



高精度行星减速器
PLANETARY GEARBOX

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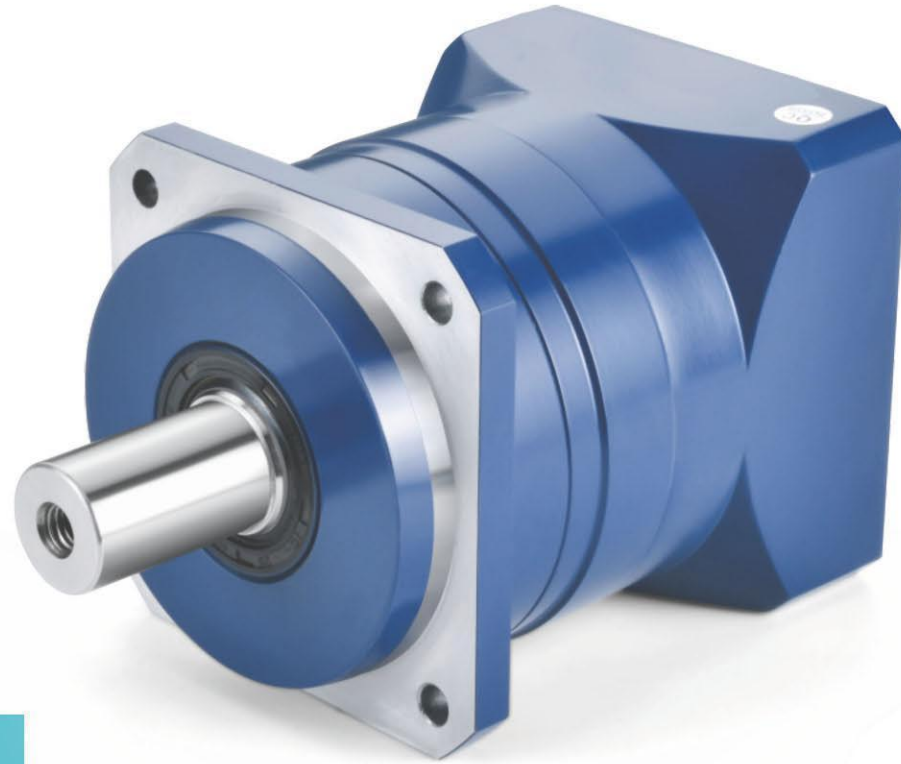
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- ✓ ADF060
- ✓ ADF090
- ✓ ADF115
- ✓ ADF140
- ✓ ADF180



ADF Series

ADF系列减速机核心特性 The Core Characteristics of ADF Series Reducer

- 1 采用斜齿齿轮传动，经渗碳淬火处理，齿向齿廓修形处理，确保运行低噪音、平稳；承载能力较直齿提高20%；
- 2 整体式输出轴，行星轮两端轴承支撑，实现高精度、强度；
- 3 回程间隙小，精密型单级可以做到3arcmin以内。

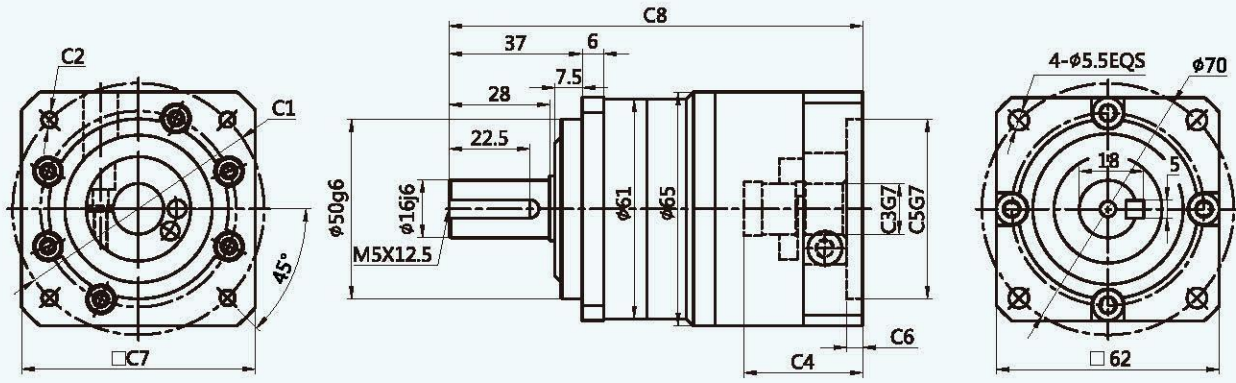
- 1 Helical gear transmission, carburizing and quenching treatment, tooth profile modification treatment, to ensure low noise and smooth operation. The bearing capacity is 20% higher than that of straight teeth.
- 2 Integral output shaft and bearing support at both ends of planetary wheel to achieve high precision and strength.
- 3 The backhaul clearance is small, and the precision single stage can achieve less than 3 arcmin.

减速机性能资料 Gear box performance information

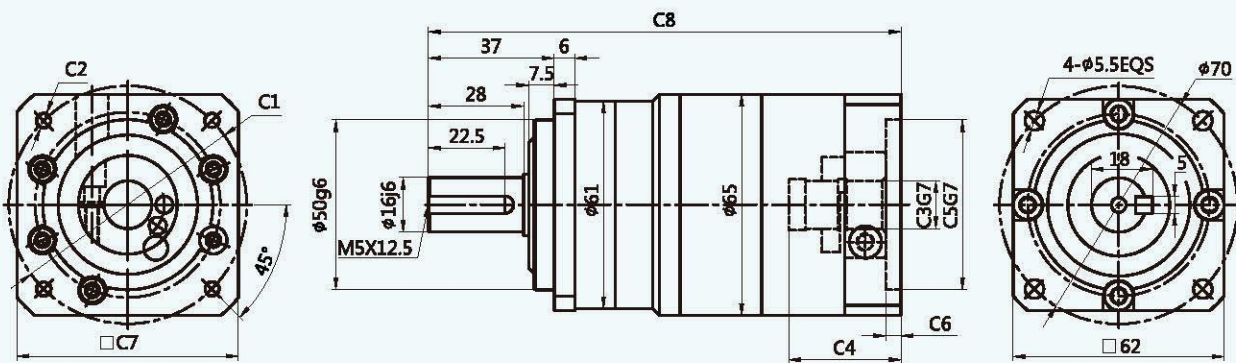
型号 Model	单位 Unit	ADF060	ADF090	ADF115	ADF140	ADF180	减速比 Ratio	Stage
额定输出扭矩 Rated output torque	N·m	18	50	120	240	600	3	1
		27	75	180	360	750	4	
		27	75	180	360	750	5	
		27	75	180	360	750	7	
		18	50	120	240	500	10	
		35	90	180	450	650	15	
		37	96	230	450	1050	16	
		37	96	230	564	1000	20	
		37	96	255	585	1000	25	
		37	96	230	564	1050	28	
		27	87	180	360	800	30	
		37	96	255	585	1000	35	
		37	96	230	564	1000	40	
		37	96	255	585	1000	50	
		27	87	180	360	800	70	
		18	50	120	240	710	100	
故障停滞扭矩 Emergency stop torque	N·m	3倍额定输出扭矩 3 times Rated output torque						
额定输入转速 Nominal input speed	rmp	3000	3000	3000	2000	1500		
最大输入转速 Maximum input speed	rmp	6000	6000	6000	3500	3000		
最大径向力 Maximum radial force	N	1200	2400	4300	9100	15000		
最大轴向力 Maximum axial force	N	1100	2200	3900	8200	14000		
效率 Efficiency	%	Single [97%]			Double [95%]			
平均寿命 Average lifetime	h	20000						
重量 Weight	kg	1.4	3.7	8	16	36		1
		1.6	4.2	8.9	18	39		2
转动惯量 Moment of Inertia	kgcm ²	0.16	0.61	3.25	12.31	28.98	3	1
		0.14	0.48	2.74	7.54	23.67	4	
		0.13	0.47	2.71	7.42	22.75	5	
		0.13	0.47	2.62	7.25	22.48	7	
		0.13	0.44	2.57	7.14	22.55	10	
		0.127	0.72	2.56	12.35	12.35	15	
		0.088	0.5	1.75	7.47	7.54	16	
		0.075	0.44	1.5	6.65	7.42	20	
		0.075	0.44	1.49	5.81	7.54	25	
		0.064	0.39	1.3	6.34	7.14	28	
		0.064	0.39	1.3	6.34	7.14	30	
		0.064	0.39	1.3	6.34	7.14	35	
		0.064	0.39	1.3	4.08	7.14	40	
		0.075	0.39	1.5	7.5	7.54	50	
		0.075	0.39	1.5	7.5	7.54	70	
		0.075	0.39	1.5	7.5	7.54	100	
回程间隙 Backlash	arcmin	≤3	≤3	≤3	≤3	≤3		Precise[1]
		≤5	≤5	≤5	≤5	≤5		Standard[1]
		≤5	≤5	≤5	≤5	≤5		Precise[2]
		≤7	≤7	≤7	≤7	≤7		Standard[2]
抗扭刚性 Torsional rigidity	N·m/arc min	7	14	25	50	145		
噪音 Noise	dB	60	62	62	68	70		
润滑 lubricating		合成油脂润滑 Synthetic grease lubrication						
防护等级 levels of protection		IP65						

外形尺寸图表
Outline dimensional

ADF060-L1



ADF060-L2

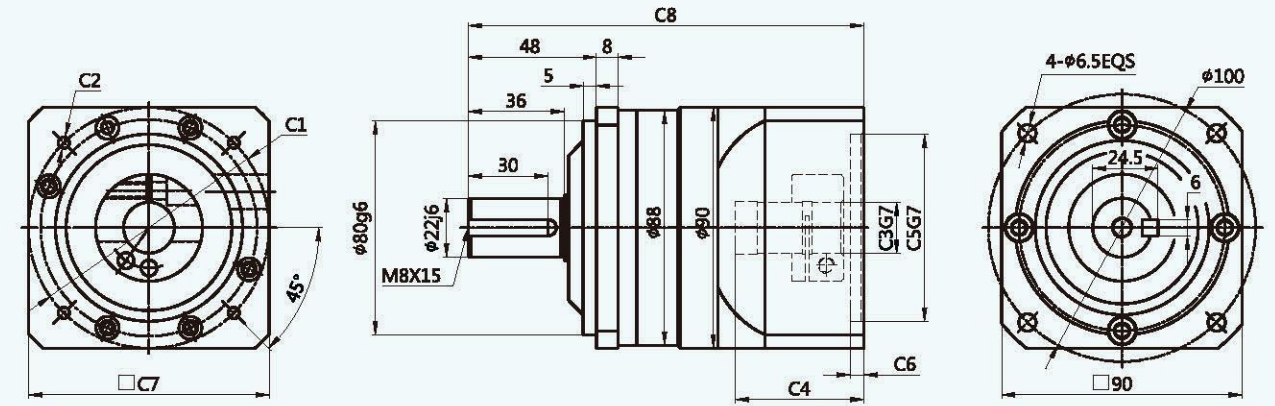


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

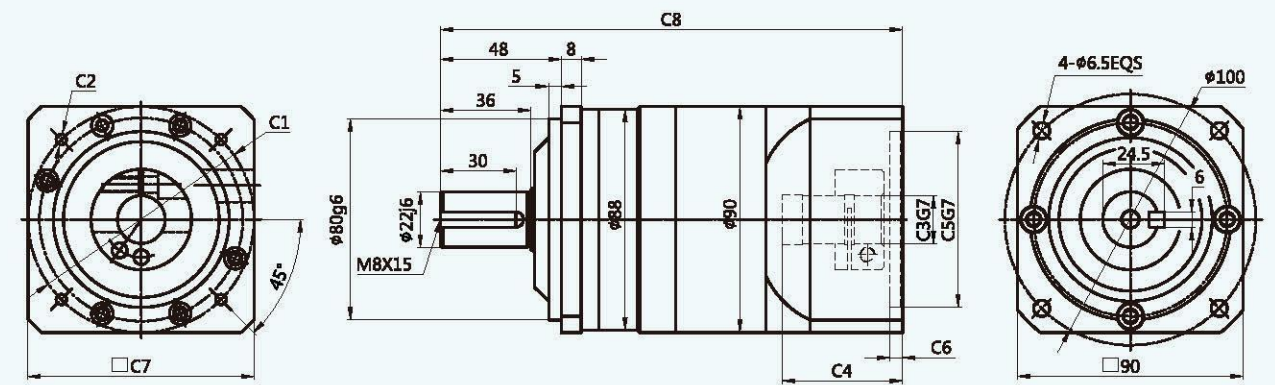
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADF060-L1	□47.14	4-M4	φ8	30	φ38.1	4.5	65	112
	φ46	4-M4	φ8	30	φ30	4.5	65	112
	φ45	4-M3	φ8	30	φ30	4.5	65	112
	φ70	4-M4/4-M5	φ14	34	φ50	4.5	65	115
ADF060-L2	□47.14	4-M4	φ8	30	φ38.1	4.5	65	136
	φ46	4-M4	φ8	30	φ30	4.5	65	136
	φ45	4-M3	φ8	30	φ30	4.5	65	136
	φ70	4-M4/4-M5	φ14	34	φ50	4.5	65	139

外形尺寸图表
Outline dimensional

ADF090-L1



ADF090-L2

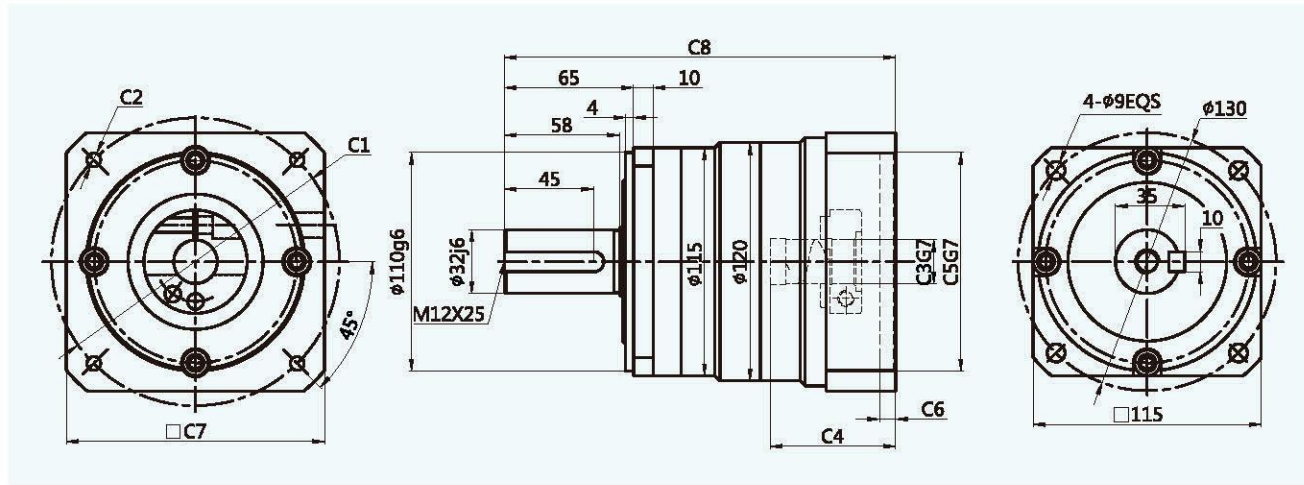


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

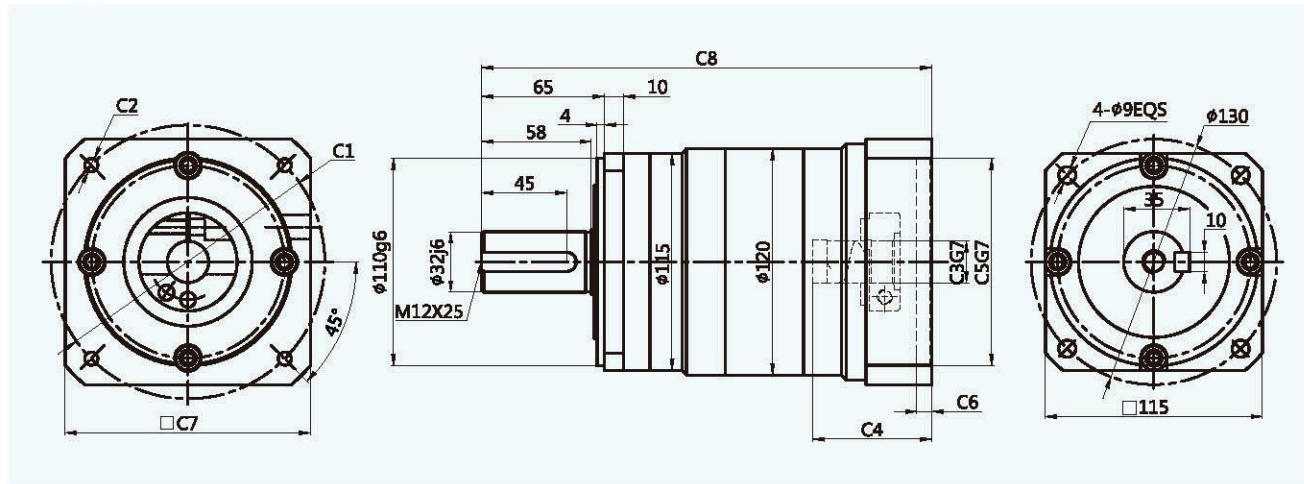
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADF090-L1	φ70	4-M4/4-M5	φ14	47	φ50	4.5	90	147
	□69.6	4-M6	φ14	48	φ73	4.5	90	148
	φ90	4-M5/4-M6	φ19	48	φ70	5.5	90	148
	φ115	4-M8	φ19/φ22	60	φ95	7.5	130	160
	φ130	4-M8	φ19/φ22	60	φ95	7.5	130	160
	φ145	4-M8	φ19/φ22/φ24	63	φ110	13	130	163.5
ADF090-L2	φ70	4-M4/4-M5	φ14	47	φ50	4.5	90	183
	□69.6	4-M6	φ14	48	φ73	4.5	90	184
	φ90	4-M5/4-M6	φ19	48	φ70	5.5	90	184

