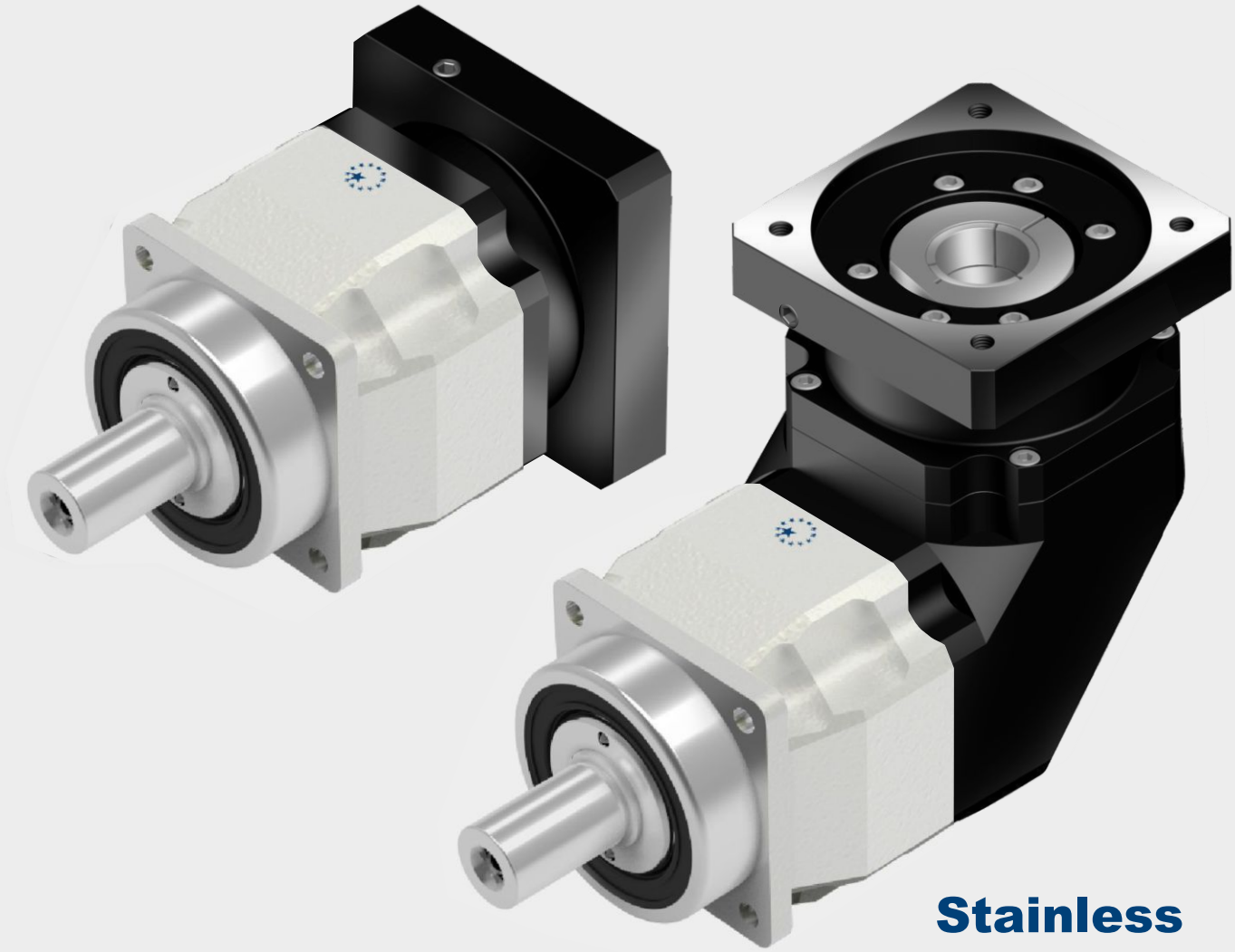
APEX DYNAMICS, INC.

