



LVD TEST REPORT

EN 61800-5-1:2007/A11:2021

Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy

For

Shenzhen Rtelligent Technology Co.,Ltd

B301Room 301,B Building,Zhuangbian Industrial park,Nanchang Road,Gushu,Baoan District,Shenzhen,Guangdong China

Model: R86, R86Mini, R86-IO, R86-IR, R85, DM860, DM860H, 3R86, T42, T60, T60PLUS, T86, DS86

2022-06-17

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: Stepper Servo Drives/Microstep Drives
Test Engineer:	Eric Tao/ 
Report Number:	TH2206052-C23-R01
Test Date:	2022-06-05 to 2022-06-17 
Reviewed By:	Prince Huang/ 
Approved By:	Prince Huang/ 
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of Shenzhen Tian Hai Test Technology Co.,Ltd.



TEST REPORT

EN 61800-5-1:2007/A11:2021

Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy

Report	
Report reference No.	: TH2206052-C23-R01
Tested by (signature)	: Eric Tao
Reviewed By (signature)	: Prince Huang
Approved By (signature)	: Prince Huang
Date of issue	: 2022-06-17
Testing laboratory	
Name	: Shenzhen Tian Hai Test Technology Co.,Ltd.
Address	: 4F, A3 BLDG, The Silicon Valley Power intelligent terminal industrial park, Guanlan street, Longhua district, Shenzhen
Client	
Applicant's Name	: Shenzhen Rtelligent Technology Co.,Ltd
Address	: B301Room 301,B Building,Zhuangbian Industrial park,Nanchang Road,Gushu,Baoan District,Shenzhen,Guangdong China
Manufacturer	: Shenzhen Rtelligent Technology Co.,Ltd
Address	: B301Room 301,B Building,Zhuangbian Industrial park,Nanchang Road,Gushu,Baoan District,Shenzhen,Guangdong China
Test specification	
Standard	: EN 61800-5-1:2007/A11:2021
Non-standard test method	: N.A.
Test item	
Description	: Stepper Servo Drives/Microstep Drives
Trade mark	: /
Series model No.	: R86, R86Mini, R86-IO, R86-IR, R85, DM860, DM860H, 3R86, T42, T60, T60PLUS, T86, DS86
Rating(s)	: DC48V 3A 150W
Note	: All tests on model R86.





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Clause	Requirement – Test	Result - Remark	Verdict
4	protection against electric shock, thermal, and energy hazards		P
4.1	General	See below	P
	Hazard and risk assessment	See below	P
4.2	Protection against electric shock		P
4.2.1	Decisive voltage class	See table 4.2.1	P
4.2.1.1	Use of decisive voltage class	See below	P
4.2.1.2	Circuit evaluation	Circuit evaluated by three cases of waveforms	P
4.2.1.2.1	General		P
4.2.1.2.2	AC working voltage		N/A
4.2.1.2.3	DC working voltage	DC working voltage Class A : work voltage 23.9Vdc<60Vdc for control circuit Class B: work voltage V< 120Vdc Class C: work voltage 601Vdc<1500Vdc for generatrix circuit	P
4.2.1.2.4	Pulsating working voltage	Pulsating working voltage Class A : work voltage ---V<42.4Vpeak Class B: work voltage ---V<71Vpeak Class C: work voltage 448Vrms /625Vpeak<4500Vpeak for output circuit	P
4.2.2	Protective Separation	Protective separation used for between ELV and other circuits	P
4.2.3	Protection against direct contact	Comply with the requirements	P
4.2.3.1	General		P
4.2.3.2	Protection by means of insulation of live parts	Basic insulation used between accessible parts conductive and live parts, and then connected to protective bonding	P
4.2.3.3	Protection by means of insulation of live parts	Protection by metal enclosures, at least IP2X used The top surface at least IP3X used.	P
4.2.4	Protection in case of direct contact	Comply with the requirements	P