外形尺寸图表
Outline dimensional

ADF115-L1



ADF115-L2

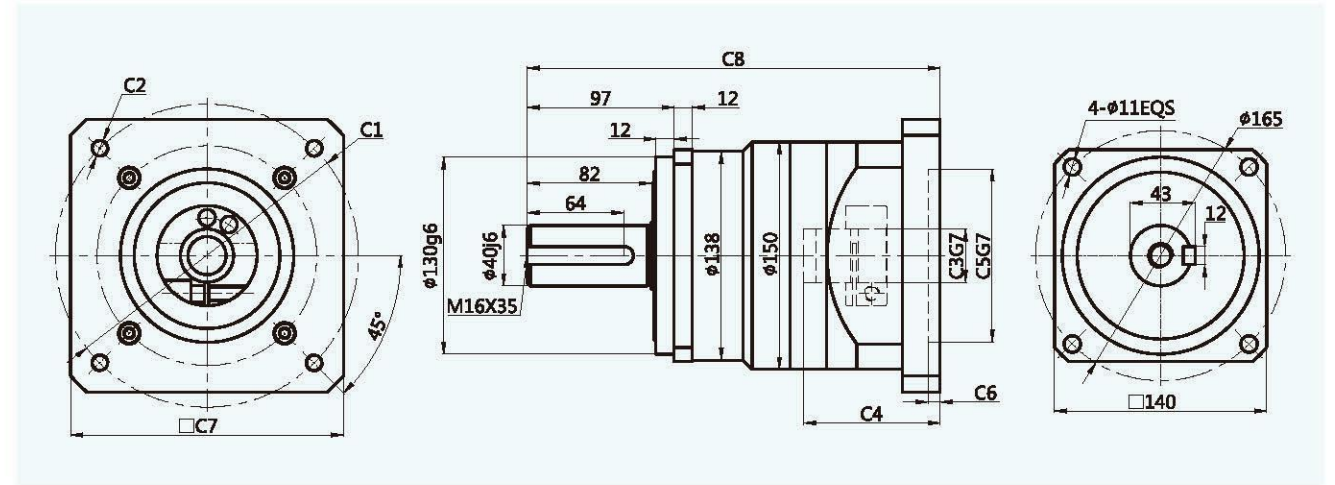


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

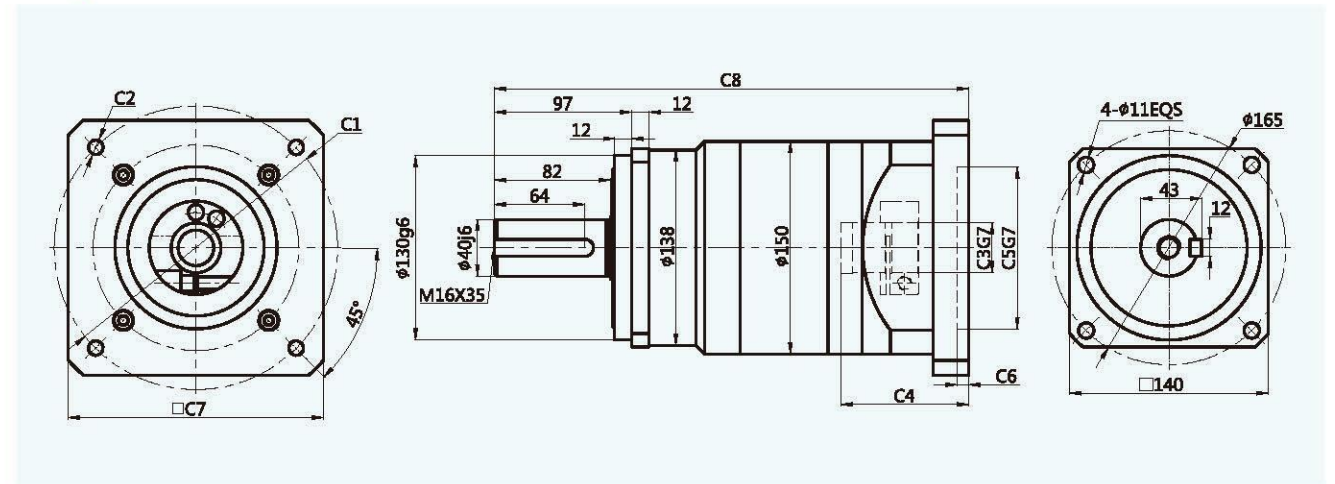
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADF115-L1	$\phi 115$	4-M8	$\phi 19/\phi 22$	60	$\phi 95$	7	130	194
	$\phi 130$	4-M8	$\phi 19/\phi 22$	60	$\phi 95$	7	130	194
	$\phi 145$	4-M8	$\phi 19/\phi 22/\phi 24$	62	$\phi 110$	7	130	197
	$\phi 200$	4-M12	$\phi 35$	82	$\phi 114.3$	7	180	215.5
ADF115-L2	$\phi 90$	4-M5/4-M6	$\phi 19$	55	$\phi 70$	5.5	90	230.5
	$\phi 115$	4-M8	$\phi 19/\phi 22$	60	$\phi 95$	7	130	235.5
	$\phi 130$	4-M8	$\phi 19/\phi 22$	60	$\phi 95$	7	130	235.5
	$\phi 145$	4-M8	$\phi 19/\phi 22/\phi 24$	62	$\phi 110$	7	180	238.5

外形尺寸图表
Outline dimensional

ADF140-L1



ADF140-L2

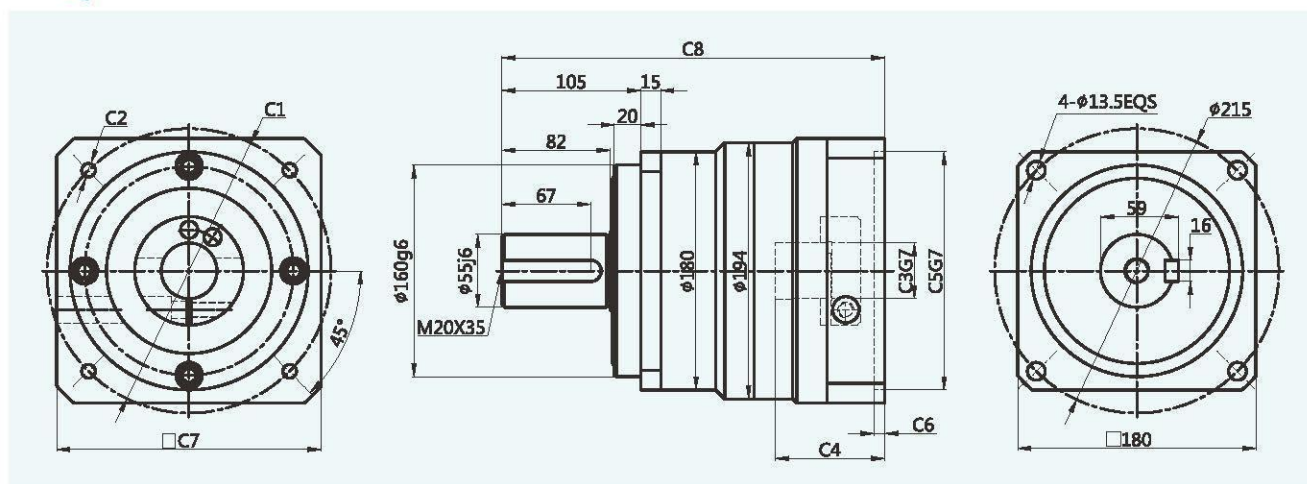


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

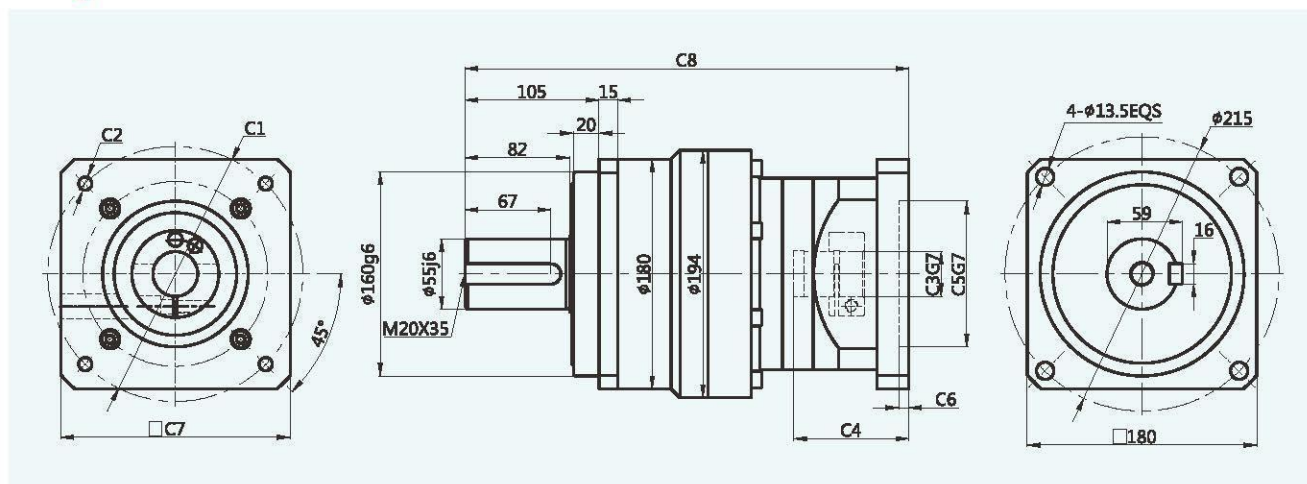
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADF140-L1	$\phi 130$	4-M8	$\phi 22$	65	$\phi 95$	7	150	247.5
	$\phi 145$	4-M8	$\phi 22/\phi 24$	65	$\phi 110$	7	150	247.5
	$\phi 165$	4-M10	$\phi 32$	90	$\phi 130$	7	150	272.5
	$\phi 200$	4-M12	$\phi 35$	90	$\phi 114.3$	7	180	272.5
	$\phi 200$	4-M12	$\phi 35$	115	$\phi 114.3$	7	180	297.5
	$\phi 215$	4-M12	$\phi 38/\phi 42$	90	$\phi 180$	7	190	272.5
ADF140-L2	$\phi 130$	4-M8	$\phi 22$	65	$\phi 95$	7	150	309.5
	$\phi 145$	4-M8	$\phi 22/\phi 24$	65	$\phi 110$	7	150	309.5
	$\phi 200$	4-M12	$\phi 35$	90	$\phi 114.3$	7	180	334.5

外形尺寸图表
Outline dimensional

ADF180-L1



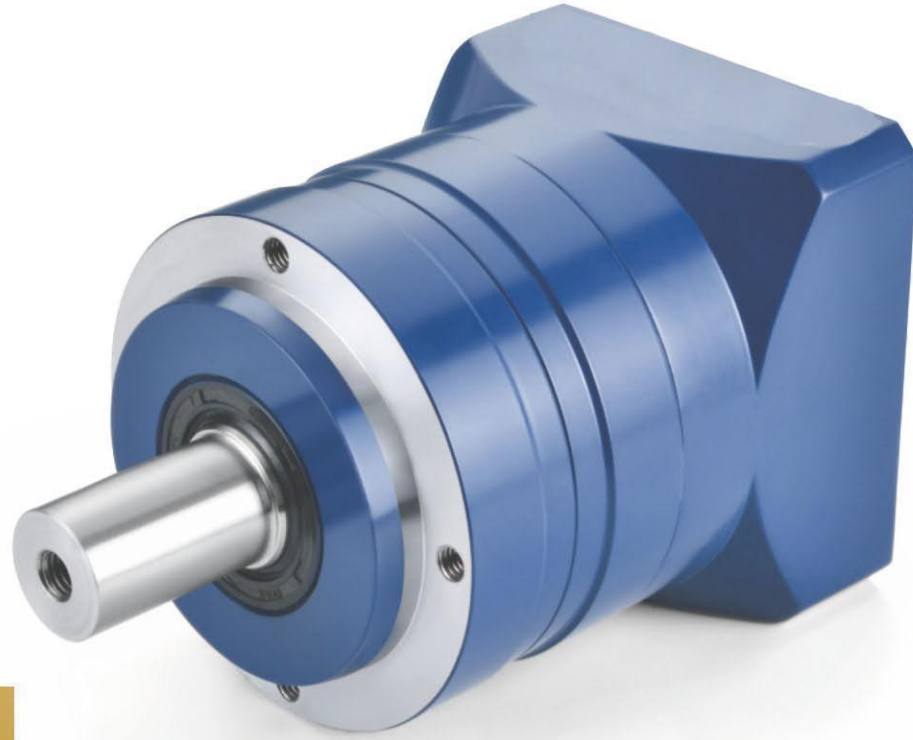
ADF180-L2



适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADF180-L1	$\phi 200$	4-M12	$\phi 35$	83	$\phi 114.3$	7	180	289.5
	$\phi 215$	4-M12	$\phi 42$	83	$\phi 180$	7	190	289.5
ADF180-L2	$\phi 145$	4-M8	$\phi 22/\phi 24$	65	$\phi 110$	7	130	323
	$\phi 200$	4-M12	$\phi 35$	90	$\phi 114.3$	7	180	348
	$\phi 200$	4-M12	$\phi 35$	115	$\phi 114.3$	7	180	373
	$\phi 215$	4-M12	$\phi 42$	90	$\phi 180$	7	190	348

- ADL070
- ADL090
- ADL120
- ADL155
- ADL205



ADL Series

ADL系列减速机核心特性 The Core Characteristics of ADL Series Reducer

- 1 采用斜齿齿轮传动，经渗碳淬火处理，齿向齿廓修形处理，确保运行低噪音、平稳；承载能力较直齿提高20%；
- 2 整体式输出轴，行星轮两端轴承支撑，实现高精度、强度；
- 3 回程间隙小，精密型单级可以做到3arcmin以内。

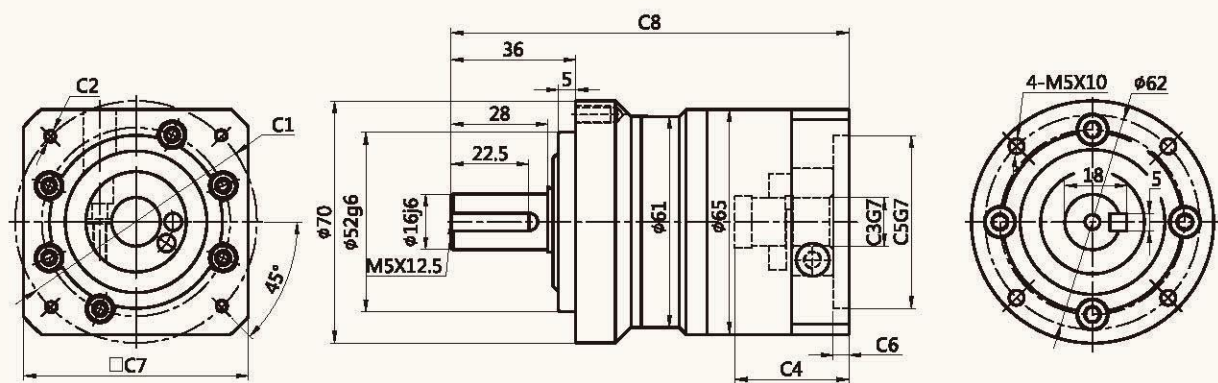
- 1 Helical gear transmission, carburizing and quenching treatment, tooth profile modification treatment, to ensure low noise and smooth operation. The bearing capacity is 20% higher than that of straight teeth.
- 2 Integral output shaft and bearing support at both ends of planetary wheel to achieve high precision and strength.
- 3 The backlash clearance is small, and the precision single stage can achieve less than 3 arcmin.

减速机性能资料 Gear box performance information

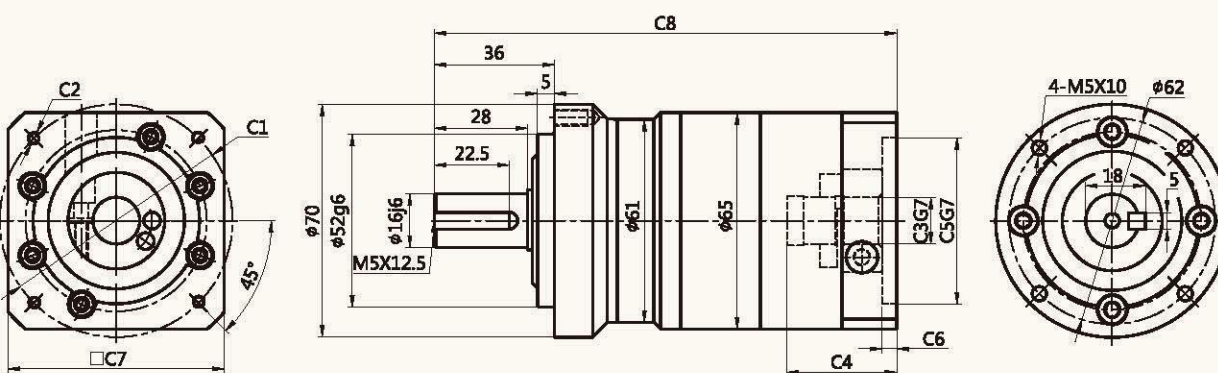
型号 Model	单位 Unit	ADL070	ADL090	ADL120	ADL155	ADL205	减速比 Ratio	Stage
额定输出扭矩 Rated output torque	N·m	18	50	120	240	600	3	1
		27	75	180	360	750	4	
		27	75	180	360	750	5	
		27	75	180	360	750	7	
		18	50	120	240	500	10	
		35	90	180	450	650	15	
		37	96	230	450	1050	16	2
		37	96	230	564	1000	20	
		37	96	255	585	1000	25	
		37	96	230	564	1050	28	
		27	87	180	360	800	30	
		37	96	255	585	1000	35	
		37	96	230	564	1000	40	
		37	96	255	585	1000	50	
		27	87	180	360	800	70	
		18	50	120	240	710	100	
故障停滞扭矩 Emergency stop torque	N·m	3倍额定输出扭矩 3 times Rated output torque						
额定输入转速 Nominal input speed	rmp	3000	3000	3000	2000	1500		
最大输入转速 Maximum input speed	rmp	6000	6000	6000	3500	3000		
最大径向力 Maximum radial force	N	1200	2400	4300	9100	15000		
最大轴向力 Maximum axial force	N	1100	2200	3900	8200	14000		
效率 Efficiency	%	Single [97%]			Double [95%]			
平均寿命 Average lifetime	h	20000						
重量 Weight	kg	1.4	3.5	7.8	16	39		1
		1.7	4.0	8.7	19	45		2
转动惯量 Moment of Inertia	kgcm ²	0.16	0.61	3.25	12.31	28.98	3	1
		0.14	0.48	2.74	7.54	23.67	4	
		0.13	0.47	2.71	7.42	22.75	5	
		0.13	0.47	2.62	7.25	22.48	7	
		0.13	0.44	2.57	7.14	22.55	10	
		0.127	0.72	2.56	12.35	12.35	15	
		0.088	0.5	1.75	7.47	7.54	16	2
		0.075	0.44	1.5	6.65	7.42	20	
		0.075	0.44	1.49	5.81	7.54	25	
		0.064	0.39	1.3	6.34	7.14	28	
		0.064	0.39	1.3	6.34	7.14	30	
		0.064	0.39	1.3	6.34	7.14	35	
		0.064	0.39	1.3	4.08	7.14	40	
		0.075	0.39	1.5	7.5	7.54	50	
		0.075	0.39	1.5	7.5	7.54	70	
		0.075	0.39	1.5	7.5	7.54	100	
回程间隙 Backlash	arcmin	≤ 3	≤ 3	≤ 3	≤ 3	≤ 3		Precise[1]
		≤ 5	≤ 5	≤ 5	≤ 5	≤ 5		Standard[1]
		≤ 5	≤ 5	≤ 5	≤ 5	≤ 5		Precise[2]
		≤ 7	≤ 7	≤ 7	≤ 7	≤ 7		Standard[2]
抗扭刚性 Torsional rigidity	N·m/arc min	7	14	25	50	145		
噪音 Noise	dB	60	62	62	68	70		
润滑 lubricating		合成油脂润滑 Synthetic grease lubrication						
防护等级 levels of protection		IP65						

