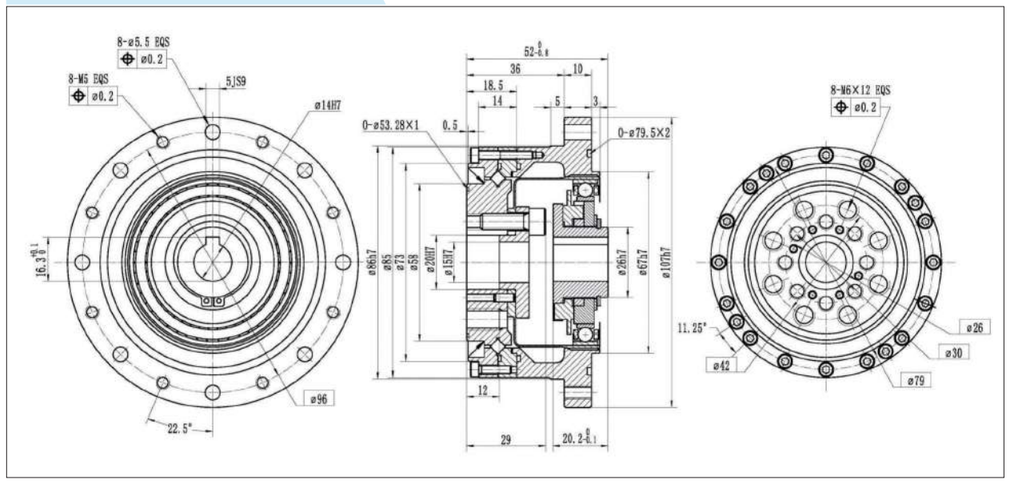
BCSF-17-XXX-Ⅱ



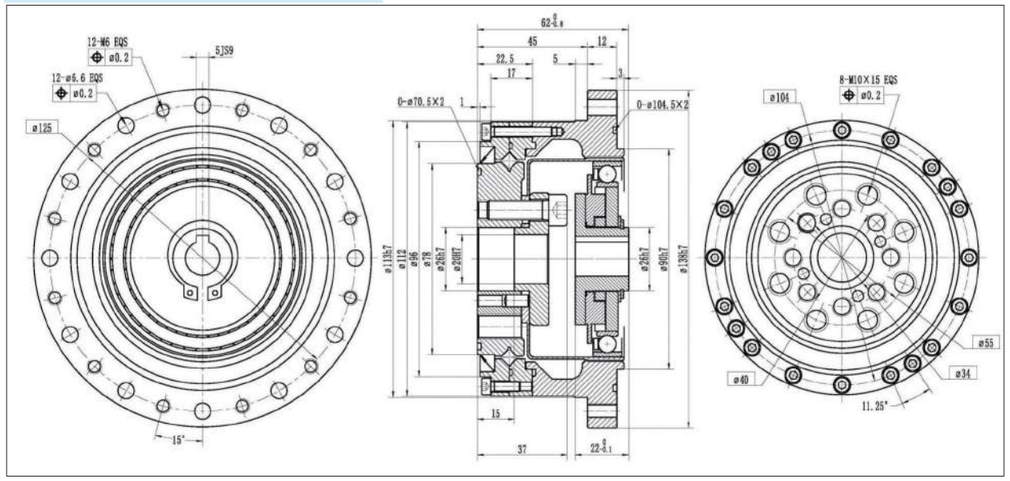
BCSF-20-XXX-Ⅱ



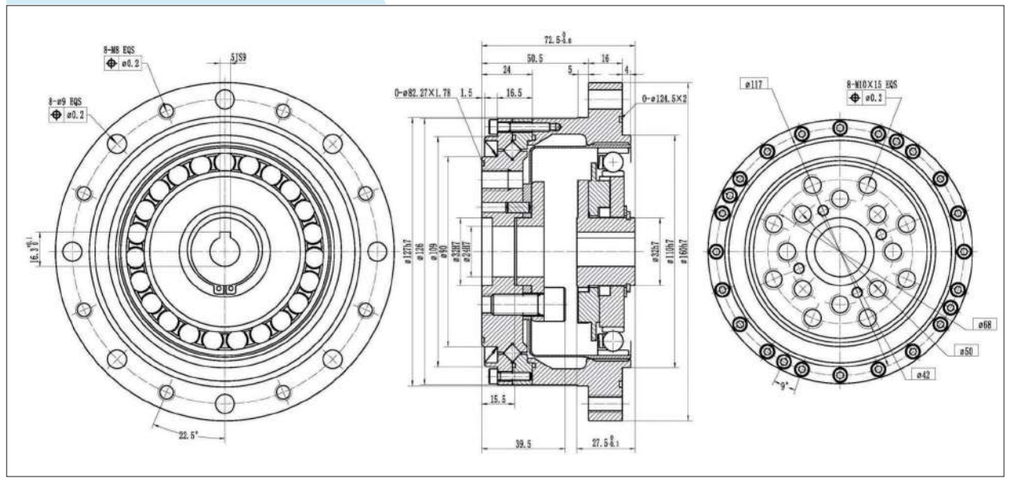
BCSF-25-XXX-Ⅱ



BCSF–32–XXX–Ⅱ



BCSF–40–XXX–Ⅱ

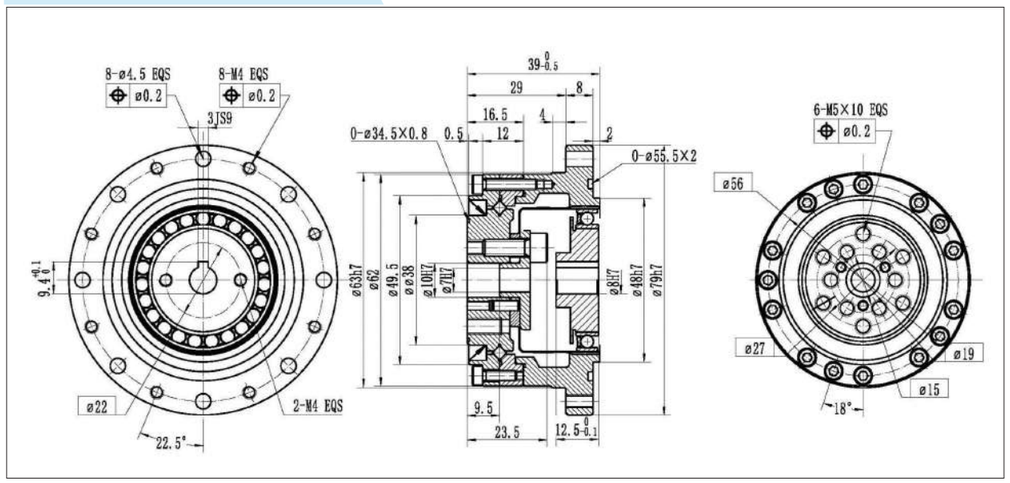


BCSF-II-E series harmonic reducer

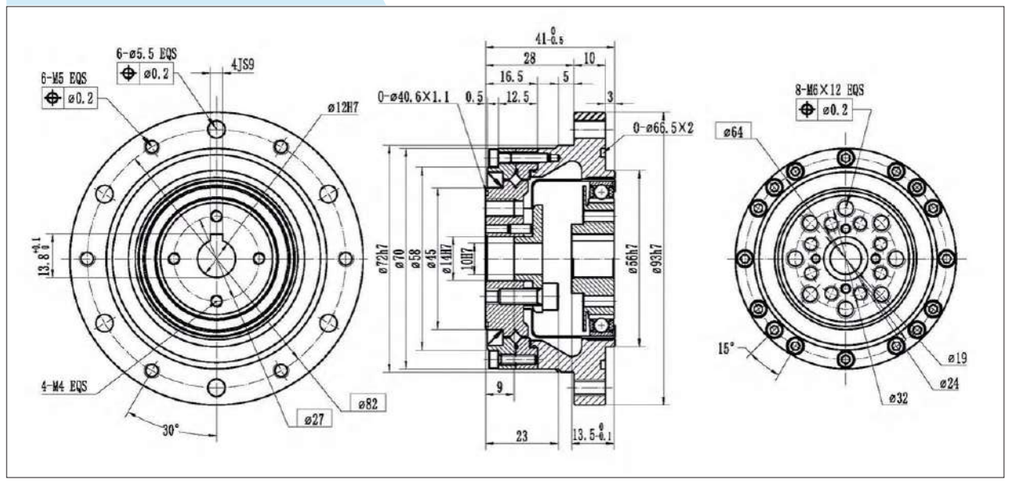
■ BCSF-II-E series harmonic reducer performance parameters

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	5.4	18	6.9	35	8000	3500	20	10000
	80	7.8	23	11	47			20	12000
	100	7.8	28	11	54			15	12000
17	50	16	34	26	70	7000	3500	20	10000
	80	22	43	27	87			20	12000
	100	24	54	39	108			15	12000
	120	24	54	39	90			15	12000
20	50	25	56	34	98	6000	3500	20	10000
	80	34	74	47	127			20	12000
	100	40	82	49	147			20	12000
	120	40	87	49	147			15	12000
	160	40	92	49	147			15	12000
25	50	39	96	55	186	5500	3500	20	10000
	80	63	137	87	255			20	12000
	100	67	157	108	284			20	12000
	120	67	167	108	305			15	12000
	160	67	178	108	315			15	12000
32	50	76	216	108	382	4500	3500	20	10000
	80	118	304	167	569			20	12000
	100	137	334	216	647			20	12000
	120	137	353	216	686			15	12000
	160	137	372	216	686			15	12000
40	50	157	402	197	686	4000	3000	20	10000
	80	210	519	284	980			20	12000
	100	265	568	372	1080			20	12000
	120	295	617	451	1180			15	12000
	160	295	650	451	1180			15	12000

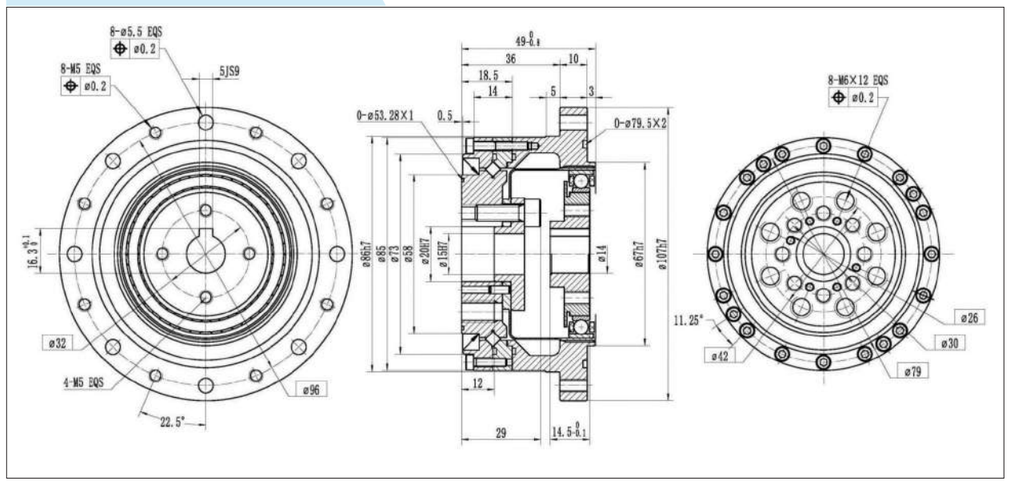
BCSF-17-XXX-Ⅱ-E



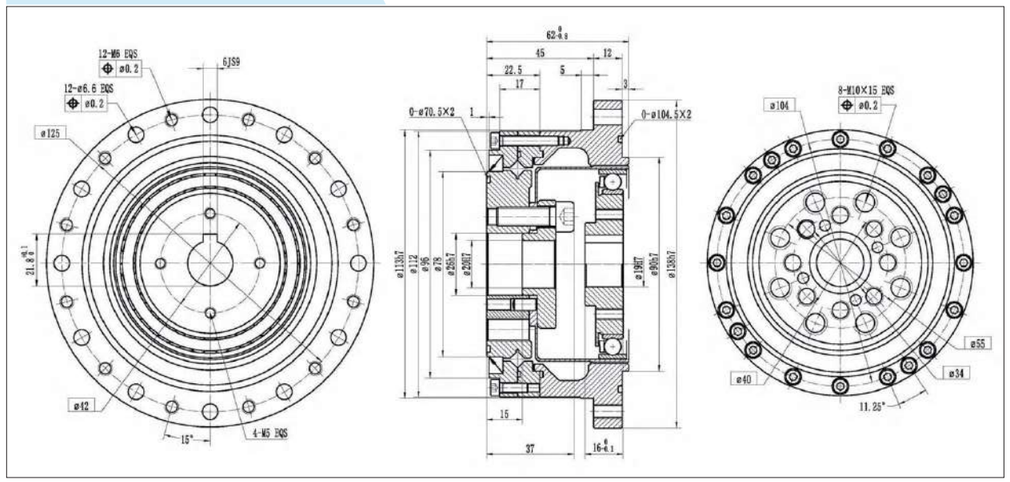
BCSF-20-XXX-Ⅱ-E



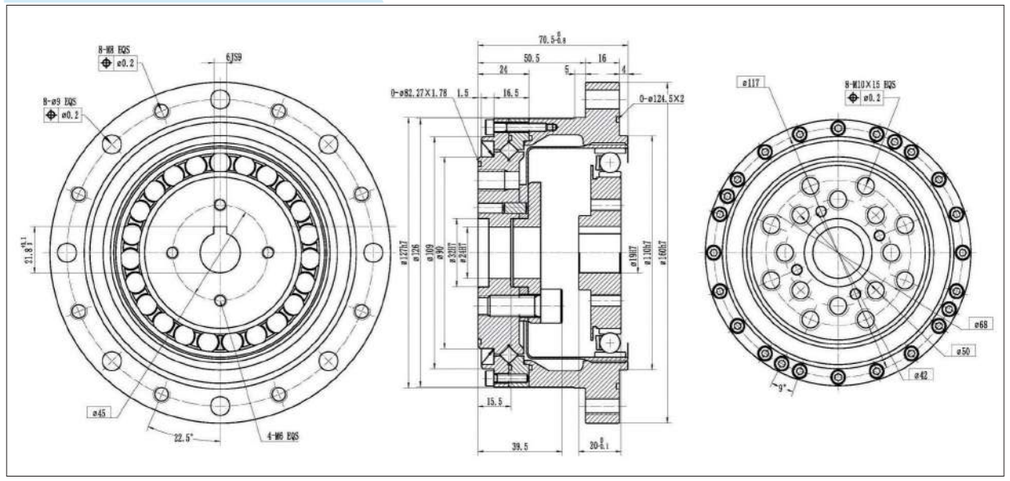
BCSF-25-XXX-Ⅱ-E



BCSF-32-XXX-Ⅱ-E



BCSF–40–XXX–Ⅱ–E

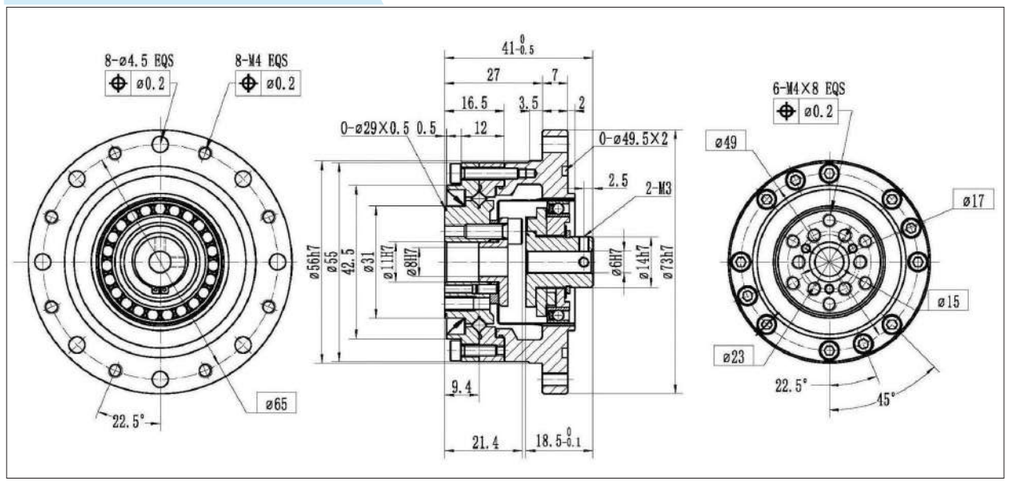


BCSG-II series harmonic reducer

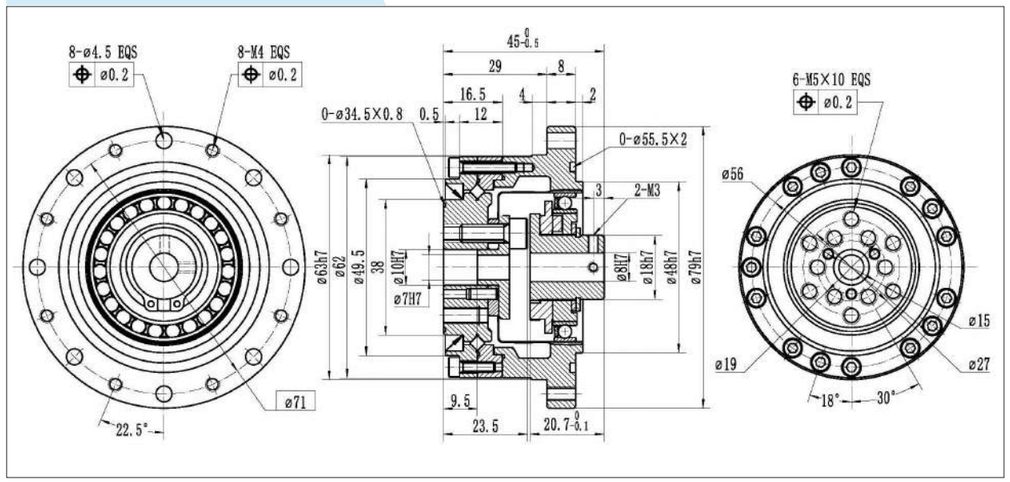
■ BCSG-II series harmonic reducer performance parameters