HIGH PRECISION
HIGH SPEED
PLANETARY GEARBOX

AF / AFR Series



Stainless

AF Series

AF075 – 010 – S1 – P1 / MOTOR

Gearbox Size:
AF042, AF060, AF060A, AF075, AF075A
AF100, AF100A, AF140, AF140A
AF180, AF220

Shaft Option:
S1: Smooth Output Shaft
S2: Output Shaft with Key
S3: DIN 5480

Motor Designation:
Manufacturer Type
And Model

Ratio:
1 Stage: 3, 4, 5, 6, 7, 8, 9, 10
2 Stage: 12, 15, 16, 20, 25, 28, 30, 32, 35, 40, 45, 50, 60, 70, 80, 90, 100

Backlash:
P0: Micro Backlash
P1: Reduced Backlash
P2: Standard Backlash

Ordering Example: AF075-010-S1-P1 / SIEMENS 1FT6 041-4AF71

AFR Series

AFR075 – 010 – S1 – P1 / MOTOR

Gearbox Size:
AFR042, AFR060, AFR060A
AFR075, AFR075A, AFR100, AFR100A
AFR140, AFR140A, AFR180, AFR220

Shaft Option:
S1: Smooth Output Shaft
S2: Output Shaft with Key
S3: DIN 5480

Motor Designation:
Manufacturer Type
And Model

Ratio:
1 Stage: 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 20
2 Stage: 12, 15, 16, 20, 25, 28, 30, 32, 35, 40, 45, 48, 50, 60, 64, 70, 80, 90, 100, 120, 140, 160, 180, 200

Backlash:
P0: Micro Backlash
P1: Reduced Backlash
P2: Standard Backlash

Ordering Example: AFR075-010-S1-P1 / SIEMENS 1FT6 041-4AF71

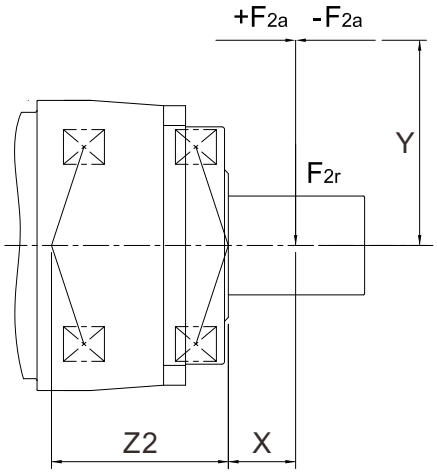
Specifications / AF Series

Gearbox Performance

Model No.		Stage	Ratio[1]	AF042	AF060	AF060A	AF075	AF075A	AF100	AF100A	AF140	AF140A	AF180	AF220
Nominal Output Torque T_{2N}	Nm	1	3	20	55	–	130	–	208	–	342	–	588	1,140
			4	19	50	–	140	–	290	–	542	–	1,050	1,700
			5	22	60	–	160	–	330	–	650	–	1,200	2,000
			6	20	55	–	150	–	310	–	600	–	1,100	1,900
			7	19	50	–	140	–	300	–	550	–	1,100	1,800
			8	17	45	–	120	–	260	–	500	–	1,000	1,600
			9	14	40	–	100	–	230	–	450	–	900	1,500
			10	14	40	–	100	–	230	–	450	–	900	1,500
		2	12	19	50	50	140	140	290	290	542	542	1,050	1,700
			15	20	55	55	130	130	208	208	342	342	588	1,140
			16	19	50	50	140	140	290	290	542	542	1,050	1,700
			20	19	50	50	140	140	290	290	542	542	1,050	1,700
			25	22	60	60	160	160	330	330	650	650	1,200	2,000
			28	19	50	50	140	140	300	300	550	550	1,100	1,800
			30	20	55	55	150	150	310	310	600	600	1,100	1,900
			32	17	45	45	120	120	260	260	500	500	1,000	1,600
			35	19	50	50	140	140	300	300	550	550	1,100	1,800
			40	17	45	45	120	120	260	260	500	500	1,000	1,600
			45	14	40	40	100	100	230	230	450	450	900	1,500
			50	22	60	60	160	160	330	330	650	650	1,200	2,000
			60	20	55	55	150	150	310	310	600	600	1,100	1,900
			70	19	50	50	140	140	300	300	550	550	1,100	1,800
			80	17	45	45	120	120	260	260	500	500	1,000	1,600
			90	14	40	40	100	100	230	230	450	450	900	1,500
			100	14	40	40	100	100	230	230	450	450	900	1,500
Emergency Stop Torque T_{2NOT}[2]	Nm	1,2	3~100	3 times of Nominal Output Torque										
Nominal Input Speed n_{1N}	rpm	1,2	3~100	5,000	5,000	5,000	4,000	4,000	4,000	4,000	3,000	3,000	3,000	2,000
Max. Input Speed n_{1B}	rpm	1,2	3~100	10,000	10,000	10,000	8,000	8,000	8,000	8,000	6,000	6,000	6,000	4,000
Micro Backlash P0	arcmin	1	3~10	–	–	–	≤1	–	≤1	–	≤1	–	≤1	≤1
		2	12~100	–	–	–	–	–	≤3	≤3	≤3	≤3	≤3	≤3
Reduced Backlash P1	arcmin	1	3~10	≤3	≤3	–	≤3	–	≤3	–	≤3	–	≤3	≤3
		2	12~100	≤5	≤5	≤5	≤5	≤5	≤5	≤5	≤5	≤5	≤5	≤5
Standard Backlash P2	arcmin	1	3~10	≤5	≤5	–	≤5	–	≤5	–	≤5	–	≤5	≤5
		2	12~100	≤7	≤7	≤7	≤7	≤7	≤7	≤7	≤7	≤7	≤7	≤7
Torsional Rigidity	Nm/arcmin	1,2	3~100	3	7	7	14	14	25	25	50	50	145	225
Max. Radial Load F_{2rB}[3]	N	1,2	3~100	610	1,400	1,400	4,100	4,100	9,200	9,200	14,000	14,000	18,000	33,000
Max. Axial Load F_{2aB}[3]	N	1,2	3~100	320	1,100	1,100	3,700	3,700	5,820	5,820	11,400	11,400	19,500	16,300
Max. Tilting Moment M_{2K}	Nm	1,2	3~100	20	85	85	380	380	970	970	1,840	1,840	2,740	5,030
Efficiency η	%	1	3~10	≥97%										
		2	12~100	≥94%										
Weight	kg	1	3~10	0.6	1.3	–	3.7	–	6.9	–	12.6	–	25.5	45
		2	12~100	0.8	1.5	2	4.1	5.5	8.1	10.6	16.6	20.2	31.5	57
Operating Temp	°C	1,2	3~100	-10°C~90°C										
Lubrication		1,2	3~100	Synthetic lubrication oils										
Degree of Gearbox Protection		1,2	3~100	IP65										
Mounting Position		1,2	3~100	all directions										
Noise[4]	dB(A)	1,2	3~100	≤56	≤58	≤60	≤60	≤63	≤63	≤65	≤65	≤67	≤67	≤70