外形尺寸图表
Outline dimensional

ADL070-L1



ADL070-L2

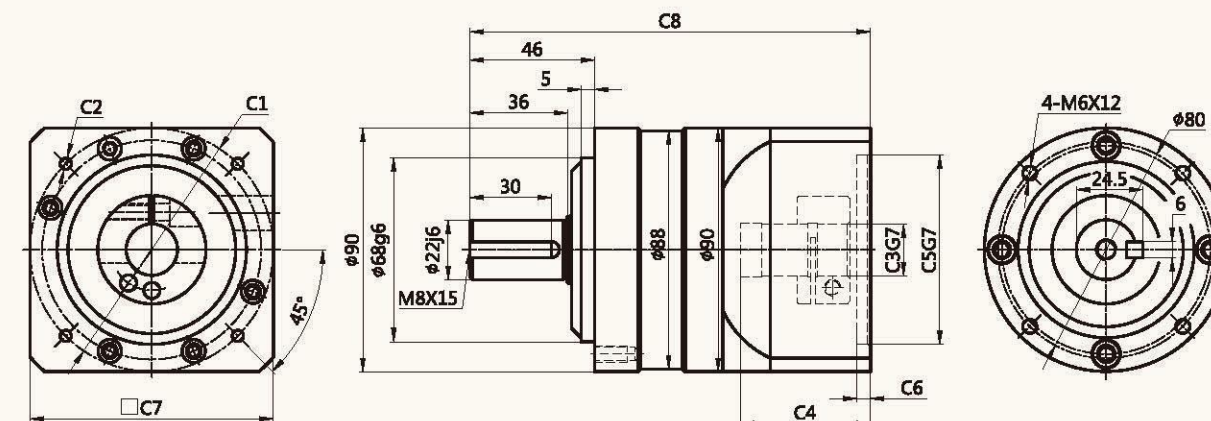


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

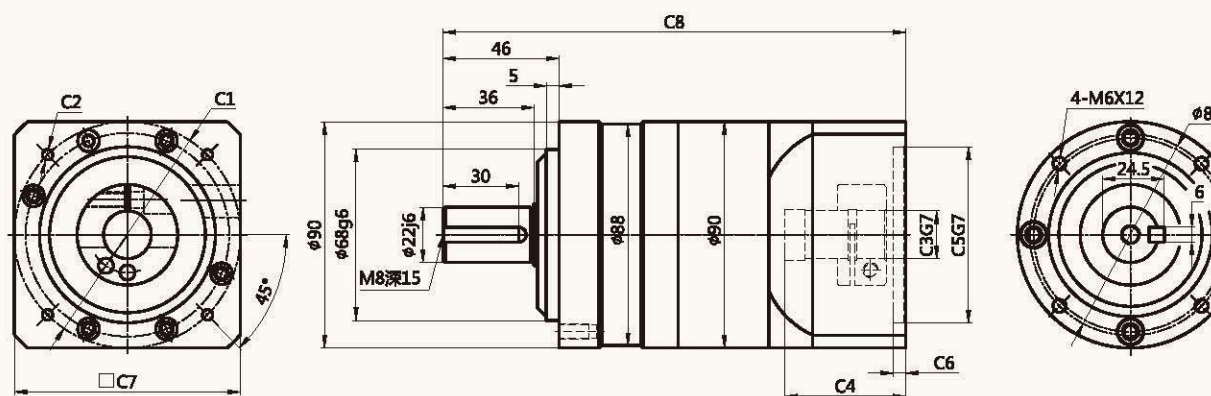
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADL070-L1	□47.14	4-M4	Φ8	30	Φ38.1	4.5	65	112
	Φ46	4-M4	Φ8	30	Φ30	4.5	65	112
	Φ45	4-M3	Φ8	30	Φ30	4.5	65	112
	Φ70	4-M4/4-M5	Φ14	34	Φ50	4.5	65	115
ADL070-L2	□47.14	4-M4	Φ8	30	Φ38.1	4.5	65	136
	Φ46	4-M4	Φ8	30	Φ30	4.5	65	136
	Φ45	4-M3	Φ8	30	Φ30	4.5	65	136
	Φ70	4-M4/4-M5	Φ14	34	Φ50	4.5	65	139

外形尺寸图表
Outline dimensional

ADL090-L1



ADL090-L2

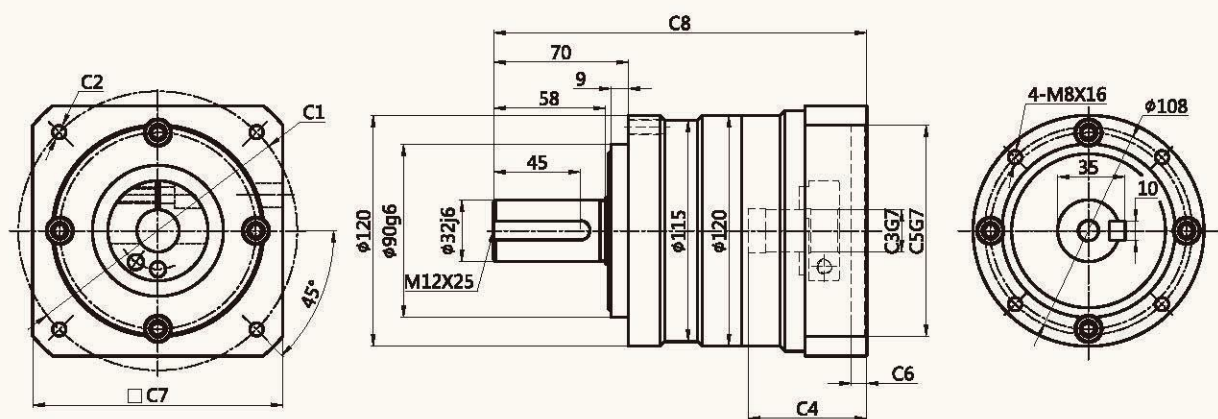


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

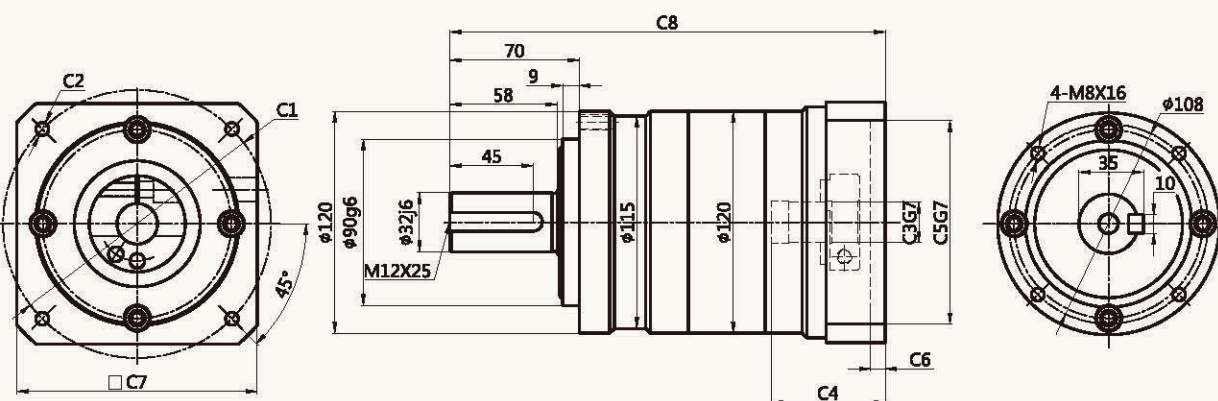
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADL090-L1	Φ70	4-M4/4-M5	Φ14	47	Φ50	4.5	90	147
	□69.6	4-M6	Φ14	48	Φ73	4.5	90	148
	Φ90	4-M5/4-M6	Φ19	48	Φ70	5.5	90	148
	Φ115	4-M8	Φ19/Φ22	60	Φ95	7.5	130	160
	Φ130	4-M8	Φ19/Φ22	60	Φ95	7.5	130	160
	Φ145	4-M8	Φ19/Φ22/Φ24	63	Φ110	13	130	163.5
ADL090-L2	Φ70	4-M4/4-M5	Φ14	47	Φ50	4.5	90	183
	□69.6	4-M6	Φ14	48	Φ73	4.5	90	184
	Φ90	4-M5/4-M6	Φ19	48	Φ70	5.5	90	184

外形尺寸图表
Outline dimensional

ADL120-L1



ADL120-L2

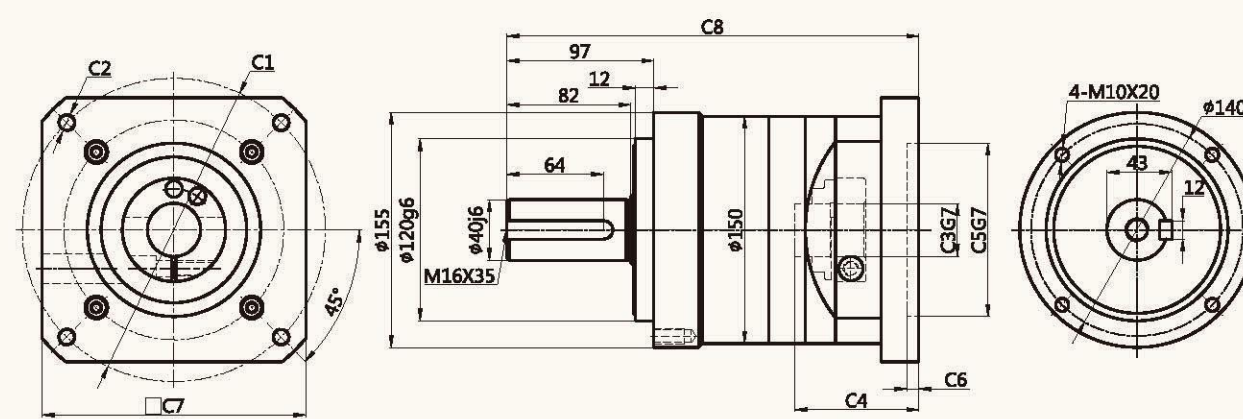


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

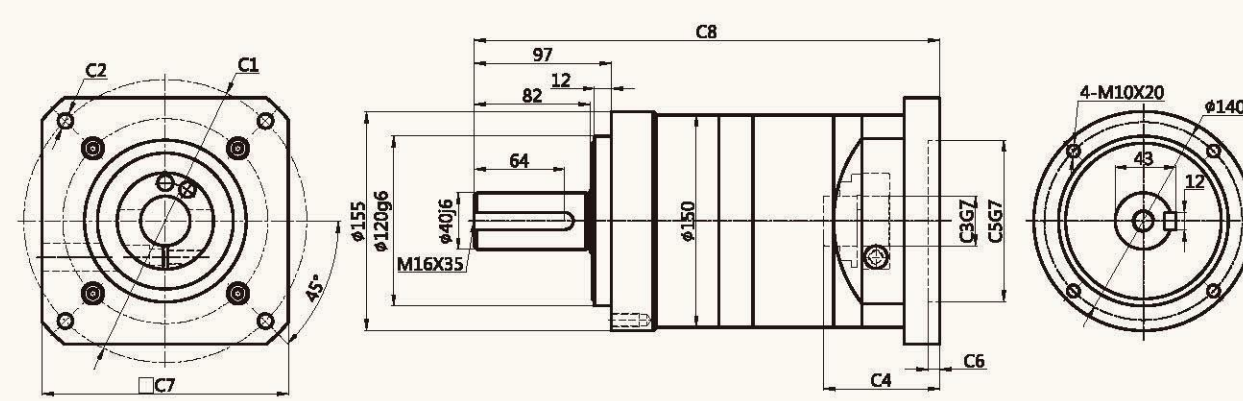
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADL120-L1	Φ115	4-M8	Φ19/Φ22	60	Φ95	7	130	194
	Φ130	4-M8	Φ19/Φ22	60	Φ95	7	130	194
	Φ145	4-M8	Φ19/Φ22/Φ24	62	Φ110	7	130	197
	Φ200	4-M12	Φ35	82	Φ114.3	7	180	215.5
ADL120-L2	Φ90	4-M5/4-M6	Φ19	55	Φ70	5.5	90	230.5
	Φ115	4-M8	Φ19/Φ22	60	Φ95	7	130	235.5
	Φ130	4-M8	Φ19/Φ22	60	Φ95	7	130	235.5
	Φ145	4-M8	Φ19/Φ22/Φ24	62	Φ110	7	180	238.5

外形尺寸图表
Outline dimensional

ADL155-L1



ADL155-L2

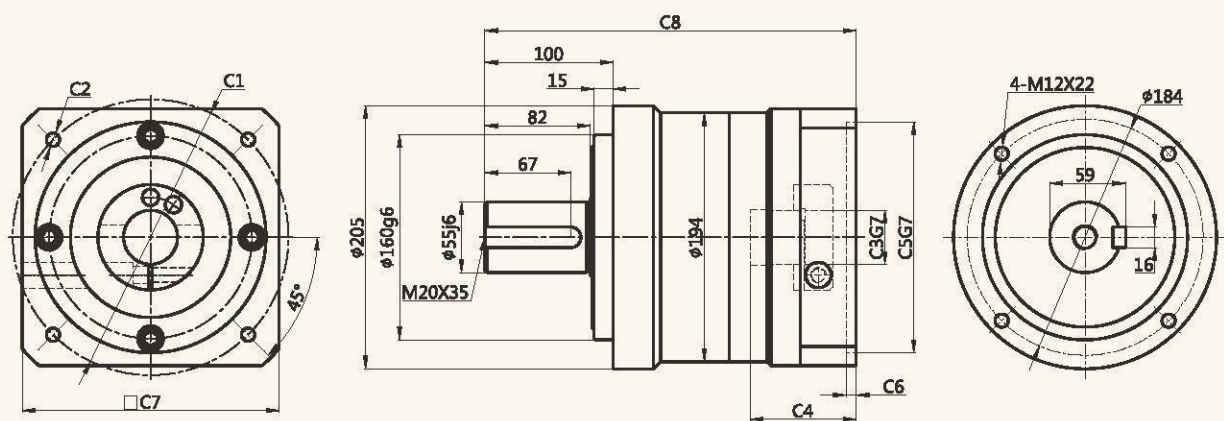


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

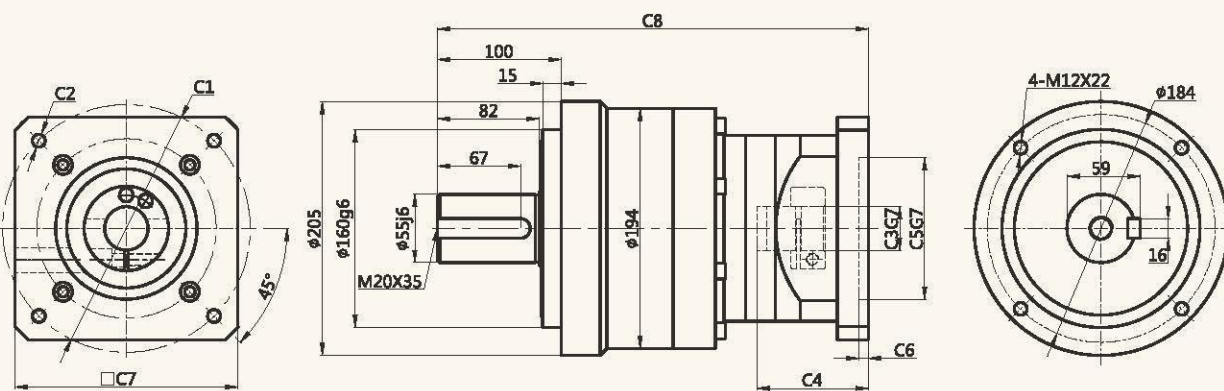
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADL155-L1	Φ130	4-M8	Φ22	65	Φ95	7	150	247.5
	Φ145	4-M8	Φ22/Φ24	65	Φ110	7	150	247.5
	Φ165	4-M10	Φ32	90	Φ130	7	150	272.5
	Φ200	4-M12	Φ35	90	Φ114.3	7	180	272.5
	Φ200	4-M12	Φ35	115	Φ114.3	7	180	297.5
	Φ215	4-M12	Φ38/Φ42	90	Φ180	7	190	272.5
ADL155-L2	Φ130	4-M8	Φ22	65	Φ95	7	150	309.5
	Φ145	4-M8	Φ22/Φ24	65	Φ110	7	150	309.5
	Φ200	4-M12	Φ35	90	Φ114.3	7	180	334.5