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	7	23	9	46	8000	3500	20	10000
	80	10	30	14	61			20	12000
	100	10	36	14	70			15	12000
17	50	21	44	34	91	7000	3500	20	10000
	80	29	56	35	113			20	12000
	100	31	70	51	143			15	12000
	120	31	70	51	112			15	12000
20	50	33	73	44	127	6000	3500	20	10000
	80	44	96	61	165			20	12000
	100	52	107	64	191			20	12000
	120	52	113	64	191			15	12000
	160	52	120	64	191			15	12000
25	50	51	127	72	242	5500	3500	20	10000
	80	82	178	113	332			20	12000
	100	87	204	140	369			20	12000
	120	87	217	140	395			15	12000
	160	87	229	140	408			15	12000
32	50	99	291	140	497	4500	3500	20	10000
	80	153	395	217	738			20	12000
	100	178	433	281	841			20	12000
	120	178	459	281	892			15	12000
	160	178	484	281	892			15	12000
40	50	178	523	256	892	4000	3000	20	10000
	80	268	675	369	1270			20	12000
	100	346	738	484	1400			20	12000
	120	382	802	586	1530			15	12000
	160	382	841	586	1530			15	12000

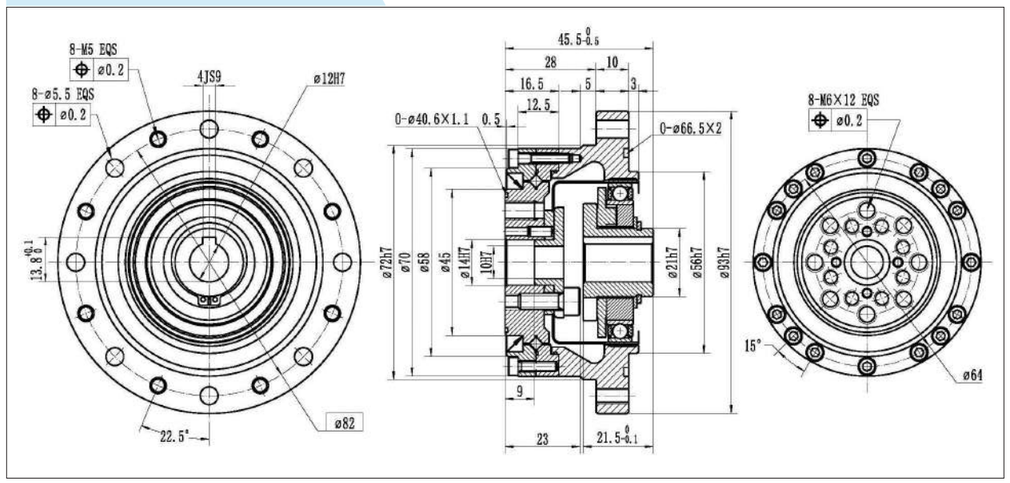
BCSG-14-XXX-Ⅱ



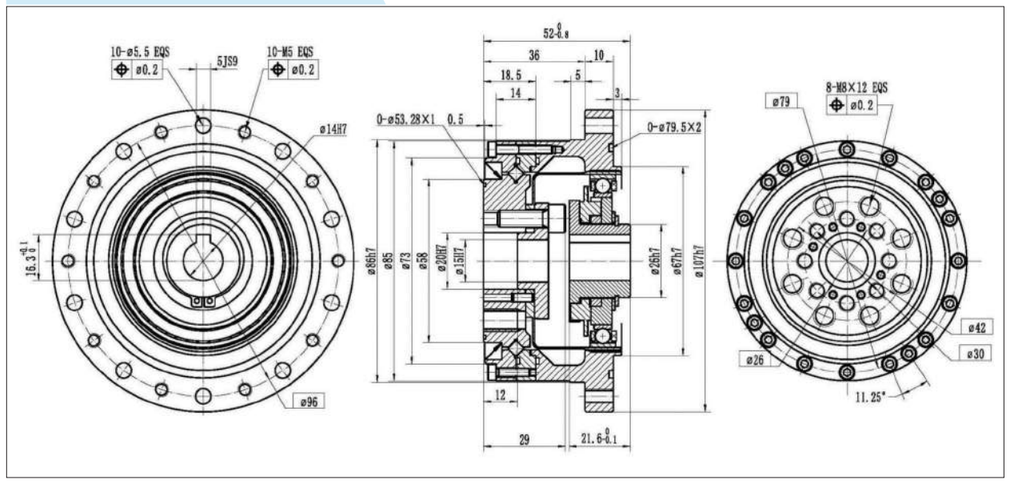
BCSG-17-XXX-Ⅱ



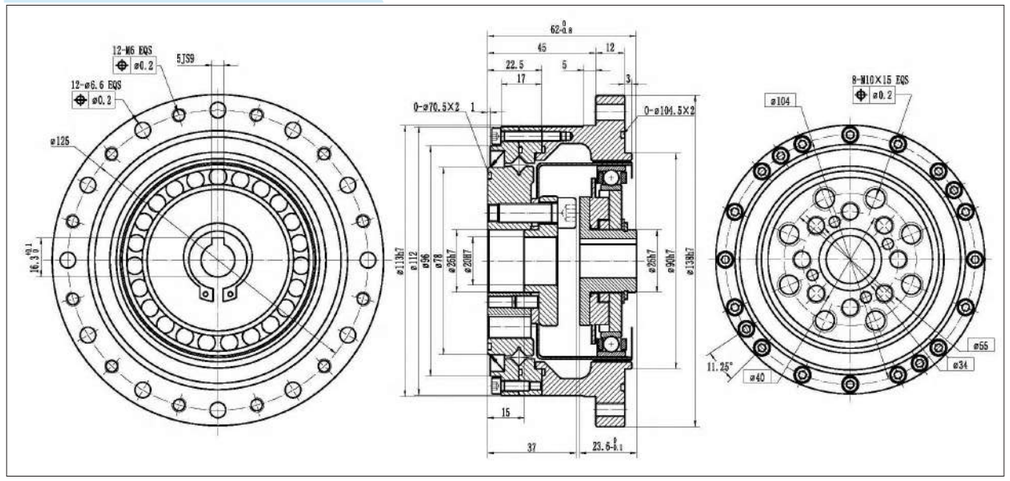
BCSG-20-XXX-Ⅱ



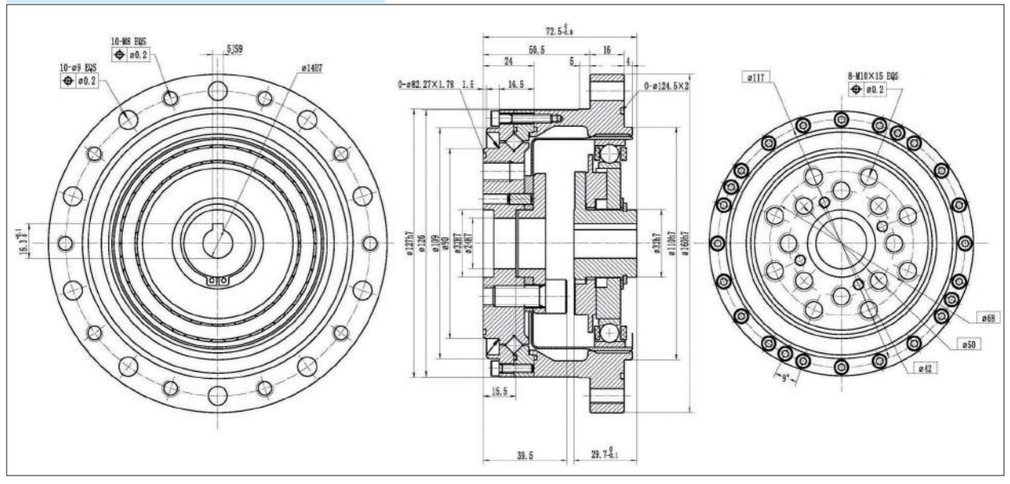
BCSG-25-XXX-Ⅱ



BCSG–32–XXX–Ⅱ



BCSG–40–XXX–Ⅱ

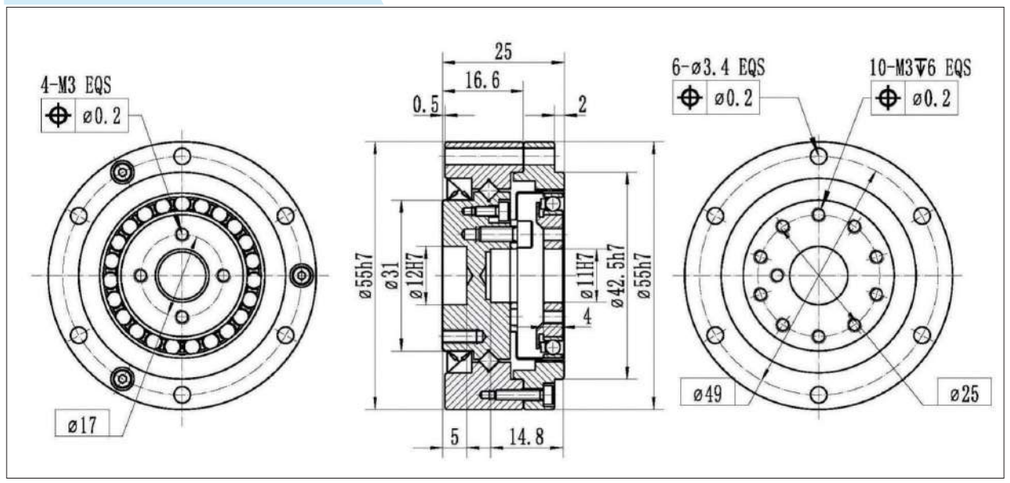


BCSD-I series harmonic reducer

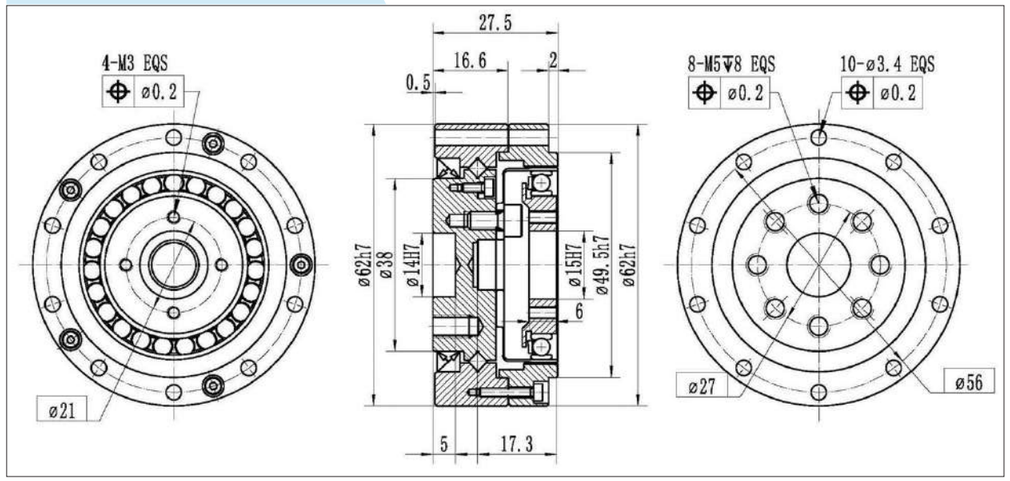
■ BCSD-I series harmonic reducer performance parameters

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	5.4	18	6.9	35	8000	3500	20	10000
	80	7.8	23	11	47			20	12000
	100	7.8	28	11	54			15	12000
17	50	16	34	26	70	7000	3500	20	10000
	80	22	43	27	87			20	12000
	100	24	54	39	108			15	12000
	120	24	54	39	90			15	12000
20	50	25	56	34	98	6000	3500	20	10000
	80	34	74	47	127			20	12000
	100	40	82	49	147			20	12000
	120	40	87	49	147			15	12000
	160	40	92	49	147			15	12000
25	50	39	96	55	186	5500	3500	20	10000
	80	63	137	87	255			20	12000
	100	67	157	108	284			20	12000
	120	67	167	108	305			15	12000
	160	67	178	108	315			15	12000
32	50	76	216	108	382	4500	3500	20	10000
	80	118	304	167	569			20	12000
	100	137	334	216	647			20	12000
	120	137	353	216	686			15	12000
	160	137	372	216	686			15	12000
40	50	157	402	197	686	4000	3000	20	10000
	80	210	519	284	980			20	12000
	100	265	568	372	1080			20	12000
	120	295	617	451	1180			15	12000
	160	295	650	451	1180			15	12000