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Clause	Requirement – Test	Result - Remark	Verdict
4.2.4.1	General	See below	P
4.2.4.2	Protection by means of extra-low voltage	SELV used No direct contact and reinforced insulation used for between SELV and other circuits	P
4.2.4.3	Protection by means of protective impedance		N/A
4.2.4.4	Protection by means of using limited voltage		N/A
4.2.5	Protection against indirect contact	Comply with the requirements	P
4.2.5.1	General	Class III	P
4.2.5.2	Insulation between live parts and exposed conductive parts	No exposed conductive parts used Reinforced insulation used for between live parts and exposed nonconductive parts and then clearances>3.0mm	N/A
4.2.5.3	Protective bonding circuit		N/A
4.2.5.4	Means of connection for the protective conductor		N/A
4.2.5.4.1	General		N/A
4.2.5.4.2	Connection under high leakage current		N/A
4.2.5.5	Special features in equipment for protection class II	Class III equipment	N/A
4.2.6	Insulation	See below	P
4.2.6.1	General	Comply with the requirements	P
4.2.6.2	Pollution degree	Pollution degree 2	P
4.2.6.3	Overvoltage Category		N/A
4.2.6.4	Supply earthing systems		N/A
4.2.6.3	Insulation to the surroundings	Comply with the requirements	P
4.2.6.3.1	General	For creepage distance, the r.m.s.value of the working voltage is used; for clearance distances and solid insulation, the recurring peak value is used. system voltage is 300V The impulse voltage is 2500V	P
4.2.6.3.2	Circuits energized directly from the supply mains	No circuits energized directly from the supply mains	N/A
4.2.6.3.3	Circuits not energized directly from the mains	Insulation designed according to the impulse voltage, or the working voltage Overvoltage Category II	P
4.2.6.3.4	Insulation between circuits	Designed according to more severe requirements	P



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Clause	Requirement – Test	Result - Remark	Verdict
4.2.6.5	Insulation voltages	system voltage is 300V The impulse voltage is 2500V	P
4.2.6.6	Clearance distances		N/A
4.2.6.6.1	Determination		N/A
4.2.6.6.2	Field homogeneity		N/A
4.2.6.6.3	Clearance to conductive enclosures		N/A
4.2.6.7	Creepage distance		N/A
4.2.6.7.1	General		N/A
4.2.6.7.2	Voltage		N/A
4.2.6.7.3	Materials		N/A
4.2.6.8	Coating		P
4.2.6.9	Testing in lieu of spacings		P
4.2.7	Solid insulation		N/A
4.2.7.1	General		N/A
4.2.7.2	Requirements for electrical withstand capability		N/A
4.2.7.2.1	Basic- and Supplementary Insulation		N/A
4.2.7.2.2	Double- and Reinforced Insulation		N/A
4.2.7.3	Thin sheet material		N/A
4.2.7.4	Printed wiring boards		N/A
4.2.7.5	Wound components		N/A
4.2.7.6	Potting materials etc.		N/A
4.2.8	Enclosures		P
4.2.8.1	General	Metal enclosure	P
4.2.8.2	Cast metal		N/A
4.2.8.3	Sheet metal		P
4.2.9	Wiring and Connections	See below	P
4.2.9.1	General	No mechanical damage and comply with relevant standard, See table: list of critical components	P
4.2.9.2	Routing	Comply with the requirements	P
4.2.9.3	Color coding		N/A
4.2.9.4	Splices and connections	All splices connection is mechanically secure No wire-binding screw used	P
4.2.9.5	SELV and PELV connections	Comply with the requirements Label and sign indication	P



