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Kinco® Automation

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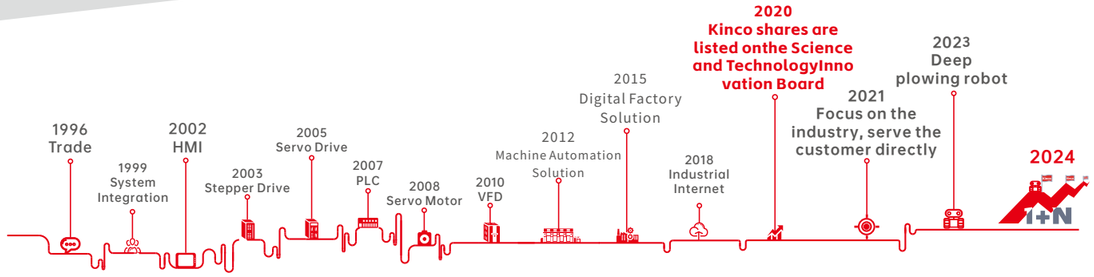
K1C57-2310

Kinco

Motion control servo system

Kinco frameless torque motor - FMC Series

About us



Kinco was founded in 1996, and successfully listed on the Shanghai Stock Exchange in 2020 (abbreviated name: Kinco share, stock code 688160), which is a high-tech, specialized and sophisticated enterprise that attaches great importance to independent research and development and innovation, mainly engaged in the research and development, production, sales and related technical services of industrial automation and robot core components and digital factory hardware and software. It is a leading supplier of automation control, robot power and digital factory solutions in China.

After years of continuous research and development and innovation, Kinco has established a complete product line with independent intellectual property rights, covering a series of products from machine iot to human-machine interaction, control, drive and execution, which are widely used in robots, medical equipment, logistics equipment, packaging equipment, food equipment, clothing equipment, environmental protection equipment, etc. New energy equipment, rail transit equipment and other automation equipment industry.

Based on the comprehensive industrial automation and digital technology platform, the company has in-depth application scenarios in the robot industry, providing display, control, drive and other multi-dimensional solutions for industrial mobile robots, collaborative robots, industrial robots, pan-service robots, and bionic robots. Through the insight of the industry pain points, deep links with robot customers, combined with the advantages of product research and development, the company continues to innovate, and launches industry-leading low-voltage servo products for mobile robots, integrated servo wheel, frameless torque motor for collaborative robots, robot human-machine interfaces, robot controllers and other products. The company has formed a relatively complete robot core parts capability, and after nearly 10 years of hard work in the robot industry, it has become a leading enterprise in the field of mobile robot low-voltage servo, and has a high brand influence in the industry.

Kinco has four research and development centers in Shanghai, Shenzhen, Changzhou and Chengdu, and two manufacturing bases in Shenzhen and Changzhou, a total of 10+ domestic marketing centers, 100+ domestic service providers, 40+ global partners, and products are exported to 70+ countries overseas. In terms of after-sales service, Kinco has established after-sales service centers in Shanghai, Shenzhen and Changzhou.

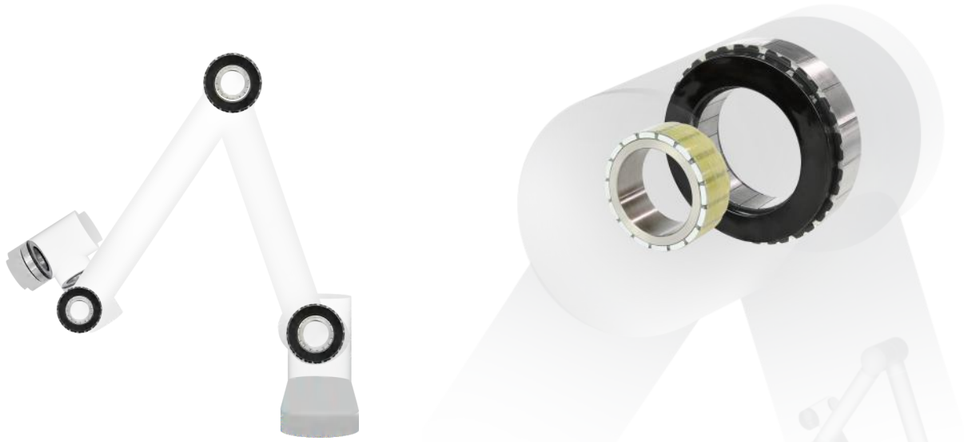
CONTENTS

Contents

FMC frameless torque motor

Frameless torque motors, unlike traditional servo motors, consist only of stator and rotor components. Compared to framed motors, frameless motors offer flexible configuration and easy installation. Considering the increasing trend of highly integrated drive systems, frameless motors better meet the expectations of engineers. Engineers no longer need to consider motor interfaces in system design, allowing for maximum reduction of space occupied by the power output unit in the drive system, leading to higher system integration.