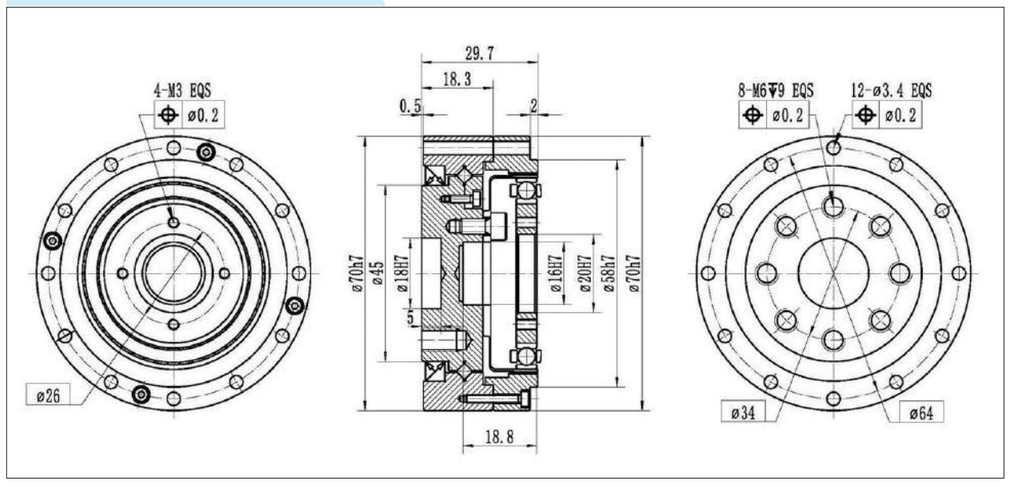
BCSD-14-XXX-I



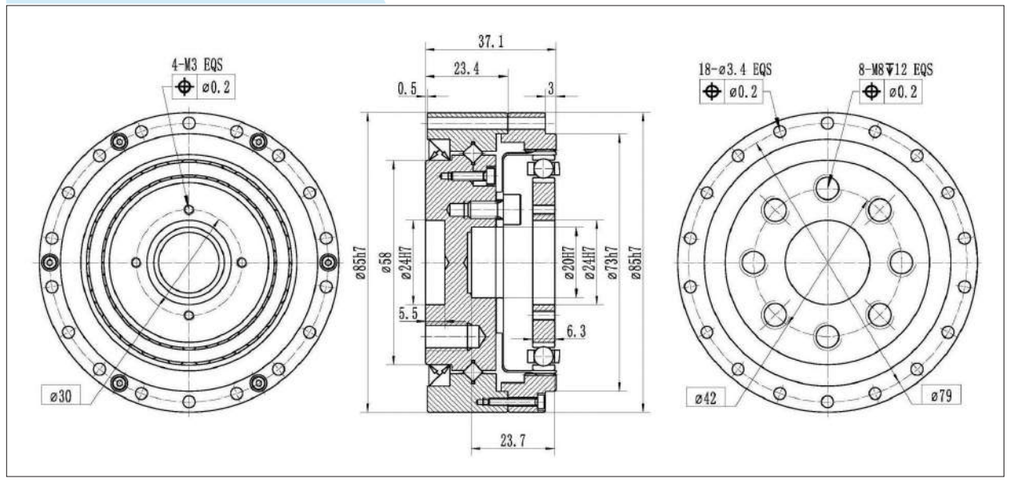
BCSD-17-XXX-I



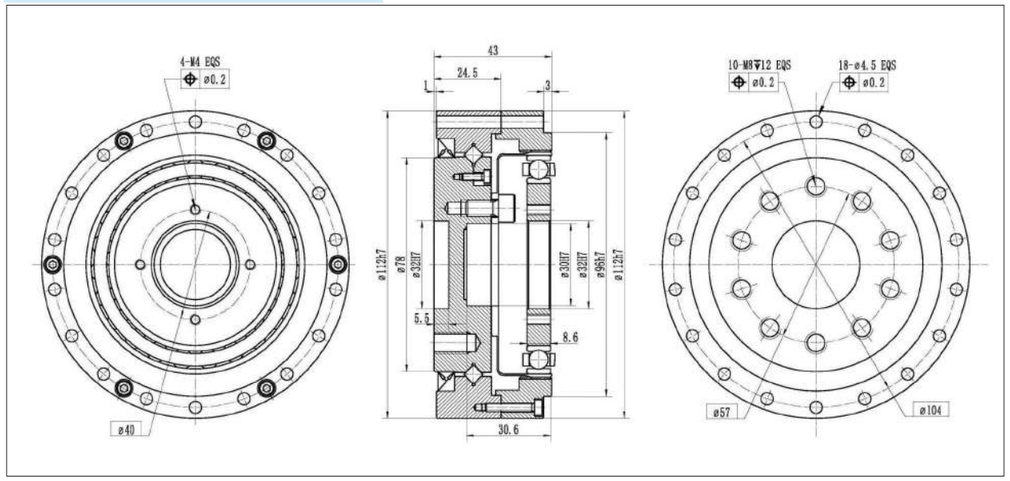
BCSD-20-XXX-I



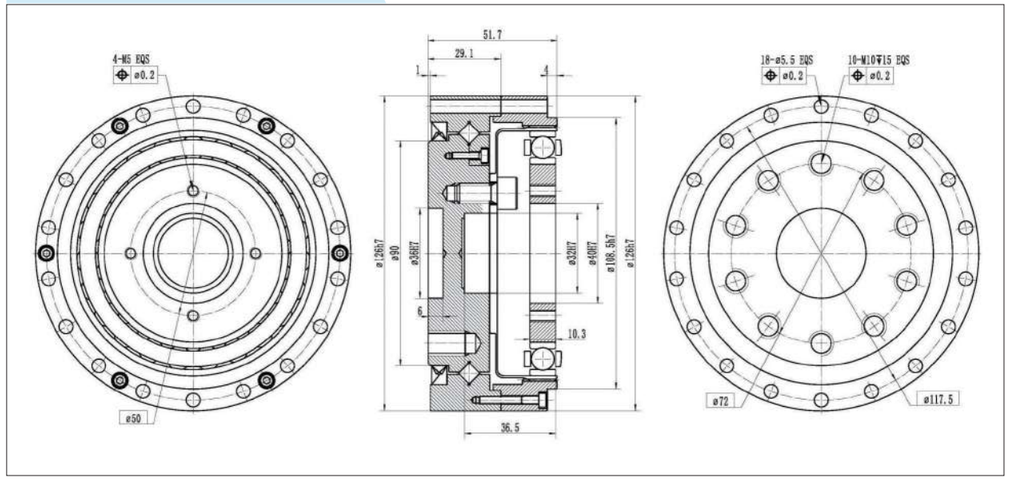
BCSD-25-XXX-I



BCSD–32–XXX–Ⅰ



BCSD–40–XXX–Ⅰ

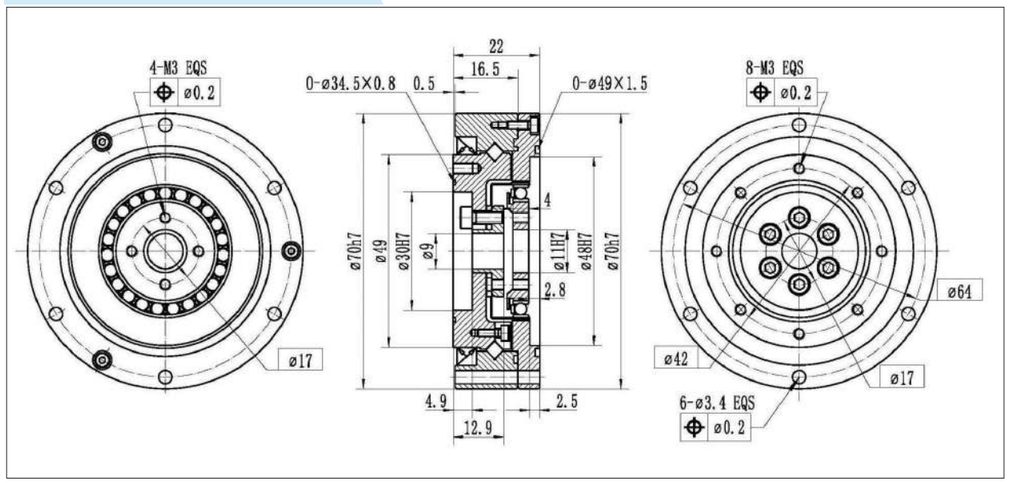


BCSD-III series wave speed reducer

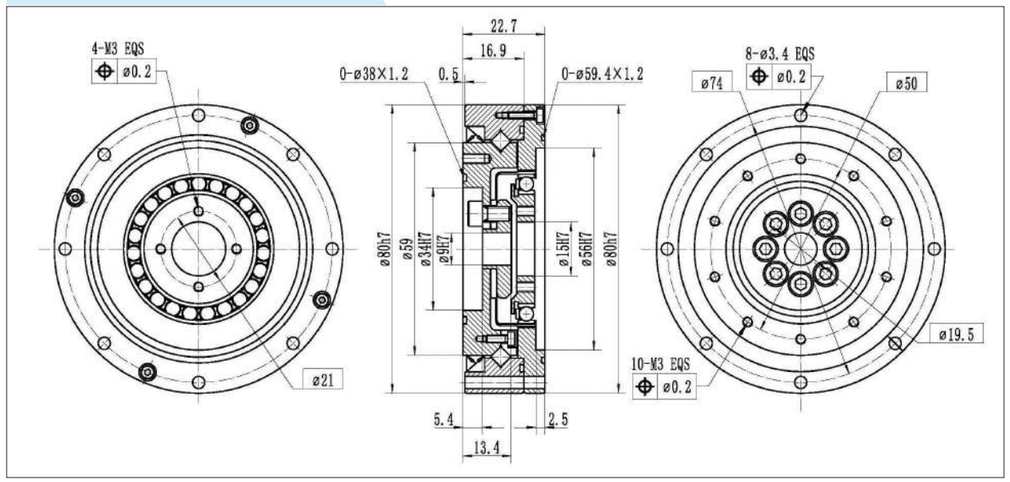
■ BCSD-III series wave speed reducer performance index

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	3.7	12	4.8	24	8500	3500	20	10000
	100	5.4	19	7.7	35			15	12000
17	50	11	23	18	48	7300	3500	20	10000
	100	16	37	27	71			15	12000
20	50	17	39	24	69	6500	3500	20	10000
	100	28	57	34	95			20	12000
	160	28	64	34	95			15	12000
25	50	27	69	38	127	5600	3500	20	10000
	100	47	110	75	184			20	12000
	160	47	123	75	204			15	12000
32	50	53	151	75	268	4800	3500	20	10000
	100	96	233	151	420			20	12000
	160	96	261	151	445			15	12000
40	50	96	261	137	480	4000	3000	20	10000
	100	185	398	260	700			20	12000
	160	206	453	316	765			15	12000

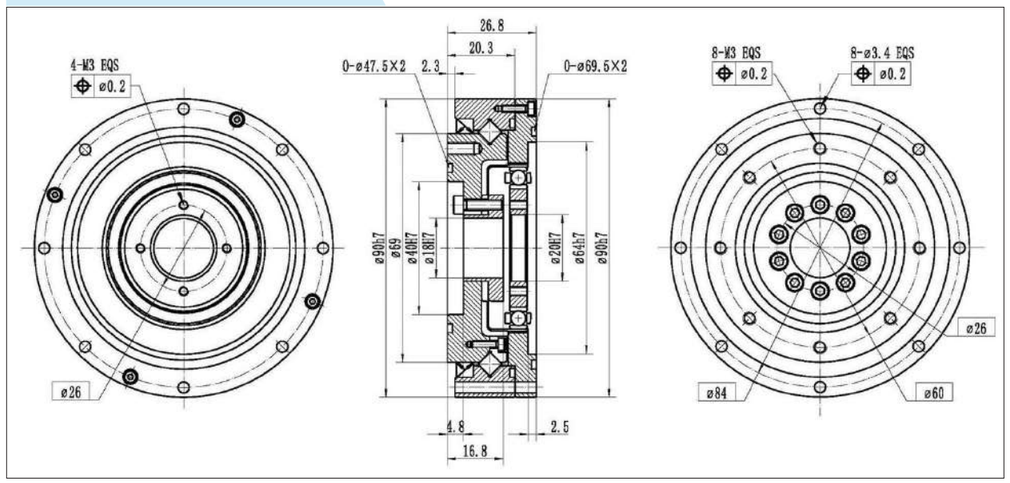
BCSD-14-XXX-Ⅲ



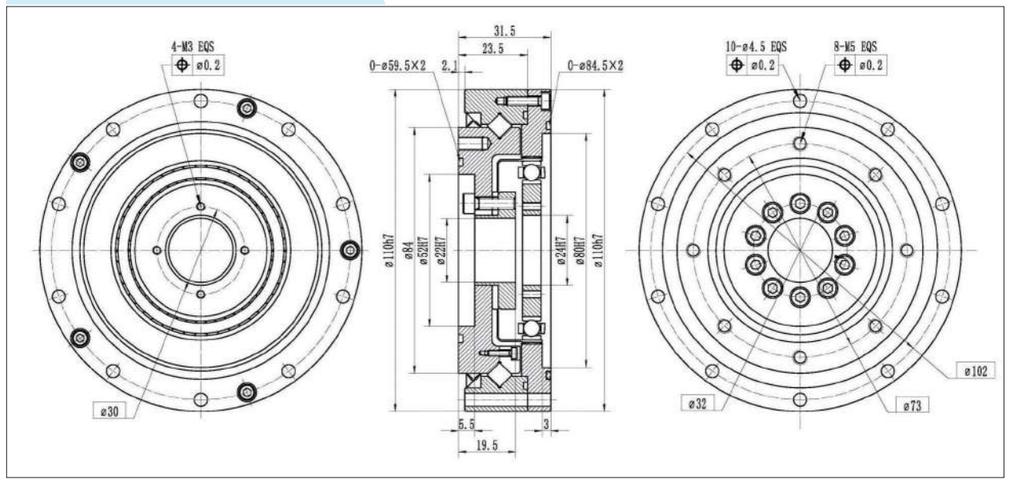
BCSD-17-XXX-Ⅲ



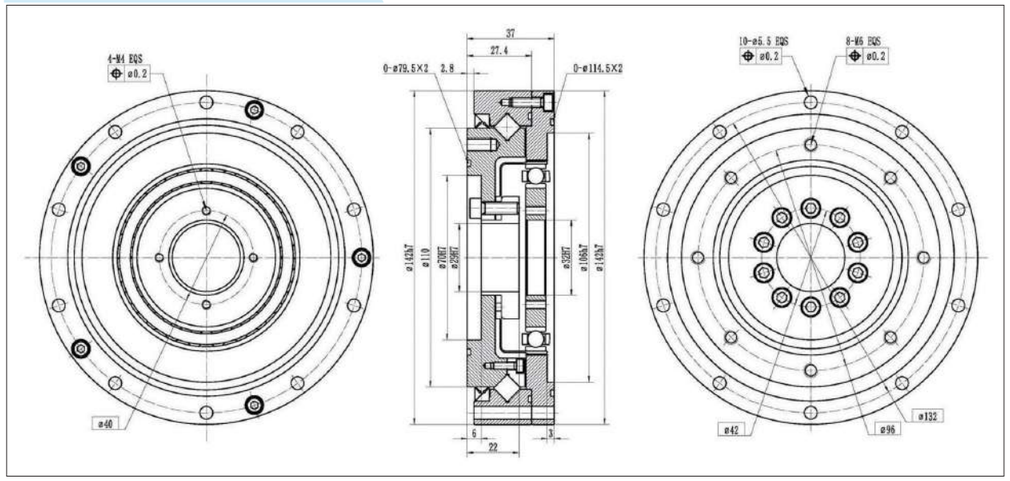
BCSD-20-XXX-Ⅲ



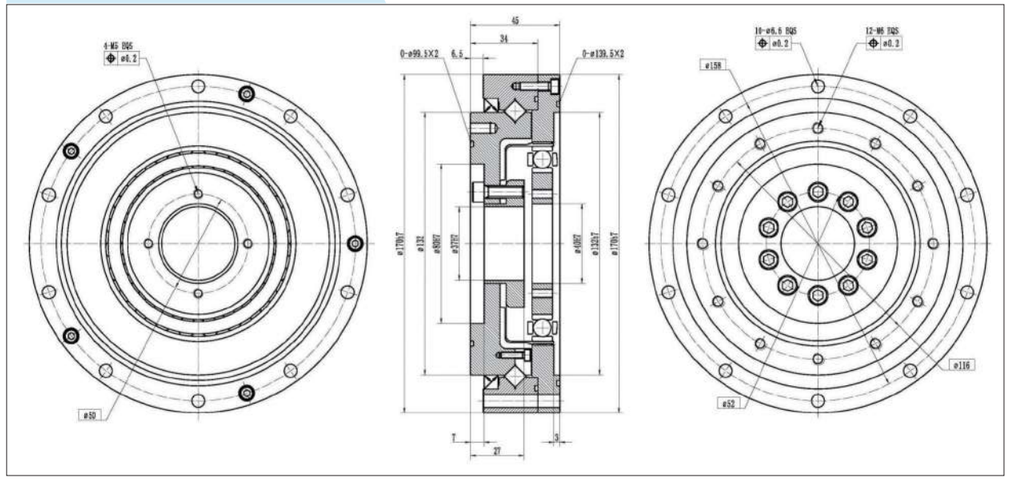
BCSD-25-XXX-Ⅲ



BCSD–32–XXX–Ⅲ



BCSD–40–XXX–Ⅲ

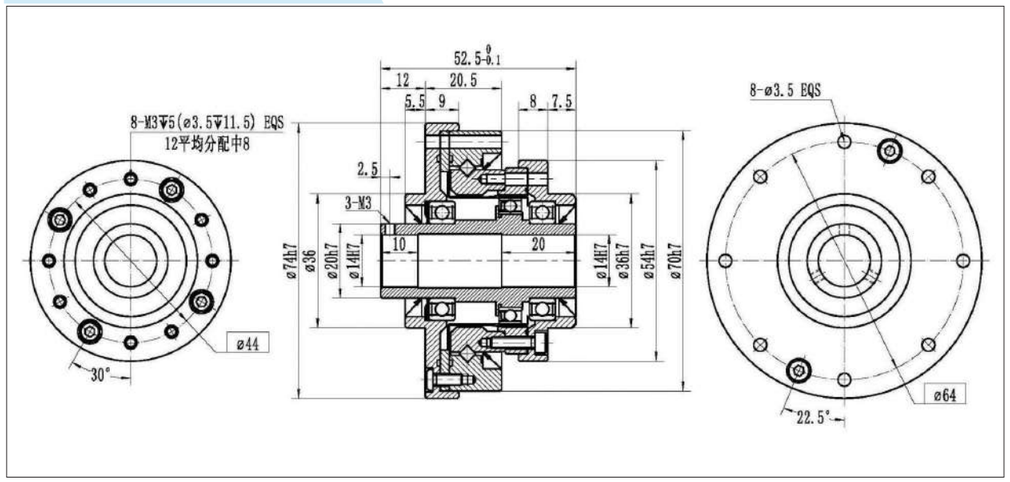


BSHG-III series wave speed reducer

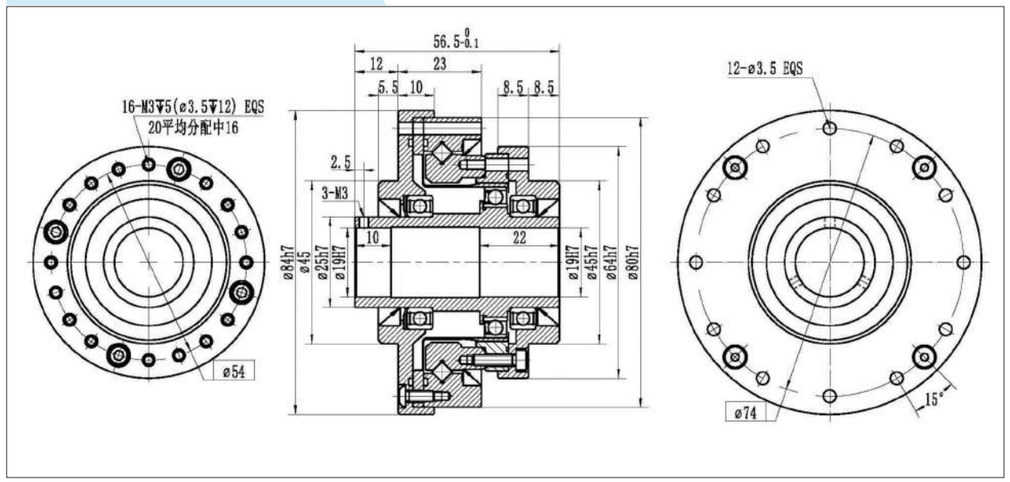
BSHG-III series wave speed reducer performance index

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	7	23	9	46	8000	3500	20	10000
	80	10	30	14	61			20	12000
	100	10	36	14	70			15	12000
17	50	21	44	34	91	7000	3500	20	10000
	80	29	56	35	113			20	12000
	100	31	70	51	143			15	12000
	120	31	70	51	112			15	12000
20	50	33	73	44	127	6000	3500	20	10000
	80	44	96	61	165			20	12000
	100	52	107	64	191			20	12000
	120	52	113	64	191			15	12000
	160	52	120	64	191			15	12000
25	50	51	127	72	242	5500	3500	20	10000
	80	82	178	113	332			20	12000
	100	87	204	140	369			20	12000
	120	87	217	140	395			15	12000
	160	87	229	140	408			15	12000
32	50	99	291	140	497	4500	3500	20	10000
	80	153	395	217	738			20	12000
	100	178	433	281	841			20	12000
	120	178	459	281	892			15	12000
	160	178	484	281	892			15	12000
40	50	178	523	256	892	4000	3000	20	10000
	80	268	675	369	1270			20	12000
	100	346	738	484	1400			20	12000
	120	382	802	586	1530			15	12000
	160	382	841	586	1530			15	12000