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Clause	Requirement – Test	Result - Remark	Verdict
		Noninterchangeability terminals and terminations	
4.2.9.6	Interconnections between parts of the PDS	Comply with the requirements Rubber bushing used for protective cable damaged	P
4.2.9.7	Supply connections	No loosen hazard	P
4.2.9.8	Terminals	Using terminals complying with IEC 60947-7-1 or IEC 60947-7-2	P
4.2.9.8.1	Construction requirements	Comply with the requirements	P
4.2.9.8.2	Connecting capacity	Comply with the requirements The terminals meet the temperature rise test of clause 5.2.3.9	P
4.2.9.8.3	Connection	Terminals for connection to external conductors is accessible during installation, no clamping screws and nuts serve to fix any other component	
4.2.9.8.4	Wire bending space for wires 10 mm ² and greater	Comply with the requirements	N/A
4.2.10	Short Circuit Requirements	See clause 5.2.3.6	P
4.2.11	RCD Compatibility		N/A
4.2.12	Capacitor Discharge	60V within 5s after the removal of power See clause 5.2.3.7	P
4.2.13	Access conditions for high voltage product		N/A
4.3	Protection against thermal hazards	See below	P
4.3.1	Minimising the risk of ignition	Comply with the requirements	P
4.3.2	Insulation Materials	Insulation materials comply with relevant standard See table: list of critical components The insulating material comply with the glow-wire test described in 5.2.5.3 at a test temperature of 850 °C. The insulating material have a CTI of 100 or greater.	P
4.3.3	Flammability of enclosure materials	Metal enclosure used	N/A
4.3.4	Temperature limits	Comply with the requirements	P
4.3.4.1	Internal parts		P
4.3.4.1.1	External parts		P
4.4	Protection against energy hazards	See below	P
4.4.1	Electrical energy hazards	No such hazards	P
4.4.2	Mechanical energy hazards	No such hazards	P



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Clause	Requirement – Test	Result - Remark	Verdict
4.4.2.1	General	See below	P
4.4.2.2	Critical torsional speed	See instruction	P
4.4.2.3	Transient torque analysis	See instruction	P
4.4.3	Acoustic noise emission		N/A
5	Test Requirements		P
5.1	General		P
5.1.1	Type testing		P
5.1.2	Earthing Conditions		N/A
5.1.3	Compliance	Comply with the requirements	P
5.1.4	Test Overview	EUT tested according to type test	P
5.2	Test specifications		P
5.2.1	Visual Inspections (type test)		P
5.2.2	Mechanical tests	See below	P
5.2.2.1	Clearance and creepage distance (type test)	See table: 4.2.6.6 and 4.2.6.7	N/A
5.2.2.2	PWB abnormal operation test (type test)	PWB comply with relevant standard	P
5.2.2.3	Non -accesssibility test (type test)		P
5.2.2.4	Enclosure integrity test (type test)		P
5.2.2.5	Deformation tests	Comply with the requirements	P
5.2.2.5.1	General		P
5.2.2.5.2	Deflection test (type test)	250N for 5s, no damage	P
5.2.2.5.3	Impact test (type test)	A solid smooth steel sphere of 500g, 50mm in diameter applied, no damage	P
5.2.3	Electrical tests	Comply with the requirements See table 5.2.3	P
5.2.3.1	Impulse voltage test (type test)		N/A
5.2.3.2	AC or DC voltage test (type and routine test)	See table 5.2.3.2	P
5.2.3.2.2	Value and type of test voltage	Test circuits connected directly to the mains 1500V for basic insulation, 3000V for supplementary damage and reinforced insulation	P
5.2.3.2.3	Performing the voltage test	See table 5.2.3.2	P
5.2.3.2.4	Duration of the AC or DC voltage test	60s	P
5.2.3.2.5	Verification of the AC or DC voltage test	No breakdown occurs	P