Collaborative Robots



Advantages and Features of FMC Frameless Torque Motors

Independent research and development, with better performance compared to second-generation products：

- Slimmer body thanks to new lightweight design, providing faster and smoother motion as well as smaller size and lower temperature rise under same torque performance.
- Higher torque density achieved through optimization of electromagnetic solutions, with smaller cogging torque thanks to increased pole pairs.
- Easy replacement of mainstream foreign products thanks to compatiable product dimensions, also wide compatibility to common harmonic reducers in the market.
- Various frame sizes, larger hollow inner diameter to meet diverse threading requirements, covering loads of 3-25Kg.
- Customizable options: optional Hall sensors, temperature sensors, etc., with noticeable cost advantages.
- Digital factory for continuous and stable production, with multiple global / local distribution and offices providing support and services.

Model Description

FMC Frameless torque motor naming rules

FMC 085 15 - 0200 - 30 28 H - 5 D S X X - X X XX

Series name	
FM	Frameless Motor
C	C generation product
E	E generation product
H	H generation product
S	S generation product

Stator outer diameter
085：85mm
……

Stator lamination stack height
15：15mm
……

Rated power	
0005	5x10(w)
0010	10x10(w)
……	

Rated speed	
10	10x100(rpm)
20	20x100(rpm)
30	30x100(rpm)
……	

Rotor inner diameter
28：28mm
……

Sensor options (with or without Hall)	
H=Hall	With Hall
N=	Without Hall

No. of pole pairs	
5	5 pairs
8	8 pairs

Restructuring transaction code	
01	The first edition of the restructuring
……	

Restructuring code	
M	Only motor body part is modified
C	Only connection part is modified
T	Both motor body and connection part are modified

Reducer option	
G	Have reducer
N	No reducer

Temperature sensor	
0	No temperature sensor
1	PT1000 temperature sensor,Wire length100mm

Wire length, terminals, temperature sensor	
0	Wire length 100mm, no terminals
3	Wire length 300mm, no terminals
6	Wire length 600mm, no terminals
……	

Design version (including magnetic steel grade, certification)	
S	S version
K	K version

Supply voltage	
D	DC48V
L	AC220V
H	AC380V

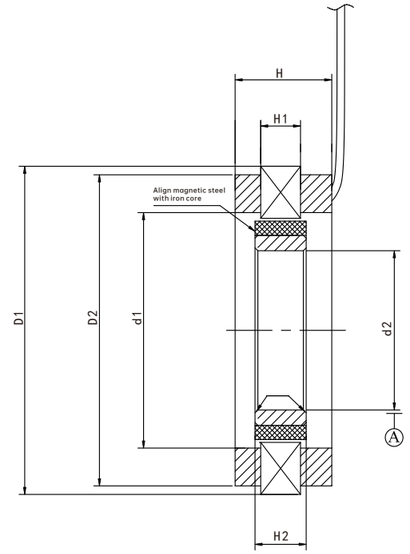
Note: Design version S stands for the 3rd generation electromagnetic design with high power density, design version K is the 2nd generation electromagnetic design.