外形尺寸图表
Outline dimensional

ADL205-L1



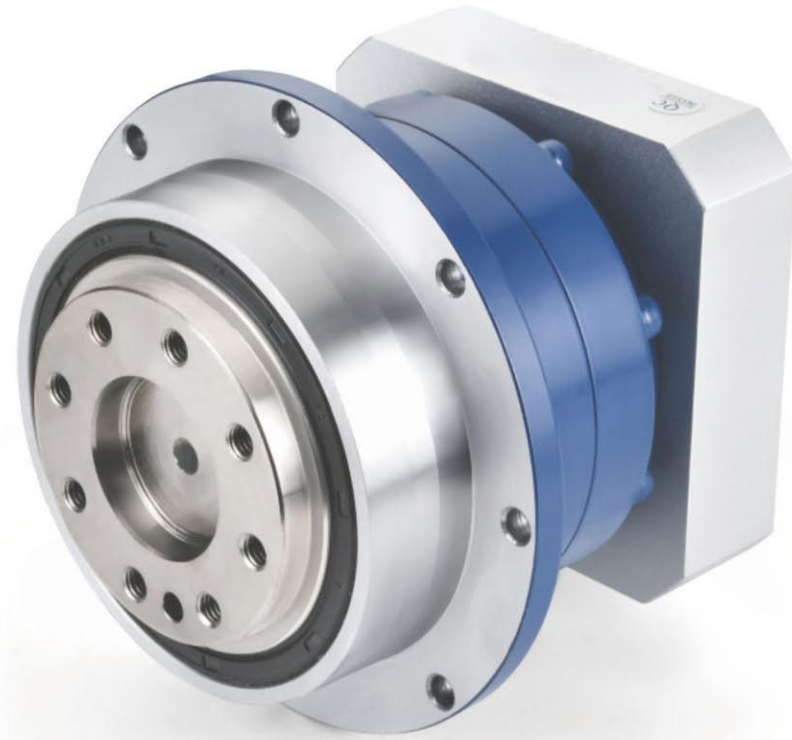
ADL205-L2



适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADL205-L1	$\phi 200$	4-M12	$\phi 35$	83	$\phi 114.3$	7	180	289.5
	$\phi 215$	4-M12	$\phi 42$	83	$\phi 180$	7	190	289.5
ADL205-L2	$\phi 145$	4-M8	$\phi 22/\phi 24$	65	$\phi 110$	7	130	323
	$\phi 200$	4-M12	$\phi 35$	90	$\phi 114.3$	7	180	348
	$\phi 200$	4-M12	$\phi 35$	115	$\phi 114.3$	7	180	373
	$\phi 215$	4-M12	$\phi 42$	90	$\phi 180$	7	190	348

- ADH064
- ADH090
- ADH110
- ADH140



ADH

Series

ADH系列减速机核心特性 The Core Characteristics of ADH Series Reducer

- 1 采用斜齿齿轮传动，经渗碳淬火处理，齿向齿廓修形处理，确保运行低噪音、平稳；承载能力较直齿提高20%；
- 2 整体式输出轴，行星轮两端轴承支撑，实现高精度、强度；
- 3 回程间隙小，精密型单级可以做到3arcmin以内。

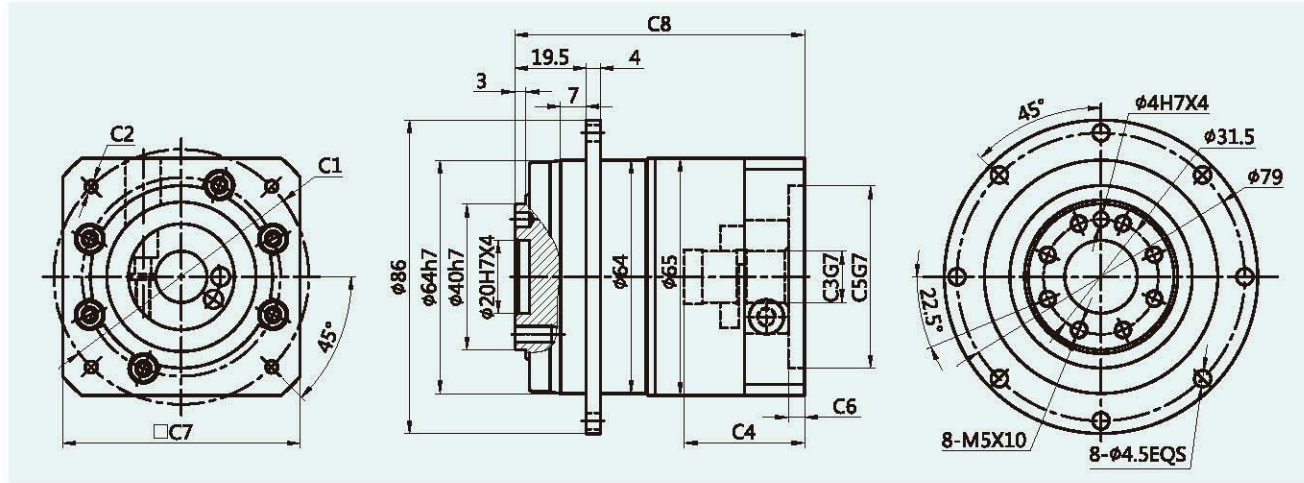
- 1 Helical gear transmission, carburizing and quenching treatment, tooth profile modification treatment, to ensure low noise and smooth operation. The bearing capacity is 20% higher than that of straight teeth.
- 2 Integral output shaft and bearing support at both ends of planetary wheel to achieve high precision and strength.
- 3 The backlash clearance is small, and the precision single stage can achieve less than 3 arcmin.

减速机性能资料 Gear box performance information

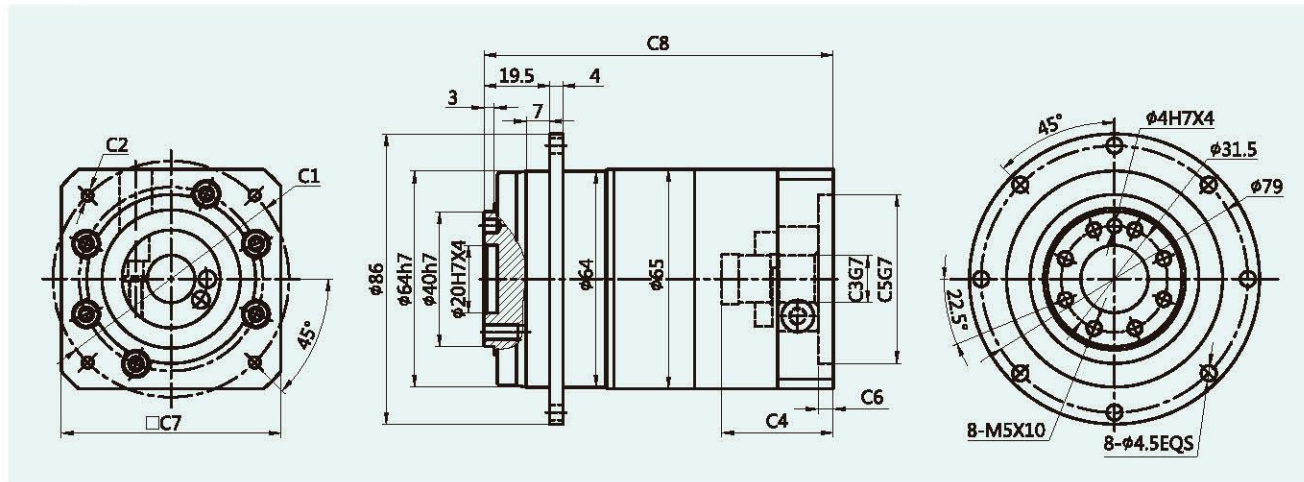
型号 Model	单位 Unit	ADH064	ADH090	ADH110	ADH140	减速比 Ratio	Stage	
额定输出扭矩 Rated output torque	N·m	18	50	120	240	3	1	
		27	75	180	360	4		
		27	75	180	360	5		
		27	75	180	360	7		
		18	50	120	240	10	2	
		35	90	180	450	15		
		37	96	230	450	16		
		37	96	230	564	20		
		37	96	255	585	25		
		37	96	230	564	28		
		27	87	180	360	30		
		37	96	255	585	35		
		37	96	230	564	40	1	
		37	96	255	585	50		
		27	87	180	360	70		
		18	50	120	240	100		
故障停滞扭矩 Emergency stop torque	N·m	3倍额定输出扭矩 3 times Rated output torque						
额定输入转速 Nominal input speed	rmp	3000	3000	3000	2000			
最大输入转速 Maximum input speed	rmp	6000	6000	6000	3500			
最大径向力 Maximum radial force	N	1500	3300	8500	9100			
最大轴向力 Maximum axial force	N	750	1700	4300	8200			
效率 Efficiency	%	Single [97%]			Double [95%]			
平均寿命 Average lifetime	h	20000						
重量 Weight	kg	1.4	3.7	8	16		1	
		1.6	4.2	8.9	17		2	
转动惯量 Moment of Inertia	kgcm ²	0.16	0.61	3.25	12.31	3	1	
		0.14	0.48	2.74	7.54	4		
		0.13	0.47	2.71	7.42	5		
		0.13	0.47	2.62	7.25	7		
		0.13	0.44	2.57	7.14	10	2	
		0.127	0.72	2.56	12.35	15		
		0.088	0.5	1.75	7.47	16		
		0.075	0.44	1.5	6.65	20		
		0.075	0.44	1.49	5.81	25		
		0.064	0.39	1.3	6.34	28		
		0.064	0.39	1.3	6.34	30		
		0.064	0.39	1.3	6.34	35		
		0.064	0.39	1.3	4.08	50	1	
		0.075	0.39	1.5	7.5	63		
		0.075	0.39	1.5	7.5	70		
		0.075	0.39	1.5	7.5	100		
回程间隙 Backlash	arcmin	≤ 3	≤ 3	≤ 3	≤ 3	Precise[1]		
		≤ 5	≤ 5	≤ 5	≤ 5	Standard[1]		
		≤ 5	≤ 5	≤ 5	≤ 5	Precise[2]		
		≤ 7	≤ 7	≤ 7	≤ 7	Standard[2]		
抗扭刚性 Torsional rigidity	N·m/arc min	7	14	25	50			
噪音 Noise	dB	60	62	62	68			
润滑 lubricating		合成油脂润滑 Synthetic grease lubrication						
防护等级 levels of protection		IP65						

外形尺寸图表
Outline dimensional

ADH064-L1



ADH064-L2

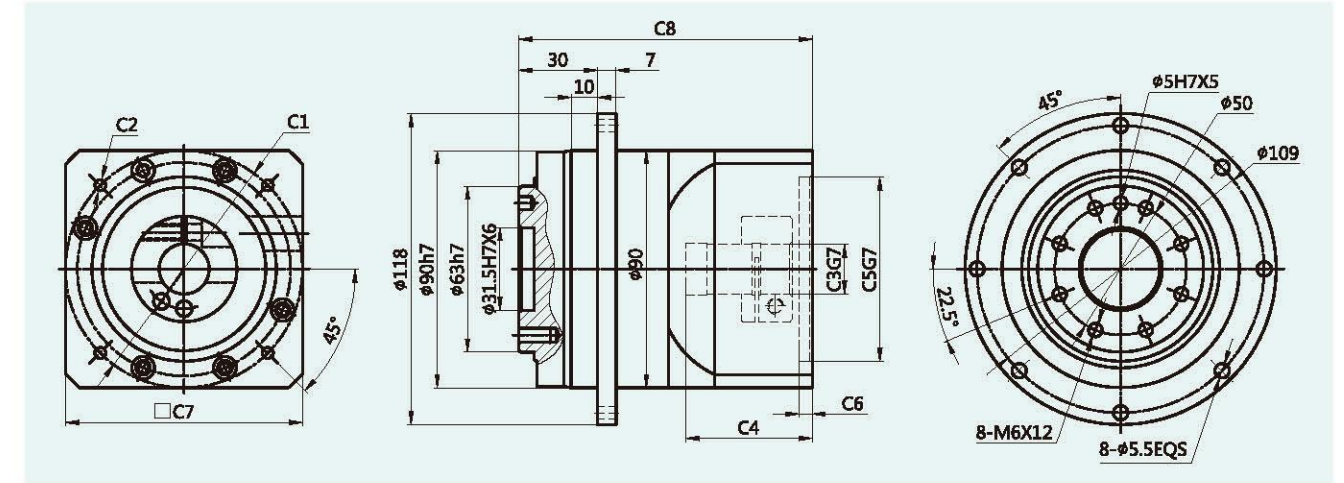


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

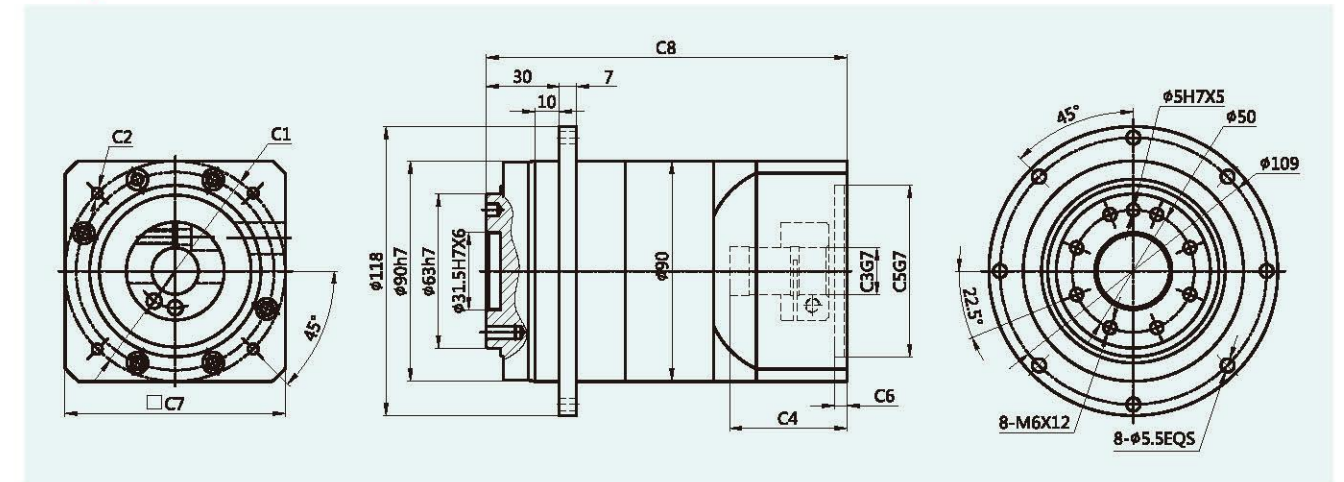
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADH064-L1	□47.14	4-M4	φ8	30	φ38.1	4.5	65	76.5
	φ46	4-M4	φ8	30	φ30	4.5	65	76.5
	φ45	4-M3	φ8	30	φ30	4.5	65	76.5
	φ70	4-M4/4-M5	φ14	34	φ50	4.5	65	79.5
ADH064-L2	□47.14	4-M4	φ8	30	φ38.1	4.5	65	100.5
	φ46	4-M4	φ8	30	φ30	4.5	65	100.5
	φ45	4-M3	φ8	30	φ30	4.5	65	100.5
	φ70	4-M4/4-M5	φ14	34	φ50	4.5	65	103.5

外形尺寸图表
Outline dimensional

ADH090-L1



ADH090-L2

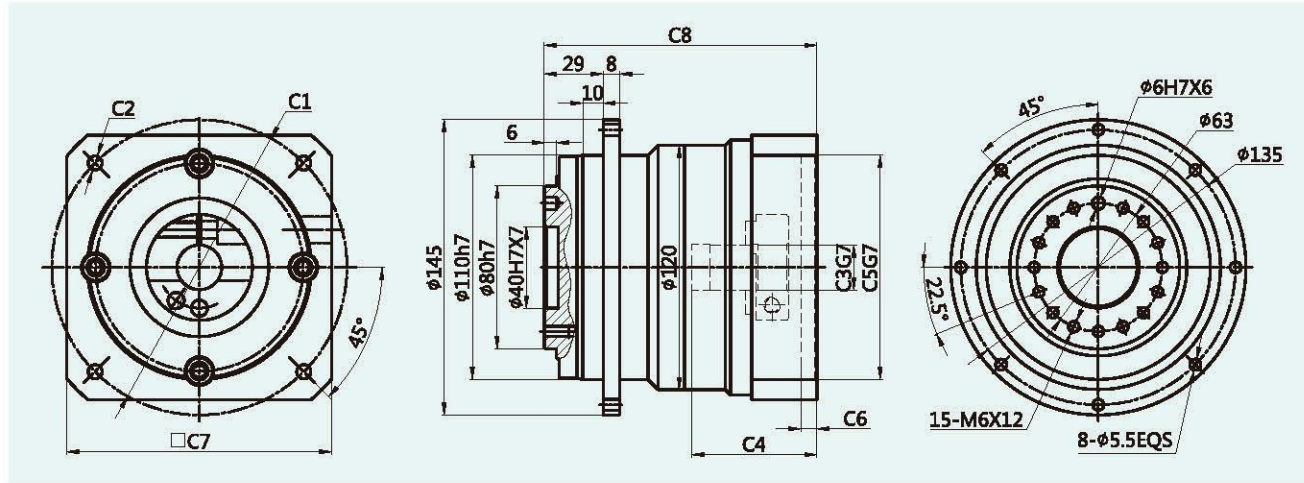


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

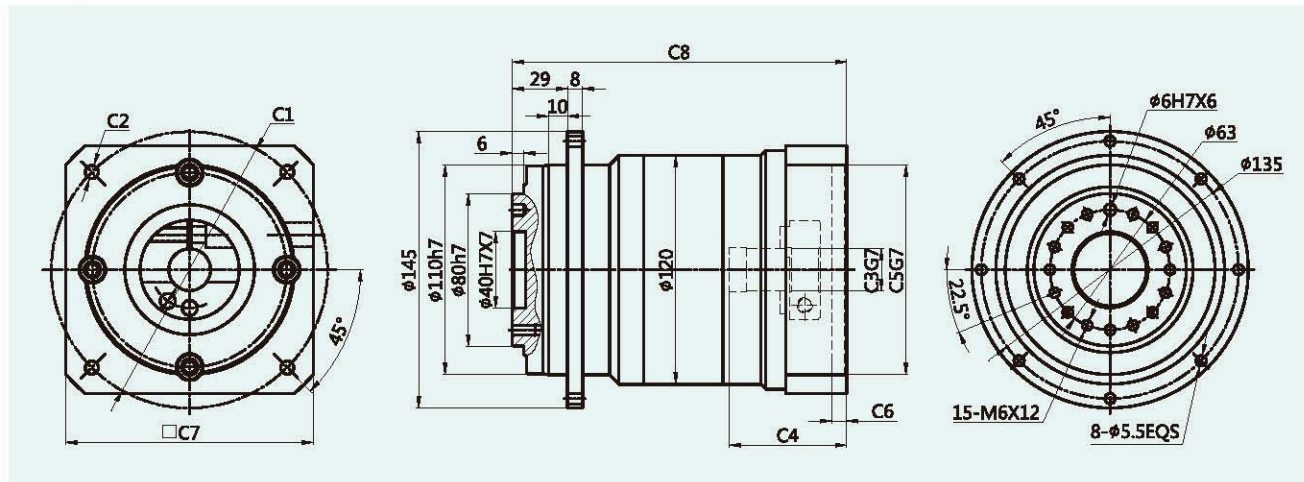
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADH090-L1	φ70	4-M4/4-M5	φ14	47	φ50	4.5	90	110.5
	□69.6	4-M6	φ14	48	φ73	4.5	90	111.5
	φ90	4-M5/4-M6	φ19	48	φ70	5.5	90	111.5
	φ115	4-M8	φ19/φ22	60	φ95	7.5	130	123.5
	φ130	4-M8	φ19/φ22	60	φ95	7.5	130	123.5
	φ145	4-M8	φ19/φ22/φ24	63	φ110	13	130	127
ADH090-L2	φ70	4-M4/4-M5	φ14	47	φ50	4.5	90	146.5
	□69.6	4-M6	φ14	48	φ73	4.5	90	147.5
	φ90	4-M5/4-M6	φ19	48	φ70	5.5	90	147.5