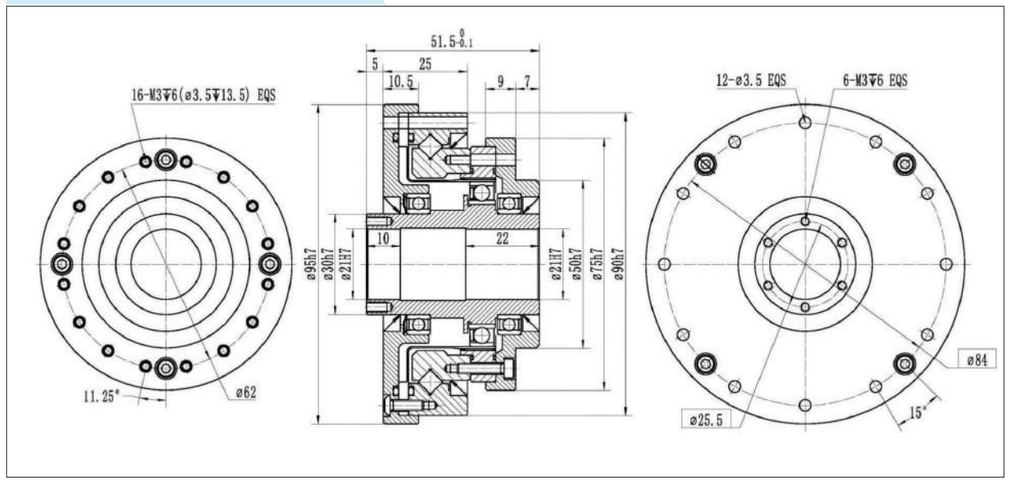
BSHG–14–XXX–Ⅲ



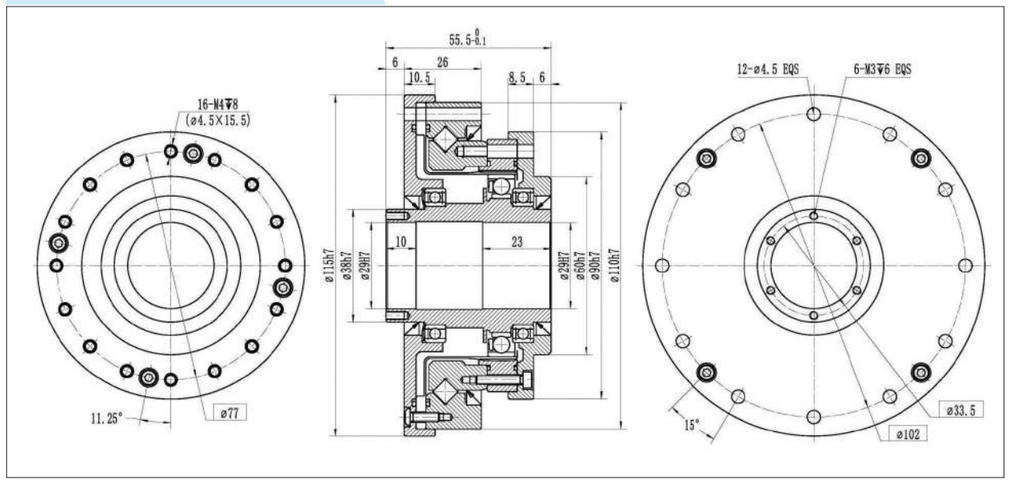
BSHG–17–XXX–Ⅲ



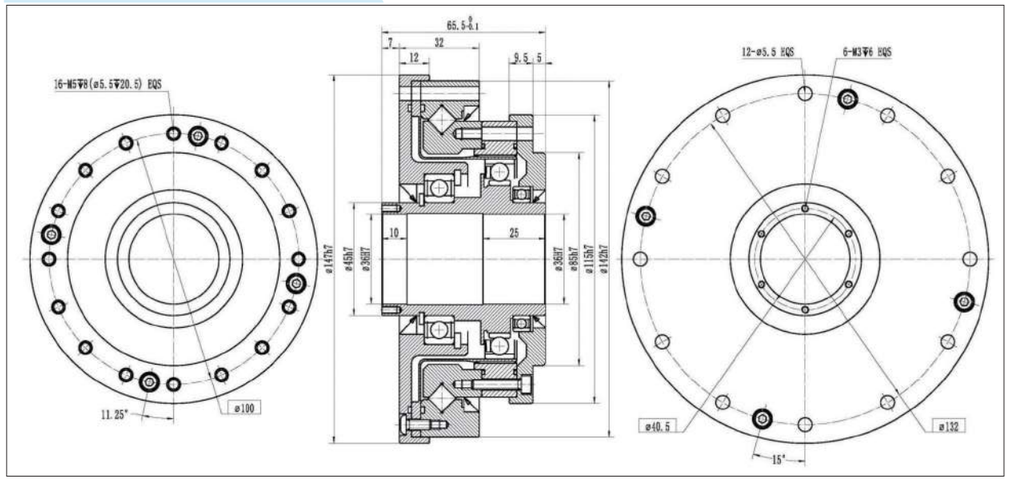
BSHG–20–XXX–Ⅲ



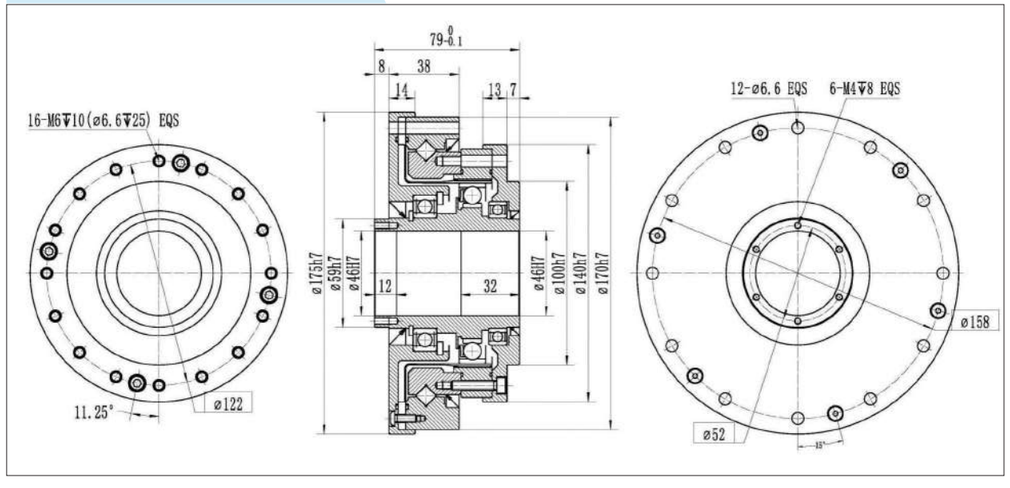
BSHG–25–XXX–Ⅲ



BSHG–32–XXX–Ⅲ



BSHG–40–XXX–Ⅲ

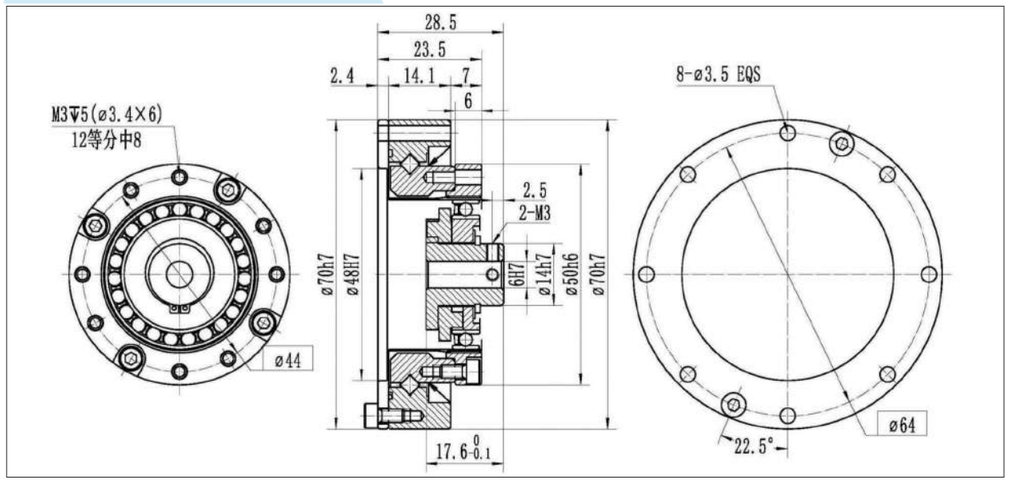


BSHF-II series wave reducer

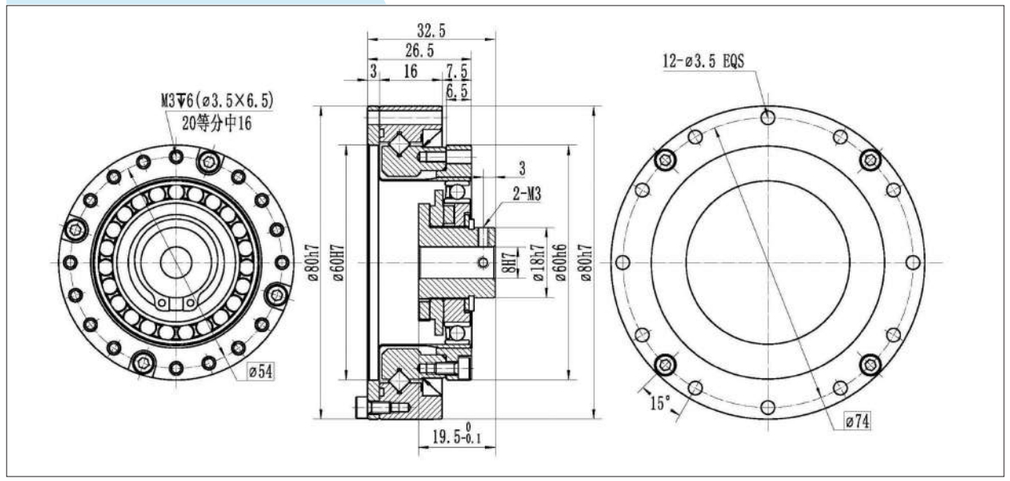
■ BSHF-II series wave reducer performance index

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	5.4	18	6.9	35	8000	3500	20	10000
	80	7.8	23	11	47			20	12000
	100	7.8	28	11	54			15	12000
17	50	16	34	26	70	7000	3500	20	10000
	80	22	43	27	87			20	12000
	100	24	54	39	108			15	12000
	120	24	54	39	90			15	12000
20	50	25	56	34	98	6000	3500	20	10000
	80	34	74	47	127			20	12000
	100	40	82	49	147			20	12000
	120	40	87	49	147			15	12000
	160	40	92	49	147			15	12000
25	50	39	96	55	186	5500	3500	20	10000
	80	63	137	87	255			20	12000
	100	67	157	108	284			20	12000
	120	67	167	108	305			15	12000
	160	67	178	108	315			15	12000
32	50	76	216	108	382	4500	3500	20	10000
	80	118	304	167	569			20	12000
	100	137	334	216	647			20	12000
	120	137	353	216	686			15	12000
	160	137	372	216	686			15	12000
40	50	157	402	197	686	4000	3000	20	10000
	80	210	519	284	980			20	12000
	100	265	568	372	1080			20	12000
	120	295	617	451	1180			15	12000
	160	295	650	451	1180			15	12000

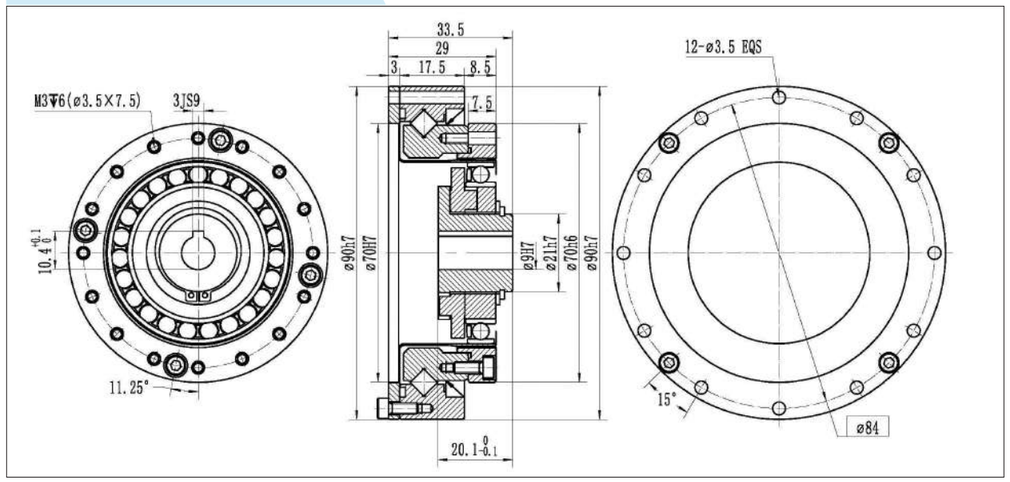
BSHF-14-XXX-Ⅱ



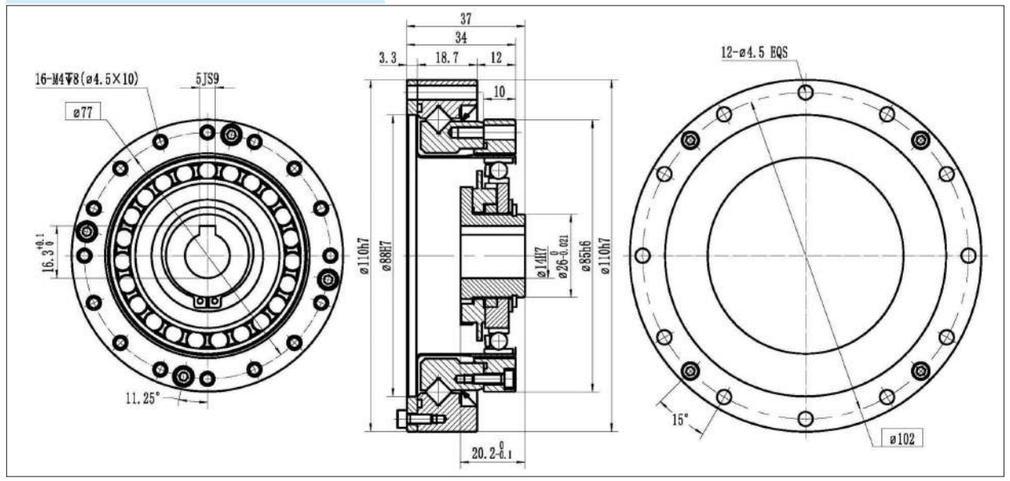
BSHF-17-XXX-Ⅱ



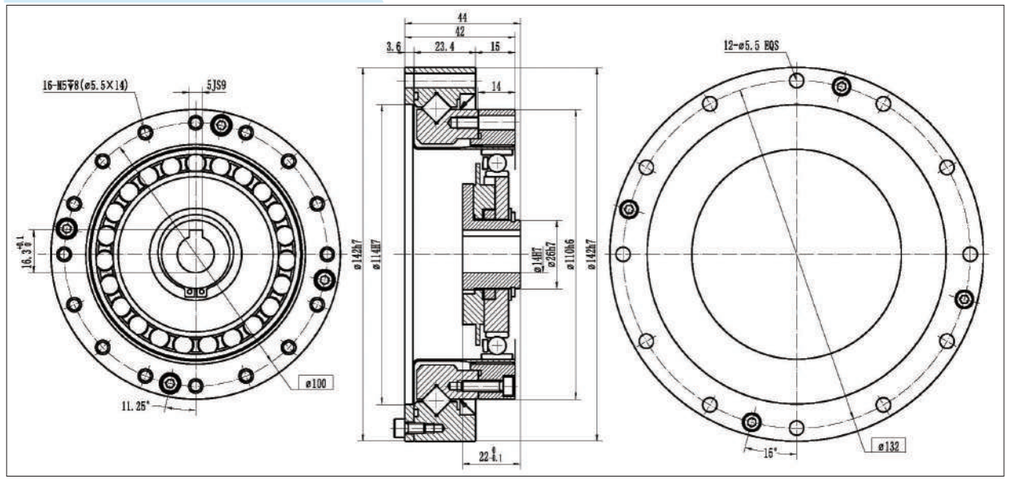
BSHF-20-XXX-Ⅱ



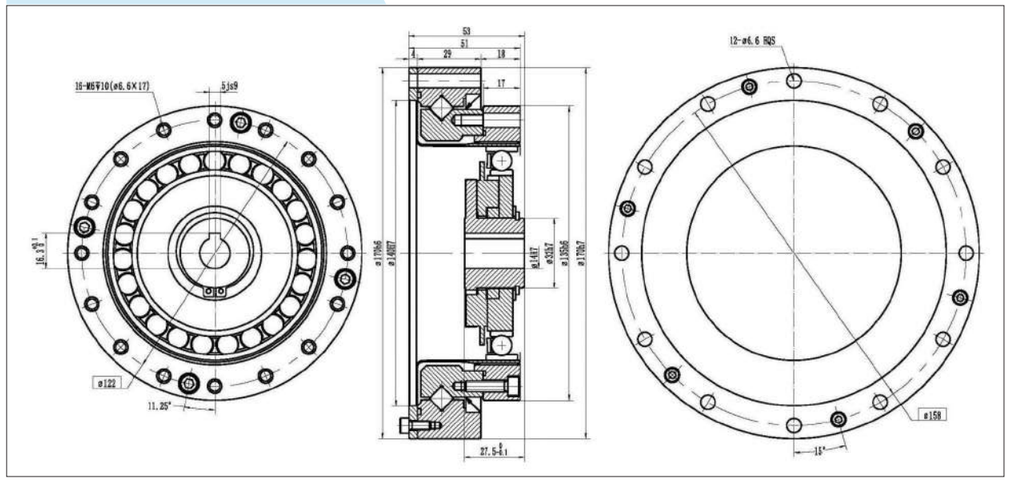
BSHF-25-XXX-Ⅱ



BSHF–32–XXX– Ⅱ



BSHF–40–XXX– Ⅱ

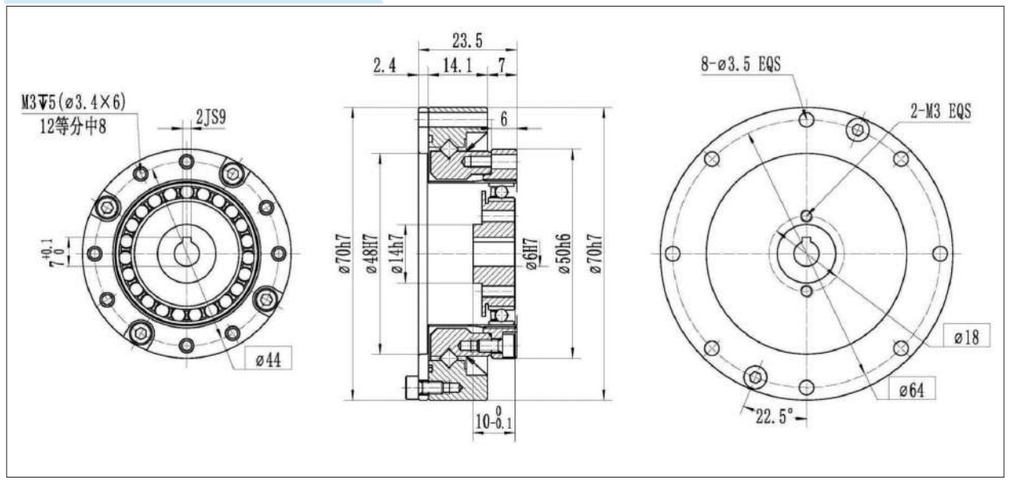


BSHF-II-E one-piece convex ring series wave reducer

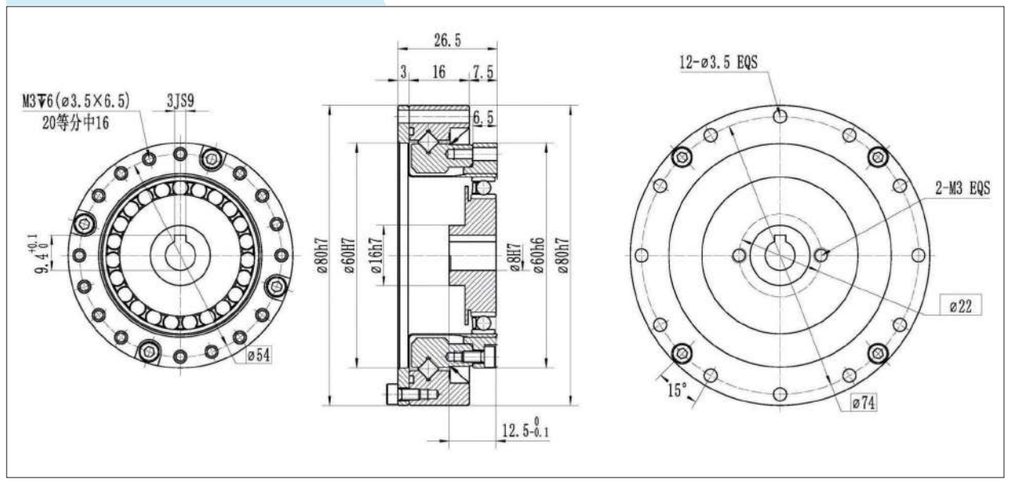
■ BSHF-II-E integrated convex ring series wave reducer performance index