Model (parameter) list

Model		FMC052XX	FMC057XX		FMC060XX		FMC076XX		FMC077XX	
Parameter	unit	13	07	14	13	21	12	28	12	30
Rated Power Pn	W	159	100	200	146	258	293	635	314	750
Rated Speed Nn	rpm	3790	3000	3000	3100	3790	3300	3790	3000	3000
Mechanical time constant τm	ms	1.127	1.83	1.47	0.9	1.36	2.4	1.3	1.45	1.25
Torque constant Kt	Nm/A	0.1014	0.132	0.132	0.117	1	0.14	0.114	0.132	0.129
Standstill Torque Ts	N.m	0.44	0.36	0.72	0.55	0.81	1.1	1.76	1.1	2.63

Model		FMC085XX	FMC091XX		FMC104XX		FMC127XX		FMC132XX
Parameter	unit	18	14	30	14	29	18	30	24
Rated Power Pn	W	565	630	1257	380	1050	904	1600	1180
Rated Speed Nn	rpm	3000	3000	3000	2420	2500	2400	2400	3220
Mechanical time constant τm	ms	1.38	1.39	0.93	1.6	1.09	1.46	1.14	0.801
Torque constant Kt	Nm/A	0.099	0.13	0.154	0.16	0.196	0.161	0.2	0.132
Standstill Torque Ts	N.m	2	2.2	4.4	2.2	4.4	4	7	3.85

Drawings (parameters) (unit:mm)



Frame (mm)	Stator		Coil		Rotor		Total height H
	Outside diameter D1	Iron core height H1	Outside diameter D2	Inside diameter d1	Inside diameter d2	Iron core height H2	
FMC052XX	52.1	13.5	50	30.1	19	15.5	23.9
FMC057XX	57.8	5	56.5	39.4	28	5.55	14.5
		7			27	9	17
		14				16	25
FMC060XX	60	13.5	58.5	40.5	30	17.27	22.7
		21	58		22	22	31.8
FMC068XX	68	5	64	46	34	6	17
		8				10	20.5
		13				17	26
		17				19	30
		26				28	40.5
FMC076XX	76	13	73.6	50.2	38	16.76	23
		28			28	30	41
FMC077XX	77	12	75	53	33	14	26
		30			35	31	44
FMC085XX	85	5	80	57	42.5	6	17.5
		8				10	19
		13				14	27.5
		18				20	34
		26				28	42
FMC091XX	91.5	14	89	63	46.7	16	28.5
		30				32	45
FMC0104XX	104	13.7	100.5	62.4	45	17.78	27.7
		14	101.5	72	55	16	28
		29			43	30	35.5
FMC0127XX	127	18	123	87	65	20	36
		30			57	32	48
FMC0132XX	132	24.2	129	82	57	29	41.1

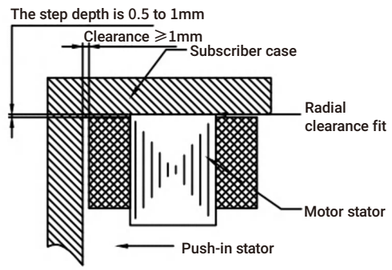
Mounting and installation guide

Kinco suggests the following options for installation of the frameless motors to realize the high performance, small space comsumption, high efficiency and serviceability desired by the user.

Stator Mounting Practices

Stator bonding

In most cases, motors may have the stator bonded in place using anaerobic, such as Loctite 638/648 or other similar adhesives. Adhesive bonding is a preferred and convenient installation technique for all stators, the user should consult the adhesive manufacturer for proper curing instructions (depends on the adhesive applied).
Following options for stator housing design and installaiton of the motor stator should be repected:
1. The stator enclosure housing should be designed as a cylindrial cup.
2. A small shoulder with radial depth of 0.5mm-1mm for axial positioning at one end of the stator housing should be designed.
3. The shoulder serves as a axial stop point for the stator bo bank against when inserted from the open end of the stator housing and should not use the stator winding lead-out end.
4. The clearance fit is adopted between stator outer diameter and the housing inner diameter. The user should consult the adhesive manufacturer's guidelines for proper housing inner diameter clearance design recommendations.
5. It is recommended to place additional adhesive grroves in the inner diameter of the housing to provide torsional strength for more reliable bonding.
6. Stator and housing surfaces should be cleaned thoroughly prior to bonding to ensure good adhesion.
7. Adhesive cure temperatures should not exceed 155°C to avoid damaging the motor stator.