外形尺寸图表
Outline dimensional

ADH110-L1



ADH110-L2

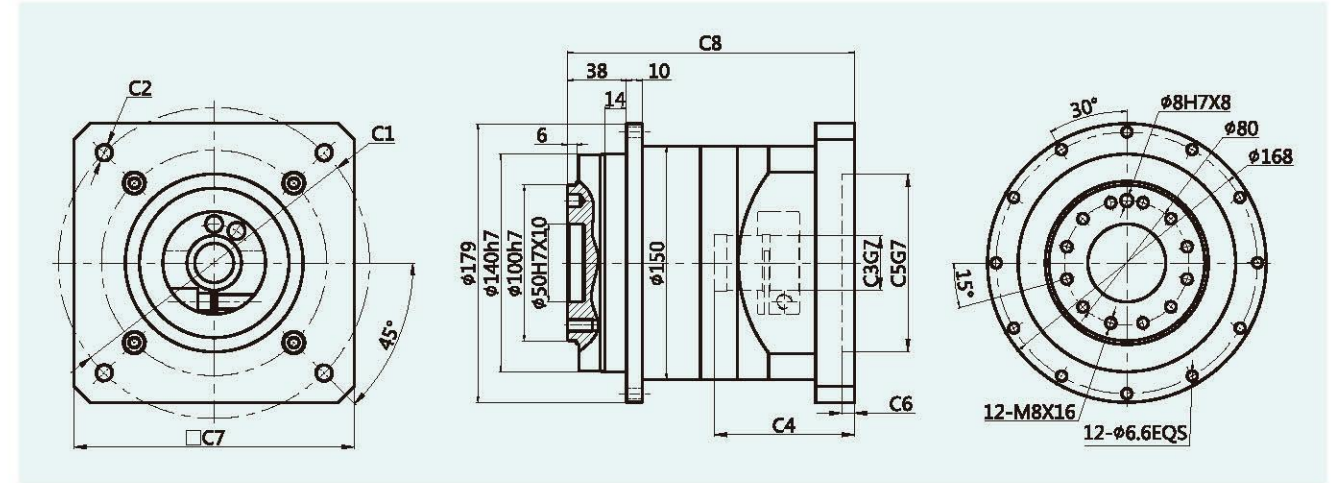


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

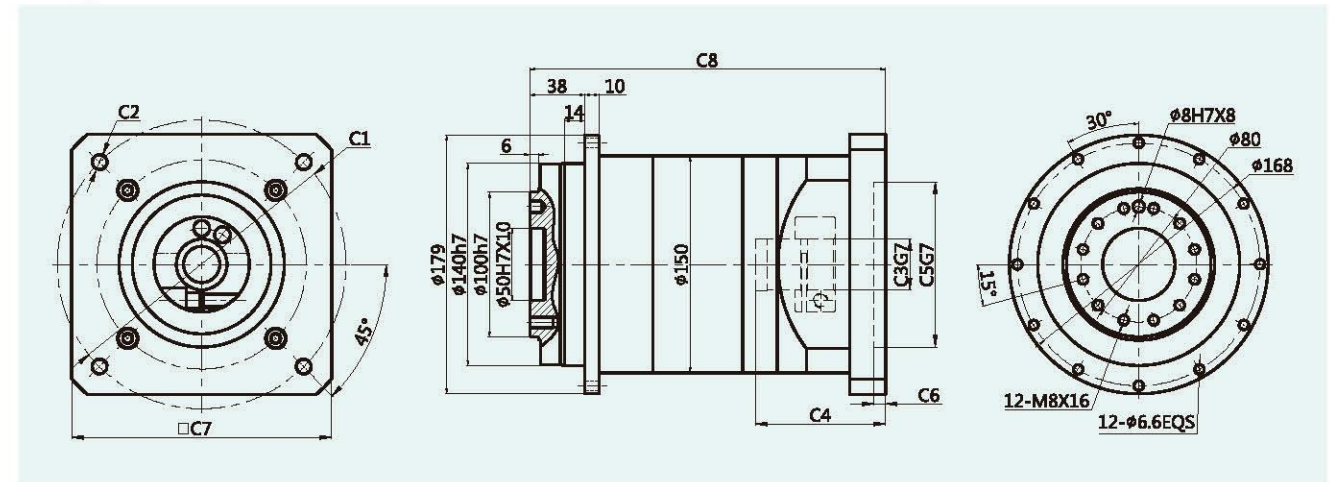
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADH110-L1	Φ115	4-M8	Φ19/Φ22	60	Φ95	7	130	134
	Φ130	4-M8	Φ19/Φ22	60	Φ95	7	130	134
	Φ145	4-M8	Φ19/Φ22/Φ24	62	Φ110	7	130	137
	Φ200	4-M12	Φ35	82	Φ114.3	7	180	155.5
ADH110-L2	Φ90	4-M5/4-M6	Φ19	55	Φ70	5.5	90	170.5
	Φ115	4-M8	Φ19/Φ22	60	Φ95	7	130	175.5
	Φ130	4-M8	Φ19/Φ22	60	Φ95	7	130	175.5
	Φ145	4-M8	Φ19/Φ22/Φ24	62	Φ110	7	180	178.5

外形尺寸图表
Outline dimensional

ADH140-L1



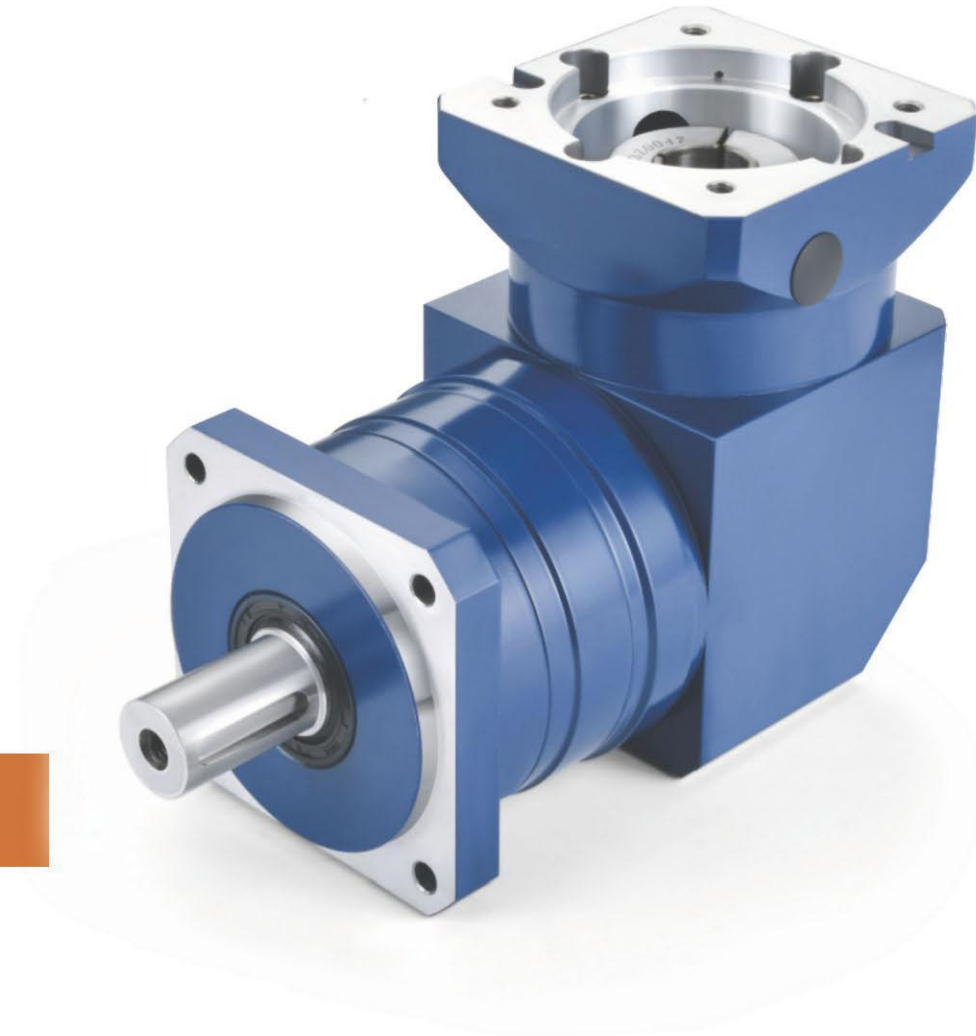
ADH140-L2



适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ADH140-L1	Φ130	4-M8	Φ22	65	Φ95	7	150	159.5
	Φ145	4-M8	Φ22/Φ24	65	Φ110	7	150	159.5
	Φ165	4-M10	Φ32	90	Φ130	7	150	184.5
	Φ200	4-M12	Φ35	90	Φ114.3	7	180	184.5
	Φ200	4-M12	Φ35	115	Φ114.3	7	180	209.5
	Φ215	4-M12	Φ38/Φ42	90	Φ180	7	190	184.5
ADH140-L2	Φ130	4-M8	Φ22	65	Φ95	7	150	221.5
	Φ145	4-M8	Φ22/Φ24	65	Φ110	7	150	221.5
	Φ200	4-M12	Φ35	90	Φ114.3	7	180	246.5

- ZADF060
- ZADF090
- ZADF115
- ZADF140



ZADF

Series

ZADF系列减速机核心特性 The Core Characteristics of ZADF Series Reducer

- ❶ 采用斜齿齿轮传动，经渗碳淬火处理，齿向齿廓修形处理，确保运行低噪音、平稳；承载能力较直齿提高20%；
- ❷ 整体式输出轴，行星轮两端轴承支撑，实现高精度、强度；
- ❸ 回程间隙小，精密型单级可以做到5arcmin以内。

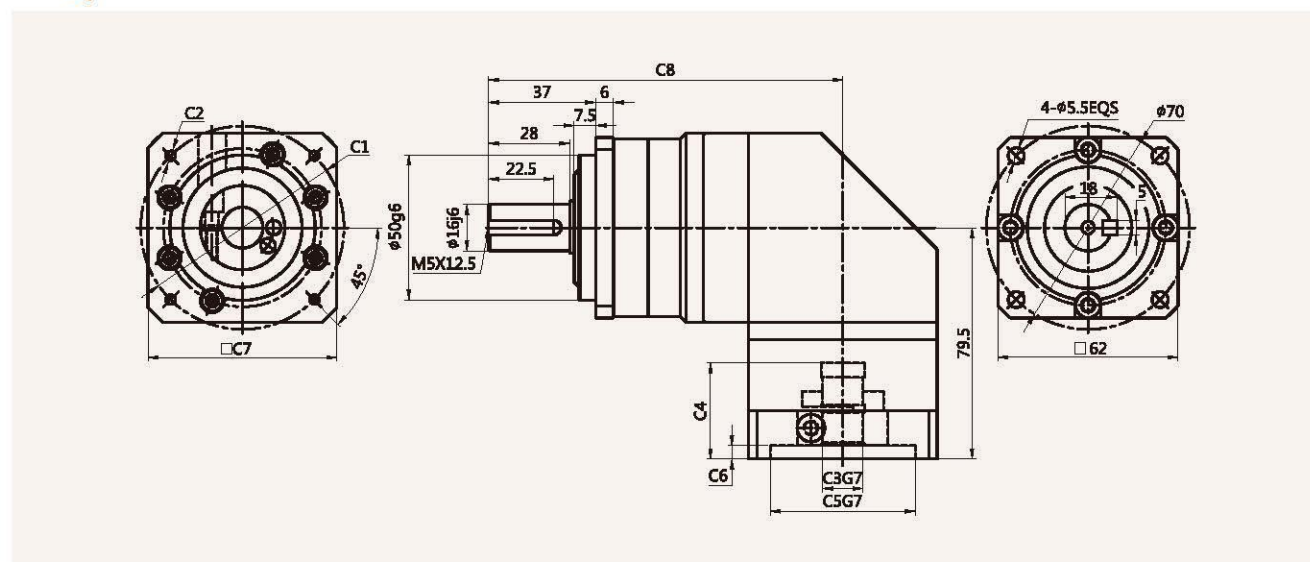
- ❶ Helical gear transmission, carburizing and quenching treatment, tooth profile modification treatment, to ensure low noise and smooth operation. The bearing capacity is 20% higher than that of straight teeth.
- ❷ Integral output shaft and bearing support at both ends of planetary wheel to achieve high precision and strength.
- ❸ The backhaul clearance is small, and the precision single stage can achieve less than 5 arcmin.

减速机性能资料 Gear box performance information

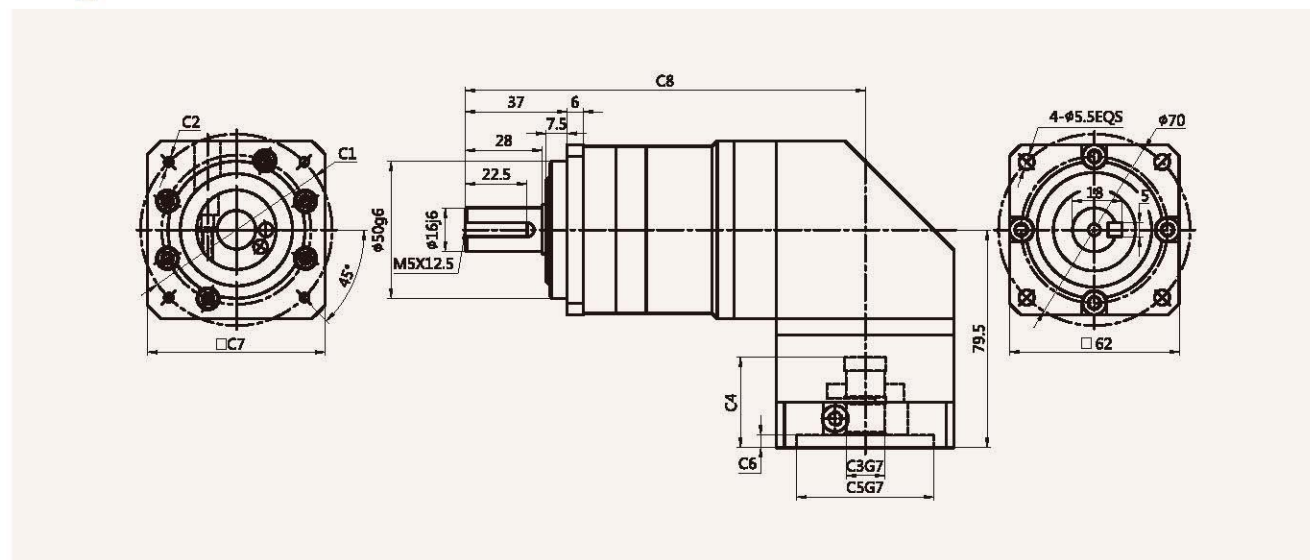
型号 Model	单位 Unit	ZADF060	ZADF090	ZADF115	ZADF140	减速比 Ratio	Stage	
额定输出扭矩 Rated output torque	N·m	18	50	120	240	3	1	
		27	75	180	360	4		
		27	75	180	360	5		
		27	75	180	360	7		
		18	50	120	240	10	2	
		35	90	180	450	15		
		37	96	230	450	16		
		37	96	230	564	20		
		37	96	255	585	25		
		37	96	230	564	28		
		27	87	180	360	30		
		37	96	255	585	35		
		37	96	230	564	40		
		37	96	255	585	50		
		27	87	180	360	70		
		18	50	120	240	100		
故障停滞扭矩 Emergency stop torque	N·m	3倍额定输出扭矩 3 times Rated output torque						
额定输入转速 Nominal input speed	rmp	3000	3000	3000	2000			
最大输入转速 Maximum input speed	rmp	6000	6000	6000	3500			
最大径向力 Maximum radial force	N	1200	2400	4300	9100			
最大轴向力 Maximum axial force	N	1100	2200	3900	8200			
效率 Efficiency	%	Single [97%]			Double [95%]			
平均寿命 Average lifetime	h	20000						
重量 Weight	kg	1.4	3.7	8	16		1	
		1.6	4.2	8.9	17		2	
转动惯量 Moment of Inertia	kgcm ²	0.16	0.61	3.25	12.31	3	1	
		0.14	0.48	2.74	7.54	4		
		0.13	0.47	2.71	7.42	5		
		0.13	0.47	2.62	7.25	7		
		0.13	0.44	2.57	7.14	10	2	
		0.127	0.72	2.56	12.35	15		
		0.088	0.5	1.75	7.47	16		
		0.075	0.44	1.5	6.65	20		
		0.075	0.44	1.49	5.81	25		
		0.064	0.39	1.3	6.34	28		
		0.064	0.39	1.3	6.34	30		
		0.064	0.39	1.3	6.34	35		
		0.064	0.39	1.3	4.08	50		
		0.075	0.39	1.5	7.5	63		
		0.075	0.39	1.5	7.5	70		
		0.075	0.39	1.5	7.5	100		
回程间隙 Backlash	arcmin	≤ 5	≤ 5	≤ 5	≤ 5	Precise[1]		
		≤ 10	≤ 10	≤ 10	≤ 10	Standard[1]		
		≤ 7	≤ 7	≤ 7	≤ 7	Precise[2]		
		≤ 12	≤ 12	≤ 12	≤ 12	Standard[2]		
抗扭刚性 Torsional rigidity	N·m/arc min	7	14	25	50			
噪音 Noise	dB	65	65	70	75			
润滑 lubricating		合成油脂润滑 Synthetic grease lubrication						
防护等级 levels of protection		IP65						