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	5.4	18	6.9	35	8000	3500	20	10000
	80	7.8	23	11	47			20	12000
	100	7.8	28	11	54			15	12000
17	50	16	34	26	70	7000	3500	20	10000
	80	22	43	27	87			20	12000
	100	24	54	39	108			15	12000
	120	24	54	39	90			15	12000
20	50	25	56	34	98	6000	3500	20	10000
	80	34	74	47	127			20	12000
	100	40	82	49	147			20	12000
	120	40	87	49	147			15	12000
	160	40	92	49	147			15	12000
25	50	39	96	55	186	5500	3500	20	10000
	80	63	137	87	255			20	12000
	100	67	157	108	284			20	12000
	120	67	167	108	305			15	12000
	160	67	178	108	315			15	12000
32	50	76	216	108	382	4500	3500	20	10000
	80	118	304	167	569			20	12000
	100	137	334	216	647			20	12000
	120	137	353	216	686			15	12000
	160	137	372	216	686			15	12000
40	50	157	402	197	686	4000	3000	20	10000
	80	210	519	284	980			20	12000
	100	265	568	372	1080			20	12000
	120	295	617	451	1180			15	12000
	160	295	650	451	1180			15	12000

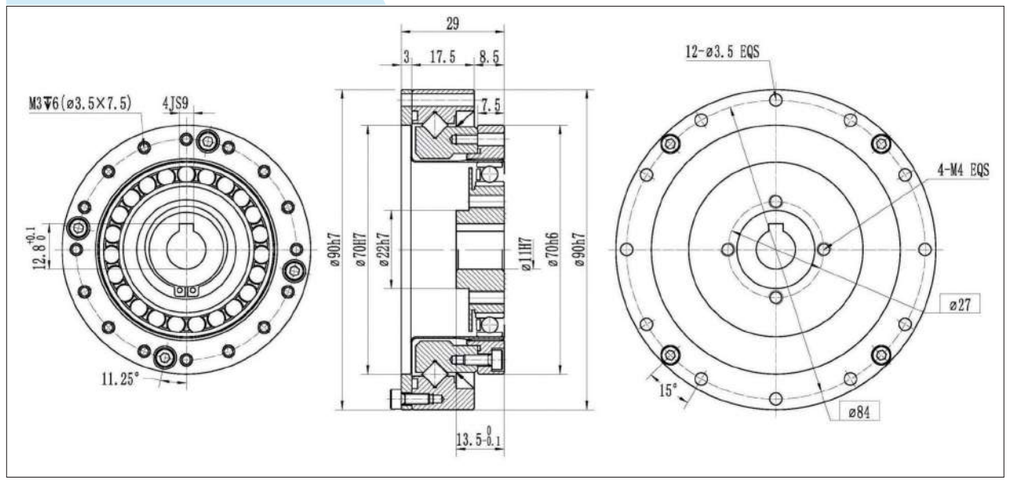
BSHF-14-XXX-Ⅱ-E



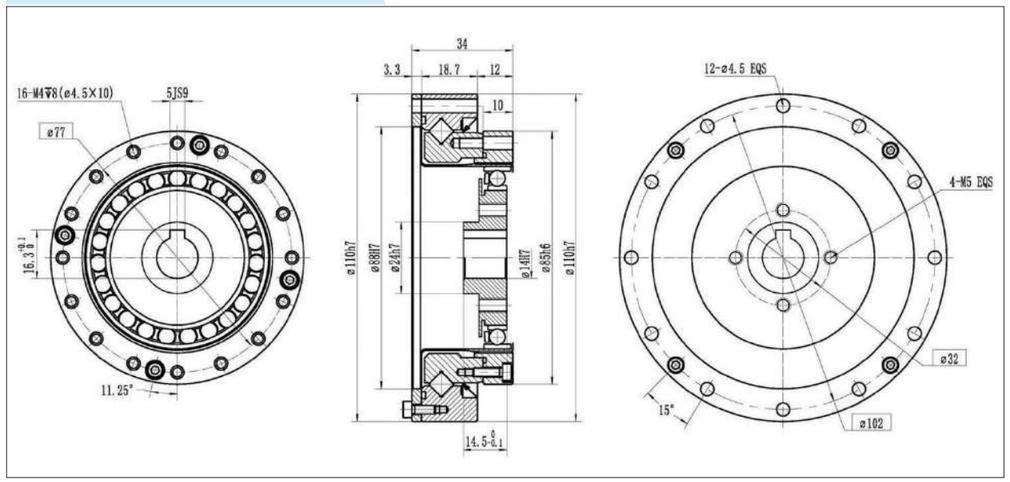
BSHF-17-XXX-Ⅱ-E



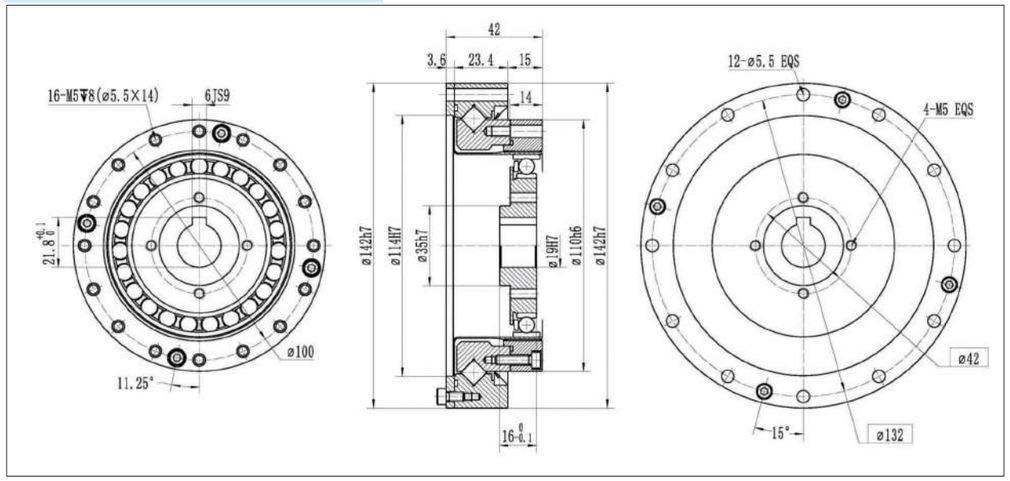
BSHF-20-XXX-Ⅱ-E



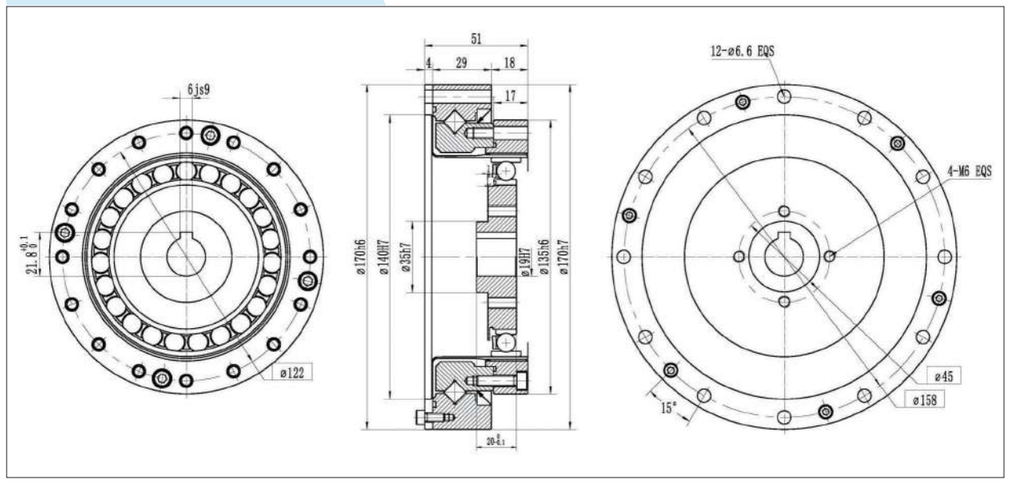
BSHF-25-XXX-Ⅱ-E



BSHF–32–XXX–Ⅱ–E



BSHF–40–XXX–Ⅱ–E

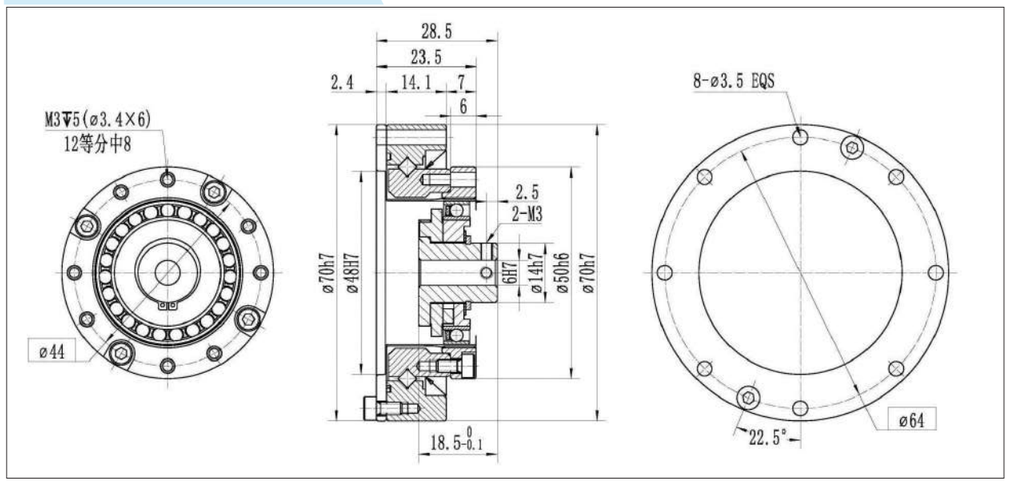


BSHG-II series wave speed reducer

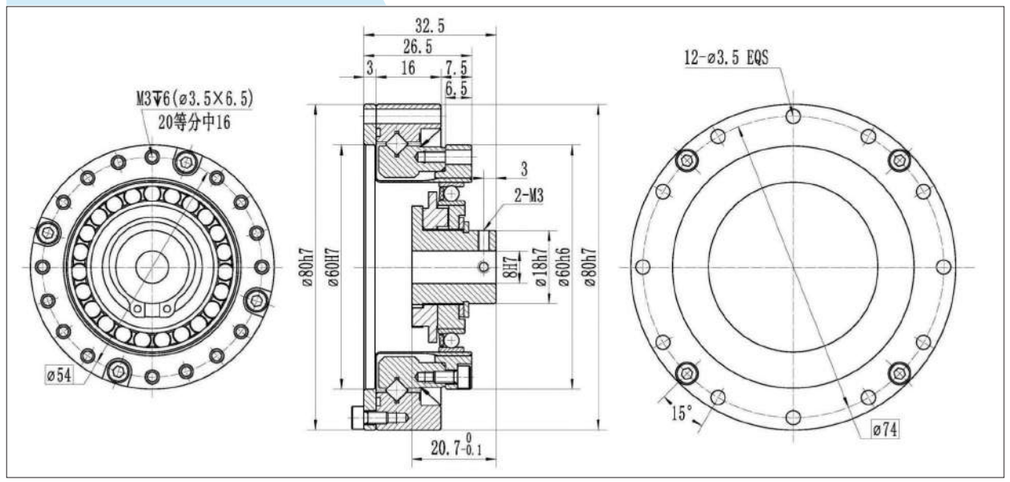
■ BSHG-II series wave speed reducer performance index

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	7	23	9	46	8000	3500	20	10000
	80	10	30	14	61			20	12000
	100	10	36	14	70			15	12000
17	50	21	44	34	91	7000	3500	20	10000
	80	29	56	35	113			20	12000
	100	31	70	51	143			15	12000
	120	31	70	51	112			15	12000
20	50	33	73	44	127	6000	3500	20	10000
	80	44	96	61	165			20	12000
	100	52	107	64	191			20	12000
	120	52	113	64	191			15	12000
	160	52	120	64	191			15	12000
25	50	51	127	72	242	5500	3500	20	10000
	80	82	178	113	332			20	12000
	100	87	204	140	369			20	12000
	120	87	217	140	395			15	12000
	160	87	229	140	408			15	12000
32	50	99	291	140	497	4500	3500	20	10000
	80	153	395	217	738			20	12000
	100	178	433	281	841			20	12000
	120	178	459	281	892			15	12000
	160	178	484	281	892			15	12000
40	50	178	523	256	892	4000	3000	20	10000
	80	268	675	369	1270			20	12000
	100	346	738	484	1400			20	12000
	120	382	802	586	1530			15	12000
	160	382	841	586	1530			15	12000