(1) Ratio ($i=N_{in} / N_{out}$)
(2) Max. acceleration torque T_{2B} = 60% of T_{2NOT}
(3) Applied to the output shaft center at 100 rpm
(4) The dB values are measured by gearbox with ratio 10 (1-stage) or ratio 100 (2-stage), no loading at 3,000 RPM or at the respective Nominal Input Speed by bigger model size.
By lower ratio and/or higher RPM, the noise level could be 3 to 5 dB higher.

Max. Tilting Moment M_{2k}



$$M_{2K} = \frac{F_{2a} * Y + F_{2r} * (X+Z2)}{1000}$$

M_{2K} : 【Nm】
F_{2a}, F_{2r} : 【N】
X, Y, Z2 : 【mm】

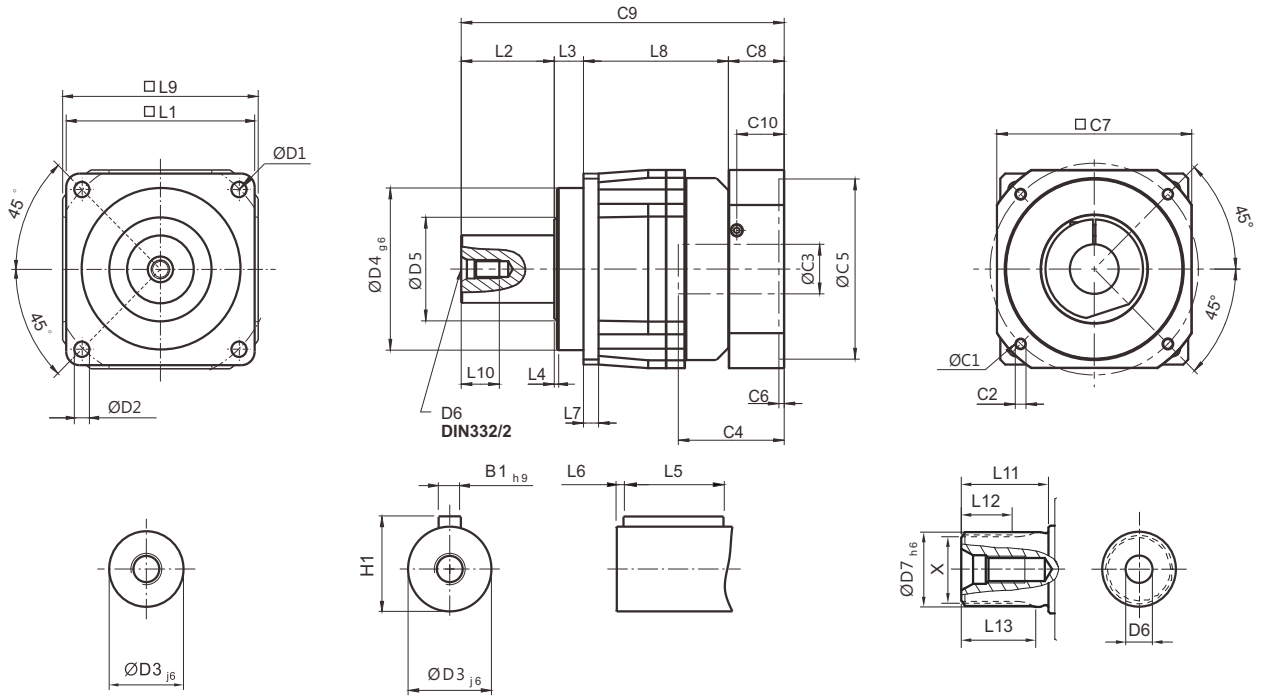
AF / AFR	042	060	075	100	140	180	220
Z2【mm】	31	66.5	88.7	96	114.2	138.7	127.1