外形尺寸图表
Outline dimensional

ZADF060-L1



ZADF060-L2

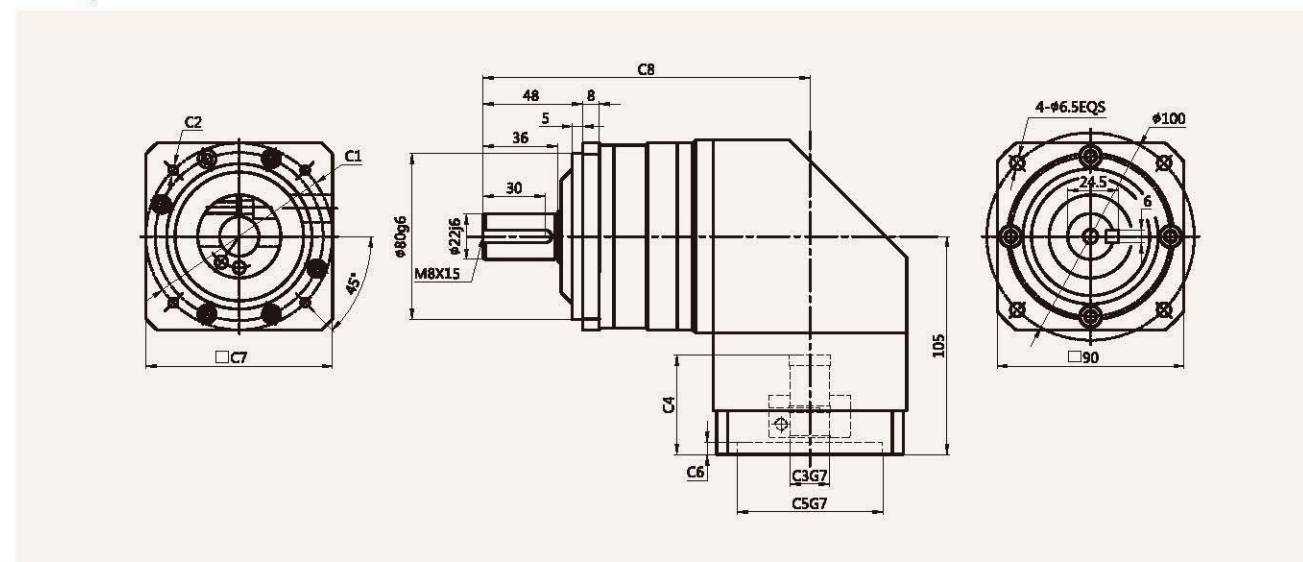


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

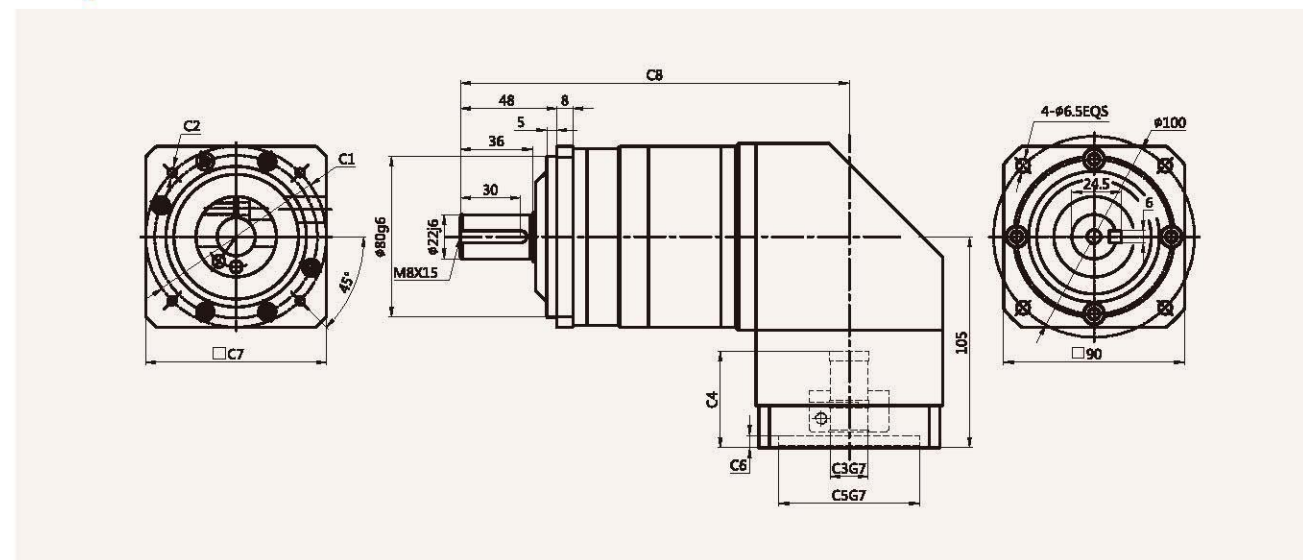
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ZADF060-L1	φ70	4-M4/4-M5	φ14	34	φ50	4.5	65	122
ZADF060-L2	φ70	4-M4/4-M5	φ14	34	φ50	4.5	65	146

外形尺寸图表
Outline dimensional

ZADF090-L1



ZADF090-L2

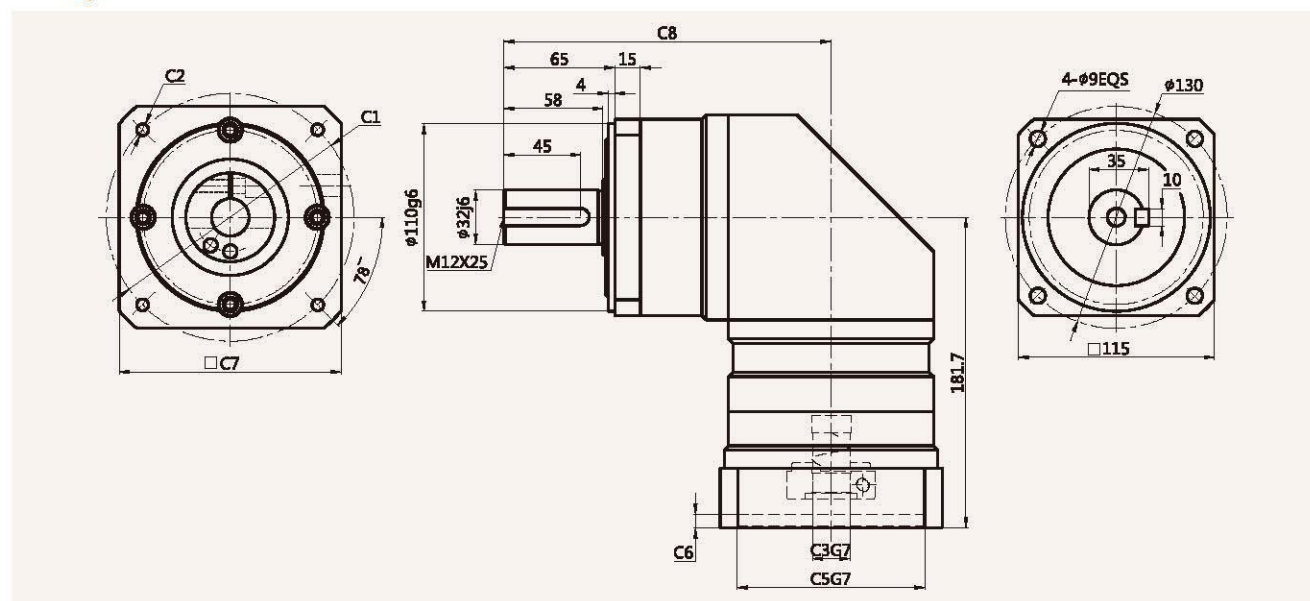


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

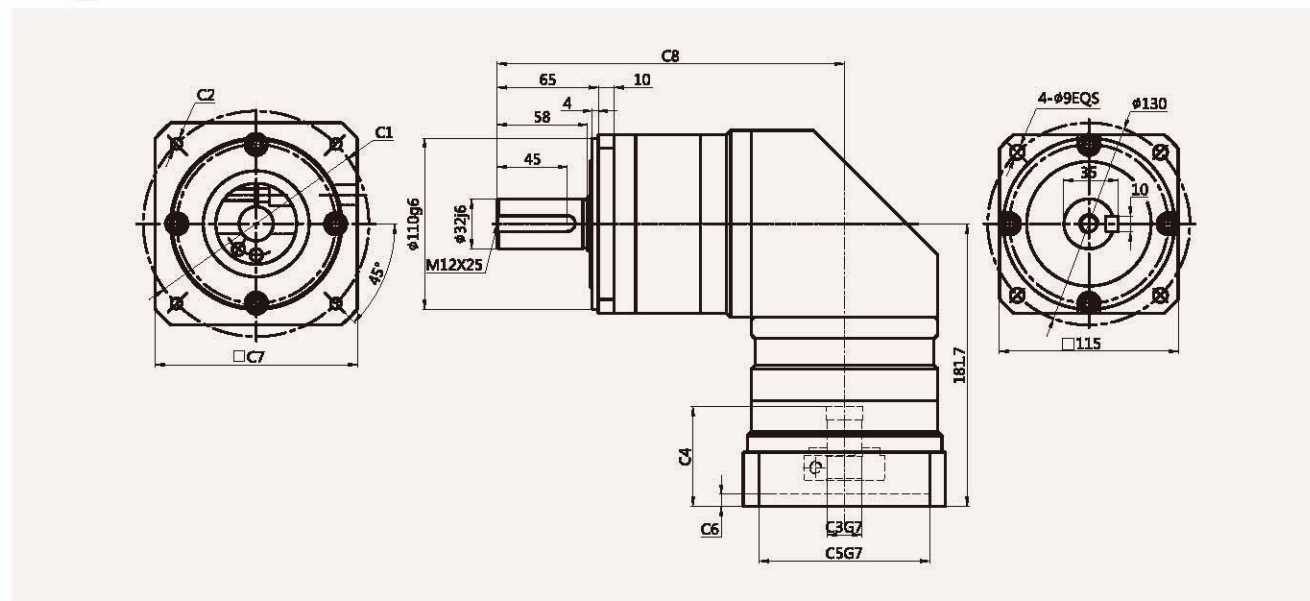
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ZADF090-L1	φ90	4-M5/4-M6	φ19	47	φ70	5.5	90	157.5
ZADF090-L2	φ90	4-M5/4-M6	φ19	47	φ70	5.5	90	193.5

外形尺寸图表
Outline dimensional

ZADF115-L1



ZADF115-L2

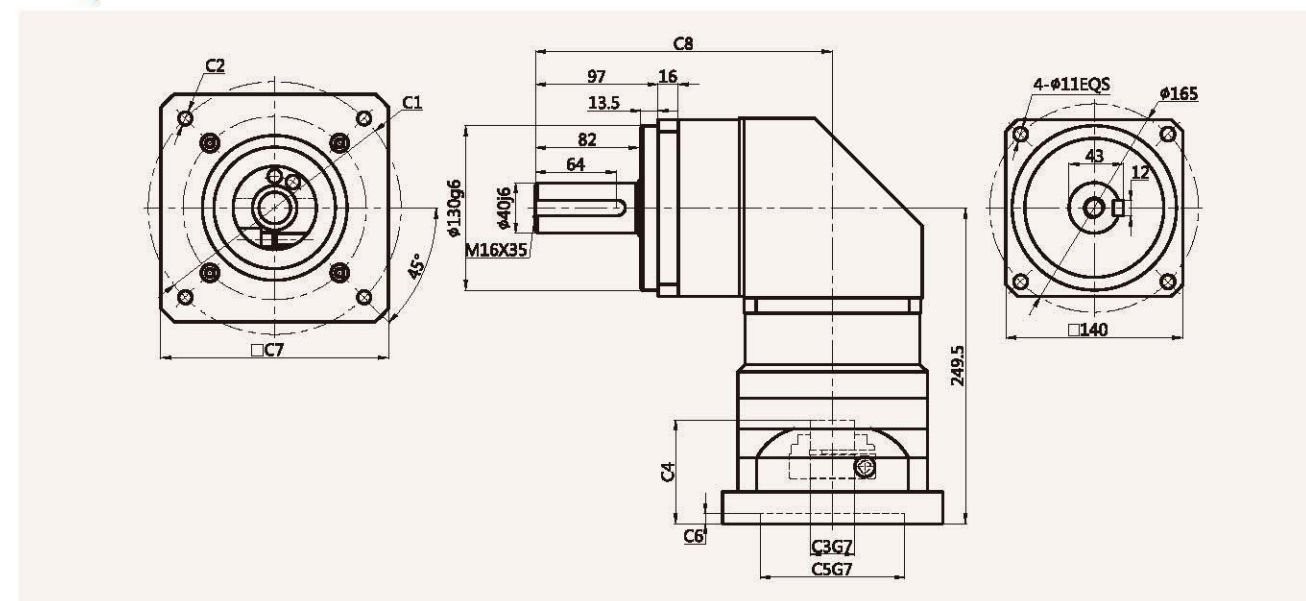


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

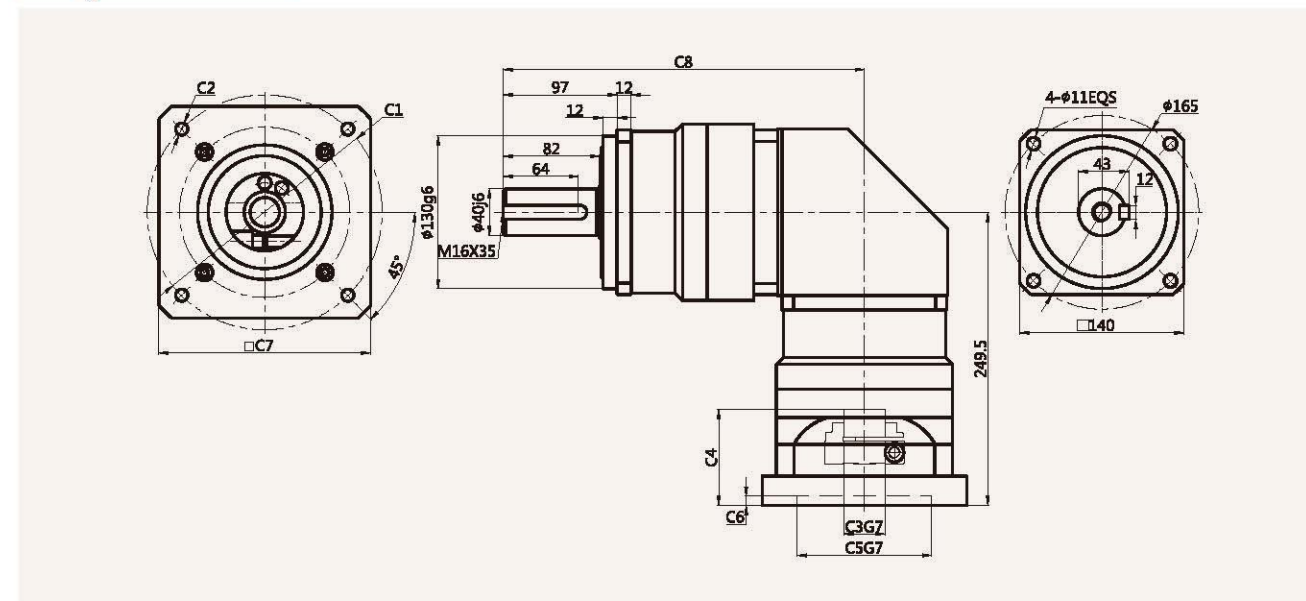
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ZADF115-L1	Φ145	4-M8	Φ19/Φ22/Φ24	62	Φ110	7	130	191.7
ZADF115-L2	Φ145	4-M8	Φ19/Φ22/Φ24	62	Φ110	7	130	223.2

外形尺寸图表
Outline dimensional

ZADF140-L1



ZADF140-L2



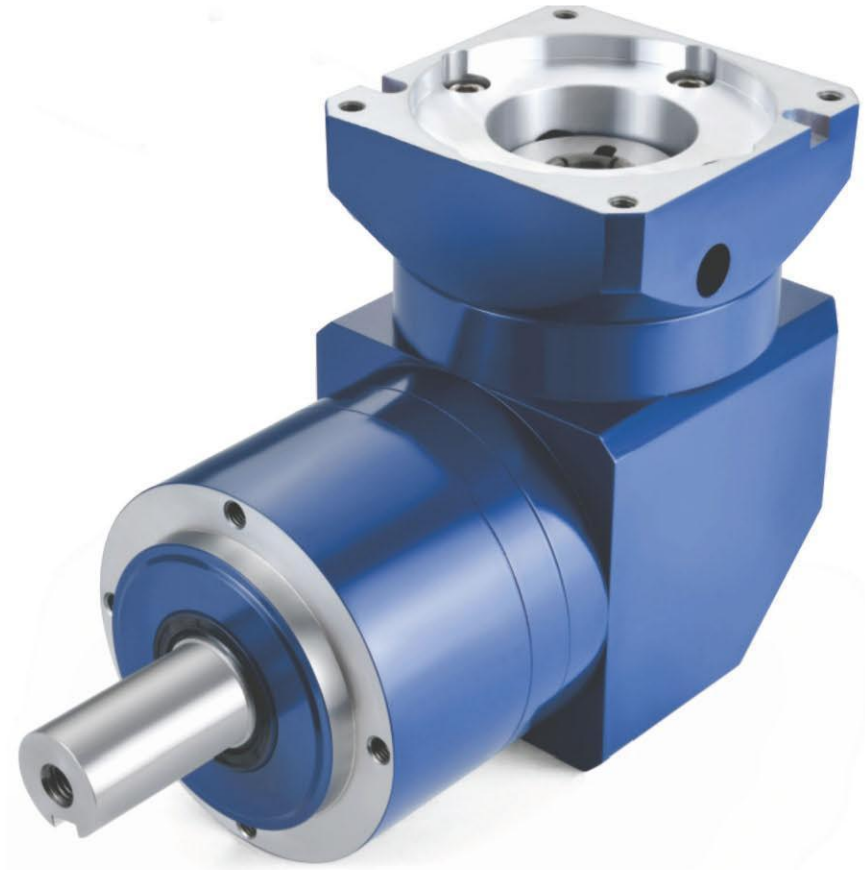
适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ZADF140-L1	Φ200	4-M12	Φ35	90	Φ114.3	7	180	235
ZADF140-L2	Φ200	4-M12	Φ35	90	Φ114.3	7	180	307.5

