TEST REPORT
IEC 60034-1
Rotating Electrical Machines – Part 1: Rating and Performance

Report Reference No. ..... :	4789799340
Date of issue ..... :	2021-12-22
Total number of pages, including attachments. ..... :	22
Testing Laboratory ..... :	Hiwin Mikrosystem Corp.
Address ..... :	6 Jingke Central Rd., Taichung Precision Machinery Park, Taichung, 40852 Taiwan
Applicant's name ..... :	Hiwin Mikrosystem Corp.
Address ..... :	6 Jingke Central Rd., Taichung Precision Machinery Park, Taichung, 40852 Taiwan
Test specification:	
Standard ..... :	☒ IEC 60034-1, Edition 12, 2010-02
Test procedure ..... :	Informative Test Report
Non-standard test method..... :	N/A
National Deviations..... :	
Test Report Form No. ..... :	
Test Report Form(s) Originator ..... :	UL LLC
Master TRF ..... :	
Test item description ..... :	Linear motors
Trade Mark ..... :	HIWIN®
Manufacturer ..... :	Hiwin Mikrosystem Corp.
Model/Type reference ..... :	LMFA24-P, LMFA41-P, LMFA43-P, LMFA44-P, LMFA64-P
Ratings ..... :	See Model List

Evaluated by..... :	Andy C. Wu	Andy C. Wu
	(printed name)	(signature)
Approved by ..... :	Andrew Yang	Andrew Yang
	(printed name)	(signature)

Summary of testing:

Tests performed (name of test and test clause):	Testing location:
1. Rating for equivalent loading / IEC 60034-1 CL5.2.6 **2.Thermal performance and tests / IEC60034-1 CL8** **3.Resistance of winding (cold) / IEC60034-1 CL9.1** **4. Withstand voltage test / IEC60034-1/CL 9.2 & IEC60204-1 CL 18.4** **5. Momentary excess torque (thrust) for motors / IEC60034-1 CL 9.4.3** **6. Insulation Resistance Tests / IEC60204-1 CL 18.3**	**Hiwin Mikrosystem Corp.** **6 Jingke Central Rd., Taichung Precision Machinery Park, Taichung, 40852 Taiwan** **Tested by:** **Win Ding Luo (Hiwin Mikrosystem Corp.)** **Witnessed by:** **Andy C. Wu (Underwriters Laboratories Taiwan Co., Ltd.)**
Summary of compliance with National Differences: These motors have been also evaluated for the requirements of EN 60034-1:2010/AC: 2010. See page No. 12.	

Test item particulars	:	LMFA24-P
Classification of installation and use	:	Linear motor
Supply Connection	:	A specified motor controller manufactured by: Hiwin Mikrosystem Corp., Model D1-N-90-S2-6-0-00, Input 220Vac,50/60Hz, 3 phases, 30 Arms, Output: 3-phase, 21Arms(continued), 63.6Arms(maximum).
	:	-
	:	-
Possible test case verdicts:		
- test case does not apply to the test object	:	N/A
- test object does meet the requirement	:	P (Pass)
- test object does not meet the requirement	:	F (Fail)
Testing	:	
Date of receipt of test item	:	2021-11-18
Date (s) of performance of tests	:	2021-11-18 ~ 2021-12-02

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.
Throughout this report a comma (point) is used as the decimal separator.

A verification of thermal conditions (normal and abnormal operation) as well as the protection against electric shock, ingress of solid foreign objects and water has to be done in conjunction with the appliance.

General product information:

These motors are designed for use with the intended drivers, manufactured by Hiwin Mikrosystem Corp., Model D1-N-90-S2-6-0-00, and the motors have PTC temperature sensor, which connect to drivers.

These motors have been evaluated as a component with the following Conditions of Acceptability when these components are employed in the end-use equipment:

1. The suitability of or need for an ultimate enclosure shall be determined in the end-use application.
2. The suitability of motor-mounting means, motor leads, strain relief, and lead terminations shall be investigated for each end-use application.
3. The slider has a metal base with grounding connection. The body of slider is made by epoxy potting compound.
4. Model LMFA24-P is used as a representative model for LMFA41-P, LMFA43-P, LMFA44-P, LMFA64-P by client declaration.

Model list:

	Symbol	Unit	LMFA24-P	LMFA41-P	LMFA43-P	LMFA44-P	LMFA64-P
Continuous force	Fc	N	819	495	1484	1979	3958
Continuous current	Ic	A(rms)	5.4	2.9	8.7	11.5	11.5
Continuous force(WC)	F_c	N	1638	990	2969	3958	7917
Continuous current(WC)	I_c	A (rms)	10.8	5.8	17.3	23.1	23.1
Peak force for 1 sec.	F_p	N	3104	2603	7810	10413	20827
Peak current for 1 sec.	I_p	A (rms)	33.5	17.9	53.5	71.6	71.3
Force constant	K_f	N/A (rms)	151.6	171.4	171.4	171.4	342.7
Attraction force	F_a	N	5036	5145	15435	20580	41160
Max. winding temp.	T_{max}	℃	120	120	120	120	120
Electrical time constant	K_e	ms	7.2	12	12	12	12
Resistance (line to line at 25℃)	R_{25}	Ω	6.2	6	2	1.5	3
Resistance (line to line at 120℃)	R_{120}	Ω	8.2	7.9	2.6	2	4
Inductance (line to line)	L	mH	44.6	72	24	18	36
Pole pair pitch	2τ	mm	30	46	46	46	46
Back emf constant(line to line)	K_v	Vrms/(m/s)	87.5	98.9	98.9	98.9	197.9
Motor constant(at 25℃)	Km	N/√W	49.7	57.1	98.9	114.2	161.6
Thermal resistance	R_{th}	℃/W	0.27	0.96	0.32	0.24	0.12
Thermal resistance (WC)	R_{th}	℃/W	0.07	0.24	0.08	0.06	0.03
Thermal time constant (WC)	T_{th}	s	150	150	150	150	150
Minimum flow rate	-	L/min	4	5.2	5.7	6.2	7.8
Temperature of cooling water	-	℃	20	20	20	20	20
Pressure drop	△P	bar	3.18	0.89	1.45	1.8	3
Thermal switch	-	-	1 x Pt1000 + 1 x (3 PTC SNM 120 In Series)				
Maximum velocity at maximum force	$v_{MAX,FMAX}$	m/s	2.21	2.61	2.61	2.61	1.12
Maximum electric power input	$P_{EL,MAX}$	W	20607	10598	31691	42393	53478
Maximum dissipated heat output	$Q_{P,H,MAX}$	W	1431	396	1187	1583	3166
Stall force(WC)	F_0	N	1146	693	2078	2771	5542
Stall current(WC)	I_0	A (rms)	7.6	4	12.1	16.2	16.2
Max. DC bus voltage	-	V	750	750	750	750	750
Mass of forcer	M_f	kg	10.4	9.5	23	29	56.2
Unit mass of stator	M_s	kg/m	9.8	22.3	22.3	22.3	40.1
Length of forcer / Dimension n	L_f	mm	460	214	536	697	697
Width of stator	W_s	mm	118	180	180	180	334
Length of stator/Dimension N	L_s	mm	120mm/N=2，180mm/N=3，300mm/N=5				184mm/N=4
Stator mounting distance	W_{s1}	mm	104	161	161	161	316
Total height	H	mm	50.5	66.1	66.1	66.1	66.1