Note : Applied to the output shaft center at 100 rpm.

Gearbox Inertia

Model No.		Stage	Ratio	AF042	AF060	AF060A	AF075	AF075A	AF100	AF100A	AF140	AF140A	AF180	AF220
Mass Moments of Inertia J_1	kg • cm^2	1	3	0.03	0.16	–	0.61	–	3.25	–	9.21	–	28.98	69.61
			4	0.03	0.14	–	0.48	–	2.74	–	7.54	–	23.67	54.37
			5	0.03	0.13	–	0.47	–	2.71	–	7.42	–	23.29	53.27
			6	0.03	0.13	–	0.45	–	2.65	–	7.25	–	22.75	51.72
			7	0.03	0.13	–	0.45	–	2.62	–	7.14	–	22.48	50.97
			8	0.03	0.13	–	0.44	–	2.58	–	7.07	–	22.59	50.84
			9	0.03	0.13	–	0.44	–	2.57	–	7.04	–	22.53	50.63
			10	0.03	0.13	–	0.44	–	2.57	–	7.03	–	22.51	50.56
		2	12	0.03	0.03	0.16	0.16	0.61	0.61	3.25	3.25	9.21	9.21	28.98
			15	0.03	0.03	0.13	0.13	0.47	0.47	2.71	2.71	7.42	7.42	23.29
			16	0.03	0.03	0.14	0.14	0.48	0.48	2.74	2.74	7.54	7.54	23.67
			20	0.03	0.03	0.13	0.13	0.47	0.47	2.71	2.71	7.42	7.42	23.29
			25	0.03	0.03	0.13	0.13	0.47	0.47	2.71	2.71	7.42	7.42	23.29
			28	0.03	0.03	0.14	0.14	0.48	0.48	2.74	2.74	7.54	7.54	23.67
			30	0.03	0.03	0.13	0.13	0.47	0.47	2.71	2.71	7.42	7.42	23.29
			32	0.03	0.03	0.14	0.14	0.48	0.48	2.74	2.74	7.54	7.54	23.67
			35	0.03	0.03	0.13	0.13	0.47	0.47	2.71	2.71	7.42	7.42	23.29
			40	0.03	0.03	0.13	0.13	0.47	0.47	2.71	2.71	7.42	7.42	23.29
			45	0.03	0.03	0.13	0.13	0.47	0.47	2.71	2.71	7.42	7.42	23.29
			50	0.03	0.03	0.13	0.13	0.44	0.44	2.57	2.57	7.03	7.03	22.51
			60	0.03	0.03	0.13	0.13	0.44	0.44	2.57	2.57	7.03	7.03	22.51
			70	0.03	0.03	0.13	0.13	0.44	0.44	2.57	2.57	7.03	7.03	22.51
			80	0.03	0.03	0.13	0.13	0.44	0.44	2.57	2.57	7.03	7.03	22.51
			90	0.03	0.03	0.13	0.13	0.44	0.44	2.57	2.57	7.03	7.03	22.51
			100	0.03	0.03	0.13	0.13	0.44	0.44	2.57	2.57	7.03	7.03	22.51