- ✓ ZADL070
- ✓ ZADL090
- ✓ ZADL120
- ✓ ZADL155

ZADL

Series



ZADL系列减速机核心特性 The Core Characteristics of ZADL Series Reducer

- 1 采用斜齿齿轮传动，经渗碳淬火处理，齿向齿廓修形处理，确保运行低噪音、平稳；承载能力较直齿提高20%；
- 2 整体式输出轴，行星轮两端轴承支撑，实现高精度、强度；
- 3 回程间隙小，精密型单级可以做到5arcmin以内。

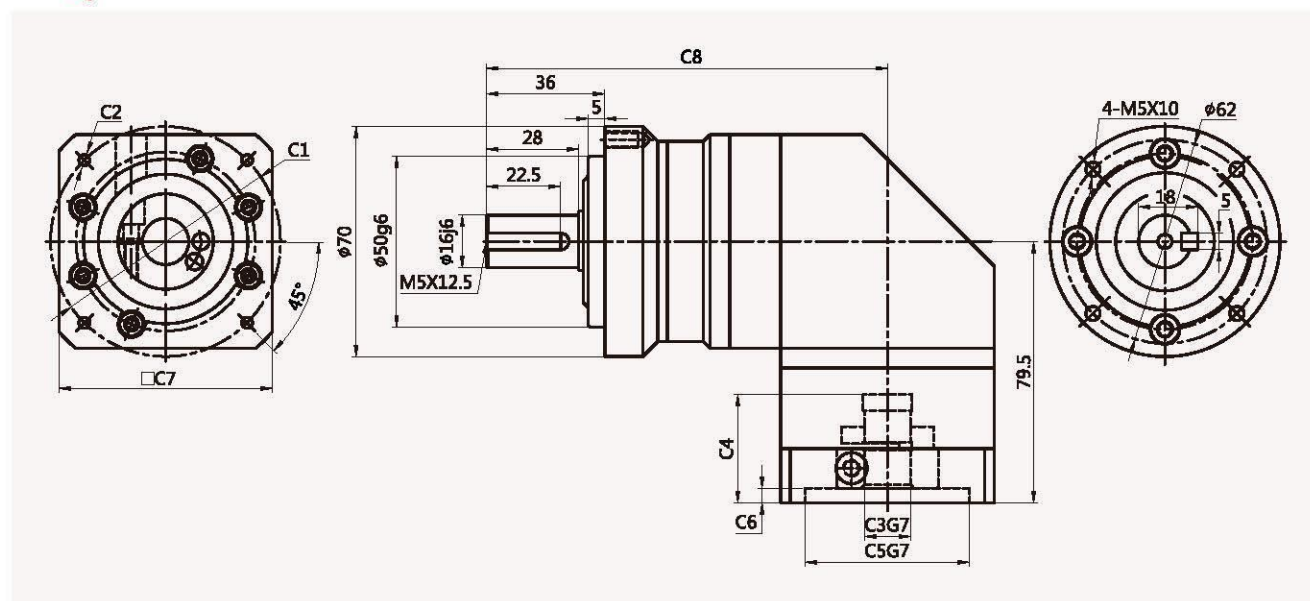
- 1 Helical gear transmission, carburizing and quenching treatment, tooth profile modification treatment, to ensure low noise and smooth operation. The bearing capacity is 20% higher than that of straight teeth.
- 2 Integral output shaft and bearing support at both ends of planetary wheel to achieve high precision and strength.
- 3 The backlash clearance is small, and the precision single stage can achieve less than 5 arcmin.

减速机性能资料 Gear box performance information

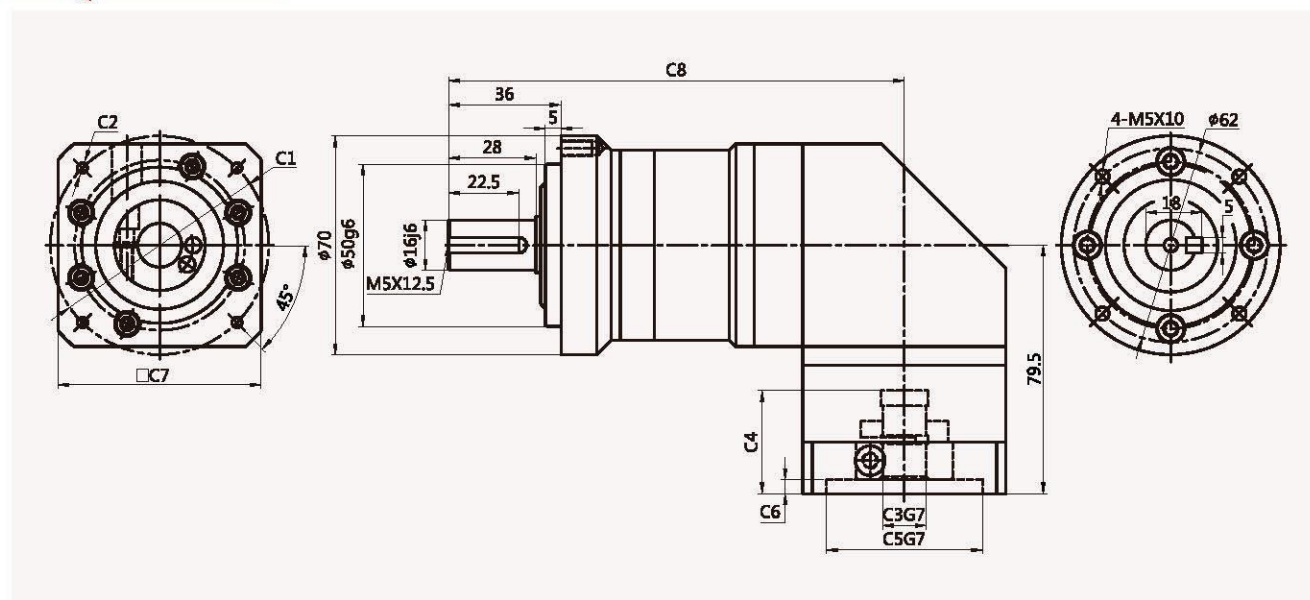
型号 Model	单位 Unit	ZADL070	ZADL090	ZADL120	ZADL155	减速比 Ratio	Stage	
额定输出扭矩 Rated output torque	N·m	18	50	120	240	3	2	
		27	75	180	360	4		
		27	75	180	360	5		
		27	75	180	360	7		
		18	50	120	240	10		
		35	90	180	450	15		
		37	96	230	450	16	3	
		37	96	230	564	20		
		37	96	255	585	25		
		37	96	230	564	28		
		27	87	180	360	30		
		37	96	255	585	35		
		37	96	230	564	40		
		37	96	255	585	50		
		27	87	180	360	70		
		18	50	120	240	100		
故障停滞扭矩 Emergency stop torque	N·m	3倍额定输出扭矩 3 times Rated output torque						
额定输入转速 Nominal input speed	rmp	3000	3000	3000	2000			
最大输入转速 Maximum input speed	rmp	6000	6000	6000	3500			
最大径向力 Maximum radial force	N	1200	2400	4300	9100			
最大轴向力 Maximum axial force	N	1100	2200	3900	8200			
效率 Efficiency	%	Single [97%]			Double [95%]			
平均寿命 Average lifetime	h	20000						
重量 Weight	kg	1.4	3.7	8	16		1	
		1.6	4.2	8.9	17		2	
转动惯量 Moment of Inertia	kgcm ²	0.16	0.61	3.25	12.31	3	2	
		0.14	0.48	2.74	7.54	4		
		0.13	0.47	2.71	7.42	5		
		0.13	0.47	2.62	7.25	7		
		0.13	0.44	2.57	7.14	10		
		0.127	0.72	2.56	12.35	15		
		0.088	0.5	1.75	7.47	16	3	
		0.075	0.44	1.5	6.65	20		
		0.075	0.44	1.49	5.81	25		
		0.064	0.39	1.3	6.34	28		
		0.064	0.39	1.3	6.34	30		
		0.064	0.39	1.3	6.34	35		
		0.064	0.39	1.3	4.08	50		
		0.075	0.39	1.5	7.5	63		
		0.075	0.39	1.5	7.5	70		
		0.075	0.39	1.5	7.5	100		
回程间隙 Backlash	arcmin	≤ 5	≤ 5	≤ 5	≤ 5	Precise[2]		
		≤ 10	≤ 10	≤ 10	≤ 10	Standard[2]		
		≤ 7	≤ 7	≤ 7	≤ 7	Precise[3]		
		≤ 12	≤ 12	≤ 12	≤ 12	Standard[3]		
抗扭刚性 Torsional rigidity	N·m/arc min	7	14	25	50			
噪音 Noise	dB	65	65	70	75			
润滑 lubricating		合成油脂润滑 Synthetic grease lubrication						
防护等级 levels of protection		IP65						

外形尺寸图表
Outline dimensional

ZADL070-L1



ZADL070-L2

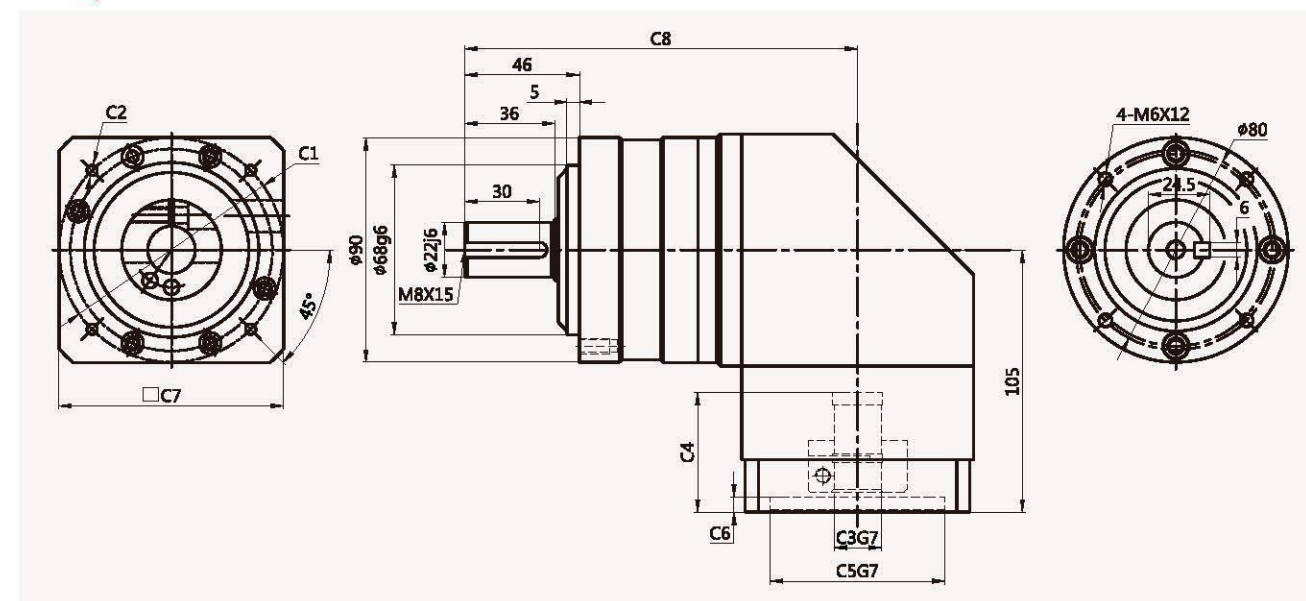


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

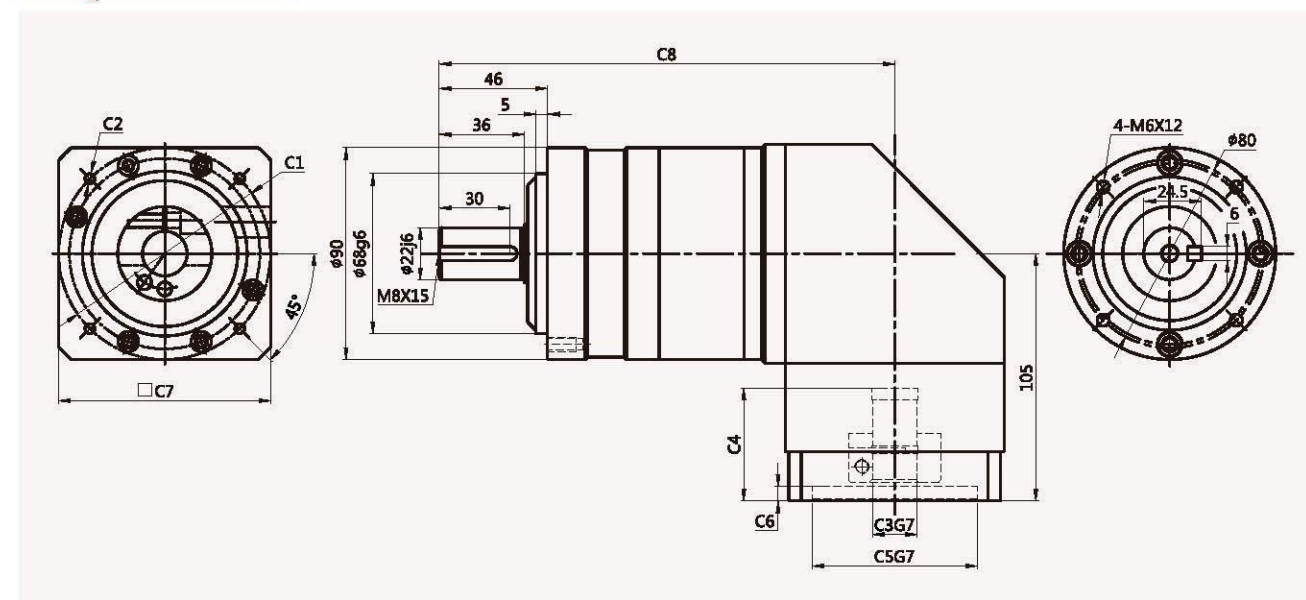
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ZADL070-L1	Φ70	4-M4/4-M5	Φ14	34	Φ50	4.5	65	122
ZADL070-L2	Φ70	4-M4/4-M5	Φ14	34	Φ50	4.5	65	146

外形尺寸图表
Outline dimensional

ZADL090-L1



ZADL090-L2

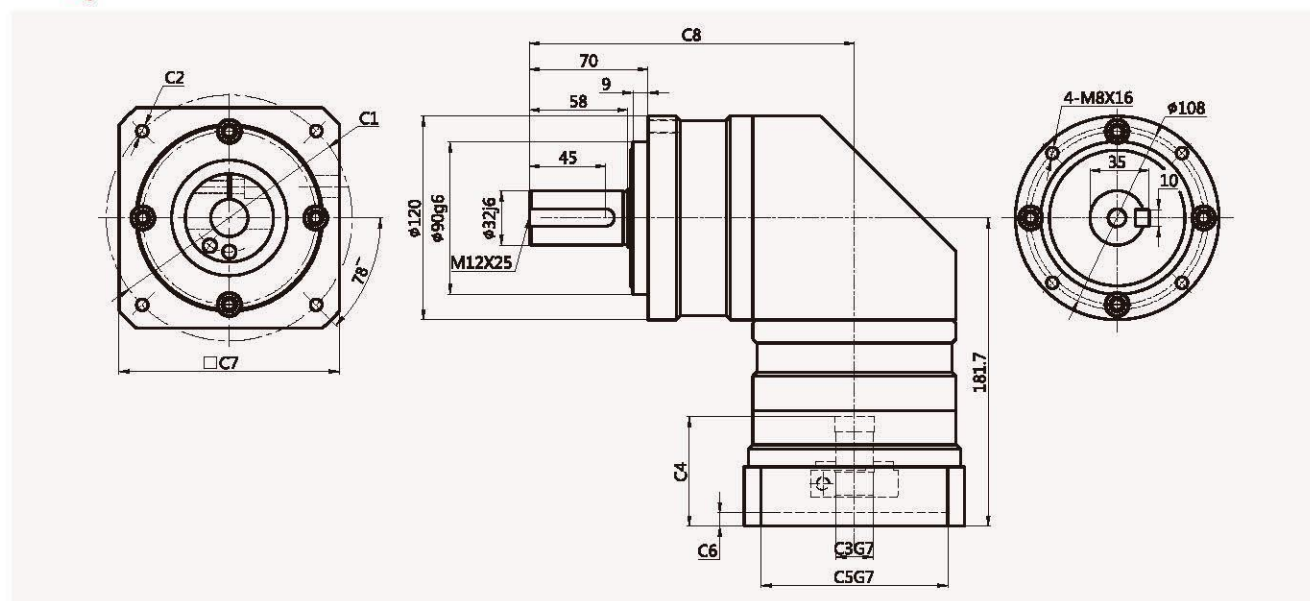


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

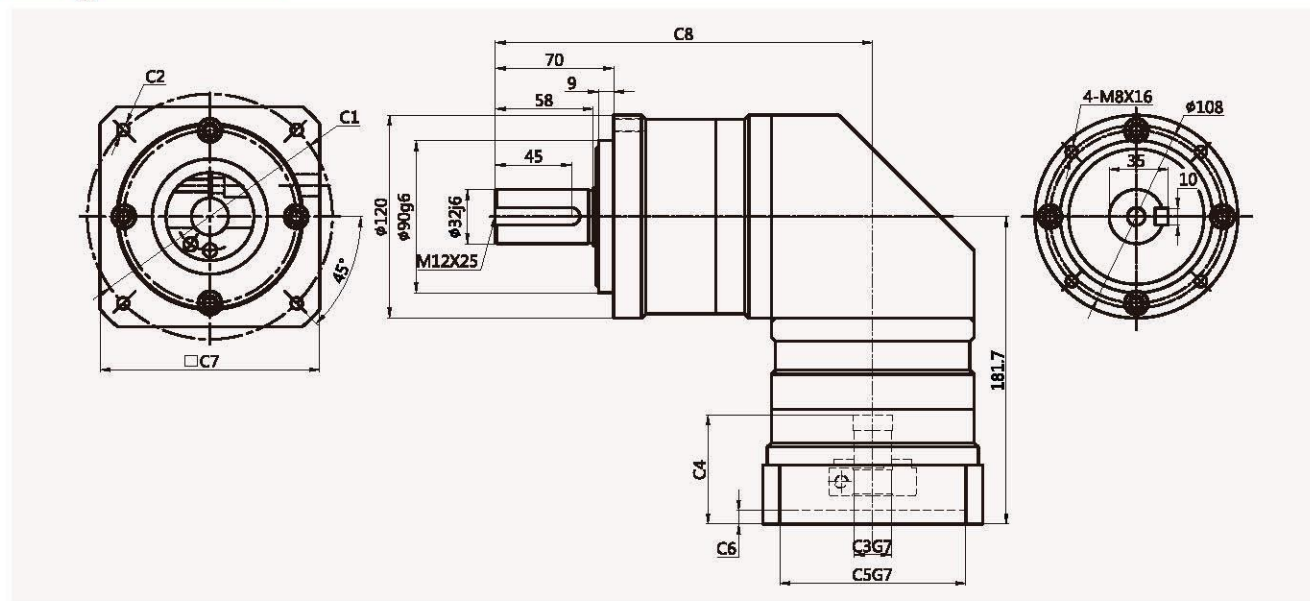
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ZADL090-L1	Φ90	4-M5/4-M6	Φ19	47	Φ70	5.5	90	157.5
ZADL090-L2	Φ90	4-M5/4-M6	Φ19	47	Φ70	5.5	90	193.5