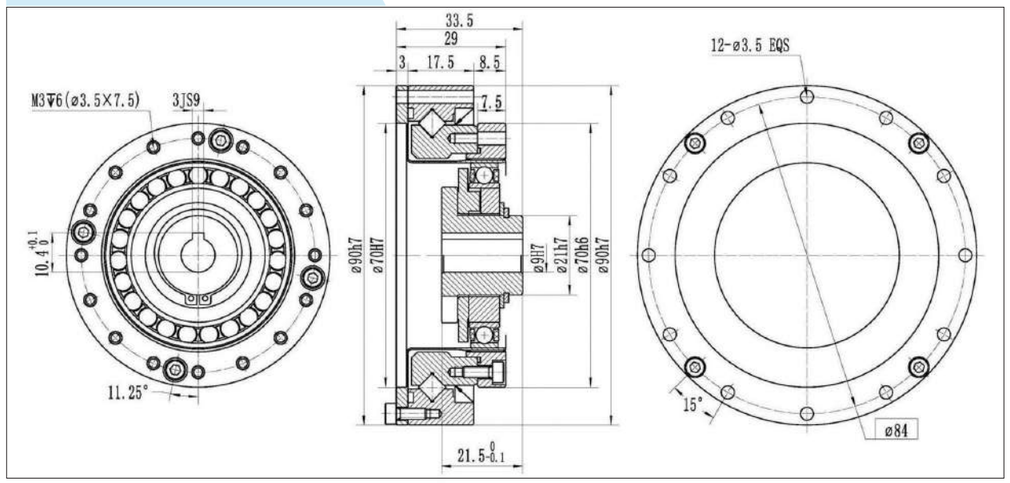
BSHG-14-XXX-Ⅱ



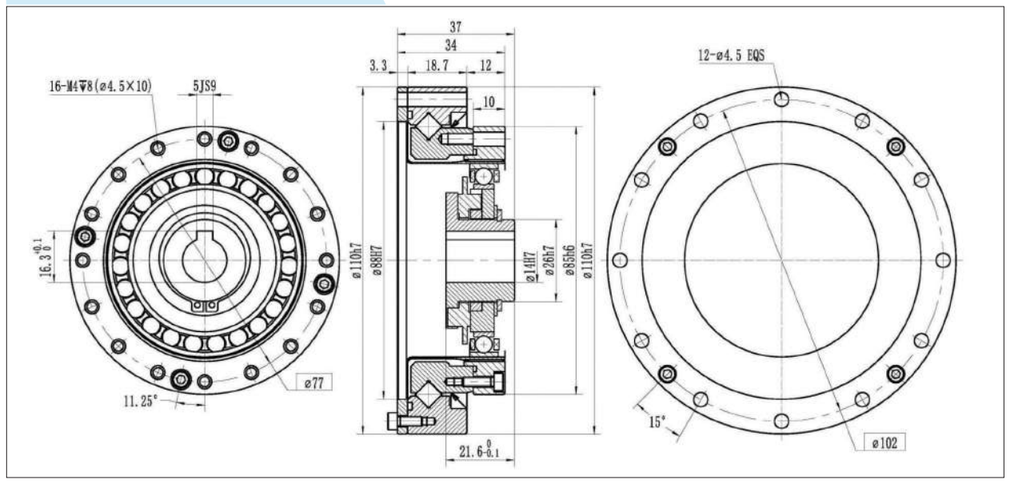
BSHG-17-XXX-Ⅱ



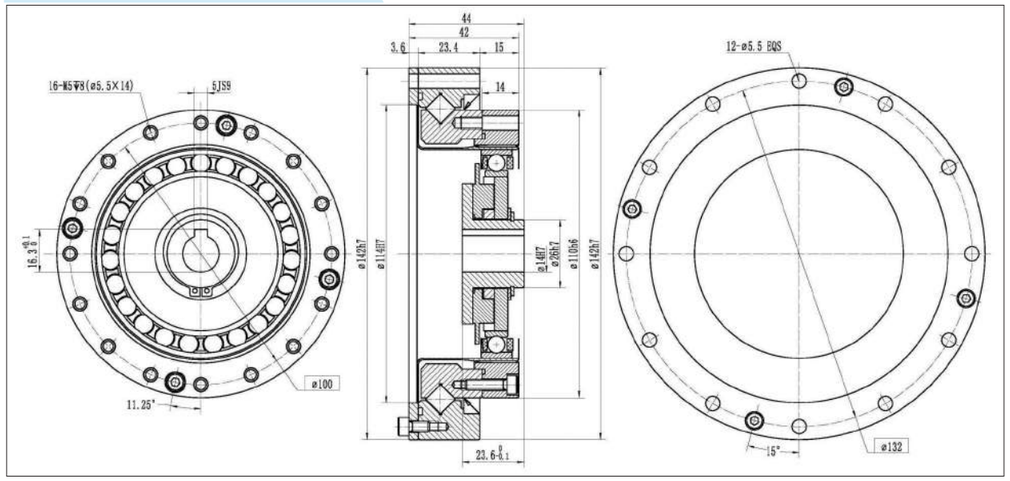
BSHG-20-XXX-Ⅱ



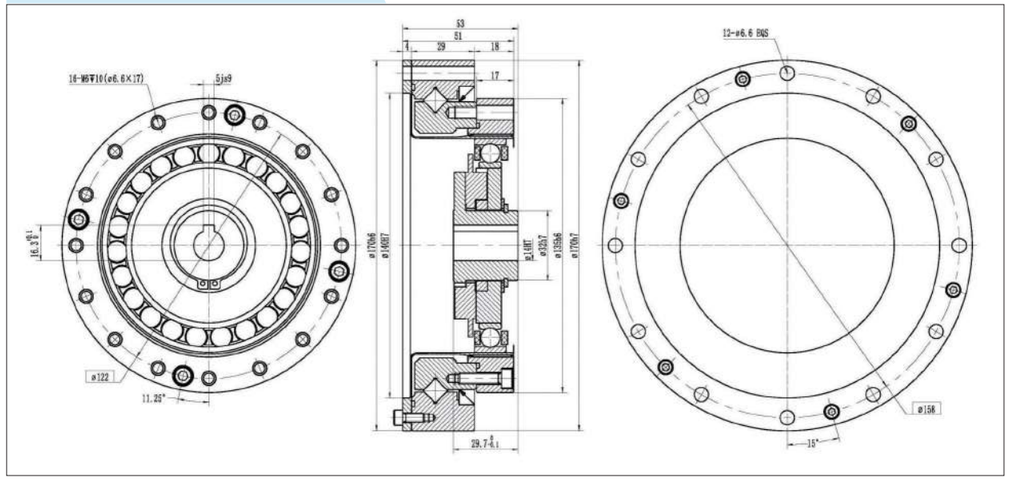
BSHG-25-XXX-Ⅱ



BSHG–32–XXX–Ⅱ



BSHG–40–XXX–Ⅱ

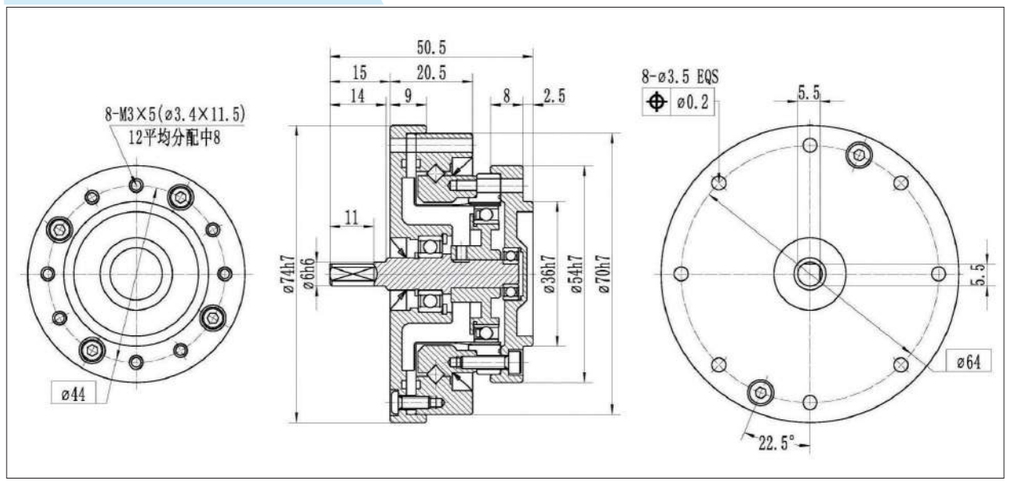


BSHG-IV series wave speed reducer

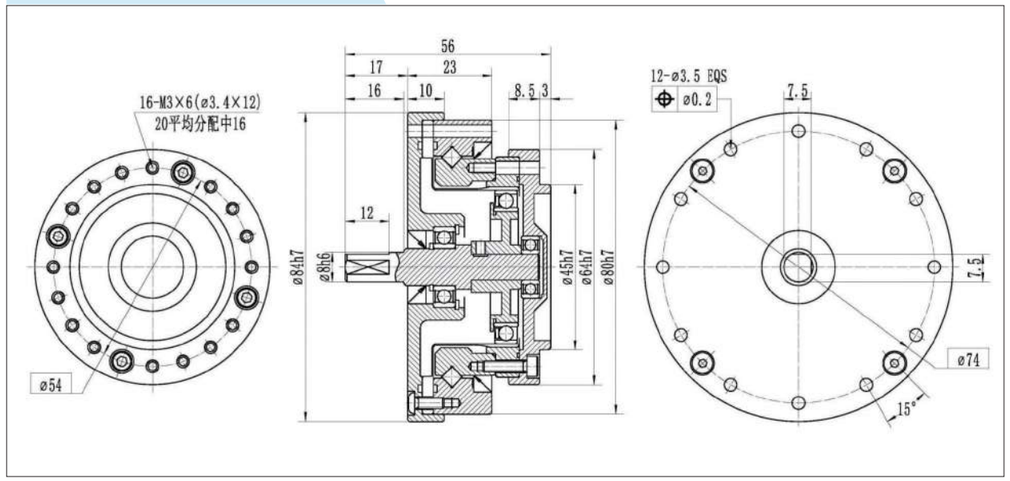
■ BSHG-IV series wave speed reducer performance index

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	7	23	9	46	8000	3500	20	10000
	80	10	30	14	61			20	12000
	100	10	36	14	70			15	12000
17	50	21	44	34	91	7000	3500	20	10000
	80	29	56	35	113			20	12000
	100	31	70	51	143			15	12000
	120	31	70	51	112			15	12000
20	50	33	73	44	127	6000	3500	20	10000
	80	44	96	61	165			20	12000
	100	52	107	64	191			20	12000
	120	52	113	64	191			15	12000
	160	52	120	64	191			15	12000
25	50	51	127	72	242	5500	3500	20	10000
	80	82	178	113	332			20	12000
	100	87	204	140	369			20	12000
	120	87	217	140	395			15	12000
	160	87	229	140	408			15	12000
32	50	99	291	140	497	4500	3500	20	10000
	80	153	395	217	738			20	12000
	100	178	433	281	841			20	12000
	120	178	459	281	892			15	12000
	160	178	484	281	892			15	12000
40	50	178	523	256	892	4000	3000	20	10000
	80	268	675	369	1270			20	12000
	100	346	738	484	1400			20	12000
	120	382	802	586	1530			15	12000
	160	382	841	586	1530			15	12000

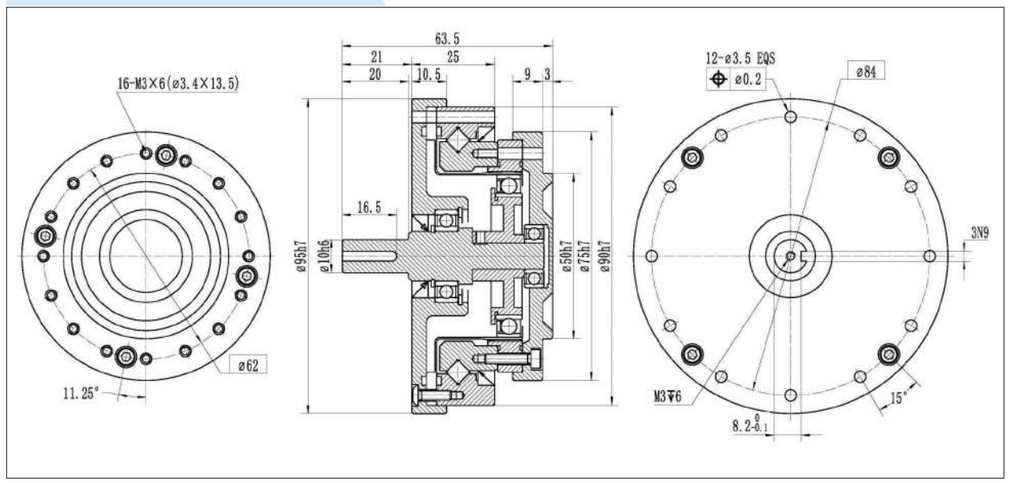
BSHG-14-XXX-Ⅳ



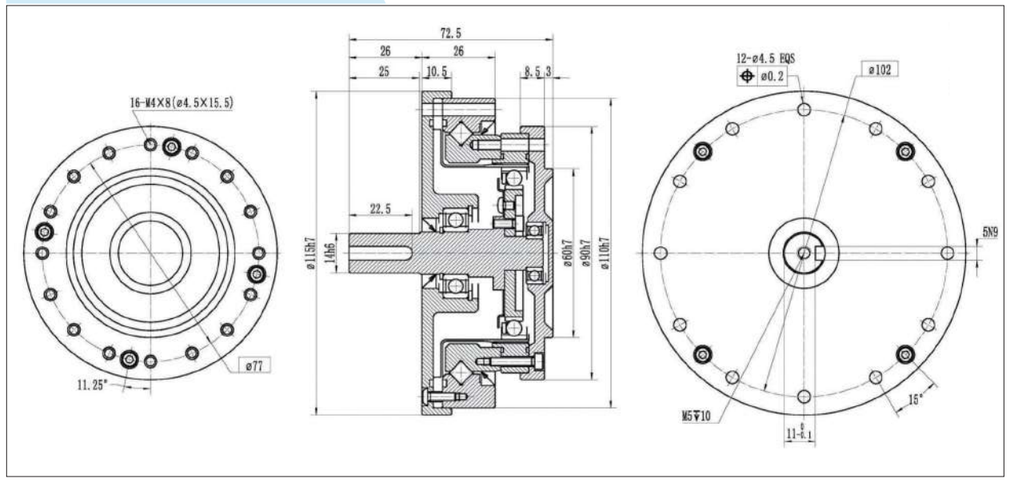
BSHG-17-XXX-Ⅳ



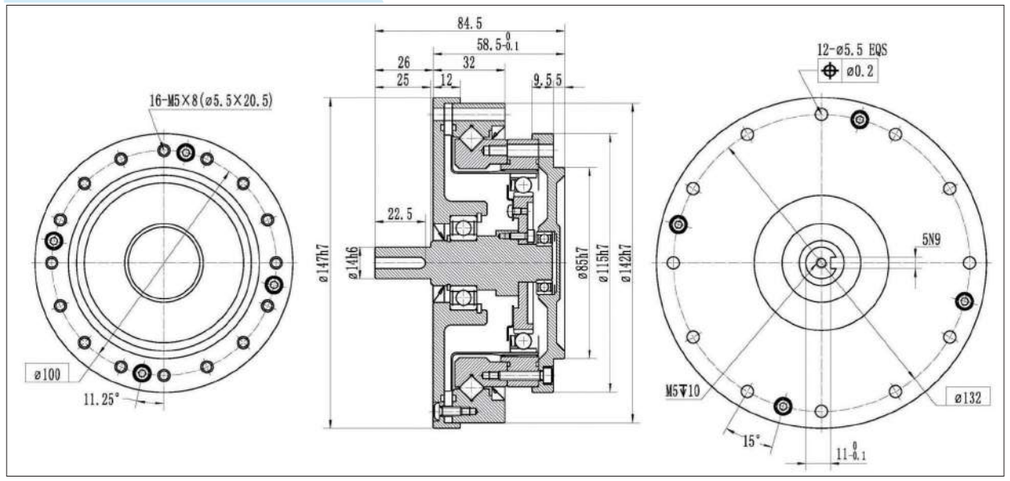
BSHG-20-XXX-Ⅳ



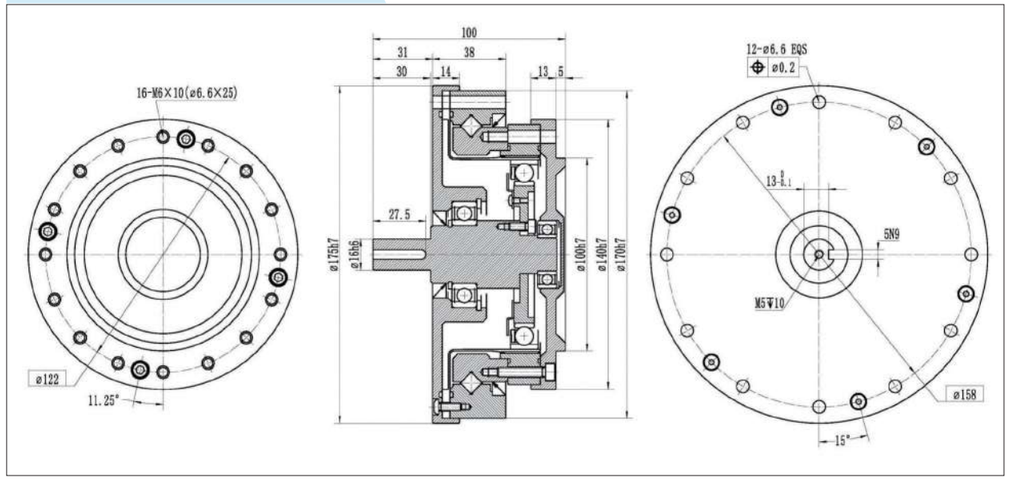
BSHG-25-XXX-Ⅳ



BSHG–32–XXX–Ⅳ



BSHG–40–XXX–Ⅳ

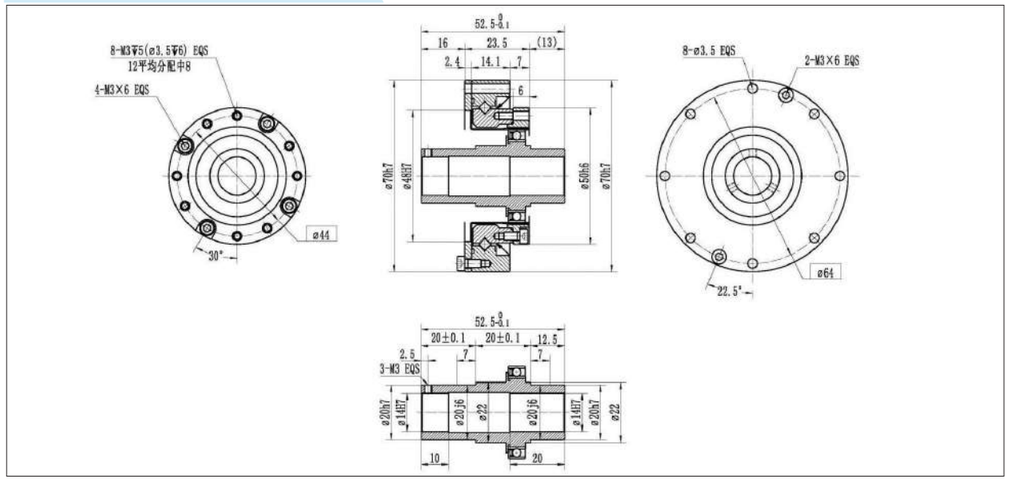


BSHG-III-SH series wave speed reducer

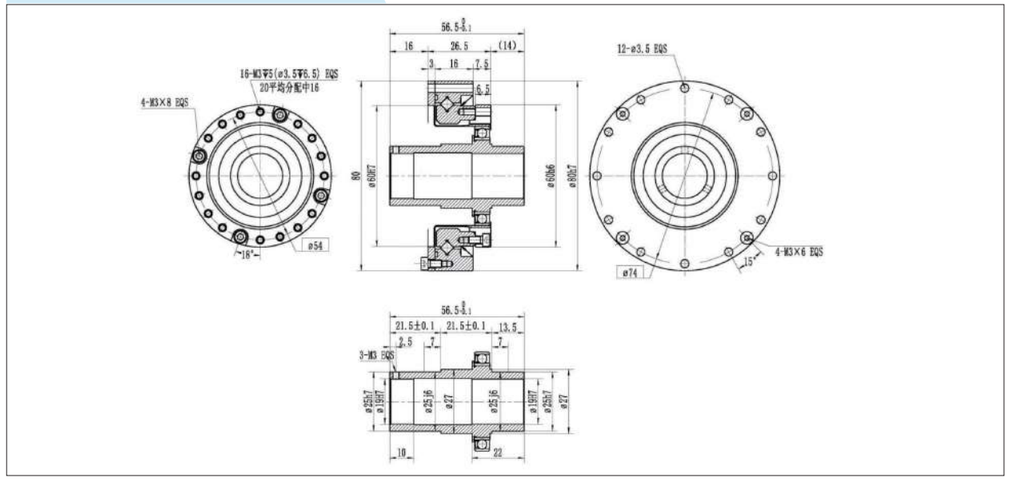
■ BSHG-III-SH series wave reducer performance index