Dimensions (1-stage, Ratio i=3~10) / AF Series



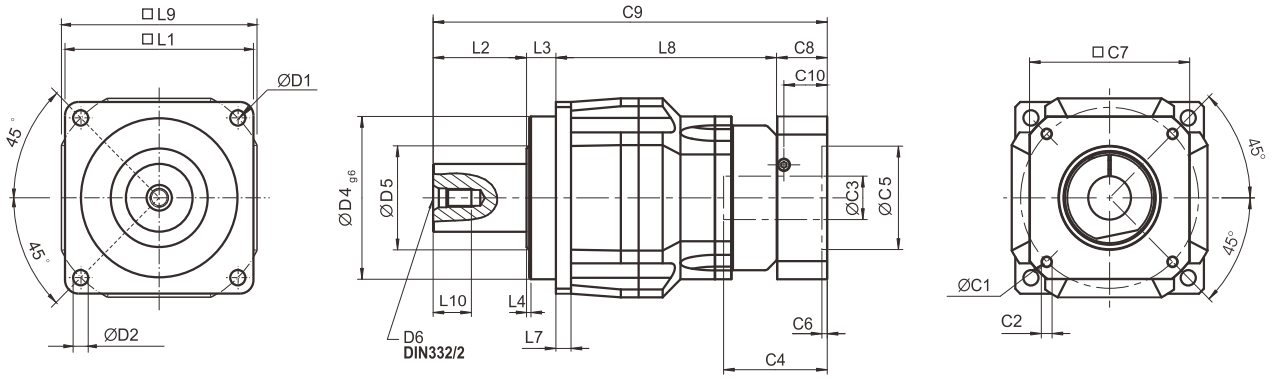
Shaft Option S1 **Shaft Option S2** **Shaft Option S3**

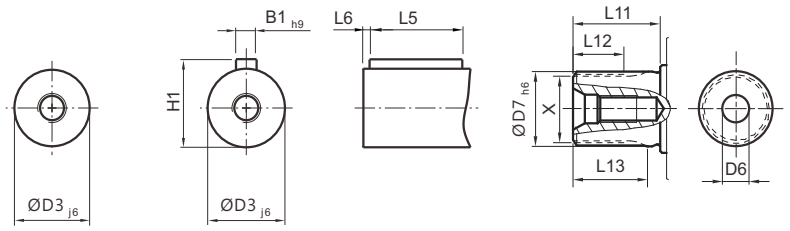
[unit: mm]

Dimension	AF042	AF060	AF075	AF100	AF140	AF180	AF220
D1	50	68	85	120	165	215	250
D2	3.4	5.5	6.8	9	11	13	17
D3 j6	13	16	22	32	40	55	75
D4 g6	35	60	70	90	130	160	180
D5	22	45	60	80	75	95	115
D6	M4 x 0.7P	M5 x 0.8P	M8 x 1.25P	M12 x 1.75P	M16 x 2P	M20 x 2.5P	M20 x 2.5P
D7 h6	-	16	22	32	40	55	75
L1	42	62	76	105	142	180	220
L2	19.5	28.5	36	58	82	82	105
L3	6.5	20	20	30	30	30	33
L4	1	1.5	2	2	3	3	3
L5	16	25	32	40	63	70	90
L6	2	2	3	5	5	6	7
L7	4	6	7	10	12	15	20
L8	31	54.5	86.5	89.5	110	150	163.5
L9	42	60	90	115	142	180	220
L10	10	12.5	19	28	36	42	42
L11	-	26	26	26	40	41.5	52
L12	-	15	15	15	20	21.5	28
L13	-	21	22.5	23	33.5	33.5	45
C1[1]	46	70	100	130	165	215	235
C2[1]	M4 x 0.7P	M5 x 0.8P	M6 x 1P	M8 x 1.25P	M10 x 1.5P	M12 x 1.75P	M12 x 1.75P
C3[1]	≤11 / ≤12[2]	≤14 / ≤16[2]	≤19 / ≤24[2]	≤32	≤38	≤48	≤55
C4[1]	25	34	40	50	60	85	116
C5[1]	30	50	80	110	130	180	200
C6[1]	3.5	8	4	5	6	6	6
C7[1]	42	60	90	115	142	190	220
C8[1]	29.5	19	17	19.5	22.5	29	63
C9[1]	86.5	122	159.5	197	244.5	291	364.5
C10[1]	8.75	13.5	10.75	13	15	20.75	53
B1 h9	5	5	6	10	12	16	20
H1	15	18	24.5	35	43	59	79.5
X DIN5480	-	W16x0.8x 30x18x6m	W22x1.25x 30x16x6m	W32x1.25x 30x24x6m	W40x2x 30x18x6m	W55x2x 30x26x6m	W70x2x 30x34x6m

1. C1~C10 are motor specific dimensions (metric std shown). Refer to www.apexdyna.com and Design Tool to view your specific motor mounting system.
2. AF042M1 ratio 5, 10 offers C3 ≤ 12 option; AF060M1 ratio 5, 10 offers C3 ≤ 16 option; AF075M1 offers C3 ≤ 24 option.