外形尺寸图表
Outline dimensional

ZADL120-L1



ZADL120-L2

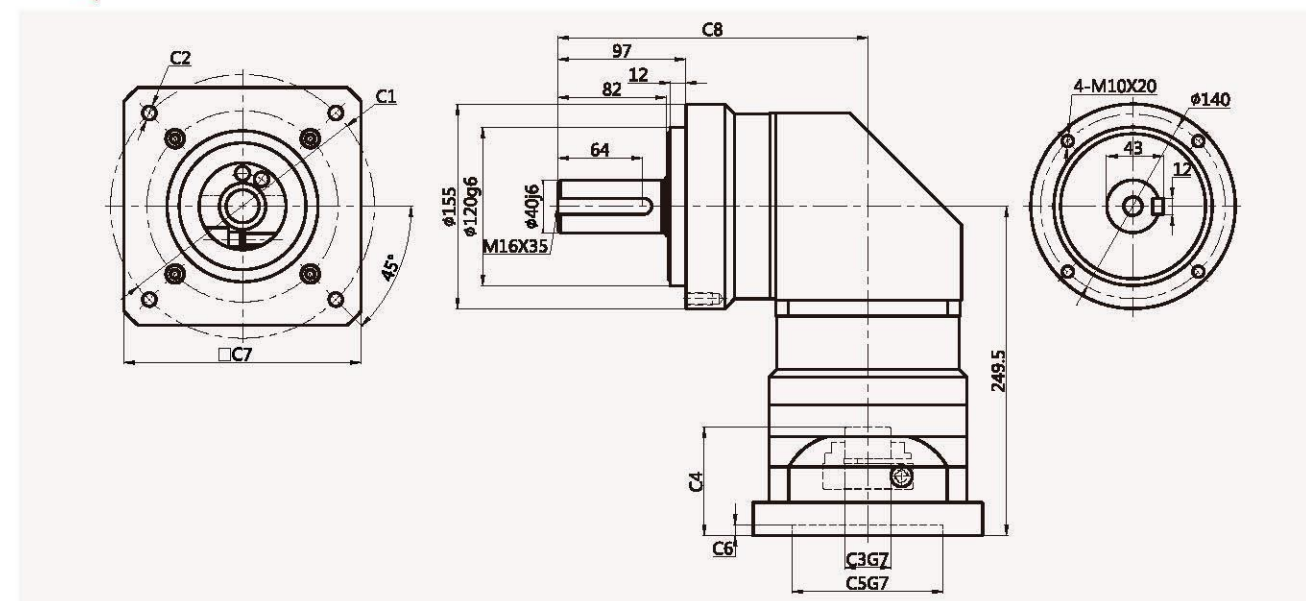


适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

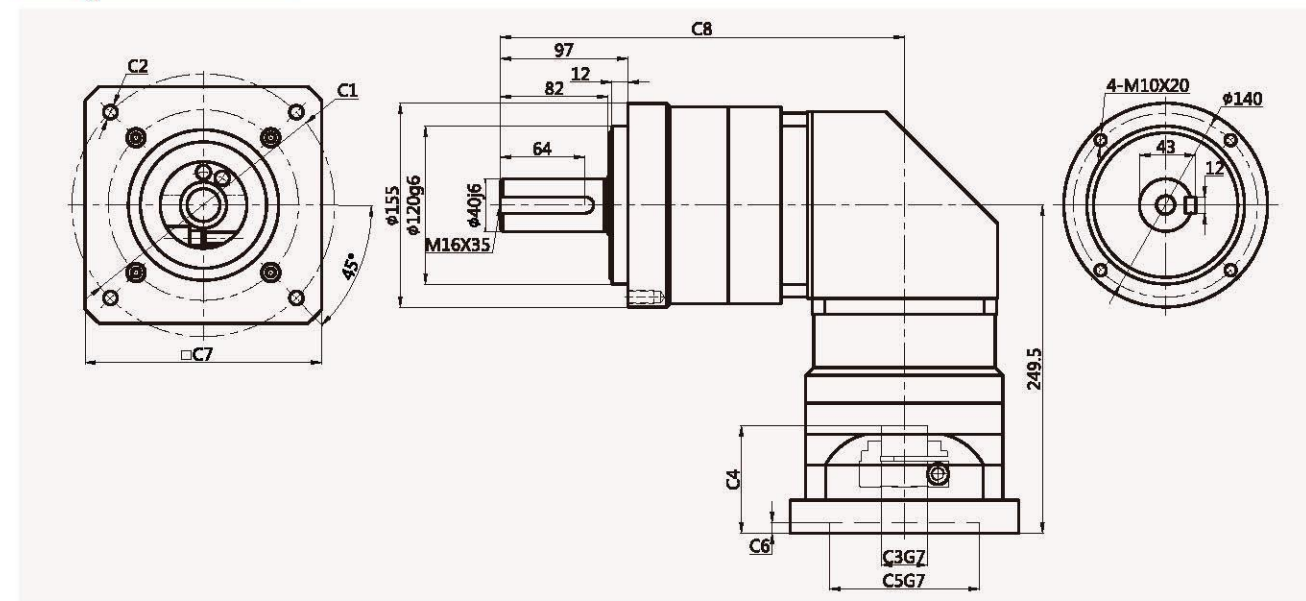
尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ZADL120-L1	Φ145	4-M8	Φ19/Φ22/Φ24	62	Φ110	7	130	191.7
ZADL120-L2	Φ145	4-M8	Φ19/Φ22/Φ24	62	Φ110	7	130	223.2

外形尺寸图表
Outline dimensional

ZADL155-L1



ZADL155-L2



适配电机输入接口尺寸(左端为输入尺寸)
Adapter motor input interface size (The left end is the input size)

尺寸 Size	C1	C2	C3	C4	C5	C6	C7	C8
ZADL155-L1	Φ200	4-M12	Φ35	90	Φ114.3	7	180	235
ZADL155-L2	Φ200	4-M12	Φ35	90	Φ114.3	7	180	307.5

Basic Concepts Related to Type Selection

选型相关的基本概念

减速比 Ratio	输入转速/输出转速 Input speed / Output speed
额定输入转速 Rated input speed n_1 [rpm]	减速机的驱动速度,若减速机与电机转速相同。本书中的额定输入转速是在环境温度 20°C 的条件下测得的。环境温度较高时请降低转速 n_1 。 The drive speed of the reducer is the same as that of the motor. The rated input speed in this book is measured at ambient temperature of 20 degrees Celsius. Reduce speed n_1 at higher ambient temperature.
输出转速 Output speed n_2 [rpm]	输出转速按照下列公式通过输入转速 n_1 和传动比 i 计算出来: $n_2=n_1/i$ The output speed is calculated in accordance with the following formula from the input speed n_1 and the transmission ratio i .
段/级数 Poles	行星减速机的套数。由于一套行星减速机无法满足较大的传比,有时需要两套或来满足用户对较大传比的求,也就是说,减速比越大段/级数越多。由于增加了行星齿轮的数量,所以二级减速机的长度有所增加,效率会有所下降。 The number of Sets of planetary gear. Owing to one set planetary can't satisfy bigger transmission ratio, two sets can meet Users' requirements of bigger transmission ratio, Since increasing the gear quality, the length of the two poles motor will increase accordingly, the efficiency will reduce accordingly.
传动效率 Efficiency	指在额定负载情况下,减速机的传动效率。减速比越大,级数越多,效率越低。 It refers to the gearing efficiency of the gearboxes in the case of the largest load.
平均寿命 Average lifetime	指减速机在额定负载下,额定输入转速是减速机的连续工作时间。 The rated input speed is the continuous working time of the reducer under the rated load.
定位精度 Prise Positioning	在高速机械往复运动中做到精确定位的关键在于尽量减少通过运动产生的角偏差。定位精度取决于两个值,一个与加载有关的偏转角,涉及回程间隙和扭转刚度;另一个是与运动控制有关的偏转角,涉及到同步偏差问题。 In high-speed reciprocating mechanical movement achieve precise Positioning, is the key to minimizing the movement through the angular deviation, positioning accuracy depends on the two values, with a load of the ration angle, involving partial synchronization the problem worse.

回程间隙/背隙 Backlash	减速机输出轴与输入轴的最大角偏差,测量时先将齿轮输入轴固定住,然后在输出轴用力矩仪加载一定力矩($2\%T_n$),以克服减速机内的摩擦力。 The maximum angular deviation between the output shaft and the input shaft of the reducer is measured by fixing the gear input shaft, and then loading a certain moment ($2\%T_n$) on the output shaft with a torquer to overcome the friction in the reducer.
迟滞曲线 hysteresis cycle	迟滞曲线是为了得出减速的扭转刚度,通过检测到迟滞曲线。检测时,先将减速机输入端固定住,然后在输出端的两个旋转方向分别持续地加载到 T_{2b} 最大输出力矩。继而逐步卸载,用仪器记录下力矩的仿差角,得到的曲线是一条闭合曲线,从中可以计算出减速机回程间隙(j)和扭转刚度(C_{2b})。 The hysteresis curve is used to obtain the torsional stiffness of deceleration, and the hysteresis curve is detected. During the detection, the input end of the reducer is fixed, and then the maximum output torque of T_{2b} is continuously loaded in the two rotating directions of the output end. Then unloading step by step and recording the imitation angle of the moment with the instrument, the curve obtained is a closed curve from which the return clearance (j) and torsional stiffness (C_{2b}) of the reducer can be calculated.
转动惯性 Inertia	本说明书中的该值均指输入端。表示一个物体尽力保持转动状态(或机静止或转动)特征的一个值。 This value in this specification refers to the input end. A value representing the characteristic of an object trying to maintain its rotational state (or the machine being stationary or rotating).
惯量比 The proportion of ratio	是指负载惯量与传动系统惯量(电机加上减速机)之间的比值。这个比值决定了系统的可控性。值越大,也就是转动惯量差值越大,高动态的动作过程就越难精确控制,建议尽可能将值控制在 <5 。齿轮箱可以将负载惯量降低 $1/i^2$ 。 It refers to the ratio between load inertia and transmission inertia (motor plus reducer). This ratio determines the controllability of the system. The greater the value, that is, the greater the difference of inertia, the more difficult it is to accurately control the high dynamic motion process. It is suggested that the value be controlled at < 5 as far as possible. Gearbox can reduce load inertia by $1/i^2$.
噪音 Noise	单位是分贝(dB)。此数值是在输入转速为3000转/分时,不带负载,距离减速机一米距离是测量的。 The unit is decibel(dB). This value is measured at the input speed of 3000 rpm without load and one meter away from the reducer.
额定输出扭矩 Rated output torque T_n [Nm]	T_n [Nm]减速机长时间(连续工作制)可以加载的力矩(无磨损),条件应满足负载均匀,安全系数 $S=1$,AF140以下机型,理论寿命为20000小时;AF180以上机型理论寿命为10000小时; T_n 值遵守ISODP6336齿轮标准与ISO281轴承标准。 T_n [Nm] reducer can be loaded for a long time (continuous working system) without wear and tear. The condition should satisfy the uniform load, safety factor $S=1$, AF140 model, theoretical life is 20 000 hours: AF180 model, theoretical life is 10 000 hours: T_n value conforms to ISODP6336 gear standard and ISO281 bearing standard.

Basic Concepts Related to Type Selection

选型相关的基本概念

加速扭矩 Accelerating Torque T_{2a} [Nm]	<p>指工作周期每小时少于1000次时允许短时间加载到输出端的最大力矩。工作周期每小时大于1000次时，须考虑冲击因素，加载扭矩是周期工作制选型时的一个最大值，实际使用中的加速力矩必须小T_{2a}，否则会缩短减速机的寿命。</p> <p>It refers to the maximum moment that can be loaded to the output in a short time when the working cycle is less than 1000 times per hour. When the working cycle is more than 1000 times per hour, the impact factor must be considered. Loading torque is the maximum value in the selection of periodic working system. The acceleration moment in actual use must be smaller than T_{2a}, otherwise the life of reducer will be shortened.</p>
紧急制动扭矩 Emergency braking torque T_{2NOT} [Nm]	<p>指减速机输出端所能加载的最大力矩，这个力矩可在减速机寿命期内加载1000次，绝对不能超过1000次。（备注：AF140以下机型为$T_{2NOT}=2*T_{2a}$，AF180以上机型为$T_{2NOT}=1.5*T_{2a}$）</p> <p>It refers to the maximum moment that can be loaded at the output end of the reducer. This moment can be loaded 1000 times in the lifetime of the reducer, absolutely not more than 1000 times.(Note: The models below AF140 are $T_{2NOT}=2*T_{2a}$, AF180 model above are $T_{2NOT}=1.5*T_{2a}$)</p>
空载扭矩 No-load Torque T_{012} [Nm]	<p>指加载到减速机上的以克服减速机内摩擦力的力矩。</p> <p>Refers to the moment loaded on the reducer to overcome friction in the reducer.</p>
最大输出扭矩 Maximum output torque T_{2max}	<p>指减速机在静态条件或频繁启动条件下所能承受的输出扭矩，通常指峰值负载或启动负载。</p> <p>Refers to the gearbox output torque can be loaded under static conditions or frequent starts conditions, usually refers to the peak load or the start load.</p>
实际所需扭矩 Actual required torque T_2 [Nm]	<p>所需扭矩取决于应用场合的实际工况，拟选减速机的额定扭矩T_{2N}必须大于这个扭矩。</p> <p>The required torque depends on the actual conditions of the applications, to be selected rated torque T_{2N} must be greater than the required torque.</p>
计算扭矩 Computational Torque T_{c2} [Nm]	<p>会在选择减速机时被用到，可以由实际所需扭矩T_2和系数f_s，按以下公式得出$T_{c2}=T_2*f_s \leq T_{2N}$</p> <p>$T_{c2}=T_2*f_s \leq T_{2N}$ can be obtained from the following formulas, which can be used to select the reducer. The actual required torque T_2 and coefficient f_s can be used to calculate the $T_{c2}=T_2*f_s \leq T_{2N}$.</p>
轴向力 axial force F_a [N]	<p>是指平行于轴心的一个力，它的作用点与输出轴端有一定的轴向偏差(Y_2)时，会形成一个额外的弯绕力矩。轴向力超过样本所示的额定值时，须用联轴节来抵消这种弯绕力。</p> <p>It refers to a force parallel to the axis. When its action point has a certain axial deviation (Y_2) from the output shaft end, it will form an additional bending moment. When the axial force exceeds the rated value shown in the sample, the bending force shall be offset by the coupling.</p>

径向力 radial force F_r [N]	<p>指垂直作用于轴向力的一个力，它平行于输出轴，它的作用点与轴端有一定的轴向距离(X_2)。这个点成一个杠杆点，横向力形成一个弯绕力矩。</p> <p>A force acting perpendicularly on the axial force, parallel to the output axis, has an axial distance (X_2) between the action point and the end of the axis. This point is a lever point, and the lateral force forms a bending moment.</p>
轴伸径向载荷、轴向载荷 Axis Extension Radial Load and Axis Load	<p>选择减速机的附加依据是输出轴伸出端上的径向载荷和轴向载荷。轴的强度和轴承的承载能力决定了许用轴伸的的径向载荷。产品样本中给出的最大允许值是指在最不利的方向作用轴伸出端中点（即1/2L处）的力。当作用力不在中点时，越接近轴肩，允许的径向载荷就越大；相反，作用点离轴肩越远，允许的径向载荷就越小。</p> <p>The additional basis for selecting the reducer is the radial and axial loads on the extension end of the output shaft. The strength of the shaft and the bearing capacity determine the allowable radial load of the axle extension. The maximum allowable value given in the product sample refers to the force at the midpoint (i.e. 1/2L) where the axis extends in the most disadvantageous direction. When the force is not at the midpoint, the closer to the shoulder, the greater the allowable radial load; on the contrary, the farther the action point is from the shoulder, the smaller the allowable radial load.</p>
安全系数 S safety factor	<p>安全系数等于减速机的额定输入功率的比值。</p> <p>The safety factor is equal to the ratio of the rated input power of the reducer.</p>
使用系数 f_s Coefficient of use	<p>使用系数表现减速机的应用特征，它考虑发喂减速机的负载类型和每日工作时间。</p> <p>The coefficient of use represents the application characteristics of the reducer. It considers the load type and working time of the reducer.</p>
扭转刚度 C_{21} Torsional stiffness [Nm/Arcmin]	<p>由加载力矩和所产生的扭转角之间的比率来定义。$C_{21}=\Delta T/\Delta \phi$ 它说明需要用多大的力矩才能把输出轴转动一弧分。扭转刚度是从迟滞曲线得出的。在曲线图上只需要关注T_{2a}的50%到100%这个范围，在这个范围内，曲线可看成是一条直线。</p> <p>It is defined by the ratio between the loading moment and the resulting torsion angle. $C_{21}=\Delta T/\Delta \phi$ indicates how much torque is required to rotate the output shaft in an arc. Torsional stiffness is derived from hysteresis curve. In the graph, only 50% to 100% of T_{2a} is needed to be concerned. In this range, the curve can be regarded as a straight line.</p>
安装力矩 Installation Torque [Nm]	<p>减速机的组装以及电机与减速机连接安装（输入轴采用弹性联轴器要求），都是有力矩要求。建议使用力矩扳手来完成安装步骤。</p> <p>The assembly of reducer and the connection between motor and reducer (the requirement of elastic coupling for input shaft) are all strong moment requirements. It is recommended to use the moment wrench to complete the installation steps.</p>