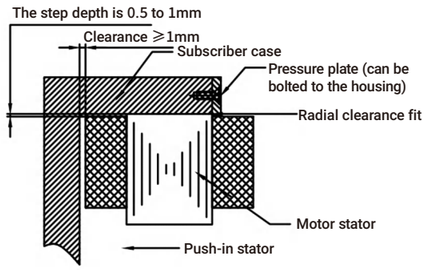


Stator shink Fit

In case adhesive is not preferred, a thermal shink fit technique for motor stator installation is recommended. Cold pressing should be avoid during installation. Extreme pressures will result in damage to the structure of stator laminations stack.
If desired, following options for stator housing design and installaiton of the motor stator should be repected:
1. The stator enclosure housing should be designed as a cylindrial cup.
2. The clearance fit is adopted between stator outer diameter and the housing inner diameter. The user should consider required pulling-out force with respect to appliations for proper housing inner diameter clearance design. Dissimilar thermal expansion coefficients (e.g. steel laminations vs. aluminum housing) should also be considered to ensure reliable holding strength across a board temperature range.

Stator clamping

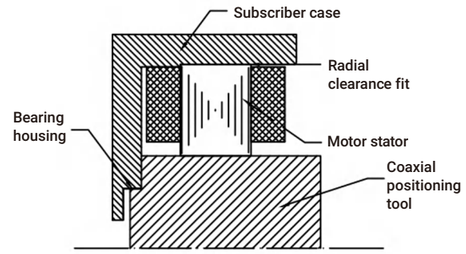
For applications where the torque range is small or the stator may need to be repeatedly installed and removed from the system, axial clamping may also be an acceptable option. Kinco does not recommend this technique in mass production where shock or vibration from motor operation is high and the clamping methods may fail.
If desired, following options for stator housing design and installaiton of the motor stator should be repected:
1. The stator enclosure housing should be designed as a cylindrial cup.
2. A small shoulder with radial depth of 0.5mm-1mm for axial positioning at one end of the stator housing should be designed.
3. The shoulder serves as a axial stop point for the stator bo bank against when inserted from the open end of the stator housing and should not use the stator winding lead-out end.
4. A clamping ring is needed is needed at the opposite end of the stator and bolted to the housing. The clamping ring should contact the stator with pressures designed according to the clamping forces needed in the applications.
5. The sliding fit between stator outer diameter and the housing inner diameter.



Mounting and installation guide

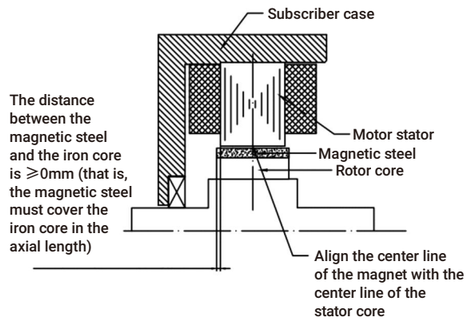
Important

All these three installation options are clearance fit between stator outer diameter and housing inner diameter during stator insertion and the radial running out tolearance in between will be presented as a result and therefore further create the running out tolerance between motor stator and rotor.
The axial alignment between stator inner diameter and rotor outer diameter must be maintained to ensure proper motor performance. It is recommended to have a common and stable axial basis when mounting the stator and rotor:
1. Set the stator housing case stop point or bearing chamber as the positioning basis.
2. Insert the rotor into the stator by using a custom installation fixture.



Rotor Mounting Practices

The rotor of a frameless motor generally consists of a ring shaped metal yoke with magnets equally placed around its outer surface with adhersive bonding technique. The user can install the rotor to a shaft by the inner bore of the metal ring for most applications. Generally the rotors can be installed by means of adhesive bonding or cold pressing techniques. Consider proper fit tolerance with repect to different installation option taken or applicaiton requirements.
To ensure proper motor performance, following specified mounting dimension principles must be respected:
1. Axial alignment must be maintained between rotor magnets and stator.
2. Or the dimension tolerance design should at least guarantee that the axial length of the rotor magnets can envelop the axial length of the stator lamination stack.



Important

Kinco FMC freamessless motors utilize high-performance rare earth magnets, the attracive forces between magnetized rotors and nearby stator steel lamination can be extremely powerful. Improper handling can result in unexpected impacts and can potentially damage the rotor fiber band layer.Following assembly process can be followed:
1. Insert the rotor into the position inside the stator by using a custom installation fixture to avoid rotor from sticking to the inner bore of the stator.
2. In case no custom fixture is available, user can install a thin layer of shim material (such as insulation film) in the inner bore of the stator, prior to inserting the rotor into the stator. Remove the shim material from the airgap between the rotor and stator after the installation.