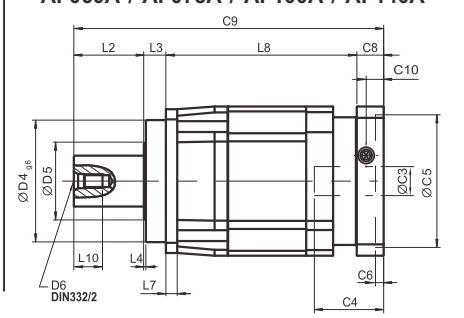
Dimensions (2-stage, Ratio i=12~100) / AF Series





Shaft Option S1 Shaft Option S2 Shaft Option S3

AF060A / AF075A / AF100A / AF140A



[unit: mm]

Dimension	AF042	AF060	AF060A	AF075	AF075A	AF100	AF100A	AF140	AF140A	AF180	AF220
D1	50	68		85		120		165		215	250
D2	3.4	5.5		6.8		9		11		13	17
D3 j6	13	16		22		32		40		55	75
D4 g6	35	60		70		90		130		160	180
D5	22	45		60		80		75		95	115
D6	M4x0.7P	M5 x 0.8P		M8 x 1.25P		M12 x 1.75P		M16 x 2P		M20x2.5P	M20x2.5P
D7	56	16		22		32		40		55	75
L1	42	62		76		105		142		180	220
L2	19.5	28.5		36		58		82		82	105
L3	6.5	20		20		30		30		30	33
L4	1	1.5		2		2		3		3	3
L5	16	25		32		40		63		70	90
L6	2	2		3		5		5		6	7
L7	4	6		7		10		12		15	20
L8	58.5	65.5	91.5	119.5	134.5	131	150.5	166.5	181.5	205.5	248
L9	42	60		90		115		142		180	220
L10	10	12.5		19		28		36		42	42
L11	-	26		26		26		40		41.5	52
L12	-	15		15		15		20		21.5	28
L13	-	21		22.5		23		33.5		33.5	45
C1[3]	46	46	70	70	100	100	130	130	165	165	215
C2[3]	M4x0.7P	M4x0.7P	M5 x 0.8P	M5 x 0.8P	M6 x 1P	M6 x 1P	M8x1.25P	M8x1.25P	M10x1.5P	M10x1.5P	M12x1.75P
C3[3]	≤11 / ≤12[4]	≤11 / ≤12[4]	≤14 / ≤16[4]	≤14 / ≤15.875 / ≤16[4]	≤19 / ≤24[4]	≤19 / ≤24[4]	≤32	≤32	≤38	≤38	≤48
C4[3]	25	25	34	34	40	40	50	50	60	60	85
C5[3]	30	30	50	50	80	80	110	110	130	130	180
C6[3]	3.5	3.5	8	8	4	4	5	5	6	6	6
C7[3]	42	42	60	60	90	90	115	115	142	142	190
C8[3]	29.5	29.5	19	19	17	17	19.5	19.5	22.5	22.5	29
C9[3]	114	143.5	159	194.5	207.5	207.5	258	298	316	340	415
C10[3]	8.75	8.75	13.5	13.5	10.75	10.75	13	13	15	15	20.75
B1 h9	5	5		6		10		12		16	20
H1	15	18		24.5		35		43		59	79.5
X DIN5480	-	W16x0.8x 30x18x6m		W22x1.25x 30x16x6m		W32x1.25x 30x24x6m		W40x2x 30x18x6m		W55x2x 30x26x6m	W70x2x 30x34x6m

3. C1~C10 are motor specific dimensions (metric std shown). Refer to www.apexdyna.com and Design Tool to view your specific motor mounting system.
4. AF042M1 offers C3 ≤ 12 option; AF060/A M1 offers C3 ≤ 12/16 option; AF075/A M1 offers C3 ≤ 16/24 option; AF075 M2 offers C3 ≤ 15.875 option. AF100M1 offers C3 ≤ 24 option.