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	7	23	9	46	8000	3500	20	10000
	80	10	30	14	61			20	12000
	100	10	36	14	70			15	12000
17	50	21	44	34	91	7000	3500	20	10000
	80	29	56	35	113			20	12000
	100	31	70	51	143			15	12000
	120	31	70	51	112			15	12000
20	50	33	73	44	127	6000	3500	20	10000
	80	44	96	61	165			20	12000
	100	52	107	64	191			20	12000
	120	52	113	64	191			15	12000
	160	52	120	64	191			15	12000
25	50	51	127	72	242	5500	3500	20	10000
	80	82	178	113	332			20	12000
	100	87	204	140	369			20	12000
	120	87	217	140	395			15	12000
	160	87	229	140	408			15	12000
32	50	99	291	140	497	4500	3500	20	10000
	80	153	395	217	738			20	12000
	100	178	433	281	841			20	12000
	120	178	459	281	892			15	12000
	160	178	484	281	892			15	12000
40	50	178	523	256	892	4000	3000	20	10000
	80	268	675	369	1270			20	12000
	100	346	738	484	1400			20	12000
	120	382	802	586	1530			15	12000
	160	382	841	586	1530			15	12000

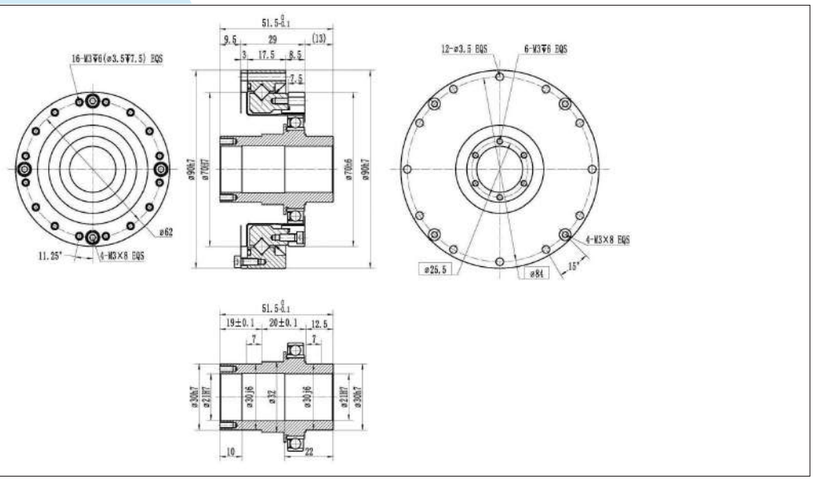
BSHG-14-XXX-Ⅲ(SH)



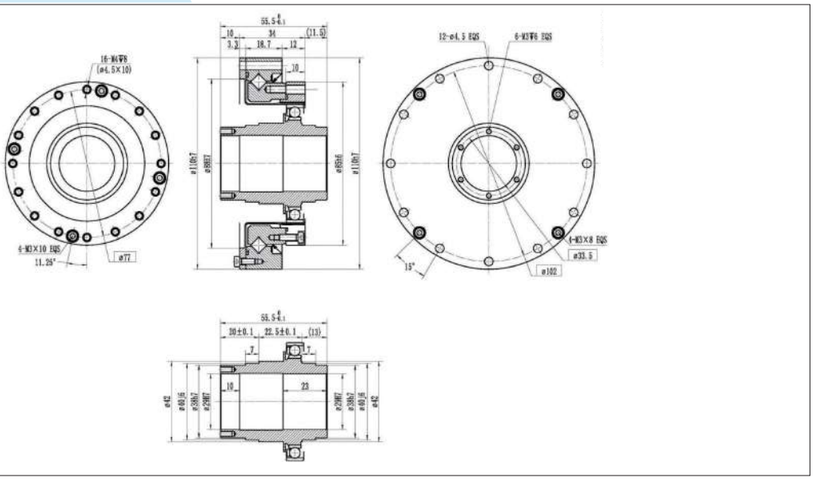
BSHG-17-XXX-Ⅲ(SH)



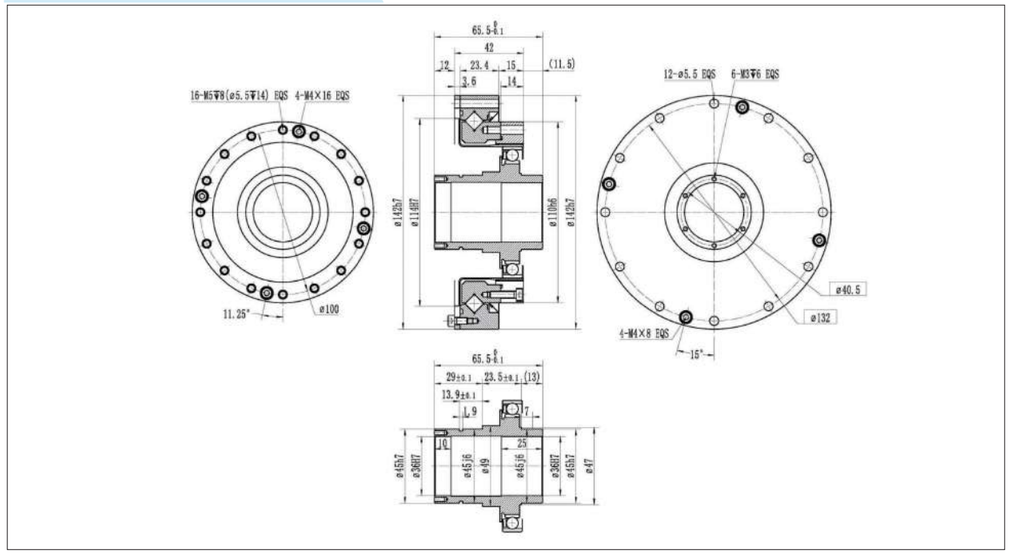
BSHG-20-XXX-Ⅲ(SH)



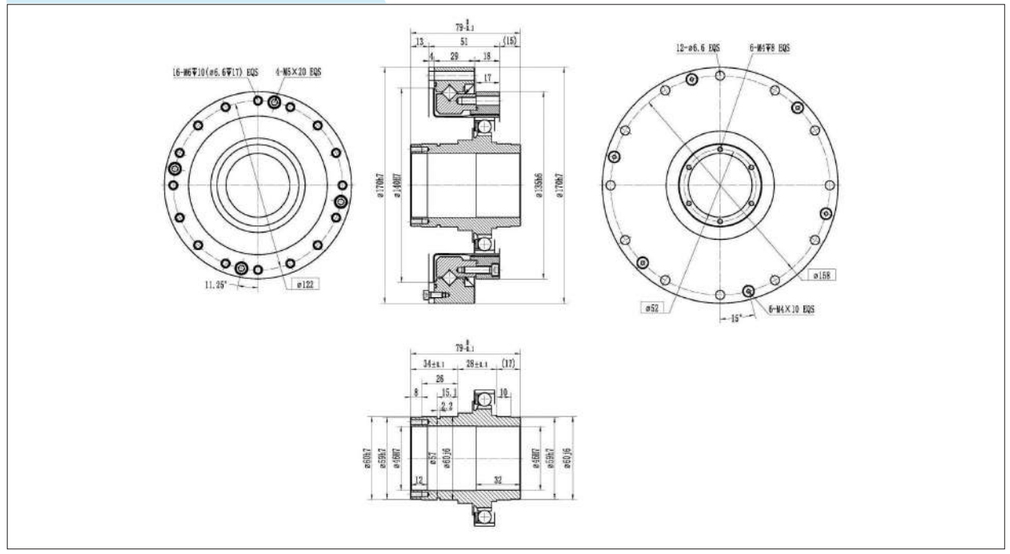
BSHG-25-XXX-Ⅲ(SH)



BSHG–32–XXX–Ⅲ(SH)



BSHG–40–XXX–Ⅲ(SH)

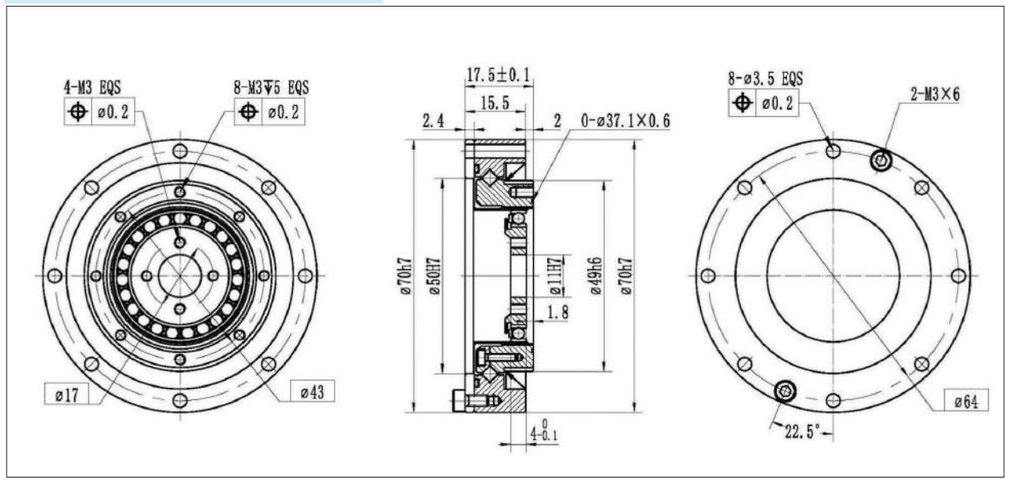


BSHD-III series wave reducer

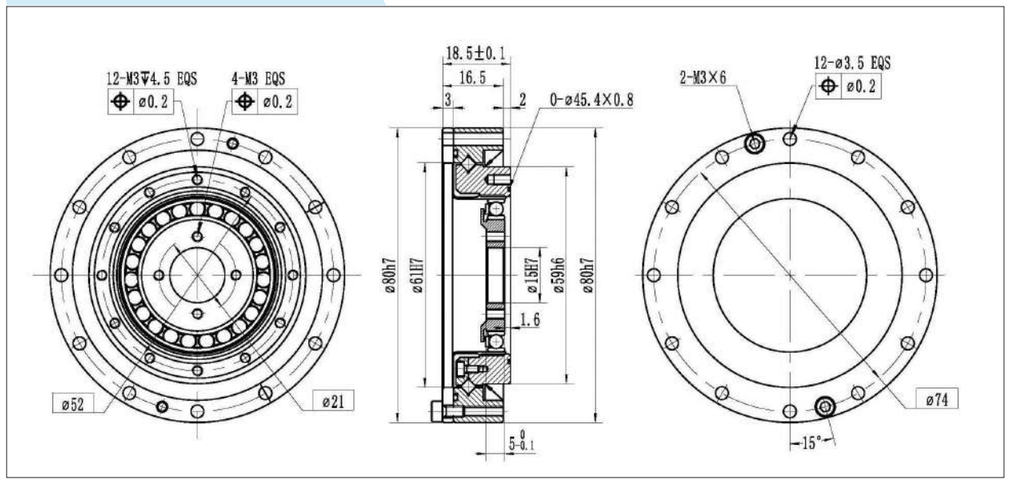
■ BSHD-III series wave reducer performance index

型号 Model	减速比 Ratio	输入 2000r/min 时的额定转矩 Pated torque at 2000r/min input	启动停止容许最大转矩 Permissible peak torque at start and stop	平均负载转矩容许最大值 Permissible maximum value for average load torque	瞬间容许最大转矩 Permissible maximum momentary torque	容许输入最高转速 Permissible maximum input rotational speed	容许平均输入转速 Permissible average input rotational speeg	背隙 Backlash Arc sec	设计寿命 Desian life
		Nm	Nm	Nm	Nm	r/min	r/min	≤	Hour
14	50	3.7	12	4.8	24	8500	3500	20	10000
	80	5.4	16	7.7	35			20	12000
	100	5.4	19	7.7	35			15	12000
17	50	11	23	18	48	7300	3500	20	10000
	80	15	29	19	61			15	12000
	100	16	37	27	71			15	12000
	120	16	37	27	71			15	12000
20	50	17	39	24	69	6500	3500	20	10000
	80	24	51	33	89			20	12000
	100	28	57	34	95			20	12000
	120	28	60	34	95			20	12000
	160	28	64	34	95			15	12000
25	50	27	69	38	127	5600	3500	20	10000
	80	44	96	60	179			20	12000
	100	47	110	75	184			20	12000
	120	47	117	75	204			20	12000
	160	47	123	75	204			15	12000
32	50	53	151	75	268	4800	3500	20	10000
	80	83	213	117	398			20	12000
	100	96	233	151	420			20	12000
	120	96	233	151	445			20	12000
	160	96	261	151	445			15	12000
40	50	96	261	137	480	4000	3000	20	10000
	80	144	364	198	686			20	12000
	100	185	398	260	700			20	12000
	120	205	432	315	765			20	12000
	160	206	453	316	765			15	12000

BSHD–14–XXX–Ⅲ



BSHD–17–XXX–Ⅲ



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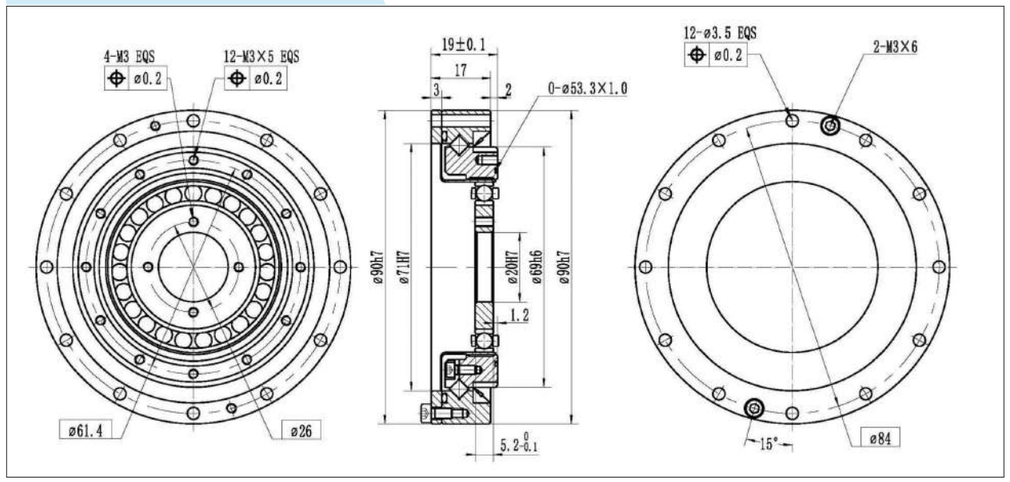
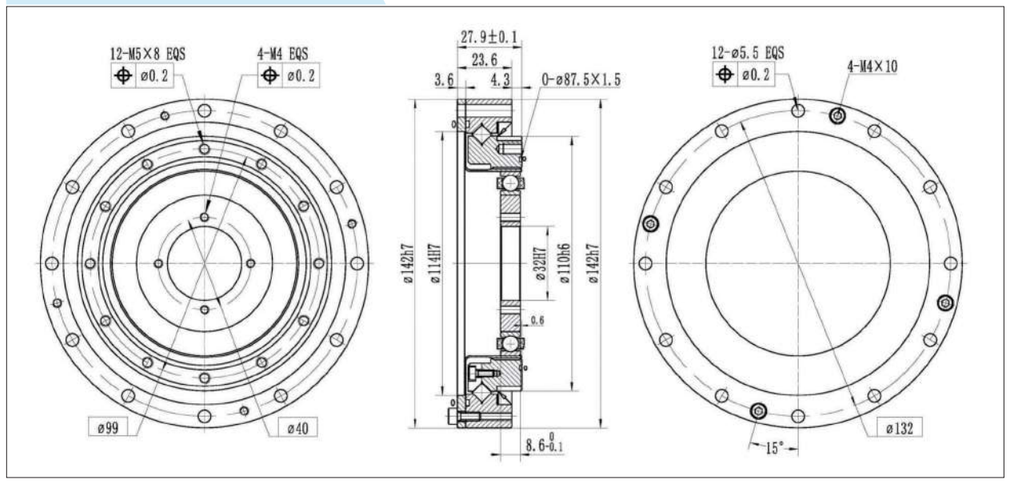
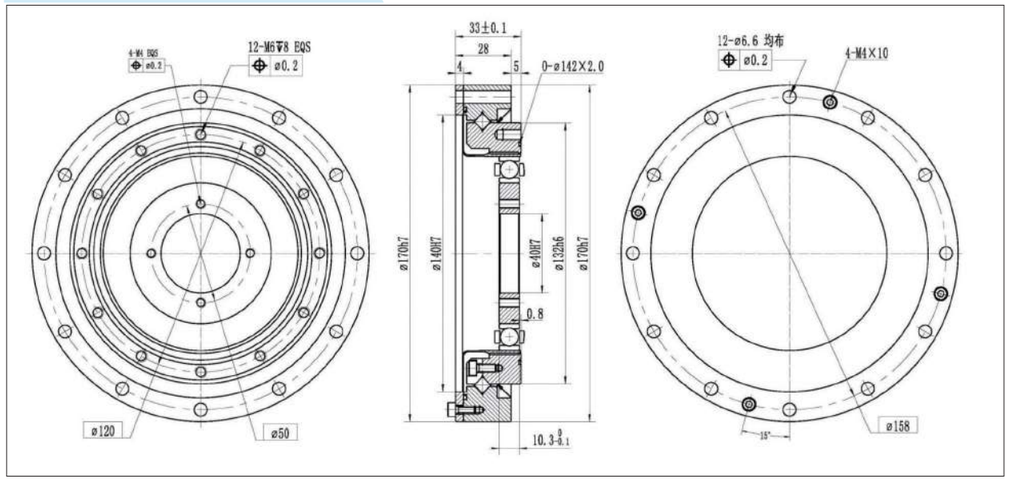


BSHD–32–XXX–Ⅲ

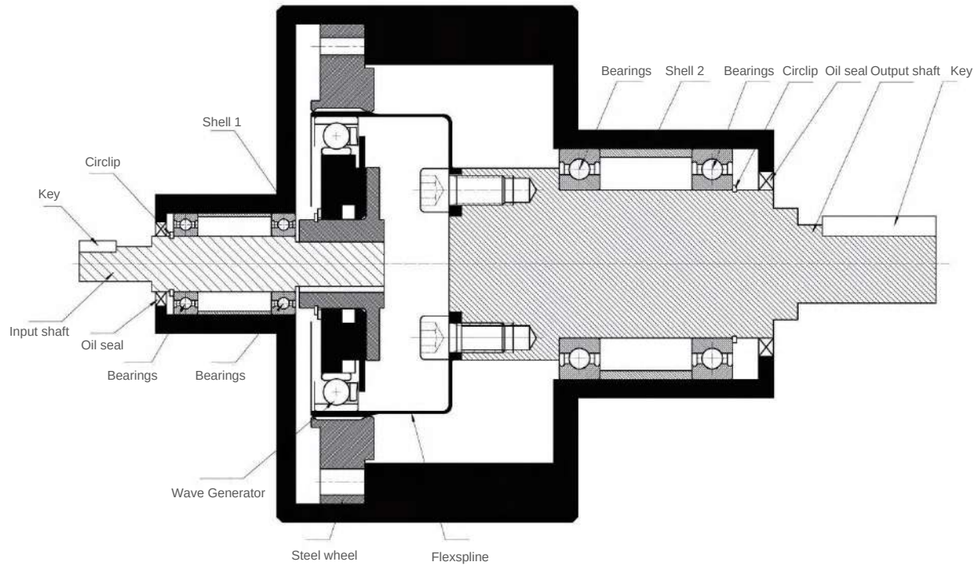


BSHD–40–XXX–Ⅲ



Harmonic reducer installation

■ Design Guide



To maximize the performance of the harmonic reducer, please note the following points:

(1) Please make the input shaft, pulley, output shaft and housing coaxial
(2) The wave generator will generate axial force, and the input shaft should be designed to support this force.
(3) Since the harmonic reducer is a small device that can transmit a large torque, the bolts connecting the flexible wheel and the output shaft should be tightened with an appropriate tightening torque.
(4) The flexible wheel will deform elastically, so the inner wall of the housing is designed according to the recommended dimensions.
(5) The input and output shafts must use matching bearings (with a gap for two-point support) to withstand radial and axial loads. Please do not apply excessive force to the wave generator and flexible wheel.
(6) Ensure that the mounting flange of the flexible wheel does not exceed the outline diameter of the flexible wheel, and process the excessive rounded corners on the flange connected to the diaphragm. Please design the dimensions of each part in accordance with the recommended dimensions.
(7) Use the shaft retaining ring to fix the wave generator hub. Make sure that the hook of the retaining ring does not interfere with the housing.