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Clause	Requirement – Test	Result - Remark	Verdict
5.2.3.3	Partial Discharge Test (type, sample or special test)		N/A
5.2.3.4	Protective impedance (type test and routine test)	See clause 4.2.4.3	N/A
5.2.3.5	Leakage current measurement (type test)	See table 5.2.3.5	P
5.2.3.6	Short circuit test	See below	P
5.2.3.6.1	General		P
5.2.3.6.2	Power outputs (type test)	See table 5.2.3.6	P
5.2.3.6.3	Auxiliary circuits (type or special test)	See table 5.2.3.8	N/A
5.2.3.7	Capacitor discharge (type test)	60V after 5s See table 5.2.3.7	P
5.2.3.8	Breakdown of Components test (type test)	See table 5.2.3.8	P
5.2.3.9	Temperature rise test (type test)	See table 5.2.3.9	P
5.2.3.10	Protective bounding (type test and routine test)	See table 5.2.3.10	N/A
5.2.4	Abnormal operation tests	See below	P
5.2.4.1	General		P
5.2.4.2	Single phasing (type test)		N/A
5.2.4.3	Inoperative blower motor (type test)	Inoperated blower motor . See table 5.2.4.3	P
5.2.4.4	Clogged filter (type test)	No clogged filter See table 5.2.4.4	P
5.2.5	Material tests	Materials comply with relevant standard	P
5.2.5.1	High current arcing ignition test (type test)		P
5.2.5.2	End-product arc resistance test (type test)		P
5.2.5.3	Glow-wire test (type test)		N/A
5.2.5.4	Hot wire ignition test (type test - alternative to glowwire test)	HWI=3	P
5.2.5.5	Flammability test (type test)	UL94-5VA/VB	P
6	Information and marking requirements		P
6.1	General	See below	P
6.2	Information for selection	See intruction	P
	Name of manufacturer, supplier or importer	See page 2	P
	Model:	See page 2	P



EN 61800-5-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Voltage, current and power rating for input		P
	Voltage, current and power rating for output		P
	Short circuit rating	150% of rated output current /1min 180% of rated output current /10s 200% of rated output current /0.5s	P
	Short circuit designation	150% of rated output current /1min 180% of rated output current /10s 200% of rated output current /0.5s	P
	Operating and storage environment	-10°C-40°C,humidity 5%-95% -40°C-+70°C	P
	Reverence to relevant standards	EN 61800-5-1:2007/A1:2017/A1:2017 See instruction	P
	Serial No. or year of fabrication	Marked on product	P
	Reverence to instructions for installation, use and maintenance	See instruction	P
6.3	Information for installing and commissioning	See below	P
6.3.1	General	See instruction	P
6.3.2	Mechanical considerations	See instruction	P
6.3.3	Environment	-10°C-40°C,humidity 5%-95%	P
6.3.4	Handling and mounting	See instruction	P
6.3.5	Motor and driven equipment	See instruction	P
6.3.5.1	General	See instruction	P
6.3.5.2	Motor selection		P
6.3.5.3	Motor integrated sensors		P
6.3.5.4	Critical torsional speeds		P
6.3.5.5	Transient torque analysis		P
6.3.6	Connections	See instruction	P
6.3.6.1	General	See instruction	P
6.3.6.2	Interconnection and wiring diagrams		P



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Clause	Requirement – Test	Result - Remark	Verdict
6.3.6.3	Conductor (cable) selection		P
6.3.6.4	Terminal capacity and identification		P
6.3.6.5	Protection requirements		P
6.3.6.6	Interface	Comply with the requirements	P
6.3.6.7	Earthing		N/A
6.3.6.8	Earth leakage current		N/A
6.3.6.9	Special requirements		N/A
6.3.7	Supply (overcurrent) protectio	See instruction	P
6.3.8	Overload protection		N/A
6.3.9	Commissioning	Comply with the requirements	P
6.3.9.1	General	See instruction	P
6.3.9.2	Commissioning record	See instruction	P
6.4	Information for use		P
6.4.1	General	See instruction	P
6.4.2	Adjustment		P
6.4.3	Special provisions		N/A
6.4.4	Labels, signs and signals		P
6.4.4.1	General	See instruction	P
6.4.4.2	Power isolators		N/A
6.4.4.3	Visual and audible signals		P
6.4.4.4	Hot surface	No exceed temperature limits	P
6.4.4.5	Equipment marking	See instruction and marking	P
6.5	Information for maintenance	See instruction	P
6.5.1	General	See instruction	P
6.5.2	Maintenance manual	See instruction	P
6.5.3	Capacitor discharge		P
6.5.4	Auto restart/bypass connection		N/A