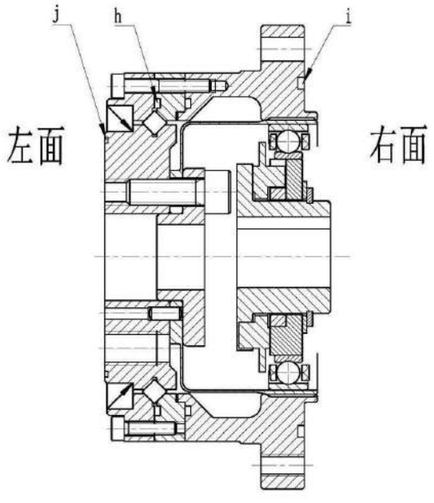
Sealing mechanism

In order to prevent the leakage of harmonic grease and maintain the durability of the harmonic reducer, the following sealing mechanism must be used

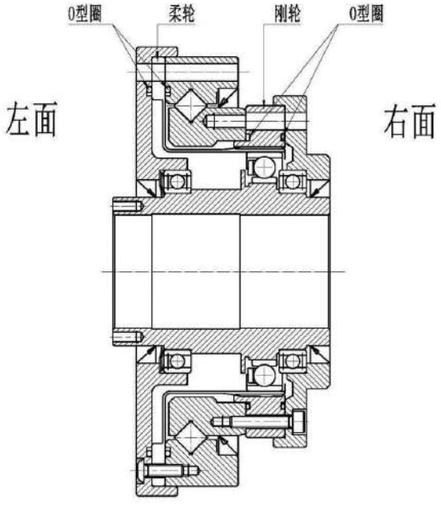
1. Rotating motion part: Skeleton oil seal (spring embedded), pay attention to whether there are scratches and other defects on the shaft side.
2. Flange assembly surface, fitting: O-ring, sealant. At this time, pay attention to whether the surface is flat and the meshing condition of the O-ring (Loctite 638 cylindrical sealant is recommended).
3. Threaded hole: Use a screw fastener with a sealing effect (Loctite 243 oil-resistant thread locking agent is recommended).

杯型	刚轮右侧面				刚轮左侧面				滚子交叉轴承侧面			
	i	0型槽尺寸			h	0型槽尺寸			j	0型槽尺寸		
	0型圈	ΦD1	ΦD2	L1	0型圈				0型圈			
14	Φ48.5×2	47.6	53	1.5	Φ40.5×0.8	41.8	40.6	0.6径向	Φ29.5×0.5	28.4	29.8	0.4
17	Φ53.5×2	53.6	59	1.5	Φ47.5×0.8	49	47.8	0.6径向	Φ34.5×0.8	33.8	36	0.6
20	Φ64.5×2	64.6	70	1.5	Φ55×0.8	56.5	55.3	0.6径向	Φ40.5×1.0	40.2	43	0.8
25	Φ77.5×2	77.4	83	1.5	Φ68.5×1.5	68.7	73.1	1.3	Φ53×1.0	52.6	55.3	0.75
32	Φ102.5×2	102.6	108	1.5	Φ90×1.8	90.2	95	1.28	Φ68.5×2	68.6	74	1.5
40	Φ122.5×2	122.6	128	1.5	Φ105.5×1.8	105.6	110	1.35	Φ81.5×1.8	81.2	86	1.35

中空型	柔轮侧面				刚轮右侧面				刚轮左侧面			
	0型圈	0型槽尺寸			0型圈	0型槽尺寸			0型圈	0型槽尺寸		
		ΦD1	ΦD2	L1		ΦD3	ΦD4	L2		ΦD3	ΦD4	L2
14	Φ53.5×1.2	53.3	56.5	0.89	Φ38×0.6	37.5	39.1	0.45	Φ38×0.6	38	光圆柱面	
17	Φ64.5×1.5	64.1	68.1	1.1	Φ47×0.8	46.7	49.1	0.6	Φ47×0.8	47		
20	Φ72.5×2	72.6	78	1.5	Φ54.5×1	54	56.8	0.75	Φ54.5×1	54	56.8	0.75
25	Φ90×1.8	90	94.8	1.35	Φ67.3×1.25	67	70.5	0.98	Φ67.3×1.25	67	70.5	0.98
32	Φ117.5×2	117.6	123	1.5	Φ88.5×1.5	88	92	1.13	Φ88.5×1.5	88	92	1.13
40	Φ142.5×2	142.6	148	1.5	Φ108.5×1.5	108	112.4	1.2	Φ108.5×1.5	108	112.4	1.2



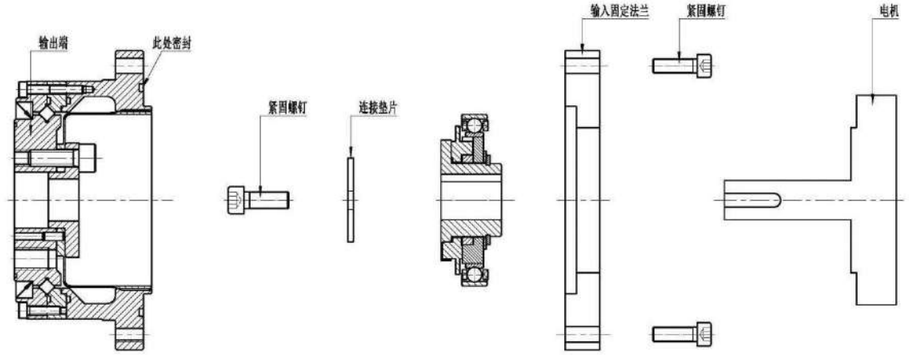
Steel wheel

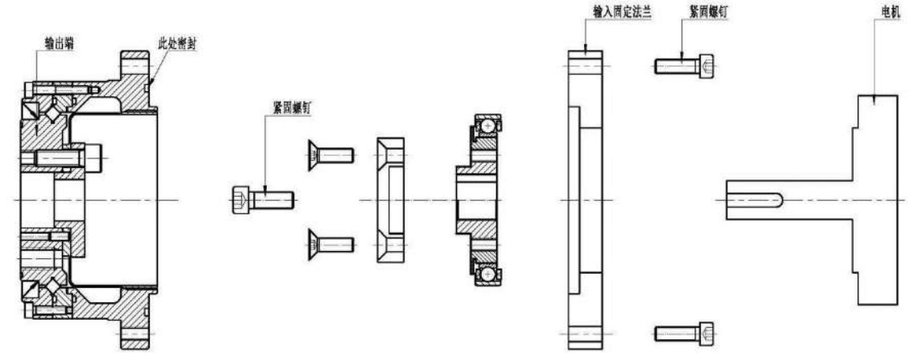


Flexspline

Installation method of harmonic reducer

BCSG (F) series connection method (rigid wheel fixed, flexible wheel output)





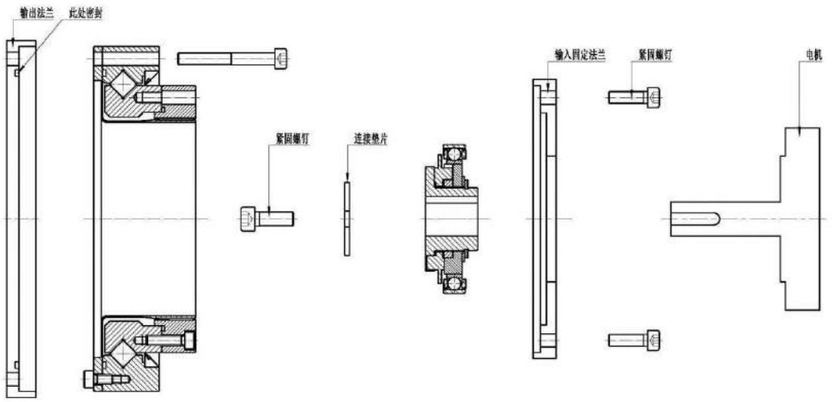
(1) Apply grease evenly on the flexible bearing, fill the cavity where the input fixed flange is connected to the motor with grease (specified brand), install the wave generator on the input motor shaft or connecting shaft, and fix it with screws and flat washers or connecting end covers.

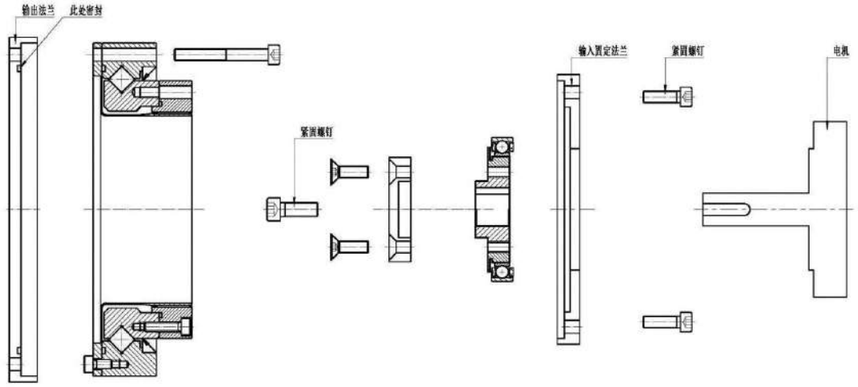
(2) First, apply a layer of grease evenly on the inner wall of the flexible wheel, and then inject grease into the flexible wheel space. The injection amount is about 50% of the flexible wheel cavity. Install the reducer in the direction shown in the figure. When installing the wave generator, press it in while rotating it. After it is in place, fix the reducer with the corresponding screws. The pre-tightening force of the screws is 0.5Nmo

(3) Set the motor speed to 100 rpm, start the motor, and tighten the screws in a cross-shaped manner, tightening the screws evenly three to four times. All connecting screws are grade 12.9 and must be coated with Loctite 243 oil-resistant thread locker to prevent the screws from failing or loosening during operation.

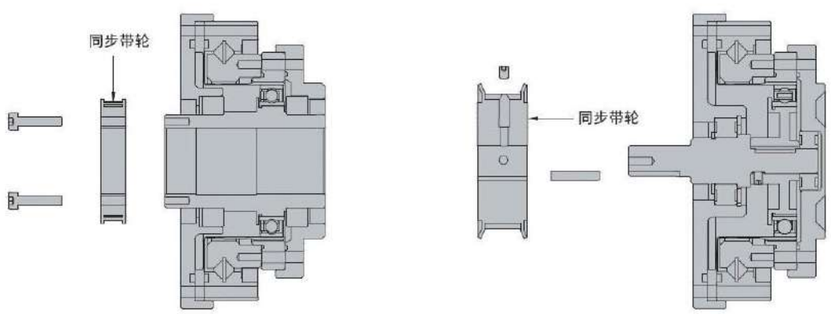
(4) Machining requirements for the fixed mounting surface connected to the reducer: flatness 0.01, perpendicularity to the axis 0.01.

BSHG(F)-S0 series connection mode (rigid wheel fixed, flexible wheel output)

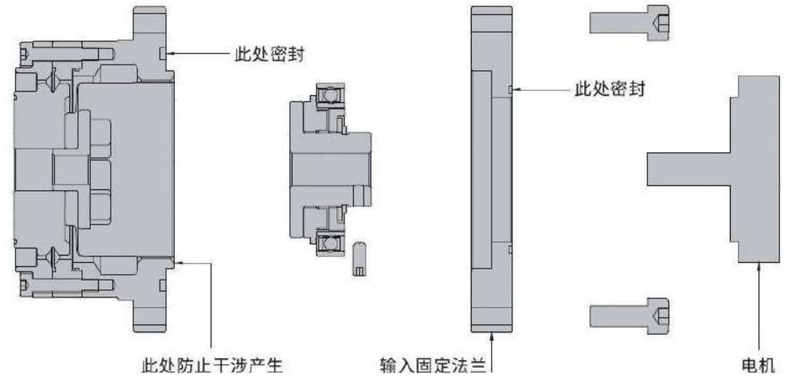


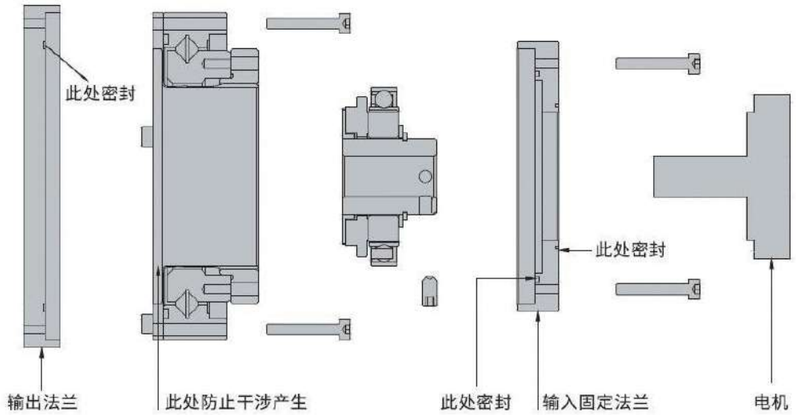


BSHG(F)-III series connection method



The motor shaft is the connection method between the optical shaft and the reducer





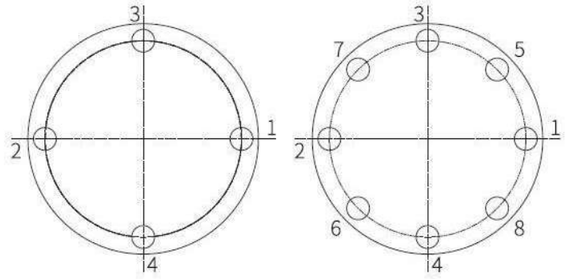
(1) Apply grease evenly on the flexible bearing, fill the cavity where the input fixed flange is connected to the motor with grease (specified brand), install the wave generator on the input motor shaft or connecting shaft, and fix it with screws and flat washers or connecting end covers.

(2) First, apply a layer of grease evenly on the inner wall of the flexible wheel, and then inject grease into the flexible wheel space. The injection amount is about 50% of the flexible wheel cavity. Install the reducer in the direction shown in the figure. When installing the wave generator, press it in while rotating it. After it is in place, fix the reducer with the corresponding screws. The pre-tightening force of the screws is 0.5Nmo

(3) Set the motor speed to 100 rpm, start the motor, and tighten the screws in a cross-shaped manner, tightening the screws evenly three to four times. All connecting screws are grade 12.9 and must be coated with Loctite 243 oil-resistant thread locker to prevent the screws from failing or loosening during operation.

(4) Machining requirements for the fixed mounting surface connected to the reducer: flatness 0.01, perpendicularity to the axis 0.01.

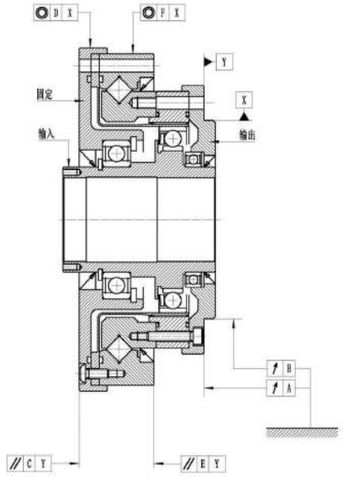
■ Screw locking method and corresponding locking force



Screw corresponding locking force

Screw performance grade	12.9							
Nominal diameter of screw	mm	3	4	5	6	8	10	12
Locking torque	Nm	2	4	9	15	35	70	125

■ Installation accuracy of harmonic reducer



model / symbol	14	17	20	25	32	40
a	0.010	0.010	0.010	0.015	0.015	0.015
b	0.010	0.012	0.012	0.013	0.013	0.015
c	0.024	0.026	0.038	0.045	0.056	0.060
d	0.010	0.010	0.010	0.010	0.010	0.015
e	0.038	0.038	0.047	0.049	0.054	0.060