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Clause	Requirement – Test	Result - Remark	Verdict

6.5.5	PT/CT connections		N/A
6.5.6	Other hazards		P

Annex A	Examples of protection in case of direct contact	Considered	P
Annex B	Safety signs and symbols	Considered	P
Annex C	Measurement of clearance and creepage distances	Considered	P
Annex D	Cross sections of round conductors	Considered	P
Annex E	Fault current waveforms	Considered	P

4.2.1	Table: Decisive voltage class (in normal conditions)					P
Location of between	Circuit type	Decisive voltage class	Work voltage (measured)	Work Voltage (limited)	Condition/status	
Input circuit	--	Class A	DC48V	<DC48V	DC48V	P

4.2.6.6 and 4.2.6.7	TABLE: clearance and creepage distance measurements					N/A
clearance cl and creepage distance dcr at/of:	Work voltage U Vr.m.s./Vpeak	required cl (mm)	cl (mm) measured	Required dcr (mm)	Dcr(mm) measured	
--	--	--	--	--	--	
*), B=Basic, S=Supplementary and R=Reinforced						

5.2.3.1 5.2.3.2 5.2.3.3	TABLE: Impulse test AC or DC voltage test Partial Discharge Test				P
Test voltage applied between:	Voltage (V)				Breakdown (Yes/No)
Test voltage applied between:	test voltage (V)	impulse withstand voltage (V)	Part discharge extinction voltage(V)		Result
Exposed conductive part (connected to earth)--> each circuit sequentially R/S/T and U/V/W and +/PB/+ pin	1500a.c.r.m.s/2 120d.c/5s (B)	--	--		No



Accessible surface (non conductive or conductive but not connected to earth)- each circuit sequentially R/S/T and U/V/W and +/PB/+ pin	3000a.c.r.m.s/4 240d.c/5s (R)	--	--	No
PELV or SELV decisive voltage class A Circuit each adjacent circuit sequentially R/S/T and U/V/W and +/PB/+ pin	3000a.c.r.m. s/4240d.c/5s(R)	--	--	No
Between primary and secondary of transformer	3000a.c.r.m.s/4 240d.c/5s(R)	--	--	No
*), B=Basic, S=Supplementary and R=Reinforced				

5.2.3.5	TABLE: Leakage current			P
	Three phase system shall be operated at rated voltage and connected motor with unloaded	--		--
	Without any connection to the earth	--		--
Leakage current between		I (mA)	Max. allowed I (mA)	
Input --accessible enclosure		0.26	3.5mA ac or 10mA dc	
SELV Circuit -- accessible enclosure		0.05	3.5mA ac or 10mA dc	
For appliances intended to be connected in star connection only, the neutral is not connected				

5.2.3.7	Table: Capacitor discharge			P
	1	2	3	Limited Value
Circuit type	input circuit	output circuit	Generatrix circuit	--
Measure voltage(Vrms	48V/31.3ms	48V/31.3ms	60V/4.9s	<60V within 5s after the removal of power

5.2.3.9	TABLE: Temperature rise test			P
	Test voltage (V)	400Vac/50Hz	--	
	Ambient Temp (°C): Test before: 25.0	--	--	
Thermocouple locations		T (°C)	Max. T (°C)	
PWB' s for main board output		47.1	130°C	
PWB' s for main board input		43.9	130°C	
PWB' s for control board		52.3	130°C	
PWB' s for main board		49.8	130°C	
User terminals		41.3	<Cable rating T +15°C	



Note: the PDS is to be tested with at least 1,2 m of wire attached to each user terminal
Test until steady condition- temperature change not more than 1°C/hour

5.2.3.10	TABLE: Protective bonding		N/A
	A current of 25 A ,from a source having a maximum no-load voltage of 60 V d.c	25A/60Vdc	--
	The current should run until steady state conditions are reached	--	--
Protective bonding resistance between		R(Ω)	Max. allowed R(Ω)
--		--	--



Appendix for EUT PHOTOGRAPHS



